Naval Facilities Engineering Systems Command Southwest
BRAC PMO West, San Diego, California

Final

Fifth Five-Year Review Report

Hunters Point Naval Shipyard
San Francisco, California

July 2024

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San Francisco, California

July 2024

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Fifth Five-Year Review Report

Hunters Point Naval Shipyard,
San Francisco, California

July 2024

This report documents the Fifth Five-Year Review for the Hunters Point Naval Shipyard that includes Installation Restoration (IR) Sites 7 and 18, and Parcels B-1, B-2, C, D-1, D-2, E, E-2, G, UC-1, UC-2, and UC-3 as required by the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) in accordance with CERCLA § 121(c), as amended, and the National Oil and Hazardous Substances Pollution Contingency Plan, Part 300.430(f)(4)(ii) of the Code of Federal Regulations.

Approved by:

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Michael Pound — Date
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Acronyms and Abbreviations

µg/L	microgram(s) per liter
AFFF	aqueous film-forming foam
Am-241	americium-241
AOMSR	Annual Operation and Maintenance Summary Report
ARAR	applicable or relevant and appropriate requirement
ARIC	area requiring institutional controls
ATC	active treatment criterion
BCT	BRAC Cleanup Team
BCY	bank cubic yard(s)
BERA	Baseline Ecological Risk Assessment
BGMP	Basewide Groundwater Monitoring Program
bgs	below ground surface
BRAC	Base Realignment and Closure
BTAG	Biological Technical Assistance Group
CDPH	California Department of Public Health
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
cis-1,2-DCE	cis-1,2-dichloroethene
cm^2	square centimeter(s)
Co-60	cobalt-60
COC	chemical of concern
COEC	chemical of ecological concern
COPC	chemical of potential concern
Cs-137	cesium-137
CVOC	chlorinated volatile organic compound
1,2-DCE	1,2-dichloroethene
DBR	Design Basis Report
DTSC	California Department of Toxic Substances Control
EcoSSL	ecological soil screening level
ERA	ecological risk assessment
ERM	effects range median
ESD	Explanation of Significant Differences
F-WBZ	fractured water-bearing zone

FFA	Federal Facilities Agreement
FS	Feasibility Study
FSS	final status survey
GCCS	gas control and collection system
HGAL	Hunters Point groundwater ambient level
HHRA	human health risk assessment
HPNS	Hunters Point Naval Shipyard
HRA	Historical Radiological Assessment
IC	institutional control
IR	Installation Restoration
IRIS	Integrated Risk Information System
ISB	in situ biodegradation
ISS	in situ stabilization
K-40	potassium-40
LLRW	low-level radioactive waste
LNAPL	light nonaqueous phase liquid
LTM	long-term monitoring
LUC	land use control
MARSSIM	Multi-Agency Radiation Survey and Site Investigation Manual
MCL	maximum contaminant level
MLLW	mean lower low water
MNA	monitored natural attenuation
MNR	monitored natural recovery
msl	mean sea level
NAPL	nonaqueous phase liquid
NAVFAC	Naval Facilities Engineering Systems Command
Navy	Department of the Navy
NMOC	non-methane organic compound
NPL	National Priorities List
NRDL	Naval Radiological Defense Laboratory
NRWQC	National Recommended Water Quality Criteria
O&M	operations and maintenance
OCII	Office of Community Investment and Infrastructure
PA	preliminary assessment

PAH	polycyclic aromatic hydrocarbon
PAL	project action limit
PCB	polychlorinated biphenyl
PCE	tetrachloroethene
PFAS	per- and polyfluoroalkyl substances
PFBS	perfluorobutane sulfonate
PFHxS	perfluorohexanesulfonic acid
PFNA	perfluorononanoic acid
PFOA	perfluorooctanoic acid
PFOS	perfluorooctane sulfonate
PMO	Program Management Office
PPRTV	Provisional Peer-reviewed Toxicity Values
PQL	practical quantitation limit
PRG	Preliminary Remediation Goal
Pu-239	plutonium-239
RA	remedial action
Ra-226	radium-226
RACR	Remedial Action Completion Report
RAMP	Remedial Action Monitoring Plan
RAMR	Remedial Action Monitoring Report
RAO	remedial action objective
RAWP	Remedial Action Work Plan
RD	remedial design
Regional Water Board	California Regional Water Quality Control Board, San Francisco Bay Region
RG	remediation goal
RI	Remedial Investigation
RMP	Risk Management Plan
RO	radiological object
ROC	radionuclide of concern
ROD	Record of Decision
RSL	Regional Screening Level
RSRS	Radiological Survey and Remedial Services
RU	remedial unit

SGAL	soil gas action level
SI	site inspection
SL	screening level
SLERA	screening-level ecological risk assessment
SLR	sea level rise
Sr-90	strontium-90
SVE	soil vapor extraction
SVOC	semivolatile organic compound
SWRCB	State Water Resources Control Board
TCE	trichloroethene
TCR	Toxicity Criteria Rule
TCRA	time-critical removal action
Th-232	thorium-232
TL	trigger level
TPH	total petroleum hydrocarbons
Triple A	Triple A Machine Shop, Inc.
TRV	toxicity reference value
U-235	uranium-235
UCL	upper confidence limit
UCSF	University of California San Francisco
USEPA	United States Environmental Protection Agency
UU/UE	unlimited use and unrestricted exposure
VC	vinyl chloride
VISL	vapor intrusion screening level
VOC	volatile organic compound
ZVI	zero-valent iron

Executive Summary

The Department of the Navy conducted this Five-Year Review for Hunters Point Naval Shipyard (HPNS) in San Francisco, California, as required by the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA). The Five-Year Review was conducted in accordance with CERCLA §121I, as amended by the Superfund Amendments and Reauthorization Act, and the National Oil and Hazardous Substances Pollution Contingency Plan, Part 300.430(f)(4)(ii) of the Code of Federal Regulations. In addition, the Five-Year Review was conducted in accordance with the following documents:

- *Comprehensive Five-Year Review Guidance* (USEPA, 2001) and supplements (USEPA, 2012a, 2012b, 2016)
- *Navy/Marine Corps Policy for Conducting Comprehensive Environmental Response, Compensation, and Liability Act Five-Year Reviews* (Navy, 2011b)
- *Toolkit for Preparing Five-Year Reviews* (NAVFAC, 2013)
- *Defense Environmental Restoration Program (DERP) Management Manual Number 4715.20* (DoD, 2018)
- *Department of the Navy Environmental Restoration Program Manual* (Navy, 2018b)

This report summarizes the evaluation of remedies that resulted in hazardous substances, pollutants, or contaminants remaining at sites above levels that allow for unlimited use and unrestricted exposure (UU/UE), and for which there is a final Record of Decision (ROD). A ROD requiring a Five-Year Review has been finalized for the following HPNS parcels and sites:

- Former Parcel B (composed of Installation Restoration [IR] Sites 7 and 18 [IR-07/18] and Parcels B-1 and B-2)
- Former Parcel C (composed of Parcels C and UC-2)
- Former Parcel D (composed of Parcels D-1, D-2, UC-1, and G)
- Former Parcel E (composed of Parcels E, E-2, and UC-3)

This is the Fifth Five-Year Review at HPNS. The objective of this Five-Year Review is to evaluate the selected remedies at these sites and parcels and determine whether the remedies remain protective of human health and the environment in accordance with the requirements set forth in each of the RODs. The principal method used to evaluate the protectiveness of the remedies was a review of documents pertaining to site activities, analytical data, and findings. The methods, findings, and conclusions from the document reviews are presented in this Five-Year Review Report. This report is intended to identify issues that may prevent a particular remedy from functioning as designed, which could affect the protection of human health and the environment should exposure occur. In addition, this report presents a screening level Climate Resilience Assessment to address potential future effects of climate change on the selected remedies. The overall evaluations of the effectiveness of each remedy are presented as protectiveness statements in the Five-Year Review Summary Form provided on the following page. Based on this Fifth Five-Year Review, the remedy at IR-07/18 is Protective, the remedies at Parcels B-1, UC-2, D-1, D-2, UC-1, G, and UC-3 are Short-Term Protective because there are no current uncontrolled exposures, the remedies at Parcels E and E-2 will be protective upon completion of remedy construction, and protectiveness is deferred for Parcel B-2 because there is uncertainty related to the concentrations of mercury discharging to the bay from

Parcel B-2, IR-26 groundwater, and Parcel C because there is uncertainty related to the hydrogeologic communication between the A- and B-aquifers and whether discharge of chemicals present in the B-aquifer present potential unacceptable risks to bay receptors.

The Five-Year Review Summary Form, which provides a summary of issues, recommendations, and protectiveness statements for each site evaluated in this Five-Year Review, is provided herein. The period under review is December 1, 2018, to November 1, 2023.

Five-Year Review Summary Form

SITE IDENTIFICATION		
Site name: Hunters Point Naval Shipyard		
USEPA ID: CA1170090087		
Region: 9	**State:** California	**City/County:** San Francisco/San Francisco
SITE STATUS		
NPL status: Final		
Multiple OUs? Yes		Has the site achieved construction completion? No
REVIEW STATUS		
Lead agency: Other Federal Agency If "Other Federal Agency" was selected above, enter Agency name: Department of the Navy		
Author name (Federal or State Project Manager): Naval Facilities Engineering Systems Command (NAVFAC), Base Realignment and Closure (BRAC) Program Management Office (PMO) West		
Review period [Time to complete the Five-Year Review]: October 1, 2022 – November 1, 2023		
Date of site inspection: February 9, 2023, January 23, 2024		
Type of review: Statutory		
Review number: 5		
Triggering action date: 7/31/2019 (signature date of Fourth Five-Year Review)		
Due date (5 years after triggering action date): 7/31/2024		

The following pages summarize issues, recommendations, other findings, and protectiveness statements for each Five-Year Review site.

ISSUES/RECOMMENDATIONS

Sites without Issues/Recommendations Affecting Protectiveness Identified in the Five-Year Review:

• IR-07/18 • Parcel E	• Parcel E-2

Issues and Recommendations Identified in the Five-Year Review:

Site: Parcels B-1, B-2, C, D-1, D-2, UC-1, UC-2, UC-3, G	Issue Category: Remedy Performance			
	Issue: As identified in the Fourth Five-Year Review, there is uncertainty with a portion of the radiological survey and remediation work performed between 2004 and 2016 under the Basewide Radiological Removal Action, Action Memorandum (Navy, 2006). The Navy is in the process of implementing corrective actions to ensure the radiological remedies specified in the decision documents were implemented as intended; however, this work is ongoing.			
	Recommendation: Complete radiological retesting at radiologically impacted sites, including current and former buildings and soil areas investigated under the Radiological Removal Action, Action Memorandum (Navy, 2006) and areas where evaluations determined previous data were unreliable.			
Affect Current Protectiveness	**Affect Future Protectiveness**	**Implementing Party**	**Oversight Party**	**Milestone Date**
N	Y	Navy	USEPA	B-1 and B-2: 2/27/2025 C: 2/5/2025 D-1: 11/27/2026 D-2, UC-1, UC-2, UC-3: 3/2/2028 G: 10/2/2025
Site: Parcel B-2	Issue Category: Remedy Performance			
	Issue: The in-situ stabilization remedy for mercury in Parcel B-2, IR-26 groundwater did not reduce concentrations to below the 0.6 µg/L trigger level across the entire site and there is uncertainty related to the concentrations of mercury potentially discharging to the Bay from Parcel B-2, IR-26 groundwater.			
	Recommendation 1: Prepare a primary document evaluating technologies for treating mercury in groundwater and presenting a proposed treatment method for FFA regulatory agency review. **Recommendation 2:** Apply the selected method that is within compliance of the selected remedy in the record of decision and initiate performance monitoring.			
Affect Current Protectiveness	**Affect Future Protectiveness**	**Implementing Party**	**Oversight Party**	**Milestone Date**
Protectiveness Deferred		Navy	USEPA	Milestone 1: 10/31/2024 Milestone 2: 7/15/2025
Site: Parcel C	Issue Category: Remedy Performance			
	Issue: There have been detections of chemicals of concern (COCs) from A-aquifer groundwater within the B-aquifer and fractured water-bearing zone (F-WBZ) groundwater and the connection and communication between hydrogeologic units within Parcel C is not fully understood. Therefore, further characterization is required to demonstrate that remedies within the A-aquifer will be effective and not re-contaminated by COCs within the B-aquifer and deep F-WBZ and unacceptable discharges to the bay are not and will not occur.			

ISSUES/RECOMMENDATIONS

	Recommendation: Complete investigations of the bay Mud/Sandy Lean Clay aquitard and extent of chemicals in the B-aquifer and F-WBZ and use current ecological risk assessment methods and criteria to assess potential impacts to bay receptors. Where warranted, additional actions or changes to the remedy will be recommended at the conclusion of these investigations.			
Affect Current Protectiveness	**Affect Future Protectiveness**	**Implementing Party**	**Oversight Party**	**Milestone Date**
Protectiveness Deferred		Navy	USEPA	5/31/2027 Interim Milestones: Five-Year Review Addendum 7/31/2025 Completion of F-WBZ investigation fieldwork 11/30/2025 completion of F-WBZ investigation report 11/30/2026
Site: Parcel D-1	Issue Category: Changed Site Conditions			
	Issue: Radiological objects (ROs) were identified during excavation and remediation of soil in areas that were not considered radiologically impacted. There is a high degree of confidence that discrete ROs were removed to a depth of 2 feet below ground surface (bgs). However, there is a potential for ROs to be present in material below 2 feet bgs where shoreline expansion has occurred since 1946.			
	Recommendation: Evaluate additional remedies to address the potential presence of ROs in material 2 feet bgs and prepare the appropriate post-ROD documentation.			
Affect Current Protectiveness	**Affect Future Protectiveness**	**Implementing Party**	**Oversight Party**	**Milestone Date**
N	Y	Navy	USEPA	12/20/2024

Other Findings

The following findings and recommendations were identified in this Five-Year Review.

Climate Change

The Navy recognizes climate change is occurring and based on a screening level Climate Resilience Assessment (CRA) (**Appendix A**), sea level rise (SLR) is the major variable of climate change that could affect the remedies at HPNS.

The CRA estimates that groundwater emergence may occur in Parcel D-1 by the year 2035 and in IR-07/18, Parcel B-1, B-2, C, D-1, E, and E-2 wetland areas by the year 2065. However, protectiveness is only affected when increased CERCLA risk attributable to climate hazards has been identified (groundwater is likely to emerge and land use is such that receptors could be exposed and a future unacceptable health or ecological risk has been identified (data collected, validated, and evaluated following CERCLA risk assessment processes resulting in unacceptable risk to receptors). Where the potential for increased vapor intrusion is identified in other CERCLA documents, areas requiring institutional controls (ARICs) for VOCs are present, groundwater is being monitored, and removal of VOCs is occurring either through monitored natural attenuation (MNA) or active remediation, thus reducing the potential for future vapor intrusion by reducing the source. Therefore, the potential for groundwater emergence does not affect the protectiveness determination in this Five-Year Review.

Based on the results of the CRA, the Navy will continue to monitor ongoing groundwater concentration and elevation data onsite through the Basewide Groundwater Monitoring Program (BGMP) and evaluate this data as

Other Findings

it relates to the effectiveness of site remedies. The Navy will also regularly evaluate nearby tidal gauge data to verify SLR projections. Additional site-specific assessments are planned which will include verifying mapping projections and evaluating the 2100 timeframe. Parcel D-1 will be prioritized and is scheduled to be initiated in 2025. Additional studies are planned for remaining parcels and meeting with the Navy and Agencies is planned for November 2024 to discuss the scope and priority of these studies as well as preparation of an adaptation plan, or similar document, if the site-specific studies show that CERCLA-type human health or ecological risk attributable to climate change requires adaptive measures.

Key climate change milestones include the following:

- Scoping and Prioritization Meeting – 11/30/2024
- Initiation of Parcel D-1 Study – Spring 2025

Per- and Polyfluoroalkyl Substances

The Navy is in the process of investigating per- and polyfluoroalkyl substances (PFAS) from historical use of PFAS-containing materials. Potential exposure pathways are under control through existing remedy components (institutional controls and durable covers) and data indicate that there is likely no imminent CERCLA risk while PFAS are investigated under the CERCLA process. The following areas are under investigation for PFAS:

- Parcels B-1, B-2, C, D-1, G, E, and E-2: A-aquifer groundwater
- Parcel B-1: IR-10 (Battery and Metal Plating Shop)
- Parcel C: Building 215, Fire Station
- Parcel D-1: Poseidon Area (Buildings 377, 384, 385, and 387), IR-69 (Bilge Water Pump House), and IR-70 (Former drum and tank storage area)
- Parcel G: IR-09 (Pickling and Plating Yard)

Key PFAS investigation milestones include the following:

- Final Basewide Remedial Investigation (RI) Work Plan – 4/30/2025
- RI Fieldwork – Spring/Summer 2025
- Final Basewide RI Report – 8/31/2026

Parcel-specific Other Findings

Parcel E-2 Remediation Goals

The California maximum contaminant levels for 1,2,3-trichloropropane was promulgated after the Parcel E-2 ROD was finalized. The Navy intends to prepare post-ROD change documentation to reflect this change.

Parcel E-2 Other Findings

The remedy at Parcel E-2 is complex and involves multiple phases of field work to install. A number of facilities that are important to understanding groundwater flow and contaminant concentrations have been completed or are substantially completed (for example, Nearshore Slurry Wall and landfill cover). The following is a summary of the remaining Remedial Action (RA) work, interim studies, and key milestones planned before completing the Remedial Action Completion Report:

- Evaluate the effect of landfill cap and slurry walls on groundwater including flow, leachate attenuation, and potential impact to the San Francisco Bay, anticipated by after the approval of the Parcel E-2 Phase IV work plan by the FFA regulatory agencies, anticipated by Spring 2027.
- Collect confirmation soil samples for lead in the wetland areas following the excavation, anticipated by Summer 2027.
- Collect confirmation soil samples for polychlorinated biphenyls (PCBs), polycyclic aromatic hydrocarbons (PAHs), pesticides and metals for the soil stockpile area, anticipated by Summer 2026.
- Construct remaining components of the remedy including the permanent landfill gas system, freshwater and tidal wetlands, and groundwater monitoring network under the approved Final Work Plan (KEMRON, 2018):
- Landfill Gas System (Phase IVa) anticipated in 11/30/2026
- Wetlands (Phase IVb) anticipated in 11/30/2027

Other Findings
• Modify the landfill gas monitoring program to include a monitoring probe (GMP54) outside of the recently expanded landfill cover as a new compliance point by revising the appropriate primary document(s). The primary document(s) needing revision and the proposed schedule for revision will be further discussed with the FFA Regulatory Parties not later than 9/30/2024. • Document completion of the protective liner and final cover installation in the Phase III Remedial Action Construction Summary Report anticipated by 11/30/2024. • Conduct a study to evaluate the performance of the upland slurry wall as documented in the Post-Remedial Action Performance Evaluation Work Plan to evaluate the performance of the Upland Slurry Wall. Approval of the Final Workplan is anticipated by 11/15/2024, fieldwork is anticipated to be completed in April 2025, Draft Report to Navy in October 2025 and the Final Post-Construction Remedial Action Performance Report is anticipated by March 2026.

PROTECTIVENESS STATEMENT(S)		
Former Parcel B		
Site: IR Site 7/18	Protectiveness Determination: Protective	Addendum Due Date (if applicable): Not Applicable
Protectiveness Statement: The remedy at IR-07/18 is protective of human health and the environment. The Remedial Action Objectives (RAOs) for soil and soil gas have been met through excavation and removal of contaminated soil, durable covers, and institutional controls (ICs). Groundwater monitoring indicates that COCs and radionuclides of potential concern (ROPCs) are less than trigger levels (TLs) during the majority of sampling events.		
Site: Parcel B-1	Protectiveness Determination: Short-term Protective	Addendum Due Date (if applicable): Not Applicable
Protectiveness Statement: The remedy at Parcel B-1 is currently protective of human health and the environment. To determine whether the remedy can be considered protective in the long term, the radiological retesting work and the excavation of volatile organic compound (VOC)-impacted soil will be completed. The RAOs for soil are met through hotspot excavation and offsite disposal, durable covers, and ICs. Excavation of VOC-impacted soil will permanently remove the source of VOCs to soil gas and groundwater. Groundwater long-term monitoring (LTM) and MNA are ongoing. Exposure to groundwater is controlled through ICs. Radiological retesting is ongoing to confirm that levels in soils and structures are protective of human health. Until retesting is complete, short-term protectiveness is met through Navy controls such as access to the parcel through fencing, locked gates, and ICs (restricting intrusive work and maintaining durable covers).		
Site: Parcel B-2	Protectiveness Determination: Protectiveness Deferred	Addendum Due Date (if applicable): 7/31/2025

PROTECTIVENESS STATEMENT(S)

Protectiveness Statement: A protectiveness determination cannot be made because there is uncertainty related to the concentrations of mercury discharging to the Bay from Parcel B-2, IR-26 groundwater. In order to make a protectiveness determination, the following actions needs to be made: (1) evaluate technologies for treating mercury in groundwater (2) apply the selected method that is within compliance of the selected remedy in the record of decision. A draft primary document presenting an evaluation of the technologies and the proposed treatment method will be provided to the FFA regulatory agencies for review by October 31, 2024. The Navy anticipates initiating field application of the selected treatment method by mid-July 2025. Contingencies will be discussed during development of the work plan and exercised as the need arises. The protectiveness determination will be re-evaluated in the Five-Year Review addendum based on information that becomes available after the completion of this FYR.

The RAOs for soil are met through durable covers and ICs. Groundwater LTM and MNA is ongoing. Exposure to groundwater is controlled through ICs. Radiological retesting is ongoing to confirm that levels in soil and structures are protective of human health.

Former Parcel C

Site:	Protectiveness Determination:	Addendum Due Date (if applicable):
Parcel C	Protectiveness Deferred	7/31/2025

Protectiveness Statement: A protectiveness determination cannot be made because there is uncertainty related to the hydrogeologic communication between the A- and B-aquifers and whether discharge of chemicals present in the B-aquifer present potential unacceptable risks to Bay receptors. In order to make a protectiveness determination, the following action, at a minimum, needs to be made: (1) complete investigations of the (a) Bay Mud/Sandy Lean Clay aquitard, (b) extent of chemicals in the deep F-WBZ in RU-C4, and (c) extent of chemicals in the B-aquifer and F-WBZ in RU-C2 and (2) use current ecological risk assessment methods and criteria, as appropriate, to assess potential impacts to Bay receptors.

The estimated timeframe for each action is as follows:

- Complete investigations of the Bay Mud/Sandy Lean Clay aquitard, expected to occur by Fall 2026
- Complete investigation of the extent of chemicals in the deep F-WBZ in RU-C4 expected to occur by Fall 2026
- Complete investigation of the extent of chemicals in the B-aquifer and F-WBZ in RU-C2 expected to occur by Spring 2027
- Assess potential impacts to Bay receptors, expected to occur by Fall 2026

The FFA parties will have discussions, as appropriate, prior to scoping and developing primary documents, such as workplans, expected to occur in Fall 2025. The protectiveness determination will be re-evaluated in the Five-Year Review addendum based on information that becomes available after the completion of this FYR.

The RAOs for soil are met through hotspot excavation and disposal, durable covers, and ICs. Groundwater remediation is ongoing, and, once active treatment is complete, MNA will continue until COCs reach remediation goals (RGs). Until that time, ICs control exposure to groundwater. Radiological retesting is ongoing to confirm that levels in soil and structures are protective of human health.

Site:	Protectiveness Determination:	Addendum Due Date (if applicable):
Parcel UC-2	Short-term Protective	Not Applicable

Protectiveness Statement: The remedy at Parcel UC-2 is currently protective of human health and the environment. In order to determine whether the remedy can be considered protective in the long term, the radiological retesting work will be completed.

The RAOs for soil are met through durable covers and ICs. Groundwater monitoring is ongoing. Radiological retesting is ongoing to confirm that levels in soil and structures are protective of human health. Until retesting is complete, short-term protectiveness is met through Navy controls such as access to the parcel through fencing, locked gates, and ICs (restricting intrusive work and maintaining durable covers).

PROTECTIVENESS STATEMENT(S)		
Former Parcel D		
Site: Parcel D-1	Protectiveness Determination: Short-term Protective	Addendum Due Date (if applicable): Not Applicable
Protectiveness Statement: The remedy at Parcel D-1 is currently protective of human health and the environment. In order to determine whether the remedy can be considered protective in the long term, the radiological retesting work will be completed, and additional actions implemented to address the potential presence of ROs in subsurface soil. The RAOs for soil are met through soil hotspot excavation and offsite disposal, durable covers, and ICs. Groundwater monitoring is ongoing and COCs have been consistently below RGs and TLs. Radiological retesting is ongoing to confirm that levels in soil and existing structures are protective of human health and post-ROD documentation is being prepared to address ROs in subsurface soil. Until retesting is complete, short-term protectiveness is met through Navy controls such as access to the parcel through fencing, locked gates, and ICs (restricting intrusive work and maintaining durable covers).		
Site: Parcel D-2	Protectiveness Determination: Short-term Protective	Addendum Due Date (if applicable): Not Applicable
Protectiveness Statement: The remedy at Parcel D-2 is currently protective of human health and the environment. Parcel D-2 was acceptable for UU/UE upon completion of the radiological TCRA; however, in order to determine whether the parcel remains acceptable for UU/UE, the radiological retesting work will be completed. Until retesting is complete, exposure to radionuclides of concern in site media is being controlled through security features such as fencing, locked gates, and signage.		
Site: Parcel UC-1	Protectiveness Determination: Short-term Protective	Addendum Due Date (if applicable): Not Applicable
Protectiveness Statement: The remedy at Parcel UC-1 is currently protective of human health and the environment. In order to determine whether the remedy can be considered protective in the long term, the radiological retesting work will be completed. The RAOs for soil are met through durable covers and ICs. Radiological retesting is ongoing to confirm that levels in soil and existing structures are protective of human health. Until retesting is complete, short-term protectiveness is met through Navy controls such as access to the parcel through fencing, locked gates, and ICs (restricting intrusive work and maintaining durable covers).		
Site: Parcel G	Protectiveness Determination: Short-term Protective	Addendum Due Date (if applicable): Not Applicable
Protectiveness Statement: The remedy at Parcel G is currently protective of human health and the environment. In order to determine whether the remedy can be considered protective in the long term, the radiological retesting work will be completed. The RAOs for soil are met through soil hotspot excavation and offsite disposal, durable covers, and ICs. Groundwater treatment is completed, and monitoring is ongoing. Radiological retesting is ongoing to confirm that levels in soil and existing structures are protective of human health. While retesting is ongoing, short-term protectiveness is met through Navy controls such as access to the parcel through fencing, locked gates, and ICs (restricting intrusive work and maintaining durable covers).		
Former Parcel E		
Site: Parcel E	Protectiveness Determination: Will be Protective	Addendum Due Date (if applicable): Not Applicable

PROTECTIVENESS STATEMENT(S)

Protectiveness Statement: The remedy at Parcel E Will Be Protective upon completion of remedy construction and completion of the radiological retesting.

In the interim, exposures to COCs in soil, sediment, and groundwater are being controlled during construction using temporary sheet piles, erosion control measures, security fencing to prevent unauthorized access, and ICs. The RAOs for soil will be met through excavation and offsite disposal, closure of fuel and steam lines, durable covers, and ICs. The RAOs for soil gas will be met through soil vapor extraction (SVE) or excavation to address VOCs, and ICs. The RAOs for shoreline sediment will be met through excavation and offsite disposal, durable cover installation, shoreline protection, and a sea wall. The RAOs for groundwater will be met through in situ groundwater treatment, installation of a belowground barrier, monitoring, and ICs. The RAOs for radiologically impacted media will be met through radiological surveys, decontamination, and removal of radiologically impacted structures, soil, and sediment, and ICs. The RAOs for NAPL will be met through removal and treatment of NAPL source, in situ stabilization, and containment.

Soil excavation to remove COC- and radiologically impacted soil has been completed. The following remedy components are under construction: installation of the shoreline armored revetment and the cement-bentonite slurry wall and belowground barrier, removal of sanitary sewer and storm drain lines, and excavation of NAPL followed by initiation of the in situ stabilization (ISS) treatment. Groundwater is currently being monitored through the BGMP.

Site:	Protectiveness Determination:	Addendum Due Date (if applicable):
Parcel E-2	Will be Protective	Not Applicable

Protectiveness Statement: The remedy at Parcel E-2 Will Be Protective upon completion of remedy construction.

Soil and sediment hotspots have been removed and the final cover is currently under construction. Landfill gas venting and monitoring is ongoing during construction activities. Exposure to soil and groundwater is currently being controlled through security fencing to prevent unauthorized access, signage, and ICs. The RAOs for soil will be met through hotspot removal, soil cover and sea wall, and ICs.

The radiological RAOs will be met through radiological screening and removal, installation of a soil cover with demarcation layer, and ICs. The RAOs for landfill gas will be met through landfill gas monitoring, removal, and treatment, landfill cover monitoring, and ICs. The RAOs for groundwater will be met through LTM and ICs. The RAOs for surface water will be met through installation of the protective soil cover, slurry walls, diversion to tidal and non-tidal constructed wetlands, and outfall monitoring.

The following activities have been completed: soil excavation to remove COC- and low-level radiologically impacted soil, installation of soil layer of radiologically cleared soil and a soil cover, installation of the shoreline armored revetment, cement-bentonite slurry walls along the shoreline and in the upland portion of the parcel, and the installation of a portion of the landfill gas collection and treatment system. Groundwater is currently being monitored through the BGMP.

Site:	Protectiveness Determination:	Addendum Due Date (if applicable):
Parcel UC-3	Short-term Protective	Not Applicable

Protectiveness Statement: The remedy at Parcel UC-3 is currently protective of human health and the environment. In order to determine whether the remedy can be considered protective in the long term, the radiological retesting work must be completed.

The RAOs for soil were met through hotspot excavation, durable covers, and ICs. Groundwater RGs have been met and groundwater meets the conditions for unlimited use/unrestricted exposure.

Radiological retesting is planned to confirm that levels in soil are protective of human health. Until retesting is complete, short-term protectiveness is met through Navy controls such as access to the parcel through fencing, locked gates, and ICs (restricting intrusive work and maintaining durable covers.

1.0 Introduction

This report was prepared by CH2M HILL, Inc., a wholly owned subsidiary of Jacobs, under Naval Facilities Engineering Systems Command (NAVFAC) Atlantic's Comprehensive Long-term Environmental Action—Navy (CLEAN) Contract Number N62470-21-D-0007, Contract Task Order N6247322F4930, for submittal to NAVFAC Southwest. This report details the Department of the Navy (Navy) Five-Year Review of Hunters Point Naval Shipyard (HPNS), San Francisco, California, as required by the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA). HPNS (United States Environmental Protection Agency [USEPA] Identification: CA1170090087) was placed on the National Priorities List (NPL) in 1989. The Navy is the lead agency responsible for investigating and addressing the release of CERCLA hazardous substances at HPNS.

The Five-Year Review was conducted in accordance with CERCLA § 121(c), as amended by the Superfund Amendments and Reauthorization Act, and the National Oil and Hazardous Substances Pollution Contingency Plan, Part 300.430(f)(4)(ii) of the Code of Federal Regulations. The Five-Year Review was conducted in accordance with the following documents:

- *Comprehensive Five-Year Review Guidance* (USEPA, 2001) and supplements (USEPA, 2012a, 2012b, 2016)
- *Navy/Marine Corps Policy for Conducting Comprehensive Environmental Response, Compensation, and Liability Act Five-Year Reviews* (Navy, 2011)
- *Toolkit for Preparing Five-Year Reviews* (NAVFAC, 2013)
- *Defense Environmental Restoration Program (DERP) Management Manual Number 4715.20* (DoD, 2018)
- *Department of the Navy Environmental Restoration Program Manual* (Navy, 2018b)

This document has been prepared by the NAVFAC, Base Realignment and Closure (BRAC) Program Management Office (PMO) West for submittal to USEPA Region 9, California Department of Toxic Substances Control (DTSC), and the California Regional Water Quality Control Board, San Francisco Bay Region (Regional Water Board).

1.1 Purpose and Approach

The purpose of the Five-Year Review is to evaluate the implementation and performance of site remedies to determine whether these remedies are, and will continue to be, protective of human health and the environment in accordance with the requirements set forth in each of the decision documents. The Five-Year Review included a document and data review, required visual site inspections, and interviews. The methods, findings, and conclusions identified during the review are presented in this Five-Year Review Report.

A statutory Five-Year Review is required for sites where: (1) concentrations of hazardous substances, pollutants, or contaminants remain at the sites at levels above those that allow for unlimited use and unrestricted exposure (UU/UE), and (2) the Records of Decision (RODs) for the sites were signed on or after October 17, 1986 (the effective date of the Superfund Amendments and Reauthorization Act). The triggering action for statutory Five-Year Reviews at HPNS was the date of mobilization for the remedial action (RA) activities at Parcel B, which was July 8, 1998. The triggering action for this Fifth Five-Year Review is the signature of the Fourth Five-Year Review, July 31, 2019 (Navy, 2019).

1.2 Environmental Restoration Program

Following inclusion of HPNS on the NPL in 1989, in 1992, the Navy, USEPA, and California Environmental Protection Agency signed a Federal Facilities Agreement (FFA). In the FFA, sites proposed for characterization during the confirmation study were reclassified within the Remedial Investigation (RI)/Feasibility Study (FS) framework of CERCLA into Operable Units because the Navy's intent was to maintain HPNS as an active facility. The focus of the FFA was subsequently changed to expedite transfer and public reuse of HPNS, so the Navy and regulatory agencies divided HPNS into geographic parcels (Parcels A through E) in 1992. In 1996, a sixth parcel was added (Parcel F, the offshore area), which encompasses areas immediately adjacent to San Francisco Bay. The parcels were further divided to expedite transfer as follows:

- In 2008, the Navy subdivided Parcel D into four separate parcels (D-1, D-2, G, and UC-1) and separated the western edge of Parcel C to create Parcel UC-2. The Navy also separated Installation Restoration (IR) Sites 07 and 18 (referred to as IR-07/18) from Parcel B to expedite remedy completion and transfer of the sites.
- In 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.
- In 2013, the Navy subdivided Parcel B, excluding IR-07/18, into two separate parcels (B-1 and B-2) to accommodate varying property transfer schedules for different portions of the original parcel. In 2015, the Navy transferred Parcels D-2, UC-1, and UC-2 to the City and County of San Francisco's Office of Community Investment and Infrastructure (OCII).

Figure 1-1 shows the current status and boundaries of the parcels.

Results of studies and initial response actions that were initiated before the FFA were incorporated, as appropriate, into additional investigations and studies in each major parcel. At each HPNS parcel, contaminated sites were designated as IR sites based on information developed during previous investigations. In most cases, IR sites were identified by a two-digit number (for example, IR-02). Site characterization activities and sampling data were mostly planned and organized by IR site. To assess risk, the BRAC Cleanup Team (BCT) agreed to divide all of HPNS into two different sized grids (residential and industrial) as a method of statistically calculating risk within an area for different future land use scenarios. RODs were prepared by parcel. **Figure 1-2** shows the parcel boundaries and locations of the IR sites across HPNS.

In general, remedies are applied by parcel with some exceptions for individual IR sites and remedial units (RUs), as discussed in their respective parcel sections of this Five-Year Review Report. The parcel sections are discussed by Former Parcels B, C, D, and E because all pre-ROD investigation work was completed before subdividing into smaller parcels to facilitate transfer. **Table 1-1** summarizes the major parcels or subdivided parcels, ROD signature date, basis for action, remedy components, Fourth Five-Year Review protectiveness determination, and inclusion in the Fifth Five-Year Review. **Table 1-2** summarizes IR sites present within each parcel.

1.3 Installation Background and Setting

This section provides background information on HPNS and consists of location and physical setting, geography, topography, geology and hydrogeology, and land and resource use. Information is summarized from the Fourth Five-Year Review (Navy, 2019) unless otherwise noted.

1.3.1 Location and Physical Setting

HPNS is located in the City and County of San Francisco, California (**Figure 1-1**). It encompasses 934 acres (491 acres on land and 443 acres under water in the San Francisco Bay) in southeastern San Francisco on a peninsula that extends east into San Francisco Bay. HPNS is currently divided into nine parcels (Parcels B-1, B-2, C, D-1, E, E-2, F, G, and UC-3) and two independent IR sites (IR-07/18) (**Figure 1-1**). HPNS formerly included Parcels A-1, A-2, D-2, UC-1, and UC-2, which since have been transferred out of federal ownership to the City and County of San Francisco OCII. Parcels A-1 and A-2 are acceptable for UU/UE and are not subject to the Five-Year Review. Issues affecting protectiveness were identified during the Fourth Five-Year Review for Parcels D-2, UC-1, and UC-2 and, although they are no longer under federal ownership, they are included in this Five-Year Review to document progress toward meeting the recommendations set forth in the Fourth Five-Year Review.

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. Additional filling operations continued into the 1960s. The shoreline at HPNS is predominantly constructed seawalls, dry docks, engineered shoreline armoring and revetments, and seawalls. Shoreline and offshore areas at HPNS are considered environmentally sensitive areas, and effects to wildlife in environmentally sensitive areas were considered during the remedy selection and design process.

1.3.2 Topography

HPNS is characterized by a central hill (Former Parcel A) that slopes radially out to San Francisco Bay. Ground surface elevations of the parcels range from 30 to 60 feet above mean sea level (msl) near the landward edges and 0 feet above msl as they meet the bay. Large areas of HPNS are flat lowlands with elevations ranging from 10 to 15 feet above msl, where most of the Base roads, buildings, and operating areas were built.

1.3.3 Geology and Hydrogeology

The peninsula that forms HPNS is within a northwest-trending belt of Franciscan Complex Bedrock known as the Hunters Point Shear Zone. HPNS is underlain by five geologic units: the youngest being of Quaternary age and the oldest being the Franciscan Complex Bedrock of Jurassic-Cretaceous age. In general, the stratigraphic sequence of these geologic units, from youngest (shallowest) to oldest (deepest), is as follows: Artificial Fill, Undifferentiated Upper Sand Deposits, Bay Mud Deposits, Undifferentiated Sedimentary Deposits, and Franciscan Complex Bedrock. The Franciscan Complex contains a variety of rock types, including basalt, chert, sandstone, shale, and serpentinite. Some of these rock types contain wide-ranging concentrations of naturally occurring metals; serpentinite also contains naturally occurring asbestos minerals. Artificial Fill covers the entire surface, except for colluvium and alluvium on the hillside at the southern edge (Navy, 2009).

There are three hydrostratigraphic units that are relevant to environmental investigations at HPNS: (1) the A-aquifer, (2) the B-aquifer, and (3) the bedrock water-bearing zone. An aquitard composed of Bay Mud separates the A-aquifer and B-aquifer. The following is a summary of each unit (Navy, 2019):

- The **A-aquifer** is present throughout most of HPNS and primarily consists of heterogeneous Artificial Fill but may also consist of the following underlying layers: Undifferentiated Upper Sand Deposits, sandy units within the uppermost Bay Mud, and upper weathered bedrock zone. The A-aquifer is generally unconfined, but semiconfined conditions may exist where fine-grained sediments overlie more permeable materials. The aquifer ranges in thickness from a few feet to greater than 50 feet. Groundwater elevations range from about -1 to +7 feet relative to msl (TRBW, 2022). Primary sources of recharge for the A-aquifer are infiltration of precipitation and runoff, leakage from utilities, intrusion of bay water, horizontal flow of groundwater from upgradient areas, and vertical flow of water from the B-aquifer.
- **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. In most areas where the Bay Mud is absent, a Sandy Lean Clay layer is present which also acts as an aquitard.
- The **B-aquifer** consists of Undifferentiated Sedimentary Deposits 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 upper portions of the B-aquifer contain layers of less permeable silts and clay that impede downward migration, making the B-aquifer 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. In areas where the aquitard is absent, the A- and B-aquifers are in hydraulic communication and behave as a single aquifer. The primary sources of recharge for the B-aquifer include infiltration of precipitation and runoff and horizontal groundwater flow from upgradient areas.
- The **fractured water-bearing zone** consists of the deeper portions of saturated fractured bedrock that are not in direct contact with the A- or B-aquifers. The fractured, unweathered bedrock is not considered an aquifer because of its limited flow capability and low storage capacity. 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.

1.3.4 Land and Resource Use

1.3.4.1 Past and Present Land Uses

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, soil gas, sediment, groundwater, and structures. These chemicals include metals, volatile organic compounds (VOCs), semivolatile organic compounds (SVOCs) (including polycyclic aromatic hydrocarbons [PAHs]), pesticides, polychlorinated biphenyls (PCBs), total petroleum hydrocarbons (TPH), and radionuclides.

Bethlehem Steel owned and operated a commercial dry dock facility in the HPNS area 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. 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 a general repair facility to specializing in submarine maintenance and repair but continued to operate Pacific Fleet carrier overhaul and ship maintenance repair facilities through the 1960s. During the 1950s and 1960s, until 1969, the Naval Radiological Defense Laboratory (NRDL) occupied buildings at HPNS to conduct practical and applied research on radiological decontamination methods and on the effects of radiation on living organisms and natural and synthetic materials. HPNS was disestablished as an active Naval facility in 1974 (NAVSEA, 2004).

From July 1, 1976, to June 30, 1986, the Navy leased 98 percent of HPNS to a private ship repair company, Triple A Machine Shop, Inc. (Triple A). 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. Triple A vacated the property in March 1987.

Currently, the San Francisco Police Department occupies a portion of Parcel E, and an artist colony occupies a portion of Parcel B-1. There are no other current land uses on Navy-owned property with the exception of environmental remediation activities.

1.3.4.2 Future Land Uses

The City and County of San Francisco OCII's HPNS Redevelopment Plan, developed in 1997 and amended in 2010 (SFRA, 2010) and 2018 (OCII, 2018), described the anticipated future use of HPNS. The Redevelopment Plan delineates "land use districts" in the subdivision of HPNS and describes the allowable uses within each land use district. **Figure 1-3** shows land use districts used at the time of the RODs, or ROD amendments, which were used for exposure scenario assumptions in human health risk assessments (HHRAs). The following is a summary of land use districts and associated HHRA exposure scenarios:

Human Health Risk Assessment Exposure Scenario	Land Use District
Industrial Use	Education/Cultural (museums, cultural centers, civic, arts, and entertainment facilities)
	Industrial and Maritime-Industrial (light industrial use)
Residential Use	Research and Development (including some residential use)
	Mixed Use (including mixed density residential, commercial/retail)
Recreational Use	Open Space (parks and recreational areas)

The HPNS Redevelopment Plan was updated in 2018 (OCII, 2018). The Navy will coordinate with the City of San Francisco to address any post-ROD changes needed for consistency with updated development plans and prepare appropriate post-ROD change documentation. Additionally, future land use will be required to comply with any environmental restrictions recorded in the Quitclaim Deed and Covenant to Restrict Use of Property developed during property transfer (OCII, 2018).

Implementation of Institutional Controls

The remedies for each parcel were selected and designed to be protective of human health and the environment for planned future land use. One component of the remedy is institutional controls (ICs), which are legal and administrative mechanisms used to implement land use restrictions that limit the exposure of future landowners or users of the property to hazardous substances present on the property and to ensure the integrity of the RA. ICs are required on a property where the selected remedial cleanup levels result in contamination remaining at the property greater than levels that allow for UU/UE. ICs will be maintained until the concentrations of hazardous substances in soil and groundwater are at such levels to allow for UU/UE. Implementation of ICs includes requirements for monitoring and inspections and reporting to ensure compliance with land use or activity restrictions.

Although ICs are implemented on a parcel-by-parcel basis, the ICs are consistently implemented across all parcels designated as areas requiring institutional controls (ARICs). **Table 1-3** presents a summary of each IC and respective performance objective and applicability by parcel. The land use and activity restrictions will be met by controlling access to each parcel until the time of transfer. The land use and activity restrictions are described in the Land Use Control (LUC) RD Reports referenced in each respective section and will be incorporated into the Quitclaim Deed and Covenant to Restrict Use of Property and will take effect upon transfer to the City and County of San Francisco's OCII and issuance of those documents. **Figure 1-4** presents the current proposed ARIC boundaries and ICs.

1.3.4.3 Surface Water and Groundwater Use

With the exception of Parcel F (sediments in the San Francisco Bay surrounding HPNS) and constructed wetlands at Parcel E, no permanent surface water features exist at HPNS. Surface water runoff flows to nearby San Francisco Bay or infiltrates into the ground. Groundwater beneath HPNS is not currently used for drinking water, irrigation, or industrial supply. The City and County of San Francisco supplies drinking water to HPNS through its municipal supply from the Hetch Hetchy watershed in the Sierra Nevada.

On September 25, 2003, Regional 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) Resolution No. 88-63, "Sources of Drinking Water"; therefore, groundwater in the A-aquifer is not suitable as a potential source of drinking water. Likewise, on July 29, 2008, Regional Water Board staff concurred with the Navy that B-aquifer groundwater in the central and southern area of Parcel C meets the exception criteria in SWRCB Resolution No. 88-63, "Sources of Drinking Water"; therefore, 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 (MCLs) were not applicable or relevant and appropriate requirements (ARARs) for CERCLA cleanups at HPNS for the A-aquifer based on an evaluation of site-specific- factors (ChaduxTt, 2007; SulTech, 2007, 2008; Barajas & Associates, Inc., 2008; and ERRG and Shaw, 2011). Results of the evaluation of site-specific factors are as follows:

- 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 of San Francisco 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 to concentrations less than MCLs would likely be prohibitive, and it may be technically impracticable to do so.
- 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. The RODs for the various parcels that require RAs all require ICs to prohibit the use of groundwater, and, consequently, future use of groundwater is expected to be prohibited, except for uses allowed by the RODs (for example, maintenance of groundwater monitoring wells). However, the potential use of groundwater in the B-aquifer, although unlikely, is considered in the risk evaluation and basis for action for each parcel, where applicable.

1.4 Basewide Considerations Relevant to the Five-Year Review Process

Basewide evaluations are being conducted to address per- and polyfluoroalkyl substances (PFAS), climate change, and radiological aspects that are relevant to evaluation of the remedies in this Five-Year Review. The status of these Basewide efforts are summarized in the following sections.

1.4.1 Per- and Polyfluoroalkyl Substances

The Navy and USEPA have identified certain PFAS compounds as emerging chemicals of environmental concern. PFAS have been used in a variety of industrial and military applications. Potential releases of PFAS resulting from historical activities conducted at Navy installations, such as use of aqueous film-forming foam (AFFF) during fire and emergency response, testing, and training activities or chromium plating operations, has prompted the Navy to develop and implement a PFAS preliminary assessment (PA)/site inspection (SI) process to identify and prioritize the investigation of sites with known or potential PFAS releases. The Department of Defense (DoD) released guidance related to the use of USEPA-issued Regional Screening Levels (RSLs) in PFAS investigations (ASD, 2023).

A Basewide PA for PFAS was completed in June 2022, which identified areas for further investigation based on historical site use or data collected during previous investigations (Multi-MAC JV, 2022). To provide for a more comprehensive and installation-wide assessment for the potential presence of PFAS at HPNS, groundwater in the A-aquifer zone within all parcels where industrial activities occurred (Parcels B-1, B-2, C, D-1, G, E, and E-2) was further investigated in a PFAS SI (Multi-MAC JV, 2022; Liberty JV, 2023a, 2023b). Because investigation of PFAS is ongoing and it has not yet been determined whether PFAS pose unacceptable risk that requires RA, and because a remedy for PFAS has not yet been determined, a protectiveness determination cannot be made. Rather, parcel-specific discussions as Other Findings in **Sections 3** through **6** present individual areas that were identified for further investigation under the SI, based on historical site use or data collected during previous investigations.

As presented in **Section 1.3.4.3,** groundwater within the A-aquifer (and portions of the B-aquifer within Parcel C) is unsuitable for drinking water. Additionally, the City and County of San Francisco prohibits installation of domestic wells within city and county limits.

For soil, the Navy maintains durable covers and implements ICs to restrict exposure to soil throughout all parcels at HPNS.

Regarding the potential pathway of groundwater discharge to surface water and exposure to aquatic receptors in the bay, the Navy's CERCLA PFAS SI data and existing site remedies were evaluated by the Navy. The following information and data support there is likely no imminent CERCLA risk:

- The highest PFAS concentrations were detected in wells in Parcel E-2 (including perfluorooctanoic acid [PFOA] at 18 micrograms per liter [µg/L]). This specific location is upgradient to the nearshore slurry wall and the slurry wall is designed to inhibit migration of chemicals of concern (COCs) in groundwater to the bay. The cement-bentonite mixture is expected to inhibit PFAS based on how they inhibit VOCs.
- The PFAS detections in other identified near shore perimeter groundwater wells across HPNS were 1 to 2 orders of magnitude lower than the highest concentration at Parcel E-2. The PFAS SI results at these wells ranged from 0.14 µg/L to a maximum concentration of 3.2 µg/L (perfluorooctane sulfonate [PFOS]).
- Published ecological screening values for aquatic receptors (Argonne, 2021) are as follows:
  - PFOS: 0.117 to 22.6 µg/L
  - PFOA: 6.12 to 1,580 µg/L

In summary, based on the above lines of evidence, there is no known imminent risk from PFAS to human or ecological receptors at HPNS.

1.4.2 Climate Resilience Assessment

The Navy recognizes climate change is occurring and based on a screening level evaluation (**Appendix A**), sea level rise (SLR) is the major variable of climate change that could affect the remedies at HPNS. The screening level climate resilience assessment (CRA) was conducted for HPNS by NAVFAC Expeditionary Warfare Center to assess how climate change-related hazards could potentially affect IR sites at HPNS. The CRA was conducted consistent with guidance provided in the *DoD Climate Assessment Tool (DCAT)* (DoD, 2020), USEPA's *Guidance on Climate Resilience in Superfund Planning* (USEPA, 2021), and the *Draft Sea Level Rise Guidance to DTSC Project Managers for Cleanup Activities* (DTSC, 2023). The CRA identified the coastal flooding caused by SLR as being the primary climate-related hazard for HPNS. Both permanent effects (seawater inundation and groundwater emergence) and transient effects (flooding from storm events) of SLR were assessed. SLR projections from the *DoD Regional Sea Level Database* (DoD, 2021) for the years 2035 and 2065 were used, with 1992 serving as the baseline year. The Navy has extensive groundwater elevation data collected annually from over 100 monitoring wells since 2002. The evaluation of this data shows groundwater level has a significant amount of variability from year to year and there is no consistent upward trend.

The initial evaluation identified the potential for permanent groundwater emergence impacts in approximately 2035 at D-1 and IR-07/18 and in approximately 2065 at B-1, B-2, C, D-1, E, and G. Parcels D-2, E-2, G, UC-1, UC-2, and UC-3 are not anticipated to be affected by SLR by 2065. No permanent seawater inundation is projected through 2065 in any of the parcels, but storm surges could lead to transient flooding in all parcels, except D-2 and UC-3, in approximately 2035 and 2065. Further study to validate these projections is needed to assess actual effects of SLR so that the Navy can evaluate, plan, and implement strategies to mitigate the impacts of SLR and groundwater emergence on its CERCLA remedies.

As recommended in Section 6.1 of the CRA (**Appendix A**), the Navy will continue to monitor ongoing groundwater concentration and elevation data onsite through the Basewide Groundwater Monitoring Program (BGMP) and evaluate this data as it relates to the effectiveness of site remedies. The Navy will also regularly evaluate nearby tidal gauge data to verify SLR projections. Additional site-specific vulnerability assessments may be conducted in a timely manner to determine site-specific impacts and what remedy modification may be required. The results of the CRA for each parcel are discussed in the Other Findings section for each respective parcel.

1.4.3 Radiological Retesting and Remediation Goal Evaluation

Radiological surveys and remediation were previously conducted at HPNS as part of a Basewide time-critical removal action (TCRA; Navy, 2006). The radiologically impacted sites evaluated under the TCRA were identified in the Historical Radiological Assessment (NAVSEA, 2004) and included soil and building structures located within Parcels B-1, B-2, C, D-1, D-2, E, G, UC-1, UC-2, and UC-3 (**Figure 1-5**). An independent third-party evaluation identified potential manipulation, falsification, and data quality issues with the TCRA data, (Navy, 2017a, 2017b, 2017c, 2017d, 2018a, 2018c). Radiological retesting, including sampling and surveys of soils previously investigated during sanitary sewer line and storm drain removal and resurvey of impacted buildings and former building sites conducted under the Basewide TCRA (Navy, 2006) is planned or ongoing at all affected parcels.

The Fourth Five-Year Review (Navy, 2019) identified this as an Issue and Recommendation as follows:

Issue: *The Navy has determined that a significant portion of the radiological survey and remediation work completed to date was not reliable because of manipulation and/or falsification of data by one of its radiological contractors. A long-term protectiveness evaluation of the radiological RGs has not yet been completed for this Fourth Five-Year Review, and it is currently not known if the RAOs for radionuclides have been achieved in Parcels B-1, B-2, C, D-1, D-2, G, E, UC-1, UC-2, and UC-3.*

Recommendation: *The Navy is in the process of implementing corrective actions to ensure that the radiological remedies specified in the decision documents are implemented as intended. In addition, the Navy is in the process of conducting a long-term protectiveness evaluation of the ROD radiological RGs. After finalization of the Five-Year Review, the Navy will issue a draft addendum evaluating the long-term protectiveness of the RGs for soil using RESRAD and the USEPA's Preliminary Remediation Goal (PRG) Calculator for radiation risk to human health. Another draft addendum evaluating the long-term protectiveness of the RGs for buildings (for both residential and commercial/industrial scenarios) will also be issued. The draft addenda will include explanations of the proposed site-specific inputs and will be issued to the public and regulatory agencies for a 30-day review and comment period. The Navy will prepare responses to regulatory agency comments and a responsiveness summary to comments from the public. The results of the final evaluations will inform the retesting sensitivity and cleanup thresholds. These risk evaluations may also inform future risk management decisions and the potential for post-ROD changes, if appropriate. It is anticipated that the radiological rework will be completed prior to the next Five-Year Review.*

1.4.3.1 Progress Since the Fourth Five-Year Review

The Navy is currently in the process of implementing corrective actions, which includes the radiological retesting of the impacted areas evaluated under the TCRA. Progress for each

parcel is discussed in their respective sections. Additionally, the Navy evaluated the radiological remediation goals (RGs) to ensure the radiological remedies will be protective in the long term, with human health risk within the risk range as described in the National Oil and Hazardous Substances Pollution Contingency Plan. Following the recommendation from the Fourth Five-Year Review, the Navy issued addendums evaluating the long-term protectiveness of the RGs for soil and building structures, which concluded that the current RGs are protective for all future land users (Navy, 2020a, 2020b). There was agency disagreement over the calculation methods for building RGs; however, the Navy is currently in the early planning stages to demolish all radiologically-impacted buildings at each parcel in response to a letter from the City of San Francisco's Office of Community Investment and Infrastructure, dated February 3, 2022, requesting that, before transferring the remaining Navy-owned property at HPNS, the Navy must demolish all remaining buildings (both radiologically impacted and nonradiologically impacted) on that property except for five small structures on the National Historic Register (OCII, pers. comm., 2022). The demolition and disposal of radiologically-impacted buildings will be completed under CERCLA. Details for managing radiological building materials during demolition will be documented in work plans for regulatory agency review. Because this is not an issue affecting protectiveness but will require a post-ROD change to document the increased cost, Explanations of Significant Differences will be prepared for each Parcel, as appropriate.

Radiological retesting is planned and/or currently underway to verify that the soil RGs, which were determined to be protective and remain valid, have been met for each parcel that was identified in the Fourth Five-Year Review.

1.4.4 Air Monitoring and Dust Control

Dust control is of paramount concern at HPNS and comprises two major goals of equal importance: (1) protection of worker safety and health and (2) protection of the nearby community and public at large. A dust control plan is included in Remedial Action Work Plans (RAWPs) for all onsite activities that have the potential to generate dust, including, but not limited to, installing durable covers, installing landfill caps, conducting radiological retesting and trenching activities, and initiating building demolition. Dust mitigation measures include the following: track-out control to dislodge any dirt adhering to tires, wetting soil during earthmoving and earth-disturbing activities and on stockpiles, minimizing the height from which soil is dropped during earthmoving activities, equipping trucks with tarping systems to cover loads during soil transport, minimizing truck traffic distances, and using real-time air monitoring.

Air monitoring is performed to confirm worker safety and provide reasonable assurance of the protection of the surrounding residents in accordance with National Institute for Occupational Safety and Health-approved air sampling methodology. The following three types of air monitoring are conducted during intrusive construction activities:

- Air quality monitoring for total suspended particulates, manganese, arsenic, lead, particulate matter less than 10 microns in diameter, and asbestos
- Air monitoring for radionuclides of concern (ROCs)
- Personnel monitoring

The air quality sampling will be used to assess the status of air quality compliance and to evaluate modifications to project activities in the event of compliance concerns. Representative meteorological data for the general project areas, specifically wind speed and direction, are used to identify the most appropriate locations for the air monitoring stations. Air samplers and

monitoring stations are located in the most practical locations upwind and downwind from the project site according to available wind speed and direction data. In addition, real-time air monitors are employed to provide immediate information for dust levels present at the site perimeter. The Navy provides updates to the community via a public website (Navy, 2024).

Available reports between November 2018 through November 2023 were reviewed for parcels with earthmoving activities. **Table 1-4** summarizes the type of work, date range, and findings during air monitoring. There were no major issues with air monitoring results identified during the monitoring period.

1.5 Report Organization

The Five-Year Review for HPNS consists of seven sections, organized as follows:

- **Section 1.0** — Introduces the Five-Year Review and its purpose and provides the background of HPNS.
- **Section 2.0** — Describes the Five-Year Review process.
- **Sections 3.0 through 7.0** — Evaluates each of the parcels included in the Fifth Five-Year Review. Discussion elements for each parcel include the site history and background, site chronology, and site characterization; description of RAs (remedy implementation and remedy operations and maintenance [O&M]); progress since the Fourth Five-Year Review; technical assessment; issues, recommendations, and follow-up actions; and statement of protectiveness. References, figures, and tables are provided at the end of each section.

Appendixes are provided at the end of the document.

1.6 References

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Table 1-1. Summary of Hunters Point Naval Shipyard Parcels for Five-Year Review

Parcel		ROD Signature Date	Basis for Action	Remedy Components	Fourth Five-Year Review Protectiveness Determination	Inclusion in the Fifth Five-Year Review	Fifth Five-Year Review Protectiveness Determination
A		11/16/1995	None	Not Applicable	Not Applicable	No	Not Applicable
B	IR-07/18	ROD: 10/7/1997 ESD: 8/24/1998 ESD: 5/4/2000 Amended ROD: 1/14/2009	Human Health Risks - exposure to chemicals in soil, soil gas, groundwater Ecological Risks - exposure to chemicals in sediment and groundwater to surface water pathway Radiologically Impacted Media	Soil excavation and offsite disposal Durable covers to prevent exposure to COCs and ROCs Monitoring for methane in soil gas Monitoring for COCs and ROCs in groundwater Radiological scanning and excavation and disposal of anomalies ICs	Protective	Yes	Protective
	B-1			Soil excavation and offsite disposal Durable covers to prevent exposure to COCs SVE In situ biological treatment for VOCs in groundwater Monitoring for COCs in groundwater Excavation and disposal of radiologically impacted soil and structures Radiological scanning and unrestricted release of buildings, former building sites, and radiologically impacted areas ICs	Will be protective	Yes	Short-term Protective
	B-2			Soil excavation and offsite disposal Durable covers to prevent exposure to COCs In situ stabilization of metals in groundwater Monitoring for COCs in groundwater Excavation and disposal of radiologically impacted soil and structures Radiological scanning and unrestricted release of buildings, former building sites, and radiologically impacted areas ICs	Will be protective	Yes	Protectiveness Deferred

Table 1-1. Summary of Hunters Point Naval Shipyard Parcels for Five-Year Review

Parcel		ROD Signature Date	Basis for Action	Remedy Components	Fourth Five-Year Review Protectiveness Determination	Inclusion in the Fifth Five-Year Review	Fifth Five-Year Review Protectiveness Determination
C	C	ROD: 9/30/2010 ESD: 10/2014	Human Health Risks - exposure to chemicals in soil, soil gas, groundwater Ecological Risks - groundwater to surface water pathway only Radiologically Impacted Media	Soil excavation and offsite disposal Durable covers to prevent exposure to COCs In situ remediation (ZVI, biological treatment) and performance monitoring for COCs in groundwater MNA for COCs in groundwater SVE Excavation and disposal of radiologically impacted soil and structures Radiological scanning and unrestricted release of buildings, former building sites, and radiologically impacted areas ICs	Will be protective	Yes	Protectiveness Deferred
	UC-2	12/17/2009	Human Health Risks - exposure to chemicals in soil, soil gas, groundwater Radiologically Impacted Media	Durable covers to prevent exposure to COCs Monitoring for COCs in groundwater Decontamination or dismantling and offsite disposal of radiologically impacted structures Excavation and disposal of radiologically impacted storm drain and sanitary sewer lines and associated soil Radiological scanning unrestricted release ICs	Short-term protective	Yes	Short-term Protective
D	D-1	12/17/2009	Human Health Risks - exposure to chemicals in soil, soil gas, groundwater Ecological Risks - groundwater to surface water pathway only Radiologically Impacted Media	Soil excavation and offsite disposal Durable covers to prevent exposure to COCs In situ remediation for groundwater (not necessary after completion of pre-ROD pilot study) MNA for COCs in groundwater Excavation and disposal of radiologically impacted soil and structures Radiological scanning and unrestricted release of buildings, former building sites, and radiologically impacted areas ICs	Short-term protective	Yes	Short-term Protective

Table 1-1. Summary of Hunters Point Naval Shipyard Parcels for Five-Year Review

Parcel		ROD Signature Date	Basis for Action	Remedy Components	Fourth Five-Year Review Protectiveness Determination	Inclusion in the Fifth Five-Year Review	Fifth Five-Year Review Protectiveness Determination
D	UC-1	12/17/2009	Human Health Risks - exposure to chemicals in soil and soil gas Radiologically Impacted Media	Durable covers to prevent exposure to COCs Decontamination or dismantling and offsite disposal of radiologically impacted structures Excavation and disposal of radiologically impacted storm drain and sanitary sewer lines and associated soil Radiological survey and unrestricted release ICs	Short-term protective	Yes	Short-term Protective
	D-2	8/9/2010	None	No Further Action - At the time of the ROD, the basewide radiological TCRA had addressed all potential risks associated with radionuclides; included in Fourth Five-Year Review because of ongoing radiological re-scan	Short-term protective	Yes	Short-term Protective
	G	ROD: 2/18/2009 ESD: 4/18/2017	Human Health Risks - exposure to chemicals in soil, soil gas, groundwater Ecological Risks - groundwater to surface water pathway only Radiologically Impacted Media	Soil excavation and offsite disposal Durable covers to prevent exposure to COCs In situ remediation for groundwater (not necessary after completion of pre-ROD pilot study) MNA for COCs in groundwater Excavation and disposal of radiologically impacted soil and structures Radiological scanning and unrestricted release of buildings, former building sites, and radiologically impacted areas ICs	Short-term protective	Yes	Short-term Protective

Table 1-1. Summary of Hunters Point Naval Shipyard Parcels for Five-Year Review

Parcel		ROD Signature Date	Basis for Action	Remedy Components	Fourth Five-Year Review Protectiveness Determination	Inclusion in the Fifth Five-Year Review	Fifth Five-Year Review Protectiveness Determination
E	E	12/1/2013	Human Health Risks - exposure to chemicals in soil, soil gas, groundwater Ecological Risks - exposure to chemicals in shoreline sediments, groundwater to surface water pathway Presence of NAPL Radiologically Impacted Media	Excavation and offsite disposal of soil and sediment Closure of steam and fuel line systems potentially acting as an ongoing source of contamination Durable covers to prevent exposure to COCs and ROCs SVE In situ treatment of groundwater In situ treatment and removal of NAPL Below-grade barriers (slurry wall) to limit COC migration in groundwater and NAPL migration Monitoring of groundwater COCs Excavation and disposal of radiologically impacted structures and soil Radiological scanning and unrestricted release of buildings and former building sites ICs	Will be protective	Yes	Will Be Protective
	E-2	11/1/2012	Human Health Risks - exposure to chemicals in soil, landfill gas, groundwater Ecological Risks - exposure to chemicals in shoreline sediments, groundwater to surface water pathway Presence of Waste Radiologically Impacted Media	Excavation and offsite disposal of soil and sediment Durable covers to prevent exposure to COCs Landfill cap to prevent exposure to COCs and landfill material Collection, treatment, and monitoring of landfill gas In situ treatment of groundwater COCs Below-grade barriers to limit groundwater migration into and out of landfill material Monitoring of groundwater COCs and landfill compliance monitoring Radiological scanning and treatment of radiologically impacted materials during remedy implementation Radiological survey of final cover ICs	Will be protective	Yes	Will Be Protective

Table 1-1. Summary of Hunters Point Naval Shipyard Parcels for Five-Year Review

Parcel		ROD Signature Date	Basis for Action	Remedy Components	Fourth Five-Year Review Protectiveness Determination	Inclusion in the Fifth Five-Year Review	Fifth Five-Year Review Protectiveness Determination
E	UC-3	1/1/2014	Human Health Risks - exposure to chemicals in soil, soil gas, groundwater Radiologically Impacted Media	Durable covers to prevent exposure to COCs In situ treatment of VOCs in groundwater Monitoring for COCs in groundwater Excavation and disposal of radiologically impacted storm drain and sanitary sewer lines and associated soil Radiological scanning unrestricted release ICs	Short-term protective	Yes	Short-term Protective
F	F	PENDING	Human Health Risks - consumption of seafood Ecological Risks - exposure to chemicals in sediment	Focused removal of sediment and backfill with clean fill Capping to prevent exposure to COCs in sediment Monitored natural recovery ICs	Not Applicable (ROD was not signed)	No	Not Applicable

COC = chemical of concern
ESD = Explanation of Significant Differences
IC = institutional control
MNA = monitored natural attenuation
NAPL = nonaqueous phase liquid
ROC = radionuclide of concern
ROD = Record of Decision
SVE = soil vapor extraction
TCRA = time-critical removal action
VOC = volatile organic compound
ZVI = zero-valent iron

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Table 1-2. Installation Restoration Site Summary

Parcel	Site	Site Name and Status	Location, Description, and Site Background	Reference
Facility-wide	IR-45	Steam Lines; Transferred	The steam line system, referred to as SI-45, was investigated as part of the 1993 SI to evaluate whether the system contained waste oil. The steam lines in Parcel A did not contain waste oil, and it was concluded that no further investigation was required.	Gilbane, 2016; Gilbane, 2018
	IR-49	Fuel Distribution System; Closed	IR Site 49 includes all of the fuel lines in Parcel C. The lines were investigated as part of the Parcel C RI and a TCRA was completed in 2001 to close an area centered on the east-west-trending main fuel line and north-south-trending North Slip lateral fuel line. Additional sampling at a portion of the site (AOC 49B) concluded that there were no unacceptable risks to human health and the environment from exposure to petroleum hydrocarbons and risk would be further mitigated by the durable cover remedy in Parcel C.	Gilbane, 2016
	IR-50	Storm Drain and Sanitary Sewer Systems; Transferred	The storm drains and sanitary systems, referred to as SI-50, were investigated as part of the 1993 SI. Visual inspection and sampling were performed to document the quality of the water and sediment, and it was concluded that no further investigation was required. Pesticides and herbicides were detected, but at concentrations that did not pose a threat to human health or the environment.	Tetra Tech, 1998
	IR-51	Former Transformer Sites; Transferred	The transformers of Parcel A are referred to collectively as SI-51. The former locations of the transformers were visually inspected for stains that might indicate a release of oil that contains PCBs during the 1993 SI. All transformers have since been removed and inspected (and sampled if necessary). The inspections indicated that no PCB-containing oils had leaked into the surrounding environment, and no further investigation was recommended.	Tetra Tech, 1998
IR-07/18	IR-07	IR Site 7; RA Completed	IR Site 7 is approximately 10.6 acres in the northwestern corner of the Former HPNS along the property line and adjacent to San Francisco Bay. Historical activities at IR Site 7 that may have contributed to contamination in soil include sandblasting and disposal of sandblast grit and debris. Investigations were performed from 1991 to 2007. Most of IR Site 7 was excavated to a depth of 10 feet bgs from 1998 to 2001. In 2008, approximately 17,000 cubic yards of soil were excavated to address methane. In 2012, a durable cover was installed to address potential risk from the remaining ubiquitous metals, and a shoreline revetment was added to provide a physical barrier to prevent exposure of humans and wildlife to remaining COCs. Pesticides were not a COC post remediation.	TriEco-Tt, 2013; Westec, 1984; SFBRWQCB, 2012
	IR-18	IR Site 18; RA Completed	IR Site 18, a 3.6-acre area near the northern tip of the Former HPNS, is in the paved parking lot adjacent to Earl Street west of IR Site 7. Triple A allegedly disposed of 50,000 to 100,000 gallons of waste oil and other liquids on the ground at this site, which was subsequently paved with asphalt. Investigations were performed from 1991 to 2007. Similar to IR Site 7, soil excavation was performed from 1998 to 2001 to a depth of 10 feet bgs. In 2012, a durable cover was installed to address potential risk from the remaining ubiquitous contaminants to provide a physical barrier to prevent exposure of humans and wildlife to remaining COCs. Pesticides were not a COC post remediation.	TriEco-Tt, 2013; Westec, 1984; HLA, 1989; SFBRWQCB, 2012
Parcel B-1	IR-10	Battery and Metal Plating Shop; Open, Remedial Monitoring	IR Site 10 is in the northern portion of the Former HPNS. There was a battery and electroplating shop in Building 123 from 1944 to 1974. Acids, chromates, and heavy metals from this operation were discharged to the storm sewer by the plating shop. Cyanide wastes were also generated but were disposed of separately and transported to the landfill. In 1974, the Navy leased the building to Triple A, which used the building as a commercial warehouse. Investigations and interim actions were performed from 1989 to 2009. Soil vapor extraction and zero valent iron injection were conducted to treat VOCs. Active remediation and a PFAS investigation is ongoing at this site.	TriEco-Tt. 2013
	IR-20	IR Site 20; RA Completed	IR Site 20 is in the northern portion of the Former HPNS and is adjacent to Parcel C. Building 156 was used to manufacture rubber parts for ships and was later used as a storage building for marine supplies. Building 163 was used as the Rubber Shop Annex used for storage. Investigations began in 1993 and excavations were conducted from 1998 to 1999. In 2012, a durable cover was installed to minimize human exposure to the potentially contaminated soil beneath the cover. The Building 156 foundation is considered part of the durable cover for the Parcel B-2 remedy.	PRC, 1994a; Tetra Tech, 1998; HLA, 1994; TriEco-Tt, 2013; NAVSEA, 2004
	IR-23	IR Site 23; RA Completed	IR Site 23 is at the northern tip of the Former HPNS. Building 146 was used as an industrial and photography development laboratory, general shops, radioactive waste storage area, and radio luminescent device turn-in building. Building 144 was a latrine. Building 121 was a former civil training center. The area previously contained unnamed ASTs. Investigations were performed from 1986 to 2008. Interim excavations took place in 1996. An unnamed, 370-gallon fuel UST was removed in 1999. In 2012, a durable cover was installed to minimize human exposure to the potentially contaminated soil beneath the cover. The foundations of Buildings 121 and 146 are considered part of the durable cover for the Parcel B-2 remedy.	TriEco-Tt, 2013; Tetra Tech, 2006; PRC, 1994a; HLA, 1994
	IR-24	IR Site 24; Cleanup Completed	IR Site 24 is on the northern boundary of the Former HPNS and was used for general berthing and dry docking of small vessels and submarines. Building 125 was used as a cafeteria servicing the submarine servicemen and was later leased to a cabinet maker. Building 128 was the former Shop Service and Work Control Center No.1 and was later used for storage. Building 130 was used as machine shop, metal working shop, and pipe fitter's shop. Building 131 was the former electrical substation U. Building 159 was a latrine. Investigations began in 1991 and excavations were conducted from 1998 to 1999 and from 2000 to 2001. In 2007, trenching and soil removal were conducted as part of the CERCLA Radiological Program Sanitary Sewer and Storm Drain Removal Project, and petroleum-related staining and odor were observed in a trench just south of Building 125. In 2009, additional investigation and removal activities were performed.	TriEco-Tt, 2013; PRC, 1994a; AMEC, 2016

Table 1-2. Installation Restoration Site Summary

Parcel	Site	Site Name and Status	Location, Description, and Site Background	Reference
Parcel B-1	IR-42	IR Site 42; RA Completed	IR Site 42 is in the northern portion of the Former HPNS and is adjacent to Parcel A. Building 109 was used as the base police station and was leased to the San Francisco Police Department. Building 113 was used as a tug maintenance shop, salvage diver facility, and torpedo storage and overhaul building. It was also used by the San Francisco Police Department for storage. Building 114 (formerly 113A) was a machine shop and maintenance shop. It was leased to Smith-Emery Co. for testing concrete, soil, and windows. Apparently, radioactive material was used in Building 113A because X-rays were taken and developed. In 2012, a durable cover was installed to minimize human exposure to the potentially contaminated soil beneath the cover. The foundations of Buildings 109, 113, and 114 (113A) are considered part of the durable cover for the Parcel B-2 remedy.	TriEco-Tt, 2013; PRC, 1994a; PRC, 1994b; Tetra Tech, 1998a; HLA, 1994; NAVSEA, 2004
	IR-60	IR Site 60; RA Completed	IR Site 60 includes Dry Docks 5, 6, and 7 and is in the northeastern section of the Former HPNS adjacent to Parcel B. Building 145 was a saltwater pump house to use sea water tor firefighting. Investigations began in 1993 and excavations were conducted in 1998 and 1999. In August 2011, the Navy submitted a site closeout report requesting regulatory site closure.	Tetra Tech, 1998; PRC, 1994b; TriEco–Tt, 2013;
	IR-61	IR Site 61; RA Completed	IR Site 61 is in the central area of Parcel B-1. Building 122 was a former electrical substation V and Compressor Plant. Investigations began in 1995 and excavations were conducted in 1998 and 1999. In 2007, trenching and soil removal was conducted as part of the CERCLA Radiological Program Sanitary Sewer and Storm Drain Removal Project, and petroleum-related staining and odor were observed in a trench near an unidentified pipeline. In 2009, an investigation was performed as a result of this discovery. In 2012, a durable cover was installed to minimize human exposure to the potentially contaminated soil beneath the cover. The Building 122 foundation is considered part of the durable cover for the Parcel B-2 remedy.	Tetra Tech, 1998; HLA, 1994
	IR-62	IR Site 62; RA Completed	IR Site 62 is in the central area of Parcel B-1 approximately 100 feet southwest of the intersection of English and Lockwood Streets. Building 115 was a former submarine office and training school. A transformer was located at the northeastern corner of the building. A large blower-like machine and concrete sump with a steel storage tank were in the southwestern part of the first floor. As of 1994, the building was leased to New World Design, a home-building and cabinetry company that uses glues and stains. Building 116 was the Navy Reserve Drill Hall and was later leased to furniture, cabinet makers, and artists. In 2012, a durable cover was installed to minimize human exposure to the potentially contaminated soil beneath the cover. The foundations of Buildings 115 and 116 are considered part of the durable cover for the Parcel B-2 remedy.	PRC, 1994a; PRC, 1994b; Tetra Tech, 1998; TriEco-Tt, 2013; NAVSEA, 2004
Parcel B-2	IR-26	IR Site 26; Open	IR Site 26 at in the northeastern tip of the Former HPNS for support of dry dock activities and ship sandblasting. Surface spills of petroleum hydrocarbons and chemical releases were suspected. Building 140 was a Dry Dock 3 Pump House, and former Building 141 was a Dock Shopwright's Shop. Former Building 157 was a Q&RA Industrial Laboratory, Metal Fabrication Branch. Soil excavation was completed in 2000 for multiple chemicals and in 2008 to remove a mercury source on the site. Groundwater monitoring indicates that mercury may have discharged to San Francisco Bay, and groundwater treatment was implemented. Groundwater at IR Site 26 continues to be monitored as part of the Basewide monitoring program and additional data needs or remedial actions will be evaluated as recommended in this Five-Year Review.	TriEco-Tt, 2013; Tetra Tech, 1998; PRC, 1994a; KMEA MACTEC JV, 2017
	IR-46	IR Site 46; RA Completed	IR Site 46 consisted of the Parcel B fuel distribution lines. The site is south of Building 130 (Parcel B-2). Investigations began in 1993, and excavations were conducted from 1998 to 1999 and from 2000 to 2001.	Tetra Tech, 1998
Parcel C and UC-2	IR-06	IR Site 6; RA Completed	IR Site 6 is west of the intersection of Robinson Street and Lockwood Street and was used as a tank farm since the early 1940s. The tanks were used to hold diesel fuel and lubricating oil. Reportedly, in the early 1940s, there was a major spill of diesel fuel caused by a ruptured tank and cleanup actions were conducted. The Navy removed the ASTs, subsurface fuel distribution lines, and more than 6,000 cubic yards of contaminated soil in 1993.	Westec, 1984
Parcel C	IR-25	IR Site 25; RA Completed	IR Site 25 is located on the boundary of Parcel B-1 and Parcel C and is in the diesel engine and gun overhaul area. Building 124 was used as an acid mixing plant. Building 134 was used as a machine shop, Q&RA offices, and central tool room. Building 134 was leased to Odaco, Inc., and was used for marine refrigeration. The Building 134 foundation is considered part of the durable cover for the Parcel C remedy.	PRC, 1994a; AMEC, 2016; Tetra Tech, 1998
	IR-27	IR Site 27; RA Completed	IR Site 27 is at the northeastern tip of the Former HPNS between Dry Docks 2 and 3. Building 205 was the Dry Dock 2 pump and compressor plant. IR Site 27 included UST S-214, which was located between Buildings 204 and 205. The 22,000-gallon UST was used to store fuel oil for the boiler units inside Building 205. The UST was closed in place.	PRC, 1994a; AMEC, 2016; Tetra Tech, 1998

Table 1-2. Installation Restoration Site Summary

Parcel	Site	Site Name and Status	Location, Description, and Site Background	Reference
Parcel C	IR-28	IR Site 28; Open	IR Site 28 is located on the eastern side of the Former HPNS adjacent to San Francisco Bay. IR Site 28 is the largest area of Parcel C and was used predominantly for ship repair and to a lesser extent shipping, office, and commercial activities. Building 251 was used as the industrial relations and central tool room. Building 258 was used as pipe-cleaning shop. Building 281 was used as the electronics-weapons precision facility and was later leased to Oakland Naval Supply for storage. Building 228 was a cafeteria. Building 230 was as a Shop Service building. As of 1994, ERMICO Enterprises, Inc., was leasing the building to manufacture skateboard wheels. Buildings 270 and 271 were paint shops. Buildings 219, 229, and 273 were electrical substations. Building 231 was used as a machine shop. There was a former drum storage area north of Building 231. Building 211 was used as a machine and electronic test and repair shop. Building 224 was used as air raid shelter and was later used to store radiological material. The first floor of building 253 was used as ordnance shop for cleaning, paint stripping, and painting of steel. The second, fourth, and fifth floors of Building 253 were used as an electronic and optical shop. Wastewater from the condensate collection drum was manually transferred periodically into a 21,000-gallon, double-contained holding tank north of Building 253. Small Buildings 214, 218, and 252 were used as an office, latrine, and bus terminal, respectively. During the 1994 SI, leaking equipment, spills, surface staining, chemical residues, periodic discharges, and generally poor housekeeping practices were observed. The foundations of Buildings 251, 258, 281, 230, 270, 271, 219, 229, 273, 231, 224, 218, and 252 are considered part of the durable cover for the Parcel C remedy.	HLA, 1994; TriEco-Tt, 2013; Aptim, 2017; Westec, 1984; PRC, 1994a; AMEC, 2016; Tetra Tech, 1998
	IR-29	IR Site 29; RA Completed	IR Site 29 is in the western portion of Parcel C. Building 203 was the former boiler room and main power plant. A 500-gallon UST was located immediately south of Building 203 and was used to supply gasoline to an engine inside the building. This UST was removed in 1991. A 210,000-gallon fuel oil UST and a 14,000-gallon brine UST were south of Building 203. Both tanks were closed in place in 1991. Two fuel oil USTs and one 35,000-gallon water UST were along the eastern side of Building 203 and were removed in 1993. Buildings 217 and 275 were used for sheet metal production, photo engraving, welding, and painting and were later used as a warehouse and storage area for furniture. Building 279 was used as materials storage. Building 280 was used as an aluminum cleaning facility. Building 282 was used as an abrasive blast facility to remove paint. The Building 203, 217, 275, 279, 280, and 282 foundations are considered part of the durable cover for the Parcel C remedy.	PRC, 1994a; AMEC, 2016; Tetra Tech, 1998; HLA, 1994
	IR-30	IR Site 30; RA Completed	IR Site 30 is in the western corner of Parcel C. Building 241 was used as a forge and metal heat-treating facility. The building contained two large oil-containing vats that were used as baths for quenching metal and numerous ovens with asbestos lining. The building was leased to Golden Gate Heat Treating. The Building 241 foundation is considered part of the durable cover for the Parcel C remedy.	Trevet, 2017; HLA, 1994
	IR-57	IR Site 57; RA Completed	IR Site 57 is in the southern portion of Parcel C surrounding Dry Dock 4. Building 300 was a Substation N. Building 301 was a latrine. Building 367 was a former Ship Supervisor Field Office. Buildings 300, 301, and 367 were all subleased to Astoria Metals along with Dry Dock 4. The site is centered on two EEs, EE-06 and EE-07, conducted in 1996. EE-06 targeted the removal of arsenic and TPH-diesel. Approximately 19 cubic yards of soil were removed from EE-06 to a depth of 2 feet. EE-07 targeted a former hazardous waste accumulation area. Approximately 91 cubic yards of soil were removed from EE-07 to a depth of 2 feet. Approximately 30,000 pounds of asbestos-containing materials were stored on this site as of the survey conducted 1997. The Building 300 and 301 foundations are considered part of the durable cover for the Parcel C remedy.	PRC, 1994b; Tetra Tech, 1998; Innovative, 2004
	IR-58	IR Site 58; RA Completed	IR Site 58 is in the north-central portion of Parcel C, north of Buildings 251 and 258. It was a former scrap yard. During the 1993 SI, observations indicated piles of scrap metal, manufacturing equipment, abandoned automobiles, motors, scrap wood, office equipment, fire extinguishers, damaged lead-acid batteries, and leaking oil drums and leaking insulators. Two USTs used to contain gasoline and diesel fuel and solvent. The tanks have been removed. The foundations of Buildings 251 and 258 are considered part of the durable cover for the Parcel C remedy.	HLA, 1994
	IR-63	IR Site 63; RA Completed	IR Site 63 is also referred to as Former Building 278, which was used for paint storage. Samples collected during the Parcel C RI indicated that there was a potential for risk to future residents from metals in soil. The area is currently under durable covers.	
	IR-64	IR Site 64; RA Completed	IR Site 64 is between Dry Docks 2 and 3. Building 206 was former substation A.	Tetra Tech, 1999; CE2-Kleinfelder. 2009; Tetra Tech, 1998
Parcel D-1	IR-16	IR Site 16; Unknown	IR Site 16 is a 10,000-square-foot fenced area at the eastern corner of H Street and Mahan Street near the southern tip of Former HPNS. Previous activities on the site by Triple A allegedly included storage of drums, transformers, and some flammable solids, and the site included a 5,000-gallon tank.	HLA, 1989; Tetra Tech, 1998
	IR-17	IR Site 17; Unknown	IR Site 17 covers approximately 1.8 acres at the southern tip of Former HPNS, immediately east of the end of H Street. Triple A supposedly stored and disposed of drums at this site, and visible stains were reported on the ground.	HLA, 1989; Tetra Tech, 1998
	IR-22	IR Site 22; Unknown	IR Site 22 is in the northern portion of Parcel D-1. Associated Building 368 was part of the shop services group and was used as pipefitting shop. Building 369 was itemized as a rigging shop and was investigated as IR Site 22. Building 308 was used as a saltwater pump house.	PRC, 1994a, Tetra Tech, 1998; NAVSEA, 2004

Table 1-2. Installation Restoration Site Summary

Parcel	Site	Site Name and Status	Location, Description, and Site Background	Reference
Parcel D-1	IR-32	IR Site 32; Unknown	IR Site 32 is in the eastern portion of Parcel D, near the northeastern end of Mahan Street. The site is approximately 9.4 acres and included the Regunning Pier, which extends along Berths 15 and 16, and 370 and 383. Building 370 was a latrine and Building 383 was used by the Navy for shipping and receiving; it was later leased to Westinghouse for office and warehouse use. As of 2009, Building 383 was used a training center by local communities. A 450-ton crane was constructed on the Regunning Pier to remove gun turrets from Navy ships during World War II. Waste oils and electrolyte solutions containing metals, thinners, and lubricants associated with crane maintenance were identified at IR Site 32. Electrical equipment, switch boxes, and crane parts were stored on exposed soil adjacent to the northeastern end of Building 383, and containers of radioactive material were stored at the Regunning Pier from 1950 to 1959.	ChaduxTt, 2009; NAVSEA, 2004
	IR-35	IR Site 35; Cleanup Completed	IR Site 35 is immediately northwest of Building 274. Building 274 was used as an office and instrument hut for Poseidon. Building 306 was Substation I. Buildings 313 and 313A were used by the NRDL. Building 322 was former Marine Guard and Pass Office. Building 372 was used as the prefab decking shelter and was leased to Astoria Metals. Approximately 35,000 pounds of lead-based paint were stored in Building 372 in 1997. A surface spill was identified during investigations conducted from 1993 to 1996, and in 2000. In 2009, the Navy conducted supplemental sampling to support a request for petroleum closure/no further action.	PRC, 1994a; PRC, 1994b; Tetra Tech, 1998; NAVSEA, 2004
	IR-48	IR Site 48; Unknown	IR Site 48 is in the south-central portion of Parcel D and was a suspected subsurface steam line transporting waste oil from the docks and berths to an AST (S-505) in Parcel E. The steam ran from Berth 15, along Manseau Street to Hussey Street, then approximately 350 feet south along the western side of Hussey Street, then west to H Street, and then south along H Street to a point between IR Site 38 and IR Site 39 where the line left Parcel D and entered Parcel E. The line termination was in the vicinity of Building 521 (Power Plant South Area) within Parcel E.	ChaduxTt, 2009; Tetra Tech, 1998
	IR-53	IR Site 53; Cleanup Completed	IR Site 53 included a former storehouse (Building 525) and the former automotive hobby shop (Building 530). Building 530 was also used for car washing. Buildings were leased to Hydro-Chemical Services, Inc., after Navy operations ceased. Investigation activities were performed in 1993, 1994, and 1996. Interim excavation activities were conducted in 1996 to remove TPH- and metals-affected soil. In 2009, the Navy conducted supplemental sampling to support a request for petroleum closure and no further action.	HLA, 1994; NAVSEA, 2004
	IR-55	IR Site 55; Unknown	IR Site 55 is in central portion of Parcel D-1. Building 307 was used as an electronic assembly facility and storage area. It was then leased to NIROP of Sunnyvale.	PRC, 1994a
	IR-68	IR Site 68 (Poseidon Area); Cleanup Completed	IR Site 68 is on the pier surrounded by Berths 17, 18, and 19. Building 376 was used as Poseidon Control Hut. Building 378 was a latrine. Building 379 was a Poseidon Instrumentation Control Center. Building 382 was a Poseidon Arresting System Shelter. North of Building 378 was a diesel generator, generator shed, and two ASTs (10,000-gallon diesel fuel tank and 50-gallon tank probably for water or coolant), which were removed from 1993 to 1995. Investigations were performed in 1995, 1996, and 2001.	PRC, 1994b; Tetra Tech, 1998; HLA, 1994; NAVSEA, 2004
	IR-69	Bilge Water Pump House; Inactive	Building 523 was a saltwater pump house and the adjacent metal shed. The site is east of Building 530 adjacent to Berths 17, 18, and 19. It contained electrical equipment containing PCBs, pumps, pipes, and a floor vault. Identified as the bilge water pump house	Tetra Tech, 1998; Tetra Tech EM, 1998; HLA, 1994; NAVSEA, 2004
	IR-70	Former drum and tank storage area; Cleanup Completed	IR Site 70 included the former drum and tank storage area southeast of Building S-308. Building S-308 was a shed with a cyclone outside the southern wall, which was used for sandblasting operations. Building S-308 was also used as a playing field and facility. The following were reportedly located within the IR Site 70 before their removal: 160-gallon metal waste petrochemical tank, three 55-gallon drums supported by pallets, 130-gallon oil-filled container, 5-gallon container of organic liquid, and an iron depressurization tank. Impacted soils were excavated in August 1996. Supplemental investigation activities were performed in 2010 to support an evaluation of no further action for non-PFAS chemicals. Materials reportedly managed or disposed of in this area include bilge liquids and sandblasting debris.	Tetra Tech EM, 1998; HLA, 1994; NAVSEA, 2004
Parcel G	IR-09	Pickling and Plating Yard; RA Completed	IR Site 9 is in the central portion of the Former HPNS and is north of Building 411. Steel pickling and metal plating occurred at this site from 1947 to 1973. Building 421 was used as an oxygen control shop. Building 422 was used as an office and latrine. This area was investigated several times before the RA began. The results indicated that the liquid from the pickling tanks contained concentrations of chromium and copper, and the paint residue samples contained concentrations of chromium, lead, and zinc, SVOCs, and PAHs. During the remedial investigation conducted from 1988 to 1991, the primary contaminant observed in the soil and groundwater was hexavalent chromium. The RA was completed in 1996, including removal of the concrete foundations in the plate storage and drying rack area, removal of zinc residue and other wastes, and removal of pickling tanks. In August 2017, three groundwater monitoring wells were sampled; including two upgradient and one downgradient of potential source areas The samples were analyzed for PFAS. The highest concentration of PFOS (0.0142 µg/L) was in downgradient monitoring well IR09P040A, and the highest concentration of PFOA (0.0119 µg/L) was in upgradient well IR09MW61A. All concentrations were less than the current Department of Defense screening criteria. The Building 411 foundation is considered part of the durable cover for the Parcel G remedy.	TriEco–Tt, 2013; IEJV, 2019; Westec, 1984; Tetra Tech, 1998; Trevet, 2018

Table 1-2. Installation Restoration Site Summary

Parcel	Site	Site Name and Status	Location, Description, and Site Background	Reference
Parcel G	IR-33	IR Site 33; RA Completed	IR Site 33 is in the central portion of Parcel G. Building 411 was used as the shipfitter and boilermaker shop and later as a workshop, storage area, and office when leased to Christian Engineering. Buildings 302 and 303 were used as transportation shops, and Building 304 was used as a service station. Building 302 was later leased to the Golden Gate Railroad Museum and was used as a shop and for storage. Building 364 was initially used as an animal irradiation and research facility for isotope processing and decontamination studies and as a general research laboratory. It was later leased to a laboratory company that performed assay operations. Building 365 was a storage building, offices, and film lab. Building 417 was used for acetylene manifolding and welding. Building 418 was used as the Q&RA Welding and Engineering Facility and was used for metal spray. Building 424 was the former Area Time House No.4. Buildings 417, 418, and 424 were leased to Hydro Chem Services after Navy use and were used as storage, parking, offices, and a workshop. Buildings 419 and 420 were used for oxygen conversion and oxygen cylinder changing. Approximately 15 cubic yards of soil affected by a cesium-137 spill were removed from this site in 2001 and 2002. The foundations for Buildings 411, 302, 303, and 304 are considered part of the durable cover for the Parcel G remedy.	TriEco–Tt, 2013; Westec, 1984; PRC, 1994a; Tetra Tech, 2008a, Tetra Tech, 2008b; Tetra Tech, 1998; CH2MHill, 2019; NAVSEA, 2004
	IR-34	IR Site 34; RA Completed	IR Site 34 is in the eastern portion of Parcel G. Buildings 351 and 351A were used as an electronics shop and NRDL Electronics Laboratory. Cleaning and painting of electronic equipment, photographic reproduction, and photo developing occurred in these two buildings. Building 366 was used as a boat and plastic shop and was leased to Christian Engineering for workshop and storage use. It was also used for NRDL instrument calibration and instrument evaluation, and as general laboratories, a chemical research lab, and a shipyard radiography shop. Ventilation ducting and a floor drain in Building 366 were the source of a release of cesium-137 at a concentration that exceeded action levels. The foundations for Buildings 351 and 366 are considered part of the durable cover for the Parcel G remedy.	Westec, 1984; PRC, 1994a; Tetra Tech, 1998; CH2MHill, 2019
	IR-37	IR Site 37; RA Completed	IR Site 37 is in the northwestern corner of Parcel G. Building 401 was used as a public workshop and was later leased as an artist studio. Building 423 was used as a compressor building until 1956 and was used for storage of paint and roofing materials afterwards. It was demolished as of 2004. Building 435 was used for equipment storage and for spray painting. Buildings 436 and 437 were used for storage. The foundation for Building 401 is considered part of the durable cover for the Parcel G remedy.	Westec, 1984; PRC, 1994a; Tetra Tech, 1998; NAVSEA, 2004
	IR-44	IR Site 44; RA Completed	IR Site 44 is on the southern boundary of Parcel G. Buildings 408, 409, and 410 were used as a heat-treating furnace shelter, welder motor facility, and generator huts, respectively. Building 438 was used as a metal spray shelter. The furnace was used as a kiln. The spray shelter was apparently used to clean and paint small metal parts. The generator motor apparently supplied power for the welding stations outside the building to the north and west.	PRC, 1994a; Tetra Tech, 2008c; Tetra Tech, 1998
	IR-65	IR Site 65; RA Completed	IR Site 65 is near the eastern boundary of Parcel G. The site includes Building 324, which was used as the carbon dioxide refilling station for fire extinguishers. IR Site 65 was part of Redevelopment Block 39 and part of DM 8866, where PCB- and arsenic-impacted soil was excavated. Investigations were conducted in 1995, 1996, and 2001. Surficial soil was found to be contaminated with petroleum hydrocarbons. In 2008, trenching and soil removal was conducted as part of the CERCLA Radiological Program Sanitary Sewer and Storm Drain Removal Project.	Navy BRAC, 2009a; Tetra Tech, 1998
	IR-66	IR Site 66; RA Completed	IR Site 66 is in the western portion of Parcel G. Building 407 was formerly used as storehouse and vehicle storage yard and was then leased to a sheet metal fabricator company and furniture storage company. The Building 407 foundation is considered part of the durable cover for the Parcel G remedy.	PRC, 1994a; Tetra Tech, 1998; HLA, 1994
	IR-67	IR Site 67; RA Completed	IR Site 67 is in the southwestern corner of Parcel G. Building 439 was previously used by the Navy as an equipment storage facility. The building contained an acid dip tank, alkaline dip tanks, and paint booths. The building was completed in 1974 by apparently never used by the Navy. It was leased from 1985 to 1990 to various tenants. The foundation for Building 439 is considered part of the durable cover for the Parcel G remedy.	HLA, 1994; NAVSEA, 2004
	IR-71	IR Site 71; RA Completed	IR Site 71 is in the southeastern corner of Parcel G. The Navy conducted a treatability study at Parcel G in 2008 to evaluate technologies to address COCs in groundwater and identified separate chloroform and PCE and TCE plumes. Groundwater monitoring results for the chloroform plume have been below remediation goals and generally below detection limits in recent sampling events. The PCE and TCE concentrations in the plume are higher than remediation goals but have been on a decreasing trend since about 2009. Groundwater zero-valent iron injection at the IR Site 71 western chloroform plume was completed in 2008.	TriEco–Tt, 2013; Tetra Tech, 1998
Parcel E	IR-02 Northwest and Central	Bay Fill; Open	IR Site 2 Northwest and Central are approximately 40 acres southwest of J Street. The site was used for disposal of industrial debris, drums, paint containers, asphalt, asbestos, sandblast waste, waste oil, and other unknown liquid waste. Building 600 is in this area and was used as a bachelor enlisted men's quarters from 1970 to 1984.	TriEco-Tt, 2013; Westec, 1984; PRC, 1994a; NAVSEA, 2004
	IR-02 Southeast	Burning Disposal Site, Open	IR Site 2 Southeast is the former burning disposal area in the southeastern corner of the Former HPNS. Approximately 11,200 cubic yards of soil, metal slag, and debris from the metal debris reef area were removed and disposed of offsite from 2005 to 2007.	TriEco-Tt, 2013; Westec, 1984

Table 1-2. Installation Restoration Site Summary

Parcel	Site	Site Name and Status	Location, Description, and Site Background	Reference
Parcel E	IR-03	Oil Reclamation Ponds, Open	IR Site 3 is on the southeastern shoreline of the Former HPNS within IR Site 2 Central. There were two oil reclamation ponds onsite. One pond was 50 feet by 60 feet and 5 feet deep with a capacity of 190,000 gallons, and the other was 55 feet by 100 feet and 5 feet deep with a capacity of 250,000 gallons. The ponds were unlined and constructed with bay fill material within 10 meters of the shoreline. In 1974, the ponds were emptied and filled with soil. A sheet pile wall and cap were installed at the former oil reclamation ponds from 1996 to 1998, and a bench scale treatability study for NAPL was conducted onsite in 2011.	IEJV, 2019; TriEco-Tt, 2013; Westec, 1984; Tetra Tech, 1998
	IR-04	Scrap Yard, Open	IR Site 4 is east of the former industrial landfill site (Parcel-E2) in the southwestern portion of the Former HPNS. The site was a scrap yard and scrap material area where the Navy stored used submarine batteries, electrical capacitors, and steel. In 1976, the area was leased to Triple A, which also used it as a scrap yard. Drums, pipe lagging, batteries, liquid wastes, and scrap metal were found, and stained soil was observed at this site. Building 807 was within IR Site 4 and was used as the scrap yard shed. This building was demolished as of 2004.	Westec, 1984; Tetra Tech, 1998; Gilbane, 2016; NAVSEA, 2004
	IR-05	Old Transformer Storage Yard, Open	IR Site 5 was used as an electrical transformer storage yard starting in 1946.	Westec, 1984
	IR-08	PCB Spill Area, Open	IR Site 8 is on the boundary of Parcel E and Parcel D-1, southeast of Building 606. Building 606 was built in 1989 in an area formerly occupied by demolished Buildings 503, 507, and 508. Building 606 was used for Shore Intermediate Maintenance Activities. Former Building 503 was a barracks. Building 507 was a biological laboratory, and Building 508 was a health physics office. IR Site 8 was identified as a PCB spill area in September 1986 when PCB contamination was found during construction work near Building 503. The initial results showed PCB concentrations as high as 910 ppm in the soil. Approximately 1,550 cubic yards of soil contaminated by PCBs were removed in 1989 during construction of Building 606.	TriEco-Tt, 2013; Tetra Tech, 1998
	IR-11	Power Plant, Open	IR Site 11 is in the southeastern portion of the Former HPNS north of J Street. Building 521 on the site was a former power plant.	Westec, 1984
	IR-12	Disposal Trench and Salvage Yard; Open	IR Site 12 covers slightly more than 6 acres near the southwestern corner of HPNS, north of 6th Avenue and south of Spear Avenue. The area was used by both the Navy and Triple A as a salvage yard where equipment was stored for later reuse. A concrete slab on a portion of the site was reportedly used as a drum crushing pad. Metals, TPH, TRPH, PCBs, PAHs, and oil and grease were detected in groundwater samples at concentrations that exceeded the site screening criteria. Building 702 was a "scrap yard shed". Building and brush fires (Class A fires) are not typically extinguished with AFFF. AFFF is used for fuel fires to suppress flammable liquid vapor (Class C fires).	HLA, 1989; Tetra Tech, 1998; Tetra Tech EM, 1998
	IR-13	Former Commissary Site; Open	IR Site 13, the former commissary site, encompasses approximately 0.66 acre near the southern edge of the Former HPNS in the triangular area bounded by T Street on the east, J Street on the south, and the extension of Manseau Street on the northwest. During Triple A's occupancy, sandblasting waste, drums, and oily dirt were reportedly stored onsite. In addition, transformers possibly containing PCBs were stored on the eastern side of the site.	HLA, 1989
	IR-14	Oily Liquid Waste Disposal Area; Open	IR Site 14 comprises approximately 4.5 acres near the southern edge of the Former HPNS between H and " Streets northwest of the power plant (Building 521). Oily liquid wastes were allegedly disposed of on the ground at IR Site 14, and drums, transformers, and chemical canisters were reportedly dumped onsite. VOCs and SVOCs were detected in soil samples.	HLA, 1989; Tetra Tech, 1998
	IR-15	IR Site 15; Open	IR Site 15 consists of two areas immediately adjacent to Building 521 near the southern tip of the Former HPNS. These areas, northeast and northwest of Building 521, comprise approximately 0.75 acre. Oily waste ponds and a tank used to incinerate wastes were allegedly present. Soil samples collected in 1987 contained VOCs and SVOCs. VOCs, SVOCs, petroleum hydrocarbons, oil, grease, and metals were detected in groundwater.	HLA, 1989
	IR-36 North	IR Site 36 North; Open	IR Site 36N is in the northern corner of Parcel E. Building 400 was used as Ships Operational Activity Parts Receiving Storehouse by Navy Planning and Engineering. Building 405 was used for storage (including transformers) and was later leased by a mushroom cultivation company after Navy use. Building 404 was formerly used as a supply storehouse. This building was then leased to Mina Metals and was used for metal products manufacturing.	PRC, 1994a; Tetra Tech, 1998
	IR-36 West	IR Site 36 West; Open	IR Site 36W is west of IR Site 36S. The associated Building 371 was used for equipment storage. Building 704 was used as Transportation Shop and Car Shelter. Building 709 was used as a gas station. Seven former USTs are associated with Building 709.	PRC, 1994a; Tetra Tech, 1998
	IR-36 South	IR Site 36 South; Open	IR Site 36S is south of IR Site 36N. Building 406 was used as storehouse for packing and preservation. Building 413 was a supply storehouse and Building 414 was a Public Works Furniture Storehouse. This site also contained vacant lots.	PRC, 1994a; Tetra Tech, 1998
	IR-38	IR Site 38; Open	IR Site 38 is in the central portion of Parcel E. Associated Building 500 was used as the Ships Bachelor Officers Quarters and Chief Petty Officer Barracks. Gasoline AST S-505 remained onsite as of 1994.	PRC, 1994a; Tetra Tech, 1998; NAVSEA, 2004

Table 1-2. Installation Restoration Site Summary

Parcel	Site	Site Name and Status	Location, Description, and Site Background	Reference
Parcel E	IR-39	IR Site 39; Open	IR Site 39 is in the central portion of Parcel E. The site consisted of two areas connected by IR Site 13. Building 505 was used as Navy Exchange, bowling alley, gymnasium, ships canteen, and NRDL Annex. Buildings 707 and 708 were used as an NRDL animal colony and an NRDL biomedical facility.	PRC, 1994a; Tetra Tech, 1998; NAVSEA, 2004
	IR-47	Fuel Distribution Lines; Open.	Fuel was transported from Berth 29 in Parcel D to Building 521 and former AST S-505. Triple A is suspected of having used the fuel lines to transport waste oil from Berth 29 in Parcel D to Building 521, former AST S-505, and the former oil reclamation ponds (IR-03). The site will be addressed as part of the Parcel E remedy (excavation and offsite disposal).	
Parcel E-2	IR-01/21	Parcel E-2 Landfill, Open	Parcel E-2 (IR Sites 01 and 21) is in the southwestern corner of the Former HPNS and is within the south bay shore area. It was used as an industrial landfill site serving the entire shipyard. The wastes disposed of at Parcel E-2 included domestic garbage and refuse, bay dredge materials, building construction and demolition materials, industrial shop waste, waste containers, and low-level radioactive waste. Approximately 44,500 cubic yards of soil and debris from the PCB hot spot area in the southern portion of Parcel E-2 were removed and disposed of offsite during 2005 to 2007. The RA is currently under construction.	TriEco–Tt, 2013
Parcel UC-3	IR-52	Railroad Right-of-Way; RA Completed	The railroad right-of-way portion (IR Site 52) of Parcel UC-3 is in the San Francisco Bayview neighborhood. The railroad was originally used to transport materials and equipment to and from the shipyard. The site was leased to Triple A in 1976. Stained soil, spilled paint, and household wastes were observed during previous investigations. The Crisp Road portion of Parcel UC-3 is adjacent to the northern boundary of the Former HPNS, and the western edge is adjacent to areas where the former Triple A had a scrapyard to store metal, drums, pipe lagging, liquid waste, and batteries. Triple A also had disposal trenches for waste liquids and a concrete pad for crushing waste liquid drums. The final ROD (2014) identified the selected remedy for Parcel UC-3 to address soil vapor and groundwater. Radiologically impacted sewer and storm drain lines within Parcel UC-3 were removed in 2012. RAs, including excavation of contaminated soil and construction of durable asphalt and a concrete cover, were conducted in 2016.	KCH, 2014; Aptim, 2017; Gilbane, 2016; Gilbane, 2018
	IR-45	Basewide Steam Line System; RA Completed	A Basewide steam line system (IR Site 45) is on Parcels D-1, G, E, and UC-3. Triple A was suspected of using portions of the Basewide steam line system within Parcels D-1 and E to transport waste oil. Based on the findings of the previous site investigation, as detailed within the design basis report, the steam line within Parcel UC-3 does not pose a threat to soil or groundwater and no additional investigation or RA is necessary.	Tetra Tech, 1998
	IR-56	Former Train Depot; Open	IR Site 56 is on the northwestern corner of Parcel E. The site was formerly a train depot. Railroad tracks next to Building 809 remain onsite. Building 809 was formerly used as a lumber storage area and service station and was used as Railroad Museum after Navy use. Use of wood preservatives and railroad cleaning solvents was suspected, and evidence of paint leakage from storage containers was observed. Metals, TPH, PAHs, and PCBs were detected at concentrations exceeding the site screening levels in soil.	PRC, 1994a; Tetra Tech, 1998; Gilbane, 2016
	IR-74	IR Site 74; Transferred	IR Site 74 was a former NRDL facility of about 4.2 acres in the vicinity of Parcel A north of UC-3. Building 815 and associated land consist of approximately 4.3 acres. The property was transferred to Ted Lowpensky, a molding manufacturer, on December 12, 1984. The building was used as Naval Radiological Defense Laboratory. USTs associated with former gasoline station operating in the 1950s were identified within the footprint of Building 815.	PRC, 1995; PRC, 1997; Tetra Tech EM, 2004; NAVSEA, 2004

Table 1-2. Installation Restoration Site Summary

Note:

Table adapted from the following reference: Multi-MAC Joint Venture (Multi-MAC JV). 2022. *Preliminary Assessment Report Basewide Investigation of Per- and Polyfluoroalkyl Substances (PFAS), Former Hunters Point Naval Shipyard, San Francisco, California*. June.

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µg/L = microgram(s) per liter
AFFF = aqueous film-forming foam
AOC = Area of Concern
AST = aboveground storage tank
bgs = below ground surface
CERCLA = Comprehensive Environmental Response, Compensation, and Liability Act
COC = chemical of concern
EE = exploratory excavation
HPNS = Hunters Point Naval Shipyard
IR = Installation Restoration
Navy = Department of the Navy
NAPL = Nonaqueous phase liquid
NIROP = Naval Industrial Reserve Ordnance Plant
NRDL = Naval Radiological Defense Laboratory
PAH = polycyclic aromatic hydrocarbon
PCB = polychlorinated biphenyl
PCE = tetrachloroethene
PFAS = per– and polyfluoroalkyl substances
PFBS = perfluorobutanesulfonic acid
PFOA = perfluorooctonaoic acid
PFOS = perfluorooctane sulfonate
RA = remedial action
RI = Remedial Investigation
ROD = Record of Decision
SI = Site Inspection
SVOC = semivolatile organic compound
TPH = total petroleum hydrocarbons
TRPH = total recoverable petroleum hydrocarbons
TCE = trichloroethene
TCRA = time-critical removal action
UST = underground storage tank
VOC = volatile organic compound

Table 1-3. Institutional Controls Summary

Institutional Control	Performance Objectives	Parcels										
		IR-07/18	B-1	B-2	C	UC-2	D-1	UC-1	G	E	E-2	UC-3
ARIC for Soil and Groundwater Use: General	Restricted activities must be conducted in accordance with the Covenant(s) to Restrict Use of Property, Quitclaim Deed(s), O&M Plan(s), LUC RD Report, Parcel-specific RMP(s), and, if required, any other work plan or document approved in accordance with these referenced documents: a. "Land disturbing activity" includes, but is not limited to, the following: (1) excavation of soil, (2) construction of roads, utilities, facilities, structures, and appurtenances of any kind, (3) demolition or removal of "hardscape" (for example, concrete roadways, parking lots, foundations, and sidewalks), (4) any activity that involves movement of soil to the surface from below the surface of the land, and (5) any other activity that causes or facilitates the movement of known contaminated groundwater. b. Alteration, disturbance, or removal of any component of a response or cleanup action (including but not limited to pump-and-treat facilities, revetment walls and shoreline protection, and soil cap/containment systems); groundwater extraction, injection, and monitoring wells and associated piping and equipment; or associated utilities. c. Extraction of groundwater and installation of new groundwater wells. d. Removal of or damage to security features (for example, locks on monitoring wells, survey monuments, fencing, signs, or monitoring equipment and associated pipelines and appurtenances). Prohibited Activities: a. Growing vegetables, fruits, or any edible items in native soil for human consumption.[a] b. Use of groundwater.	●	●	●	●	●	●	●	●	●	●	●
Restrictions Related to VOC Vapors	Any proposed construction of enclosed structures must be approved in accordance with the Covenant(s) to Restrict Use of the Property, Quitclaim Deed(s), LUC RD, and RMPs before conducting such activity within the ARIC for VOC vapors to ensure that the risks of potential exposures to VOC (and SVOC, as applicable) vapors are reduced to acceptable levels that are adequately protective of human health. The reduction in potential risk can be achieved through engineering controls or other design alternatives that meet the specifications set forth in the Amended ROD, RD Reports, LUC RD Report, and RMPs. The ARIC for VOC (and SVOC, as applicable) vapors may be modified by the FFA signatories (and CDPH as applicable), as the soil contamination areas and groundwater contaminant plumes that are producing unacceptable vapor inhalation risks are reduced over time or in response to further soil, vapor, and groundwater sampling and analysis for VOCs that establishes that areas now included in the ARIC for VOC vapors do not pose an unacceptable potential exposure risk to VOC vapors.	◐	◐	◐	●	◐	◐	◐	◐	◐		◐
ARIC for Soil and Groundwater Use: Within Areas Designated for Open Space, Educational/ Cultural, and/or Industrial Reuse (**Figure 1-3**)	Use restricted unless prior written approval for other uses is granted by the FFA signatories and CDPH (as applicable). In addition, the following land uses are specifically prohibited within the ARIC for radionuclides unless prior written approval for these uses is granted by the FFA signatories and CDPH (as applicable): a. A residence, including any mobile home or factory-built housing, constructed or installed for use as residential human habitation b. A hospital for humans c. A school for persons under 21 years of age d. A daycare facility for children e. Any permanently occupied human habitation, including those used for commercial or industrial purposes.	◐			◐	◐	●	◐	◐	◐	●	◐
											●	
Radiologically Impacted Soil and Structures	For land-disturbing activities, as defined previously and including installation of water lines, storm drains, or sanitary sewers, above the demarcation layer, the LUC RD Report, O&M Plan, RMP, or a project-specific work plan, if applicable, will list the procedures for ensuring that the cap is not disturbed or breeched. The specific design of the cap and clean soil cover will be agreed to in the RD. The installation of water or sewer lines below the demarcation layer will be prohibited unless written approval is granted by the FFA signatories and CDPH. Excavation into site soils within the ARIC for radionuclides beneath the demarcation layer is strictly prohibited unless approved in writing by the FFA signatories and CDPH (as applicable). Any proposed excavation will be required to be described in a work plan that will include, but not be limited to, a radiological work plan, the identification of a radiological safety specialist, a soil management plan, soil sampling and analysis requirements, and a plan for offsite disposal of any excavated radionuclides by the transferee in accordance with federal and state law. The integrity of the cover/cap must be restored upon completion of excavation as provided in the O&M Plan(s), LUC RD Report(s), or similar document.	◐								◐	●	

Table 1-3. Institutional Controls Summary

Institutional Control	Performance Objectives	Parcels										
		IR-07/18	B-1	B-2	C	UC-2	D-1	UC-1	G	E	E-2	UC-3
Landfill Gas	Any proposed construction of enclosed structures must be approved in accordance with the Covenant to Restrict Use of the Property, Quitclaim Deed(s), LUC RD Report, and, if deemed necessary, the Parcel E-2 RMP before conducting such activities within the ARIC to ensure compliance with the substantive provisions of Cal. Code Regs. tit. 27 § 21190(a), (b), (d), (e), (f), and (g), which require that post-closure land uses be designed and maintained to protect health and safety in areas affected by landfill gas migration. In particular, Cal. Code Regs. tit. 27 § 21190(g) specifies design and construction standards for "all on site construction within 1,000 feet of the boundary of any disposal area."										●	

[a] For Parcel E: Plants for human consumption may be grown if they are planted in raised beds (above the CERCLA-approved cover) containing non-native soil. Trees producing edible fruit (including trees producing edible nuts) may also be planted provided they are grown in containers with a bottom that prevents the roots from penetrating the native soil.

● = Applies to entire parcel
◐ = Applies to a portion of the parcel
ARIC = area requiring institutional control
Cal. Code Regs. = California Code of Regulations
CDPH = California Department of Public Health
CERCLA = Comprehensive Environmental Response, Compensation, and Liability Act
FFA = Federal Facilities Agreement
LUC RD = Land Use Control Remedial Design
O&M = operations and maintenance
RD = Remedial Design
ROD = Record of Decision
RMP = Risk Management Plan
SVOC = semivolatile organic compound
VOC = volatile organic compound

Table 1-4. Air Monitoring Summary

Parcel	Work	Timeframe	Findings	Reference
B	Radiological Retesting	July 2022 to August 2023	On May 11, 2023, radium-226 exceeded project-specific action levels at one sample location that was later determined to be a false positive and was then categorized as a nondetect.	GES-ASRC Industrial, 2023a
C	Radiological Retesting	December 2022 to October 2023	On July 6, 2023, PM10 was reported in one downgradient filter sample exceeding the DTSC HERO action level (50 µg/m^3) but not the California OSHA PEL of 5,000 µg/m^3. Real-time monitoring results were below the DTSC HERO action level. Additionally, a thorium-232 sample from the same filter exceeded the project-specific action level. A safety standdown was held on August 17, 2023, to address the matter. Operations were reevaluated to reduce the presence of visible dust. The contractor continued to maintain persistent dust control measures.	GES-ASRC Industrial, 2023b
G	Radiological Retesting	August 2020 to May 2023	Throughout site activities, there were several exceedances of the DTSC HERO action level for PM10 on filter samples. Real-time dust monitoring results for the same time periods were consistently below the DTSC action level and most of the exceedances were attributed to regional poor air quality from fires or smog unrelated to the site activities (for example, the Bay Area Air Quality Management District issued “spare the air” advisories for particulate matter on the same days where exceedances were reported). On December 21 and 22, 2020, thorium-232 exceedances were reported but determined to be related to naturally occurring radioactive material.	Aptim, 2023a
E	Phase 1 Remedial Action	November 2019 to March 2023	In April 2021 and June 2021, there were no earthmoving activities; however, asbestos samples slightly exceeded the action level. The lab sampling method does not differentiate between asbestos and other fibers. Retesting using the National Institute for Occupational Safety and Health Method 7402 can differentiate between fiber types, which indicated that the asbestos fiber concentration was below the action level. On March 20, 2023, the total suspended particulates downwind filter-based sample result exceeded the action level. All other sampling results were below action levels.	Aptim, 2023b

Table 1-4. Air Monitoring Summary

Parcel	Work	Timeframe	Findings	Reference
E	Phase 2 Remedial Action	December 2022 to June 2023	No exceedances of project-specific action levels were reported.	GES-ASRC Industrial, 2023c, 2023d, 2023e
E-2	Phase 3 Remedial Action	March 2022 to March 2023	No exceedances of project-specific action levels were reported.	KEMRON, 2022, 2023

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GES-ASRC Industrial. 2023d. *Air Monitoring Summary Report for Parcel E Remedial Action Phase 2, Hunters Point Naval Shipyard, San Francisco, California. May 1st, 2023 through May 31st, 2023.*

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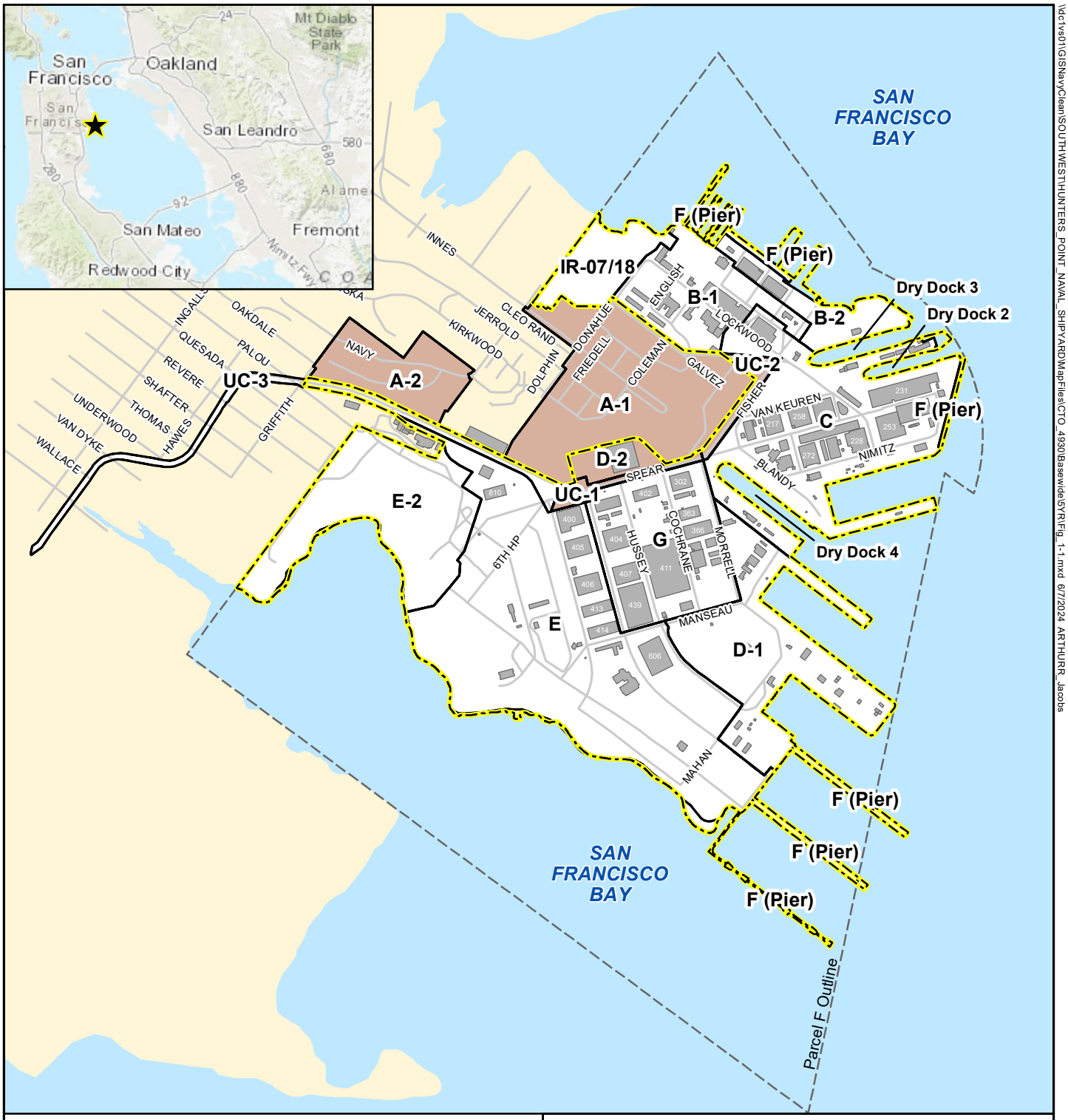
$\mu g/m^3$ = microgram(s) per cubic meter
OSHA = Occupational Safety and Health Administration
DTSC = California Department of Toxic Substances Control
HERO = Human and Ecological Risk Office
PEL = permissible exposure limit
PM10 = particulate matter larger than 10 microns in size



LEGEND

- Hunters Point Naval Shipyard Boundary
- Parcel Boundary
- Parcel F (Water) Boundary
- Former Navy Property
- Non-Navy Property
- Water
- Building
- Road

Base Overview Figure/Parcel Map

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

NAVFAC Naval Facilities Engineering Systems Command

Figure 1-1

NOTES:

IMAGERY SOURCE:
ESRI ArcGIS Online Web Service,
World Street Map

N

0 1,400 Feet

1 inch = 1,400 feet

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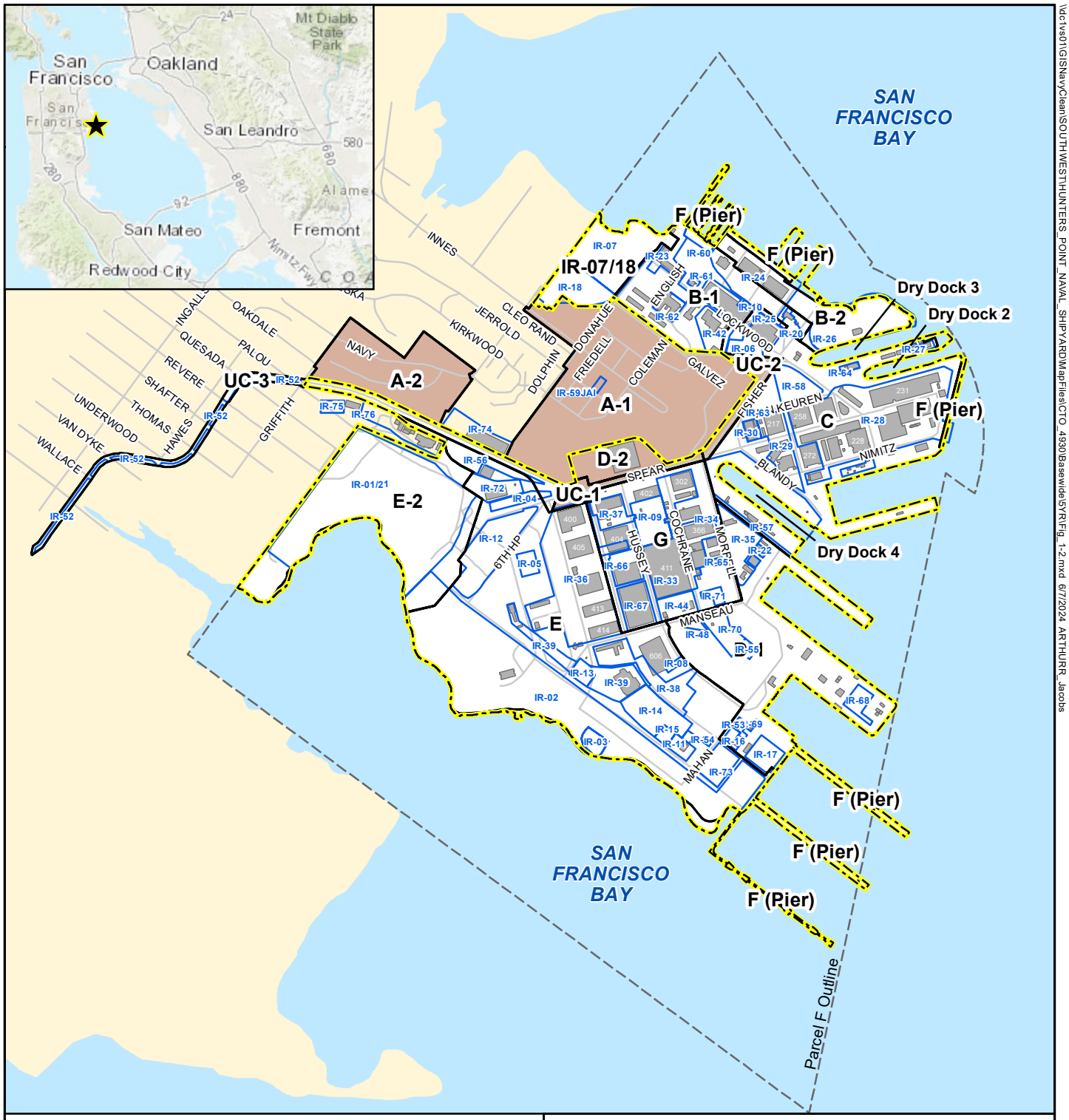

LEGEND

- Hunters Point Naval Shipyard Boundary
- IRP Site
- Parcel Boundary
- Parcel F (Water) Boundary
- Former Navy Property
- Non-Navy Property
- Water
- Building
- Road

Installation Restoration Sites

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

NAVFAC Naval Facilities Engineering Systems Command

Figure 1-2

NOTES:

IMAGERY SOURCE:
ESRI ArcGIS Online Web Service,
World Street Map

N

0 1,400 Feet

1 inch = 1,400 feet

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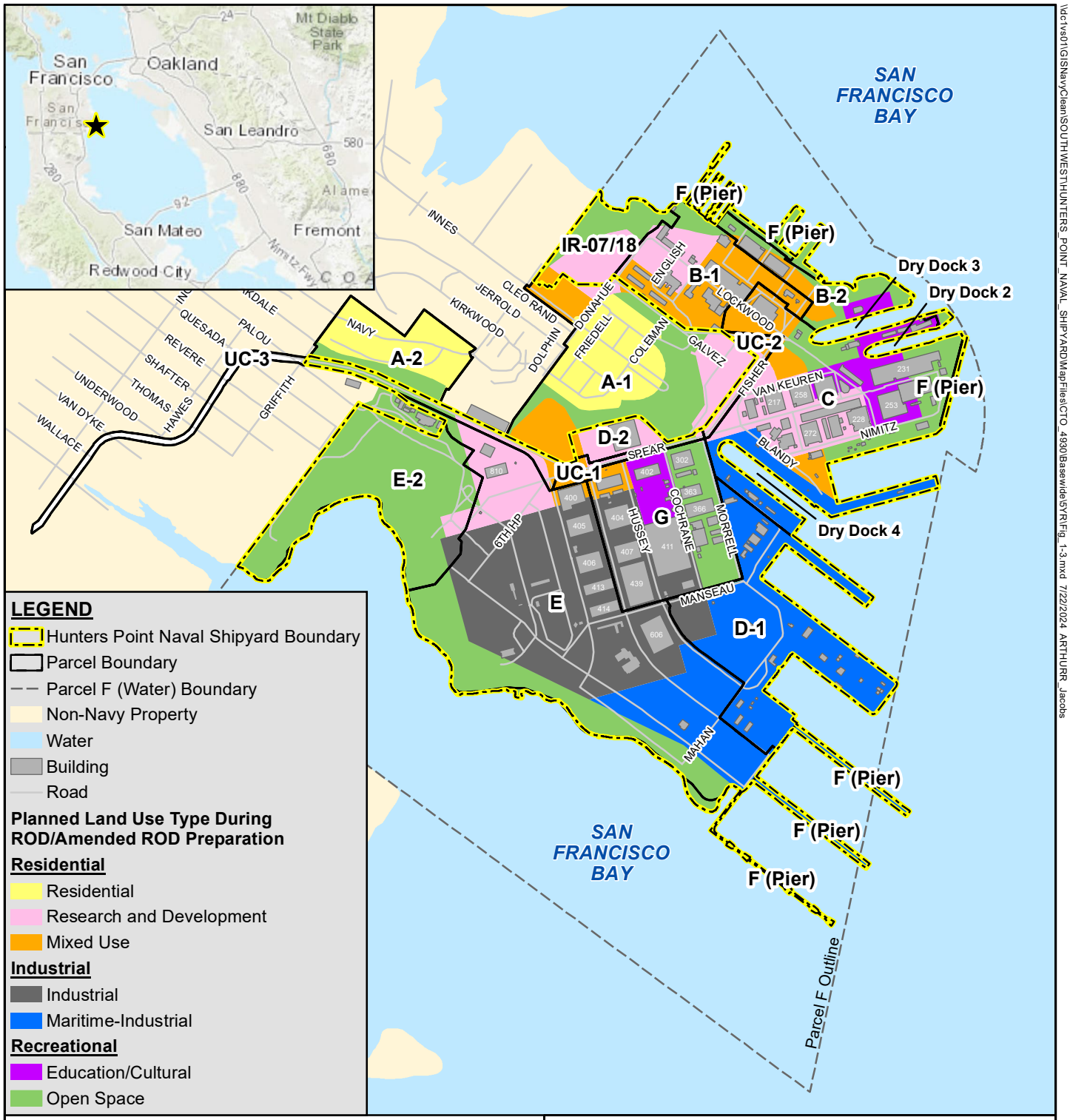

The Redevelopment Plan was updated in 2018. The Land Use Districts shown on this figure were applicable at the time when risk evaluations and the development of institutional controls for future use were completed and may not be reflective of the current 2018 Redevelopment Plan.

Land Use Districts

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

NAVFAC Naval Facilities Engineering Systems Command

Figure 1-3

NOTES:

IMAGERY SOURCE:
ESRI ArcGIS Online Web Service, World Street Map

N

0 1,400 Feet

1 inch = 1,400 feet

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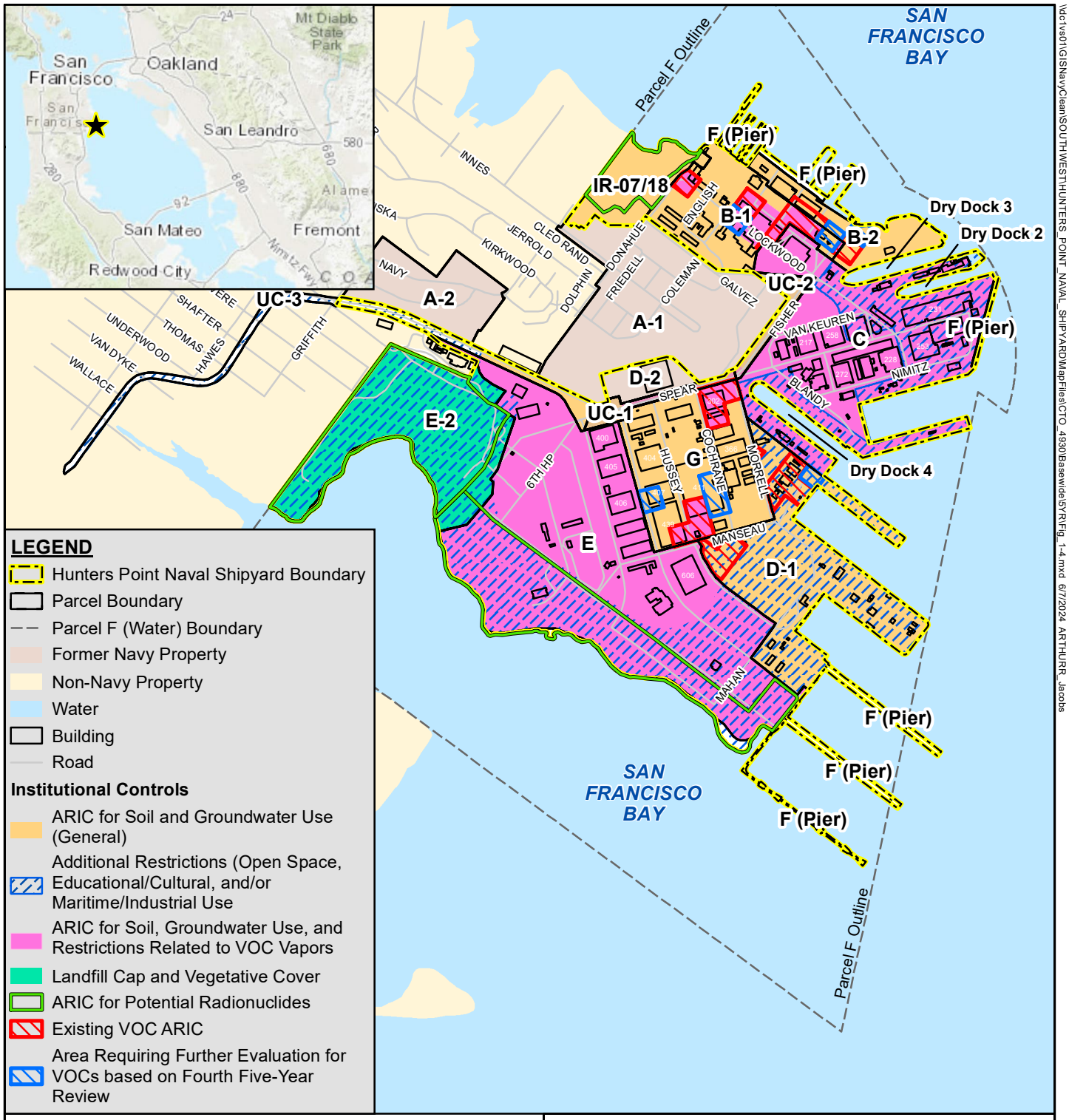

ARIC = area requiring institutional controls
VOC = volatile organic compound

General ARICs apply to all areas and allow residential uses with restrictions. Additional Restrictions apply to areas designate as Open Space, Educational/Cultural, and/or Maritime/Industrial Use and prohibit residential uses.

ARIC performance objectives are provided in Table 1-2.

All ARICs shown are proposed and/or recommended boundaries, actual boundaries will be surveyed and included in the Quitclaim Deed(s) upon property transfer.

Institutional Controls

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

NAVFAC Naval Facilities Engineering Systems Command

Figure 1-4

NOTES:

IMAGERY SOURCE:
ESRI ArcGIS Online Web Service, World Street Map

N

0 1,400 Feet

1 inch = 1,400 feet

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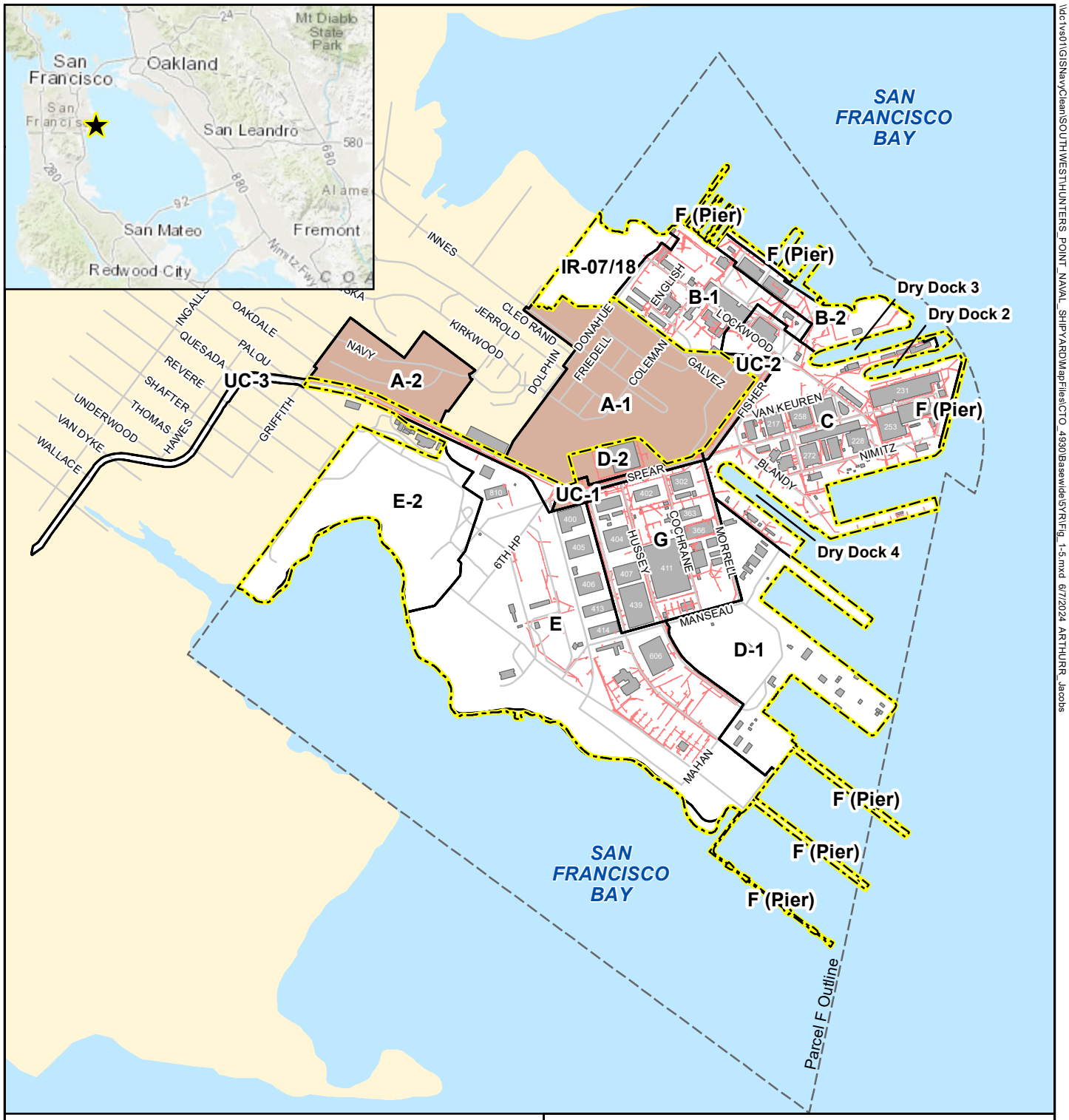

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LEGEND

- Hunters Point Naval Shipyard Boundary
- Parcel Boundary
- Parcel F (Water) Boundary
- Radiological Survey Unit Trenches
- Former Navy Property
- Non-Navy Property
- Water
- Building
- Road

Basewide Radiological Time-Critical Removal Action Survey Trenches

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

NAVFAC Naval Facilities Engineering Systems Command

Figure 1-5

NOTES:

IMAGERY SOURCE:
ESRI ArcGIS Online Web Service,
World Street Map

N

0 1,400 Feet

1 inch = 1,400 feet

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2.0 Five-Year Review Process

This section describes the Five-Year Review process for the sites at HPNS. This process includes conducting interviews and visual site inspections, reviewing all relevant documents, and notifying and presenting the findings to the community to keep the public informed of the progress to evaluate remedy effectiveness.

2.1 Site Interviews

The following individuals were interviewed via email in February 2023:

- Project Manager, KEMRON – Parcel E-2 Construction Contractor
- Project Manager, GES-AIS – Parcels B-1, B-2, C, D-1, D-2, UC-1, UC-2, and UC-3 Radiological Rework Contractor, Parcel E Construction Contractor
- Caretaker Site Office Facility/Compliance Project Manager

Appendix B provides the survey and consolidated responses. Overall, there were no issues identified.

2.2 Site Inspections

The Five-Year Review inspection was conducted on February 9, 2023. Applicable site sections summarize specific findings, and **Appendix C** provides inspection forms and photograph logs. Overall, the remedies were in good condition. Active work is being conducted at Parcels B-1, B-2, C, D-1, G, E, and E-2. An additional site inspection was conducted on January 23, 2024, with representatives from USEPA, DTSC, Regional Water Board, and the City of San Francisco OCII.

2.3 Document and Data Review

The Five-Year Review included a review of site-specific documentation for each site. First, the ROD, or post-ROD decision document if applicable, for each site was reviewed to identify the potential risks to human health and the environment that are the basis for taking RA, Remedial Action Objectives (RAOs), selected remedies, and ARARs. Additional review of relevant documents, including O&M records, monitoring data, and other pertinent documents and data, was also completed to assess remedy performance and continued protection of human health and the environment. Documents reviewed for each site are listed in their respective reference section.

Copies of Administrative Record documents are available by searching the online Administrative Record located on the HPNS public website at:

https://www.bracpmo.navy.mil/BRAC-Bases/California/Former-Naval-Shipyard-Hunters-Point/.

2.4 Technical Assessment

Information from the document and data review was used to answer three technical assessment questions from USEPA guidance. The type of information used for each question is discussed in this section.

Question A: Is the remedy functioning as intended by the decision documents?

The following information was used to address this question: decision documents, remedy performance monitoring data, long-term monitoring (LTM) or monitored natural attenuation (MNA) data, O&M reports, and IC inspection findings in comparison with the RAOs.

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

The following information was used to address this question:

Exposure Assumptions: Reviewed chemicals of emerging concern, new pathways of concern, and changes in land use.

Toxicity Data: Reviewed the toxicity information and values for COCs and ROCs to evaluate whether the conclusions from the previous HHRAs and ecological risk assessments (ERAs) are still valid.

Cleanup Levels: Reviewed current ARARs and standards on which the ROD cleanup levels are based.

RAOs: Reviewed existing RAOs in context with the other components of Question B to determine whether the remedy will meet the existing RAOs.

Question C: Has any other information come to light that could call into question the protectiveness of the remedy?

Information used to answer this question includes external factors that were not apparent during remedy selection and were not covered under Questions A and B, such as resilience to climate change.

2.5 Community Notification and Involvement

Members of the community were notified of the initiation of the Fifth Five-Year Review on February 15, 2023, via an announcement in the *San Francisco Chronicle* (**Appendix D**). When the Five-Year Review has been finalized, a notice will be sent to the newspaper indicating the results and that the final report is available to the public.

The Navy conducts outreach to members of the community with the objective to reach stakeholders, share program information, and receive community input. The Navy published an update to the Community Involvement Plan in November 2022 (Navy, 2022) that describes the surrounding community demographics and key stakeholders, current and planned outreach methods, and metrics for measuring outreach efforts. The outreach program consists of community meetings, presentations to local groups, updates to elected officials, small group site tours and stakeholder meetings, guided bus tours, local community events, and community technical assistance where experts in the field answer health and safety questions at meetings and events by phone or by email. Newsletters are provided to individuals and groups who subscribe, are posted to the HPNS public website (www.bracpmo.navy.mil/hpns), and key documents are maintained at the following local information repository:

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

The following community engagement and opportunities for stakeholder feedback on this fifth Five-Year Review were provided by the Navy:

- Meetings with agencies and San Francisco Department of Public Health to review parcel-specific findings and receive preliminary comments and feedback (5 biweekly 2-hour long meetings in February, March, and April)
- Providing the Draft Five-Year Review for public inspection and comment from February 7, 2024, to May 7, 2024
- Public outreach to notify the community about the CRA and Five-Year Review:
  - 1/22/24 – Navy presentation to Hunters Point Shipyard Citizens Advisory Committee
  - 2/26/24 – Email to Parcel A homeowner and resident points of contact for posting
  - 2/29/24 – Mailer to approximately 17,000 addresses
  - 3/1/24 – Outgoing informational message on HPNS Info Line
  - 3/1/24 – Mailer to approximately 90 community groups and organizations
  - 3/8/24 – Email to Parcel A homeowner and resident points of contact
  - 3/25/24 – Navy presentation to Hunters Point Shipyard Citizens Advisory Committee
  - 3/26/24 – Electronic newsletter to approximately 1,300 addresses
  - 4/11/24 – Email to Parcel A homeowner/resident points of contact
  - 3/18/24 – Electronic newsletter to approximately 1,280 addresses
  - Various meetings and discussions between the BRAC Environmental Coordinator and Shipyard Trust for the Arts members
  - Meeting announcement and materials on BRAC website
  - 4/1/24 – Outgoing information message on HPNS Info Line
  - 4/17/24 – Electronic newsletter to approximately 1,300 addresses
  - 4/22/24 – CRA Workshop (posterboards, presentation, and a question-and-answer session)
  - 4/27/24 to 4/28/24 – HPNS Bus Tours and information provided and questions answered about Five-Year Review and CRA (as appropriate with discussions)
  - 4/29/24 – Navy presentation to San Francisco Shipyard (Parcel A) homeowners and residents; CRA workshop slide deck was included in presentation materials

2.6 Next Five-Year Review

Per USEPA and Navy guidance, the next Five-Year Review is due to be finalized within 5 years from the signature of this Five-Year Review.

2.7 References

Department of the Navy (Navy). 2022. *Community Involvement Plan, Hunters Point Naval Shipyard, San Francisco, California.* Department of the Navy Base Realignment and Closure Program Management Office West. November.

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3.0 Former Parcel B (Installation Restoration Sites 07 and 18, Parcels B-1 and B-2)

3.1 Site History and Background

Former Parcel B was formerly part of the industrial support area at HPNS and was used for shipping, ship repair, training, barracks, and offices. Activities supporting these uses, such as painting, metalworking, and storing, using, and disposing of liquids and fuels, are potential sources of chemicals (Navy, 2009).

Former Parcel B is bounded by Parcels A and C to the south, the City of San Francisco Bayview-Hunters Point District to the west, and Parcel F and San Francisco Bay to the north and east. The boundary between Parcel B and Parcel F is considered the mean lower low water line. Any base infrastructure at Parcel B that is considered to be “hanging” off seawalls and quay walls into the bay, such as piers, wharves, and dry dock sidewalls, is considered to be part of Parcel F.

Former Parcel B covers approximately 63 acres, which has been subdivided into two independent IR sites, IR-07 and IR-18 (referred to as IR-07/18) (14 acres) and Parcels B-1 (27 acres) and B-2 (22 acres) (**Figure 3-1**). IR-07/18 was split from Parcel B in 2008 to expedite remedy completion and transfer of the sites (Navy, 2019). In 2013, following the issuance of the Third Five-Year Review Report, the Navy subdivided Parcel B, excluding IR-07/18, into two separate parcels (Parcels B-1 and B-2) to accommodate varying property transfer schedules for different portions of the original parcel (ERRG, 2017).

The following IR sites are located in Former Parcel B:

- IR-07/18
- Parcel B-1: IR-10, IR-20, IR-23, IR-24, IR-42, IR-60, IR-61, and IR-62
- Parcel B-2: portions of IR-24, and IR-26

Facility-wide sites IR-50 and IR-51 also traverse the parcels. Active remediation is ongoing at IR-10 and IR-26. Investigations and actions began in 1994, as shown in the following chronology.

Parcel B Chronology

Date	Investigation/Action
1994	SI
1996	RI and FS
1996	Removal Actions at IR-23, IR-26, and IR-50 (Sediment in Parcel B Storm Drains)
10/7/1997	ROD
1998	Explanation of Significant Differences (ESD)
1998–1999	RA (Phase 1)
2000	ESD (Second)
2000–2001	RA (Phase 2)
2001	Quarterly Groundwater Monitoring
2000–2002	Soil Vapor Extraction (SVE) Treatability Study at IR-10

Parcel B Chronology	
Date	**Investigation/Action**
2003	Investigation of Chromium VI in IR-10 Groundwater Characterization and Sampling of Shoreline at IR-07 and IR-26 First Five-Year Review
2004	Historical Radiological Assessment (HRA)
2003–2004	Waste Consolidation and Removal Activities Groundwater Treatability Study at IR-10
2004–Ongoing	Groundwater LTM
2005	Soil Gas Survey at IR-07/18
2006	Phase III SVE Treatability Study at IR-10
2007	Technical Memorandum in Support of a ROD Amendment
2006–2010	Radiological Removal Actions
2008	TCRA for Methane at IR-07 TCRA for Mercury at IR-26 Second Five-Year Review
1/26/2009	Amended ROD
2010	LUC RD – IR-07/18
2010–2012	RD and Amendments
2010–2011	Construction of IR-07/18 Remedy Hotspot Removal (Parcels B-1 and B-2)
2011	LUC RD Parcel B, Excluding IR-07/18 Remedial Action Completion Report (RACR) for Hotspot Excavation at Parcel B (B-1 and B-2)
2011–Ongoing	O&M of Durable Covers and ICs (IR-07/18)
2012	RACR for IR-07/18
2012–2015	Durable Cover Installation (Parcels B-1 and B-2)
2013	Biological Amendment Injection at IR-10 Third Five-Year Review
2013–2020	SVE at IR-10 (Parcel B-1)
2015–Ongoing	O&M of Durable Covers and ICs (Parcels B-1 and B-2)
2017	In Situ Stabilization (ISS) Using Organo-sulfur Injections at IR-26 (Parcel B-2) RACR for Durable Covers at Parcel B-1
2018	RACR for Durable Covers at Parcel B-2
2019	Fourth Five-Year Review for HPNS

3.2 Site Characterization

This section summarizes the findings from various investigations at Former Parcel B that are pertinent to the Five-Year Review.

3.2.1 Physical Characteristics

3.2.1.1 Surface Features

Parcel B is located in the lowlands portion of HPNS, and ground surface elevations range from 0 to 18 feet above msl (Navy, 1997). The elevation at IR-07/18 ranges from approximately 14 to 50 feet above msl. About 75 percent of the ground surface at Parcel B is covered by pavement and buildings; the western portion (IR-07/18) is unpaved and without structures. There is no surface water on Parcel B. Stormwater at Parcel B is currently handled via surface swales and storm sewers. The shoreline at Parcel B includes a mix of sandy beach and riprap, concrete and wooden seawalls, and riprap and concrete seawalls (Navy, 2009). The shoreline at IR-07 and portions of Parcels B-1 and B-2 are also covered by shoreline protection materials consisting of engineered riprap (ERRG, 2012a, 2017; Innovex-ERRG Joint Venture, 2018b).

3.2.1.2 Geology and Hydrogeology

Parcel B was constructed in the 1940s by placing borrowed fill material from various sources, including crushed serpentinite bedrock from the adjacent highlands and dredged sediments (ChaduxTt, 2011a).

The following is a summary of hydrostratigraphic units at Parcel B:

- A-Aquifer: The A-aquifer generally thickens from about 15 feet in the southwest to as much as 80 feet in the northeast, but averages about 25 feet thick over most of Parcel B. In general, groundwater flows north/northeast, toward San Francisco Bay, approximately perpendicular to the shoreline (Navy, 2009). The tidal influence zone extends inland up to about 300 feet from the shoreline (PRC et al., 1996; PRC, 1996). Tidal influence may also mix groundwater with San Francisco Bay water; however, mixing usually does not occur as far inland as the fluctuations in groundwater elevation do (Navy, 2009). Depth to groundwater averages at approximately 8 feet below ground surface (bgs) (KMJV, 2021).
- Bay Mud: The Bay Mud is present over most of Parcel B; however, the Bay Mud is absent in some areas in the western and central portions of the parcel, and the A- and B-aquifers directly contact each other in those areas. Hydraulic communication is restricted, although not prevented, in areas where Bay Mud Deposits are present, and the potential for communication between the A- and B-aquifers is greater where the Bay Mud Deposits are absent. However, previous investigations (Tetra Tech, 2001) concluded that, although lithologic data suggest the potential for communication, chemical results do not indicate communication exists. The eastern portion of Parcel B that includes the peninsula called Point Avisadero is characterized by a thin layer of Artificial Fill over bedrock (Navy, 2009). The Bay Mud Deposits generally thicken from where they pinch out against the historical shoreline in the southwest to 40 feet near the bay margin in the northeast. Dredging has removed the Bay Mud and B-aquifer at various locations across Parcel B (Insight-ESI, 2023).
- B-Aquifer: The B-aquifer is not continuous across Parcel B but exists primarily in two separate areas, along the western parcel boundary and in a portion of the central area of the parcel. The semiconfined B-aquifer includes interbedded sands and clayey silts and ranges in thickness from about 5 to 15 feet where it is present and averages 10 feet thick

(Insight-ESI, 2023). In general, groundwater flows north/northeast toward San Francisco Bay. The groundwater elevation averages at approximately 6 feet above msl (TRWB, 2022).

3.2.2 Land Use

3.2.2.1 Current Land Use

Parcel B is owned by the federal government and is under the jurisdiction of the Navy. Most of the buildings at Parcel B are vacant, although a small number are used for commercial enterprises such as artist studios (Building 103, 104, 116, 117, and 125). Except for the few occupied buildings, Parcel B is unoccupied and unused. Most of Parcel B is fenced, and access is limited (Navy, 2009).

3.2.2.2 Future Land Use

Parcel B is currently planned to be transferred to the City and County of San Francisco. Based on the City and County of San Francisco's reuse plan as currently amended (SFRA, 1997; OCII, 2018), Parcel B land uses will include residential, institutional, retail sales and services, civic, arts and entertainment, parks and recreation, and office uses. The land use at IR-07/18 will be limited to parks and open space.

3.2.3 Basis for Taking Action

This section describes the results of site investigations and risk assessments that provide the basis for taking action at Parcel B. Details are provided in the RI (PRC et al., 1996), FS (PRC, 1996b), ROD (Navy, 1997), and Amended ROD (Navy, 2009).

3.2.3.1 Site Investigations and Removal Actions

Previous investigations at Parcel B identified the presence of metals, VOCs, SVOCs, pesticides, PCBs, and radionuclides in soil, groundwater, structures, and sediment.

After the initial ROD was signed, potential sources of mercury (IR-26, Parcel B-2) and methane (IR-07) were identified and subsequently removed via TCRAs in 2008 (Insight, 2009; SES-TECH, 2009). Post-removal action monitoring for mercury in groundwater and methane in soil gas was incorporated into the remedy as documented in the Amended ROD (Navy, 2009).

3.2.3.2 Human Health Risk

The most current HHRA for Parcel B was performed in support of the Amended ROD using data collected from previous investigations. Human health risks were characterized separately for COCs and ROCs. The following unacceptable risks to potential receptors from COCs were identified (**Table 3-1**):

- Future industrial workers from exposure to metals and SVOCs in subsurface soil (no unacceptable risks were identified for surface soil) and VOCs in groundwater (in A-aquifer through the vapor intrusion to indoor air pathway)
- Future recreational users from exposure to metals, SVOCs, and PCBs in surface soil
- Future residents (adult and child) from exposure to metals, VOCs, SVOCs, pesticides, and PCBs in surface and subsurface soil; to mercury, VOCs, and SVOCs in groundwater (A--aquifer through the vapor intrusion to indoor air pathway); and metals, VOCs, and pesticides in the B-aquifer through domestic use
- Future construction workers from exposure to metals, VOCs, and SVOCs in subsurface soil and metals, VOCs, SVOCs, and pesticides in groundwater

Additionally, ROCs were identified for soil and structures at Parcel B (**Table 3-2**) (Navy, 2009). Radionuclides of potential concern (ROPCs) and metals were identified as potential concerns for groundwater migrating to the bay within IR-07/18 if future development actions mobilize impacted soil left in place.

3.2.3.3 Ecological Risk

A screening-level ecological risk assessment (SLERA) was conducted in support of the ROD Amendment to evaluate potential ecological risks from exposure to shoreline sediment. The SLERA identified the following potential unacceptable risks to ecological receptors (**Table 3-1**):

- Sediment: Potential unacceptable risks to benthic invertebrates, birds, and mammals from selected metals, pesticides, PAHs, and PCBs in sediment along the Parcel B shoreline
- Groundwater: Potential unacceptable risk to aquatic organisms from mercury in groundwater under the assumption that groundwater mixes with surface water in San Francisco Bay; in addition, potential risks to ecological receptors from chromium VI, copper, lead, and nickel based upon review of groundwater data in the Amended ROD (Navy, 2009); metals not identified as COCs in the SLERA due to low frequency of detection and no defined plume, included for monitoring purposes

3.3 Remedial Action Objectives

The Parcel B ROD was signed on October 7, 1997 (Navy, 1997), two ESDs were signed on August 24, 1998 (Navy, 1998) and May 4, 2000 (Navy, 2000), and the Amended ROD was signed on January 14, 2009 (Navy, 2009).

Table 3-3 summarizes the basis for action, RAOs, remedy components, performance metrics, and expected outcomes for Former Parcel B. The presence of VOCs in groundwater and soil may contribute to the presence of VOCs in soil gas; therefore, the vapor intrusion pathway is included as a basis for action and development of RAOs.

The Navy developed RGs to meet the RAOs for soil, sediment, and groundwater, which are summarized for COCs in **Table 3-1** and for ROCs in **Table 3-2**. The Navy also developed trigger levels (TLs) to evaluate attenuation of contaminants as groundwater moves from inland areas toward the bay. The TLs are as follows: 50 µg/L for chromium VI, 28.04 µg/L for copper, 14.44 µg/L for lead, and 0.6 µg/L for mercury in the surface water of San Francisco Bay. The TLs are conservative, and exceedance of a TL does not necessarily indicate an immediate risk, given dilution and mixing with surface water; nonetheless, a potential for ecological risk was identified if the metals in groundwater discharge undiluted to the bay.

3.4 Remedial Actions

This section presents a summary of the remedy implemented and ongoing O&M actions. Although there are a ROD and post-ROD decision documents for all of Parcel B, IR-07/18, Parcel B-1, and Parcel B-2 are managed independently and have individual protectiveness determinations, so they are evaluated individually.

3.4.1 IR-07/18

The RA for IR-07/18 includes the following major components:

- Soil excavation and removal to address COCs in soil
- Durable cover installation and maintenance to address COCs and ROCs in soil
- LTM of methane in soil gas

- LTM of groundwater for COCs and ROPCs
- Radiological surveys and remediation through soil removal and durable cover installation
- ICs for soil and groundwater

Figures 3-1, **3-2**, and **3-3** show the remedy components.

3.4.1.1 Remedy Implementation

Soil Excavation and Removal

Soil excavation was conducted in two phases after the initial ROD (**Figure 3-1**): from 1998 to 1999 and again in 2000 to 2001. Approximately 42,200 cubic yards of soil was removed from 25 areas between July 1998 and September 1999. However, RGs were not met, and an additional 27,700 cubic yards were removed from 10 areas between May 2000 and December 2001 (ChaduxTt, 2008). However, RGs were not met during the second excavation, and the Navy re-evaluated the approach in the Technical Memorandum in Support of a ROD Amendment (ChaduxTt, 2007) to include parcel-wide covers to address potential risk from remaining ubiquitous metals and other COCs at Parcel B (including IR-07/18), which was included in the Amended ROD (Navy, 2009). Responses completed for the soil RAOs applicable to IR-07/18, which includes soil excavation and removal, is documented in the RACR for IR-07/18 (ERRG, 2012a).

Durable Cover Installation

The construction of durable covers began in June 2010 and was completed in September 2011. Completion of the durable covers, along with implementation of ICs discussed in **Section 1.3.4.2**, meets the RAOs for soil applicable to IR-07/18. Response complete for soil is documented in the RACR for IR-07/18 (ERRG, 2012a).

Durable covers consist of shoreline revetment, soil covers, and asphalt covers at IR-07/18, as shown on **Figure 3-3** and described as follows:

- **Shoreline Revetment:** 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.
- **Soil Covers:** In the area identified as radiologically impacted in the Amended ROD (Navy, 2009), 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 for a total of 3 feet of cover. In areas not identified as radiologically impacted in the Amended ROD, the cover is composed of 2 feet of clean imported soil. The final cover includes surface completions for groundwater monitoring wells and methane monitoring probes, as well as stormwater drainage features.
- **Asphalt Covers:** An asphalt cover was constructed over a small area (about 60 feet by 130 feet) in the southeastern corner of IR-07 to allow for a more gradual transition to the final asphalt cover in the adjoining area of Parcel B-1. The asphalt cover included 2 inches of asphalt over 4 inches of aggregate base course.

Long-term Monitoring of Methane

The Navy conducted a TCRA to address methane in soil gas at IR-07 in 2008. The Navy excavated 17,000 cubic yards of soil, including the organic layer considered to be the source of methane in soil gas (ERRG, 2012a). Methane was not detected in any gas monitoring probes in

samples collected semiannually since the probes were installed in November 2008. Response complete for soil gas was documented in the RACR for IR-07/18 (ERRG, 2012a), and the methane probes were decommissioned in 2012 (ERRG, 2012c).

Groundwater Monitoring

LTM was initiated in 2004 and is currently conducted under the BGMP. Groundwater sampling is conducted semiannually for metals (COCs) and ROPCs in two San Francisco Bay margin monitoring wells (IR07MW24A and IR07MW26A) to ensure that redevelopment does not mobilize contaminants that could migrate into the bay and adversely impact ecological receptors (Navy, 2010). Annual and semiannual groundwater monitoring reports from 2019 through 2022 were reviewed (TRBW, 2020b, 2020c, 2021, 2022a, 2022b, 2023).

Since at least 2009, concentrations of COCs and ROPCs have remained under their TLs, except for lead in September 2017 and March 2022 (TRWB, 2023). Concentrations of lead exceeded the TL but were within the same order of magnitude as the TL (14.44 µg/L) at two locations (23 and 23.9 µg/L) in March 2022 and were below laboratory detection limits during the September 2022 event (**Appendix E, Figure 3-5**). The TL exceedances have been infrequent during monitoring. During the last 5 years, lead was reported below the TL in April 2019 and September 2020. Lead was below laboratory detection limits in September 2019, May 2020, March 2021, September 2021, and September 2022. However, if concentrations consistently exceed a TL, the Remedial Action Monitoring Plan (RAMP) provides several additional evaluations that may occur, including increasing the frequency of monitoring, monitoring farther downgradient, using site-specific detailed information to more accurately estimate attenuation, or implementing a selected remediation alternative for groundwater treatment (ChaduxTt, 2010).

Radiological Surveys and Remediation

The Navy completed a Multi-Agency Radiation Survey and Site Investigation Manual (MARSSIM) Class 1 survey of the entire surface of IR-07/18, and the top 1 foot of soil was remediated in place to levels specified in the Amended ROD (Navy, 2009) before placement of the final cover. Material beneath the 1 foot was not remediated, requiring additional radiological ICs and the demarcation layer under the durable cover within the radiological IC area.

About 470 cubic yards of soil from the inland areas and additional sediment and debris (concrete, brick, and metal) from the shoreline were removed because cesium or radium concentrations exceeded RGs or because the waste was unable to be scanned and thus was assumed to be low-level radioactive waste (LLRW). No radiological releases were confirmed, and no radiological devices were discovered during any of the radiological surveys. In total, 109 LLRW bins (representing about 1,970 tons of waste) were removed and disposed of offsite as LLRW. In addition, about 5,390 tons of nonhazardous waste and 2,940 tons of non-Resource Conservation and Recovery Act hazardous waste were removed and disposed of offsite. The California Department of Public Health (CDPH) completed further surface scans at IR-07/18 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).

There are no buildings and there are no areas subject to radiological rework within the boundary of IR-07/18.

Institutional Controls

The entire area of IR-07/18 (about 14 acres) is subject to general soil and groundwater ICs. A portion of IR-07/18 (about 11 acres) is subject to ICs specifically related to radionuclides (**Figure 3-2**). IC performance objectives were developed and presented in the LUC RD (ChaduxTt, 2010). **Table 1-3** summarizes the IC performance objectives to be implemented through land use restrictions for the site.

3.4.1.2 Remedy Operations and Maintenance

Ongoing O&M at IR-07/18 includes maintaining the integrity of the soil cover, revetment, asphalt cover, and IC inspections. The inspection and maintenance requirements for the remedy are described in the Final O&M Plan (ERRG, 2012b). Annual Operation and Maintenance Summary Reports (AOMSRs) are prepared to summarize inspections and maintenance performed and to document the effectiveness of the remedy components. AOMSRs from 2019, 2020, 2021, and 2022 were reviewed (Innovex-ERRG Joint Venture, 2020, 2021a; APTIM, 2022, 2023).

Durable Cover Maintenance

Annual reports indicated the shoreline revetment was in good condition. No signs of vegetation or trash, pests, excessive vehicle traffic, settlement or movement, improper placement of fabric, vandalism or theft, cover soil overtopping, wave overtopping, or scouring were observed.

Annual inspections found the soil cover to be in good condition, with no signs of settling, slope failure, cracking, soil movement, or erosion. Minor evidence of burrowing animals was noted in one area of the parcel in 2019, further monitoring of this area has been performed since its inspection, and expansion of the burrowed area was not noted. Drainage swales within the soil cover were also found to be in good condition. Vegetation growth was well established over the soil cover, with no bare areas observed. Vegetation on the soil cover was mowed in August 2019, August 2020, and January 2022. No signs of excessive vehicle traffic on the cover were observed. No exposure of the demarcation layer was observed in any area, and no tree or deep-rooting plant growth that could compromise the demarcation layer was present on the soil cover. No signs of vandalism or settling were noted in the retaining wall area.

The asphalt cover was generally found to be in good condition. No signs of cracking of the curbs, vandalism, ponding, settlement, or excessive vehicle traffic were observed. Minor cracking (less than 0.25-inch width) was observed due to vegetation growth through seams in the asphalt cover. In areas of minor cracking, no asphalt repair was required; however, ongoing vegetation management and monitoring of the observed minor cracking are recommended. Vegetation growing through cracks in the asphalt pavement cover was removed in October 2020. Vegetation growth and damage was noted on the asphalt curve along Donahue Avenue in the 2021 Report (Aptim, 2022). In January 2022, the vegetation growth was removed, and the cracking was sealed using a rubberized asphalt crack filler.

The 2019 survey data for the settlement monuments indicated Monument 2 in IR-07/18 showed negligible change in elevation (that is, less than 0.1 foot of settlement) since surveyed in 2018. Based on the negligible change (less than 0.1 foot) in historical survey monument elevations, the next round of settlement monument surveys will be in 2024.

Institutional Controls Compliance

ICs are inspected annually, and no deficiencies or inconsistent uses were observed during the review. General site conditions were determined to be good. Remedy components, such as survey benchmarks and monitoring well vault covers, were found to be in good condition.

Navy controls access to the parcel using security fencing, signage, locks, and gates, which were found to be in good condition, with no signs of damage or vandalism. A breach in the chain-link perimeter fence along northeastern IR07/18 boundary was observed in 2019 resulting in fence repairs (Innovex-ERRG Joint Venture, 2020).

3.4.2 Parcel B-1

The RA for Parcel B-1 includes the following major components:

- Soil excavation and removal to address COCs in soil
- Durable cover installation and maintenance to address COCs in soil
- SVE to address VOCs in soil gas at IR-10
- In situ biological treatment to address VOCs in groundwater at IR-10
- LTM and MNA of groundwater for COCs
- Radiological surveys and remediation through soil excavation and sanitary sewer line and storm drain removal and through decontamination (and demolition/dismantling if necessary) buildings, structures, and former building sites
- ICs for VOC vapors

Figures 3-1, **3-2**, and **3-4** show the locations of major remedy components.

3.4.2.1 Remedy Implementation

Soil Excavation and Removal

Excavation and removal of soil containing COCs at concentrations greater than RGs were conducted from 2010 to 2011 (**Figure 3-1**). In total, approximately 25.5 loose cubic yards of soil was excavated from one hotspot area in Parcel B-1 to address lead in soil and was then disposed of offsite. The excavation was backfilled with clean imported soil. Completion of construction activities is documented in the *RACR for Soil Hotspot Locations at Parcel B, D-1, and G* (ERRG, 2011).

Durable Cover Installation

Construction of the durable covers at Parcel B-1 began in 2012 and was completed in 2015. Completion of the durable covers along with ICs discussed in **Section 1.3.4.2** meets the RAOs for soil at Parcel B-1. Response complete is documented in the RACR for the Durable Covers Remedy in Parcel B-1 (ERRG, 2017). Durable covers consist of shoreline revetment, soil cover, asphalt cover, and building foundations at Parcel B-1, as shown on **Figure 3-4** and described as follows:

- **Shoreline Revetment:** Shoreline revetment was constructed along the portion of Parcel B adjacent to IR-07/18 (ERRG, 2017). 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.
- **Soil Cover:** A vegetated soil cover was constructed on the hillside portions of Parcel B-1 (ERRG, 2017). The soil cover is composed of 2 feet of clean imported soil. The soil cover includes surface completions for groundwater monitoring wells and stormwater drainage features.

- **Asphalt Cover:** An asphalt concrete cover was constructed over the remaining upland areas of Parcel B-1 (ERRG, 2017). The asphalt cover consists of 4 inches of aggregate base course overlain by 2 inches of asphaltic concrete. Drainage features such as swales, diversion berms, catch basins, and storm drainpipes were incorporated into the asphalt cover to convey stormwater offsite.
- **Building Foundations:** Cracks and penetrations in building foundations were repaired using a variety of materials, such as concrete, non-shrink grout, and asphaltic concrete, to prevent access to underlying soil (ERRG, 2017). Additionally, access to soil under buildings (for example, crawl spaces) was blocked with durable wire mesh.

Soil Vapor Extraction at IR-10

The SVE system in Building 123 at IR-10 was originally installed in 2000 as a pilot study, was later expanded in 2005 as part of another pilot study, and was expanded again in May 2013 as part of the RA. The SVE system consists of a blower, blower motor, electrical panel, SVE wells, vapor monitoring wells, liquid/air separator, transfer pump, liquid storage tank, connection hoses, level switches, system interlocks and controls, and gauges (ERRG, 2015c).

The system operated intermittently after restarting in 2013. Concentrations of VOCs decreased to below soil gas action levels (SGALs) during operations and rebounded after every operating period within approximately 6 weeks. Overall, approximately 122 pounds of trichloroethene (TCE) was removed from the beginning of the system operations (December 2000) through the end of May 2019. The February 2018 to May 2019 operating period reported removal of approximately 7.22 pounds of VOCs and 6.62 pounds of TCE. The February 2018 to May 2019 report recommended additional long-term SVE operation at IR-10 be evaluated based on the diffusion-limited conditions, low mass removal rates, and operational costs associated with achieving RGs using this technology. An optimization review of the SVE remedy was recommended to determine whether other measures, such as remedy improvements or alternatives, can be implemented to enhance RA performance (Insight-ESI, 2023). The most recent operating period (October 2019 to April 2020) represented approximately 21 percent of the total operating period but removed approximately 1.4 pounds of TCE, or 1.2 percent of the total mass removal (Innovex-ERRG Joint Venture, 2021b).

The original intent of the SVE system was as a source-reduction measure, and the other actions associated with the remedy provide overall protectiveness to meet the RAOs (Navy, 2009). Evaluation of VOC mass removal rates and cumulative mass removed by the SVE system indicated that system operation reached a point of diminishing returns and, in general, appears to have had limited effectiveness in extracting significant VOC mass from subsurface soils. This is likely a result of low permeability and diffusion-limited soils. Therefore, soil excavation and subsequent confirmation monitoring is planned for IR-10 to address VOC soil contamination to a depth of 10 feet bgs (Insight-ESI, 2023).

Biological Amendment Injection at IR-10

Groundwater remediation to treat the IR-10 VOCs plume in Parcel B-1 near Building 123 was conducted in 2013. Approximately 2,658 pounds of polylactate hydrogen release compound primer and 5,490 pounds of polylactate hydrogen release compound were injected into 45 groundwater injection points in March 2013 (ERRG, 2015). Approximately 152 pounds of polylactate substrate was injected at each location (approximately 7.6 pounds of polylactate substrate per vertical foot). Post-injection monitoring is currently ongoing under the BGMP.

Groundwater LTM and MNA

Groundwater is sampled through the BGMP. At Parcel B-1, groundwater monitoring was initiated in 2004 and currently consists of sampling six groundwater monitoring wells screened in the A-aquifer for VOCs and metals, as well as MNA parameters to evaluate and track natural attenuation processes. The BGMP is routinely optimized based on monitoring data. The sampling protocol was amended so that monitoring well IR20MW17A, which was only sampled for vinyl chloride (VC), was revised to include 1,2-dichloroethene and TCE for consistency in monitoring the VOC plume at IR-10 (TRBW, 2020a). Annual and semiannual groundwater monitoring reports from 2019 through 2021 were also reviewed (TRBW, 2020b; 2020c, 2022a, 2022b, 2023). **Appendix E** presents exceedances of RGs (identified as project action limits [PALs]) from 2019, 2020, 2021, and 2022.

One VOC (VC) exceeded its RG in multiple wells for all sampling events from 2019 to 2022. One additional VOC (TCE) exceeded its RG in one well during the March 2021 sampling event but did not exceed before or after that event. Exceedances of RGs from the 2022 BGMP sampling are shown on **Figure 3-5**. Concentrations of TCE and VC were within historical ranges for all monitoring wells in Parcel B-1 (TRBW, 2023).

Radiological Surveys and Remediation

ROCs suspected to be present at Parcel B include cobalt-60 (Co-60), strontium-90 (Sr-90), cesium-137 (Cs-137), radium-226 (Ra-226), and plutonium-239 (Pu-239). The Navy conducted TCRAs at Parcel B (both Parcels B-1 and B-2) to address potential radioactive contamination in storm drains and sanitary sewer lines and radiologically impacted structures. In total, 65,184 cubic yards of soil was excavated during removal of 24,826 linear feet of sanitary sewer and storm drain lines. Approximately 6,641 cubic yards of soil was disposed of offsite as LLRW based on surface scan and analytical laboratory results. Additionally, final status surveys (FSSs) were performed at four radiologically impacted buildings (103, 113, 113A, and 146) and three former building sites (114, 142, and 157) (TtEC, 2012).

TCRA data were reviewed as described in **Section 1.4.3**, and radiological retesting, including sampling and surveys of soils previously investigated during sanitary sewer line storm drain removal and resurvey of impacted buildings and former building sites, is currently being conducted to determine if current site conditions are compliant with the RAOs.

Institutional Controls

The land use and activity restrictions are described in the LUC RD Report (ChaduxTt, 2011a). As described in the Amended ROD (Navy, 2009), the entire area of Parcel B-1 is subject to ICs. A portion of Parcel B-1 is also subject to ICs related to VOC vapors (**Figure 3-2**). The ARICs related to VOC vapors will be redefined after the IR-10 RA is complete and documented in the RAWP (Insight-ESI, 2023). **Table 1-3** summarizes the IC performance objectives to be implemented through land use restrictions for the site.

3.4.2.2 Remedy Operations and Maintenance

Ongoing O&M at Parcel B-1 includes maintaining the integrity of the soil cover, revetment, and asphalt cover, and IC inspections. The inspection and maintenance requirements for the remedy are described in the Final O&M Plan (ERRG, 2016). AOMSRs are prepared to summarize inspections and maintenance performed and to document the effectiveness of the remedy components. AOMSRs from 2019, 2020, 2021, and 2022 were reviewed (Innovex-ERRG Joint Venture, 2020, 2021a; APTIM, 2022, 2023).

Durable Cover Maintenance

The shoreline revetment was determined to be in good condition. No signs of vegetation or trash, pests, excessive vehicle traffic, settlement or movement, improper placement of fabric, vandalism or theft, cover soil overtopping, wave overtopping, or scouring were observed. The Navy is currently conducting a shoreline assessment study to identify and recommend repairs and/or stabilization of structures and shoreline.

Annual inspections found the soil cover to be in good condition, with no signs of settling, slope failure, cracking, soil movement, or erosion. Minor evidence of burrowing animals was noted in one area of Parcel B-1 in 2021; however, no corrective actions were recommended. Drainage swales within the soil cover were also found to be in good condition. Vegetation growth was well established over the soil cover, with no bare areas observed. Vegetation on the soil cover was mowed in August 2019 and August 2020. No signs of excessive vehicle traffic on the cover were observed.

The asphalt cover was generally found to be in good condition, except for minor sinkholes on the northern side of Parcel B-1 near the former dry dock observed during the September 2021 inspection, which were repaired. Vegetation observed growing through cracks in the asphalt pavement cover was removed in October 2020 and December 2021.

Building foundations were found to be in good condition, with no new or expanding cracking. Generally, swales and check dams were clean and intact; however, minor coating of sediment was noted and removed in the drainage swale northwest of Building 146. Signs of excessive vehicle traffic (such as minor cracking in the asphalt surface) within the drainage swale southwest of Building 123 prompted the construction of a vehicle crossing using rock and steel plates in March 2018. The vehicle crossing was observed to be intact and in good condition. However, access to Parcel B-1 should continue to be restricted to limit degradation to the swale and associated asphalt cover.

The 2019 survey data for the settlement monuments indicated Monument SM-1 in Parcel B-1 showed negligible change in elevation (that is, less than 0.1 foot of settlement) since surveyed in 2018. Based on the negligible change (less than 0.1 foot) in historical survey monument elevations, the next round of settlement monument surveys will be in 2024.

Institutional Controls Compliance

ICs are inspected annually, and no deficiencies or inconsistent uses were observed during the review. General site conditions were determined to be good. Remedy components, such as survey benchmarks and monitoring well vault covers, were found to be in good conditions.

Navy controls access to the parcel using security fencing, signage, locks, and gates, which were found to be in good condition, with no signs of damage or vandalism.

3.4.3 Parcel B-2

The RA for Parcel B-2 includes the following major components:

- Soil excavation and removal to address COCs in soil
- Durable cover installation and maintenance to address COCs in soil
- ISS of mercury in groundwater at IR-26
- LTM and MNA of groundwater for COCs

- Radiological surveys and remediation through soil excavation and sampling during sanitary sewer line storm drain removal and through decontamination (and demolition/dismantling if necessary) buildings, structures, and former building sites
- ICs for soil, groundwater, and VOC vapors

Figures 3-1, 3-2, and **3-6** show the locations of major remedy components.

3.4.3.1 Remedy Implementation

Soil Excavation and Removal

Excavation and removal of soil containing COCs at concentrations greater than RGs were conducted from 2010 to 2011. In total, approximately 118 loose cubic yards of soil was excavated from two hotspot areas in Parcel B-2 to address lead and PAHs in soil and was disposed of offsite. Excavations were backfilled with clean imported soil. The *RACR for Soil Hotspot Locations at Parcel B, D-1, and G* (ERRG, 2011) documents completion of excavation activities and response complete.

Durable Cover Installation

Construction of the durable covers at Parcel B-2 began in 2012 and was completed in 2015. Completion of the durable covers along with ICs discussed in **Section 1.3.4.2** meets the RAOs for soil at Parcel B-2. Response complete is documented in the RACR for the Durable Covers Remedy in Parcel B-2 (Innovex-ERRG Joint Venture, 2018a). Durable covers consist of shoreline revetment, asphalt cover, and building foundations at Parcel B-2 shown on **Figure 3-6** and described as follows:

- **Shoreline Revetment:** Shoreline revetment was constructed along approximately 1,800 linear feet of shoreline at IR-23 and IR-26 (Innovex-ERRG Joint Venture, 2018a). An unforeseen discovery of TPH contamination along a 230-foot section of the IR-26 shoreline (in Parcel B-2) delayed completion of the revetment to allow for the TPH contamination to be delineated and removed. 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.
- **Asphalt Cover:** An asphalt concrete cover was constructed over the remaining upland areas of Parcel B-2 (Innovex-ERRG Joint Venture, 2018a). The asphalt cover consists of 4 inches of aggregate base course overlain by 2 inches of asphaltic concrete. Drainage features, such as swales, diversion berms, catch basins, and storm drain pipes, were incorporated into the asphalt cover to convey stormwater offsite.
- **Building Foundations:** Cracks and penetrations in building foundations were repaired using a variety of materials, such as concrete, non-shrink grout, and asphaltic concrete, to prevent access to underlying soil (Innovex-ERRG Joint Venture, 2018a). Additionally, access to soil under buildings (for example, crawl spaces) was blocked with durable wire mesh.

In Situ Stabilization of Mercury in Groundwater at IR-26

During the Third Five-Year Review for HPNS, the Navy identified that concentrations of mercury in groundwater at IR-26 Parcel B-2 continue to exceed the TL of 0.6 µg/L and recommended evaluation of the mass flux of mercury to San Francisco Bay to estimate potentially discharging mercury concentrations (Navy, 2013). An investigation to further evaluate the lateral and vertical extent of mercury in groundwater was conducted. The evaluation also included modeling, which

indicated that at the concentrations reported during sampling and based on site-specific hydrogeologic inputs, there is a potential that the discharge exceeds ambient levels (TriEco-Tt, 2016). As a result, ISS using an organo-sulfur compound injected into groundwater was completed in December 2017. The goal of the remedy was to reduce concentrations to be less than the TL of 0.6 µg/L in groundwater.

An estimated 32,000 pounds of the organo-sulfur compound MetaFix was injected into the subsurface at IR-26. A total of 43 of 52 planned injection locations were injected with a MetaFix -guar gum slurry using direct-push technology and a bottom-up injection pattern (KMJV, 2021). Four quarters of post-injection monitoring was included as part of the performance monitoring for the ISS injections. Additionally, the performance monitoring wells are also sampled for dissolved mercury (as well as other Parcel B COCs) as part of the BGMP.

Performance monitoring and review of BGMP data from the performance monitoring wells are as follows (KMJV, 2021; TRBW, 2023):

- IR26MW49A: Dissolved mercury exceeded the TL during baseline and performance and BGMP monitoring. The most recent dissolved mercury concentrations were 1.01 µg/L in March/April 2019, 3.45 µg/L in September 2019, 0.494 µg/L in June 2020, 3.57 µg/L in September 2021, and 1.79 µg/L and 5.55 µg/L in March and September 2022, respectively (TRBW, 2023). The Mann-Kendall statistical evaluation indicates a decreasing trend (KMJV, 2021).
- IR26MW50A: Dissolved mercury was not detected during baseline or any post-treatment monitoring.
- IR26MW51A: Dissolved mercury exceeded the TL during baseline sampling but was not detected during seven of eight post-treatment monitoring events through June 2020. The only detection exceeded the TL with a concentration of 1.66 µg/L in December 2019.
- IR26MW70A: Dissolved mercury was not detected during baseline or any post-treatment monitoring.
- IR26MW71A: Dissolved mercury exceeded the TL during baseline and performance monitoring. Concentrations fluctuated between less than detection limits to a high of 8.55 µg/L. In 2022 concentrations were 1.18 µg/L and 1.75 µg/L in March and September, respectively. Seasonal variability and possible localized releases from native sediment may be contributing factors to the continued fluctuations of dissolved mercury. Native sediment at this location consists of silty clay, organic materials, and silty sand to silty clay. The Mann-Kendall statistical evaluation concluded that there was insufficient evidence of a trend (KMJV, 2021).

After completion of the 3-year post-ISS treatment performance monitoring, the FFA regulatory agencies (USEPA Region 9, DTSC, and Regional Water Board) released a tri-agency letter on November 23, 2021 which reiterated that “mercury concentrations in groundwater along the San Francisco Bay margin consistently exceed the trigger level. Therefore, in-situ stabilization (ISS) has failed to minimize or prevent unacceptable discharge of mercury to the San Francisco Bay. Consequently, additional treatment options need to be screened, evaluated, and pursued by the Navy via the development of a new primary document work plan.” (USEPA, DTSC, and Regional Water Board, 2021).

As discussed at the April 25, 2024 meeting, the Navy stated it would move forward with optimizing ISS (e.g., use of a larger rig in areas of prior injection refusal) and the Navy

recognizes that USEPA does not oppose any Navy attempt to do so, as long as such action is timely and completed prior to July 31, 2025. As stated in the November 23, 2021 tri-agency letter, the Navy also recognizes that USEPA continues to expect that additional treatment options need to be screened, evaluated, and pursued by the Navy.

While there are continued exceedances of the TL in groundwater, the Navy's current assessment is that the following provides lines of evidence that the residual concentrations in mercury in groundwater are not likely to result in a concentration above 0.6 µg/L in the bay surface water:

- Completion of source removal in 2008 via a time-critical removal action (Insight, 2009).
- Partial success of the ISS as evidenced by reducing the extent of mercury exceedances of the TL from 3 performance monitoring locations to 2 performance monitoring locations and decreasing concentrations in one of the remaining locations (IR26MW49A). A time-series plot of data through 2023 for IR26MW49A, IR26MW51A, and IR26MW71A is presented on **Figure 3-7**. Mercury concentrations during the last 5 years of monitoring have been below historical maximums and are consistently below 10 times the HGAL.
- The limited extent of impacted groundwater; IR26MW71A and IR26MW49A are approximately 45 feet apart and IR26MW49A is approximately 88 feet from IR26MW51A with no exceedances.
- Comparison of groundwater quality parameters to Bay surface water quality parameters (temperature and dissolved oxygen, **Table 3-4**) indicate that the groundwater is not representative of Bay water because groundwater temperature is consistently warmer than surface water, and dissolved oxygen is consistently lower than surface water.

However, because there is uncertainty in the concentration at the exposure point and because the ISS remedy did not reduce the concentration in groundwater to below 0.6 µg/L at all monitoring wells, additional data collection, remedy optimization, and/or additional remedial alternatives/treatment that have been screened for further evaluation are necessary to determine whether the remedy is protective of the bay. Monitoring is ongoing under the BGMP. Mercury detections in 2022 were within the historical range of concentrations.

Groundwater Monitoring

Groundwater is sampled through the BGMP. At Parcel B-2, groundwater LTM was initiated in 2004 and currently consists of sampling 12 groundwater monitoring wells screened in the A-aquifer for VOCs, dichlorodifluoromethane (Freon-12), and metals, as well as MNA parameters. The BGMP is routinely optimized based on monitoring data. The sampling protocol for Parcel B-2 has not been amended. Annual and semiannual groundwater monitoring reports from 2019 through 2021 were also reviewed (TRBW, 2020b, 2020c, 2021, 2022a, 2022b, 2023). **Appendix E** presents exceedances of RGs (identified as PALs) from 2019, 2020, 2021, and 2022. **Figure 3-5** shows exceedances of RGs from 2022.

Freon-12, lead, and mercury were the only COCs that exceeded RGs or TLs during this review period. Historically, Freon-12 has been detected only in monitoring well IR26MW41A, and before September 2018, concentrations were highly variable (TRBW, 2022b). Freon-12 was not detected in monitoring well IR26MW41A in March 2021, which was the fifth consecutive event concentrations had been less than the RG of 14 µg/L, but then exceeded the RG in September 2021 with a concentration of 21 µg/L and was not detected in 2022. Lead exceeded the TL (14.44 µg/L) at IR26MW70A with a result of 17.7 µg/L in March 2022, it did not exceed in

September and was within the historic range for lead in Parcel B-2 (TRBW, 2023). Dissolved mercury exceedances have been previously discussed.

Radiological Surveys and Remediation

ROCs suspected to be present at Parcel B include cobalt-60 (Co-60), strontium-90 (Sr-90), cesium-137 (Cs-137), radium-226 (Ra-226), and plutonium-239 (Pu-239). The Navy conducted TCRAs at Parcel B (both Parcels B-1 and B-2) to address potential radioactive contamination in storm drains and sanitary sewer lines and radiologically impacted structures. In total, 65,184 cubic yards of soil was excavated during removal of 24,826 linear feet of sanitary sewer and storm drain lines. Approximately 6,641 cubic yards of soil was disposed of offsite as LLRW based on surface scan and analytical laboratory results. Additionally, FSSs were performed at two radiologically impacted buildings (130 and 140), and the Building 140 discharge channel (TtEC, 2012).

Institutional Controls

The land use and activity restrictions are described in the LUC RD Report (ChaduxTt, 2011a). As described in the Amended ROD (Navy, 2009), the entire area of Parcel B-2 is subject to soil and groundwater ICs. A portion of Parcel B-2 is also subject to ICs related to VOC vapors (**Figure 3-2**). The ARICs related to VOC vapors may be redefined when land is planned for transfer. **Table 1-3** summarizes the IC performance objectives to be implemented through land use restrictions for the site.

3.4.3.2 Remedy Operations and Maintenance

Ongoing O&M at Parcel B-2 includes maintaining the integrity of the revetment and asphalt cover and performing IC inspections. The inspection and maintenance requirements for the remedy are described in the Final O&M Plan for Parcel B-2 (Innovex-ERRG Joint Venture, 2018b). AOMSRs are prepared to summarize inspections and maintenance performed and to document the effectiveness of the remedy components. AOMSRs from 2019, 2020, 2021, and 2022 were reviewed (Innovex-ERRG Joint Venture, 2020, 2021a; APTIM, 2022, 2023).

Durable Cover Maintenance

The shoreline revetment was determined to be in good condition. No signs of vegetation or trash, pests, excessive vehicle traffic, settlement or movement, improper placement of fabric, vandalism or theft, cover soil overtopping, wave overtopping, or scouring were observed. The Navy is currently conducting a shoreline assessment study to identify and recommend repairs and/or stabilization of structures and shoreline.

The asphalt cover was generally found to be in good condition, except for two small areas of subsidence noted south of Building 140 during the September 2019 and October 2020 and potholes near Building 130 and Building 140 observed during the September 2021 inspection. The small subsidence areas damaged were repaired. Vegetation observed growing through cracks in the asphalt pavement cover was removed in October 2020 and December 2021.

Building foundations were found to be in good condition, with no new or expanding cracking. Generally, swales and check dams were clean and intact.

No settlement monuments were surveyed in Parcel B-2 during this review period. Based on the negligible change (less than 0.1 foot) in historical survey monument elevations, the next round of settlement monument surveys will be in 2024.

Institutional Controls Compliance

ICs are inspected annually, and no deficiencies or inconsistent uses were observed during the review. General site conditions were determined to be good. Remedy components, such as survey benchmarks and monitoring well vault covers, were found to be in good conditions.

The Navy controls access to the parcel using security fencing, signage, locks, and gates, which were found to be in good condition with no signs of damage or vandalism. However, during the September 2021 inspection, the metal hasp on a door that secures Building 159 was found broken during the annual inspection. The door was re-secured to Building 159 to prevent unauthorized access.

3.4.4 Progress Since the Fourth Five-Year Review

Table 3-5 summarizes issues, recommendations, and follow-up actions from the Fourth Five-Year Review.

3.5 Technical Assessment

3.5.1 Question A: Is the Remedy Functioning as Intended by the Decision Document?

3.5.1.1 IR-07/18

Yes. Based on the review of historical documents, annual IC inspections, and the Five-Year Review inspection, the remedy at IR-07/18 is functioning as intended.

Exposure pathways that could result in an unacceptable risk are being controlled through the durable covers and ICs. The shoreline revetment, soil cover, and asphalt cover are in good condition, and any minor issues have been repaired. No deficiencies or inconsistent uses of the ICs were observed during the inspections. Radiological concerns in soil are addressed by the cover with demarcation layer and ICs. Groundwater monitoring of metals and radionuclides is ongoing, and TLs were not exceeded during this review period.

3.5.1.2 Parcel B-1

Yes. Based on the review of historical documents, annual IC inspections, and the Five-Year Review inspection, the remedy at Parcel B-1 is functioning as intended.

Soil hotspot areas were removed through excavation and offsite disposal. Exposure pathways to residual COCs that could result in an unacceptable risk are being controlled through the durable covers and ICs. The soil cover, shoreline revetment, and asphalt cover are in good condition, and any minor issues have been repaired. VC and TCE groundwater exceedances of the RGs were reported for 2019 to 2021. The SVE system was operated as a source-reduction measure and reached a point of diminishing returns in 2020. Proposed work to remove the SVE system and to excavate soil exceedances (Insight-ESI, 2023) will further address VOC contamination at IR-10. No deficiencies or inconsistent uses of the ICs were observed during the inspections. Radiological concerns were addressed through previous radiological surveys and remediation of soil and building structures, and radiological retesting is being conducted to confirm that the RAO has been met, with the goal of unrestricted closure.

3.5.1.3 Parcel B-2

Uncertain. The ISS injections did not effectively reduce mercury in two locations (IR26MW49A and IR26MW71A) to below the TL of 0.6 µg/L. Although mercury continues to exceed TLs in

groundwater collected from downgradient monitoring wells, data demonstrating that mercury concentrations in surface water (the ultimate receptor) are below the HGAL of 0.6 µg/L still lacks. The RAO is stated as follows:

> Prevent or minimize migration to the surface water of San Francisco Bay of chromium VI, copper, lead, and mercury in the A-aquifer groundwater that would result in concentrations of chromium VI above 50 µg/L, copper above 28.04 µg/L, lead above 14.44 µg/L, and mercury above 0.6 µg/L in the surface water of San Francisco Bay. This RAO is intended to protect the beneficial uses of the bay, including ecological receptors (Navy, 2009).

Data at the groundwater-surface water interface has not been collected; however, from the Navy's perspective, it is not expected that mercury exceeds 0.6 µg/L based on the following rationale:

- Source concentrations in soil have been removed during the IR-26 Mercury Removal TCRA (Insight, 2009).
- Although dissolved mercury in groundwater exceeds the TL in two locations, Mann-Kendall analysis indicates it is decreasing at one location (KMJV, 2021), indicating partial success of the ISS remedy at minimizing migration to the surface water.
- The TL is the Hunters Point groundwater ambient level (HGAL), which is not a risk-based concentration, formal RG, or ARAR according to the ROD Amendment (Navy, 2009).
- The screening of groundwater data against the TL or other surface water benchmarks, such as the National Recommended Water Quality Criteria (NRWQC; USEPA, 2023), conservatively assumes that ecological receptors are directly exposed to measured concentrations in groundwater. However, there will be a mixing zone where groundwater interfaces with surface water. The extent of that zone is unknown, but mixing is expected to occur, and the concentrations would decrease with distance from the mixing zone and tidal action. Site-specific mixing factors can range from 1 to several thousand. For example, USEPA uses a default mixing and attenuation factor of 20 to address the dilution of soil leachate as it moves through the groundwater aquifer (USEPA, 1996). Furthermore, mixing studies conducted by State of Washington, Department of Ecology (2009) found that the majority of the reduction in porewater concentrations was because of dilution by surface water and averaged 90 percent (that is, a dilution factor of 0.1). Assuming a similar dilution factor, the maximum post-injection detected concentration of dissolved mercury (8.55 µg/L) would be 0.855 µg/L, which does not exceed the NRWQC of 0.94 µg/L (USEPA, 2023).
- The post-treatment concentrations after 2018 have consistently been lower than 10 times the 0.6 µg/L TL at both IR26MW49A and IR26MW71A (**Figure 3-7**).
- Groundwater quality parameters (temperature and dissolved oxygen) indicate that the water in sentinel wells IR26MW49A, IR26MW50A, IR26MW51A, and IR26MW71A are not representative of surface water (**Table 3-4**).

Review of annual O&M inspections, historical documents, and the Five-Year Review inspection indicates that the durable covers and ICs are effective. Soil hotspot areas were removed through excavation and offsite disposal. Exposure pathways that could result in an unacceptable risk to human receptors are being controlled through the durable covers and ICs. The soil cover, shoreline revetment, and asphalt cover are in good condition, and any minor issues have been repaired. No deficiencies or inconsistent uses of the ICs were observed during the inspections.

Radiological concerns are addressed through past radiological work, and radiological retesting is being conducted to confirm that the RAO has been met, with the goal of unrestricted closure. With the exception of dissolved mercury at one location, groundwater monitoring indicates COCs in groundwater are decreasing or continue to be less than RGs and TLs.

3.5.2 Question B: Are the Exposure Assumptions, Toxicity Data, Cleanup Levels, and Remedial Action Objectives Used at the Time of the Remedy Selection Still Valid?

Yes. Based on the results of the ARAR evaluation, HHRA analysis, and ERA analysis discussed in the following sections, the exposure assumptions, toxicity data, cleanup levels, and RAOs used at the time of remedy selection are still valid. Although there have been some changes to toxicity values and risk assessment methods, these changes do not affect remedy protectiveness.

3.5.2.1 ARAR Evaluation

The Navy evaluated the ARARs established in the RODs for Parcel B. No changes to location-specific or action-specific ARARs that would affect the protectiveness of the remedies were identified. Changes to chemical-specific ARARs for individual chemicals are discussed in the following HHRA and ERA Analysis sections.

In 2021, California Public Resources Code Division 20.6.5, California Sea Level Rise Mitigation and Adaptation Act of 2021, was passed; however, no regulations have been promulgated to implement the act. The Navy is addressing SLR as discussed in **Section 1.4.2** of this Five-Year Review.

3.5.2.2 HHRA Analysis

The HHRA evaluation was conducted by comparing the human health RGs from the Amended ROD (Navy, 2009) with current risk-based criteria based on the same exposure scenario, and ARARs, if available. In September 2018, the State of California promulgated the *Toxicity Criteria for Human Health Risk Assessments, Screening Levels, and Remediation Goals* regulation (Toxicity Criteria Rule [TCR]). The TCR is codified at Cal. Code Regs., title 22, division 4.5, chapter 51, article 2, §§ 69020, 69021, and 69022. The TCR specifies the DTSC-preferred toxicity criteria (identified in TCR Appendix I, Tables A and B) to use to prepare HHRAs and to calculate screening levels and RGs based on human health risk at California hazardous waste and hazardous substance release sites. For this Five-Year Review, the USEPA recommended toxicity criteria hierarchy for HHRAs was followed to calculate the current comparison criteria discussed herein (USEPA, 2003):

- Tier 1 - USEPA Integrated Risk Information System (IRIS)
- Tier 2 - USEPA Provisional Peer-Reviewed Toxicity Values (PPRTVs)
- Tier 3 – Other sources in the order listed:
  - Agency for Toxic Substances and Disease Registry minimal risk levels
  - California Environmental Protection Agency Office of Environmental Health Hazard Assessment toxicity values
  - Screening toxicity values provided in USEPA PPRTV appendices
  - USEPA Health Effects Summary Table values

USEPA has incorporated this toxicity criteria hierarchy into its RSLs, which are updated semi-annually.

Response complete for soil is achieved with excavation, durable cover construction and maintenance, and ICs, as documented in the respective RACRs for IR-07/18, Parcel B-1, and Parcel B-2 (ERRG, 2011, 2012a, 2017; Innovex-ERRG Joint Venture, 2018a). Therefore, any changes in exposure assumptions and toxicity data would not affect protectiveness of the remedy.

Table 3-6 shows the RGs and current comparison criteria for groundwater. The RGs for the groundwater COCs in the Amended ROD (Navy, 2009) were based on consideration of exposure scenario-specific (residential or industrial vapor intrusion and construction worker trench exposure [A-aquifer], or residential domestic use [B-aquifer]) risk-based- concentrations (based on a cancer risk of 10^{-6} or a noncancer hazard index of 1), laboratory practical quantitation limits (PQLs), chemical-specific ARARs, and HGALs. RGs were compared with the following current comparison criteria (USEPA, 2022a):

- A-aquifer Groundwater: Vapor intrusion screening levels (VISLs) calculated using the current USEPA VISL calculator for the residential and commercial scenarios
- B-aquifer Groundwater: Current USEPA tap water RSLs, California MCLs, and USEPA MCLs

For the majority of the COCs where the risk-based concentration was selected as the RG, the current risk-based concentration (RSL, DTSC-screening level [SL], or VISL) is higher.

There are a few cases where a current risk-based concentration (VISL) is less than a risk-based RG (or the PQL or HGAL) from the Amended ROD (Navy, 2009; **Table 3-6**).

Although some current risk-based levels are less than the RGs, the ICs that are currently in place and the durable cover across the site prevent exposure to site media; therefore, the remedy remains protective. There may be changes with HHRA analysis for the construction worker scenario. Changes in exposure parameter values would likely only result in a small change to HHRA results since standard construction worker exposure factors have not changed significantly since the RI was prepared (not orders of magnitude). The following construction worker exposure parameter values have changed since the original HHRA was prepared:

- The construction worker body weight used in the HHRA was 70 kilograms; however, the adult body weight used in HHRAs based on current USEPA guidance (USEPA, 2014) would be 80 kilograms.
- The skin surface area for a construction worker exposed to soil used in the HHRA was 5,700 square centimeters (cm^2); however, based on current USEPA guidance (USEPA, 2014), a construction worker skin surface area exposed to soil is 3,527 cm^2.
- The soil-to-skin adherence factor used in the HHRA for a construction worker was 0.8 milligram per cm^2, where the soil-to-skin adherence factor for a construction worker used in a current HHRA would be 0.3 milligram per cm^2 (the 95th percentile adherence factor for construction workers [USEPA, 2004]).
- The skin surface area for exposure to groundwater used in the HHRA was 2,370 cm^2. A current HHRA would use a skin surface area of 6,032 cm^2 (the weighted average of mean values for head, hands, forearms, and lower legs [USEPA, 2011]).

- Additionally, for inhalation exposures for both groundwater and soil, inhalation toxicity values are now presented and used in milligram(s) per cubic meter (noncancer) or 1 microgram per cubic meter for cancer; therefore, the intake equations no longer incorporate inhalation rate.

Toxicity values could result in larger changes (potential orders of magnitude changes), such as for TCE, for which toxicity values were updated in 2009 after the initial HHRA was completed. However, those changes will not affect the RGs for the construction worker scenario identified in the ROD because ICs require identification and management of potential risks to construction workers through the preparation and approval of plans and specifications for all construction activities that may pose unacceptable exposure to construction workers. There have been no changes in current exposure pathways based on the site controls or changes in planned future site use since the ROD that would change the protectiveness of the current remedy.

Radiological Risk Review

In October 2020, after the preparation of the Five-Year Review addenda, USEPA introduced a PRG calculation method called "Peak PRG," which computes PRGs accounting for ingrowth and decay of progeny over time. An evaluation was performed for this Five-Year Review to assess whether this change affected the continued protectiveness of the current soil RGs for future residents. Exposure calculations were performed using the USEPA PRG Calculator (USEPA, 2022b). For this soil evaluation, the estimated excess cancer risk was calculated using the "Peak Risk" time interval of 1,000 years (Navy, 2020). The soil RGs were used as exposure point concentrations, and the cumulative cancer risk was calculated as the sum of risks from all ROCs. **Appendix F** presents the estimated excess cancer risks calculated from this evaluation and the supporting data. Under CERCLA, cleanup goals are considered protective if excess cancer risks from site exposures remain within the 10^{-4} to 10^{-6} range. Based on the findings of this evaluation, the soil RGs are within this range and continue to be protective for future residential exposures.

There were no changes to the risk assessment methods related to structures or buildings for radiological concerns since the last Five-Year Review.

3.5.2.3 ERA Analysis

The ERA evaluation was conducted by reviewing the exposure and toxicity assumptions used in the SLERA, identifying the most sensitive receptor that was used as the basis of the ecological RGs or TLs and comparing them with current standards of practice for ERAs to determine if the RGs remain protective. Overall, the SLERA was a very conservative assessment, and minor changes to risk methodology or current sources of exposure and toxicity values do not significantly affect the resulting RGs or TLs. The key input parameters are summarized as follows:

- Exposure Factors and Assumptions: Potential exposures to sediment were evaluated for benthic invertebrates, birds, and mammals. Exposures were evaluated for both surface (0 to 2 feet bgs) and subsurface (2.5 to 4 feet bgs) sediments, although the biologically active zone is considered to occur within the top 0.5 foot bgs. The deeper sediments were evaluated under the assumption that erosion may expose deeper sediments to the surface. The sources of exposure factors for birds and mammals, including body weight, ingestion rate, and dietary items, are still in use today and represent current state of practice. Area use factors were not used to estimate potential exposure for birds or mammals (that is, receptors were assumed to spend 100 percent of their life within the site boundary).

- Toxicity Values: Toxicity values used for benthic invertebrates, birds, and mammals are still used in ERAs, although there are additional sources for some analytes that are more commonly used. Toxicity values used to evaluate potential risks to benthic invertebrates were effects range median (ERM) values (Long et al., 1995). Toxicity reference values (TRVs) used for birds and mammals were the Region 9 Biological Technical Assistance Group (BTAG) TRVs (USEPA Region 9 BTAG, 1998) or wildlife TRVs (Sample et al., 1996). The benthic invertebrate sediment ERMs and bird and mammal TRVs (Sample et al., 1996) are still commonly used. The Region 9 BTAG TRVs are not used as often and are typically placed after USEPA ecological soil screening level (EcoSSL)-based TRVs. The differences in TRVs between the sources vary depending on the analyte. For some analytes, the EcoSSL TRVs are more conservative than the Region 9 BTAG TRVs, and, for others, the EcoSSL TRVs are less conservative. However, overall use of the Region 9 BTAG TRVs in estimating risk or deriving RGs remains protective because area use factors were not used.
- Risk Estimation: Recommendations for retaining analytes as COCs were made based on hazard quotient exceeding 1 at the Low Effect toxicity level for at least one receptor group. Additional lines of evidence to weigh the significance of an exceedance were not employed.

Table 3-7 summarizes the sediment COCs identified for ecological receptors. along with the basis of the RGs, comparison with current state of practice, and evaluation of protectiveness. Overall, slight changes in toxicity values would not significantly change the results of the risk assessment or derivation of risk-based concentrations that were evaluated for use as RGs. The sediment RGs remain protective for ecological receptors.

Table 3-8 presents groundwater COCs with a summary of TLs and current surface water quality criteria from NRWQC (USEPA, 2023) and the San Francisco Basin Plan (SFRWCQB, 2019). Groundwater data were compared with surface water screening levels and HGALs in the SLERA to evaluate potential for risk to aquatic organisms in San Francisco Bay. The evaluation of groundwater was very conservative because it was assumed that aquatic receptors would have direct exposure to chemicals in groundwater at their measured concentrations.

Mercury was the only metal retained as a potential risk to aquatic organisms in the SLERA. Chromium VI, copper, and lead were also included in the groundwater RAO based on review of data during the Amended ROD (Navy, 2009). The chronic NRWQC for chromium VI and the HGALs for copper, lead, and mercury were retained as TLs for monitoring purposes only as surface water benchmarks are not ARARs for ecological exposures to groundwater.

There have been no changes in site conditions or exposure parameters or mercury toxicity values that would call into question the selected trigger level of 0.6 µg/L, which is the background concentration of mercury in groundwater. The calculation methods and supporting information for this value are provided in the Estimation of Hunters Point Shipyard Groundwater Ambient Levels Technical Memorandum (PRC, 1996a).

3.5.3 Question C: Has Any Other Information Come to Light that Could Question the Protectiveness of the Remedy?

Yes. As identified in the Fourth Five-Year Review, there is uncertainty with the radiological survey and remediation work. The Navy is in the process of implementing corrective actions to ensure the radiological remedies specified in the decision documents were implemented as intended; however, this work is ongoing. Radiological retesting is currently being conducted at Parcels B-1 and B-2; long-term protectiveness will be confirmed upon completion. Until retesting

is complete, Navy controls access to the parcel through fencing, locked gates and institutional controls (restricting intrusive work and maintaining durable covers).

3.6 Issues, Recommendations, and Follow-up Actions

Table 3-9 summarizes the identified issues, recommendations, and follow-up actions for Parcels B-1 and B-2.

No issues have been identified for IR-07/18 that prevent the remedy from being protective of human health and the environment; therefore, no recommendations or follow-up actions are required to ensure protectiveness of the remedy.

3.6.1 Other Findings

The following findings were identified that do not affect current or future remedy protectiveness but warrant consideration as part of CERCLA cleanup and site management.

3.6.1.1 PFAS

As discussed in **Section 1.4.1**, a Basewide PA was conducted to identify potential PFAS release areas based on historical use or limited sampling data. The following is a summary of the areas identified for additional investigation in the PA (Multi-MAC JV, 2022) and SI (Liberty JV, 2023):

- **Parcels B-1 and B-2 A-aquifer Groundwater**: A-aquifer groundwater beneath Parcels B-1 and B-2 was identified for additional investigation because of past industrial use in the parcels and PFOA, PFOS, PFNA, and PFHxS exceeded project screening levels during the SI (**Appendix G**).
- **Parcel B-1:** IR-10, Battery and Metal Plating Shop, was identified as an area where further investigation is warranted to determine the presence of PFAS in soil and groundwater based on historical site use and limited groundwater sampling results that detected PFOA, PFOS, PFNA, PFBS, and PFHxS. PFOA, PFOS, and PFNA exceeded project screening levels in groundwater during the SI (**Appendix G**).

Exposure to groundwater and soil is restricted by ICs within the HPNS, and the City and County of San Francisco prohibits installation of domestic wells within city and county limits.

3.6.1.2 Climate Resilience

The CRA estimates that groundwater emergence may occur within IR-07/18 and Parcels B-1 and B-2 by the year 2065 (**Appendix A**). Site-specific studies are planned to verify these mapping projections and evaluate the 2100 timeframe, at a minimum.

However, protectiveness is only affected when increased CERCLA risk attributable to climate hazards has been identified (groundwater is likely to emerge and land use is such that receptors could be exposed and a future unacceptable health or ecological risk has been identified, data collected, validated, and evaluated following CERCLA risk assessment processes resulting in unacceptable risk to receptors). Where the potential for increased vapor intrusion is identified in other CERCLA documents, ARICs for VOCs are present, groundwater is being monitored, and removal of VOCs is occurring either through MNA or active remediation, thus reducing the potential for future vapor intrusion by reducing the source. Therefore, the potential for groundwater emergence does not affect the protectiveness determination in this Five-Year Review.

3.6.1.3 Site Management Strategy

The Navy is reassessing the site management strategy for Parcel B based on the following considerations:

- The Navy is planning to conduct a detailed assessment of groundwater COC concentrations to document and eliminate COCs that have achieved response complete and to tabulate groundwater and soil COC concentrations to ensure health and safety professionals have the information needed to protect future construction workers.
- The Navy is also planning to optimize the monitoring frequency and locations for areas that have not undergone any changes that could affect the concentrations of chemicals, metals, and/or ROPCs in groundwater (for example, RA or development construction).

3.7 Statement of Protectiveness

3.7.1 IR-07/18

Protectiveness Determination: Protective

Protectiveness Statement: The remedy at IR-07/18 is protective of human health and the environment.

The RAOs for soil and soil gas have been met through excavation and removal of contaminated soil, durable covers, and ICs. Groundwater monitoring indicates that COCs and ROPCs are less than TLs during the majority of sampling events.

3.7.2 Parcel B-1

Protectiveness Determination: Short-term Protective

Protectiveness Statement: The remedy at Parcel B-1 is currently protective of human health and the environment. To determine whether the remedy can be considered protective in the long term, the radiological retesting work and the excavation of VOC-impacted soil will be completed.

The RAOs for soil are met through hotspot excavation and offsite disposal, durable covers, and ICs. Excavation of VOC-impacted soil will permanently remove the source of VOCs to soil gas and groundwater. Groundwater LTM and MNA is ongoing. Exposure to groundwater is controlled through ICs. Radiological retesting is ongoing to confirm that levels in soils and structures are protective of human health. Until retesting is complete, short-term protectiveness is met through Navy controls such as access to the parcel through fencing, locked gates, and ICs (restricting intrusive work and maintaining durable covers).

3.7.3 Parcel B-2

Protectiveness Determination: Protectiveness Deferred

Protectiveness Statement: A protectiveness determination cannot be made because there is uncertainty related to the concentrations of mercury discharging to the Bay from Parcel B-2, IR-26 groundwater. In order to make a protectiveness determination, the following actions needs to be made: (1) evaluate technologies for treating mercury in groundwater (2) apply the selected method that is within compliance of the selected remedy in the record of decision. A draft primary document presenting the evaluation of the technologies and the proposed treatment method will be provided to the FFA regulatory agencies for review by October 31, 2024. The Navy anticipates initiating field application of the selected treatment method by Mid-July 2025.

Contingencies will be discussed during development of the work plan and exercised as the need arises. The protectiveness determination will be re-evaluated in the Five-Year Review addendum based on information that becomes available after the completion of this FYR. The RAOs for soil are met through durable covers and ICs. Groundwater LTM and MNA is ongoing. Exposure to groundwater is controlled through ICs. Radiological retesting is ongoing to confirm that levels in soil and structures are protective of human health.

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Table 3-1. Parcel B Chemicals of Concern and Remediation Goals

Exposure Medium	Exposure Scenario	Chemical of Concern	Amended ROD Remediation Goal (2009)	Source of Remediation Goal
Soil (mg/kg)	Residential	Antimony	10	RBC
		Aroclor-1254	0.093	RBC
		Aroclor-1260	0.21	RBC
		Arsenic	11.1	HPAL
		Benzo(a)anthracene	0.37	RBC
		Benzo(a)pyrene	0.33	PQL
		Benzo(b)fluoranthene	0.34	RBC
		Benzo(k)fluoranthene	0.34	RBC
		Beta-BHC	0.0066	RBC
		Bis(2-ethylhexyl)phthalate	1.1	RBC
		Cadmium	3.5	RBC
		Copper	159	RBC
		Dibenz(a,h)anthracene	0.33	PQL
		Dieldrin	0.0034	PQL
		Heptachlor epoxide	0.0017	PQL
		Indeno(1,2,3-cd) pyrene	0.35	RBC
		Iron	58,000	HPAL
		Lead	155	RBC
		Manganese	1,431	HPAL
		Mercury	2.3	HPAL
		Naphthalene	1.7	RBC
		Tetrachloroethene	0.48	RBC
		Trichloroethene	2.9	RBC
		Vanadium	117	HPAL
		Zinc	373	RBC
	Recreational	Aroclor-1254	0.74	RBC
		Aroclor-1260	0.74	RBC
		Arsenic	11.1	HPAL
		Benzo(a)pyrene	0.33	PQL
		Lead	155	RBC
	Industrial	Arsenic	11.1	HPAL
		Benzo(a)anthracene	1.8	RBC
		Benzo(a)pyrene	0.33	PQL
	Construction Worker	Aroclor-1260	2.1	RBC
		Arsenic	11.1	HPAL
		Benzo(a)pyrene	0.65	RBC
		Lead	800	RBC
		Trichloroethene	151	RBC
Sediment (mg/kg)	Ecological Receptor	Aluminum	3400	RBC
		Copper	270	RBC
		Dibenz(a,h)anthracene	0.33	PQL
		Dieldrin	0.008	RBC
		Lead	218	RBC
		Methoxychlor	0.4	RBC
		Total Aroclors	0.18	RBC
		Total DDT	0.046	RBC
		Zinc	410	RBC

Table 3-1. Parcel B Chemicals of Concern and Remediation Goals

Exposure Medium	Exposure Scenario	Chemical of Concern	Amended ROD Remediation Goal (2009)	Source of Remediation Goal
Groundwater - A-aquifer (µg/L)	Residential Vapor Intrusion	1,2,4-Trichlorobenzene	66	RBC
		1,2,4-Trimethylbenzene	25	RBC
		1,2-Dichlorobenzene	2,561	RBC
		1,2-Dichloroethane	2.3	RBC
		1,2-Dichloroethene (total)	209	RBC
		1,2-Dichloropropane	1.1	RBC
		1,3,5-Trimethylbenzene	19	RBC
		1,4-Dichlorobenzene	2.1	RBC
		2-Methylnaphthalene	707	RBC
		Benzene	0.5	PQL
		Bromodichloromethane	1	RBC
		Chlorobenzene	392	RBC
		Chloroethane	6.5	RBC
		Chloroform	1	PQL
		cis-1,2-Dichloroethene	209	RBC
		Dichlorodifluoromethane	14	RBC
		Mercury	0.68	RBC
		Methylene chloride	27	RBC
		Naphthalene	3.6	RBC
		Tetrachloroethene	1	PQL
		trans-1,2-Dichloroethene	182	RBC
		Trichloroethene	2.9	RBC
		Trichlorofluoromethane	176	RBC
		Vinyl chloride	0.5	PQL
	Industrial Vapor	Chloroform	1.2	RBC
	Construction Worker Trench Exposure	1,2,4-Trichlorobenzene	55	RBC
		1,2,4-Trimethylbenzene	72	RBC
		1,2-Dichlorobenzene	2,215	RBC
		1,2-Dichloroethane	30	RBC
		1,2-Dichloroethene (total)	363	RBC
		1,2-Dichloropropane	40	RBC
		1,4-Dichlorobenzene	68	RBC
		2,4,6-Trichlorophenol	15	RBC
		2,4-Dimethylphenol	9,801	RBC
		2,4-Dinitrotoluene	179	RBC
		2-Methylnaphthalene	140	RBC
		4-Methylphenol	3,500	RBC
		Arsenic	40	RBC
		Benzene	22	RBC
		Benzo(a)anthracene	2	PQL
		Benzo(a)pyrene	2	PQL
		Bromodichloromethane	26	RBC
		Chlorobenzene	594	RBC
		Chloroform	36	RBC
		Chrysene	6.4	RBC
		cis-1,2-Dichloroethene	363	RBC
		Mercury	4.68	RBC
		Naphthalene	20	RBC
		Pentachlorophenol	25	PQL
		Tetrachloroethene	19	RBC
		trans-1,2-Dichloroethene	721	RBC
		Trichloroethene	374	RBC
		Vinyl chloride	7.2	RBC

Table 3-1. Parcel B Chemicals of Concern and Remediation Goals

Exposure Medium	Exposure Scenario	Chemical of Concern	Amended ROD Remediation Goal (2009)	Source of Remediation Goal
Groundwater - B-aquifer (µg/L)	Residential Domestic Use	1,4-Dichlorobenzene	7.5	ARAR
		Antimony	43.26	HGAL
		Arsenic	27.34	HGAL
		Benzene	5	ARAR
		Chloroethane	4.6	RBC
		Manganese	8,140	HGAL
		Pentachlorophenol	25	PQL
		Thallium	12.97	HGAL
		Trichloroethene	5	ARAR

µg/L = microgram(s) per liter
ARAR = applicable or relevant and appropriate requirement
BHC = benzene hexachloride
DDT = dichlorodiphenyltrichloroethane
HGAL = Hunters Point groundwater ambient level
HPAL = Hunters Point ambient level
mg/kg = milligram(s) per kilogram
PQL = practical quantitation limit
RBC = risk-based concentration
ROD = Record of Decision

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Table 3-2. Parcel B Remediation Goals for Radionuclides

Radionuclide	Surfaces (dpm/100cm^2)		Soil[c] (pCi/g)		Water[e] (pCi/L)
	Equipment, Waste[a]	Structures[b]	Construction Worker	Residential[g]	Equipment, Waste[a]
Cesium-137	5,000	5,000	0.113	0.113	119
Cobalt-60	5,000	5,000	0.0602	0.0361	100
Plutonium-239	100	100	14	2.59	15
Radium-226	100	100	1.0[d]	1.0[d]	5.0[f]
Strontium-90	1,000	1,000	10.8	0.331	8

References:

Department of the Navy (Navy). 2006. *Base-wide Radiological Removal Action, Action Memorandum – Revision 2006, Hunters Point Shipyard, San Francisco, California* . Final. April 21.

United States Environmental Protection Agency (USEPA). 2000. *Radionuclides Notice of Data Availability Technical Support Document* . Targeting and Analysis Branch, Standards and Risk Management Division, Office of Groundwater and Drinking Water. March.

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

[b] Goals are based on 25 millirem per year (USEPA does not believe this NRC regulation is protective of human health and the environment, and the HPNS cleanup goals are more protective. This regulation is an ARAR only for radiologically impacted sites that are undergoing TCRAs, and any additional remedial action required for those sites. It is not an ARAR for radiologically impacted portions of IR-07/18 that will be transferred with engineering and institutional controls for radiological contaminants.

[c] USEPA PRGs for two future use scenarios

[d] Goal is 1 pCi/g above background per agreement with USEPA.

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

[f] Goal is for total radium concentration.

[g] Also applies to scanned surface soil at IR-07/18.

AEC = Atomic Energy Commission
ARAR = applicable or relevant and appropriate requirement
cm^2 = square centimeter(s)
dpm = disintegration(s) per minute
HPNS = Hunters Point Naval Shipyard
NRC = Nuclear Regulatory Commission
pCi/g = picocurie(s) per gram
pCi/L = picocurie(s) per liter
PRG = preliminary remediation goal
TCRA = time-critical removal action
USEPA = United States Environmental Protection Agency

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Table 3-3. Parcel B Remedial Action Summary and Expected Outcomes

Media	Risk/Basis for Action	Reasonably Anticipated Land Use	RAO	Remedy Component	Parcel[a]	Performance Metric	Expected Outcome
Soil, Soil Gas, and Sediment	**Human Health**: Unacceptable risk to industrial workers from exposure to metals and SVOCs; recreational users from exposure to metals, SVOCs, and PCBs; residents from exposure to metals, VOCs, SVOCs, pesticides, and PCBs; and construction worker from metals, VOCs, and SVOCs in surface or subsurface soil and VOCs in indoor air via the vapor intrusion pathway Potential presence of ROCs in soil beneath the cover at IR-07/18	**Current use:** Limited access unoccupied and unused buildings, few commercial buildings **Planned future use**: Predominantly residential and shoreline open space	1. Prevent exposure to organic and inorganic compounds in soil at concentrations above remediation goals developed in the HHRA (Table 8-1 from Amended ROD [Navy, 2009]) 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.	Soil Excavation	IR-07/18	Approximately 69,900 cubic yards of soil was removed from IR-07/18 from 1998 to 2001; however, RGs were not met and the soil remedy approach from the 1997 ROD (Navy, 1997) was re-evaluated to address ubiquitous metals and remaining COCs in soil. The Amended ROD (Navy, 2009) documents a parcel-wide application of durable covers to address these risks.	Land suitable for planned future use compatible with durable covers and ICs as required by the LUC RD.
					B-1 and B-2	Hotspot excavation to remove lead and PAH-impacted soil from the site to prevent exposure to humans and wildlife. Excavations were backfilled with clean imported soil	
				Durable Covers	IR-07/18	Durable covers to provide physical barriers to prevent exposure of humans and wildlife include the following: 1) A 3-foot (minimum) vegetated soil cover with a demarcation layer over IR-07/18 upland areas within the ARIC 2) A 2-foot (minimum) vegetated soil cover over IR-07/18 upland areas outside of the ARIC 3) A 6-inch (minimum) asphalt cover comprising 4 inches of aggregate base and 2 inches of asphalt over IR-07/18 upland areas outside of the ARIC that required paving Covers are inspected and maintained to prevent exposure to COCs and ROCs.	
					B-1 and B-2	Durable covers to provide physical barriers to prevent exposure of humans and wildlife include the following: 1) A 2-foot-thick (minimum) vegetated soil cover 2) A 6-inch-thick (minimum) asphaltic pavement cover 3) Repaired concrete building foundations Covers are inspected and maintained to prevent exposure to COCs.	
				ICs	All	ICs to maintain durable covers and security features, restrict land-disturbing activities, and prohibit growing produce in native soil for human consumption	
			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.	SVE	B-1	SVE to remove VOCs from soil gas. SVE system was operated intermittently as part of the remedy at IR-10 from March 2013 until May 2019 when evaluation of the mass removal rates indicated that the system had limited effectiveness extracting VOCs	
				Soil Excavation		Planned: Excavation to remove VOC-impacted soil source area beneath Building 123 (IR-10), backfilling with clean fill, and post-excavation soil vapor monitoring to SGALs for residential use	
				ICs	B-1 and B-2	ICs to prohibit construction of enclosed structures unless prior written approval of vapor mitigation strategies is granted by the FFA signatories	
	Presence of residual methane post-TCRA in IR-07/18		3. Reduce presence of methane in soil gas so that concentrations do not accumulate and become explosive in structures.	Soil Gas LTM	IR-07/18	Soil gas LTM to monitor concentrations of residual methane. Post-TCRA methane concentrations have been reduced to less than the lower explosive limit, and monitoring was discontinued in 2012.	
				ICs	IR-07/18	ICs to prohibit construction of enclosed structures unless prior written approval of vapor mitigation strategies is granted by the FFA signatories and the CDPH	

Table 3-3. Parcel B Remedial Action Summary and Expected Outcomes

Media	Risk/Basis for Action	Reasonably Anticipated Land Use	RAO	Remedy Component	Parcel[a]	Performance Metric	Expected Outcome
Soil, Soil Gas, and Sediment	**Ecological:** Potential unacceptable risk to benthic invertebrates, birds, and mammals from metals, pesticides, and PCBs in sediment	**Current use:** Limited access unoccupied and unused buildings, few commercial buildings **Planned future use**: Predominantly residential and shoreline open space	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 (Table 8-1 from Amended ROD [Navy, 2009]).	Durable Cover	All	Durable covers to provide physical barriers to prevent exposure of humans and wildlife to COCs along the shoreline. Durable cover consists of a 3-foot-thick (minimum) shoreline revetment structure made of riprap with underlying geotextile. Covers are inspected and maintained to prevent exposure to COCs.	Land suitable for planned future use compatible with durable covers and ICs as required by the LUC RD.
Groundwater	**Human Health**: Risk to industrial workers and residents from VOCs in A-aquifer through the vapor intrusion pathway; construction workers through direct contact with VOCs, SVOCs, and metals in A-aquifer groundwater and vapors in trenches; and residents through VOCs, and metals in B-aquifer groundwater from domestic use		1. Prevent exposure to VOCs and mercury in the A-aquifer groundwater at concentrations above remediation goals via indoor inhalation of vapors from groundwater (Table 8-3 from Amended ROD [Navy, 2009]).	In Situ Groundwater Remediation and Monitoring	B-1	Polylactate hydrogen was injected into 45 groundwater injection points to treat the VOC plume near Building 123 in IR-10. Post-injection monitoring is ongoing.	
					B-2	Organo-sulfur compound was injected into 43 groundwater injection points to treat dissolved mercury plume at IR-26 to the TL. Results were mixed and mercury continues to exceed TLs in downgradient monitoring wells.	
				ICs	B-1 and B-2	ICs to prohibit construction of enclosed structures unless prior written approval of vapor mitigation strategies is granted by the FFA signatories	
				MNA	B-1 and B-2	MNA of groundwater to monitor VOC attenuation. Although exceedances of the VC and TCE RGs have occurred, VOC concentrations are within historical ranges for all monitoring wells, and the presence of VC demonstrates that TCE biodegradation is occurring in groundwater in Parcel B-1. VOCs in Parcel B-2 are consistently less than RGs.	
			2. Prevent direct exposure to B-aquifer groundwater at concentrations above remediation goals (Table 8-3 from Amended ROD [Navy, 2009]) through the domestic use pathway (for example, drinking water or showering).	ICs	All	ICs to prohibit the use of groundwater and installation of new groundwater wells for domestic purposes	
			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 (Table 8-3 from Amended ROD [Navy, 2009]).	ICs	All	ICs restrict land-disturbing activity unless prior written approval is granted by the FFA signatories (and CDPH at IR-07/18).	

Table 3-3. Parcel B Remedial Action Summary and Expected Outcomes

Media	Risk/Basis for Action	Reasonably Anticipated Land Use	RAO	Remedy Component	Parcel[a]	Performance Metric	Expected Outcome
Groundwater	**Ecological:** Potential migration pathway of metals to surface water	**Current use:** Limited access unoccupied and unused buildings, few commercial buildings **Planned future Use:** Predominantly residential and shoreline open space	4. Prevent or minimize migration to the surface water of San Francisco Bay of chromium VI, copper, lead, and mercury in the A-aquifer groundwater that would result in concentrations of chromium VI above 50 µg/L, copper above 28.04 µg/L, lead above 14.44 µg/L, and mercury above 0.6 µg/L in the surface water of San Francisco Bay. This RAO is intended to protect the beneficial uses of the bay, including ecological receptors.	LTM	All	LTM of groundwater in wells installed near the bay to monitor metals concentrations in groundwater and to verify that metals concentrations in groundwater do not exceed TLs that might pose a risk to the San Francisco Bay if mobilized from redevelopment actions. IR-07/18: Concentrations of metals do not exceed TLs. Parcel B-1: Concentrations of metals do not exceed TLs. Parcel B-2: Concentrations of dissolved mercury exceed TLs.	Land suitable for planned future use compatible with durable covers and ICs as required by the LUC RD.
Radiologically Impacted Soil and Structures	**Human Health:** Radiological risks for soil and structures (storm drains, sanitary sewers, buildings) were greater than 10^{-6}.		1. Prevent exposure to radionuclides of concern in concentrations that exceed remediation goals (Table 8-4 from Amended ROD [Navy, 2009]) for the ingestion or inhalation exposure pathways.	Survey, Decontamination, and Removal of Radiologically Impacted Structures and Soil	B-1 and B-2	Identification and removal of historical subsurface storm drain and sanitary sewer utilities and screening and remediation of buildings, former building sites, and discharge channel as part of the TCRA for radionuclides. Radiological retesting is currently being conducted to confirm site conditions are compliant with the RAO.	
				Surface Scan for Radiological Materials and Excavation and Disposal of Radiological Anomalies	IR-07/18	MARSSIM Class 1 Survey of the entire surface of IR-07/18 was completed. Soil, sediment, and debris that exceeded release criteria or was assumed to be LLRW was removed.	
				Durable Cover with Demarcation Layer	IR-07/18	Durable covers provide physical barriers to prevent exposure of humans and wildlife to potential ROCs. The demarcation layer within the cover over potentially radiologically impacted areas serves as a warning against digging into potentially contaminated soil. Covers are inspected and maintained to prevent exposure to COCs.	
				LTM	IR-07/18	Groundwater LTM to monitor potential ROC concentrations. Since at least 2009, concentrations of potential ROCs have remained less than TLs.	
				ICs	IR-07/18	ICs to prohibit excavation below the demarcation layer unless prior written approval is granted by the FFA signatories and CDPH (ERRG, 2012b).	

Table 3-3. Parcel B Remedial Action Summary and Expected Outcomes

References:

Department of the Navy (Navy). 1997. *Hunters Point Shipyard, Parcel B, Final Record of Decision*. Engineering Field Activity West, Naval Facilities Engineering Command. October 7.

Navy. 2009. *Amended Parcel B Record of Decision, Hunters Point Naval Shipyard, San Francisco, CA*. Final. January 14.

ERRG. 2012b. *Operation and Maintenance Plan for Installation Restoration Sites 07 and 18 in Parcel B, Hunters Point Naval Shipyard, San Francisco, California*. Final. October.

[a] IR-07/18, Parcel B-1, and Parcel B-2 were included in a single ROD/Amended ROD (Navy, 1997, 2009) for former Parcel B; however, the remedy components associated with a number of RAOs was specific to a site or parcel as noted in the Parcel column.

µg/L = microgram(s) per liter
ARIC = area requiring institutional controls
CDPH = California Department of Public Health
COC = chemical of concern
FFA = Federal Facilities Agreement
HHRA = human health risk assessment
IC = institutional control
LLRW = Low-level radiological waste
LTM = long-term monitoring
LUC = land use control
MARSSIM = Multi-Agency Radiation Survey and Site Investigation Manual
PAH = polycyclic aromatic hydrocarbon
PCB = polychlorinated biphenyl
RAO = remedial action objective
RD = remedial design
RG = remediation goal
ROC = radionuclide of concern
ROD = Record of Decision
SGAL = soil gas action level
SVE = soil vapor extraction
SVOC = semivolatile organic compound
TCE = trichloroethene
TCRA = time-critical removal action
TL = trigger level
VC = vinyl chloride
VOC = volatile organic compound

Table 3-4. Comparison of Groundwater and Surface Water Quality Parameters

Location	Temperature (°C) – Bay Avg 12 to 16 °C			DO (mg/L) – Bay DO 8.0 to 8.3 mg/L		
	Minimum	Maximum	Average	Minimum	Maximum	Average
IR26MW49A	17	20.38	18.9	2.4	6.31	4.068
IR26MW50A	18	23.02	20.3	0.4	3.97	2.046
IR26MW51A	17.3	23.52	19.7	0	6.82	2.266
IR26MW70A	18.3	21.9	19.7	0	5.71	1.35
IR26MW71A	16.7	25.51	20.1	0.5	5.98	2.516

Notes:

Data collected during post-in situ stabilization monitoring in 9/2017, 3/2018, 6/2018, 9/2018, 12/2018

References:

KMEA MACTEC Joint Venture (KMJV). 2021. *Remedial Action Construction Summary Report, Parcel B-2, Installation Restoration Site 26 Groundwater Treatment, Former Hunters Point Naval Shipyard, San Francisco, California*. December 9.

Osborn, Liz. 2024. “Average Ocean Water Temperatures at San Francisco.” CurrentResults.com. https://www.currentresults.com/Oceans/Temperature/san-francisco-average-water-temperature.php.

Schraga, T.S., E.S. Nejad, C.A. Martin, and J.E. Cloern. 2023. *USGS Measurements of Water Quality in San Francisco Bay (CA), 2016-2021*. U.S. Geological Survey data release. Version 4. March. https://www.sciencebase.gov/catalog/item/5966abe6e4b0d1f9f05cf551.

°C = degree(s) Celsius
DO = dissolved oxygen
mg/L = milligram(s) per liter

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Table 3-5. Fourth Five-Year Review Parcel B Issues, Recommendations, and Follow-up Actions

Parcel/Site	Fourth Five-Year Review Protectiveness	Issue	Recommendation (Milestone)	Date Complete/Current Status
B-1	Will be protective	SVE implementation in Parcels B-1 and C is reducing source mass, but with limited effectiveness due to diffusion-limited conditions in the subsurface. Although ICs will maintain future protectiveness, source-removal inefficiency is extending the period within which SVE will be implemented.	It is recommended that use of the SVE technology be evaluated for each treatment area due to inefficiency caused by diffusion-limited conditions. Site-specific studies (e.g., remedy analyses) should be performed to estimate the magnitude and extent of source mass at each treatment area in Parcels B-1 and C to determine if other measures could be implemented to enhance SVE performance in the future. Any changes implemented to the approach for reducing source contamination in SVE areas should be discussed in the next Five-Year Review report. Changes made to the treatment approach should be considered for any other SVE treatment areas at HPNS, including areas where treatment is planned but has not yet been initiated. (12/31/2019)	**Completed February 2021.** The system was operated most recently from October 2019 to April 2020, resulting in the removal of 1.4 pounds of TCE. Post-SVE shutdown rebound monitoring demonstrated that the SVE system reached a point of diminishing returns (Navy, 2019, Innovex-ERRG Joint Venture, 2021). Therefore, soil excavation and subsequent confirmation monitoring is planned for IR-10 to address VOC soil contamination to a depth of 10 feet bgs (Insight-ESI, 2023).
B-1, B-2	Will be protective	The regulatory agencies do not agree with the Navy's risk assessment methodology used to reduce the ARICs for VOC vapors.	The Navy intends to consider agency concerns (including specific recommendations made by USEPA) and reevaluate its approach to calculating SGALs, which may affect the ARICs for VOC vapors at Parcels B-1, B-2, D-1, and G. Appendix E (of the Fourth Five-Year Review) evaluated how USEPA's recommendations may affect the SGALs and the ARICs for VOC vapors. Based on the information in Appendix E, none of the potential changes to the ARICs for VOC vapors affect the current protectiveness of the remedies at Parcels B-1, B-2, D-1, and G. The regulatory agencies are currently reviewing and re-evaluating their methods for assessing vapor intrusion risk. Once consensus is achieved, the Navy should reevaluate its approach for calculating SGALs and adjusting ARICs for VOC vapors. The new SGALs would be developed based on the most current standards, toxicity criteria, and risk assessment methods. The new SGALs would be used to redefine the ARICs for soil gas at each parcel prior to property transfer. Any changes to soil gas risk assessment methodology should be discussed in the next Five-Year Review report. (12/31/2019)	In progress. The work plan was finalized in September 2023 and excavation fieldwork is currently underway and will be completed in fall 2024 followed by a year of quarterly soil gas monitoring. A remedial action is currently being planned to address VOCs at Building 123, Site 10 (within Parcel B-1). A dual tracking approach is being used to evaluate methods to calculate SGALs for the removal which includes Method 1: Federal Toxicity Criteria Hierarchy (USEPA, 2003) and Method 2: State of California Toxicity Criteria Hierarchy using DTSC toxicity criteria for human health risk assessments. The Navy will evaluate differences between the Method 1 and Method 2 risk estimates in the risk characterization. The Navy will also discuss results of the risk characterization and its recommendations for updating VI areas requiring ICs with the BCT prior to submitting the draft RACR for BCT review (Insight-ESI, 2023). While there is disagreement about the method to calculate the SGALs which may affect ARIC boundaries, the final ARICs that will be surveyed and recorded in quitclaim deeds and covenants to restrict land use will be established in agreement with the BCT. Because attenuation of VOCs is likely to occur, ARICs for VOC vapors, and likewise SGALs that are the basis of the ARICs, in Parcels B-1 and B-2 will be re-evaluated and finalized during preparation for property transfer. Protectiveness is not affected because the Navy currently controls the property and land use, and future protectiveness will not be affected because the ARICs will be established in the appropriate legal documentation.
B-1, B-2	Will be protective	The Navy has determined that a significant portion of the radiological survey and remediation work completed to date was not reliable because of manipulation or falsification of data by one of its radiological contractors. A long-term protectiveness evaluation of the radiological RGs has not yet been completed for the Fourth Five-Year Review, and it is currently not known if the RAOs for radionuclides have been achieved in Parcels B-1, B-2, C, D-1, D-2, G, E, UC-1, UC-2, and UC-3.	See Section 1.4.3 for the long-term protectiveness evaluation component of this recommendation. The Navy is in the process of implementing corrective actions to ensure that the radiological remedies specified in the decision documents are implemented as intended. It is anticipated that the radiological rework will be completed prior to the next Five-Year Review.	Long-term Protectiveness Evaluation: Completed June 2020. Addenda to the Fourth Five-Year Review were prepared to evaluate the Radiological RGs for soil and buildings. The conclusions of both reports were that the current RGs were protective of human health and the environment (Navy, 2020a, 2020b). In Progress. Planning for the radiological retesting of soil and surveys of building and former building structures at Parcel B (including Parcels B-1 and B-2) was initiated in February 2019. Fieldwork activities were initiated in fall 2022. Upon completion, radiological rework will be summarized in a RACR anticipated to be completed in 2025.

Table 3-5. Fourth Five-Year Review Parcel B Issues, Recommendations, and Follow-up Actions

References:

Department of the Navy (Navy). 2019. *Fourth Five-Year Review, Hunters Pont Naval Shipyard, San Francisco, California.* July.

Innovex-ERRG Joint Venture. 2021. *SVE System Operation, Maintenance, and Monitoring Status Update for October 2019-September 2020 Operating Period, IR-10 Carveout, Parcel B-1, Hunters Point Naval Shipyard, San Francisco, California*. Final. February 1.

Insight-ESI, LLC (Insight-ESI). 2023. *Remedial Action Work Plan, Parcel B-1, Installation Restoration Site 10, Building 123, Hunters Point Naval Shipyard, San Francisco, California.* Final. September.

Navy. 2020a. *Addendum to the Five-Year Review, Evaluation of Radiological Remedial Goals for Soil, Hunters Point Naval Shipyard, San Francisco, California.* June 18.

Navy. 2020b. *Addendum to the Five-Year Review, Evaluation of Radiological Remedial Goals for Building Structures, Hunters Point Naval Shipyard, San Francisco, CA*. June 18.

ARIC = area requiring institutional controls
BCT = BRAC Cleanup Team
bgs = below ground surface
BRAC = Base Realignment and Closure
DTSC = California Department of Toxic Substances Control
HPNS = Hunters Point Naval Shipyard
IC = institutional control
Navy = Department of the Navy
RACR = Remedial Action Completion Report
RG = remediation goal
SGAL = soil gas action level
SVE = soil vapor extraction
TCE = trichloroethene
USEPA = United States Environmental Protection Agency
VI = vapor intrusion
VOC = volatile organic compound

Table 3-6. Parcel B Chemicals of Concern and Current Comparison Criteria for Groundwater

Exposure Medium	Exposure Scenario	Chemical of Concern	Values from Amended ROD		Current Comparison Criteria				
			Amended ROD Remediation Goal (2009)	Source of Remediation Goal	11/2022 USEPA RSL or VISL[a]	Basis of RSL or VISL (C/NC)	DTSC-SL	California MCL	USEPA MCL
Groundwater A-Aquifer (µg/L)	Residential Vapor Intrusion	1,2,4-Trichlorobenzene	66	RBC	35.9	NC	NA	5	70
		1,2,4-Trimethylbenzene	25	RBC	248	NC	NA	None	None
		1,2-Dichlorobenzene	2,561	RBC	2660	NC	NA	600	600
		1,2-Dichloroethane	2.3	RBC	2.24	C	NA	0.5	5
		1,2-Dichloroethene (total)	209	RBC	109	NC	NA	6 / 10	70 / 100
		1,2-Dichloropropane	1.1	RBC	6.58	C	NA	5	5
		1,3,5-Trimethylbenzene	19	RBC	175	NC	NA	None	None
		1,4-Dichlorobenzene	2.1	RBC	2.59	C	NA	5	75
		2-Methylnaphthalene	707	RBC	NITD		NA	None	None
		Benzene	0.5	PQL	1.59	C	NA	1	5
		Bromodichloromethane	1	RBC	0.876	C	NA	80	80
		Chlorobenzene	392	RBC	410	NC	NA	70	100
		Chloroethane	6.5	RBC	9190	NC	NA	None	None
		Chloroform	1	PQL	0.814	C	NA	80	80
		cis-1,2-Dichloroethene	209	RBC	250	NC	NA	6	70
		Dichlorodifluoromethane	14	RBC	7.44	NC	NA	None	None
		Mercury	0.68	RBC	0.889	NC	NA	2	2
		Methylene chloride	27	RBC	763	C	NA	5	5
		Naphthalene	3.6	RBC	4.59	C	NA	None	None
		Tetrachloroethene	1	PQL	14.9	C	NA	5	5
		trans-1,2-Dichloroethene	182	RBC	109	NC	NA	10	100
		Trichloroethene	2.9	RBC	1.19	C	NA	5	5
		Trichlorofluoromethane	176	RBC	NITD		NA	150	None
		Vinyl chloride	0.5	PQL	0.147	C	NA	0.5	2
	Industrial Vapor Intrusion	Chloroform	1.2	RBC	3.55	C	NA	80	80

Table 3-6. Parcel B Chemicals of Concern and Current Comparison Criteria for Groundwater

Exposure Medium	Exposure Scenario	Chemical of Concern	Values from Amended ROD		Current Comparison Criteria				
			Amended ROD Remediation Goal (2009)	Source of Remediation Goal	11/2022 USEPA RSL or VISL[a]	Basis of RSL or VISL (C/NC)	DTSC-SL	California MCL	USEPA MCL
Groundwater B-Aquifer (µg/L)	Residential Domestic Use	1,4-Dichlorobenzene	7.5	ARAR	0.48	C	No value	5	75
		Antimony	43.26	HGAL	7.8	NC	No value	6	6
		Arsenic	27.34	HGAL	0.052	C	0.0082	10	10
		Benzene	5	ARAR	0.46	C	0.15	1	5
		Chloroethane	4.6	RBC	8300	NC	No value	None	None
		Manganese	8,140	HGAL	430	NC	No value	None	None
		Pentachlorophenol	25	PQL	0.041	C	No value	1	1
		Thallium	12.97	HGAL	0.2	NC	0.59	2	2
		Trichloroethene	5	ARAR	0.49	C	No value	5	5

[a] VISL presented for A-aquifer groundwater, RSL for all other media and groundwater aquifers.

Notes:

Shading indicates current comparison criteria is lower than Amended ROD Remediation Goal unless Remediation Goal is Background.

µg/L = microgram(s) per liter
ARAR = applicable or relevant and appropriate requirement
C = carcinogen
DTSC = California Department of Toxic Substances Control
HGAL = Hunters Point groundwater ambient level
MCL = maximum contaminant level
mg/kg = milligram(s) per kilogram
NA = not available
NC = noncarcinogen
PQL = practical quantitation limit
RBC = risk-based concentration
ROD = Record of Decision
RSL = regional screening level
SL = screening level
USEPA = U.S. Environmental Protection Agency
VISL = vapor intrusion screening level

Table 3-7. Parcel B Chemicals of Concern for Ecological Receptors - Sediment

Exposure Medium	Exposure Scenario	Chemical of Concern	Amended ROD Remediation Goal (2009)	Source of Remediation Goal/Target Level	Receptor Basis	Toxicity Value Used as Source of Remediation Goal	Changes in Exposure Factors?	Changes in Toxicity Values?	Remediation Goal Still Protective?
Sediment (mg/kg)	Ecological Receptor	Aluminum	3,400	RBC	Small Mammals	Sample et al., 1996	No	TRV scaling is no longer used. Sample et al. (1996) is still used.	Yes. Changes to toxicity values would not alter the overall conclusion of the risk assessment or significantly alter the derivation of RBCs. RG is still protective.
		Copper	270	RBC	Benthic macroinvertebrates	ERM	No	No	Yes. Source of benchmark used as RG is still in use today.
		Dibenz(a,h)anthracene	0.33	PQL	Benthic macroinvertebrates	ERM	No	No	Yes. Source of the RG is the PQL. Analyte was only identified as a COC for subsurface sediments (2.5 to 4 feet bgs) which are not in the biologically active zone.
		Dieldrin	0.008	RBC	Benthic macroinvertebrates	ERM	No	No	Yes. Source of benchmark used as RG is still in use today.
		Lead	218	RBC	Benthic macroinvertebrates	ERM	No	No	Yes. Source of benchmark used as RG is still in use today.
		Methoxychlor	0.4	RBC	Birds	BTAG TRVs for DDT	No	TRV scaling is no longer used. Bird TRVs are available for methoxyclor in LANL (2022) and are less conservative (higher) than those from BTAG.	Yes. TRVs used to derive the RG are more conservative than TRVs commonly used today. RG is overprotective.
		Total Aroclors	0.18	RBC	Benthic macroinvertebrates	ERM	No	No	Yes. Source of benchmark used as RG is still in use today.
		Total DDT	0.046	RBC	Benthic macroinvertebrates	ERM	No	No	Yes. Source of benchmark used as RG is still in use today.
		Zinc	410	RBC	Benthic macroinvertebrates	ERM	No	No	Yes. Source of benchmark used as RG is still in use today.

Reference:

Sample, B.E., D.M. Opresko, and G.W. Suter II. 1996. *Toxicological Benchmarks for Wildlife: 1996 Revision* . ES/ER/TM-86/R3. ORNL, Oak Ridge, Tennessee.
Los Alamos National Laboratory (LANL). 2022. EcoRisk database. Release 4.2. November.

bgs = below ground surface
BTAG = Biological Technical Assistance Group
COC = chemical of concern
DDT = dichlorodiphenyltrichloroethane
ERM = effects range median
LANL = Los Alamos National Laboratory
mg/kg = milligram(s) per kilogram
PQL = practical quantitation limit
RBC = risk-based concentration
RG = remediation goal
ROD = Record of Decision
TRV = toxicity reference value

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Table 3-8. Parcel B Chemicals of Potential Concern for Ecological Receptors - Groundwater

Exposure Medium	Exposure Scenario	Chemical of Concern	Amended ROD Trigger Level (2009)	Source of Trigger Level	Receptor Basis	NRWQC (2023)	Basin Plan SF Bay (2019)	Value Still Protective?	Notes
Groundwater (µg/L)	Ecological Receptor	Chromium VI	50	NRWQC - CCC	Aquatic Organisms	50	50	Yes	Analyte was not identified as posing potential risk to ecological receptors in the SLERA. It was included in the monitoring due to detections in well IR10MW12A/IR10MW82A. The TL is a risk-based criteria for surface water exposures but is not an ARAR for ecological exposure to groundwater.
		Copper	28.04	HGAL	Aquatic Organisms	3.1	6	Yes	Analyte was not identified as posing potential risk to ecological receptors in the SLERA due to low FOD and no defined plume. However, it was included in the monitoring plan. The TL is based on ambient levels and is not a risk-based value. Risk-based criteria for surface water (NRWQC and Basin Plan) are for comparison purposes only and are not ARARs for groundwater exposures.
		Lead	14.44	HGAL	Aquatic Organisms	8.1	8.1	Yes	Analyte was not identified as posing potential risk to ecological receptors in the SLERA due to low FOD and no defined plume. However, it was included in the monitoring plan. The TL is based on ambient levels and is not a risk-based value. Risk-based criteria for surface water (NRWQC and Basin Plan) are for comparison purposes only and are not ARARs for groundwater exposures.
Groundwater (µg/L)	Ecological Receptor	Mercury	0.6	HGAL	Aquatic Organisms	0.94 (D)	0.03 mg/kg fish tissue	Yes	Detected in well IR26MW47A/49A greater than TL. Assumes aquatic receptors are exposed to full concentration detected in groundwater well. Potential for mixing is not accounted for in the comparisons with the TL. The TL is based on ambient levels and is not a risk-based value. Risk-based criteria for surface water (NRWQC and Basin Plan) are for comparison purposes only and are not ARARs for groundwater exposures. The 2019 update to the San Francisco Bay Basin Plan (2019) has revised the mercury goal to a tissue-based value.

Reference:
San Francisco Bay Region Water Quality Control Board (SFRWQCB). 2019. *San Francisco Bay Basin (Region 2) Water Quality Control Plan (Basin Plan). California Regional Water Quality Control Board – San Francisco Bay Region* . November.

µg/L = microgram(s) per liter
ARAR = applicable or relevant and appropriate requirement
CCC = criterion continuous concentration
(D) = dissolved
FOD = frequency of detection
HGAL = Hunters Point groundwater ambient level
mg/kg = milligram(s) per kilogram
NRWQC = National Recommended Water Quality Criteria
ROD = Record of Decision
SLERA = screening-level ecological risk assessment
TL = trigger level

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Table 3-9. Parcel B Issues, Recommendations, and Follow-up Actions

Parcel	Issue	Recommendations/ Actions	Party Responsible	Oversight Agency	Milestone Date	Affects Protectiveness (Y/N)	
						Current	Future
B-1 B-2	As identified in the Fourth Five-Year Review, there is uncertainty with a portion of the radiological survey and remediation work performed between 2004 and 2016 under the Basewide Radiological Removal Action, Action Memorandum (Navy, 2006). The Navy is in the process of implementing corrective actions to ensure the radiological remedies specified in the decision documents were implemented as intended; however, this work is ongoing.	Complete radiological retesting at radiologically impacted sites, including current and former buildings and soil areas investigated under the Radiological Removal Action, Action Memorandum (Navy, 2006) and areas where evaluations determined previous data were unreliable.	Navy	USEPA	2/27/2025	N	Y
B-2	The in-situ stabilization remedy for mercury in Parcel B-2, IR-26 groundwater did not reduce concentrations to below the 0.6 µg/L trigger level and there is uncertainty related to the concentrations of mercury potentially discharging to the Bay from Parcel B-2, IR-26 groundwater.	1. Prepare a primary document evaluating technologies for treating mercury in groundwater and presenting a proposed treatment method for FFA regulatory agency review.	Navy	USEPA	10/31/2024	Protectiveness Deferred	
		2. Apply the selected method that is within compliance of the selected remedy in the record of decision and initiate performance monitoring.	Navy	USEPA	7/15/2025		

Source: Navy. 2006. *Base-wide Radiological Removal Action, Action Memorandum – Revision 2006*, Hunters Point Shipyard, San Francisco, California. Final. April 21.

Navy = Department of the Navy
USEPA = United States Environmental Protection Agency

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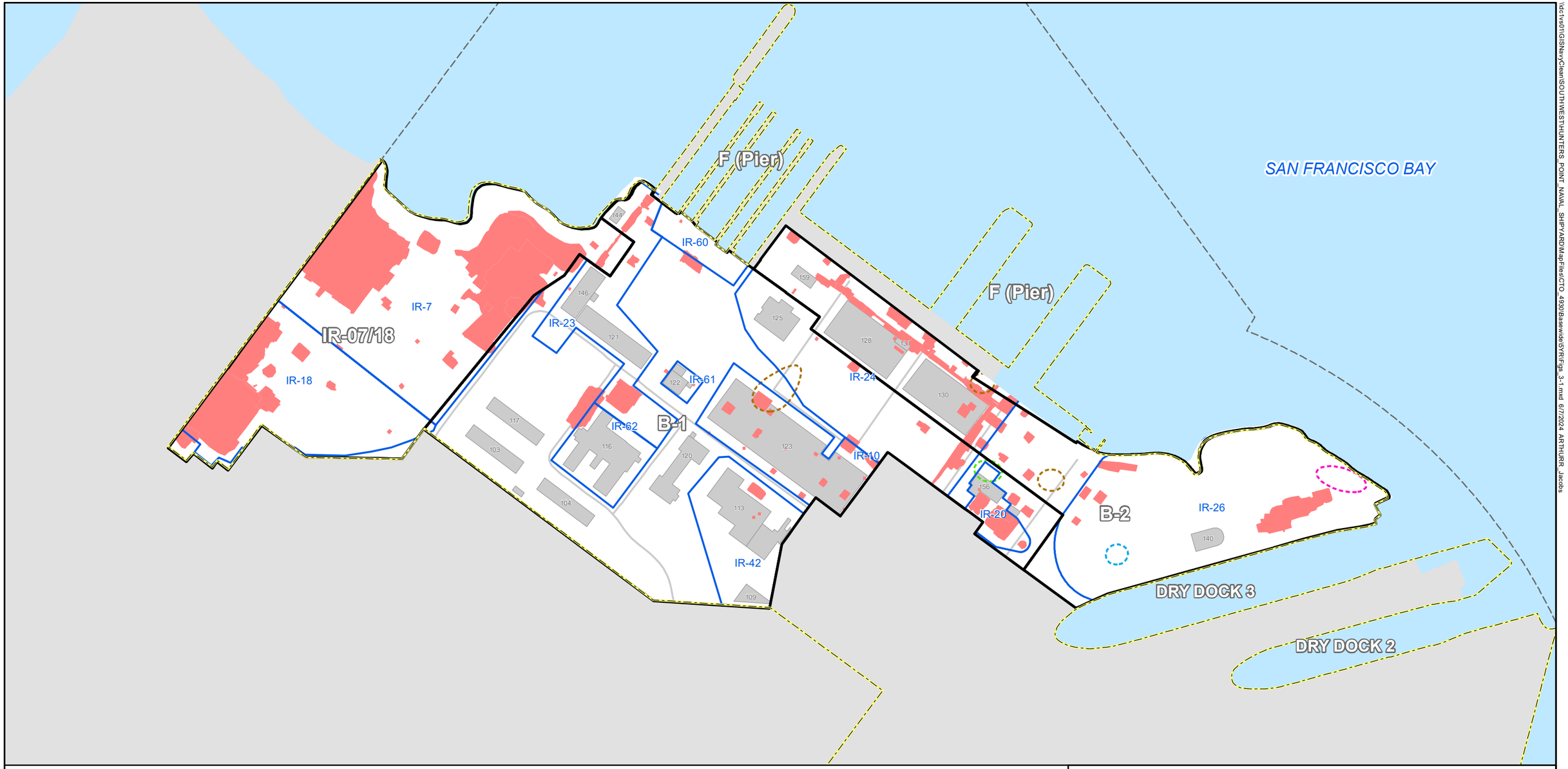


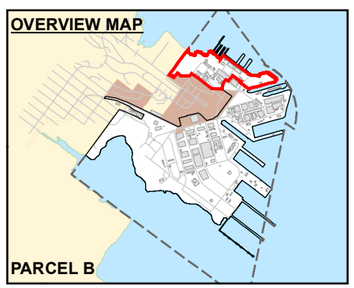
LEGEND

- Hunters Point Naval Shipyard Boundary
- Parcel Boundary
- Parcel F (Water) Boundary
- IR Site
- COC Excavation Area (Complete)
- Water
- Building
- Road

Plume Detection Area

- Mercury
- Mercury, Selenium
- VOC
- Vinyl Chloride

OVERVIEW MAP



COC = chemical of concern
IR = Installation Restoration
VOC = volatile organic compound

0 150 300 Feet
1 inch = 300 feet

N

Parcel B (Installation Restoration Sites 07 and 18, Parcels B-1 and B-2)

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

NAVFAC Naval Facilities Engineering Systems Command

Figure 3-1

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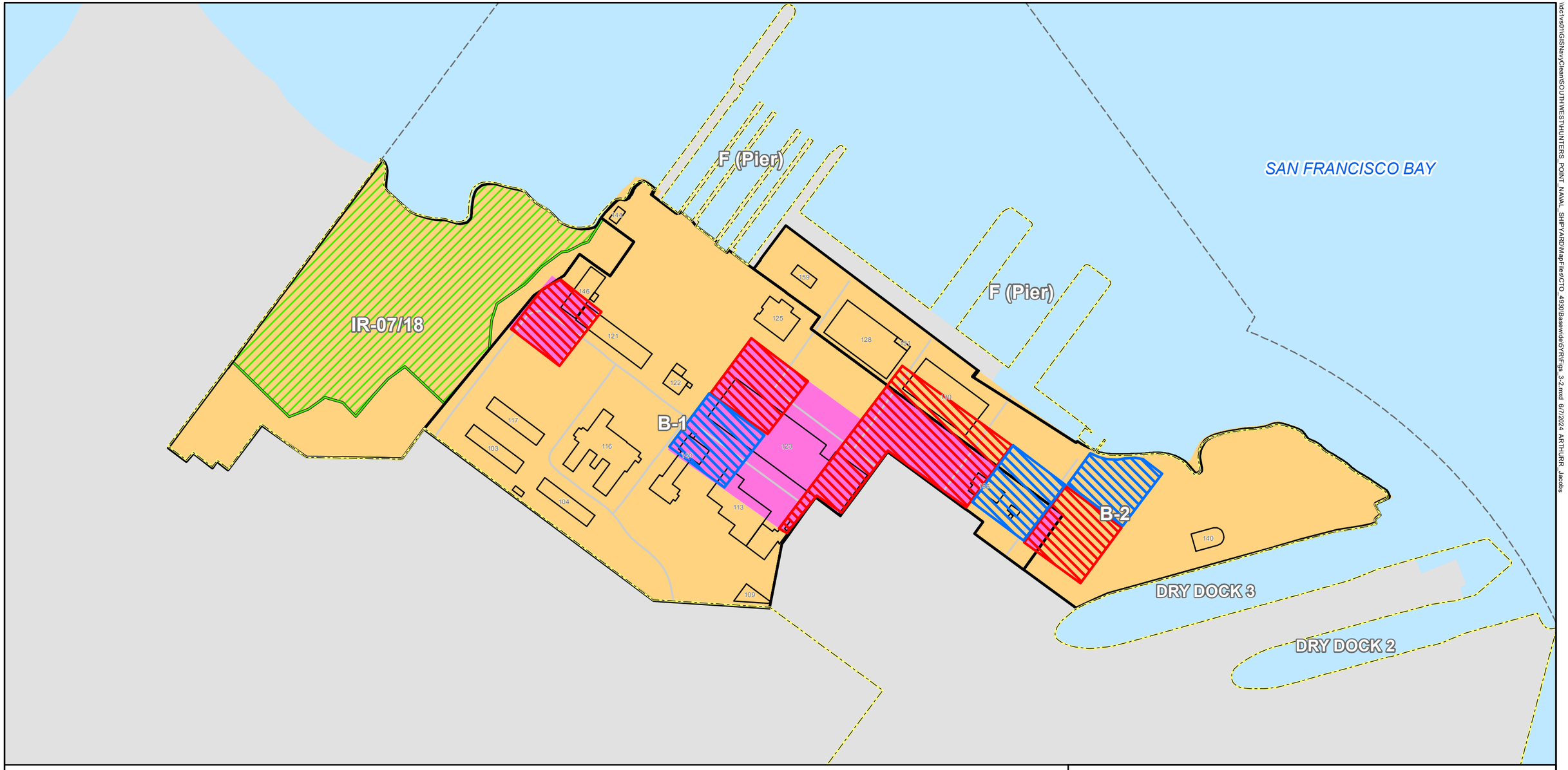

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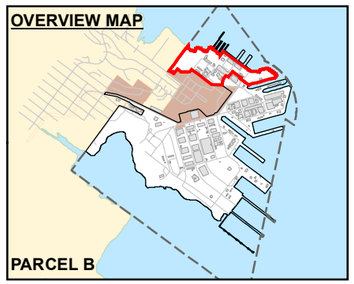
LEGEND

- Hunters Point Naval Shipyard Boundary
- Parcel Boundary
- Parcel F (Water) Boundary
- Water
- Building
- Road

Institutional Controls

- ARIC for Soil and Groundwater Use (General)
- ARIC for Soil, Groundwater Use, and Restrictions Related to VOC Vapors
- ARIC for Potential Radionuclides
- Existing VOC ARIC
- Area Requiring Further Evaluation for VOCs based on Fourth Five-Year Review

OVERVIEW MAP



ARIC = area requiring institutional controls
VOC = volatile organic compound

0 150 300 Feet
1 inch = 300 feet

N

Parcel B (Installation Restoration Sites 07 and 18, Parcels B-1 and B-2)
Institutional Controls

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

NAVFAC Naval Facilities Engineering Systems Command

Figure 3-2

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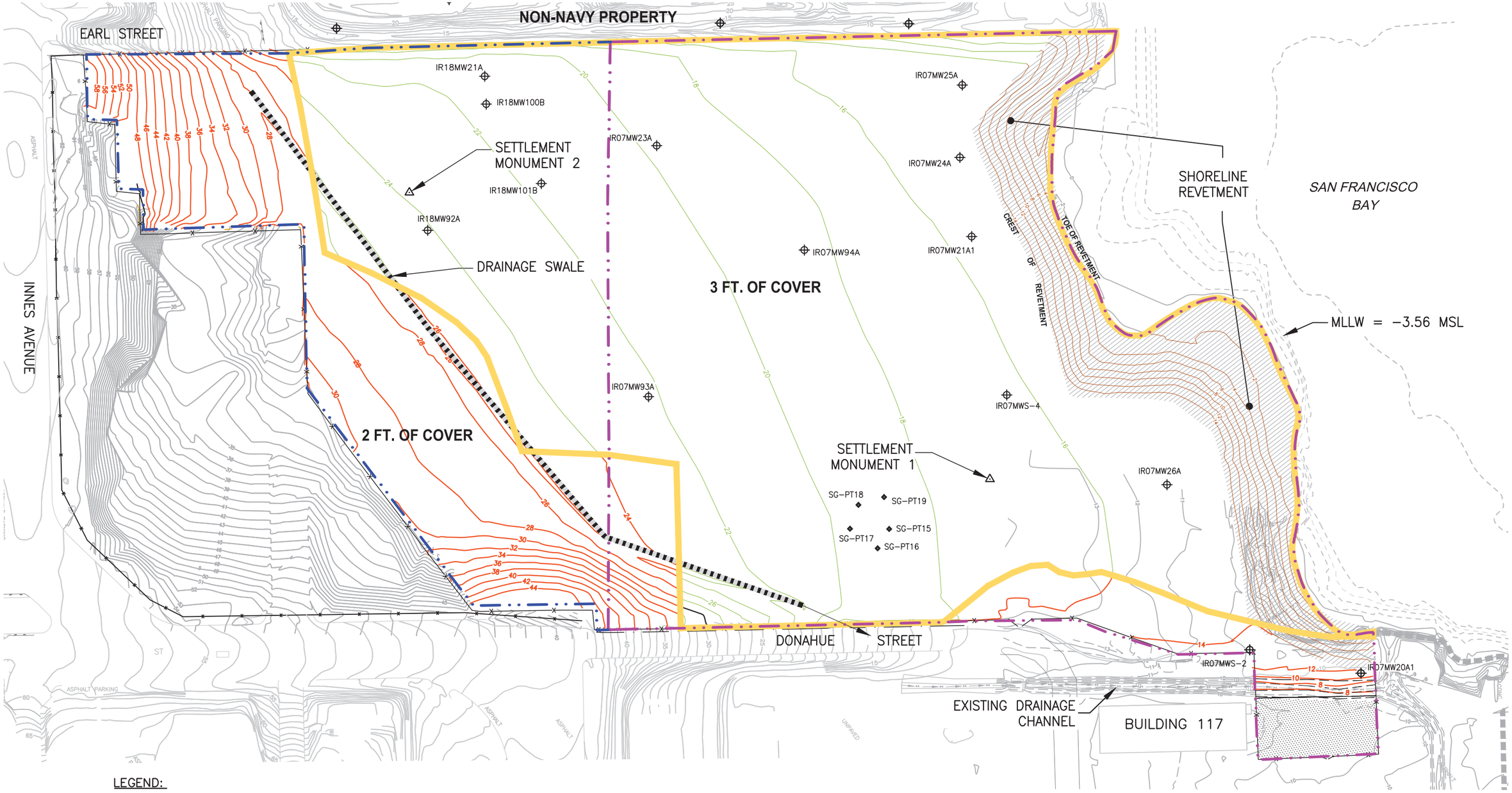

LEGEND:

- SHORELINE REVETMENT (RIPRAP)
- ASPHALT COVER
- GROUNDWATER MONITORING WELL
- FORMER METHANE MONITORING PROBE
- SETTLEMENT MONUMENT
- DRAINAGE SWALE
- AREA REQUIRING INSTITUTIONAL CONTROLS FOR POTENTIAL RADIONUCLIDES
- IR-07 BOUNDARY
- IR-18 BOUNDARY
- EXISTING TOPOGRAPHIC CONTOUR
- FINAL TOPOGRAPHIC CONTOUR 3-FT. COVER
- FINAL TOPOGRAPHIC CONTOUR 2-FT. COVER
- FINAL TOPOGRAPHIC CONTOUR REVETMENT
- FENCE

0' 120'

Source:
Innovex-ERRG Joint Venture. 2019. *Fourth Five-Year Review, Hunters Point Naval Shipyard, San Francisco, California.* Figure 3. July.

Figure 3-3
Overview of Remedy Components for IR-07/18
Fifth Five-Year Review Report
Hunters Point Naval Shipyard
San Francisco, California

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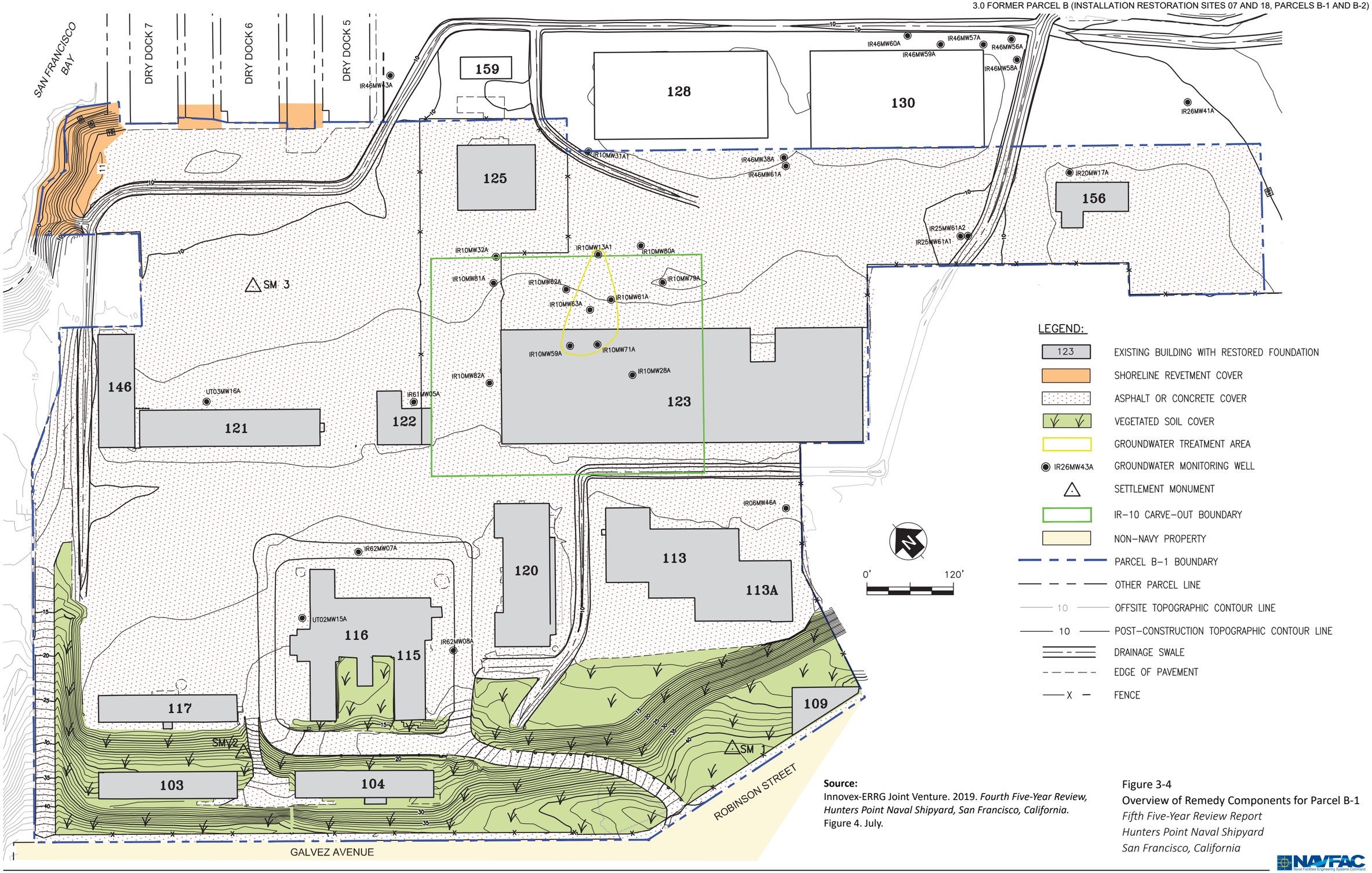

Source:
Innovex-ERRG Joint Venture. 2019. *Fourth Five-Year Review, Hunters Point Naval Shipyard, San Francisco, California.* Figure 4. July.

Figure 3-4
Overview of Remedy Components for Parcel B-1
Fifth Five-Year Review Report
Hunters Point Naval Shipyard
San Francisco, California

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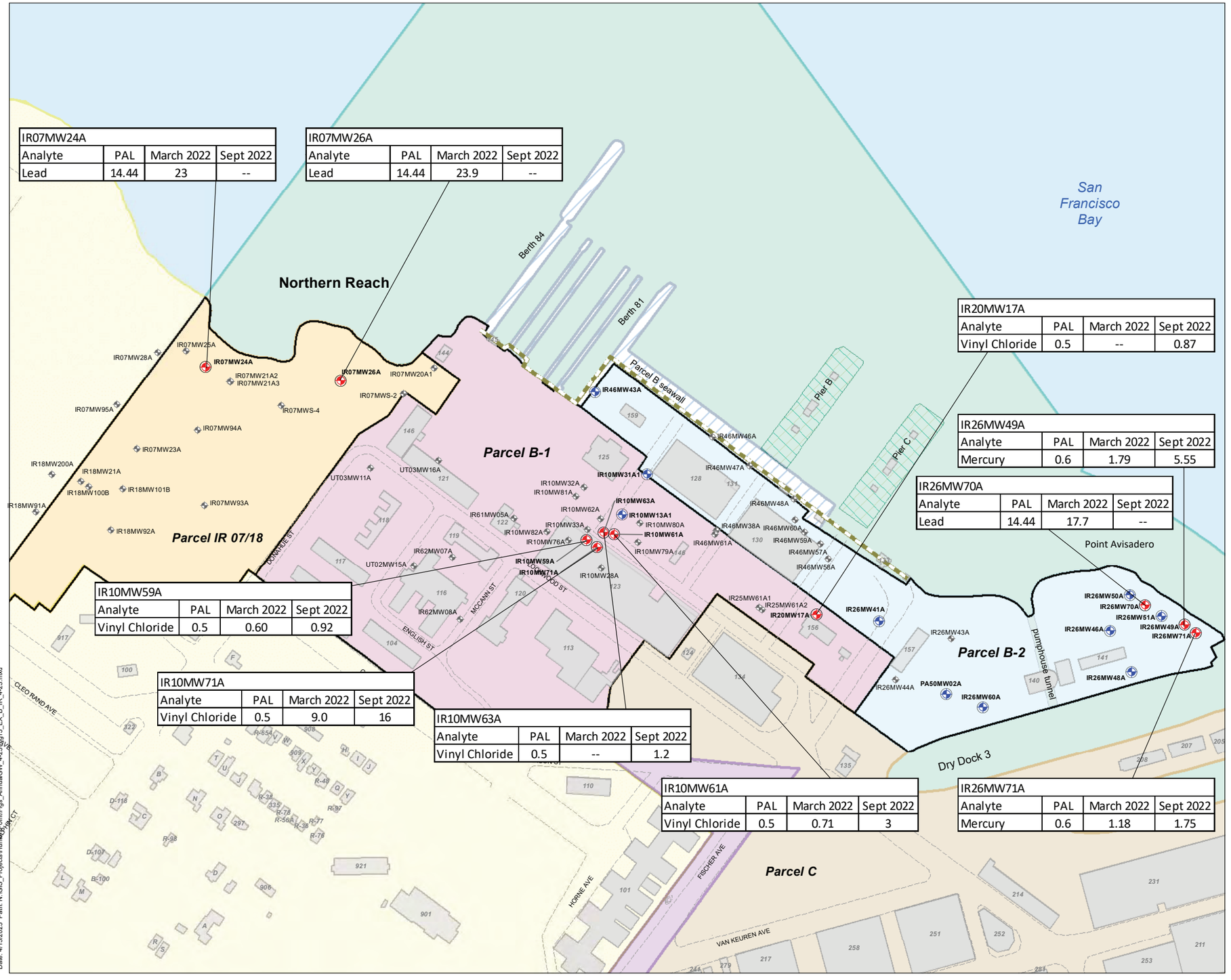

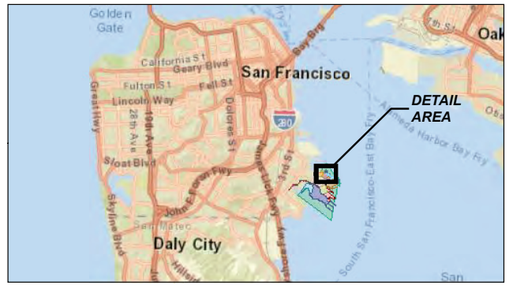

LEGEND

- IR26MW51A — Monitoring Well exceeding remediation goals
- IR26MW71A — BGMP Monitoring Well
- IR26MW43A — Other Monitoring Well (Not Sampled)
- Parcel B seawall
- Roads

Parcels

- B-1
- B-2
- C
- F (Pier)
- F (Water)
- Demolished Pier
- UC-2
- Buildings
- IR 07/18
- Non - Navy property
- San Francisco Bay

NOTE:
All units in micrograms per liter - µg/L

BGMP - Basewide Groundwater Monitoring Program
PAL - Project Action Level
µg/L - Micrograms per Liter

GRAPHIC SCALE
N
0 300 FEET

Source:
TRBW. 2023. *2022 Basewide Annual Groundwater Monitoring Report, Hunters Point Naval Shipyard, San Francisco, California*. December 2023. FINAL

Figure 3-5
March and September 2022 Exceedances of Remediation Goals in Parcels B-1, B-2, and IR 07/18
Fifth Five-Year Review Report
Hunters Point Naval Shipyard
San Francisco, California

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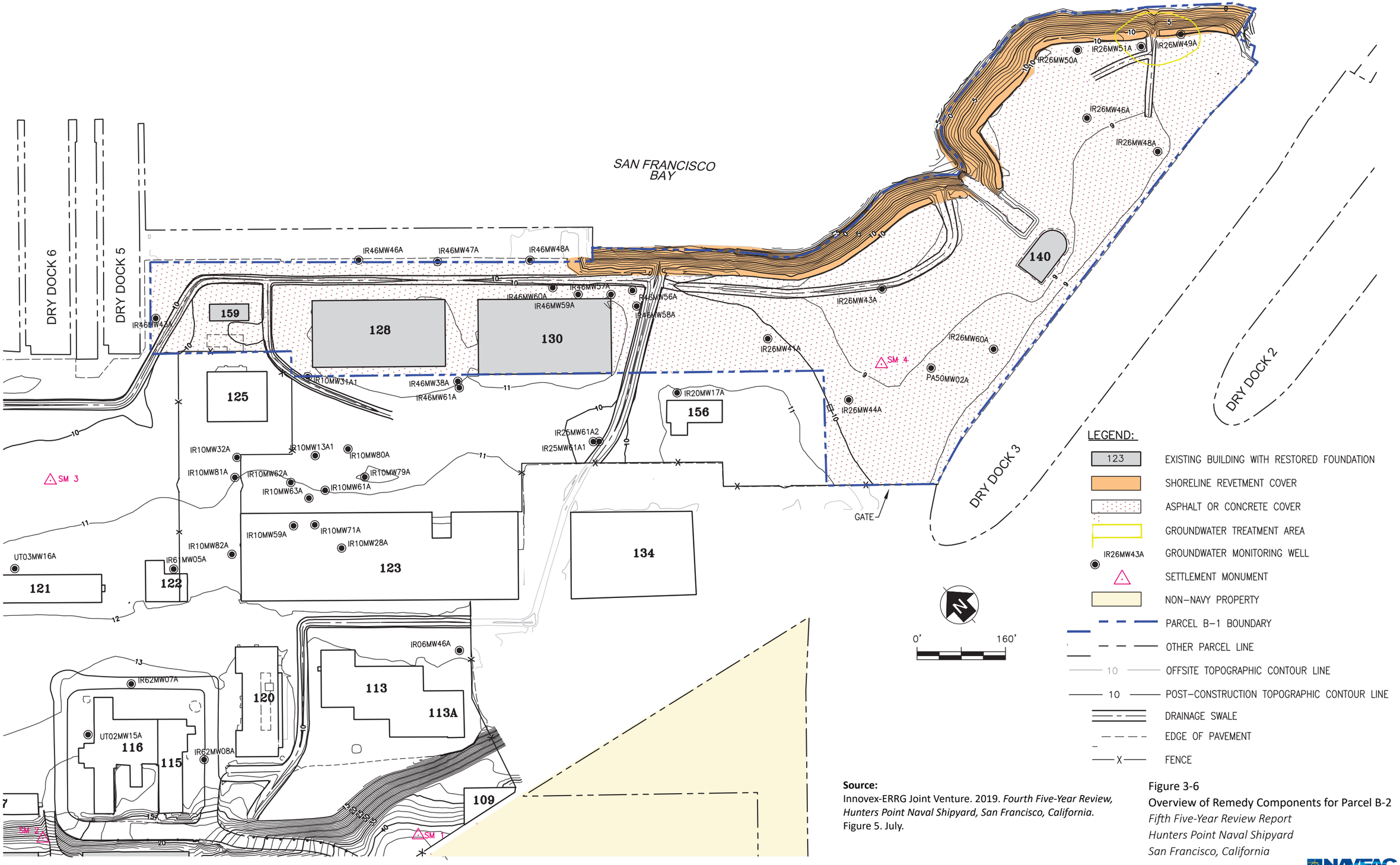

Source:
Innovex-ERRG Joint Venture. 2019. *Fourth Five-Year Review, Hunters Point Naval Shipyard, San Francisco, California.* Figure 5. July.

Figure 3-6
Overview of Remedy Components for Parcel B-2
Fifth Five-Year Review Report
Hunters Point Naval Shipyard
San Francisco, California

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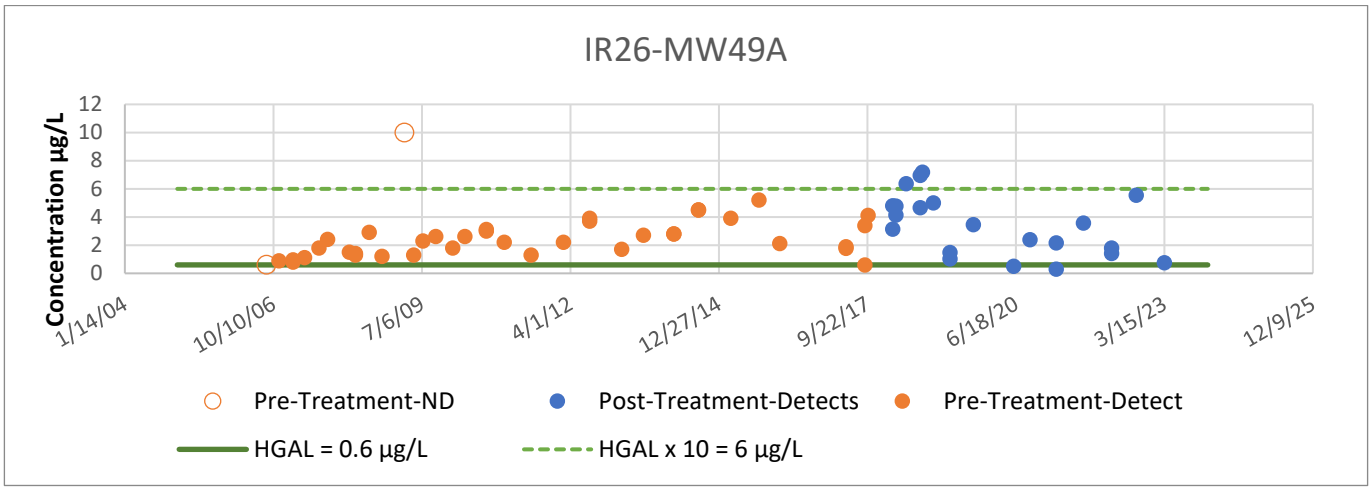

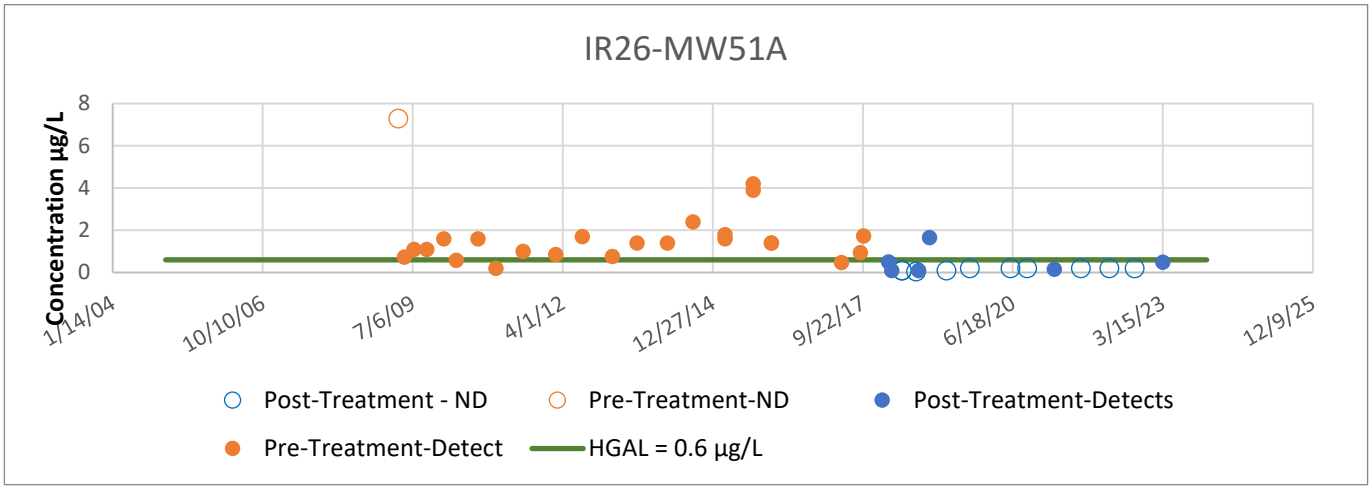

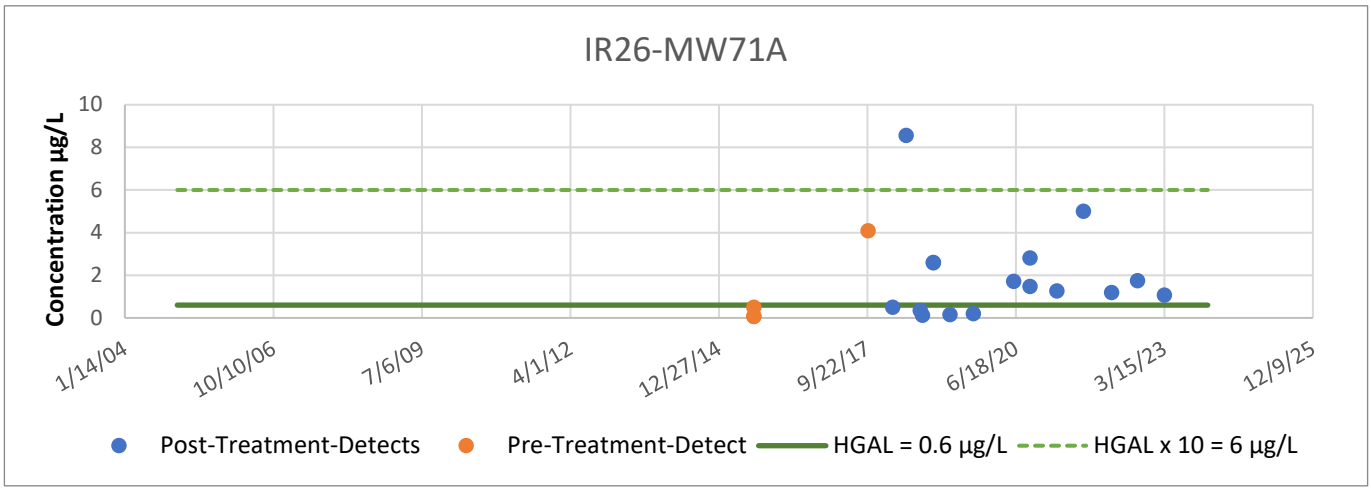

Time-series Plots for Mercury in IR-26 Groundwater	
Fifth Five-Year Review Hunters Point Naval Shipyard San Francisco, California	
NAVFAC Naval Facilities Engineering Systems Command	**Figure 3-7**

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4.0 Former Parcel C (Parcels C and UC-2)

4.1 Site History and Background

Former Parcel C is the oldest portion of the shipyard and was used almost exclusively for industrial purposes since the late 1800s. The central portion of the shipyard was formerly part of the industrial support area and was used for shipping, ship repair, and office and commercial activities. NRDL used portions of Parcel C.

Former Parcel C is bounded by Former Parcel B to the north, Parcel A to the west, Former Parcel D to the south, and the San Francisco Bay to the east. Former Parcel C covered approximately 79 acres, which was subdivided into two parcels in 2008: Parcel C (73 acres) and Parcel UC-2 (3.9 acres) (**Figure 4-1**).

The following IR sites are located in Parcels C and UC-2:

- Parcel C: IR-06 (partial), IR-25, IR-27, IR-28, IR-29, IR-30, IR-57, IR-58, IR-63, and IR-64
- Parcel UC-2: IR-06 (partial)

Four IR sites (IR-45, IR-49, IR-50, and IR-51) are facility-wide utilities that cut across other IR sites or are the locations of former transformer storage areas. Investigations at Parcels C and UC-2 began in 1994 as shown in the following chronology.

Parcel C Chronology	
Date	**Investigation/Action**
1994	SI
3/1997	RI
1996–1997	Exploratory Excavation Removal Action
1996–1997	Storm Drain Sediment Removal
1996–1998	FS (initial phase)
7/1998–9/1999	Soil Removals at IR-06 and IR-25
1999	Risk Management Review
4/2001	Groundwater Treatability Study at Building 253
2000–2002	Fuel and Steam Line TCRA
2001–2002	SVE Treatability Studies
9/2002	Groundwater Treatability Study at Building 272
2002–2004	Waste Consolidation and Removal Activities
2003	Encapsulation of Drainage Culvert Sediment at Dry Dock 4
2004	Degreaser Pit/Separator Demolition at RU-C5 HRA
2004–Ongoing	Groundwater Monitoring under the BGMP

Parcel C Chronology	
Date	**Investigation/Action**
2004–2005	Groundwater Treatability Study at Building 134 Follow-on Groundwater Treatability Study at Building 272
2008	Revised FS
12/2009	Parcel UC-2 ROD
2009–2010	Groundwater Treatability Study at Building 253
2010–2011	Groundwater Treatability Study at Building 134
9/2010	Parcel C ROD
2012	Pre-design Investigation RU-C2 RD for Parcel C Treatability Study RU-C5 Durable Cover installation Parcel UC-2
2013	RAWPs for Parcel C Third Five-Year Review for HPNS RACR for Durable Covers at UC-2
2013–2015	Soil Excavation and Disposal, Parcel C
2013–2018	SVE System Operation, Parcel C
2013–Ongoing	Groundwater Remediation and Performance Monitoring
10/2014	ESD to the Final ROD for Parcel C
2015	Transfer of Parcel UC-2 to the City and County of San Francisco's OCII
2015–2016	Durable Cover Installation, Parcel C
2017	RACR for Durable Covers in Parcel C
2019	Fourth Five-Year Review for HPNS
2019	Groundwater remediation in RU-C1 and RU-C2
2021	Groundwater remediation in RU-C4
2022–Ongoing	Radiological Retesting Fieldwork Parcel C

4.2 Site Characterization

This section summarizes the findings from various investigations at Parcels C and UC-2 that are pertinent to the Five-Year Review.

4.2.1 Physical Characteristics

4.2.1.1 Surface Features

Parcel C is located in the lowlands portion of HPNS, and ground surface elevations generally range from 0 to 10 feet above msl. More than 90 percent of Parcel C is covered by pavement

and former industrial buildings. The area surrounding and adjacent to Dry Dock 2 and Dry Dock 3 was identified as the Hunters Point Commercial Dry Docks Historical District.

Surface water runoff was historically collected in the storm drain system and discharged to the bay through outfalls. However, the storm drains and sewer lines were removed during ongoing radiological investigations, and surface drainage swales redirect stormwater to San Francisco Bay.

4.2.1.2 Geology and Hydrogeology

The western portion of Parcel C contains native soil over shallow bedrock, whereas most of the parcel consists of flat lowlands. The lowlands were constructed by placing borrowed fill material from various sources, including crushed serpentinite bedrock from the adjacent highland, construction debris, and waste materials (such as used sandblast materials). The serpentinite bedrock and serpentine bedrock-derived fill material consist of minerals that naturally contain asbestos and relatively high concentrations of arsenic, manganese, nickel, and other ubiquitous metals.

The following is a summary of hydrostratigraphic units at Parcel C (SulTech, 2008; ECC-Insight, 2019):

- A-Aquifer: Depth to the top of the A-aquifer occurs at approximately 8 to 10 feet bgs across most of Parcels C and UC-2. Groundwater flows to the southeast or northeast, directly toward the bay or dry dock, at bayside perimeter locations of the parcels. The A-aquifer averages between 20 and 25 feet thick over most of Parcels C and UC-2. Tidal fluctuations were observed from 150 to 500 feet inland from the bay.
- Bay Mud: The Bay Mud is present at Parcels C and UC-2. It generally thickens from 0 feet in the southwest to 40 feet in the northeast. A 5- to 12-foot-thick Sandy Lean Clay layer was identified in borings advanced during previous investigations within the RU-C2 area, which also acts as an aquitard separating the A- and B-aquifers when Bay Mud is absent (ECC-Insight, 2019).
- B-Aquifer: The B-aquifer is present over an area of approximately 22 acres, or about 28 percent of Parcel C, in the east-central area. It is semiconfined by Bay Mud and Sandy Lean Clay (ECC-Insight, 2019). It is not present at Parcel UC-2. Groundwater elevations range from 1 foot below msl in the eastern portion of Parcel C during spring and summer to 4 to 5 feet above msl in the western portion of the parcel (TRBW, 2023). Groundwater flows generally to the southeast.
- Fractured Water-bearing Zone (F-WBZ): The water table is present within the saturated F-WBZ over approximately 30 acres (38 percent) of Parcel C.

As discussed in **Section 1.3.4.3**, the entire A-aquifer and the B-aquifer within Parcel C, with the exception of a small portion of the B-aquifer associated with Parcel B (RU-5, in the area of Building 134), meets the Resolution 88-63 exception criteria. Similarly, the exception applies to F-WBZ where it is in direct contact with or hydrogeologically connected to the overlying A- and B-aquifers.

4.2.2 Land Use

4.2.2.1 Current Land Use

Parcel C is currently owned by the federal government and is under the jurisdiction of the Navy. There are no tenants at Parcel C.

Parcel UC-2 was transferred out of federal ownership to the City and County of San Francisco's OCII in late 2015 and is currently used as a roadway and utility corridor.

4.2.2.2 Future Land Use

According to the Redevelopment Plan (OCII, 2018), Parcel C land uses will include office and industrial, multi-media and digital arts, hotel, retail sales and services, residential (select areas; see redevelopment plan), civic, arts and entertainment, parks and recreation, and institutional uses. The area along the eastern portion of Parcel C bounded by the bay will be set aside for parks and open space.

4.2.3 Basis for Taking Action

This section describes the results of site investigations and risk assessments that provide the basis for taking action at Parcel C. Details are provided in the RI (PRC et al., 1997), FS (SulTech, 2008), Parcel C ROD (Navy, 2010) and ESD (Navy, 2014), and Parcel UC-2 ROD (Navy, 2009).

4.2.3.1 Site Investigations and Pre-ROD Removal Actions

Previous investigations at Parcel C identified metals, VOCs, PAHs, and PCBs in soil; VOCs, PAHs, SVOCs, and metals in groundwater; and radiologically impacted structures and soil. The Navy has currently defined four Rus for groundwater: RU-C1, RU-C2, RU-C4 (includes former RU-C3), and RU-C5. Rus consist of an area of a known source of contamination and the area of contaminated groundwater associated with that source.

The Navy has completed a number of removal actions and treatability studies at Parcel C. Two key soil removal actions reduced or eliminated certain risks to human health and ecological receptors. More than 3,000 samples were collected, and approximately 9,600 cubic yards of soil was excavated during the exploratory excavations and the steam and fuel lines TCRA. Past and ongoing treatability studies at Parcel C have focused on technologies to reduce VOCs in groundwater and soil, including zero-valent iron (ZVI) injection and sequential anaerobic or aerobic bioremediation. Based on these removal actions and studies, the sources and extent of the remaining contamination in soil and groundwater have been well characterized (Navy, 2010).

4.2.3.2 Human Health Risk

A quantitative HHRA was completed for Parcels C and UC-2 as part of the 1997 RI (PRC et al., 1997) and was updated in the 2008 FS (SulTech, 2008). Human health risks were characterized separately for COCs and ROCs. The RODs for Parcels C and UC-2 (Navy, 2010, 2009, respectively) identified the following unacceptable human health risks from nonradiological chemicals (**Table 4-1**):

- Future industrial users from exposure to metals, VOCs, and SVOCs in surface (0 to 2 feet bgs) and subsurface soil (0 to 10 feet bgs), and VOCs in groundwater (in A-aquifer through the vapor intrusion to indoor air pathway)
- Future recreational users from exposure to metals and SVOCs in surface soil (0 to 2 feet bgs)

- Future residents (adult and child) from exposure to metals, VOCs, SVOCs, pesticides, and PCBs in surface (0 to 2 feet bgs) and subsurface soil (0 to 10 feet bgs); VOCs in A-aquifer through the vapor intrusion to indoor air pathway; and metals, VOCs, SVOCs, and pesticides in B-aquifer through domestic use (in RU-C5 only)
- Future construction workers from exposure to metals, SVOCs, and PCBs in subsurface soil (0 to 10 feet bgs) and VOCs in groundwater (A-aquifer through direct exposure and VOCs in trenches)

Table 4-2 presents ROCs from radiologically impacted buildings, storm drains, sanitary sewers, and associated soil identified at Parcels C and UC-2 (Tetra Tech, 2008).

4.2.3.3 Ecological Risk

The Navy concluded in the RI (PRC et al., 1997) that limited viable habitat is available for terrestrial wildlife at Parcel C because most of the site is covered with pavement and most of the terrestrial component of the shoreline at Parcel C is paved. The tidal area associated with the shoreline is associated with Parcel F. Therefore, ecological risk associated with exposure to soil was not evaluated further in the FS.

The Navy completed a screening evaluation of surface water quality to assess potential exposure by aquatic wildlife to groundwater as it interacts with the surface water of San Francisco Bay. Results of the screening evaluation indicated two metals (chromium VI and zinc) in groundwater may pose a potential risk to aquatic wildlife. However, groundwater monitoring data indicate metals migrate at a much slower rate than groundwater flows; thus, discharge of metals to the bay is not imminent. **Table 4-1** presents chemicals of ecological concern (COECs) and TLs. It is necessary to monitor affected areas to determine whether the plume is migrating and whether it will discharge to the bay at concentrations that exceed surface water criteria.

No COECs were identified in UC-2 groundwater.

4.3 Remedial Action Objectives

In 2009, the Navy divided Parcel C into two new parcels: Parcels C and UC-2.

The ROD for Parcel C was signed on September 30, 2010 (Navy, 2010), and an ESD to modify removal action boundaries was signed in October 2014 (Navy, 2014). **Table 4-3** summarizes the basis for action, reasonably anticipated land use, RAOs, remedy components, performance metrics, and expected outcomes for Parcel C. The presence of VOCs in groundwater and soil may contribute to the presence of VOC in soil gas; therefore, the vapor intrusion pathway is included as a basis for action and development of RAOs.

The ROD for Parcel UC-2 was signed on December 17, 2009 (Navy, 2009). **Table 4-4** summarizes the basis for action, reasonably anticipated land use, RAOs, remedy components, performance metrics, and expected outcomes for Parcel UC-2. One overall remedy was selected for Parcels C and UC-2, but many actions in the overall remedy were not applicable to Parcel UC-2; **Table 4-4** presents only applicable components.

Tables 4-1 and **4-2** summarize the Navy-developed RGs to meet the RAOs for soil, groundwater, and radiologically impacted media. The Navy also developed TLs for use in monitoring concentrations of metals in groundwater, as summarized in **Table 4-1**, in the A-aquifer for the protection of the environment. The TLs are conservative, and exceedance of a TL does not necessarily indicate an immediate risk, given dilution and mixing with surface water;

nonetheless, a potential for ecological risk was identified if the metals in groundwater discharge undiluted to the bay.

4.4 Remedial Actions

4.4.1 Parcel C

The RA for Parcel C includes the following major components:

- Soil excavation and removal to address COC in soil
- Durable cover installation and maintenance to address COCs in soil
- SVE to address VOCs in soil gas
- In situ treatment to address VOCs and metals in groundwater
- Groundwater monitoring, including in situ treatment performance monitoring, LTM of metals, and MNA of VOCs
- Radiological surveys and remediation through soil excavation and removal of sanitary sewer and storm drain lines and through decontamination (and demolition/dismantling if necessary) buildings, structures, and former building sites
- ICs for soil, soil gas, and groundwater

Remedy components are shown on **Figure 4-1, 4-2,** and **4-3**.

4.4.1.1 Remedy Implementation

Soil Excavation and Removal

An ESD was finalized in October 2014 documenting a change to the excavation boundaries based on a tiered action level approach to remove the highest concentrations of COCs and relying on durable covers and ICs to meet the soil RAOs (Navy, 2014). Between 2013 and 2015, approximately 28,261 bank cubic yards (BCY) of contaminated soil was excavated from 18 excavation areas within Parcel C (RU-C1, C4, and C5 and Building 241) and disposed of offsite (APTIM, 2018). Excavations were successfully completed to remove contaminated soil with concentrations 5 to 10 times greater than the RGs in accordance with the Final RAWP (CB&I, 2013). Excavations were backfilled with clean fill.

Although excavations within RU-C2 were completed, achievement of RGs was not documented (IGI, 2020); however, the excavated area is under durable cover as described in the following section, thereby preventing current and future exposure to contaminated soil.

Additional Soil and Source Excavation

Additional areas of soil excavation were identified during preparation of the RAWP for groundwater (ECC-Insight and CDM Smith, 2017). Pre-RA characterization was completed over two mobilizations between November 2017 and July 2018, and identified several significant changes to the RAWP, including the following:

- **RU-C1:** Based on groundwater concentrations in samples collected from monitoring well IR28MW557A, which exhibited high concentrations of VOCs, the suspected source (sumps within Building 253) was confirmed with the identification of dense nonaqueous phase liquid (DNAPL) in the center of the former paint room (within Building 253); consequently, excavation and removal of the sumps was not conducted (ECC-Insight, 2019). The Navy is

evaluating options to treat the DNAPL source area at Building 253 and, subsequently, the associated groundwater plume. This work is anticipated to begin in 2031.

- **RU-C2:** Soil concentrations in confirmation samples from excavation 20B-1 at Building 251 remained greater than RGs and are a continuing source to groundwater. However, further excavation was not completed because pre-RA characterization activities indicated that the lateral and vertical extent of COCs was greater than the ROD's soil excavation limit of 10 feet bgs (Navy, 2009) and would require extensive shoring in Building 251 to complete. The Navy is evaluating a revised approach to achieve soil RAOs and address a potential ongoing source to A-aquifer groundwater (ECC-Insight, 2019). The investigation expected to occur by Spring 2027.
- **RU-C4:** The Navy has initiated a study to evaluate the F-WBZ in the vicinity of elevated TCE reported during Basewide groundwater monitoring. The investigation is expected to be completed by Fall 2026.

Durable Cover Installation

The construction of durable covers began in June 2015 and was completed in May 2016. Completion of the durable covers along with implementation of ICs, discussed in **Section 1.3.4.2**, meets the RAOs for soil applicable to Parcel C. Response complete for soil is documented in the RACR for durable covers remedy in Parcel C (TtEC, 2017c). Durable covers consist of shoreline armoring; soil cover installation; asphalt cover installation, replacement, or repairs; and building foundation repairs, as shown on **Figure 4-2** and described as follows:

- Shoreline Armoring: Shoreline armoring was constructed along approximately 80 linear feet of deteriorated seawall northeast of Building 231. Shoreline armoring included, from the bottom up, filter fabric to prevent migration of soil to San Francisco Bay, a 6-inch minimum layer of filter rock, and a 3-foot minimum layer of riprap to protect the fabric from wave action.
- Soil Cover: A 2-foot-thick soil cover made up of clean imported soil was constructed on the hillside in the northwestern corner of Parcel C (RU-C5). The soil cover includes surface completions for monitoring wells.
- Asphalt Cover: The asphalt cover was constructed over the remaining areas of Parcel C. Most of Parcel C was covered with degraded asphalt pavement before the RA, and the existing asphalt pavement was repaired or replaced as needed to create a continuous intact cover. Repaired areas were typically overlain with new asphaltic concrete to achieve a 2-inch-thick cover. Asphalt replacement consisted of 4 inches of aggregate base course overlain by 2 inches of asphaltic concrete. Drainage features, such as swales, catch basins, and storm drain pipes, were incorporated into the asphalt cover to convey stormwater offsite (TtEC, 2017c).
- Building Foundation Repairs: Building foundation repairs were completed by using a variety of materials such as concrete, non-shrink grout, and asphaltic concrete, to prevent access to underlying soil. Building foundations that could not be restored or repaired (for example, historical buildings) were secured using a combination of steel plates, framed plywood walls, wire mesh, or chain-link fence to prevent access. Access to soil under buildings through crawlspaces and vaults was blocked with durable wire mesh or secured with steel ties.

Soil Vapor Extraction and Monitoring

Construction and operation of five SVE systems to remediate 8 soil vapor areas within RU-C1, RU-C4, and RU-C5 began in 2013 (**Figure 4-3**; APTIM, 2018). Each system includes a blower, blower motor, main control panel, SVE wells, vapor monitoring wells, liquid/air separator, transfer pump and liquid storage tank, conveyance piping and connection hoses, granular activated carbon vessels, level switches, system interlocks and controls, and gauges. The following is a summary of each system's operation timeframe and cumulative VOC removal:

- Area 1 (RU-C4): Constructed and operated for 4 months in 2001; operated August 2014 to February 2016, May 2016 to June 2017. Estimated cumulative removal was 3.9 pounds (predominantly TCE).
- Area 2 (RU-C2): Constructed but not yet operated.
- Areas 3/4/5 (RU-C5): Constructed and operated for 5 months in 2001; operated August 2014 to December 2015. Areas 4 and 5 SVE system constructed in February 2016. SVE Areas 3/4/5 operated May 2016 to November 2016. Estimated cumulative removal was 1.95 pounds (predominantly tetrachloroethene [PCE] and TCE).
- Areas 6/7 (RU-C1): Constructed and operated for 3 months in 2001; operated August 2014 to July 2014, September to December 2015, and May 2016 to September 2016. Estimated cumulative removal was 4.33 pounds (predominantly TCE).
- Area 8 (RU-C1): Constructed and operated for 4 months in 2001; operated August 2014 to February 2016, and July to September 2016. Estimated cumulative removal was 23.21 pounds (predominantly PCE and TCE).

The evaluation of the VOC mass removed as a result of the SVE O&M in SVE Areas 1, ¾/5, and 6/7 indicate that the SVE operation in Parcel C has reached points of diminishing return and, in general, has had limited effectiveness in treating mass in soil due to the following primary reasons:

- The shallow groundwater table (mostly less than 7 feet bgs in all areas and 2 feet bgs in SVE Area 3) limits the effectiveness of the SVE system.
- Low SVE rates limited by low-permeability soil or sediment and water entrainment in the SVE wells.
- RAs (groundwater treatment) in the vicinity of SVE areas are not yet complete and likely contributing to the apparent ineffectiveness of SVE in reducing vapor concentrations to less than SGALs.

The Navy is in the process of reviewing the strategy for addressing soil gas at all Parcel C areas in conjunction with additional in situ groundwater remediation activities that are ongoing (ECC-Insight and CDM Smith, 2019). The work plan for post-remediation soil gas surveys at Parcel C is anticipated for spring 2029 and fieldwork is anticipated to begin between 2029 and 2030.

In Situ Groundwater Remediation

In situ groundwater remediation consists of treating COCs (VOCs or chromium VI) in A-aquifer groundwater using ZVI or an injected biological substrate in the groundwater plumes at RU-C1, RU-C2, RU-C4, and RU-C5. Target treatment area and subsequent performance metrics were selected based on active treatment criteria (ATCs) developed in the FS (SulTech, 2008), ROD (Navy, 2010), and RD (KCH, 2012). The groundwater ATCs and activities are as follows:

- ZVI treatment to target hotspot areas where concentrations of PCE exceed 15 µg/L or concentrations of TCE exceed 110 µg/L.
- Anaerobic in situ bioremediation (ISB) treatment targeted areas where VOCs exceed the RG by factors ranging from 10 to 50 and where chromium VI exceeds RGs. Zinc was initially targeted for active treatment but was documented not to be warranted based on pre-remedial characterization sampling (APTIM, 2018).
- Aerobic ISB treatment will target areas where 1,4-dichlorobenzene is greater than 21 µg/L or chlorobenzene is greater than 3,900 µg/L.

Between 2013 and 2017, groundwater remediation was conducted in chlorinated ethene and chromium VI plumes within RU-C1, C4, and C5 (APTIM, 2018). Chlorinated ethene plumes were treated in situ by direct injection of ZVI or an anaerobic organic substrate (sodium lactate) with bioaugmentation (*Dehalococcoides*, specifically SDC-9). The chromium VI plumes were treated using anaerobic ISB by injecting food-grade molasses as a substrate. Aerobic treatment was completed by direct injection of an oxygen-releasing compound (PermeOx Ultra). The following is a summary of the approximate injection totals:

- 206,183 pounds of ZVI was injected into 40 injection points.
- 123,503 gallons of diluted sodium lactate with SDC-9 culture was injected into 131 injection points.
- 16,064 gallons of food-grade molasses and water were injected into 17 injection points.
- 5,975 pounds of PermeOx Ultra was injected into eight injection points.

Monitoring results showed that the concentrations of COCs in source areas were significantly reduced by ZVI and anaerobic or aerobic ISB treatment activities in RU-C1, C4, and C5. Post-injection monitoring is currently being conducted under the BGMP. Chromium VI was successfully reduced by anaerobic bioremediation in target treatment areas within RU-C1 and RU-C5 with concentrations remaining less than treatment goals through the end of the performance monitoring period. Groundwater treatment minimized the potential for chromium VI to migrate to the bay at concentrations greater than the surface water quality criteria (APTIM, 2018).

In 2019, RU-C1 and RU-C2 were treated using a ZVI, Lactoil/WilclearPlus amendment mix; 249,120 pounds of ZVI and 1,130 gallons of Lactoil/WilclearPlus were injected. Bioaugmentation with KB-1 (SIREM) culture was completed in RU-C2 (ECC-Insight and CDM Smith, 2021). Performance monitoring is ongoing, and additional investigations and RAs are planned in RU-C1 (DNAPL source investigation), RU-C2, RU-C4, and RU-C5 (IGI, 2020; Gilbane, 2022). In September through December 2021, an RA was completed in RU-C4 to treat VOCs (IGI, 2020; TRBW, 2022b).

Groundwater Monitoring

Groundwater monitoring is conducted under the BGMP and includes LTM, remedy performance monitoring, and MNA, depending on the plume being monitored. Data evaluation and proposed changes to the Parcel C BGMP sampling locations, analytical requirements, and sampling frequency and approach have been presented in the Parcel C Remedial Action Monitoring Reports (RAMRs) for review and concurrence by BCT before incorporation into the BGMP (IGI, 2020).The Navy and the FFA regulatory parties are currently evaluating different approaches to present future changes to Parcel C BGMP sampling locations, analytical

requirements, and sampling frequency. Changes to which FFA regulatory parties have agreed in writing will be implemented per the agreement before incorporation into the BGMP. Performance monitoring is generally conducted for a Parcel C groundwater plume at frequencies of 1, 3, 6, 9, and 12 months during the first year after in situ groundwater injections and semiannually during the second year to obtain a minimum of seven data points for evaluation. The following criteria are used to determine how a BGMP well is monitored and to define key decision points:

- If COC concentration trend analyses of specific BGMP COC plume wells evaluated as part of the Parcel C RAMR show stable, no trend, or declining COC concentration trends greater than ATCs, then performance monitoring at that BGMP plume well will continue.
- If COC concentration trend analyses of specific BGMP COC plume wells evaluated as part of the Parcel C RAMR show stable or declining COC concentration trends greater than RGs (but less than ATCs), then the MNA monitoring period will ensue until RGs are met.
- If statistical data demonstrate that concentrations are less than RGs following the minimum 2 years of performance monitoring and 1 year of MNA monitoring, closure of the plume will be initiated, with BCT review and concurrence.
- If COC concentration trend analyses of specific BGMP COC plume wells evaluated as part of the Parcel C RAMR show stable, no trend, or increasing COC concentration trends greater than ATCs, then performance monitoring at that BGMP plume well will continue and the Navy will consider further active treatment.

As a result, the number of monitoring wells sampled during each monitoring event can fluctuate based on data and recommendations from BCT. Annual and semiannual groundwater monitoring reports from 2019 through 2022 were also reviewed (TRBW, 2020b, 2020c, 2022a, 2022b, 2023b). **Appendix E** presents exceedances of the RGs (identified as PALs) and the ATCs from 2019, 2020, 2021, and 2022.

Figures 4-4 through **4-7** present groundwater concentrations from the 2021 annual monitoring. The following is a summary of the most recent (2022) groundwater monitoring results by RU and plume at Parcel C and the RAMR evaluating the 2021 data (IGI, 2023).

RU-C1 (Figure 4-4)

- Plume RU-C1-1 is currently undergoing performance monitoring for ISB and ZVI injections that were completed in May 2019 to treat VOCs. Benzene, PCE, TCE, and VC consistently exceeded RGs from 2019 to 2022, and benzene, VC, and PCE exceeded the ATCs during one or more rounds of sampling. Six A-aquifer monitoring wells were sampled in March and September 2022. Benzene, PCE, TCE, and VC exceeded RGs in March and benzene and PCE exceeded the RGs in September. PCE also exceeded ATC in March but not in September. Performance monitoring is expected to continue until data are statistically less than ATCs. Based on data up to December 2021 PCE data is statistically higher than the ATC; however, statistical trends indicate it is probably decreasing (IGI, 2023). Conditions are generally conducive to anaerobic degradation indicated by depleted dissolved oxygen (that is, less than 1 milligram per liter), presence of dissolved redox-sensitive metals (iron and manganese), and methane. The presence of ethene or ethane also indicates that complete biotic or abiotic degradation is occurring (IGI, 2023).

- Plume RU-C1-2 is currently undergoing MNA for VOCs (PCE and degradation products TCE, cis-1,2-dichloroethene [cis-1,2-DCE], and VC). PCE has sporadically exceeded the RG in one location throughout the monitoring period and benzene exceeded the RG during the January through June sampling periods of 2019 and 2020. Five A-aquifer monitoring wells were sampled in March 2022 with only benzene exceeding the RG. Five A-aquifer monitoring wells were sampled in September 2022, and there were no exceedances of RGs. There were no exceedances of ATCs during this monitoring period. MNA parameters indicate moderate to high potential for anaerobic attenuation of COCs. Statistical evaluation indicates that PCE (no trend) and benzene (stable trend) have UCLs that exceed the RG at one well each. MNA will continue until statistical data demonstrate that concentrations are less than RGs, at which time plume closure may be initiated with BCT review and concurrence (IGI, 2023).
- Plume RU-C1-3 is currently undergoing performance monitoring for ISB and ZVI injections that were completed in 2016 to treat VOCs. Additional characterization in 2017 to 2018 indicated the presence of DNAPL and light nonaqueous phase liquid (LNAPL) source under the paint room and sumps in Building 253, in the southern portion of RU-C1-3. Eight A-aquifer monitoring wells were sampled in both March and September 2022, and several VOCs (1,1,2,2-tetrachloroethane, 1,1-dichloroethane, 1,2,4-trimethylbenzene, 1,2-DCE 1,3,5-trimethylbenzene, cis-1,2-DCE, benzene, isopropylbenzene, naphthalene, PCE, TCE, and VC) exceeded RGs at one or more locations during 2019, 2020, 2021 and 2022 events, and 1,2-DCE, benzene, and VC exceeded ATCs in 2022. Non-aqueous phase liquid (NAPL) has also been observed in IR28MW557A, and concentrations are greatest in samples collected from that location (**Appendix E** and **Figure 4-4**). Performance monitoring will continue and the Navy is planning to address the DNAPL source area and dissolved groundwater plume (IGI, 2023).
- RU-C1-4 was sampled in March and September 2022 (three A-aquifer monitoring wells just south of Dry Dock 2: IR28MW561A, IR28MW125A, and IR28MW562A) for chromium VI. Monitoring was discontinued in 2020 after the UCL of the mean for all COCs was less than RGs but was added back to the BGMP in September 2021 based on discussions between regulatory agencies and the Navy. Chromium VI was not detected in any monitoring wells and has not exceeded the RG of 50 µg/L since February 2014 (TRBW, 2023).

RU-C2 (Figure 4-5)

- Plume RU-C2-1 is currently undergoing performance monitoring for ISB completed in 2013 to treat VOCs. Eleven monitoring wells in both the A- and B-aquifer were sampled in 2022. In the A-aquifer, PCE, TCE, 1,4-dichlorobenzene, benzene, chlorobenzene, chloroform, and VC exceeded RGs at one or more samples during one or more sampling events during the review period. PCE, benzene, chloroform, and VC exceeded ATCs at one or more locations during one or more sampling events during this review period (2019-2022). Data indicate that degradation is occurring and conditions are favorable for continued degradation (IGI, 2023). Performance monitoring will continue because the criteria for MNA have not been met and additional RAs are planned for the RU-C2-1 plume (Gilbane, 2022). Adding sampling of a downgradient well, IR28MW398A, to the BGMP was recommended (IGI, 2023).

  Monitoring in the B-aquifer was discontinued in September 2020 because there were no RAOs for the B-aquifer in the ROD because of the beneficial reuse exemption discussed in **Section 1.3.4.2** (Navy, 2010); however, after concerns were raised by the USEPA and Regional Water Board in July 2021 (USEPA and Regional Water Board, 2021), B-aquifer

monitoring was reinstated. PCE was the most widely detected chemical in the B-aquifer with concentrations ranging from 15 to 270 µg/L (less than 100 times the federal MCL of 5 µg/L) in 2022. TCE, vinyl chloride, and benzene were detected in B-aquifer samples at concentrations within 1 to 10 times their respective MCLs (IGI, 2023).

- Plume RU-C2-2 is currently undergoing MNA for VOCs. Monitoring wells in both the A- and B-aquifer are sampled. PCE, carbon tetrachloride, and chloroform have exceeded the RGs and ATCs at one or more location during this review period (2019 to 2022). PCE was the only VOC to exceed the RG in a single well during both sampling events in 2022 (RUC2MW11A). A review of MNA geochemical parameters indicated that conditions within the ISB treatment area are generally moderately conducive to anaerobic degradation. In 2021, the UCL of the mean of chloroform and carbon tetrachloride were below the RG with the exception of one location. However, PCE began exceeding the RG sporadically and was added to the statistical evaluation for the plume in 2021 (IGI, 2021) and exhibits an increasing trend using data through September 2021 (IGI, 2023). MNA will continue until criteria for plume closure have been met.
- Plume RU-C2-3 is currently undergoing performance monitoring for ISB and ZVI injections conducted in May 2019 for VOCs (primarily chloroform, TCE, and carbon tetrachloride). Monitoring wells in fractured bedrock and the A-aquifer are sampled and 1,4-dichlorobenzene, benzene, carbon tetrachloride, chloroform, TCE, and VC in groundwater exceeded RGs, and carbon tetrachloride, chloroform, and VC exceeded ATCs in one or more locations in March and September 2022. Conditions were considered generally favorable for anaerobic degradation (IGI, 2023). Statistical evaluation of the data indicates that multiple carbon tetrachloride, benzene, and 1,4-dichlorobenzene are increasing in one or more locations. Notably, carbon tetrachloride (increasing trend) and chloroform (stable trend) UCL data from downgradient well IR28MW940F continues to exceed ATCs. The Navy intends to prepare a RAWP to implement additional phases of remediation to address persistent chlorinated methane concentrations above ATCs in the vicinity of IR28MW940F. Performance monitoring will continue until conditions for MNA have been met.

RU-C4 (Figure 4-6)

- Plume RU-C4-1 is the only groundwater plume in RU-C4 and is currently undergoing performance monitoring for ISB and ZVI injections completed in September through December 2021 to treat VOCs (primarily PCE and degradation products). Groundwater samples were collected from 6 monitoring wells in March 2022, 19 monitoring wells in September 2022, and 12 monitoring wells in December 2022. All monitoring wells were in the A-aquifer except IR28MW272F, which is in the F-WBZ. In 2022, 1,2-dichloroethane, 1,4-dichlorobenzene, benzene, chloroform, cis-1,2-DCE, TCE, and VC exceeded the RGs in one or more locations. TCE and VC exceeded ATCs in 2019, 2020, and 2022, but there were no exceedances of ATCs in 2021; however, the BGMP did not include wells within the RA treatment area in 2021 Performance monitoring is underway.

RU-C5 (Figure 4-7)

- Plume RU-C5-1 is currently undergoing performance monitoring for ISB and ZVI injections completed in 2014 and 2016 to treat VOCs. Seven A-aquifer monitoring wells are sampled for VOCs and MNA parameters. Several VOCs (1,1-dichloroethane, 1,2-DCE, benzene, cis-1,2-DCE, PCE, TCE, and VC) exceeded their RGs, and PCE, TCE, and VC exceeded their ATCs in one or more location and events during this review period. Samples collected

at IR06MW67A consistently exhibit the highest concentrations and statistical evaluation indicates COC concentrations are stable, no trend, or increasing/probably increasing. Conditions are favorable for MNA and presence of increasing concentrations of degradation products indicate that biodegradation is occurring (IGI, 2023). Performance monitoring will continue, and additional RA is planned to address persistent COCs greater than ATCs in the IR06MW67A area (Gilbane, 2022; IGI, 2023).

- Plume RU-C5-2 was sampled in September 2021 for chromium VI. Like plume RU-C1-4, sampling at RU-C5-2 was discontinued because conditions for plume closure were met; however, sampling three fractured bedrock monitoring wells (IR06MW68F, IR06MW69F, and IR06MW70FR) was added back into the BGMP based on discussions between the agencies and the Navy. Chromium VI was reported at a concentration of 40.2 µg/L, less than the TL of 50 µg/L, in September 2021 and was not detected in March or September 2022. Chromium VI has historically been detected in RU-C5-2 at concentrations less than the TL since the wells were incorporated into the BGMP in 2015 (TRBW, 2023).
- Plume RU-C5-3 is currently undergoing performance monitoring for aerobic ISB injections completed in February 2016 to address VOCs (primarily naphthalene). Samples are collected from three A-aquifer monitoring wells and analyzed for VOCs, chromium VI, and MNA parameters. Naphthalene has consistently exceeded the RG in one location (IR06MW42A) during all sampling events during this review period. Chromium VI was not detected in groundwater during any events during this review period. There were no exceedances of ATCs during this review period, but statistical evaluation in the 2021 RAMR indicated the UCL of naphthalene exceeded the ATC. Conditions have transitioned from being favorable for aerobic degradation in 2019 to anaerobic in 2020 (unfavorable for naphthalene degradation), and naphthalene is stable based on statistical evaluation (IGI, 2023). Performance monitoring will continue, and an additional RA is planned to address persistent naphthalene greater than the ATC (Gilbane, 2022).
- Plume RU-C5-4 is currently undergoing performance monitoring for ISB and ZVI injections completed in January to February 2016 to address VOCs. Four A-aquifer monitoring wells are sampled for VOCs and MNA parameters. Benzene and VC exceeded their RGs but not ATCs during this review period. MNA parameters indicate conditions are favorable for anaerobic bioremediation (IGI, 2023). Statistical evaluation completed on 2021 and earlier data indicated that the UCL for VC continued to exceed the ATC, so performance monitoring continued through 2021. Continued performance monitoring was recommended in the Fall 2021 RAMR (IGI, 2023).
- Plume RU-C5-5 is currently undergoing performance monitoring for aerobic ISB completed in February 2016 and an additional RA in 2021 to address VOCs (primarily chlorinated benzenes). In 2022, three monitoring wells were sampled in March, five different monitoring wells were sampled in June, and all eight were sampled in September. Eight VOCs (1,2-dichloroethane, 1,4-dichlorobenzene, benzene, chlorobenzene, naphthalene, PCE, TCE, and VC) exceeded their respective RGs, and 1,4-dichlorobenzene, benzene, and chlorobenzene exceeded their ATCs in 2022. Performance monitoring for the 2021 RA is currently underway. Visual trends for source area monitoring well concentrations generally indicate that while some COCs initially decreased in concentration immediately after the 2021 RA, most have rebounded, and some have increased above concentrations before the RA. The need for additional RAs will be evaluated based on the decision criteria established in the RAMP.

Radiological Surveys and Remediation

ROCs suspected to be present at Parcel C include potassium-40 (K-40), Co-60, Sr-90, Cs-137, Ra-226, thorium-232 (Th-232), and Pu-239. The following buildings at Parcel C were designated as radiologically impacted: Buildings 203, 205 and discharge tunnel, 211, 214, 224, 241, 253, 271, and 272. The Navy conducted a TCRA at Parcel C to address potential radioactive contamination in storm drains and sanitary sewer lines and radiologically impacted structures (TtEC, 2016, 2017b). In total, 67,596 cubic yards of soil was excavated during removal of 31,190 linear feet of sanitary sewer and storm drain lines. Approximately 6,641 cubic yards of soil was disposed of offsite as LLRW based on surface scan and analytical laboratory results. Additional characterization surveys of the sanitary sewer lines and storm drains withing the Parcel C Historic District were also performed (APTIM, 2020). Additionally, FSSs were performed at six radiologically impacted buildings (Buildings 203, 214, 224, 241, 271, and 272) and radiologically impacted sites (North Pier and Ship Berths 1 to 5) (TtEC, 2016, 2017a, 2017b). Additional surveys are planned at three radiologically impacted buildings (Buildings 211, 253, and the discharge channel at Building 205) (TtEC, 2017b).

The TCRA data were reviewed as described in **Section 1.4.3**, and radiological retesting, including sampling and surveys of soils previously investigated during sanitary sewer line storm drain removal and resurvey of impacted buildings and former building sites, is currently being conducted to determine if current site conditions are compliant with the RAOs.

Institutional Controls

The entire area of Parcel C (73 acres) is subject to soil, soil gas, and groundwater ICs. IC performance objectives were developed and presented in the ROD (Navy, 2010) and LUC RD (Appendix B of KCH, 2012). **Table 1-3** summarizes the IC performance objectives to be implemented through land use restrictions for the site.

4.4.1.2 Remedy Operations and Maintenance

Ongoing O&M at Parcel C includes maintaining the integrity of the durable covers and IC inspections. The inspection and maintenance requirements for the durable covers are described in the Final O&M Plan for Parcel C (Navy, 2017). AOMSRs are prepared to summarize inspections and maintenance performed and to document the effectiveness of the remedy components. AOMSRs from 2019, 2020, 2021, and 2022 were reviewed (Innovex-ERRG Joint Venture, 2020, 2021; APTIM, 2022, 2023).

Durable Cover Maintenance

The shoreline armoring was determined to be in good condition. No signs of vegetation or trash, pests, excessive vehicle traffic, settlement or movement, wave overtopping, or scouring were found.

Annual inspections found the soil cover to be in good condition, with no signs of settling, slope failure, cracking, soil movement, erosion, or burrowing pests. Vegetation growth was well established over the soil cover, with no bare areas observed.

The asphalt cover was generally in good condition with the exception of the eastern portion of Parcel C where subsidence areas greater than 4 feet deep were found at several locations. Two areas of previous repair were heavily deteriorated and formed major subsidence areas (7 feet wide by 25 feet long by 6 feet deep and 6 feet wide by 20 feet long by 7 feet deep). A 7-foot-deep void observed along the pier edge that allowed water to wash in and out with the tide may have contributed to the subsidence. The subsidence areas were repaired. Subsidence was

noted near Buildings 205, 207, and 208 between Dry Dock 2 and Dry Dock 3 that required extensive repairs outside of routine O&M, and 100 feet of permanent chain-link fence was installed across Building 208 to secure the end of the pier. Minor subsidence areas (less than 4 feet deep) were observed during the 2022 inspection; however, repairs were not recommended until the completion of radiological retesting in the area to minimize generating waste and rework. The Navy is currently conducting a shoreline assessment study to identify and recommend repairs and/or stabilization of structures and shoreline.

Building foundations were generally in good condition, and any cracks or potholes were repaired during routine O&M activities.

Institutional Control Compliance

ICs are inspected annually, and no deficiencies or inconsistent uses were observed during the review. General site conditions were determined to be good. Remedy components, such as survey benchmarks and monitoring well vault covers, were found to be in good conditions.

The Navy controls access to the parcel using security fencing, signage, locks, and gates, which were found to be in good condition. However, during the September 2021 inspection, the metal hasp on a door that secures Building 367 was found broken during the annual inspection. The door was re-secured on Building 367 to prevent unauthorized access (APTIM, 2022).

4.4.2 Parcel UC-2

The RA for Parcel UC-2 includes the following major components:

- Durable cover installation and maintenance to address COCs in soil
- Radiological surveys and remediation through soil excavation and removal of sanitary sewer and storm drain lines
- LTM of groundwater for COCs
- ICs for VOCs

Figures 4-1, 4-2, and **4-7** show remedy components.

4.4.2.1 Remedy Implementation

Durable Cover Installation

Durable covers were constructed between May 14, 2012, and September 18, 2012. Completion of the durable covers along with ICs, as discussed in **Section 1.3.4.2**, meets the RAOs for soil in Parcel UC-2. Response complete is documented in the RACR for Parcels UC-1 and UC-2 (ERRG, 2013). The RA includes installation and repair of durable covers, including soil covers, asphalt covers, and building foundations, to minimize exposure of humans and wildlife to potential COCs in underlying soil, as shown on **Figure 4-8** and described as follows:

- **Soil Cover:** A 2-foot-thick soil cover made up of clean imported fill was installed over previously vegetated areas by removing 2 feet of existing soil so that the surface of the newly installed cover matched historical site grades. Live beach strawberry, California poppy, and summer lupine plants were then hand-planted across the entire soil cover to provide future slope stability and aesthetic appeal.
- **Asphalt Covers:** An 8-inch asphalt cover, with a minimum of 4 inches of asphalt concrete and 4 inches of aggregate base, was installed. Existing AC covers that were in good condition were left in place and incorporated into the final AC cover. Degraded existing AC

covers were repaired by removing and replacing one or more of the following: AC cover, aggregate base, or subbase material, depending on the level of degradation. AC covers with minor cracking were repaired by applying an asphalt seal to fill the cracks.

- **Restored Building Foundations:** Concrete building foundations and sidewalks were restored and incorporated into the durable cover, and cracks and penetrations were filled with non-shrink grout.

Radiological Surveys and Remediation

The ROPCs at Parcels UC-2 include Cs-137, Ra-226, and Sr-90, and are associated with sanitary sewer lines and storm drain lines (Navy, 2009). The Navy conducted TCRAs at Parcel UC-2 to address potential radioactive contamination in storm drains and sanitary sewer lines at Parcels UC-1 (adjacent to Parcel UC-2) and UC-2 (ChaduxTt, 2010a; TtEC, 2011). In total, approximately 20,680 cubic yards of soil was excavated during removal of approximately 6,407 linear feet of sanitary sewer and storm drain lines. Approximately 1,138 cubic yards of soil was disposed of offsite as LLRW based on surface scan and analytical laboratory results. TCRAs for radionuclides were completed, and the radiological RGs established in the ROD for Parcel UC-2 were presumed to be met (Navy, 2009).

The TCRA data were reviewed, as described in **Section 1.4.3**, and radiological retesting, including sampling and surveys of soils previously investigated during sanitary sewer line storm drain removal and resurvey of impacted buildings and former building sites, is currently being conducted to determine if current site conditions are compliant with the RAOs.

Groundwater LTM

Groundwater monitoring at Parcel UC-2 is conducted under the BGMP. Annual and semiannual groundwater monitoring reports from 2019 through 2022 were reviewed (TRBW, 2020b, 2020c, 2021, 2022a, 2022b, 2023) **Appendix E** presents exceedances of RGs (identified as PALs) from 2019, 2020, 2021, and 2022.

Two groundwater monitoring wells are sampled semiannually for VOCs. Carbon tetrachloride and chloroform consistently exceed the RGs; however, during 2022, carbon tetrachloride was the only COC that exceeded the RG. Concentrations of carbon tetrachloride are generally within 1 order of magnitude of the RG (0.5 µg/L), and concentrations of chloroform are generally the same order of magnitude as the RG (1 µg/L). No RA for groundwater treatment is required at this time. Ownership of Parcel UC-2 has been transferred to the City of San Francisco and is no longer Navy property; however, sampling of the monitoring wells is still included in the BGMP.

Institutional Controls

The entire area of Parcel UC-2 (3.9 acres) is subject to soil and groundwater ICs. IC performance objectives were developed and presented in the ROD (Navy, 2009) and LUC RD (ChaduxTt, 2010b). A portion of Parcel UC-2 located adjacent to Parcel UC-1, is also subjected to ARICs for VOCs. **Table 1-3** summarizes the IC performance objectives to be implemented through land use restrictions for the site. The ICs are currently being enforced through a Covenant to Restrict Use of Property recorded on September 16, 2015 (Navy, 2015).

4.4.2.2 Remedy Operations and Maintenance

Ongoing O&M at Parcel UC-2 is the responsibility of the City and County of San Francisco OCII's contractor in accordance with the approved Risk Management Plan (Geosyntec, 2019) and O&M Plan (Navy, 2013). Annual reports from the City and County of San Francisco's OCII

contractor summarizing durable cover O&M and IC inspections were reviewed (Geosyntec-Albion Joint Association, 2020, 2021, 2022).

Durable Cover Maintenance

Minor settling was observed during the 2021 inspection, and evidence of burrowing pests within the soil cover were observed during the 2020 and 2021 inspections. Repairs were conducted in October 2020, December 2021, and January 2022. Vegetation in the soil cover is in good condition.

In general, the durable cover was found in good condition with minor crack and pothole repairs completed during O&M. An area in Parcel UC-2, the Hunters Point Artists Parcel, was scheduled for redevelopment, resulting in removal of the durable cover in the area in October 2017. Construction was put on hold indefinitely in June 2018, leaving a portion of the durable cover missing. The area is secured with a chain-link fence surrounding the uncovered area and is treated with tackifier annually for dust control. A Notice of Termination for the Hunters Point Artists Parcel project was submitted to the State Water Boards Stormwater Multiple Applications and Report Tracking System in August 2020.

Institutional Controls Compliance

No deficiencies or inconsistent uses were observed during the review period.

4.4.3 Progress Since the Fourth Five-Year Review

Table 4-5 summarizes issues, recommendations, and follow-up actions from the Fourth Five-Year Review.

4.5 Technical Assessment

4.5.1 Question A: Is the Remedy Functioning as Intended by the Decision Document?

4.5.1.1 Parcel C

Yes. Based on the review of historical documents, annual O&M inspections, and the Five-Year Review inspection, the remedy at Parcel C is functioning as intended.

Soil hotspot areas were removed through excavation and offsite disposal and additional hot spot removal is planned to address deeper than anticipated chemicals at Building 251. Exposure pathways that could result in an unacceptable risk are being controlled through durable covers and ICs. The shoreline revetment, soil cover, and asphalt cover are in good condition, and any minor issues have been repaired. Areas needing repair outside of typical O&M are secured to prevent access. Although the SVE soil remedy did not function as well as intended, the SVE technology was intended to remove source-level concentrations and meet RAOs through other remedy components. Short-term protectiveness is achieved because ICs are in place to ensure current and future exposures through the vapor intrusion pathway do not occur. Groundwater remediation and MNA/LTM are ongoing, and ICs prevent exposure to groundwater while treatment is ongoing. Radiological concerns are addressed through previous radiological surveys and remediation of soil and building structures, and radiological retesting is being conducted to confirm that the RAO has been met, with the goal of unrestricted closure. Radiological retesting is underway.

4.5.1.2 Parcel UC-2

Yes. Based on the review of historical documents, annual O&M inspections, and the Five-Year Review inspection, the remedy at Parcel UC-2 is functioning as intended.

Exposure pathways that could result in an unacceptable risk are being controlled through durable covers and ICs. Groundwater monitoring is ongoing, and ICs prevent exposure to groundwater until that time. The soil and asphalt covers are in good condition, and any minor issues have been repaired. Radiological concerns are addressed through previous radiological surveys and remediation of soil and building structures, and radiological retesting is being conducted to confirm that the RAO has been met, with the goal of unrestricted closure. Radiological retesting is planned for 2023.

4.5.2 Question B: Are the Exposure Assumptions, Toxicity Data, Cleanup Levels, and Remedial Action Objectives Used at the Time of the Remedy Selection Still Valid?

Uncertain. Based on the results of the ARAR evaluation, HHRA analysis, and ERA analysis discussed in the following sections, the exposure assumptions, toxicity data, cleanup levels, and RAOs used at the time of remedy selection are still valid for soil and A-aquifer groundwater. Although there have been some changes to toxicity values and risk assessment methods, these changes do not affect remedy protectiveness for soil and A-aquifer groundwater. However, chemicals were identified in the B-aquifer and F-WBZ groundwater that require additional investigation to determine if the exposure assumptions, toxicity data, cleanup levels, and RAOs at the time of remedy selection remain valid for these groundwater zones.

4.5.2.1 ARAR Evaluation

The Navy evaluated the ARARs established in the RODs and ESD for Parcel C and Parcel UC-2. No changes to location-specific or action-specific ARARs that would affect the protectiveness of the remedies were identified. Changes to chemical-specific ARARs for individual chemicals are discussed in the following HHRA and ERA Analysis sections.

In 2021, California Public Resources Code Division 20.6.5, California Sea Level Rise Mitigation and Adaptation Act of 2021, was passed; however, no regulations have been promulgated to implement the act. The Navy is addressing SLR, as discussed in **Section 1.4.2**, of this Five-Year Review.

4.5.2.2 HHRA Analysis

As **Section 3.5.2.1** notes, in 2018, the State of California promulgated the TCR. However, the Navy continues to view the values identified in the USEPA IRIS database (a Tier 1 value) as the primary source of toxicity factors for risk-related calculations. The HHRA evaluation was conducted by comparing the human health RGs from the ROD with current risk-based criteria based on the same exposure scenario and ARARs, if available. Response complete for soil was achieved with excavation, durable cover construction and maintenance, and ICs as documented in the respective RACRs for Parcels C and UC-2 (TtEC, 2017c; ERRG, 2013). Therefore, any changes in exposure assumptions and toxicity data would not affect protectiveness of the remedy.

Table 4-6 shows the RGs and current comparison criteria for groundwater. The RGs for the groundwater COCs included in the ROD were based on consideration of exposure scenario-specific (residential or industrial vapor intrusion and construction worker trench exposure [A-

aquifer], or residential domestic use [B-aquifer in RU-C5 only]), risk-based concentrations (based on a cancer risk of 10^{-6} or a noncancer hazard index of 1); laboratory PQLs; chemical-specific ARARs; and HGALs. RGs were compared with the following current comparison criteria (USEPA, 2022a):

- A-aquifer Groundwater: VISLs calculated using the current USEPA VISL calculator for the residential and commercial scenarios.
- B-aquifer Groundwater: Current USEPA tapwater RSLs, California MCLs, and USEPA MCLs.

For groundwater, there are a few cases where a current risk-based concentration (VISL or RSL) is less than a risk-based RG (or the PQL or HGALs) from the ROD (**Table 4-6**). Although current risk-based levels for some chemicals are lower than the RGs, the ICs that are currently in place and the durable cover across the site prevent exposure to site media; therefore, the remedy remains protective. There may be changes with HHRA analysis for the construction worker scenario. Changes in exposure parameter values would likely only result in a small change to HHRA results since standard construction worker exposure factors have not changed significantly since the RI was prepared (not orders of magnitude). The following construction worker exposure parameter values have changed since the original HHRA was prepared:

- The construction worker body weight used in the HHRA was 70 kilograms; however, the adult body weight used in HHRAs based on current USEPA guidance (USEPA, 2014) would be 80 kilograms.
- The skin surface area for a construction worker exposed to soil used in the HHRA was 5,700 cm^2; however, based on current USEPA guidance (USEPA, 2014), a construction worker skin surface area exposed to soil is 3,527 cm^2.
- The soil-to-skin adherence factor used in the HHRA for a construction worker was 0.8 milligram per cm^2, where the soil-to-skin adherence factor for a construction worker used in a current HHRA would be 0.3 milligram per cm^2 (the 95th percentile adherence factor for construction workers [USEPA, 2004]).
- The skin surface area for exposure to groundwater used in the HHRA was 2,370 cm^2. A current HHRA would use a skin surface area of 6,032 cm^2 (the weighted average of mean values for head, hands, forearms, and lower legs [USEPA, 2011]).
- Additionally, for inhalation exposures for both groundwater and soil, inhalation toxicity values are now presented and used in milligram(s) per cubic meter (noncancer) or 1 microgram per cubic meter for cancer; therefore, the intake equations no longer incorporate inhalation rate.

Toxicity values could result in larger changes (potential orders of magnitude changes), such as for TCE, for which toxicity values were updated in 2009 after the initial HHRA was completed. However, those changes will not affect the RGs for the construction worker scenario identified in the ROD because ICs require identification and management of potential risks to construction workers through the preparation and approval of plans and specifications for all construction activities that may pose unacceptable exposure to construction workers. There have been no changes in current exposure pathways based on the site controls, or changes in planned future site use since the ROD that would change the protectiveness of the current remedy.

Radiological Risk Review

In October 2020, after the preparation of the Five-Year Review addenda, USEPA introduced a PRG calculation method called "Peak PRG," which computes PRGs accounting for ingrowth and decay of progeny over time. An evaluation was performed for this Five-Year Review to assess whether this change affected the continued protectiveness of the current soil RGs for future residents. Exposure calculations were performed using the USEPA PRG Calculator (USEPA, 2022b). For this soil evaluation, the estimated excess cancer risk was calculated using the "Peak Risk" time interval of 1,000 years (Navy, 2020). The soil RGs were used as exposure point concentrations, and the cumulative cancer risk was calculated as the sum of risks from all ROCs. **Appendix F** presents the calculated estimated excess cancer risks from this evaluation and the supporting data. Under CERCLA, cleanup goals are considered protective if excess cancer risks from site exposures remain within the 10^{-4} to 10^{-6} range. Based on the findings of this evaluation, the soil RGs are within this range and continue to be protective for future residential exposures.

There were no changes to the risk assessment methods related to structures or buildings for radiological concerns since the last Five-Year Review.

4.5.2.3 ERA Analysis

Table 4-7 presents groundwater COCs with a summary of TLs and current surface water quality criteria. Groundwater data were compared with surface water screening levels to evaluate potential for risk to aquatic organisms in San Francisco Bay. The evaluation of groundwater was very conservative because it was assumed that aquatic receptors would have direct exposure to chemicals in groundwater at their measured concentrations.

Chromium VI and zinc were retained for ongoing monitoring. Concentrations of chromium VI were successfully reduced by anaerobic bioremediation in target treatment areas within RU-C1 and RU-C5, with concentrations remaining less than treatment goals through the end of the performance monitoring period. Groundwater treatment minimized the potential for chromium VI to migrate to the bay at concentrations greater than the surface water quality criteria. The chronic marine NRWQC (USEPA, 2023) for each metal was set as the TL. These values have not changed since the FS and ROD were completed. The TLs remain current and protective of surface water exposures for aquatic organisms. Surface water TLs are for monitoring purposes only because surface water benchmarks are not ARARs for ecological exposures to groundwater.

4.5.3 Question C: Has Any Other Information Come to Light that Could Question the Protectiveness of the Remedy?

Yes. The following information has come to light that could question the protectiveness of the remedy:

- There have been detections of COCs from A-aquifer groundwater within the B-aquifer and F-WBZ groundwater and the connection and communication between hydrogeologic units within Parcel C is not fully understood. Therefore, further characterization of the Deep F-WBZ in RU-C4 and the B-aquifer and Upper F-WBZ in RU-C2 are required to demonstrate that remedies within the A-aquifer will be effective and not re-contaminated by COCs within the B-aquifer and F-WBZ and unacceptable discharges to the Bay are not and will not occur.
- As identified in the Fourth Five-Year Review, there is uncertainty with a portion of the radiological survey and remediation work. The Navy is in the process of implementing

corrective actions to ensure the radiological remedies specified in the decision documents were implemented as intended; however, this work is ongoing. Radiological retesting is currently being conducted at Parcels C and UC-2; long-term protectiveness will be confirmed upon completion.

4.6 Issues, Recommendations, and Follow-up Actions

Table 4-8 summarizes the issues, recommendations, and follow-up actions identified for Parcels C and UC-2.

4.6.1 Other Findings

The following findings were identified that do not directly relate to achieving or maintaining remedy protectiveness but are relevant to overall site management.

4.6.1.1 PFAS

As discussed in **Section 1.4.1**, a Basewide PA was conducted to identify potential PFAS release areas based on historical use or limited sampling data. The following is a summary of the areas identified for additional investigation in the PA (Multi-MAC JV, 2022) and SI (Liberty JV, 2023):

- **Parcel C A-aquifer Groundwater:** A-aquifer groundwater beneath Parcel C was identified for additional investigation because of past industrial use in the parcels and PFOA, PFOS, PFNA, and PFHxS exceeded project screening levels during the SI (**Appendix G**).
- **Parcel C:** Building 215, Fire Station, was identified as an area where further investigation is warranted in the form based on historical activities. During the SI, PFOA and PFOS exceeded project screening levels in soil and PFOA, PFOS, PFNA, and PFHxS exceeded project screening levels in groundwater (**Appendix G**).

There are no PFAS areas identified for additional investigation in Parcel UC-2. Exposure to groundwater and soil is restricted by ICs within the HPNS and the City and County of San Francisco prohibits installation of domestic wells within city and county limits.

4.6.1.2 Climate Resilience

The CRA estimates that groundwater emergence due to SLR may occur within Parcel C by the year 2065 (**Appendix A**). Site-specific studies are planned to verify these mapping projections and evaluate the 2100 timeframe, at a minimum.

However, protectiveness is only affected when increased CERCLA risk attributable to climate hazards has been identified (groundwater is likely to emerge and land use is such that receptors could be exposed and a future unacceptable health or ecological risk has been identified, data collected, validated, and evaluated following CERCLA risk assessment processes resulting in unacceptable risk to receptors). Where the potential for increased vapor intrusion is identified in other CERCLA documents, ARICs for VOCs are present, groundwater is being monitored, and removal of VOCs is occurring either through MNA or active remediation, thus reducing the potential for future vapor intrusion by reducing the source. Therefore, the potential for groundwater emergence does not affect the protectiveness determination in this Five-Year Review.

No SLR effects are anticipated for Parcel UC-2 by the year 2065.

4.6.1.3 Site Management Strategy

The Navy is reassessing the site management strategy for Parcels C and UC-2 based on the following considerations:

- The Navy is planning to conduct a detailed assessment of groundwater COC concentrations to document and eliminate COCs that have achieved response complete and to tabulate groundwater and soil COC concentrations to ensure health and safety professionals have the information needed to protect future construction workers.
- The Navy is also planning to optimize the monitoring frequency and locations for areas that have not undergone any changes that could affect the concentrations of chemicals or metals in groundwater (for example, RA or development construction).

4.7 Statement of Protectiveness

4.7.1 Parcel C

Protectiveness Determination: Protectiveness Deferred

Protectiveness Statement: A protectiveness determination cannot be made because there is uncertainty related to the hydrogeologic communication between the A- and B-aquifers and whether discharge of chemicals present in the B-aquifer present potential unacceptable risks to Bay receptors. In order to make a protectiveness determination, the following action, at a minimum, needs to be made: (1) complete investigations of the (a) Bay Mud/Sandy Lean Clay aquitard, (b) extent of chemicals in the deep F-WBZ in RU-C4, and (c) extent of chemicals in the B-aquifer and F-WBZ in RU-C2 and (2) use current ecological risk assessment methods and criteria, as appropriate, to assess potential impacts to Bay receptors.

The estimated timeframe for each action is as follows:

- Complete investigations of the Bay Mud/Sandy Lean Clay aquitard, expected to occur by Fall 2026
- Complete investigation of the extent of chemicals in the deep F-WBZ in RU-C4 expected to occur by Fall 2026
- Complete investigation of the extent of chemicals in the B-aquifer and F-WBZ in RU-C2 expected to occur by Spring 2027
- Assess potential impacts to Bay receptors, expected to occur by Fall 2026

The FFA parties will have discussions, as appropriate, prior to scoping and developing primary documents, such as workplans, expected to occur in Fall 2025. The protectiveness determination will be re-evaluated in the Five-Year Review addendum based on information that becomes available after the completion of this FYR.

The RAOs for soil are met through hotspot excavation and disposal, durable covers, and ICs. Groundwater remediation is ongoing, and, once active treatment is complete, MNA will continue until COCs reach RGs. Until that time, ICs control exposure to groundwater. Radiological retesting is ongoing to confirm that levels in soil and structures are protective of human health.

4.7.2 Parcel UC-2

Protectiveness Determination: Short-term Protective

Protectiveness Statement: The remedy at Parcel UC-2 is currently protective of human health and the environment. To determine whether the remedy can be considered protective in the long term, the radiological retesting work will be completed.

The RAOs for soil are met through durable covers and ICs. Groundwater monitoring is ongoing. Radiological retesting is ongoing to confirm that levels in soil and structures are protective of human health. Until retesting is complete, short-term protectiveness is met through Navy controls such as access to the parcel through fencing, locked gates, and ICs (restricting intrusive work and maintaining durable covers).

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Table 4-1. Parcel C and UC-2 Chemicals of Concern and Remediation Goals

Exposure Medium	Exposure Scenario	Chemical of Concern	ROD Remediation Goal (2008)[a]	Source of Remediation Goal	Parcel
Soil (mg/kg)	Residential	1,2-Dichloroethane	0.28	RBC	C
		1,4-Dichlorobenzene	2	RBC	C
		2-Methylnaphthalene	150	RBC	C
		3,3'-Dichlorobenzidine	1.6	PQL	C
		Antimony	10	RBC	C
		Aroclor-1254	0.093	RBC	C
		Aroclor-1260	0.21	RBC	C
		Arsenic	11.1	HPAL	C, UC-2
		Benzene	0.18	RBC	C
		Benzo(a)anthracene	0.37	RBC	C
		Benzo(a)pyrene	0.33	PQL	C
		Benzo(b)fluoranthene	0.34	RBC	C
		Benzo(k)fluoranthene	0.34	RBC	C
		bis(2-Ethylhexyl)phthalate	1.1	RBC	C
		Cadmium	3.5	RBC	C
		Chrysene	3.3	RBC	C
		Copper	160	RBC	C
		Dibenz(a,h)anthracene	0.33	PQL	C
		Dieldrin	0.003	PQL	C
		gamma-BHC (Lindane)	0.0026	RBC	C
		Heptachlor epoxide	0.002	PQL	C
		Hexachlorobenzene	0.33	PQL	C
		Indeno(1,2,3-cd)pyrene	0.35	RBC	C
		Iron	58,000	HPAL	C
		Lead	155	RBC	C
		Manganese	1,431	HPAL	C, UC-2
		Mercury	2.28	HPAL	C
		Naphthalene	1.7	RBC	C
		Nickel	2,650	HPAL	C
		n-Nitroso-di-n-propylamine	0.33	PQL	C
		Organic Lead	0.5	PQL	C
		Tetrachloroethene	0.48	RBC	C
		Thallium	5	RBC	C
		Trichloroethene	2.9	RBC	C
		Vanadium	117	HPAL	C
		Vinyl chloride	0.024	RBC	C
		Zinc	370	RBC	C
	Industrial	1,4-Dichlorobenzene	4.5	RBC	C
		Aroclor-1260	1	RBC	C
		Arsenic	11.1	HPAL	C
		Benzene	0.39	RBC	C
		Benzo(a)anthracene	1.8	RBC	C
		Benzo(a)pyrene	0.33	PQL	C
		Benzo(b)fluoranthene	1.8	RBC	C
		Benzo(k)fluoranthene	1.8	RBC	C
		Chrysene	18	RBC	C
		Dibenz(a,h)anthracene	0.33	PQL	C
		Indeno(1,2,3-cd)pyrene	1.8	RBC	C
		Lead	800	RBC	C
		Organic Lead	0.5	PQL	C
		Tetrachloroethene	1.5	RBC	C
		Trichloroethene	6.6	RBC	C
		Vinyl chloride	0.055	RBC	C

Table 4-1. Parcel C and UC-2 Chemicals of Concern and Remediation Goals

Exposure Medium	Exposure Scenario	Chemical of Concern	ROD Remediation Goal (2008)[a]	Source of Remediation Goal	Parcel
Soil (mg/kg)	Recreational	Arsenic	11.1	HPAL	C
		Benzo(a)pyrene	0.33	PQL	C
		Lead	155	RBC	C
	Construction	Aroclor-1260	2.1	RBC	C
		Arsenic	11.1	HPAL	C, UC-2
		Benzo(a)anthracene	6.5	RBC	C
		Benzo(a)pyrene	0.65	RBC	C
		Benzo(b)fluoranthene	6.5	RBC	C
		Benzo(k)fluoranthene	6.5	RBC	C
		Dibenz(a,h)anthracene	1.1	RBC	C
		Indeno(1,2,3-cd)pyrene	6.5	RBC	C
		Lead	800	RBC	C
		Manganese	6,900	RBC	C, UC-2
		Organic Lead	0.5	PQL	C
		Thallium	20	RBC	C
A-Aquifer (µg/L)	Residential - Vapor Intrusion	1,1,2,2-Tetrachloroethane	3	RBC	C
		1,1,2-Trichloroethane	4	RBC	C
		1,1-Dichloroethane	6.5	RBC	C
		1,2,3-Trichloropropane	0.5	PQL	C
		1,2,4-Trimethylbenzene	25	RBC	C
		1,2-Dichlorobenzene	2,600	RBC	C
		1,2-Dichloroethane	2.3	RBC	C
		1,2-Dichloroethene (Total)	210	RBC	C
		1,2-Dichloropropane	1.1	RBC	C
		1,3,5-Trimethylbenzene	19	RBC	C
		1,4-Dichlorobenzene	2.1	RBC	C
		Benzene	0.5	PQL	C
		Bromodichloromethane	1	RBC	C
		Carbon Tetrachloride	0.5	PQL	C, UC-2
		Chlorobenzene	390	RBC	C
		Chloroethane	6.5	RBC	C
		Chloroform	0.7	RBC	C, UC-2
		cis-1,2-Dichloroethene	210	RBC	C
		cis-1,3-Dichloropropene	0.5	PQL	C
		Dibromochloromethane	2.6	RBC	C
		Isopropylbenzene	7.8	RBC	C
		Methylene Chloride	27	RBC	C
		Naphthalene	3.6	RBC	C
		Tetrachloroethene	0.54	RBC	C
		trans-1,2-Dichloroethene	180	RBC	C
		trans-1,3-Dichloropropene	0.5	PQL	C
		Trichloroethene	2.9	RBC	C, UC-2
		Trichlorofluoromethane	180	RBC	C
		Vinyl Chloride	0.5	PQL	C
	Industrial- Vapor Intrusion	1,1,2,2-Tetrachloroethane	5.1	RBC	C
		1,1,2-Trichloroethane	6.7	RBC	C
		1,1-Dichloroethane	11	RBC	C
		1,2,3-Trichloropropane	0.5	PQL	C
		1,2,4-Trimethylbenzene	25	RBC	C
		1,2-Dichloroethane	3.9	RBC	C
		1,2-Dichloroethene (Total)	210	RBC	C
		1,2-Dichloropropane	1.8	RBC	C
		1,3,5-Trimethylbenzene	19	RBC	C
		1,4-Dichlorobenzene	3.6	RBC	C

Table 4-1. Parcel C and UC-2 Chemicals of Concern and Remediation Goals

Exposure Medium	Exposure Scenario	Chemical of Concern	ROD Remediation Goal (2008)[a]	Source of Remediation Goal	Parcel
A-Aquifer (µg/L)	Industrial- Vapor Intrusion	Benzene	0.63	RBC	C
		Bromodichloromethane	1.7	RBC	C
		Carbon Tetrachloride	0.5	PQL	C
		Chlorobenzene	390	RBC	C
		Chloroform	1.2	RBC	C
		cis-1,2-Dichloroethene	210	RBC	C
		cis-1,3-Dichloropropene	0.5	PQL	C
		Isopropylbenzene	7.8	RBC	C
		Methylene Chloride	46	RBC	C
		Naphthalene	6	RBC	C
		Tetrachloroethene	0.9	RBC	C
		trans-1,3-Dichloropropene	0.5	PQL	C
		Trichloroethene	4.8	RBC	C
		Trichlorofluoromethane	180	RBC	C
		Vinyl Chloride	0.5	PQL	C
	Construction Worker	1,1,2-Trichloroethane	40	RBC	C
		1,2,3-Trichloropropane	0.6	RBC	C
		1,2,4-Trichlorobenzene	41	RBC	C
		1,2,4-Trimethylbenzene	53	RBC	C
		1,2-Dichlorobenzene	1700	RBC	C
		1,2-Dichloroethane	22	RBC	C
		1,2-Dichloroethene (Total)	270	RBC	C
		1,2-Dichloropropane	30	RBC	C
		1,4-Dichlorobenzene	52	RBC	C
		Benzene	16	RBC	C
		Bromodichloromethane	19	RBC	C
		Carbon Tetrachloride	15	RBC	C, UC-2
		Chlorobenzene	450	RBC	C
		Chloroform	26	RBC	C
		cis-1,2-Dichloroethene	270	RBC	C
		Naphthalene	16	RBC	C
		Tetrachloroethene	18	RBC	C
		Trichloroethene	290	RBC	C
		Vinyl Chloride	5.4	RBC	C
		2,4-Dimethylphenol	9800	RBC	C
		2,4-Dinitrotoluene	180	RBC	C
		3,4-Dimethylphenol	700	RBC	C
		4-Methylphenol	3500	RBC	C
		Benzo(a)anthracene	0.67	RBC	C
		Benzo(a)pyrene	0.05	RBC	C
		Benzo(b)fluoranthene	0.45	RBC	C
		Benzo(k)fluoranthene	0.45	RBC	C
		Chrysene	6.7	RBC	C
		Pentachlorophenol	50	PQL	C
	Protection of the Environment [b]	Chromium VI	50	SWC	C
		Zinc	81	SWC	C

Table 4-1. Parcel C and UC-2 Chemicals of Concern and Remediation Goals

Exposure Medium	Exposure Scenario	Chemical of Concern	ROD Remediation Goal (2008)[a]	Source of Remediation Goal	Parcel
B - Aquifer (RU-C5 Plume Only) (µg/L)	Residential - Domestic Use	Chromium VI	109	MCL	C
		Antimony	6	MCL	C
		Arsenic	10	MCL	C
		Iron	10,950	RBC	C
		Manganese	8,140	HPAL	C
		Thallium	2	MCL	C
		1,1-Dichloroethane	5	MCL	C
		1,2,4-Trichlorobenzene	70	MCL	C
		1,2,4-Trimethylbenzene	12	RBC	C
		1,2-Dichlorobenzene	600	MCL	C
		1,2-Dichloroethane	0.5	MCL	C
		1,2-Dichloroethene (Total)	6	MCL	C
		1,2-Dichloropropane	5	MCL	C
		1,3,5-Trimethylbenzene	12	RBC	C
		1,3-Dichlorobenzene	183	MCL	C
		1,4-Dichlorobenzene	5	MCL	C
		Benzene	1	MCL	C
	Residential - Domestic Use	Bromodichloromethane	80	MCL	C
		Chlorobenzene	70	MCL	C
		Chloroethane	4.6	MCL	C
		Chloroform	80	MCL	C
		cis-1,2-Dichloroethene	6	MCL	C
		Methylene Chloride	5	MCL	C
		Naphthalene	0.093	RBC	C
		Tetrachloroethene	5	MCL	C
		trans-1,2-Dichloroethene	10	MCL	C
		Trichloroethene	5	MCL	C
		Trichlorofluoromethane	1,288	RBC	C
		Vinyl Chloride	0.5	MCL	C
		2,4-Dimethylphenol	730	MCL	C
		2,4-Dinitrotoluene	10	MCL	C
		2-Methylnaphthalene	24	MCL	C
		2-Methylphenol	1,825	MCL	C
		4-Methylphenol	182	MCL	C
		Benzo(a)anthracene	0.2	MCL	C
		Benzo(a)pyrene	0.2	MCL	C
		Bis(2-ethylhexyl)phthalate	4	MCL	C
		Carbazole	10	MCL	C
		Chrysene	0.2	MCL	C
		Dibenzofuran	12	MCL	C
		Hexachloroethane	1.7	MCL	C
		Pentachlorophenol	1	MCL	C
		Aldrin	0.05	MCL	C
		alpha-BHC	1	MCL	C
		Dieldrin	0.02	MCL	C
		Heptachlor Epoxide	0.01	MCL	C

Table 4-1. Parcel C and UC-2 Chemicals of Concern and Remediation Goals

Exposure Medium	Exposure Scenario	Chemical of Concern	ROD Remediation Goal (2008)[a]	Source of Remediation Goal	Parcel

Reference:

Navy. 2014. *Explanation of Significant Differences to the Final Record of Decision for Parcel C, Hunters Point Shipyard, San Francisco, California.* Final. October.

[a] In cooperation with the FFA signatories, the Navy developed a revised tiered approach that reduces excavation of soil that will not pose an unacceptable risk to human health and the environment once the remedy is fully implemented. Application of tiered action levels for the excavation portion of the selected soil remedy resulted in changes to the specific numerical RGs identified in the ROD as summarized in Table 4-1 of the ESD (Navy, 2014).

[b] Protection of the environment protects or minimizes discharge that would be above the specified remediation goals; specific trigger levels are developed for each plume. Groundwater remediation goals for chromium VI and zinc are at the point of discharge to the bay.

µg/L = microgram(s) per liter
BHC = benzene hexachloride
ESD = Explanation of Significant Differences
FFA = Federal Facilities Agreement
HPAL = Hunters Point Ambient Level
MCL = maximum contaminant level
mg/kg = milligram(s) per liter
Navy = Department of the Navy
PQL = practical quantitation limit
RBC = risk-based concentration
RG = remediation goal
ROD = Record of Decision
SWC = Surface Water Criteria

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Table 4-2. Parcels C and UC-2 Remediation Goals for Radionuclides

Radionuclide	Surfaces (dpm/100cm^2)		Soil[c] (pCi/g)	Water[e] (pCi/L)	Parcel
	Equipment, Waste[a]	Structures[b]			
Cesium-137	5,000	5,000	0.113	119	C, UC-2
Cobalt-60	5,000	5,000	0.0361	100	C
Plutonium-239	100	100	2.59	15	C
Radium-226	100	100	1[d]	5	C, UC-2
Strontium-90	1,000	1,000	0.331	8	C, UC-2
Thorium-232	1,000	37	1.69	15	C

Source of Goals:

Department of the Navy (Navy). 2006. *Base-wide Radiological Removal Action, Action Memorandum – Revision 2006, Hunters Point Shipyard, San Francisco, California* . Final. April 21.

United States Environmental Protection Agency (USEPA). 2000. *Radionuclides Notice of Data Availability Technical Support Document* . Targeting and Analysis Branch, Standards and Risk Management Division, Office of Groundwater and Drinking Water. March.

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

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

[c] USEPA PRGs for two future use scenarios.

[d] Goal is 1 pCi/g above background per agreement with USEPA.

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

AEC = Atomic Energy Commission
ARAR = applicable or relevant and appropriate requirement
cm^2 = square centimeter(s)
dpm = disintegration(s) per minute
HPNS = Hunters Point Naval Shipyard
NRC = Nuclear Regulatory Commission
pCi/g = picocurie(s) per gram
pCi/L = picocurie(s) per liter
PRG = preliminary remediation goal
TCRA = time-critical removal action
USEPA = United States Environmental Protection Agency

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Table 4-3. Parcel C Remedial Action Summary and Expected Outcomes

Media	Risk/Basis for Action	Reasonably Anticipated Land Use	RAO	Remedy Component	Performance Metric	Expected Outcome
Soil	**Human Health:** Unacceptable risk to potential future industrial users from exposure to metals, VOCs, and SVOCs in soil; recreational users from exposure to metals and SVOCs in soil; residents (adult and child) from metals, VOCs, SVOCs, pesticides, and PCBs in soil; and construction workers from metals, SVOCs, and PCBs in soil. Potential volatilization of VOCs and some SVOCs from soil into soil gas and/or indoor air via the VI pathway.	**Current use:** Limited access unoccupied and unused buildings **Planned future use**: Multiuse, including areas of predominantly arts-related, commercial, retail and residential, research and development, and shoreline open space	1. Prevent or minimize 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 in native soil.	Excavation	Excavation to remove COCs in soil that exceeded RGs and action levels established in the 2014 ESD (Navy, 2014). Completed in 2015.	Land suitable for planned future use compatible with durable covers and ICs as required by the LUC RD.
				Durable covers	Durable covers to provide physical barriers to prevent exposure to metals in soil. Durable covers include: 1) a 3-foot-thick (minimum) shoreline armoring, 2) a 2-foot-thick (minimum) vegetated soil cover, 3) a 6-inch-thick (minimum) asphaltic pavement cover, and 4) repaired concrete building foundations. Covers are inspected and maintained to prevent exposure to COCs.	
				ICs	ICs to maintain durable covers, restrict land use and land-disturbing activity, and prohibit growing vegetables or fruits in native soil for human consumption	
Soil Gas			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, 2010) 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 HP[N]S.	SVE	SVE to remove VOCs from soil gas. Five SVE systems within RU-C1, RU-C2, RU-C4, and RU-C5 were operated from 2014 to 2017 with limited success due to shallow groundwater table, low permeability soil/sediment, water entrainment in the SVE wells, and ongoing remedial actions that may contribute to ineffectiveness of removal. The Navy is in the process of reviewing the strategy for addressing soil vapor exceedances at all Parcel C Areas in conjunction with additional in-situ groundwater remediation activities that are ongoing.	
				ICs	ICs to prohibit construction of enclosed structures unless prior written approval of vapor mitigation strategies is granted by the FFA signatories.	
Groundwater	**Human Health:** Potential volatilization of VOCs from soil and A-aquifer groundwater into soil gas and/or indoor air via the VI pathway. Potential unacceptable risks to future construction workers from dermal exposure to COCs in A-aquifer groundwater and VOCs through volatilization in trenches. Potential unacceptable risks to residents through COCs in B-aquifer groundwater from domestic use (RU-C5 only).		1. Prevent or minimize exposure to VOCs in the A-aquifer groundwater at concentrations above remediation goals via indoor inhalation of vapors from groundwater. 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.	Groundwater treatment	In-situ groundwater remediation to active treatment criteria consisting of injecting ZVI or a biological substrate to treat COCs (VOCs and hexavalent chromium) in RU-C1, RU-C2, RU-C4, and RU-C5. The first round of injections was conducted from 2013 to 2017 and the latest round was in 2021. Performance monitoring is ongoing for plumes that have not met MNA criteria (COCs statistically below ATCs). Additional treatment, moving to MNA, or plume closure is determined through decision criteria that were established in the RD.	
				MNA	Upon completion of groundwater treatment, MNA will be conducted to monitor COC degradation, aquifer conditions, and plume stability until RGs are met.	
				ICs	ICs to prohibit construction of enclosed structures, the use of groundwater and installation of new groundwater wells for domestic purposes, and to restrict land-disturbing activity unless prior written approval is granted by the FFA signatories	

Table 4-3. Parcel C Remedial Action Summary and Expected Outcomes

Media	Risk/Basis for Action	Reasonably Anticipated Land Use	RAO	Remedy Component	Performance Metric	Expected Outcome
Groundwater	Potential migration pathway of contaminants	**Current use:** limited access unoccupied and unused buildings **Planned future use**: Multiuse, including areas of predominantly arts-related, commercial, retail and residential, research and development, and shoreline open space	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.	Groundwater treatment and monitoring	In-situ groundwater remediation consisting of injecting food-grade molasses was completed in RU-C3 and RU-C5 to reduce hexavalent chromium via anaerobic bioremediation. Zinc was initially targeted for active remediation but was documented not to be warranted based on pre-remedial characterization sampling. Concentrations are below treatment goals.	Land suitable for planned future use compatible with durable covers and ICs as required by the LUC RD.
				LTM	Groundwater LTM to monitor hexavalent chromium and zinc concentrations and migration. LTM will continue until concentrations are below TLs protective of the bay.	
Radiologically Impacted Soil and Structures	**Human Health:** Radiological risks for soil and structures (storm drains, sanitary sewers, buildings) were greater than 10^{-6}.		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).	Survey, decontamination, and removal of radiologically impacted structures and soil	Identification and removal of historical subsurface storm drain and sanitary sewer utilities and screening and remediation of buildings, and former building sites as part of the TCRA for radionuclides. Radiological retesting is currently being conducted to confirm site conditions are compliant with the RAO.	

References:

ChaduxTt, A Joint Venture of St. George Chadux Corp. and Tetra Tech EM Inc. (ChaduxTt). 2010. *Memorandum: Approach for Developing Soil Gas Action Levels for Vapor Intrusion Exposure at Hunters Point Shipyard, Hunters Point Shipyard, San Francisco, California.*

Navy. 2014. *Explanation of Significant Differences to the Final Record of Decision for Parcel C, Hunters Point Shipyard, San Francisco, California.* Final. October.

µg/L = microgram(s) per liter
ATC = active treatment criterion
COC = chemical of concern
ESD = Explanation of Significant Differences
FFA = Federal Facilities Agreement
HHRA = human health risk assessment
HPNS = Hunters Point Naval Shipyard
IC = institutional control
LTM = long-term monitoring
LUC = land use control
MNA = monitored natural attenuation
Navy = Department of the Navy
PAH = polycyclic aromatic hydrocarbon
PCB = polychlorinated biphenyl
RAO = remedial action objective
RD = remedial design
RG = remediation goal
SVE = soil vapor extraction
SVOC = semivolatile organic compound
TCRA = time-critical removal action
VI = vapor intrusion
VOC = volatile organic compound
ZVI = zero-valent iron

Table 4-4. Parcel UC-2 Remedial Action Summary and Expected Outcomes

Media	Risk/Basis for Action	Reasonably Anticipated Land Use	RAO	Remedy Component	Performance Metric	Expected Outcome
Soil	**Human Health:** Unacceptable risk to potential future residents (adult and child) and construction workers from metals in soil. Potential volatilization of VOCs and some SVOCs from soil into soil gas and/or indoor air via the VI pathway.	**Current use:** Utility corridor, access road, unused buildings. **Planned future use:** Multiuse, including mixed residential, arts, commercial, retail, and research and development (industrial)	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	Durable covers	Durable covers (asphalt pavement or vegetated soil) to provide physical barriers to prevent exposure to metals in soil. Durable covers include: 1) a 2-foot-thick (minimum) vegetated soil cover, 2) a 6-inch-thick (minimum) asphaltic pavement cover, and 3) repaired concrete building foundations. Covers are inspected and maintained to prevent exposure to COCs.	Land suitable for planned future use compatible with durable covers and ICs as required by the LUC RD.
				ICs	ICs to maintain durable covers, restrict land use and land-disturbing activity, and prohibit growing vegetables or fruits in native soil for human consumption	
Soil Gas			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 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 HP[N]S.	ICs	ICs to prohibit construction of enclosed structures unless prior written approval of vapor mitigation strategies is granted by the FFA signatories.	
Groundwater	**Human Health:** Risk to potential future residents from VOCs in A-aquifer through the vapor intrusion pathway, construction workers through vapors in trenches.		1. Prevent or minimize exposure to VOCs in the A-aquifer groundwater at concentrations above remediation goals via indoor inhalation of vapors from groundwater. 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.	LTM	LTM of groundwater is conducted to monitor COC concentrations in groundwater. Parcel UC-2 has been transferred to the City of San Francisco and is no longer on Navy property. Monitoring of these two wells will continue semiannually to assess trends in concentrations of carbon tetrachloride and chloroform at Parcel UC-2; no remedial action for groundwater treatment is required at this time. Ownership of Parcel UC-2 has been transferred to the City of San Francisco and is no longer Navy property; however, sampling of the monitoring wells is still included in the BGMP.	
				ICs	ICs to prohibit construction of enclosed structures, the use of groundwater and installation of new groundwater wells for domestic purposes, and to restrict land-disturbing activity unless prior written approval is granted by the FFA signatories.	
Radiologically Impacted Soil and Structures	**Human Health:** Radiological risks for soil and structures (storm drains and sanitary sewers) were greater than 10^{6}.		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).	Survey, decontamination, and removal of radiologically impacted structures and soil	Identification and removal of historical subsurface storm drain and sanitary sewer utilities and screening and remediation of buildings, and former building sites as part of the TCRA for radionuclides. Radiological retesting is planned to confirm site conditions are compliant with the RAO.	

Table 4-4. Parcel UC-2 Remedial Action Summary and Expected Outcomes

BGMP = Basewide Groundwater Monitoring Program
COC = chemical of concern
FFA = Federal Facilities Agreement
HHRA = human health risk assessment
HPNS = Hunters Point Naval Shipyard
IC = institutional control
LTM = long-term monitoring
LUC = land use control
Navy = Department of the Navy
RAO = remedial action objective
RD = remedial design
SVOC = semivolatile organic compound
TCRA = time-critical removal action
VI = vapor intrusion
VOC = volatile organic compound

Table 4-5. Fourth Five-Year Review Parcel C and UC-2 Issues, Recommendations, and Follow-up Actions

Parcel/Site	Fourth Five-Year Review Protectiveness	Issue	Recommendation (Milestone)	Date Complete/Current Status
C	Will be protective	SVE implementation in Parcels B-1 and C is reducing source mass, but with limited effectiveness due to diffusion-limited conditions in the subsurface. Although ICs will maintain future protectiveness, source removal inefficiency is extending the period within which SVE will be implemented.	It is recommended that use of the SVE technology be evaluated for each treatment area due to inefficiency caused by diffusion-limited conditions. Site-specific studies (e.g., remedy analyses) should be performed to estimate the magnitude and extent of source mass at each treatment area in Parcels B-1 and C to determine if other measures could be implemented to enhance SVE performance in the future. Any changes implemented to the approach for reducing source contamination in SVE areas should be discussed in the next Five-Year Review report. Changes made to the treatment approach should be considered for any other SVE treatment areas at HPNS, including areas where treatment is planned but has not yet been initiated. (12/31/2019)	**Completed February 2019:** The SVE systems at Parcel C were turned off between 2016 and 2017 when they reached points of diminishing returns primarily because of shallow groundwater, low permeability soils, and additional remedial actions pending in the treatment areas. The Navy will review the strategy for addressing soil gas at all Parcel C Areas after completion of additional in-situ groundwater remediation activities that are ongoing and discussed in **Section 4.4.1** of this Five-Year Review (ECC-Insight and CDM Smith, 2019).
C and UC-2	Will be protective (C) Short-term protective (UC-2)	The Navy has determined that a significant portion of the radiological survey and remediation work completed to date was not reliable because of manipulation and/or falsification of data by one of its radiological contractors. A long-term protectiveness evaluation of the radiological RGs has not yet been completed for this fourth Five-Year Review, and it is currently not known if the RAOs for radionuclides have been achieved in Parcels B-1, B-2, C, D-1, D-2, G, E, UC-1, UC-2, and UC-3.	Refer to **Section 1.4.3** for the long-term protectiveness evaluation component of this recommendation. The Navy is in the process of implementing corrective actions to ensure that the radiological remedies specified in the decision documents are implemented as intended. It is anticipated that the radiological rework will be completed prior to the next Five-Year Review.	**Long-term Protectiveness Evaluation:** Completed June 2020. Addenda to the Fourth Five-Year Review were prepared to evaluate the Radiological RGs for soil and buildings. The conclusions of both reports were that the current RGs were protective of human health and the environment (Navy, 2020a, 2020b). **In Progress:** Planning for the radiological retesting of soil and surveys of building structures at Parcel C was initiated in February 2019. Fieldwork activities were initiated in Spring 2022. Radiological retesting will be summarized in a radiological RACR anticipated to be completed in 2025. Planning for the radiological retesting of soil at Parcel UC-2 was initiated in February 2019. Fieldwork began in 2023. Radiological retesting will be summarized in a radiological RACR anticipated to be completed in 2028.

References:

Department of the Navy (Navy). 2020a. *Addendum to the Five-Year Review, Evaluation of Radiological Remedial Goals for Soil, Hunters Point Naval Shipyard, San Francisco, California*. June 18.

Navy. 2020b. *Addendum to the Five-Year Review, Evaluation of Radiological Remedial Goals for Building Structures, Hunters Point Naval Shipyard, San Francisco, CA*. June 18.

ECC-Insight, LLC and CDM Smith. 2019. *Parcel C Soil Vapor Extraction System Operation and Maintenance Summary Report, Hunters Point Naval Shipyard, San Francisco, California*. Final. February.

HPNS = Hunters Point Naval Shipyard
IC = institutional control
Navy = Department of the Navy
RACR = Remedial Action Completion Report
RAO = remedial action objective
RG = remediation goal
SVE = soil vapor extraction

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Table 4-6. Parcels C and UC-2 Chemicals of Concern and Current Comparison Criteria for Groundwater

Exposure Medium	Exposure Scenario	Chemical of Concern	Values from ROD			Current Comparison Criteria				
			ROD Remediation Goal (2009/2010)	Source of Remediation Goal	Parcel	11/2022 USEPA RSL or VISL[a]	Basis of RSL or VISL (C/NC)	DTSC-SL	California MCL	USEPA MCL
A-Aquifer (µg/L)	Residential Vapor Intrusion	1,1,2,2-Tetrachloroethane	3	RBC	C	3.23	C	NA	1	NA
		1,1,2-Trichloroethane	4	RBC	C	5.21	C	NA	5	5
		1,1-Dichloroethane	6.5	RBC	C	7.64	C	NA	5	NA
		1,2,3-Trichloropropane	0.5	PQL	C	22.3	NC	NA	0.005	NA
		1,2,4-Trimethylbenzene	25	RBC	C	248	NC	NA	NA	NA
		1,2-Dichlorobenzene	2,600	RBC	C	2660	NC	NA	600	600
		1,2-Dichloroethane	2.3	RBC	C	2.24	C	NA	0.5	5
		1,2-Dichloroethene (Total)	210	RBC	C	109	NC	NA	6 / 10	70 / 100
		1,2-Dichloropropane	1.1	RBC	C	6.58	C	NA	5	5
		1,3,5-Trimethylbenzene	19	RBC	C	175	NC	NA	NA	NA
		1,4-Dichlorobenzene	2.1	RBC	C	2.59	C	NA	5	75
		Benzene	0.5	PQL	C	1.59	C	NA	1	5
		Bromodichloromethane	1	RBC	C	0.876	C	NA	80	80
		Carbon Tetrachloride	0.5	PQL	C, UC-2	0.415	C	NA	0.5	5
		Chlorobenzene	390	RBC	C	410	NC	NA	70	100
		Chloroethane	6.5	RBC	C	9190	NC	NA	NA	NA
		Chloroform	0.7	RBC	C, UC-2	0.814	C	NA	80	80
		cis-1,2-Dichloroethene	210	RBC	C	250	NC	NA	6	70
		cis-1,3-Dichloropropene	0.5	PQL	C	4.84	C	NA	0.5	NA
		Dibromochloromethane	2.6	RBC	C	NITD		NA	80	80
		Isopropylbenzene	7.8	RBC	C	887	NC	NA	NA	NA
		Methylene Chloride	27	RBC	C	763	C	NA	5	5
		Naphthalene	3.6	RBC	C	4.59	C	NA	NA	NA
		Tetrachloroethene	0.54	RBC	C	14.9	C	NA	5	5
		trans-1,2-Dichloroethene	180	RBC	C	109	NC	NA	10	100
		trans-1,3-Dichloropropene	0.5	PQL	C	4.84	NC	NA	0.5	NA
		Trichloroethene	2.9	RBC	C, UC-2	1.19	C	NA	5	5
		Trichlorofluoromethane	180	RBC	C	NITD		NA	150	NA
		Vinyl Chloride	0.5	PQL	C	0.147	C	NA	0.5	2

Table 4-6. Parcels C and UC-2 Chemicals of Concern and Current Comparison Criteria for Groundwater

Exposure Medium	Exposure Scenario	Chemical of Concern	Values from ROD			Current Comparison Criteria				
			ROD Remediation Goal (2009/2010)	Source of Remediation Goal	Parcel	11/2022 USEPA RSL or VISL[a]	Basis of RSL or VISL (C/NC)	DTSC-SL	California MCL	USEPA MCL
A-Aquifer (µg/L)	Industrial - Vapor Intrusion	1,1,2,2-Tetrachloroethane	5.1	RBC	C	14.1	C	NA	1	NA
		1,1,2-Trichloroethane	6.7	RBC	C	22.8	C	NA	5	5
		1,1-Dichloroethane	11	RBC	C	33.4	C	NA	5	NA
		1,2,3-Trichloropropane	0.5	PQL	C	93.7	NC	NA	0.000005	NA
		1,2,4-Trimethylbenzene	25	RBC	C	1040	NC	NA	NA	NA
		1,2-Dichloroethane	3.9	RBC	C	9.78	C	NA	0.5	5
		1,2-Dichloroethene (Total)	210	RBC	C	457	NC	NA	6 / 10	70 / 100
		1,2-Dichloropropane	1.8	RBC	C	28.7	C	NA	5	5
		1,3,5-Trimethylbenzene	19	RBC	C	733	NC	NA	NA	NA
		1,4-Dichlorobenzene	3.6	RBC	C	11.3	C	NA	5	75
		Benzene	0.63	RBC	C	6.93	C	NA	1	5
		Bromodichloromethane	1.7	RBC	C	3.82	C	NA	80	80
		Carbon Tetrachloride	0.5	PQL	C	1.81	C	NA	0.5	5
		Chlorobenzene	390	RBC	C	1720	NC	NA	70	100
		Chloroform	1.2	RBC	C	3.55	C	NA	80	80
		cis-1,2-Dichloroethene	210	RBC	C	1050	NC	NA	6	70
		cis-1,3-Dichloropropene	0.5	PQL	C	21.1	C	NA	0.5	NA
		Isopropylbenzene	7.8	RBC	C	3730	NC	NA	NA	NA
		Methylene Chloride	46	RBC	C	9230	C	NA	5	5
		Naphthalene	6	RBC	C	20.1	C	NA	NA	NA
		Tetrachloroethene	0.9	RBC	C	65.2	C	NA	5	5
		trans-1,3-Dichloropropene	0.5	PQL	C	21.1	C	NA	0.5	NA
		Trichloroethene	4.8	RBC	C	7.4	C	NA	5	5
		Trichlorofluoromethane	180	RBC	C	NITD		NA	150	NA
		Vinyl Chloride	0.5	PQL	C	2.45	C	NA	0.5	2
	Construction Worker	1,1,2-Trichloroethane	40	RBC	C	NA	NA	NA	NA	NA
		1,2,3-Trichloropropane	0.6	RBC	C	NA	NA	NA	NA	NA
		1,2,4-Trichlorobenzene	41	RBC	C	NA	NA	NA	NA	NA
		1,2,4-Trimethylbenzene	53	RBC	C	NA	NA	NA	NA	NA
		1,2-Dichlorobenzene	1700	RBC	C	NA	NA	NA	NA	NA
		1,2-Dichloroethane	22	RBC	C	NA	NA	NA	NA	NA
		1,2-Dichloroethene (Total)	270	RBC	C	NA	NA	NA	NA	NA
		1,2-Dichloropropane	30	RBC	C	NA	NA	NA	NA	NA
		1,4-Dichlorobenzene	52	RBC	C	NA	NA	NA	NA	NA

Table 4-6. Parcels C and UC-2 Chemicals of Concern and Current Comparison Criteria for Groundwater

Exposure Medium	Exposure Scenario	Chemical of Concern	Values from ROD			Current Comparison Criteria				
			ROD Remediation Goal (2009/2010)	Source of Remediation Goal	Parcel	11/2022 USEPA RSL or VISL[a]	Basis of RSL or VISL (C/NC)	DTSC-SL	California MCL	USEPA MCL
A-Aquifer (µg/L)	Construction Worker	Benzene	16	RBC	C	NA	NA	NA	NA	NA
		Bromodichloromethane	19	RBC	C	NA	NA	NA	NA	NA
		Carbon Tetrachloride	15	RBC	C, UC-2	NA	NA	NA	NA	NA
		Chlorobenzene	450	RBC	C	NA	NA	NA	NA	NA
		Chloroform	26	RBC	C	NA	NA	NA	NA	NA
		cis-1,2-Dichloroethene	270	RBC	C	NA	NA	NA	NA	NA
		Naphthalene	16	RBC	C	NA	NA	NA	NA	NA
		Tetrachloroethene	18	RBC	C	NA	NA	NA	NA	NA
		Trichloroethene	290	RBC	C	NA	NA	NA	NA	NA
		Vinyl Chloride	5.4	RBC	C	NA	NA	NA	NA	NA
		2,4-Dimethylphenol	9800	RBC	C	NA	NA	NA	NA	NA
		2,4-Dinitrotoluene	180	RBC	C	NA	NA	NA	NA	NA
		3,4-Dimethylphenol	700	RBC	C	NA	NA	NA	NA	NA
		4-Methylphenol	3500	RBC	C	NA	NA	NA	NA	NA
		Benzo(a)anthracene	0.67	RBC	C	NA	NA	NA	NA	NA
		Benzo(a)pyrene	0.05	RBC	C	NA	NA	NA	NA	NA
		Benzo(b)fluoranthene	0.45	RBC	C	NA	NA	NA	NA	NA
		Benzo(k)fluoranthene	0.45	RBC	C	NA	NA	NA	NA	NA
		Chrysene	6.7	RBC	C	NA	NA	NA	NA	NA
		Pentachlorophenol	50	PQL	C	NA	NA	NA	NA	NA
	Protection of the Environment	Chromium VI	50	SWC	C	NA	NA	NA	NA	NA
		Zinc	81	SWC	C	NA	NA	NA	NA	NA
B-Aquifer (RU-C5 Plume Only) (µg/L)	Residential - Domestic Use	Chromium VI [b]	109	RBC [c]	C	0.035	C	NA	50	100
		Antimony	6	MCL	C	7.8	NC	NA	6	6
		Arsenic	10	MCL	C	0.052	C	0.0082	10	10
		Iron	10,950	RBC	C	14000	NC	NA	NA	NA
		Manganese	8,140	HGAL	C	430	NC	NA	NA	NA
		Thallium	2	MCL	C	0.2	NC	0.059	2	2
		1,1-Dichloroethane	5	MCL	C	2.8	C	2.8 (USEPA)	5	NA
		1,2,4-Trichlorobenzene	70	MCL	C	1.2	C	0.46	5	70
		1,2,4-Trimethylbenzene	12	RBC	C	56	NC	NA	NA	NA
		1,2-Dichlorobenzene	600	MCL	C	30	NC	NA	600	600
		1,2-Dichloroethane	0.5	MCL	C	0.17	C	0.17 (USEPA)	0.5	5
		1,2-Dichloroethene (Total)	6	MCL	C	25	NC	6 / 10	6 / 10	70 / 100

Table 4-6. Parcels C and UC-2 Chemicals of Concern and Current Comparison Criteria for Groundwater

Exposure Medium	Exposure Scenario	Chemical of Concern	Values from ROD			Current Comparison Criteria				
			ROD Remediation Goal (2009/2010)	Source of Remediation Goal	Parcel	11/2022 USEPA RSL or VISL[a]	Basis of RSL or VISL (C/NC)	DTSC-SL	California MCL	USEPA MCL
B-Aquifer (RU-C5 Plume Only) (µg/L)	Residential - Domestic Use	1,2-Dichloropropane	5	MCL	C	0.85	C	NA	5	5
		1,3,5-Trimethylbenzene	12	RBC	C	60	NC	NA	NA	NA
		1,3-Dichlorobenzene	183	RBC [c]	C	NA	NA	NA	NA	NA
		1,4-Dichlorobenzene	5	MCL	C	0.48	C	NA	5	75
		Benzene	1	MCL	C	0.46	C	0.15	1	5
		Bromodichloromethane	80	MCL	C	0.13	C	0.13 (USEPA)	80	80
		Chlorobenzene	70	MCL	C	78	NC	NA	70	100
		Chloroethane	4.6	RBC [c]	C	8300	NC	NA	NA	NA
		Chloroform	80	MCL	C	0.22	C	NA	80	80
		cis-1,2-Dichloroethene	6	MCL	C	25	NC	12	6	70
		Methylene Chloride	5	MCL	C	11	C	1.7	5	5
		Naphthalene	0.093	RBC	C	0.12	C	0.12	NA	NA
		Tetrachloroethene	5	MCL	C	11	C	0.084	5	5
		trans-1,2-Dichloroethene	10	MCL	C	68	NC	110	10	100
		Trichloroethene	5	MCL	C	0.49	C	NA	5	5
		Trichlorofluoromethane	1,288	RBC	C	5200	NC	1700	150	NA
		Vinyl Chloride	0.5	MCL	C	0.019	C	0.0098	0.5	2
		2,4-Dimethylphenol	730	RBC [c]	C	360	NC	NA	NA	NA
		2,4-Dinitrotoluene	10	RBC [c]	C	0.24	C	0.11 (USEPA)	NA	NA
		2-Methylnaphthalene	24	RBC [c]	C	36	NC	17	NA	NA
		2-Methylphenol	1,825	RBC [c]	C	930	NC	NA	NA	NA
		4-Methylphenol	182	RBC [c]	C	370	NC	NA	NA	NA
		Benzo(a)anthracene	0.2	RBC [c]	C	0.03	C	0.017	NA	NA
		Benzo(a)pyrene	0.2	MCL	C	0.025	C	NA	0.2	0.2
		Bis(2-ethylhexyl)phthalate	4	MCL	C	5.6	C	NA	4	6
		Carbazole	10	RBC [c]	C	NA		NA	NA	NA
		Chrysene	0.2	RBC [c]	C	25	C	NA	NA	NA
		Dibenzofuran	12	RBC [c]	C	7.9	NC	4	NA	NA
		Hexachloroethane	1.7	RBC [c]	C	0.33	C	NA	NA	NA
		Pentachlorophenol	1	MCL	C	0.041	C	NA	1	1
		Aldrin	0.05	RBC [c]	C	0.00092	C	0.0092 (USEPA)	NA	NA
		alpha-BHC	1	RBC [c]	C	0.0072	C	0.011	NA	NA
		Dieldrin	0.02	RBC [c]	C	0.0018	C	0.00066 (USEPA)	NA	NA
		Heptachlor Epoxide	0.01	MCL	C	0.0014	C	0.0014 (USEPA)	0.01	0.2

Table 4-6. Parcels C and UC-2 Chemicals of Concern and Current Comparison Criteria for Groundwater

Exposure Medium	Exposure Scenario	Chemical of Concern	Values from ROD			Current Comparison Criteria				
			ROD Remediation Goal (2009/2010)	Source of Remediation Goal	Parcel	11/2022 USEPA RSL or VISL[a]	Basis of RSL or VISL (C/NC)	DTSC-SL	California MCL	USEPA MCL

[a] VISL presented for A-aquifer groundwater, RSL for B-aquifer groundwater.

[b] MCLs shown are for total chromium, no MCLs available for Chromium VI.

[c] Risk-based concentration was identified as "MCL" in the ROD.

Note:

Shading indicates current comparison criteria is lower than ROD Remediation Goal unless Remediation Goal is HGAL.

µg/L = microgram(s) per liter
BHC = benzene hexachloride
C = carcinogen
DTSC = California Department of Toxic Substances Control
HGAL = Hunters Point groundwater ambient level
MCL = maximum contaminant level
NA = not available
NC = noncarcinogen
NITD = no inhalation toxicity data
PQL = practical quantitation limit
RBC = risk-based concentration
ROD = Record of Decision
RSL = Regional Screening Level
SL = screening level
SWC = Surface Water Criteria
USEPA = United States Environmental Protection Agency
VISL = vapor intrusion screening level

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Table 4-7. Parcel C Chemicals of Potential Concern for Ecological Receptors - Groundwater

Exposure Medium	Exposure Scenario	Chemical of Concern	ROD Trigger Level (2008)	Source of Trigger Level	Receptor Basis	NRWQC (2023)	Basin Plan SF Bay (2019)	Value Still Protective?	Notes
Groundwater (µg/L)	Ecological Receptor	Chromium VI	50	NRWQC - CCC	aquatic organisms	50	50	Yes	Analyte was included in the monitoring due to detections at Dry Dock 2 and Building 253. Exceeding the trigger level does not indicate immediate risk but a potential exists if the plume migrates toward the bay. The trigger level is a risk based criteria for surface water exposures but is not an ARAR for ecological exposure to groundwater.
		Zinc	81	NRWQC - CCC	aquatic organisms	81	81	Yes	Analyte was included in the monitoring due to detections at RU-C1 wells. Exceeding the trigger level does not indicate immediate risk but a potential exists if the plume migrates toward the bay. The trigger level is a risk based criteria for surface water exposures but is not an ARAR for ecological exposure to groundwater.

µg/L = microgram(s) per liter
ARAR = applicable or relevant and appropriate requirement
CCC = Criterion Continuous Concentration
NRWQC = National Recommended Water Quality Criteria
ROD = Record of Decision

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Table 4-8. Parcel C and UC-2 Issues, Recommendations, and Follow-up Actions

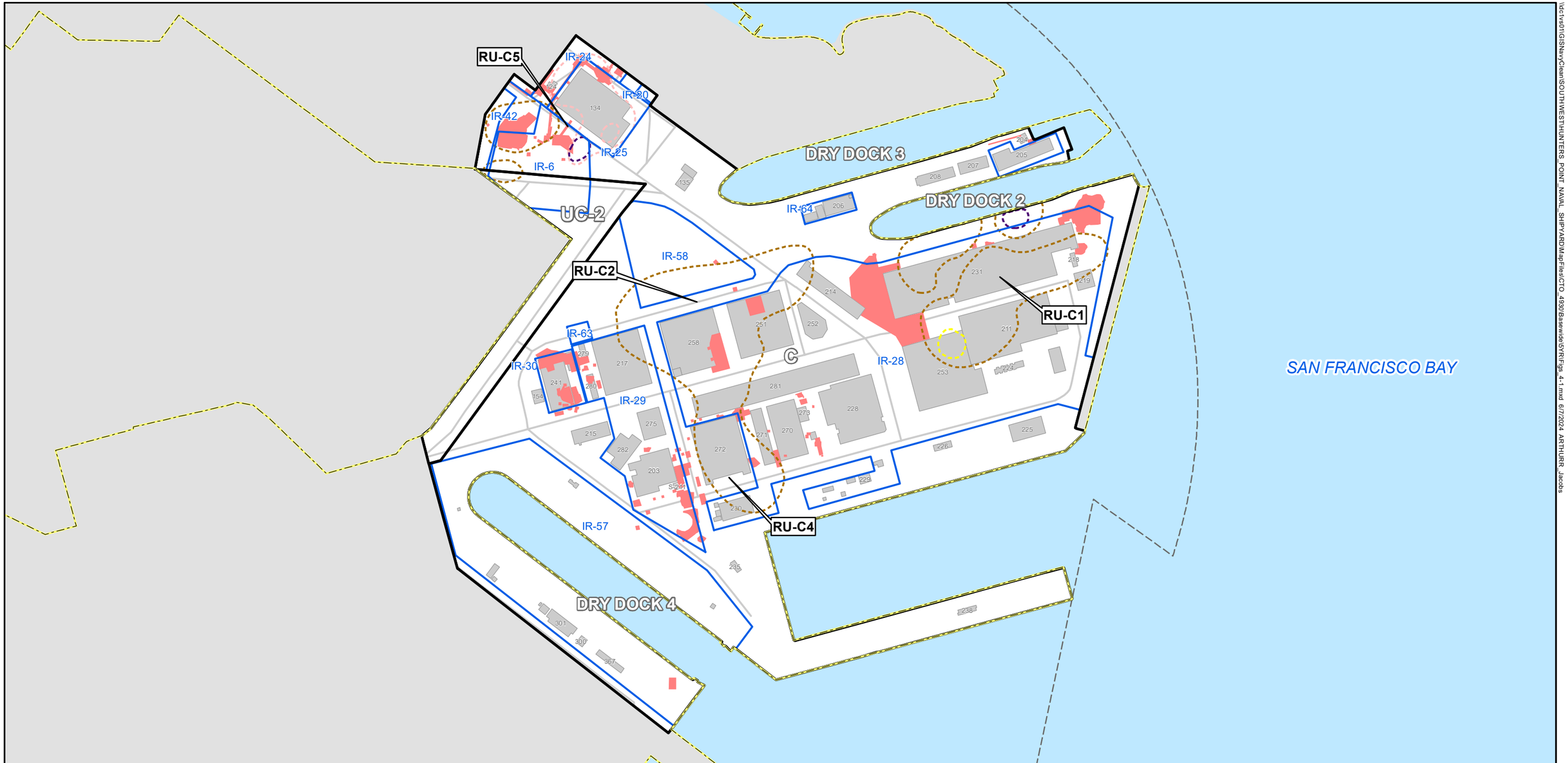
Parcel	Issue	Recommendations/ Actions	Party Responsible	Oversight Agency	Milestone Date	Affects Protectiveness (Y/N)	
						Current	Future
C	As identified in the Fourth Five-Year Review there is uncertainty with a portion of the radiological survey and remediation work performed between 2004 and 2016 under the Basewide Radiological Removal Action, Action Memorandum (Navy, 2006). The Navy is in the process of implementing corrective actions to ensure the radiological remedies specified in the decision documents were implemented as intended; however, this work is ongoing.	Complete radiological retesting at radiologically impacted sites, including current and former buildings and soil areas investigated under the Radiological Removal Action, Action Memorandum (Navy, 2006) and areas where evaluations determined previous data were unreliable.	Navy	USEPA	2/5/2025	N	Y
UC-2					3/2/2028		
C	There have been detections of COCs from A-aquifer groundwater within the B-aquifer and F-WBZ groundwater and the connection and communication between hydrogeologic units within Parcel C is not fully understood. Therefore, further characterization is required to demonstrate that remedies within the A-aquifer will be effective and not re-contaminated by COCs within the B-aquifer and deep F-WBZ and unacceptable discharges to the Bay are not and will not occur.	Complete investigations of the bay Mud/Sandy Lean Clay aquitard and extent of chemicals in the B-aquifer and F-WBZ, and use current ecological risk assessment methods and criteria to assess potential impacts to bay receptors. Where warranted, additional actions or changes to the remedy will be recommended at the conclusion of these investigations.	Navy	USEPA	5/31/2027 Interim Milestones: Five-Year Review Addendum 7/31/2025 Completion of F-WBZ investigation fieldwork 11/30/2025, Completion of F-WBZ investigation report 11/30/2026	Protectiveness Deferred	

Table 4-8. Parcel C and UC-2 Issues, Recommendations, and Follow-up Actions

Reference:

Navy. *2006. Base-wide Radiological Removal Action, Action Memorandum – Revision 2006, Hunters Point Shipyard, San Francisco, California*. Final. April 21.

Navy = Department of the Navy
TBD = to be determined
USEPA = United States Environmental Protection Agency

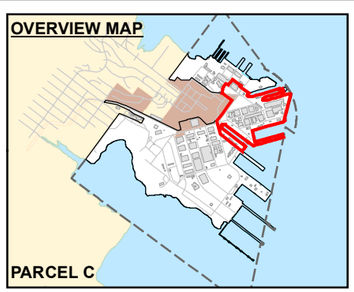


LEGEND

- Hunters Point Naval Shipyard Boundary
- Parcel Boundary
- Parcel F (Water) Boundary
- IR Site
- COC Excavation Area
- Water
- Building
- Road

Plume Detection Area

- Chromium VI
- Chromium VI, Zinc
- Naphthalene
- VOC



COC = chemical of concern
IR = Installation Restoration
RU = remediation unit
VOC = volatile organic compound

0 200 400 Feet
1 inch = 350 feet
N

Parcel C (Parcels C and UC-2)

**Fifth Five-Year Review Report
Hunters Point Naval Shipyard, San Francisco, California**

NAVFAC Naval Facilities Engineering Systems Command

Figure 4-1

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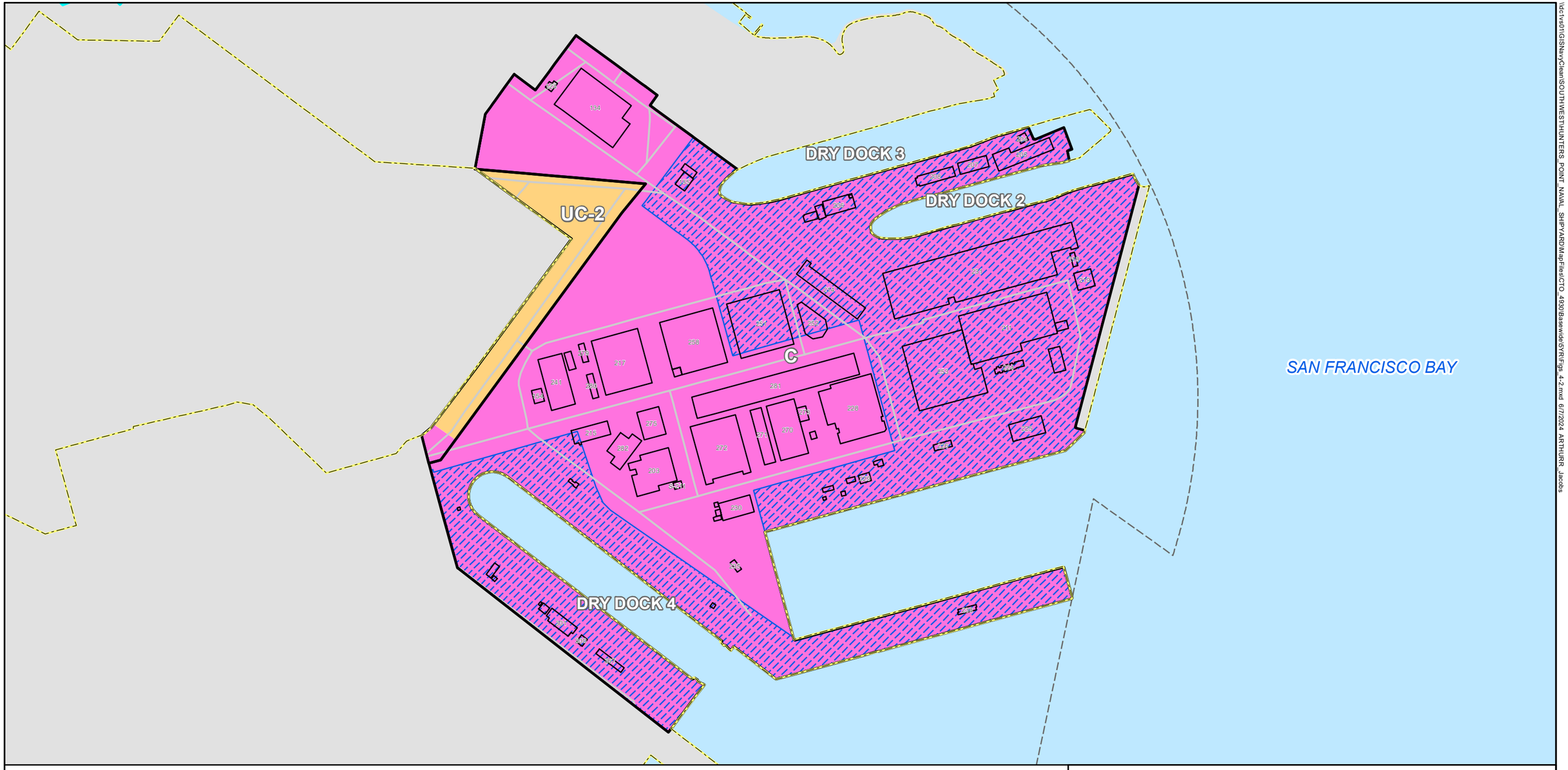


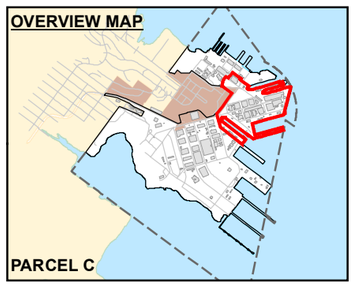
LEGEND

- Hunters Point Naval Shipyard Boundary
- Parcel Boundary
- Parcel F (Water) Boundary
- Water
- Building
- Road

Institutional Controls

- Additional Restrictions (Open Space, Educational/Cultural, and/or Maritime/Industrial Use
- ARIC for Soil and Groundwater Use (General)
- ARIC for Soil, Groundwater Use, and Restrictions Related to VOC Vapors

OVERVIEW MAP



ARIC = area requiring institutional controls
VOC = volatile organic compound

0 175 350 Feet
1 inch = 350 feet

N

Parcel C (Parcels C and UC-2) Institutional Controls

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

NAVFAC Naval Facilities Engineering Systems Command

Figure 4-2

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LEGEND:

- BUILDING WITH FOUNDATION REPAIRED
- ASPHALTIC CONCRETE COVER
- ARMORED SHORELINE
- BUILDING SECURED (FOUNDATION NOT ACCESSIBLE)
- SWALE
- 2-FOOT SOIL COVER WITH VEGETATION
- MONITORING WELL IN EXTERIOR DURABLE COVER
- APPROXIMATE BOUNDARY OF SVE AREA (INSTALLED)
- APPROXIMATE BOUNDARY OF SVE AREA (PLANNED)
- APPROXIMATE BOUNDARY OF REMEDIAL UNIT
- APPROXIMATE BOUNDARY OF GROUNDWATER TREATMENT AREA
- PARCEL C BOUNDARY LINE
- OTHER PARCEL BOUNDARY LINE
- FENCE OR BARRIER
- UNDERGROUND STORM DRAIN LINE

N

0’ 250’

Note:
1. The system at SVE Area 3 was expanded in 2016 to treat SVE Areas 4 and 5.
2. SVE Area 2 is pending comple on of groundwater remedia on in the area.

Source:
Innovex-ERRG Joint Venture. 2019. *Fourth Five-Year Review, Hunters Point Naval Shipyard, San Francisco, California.* Figure 6. July.

Figure 4-3
Overview of Remedy Components for Parcel C
Fifth Five-Year Review Report
Hunters Point Naval Shipyard
San Francisco, California

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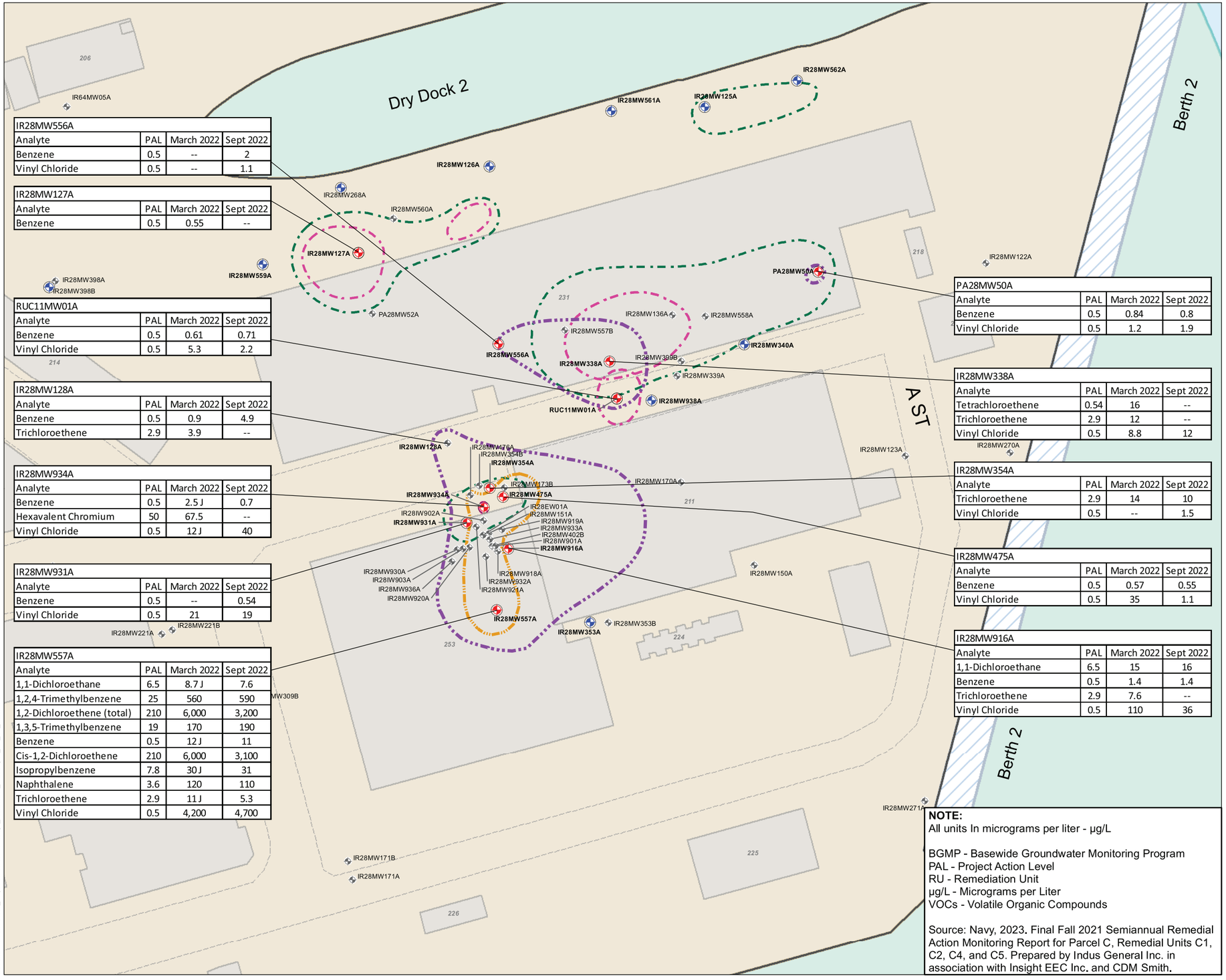


IR28MW556A			
Analyte	PAL	March 2022	Sept 2022
Benzene	0.5	--	2
Vinyl Chloride	0.5	--	1.1

IR28MW127A			
Analyte	PAL	March 2022	Sept 2022
Benzene	0.5	0.55	--

RUC11MW01A			
Analyte	PAL	March 2022	Sept 2022
Benzene	0.5	0.61	0.71
Vinyl Chloride	0.5	5.3	2.2

IR28MW128A			
Analyte	PAL	March 2022	Sept 2022
Benzene	0.5	0.9	4.9
Trichloroethene	2.9	3.9	--

IR28MW934A			
Analyte	PAL	March 2022	Sept 2022
Benzene	0.5	2.5 J	0.7
Hexavalent Chromium	50	67.5	--
Vinyl Chloride	0.5	12 J	40

IR28MW931A			
Analyte	PAL	March 2022	Sept 2022
Benzene	0.5	--	0.54
Vinyl Chloride	0.5	21	19

IR28MW557A			
Analyte	PAL	March 2022	Sept 2022
1,1-Dichloroethane	6.5	8.7 J	7.6
1,2,4-Trimethylbenzene	25	560	590
1,2-Dichloroethene (total)	210	6,000	3,200
1,3,5-Trimethylbenzene	19	170	190
Benzene	0.5	12 J	11
Cis-1,2-Dichloroethene	210	6,000	3,100
Isopropylbenzene	7.8	30 J	31
Naphthalene	3.6	120	110
Trichloroethene	2.9	11 J	5.3
Vinyl Chloride	0.5	4,200	4,700

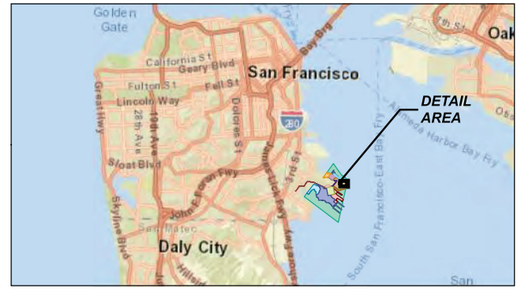
PA28MW50A			
Analyte	PAL	March 2022	Sept 2022
Benzene	0.5	0.84	0.8
Vinyl Chloride	0.5	1.2	1.9

IR28MW338A			
Analyte	PAL	March 2022	Sept 2022
Tetrachloroethene	0.54	16	--
Trichloroethene	2.9	12	--
Vinyl Chloride	0.5	8.8	12

IR28MW354A			
Analyte	PAL	March 2022	Sept 2022
Trichloroethene	2.9	14	10
Vinyl Chloride	0.5	--	1.5

IR28MW475A			
Analyte	PAL	March 2022	Sept 2022
Benzene	0.5	0.57	0.55
Vinyl Chloride	0.5	35	1.1

IR28MW916A			
Analyte	PAL	March 2022	Sept 2022
1,1-Dichloroethane	6.5	15	16
Benzene	0.5	1.4	1.4
Trichloroethene	2.9	7.6	--
Vinyl Chloride	0.5	110	36



LEGEND

- IR26MW51A — Monitoring Well exceeding remediation goals
- IR26MW71A — BGMP Monitoring Well
- IR26MW43A — Other Monitoring Well (Not Sampled)
- Roads

Parcels

- C
- F (Pier)
- Buildings
- F (Water)
- Approximate Area of Groundwater COC Plume that exceed RGs
- Approximate Area of Groundwater COC Plume that exceed ATCs
- Aerobic ISB Treatment
- Anaerobic ISB Treatment Area
- ZVI / Anaerobic ISB Treatment
- ZVI Treatment Area

GRAPHIC SCALE
N
0 100 FEET

NOTE:
All units In micrograms per liter - µg/L

BGMP - Basewide Groundwater Monitoring Program
PAL - Project Action Level
RU - Remediation Unit
µg/L - Micrograms per Liter
VOCs - Volatile Organic Compounds

Source: Navy, 2023. Final Fall 2021 Semiannual Remedial Action Monitoring Report for Parcel C, Remedial Units C1, C2, C4, and C5. Prepared by Indus General Inc. in association with Insight EEC Inc. and CDM Smith.

Source:
TRBW. 2023. *2022 Basewide Annual Groundwater Monitoring Report, Hunters Point Naval Shipyard, San Francisco, California*. December 2023. FINAL

Figure 4-4
March and September 2022 Exceedances of Remediation Goals in Parcel C Remedial Units C-1
Fifth Five-Year Review Report
Hunters Point Naval Shipyard
San Francisco, California

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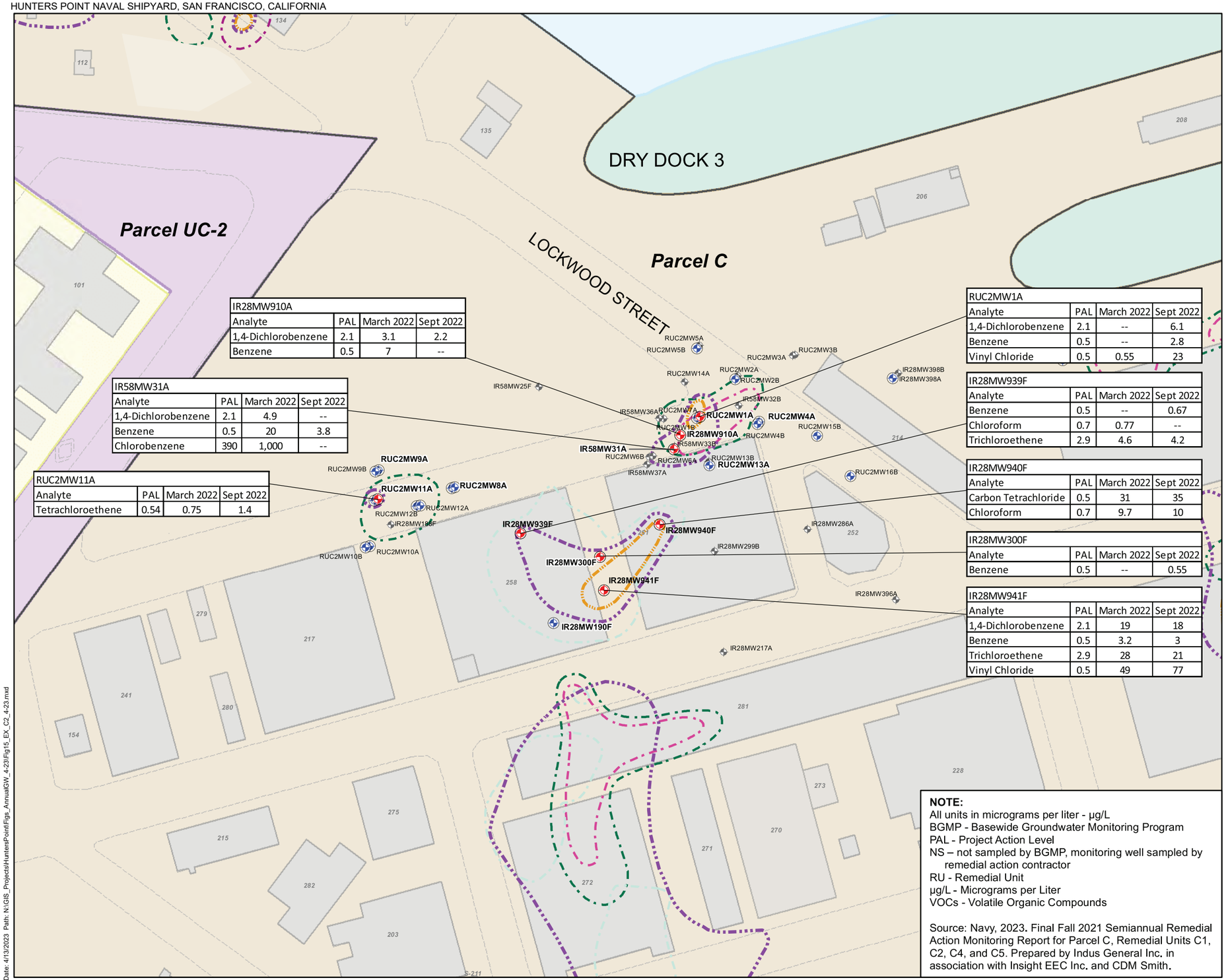

IR28MW910A			
Analyte	PAL	March 2022	Sept 2022
1,4-Dichlorobenzene	2.1	3.1	2.2
Benzene	0.5	7	--

IR58MW31A			
Analyte	PAL	March 2022	Sept 2022
1,4-Dichlorobenzene	2.1	4.9	--
Benzene	0.5	20	3.8
Chlorobenzene	390	1,000	--

RUC2MW11A			
Analyte	PAL	March 2022	Sept 2022
Tetrachloroethene	0.54	0.75	1.4

RUC2MW1A			
Analyte	PAL	March 2022	Sept 2022
1,4-Dichlorobenzene	2.1	--	6.1
Benzene	0.5	--	2.8
Vinyl Chloride	0.5	0.55	23

IR28MW939F			
Analyte	PAL	March 2022	Sept 2022
Benzene	0.5	--	0.67
Chloroform	0.7	0.77	--
Trichloroethene	2.9	4.6	4.2

IR28MW940F			
Analyte	PAL	March 2022	Sept 2022
Carbon Tetrachloride	0.5	31	35
Chloroform	0.7	9.7	10

IR28MW300F			
Analyte	PAL	March 2022	Sept 2022
Benzene	0.5	--	0.55

IR28MW941F			
Analyte	PAL	March 2022	Sept 2022
1,4-Dichlorobenzene	2.1	19	18
Benzene	0.5	3.2	3
Trichloroethene	2.9	28	21
Vinyl Chloride	0.5	49	77

LEGEND

- IR26MW51A — Monitoring Well exceeding remediation goals
- IR26MW71A — BGMP Monitoring Well
- IR26MW43A — Other Monitoring Well (Not Sampled)
- Roads

Parcels

- C
- F (Water)
- UC-2
- Buildings
- Non - Navy Property
- Approximate Area of Groundwater COC Plume that exceed RGs
- Approximate Area of Groundwater COC Plume that exceed ATCs
- Aerobic ISB Treatment
- Anaerobic ISB Treatment Area
- ZVI / Anaerobic ISB Treatment
- ZVI Treatment Area

GRAPHIC SCALE
0 125 FEET

NOTE:
All units in micrograms per liter - µg/L
BGMP - Basewide Groundwater Monitoring Program
PAL - Project Action Level
NS – not sampled by BGMP, monitoring well sampled by remedial action contractor
RU - Remedial Unit
µg/L - Micrograms per Liter
VOCs - Volatile Organic Compounds

Source: Navy, 2023. Final Fall 2021 Semiannual Remedial Action Monitoring Report for Parcel C, Remedial Units C1, C2, C4, and C5. Prepared by Indus General Inc. in association with Insight EEC Inc. and CDM Smith.

Source:
TRBW. 2023. *2022 Basewide Annual Groundwater Monitoring Report, Hunters Point Naval Shipyard, San Francisco, California.* December 2023. FINAL

Figure 4-5
March and September 2022 Exceedances of Remediation Goals in Parcel C Remedial Unit C-2
Fifth Five-Year Review Report
Hunters Point Naval Shipyard
San Francisco, California

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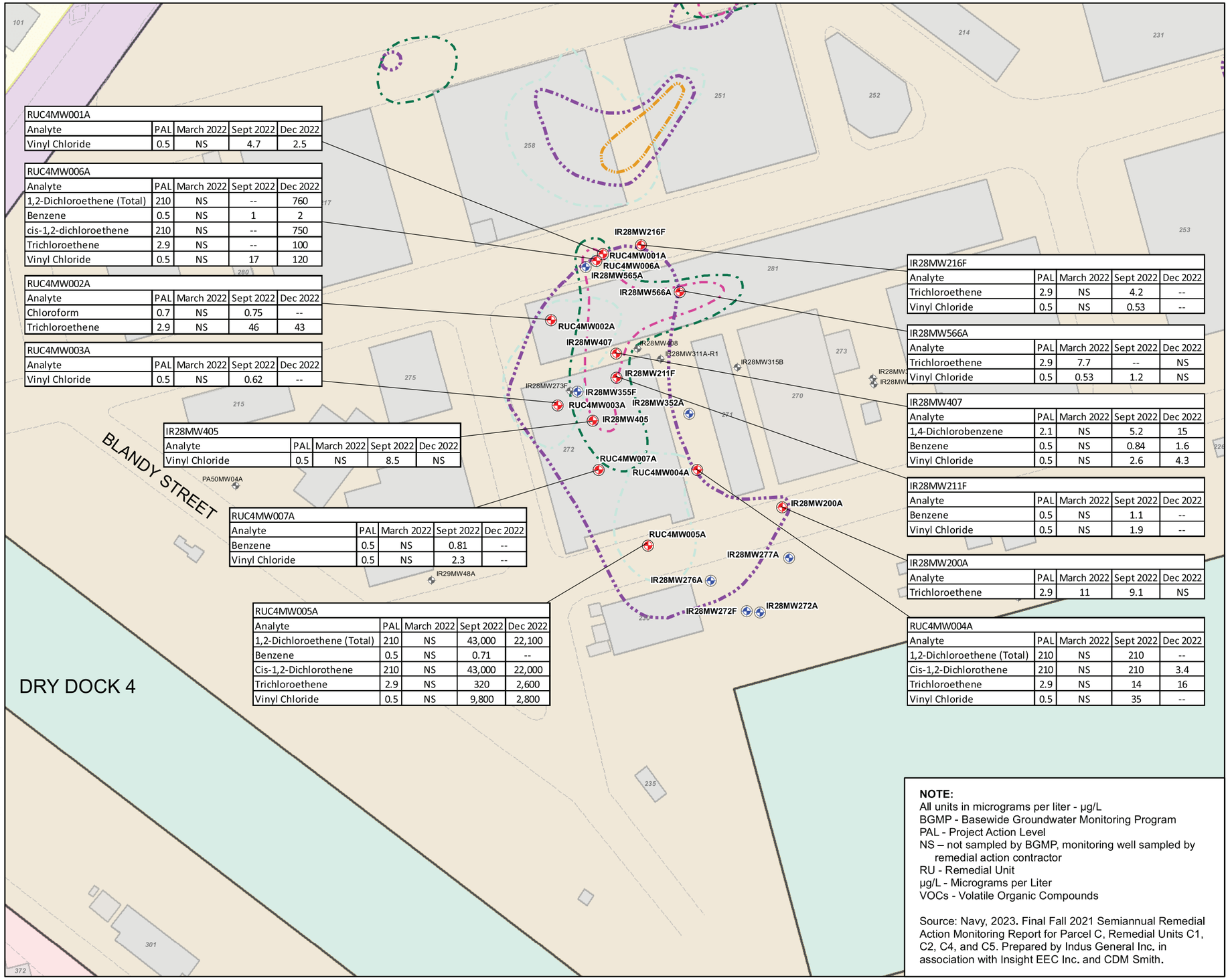

RUC4MW001A				
Analyte	PAL	March 2022	Sept 2022	Dec 2022
Vinyl Chloride	0.5	NS	4.7	2.5

RUC4MW006A				
Analyte	PAL	March 2022	Sept 2022	Dec 2022
1,2-Dichloroethene (Total)	210	NS	--	760
Benzene	0.5	NS	1	2
cis-1,2-dichloroethene	210	NS	--	750
Trichloroethene	2.9	NS	--	100
Vinyl Chloride	0.5	NS	17	120

RUC4MW002A				
Analyte	PAL	March 2022	Sept 2022	Dec 2022
Chloroform	0.7	NS	0.75	--
Trichloroethene	2.9	NS	46	43

RUC4MW003A				
Analyte	PAL	March 2022	Sept 2022	Dec 2022
Vinyl Chloride	0.5	NS	0.62	--

IR28MW405				
Analyte	PAL	March 2022	Sept 2022	Dec 2022
Vinyl Chloride	0.5	NS	8.5	NS

RUC4MW007A				
Analyte	PAL	March 2022	Sept 2022	Dec 2022
Benzene	0.5	NS	0.81	--
Vinyl Chloride	0.5	NS	2.3	--

RUC4MW005A				
Analyte	PAL	March 2022	Sept 2022	Dec 2022
1,2-Dichloroethene (Total)	210	NS	43,000	22,100
Benzene	0.5	NS	0.71	--
Cis-1,2-Dichlorothene	210	NS	43,000	22,000
Trichloroethene	2.9	NS	320	2,600
Vinyl Chloride	0.5	NS	9,800	2,800

IR28MW216F				
Analyte	PAL	March 2022	Sept 2022	Dec 2022
Trichloroethene	2.9	NS	4.2	--
Vinyl Chloride	0.5	NS	0.53	--

IR28MW566A				
Analyte	PAL	March 2022	Sept 2022	Dec 2022
Trichloroethene	2.9	7.7	--	NS
Vinyl Chloride	0.5	0.53	1.2	NS

IR28MW407				
Analyte	PAL	March 2022	Sept 2022	Dec 2022
1,4-Dichlorobenzene	2.1	NS	5.2	15
Benzene	0.5	NS	0.84	1.6
Vinyl Chloride	0.5	NS	2.6	4.3

IR28MW211F				
Analyte	PAL	March 2022	Sept 2022	Dec 2022
Benzene	0.5	NS	1.1	--
Vinyl Chloride	0.5	NS	1.9	--

IR28MW200A				
Analyte	PAL	March 2022	Sept 2022	Dec 2022
Trichloroethene	2.9	11	9.1	NS

RUC4MW004A				
Analyte	PAL	March 2022	Sept 2022	Dec 2022
1,2-Dichloroethene (Total)	210	NS	210	--
Cis-1,2-Dichlorothene	210	NS	210	3.4
Trichloroethene	2.9	NS	14	16
Vinyl Chloride	0.5	NS	35	--

LEGEND

- IR26MW51A — Monitoring Well exceeding remediation goals
- IR26MW71A — BGMP Monitoring Well
- IR26MW43A — Other Monitoring Well (Not Sampled)
- Roads

Parcels

- C
- F (Water)
- UC-2
- Buildings
- Non - Navy Property
- Approximate Area of Groundwater COC Plume that exceed RGs
- Approximate Area of Groundwater COC Plume that exceed ATCs
- Aerobic ISB Treatment
- Anaerobic ISB Treatment Area
- ZVI / Anaerobic ISB Treatment
- ZVI Treatment Area

GRAPHIC SCALE
N
0 125 FEET

NOTE:
All units in micrograms per liter - µg/L
BGMP - Basewide Groundwater Monitoring Program
PAL - Project Action Level
NS – not sampled by BGMP, monitoring well sampled by remedial action contractor
RU - Remedial Unit
µg/L - Micrograms per Liter
VOCs - Volatile Organic Compounds

Source: Navy, 2023. Final Fall 2021 Semiannual Remedial Action Monitoring Report for Parcel C, Remedial Units C1, C2, C4, and C5. Prepared by Indus General Inc. in association with Insight EEC Inc. and CDM Smith.

Source:
TRBW. 2023. *2022 Basewide Annual Groundwater Monitoring Report, Hunters Point Naval Shipyard, San Francisco, California.* December 2023. FINAL

Figure 4-6
March and September 2022 Exceedances of Remediation Goals in Parcel C Remedial Units C-4
Fifth Five-Year Review Report
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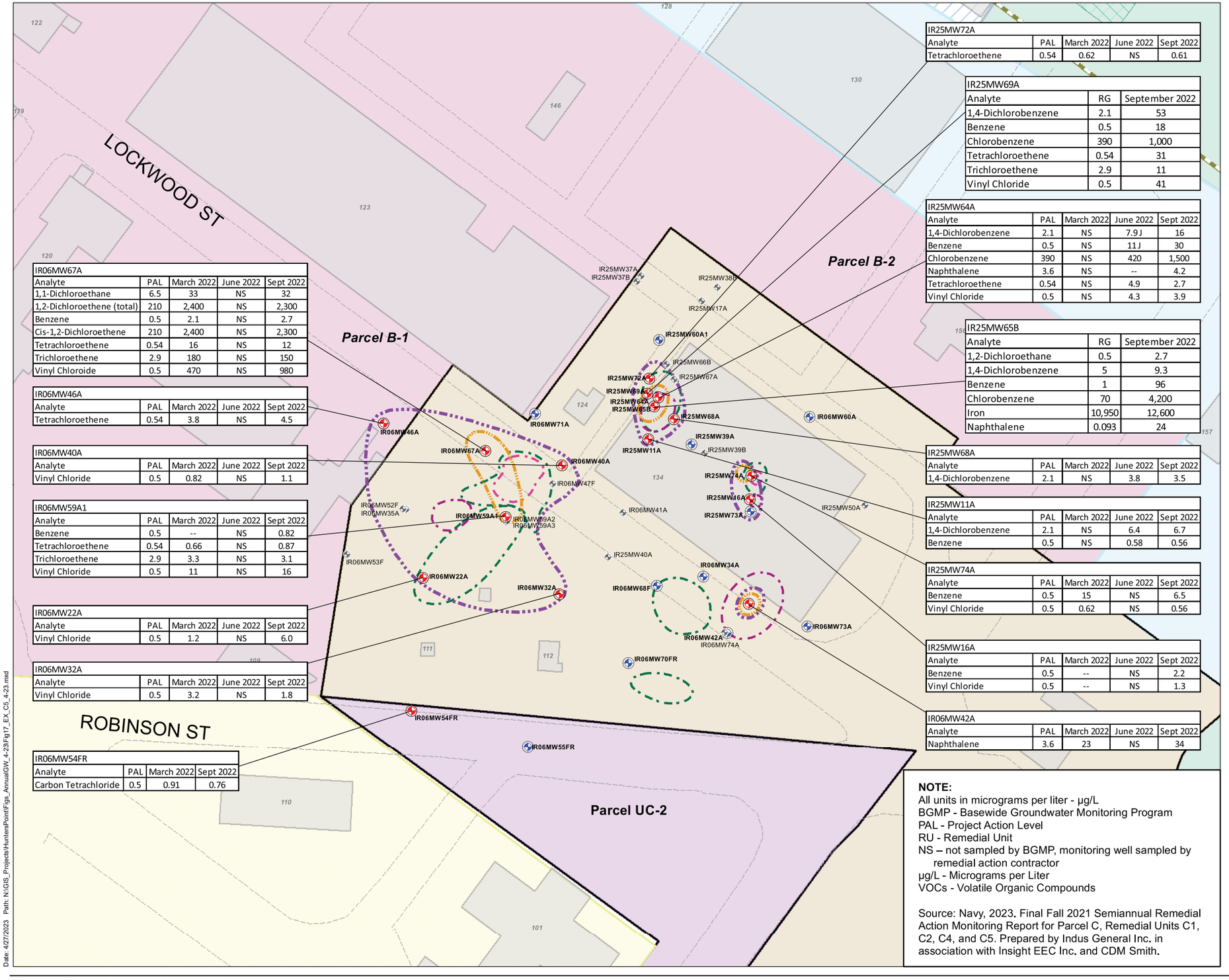


IR06MW67A				
Analyte	PAL	March 2022	June 2022	Sept 2022
1,1-Dichloroethane	6.5	33	NS	32
1,2-Dichloroethene (total)	210	2,400	NS	2,300
Benzene	0.5	2.1	NS	2.7
Cis-1,2-Dichloroethene	210	2,400	NS	2,300
Tetrachloroethene	0.54	16	NS	12
Trichloroethene	2.9	180	NS	150
Vinyl Chloroide	0.5	470	NS	980

IR06MW46A				
Analyte	PAL	March 2022	June 2022	Sept 2022
Tetrachloroethene	0.54	3.8	NS	4.5

IR06MW40A				
Analyte	PAL	March 2022	June 2022	Sept 2022
Vinyl Chloride	0.5	0.82	NS	1.1

IR06MW59A1				
Analyte	PAL	March 2022	June 2022	Sept 2022
Benzene	0.5	--	NS	0.82
Tetrachloroethene	0.54	0.66	NS	0.87
Trichloroethene	2.9	3.3	NS	3.1
Vinyl Chloride	0.5	11	NS	16

IR06MW22A				
Analyte	PAL	March 2022	June 2022	Sept 2022
Vinyl Chloride	0.5	1.2	NS	6.0

IR06MW32A				
Analyte	PAL	March 2022	June 2022	Sept 2022
Vinyl Chloride	0.5	3.2	NS	1.8

IR06MW54FR			
Analyte	PAL	March 2022	Sept 2022
Carbon Tetrachloride	0.5	0.91	0.76

IR25MW72A				
Analyte	PAL	March 2022	June 2022	Sept 2022
Tetrachloroethene	0.54	0.62	NS	0.61

IR25MW69A		
Analyte	RG	September 2022
1,4-Dichlorobenzene	2.1	53
Benzene	0.5	18
Chlorobenzene	390	1,000
Tetrachloroethene	0.54	31
Trichloroethene	2.9	11
Vinyl Chloride	0.5	41

IR25MW64A				
Analyte	PAL	March 2022	June 2022	Sept 2022
1,4-Dichlorobenzene	2.1	NS	7.9 J	16
Benzene	0.5	NS	11 J	30
Chlorobenzene	390	NS	420	1,500
Naphthalene	3.6	NS	--	4.2
Tetrachloroethene	0.54	NS	4.9	2.7
Vinyl Chloride	0.5	NS	4.3	3.9

IR25MW65B		
Analyte	RG	September 2022
1,2-Dichloroethane	0.5	2.7
1,4-Dichlorobenzene	5	9.3
Benzene	1	96
Chlorobenzene	70	4,200
Iron	10,950	12,600
Naphthalene	0.093	24

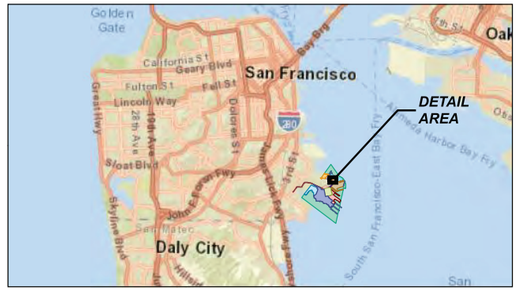
IR25MW68A				
Analyte	PAL	March 2022	June 2022	Sept 2022
1,4-Dichlorobenzene	2.1	NS	3.8	3.5

IR25MW11A				
Analyte	PAL	March 2022	June 2022	Sept 2022
1,4-Dichlorobenzene	2.1	NS	6.4	6.7
Benzene	0.5	NS	0.58	0.56

IR25MW74A				
Analyte	PAL	March 2022	June 2022	Sept 2022
Benzene	0.5	15	NS	6.5
Vinyl Chloride	0.5	0.62	NS	0.56

IR25MW16A				
Analyte	PAL	March 2022	June 2022	Sept 2022
Benzene	0.5	--	NS	2.2
Vinyl Chloride	0.5	--	NS	1.3

IR06MW42A				
Analyte	PAL	March 2022	June 2022	Sept 2022
Naphthalene	3.6	23	NS	34



LEGEND

- IR26MW51A — Monitoring Well exceeding remediation goals
- IR26MW71A — BGMP Monitoring Well
- IR26MW43A — Other Monitoring Well (Not Sampled)
- Roads
- Parcel B seawall

Parcels

B-1, C, F (Water), B-2, UC-2, F (Pier), Non - Navy Property, Buildings

- Approximate Area of Groundwater COC Plume that exceed RGs
- Approximate Area of Groundwater COC Plume that exceed ATCs
- Aerobic ISB Treatment
- Anaerobic ISB Treatment Area
- ZVI / Anaerobic ISB Treatment
- ZVI Treatment Area

GRAPHIC SCALE
N
0 100 FEET

NOTE:
All units in micrograms per liter - µg/L
BGMP - Basewide Groundwater Monitoring Program
PAL - Project Action Level
RU - Remedial Unit
NS – not sampled by BGMP, monitoring well sampled by remedial action contractor
µg/L - Micrograms per Liter
VOCs - Volatile Organic Compounds

Source: Navy, 2023. Final Fall 2021 Semiannual Remedial Action Monitoring Report for Parcel C, Remedial Units C1, C2, C4, and C5. Prepared by Indus General Inc. in association with Insight EEC Inc. and CDM Smith.

Source:
TRBW. 2023. *2022 Basewide Annual Groundwater Monitoring Report, Hunters Point Naval Shipyard, San Francisco, California.* December 2023. FINAL

Figure 4-7
March and September 2022 Exceedances of Remediation Goals in Parcel C Remedial Unit C-5 and Parcel UC-2
Fifth Five-Year Review Report
Hunters Point Naval Shipyard
San Francisco, California

Date: 4/27/2023 Path: N:\GIS_Projects\HuntersPoint\Figs_Annual\GW_4-23\Fig17_EX_C5_4-23.mxd

2303071115911_589d933e Figure_4-7_2022Exceedances_C-5_UC-2

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LEGEND:

- IR06MW54F / (12.38) — MONITORING WELL AND WELL ID / WATER LEVEL ELEVATION (MSL)*
- EXISTING BUILDING
- ASPHALT PAVEMENT COVER
- SOIL COVER
- ADJACENT NAVY PARCEL
- ADJACENT NON–NAVY PROPERTY
- PARCEL BOUNDARY
- CATCH BASIN
- MANHOLE
- SANITARY SEWER
- STORM DRAIN
- SETTLEMENT MONUMENT
- FIRE HYDRANT
- WATER VALVE
- UTILITY FEATURE STREET LIGHT
- UTILITY POLE APPROX. LOCATION
- UTILITY FEATURE
- FENCE
- CONCRETE WALL

Source:
Innovex-ERRG Joint Venture. 2019. *Fourth Five-Year Review, Hunters Point Naval Shipyard, San Francisco, California.* Figure 12. July.

Figure 4-8
Overview of Remedy Components for Parcel UC-2
Fifth Five-Year Review Report
Hunters Point Naval Shipyard
San Francisco, California

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5.0 Former Parcel D (Parcels D-1, D-2, UC-1, and G)

5.1 Site History and Background

Former Parcel D was formerly part of the industrial support area and was used for shipping, ship repair, and office and commercial activities. Portions of the parcel were used by NRDL (Navy, 2009a).

Former Parcel D is located in the central portion of HPNS and is bordered by Former Parcel C to the northeast, Parcel A to the north/northwest, Parcel E to the west/southwest and the San Francisco Bay to the east. Former Parcel D covered approximately 98 acres which has been subdivided into Parcel D-1 (48.7 acres), Parcel D-2 (5 acres), Parcel UC-1 (3.6 acres), and Parcel G (40 acres) (**Figure 5-1**).

The following IR sites are located in Former Parcel D:

- Parcel D-1: IR-16, IR-17, IR-22, IR-32, IR-35, IR-48, IR-53, IR-55, IR-68, IR-69, and IR-70
- Parcel D-2: none
- Parcel UC-1: none
- Parcel G: IR-09, IR-33, IR-34, IR-37, IR-44, IR-65, IR-66, IR-67, and IR-71

IR-09, the former Pickling and Plate Yard was identified as a source of chromium VI and possibly nickel in groundwater. IR-71 was identified as a solvent plume area. Investigations and actions at Parcel D began in 1988, as shown in the following chronology:

Parcel D Chronology	
Date	**Investigation/Action**
1988–1997	RI
1989	PCB-Contaminated Soil Removal at IR-08
1991-1993	UST and Aboveground Storage Tank Removal
1994	SI for Parcels B, C, D, and E
1991-1995	Basewide removal of sandblast waste
1994-1996	Contaminated equipment and residue removal – IR-09
1996	Removal of Cesium-Impacted Soil (Building 364)
1996–1997	Exploratory Excavation Removal Action
1996–1997	Removal of Storm Drain Sediment
1996–1997	FS
2001	TCRA for Non-VOCs in Soil
2001-2002	Radiological TCRA
2002	Groundwater Data Gaps Investigation
2002–2003	Waste Consolidation and Removal Activities
2003–2004	Soil Stockpile Removal Action
2004	HRA

Parcel D Chronology	
Date	**Investigation/Action**
2004-ongoing	Groundwater Monitoring under BGMP
2006–2011	Storm Drain and Sanitary Sewer Removal Actions
2007	Revised FS
2008-2009	Treatability Study for Groundwater at Parcels D-1 and G
2/2009	ROD for Parcel G
7/2009	ROD for Parcels D-1 and UC-1
8/2010	NFA ROD for Parcel D-2
2010-2011	Soil excavation and removal Parcel G
2010-2013	Soil Excavation and Removal at Parcel D-1 Phase I Radiological TCRA for Parcel D-1
2011	RACR for Soil Hotspot Removal at Parcel D and G
2012	Durable Cover Installation Parcel UC-1
2012-2013	Durable Cover Installation Parcel G
2013	Third Five-Year Review for HPNS RACR for Durable Covers and Groundwater Remediation in Parcel UC-1
2014	RACR for Durable Covers in Parcel G
2014-2017	Phase II Radiological TCRA for Parcel D-1
2015	Parcel UC-1 Transferred to OCII
2016-2018	Durable Cover Installation at Parcel D-1
4/2017	ESD to the Final ROD for Parcel G
2018	RACR for Durable Cover in Phase I area of Parcel D-1
2019	Fourth Five-Year Review for HPNS
2022-ongoing	Radiological Retesting in Parcel G
2023	Focused FS Parcel D-1

5.2 Site Characterization

This section summarizes the findings from various investigations at Former Parcel D that are pertinent to the Five-Year Review.

5.2.1 Physical Characteristics

5.2.1.1 Surface Features

Former Parcel D is located in the lowlands portion of HPNS and ground surface elevations range between 0 and 10 feet above msl. The majority (approximately 85 percent) of the surface

is covered with pavement and former industrial buildings. Surface water runoff was historically collected in the storm drain system and discharged to the bay through outfalls; however, the storm drains and sewer lines were removed during radiological investigations and stormwater is redirected to San Francisco Bay via surface drainage swales.

5.2.1.2 Geology and Hydrogeology

The majority of the parcel consists of lowlands that were filled by placing borrowed fill material from various sources, including crushed serpentinite bedrock from the adjacent highland, construction debris, and waste materials (such as used sandblast materials). The serpentinite bedrock and serpentine bedrock-derived fill material consist of minerals that naturally contain asbestos and relatively high concentrations of arsenic, manganese, nickel, and other ubiquitous metals.

The following is a summary of hydrostratigraphic units at Former Parcel D (SulTech, 2007):

- **A-Aquifer**: The A-aquifer is present throughout Former Parcel D. Groundwater flow is complex because it is affected by a groundwater sink located near the former boundary of Parcel D (currently in Parcel E), a groundwater mound in Parcel E, leaks of groundwater into former sanitary sewers, recharge from water supply lines, and tides in the bay. Most groundwater flows toward the bay except in the western portion of Parcel D which flows away from the mound and toward the sink in Parcel E. The A-aquifer averages between 10 and 40 feet thick with an average thickness of 25 feet over most of Former Parcel D. Tidal fluctuations were observed from 150 to 500 feet inland from the bay.
- **Bay Mud**: The Bay Mud is absent in the northern part of Former Parcel D (Parcels D-2, UC-1, and G) where the A-aquifer is in direct communication with the bedrock aquifer. It is thickest in the southeastern part of the parcel (Parcel D-1).
- **B-Aquifer**: The B-aquifer consists of small laterally discontinuous permeable sediment lenses of gravel, sand, silty sand, or clayey sand intermingled with aquitard. The largest B-aquifer area is present near the center of the parcel (Parcel G) and is approximately 1,500 feet wide, 1,000 feet long and 20 to 30 feet thick. It is not present in Parcel D-2 and UC-1. Groundwater elevations range from 0 to 2 feet above msl through the majority of Parcel D-1 and the eastern portion of Parcel G, to an elevation of 3 to 4 feet above msl in the western portion of Parcel G (TRBW, 2023). Groundwater flow is generally to the southeast.

As discussed in **Section 1.3.4.3**, the entire A-aquifer meets the Resolution 88-63 exception criteria. Although it does not meet the Resolution 88-63 exception criteria, the B-aquifer has a low potential for drinking water use.

5.2.2 Land Use

5.2.2.1 Current Land Use

Parcels D-1 and G are currently owned by the federal government under the jurisdiction of the Navy. There are no tenants at Parcels D-1 and G.

Parcels D-2 and UC-1 were transferred out of federal ownership to the OCII in late 2015. Redevelopment activities were temporarily suspended pending completion of the corrective actions related to the radiological remediation. In the interim, access restrictions are in place to limit exposure of property users to hazardous substances.

5.2.2.2 Future Land Use

According to the Redevelopment Plan (OCII, 2018), Parcel D-1 land use will predominantly include parks and open space; however, land use in the northern portion of the parcel will be identical to Parcels D-2, G, and UC-1. Land use at Parcels D-2, G, and UC-1 will include office and industrial, hotel, infrastructure/utility, multi-media and digital arts, institutional, civic, arts and entertainment, residential, parks and recreation uses (if not subject to applicable environmental restrictions).

5.2.3 Basis for Taking Action

This section describes the results of site investigations and risk assessments that provide the basis for taking action at Parcel D. Details are provided in the RI (PRC et al., 1996), FS (SulTech, 2007), Parcels D-1 and UC-1 ROD (Navy, 2009a), Parcel G ROD (Navy, 2009b) and Parcel D-2 ROD (Navy, 2010).

5.2.3.1 Site Investigations and Pre-ROD Removal Actions

Previous investigations at Former Parcel D identified metals and PAHs in soil (Parcels D-1, UC-1, and G), metals and VOCs in groundwater (Parcels D-1 and G), and radiologically impacted structures and soil (Parcels D-1, D-2, UC-1, and G).

Several removal actions have occurred throughout Former Parcel D including underground storage tank removals, sandblast grit removal, storm drain sediment removal, and a TCRA to remove contaminated soil from IR-09, IR-37, and IR-65 within Parcel G. Contamination in soil and groundwater remained after these removal actions (Navy, 2009a, 2009b).

A groundwater treatability study was conducted prior to the RODs using ZVI to address VOCs in two plumes (identified as IR-71 West and IR-71 East) originating in Parcel G and extending into Parcel D-1. Approximately 136,000 pounds of ZVI was injected into 88 groundwater injection points in the IR-71 West plume between October and December 2008. A post-injection groundwater and soil vapor assessment was conducted between December 2008 and April 2009 to verify the effectiveness of the ZVI treatment. The treatability study concluded the IR-71 West plume required treatment with ZVI to address chloroform in groundwater and the IR-71 East plume did not require treatment to address VOCs in groundwater (Alliance, 2010).

5.2.3.2 Human Health Risk

A quantitative HHRA was completed for Parcel D as part of the RI (PRC et al., 1996), updated in the 2002 draft revised FS for Parcel D, and updated again in the 2007 Revised FS (SulTech, 2007) to account for the soil data collected during the 2004 TCRA, and to incorporate changes in regulatory guidance and toxicological criteria that occurred since the previous HHRAs. Human health risks were characterized separately for COCs and ROCs. The following unacceptable human health risks from nonradiological chemicals were identified in the ROD for Parcels D-1, UC-1 and/or G (**Table 5-1**):

- Future industrial users from exposure to metals in surface soil (0 to 2 feet bgs) and subsurface soil (0 to 10 feet bgs), and VOCs in groundwater (in A-aquifer beneath Parcels D-1 and G through the vapor intrusion to indoor air pathway).
- Future recreational users from exposure to metals and PAHs in surface soil (0 to 2 feet bgs).
- Future residents (adult and child) from exposure to metals and PAHs in surface soil (0 to 2 feet bgs) and subsurface soil (0 to 10 feet bgs) and VOCs in groundwater (A-aquifer

beneath Parcels D-1 and G through the vapor intrusion to indoor air pathway and B-aquifer through domestic use).

- Future construction workers from exposure to metals and PAHs in subsurface soil (0 to 10 feet bgs) and VOCs and metals in A-aquifer groundwater via inhalation and through direct exposure in trenches.

There were no potential unacceptable human health risks associated with nonradiological chemicals for Parcel D-2 and no RA is required for nonradiological chemicals.

Additionally, ROCs within impacted buildings, storm drains, sanitary sewers, and associated soil were identified at Parcels D-1, D-2, UC-1, and G (**Table 5-2**) (TtEC, 2008).

5.2.3.3 Ecological Risk

The Navy concluded that limited viable habitat is available for terrestrial wildlife at Former Parcel D because most of the site is covered with pavement and most of the terrestrial component of the shoreline at Parcel D is paved (PRC et al., 1996). The tidal area associated with the shoreline is associated with Parcel F. Therefore, ecological risk associated with exposure to soil was not evaluated further.

The Navy completed a screening evaluation of surface water quality to assess potential exposure by aquatic wildlife to groundwater as it interacts with the surface water of San Francisco Bay. Results of the screening evaluation indicated two metals (chromium VI and nickel) in groundwater may pose a potential risk to aquatic wildlife. However, groundwater monitoring data indicate metals migrate at a much slower rate than groundwater flows; thus, discharge of metals to the bay is not imminent. COECs and TLs are presented in **Table 5-1**.

No COECs were identified in the B-aquifer.

5.3 Remedial Action Objectives

The ROD for Parcels D-1 and UC-1 was signed on July 24, 2009 (Navy, 2009b). **Table 5-3** summarizes the basis for action, RAOs, remedy components, performance metrics, and expected outcomes for Parcels D-1 and UC-1.

The ROD for Parcel G was signed on February 18, 2009 (Navy, 2009a) and the ESD was signed on April 19, 2017 (Navy, 2017). **Table 5-4** summarizes the basis for action, RAOs, remedy components, performance metrics, and expected outcomes for Parcel G. The presence of VOCs in groundwater and soil may contribute to the presence of VOC in soil gas, therefore the vapor intrusion pathway is included as a basis for action and development of RAOs.

The Navy developed RGs to meet the RAOs for soil, sediment, and RGs and TLs for groundwater which are summarized for COCs (or COECs) in **Table 5-1** and for ROCs in **Table 5-2.** The TLs are conservative, and exceedance of a TL does not necessarily indicate an immediate risk, given dilution and mixing with surface water; nonetheless a potential for ecological risk was identified if the metals in groundwater discharge undiluted to the bay.

The No Further Action ROD for Parcel D-2 was signed on August 9, 2010 (Navy, 2010).

5.4 Remedial Actions

5.4.1 Parcel D-1

The RA for Parcel D-1 includes the following major components:

- Soil excavation and removal to address COCs in soil
- Durable cover installation and maintenance to address COCs in soil
- In situ treatment for VOCs and metals in groundwater
- LTM of groundwater for COCs
- Radiological surveys and remediation through removal of all radiologically impacted soil and through decontamination (and demolition/dismantling if necessary) buildings, structures, and former building sites
- ICs for soil and groundwater

Remedy components are shown on **Figures 5-1** and **5-2**.

5.4.1.1 Remedy Implementation

Soil Excavation and Removal

Excavation and removal of soil containing COCs above RGs was conducted from 2010 to 2011 and in a second phase in 2013. In total, approximately 237 loose cubic yards of soil was excavated from six hotspot areas in Parcel D-1 to address PAH contamination in soil. Four of the hotspot areas were removed during the first phase of the RA conducted between August 2010 and May 2011. The two remaining hotspot areas were removed during the second phase of the RA conducted between May 2013 and July 2013, when the radiological screening yard was inactive. All excavated soil was disposed of offsite and the excavations were backfilled with clean imported soil (ERRG, 2011 and 2014). One soil stockpile, totaling 75 cubic yards, identified in the RD was also removed and disposed of offsite. Completion of construction activities is documented in the *RACR for Soil Hotspot Locations at Parcels B, D-1, and G* (ERRG, 2011).

Durable Cover Installation

Durable covers consist of seawall stabilization, asphalt concrete durable covers, and building foundations. Durable covers were installed in two phases at Parcel D-1. Phase I was conducted from May 2016 to February 2017 (APTIM, 2018, **Figure 5-3**) and Phase II was conducted from August to November 2018 (APTIM, 2021). Completion of the durable covers along with ICs discussed in **Section 1.3.4.2** meets the RAOs for soil at Parcel D-1. Response complete for the Phase I area soil is documented in the RACR for Parcel D-1, Phase I (APTIM, 2018). The RACR for Phase II is pending completion of a Focused FS to address radioactive objects that were identified during construction of the cover (discussed in **Radiological Surveys and Remediation** below).

- **Seawall Stabilization**. Repairs to the subgrade were made behind the Parcel D-1 seawalls along portions of the piers to provide a stable vertical surface for attaching the durable cover. Where necessary, granular fill or, where greater than 18 inches was needed, gabion baskets were used to restore the area behind the seawall to meet surrounding grade. A layer of geotextile was emplaced to minimize fine soil from entering the bay and prevent soil from "piping" through the riprap, and riprap was placed over the fabric. Along Berth 15 of the Gun Mole Pier, an approximately 40-foot long segment of seawall was heavily corroded and gabion baskets were installed along the interior sheet pile wall rather than the outer seawall. The durable cover was installed to the edge of the gabion basket and a fence and entry gate were installed surrounding the area to prevent access.

- **Asphalt Cover**. New asphalt cover was installed over portions of the site that did not have an existing asphalt cover. Low-lying areas were filled with clean fill and a minimum 4-inch thick layer of recycled aggregate base course was emplaced with a minimum 2-inches of asphaltic concrete wear surface. Areas with existing asphalt cover were repaired either by removing and replacing the cover or by repairing where cracks were between ¼ to ¾ inches wide by hot-pouring crack sealant.
- **Building foundation repairs**. Eleven buildings are located within Parcel D-1: Buildings 274, 306, 307, 308, 368, 369 381, 523, 525, 526, and 530. Where needed, building foundation repairs were completed by using a variety of materials such as concrete, non-shrink grout, and asphaltic concrete, to prevent access to underlying soil. Building foundations that could not be restored or repaired (for example, historical buildings) were secured using a combination of steel plates, framed plywood walls, wire mesh, and/or chain-link fence to prevent access. Access to soil under buildings through crawlspaces and vaults was blocked with durable wire mesh or secured with steel ties. A transformer was found inside of Building 369 and testing indicated that the oil did not contain PCBs so it was recycled (APTIM, 2018). Asbestos tile was identified in Buildings 526 and 530, which was removed and disposed of by a California-licensed asbestos abatement contractor (APTIM, 2021).

In Situ Groundwater Remediation

The active treatment portion of the IR-71 plume was conducted within Parcel G and is discussed in **Section 5.4.4**. There were no active groundwater treatment activities conducted within the boundary of Parcel D-1.

Groundwater Monitoring

Groundwater monitoring is conducted under the BGMP to evaluate COCs concentration trends. VOC analysis was discontinued in 2012 since concentrations were below the RG and were stable and declining (Navy, 2012). Annual and semiannual groundwater monitoring reports from 2019 through 2022 were reviewed (TRBW, 2020a, 2020b, 2021, 2022a, 2022b, 2023). Three monitoring wells are currently sampled semiannually for metals. There were no exceedances of the TLs during any of the sampling events (**Appendix E**). Concentrations of metals have remained under RGs and TLs since 2004 with the exception of silver in July 2008 and lead in September 2015 in 1 monitoring well.

The Parcel D-1 RAMP (ChaduxTt, 2011a) states that groundwater samples will be collected semiannually until at least two years after property redevelopment to ensure redevelopment activities do not mobilize metals that could migrate into the bay.

Radiological Surveys and Remediation

The TCRA for radiologically impacted soil and structures at Parcel D-1 was completed in two phases. Phase I addressed the northern portion of Parcel D-1 and was initiated in 2009 and completed in 2013 (Shaw, 2014). The second phase was initiated in 2013 and completed in 2017. During Phase II excavation work, low-level radiological objects (ROs) were discovered in areas that were not considered radiologically impacted. The Navy determined that these objects were within the fill soil used to expand the shipyard after 1946. Based on the post-removal sampling completed during both phases, all radiologically impacted soil and structures identified in the HRA were removed. Additionally, there is a high degree of confidence that discrete ROs were removed to a depth of 2 feet bgs. However, there is a potential for ROs to be present in material below 2 feet bgs where shoreline expansion has occurred since 1946 (Gilbane, 2019).

The ROD anticipated that the TCRA for radiologically impacted structures would result in unrestricted radiological release of Parcel D-1. However, due to the potential for radiological items to be present in fill, unrestricted radiological release could not be achieved for Parcel D-1. Land use and activity restrictions are currently in place to prohibit land-disturbing activities throughout Parcel D-1 until the remedy is amended to mitigate risk to human health relating to the potential presence of ROs in material below 2 feet. The Focused FS to evaluate additional remedies to address radiologically impacted soil at was finalized in 2023 (Innovex-ERRG Joint Venture, 2023) and the Proposed Plan and Amended ROD is pending.

Institutional Controls

The entire area of Parcel D-1 (48.7 acres) is subject to soil and groundwater ICs. A portion of Parcel D-1 is also subject to ICs for VOCs; however, the extent is currently under evaluation as discussed in the following paragraph. IC performance objectives were developed and presented in the ROD (Navy, 2009b) and LUC RD (ChaduxTt, 2011b). The IC performance objectives to be implemented through land use restrictions for the site are summarized in **Table 1-3**.

Vapor intrusion ARICs are based on a soil gas survey completed in 2010 (Sealaska Environmental Services, 2013). As requested by USEPA, the Fourth Five-Year Review evaluated the SGALs and ARICs boundary for VOCs in soil gas based on a grid overlay and risk screening estimates/ grid block. One block was identified for additional investigation due to the noncancer hazard index exceeding 1.0. Current and future exposures are being controlled under Navy ownership; however, this additional block may warrant further evaluation prior to Navy transfer of this parcel (APTIM, 2021).

5.4.1.2 Remedy Operations and Maintenance

Ongoing O&M at Parcel D-1 includes maintaining the integrity of the durable covers and IC inspections. The inspection and maintenance requirements for the durable covers are described in the Final O&M Plan for Parcel D-1 (APTIM, 2018, 2019). AOMSRs are prepared to summarize inspections and maintenance performed and to document the effectiveness of the remedy components. AOMSRs from 2019, 2020, 2021, and 2022 were reviewed (Innovex-ERRG Joint Venture, 2020, 2021; APTIM, 2022, 2023).

Durable Cover Maintenance

The shoreline armoring was found to be in good condition with the exception of the north side of Gun Mole Pier during the 2021 inspection, which showed signs of rock movement, but the integrity of the riprap was not compromised and was still functioning.

Overall, the durable covers were in good repair with the exception of several cracks and subsidence areas on Gun Mole Pier. A large subsidence area that could not be repaired was identified during the 2020 inspection. Twelve subsidence areas were identified in 2021, nine of which were repaired, and three were deemed no longer repairable and the area was permanently fenced off to prevent access (APTIM, 2022). The Navy is currently conducting a shoreline assessment study to identify and recommend repairs and/or stabilization of structures and shoreline.

Institutional Controls Compliance

ICs are inspected annually and no deficiencies or inconsistent uses were observed during the reviews. General site conditions were determined to be good. Remedy components such as survey benchmarks and monitoring well vault covers were found to be in good condition.

Navy controls access to the parcel using security fencing, signage, locks, and gates which were found to be in good condition, with no signs of damage or vandalism.

5.4.2 Parcel UC-1

The RA for Parcel UC-1 includes the following major components:

- Durable cover installation and maintenance to address COCs in soil
- Radiological surveys and remediation through soil excavation and removal of sanitary sewer and storm drain lines and through decontamination (and demolition/dismantling if necessary) buildings, structures, and former building sites
- ICs for soil

Remedy components are shown on **Figures 5-1, 5-2,** and **5-4**.

5.4.2.1 Remedy Implementation

Durable Covers

Durable covers were constructed between May 14, 2012 and September 18, 2012. Completion of the durable covers along with ICs as discussed in **Section 1.3.4.2** meets the RAOs for soil in Parcel UC-1; response complete is documented in the RACR for Parcels UC-1 and UC-2 (ERRG, 2013). The RA included installation and repair of durable covers, including soil covers, asphalt covers, and building foundations, to minimize exposure of humans and wildlife to potential COCs in underlying soil. The following is a description of each cover type:

- **Soil Cover**. A 2-foot-thick soil cover comprised of clean imported fill was installed over previously vegetated areas by removing two feet of existing soil so that the surface of the newly installed cover matched historical site grades. Live beach strawberry, California poppy, and summer lupine plants were then hand-planted across the entire soil cover to provide future slope stability and aesthetic appeal.
- **Asphalt Covers**. An 8-inch asphalt cover, comprising 4 inches (minimum) of AC and 4 inches (minimum) of aggregate base, was installed. Existing asphalt covers that were in good condition were left in place and incorporated into the final asphalt pavement cover. Degraded existing asphalt covers were repaired by removing and replacing one or more of the following: asphalt concrete cover, aggregate base, or subbase material, depending the level of degradation. Asphalt concrete covers with minor cracking were repaired by applying an asphalt seal to fill the cracks.
- **Restored Building Foundations**. Concrete building foundations and sidewalks were restored and incorporated into the durable cover and cracks and penetrations were filled with non-shrink grout.

Radiological Surveys and Remediation

ROPCs at Parcel UC-1 include Cs-137, Co-60, Pu-239, Ra-226, Sr-90, Th-232, tritium (hydrogen-3), and uranium-235 (U-235) (Navy, 2009a). The Navy conducted TCRAs at Parcel UC-1 to address potential radioactive contamination in storm drains and sanitary sewer lines at Parcels UC-1 and UC-2 (ChaduxTt, 2010a; TtEC, 2011). In total, approximately 20,680 cubic yards of soil were excavated during removal of approximately 6,407 linear feet of sanitary sewer and storm drain lines. Approximately 1,138 cubic yards of soil was disposed of offsite as

LLRW based on surface scan and analytical laboratory results. Additionally, FSSs were performed at two radiologically impacted buildings (819 and 823) [TtEC, 2011].

The TCRA data was reviewed as described in **Section 1.4.3** and radiological retesting, including sampling and surveys of soils previously investigated during sanitary sewer line storm drain removal and resurvey of impacted buildings and former building sites, is in progress to determine if current site conditions are compliant with the RAOs.

Institutional Controls

The entire area of Parcel UC-1 is subject to soil ICs. The majority of Parcel UC-1 is also subjected to ARICs for VOCs. The IC performance objectives were developed and presented in the ROD (Navy, 2009b) and LUC RD (ChaduxTt, 2010b) and are summarized in **Table 1-3**. The ICs are currently being enforced through a Covenant to Restrict Use of Property recorded on September 16, 2015 (Navy, 2015).

5.4.2.2 Remedy Operations and Maintenance

Ongoing O&M at Parcel UC-1 is the responsibility of the OCII's contractor in accordance with the approved RMP (Geosyntec, 2019) and O&M plan (Navy, 2013). Annual reports from the OCII contractor summarizing durable cover O&M and IC inspections were reviewed (Geosyntec-Albion Joint Association, 2020, 2021, 2022).

Durable Cover Maintenance

Minor settling was observed during the 2021 inspection and evidence of burrowing pests within the soil cover were observed during the 2020 and 2021 inspections. Repairs were conducted in October 2020, December 2021, and January 2022. Vegetation in the soil cover is in good condition. In general, the durable cover was found in good condition with minor crack and pothole repairs completed during O&M.

Land Use Controls Compliance

No deficiencies or inconsistent uses were observed during the review period.

5.4.3 Parcel D-2

An NFA ROD was signed for Parcel D-2 in 2010 after the TCRA remediated all radiological concerns at Parcel D-2 (Navy, 2010). The pre-TCRA ROPCs at Parcel D-2 included Cs-137, Ra-226, Sr-90 (Navy, 2010). The Navy conducted TCRAs from 2004 to 2010 at Parcel D-2 to address potential radioactive contamination in storm drains and sanitary sewer lines and radiologically impacted structures. In total, 1,988 linear feet of trench and 1,434 cubic yards of soil were excavated; approximately 45 cubic yards of soil was disposed of offsite as LLRW based on surface scan and analytical laboratory results (TtEC, 2011a). Additionally, a FSS was performed at one radiologically impacted building (Building 813) (TtEC, 2011a).

The TCRA data was reviewed as described in **Section 1.4.3** and radiological retesting, including sampling and surveys of soils previously investigated during sanitary sewer line storm drain removal and resurvey of impacted buildings and former building sites, is in progress to determine if current site conditions are acceptable for UU/UE.

5.4.4 Parcel G

The RA for Parcel G includes the following major components:

- Soil excavation and removal to address COCs in soil

- Durable cover installation and maintenance to address COCs in soil
- In situ treatment to address COCs in groundwater
- Groundwater monitoring including MNA and LTM to address VOCs and metals in groundwater
- Radiological surveys and remediation through soil excavation and removal of sanitary sewer and storm drain lines and through decontamination (and demolition/dismantling if necessary) buildings, structures, and former building sites
- ICs for soil and groundwater

Remedy components are shown on **Figures 5-1, 5-2,** and **5-5**.

5.4.4.1 Remedy Implementation

Soil Excavation and Removal

In total, approximately 66 loose cubic yards of soil was excavated from two hotspot areas in Parcel G to address PAH and lead contamination in soil between August 2010 and May 2011. All excavated soil was disposed of offsite and the excavations were backfilled with clean imported soil. Two soil stockpile, totaling 20 cubic yards, identified in the RD were also removed and disposed of offsite. Completion of construction activities is documented in the *RACR for Soil Hotspot Locations at Parcels B, D-1, and G* (ERRG, 2011).

Durable Cover Installation

Durable covers at Parcel G consist of asphalt concrete durable covers and building foundations. Work was initiated in June 2012 and was completed in October 2013. Completion of the durable covers along with ICs discussed in **Section 1.3.4.2** meets the RAOs for soil at Parcel G; response complete for soil is documented in the RACR for Parcel G (Arcadis, 2014a).

- **Asphalt Durable Cover**. Existing asphalt concrete in functional and reparable condition were sealed with asphalt crack seal or, in areas with larger cracks, application of additional layers of asphalt concrete over the existing surface. Portions of Parcel G where asphalt pavement was not exposed at the ground surface received new pavement construction. New construction included the reuse of the aggregate base material present at the site and import of new aggregate base material. New pavement was constructed on approximately 66 percent of the exterior ground surface area or about 44 percent of the total parcel area. The overall thickness of the aggregate base was a minimum of 4 inches with a minimum of 2 inches of asphalt concrete wear surface. Pavement restoration and subgrade preparation were conducted in a manner that improves site drainage and directs runoff to the existing swales that run through Parcel G as specified in the Grading, Drainage, and Paving Plan (Arcadis, 2012). This improvement was achieved by establishing proper pavement grades and slopes that allow for positive drainage away from buildings and into the four swales on Parcel G, which run north to south, and limits upland accumulation of stormwater.
- **Building foundation repairs**. Twelve buildings are located within Parcel G: Buildings 302, 324, 351, 363, 366, 401, 402, 404, 407, 411, 415, and 439. Where needed, building foundation repairs were completed by using a variety of materials such as concrete, non-shrink grout, and asphaltic concrete, to prevent access to underlying soil. Building foundations that could not be restored or repaired were secured using a combination of steel plates, framed plywood walls, wire mesh, and/or chain-link fence to prevent access. Access

to soil under buildings through crawlspaces and vaults was blocked with durable wire mesh or secured with steel ties.

The site was secured with temporary K-rail barriers and signs to prevent access.

In Situ Groundwater Treatment

The Navy conducted a treatability study using ZVI at Parcel G in 2008 to evaluate technologies to address VOCs and metals in groundwater beneath IR-09 (North) and IR-71 (Alliance, 2010). Three additional plumes were originally identified for treatment (within IR-33, IR-71 East, and IR-09 South) but treatment was not required based on a soil gas investigation that indicated soil gas levels were acceptable. After the treatability study, concentrations of COCs in groundwater within the treatability study area dropped below the RGs established in the ROD except for groundwater at one well (IR09MW07A) in the deeper portion of the upper A-aquifer. The Navy decided, with the concurrence from the BCT, not to continue to treat the deeper portions of the A-aquifer. The risk related to VOCs in groundwater was based on migration to indoor air from the shallow groundwater, and the study concluded that the associated risk to commercial/industrial workers was less than the target risk threshold and that RAOs are being met. Response complete for groundwater treatment is documented in the RACR for Parcel G (Arcadis, 2014a).

Groundwater Monitoring

Groundwater monitoring is conducted under the BGMP to evaluate COCs concentration trends. Chromium VI sampling was discontinued in 2012 because concentrations were below the TL and were stable or decreasing (Navy, 2012). Annual and semiannual groundwater monitoring reports from 2019 through 2022 were reviewed (TRBW, 2020a, 2020b, 2021, 2022a, 2022b, 2023). Exceedances of the RGs (identified as PALs) from 2019, 2020, 2021, and 2022 are presented in **Appendix E**.

Two monitoring wells are sampled semiannually for VOCs under the BGMP; however, One monitoring well (IR71MW03A) was inaccessible because of the ongoing radiological rework during the 2021 and 2022 events. Chloroform and carbon tetrachloride exceeded the RG in 2022, and PCE has historically exceeded the RG in groundwater from IR71MW03A during one or more sampling events during this Five-Year Review period.

Radiological Surveys and Remediation

The ROPCs at Parcel G include Cs-137, Co-60, Pu-239, Ra-226, Sr-90, Th-232, tritium, and U-235 (Navy, 2009a). The Navy conducted a TCRA at Parcel G to address potential radioactive contamination in storm drains and sanitary sewer lines and radiologically impacted structures. In total, 50,688 cubic yards of soil were excavated during removal of 23,166 linear feet of sanitary sewer and storm drain lines. Approximately 6,228 cubic yards of soil was disposed of offsite as LLRW based on surface scan and analytical laboratory results. Additionally, FSSs were performed at seven radiologically impacted buildings (351, 351A, 366, 401, 408, 411, 439) and one former site (317/364/365) [TtEC, 2011b].

The TCRA data was reviewed as described in **Section 1.4.3** and radiological retesting, including sampling and surveys of soils previously investigated during sanitary sewer line storm drain removal and resurvey of impacted buildings and former building sites, is currently being conducted to determine if current site conditions are compliant with the RAOs.

Institutional Controls

The entire area of Parcel G (49 acres) is subject to soil and groundwater ICs. A portion of Parcel G is also subject to ICs for VOCs (**Figure 5-2**). IC performance objectives were developed and presented in the ROD (Navy, 2009b) and LUC RD (ChaduxTt, 2011b) and were updated in the ESD to remove residential restrictions throughout the majority of the site (Navy, 2017). The IC performance objectives to be implemented through land use restrictions for the site are summarized in **Table 1-3**.

5.4.4.2 Remedy Operations and Maintenance

Ongoing O&M at Parcel G includes maintaining the integrity of the durable covers and IC inspections. The inspection and maintenance requirements for the durable covers are described in the Final O&M Plan for Parcel G (Arcadis, 2014b). AOMSRs are prepared to summarize inspections and maintenance performed and to document the effectiveness of the remedy components. AOMSRs from 2019, 2020, 2021, and 2022 were reviewed (Innovex-ERRG Joint Venture, 2020, 2021; APTIM, 2022, 2023).

Durable Cover Maintenance

In general, the durable covers were in good condition with some minor subsidence around Building 351 that was repaired in 2019. Beginning in 2020, radiological retesting was being conducted which limited site access to perform durable cover inspections; however, the areas that could be inspected were in generally good condition with areas that could easily be repaired. Swales and check dams were in good condition.

Institutional Controls Compliance

ICs are inspected annually and no deficiencies or inconsistent uses were observed during the reviews. General site conditions were determined to be good. Remedy components such as survey benchmarks and monitoring well vault covers were found to be in good condition.

Navy controls access to the parcel using security fencing, signage, locks, and gates which were found to be in good condition, with no signs of damage or vandalism.

5.4.5 Progress Since the Fourth Five-Year Review

Issues, recommendations, and follow-up actions from the Fourth Five-Year Review are summarized in **Table 5-5**.

5.5 Technical Assessment

5.5.1 Question A: Is the Remedy Functioning as Intended by the Decision Document?

5.5.1.1 Parcel D-1

Yes. Based on the review of historical documents, annual O&M inspections, and the Five-Year Review inspection the remedy at Parcel D-1 is functioning as intended.

Soil hotspot areas were removed through excavation and offsite disposal. Exposure pathways to residual COCs that could result in an unacceptable risk are being controlled through durable covers and ICs. The shoreline revetment, soil cover, and asphalt cover are in good condition, and any minor issues have been repaired. Areas needing repair outside of typical O&M are secured to prevent access. Groundwater COCs have been consistently below TLs and RGs. The radiological component of the remedy is currently being revised to include the potential

presence of RO in soil deeper than 2 feet, in the interim, exposure pathways are being controlled through existing ICs. Radiological concerns are addressed through previous radiological surveys and remediation of soil and building structures and radiological retesting was initiated in 2023 to confirm that the RAO has been met, with the goal of unrestricted closure.

5.5.1.2 Parcel UC-1

Yes. Based on the review of historical documents, annual O&M inspections, and the Five-Year Review inspection the remedy at Parcel UC-1 is functioning as intended.

Exposure pathways that could result in an unacceptable risk are being controlled through durable covers and ICs. The soil and asphalt covers are in good condition, and any minor issues have been repaired. Radiological concerns are addressed through previous radiological surveys and remediation of soil and building structures and radiological retesting, with the goal of unrestricted closure. Radiological retesting was initiated in 2023.

5.5.1.3 Parcel D-2

There are no remedy components for Parcel D-2 in the decision document. Radiological concerns are addressed through previous radiological surveys and remediation of soil and building structures and radiological retesting, with the goal of unrestricted closure. Radiological was initiated in 2023.

5.5.1.4 Parcel G

Yes. Based on the review of historical documents, annual O&M inspections, and the Five-Year Review inspection the remedy at Parcel G is functioning as intended.

Soil hotspot areas were removed through excavation and offsite disposal. Exposure pathways to residual COCs that could result in an unacceptable risk are being controlled through durable covers and ICs. The durable covers are in good condition and any minor issues have been repaired. Groundwater monitoring of COCs is ongoing. In the interim, exposure pathways are being controlled through ICs. Radiological concerns are addressed through previous radiological surveys and remediation of soil and building structures and radiological retesting is being conducted to confirm that the RAO has been met, with the goal of unrestricted closure.

5.5.2 Question B: Are the Exposure Assumptions, Toxicity Data, Cleanup Levels, and Remedial Action Objectives Used at the Time of the Remedy Selection Still Valid?

Yes. Based on the results of the ARAR evaluation, HHRA analysis, and ERA analysis discussed in the following sections, the exposure assumptions, toxicity data, cleanup levels, and RAOs used at the time of remedy selection are still valid. Although there have been some changes to toxicity values and risk assessment methods, these changes do not affect remedy protectiveness.

5.5.2.1 ARAR Evaluation

The Navy evaluated the ARARs established in the RODs and ESD for Parcels D-1, D-2, G, and UC-1, collectively known as Former Parcel D. No changes to location-specific or action-specific ARARs that would affect the protectiveness of the remedies were identified. Changes to chemical-specific ARARs for individual chemicals are discussed in the HHRA and ERA Analysis that follows.

The California Public Resources Code Division 20.6.5, California Sea Level Rise Mitigation and Adaptation Act of 2021, was passed in 2021; however, no regulations have been promulgated to implement the Act. The Navy is addressing SLR as discussed in Section 2.2.2 of this Five-Year Review.

5.5.2.2 HHRA Analysis

As **Section 3.5.2.1** notes, in 2018, the State of California promulgated the TCR. However, the Navy continues to view the values identified in the USEPA IRIS database (a Tier 1 value) as the primary source of toxicity factors for risk-related calculations. The HHRA evaluation was conducted by comparing the human health RGs from the RODs to current risk-based criteria based on the same exposure scenario, and ARARs, if available. Response complete for soil was achieved with hotspot excavation, durable cover construction and maintenance, and ICs as documented in the respective RACRs for Parcel D-1, UC-1, and G (ERRG, 2011, 2013; APTIM, 2018; Arcadis, 2014a). Therefore, any changes in exposure assumptions and toxicity data would not affect protectiveness of the remedy.

Table 5-6 shows the RGs and current comparison criteria for groundwater. The RGs for the groundwater COCs included in the ROD were based on consideration of exposure scenario-specific (residential or industrial vapor intrusion and construction worker trench exposure [A-aquifer], or residential domestic use [B-aquifer]) risk-based concentrations (based on a cancer risk of 10-6 or a noncancer hazard index of 1), laboratory PQLs, chemical-specific ARARs, and Hunters Point groundwater ambient levels. RGs were compared to the following current comparison criteria (USEPA, 2002a):

- A-aquifer groundwater: VISLs calculated using the current USEPA VISL calculator for the residential and commercial scenarios.
- B-aquifer groundwater: current USEPA tapwater RSLs, California MCLs, and USEPA MCLs.

For the majority of the COCs where the risk-based concentration was selected as the RG, the current risk-based concentration (RSL or VISL) is higher. For groundwater, the current risk-based concentration (VISL) for TCE for the residential receptor is slightly lower than the risk-based RG from the ROD (see **Table 5-6**). Although current risk-based levels are lower than the RGs in some cases, the ICs that are currently in place and the durable cover across the site prevent exposure to site media, and therefore, the remedy remains protective. There may be changes with HHRA analysis for the construction worker scenario. Changes in exposure parameter values would likely only result in a small change to HHRA results since standard construction worker exposure factors have not changed significantly since the RI was prepared (not orders of magnitude). The following construction worker exposure parameter values have changed since the original HHRA was prepared:

- The construction worker body weight used in the HHRA was 70 kilograms; however, the adult body weight used in HHRAs based on current USEPA guidance (USEPA, 2014) would be 80 kilograms.
- The skin surface area for a construction worker exposed to soil used in the HHRA was 5,700 cm^2; however, based on current USEPA guidance (USEPA, 2014), a construction worker skin surface area exposed to soil is 3,527 cm^2.
- The soil-to-skin adherence factor used in the HHRA for a construction worker was 0.8 milligram per cm^2, where the soil-to-skin adherence factor for a construction worker used

in a current HHRA would be 0.3 milligram per cm^2 (the 95th percentile adherence factor for construction workers [USEPA, 2004]).

- The skin surface area for exposure to groundwater used in the HHRA was 2,370 cm^2. A current HHRA would use a skin surface area of 6,032 cm^2 (the weighted average of mean values for head, hands, forearms, and lower legs [USEPA, 2011]).
- Additionally, for inhalation exposures for both groundwater and soil, inhalation toxicity values are now presented and used in milligram(s) per cubic meter (noncancer) or 1 microgram per cubic meter for cancer; therefore, the intake equations no longer incorporate inhalation rate.

Toxicity values could result in larger changes (potential orders of magnitude changes), such as for TCE, for which toxicity values were updated in 2009 after the initial HHRA was completed. However, those changes will not affect the RGs for the construction worker scenario identified in the ROD because ICs require identification and management of potential risks to construction workers through the preparation and approval of plans and specifications for all construction activities that may pose unacceptable exposure to construction workers. There have been no changes in current exposure pathways based on the site controls, or changes in planned future site use since the ROD that would change the protectiveness of the current remedy.

Radiological Risk Review

In October 2020, after the preparation of the Five-Year Review addenda, USEPA introduced a PRG calculation method called “Peak PRG,” which computes PRGs accounting for ingrowth and decay of progeny over time. An evaluation was performed for this Five-Year Review to assess whether this change affected the continued protectiveness of the current soil RGs for future residents. Exposure calculations were performed using the USEPA PRG Calculator (USEPA, 2022b). For this soil evaluation, the estimated excess cancer risk was calculated using the “Peak Risk” time interval of 1,000 years (Navy, 2020). The soil RGs were used as exposure point concentrations and the cumulative cancer risk was calculated as the sum of risks from all ROCs. **Appendix F** presents the calculated estimated excess cancer risks calculated from this evaluation and the supporting data. Under CERCLA, cleanup goals are considered protective if excess cancer risks from site exposures remain within the 10^{-4} to 10^{-6} range. Based on the findings of this evaluation, the soil RGs are within this range and continue to be protective for future residential exposures.

There were no changes to the risk assessment methods related to structures or buildings for radiological concerns since the last Five-Year Review.

5.5.2.3 ERA Analysis

There were no COECs identified for Former Parcel D. However, groundwater has been monitored for chromium VI and nickel to evaluate potential for risk to aquatic organisms in San Francisco Bay should groundwater reach the bay. **Table 5-7** presents the TLs and current surface water quality criteria. The chronic marine NRWQC (USEPA, 2023) was set as the TL for chromium VI. This value has not changed since the ROD was completed. The TL for nickel is the HGAL and represents ambient conditions. The TLs remain current and protective of surface water exposures for aquatic organisms. Surface water TLs are for monitoring purposes only as surface water benchmarks are not ARARs for ecological exposures to groundwater.

5.5.3 Question C: Has Any Other Information Come to Light that Could Question the Protectiveness of the Remedy?

Yes. As identified in the Fourth Five-Year Review there is uncertainty with a portion of the radiological survey and remediation work. The Navy is in the process of implementing corrective actions to ensure the radiological remedies specified in the decision documents were implemented as intended; however, this work is ongoing. Radiological retesting is currently being conducted at Parcels G, D-1, D-2, and UC-1; long-term protectiveness will be confirmed upon completion.

5.6 Issues, Recommendations, and Follow-up Actions

Issues, recommendations, and follow-up actions were identified for Parcels D-1, UC-1, D-2, and G as summarized in **Table 5-8**.

5.6.1 Other Findings

The following findings were identified that do not directly relate to achieving or maintaining remedy protectiveness but are relevant to overall site management.

5.6.1.1 PFAS

As discussed in **Section 1.4.1,** a Basewide PA was conducted to identify potential PFAS release areas based on historical use or limited sampling data. The following is a summary of the areas identified for additional investigation in the PA (Multi-MAC JV, 2022) and SI (Liberty JV, 2023b):

- **Parcels D-1 and G A-aquifer groundwater:** A-aquifer groundwater beneath Parcels D-1 and G was identified for additional investigation because of past industrial use in the Parcels and PFOA, PFOS, and PFHxS exceeded project screening levels in soil and groundwater during the SI (**Appendix G**).
- **Parcel D-1:** Poseidon Area (Buildings 377, 384, 385, and 387), IR-69 (Bilge Water Pump House), and IR-70 (Former drum and tank storage area) were identified as areas where further investigation is warranted to determine the presence of PFAS in soil based on historical site use. Upon further review and visual inspections, the Poseidon Area was not sampled in the SI as there was limited soil to sample and any release that may have occurred as a result of site operations would have been released into San Francisco Bay over 40 years ago (no later than 1972). It is also significant to note that this area was identified for the storage of AFFF but there is no evidence that a release of AFFF had occurred (Liberty JV, 2023a). However, it was recommended for further investigation because PFAS were detected in other areas of HPNS.
- **Parcel G:** IR-09 (Pickling and Plating Yard) was identified as an area where further investigation is warranted based on historical site use and limited groundwater sampling results that contained PFOA PFOS, PFBS, and PFHxS. PFOA, PFOS, and PFHxS exceeded project screening levels in groundwater during the SI.

There were no areas identified for investigation in Parcels D-2 and UC-1. Exposure to groundwater and soil is restricted by ICs within the HPNS and the City and County of San Francisco prohibits installation of domestic wells within city and county limits.

5.6.1.2 Climate Resilience

The CRA estimates that groundwater emergence due to SLR may occur within Parcel D-1 by the year 2035 and Parcel G by the year 2065 (**Appendix A**). Site-specific studies are planned to verify these mapping projections and evaluate the 2100 timeframe, at a minimum. Parcel D-1 will be prioritized and is scheduled to be initiated in 2025.

However, protectiveness is only affected when increased CERCLA risk attributable to climate hazards has been identified (groundwater is likely to emerge and land use is such that receptors could be exposed and a future unacceptable health or ecological risk has been identified, data collected, validated, and evaluated following CERCLA risk assessment processes resulting in unacceptable risk to receptors). Where the potential for increased vapor intrusion is identified in other CERCLA documents, ARICs for VOCs are present, groundwater is being monitored, and removal of VOCs is occurring either through MNA or active remediation, thus reducing the potential for future vapor intrusion by reducing the source. Therefore, the potential for groundwater emergence does not affect the protectiveness determination in this Five-Year Review.

There are no anticipated effects of SLR on Parcels D-2 and UC-1.

A site-specific study is recommended at Parcels D-1 and G to assess whether the projected climate change vulnerabilities are likely to result in additional CERCLA risk.

5.6.1.3 Site Management Strategy

The Navy is reassessing the site management strategy for Parcels D-1 and G based on the following considerations:

- The Navy is planning to conduct a detailed assessment of groundwater COC concentrations to document and eliminate COCs that have achieved response complete and to tabulate groundwater and soil COC concentrations to ensure health and safety professionals have the information needed to protect future construction workers.
- The Navy is also planning to optimize the monitoring frequency and locations for areas that have not undergone any changes that could affect the concentrations of chemicals and/or metals in groundwater (for example, remedial action or development construction). Optimize, in this case, means to balance the cost of continued monitoring at the frequency and locations with the land use. It could mean decreasing or increasing depending on whether land use changes that could affect exposure. For example, reducing monitoring frequency when the parcel is awaiting transfer and is generally unused and increasing frequency upon transfer and land use changes from construction or other activities.

5.7 Statement of Protectiveness

5.7.1 Parcel D-1

Protectiveness Determination: Short-term Protective

Protectiveness Statement: The remedy at Parcel D-1 is currently protective of human health and the environment. In order to determine whether the remedy can be considered protective in the long term, the radiological retesting work will be completed, and additional actions implemented to address the potential presence of ROs in subsurface soil.

The RAOs for soil are met through soil hotspot excavation and offsite disposal, durable covers, and ICs. Groundwater monitoring is ongoing and COCs have been consistently below RGs and

TLs. Radiological retesting is ongoing to confirm that levels in soil and existing structures are protective of human health and post-ROD documentation is being prepared to address ROs in subsurface soil. Until retesting is complete, short-term protectiveness is met through Navy controls such as access to the parcel through fencing, locked gates, and ICs (restricting intrusive work and maintaining durable covers).

5.7.2 Parcel D-2

Protectiveness Determination: Short-term Protective

Protectiveness Statement: The remedy at Parcel D-2 is currently protective of human health and the environment.

Parcel D-2 was acceptable for UU/UE upon completion of the radiological TCRA; however, in order to determine whether the parcel remains acceptable for UU/UE, the radiological retesting work will be completed. Until retesting is complete, exposure to ROCs in site media is being controlled through security features such as fencing, locked gates, and signage.

5.7.3 Parcel UC-1

Protectiveness Determination: Short-term Protective

Protectiveness Statement: The remedy at Parcel UC-1 is currently protective of human health and the environment. In order to determine whether the remedy can be considered protective in the long term, the radiological retesting work will be completed.

The RAOs for soil are met through durable covers and ICs. Radiological retesting is ongoing to confirm that levels in soil and existing structures are protective of human health. Until retesting is complete, short-term protectiveness is met through Navy controls such as access to the parcel through fencing, locked gates, and ICs (restricting intrusive work and maintaining durable covers).

5.7.4 Parcel G

Protectiveness Determination: Short-term Protective

Protectiveness Statement: The remedy at Parcel G is currently protective of human health and the environment. In order to determine whether the remedy can be considered protective in the long term, the radiological retesting work will be completed.

The RAOs for soil are met through soil hotspot excavation and offsite disposal, durable covers, and ICs. Groundwater treatment is completed, and monitoring is ongoing. Radiological retesting is ongoing to confirm that levels in soil and existing structures are protective of human health. While retesting is ongoing, short-term protectiveness is met through Navy controls such as access to the parcel through fencing, locked gates, and ICs (restricting intrusive work and maintaining durable covers).

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United States Environmental Protection Agency (USEPA). 2004. *Risk Assessment Guidance for Superfund Volume I: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment.* Final*. EPA/540/R/99/005*. July.

USEPA. 2011. *Exposure Factors Handbook: 2011 Edition. National Center for Environmental Assessment, Washington, DC; EPA/600/R-09/052F*. September.

USEPA. 2014. *Human Health Evaluation Manual, Supplemental Guidance: Update of Standard Default Exposure Factors, OSWER Directive 9200.1-120*, February 6.

USEPA. 2022a. *Preliminary Remediation Goals (PRG) for Radionuclides Calculator.*

USEPA. 2022b. *Regional Screening Levels for Chemical Contaminants at Superfund Sites*. November.

Table 5-1. Parcels D-1, G, and UC-1 Chemicals of Concern and Remediation Goals

Exposure Medium	Exposure Scenario	Chemical of Concern	ROD Remediation Goal (2009)	Source of Remediation Goal	Parcel
Soil (mg/kg)	Residential	Manganese	1,431	HPAL	D-1, UC-1, G
		Arsenic	11.1	HPAL	D-1, UC-1
		Benzo(a)pyrene	0.33	PQL	D-1, UC-1
		Benzo(b)fluoranthene	1.76	RBC	D-1, UC-1
	Recreational	Arsenic	11.1	HPAL	G
		Benzo(a)pyrene	0.33	PQL	G
	Industrial	Arsenic	11.1	HPAL	G
		Benzo(a)pyrene	0.33	PQL	G
		Benzo(b)fluoranthene	1.76	RBC	G
		Lead	800	RBC	G
	Construction Worker	Arsenic	11.1	HPAL	D-1, UC-1, G
		Benzo(a)pyrene	0.65	RBC	D-1, UC-1, G
		Lead	800	RBC	G
		Manganese	6,889	RBC	D-1, UC-1, G
Groundwater (µg/L)	Residential – Vapor Intrusion	Chloroform	1	PQL	G
		Methylene Chloride	27	RBC	G
		Trichloroethene	2.9	RBC	G
	Industrial – Vapor Intrusion	Benzene	0.63	RBC	D-1, UC-1, G
		Carbon Tetrachloride	0.5	PQL	D-1, UC-1, G
		Chloroform	1.2	RBC	D-1, UC-1, G
		Naphthalene	6	RBC	D-1, UC-1, G
		Tetrachloroethene	1	PQL	D-1, UC-1, G
		Trichloroethene	4.8	RBC	D-1, UC-1, G
		Xylene (total)	337	RBC	D-1, UC-1, G
	Construction Worker – Trench Exposure	Arsenic	40	RBC	D-1, UC-1, G
		Benzene	17	RBC	D-1, UC-1, G
		Naphthalene	17	RBC	D-1, UC-1, G
		Tetrachloroethene	18	RBC	D-1, UC-1, G
		Xylene (total)	861	RBC	D-1, UC-1, G
	Migration to Surface Water of Bay [a]	Chromium VI	50	SWC	D-1, UC-1, G
		Nickel	96.5	HPAL	D-1, UC-1, G

[a] Migration to Surface Water of Bay addresses discharge that would be above the specified remediation goals; specific trigger levels are developed for each plume. Groundwater remediation goals for chromium VI and zinc are at the point of discharge to the bay.

µg/L = microgram(s) per liter
HPAL = Hunters Point ambient level
PQL = practical quantitation limit
RBC = risk-based concentration
ROD = Record of Decision
SWC = Surface Water Criteria

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Table 5-2. Parcels D-1, G, and UC-1 Remediation Goals for Radionuclides

Radionuclide	Surfaces (dpm/100cm^2)		Soil (pCi/g)		Water (pCi/L)	Parcel
	Equipment and Waste[a]	Structures[b]	Construction Worker[c]	Resident[e]		
Cesium-137	5,000	5,000	0.113	0.113	119	D-1, G, UC-1
Cobalt-60	5,000	5,000	0.0602	0.0361	100	D-1, G, UC-1
Plutonium-239	100	100	14	2.59	15	D-1, G, UC-1
Radium-226	100	100	1[d]	1[d]	5	D-1, G, UC-1
Strontium-90	1,000	1,000	10.8	0.331	8	D-1, G, UC-1
Thorium-232	1,000	36.5	19	1.69	15	D-1, G, UC-1
Hydrogen-3	5,000	5,000	4.23	2.28	20,000	D-1, G, UC-1
Uranium-235 + daughters	5,000	488	0.398	0.195	30	D-1, G, UC-1

Source of Goals:

Department of the Navy (Navy). 2006. *Base-wide Radiological Removal Action, Action Memorandum – Revision 2006, Hunters Point Shipyard, San Francisco, California* . Final. April 21.

United States Environmental Protection Agency (USEPA). 2000. *Radionuclides Notice of Data Availability Technical Support Document* . Targeting and Analysis Branch, Standards and Risk Management Division, Office of Groundwater and Drinking Water. March.

[a] Limits for removable surface activity are 20 percent of these values.

[b] Remediation goals are consistent with those issued in the Radiological TCRA Action Memo. Remediation goals meet the 25 millirem per year residual dose level consistent with 10 CFR Section 20.1402. Furthermore, for most radionuclides of concern, goals meet the 15 millirem per year residual dose level consistent with the 1997 USEPA OSWER Directive (OSWER No. 9200.4-18). Of exception, is the goal for Thorium-232 which because of detection limit technical limitations, corresponds to a dose of 25 millirems per year.

[c] Applicable to Parcel G only

[d] Goal is 1 pCi/g above background per agreement with USEPA.

[e] All radiologically impacted soils in this parcel will be remediated according to Residential Remediation Goals.

Note:
Unless otherwise stated, the radiological remediation goals in this table are based on total activity per sample including the background.

CFR = Code of Federal Regulations
cm^2 = square centimeter(s)
dpm = disintegration(s) per minute
OSWER = Office of Solid Waste and Emergency Response
pCi/g = picocurie(s) per gram
pCi/L = picocurie(s) per liter
TCRA = time-critical removal action
USEPA = United States Environmental Protection Agency

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Table 5-3. Parcel D-1 and UC-1 Remedial Action Summary and Expected Outcomes

Media	Risk/Basis for Action	Reasonably Anticipated Land Use	RAO	Remedy Component	Parcel	Performance Metric	Expected Outcome
Soil	**Human Health:** Unacceptable risks to potential future industrial or construction workers from exposure to PAHs and metals in surface and subsurface soils. Potential volatilization of VOCs from soil into soil gas and/or indoor air via the VI pathway.	**Current use:** Limited access, unoccupied and unused buildings **Planned Future Use:** Multiuse including residential, research and development, and open space	1. Prevent exposure to PAHs and metals in soil at concentrations above remediation goals developed in the HHRA for the following exposure pathways: 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 HP[N]S.	Excavation	D-1	Excavation and offsite disposal of COC-contaminated soil to industrial-based RGs. One soil stockpile identified in the remedial design was also removed and disposed offsite.	Land suitable for planned future use compatible with durable covers and ICs as required by the LUC RD.
				Durable Covers	D-1 and UC-1	Durable covers to provide physical barriers to prevent exposure to PAHs and metals in soil. Durable covers include: 1) a 3-foot-thick (minimum) shoreline armoring (D-1 only) 2) a 2-foot-thick (minimum) vegetated soil cover (UC-1 only) 3) a 6-inch-thick (minimum) asphaltic pavement cover 4) repaired concrete building foundations Covers are inspected and maintained to prevent exposure to COCs.	
				ICs	D-1 and UC-1	ICs to maintain durable covers, restrict land use and land-disturbing activity and, in areas for VOC ICs, prohibit construction of enclosed structures unless prior written approval is granted by the FFA signatories	
Groundwater	**Human Health:** Unacceptable risks to potential future industrial or construction workers from exposure to VOCs in indoor air from A-aquifer groundwater via the vapor intrusion pathway. Unacceptable risks to potential future construction workers through dermal contact with metals and VOCs in A-aquifer groundwater and volatilization of VOCs.		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. 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.	Groundwater treatment	D-1	A pre-ROD groundwater treatability study was completed, consisting of injection of approximately 136,000 pounds of zero valent iron into the A-aquifer. Concentrations of VOCs were treated to below RGs established for D-1 groundwater and active treatment was not required.	
				Groundwater LTM	D-1	Groundwater monitoring is ongoing. VOC monitoring was discontinued in 2012 when RGs were met. Concentrations of metals continue to be below RGs and TLs since 2004 with the exception of silver in July 2008 and lead in September 2015 in 1 monitoring well.	
				ICs	D-1	ICs to prohibit construction of enclosed structures, the use of groundwater and installation of new groundwater wells for domestic purposes, and to restrict land-disturbing activity unless prior written approval is granted by the FFA signatories.	
Radiologically Impacted Soil and Structures	**Human Health:** Radiological risks for soil and structures (storm drains, sanitary sewers, buildings) were greater than 10^{-6}.		1. Prevent exposure to radionuclides of concern in concentrations that exceed remediation goals for all potentially complete exposure pathways.	Survey, decontamination, and removal of radiologically impacted structures and soil	D-1 and UC-1	Radiologically impacted structures and soil was removed during the Basewide TCRA. Low-level radiological objects were identified in soil within Parcel D-1 and may be present at depths greater than 2 feet bgs. Additional remedy evaluation is currently under way to address these objects. Additionally, radiological rescanning is currently being completed. While the remedy evaluation and retesting is underway, exposure pathways are being controlled through ICs.	

Table 5-3. Parcel D-1 and UC-1 Remedial Action Summary and Expected Outcomes

bgs = below ground surface
COC = chemical of concern
FFA = Federal Facilities Agreement
HHRA = human health risk assessment
HPNS = Hunters Point Naval Shipyard (referred in the ROD as HPS)
IC = institutional control
LTM = long-term monitoring
LUC = land use control
PAH = polycyclic aromatic hydrocarbon
RAO = remedial action objective
RD = remedial design
RG = remediation goal
ROD = Record of Decision
TCRA = time-critical removal action
TL = trigger level
VI = vapor intrusion
VOC = volatile organic compound

Table 5-4. Parcel G Remedial Action Summary and Expected Outcomes

Media	Risk/Basis for Action	Reasonably Anticipated Land Use	RAO	Remedy Component	Performance Metric	Expected Outcome
Soil	**Human Health:** Unacceptable risks to potential future industrial, residential, or construction workers from exposure to PAHs and metals in surface and subsurface soils. Potential volatilization of VOCs from soil into soil gas and/or indoor air via the VI pathway.	**Current use:** Limited access unoccupied and unused buildings, few commercial buildings **Planned Future Use:** Multiuse including residential, research and development, and open space	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	Excavation	Excavation and offsite disposal of COC-contaminated soil to industrial-based RGs. Two soil stockpiles identified in the remedial design were also removed and disposed offsite.	Land suitable for planned future use compatible with durable covers and ICs as required by the LUC RD.
				Durable Covers	Durable covers to provide physical barriers to prevent exposure to PAHs and metals in soil. Durable covers include: 1) a 6-inch-thick (minimum) asphaltic pavement cover and 2) repaired concrete building foundations. Covers are inspected and maintained to prevent exposure to COCs.	
				ICs	ICs to maintain durable covers, restrict land use and land-disturbing activity, and prohibit growing produce in native soil for human consumption 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 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 HP[N]S.	ICs	ICs to prohibit construction of enclosed structures unless prior written approval of vapor mitigation strategies is granted by the FFA signatories.	
Groundwater	**Human Health:** Unacceptable risks to potential future industrial, residential, or construction workers from exposure to VOCs in indoor air from A-aquifer groundwater via the vapor intrusion pathway. Unacceptable risks to potential future construction workers through dermal contact with metals and VOCs in A-aquifer groundwater and volatilization of VOCs. Potential migration pathway of contaminants to San Francisco Bay.		1. Prevent exposure to VOCs in the A-aquifer groundwater at concentrations above remediation goals via indoor inhalation of vapors from groundwater. 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.	Groundwater treatment	A pre-ROD groundwater treatability study was completed, consisting of injection of approximately 136,000 pounds of zero valent iron into the A-aquifer. Concentrations of VOCs were below the RGs in all monitoring wells except one location at the time of the RD, therefore additional treatment was determined to be unnecessary.	
				Groundwater monitoring	Groundwater monitoring is ongoing. Sampling for hexavalent chromium was discontinued in 2012 because concentrations were below TLs and were stable or decreasing. VOCs continue to exceed RGs and monitoring will continue until RGs have been met.	
				ICs	ICs to prohibit extraction of groundwater and installation of new groundwater wells with the exception of environmental sampling and monitoring requirements described in the ROD. ICs within areas with VOCs to prohibit construction of enclosed structures unless prior written approval is granted by the FFA signatories.	
Radiologically Impacted Soil and Structures	**Human Health:** Radiological risks for soil and structures (storm drains, sanitary sewers, buildings) were greater than 10^{-6}.		1. Prevent exposure to radionuclides of concern in concentrations that exceed remediation goals for all potentially complete exposure pathways.	Survey, decontamination, and removal of radiologically impacted structures and soil	Radiologically impacted structures and soil was removed during the Basewide TCRA. Radiological retesting is currently being completed. While the rescanning is underway, exposure pathways are being controlled through ICs.	Land suitable for planned future use compatible with durable covers and ICs as required by the LUC RD.

Table 5-4. Parcel G Remedial Action Summary and Expected Outcomes

µg/L = microgram(s) per liter
COC = chemical of concern
FFA = Federal Facilities Agreement
HHRA = human health risk assessment
HPNS = Hunters Point Naval Shipyard (referenced in ROD as HPS)
IC = institutional control
LTM = long-term monitoring
LUC = land use control
PAH = polycyclic aromatic hydrocarbon
RAO = remedial action objective
RD = remedial design
RG = remediation goal
ROD = Record of Decision
TCRA = time-critical removal action
TL = trigger level
VI = vapor intrusion
VOC = volatile organic compound

Table 5-5. Fourth Five-Year Review Parcels D-1, D-2, UC-1, and G Issues, Recommendations, and Follow-up Actions

Parcel/ Site	Fourth Five-Year Review Protectiveness	Issue	Recommendation (Milestone)	Date Complete/ Current Status
D-1, G	Short-term protective	The regulatory agencies do not agree with the Navy's risk assessment methodology used to reduce the ARICs for VOC vapors.	The Navy intends to consider agency concerns (including specific recommendations made by EPA) and reevaluate its approach to calculating SGALs, which may affect the ARICs for VOC vapors at Parcels B-1, B-2, D-1, and G. Appendix E (of the Fourth Five-Year Review) evaluated how EPA's recommendations may affect the SGALs and the ARICs for VOC vapors. Based on the information in Appendix E, none of the potential changes to the ARICs for VOC vapors affect the current protectiveness of the remedies at Parcels B-1, B-2, D-1, and G. The regulatory agencies are currently reviewing and reevaluating their methods for assessing vapor intrusion risk. Once consensus is achieved, the Navy should reevaluate its approach for calculating SGALs and adjusting ARICs for VOC vapors. The new SGALs would be developed based on the most current standards, toxicity criteria, and risk assessment methods. The new SGALs would be used to redefine the ARICs for soil gas at each parcel prior to property transfer. Any changes to soil gas risk assessment methodology should be discussed in the next Five-Year Review report. (12/31/2019)	No changes to the VOC ARIC are planned for Parcel D-1 or G at this time. Because attenuation of VOCs is likely to occur, ARICs for VOC vapors, and likewise SGALs that are the basis of the ARICs, in Parcels D-1 and G will be re-evaluated during preparation for property transfer. While there is disagreement about the method to calculate the SGALs, which may affect ARIC boundaries, the final ARICs that will be surveyed and recorded in quitclaim deeds and covenants to restrict land use will be established in agreement with the BCT. Protectiveness is not affected because the Navy currently controls the property and land use, and future protectiveness will not be affected because the ARICs will be established in the appropriate legal documentation.
D-1, D-2, UC-1, and G	Short-term protective	The Navy has determined that a significant portion of the radiological survey and remediation work completed to date was not reliable because of manipulation and/or falsification of data by one of its radiological contractors. A long-term protectiveness evaluation of the radiological RGs has not yet been completed for this fourth Five-Year Review, and it is currently not known if the RAOs for radionuclides have been achieved in Parcels B-1, B-2, C, D-1, D-2, G, E, UC-1, UC-2, and UC-3.	Refer to **Section 1.4.3** for the long-term protectiveness evaluation component of this recommendation. The Navy is in the process of implementing corrective actions to ensure that the radiological remedies specified in the decision documents are implemented as intended. It is anticipated that the radiological rework will be completed prior to the next Five-Year Review.	**Long-term Protectiveness Evaluation: Completed June 2020**. Addenda to the Fourth Five-Year Review were prepared to evaluate the Radiological RGs for soil and buildings. The conclusions of both reports were that the current RGs were protective of human health and the environment (Navy, 2020a, 2020b). **In Progress.** The radiological retesting of soil and surveys of building structures at Parcel D-1 was initiated in 2023. Radiological rework will be summarized in a radiological RACR anticipated to be completed in 2026. Planning for the radiological retesting of soil and building structures at Parcels D-2 and UC-1 was initiated in February 2019. Fieldwork activities were initiated in 2023. Radiological rework will be summarized in a radiological removal action construction summary report anticipated to be completed in 2028. The radiological retesting of soil and building structures at Parcel G was initiated in Fall 2018. Fieldwork activities were initiated in Fall 2020. Radiological rework will be summarized in a radiological RACR anticipated to be completed in 2025.

References:

Navy. 2020a. *Addendum to the Five-Year Review, Evaluation of Radiological Remedial Goals for Soil, Hunters Point Naval Shipyard, San Francisco, California*. June 18.

Navy. 2020b. *Addendum to the Five-Year Review, Evaluation of Radiological Remedial Goals for Building Structures, Hunters Point Naval Shipyard, San Francisco, CA*. June 18.

ARIC = area requiring institutional controls
BCT = BRAC Cleanup Team
BRAC = Base Realignment and Closure
Navy = Department of the Navy
RG = remediation goal
RACR = removal action completion report
SGAL = soil gas action level
USEPA = United States Environmental Protection Agency
VOC = volatile organic compound

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Table 5-6. Parcels D-1, G, and UC-1 Chemicals of Concern and Current Comparison Criteria for Groundwater

Exposure Medium	Exposure Scenario	Chemical of Concern	Values from ROD			Current Comparison Criteria				
			ROD Remediation Goal (2009, 2010)	Source of Remediation Goal	Parcel	11/2022 USEPA RSL or VISL	Basis of RSL or VISL (C/NC)[a]	DTSC-SL	Cal MCL	USEPA MCL
Groundwater (µg/L)	Residential – Vapor Intrusion	Chloroform	1	PQL	G	0.814	C	NA	80	80
		Methylene Chloride	27	RBC	G	763	C	NA	5	5
		Trichloroethene	2.9	RBC	G	1.19	C	NA	5	5
	Industrial – Vapor Intrusion	Benzene	0.63	RBC	D1, UC-1, G	6.93	C	NA	1	5
		Carbon Tetrachloride	0.5	PQL	D1, UC-1, G	1.81	C	NA	0.5	5
		Chloroform	1.2	RBC	D1, UC-1, G	3.55	C	NA	80	80
		Naphthalene	6	RBC	D1, UC-1, G	20.1	C	NA	None	None
		Tetrachloroethene	1	PQL	D1, UC-1, G	65.2	C	NA	5	5
		Trichloroethene	4.8	RBC	D1, UC-1, G	7.4	C	NA	5	5
		Xylene (total)	337	RBC	D1, UC-1, G	1620	NC	NA	1,750	10,000
	Construction Worker – Trench Exposure	Arsenic	40	RBC	D1, UC-1, G	NA		NA	NA	NA
		Benzene	17	RBC	D1, UC-1, G	NA	C	NA	NA	NA
		Naphthalene	17	RBC	D1, UC-1, G	NA	C	NA	NA	NA
		Tetrachloroethene	18	RBC	D1, UC-1, G	NA	C	NA	NA	NA
		Xylene (total)	861	RBC	D1, UC-1, G	NA	NC	NA	NA	NA

[a] VISL presented for A-aquifer groundwater

Note:
Shading indicates current comparison criteria is lower than ROD Remediation Goal.

µg/L = microgram(s) per liter
C = carcinogen
DTSC = California Department of Toxic Substances Control
MCL = maximum contaminant level
NA = not available
NC = noncarcinogen
PQL = practical quantitation limit
RBC = risk-based concentration
ROD = Record of Decision
RSL = Regional Screening Level
SL = screening level
USEPA = United States Environmental Protection Agency
VISL = vapor intrusion screening level

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Table 5-7. Parcels D-1, UC-1, and G Chemicals of Potential Concern for Ecological Receptors – Groundwater

Exposure Medium	Exposure Scenario	Chemical of Concern	ROD Trigger Level (2009)	Source of Trigger Level	Receptor Basis	NRWQC (2023)	Basin Plan SF Bay (2019)	Value Still Protective?	Notes
Groundwater (µg/L)	Ecological Receptor	Chromium VI	50	NRWQC - CCC	aquatic organisms	50	50	Yes	Analyte was included in the monitoring plan for Parcel D. The trigger level is a risk based criteria for surface water exposures but is not an ARAR for ecological exposure to groundwater. Exceeding the trigger level does not indicate immediate risk but a potential exists if the plume migrates toward the bay.
		Nickel	96.5	HGAL	aquatic organisms	8.2 (D)	8.2 (D)	Yes	The trigger level is based on ambient levels and is not a risk-based value. Risk-based criteria for surface water (NRWQC and Basin Plan) are for comparison purposes only and are not ARARs for groundwater exposures.

µg/L = microgram(s) per liter
ARAR = applicable or relevant and appropriate requirement
CCC = Criterion Continuous Concentration
(D) = dissolved
HGAL = Hunters Point groundwater ambient level
NRWQC = National Recommended Water Quality Criteria
ROD = Record of Decision

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Table 5-8. Parcels D-1, D-2, UC-1, and G Issues, Recommendations, and Follow-up Actions

Parcel	Issue	Recommendations/ Actions	Party Responsible	Oversight Agency	Milestone Date	Affects Protectiveness (Y/N)	
						Current	Future
D-1	As identified in the Fourth Five-Year Review there is uncertainty with a portion of the radiological survey and remediation work performed between 2004 and 2016 under the Basewide Radiological Removal Action, Action Memorandum (Navy, 2006). The Navy is in the process of implementing corrective actions to ensure the radiological remedies specified in the decision documents were implemented as intended; however, this work is ongoing.	Complete radiological retesting at radiologically impacted sites, including current and former buildings and soil areas investigated under the Radiological Removal Action, Action Memorandum (Navy, 2006) and areas where evaluations determined previous data were unreliable.	Navy	USEPA	11/27/2026	N	Y
UC-1					3/2/2028		
D-2					3/2/2028		
G					10/2/2025		
D-1	ROs were identified during excavation and remediation of soil in areas that were not considered radiologically impacted. There is a high degree of confidence that discrete ROs were removed to a depth of 2 feet bgs. However, there is a potential for ROs to be present in material below 2 feet bgs where shoreline expansion has occurred since 1946.	Evaluate additional remedies to address the potential presence of ROs in material 2 feet bgs and prepare the appropriate post-ROD documentation.	Navy	USEPA	12/20/2024	N	Y

Source: Navy. 2006. *Base-wide Radiological Removal Action, Action Memorandum – Revision 2006, Hunters Point Shipyard, San Francisco, California*. Final. April 21.

bgs = below ground surface
Navy = Department of the Navy
RO = radiological object
ROD = Record of Decision
USEPA = United States Environmental Protection Agency

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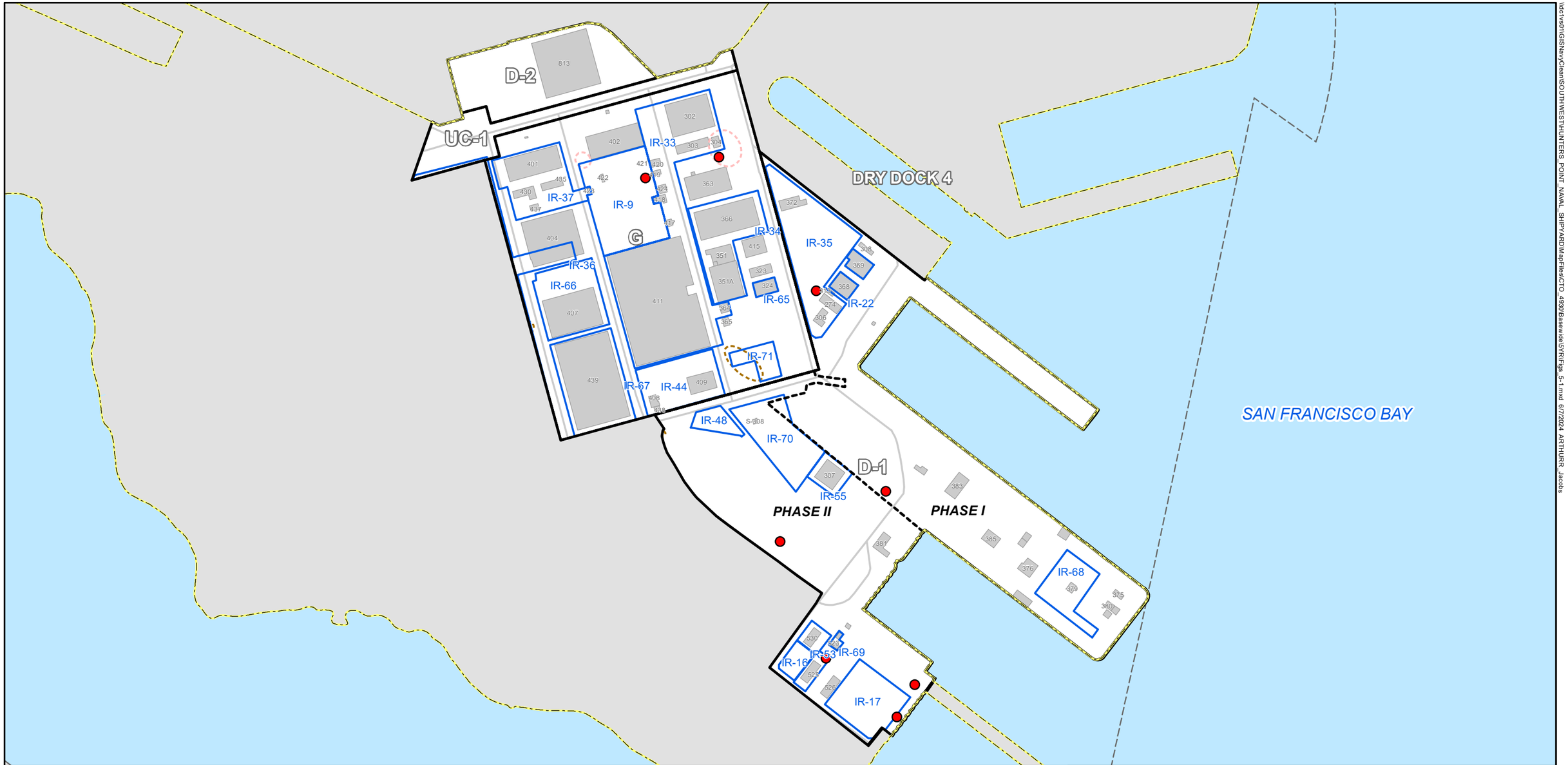
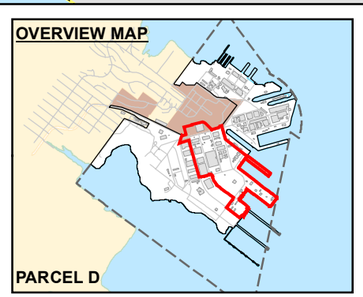


LEGEND

- Hunters Point Naval Shipyard Boundary
- Parcel Boundary
- Parcel F (Water) Boundary
- IR Site
- Approximate Hotspot Excavation Areas
- Water
- Building
- Road
- Phase II Boundary
- **Plume Detection Area**
- Naphthalene
- VOC



IR = Installation Restoration
VOC = volatile organic compound

0 225 450 Feet
1 inch = 450 feet

N

Parcel D (Parcels D-1, D-2, G, and UC-1)

**Fifth Five-Year Review Report
Hunters Point Naval Shipyard, San Francisco, California**

NAVFAC Naval Facilities Engineering Systems Command

Figure 5-1

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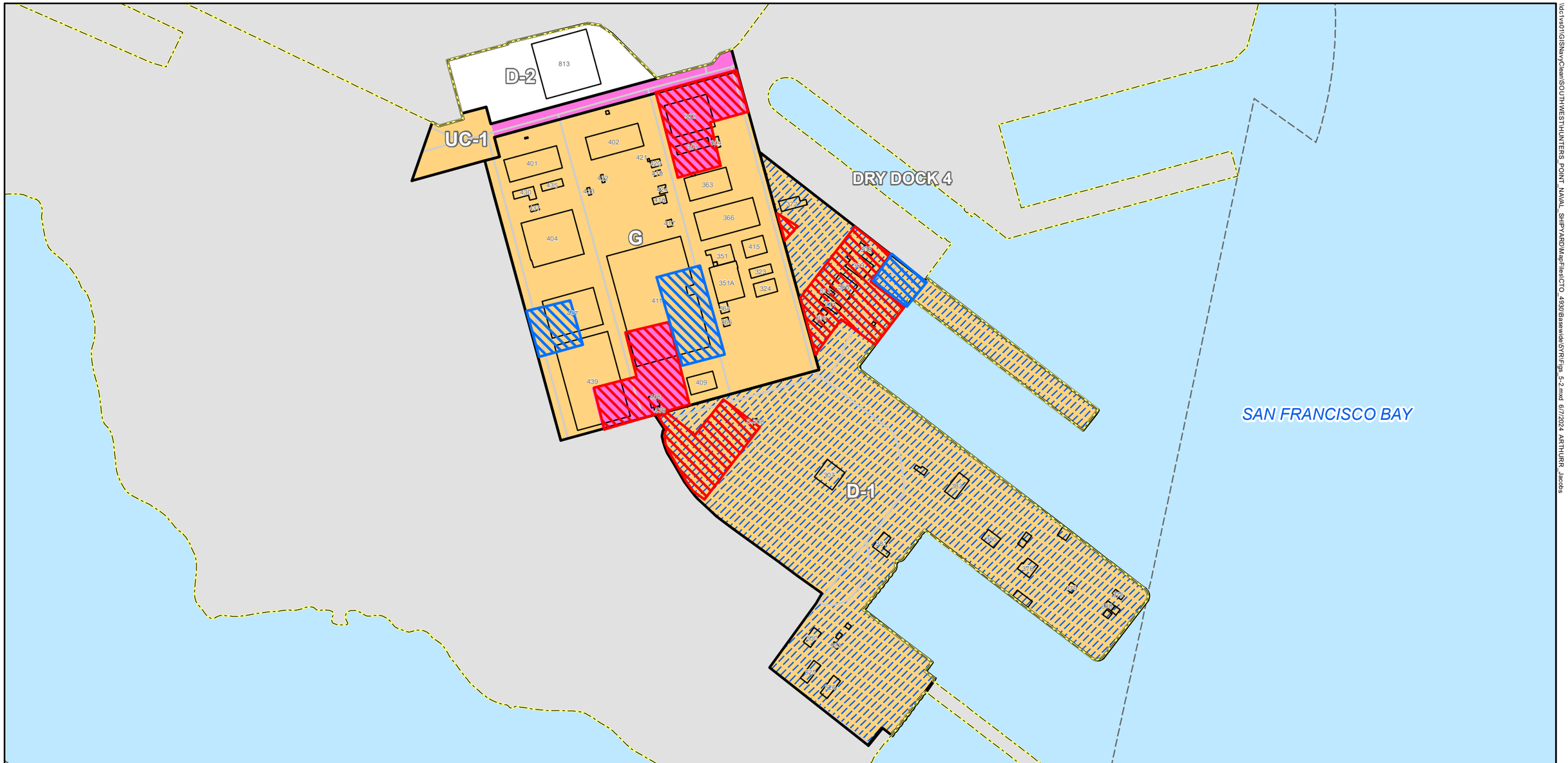
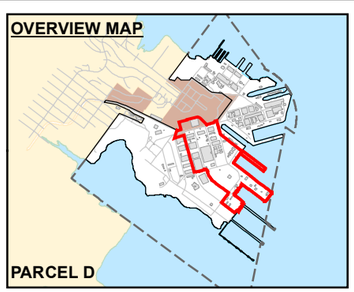


LEGEND

- Hunters Point Naval Shipyard Boundary
- Parcel Boundary
- Parcel F (Water) Boundary
- Water
- Building
- Road

Institutional Controls

- Additional Restrictions (Open Space, Educational/Cultural, and/or Maritime/Industrial Use
- ARIC for Soil and Groundwater Use (General)
- ARIC for Soil, Groundwater Use, and Restrictions Related to VOC Vapors
- Existing VOC ARIC
- Area Requiring Further Evaluation for VOCs based on Fourth Five-Year Review



ARIC = area requiring institutional controls
VOC = volatile organic compound

0 200 400 Feet

1 inch = 450 feet

N

Parcel D (Parcels D-1, D-2, UC-1, and G) Institutional Controls

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NAVFAC Naval Facilities Engineering Systems Command

Figure 5-2

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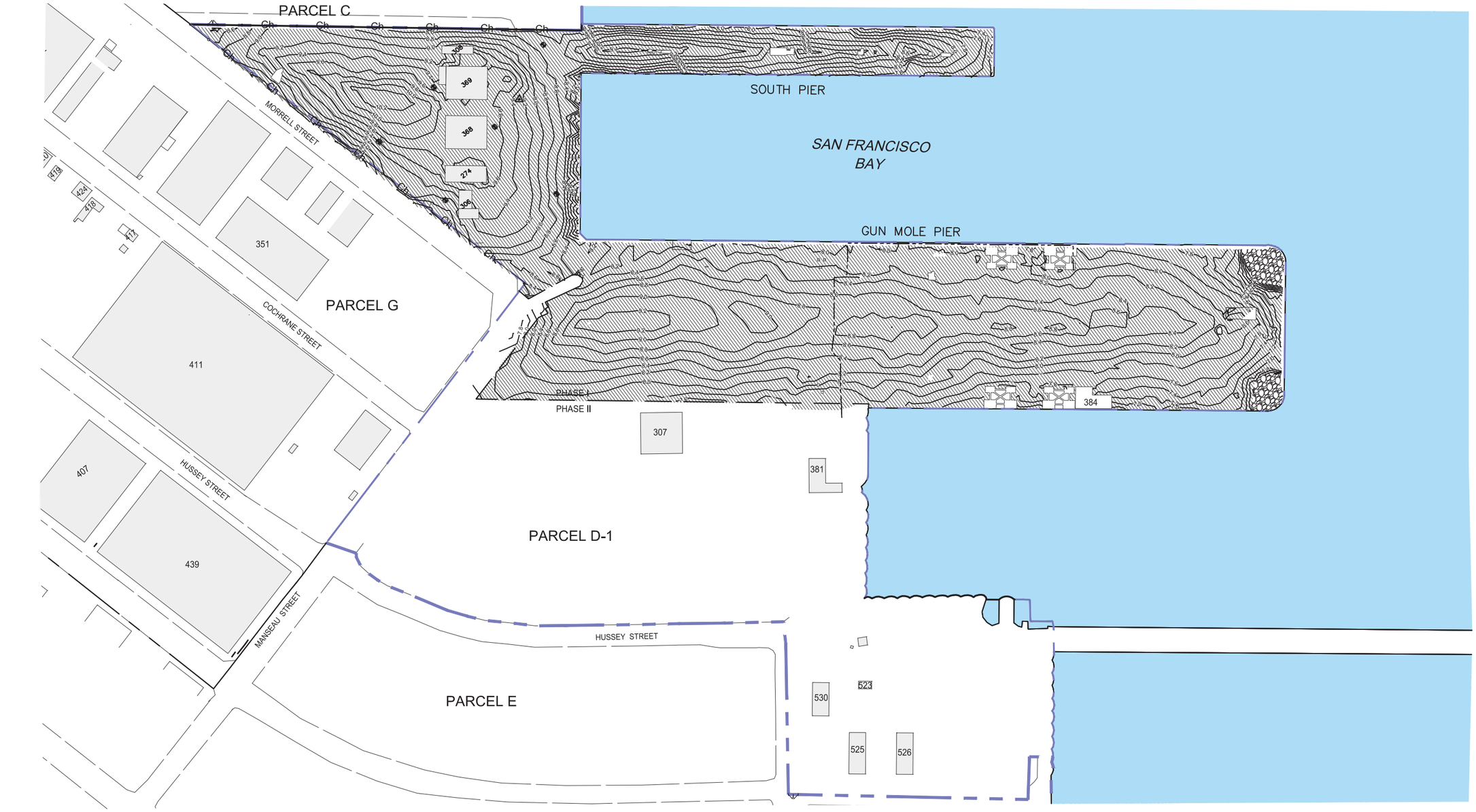

Source:
Innovex-ERRG Joint Venture. 2019. *Fourth Five-Year Review, Hunters Point Naval Shipyard, San Francisco, California.* Figure 7. July.

Figure 5-3
Overview of Remedy Components for Parcel D-1
Fifth Five-Year Review Report
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Source:
Innovex-ERRG Joint Venture. 2019. *Fourth Five-Year Review, Hunters Point Naval Shipyard, San Francisco, California.* Figure 11. July.

Figure 5-4
Overview of Remedy Components for Parcel UC-1
Fifth Five-Year Review Report
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San Francisco, California

230307115911_589d933e Figure_5-3_UC-1

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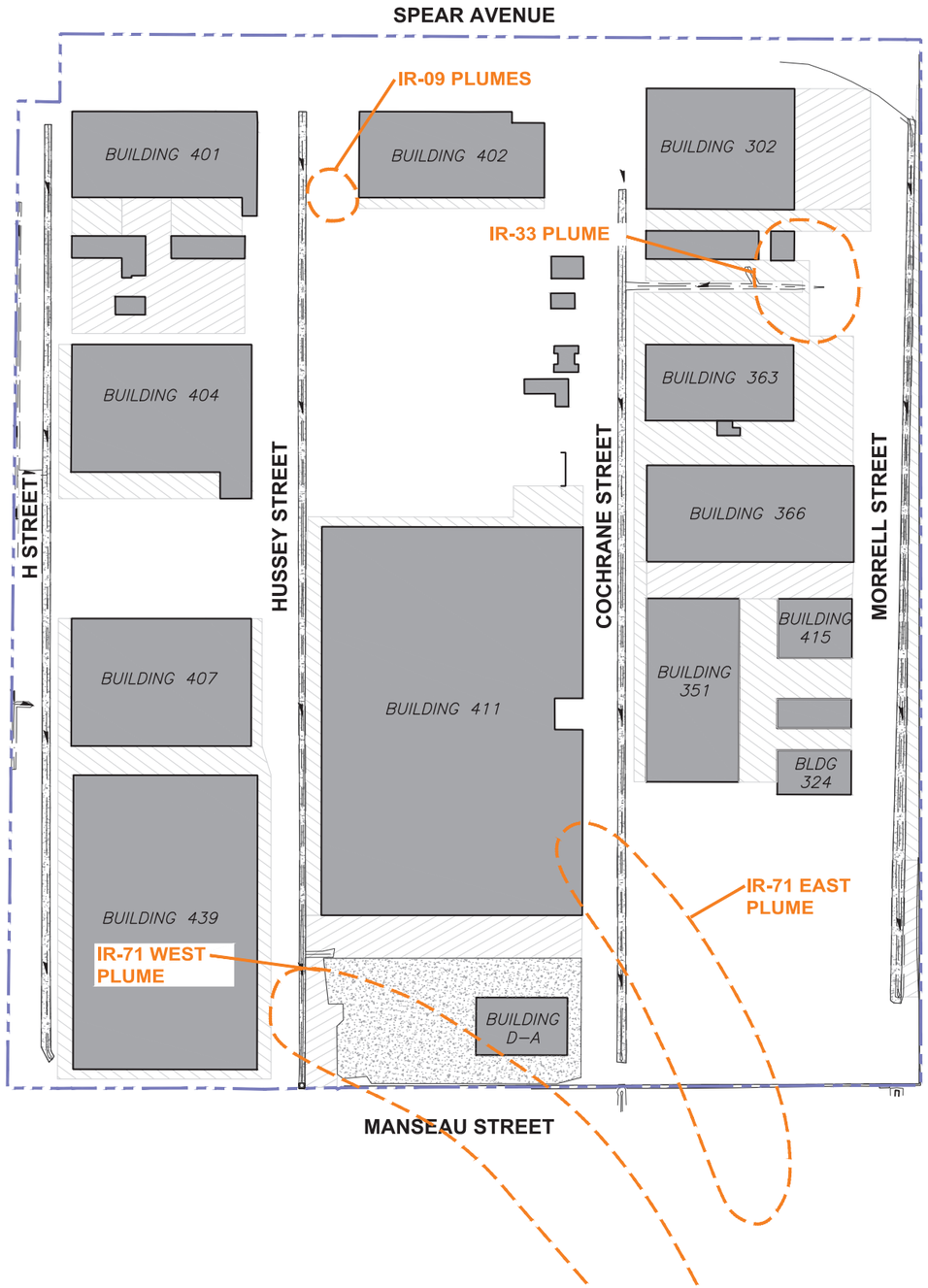

LEGEND:

- SEAL COAT APPLICATION (11%)
- 2" AC OVERLAY ON EXISTING AC (5%)
- CONCRETE PATCHING AND SHOTCRETE (6%)
- CRACK REPAIR/SEALING ON BUILDING SLAB (34%)
- NEW PAVEMENT CONSTRUCTION (44%) (REMAINDER OF SITE)
- DRAINAGE SWALE
- PARCEL BOUNDARY

N

0' 200'

Source:
Innovex-ERRG Joint Venture. 2019. *Fourth Five-Year Review, Hunters Point Naval Shipyard, San Francisco, California.* Figure 10. July.

Figure 5-5
Overview of Remedy Components for Parcel G
Fifth Five-Year Review Report
Hunters Point Naval Shipyard
San Francisco, California

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6.0 Former Parcel E (Parcels E, E-2, and UC-3)

6.1 Site History and Background

Former Parcel E was used as an industrial support area, including a warehouse (Building 406) where chlorinated solvents were released and Former Oily Waste Ponds (known as IR-03) where spent waste oil was stored from 1944 to 1974. Shoreline areas of Parcel E (known as IR-02) were used to store construction materials and industrial materials, as well as to dispose of industrial waste and construction debris. During its occupancy of HPNS (between 1976 and 1986), Triple A allegedly disposed of hazardous wastes at various locations at HPNS, including possibly discharging waste oil within Parcel E using belowground fuel and steam lines. NRDL conducted research activities within Parcel E, most notably at the former 500 series buildings in the southwestern portion of Parcel E and within the Building 707 Triangle Area which may have discharged small amounts of low-level radioactive liquids into sanitary sewer, storm drain, and septic sewer lines; as a result, sanitary sewer, storm drain, and septic sewer lines throughout Parcel E were identified in the HRA as radiologically impacted. Dials, gauges, and deck markers painted with radioluminescent paint (containing low levels of Ra-226) to make the devices glow in the dark were disposed of along the shoreline (IR-02 and IR-03). Sandblast waste from cleaning ships used during weapons testing in the South Pacific may have been disposed of at IR-02.

Parcel E has been subdivided into Parcels E (128 acres), E-2 (47 acres), and UC-3 (11 acres). Parcel E consists of shoreline and lowland coast along the southwestern portion of HPNS, and contains 17 existing buildings, 25 former buildings, 1 ship berth, numerous IR sites, and future reuse areas (Navy, 2013) (**Figure 6-1**).

The following IR sites are present:

- Parcel E – IR-02, IR-03, IR-04, IR-05, IR-08, IR-11, IR-12, IR-13, IR-14, IR-15, IR-36, IR-38, and IR-39
- Parcel E-2 – IR-01/21
- Parcel UC-3 – Portions of IR-04, IR-52, IR-56, IR-74

Parcel E also includes four IR sites that were established for the former utility network at HPNS: IR-45 (steam line system), IR-47 (fuel distribution lines), IR-50 (storm drain and sanitary sewer systems), and IR-51 (former electrical transformer locations) (ERRG, 2012). Investigations and actions at Parcel E began in 1984, as shown in the following chronology.

Parcel E Chronology	
Date	**Investigation/Action**
1984	Initial Assessment Study
1988–1989	Solid Waste Air Quality Assessment Test
1988	OU RI Phase 1 Reconnaissance
1988–1992	OU-1 RI
1989	Removal of Soil at IR-08 PCB Spill Area
1991	Removal of Floating Product at IR-03

Parcel E Chronology	
Date	**Investigation/Action**
1991–1992	Intertidal Sediment Study
1993	Phase II Radiological Investigation
1994	SI
1996	Exploratory Excavations at IR-11/14/15
1997	RI
1996–1997	Removal of Sediment from the Storm Drain System Phase III Radiological Investigation
1996–1998	Installation of Sheet Pile Wall and Low-Permeability Cap at the Former Oily Waste Ponds in IR-03
1997–1998	FS Groundwater Extraction System and Containment Barrier
1998–1999	Phase IV Radiological Investigation
1999–2000	Parcel E Validation Study and Protective Soil Concentrations Technical Memorandum
2000–2001	Interim Landfill Cap Construction
2000–2002	Groundwater Data Gaps Investigation SVE Treatability Study
2001–2002	Nonstandard Data Gaps Investigation Wetland Delineation and Wetland Functions Assessment
2001	Removal of Soil with Non-VOCs at IR-08 Radiological Investigation of Parcel E Shoreline
2001–2005	Radiological Investigations, Phase V (and other interim investigations)
2002	Standard Data Gaps Investigation
2002–2004	Waste Consolidation and Removal
2002–2003	Construction of Landfill Gas (LFG) Control System
2002–2005	Parcels E and E-2 Shoreline Investigation and Risk Assessment
2003–2004	HRA Parcel E Shoreline Debris Removal
2003	Stockpile Inventory
2003–2004	Removal of Soil Stockpiles
2003– Present	Landfill Gas Monitoring and Control
2004	Removal of TPH-Contaminated Soil from Various Locations Metal Slag Area Characterization

Parcel E Chronology	
Date	**Investigation/Action**
2005–2007	Metal Debris Reef and Metal Slag Area Removal Action Removal of Soil at IR-02 Northwest and IR-02 Central Area PCB Hotspot Area Removal Action (Phase I)
2008	Revised RI, including HHRA and ERA
2009–2011	Groundwater Treatability Study at IR-56
2009–2012	Groundwater Characterization and ZVI Treatability Study at Various VOC Groundwater Plumes
2009—present	Basewide Radiological TCRA and retesting
2010–2012	PCB Hotspot Area Removal Action (Phase II)
2011–2016	Characterization and Treatability Study at IR-03
2011	RI/FS for Parcel E-2
2012	Ship Shielding Area Removal Action Final FS for Parcels E and UC-3
11/2012	ROD for Parcel E-2
2013	Soil Excavation Characterization
12/2013	ROD for Parcel E
1/2014	ROD for Parcel UC-3
2014–2016	Phase 1 Hotspot Removal and Nearshore Slurry Wall Installation Parcel E-2
2016	RD and Design Basis Report and LUC RD for Parcel UC-3
2016–2019	Phase 2 Hotspot Removal, Upland Slurry Wall, Shoreline revetment, and foundation layer installation Parcel E-2
2018	RD for Parcel E LUC RD for Parcel E RACR for Soil Hotspot Excavation, Durable Cover, and Groundwater Remediation Parcel UC-3
2019	Parcel E RA initiation

6.2 Site Characterization

This section summarizes the findings from various investigations at Parcels E, E-2, and UC-3 that are pertinent to the Five-Year Review.

6.2.1 Physical Characteristics

6.2.1.1 Surface Features

Parcels E, E-2, and UC-3 are located in the lowlands of HPNS with surface elevations ranging from 0 to 30 feet above msl; predominant ground surface elevations range from 7 to 10 feet above msl (ERRG, 2012; KCH, 2014). The only surface water features within Parcel E are wetlands areas located along the shoreline. About 30 percent of Parcel E is ruderal habitat

characterized by scattered shrubs and grasses, and about 65 percent is covered by pavement with some sparse vegetation. The remaining 5 percent of Parcel E consists of beach areas, intertidal areas, and wetland areas (ERRG, 2012). Wetlands are also located in the Panhandle Area and Shoreline Area within Parcel E-2 (**Figure 6-1**) (Navy, 2012).

Parcel E contains buildings and paved areas over the northern portion of the parcel and is undeveloped/wetland areas in the southern portion. Parcel E-2 is a landfill with an interim cover (installed in 2000) and open undeveloped areas.

Parcel UC-3 is predominantly paved or open undeveloped land consisting of a railroad right-of-way west of HPNS and an access road (Crisp Road) north of Parcels E and E-2.

6.2.1.2 Geology and Hydrogeology

The Parcels E, E-2, and UC-3 area was created by filling in the bay margin with various materials, including native soil, rock, and sediments, as well as construction and industrial debris (Navy, 2012). Nearly all of the Parcels E, E-2, and UC-3 area was developed from Artificial Fill made up largely of crushed serpentinite bedrock from the hillsides; as a result, high levels of naturally occurring bedrock metals, such as arsenic and manganese, are present in fill materials throughout the parcel.

The following is a summary of hydrostratigraphic units at Parcel E and E-2:

- **A-Aquifer**: The A-aquifer covers almost all of Parcel E, from a few feet to over 50 feet thick. However, the lateral continuity of the A-aquifer is disrupted by numerous low-permeability zones because of the heterogeneous nature of the Artificial Fill. The A-aquifer is unconfined throughout most of Parcel E, but semiconfined conditions may exist in many places where fine-grained sediments below the water table overlie more permeable materials. Depth to groundwater ranges from 4 to 15 feet bgs, with an average depth to groundwater across Parcel E of about 8 feet bgs. A-aquifer groundwater flow patterns at Parcel E are complex. The prominent flow directions are influenced by two major features: (1) the large groundwater sink along the boundary between Parcels D and E, and (2) a groundwater divide in the central shoreline area. The natural flow of groundwater toward the bay from the topographically high area of Parcel A is typically disrupted by these two features (Barajas, 2008). Groundwater at Parcel E generally flows southeast (TRWB, 2022). A groundwater mound exists in the center of Parcel E-2, causing groundwater to flow both east and west. Various groundwater sinks exist across the HPNS, including in the Panhandle and eastern boundary of Parcel E-2 (TRWB, 2022).
- **Bay Mud**: The Bay Mud Deposits range from 5 to 76 feet thick under most of Parcel E (Barajas, 2008). The aquitard is thickest in the southern portion of Parcel E along the shoreline (CES, 2018a). The aquitard is absent in the northern portion of Parcel E, along Crisp Avenue (Parcel UC3), in the northwest corner of Parcel E-2, and in the areas of the bedrock highs (Barajas, 2008; Navy, 2012). In locations where the Mud Bay deposits are absent, the A- and B-aquifers are in hydraulic communication and behave as a single aquifer.
- **B-Aquifer**: Groundwater flow in the B-aquifer is generally toward the southeast. However, groundwater in Parcel E-2 from the B-aquifer flows west from the Panhandle Area to the adjacent offsite properties to the west (TRWB, 2022). Groundwater elevations range from 0 to 2 feet above msl along the western portion of Parcel E-2 and a maximum of 9 feet above msl in the eastern portion of Parcel E-2. Elevations range from 0 feet above msl in the

eastern portion of Parcel E to 5 to 6 feet above msl in the central coastal area of Parcel E (TRBW, 2023).

As discussed in **Section 1.3.4.3**, the entire A-aquifer meets the Resolution 88-63 exception criteria. Although it does not meet the Resolution 88-63 exception criteria, the B-aquifer has a low potential for drinking water use.

6.2.2 Land Use

6.2.2.1 Current Land Use

Parcel E is a former industrial use area with most areas subject to restricted access because of ongoing remediation. Building 606, located in the southeast portion of Parcel E near the Parcel D-1 boundary, is the only occupied building at Parcel E; it is currently leased to the San Francisco Police Department (Navy, 2013). Parcel E-2 is a landfill and Parcel UC-3 is a road and utility corridor.

6.2.2.2 Future Land Use

According to the Redevelopment Plan (SFRA, 1997, OCII, 2018), Parcel E land use will include office and industrial, hotel, infrastructure/utility, multimedia and digital arts, institutional, civic, arts and entertainment, residential, and parks and recreation uses (if not subject to applicable environmental restrictions). The land use at Parcel E-2 will be limited to parks and open space. The future reuse of Parcel UC-3 will be mixed use in the eastern half of Crisp Road that borders Parcel E, and commercial and light industrial uses in the western half of Crisp Road and the railroad right-of-way (AFW, 2016a).

6.2.3 Basis for Taking Action

This section describes the results of site investigations and risk assessments that provide the basis for taking action at Parcels E, E-2, and UC-3. Details for Parcel E are provided in the Revised RI (Barajas, 2008), FS (ERRG, 2012), radiological addendum to the FS (ERRG and RSRS, 2012), RD (CES, 2018a), and Parcel E ROD (Navy, 2013). Details for Parcel E-2 are provided in the RI/FS (ERRG and Shaw, 2011), radiological addendum (ERRG and RSRS, 2011) and Parcel E-2 ROD (Navy, 2012). Details for Parcel UC-3 are provided in the Revised Parcel E RI Report (Barajas, 2008), Parcel E Groundwater Treatability Study (Shaw, 2011), Parcel E radiological addendum (ERRG and RSRS, 2012), Parcel E FS (ERRG, 2012), Parcel E Soil Excavation Characterization (Arcadis, 2013), and Parcel UC-3 ROD (KCH, 2014).

6.2.3.1 Site Investigations and Pre-ROD Removal Actions

Previous investigations at Parcels E, E2, and UC3 identified metals, VOCs, SVOCs, PCBs, pesticides, dioxins and furans, and TPH in soil; methane in landfill gas (Parcel E2); metals, VOCs, SVOCs, PCBs, pesticides, TPH, and anions in groundwater; NAPL at IR-03 (Parcel E); metals, PCBs, and pesticides in sediment; and radionuclides in soil, sediment, groundwater, and structures.

Since the Initial Assessment Study identified several environmental investigation sites in 1984, the Navy has performed multiple environmental investigations at Parcels E, E2, and UC3 to further evaluate IR sites associated with former shipyard operations. The Navy has completed a number of removal actions and treatability studies at Parcels E, E-2, and UC-3. The Navy performed several treatability studies that involved testing technologies to reduce VOCs in groundwater and soil as summarized in the chronology and respective RODs. The Navy has

collected extensive information during these investigations and studies, as well as during ongoing environmental monitoring programs for groundwater (Navy, 2013).

NAPL, both dense NAPL (DNAPL) and/or light NAPL (LNAPL) has been periodically measured in Parcel E (IR Sites 02, 03, and 14, **Figure 6-1**). NAPL at the Former Oily Waste Ponds (IR-03) contains VOCs, SVOCs, PCBs, and TPH that are a source to soil and groundwater contamination (CES, 2018a). The DNAPL typically consists of chlorinated solvents such as PCE and TCE, while the LNAPL typically consists of petroleum hydrocarbons such as fuel and waste oil (TRBW, 2022).

6.2.3.2 Human Health Risk

A quantitative HHRA was completed for Parcel E and UC-3 as part of the Revised RI for Parcel E (Barajas, 2008) and for Parcel E-2 as part of the RI/FS for Parcel E-2 (ERRG and Shaw, 2011). Human health risks were characterized separately for COCs and ROCs. The following unacceptable risks from COCs were identified (**Table 6-1** and **6-2**):

For Parcel UC-3:

- Future industrial workers from exposure to metals, SVOCs (primarily PAHs), and TPH in surface soil (0 to 2 feet bgs), subsurface soil (0 to 10 feet bgs)

For all parcels:

- Future recreational users from exposure to metals, SVOCs (primarily PAHs), pesticides, PCBs, and TPH in surface soil and PCBs in shoreline sediment (0 to 2 feet bgs).
- Future residents (adult and child) from exposure to metals, VOCs, SVOCs (primarily PAHs), pesticides, PCBs, and TPH in surface soil (0 to 2 feet bgs), subsurface soil (0 to 10 feet bgs), and metals and VOCs in A-aquifer groundwater through the vapor intrusion to indoor air pathway and metals, VOCs, SVOCs (primarily PAHs), pesticides, PCBs, and TPH in B-aquifer through domestic use.
- Future construction workers from exposure to metals, VOCs, SVOCs (primarily PAHs), pesticides, PCBs, and TPH in subsurface soil (0 to 10 feet bgs) and SVOCs (primarily PAHs) and lead in A-aquifer groundwater through direct exposure and VOCs in trenches.

Additionally, unacceptable risk from ROCs in soil was identified for future residents, recreational users, and outdoor workers at Parcels E, E-2, and UC-3 (**Table 6-3**) (ERRG and RSRS, 2011, 2012).

6.2.3.3 Ecological Risk

Two assessments of ecological risk evaluations were performed for Parcel E: (l) the baseline ecological risk assessment (BERA), which evaluated risks from exposure to soil in areas planned for open space reuse along the Parcel E shoreline; and (2) the SLERA, which evaluated risks from exposure to sediment in the intertidal zone along the shoreline for both Parcels E and E-2. The BERA found potential risk to birds and mammals from exposure to copper, lead, and total PCBs in soil along the shoreline. The SLERA found potential risk to benthic invertebrates, birds, and mammals from exposure to metals and total PCBs in surface and subsurface sediments along the shoreline and metals, PCBs, pesticides, and total TPH in groundwater (Barajas, 2008; Navy, 2013).

The SLERA for Parcel E-2 evaluated potential risks to wildlife, specifically benthic invertebrates, birds, and mammals, exposed to intertidal sediments at Parcel E-2. The shoreline SLERA

concluded that concentrations of copper and lead in sediment along the Parcel E-2 shoreline are a potential source of contamination to Parcel F. In addition, benthic invertebrates, birds, and mammals are at risk from exposure to PCBs in surface sediments along the Parcel E-2 shoreline (ERRG and Shaw, 2011). Based on the SLERA results, chemical concentrations in soil, shoreline sediment, and groundwater in Parcel E-2 pose a potential threat to wildlife (Navy, 2012). In addition, the SLERA identified COPECs in groundwater for the migration to surface water pathway which include: copper, lead, zinc, un-ionized ammonia, sulfide, cyanide, PCBs, and TPH.

A summary of the COECs identified in the RODs are provided in **Table 6-1** and **6-2** for soil/shoreline sediment and groundwater, respectively.

6.3 Remedial Action Objectives

The ROD for Parcel E was signed in December 2013 (Navy, 2013). **Table 6-4** summarizes the basis for action, RAOs, remedy components, performance metrics, and expected outcomes.

The ROD for Parcel E-2 was signed in November 2012 (Navy, 2012). **Table 6-5** summarizes the basis for action, RAOs, remedy components, performance metrics, and expected outcomes.

The ROD for Parcel UC-3 was signed on January 21, 2014 (Navy, 2014). **Table 6-6** summarizes the basis for action, RAOs, remedy components, performance metrics, and expected outcomes.

The presence of VOCs in groundwater and soil may contribute to the presence of VOC in soil gas, therefore the vapor intrusion pathway is included as a basis for action and development of RAOs for all parcels.

The Navy developed RGs to meet the RAOs for soil, sediment, and RGs and TLs for groundwater which are summarized for COCs/COECs in **Table 6-1** and **6-2**, and for ROCs in **Table 6-3.**

6.4 Remedial Actions

6.4.1 Parcel E

The RA for Parcel E includes the following major components:

- Soil and nearshore sediment excavation and removal to address COCs in soil and nearshore sediment
- Investigation and closure of steam and fuel line system to address potential continuing sources of COCs
- SVE to address VOCs in soil gas
- Durable cover installation to address COCs in soil
- Shoreline protection to address COCs in nearshore sediment and soil
- In situ groundwater treatment for VOCs
- Installation of a belowground barrier to contain COCs and NAPL in groundwater and prevent migration
- Monitoring and MNA of groundwater for VOCs
- Removal and treatment of NAPL source

- Radiological screening and remediation through soil excavation, removal of sanitary sewer and storm drain lines, and FSSs area at three radiologically impacted buildings (404, 414, and 810) and through decontamination (and demolition/dismantling if necessary) buildings, structures, and former building sites
- ICs for to radionuclides

Remedy components are shown on **Figure 6-1, 6-2,** and **6-3**.

6.4.1.1 Remedy Implementation

Remedy construction and implementation is currently underway and is being conducted in phases as described in the Phase 1 RAWP (APTIM, 2019a), Phase 2 RAWP (Gilbane, 2019), and Phase 3 RAWP (APTIM, 2019b). Radiological remediation within Parcel E will be addressed by a future Phase 4 task order, to be completed following the Phase 2 RA and before the unrestricted release of Parcel E. The RA construction began in October 2019 and is currently in progress. The following sections provide the current status of remedy implementation; however, progress at this time has not been documented in a construction completion, or RACR.

Soil Excavation and Removal

Excavation activities were conducted from May 2020 to November 2022 (report pending). The objective of the soil excavation was to remove and dispose of contaminated soil in selected areas (referred to as Tier 1, Tier 2, and TPH locations) that contain nonradioactive chemicals at concentrations exceeding risk-based levels, as well as separate and dispose of materials and soil with radioactive contamination found in these areas.

- Tier 1 locations contain COCs at concentrations greater than 10 times the RGs.
- Tier 2 locations contain COCs at concentrations greater than 5 times the RGs.
- TPH locations contain TPH (commingled with CERCLA-contaminants) at concentrations exceeding the petroleum source criterion (3,500 milligrams per kilogram).

As part of Phase 1 RA, excavation of contaminated material was performed until the Tier 2 soil action levels have been achieved, the excavation reaches 10 feet in depth or bedrock/Bay Mud is encountered, whichever is shallower, or upon the Navy's determination to limit excavation with approval provided in writing by the FFA regulatory parties. Additional excavation may be completed in the event that methane-generating debris is encountered while completing the six nearby source-removal excavations in the IR-12 Area. Additional excavation may also be completed in areas of VOC-impacted soil beneath Building 406 in lieu of SVE if Building 406 has been removed prior to conducting RA (APTIM, 2019a). Building 406 had not been demolished at the time of this review.

In addition, there are 11 planned shoreline excavation areas for the Phase 3 RA at Parcel E (APTIM, 2019b). Shoreline excavation at IR-03 (Phase 2) is discussed in the Nonaqueous Phase Liquid Removal and Treatment section.

Closure of Fuel and Steam Lines

Inactive underground steam and fuel lines located within Parcel E that are potential continuing sources of contamination to soil and/or groundwater will be inspected and either removed or closed-in-place as part of the Phase 1 RA. This work is anticipated to be initiated in spring 2025.

Parcel E contains approximately 2,700 linear feet of inactive underground steam lines that are contained in concrete utilidors (i.e., concrete-lined utility chases) with access points every 200 to 400 feet. Visual inspections and/or sampling will be conducted to evaluate whether individual steam lines, condensate, and pump return lines within Parcel E have been used to transfer waste oil and, if so, whether they leaked onto the concrete utilidors. If the sampling shows that steam lines are contaminated with waste oil, they will be cleaned or removed. Uncontaminated steam lines at Parcel E may be capped and abandoned in place or removed for offsite recycling or disposal (APTIM, 2019a).

Parcel E contains approximately 3,100 linear feet of inactive underground fuel (**Figure 6-3**). Most of the fuel lines are buried directly in soil, although some lines may be located within concrete utilidors. The primary fuel line at Parcel E extends from the Parcels D-1 and E boundary (near former ship Berth 29) to the locations of a former aboveground storage tank (S-505) in IR-02 Southeast, and the Former Oily Waste Ponds (IR-03). The fuel lines will be exposed and inspected to evaluate the condition of the lines, valves, and flanges, and to identify whether fluids or combustible vapors are present in the lines. Residual fluids will be sampled and removed. Fuel lines will be evaluated for potential historic leaks and the surrounding soil will be evaluated for signs of contamination. Fuel lines may be removed or closed-in-place (APTIM, 2019a).

Soil Vapor Extraction

SVE is planned as a source-reduction measure to address VOC-contaminated soil beneath Building 406 in the event that the building has not been removed prior to the time of RA (CES, 2018a). If Building 406 has been removed prior to RA, then excavation may be used in lieu of SVE to remove VOC source material in the area. If Building 406 remains in place, VOCs the vapor intrusion pathway will be evaluated (APTIM, 2019a). This work is anticipated to be initiated in spring 2025.

The following soil gas surveys will be completed: soil gas monitoring at existing VOC plumes at Building 406, IR-04, and IR-12; supplemental methane monitoring will be performed at the potential debris removal area within IR-12; and a focused soil gas survey will be performed in redevelopment areas planned for mixed use to evaluate residual VOCs in soil (APTIM, 2019a).

Durable Cover Installation

The sitewide cover will be composed of either: 1) a minimum 2-foot erosion resistant layer of soil; 2) a minimum 2-inch layer of asphaltic concrete underlain by a minimum 4-inch compacted aggregate base foundation layer; or 3) a minimum 4-foot layer of shoreline armoring comprised of riprap overlying filter rock for steeper slopes (i.e., 3H:1V) and course sand overlying light riprap and filter rock for shallower slopes (i.e., 7H:1V) (APTIM, 2019a). The asphalt and concrete surfaces in the northern portion of Parcel E are part of the future Multi-Use District. The 2-foot-thick soil cover in the southern portion and northwestern edge adjacent to Parcel E-2 are part of the future open space area (CES, 2018a). This work is expected to be initiated in fall 2026.

Shoreline Protection

Shoreline protection will be installed along approximately 3,730 feet of exposed IR-02 shoreline and 550 feet of IR-03 shoreline within Parcel E (**Figure 6-3**). Two separate types of shoreline protection are planned or have been installed:

- **Armored revetment (rock revetment)**: The armored revetment was installed from June 2020 to July 2022 and includes natural rock armor facing (i.e., riprap), with a 3-foot high concrete seawall incorporated into the revetment crest, and will be constructed in the steep and narrow shoreline areas. This revetment has been designed to be stable to wave action and provide protection from exposure to potentially contaminated sediment.
- **Hybrid shoreline stabilization**: The shoreline stabilization will be installed from summer 2023 to summer 2024 and will include natural shoreline materials (i.e., coarse sand) underlain by rock armor (i.e., riprap) and will be constructed in the gradually sloped and wide shoreline areas. This protection measure will provide a more natural look along the shoreline and be more aesthetically pleasing. The primary structural component of the hybrid stabilization design is the underlying riprap rock layer, which is sized based on a worst-case scenario of the rock being exposed to wave action. The overlying sand will improve pedestrian access to shoreline areas and provide an additional layer of protection from exposure to potentially contaminated sediment under the rock armor.

To increase the wave run-up protection level above the +9-foot msl elevation for the armored revetment sections, a 3-foot high concrete seawall will be constructed at the crest of the revetment terminating at elevation 12-feet msl. The seawall is intended to maximize the shoreline protection without substantially increasing the fill volume and associated weight of additional shoreline revetment (CES, 2018a).

In Situ Groundwater Remediation

In situ groundwater VOC treatment will be implemented after the remedial excavations in the treatment area(s) are completed, the performance wells are installed, and baseline sampling conducted (anticipated spring 2025). Groundwater treatment will be completed at the Building 406 Chlorinated VOC (CVOC) Plume, and potentially at the IR-04 CVOC plume, depending on characterization sampling results. Groundwater CVOC plume areas where CVOC concentrations are consistently detected above the GWTDCs (CES, 2018a) will be remediated using in situ bioremediation (ISB) of a carbon source and a dechlorinating microbial consortium injected into the subsurface. In-situ groundwater treatment is intended to be a focused short-term action that enhances degradation of VOCs, at which point MNA and ICs will be relied upon to meet the RAOs (APTIM, 2019a).

Belowground Barrier

A cement-bentonite slurry wall was installed during the Phase 3 RA (from April to July 2020) as a belowground barrier to control discharge of contaminated groundwater. This slurry wall ties into the previously installed Parcel E-2 nearshore slurry wall and extends to the southeastern limits of IR-02 Northwest. The total length of the IR-02 Northwest slurry wall is approximately 1,090 feet, including a 20-foot-long overlap with the Parcel E-2 nearshore slurry wall to form a continuous low-permeability barrier between the two parcels (APTIM, 2019b).

A second slurry wall will be installed at IR-03 as discussed in the Nonaqueous Phase Liquid Removal and Treatment section.

Groundwater Monitoring

Groundwater monitoring wells and soil gas monitoring points will be installed in VOC-impacted plumes located near Building 406 (IR-36), IR-04, IR-12A, and IR-12B to monitor remedial progress. In addition, groundwater monitoring wells will be installed in remedial excavation areas after backfilling activities are completed to replace wells required for Phase 1 groundwater

monitoring. Groundwater and soil gas monitoring will be conducted at IR-36 to support the selected remedy, including documenting the beneficial impact to groundwater quality following implementation of ISB (APTIM, 2019a).

Ten monitoring wells and piezometers will be installed during Phase 2 to complete the RA monitoring well network. The design of the IR-03 slurry wall includes monitoring wells and piezometers to measure groundwater levels and the hydraulic gradient across the IR-03 slurry wall. Existing groundwater monitoring wells within the IR-03 area will be removed during the site preparation phase, and new monitoring wells and piezometers will be installed after the IR-03 slurry wall and ISS are constructed.

Groundwater is currently sampled through the BGMP. Groundwater monitoring wells screened in the A-aquifer are sampled for VOCs, metals, PCBs, pesticides, and TPH. Radionuclides are also sampled at Parcel E to demonstrate, consistent with previous radiological investigations, that radionuclides are not present in groundwater at activity levels that are both statistically significant and pose an unacceptable risk to human health and the environment (TRBW, 2022b). Exceedances of the RGs (identified as PALs) from 2019, 2020, 2021, and 2022 are presented in **Appendix E**. Nickel, zinc, naphthalene, total TPH, and VC have exceeded the RGs and/or TLs in one or more locations during this review period. While these exceedances were identified, the locations are upgradient of the slurry wall, which was designed to contain the metals and other chemicals, preventing discharge to surface water.

The current monitoring program will continue in accordance with the selected remedy identified in the ROD (Navy, 2013). Additional sampling is also being conducted to support the multiple phases of RA being completed in Parcel E. Once RA is completed in Parcel E, then the monitoring program will be conducted in accordance with the RAMP (CES, 2019).

Nonaqueous Phase Liquid Removal and Treatment

NAPL will be addressed at Parcel E through a combination of excavation, ISS treatment, and a slurry wall (Gilbane, 2019). A summary of the planned actions are as follows:

- Shoreline excavation of NAPL up to the Bay Mud Layer was completed at IR-03 from August 2021 to April 2023.
- ISS treatment will be initiated in August 2024 and will consist of bentonite slurry and cement grout mixed with the soil to create a solidified and stabilized soil-bentonite-cement monolith. The anticipated ISS area is approximately 69,000 square feet, with the estimated target zone of soil ranging from 12 to 30 feet bgs. The ISS treatment at IR-03 is targeted to areas with the highest total TPH concentrations (i.e., greater than 9,000 milligrams per kilograms), indicating that high-saturation and mobile NAPL are present (Gilbane, 2019).
- A cement-bentonite slurry wall will be constructed at IR-03 and the surrounding area (**Figure 6-3**). Construction is planned for December 2024. The IR-03 slurry wall will encompass the extent of known groundwater contamination, including areas with elevated TPH concentrations in soil that may serve as secondary sources, providing a low-permeability barrier to prevent or minimize flow of contaminated groundwater toward San Francisco Bay from areas upgradient of the wall. A cement-bentonite backfill mix is proposed for the IR-03 slurry wall, which will create self-hardening slurry that will act as both the trench stabilizing slurry and the final backfill material (Gilbane, 2019).

During the Phase 2 shoreline excavation, a temporary sheet pile wall will be installed along the excavation area to provide stability for the shoreline and prevent releases to the San Francisco Bay during excavation (Gilbane, 2019).

Radiological Surveys and Remediation

The ROPCs at Parcel E include Co-60, Cs-137, Ra-226, Sr-90, U-235, Pu-239, and americium-241 (Am-241) (Navy, 2013).

The Navy conducted TCRAs to address potential radioactive contamination in the interior Parcel E area, including storm drains and sanitary sewer lines and radiologically impacted structures (TtEC, 2012a). In total, 6,984 cubic yards of soil were excavated during removal of 5,131 linear feet of sanitary sewer and storm drain lines. Approximately 177 cubic yards of soil was disposed of offsite as LLRW based on surface scan and analytical laboratory results. FSSs were performed within the interior Parcel E area at three radiologically impacted buildings (404, 414, and 810), three radiological sites (Building 701 Site, Building 704 Site, and the IR-04 Former Scrap Yard Site, which includes the former Building 807 Site) (TtEC, 2012b). Additionally, FSSs were performed at other areas within Parcel E at 13 radiologically impacted buildings (406, 500, 509, 521, and 529) and 7 radiological sites (Former Building 500 Series, Former Building 503 Site, Former Building 506 Site, Former Building 507 Site, Former Building 508 Site, Former Building 510/510A Site, Former Building 517 Site, Former Building 520 Site, Building 707 Triangle Area, and Former Shack 79 and 80 Site) (TtEC, 2010, 2012c, 2012d, 2012e, 2012f, 2013a, 2013b, 2013c, 2013d, 2013e, 2013f, 2013g, 2014, and 2016).

The TCRA data was reviewed as described in **Section 1.4.3** and radiological retesting, including sampling and surveys of soils previously investigated during sanitary sewer line storm drain removal and resurvey of impacted buildings and former building sites, is currently being conducted to determine if current site conditions are compliant with the RAOs.

Institutional Controls

The entire area of Parcel E (about 128 acres) is subject to ICs. IR-02 (Former Disposal Areas) and IR-03 (Former Oily Waste Ponds) are subject to ICs specifically related to radionuclides (**Figure 6-2**). IC performance objectives were developed and presented in the LUC RD (CES, 2018b). The IC performance objectives to be implemented through land use restrictions for the site are summarized in **Table 1-3**. The Navy currently controls land use and access to the Parcel while RAs are ongoing.

6.4.1.2 Remedy Operations and Maintenance

Because remedy construction is ongoing, there are no O&M activities.

6.4.2 Parcel E-2

The RA for Parcel E-2 includes the following major components:

- Excavation and disposal of COCs in soil and sediment and debris and construction of tidal and non-tidal wetlands
- Durable cover installation to address COCs in soil and landfill material
- Installation of a belowground barrier (slurry wall) to contain COCs in groundwater and prevent migration
- LTM of groundwater for COCs

- Landfill gas monitoring, collection, and treatment
- Radiological screening and remediation through conducted TCRAs
- ICs for land use

Remedy components are shown on **Figure 6-1, 6-2,** and **6-4**.

6.4.2.1 Remedy Implementation

Soil, Sediment, and Debris Excavation, Consolidation, and/or Removal

Hotspot delineation and excavation of contaminated materials in Parcel E-2 was conducted over two phases. Phase I was completed from June 2005 to September 2006. The Phase 1 TCRA at the PCB Hotspot Areas was performed to remove contaminated soil and debris, possibly containing low-level radioactive material. The removal action goals included removal of free-phase petroleum hydrocarbons to a practical extent. Approximately 44,500 cubic yards of contaminated soil, including 611 cubic yards of material with radionuclides, was excavated from this area in the southeast portion of Parcel E-2. From March 2010 to November 2012, a Phase 2 TCRA at the PCB Hotspot Areas was performed to remove contaminated soil and debris from the shoreline portion of the PCB Hotspot Area, and other select hotspots identified in the RI/FS Report. Approximately 42,200 cubic yards of contaminated soil and 3,000 cubic yards of large debris were excavated from areas not addressed during the Phase 1 TCRA (KEMRON, 2018). Because all hotspots identified for removal in the TCRAs were not removed at the time the ROD was in preparation, the remaining hotspot removal was incorporated into the remedy.

From November 2014 through March 2016, the remaining Hotspots in Parcel E-2 as determined by the Design Basis Report (DBR) (ERRG, 2014) were excavated as part of the Phase 1 Parcel E-2 RA. Approximately 39,000 BCY of PCB, TPH, lead, copper and PCE-contaminated soil were excavated from within the Panhandle, Shoreline, and East Adjacent Areas. In addition, approximately 5,324 BCY of soil and debris were excavated prior to installation of the nearshore slurry wall, and another 3,499 BCY of material were trenched during slurry wall installation (Gilbane, 2018a).

As part of the Phase 2 RA, the tidal and freshwater wetland areas were excavated and graded to the subgrade design as specified in the DBR (ERRG, 2014). Approximately 51,902 cy of soil, sediment and debris was excavated and radiologically screened from the tidal and freshwater wetland. While grading within the vicinity of the freshwater wetland, approximately 1,204 cy of material suspected of containing methane-generating debris were removed (APTIM, 2021). During the Phase 3 RA, the contractor will build approximately 3.18 acres of tidal wetlands and approximately 1.59 acres of freshwater wetlands in the Panhandle Area in accordance with the DBR (ERRG, 2014; KEMRON, 2018). The tidal and freshwater wetland installations are anticipated to be completed in 2027.

Waste generated during RA construction and grading activities, including soil, sediment, and non-recyclable or non-reusable debris, provided it met the consolidation criteria, was consolidated on site to establish the top of foundation layer elevation (ERRG, 2014). Radiologically cleared debris such as concrete, bricks, timber, metal, etc., were resized and reshaped as necessary, and buried at least 5 feet below the final protective layer to minimize the potential for damage to the final cover system. This depth was specified to result in a minimum cover thickness of 7 feet over consolidated debris, corresponding to 3 feet of cover fill over the debris, 2 feet of foundation layer soil, and 2 feet of cover soil over the liner. Based on the foundation grading plan, the northwest area of the landfill was selected for the waste (i.e.,

debris) consolidation area because it had the greatest capacity to receive waste while meeting the waste consolidation criteria established within the DBR (ERRG, 2014). An estimated 9,754 cy of debris was generated during grading operations (APTIM, 2021).

Durable Cover Installation

Durable covers at Parcel E-2 were constructed under the Phase 3 RA and completed in fall 2023. They consist of vegetated soil cover over the entire parcel as follows:

- A minimum 2-foot-thick foundation soil layer consisting of radiologically cleared soil located directly beneath a protective liner.
- A minimum 2-foot-thick soil cover (vegetative soil layer) with protective liner and demarcation layer in non-wetland areas, and a minimum 4-foot-thick soil cover in the new wetlands directly over the foundation layer, in accordance with the DBR (ERRG, 2014).
- A demarcation layer will be installed at the bottom of the vegetative soil cover where necessary to mark the potential presence of remaining radiological hazardous substances.
- All non-wetland areas will be covered with a protective liner that will include a geocomposite drainage layer. In non-wetland areas that are radiologically impacted, the upper layer of geotextile fabric within the geocomposite drainage layer will also serve as the demarcation layer. That is, the upper layer of fabric will be orange-colored and overlain by magnetic marking tape, and will then be covered by 2 feet of soil (KEMRON, 2018).

Radiologically cleared soil was reused for construction of the final foundation layer. A portion of the foundation layer and the remaining layers of the covers are pending installation.

Shoreline Revetment

The shoreline revetment was installed along approximately 1,800 feet of shoreline where Parcel E-2 meets Parcel F. The revetment is approximately 35 feet wide with a crest elevation of +9 feet msl. A concrete seawall is incorporated into the crest of the revetment to protect against additional wave run-up from the design storm conditions (CB&I, 2016; APTIM, 2021). During the installation of the shoreline revetment an additional excavation 6 feet into Parcel F was completed to assure the integrity of the revetment structure during future remediation activities within the San Francisco Bay (APTIM, 2021). After the installation of the shoreline revetment, 4 piezometers, 3 monitoring wells, and 13 leachate monitoring/extraction wells were installed, predominantly in accordance with the DBR (ERRG, 2014; APTIM, 2021).

Belowground Barrier (Slurry Walls)

Two belowground barriers were installed as follows:

- A nearshore cement-bentonite slurry wall was installed during the Phase 1 Parcel E-2 RA to control discharge of contaminated groundwater. This slurry wall was installed near the shoreline adjacent to the Parcel E-2 Landfill and eastern boundary of the parcel (**Figure 6-4**). The nearshore slurry wall extends about 1,250 feet along the western edge of the landfill waste, to the Parcel E boundary to the south. It is aligned with the shape of the Parcel E-2 shoreline to prevent groundwater located bayward of the landfill waste from contacting surface water in San Francisco Bay and divert nearshore groundwater flow to the southeast toward adjacent Parcel E (Gilbane, 2014). At Parcel E-2, an aquitard exists in the form of a Bay Mud layer, the top of which is located between 4 and 18 feet bgs. The specifications dictated that the nearshore slurry wall would be keyed a minimum of 2 feet into the Bay Mud aquitard, and would extend up to 2.5 feet below the design finish grade (ERRG, 2014).

- An upland cement-bentonite slurry wall was installed during Phase 2 Parcel E-2 RA. As designed, the upland slurry wall extends approximately 571 feet from the northern parcel boundary to the southern extent of the landfill waste in the western portion of Parcel E-2 (ERRG, 2014; APTIM, 2021). It is aligned perpendicular to the direction of groundwater flow in the western portion of the site to divert upgradient offsite groundwater away from groundwater that contacts landfill waste. As designed, the upland slurry wall is considered a "hanging" slurry wall because it was not intended to key into an aquitard. The upland slurry wall was designed to be installed from the planned finish grade, down through a thin noncontiguous lens of Bay Mud, to an elevation of approximately -10 feet below msl. Some groundwater will flow under the upland slurry wall, but groundwater modeling predictions (ERRG, 2014) indicate that upgradient flow will mostly be diverted around the upland slurry wall or diverted to the freshwater wetland via a French drain installed on the upgradient side of the upland slurry wall to divert groundwater and surface water runoff to the freshwater wetland (APTIM, 2021). The French drain consisted of a buried 4-inch perforated schedule 80 PVC pipe embedded within the trench filled with gravel and geofabric (APTIM, 2021).

Landfill Gas Controls and Monitoring

During the Phase 3 RA, a new gas control and collection system (GCCS) is anticipated to be installed in 2024 or 2025, consisting of active LFG extraction wells; conveyance piping; an extraction blower; a methane and non-methane organic compounds (NMOC) LFG treatment system; an existing LFG collection trench; subsurface methane monitoring probes, and methane monitoring points throughout the GCCS to monitor its successful operation. An existing barrier wall and LFG collection trench was installed from August 2002 to May 2003 along the northern Parcel E-2 boundary to address LFG migration beneath the University of California San Francisco (UCSF) facility. The barrier is approximately 1,475 feet long and consists of interlocking high-density polyethylene panels installed to depths below the water table in that region. The LFG collection trench was installed between the barrier wall and the landfill waste. It consists of a perforated pipe wrapped with geotextile and set above the seasonal high water table and surrounded with backfilled sand and gravel. Ten SVE wells will be decommissioned and 34 LFG extraction wells installed. Major components of the LFG treatment facility include an electric blower; activated carbon and potassium permanganate pre-treatment adsorptive filters to remove NMOCs; an enclosed ground flare to oxidize methane; and a condensate collection and storage system. The LFG treatment facility will be located in the East Adjacent Area. Eighteen additional gas monitoring probes will be installed to complete the network (KEMRON, 2018).

The purpose of monitoring the landfill surface is to confirm that the remedy (including the GCCS, soil cover, and protective liner) is inhibiting emissions of fugitive LFG and maintaining ambient concentrations of NMOCs less than site-specific action levels (KEMRON, 2018).

Groundwater Monitoring

Groundwater is sampled through the BGMP. At Parcel E-2 groundwater LTM was initiated in 2012 and consisted of sampling 13 groundwater monitoring wells screened in the A-aquifer and B-aquifer for VOCs, SVOCs, metals (including chromium VI), PCBs, pesticides, and TPH. Radionuclides are also sampled at Parcel E-2 to verify that ROPCs are not being mobilized in groundwater. Exceedances of the RGs or TLs (identified as PALs) from 2019, 2020, 2021, and 2022 are presented in **Appendix E**. Arsenic, cyanide, un-ionized ammonia, and TPH have exceeded comparison criteria in one or more location during one or more sampling events

during this review period. The monitoring wells are all located upgradient from the slurry wall discussed in the previous section.

The RA is in progress and the monitoring network has been changed throughout construction activities due to well decommissioning, access, and/or other issues to prevent sampling. Therefore, monitoring data do not provide insight into the effectiveness of the RA but can provide pre-RA completion baseline information.

The current monitoring program will continue in accordance with the selected remedy identified in the ROD (Navy, 2012). RA is currently being conducted in Parcel E-2 in accordance with the Final Design Basis Report (ERRG, 2014) and Work Plan (CB&I, 2016). Once the RA is completed the Parcel E-2 data will be collected as part of the BGMP.

Radiological Surveys and Remediation

The ROPCs at Parcel E-2 include Co-60, Cs-137, Ra-226, and Sr-90 (Navy, 2012). The Navy conducted TCRAs at Parcel E-2 to address potential radioactive contamination at several areas, including the PCB Hotspot Area, Metal Slag Area, and Ship Shielding Area (Gilbane, 2018a) and is addressing potential residual radioactive contamination at the Parcel E-2 landfill and adjacent areas through RAs (APTIM, 2019a, 2019b, 2021; Gilbane, 2019).

Institutional Controls

The entire area of Parcel E-2 (about 47 acres) is subject to ICs. IC performance objectives were developed and presented in the LUC RD (CES, 2018b). The IC performance objectives to be implemented through land use restrictions for the site are summarized in **Table 1-3**. The Navy currently controls land use and access to the parcel while RAs are ongoing.

6.4.2.2 Remedy Operations and Maintenance

Because remedy construction is not complete and is ongoing, there are no O&M activities related to the RA. However, O&M activities related to the existing landfill and landfill gas monitoring are ongoing.

Landfill Cap Inspections

The existing landfill cap area is inspected to ensure the integrity of the interim landfill cap and landfill gas control and monitoring system (Tetra Tech, 2003). The inspection typically includes inspecting the property fence, gas vents, vegetation and irrigation system, burrowing animals and deterrent system, and conducting settlement surveys. Since the remedy construction was initiated in 2019 vegetation and the top foot of soil, irrigation system, and burrowing animal deterrents were removed and settlement surveys were discontinued until the final remedy is in place (INYA, 2022).

Landfill Gas Monitoring

Landfill gas is currently monitored and reported in accordance with the Final Interim Landfill Gas Monitoring and Control Plan (Tetra Tech, 2004). Methane concentrations were generally below action levels until spring 2020 when methane exceeded action levels at the fenceline. Concentrations remained generally below action levels until July 2021 and December 2021 when the active venting system was turned on and powered by a generator beginning in January 2022 (INYA, 2022). The system is currently operational and powered by solar power (INYA, 2023). Methane concentrations were below action levels after the system was turned on until December 2022 when methane exceeded action levels at the fence line again. The exceedance was being investigated at the time the quarterly report was being prepared (INYA,

2023). Methane concentrations did not exceed at the monitoring points on UCSF property during October 2018 to December 2022 monitoring period. NMOC concentrations have been below action levels for all monitoring areas through the period from January 2019 until December 2022 (INYA, 2023). On June 21, 2023, the Navy detected a methane gas reading above the State of California action level at an HPNS landfill gas monitoring probe (GMP-07). The probe is located inside the newly installed landfill cover and is no longer representative of a perimeter monitoring point. To confirm that the methane levels are below action levels at a boundary location, a new monitoring probe was installed on October 13, 2023 (GMP-54). Measurements were collected in October through December with no detections of methane with the exception of a reading of 0.1 percent on October 31, below the action level of 5 percent by volume. Details and data are provided in **Appendix H**.

Upon notification of the reading, the Navy notified UCSF, the California Department of Recycling and Recovery, and the HPNS Base Closure Team. The Navy has increased the frequency of monitoring at the gas monitoring probe with the elevated reading to determine if this was an isolated case. To date, readings continue to remain elevated at that location. To provide protectiveness of human health, the Navy is measuring the air to confirm no methane is escaping from the gas monitoring probe or the landfill perimeter. The Navy has not detected any methane. The Navy will maintain the increased monitoring frequency through resolution of this situation and is collaborating with regulatory agencies to resolve the methane issue.

6.4.3 Parcel UC-3

The RA for Parcel UC-3 includes the following major components:

- Soil hotspot excavation and removal to address COCs in soil
- Steam line closure
- Durable cover installation and maintenance to address COCs in soil
- Soil gas sampling to identify areas impacted by VOCs
- In situ treatment and MNA for VOCs in groundwater
- Radiological surveys and remediation through soil excavation, removal of sanitary sewer and storm drain lines, and TCRAs
- ICs for soil and groundwater

Remedy components are shown on **Figure 6-1, 6-2,** and **6-5**.

6.4.3.1 Remedy Implementation

Soil Hotspot Excavation and Removal

Soil excavations were conducted in April and November 2017 to remove soil to levels below 5 times the RG for residential exposure. Three hotspot areas were excavated for a total of 783 cubic yards. Excavations were backfilled with clean fill. Response complete for soil was documented in the RACR for Parcel UC-3 (Gilbane, 2018c).

Steam Line Closure

As discussed in the Parcel E summary, the steam lines at HPNS may have been a source of contamination so steam line closure was included as a remedy component. Steam line closure RAs for Parcel UC-3 were determined post-ROD to be unnecessary to protect human health and the environment because (1) the portion of the steam line within Parcel UC-3 was not used

for conveying oil; (2) the portion of the steam line system within Parcel UC-3 was assessed during previous site investigations with no evidence of contamination; and (3) the portions of the steam line system within Parcel UC-3 are outside of the area where previous investigations identified waste oil impacts in the steam lines (AFW, 2016a).

Durable Cover Installation

Durable covers consisting of asphalt concrete were installed in the eastern portion of Crisp Road to eliminate the exposure pathway for residual contamination left in place (**Figure 6-5**). Durable covers were not required in the railroad right-of-way or on Crisp Road between the right-of-way and Redevelopment Block MU-3. Completion of the durable covers along with ICs as discussed in **Section 1.3.4.2** meets the RAOs for soil in Parcel UC-3; response complete is documented in the RACR for Parcel UC-3 (Gilbane, 2018c). Covers consisted of:

- Existing asphalt concrete pavement that did not require repairs
- Existing concrete sidewalks and concrete utility trench and covers
- Repaired asphalt concrete to a minimum 4-inch thickness
- Newly installed minimum 4-inch-thick asphalt concrete over areas where a cover had not been or where the existing pavement could not be repaired

Soil Gas Monitoring

A soil gas survey was conducted to confirm whether the ARIC for potential VOCs in groundwater and soil gas was warranted. Samples were collected from three soil gas probes in May 2017 and benzene exceeded the project screening goal of 8.39 micrograms per cubic meter with a concentration of 10 micrograms per cubic meter, resulting in the retention of the ARIC (Gilbane, 2018c).

In situ Groundwater Remediation and Monitoring

ISB and MNA were selected in the ROD to reduce VOCs, specifically TCE, in groundwater; however, based on historical and current (2018) data, TCE concentrations were below RGs since 1996 and below the 2.9 µg/L vapor intrusion criteria since 2009 (Gilbane, 2018c). Additional remediation for groundwater was not warranted since TCE concentrations were below RGs and natural attenuation processes had effectively reduced COCs below vapor intrusion criterion. Since RGs were met, groundwater is response complete for unlimited use/unrestricted exposure which is documented in the RACR for Parcel UC-3 and no further groundwater sampling is warranted (Gilbane, 2018c).

Radiological Surveys and Remediation

The ROCs suspected to be present at Parcel UC-3 include Cs-137, Ra-226, and Sr-90 (Navy, 2014). The Navy conducted TCRAs at Parcel UC-3 to address potential radioactive contamination in storm drains and sanitary sewer lines (TtEC, 2012a). In total, approximately 18,024 cubic yards of soil were excavated during removal of approximately 18,363 linear feet of sanitary sewer and storm drain lines. Approximately 1,879 cubic yards of soil was disposed of offsite as LLRW based on surface scan and analytical laboratory results.

The TCRA data was reviewed as described in **Section 1.4.3** and radiological retesting, including sampling and surveys of soils previously investigated during sanitary sewer line storm drain removal and resurvey of impacted buildings and former building sites, is currently being conducted to determine if current site conditions are compliant with the RAOs.

Institutional Controls

The entire area of Parcel UC-3 (about 11 acres) is subject to ICs prohibiting growing produce in native soil and use of groundwater. The portion of Parcel UC-3 that is adjacent to Parcel E is also subjected to general soil and groundwater ICs and a small portion is subject to ICs related to VOCs (**Figure 6-2**). IC performance objectives were developed and presented in the LUC RD (AFW, 2016b). The IC performance objectives to be implemented through land use restrictions for the site are summarized in **Table 1-3**.

6.4.3.2 Remedy Operations and Maintenance

Ongoing O&M at Parcel UC-3 includes maintaining the integrity of the durable covers and IC inspections. The inspection and maintenance requirements for the durable covers are described in the Final O&M Plan for Parcel UC-3 (Gilbane, 2018b). AOMSRs are prepared to summarize inspections and maintenance performed and to document the effectiveness of the remedy components. AOMSRs from 2019, through 2023 were reviewed (Innovex-ERRG Joint Venture, 2020, 2021a; APTIM, 2022, 2023).

Durable Cover Maintenance

In general, the durable covers were in good condition with some minor deterioration around metal trench plates and a storm drain that were repaired in 2022 (APTIM, 2023). The metal trench plates were installed to temporarily cover sections of the road that were deteriorated but are frequently used by heavy trucks during RA activities at Parcels E and E-2.

Institutional Controls Compliance

ICs are inspected annually, and no deficiencies or inconsistent uses were observed during the reviews. General site conditions were determined to be good. Remedy components such as survey benchmarks and monitoring well vault covers were found to be in good condition.

Navy controls access to the portion of the parcel adjacent to Parcel E using security fencing, signage, locks, and gates which were found to be in good condition, with no signs of damage or vandalism. The remaining portion of the parcel did not show any indications of incompatible land use.

6.4.4 Progress Since the Fourth Five-Year Review

Issues, recommendations, and follow-up actions from the Fourth Five-Year Review are summarized in **Table 6-7**.

6.5 Technical Assessment

While the remedy construction is not complete for Parcels E and E-2, evaluation of Technical Assessment Question A is not feasible. However, because the RODs were signed in 2013 and 2012, respectively, Technical Assessment Question B is evaluated. Because the remedy is still under construction, the Navy considers a Will Be Protective determination to be appropriate for Parcels E and E-2.

6.5.1 Question A: Is the Remedy Functioning as Intended by the Decision Document?

6.5.1.1 Parcel E

Technical assessment related to remedy function was not conducted because the remedy is still under construction. However, the remedy is being constructed in accordance with the

requirements in the ROD (Navy, 2013), Design (CES, 2018a), and RAWPs (APTIM, 2019a, 2019b; Gilbane, 2019). Controls such as a temporary sheet pile wall and silt fencing are in place to prevent erosion and migration of subsurface contaminants during construction.

6.5.1.2 Parcel E-2

Technical assessment related to remedy function was not conducted because the majority of the remedy is still under construction or O&M data collection is still in progress for an evaluation. However, the remedy is being constructed in accordance with the requirements in the ROD (Navy, 2013), DBR (ERRG, 2014), and RAWP (KEMRON, 2018). The nearshore slurry wall has been constructed; hot spots have been excavated and removed; and a portion of the landfill cover base has been installed (Gilbane, 2018a). The remaining remedy construction is ongoing. Landfill gas is being monitored under the interim monitoring plan, and active venting is ongoing to reduce methane concentrations to below action levels at the points of compliance. While the remedy is currently under construction, agency concerns have been raised regarding the following completed components:

- **Concern: The Upland Slurry Wall was not installed as designed**. Geologic refusal was met along a 200-foot section of the planned wall at approximately 0 feet msl (10 feet shallower than the designed depth). The slurry wall was designed to minimize flow of offsite groundwater into the landfill and was designed as a “hanging wall” (not embedded into bedrock) with a French drain (which was installed according to the design) to prevent precipitation recharge and divert flow to the freshwater wetland. The material encountered was determined to be bedrock, which has a lower permeability than the surrounding aquifer material. A work plan is under agency review to evaluate the Upland Slurry Wall performance and work is anticipated to begin in 2025.
- **Concern: The turbidity curtain was not used during remedy construction.** A 2,000-foot U.S. Department of Transportation Type III offshore turbidity curtain was installed during shoreline work in accordance with the Design (ERRG, 2014) on November 30, 2016, as documented in the Phase II Remedial Action Construction Summary Report (APTIM, 2021). The turbidity curtain was removed after shoreline activities were completed, in accordance with the RAWP Appendix D, Environmental Protection Plan (CB&I, 2016) which states the following: “During shoreline earthwork (revetment installation, wetlands excavation, and site grading), a turbidity curtain will be deployed as the BMP for sediment control.” Upcoming nearshore work, such as wetland installation, will be conducted in accordance with the design and RAWP.
- **Concern: The Navy has not provided all stormwater best practices documentation.** The Navy provided the following final primary documents that contain stormwater best practices: Remedial Action Work Plans (RAWPs) (CB&I, 2016; KEMRON, 2018); Stormwater Protection Plan; and stormwater best practices monitoring documentation during construction (provided in the Phase I RACR [Gilbane, 2018a] and Phase II RACSR [APTIM, 2021], which will also be provided in the forthcoming Phase III RACSR [pending]). The Navy also responded to the Water Board’s December 3, 2022, January 11, 2023, and May 23, 2023, follow-up email requests for stormwater records.
- **Concern: There is not adequate documentation that lead was removed from the wetland areas and groundwater may be affected in the future.** Lead was removed from the tidal wetland areas according to the Phase II RAWP (KEMRON, 2018) and subsequent Fieldwork Variance #5 (Appendix G of APTIM, 2021). Exceedances shown on Figures 6 and

7 of the RACSR (APTIM, 2021) were initial samples prior to over-excavation to remove lead-impacted soils. Post-over-excavation samples were found to be below the RG. Additionally, the landfill cap geomembrane and geosynthetic clay liner layers prevent vertical infiltration of rainfall from reaching the underlying landfill waste and promoting leachate. The geocomposite drainage layer carries any flow that infiltrates through the vegetative layer to the perimeter ditches. The surface water from the eastern half of the site will be collected by the eastern perimeter ditch and will drain directly into the Bay through the culvert pipe at the southeast corner of the site. The surface water from the western half of the site will be collected by the western perimeter ditch and will flow into the freshwater wetlands with excess runoff draining through the freshwater wetlands outfall pipe into the Bay. The chemically contaminated soils near the freshwater wetlands were removed during previous hot spot excavations and excavations during Phase II subgrade preparations, with confirmation testing to show that they are below action limits in the Final RACSR for copper, lead, total PCBs, and total TPHs. There is no required tie into the underlying Bay Mud at the Wetlands Boundary. Refer to Detail 4 on Design Drawing C18 from the DBR for the cover termination at the wetlands boundaries.

- **Concern: There may be impacts to soil due to RCRA hazardous waste handling in stockpiles during remedy installation**: Navy is planning, at agencies' request, to sample the soil under former Parcel E-2 stockpile locations now covered with radiological retesting radiological screening yard pads for metals to confirm that the stockpiles didn't impact the soils around them during storm events. This will be completed after the pads are removed.

6.5.1.3 Parcel UC-3

Yes. Based on the review of historical documents, annual O&M inspections, and the Five-Year Review inspection the remedy at Parcel UC-3 is functioning as intended.

Soil hotspot areas were removed through excavation and offsite disposal. Exposure pathways to residual COCs that could result in an unacceptable risk are being controlled through durable covers and ICs. Asphalt cover is in good condition, and any minor issues have been repaired. Groundwater has met RGs and response complete. Radiological concerns are addressed through previous radiological surveys and remediation of soil and structures (utilities) and radiological retesting, with the goal of unrestricted closure.

6.5.2 Question B: Are the Exposure Assumptions, Toxicity Data, Cleanup Levels, and Remedial Action Objectives Used at the Time of the Remedy Selection Still Valid?

6.5.2.1 Parcels E and E-2

Any changes in toxicity data or cleanup levels would not affect protectiveness because protectiveness is assured through the remedies for soil (excavation, durable covers and/or landfill cover, and ICs) that prevent exposure to COCs in soil. Similarly, although there may be changes with HHRA analysis for the construction worker scenario exposure to A-aquifer groundwater, those changes will not affect protectiveness because ICs will require identification and management of potential risks to construction workers.

Although residential use is an unlikely use scenario, the ROD establishes residential use-based cleanup levels for groundwater in the B-aquifer that are either a risk-based calculation, based on background, or established ARARs. **Tables 6-8** and **6-9** show the RGs and current comparison criteria for groundwater use as a domestic supply for Parcels E and E-2, respectively. There

have been no changes since the ROD for Parcel E. There are three COCs with current comparison criteria that are lower than the RG for Parcel E-2:

- The RG for 1,2,3-tricholoropropane (1 µg/L) was based on the practical quantitation limit at the time of the ROD (2012); however, the California MCL of 0.005 µg/L was promulgated in 2017 and the California MCL was identified as an ARAR.
- The RG for 4-nitrophenol is a risk-based calculation and is higher than the RSL for nitrobenzene, which is used as a proxy for 4-nitrophenol. The toxicity and chemical-specific information for nitrobenzene has not changed since the ROD was signed in 2012 and there have been no changes in exposure assumptions or site conditions that would affect the risk-based assumptions used in the ROD. Therefore, the RG for 4-nitrophenol remains protective.
- The risk-based RG for chromium VI is higher than the current RSL. The toxicity and chemical-specific information for chromium VI has also not changed since the ROD was signed in 2012 and there have been no changes in exposure assumptions or site conditions that would affect the risk-based assumptions used in the ROD. Therefore, the RG for chromium VI remains protective.

These changes do not affect protectiveness because parcel-wide ARICs prohibit the use of groundwater. Further, all three COCs were below detection limits during the 2022 BGMP sampling (TRBW, 2023). However, because 1,2,3-trichloropropane is based on an ARAR and the ARAR has changed since the ROD was signed, the Navy intends to update the BGMP to use a laboratory method that can meet the level of detection required to meet the California MCL of 0.005 µg/L and prepare post-ROD change documentation to update the RG for 1,2,3-trichloropropane consistent with the current ARAR.

The RAOs used at the time of remedy selection are still valid as there have been no changes to the planned future use and, apart from installing remedy components, there have been no changes in the site conditions that would impact the basis for the RAOs.

6.5.2.2 Parcel UC-3

Yes. Based on the results of the ARAR evaluation and HHRA analysis discussed in the following sections, the exposure assumptions, toxicity data, cleanup levels, and RAOs used at the time of remedy selection are still valid. Although there have been some changes to toxicity values and risk assessment methods, these changes do not affect remedy protectiveness.

ARAR Evaluation

The Navy evaluated the ARARs established in the ROD for Parcel UC-3. No changes to location-specific or action-specific ARARs that would affect the protectiveness of the remedies were identified. Changes to chemical-specific ARARs for individual chemicals are discussed in the HHRA Analysis.

The California Public Resources Code Division 20.6.5, California Sea Level Rise Mitigation and Adaptation Act of 2021, was passed in 2021; however, no regulations have been promulgated to implement the Act. The Navy is addressing SLR as discussed in **Section 1.4.2** of this Five-Year Review.

HHRA Analysis

As **Section 3.5.2.1** notes, in 2018, the State of California promulgated the TCR. However, the Navy continues to view the values identified in the USEPA IRIS database (a Tier 1 value) as the

primary source of toxicity factors for risk-related calculations. The HHRA evaluation was conducted by comparing the human health RGs from the ROD to current risk-based criteria based on the same exposure scenario, and ARARs, if available. Response complete for soil at UC-3 is achieved with hotspot excavation, durable cover construction and maintenance, and ICs as documented in the RACR for Parcel UC-3 (Gilbane, 2018b). Therefore, any changes in exposure assumptions and toxicity data for soil COCs would not affect protectiveness of the remedy.

Table 6-10 shows the RGs and current comparison criteria for groundwater. The RGs for the groundwater COCs included in the Parcel UC-3 ROD are based on consideration of exposure scenario-specific (construction worker trench exposure [A-aquifer]) risk-based concentrations (based on a cancer risk of 10^{-6} or a noncancer hazard index of 1), laboratory PQLs, chemical-specific ARARs, and Hunters Point groundwater ambient levels. There were only three groundwater COCs identified for Parcel UC-3: TCE, 1,2-dichloroethene (total), and VC.

While the construction worker scenario was selected as the only risk pathway for Parcel UC-3 RGs were compared to the following current comparison criteria for UU/UE:

- A-aquifer groundwater: VISLs calculated using the current USEPA VISL calculator for the residential and commercial scenarios (USEPA, 2022a).

Although the comparison criteria are lower than the RG, as discussed in **Section 6.4.3**, TCE was the only COC that was detected in groundwater and was below the 2008 groundwater criterion for vapor intrusion (2.9 µg/L) in 2009 and subsequent monitoring events. The groundwater data from 2015 and 2016 (final four sampling events) was below laboratory detection limits, which ranged from 0.3 to 0.5 µg/L (Gilbane, 2018b). Therefore, the conditions for UU/UE related to groundwater have been met and changes in toxicity, exposure scenarios, and ARARs do not affect protectiveness.

Radiological Risk Review

In October 2020, after the preparation of the Five-Year Review addenda, USEPA introduced a PRG calculation method called “Peak PRG,” which computes PRGs accounting for ingrowth and decay of progeny over time. An evaluation was performed for this Five-Year Review to assess whether this change affected the continued protectiveness of the current soil RGs for future residents. Exposure calculations were performed using the USEPA PRG Calculator (USEPA, 2022b). For this soil evaluation, the estimated excess cancer risk was calculated using the “Peak Risk” time interval of 1,000 years (Navy, 2020). The soil RGs were used as exposure point concentrations and the cumulative cancer risk was calculated as the sum of risks from all ROCs. **Appendix F** presents the calculated estimated excess cancer risks calculated from this evaluation and the supporting data. Under CERCLA, cleanup goals are considered protective if excess cancer risks from site exposures remain withing the 10^{-4} to 10^{-6} range. Based on the findings of this evaluation, the soil RGs are within this range and are protective for future residential exposures.

There were no changes to the risk assessment methods related to structures or buildings for radiological concerns since the last Five-Year Review.

6.5.3 Question C: Has Any Other Information Come to Light that Could Question the Protectiveness of the Remedy?

Yes. As identified in the Fourth Five-Year Review there is uncertainty with a portion of the radiological survey and remediation work. The Navy is in the process of implementing corrective

actions to ensure the radiological remedies specified in the decision documents were implemented as intended; however, this work is ongoing. Radiological retesting is currently being conducted at Parcel UC-3; long-term protectiveness will be confirmed upon completion.

6.6 Issues, Recommendations, and Follow-up Actions

Issues, recommendations, and follow-up actions were identified for Parcel UC-3 as summarized in **Table 6-9**.

6.6.1 Other Findings

The following findings were identified that do not directly relate to achieving or maintaining remedy protectiveness but are relevant to overall site management.

6.6.1.1 PFAS

As discussed in **Section 1.4.1**, a Basewide PA was conducted to identify potential PFAS release areas based on historical use or limited sampling data. There were no individual areas identified for investigation in the form of an SI with the exception of the general approach to sample all A-aquifer groundwater beneath Parcels E and E-2 (Multi-MAC JV, 2022). During the SI, PFOA, PFOS, PFNA, PFHxA (Parcel E-2 only), and PFHxS exceeded project screening levels in soil and groundwater (**Appendix G**) and additional investigation was recommended (Liberty JV, 2023).

There were no areas identified for investigation at Parcel UC-3. Exposure to groundwater is restricted by ICs within the HPNS, and the City and County of San Francisco prohibits installation of domestic wells within city and county limits.

6.6.1.2 Climate Resilience

The CRA estimates that groundwater emergence from SLR may occur within Parcel E and E-2 wetland areas by the year 2065 (**Appendix A**). Site-specific assessments are planned, which will include verifying mapping projections and evaluating the 2100 timeframe, at a minimum.

However, protectiveness is only affected when increased CERCLA risk attributable to climate hazards has been identified (groundwater is likely to emerge and land use is such that receptors could be exposed and a future unacceptable health or ecological risk has been identified, data collected, validated, and evaluated following CERCLA risk assessment processes resulting in unacceptable risk to receptors). Where the potential for increased vapor intrusion is identified in other CERCLA documents, ARICs for VOCs are present, groundwater is being monitored, and removal of VOCs is occurring either through MNA or active remediation, thus reducing the potential for future vapor intrusion by reducing the source. Therefore, the potential for groundwater emergence does not affect the protectiveness determination in this Five-Year Review.

At Parcel E, during the January 23, 2024, Five-Year Review site inspection, standing water was observed near the southern end of a bioswale. The source of the water was unclear and concerns were raised by the agency representatives whether this was climate-related flooding. There were rain events before the site visit and the area is undergoing final cover installation and grading which may have been causing poor drainage. This area will be evaluated during site-specific studies.

At Parcel E-2, additional potential vulnerabilities were identified that could affect the LFG treatment system, such as vulnerability to power outages from extreme weather events or

wildfires. However, the LFG system is currently solar powered and O&M of the remedy includes routine inspections conducted during monitoring events and inspections following any catastrophic event (earthquakes, floods, or fires and explosions). Repairs will be made promptly for continued operation and to ensure protectiveness of the remedy (ERRG, 2014). The Parcel E-2 remedy design includes several additional components that make the remedy resilient through the year 2065 including the seawall, slurry walls, and freshwater and tidal wetlands that are discussed in detail in **Appendix A**. Although the Parcel E-2 remedy components such as the sea wall were designed for resilience through a 3-foot rise in sea level (similar to the 2065 scenario), a site-specific study is recommended to evaluate the longer-term scenarios, such as 2100.

There are no estimated effects from SLR on Parcel UC-3.

6.6.1.3 Site Management Strategy

Parcel UC-3 groundwater has achieved response complete and poses no unacceptable risk for unlimited use/unrestricted exposure (Gilbane, 2018b). The Navy plans to remove groundwater ICs, which are no longer necessary to ensure protection of human health and the environment.

6.6.1.4 Remediation Goal Updates

The California MCL for 1,2,3-trichloropropane was promulgated after the Parcel E-2 ROD was finalized. The Navy intends to prepare post-ROD change documentation to reflect this change.

6.6.1.5 Parcel E-2 Other Findings

The remedy at Parcel E-2 is complex and involves multiple phases of field work to install. A number of facilities that are important to understanding groundwater flow and contaminant concentrations have been completed or are substantially completed (for example, Nearshore Slurry Wall and landfill cover). The following is a summary of the remaining Remedial Action (RA) work, interim studies, and key milestones planned before completing the Remedial Action Completion Report:

- Evaluate the effect of landfill cap and slurry walls on groundwater including flow, leachate attenuation, and potential impact to the San Francisco Bay, anticipated by after the approval of the Parcel E-2 Phase IV work plan by the FFA regulatory agencies, anticipated by Spring 2027.
- Collect confirmation soil samples for lead in the wetland areas following the excavation, anticipated by Summer 2027.
- Collect confirmation soil samples for PCBs, PAHs, pesticides and metals for the soil stockpile area, anticipated by Summer 2026.
- Construct remaining components of the remedy including the permanent landfill gas system, freshwater and tidal wetlands, and groundwater monitoring network under the approved Final Work Plan (KEMRON, 2018):
  - Landfill Gas System (Phase IVa) anticipated in 11/30/2026
  - Wetlands (Phase IVb) anticipated in 11/30/2027
- Modify the landfill gas monitoring program to include a monitoring probe (GMP54) outside of the recently expanded landfill cover as a new compliance point by revising the appropriate primary document(s). The primary document(s) needing revision and the proposed schedule for revision will be further discussed with the FFA Regulatory Parties not later than 9/30/2024

- Document completion of the protective liner and final cover installation in the Phase III Remedial Action Construction Summary Report anticipated by 11/30/2024.
- Conduct a study to evaluate the performance of the upland slurry wall as documented in the Post-Remedial Action Performance Evaluation Work Plan to evaluate the performance of the Upland Slurry Wall Approval of the Final Workplan is anticipated by 11/15/2024, Fieldwork is anticipated to be completed in April 2025, Draft Report to Navy October 2025 and the Final Post-Construction Remedial Action Performance Report is anticipated by March 2026.

6.7 Statement of Protectiveness

6.7.1 Parcel E

Protectiveness Determination: Will Be Protective

Protectiveness Statement: The remedy at Parcel E Will be Protective upon completion of remedy construction and completion of the radiological retesting.

In the interim, exposures to COCs in soil, sediment, and groundwater are being controlled during construction using temporary sheet piles, erosion control measures, security fencing to prevent unauthorized access, and ICs. The RAOs for soil will be met through excavation and offsite disposal, closure of fuel and steam lines, installation of durable covers, and ICs. The RAOs for soil gas will be met through SVE or excavation to address VOCs, and ICs. The RAOs for shoreline sediment will be met through excavation and offsite disposal, durable cover installation, shoreline protection, and a sea wall. The RAOs for groundwater will be met through in situ groundwater treatment, installation of a belowground barrier, monitoring, and ICs.

The RAOs for radiologically impacted media will be met through radiological surveys, decontamination, and removal of radiologically impacted structures and soil and sediment, and ICs. The RAOs for NAPL will be met through removal and treatment of NAPL source, ISS, and containment.

Soil excavation to remove COC- and radiologically impacted soil has been completed. The following remedy components are under construction: installation of the shoreline armored revetment and the cement-bentonite slurry wall and belowground barrier, removal of sanitary sewer and storm drain lines, and excavation of NAPL followed by initiation of the ISS treatment. Groundwater is currently being monitored through the BGMP.

6.7.2 Parcel E-2

Protectiveness Determination: Will Be Protective

Protectiveness Statement: The remedy at Parcel E-2 Will be Protective upon completion of remedy construction.

Soil and sediment hotspots have been removed and the final cover is currently under construction. Landfill gas venting and monitoring is ongoing during construction activities. Exposure to soil and groundwater is currently being controlled through security fencing to prevent unauthorized access, signage, and ICs. The RAOs for soil will be met through hotspot removal, soil cover and sea wall, and ICs.

The radiological RAOs will be met through radiological screening and removal, installation of a soil cover with demarcation layer, and ICs. The RAOs for landfill gas will be met through landfill gas monitoring, removal, and treatment, landfill cover monitoring, and ICs. The RAOs for groundwater will be met through LTM and ICs. The RAOs for surface water will be met through

installation of the protective soil cover, slurry walls, diversion to tidal and non-tidal constructed wetlands, and outfall monitoring.

The following activities have been completed: soil excavation to remove COC- and low-level radiologically impacted soil, installation of soil layer of radiologically cleared soil and a soil cover, installation of the shoreline armored revetment, cement-bentonite slurry walls along the shoreline and in the upland portion of the parcel, and the installation of a portion of the landfill gas collection and treatment system. Groundwater is currently being monitored through the BGMP.

6.7.3 Parcel UC-3

Protectiveness Determination: Short-term Protective

Protectiveness Statement: The remedy at Parcel UC-3 is currently protective of human health and the environment. In order to determine whether the remedy can be considered protective in the long term, the radiological retesting work must be completed.

The RAOs for soil are met through hotspot excavation, durable covers and ICs. Groundwater RGs have been met. Radiological retesting is planned to confirm that levels in soil are protective of human health. Until retesting is complete, short-term protectiveness is met through Navy controls such as access to the parcel through fencing, locked gates, and ICs (restricting intrusive work and maintaining durable covers).

6.8 References

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Table 6-1. Parcels E and UC-3 Chemicals of Concern and Remediation Goals

Exposure Medium	Exposure Scenario	Chemical of Concern	ROD Remediation Goal (2013, 2014)	Source of Remediation Goal	Parcel
Soil (mg/kg)	Residential	3,3'-Dichlorobenzidine	1.6	RBC	E
		4-Nitrophenol	0.29	RBC	E
		4,4'-DDD	2.1	RBC	E
		4,4'-DDE	1.6	RBC	E
		Aldrin	0.024	RBC	E
		alpha-BHC	0.0019	RBC	E
		Antimony	10	RBC	E, UC-3
		Aroclor-1254	0.093	RBC	E
		Aroclor-1260	0.21	RBC	E, UC-3
		Arsenic	11.1	HPAL	E
		Benzene	0.18	RBC	E, UC-3
		Benzo(a)anthracene	0.37	RBC	E, UC-3
		Benzo(a)pyrene	0.33	PQL	E, UC-3
		Benzo(b)fluoranthene	0.34	RBC	E, UC-3
		Benzo(k)fluoranthene	0.34	RBC	E, UC-3
		Bis(2-ethylhexyl)phthalate	1.1	RBC	E, UC-3
		Cadmium	3.5	RBC	E, UC-3
		Carbazole	2.2	RBC	E
		Copper	160	RBC	E, UC-3
		Dibenz(a,h)anthracene	0.33	PQL	E, UC-3
		Dieldrin	0.0033	PQL	E
		gamma-BHC	0.0026	PQL	E
		Heptachlor epoxide	0.0017	RBC	E, UC-3
		Indeno(1,2,3-cd)pyrene	0.35	RBC	E, UC-3
		Iron	58,000	HPAL	E, UC-3
		Lead	155	RBC	E, UC-3
		Manganese	1,431	HPAL	E, UC-3
		Mercury	2.28	HPAL	E, UC-3
		n-Nitroso-di-n-propylamine	0.33	PQL	E
		n-Nitrosodiphenylamine	0.68	RBC	E
		Naphthalene	1.7	RBC	E
		Pentachlorophenol	2.6	RBC	E
		Thallium	5	RBC	E, UC-3
		Vanadium	117	HPAL	E, UC-3
		Trichloroethene	2.9	RBC	E
		Zinc	370	RBC	E, UC-3
		Xylene	270	RBC	E, UC-3
		Total TPH [a]	3,500	--	E, UC-3
	Recreational	Aroclor-1254	0.74	RBC	E
		Aroclor-1260	0.74	RBC	E, UC-3
		Arsenic	11.1	HPAL	E, UC-3
		Benzo(a)anthracene	1.3	RBC	E, UC-3
		Benzo(a)pyrene	0.33	PQL	E, UC-3
		Benzo(b)fluoranthene	1.3	RBC	E, UC-3

Table 6-1. Parcels E and UC-3 Chemicals of Concern and Remediation Goals

Exposure Medium	Exposure Scenario	Chemical of Concern	ROD Remediation Goal (2013, 2014)	Source of Remediation Goal	Parcel
Soil (mg/kg)	Recreational	Benzo(k)fluoranthene	1.3	RBC	E, UC-3
		Chrysene	13	RBC	E
		Copper	470[a]	--	E, UC-3
		Dibenz(a,h)anthracene	0.33	PQL	E, UC-3
		Dieldrin	0.12	RBC	E
		Heptachlor epoxide	0.21	RBC	E, UC-3
		Indeno(1,2,3-cd)pyrene	1.3	RBC	E, UC-3
		Lead	155	RBC	E, UC-3
		Manganese	2,430	RBC	E, UC-3
		Mercury	210	RBC	E, UC-3
		n-Nitroso-di-n-propylamine	0.33	PQL	E
		Zinc	719[a]	--	E
		Total TPH [a]	3,500	--	E, UC-3
	Industrial	Arsenic	11.1	HPAL	UC-3
		Benzo(a)anthracene	1.8	RBC	UC-3
		Benzo(a)pyrene	0.33	PQL	UC-3
		Benzo(b)fluoranthene	1.8	RBC	UC-3
		Benzo(k)fluoranthene	1.8	RBC	UC-3
		Copper	76000	RBC	UC-3
		Dibenz(a,h)anthracene	0.33	PQL	UC-3
		Indeno(1,2,3-cd)pyrene	1.8	RBC	UC-3
		Lead	800	RBC	UC-3
		Total TPH [a]	3500	--	UC-3
	Construction Workers	1,2,4-Trichlorobenzene	230	RBC	E
		1,2,4-Trimethylbenzene	170	RBC	E
		1,3,5-Trimethylbenzene	69	RBC	E
		Aldrin	0.54	RBC	E
		Antimony	120	RBC	E, UC-3
		Aroclor-1248	2.1	RBC	E
		Aroclor-1254	2.1	RBC	E
		Aroclor-1260	2.1	RBC	E, UC-3
		Arsenic	11.1	HPAL	E, UC-3
		Benzene	9.4	RBC	E, UC-3
		Benzo(a)anthracene	6.4	RBC	E, UC-3
		Benzo(a)pyrene	0.65	RBC	E, UC-3
		Benzo(b)fluoranthene	6.5	RBC	E, UC-3
		Benzo(k)fluoranthene	6.5	RBC	E, UC-3
		Copper	11,000	RBC	E, UC-3
		Dibenz(a,h)anthracene	1.1	RBC	E, UC-3
		Dioxins/furans (TEQ)[b]	0.000023	--	E
		Indeno(1,2,3-cd)pyrene	6.5	RBC	E, UC-3
		Iron	93,000	RBC	E, UC-3
		Lead	800	RBC	E, UC-3

Table 6-1. Parcels E and UC-3 Chemicals of Concern and Remediation Goals

Exposure Medium	Exposure Scenario	Chemical of Concern	ROD Remediation Goal (2013, 2014)	Source of Remediation Goal	Parcel
Soil (mg/kg)	Construction Workers	Manganese	6,900	RBC	E, UC-3
		Mercury	93	RBC	E, UC-3
		n-Nitroso-di-n-propylamine	1.3	RBC	E
		Naphthalene	75	RBC	E
		Nickel	5,800	RBC	E
		Vanadium	310	RBC	E, UC-3
		Total TPH [a]	3,500	--	E, UC-3
Shoreline Sediment (mg/kg)	Ecological Receptors	Cadmium	3.14	HPAL	E
		Copper	124	HPAL	E
		Lead	218	RBC	E
		Mercury	2.28	RBC	E
		Molybdenum	2.68	HPAL	E
		Zinc	158	SF Bay Ambient Level	E
		Total DDT	0.0461	RBC	E
		Total Aroclors (PCBs)	0.2	SF Bay Ambient Level	E
Groundwater (µg/L)	Construction Worker Exposure to A-Aquifer Groundwater	1,2-Dichloroethene (total)	270	RBC	E, UC-3
		1,4-Dichlorobenzene	52	RBC	E
		Arsenic	39	RBC	E
		Benzo(a)anthracene	0.65	RBC	E
		Benzo(a)pyrene	0.05	PQL	E
		Benzo(b)fluoranthene	0.45	RBC	E
		Chrysene	6.7	RBC	E
		Indeno(1,2,3-cd)pyrene	0.31	RBC	E
		Naphthalene	16	RBC	E
		Pentachlorophenol	50	PQL	E
		Tetrachloroethene	18	RBC	E
		Trichloroethene	290	RBC	E, UC-3
		Vinyl chloride	5.4	RBC	E, UC-3
Groundwater (µg/L)	Domestic Use Exposure to B-Aquifer Groundwater	1,1- Dichloroethene	6	MCL	E
		cis-1,2- Dichloroethene	6	MCL	E
		trans-1,2- Dichloroethene	10	MCL	E
		1,4-Dichlorobenzene	5	MCL	E
		Arsenic	27.3	HPAL	E
		Manganese	8,140	HPAL	E
		Tetrachloroethene	5	MCL	E
		Thallium	12.97	HPAL	E
		Trichloroethene	5	MCL	E
		Vinyl chloride	0.5	MCL	E

Table 6-1. Parcels E and UC-3 Chemicals of Concern and Remediation Goals

Exposure Medium	Exposure Scenario	Chemical of Concern	ROD Remediation Goal (2013, 2014)	Source of Remediation Goal	Parcel
Groundwater (µg/L)	Aquatic Wildlife Exposure to A-Aquifer Groundwater	Total TPH (goals vary based on distance from the bay) [a]	1,400 to 20,000	--	E

[a] The total TPH remediation goal is based on the petroleum source criterion for HPNS

[b] Remediation goal for dioxins and furans is expressed as a TEQ, which is calculated by multiplying the concentration of each dioxin and furan congener by a toxicity equivalency factor established by the 2005 World Health Organization and based on each congener's toxicity relative to 2,3,7,8-tetrachlorodibenzo-p-dioxin.

Notes:

The distance-based TPH criteria are as follows:

Distance from shoreline		Distance from shoreline	
Feet	**Total TPH (µg/L)**	**Feet**	**Total TPH (µg/L)**
0–<25	1,400	125–<150	6,949
25–<50	1,467	150–<175	9,539
50–<75	2,092	175–<200	12,604
75–<100	3,216	200–<225	16,145
100–<125	4,839	≥225	20,000

< = less than
µg/L = microgram(s) per liter
BHC = benzene hexachloride
DDD = dichlorodiphenyldichloroethane
DDE = dichlorodiphenyldichloroethene
DDT = dichlorodiphenyltrichloroethane
HPAL = Hunters Point ambient level
HPNS = Hunters Point Naval Shipyard
MCL = maximum contaminant level
mg/kg = milligram(s) per liter
PCB = polychlorinated biphenyl
PQL = practical quantitation limit
RBC = risk-based concentration
ROD = Record of Decision
TEQ = toxic equivalent quotient
TPH = total petroleum hydrocarbons

Table 6-2. Parcel E-2 Chemicals of Concern and Remediation Goals

Exposure Medium	Exposure Scenario	Chemical of Concern	ROD Remediation Goal (2012)	Source of Remediation Goal
Soil & Sediment	Recreational (Soil)	Antimony	270	RBC
		Aroclor-1242	0.74	RBC
		Aroclor-1248	0.74	RBC
		Aroclor-1254	0.74	RBC
		Aroclor-1260	0.74	RBC
		Arsenic	11.1	HPAL
		Benzo(a)anthracene	1.3	RBC
		Benzo(a)pyrene	0.33	PQL
		Benzo(b)fluoranthene	1.3	RBC
		Benzo(k)fluoranthene	1.3	RBC
		Dieldrin	0.12	RBC
		Heptachlor epoxide	0.21	RBC
		Indeno(1,2,3-cd)pyrene	1.3	RBC
		Lead	155	RBC
		Total PCBs (Non-Dioxin)[a]	0.74	RBC
	Construction Worker (Soil)	4,4'-DDT	45	RBC
		Antimony	120	RBC
		Aroclor-1016	7.4	RBC
		Aroclor-1248	2.1	RBC
		Aroclor-1254	2.1	RBC
		Aroclor-1260	2.1	RBC
		Arsenic	11.1	HPAL
		Benzo(a)anthracene	6.5	RBC
		Benzo(a)pyrene	0.65	RBC
		Benzo(b)fluoranthene	6.5	RBC
		Benzo(k)fluoranthene	6.5	RBC
		Cadmium	150	RBC
		Copper	11,000	RBC
		Dibenz(a,h)anthracene	1.1	RBC
		Dieldrin	0.57	RBC
		Dioxin (TEQ)[b]	0.000023	RBC
		Heptachlor epoxide	1	RBC
		Indeno(1,2,3-cd)pyrene	6.5	RBC
		Iron	93,000	RBC
		Lead	800	RBC
		Manganese	6,900	RBC
		Naphthalene	75	RBC
		Total PCBs (non-dioxin)[a]	2.1	RBC
		Total TPH[c]	3,500	RBC
		Vanadium	310	RBC
	Terrestrial wildlife	Cadmium	4.2	RBC
		Copper	470	RBC
		Lead	197	RBC
		Manganese	2,433	RBC
		Mercury	1	RBC
		Nickel	1,941	RBC

Table 6-2. Parcel E-2 Chemicals of Concern and Remediation Goals

Exposure Medium	Exposure Scenario	Chemical of Concern	ROD Remediation Goal (2012)	Source of Remediation Goal
Soil & Sediment	Terrestrial wildlife	Vanadium	117	HPAL
		Zinc	719	RBC
		Total DDT	3.53	RBC
		Total PCBs	37	RBC
		Total HMW PAHs	231	RBC
	Aquatic Wildlife	Antimony	25	RBC
		Copper	270	RBC
		Lead	218	RBC
		Mercury	0.71	RBC
		Nickel	112	RBC
		Zinc	410	RBC
		Total DDTs	0.046	RBC
		Dieldrin	0.008	RBC
		Endrin	0.045	RBC
		Total PCBs	0.18	RBC
Groundwater (µg/L)	Domestic Use of Deep Groundwater (B-Aquifer)	1,1-Dichloroethane	5	PQL
		1,2,3-Trichloropropane	1	PQL
		1,2-Dichloroethane	0.5	MCL
		1,4-Dichlorobenzene	5	MCL
		4-Nitrophenol[d]	3.4	RBC
		Aroclor-1016	0.5	MCL
		Aroclor-1242	0.5	MCL
		Aroclor-1254	0.5	MCL
		Aroclor-1260	0.5	MCL
		Arsenic	10	MCL
		Benzene	1	MCL
		Benzo(a)anthracene	0.2	MCL
		Benzo(a)pyrene	0.2	MCL
		Benzo(b)fluoranthene	0.2	MCL
		Benzo(k)fluoranthene	0.2	MCL
		Bis(2-ethylhexyl)phthalate	10	PQL
		beta-BHC	0.05	PQL
		Carbon tetrachloride	0.5	MCL
		Chloroform	80	MCL
		Chromium VI	109	RBC
		Chrysene	0.56	RBC
		Dibenz(a,h)anthracene	2	MCL
		Dieldrin	0.02	PQL
		Heptachlor	0.01	MCL
		Heptachlor epoxide	0.01	MCL
		Heptachlor epoxide A	0.01	MCL
		Heptachlor epoxide B	0.01	MCL
		Indeno(1,2,3-cd)pyrene	0.2	MCL
		Iron	10,950	RBC
		Lead	15	MCL
		Methylene chloride	5	MCL

Table 6-2. Parcel E-2 Chemicals of Concern and Remediation Goals

Exposure Medium	Exposure Scenario	Chemical of Concern	ROD Remediation Goal (2012)	Source of Remediation Goal
Groundwater (µg/L)	Domestic Use of Deep Groundwater (B-Aquifer)	Naphthalene	1	PQL
		Tetrachloroethene	5	MCL
		Thallium	2	MCL
		Trichloroethene	5	MCL
		Vinyl chloride	0.5	MCL
	Wild Life in Bay	Total TPH	1,400 to 20,000	RBC

[a] Aroclor-1254 used for PCBs.

[b] Remediation goal for Dioxins/furans (TEQ) is based on 2,3,7,8-TCDD. The dioxin/furan TEQ is calculated by multiplying the concentration of each dioxin and furan congener by the toxicity equivalency factor established by the 2005 World Health Organization and based on each congener's toxicity relative to 2,3,7,8-tetrachlorodibenzo-p-dioxin.

[c] The total TPH remediation goal is based on the petroleum source criterion for HPNS.

[d] Nitrobenzene used as surrogate for 4-nitrophenol

Notes:

The distance-based TPH criteria are as follows:

Distance from shoreline		Distance from shoreline	
Feet	**Total TPH (µg/L)**	**Feet**	**Total TPH (µg/L)**
0–<25	1,400	125–<150	6,949
25–<50	1,467	150–<175	9,539
50–<75	2,092	175–<200	12,604
75–<100	3,216	200–<225	16,145
100–<125	4,839	≥225	20,000

< = less than
µg/L = microgram(s) per liter
BHC = benzene hexachloride
DDD = dichlorodiphenyldichloroethane
DDE = dichlorodiphenyldichloroethene
DDT = dichlorodiphenyltrichloroethane
HMW = high molecular weight
HPAL = Hunters Point ambient level
HPNS = Hunters Point Naval Shipyard
MCL = maximum contaminant level
mg/kg = milligram(s) per liter
PAH = polycyclic aromatic hydrocarbon
PCB = polychlorinated biphenyl
PQL = practical quantitation limit
RBC = risk-based concentration
ROD = Record of Decision
TCDD
TEQ = toxic equivalent quotient
TPH = total petroleum hydrocarbons

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Table 6-3. Parcels E and E-2 Remediation Goals for Radionuclides

Radionuclide	Surfaces (dpm/100cm^2)		Soil (pCi/g)		Parcel
	Equipment, Waste[a]	Structures[b]	Construction/Industrial/ Outdoor Worker [c]	Resident[c]	
Americium-241	100	100	5.67	1.36	E
Cesium-137	5,000	5,000	0.113	0.113	E, E-2
Cobalt-60	5,000	5,000	0.252 [d]	0.252 [d]	E, E-2
Plutonium-239	100	100	14	2.59	E
Radium-226	100	100	1.0 [e]	1.0 [e]	E, E-2
Strontium-90	1,000	1,000	10.8	0.331	E, E-2
Uranium-235	5,000	488	0.398	0.195	E

Source of Goals:

Department of the Navy (Navy). 2006. *Base-wide Radiological Removal Action, Action Memorandum – Revision 2006, Hunters Point Shipyard, San Francisco, California* . Final. April 21.

United States Environmental Protection Agency (USEPA). 2000. *Radionuclides Notice of Data Availability Technical Support Document* . Targeting and Analysis Branch, Standards and Risk Management Division, Office of Groundwater and Drinking Water. March.

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

[b] Goals are based on 25 millirem per year (USEPA does not believe this NRC regulation is protective of human health and the environment, and the HPNS cleanup goals are more protective. This regulation is an ARAR only for radiologically impacted sites that are undergoing TCRAs and any additional remedial action required for those sites.)

[c] RGs for two future use scenarios; however, the residential RGs will apply in all Parcel E and E-2 areas. These more conservative RGs will enhance protectiveness of the remedial action, particularly as it relates to future property transfer and the potential need to apply institutional controls for radionuclides (Parcel E only).

[d] RG for Cobalt-60 was revised to support efficient laboratory gamma spectroscopy analysis of soil samples. This revised RG maintains morbidity risks within the U.S. Environmental Protection Agency-defined acceptable range and permits an exposure level that does not increase the risk of cancer from a potential exposure to Cobalt-60.

[e] Objective is 1 pCi/g above background per agreement with U.S. Environmental Protection Agency

AEC = Atomic Energy Commission
ARAR = applicable or relevant and appropriate requirement
cm^2 = square centimeter(s)
dpm = disintegration(s) per minute
HPNS = Hunters Point Naval Shipyard
NRC = Nuclear Regulatory Commission
pCi/g = picocurie(s) per gram
pCi/L = picocurie(s) per liter
RG = remediation goal
TCRA = time-critical removal action
USEPA = United States Environmental Protection Agency

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Table 6-4. Parcel E Remedial Action Summary and Expected Outcomes

Media	Risk/Basis for Action	Reasonably Anticipated Land Use	RAO	Remedy Component	Performance Metric	Expected Outcome
Soil	**Human Health:** Potential unacceptable risks to future recreational users from exposure to metals, SVOCs, pesticides, PCBs, and TPH in surface and subsurface soil; future residents from exposure to metals, VOCs, SVOCs, pesticides, PCBs, and TPH in surface and subsurface soil; future construction workers from exposure to metals, VOCs, SVOCs, pesticides, PCBs, and TPH in subsurface soil.	**Current use:** Limited access unoccupied and unused buildings **Planned future use:** Shoreline open space and multiuse open space, including residential and research and development	1. Prevent exposure of humans to inorganic and organic chemicals in soil at concentrations exceeding the remediation goals (see Table 5 of the Parcel E ROD [Navy, 2013]) for the following exposure pathways: a) Ingestion of, outdoor inhalation of, and dermal exposure to soil from 0 to 10 feet bgs by residents in areas zoned for mixed-use reuse b) Ingestion of homegrown produce in native soil in areas zoned for mixed-use reuse c) Ingestion of, outdoor inhalation of, and dermal exposure to soil from 0 to 2 feet bgs by recreational users in areas zoned for open space reuse d) Ingestion of, outdoor inhalation of, and dermal exposure to soil from 0 to 10 feet bgs by construction workers in all areas	Excavation and Offsite Disposal	Excavation and offsite disposal of Tier 1 (COCs in soil at concentrations 10 times the RGs), Tier 2 (COCs in soil at concentrations 5 times the RGs), and TPH (greater than 3,500 mg/kg of TPH) hotspot areas is currently in progress.	Land suitable for planned future use compatible with durable covers and ICs as required by the LUC RD.
				Closure of Fuel and Steam Lines	Inspection and removal of inactive fuel and steam lines that may be acting as a continuing source of COCs (particularly VOCs and SVOCs).	
				Durable Cover	Durable covers to provide physical barriers to prevent exposure of humans and wildlife to residual COCs in soil after excavation. Durable covers include: 1) A 2-foot (minimum) vegetated soil cover over the southern portion of Parcel E. The areas within IR-03 and the northwest portion of IR-02 will have a protective liner installed beneath the soil cover to minimize water seeping into contaminated soil. 2) A 6-inch (minimum) asphalt cover comprising 4 inches of aggregate base and 2 inches of asphalt over the northern portion of Parcel E. 3) A 3-foot (minimum) vegetated soil cover with a demarcation layer over IR-02 and IR-03 within the radiological ARIC; Cover installation is in progress and when installed, they will be inspected and maintained to prevent exposure to COCs.	
				ICs	ICs to maintain durable covers and security features, restrict land use and land disturbing activities, and prohibit growing produce in native soil for human consumption.	
Soil Gas	**Human Health:** Potential volatilization of VOCs and some SVOCs from soil into soil gas and/or indoor air via the VI pathway.		1. Prevent exposure of humans to VOCs in soil gas at concentrations that would pose unacceptable risk via indoor inhalation of vapors. Table 7 of ChaduxTt (2010), lists risk-based action levels for various volatile chemicals, including SVOCs and pesticides, that may pose an unacceptable risk via indoor inhalation of vapors. These soil gas action levels will be used for an initial risk-based screening of data collected during a future soil gas survey (such as the survey to be performed at Building 406 and VOC groundwater plumes following active treatment). After the initial risk-based screening, areas with unacceptable risk will be further evaluated using location-specific data (i.e., physical characteristics of the soil) to assess potential exposures consistent with the most current State of California and USEPA vapor intrusion guidance. In addition, risks and hazards at these areas will be further characterized using the accepted methodology for risk assessments at HPNS. Section 2.9.2.1 of the Parcel E ROD (Navy, 2013) provides additional information on the future soil gas survey and potential actions that may be prompted based on the results of the risk and hazard evaluation.	SVE	RA Pending: If Building 406 has not been demolished, operation of an SVE system where volatile chemicals are present in soil and soil gas until soil gas action levels are achieved or asymptotic conditions are reached. If Building 406 has been demolished at the time of the RA, excavation and offsite removal may be performed instead of SVE.	
				ICs	ICs to prohibit construction of enclosed structures unless prior written approval of vapor mitigation strategies is granted by the FFA signatories.	

Table 6-4. Parcel E Remedial Action Summary and Expected Outcomes

Media	Risk/Basis for Action	Reasonably Anticipated Land Use	RAO	Remedy Component	Performance Metric	Expected Outcome
Shoreline Sediment	**Human Health:** Potential unacceptable risk to future recreational users from exposure to PCBs in shoreline sediment. **Ecological:** Potential unacceptable risks to benthic invertebrates from exposure to metals, PCBs, and pesticides; to birds from PCBs; and to mammals from metals and PCBs in nearshore sediment.	**Current use:** Limited access unoccupied and unused buildings **Planned future use:** Shoreline open space and multiuse open space, including residential and research and development	1. Prevent exposure of humans to COCs in shoreline sediment at concentrations exceeding the remediation goals in Table 6 of the Parcel E ROD. 2. Prevent exposure of benthic invertebrates, birds, and mammals to COECs in shoreline sediment at concentrations exceeding the remediation goals in Table 6 of the Parcel E ROD (Navy, 2013).	Excavation and Offsite Disposal	Excavation of minimum 2.5 feet of nearshore sediment (the biologically active zone) and offsite disposal to remove COECs/COCs from nearshore sediment. The excavation will be backfilled with natural materials such as sand and rock.	Land suitable for planned future use compatible with durable covers and ICs as required by the LUC RD.
				Durable Cover and Sea Wall	Durable cover to provide a physical barrier to prevent exposure of humans and wildlife to residual COCs in nearshore sediment. The nearshore sediment durable cover consists of a minimum 4-foot layer of shoreline armoring a minimum 4-foot layer of shoreline armoring comprised of riprap overlying filter rock for steeper slopes (i.e., 3H:1V) and course sand overlying light riprap and filter rock for shallower slopes (i.e., 7H:1V). Shoreline revetment installation is in progress and when installed, they will be inspected and maintained to prevent exposure to COCs. To increase wave run-up protection above the +9 foot msl elevation for the armored revetment sections, a 3-foot high concrete seawall was constructed at the crest of the revetment, terminating at an elevation of 12 feet msl.	
Groundwater	**Human Health:** Potential unacceptable risks to future residents (adult and child) from exposure to metals, VOCs, SVOCs (primarily PAHs), pesticides, PCBs, and TPH in B-aquifer through domestic use; and future construction workers from exposure to SVOCs and lead in A-aquifer groundwater from direct exposure to A-aquifer groundwater and VOCs in trenches. **Ecological:** Potential migration of metals, PCBs, and pesticides in groundwater discharging to surface water at concentrations above surface water criteria for aquatic wildlife.		1. Prevent or minimize exposure of construction worker to VOCs in A-aquifer groundwater by dermal exposure and inhalation of vapors with chemicals exceeding remediation goals (Table 7 of the Parcel E ROD). 2. Prevent or minimize exposure of humans to COCs in the B-aquifer at concentrations exceeding remediation goals (Table 7 of the Parcel E ROD) via the domestic use pathway. 3. Prevent or minimize migration of arsenic, copper, lead, nickel, zinc, Aroclor-1254, Aroclor-1260, alpha-chlordane, and 4,4'-DDE to prevent discharge (into San Francisco Bay) that would result in concentrations exceeding corresponding surface water quality criteria for aquatic wildlife. 4. Prevent or minimize migration of A-aquifer groundwater containing total TPH concentrations greater than 1,400 µg/L (where commingled with CERCLA-regulated substances) into San Francisco Bay.	In-situ Treatment	In-situ treatment of groundwater through biological remediation or ZVI injections to remove VOCs from areas exceeding active treatment criteria. Groundwater remediation will be initiated after soil excavation and durable covers are installed.	
				Below-ground barrier	A cement-bentonite slurry wall will be installed to control discharge of contaminated groundwater along IR-02.	
				Groundwater monitoring	Groundwater monitoring will be conducted to assess treatment and below-ground barrier performance, COC concentration trends, plume stability, and attenuation of VOCs where MNA conditions are met after active treatment. Monitoring will continue until RGs are met.	
				ICs	ICs to prohibit construction of enclosed structures, the use of groundwater and installation of new groundwater wells for domestic purposes, and to restrict land disturbing activities which includes activities that causes or facilitates the movement of groundwater known to be contaminated with COCs unless prior written approval is granted by the FFA signatories	
Nonaqueous Phase Liquid	Presence of NAPL as a potential continuing source of COCs to soil and groundwater.		1. Prevent or minimize migration of NAPL to prevent discharge that would result in COEC concentrations greater than the surface water quality criteria for aquatic wildlife. 2. Prevent or minimize migration of NAPL to prevent discharge that would result in total TPH groundwater concentrations greater than 1,400 µg/L into San Francisco Bay.	Source Removal	Excavation of NAPL-impacted soils and nearshore sediment to the Bay Mud to remove the potential ongoing source to soil and groundwater at IR-03.	
				In-situ Stabilization	ISS consisting of cement-bentonite slurry and grout mixed with NAPL-impacted soil to create a soil-bentonite-cement monolith in the areas with the highest total TPH concentrations.	
				Containment	Containment of NAPL-impacted areas through a cement-bentonite slurry wall constructed at IR-03 and the surrounding area to encompass the extent of known groundwater contamination that may serve as a potential secondary source of COCs to groundwater.	

Table 6-4. Parcel E Remedial Action Summary and Expected Outcomes

Media	Risk/Basis for Action	Reasonably Anticipated Land Use	RAO	Remedy Component	Performance Metric	Expected Outcome
Radiologically Impacted Media	Human Health: Radiological risks for soil and structures (storm drains, sanitary sewers, buildings) were greater than 10^{-6}.	**Current use:** Limited access unoccupied and unused buildings **Planned future use:** Shoreline open space and multiuse open space, including residential and research and development	1. Prevent exposure to ROCs at activity levels that exceed remediation goals (see Table 8 of the Parcel E ROD [Navy, 2013]) for all potentially complete exposure pathways (which include external exposure, ingestion, and inhalation of soil based on the CSM for human health).	Survey, decontamination, and removal of radiologically impacted structures and soil	Identification and removal of historical subsurface storm drain and sanitary sewer utilities and screening and remediation of buildings, and former building sites as part of the TCRA for radionuclides. Radiological retesting is currently being conducted to confirm site conditions are compliant with the RAO.	Land suitable for planned future use compatible with durable covers and ICs as required by the LUC RD.
				ICs	ICs to restrict land disturbing activities which includes activities that causes or facilitates the movement of groundwater known to be contaminated with ROCs and to prohibit excavation below the demarcation layer unless prior written approval is granted by the FFA signatories	

References:

Department of the Navy (Navy). 2013. *Record of Decision for Parcel E, Hunters Point Naval Shipyard, San Francisco, California.* Final. December.

ChaduxTt. 2010. *Memorandum: Approach for Developing Soil Gas Action Levels for Vapor Intrusion Exposure at Hunters Point Shipyard, Hunters Point Shipyard, San Francisco, California*. Final. April 30.

µg/L = microgram(s) per liter
ARIC = area requiring institutional controls
bgs = below ground surface
CERCLA = Comprehensive Environmental Response, Compensation, and Liability Act
COC = chemical of concern
COEC = chemical of ecological concern
CSM = conceptual site model
DDE = dichlorodiphenyldichloroethane
FFA = Federal Facilities Agreement
HPNS = Hunters Point Naval Shipyard
IC = institutional control
ISS = in situ stabilization
LUC = land use control
mg/kg = milligram(s) per kilogram
MNA = monitored natural attenuation
msl = mean sea level
NAPL = nonaqueous phase liquid
PAH = polycyclic aromatic hydrocarbon
PCB = polychlorinated biphenyl
RA = remedial action
RAO = remedial action objective
RD = remedial design
RG = remediation goal
ROC = radionuclide of concern
ROD = Record of Decision
SVE = soil vapor extraction
SVOC = semivolatile organic compound
TCRA = time-critical removal action
TPH = total petroleum hydrocarbons
USEPA = United States Environmental Protection Agency
VI = vapor intrusion
VOC = volatile organic compound

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Table 6-5. Parcel E-2 Remedial Action Summary and Expected Outcomes

Media	Risk/Basis for Action	Reasonably Anticipated Land Use	RAO	Remedy Component	Performance Metric	Expected Outcome
Soil and Sediment	**Human Health:** Unacceptable risks to future recreational users and construction workers from exposure to metals, SVOCs, pesticides, PCBs, TPH landfill debris, and ROCs in soil and sediment. **Ecological:** Risks to wildlife from exposure to metals, pesticides, PCBs, and PAHs in soil and sediment.	**Current use:** Limited access, landfill **Planned future use:** Shoreline open space	1. Prevent human exposure to inorganic and organic chemicals at concentrations greater than remediation goals (see Table 5 of [Navy 2012]) 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 air 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 solid waste or soil greater than remediation goals (see Table 5 of [Navy 2012]) 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 [Navy 2012]) from 0 to 2.5 feet bgs by aquatic wildlife throughout the Shoreline Area.	Hot Spot Removal	Excavation and offsite disposal of soil, sediment, and debris with concentrations of COCs or COECs exceeding RGs for recreational/construction worker or ecological receptor and backfill with clean fill was completed. Freshwater and salt-water wetlands are being constructed in removal areas in the western portion of Parcel E-2.	Land suitable for planned future use compatible with durable covers and ICs as required by the LUC RD.
				Soil Cover and Sea Wall	Soil cover to provide a physical barrier to prevent exposure of humans and wildlife to residual COCs and debris in soil after excavation. The cover consists of a minimum 2-foot thick soil cover over the entire Parcel E-2 area with a geomembrane liner in all areas except the constructed wetland to minimize water seeping into the subsurface and deter burrowing animals. The liner foundation layer and final cover have been placed. Final construction of the landfill gas system is ongoing. A rock revetment and sea wall was constructed prior to installation of the cover to mitigate erosion. The soil cover and rock revetment/sea wall will be inspected and maintained prevent exposure to COCs and landfill debris.	
				ICs	ICs to maintain soil covers and security features, restrict land use and land disturbing activities, and prohibit growing produce in native soil for human consumption.	
			1. Prevent exposure to ROCs at activity levels that exceed remediation goals (see Table 6 of [Navy 2012]) for all potentially complete exposure pathways.	Radiological Screening and Removal	Radiological screening during hot spot removal, revetment and wetland creation, and soil cover installation to identify radiological contamination above the RG. If identified, materials will be removed and disposed of offsite. A final surface survey will be completed when all remediation activities are complete to identify and remove radiological contamination exceeding RGs to 1 foot bgs.	
				Demarcation Layer	A demarcation layer will be installed within the cover over potentially radiologically impacted areas and landfill material serves as a warning against digging into potentially contaminated materials.	
				ICs	ICs to prohibit excavation below the demarcation layer unless prior written approval is granted by the FFA signatories and CDPH.	

Table 6-5. Parcel E-2 Remedial Action Summary and Expected Outcomes

Media	Risk/Basis for Action	Reasonably Anticipated Land Use	RAO	Remedy Component	Performance Metric	Expected Outcome
Landfill Gas	**Human Health:** Unacceptable risks to potential future industrial and residential users from exposure to landfill gas vapors.	**Current use:** Limited access, landfill **Planned future use:** Shoreline open space	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 onsite structures (“onsite” for this ROD is defined as any area within the subsurface points of compliance for landfill gas). 3. Prevent exposure to non-methane organic compounds (NMOCs) at concentrations greater than 500 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 onsite workers and visitors.	Landfill Gas Removal and Treatment	Collection and treatment of landfill gas through a collection system and controlled flare to treat methane and/or adsorption to treat NMOCs. An interim system is currently operating and will be expanded when the landfill cover construction has been completed.	Land suitable for planned future use compatible with durable covers and ICs as required by the LUC RD.
				Landfill Gas Monitoring	Landfill gas monitoring will be performed to demonstrate compliance with ARARs.	
				ICs	ICs to prohibit construction of enclosed structures unless prior written approval is granted by the FFA signatories and the CDPH and complies with the substantive provisions of ARARs regarding post-closure land uses.	
Groundwater	**Human Health:** Unacceptable risks to potential future residential users from metals, VOCs, SVOCs, pesticides, and PCBs in groundwater if used as a potable source (B-aquifer)		1. Prevent exposure to groundwater that may contain COCs at concentrations greater than remediation goals (see Table 7 of [Navy 2012]) 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 [Navy 2012]) beyond the point of compliance (defined in the RI/FS Report at the downgradient boundary of Parcel E-2).	LTM	Groundwater LTM to verify that chemical concentrations in groundwater do not exceed concentrations designated by the RAOs at the point of compliance.	
				ICs	ICs to prohibit extraction of groundwater and installation of new groundwater wells and prohibit use of or access to groundwater	
	Human Health: Unacceptable risks to potential future construction workers from dermal exposure to and vapor inhalation from lead and SVOCs in A-aquifer groundwater		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 in [Navy 2012]) by construction workers.	ICs	ICs to restrict land disturbing activities which includes activities that causes or facilitates the movement of groundwater known to be contaminated with COCs or ROCs.	
Groundwater	**Ecological:** Risks to aquatic wildlife from COECs (metals, anions, PCBs, and TPH) in groundwater through the groundwater to surface water pathway.		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. 2. Prevent or minimize migration of A-aquifer groundwater containing total TPH concentrations greater than the remediation goal (see Table 7 of [Navy 2012]) (where commingled with CERCLA substances) into San Francisco Bay.	Slurry Walls, Freshwater and Tidal Wetlands and Drain	Two slurry walls comprised of cement-bentonite mixture were installed to prevent migration of groundwater from the landfill to the bay and upgradient groundwater from entering the landfill material. The nearshore slurry wall was installed along the shoreline adjacent to the landfill and east adjacent area to prevent bayward groundwater in the landfill area from entering the bay. The upland slurry wall was installed from the northern parcel boundary to the southern extent of the landfill waste perpendicular to groundwater flow to divert upgradient offsite groundwater away from groundwater that contacts landfill waste. Groundwater will be diverted around the upland slurry wall or via a French drain system into the freshwater wetland. A study is planned to evaluate the performance of the upland slurry wall as a geological formation that prevented the wall from being installed as designed.	
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.			

Table 6-5. Parcel E-2 Remedial Action Summary and Expected Outcomes

Reference:

Department of the Navy (Navy). 2012. *Record of Decision for Parcel E-2, Hunters Point Naval Shipyard, San Francisco, California. Final.* November.

ARAR = applicable or relevant and appropriate requirement
bgs = below ground surface
CDPH = California Department of Public Health
COC = chemical of concern
COEC = chemical of ecological concern
COPEC = chemical of potential ecological concern
FFA = Federal Facilities Agreement
IC = institutional control
LTM = long-term monitoring
LUC = land use control
NMOC = non-methane organic compounds
PAH = polycyclic aromatic hydrocarbon
PCB = polychlorinated biphenyl
ppmv = part(s) per million volume
RAO = remedial action objective
RD = remedial design
RG = remediation goal
RI/FS = Remedial Investigation/Feasibility Study
ROC = radionuclide of concern
ROD = Record of Decision
SVOC = semivolatile organic compound
TPH = total petroleum hydrocarbons

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Table 6-6. Parcel UC-3 Remedial Action Summary and Expected Outcomes

Media	Risk/Basis for Action	Reasonably Anticipated Land Use	RAO	Remedy Component	Performance Metric	Expected Outcome
Soil	**Human Health:** Unacceptable risk to industrial workers from exposure to metals, SVOCs and TPH; recreational users and residents from metals, SVOCs, pesticides, PCBs, and TPH; and construction worker from metals, SVOCs, PCBs, and TPH in surface and/or subsurface soil.	**Current use:** Utility corridor and railroad right-of-way **Planned future use**: Multiuse open space, including residential and research and development	1. Prevent unacceptable exposure of humans to chemicals and radionuclides in soil at concentrations exceeding the RGs (Table 7 of the Parcel UC-3 ROD [Navy, 2014]) for the following exposure pathways: a) Ingestion of, outdoor inhalation of, and dermal exposure to soil from 0 to 10 feet bgs by residents in areas zoned for mixed-use reuse. b) Ingestion of homegrown produce in native soil in areas zoned for mixed-use reuse. c) Ingestion of, outdoor inhalation of, and dermal exposure to soil from 0 to 10 feet bgs by construction workers in all areas. d) Ingestion of, outdoor inhalation of, and dermal exposure to soil from 0 to 10 feet bgs by industrial users of the railroad right-of-way.	Excavation and offsite disposal	Excavation of soil from areas with COC concentrations above 5 times the RGs for industrial and residential use were removed.	Land suitable for planned future use compatible with durable covers and ICs as required by the LUC RD.
				Durable covers	Durable covers installed in the eastern portion of UC-3 to provide physical barriers to prevent exposure to metals in soil. The durable cover consists of a 4-inch-thick (minimum) asphaltic pavement cover that was either newly installed or repaired existing cover to meet the minimum criteria in the RD. Covers were not required in the western portion of UC-3. Covers are inspected and maintained to prevent exposure to COCs.	
				ICs	ICs to maintain durable covers, restrict land use and land-disturbing activity, and prohibit growing produce in native soil in the areas zoned for mixed-use.	
Soil Gas	Potential volatilization of VOCs and from soil into soil gas and/or indoor air via the VI pathway.		1. Prevent exposure of humans 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, 2010) lists risk-based action levels for various volatile chemicals, including SVOCs, that may pose an unacceptable risk via indoor inhalation of vapors. These soil gas action levels will be used for an initial risk-based screening of data collected during future soil gas surveys (such as the surveys to be performed at the IR Site 56 VOC groundwater plume following active treatment). After the initial risk-based screening, areas with unacceptable risk will be further evaluated using location-specific data (i.e., physical characteristics of the soil) to assess potential exposures consistent with the State of California and USEPA vapor intrusion guidance. In addition, risks and hazards at these areas will be further characterized using the accepted methodology for risk assessments at HPNS.	Soil Gas Survey	A soil gas survey was conducted to confirm whether concentrations of VOCs warranted ICs. Results exceeded the comparison criteria established in the Sampling and Analysis plan and the ICs for VOCs were retained over a portion of Parcel UC-3.	
				ICs	ICs to prohibit construction of enclosed structures unless prior written approval of vapor mitigation strategies is granted by the FFA signatories	
Groundwater	**Human Health:** Risk to industrial workers and residents from VOCs in A-aquifer through the vapor intrusion pathway, construction workers through vapors in trenches. Risks to potential future residents from metals and VOCs in B-aquifer groundwater via domestic use.		1. Prevent or minimize unacceptable exposure of humans to COCs in the B-aquifer at concentrations exceeding RGs via the domestic use pathway.	Groundwater Treatment and MNA	ISB and MNA were selected in the ROD to remove VOCs, specifically TCE, in groundwater; however, based on historical and current (2018) data, TCE concentrations were below RGs since 1996 and below the 2.9 µg/L vapor intrusion criteria since 2009 (Gilbane, 2018). Additional remediation for groundwater was not warranted since TCE concentrations were below RGs and natural attenuation processes had effectively reduced COCs below vapor intrusion criterion.	
				ICs	ICs to prohibit the use of groundwater and installation of new groundwater wells for domestic purposes	
			2. Prevent or minimize unacceptable exposure of construction workers to VOCs in A-aquifer groundwater by dermal exposure and inhalation of vapors with chemicals exceeding RGs.	ICs	ICs to restrict land-disturbing activity unless prior written approval is granted by the FFA signatories	

Table 6-6. Parcel UC-3 Remedial Action Summary and Expected Outcomes

Media	Risk/Basis for Action	Reasonably Anticipated Land Use	RAO	Remedy Component	Performance Metric	Expected Outcome
Radiologically Impacted Soil and Structures	**Human Health:** Radiological risks for soil and structures (storm drains and sanitary sewers) were greater than 10-6.	**Current use:** Utility corridor and railroad right-of-way **Planned future use**: Multiuse open space, including residential and research and development	1. Prevent exposure to radiological isotopes at activity levels that exceed remediation goals for all potentially complete exposure pathways (which include external exposure, ingestion, and inhalation of soil based on the CSM for human health).	Survey, decontamination, and removal of radiologically impacted structures and soil	Identification and removal of historical subsurface storm drain and sanitary sewer utilities and screening and remediation of buildings, and former building sites as part of the TCRA for radionuclides. Radiological retesting is planned to confirm site conditions are compliant with the RAO.	Land suitable for planned future use compatible with durable covers and ICs as required by the LUC RD.

References:

Department of the Navy (Navy). 2014. *Record of Decision for Parcel UC-3, Hunters Point Naval Shipyard, San Francisco, California*. Final. January.

ChaduxTt. 2010. *Memorandum: Approach for Developing Soil Gas Action Levels for Vapor Intrusion Exposure at Hunters Point Shipyard, Hunters Point Shipyard, San Francisco, California*. Final. April 30.

Gilbane. 2018 *Remedial Action Completion Report Parcel UC-3, Hunters Point Naval Shipyard. San Francisco, California.* July.

µg/L = microgram(s) per liter
bgs = below ground surface
COC = chemical of concern
CSM = conceptual site model
FFA = Federal Facilities Agreement
HPNS = Hunters Point Naval Shipyard
IC = institutional control
IR = Installation Restoration
ISB = in situ biodegradation
LUC = land use control
MNA = monitored natural attenuation
PCB = polychlorinated biphenyl
RAO = remedial action objective
RD = remedial design
RG = remediation goal
ROD = Record of Decision
SVOC = semivolatile organic compound
TCE = trichloroethene
TCRA = time-critical removal action
TPH = total petroleum hydrocarbons
USEPA = United States Environmental Protection Agency
VI = vapor intrusion
VOC = volatile organic compound

Table 6-7. Fourth Five-Year Review Parcel E Issues, Recommendations, and Follow-up Actions

Parcel/Site	Fourth Five-Year Review Protectiveness	Issue	Recommendation (Milestone)	Date Complete/Current Status
E and UC-3	Will be protective (E) Short-term protective (UC-3)	The Navy has determined that a significant portion of the radiological survey and remediation work completed to date was not reliable because of manipulation and/or falsification of data by one of its radiological contractors. A long-term protectiveness evaluation of the radiological RGs has not yet been completed for this fourth Five-Year Review, and it is currently not known if the RAOs for radionuclides have been achieved in Parcels B-1, B-2, C, D-1, D-2, G, E, UC-1, UC-2, and UC-3.	Refer to **Section 1.4.3** for the long-term protectiveness evaluation component of this recommendation. The Navy is in the process of implementing corrective actions to ensure that the radiological remedies specified in the decision documents are implemented as intended. It is anticipated that the radiological rework will be completed prior to the next Five-Year Review.	**Long-term Protectiveness Evaluation: Completed June 2020**. Addenda to the Fourth Five-Year Review were prepared to evaluate the Radiological RGs for soil and buildings. The conclusions of both reports were that the current RGs were protective of human health and the environment (Navy, 2020a, 2020b). **In progress.** The radiological retesting of soil at Parcel UC-3 was initiated in February 2019. Fieldwork activities were initiated in 2023. Radiological retesting will be summarized in a radiological removal action construction summary report anticipated to be completed in 2028. The radiological retesting of soil and surveys of building structures at Parcel E was initiated in Fall 2019. Fieldwork activities for radiological retesting are expected to begin in 2026. Radiological retesting will be summarized in a radiological removal action construction summary report anticipated to be completed in 2029.

References:

Department of the Navy (Navy). 2020a. *Addendum to the Five-Year Review, Evaluation of Radiological Remedial Goals for Soil, Hunters Point Naval Shipyard, San Francisco, California.* June 18.

Navy. 2020b. *Addendum to the Five-Year Review, Evaluation of Radiological Remedial Goals for Building Structures, Hunters Point Naval Shipyard, San Francisco, CA*. June 18.

RAO = remedial action objective
RG = remediation goal

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Table 6-8. Parcel E Chemicals of Concern and Current Comparison Criteria for Domestic Use of Groundwater

Exposure Medium	Exposure Scenario	Chemical of Concern	Values from ROD		Current Comparison Criteria				
			ROD Remediation Goal (2013, 2014)	Source of Remediation Goal	11/2022 USEPA RSL or VISL	Cancer/ Noncancer Basis	DTSC-SL	Cal MCL	USEPA MCL
Groundwater (µg/L)	Domestic Use Exposure to B-Aquifer Groundwater	1,1- Dichloroethene[a]	6	MCL	280	NC	130	6	7
		cis-1,2- Dichloroethene[a]	6	MCL	25	NC	12	6	70
		trans-1,2- Dichloroethene[a]	10	MCL	68	NC	110	10	100
		1,4-Dichlorobenzene	5	MCL	0.48	C	No value	5	75
		Arsenic	27.3	HPAL	0.052	C	0.0082	10	10
		Manganese	8,140	HPAL	430	NC	No value	None	None
		Tetrachloroethene	5	MCL	11	C	0.084	5	5
		Thallium	12.97	HPAL	0.2	NC	0.059	2	2
		Trichloroethene	5	MCL	0.49	C	No value	5	5
		Vinyl chloride	0.5	MCL	0.019	C	0.0098	0.5	2

[a] Remediation goals for select VOCs were added to the ROD because of their relationship to other VOCs (e.g., 1,1-dichloroethene and 1,2-dichloroethene are degradation products of trichloroethene) that were identified as chemicals of concern in the FS Report. The remediation goal for tetrachloroethene in A-aquifer groundwater is based on the risk-based criteria presented in the ROD for HPNS Parcel C. The remediation goals for 1,1-dichloroethene and 1,2-dichloroethene in B-aquifer groundwater are based on the State of California maximum contaminant limits.

µg/L = microgram(s) per liter
C = carcinogen
Cal = California
DTSC = California Department of Toxic Substances Control
FS = Feasibility Study
HPAL = Hunters Point ambient level
HPNS = Hunters Point Naval Shipyard
MCL = maximum contaminant level
NA = not available
NC = noncarcinogen
ROD = Record of Decision
RSL = Regional Screening Level
SL = screening level
USEPA = United States Environmental Protection Agency
VISL = vapor intrusion screening level
VOC = volatile organic compound

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Table 6-9. Parcel E-2 Chemicals of Concern and Current Comparison Criteria for Domestic Use of Groundwater

Exposure Medium	Exposure Scenario	Chemical of Concern	Values from ROD		Current Comparison Criteria				
			ROD Remediation Goal (2012)	Source of Remediation Goal	11/2022 USEPA RSL	Basis of RSL (C/NC)	DTSC-SL	Cal MCL	USEPA MCL
Groundwater (µg/L)	Domestic Use of Deep Groundwater (B-Aquifer)	1,1-Dichloroethane	5	PQL	2.8	C	2.8 (USEPA)	5	None
		1,2,3-Trichloropropane	1	PQL	0.00075	C	0.0002	0.005	None
		1,2-Dichloroethane	0.5	MCL	0.17	C	0.17 (USEPA)	0.5	5
		1,4-Dichlorobenzene	5	MCL	0.48	C	No value	5	75
		4-Nitrophenol[a]	3.4	RBC	0.14	C	No value	None	None
		Aroclor-1016	0.5	MCL	0.22	C	0.22 (USEPA)	None	0.5
		Aroclor-1242	0.5	MCL	0.0078	C	No value	None	0.5
		Aroclor-1254	0.5	MCL	0.0078	C	0.0079 (USEPA)	None	0.5
		Aroclor-1260	0.5	MCL	0.0078	C	No value	None	0.5
		Arsenic	10	MCL	0.052	C	0.0082	10	10
		Benzene	1	MCL	0.46	C	0.15	1	5
		Benzo(a)anthracene	0.2	MCL	0.03	C	0.017	None	None
		Benzo(a)pyrene	0.2	MCL	0.025	C	No value	0.2	0.2
		Benzo(b)fluoranthene	0.2	MCL	0.25	C	No value	None	None
		Benzo(k)fluoranthene	0.2	MCL	2.5	C	No value	None	None
		Bis(2-ethylhexyl)phthalate	10	PQL	5.6	C	No value	4	6
		beta-BHC	0.05	PQL	0.025	C	0.0014 (USEPA)	None	None
		Carbon tetrachloride	0.5	MCL	0.46	C	0.45 (USEPA)	0.5	5
		Chloroform	80	MCL	0.22	C	No value	80	80
		Chromium VI [b]	109	RBC	0.035	C	No value	50	100
		Chrysene	0.56	RBC	25	C	No value	None	None
		Dibenz(a,h)anthracene	2	MCL	0.025	C	0.0061	None	None
		Dieldrin	0.02	PQL	0.0018	C	0.00066 (USEPA)	None	None
		Heptachlor	0.01	MCL	0.0014	C	0.0014 (USEPA)	0.01	0.4
		Heptachlor epoxide	0.01	MCL	0.0014	C	0.0014 (USEPA)	0.01	0.2
		Heptachlor epoxide A	0.01	MCL	0.0014	C	0.0014 (USEPA)	0.01	0.2
		Heptachlor epoxide B	0.01	MCL	0.0014	C	0.0014 (USEPA)	0.01	0.2
		Indeno(1,2,3-cd)pyrene	0.2	MCL	0.25	C	No value	None	None
		Iron	10,950	RBC	14000	NC	No value	None	None
		Lead	15	MCL	15	NC	No value	15	15
		Methylene chloride	5	MCL	11	C	1.70	5	5
		Naphthalene	1	PQL	0.12	C	0.12	None	None
		Tetrachloroethene	5	MCL	11	C	0.084	5	5
		Thallium	2	MCL	0.2	NC	0.059	2	2
		Trichloroethene	5	MCL	0.49	C	No value	5	5
		Vinyl chloride	0.5	MCL	0.019	C	0.0098	0.5	2

[a] Nitrobenzene used as surrogate for 4-nitrophenol

[b] MCLs shown are for total chromium, no MCLs available for Chromium VI

Note:

Shading indicates current comparison criteria is lower than ROD remediation goal

BHC = benzene hexachloride
C = carcinogen
Cal = California
DTSC = California Department of Toxic Substances Control
MCL = maximum contaminant level
NA = not available
NC = noncarcinogen
PQL = practical quantitation limit
RBC = risk-based concentration
ROD = Record of Decision
RSL = Regional Screening Level
SL = screening level
USEPA = United States Environmental Protection Agency

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Table 6-10. Parcel UC-3 Chemicals of Concern and Current Comparison Criteria for Groundwater

Exposure Medium	Exposure Scenario	Chemical of Concern	Values from ROD			Current Comparison Criteria (for UU/UE scenario)				
			ROD Remediation Goal (2013)	Source of Remediation Goal	Parcel	11/2022 USEPA RSL or VISL	11/2022 USEPA RSL or VISL[a]	DTSC-SL	Cal MCL	USEPA MCL
Groundwater (µg/L)	Construction Worker Exposure to A-Aquifer Groundwater	1,2-Dichloroethene (total)	270	RBC	UC-3	109	NC	NA	6 / 10	70 / 100
		Trichloroethene	290	RBC	UC-3	1.19	C	NA	5	5
		Vinyl chloride	5.4	RBC	UC-3	0.147	C	NA	0.5	2

[a] VISL for residential use presented for A-aquifer groundwater for conservative comparison.

Note:
Shading indicates current comparison criteria is lower than ROD Remediation Goals.

µg/L = microgram(s) per liter
C = carcinogen
Cal = California
DTSC = California Department of Toxic Substances Control
MCL = maximum contaminant level
NA = not available
NC = noncarcinogen
RBC = risk-based concentration
ROD = Record of Decision
RSL = Regional Screening Level
SL = screening level
USEPA = United States Environmental Protection Agency
UU/UE = unlimited use and unrestricted exposure
VISL = vapor intrusion screening level

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Table 6-11. Parcel UC-3 Issues, Recommendations, and Follow-up Actions

Parcel	Issue	Recommendations/ Actions	Party Responsible	Oversight Agency	Milestone Date	Affects Protectiveness (Y/N)	
						Current	Future
UC-3	As identified in the Fourth Five-Year Review there is uncertainty with a portion of the radiological survey and remediation work performed between 2004 and 2016 under the Basewide Radiological Removal Action, Action Memorandum (Navy, 2006). The Navy is in the process of implementing corrective actions to ensure the radiological remedies specified in the decision documents were implemented as intended; however, this work is ongoing.	Complete radiological retesting at radiologically-impacted sites, including current and former buildings and soil areas investigated under the Radiological Removal Action, Action Memorandum (Navy, 2006) and areas where evaluations determined previous data were unreliable.	Navy	USEPA	3/2/2028	N	Y

Reference:

Navy. 2006. B*ase-wide Radiological Removal Action, Action Memorandum – Revision 2006, Hunters Point Shipyard, San Francisco, California*. Final. April 21.

Navy = Department of the Navy
USEPA = United States Environmental Protection Agency

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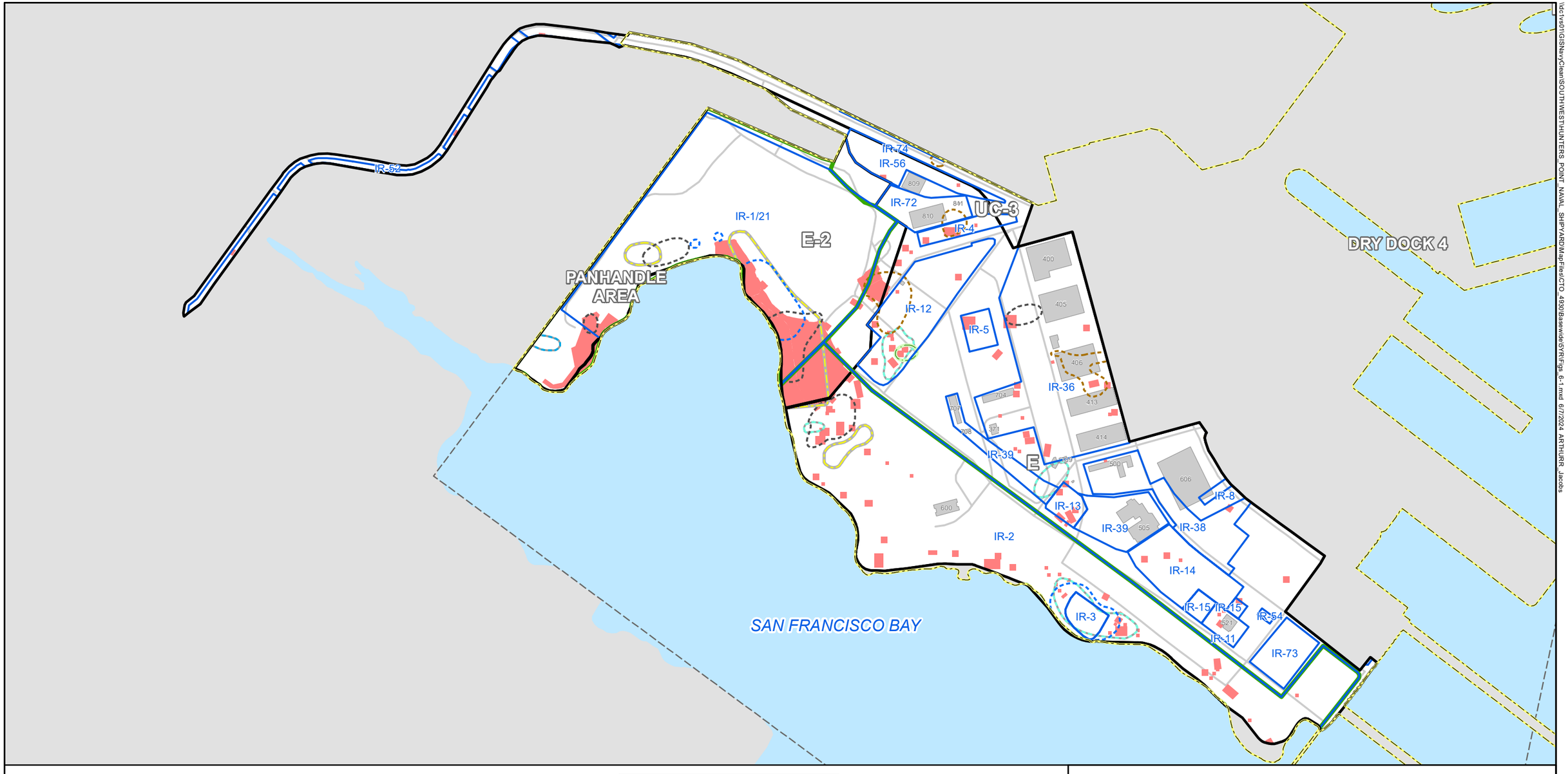


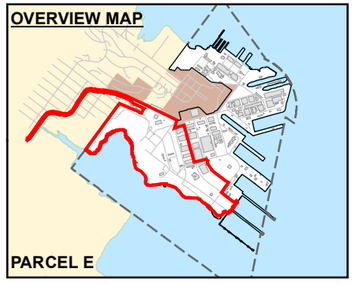
LEGEND

- Hunters Point Naval Shipyard Boundary
- Parcel Boundary
- Parcel F (Water) Boundary
- IR Site
- COC Excavation Area (Complete)
- ARIC for Potential Radionuclides
- Water
- Building
- Road

Plume Detection Area

- Anions
- Benzene
- Metals
- Nickel
- PCBs
- TPH
- VOC

OVERVIEW MAP



COC = chemical of concern
IR = Installation Restoration
PCB = polychlorinated biphenyl
TPH = total petroleum hydrocarbons
VOC = volatile organic compound

0 300 600 Feet
1 inch = 600 feet

N

Parcel E (Parcels E, E-2, and UC-3)

**Fifth Five-Year Review Report
Hunters Point Naval Shipyard, San Francisco, California**

NAVFAC Naval Facilities Engineering Systems Command

Figure 6-1

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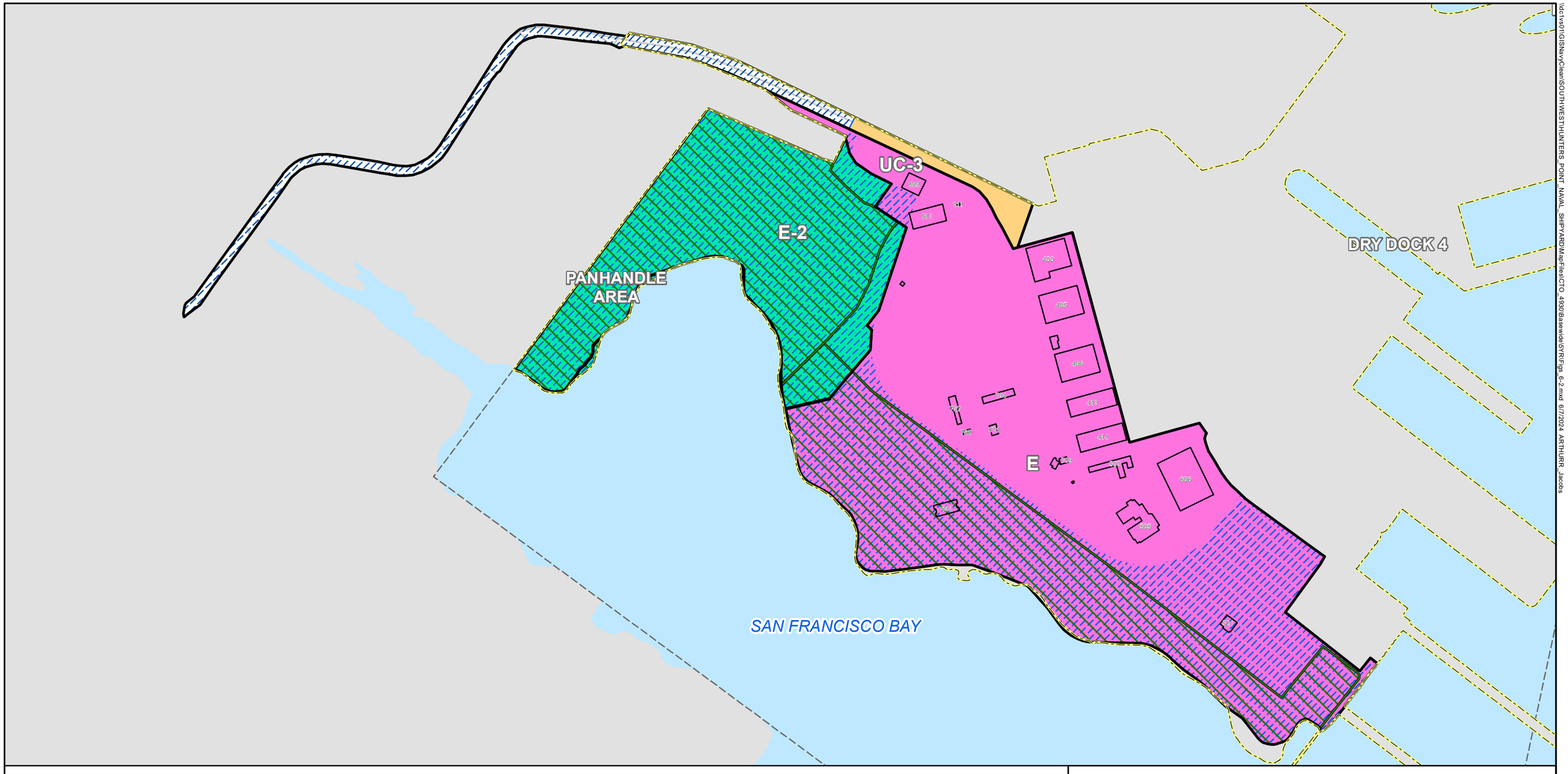
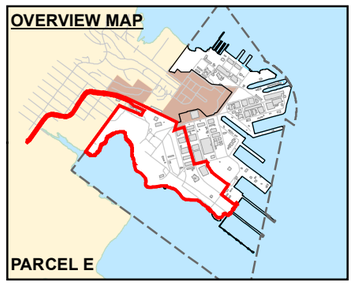


LEGEND

- Hunters Point Naval Shipyard Boundary
- Parcel Boundary
- Parcel F (Water) Boundary
- Water
- Building
- Road

Institutional Controls

- ARIC for Soil and Groundwater Use (General)
- Additional Restrictions (Open Space, Educational/Cultural, and/or Maritime/Industrial Use
- ARIC for Soil, Groundwater Use, and Restrictions Related to VOC Vapors
- Landfill Cap and Vegetative Cover
- ARIC for Potential Radionuclides



ARIC = area requiring institutional controls
VOC = volatile organic compound

0 300 600 Feet
1 inch = 600 feet

N

Parcel E (Parcels E, E-2, and UC-3) Institutional Controls

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

NAVFAC Naval Facilities Engineering Systems Command

Figure 6-2

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Source:
Innovex-ERRG Joint Venture. 2019. *Fourth Five-Year Review, Hunters Point Naval Shipyard, San Francisco, California.* Figure 8. July.

Figure 6-3
Overview of Remedy Components for Parcel E
Fifth Five-Year Review Report
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LEGEND:

- FINAL COVER
- WASTE CONSOLIDATION AREA
- FRESHWATER WETLAND (NO GEOSYNTHETIC CAP)
- TIDAL WETLAND
- SERVICE ROAD
- RIPRAP REVETMENT SLOPE PROTECTION
- PARCEL E–2 BOUNDARY
- GROUNDWATER DIVERSION DRAIN
- LIMIT OF LANDFILL WASTE
- APPROXIMATE LIMIT OF GEOSYNTHETIC CAP
- APPROXIMATE LIMIT OF EXISTING GEOSYNTHETIC CAP
- PERIMETER DRAINAGE CHANNEL
- EXISTING GROUNDWATER MONITORING WELL (TO REMAIN)
- EXISTING GAS MONITORING PROBE
- EXISTING LFG VENT
- EXISTING LFG VENT (TO BE DECOMMISSIONED)
- EXISTING LFG ROI TEST WELL
- NEW PIEZOMETER
- NEW GAS MONITORING PROBE
- NEW GROUNDWATER MONITORING WELL
- NEW LANDFILL GAS EXTRACTION WELL
- NEW LEACHATE MONITORING/EXTRACTION WELL
- NEW SURVEY MONUMENT
- DRAIN INLET
- FINISH GRADE TOPOGRAPHIC CONTOUR LINE
- EXISTING TOPOGRAPHIC CONTOUR LINE
- SLURRY WALL
- FENCE

N

0’ 250’

Source:
Innovex-ERRG Joint Venture. 2019. *Fourth Five-Year Review, Hunters Point Naval Shipyard, San Francisco, California.* Figure 9. July.

Figure 6-4
Overview of Remedy Components for Parcel E-2
Fifth Five-Year Review Report
Hunters Point Naval Shipyard
San Francisco, California

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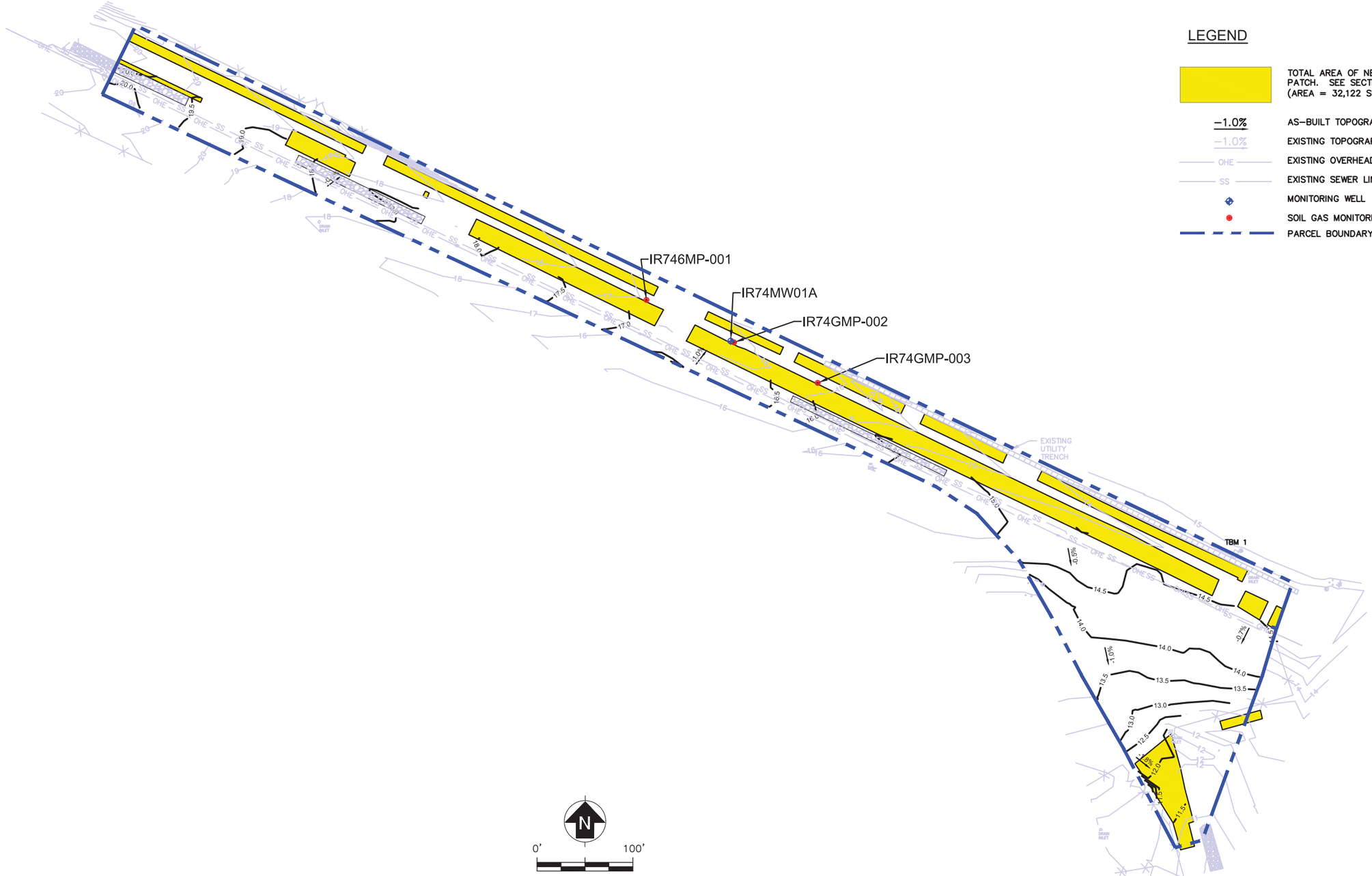

Source:
Innovex-ERRG Joint Venture. 2019. *Fourth Five-Year Review, Hunters Point Naval Shipyard, San Francisco, California.* Figure 13. July.

Figure 6-5
Overview of Remedy Components for Parcel UC-3
Fifth Five-Year Review Report
Hunters Point Naval Shipyard
San Francisco, California

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Appendix A
Climate Resilience Assessment

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Acronyms and Abbreviations

bgs	below ground surface
BGMP	Basewide Groundwater Monitoring Program
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
COC	chemicals of concern
CVOC	chlorinated volatile organic compound
CRA	climate resilience assessment
DoD	Department of Defense
DEM	digital elevation models
DCAT	DoD Climate Assessment Tool
DRSL	DoD Regional Sea Level Database
DTSC	California Department of Toxic Substances Control
GIS	Geographical Information System
GHG	greenhouse gas
HPNS	Hunters Point Naval Shipyard
IR	installation restoration
LFG	landfill gas
LTM	long-term monitoring
MSL	mean sea level
MHHW	Mean Higher High Water
Navy	Department of the Navy
OPC	California Ocean Protection Council
PAH	polycyclic aromatic hydrocarbon
PCB	polychlorinated biphenyl
RD	remedial design
RG	remedial goal
ROD	Record of Decision
SLR	sea level rise
SVE	soil vapor extraction
USACE	U.S. Army Corps of Engineers
VLM	vertical land movement

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Executive Summary

As part of the fifth Five-Year Review, this screening-level Climate Resilience Assessment (CRA) assessed climate-related hazards, their potential impacts, and whether vulnerabilities were projected that may impact the protectiveness of the remedies at Former Hunters Point Naval Shipyard (HPNS) in San Francisco, California. The Department of the Navy used methodologies that are consistent with guidance provided in the Department of Defense (DoD) Climate Assessment Tool (DCAT) (Gade, et.al., 2020); U.S. Environmental Protection Agency's *Memorandum: Consideration of Climate Resilience in the Superfund Cleanup Process for NonFederal National Priorities List Sites* (2021); U.S. Army Corps of Engineers (USACE's) *Procedures to Evaluate Sea Level Change: Impacts, Responses, and Adaptation* (2014); and the Department of Toxic Substances Control's Draft *Sea Level Rise Guidance to DTSC Project Managers for Cleanup Activities* (2023). The HPNS CRA is a unique case study designed to address the concerns raised by the San Francisco Civil Grand Jury report regarding sea level rise (SLR) (City and County of San Francisco Civil Grand Jury, 2022).

Climate Change Hazards

The CRA evaluated eight climate-related hazards that were identified in DCAT. The eight hazards include: coastal flooding, extreme weather events, drought, wildfire, riverine flooding, extreme temperature, energy demand, and land degradation. The primary climate-related hazard identified for HPNS is coastal flooding. Coastal flooding is caused by SLR (that is, seawater inundation) and groundwater emergence. Groundwater table rise to within 3 feet below ground surface (bgs) was also assessed. Coastal flooding can either be permanent (because of permanent SLR) or transient (because of storm surges). Another climate hazard identified as relevant for HPNS included extreme weather events. Storm surges were evaluated as part of this CRA.

SLR projections developed for HPNS are based on the 2021 *DoD Regional Sea Level* (DRSL) database developed as part of the U.S. Climate Resilience Toolkit (U.S. Climate Resilience Toolkit, 2024). The DRSL database was developed in 2015 and periodic updates are planned. The 20-year and 50-year USACE planning and construction design time horizons lead to SLR projections for the years 2035 and 2065. The DRSL database provides Installation-specific, regionalized SLR scenarios for 1,744 active DoD and Base Realignment and Closure installations worldwide and is now being incorporated into the master planning at these installations.

The HPNS CRA used the highest greenhouse gas (GHG) emissions scenario for SLR projections of 1.0 feet and 3.2 feet for the years 2035 and 2065, respectively, to represent a conservative upper limit of the range of SLR scenarios evaluated in this assessment. Groundwater rise from SLR was conservatively projected based on a 1:1 ratio consistent with the City of Alameda's 2022 *Climate Adaptation and Hazard Mitigation Plan*. The DRSL projections take into account both SLR and vertical land movement (for example, land subsidence) and are generally consistent with the projections in the California Ocean Protection Council (OPC) and California Natural Resources Agency's *State of California Sea-Level Rise Guidance Document, 2018 Update* (CNRA and OPC, 2018) and the more recent OPC projections (OPC, 2024).

Potential Impacts and Vulnerabilities

Impacts are areas on an installation (or former installation) where climate change hazards are projected (for example, areas where seawater inundation is projected). The HPNS CRA identified the following potential impacts that may be attributable to climate change:

- In 2035, limited impacts from permanent groundwater emergence are projected to occur in Parcels D-1 and E-2 wetland areas (**Figure 3-1** and **Table 2-2**).
- In 2065, limited impacts from permanent groundwater emergence are projected to occur in Installation Restoration (IR) Sites 7 and 18 (IR-07/18), Parcels B-1 and B-2, C, D-1, E, and E-2 wetland areas (**Figure 3-2** and **Table 2-3**).

Validation of these impacts via site walkthroughs and site data reviews are important next steps. Not all impacts lead to vulnerabilities, which are defined as potentially complete exposure pathways. The HPNS CRA identified the following potential vulnerabilities resulting from the preliminary impacts previously identified:

- In 2035, a potential vulnerability of human receptors from permanent groundwater emergence at Parcels D-1 and E-2 wetland areas.
- In 2065, potential vulnerability of human receptors at the current ground surface from heavy metals due to groundwater emergence at IR-07/18, Parcels B-1, B-2, C, D-1, E, and E-2.
- In 2065, potential vulnerability to San Francisco Bay receptors from heavy metals due to groundwater emergence at IR-07/18, Parcels B-1, B-2, C, D-1, E, and E-2.

CRA Recommendations in the Five-Year Review

The first recommended next step is to conduct validation of the impacts and vulnerabilities identified in this CRA. If a vulnerability is projected to result in a potentially new exposure scenario for either human or ecological receptors through 2065, then an IR site-specific study will be discussed with the agencies to evaluate the potential Comprehensive Environmental Response, Compensation, and Liability Act risk to human and ecological receptors.

1. Based on 2035 SLR projections, an IR site-specific study for Parcels D-1 and E-2 wetland areas will be discussed with the agencies.
2. Based on 2065 SLR projections, IR site-specific studies for IR-07/18, Parcels B-1, B-2, C, D-1, E, and E-2 wetland areas will be discussed with the agencies.

1.0 Introduction

As part of Former Hunters Point Naval Shipyard's (HPNS's) fifth Five-Year Review, a Climate Resilience Assessment (CRA) was completed to evaluate potential impacts from climate change-related hazards to remedy protectiveness. The Department of the Navy (Navy) used methodologies that are consistent with guidance provided in the Department of Defense (DoD) Climate Assessment Tool (DCAT) (Gade, et.al., 2020), U.S. Environmental Protection Agency's *Memorandum: Consideration of Climate Resilience in the Superfund Cleanup Process for NonFederal National Priorities List Sites* (2021); U.S. Army Corps of Engineers' (USACE's) *Procedures to Evaluate Sea Level Change: Impacts, Responses, and Adaptation* (2014); and the California Department of Toxic Substances Control's (DTSC's) *Draft Sea Level Rise Guidance to DTSC Project Managers for Cleanup Activities* (2023). **Figure 1-1** describes the four screening steps used to complete this CRA and are as follows:

1. Climate Hazards: Identify climate change-related hazards that apply to HPNS using DCAT.
2. Climate Impacts: Areas that are projected to be impacted from the primary hazards identified in step 1.
3. Exposure Scenarios: Assess the potential for new exposure scenarios.
4. Vulnerability Assessment: Determine whether a potentially new exposure scenario exceeds the adaptive capacity of the site.

This screening-level CRA evaluated the following eight climate-related hazards identified in the DCAT: coastal flooding, extreme weather events, drought, wildfire, riverine flooding, extreme temperature, energy demand, and land degradation. **Table 1-1** describes the nature of these hazards.

The most important climate hazard and associated impact identified at HPNS is coastal flooding, because of its proximity to San Francisco Bay and because residual chemicals of concern (COCs) are present in subsurface soils and groundwater. Coastal flooding can be permanent (because of permanent sea level rise [SLR]) or transient (because of storm surges). The other relevant climate hazard identified was extreme weather events. This other hazard is considered relatively transient. Regarding extreme weather events, permanent SLR can amplify the impacts of storm surges, which was evaluated in this screening-level CRA. The following describes the sections provided in this Five-Year Review:

- **Section 2** assesses the coastal flooding hazard and identifies the parcels (and installation restoration [IR] sites) projected to be impacted by permanent seawater inundation or storm surges using the 2021 *DoD Regional Sea Level* (DRSL) database developed as part of the U.S. Climate Resilience Toolkit (U.S. Climate Resilience Toolkit, 2024).
- **Section 3** assesses the coastal flooding hazard in terms of SLR causing groundwater table emergence at the ground surface and identifies the areas affected. Groundwater table rise within 3 feet below ground surface (bgs) was also assessed.
- **Section 4** assesses whether or not the other seven hazards are projected to impact the parcels at HPNS.
- **Section 5** identifies the potential new exposure scenarios attributable to climate change applicable to residual COCs. It also assesses the adaptive capacity of the IR sites' remedies to the climate hazards in the areas of impact.

- **Section 6** presents the conclusions and recommendations of the screening-level CRA.
- **Section 7** presents the references cited.

2.0 Impacts of Seawater Inundation

HPNS is bounded on three sides by San Francisco Bay. Several parcels and IR sites are located near the current shoreline. It is expected that SLR will result in coastal flooding, primarily because of the upland advancement of seawater, but also because of groundwater emergence.

Flooding can either be permanent (for example, a rising mean sea level [MSL] and high tide) or transient (for example, storm surges or extreme precipitation events). Gradual and permanent SLR causes permanent seawater inundation of increasingly upland areas along the coast. For this assessment, permanent seawater inundation is defined by an upland area projected to be impacted by daily high tides, forming a permanently higher intertidal zone. Transient flooding is caused by storm surges that temporarily raise sea level and bring seawater temporarily upland. Transient flood waters recede within hours or days.

2.1 Sea Level Rise Projections

SLR projections developed for HPNS are based on the 2021 DRSL database for the years 2035 and 2065. The DRSL database was developed in 2015 and provides regionalized SLR scenarios for 1,744 active DoD and Base Realignment and Closure installations worldwide and is now being incorporated into the master planning at these installations. The years 2035 and 2065 are based on the 20-year and 50-year time horizons used by USACE for longer-term planning. The period 2023 through 2065 also approximates the 30-year timeframe discussed in the *Draft Sea Level Rise Guidance to DTSC Project Managers for Cleanup Activities* (DTSC, 2023), as the timeframe for a phased approach to plan.

DRSL is a scenario-driven tool. Scenarios are not deterministic or probabilistic, but rather they attempt to bound scientific and human-influenced future uncertainties (for example, level of future greenhouse gas [GHG] emissions). The advantage of DRSL is that it incorporates regional land subsidence estimates into the SLR projections. Adjustments to the regional scenarios of 2035 and 2065 were developed in DRSL on a site-specific basis and include local vertical land movement, dynamic sea level, and polar ice melt.

The DRSL projections for SLR, applicable to HPNS, are summarized in **Table 2-1**. For HPNS, DRSL projects an MSL rise of between 0.3 foot (lowest) and 1.0 foot (highest) by 2035, and between 0.6 and 3.2 feet by 2065 for the San Francisco Bay Area, using 1992 as the baseline year. **Figure 2-1** shows the actual SLR measured in five tide gauges nearest HPNS over the past 30 years (1992 through 2022). The difference between SLR projections for lowest and highest GHG emissions scenarios widens by 2065, as uncertainty grows over the trajectory of SLR, further out in time.

For HPNS, the highest GHG emissions and resulting SLR projections of 1.0 foot and 3.2 feet for the years 2035 and 2065, respectively (Table 2-1), are the most conservative projections in DRSL and were used as the upper limit of the range evaluated in this assessment. DRSL (2015) considers vertical land movement (VLM) in its SLR projections for both 2035 and 2065, as estimated through local tide gauges and continuous Global Positioning System stations. However, at installations like HPNS, where the projected VLM in 2035 is less than the estimated error (that is, 0.05 meter or 0.15 foot), VLM is assumed to be zero. Even if this low local VLM projection were to be included, it would not appreciably change HPNS' 2035 SLR projection. The DRSL projections for 2065 take into account both SLR and land subsidence of 0.3 feet.

DRSL projections are generally consistent with the projections in the *State of California Ocean Protection Council's Sea-Level Rise Guidance Document, 2018 Update* (CNRA and OPC, 2018)

and the 2024 California Ocean Protection Council (OPC) update (OPC, 2024). DoD plans to periodically update the DRSL guidance. DoD uses DRSL projections for the following: (1) Master Planning at installations for infrastructure protection and sustainability and (2) environmental protection planning. DoD is trying to maintain consistent maps for both. Simultaneously, the Navy is comparing DRSL projections with those from OPC and verifying that the two projections are similar. The Navy plans to assess the impacts of SLR in the year 2100 during site-specific studies.

The screening-level CRA was conducted to identify potential vulnerabilities to further assess in site-specific studies. DTSC's and OPC's climate change assessment guidance was considered in this CRA and will be considered further in the recommended site-specific studies. Recently, OPC lowered its SLR projections for future years, making the DRSL projections even more conservative. OPC (2024) now projects 0.4 to 0.7 foot SLR between 2030 and 2040, and 1.4 to 2.2 feet SLR between 2060 and 2070, making the Navy's projections even more conservative. The Navy's highest projection of 3.2 feet SLR by 2035 is also close to DTSC's climate resilience goal of 3.5 feet SLR by 2050 (DTSC, 2023). In accordance with DTSC guidance, the Navy will confirm that remedies are protective for the next 30 years.

2.2 Seawater Inundation Impacts

Seawater inundation, as previously described, is the permanent overland flooding of seawater that happens because of permanent MSL rise and daily high tides. The tidal datum Mean Higher High Water (MHHW) is a standard elevation used as a baseline, above which inundation often is depicted on digital elevation models (DEM) and inundation maps (Hall, 2016). The DEM for HPNS was developed in 2019. Similarly, MHHW is the standard vertical datum used in several online SLR mapping tools (for example, National Oceanic and Atmospheric Administration SLR Viewer and Naval Facilities Engineering Systems Command geo-readiness explorer Flood Inundation Surge Hazard). Therefore, this study has used MHHW in 1992 as the datum, above which SLR is mapped and the potential for seawater inundation of upland areas is evaluated. As a risk-averse case, an upland area is considered permanently flooded when it experiences daily flooding during high tide.

In addition, vertical land elevations in the U.S. were identified and referenced using the North American Vertical Datum and tidal datums are created through local surveys between tidal and geodetic benchmarks. Geographical Information System (GIS) mapping was used to compare the land topography to SLR projections. GIS maps were developed for the highest GHG emissions scenarios in **Table 2-1**. Several past and currently planned remedy design features are effective measures to prevent permanent seawater inundation in 2035 and 2065. These include a revetment and a seawall and berms along the coastline of Parcels E-2 and E. Additionally, 2 or 3 feet of fill has been added for vegetative covers in some parcels (NAVFAC, 2014). The vegetative soil covers were designed as part of ongoing remedies and are accounted for in the GIS mapping. Therefore, the DEM for HPNS was adjusted for Parcels E and E-2 to include the IR site management remedies (including additional fill, berms, and seawall extensions). Other adjustments to the land grade as a result of planned remedies in other parcels in the next 10 years should be added in future versions of the GIS maps. In all seawater inundation maps, any isolated low-lying areas showing upland accumulation of seawater were eliminated if they did not have connectivity with the sea.

Figures 2-2 and **2-3** show the potential for permanent seawater inundation in 2035 and 2065, for the highest SLR scenarios in DRSL. Except for some marginal seawater encroachment at the edges of some parcels, no permanent seawater inundation is projected in any of the parcels

during 2035 and 2065, under the highest SLR scenario. **Tables 2-2** and **2-3** lists the impacts of coastal flooding (seawater and groundwater) in the parcels at HPNS for the years 2035 and 2065, respectively. Permanent seawater inundation is not projected through year 2065 under the highest SLR scenarios.

2.3 Storm Surges

Storm surges can cause transient flooding and the surges have the potential to reach farther upland from the coastline in conjunction with SLR. DRSL projects that a 100-year storm surge would add 5.9 feet to the MHHW. Conservatively, it was assumed that the storm surge and high tide occur simultaneously. The transient flooding because of the combined effect of SLR and a 100-year storm surge is mapped on **Figures 2-4** and **2-5** for 2035 and 2065, respectively. As seen from the differences in the extent of flooding between 2035 and 2065, the degree of SLR projected greatly affects the size of the areas impacted by the storm surge. The following summarizes the potential effects from storm surges based on the highest SLR scenarios in 2035 and 2065:

- In 2035, a 100-year storm surge is not projected to impact Parcels D-2, F, UC-1, UC-2, or UC-3. Portions of IR-07/18, and Parcels B-1, B-2, C, D-1, E, and the low-lying areas of E-2 are projected to be impacted. The low-lying areas in the panhandle of Parcel E-2 are wetlands under construction as part of the Remedial Action. The wetlands are designed to mitigate the impact of storms (**Table 2-2**).
- In 2065, a 100-year storm surge would impact portions of all parcels except UC-3 (**Table 2-3**).

Impacts from storm surges will be addressed in accordance with the long-term monitoring (LTM) plan for each IR site or parcel. Storm events of a certain magnitude trigger an ad hoc inspection with repairs. Under the emergency response plans included in the operations and maintenance manuals for Parcels B-1 (ERRG, 2016), B-2 (INNOVEX-ERRG Joint Venture, 2018), C (Tetra Tech, Inc. and ERRG, 2017), D-1, (APTIM 2018, 2019), E-2 (ERRG, 2014b), G (Arcadis U.S., Inc., 2014), and IR-07/18 (ERRG, 2012), the following emergency response procedure is identified in the event of flooding, which is caused by intense storm events, high sea level, or wave action:

1. Immediately conduct visual inspection of area to assess damage and potential impact.
2. In the event of safety hazard, immediately cordon off the affected area.
3. In the event of slope failure, contact contracted geotechnical consultant, as appropriate, to participate in an evaluation of problem area with 48 hours. If necessary, conduct a geotechnical investigation of the failure to develop a corrective action plan.
4. For damage or potential damage to components that affect site integrity, security, or safety, arrange repair or restoration within 2 weeks (weather and conditions permitting) to design conditions and in accordance with construction specifications.
5. Investigate preventive measures.
6. Notify California Regional Water Quality Control Board, San Francisco Bay Region, and California's Department of Resources Recycling and Recovery (for IR-07/18 and Parcel E-2), Resident Officer in Charge of Construction, DTSC, U.S. Environmental Protection Agency, and the California Department of Public Health.

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3.0 Sea Level Rise Impacts on Shallow Groundwater

Groundwater emergence at the ground surface can occur in areas where the groundwater table is projected to rise above the current land surface from SLR. Impacts from groundwater table rise to within 3 feet of the ground surface was also evaluated to assess potential vulnerabilities to vapor intrusion or preferential pathways along underground utility corridors.

3.1 Groundwater Emergence

Groundwater table rise projections were prepared by the method described by Hoover et al. (Hoover, 2017). This is also the method used by the City of Alameda (City of Alameda, 2022) and May et al. (2024) for assessing climate-related impacts on the groundwater table. To determine permanent SLR-induced groundwater table rise, a 1:1 ratio of groundwater table rise to SLR was used, and the projected groundwater rise was added to a baseline as described in the next paragraph. It is unlikely that SLR will uniformly be linear at a 1:1 ratio in all parcels. However, this approximation is effective for areas that are flux controlled; that is, where the sea level and tidal fluctuations have influence over an aquifer (Plane E, 2019). The method is limited because it does not account for drainage features, such as swales, ditches, or storm drains. The method also assumes that the geology is homogeneous and that the wells are in flux with SLR. This method provides a conservative upper limit to groundwater rise because of SLR.

The HPNS Basewide Groundwater Monitoring Program (BGMP) has been collecting groundwater monitoring data, including groundwater elevations, regularly since 2002. This database was evaluated to determine the baseline potentiometric surface. The monitoring wells of primary focus in this assessment are screened in Aquifer A, which is the uppermost, unconfined water-bearing zone at HPNS. Wells IR39MW21A and PA39MW02A were selected as indicator wells because they are the closest to the area where groundwater emergence is projected to occur first. Measurements from 2002 to 2022 were reviewed to determine the date when the indicator wells had their highest groundwater elevations; the date determined was December 7, 2012, for both wells. Next, all monitoring wells with measurements on this date were further filtered to only provide monitoring wells screened within the water table Aquifer A. Ultimately, groundwater elevation measurements from a total of 125 monitoring wells from across HPNS that were measured on December 7, 2012, and screened within Aquifer A were then used to develop the baseline potentiometric surface.

Using the historical high groundwater table as the baseline to project its rise in 2035 and 2065 is similar to using MHHW as the baseline for assessing areas of seawater flooding. Given the daily fluctuations of the groundwater table in nearshore areas and annual fluctuations over one tidal epoch (19 years), the highest historical level in the last 20 years is used as the baseline to project future increases as a risk-averse case. Groundwater table rise projections in the impacted parcels will be further examined during site-specific studies.

The same adjusted DEM used to evaluate seawater inundation was used in this groundwater assessment. **Figures 3-1** and **3-2** show groundwater emergence at HPNS in 2035 and 2065, respectively. **Tables 2-2** and **2-3** provides a list of areas projected to be impacted by groundwater table rise in 2035 and 2065.

In summary, groundwater table emergence is expected to be minimal but present in Parcel D-1 and a small portion of E-2 wetlands by 2035 and is projected to appear in most parcels by 2065 in the highest SLR scenario. Although Figure 3-1 shows groundwater emergence in a small portion of the IR-07/18 and B-1 coastline, the projection is highly conservative and shows a

minimal area of impact nearshore in 2035. These parcels (IR-07/18, and B-1) are projected more clearly as impacted in the maps for 2065 and are identified as impacts for 2065 (along with Parcels B-2, C, D-1, E, and E-2). These mapping projections will be verified during site-specific studies, which are expected to include validation of well construction details and current ground elevation. The Navy will track actual water table trends in the HPNS BGMP, to compare measurements to projections over time.

3.2 Groundwater Table Rise to Within 3 Feet of Ground Surface

In addition to identifying areas of groundwater emergence, the similar methodology was applied to identify areas that may experience a groundwater table rise to a depth of 3 feet bgs. This is a depth at which building infrastructure, such as sewer lines, may be present; however, all sewer and storm drains have been removed at HPNS. The density requirement for backfilled trench soil is 90 percent relative density by test method ASTM D1557; therefore, it is unlikely to act as a preferential pathway.

The historical high groundwater table from December 2012 was used as the baseline. **Figures 3-3** and **3-4** show the areas where the groundwater table is projected to be within 3 feet bgs in 2035 and 2065, respectively. The following potential impacts from groundwater table rise were projected for 2035 and 2065 based on the highest SLR scenario:

- In 2035, IR-07/18 and Parcels D-2, E-2, UC-1, UC-2, and UC-3 are not impacted; however, limited areas in Parcels B-1, B-2, C, D-1, E, and G may experience groundwater table rise within 3 feet bgs (**Table 2-2, Figure 3-3**).
- In 2065, all parcels except Parcel UC-3 are impacted in limited areas by groundwater table rise to within 3 feet bgs. (**Table 2-3** and **Figure 3-4**).

4.0 Impacts of Other Climate Hazards

This section describes the other DCAT-identified climate hazards in addition to coastal flooding at HPNS. The following impacts from climate-related hazards are anticipated at HPNS:

- Extreme weather events. The number of days with extreme 1-day or 2-day precipitation events could increase.
- Drought. Future years could see extended periods of drought during the dry months and shorter wetter periods during wet months.
- Wildfires. Future years could see higher instances of wildfires following extended periods of drought.
- Energy demand. Future years could see more power outages, with potential impacts on the Parcel E-2 landfill operation.

After a storm event in March 2023, the Navy noted four locations of standing water, as follows: one in Parcel C, one in Parcel D-1, and two in Parcel E. As a preliminary trial, conductivity of the standing water was measured in an attempt to differentiate between rainwater and seawater, but no definitive determination could be made. Conductivity in three of the locations in Parcels C, D-1, and E was low, indicating that the water was likely rainwater ponding in troughs in asphaltic surfaces. The fourth ponding location in Parcel E, closer to the shoreline, showed elevated conductivity, but it was unclear if there was any seawater influence. Conductivity by itself may not be a good indicator of the source of flooding. These locations will be discussed more in the workplan for site-specific studies. Parcel-specific operations and maintenance manuals discuss routine inspections and inspections following storms (intense rainfall events) as triggers for an additional inspection.

Transient climate change phenomena that may impact a Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) site will be managed and addressed as part of regular inspections, maintenance, and repairs as required in the land use control remedial design (RD) and applicable operations and maintenance and LTM plans for each IR site or parcel. **Table 4-1** presents the hazards and whether a parcel may be affected.

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5.0 Vulnerability Assessment

This section discusses the projected vulnerabilities as a result of potentially new future exposure scenarios from the primary hazard identified to impact HPNS: coastal flooding. A review of the remedy components at Parcel E-2 (landfill) that take into account climate resilience is also included in this section.

5.1 Assessment Methodology

The vulnerability assessment evaluates whether the impacts identified in this screening-level CRA indicate a projected new exposure scenario that may impact the CERCLA risk assessed at the IR site. If yes, a site is determined to be vulnerable. If no, the site is determined to be resilient. Factors that affect the assessment include COCs that may persist through 2035 and 2065, and whether there are new exposure pathways that were not previously addressed in the remedies.

COCs: Heavy metals are likely to persist at current (or post-remedy) levels in 2035 and 2065 and are potentially soluble in seawater and groundwater. Therefore, their potential to be mobilized through dissolution in flooded areas is identified as a vulnerability. In general, residual chlorinated volatile organic compounds (CVOCs) (after ongoing or planned source treatment and removal) are not expected to persist through 2065 and their attenuation will be monitored through the ongoing monitoring program. Polycyclic aromatic hydrocarbons (PAHs) and polychlorinated biphenyls (PCBs) are relatively insoluble and their mobilization potential is only through soil erosion. As HPNS has ubiquitous land covers (asphalt or vegetated soil), erosion of soil containing any residual (post-remedy) PAHs and PCBs is not identified as a vulnerability. The attenuation of any residual (post-remedy) COCs by 2035 or 2065 will be verified through the ongoing monitoring program and will be discussed with the agencies during planning of the site-specific studies.

New Exposure Pathways: Groundwater emergence because of SLR is projected to occur in limited areas beginning in 2035 as follows:

- In 2035, groundwater emergence is projected in a limited area in Parcels D-1 and E-2 (**Figure 3-1**).
- In 2065, groundwater emergence is projected in limited areas in IR-07/18, Parcels B-1, B-2, C, D-1, E, and E-2 (**Figure 3-2**).

Vulnerabilities: When the likelihood for migration of these COCs to potential receptors is assessed, the following vulnerabilities attributable to climate change are identified at HPNS:

- Potential vulnerability of human receptors at the ground surface to heavy metals because of groundwater emergence.
- Potential vulnerability of ecological receptors in the bay to heavy metals because of groundwater emergence.

The Navy has been monitoring water levels and COC trends for the past 21 years as part of the BGMP and will continue to monitor COC concentrations to inform the CRA in the next Five-Year Review.

5.2 Potential New Exposure Scenarios for Residual COCs

Residual COCs are expected to remain onsite in areas not remediated to unrestricted reuse in accordance with each parcel's Record of Decision (ROD) and the HPNS reuse plan.

Based on the description of the parcels, IR sites, COCs, and past or future remedies in this Five-Year Review, the following potential new exposure scenarios are identified as relevant to the primary climate hazard anticipated at HPNS, coastal flooding. Coastal flooding includes the impacts of permanent SLR, the associated groundwater emergence, and transient storm surges):

- Potential new exposure to CVOCs from vapor intrusion because of groundwater table rise to 3 feet bgs
- Potential new exposure of human receptors at the current ground surface to heavy metals because of groundwater emergence
- Potential new exposure of ecological receptors in the bay to heavy metals because of groundwater emergence

5.3 Assessing the Resilience to Coastal Flooding

Coastal flooding is the primary climate change hazard that is projected to impact HPNS. Parcel D-1 is the only parcel projected to be impacted in 2035. The following parcels are projected to be impacted in 2065: IR-07/18, Parcels B-1, B-2, C, D-1, and E. **Tables 5-1** and **5-2** list the results of this vulnerability assessment.

5.3.1 Potential New Exposure to CVOCs from Vapor Intrusion due to Groundwater Table Rise to 3 feet bgs

This exposure scenario examines a potential hypothetical future scenario, in which a rising groundwater table causes CVOC plumes to enter sewer lines or come in contact with foundations of buildings, thus increasing the potential for CVOC vapor intrusion into buildings, where occupants could potentially be exposed to CVOC vapors. This assessment found no new or increased exposure created in this scenario, based on the following findings:

- All sewer lines in the impacted parcels and IR sites with CVOC plumes have either been removed or will be removed.
- Following past and future treatment of source areas, most of the residual CVOC plumes in parcels like Parcels B-1 and G have been greatly reduced in concentration (NAVFAC, 2020). In Parcel C (IR 28), where previous treatment of a CVOC source left residual source mass, additional treatment (excavation and bioremediation) is planned. By 2035, any residual CVOCs in groundwater are projected to attenuate below remedial goals (RGs).

The CRA projects that any residual petroleum-based volatile organic compounds will be successfully remediated by 2035 and CVOCs by 2065. A 100 part-per billion chlorinated VOCs source should dissipate by approximately 99% over 41 years based on first-order decay and median point decay rates observed at chlorinated solvent natural attenuation sites (Newell et al., 2006). Ongoing sampling of relevant monitoring wells will be used to verify these assumptions. The goal of the CRA is to evaluate whether climate hazards, such as SLR or groundwater level rise, have the potential to create new or increased exposure pathways. Vapor intrusion is already being considered in current CERCLA documents, sewer lines in impacted areas have been removed, and there is no indication that any of the climate hazards will create new or

increased vapor intrusion. Vapor intrusion will be considered in applicable parcel-specific studies.

5.3.2 Potential New Exposure of Human Receptors at the Current Ground Surface to Heavy Metals due to Groundwater Emergence

This exposure scenario assesses the possibility that groundwater emergence could lead to new potential exposures to heavy metals at the ground surface. In some parcels, asphalt covers have been placed on soils that contain levels of residual heavy metals, in order to isolate them from potential aboveground receptors. If near -surface soils with elevated concentrations of heavy metals are present under the asphalt covers, a relatively permanent rise in the groundwater table could bring dissolved metals to the surface (through cracks in the asphalt or from the sides of the paved areas), without the attenuating effect of cleaner soil covers.

Depending on the varying land use scenarios, potential receptors could include construction workers, industrial workers, recreational users, or (in parts of Parcel C planned for mixed use) residents or residents growing produce (Table 4-3 in this Five-Year Review). Potential new exposures for these aboveground receptors are unlikely in areas with vegetative covers, namely, Parcel E-2 and portions of Parcels E (IR-2SE), B-1, and IR-07/18. However, this CRA found some potential vulnerabilities for these aboveground receptors in areas with asphalt covers, namely, Parcels D-1, B-2, and C and portions of Parcels E, B-1, and IR-07/18.

IR site-specific studies may be warranted in the future to evaluate the risk associated with this projected vulnerability.

5.3.3 Potential New Exposure of Ecological Receptors in the Bay to Heavy Metals due to Groundwater Emergence

As described in **Section 5.3.2**, in future climate-driven scenarios, residual heavy metals in vadose zone soil could dissolve in rising groundwater. In areas with a vegetative cover (with 2 or 3 feet of clean soil), the solubilized heavy metals are likely to sorb to clean soil along the path to the bay, as is evident in past groundwater data (TRBW, 2022). Past groundwater monitoring data show no sustained exceedance of aquatic ecology-based trigger levels, with a reduction in concentration of metals evident in monitoring wells in parcels where remedial excavations have taken place. One exception is heavy metals like zinc that exceed the trigger levels in monitoring well IR02MW373A in Parcel E. Additional excavation remedies are planned near this well in the future to target the exceedances here. Additionally, a nearshore slurry wall is planned to contain groundwater COCs before discharge to the Bay. This illustrates the continuous cycle of annual monitoring and refocusing of remedies that are already in place, leading to continuing improvements that are expected to help achieve the remedial action objectives at HPNS.

In areas with an asphalt cover, heavy metals in near-surface soils could emerge at the ground surface with the groundwater. In this scenario, there is potential for heavy metals in the emergent groundwater to migrate to the bay. Such migration could occur if the emerging groundwater laden with metals drains to the bay through surface features (for example, drainage swales or storm water drains) or merges with seawater during storm surges or rainstorms and then drains to the bay, potentially at levels that exceed surface water quality criteria for ecological receptors. Therefore, this scenario is a potential climate-driven vulnerability in areas with asphalt cover at HPNS.

5.3.4 Potential New Exposure of Subsurface Remedy Infrastructure to Saltwater Intrusion

The groundwater in many wells seems to show low conductivity, indicating that saltwater intrusion is not pervasive across the parcels. In a few monitoring wells, especially near the coastline the groundwater has elevated conductivity and is brackish, indicating that it may be elevated in saltwater components, such as chloride. None of the parcels have remedies that require ongoing use of subsurface remedy infrastructure (for example, no pump-and-treat systems with subsurface extraction wells). There is a soil vapor extraction (SVE) system at IR Site 10 in Parcel B-1 that has subsurface components, but it is slated for decommissioning, as it has reached asymptotic conditions. Parcel E-2 (landfill) is decommissioning its SVE wells and installing 34 landfill gas (LFG) extraction wells. There are several monitoring wells throughout all the parcels that will continue to be sampled in the future. Monitoring wells at HPNS are designed for brackish or saline environments and will undergo routine maintenance and/or replacement in the future. Therefore, all parcels at HPNS are resilient to this potential exposure scenario.

5.3.5 Potential New Exposure of Bay Ecological Receptors to Heavy Metals, PCBs and PAHs from Erosion due to Storm Surges

This scenario is considered because several parcels are projected to flood temporarily during a 100-year storm. Soils with residual COCs may impact the bay during high erosion storm events. **Figures 2-4** and **2-5** show projected areas of transient flooding due to storms projected in years 2035 and 2065, respectively.

Excavation remedies reduce heavy metals, PCBs and PAHs to their applicable RGs in accordance with each parcel's ROD. Because the land in many parcels at HPNS is relatively flat and all parcels have durable covers, either vegetative cover or asphalt cover, there is less likelihood of erosion-related impacts on underlying COCs. Of the two parcels expected to experience the most flooding, Parcel D-1 has asphalt cover throughout the parcel and Parcel E has a mix of asphalt cover and vegetative cover planned. In addition, parts of Parcel E-2 have a protective liner underneath the vegetative cover, to minimize water seeping into the soil with elevated COCs below. The parcels on the southern side of HPNS are lined with seawall and many of the parcels on the northern side have revetments, which will further reduce the impact of storm surges and waves. In addition, wetlands have been incorporated into Parcel E-2 and those will act to reduce storm surges and wave action as well. Therefore, for multiple reasons, the parcels at HPNS are resilient to this potential exposure scenario.

5.3.6 Parcel E-2 Remedy Resiliency

The Parcel E-2 remedy, currently under construction, incorporates remedy design features that make it resilient to climate impacts and protective of the bay. The Parcel E-2 tidal and freshwater wetlands (under construction) are projected to flood in 2035 and 2065; however, the wetlands were designed to store and transmit seawater, rain, and groundwater to mitigate the effects of SLR in accordance with the RD (ERRG, 2014a). Power interruptions from extreme weather events could temporarily impact the LFG system that requires power, but a few days of interruption is not likely to affect the overall gas collection system efficiency. Also, the LFG system is now solar powered.

The following design elements have made the E-2 remedy resilient:

- Excavation and offsite disposal of hotspots

- Grading and onsite consolidation of soil, sediment, and debris. Shoreline revetment (9 feet high) and seawall (additional 3 feet)
- Tidal and freshwater wetlands installed to mitigate the daily influence of tides and periodic influence of waves during storms
- Excavation and shipping out of radiological COCs, removal of sanitary sewers, storm drains, septic and sewer lines
- Landfill cap consisting of 2-foot-thick foundation soil layer, a protective geo-composite liner with drainage layer, and a minimum 2-foot-thick vegetative soil cover
- Groundwater controls, including downgradient slurry wall (keyed into aquitard), upgradient slurry wall, French drain upgradient to divert groundwater around the landfill, and monitoring wells around the landfill that are regularly monitored. Downgradient groundwater monitoring wells so far have not shown exceedances of applicable risk thresholds for any of the COCs monitored.
- LFG controls, including an active collection and treatment system to control LFG emissions and migration
- Regular maintenance, monitoring, and institutional controls, including
  - Cover integrity inspections
  - Groundwater and LFG monitoring
  - Stormwater and erosion controls
  - Wetlands monitoring and maintenance
  - Inspections after a qualifying event (earthquake, storm event, or system alarm)
  - Prompt repairs to any damage observed during routine and event-triggered inspections

The revetment is designed to withstand a 100-year storm and the addition of the seawall makes the landfill resilient to projected SLR through year 2065 (3.2 feet projected SLR highest GHG scenario). Drainage channels, culvert, and outfall structures around the landfill are designed to accommodate peak flows from a 1,000-year storm (ERRG, 2014a). Any damage to the system would be promptly repaired to comply with the operations and maintenance plan. Although the Parcel E-2 remedy components such as the sea wall were designed for resilience through a 3-foot rise in sea level (similar to the 2065 scenario), a site-specific study is recommended to evaluate the longer-term scenarios (such as in the year 2100).

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6.0 Conclusions and Recommendations

The following section discusses the conclusions and recommendations of the screening-level CRA.

6.1 Conclusions

The CRA concluded that the past and ongoing remedies implemented by the Navy have made the parcels at HPNS resilient to most impacts projected to result from the climate change hazards identified by DCAT. The vulnerabilities to climate change identified in this CRA include the following:

- In 2035, a potential vulnerability to human receptors and San Francisco Bay receptors from heavy metals and low-level radiological objects to permanent groundwater emergence at Parcels D-1 and E-2.
- In 2065, potential vulnerability to human receptors and San Francisco Bay receptors from heavy metals because of permanent groundwater emergence at IR-07/18, Parcels B-1, B-2, C, D-1, E, and E-2.

CRA Recommendations in the Five-Year Review

If a vulnerability is projected to result in a potentially new exposure scenario for either human or ecological receptors, then further IR site-specific study is recommended to evaluate whether there may be additional CERCLA risk as a result of the vulnerability. The findings for this CRA are as follows:

- Based on 2035 SLR projections, an IR site-specific study is recommended to assess whether the projected climate change vulnerabilities are likely to result in additional CERCLA risk at wetland areas in Parcels D-1 and E-2.
- Based on 2065 SLR projections, IR site-specific studies are recommended to assess whether the projected climate change vulnerabilities are likely to result in additional CERCLA risk at IR-07/18 and at wetland areas in Parcels B-1, B-2, C, D-1, E, and E-2.

For future Five-Year Reviews, the following are recommended to assess the impact of the projected vulnerabilities identified in this CRA:

- **Verification of HPNS SLR and Groundwater Emergence Projections:** SLR projections can be verified by tracking the five tide gauges nearest to HPNS. The DCAT guides users to a sea level tracker developed by USACE (USACE, 2023), where SLR measurements in tide gauges can be plotted against a 19-year moving average that accounts for normal fluctuations over one tidal cycle. Groundwater emergence projections will be verified by validating monitoring well construction data and ground elevations.
- **Annual Evaluation of Groundwater Elevation Data:** Evaluate the impacts of SLR on groundwater elevations over time. Perform an annual evaluation to compare tidal gauge trends to shallow water table elevation trends.

The Navy framework for CRA (2024) recommends that climate impacts on protectiveness determinations can be better evaluated after detailed site-specific studies have been conducted to verify projected impacts and vulnerabilities identified in the screening-level CRA. The CRA is a screening-level assessment to identify potential vulnerabilities that can be further assessed in site-specific studies at HPNS. These site-specific studies and prioritization of parcels will be

discussed with the agencies. Protectiveness statements in a Five-Year Review will be affected when site-specific studies show that an exposure pathway has the potential to be complete and a future unacceptable health risk has been identified (data collected, validated, and evaluated following CERCLA risk assessment processes resulting in unacceptable risk to receptors). The Navy will assess year 2100 projections in conjunction with site-specific studies.

The CRA estimates that groundwater emergence may occur in several parcels by the year 2065. These mapping projections will be verified during site-specific studies. However, protectiveness is only affected when increased CERCLA risk attributable to climate hazards has been identified (groundwater is likely to emerge and land use is such that receptors could be exposed and a future unacceptable health or ecological risk has been identified, data collected, validated, and evaluated following CERCLA risk assessment processes resulting in unacceptable risk to receptors).

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Tables

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Table 1-1. Eight Climate Change-related Hazards Identified in Department of Defense Climate Assessment Tool

Continental U.S. Climate Hazard	Supporting Indicators
Drought	Flash drought frequency, drought year frequency, aridity, consecutive dry days, mean annual runoff
Coastal Flooding	Coastal flood extent, coastal erosion
Riverine Flooding	Riverine flood extent, flood magnification factor, maximum 1-day precipitation, maximum 5-day precipitation, extreme precipitation days
Heat	Days above 95 degrees Fahrenheit (°F), 5-day maximum temperature, high heat days, frost days, high heat Index days
Energy Demand	Heating degree days, cooling degree days, 5-day minimum temperature, 5-day maximum temperature
Land Degradation	Fire season length, aridity, soil loss, coastal erosion, permafrost hazard
Wildfire	Fuel abundance, ignition rate, fire season length, flash drought frequency
Historical Extreme Conditions	Tornado frequency, hurricane wind greater than 50 knots, hurricane maximum precipitation, hurricane frequency, ice storms, historic drought frequency, ice jams, wildland urban interface

°F = degree(s) Fahrenheit
DCAT = Department of Defense Climate Assessment Tool

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Table 2-1. Sea Level Rise Projections for 2035 and 2065 in Department of Defense Regional Sea Level Database

Global Greenhouse Gas Scenario	Site-specific Sea Level Rise Projections Including Vertical Land Movement	
	2035 (feet)	2065 (feet)
Lowest	0.3	0.6
Low	0.3	1.0
Medium	0.7	1.6
High	0.7	2.3
Highest	1.0	3.2

DRSL = Department of Defense Regional Sea Level Database
GHG = greenhous gas
SLR = sea level rise

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Table 2-2. Impacts of Coastal Flooding in Parcels by 2035

Parcel	Impacted by Groundwater Emergence	Impacted by 100-year Storm	Impacted by Groundwater Table Rise to 3-feet Below Ground Surface
IR-07/18	No	Yes. IR-07/18	No
B-1	No	Yes. IR-10, IR-23, IR-24, IR-60, and IR-61	Yes IR-20 and IR-62
B-2	No	Yes. IR-24 and IR-26	Yes IR-26
C	No	Yes. IR-27, IR-28, IR-29, IR-57, and IR-64	Yes IR-25 and IR-28
D-1	Yes	Yes. IR-17, 55, 68, 70	Yes IR-70
D-2	No	No	No
E	No	Yes. IR-2, IR-8, IR-13, IR-14, IR-36, IR-38, and IR-39	Yes IR-2, IR-8, IR-13, IR-36, and IR-39
E-2	Yes. Wetland areas	Yes. IR-1 and IR-21	No
G	No	No	Yes. IR-9, IR-33, IR-34, and IR-37
UC-1	No	No	No
UC-2	No	No	No
UC-3	No	No	No

bgs = below ground surface
IR = installation restoration

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Table 2-3. Impacts of Coastal Flooding in Parcels by 2065

Parcel	Impacted by Groundwater Emergence	Impacted by 100-year Storm	Impacted by Groundwater Table Rise to 3-feet Below Ground Surface
IR-07/18	Yes. IR-07/18	Yes. IR-07/18	Yes. IR-07/18
B-1	Yes. IR 23, 24, 60	Yes. IR 10, 23, 24, 60, 61	Yes. IR 10, 20, 62
B-2	Yes. IR 26	Yes. IR 26	Yes. IR 26
C	Yes. IR 27, 28, 57	Yes. IR 27, 28, 29, 30, 57, 58, 63, 64	Yes. IR 25, 28
D-1	Yes. IR 17, 53, 68, 69	Yes. IR 16, 17, 22, 35, 48, 53, 55, 68, 69, 70	Yes. IR 22, 55, 70
D-2	No	Yes. Small portion along boundary.	No
E	Yes. IR 2, 38, 39	Yes. IR 2, 3, 5, 8, 11, 12, 13, 14, 36, 38, 39, 73	Yes. IR 2, 4, 8, 13, 14, 15, 36, 39
E-2	Yes. IR 1/21, Wetland areas	Yes. IR 1/21	Yes. IR 1/21
G	No	Yes. IR 9, 33, 34, 37, 44, 65, 66, 67, 71	Yes. IR 9, 33, 34, 37
UC-1	No	Yes	No
UC-2	No	Yes	No
UC-3	No	No	No

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Table 4-1. Impacts of Other Climate Hazards (Other than Coastal Flooding)

Parcel	Extreme Weather Events (Rain Storms)	Drought	Wildfires	Riverine Flooding	Extreme Temperatures	Energy Demand	Land Degradation
All Parcels (except E-2)	Yes	Yes	Yes	No	No	No	No
E-2	Yes	Yes	Yes	No	No	Yes	No

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Table 5-1. Resilience of Parcels to Coastal Flooding Impacts in 2035

Parcel	Impacted By Groundwater Emergence	Impacted by 100-year Storm	Impacted by Groundwater Table Rise to 3-feet Below Ground Surface (bgs)	Potential New Exposure to Chlorinated Volatile Organic Compounds from Vapor Intrusion due to Groundwater Table Rise of 3-feet bgs	Potential New Exposure of Human Receptors at the Ground Surface to Heavy Metals due to Groundwater Emergence	Potential New Exposure of Ecological Receptors in the Bay to Heavy Metals due to Groundwater Emergence	Potential New Exposure of Subsurface Remedy Infrastructure to Saltwater Intrusion	Potential New Exposureof Human Receptors to Heavy Metals from Erosion due to Storm Surges
IR-07/18	No	Yes. IR-07/18	No	No	No	No	No	No
B-1	No	Yes. IR 10, 23, 24, 60, 61	Yes. IR 20, 62	No	No	No	No	No
B-2	No	Yes. IR 24, 26	Yes. IR 26	No	No	No	No	No
C	No	Yes. IR 27, 28, 29, 57, 64	Yes. IR 25, 28	No	No	No	No	No
D-1	Yes. (outside of IR boundary)	Yes. IR 17, 55, 68, 70	Yes. IR 70	No	Yes	Yes	No	No
D-2	No	No	No	No	No	No	No	No
E	No	Yes. IR 2, 8, 13, 14, 36, 38, 39	Yes. IR 2, 8, 13, 36, 39	No	No	No	No	No
E-2	Yes. Wetland areas	Yes. IR 1/21	No	No	No	No	No. LFG extraction wells and collection trench above groundwater table rise	No

Table 5-1. Resilience of Parcels to Coastal Flooding Impacts in 2035

Parcel	Impacted By Groundwater Emergence	Impacted by 100-year Storm	Impacted by Groundwater Table Rise to 3-feet Below Ground Surface (bgs)	Potential New Exposure to Chlorinated Volatile Organic Compounds from Vapor Intrusion due to Groundwater Table Rise of 3-feet bgs	Potential New Exposure of Human Receptors at the Ground Surface to Heavy Metals due to Groundwater Emergence	Potential New Exposure of Ecological Receptors in the Bay to Heavy Metals due to Groundwater Emergence	Potential New Exposure of Subsurface Remedy Infrastructure to Saltwater Intrusion	Potential New Exposureof Human Receptors to Heavy Metals from Erosion due to Storm Surges
G	No	No	Yes. IR 9, 33, 34, 37	No	No	No	No	No
UC-1	No	No	No	No	No	No	No	No
UC-2	No	No	No	No	No	No	No	No
UC-3	No	No	No	No	No	No	No	No

CVOC = chlorinated volatile organic compound
LFG = landfill gas

Table 5-2. Resilience of Parcels to Coastal Flooding Impacts in 2065

Parcel	Impacted by Groundwater Emergence	Impacted by 100-year Storm	Impacted by Groundwater Table Rise to 3-feet Below Ground Surface (bgs)	Potential New Exposure to Chlorinated Volatile Organic Compounds from Vapor Intrusion due to Groundwater Table Rise of 3-feet bgs	Potential New Exposure of Human Receptors at the Ground Surface to Heavy Metals due to Groundwater Emergence	Potential New Exposure of Ecological Receptors in the Bay to Heavy Metals due to Groundwater Emergence	Potential New Exposure of Subsurface Remedy Infrastructure to Saltwater Intrusion	Potential New Exposureof Human Receptors to Heavy Metals from Erosion due to Storm Surges
IR-07/18	Yes. IR-07/18	Yes. IR-07/18	Yes. IR-07/18	No	Yes. (in areas with asphalt cover)	Yes. (in areas with asphalt cover)	No	No
B-1	Yes. IR 23, 24, 60	Yes. IR 10, 23, 24, 60, 61	Yes. IR 10, 20, 62	No	Yes. (in areas with asphalt cover)	Yes. (in areas with asphalt cover)	No	No
B-2	Yes. IR 26	Yes. IR 26	Yes. IR 26	No	Yes	Yes	No	No
C	Yes. IR 27, 28, 57	Yes. IR 27, 28, 29, 30, 57, 58, 63, 64	Yes. IR 25, 28	No	Yes	Yes	No	No
D-1	Yes. IR 17, 53, 68, 69	Yes. IR 16, 17, 22, 35, 48, 53, 55, 68, 69, 70	Yes. IR 22, 55, 70	No	Yes	Yes	No	No
D-2	No	Yes. Small portion of boundary.	No	No	No	No	No	No
E	Yes. IR 2, 38, 39	Yes. IR 2, 3, 5, 8, 11, 12, 13, 14, 36, 38, 39, 73	Yes. IR 2, 4, 8, 13, 14, 15, 36, 39	No	Yes. (in areas with asphalt cover)	Yes. (in areas with asphalt cover)	No	No

Table 5-2. Resilience of Parcels to Coastal Flooding Impacts in 2065

Parcel	Impacted by Groundwater Emergence	Impacted by 100-year Storm	Impacted by Groundwater Table Rise to 3-feet Below Ground Surface (bgs)	Potential New Exposure to Chlorinated Volatile Organic Compounds from Vapor Intrusion due to Groundwater Table Rise of 3-feet bgs	Potential New Exposure of Human Receptors at the Ground Surface to Heavy Metals due to Groundwater Emergence	Potential New Exposure of Ecological Receptors in the Bay to Heavy Metals due to Groundwater Emergence	Potential New Exposure of Subsurface Remedy Infrastructure to Saltwater Intrusion	Potential New Exposureof Human Receptors to Heavy Metals from Erosion due to Storm Surges
E-2	Yes. IR 1/21, Wetland areas	Yes. IR 1/21	Yes. IR 1/21	No	No	No	No	No
G	No	Yes. IR 9, 33, 34, 37, 44, 65, 66, 67, 71	Yes. IR 9, 33, 34, 37	No	No	No	No	No
UC-1	No	Yes	No	No	No	No	No	No
UC-2	No	Yes	No	No	No	No	No	No
UC-3	No	No	No	No	No	No	No	No

Table 5-3. Resilience of Parcels to Other Climate Hazards

Parcel	Potential New Exposure of Human Receptors to Heavy Metals from Erosion due to Rain Storms	Potential New Exposure from Vapor Intrusion due to a Drop in Groundwater Table During Drought	Potential New Concern due to Wildfires	Potential New Concern due to Inability to Meet Energy Demand During Power Outage	Potential New Concern due to Land Degradation
IR-07/18	No	No	No	No	No
B-1	No	No	No	No	No
B-2	No	No	No	No	No
C	No	No	No	No	No
D-1	No	No	No	No	No
D-2	No	No	No	No	No
E	No	No	No	No	No
E-2	No	No	No	No	No
G	No	No	No	No	No
UC-1	No	No	No	No	No
UC-2	No	No	No	No	No
UC-3	No	No	No	No	No

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Figures

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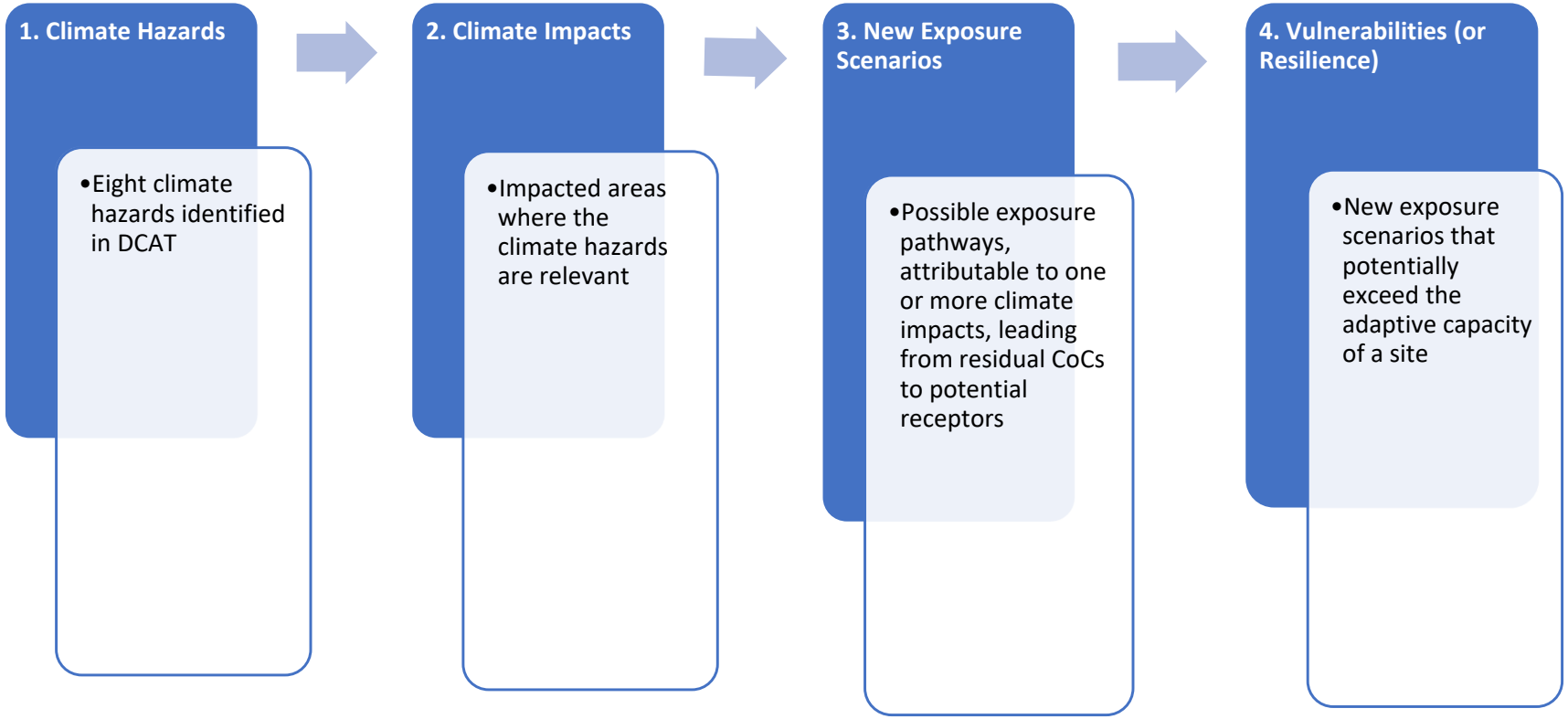

Figure 1-1. Steps in the CRA leading from climate-related hazards to identification of potential vulnerabilities or resilience

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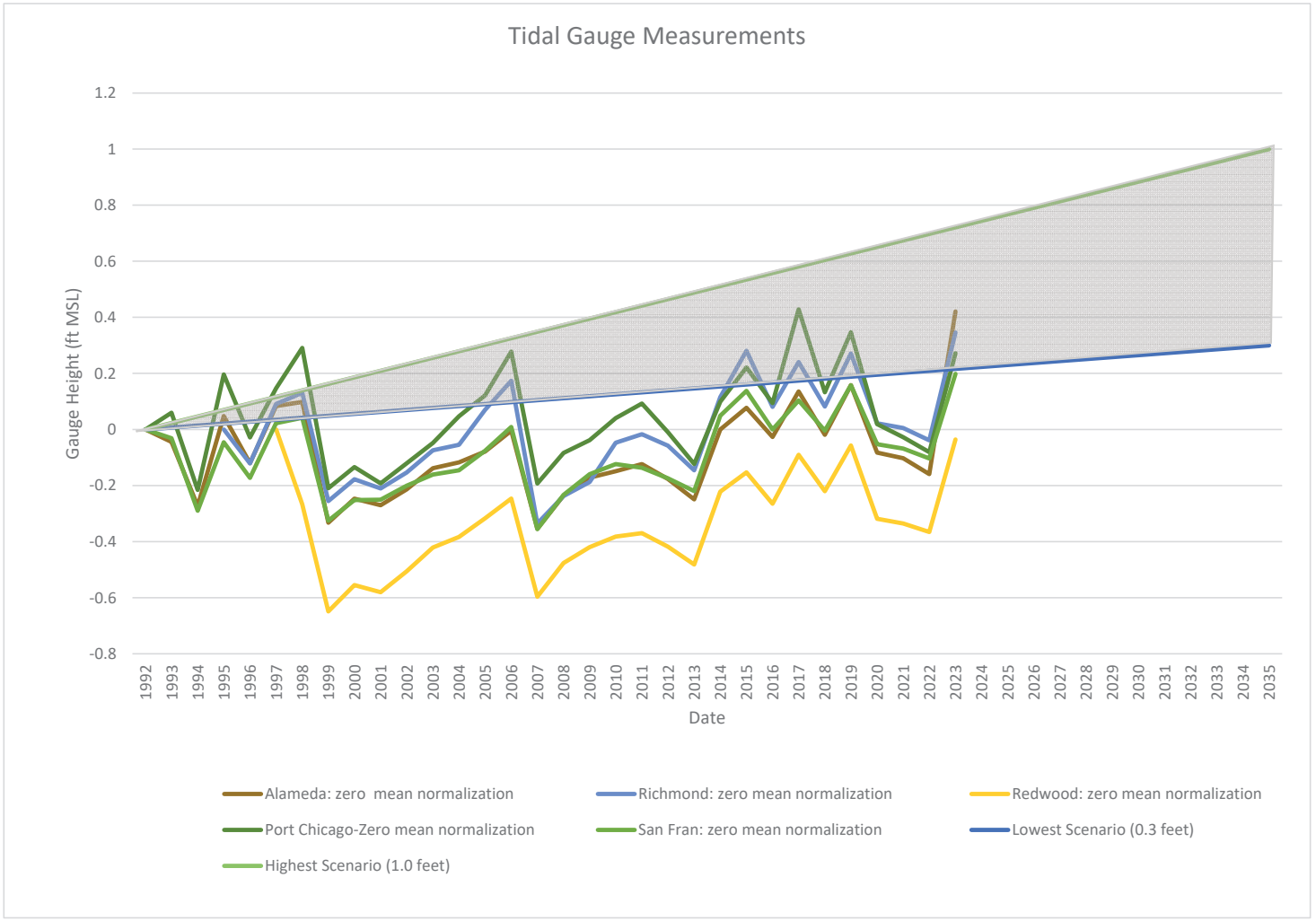

Figure 2-1
Actual Sea Level Rise Measurements in Five Tidal Gauges Nearest to Former Hunters Point Naval Shipyard Compared to DRSL Projected Range to Year 2035

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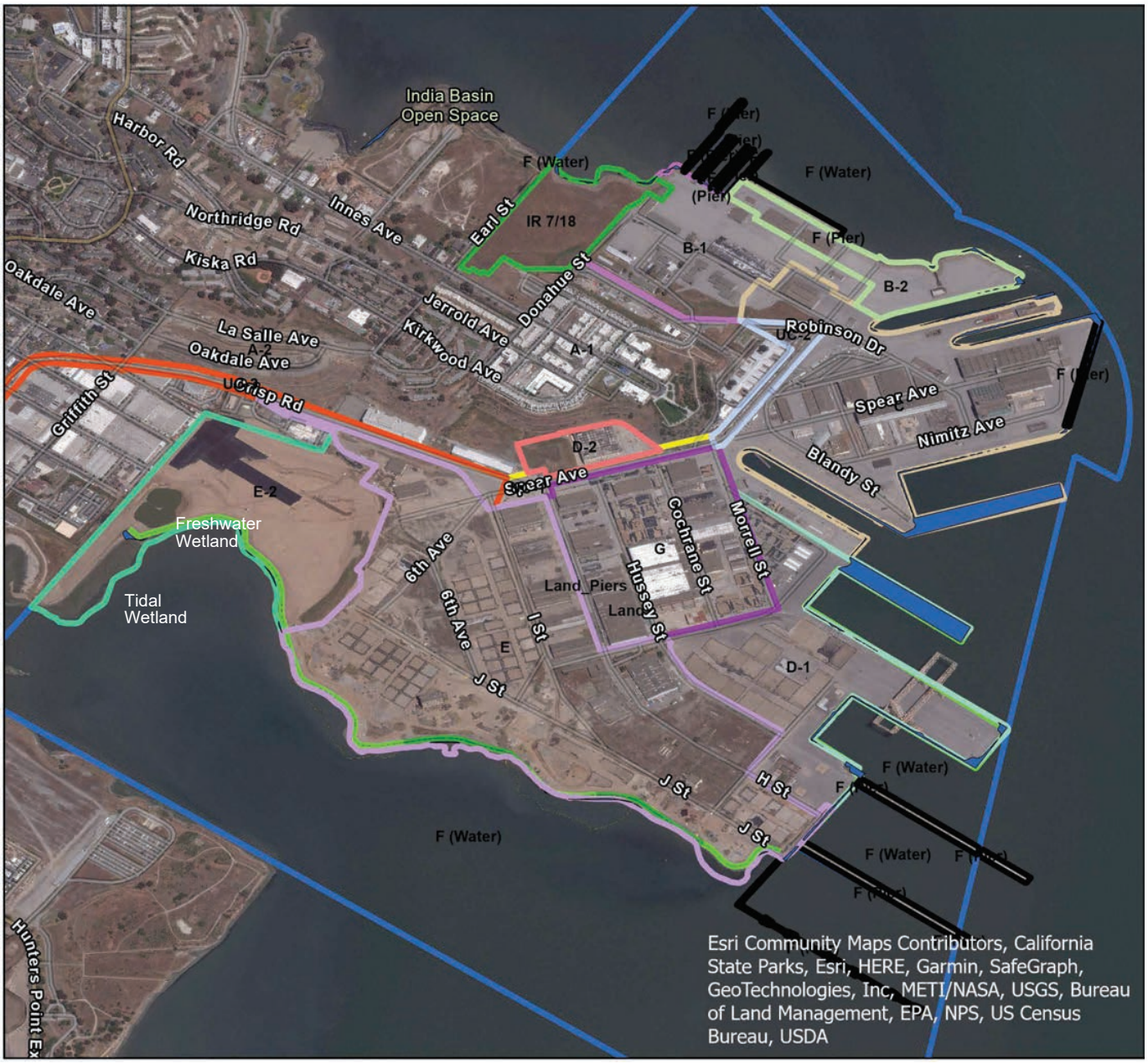

Parcels

- B-1
- B-2
- C
- D-1
- D-2
- E
- E-2
- F (Pier)
- F (Water)
- G
- IR 7/18
- UC-1
- UC-2
- UC-3

Features

- Permanent Inundation due to sea level rise only
- Berms
- Seawall_12ft

Global GHG Scenarios 2035
Permanent Inundation
due to Sea Level Rise
Highest GHG: 1.0 feet above MSL
Figure 2-2

N
W E
S

0 0.07 0.15 0.3 0.45 0.6 Miles

Spatial Reference
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GCS: GCS WGS 1984
Datum: WGS 1984
Map Units: Degree

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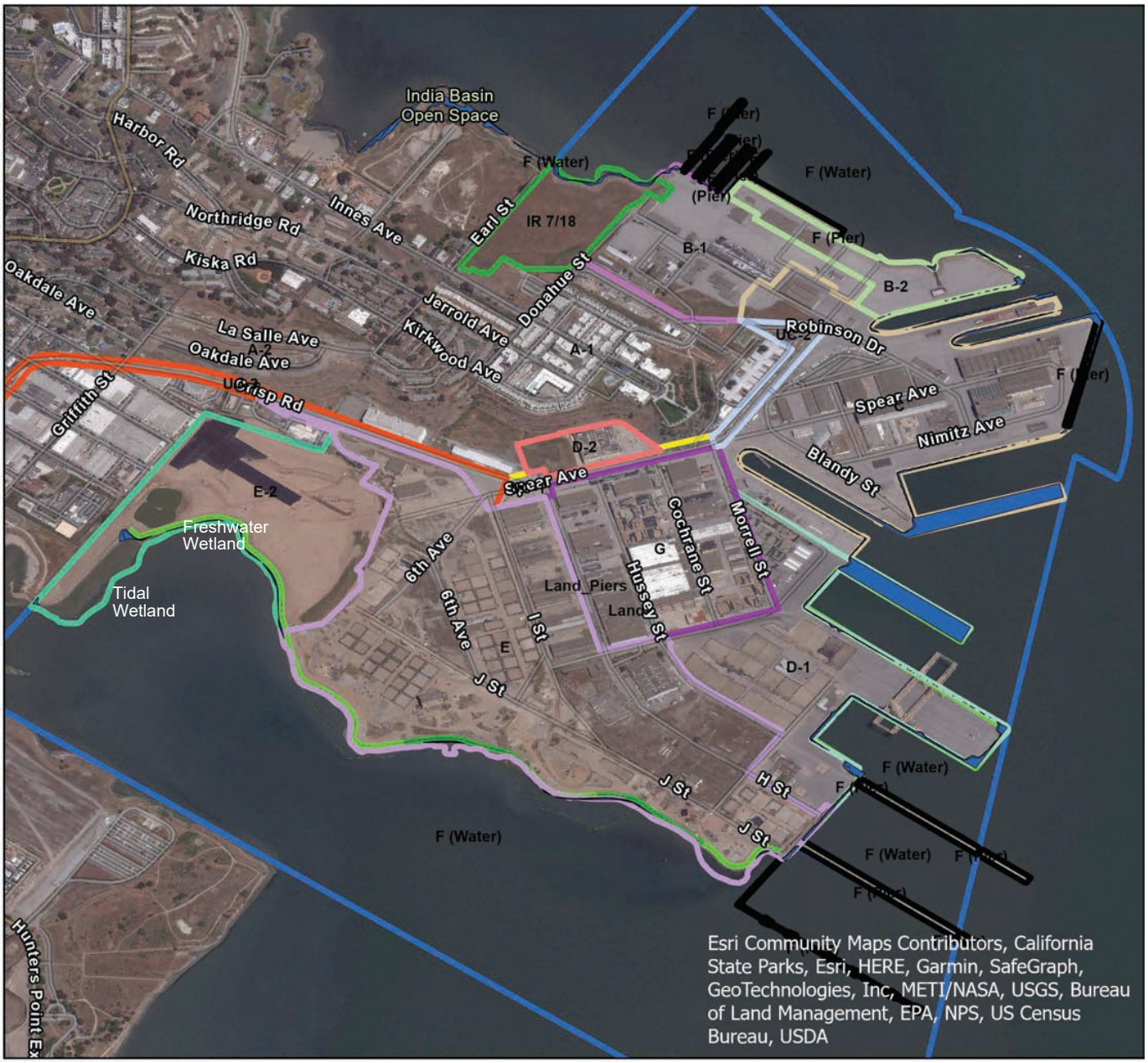

Parcels

- B-1
- B-2
- C
- D-1
- D-2
- E
- E-2
- F (Pier)
- F (Water)
- G
- IR 7/18
- UC-1
- UC-2
- UC-3

Features

- Permanent Inundation due to sea level rise only
- Berms
- Seawall_12ft

Global GHG Scenarios 2065
Permanent Inundation
due to Sea Level Rise
Highest GHG: 3.2 feet above MSL
Figure 2-3

N
W E
S

0 0.07 0.15 0.3 0.45 0.6 Miles

Spatial Reference
Name: GCS WGS 1984
GCS: GCS WGS 1984
Datum: WGS 1984
Map Units: Degree

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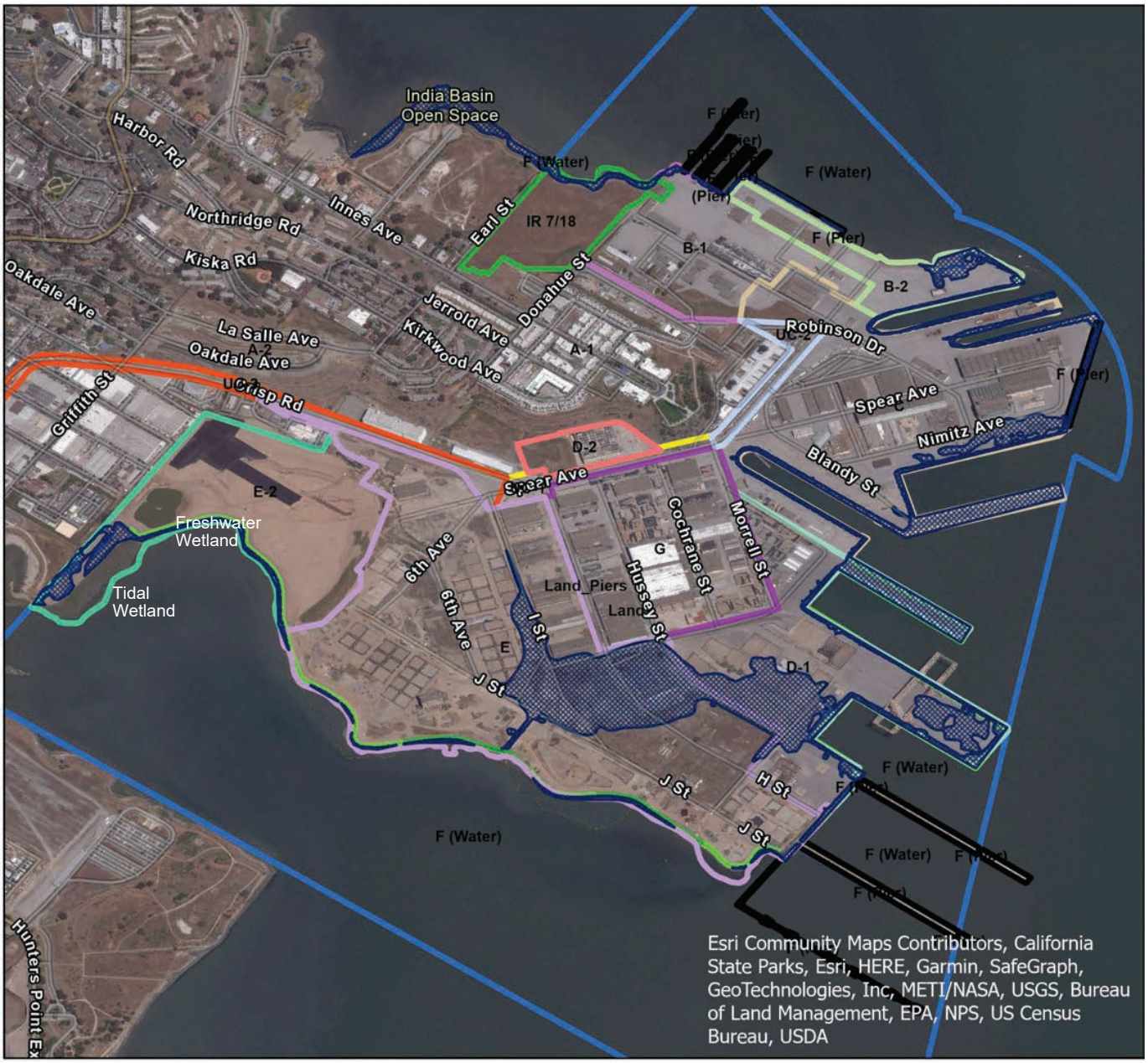

Parcels

- B-1
- B-2
- C
- D-1
- D-2
- E
- E-2
- F (Pier)
- F (Water)
- G
- IR 7/18
- UC-1
- UC-2
- UC-3

Features

- Transient Inundation
- Berms
- Seawall_12ft

Global GHG Scenarios 2035
Transient Inundation
100-Year Storm Event Projection
Highest GHG: 1.0 feet above MSL
Figure 2-4

N
W E
S

0 0.07 0.15 0.3 0.45 0.6 Miles

Spatial Reference
Name: GCS WGS 1984
GCS: GCS WGS 1984
Datum: WGS 1984
Map Units: Degree

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Parcels

- B-1
- B-2
- C
- D-1
- D-2
- E
- E-2
- F (Pier)
- F (Water)
- G
- IR 7/18
- UC-1
- UC-2
- UC-3

Features

- Transient Inundation
- Berms
- Seawall_12ft

Global GHG Scenarios 2065
Transient Inundation
100-Year Storm Event Projection
Highest GHG: 3.2 feet above MSL
Figure 2-5

N
W E
S

0 0.07 0.15 0.3 0.45 0.6
Miles

Spatial Reference
Name: GCS WGS 1984
GCS: GCS WGS 1984
Datum: WGS 1984
Map Units: Degree

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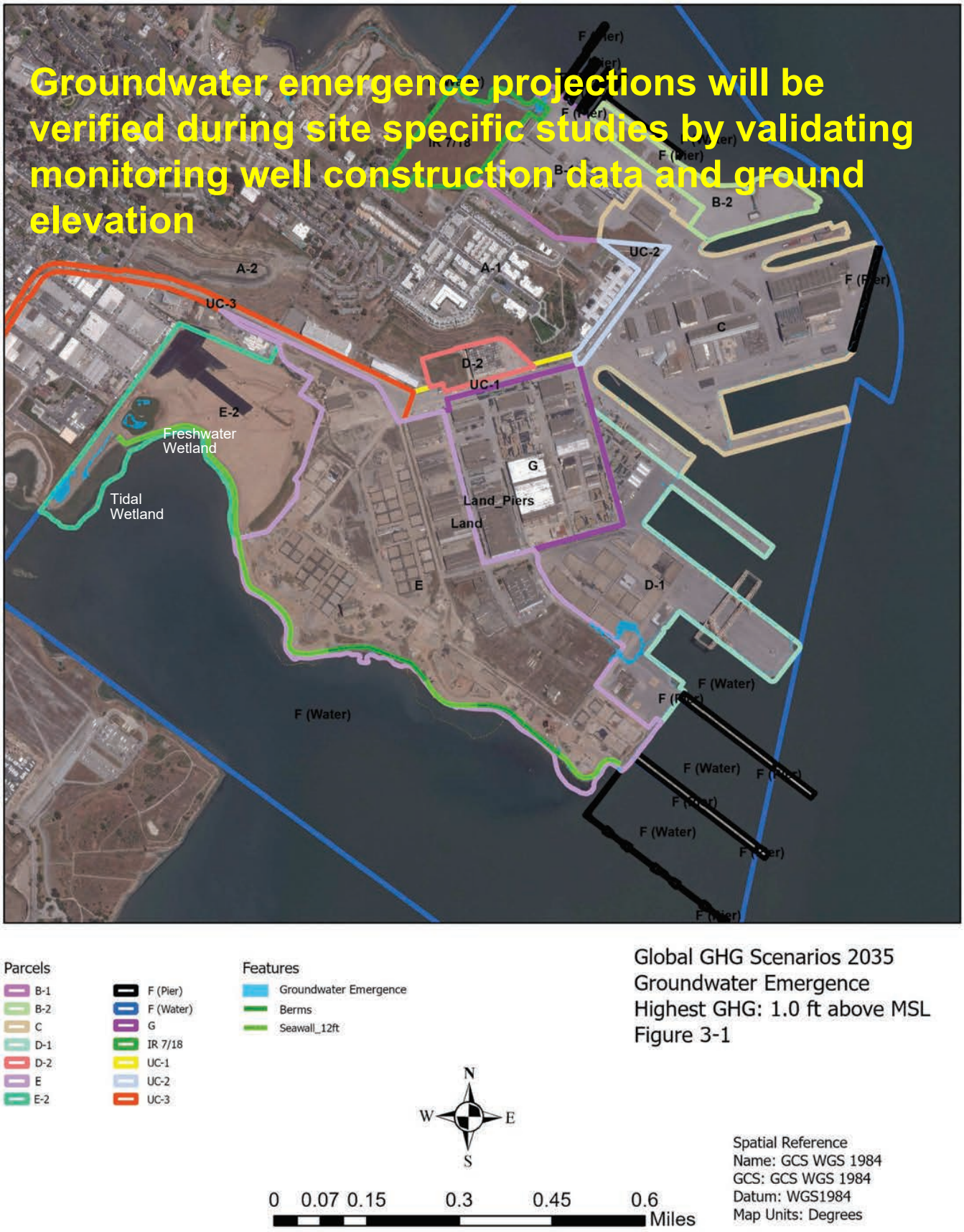
Groundwater emergence projections will be verified during site specific studies by validating monitoring well construction data and ground elevation
A-2
A-1
UC-2
B-2
UC-3
C
D-2
UC-1
E-2
Freshwater Wetland
Tidal Wetland
G
Land_Piers
Land
E
D-1
F (Water)
F (Pier)
IR 7/18
Parcels
B-1
B-2
C
D-1
D-2
E
E-2
F (Pier)
F (Water)
G
IR 7/18
UC-1
UC-2
UC-3
Features
Groundwater Emergence
Berms
Seawall_12ft
Global GHG Scenarios 2035
Groundwater Emergence
Highest GHG: 1.0 ft above MSL
Figure 3-1
N
W
E
S
0 0.07 0.15 0.3 0.45 0.6
Miles
Spatial Reference
Name: GCS WGS 1984
GCS: GCS WGS 1984
Datum: WGS1984
Map Units: Degrees

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Groundwater emergence projections will be verified during site specific studies by validating monitoring well construction data and ground elevation
IR 7/18
F (Water)
B-2
UC-2
A-2
A-1
F (Pier)
UC-3
C
D-2
UC-1
E-2
Freshwater Wetland
Tidal Wetland
G
Land_Piers
Land
E
D-1
F (Water)
F (Water)
F (Water)
F (Water)
F (Water)
Parcels
B-1
B-2
C
D-1
D-2
E
E-2
F (Pier)
F (Water)
G
IR 7/18
UC-1
UC-2
UC-3
Features
Groundwater Emergence
Berms
Seawall_12ft
Global GHG Scenarios 2065
Groundwater Emergence
Highest GHG: 3.2 ft above MSL
Figure 3-2
N
W
E
S
0 0.07 0.15 0.3 0.45 0.6
Miles
Spatial Reference
Name: GCS WGS 1984
GCS: GCS WGS 1984
Datum: WGS1984
Map Units: Degrees

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Groundwater table rise projections will be verified during site specific studies by validating monitoring well construction data and ground elevation
F (Water)
IR 7/18
B-1
B-2
UC-2
A-2
A-1
UC-3
C
D-2
UC-1
E-2
G
Land_Piers
Land
E
D-1
F (Water)
F (Water)
F (Water)
F (Water)
Parcels
B-1
B-2
C
D-1
D-2
E
E-2
F (Pier)
F (Water)
G
IR 7/18
UC-1
UC-2
UC-3
Features
Well locations where groundwater is projected to be less than 3 feet below ground surface
Berms
Seawall_12ft
Global GHG Scenarios 2035
Groundwater Table Rise to 3 ft bgs
Highest GHG: 1.0 ft above MSL
Figure 3-3
N
W
E
S
0 0.07 0.15 0.3 0.45 0.6
Miles
Spatial Reference
Name: GCS WGS 1984
GCS: GCS WGS 1984
Datum: WGS1984
Map Units: Degrees

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Groundwater table rise projections will be verified during site specific studies by validating monitoring well construction data and ground elevation
F (Water)
B-1
B-2
UC-2
A-2
A-1
UC-3
D-2
UC-1
E-2
Land_Piers
Land
E
D-1
F (Water)
F (Water)
F (Water)
F (Water)
Parcels
B-1
B-2
C
D-1
D-2
E
E-2
F (Pier)
F (Water)
G
IR 7/18
UC-1
UC-2
UC-3
Features
Well locations where groundwater is projected to be less than 3 feet below ground surface
Berms
Seawall_12ft
N
W
E
S
0 0.07 0.15 0.3 0.45 0.6
Miles
Global GHG Scenarios 2065
Groundwater Table Rise to 3 ft bgs
Highest GHG: 3.2 ft above MSL
Figure 3-4
Spatial Reference
Name: GCS WGS 1984
GCS: GCS WGS 1984
Datum: WGS1984
Map Units: Degrees

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Appendix B
Interview Summaries

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INTERVIEW RECORD		
Site Name: Hunters Point Naval Shipyard		**EPA ID No.:** CA1170090087
Subject: Five-Year Review O&M Interview		**Date:** 2/7/2023
Type: Telephone Visit Other **Location of Visit:** Questions and responses provided via e-mail.		
Contact Made By:		
Name: Jamie Egan	**Title:** Project Manager	**Organization:** CH2M HILL
Individual Contacted:		
Name: Lou Ehrhard	**Title:** Project Manager	**Organization:** Kemron
E-Mail Address: lehrhard@kemron.com		

Summary Of Conversation

1. What is your affiliation with the Former Hunter's Point Naval Shipyard and what is your role in regard to the oversight of any of the Five Year Review sites/parcels? The sites are as follows:

- Installation Restoration [IR] Sites 7 and 18
- Parcel B-1
- Parcel B-2
- Parcel C
- Parcel D-1
- Parcel D-2
- Parcel E
- Parcel E-2
- Parcel F (Final ROD pending)
- Parcel UC-1
- Parcel UC-2
- Parcel UC-3

Project Manager for the Parcel E-2, Phase III scope, consisting of construction of the landfill cap over the main portion of the existing landfill and installation of the gas control and containment system. I am responsible for the implementation of the Phase III construction scope as well as preparation of plans and reports, including O&M Plans.

2. Over the past five years, have you been involved in on-going communication with the Navy in regard to the Navy's environmental activities at any of the Five-Year Review sites?

Yes, we have weekly calls with the Navy to discuss the scope and progress of the construction at Parcel E-2.

3. Is there an on-site O&M Presence at any of the Five-Year Review sites? Please describe staff O&M activities and their frequency.

As part of our scope, we had a requirement to inspect the revetment wall at Parcel E-2 constructed by others. Two years of inspections were performed, on a quarterly basis in 2020 and on a semiannual basis in 2021, and this scope has been completed.

4. Have there been any significant changes in the O&M requirements, maintenance schedules, or sampling routines since the start-up or in the last five years at any of the Five-Year Review sites? Please describe and include whether they affect the protectiveness of the remedy.

No, as the landfill cap and gas control and containment system remedy has not yet been completed O&M of the landfill cap at Parcel E-2 has not started.

5. Have there been unexpected O&M difficulties or changes in costs since start-up or in the last five years at any of the Five-Year Review sites? If so, please give details.

No.

6. Have there been opportunities to optimize O&M or sampling efforts at any of the Five-Year Review sites? Please describe changes and results or improved efficiency?

No, O&M for the Parcel E-2 landfill cover has not yet started.

INTERVIEW RECORD		
Site Name: Hunters Point Naval Shipyard		**EPA ID No.:** CA1170090087
Subject: Five-Year Review O&M Interview		**Date:** 2/7/2023
Type: Telephone Visit Other **Location of Visit:** Questions and responses provided via e-mail.		
Contact Made By:		
Name: Jamie Egan	**Title:** Project Manager	**Organization:** CH2M HILL
Individual Contacted:		
Name: Brett Womack	**Title:** Project Manager	**Organization:** GES-AIS
E-Mail Address: bwomack@ges-ais.com		

Summary Of Conversation

1. What is your affiliation with the Former Hunter's Point Naval Shipyard and what is your role in regard to the oversight of any of the Five Year Review sites/parcels? The sites are as follows:

- Installation Restoration [IR] Sites 7 and 18
- Parcel B-1 – ***Radiological Rework Contractor (active)***
- Parcel B-2 – ***Radiological Rework Contractor (active)***
- Parcel C – ***Radiological Rework Contractor (active)***
- Parcel D-1 – ***RCA Operator – RSY pads (active)***
- Parcel D-2 – ***Radiological Rework Contractor (not active)***
- Parcel E – ***RA Contractor, Phase 2 (active)***
- Parcel E-2
- Parcel F (Final ROD pending)
- Parcel UC-1 – ***Radiological Rework Contractor (not active)***
- Parcel UC-2 – ***Radiological Rework Contractor (not active)***
- Parcel UC-3 – ***Radiological Rework Contractor (not active)***

2. Over the past five years, have you been involved in on-going communication with the Navy in regard to the Navy's environmental activities at any of the Five-Year Review sites?

Yes.

3. Is there an on-site O&M Presence at any of the Five-Year Review sites? Please describe staff O&M activities and their frequency.

GES has no O&M presence beyond requirements on active work sites. Active mowing/vegetation control and swale maintenance is performed by ERRG.

4. Have there been any significant changes in the O&M requirements, maintenance schedules, or sampling routines since the start-up or in the last five years at any of the Five-Year Review sites? Please describe and include whether they affect the protectiveness of the remedy.

No change to my knowledge.

5. Have there been unexpected O&M difficulties or changes in costs since start-up or in the last five years at any of the Five-Year Review sites? If so, please give details.

Unaware.

6. Have there been opportunities to optimize O&M or sampling efforts at any of the Five-Year Review sites? Please describe changes and results or improved efficiency?

Unaware.

INTERVIEW RECORD		
Site Name: Hunters Point Naval Shipyard		**EPA ID No.:** CA1170090087
Subject: Five-Year Review O&M Interview		**Date:** 2/20/2023
Type: Telephone Visit Other **Location of Visit:** Questions and responses provided via e-mail.		
Contact Made By:		
Name: Jamie Egan	**Title:** Project Manager	**Organization:** CH2M HILL
Individual Contacted:		
Name: Doug Delong	**Title:** CSO Facility/ Compliance Project Manager	**Organization:** NAVFAC BRAC
E-Mail Address: douglas.e.delong.ctr@us.navy.mil		

Summary Of Conversation

1. What is your affiliation with the Former Hunter's Point Naval Shipyard and what is your role in regard to the oversight of any of the Five Year Review sites/parcels? The sites are as follows:

- Installation Restoration [IR] Sites 7 and 18
- Parcel B-1
- Parcel B-2
- Parcel C
- Parcel D-1
- Parcel D-2
- Parcel E
- Parcel E-2
- Parcel F (Final ROD pending)
- Parcel UC-1
- Parcel UC-2
- Parcel UC-3

I am the BRAC PMO-W's Caretaker Site Office (CSO) Facility/Compliance Project Manager. Our RPM team work[s] out of San Diego & the CSO team works out of the Treasure Island office. I provide the daily access, coordination to all the parcels on HPS as well as review & coordination of the waste manifests generated.

2. Over the past five years, have you been involved in on-going communication with the Navy in regard to the Navy's environmental activities at any of the Five-Year Review sites?

As a member of the BRAC-PMO staff, I work with the Navy on a daily basis, all day, every year. I attend & contribute at the weekly QC meetings.

3. Is there an on-site O&M Presence at any of the Five-Year Review sites? Please describe staff O&M activities and their frequency.

We have a contract to various contractors, to maintain ongoing O&M issues at all the parcels. The current contractors doing ongoing operations within them (i.e., APTIM, GES) maintain the Parcels and as issues arise, they are dealt with, on an as needed base. I.e. daily fence breaches or scheduled, sampling wells.

4. Have there been any significant changes in the O&M requirements, maintenance schedules, or sampling routines since the start-up or in the last five years at any of the Five-Year Review sites? Please describe and include whether they affect the protectiveness of the remedy.

No significant changes to the five-year- O&M requirements other that what is approved by the signature authorities & contracts

5. Have there been unexpected O&M difficulties or changes in costs since start-up or in the last five years at any of the Five-Year Review sites? If so, please give details.

No unexpected O&M difficulties or changes that I am aware of.

6. Have there been opportunities to optimize O&M or sampling efforts at any of the Five-Year Review sites? Please describe changes and results or improved efficiency?

From time-to-time when we have another contractor requiring access to a parcel, we have the prime contractor, work with the sub, so both parties can continue their requirements without interfering with one another (i.e., working different hours or a different location within the parcel so both have access)

Appendix C
Site Inspection and Photograph Logs

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Five-Year Review Site Inspection Checklist

I. SITE INFORMATION	
Site name: Installation Restoration Site 07 and 18	**Date of inspection:** 2/9/2023
Location and Region: Hunters Point Naval Shipyard San Francisco, CA, Region 9	**EPA ID:** CA1170090087
Agency, office, or company leading the five-year review: Department of the Navy	**Weather/temperature:** Sunny, 50s

Remedy Includes: (Check all that apply)

☐ Landfill cover/containment ☒ Monitored natural attenuation
☐ Access controls ☐ Groundwater containment
☒ Institutional controls ☐ Vertical barrier walls
☐ Groundwater pump and treatment
☐ Surface water collection and treatment
☒ Other Durable cover consisting of a soil cover, shoreline revetment (riprap), asphaltic concrete pavement

Attachments: ☐ Inspection team roster attached ☒ Site map attached

II. INTERVIEWS (Interviews Conducted Separately)

III. ON-SITE DOCUMENTS & RECORDS VERIFIED (Check all that apply)

1. **O&M Documents**
   ☒ O&M manual ☒ Readily available ☐ Up to date ☐Not applicable (N/A)
   ☒ As-built drawings ☒ Readily available ☐ Up to date ☐ N/A
   ☐ Maintenance logs ☐ Readily available ☐ Up to date ☒ N/A
   Remarks Documents available in the Administrative Record and O&M contractors' offices.

2. **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_____

3. **O&M and OSHA Training Records** ☐ Readily available ☐ Up to date ☐ N/A
   Remarks_____

4. **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_____

5.	**Gas Generation Records** ☐ Readily available ☐ Up to date ☒ N/A Remarks Soil gas monitoring is not required as documented in 2012 Operations and Maintenance Plan.[1]
6.	**Settlement Monument Records** ☒ Readily available ☐ Up to date ☐ N/A Remarks
7.	**Groundwater Monitoring Records** ☒ Readily available ☐ Up to date ☐ N/A Remarks: Groundwater monitoring is reported in annual Basewide groundwater monitoring reports.
8.	**Leachate Extraction Records** ☐ Readily available ☐ Up to date ☒ N/A Remarks
9.	**Discharge Compliance Records** ☐ Air ☐ Readily available ☐ Up to date ☒ N/A ☐ Water (effluent) ☐ Readily available ☐ Up to date ☒ N/A Remarks
10.	**Daily Access/Security Logs** ☐ Readily available ☐ Up to date ☒ N/A Remarks: Guarded security gates at Robinson Street and Crisp Road restrict access to Hunters Point Naval Shipyard. City of San Francisco provides security and maintains access logs.
	IV. O&M COSTS (Not Applicable for Site Inspection)
	V. ACCESS AND INSTITUTIONAL CONTROLS ☒ Applicable ☐ N/A
A. Fencing	
1.	**Fencing damaged** ☐ Location shown on site map ☒ Gates secured ☐ N/A Remarks Fencing in good condition.
B. Other Access Restrictions	
1.	**Signs and other security measures** ☒ Location shown on site map ☐ N/A Remarks Signs in generally good condition, some fading evident (Photograph 13).
C. Institutional Controls (ICs)	

[1] ERRG. 2012. *Annual Operation and Maintenance Summary Report for Installation Restoration Sites 07 and 18 in Parcel B, Hunters Point Naval Shipyard, San Francisco, California*. October 4.

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) Routine Inspection
Frequency Annually
Responsible party/agency Navy and Navy O&M Contractors (Aptim Federal Services)
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
None

2. **Adequacy** ☒ ICs are adequate ☐ ICs are inadequate ☐ N/A
Remarks No evidence of unauthorized intrusive activities or incompatible land uses.

D. General

1. **Vandalism/trespassing** ☐ Location shown on site map ☒ No vandalism evident
Remarks_____

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_____

B. Other Site Conditions

Remarks Some weeds growing near the retainment wall.

VII. LANDFILL COVERS ☒ Applicable ☐ N/A

Note that the durable covers onsite are not engineered landfill covers.

A. Landfill Surface

1. **Settlement** (Low spots) ☐ Location shown on site map ☒ Settlement not evident
Areal extent_____ Depth_____
Remarks_____

2. **Cracks** ☐ Location shown on site map ☒ Cracking not evident
Lengths_____ Widths_____ Depths_____
Remarks_____

3.	**Erosion** Areal extent_____ Remarks_____	☐ Location shown on site map ☒ Erosion not evident Depth_____
4.	**Holes** Areal extent_____ Remarks_____	☐ Location shown on site map ☒ Holes not evident Depth_____
5.	**Vegetative Cover** ☒ Grass ☒ Cover properly established ☐ No signs of stress ☐ Trees/Shrubs (indicate size and locations on a diagram) Remarks Some minor areas of stressed vegetation from vehicles (Photograph 7) and a small hole in the vegetated cover (Photograph 11).	
6.	**Alternative Cover (Shoreline Revetment)** ☐ N/A Remarks Revetment in good condition, no signs of significant rock movement.	
7.	**Bulges** Remarks	☐ Location shown on site map ☒ Bulges not evident
8.	**Wet Areas/Water Damage** ☐ Wet areas ☐ Ponding ☐ Seeps ☐ Soft subgrade Remarks	☒ Wet areas/water damage not evident ☐ Location shown on site map Areal extent_____ ☐ Location shown on site map Areal extent_____ ☐ Location shown on site map Areal extent_____ ☐ Location shown on site map Areal extent_____
9.	**Slope Instability** ☐ Slides ☐ Location shown on site map ☒ No evidence of slope instability Remarks	
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 runoff and intercept and convey the runoff to a lined channel.)		
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: Drainage channel along bump-out area north of Building 146 appears clear of heavy vegetation and in good condition.		
1.	**Settlement** Remarks	☐ Location shown on site map ☒ No evidence of settlement
2.	**Material Degradation** Remarks	☐ Location shown on site map ☒ No evidence of degradation
3.	**Erosion** Remarks	☐ Location shown on site map ☒ No evidence of erosion
4.	**Undercutting** Remarks	☐ Location shown on site map ☒ No evidence of undercutting

5.	**Obstructions** Type_____ ☒ No obstructions ☐ Location shown on site map Remarks_____
6.	**Excessive Vegetative Growth** Type_____ ☒ No evidence of excessive growth ☒ Vegetation in channels does not obstruct flow ☐ Location shown on site map Areal extent_____ Remarks Minor vegetation growth near retaining wall.
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 landfill) ☒ Properly secured/locked ☐ Functioning ☐ Routinely sampled ☒ Good condition ☐ Evidence of leakage at penetration ☐ Needs Maintenance ☐ N/A Remarks None.
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 Settlement Monument 2 in IR-07/18 is scheduled for surveying in 2024.
E. Gas Collection and Treatment	☐ Applicable ☒ N/A
F. Cover Drainage Layer	☐ Applicable ☒ N/A
G. Detention/Sedimentation Ponds	☐ Applicable ☒ N/A
H. Retaining Walls	☒ Applicable ☐ N/A
1.	**Deformations** ☐ Location shown on site map ☒ Deformation not evident Remarks_____
2.	**Degradation** ☐ Location shown on site map ☒ Degradation not evident Remarks_____
I. Perimeter Ditches/Off-Site Discharge	☒ Applicable ☐ N/A Remarks: Swales are located in IR-07/IR-18 and are in good shape.

1.	**Siltation** ☐ Location shown on site map ☒ Siltation not evident Remarks
2.	**Vegetative Growth** ☐ Location shown on site map ☐ N/A ☒ Vegetation does not impede flow Remarks
3.	**Erosion** ☐ Location shown on site map ☒ Erosion not evident Remarks None
4.	**Discharge Structure** ☒ Functioning ☐ N/A Remarks Drainage swale in good condition; check dam clear of debris.
VIII. VERTICAL BARRIER WALLS ☐ Applicable ☒ N/A	
IX. GROUNDWATER/SURFACE WATER REMEDIES ☒ Applicable ☐ N/A	
A. Groundwater Extraction Wells, Pumps, and Pipelines ☐ Applicable ☒ N/A	
B. Surface Water Collection Structures, Pumps, and Pipelines ☐ Applicable ☒ N/A	
C. Treatment System ☐ Applicable ☒ N/A	
D. Monitoring Data	
1.	Monitoring Data ☒ Is routinely submitted on time ☒ Is of acceptable quality
2.	Monitoring data suggests: ☐ Groundwater plume is effectively contained ☐ Contaminant concentrations are declining Remarks Chemicals of concern and radionuclides of concern have not exceeded trigger levels during this review period.
D. Monitored Natural Attenuation	
1.	**Monitoring Wells** (natural attenuation remedy) ☐ Properly secured/locked ☐ Functioning ☐ Routinely sampled ☒ Good condition ☐ All required wells located ☐ Needs Maintenance ☐ N/A Remarks Monitoring wells routinely inspected and maintained in Basewide groundwater monitoring program.
X. OTHER REMEDIES - None	
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.). No issues observed related to implementation of the remedy (durable covers, ICs, groundwater monitoring) at IR-07/18.
B.	**Adequacy of O&M**

	Describe issues and observations related to the implementation and scope of O&M procedures. In particular, discuss their relationship to the current and long-term protectiveness of the remedy. Review of O&M reports indicates that issues related to cover maintenance and vegetation are addressed promptly. Signs/fences reported in good condition.
C.	**Early Indicators of Potential Remedy Problems**
	Describe issues and observations such as unexpected changes in the cost or 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. None
D.	**Opportunities for Optimization**
	Describe possible opportunities for optimization in monitoring tasks or the operation of the remedy. None

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IR-07/18 Photograph 1: *Soil cover near revetment crest. Facing northwest.*
Photographed by: Marcella Navas/CH2M, 2/9/2023

IR-07/18 Photograph 2: *Soil cover. Facing southwest.*
Photographed by: Marcella Navas/CH2M, 2/9/2023

IR-07/18 Photograph 3: *Soil cover in southwest corner of site showing residential homes nearby. Facing southwest*
Photographed by: Marcella Navas/CH2M, 2/9/2023

IR-07/18 Photograph 4: *Soil cover northeast of Innes Avenue. Facing northeast.*
Photographed by: Marcella Navas/CH2M, 2/9/2023

IR-07/18 Photograph 5: *Soil cover near entrance gate adjacent to Donahue Street. Facing northwest.*
Photographed by: Marcella Navas/CH2M, 2/9/2023

IR-07/18 Photograph 6: *Soil cover southwest of revetment crest along non-Navy property. Facing southwest.*
Photographed by: Marcella Navas/CH2M, 2/9/2023

IR-07/18 Photograph 7: *Vehicle tracks near intersection of Galvez Avenue and Donahue Street. Facing west.*
Photographed by: Marcella Navas/CH2M, 2/9/2023

IR-07/18 Photograph 8: *Drainage channel with gravel patch southwest of Building 146. Facing northeast.*
Photographed by: Marcella Navas/CH2M, 2/9/2023

IR-07/18 Photograph 9: *Retaining wall with vegetation growth. Facing southwest.*
Photographed by: Marcella Navas/CH2M, 2/9/2023

IR-07/18 Photograph 10: *Shoreline revetment northwest of Building 146. Facing northwest.*
Photographed by: Marcella Navas/CH2M, 2/9/2023

IR-07/18 Photograph 11: *View of shoreline revetment west of Building 144. Small hole in vegetated cover. Facing northwest.*
Photographed by: Marcella Navas/CH2M, 2/9/2023

IR-07/18 Photograph 12: *Asphalt pavement at bump-out area north of Building 146 and vegetated drainage swale. Facing east.*
Photographed by: Marcella Navas/CH2M, 2/9/2023

IR-07/18 Photograph 13: *Caution sign showing fading from Donahue Street northwest of Building 117. Facing northwest.*

Photographed by: Marcella Navas/CH2M, 2/9/2023

IR-07/18 Photograph 14: *Chain-link fence along Donahue Street. Facing northeast.*
Photographed by: Marcella Navas/CH2M, 2/9/2023

IR-07/18 Photograph 15: *Chain-link fence along non-Navy property. Facing southwest.*

Photographed by: Marcella Navas/CH2M, 2/9/2023

IR-07/18 Photograph 16: *Monitoring well southwest of revetment crest. Facing northeast.*
Photographed by: Marcella Navas/CH2M, 2/9/2023

Five-Year Review Site Inspection Checklist

I. SITE INFORMATION	
Site name: Parcel B-1	**Date of inspection:** 2/9/23
Location and Region: Hunters Point Naval Shipyard San Francisco, CA, Region 9	**EPA ID:** CA1170090087
Agency, office, or company leading the five-year review: Department of the Navy	**Weather/temperature:** Sunny, 50s

Remedy Includes: (Check all that apply)

☐ Landfill cover/containment ☒ Monitored natural attenuation
☐ Access controls ☐ Groundwater containment
☒ Institutional controls ☐ Vertical barrier walls
☐ Groundwater pump and treatment
☐ Surface water collection and treatment
☒ Other Durable cover consisting of a soil cover, shoreline revetment (riprap), asphaltic concrete pavement, soil vapor extraction system at IR-10

Attachments: ☐ Inspection team roster attached ☒ Site map attached

II. INTERVIEWS (Interviews Conducted Separately)

III. ON-SITE DOCUMENTS & RECORDS VERIFIED (Check all that apply)

1. **O&M Documents**
   ☒ O&M manual ☒ Readily available ☐ Up to date ☐Not applicable (N/A)
   ☒ As-built drawings ☒ Readily available ☐ Up to date ☐ N/A
   ☐ Maintenance logs ☐ Readily available ☐ Up to date ☒ N/A
   Remarks Documents available in the Administrative Record and O&M contractors' offices.

2. **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

3. **O&M and OSHA Training Records** ☒ Readily available ☐ Up to date ☐ N/A
   Remarks

4. **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

5. **Gas Generation Records** ☐ Readily available ☐ Up to date ☒ N/A
   Remarks Soil vapor extraction system monitoring is discussed under Other Remedies.

6.	**Settlement Monument Records** ☒ Readily available ☐ Up to date ☐ N/A Remarks	
7.	**Groundwater Monitoring Records** ☒ Readily available ☐ Up to date ☐ N/A Remarks: Groundwater monitoring is reported in annual Basewide groundwater monitoring reports.	
8.	**Leachate Extraction Records** ☐ Readily available ☐ Up to date ☒ N/A Remarks	
9.	**Discharge Compliance Records** ☐ Air ☐ Readily available ☐ Up to date ☒ N/A ☐ Water (effluent) ☐ Readily available ☐ Up to date ☒ N/A Remarks	
10.	**Daily Access/Security Logs** ☐ Readily available ☐ Up to date ☒ N/A Remarks: Guarded security gates at Robinson Street and Crisp Road restrict access to Hunters Point Naval Shipyard. City of San Francisco provides security and maintains access logs.	
	IV. O&M COSTS (Not Applicable for Site Inspection)	
	V. ACCESS AND INSTITUTIONAL CONTROLS ☒ Applicable ☐ N/A	
A. Fencing		
1.	**Fencing damaged** ☐ Location shown on site map ☐ Gates secured ☐ N/A Remarks Fencing in good condition.	
B. Other Access Restrictions		
1.	**Signs and other security measures** ☐ Location shown on site map ☐ N/A Remarks Signs in generally good condition.	
C. Institutional Controls (ICs)		
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) Routine Inspection Frequency Annually Responsible party/agency Navy and Navy O&M Contractors (Aptim Federal Services) 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 None.	
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

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 Roads in good condition.

B. Other Site Conditions

Remarks Some debris accumulation in drainage ditch and protective riprap around outfalls.

VII. LANDFILL COVERS ☒ Applicable ☐ N/A

Note that the durable covers onsite are not engineered landfill covers.

A. Landfill Surface

1. **Settlement** (Low spots) ☐ Location shown on site map ☒ Settlement not evident
   Remarks

2. **Cracks** ☐ Location shown on site map ☒ Cracking not evident
   Remarks If present, cracks are minor.

3. **Erosion** ☒ Location shown on site map ☐ Erosion not evident
   Remarks Small areas of erosion observed southwest of Building 103 (Photograph 2).

4. **Holes** ☐ Location shown on site map ☒ Holes not evident
   Remarks

5. **Vegetative Cover** ☒ Grass ☒ Cover properly established ☐ No signs of stress
   ☐ Trees/Shrubs (indicate size and locations on a diagram)
   Remarks None

6. **Alternative Cover (Shoreline Revetment)** ☐ N/A
   Remarks Revetment in good condition.

7. **Bulges** ☐ Location shown on site map ☒ Bulges not evident
   Remarks None

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 Drainage swale contained standing water but no depressions with standing water observed.

9.	**Slope Instability** ☐ Slides ☐ Location shown on site map ☒ No evidence of slope instability Remarks None
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 runoff and intercept and convey the runoff to a lined channel.)
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.)
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 Soil vapor monitoring probes and system shut down and pending removal.
3.	**Monitoring Wells** (within surface area of landfill) ☐ Properly secured/locked ☐ Functioning ☐ Routinely sampled ☐ Good condition ☐ Evidence of leakage at penetration ☐ Needs Maintenance ☐ N/A Remarks None
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 Settlement Monument 1 is scheduled for surveying in 2024.
E. Gas Collection and Treatment	☐ Applicable ☒ N/A
F. Cover Drainage Layer	☐ Applicable ☒ N/A
G. Detention/Sedimentation Ponds	☐ Applicable ☒ N/A
H. Retaining Walls	☒ Applicable ☐ N/A
1.	**Deformations** ☐ Location shown on site map ☐ Deformation not evident Remarks No deformations observed. Retaining walls in good condition (Photograph 1).
2.	**Degradation** ☐ Location shown on site map ☐ Degradation not evident Remarks No degradation observed. Retaining wall in good condition (Photograph 1).

I. Perimeter Ditches/Off-Site Discharge ☐ Applicable ☒ N/A Remarks:	
VIII. VERTICAL BARRIER WALLS ☐ Applicable ☒ N/A	
IX. GROUNDWATER/SURFACE WATER REMEDIES ☒ Applicable ☐ N/A	
A. Groundwater Extraction Wells, Pumps, and Pipelines ☐ Applicable ☒ N/A	
B. Surface Water Collection Structures, Pumps, and Pipelines ☐ Applicable ☒ N/A	
C. Treatment System ☐ Applicable ☒ N/A	
D. Monitoring Data	
1. Monitoring Data ☒ Is routinely submitted on time ☒ Is of acceptable quality	
2. Monitoring data suggests: ☒ Groundwater plume is effectively contained ☒ Contaminant concentrations are declining	
D. Monitored Natural Attenuation	
1. **Monitoring Wells** (natural attenuation remedy) ☒ Properly secured/locked ☐ Functioning ☒ Routinely sampled ☒ Good condition ☒ All required wells located ☐ Needs Maintenance ☐ N/A Remarks Monitoring wells inspected and repaired as needed as part of the Basewide groundwater monitoring program.	
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. Soil vapor extraction (SVE) System: 1. **SVE wells and conveyance piping** ☐ Functioning ☐ Good condition ☐ Needs Maintenance ☒ N/A Remarks SVE system is currently off and pending removal. 2. **SVE treatment system components** ☐ Functioning ☐ Good condition ☐ Needs Maintenance ☒ N/A Remarks SVE system is currently off and pending removal.	
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.). Remedy is effective and functioning as intended. SVE reached asymptotic conditions and a soil removal action is planned to address residual volatile organic compounds. Durable covers are intact and maintained and ICs are effective.	

B.	**Adequacy of O&M**
	Describe issues and observations related to the implementation and scope of O&M procedures. In particular, discuss their relationship to the current and long-term protectiveness of the remedy. O&M is effective and addresses routine maintenance to durable covers as needed.
C.	**Early Indicators of Potential Remedy Problems**
	Describe issues and observations such as unexpected changes in the cost or 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. None observed.
D.	**Opportunities for Optimization**
	Describe possible opportunities for optimization in monitoring tasks or the operation of the remedy. No opportunities for optimization outside of efforts to routinely optimize the Basewide groundwater monitoring program network and sampling strategy.

Parcel B-1 Photograph 1: *Retaining wall southwest of Building 113. Facing southeast.*
Photographed by: Marcella Navas/CH2M, 2/9/2023

Parcel B-1 Photograph 2: *Soil cover southwest of Building 103 adjacent to Galvez Avenue. Facing southeast.*
Photographed by: Marcella Navas/CH2M, 2/9/2023

Parcel B-1 Photograph 3: *Outfall protection for storm drainpipe southwest of Building 120. Facing southwest.*
Photographed by: Marcella Navas/CH2M, 2/9/2023

Parcel B-1 Photograph 4: *Asphalt pavement cover southeast of Building 121. Facing northwest.*
Photographed by: Marcella Navas/CH2M, 2/9/2023

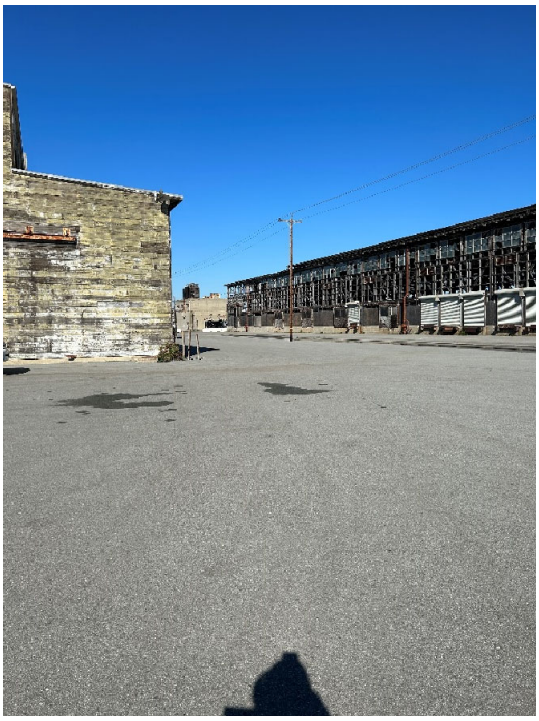
Parcel B-1 Photograph 5: *Asphalt pavement cover southwest of Building 121. Cover is generally intact and in good condition. Facing east.*
Photographed by: Marcella Navas/CH2M, 2/9/2023

Parcel B-1 Photograph 6: *Asphalt pavement cover along Donahue Street. Facing northeast.*
Photographed by: Marcella Navas/CH2M, 2/9/2023

Parcel B-1 Photograph 7: *Drainage swale in asphalt pavement cover southwest of Building 123, with accumulation of water. Facing southeast.*
Photographed by: Marcella Navas/CH2M, 2/9/2023

Parcel B-1 Photograph 8: *Soil cover on slope southwest of Building 113. Facing northeast.*
Photographed by: Marcella Navas/CH2M, 2/9/2023

Parcel B-1 Photograph 9: *Drainage swale in asphalt pavement cover southwest of Building 120, with small accumulation of water. Facing southeast.*
Photographed by: Marcella Navas/CH2M, 2/9/2023



Parcel B-1 Photograph 10: *Asphalt pavement cover northeast of Building 113. Facing northwest.*
Photographed by: Marcella Navas/CH2M, 2/9/2023

Parcel B-1 Photograph 11: *Asphalt cover southwest of Building 113. Facing northwest.*
Photographed by: Marcella Navas/CH2M, 2/9/2023

Parcel B-1 Photograph 12: *Driveway northeast of Buildings 103 and 117. Facing northwest.*
Photographed by: Marcella Navas/CH2M, 2/9/2023

Parcel B-1 Photograph 13: *Asphalt pavement cover and soil cover southwest of Building 113. Facing southeast.*
Photographed by: Marcella Navas/CH2M, 2/9/2023

Parcel B-1 Photograph 14: *Drainage swale in asphalt pavement cover southwest of Building 120. Facing southwest.*
Photographed by: Marcella Navas/CH2M, 2/9/2023

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Five-Year Review Site Inspection Checklist

I. SITE INFORMATION	
Site name: Parcel B-2	**Date of inspection:** 2/9/23
Location and Region: Hunters Point Naval Shipyard San Francisco, CA, Region 9	**EPA ID:** CA1170090087
Agency, office, or company leading the five-year review: Department of the Navy	**Weather/temperature:** Sunny, 50s

Remedy Includes: (Check all that apply)

☐ Landfill cover/containment ☒ Monitored natural attenuation
☐ Access controls ☐ Groundwater containment
☒ Institutional controls ☐ Vertical barrier walls
☐ Groundwater pump and treatment
☐ Surface water collection and treatment
☒ Other Durable cover consisting of a soil cover, shoreline revetment (riprap), asphaltic concrete pavement

Attachments: ☐ Inspection team roster attached ☒ Site map attached

II. INTERVIEWS (Interviews Conducted Separately)

III. ON-SITE DOCUMENTS & RECORDS VERIFIED (Check all that apply)

1. **O&M Documents**
   ☒ O&M manual ☒ Readily available ☐ Up to date ☐Not applicable (N/A)
   ☐ As-built drawings ☒ Readily available ☐ Up to date ☐ N/A
   ☐ Maintenance logs ☐ Readily available ☐ Up to date ☒ N/A
   Remarks Documents available in the Administrative Record and O&M contractors' offices.

2. **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_____

3. **O&M and OSHA Training Records** ☐ Readily available ☐ Up to date ☐ N/A
   Remarks_____

4. **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_____

5. **Gas Generation Records** ☐ Readily available ☐ Up to date ☒ N/A
   Remarks

6.	**Settlement Monument Records** ☒ Readily available ☐ Up to date ☐ N/A Remarks	
7.	**Groundwater Monitoring Records** ☒ Readily available ☐ Up to date ☐ N/A Remarks: Groundwater monitoring is reported in annual Basewide groundwater monitoring reports.	
8.	**Leachate Extraction Records** ☐ Readily available ☐ Up to date ☒ N/A Remarks	
9.	**Discharge Compliance Records** ☐ Air ☐ Readily available ☐ Up to date ☒ N/A ☐ Water (effluent) ☐ Readily available ☐ Up to date ☒ N/A Remarks	
10.	**Daily Access/Security Logs** ☐ Readily available ☐ Up to date ☒ N/A Remarks: Guarded security gates at Robinson Street and Crisp Road restrict access to Hunters Point Naval Shipyard. City of San Francisco provides security and maintains access logs.	
	IV. O&M COSTS (Not Applicable for Site Inspection)	
	V. ACCESS AND INSTITUTIONAL CONTROLS ☒ Applicable ☐ N/A	
A. Fencing		
1.	**Fencing damaged** ☐ Location shown on site map ☒ Gates secured ☐ N/A Remarks Fencing in good condition.	
B. Other Access Restrictions		
1.	**Signs and other security measures** ☐ Location shown on site map ☐ N/A Remarks Signs in generally good condition, buildings locked.	
C. Institutional Controls (ICs)		
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) Routine Inspection Frequency Annually Responsible party/agency Navy and Navy O&M Contractors (Aptim Federal Services) 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 None	
2.	**Adequacy** ☒ ICs are adequate ☐ ICs are inadequate ☐ N/A Remarks None	

D. General	
1.	**Vandalism/trespassing** ☒ Location shown on site map ☐ No vandalism evident Remarks Evidence of graffiti on buildings (Photograph 2).
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 None
B. Other Site Conditions	
	Remarks General site conditions are good. Trenching is being conducted for radiological rework.
VII. COVERS ☒ Applicable ☐ N/A Note that the durable covers onsite are not engineered landfill covers.	
A. Surface	
1.	**Settlement** (Low spots) ☐ Location shown on site map ☒ Settlement not evident Remarks None
2.	**Cracks** ☒ Location shown on site map ☐ Cracking not evident Remarks Minor cracking observed with vegetation growing (Photograph 16).
3.	**Erosion** ☐ Location shown on site map ☒ Erosion not evident Remarks
4.	**Holes** ☐ Location shown on site map ☒ Holes not evident Remarks
5.	**Vegetative Cover** ☐ Grass ☐ Cover properly established ☐ No signs of stress ☐ Trees/Shrubs (indicate size and locations on a diagram) Remarks No vegetative cover.
6.	**Alternative Cover (Shoreline Revetment)** ☐ N/A Remarks Shoreline revetment in good condition with minor areas of vegetation growth (Photograph 16). No signs of major rock movement.
7.	**Bulges** ☐ Location shown on site map ☒ Bulges not evident Remarks None
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 Standing water present from heavy rains during preceding day.

9. **Slope Instability**

☐ Slides ☐ Location shown on site map ☐ No evidence of slope instability
Remarks Not applicable.

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 runoff and intercept and convey the runoff to a lined channel.)

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.)

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 landfill)
☐ Properly secured/locked ☐ Functioning ☐ Routinely sampled ☐ Good condition
☐ Evidence of leakage at penetration ☐ Needs Maintenance ☒ N/A
Remarks_____

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 Minimal settlement observed; no monuments scheduled for surveying in the next 2 years.

E. Gas Collection and Treatment ☐ Applicable ☒ N/A

F. Cover Drainage Layer ☐ Applicable ☒ N/A

G. Detention/Sedimentation Ponds ☐ Applicable ☒ N/A

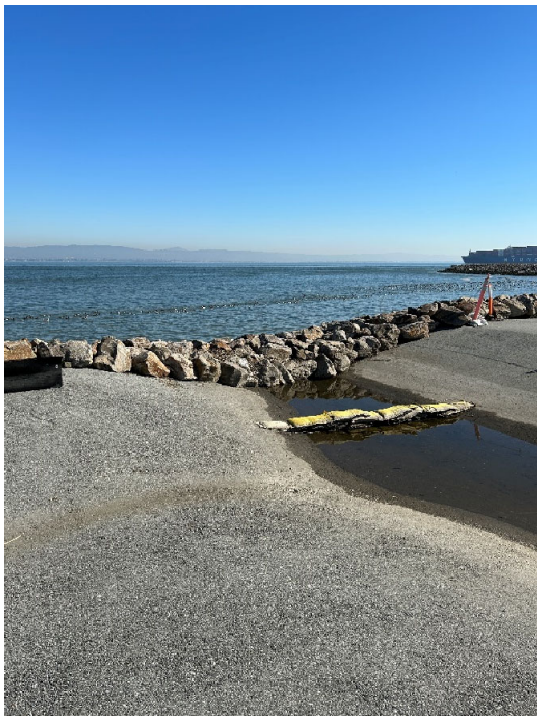
H. Retaining Walls ☒ Applicable ☐ N/A

1.	**Deformations** ☐ Location shown on site map ☒ Deformation not evident Remarks None
2.	**Degradation** ☐ Location shown on site map ☒ Degradation not evident Remarks None
I. Perimeter Ditches/Off-Site Discharge ☒ Applicable ☐ N/A Remarks: Swales are located near Building 140 and 130, appear in good condition.	
1.	**Siltation** ☐ Location shown on site map ☒ Siltation not evident Remarks None observed.
2.	**Vegetative Growth** ☐ Location shown on site map ☒ N/A ☐ Vegetation does not impede flow Remarks Swales are in asphaltic concrete pavement.
3.	**Erosion** ☐ Location shown on site map ☒ Erosion not evident Remarks Swales are in asphaltic concrete pavement.
4.	**Discharge Structure** ☒ Functioning ☐ N/A Remarks Discharge point appears in good condition with nothing impeding the flow.
VIII. VERTICAL BARRIER WALLS ☐ Applicable ☒ N/A	
IX. GROUNDWATER/SURFACE WATER REMEDIES ☒ Applicable ☐ N/A	
A. Groundwater Extraction Wells, Pumps, and Pipelines ☐ Applicable ☒ N/A	
B. Surface Water Collection Structures, Pumps, and Pipelines ☐ Applicable ☒ N/A	
C. Treatment System ☐ Applicable ☒ N/A	
D. Monitoring Data	
1.	Monitoring Data ☒ Is routinely submitted on time ☒ Is of acceptable quality
2.	Monitoring data suggests: ☐ Groundwater plume is effectively contained ☐ Contaminant concentrations are declining Remarks In situ treatment for mercury was completed but concentrations continue to exceed trigger levels.
D. Monitored Natural Attenuation	
1.	**Monitoring Wells** (natural attenuation remedy) ☐ Properly secured/locked ☐ Functioning ☐ Routinely sampled ☐ Good condition ☐ All required wells located ☐ Needs Maintenance ☐ N/A Remarks Monitoring wells inspected and repaired as needed as part of the Basewide groundwater monitoring program.

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: In situ groundwater remediation was conducted. There are no physical structures or ongoing maintenance.
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.). Durable cover, ICs are effective and functioning as designed. Groundwater monitoring data for mercury continue to exceed trigger levels after remediation activities were completed.
B.	**Adequacy of O&M**
	Describe issues and observations related to the implementation and scope of O&M procedures. In particular, discuss their relationship to the current and long-term protectiveness of the remedy. O&M efforts to maintain the durable cover and security features are effective.
C.	**Early Indicators of Potential Remedy Problems**
	Describe issues and observations such as unexpected changes in the cost or 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. None observed.
D.	**Opportunities for Optimization**
	Describe possible opportunities for optimization in monitoring tasks or the operation of the remedy. No opportunities for optimization outside of efforts to routinely optimize the Basewide groundwater monitoring program network and sampling strategy.

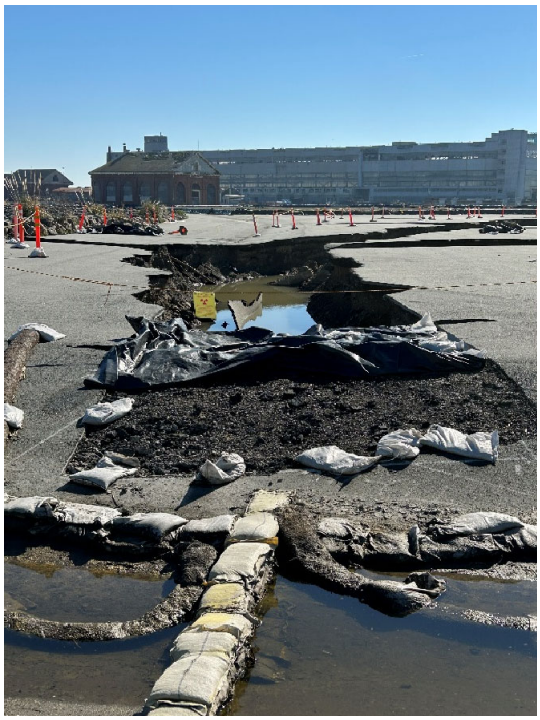
Parcel B-2 Photograph 1: *Drainage swale in asphalt pavement cover northwest of Building 159. Facing north.*
Photographed by: Marcella Navas/CH2M, 2/9/2023

Parcel B-2 Photograph 2: *Drainage swale in asphalt pavement cover and graffiti north of Building 128. Facing west.*
Photographed by: Marcella Navas/CH2M, 2/9/2023

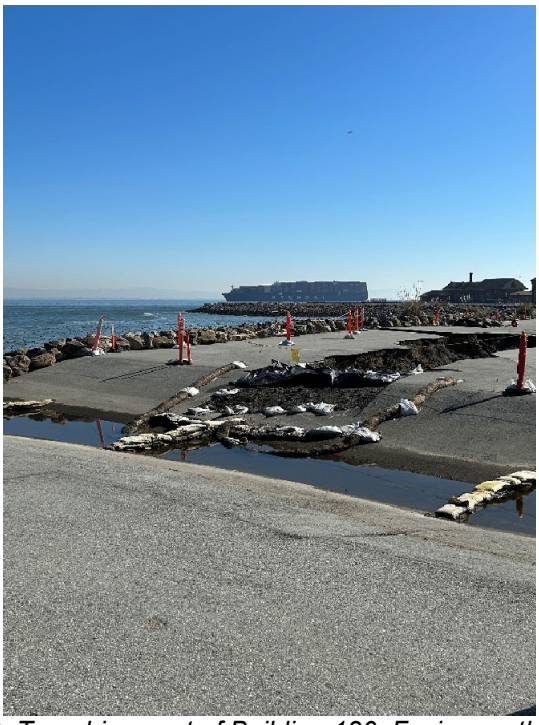


Parcel B-2 Photograph 3: *Swale outfall northeast of Building 130. Facing northeast.*
Photographed by: Marcella Navas/CH2M, 2/9/2023

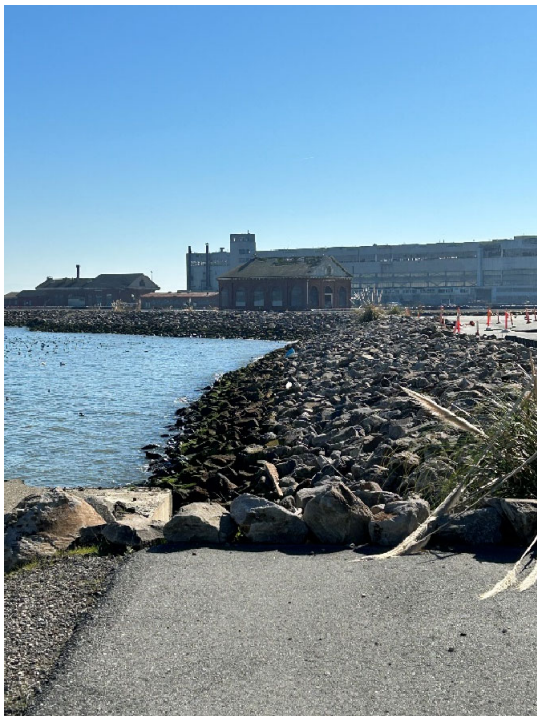
Parcel B-2 Photograph 4: *Swale east of Building 130. Facing south.*
Photographed by: Marcella Navas/CH2M, 2/9/2023



Parcel B-2 Photograph 5: *Trenching east of Building 130 located south of outfall. Facing east.*
Photographed by: Marcella Navas/CH2M, 2/9/2023



Parcel B-2 Photograph 6: *Trenching east of Building 130. Facing northeast.*
Photographed by: Marcella Navas/CH2M, 2/9/2023



Parcel B-2 Photograph 7: *Shoreline revetment southwest of Building 140. Facing southeast.*
Photographed by: Marcella Navas/CH2M, 2/9/2023

Parcel B-2 Photograph 8: *Shoreline revetment north of Building 140. Facing west.*
Photographed by: Marcella Navas/CH2M, 2/9/2023

Parcel B-2 Photograph 9: *Do Not Enter sign and locked door, Building 128. Facing north*
Photographed by: Marcella Navas/CH2M, 2/9/2023

Parcel B-2 Photograph 10: *View of the Building 128 foundation. Facing northwest.*
Photographed by: Marcella Navas/CH2M, 2/9/2023

Parcel B-2 Photograph 11: *Chain-link fence along Parcel B-1 boundary. Facing west.*
Photographed by: Marcella Navas/CH2M, 2/9/2023

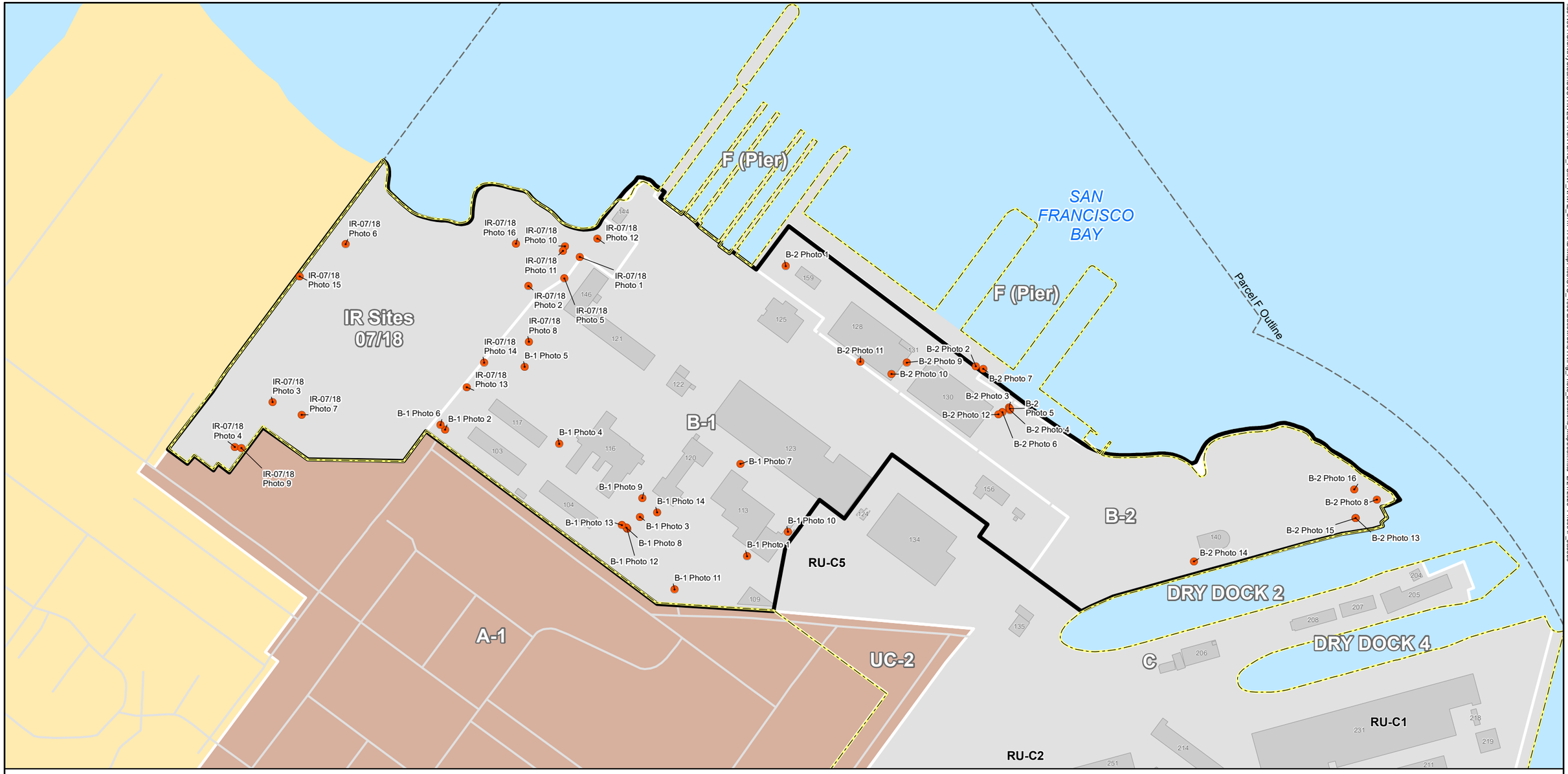
Parcel B-2 Photograph 12: *Monitoring well. Facing southwest.*
Photographed by: Marcella Navas/CH2M, 2/9/2023

Parcel B-2 Photograph 13: *Asphalt pavement cover. Facing west.*
Photographed by: Marcella Navas/CH2M, 2/9/2023

Parcel B-2 Photograph 14: *Construction area with containment west of Building 140. Facing northeast.*
Photographed by: Marcella Navas/CH2M, 2/9/2023

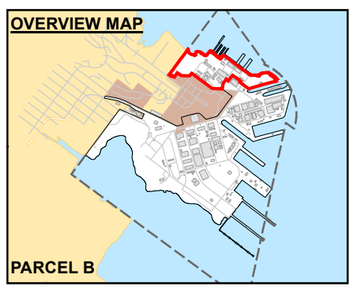
Parcel B-2 Photograph 15: *Asphalt pavement cover. Facing northwest.*
Photographed by: Marcella Navas/CH2M, 2/9/2023

Parcel B-2 Photograph 16: *Revetment crest northeast of Building 140. Facing northwest.*
Photographed by: Marcella Navas/CH2M, 2/9/2023



LEGEND

- Hunters Point Naval Shipyard Boundary
- Parcel Boundary
- Parcel F (Water) Boundary
- Former Navy Property
- Non-Navy Property
- Photograph Location
- Water
- Building
- Road



Parcel B (Installation Restoration Sites 07 and 18, Parcels B-1 and B-2)
Five-Year Review Site Inspection Photograph Locations
Five-Year Review of Remedial Actions
Hunters Point Naval Shipyard, San Francisco, California

0 200 400 Feet

1 Inch = 300 Feet

N

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Five-Year Review Site Inspection Checklist

I. SITE INFORMATION	
Site name: Parcel C	**Date of inspection:** 2/9/23
Location and Region: Hunters Point Naval Shipyard San Francisco, CA, Region 9	**EPA ID:** CA1170090087
Agency, office, or company leading the five-year review: Department of the Navy	**Weather/temperature:** Sunny 50s

Remedy Includes: (Check all that apply)

☐ Landfill cover/containment ☒ Monitored natural attenuation
☐ Access controls ☐ Groundwater containment
☒ Institutional controls ☐ Vertical barrier walls
☐ Groundwater pump and treatment
☐ Surface water collection and treatment
☒ Other Durable cover consisting of a soil cover, shoreline armoring (small area), asphaltic concrete pavement, soil vapor extraction, groundwater remediation (injections).

Attachments: ☐ Inspection team roster attached ☒ Site map attached

II. INTERVIEWS (Interviews Conducted Separately)

III. ON-SITE DOCUMENTS & RECORDS VERIFIED (Check all that apply)

1. **O&M Documents**
   ☒ O&M manual ☒ Readily available ☐ Up to date ☐Not applicable (N/A)
   ☒ As-built drawings ☒ Readily available ☐ Up to date ☐ N/A
   ☐ Maintenance logs ☐ Readily available ☐ Up to date ☒ N/A
   Remarks Documents available in the Administrative Record and O&M contractors' offices.

2. **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 Documents available in O&M contractors' offices.

3. **O&M and OSHA Training Records** ☒ Readily available ☐ Up to date ☐ N/A
   Remarks Documents available in O&M contractors' offices.

4. **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_____

5. **Gas Generation Records** ☐ Readily available ☐ Up to date ☒ N/A
   Remarks

6.	**Settlement Monument Records** ☒ Readily available ☐ Up to date ☐ N/A Remarks Settlement monuments surveyed as part of O&M if required.
7.	**Groundwater Monitoring Records** ☒ Readily available ☐ Up to date ☐ N/A Remarks: Groundwater monitoring is reported in annual Basewide groundwater monitoring reports.
8.	**Leachate Extraction Records** ☐ Readily available ☐ Up to date ☒ N/A Remarks
9.	**Discharge Compliance Records** ☐ Air ☐ Readily available ☐ Up to date ☒ N/A ☐ Water (effluent) ☐ Readily available ☐ Up to date ☒ N/A Remarks
10.	**Daily Access/Security Logs** ☐ Readily available ☐ Up to date ☒ N/A Remarks: Guarded security gates at Robinson Street and Crisp Road restrict access to Hunters Point Naval Shipyard. City of San Francisco provides security and maintains access logs.
	IV. O&M COSTS (Not Applicable for Site Inspection)
	V. ACCESS AND INSTITUTIONAL CONTROLS ☒ Applicable ☐ N/A
A. Fencing	
1.	**Fencing damaged** ☐ Location shown on site map ☒ Gates secured ☐ N/A Remarks Fence in good condition (Photographs 1, 2, 4, 9, 17).
B. Other Access Restrictions	
1.	**Signs and other security measures** ☐ Location shown on site map ☐ N/A Remarks Permanent and temporary signs during active work in good condition (Photograph 19).
C. Institutional Controls (ICs)	
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) Routine Inspection Frequency Annually Responsible party/agency Navy and Navy O&M Contractors (Aptim Federal Services) 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 None; no incompatible land uses observed or unauthorized intrusive activities.

2.	**Adequacy** ☒ ICs are adequate ☐ ICs are inadequate ☐ N/A Remarks None
D. General	
1.	**Vandalism/trespassing** ☐ Location shown on site map ☒ No vandalism evident Remarks None
2.	**Land use changes on site** ☒ N/A Remarks None
3.	**Land use changes off site** ☒ N/A Remarks None
VI. GENERAL SITE CONDITIONS	
A. Roads ☒ Applicable ☐ N/A	
1.	**Roads damaged** ☐ Location shown on site map ☒ Roads adequate ☐ N/A Remarks None
B. Other Site Conditions	
	Remarks Active work is being conducted related to radiological rescanning efforts; many areas of site are inaccessible while work is ongoing but stormwater best management practices are in use (Photographs 9, 11, 12).
VII. COVERS ☒ Applicable ☐ N/A Note that the durable covers onsite are not engineered landfill covers.	
A. Surface	
1.	**Settlement** (Low spots) ☐ Location shown on site map ☒ Settlement not evident Remarks None
2.	**Cracks** ☐ Location shown on site map ☐ Cracking not evident Remarks Minimal cracking outside of active treatment areas, large areas of piers are fenced off due to sinkholes identified during O&M, repairs will be completed when trenching work is complete.
3.	**Erosion** ☐ Location shown on site map ☒ Erosion not evident Remarks Soil cover is in good condition with no apparent erosion. Not all of the site was able to be inspected because of fencing and active work.
4.	**Holes** ☐ Location shown on site map ☐ Holes not evident Remarks Not all of the site was able to be inspected because of fencing and active work. Past O&M records indicate sinkholes and potholes occur along waterfront.
5.	**Vegetative Cover** ☒ Grass ☒ Cover properly established ☒ No signs of stress ☐ Trees/Shrubs (indicate size and locations on a diagram) Remarks Cover in good condition (Photographs 1 and 2).
6.	**Alternative Cover (Shoreline Revetment)** ☒ N/A Remarks Unable to access during inspection. O&M reports consistently note shoreline revetment is in good condition.
7.	**Bulges** ☐ Location shown on site map ☒ Bulges not evident Remarks Not applicable for durable cover.

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 Water present in drainage swales and in an active trench from recent heavy rains.

9. **Slope Instability**
☐ Slides ☐ Location shown on site map ☐ No evidence of slope instability
Remark Not applicable at Parcel C.

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 runoff and intercept and convey the runoff to a lined channel.)

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.)

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 landfill)
☐ Properly secured/locked ☐ Functioning ☐ Routinely sampled ☐ Good condition
☐ Evidence of leakage at penetration ☐ Needs Maintenance ☒ N/A
Remarks See Groundwater Monitoring section.

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 Not scheduled for surveying in the next 3 years at Parcel C.

E. Gas Collection and Treatment ☐ Applicable ☒ N/A

F. Cover Drainage Layer ☐ Applicable ☒ N/A

G. Detention/Sedimentation Ponds ☐ Applicable ☒ N/A

H. Retaining Walls ☐ Applicable ☒ N/A

I. Perimeter Ditches/Off-Site Discharge ☒ Applicable ☐ N/A

Remarks: Drainage swales in good condition.

1. **Siltation** ☐ Location shown on site map ☒ Siltation not evident
   Remarks None

2. **Vegetative Growth** ☐ Location shown on site map ☒ N/A
   ☐ Vegetation does not impede flow
   Remarks None.

3. **Erosion** ☐ Location shown on site map ☒ Erosion not evident
   Remarks None

4. **Discharge Structure** ☒ Functioning ☐ N/A
   Remarks None

VIII. VERTICAL BARRIER WALLS ☐ Applicable ☒ N/A

IX. GROUNDWATER/SURFACE WATER REMEDIES ☒ Applicable ☐ N/A

A. Groundwater Extraction Wells, Pumps, and Pipelines ☐ Applicable ☒ N/A

B. Surface Water Collection Structures, Pumps, and Pipelines ☐ Applicable ☒ N/A

C. Treatment System ☐ Applicable ☒ N/A

D. Monitoring Data

1. Monitoring Data
   ☒ Is routinely submitted on time ☒ Is of acceptable quality

2. Monitoring data suggests:
   ☒ Groundwater plume is effectively contained ☐ Contaminant concentrations are declining
   Remarks Groundwater plumes in some portions of the site have declined to below active treatment levels, others continue to exceed and are undergoing active treatment.

D. Monitored Natural Attenuation

1. **Monitoring Wells** (natural attenuation remedy)
   ☒ Properly secured/locked ☒ Functioning ☒ Routinely sampled ☒ Good condition
   ☐ All required wells located ☐ Needs Maintenance ☐ N/A
   Remarks Monitoring wells are inspected, sampled, and repaired under the Basewide groundwater monitoring program and plume-specific remediation actions.

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. Soil vapor extraction (SVE) System:

3.**SVE wells and conveyance piping**
☐ Functioning ☒ Good condition ☐ Needs Maintenance ☐ N/A

4.**SVE treatment system components**
☐ Functioning ☒ Good condition ☐ Needs Maintenance ☐ N/A

Remarks SVE systems are currently not operating until active treatment is complete and an evaluation of the remedy is completed. Piping is in good condition (Photographs 4 and 5).

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.). Remedy for Parcel C consists of durable covers, active groundwater remediation and monitoring, and ICs to prevent exposure to chemicals of concern and radionuclides of concern in groundwater, soil, and structures. The remedy is functioning as intended, groundwater is being monitored, and the monitoring and treatment approach is conducted as defined in the remedial action work plan and remedial action monitoring plans. Durable covers are maintained through the O&M program and access restrictions appear effective in preventing unauthorized access to the site. Active trenching work is underway.
B.	**Adequacy of O&M**
	Describe issues and observations related to the implementation and scope of O&M procedures. In particular, discuss their relationship to the current and long-term protectiveness of the remedy. O&M is effective in identifying areas for repair and conducting routine repairs. O&M reports indicate some areas with more frequent and larger sinkholes that require repairs outside of routine O&M scope. These areas are monitored and access is restricted by permanent fencing.
C.	**Early Indicators of Potential Remedy Problems**
	Describe issues and observations such as unexpected changes in the cost or 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. Increased frequency of sinkholes that cause damage to the durable cover may be caused by aging infrastructure underlying Parcel C. Infrastructure repairs are not under the responsibility of environmental restoration. Exposure is controlled through fencing, signage, and other mechanisms to prevent access to the area.
D.	**Opportunities for Optimization**
	Describe possible opportunities for optimization in monitoring tasks or the operation of the remedy. No opportunities outside of optimization documented in the remedy evaluations routinely conducted for the groundwater remedy.

Parcel C Photograph 1: *Soil cover west of Building 134. Facing southeast.*
Photographed by: Marcella Navas/CH2M, 2/9/2023

Parcel C Photograph 2: *Soil cover west of Building 134. Facing northwest.*
Photographed by: Marcella Navas/CH2M, 2/9/2023

Parcel C Photograph 3: *Drainage swale southwest of Building 134. Facing southwest.*
Photographed by: Marcella Navas/CH2M, 2/9/2023

Parcel C Photograph 4: *SVE treatment systems surrounded by chain-link fence. Facing west.*
Photographed by: Marcella Navas/CH2M, 2/9/2023

Parcel C Photograph 5: *SVE treatment systems surrounded by chain-link fence. Facing northwest.*
Photographed by: Marcella Navas/CH2M, 2/9/2023

Parcel C Photograph 6: *Asphalt pavement cover southeast of Building 134. Facing north.*
Photographed by: Marcella Navas/CH2M, 2/9/2023

Parcel C Photograph 7: *Asphalt pavement cover southwest of Building 214 along Lockwood Avenue. Facing northwest.*
Photographed by: Marcella Navas/CH2M, 2/9/2023

Parcel C Photograph 8: *Asphalt pavement cover alongside Parcel G and Parcel U2. Barrier to prevent access. Facing south.*
Photographed by: Marcella Navas/CH2M, 2/9/2023

Parcel C Photograph 9: *Stormwater best management practices around catch basins during active trenching work. Facing northwest.*
Photographed by: Marcella Navas/CH2M, 2/9/2023

Parcel C Photograph 10: *Paved drainage swale outfall south of Building 230. Facing southwest.*
Photographed by: Marcella Navas/CH2M, 2/9/2023

Parcel C Photograph 11: *Storage of stockpiles with stormwater management best management practices surrounding and intact. Facing northeast.*
Photographed by: Marcella Navas/CH2M, 2/9/2023

Parcel C Photograph 12: *Stormwater best management practice around catch basin west of Building 231. Facing southeast.*
Photographed by: Marcella Navas/CH2M, 2/9/2023

Parcel C Photograph 13: *Asphalt paved drainage swale along Spear Avenue between Building 281 and 251. Facing southwest.*
Photographed by: Marcella Navas/CH2M, 2/9/2023

Parcel C Photograph 14: *Paved drainage swale southeast of Building 235. Outfall south of Building 234. Facing northwest.*
Photographed by: Marcella Navas/CH2M, 2/9/2023

Parcel C Photograph 15: *Paved drainage swale southwest of Building 230. Facing northwest.*
Photographed by: Marcella Navas/CH2M, 2/9/2023

Parcel C Photograph 16: *Asphalt pavement cover southeast of Building 228 along Nimitz Avenue. Facing southwest.*
Photographed by: Marcella Navas/CH2M, 2/9/2023

Parcel C Photograph 17: *Chain-link fence in between parcel UC-2 along Fischer Avenue. Facing west.*
Photographed by: Marcella Navas/CH2M, 2/9/2023

Parcel C Photograph 18: *Monitoring well south of Building 271 along Nimitz Avenue. Facing northwest.*
Photographed by: Marcella Navas/CH2M, 2/9/2023

Parcel C Photograph 19: *Signs signaling caution near trenching between of Building 134 and 135 outside of gated area of Parcel B-1. Facing southeast.*
Photographed by: Marcella Navas/CH2M, 2/9/2023

Parcel C Photograph 20: *Planned excavation area west of Building 253. Facing east.*
Photographed by: Marcella Navas/CH2M, 2/9/2023

IR Sites 07/18
A-1
B-1
B-2
C
D-1
D-2
E
G
UC-1
UC-2
UC-3
RU-C1
RU-C2
RU-C4
RU-C5
DRY DOCK 2
DRY DOCK 4
DRY DOCK 4
Parcel F Outline
SAN FRANCISCO BAY
C Photo 1
C Photo 2
C Photo 3
C Photo 4
C Photo 5
C Photo 6
C Photo 7
C Photo 8
C Photo 9
C Photo 10
C Photo 11
C Photo 12
C Photo 13
C Photo 14
C Photo 15
C Photo 16
C Photo 17
C Photo 18
C Photo 19
C Photo 20
UC-2 Photo 1
UC-2 Photo 2
UC-2 Photo 3
UC-2 Photo 4

LEGEND

- Hunters Point Naval Shipyard Boundary
- Parcel Boundary
- Parcel F (Water) Boundary
- Former Navy Property
- Non-Navy Property
- Photograph Location
- Water
- Building
- Road

OVERVIEW MAP

PARCEL C

Parcel C (Parcels C and UC-2)
Five-Year Review Site Inspection Photograph Locations
Five-Year Review of Remedial Actions
Hunters Point Naval Shipyard, San Francisco, California

0 200 400 Feet
1 Inch = 350 Feet
N

\\dc1vs011\GIS\Navy\Clean\SOUTHWEST\HUNTERS_POINT_NAVAL_SHIPYARD\MapFiles\CTO_4930\Basewide5YRFig_Photo_Locations_Mapbook.mxd 2/24/2023 PHeist\AF_Jacobs

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Five-Year Review Site Inspection Checklist

I. SITE INFORMATION	
Site name: Parcel D-1	**Date of inspection:** 2/9/23
Location and Region: Hunters Point Naval Shipyard San Francisco, CA, Region 9	**EPA ID:** CA1170090087
Agency, office, or company leading the five-year review: Department of the Navy	**Weather/temperature:** Sunny 50s

Remedy Includes: (Check all that apply)

☐ Landfill cover/containment ☒ Monitored natural attenuation
☐ Access controls ☐ Groundwater containment
☒ Institutional controls ☐ Vertical barrier walls
☐ Groundwater pump and treatment
☐ Surface water collection and treatment
☒ Other Durable cover consisting of a soil cover, shoreline revetment (riprap), asphaltic concrete pavement

Attachments: ☐ Inspection team roster attached ☒ Site map attached

II. INTERVIEWS (Interviews Conducted Separately)

III. ON-SITE DOCUMENTS & RECORDS VERIFIED (Check all that apply)

1. **O&M Documents**
   ☒ O&M manual ☒ Readily available ☐ Up to date ☐Not applicable (N/A)
   ☒ As-built drawings ☒ Readily available ☐ Up to date ☐ N/A
   ☐ Maintenance logs ☐ Readily available ☐ Up to date ☒ N/A
   Remarks Documents available in the Administrative Record and O&M contractors' offices.

2. **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 Available in O&M contractors' offices.

3. **O&M and OSHA Training Records** ☒ Readily available ☐ Up to date ☐ N/A
   Remarks Available in O&M contractors' offices.

4. **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_____

5. **Gas Generation Records** ☐ Readily available ☐ Up to date ☒ N/A
   Remarks

6.	**Settlement Monument Records** ☒ Readily available ☐ Up to date ☐ N/A Remarks Records in O&M reports.
7.	**Groundwater Monitoring Records** ☒ Readily available ☐ Up to date ☐ N/A Remarks: Groundwater monitoring is reported in annual Basewide groundwater monitoring reports.
8.	**Leachate Extraction Records** ☐ Readily available ☐ Up to date ☒ N/A Remarks
9.	**Discharge Compliance Records** ☐ Air ☐ Readily available ☐ Up to date ☒ N/A ☐ Water (effluent) ☐ Readily available ☐ Up to date ☒ N/A Remarks
10.	**Daily Access/Security Logs** ☐ Readily available ☐ Up to date ☒ N/A Remarks: Guarded security gates at Robinson Street and Crisp Road restrict access to Hunters Point Naval Shipyard. City of San Francisco provides security and maintains access logs.
	IV. O&M COSTS (Not Applicable for Site Inspection)
	V. ACCESS AND INSTITUTIONAL CONTROLS ☒ Applicable ☐ N/A
A. Fencing	
1.	**Fencing damaged** ☐ Location shown on site map ☒ Gates secured ☐ N/A Remarks No damage observed.
B. Other Access Restrictions	
1.	**Signs and other security measures** ☐ Location shown on site map ☐ N/A Remarks Signs legible, access is controlled in active trenching areas. Buildings locked and secure.
C. Institutional Controls (ICs)	
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) Routine Inspection Frequency Annually Responsible party/agency Navy and Navy O&M Contractors (Aptim Federal Services) 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 None; no incompatible land uses or unauthorized intrusive activities observed.
2.	**Adequacy** ☒ ICs are adequate ☐ ICs are inadequate ☐ N/A Remarks None

D. General	
1.	**Vandalism/trespassing** ☐ Location shown on site map ☒ No vandalism evident Remarks None
2.	**Land use changes on site** ☒ N/A Remarks None
3.	**Land use changes off site** ☒ N/A Remarks None
VI. GENERAL SITE CONDITIONS	
A. Roads ☒ Applicable ☐ N/A	
1.	**Roads damaged** ☐ Location shown on site map ☒ Roads adequate ☐ N/A Remarks None
B. Other Site Conditions	
	Remarks Active work is being conducted related to radiological rescanning efforts. Many areas of the site are inaccessible while work is ongoing but stormwater best management practices (BMPs) are in use. Old soil stockpiles were observed, secondary containment or other BMPs and signage is present (Photographs 11, 15, and 20).
VII. COVERS ☒ Applicable ☐ N/A Note that the durable covers onsite are not engineered landfill covers.	
A. Surface	
1.	**Settlement** (Low spots) ☐ Location shown on site map ☒ Settlement not evident Remarks None
2.	**Cracks** ☐ Location shown on site map ☐ Cracking not evident Remarks Minor cracks along drainage swale and flat asphalt cover where vegetation is growing (Photographs 7, 8, and 9).
3.	**Erosion** ☐ Location shown on site map ☒ Erosion not evident Remarks None
4.	**Holes** ☒ Location shown on site map ☐ Holes not evident Remarks Small hole from vegetation growth observed (Photograph 7).
5.	**Vegetative Cover** ☐ Grass ☐ Cover properly established ☐ No signs of stress ☐ Trees/Shrubs (indicate size and locations on a diagram) Remarks Not applicable.
6.	**Alternative Cover (Shoreline Revetment)** ☐ N/A Remarks Generally good condition, smaller rocks (3- to 4-inch diameter) appear to have been washed onto the durable cover from the shore (Photographs 17 and 18).
7.	**Bulges** ☐ Location shown on site map ☒ Bulges not evident Remarks None

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 None
9.	**Slope Instability** ☐ Slides ☐ Location shown on site map ☒ No evidence of slope instability Remarks Not applicable.
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 runoff and intercept and convey the runoff to a lined channel.)
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.)
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 landfill) ☐ Properly secured/locked ☐ Functioning ☐ Routinely sampled ☐ Good condition ☐ Evidence of leakage at penetration ☐ Needs Maintenance ☐ N/A Remarks See Groundwater (Section IX)
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 Settlement monuments in Parcel D are not scheduled for surveying in the next 3 years.
E. Gas Collection and Treatment	☐ Applicable ☒ N/A
F. Cover Drainage Layer	☐ Applicable ☒ N/A
G. Detention/Sedimentation Ponds	☐ Applicable ☒ N/A
H. Retaining Walls	☐ Applicable ☒ N/A

I. Perimeter Ditches/Off-Site Discharge ☒ Applicable ☐ N/A Remarks: Asphalt-lined drainage channels/swales are in good condition (Photographs 4, 5, 6, and 8).	
1. **Siltation** ☐ Location shown on site map ☒ Siltation not evident Remarks None	
2. **Vegetative Growth** ☒ Location shown on site map ☐ N/A ☒ Vegetation does not impede flow Remarks Minor vegetation growth (Photographs 8 and 9).	
3. **Erosion** ☐ Location shown on site map ☒ Erosion not evident Remarks None	
4. **Discharge Structure** ☒ Functioning ☐ N/A Remarks Structure in good condition (Photograph 8).	
VIII. VERTICAL BARRIER WALLS ☐ Applicable ☒ N/A	
IX. GROUNDWATER/SURFACE WATER REMEDIES ☒ Applicable ☐ N/A	
A. Groundwater Extraction Wells, Pumps, and Pipelines ☐ Applicable ☒ N/A	
B. Surface Water Collection Structures, Pumps, and Pipelines ☐ Applicable ☒ N/A	
C. Treatment System ☐ Applicable ☒ N/A	
D. Monitoring Data	
1. Monitoring Data ☐ Is routinely submitted on time ☒ Is of acceptable quality	
2. Monitoring data suggests: ☐ Groundwater plume is effectively contained ☒ Contaminant concentrations are declining No chemicals of concern (COCs) exceeded trigger levels during last 2 years of sampling.	
D. Monitored Natural Attenuation	
1. **Monitoring Wells** (natural attenuation remedy) ☒ Properly secured/locked ☒ Functioning ☒ Routinely sampled ☒ Good condition ☐ All required wells located ☐ Needs Maintenance ☐ N/A Remarks Monitoring wells are inspected, sampled, and repaired under the Basewide groundwater monitoring program and plume-specific remediation actions.	
X. OTHER REMEDIES – None	
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.). Remedy for Parcel D-1 consists of durable covers, groundwater monitoring, and ICs to prevent exposure to COCs and radionuclides of concern (ROCs) in groundwater, soil, and structures. The remedy is functioning as intended, groundwater COCs are below trigger levels. Durable covers are maintained through the O&M program and access restrictions appear effective in preventing unauthorized access to the site. Active trenching work is underway.
B.	**Adequacy of O&M**
	Describe issues and observations related to the implementation and scope of O&M procedures. In particular, discuss their relationship to the current and long-term protectiveness of the remedy. A review of O&M reports from 2019-2022 observed degradation in areas of previous repair along Gun Mole Pier that would require repairs outside of the O&M scope. These areas are currently being monitored and access has been restricted.
C.	**Early Indicators of Potential Remedy Problems**
	Describe issues and observations such as unexpected changes in the cost or 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. Increased frequency of sinkholes that cause damage to the durable cover may be caused by aging infrastructure underlying Parcel D-1. Infrastructure repairs are not under the responsibility of environmental restoration. Exposure is controlled through fencing, signage, and other mechanisms to prevent access to the area.
D.	**Opportunities for Optimization**
	Describe possible opportunities for optimization in monitoring tasks or the operation of the remedy. No opportunities for optimization have been identified.

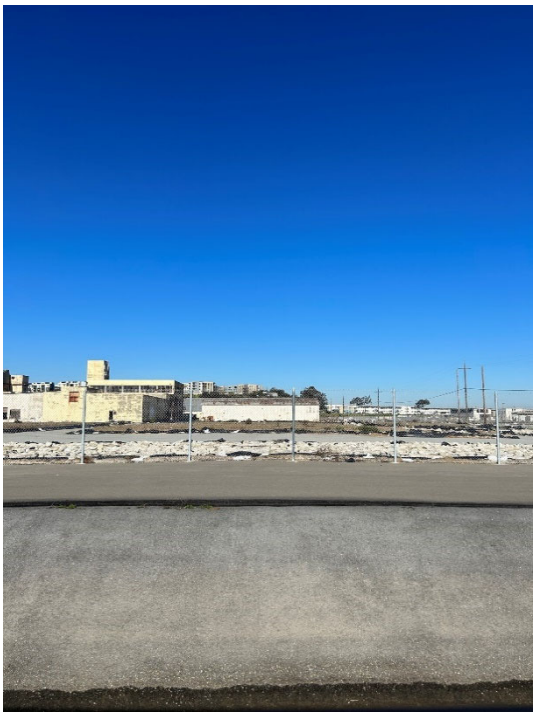
Parcel D-1 Photograph 1: *Asphalt pavement cover adjacent to Parcel G. Facing northeast.*
Photographed by: Marcella Navas/CH2M, 2/9/2023

Parcel D-1 Photograph 2: *Asphalt pavement cover adjacent to Buildings 306 and 274. Facing northwest.*
Photographed by: Marcella Navas/CH2M, 2/9/2023

Parcel D-1 Photograph 3: *Asphalt pavement cover adjacent to Buildings 306 and 274. Facing northeast.*
Photographed by: Marcella Navas/CH2M, 2/9/2023

Parcel D-1 Photograph 4: *Drainage swale adjacent to Parcel G. Facing southwest.*
Photographed by: Marcella Navas/CH2M, 2/9/2023

Parcel D-1 Photograph 5: *Drainage swale adjacent to Parcel G. Facing southwest.*
Photographed by: Marcella Navas/CH2M, 2/9/2023



Parcel D-1 Photograph 6: *Drainage swale adjacent to Parcel G. Facing northwest.*
Photographed by: Marcella Navas/CH2M, 2/9/2023

Parcel D1 Photograph 7: *Hole and vegetation adjacent to asphalt drainage swale. Facing northwest.*
Photographed by: Marcella Navas/CH2M, 2/9/2023

Parcel D-1 Photograph 8: *Drainage swale adjacent to Parcel G. Minor vegetation growth in cracks along the seam between swale material and flat surface material. Facing northwest.*
Photographed by: Marcella Navas/CH2M, 2/9/2023

Parcel D-1 Photograph 9: *Drainage swale with water southeast to Building 307. Facing northeast.*
Photographed by: Marcella Navas/CH2M, 2/9/2023

Parcel D-1 Photograph 10: *Building 381, vegetation growth in the seam between exterior cover and building foundation. Facing northeast.*
Photographed by: Marcella Navas/CH2M, 2/9/2023

Parcel D-1 Photograph 11: *Stormwater management best management practices southwest of Building 307. Facing southwest.*
Photographed by: Marcella Navas/CH2M, 2/9/2023

Parcel D-1 Photograph 12: *Asphalt pavement cover between Buildings 381 and 383. Facing northeast.*
Photographed by: Marcella Navas/CH2M, 2/9/2023

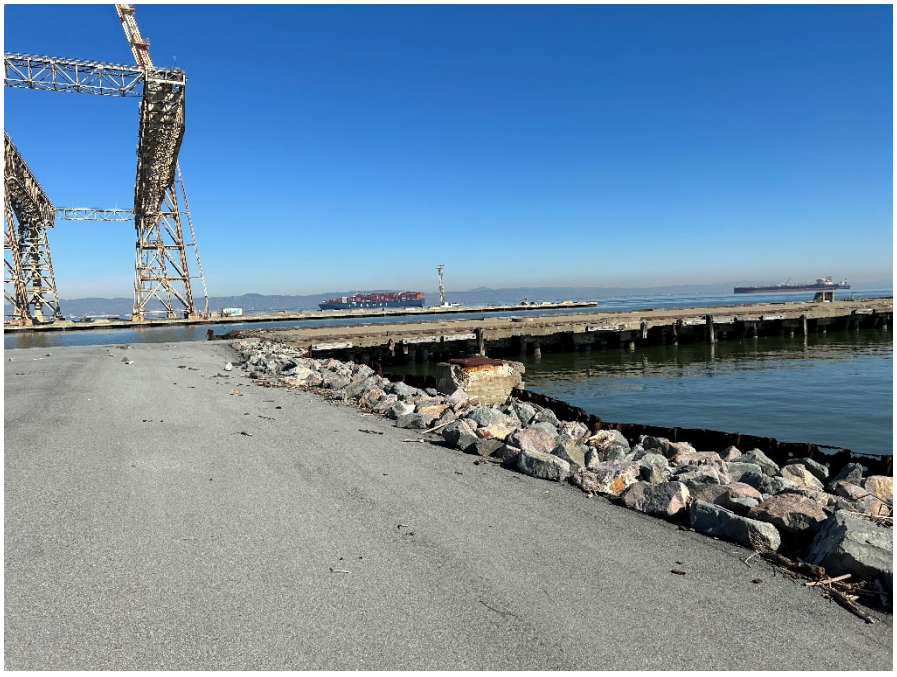
Parcel D-1 Photograph 13: *Asphalt pavement cover adjacent to Building 530. Facing southwest.*
Photographed by: Marcella Navas/CH2M, 2/9/2023

Parcel D-1 Photograph 14: *Asphalt pavement cover adjacent to Building 530. Facing southwest.*
Photographed by: Marcella Navas/CH2M, 2/9/2023

Parcel D-1 Photograph 15: *Stockpile east of Building 525 within secondary containment and signage. Facing northeast.*
Photographed by: Marcella Navas/CH2M, 2/9/2023

Parcel D-1 Photograph 16: *Building 526 foundation. Facing southeast.*
Photographed by: Marcella Navas/CH2M, 2/9/2023

Parcel D-1 Photograph 17: *Shoreline revetment east of Building 381. Facing southeast.*
Photographed by: Marcella Navas/CH2M, 2/9/2023



Parcel D-1 Photograph 18: *Shoreline revetment east of Building 381. Facing northeast.*
Photographed by: Marcella Navas/CH2M, 2/9/2023

Parcel D-1 Photograph 19: *Monitoring well completion and repaired boreholes east of Building 523. Facing southwest.*
Photographed by: Marcella Navas/CH2M, 2/9/2023

Parcel D-1 Photograph 20: *Stockpiles from ongoing work with best management practices surrounding. Facing northeast.*
Photographed by: Marcella Navas/CH2M, 2/9/2023

Five-Year Review Site Inspection Checklist

I. SITE INFORMATION	
Site name: Parcel G	**Date of inspection:** 2/9/23
Location and Region: Hunters Point Naval Shipyard San Francisco, CA, Region 9	**EPA ID:** CA1170090087
Agency, office, or company leading the five-year review: Department of the Navy	**Weather/temperature:** Sunny, 50s

Remedy Includes: (Check all that apply)

☐ Landfill cover/containment ☒ Monitored natural attenuation
☐ Access controls ☐ Groundwater containment
☒ Institutional controls ☐ Vertical barrier walls
☐ Groundwater pump and treatment
☐ Surface water collection and treatment
☒ Other Durable cover consisting of a soil cover, asphaltic concrete pavement

Attachments: ☐ Inspection team roster attached ☒ Site map attached

II. INTERVIEWS (Interviews Conducted Separately)

III. ON-SITE DOCUMENTS & RECORDS VERIFIED (Check all that apply)

1. **O&M Documents**
   ☒ O&M manual ☒ Readily available ☐ Up to date ☐Not applicable (N/A)
   ☒ As-built drawings ☒ Readily available ☐ Up to date ☐ N/A
   ☐ Maintenance logs ☐ Readily available ☐ Up to date ☒ N/A
   Remarks Documents available in the Administrative Record and O&M contractors' offices.

2. **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 Documents available in O&M contractors' offices.

3. **O&M and OSHA Training Records** ☒ Readily available ☐ Up to date ☐ N/A
   Remarks Documents available in O&M contractors' offices.

4. **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

5. **Gas Generation Records** ☐ Readily available ☐ Up to date ☒ N/A
   Remarks

6. **Settlement Monument Records** ☒ Readily available ☐ Up to date ☐ N/A
   Remarks Settlement monuments surveyed as part of O&M.

7.	**Groundwater Monitoring Records** ☒ Readily available ☐ Up to date ☐ N/A Remarks: Groundwater monitoring is reported in annual Basewide groundwater monitoring reports.
8.	**Leachate Extraction Records** ☐ Readily available ☐ Up to date ☒ N/A Remarks
9.	**Discharge Compliance Records** ☐ Air ☐ Readily available ☐ Up to date ☒ N/A ☐ Water (effluent) ☐ Readily available ☐ Up to date ☒ N/A Remarks
10.	**Daily Access/Security Logs** ☐ Readily available ☐ Up to date ☒ N/A Remarks: Guarded security gates at Robinson Street and Crisp Road restrict access to Hunters Point Naval Shipyard. City of San Francisco provides security and maintains access logs.
	IV. O&M COSTS (Not Applicable for Site Inspection)
	V. ACCESS AND INSTITUTIONAL CONTROLS ☒ Applicable ☐ N/A
A. Fencing	
1.	**Fencing damaged** ☐ Location shown on site map ☒ Gates secured ☐ N/A Remarks Good condition (Photograph 12).
B. Other Access Restrictions	
1.	**Signs and other security measures** ☐ Location shown on site map ☐ N/A Remarks Area is completely fenced in, cones and flagging around active trench work, signs to warn against entry into buildings (Photographs 8, 14, and 15).
C. Institutional Controls (ICs)	
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) Routine Inspection Frequency Annually Responsible party/agency Navy and Navy O&M Contractors (Aptim Federal Services) 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 None; no incompatible land uses observed or unauthorized intrusive activities.
2.	**Adequacy** ☒ ICs are adequate ☐ ICs are inadequate ☐ N/A Remarks None
D. General	

1.	**Vandalism/trespassing** ☐ Location shown on site map ☒ No vandalism evident Remarks None
2.	**Land use changes on site** ☒ N/A Remarks None
3.	**Land use changes off site** ☒ N/A Remarks None
	VI. GENERAL SITE CONDITIONS
A. Roads	☒ Applicable ☐ N/A
1.	**Roads damaged** ☐ Location shown on site map ☒ Roads adequate ☐ N/A Remarks None
B. Other Site Conditions	
	Remarks Active work is being conducted related to radiological rescanning efforts. Many areas of site are inaccessible while work is ongoing but stormwater best management practices are in use (Photographs 1, 3, 5, 7, 10, 13, 14, 15, and 16).
	VII. COVERS ☒ Applicable ☐ N/A Note that the durable covers onsite are not engineered landfill covers. The durable cover inspection was not completed because active excavation and trenching work is being conducted over the majority of the parcel; complete durable covers are expected to be reinstalled in accordance with the remedial design.
A. Surface	
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 runoff and intercept and convey the runoff to a lined channel.)
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.)
D. Cover Penetrations	☒ Applicable ☐ N/A
5.	**Settlement Monuments** ☐ Located ☒ Routinely surveyed ☐ N/A Remarks Monument 3723 is scheduled for resurveying in 2025.
E. Gas Collection and Treatment	☐ Applicable ☒ N/A
F. Cover Drainage Layer	☐ Applicable ☒ N/A
G. Detention/Sedimentation Ponds	☐ Applicable ☒ N/A
H. Retaining Walls	☐ Applicable ☒ N/A
I. Perimeter Ditches/Off-Site Discharge	☐ Applicable ☒ N/A

VIII. VERTICAL BARRIER WALLS ☐ Applicable ☒ N/A	
IX. GROUNDWATER/SURFACE WATER REMEDIES ☒ Applicable ☐ N/A	
A. Groundwater Extraction Wells, Pumps, and Pipelines ☐ Applicable ☒ N/A	
B. Surface Water Collection Structures, Pumps, and Pipelines ☐ Applicable ☒ N/A	
C. Treatment System ☐ Applicable ☒ N/A	
D. Monitoring Data	
1.	Monitoring Data ☒ Is routinely submitted on time ☒ Is of acceptable quality
2.	Monitoring data suggests: ☒ Groundwater plume is effectively contained ☒ Contaminant concentrations are declining Monitoring well access is impeded by ongoing work. Concentrations of chemicals of concern (COCs) have been declining.
D. Monitored Natural Attenuation	
1.	**Monitoring Wells** (natural attenuation remedy) ☒ Properly secured/locked ☐ Functioning ☐ Routinely sampled ☐ Good condition ☐ All required wells located ☐ Needs Maintenance ☐ N/A Remarks Monitoring wells are inspected, sampled, and repaired under the Basewide groundwater monitoring program and plume-specific remediation actions.
X. OTHER REMEDIES - None	
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.). Remedy for Parcel G consists of durable covers, groundwater monitoring, and ICs to prevent exposure to COCs and radionuclides of concern in groundwater, soil, and structures. The remedy is functioning as intended, groundwater COCs are declining. Active trenching work is underway and it is expected that the durable covers will be repaired upon completion.
B.	**Adequacy of O&M**
	Describe issues and observations related to the implementation and scope of O&M procedures. In particular, discuss their relationship to the current and long-term protectiveness of the remedy. O&M of the durable covers will be reinstituted when the current investigation is complete and the covers are fully restored.
C.	**Early Indicators of Potential Remedy Problems**
	Describe issues and observations such as unexpected changes in the cost or 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. None identified.

D.	Opportunities for Optimization
	Describe possible opportunities for optimization in monitoring tasks or the operation of the remedy. No opportunities outside of optimization is documented in the Basewide groundwater monitoring program for the groundwater remedy.

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Parcel G Photograph 1: *Excavation between Building 302 and 303. Facing northeast.*
Photographed by: Marcella Navas/CH2M, 2/9/2023

Parcel G Photograph 2: *Stormwater best management practice southeast of Building 402. Facing southwest.* Photographed by: Marcella Navas/CH2M, 2/9/2023

Parcel G Photograph 3: *Stockpile with berm surrounding located east of Building 419. Facing northwest.*
Photographed by: Marcella Navas/CH2M, 2/9/2023

Parcel G Photograph 4: *Stormwater best management practice east of Building 418. Facing southeast.*

Photographed by: Marcella Navas/CH2M, 2/9/2023

Parcel G Photograph 5: *Trenching east of Building 366. Facing northeast.*

Photographed by: Marcella Navas/CH2M, 2/9/2023

Parcel G Photograph 6: *Stormwater best management practice east of Building 415. Facing southeast.*
Photographed by: Marcella Navas/CH2M, 2/9/2023

Parcel G Photograph 7: *Trenching northwest of Building 363. Facing north.*

Photographed by: Marcella Navas/CH2M, 2/9/2023

Parcel G Photograph 8: *Warning sign outside of Building 351. Facing southwest.*
Photographed by: Marcella Navas/CH2M, 2/9/2023

Parcel G Photograph 9: *Stormwater best management practice along southeast portion of Parcel G along Buildings 415, 323, and 324. Facing southeast.*
Photographed by: Marcella Navas/CH2M, 2/9/2023

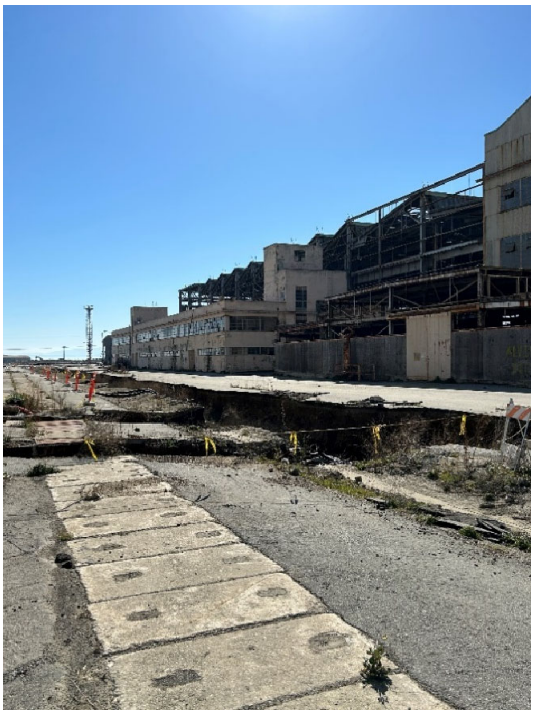
Parcel G Photograph 10: *Excavation west of Building 411 and east of Building 439. Facing northwest.*
Photographed by: Marcella Navas/CH2M, 2/9/2023

Parcel G Photograph 11: *Stormwater best management practice east of Building 409. Facing northwest.*
Photographed by: Marcella Navas/CH2M, 2/9/2023

Parcel G Photograph 12: *Chain-link fence located east of Parcel G adjacent to Parcel D-1. Facing northwest.*
Photographed by: Marcella Navas/CH2M, 2/9/2023

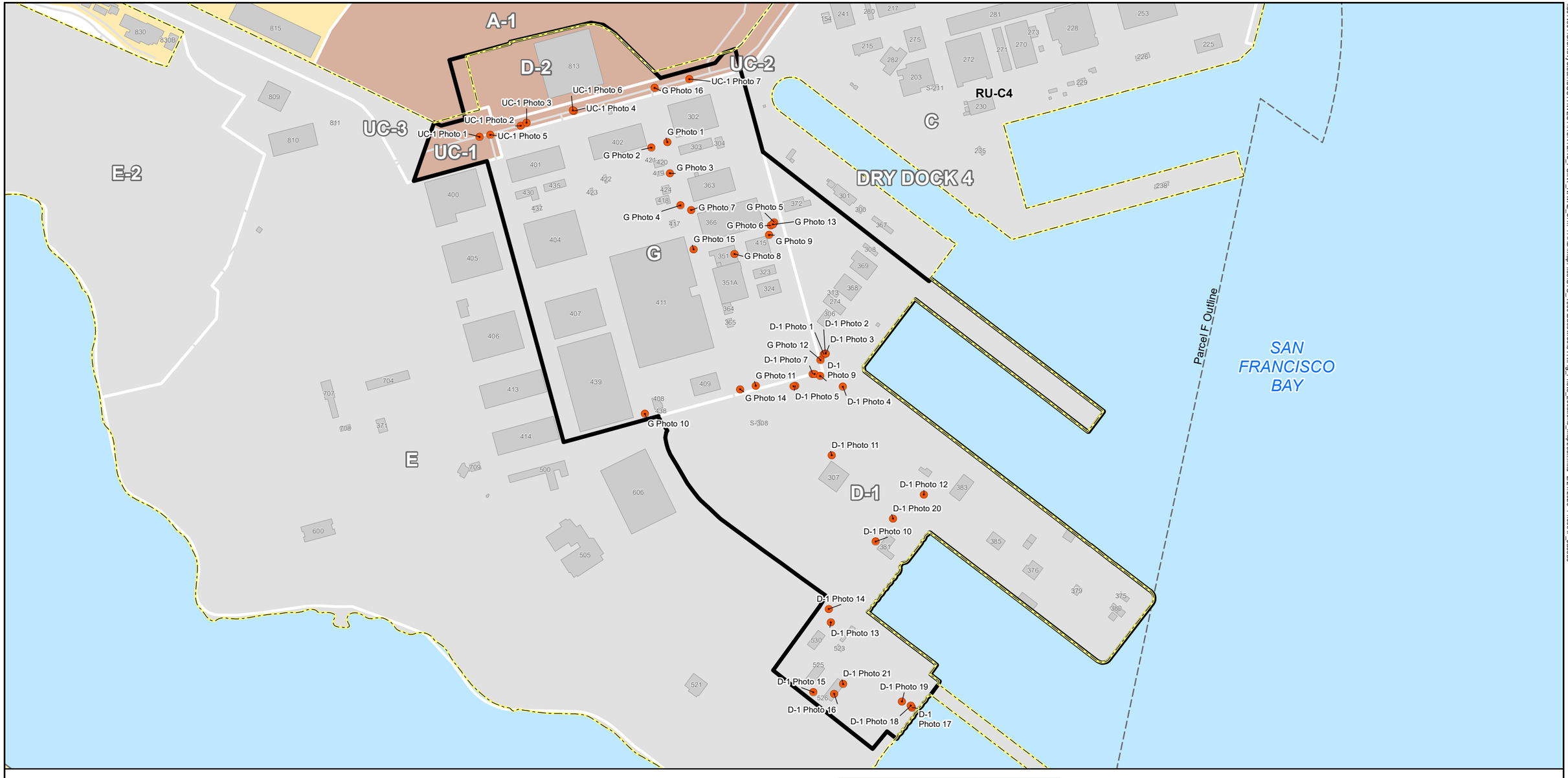
Parcel G Photograph 13: *Stockpile between Building 415 and Building 366. Facing west.*
Photographed by: Marcella Navas/CH2M, 2/9/2023

Parcel G Photograph 14: *Asphalt pavement cover, trenching, and stormwater best management practices southeast of Building 411. Facing northwest.*
Photographed by: Marcella Navas/CH2M, 2/9/2023



Parcel G Photograph 15: *Trenching east of Building 411. Facing southwest.*
Photographed by: Marcella Navas/CH2M, 2/9/2023

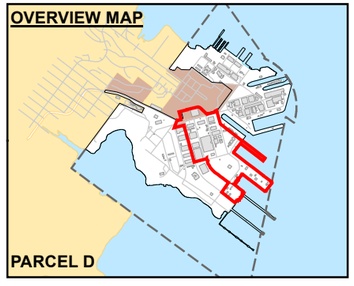
Parcel G Photograph 16: *Trenching between Building 402 and 302 within Parcel G from UC-1. Facing southeast.*
Photographed by: Marcella Navas/CH2M, 2/9/2023



LEGEND

- Hunters Point Naval Shipyard Boundary
- Parcel Boundary
- Parcel F (Water) Boundary
- Former Navy Property
- Non-Navy Property
- Photograph Location
- Water
- Building
- Road

OVERVIEW MAP



Parcel D (Parcels D-1, D-2, G, and UC-1)
Five-Year Review Site Inspection Photograph Locations
Five-Year Review of Remedial Actions
Hunters Point Naval Shipyard, San Francisco, California

0 200 400
Feet

1 Inch = 450 Feet

N

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Five-Year Review Site Inspection Checklist

I. SITE INFORMATION	
Site name: Parcel E	**Date of inspection:** 2/9/23
Location and Region: Hunters Point Naval Shipyard San Francisco, CA, Region 9	**EPA ID:** CA1170090087
Agency, office, or company leading the five-year review: Department of the Navy	**Weather/temperature:** Sunny, 50s

Remedy Includes: (Check all that apply)

☐ Landfill cover/containment ☒ Monitored natural attenuation
☒ Access controls ☐ Groundwater containment
☒ Institutional controls ☒ Vertical barrier walls
☐ Groundwater pump and treatment
☐ Surface water collection and treatment
☒ Other Durable cover consisting of a soil cover, shoreline revetment (riprap), asphaltic concrete pavement, nonaqueous phase liquid (NAPL) removal

Attachments: ☐ Inspection team roster attached ☒ Site map attached

II. INTERVIEWS (Interviews Conducted Separately)

III. ON-SITE DOCUMENTS & RECORDS VERIFIED (Check all that apply)

1. **O&M Documents**
   ☐ O&M manual ☐ Readily available ☐ Up to date ☒Not applicable (N/A)
   ☐ As-built drawings ☐ Readily available ☐ Up to date ☒ N/A
   ☐ Maintenance logs ☐ Readily available ☐ Up to date ☒ N/A
   Remarks Remedy construction is currently underway; O&M has not begun

2. **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 Construction contractors' office.

3. **O&M and OSHA Training Records** ☒ Readily available ☐ Up to date ☐ N/A
   Remarks Construction contractors' office.

4. **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

5. **Gas Generation Records** ☐ Readily available ☐ Up to date ☒ N/A
   Remarks

6.	**Settlement Monument Records** ☐ Readily available ☐ Up to date ☒ N/A Remarks Remedy construction is ongoing, settlement monuments for O&M have not been established.
7.	**Groundwater Monitoring Records** ☒ Readily available ☐ Up to date ☐ N/A Remarks: Groundwater monitoring is reported in annual Basewide groundwater monitoring reports.
8.	**Leachate Extraction Records** ☐ Readily available ☐ Up to date ☒ N/A Remarks
9.	**Discharge Compliance Records** ☐ Air ☐ Readily available ☐ Up to date ☒ N/A ☐ Water (effluent) ☐ Readily available ☐ Up to date ☒ N/A Remarks
10.	**Daily Access/Security Logs** ☐ Readily available ☐ Up to date ☒ N/A Remarks: Guarded security gates at Robinson Street and Crisp Road restrict access to Hunters Point Naval Shipyard. City of San Francisco provides security and maintains access logs.
	IV. O&M COSTS (Not Applicable for Site Inspection)
	V. ACCESS AND INSTITUTIONAL CONTROLS ☒ Applicable ☐ N/A
A. Fencing	
1.	**Fencing damaged** ☐ Location shown on site map ☒ Gates secured ☐ N/A Remarks Fencing in good condition.
B. Other Access Restrictions	
1.	**Signs and other security measures** ☒ Location shown on site map ☐ N/A Remarks Signs legible and in good condition (Photographs 6, 11, 12, 17, and 18).
C. Institutional Controls (ICs) – Remedy ICs are not in fully in place, access and exposure is controlled during active construction per the Remedial Action Work Plan(s).	
D. General	
1.	**Vandalism/trespassing** ☐ Location shown on site map ☒ No vandalism evident Remarks None
2.	**Land use changes on site** ☒ N/A Remarks None
3.	**Land use changes off site** ☒ N/A Remarks None
	VI. GENERAL SITE CONDITIONS
A. Roads ☒ Applicable ☐ N/A	
1.	**Roads damaged** ☐ Location shown on site map ☒ Roads adequate ☐ N/A Remarks Heavy construction is being conducted within the site and roads show some signs of wear.
B. Other Site Conditions	

Remarks Ongoing construction through the majority of the parcel.
VII. COVERS ☒ Applicable ☐ N/A Note that the durable covers onsite are not engineered landfill covers. Cover is in various phases of construction so was not inspected. BMPs to control stormwater during construction are present.
A. Surface – not constructed, not applicable for this FYR site inspection.
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 runoff and intercept and convey the runoff to a lined channel.)
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.)
D. Cover Penetrations ☐ Applicable ☒ N/A
5. **Settlement Monuments** ☐ Located ☐ Routinely surveyed ☒ N/A Remarks Final settlement monuments will be installed when construction is complete.
E. Gas Collection and Treatment ☐ Applicable ☒ N/A
F. Cover Drainage Layer ☐ Applicable ☒ N/A
G. Detention/Sedimentation Ponds ☐ Applicable ☒ N/A
H. Retaining Walls ☐ Applicable ☒ N/A
I. Perimeter Ditches/Off-Site Discharge ☐ Applicable ☒ N/A Remarks:
VIII. VERTICAL BARRIER WALLS ☒ Applicable ☐ N/A Barrier wall is a remedy component but construction is in progress and was not inspected.
IX. GROUNDWATER/SURFACE WATER REMEDIES ☒ Applicable ☐ N/A
A. Groundwater Extraction Wells, Pumps, and Pipelines ☐ Applicable ☒ N/A
B. Surface Water Collection Structures, Pumps, and Pipelines ☐ Applicable ☒ N/A
C. Treatment System ☐ Applicable ☒ N/A
D. Monitoring Data
1. Monitoring Data ☒ Is routinely submitted on time ☒ Is of acceptable quality
2. Monitoring data suggests: ☒ Groundwater plume is effectively contained ☒ Contaminant concentrations are declining Analytes are within or below historical average at Parcel E.
D. Monitored Natural Attenuation

1.	**Monitoring Wells** (natural attenuation remedy) ☒ Properly secured/locked ☒ Functioning ☒ Routinely sampled ☒ Good condition ☐ All required wells located ☐ Needs Maintenance ☐ N/A Remarks Monitoring wells are inspected, sampled, and repaired under the Basewide groundwater monitoring program and plume-specific remediation actions.
	X. OTHER REMEDIES - None
	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 Parcel E consists of excavation and offsite disposal, in situ soil vapor extraction, durable covers, groundwater remediation, barrier walls for groundwater and NAPL, groundwater monitoring, and ICs. The remedy is currently in the construction phase and has not been fully implemented. While construction is ongoing, dust monitoring and access control/signage are being implemented to prevent exposure to contamination.
B.	**Adequacy of O&M**
	Describe issues and observations related to the implementation and scope of O&M procedures. In particular, discuss their relationship to the current and long-term protectiveness of the remedy. Not applicable.
C.	**Early Indicators of Potential Remedy Problems**
	Describe issues and observations such as unexpected changes in the cost or 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. Not applicable.
D.	**Opportunities for Optimization**
	Describe possible opportunities for optimization in monitoring tasks or the operation of the remedy. Not applicable.

Parcel E Photograph 1: *Soil stockpile at the intersection of J and Mahan Street with delineator barricading. Facing southwest.*
Photographed by: Marcella Navas/CH2M, 2/9/2023

Parcel E Photograph 2: *Shack on the corner of J Street and 6th Avenue. Facing northwest.*
Photographed by: Marcella Navas/CH2M, 2/9/2023

Parcel E Photograph 3: *Construction debris. Facing southeast.*
Photographed by: Marcella Navas/CH2M, 2/9/2023

Parcel E Photograph 4: *Stockpile with standing water adjacent. Facing southeast.*
Photographed by: Marcella Navas/CH2M, 2/9/2023

Parcel E Photograph 5: *Stockpile with standing water at corner of J and Mahan Street. Facing southwest.*
Photographed by: Marcella Navas/CH2M, 2/9/2023

Parcel E Photograph 6: *Restricted Area signage, stockpile, and best management practice on the corner of 6th Avenue and J Street. Facing southeast.*
Photographed by: Marcella Navas/CH2M, 2/9/2023

Parcel E Photograph 7: *Stockpile near shoreline southeast of J Street. Facing southeast.*
Photographed by: Marcella Navas/CH2M, 2/9/2023

Parcel E Photograph 8: *Stockpiles along fence line. Facing southwest.*
Photographed by: Marcella Navas/CH2M, 2/9/2023

Parcel E Photograph 9: *Stormwater management best management practices along corner of J Street and 6th Avenue. Facing southeast.*
Photographed by: Marcella Navas/CH2M, 2/9/2023

Parcel E Photograph 10: *Building 521 with cordoned work area and warning signs. Facing southwest.*
Photographed by: Marcella Navas/CH2M, 2/9/2023

Parcel E Photograph 11: *Stockpiles with warning signage and sediment control berms along 6th Avenue. Facing southwest.*

Photographed by: Marcella Navas /CH2M, 2/9/2023

Parcel E Photograph 12: *Caution and danger signs along fence line adjacent to H Street. Facing southwest.*
Photographed by: Marcella Navas/CH2M, 2/9/2023

Parcel E Photograph 13: *Overview of northeast end of Parcel E. Facing southwest.*
Photographed by: Marcella Navas/CH2M, 2/9/2023

Parcel E Photograph 14: *Overview of active construction area. Facing northeast.*
Photographed by: Marcella Navas/CH2M, 2/9/2023

Parcel E Photograph 15: *Stockpiles along embankment. Facing southeast.*
Photographed by: Marcella Navas/CH2M, 2/9/2023

Parcel E Photograph 16: *Monitoring well intact and in good condition. Facing northeast.*
Photographed by: Marcella Navas/CH2M, 2/9/2023

Parcel E Photograph 17: *Restricted area signage. Facing southwest*

Photographed by: Marcella Navas/CH2M, 2/9/2023

Parcel E Photograph 18: *Caution sign around active work. Facing southeast.*
Photographed by: Marcella Navas /CH2M, 2/9/2023

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Five-Year Review Site Inspection Checklist

I. SITE INFORMATION	
Site name: Parcel E-2	**Date of inspection:** 2/9/23
Location and Region: Hunters Point Naval Shipyard San Francisco, CA, Region 9	**EPA ID:** CA1170090087
Agency, office, or company leading the five-year review: Department of the Navy	**Weather/temperature:** Sunny, 50s

Remedy Includes: (Check all that apply)

☒ Landfill cover/containment ☒ Monitored natural attenuation
☒ Access controls ☐ Groundwater containment
☒ Institutional controls ☒ Vertical barrier walls
☐ Groundwater pump and treatment
☐ Surface water collection and treatment
☒ Other Durable cover consisting of a soil cover, shoreline revetment (riprap), asphaltic concrete pavement

Attachments: ☐ Inspection team roster attached ☒ Site map attached

II. INTERVIEWS (Interviews Conducted Separately)

III. ON-SITE DOCUMENTS & RECORDS VERIFIED (Check all that apply)

1. **O&M Documents**
   ☒ O&M manual ☐ Readily available ☐ Up to date ☐ Not applicable (N/A)
   ☐ As-built drawings ☐ Readily available ☐ Up to date ☒ N/A
   ☐ Maintenance logs ☐ Readily available ☐ Up to date ☒ N/A
   Remarks O&M ongoing for interim cover and gas control and monitoring system.

2. **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 Construction contractors' office.

3. **O&M and OSHA Training Records** ☒ Readily available ☐ Up to date ☐ N/A
   Remarks Construction contractors' office.

4. **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_____

5. **Gas Generation Records** ☒ Readily available ☒ Up to date ☐ N/A
   Remarks Gas monitoring records available in Administrative Record.

6.	**Settlement Monument Records** ☐ Readily available ☐ Up to date ☒ N/A Remarks Landfill settlement surveys available in O&M reports for interim cover.
7.	**Groundwater Monitoring Records** ☒ Readily available ☐ Up to date ☐ N/A Remarks: Groundwater monitoring is reported in annual Basewide groundwater monitoring reports.
8.	**Leachate Extraction Records** ☐ Readily available ☐ Up to date ☒ N/A Remarks
9.	**Discharge Compliance Records** ☐ Air ☐ Readily available ☐ Up to date ☒ N/A ☐ Water (effluent) ☐ Readily available ☐ Up to date ☒ N/A Remarks
10.	**Daily Access/Security Logs** ☐ Readily available ☐ Up to date ☒ N/A Remarks: Guarded security gates at Robinson Street and Crisp Road restrict access to Hunters Point Naval Shipyard. City of San Francisco provides security and maintains access logs.
	IV. O&M COSTS (Not Applicable for Site Inspection)
	V. ACCESS AND INSTITUTIONAL CONTROLS ☒ Applicable ☐ N/A
A. Fencing	
1.	**Fencing damaged** ☐ Location shown on site map ☒ Gates secured ☐ N/A Remarks Fencing in good condition.
B. Other Access Restrictions	
1.	**Signs and other security measures** ☐ Location shown on site map ☐ N/A Remarks Signs present and legible.
C. Institutional Controls (ICs) - Remedy ICs are not in fully in place, access and exposure is controlled during active construction per the Remedial Action Work Plan(s).	
D. General	
1.	**Vandalism/trespassing** ☐ Location shown on site map ☐ No vandalism evident Remarks Graffiti present along inside of seawall (Photographs 7, 9, and 10).
2.	**Land use changes on site** ☒ N/A Remarks None
3.	**Land use changes off site** ☒ N/A Remarks None
	VI. GENERAL SITE CONDITIONS
A. Roads ☒ Applicable ☐ N/A	
1.	**Roads damaged** ☐ Location shown on site map ☒ Roads adequate ☐ N/A Remarks Access roads are adequate; majority of the area is a construction site.
B. Other Site Conditions	
	Remarks Ongoing construction through the majority of the parcel.

VII. LANDFILL COVERS ☒ Applicable ☐ N/A

Landfill cover is currently under construction and was not inspected. An interim soil cover is in place while the final cover is being installed to maintain protectiveness.

A. Landfill Surface

6. **Alternative Cover (Shoreline Revetment)** ☐ N/A
Remarks Rocks and sea wall intact. Water accumulated behind sea wall may be a result of overtopping or from heavy rains that recently occurred (Photographs 7, 9, and 10).

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 runoff and intercept and convey the runoff to a lined channel.)

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.)

D. Cover Penetrations ☐ Applicable ☒ N/A – Cover has not been installed.

E. Gas Collection and Treatment ☒ Applicable ☐ N/A

An interim landfill collection and venting system is currently in place and monitored. Monitoring reports are readily available in the Administrative Record.

F. Cover Drainage Layer ☐ Applicable ☒ N/A

G. Detention/Sedimentation Ponds ☐ Applicable ☒ N/A

H. Retaining Walls ☒ Applicable ☐ N/A - Seawall

1. **Deformations** ☐ Location shown on site map ☒ Deformation not evident
Remarks None

2. **Degradation** ☐ Location shown on site map ☒ Degradation not evident
Remarks None

I. Perimeter Ditches/Off-Site Discharge ☐ Applicable ☒ N/A
Remarks: Not observed.

1. **Siltation** ☐ Location shown on site map ☐ Siltation not evident
Remarks Stormwater best management practices employed during remedy construction work.

2. **Vegetative Growth** ☐ Location shown on site map ☒ N/A
☐ Vegetation does not impede flow
Remarks None

3. **Erosion** ☐ Location shown on site map ☐ Erosion not evident
Remarks Active construction site.

4. **Discharge Structure** ☐ Functioning ☒ N/A
Remarks Not observed.

VIII. VERTICAL BARRIER WALLS ☒ Applicable ☐ N/A

1.	**Settlement** ☐ Location shown on site map ☐ Settlement not evident Remarks Area not accessible from construction.
2.	**Performance Monitoring** Type of monitoring_____ ☐ Performance not monitored Remarks Remedy is in construction phase.
	IX. GROUNDWATER/SURFACE WATER REMEDIES ☒ Applicable ☐ N/A
A.	**Groundwater Extraction Wells, Pumps, and Pipelines** ☐ Applicable ☒ N/A
B.	**Surface Water Collection Structures, Pumps, and Pipelines** ☐ Applicable ☒ N/A
C.	**Treatment System** ☐ Applicable ☒ N/A
D.	**Monitoring Data**
1.	Monitoring Data ☒ Is routinely submitted on time ☒ Is of acceptable quality
2.	Monitoring data suggests: ☒ Groundwater plume is effectively contained ☒ Contaminant concentrations are declining Groundwater chemicals of concern (COCs) continue to exceed remediation goals but concentrations are similar to or below historical levels.
D.	**Monitored Natural Attenuation**
1.	**Monitoring Wells** (natural attenuation remedy) ☐ Properly secured/locked ☒ Functioning ☒ Routinely sampled ☐ Good condition ☐ All required wells located ☐ Needs Maintenance ☐ N/A Remarks Wells affected by cap construction will be restored.
	X. OTHER REMEDIES - None
	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 Parcel E-2 consists of excavation and removal of contaminated soil, installation of a soil cover, installation of belowground barrier walls, removal and treatment of landfill gas, shoreline revetment, and monitoring and ICs. The remedy is currently under construction. While construction is ongoing, an interim cover and landfill gas monitoring and collection system is in place.
B.	**Adequacy of O&M**
	Describe issues and observations related to the implementation and scope of O&M procedures. In particular, discuss their relationship to the current and long-term protectiveness of the remedy. Not applicable.
C.	**Early Indicators of Potential Remedy Problems**

	Describe issues and observations such as unexpected changes in the cost or 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. Not applicable.
D.	**Opportunities for Optimization**
	Describe possible opportunities for optimization in monitoring tasks or the operation of the remedy. Not applicable.

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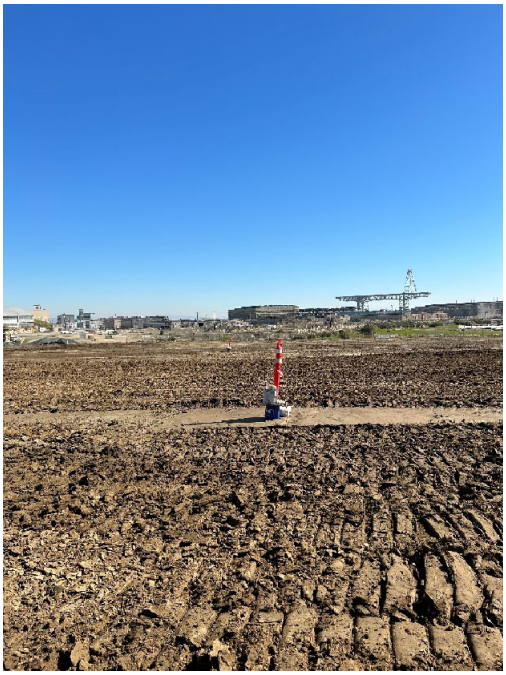
Parcel E-2 Photograph 1: *Active construction with stormwater best management practices. Facing southeast.*
Photographed by: Marcella Navas/CH2M, 2/9/2023

Parcel E-2 Photograph 2: *Storage containers onsite for generators. Facing southwest.*
Photographed by: Marcella Navas/CH2M, 2/9/2023

Parcel E-2 Photograph 3: *Small excavated area within soil cover construction area. Facing southwest.*
Photographed by: Marcella Navas/CH2M, 2/9/2023



Parcel E-2 Photograph 4: *Graded area with marked monitoring point. Facing southeast.*
Photographed by: Marcella Navas/CH2M, 2/9/2023

Parcel E-2 Photograph 5: *Graded area with marked monitoring point. Facing southeast.*
Photographed by: Marcella Navas/CH2M, 2/9/2023

Parcel E-2 Photograph 6: *Storage containers and laydown area. Facing west.*
Photographed by: Marcella Navas/CH2M, 2/9/2023

Parcel E-2 Photograph 7: *Accumulated water and monitoring well adjacent to shoreline revetment and seawall. Facing southwest.*
Photographed by: Marcella Navas/CH2M, 2/9/2023

Parcel E-2 Photograph 8: *Monitoring well located in soil cover area. Facing southwest.*
Photographed by: Marcella Navas/CH2M, 2/9/2023

Parcel E-2 Photograph 9: *Accumulated water behind seawall in active construction area. Facing southeast.*

Photographed by: Marcella Navas/CH2M, 2/9/2023

Parcel E-2 Photograph 10: *Graffiti along seawall. Facing southwest.*
Photographed by: Marcella Navas/CH2M, 2/9/2023

Parcel E2 Photograph 11: *Small excavated area with sandbags. Facing southwest.*
Photographed by: Marcella Navas/CH2M, 2/9/2023

Parcel E-2 Photograph 12: *Active soil cover construction area with seawall in the background. Facing southeast.*
Photographed by: Marcella Navas/CH2M, 2/9/2023

Parcel E-2 Photograph 13: *Accumulated water within retention area, active construction site. Facing southwest.*
Photographed by: Marcella Navas/CH2M, 2/9/2023

Parcel E-2 Photograph 14: *Stockpile along J Street surrounded by stormwater best management practices. Facing southeast.*
Photographed by: Marcella Navas/CH2M, 2/9/2023

Parcel E-2 Photograph 15: *Stockpiles along J Street with swale surrounding. Facing northeast.*
Photographed by: Marcella Navas/CH2M, 2/9/2023

Five-Year Review Site Inspection Checklist

I. SITE INFORMATION	
Site name: Parcel UC-1, UC-2, UC-3	**Date of inspection:** 2/9/23
Location and Region: Hunters Point Naval Shipyard San Francisco, CA, Region 9	**EPA ID:** CA1170090087
Agency, office, or company leading the five-year review: Department of the Navy	**Weather/temperature:** Sunny, 50s

Remedy Includes: (Check all that apply)

☐ Landfill cover/containment ☐ Monitored natural attenuation
☐ Access controls ☐ Groundwater containment
☒ Institutional controls ☐ Vertical barrier walls
☐ Groundwater pump and treatment
☐ Surface water collection and treatment
☒ Other Durable cover consisting of a soil cover and/or asphaltic concrete pavement.

Attachments: ☐ Inspection team roster attached ☒ Site map attached

II. INTERVIEWS (Interviews Conducted Separately)

III. ON-SITE DOCUMENTS & RECORDS VERIFIED (Check all that apply)

1. **O&M Documents**

☒ O&M manual	☒ Readily available	☐ Up to date	☐Not applicable (N/A)
☒ As-built drawings	☒ Readily available	☐ Up to date	☐ N/A
☐ Maintenance logs	☐ Readily available	☐ Up to date	☒ N/A

Remarks Documents available in the Administrative Record and O&M contractors' offices.

2. **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 Available onsite during inspections.

3. **O&M and OSHA Training Records** ☐ Readily available ☐ Up to date ☐ N/A
Remarks Available in O&M contractor office.

4. **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_____

5. **Gas Generation Records** ☐ Readily available ☐ Up to date ☒ N/A
Remarks

6.	**Settlement Monument Records**	☐ Readily available	☐ Up to date	☒ N/A
	Remarks			
7.	**Groundwater Monitoring Records**	☐ Readily available	☐ Up to date	☒ N/A
	Remarks:			
8.	**Leachate Extraction Records**	☐ Readily available	☐ Up to date	☒ N/A
	Remarks			
9.	**Discharge Compliance Records**			
	☐ Air	☐ Readily available	☐ Up to date	☒ N/A
	☐ Water (effluent)	☐ Readily available	☐ Up to date	☒ N/A
	Remarks			
10.	**Daily Access/Security Logs**	☐ Readily available	☐ Up to date	☒ N/A
	Remarks: Guarded security gates at Robinson Street and Crisp Road restrict access to Hunters Point Naval Shipyard. City of San Francisco provides security and maintains access logs.			
	IV. O&M COSTS (Not Applicable for Site Inspection)			
	V. ACCESS AND INSTITUTIONAL CONTROLS ☒ Applicable ☐ N/A			
A. Fencing				
1.	**Fencing damaged** ☐ Location shown on site map ☒ Gates secured ☐ N/A			
	Remarks Fencing to keep out of other parcels adjacent to UC-1, -2, and -3 (UC-1 Photographs 1, 2, 4, 5, and 6).			
B. Other Access Restrictions				
1.	**Signs and other security measures** ☐ Location shown on site map ☒ N/A			
	Remarks			
C. Institutional Controls (ICs)				
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) Routine Inspection			
	Frequency Annually			
	Responsible party/agency Navy and Navy O&M Contractors (UC-3), OCII O&M Contractors (UC-1 and UC-2)			
	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			
2.	**Adequacy** ☒ ICs are adequate ☐ ICs are inadequate ☐ N/A			
	Remarks None			

D. General	
1.	**Vandalism/trespassing** ☐ Location shown on site map ☒ No vandalism evident Remarks None
2.	**Land use changes on site** ☒ N/A Remarks None
3.	**Land use changes off site** ☒ N/A Remarks None
VI. GENERAL SITE CONDITIONS	
A. Roads ☒ Applicable ☐ N/A	
1.	**Roads damaged** ☐ Location shown on site map ☒ Roads adequate ☐ N/A Remarks Areas where durable cover has been restored apparent (UC-2 Photographs 1, 2, and 3) .
B. Other Site Conditions	
	Remarks Vegetation observed around Building 815 in cracks around foundation.
VII. COVERS ☒ Applicable ☐ N/A Note that the durable covers onsite are not engineered landfill covers.	
A. Surface	
1.	**Settlement** (Low spots) ☐ Location shown on site map ☒ Settlement not evident Remarks
2.	**Cracks** ☐ Location shown on site map ☐ Cracking not evident Remarks Minor cracking along Crisp Road (UC-3, Photograph 6) from increased heavy equipment and truck traffic.
3.	**Erosion** ☐ Location shown on site map ☒ Erosion not evident Remarks
4.	**Holes** ☐ Location shown on site map ☒ Holes not evident Remarks
5.	**Vegetative Cover** ☒ Grass ☒ Cover properly established ☒ No signs of stress ☐ Trees/Shrubs (indicate size and locations on a diagram) Remarks
6.	**Alternative Cover** ☒ N/A Remarks
7.	**Bulges** ☐ Location shown on site map ☒ Bulges not evident Remarks
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 Remarks Not applicable.
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 runoff and intercept and convey the runoff to a lined channel.)
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.)
D. Cover Penetrations ☐ Applicable ☒ N/A
5. **Settlement Monuments** ☐ Located ☐ Routinely surveyed ☒ N/A Remarks_____
E. Gas Collection and Treatment ☐ Applicable ☒ N/A
F. Cover Drainage Layer ☐ Applicable ☒ N/A
G. Detention/Sedimentation Ponds ☐ Applicable ☒ N/A
H. Retaining Walls ☐ Applicable ☒ N/A
I. Perimeter Ditches/Off-Site Discharge ☒ Applicable ☐ N/A
1. **Siltation** ☐ Location shown on site map ☒ Siltation not evident Remarks_____
2. **Vegetative Growth** ☐ Location shown on site map ☒ N/A ☒ Vegetation does not impede flow Remarks_____
3. **Erosion** ☐ Location shown on site map ☒ Erosion not evident Remarks_____
4. **Discharge Structure** ☐ Functioning ☒ N/A Remarks
VIII. VERTICAL BARRIER WALLS ☐ Applicable ☒ N/A
IX. GROUNDWATER/SURFACE WATER REMEDIES ☐ Applicable ☒ N/A
X. OTHER REMEDIES - None
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.). Remedies at Parcels UC-1, UC-2, and UC-3 consist of durable cover and ICs. Cover is in good condition and monitored regularly. UC-1 and UC-2 were transferred and are monitored by the OCII contractor. Reports indicate remedy is functioning and no land use control violations have occurred.
B.	**Adequacy of O&M**
	Describe issues and observations related to the implementation and scope of O&M procedures. In particular, discuss their relationship to the current and long-term protectiveness of the remedy. None.
C.	**Early Indicators of Potential Remedy Problems**
	Describe issues and observations such as unexpected changes in the cost or 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. None.
D.	**Opportunities for Optimization**
	Describe possible opportunities for optimization in monitoring tasks or the operation of the remedy. None identified.

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Parcel UC-1 Photograph 1: *Chain-link fence along Parcel UC-1 and Parcel G. Facing south.*
Photographed by: Marcella Navas/CH2M, 2/9/2023

Parcel UC-1 Photograph 2: *Chain-link fence along Parcel UC-1 and Parcel G. Facing northeast.*
Photographed by: Marcella Navas/CH2M, 2/9/2023

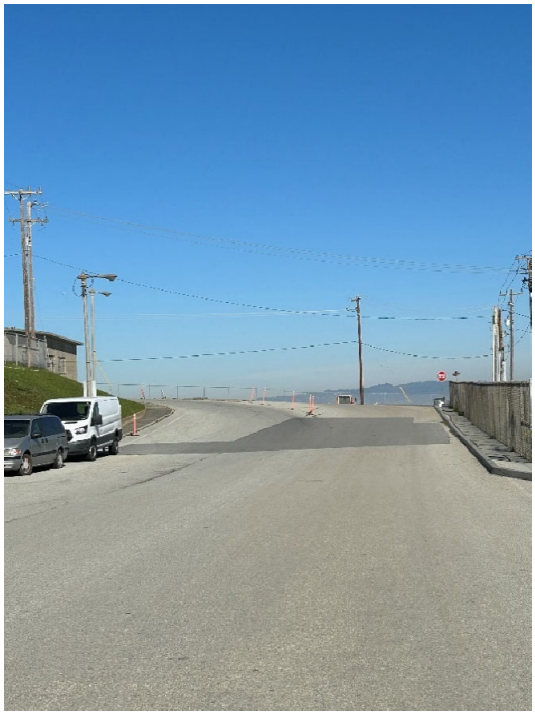
Parcel UC-1 Photograph 3: *Asphalt pavement cover along Spear Avenue. Facing northeast.*
Photographed by: Marcella Navas/CH2M, 2/9/2023

Parcel UC-1 Photograph 4: *Chain-link fence along Parcel UC-1 north of Building 402. Facing southeast.*
Photographed by: Marcella Navas/CH2M, 2/9/2023

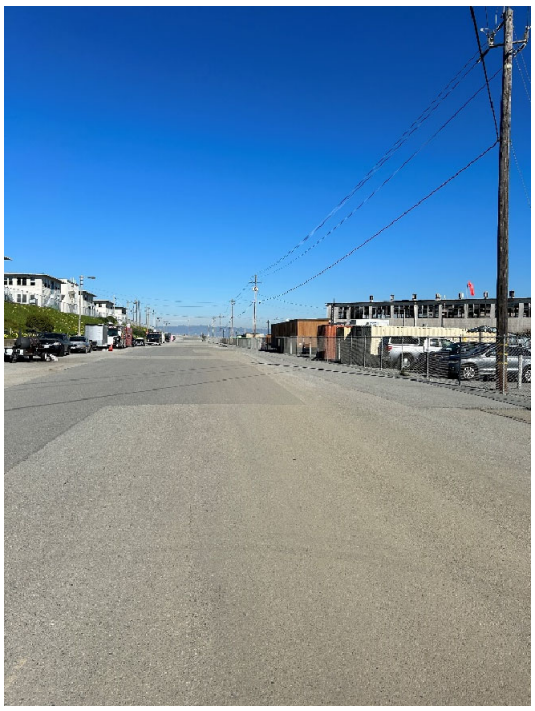
Parcel UC-1 Photograph 5: *Chain-link fence along Parcel UC-1 north of Building 401. Facing southeast.*
Photographed by: Marcella Navas/CH2M, 2/9/2023

Parcel UC-1 Photograph 6: *Chain-link fence along Spear Avenue between Buildings 401 and 402. Facing south.*
Photographed by: Marcella Navas/CH2M, 2/9/2023

Parcel UC-1 Photograph 7: *Asphalt pavement cover between Horn and Spear Avenue. Facing north.*
Photographed by: Marcella Navas/CH2M, 2/9/2023



Parcel UC-2 Photograph 1: *Asphalt pavement cover along Fisher Avenue. Facing northeast.*
Photographed by: Marcella Navas/CH2M, 2/9/2023

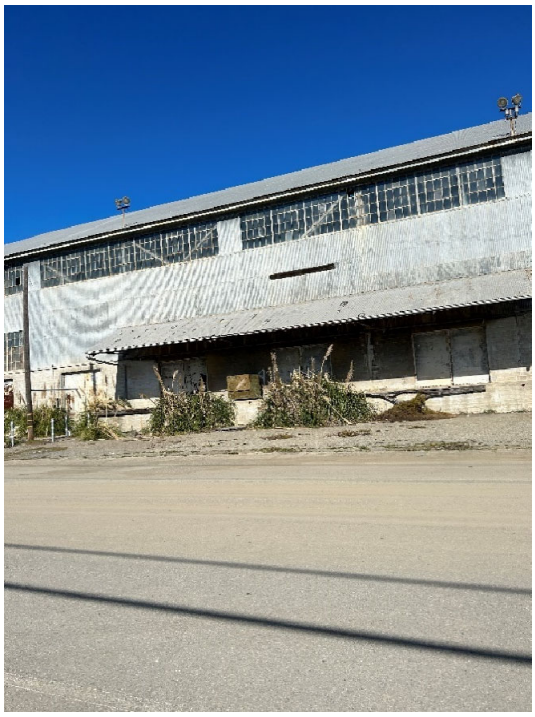


Parcel UC-2 Photograph 2: *Asphalt pavement cover along Fisher Avenue. Facing northeast.*
Photographed by: Marcella Navas/CH2M, 2/9/2023

Parcel UC-2 Photograph 3: *Asphalt pavement cover along Fisher Avenue. Facing northeast.*
Photographed by: Marcella Navas/CH2M, 2/9/2023

Parcel UC-3 Photograph 1: *Gravel located south of Building 815. Facing southeast.*
Photographed by: Marcella Navas/CH2M, 2/9/2023

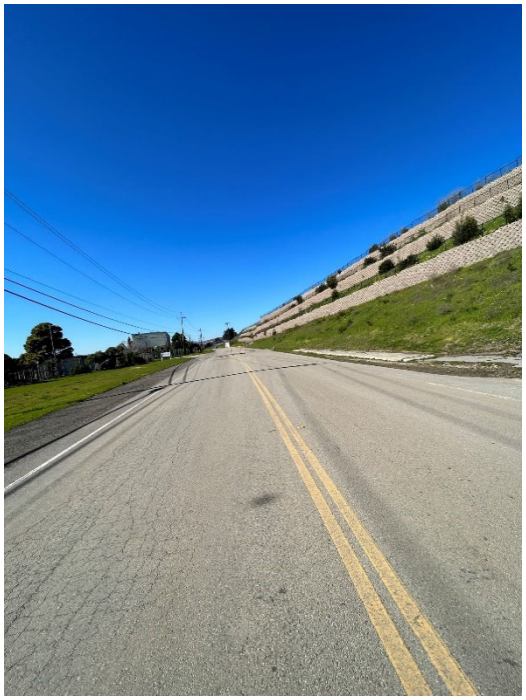
Parcel UC-3 Photograph 2: *Gravel located south of Building 815. Facing northwest.*
Photographed by: Marcella Navas/CH2M, 2/9/2023



Parcel UC-3 Photograph 3: *Overgrowth of vegetation south of Building 815. Facing north.*
Photographed by: Marcella Navas/CH2M, 2/9/2023

Parcel UC-3 Photograph 4: *Asphalt pavement cover southeast of Building 815. Facing northwest.*
Photographed by: Marcella Navas/CH2M, 2/9/2023

Parcel UC-3 Photograph 5: *Asphalt pavement cover southeast of Building 815 located between Parcel UC-1 and Parcel E-2. Facing northeast.*
Photographed by: Marcella Navas/CH2M, 2/9/2023



Parcel UC-3 Photograph 6: *Street along Crisp Road. Facing northwest.*
Photographed by: Marcella Navas/CH2M, 2/9/2023

Parcel UC-3 Photograph 7: *Asphalt pavement cover between Parcel UC-3 and UC-1. Facing south.*
Photographed by: Marcella Navas/CH2M, 2/9/2023

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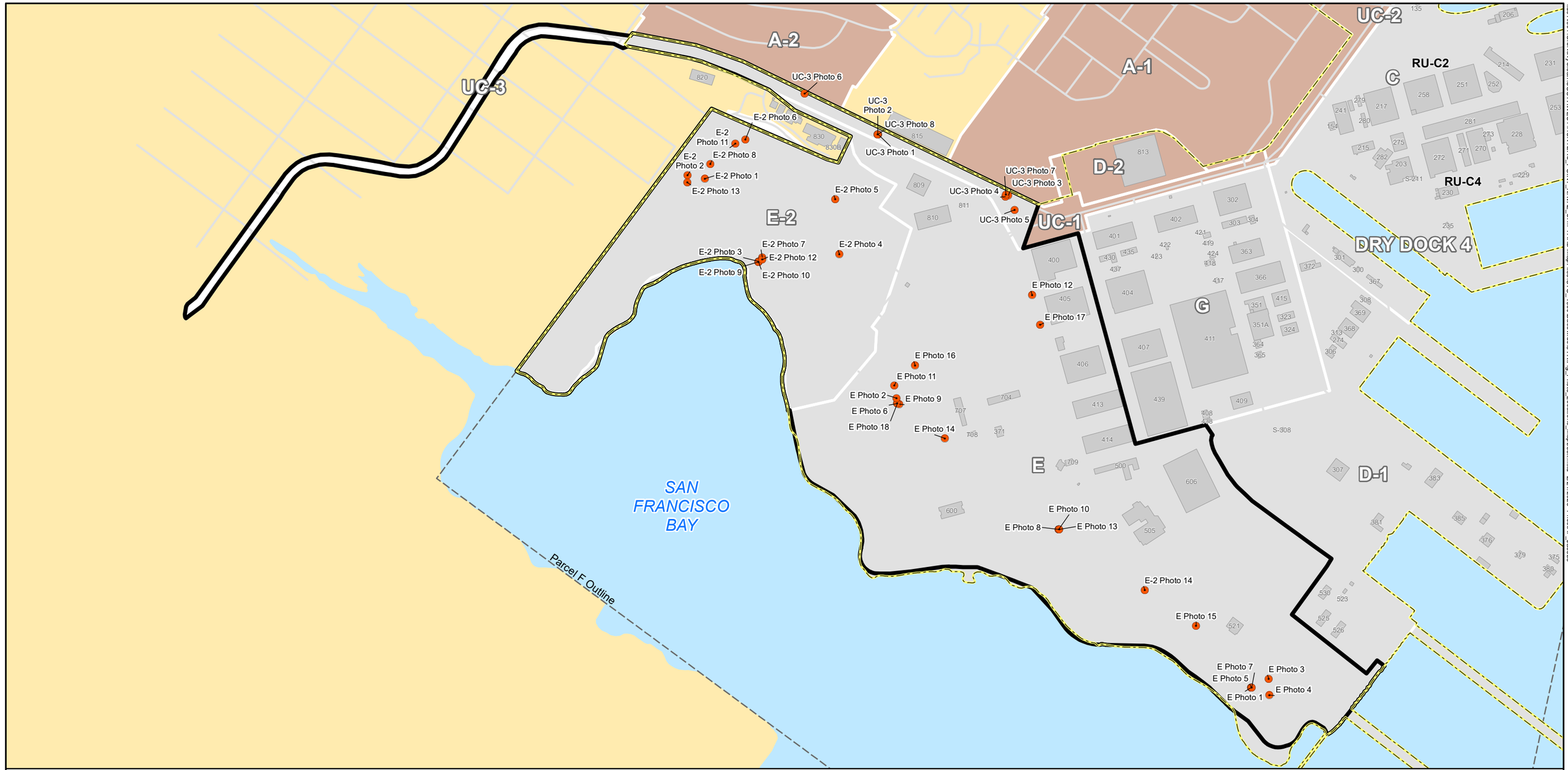
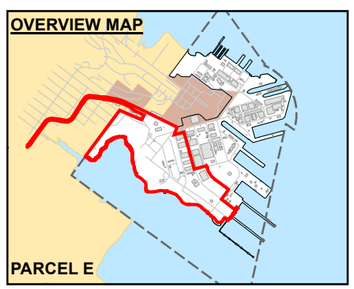


LEGEND

- Hunters Point Naval Shipyard Boundary
- Parcel Boundary
- Parcel F (Water) Boundary
- Former Navy Property
- Non-Navy Property
- Photograph Location
- Water
- Building
- Road

OVERVIEW MAP



Parcel E (Parcels E, E-2, and UC-3)
Five-Year Review Site Inspection Photograph Locations
Five-Year Review of Remedial Actions
Hunters Point Naval Shipyard, San Francisco, California

0 200 400 Feet

1 Inch = 600 Feet

N

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Appendix D
Public Notice

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NTSB probes SFO-bound flight from Maui that dove toward ocean

By Rachel Swan

A United Airlines flight bound for San Francisco plunged to within 775 feet of the ocean shortly after taking off on Dec. 18, according to flight tracker data posted by FlightRadar24.

The data shows a sudden nosedive about 71 seconds after the plane departed from Kahului Airport on Maui, Hawaii. Before plummeting, the Boeing 777 had reached an altitude of 2,200 feet.

Despite the harrowing incident, Flight UA1722 landed safely at San Francisco International Airport, where the pilots filed a safety report, spokespeople for United Airlines said in a statement.

"United then closely coordinated with the (Federal Aviation Administration) and (the Air Line Pilots Association) on an investigation that ultimately resulted in the pilots receiving additional training," the statement read.

The National Transportation Safety Board said Tuesday it was investigating the nose-dive incident.

The two pilots, who have 25,000 hours of flight experience between them, cooperated with the probe, the statement said. It did not explain the circumstances that led to the abrupt descent, nor did it specify whether the flight contained passengers or cargo.

"Safety remains our highest priority," the statement concluded. A spokesperson for San Francisco International Airport declined to comment.

Reach Rachel Swan: rswan@sfchronicle.com.

Paul Chinn/The Chronicle 2020

A United Airlines Boeing 777, like this one at SFO, took a terrifying nosedive toward the Pacific Ocean last December.

KNIGHT

From page A1

and a loaded gun that had been reported stolen fell from his waistband. That same day, police arrested a 19-year-old man for alleged battery against his girlfriend on the platform of the Powell St. Station.

Since 2017, BART has received 509 reports of domestic violence on its trains or in its stations including assault against a partner, spouse or child, and abandoning or neglecting children. Since 2015, the agency has banned more than 300 abusers from riding its trains.

To its credit, the agency isn't trying to hide these grim statistics. In fact, its spokesperson, Alicia Trost, offered them up to me, noting BART is a frequent meeting point for parents who've split up to hand off their children, fueling some of the violence.

Also to its credit, the agency — which has so much to focus on, including its own solvency as ridership remains lackluster due to the pandemic — is trying to do something about it even if publicizing violence isn't exactly great for the bottom line.

"This is what prevents transit agencies from talking about difficult things," Trost told me. "They're so afraid you're reminding people it happens. We've decided not to let that stop us from talking about it."

To that end, passengers will notice new public art that's impossible to ignore throughout BART stations and trains this week. They're gorgeous, brightly colored, sometimes giant images depicting family and friends alongside messages including "Love Shouldn't Hurt," "Be the Friend Who Brings it Up" and "We All Deserve Respect."

The campaign is the brainchild of the Asian Women's Shelter, which received a $50,000 grant from the AAPI Civic Engagement Fund to spread awareness about domestic violence prevention throughout public transit stations and wisely tapped famed New York City artist Amanda Phingbodhipakkiya to create the work.

Hundreds of posters and digital ads will blanket all four downtown San Francisco stations as well as 10 others around the bay and the trains themselves, all space given free by BART. Another grant from the Asian Pacific Fund, as well as private donations, will fund the art's placement in Muni shelters and billboards around the city.

Each piece has a QR code that directs viewers to the website, www.letstalkaboutus.org, with a message about the importance of having difficult conversations with friends and family about domestic violence, and resources for getting help.

Saara Ahmed, community resource coordinator for the Asian Women's Shelter, said the idea is to get people talking about the problem and thinking of what they can do to prevent it.

"These issues can feel really overwhelming and scary and daunting — or something that's really far away and distant," she said. "Like, 'That's not an issue for us.' Having folks reflect on the fact that these things are happening every day in our community, but there's also things we can do every day about them, that's the invitation."

Orchid Pusey, executive director of the Asian Women's Shelter, said it's important to question behaviors that get passed down from one generation to the next and to not be afraid to start tough conversations. Why do some kids feel comfortable treating their mom in a rude, angry way that they'd never treat their dad? Why do some kids get punished for that behavior and others don't? Why do communities rail at outsiders causing harm to their members, but stay quiet when the harm is caused from within?

"There's a lot of gender in it," she said. "And it can be changed."

Phingbodhipakkiya, 34, spent a lot of time in the Bay Area over the past several months talking to victims of domestic violence and crafting her messages and art. She's the daughter of Asian immigrants herself: a Thai dad and Indonesian mom who met in an Atlanta cafe where he was a busboy and she was a business student poring over her books.

"I look at my work as invoking joy and belonging in the face of grief and injustice," she told me. "The reason why I focus so deeply on belonging is it's something that I so rarely felt as a young Asian girl."

She said she loves creating art in the public sphere because it's accessible to anybody — and you can't opt to not see it.

"It's impossible to ignore, which means the truth that I'm speaking through my art is impossible to ignore," she said. "Domestic violence is a topic that's often pushed to the edges of our society. We often only hear whispers about it. I love that we're openly inviting people to join us in fostering healthy, nurturing relationships."

She said she hopes Asian immigrants in particular benefit from her art because they often neglect their own mental health as they work hard to support their families in an unfamiliar place where they might not speak the language.

Recent public art campaigns by Phingbodhipakkiya in New York City, including prominent displays in Times Square, used similar imagery to highlight the importance of standing up to anti-Asian hate, celebrating Asian resilience and defending the Big Apple overall as it weathered the pandemic. "I Still Believe in Our City," one campaign read. (Note to San Francisco leaders: How about a public art campaign sticking up for our city?)

Trost, the BART spokesperson, said the agency hears frequently about gender-based violence and harassment on BART.

The agency in 2021 launched the Not One More Girl campaign to emphasize what to do if you're the victim of sketchy behavior or violence on BART — or if you witness it. (My favorite tip Trost shared for bystanders is ignoring the perpetrator and starting an unrelated conversation with the victim like pretending to know her or asking to sit with her.) Trost said surveys show women and girls felt safer riding transit just knowing the campaign existed.

"Sexual harassment is prevalent on all transit, and we're showing the model for the country," Trost said, noting BART is getting calls from agencies around the U.S. wanting to replicate the campaign.

She said partnering with Phingbodhipakkiya and the Asian Women's Shelter is a natural next chapter in the campaign. At first blush, it might seem counterintuitive to advertise the sexual harassment and violence that occurs on BART, but Trost said the agency and other public transit agencies ignored it for far too long.

"We think everybody already knows it's happening, and talking about it shows we care deeply about it," she told me. "It's better than doing nothing, which is what BART was doing for many years. We'd like to flip that script."

Reach Heather Knight: hknight@sfchronicle.com; Twitter: @hknightsf

LEGAL NOTICES

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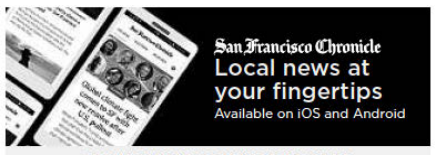
PUBLIC NOTICES

THE San Francisco Disability and Aging Services Commission and its Advisory Council will hold two public hearings to solicit comments and present information on the Area Plan 2023-24 Update. The hybrid in-person/virtual meetings will be held on Wednesday, March 15, 2023 at 10:00 am (1650 Mission Street, 5th Floor – Golden Gate Conference Room) and on Wednesday, April 5, 2023, at 9:30 am (City Hall, 1 Dr. Carlton Goodlett Place, Room 416). For information on how to participate, please contact Ravi Durbeej by phone at (415) 307-0609 or email at Ravi.Durbeej@sfgov.org.

PUBLIC NOTICES

PUBLIC NOTICES



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PUBLIC NOTICE

Hunters Point Naval Shipyard

Notice of Fifth Five-Year Review

NAVFAC

The Navy, as the lead agency, is currently conducting the Fifth Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) Five-Year Review for Hunters Point Naval Shipyard (HPNS) in San Francisco, California. HPNS was a naval shipyard operating from 1939 to 1974. The Navy is conducting the Five-Year Review in accordance with the requirements of CERCLA Section 121 (c).

The purpose of this Fifth Five-Year Review is to determine whether the remedies implemented in accordance with the Final Records of Decision and Post-Record of Decision Documents for the following Sites remain protective of human health and the environment:

- Installation Restoration [IR] Sites 7 and 18
- Parcel B-1
- Parcel B-2
- Parcel C
- Parcel D-1
- Parcel D-2
- Parcel E
- Parcel E-2
- Parcel F (Final ROD pending)
- Parcel UC-1
- Parcel UC-2
- Parcel UC-3

The remedies were implemented to address chemicals of concern, including metals, volatile organic compounds, semi-volatile organic compounds, pesticides, polychlorinated biphenyls, and radionuclides in soil, sediment, soil gas, and/or groundwater that pose potentially unacceptable risk to human health and the environment. The remedies include soil removal, covers over surface soil and shoreline sediment, groundwater treatment and/or monitoring, soil vapor extraction and monitoring, and institutional controls. The review provides an update of the status of remedial actions implemented since the Fourth Five-Year Review completed in 2019 and assesses progress made on the recommendations in the Fourth Five-Year Review.

A draft of the Fifth Five-Year Review will be made available for public comment, instructions will be provided in a future public notice and on the HPNS public website. Following the public comment period, the Navy will issue a public notice when the Five-Year Review has been finalized, anticipated December 2023.

For information about the Five-Year Review or any environmental cleanup activities at HPNS please visit the HPNS Public Website https://go.usa.gov/xhqES or contact the following:

Brooks Pauly/Navy
Remedial Project Manager
33000 Nixie Way, Building 50
San Diego, CA 92147
(619) 524-5096
brooks.pauly2.civ@us.navy.mil

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Appendix E
Groundwater Monitoring Summary (DCNs: TRBW-0202-4996-0013; TRBW-0202-4996-0018; TRBW-0202-4996-0022)

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Table 5
Analytical Results Exceeding Project Action Limits
January through December 2019
Hunters Point Naval Shipyard, San Francisco, California

Well ID	Analyte	Project Action Limit (µg/L)	Active Treatment Criteria (µg/L)	1Q/2Q 2019 Result (µg/L)	3Q/4Q 2019 Result (µg/L)
IR Site 07/18					
No Exceedances in IR Site 07/18					
Parcel B-1					
IR10MW13A1	VINYL CHLORIDE	0.5	NA	--	3.1
IR10MW61A	VINYL CHLORIDE	0.5	NA	3.2	4.3
IR10MW63A	VINYL CHLORIDE	0.5	NA	--	1.4
IR10MW71A	VINYL CHLORIDE	0.5	NA	9	19
IR20MW17A	VINYL CHLORIDE	0.5	NA	1.2	0.96
Parcel B-2					
IR26MW49A	MERCURY	0.6	NA	1.01	3.45
Parcel C (RU-C1)					
IR28MW557A	1,1-DICHLOROETHANE	6.5	NA	14 J	13
IR28MW916A	1,1-DICHLOROETHANE	6.5	NA	--	17
IR28MW557A	1,2,4-TRIMETHYLBENZENE	25	NA	700	590
IR28MW934A	1,2,4-TRIMETHYLBENZENE	25	NA	70	--
IR28MW557A	1,2-DICHLOROETHENE (TOTAL)	210	2,100	16,000	14,000
IR28MW557A	1,3,5-TRIMETHYLBENZENE	19	NA	180 J	170
IR28MW934A	1,3,5-TRIMETHYLBENZENE	19	NA	21	--
IR28MW128A	BENZENE	0.5	5	--	1.9
IR28MW338A	BENZENE	0.5	5	0.67	--
IR28MW556A	BENZENE	0.5	5	0.74	--
IR28MW127A	BENZENE	0.5	5	0.51	--
IR28MW557A	BENZENE	0.5	5	19	17
IR28MW916A	BENZENE	0.5	5	--	1.9
IR28MW934A	BENZENE	0.5	5	3.8	3.4 J
IR28MW354A	CHLOROFORM	0.7	7	1.4	--
IR28MW557A	CIS-1,2-DICHLOROETHENE	210	NA	16,000	14,000
IR28MW557A	ISOPROPYLBENZENE	7.8	NA	36 J	30
IR28MW557A	NAPHTHALENE	3.6	NA	190 J	120
IR28MW934A	NAPHTHALENE	3.6	NA	12	15 J
IR28MW338A	TETRACHLOROETHENE	0.54	5.4	15	--
PA28MW52A	TETRACHLOROETHENE	0.54	5.4	2.5	--
IR28MW557A	TETRACHLOROETHENE	0.54	5.4	3.2	--
IR28MW354A	TRICHLOROETHENE	2.9	29	3.5	--
IR28MW557A	TRICHLOROETHENE	2.9	29	49 J	12
IR28MW338A	VINYL CHLORIDE	0.5	25	6.9	--
IR28MW354A	VINYL CHLORIDE	0.5	25	--	11
IR28MW556A	VINYL CHLORIDE	0.5	25	2.3	0.8
IR28MW475A	VINYL CHLORIDE	0.5	25	20	1.6
IR28MW557A	VINYL CHLORIDE	0.5	25	4,300	5,700
IR28MW916A	VINYL CHLORIDE	0.5	25	--	120
IR28MW931A	VINYL CHLORIDE	0.5	25	52	6.9
IR28MW934A	VINYL CHLORIDE	0.5	25	390	180
Parcel C (RU-C2)					
RUC2MW1A	1,2-DICHLOROETHENE (TOTAL)	210	2,100	630	--
IR28MW910A	1,4-DICHLOROBENZENE	2.1	21	3.9	6.7
IR58MW31A	1,4-DICHLOROBENZENE	2.1	21	9.1	5.7

DCN: TRBW-0202-4996-0013

Table 5
Analytical Results Exceeding Project Action Limits
January through December 2019
Hunters Point Naval Shipyard, San Francisco, California

Well ID	Analyte	Project Action Limit (µg/L)	Active Treatment Criteria (µg/L)	1Q/2Q 2019 Result (µg/L)	3Q/4Q 2019 Result (µg/L)
RUC2MW1A	1,4-DICHLOROBENZENE	2.1	21	25	8.8
RUC2MW13A	1,4-DICHLOROBENZENE	2.1	21	--	2.7
IR58MW31A	BENZENE	0.5	5	37	7.7
RUC2MW15B	BENZENE	0.5	5	0.74	0.7
RUC2MW1A	BENZENE	0.5	5	0.74	1
RUC2MW13A	CARBON TETRACHLORIDE	0.5	5	1.8	0.67
RUC2MW08B	CARBON TETRACHLORIDE	0.5	5	0.67	14
RUC2MW11A	CARBON TETRACHLORIDE	0.5	5	3.5	--
RUC2MW11B	CARBON TETRACHLORIDE	0.5	5	--	4.8
IR28MW190F	CARBON TETRACHLORIDE	0.5	5	42	--
IR58MW31A	CHLOROBENZENE	390	3,900	1,500	430
RUC2MW13A	CHLOROFORM	0.7	7	1.3	0.8
RUC2MW15B	CHLOROFORM	0.7	7	1.3	1.5
RUC2MW16B	CHLOROFORM	0.7	7	NS	8.3
RUC2MW2B	CHLOROFORM	0.7	7	0.84	0.99
RUC2MW08B	CHLOROFORM	0.7	7	19	18
RUC2MW09B	CHLOROFORM	0.7	7	--	1.5
RUC2MW11A	CHLOROFORM	0.7	7	1.1	--
RUC2MW11B	CHLOROFORM	0.7	7	--	1.3
IR28MW190F	CHLOROFORM	0.7	7	38	--
RUC2MW1A	CIS-1,2-DICHLOROETHENE	210	NA	600	--
RUC2MW13A	TETRACHLOROETHENE	0.54	5.4	0.55	--
RUC2MW15B	TETRACHLOROETHENE	0.54	5.4	110	70
RUC2MW16B	TETRACHLOROETHENE	0.54	5.4	NS	1.8
RUC2MW1A	TETRACHLOROETHENE	0.54	5.4	1.8	--
RUC2MW1B	TETRACHLOROETHENE	0.54	5.4	8.8	61
RUC2MW2B	TETRACHLOROETHENE	0.54	5.4	18	23
RUC2MW4B	TETRACHLOROETHENE	0.54	5.4	--	23
RUC2MW5B	TETRACHLOROETHENE	0.54	5.4	9.9	21
RUC2MW1B	TPH-TOTAL	20000	NA	24,400 C	32,000 C
RUC2MW4A	TPH-TOTAL	20000	NA	30,000 C	31,000 C
RUC2MW15B	TRICHLOROETHENE	2.9	29	10	36
RUC2MW1A	TRICHLOROETHENE	2.9	29	9	--
IR58MW31A	VINYL CHLORIDE	0.5	25	0.59	--
RUC2MW15B	VINYL CHLORIDE	0.5	25	5.1	36 J
RUC2MW1A	VINYL CHLORIDE	0.5	25	67	20
Parcel C (RU-C4)					
IR28MW407	1,2-DICHLOROETHANE	2.3	115	--	6
IR28MW407	1,4-DICHLOROBENZENE	2.1	21	--	4.3
IR28MW211F	BENZENE	0.5	5	0.58	0.8
IR28MW405	BENZENE	0.5	5	0.73	--
IR28MW407	BENZENE	0.5	5	--	2.2
IR28MW272F	CARBON TETRACHLORIDE	0.5	5	0.51	0.51
IR28MW276A	CARBON TETRACHLORIDE	0.5	5	1.3	2.3
IR28MW272A	CHLOROFORM	0.7	7	0.92	--
IR28MW272F	CHLOROFORM	0.7	7	0.99	0.94
IR28MW276A	CHLOROFORM	0.7	7	--	0.77

DCN: TRBW-0202-4996-0013

Table 5
Analytical Results Exceeding Project Action Limits
January through December 2019
Hunters Point Naval Shipyard, San Francisco, California

Well ID	Analyte	Project Action Limit (µg/L)	Active Treatment Criteria (µg/L)	1Q/2Q 2019 Result (µg/L)	3Q/4Q 2019 Result (µg/L)
IR28MW272A	TRICHLOROETHENE	2.9	29	13	--
IR28MW272F	TRICHLOROETHENE	2.9	29	180	120
IR28MW276A	TRICHLOROETHENE	2.9	29	5.9	4.4
IR28MW277A	TRICHLOROETHENE	2.9	29	5.2	--
IR28MW355F	TRICHLOROETHENE	2.9	29	4.5	--
IR28MW566A	TRICHLOROETHENE	2.9	29	3.2	--
IR28MW211F	VINYL CHLORIDE	0.5	25	3.7	11
IR28MW355F	VINYL CHLORIDE	0.5	25	--	1.7
IR28MW405	VINYL CHLORIDE	0.5	25	--	13
IR28MW407	VINYL CHLORIDE	0.5	25	--	86
IR28MW566A	VINYL CHLORIDE	0.5	25	--	0.8
Parcel C (RU-C5)					
IR06MW67A	1,1-DICHLOROETHANE	6.5	NA	25	12
IR06MW67A	1,2-DICHLOROETHENE (TOTAL)	210	2,100	1,200	--
IR25MW11A	1,4-DICHLOROBENZENE	2.1	21	8.2	8.9
IR25MW64A	1,4-DICHLOROBENZENE	2.1	21	12	17
IR25MW65B	1,4-DICHLOROBENZENE	5	21	10	19
IR25MW68A	1,4-DICHLOROBENZENE	2.1	21	--	2.9
IR06MW67A	BENZENE	0.5	5	2	2.6
IR25MW74A	BENZENE	0.5	5	9.2	5.2
IR25MW11A	BENZENE	0.5	5	1.2	0.73
IR25MW16A	BENZENE	0.5	5	--	1
IR25MW64A	BENZENE	0.5	5	13	21
IR25MW65B	BENZENE	1	5	54	57
IR25MW68A	BENZENE	0.5	5	--	0.96
IR25MW64A	CHLOROBENZENE	390	3,900	510	480
IR25MW65B	CHLOROBENZENE	70	3,900	3,600	1,800
IR06MW67A	CIS-1,2-DICHLOROETHENE	210	NA	1,200	--
IR06MW42A	NAPHTHALENE	4	NA	120	23
IR25MW65B	NAPHTHALENE	0.093	NA	24	44
IR06MW46A	TETRACHLOROETHENE	0.54	5.4	--	4.2
IR06MW67A	TETRACHLOROETHENE	0.54	5.4	15	9.5
IR25MW68A	TETRACHLOROETHENE	0.54	5.4	1.4	--
IR25MW72A	TETRACHLOROETHENE	0.54	5.4	0.84	--
IR06MW67A	TRICHLOROETHENE	2.9	29	200	12
IR06MW22A	VINYL CHLORIDE	0.5	25	2.1	5.1
IR06MW32A	VINYL CHLORIDE	0.5	25	0.95	2.4
IR06MW40A	VINYL CHLORIDE	0.5	25	1.3	2.2
IR06MW59A1	VINYL CHLORIDE	0.5	25	--	1.3
IR06MW67A	VINYL CHLORIDE	0.5	25	380	460
IR25MW16A	VINYL CHLORIDE	0.5	25	--	2.1
IR25MW64A	VINYL CHLORIDE	0.5	25	--	3.8
IR25MW68A	VINYL CHLORIDE	0.5	25	--	0.53
IR25MW74A	VINYL CHLORIDE	0.5	25	0.74	--
Parcel D-1					
No Exceedances in Parcel D-1					
Parcel E[(1)]					

DCN: TRBW-0202-4996-0013

Table 5
Analytical Results Exceeding Project Action Limits
January through December 2019
Hunters Point Naval Shipyard, San Francisco, California

Well ID	Analyte	Project Action Limit (µg/L)	Active Treatment Criteria (µg/L)	1Q/2Q 2019 Result (µg/L)	3Q/4Q 2019 Result (µg/L)
IR03MW218A2	NAPHTHALENE	63	NA	22	NS
IR03MW218A2	TPH-TOTAL	3216	NA	7,180	NS
IR03MW342A	TPH-TOTAL	4839	NA	6,400	NS
IR36MW237A	VINYL CHLORIDE	6.3	NA	45	NS
IR02MW373A	ZINC	81	NA	1,280	NS
Parcel E-2					
IR01MWI-9R	ARSENIC	10	NA	--	14.1
IR01MW38A	CYANIDE	10	NA	--	12.2
IR01MW62A	CYANIDE	10	NA	20	29.7
IR01MW63A	CYANIDE	10	NA	23	26.8
IR01MW60A	TPH-TOTAL	4839	NA	7,600 C	10,200 C
IR01MW64A	TPH-TOTAL	4839	NA	7,911 C	7,100 C
IR01MW66A	TPH-TOTAL	4,839	NA	--	5,400 C
IR01MWI-7R	TPH-TOTAL	1,467	NA	NS	3,200 C
IR01MWI-9R	TPH-TOTAL	2,092	NA	NS	3,000 C
IR01MW38A	UN-IONIZED AMMONIA(1)	25	NA	99 C	170 C
IR01MW48A	UN-IONIZED AMMONIA(1)	25	NA	63 C	491 C
IR01MW60A	UN-IONIZED AMMONIA(1)	25	NA	--	27 C
IR01MWI-9R	UN-IONIZED AMMONIA(1)	25	NA	NS	419 C
Parcel G					
IR33MW64A	CARBON TETRACHLORIDE	0.5	NA	1	--
IR33MW64A	CHLOROFORM	1	NA	8.1	--
IR71MW03A	TETRACHLOROETHENE	0.54	NA	1.3 J	1.8
Parcel UC-2					
IR06MW54F	CARBON TETRACHLORIDE	0.5	NA	4	1.6
IR06MW55F	CARBON TETRACHLORIDE	0.5	NA	0.84	--
IR06MW54F	CHLOROFORM	1	NA	1.6	1.2

Notes/Abbreviations:
(1) Parcel E is sampled annually during 1Q2Q 2019
Grey box = concentration exceeded both the Project Action Limit and the Active Treatment Criteria
-- = did not exceed the PAL during sampling event
µg/L = micrograms per liter
C = Calculated
J = estimated
NA = Active Treatment Criteria values are only used for Parcel C Remedial Action and are not applicable for other Parcels
NS = not sampled
IR = Installation Restoration
1Q2Q = first quarter/second quarter
3Q/4Q = third quarter/fourth quarter

DCN: TRBW-0202-4996-0013

Table 5
Analytical Results Exceeding Project Action Limits and Active Treatement Criteria
January through December 2020
Hunters Point Naval Shipyard, San Francisco, California

Well ID	Analyte	Project Action Limit (µg/L)	Active Treatment Criteria (µg/L)	1Q/2Q 2020 Result (µg/L)	3Q/4Q 2020 Result (µg/L)
IR Site 07/18					
No Exceedances in IR 07/18					
Parcel B-1					
IR10MW59A	VINYL CHLORIDE	0.5	NA	--	2.3
IR10MW61A	VINYL CHLORIDE	0.5	NA	3.9	4.4
IR10MW63A	VINYL CHLORIDE	0.5	NA	1.3	1.5
IR10MW71A	VINYL CHLORIDE	0.5	NA	16	21
IR20MW17A	VINYL CHLORIDE	0.5	NA	0.92	1.1
Parcel B-2					
IR26MW49A	MERCURY	0.6	NA	--	2.38
IR26MW71A	MERCURY	0.6	NA	1.72	1.47
PA50MW02A	MERCURY	0.6	NA	--	0.829
Parcel C (RU-C1)					
Plume C1-1					
IR28MW338A	TETRACHLOROETHENE	0.54	5.4	1	--
IR28MW338A	VINYL CHLORIDE	0.5	25	26	21
IR28MW556A	BENZENE	0.5	5	1.2	0.79
IR28MW556A	VINYL CHLORIDE	0.5	25	2.1	0.85
PA28MW50A	BENZENE	0.5	5	--	0.73
PA28MW50A	VINYL CHLORIDE	0.5	25	--	1.1
Plume C1-2					
PA28MW52A	TETRACHLOROETHENE	0.54	5.4	--	0.61
IR28MW127A	BENZENE	0.5	5	0.62	--
Plume C1-3					
IR28MW128A	BENZENE	0.5	5	1.4	2.2
IR28MW354A	TRICHLOROETHENE	2.9	29	3.1	3.3
IR28MW354A	VINYL CHLORIDE	0.5	25	4.1	2.5
IR28MW475A	BENZENE	0.5	5	0.79	--
IR28MW475A	VINYL CHLORIDE	0.5	25	21	3.2
IR28MW475A	ZINC	81	NA	155	--
IR28MW557A	1,1-DICHLOROETHANE	6.5	NA	14 J	11
IR28MW557A	1,2,4-TRIMETHYLBENZENE	25	NA	690	580
IR28MW557A	1,2-DICHLOROETHENE (TOTAL)	210	2100	13,000	11,000
IR28MW557A	1,3,5-TRIMETHYLBENZENE	19	NA	180	160
IR28MW557A	BENZENE	0.5	5	19 J	14
IR28MW557A	CIS-1,2-DICHLOROETHENE	210	NA	13,000	11,000
IR28MW557A	ISOPROPYLBENZENE	7.8	NA	35 J	27
IR28MW557A	NAPHTHALENE	3.6	NA	170	130
IR28MW557A	TETRACHLOROETHENE	0.54	5.4	0.62 J	--
IR28MW557A	TRICHLOROETHENE	2.9	29	21 J	10
IR28MW557A	VINYL CHLORIDE	0.5	25	6,400	4,600
IR28MW916A	1,1-DICHLOROETHANE	6.5	NA	11	12
IR28MW916A	BENZENE	0.5	5	1.3	1.3
IR28MW916A	VINYL CHLORIDE	0.5	25	42	0.75
IR28MW931A	BENZENE	0.5	5	--	0.52
IR28MW931A	VINYL CHLORIDE	0.5	25	3.4	6.5
IR28MW934A	BENZENE	0.5	5	1.7	2.1
IR28MW934A	VINYL CHLORIDE	0.5	25	89	54
IR28MW934A	HEXAVALENT CHROMIUM	50	50	202	--

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Table 5
Analytical Results Exceeding Project Action Limits and Active Treatement Criteria
January through December 2020
Hunters Point Naval Shipyard, San Francisco, California

Well ID	Analyte	Project Action Limit (µg/L)	Active Treatment Criteria (µg/L)	1Q/2Q 2020 Result (µg/L)	3Q/4Q 2020 Result (µg/L)
Plume C1-4					
No Exceedances in Plume C1-4					
Parcel C (RU-C2)					
Plume C2-1					
IR28MW910A	TETRACHLOROETHENE	0.54	5.4	--	2.3
IR58MW31A	1,4-DICHLOROBENZENE	2.1	21	4.6	3.3
IR58MW31A	BENZENE	0.5	5	6.7	5.2
IR58MW31A	CHLOROBENZENE	390	3,900	480	--
RUC2MW15B	TETRACHLOROETHENE	0.54	5.4	9.3	--
RUC2MW15B	TRICHLOROETHENE	2.9	29	15	--
RUC2MW15B	VINYL CHLORIDE	0.5	25	0.61	--
RUC2MW16B	TETRACHLOROETHENE	0.54	5.4	0.87	--
RUC2MW1A	1,4-DICHLOROBENZENE	2.1	21	4.3	8.5
RUC2MW1A	BENZENE	0.5	5	1.1	2.9
RUC2MW1A	TRICHLOROETHENE	2.9	29	--	5.3
RUC2MW1A	VINYL CHLORIDE	0.5	25	3.6	7.2
RUC2MW1B	TETRACHLOROETHENE	0.54	5.4	56	--
RUC2MW2B	CHLOROFORM	0.7	7	0.94	--
RUC2MW2B	TETRACHLOROETHENE	0.54	5.4	21	--
RUC2MW4B	TETRACHLOROETHENE	0.54	5.4	8.6	--
RUC2MW5B	TETRACHLOROETHENE	0.54	5.4	20	--
Plume C2-2					
RUC2MW08A	TETRACHLOROETHENE	0.54	5.4	--	0.76
RUC2MW08B	CARBON TETRACHLORIDE	0.5	5	17	--
RUC2MW08B	CHLOROFORM	0.7	7	19	--
RUC2MW11A	CARBON TETRACHLORIDE	0.5	5	4.1	--
RUC2MW11A	CHLOROFORM	0.7	7	1.0	--
RUC2MW11A	TETRACHLOROETHENE	0.54	5.4	--	11
Plume C2-3					
IR28MW300F	BENZENE	0.5	5	0.51	0.86
IR28MW939F	BENZENE	0.5	5	1.0	0.76
IR28MW940F	CARBON TETRACHLORIDE	0.5	5	30	29 J
IR28MW940F	CHLOROFORM	0.7	7	9.1	12
IR28MW941F	1,4-DICHLOROBENZENE	2.1	21	11	13
IR28MW941F	BENZENE	0.5	5	3.1	3.8
IR28MW941F	CHLOROFORM	0.7	7	0.80	0.83
IR28MW941F	TRICHLOROETHENE	2.9	29	12	5.1
IR28MW941F	VINYL CHLORIDE	0.5	25	93	140
Parcel C (RU-C4)					
Plume C4-1					
IR28MW200A	TRICHLOROETHENE	2.9	29	--	6.0
IR28MW211F	BENZENE	0.5	5	0.87	1.2
IR28MW211F	VINYL CHLORIDE	0.5	25	10	13
IR28MW216F	TRICHLOROETHENE	2.9	29	--	3.6
IR28MW216F	VINYL CHLORIDE	0.5	25	--	0.62
IR28MW272F	CARBON TETRACHLORIDE	0.5	5	0.60	0.51
IR28MW272F	CHLOROFORM	0.7	7	1.0	1.0
IR28MW272F	TRICHLOROETHENE	2.9	29	150	78
IR28MW276A	TRICHLOROETHENE	2.9	29	6.3	7.3

Table 5
Analytical Results Exceeding Project Action Limits and Active Treatement Criteria
January through December 2020
Hunters Point Naval Shipyard, San Francisco, California

Well ID	Analyte	Project Action Limit (µg/L)	Active Treatment Criteria (µg/L)	1Q/2Q 2020 Result (µg/L)	3Q/4Q 2020 Result (µg/L)
IR28MW405	TRICHLOROETHENE	2.9	29	9.7	3.1
IR28MW405	VINYL CHLORIDE	0.5	25	--	15
IR28MW407	1,2-DICHLOROETHANE	2.3	115	6.7	4.6
IR28MW407	1,4-DICHLOROBENZENE	2.1	21	3.9	4.7
IR28MW407	BENZENE	0.5	5	1.7	2.9
IR28MW407	VINYL CHLORIDE	0.5	25	67	72
IR28MW566A	VINYL CHLORIDE	0.5	25	0.58	1.1
Parcel C (RU-C5)					
Plume C5-1					
IR06MW22A	VINYL CHLORIDE	0.5	25	0.96	18
IR06MW32A	VINYL CHLORIDE	0.5	25	4.1	2.0
IR06MW40A	VINYL CHLORIDE	0.5	25	1.6	1.4
IR06MW59A1	BENZENE	0.5	5	1.6	1.3
IR06MW59A1	TETRACHLOROETHENE	0.54	5.4	1.2	0.90
IR06MW59A1	TRICHLOROETHENE	2.9	29	8.8	5.6
IR06MW59A1	VINYL CHLORIDE	0.5	25	29	20
IR06MW67A	1,1-DICHLOROETHANE	6.5	NA	22	23
IR06MW67A	1,2-DICHLOROETHENE (TOTAL)	210	NA	320	--
IR06MW67A	BENZENE	0.5	5	3.1	3.7
IR06MW67A	CIS-1,2-DICHLOROETHENE	210	NA	320	--
IR06MW67A	TETRACHLOROETHENE	0.54	5.4	13	15
IR06MW67A	TRICHLOROETHENE	2.9	29	69	33
IR06MW67A	VINYL CHLORIDE	0.5	25	520	670
Plume C5-2					
No Exceedances in Plume C5-2					
Plume C5-3					
IR06MW42A	NAPHTHALENE	3.6	NA	7.4	120
Plume C5-4					
IR25MW16A	BENZENE	0.5	5	2.8	2.8
IR25MW16A	VINYL CHLORIDE	0.5	25	1.2	0.52
IR25MW73A	VINYL CHLORIDE	0.5	25	0.61	0.75
IR25MW74A	BENZENE	0.5	5	4.4	4.7
Plume C5-5					
IR25MW11A	1,4-DICHLOROBENZENE	2.1	21	7.5	8.3
IR25MW11A	BENZENE	0.5	5	--	0.62
IR25MW64A	1,4-DICHLOROBENZENE	2.1	21	23	28
IR25MW64A	BENZENE	0.5	5	20	64
IR25MW64A	CHLOROBENZENE	390	3,900	770	1,700
IR25MW64A	VINYL CHLORIDE	0.5	25	2.6	2.1
IR25MW65B	1,4-DICHLOROBENZENE	5	21	15	18
IR25MW65B	BENZENE	1	5	62	80
IR25MW65B	CHLOROBENZENE	70	3,900	4,000	4,200
IR25MW65B	IRON	10,950	NA	--	12,300
IR25MW65B	NAPHTHALENE	0.093	NA	35	36
IR25MW68A	1,4-DICHLOROBENZENE	2.1	21	4.7	3.9
IR25MW68A	BENZENE	0.5	5	1.9	0.51
IR25MW68A	VINYL CHLORIDE	0.5	25	1.2	--
IR25MW72A	1,4-DICHLOROBENZENE	2.1	21	--	3.4
IR25MW72A	TETRACHLOROETHENE	0.54	5.4	--	0.61

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Table 5
Analytical Results Exceeding Project Action Limits and Active Treatement Criteria
January through December 2020
Hunters Point Naval Shipyard, San Francisco, California

Well ID	Analyte	Project Action Limit (µg/L)	Active Treatment Criteria (µg/L)	1Q/2Q 2020 Result (µg/L)	3Q/4Q 2020 Result (µg/L)
Parcel D-1					
No Exceedances in Parcel D-1					
Parcel E					
IR02MW373A	NICKEL	96.5	NA	287	--
IR02MW373A	ZINC	81	NA	1,950	--
IR03MW218A2	NAPHTHALENE	63	NA	47 J	--
IR03MW218A2	TPH-TOTAL	3,216	NA	24,510 C	--
IR03MW342A	TPH-TOTAL	4,839	NA	9,000 C	--
IR36MW237A	VINYL CHLORIDE	6.3	NA	70	--
Parcel E-2					
IR01MW31A	UN-IONIZED AMMONIA(1)	25	NA	62 C	48 C
IR01MW38A	CYANIDE	10	NA	16.6	15.2
IR01MW38A	UN-IONIZED AMMONIA(1)	25	NA	154 C	172 C
IR01MW48A	CYANIDE	10	NA	14.1	11.7
IR01MW48A	UN-IONIZED AMMONIA(1)	25	NA	134 C	201 C
IR01MW60A	CYANIDE	10	NA	15.4	--
IR01MW60A	TPH-TOTAL	4,839	NA	8,330 C	11,232 C
IR01MW60A	UN-IONIZED AMMONIA(1)	25	NA	29 C	26 C
IR01MW62A	CYANIDE	10	NA	17.8	28.0
IR01MW62A	ZINC	81	NA	88.3	--
IR01MW63A	CYANIDE	10	NA	21.5	18.1
IR01MW64A	TPH-TOTAL	4,839	NA	--	6,393 C
IR01MWI-9R	ARSENIC	10	NA	--	13.2 J
IR01MWI-9R	CYANIDE	10	NA	10.4	12.4
IR01MWI-9R	TPH-TOTAL	2,092	NA	3,500 C	3,300 C
IR01MWI-9R	UN-IONIZED AMMONIA(1)	25	NA	527 C	610 C
Parcel G					
IR33MW64A	CHLOROFORM	1	NA	--	1.3
IR71MW03A	TETRACHLOROETHENE	0.5	NA	1.7	1.1
Parcel UC-2					
IR06MW54FR	CARBON TETRACHLORIDE	0.5	NA	1.8	1.3
IR06MW54FR	CHLOROFORM	1	NA	1.3	1.4

Abbreviations:
µg/L = micrograms per liter
C= Calculated
NA = Active Treatment Criteria values are only used for Parcel C remedial action and are not applicable for other Parcels at Hunters Point Naval Shipyard
J= estimated
IR= Installation Restoration
Grey box = concentration exceeded both the Project Action Limit and the Active Treatement Criteria

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Table 5
Analytical Results Exceeding Project Action Limits and Active Treatement Criteria
January through December 2021
Hunters Point Naval Shipyard, San Francisco, California

Well ID	Analyte	Project Action Limit (µg/L)	Active Treatment Criteria (µg/L)	1Q/2Q 2021 Result (µg/L)	3Q/4Q 2021 Result (µg/L)
IR Site 07/18					
No Exceedances in IR 07/18					
Parcel B-1					
IR10MW13A	VINYL CHLORIDE	0.5	NA	--	1.3
IR10MW59A	VINYL CHLORIDE	0.5	NA	--	2.1
IR10MW61A	VINYL CHLORIDE	0.5	NA	3.4	3.3
IR10MW63A	VINYL CHLORIDE	0.5	NA	--	1.2
IR10MW71A	TRICHLOROETHENE	2.9	NA	3.2	--
IR10MW71A	VINYL CHLORIDE	0.5	NA	17	17
IR20MW17A	VINYL CHLORIDE	0.5	NA	1.1	1.3
Parcel B-2					
IR26MW41A	DICHLORODIFLUOROMETHANE	14	NA	--	21
IR26MW49A	MERCURY	0.6	NA	--	3.57
IR26MW71A	MERCURY	0.6	NA	1.26	5
Parcel C (RU-C1)					
Plume C1-1					
IR28MW338A	TETRACHLOROETHENE	0.54	5.4	13	--
IR28MW338A	TRICHLOROETHENE	2.90	29	8.3	--
IR28MW338A	VINYL CHLORIDE	0.5	25	13	31
IR28MW556A	BENZENE	0.5	5	1.2	1.7
IR28MW556A	VINYL CHLORIDE	0.5	25	1.7	2.2
PA28MW50A	BENZENE	0.5	5	0.88	0.66
PA28MW50A	VINYL CHLORIDE	0.5	25	1	0.67
RUC11MW01A	BENZENE	0.5	5	--	0.64
RUC11MW01A	VINYL CHLORIDE	0.5	25	--	4.3
Plume C1-2					
PA28MW52A	TETRACHLOROETHENE	0.54	5.4	3.4	--
Plume C1-3					
IR28MW128A	BENZENE	0.5	5	--	2.2
IR28MW128A	TRICHLOROETHENE	2.90	29	3.9	--
IR28MW354A	TRICHLOROETHENE	2.9	29	11	--
IR28MW354A	VINYL CHLORIDE	0.5	25	1.5	4.1
IR28MW475A	VINYL CHLORIDE	0.5	25	44	7
IR28MW557A	1,1,2,2-TETRACHLOROETHANE	3	NA	--	3 J
IR28MW557A	1,1-DICHLOROETHANE	6.5	NA	9.5	11 J
IR28MW557A	1,2,4-TRIMETHYLBENZENE	25	NA	560	850
IR28MW557A	1,2-DICHLOROETHENE (TOTAL)	210	2,100	6,500	8,900
IR28MW557A	1,3,5-TRIMETHYLBENZENE	19	NA	160	--
IR28MW557A	BENZENE	0.5	5	10	12 J
IR28MW557A	CARBON TETRACHLORIDE	0.5	5	--	11 J
IR28MW557A	CIS-1,2-DICHLOROETHENE	210	NA	6,500	8,800
IR28MW557A	ISOPROPYLBENZENE	7.8	NA	20	25 J
IR28MW557A	NAPHTHALENE	3.6	NA	84 J	130
IR28MW557A	TRICHLOROETHENE	2.9	29	5.2	5.5 J
IR28MW557A	VINYL CHLORIDE	0.5	25	6,300	7,300

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Table 5
Analytical Results Exceeding Project Action Limits and Active Treatement Criteria
January through December 2021
Hunters Point Naval Shipyard, San Francisco, California

Well ID	Analyte	Project Action Limit (µg/L)	Active Treatment Criteria (µg/L)	1Q/2Q 2021 Result (µg/L)	3Q/4Q 2021 Result (µg/L)
Plume C1-3 continued					
IR28MW916A	1,1-DICHLOROETHANE	6.5	NA	11	20
IR28MW916A	BENZENE	0.5	5	1.2	1.7
IR28MW916A	CARBON TETRACHLORIDE	0.5	5	--	20
IR28MW916A	TRICHLOROETHENE	2.9	29	28	--
IR28MW916A	VINYL CHLORIDE	0.5	25	110	0.91
IR28MW931A	BENZENE	0.5	5	--	0.57
IR28MW931A	VINYL CHLORIDE	0.5	25	1.5	14
IR28MW934A	BENZENE	0.5	5	1.7	1.6 J
IR28MW934A	VINYL CHLORIDE	0.5	25	45	40 J
Plume C1-4					
No Exceedances in Plume C1-4					
Parcel C (RU-C2)					
Plume C2-1					
IR28MW910A	TETRACHLOROETHENE	0.54	5.4	--	1.4
IR58MW31A	1,4-DICHLOROBENZENE	2.1	21	4.3	--
IR58MW31A	BENZENE	0.5	5	15	3.3
IR58MW31A	CHLOROBENZENE	390	3,900	1,000	--
RUC2MW1A	1,4-DICHLOROBENZENE	2.1	21	--	5.9
RUC2MW1A	BENZENE	0.5	5	--	2.4
RUC2MW1A	VINYL CHLORIDE	0.5	25	0.84	28
Plume C2-2					
RUC2MW11A	TETRACHLOROETHENE	0.54	5.4	1.1	2
Plume C2-3					
IR28MW300F	BENZENE	0.5	5	0.57	0.68
IR28MW565A	VINYL CHLORIDE	0.5	25	--	1.8
IR28MW939F	BENZENE	0.5	5	0.82	1.1
IR28MW940F	CARBON TETRACHLORIDE	0.5	5	26	40
IR28MW940F	CHLOROFORM	0.7	7	8.8	13
IR28MW941F	1,4-DICHLOROBENZENE	2.1	21	13	17
IR28MW941F	BENZENE	0.5	5	3.2	3.4
IR28MW941F	TRICHLOROETHENE	2.9	29	9.6	14
IR28MW941F	VINYL CHLORIDE	0.5	25	51	50
Parcel C (RU-C4)					
Plume C4-1					
IR28MW200A	TRICHLOROETHENE	2.9	29	6.6	5.5
IR28MW211F	BENZENE	0.5	5	0.91	NS[(2)]
IR28MW211F	VINYL CHLORIDE	0.5	25	9.7	NS[(2)]
IR28MW276A	TRICHLOROETHENE	2.9	29	8.8	NS[(2)]
IR28MW405	TRICHLOROETHENE	2.9	29	12	NS[(2)]
IR28MW407	1,4-DICHLOROBENZENE	2.1	21	3	NS[(2)]
IR28MW407	VINYL CHLORIDE	0.5	25	0.93	NS[(2)]
IR28MW566A	TRICHLOROETHENE	2.9	29	6.1	--
IR28MW566A	VINYL CHLORIDE	0.5	25	2.60	2

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Table 5
Analytical Results Exceeding Project Action Limits and Active Treatement Criteria
January through December 2021
Hunters Point Naval Shipyard, San Francisco, California

Well ID	Analyte	Project Action Limit (µg/L)	Active Treatment Criteria (µg/L)	1Q/2Q 2021 Result (µg/L)	3Q/4Q 2021 Result (µg/L)
Parcel C (RU-C5)					
Plume C5-1					
IR06MW22A	VINYL CHLORIDE	0.5	25	2.1	13
IR06MW32A	VINYL CHLORIDE	0.5	25	3.1	--
IR06MW40A	VINYL CHLORIDE	0.5	25	1.1	2 J
IR06MW46A	TETRACHLOROETHENE	0.54	5.4	3.2	2.9
IR06MW59A1	BENZENE	0.5	5	--	1.2
IR06MW59A1	TETRACHLOROETHENE	0.54	5.4	--	1.2
IR06MW59A1	TRICHLOROETHENE	2.9	29	--	10
IR06MW59A1	VINYL CHLORIDE	0.5	25	--	32
IR06MW67A	1,1-DICHLOROETHANE	6.5	NA	34	32
IR06MW67A	1,2-DICHLOROETHENE (TOTAL)	210	NA	1,500	780
IR06MW67A	BENZENE	0.5	5	3	3.2
IR06MW67A	CIS-1,2-DICHLOROETHENE	210	NA	1,500	780
IR06MW67A	TETRACHLOROETHENE	0.54	5.4	37	13
IR06MW67A	TRICHLOROETHENE	2.9	29	350	92
IR06MW67A	VINYL CHLORIDE	0.5	25	1,100	810
Plume C5-2					
No Exceedances in Plume C5-2					
Plume C5-3					
IR06MW42A	NAPHTHALENE	3.6	NA	17	49
Plume C5-4					
IR25MW16A	BENZENE	0.5	5	1.4	1.1
IR25MW16A	VINYL CHLORIDE	0.5	25	--	0.82
IR25MW73A	VINYL CHLORIDE	0.5	25	0.69	0.60
IR25MW74A	BENZENE	0.5	5	9.4	8.7
IR25MW74A	VINYL CHLORIDE	0.5	25	--	0.83
Plume C5-5					
IR25MW11A	1,4-DICHLOROBENZENE	2.1	21	8.7	NS[(2)]
IR25MW11A	BENZENE	0.5	5	0.72	NS[(2)]
IR25MW64A	1,4-DICHLOROBENZENE	2.1	21	13	NS[(2)]
IR25MW64A	BENZENE	0.5	5	15	NS[(2)]
IR25MW64A	CHLOROBENZENE	390	3,900	690	NS[(2)]
IR25MW64A	VINYL CHLORIDE	0.5	25	0.75	NS[(2)]
IR25MW65B	1,4-DICHLOROBENZENE	5	21	23 J	NS[(2)]
IR25MW65B	BENZENE	1	5	73	NS[(2)]
IR25MW65B	CHLOROBENZENE	70	3,900	5,100	NS[(2)]
IR25MW65B	NAPHTHALENE	0.093	NA	50 J	NS[(2)]
IR25MW65B	IRON	10,950	NA	12,800	NS[(2)]
IR25MW68A	1,4-DICHLOROBENZENE	2.1	21	5	NS[(2)]
IR25MW68A	BENZENE	0.5	5	0.71	NS[(2)]
IR25MW72A	1,4-DICHLOROBENZENE	2.1	21	3.2	--
IR25MW72A	BENZENE	0.5	5	4.3	--
IR25MW72A	CHLOROFORM	0.7	7	--	0.84
IR25MW72A	TETRACHLOROETHENE	0.54	5.4	1.5	1.7
IR25MW72A	VINYL CHLORIDE	0.5	25	0.68	--

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Table 5
Analytical Results Exceeding Project Action Limits and Active Treatement Criteria
January through December 2021
Hunters Point Naval Shipyard, San Francisco, California

Well ID	Analyte	Project Action Limit (µg/L)	Active Treatment Criteria (µg/L)	1Q/2Q 2021 Result (µg/L)	3Q/4Q 2021 Result (µg/L)
Parcel D-1					
No Exceedances in Parcel D-1					
Parcel E					
IR02MW373A	NICKEL	96.5	NA	158	--
IR02MW373A	ZINC	81	NA	776	--
Parcel E-2					
IR01MW38A	UN-IONIZED AMMONIA(1)	25	NA	91 C	170 C
IR01MW38A	CYANIDE	10	NA	--	12.1
IR01MW48A	TPH-TOTAL	25	NA	--	4,900 C
IR01MW48A	UN-IONIZED AMMONIA(1)	25	NA	158 C	--
IR01MW60A	TPH-TOTAL	25	NA	--	10,900 C
IR01MW60A	UN-IONIZED AMMONIA(1)	25	NA	--	28 C
IR01MW62A	CYANIDE	10	NA	35.3	39.7
IR01MW64A	TPH-TOTAL	25	NA	--	10,500 C
IR01MW66A	TPH-TOTAL	25	NA	--	5,100 C
IR01MWI-9R	ARSENIC	10	NA	13.1	12.7
IR01MWI-9R	TPH-TOTAL	2,092	NA	2,900 C	3,500 C
IR01MWI-9R	UN-IONIZED AMMONIA(1)	25	NA	152 C	460 C
IR01MWLF2A	ARSENIC	10	NA	10.8	--
Parcel G					
No Exceedances in Parcel G					
Parcel UC-2					
IR06MW54FR	CARBON TETRACHLORIDE	0.5	NA	2.7	1.7
IR06MW54FR	CHLOROFORM	1	NA	1.2	1.4

Abbreviations:
-- = did no exceed project action limit
BGMP = Basewide Groundwater Monitoring Program
µg/L = micrograms per liter
C= Calculated
NA = Active Treatment Criteria values are only used for Parcel C remedial action and are not applicable for other Parcels at Hunters Point Naval Shipyard
NS = not sampled
J= estimated
IR= Installation Restoration
Grey box = concentration exceeded both the Project Action Limit and the Active Treatement Criteria
(1) = Un-ionized ammonia is a calculated amount using pH, temperature, and ammonia.
(2) = Monitoring well not sampled by the BGMP in September 2021 but was sampled by the remedial action contractor in accordance with the Revised Final Phase II Remedial Action Work Plan (ICI 2020c). The data can be found in a seperate summary report.

Table 5
2022 Groundwater Analytical Results
Exceeding Project Action Limits and Active Treatement Criteria
Hunters Point Naval Shipyard, San Francisco, California

Well ID	Analyte	Project Action Limit (µg/L)	Active Treatment Criteria (µg/L)	March 2022 Result (µg/L)	June 2022 Result (µg/L)	September 2022 Result (µg/L)	December 2022 Result (µg/L)
IR Site 07/18							
IR07MW24A	LEAD	14.44	NA	23	NS	--	NS
IR07MW26A	LEAD	14.44	NA	23.9	NS	--	NS
Parcel B-1							
IR10MW59A	VINYL CHLORIDE	0.5	NA	0.60	NS	0.92	NS
IR10MW61A	VINYL CHLORIDE	0.5	NA	0.71	NS	3	NS
IR10MW63A	VINYL CHLORIDE	0.5	NA	--	NS	1.2	NS
IR10MW71A	VINYL CHLORIDE	0.5	NA	9.0	NS	16.0	NS
IR10MW17A	VINYL CHLORIDE	0.5	NA	--	NS	0.87	NS
Parcel B-2							
IR26MW70A	LEAD	14.44	NA	17.7	NS	--	NS
IR26MW49A	MERCURY	0.6	NA	1.79	NS	5.6	NS
IR26MW71A	MERCURY	0.6	NA	1.18	NS	1.75	NS
Parcel C (RU-C1)							
IR28MW557A	1,1-DICHLOROETHANE	6.5	NA	8.7 J	NS	7.6	NS
IR28MW916A	1,1-DICHLOROETHANE	6.5	NA	15	NS	16	NS
IR28MW557A	1,2,4-TRIMETHYLBENZENE	25	NA	560	NS	590	NS
IR28MW557A	1,2-DICHLOROETHENE (TOTAL)	210	2,100	6,000	NS	3,200	NS
IR28MW557A	1,3,5-TRIMETHYLBENZENE	19	NA	170	NS	190	NS
PA28MW50A	BENZENE	0.5	5	0.84	NS	0.8	NS
RUC11MW01A	BENZENE	0.5	5	0.61	NS	0.71	NS
IR28MW127A	BENZENE	0.5	5	0.55	NS	--	NS
IR28MW128A	BENZENE	0.5	5	0.9	NS	4.9	NS
IR28MW475A	BENZENE	0.5	5	0.57	NS	0.55	NS
IR28MW557A	BENZENE	0.5	5	12 J	NS	11	NS
IR28MW556A	BENZENE	0.5	5	--	NS	2	NS
IR28MW916A	BENZENE	0.5	5	1.4	NS	1.4	NS
IR28MW931A	BENZENE	0.5	5	--	NS	0.54	NS
IR28MW934A	BENZENE	0.5	5	2.5 J	NS	0.7	NS
IR28MW557A	CIS-1,2-DICHLOROETHENE	210	NA	6,000	NS	3,100	NS
IR28MW934A	HEXAVALENT CHROMIUM	50	NA	67.5	NS	--	NS
IR28MW557A	ISOPROPYLBENZENE	7.8	NA	30 J	NS	31	NS
IR28MW557A	NAPHTHALENE	3.6	NA	120	NS	110	NS
IR28MW338A	TETRACHLOROETHENE	0.54	5.4	16	NS	--	NS
IR28MW338A	TRICHLOROETHENE	2.9	29	12	NS	--	NS
IR28MW128A	TRICHLOROETHENE	2.9	29	3.9	NS	--	NS
IR28MW354A	TRICHLOROETHENE	2.9	29	14	NS	10	NS
IR28MW557A	TRICHLOROETHENE	2.9	29	11 J	NS	5.3	NS
IR28MW916A	TRICHLOROETHENE	2.9	29	7.6	NS	--	NS
IR28MW338A	VINYL CHLORIDE	0.5	25	8.8	NS	12	NS
IR28MW556A	VINYL CHLORIDE	0.5	25	--	NS	1.1	NS
PA28MW50A	VINYL CHLORIDE	0.5	25	1.2	NS	1.9	NS
RUC11MW01A	VINYL CHLORIDE	0.5	25	5.3	NS	2.2	NS

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IR28MW354A	VINYL CHLORIDE	0.5	25	--	NS	1.5	NS
IR28MW475A	VINYL CHLORIDE	0.5	25	35	NS	1.1	NS
IR28MW557A	VINYL CHLORIDE	0.5	25	4,200	NS	4,700	NS
IR28MW916A	VINYL CHLORIDE	0.5	25	110	NS	36	NS
IR28MW931A	VINYL CHLORIDE	0.5	25	21	NS	19	NS
IR28MW934A	VINYL CHLORIDE	0.5	25	12 J	NS	40	NS
Parcel C (RU-C2)							
IR28MW910A	1,4-DICHLOROBENZENE	2.1	21	3.1	NS	2.2	NS
IR58MW31A	1,4-DICHLOROBENZENE	2.1	21	4.9	NS	--	NS
RUC2MW1A	1,4-DICHLOROBENZENE	2.1	21	0.53 J	NS	6.1	NS
IR28MW941F	1,4-DICHLOROBENZENE	2.1	21	19	NS	18	NS
IR58MW31A	BENZENE	0.5	5	20	NS	3.8	NS
RUC2MW1A	BENZENE	0.5	5	--	NS	2.8	NS
IR28MW300F	BENZENE	0.5	5	--	NS	0.55	NS
IR28MW910A	BENZENE	0.5	5	7	NS	--	NS
IR28MW939F	BENZENE	0.5	5	--	NS	0.67	NS
IR28MW941F	BENZENE	0.5	5	3.2	NS	3	NS
IR28MW940F	CARBON TETRACHLORIDE	0.5	5	31	NS	35	NS
IR58MW31A	CHLOROBENZENE	390	3900	1,000	NS	--	NS
IR28MW939F	CHLOROFORM	0.7	7	0.77	NS	--	NS
IR28MW940F	CHLOROFORM	0.7	7	9.7	NS	10	NS
RUC2MW11A	TETRACHLOROETHENE	0.54	5.4	0.75	NS	1.4	NS
IR28MW939F	TRICHLOROETHENE	2.9	29	4.6	NS	4.2	NS
IR28MW941F	TRICHLOROETHENE	2.9	29	28	NS	21	NS
RUC2MW1A	VINYL CHLORIDE	0.5	25	0.55	NS	23	NS
IR28MW941F	VINYL CHLORIDE	0.5	25	49	NS	77	NS
Parcel C (RU-C4)							
RUC4MW004A	1,2-DICHLOROETHENE (TOTAL)	210	NA	NS	NS	210	--
RUC4MW005A	1,2-DICHLOROETHENE (TOTAL)	210	NA	NS	NS	43,000	22,100
RUC4MW006A	1,2-DICHLOROETHENE (TOTAL)	210	NA	NS	NS	--	760
IR28MW407	1,4-DICHLOROBENZENE	2.1	21	NS	NS	5.2	15
IR28MW211F	BENZENE	0.5	5	NS	NS	1.1	--
IR28MW407	BENZENE	0.5	5	NS	NS	0.84	1.6
RUC4MW005A	BENZENE	0.5	5	NS	NS	0.71	--
RUC4MW006A	BENZENE	0.5	5	NS	NS	1	2
RUC4MW007A	BENZENE	0.5	5	NS	NS	0.81	--
RUC4MW002A	CHLOROFORM	0.7	7	NS	NS	0.75	--
RUC4MW004A	CIS-1,2-DICHLOROETHENE	210	NA	NS	NS	210	--
RUC4MW005A	CIS-1,2-DICHLOROETHENE	210	NA	NS	NS	43,000	22,000
RUC4MW006A	CIS-1,2-DICHLOROETHENE	210	NA	NS	NS	--	750
IR28MW200A	TRICHLOROETHENE	2.9	29	11	NS	9.1	NS
IR28MW216F	TRICHLOROETHENE	2.9	29	NS	NS	4.2	--

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IR28MW566A	TRICHLOROETHENE	2.9	29	7.7	NS	--	NS
RUC4MW002A	TRICHLOROETHENE	2.9	29	NS	NS	46	43
RUC4MW004A	TRICHLOROETHENE	2.9	29	NS	NS	14	16
RUC4MW005A	TRICHLOROETHENE	2.9	29	NS	NS	320	2,600
RUC4MW006A	TRICHLOROETHENE	2.9	29	NS	NS	--	100
IR28MW211F	VINYL CHLORIDE	0.5	25	NS	NS	1.9	--
IR28MW216F	VINYL CHLORIDE	0.5	25	NS	NS	0.53	--
IR28MW405	VINYL CHLORIDE	0.5	25	NS	NS	8.5	NS
IR28MW407	VINYL CHLORIDE	0.5	25	NS	NS	2.6	4.3
IR28MW566A	VINYL CHLORIDE	0.5	25	0.53	NS	1.2	NS
RUC4MW001A	VINYL CHLORIDE	0.5	25	NS	NS	4.7	2.5
RUC4MW003A	VINYL CHLORIDE	0.5	25	NS	NS	0.62	--
RUC4MW004A	VINYL CHLORIDE	0.5	25	NS	NS	35	--
RUC4MW005A	VINYL CHLORIDE	0.5	25	NS	NS	9,800	2,800
RUC4MW006A	VINYL CHLORIDE	0.5	25	NS	NS	17	120
RUC4MW007A	VINYL CHLORIDE	0.5	25	NS	NS	2.3	--
Parcel C (RU-C5)							
IR25MW65B	IRON	10,950	NA	NS	13,100	12,600	NS
IR06MW67A	1,1-DICHLOROETHANE	6.5	NA	33	NS	32	NS
IR25MW65B	1,2-DICHLOROETHANE	0.5	NA	NS	--	2.7	NS
IR06MW67A	1,2-DICHLOROETHENE (TOTAL)	210	NA	2,400	NS	2,300	NS
IR25MW11A	1,4-DICHLOROBENZENE	2.1	21	NS	6.4	6.7	NS
IR25MW64A	1,4-DICHLOROBENZENE	2.1	21	NS	7.9 J	16	NS
IR25MW65B	1,4-DICHLOROBENZENE	2.1	21	NS	6.5	9.3	NS
IR25MW68A	1,4-DICHLOROBENZENE	2.1	21	NS	3.8	3.5	NS
IR25MW69A	1,4-DICHLOROBENZENE	2.1	21	NS	40	53	NS
IR06MW59A1	BENZENE	0.5	5	--	NS	0.82	NS
IR06MW67A	BENZENE	0.5	5	2.1	NS	2.7	NS
IR25MW16A	BENZENE	0.5	5	--	NS	2.2	NS
IR25MW74A	BENZENE	0.5	5	15	NS	6.5	NS
IR25MW11A	BENZENE	0.5	5	NS	0.58	0.56	NS
IR25MW64A	BENZENE	0.5	5	NS	11 J	30	NS
IR25MW65B	BENZENE	1	5	NS	58	96	NS
IR25MW69A	BENZENE	0.5	5	NS	12.0	18	NS
IR06MW67A	CIS-1,2-DICHLOROETHENE	210	NA	2,400	NS	2,300	NS
IR25MW64A	CHLOROBENZENE	390	3,900	NS	420	1,500	NS
IR25MW65B	CHLOROBENZENE	70	3,900	NS	3,200	4,200	NS
IR25MW69A	CHLOROBENZENE	390	3,900	NS	650	1,000	NS
IR06MW42A	NAPHTHALENE	3.6	NA	23	NS	34	NS
IR25MW64A	NAPHTHALENE	3.6	NA	NS	--	4.2	NS
IR25MW65B	NAPHTHALENE	0.093	NA	NS	17	24	NS

Table 5
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IR06MW46A	TETRACHLOROETHENE	0.54	5.4	3.8	NS	4.5	NS
IR06MW59A1	TETRACHLOROETHENE	0.54	5.4	0.66	NS	0.87	NS
IR06MW67A	TETRACHLOROETHENE	0.54	5.4	16	NS	12	NS
IR25MW64A	TETRACHLOROETHENE	0.54	5.4	NS	4.9 J	2.7	NS
IR25MW69A	TETRACHLOROETHENE	0.54	5.4	NS	22	31	NS
IR25MW72A	TETRACHLOROETHENE	0.54	5.4	0.62	NS	0.61	NS
IR06MW59A1	TRICHLOROETHENE	2.9	29	3.3	NS	3.1	NS
IR06MW67A	TRICHLOROETHENE	2.9	29	180	NS	150	NS
IR25MW69A	TRICHLOROETHENE	2.9	29	NS	7.6	11	NS
IR06MW22A	VINYL CHLORIDE	0.5	25	1.2	NS	6	NS
IR06MW32A	VINYL CHLORIDE	0.5	25	3.2	NS	1.8	NS
IR06MW40A	VINYL CHLORIDE	0.5	25	0.82	NS	1.1	NS
IR06MW59A1	VINYL CHLORIDE	0.5	25	11	NS	16	NS
IR06MW67A	VINYL CHLORIDE	0.5	25	470	NS	980	NS
IR25MW16A	VINYL CHLORIDE	0.5	25	--	NS	1.3	NS
IR25MW74A	VINYL CHLORIDE	0.5	25	0.62	NS	0.56	NS
IR25MW64A	VINYL CHLORIDE	0.5	25	NS	4.3	3.9	NS
IR25MW69A	VINYL CHLORIDE	0.5	25	NS	20	41	NS
Parcel D-1							
No Exceedances in Parcel D-1							
Parcel E							
IR02MW373A	COPPER	28	NA	971	NS	NS	NS
IR02MW126A	LEAD	14.4	NA	17.9	NS	NS	NS
IR02MW373A	LEAD	14.4	NA	33.7	NS	NS	NS
IR02MW373A	NICKEL	96.5	NA	927	NS	NS	NS
IR02MW373A	ZINC	81	NA	5,000	NS	NS	NS
Parcel E-2							
IR01MW403B	1,2-DICHLOROETHANE	0.5	NA	--	NS	0.65	NS
IR01MWI-9R-D	ARSENIC	10	NA	--	NS	10.8	NS
IR01MW38A	CYANIDE	10	NA	--	NS	12.9	NS
IR01MW62A	CYANIDE	10	NA	30	NS	24.8	NS
IR01MWI-9R	CYANIDE	10	NA	--	NS	10.5	NS
IR01MW09B	LEAD	14.4	NA	18.7	NS	--	NS
IR01MW31A	LEAD	14.4	NA	25.9	NS	--	NS
IR01MW403B	LEAD	14.4	NA	28.1	NS	--	NS
IR01MW53BR	LEAD	14.4	NA	22.6	NS	--	NS
IR01MW64A	LEAD	14.4	NA	26.8	NS	--	NS
IR01MW66A	LEAD	14.4	NA	18.0	NS	--	NS
IR01MWLF2A	LEAD	14.4	NA	19.8	NS	--	NS
IR76MW13A	LEAD	14.4	NA	24.6	NS	--	NS

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IR01MW48A	TPH-TOTAL	4,839	NA	--	NS	7,600 C	NS
IR01MW60A	TPH-TOTAL	4,839	NA	9,799 C	NS	12,545 C	NS
IR01MW64A	TPH-TOTAL	4,839	NA	6,692 C	NS	10,419 C	NS
IR01MW31A	UN-IONIZED AMMONIA(1)	25	NA	369	NS	--	NS
IR01MW38A	UN-IONIZED AMMONIA(1)	25	NA	151	NS	128	NS
IR01MW48A	UN-IONIZED AMMONIA(1)	25	NA	464	NS	376	NS
IR01MW60A	UN-IONIZED AMMONIA(1)	25	NA	39	NS	49	NS
IR01MWI-9R	UN-IONIZED AMMONIA(1)	25	NA	1,945	NS	894	NS
Parcel G							
IR33MW64A	CARBON TETRACHLORIDE	0.5	NA	2.1	NS	0.5	2.1
IR33MW64A	CHLOROFORM	1.0	NA	8.4	NS	--	8.4
Parcel UC-2							
IR06MW54FR	CARBON TETRACHLORIDE	0.5	NA	0.91	NS	0.76	0.91

Notes:
µg/L = micrograms per liter
C= Calculated
NA = Active Treatment Criteria values are only used for Parcel C remedial action and are not applicable for other Parcels at Hunters Point Naval Shipyard
NS = monitoring well not sampled
'-- = analytical result did not exceed PALs or ATCs
ATCs = active treatment criteria
PAL = project action limit
J= estimated
IR= Installation Restoration
Grey box = concentration exceeded both the Project Action Limit and the Active Treatement Criteria
(1) = Un-ionizd ammonia is a calculated amount using the pH, tempurature, and ammonia

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Appendix F
Radiological Review

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Comparison of Estimated Excess Cancer Risk Calculated with the USEPA Radionuclide PRG Calculator Using the Peak Risk Time Interval to those in the 2019 Five-Year Review.

Radionuclide of Concern	Soil Remediation Goals (pCi/g)[a]		Estimated Excess Cancer Risks	
	Outdoor Worker	Residential	Risk (2019 Five-Year Review)[b,d]	Risk Calculated Using the Peak Risk Time Interval[c,d,f]
Americium-241 (Am-241)	5.67	1.36	6.0E-07	6.0E-07
Cesium-137 (Cs-137)	0.113	0.113	2.0E-06	1.9E-06
Cobalt-60 (Co-60)	0.0602	0.0361	1.1E-06	1.1E-06
Europium-152 (Eu-152)	0.13	0.13	3.4E-06	3.4E-06
Europium-154 (Eu-154)	0.23	0.23	4.9E-06	4.9E-06
Plutonium-239 (Pu-239)	14	2.59	6.7E-07	6.7E-07
Radium-226 (Ra-226)	1	1.0	7.9E-05	7.8E-05
Strontium-90 (Sr-90)	10.8	0.331	7.9E-08	7.9E-08
Thallium-232 (Th-232)	2.7	1.69	1.7E-04	1.7E-04
Tritium (H-3)	4.23	2.28	9.6E-06	9.6E-06
Uranium-235 (U-235)	0.398	0.195	1.0E-06	1.1E-06
	Cumulative Risk[e]		2.7E-04	2.7E-04

[a] Table 1 of the 2019 Five-Year Review (Navy, 2019)

[b] Table 5 of the 2019 Five-Year Review (Navy, 2019)

[c] Cancer risk calculated using the "Peak Risk" time interval using the USEPA Radionuclides PRG Calculator (2023).

[d] Residential soil remediation goals are used as exposure point concentrations.

[e] Cumulative cancer risk is calculated summing risks from all radionuclides of concern.

[f] Consistent with the 2019 Five-Year Review, peak risk is calculated within the first 1,000 years peak time period.

pCi/g = picocurie(s) per gram

Sources:

Navy. 2019. *Fourth Five-Year Review, Hunters Point Naval Shipyard, San Francisco, California* . July.

United States Environmental Protection Agency (USEPA). 2020. Preliminary Remediation Goals for Radionuclides (PRG) Calculator. Updated July. https://epa-prgs.ornl.gov/cgi-bin/radionuclides/rprg_search.

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Table F-1. Site-specific Resident Soil Inputs

Variable	Resident Soil Default Value	Form-input Value
A (PEF Dispersion Constant)	16.2302	13.8139
B (PEF Dispersion Constant)	18.7762	20.1624
City (Climate Zone)	Default	San Francisco, CA (2
C (PEF Dispersion Constant)	216.108	234.2869
Cover thickness for GSF_o (gamma shielding factor) cm	0 cm	0 cm
Cover thickness for GSF_b (gamma shielding factor) cm	0 cm	0 cm
$CF_{res\text{-}produce}$ (contaminated plant fraction) unitless	1	1
$ED_{res\text{-}a}$ (produce exposure duration - resident adult) yr	20	20
$ED_{res\text{-}c}$ (produce exposure duration - resident child) yr	6	6
$EF_{res\text{-}a}$ (produce exposure frequency - resident adult) day/yr	350	350
$EF_{res\text{-}c}$ (produce exposure frequency - resident child) day/yr	350	350
TR (produce target cancer risk) unitless	0.000001	0.000001
F(x) (function dependent on U_m/U_t) unitless	0.194	0.0391
PEF (particulate emission factor) m^3/kg	1359344438	4078965032
Q/C_{wind} (g/m^2-s per kg/m^3)	93.77	32.35983268
A_s (acres)	0.5	420
Site area for ACF (area correction factor) m^2	1000000 m^2	1000000 m^2
ED_{res} (soil exposure duration - resident) yr	26	26
$ED_{res\text{-}a}$ (soil exposure duration - resident adult) yr	20	20
$ED_{res\text{-}c}$ (soil exposure duration - resident child) yr	6	6
EF_{res} (soil exposure frequency - resident) day/yr	350	350
$EF_{res\text{-}a}$ (soil exposure frequency - resident adult) day/yr	350	350
$EF_{res\text{-}c}$ (soil exposure frequency - resident child) day/yr	350	350
ET_{res} (soil exposure time - resident) hr/day	24	24
$ET_{res\text{-}a}$ (soil exposure time - resident adult) hr/day	24	24
$ET_{res\text{-}c}$ (soil exposure time - resident child) hr/day	24	24
$ET_{res\text{-}i}$ (soil exposure time - indoor resident) hr/day	16.416	16.416
$ET_{res\text{-}o}$ (soil exposure time - outdoor resident) hr/day	1.752	1.752
GSF_i (gamma shielding factor - indoor) unitless	0.4	0.4
$IFA_{res\text{-}adj}$ (age-adjusted soil inhalation factor - resident) m^3	161000	161000
$IFS_{res\text{-}adj}$ (age-adjusted soil ingestion factor - resident) mg	1120000	1120000
$IRA_{res\text{-}a}$ (soil inhalation rate - resident adult) m^3/day	20	20
$IRA_{res\text{-}c}$ (soil inhalation rate - resident child) m^3/day	10	10
$IRS_{res\text{-}a}$ (soil intake rate - resident adult) mg/day	100	100
$IRS_{res\text{-}c}$ (soil intake rate - resident child) mg/day	200	200
t_{res} (time - resident) yr	26	26
TR (target cancer risk) unitless	0.000001	0.000001
Soil type	Default	Default
U_m (mean annual wind speed) m/s	4.69	3.89
U_t (equivalent threshold value)	11.32	11.32
V (fraction of vegetative cover) unitless	0.5	0.5

Table F-2. Soil PRG Am-241

Resident Parent Risk and CDI at Time=T_0 Soil (no decay)

Isotope	ICRP Lung Absorption Type	Inhalation Slope Factor (risk/pCi)	External Exposure Slope Factor (risk/yr per pCi/g)	Food Ingestion Slope Factor (risk/pCi)	Soil Ingestion Slope Factor (risk/pCi)	Lambda (1/yr)	Half-life (yr)
Am-241	F	3.77E-08	2.77E-08	1.34E-10	1.84E-10	1.60E-03	4.32E+02

1000000 m^2 Soil Volume Area Correction Factor	0 cm Soil Volume Gamma Shielding Factor	Infinite Soil Volume Concentration (pCi/g)	Ingestion CDI (pCi)	Inhalation CDI (pCi)	External Exposure CDI (pCi-year/g)	Produce Consumption CDI (pCi)
1.00E+00	1.00E+00	1.36E+00	1.52E+03	5.37E-02	1.18E+01	-

Ingestion Risk	Inhalation Risk	External Exposure Risk	Produce Consumption Risk	Total Risk
2.81E-07	2.03E-09	3.25E-07	-	**6.08E-07**

Table F-3. Soil Peak Times Am-241

Resident Peak Risk Start Times (by route)

Soil

Peak Risk Start Time Ingestion (yrs)	Peak Risk Start Time Inhalation (yrs)	Peak Risk Start Time External Exposure (yrs)
1.00E-08	1.00E-08	1.00E-08

Table F-4. Soil Peak Risk Am-241

Resident Peak Risks
Soil (complete chain decay)
using the peak risk time intervals from PRG calculations (by route)

Isotope	Ingestion Concentration (pCi/g)	Inhalation Concentration (pCi/g)	External Exposure Concentration (pCi/g)	Produce Ingestion Concentration (pCi/g)	Ingestion Risk	Inhalation Risk	External Exposure Risk	Produce Consumption Risk	Total Risk
Am-241	1.36E+00	1.36E+00	1.36E+00	-	2.75E-07	1.98E-09	3.19E-07	-	**5.95E-07**
Np-237	0.00E+00	0.00E+00	0.00E+00	-	7.87E-13	6.38E-15	2.52E-12	-	**3.31E-12**
Pa-233	0.00E+00	0.00E+00	0.00E+00	-	1.03E-13	3.37E-18	3.88E-11	-	**3.89E-11**
U-233	0.00E+00	0.00E+00	0.00E+00	-	3.55E-17	2.35E-19	1.30E-18	-	**3.70E-17**
Th-229	0.00E+00	0.00E+00	0.00E+00	-	5.56E-20	8.90E-22	2.50E-19	-	**3.07E-19**
Ra-225	0.00E+00	0.00E+00	0.00E+00	-	3.47E-20	1.32E-22	6.75E-21	-	**4.16E-20**
Ac-225	0.00E+00	0.00E+00	0.00E+00	-	6.95E-20	1.43E-22	4.53E-20	-	**1.15E-19**
Fr-221	0.00E+00	0.00E+00	0.00E+00	-	0.00E+00	0.00E+00	1.15E-19	-	**1.15E-19**
At-217	0.00E+00	0.00E+00	0.00E+00	-	0.00E+00	0.00E+00	1.03E-21	-	**1.03E-21**
Bi-213	0.00E+00	0.00E+00	0.00E+00	-	1.70E-22	3.71E-25	5.96E-19	-	**5.96E-19**
Po-213	0.00E+00	0.00E+00	0.00E+00	-	0.00E+00	0.00E+00	1.86E-22	-	**1.86E-22**
Tl-209	0.00E+00	0.00E+00	0.00E+00	-	0.00E+00	0.00E+00	2.37E-19	-	**2.37E-19**
Pb-209	0.00E+00	0.00E+00	0.00E+00	-	8.90E-23	1.04E-27	5.31E-22	-	**6.20E-22**
Total Risk	**-**	**-**	**-**	**-**	***2.75E-07***	***1.98E-09***	***3.19E-07***	**-**	***5.95E-07***

Table F-5. Soil PRG Co-60

Resident Parent Risk and CDI at Time=T_0 Soil (no decay)

Isotope	ICRP Lung Absorption Type	Inhalation Slope Factor (risk/pCi)	External Exposure Slope Factor (risk/yr per pCi/g)	Food Ingestion Slope Factor (risk/pCi)	Soil Ingestion Slope Factor (risk/pCi)	Lambda (1/yr)	Half-life (yr)
Co-60	S	1.01E-10	1.24E-05	2.23E-11	3.81E-11	1.31E-01	5.27E+00

1000000 m^2 Soil Volume Area Correction Factor	0 cm Soil Volume Gamma Shielding Factor	Infinite Soil Volume Concentration (pCi/g)	Ingestion CDI (pCi)	Inhalation CDI (pCi)	External Exposure CDI (pCi-year/g)	Produce Consumption CDI (pCi)
1.00E+00	1.00E+00	3.61E-02	4.04E+01	1.42E-03	3.12E-01	-

Ingestion Risk	Inhalation Risk	External Exposure Risk	Produce Consumption Risk	Total Risk
1.54E-09	1.43E-13	3.86E-06	-	**3.86E-06**

Table F-6. Soil Peak Times Co-60

Resident Peak Risk Start Times (by route)

Soil

Peak Risk Start Time Ingestion (yrs)	Peak Risk Start Time Inhalation (yrs)	Peak Risk Start Time External Exposure (yrs)
1.00E-08	1.00E-08	1.00E-08

Table F-7. Soil Peak Risk Co-60

Resident Peak Risks
Soil (complete chain decay)
using the peak risk time intervals from PRG calculations (by route)

Isotope	Ingestion Concentration (pCi/g)	Inhalation Concentration (pCi/g)	External Exposure Concentration (pCi/g)	Produce Ingestion Concentration (pCi/g)	Ingestion Risk	Inhalation Risk	External Exposure Risk	Produce Consumption Risk	Total Risk
Co-60	3.61E-02	3.61E-02	3.61E-02	-	4.36E-10	4.06E-14	1.09E-06	-	**1.09E-06**
Total Risk	**-**	**-**	**-**	**-**	***4.36E-10***	***4.06E-14***	***1.09E-06***	**-**	***1.09E-06***

Table F-8. Soil PRG Cs-137

Resident Parent Risk and CDI at Time=T_0 Soil (no decay)

Isotope	ICRP Lung Absorption Type	Inhalation Slope Factor (risk/pCi)	External Exposure Slope Factor (risk/yr per pCi/g)	Food Ingestion Slope Factor (risk/pCi)	Soil Ingestion Slope Factor (risk/pCi)	Lambda (1/yr)	Half-life (yr)
Cs-137	S	1.12E-10	5.52E-10	3.74E-11	4.26E-11	2.30E-02	3.02E+01

1000000 m^2 Soil Volume Area Correction Factor	0 cm Soil Volume Gamma Shielding Factor	Infinite Soil Volume Concentration (pCi/g)	Ingestion CDI (pCi)	Inhalation CDI (pCi)	External Exposure CDI (pCi-year/g)	Produce Consumption CDI (pCi)
1.00E+00	1.00E+00	1.13E-01	1.27E+02	4.46E-03	9.76E-01	-

Ingestion Risk	Inhalation Risk	External Exposure Risk	Produce Consumption Risk	Total Risk
5.39E-09	5.02E-13	5.39E-10	-	**5.92E-09**

Table F-9. Soil Peak Times Cs-137

Resident Peak Risk Start Times (by route)

Soil

Peak Risk Start Time Ingestion (yrs)	Peak Risk Start Time Inhalation (yrs)	Peak Risk Start Time External Exposure (yrs)
1.00E-08	1.00E-08	1.00E-08

Table F-10. Soil peak Risk Cs-137

Resident Peak Risks
Soil (complete chain decay)
using the peak risk time intervals from PRG calculations (by route)

Isotope	Ingestion Concentration (pCi/g)	Inhalation Concentration (pCi/g)	External Exposure Concentration (pCi/g)	Produce Ingestion Concentration (pCi/g)	Ingestion Risk	Inhalation Risk	External Exposure Risk	Produce Consumption Risk	Total Risk
Cs-137	1.13E-01	1.13E-01	1.13E-01	-	4.05E-09	3.78E-13	4.06E-10	-	**4.46E-09**
Ba-137m	0.00E+00	0.00E+00	0.00E+00	-	0.00E+00	0.00E+00	1.86E-06	-	**1.86E-06**
Total Risk	**-**	**-**	**-**	**-**	***4.05E-09***	***3.78E-13***	***1.86E-06***	**-**	***1.87E-06***

Table F-11. Soil PRG Eu-152

Resident Parent Risk and CDI at Time=T_0 Soil (no decay)

Isotope	ICRP Lung Absorption Type	Inhalation Slope Factor (risk/pCi)	External Exposure Slope Factor (risk/yr per pCi/g)	Food Ingestion Slope Factor (risk/pCi)	Soil Ingestion Slope Factor (risk/pCi)	Lambda (1/yr)	Half-life (yr)
Eu-152	F	1.91E-10	5.41E-06	8.33E-12	1.46E-11	5.12E-02	1.35E+01

1000000 m^2 Soil Volume Area Correction Factor	0 cm Soil Volume Gamma Shielding Factor	Infinite Soil Volume Concentration (pCi/g)	Ingestion CDI (pCi)	Inhalation CDI (pCi)	External Exposure CDI (pCi-year/g)	Produce Consumption CDI (pCi)
1.00E+00	1.00E+00	1.30E-01	1.46E+02	5.13E-03	1.12E+00	-

Ingestion Risk	Inhalation Risk	External Exposure Risk	Produce Consumption Risk	Total Risk
2.12E-09	9.82E-13	6.07E-06	-	**6.08E-06**

Table F-12. Soil Peak Times Eu-152

Resident Peak Risk Start Times (by route)

Soil

Peak Risk Start Time Ingestion (yrs)	Peak Risk Start Time Inhalation (yrs)	Peak Risk Start Time External Exposure (yrs)
1.00E-08	1.00E-08	1.00E-08

Table F-13. Soil Peak Risk Eu-152

Resident Peak Risks
Soil (complete chain decay)
using the peak risk time intervals from PRG calculations (by route)

Isotope	Ingestion Concentration (pCi/g)	Inhalation Concentration (pCi/g)	External Exposure Concentration (pCi/g)	Produce Ingestion Concentration (pCi/g)	Ingestion Risk	Inhalation Risk	External Exposure Risk	Produce Consumption Risk	Total Risk
Eu-152	1.30E-01	1.30E-01	1.30E-01	-	1.17E-09	5.43E-13	3.36E-06	-	**3.36E-06**
Gd-152	0.00E+00	0.00E+00	0.00E+00	-	1.25E-22	7.30E-25	0.00E+00	-	**1.25E-22**
Sm-148	0.00E+00	0.00E+00	0.00E+00	-	1.20E-37	8.21E-40	0.00E+00	-	**1.21E-37**
Nd-144	0.00E+00	0.00E+00	0.00E+00	-	0.00E+00	0.00E+00	0.00E+00	-	**0.00E+00**
Total Risk	**-**	**-**	**-**	**-**	***1.17E-09***	***5.43E-13***	***3.36E-06***	**-**	***3.36E-06***

Table F-14. PRG Eu-154

Resident Parent Risk and CDI at Time=T_0 Soil (no decay)

Isotope	ICRP Lung Absorption Type	Inhalation Slope Factor (risk/pCi)	External Exposure Slope Factor (risk/yr per pCi/g)	Food Ingestion Slope Factor (risk/pCi)	Soil Ingestion Slope Factor (risk/pCi)	Lambda (1/yr)	Half-life (yr)
Eu-154	F	2.06E-10	5.85E-06	1.42E-11	2.54E-11	8.06E-02	8.59E+00

1000000 m^2 Soil Volume Area Correction Factor	0 cm Soil Volume Gamma Shielding Factor	Infinite Soil Volume Concentration (pCi/g)	Ingestion CDI (pCi)	Inhalation CDI (pCi)	External Exposure CDI (pCi-year/g)	Produce Consumption CDI (pCi)
1.00E+00	1.00E+00	2.30E-01	2.58E+02	9.08E-03	1.99E+00	-

Ingestion Risk	Inhalation Risk	External Exposure Risk	Produce Consumption Risk	Total Risk
6.54E-09	1.87E-12	1.16E-05	-	**1.16E-05**

Table F-15. Soil Peak Times Eu-154

Resident Peak Risk Start Times (by route)

Soil

Peak Risk Start Time Ingestion (yrs)	Peak Risk Start Time Inhalation (yrs)	Peak Risk Start Time External Exposure (yrs)
1.00E-08	1.00E-08	1.00E-08

Table F-16. Soil Peak Risk Eu-154

Resident Peak Risks
Soil (complete chain decay)
using the peak risk time intervals from PRG calculations (by route)

Isotope	Ingestion Concentration (pCi/g)	Inhalation Concentration (pCi/g)	External Exposure Concentration (pCi/g)	Produce Ingestion Concentration (pCi/g)	Ingestion Risk	Inhalation Risk	External Exposure Risk	Produce Consumption Risk	Total Risk
Eu-154	2.30E-01	2.30E-01	2.30E-01	-	2.74E-09	7.83E-13	4.86E-06	-	**4.87E-06**
Total Risk	**-**	**-**	**-**	**-**	***2.74E-09***	***7.83E-13***	***4.86E-06***	**-**	***4.87E-06***

Table F-17. Soil PRG H-3

Resident Parent Risk and CDI at Time=T_0 Soil (no decay)

Isotope	ICRP Lung Absorption Type	Inhalation Slope Factor (risk/pCi)	External Exposure Slope Factor (risk/yr per pCi/g)	Food Ingestion Slope Factor (risk/pCi)	Soil Ingestion Slope Factor (risk/pCi)	Lambda (1/yr)	Half-life (yr)
H-3	S	8.47E-13	0.00E+00	1.44E-13	8.99E-14	5.63E-02	1.23E+01

1000000 m^2 Soil Volume Area Correction Factor	0 cm Soil Volume Gamma Shielding Factor	Infinite Soil Volume Concentration (pCi/g)	Ingestion CDI (pCi)	Inhalation CDI (pCi)	External Exposure CDI (pCi-year/g)	Produce Consumption CDI (pCi)
9.00E-01	1.00E+00	2.28E+00	2.55E+03	2.16E+07	1.77E+01	-

Ingestion Risk	Inhalation Risk	External Exposure Risk	Produce Consumption Risk	Total Risk
2.30E-10	1.83E-05	0.00E+00	-	**1.83E-05**

Table F-18. Soil Peak times H-3

Resident Peak Risk Start Times (by route)
Soil

Peak Risk Start Time Ingestion (yrs)	Peak Risk Start Time Inhalation (yrs)
1.00E-08	1.00E-08

Table F-19. Soil Peak Risk H-3

Resident Peak Risks
Soil (complete chain decay)
using the peak risk time intervals from PRG calculations (by route)

Isotope	Ingestion Concentration (pCi/g)	Inhalation Concentration (pCi/g)	External Exposure Concentration (pCi/g)	Produce Ingestion Concentration (pCi/g)	Ingestion Risk	Inhalation Risk	External Exposure Risk	Produce Consumption Risk	Total Risk
H-3	2.28E+00	2.28E+00	-	-	1.21E-10	9.61E-06	-	-	**9.61E-06**
Total Risk	***-***	***-***	***-***	***-***	***1.21E-10***	***9.61E-06***	***-***	***-***	***9.61E-06***

Table F-20. Soil PRG Pu239

Resident Parent Risk and CDI at Time=T_0 Soil (no decay)

Isotope	ICRP Lung Absorption Type	Inhalation Slope Factor (risk/pCi)	External Exposure Slope Factor (risk/yr per pCi/g)	Food Ingestion Slope Factor (risk/pCi)	Soil Ingestion Slope Factor (risk/pCi)	Lambda (1/yr)	Half-life (yr)
Pu-239	F	5.55E-08	2.09E-10	1.74E-10	2.28E-10	2.87E-05	2.41E+04

1000000 m^2 Soil Volume Area Correction Factor	0 cm Soil Volume Gamma Shielding Factor	Infinite Soil Volume Concentration (pCi/g)	Ingestion CDI (pCi)	Inhalation CDI (pCi)	External Exposure CDI (pCi-year/g)	Produce Consumption CDI (pCi)
1.00E+00	1.00E+00	2.59E+00	2.90E+03	1.02E-01	2.24E+01	-

Ingestion Risk	Inhalation Risk	External Exposure Risk	Produce Consumption Risk	Total Risk
6.61E-07	5.67E-09	4.68E-09	-	**6.72E-07**

Table F-21. Soil Peak Times Pu-239

Resident Peak Risk Start Times (by route)

Soil

Peak Risk Start Time Ingestion (yrs)	Peak Risk Start Time Inhalation (yrs)	Peak Risk Start Time External Exposure (yrs)
1.00E-08	1.00E-08	1.00E-08

Table F-22. Soil Peak Risk Pu-239

Resident Peak Risks
Soil (complete chain decay)
using the peak risk time intervals from PRG calculations (by route)

Isotope	Ingestion Concentration (pCi/g)	Inhalation Concentration (pCi/g)	External Exposure Concentration (pCi/g)	Produce Ingestion Concentration (pCi/g)	Ingestion Risk	Inhalation Risk	External Exposure Risk	Produce Consumption Risk	Total Risk
Pu-239	2.59E+00	2.59E+00	2.59E+00	-	6.61E-07	5.67E-09	4.68E-09	-	**6.71E-07**
U-235m	0.00E+00	0.00E+00	0.00E+00	-	4.78E-14	1.91E-19	0.00E+00	-	**4.78E-14**
U-235	0.00E+00	0.00E+00	0.00E+00	-	5.48E-15	3.27E-17	1.58E-13	-	**1.63E-13**
Th-231	0.00E+00	0.00E+00	0.00E+00	-	2.21E-16	1.96E-21	7.12E-15	-	**7.34E-15**
Pa-231	0.00E+00	0.00E+00	0.00E+00	-	2.03E-18	1.83E-20	6.68E-18	-	**8.72E-18**
Ac-227	0.00E+00	0.00E+00	0.00E+00	-	3.49E-19	6.34E-21	1.84E-21	-	**3.57E-19**
Th-227	0.00E+00	0.00E+00	0.00E+00	-	1.51E-19	1.45E-21	4.03E-18	-	**4.18E-18**
Fr-223	0.00E+00	0.00E+00	0.00E+00	-	2.81E-22	2.38E-26	1.73E-20	-	**1.76E-20**
Ra-223	0.00E+00	0.00E+00	0.00E+00	-	7.08E-19	1.22E-21	4.15E-18	-	**4.86E-18**
At-219	0.00E+00	0.00E+00	0.00E+00	-	0.00E+00	0.00E+00	0.00E+00	-	**0.00E+00**
Rn-219	0.00E+00	0.00E+00	0.00E+00	-	0.00E+00	0.00E+00	2.14E-18	-	**2.14E-18**
Bi-215	0.00E+00	0.00E+00	0.00E+00	-	0.00E+00	0.00E+00	8.08E-24	-	**8.08E-24**
Po-215	0.00E+00	0.00E+00	0.00E+00	-	0.00E+00	0.00E+00	6.83E-21	-	**6.83E-21**
Pb-211	0.00E+00	0.00E+00	0.00E+00	-	1.13E-21	1.68E-24	2.65E-18	-	**2.65E-18**
Bi-211	0.00E+00	0.00E+00	0.00E+00	-	0.00E+00	0.00E+00	1.74E-18	-	**1.74E-18**
Po-211	0.00E+00	0.00E+00	0.00E+00	-	0.00E+00	0.00E+00	9.46E-22	-	**9.46E-22**
Tl-207	0.00E+00	0.00E+00	0.00E+00	-	0.00E+00	0.00E+00	1.44E-19	-	**1.44E-19**
Total Risk	**-**	**-**	**-**	**-**	***6.61E-07***	***5.67E-09***	***4.68E-09***	**-**	***6.71E-07***

Table F-23. Soil PRG Ra-226

Resident Parent Risk and CDI at Time=T_0 Soil (no decay)

Isotope	ICRP Lung Absorption Type	Inhalation Slope Factor (risk/pCi)	External Exposure Slope Factor (risk/yr per pCi/g)	Food Ingestion Slope Factor (risk/pCi)	Soil Ingestion Slope Factor (risk/pCi)	Lambda (1/yr)	Half-life (yr)
Ra-226	S	2.82E-08	2.50E-08	5.14E-10	6.77E-10	4.33E-04	1.60E+03

1000000 m^2 Soil Volume Area Correction Factor	0 cm Soil Volume Gamma Shielding Factor	Infinite Soil Volume Concentration (pCi/g)	Ingestion CDI (pCi)	Inhalation CDI (pCi)	External Exposure CDI (pCi-year/g)	Produce Consumption CDI (pCi)
1.00E+00	1.00E+00	1.00E+00	1.12E+03	3.95E-02	8.64E+00	-

Ingestion Risk	Inhalation Risk	External Exposure Risk	Produce Consumption Risk	Total Risk
7.58E-07	1.11E-09	2.16E-07	-	**9.75E-07**

Table F-24. Soil Peak Times Ra-226

Resident Peak Risk Start Times (by route)

Soil

Peak Risk Start Time Ingestion (yrs)	Peak Risk Start Time Inhalation (yrs)	Peak Risk Start Time External Exposure (yrs)
1.23E+02	1.06E+02	6.82E-02

Table F-25. Soil Peak Risk Ra-226

Resident Peak Risks
Soil (complete chain decay)
using the peak risk time intervals from PRG calculations (by route)

Isotope	Ingestion Concentration (pCi/g)	Inhalation Concentration (pCi/g)	External Exposure Concentration (pCi/g)	Produce Ingestion Concentration (pCi/g)	Ingestion Risk	Inhalation Risk	External Exposure Risk	Produce Consumption Risk	Total Risk
Ra-226	9.48E-01	9.55E-01	1.00E+00	-	7.15E-07	1.06E-09	2.15E-07	-	**9.31E-07**
Rn-222	9.48E-01	9.55E-01	9.89E-01	-	0.00E+00	8.55E-14	1.45E-08	-	**1.45E-08**
Po-218	9.48E-01	9.55E-01	9.89E-01	-	0.00E+00	5.21E-13	5.29E-14	-	**5.74E-13**
At-218	1.90E-04	1.91E-04	1.98E-04	-	0.00E+00	0.00E+00	4.24E-14	-	**4.24E-14**
Rn-218	1.90E-07	1.91E-07	1.98E-07	-	0.00E+00	0.00E+00	5.82E-15	-	**5.82E-15**
Pb-214	9.48E-01	9.55E-01	9.89E-01	-	8.36E-10	2.91E-12	8.54E-06	-	**8.54E-06**
Bi-214	9.48E-01	9.55E-01	9.89E-01	-	4.26E-10	2.32E-12	6.31E-05	-	**6.31E-05**
Po-214	9.48E-01	9.55E-01	9.89E-01	-	0.00E+00	0.00E+00	3.31E-09	-	**3.31E-09**
Tl-210	1.99E-04	2.01E-04	2.08E-04	-	0.00E+00	0.00E+00	2.42E-08	-	**2.42E-08**
Pb-210	9.40E-01	9.32E-01	1.66E-03	-	1.81E-06	5.87E-10	4.04E-09	-	**1.81E-06**
Bi-210	9.40E-01	9.32E-01	1.10E-03	-	2.53E-08	1.68E-11	7.52E-09	-	**3.28E-08**
Po-210	9.40E-01	9.31E-01	4.50E-05	-	3.45E-06	5.37E-10	1.18E-10	-	**3.45E-06**
Hg-206	1.79E-08	1.77E-08	3.14E-11	-	0.00E+00	0.00E+00	2.50E-14	-	**2.50E-14**
Tl-206	1.26E-06	1.25E-06	1.48E-09	-	0.00E+00	0.00E+00	2.22E-14	-	**2.22E-14**
Total Risk	**-**	**-**	**-**	**-**	***6.00E-06***	***2.20E-09***	***7.19E-05***	**-**	***7.79E-05***

Table F-26. Soil PRG Sr-90

Resident Parent Risk and CDI at Time=T_0 Soil (no decay)

Isotope	ICRP Lung Absorption Type	Inhalation Slope Factor (risk/pCi)	External Exposure Slope Factor (risk/yr per pCi/g)	Food Ingestion Slope Factor (risk/pCi)	Soil Ingestion Slope Factor (risk/pCi)	Lambda (1/yr)	Half-life (yr)
Sr-90	S	4.26E-10	4.83E-10	6.88E-11	8.62E-11	2.41E-02	2.88E+01

1000000 m^2 Soil Volume Area Correction Factor	0 cm Soil Volume Gamma Shielding Factor	Infinite Soil Volume Concentration (pCi/g)	Ingestion CDI (pCi)	Inhalation CDI (pCi)	External Exposure CDI (pCi-year/g)	Produce Consumption CDI (pCi)
9.00E-01	1.00E+00	3.31E-01	3.71E+02	1.31E-02	2.57E+00	-

Ingestion Risk	Inhalation Risk	External Exposure Risk	Produce Consumption Risk	Total Risk
3.20E-08	5.56E-12	1.24E-09	-	**3.32E-08**

Table F-27. Soil Peak Times Sr-90

Resident Peak Risk Start Times (by route)
Soil

Peak Risk Start Time Ingestion (yrs)	Peak Risk Start Time Inhalation (yrs)	Peak Risk Start Time External Exposure (yrs)
1.00E-08	1.00E-08	1.00E-08

Table F-28. Soil Peak Risk Sr-90

Resident Peak Risks
Soil (complete chain decay)
using the peak risk time intervals from PRG calculations (by route)

Isotope	Ingestion Concentration (pCi/g)	Inhalation Concentration (pCi/g)	External Exposure Concentration (pCi/g)	Produce Ingestion Concentration (pCi/g)	Ingestion Risk	Inhalation Risk	External Exposure Risk	Produce Consumption Risk	Total Risk
Sr-90	3.31E-01	3.31E-01	3.31E-01	-	2.38E-08	4.13E-12	9.25E-10	-	**2.47E-08**
Y-90	0.00E+00	0.00E+00	0.00E+00	-	1.36E-08	8.15E-14	4.05E-08	-	**5.40E-08**
Total Risk	**-**	**-**	**-**	**-**	***3.73E-08***	***4.21E-12***	***4.14E-08***	**-**	***7.87E-08***

Table F-29. Soil PRG Th-232

Resident Parent Risk and CDI at Time=T_0 Soil (no decay)

Isotope	ICRP Lung Absorption Type	Inhalation Slope Factor (risk/pCi)	External Exposure Slope Factor (risk/yr per pCi/g)	Food Ingestion Slope Factor (risk/pCi)	Soil Ingestion Slope Factor (risk/pCi)	Lambda (1/yr)	Half-life (yr)
Th-232	S	4.33E-08	3.58E-10	1.33E-10	1.84E-10	4.93E-11	1.41E+10

1000000 m^2 Soil Volume Area Correction Factor	0 cm Soil Volume Gamma Shielding Factor	Infinite Soil Volume Concentration (pCi/g)	Ingestion CDI (pCi)	Inhalation CDI (pCi)	External Exposure CDI (pCi-year/g)	Produce Consumption CDI (pCi)
1.00E+00	1.00E+00	1.69E+00	1.89E+03	6.67E-02	1.46E+01	-

Ingestion Risk	Inhalation Risk	External Exposure Risk	Produce Consumption Risk	Total Risk
3.48E-07	2.89E-09	5.23E-09	-	**3.56E-07**

Table F-30. Soil Peak Times Th-232

Resident Peak Risk Start Times (by route)

Soil

Peak Risk Start Time Ingestion (yrs)	Peak Risk Start Time Inhalation (yrs)	Peak Risk Start Time External Exposure (yrs)
1.69E+02	1.69E+02	1.70E+02

Table F-31. Soil Peak Risk Th-232

Resident Peak Risks
Soil (complete chain decay)
using the peak risk time intervals from PRG calculations (by route)

Isotope	Ingestion Concentration (pCi/g)	Inhalation Concentration (pCi/g)	External Exposure Concentration (pCi/g)	Produce Ingestion Concentration (pCi/g)	Ingestion Risk	Inhalation Risk	External Exposure Risk	Produce Consumption Risk	Total Risk
Th-232	1.69E+00	1.69E+00	1.69E+00	-	3.48E-07	2.89E-09	5.23E-09	-	**3.56E-07**
Ra-228	1.69E+00	1.69E+00	1.69E+00	-	3.75E-06	2.91E-09	5.01E-10	-	**3.75E-06**
Ac-228	1.69E+00	1.69E+00	1.69E+00	-	9.31E-09	3.28E-12	5.90E-05	-	**5.90E-05**
Th-228	1.69E+00	1.69E+00	1.69E+00	-	4.60E-07	8.84E-09	8.24E-08	-	**5.51E-07**
Ra-224	1.69E+00	1.69E+00	1.69E+00	-	8.05E-07	7.55E-10	5.71E-07	-	**1.38E-06**
Rn-220	1.69E+00	1.69E+00	1.69E+00	-	0.00E+00	7.67E-14	4.04E-08	-	**4.04E-08**
Po-216	1.69E+00	1.69E+00	1.69E+00	-	0.00E+00	0.00E+00	1.04E-09	-	**1.04E-09**
Pb-212	1.69E+00	1.69E+00	1.69E+00	-	1.20E-07	4.20E-11	7.25E-06	-	**7.37E-06**
Bi-212	1.69E+00	1.69E+00	1.69E+00	-	3.18E-09	7.54E-12	7.25E-06	-	**7.25E-06**
Po-212	1.08E+00	1.08E+00	1.08E+00	-	0.00E+00	0.00E+00	0.00E+00	-	**0.00E+00**
Tl-208	6.07E-01	6.07E-01	6.07E-01	-	0.00E+00	0.00E+00	9.19E-05	-	**9.19E-05**
Total Risk	**-**	**-**	**-**	**-**	***5.49E-06***	***1.54E-08***	***1.66E-04***	**-**	***1.72E-04***

Table F-32. Soil PRG U-235

Resident Parent Risk and CDI at Time=T_0 Soil (no decay)

Isotope	ICRP Lung Absorption Type	Inhalation Slope Factor (risk/pCi)	External Exposure Slope Factor (risk/yr per pCi/g)	Food Ingestion Slope Factor (risk/pCi)	Soil Ingestion Slope Factor (risk/pCi)	Lambda (1/yr)	Half-life (yr)
U-235	S	2.50E-08	5.51E-07	9.44E-11	1.48E-10	9.84E-10	7.04E+08

1000000 m^2 Soil Volume Area Correction Factor	0 cm Soil Volume Gamma Shielding Factor	Infinite Soil Volume Concentration (pCi/g)	Ingestion CDI (pCi)	Inhalation CDI (pCi)	External Exposure CDI (pCi-year/g)	Produce Consumption CDI (pCi)
1.00E+00	1.00E+00	1.95E-01	2.18E+02	7.70E-03	1.69E+00	-

Ingestion Risk	Inhalation Risk	External Exposure Risk	Produce Consumption Risk	Total Risk
3.22E-08	1.93E-10	9.29E-07	-	**9.61E-07**

Table F-33. Soil Peak Times U-235

Resident Peak Risk Start Times (by route)

Soil

Peak Risk Start Time Ingestion (yrs)	Peak Risk Start Time Inhalation (yrs)	Peak Risk Start Time External Exposure (yrs)
9.74E+02	9.74E+02	9.74E+02

Table F-34. Soil Peak Risk U-235

Resident Peak Risks
Soil (complete chain decay)
using the peak risk time intervals from PRG calculations (by route)

Isotope	Ingestion Concentration (pCi/g)	Inhalation Concentration (pCi/g)	External Exposure Concentration (pCi/g)	Produce Ingestion Concentration (pCi/g)	Ingestion Risk	Inhalation Risk	External Exposure Risk	Produce Consumption Risk	Total Risk
U-235	1.95E-01	1.95E-01	1.95E-01	-	3.22E-08	1.93E-10	9.29E-07	-	**9.61E-07**
Th-231	1.95E-01	1.95E-01	1.95E-01	-	1.30E-09	1.16E-14	4.19E-08	-	**4.32E-08**
Pa-231	3.98E-03	3.98E-03	3.98E-03	-	1.34E-09	1.21E-11	4.43E-09	-	**5.79E-09**
Ac-227	3.85E-03	3.85E-03	3.85E-03	-	1.27E-09	2.30E-11	6.69E-12	-	**1.30E-09**
Th-227	3.80E-03	3.80E-03	3.80E-03	-	5.55E-10	5.32E-12	1.48E-08	-	**1.54E-08**
Fr-223	5.31E-05	5.31E-05	5.31E-05	-	1.02E-12	8.65E-17	6.30E-11	-	**6.40E-11**
Ra-223	3.85E-03	3.85E-03	3.85E-03	-	2.62E-09	4.50E-12	1.54E-08	-	**1.80E-08**
At-219	3.19E-09	3.19E-09	3.19E-09	-	0.00E+00	0.00E+00	0.00E+00	-	**0.00E+00**
Rn-219	3.85E-03	3.85E-03	3.85E-03	-	0.00E+00	0.00E+00	7.91E-09	-	**7.91E-09**
Bi-215	3.09E-09	3.09E-09	3.09E-09	-	0.00E+00	0.00E+00	2.93E-14	-	**2.93E-14**
Po-215	3.85E-03	3.85E-03	3.85E-03	-	0.00E+00	0.00E+00	2.52E-11	-	**2.52E-11**
Pb-211	3.85E-03	3.85E-03	3.85E-03	-	4.17E-12	6.21E-15	9.80E-09	-	**9.81E-09**
Bi-211	3.85E-03	3.85E-03	3.85E-03	-	0.00E+00	0.00E+00	6.42E-09	-	**6.42E-09**
Po-211	1.06E-05	1.06E-05	1.06E-05	-	0.00E+00	0.00E+00	3.50E-12	-	**3.50E-12**
Tl-207	3.84E-03	3.84E-03	3.84E-03	-	0.00E+00	0.00E+00	5.34E-10	-	**5.34E-10**
Total Risk	**-**	**-**	**-**	**-**	***3.93E-08***	***2.37E-10***	***1.03E-06***	**-**	***1.07E-06***

Appendix G
A-Aquifer Groundwater Figures from Site Inspection for Basewide Investigation of PFAS (DCN: LBJV-5006-4496-0034)

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Appendix G Index

- Figure 9. Groundwater Sampling Locations and Analytical Results, AOI 92, Parcel B-1, "A" Zone Groundwater
- Figure 10. Groundwater Sampling Locations and Analytical Results, AOI 93, Parcel B-2, "A" Zone Groundwater
- Figure 11. Groundwater Sampling Locations and Analytical Results, AOI 94, Parcel C, "A" Zone Groundwater
- Figure 12. Groundwater Sampling Locations and Analytical Results, AOI 95, Parcel D-1, "A" Zone Groundwater
- Figure 13. Groundwater Sampling Locations and Results, AOI 96, Parcel E, "A" Zone Groundwater
- Figure 14. Groundwater Sampling Locations and Results, AOI 97 and Off-Base Locations, Parcel E-2, "A" Zone Groundwater
- Figure 15. Groundwater Sampling Locations and Results, AOI 98, Parcel G, "A" Zone Groundwater

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IR07MW20A1										
Sample Depth (feet)	Sample Date	Units	PFOA	PFOS	PFBA	PFBS	PFNA	PFHxA	PFHxS	HFPO-DA
Groundwater	3/20/2023	µg/L	**0.0087**	**0.016 J**	**0.0092**	**0.0027**	**0.00025 J**	**0.016**	**0.0093**	0.0039 U
Groundwater DUP			**0.0067 J**	**0.011 J**	**0.0097 J**	**0.0023 J**	0.00089 U	**0.014 J**	**0.0079 J**	0.0035 U

UT03MW16A										
Sample Depth (feet)	Sample Date	Units	PFOA	PFOS	PFBA	PFBS	PFNA	PFHxA	PFHxS	HFPO-DA
Groundwater	3/27/2023	µg/L	**0.0014**	**0.0029**	**0.0078**	**0.00067 J**	**0.00051 J**	**0.0013**	**0.0013**	0.0040 U

IR61MW05A										
Sample Depth (feet)	Sample Date	Units	PFOA	PFOS	PFBA	PFBS	PFNA	PFHxA	PFHxS	HFPO-DA
Groundwater	3/20/2023	µg/L	0.00099 U	**0.00027 J**	0.0039 U	**0.0012**	0.00099 U	**0.00034 J**	**0.00063 J**	0.0039 U
Groundwater DUP			0.00096 U	**0.00025 J**	0.0039 U	**0.0012**	0.00096 U	**0.00056 J**	**0.00074 J**	0.0039 U

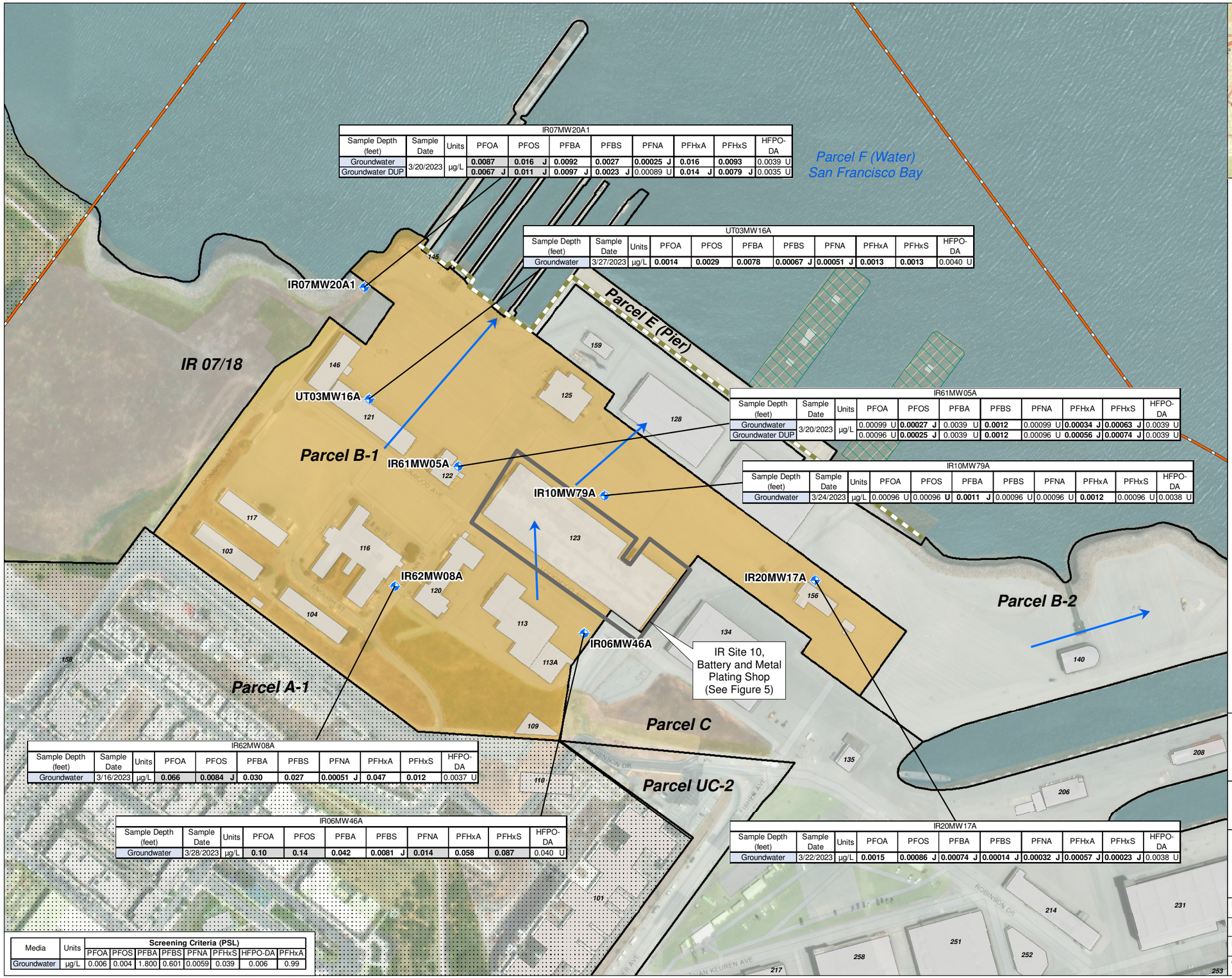
IR10MW79A										
Sample Depth (feet)	Sample Date	Units	PFOA	PFOS	PFBA	PFBS	PFNA	PFHxA	PFHxS	HFPO-DA
Groundwater	3/24/2023	µg/L	0.00096 U	0.00096 U	**0.0011 J**	0.00096 U	0.00096 U	**0.0012**	0.00096 U	0.0038 U

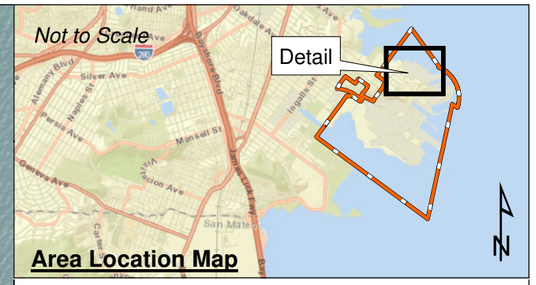
IR62MW08A										
Sample Depth (feet)	Sample Date	Units	PFOA	PFOS	PFBA	PFBS	PFNA	PFHxA	PFHxS	HFPO-DA
Groundwater	3/16/2023	µg/L	**0.066**	**0.0084 J**	**0.030**	**0.027**	**0.00051 J**	**0.047**	**0.012**	0.0037 U

IR06MW46A										
Sample Depth (feet)	Sample Date	Units	PFOA	PFOS	PFBA	PFBS	PFNA	PFHxA	PFHxS	HFPO-DA
Groundwater	3/28/2023	µg/L	**0.10**	**0.14**	**0.042**	**0.0081 J**	**0.014**	**0.058**	**0.087**	0.040 U

IR20MW17A										
Sample Depth (feet)	Sample Date	Units	PFOA	PFOS	PFBA	PFBS	PFNA	PFHxA	PFHxS	HFPO-DA
Groundwater	3/22/2023	µg/L	**0.0015**	**0.00086 J**	**0.00074 J**	**0.00014 J**	**0.00032 J**	**0.00057 J**	**0.00023 J**	0.0038 U

Media	Units	Screening Criteria (PSL)							
		PFOA	PFOS	PFBA	PFBS	PFNA	PFHxS	HFPO-DA	PFHxA
Groundwater	µg/L	0.006	0.004	1.800	0.601	0.0059	0.039	0.006	0.99





Legend

- Existing Monitoring Well Sampled for PFAS
- PFAS AOI 92, Parcel B-1 "A" Zone Groundwater
- Approximate Groundwater Flow Direction
- Parcel B seawall
- Potential PFAS Source Area AOI
- Parcel Boundary
- Buildings
- Demolished Piers
- Non-Navy Property
- Former HPNS Boundary

Notes:
Groundwater results reported in µg/L
Bold = analyte detected in sample above the detection limit
Shaded results exceed the screening criteria (PSL)

µg/L = micrograms per liter
AOI = Area of Interest
HFPO-DA = hexafluoropropylene oxide dimer acid
HPNS = Hunters Point Naval Shipyard
IR = Installation Restoration
J = estimated value
PFAS = Per- and Polyfluoroalkyl Substances
PFBA = perfluorobutanoic acid
PFBS = perfluorobutanesulfonic acid
PFHxA = perfluorohexanoic Acid
PFHxS = perfluorohexanesulfonic acid
PFOA = perfluorooctanoic acid
PFOS = perfluorooctane sulfonic acid
PFNA = perfluorononanoic acid
PSL = Project Screening Level
U = not detected at or above the detection limit

Basemap Source/Aerial Photo: ESRI ArcGIS online service 2023

N
0 125 250 500
Feet
1 Inch = 250 Feet

Site Inspection for Basewide Investigation of PFAS
Former HPNS, San Francisco, California

Groundwater Sampling Locations and Analytical Results AOI 92 Parcel B-1 "A" Zone Groundwater

PROJECT NO.:	5026-22-5496
DATE:	September 2023
DRAWN BY:	KOB
CHECKED BY:	TG

NAVFAC

FIGURE 9

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Date: 9/27/2023

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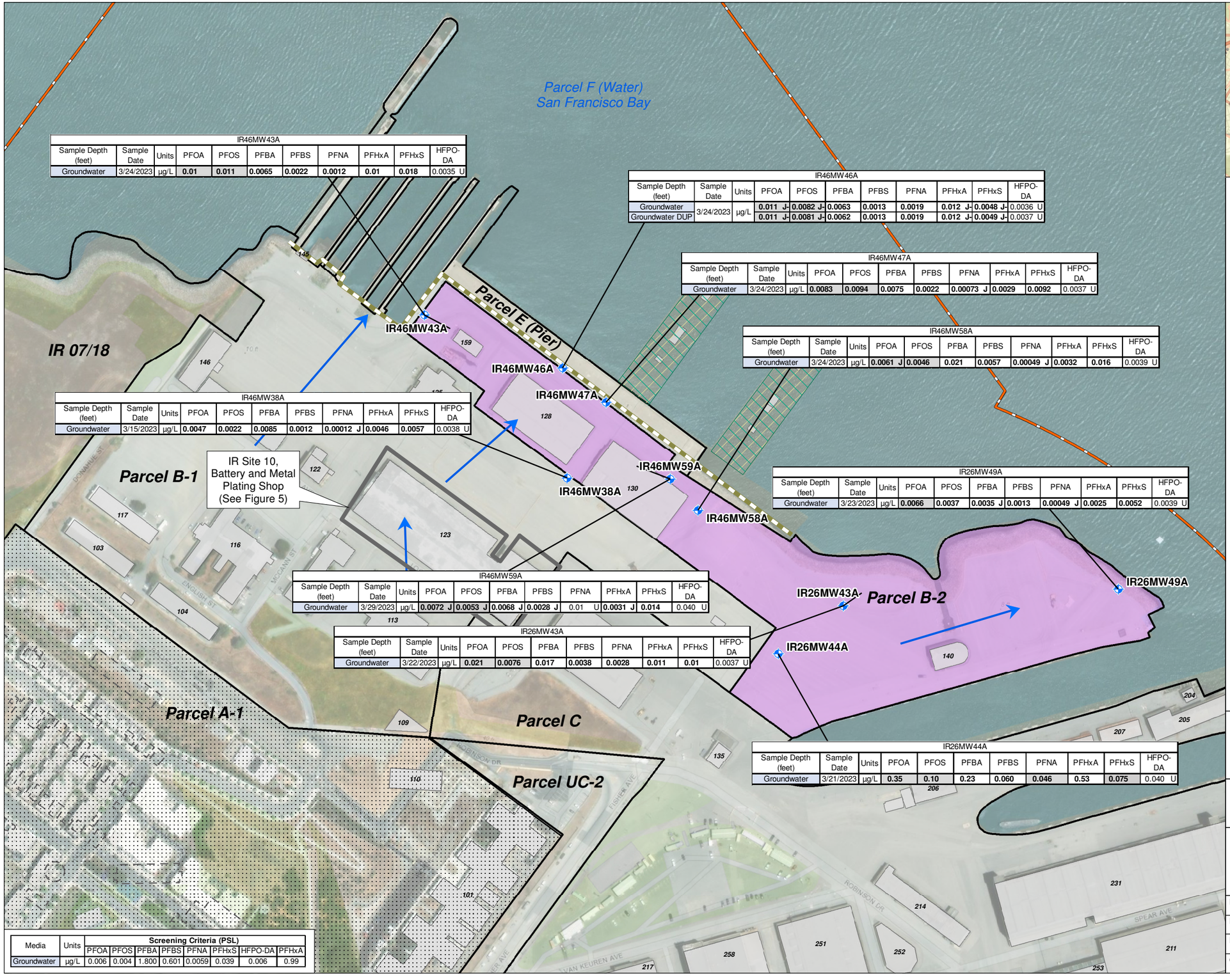


IR46MW43A										
Sample Depth (feet)	Sample Date	Units	PFOA	PFOS	PFBA	PFBS	PFNA	PFHxA	PFHxS	HFPO-DA
Groundwater	3/24/2023	µg/L	**0.01**	**0.011**	**0.0065**	**0.0022**	**0.0012**	**0.01**	**0.018**	0.0035 U

IR46MW46A										
Sample Depth (feet)	Sample Date	Units	PFOA	PFOS	PFBA	PFBS	PFNA	PFHxA	PFHxS	HFPO-DA
Groundwater	3/24/2023	µg/L	**0.011 J-**	**0.0082 J-**	**0.0063**	**0.0013**	**0.0019**	**0.012 J-**	**0.0048 J-**	0.0036 U
Groundwater DUP			**0.011 J-**	**0.0081 J-**	**0.0062**	**0.0013**	**0.0019**	**0.012 J-**	**0.0049 J-**	0.0037 U

IR46MW47A										
Sample Depth (feet)	Sample Date	Units	PFOA	PFOS	PFBA	PFBS	PFNA	PFHxA	PFHxS	HFPO-DA
Groundwater	3/24/2023	µg/L	**0.0083**	**0.0094**	**0.0075**	**0.0022**	**0.00073 J**	**0.0029**	**0.0092**	0.0037 U

IR46MW58A										
Sample Depth (feet)	Sample Date	Units	PFOA	PFOS	PFBA	PFBS	PFNA	PFHxA	PFHxS	HFPO-DA
Groundwater	3/24/2023	µg/L	**0.0061 J**	**0.0046**	**0.021**	**0.0057**	**0.00049 J**	**0.0032**	**0.016**	0.0039 U

IR46MW38A										
Sample Depth (feet)	Sample Date	Units	PFOA	PFOS	PFBA	PFBS	PFNA	PFHxA	PFHxS	HFPO-DA
Groundwater	3/15/2023	µg/L	**0.0047**	**0.0022**	**0.0085**	**0.0012**	**0.00012 J**	**0.0046**	**0.0057**	0.0038 U

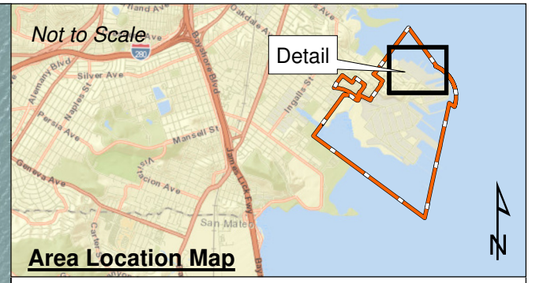
IR26MW49A										
Sample Depth (feet)	Sample Date	Units	PFOA	PFOS	PFBA	PFBS	PFNA	PFHxA	PFHxS	HFPO-DA
Groundwater	3/23/2023	µg/L	**0.0066**	**0.0037**	**0.0035 J**	**0.0013**	**0.00049 J**	**0.0025**	**0.0052**	0.0039 U

IR46MW59A										
Sample Depth (feet)	Sample Date	Units	PFOA	PFOS	PFBA	PFBS	PFNA	PFHxA	PFHxS	HFPO-DA
Groundwater	3/29/2023	µg/L	**0.0072 J**	**0.0053 J**	**0.0068 J**	**0.0028 J**	0.01 U	**0.0031 J**	**0.014**	0.040 U

IR26MW43A										
Sample Depth (feet)	Sample Date	Units	PFOA	PFOS	PFBA	PFBS	PFNA	PFHxA	PFHxS	HFPO-DA
Groundwater	3/22/2023	µg/L	**0.021**	**0.0076**	**0.017**	**0.0038**	**0.0028**	**0.011**	**0.01**	0.0037 U

IR26MW44A										
Sample Depth (feet)	Sample Date	Units	PFOA	PFOS	PFBA	PFBS	PFNA	PFHxA	PFHxS	HFPO-DA
Groundwater	3/21/2023	µg/L	**0.35**	**0.10**	**0.23**	**0.060**	**0.046**	**0.53**	**0.075**	0.040 U

Media	Units	Screening Criteria (PSL)							
		PFOA	PFOS	PFBA	PFBS	PFNA	PFHxS	HFPO-DA	PFHxA
Groundwater	µg/L	0.006	0.004	1.800	0.601	0.0059	0.039	0.006	0.99



Legend

- Existing Monitoring Well Sampled for PFAS
- PFAS AOI 93, Parcel B-2 "A" Zone Groundwater
- Approximate Groundwater Flow Direction
- Parcel B seawall
- Potential PFAS Source Area AOI
- Parcel Boundary
- Buildings
- Demolished Piers
- Non-Navy Property
- Former HPNS Boundary

Notes:
Groundwater results reported in µg/L
Bold = analyte detected in sample above the detection limit
Shaded results exceed the screening criteria (PSL)

µg/L = micrograms per liter
AOI = Area of Interest
HFPO-DA = hexafluoropropylene oxide dimer acid
HPNS = Hunters Point Naval Shipyard
IR = Installation Restoration
J = estimated value
J+ = estimated value, bias high
J- = estimated value bias low
PFAS = Per- and Polyfluoroalkyl Substances
PFBA = perfluorobutanoic acid
PFBS = perfluorobutanesulfonic acid
PFHxA = perfluorohexanoic Acid
PFHxS = perfluorohexanesulfonic acid
PFOA = perfluorooctanoic acid
PFOS = perfluorooctane sulfonic acid
PFNA = perfluorononanoic acid
PSL = Project Screening Level
U = not detected at or above the detection limit

Basemap Source/Aerial Photo: ESRI ArcGIS online service 2023

0 125 250 500
Feet
1 Inch = 250 Feet

Site Inspection for Basewide Investigation of PFAS
Former HPNS, San Francisco, California

Groundwater Sampling Locations and Analytical Results AOI 93 Parcel B-2 "A" Zone Groundwater

PROJECT NO.:	5026-22-5496
DATE:	September 2023
DRAWN BY:	KOB
CHECKED BY:	TG

NAVFAC

FIGURE 10

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Date: 9/8/2023

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IR06MW32A

Sample Depth (feet)	Sample Date	Units	PFOA	PFOS	PFBA	PFBS	PFNA	PFHxA	PFHxS	HFPO-DA
Groundwater	3/27/2023	µg/L	**0.087**	**0.18**	**0.035**	**0.015**	**0.0022**	**0.046**	**0.19**	0.0039 U

IR25MW37A

Sample Depth (feet)	Sample Date	Units	PFOA	PFOS	PFBA	PFBS	PFNA	PFHxA	PFHxS	HFPO-DA
Groundwater	3/15/2023	µg/L	**0.013 J**	**0.022**	**0.021 J**	0.020 U	**0.0075 J**	**0.01 J**	**0.0045 J**	0.080 U

IR25MW17A

Sample Depth (feet)	Sample Date	Units	PFOA	PFOS	PFBA	PFBS	PFNA	PFHxA	PFHxS	HFPO-DA
Groundwater	3/16/2023	µg/L	**0.0019 J**	**0.0025**	**0.017**	**0.0024**	**0.00030 J**	**0.0030**	**0.0040**	0.0037 U

IR25MW16A

Sample Depth (feet)	Sample Date	Units	PFOA	PFOS	PFBA	PFBS	PFNA	PFHxA	PFHxS	HFPO-DA
Groundwater	3/28/2023	µg/L	**0.0099**	**0.0046 J**	**0.01**	**0.0077**	**0.00038 J**	**0.0065**	**0.0099**	0.0040 U

IR06MW40A

Sample Depth (feet)	Sample Date	Units	PFOA	PFOS	PFBA	PFBS	PFNA	PFHxA	PFHxS	HFPO-DA
Groundwater	3/17/2023	µg/L	**0.38**	**0.013 J**	**0.039 J**	**0.016**	**0.0020 J**	**0.092**	**0.14**	0.040 U
Groundwater DUP			**0.38**	**0.012**	**0.040**	**0.016**	**0.0026 J**	**0.087**	**0.15**	0.040 U

IR06MW22A

Sample Depth (feet)	Sample Date	Units	PFOA	PFOS	PFBA	PFBS	PFNA	PFHxA	PFHxS	HFPO-DA
Groundwater	4/25/2023	µg/L	**0.040**	**0.047**	**0.049**	**0.013**	**0.0014**	**0.053**	**0.094**	0.0037 U

IR28MW125A

Sample Depth (feet)	Sample Date	Units	PFOA	PFOS	PFBA	PFBS	PFNA	PFHxA	PFHxS	HFPO-DA
Groundwater	3/29/2023	µg/L	**0.013**	**0.011**	**0.022 J**	**0.0058 J**	**0.0011 J**	**0.022**	**0.048**	0.040 U

IR28MW127A

Sample Depth (feet)	Sample Date	Units	PFOA	PFOS	PFBA	PFBS	PFNA	PFHxA	PFHxS	HFPO-DA
Groundwater	3/30/2023	µg/L	**0.0060**	**0.01**	**0.0096**	**0.0018**	**0.00046 J**	**0.0024**	**0.011**	0.0037 U

PC-PFAS-TW4

Sample Depth (feet)	Sample Date	Units	PFOA	PFOS	PFBA	PFBS	PFNA	PFHxA	PFHxS	HFPO-DA
Groundwater	3/20/2023	µg/L	**0.020 J**	**0.0091**	**0.035**	**0.0034**	**0.00059 J**	**0.025**	**0.0065**	0.0047 U

IR28MW910A

Sample Depth (feet)	Sample Date	Units	PFOA	PFOS	PFBA	PFBS	PFNA	PFHxA	PFHxS	HFPO-DA
Groundwater	3/28/2023	µg/L	**0.048**	**0.023**	**0.034**	**0.0027**	**0.0016**	**0.018**	**0.023**	0.0040 U

PC-PFAS-TW1

Sample Depth (feet)	Sample Date	Units	PFOA	PFOS	PFBA	PFBS	PFNA	PFHxA	PFHxS	HFPO-DA
Groundwater	3/30/2023	µg/L	**0.023**	**0.013**	**0.016**	**0.0026**	**0.00075 J**	**0.0070**	**0.013**	0.0038 U

PC-PFAS-TW3

Sample Depth (feet)	Sample Date	Units	PFOA	PFOS	PFBA	PFBS	PFNA	PFHxA	PFHxS	HFPO-DA
Groundwater	3/27/2023	µg/L	**0.0005 J**	0.00087 U	**0.65**	0.00087 U	**0.00017 J**	**0.0054**	0.00087 U	0.0035 U

PC-PFAS-TW2

Sample Depth (feet)	Sample Date	Units	PFOA	PFOS	PFBA	PFBS	PFNA	PFHxA	PFHxS	HFPO-DA
Groundwater	3/27/2023	µg/L	**0.0025**	**0.0033**	**0.025**	**0.0027**	**0.00034 J**	**0.0097**	**0.0059**	0.0037 U

PC-PFAS-TW6

Sample Depth (feet)	Sample Date	Units	PFOA	PFOS	PFBA	PFBS	PFNA	PFHxA	PFHxS	HFPO-DA
Groundwater	3/29/2023	µg/L	**0.030**	**0.012**	**0.012**	**0.019**	**0.0022**	**0.025**	**0.014**	0.0037 U

IR28MW150A

Sample Depth (feet)	Sample Date	Units	PFOA	PFOS	PFBA	PFBS	PFNA	PFHxA	PFHxS	HFPO-DA
Groundwater	3/28/2023	µg/L	**0.0042**	**0.0082**	**0.0043**	**0.0020**	**0.00051 J**	**0.0031**	**0.0086**	0.0037 U

IR28MW217A

Sample Depth (feet)	Sample Date	Units	PFOA	PFOS	PFBA	PFBS	PFNA	PFHxA	PFHxS	HFPO-DA
Groundwater	3/17/2023	µg/L	**0.035**	**0.0090 J**	**0.014 J+**	**0.0063 J+**	0.0019 UJ	**0.0048** J+	**0.045 J+**	0.0078 UJ

IR28MW297A

Sample Depth (feet)	Sample Date	Units	PFOA	PFOS	PFBA	PFBS	PFNA	PFHxA	PFHxS	HFPO-DA
Groundwater	3/29/2023	µg/L	**0.0068**	**0.013**	**0.0047**	**0.0020**	**0.00053 J**	**0.0059**	**0.013**	0.0036 U
Groundwater DUP			**0.0067**	**0.012**	**0.0045**	**0.0020**	**0.00054 J**	**0.0060**	**0.012**	0.0039 U

IR29MW48A

Sample Depth (feet)	Sample Date	Units	PFOA	PFOS	PFBA	PFBS	PFNA	PFHxA	PFHxS	HFPO-DA
Groundwater	3/28/2023	µg/L	**0.068**	**0.080**	**0.021**	**0.0078**	**0.0042**	**0.047**	**0.074**	0.0037 U

IR28MW352A

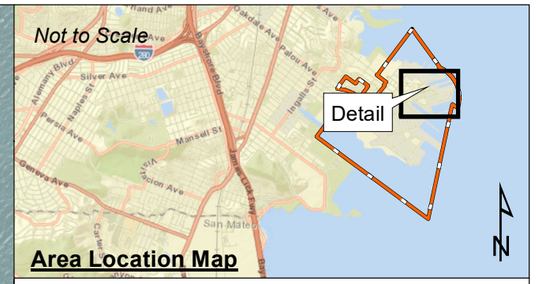
Sample Depth (feet)	Sample Date	Units	PFOA	PFOS	PFBA	PFBS	PFNA	PFHxA	PFHxS	HFPO-DA
Groundwater	3/17/2023	µg/L	**0.015**	**0.035**	**0.0072 J**	**0.0045 J**	**0.0028 J**	**0.0090 J**	**0.034**	0.040 U

IR28MW394A

Sample Depth (feet)	Sample Date	Units	PFOA	PFOS	PFBA	PFBS	PFNA	PFHxA	PFHxS	HFPO-DA
Groundwater	3/16/2023	µg/L	**0.028**	**3.2**	**0.016**	**0.047**	**0.0020**	**0.080**	**1.2**	0.0038 U

Media	Units	Screening Criteria (PSL)							
		PFOA	PFOS	PFBA	PFBS	PFNA	PFHxS	HFPO-DA	PFHxA
Groundwater	µg/L	0.006	0.004	1.800	0.601	0.0059	0.039	0.006	0.99

Parcel B-1
Parcel C
Parcel F (Pier)
Parcel F (Water)
San Francisco Bay
AOI 1
Former
Fire Station
(See Figure 8)



Legend

- Existing Monitoring Well Sampled for PFAS
- Temporary Monitoring Well Sampled for PFAS
- PFAS AOI 94, Parcel C "A" Zone Groundwater
- Approximate Groundwater Flow Direction
- Parcel B seawall
- Potential PFAS Source Area AOI
- Parcel Boundary
- Buildings
- Non-Navy Property
- Former HPNS Boundary

Notes:
Groundwater results reported in µg/L
Bold = analyte detected in sample above the detection limit
Shaded results exceed the screening criteria

µg/L = micrograms per liter
AOI = Area of Interest
HFPO-DA = hexafluoropropylene oxide dimer acid
HPNS = Hunters Point Naval Shipyard
IR = Installation Restoration
J = estimated value
J+ = estimated value, bias high
PFAS = Per- and Polyfluoroalkyl Substances
PFBA = perfluorobutanoic acid
PFBS = perfluorobutanesulfonic acid
PFHxA = perfluorohexanoic Acid
PFHxS = perfluorohexanesulfonic acid
PFOA = perfluorooctanoic acid
PFOS = perfluorooctane sulfonic acid
PFNA = perfluorononanoic acid
PSL = Project Screening Level
U = not detected at or above the detection limit

Basemap Source/Aerial Photo: ESRI ArcGIS online service 2023

0 125 250 500
Feet
1 Inch = 250 Feet

Site Inspection for Basewide Investigation of PFAS
Former HPNS, San Francisco, California

Groundwater
Sampling Locations and Analytical Results
AOI 94
Parcel C "A" Zone Groundwater

PROJECT NO.:	5026-22-5496
DATE:	September 2023
DRAWN BY:	KOB
CHECKED BY:	TG

FIGURE 11

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Date: 9/15/2023

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IR22MW08A

Sample Depth (feet)	Sample Date	Units	PFOA	PFOS	PFBA	PFBS	PFNA	PFHxA	PFHxS	HFPO-DA
Groundwater	3/28/2023	µg/L	**0.0053**	**0.011**	**0.0093**	**0.0022**	**0.00088 J**	**0.0046**	**0.0086**	0.0036 U

IR22MW07A

Sample Depth (feet)	Sample Date	Units	PFOA	PFOS	PFBA	PFBS	PFNA	PFHxA	PFHxS	HFPO-DA
Groundwater	3/23/2023	µg/L	**0.0034**	**0.0096**	**0.0060**	**0.0018**	**0.00053 J**	**0.0015**	**0.0090**	0.0034 U

IR70MW04A

Sample Depth (feet)	Sample Date	Units	PFOA	PFOS	PFBA	PFBS	PFNA	PFHxA	PFHxS	HFPO-DA
Groundwater	3/27/2023	µg/L	**0.013**	**0.081**	**0.014**	**0.0024**	**0.0033**	**0.018**	**0.035**	0.0038 U

IR22MW16A

Sample Depth (feet)	Sample Date	Units	PFOA	PFOS	PFBA	PFBS	PFNA	PFHxA	PFHxS	HFPO-DA
Groundwater	3/29/2023	µg/L	**0.0080**	**0.0079**	**0.017**	**0.0032**	**0.00076 J**	**0.015**	**0.015**	0.0037 U

IR55MW02

Sample Depth (feet)	Sample Date	Units	PFOA	PFOS	PFBA	PFBS	PFNA	PFHxA	PFHxS	HFPO-DA
Groundwater	3/23/2023	µg/L	**0.033**	**0.33**	**0.025**	**0.015**	**0.0058**	**0.055**	**0.22**	0.0037 U

PD-PFAS-TW1

Sample Depth (feet)	Sample Date	Units	PFOA	PFOS	PFBA	PFBS	PFNA	PFHxA	PFHxS	HFPO-DA
Groundwater	3/30/2023	µg/L	**0.45**	**0.043**	**0.038**	**0.028**	**0.0023**	**0.067**	**0.41**	0.0039 U

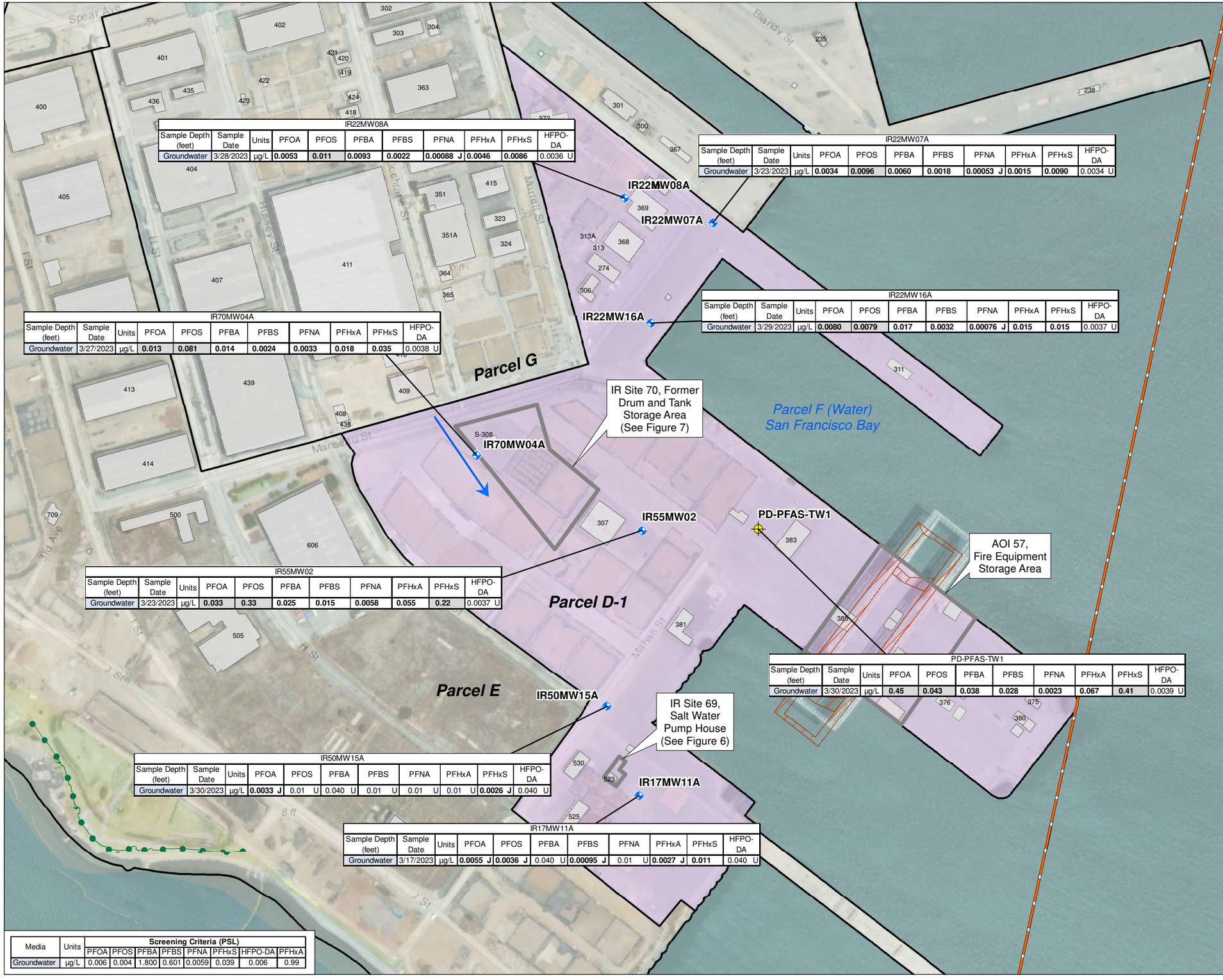
IR50MW15A

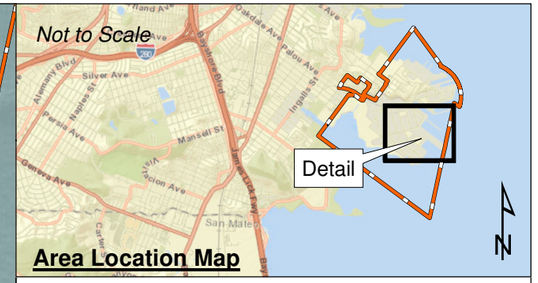
Sample Depth (feet)	Sample Date	Units	PFOA	PFOS	PFBA	PFBS	PFNA	PFHxA	PFHxS	HFPO-DA
Groundwater	3/30/2023	µg/L	**0.0033 J**	0.01 U	0.040 U	0.01 U	0.01 U	0.01 U	**0.0026 J**	0.040 U

IR17MW11A

Sample Depth (feet)	Sample Date	Units	PFOA	PFOS	PFBA	PFBS	PFNA	PFHxA	PFHxS	HFPO-DA
Groundwater	3/17/2023	µg/L	**0.0055 J**	**0.0036 J**	0.040 U	**0.00095 J**	0.01 U	**0.0027 J**	**0.011**	0.040 U

Media	Units	Screening Criteria (PSL)							
		PFOA	PFOS	PFBA	PFBS	PFNA	PFHxS	HFPO-DA	PFHxA
Groundwater	µg/L	0.006	0.004	1.800	0.601	0.0059	0.039	0.006	0.99





Legend

- Existing Monitoring Well Sampled for PFAS
- Temporary Monitoring Well Sampled for PFAS
- PFAS AOI 95, Parcel D-1 "A" Zone Groundwater
- Approximate Groundwater Flow Direction
- Sheetpile wall
- Potential PFAS Source Area AOIs
- Parcel Boundary
- Buildings
- Gantry Crane
- Former HPNS Boundary

Notes:
Groundwater results reported in µg/L
Bold = analyte detected in sample above the detection limit
Shaded results exceed the screening criteria

µg/L = micrograms per liter
AOI = Area of Interest
HFPO-DA = hexafluoropropylene oxide dimer acid
HPNS = Hunters Point Naval Shipyard
IR = Installation Restoration
J = estimated value
PFAS = Per- and Polyfluoroalkyl Substances
PFBA = perfluorobutanoic acid
PFBS = perfluorobutanesulfonic acid
PFHxA = perfluorohexanoic Acid
PFHxS = perfluorohexanesulfonic acid
PFOA = perfluorooctanoic acid
PFOS = perfluorooctane sulfonic acid
PFNA = perfluorononanoic acid
PSL = Project Screening Level
U = not detected at or above the detection limit

Basemap Source/Aerial Photo: ESRI ArcGIS online service 2023

0 150 300 600
Feet
1 Inch = 300 Feet

Site Inspection for Basewide Investigation of PFAS
Former HPNS, San Francisco, California

Groundwater Sampling Locations and Analytical Results AOI 95 Parcel D-1 "A" Zone Groundwater

PROJECT NO.:	5026-22-5496
DATE:	September 2023
DRAWN BY:	KOB
CHECKED BY:	TG

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FIGURE 12

Path: D:\FilesFromWork\5026-22-5496_PFAS_HuntersPoint_SI\GIS\Figs_HuntersPoint_SI_Results_PFAS_June2023\Fig12_HuntersPointSI_PFAS_AOI95.mxd
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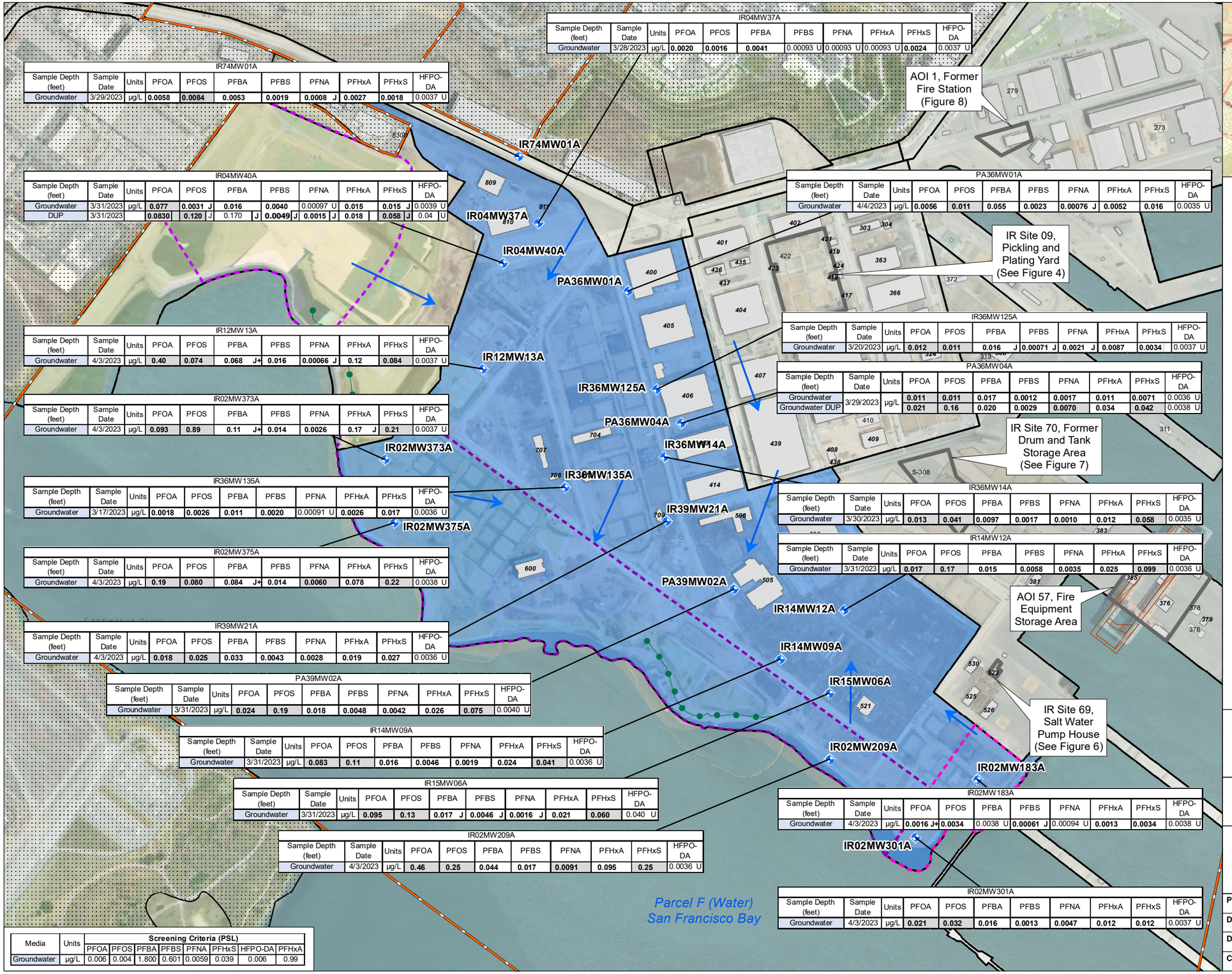


IR04MW37A

Sample Depth (feet)	Sample Date	Units	PFOA	PFOS	PFBA	PFBS	PFNA	PFHxA	PFHxS	HFPO-DA
Groundwater	3/28/2023	µg/L	**0.0020**	**0.0016**	**0.0041**	0.00093 U	0.00093 U	0.00093 U	**0.0024**	0.0037 U

IR74MW01A

Sample Depth (feet)	Sample Date	Units	PFOA	PFOS	PFBA	PFBS	PFNA	PFHxA	PFHxS	HFPO-DA
Groundwater	3/29/2023	µg/L	**0.0058**	**0.0084**	**0.0053**	**0.0019**	**0.0008 J**	**0.0027**	**0.0018**	0.0037 U

IR04MW40A

Sample Depth (feet)	Sample Date	Units	PFOA	PFOS	PFBA	PFBS	PFNA	PFHxA	PFHxS	HFPO-DA
Groundwater	3/31/2023	µg/L	**0.077**	**0.0031 J**	**0.016**	**0.0040**	0.00097 U	**0.015**	**0.015 J**	0.0039 U
DUP	3/31/2023		**0.0830**	**0.120** J	0.170 J	**0.0049** J	**0.0015** J	**0.018**	**0.058** J	0.04 U

PA36MW01A

Sample Depth (feet)	Sample Date	Units	PFOA	PFOS	PFBA	PFBS	PFNA	PFHxA	PFHxS	HFPO-DA
Groundwater	4/4/2023	µg/L	**0.0056**	**0.011**	**0.055**	**0.0023**	**0.00076 J**	**0.0052**	**0.016**	0.0035 U

IR12MW13A

Sample Depth (feet)	Sample Date	Units	PFOA	PFOS	PFBA	PFBS	PFNA	PFHxA	PFHxS	HFPO-DA
Groundwater	4/3/2023	µg/L	**0.40**	**0.074**	**0.068 J+**	**0.016**	**0.00066 J**	**0.12**	**0.084**	0.0037 U

IR36MW125A

Sample Depth (feet)	Sample Date	Units	PFOA	PFOS	PFBA	PFBS	PFNA	PFHxA	PFHxS	HFPO-DA
Groundwater	3/20/2023	µg/L	**0.012**	**0.011**	**0.016 J**	**0.00071 J**	**0.0021 J**	**0.0087**	**0.0034**	0.0037 U

IR02MW373A

Sample Depth (feet)	Sample Date	Units	PFOA	PFOS	PFBA	PFBS	PFNA	PFHxA	PFHxS	HFPO-DA
Groundwater	4/3/2023	µg/L	**0.093**	**0.89**	**0.11 J+**	**0.014**	**0.0026**	**0.17 J**	**0.21**	0.0037 U

PA36MW04A

Sample Depth (feet)	Sample Date	Units	PFOA	PFOS	PFBA	PFBS	PFNA	PFHxA	PFHxS	HFPO-DA
Groundwater	3/29/2023	µg/L	**0.011**	**0.011**	**0.017**	**0.0012**	**0.0017**	**0.011**	**0.0071**	0.0036 U
Groundwater DUP			**0.021**	**0.16**	**0.020**	**0.0029**	**0.0070**	**0.034**	**0.042**	0.0038 U

IR36MW135A

Sample Depth (feet)	Sample Date	Units	PFOA	PFOS	PFBA	PFBS	PFNA	PFHxA	PFHxS	HFPO-DA
Groundwater	3/17/2023	µg/L	**0.0018**	**0.0026**	**0.011**	**0.0020**	0.00091 U	**0.0026**	**0.017**	0.0036 U

IR36MW14A

Sample Depth (feet)	Sample Date	Units	PFOA	PFOS	PFBA	PFBS	PFNA	PFHxA	PFHxS	HFPO-DA
Groundwater	3/30/2023	µg/L	**0.013**	**0.041**	**0.0097**	**0.0017**	**0.0010**	**0.012**	**0.058**	0.0035 U

IR02MW375A

Sample Depth (feet)	Sample Date	Units	PFOA	PFOS	PFBA	PFBS	PFNA	PFHxA	PFHxS	HFPO-DA
Groundwater	4/3/2023	µg/L	**0.19**	**0.080**	**0.084 J+**	**0.014**	**0.0060**	**0.078**	**0.22**	0.0038 U

IR14MW12A

Sample Depth (feet)	Sample Date	Units	PFOA	PFOS	PFBA	PFBS	PFNA	PFHxA	PFHxS	HFPO-DA
Groundwater	3/31/2023	µg/L	**0.017**	**0.17**	**0.015**	**0.0058**	**0.0035**	**0.025**	**0.099**	0.0036 U

IR39MW21A

Sample Depth (feet)	Sample Date	Units	PFOA	PFOS	PFBA	PFBS	PFNA	PFHxA	PFHxS	HFPO-DA
Groundwater	4/3/2023	µg/L	**0.018**	**0.025**	**0.033**	**0.0043**	**0.0028**	**0.019**	**0.027**	0.0036 U

PA39MW02A

Sample Depth (feet)	Sample Date	Units	PFOA	PFOS	PFBA	PFBS	PFNA	PFHxA	PFHxS	HFPO-DA
Groundwater	3/31/2023	µg/L	**0.024**	**0.19**	**0.018**	**0.0048**	**0.0042**	**0.026**	**0.075**	0.0040 U

IR14MW09A

Sample Depth (feet)	Sample Date	Units	PFOA	PFOS	PFBA	PFBS	PFNA	PFHxA	PFHxS	HFPO-DA
Groundwater	3/31/2023	µg/L	**0.083**	**0.11**	**0.016**	**0.0046**	**0.0019**	**0.024**	**0.041**	0.0036 U

IR15MW06A

Sample Depth (feet)	Sample Date	Units	PFOA	PFOS	PFBA	PFBS	PFNA	PFHxA	PFHxS	HFPO-DA
Groundwater	3/31/2023	µg/L	**0.095**	**0.13**	**0.017 J**	**0.0046 J**	**0.0016 J**	**0.021**	**0.060**	0.040 U

IR02MW209A

Sample Depth (feet)	Sample Date	Units	PFOA	PFOS	PFBA	PFBS	PFNA	PFHxA	PFHxS	HFPO-DA
Groundwater	4/3/2023	µg/L	**0.46**	**0.25**	**0.044**	**0.017**	**0.0091**	**0.095**	**0.25**	0.0036 U

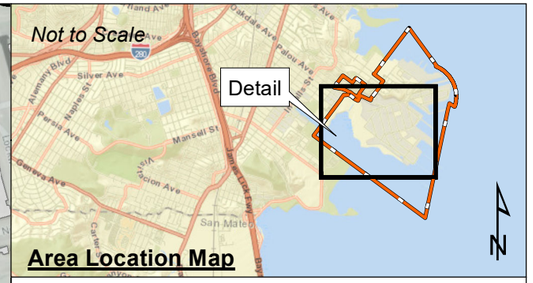
IR02MW183A

Sample Depth (feet)	Sample Date	Units	PFOA	PFOS	PFBA	PFBS	PFNA	PFHxA	PFHxS	HFPO-DA
Groundwater	4/3/2023	µg/L	**0.0016 J+**	**0.0034**	0.0038 U	**0.00061 J**	0.00094 U	**0.0013**	**0.0034**	0.0038 U

IR02MW301A

Sample Depth (feet)	Sample Date	Units	PFOA	PFOS	PFBA	PFBS	PFNA	PFHxA	PFHxS	HFPO-DA
Groundwater	4/3/2023	µg/L	**0.021**	**0.032**	**0.016**	**0.0013**	**0.0047**	**0.012**	**0.012**	0.0037 U

Media	Units	Screening Criteria (PSL)							
		PFOA	PFOS	PFBA	PFBS	PFNA	PFHxS	HFPO-DA	PFHxA
Groundwater	µg/L	0.006	0.004	1.800	0.601	0.0059	0.039	0.006	0.99



Legend

- Existing Monitoring Well Sampled for PFAS
- PFAS AOI 96, Parcel E "A" Zone Groundwater
- Approximate Groundwater Flow Direction
- Sheetpile wall
- Potential PFAS Source Area AOIs
- Parcel Boundary
- Buildings
- Gantry Crane
- Non-Navy Property
- Bay Fill Area Based on WESTEC Initial Assessment Report
- Burning Disposal Site at IR Site 02
- Industrial Landfill Areas
- Former HPNS Boundary

Notes:
Groundwater results reported in µg/L
Bold = analyte detected in sample above the detection limit
Shaded results exceed the screening criteria (PSL)

µg/L = micrograms per liter
AOI = Area of Interest
HFPO-DA = hexafluoropropylene oxide dimer acid
HPNS = Hunters Point Naval Shipyard
IR = Installation Restoration
J = estimated value
J = estimated value, bias high
PFAS = Per- and Polyfluoroalkyl Substances
PFBA = perfluorobutanoic acid
PFBS = perfluorobutanesulfonic acid
PFHxA = perfluorohexanoic Acid
PFHxS = perfluorohexanesulfonic acid
PFOA = perfluorooctanoic acid
PFOS = perfluorooctane sulfonic acid
PFNA = perfluorononanoic acid
PSL = Project Screening Level
U = not detected at or above the detection limit

Basemap Source/Aerial Photo: ESRI ArcGIS online service 2023

N

0 250 500 1,000
Feet
1 Inch = 500 Feet

Site Inspection for Basewide Investigation of PFAS
Former HPNS, San Francisco, California

Groundwater Sampling Locations and Results AOI 96, Parcel E, "A" Zone Groundwater

PROJECT NO.:	5026-25-5496
DATE:	September 2023
DRAWN BY:	KOB
CHECKED BY:	TG

NAVFAC

FIGURE 13

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Date: 9/18/2023

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IR01MW05A

Sample Depth (feet)	Sample Date	Units	PFOA	PFOS	PFBA	PFBS	PFNA	PFHxA	PFHxS	HFPO-DA
Groundwater	3/27/2023	µg/L	**0.19**	**0.046**	**0.067**	**0.0076 J**	0.01 U	**0.033**	**0.020**	0.040 U
Groundwater DUP			**0.011**	**0.012**	**0.017**	**0.0012**	**0.0018**	**0.01**	**0.0071**	0.0037 U

BKG-PFAS-TW1 (Off-Base)

Sample Depth (feet)	Sample Date	Units	PFOA	PFOS	PFBA	PFBS	PFNA	PFHxA	PFHxS	HFPO-DA
Groundwater	4/26/2023	µg/L	0.0011 U	0.0011 U	**0.068**	0.0011 U	0.0011 U	0.0011 U	0.0011 U	0.0043 U

IR01MW18A

Sample Depth (feet)	Sample Date	Units	PFOA	PFOS	PFBA	PFBS	PFNA	PFHxA	PFHxS	HFPO-DA
Groundwater	3/27/2023	µg/L	**3.0**	**0.024**	**0.059**	**0.0095**	**0.0034 J**	**0.33**	**0.12**	0.036 U

IR01MW48A

Sample Depth (feet)	Sample Date	Units	PFOA	PFOS	PFBA	PFBS	PFNA	PFHxA	PFHxS	HFPO-DA
Groundwater	4/4/2023	µg/L	**6.2 J**	**0.34**	**0.12 J**	**0.048**	**0.061**	**0.80 J**	**0.42 J**	0.0035 U
Groundwater DUP			**11 J**	**0.34**	**0.20 J**	**0.057**	**0.066**	**1.3 J**	**0.44 J**	0.0036 U

IR01MW62A

Sample Depth (feet)	Sample Date	Units	PFOA	PFOS	PFBA	PFBS	PFNA	PFHxA	PFHxS	HFPO-DA
Groundwater	4/4/2023	µg/L	**0.037**	**0.016**	**0.019**	**0.0078**	**0.0011**	**0.018**	**0.016**	0.0039 U

IR01MW60A

Sample Depth (feet)	Sample Date	Units	PFOA	PFOS	PFBA	PFBS	PFNA	PFHxA	PFHxS	HFPO-DA
Groundwater	4/4/2023	µg/L	**18**	**0.14**	**0.36**	**0.053 J+**	**0.0070**	**2.5**	**0.48**	0.0036 U

IR07MW95A (Off-Base)

Sample Depth (feet)	Sample Date	Units	PFOA	PFOS	PFBA	PFBS	PFNA	PFHxA	PFHxS	HFPO-DA
Groundwater	3/31/2023	µg/L	**0.0012**	**0.0061**	0.0036 U	**0.0012**	**0.00016 J**	**0.0012**	**0.0012**	0.0036 U

IR01MW12A

Sample Depth (feet)	Sample Date	Units	PFOA	PFOS	PFBA	PFBS	PFNA	PFHxA	PFHxS	HFPO-DA
Groundwater	3/27/2023	µg/L	**0.14**	**0.027**	**0.042 J**	**0.0067**	**0.00054 J**	**0.038**	**0.049**	0.0039 U

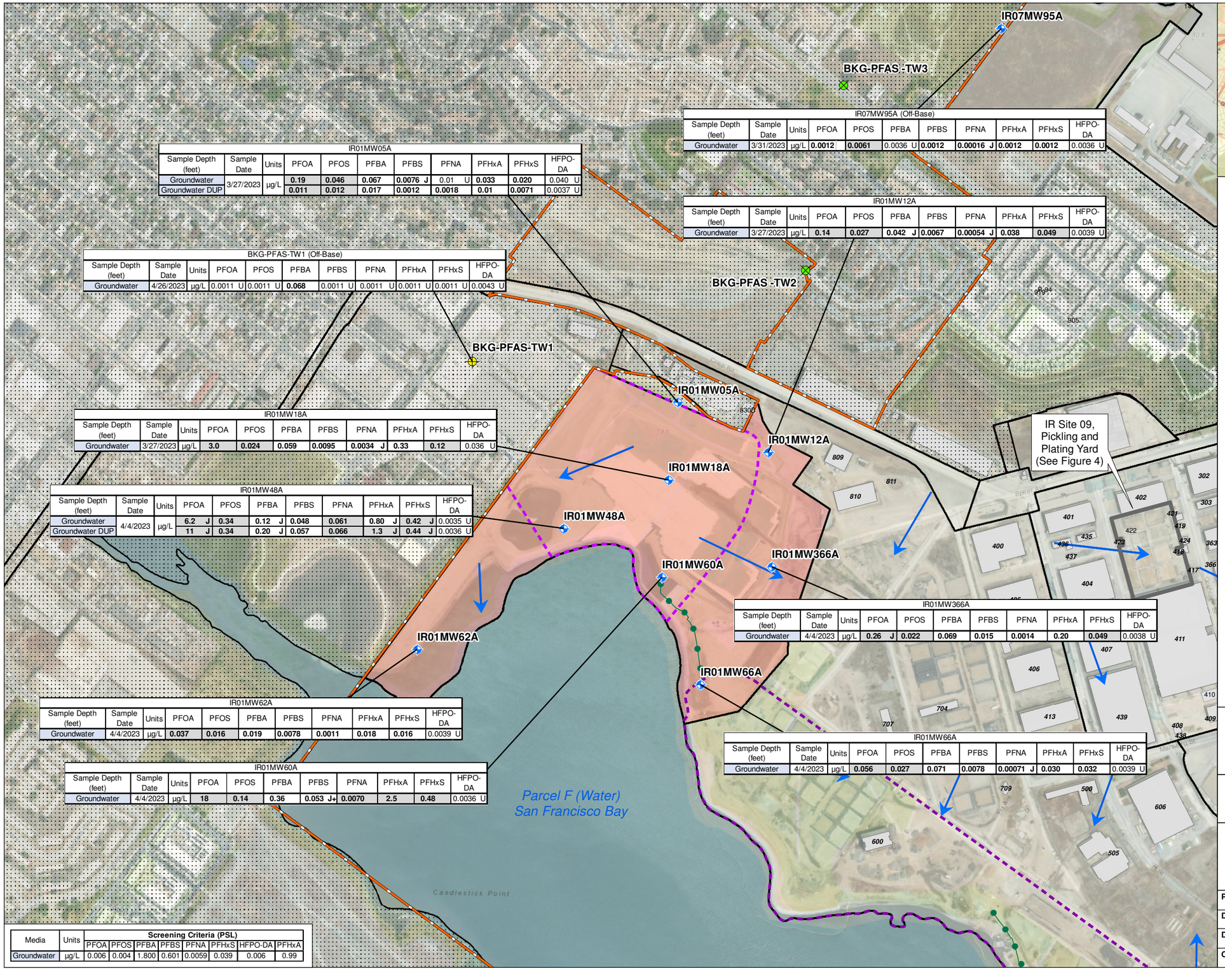
IR01MW366A

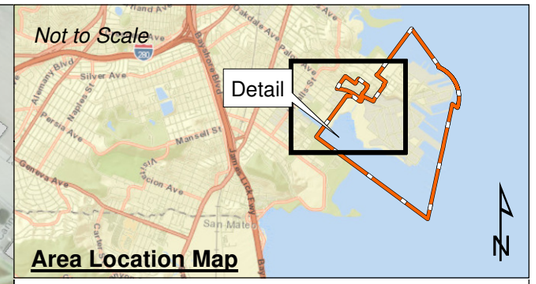
Sample Depth (feet)	Sample Date	Units	PFOA	PFOS	PFBA	PFBS	PFNA	PFHxA	PFHxS	HFPO-DA
Groundwater	4/4/2023	µg/L	**0.26 J**	**0.022**	**0.069**	**0.015**	**0.0014**	**0.20**	**0.049**	0.0038 U

IR01MW66A

Sample Depth (feet)	Sample Date	Units	PFOA	PFOS	PFBA	PFBS	PFNA	PFHxA	PFHxS	HFPO-DA
Groundwater	4/4/2023	µg/L	**0.056**	**0.027**	**0.071**	**0.0078**	**0.00071 J**	**0.030**	**0.032**	0.0039 U

Media	Units	Screening Criteria (PSL)							
		PFOA	PFOS	PFBA	PFBS	PFNA	PFHxS	HFPO-DA	PFHxA
Groundwater	µg/L	0.006	0.004	1.800	0.601	0.0059	0.039	0.006	0.99





Legend

- Existing Monitoring Well Sampled for PFAS
- Temporary Monitoring Well Sampled for PFAS
- Temporary Off-Base Well met auger refusal and was not installed
- PFAS AOI 97, Parcel E-2 "A" Zone Groundwater
- Approximate Groundwater Flow Direction
- Sheetpile wall
- Potential PFAS Source Area AOIs
- Parcel Boundary
- Buildings
- Non-Navy Property
- Bay Fill Area Based on WESTEC Initial Assessment
- Industrial Landfill Areas
- Former HPNS Boundary

Notes:
Groundwater results reported in µg/L
Bold = analyte detected in sample above the detection limit
Shaded results exceed the screening criteria (PSL)

µg/L = micrograms per liter
AOI = Area of Interest
HFPO-DA = hexafluoropropylene oxide dimer acid
HPNS = Hunters Point Naval Shipyard
IR = Installation Restoration
J = estimated value
J+ = estimated value, bias high
PFAS = Per- and Polyfluoroalkyl Substances
PFBA = perfluorobutanoic acid
PFBS = perfluorobutanesulfonic acid
PFHxA = perfluorohexanoic Acid
PFHxS = perfluorohexanesulfonic acid
PFOA = perfluorooctanoic acid
PFOS = perfluorooctane sulfonic acid
PFNA = perfluorononanoic acid
PSL = Project Screening Level
U = not detected at or above the detection limit

Basemap Source/Aerial Photo: ESRI ArcGIS online service 2023

0 250 500 1,000 Feet
1 Inch = 500 Feet

Site Inspection for Basewide Investigation of PFAS
Former HPNS, San Francisco, California

Groundwater Sampling Locations and Results AOI 97 and Off-Base Locations Parcel E-2 "A" Zone Groundwater

PROJECT NO.:	5026-22-5496
DATE:	September 2023
DRAWN BY:	KOB
CHECKED BY:	TG

NAVFAC

FIGURE 14

Path: D:\FilesFromWork\5026-22-5496_PFAS_HuntersPoint_SI\GIS\Figs_HuntersPoint_SI_Results_PFAS_June2023\Fig14_HuntersPoint_SI_Results_PFAS_AOI97.mxd
Date: 9/10/2023

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IR09MW61A

Sample Depth (feet)	Sample Date	Units	PFOA	PFOS	PFBA	PFBS	PFNA	PFHxA	PFHxS	HFPO-DA
Groundwater	3/22/2023	µg/L	**0.0064**	**0.0058**	**0.022**	**0.0023**	**0.00067 J**	**0.0048**	**0.0092**	0.0039 U

IR09MW36A

Sample Depth (feet)	Sample Date	Units	PFOA	PFOS	PFBA	PFBS	PFNA	PFHxA	PFHxS	HFPO-DA
Groundwater	3/22/2023	µg/L	0.00096 U	**0.00024 J**	0.0039 U	0.00096 U	0.00096 U	0.00096 U	**0.00023 J**	0.0039 U

IR09P040A

Sample Depth (feet)	Sample Date	Units	PFOA	PFOS	PFBA	PFBS	PFNA	PFHxA	PFHxS	HFPO-DA
Groundwater	4/9/2023	µg/L	**0.016**	**0.0079**	**0.021**	**0.0018**	**0.019**	**0.012**	**0.0060**	0.0039 U

IR36MW16A

Sample Depth (feet)	Sample Date	Units	PFOA	PFOS	PFBA	PFBS	PFNA	PFHxA	PFHxS	HFPO-DA
Groundwater	3/22/2023	µg/L	**0.0029**	**0.0047**	**0.012**	**0.0011**	**0.00045 J**	**0.00079 J**	**0.0030**	**0.0016 J**

IR33MW66A

Sample Depth (feet)	Sample Date	Units	PFOA	PFOS	PFBA	PFBS	PFNA	PFHxA	PFHxS	HFPO-DA
Groundwater	3/23/2023	µg/L	**0.011**	**0.031**	**0.038 J+**	**0.0024**	**0.0010**	**0.0052**	**0.012**	0.0039 U

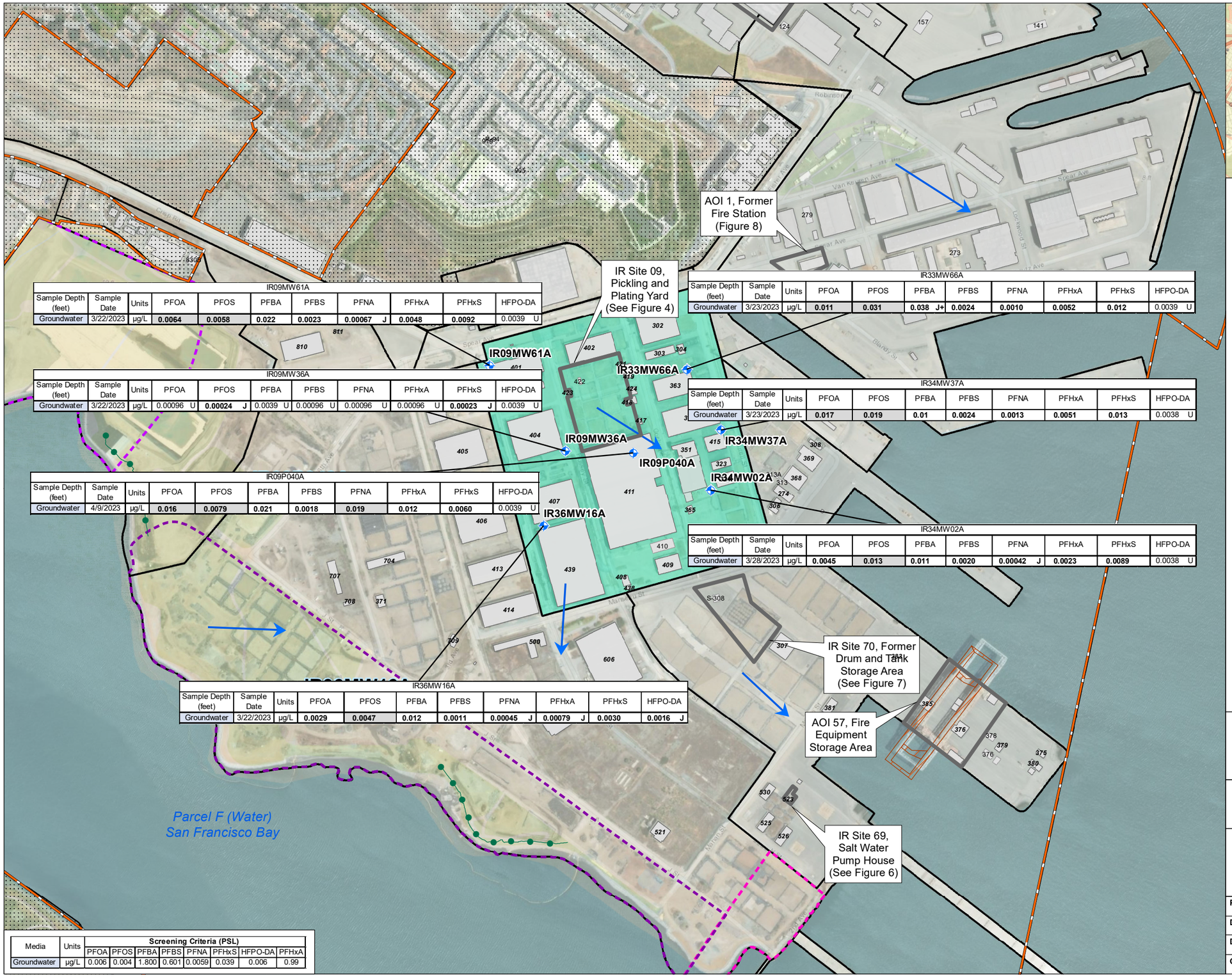
IR34MW37A

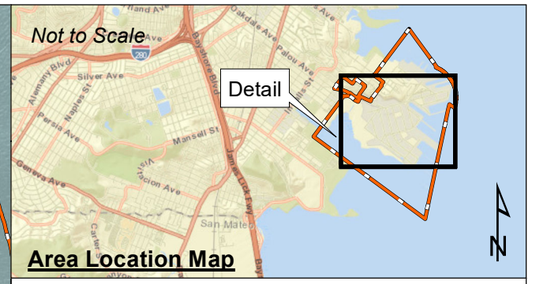
Sample Depth (feet)	Sample Date	Units	PFOA	PFOS	PFBA	PFBS	PFNA	PFHxA	PFHxS	HFPO-DA
Groundwater	3/23/2023	µg/L	**0.017**	**0.019**	**0.01**	**0.0024**	**0.0013**	**0.0051**	**0.013**	0.0038 U

IR34MW02A

Sample Depth (feet)	Sample Date	Units	PFOA	PFOS	PFBA	PFBS	PFNA	PFHxA	PFHxS	HFPO-DA
Groundwater	3/28/2023	µg/L	**0.0045**	**0.013**	**0.011**	**0.0020**	**0.00042 J**	**0.0023**	**0.0089**	0.0038 U

Media	Units	Screening Criteria (PSL)							
		PFOA	PFOS	PFBA	PFBS	PFNA	PFHxS	HFPO-DA	PFHxA
Groundwater	µg/L	0.006	0.004	1.800	0.601	0.0059	0.039	0.006	0.99





Legend

- Existing Monitoring Well Sampled for PFAS
- PFAS AOI 98, Parcel G "A"Zone Groundwater
- Approximate Groundwater Flow Direction
- Sheetpile wall
- Potential PFAS Source Area AOIs
- Parcel Boundary
- Buildings
- Gantry Crane
- Non-Navy Property
- Bay Fill Area Based on WESTEC Initial Assessment Report
- Burning Disposal Site at IR Site 02
- Industrial Landfill Areas
- Former HPNS Boundary

Notes:
Groundwater results reported in µg/L
Bold = analyte detected in sample above the detection limit
Shaded results exceed the screening criteria (PSL)

µg/L = micrograms per liter
AOI = Area of Interest
HFPO-DA = hexafluoropropylene oxide dimer acid
HPNS = Hunters Point Naval Shipyard
IR = Installation Restoration
J = estimated value
PFAS = Per- and Polyfluoroalkyl Substances
PFBA = perfluorobutanoic acid
PFBS = perfluorobutanesulfonic acid
PFHxA = perfluorohexanoic Acid
PFHxS = perfluorohexanesulfonic acid
PFOA = perfluorooctanoic acid
PFOS = perfluorooctane sulfonic acid
PFNA = perfluorononanoic acid
PSL = Project Screening Level
U = not detected at or above the detection limit

Basemap Source/Aerial Photo: ESRI ArcGIS online service 2023

N

0 250 500 1,000
Feet
1 Inch = 500 Feet

Site Inspection for Basewide Investigation of PFAS
Former HPNS, San Francisco, California

Groundwater
Sampling Locations and Results
AOI 98
Parcel G "A" Zone Groundwater

PROJECT NO.:	5026-22-5496
DATE:	September 2023
DRAWN BY:	KOB
CHECKED BY:	TG

NAVFAC

FIGURE 15

Path: E:\FilesFromWork\5026-22\5496_PFAS_HuntersPoint_SI\GIS\Figs_HuntersPoint_SI_Results_PFAS_June2023\Fig15_HuntersPoint_SI_Results_PFAS_AOI98.mxd
Date: 9/15/2023

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Appendix H
Parcel E-2 Landfill Extraction Well Letter and Landfill Gas Monitoring Probe Technical Memorandum (DCNs: ERRG-6011-0000-0036; GESL-0005-5163-0022)

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DEPARTMENT OF THE NAVY
NAVAL FACILITIES ENGINEERING SYSTEMS COMMAND
BASE REALIGNMENT AND CLOSURE
PROGRAM MANAGEMENT OFFICE WEST
33000 NIXIE WAY, BLDG 50 Suite 207
SAN DIEGO, CA 92147

5000-33B
Ser BPMOW.rd/031
February 9, 2024

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

Ms. Karen Ueno
United States Environmental
Protection Agency Region 9
75 Hawthorne St
San Francisco, CA 94105

Dear Mr. Tanouye and Ms.Ueno

The enclosed technical memorandum provides our technical rationale for the installation of an extraction well (EX-11) as the next step in implementing a solution for addressing the methane levels associated with GMP-07A. To continue forward progress, it is tentatively planned to install the extraction well the week of February 22, 2024 weather permitting.

We look forward to discussing and resolving the methane issue with the regulatory agencies as this is a vital step in implementing a permanent solution. Please contact Andre Baker at (619) 524-5167 if you have any questions.

Sincerely,

M. POUND
BRAC Environmental Coordinator
By direction of the Director

Enclosure: Technical Memorandum: Technical Rationale for the Installation of a New Extraction Well on Parcel E-2 Landfill Geomembrane date February 9, 2024

Copy to: (Next page)

5000-33B
Ser BPMOW.rd/031
February 9 , 2024

Copy Via Email:
Mr. Andrew Bain, United States Environmental Protection Agency
Andrew.Bain@epa.gov

Mr. Michael Howley, California Department of Toxic Substances Control,
Michael.howley@dtsc.ca.gov

Mr. Ryan Casey, City of San Francisco Department of Public Health,
Ryan.casey@sfdph.org

Ms. Lila Hussain, Office of Community Investment and infrastructure
Lila.hussain@sfgov.org

Technical Memorandum

From: Andre Baker, Remedial Project Manager

Via: Michael Pound, BRAC Environmental Coordinator

To: BCT Members

Date: February 9, 2024

SUBJECT: Technical Rationale for the Installation of a New Extraction Well on Parcel E-2 Landfill Geomembrane

The Department of the Navy is providing a technical rationale for the installation of an extraction well (EX-11) as a step forward to resolve the methane levels found at GMP-07A.

The extraction well will be installed on the week of February 22, 2024, on the Parcel E-2 Landfill within the geomembrane boundary, approximately 20 feet from GMP-07A (Attachment 1). The installation of this extraction well is in response to the methane levels at GMP-07A and will be incorporated into the long-term methane control solution portion of the approved remedy. The Navy will continue to work with the regulatory agencies to develop and implement a long-term strategy for the methane levels at GMP-07A.

OBJECTIVE

- Installation of EX-11 in the area of GMP-07A will allow the mobile extraction unit to be attached and lower the methane concentrations in that area to protect human health and the environment, in accordance with the Final Interim Monitoring and Control Plan Section 2.2.2 Gas extraction Units and Treatment System (Attachment 2).

RATIONALE FOR LOCATION

- EX-11 will be installed approximately 20 feet away from GMP07A to prevent damage to GMP07A during installation and placed in similar elevation, lithology, depth to GMP-07A (Attachment 1 and 3).

- The radius of influence is assumed to be approximately 100 to150 feet based on the Final Remedial Design section 3.8.3.1 LFG Extraction Well Radius of Influence (Attachment 4).

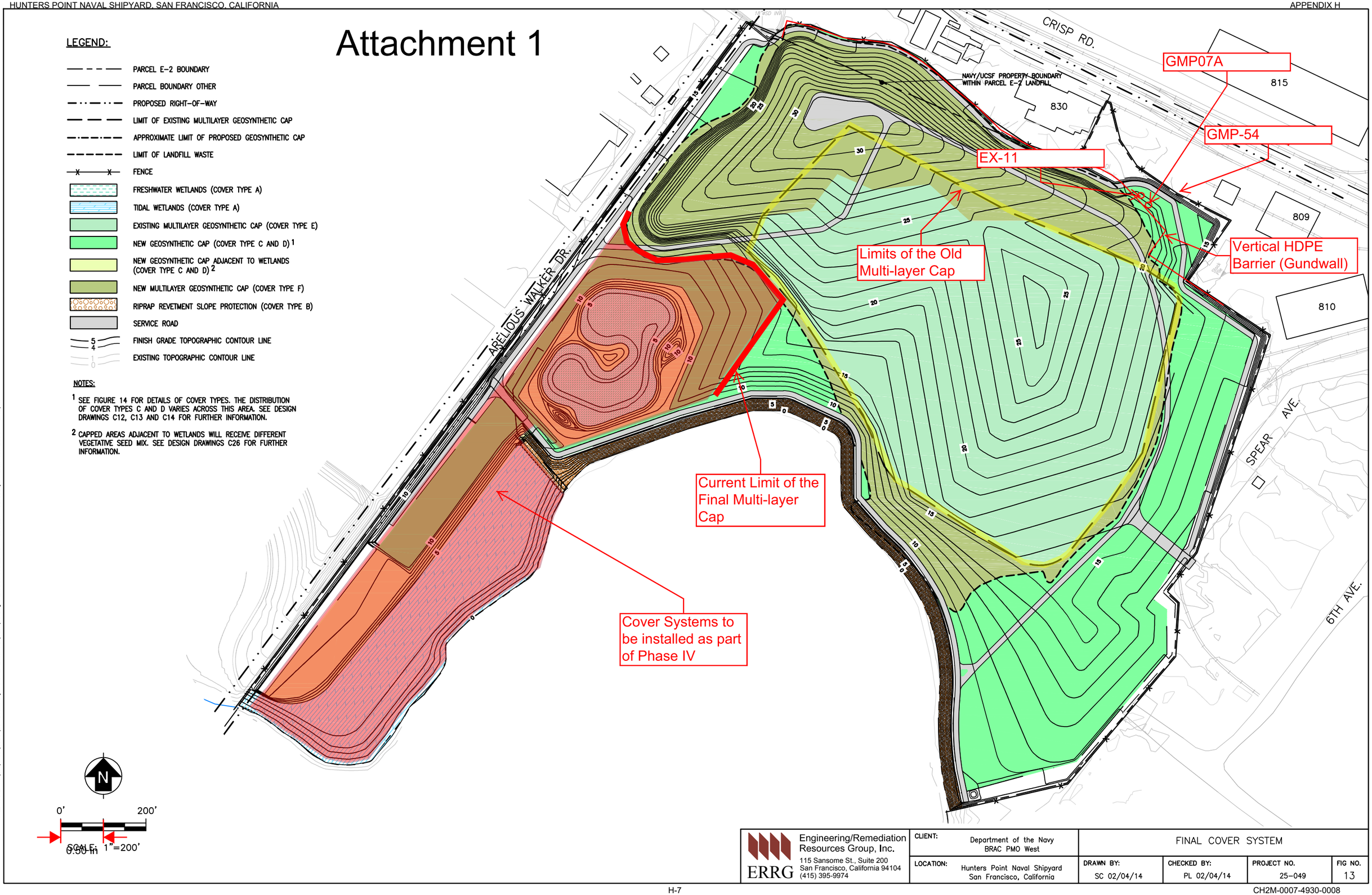
RATIONALE FOR EXTRACTION WELL DESIGN

- The extraction well will follow the design requirements for the extraction well as outlined in the Remedial Design section 3.8.3.2 LFG Extraction Wells Construction (Attachment 5 and Attachment 6). “Vertical extraction wells will be constructed of Schedule 80 PVC pipe casings, 4 inches in diameter. The lower section of the well casing will be perforated with 0.5-inch round holes to allow LFG to be extracted from the waste. The perforated length of pipe will typically be from 1/2 to 3/4 of the overall casing length (5 to 25 feet), depending on the depth of the well bore to groundwater and the thickness of waste encountered. The remaining length of the well casing will be constructed of non-perforated pipe to reduce the potential for intrusion of air into the waste and the well. The well casings will be installed in borings ranging from 18 to 24 inches in diameter and backfilled with coarse gravel around the perforated section of pipe and a bentonite seal around the solid section of pipe”.

Attachments

1. Figure 13 - Final Cover System with GMP and Extraction Well Location (Final Remedial Design ERRG 2014)
2. Excerpt from Parcel E-2 Design Basis Report section 3.8.3.2 LFG Extraction Wells construction pages 62 (Final Design Basis Report, ERRG 2014)
3. GMP-07A Boring Log (Final Interim Landfill Gas Monitoring and Control Plan Tetra Tech 2004)
4. Excerpt from Parcel E-2 Design Basis Report section 3.8.3.1 LFG Extraction Well Radius of Influence pages 60-61 (Final Design Basis Report, ERRG 2014)
5. Figure C-31 Details Extraction Well Details (Final Design Basis Report ERRG 2014)
6. Excerpt from Parcel E-2 Final Interim Landfill Gas Monitoring and Control Plan section 2.2.2 Gas extraction Units and Treatment System Pages A-6 – A-7 (Final Interim MCP, Tetra Tech 2004)

Attachment 1



ERRG Engineering/Remediation Resources Group, Inc. 115 Sansome St., Suite 200 San Francisco, California 94104 (415) 395-9974	CLIENT: Department of the Navy BRAC PMO West	FINAL COVER SYSTEM			
	LOCATION: Hunters Point Naval Shipyard San Francisco, California	DRAWN BY: SC 02/04/14	CHECKED BY: PL 02/04/14	PROJECT NO. 25-049	FIG NO. 13

FILE NAME: N:\Graphics\2005\25-049_Navy_HPS_E-2_RI-FS\DBR\13.dwg LAYOUT NAME: 13 PLOTTED: Wednesday, March 19, 2014 - 2:42pm

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Attachment 2

2,2.2 Gas Extraction Units and Treatment System

Hie Navy has two portable gas extraction units with treatment systems. Hie units consist of the following:

- The two gas recovery blowers are Carbonair Model CE-404 1 (maximum flow capacity of about 100 cubic feet per minute [cfin]) equipped with a moisture separator
- Each treatment system consists of two Carbonair Model GPC3 carbon vessels (with. 200 pounds of carbon per vessel) in series and one Hydrosil HS-600 vessel (with 400 pounds of permanganate-infused zeolite) as a polishing filter to remove select constituents not removed by the carbon

Appendix A, Fharf /nrenYn *Monitoring and Control* Plan

Attachment 2

Attachment A1 contains additional manufacturer's information on these units. During extraction, the treatment units will remove NMOCs, and methane will be vented to the atmosphere. Methane will be vented to the atmosphere at a minimum elevation of 15 feet above the ground through the polyvinyl chloride (PVC) pipe stack located on each unit. The expected life of the carbon and Hydrosil units on the gas recovery systems will vary depending on the flow rate and influent concentration of the various constituents. Carbonair performed modeling for the filter system and projected that new carbon vessels will last 487 days (16 months), assuming the expected average influent concentration of 2 parts per billion by volume NMOCs and a flow rate of 20 cfm. The Hydrosil vessel, in series with the carbon, is predicted to last 3,300 days (9 years).

Treatment units similar to those on the extraction units (consisting of carbon and Hydrosil) are connected to each of the five vent risers during venting. The treatment units attached to each vent riser will remove NMOCs, and methane is then vented to the atmosphere at about 15 feet above the ground to ensure safe dissipation. The treatment units cause some resistance to flow, decreasing the preferential pathway. They must be maintained in good operating condition to prevent excessive decreases in the venting capacity of the system. Each vent riser has three existing valves that allow the connection of a trailer-mounted, active extraction unit to assist the venting system as necessary to control migration.

Attachment 3 - Boring Log GMP07A

Tetra Tech EM Inc.

Log of Boring: GMP07A

Project: GMP WELLS
Project No: DO 003
Location: PARCEL E LANDFILL
Ground Surface Elevation (feet MSL): 15.20
Top of Casing Elevation (feet MSL): NA

Drilling Method: HSA
Boring Started: 09/12/02
Completed: 09/12/02
Boring Depth (feet bgs): 14.00
Boring Diameter (inches): 5.50
Casing Diameter (inches): 0.75

Logged By: REBECCA LESHER
Logging Consultant: TETRA TECH
Drilling Company: GREGG

DEPTH (FEET)	DRIVE INTERVAL	RECOVERY (IN)	SAMPLE ID	OVM (PPM)	WATER LEVEL	GRAPHIC LOG	ASTM SOIL TYPE	DESCRIPTION	COMMENTS
0								Ground Surface	NOTE: GMP07A IS A REPLACEMENT FOR GMP07. LITHOLOGY IS FROM BORING SG07.
1							CL	CLAY: black staining from 1.5 to 2 feet; reddish brown (5YR 4/4); slightly moist; about 20% fine- to medium-grained sand; occasional fine gravel; 2-inch lens of fine-grained sand (light gray) at 4.25 feet	
2									
3									
4									
5								CLAY with gravel: slightly moist; clay lens from 5.5 to 7 feet containing about 10% fine-grained gravel	
6									
7									
8								CLAYwith gravel: very slightly moist; no staining	
9									
10							GR	GRAVEL: increasing gravel content At 9.5 to 10.5 feet: gravel lens serpentinite)	
11							CL	SANDY CLAY: very dark gray (N3/); slightly moist; 70% clay; 30% fine-grained; sand; no staining; occasional gravelly layer (about 1 to 2 inches thick); saturated at about 11 feet	
12									
13					▽				
14								Total depth of boring = 14 feet	
15									
16									
17									
18									
19									
20									
21									
22									
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35									

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The GMPs in the UCSF compound and along the HDPE barrier wall will be retained for future monitoring (as part of the GCCS). Section 3.8.5 provides additional information on the GMP network at Parcel E-2 and surrounding areas (e.g., GMPs along Crisp Road in Parcel UC-3).

3.8.3. Extraction Wells and Conveyance Piping

Design calculations for Figure 16 and design drawings C30 through C32 in Appendix B present the piping layout and details for the extraction wells designed to capture LFG from below the cap, minimize migration of LFG along the perimeter of the Parcel E-2 Landfill, and maintain regulatory compliance at the current locations with known LFG impacts (e.g., the northern parcel boundary). A network of 37 vertical extraction wells is proposed to efficiently extract LFG produced by the waste within the Parcel E-2 Landfill. The number and spacing of the extraction wells were revised, relative to information presented in the Draft DBR, based on information (i.e., estimated radii of influence) collected during the recent LFG generation study (ITSI Gilbane Company, 2014). Further information is presented in Section 3.8.3.1. The extraction wells will be installed within the unsaturated waste layer within the landfill, which extends to depths ranging from 5 to 25 feet bgs. The RAWP will identify procedures to ensure that each extraction well is properly screened within the unsaturated waste layer. One additional extraction well will be installed in the East Adjacent Area

The extraction wells will draw LFG out of the waste and away from the landfill perimeter to control its migration. The network of vertical extraction wells will be spaced sufficiently close together to facilitate capture of LFG from all solid waste areas, especially near the landfill perimeter. The vertical extraction wells (which, as shown on design drawing C31, will be constructed from Schedule 80 polyvinyl chloride [PVC] piping) will be connected with laterals to a header pipe (as shown on design drawing C31, HDPE piping will be used to construct the lateral and header pipes). The lateral and header pipes will be installed underground, but above the protective liner. All extraction wells and their control equipment will be terminated flush with the ground and have vaults with lockable covers at the surface to discourage vandalism. A blower assembly will be used to create a vacuum in the header pipe that will draw LFG to the treatment facility located in the southeast corner of the landfill. The collected gas will then be conveyed through the treatment facility, where methane and NMOCs in LFG will be treated. Figure 16 shows the conveyance piping alignments leading to the treatment facility.

As described in Section 3.8.1, the findings from the recent soil gas survey do not necessitate active extraction in the Panhandle Area or the East Adjacent Area (with one exception in the East Adjacent Area) (ITSI Gilbane Company, 2014). The following subsections summarize the calculation of the radius of influence for and the construction of the extraction wells.

3.8.3.1. LFG Extraction Well Radius of Influence

Radii of influence were estimated during the LFG generation study using three vertical extraction wells drilled and installed, at depths ranging from 11.5 to 21.5 feet bgs, into the Parcel E-2 Landfill. Each

extraction well included an array of monitoring probes that were used to record vacuum pressure during the study, which involved active extraction from each of the three extraction wells. Radii of influence were calculated using two empirical equations established by EPA and EMCON, and the results were compared with the field pressure reading (to verify their validity). The results of the LFG generation study are detailed in a draft technical memorandum (ITSI Gilbane Company, 2014).

The draft technical memorandum describes the short- and long-term vacuum tests that were performed and summarizes the resulting data that were used to estimate the radii of influence for the extraction wells. The radius of influence for extraction well ROI-1, which is located in the western portion of the landfill that is not covered by a protective liner, was estimated at approximately 100 feet (note that testing at ROI-1 included installation of the 10-foot-by-10-foot HDPE liner to minimize entrainment of atmospheric air at the extraction well). The estimated radius of influence at ROI-1 is useful in determining the spacing of extraction wells near the edges of the Parcel E-2 Landfill, where the surface materials adjacent to the protective liner may have permeabilities similar to the tested conditions. The estimated radii of influence at ROI-2 and ROI-3, which are located in the central and eastern portions of the landfill that are covered by a protective liner, were estimated at approximately 150 feet for each well (note that testing at ROI-2 and ROI-3 included installation of an HDPE patch onto the existing liner to provide a continuous low-permeability layer). The estimated radii of influence at ROI-2 and ROI-3 are useful in determining the spacing of extraction wells within the interior portions of the landfill. The radii of influence were estimated conservatively, which provides sufficient overlap between extraction wells to account for the heterogeneities in the landfill waste.

The estimated radii of influence were used to refine the spacing of the extraction wells in this design, as shown on Figure 16 and design drawing C30 in Appendix B. The spacing of the extraction wells were adjusted based on the criteria listed below.

- A 100-foot radius of influence was assumed for all extraction wells along the perimeter of the landfill, and a 150-foot radius of influence was assumed for all extraction wells in the interior portions of the landfill.
- The vacuum-induced influence from the extraction wells needed to cover the entire surface area of the Parcel E-2 Landfill and provide incremental overlap between adjacent extraction wells and beyond the landfill extent.
- The vacuum-induced influence from extraction wells in the southwestern portion of the Parcel E-2 Landfill needed to extend slightly into the Panhandle Area to address isolated areas with elevated methane (as described in Section 3.8.1).
- The extraction well field needed to incorporate the three extraction wells (ROI-1, ROI-2, and ROI-3) installed during the LFG generation study.

The resulting extraction well field includes wells along the perimeter of the landfill that are spaced about 173 feet apart and set back about 40 feet from the edge of the landfill. Wells in the interior portion of the

landfill are spaced about 260 feet apart. Additional wells with assumed 100-foot radii of influence were inserted, as necessary, in a non-uniform pattern to provide 100 percent surface coverage.

3.8.3.2. LFG Extraction Wells Construction

Vertical extraction wells will be constructed of Schedule 80 PVC pipe casings, 4 inches in diameter. The lower section of the well casing will be perforated with 0.5-inch round holes to allow LFG to be extracted from the waste. The perforated length of pipe will typically be from 1/2 to 3/4 of the overall casing length (5 to 25 feet), depending on the depth of the well bore to groundwater and the thickness of waste encountered. The remaining length of the well casing will be constructed of non-perforated pipe to reduce the potential for intrusion of air into the waste and the well. The well casings will be installed in borings ranging from 18 to 24 inches in diameter and backfilled with coarse gravel around the perforated section of pipe and a bentonite seal around the solid section of pipe. An HDPE well boot will be used to seal the pipe casing with the cap geomembrane. A wellhead with a flow control valve will be installed in a lockable, below-grade vault at the top of each casing to monitor gas and adjust flow.

The planned depths and screened intervals for the extraction wells may vary based on the thickness of the unsaturated waste layer encountered during construction. The RAWP will include a table identifying the horizontal coordinates, ground surface elevation, anticipated depth of cover and solid waste, and the estimated range of historical water levels for all planned extraction wells. The RAWP will also specify procedures to verify this information during field construction and, if necessary, adjust the depths and screened intervals for the extraction wells.

3.8.3.3. Conveyance Piping

Conveyance piping refers to the lateral piping and main header piping that transport the LFG flow from the extraction components (vertical wells, vents, and trenches) to the treatment facility. LFG conveyance pipes will be constructed and buried in trenches in the vegetative soil above the geomembrane layer of the final cap. The LFG pipes will be constructed of HDPE, a very durable material for conveying LFG. Design drawing C32 in Appendix B shows the typical LFG conveyance piping details.

Laterals refer to smaller diameter pipes (2-, 3-, and 4-inch nominal pipe size) that convey LFG from each of the extraction components to the main LFG pipe (i.e., the header). LFG lateral pipes will be constructed of HDPE and will be buried above the geomembrane layer of the cap to facilitate operator access to control valves and condensate sumps. The laterals are generally sloped away from the extraction components and toward the main headers to remove LFG condensate from the waste and facilitate drainage toward the condensate collection sumps. To account for landfill settlement, laterals located over waste will be constructed with a minimum 3 percent slope and will be equipped with flexible connections (as shown in design drawings C30 and C31 in Appendix B).

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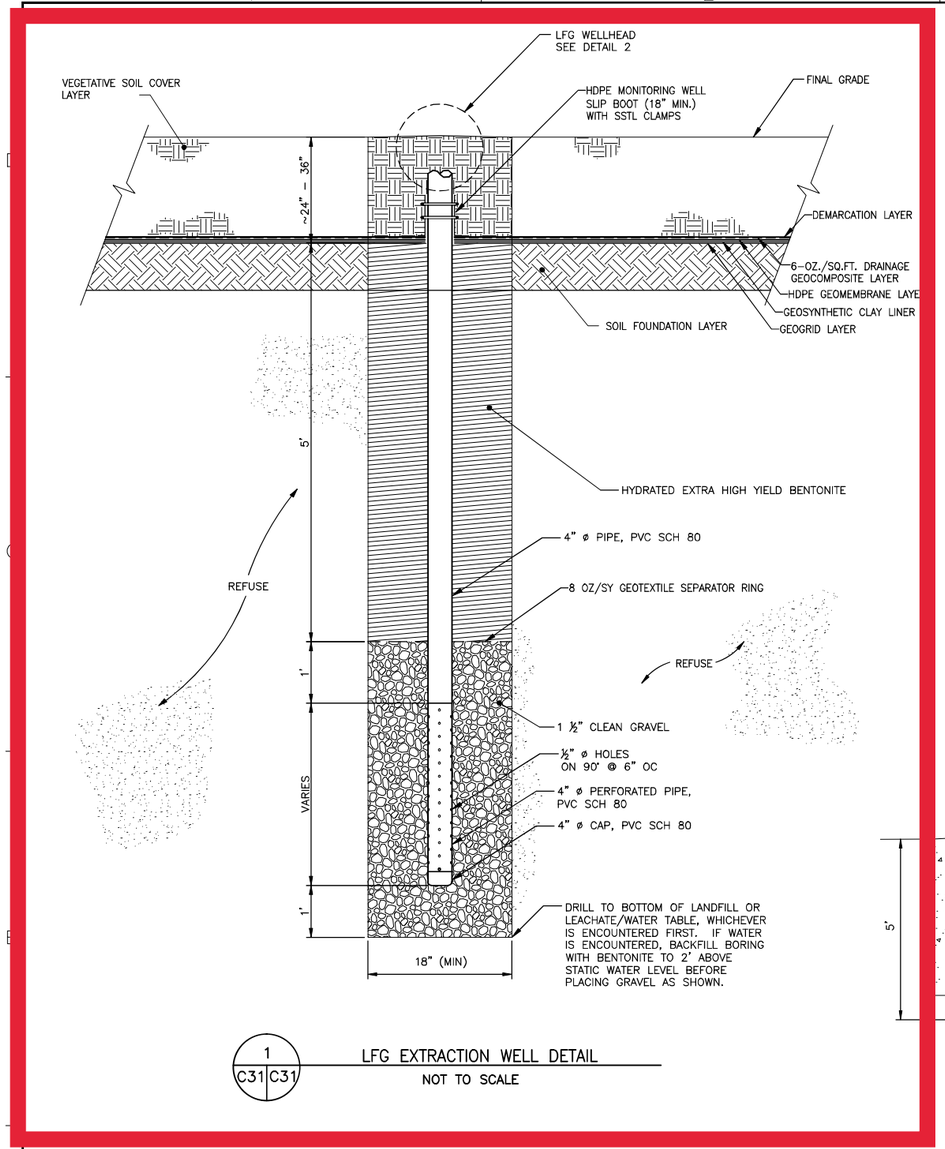
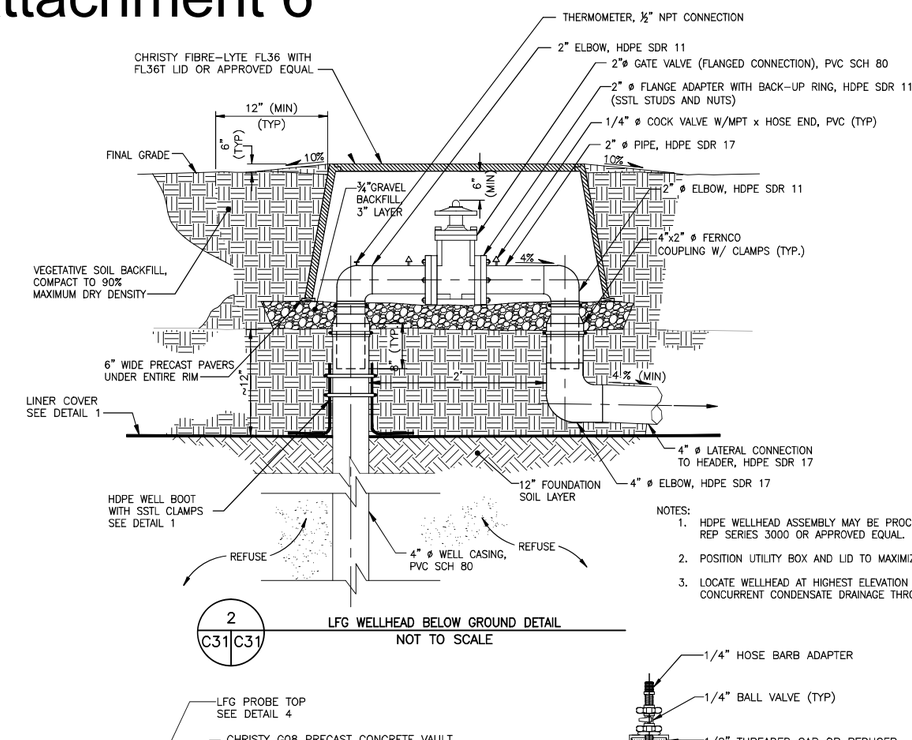
Attachment 6

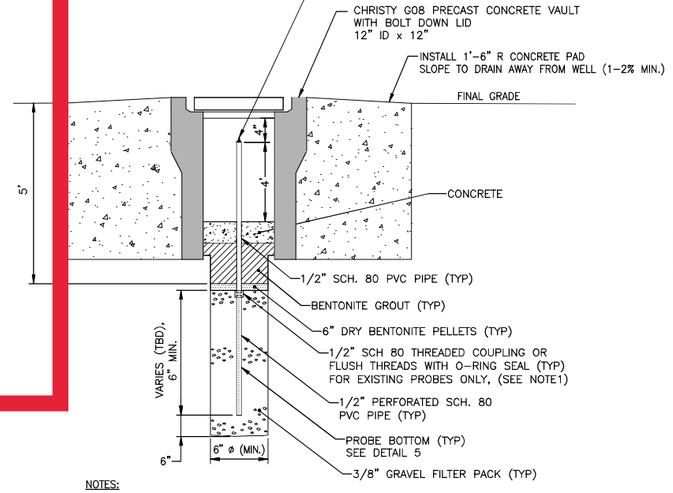


1 C31 C31 LFG EXTRACTION WELL DETAIL
NOT TO SCALE



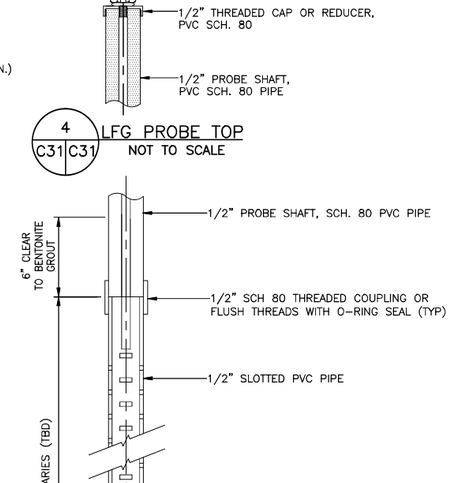
2 C31 C31 LFG WELLHEAD BELOW GROUND DETAIL
NOT TO SCALE

NOTES:
1. HDPE WELLHEAD ASSEMBLY MAY BE PROCURED PRE-FABRICATED QED PRECISION, REP SERIES 3000 OR APPROVED EQUAL.
2. POSITION UTILITY BOX AND LID TO MAXIMIZE VALVE AND SAMPLE PORT ACCESS.
3. LOCATE WELLHEAD AT HIGHEST ELEVATION OF EACH WELL LATERAL PIPE TO ENSURE CONCURRENT CONDENSATE DRAINAGE THROUGH VALVE.



NOTES:
1. ACTUAL CONSTRUCTION MAY VARY DEPENDING ON WELL LOCATION.
2. EXISTING GAS MONITORING PROBES NOT DESIGNATED TO BE ABANDONED WILL BE EXTENDED OR REPLACED WITH EQUIVALENT MATERIALS, AS NEEDED TO MEET THE FINAL SURFACE GRADE.
3. PROBE VAULTS AND SURFACE COMPLETIONS WILL BE REPLACED IN ACCORDANCE WITH DRAWING C26, DETAILS 2 AND 3.
4. EXISTING CONCRETE SURFACE COMPLETIONS CAN REMAIN IN PLACE IF NOT OBSTRUCTIVE TO THE EXTENSION OF THE PROBE.
5. DRILL BORING TO HIGH GROUNDWATER ELEVATION. IF GROUNDWATER IS ENCOUNTERED, BACKFILL BORING WITH BENTONITE TO 2' ABOVE STATIC WATER LEVEL BEFORE PLACING FILTER PACK AS SHOWN.

3 C31 C31 SINGLE-LEVEL LFG MONITORING PROBE DETAIL
NOT TO SCALE



4 C31 C31 LFG PROBE TOP
NOT TO SCALE

5 C31 C31 LFG PROBE BOTTOM DETAIL
NOT TO SCALE

REGISTERED PROFESSIONAL ENGINEER
Exp 9/30/2015
CIVIL
STATE OF CALIFORNIA

PREPARED FOR:	Department of the Navy, Naval Facilities Engineering Command, Base Realignment and Closure Program Management Office West, San Diego, CA
PREPARED BY:	Golder Associates Inc., 425 Ja Iside Drive, Sunnyvale, CA 940 5, (40) 2 4-2 2
SIZE	D
	IF SHEET IS LESS THAN 22" X 34" IT IS A REDUCED PRINT
	SCALE REDUCED ACCORDINGLY
DRAWN BY:	SC
DESIGN BY:	AW
CHIEF ENG:	DB
PM/CM:	DB
ENGINEERING/ REMEDIATION RESOURCES GROUP, INC. SAN FRANCISCO, CA	
BRAC PMO WEST SAN DIEGO, CALIFORNIA	
SIZE:	22" X 34"
SCALE:	AS NOTED
PROJ. NO.	25-049
CONSTR. CONTR. NO.	N68711-05-C-6011
DRAWING NO.	C31
SHEET	33 OF 49 SHEETS

LFG EXTRACTION WELL AND MONITORING PROBE DETAILS

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DEPARTMENT OF THE NAVY
NAVAL FACILITIES ENGINEERING SYSTEMS COMMAND
BASE REALIGNMENT AND CLOSURE
PROGRAM MANAGEMENT OFFICE WEST
33000 NIXIE WAY, BLDG 50 Suite 207
SAN DIEGO, CA 92147

5000-33B
Ser BPMOW/281
December 27, 2023

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

Ms. Karen Ueno
U. S. Environmental Protection Agency Region 9
75 Hawthorne St
San Francisco, CA 94105

Dear Mr. Tanouye and Ms.Ueno:

The Department of the Navy is providing a follow up to Enclosure 4 (GMP-54 Installation Technical Memorandum) from our letter dated October 10, 2023 to the United States Environmental Protection Agency and San Francisco Bay Regional Water Board. GMP-54 was installed on October 12, 2023. The enclosure provides additional technical rationale for the installation of GMP-54 and the initial monitoring results. We look forward to discussing and resolving the methane issue with the regulatory agencies to implement a permanent solution. Please contact Andre Baker at (619) 524-5167, if you have any questions.

Sincerely,
POUND.MICHAEL.J. Digitally signed by POUND.MICHAEL.J.
Date: 2023.12.27 11:38:48 -08'00'

MICHAEL POUND
BRAC Environmental Coordinator
By direction of the Director

Enclosure: Tech Memo Monitoring Update and Additional Technical Rationale for the Installation of a New Gas Parcel E-2 Landfill Geomembrane Perimeter Boundary Monitoring Probe, December 21, 2023

Copy to: (via email)
Mr. Andrew Bain, United States Environmental Protection Agency
Andrew.Bain@epa.gov
Mr. Michael Howley, California Department of Toxic Substances Control
Michael.howley@dtsc.ca.gov
Mr. Ryan Casey, City of San Francisco Department of Public Health
Ryan.casey@sfdph.org
Ms. Lila Hussain, Office of Community Investment and Infrastructure
lila.hussain@sfgov.org

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Technical Memorandum

From: Andre Baker, Remedial Project Manager

Via: Michael Pound, BRAC Environmental Coordinator

To: BCT Members

Date: December 21, 2023

SUBJECT: Monitoring Update and Additional Technical Rationale for the Installation of a New Gas Parcel E-2 Landfill Geomembrane Perimeter Boundary Monitoring Probe

The Department of the Navy is providing a follow up to Enclosure 4 (GMP054 Installation Technical Memorandum) from its letter dated October 10, 2023 to the EPA and Water Board. Included here is the Navy's additional technical rationale for the installation of an additional soil gas-monitoring probe (GMP), designated GMP-54 and the results of initial GMP-54 monitoring.

The probe was installed October 13, 2023 on the Parcel E-2 Landfill geomembrane boundary (Attachement 1). The installation of this GMP was in response to the methane exceedance at GMP-07A. The Navy will continue to work with the regulatory agencies to develop and implement a long-term strategy for the exceedance at GMP-07A.

A summary of the rationale for the location, design, and data objective of GMP-54 was provided in Enclosure 4 sent as an attachment to the Navy's October 10, 2023 letter and is updated with lithology and installation information below:

LOCATION

- GMP-54 was installed in close proximity to GMP-06A, GMP-07A and GMP-08A without being under the landfill geomembrane cover system. (Attachment 2)

- GMP-54 was installed approximately 70 ft away from GMP07A in similar lithology as GMP-07A, -06A, and -08A as shown in the boring logs (Attachment 3). Due to the distance, approximately 120 feet between GMP-07A to GMP-06A and GMP-08A and between GMP-06A to GMP-08A, the lithology of the GMP-54 location is similar to the other listed GMPs.

- Upcoming stormwater/sewer line decommission activity will be in close proximity. GMP-54 is located in an area where is will not be affected by this activity once installed. (Attachment 4)

DESIGN

- The installed monitoring probe followed the requirements for the new probes as outlined in the Remedial Design (Attachment 5 and Attachment 6). The requirement is GMPs will be screened approximately 5 feet below ground surface (bgs) (above the historical high groundwater elevation at Parcel E-2) to the historical low groundwater elevation, which varies across Parcel E-2 to a maximum depth of 16 feet bgs (north of the landfill).

Data Objectives

- Ensure that no methane is migrating past the landfill geomembrane boundary above the action level, in accordance with the Record of Decision's ARARs for protecting human health and the environment.
- Gather data regarding subsurface methane near GMP-07A.

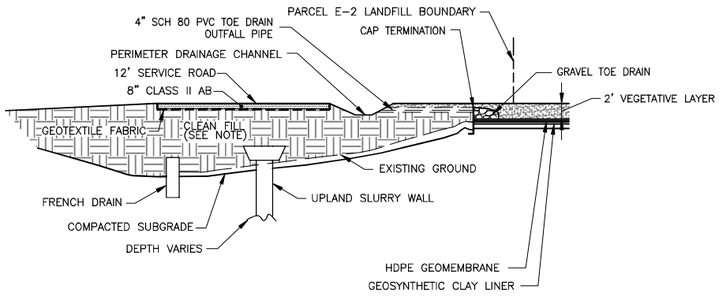
Current Measurements from GMP-54

- 10/18/23 – 0.0% methane by volume
- 10/24/23 – 0.0% methane by volume
- 10/31/23 – 0.1% methane by volume
- 11/02/23 – 0.0% methane by volume
- 11/16/23 – 0.0% methane by volume
- 11/30/23 – 0.0% methane by volume
- 12/14/23 – 0.0% methane by volume

Attachments

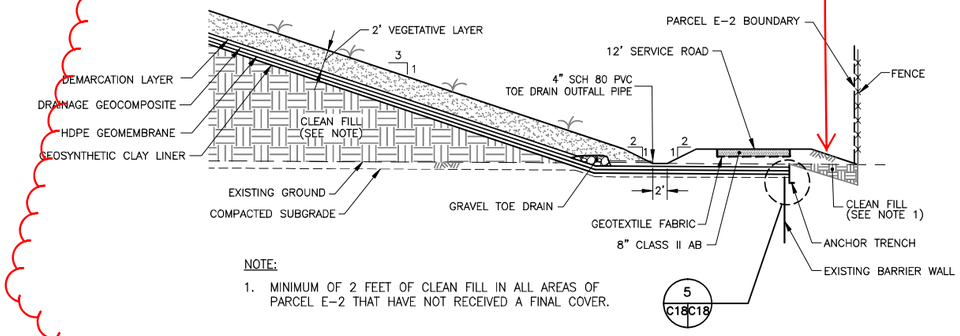
1. Figure C-18- Cap Termination (Northern Perimeter) Detail 2 (Final Remedial Design ERRG 2014)
2. Figure 13 - Final Cover System with GMP Locations (Final Remedial Design ERRG 2014)
3. GMP-06A,07A and 08A Boring Logs (Final Interim Landfill Gas Monitoring and Control Plan Tetra Tech 2004) and GMP-54 Boring Log (Trevet, 2023)
4. Figure 3- GMP-54 location in relation to future E-2 storm drain and sanitary sewer removal locations
5. Excerpt from Parcel E-2 Design Basis Report page 3-75 (Final Design Basis Report, ERRG 2014)
6. Figure C-31 Details GMP Construction Details (Final Design Basis Report ERRG 2014)

Attachment 1



1 C15|C18 CAP TERMINATION (WEST BOUNDARY)
NOT TO SCALE

Approximate GMP54 location between anchor trench and Parcel Boundary

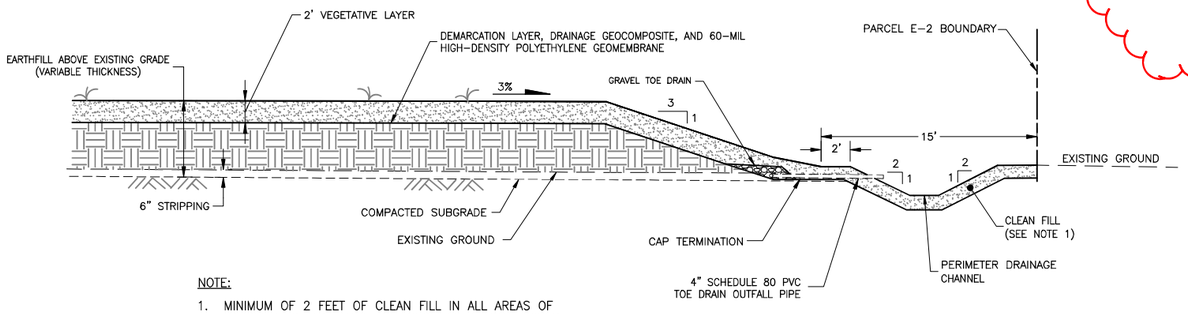


NOTE:

1. MINIMUM OF 2 FEET OF CLEAN FILL IN ALL AREAS OF PARCEL E-2 THAT HAVE NOT RECEIVED A FINAL COVER.

5 C18|C18

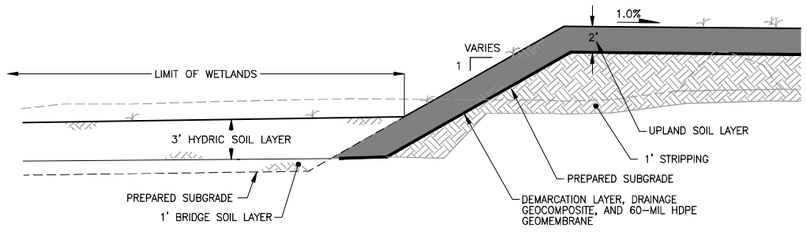
2 C15|C18 CAP TERMINATION (NORTH PERIMETER)
NOT TO SCALE



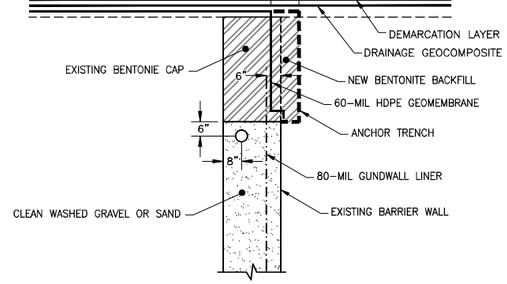
NOTE:

1. MINIMUM OF 2 FEET OF CLEAN FILL IN ALL AREAS OF PARCEL E-2 THAT HAVE NOT RECEIVED A FINAL COVER.

3 C15|C18 CAP TERMINATION (EAST BOUNDARY)
NOT TO SCALE



4 C16|C18 CAP TERMINATION (FRESHWATER/ TIDAL WETANDS)
NOT TO SCALE



5 C18|C18 GEOMEMBRANE AND BARRIER WALL TIE-IN DETAIL
NOT TO SCALE

REGISTERED PROFESSIONAL ENGINEER DOUGLAS A. BIELSKIS No. C 63113 Exp. 6/30/16 CIVIL STATE OF CALIFORNIA

APPR. | DATE | DESCRIPTION | SYM

PREPARED FOR: Department of the Navy, Naval Facilities Engineering Command, Base Realignment and Closure Program Management Office West, San Diego, CA. NAVFAC

PREPARED BY: Engineering/Remediation Resources Group, Inc., 1330 Broadway, Suite 730, Oakland, California 94612, (510) 251-2426 | San Francisco, California 94104, (415) 397-0872 | ERRG

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

DRAWN BY:	SC
DESIGN BY:	PDL
CHIEF ENG:	DB
PM/CM:	DB

ENGINEERING/ REMEDIATION RESOURCES GROUP, INC. SAN FRANCISCO, CA

COVER TERMINATION DETAILS

BRAC PMO WEST SAN DIEGO, CALIFORNIA

SIZE:	22" X 34"
SCALE:	AS NOTED
PROJ. NO.	25-049
CONSTR. CONTR. NO.	N68711-05-C-6011
DRAWING NO.	C18
SHEET	20 OF 49 SHEETS

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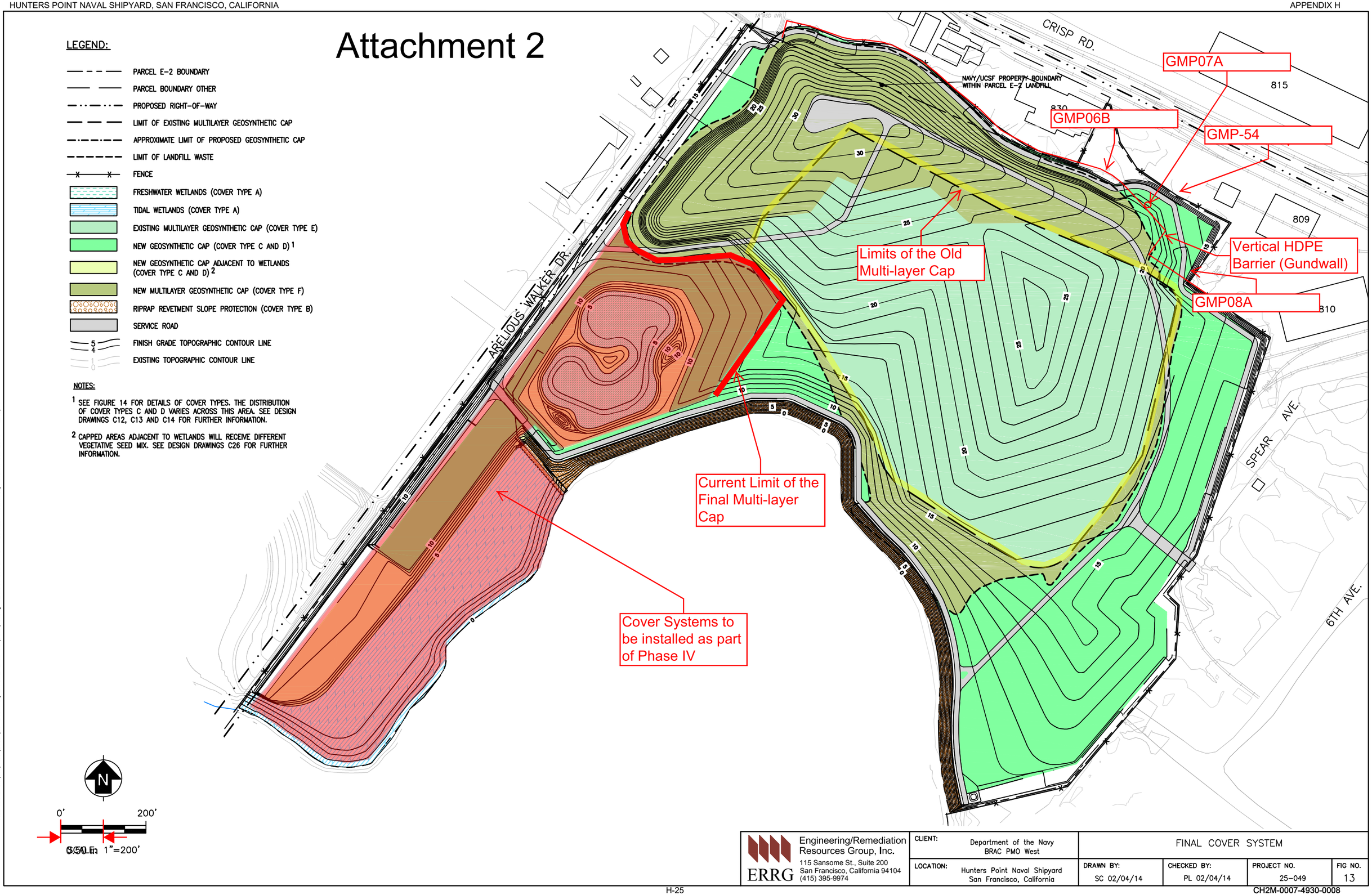
Attachment 2



FILE NAME: H:\Graphics\2005\25-049_Navy_HPS_E-2_RI-FS\DBR\13.dwg LAYOUT NAME: 13 PLOTTED: Wednesday, March 19, 2014 - 2:42pm

ERRG Engineering/Remediation Resources Group, Inc. 115 Sansome St., Suite 200 San Francisco, California 94104 (415) 395-9974	CLIENT: Department of the Navy BRAC PMO West	FINAL COVER SYSTEM		
	LOCATION: Hunters Point Naval Shipyard San Francisco, California	DRAWN BY: SC 02/04/14	CHECKED BY: PL 02/04/14	PROJECT NO. 25-049 / FIG NO. 13

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Attachment 3 - Boring Log GMP06B

Tetra Tech EM Inc.

Log of Boring: GMP06B

Logged By: REBECCA LESHER
Logging Consultant: TETRA TECH
Drilling Company: GREGG

Project: GMP WELLS
Project No: DO 003
Location: PARCEL E LANDFILL
Ground Surface Elevation (feet MSL): 15.10
Top of Casing Elevation (feet MSL): NA

Drilling Method: HSA
Boring Started: 11/25/02
Completed: 11/25/02
Boring Depth (feet bgs): 14.00
Boring Diameter (inches): 5.50
Casing Diameter (inches): 0.75

DEPTH (FEET)	DRIVE INTERVAL	RECOVERY (IN)	SAMPLE ID	OVM (PPM)	WATER LEVEL	GRAPHIC LOG	ASTM SOIL TYPE	DESCRIPTION	COMMENTS
0								Ground Surface	NOTE: GMP06B IS A REPLACEMENT FOR GMP06A. LITHOLOGY IS FROM BORING SGD6.
1							SC	CLAYEY SAND: very dark grayish brown (2.5Y 3/2); slightly moist; more fine- to medium-grained sand; subangular to subrounded	
2									
3							CL	LEAN CLAY: reddish brown (3.5Y 3/2); 5 to 10% fine-grained sand; color changes to very dark grayish brown (2.5Y 3/2); increase in sand content	
4									
5									
6								Decreasing sand content to about 20%	
7									
8							SC	CLAYEY SAND with gravel: very dark gray (N3/); slightly moist; gravel and sand are serpentinite in content; sand is well graded; gravel up to 1-inch diameter; no staining	
9									
10									
11									
12									
13									
14								Total depth of boring = 14 feet	
15									
16									
17									
18									
19									
20									
21									
22									
23									
24									
25									
26									
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35									

Attachment 3 - Boring Log GMP07A

Tetra Tech EM Inc.

Log of Boring: GMP07A

Logged By: REBECCA LESHER
Logging Consultant: TETRA TECH
Drilling Company: GREGG

Project: GMP WELLS
Project No: DO 003
Location: PARCEL E LANDFILL
Ground Surface Elevation (feet MSL): 15.20
Top of Casing Elevation (feet MSL): NA

Drilling Method: HSA
Boring Started: 09/12/02
Completed: 09/12/02
Boring Depth (feet bgs): 14.00
Boring Diameter (inches): 5.50
Casing Diameter (inches): 0.75

DEPTH (FEET)	DRIVE INTERVAL	RECOVERY (IN)	SAMPLE ID	OVM (PPM)	WATER LEVEL	GRAPHIC LOG	ASTM SOIL TYPE	DESCRIPTION	COMMENTS
0								Ground Surface	NOTE: GMP07A IS A REPLACEMENT FOR GMP07. LITHOLOGY IS FROM BORING SG07.
0–9							CL	CLAY: black staining from 1.5 to 2 feet; reddish brown (5YR 4/4); slightly moist; about 20% fine- to medium-grained sand; occasional fine gravel; 2-inch lens of fine-grained sand (light gray) at 4.25 feet CLAY with gravel: slightly moist; clay lens from 5.5 to 7 feet containing about 10% fine-grained gravel CLAYwith gravel: very slightly moist; no staining	
9–10							GR	GRAVEL: increasing gravel content At 9.5 to 10.5 feet: gravel lens serpentinite)	
10–13					▽		CL	SANDY CLAY: very dark gray (N3/); slightly moist; 70% clay; 30% fine-grained; sand; no staining; occasional gravelly layer (about 1 to 2 inches thick); saturated at about 11 feet	
14								Total depth of boring = 14 feet	

Attachment 3 - Boring Log GMP08A

Tetra Tech EM Inc.

Log of Boring: GMP08A

Logged By: REBECCA LESHER
Logging Consultant: TETRA TECH
Drilling Company: GREGG

Project: GMP WELLS
Project No: DO 003
Location: PARCEL E LANDFILL
Ground Surface Elevation (feet MSL): 13.10
Top of Casing Elevation (feet MSL): NA

Drilling Method: HSA
Boring Started: 09/12/02
Completed: 09/12/02
Boring Depth (feet bgs): 12.00
Boring Diameter (inches): 5.50
Casing Diameter (inches): 0.75

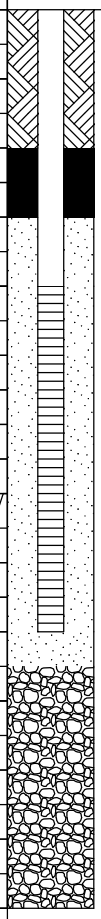
DEPTH (FEET)	DRIVE INTERVAL / RECOVERY (IN)	SAMPLE ID	OVM (PPM)	WATER LEVEL	GRAPHIC LOG	ASTM SOIL TYPE	DESCRIPTION	COMMENTS
0							Ground Surface	NOTE: GMP08A IS A REPLACEMENT FOR GMP08. LITHOLOGY IS FROM BORING SGD8.
1–3						CL	SANDY CLAY: very dark brown (10YR 3/1); very slightly moist; 30% sand; occasional gravel	
4						SC	CLAYEY SAND: greenish gray (5G 5/1); fine- to medium-grained	
5–12	14 / 24			▽		CL	SANDY CLAY: greenish gray (5BG 4/1); occasional gravel Poor recovery from 8 to 12 feet due to cobble/boulder	
12							Total depth of boring = 12 feet	
13–35								

TREVET

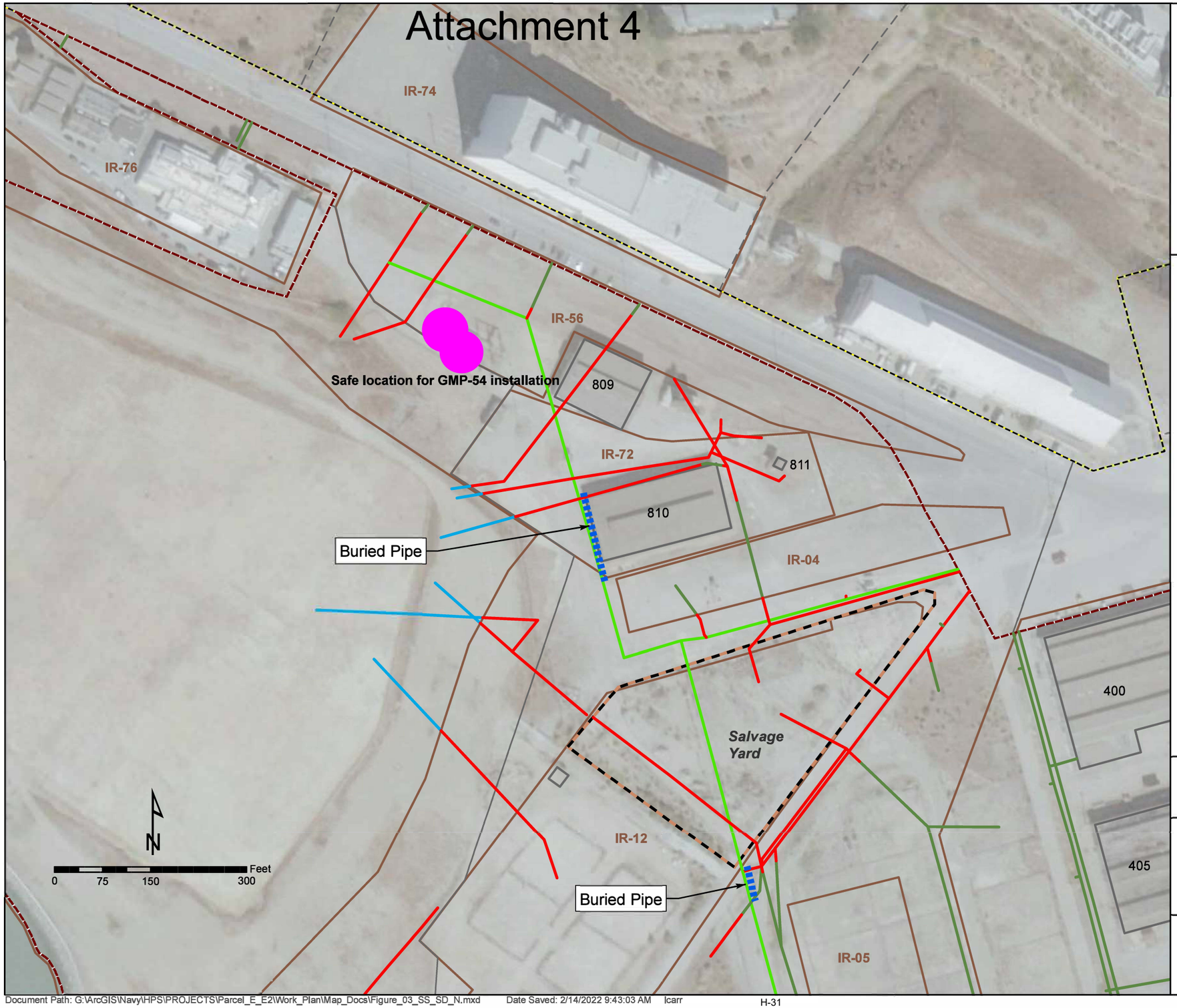
Attachment 3 - Boring Log GMP54
Borehole Log/Well Completion Log

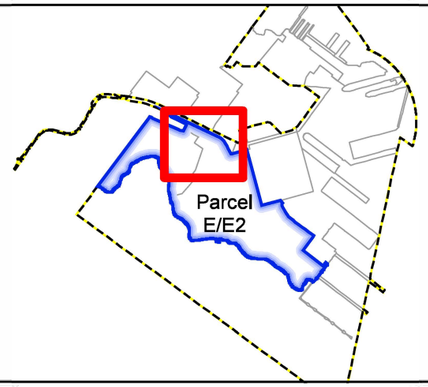
Project Name: Hunters Point BGMP			Project Number: 1261-008	**Borehole Number:**	**GMP-54**
Borehole Location: Parcel E-2	*Northing:*	*Easting:*		Sheet	of
Drilling Agency: Cascade Drilling			Driller: Gary W.		
Drilling Equipment: CME75			Date Started: 10/13/23	Total Depth (feet):	13.00
Drilling Method: HOLLOW STEM AUGER	Number of Soil Samples: 0		Date Finished: 10/13/23		
Drilling Fluid: N/A	Borehole Diameter (in): 8		Depth to Water (feet): *Drilling:* 13.0	*Static: 8.0*	
Completion Information: Landfill Gas Monitoring Well			Elevation (feet MSL) :		
			Logged By: Megan Hutchinson	Checked By: Erin Rosen, PG	

Depth (feet)	Samples: Number	Type	Blow Count	Percent Recovery	Time	Field Analyses: PID/FID (ppm) Sample	Additional Tests	Log: Graphic	USCS or Rock Type	Lithologic Description
0										Artificial Fill Material
1						PID = 48			CL	GRAVELLY LEAN CLAY, black (7.5YR 2.5/1), low plasticity, non cohesive, dry, 30% well-graded angular gravel, strong petroleum odor
2										
3						PID = 33.86			CL	Same as above; less gravel
4						PID = 56.29			CL	LEAN CLAY WITH GRAVEL, dark brown (7.5YR 3/4), low plasticity, non cohesive, dry, 20% well-graded angular gravel, slight odor
5										
6						PID = 68.6			CL	Same as above; moist, less gravel
7						PID = 31.31			CL	Same as above; light greenish gray (GLEY1 8/1), some oxidation staining
8									CL	LEAN CLAY, dark brown (7.5YR 3/4), some oxidation staining, medium plasticity, cohesive, moist, 10% well-graded angular gravel, slight odor
9						PID = 62.85			CL	Same as above; less gravel
10									CL	Same as above; wet
11										
12						PID = 40.36				
13										



Attachment 4





Legend

- Buried Pipe
- Sanitary Sewer/Storm Drain Lines to be Removed and Replace with Swales
- Sanitary Sewer/Storm Drain Lines to be Removed
- Previously Removed Sanitary Sewer/Storm Drain Lines and Radiologically Cleared Lines Left in Place
- Sanitary Sewer/Storm Drain Lines to Remain Under Radiological Area Requiring Institutional Control
- Salvage Yard (Approximate)
- Building
- Parcel E/E2 Boundary
- IR Site Boundary
- Parcel Boundary
- HPNS Property Boundary

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

Work Plan
Parcels E and E-2 Sanitary Sewer and Storm Drain and Former Salvage Yard Radiological Remediation and Support

Hunters Point Naval Shipyard (HPNS)
San Francisco, California

Figure 3

Sanitary Sewers/Storm Drains – North

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specific pre-treatment requirements). If confirmed to be suitable for discharge, the condensate may be transported to an appropriate treatment facility either by hauling or via an existing sanitary sewer connection.

The San Francisco Public Utilities Commission (SFPUC) enforces a Pretreatment Program regulating discharges from nondomestic sources into the city's sewerage system. Regulations governing these discharges are contained in the city's sewer use ordinance (Article 4.1, Chapter X, Part II of the San Francisco Municipal Code). Additional wastewater pollutant limitations are contained in Department of Public Works Order No. 158170. In San Francisco, SFPUC issues Industrial User Permits to "industrial users" for regular or continuous discharges that result from commercial or industrial operations. SFPUC also issues Batch Wastewater Discharge permits for nonroutine, episodic, or other temporary discharges. The discharge of pre-treated LFG condensate will require prior permit application and issuance. The permits specify the conditions under which wastewater may be discharged into the sewer system. Permits are issued for a specified duration and are tailored to each user. In addition to the specific limits, all dischargers shall comply with all requirements set forth in federal Categorical Pretreatment Standards and other applicable federal regulatory standards, and applicable state orders and water quality control regulations, permits, and orders.

3.8.5. GMP Network

Monitoring of LFG is required to meet the RAOs and to demonstrate compliance with Title 27 Cal. Code Regs. § 20917 through § 20934, "Gas Monitoring and Control at Active and Closed Disposal Sites." The gas monitoring system will be designed to account for:

- Local soil, rock, and hydrogeological conditions
- Locations of buildings and structures relative to the waste disposal area
- Adjacent land use and inhabitable structures within 1,000 feet of the landfill
- Manmade underground structures, such as vaults
- The nature and age of waste and its potential to generate LFG

Several general assumptions were made to develop the RD and costs for the LFG monitoring component. LFG will not migrate below the groundwater table, which is between 6 and 20 feet bgs, so GMPs will not be screened below the water table. Rather, GMPs will be screened from approximately 5 feet bgs (above the historical high groundwater elevation at Parcel E-2) to the historical low groundwater elevation, which varies across Parcel E-2 to a maximum depth of 16 feet bgs (north of the landfill). Existing GMPs are located approximately 150 feet apart on the Parcel E-2 boundary north of the landfill, and this spacing will continue to be used to complete the compliance monitoring boundary on the western and eastern sides of Parcel E-2.

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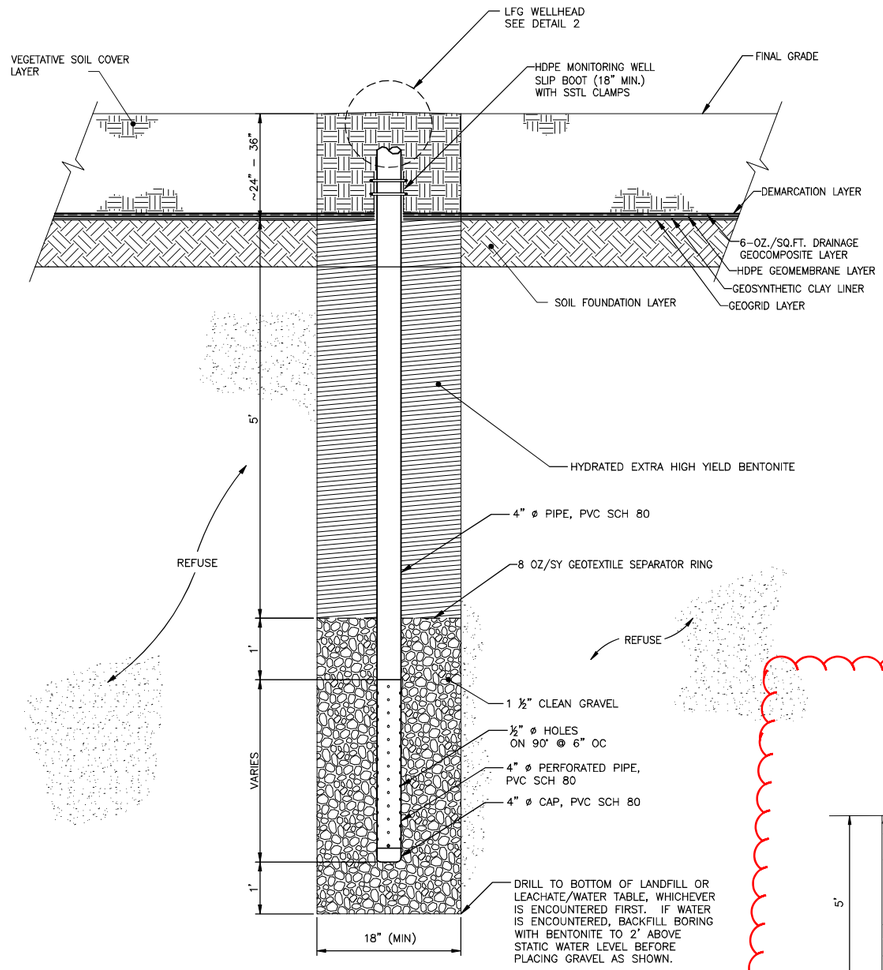
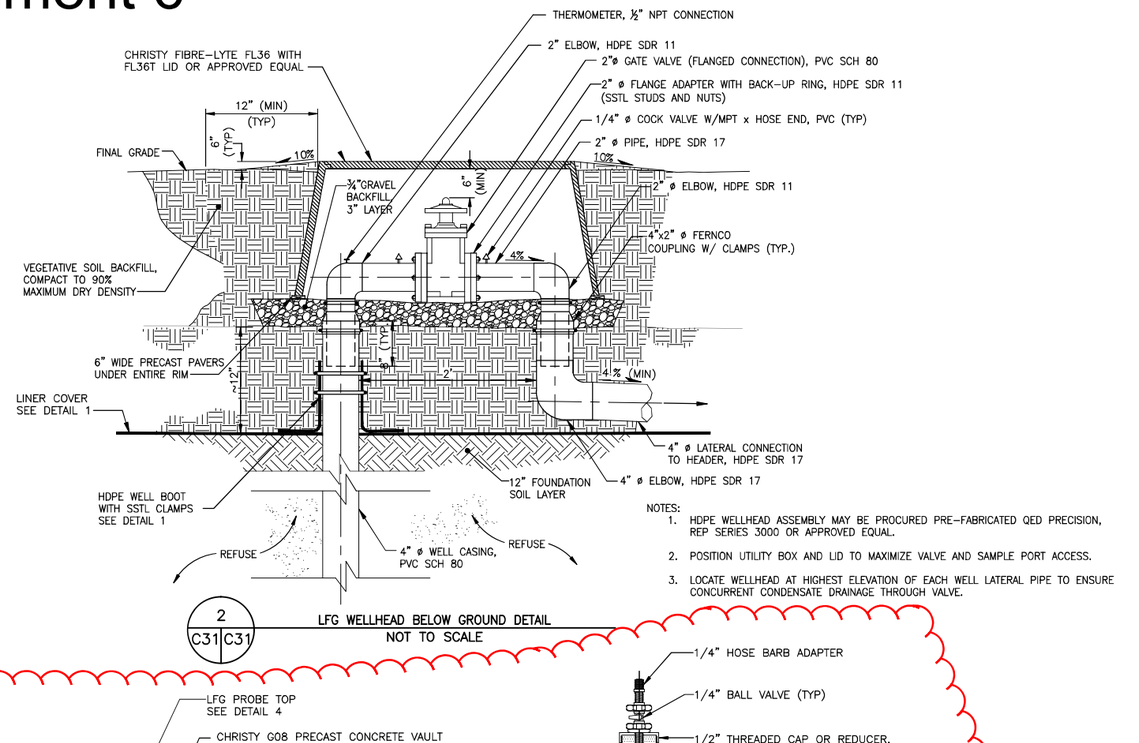
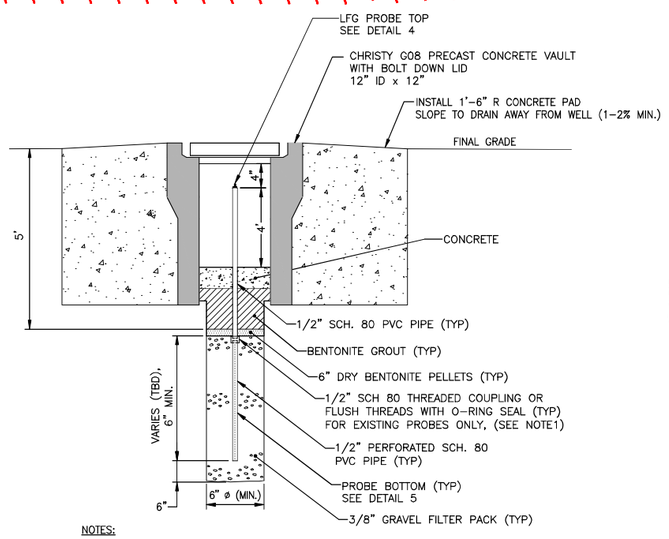


1 C31|C31 LFG EXTRACTION WELL DETAIL
NOT TO SCALE



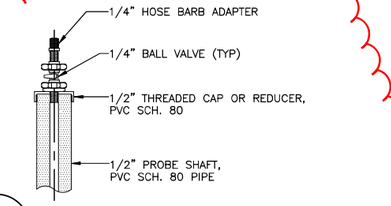
NOTES:
1. HDPE WELLHEAD ASSEMBLY MAY BE PROCURED PRE-FABRICATED QED PRECISION, REP SERIES 3000 OR APPROVED EQUAL.
2. POSITION UTILITY BOX AND LID TO MAXIMIZE VALVE AND SAMPLE PORT ACCESS.
3. LOCATE WELLHEAD AT HIGHEST ELEVATION OF EACH WELL LATERAL PIPE TO ENSURE CONCURRENT CONDENSATE DRAINAGE THROUGH VALVE.

2 C31|C31 LFG WELLHEAD BELOW GROUND DETAIL
NOT TO SCALE

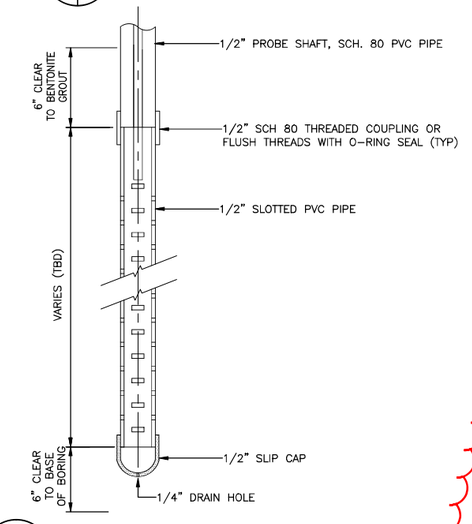


NOTES:
1. ACTUAL CONSTRUCTION MAY VARY DEPENDING ON WELL LOCATION.
2. EXISTING GAS MONITORING PROBES NOT DESIGNATED TO BE ABANDONED WILL BE EXTENDED OR REPLACED WITH EQUIVALENT MATERIALS, AS NEEDED TO MEET THE FINAL SURFACE GRADE.
3. PROBE VAULTS AND SURFACE COMPLETIONS WILL BE REPLACED IN ACCORDANCE WITH DRAWING C26, DETAILS 2 AND 3.
4. EXISTING CONCRETE SURFACE COMPLETIONS CAN REMAIN IN PLACE IF NOT OBSTRUCTIVE TO THE EXTENSION OF THE PROBE.
5. DRILL BORING TO HIGH GROUNDWATER ELEVATION. IF GROUNDWATER IS ENCOUNTERED, BACKFILL BORING WITH BENTONITE TO 2' ABOVE STATIC WATER LEVEL BEFORE PLACING FILTER PACK AS SHOWN.

3 C31|C31 SINGLE-LEVEL LFG MONITORING PROBE DETAIL
NOT TO SCALE



4 C31|C31 LFG PROBE TOP
NOT TO SCALE



5 C31|C31 LFG PROBE BOTTOM DETAIL
NOT TO SCALE

REGISTERED PROFESSIONAL ENGINEER — Wael Abdelrazig No. 046899 Exp. 6/30/2015 CIVIL — STATE OF CALIFORNIA

PREPARED FOR: Department of the Navy, Naval Facilities Engineering Command Base Realignment and Closure Program Management Office West, San Diego, CA

PREPARED BY: Golder Associates Inc., 425 Ja Iside Drive, Sunnyvale, CA 94089-1168, (408) 220-0622

NO.	DESCRIPTION	DATE	APPR.

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

DRAWN BY:	SC
DESIGN BY:	AW
CHIEF ENG:	DB
PM/CM:	DB

ENGINEERING/ REMEDIATION RESOURCES GROUP, INC. SAN FRANCISCO, CA

LFG EXTRACTION WELL AND MONITORING PROBE DETAILS

BRAC PMO WEST SAN DIEGO, CALIFORNIA

SIZE:	22" X 34"
SCALE:	AS NOTED
PROJ. NO.	25-049
CONSTR. CONTR. NO.	N68711-05-C-6011
DRAWING NO.	C31
SHEET	33 OF 49 SHEETS

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Appendix I
Comments and Responses to Regulatory Agency Comments on Draft Fifth Five-Year Review Report and Climate Resilience Assessment

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California Water Boards

Gavin Newsom
Governor

Yana Garcia
Secretary for
Environmental Protection

San Francisco Bay Regional Water Quality Control Board

April 30, 2024

U.S. Department of the Navy
Attn: Michael Pound, BRAC Environmental Coordinator
NAVFAC BRAC PMO West
33000 Nixie Way, Bldg. 50, 2nd Floor
San Diego, CA 92147
Sent via email only: michael.j.pound.civ@us.navy.mil

Subject: Regional Water Board Comments on November 2023 Draft Fifth Five-Year Review Report, Hunters Point Naval Shipyard, San Francisco, San Francisco County

Dear Mr. Pound:

The San Francisco Bay Regional Water Board (Regional Water Board) has reviewed the subject Draft Fifth Five-Year Review Report (Draft Five-Year Review) for the Former Hunters Point Naval Shipyard (HPNS).

Our preliminary protectiveness determinations are different from the Navy's for Parcel B-2, Parcel C, and Parcel E-2; and we are requesting additional details or supporting information to be able to concur with the Navy's determination for all parcels due to the climate change vulnerabilities and/or presence of per- and polyfluoroalkyl substances (PFAS) as summarized in the table below:

Parcel	Navy's Protectiveness Determination	Regional Water Board's Preliminary Protectiveness Determination
Parcel B-2*	Short-Term Protective	Not Protective
Parcel C*	Short-Term Protective	Protectiveness Deferred
Parcel E-2*	Will Be Protective	Protectiveness Deferred
Installation Restoration Site 07/18	Protective	Requesting additional details/information to support Navy's position

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Parcel	Navy's Protectiveness Determination	Regional Water Board's Preliminary Protectiveness Determination
Parcel B-1 Parcel C Parcel UC-2 Parcel D-1 Parcel UC-1 Parcel D-2 Parcel G Parcel UC-3	Short-Term Protective	Requesting additional details/information to support Navy's position
Parcel E	Will be Protective	Requesting additional details/information to support Navy's position

* For Parcel B-2, Parcel C, and Parcel E-2, in addition to differing positions based on our technical assessment of the remedies, we are requesting additional details/information to support Navy's position due to the climate change vulnerabilities and/or presence of PFAS.

We defer to Department of Toxic Substances Control (DTSC) and United States Environmental Protection Agency (USEPA) regarding the radiological findings presented in the Draft Five-Year Review.

We will continue to meet and work collaboratively with the Navy and our regulatory counterparts and look forward to satisfactory resolution to our attached comments, so that we will be able to provide our concurrence on the Final Five-Year Review.

If you have any questions, please contact me at Mary.Snow@waterboards.ca.gov or (510) 622-2338.

Sincerely,

Mary K Snow

Mary Snow, P.G.
Remedial Project Manager
Groundwater Protection Division

Attachment: Regional Water Board Comments

Copy to:

Wilson Doctor, Navy, wilson.e.doctor.civ@us.navy.mil
Michael Howley, DTSC, Michael.Howley@dtsc.ca.gov
Ryan Casey, SFDPH, Ryan.Casey@sfdph.org
Andy Bain, USEPA, Bain.Andrew@epa.gov

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Attachment

Regional Water Board Protectiveness Determination Comments

1. **Comment 1a:** We do not agree with the protectiveness statement provided in the Draft Five-Year Review for Parcel B-2, Installation Restoration (IR) Site 26. The Regional Water Board's preliminary protectiveness determination for Parcel B-2, IR Site 26 is "Not Protective." This determination is consistent with USEPA guidance (2012) because for mercury concentrations in groundwater the "[M]igration of contaminants is uncontrolled and poses an unacceptable risk to human health and the environment; or potential or actual exposure is clearly present or there is evidence of exposure."

   Comment 1b: The remedy at Parcel B-2, IR Site 26 is not protective because elevated mercury concentrations in groundwater may be discharging to San Francisco Bay (Bay). Therefore, development of a new primary document work plan focused on alternative treatments and treatment methodologies is warranted as a priority to mitigate discharge of mercury to the Bay and ensure protectiveness. Our expectation is that the Draft-Final Five-Year Review will include a commitment to developing this work plan with appropriate implementation timelines that are agreeable to the Federal Facility Agreement (FFA) signatories.

   The Draft Five-Year Review does not adequately reflect the Regulatory Agencies' (i.e., USEPA, Department of Toxic Substances Control (DTSC), and Regional Water Board) comments and concerns regarding the status of the remedy for Parcel B-2, IR Site 26. The remedy at Parcel B-2 includes soil excavation, installation of a durable cover, in situ stabilization of mercury in groundwater, monitoring, and institutional controls.

   The Navy's "Short-Term Protective" determination for Parcel B-2 IR Site 26 groundwater is not supported due to elevated concentrations of mercury in groundwater, as identified in the following Regulatory Agencies' correspondence: Tri-Agency Letter dated August 20, 2021, Tri-Agency Letter dated November 23, 2021, DTSC Note to File - Non-Concurrence dated December 23, 2021, and Regional Water Board Letter dated March 14, 2022.

   Specifically, after a three-year performance and post-treatment monitoring period, the remedial action, in situ stabilization using the reagent Metafix, has failed to reduce mercury concentrations in groundwater to below 0.6 micrograms per liter (µg/L), the Parcel B Remedial Design (RD) trigger level. Elevated concentrations of mercury in groundwater are in "sentinel" wells, representing a discharge to the Bay. Additionally, the Regional Water Board's concerns regarding the validity of the development of the trigger concentration for mercury have not been addressed by the Navy.

2. **Comment 2a:** We do not agree with the Navy's protectiveness determination for Parcel C. The Regional Water Board's preliminary protectiveness determination for

Parcel C is "Protectiveness Deferred." This determination is consistent with USEPA guidance (2012) because it is unknown if the response should be "yes" to "Question B - Are the exposure assumptions, toxicity data, cleanup levels, and remedial action objectives (RAOs) used at the time of the remedy selection still valid?"

Comment 2b: A protectiveness determination of the remedy at Parcel C cannot be made at this time until further information is obtained. Further information will be obtained upon successful implementation of the *Deep Fractured Water Bearing Zone (F-WBZ) Investigation for Remedial Unit-C4 (RU-C4)* and the planned B-aquifer investigation, at which time a protectiveness determination can likely be made. Our expectation is that the Draft-Final Five-Year Review will specify these documents as "follow-up actions" and commit to implementation timelines that are agreeable to the FFA signatories.

The Draft Five-Year Review does not adequately reflect the Regulatory Agencies' comments and concerns regarding the status of the remedy for Parcel C. The remedy at Parcel C includes soil excavation, installation of a durable cover, soil vapor extraction, in situ treatment of groundwater, monitoring, and institutional controls. The Navy's "Short-Term Protective" determination for Parcel C is not supported for groundwater due to data gaps in the understanding of the communication/connections between the hydrologic units within Parcel C, as documented in the following Regulatory Agencies' correspondence: Joint-Agency Letter (USEPA) dated July 30, 2021, Joint-Agency Letter (USEPA) dated September 17, 2021, and Tri-Agency Letter dated May 24, 2022.

Specifically, the connection and communication between hydrogeologic units within Parcel C is not fully understood; therefore, further characterization is required to demonstrate that 1) remedies within the A-aquifer will be effective and not recontaminated by chemicals of concern (COCs) within the B-aquifer and/or Deep F-WBZ and 2) unacceptable discharges to the Bay are not and will not occur.

3. **Comment 3a:** We do not agree with the Navy's protectiveness determination for Parcel E-2. The Regional Water Board's preliminary protectiveness determination for Parcel E-2 is "Protectiveness Deferred" because the remedy components were not implemented (turbidity curtain) or constructed as designed (Upland Slurry Wall). There are data gaps regarding lead contamination within the wetland, concerns regarding stormwater management practices during construction, questions regarding management of hazardous waste piles, and ongoing concerns regarding the management and monitoring of methane in soil gas at Parcel E-2.

   Comment 3b: A protectiveness determination of the remedy at Parcel E-2 cannot be made at this time until further information is obtained. Further information and data should include:

   - Obtaining as-built design drawings for the Upland Slurry Wall signed and stamped by a registered professional civil engineer in California.

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- Monitoring water levels and collecting analytical data to demonstrate the Upland Slurry Wall is functioning as designed.
- Collection of soil samples in the vicinity of Resource Conservation and Recovery Act (RCRA) hazardous waste piles.
- Collection of soil/groundwater samples within the wetland to demonstrate that lead has been adequately remediated.
- Provide a revised compliance monitoring and mitigation plan for methane at the landfill.
- Provide full records for stormwater best management practices for the duration of the implementation phases for the remedy at Parcel E-2.

These actions should be prioritized by the FFA Remedial Project Managers and/or based on imminent exposure threats. Our expectation is that the Draft-Final Five-Year Review will include a commitment to developing the appropriate primary documents to address these concerns and include implementation timelines that are agreeable to the FFA signatories.

The Draft Five-Year Review does not adequately reflect the Regulatory Agencies' comments and concerns regarding the status of the remedy for Parcel E-2. The remedy at Parcel E-2 includes soil excavation, installation of a durable cover, installation of belowground barriers, landfill gas monitoring, collection, and treatment, long-term monitoring of groundwater, radiological screening and remediation, and institutional controls.

The Navy's "Will be Protective" determination for Parcel E-2 is not supported due to concern regarding remedy implementation and site characterization, as documented in the following Regulatory Agencies' correspondence: Regional Water Board Letter dated March 6, 2023, Regional Water Board Letter dated August 7, 2020, Regional Water Board Letter dated December 15, 2020, Joint-Agency Letter dated March 16, 2021, Joint-Agency Letter dated April 28, 2021, Tri-Agency Letter dated May 5, 2022, Regional Water Board Letter dated August 17, 2022, Tri-Agency Letter dated December 8, 2022, Regional Water Board Letter dated December 13, 2022, and Joint-Agency Letter (USEPA) dated July 18, 2023.

Although it is understood that the remedy has not been fully implemented, the Navy has not addressed Regulatory Agencies' concerns regarding: lack of deployment of turbidity curtain during construction, stormwater best management practices/records keeping, Upland Slurry Wall not implemented as designed, request for as-built designs for changes to the Upland Slurry Wall, methane mitigation and monitoring within the landfill, potential lead contamination in the wetlands, potential impacts to soil due to RCRA hazardous waste handling.

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4. **Comment 4:** The Draft Five-Year Review does not adequately support the parcel specific protectiveness determinations with respect to the presence of PFAS, a class of chemical compounds that are considered emerging contaminants. The Navy must provide sufficient additional details to demonstrate that the protectiveness determinations are appropriate for each parcel. Otherwise, the determination should be "Protectiveness Deferred" with respect to PFAS.

   It is understood that PFAS investigations are ongoing. However, the findings in the *Site Inspection for Basewide Investigation of Per- and Polyfluoroalkyl Substances* (Liberty 2023) determined that a remedial investigation is necessary for all parcels for both soil and groundwater, therefore the extent of PFAS contamination is currently unknown. These concerns apply to: IR Site 07/18, Parcel B-1, Parcel B-2, Parcel C, Parcel UC-2, Parcel D-1, Parcel D-2, Parcel UC-1, Parcel G, Parcel E, Parcel E-2, and Parcel UC-3.

   The Navy must provide additional justification for their responses to protectiveness Questions A, B, and C (USEPA 2001 and 2012) with data and information that can demonstrate that remedies that were not specifically designed to prevent exposures to PFAS contamination are protective of human health and the environment. Additional supporting information could include but is not limited to exposure assumptions for PFAS, a discussion of remedy design features that can/will prevent exposures to PFAS, and figures showing the distribution of PFAS concentrations in context of remedy boundaries.

5. **Comment 5a:** With respect to protectiveness determinations, additional justification/evaluations for climate vulnerability should be presented in the Draft-Final Five-Year Review. Media of concern and associated exposure assumptions should be considered in the context of existing Institutional Controls and Engineering Controls or other remedy components to support the Navy's protectiveness statements. Otherwise, a "Protectiveness Deferred" determination may be most appropriate in the context of climate vulnerability.

   Comment 5b: There is an urgency to conduct parcel-specific climate vulnerability assessments at all parcels as soon as practical, with a prioritization of Parcel D-1, Parcel E, and Parcel E-2.

   The Draft Five-Year Review does not adequately support the parcel specific protectiveness determinations with respect to the findings in the Climate Resilience Assessment (CRA), Appendix A, and the site-specific data and information collected during the reporting period.

   The CRA is a screening-level assessment of climate-related hazards, their potential impacts, and whether vulnerabilities were identified that may impact the protectiveness of the remedies at HPNS.

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We acknowledge that this CRA is a screening or baseline assessment, but additional parcel-specific evaluation is required. Examples of the urgency for additional work include but are not limited to:

- Transient inundation is likely to occur within the next 11 years at Parcel D-1, Parcel E, and Parcel E-2.
- 11 years may not leave adequate time for planning if remedies require modifications to become or remain protective.
- As documented in Regional Water Board (M. Snow) email dated January 30, 2024, flooding/standing water observed January 23, 2024, at Parcel E may demonstrate that transient inundation predictions for 2035 are not conservative enough.
- Observance of "sinkholes" attributed to tidal waters and subsidence near Buildings 205, 207, and 208 at Parcel C.
- COCs and chemicals of potential concern (COPCs) in soil not currently saturated may be subject to mobilization with a small rise in groundwater elevation.

Parcel-specific assessments should be conducted at all parcels. These concerns apply to: IR Site 07/18, Parcel B-1, Parcel B-2, Parcel C, Parcel UC-2, Parcel D-1, Parcel D-2, Parcel UC-1, Parcel G, Parcel E, Parcel E-2, and UC-3. However, Parcel D-1, Parcel E, and Parcel E-2 should be prioritized.

Regional Water Board Specific Comments

1. **Five Year Review Summary Form, Page XVII, and Section 1.1 Purpose and Approach, Section 2.1 Site Interviews -** page 1.1 text states, "[T]he Five-Year Review included a document and data review, required visual site inspections, and interviews."

   Specific Comment 1: The Regulatory Agency site inspection was not conducted until after the Draft Five-Year Review was submitted. Also, it is unclear why interviews were limited to Navy contractors and were not conducted with Navy personnel, Regulatory Agencies, local authorities, including San Francisco Department of Public Health (SFDPH), nearest neighbors, and/or community members; this is inconsistent with USEPA guidance (2001).
   The form should be updated to include January 23, 2024, the date of the Regulatory Agencies' Fifth Five-Year Review site inspection. Justification for why interviews were limited to Navy contractors should be provided. Also, interviews should be conducted with the Navy personnel, Regulatory Agencies, SFDPH, nearest neighbors, and/or community members and provided in the Draft-Final Five-Year Review.

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2. **Five Year Review Summary Form, Page XVII; Section 1.1 Purpose and Approach, and Section 2.6, Next Five-Year Review -** page 1-1 text states, "The triggering action for statutory Five-Year Reviews at HPNS was the date of mobilization for the remedial action (RA) activities at Parcel B, which was July 8, 1998. The triggering action for this Fifth Five-Year Review is the signature of the Fourth Five-Year Review, July 31, 2019 (Navy, 2019)". Section 2.6, page 2-2 text states, "[T]he next Five-Year Review is due to be finalized 5 years from the signature of this Five-Year Review, which is anticipated to be in 2029."

   Specific Comment 2: Per USEPA letter dated November 16, 2023, the Sixth Five-Year Review is due November 8, 2028; therefore, the Draft-Final Five-Year Review should be revised accordingly.

3. **Section 1.2 Environmental Restoration Program, and Figure 1-2 Installation Restoration Sites -** page 1-2 the text states "In most cases, IR sites were identified by a two-digit number (for example, IR-02)," but depicted as single digits on Figure 1-2 for IR sites 1 through 9 instead of 01 through 09.

   Specific Comment 3: For clarity two-digit nomenclature for IR sites 01 through 09 should be used throughout the Five-Year Review.

4. **Section 1.4.1 Per- and Polyfluoroalkyl Substances -** page 1-7 text states "Because investigation of PFAS is ongoing and it has not yet been determined whether PFAS pose unacceptable risk that requires RA [Remedial Action], and because a remedy for PFAS has not yet been determined, a protectiveness determination cannot be made."

   Specific Comment 4: This is not consistent with USEPA Guidance (September 2012) regarding protectiveness statements for emerging contaminants. Per USEPA Guidance (September 2012) for emerging contaminants protectiveness is deferred. Unless parcel specific evaluations of existing PFAS concentrations, likely data gaps, media of concern, and exposure assumptions are conducted in the context of existing Institutional Controls, Engineering Controls, or other remedy components to support the Navy's protectiveness statements, then "Deferred Protectiveness" is appropriate for sites with PFAS detections. See Protectiveness Determination Comment 4 above.

5. **Section 1.4.3.1 Progress Since the Fourth Five-Year Review -** Discussion in this section was limited to the radiological retesting.

   Specific Comment 5: This section should be consistent with the issues, recommendations, and other findings as presented in the last Five-Year Review and

not limited to radiological retesting. The *Final Fourth Five-Year Review* (2019) "Issues, Recommendation and Other Findings" included the following items:

- SVE [soil vapor extraction] implementation in Parcels B-1 and C is reducing source mass, but with limited effectiveness due to diffusion-limited conditions in the subsurface.

- The Regulatory Agencies do not agree with the Navy's risk assessment methodology used to reduce the ARICs [areas requiring institutional controls] for VOC [volatile organic compounds] vapors.

- The Navy has determined that a significant portion of the radiological survey and remediation work completed to date was not reliable because of manipulation and/or falsification of data by one of its radiological contractors. A long-term protectiveness evaluation of the radiological RGs [remediation goals] has not yet been completed for this fourth Five-Year Review, and it is currently not known if the RAOs for radionuclides have been achieved in Parcels B-1, B-2, C, D-1, D-2, G, E, UC-1, UC-2, and UC-3.

Specific updates for the SVE implementation at Parcels B-1 and C, as well as the status of the disagreement regarding the Navy's risk assessment methodology used to reduce the ARICs for VOC vapors from the Fourth Five-Year Review, including milestones and timelines, should be provided in the Draft-Final Fifth Five-Year Review.

6. **Section 3.4.1.2 Remedy Operations and Maintenance, Durable Cover Maintenance (IR 07/18), 3.4.2.2 Remedy Operations and Maintenance, Durable Cover (B-1); Section 3.4.3.2 Remedy Operations and Maintenance, Durable Cover (B-2), Section 4.4.1.2 Remedy Operations and Maintenance, Durable Cover (Parcel C), and Section 6.4.2.2 Remedy Operations and Maintenance, Durable Cover (E-2) -** provides information regarding remedy operations and maintenance for the durable covers and monument surveys.

   Specific Comment 6a: The 2023 monument surveys results were not provided, and the frequency of monument surveys is not specified in the Draft Five-Year Review. Provide the 2023 monument survey results in the Draft-Final Five-Year Review.

   Specific Comment 6b: Provide the frequency of the monument surveys by parcel, i.e., IR Site 07/18, Parcel B-1, Parcel B-2, Parcel C, and Parcel E-2.

   Specific Comment 6c: Consider increasing the frequency of monument surveys in support of evaluating impacts on the remedies due to sea level rise/groundwater rise.

7. **Section 3.4.1.1 Remedy Implementation -** page 3-7 text states "[S]ince at least 2009, concentrations of COCs and ROPCs [radionuclides of potential concern] have remained under their TLs [trigger levels], except for lead in September 2017 and

March 2022 (TRWB, 2023). Concentrations of lead exceeded the TL but were within the same order of magnitude as the TL (14.44 µg/L) at two locations (23 and 23.9 µg/L) in March 2022 and were below laboratory detection limits during the September 2022 event (Appendix E, Figure 3-5)."

Specific Comment 7: The Draft-Final Five-Year Review should provide a discussion of groundwater flow directions and include groundwater flow path depictions on Figure 3-5, and trend analysis for lead concentrations in wells IR07MW24A and IR07MW26A. With the fluctuating lead concentrations in groundwater and the lack of sentinel wells between the elevated concentrations in groundwater and the Bay, it is unclear if the remedy is adequately protective of ecological receptors and that lead is not being discharged to the Bay.

8. **Section 3.5.1, Question A: Is the Remedy Functioning as Intended by the Decision Document? and Section 3.5.1.3, Parcel B-2 -** with respect to IR Site 26, the Navy responded "yes" to Question A.

   Specific Comment 8: A "yes" response is inconsistent with the mercury exceedances in groundwater, as well as not adequately reflecting regulatory comments and concerns since the Forth Five-Year Review. The Draft-Final Fifth Five-Year Review should be revised to respond "No" to Question A. See Protectiveness Determination Comment 1 above.

9. **Section 3.5.2 Question B: Are the Exposure Assumptions, Toxicity Data, Cleanup Levels, and Remedial Action Objectives Used at the Time of the Remedy Selection Still Valid? -** with respect to IR Site 26, the Navy responded "yes" to Question B.

   Specific Comment 9: It is not clear if the cleanup levels associated with mercury in groundwater are still valid. As the Navy has not responded to the Regional Water Board Letter dated March 14, 2022, regarding the development of the 0.6 µg/L as the Parcel B RD trigger level for mercury. The response to Question B may be "no" and the Navy should provide a response to the Regional Water Board's concerns with respect to the mercury trigger level to justify that the RAOs are still valid. See Protectiveness Determination Comment 1 above for additional details.

10. **Section 3.6 Issues, Recommendations, and Follow-up Actions and Table 3-8 Parcel B Issues, Recommendations, and Follow-up Actions -** provides a summary of the Issues, Recommendations, and Follow-up Actions for Parcel B, including, Parcel B-2 IR Site 26.

    Specific Comment 10: There are outstanding Regulatory Agencies' comments and recommendations related to the remedy at Parcel B-2 IR Site 26 that were not included in this section or on this table, as detailed in the Protectiveness Determination Comment 1 above.

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The following issues need to be included in this section: 1) Metafix has failed to reduce mercury in groundwater to concentrations below the Parcel B RD trigger level and 2) elevated concentrations of mercury in groundwater are in "sentinel" wells, representing a discharge to the Bay. The recommendations and follow-up actions should include development of a new primary document work plan focused on alternative treatments and treatment methodologies as a priority to mitigate discharge of mercury to the Bay and ensure protectiveness.

11. **Figure 3-5, March and September 2022 Exceedances of Remediation Goals in Parcels B-1 and B-2 and IR-07/18 and Figures 4-4 through 4-7 -** The figures show exceedances of remediation goals in groundwater.

    Specific Comment 11: The figures showing exceedances of remediation goals in groundwater do not include groundwater flow direction. General groundwater flow direction arrows should be presented on figures that show exceedances of remediation goals for COCs in groundwater.

12. **Section 4.2.1.1 Geology and Hydrogeology, Section 5.2.1.2 Geology and Hydrogeology, and Section 6.2.1.1 Geology and Hydrogeology -** sections describe hydrogeologic characteristics including B-Aquifer.

    Specific Comment 12: B-Aquifer groundwater elevations are not provided in these sections. B-Aquifer groundwater elevation ranges should be provided in Section 4.2.1.1, Section 5.2.1.2, and Section 6.2.1.1.

13. **Section 4.4.1.1 Remedy implementation, Soil Excavation and Removal -** The text discusses changes to the Remedial Action Work Plan (RAWP) based on the findings of Pre-RA investigation. For RUC1 on page 4-6 the text states "[T]he Navy is evaluating options to treat the DNAPL source area and, subsequently, the associated groundwater plume." And for RU-C2 the text states "The Navy is evaluating a revised approach to achieve soil RAOs and address a potential ongoing source to A-aquifer groundwater (ECC-Insight, 2019)." On page 4-8 for the Soil Vapor Extraction Monitoring the text states "[T]he Navy is in the process of reviewing the strategy for addressing soil gas at all Parcel C areas in conjunction with additional in situ groundwater remediation activities that are ongoing (ECCInsight and CDM Smith, 2019)."

    Specific Comment 13: The text discusses changes to the RAWP based on the findings of Pre-RA investigation but does not provide specificity regarding a timeline for how and when alternatives will be evaluated or provided for review. For clarity, Section 4.4.1.1 should be revised to indicate which documents these evaluations will be presented in and when they will be provided to the Regulatory Agencies for review.

14. **Section 4.4.1.2 Remedy Operations and Maintenance -** as stated on page 4-14, "[A] 7-foot-deep void observed along the pier edge that allowed water to wash in and

out with the tide may have contributed to the sinkholes;" a number of "sinkholes" were observed and for some their presence was attributed to tidal action.

Additionally, the text states that, "Subsidence was noted near Buildings 205, 207, and 208 between Dry Dock 2 and Dry Dock 3 that required extensive repairs outside of routine O&M, and 100 feet of permanent chain-link fence was installed across Building 208 to secure the end of the pier."

Specific Comment 14: It does not appear that existing Operations and Maintenance (O&M) methodologies are adequate to address these concerns. The Navy should provide the long-term strategies to address "sinkholes" and subsidence for Parcel C.

15. **Section 4.5.2 Question B: Are the Exposure Assumptions, Toxicity Data, Cleanup Levels, and Remedial Action Objectives Used at the Time of the Remedy Selection Still Valid? -** with respect to Parcel C, the Navy responded "yes" to Question B.

    Specific Comment 15: The response to Question B should be "uncertain" at this time because the connection and communication between hydrogeologic units within Parcel C is not fully understood. See Protectiveness Determination Comment 2 above for additional details.

16. **Section 4.6 Issues, Recommendations, and Follow-up Actions, and Table 4-8 Parcel C and UC-2 Issues, Recommendations, and Follow-up Actions -** provides a summary of the issues, recommendations, and follow-up actions for Parcel C.

    Specific Comment 16: Radiological retesting should not be the only issue presented in Section 4.6 and on Table 4-8. There are outstanding issues related to the characterization of hydrogeologic units within Parcel C.

    Further characterization to demonstrate that 1) remedies within the A-aquifer will be remediated by the selected remedy and not recontaminated by COCs within the B-aquifer and/or F-WBZ and 2) unacceptable discharges to the Bay are not and will not occur should be added to the "Issues" for Parcel C. Additionally, successful implementation of the Deep F-WBZ Investigation for Remedial Unit-C4 (RU-C4) and the planned B-Aquifer investigation should be included in the "Follow-up Actions" for Parcel C.

17. **Section 5.4.1.1 Remedy Implementation -** page 5-7 text states that, "[T]he Parcel D-1 RAMP (ChaduxTt, 2011a) states that groundwater samples will be collected semiannually until at least two years after property redevelopment to ensure redevelopment activities do not mobilize metals that could migrate into the [B]ay."

    Specific Comment 17: Mobilization of metals should be considered due to potential groundwater rise, and monitoring should be reevaluated in this context for

Parcel D-1. Groundwater monitoring for metals at Parcel D-1 should be continued beyond pending redevelopment and evaluated for continued monitoring due to groundwater rise.

18. **Section 6.4.2.1 Remedy Implementation - Soil, Sediment, and Debris Excavation, Consolidation, and/or Removal -** page 6-13 text states, "[A]s part of the Phase 2 RA, the tidal and freshwater wetland areas were excavated and graded to the subgrade design as specified in the DBR [Design Basis Report] (ERRG, 2014)."

    Specific Comment 18: The full magnitude and extent of crystalline lead oxide and soil contaminated with lead above the hot spot cleanup goal must be addressed with further soil and groundwater sampling**.** The "white crystalline lead oxide particles" were neither delineated nor removed during construction of the freshwater wetland where it may intersect the Experimental Ship Shielding Range. The description of "crystalline lead oxide particles" encountered during freshwater wetland excavation was removed from the Final Phase II Remedial Action Construction Summary Report; however, that information remains relevant because the vertical extent of lead has not been characterized. The left-in-place lead contamination above the hot spot cleanup goal poses risks to wildlife and may cause lead discharges to the freshwater wetland or the Bay.

19. **Section 6.4.2.1 Remedy Implementation - Soil, Sediment, and Debris Excavation, Consolidation, and/or Removal, Table 6-5. Parcel E-2 Remedial Action Summary and Expected Outcomes, and Appendix C Site Inspection and Photograph Logs -** summarizes the remedy implementation, expected outcomes, and provides the site inspection details and photos for Parcel E-2.

    Specific Comment 19: Failure to implement portions of the remedy demonstrates that RAOs for ecological receptors have not been met in the short-term and deferred protectiveness is appropriate for Parcel E-2.

    In accordance with the 2018 RAWP, the Navy committed to installing a turbidity curtain to prevent potential discharges of sediment into the Bay for activities conducted within 250 feet of the shoreline as detailed in Section 11.3, Erosion and Sediment Control Measures, and Appendix E, CERCLA Stormwater Plan (SWP) Section 3.3.1, Non-Stormwater Controls. RAWP construction activities within the tidal influence zone included 1) placement, grading, and compaction of final soil cover and 2) installation of drainage piping features at the freshwater wetlands and near the shoreline retaining wall.

    A turbidity curtain was not deployed and evidence shows heavily disturbed soils throughout the shoreline area during the rainy season (see Appendix C, Site Inspection and Photograph Logs, Pages C-119 to C-126 – Site inspection photographs). Visibly turbid standing water along the shoreline revetment indicates a discharge of sediments to the Bay.

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20. **Section 6.4.2.1 Remedy Implementation - Soil, Sediment, and Debris Excavation, Consolidation, and/or Removal; and Below Ground Barrier (Slurry Walls) and Table 6-5. Parcel E-2 Remedial Action Summary and Expected Outcomes -** The text and table provide details regarding the Upland Slurry Wall including RAOs and performance metrics.

    Specific Comment 20: Per Regulatory Agencies' comments, water level and analytical data to demonstrate the Upland Slurry Wall is functioning as designed, as well as engineer certified as-built designs for the Upland Slurry Wall, as modified, need to be provided.

    The Upland Slurry Wall was not constructed in accordance with the final design and specifications. The unplanned 220-feet long by 10-feet deep gap in the Upland Slurry Wall may result in unintended consequences to the groundwater flow system and thus unacceptable discharges to the freshwater wetlands and the Bay. The Navy has allowed several years of time lapse without adequately showing that unacceptable discharges of leachate generated from groundwater contact with the landfill waste are being mitigated by collecting and analyzing groundwater data from the existing monitoring wells as requested by the Regulatory Agencies. See Protectiveness Determination Comment 3 for additional details.

21. **Section 6.6 Issues, Recommendations, and Follow-up Actions -** provides a summary of issues, recommendations, and follow-up actions for Parcel UC-3.

    Specific Comment 21: Issues, recommendations, and follow-up actions should not be limited to Parcel UC-3 as there are outstanding issues for Parcel E-2 as documented in Regulatory Agencies' correspondence. See Protectiveness Determination Comment 3 above for additional details.

    The following should be added to "Issues" in Section 6.6: turbidity curtain not deployed during construction, stormwater best management practices/records keeping, Upland Slurry Wall not implemented as designed, as-built designs for changes to the Upland Slurry Wall not provided, methane mitigation and monitoring within the landfill, potential lead contamination in the wetlands, potential impacts to soil due to RCRA hazardous waste handling.

    The following "Recommendations and Follow-up Actions" should be added to Table 6-11: obtain as-built design drawings for the Upland Slurry Wall signed and stamped by a registered professional civil engineer in California, monitor water levels and collect analytical data to demonstrate the Upland Slurry Wall is functioning as designed, collect soil samples in the vicinity of RCRA hazardous waste piles, collect soil/groundwater samples within the wetland to demonstrate that lead has been adequately remediated, revise compliance monitoring and mitigation plan for methane at the landfill, and provide full records for stormwater best management practices for the duration of the implementation phases for the remedy at Parcel E-2.

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22. **Appendix A, Section 1.0 Introduction -** The Navy used the Department of Defense Regional Sea Level (DRSL, 2015) database to evaluate climate-related hazards, the most important of which is coastal flooding due to the site's proximity to the Bay. The DRSL considers scenarios for the years 2035, 2065, and 2100 and accounts for site specific adjustments, including vertical land movement.

    Specific Comment 22a: Of the two timeframes evaluated (2035 and 2065), vertical land movement was only considered for the 2065 scenario. Explain why the Navy doesn't evaluate vertical land movement in the 2035 scenario.

    Specific Comment 22b: Why isn't the 2100 scenario considered in this CRA?

    Specific Comment 22c: Justify the use of guidance dated 2015 when more current and site-specific guidance and sea level rise projections are available, such as the Ocean Protection Council (OPC) State of California Sea Level Rise Guidance (2018) and OPC Sea-Level Rise Action Plan (2022).

23. **Appendix A, Section 2.1, Sea Level Rise Projections -** This section references a 30-year timeframe for a phased approach to plan for sea level rise, per the DTSC Draft Sea Level Rise Guidance (2023). Sea level rise projections of 1 foot for the year 2035, and 3.2 feet for 2065 were selected as the most conservative levels based on the DRSL report and are generally consistent with projections made in the OPC State of California Sea Level Rise Guidance which DTSC's Draft Guidance relies upon.

    Specific Comment 23a: While 30 years is referenced as a minimum planning timeframe for a phased approach, this document fails to mention that applies to a remedy that provides a minimum of 30 years of protection against sea level rise and that DTSC "prefers full action taken now to address future impacts, but will consider a phased adaptation approach on a case-by-case basis."

    Specific Comment 23b: The DTSC Draft Guidance states that "to ensure remedy resilience…evaluate projects based on sea level rise of 3.5 feet by 2050, and 6 feet by 2100," which are the recommended targets for minimum sea level rise planning and preparation, as presented in the OPC Sea-Level Rise Action Plan (2022).

24. **Appendix A, Section 2.2 Seawater Inundation Impacts, Section 2.3 Storm Surges, Section 3.1 Groundwater Emergence, Figures 2-2, 2-3, 2-4, 2-5, 3-1, and 3-2 -** the text states that "[F]igures 2-2 and 2-3 show the potential for permanent seawater inundation in 2035 and 2065, for the highest SLR scenarios in DRSL. Except for some marginal seawater encroachment at the edges of some parcels, no permanent seawater inundation is projected in any of the parcels during 2035 and 2065, under the highest SLR scenario."

    Specific Comment 24: No details are provided regarding which specific remedies, remedy components, or COCs may be impacted by this inundation. These concerns apply to storm surges, transient inundation, and groundwater emergence. The text

should be revised to include which specific remedies, remedy components, and/or COCs will be impacted by permanent inundation, storm surges, or groundwater emergence. Additionally, figures should be revised to depict the locations of remedy and COC boundaries in relation to permanent inundation, storm surges, or groundwater emergence.

25. **Section 2.3 Storm Surges, Figure 2-4 and Figure 2-5 -** The transient inundation is shown to be extensive by 2035 as stated in the text, "[P]ortions of IR 7/18, and Parcels B-1, B-2, C, D-1, E, and the low-lying areas of E-2 are projected to be impacted."

    Specific Comment 25: Parcel specific evaluations should be initiated immediately due to concerns regarding transient inundation. Parcel D-1, Parcel E, and Parcel E-2 should be prioritized.

    Eleven years is a short time to assess existing remedies for resilience and implement changes if needed to prevent exposures. Additionally, this prediction may not be appropriately conservative, as similar inundation to that depicted in Figure 2-4 for Parcel E in 2035 was observed on January 23, 2024, as documented in the Regional Water Board's email to the Navy sent on January 30, 2024.

26. **Appendix A, Section 3.1 Groundwater Emergence -** The mean sea level (MSL) is used as the datum to determine permanent sea level rise induced groundwater table rise, as used by the City of Alameda (2022). A 1:1 ratio of groundwater table rise to MSL rise was considered, and the projected groundwater rise was added to the baseline.

    Specific Comment 26a: In the Seawater Inundation Impacts section, mean high higher water (MHHW) is the standard elevation used as a baseline, and is the standard used in SLR mapping tools. SLR is added to the MHHW for evaluation for potential upland inundation. The MHHW should be applied instead of MSL for SLR calculations.

    Specific Comment 26b: The reference to the City of Alameda report from 2022 uses data from a 2020 report on "The Response of the Shallow Groundwater and Contaminants to Sea Level Rise" for the City of Alameda. The authors of this report have published more recent, and more applicable data that should be applied to this CRA - "Shallow Groundwater Response to Sea-Level Rise (Alameda, Marin, San Francisco, and San Mateo Counties)." The more recent report with county-specific data should be used.

    Specific Comment 26c: The above report does reference the MSL datum; however, this assessment fails to mention "the Bay water level elevation approximately one foot above the mean tide line was selected because fresh groundwater is usually found just above the mean tide line inland of coastal embayments." The additional foot above MSL should be accounted for in these projections of groundwater emergence.

Specific Comment 26d: The CRA should explain how tidal fluctuations were accounted for in evaluating groundwater emergence, when "tidal fluctuations were observed from 150 to 500 feet inland from the [B]ay" within the A-Aquifer in both Parcels C and D, as stated in sections 4.2.1.2 and 5.2.1.2.

27. **Appendix A, Section 5.1 Assessment Methodology -** The vulnerability assessment evaluates whether impacts identified in the CRA indicate a new exposure, and whether site COCs (chlorinated volatile organic compounds [CVOCs], heavy metals, polychlorinated biphenyls [PCBs], and polycyclic aromatic hydrocarbons [PAHs]) are identified as most likely to persist through 2035 and 2065. Potential vulnerabilities to both human and ecological receptors to heavy metals were identified due to groundwater emergence.

    Specific Comment 27: Explain why the other COCs, i.e., CVOCs, PCBs, and PAHs, do not present a threat to human health and the environment as groundwater emerges.

28. **Appendix A, Section 5.3.1 Potential New Exposure to CVOCs from Vapor Intrusion due to Groundwater Table Rise to 3 feet bgs, Page A-20 -** Where previous treatment of a CVOC source left behind residual mass, additional treatment is planned. By 2035 any residual CVOCs in groundwater are projected to attenuate below remedial goals.

    Specific Comment 28: This assumption should be reevaluated after additional treatment is performed, and well ahead of any projected groundwater emergence.

29. **Appendix A, Section 5.3.4 Potential New Exposure to Subsurface Remedy Infrastructure to Saltwater Intrusion, Page A-21 -** The groundwater at many locations is high in "saltwater components, such as chloride" indicating that saltwater intrusion is an ongoing phenomenon.

    Specific Comment 29: A geochemical evaluation should be performed to evaluate how the site COCs detected in soil and groundwater will be affected by increasing salinity.

30. **Appendix A, Section 5.3.6 Parcel E-2 Remedy Resiliency -** The Parcel E-2 landfill has design elements which will make the remedy resilient to sea level rise through 2065, including the addition of a 9-foot shoreline revetment and 3-foot sea wall. The planned construction of fresh and tidal wetlands is designed to store and transmit seawater, rain, and groundwater to mitigate sea level rise effects.

    Specific Comment 30: Consider the following in the remedy design and future monitoring and maintenance of the landfill: as groundwater becomes emergent, as it is projected in the CRA to do by 2035 with 1 foot of sea level rise, contaminated groundwater may enter the freshwater wetland impacting ecological receptors; the wetland may overflow its design footprint which can impact the nearby or surrounding protective landfill cap; and contaminated groundwater may overtop the

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downgradient slurry wall. Additionally, it is unclear how/why passive design elements alone are considered enough for resilience when active solutions such as hydraulic control may be needed to prevent migration of contaminants.

CALIFORNIA Water Boards

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SECRETARY FOR
ENVIRONMENTAL PROTECTION

San Francisco Bay Regional Water Quality Control Board

June 4, 2024

U.S. Department of the Navy
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Subject: Regional Water Board Evaluation of May 2024 Navy Responses to Consolidated Agency Comments (Redline version dated May 27, 2024) for the November 2023 Draft Fifth Five-Year Review Report, Hunters Point Naval Shipyard, San Francisco, San Francisco County

Dear Mr. Pound:

The San Francisco Bay Regional Water Quality Control Board (Regional Water Board) has reviewed the subject responses to comments (RTCs) on the Draft Fifth Five-Year Review Report (Draft Five-Year Review) for the Former Hunters Point Naval Shipyard (HPNS).

After reviewing the RTCs, including the Navy's proposed changes for its protectiveness determination for Parcel B-2 for Installation Restoration (IR) Site 26 and Parcel C, our protectiveness determinations remain different from the Navy's for Parcel B-2 and Parcel E-2.

A summary of the Navy's protectiveness determination, including changes proposed since the November 2023 submittal of the Draft Five-Year Review, and the Regional Water Board's protectiveness determinations for Parcel B-2, Parcel C, and Parcel E-2 is provided below:

Parcel	Navy's Protectiveness Determination	Regional Water Board's Preliminary Protectiveness Determination
Parcel B-2	Protectiveness Deferred revised from Short-Term Protective	Not Protective
Parcel C	Protectiveness Deferred revised from Will Be Protective	Protectiveness Deferred
Parcel E-2	Will Be Protective	Protectiveness Deferred

In addition to the changes to protectiveness determination there are several revisions that the Navy verbally committed to during April and May 2024 in person meetings with the Regulatory Agencies (Regional Water Board, Department of Toxic Substances Control (DTSC), and United States Environmental Protection Agency (USEPA)) that are not reflected in the Navy's RTCs. For example, it is important to revise the "Issues, Recommendations, and Follow-up Actions" sections and tables that reflect key milestones (i.e., primary documents) with timeframes and schedules in order to address Regulatory Agencies concerns related to protectiveness and/or remedy effectiveness and demonstrate that the Navy and Regulatory Agencies have a shared understanding of the path forward for the individual parcels. These timeframes and schedules can/will be used as a tracking tool until the next Five-Year Review.

For transparency and as a matter of public record, we request that Regulatory Agencies evaluations of the Navy response to comments be included in the responsiveness summary of the Draft-Final Five-Year Review.

Due to the Navy's request for an expedited review of the RTCs, our attached comments focus on overarching concerns and are not exhaustive. We will continue to meet and work collaboratively with the Navy and our regulatory counterparts on the Five-Year Review and look forward to satisfactory resolution to our comments, so that we will be able to provide our concurrence on the Final Five-Year Review.

We defer to DTSC and USEPA regarding the radiological findings presented in the Draft Five-Year Review.

If you have any questions, please contact me at Mary.Snow@waterboards.ca.gov or (510) 622-2338.

Sincerely,

Mary K Snow

Mary Snow, P.G.
Engineering Geologist
Groundwater Protection Division

Attachment: Regional Water Board Comments

cc via email:

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Attachment

Regional Water Board New Comment

1. **New Comment 1:** There was an expectation that the redline RTC revisions would include all relevant revisions for the purpose of evaluating the Navy response to Regulatory Agencies' comments, e.g., revised text, tables, and figures; however, these details have been inconsistently provided or not included in the RTCs. The Regulatory Agencies have identified several issues, recommendations, and follow-up actions that are necessary to inform and/or demonstrate effectiveness of existing remedies or for remedies in the implementation phase. Specific milestones (i.e., primary documents), schedules, and timeframes should be specified and included in the Draft-Final Five-Year Review. Sections 3.6 (Parcel B-2), 4.6 (Parcel C), 5.6 (Parcel D), and 6.6 (Parcel E-2), as well as Tables 3-4, 4-8, 5-8, and 6-11 need to be updated to provide the specific details requested by the Regulatory Agencies.

Regional Water Board Evaluation of Navy Response to Comments

1. **Navy Response to Regional Water Board Protectiveness Determination Comment 1 (General)**: On page 1 of 71 the response states that "[T]he multiple lines of evidence presented in the Five-Year Review suggest the [mercury] concentrations observed in groundwater are unlikely to exceed [the Remedial Design Trigger Level (TL) of] 0.6 micrograms per liter (µg/L) in Bay (San Francisco Bay) surface water."

   Page 2 of 71 the response goes on to state:

   a) Completion of source removal in 2008 via a time-critical removal action (TCRA; Insight, 2009)

   b) Partial success of the in-situ stabilization (ISS) as evidenced by reducing the extent of mercury exceedances of the [RAO] from 3 locations to 2 and decreasing concentrations in one of the remaining locations (IR26MW49A). A time-series plot of data through 2023 for IR26MW49A, IR26MW51A, and IR26MW71A is presented on Figure 3-6. Mercury concentrations during the last 5 years of monitoring have been below historical maximums and are consistently below 10 times the HGAL [Hunters Point Groundwater Ambient Level].

   c) The limited extent of impacted groundwater; IR26MW71A and IR26MW49A are approximately 45 feet apart and IR26MW49A is approximately 88 feet from IR26MW51A with no exceedances.

   d) Comparison of groundwater quality parameters to Bay surface water quality parameters (temperature and dissolved oxygen, Table 3-4) indicate that the groundwater is not representative of Bay water because groundwater

temperature is consistently warmer than surface water, and dissolved oxygen is consistently lower than surface water.

Regional Water Board Response 1a: We do not agree that the 2008 TCRA is a line of evidence supporting Navy's conclusion that mercury concentrations in groundwater are unlikely to exceed 0.6 µg/L in Bay water. The TCRA did not remove mercury contamination within bedrock. Five samples collected from the top of the underlying bedrock contained mercury concentrations that exceeded the soil remediation goal (RG) of 2.3 mg/kg, ranging from 5.9 to 15 mg/kg (Figure 4). All five samples with elevated mercury were located immediately adjacent to the Bay and up-gradient "sentinel" wells IR26MW49A and IR26MW71A. Incomplete removal of mercury from bedrock sustains the unacceptable mercury discharges to the Bay.

Regional Water Board Response 1b: Given that groundwater treatment was implemented 7.5 years ago and has failed to achieve the TL of 0.6 µg/L mercury in sentinel wells IR26MW49A and IR26MW71A, the only wells down-gradient of the source area, we do not agree that the remedy has been partially successful. Rather, it has failed.

Whereas our trend analysis indicates that mercury concentrations are likely decreasing in well IR26MW49A, it is nonetheless an order of magnitude greater than the TL; consequently, the cleanup timeframe at best will be many decades unless alternative remedial actions are completed. Mercury concentrations in well IR26MW71A are consistently greater than the RAO and stable, meaning that the cleanup timeframe for that plume area is unknown, and requires further evaluation.

Regional Water Board Response 1c: We do not agree that the Navy's assessment that the extent of mercury-contaminated groundwater is limited (and shrinking), because the extent of mercury contamination has not been characterized in the following directions:

- vertically in bedrock;
- east and south of Source Area 2 where five confirmation samples contained mercury concentrations above the soil RG; and
- in the San Francisco Bay.

Until the data gaps are addressed with additional investigation, the conclusions presented in the Five-Year review are not supported regarding the extent of the mercury plume.

Regional Water Board Response 1d: We disagree with the Navy's statement that "the groundwater is not representative of Bay water." The industry standard to evaluate freshwater-seawater mixing uses conductivity measurements. Based on our review of the 2022 conductivity measurements for nearshore wells IR26MW49A, IR26MW70A, and IR26MW71A, samples collected from these wells were

100 percent mixed (i.e., the water samples were essentially Bay water). Therefore, sample laboratory analytical data for these wells are more representative of ambient mercury concentrations in Bay surface water. Additionally, based on our comparison of the 2022 sampling times to the National Oceanic and Atmospheric Administration's tide predictions, sampling of the nearshore monitoring wells was not conducted with consideration of predicted tide levels and, consequently, samples were not collected at low tides when groundwater discharges to the Bay. Because samples collected from nearshore wells were likely mixed/diluted, no dilution factor should be applied to nearshore groundwater data.

Applying a standard Site Conceptual Model for groundwater discharge to surface water, mercury-contaminated groundwater migrates through and beneath the shoreline revetment during low tides and upwells into the Bay's transition zone[1]. We are concerned that benthic organisms are exposed to harmful mercury concentrations.

Further, we are concerned that sample analytical results do not represent the mercury concentrations that the Bay's aquatic life is exposed to because samples are filtered in the field, removing mercury adsorbed on colloids in groundwater. When/where mercury discharges to the Bay with minimal dilution, including mercury in adsorbed phases, mercury concentrations may be greater than the reported concentrations in sentinel wells IR26MW49A and IR26MW71A. Consequently, we recommend that future water samples collected from all nearshore wells be analyzed for both dissolved and total mercury (no field filtration prior to analysis).

The Navy concluded that a "protectiveness determination cannot be made because there is uncertainty related to the concentrations of mercury discharging to the Bay from Parcel B-2, IR-26 groundwater." We disagree and as stated in our original comment, our protectiveness determination for Parcel B-2, IR Site 26 is "Not Protective."

Regional Water Board Response 1e: We disagree that a protectiveness determination cannot be made at this time. Elevated concentrations of mercury in groundwater exist in the sentinel wells, i.e., the points of compliance, representing unacceptable discharges to the Bay and evidence of exposure to the Bay's aquatic life. Consistent with USEPA guidance (2012), "Not Protective" is the appropriate protectiveness determination.

TL for Mercury in Groundwater. In response to the Regional Water Board's concerns regarding the validity of the mercury TL in groundwater, a link to the source document was provided. However, the link was not accessible and could not

[1] U.S. EPA, 2008. ECO Update/Ground Water Forum Issue Paper: Evaluating Ground-Water/Surface-Water Transition Zones in Ecological Risk Assessments. July. A transition zone is a region beneath the bottom of a surface-water body where conditions change from a groundwater dominated to surface-water dominated system within the substrate. The transition zone is an ecologically active area beneath the sediment/water interface where a variety of important ecological and physiochemical conditions and processes may occur.

be evaluated. Therefore, we continue to maintain that the HGAL for mercury of 0.6 µg/L, which is the basis of the mercury TL and Remedial Action Objective, is not appropriately representative because:

a. Influences from HPNS industrial activities are reflected in the data used.

b. The HGAL is not specific to IR Site 26. Only 8 of 162 samples were collected from Parcel B-2, and it is likely that no sample was collected from IR Site 26.

c. Mercury analytical results used to estimate the mercury HGAL were obtained over a period of about one year, which could not reflect the seasonal and medium- to long-term variability of mercury in groundwater.

d. The data used to calculate the mercury HGAL were entirely comprised of non-detect concentrations or their derivatives.

2. **Navy Response to Regional Water Board Protectiveness Determination Comment 2 (General):** Page 5 of 71 response states, "[N]avy acknowledges that while the remedy is protective of human health through active remediation, monitoring, and land use controls; additional information is needed to determine protectiveness for Bay receptors and has changed the remedy protectiveness determination to "Protectiveness Deferred" until such time the investigations are completed, and a protectiveness determination can be made. Specifically, the Navy will complete the Deep F-WBZ (fractured water-bearing zone) investigation for RU-C4 (Remedial Unit) and the B-Aquifer investigation."

   Page 7 of 71 revised text states," [I]t is expected that these actions will take approximately 5 years to complete, at which time a protectiveness determination will be made."

   Regional Water Board Response 2: Although the response discusses the two documents that will fill the data gaps, i.e., Deep F-WBZ investigation for RU-C4 and the B-Aquifer investigation, the response lacks specificity regarding detailed timeframes and schedules for completion. The text should be revised to include timeframe/schedule details.

3. **Navy Response to Regional Water Board Protectiveness Determination Comment 3 (General)**: The RTC identifies concerns from Water Board Specific Comments 18, 19, 20 and 21 on Parcel E-2 and explains the protectiveness determination of "Will be Protective" is due to the remedy being currently under construction. The following summarizes Navy responses that do not adequately address Water Board concerns:

   - **Upland Slurry Wall (USW) was not installed as designed.** The Navy states a work plan is under Agency review to evaluate USW performance and work is anticipated to begin in 2025.

- **Turbidity curtain was not used during remedy construction.** The Navy indicates a turbidity curtain was used during Phase II remedial action construction work.

- **The Navy has not provided all stormwater best practices documentation.** The Navy states they have responded to the requests for stormwater records, specifically related to December 3, 2022, and January 11, 2023, Water Board correspondences.

- **There is not adequate documentation that lead was removed from the wetland areas and groundwater may be affected in the future.** The Navy references post-over-excavation samples that were below the RG for lead-impacted soils.

Regional Water Board Response 3a: We disagree with the rationale for the Navy's protectiveness determination based on the completion of several remedy components that can be monitored for effectiveness/protectiveness. As described in the original Comment 3a, we have outlined the necessary data and information that can be collected to address longstanding agency concerns about the completed remedies.

We acknowledge that the Navy has agreed to address the following issues: collection of soil samples near Resource Conservation and Recovery Act (RCRA) hazardous waste piles and provide an addendum to the compliance monitoring and mitigation plan for methane at the landfill. However, several outstanding concerns have not been addressed by the RTCs as described in our Responses 3b to 3e below.

Regional Water Board Response 3b: Based on our understanding of the scope of work for the work plan to evaluate USW performance, the water level and analytical data to demonstrate USW is functioning as designed have not been included as requested by regulatory agencies. We have reiterated the importance of the data for evaluation of potential discharges using existing monitoring wells and have not received an adequate rationale for omitting this from forthcoming field investigations. Therefore, we cannot concur that the remedy "Will be Protective" because the necessary data to show remedy effectiveness/protectiveness is not being collected.

Regional Water Board Response 3c: The Navy references the turbidity curtain installed as part of the Phase II remedial action. However, as described in Specific Comment 19, our concerns are related to the 2018 Remedial Action Work Plan (RAWP), which covers activities of the Phase III remedial action and also required installation of a turbidity curtain. The RTC does not adequately address our comment and we find that a "Protectiveness Deferred" designation is more appropriate until the Navy can assure regulatory agencies that future work will comply with the site-specific Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) Stormwater Plans.

Regional Water Board Response 3d: The RTC references Water Board correspondences from December 2022 and January 2023. As discussed in the May 2025 meetings, this does not represent the most recent correspondence and discussions regarding these concerns. On May 11, 2023, the Navy and regulatory agencies met to discuss unresolved issues with the records provided. Our concerns about significant lapses in the submitted best management practices (BMP) Inspection Reports were not addressed and the Navy contractor indicated they would submit additional documentation. We followed up with a May 23, 2023, email requesting the additional records and received no acknowledgement or response from the Navy nor its contractors. "Protectiveness Deferred" is consistent with our assessment that the previous five-year period showed inadequate documentation of stormwater BMPs and the CERCLA Stormwater Plans compliance.

Regional Water Board Response 3e: We maintain that lead-contaminated soil was not adequately characterized or removed during the over-excavations documented in Fieldwork Variance #5 (Appendix G of Phase 2 Remedial Action Construction Summary Report, RACSR). See Attachment 2 from the August 7, 2020, Water Board letter for unresolved concerns about the lead RG exceedances that appear to have been left-in-place. As described in follow on correspondences listed in General Comment 3, the collection of soil/groundwater samples is needed to evaluate whether remediation was adequately completed, and we cannot concur with the "Will be Protective" determination until there is commitment from the Navy to provide this data.

4. **Navy Response to Regional Water Board Protectiveness Determination Comment 4 (General)**: The Water Board stated that there is insufficient data from each parcel to demonstrate that existing remedies account for per- and polyfluoroalkyl substances (PFAS) transport and containment.

   The Navy response states that site remedies should only be evaluated for protectiveness if it is confirmed that they do not address current or future exposure to PFAS. In addition, the response states that it is not appropriate to evaluate existing site remedies prior to initiation of the PFAS remedial investigation.

   The response identifies concerns from Water Board Specific Comment 4 on PFAS and explains that protectiveness determinations for existing remedies are not affected because existing remedies already account for PFAS in their design and implementation. According to the Navy, these existing protections are accounted for because:

   - Groundwater is not suitable for use as drinking water within the A-aquifer.
   - Current durable covers and institutional controls restrict human and terrestrial ecological receptor exposure to all site soils.

   Only one site-specific remedy was evaluated in the RTC and provided in the text revision, the near-shore slurry wall located at Parcel E-2. The Navy described that

the cement-bentonite mixture of the wall is expected to inhibit PFAS based on how it inhibits volatile organic compounds (VOCs).

Published ecological screening values from Argonne (2021) were also provided in the text as a line of evidence supporting no imminent CERCLA-related risk at HPNS.

Regional Water Board Response 4a: The lines of evidence provided supporting no imminent CERCLA-related risk are insufficient. Therefore, our protectiveness determination with respect to PFAS is "Protectiveness Deferred" Basewide.

The Regional Water Board has not provided a Basewide exemption for groundwater as a drinking water source, while groundwater at or near the site is not currently used as a drinking water source (i.e., for comparison to the USEPA National Drinking Water Regulations (NDWR) for six primary PFAS compounds), risk for ecological receptors and therefore, recreational users, to PFAS in contaminated surface water and groundwater is not accounted for or established in this response. The Argonne ecological screening values provided are on the order of a wide range, up to over three orders of magnitude for perfluorooctanoic acid (PFOA). These values also do not represent established site-specific risk criteria as agreed to by the Federal Facility Agreement parties.

Further, there is no evidence that the durable covers currently in-place can prevent PFAS from leaching from soil to groundwater or surface water at the site, which is a potential migration pathway. Considering the highly mobile nature of PFAS compounds, these pathways likely result in PFAS discharge to Bay waters and exposure to offshore receptors. The risk for exposure to these receptors has yet to be addressed by site remedies and demonstrate that protectiveness with regard to site PFAS has not been established.

Regional Water Board Response 4b: The response that the properties of the near-shore slurry wall at Parcel E-2 (i.e. a cement-bentonite mixture) are capable of inhibiting PFAS transport in groundwater, and groundwater to surface water, is not informed nor substantiated.

PFOA detected in groundwater upgradient of this location (i.e. 18 micrograms per liter at IR01MW60A) is multiple orders of magnitude more than its NDWR of 4 nanograms per liter. This indicates that there is a significant PFAS plume present within groundwater at Parcel E-2. No data was provided to support that this site remedy, which was not designed to mitigate PFAS releases in groundwater, is able to prevent a PFAS plume of this magnitude from migrating in groundwater.

PFAS compounds are known to be considerably more mobile and pervasive compared to VOCs, so it is unclear how this remedy can inhibit this contamination. PFAS compounds are also considerably more toxic at minor concentrations compared to VOCs (e.g. compared to tetrachloroethene federal maximum contaminant level of 5 *micro*grams per liter), so it should be expected that PFAS are more difficult to contain with the same remedy. In addition, it is also unclear how the

physical extent of the remedy (i.e. depth and lateral extent) was designed to mitigate this high concentration PFAS plume.

Further, no downgradient data, either in surface water or groundwater, exist to support that this remedy is currently functioning to inhibit PFAS migration.

Regional Water Board Response 4c: Based on the information provided above, we disagree with the rationale for the Navy's protectiveness determination with respect to PFAS. As stated in USEPA's April 3, 2024, RPM Bulletin 2024-01 (*Considerations When Reviewing PFAS in Five-Year Reviews*):

> To build a case to support the analysis of whether the newly identified contaminants could impact the protectiveness of the existing remedy, the FYR should incorporate what is known and not known about the contamination, and whether existing remedies may fully or partially mitigate risks.
>
> Because there is insufficient data available at this time, prior to the initiation of the remedial investigation, a Protectiveness Deferred determination should be assigned with respect to site PFAS.

Further, the June 2011 Navy policy which was provided does not substantiate the statement in the response that "an emerging contaminant should only affect a protectiveness determination if the emerging contaminant is present at a concentration posing a potential unacceptable risk at the site and the existing remedy does not address the current or future exposure to the emerging contaminant." The June 2011 policy only refers to investigation of the emerging contaminant itself and does not reference initiation of remedial investigations precluding assignment of protectiveness determinations. Rather, this policy states the investigation of an emerging contaminant should proceed based on whether "the contaminant may call into question the protectiveness of either the remedy or the RAOs."

Therefore, our protectiveness determination with respect to PFAS is "Protectiveness Deferred" Basewide

5. **Navy Response to Regional Water Board Protectiveness Determination Comment 5 (General)**: The RTC identifies concerns from Water Board Specific Comments 17, 24, 25, 28, and 29 on climate vulnerability and explains that protectiveness determinations can be better evaluated with site-specific studies. The following parcels were identified for site-specific studies based on threat from sea level rise: IR Site 07/18, Parcel B-1, Parcel B-2, Parcel C, Parcel D-1, Parcel G, Parcel E, and Parcel E-2. Further, the RTC indicates that the Navy will commit to holding a prioritization meeting with the members of the Federal Facility Agreement in November 2024.

   Regional Water Board Response 5: The Water Board generally concurs with these recommendations; however, we request the following response be addressed.

Describe why Parcel UC-1, Parcel UC-2, Parcel UC-3, and Parcel D-2 were not included in the list of site-specific studies to address climate vulnerability. It is our understanding that while these parcels have less prioritization compared to other, more vulnerable site locations, they are still susceptible to climate vulnerability (e.g. transient inundation, groundwater rise, etc.) and should also be included for site-specific evaluations.

Additionally, Site-specific climate vulnerability sturdies should be discussed in and presented on in parcel specific sections and tables for "Issues, Recommendations, and Follow-up Actions."

Regional Water Board Evaluation of Navy Response to Specific Comments

1. **Navy Response to Specific Comment 3**: The Navy provides an affirmative response to the Regional Water Boards request for consistent nomenclature for Installation Restoration (IR) Site numbering.

   Regional Water Board Response Specific Comment 3: could not be evaluated without the revisited document.

2. **Navy Response to Specific Comment 6a:** Proposed text revision "Based on the negligible change in historical survey monument elevations, the next round of settlement monument surveys will be in 2024."

   Regional Water Board Response Specific Comment 6a: Consider the defining "negligible change" in the text e.g., "negligible change (i.e., less than 0.1 foot)."

3. **Navy Response to Specific Comments 7 and 11**: The Navy disagrees with the Regional Water Boards request for discussion and depiction of flow directions and flow lines.

   Regional Water Board Response Specific Comments 7 and 11: Response does not address the request with respect to the addition of a discussion of groundwater flow or request for depiction for groundwater flow paths on a figure. These requests will assist the public in understanding the relationship between groundwater, surface water, and contamination at the Parcels.

4. **Navy Response to Specific Comment 8, 9 and 10**: The Navy provided responses to Regional Water Board comments regarding Parcel B-2, IR Site-26.

   Regional Water Board Response Specific Comment 8, 9, and 10: The responses do not adequately address Regional Water Board's concerns, refer to our evaluation of Response to Protectiveness Determination Comment 1 (General) above.

5. **Navy Response to Specific Comment 14**: The Navy provided a response to the Regional Water Boards comments regarding Operations and Maintenance (O&M) strategies to address erosional features at Parcel C.

Regional Water Board Response Specific Comment 14: The text should be updated to notify the public of the plan and include schedule timeframes for addressing these erosional features.

6. **Navy Response to Specific Comment 15**: The Navy provided responses to Regional Water Board comments regarding Parcel C.

   Regional Water Board Response Specific Comment 15: The response does not address the Regional Water Boards comment; the data gaps will persist until the proposed investigations are complete therefore the response to Question B remains uncertain.

7. **Navy Response to Specific Comment 18, 19, 20, and 21**: The Navy provided responses to Regional Water Board comments regarding Parcel E-2.

   Regional Water Board Response Specific Comment 18, 19, 20, and 21: The responses do not adequately address Regional Water Board's concerns, refer to our evaluation of Response to Protectiveness Determination Comment 3 (General) above.

8. **Navy Response to Specific Comment 22c (Specific)**: The RTC states that the Department of Defense (DoD) plans to update the DoD Regional Sea Level (DRSL) guidance periodically.

   Regional Water Board Response Specific Comment 22c: Please clarify whether there is an associated date or timeline for this updated DRSL guidance.

9. **Navy Response to Specific Comment 23b**: The RTC states that the DRSL projections are now more conservative based on consistency with the upcoming Ocean Protection Council (OPC) State of California Sea Level Rise Guidance (2024).

   Regional Water Board Response Specific Comment 23b: Note the OPC State of California Sea-Level Rise Action Plan (2022) lists 3.5 feet (ft) and 6 ft of sea level rise as target planning levels for resiliency by 2050 and 2100, respectively. Therefore, the DRSL projections should be benchmarked, or as close as possible, to the above Sea-Level Rise Action Plan criteria to factor in the need for a 2100 planning scenario, which is consistent with the current DTSC guidance.

CALIFORNIA Water Boards

GAVIN NEWSOM
GOVERNOR

YANA GARCIA
SECRETARY FOR
ENVIRONMENTAL PROTECTION

San Francisco Bay Regional Water Quality Control Board

July 18, 2024

U.S. Department of the Navy
Attn: Michael Pound, BRAC Environmental Coordinator
NAVFAC BRAC PMO West
33000 Nixie Way, Bldg. 50, 2nd Floor
San Diego, CA 92147
michael.j.pound.civ@us.navy.mil

Subject: Regional Water Board Comments on the redline June 2024 Draft-Final Fifth Five-Year Review Report, Hunters Point Naval Shipyard, San Francisco, San Francisco County

Dear Mr. Pound:

The San Francisco Bay Regional Water Quality Control Board (Regional Water Board) has reviewed the subject redline Draft-Final Fifth Five-Year Review Report (Draft-Final Five-Year Review) for the Former Hunters Point Naval Shipyard (HPNS).

After reviewing the Draft-Final Five-Year Review, including the Navy's proposed changes for its protectiveness determination for Parcel B-2 for Installation Restoration (IR) Site 26 and Parcel C, our protectiveness determinations remain different from the Navy's for Parcel B-2 and Parcel E-2.

A summary of the differences between the Navy's protectiveness determination, including changes proposed since the November 2023 submittal of the Draft Five-Year Review, and the Regional Water Board's protectiveness determinations for Parcel B-2 and Parcel E-2 is provided below:

Parcel	Navy's Protectiveness Determination	Regional Water Board's Protectiveness Determination
Parcel B-2	Protectiveness Deferred	Not Protective
Parcel E-2	Will Be Protective	Protectiveness Deferred

Additionally, as discussed in our April 30 and June 4, 2024, letters (attached), the lines of evidence are not sufficient to demonstrate that there is no risk to human or ecological receptors due to the presence of per- and polyfluoroalkyl substances (PFAS).

ALEXIS STRAUSS HACKER, CHAIR | EILEEN M. WHITE, EXECUTIVE OFFICER

1515 Clay St., Suite 1400, Oakland, CA 94612 | www.waterboards.ca.gov/sanfranciscobay

U.S. Department of the Navy July 18, 2024
Comments on the Draft-Final Fifth Five-Year Review

Therefore, consistent with USEPA *Memorandum: Clarifying the Use of Protectiveness Determinations for CERCLA [Comprehensive, Environmental Response, Compensation, and Liability Act] Five-Year Reviews* (2012) and USEPA *RPM Bulletin 2024-01 Considerations When Reviewing PFAS in Five-Year Reviews* (2024), our protectiveness determination with respect to PFAS is "Protectiveness Deferred" Basewide.

In our June 4, 2024, letter (attached), for transparency and as a matter of public record, we requested that Regulatory Agencies evaluations of the Navy response to comments be included in the responsiveness summary of the Draft-Final Five-Year Review; however, this was not done. Thus, we reiterate this request.

We will continue to meet and work collaboratively with the Navy and our regulatory counterparts on the Five-Year Review and look forward to satisfactory resolution to our comments, so that we will be able to provide our concurrence on the Final Five-Year Review.

We defer to DTSC and USEPA regarding the radiological findings presented in the Draft-Final Five-Year Review.

If you have any questions, please contact me at Mary.Snow@waterboards.ca.gov or (510) 622-2338.

Sincerely,

Mary K Snow

Mary Snow, P.G.
Engineering Geologist
Groundwater Protection Division

Attachments: Regional Water Board Comment Letters dated April 30 and June 4, 2024.

Copy to via email:
Wilson Doctor, Navy, Wilson.E.Doctor.civ@us.navy.mil
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Attachment 1

CALIFORNIA Water Boards

GAVIN NEWSOM GOVERNOR

YANA GARCIA SECRETARY FOR ENVIRONMENTAL PROTECTION

San Francisco Bay Regional Water Quality Control Board

April 30, 2024

U.S. Department of the Navy
Attn: Michael Pound, BRAC Environmental Coordinator
NAVFAC BRAC PMO West
33000 Nixie Way, Bldg. 50, 2nd Floor
San Diego, CA 92147
Sent via email only: michael.j.pound.civ@us.navy.mil

Subject: Regional Water Board Comments on November 2023 Draft Fifth Five-Year Review Report, Hunters Point Naval Shipyard, San Francisco, San Francisco County

Dear Mr. Pound:

The San Francisco Bay Regional Water Board (Regional Water Board) has reviewed the subject Draft Fifth Five-Year Review Report (Draft Five-Year Review) for the Former Hunters Point Naval Shipyard (HPNS).

Our preliminary protectiveness determinations are different from the Navy's for Parcel B-2, Parcel C, and Parcel E-2; and we are requesting additional details or supporting information to be able to concur with the Navy's determination for all parcels due to the climate change vulnerabilities and/or presence of per- and polyfluoroalkyl substances (PFAS) as summarized in the table below:

Parcel	Navy's Protectiveness Determination	Regional Water Board's Preliminary Protectiveness Determination
Parcel B-2*	Short-Term Protective	Not Protective
Parcel C*	Short-Term Protective	Protectiveness Deferred
Parcel E-2*	Will Be Protective	Protectiveness Deferred
Installation Restoration Site 07/18	Protective	Requesting additional details/information to support Navy's position

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Parcel	Navy's Protectiveness Determination	Regional Water Board's Preliminary Protectiveness Determination
Parcel B-1 Parcel C Parcel UC-2 Parcel D-1 Parcel UC-1 Parcel D-2 Parcel G Parcel UC-3	Short-Term Protective	Requesting additional details/information to support Navy's position
Parcel E	Will be Protective	Requesting additional details/information to support Navy's position

* For Parcel B-2, Parcel C, and Parcel E-2, in addition to differing positions based on our technical assessment of the remedies, we are requesting additional details/information to support Navy's position due to the climate change vulnerabilities and/or presence of PFAS.

We defer to Department of Toxic Substances Control (DTSC) and United States Environmental Protection Agency (USEPA) regarding the radiological findings presented in the Draft Five-Year Review.

We will continue to meet and work collaboratively with the Navy and our regulatory counterparts and look forward to satisfactory resolution to our attached comments, so that we will be able to provide our concurrence on the Final Five-Year Review.

If you have any questions, please contact me at Mary.Snow@waterboards.ca.gov or (510) 622-2338.

Sincerely,

Mary K Snow

Mary Snow, P.G.
Remedial Project Manager
Groundwater Protection Division

Attachment: Regional Water Board Comments

Copy to:

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Draft Fifth Five-Year Review Comments

Attachment

Regional Water Board Protectiveness Determination Comments

1. **Comment 1a:** We do not agree with the protectiveness statement provided in the Draft Five-Year Review for Parcel B-2, Installation Restoration (IR) Site 26. The Regional Water Board's preliminary protectiveness determination for Parcel B-2, IR Site 26 is "Not Protective." This determination is consistent with USEPA guidance (2012) because for mercury concentrations in groundwater the "[M]igration of contaminants is uncontrolled and poses an unacceptable risk to human health and the environment; or potential or actual exposure is clearly present or there is evidence of exposure."

   Comment 1b: The remedy at Parcel B-2, IR Site 26 is not protective because elevated mercury concentrations in groundwater may be discharging to San Francisco Bay (Bay). Therefore, development of a new primary document work plan focused on alternative treatments and treatment methodologies is warranted as a priority to mitigate discharge of mercury to the Bay and ensure protectiveness. Our expectation is that the Draft-Final Five-Year Review will include a commitment to developing this work plan with appropriate implementation timelines that are agreeable to the Federal Facility Agreement (FFA) signatories.

   The Draft Five-Year Review does not adequately reflect the Regulatory Agencies' (i.e., USEPA, Department of Toxic Substances Control (DTSC), and Regional Water Board) comments and concerns regarding the status of the remedy for Parcel B-2, IR Site 26. The remedy at Parcel B-2 includes soil excavation, installation of a durable cover, in situ stabilization of mercury in groundwater, monitoring, and institutional controls.

   The Navy's "Short-Term Protective" determination for Parcel B-2 IR Site 26 groundwater is not supported due to elevated concentrations of mercury in groundwater, as identified in the following Regulatory Agencies' correspondence: Tri-Agency Letter dated August 20, 2021, Tri-Agency Letter dated November 23, 2021, DTSC Note to File - Non-Concurrence dated December 23, 2021, and Regional Water Board Letter dated March 14, 2022.

   Specifically, after a three-year performance and post-treatment monitoring period, the remedial action, in situ stabilization using the reagent Metafix, has failed to reduce mercury concentrations in groundwater to below 0.6 micrograms per liter (µg/L), the Parcel B Remedial Design (RD) trigger level. Elevated concentrations of mercury in groundwater are in "sentinel" wells, representing a discharge to the Bay. Additionally, the Regional Water Board's concerns regarding the validity of the development of the trigger concentration for mercury have not been addressed by the Navy.

2. **Comment 2a:** We do not agree with the Navy's protectiveness determination for Parcel C. The Regional Water Board's preliminary protectiveness determination for

Parcel C is "Protectiveness Deferred." This determination is consistent with USEPA guidance (2012) because it is unknown if the response should be "yes" to "Question B - Are the exposure assumptions, toxicity data, cleanup levels, and remedial action objectives (RAOs) used at the time of the remedy selection still valid?"

Comment 2b: A protectiveness determination of the remedy at Parcel C cannot be made at this time until further information is obtained. Further information will be obtained upon successful implementation of the *Deep Fractured Water Bearing Zone (F-WBZ) Investigation for Remedial Unit-C4 (RU-C4)* and the planned B-aquifer investigation, at which time a protectiveness determination can likely be made. Our expectation is that the Draft-Final Five-Year Review will specify these documents as "follow-up actions" and commit to implementation timelines that are agreeable to the FFA signatories.

The Draft Five-Year Review does not adequately reflect the Regulatory Agencies' comments and concerns regarding the status of the remedy for Parcel C. The remedy at Parcel C includes soil excavation, installation of a durable cover, soil vapor extraction, in situ treatment of groundwater, monitoring, and institutional controls. The Navy's "Short-Term Protective" determination for Parcel C is not supported for groundwater due to data gaps in the understanding of the communication/connections between the hydrologic units within Parcel C, as documented in the following Regulatory Agencies' correspondence: Joint-Agency Letter (USEPA) dated July 30, 2021, Joint-Agency Letter (USEPA) dated September 17, 2021, and Tri-Agency Letter dated May 24, 2022.

Specifically, the connection and communication between hydrogeologic units within Parcel C is not fully understood; therefore, further characterization is required to demonstrate that 1) remedies within the A-aquifer will be effective and not recontaminated by chemicals of concern (COCs) within the B-aquifer and/or Deep F-WBZ and 2) unacceptable discharges to the Bay are not and will not occur.

3. **Comment 3a:** We do not agree with the Navy's protectiveness determination for Parcel E-2. The Regional Water Board's preliminary protectiveness determination for Parcel E-2 is "Protectiveness Deferred" because the remedy components were not implemented (turbidity curtain) or constructed as designed (Upland Slurry Wall). There are data gaps regarding lead contamination within the wetland, concerns regarding stormwater management practices during construction, questions regarding management of hazardous waste piles, and ongoing concerns regarding the management and monitoring of methane in soil gas at Parcel E-2.

   Comment 3b: A protectiveness determination of the remedy at Parcel E-2 cannot be made at this time until further information is obtained. Further information and data should include:

   - Obtaining as-built design drawings for the Upland Slurry Wall signed and stamped by a registered professional civil engineer in California.

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- Monitoring water levels and collecting analytical data to demonstrate the Upland Slurry Wall is functioning as designed.
- Collection of soil samples in the vicinity of Resource Conservation and Recovery Act (RCRA) hazardous waste piles.
- Collection of soil/groundwater samples within the wetland to demonstrate that lead has been adequately remediated.
- Provide a revised compliance monitoring and mitigation plan for methane at the landfill.
- Provide full records for stormwater best management practices for the duration of the implementation phases for the remedy at Parcel E-2.

These actions should be prioritized by the FFA Remedial Project Managers and/or based on imminent exposure threats. Our expectation is that the Draft-Final Five-Year Review will include a commitment to developing the appropriate primary documents to address these concerns and include implementation timelines that are agreeable to the FFA signatories.

The Draft Five-Year Review does not adequately reflect the Regulatory Agencies' comments and concerns regarding the status of the remedy for Parcel E-2. The remedy at Parcel E-2 includes soil excavation, installation of a durable cover, installation of belowground barriers, landfill gas monitoring, collection, and treatment, long-term monitoring of groundwater, radiological screening and remediation, and institutional controls.

The Navy's "Will be Protective" determination for Parcel E-2 is not supported due to concern regarding remedy implementation and site characterization, as documented in the following Regulatory Agencies' correspondence: Regional Water Board Letter dated March 6, 2023, Regional Water Board Letter dated August 7, 2020, Regional Water Board Letter dated December 15, 2020, Joint-Agency Letter dated March 16, 2021, Joint-Agency Letter dated April 28, 2021, Tri-Agency Letter dated May 5, 2022, Regional Water Board Letter dated August 17, 2022, Tri-Agency Letter dated December 8, 2022, Regional Water Board Letter dated December 13, 2022, and Joint-Agency Letter (USEPA) dated July 18, 2023.

Although it is understood that the remedy has not been fully implemented, the Navy has not addressed Regulatory Agencies' concerns regarding: lack of deployment of turbidity curtain during construction, stormwater best management practices/records keeping, Upland Slurry Wall not implemented as designed, request for as-built designs for changes to the Upland Slurry Wall, methane mitigation and monitoring within the landfill, potential lead contamination in the wetlands, potential impacts to soil due to RCRA hazardous waste handling.

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4. **Comment 4:** The Draft Five-Year Review does not adequately support the parcel specific protectiveness determinations with respect to the presence of PFAS, a class of chemical compounds that are considered emerging contaminants. The Navy must provide sufficient additional details to demonstrate that the protectiveness determinations are appropriate for each parcel. Otherwise, the determination should be "Protectiveness Deferred" with respect to PFAS.

   It is understood that PFAS investigations are ongoing. However, the findings in the *Site Inspection for Basewide Investigation of Per- and Polyfluoroalkyl Substances* (Liberty 2023) determined that a remedial investigation is necessary for all parcels for both soil and groundwater, therefore the extent of PFAS contamination is currently unknown. These concerns apply to: IR Site 07/18, Parcel B-1, Parcel B-2, Parcel C, Parcel UC-2, Parcel D-1, Parcel D-2, Parcel UC-1, Parcel G, Parcel E, Parcel E-2, and Parcel UC-3.

   The Navy must provide additional justification for their responses to protectiveness Questions A, B, and C (USEPA 2001 and 2012) with data and information that can demonstrate that remedies that were not specifically designed to prevent exposures to PFAS contamination are protective of human health and the environment. Additional supporting information could include but is not limited to exposure assumptions for PFAS, a discussion of remedy design features that can/will prevent exposures to PFAS, and figures showing the distribution of PFAS concentrations in context of remedy boundaries.

5. **Comment 5a:** With respect to protectiveness determinations, additional justification/evaluations for climate vulnerability should be presented in the Draft-Final Five-Year Review. Media of concern and associated exposure assumptions should be considered in the context of existing Institutional Controls and Engineering Controls or other remedy components to support the Navy's protectiveness statements. Otherwise, a "Protectiveness Deferred" determination may be most appropriate in the context of climate vulnerability.

   Comment 5b: There is an urgency to conduct parcel-specific climate vulnerability assessments at all parcels as soon as practical, with a prioritization of Parcel D-1, Parcel E, and Parcel E-2.

   The Draft Five-Year Review does not adequately support the parcel specific protectiveness determinations with respect to the findings in the Climate Resilience Assessment (CRA), Appendix A, and the site-specific data and information collected during the reporting period.

   The CRA is a screening-level assessment of climate-related hazards, their potential impacts, and whether vulnerabilities were identified that may impact the protectiveness of the remedies at HPNS.

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We acknowledge that this CRA is a screening or baseline assessment, but additional parcel-specific evaluation is required. Examples of the urgency for additional work include but are not limited to:

- Transient inundation is likely to occur within the next 11 years at Parcel D-1, Parcel E, and Parcel E-2.
- 11 years may not leave adequate time for planning if remedies require modifications to become or remain protective.
- As documented in Regional Water Board (M. Snow) email dated January 30, 2024, flooding/standing water observed January 23, 2024, at Parcel E may demonstrate that transient inundation predictions for 2035 are not conservative enough.
- Observance of "sinkholes" attributed to tidal waters and subsidence near Buildings 205, 207, and 208 at Parcel C.
- COCs and chemicals of potential concern (COPCs) in soil not currently saturated may be subject to mobilization with a small rise in groundwater elevation.

Parcel-specific assessments should be conducted at all parcels. These concerns apply to: IR Site 07/18, Parcel B-1, Parcel B-2, Parcel C, Parcel UC-2, Parcel D-1, Parcel D-2, Parcel UC-1, Parcel G, Parcel E, Parcel E-2, and UC-3. However, Parcel D-1, Parcel E, and Parcel E-2 should be prioritized.

Regional Water Board Specific Comments

1. **Five Year Review Summary Form, Page XVII, and Section 1.1 Purpose and Approach, Section 2.1 Site Interviews -** page 1.1 text states, "[T]he Five-Year Review included a document and data review, required visual site inspections, and interviews."

   Specific Comment 1: The Regulatory Agency site inspection was not conducted until after the Draft Five-Year Review was submitted. Also, it is unclear why interviews were limited to Navy contractors and were not conducted with Navy personnel, Regulatory Agencies, local authorities, including San Francisco Department of Public Health (SFDPH), nearest neighbors, and/or community members; this is inconsistent with USEPA guidance (2001).
   The form should be updated to include January 23, 2024, the date of the Regulatory Agencies' Fifth Five-Year Review site inspection. Justification for why interviews were limited to Navy contractors should be provided. Also, interviews should be conducted with the Navy personnel, Regulatory Agencies, SFDPH, nearest neighbors, and/or community members and provided in the Draft-Final Five-Year Review.

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2. **Five Year Review Summary Form, Page XVII; Section 1.1 Purpose and Approach, and Section 2.6, Next Five-Year Review -** page 1-1 text states, "The triggering action for statutory Five-Year Reviews at HPNS was the date of mobilization for the remedial action (RA) activities at Parcel B, which was July 8, 1998. The triggering action for this Fifth Five-Year Review is the signature of the Fourth Five-Year Review, July 31, 2019 (Navy, 2019)". Section 2.6, page 2-2 text states, "[T]he next Five-Year Review is due to be finalized 5 years from the signature of this Five-Year Review, which is anticipated to be in 2029."

   Specific Comment 2: Per USEPA letter dated November 16, 2023, the Sixth Five-Year Review is due November 8, 2028; therefore, the Draft-Final Five-Year Review should be revised accordingly.

3. **Section 1.2 Environmental Restoration Program, and Figure 1-2 Installation Restoration Sites -** page 1-2 the text states "In most cases, IR sites were identified by a two-digit number (for example, IR-02)," but depicted as single digits on Figure 1-2 for IR sites 1 through 9 instead of 01 through 09.

   Specific Comment 3: For clarity two-digit nomenclature for IR sites 01 through 09 should be used throughout the Five-Year Review.

4. **Section 1.4.1 Per- and Polyfluoroalkyl Substances -** page 1-7 text states "Because investigation of PFAS is ongoing and it has not yet been determined whether PFAS pose unacceptable risk that requires RA [Remedial Action], and because a remedy for PFAS has not yet been determined, a protectiveness determination cannot be made."

   Specific Comment 4: This is not consistent with USEPA Guidance (September 2012) regarding protectiveness statements for emerging contaminants. Per USEPA Guidance (September 2012) for emerging contaminants protectiveness is deferred. Unless parcel specific evaluations of existing PFAS concentrations, likely data gaps, media of concern, and exposure assumptions are conducted in the context of existing Institutional Controls, Engineering Controls, or other remedy components to support the Navy's protectiveness statements, then "Deferred Protectiveness" is appropriate for sites with PFAS detections. See Protectiveness Determination Comment 4 above.

5. **Section 1.4.3.1 Progress Since the Fourth Five-Year Review -** Discussion in this section was limited to the radiological retesting.

   Specific Comment 5: This section should be consistent with the issues, recommendations, and other findings as presented in the last Five-Year Review and

not limited to radiological retesting. The *Final Fourth Five-Year Review* (2019) "Issues, Recommendation and Other Findings" included the following items:

- SVE [soil vapor extraction] implementation in Parcels B-1 and C is reducing source mass, but with limited effectiveness due to diffusion-limited conditions in the subsurface.

- The Regulatory Agencies do not agree with the Navy's risk assessment methodology used to reduce the ARICs [areas requiring institutional controls] for VOC [volatile organic compounds] vapors.

- The Navy has determined that a significant portion of the radiological survey and remediation work completed to date was not reliable because of manipulation and/or falsification of data by one of its radiological contractors. A long-term protectiveness evaluation of the radiological RGs [remediation goals] has not yet been completed for this fourth Five-Year Review, and it is currently not known if the RAOs for radionuclides have been achieved in Parcels B-1, B-2, C, D-1, D-2, G, E, UC-1, UC-2, and UC-3.

Specific updates for the SVE implementation at Parcels B-1 and C, as well as the status of the disagreement regarding the Navy's risk assessment methodology used to reduce the ARICs for VOC vapors from the Fourth Five-Year Review, including milestones and timelines, should be provided in the Draft-Final Fifth Five-Year Review.

6. **Section 3.4.1.2 Remedy Operations and Maintenance, Durable Cover Maintenance (IR 07/18), 3.4.2.2 Remedy Operations and Maintenance, Durable Cover (B-1); Section 3.4.3.2 Remedy Operations and Maintenance, Durable Cover (B-2), Section 4.4.1.2 Remedy Operations and Maintenance, Durable Cover (Parcel C), and Section 6.4.2.2 Remedy Operations and Maintenance, Durable Cover (E-2) -** provides information regarding remedy operations and maintenance for the durable covers and monument surveys.

   Specific Comment 6a: The 2023 monument surveys results were not provided, and the frequency of monument surveys is not specified in the Draft Five-Year Review. Provide the 2023 monument survey results in the Draft-Final Five-Year Review.

   Specific Comment 6b: Provide the frequency of the monument surveys by parcel, i.e., IR Site 07/18, Parcel B-1, Parcel B-2, Parcel C, and Parcel E-2.

   Specific Comment 6c: Consider increasing the frequency of monument surveys in support of evaluating impacts on the remedies due to sea level rise/groundwater rise.

7. **Section 3.4.1.1 Remedy Implementation -** page 3-7 text states "[S]ince at least 2009, concentrations of COCs and ROPCs [radionuclides of potential concern] have remained under their TLs [trigger levels], except for lead in September 2017 and

March 2022 (TRWB, 2023). Concentrations of lead exceeded the TL but were within the same order of magnitude as the TL (14.44 µg/L) at two locations (23 and 23.9 µg/L) in March 2022 and were below laboratory detection limits during the September 2022 event (Appendix E, Figure 3-5)."

Specific Comment 7: The Draft-Final Five-Year Review should provide a discussion of groundwater flow directions and include groundwater flow path depictions on Figure 3-5, and trend analysis for lead concentrations in wells IR07MW24A and IR07MW26A. With the fluctuating lead concentrations in groundwater and the lack of sentinel wells between the elevated concentrations in groundwater and the Bay, it is unclear if the remedy is adequately protective of ecological receptors and that lead is not being discharged to the Bay.

8. **Section 3.5.1, Question A: Is the Remedy Functioning as Intended by the Decision Document? and Section 3.5.1.3, Parcel B-2 -** with respect to IR Site 26, the Navy responded "yes" to Question A.

   Specific Comment 8: A "yes" response is inconsistent with the mercury exceedances in groundwater, as well as not adequately reflecting regulatory comments and concerns since the Forth Five-Year Review. The Draft-Final Fifth Five-Year Review should be revised to respond "No" to Question A. See Protectiveness Determination Comment 1 above.

9. **Section 3.5.2 Question B: Are the Exposure Assumptions, Toxicity Data, Cleanup Levels, and Remedial Action Objectives Used at the Time of the Remedy Selection Still Valid? -** with respect to IR Site 26, the Navy responded "yes" to Question B.

   Specific Comment 9: It is not clear if the cleanup levels associated with mercury in groundwater are still valid. As the Navy has not responded to the Regional Water Board Letter dated March 14, 2022, regarding the development of the 0.6 µg/L as the Parcel B RD trigger level for mercury. The response to Question B may be "no" and the Navy should provide a response to the Regional Water Board's concerns with respect to the mercury trigger level to justify that the RAOs are still valid. See Protectiveness Determination Comment 1 above for additional details.

10. **Section 3.6 Issues, Recommendations, and Follow-up Actions and Table 3-8 Parcel B Issues, Recommendations, and Follow-up Actions -** provides a summary of the Issues, Recommendations, and Follow-up Actions for Parcel B, including, Parcel B-2 IR Site 26.

    Specific Comment 10: There are outstanding Regulatory Agencies' comments and recommendations related to the remedy at Parcel B-2 IR Site 26 that were not included in this section or on this table, as detailed in the Protectiveness Determination Comment 1 above.

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The following issues need to be included in this section: 1) Metafix has failed to reduce mercury in groundwater to concentrations below the Parcel B RD trigger level and 2) elevated concentrations of mercury in groundwater are in "sentinel" wells, representing a discharge to the Bay. The recommendations and follow-up actions should include development of a new primary document work plan focused on alternative treatments and treatment methodologies as a priority to mitigate discharge of mercury to the Bay and ensure protectiveness.

11. **Figure 3-5, March and September 2022 Exceedances of Remediation Goals in Parcels B-1 and B-2 and IR-07/18 and Figures 4-4 through 4-7 -** The figures show exceedances of remediation goals in groundwater.

    Specific Comment 11: The figures showing exceedances of remediation goals in groundwater do not include groundwater flow direction. General groundwater flow direction arrows should be presented on figures that show exceedances of remediation goals for COCs in groundwater.

12. **Section 4.2.1.1 Geology and Hydrogeology, Section 5.2.1.2 Geology and Hydrogeology, and Section 6.2.1.1 Geology and Hydrogeology -** sections describe hydrogeologic characteristics including B-Aquifer.

    Specific Comment 12: B-Aquifer groundwater elevations are not provided in these sections. B-Aquifer groundwater elevation ranges should be provided in Section 4.2.1.1, Section 5.2.1.2, and Section 6.2.1.1.

13. **Section 4.4.1.1 Remedy implementation, Soil Excavation and Removal -** The text discusses changes to the Remedial Action Work Plan (RAWP) based on the findings of Pre-RA investigation. For RUC1 on page 4-6 the text states "[T]he Navy is evaluating options to treat the DNAPL source area and, subsequently, the associated groundwater plume." And for RU-C2 the text states "The Navy is evaluating a revised approach to achieve soil RAOs and address a potential ongoing source to A-aquifer groundwater (ECC-Insight, 2019)." On page 4-8 for the Soil Vapor Extraction Monitoring the text states "[T]he Navy is in the process of reviewing the strategy for addressing soil gas at all Parcel C areas in conjunction with additional in situ groundwater remediation activities that are ongoing (ECCInsight and CDM Smith, 2019)."

    Specific Comment 13: The text discusses changes to the RAWP based on the findings of Pre-RA investigation but does not provide specificity regarding a timeline for how and when alternatives will be evaluated or provided for review. For clarity, Section 4.4.1.1 should be revised to indicate which documents these evaluations will be presented in and when they will be provided to the Regulatory Agencies for review.

14. **Section 4.4.1.2 Remedy Operations and Maintenance -** as stated on page 4-14, "[A] 7-foot-deep void observed along the pier edge that allowed water to wash in and

out with the tide may have contributed to the sinkholes;" a number of "sinkholes" were observed and for some their presence was attributed to tidal action.

Additionally, the text states that, "Subsidence was noted near Buildings 205, 207, and 208 between Dry Dock 2 and Dry Dock 3 that required extensive repairs outside of routine O&M, and 100 feet of permanent chain-link fence was installed across Building 208 to secure the end of the pier."

Specific Comment 14: It does not appear that existing Operations and Maintenance (O&M) methodologies are adequate to address these concerns. The Navy should provide the long-term strategies to address "sinkholes" and subsidence for Parcel C.

15. **Section 4.5.2 Question B: Are the Exposure Assumptions, Toxicity Data, Cleanup Levels, and Remedial Action Objectives Used at the Time of the Remedy Selection Still Valid? -** with respect to Parcel C, the Navy responded "yes" to Question B.

    Specific Comment 15: The response to Question B should be "uncertain" at this time because the connection and communication between hydrogeologic units within Parcel C is not fully understood. See Protectiveness Determination Comment 2 above for additional details.

16. **Section 4.6 Issues, Recommendations, and Follow-up Actions, and Table 4-8 Parcel C and UC-2 Issues, Recommendations, and Follow-up Actions -** provides a summary of the issues, recommendations, and follow-up actions for Parcel C.

    Specific Comment 16: Radiological retesting should not be the only issue presented in Section 4.6 and on Table 4-8. There are outstanding issues related to the characterization of hydrogeologic units within Parcel C.

    Further characterization to demonstrate that 1) remedies within the A-aquifer will be remediated by the selected remedy and not recontaminated by COCs within the B-aquifer and/or F-WBZ and 2) unacceptable discharges to the Bay are not and will not occur should be added to the "Issues" for Parcel C. Additionally, successful implementation of the Deep F-WBZ Investigation for Remedial Unit-C4 (RU-C4) and the planned B-Aquifer investigation should be included in the "Follow-up Actions" for Parcel C.

17. **Section 5.4.1.1 Remedy Implementation -** page 5-7 text states that, "[T]he Parcel D-1 RAMP (ChaduxTt, 2011a) states that groundwater samples will be collected semiannually until at least two years after property redevelopment to ensure redevelopment activities do not mobilize metals that could migrate into the [B]ay."

    Specific Comment 17: Mobilization of metals should be considered due to potential groundwater rise, and monitoring should be reevaluated in this context for

Parcel D-1. Groundwater monitoring for metals at Parcel D-1 should be continued beyond pending redevelopment and evaluated for continued monitoring due to groundwater rise.

18. **Section 6.4.2.1 Remedy Implementation - Soil, Sediment, and Debris Excavation, Consolidation, and/or Removal -** page 6-13 text states, "[A]s part of the Phase 2 RA, the tidal and freshwater wetland areas were excavated and graded to the subgrade design as specified in the DBR [Design Basis Report] (ERRG, 2014)."

    Specific Comment 18: The full magnitude and extent of crystalline lead oxide and soil contaminated with lead above the hot spot cleanup goal must be addressed with further soil and groundwater sampling**.** The "white crystalline lead oxide particles" were neither delineated nor removed during construction of the freshwater wetland where it may intersect the Experimental Ship Shielding Range. The description of "crystalline lead oxide particles" encountered during freshwater wetland excavation was removed from the Final Phase II Remedial Action Construction Summary Report; however, that information remains relevant because the vertical extent of lead has not been characterized. The left-in-place lead contamination above the hot spot cleanup goal poses risks to wildlife and may cause lead discharges to the freshwater wetland or the Bay.

19. **Section 6.4.2.1 Remedy Implementation - Soil, Sediment, and Debris Excavation, Consolidation, and/or Removal, Table 6-5. Parcel E-2 Remedial Action Summary and Expected Outcomes, and Appendix C Site Inspection and Photograph Logs -** summarizes the remedy implementation, expected outcomes, and provides the site inspection details and photos for Parcel E-2.

    Specific Comment 19: Failure to implement portions of the remedy demonstrates that RAOs for ecological receptors have not been met in the short-term and deferred protectiveness is appropriate for Parcel E-2.

    In accordance with the 2018 RAWP, the Navy committed to installing a turbidity curtain to prevent potential discharges of sediment into the Bay for activities conducted within 250 feet of the shoreline as detailed in Section 11.3, Erosion and Sediment Control Measures, and Appendix E, CERCLA Stormwater Plan (SWP) Section 3.3.1, Non-Stormwater Controls. RAWP construction activities within the tidal influence zone included 1) placement, grading, and compaction of final soil cover and 2) installation of drainage piping features at the freshwater wetlands and near the shoreline retaining wall.

    A turbidity curtain was not deployed and evidence shows heavily disturbed soils throughout the shoreline area during the rainy season (see Appendix C, Site Inspection and Photograph Logs, Pages C-119 to C-126 – Site inspection photographs). Visibly turbid standing water along the shoreline revetment indicates a discharge of sediments to the Bay.

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20. **Section 6.4.2.1 Remedy Implementation - Soil, Sediment, and Debris Excavation, Consolidation, and/or Removal; and Below Ground Barrier (Slurry Walls) and Table 6-5. Parcel E-2 Remedial Action Summary and Expected Outcomes -** The text and table provide details regarding the Upland Slurry Wall including RAOs and performance metrics.

    Specific Comment 20: Per Regulatory Agencies' comments, water level and analytical data to demonstrate the Upland Slurry Wall is functioning as designed, as well as engineer certified as-built designs for the Upland Slurry Wall, as modified, need to be provided.

    The Upland Slurry Wall was not constructed in accordance with the final design and specifications. The unplanned 220-feet long by 10-feet deep gap in the Upland Slurry Wall may result in unintended consequences to the groundwater flow system and thus unacceptable discharges to the freshwater wetlands and the Bay. The Navy has allowed several years of time lapse without adequately showing that unacceptable discharges of leachate generated from groundwater contact with the landfill waste are being mitigated by collecting and analyzing groundwater data from the existing monitoring wells as requested by the Regulatory Agencies. See Protectiveness Determination Comment 3 for additional details.

21. **Section 6.6 Issues, Recommendations, and Follow-up Actions -** provides a summary of issues, recommendations, and follow-up actions for Parcel UC-3.

    Specific Comment 21: Issues, recommendations, and follow-up actions should not be limited to Parcel UC-3 as there are outstanding issues for Parcel E-2 as documented in Regulatory Agencies' correspondence. See Protectiveness Determination Comment 3 above for additional details.

    The following should be added to "Issues" in Section 6.6: turbidity curtain not deployed during construction, stormwater best management practices/records keeping, Upland Slurry Wall not implemented as designed, as-built designs for changes to the Upland Slurry Wall not provided, methane mitigation and monitoring within the landfill, potential lead contamination in the wetlands, potential impacts to soil due to RCRA hazardous waste handling.

    The following "Recommendations and Follow-up Actions" should be added to Table 6-11: obtain as-built design drawings for the Upland Slurry Wall signed and stamped by a registered professional civil engineer in California, monitor water levels and collect analytical data to demonstrate the Upland Slurry Wall is functioning as designed, collect soil samples in the vicinity of RCRA hazardous waste piles, collect soil/groundwater samples within the wetland to demonstrate that lead has been adequately remediated, revise compliance monitoring and mitigation plan for methane at the landfill, and provide full records for stormwater best management practices for the duration of the implementation phases for the remedy at Parcel E-2.

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22. **Appendix A, Section 1.0 Introduction -** The Navy used the Department of Defense Regional Sea Level (DRSL, 2015) database to evaluate climate-related hazards, the most important of which is coastal flooding due to the site's proximity to the Bay. The DRSL considers scenarios for the years 2035, 2065, and 2100 and accounts for site specific adjustments, including vertical land movement.

    Specific Comment 22a: Of the two timeframes evaluated (2035 and 2065), vertical land movement was only considered for the 2065 scenario. Explain why the Navy doesn't evaluate vertical land movement in the 2035 scenario.

    Specific Comment 22b: Why isn't the 2100 scenario considered in this CRA?

    Specific Comment 22c: Justify the use of guidance dated 2015 when more current and site-specific guidance and sea level rise projections are available, such as the Ocean Protection Council (OPC) State of California Sea Level Rise Guidance (2018) and OPC Sea-Level Rise Action Plan (2022).

23. **Appendix A, Section 2.1, Sea Level Rise Projections -** This section references a 30-year timeframe for a phased approach to plan for sea level rise, per the DTSC Draft Sea Level Rise Guidance (2023). Sea level rise projections of 1 foot for the year 2035, and 3.2 feet for 2065 were selected as the most conservative levels based on the DRSL report and are generally consistent with projections made in the OPC State of California Sea Level Rise Guidance which DTSC's Draft Guidance relies upon.

    Specific Comment 23a: While 30 years is referenced as a minimum planning timeframe for a phased approach, this document fails to mention that applies to a remedy that provides a minimum of 30 years of protection against sea level rise and that DTSC "prefers full action taken now to address future impacts, but will consider a phased adaptation approach on a case-by-case basis."

    Specific Comment 23b: The DTSC Draft Guidance states that "to ensure remedy resilience…evaluate projects based on sea level rise of 3.5 feet by 2050, and 6 feet by 2100," which are the recommended targets for minimum sea level rise planning and preparation, as presented in the OPC Sea-Level Rise Action Plan (2022).

24. **Appendix A, Section 2.2 Seawater Inundation Impacts, Section 2.3 Storm Surges, Section 3.1 Groundwater Emergence, Figures 2-2, 2-3, 2-4, 2-5, 3-1, and 3-2 -** the text states that "[F]igures 2-2 and 2-3 show the potential for permanent seawater inundation in 2035 and 2065, for the highest SLR scenarios in DRSL. Except for some marginal seawater encroachment at the edges of some parcels, no permanent seawater inundation is projected in any of the parcels during 2035 and 2065, under the highest SLR scenario."

    Specific Comment 24: No details are provided regarding which specific remedies, remedy components, or COCs may be impacted by this inundation. These concerns apply to storm surges, transient inundation, and groundwater emergence. The text

should be revised to include which specific remedies, remedy components, and/or COCs will be impacted by permanent inundation, storm surges, or groundwater emergence. Additionally, figures should be revised to depict the locations of remedy and COC boundaries in relation to permanent inundation, storm surges, or groundwater emergence.

25. **Section 2.3 Storm Surges, Figure 2-4 and Figure 2-5 -** The transient inundation is shown to be extensive by 2035 as stated in the text, "[P]ortions of IR 7/18, and Parcels B-1, B-2, C, D-1, E, and the low-lying areas of E-2 are projected to be impacted."

    Specific Comment 25: Parcel specific evaluations should be initiated immediately due to concerns regarding transient inundation. Parcel D-1, Parcel E, and Parcel E-2 should be prioritized.

    Eleven years is a short time to assess existing remedies for resilience and implement changes if needed to prevent exposures. Additionally, this prediction may not be appropriately conservative, as similar inundation to that depicted in Figure 2-4 for Parcel E in 2035 was observed on January 23, 2024, as documented in the Regional Water Board's email to the Navy sent on January 30, 2024.

26. **Appendix A, Section 3.1 Groundwater Emergence -** The mean sea level (MSL) is used as the datum to determine permanent sea level rise induced groundwater table rise, as used by the City of Alameda (2022). A 1:1 ratio of groundwater table rise to MSL rise was considered, and the projected groundwater rise was added to the baseline.

    Specific Comment 26a: In the Seawater Inundation Impacts section, mean high higher water (MHHW) is the standard elevation used as a baseline, and is the standard used in SLR mapping tools. SLR is added to the MHHW for evaluation for potential upland inundation. The MHHW should be applied instead of MSL for SLR calculations.

    Specific Comment 26b: The reference to the City of Alameda report from 2022 uses data from a 2020 report on "The Response of the Shallow Groundwater and Contaminants to Sea Level Rise" for the City of Alameda. The authors of this report have published more recent, and more applicable data that should be applied to this CRA - "Shallow Groundwater Response to Sea-Level Rise (Alameda, Marin, San Francisco, and San Mateo Counties)." The more recent report with county-specific data should be used.

    Specific Comment 26c: The above report does reference the MSL datum; however, this assessment fails to mention "the Bay water level elevation approximately one foot above the mean tide line was selected because fresh groundwater is usually found just above the mean tide line inland of coastal embayments." The additional foot above MSL should be accounted for in these projections of groundwater emergence.

Specific Comment 26d: The CRA should explain how tidal fluctuations were accounted for in evaluating groundwater emergence, when "tidal fluctuations were observed from 150 to 500 feet inland from the [B]ay" within the A-Aquifer in both Parcels C and D, as stated in sections 4.2.1.2 and 5.2.1.2.

27. **Appendix A, Section 5.1 Assessment Methodology -** The vulnerability assessment evaluates whether impacts identified in the CRA indicate a new exposure, and whether site COCs (chlorinated volatile organic compounds [CVOCs], heavy metals, polychlorinated biphenyls [PCBs], and polycyclic aromatic hydrocarbons [PAHs]) are identified as most likely to persist through 2035 and 2065. Potential vulnerabilities to both human and ecological receptors to heavy metals were identified due to groundwater emergence.

    Specific Comment 27: Explain why the other COCs, i.e., CVOCs, PCBs, and PAHs, do not present a threat to human health and the environment as groundwater emerges.

28. **Appendix A, Section 5.3.1 Potential New Exposure to CVOCs from Vapor Intrusion due to Groundwater Table Rise to 3 feet bgs, Page A-20 -** Where previous treatment of a CVOC source left behind residual mass, additional treatment is planned. By 2035 any residual CVOCs in groundwater are projected to attenuate below remedial goals.

    Specific Comment 28: This assumption should be reevaluated after additional treatment is performed, and well ahead of any projected groundwater emergence.

29. **Appendix A, Section 5.3.4 Potential New Exposure to Subsurface Remedy Infrastructure to Saltwater Intrusion, Page A-21 -** The groundwater at many locations is high in "saltwater components, such as chloride" indicating that saltwater intrusion is an ongoing phenomenon.

    Specific Comment 29: A geochemical evaluation should be performed to evaluate how the site COCs detected in soil and groundwater will be affected by increasing salinity.

30. **Appendix A, Section 5.3.6 Parcel E-2 Remedy Resiliency -** The Parcel E-2 landfill has design elements which will make the remedy resilient to sea level rise through 2065, including the addition of a 9-foot shoreline revetment and 3-foot sea wall. The planned construction of fresh and tidal wetlands is designed to store and transmit seawater, rain, and groundwater to mitigate sea level rise effects.

    Specific Comment 30: Consider the following in the remedy design and future monitoring and maintenance of the landfill: as groundwater becomes emergent, as it is projected in the CRA to do by 2035 with 1 foot of sea level rise, contaminated groundwater may enter the freshwater wetland impacting ecological receptors; the wetland may overflow its design footprint which can impact the nearby or surrounding protective landfill cap; and contaminated groundwater may overtop the

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downgradient slurry wall. Additionally, it is unclear how/why passive design elements alone are considered enough for resilience when active solutions such as hydraulic control may be needed to prevent migration of contaminants.

Attachment 2

San Francisco Bay Regional Water Quality Control Board

June 4, 2024

U.S. Department of the Navy
Attn: Michael Pound, BRAC Environmental Coordinator
NAVFAC BRAC PMO West
33000 Nixie Way, Bldg. 50, 2nd Floor
San Diego, CA 92147
michael.j.pound.civ@us.navy.mil

Subject: Regional Water Board Evaluation of May 2024 Navy Responses to Consolidated Agency Comments (Redline version dated May 27, 2024) for the November 2023 Draft Fifth Five-Year Review Report, Hunters Point Naval Shipyard, San Francisco, San Francisco County

Dear Mr. Pound:

The San Francisco Bay Regional Water Quality Control Board (Regional Water Board) has reviewed the subject responses to comments (RTCs) on the Draft Fifth Five-Year Review Report (Draft Five-Year Review) for the Former Hunters Point Naval Shipyard (HPNS).

After reviewing the RTCs, including the Navy's proposed changes for its protectiveness determination for Parcel B-2 for Installation Restoration (IR) Site 26 and Parcel C, our protectiveness determinations remain different from the Navy's for Parcel B-2 and Parcel E-2.

A summary of the Navy's protectiveness determination, including changes proposed since the November 2023 submittal of the Draft Five-Year Review, and the Regional Water Board's protectiveness determinations for Parcel B-2, Parcel C, and Parcel E-2 is provided below:

Parcel	Navy's Protectiveness Determination	Regional Water Board's Preliminary Protectiveness Determination
Parcel B-2	Protectiveness Deferred revised from Short-Term Protective	Not Protective
Parcel C	Protectiveness Deferred revised from Will Be Protective	Protectiveness Deferred
Parcel E-2	Will Be Protective	Protectiveness Deferred

ALEXIS STRAUSS HACKER, CHAIR | EILEEN M. WHITE, EXECUTIVE OFFICER

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In addition to the changes to protectiveness determination there are several revisions that the Navy verbally committed to during April and May 2024 in person meetings with the Regulatory Agencies (Regional Water Board, Department of Toxic Substances Control (DTSC), and United States Environmental Protection Agency (USEPA)) that are not reflected in the Navy's RTCs. For example, it is important to revise the "Issues, Recommendations, and Follow-up Actions" sections and tables that reflect key milestones (i.e., primary documents) with timeframes and schedules in order to address Regulatory Agencies concerns related to protectiveness and/or remedy effectiveness and demonstrate that the Navy and Regulatory Agencies have a shared understanding of the path forward for the individual parcels. These timeframes and schedules can/will be used as a tracking tool until the next Five-Year Review.

For transparency and as a matter of public record, we request that Regulatory Agencies evaluations of the Navy response to comments be included in the responsiveness summary of the Draft-Final Five-Year Review.

Due to the Navy's request for an expedited review of the RTCs, our attached comments focus on overarching concerns and are not exhaustive. We will continue to meet and work collaboratively with the Navy and our regulatory counterparts on the Five-Year Review and look forward to satisfactory resolution to our comments, so that we will be able to provide our concurrence on the Final Five-Year Review.

We defer to DTSC and USEPA regarding the radiological findings presented in the Draft Five-Year Review.

If you have any questions, please contact me at Mary.Snow@waterboards.ca.gov or (510) 622-2338.

Sincerely,

Mary K Snow

Mary Snow, P.G.
Engineering Geologist
Groundwater Protection Division

Attachment: Regional Water Board Comments

cc via email:

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Response to Comments Draft Fifth Five-Year Review

Attachment

Regional Water Board New Comment

1. **New Comment 1:** There was an expectation that the redline RTC revisions would include all relevant revisions for the purpose of evaluating the Navy response to Regulatory Agencies' comments, e.g., revised text, tables, and figures; however, these details have been inconsistently provided or not included in the RTCs. The Regulatory Agencies have identified several issues, recommendations, and follow-up actions that are necessary to inform and/or demonstrate effectiveness of existing remedies or for remedies in the implementation phase. Specific milestones (i.e., primary documents), schedules, and timeframes should be specified and included in the Draft-Final Five-Year Review. Sections 3.6 (Parcel B-2), 4.6 (Parcel C), 5.6 (Parcel D), and 6.6 (Parcel E-2), as well as Tables 3-4, 4-8, 5-8, and 6-11 need to be updated to provide the specific details requested by the Regulatory Agencies.

Regional Water Board Evaluation of Navy Response to Comments

1. **Navy Response to Regional Water Board Protectiveness Determination Comment 1 (General)**: On page 1 of 71 the response states that "[T]he multiple lines of evidence presented in the Five-Year Review suggest the [mercury] concentrations observed in groundwater are unlikely to exceed [the Remedial Design Trigger Level (TL) of] 0.6 micrograms per liter (µg/L) in Bay (San Francisco Bay) surface water."

   Page 2 of 71 the response goes on to state:

   a) Completion of source removal in 2008 via a time-critical removal action (TCRA; Insight, 2009)

   b) Partial success of the in-situ stabilization (ISS) as evidenced by reducing the extent of mercury exceedances of the [RAO] from 3 locations to 2 and decreasing concentrations in one of the remaining locations (IR26MW49A). A time-series plot of data through 2023 for IR26MW49A, IR26MW51A, and IR26MW71A is presented on Figure 3-6. Mercury concentrations during the last 5 years of monitoring have been below historical maximums and are consistently below 10 times the HGAL [Hunters Point Groundwater Ambient Level].

   c) The limited extent of impacted groundwater; IR26MW71A and IR26MW49A are approximately 45 feet apart and IR26MW49A is approximately 88 feet from IR26MW51A with no exceedances.

   d) Comparison of groundwater quality parameters to Bay surface water quality parameters (temperature and dissolved oxygen, Table 3-4) indicate that the groundwater is not representative of Bay water because groundwater

temperature is consistently warmer than surface water, and dissolved oxygen is consistently lower than surface water.

Regional Water Board Response 1a: We do not agree that the 2008 TCRA is a line of evidence supporting Navy's conclusion that mercury concentrations in groundwater are unlikely to exceed 0.6 µg/L in Bay water. The TCRA did not remove mercury contamination within bedrock. Five samples collected from the top of the underlying bedrock contained mercury concentrations that exceeded the soil remediation goal (RG) of 2.3 mg/kg, ranging from 5.9 to 15 mg/kg (Figure 4). All five samples with elevated mercury were located immediately adjacent to the Bay and up-gradient "sentinel" wells IR26MW49A and IR26MW71A. Incomplete removal of mercury from bedrock sustains the unacceptable mercury discharges to the Bay.

Regional Water Board Response 1b: Given that groundwater treatment was implemented 7.5 years ago and has failed to achieve the TL of 0.6 µg/L mercury in sentinel wells IR26MW49A and IR26MW71A, the only wells down-gradient of the source area, we do not agree that the remedy has been partially successful. Rather, it has failed.

Whereas our trend analysis indicates that mercury concentrations are likely decreasing in well IR26MW49A, it is nonetheless an order of magnitude greater than the TL; consequently, the cleanup timeframe at best will be many decades unless alternative remedial actions are completed. Mercury concentrations in well IR26MW71A are consistently greater than the RAO and stable, meaning that the cleanup timeframe for that plume area is unknown, and requires further evaluation.

Regional Water Board Response 1c: We do not agree that the Navy's assessment that the extent of mercury-contaminated groundwater is limited (and shrinking), because the extent of mercury contamination has not been characterized in the following directions:

- vertically in bedrock;
- east and south of Source Area 2 where five confirmation samples contained mercury concentrations above the soil RG; and
- in the San Francisco Bay.

Until the data gaps are addressed with additional investigation, the conclusions presented in the Five-Year review are not supported regarding the extent of the mercury plume.

Regional Water Board Response 1d: We disagree with the Navy's statement that "the groundwater is not representative of Bay water." The industry standard to evaluate freshwater-seawater mixing uses conductivity measurements. Based on our review of the 2022 conductivity measurements for nearshore wells IR26MW49A, IR26MW70A, and IR26MW71A, samples collected from these wells were

100 percent mixed (i.e., the water samples were essentially Bay water). Therefore, sample laboratory analytical data for these wells are more representative of ambient mercury concentrations in Bay surface water. Additionally, based on our comparison of the 2022 sampling times to the National Oceanic and Atmospheric Administration's tide predictions, sampling of the nearshore monitoring wells was not conducted with consideration of predicted tide levels and, consequently, samples were not collected at low tides when groundwater discharges to the Bay. Because samples collected from nearshore wells were likely mixed/diluted, no dilution factor should be applied to nearshore groundwater data.

Applying a standard Site Conceptual Model for groundwater discharge to surface water, mercury-contaminated groundwater migrates through and beneath the shoreline revetment during low tides and upwells into the Bay's transition zone[1]. We are concerned that benthic organisms are exposed to harmful mercury concentrations.

Further, we are concerned that sample analytical results do not represent the mercury concentrations that the Bay's aquatic life is exposed to because samples are filtered in the field, removing mercury adsorbed on colloids in groundwater. When/where mercury discharges to the Bay with minimal dilution, including mercury in adsorbed phases, mercury concentrations may be greater than the reported concentrations in sentinel wells IR26MW49A and IR26MW71A. Consequently, we recommend that future water samples collected from all nearshore wells be analyzed for both dissolved and total mercury (no field filtration prior to analysis).

The Navy concluded that a "protectiveness determination cannot be made because there is uncertainty related to the concentrations of mercury discharging to the Bay from Parcel B-2, IR-26 groundwater." We disagree and as stated in our original comment, our protectiveness determination for Parcel B-2, IR Site 26 is "Not Protective."

Regional Water Board Response 1e: We disagree that a protectiveness determination cannot be made at this time. Elevated concentrations of mercury in groundwater exist in the sentinel wells, i.e., the points of compliance, representing unacceptable discharges to the Bay and evidence of exposure to the Bay's aquatic life. Consistent with USEPA guidance (2012), "Not Protective" is the appropriate protectiveness determination.

TL for Mercury in Groundwater. In response to the Regional Water Board's concerns regarding the validity of the mercury TL in groundwater, a link to the source document was provided. However, the link was not accessible and could not

[1] U.S. EPA, 2008. ECO Update/Ground Water Forum Issue Paper: Evaluating Ground-Water/Surface-Water Transition Zones in Ecological Risk Assessments. July. A transition zone is a region beneath the bottom of a surface-water body where conditions change from a groundwater dominated to surface-water dominated system within the substrate. The transition zone is an ecologically active area beneath the sediment/water interface where a variety of important ecological and physiochemical conditions and processes may occur.

be evaluated. Therefore, we continue to maintain that the HGAL for mercury of 0.6 µg/L, which is the basis of the mercury TL and Remedial Action Objective, is not appropriately representative because:

a. Influences from HPNS industrial activities are reflected in the data used.

b. The HGAL is not specific to IR Site 26. Only 8 of 162 samples were collected from Parcel B-2, and it is likely that no sample was collected from IR Site 26.

c. Mercury analytical results used to estimate the mercury HGAL were obtained over a period of about one year, which could not reflect the seasonal and medium- to long-term variability of mercury in groundwater.

d. The data used to calculate the mercury HGAL were entirely comprised of non-detect concentrations or their derivatives.

2. **Navy Response to Regional Water Board Protectiveness Determination Comment 2 (General):** Page 5 of 71 response states, “[N]avy acknowledges that while the remedy is protective of human health through active remediation, monitoring, and land use controls; additional information is needed to determine protectiveness for Bay receptors and has changed the remedy protectiveness determination to “Protectiveness Deferred” until such time the investigations are completed, and a protectiveness determination can be made. Specifically, the Navy will complete the Deep F-WBZ (fractured water-bearing zone) investigation for RU-C4 (Remedial Unit) and the B-Aquifer investigation.”

   Page 7 of 71 revised text states,” [I]t is expected that these actions will take approximately 5 years to complete, at which time a protectiveness determination will be made.”

   Regional Water Board Response 2: Although the response discusses the two documents that will fill the data gaps, i.e., Deep F-WBZ investigation for RU-C4 and the B-Aquifer investigation, the response lacks specificity regarding detailed timeframes and schedules for completion. The text should be revised to include timeframe/schedule details.

3. **Navy Response to Regional Water Board Protectiveness Determination Comment 3 (General)**: The RTC identifies concerns from Water Board Specific Comments 18, 19, 20 and 21 on Parcel E-2 and explains the protectiveness determination of “Will be Protective” is due to the remedy being currently under construction. The following summarizes Navy responses that do not adequately address Water Board concerns:

   - **Upland Slurry Wall (USW) was not installed as designed.** The Navy states a work plan is under Agency review to evaluate USW performance and work is anticipated to begin in 2025.

- **Turbidity curtain was not used during remedy construction.** The Navy indicates a turbidity curtain was used during Phase II remedial action construction work.

- **The Navy has not provided all stormwater best practices documentation.** The Navy states they have responded to the requests for stormwater records, specifically related to December 3, 2022, and January 11, 2023, Water Board correspondences.

- **There is not adequate documentation that lead was removed from the wetland areas and groundwater may be affected in the future.** The Navy references post-over-excavation samples that were below the RG for lead-impacted soils.

Regional Water Board Response 3a: We disagree with the rationale for the Navy's protectiveness determination based on the completion of several remedy components that can be monitored for effectiveness/protectiveness. As described in the original Comment 3a, we have outlined the necessary data and information that can be collected to address longstanding agency concerns about the completed remedies.

We acknowledge that the Navy has agreed to address the following issues: collection of soil samples near Resource Conservation and Recovery Act (RCRA) hazardous waste piles and provide an addendum to the compliance monitoring and mitigation plan for methane at the landfill. However, several outstanding concerns have not been addressed by the RTCs as described in our Responses 3b to 3e below.

Regional Water Board Response 3b: Based on our understanding of the scope of work for the work plan to evaluate USW performance, the water level and analytical data to demonstrate USW is functioning as designed have not been included as requested by regulatory agencies. We have reiterated the importance of the data for evaluation of potential discharges using existing monitoring wells and have not received an adequate rationale for omitting this from forthcoming field investigations. Therefore, we cannot concur that the remedy "Will be Protective" because the necessary data to show remedy effectiveness/protectiveness is not being collected.

Regional Water Board Response 3c: The Navy references the turbidity curtain installed as part of the Phase II remedial action. However, as described in Specific Comment 19, our concerns are related to the 2018 Remedial Action Work Plan (RAWP), which covers activities of the Phase III remedial action and also required installation of a turbidity curtain. The RTC does not adequately address our comment and we find that a "Protectiveness Deferred" designation is more appropriate until the Navy can assure regulatory agencies that future work will comply with the site-specific Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) Stormwater Plans.

Regional Water Board Response 3d: The RTC references Water Board correspondences from December 2022 and January 2023. As discussed in the May 2025 meetings, this does not represent the most recent correspondence and discussions regarding these concerns. On May 11, 2023, the Navy and regulatory agencies met to discuss unresolved issues with the records provided. Our concerns about significant lapses in the submitted best management practices (BMP) Inspection Reports were not addressed and the Navy contractor indicated they would submit additional documentation. We followed up with a May 23, 2023, email requesting the additional records and received no acknowledgement or response from the Navy nor its contractors. “Protectiveness Deferred” is consistent with our assessment that the previous five-year period showed inadequate documentation of stormwater BMPs and the CERCLA Stormwater Plans compliance.

Regional Water Board Response 3e: We maintain that lead-contaminated soil was not adequately characterized or removed during the over-excavations documented in Fieldwork Variance #5 (Appendix G of Phase 2 Remedial Action Construction Summary Report, RACSR). See Attachment 2 from the August 7, 2020, Water Board letter for unresolved concerns about the lead RG exceedances that appear to have been left-in-place. As described in follow on correspondences listed in General Comment 3, the collection of soil/groundwater samples is needed to evaluate whether remediation was adequately completed, and we cannot concur with the “Will be Protective” determination until there is commitment from the Navy to provide this data.

4. **Navy Response to Regional Water Board Protectiveness Determination Comment 4 (General)**: The Water Board stated that there is insufficient data from each parcel to demonstrate that existing remedies account for per- and polyfluoroalkyl substances (PFAS) transport and containment.

   The Navy response states that site remedies should only be evaluated for protectiveness if it is confirmed that they do not address current or future exposure to PFAS. In addition, the response states that it is not appropriate to evaluate existing site remedies prior to initiation of the PFAS remedial investigation.

   The response identifies concerns from Water Board Specific Comment 4 on PFAS and explains that protectiveness determinations for existing remedies are not affected because existing remedies already account for PFAS in their design and implementation. According to the Navy, these existing protections are accounted for because:

   - Groundwater is not suitable for use as drinking water within the A-aquifer.
   - Current durable covers and institutional controls restrict human and terrestrial ecological receptor exposure to all site soils.

   Only one site-specific remedy was evaluated in the RTC and provided in the text revision, the near-shore slurry wall located at Parcel E-2. The Navy described that

the cement-bentonite mixture of the wall is expected to inhibit PFAS based on how it inhibits volatile organic compounds (VOCs).

Published ecological screening values from Argonne (2021) were also provided in the text as a line of evidence supporting no imminent CERCLA-related risk at HPNS.

Regional Water Board Response 4a: The lines of evidence provided supporting no imminent CERCLA-related risk are insufficient. Therefore, our protectiveness determination with respect to PFAS is “Protectiveness Deferred” Basewide.

The Regional Water Board has not provided a Basewide exemption for groundwater as a drinking water source, while groundwater at or near the site is not currently used as a drinking water source (i.e., for comparison to the USEPA National Drinking Water Regulations (NDWR) for six primary PFAS compounds), risk for ecological receptors and therefore, recreational users, to PFAS in contaminated surface water and groundwater is not accounted for or established in this response. The Argonne ecological screening values provided are on the order of a wide range, up to over three orders of magnitude for perfluorooctanoic acid (PFOA). These values also do not represent established site-specific risk criteria as agreed to by the Federal Facility Agreement parties.

Further, there is no evidence that the durable covers currently in-place can prevent PFAS from leaching from soil to groundwater or surface water at the site, which is a potential migration pathway. Considering the highly mobile nature of PFAS compounds, these pathways likely result in PFAS discharge to Bay waters and exposure to offshore receptors. The risk for exposure to these receptors has yet to be addressed by site remedies and demonstrate that protectiveness with regard to site PFAS has not been established.

Regional Water Board Response 4b: The response that the properties of the near-shore slurry wall at Parcel E-2 (i.e. a cement-bentonite mixture) are capable of inhibiting PFAS transport in groundwater, and groundwater to surface water, is not informed nor substantiated.

PFOA detected in groundwater upgradient of this location (i.e. 18 micrograms per liter at IR01MW60A) is multiple orders of magnitude more than its NDWR of 4 nanograms per liter. This indicates that there is a significant PFAS plume present within groundwater at Parcel E-2. No data was provided to support that this site remedy, which was not designed to mitigate PFAS releases in groundwater, is able to prevent a PFAS plume of this magnitude from migrating in groundwater.

PFAS compounds are known to be considerably more mobile and pervasive compared to VOCs, so it is unclear how this remedy can inhibit this contamination. PFAS compounds are also considerably more toxic at minor concentrations compared to VOCs (e.g. compared to tetrachloroethene federal maximum contaminant level of 5 *micro*grams per liter), so it should be expected that PFAS are more difficult to contain with the same remedy. In addition, it is also unclear how the

physical extent of the remedy (i.e. depth and lateral extent) was designed to mitigate this high concentration PFAS plume.

Further, no downgradient data, either in surface water or groundwater, exist to support that this remedy is currently functioning to inhibit PFAS migration.

Regional Water Board Response 4c: Based on the information provided above, we disagree with the rationale for the Navy's protectiveness determination with respect to PFAS. As stated in USEPA's April 3, 2024, RPM Bulletin 2024-01 (*Considerations When Reviewing PFAS in Five-Year Reviews*):

> To build a case to support the analysis of whether the newly identified contaminants could impact the protectiveness of the existing remedy, the FYR should incorporate what is known and not known about the contamination, and whether existing remedies may fully or partially mitigate risks.
>
> Because there is insufficient data available at this time, prior to the initiation of the remedial investigation, a Protectiveness Deferred determination should be assigned with respect to site PFAS.

Further, the June 2011 Navy policy which was provided does not substantiate the statement in the response that "an emerging contaminant should only affect a protectiveness determination if the emerging contaminant is present at a concentration posing a potential unacceptable risk at the site and the existing remedy does not address the current or future exposure to the emerging contaminant." The June 2011 policy only refers to investigation of the emerging contaminant itself and does not reference initiation of remedial investigations precluding assignment of protectiveness determinations. Rather, this policy states the investigation of an emerging contaminant should proceed based on whether "the contaminant may call into question the protectiveness of either the remedy or the RAOs."

Therefore, our protectiveness determination with respect to PFAS is "Protectiveness Deferred" Basewide

5. **Navy Response to Regional Water Board Protectiveness Determination Comment 5 (General)**: The RTC identifies concerns from Water Board Specific Comments 17, 24, 25, 28, and 29 on climate vulnerability and explains that protectiveness determinations can be better evaluated with site-specific studies. The following parcels were identified for site-specific studies based on threat from sea level rise: IR Site 07/18, Parcel B-1, Parcel B-2, Parcel C, Parcel D-1, Parcel G, Parcel E, and Parcel E-2. Further, the RTC indicates that the Navy will commit to holding a prioritization meeting with the members of the Federal Facility Agreement in November 2024.

   Regional Water Board Response 5: The Water Board generally concurs with these recommendations; however, we request the following response be addressed.

Describe why Parcel UC-1, Parcel UC-2, Parcel UC-3, and Parcel D-2 were not included in the list of site-specific studies to address climate vulnerability. It is our understanding that while these parcels have less prioritization compared to other, more vulnerable site locations, they are still susceptible to climate vulnerability (e.g. transient inundation, groundwater rise, etc.) and should also be included for site-specific evaluations.

Additionally, Site-specific climate vulnerability sturdies should be discussed in and presented on in parcel specific sections and tables for “Issues, Recommendations, and Follow-up Actions.”

Regional Water Board Evaluation of Navy Response to Specific Comments

1. **Navy Response to Specific Comment 3**: The Navy provides an affirmative response to the Regional Water Boards request for consistent nomenclature for Installation Restoration (IR) Site numbering.

   Regional Water Board Response Specific Comment 3: could not be evaluated without the revisited document.

2. **Navy Response to Specific Comment 6a:** Proposed text revision “Based on the negligible change in historical survey monument elevations, the next round of settlement monument surveys will be in 2024.”

   Regional Water Board Response Specific Comment 6a: Consider the defining “negligible change” in the text e.g., “negligible change (i.e., less than 0.1 foot).”

3. **Navy Response to Specific Comments 7 and 11**: The Navy disagrees with the Regional Water Boards request for discussion and depiction of flow directions and flow lines.

   Regional Water Board Response Specific Comments 7 and 11: Response does not address the request with respect to the addition of a discussion of groundwater flow or request for depiction for groundwater flow paths on a figure. These requests will assist the public in understanding the relationship between groundwater, surface water, and contamination at the Parcels.

4. **Navy Response to Specific Comment 8, 9 and 10**: The Navy provided responses to Regional Water Board comments regarding Parcel B-2, IR Site-26.

   Regional Water Board Response Specific Comment 8, 9, and 10: The responses do not adequately address Regional Water Board’s concerns, refer to our evaluation of Response to Protectiveness Determination Comment 1 (General) above.

5. **Navy Response to Specific Comment 14**: The Navy provided a response to the Regional Water Boards comments regarding Operations and Maintenance (O&M) strategies to address erosional features at Parcel C.

Regional Water Board Response Specific Comment 14: The text should be updated to notify the public of the plan and include schedule timeframes for addressing these erosional features.

6. **Navy Response to Specific Comment 15**: The Navy provided responses to Regional Water Board comments regarding Parcel C.

   Regional Water Board Response Specific Comment 15: The response does not address the Regional Water Boards comment; the data gaps will persist until the proposed investigations are complete therefore the response to Question B remains uncertain.

7. **Navy Response to Specific Comment 18, 19, 20, and 21**: The Navy provided responses to Regional Water Board comments regarding Parcel E-2.

   Regional Water Board Response Specific Comment 18, 19, 20, and 21: The responses do not adequately address Regional Water Board's concerns, refer to our evaluation of Response to Protectiveness Determination Comment 3 (General) above.

8. **Navy Response to Specific Comment 22c (Specific)**: The RTC states that the Department of Defense (DoD) plans to update the DoD Regional Sea Level (DRSL) guidance periodically.

   Regional Water Board Response Specific Comment 22c: Please clarify whether there is an associated date or timeline for this updated DRSL guidance.

9. **Navy Response to Specific Comment 23b**: The RTC states that the DRSL projections are now more conservative based on consistency with the upcoming Ocean Protection Council (OPC) State of California Sea Level Rise Guidance (2024).

   Regional Water Board Response Specific Comment 23b: Note the OPC State of California Sea-Level Rise Action Plan (2022) lists 3.5 feet (ft) and 6 ft of sea level rise as target planning levels for resiliency by 2050 and 2100, respectively. Therefore, the DRSL projections should be benchmarked, or as close as possible, to the above Sea-Level Rise Action Plan criteria to factor in the need for a 2100 planning scenario, which is consistent with the current DTSC guidance.

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DRAFT FIFTH FIVE-YEAR REVIEW REPORT FOR THE HUNTERS POINT NAVAL SHIPYARD IN SAN FRANCISCO, CALIFORNIA (SITE CODE: 200050)

Dear Michael Pound:

The Department of Toxic Substances Control (DTSC) has completed our review of the *Draft Fifth Five-Year Review Report,* dated November 2023 (draft Five-Year Review). The California Department of Public Health (CDPH) has also reviewed the draft Five-Year Review and has no comments. DTSC's comments are presented below.

DTSC Comments:

Michael Pound
April 30, 2024

1. General comment: Throughout the document, references to the Fourth Five-Year Review Issues, Recommendations, and Follow-up Actions (e.g., Table 3-4) note that addenda were prepared to evaluate the Radiological Remediation Goals for soil and buildings. During the Fourth Five-Year Review, DTSC and CDPH deferred to the United States Environmental Protection Agency (USEPA) for resolution of comments on the Radiological Building Addendum. DTSC understands that the addendum may have been overcome by events and is no longer relevant as the Navy intends to demolish and dispose of the buildings in question, and that risk-based remediation goals would be moot. DTSC defers to USEPA for resolution of any outstanding issues related to the Fourth Five-Year Review Radiological Building Addendum.

2. Issues/Recommendations: The Five-Year Review Summary Form and individual parcel recommendations (e.g., Table 4-8 for Parcel C) do not reflect the conclusions and recommendations of the Climate Resiliency Assessment (CRA). The CRA states: “if a vulnerability is projected to result in a potentially new exposure scenario for either human or ecological receptors through 2065, then an IR site-specific study is recommended to evaluate the potential Comprehensive environmental Response, Compensation, and Liability Act (CERCLA) risk to human and ecological receptors to inform the next Five-Year Review.” The CRA then recommends such studies for Parcels IR 7/18, B-1, B-2, C, D-1, and E. Based on the results of the CRA, DTSC also believes this list should include Parcel E-2 (see comment 19 below). Each of these should be reflected in the Issues/Recommendations. The recommendations should include information on what is to be studied (see comments 12 and 13 below), what information or guidance may be relevant (see comment 11 below), and the anticipated completion date.

3. Issues/Recommendations: Parcels B-1, B-2, C, D-1, E, E-2, and G should note in the respective Issues/Recommendations tables that the September 2023 *Final Site Inspection Report for the Basewide Investigation of Per- and Polyfluoroalkyl Substances (PFAS)* recommended further investigation for PFAS in soil and groundwater. The PFAS discussion sections of the Five-Year Review should reference the April 10, 2024, *USEPA Final PFAS National Primary Drinking Water Regulation*, and compare data collected in the Site Inspection Report to the USEPA Regional Screening Levels (RSLs) and Maximum Contaminant Levels (MCLs) as applicable. While institutional controls may render the site short-term protective for human health risk, parcels with identified ecological receptors should be evaluated for deferred protection.

Michael Pound
April 30, 2024

4. Issues/Recommendations, Parcel E-2: Although remedy construction at Parcel E-2 is ongoing, DTSC, the San Francisco Bay Regional Water Quality Control Board (Regional Water Board), and USEPA have raised concerns about multiple aspects of implementation that should be reflected here (see letters dated May 5, 2022, and December 8, 2022). The Five-Year Review should reflect Navy commitments to develop a Remedial Action Study Workplan to evaluate the integrity and performance of the upland slurry wall, as well as a commitment to revise the landfill gas monitoring plan to account for changes in monitoring well locations. In addition, the Navy should develop a work plan (primary document under the Federal Facilities Agreement) to evaluate groundwater and surface water near the freshwater wetlands to demonstrate that lead compounds are not leaching to the San Francisco Bay while the remainder of the remedy is constructed or that new contamination was not introduced from improperly managed stockpiles.

5. Protectiveness Statements, Parcel B-2: As stated in letters from DTSC, the Regional Water Board, and the USEPA dated August 20, 2021, and November 23, 2021, the agencies believe that the *in situ* stabilization remedy at IR-26 has failed to prevent mercury discharge to San Francisco Bay. Based on the information in the record, DTSC believes the remedy for Parcel B-2 should be deemed Not Protective. However, in a meeting with the regulatory agencies on April 25, 2024, the Navy presented evidence that exceedances of mercury thresholds in groundwater wells may not necessarily indicate exceedances at the Bay water point of compliance. The Navy acknowledged that data gaps remain and that protectiveness should be deferred until additional investigation can be conducted. These data presented by the Navy on April 25, 2024, should be included in the assessment of Parcel B-2. This includes a comparison of parametric measurements of groundwater and surface water, an explanation of the data source of the mercury trigger level, and an explanation of any attenuation factor assumptions used in the analysis. The Issues/Recommendations tables should be updated to document the exceedances and data gaps, describe how the Navy intends to address them, and set an expected timeline for resolution of the data gaps and additional remedy implementation. If these revisions are made as described, DTSC would concur with a designation of Protectiveness Deferred.

Michael Pound
April 30, 2024

6. Protectiveness Statements, Parcel C: DTSC believes Parcel C should be deemed Protectiveness Deferred until certain planned investigations can be completed. While remedy implementation is ongoing to address contamination in the A-Aquifer, the Navy has planned investigations of the B-Aquifer and Fractured Water-Bearing Zone and their potential communication with the A-Aquifer and the San Francisco Bay. The need for these investigations, along with vulnerabilities identified in the CRA, represent data gaps that must be addressed before the remedy can be deemed protective. In a meeting with regulatory agencies on April 25, 2024, the Navy agreed to a statement of Protectiveness Deferred for Parcel C and agreed to include these investigations in the Issues/Recommendations.
7. General comment: The history of some Installation Restoration (IR) sites are not mentioned. For example, IR-A in Parcel B-1 was listed in Section 3.1 as an IR located in Former Parcel B but was no longer mentioned in the following description of the site in Section 3.1 or subsequent report sections. Please edit the Five-Year Review to include the history of all IRs. For each Parcel Letter, DTSC recommends creating an additional table listing the IRs and their history and status.
8. Section 6.4.1.1, Nonaqueous Phase Liquid Removal and Treatment: The text states, “ISS treatment will be initiated in winter 2023”. Please revise the text to state when this in situ stabilization (ISS) treatment began or revise the anticipated initiation date.
9. Section 6.4.2.1, Durable Cover Installation & Landfill Gas Controls and Monitoring: This section states that the Phase 3 [Remedial Action (RA)] is “anticipated to be completed in summer 2023.” Please revise the text to state if the Phase 3 RA was completed or revise the anticipated completion date. Please also update the subsequent paragraph, which describes construction planned “prior to spring 2024.”
10. Section 6.4.2, Landfill Gas Monitoring: This section describes recent detections of excess methane at a monitoring well and notes that readings continue to remain elevated to date. This section should be updated to reflect recent developments, including methane extraction, reduction of methane exceedances below action levels, and the installation of a confirmation well outside of the landfill boundary.

Michael Pound
April 30, 2024

11. Appendix A, general comment: Elements of the CRA are not consistent with DTSC's 2023 draft Sea Level Rise (SLR) Guidance. Most significantly, DTSC's guidance calls for evaluating resiliency to 3 feet of SLR by 2050 and 6 feet by 2100. The CRA also does not evaluate king tide events or the interaction between sea level rise, groundwater rise, king tides, and/or storm events. Even so, this screening-level assessment recommends site-specific investigations. DTSC concurs with these recommendations and strongly urges the Navy to use DTSC's SLR guidance in these additional studies.

12. Appendix A, general comment: During a public meeting and presentation on April 22, 2024, Navy staff (Arun Gavaskar, NAVFAC EXWC), discussing the evaluation of groundwater rise, noted to DTSC that the Navy had taken surface water conductivity measurements following storm events to assess potential communication between surface water and groundwater. These data and any other data collected for the CRA should be included and discussed for their use in the recommended site-specific follow-up studies.

13. Appendix A, general comment: During the Five-Year Review Site Inspection on January 23, 2024, DTSC observed significant stormwater inundation in Parcel E. The submerged area was near the southern end of a bioswale, where 100-year storm events will cause transient inundation by 2035 (Figure 2-4) and groundwater is predicted to emerge by 2065 (Figure 3-2). Navy personnel (Doug Delong, CSO) noted that the bioswale floods routinely and appears to be tidally influenced. The CRA should recommend that follow-up studies evaluate the performance of bioswales to control stormwater inundation and the potential impact of tidal influence on groundwater to stormwater communication in the swales.

14. Appendix A, Section 2.3: The text states, "Storm events of a certain magnitude trigger an ad hoc inspection with repairs." DTSC requests further details on what defines the magnitude trigger, as well as ad hoc inspection details. DTSC notes that ad hoc inspections for storm events at or around the defined magnitude trigger should occur immediately after or near the end of the storm event due to the potential early signs of sea level rise. An inspection photo log detailing pictures and a map indicating direction of the view of the photos should be included to document the potential effects of early signs of sea level rise.

15. Appendix A, Section 3.1: The last paragraph states, "[groundwater table emergence] is projected to appear in several parcels by 2065." Please revise the text to list the expected parcels.

16. Appendix A, Section 5.1: The list of parcels with projected groundwater emergence in 2065 is missing Parcel E-2. Please revise.

Michael Pound
April 30, 2024

17. Appendix A, Section 5.3.1: This section largely assumes that all volatile organic compound (VOC) plumes will be successfully remediated before climate impacts occur in 2035. This is not an appropriate assumption for such a screening level assessment. Given the complex nature of the site, past delays in remediation efforts, and the potential for site conditions or remediation goals to change in the future, this assessment should conservatively assume that vapor intrusion is a potential risk until such time as VOCs are fully mitigated to better inform future Five-Year Reviews.

18. Appendix A, Section 5.3.3: The text states: “Similarly, in Parcel B-2 (IR 26), annual monitoring indicates an exceedance for mercury, but additional remedies are planned to address that.” As noted in comment 5 above, no such additional remedies have been selected. Please remove this sentence.

19. Appendix A, Section 5.3.6: As noted in comment 4 above, the regulatory agencies have unaddressed concerns about the potential migration of lead contamination from groundwater to the freshwater wetlands. The vulnerability and resiliency assessment should be revised to assume that groundwater within 3 feet below ground surface (bgs), as identified in Figure 2-5, emerging groundwater in the freshwater wetland, and surface runoff from storms may be in contact with contaminated material.

20. Appendix A, Table 5-2: The impacts at Parcel E-2 are not consistent with the impacts identified in Table 2-3. The table should be updated to reflect the impacts in Table 2-3 and revised based on comment 19 above. Section 6.6.1.2 of the Five-Year Review should be similarly revised.

21. Appendix A, Figure 3-1: The figure appears to indicate groundwater emergence at the northernmost point of the boundary between IR 7/18 and Parcel B-1, but this is not reflected in Table 2-2 or the text. Please confirm and revise as necessary.

If you have any questions, please contact me at (510)-540-3840 or via email at Michael.Howley@dtsc.ca.gov.

Sincerely,

Michael Howley

Michael Howley
Project Manager
Site Mitigation and Restoration Program – Berkeley Office
Department of Toxic Substances Control

Michael Pound
April 30, 2024

Cc (via email):

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June 3, 2024

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RESPONSES TO COMMENTS ON FIFTH FIVE-YEAR REVIEW REPORT FOR THE HUNTERS POINT NAVAL SHIPYARD IN SAN FRANCISCO, CALIFORNIA (SITE CODE: 200050)

Dear Michael Pound:

The Department of Toxic Substances Control (DTSC) has reviewed the draft response to comments table (RTCs or RTC table) for comments from DTSC, the San Francisco Bay Regional Water Quality Control Board (Water Board), and the United States Environmental Protection Agency (USEPA) on the *Draft Fifth Five-Year Review Report,* (draft Five-Year Review) for the former Hunters Point Naval Shipyard in San Francisco, California. The RTC table was initially provided to DTSC on May 15, 2024. A revised RTC table was provided on May 28, 2024, following two days of collaborative meetings between the regulatory agencies and the Navy. DTSC appreciates the Navy's ongoing commitment to productive communication and cooperation with the regulatory agencies.

At the Navy's request, DTSC is providing feedback on the RTCs in advance of the accompanying revisions being incorporated into the *Draft Final Fifth Five-Year Review Report*, anticipated later this month. These follow-up comments are intended to clarify specific information in the responses. In general, DTSC will not consider any of the comments as resolved until the revisions are confirmed in the Draft Final document. DTSC also continues to coordinate with the Water Board and USEPA to ensure their comments are satisfactorily addressed. In particular, DTSC recognizes and supports the Water Board's role in protecting water quality. DTSC's comments are presented below.

Michael Pound
June 3, 2024

DTSC Comments:

1. General Comment: Several of DTSC's original comments (DTSC comments 2, 3, 4, 5, and 6) requested changes to the Issues/Recommendations tables of the document, in both the executive summary and parcel-specific sections (e.g., Tables 3-8, 4-8, and 6-7). The RTC table describes revisions to specific sections of the text, but does not refer to similar revisions in the Issues/Recommendations tables. These tables are the primary information summary for the public, and a critical means of tracking progress between this Fifth Five-Year Review and the upcoming Sixth Five-Year Review. The RTC table should note which tables will be revised in the Draft Final document.
2. Response to DTSC Comment 2: Per the Climate Resilience Assessment (CRA) in Appendix A, remedy resilience is likely to be impacted by sea level rise. More robust site-specific analyses are required based on results of this evaluation and therefore the Navy's RTCs propose a prioritization meeting in November 2024, with the first site-specific study, at Parcel D-1,beginning in 2025. DTSC requests a target month and year be specified for the first site-specific study scoping meeting, or that the Navy provide clarification in the RTCs that the proposed prioritization meeting includes planning for the details of the site-specific studies with the regulatory agencies. Per DTSC's 2023 Sea Level Rise Guidance, an adaptation plan is required because potential effects of sea level rise were witnessed during the January 2024 site visit and the CRA confirms future sea level rise impacts for the site. In adaptation planning, the remedy or action should be evaluated to determine adaptive capacity to sea level rise. Please include in the text that the upcoming site-specific/prioritization meetings will include discussion of an adaptation plan or a similar document.
3. Response to DTSC Comment 6: The revised Parcel C Protectiveness Statement notes that investigation of the B-Aquifer and Fractured Water-Bearing Zone (F-WBZ) "will take approximately 5 years to complete." This statement should also note that the F-WBZ investigation work plan has already been reviewed by the regulatory agencies and further describe the anticipated milestones for field work, data collection, and reporting within that total five-year period.
4. Response to DTSC Comment 11: DTSC appreciates the commitment to assessing sea-level rise impacts in the year 2100 in the site-specific assessments, consistent with DTSC's 2023 Sea-Level Rise Guidance. Please include in the Issues/Recommendations section, the Other Findings section, and the CRA that the Navy plans to evaluate the Year 2100 impacts as a next step in conjunction with the site-specific studies for all parcels. Please edit the RTC to indicate that such wording was added to the text and in which section. Include

Michael Pound
June 3, 2024

reference that the Year 2100 evaluation is consistent with the DTSC 2023 Sea Level Rise Guidance and the Ocean Protection Council's 2022 State Agency Sea-Level Rise Action Plan for California.

5. Response to DTSC Comment 12: The comment response describes field measurements taken for surface water conductivity during the CRA to screen ponded surface water following storm events for similar characteristics to groundwater or Bay water. Please provide additional details on the locations of these conductivity measurements (i.e., which topographic trough), the units for readings recorded (i.e., in milliSiemens per meter), and the title and date of the deliverables reporting those data. If the Navy does not intend to report the data, please explain why not and describe how similar data collection efforts may be incorporated into the site-specific sea-level rise assessments.

6. Response to DTSC Comment 14: The comment response states that a major storm event that would trigger ad hoc inspections "is defined in the Parcel E-2 [Operations and Maintenance Plan (O&M Plan)] as '4.17 inches of precipitation or more over a 24-hour period (24-hour, 25-year storm).'" Section 2.6.1 of the most recent O&M Plan, *Final Operation and Maintenance Plan Remedial Action, Parcel UC-3*, dated July 2018, states that "Annual inspections will be performed during the rainy season, preferably after the first qualifying storm event, to enable determination of its effectiveness in providing drainage to the durable cover. A qualifying storm event is one that produces precipitation of 0.5 inches or more over a period of 48 hours." The 2012 *Interim Monitoring and Maintenance, Landfill Gas Control System*, *Parcel E-2 Landfill* similarly describes "a significant rain event (1/2 inch or greater)". Please advise if a different O&M Plan is referenced in the RTC or resolve the inconsistency.

If you have any questions, please contact me at (510)-540-3840 or via email at Michael.Howley@dtsc.ca.gov.

Sincerely,

Michael Howley

Michael Howley
Project Manager
Site Mitigation and Restoration Program – Berkeley Office
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June 3, 2024

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April 30, 2024

Via email only

Department of the Navy
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Program Management Office West
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michael.j.pound.civ@us.navy.mil

Re: U.S. EPA comments on the Draft Fifth Five-Year Review Report for the Hunters Point Naval Shipyard, San Francisco, CA, November 2023

Dear Mr. Pound:

The U.S. Environmental Protection Agency ("EPA") is providing comments to the U.S. Navy on its *Draft Fifth Five-Year Review ("FYR") Report for the Hunters Point Naval Shipyard,* ("HPNS"), ("Report"), dated November 2023. EPA appreciates the Navy's first program-wide effort to incorporate a Climate Resiliency Assessment ("CRA") into a FYR Report. Moreover, EPA appreciates the multiple efforts in which the Navy has collaborated with the HPNS Federal Facility Agreement ("FFA") participating agencies as well as the public, to make the draft document available for review and discussion.

Although we differ on some important issues in this draft document, the Navy has demonstrated a commitment to substantively work through technical and programmatic issues with the FFA Parties, including during the recent technical meeting on April 25 to review the FYR Protectiveness Determinations and CRA report as well as during bi-weekly FYR technical discussions. We share the FFA Parties' goal of reaching consensus on the final FYR by July 31. As such, EPA's comments reflect this draft stage, and we also look forward to working with the Navy and the state to evaluate public comments, which are due to the Navy by the extended public comment period (albeit after the agencies') ending May 7.

Our formal comments contained herein are not exhaustive and focus primarily on the summary protectiveness statements and recommendations to address several substantive remedy protectiveness questions. EPA is first providing comments on the CRA report as a potentially

significant risk driver with respect to the parcel-specific issues, recommendations and protectiveness determinations.

Climate Resiliency Assessment, Appendix A

The assessment looked at certain climate-related events and identified future, potential vulnerabilities to human and San Francisco Bay receptors from heavy metals and low-level radiological objects due to groundwater emergence. The draft CRA recommends that parcel-specific assessments be performed to determine if the projected climate change vulnerabilities increase CERCLA risk at this Site. However, the Navy does not specifically relate its CRA findings to each parcel's FYR protectiveness evaluation. Rather, the Navy makes generalized statements about projected climate impacts on a site-wide basis. In the Final Report, EPA recommends that the Navy commit to prioritize and commence parcel-specific climate vulnerability assessments prior to the Sixth FYR to address probable impacts anticipated as soon as 2035.

Additionally, EPA acknowledges that the Navy's CRA document substantively applies EPA's Climate Vulnerability Assessment ("CVA") guidance criteria. However, the Navy only projects climate impacts through 2065, which is less conservative than the 100-year scenario EPA, as well as the state, use. Lastly, EPA requests that the Report formally include criteria for evaluating extreme precipitation event projections and correlation and analysis of groundwater contaminant concentrations, when collecting water-level elevation measurements.

Navy's draft Protectiveness Determinations for Parcels B-2, C, and E-2

- **Five-Year Review Summary Form, Protectiveness Statements, page xix, Parcel B-2, IR-26, Protectiveness Determination:** Based on treatment efficacy uncertainties associated with the treatment for mercury in groundwater and the potential ecological impact on the San Francisco Bay, EPA does not support the Navy's *Short-term Protective* determination. Because of this uncertainty, and the agreed-upon need to enhance treatment delivery and/or explore other treatment options, EPA supports a Protectiveness Deferred determination. A *Short-Term Protective* determination is not appropriate because the MetaFix treatment for mercury in groundwater is not achieving its performance goals at two monitoring well locations, IR26MW49A and IR26MW71A. EPA recognizes, as documented by the Navy, that MetaFix could not be injected at certain locations due to limitations of the injection method. At our April 25, 2024, meeting, the Federal Facility Agreement (FFA) Parties discussed whether the Navy continues its plan to implement the enhanced delivery of Metafix, although the FFA regulatory parties believe that other treatment options need to be explored. The Navy agreed that the final *Fifth Five-Year Review Report* will include a date to submit a new FFA primary document, such as a technical memorandum. EPA expects the new primary document will be submitted as soon as practicable, and well ahead of the next Five-Year Review. Among other things, the new primary document should evaluate and analyze all available mercury groundwater monitoring data, including data collected from March 2018 to September 2022, and mercury exceedances at IR26MW49A and IR26MW71A,

and propose next steps, including additional treatment options (tri-Agency letter of November 23, 2021).

If the Navy is unable to commit to develop and provide a primary document within a timeline acceptable to the FFA regulatory parties, EPA may need to consider the effect that the continued lack of sufficient treatment performance, and groundwater mercury data and documentation may have on Parcel B-2.

- **Five-Year Review Summary Form, Protectiveness Statements, page xix, Parcel C, B-aquifer, Protectiveness Determination:** This comment addresses the B-aquifer characterization. EPA does not support the Navy's draft *Short-term Protective* determination but rather a *Protectiveness Deferred* determination because from EPA's perspective, for groundwater, information has come to light that calls into question the protectiveness of the remedy (Question C of the Report), and more information is needed to determine protectiveness and whether an unacceptable risk exists.

  In general, both the A-aquifer and B-aquifer (and bedrock) groundwater flows towards the San Francisco Bay. The Navy's cross-sections in the RU-C2 area confirm there are gaps or holes in the aquitard that enable communication between the A- and B-aquifers, and the Navy's data confirm there is contamination in the underlying B-aquifer at RU-C2 downgradient of the gaps or holes, and in the deep Fractured-Water Bearing Zone (deep F-WBZ) at RU-C4. Consequently, the A-aquifer cannot be isolated as protective.

  In response to FFA regulatory concerns, the Navy has agreed to, but has not initiated, a full and timely characterization of the B-aquifer in the RU-C2 area, including the upper F-WBZ below and in contact with the B-aquifer. The Navy has also agreed to monitor B-aquifer wells as part of performance monitoring of the groundwater treatment of the A-aquifer at RU-C2 (RAWP Phase III). With respect to the Deep F-WBZ at RU-C4, which was the subject of an informal dispute brought by the Regional Water Quality Control Board and EPA, the Navy has submitted a draft workplan to fully characterize the nature and extent of contamination and groundwater flow patterns to the San Francisco Bay. The workplan has not been finalized and work has not yet commenced.

  For the Final *Fifth Five-Year Review Report*, EPA requires a list of the primary documents that are anticipated to be developed to perform the full and timely characterization of the B-aquifer in the RU-C2 groundwater area, and the Navy's anticipated timeframe for developing these documents. An anticipated timeframe for the performance monitoring of the groundwater treatment at RU-C2 in both the A- and B-aquifers should also be provided. At the April 25, 2024, meeting, the Navy expressed agreement in concept that these commitments have been made.

  If the Navy is unable to commit to develop and provide the requested primary

documents within a timeline acceptable to the FFA regulatory parties, EPA reserves its right to reassess our evaluation of B-aquifer and Deep F-WBZ groundwater at Parcel C.

- **Five-Year Review Summary Form, Protectiveness Statements, page xxi, Parcel E-2, Protectiveness Determination:** EPA agrees with the Navy's *Will Be Protective* determination, however, additional actions are requested in the Final *Fifth Five-Year Review Report*. For landfills of this nature, the presumptive remedy in both the CERCLA and RCRA programs is to "cap and contain the waste," and include appropriate environmental controls and monitoring for, at a minimum, stormwater, groundwater, and landfill gas. After a careful review and comparison of cleanup alternatives against EPA's nine evaluation criteria, the Parcel E-2 landfill ROD selected a remedy consistent with the presumptive remedy approach yet included several special design elements to account for the unique nature and location of this particular landfill. EPA agrees that Parcel E-2 is still undergoing remedy construction, including relatively minor work on the cover system, the completion of the landfill gas extraction and conveyance system, and the completion of the freshwater (FW) and tidal wetlands.

  Notwithstanding EPA's agreement that the remedy is still under construction, given that the Navy has deferred responding to Question A ("is the remedy functioning as intended by the decision documents?") in the Report, and given that certain fundamental landfill containment and control facilities, such as the nearshore slurry wall, the upland slurry wall, and the landfill cover system have been constructed, EPA has indicated that it is imperative that the Navy immediately begin to evaluate the effect the landfill cap and slurry walls have on groundwater flow and contaminant concentration within the landfill, and potential impact on the San Francisco Bay. The Navy needs to collect and analyze groundwater elevations and water quality in both the A- and B-aquifers underlying the Parcel. The collection and more importantly the analysis of such data should not be deferred pending the completion of the remaining facilities. The FFA Parties need a clear and common understanding of the status of Parcel E-2 groundwater and leachate monitoring and extraction wells, French Drain sampling port, FW piezometers, and FW outfall. EPA also expects that as part of the evaluation, the Navy will produce, at a minimum, plume maps of contaminant concentrations, and groundwater contour maps showing flow direction in the A- and B-aquifers. For the Final *Fifth Five-Year Review Report*, EPA requires a list of the primary documents that are anticipated to be developed to perform the evaluation work, and the Navy's anticipated timeframe for developing those documents. At the April 25, 2024, meeting, the Navy expressed agreement in concept but awaits further information from the FFA regulatory parties, which is forthcoming in a tri-Agency letter.

  If the Navy is unable to provide the required list and schedule in the Final *Fifth Five-Year Review Report*, EPA may need to consider the effect that the lack of sufficient groundwater data and documentation may have on potential performance issues at Parcel E-2.

In addition, EPA has conveyed, most recently at the April 25, 2024, meeting, that the Navy needs to amend the appropriate primary document to change/replace an existing compliance point for monitoring methane, an explosive gas, at the facility property boundary. At the April 25 meeting, the Navy agreed in principle and will propose the primary document that must be amended and an anticipated timeframe for modifying that primary document.

Other Comments:

1. **Air Monitoring Program:** Throughout the HPNS Site, the Navy implements a robust dust control and air monitoring program. This program includes requirements for dust control activities, such as wetting soil during excavation and stockpiling, covering soil stockpiles with soil fixative, tarping loads of soil when transported, etc., in addition to monitoring real-time PM10, asbestos, radionuclides of concern, and filter-based PM10, Total Suspended Particulates, and metals. Air monitoring stations are placed throughout the site to evaluate community exposure. The FYR does not mention these activities, in spite of significant interagency and community coordination. Please add information about the Navy's dust control and air monitoring program, summarize data collected over the last five years and discuss the impact on short-term protectiveness.

2. **The Fourth Five-Year Review, Parcel B Issues, Recommendations, and Follow-up Actions:** There was a criticism of the Fourth FYR that has not been described in sufficient detail. EPA needs confirmation that this issue is addressed:

   "*The regulatory agencies do not agree with the Navy's risk assessment methodology used to reduce the ARICs for VOC vapors*." This is described in tables for Parcels B-1 and B-2, in Table 3-4 and elsewhere (e.g., Table 5-5, Fourth Five-Year Review Parcels D-1, D-2, UC-1, and G Issues, Recommendations, and Follow-up Actions, for Parcels D-1 and G).

3. **Misrepresentation of evidence that TCE biodegradation is an effective remedy:** Multiple times in the document, (e.g., Section 3.5.1 "Question A: Is the remedy functioning as intended by the decision document?"; Table 3-3 "Parcel B Remedial Action Summary and Expected Outcomes"), the claim is made that: "*The presence of VC demonstrates that TCE biodegradation is occurring in groundwater in Parcel B-1 (TRBW, 2023).*" A similar statement is made for RU-C1 (Section 4.4.1.1, Remedy Implementation, p. 124): "*The presence of VC indicates that biodegradation is occurring*." Although appearance of VC may indicate that reductive dechlorination is occurring (or has occurred), it is not necessarily evidence that *in situ* biodegradation is working as intended. Stalling of biodegradation and accumulation of VC can pose more risk than the presence of the parent compound (TCE), as VC is a more potent carcinogen than PCE and TCE.

4. **Five-Year Review Summary Form, Review Status, Triggering Action Date and Due Date, page xvii; and Section 2.6 Next Five-Year Review, pg. 2-2:** As EPA outlined in its

November 16, 2023, letter, the trigger action date is the Remedial Action Start date, not the signature date of the Fourth FYR. As such, the statutory due date for the Sixth FYR is November 8, 2028. Please correct the table to reflect the statutory due date.

5. **Five-Year Review Summary Form, Issues/Recommendations, page xviii, second item, Changed Site Conditions, Parcel D-1, Other Findings:** With regards to Radiological Objects, and other wastes left in place, and based on the Navy's initial evaluation for potential, permanent groundwater emergence impacts at Parcel D-1 in 2035 (p. 30 of the Report), EPA recommends that the Navy prioritize and commence a Parcel D-1 specific CRA vulnerability assessment study to address groundwater emergence prior to the Sixth FYR.

6. **Section 1.1 Purpose and Approach, page 1-1, second paragraph, last line:** see Comment 4 above.

7. **Section 1.4.1 Per and Polyfluoroalkyl Substances, pg. 1-7, 3rd paragraph, 1st line:** The document states "Current exposure pathways for PFAS are potentially incomplete at HPNS." Immediately following, the document states that there is a prohibition to using drinking water yet provides no discussion of other potential exposure pathways, such as to the SF Bay environment. There's no discussion of what uncertainty leads the Navy to state that the exposure pathway is only "potentially" incomplete. Is this because the PFAS investigation is incomplete? Please provide additional discussion to explain the statement.

8. **Section 1.4.3.1 Progress since the Fourth Five-Year Review, page 1-9**:
The addendum evaluating the protectiveness of remedial goals for building structures, as described, does not accurately reflect several important facts/updates. First, EPA did not approve this addendum nor the follow-on building re-testing workplans due to our collective inability to reconcile technical differences between the Navy's use of the RESRAD Build model and EPA's Building Preliminary Remediation Goal calculator. More importantly, based on a substantive change in building reuse plans and recent congressional authorization, the Navy is now preparing to demolish and dispose of all potentially radiologically impacted buildings, except two historical structures, rather than certify them for unrestricted reuse. The main objective moving forward, therefore, should be to ensure building materials are characterized sufficiently to help determine how to safely protect human health and the environment during demolition and how to dispose of the debris in a regulatory-compliant way. To that end, we appreciate that the Navy is working closely with the California Department of Public Health to identify the protocol the Navy will be using to clear buildings for disposal. Once clarified, while the ROD already contemplates building demolition as a part of the remedy, EPA recommends the FFA members more clearly document the approach that the Navy will be using for the disposal of the building materials, as well as the significantly increased disposal costs, in the appropriate post-ROD change document.

9. **Section 2.2 Site Inspections, pg. 2-1:** Please update the narrative to indicate a second site inspection was provided on January 23, 2024, specifically for the benefit of the FFA regulators and city representatives.

10. **Section 3.5.2.2 HHRA Analysis, Former Parcel B, pg. 75; Section 4.5.2.2 HHRA Analysis, Former Parcel C, pg. 132; Section 5.5.2.2 HHRA Analysis, Former Parcel D, pg. 191; and Section 6.5.2 Question B, Parcels E and E-2, pg. 244:** The report contains vague references to changes in Construction Worker exposure scenario - "*There may be changes with HHRA analysis for the construction worker scenario.*" It is not clear specifically what change is being referred to. Please clarify in the draft final FYR.

11. **Section 3.7.3 Navy's Parcel B-2 Draft Protectiveness Determination – *Short-term Protective*.** EPA's Response – *Protectiveness Deferred*, as discussed above.

12. **Section 4.7.1 Navy's Parcel C, Draft Protectiveness Determination – *Short-term Protective*.** EPA's Response – *Protectiveness Deferred,* as discussed above.

13. **Section 6.7.1.2 Navy's Parcel E-2, Draft Protectiveness Determination – *Will Be Protective*.** EPA's Response – *Will Be Protective*, but additional actions are requested, as discussed above.

EPA appreciates the Navy's substantial work on the Draft Five-Year Review Report and look forward to discussing and resolving comments. If you have any questions regarding our comments, please feel free to contact me at (415) 972-3167.

Sincerely,

Digitally signed by ANDREW BAIN
Date: 2024.04.30 23:25:49 -07'00'

Andrew Bain
Lead Remedial Project Manager
Northern California Federal Facilities Section
Superfund Division

cc: Mary Snow, SF Bay RWQCB
Michael Howley, DTSC

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June 5, 2024

Via email only

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Base Realignment and Closure
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Re: U.S. EPA Response to the Navy Draft Responses to Consolidated Agency Comments on the Draft Fifth Five-Year Review Report for the Hunters Point Naval Shipyard, San Francisco, CA, November 2023

Dear Mr. Pound:

The U.S. Environmental Protection Agency ("EPA") is providing our response to the U.S. Navy's draft Responses to Consolidated Agency Comments (redline-strikeout version transmitted by you on May 28, 2024), on the *Draft Fifth Five-Year Review ("FYR") Report for the Hunters Point Naval Shipyard* ("HPNS"), dated November 2023.

EPA appreciates the Navy's efforts to work with the FFA Regulatory Parties through a series of focused meetings on the FYR Report and Climate Resiliency Assessment Report, most recently on April 25, May 15, and May 16. We continue to support the goal of reaching consensus on the final FYR Report, if possible, by July 31. Key to reaching this goal is a clear understanding and agreement among the FFA Parties and reflected in the FYR Report on the path forward regarding protectiveness statements.

EPA's response contained and attached herein focuses on resolution of our April 30 concerns regarding protectiveness statements, as determining if a remedy is or will be protective of human health and the environment is the primary purpose of a five-year review. EPA's response is below, and on the attached table. The table is an annotated version of the one that you transmitted on May 28. It adds another column to your table labeled "U.S. EPA Response (6/4/2024)" and under the column labeled "Navy Response (May 2024)" we offer suggested redline-strikeout ("RLSO") in blue to help address EPA concerns, and possibly facilitate the

process. The red and black text in that same column are the Navy's (cut and pasted from your original table).

Climate Resiliency Assessment, Appendix A

EPA appreciates the additional narrative including the Navy's commitment to conceptually address near- and long-term impacts described in the proposed CRA copy revisions. EPA requests that the Navy provide a specific target timeframe in 2025 for the prioritization scoping meeting.

Five-Year Review, Protectiveness Statements, Parcels B-2, C, and E-2

See attached annotated table for EPA response to the Navy's draft response to comments Nos. 1, 2, and 3, and Other Comments Nos. 11, 12, and 13. (Navy numbering per Navy's "Index of Agency Comments by Category," also transmitted by you on May 28). As indicated above, EPA response is under a new added column ("U.S. EPA Response (6/4/2024)") and our suggested RLSO is in Blue under the column "Navy Response (May 2024)," which we provided to help address EPA's concerns and facilitate the process. The red and black text in that same column are the Navy's.

Other Comments:

1. **Air Monitoring Program:** EPA appreciates the additional description about the site-wide air monitoring program implementation status and its importance to the regulatory and local communities.

2. **The Fourth Five-Year Review, Parcel B-1 Issues, Recommendations, and Follow-up Actions:** The RTC refers to Section 8 ("Revised Preliminary Soil Gas Action Levels and Post-Removal Human Health Risk Assessment Methodology") of the *Final Remedial Action Work Plan for Parcel B-1, IR Site 10, Building 123* (September 2023) for the Navy's approach to evaluating VI ARICs. Regarding the approach to establishing site-specific and chemical-specific soil-gas attenuation factors (AFsg) described in Section 8.3 of that 2023 document, EPA has multiple concerns with the technical defensibility of the approach. Section 8.3 (*Tier 2*) lists six bullets to describe elements of the approach to establishing site-specific AFsg values. Only one of these, bullet 2, addresses a scientifically defensible approach to establishing site-specific AFsg values, namely, the collection of co-located site-specific indoor air – subslab or near-source soil gas data. What is not mentioned in this bullet, but should be, is that the paired data should be collected contemporaneously in both cold and warm seasons with HVAC systems off and with a sufficient amount of paired data that statistically robust AFsg values could be determined, and the values should be consistent with the RME approach (i.e., not a central tendency approach). Such an empirical approach would likely be acceptable, pending evaluation of the work plan and resulting data by agency subject matter experts, including statisticians. Other bullets describe methods that are unacceptable

for reasons that are briefly described here. Bullet 1 describes microbial studies of aerobic degradation of vinyl chloride, which is not the domain of attenuation factors based on mass transfer of a chemical between different media. Biological mitigation is addressed in the site-specific soil vapor concentrations themselves and should not be treated as a physical partitioning constant. In any case, it would need to be rigorously demonstrated that laboratory microbial studies have direct relevance to *in situ* conditions and that observed degradation parameters (e.g., kinetics) could be treated as constant without consideration of site-specific conditions (e.g., populations of metabolically active bacteria, temperature, moisture content, etc.). Use of the EPA spreadsheet adaptation of the Johnson and Ettinger (1991) model (bullet 4) would not be sufficiently representative of site-specific conditions to justify establishing AFsg values; note that the "JE_README" tab of the EPA J&E spreadsheet explicitly states in red, boldface font that "The J&E model does not replace the EPA VISLs [Vapor Intrusion Screening Levels]." Similarly, evaluation of soil lithology (bullets 3 and 5) is not sufficiently rigorous to quantitatively establish site-specific AFsg values. Published state-wide (California) empirical studies of attenuation factors are also not defensible for establishing site-specific AFsg values unless it can be definitively demonstrated that the state-wide database is applicable to the site of interest. In essence, site-specific AFsg values should be based on a robust database of site-specific measurements of paired indoor air – subslab or near-source soil vapor data. Further, it does not enhance a sense of objectivity to state the conclusions of studies before they are conducted; almost every bullet, including bullet 2, which describes empirical studies that have presumably not been conducted yet, states that the approach will "demonstrate that the USEPA (2015) generic AFsg of 0.03 is overly conservative" (or words to that effect).

3. **Misrepresentation of evidence that TCE biodegradation is an effective remedy:** Thank you for addressing the comment.

4. **Five-Year Review Summary Form, Review Status, Triggering Action Date and Due Date, page xvii; and Section 2.6 Next Five-Year Review, pg. 2-2:** EPA continues to disagree with the Navy's interpretation about the signature date. We note that the Navy/Marine policy does not preclude conducting the subsequent FYR sooner, consistent with EPA's stated statutory policy and respectfully requests that the Navy reconsider its position.

5. **Five-Year Review Summary Form, Issues/Recommendations, page xviii, second item, Changed Site Conditions, Parcel D-1, Other Findings:** EPA requests that the Navy commit to a specific date in 2025 to produce a primary document and begin scoping the monitoring well construction and ground elevation details in Parcel D-1 data (and in other Parcels projecting groundwater emergence).

6. **Section 1.1 Purpose and Approach, page 1-1, second paragraph, last line:** see Comment 4 above.

7. **Section 1.4.1 Per and Polyfluoroalkyl Substances, pg. 1-7, 3rd paragraph, 1st line:** EPA appreciates the clarification and agrees with the description.

8. **Section 1.4.3.1 Progress since the Fourth Five-Year Review, page 1-9**:
   EPA appreciates the clarification.

9. **Section 2.2 Site Inspections, pg. 2-1:** EPA appreciates acknowledgment of the addition.

10. **Section 3.5.2.2 HHRA Analysis, Former Parcel B, pg. 75; Section 4.5.2.2 HHRA Analysis, Former Parcel C, pg. 132; Section 5.5.2.2 HHRA Analysis, Former Parcel D, pg. 191; and Section 6.5.2 Question B, Parcels E and E-2, pg. 244:** EPA appreciates the clarification.

EPA looks forward to a mutually acceptable resolution of our concerns to help enable the goal of consensus on the final FYR Report by July 31. If you have any questions regarding our response, please feel free to contact me at (415) 972-3167.

Sincerely,

Andrew Bain
EPA Region 9
Lead Remedial Project Manager
Northern California Federal Facilities Section
Superfund Division

Attachment

cc with Attachment:
Mary Snow, SF Bay RWQCB
Michael Howley, DTSC

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RTC Table 1 - Comments on the Navy's Draft Protectiveness Determinations for Parcels B-2, C, and E-2
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No.	Location	U.S. EPA Comment (4/30/2024)	Navy Response (May 2024)	U.S. EPA Response (6/4/2024)
1	Five-Year Review Summary Form, Protectiveness Statements, page xix, Parcel B-2, IR-26, Protectiveness Determination	Based on treatment efficacy uncertainties associated with the treatment for mercury in groundwater and the potential ecological impact on the San Francisco Bay, EPA does not support the Navy's *Short-term Protective* determination. Because of this uncertainty, and the agreed-upon need to enhance treatment delivery and/or explore other treatment options, EPA supports a Protectiveness Deferred determination. A *Short-Term Protective* determination is not appropriate because the MetaFix treatment for mercury in groundwater is not achieving its performance goals at two monitoring well locations, IR26MW49A and IR26MW71A. EPA recognizes, as documented by the Navy, that MetaFix could not be injected at certain locations due to limitations of the injection method. At our April 25, 2024, meeting, the Federal Facility Agreement (FFA) Parties discussed whether the Navy continues its plan to implement the enhanced delivery of Metafix, although the FFA regulatory parties believe that other treatment options need to be explored. The Navy agreed that the final *Fifth Five-Year Review Report* will include a date to submit a new FFA primary document, such as a technical memorandum. EPA expects the new primary document will be submitted as soon as practicable, and well ahead of the next Five-Year Review. Among other things, the new primary document should evaluate and analyze all available mercury groundwater monitoring data, including data collected from March 2018 to September 2022, and mercury exceedances at IR26MW49A and IR26MW71A, and propose next steps, including additional treatment options (tri-Agency letter of November 23, 2021). If the Navy is unable to commit to develop and provide a primary document within a timeline	From the Navy's perspective, t~~T~~here are multiple lines of evidence presented in the Five-Year Review that suggest the concentrations observed in groundwater are unlikely to exceed 0.6 µg/L in Bay surface water. However, as discussed in the April 25, 2024 meeting with Agency representatives (Regional Water Board, US EPA Region 9, and Department of Toxic Substances Control [DTSC]), the Navy agreed to "Protectiveness Deferred" determination. The Protectiveness Statement has been changed to: A protectiveness determination cannot be made because there is uncertainty related to the concentrations of mercury discharging to the Bay from Parcel B-2, IR-26 groundwater. In order to make a protectiveness determination, the following actions needs to be made: evaluate all existing data to determine a path forward for additional data collection, remedy optimization, and/or additional remedial alternatives~~ction~~/treatment that have been screened for further evaluation. A ~~technical memorandum~~primary document presenting the path forward will be ~~prepared~~ finalized as soon as practicable and not later than~~by~~ July 31, 2025. The FFA parties will have discussions, as appropriate, prior to scoping and developing the primary document. The concerns raised by the Agencies regarding the success of the remedy have been added after the final paragraph of Section 3.4.3.1, discussion of In Situ Stabilization of Mercury in Groundwater at IR-26 as follows: After completion of the 3-year post-ISS treatment performance monitoring, the FFA R~~r~~egulatory	It is Navy's opinion, not necessarily shared by the FFA regulatory parties, that multiple lines of evidence are presented in the Five-Year Review that suggest the concentrations are unlikely to exceed 0.6 µg/L. A higher level of direct proof rather than indirect weight of evidence is needed to better determine impact to the Bay. At the April 25, 2024 meeting, the FFA regulatory parties, including EPA, expressed concern with a protracted Navy effort given the issue is over three years old. EPA expects that the Navy will complete the final primary document as soon as practicable and not later than the end of July 2025. The primary document must include additional treatment options that have been initially screened for further evaluation. EPA also expects discussions among the FFA parties, as appropriate, prior to scoping and developing the primary document. Please cite the date of the letter (November 23, 2021) and do not attempt to interpret what is meant by the tri-agency letter. EPA quotes the letter directly. As discussed at the April 25, 2024 meeting, the FFA Regulatory Parties assumed that the Navy has the authority to "optimize" ISS (e.g., use of a larger rig in

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		acceptable to the FFA regulatory parties, EPA may need to consider the effect that the continued lack of sufficient treatment performance, and groundwater mercury data and documentation may have on Parcel B-2.	Parties~~agencies~~ (EPA Region 9, DTSC, and Regional Water Board) released a tri-agency letter on November 23, 2021 which reiterated that "mercury concentrations in groundwater along the San Francisco Bay margin consistently exceed the trigger level. Therefore, in-situ stabilization (ISS) has failed to minimize or prevent unacceptable discharge of mercury to the San Francisco Bay. Consequently, additional treatment options need to be screened, evaluated, and pursued by the Navy via the development of a new primary document work plan." ~~asserting that the remedy failed and was not protective of the Bay because of continuing exceedances of the trigger level (TL) (0.6 µg/L) at "sentinel" wells (IR26MW49A, IR26MW51A, and IR26MW71A) which are representative of a discharge to the Bay. Because the remedy did not achieve the 0.6 µg/L performance goal, the Agencies require that focused alternative treatments and treatment methodologies should be evaluated and, if warranted and accepted by the FFA regulatory parties, implemented (EPA, DTSC, and Regional Water Board, 2021).~~ As discussed at the April 25, 2024 meeting, the FFA regulatory parties assumed that the Navy has the authority to "optimize" ISS (e.g., use of a larger rig in areas of prior injection refusal) and the Navy recognizes that EPA does not oppose any Navy attempt to do so, as long as such action is timely and completed prior to July 31, 2025. As stated in the November 23, 2021 tri-agency letter, the Navy also recognizes that EPA	areas of prior injection refusal), and EPA does not oppose any Navy attempt to do so, as long as such action is timely and completed prior to July 31, 2025. However, as stated in the November 23, 2021 tri-agency letter, EPA continues to expect that additional treatment options need to be screened, evaluated and pursued by the Navy. The Navy needs to acknowledge this.

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			continues to expect that additional treatment options need to be screened, evaluated, and pursued by the Navy. While there are continued exceedances of the TL in groundwater, the Navy believes the following provides lines of evidence that the residual concentrations in mercury in groundwater are not likely to result in a concentration above 0.6 µg/L in the Bay surface water: • Completion of source removal in 2008 via a time-critical removal action (Insight, 2009) • Partial success of the in-situ stabilization (ISS) as evidenced by reducing the extent of mercury exceedances of the TL from 3 locations to 2 and decreasing concentrations in one of the remaining locations (IR26MW49A). A time-series plot of data through 2023 for IR26MW49A, IR26MW51A, and IR26MW71A is presented on **Figure 3-6**. Mercury concentrations during the last 5 years of monitoring have been below historical maximums and are consistently below 10 times the HGAL. • The limited extent of impacted groundwater; IR26MW71A and IR26MW49A are approximately 45 feet apart and IR26MW49A is approximately 88 feet from IR26MW51A with no exceedances. • Comparison of groundwater quality parameters to Bay surface water quality parameters (temperature and dissolved oxygen, **Table 3-4**) indicate that the groundwater is not representative of Bay water	Please reflect this is the Navy's belief/perspective. It is not necessarily shared by the FFA Regulatory Parties.

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			because groundwater temperature is consistently warmer than surface water, and dissolved oxygen is consistently lower than surface water. However, because there is uncertainty in the concentration at the exposure point and because the ISS remedy did not reduce the concentration in groundwater to below 0.6 µg/L at all monitoring wells, additional data collection, remedy optimization, and/or additional ~~reevaluation of~~ remedial alternatives/treatment that have been screened for further evaluation are ~~is~~ necessary to determine whether the remedy is protective of the Bay. Section 3.5.1.3 (Technical Question A, Is the remedy functioning as intended by the decision document) has been modified as follows: ***3.5.1.3 Parcel B-2*** ~~Yes.~~ The ISS injections did not effectively reduce mercury in two locations (IR26MW49A and IR26MW71A) to below the TL of 0.6 µg/L. Although mercury continues to exceed TLs in groundwater collected from downgradient monitoring wells, data are lacking that demonstrate mercury concentrations in surface water (the ultimate receptor) are below the HGAL of 0.6 µg/L. The RAO is stated as follows: … [no change from existing text] ~~Protectiveness is not affected based on the following rationale:~~ Data at the groundwater-surface water interface has not been collected, however, from the Navy's perspective, it is not expected that mercury exceeds 0.6	The wording of what the Navy needs to do because of uncertainty is worded differently from that stated earlier (above). The wording needs to be consistent. Please reflect it is the Navy's belief/perspective (not the FFA Regulatory Parties) that mercury exceedances are not expected.

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			µg/L based on the following rationale: • Source concentrations in soil have been removed during the IR-26 Mercury Removal TCRA (Insight, 2009). • Although dissolved mercury in groundwater exceeds the TL in two locations, Mann-Kendall analysis indicates it is decreasing at one location (KMJV, 2021), indicating partial success of the ISS remedy at minimizing migration to the surface water. • The TL is the Hunters Point groundwater ambient level (HGAL), which is not a risk-based concentration, formal RG, or ARAR according to the ROD Amendment (Navy, 2009). The screening of groundwater data against the TL or other surface water benchmarks, such as the National Recommended Water Quality Criteria (NRWQC; USEPA, 2023), conservatively assumes that ecological receptors are directly exposed to measured concentrations in groundwater. However, there will be a mixing zone where groundwater interfaces with surface water. The extent of that zone is unknown, but mixing is expected to occur, and the concentrations would decrease with distance from the mixing zone and tidal action. Site-specific mixing factors can range from 1 to several thousand. For example, USEPA uses a default mixing and attenuation factor of 20 to address the dilution of soil leachate as it moves through the groundwater aquifer (USEPA, 1996). Furthermore, mixing studies conducted by State of Washington, Department of	

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			Ecology (2009) found that the majority of the reduction in porewater concentrations was because of dilution by surface water and averaged 90 percent (that is, a dilution factor of 0.1). Assuming a similar dilution factor, the maximum post-injection detected concentration of dissolved mercury (8.55 µg/L) would be 0.855 µg/L, which does not exceed the NRWQC of 0.94 µg/L (USEPA, 2023). • The post-treatment concentrations after 2018 have consistently been lower than 10 times the 0.6 µg/L TL at both IR26MW49A and IR26MW71A (**Figure 3-6**). • Groundwater quality parameters (temperature and dissolved oxygen) indicate that the water in "sentinel" wells IR26MW49A, IR26MW50A, IR26MW51A, and IR26MW71A are not representative of surface water (**Table 3-4**). Review of annual O&M inspections, historical documents… [no change from original text].	
2	Five-Year Review Summary Form, Protectiveness Statements, page xix, Parcel C, B- aquifer, Protectiveness Determination	This comment addresses the B-aquifer characterization. EPA does not support the Navy's draft *Short-term Protective* determination but rather a *Protectiveness Deferred* determination because from EPA's perspective, for groundwater, information has come to light that calls into question the protectiveness of the remedy (Question C of the Report), and more information is needed to determine protectiveness and whether an unacceptable risk exists. In general, both the A-aquifer and B-aquifer (and bedrock) groundwater flows towards the San Francisco Bay. The Navy's cross-sections in the RU-C2 area confirm there are gaps or	Navy acknowledges that while, from the Navy's perspective, the remedy is protective of human health through active remediation, monitoring, and land use controls; additional information is needed to determine protectiveness for Bay receptors and has changed the remedy protectiveness determination to "Protectiveness Deferred" until such time the investigations are completed, and a protectiveness determination can be made. Specifically, the Navy will complete the Deep F-WBZ investigation for RU- C4 and the B-Aquifer and Upper F-WBZ investigation for RU-C2~~investigation~~.	Please clarify that this is the Navy's belief/perspective, not necessarily that of the FFA Regulatory Parties. The Navy states that it "…will complete the Deep F-WBZ investigation for RU- C4 and the B-Aquifer investigation." This statement needs to clearly identify two separate investigations: the Deep F-WBZ investigation in RU-C4 (which is the subject of the Water Board/EPA Informal Dispute, and which is currently in the "Draft Final Work Plan" stage) and

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		holes in the aquitard that enable communication between the A- and B-aquifers, and the Navy's data confirm there is contamination in the underlying B-aquifer at RU-C2 downgradient of the gaps or holes, and in the deep Fractured-Water Bearing Zone (deep F-WBZ) at RU- C4. Consequently, the A-aquifer cannot be isolated as protective. In response to FFA regulatory concerns, the Navy has agreed to, but has not initiated, a full and timely characterization of the B-aquifer in the RU-C2 area, including the upper F-WBZ below and in contact with the B-aquifer. The Navy has also agreed to monitor B-aquifer wells as part of performance monitoring of the groundwater treatment of the A-aquifer at RU-C2 (RAWP Phase III). With respect to the Deep F-WBZ at RU-C4, which was the subject of an informal dispute brought by the Regional Water Quality Control Board and EPA, the Navy has submitted a draft workplan to fully characterize the nature and extent of contamination and groundwater flow patterns to the San Francisco Bay. The workplan has not been finalized and work has not yet commenced. For the Final *Fifth Five-Year Review Report*, EPA requires a list of the primary documents that are anticipated to be developed to perform the full and timely characterization of the B-aquifer in the RU-C2 groundwater area, and the Navy's anticipated timeframe for developing these documents. An anticipated timeframe for the performance monitoring of the groundwater treatment at RU-C2 in both the A- and B-aquifers should also be provided. At the April 25, 2024, meeting, the Navy expressed agreement in concept that these commitments have been made. If the Navy is unable to commit to develop and provide the requested primary	The Draft-Final Five-Year Review Section 4.5.3 Technical Assessment Question C has been updated to incorporate agency concerns related to the hydrogeological communication between aquifer units at Parcel C, discharges to the Bay, and the ~~planned~~ investigations currently underway for the Deep F-WBZ in RU-C4, and planned for the B-Aquifer and Upper F-WBZ in the RU-C2 area to address these data needs as follows: Yes. The following information has come to light that could question the protectiveness of the remedy: • There have been detections of COCs from A-aquifer groundwater within the B-aquifer and F-WBZ groundwater and the connection and communication between hydrogeologic units within Parcel C is not fully understood. Therefore, further characterization of the Deep F-WBZ in RU-C4 and the B-Aquifer and Upper F-WBZ in RU-C2 are ~~is~~ required to demonstrate that remedies within the A-aquifer will be effective and not re-contaminated by COCs within the B-aquifer and ~~deep~~ F- WBZ and unacceptable discharges to the Bay are not and will not occur. The Protectiveness Statement has been changed to: A protectiveness determination cannot be made because there is uncertainty related to the hydrogeologic communication between the A- and B-aquifers and whether discharge of chemicals present in the B- aquifer present potential unacceptable risks to Bay receptors. In	the B-aquifer and underlying Upper F-WBZ in the RU-C2 area (still in development). The first component of the RU-C2 investigation has been agreed to by the Navy. The Navy has committed to collecting and evaluating B-aquifer data as part of the performance monitoring of the A-aquifer remedial action (as documented in the Navy's Response dated 2/8/24 to EPA's Item Nos. 1 and 2 dated 3/14/23 & 11/22/23 in Appendix H of the Final Parcel C Phase III Remedial Action at RUs C2 and C5, dated March 2024). The protectiveness statement does not include the development of a conceptual site model (CSM) of the A- and B-aquifers and shallow F-WBZ at RU-C2 and the deep F-WBZ at RU-C4. The statement should be revised to include the development of CSMs for both RU-C2 and RU-C4. As EPA discussed at the April 25, 2024 meeting, regarding RU-C2, the collection of B-aquifer and shallow F-WBZ data, as appropriate, should commence with the performance monitoring period, which EPA expects will be within the next two years. EPA also expects discussions among the FFA parties, as appropriate, prior to scoping and developing primary documents, such as workplans.

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		documents within a timeline acceptable to the FFA regulatory parties, EPA reserves its right to reassess our evaluation of B-aquifer and Deep F-WBZ groundwater at Parcel C.	order to make a protectiveness determination, the following action, at a minimum, needs to be made: complete investigations of the Bay Mud/Sandy Lean Clay aquitard, extent of chemicals in the B-aquifer and F-WBZ and use current ecological risk assessment methods and criteria, as appropriate, to assess potential impacts to Bay receptors. For the Deep F-WBZ, a draft final workplan has been provided to the FFA Regulatory Parties. For RU-C2, B-Aquifer data collection and Upper F-WBZ, as appropriate, are expected to commence coincident with the performance monitoring period. The FFA parties will have discussions, as appropriate, prior to scoping and developing primary documents, such as workplans. Depending on the results of data analyses, the development of conceptual site models, and necessary next steps, ~~It is expected that~~ these actions could possibly be completed within the next ~~will take approximately~~ 5 years, at which time, as appropriate, ~~to complete, at which time~~ a protectiveness determination will be made.	
3	Five-Year Review Summary Form, Protectiveness Statements, page xxi, Parcel E-2, Protectiveness Determination	EPA agrees with the Navy's *Will Be Protective* determination, however, additional actions are requested in the Final *Fifth Five-Year Review Report*. For landfills of this nature, the presumptive remedy in both the CERCLA and RCRA programs is to "cap and contain the waste," and include appropriate environmental controls and monitoring for, at a minimum, stormwater, groundwater, and landfill gas. After a careful review and comparison of cleanup alternatives against EPA's nine evaluation criteria, the Parcel E-2 landfill ROD selected a remedy consistent with the presumptive remedy approach yet	The Navy acknowledges that EPA agrees with the Will Be Protective determination, as long as the minimum information and analysis needs of the FFA Regulatory Parties, including the detailed status of all planned and installed wells, are provided on an agreed upon schedule ~~with the caveats stated in this comment~~. Because the remedy is complex and requires multiple phases for installation over a longer timeframe, the Navy has identified the following additional Other Findings (new section 6.6.1.5) to document the Navy's commitment to	As stated in our comments and at the April 25, 2024 meeting, it is EPA's position that if the Navy is unable to agree to the timely analysis of existing Parcel E-2 groundwater data, EPA may need to consider the effect this may have on potential performance issues at Parcel E-2 and our current protectiveness determination. As discussed, most recently at the April 25, 2024, meeting, the Navy needs to amend the appropriate

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		included several special design elements to account for the unique nature and location of this particular landfill. EPA agrees that Parcel E-2 is still undergoing remedy construction, including relatively minor work on the cover system, the completion of the landfill gas extraction and conveyance system, and the completion of the freshwater (FW) and tidal wetlands. Notwithstanding EPA's agreement that the remedy is still under construction, given that the Navy has deferred responding to Question A ("is the remedy functioning as intended by the decision documents?") in the Report, and given that certain fundamental landfill containment and control facilities, such as the nearshore slurry wall, the upland slurry wall, and the landfill cover system have been constructed, EPA has indicated that it is imperative that the Navy immediately begin to evaluate the effect the landfill cap and slurry walls have on groundwater flow and contaminant concentration within the landfill, and potential impact on the San Francisco Bay. The Navy needs to collect and analyze groundwater elevations and water quality in both the A- and B-aquifers underlying the Parcel. The collection and more importantly the analysis of such data should not be deferred pending the completion of the remaining facilities. The FFA Parties need a clear and common understanding of the status of Parcel E-2 groundwater and leachate monitoring and extraction wells, French Drain sampling port, FW piezometers, and FW outfall. EPA also expects that as part of the evaluation, the Navy will produce, at a minimum, plume maps of contaminant concentrations, and groundwater contour maps showing flow direction in the A- and B-aquifers. For the Final	continue to construct the remedy as well as ~~evaluate~~ analyze currently available ~~performance~~ data in a timely manner on a schedule agreed to among the FFA parties for the remedy components that are in place. As discussed at the April 24, 2024 meeting, the specific minimum information and analysis needs of the FFA Regulatory Parties, including a detailed status of all wells, are forthcoming in a tri-agency letter, after which the FFA parties will meet to discuss specific tasks and schedules. As discussed informally and in EPA's comments, the Navy recognizes that EPA expects the Navy will immediately begin to evaluate the effect the landfill cap and slurry walls have on groundwater flow and contaminant concentration within the landfill, and potential impact on the San Francisco Bay: ***6.6.1.5 Parcel E-2 Other Findings*** The remedy at Parcel E-2 is complex and involves multiple phases of field work to install. A number of facilities that are important to understanding groundwater flow and contaminant concentrations have been completed or are substantially completed (e.g., Nearshore Slurry Wall and landfill cover). The following is a summary of the remaining RA work and interim studies planned prior to completing the RACR: • Construct remaining components of the remedy including the permanent landfill gas system, freshwater and tidal wetlands, and groundwater monitoring network under the approved Final Work Plan (KEMRON, 2018):	primary document(s) to change/replace an existing compliance point for monitoring methane, an explosive gas, at the facility property boundary. This is overdue and must be done as soon as practicable. We suggest the primary document(s) be identified and a draft schedule is developed for discussion with the FFA Regulatory Parties as soon as possible and not later than September 30, 2024. The Navy's informal exchange of one point of compliance with another, without amending the necessary primary document(s), is not acceptable. Our concerns stand and must be appropriately addressed: EPA has indicated that it is imperative that the Navy immediately begin to evaluate the effect the landfill cap and slurry walls have on groundwater flow and contaminant concentration within the landfill, and potential impact on the San Francisco Bay. The Navy needs to collect and analyze groundwater elevations and water quality in both the A- and B-aquifers underlying the Parcel. The collection and more importantly the analysis of such data should not be deferred pending the completion of the remaining facilities. The FFA Parties need a clear and common understanding of the status of Parcel E-2 groundwater and leachate monitoring and extraction wells, French Drain sampling port, FW piezometers, and FW outfall. EPA also expects that as part of the

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		Fifth Five-Year Review Report, EPA requires a list of the primary documents that are anticipated to be developed to perform the evaluation work, and the Navy's anticipated timeframe for developing those documents. At the April 25, 2024, meeting, the Navy expressed agreement in concept but awaits further information from the FFA regulatory parties, which is forthcoming in a tri-Agency letter. If the Navy is unable to provide the required list and schedule in the Final *Fifth Five-Year Review Report*, EPA may need to consider the effect that the lack of sufficient groundwater data and documentation may have on potential performance issues at Parcel E-2. In addition, EPA has conveyed, most recently at the April 25, 2024, meeting, that the Navy needs to amend the appropriate primary document to change/replace an existing compliance point for monitoring methane, an explosive gas, at the facility property boundary. At the April 25 meeting, the Navy agreed in principle and will propose the primary document that must be amended and an anticipated timeframe for modifying that primary document.	○ Landfill Gas System (Phase IVa) anticipated in 4/2025 ○ Wetlands (Phase IVb) anticipated in 10/2027 • Modify the landfill gas monitoring program to include a monitoring probe (GMP54) outside of the newly installed landfill cover as ~~a~~the new compliance point by ~~preparing an addendum to~~ revising the appropriate primary document(s). The primary document(s) needing revision and the proposed schedule for revision will be further discussed with the FFA Regulatory Parties not later than September 30, 2024.~~e the compliance monitoring and mitigation plan for methane at the landfill.~~ • Document completion of the protective liner and final cover installation in the Phase III Remedial Action Construction Summary Report anticipated in 12/2024 • Conduct a study to evaluate the performance of the upland slurry wall as documented in the Post-Remedial Action Performance Evaluation Work Plan to evaluate the performance of the Upland Slurry Wall – Final 6/2024. Fieldwork is anticipated to be completed in 2024 and the Post-Construction RA Performance Report is anticipated in 3/2025. Water Board specific concerns (See Water Board Protectiveness Determinations General Comment #3) and responses were added to the technical assessment for Parcel E-2 (Section 6.5.1, page 6-19) as follows: While the remedy is currently under construction, Agency concerns have been raised regarding the completed	evaluation, the Navy will produce, at a minimum, plume maps of contaminant concentrations, and groundwater contour maps showing flow direction in the A- and B-aquifers. Except as noted, below, EPA is not providing comment or response on the Navy's inclusion, under "Navy Response (May 2024)" pertaining to EPA's comments of 4/30/2024, of "Water Board specific concerns." Irrespective, EPA's responses of 6/4/2024 presented herein stand.

U.S. EPA Response to Navy Draft RTCs (5-28-2024) U.S. EPA Comments (4-30-2024)
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RTC Table 1 - Comments on the Navy's Draft Protectiveness Determinations for Parcels B-2, C, and E-2 EPA's Suggested RLSO to Help Address our Concerns are in Blue				
No.	**Location**	**U.S. EPA Comment (4/30/2024)**	**Navy Response (May 2024)**	**U.S. EPA Response (6/4/2024)**
			components: • **Concern: The Upland Slurry Wall was not installed as designed**. Geologic refusal was met along a 200-foot section of the planned wall at approximately 0 feet msl (10 feet shallower than the designed depth). The slurry wall was designed to minimize flow of offsite groundwater into the landfill and was designed as a "hanging wall" (not embedded into bedrock) with a french drain (which was installed according to the design) to prevent precipitation recharge and divert flow to the freshwater wetland. The material encountered was determined to be bedrock which has a lower permeability than the surrounding aquifer material. A work plan is under Agency review to evaluate the Upland Slurry Wall performance and work is anticipated to begin in 2025. • **Concern: The turbidity curtain was not used during remedy construction.** A 2,000-foot US Department of Transportation Type III offshore turbidity curtain was installed during shoreline work in accordance with the Design (ERRG, 2014) on November 30, 2016 as documented in the Phase II Remedial Action Construction Summary Report (Aptim, 2021). The turbidity curtain was removed after shoreline activities were completed, in accordance with the RAWP Appendix D, Environmental Protection Plan (CB&I, 2016) which states "During shoreline earthwork (revetment installation, wetlands excavation, and site grading), a turbidity curtain will be deployed as the BMP for sediment control."	

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RTC Table 1 - Comments on the Navy's Draft Protectiveness Determinations for Parcels B-2, C, and E-2 EPA's Suggested RLSO to Help Address our Concerns are in Blue				
No.	**Location**	**U.S. EPA Comment (4/30/2024)**	**Navy Response (May 2024)**	**U.S. EPA Response (6/4/2024)**
			• **Concern: The Navy has not provided all stormwater best practices documentation.** The Navy has provided the following final primary documents that contain stormwater best practices: Remedial Action Work Plans (RAWPs) (CB&I, 2016; KEMRON, 2018), Stormwater Protection Plan (ref), stormwater best practices monitoring documentation during construction is provided in the Phase I RACR (Gilbane, 2018) and Phase II RACSR (Aptim, 2021) and will also be provided in the forthcoming Phase III RACSR (Pending). The Navy has also responded to the Water Board's December 3, 2022 and January 11, 2023 follow-up e-mail request for stormwater records. • **Concern: There is not adequate documentation that lead was removed from the wetland areas and groundwater may be affected in the future.** Lead was removed from the tidal wetland areas in accordance with the Phase II RAWP (KEMRON, 2018) and subsequent Fieldwork Variance #5 (Appendix G of Aptim, 2021). Exceedances shown on Figures 6 and 7 of the RACSR (Aptim, 2021) were initial samples prior to over-excavation to remove lead- impacted soils, post-over-excavation samples were below the RG. Additionally, the landfill cap geomembrane and geosynthetic clay liner (GCL) layers prevent vertical infiltration of rainfall from reaching the underlying the landfill waste and promoting leachate. The Geocomposite drainage layer carries any flow that infiltrates through the vegetative layer to the perimeter ditches. The surface water from the eastern half of the	

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RTC Table 1 - Comments on the Navy's Draft Protectiveness Determinations for Parcels B-2, C, and E-2 EPA's Suggested RLSO to Help Address our Concerns are in Blue				
No.	**Location**	**U.S. EPA Comment (4/30/2024)**	**Navy Response (May 2024)**	**U.S. EPA Response (6/4/2024)**
			site will be collected by the eastern perimeter ditch and will drain directly into the Bay through the culvert pipe at the southeast corner of the site. The surface water from the western half of the site will be collected by the western perimeter ditch and will flow into the Freshwater Wetlands with excess runoff draining through the Freshwater Wetlands Outfall pipe into the Bay. The chemically contaminated soils near the Freshwater Wetlands were removed during previous hot spot excavations and excavations during Phase II subgrade preparations, with confirmation testing to show that they are below action limits in the FINAL RASCR (Figure 6 attached) for copper, lead, total PCBs, and total TPHs. There is no required tie into the underlying Bay Mud at the Wetlands Boundary. See Detail 4 on Design Drawing C18 from the DBR (attached) for the cover termination at the Wetlands boundaries. • **Concern: There may be impacts to soil due to RCRA hazardous waste handling in stockpiles during remedy installation**: Navy is planning, at agencies' request, to sample the soil under former Parcel E-2 stockpile locations now covered with radiological retesting radiological screening yard (RSY) pads for metals to confirm that the stockpiles didn't impact the soils around them during storm events. This will be completed after the RSY pads are removed. The Navy understands that there is a pending data request and notes the following:	Regarding what the Navy notes, as stated at the April 25, 2024 meeting, the FFA Regulatory Parties expect

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RTC Table 1 - Comments on the Navy's Draft Protectiveness Determinations for Parcels B-2, C, and E-2 EPA's Suggested RLSO to Help Address our Concerns are in Blue				
No.	**Location**	**U.S. EPA Comment (4/30/2024)**	**Navy Response (May 2024)**	**U.S. EPA Response (6/4/2024)**
			• Groundwater elevations are available in the BGMP reports for all installed wells at Parcel E-2 • COC data for A- and B-aquifers are available in the BGMP for all installed wells at Parcel E-2 • Leachate testing is unavailable as the leachate ports have not yet been installed • Extraction well data, french drain sample port data, freshwater wetland piezometer and wetland outfall data is not available because these components have not yet been installed • Detailed plume and flow direction cannot be determined as the full monitoring well network has not been installed; However, groundwater modeling conducted during design planning supports the theoretical performance of the remedy. This is included in Appendix F of the RD (ERRG, 2014) The Final RAWP (KEMRON, 2018) covers all the remaining remedy installation elements in the RD/ROD. The Final RAMP for Parcel E-2 (ERRG, 2014b) will be used to monitor the remedy once its installation is completed. References: Engineering/Remediation Resources Group, Inc. (ERRG). 2014. Design Basis Report, Parcel E-2, Hunters Point Naval Shipyard, San Francisco, California. Final. August 15. ERRG, 2014b. Final Remedial Action Monitoring Plan, Parcel E-2, Hunters Point Naval Shipyard, San Francisco, California. August 15.	that the Navy immediately begin to evaluate the effect the landfill cap and slurry walls have on groundwater flow and contaminant concentration within the landfill, and potential impact on the San Francisco Bay. The Navy needs to collect and analyze groundwater elevations and water quality in both the A- and B-aquifers underlying the Parcel. The collection and more importantly the analysis of such data should not be deferred pending the completion of the remaining facilities. The FFA Parties need a clear and common understanding of the status of Parcel E-2 groundwater and leachate monitoring and extraction wells, French Drain sampling port, FW piezometers, and FW outfall. EPA also expects that as part of the evaluation, the Navy will produce, at a minimum, plume maps of contaminant concentrations, and groundwater contour maps showing flow direction in the A- and B-aquifers.

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RTC Table 1 - Comments on the Navy's Draft Protectiveness Determinations for Parcels B-2, C, and E-2 EPA's Suggested RLSO to Help Address our Concerns are in Blue				
No.	**Location**	**U.S. EPA Comment (4/30/2024)**	**Navy Response (May 2024)**	**U.S. EPA Response (6/4/2024)**
			CB&I Federal Services, LLC. (CB&I). 2016. Work Plan Shoreline Revetment; Site Grading and Consolidation of Excavated Soil, Sediment, and Debris; and Upland Slurry Wall Installation Remedial Action, Parcel E-2, Hunters Point Naval Shipyard, San Francisco, California. Final. October 12. KEMRON Environmental Services (KEMRON). 2018. Remedial Action Work Plan, Final Cove, Wetlands, and Landfill Gas Control and Containment System, Remedial Action Parcel E-2, Hunters Point Naval Shipyard, San Francisco, California. Final. December 26. Gilbane. 2018. Remedial Action Completion Report, Hot Spot Delineation and Excavation and Nearshore Slurry Wall Installation, Remedial Action, Parcel E-2, Hunters Point Naval Shipyard, San Francisco, California. June. APTIM. 2021. Remedial Action Construction Summary Report, Parcel E-2 (Phase II), Hunters Point Naval Shipyard, CA. April 6	

RTC Table 2 - Other Comments				
No.	**Location**	**U.S. EPA Comment (4/30/2024)**	**Navy Response (May 2024)**	**U.S. EPA Response (6/4/2024)**
11	Section 3.7.3	Navy's Parcel B-2 Draft Protectiveness Determination – *Short-term Protective* EPA's Response – *Protectiveness Deferred*, as discussed above.	Comment acknowledged, see response to EPA Comment 1 (Navy's Draft Protectiveness Determinations for Parcels B-2, C, and E-2)	See EPA responses, above.
12	Section 4.7.1	Navy's Parcel C, Draft Protectiveness Determination – *Short-term Protective* EPA's Response – *Protectiveness Deferred,* as discussed above.	Comment acknowledged, see response to EPA Comment 2 (Navy's Draft Protectiveness Determinations for Parcels B-2, C, and E-2)	See EPA responses, above.

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RTC Table 2 - Other Comments				
No.	**Location**	**U.S. EPA Comment (4/30/2024)**	**Navy Response (May 2024)**	**U.S. EPA Response (6/4/2024)**
13	Section 6.7.1.2	Navy's Parcel E-2, Draft Protectiveness Determination – *Will Be Protective* EPA's Response – *Will Be Protective*, but additional actions are requested, as discussed above.	Comment acknowledged, see response to EPA Comment 3 (Navy's Draft Protectiveness Determinations for Parcels B-2, C, and E-2)	See EPA responses, above.

Response to Comments	**Contract/CTO** N62470-21-D-0007; Contract Task Order No. N6247322F4930	**Responses By** Navy
Comment By Mary Snow, P.G.	**Code/Organization** Groundwater Protection Division, San Francisco Regional Water Board	Date April 2024
Project Title and Location Draft Fifth Five-Year Review Report, Hunters Point Naval Shipyard, San Francisco, California, November 2023		**Type of Review** **X** Draft Final Other

No.	Location	Regional Water Board Comments Dated April 30, 2024	Navy Response
		Protectiveness Determination Comments	
1	General	**Comment 1a**: We do not agree with the protectiveness statement provided in the Draft Five-Year Review for Parcel B-2, Installation Restoration (IR) Site 26. The Regional Water Board's preliminary protectiveness determination for Parcel B-2, IR Site 26 is "Not Protective." This determination is consistent with USEPA guidance (2012) because for mercury concentrations in groundwater the "[M]igration of contaminants is uncontrolled and poses an unacceptable risk to human health and the environment; or potential or actual exposure is clearly present or there is evidence of exposure." **Comment 1b**: The remedy at Parcel B-2, IR Site 26 is not protective because elevated mercury concentrations in groundwater may be discharging to San Francisco Bay (Bay). Therefore, development of a new primary document work plan focused on alternative treatments and treatment methodologies is warranted as a priority to mitigate discharge of mercury to the Bay and ensure protectiveness. Our expectation is that the Draft-Final Five-Year Review will include a commitment to developing this work plan with appropriate implementation timelines that are agreeable to the Federal Facility Agreement (FFA) signatories. The Draft Five-Year Review does not adequately reflect the Regulatory Agencies' (i.e., USEPA, Department of Toxic Substances Control (DTSC), and Regional Water Board) comments and concerns regarding	From the Navy's perspective, there are multiple lines of evidence presented in the Five-Year Review suggest the concentrations observed in groundwater are unlikely to exceed 0.6 µg/L in Bay surface water. However, as discussed in the April 25, 2024 meeting with Agency representatives (Regional Water Board, US EPA Region 9, and Department of Toxic Substances Control [DTSC]), the Navy agreed to "Protectiveness Deferred" determination. The Protectiveness Statement has been changed to: A protectiveness determination cannot be made because there is uncertainty related to the concentrations of mercury discharging to the Bay from Parcel B-2, IR-26 groundwater. In order to make a protectiveness determination, the following actions needs to be made: evaluate all existing data to determine a path forward for additional data collection, remedy optimization, and/or additional remedial alternatives/treatment that have been screened for further evaluation. A primary document presenting the path forward will be finalized as soon as practicable but no later than July 31, 2025. The FFA parties will have discussions, as appropriate, prior to scoping and developing the primary document. The concerns raised by the Agencies regarding the success of the remedy have been added after the final paragraph of Section 3.4.3.1, discussion of In Situ Stabilization of Mercury in Groundwater at IR-26 as follows:

No.	Location	Regional Water Board Comments Dated April 30, 2024	Navy Response
Protectiveness Determination Comments			
		the status of the remedy for Parcel B-2, IR Site 26. The remedy at Parcel B-2 includes soil excavation, installation of a durable cover, in situ stabilization of mercury in groundwater, monitoring, and institutional controls. The Navy's "Short-Term Protective" determination for Parcel B-2 IR Site 26 groundwater is not supported due to elevated concentrations of mercury in groundwater, as identified in the following Regulatory Agencies' correspondence: Tri-Agency Letter dated August 20, 2021, Tri-Agency Letter dated November 23, 2021, DTSC Note to File - Non-Concurrence dated December 23, 2021, and Regional Water Board Letter dated March 14, 2022. Specifically, after a three-year performance and post-treatment monitoring period, the remedial action, in situ stabilization using the reagent Metafix, has failed to reduce mercury concentrations in groundwater to below 0.6 micrograms per liter (µg/L), the Parcel B Remedial Design (RD) trigger level. Elevated concentrations of mercury in groundwater are in "sentinel" wells, representing a discharge to the Bay. Additionally, the Regional Water Board's concerns regarding the validity of the development of the trigger concentration for mercury have not been addressed by the Navy. **Additional Comment Received 6/4/2024** **Regional Water Board Response 1a:** We do not agree that the 2008 TCRA is a line of evidence supporting Navy's conclusion that mercury concentrations in groundwater are unlikely to exceed 0.6 µg/L in Bay water. The TCRA did not remove mercury contamination within bedrock. Five samples collected from the top of the underlying bedrock contained mercury concentrations that exceeded the soil remediation goal (RG) of 2.3 mg/kg, ranging from 5.9 to 15 mg/kg (Figure 4). All five samples with elevated mercury were located immediately adjacent to the Bay and up-gradient "sentinel" wells IR26MW49A and IR26MW71A. Incomplete removal of mercury from bedrock sustains the unacceptable mercury discharges to the Bay.	After completion of the 3-year post-ISS treatment performance monitoring, the FFA regulatory agencies (EPA Region 9, DTSC, and Regional Water Board) released a tri-agency letter on November 23, 2021 which reiterated that "mercury concentrations in groundwater along the San Francisco Bay margin consistently exceed the trigger level. Therefore, in-situ stabilization (ISS) has failed to minimize or prevent unacceptable discharge of mercury to the San Francisco Bay. Consequently, additional treatment options need to be screened, evaluated, and pursued by the Navy via the development of a new primary document work plan." (EPA, DTSC, and Regional Water Board, 2021). As discussed at the April 25, 2024 meeting, the FFA regulatory parties assumed that the Navy has the authority to "optimize" ISS (e.g., use of a larger rig in areas of prior injection refusal) and the Navy recognizes that EPA does not oppose any Navy attempt to do so, as long as such action is timely and completed prior to July 31, 2025. As stated in the November 23, 2021 tri-agency letter, the Navy also recognizes that EPA continues to expect that additional treatment options need to be screened, evaluated, and pursued by the Navy. While there are continued exceedances of the TL in groundwater, the Navy believes the following provides lines of evidence that the residual concentrations in mercury in groundwater are not likely to result in a concentration above 0.6 µg/L in the Bay surface water: • Completion of source removal in 2008 via a time-critical removal action (Insight, 2009) • Partial success of the in-situ stabilization (ISS) as evidenced by reducing the extent of mercury exceedances of the TL from 3 performance monitoring locations to 2 performance monitoring locations and decreasing concentrations in one of the remaining locations (IR26MW49A). A time-series plot of data through 2023 for IR26MW49A, IR26MW51A, and IR26MW71A is presented on **Figure 3-7**. Mercury concentrations during the last 5 years of monitoring have been below historical maximums and are consistently below 10 times the HGAL.

No.	Location	Regional Water Board Comments Dated April 30, 2024	Navy Response
Protectiveness Determination Comments			
		Regional Water Board Response 1b: Given that groundwater treatment was implemented 7.5 years ago and has failed to achieve the TL of 0.6 µg/L mercury in sentinel wells IR26MW49A and IR26MW71A, the only wells down-gradient of the source area, we do not agree that the remedy has been partially successful. Rather, it has failed. Whereas our trend analysis indicates that mercury concentrations are likely decreasing in well IR26MW49A, it is nonetheless an order of magnitude greater than the TL; consequently, the cleanup timeframe at best will be many decades unless alternative remedial actions are completed. Mercury concentrations in well IR26MW71A are consistently greater than the RAO and stable, meaning that the cleanup timeframe for that plume area is unknown, and requires further evaluation. **Regional Water Board Response 1c:** We do not agree that the Navy's assessment that the extent of mercury-contaminated groundwater is limited (and shrinking), because the extent of mercury contamination has not been characterized in the following directions: • vertically in bedrock; • east and south of Source Area 2 where five confirmation samples contained mercury concentrations above the soil RG; and • in the San Francisco Bay. Until the data gaps are addressed with additional investigation, the conclusions presented in the Five-Year review are not supported regarding the extent of the mercury plume. **Regional Water Board Response 1d:** We disagree with the Navy's statement that "the groundwater is not representative of Bay water." The industry standard to evaluate freshwater-seawater mixing uses conductivity measurements. Based on our review of the 2022 conductivity measurements for nearshore wells IR26MW49A, IR26MW70A, and IR26MW71A, samples collected from these wells were 100 percent mixed (i.e., the water samples were essentially Bay	• The limited extent of impacted groundwater; IR26MW71A and IR26MW49A are approximately 45 feet apart and IR26MW49A is approximately 88 feet from IR26MW51A with no exceedances. • Comparison of groundwater quality parameters to Bay surface water quality parameters (temperature and dissolved oxygen, **Table 3-4**) indicate that the groundwater is not representative of Bay water because groundwater temperature is consistently warmer than surface water, and dissolved oxygen is consistently lower than surface water. However, because there is uncertainty in the concentration at the exposure point and because the ISS remedy did not reduce the concentration in groundwater to below 0.6 µg/L at all monitoring wells, additional data collection, remedy optimization, and/or additional remedial alternatives/treatment that have been screened for further evaluation are necessary to determine whether the remedy is protective of the Bay. Section 3.5.1.3 (Technical Question A, Is the remedy functioning as intended by the decision document) has been modified as follows: ***3.5.1.3 Parcel B-2*** ~~Yes.~~ The ISS injections did not effectively reduce mercury in two locations (IR26MW49A and IR26MW71A) to below the TL of 0.6 µg/L. Although mercury continues to exceed TLs in groundwater collected from downgradient monitoring wells, data demonstrating that mercury concentrations in surface water (the ultimate receptor) are below the HGAL of 0.6 µg/L are lacking. The RAO is stated as follows: … [no change from existing text] ~~Protectiveness is not affected based on the following rationale:~~ Data at the groundwater-surface water interface has not been collected; however, from the Navy's perspective, it is not expected that mercury exceeds 0.6 µg/L based on the following rationale: • Source concentrations in soil have been removed during the IR-26 Mercury Removal TCRA (Insight, 2009).

No.	Location	Regional Water Board Comments Dated April 30, 2024	Navy Response
		Protectiveness Determination Comments	
		water). Therefore, sample laboratory analytical data for these wells are more representative of ambient mercury concentrations in Bay surface water. Additionally, based on our comparison of the 2022 sampling times to the National Oceanic and Atmospheric Administration's tide predictions, sampling of the nearshore monitoring wells was not conducted with consideration of predicted tide levels and, consequently, samples were not collected at low tides when groundwater discharges to the Bay. Because samples collected from nearshore wells were likely mixed/diluted, no dilution factor should be applied to nearshore groundwater data. Applying a standard Site Conceptual Model for groundwater discharge to surface water, mercury-contaminated groundwater migrates through and beneath the shoreline revetment during low tides and upwells into the Bay's transition zone1. We are concerned that benthic organisms are exposed to harmful mercury concentrations. Further, we are concerned that sample analytical results do not represent the mercury concentrations that the Bay's aquatic life is exposed to because samples are filtered in the field, removing mercury adsorbed on colloids in groundwater. When/where mercury discharges to the Bay with minimal dilution, including mercury in adsorbed phases, mercury concentrations may be greater than the reported concentrations in sentinel wells IR26MW49A and IR26MW71A. Consequently, we recommend that future water samples collected from all nearshore wells be analyzed for both dissolved and total mercury (no field filtration prior to analysis). The Navy concluded that a "protectiveness determination cannot be made because there is uncertainty related to the concentrations of mercury discharging to the Bay from Parcel B-2, IR-26 groundwater." We disagree and as stated in our original comment, our protectiveness determination for Parcel B-2, IR Site 26 is "Not Protective." **Regional Water Board Response 1e:** We disagree that a protectiveness determination cannot be made at this time. Elevated concentrations of mercury in groundwater exist in the sentinel wells,	• Although dissolved mercury in groundwater exceeds the TL in two locations, Mann-Kendall analysis indicates it is decreasing at one location (KMJV, 2021), indicating partial success of the ISS remedy at minimizing migration to the surface water. • The TL is the Hunters Point groundwater ambient level (HGAL), which is not a risk-based concentration, formal RG, or ARAR according to the ROD Amendment (Navy, 2009). • The screening of groundwater data against the TL or other surface water benchmarks, such as the National Recommended Water Quality Criteria (NRWQC; USEPA, 2023), conservatively assumes that ecological receptors are directly exposed to measured concentrations in groundwater. However, there will be a mixing zone where groundwater interfaces with surface water. The extent of that zone is unknown, but mixing is expected to occur, and the concentrations would decrease with distance from the mixing zone and tidal action. Site-specific mixing factors can range from 1 to several thousand. For example, USEPA uses a default mixing and attenuation factor of 20 to address the dilution of soil leachate as it moves through the groundwater aquifer (USEPA, 1996). Furthermore, mixing studies conducted by State of Washington, Department of Ecology (2009) found that the majority of the reduction in porewater concentrations was because of dilution by surface water and averaged 90 percent (that is, a dilution factor of 0.1). Assuming a similar dilution factor, the maximum post-injection detected concentration of dissolved mercury (8.55 µg/L) would be 0.855 µg/L, which does not exceed the NRWQC of 0.94 µg/L (USEPA, 2023). • The post-treatment concentrations after 2018 have consistently been lower than 10 times the 0.6 µg/L TL at both IR26MW49A and IR26MW71A (**Figure 3-7**). • Groundwater quality parameters (temperature and dissolved oxygen) indicate that the water in sentinel wells IR26MW49A, IR26MW50A, IR26MW51A, and IR26MW71A are not representative of surface water (**Table 3-4**).

No.	Location	Regional Water Board Comments Dated April 30, 2024	Navy Response
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		i.e., the points of compliance, representing unacceptable discharges to the Bay and evidence of exposure to the Bay's aquatic life. Consistent with USEPA guidance (2012), "Not Protective" is the appropriate protectiveness determination. TL for Mercury in Groundwater. In response to the Regional Water Board's concerns regarding the validity of the mercury TL in groundwater, a link to the source document was provided. However, the link was not accessible and could not be evaluated. Therefore, we continue to maintain that the HGAL for mercury of 0.6 µg/L, which is the basis of the mercury TL and Remedial Action Objective, is not appropriately representative because: a. Influences from HPNS industrial activities are reflected in the data used. b. The HGAL is not specific to IR Site 26. Only 8 of 162 samples were collected from Parcel B-2, and it is likely that no sample was collected from IR Site 26. c. Mercury analytical results used to estimate the mercury HGAL were obtained over a period of about one year, which could not reflect the seasonal and medium- to long-term variability of mercury in groundwater. d. The data used to calculate the mercury HGAL were entirely comprised of non-detect concentrations or their derivatives.	Review of annual O&M inspections, historical documents… [no change from original text]. The following issue/recommendation has been added to the Five-Year Review Summary Table and Table 3-9 (Parcel B Issues, Recommendations, and Follow-up Actions): Issue: There is uncertainty related to the concentrations of mercury discharging to the Bay from Parcel B-2, IR-26 groundwater Recommendation: Evaluate all existing data to determine a path forward for additional data collection, remedy optimization, and/or remedial alternatives/treatment that have been screened for further evaluation. Prepare a primary document presenting the path forward. Milestone Date: 10/31/2025 Affects Protectiveness: Protectiveness Deferred **Response to Additional Comment:** The Navy appreciates the detailed evaluation that was provided. The Navy acknowledges that an agreement cannot be reached regarding the Protectiveness Deferred determination for Parcel B-2 prior to the Five-Year Review signature date therefore, the protectiveness determination is Deferred. The Navy will work with the Water Board, DTSC, and USEPA to develop the approach for data collection, remedy optimization, and/or remedial alternatives/treatment that have been screened for further evaluation to determine protectiveness and ensure future protectiveness of the remedy at Parcel B-2. Note that additional revisions in the response above were made in blue font based on EPA's additional response (See EPA Comment #1). The date of July 31, 2025 was identified for the milestone date during the April 2024 meeting. It was determined after this meeting that since this is an FY25 project award, it would be affected by the financial brownout. NAVFAC's financial system is being changed which not allow the award of FY25 projects to start until after December 31, 2024. Due to this uncontrollable issue, the Navy will require a

No.	Location	Regional Water Board Comments Dated April 30, 2024	Navy Response
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			date change to October 31, 2025. This date change is shorter than the duration of the brownout.
2	General	**Comment 2a:** We do not agree with the Navy's protectiveness determination for Parcel C. The Regional Water Board's preliminary protectiveness determination for Parcel C is "Protectiveness Deferred." This determination is consistent with USEPA guidance (2012) because it is unknown if the response should be "yes" to "Question B - Are the exposure assumptions, toxicity data, cleanup levels, and remedial action objectives (RAOs) used at the time of the remedy selection still valid?" **Comment 2b:** A protectiveness determination of the remedy at Parcel C cannot be made at this time until further information is obtained. Further information will be obtained upon successful implementation of the Deep Fractured Water Bearing Zone (F-WBZ) Investigation for Remedial Unit-C4 (RU-C4) and the planned B-aquifer investigation, at which time a protectiveness determination can likely be made. Our expectation is that the Draft-Final Five-Year Review will specify these documents as "follow-up actions" and commit to implementation timelines that are agreeable to the FFA signatories. The Draft Five-Year Review does not adequately reflect the Regulatory Agencies' comments and concerns regarding the status of the remedy for Parcel C. The remedy at Parcel C includes soil excavation, installation of a durable cover, soil vapor extraction, in situ treatment of groundwater, monitoring, and institutional controls. The Navy's "Short-Term Protective" determination for Parcel C is not supported for groundwater due to data gaps in the understanding of the communication/connections between the hydrologic units within Parcel C, as documented in the following Regulatory Agencies' correspondence: Joint-Agency Letter (USEPA) dated July 30, 2021, Joint-Agency Letter (USEPA) dated September 17, 2021, and Tri-Agency Letter dated May 24, 2022.	Navy acknowledges that while, from the Navy's perspective, the remedy is protective of human health through active remediation, monitoring, and land use controls; additional information is needed to determine protectiveness for Bay receptors and has changed the remedy protectiveness determination to "Protectiveness Deferred" until such time the investigations are completed, and a protectiveness determination can be made. Specifically, the Navy will complete the Deep F-WBZ investigation for RU-C4 and the B-Aquifer and Upper F-WBZ investigation for RU-C2. The Draft-Final Five-Year Review Section 4.5.3 Technical Assessment Question C has been updated to incorporate agency concerns related to the hydrogeological communication between aquifer units at Parcel C, discharges to the Bay, and the investigations currently underway for the Deep F-WBZ in RU-C4, and planned for the B-Aquifer and Upper F-WBZ in the RU-C2 area to address these data needs as follows: Yes. The following information has come to light that could question the protectiveness of the remedy: • There have been detections of COCs from A-aquifer groundwater within the B-aquifer and F-WBZ groundwater and the connection and communication between hydrogeologic units within Parcel C is not fully understood. Therefore, further characterization of the Deep F-WBZ in RU-C4 and the B-aquifer and Upper F-WBZ in RU-C2 are required to demonstrate that remedies within the A-aquifer will be effective and not re-contaminated by COCs within the B-aquifer and F-WBZ and unacceptable discharges to the Bay are not and will not occur. The Protectiveness Statement has been changed to: A protectiveness determination cannot be made because there is uncertainty related to the hydrogeologic communication between the A- and B-aquifers and whether discharge of chemicals present in the B-aquifer present potential unacceptable risks to Bay receptors. In order to make a protectiveness determination, the following action, at a minimum, needs to be made:

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		Specifically, the connection and communication between hydrogeologic units within Parcel C is not fully understood; therefore, further characterization is required to demonstrate that 1) remedies within the A-aquifer will be effective and not recontaminated by chemicals of concern (COCs) within the B-aquifer and/or Deep FWBZ and 2) unacceptable discharges to the Bay are not and will not occur. **Additional Comment Received 6/4/2024** Although the response discusses the two documents that will fill the data gaps, i.e., Deep F-WBZ investigation for RU-C4 and the B-Aquifer investigation, the response lacks specificity regarding detailed timeframes and schedules for completion. The text should be revised to include timeframe/schedule details.	complete investigations of the Bay Mud/Sandy Lean Clay aquitard, extent of chemicals in the B-aquifer and F-WBZ and use current ecological risk assessment methods and criteria, as appropriate, to assess potential impacts to Bay receptors. For the Deep F-WBZ, a draft-final workplan has been provided to the FFA Regulatory Parties. For RU-C2, B-aquifer data collection and Upper F-WBZ, as appropriate, are expected to commence coincident with the performance monitoring period. The FFA parties will have discussions, as appropriate, prior to scoping and developing primary documents, such as workplans. Depending on the results of the data analyses, the development of conceptual site models, and necessary steps, these actions could possibly be completed within the next 5 years, at which time, as appropriate, a protectiveness determination will be made. **Response to Additional Comment:** The following issue/recommendation has been added to the Five-Year Review Summary Table and Table 4-8 (Parcel C Issues, Recommendations, and Follow-up Actions): Issue: There have been detections of COCs from A-aquifer groundwater within the B-aquifer and F-WBZ groundwater and the connection and communication between hydrogeologic units within Parcel C is not fully understood. Therefore, further characterization is required to demonstrate that remedies within the A-aquifer will be effective and not re-contaminated by COCs within the B-aquifer and deep F-WBZ and unacceptable discharges to the Bay are not and will not occur. Recommendation: Complete investigations of the Bay Mud/Sandy Lean Clay aquitard, extent of chemicals in the B-aquifer and F-WBZ and use current ecological risk assessment methods and criteria to assess potential impacts to Bay receptors. Where warranted, additional actions or changes to the remedy will be recommended at the conclusion of these investigations. Milestone Date: 7/31/2029 Interim Milestones: Completion of F-WBZ investigation fieldwork 11/30/2025, completion of the F-WBZ investigation report 11/30/2026[1] Affects Protectiveness: Protectiveness Deferred

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			Footnote: [1] The Parcel C B-aquifer study will also be conducted within the overall timeframe to meet the milestone date; however, because funding and contracts are not currently in place, the interim milestones are unavailable. Note that additional revisions in the response above were made in blue font based on EPA's additional response (See EPA Comment #2).
3	General	**Comment 3a**: We do not agree with the Navy's protectiveness determination for Parcel E-2. The Regional Water Board's preliminary protectiveness determination for Parcel E-2 is "Protectiveness Deferred" because the remedy components were not implemented (turbidity curtain) or constructed as designed (Upland Slurry Wall). There are data gaps regarding lead contamination within the wetland, concerns regarding stormwater management practices during construction, questions regarding management of hazardous waste piles, and ongoing concerns regarding the management and monitoring of methane in soil gas at Parcel E-2. **Comment 3b:** A protectiveness determination of the remedy at Parcel E-2 cannot be made at this time until further information is obtained. Further information and data should include: • Obtaining as-built design drawings for the Upland Slurry Wall signed and stamped by a registered professional civil engineer in California. • Monitoring water levels and collecting analytical data to demonstrate the Upland Slurry Wall is functioning as designed. • Collection of soil samples in the vicinity of Resource Conservation and Recovery Act (RCRA) hazardous waste piles. • Collection of soil/groundwater samples within the wetland to demonstrate that lead has been adequately remediated. • Provide a revised compliance monitoring and mitigation plan for methane at the landfill.	Because the Remedy at Parcel E-2 is currently under construction the Navy's protectiveness determination is "Will be Protective". The construction has prioritized components to address potential migration to the Bay first with the following components completed: • Hot spot removal, Nearshore slurry wall, Shoreline revetment • Soil excavation to create freshwater and tidal wetlands • Radiological characterization, installation of foundation soil layer in preparation of Phase III landfill cover installation • Final cover installation Because the remedy is complex and requires multiple phases for installation over a longer timeframe, the Navy has identified the following additional Other Findings (new section 6.6.1.5 and in the Five-Year Review Summary Table under Other Findings) to document the Navy's commitment to continue to construct the remedy as well as analyze currently available data in a timely manner on a schedule agreed to among the FFA parties for the remedy components that are in place. As discussed at the April 24, 2024 meeting, the specific minimum information and analysis needs of the FFA Regulatory Parties, including a detailed status of all wells, are forthcoming in a tri-agency letter, after which the FFA parties will meet to discuss specific tasks and schedules. As discussed informally and in EPA's comments, the Navy recognizes that EPA expects the Navy will immediately begin to evaluate the effect the landfill cap and slurry walls have on groundwater flow and contaminant concentration within the landfill, and potential impact on the San Francisco Bay:

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		• Provide full records for stormwater best management practices for the duration of the implementation phases for the remedy at Parcel E-2. These actions should be prioritized by the FFA Remedial Project Managers and/or based on imminent exposure threats. Our expectation is that the Draft-Final Five- Year Review will include a commitment to developing the appropriate primary documents to address these concerns and include implementation timelines that are agreeable to the FFA signatories. The Draft Five-Year Review does not adequately reflect the Regulatory Agencies' comments and concerns regarding the status of the remedy for Parcel E-2. The remedy at Parcel E-2 includes soil excavation, installation of a durable cover, installation of belowground barriers, landfill gas monitoring, collection, and treatment, long-term monitoring of groundwater, radiological screening and remediation, and institutional controls. The Navy's "Will be Protective" determination for Parcel E-2 is not supported due to concern regarding remedy implementation and site characterization, as documented in the following Regulatory Agencies' correspondence: Regional Water Board Letter dated March 6, 2023, Regional Water Board Letter dated August 7, 2020, Regional Water Board Letter dated December 15, 2020, Joint-Agency Letter dated March 16, 2021, Joint-Agency Letter dated April 28, 2021, Tri-Agency Letter dated May 5, 2022, Regional Water Board Letter dated August 17, 2022, Tri-Agency Letter dated December 8, 2022, Regional Water Board Letter dated December 13, 2022, and Joint-Agency Letter (USEPA) dated July 18, 2023. Although it is understood that the remedy has not been fully implemented, the Navy has not addressed Regulatory Agencies' concerns regarding: lack of deployment of turbidity curtain during construction, stormwater best management practices/records keeping, Upland Slurry Wall not implemented as designed, request for as-built designs for changes to the Upland Slurry Wall, methane	***6.6.1.5 Parcel E-2 Other Findings*** The remedy at Parcel E-2 is complex and involves multiple phases of field work to install. A number of facilities that are important to understanding groundwater flow and contaminant concentrations have been completed or are substantially completed (for example, Nearshore Slurry Wall and landfill cover). The following is a summary of the remaining RA work, interim studies, and key milestones planned prior to completing the RACR: • Construct remaining components of the remedy including the permanent landfill gas system, freshwater and tidal wetlands, and groundwater monitoring network under the approved Final Work Plan (KEMRON, 2018): - Landfill Gas System (Phase IVa) anticipated in 11/30/2025 - Wetlands (Phase IVb) anticipated in 11/30/2027 • Modify the landfill gas monitoring program to include a monitoring probe (GMP54) outside of the newly installed landfill cover as a new compliance point by revising the appropriate primary document(s). The primary document(s) needing revision and the proposed schedule for revision will be further discussed with the FFA Regulatory Parties not later than 9/30/2024. • Document completion of the protective liner and final cover installation in the Phase III Remedial Action Construction Summary Report anticipated by 11/30/2024. • Conduct a study to evaluate the performance of the upland slurry wall as documented in the Post-Remedial Action Performance Evaluation Work Plan to evaluate the performance of the Upland Slurry Wall – Final 8/31/2024. Fieldwork is anticipated to be completed in 2024 and the Post-Construction Remedial Action Performance Report is anticipated by 12/31/2024. Water Board specific concerns and responses were added to the technical assessment for Parcel E-2 (Section 6.5.1, page 6-20 and 6-21) as follows: While the remedy is currently under construction, Agency concerns have been raised regarding the completed components:

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		mitigation and monitoring within the landfill, potential lead contamination in the wetlands, potential impacts to soil due to RCRA hazardous waste handling. **Additional Comments Received 6/4/2024** **Regional Water Board Response 3a:** We disagree with the rationale for the Navy's protectiveness determination based on the completion of several remedy components that can be monitored for effectiveness/protectiveness. As described in the original Comment 3a, we have outlined the necessary data and information that can be collected to address longstanding agency concerns about the completed remedies. We acknowledge that the Navy has agreed to address the following issues: collection of soil samples near Resource Conservation and Recovery Act (RCRA) hazardous waste piles and provide an addendum to the compliance monitoring and mitigation plan for methane at the landfill. However, several outstanding concerns have not been addressed by the RTCs as described in our Responses 3b to 3e below. **Regional Water Board Response 3b:** Based on our understanding of the scope of work for the work plan to evaluate USW performance, the water level and analytical data to demonstrate USW is functioning as designed have not been included as requested by regulatory agencies. We have reiterated the importance of the data for evaluation of potential discharges using existing monitoring wells and have not received an adequate rationale for omitting this from forthcoming field investigations. Therefore, we cannot concur that the remedy "Will be Protective" because the necessary data to show remedy effectiveness/protectiveness is not being collected. **Regional Water Board Response 3c:** The Navy references the turbidity curtain installed as part of the Phase II remedial action. However, as described in Specific Comment 19, our concerns are related to the 2018 Remedial Action Work Plan (RAWP), which covers activities of the Phase III remedial action and also required installation of a turbidity curtain. The RTC does not adequately address our comment	• **Concern: The Upland Slurry Wall was not installed as designed**. Geologic refusal was met along a 200-foot section of the planned wall at approximately 0 feet msl (10 feet shallower than the designed depth). The slurry wall was designed to minimize flow of offsite groundwater into the landfill and was designed as a "hanging wall" (not embedded into bedrock) with a french drain (which was installed according to the design) to prevent precipitation recharge and divert flow to the freshwater wetland. The material encountered was determined to be bedrock which has a lower permeability than the surrounding aquifer material. The draft final work plan to evaluate the Upland Slurry Wall performance is currently under way and work is anticipated to begin in 2025. • **Concern: The turbidity curtain was not used during remedy construction.** A 2,000-foot US Department of Transportation Type III offshore turbidity curtain was installed during shoreline work in accordance with the Design (ERRG, 2014) on November 30, 2016 as documented in the Phase II Remedial Action Construction Summary Report (Aptim, 2021). The turbidity curtain was removed after shoreline activities were completed, in accordance with the RAWP Appendix D, Environmental Protection Plan (CB&I, 2016) which states "During shoreline earthwork (revetment installation, wetlands excavation, and site grading), a turbidity curtain will be deployed as the BMP for sediment control." Upcoming nearshore work, such as wetland installation, will be conducted in accordance with the design and RAWP. • **Concern: The Navy has not provided all stormwater best practices documentation.** Navy provided the following final primary documents that contain stormwater best practices: Remedial Action Work Plans (RAWPs) (CB&I, 2016; KEMRON, 2018); Stormwater Protection Plan; and stormwater best practices monitoring documentation during construction (provided in the Phase I RACR [Gilbane, 2018a] and Phase II RACSR [APTIM, 2021], which will also be provided in the forthcoming Phase III RACSR [pending]). The Navy also responded to the Water Board's December 3, 2022, January 11, 2023, and May 23, 2023 follow-up e-mail requests for stormwater records.

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		and we find that a "Protectiveness Deferred" designation is more appropriate until the Navy can assure regulatory agencies that future work will comply with the site-specific Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) Stormwater Plans. **Regional Water Board Response 3d:** The RTC references Water Board correspondences from December 2022 and January 2023. As discussed in the May 2025 meetings, this does not represent the most recent correspondence and discussions regarding these concerns. On May 11, 2023, the Navy and regulatory agencies met to discuss unresolved issues with the records provided. Our concerns about significant lapses in the submitted best management practices (BMP) Inspection Reports were not addressed and the Navy contractor indicated they would submit additional documentation. We followed up with a May 23, 2023, email requesting the additional records and received no acknowledgement or response from the Navy nor its contractors. "Protectiveness Deferred" is consistent with our assessment that the previous five-year period showed inadequate documentation of stormwater BMPs and the CERCLA Stormwater Plans compliance. **Regional Water Board Response 3e:** We maintain that lead-contaminated soil was not adequately characterized or removed during the over-excavations documented in Fieldwork Variance #5 (Appendix G of Phase 2 Remedial Action Construction Summary Report, RACSR). See Attachment 2 from the August 7, 2020, Water Board letter for unresolved concerns about the lead RG exceedances that appear to have been left-in-place. As described in follow on correspondences listed in General Comment 3, the collection of soil/groundwater samples is needed to evaluate whether remediation was adequately completed, and we cannot concur with the "Will be Protective" determination until there is commitment from the Navy to provide this data.	• **Concern: There is not adequate documentation that lead was removed from the wetland areas and groundwater may be affected in the future.** Lead was removed from the tidal wetland areas according to the Phase II RAWP (KEMRON, 2018) and subsequent Fieldwork Variance #5 (Appendix G of APTIM, 2021). Exceedances shown on Figures 6 and 7 of the RACSR (APTIM, 2021) were initial samples prior to over-excavation to remove lead-impacted soils. Post-over-excavation samples were found to be below the RG. Additionally, the landfill cap geomembrane and geosynthetic clay liner layers prevent vertical infiltration of rainfall from reaching the underlying landfill waste and promoting leachate. The geocomposite drainage layer carries any flow that infiltrates through the vegetative layer to the perimeter ditches. The surface water from the eastern half of the site will be collected by the eastern perimeter ditch and will drain directly into the Bay through the culvert pipe at the southeast corner of the site. The surface water from the western half of the site will be collected by the western perimeter ditch and will flow into the freshwater wetlands with excess runoff draining through the freshwater wetlands outfall pipe into the Bay. The chemically contaminated soils near the freshwater wetlands were removed during previous hot spot excavations and excavations during Phase II subgrade preparations, with confirmation testing to show that they are below action limits in the Final RACSR for copper, lead, total PCBs, and total TPHs. There is no required tie into the underlying Bay Mud at the Wetlands Boundary. Refer to Detail 4 on Design Drawing C18 from the DBR for the cover termination at the wetlands boundaries. • **Concern: There may be impacts to soil due to RCRA hazardous waste handling in stockpiles during remedy installation**: Navy is planning, at agencies' request, to sample the soil under former Parcel E-2 stockpile locations now covered with radiological retesting radiological screening yard pads for metals to confirm that the stockpiles didn't impact the soils around them during storm events. This will be completed after the pads are removed.

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			References: Engineering/Remediation Resources Group, Inc. (ERRG). 2014. Design Basis Report, Parcel E-2, Hunters Point Naval Shipyard, San Francisco, California. Final. August 15. CB&I Federal Services, LLC. (CB&I). 2016. Work Plan Shoreline Revetment; Site Grading and Consolidation of Excavated Soil, Sediment, and Debris; and Upland Slurry Wall Installation Remedial Action, Parcel E-2, Hunters Point Naval Shipyard, San Francisco, California. Final. October 12. KEMRON Environmental Services (KEMRON). 2018. Remedial Action Work Plan, Final Cove, Wetlands, and Landfill Gas Control and Containment System, Remedial Action Parcel E-2, Hunters Point Naval Shipyard, San Francisco, California. Final. December 26. Gilbane. 2018. Remedial Action Completion Report, Hot Spot Delineation and Excavation and Nearshore Slurry Wall Installation, Remedial Action, Parcel E-2, Hunters Point Naval Shipyard, San Francisco, California. June. APTIM. 2021. Remedial Action Construction Summary Report, Parcel E-2 (Phase II), Hunters Point Naval Shipyard, CA. April 6 **Response to Additional Comment:** **Response to 3a:** The Navy acknowledges that an agreement cannot be reached regarding the Will Be Protective determination for Parcel E-2 prior to the Five-Year Review signature date; the Navy feels that a Will Be Protective determination is the appropriate protectiveness determination for Parcel E-2. **Response to 3b:** The water level and analytical data requested during agency review is now included in the scope of work for the USW performance work plan. **Response to 3c:** Text has been added that the upcoming nearshore work will be conducted in accordance with the design and RAWP. **Response to 3d:** The Navy has provided the requested documentation since receiving the follow up comments. The reference to the May 23, 2023 letter was added above. **Response to 3e:** The Navy maintains that the lead removal action was conducted in accordance with the RAWP as described in the response above.

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			Note that revisions in the response above were made in blue font based on these and EPA's Additional Response received 6/5/2024 (See EPA Comment #3).
4	General	**Comment 4**: The Draft Five-Year Review does not adequately support the parcel specific protectiveness determinations with respect to the presence of PFAS, a class of chemical compounds that are considered emerging contaminants. The Navy must provide sufficient additional details to demonstrate that the protectiveness determinations are appropriate for each parcel. Otherwise, the determination should be "Protectiveness Deferred" with respect to PFAS. It is understood that PFAS investigations are ongoing. However, the findings in the Site Inspection for Basewide Investigation of Per- and Polyfluoroalkyl Substances (Liberty 2023) determined that a remedial investigation is necessary for all parcels for both soil and groundwater, therefore the extent of PFAS contamination is currently unknown. These concerns apply to: IR Site 07/18, Parcel B-1, Parcel B-2, Parcel C, Parcel UC-2, Parcel D-1, Parcel D-2, Parcel UC-1, Parcel G, Parcel E, Parcel E-2, and Parcel UC-3. The Navy must provide additional justification for their responses to protectiveness Questions A, B, and C (USEPA 2001 and 2012) with data and information that can demonstrate that remedies that were not specifically designed to prevent exposures to PFAS contamination are protective of human health and the environment. Additional supporting information could include but is not limited to exposure assumptions for PFAS, a discussion of remedy design features that can/will prevent exposures to PFAS, and figures showing the distribution of PFAS concentrations in context of remedy boundaries. **Additional Comment Received 6/4/2024** **Regional Water Board Response 4a:** The lines of evidence provided supporting no imminent CERCLA-related risk are insufficient.	The incorporation and evaluation of PFAS in the HPNS FYR was conducted in accordance with Navy policy and guidance. The Navy Policy for Conducting Five Year Reviews (dated June 2011), under Section 5.5 Five Year Review Technical Assessment, Item (d)ii, states, *"Emerging contaminants which have not been previously investigated will only be assessed if (1) the contaminant is known or suspected due to site history, (2) peer reviewed toxicity criteria that can be used for risk assessment have been published, and (3) the contaminant may call into question the protectiveness of either the remedy or the RAOs."* Current Navy Guidance states that an emerging contaminant (EC) should only affect a protectiveness determination if the EC is present at a concentration posing a potential unacceptable risk at the site AND the existing remedy does not address the current or future exposure to the emerging contaminant. As the PFAS remedial investigation (RI) has not been initiated to confirm whether there is unacceptable CERCLA risk to human and/or ecological receptors from PFAS at HPNS, it is not appropriate yet to evaluate if the existing remedy remains protective. Once the RI human health and ecological risk assessment is completed, the Navy will evaluate any identified PFAS CERCLA risk in the context of the existing site remedies. For a Protectiveness Deferred determination, Navy guidance is that the teams should determine if there is sufficient information to conclude that all human and ecological risks are currently under control and no unacceptable exposures are occurring. The Draft Five-Year Review presents lines of evidence supporting that any potential exposure pathways to PFAS contaminants likely do not pose an imminent risk based on the current remedies in place including ICs for soil and groundwater that are in place throughout all parcels. These lines of evidence are summarized below:

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		Therefore, our protectiveness determination with respect to PFAS is "Protectiveness Deferred" Basewide. The Regional Water Board has not provided a Basewide exemption for groundwater as a drinking water source, while groundwater at or near the site is not currently used as a drinking water source (i.e., for comparison to the USEPA National Drinking Water Regulations (NDWR) for six primary PFAS compounds), risk for ecological receptors and therefore, recreational users, to PFAS in contaminated surface water and groundwater is not accounted for or established in this response. The Argonne ecological screening values provided are on the order of a wide range, up to over three orders of magnitude for perfluorooctanoic acid (PFOA). These values also do not represent established site-specific risk criteria as agreed to by the Federal Facility Agreement parties. Further, there is no evidence that the durable covers currently in-place can prevent PFAS from leaching from soil to groundwater or surface water at the site, which is a potential migration pathway. Considering the highly mobile nature of PFAS compounds, these pathways likely result in PFAS discharge to Bay waters and exposure to offshore receptors. The risk for exposure to these receptors has yet to be addressed by site remedies and demonstrate that protectiveness with regard to site PFAS has not been established. **Regional Water Board Response 4b:** The response that the properties of the near-shore slurry wall at Parcel E-2 (i.e. a cement-bentonite mixture) are capable of inhibiting PFAS transport in groundwater, and groundwater to surface water, is not informed nor substantiated. PFOA detected in groundwater upgradient of this location (i.e. 18 micrograms per liter at IR01MW60A) is multiple orders of magnitude more than its NDWR of 4 nanograms per liter. This indicates that there is a significant PFAS plume present within groundwater at Parcel E-2. No data was provided to support that this site remedy, which was not designed to mitigate PFAS releases in groundwater, is able to prevent a PFAS plume of this magnitude from migrating in groundwater.	• As presented in Section 1.3.4.3, groundwater within the A-aquifer (and portions of the B-aquifer within Parcel C) is unsuitable for drinking water. Additionally, the City and County of San Francisco prohibits installation of domestic wells within city and county limits. • For soil, the Navy maintains durable covers and implements ICs to restrict human and terrestrial ecological receptor exposure to soil throughout all parcels at HPNS. The following text has been added to Section 1.4.1: Regarding the potential pathway of groundwater discharge to surface water and exposure to aquatic receptors in the bay, the Navy's CERCLA PFAS SI data and existing site remedies were evaluated by the Navy. The following information and data support there is likely no imminent CERCLA risk: • The highest PFAS concentrations were detected in wells in Parcel E-2 (including PFOA at 18 µg/L). This specific location is upgradient to the nearshore slurry wall and the slurry wall is designed to inhibit migration of COCs in groundwater to the bay. The cement-bentonite mixture is expected to inhibit PFAS based on how they inhibit VOCs. • The PFAS detections in other identified near shore perimeter groundwater wells across HPNS were 1 to 2 orders of magnitude lower than the highest concentration at Parcel E-2, the PFAS SI results at these wells ranged from 0.14 µg/L to a maximum concentration of 3.2 µg/L (PFOS). • Published ecological screening values for aquatic receptors (Argonne, 2021) are: - PFOS: 0.117 to 22.6 µg/L - PFOA: 6.12 to 1,580 µg/L In summary, based on the above lines of evidence, there is no known imminent risk from PFAS to human or ecological receptors at HPNS. In addition, parcel-specific discussions as Other Findings in Sections 3 through 6 present individual areas that were identified for further investigation under

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		PFAS compounds are known to be considerably more mobile and pervasive compared to VOCs, so it is unclear how this remedy can inhibit this contamination. PFAS compounds are also considerably more toxic at minor concentrations compared to VOCs (e.g. compared to tetrachloroethene federal maximum contaminant level of 5 micrograms per liter), so it should be expected that PFAS are more difficult to contain with the same remedy. In addition, it is also unclear how the physical extent of the remedy (i.e. depth and lateral extent) was designed to mitigate this high concentration PFAS plume. Further, no downgradient data, either in surface water or groundwater, exist to support that this remedy is currently functioning to inhibit PFAS migration. **Regional Water Board Response 4c:** Based on the information provided above, we disagree with the rationale for the Navy's protectiveness determination with respect to PFAS. As stated in USEPA's April 3, 2024, RPM Bulletin 2024-01 (Considerations When Reviewing PFAS in Five-Year Reviews): To build a case to support the analysis of whether the newly identified contaminants could impact the protectiveness of the existing remedy, the FYR should incorporate what is known and not known about the contamination, and whether existing remedies may fully or partially mitigate risks. Because there is insufficient data available at this time, prior to the initiation of the remedial investigation, a Protectiveness Deferred determination should be assigned with respect to site PFAS. Further, the June 2011 Navy policy which was provided does not substantiate the statement in the response that "an emerging contaminant should only affect a protectiveness determination if the emerging contaminant is present at a concentration posing a potential unacceptable risk at the site and the existing remedy does not address the current or future exposure to the emerging contaminant." The June 2011 policy only refers to investigation of the emerging contaminant itself and does not reference initiation of remedial	the SI, based on historical site use or data collected during previous investigations. Reference: Argonne National Laboratory (Argonne). 2021. Derivation of PFAS Ecological Screening Values. Environmental Science Division, Argonne National Laboratory. Completed under interagency agreement between the U.S. Department of Energy (DOE), Argonne National Laboratory (Argonne), and AFCEC. Final. September. https://www.denix.osd.mil/dodepa/denix-files/sites/85/2022/10/Final-PFAS-ESV-Report_Sept-2021_508.pdf **Response to Additional Comments:** The lines of evidence provided were assessed by the Navy to determine if there is a potential imminent CERCLA risk from PFAS that would require an action other than proceeding with the CERCLA process, which is completion of the Basewide PFAS Remedial Investigation (RI) to determine if there are CERCLA PFAS risks present at HPNS. The Navy reiterates our FYR policy and guidance, which discusses that it is generally not appropriate to assess remedy protectiveness from an emerging or new contaminate until a CERCLA risk for that contaminant is established, at which point, an evaluation of the existing remedies can be assessed. If at any time during the CERCLA process, the Navy finds evidence or data to suggest that an imminent human health or ecological risk exists at the sites, the Navy will take appropriate actions. However, the data and site knowledge, at this time, does not indicate any imminent risk from PFAS at HPNS. The HPNS PFAS RI is planned for award this fiscal year. The PFAS RI will further investigate several of the points identified by the Waterboard including migration pathways, mobility of PFAS, and completion of a risk assessment for ecological receptors and recreational users in surface water and groundwater. The Argonne PFAS ecological screening values (ESVs) are provided for information and will be utilized during the RI as an initial screening level criteria only. If deemed necessary, site-specific ecological risk criteria will be established in agreement with the FFA parties as stated by the Waterboard. The discussion of the existing Parcel E-2 remedy components and durable

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		investigations precluding assignment of protectiveness determinations. Rather, this policy states the investigation of an emerging contaminant should proceed based on whether "the contaminant may call into question the protectiveness of either the remedy or the RAOs." Therefore, our protectiveness determination with respect to PFAS is "Protectiveness Deferred" Basewide	covers with respect to the PFAS SI findings was only to identify that there are existing remedies in place where there is PFAS contamination identified. The site-specific analysis will be conducted as part of the RI. Therefore, the Navy respectfully disagrees with the Waterboards determination that a "Protectiveness Deferred" determination basewide for PFAS is required at this time. Continuing the CERCLA process for PFAS at HPNS is appropriate and protectiveness will be assessed once the PFAS CERCLA risk assessment is complete. **Additional Response based on Water Board New Comment #1 Below. Included in this Comment Response for completeness:** Figures from the SI for each Parcel have been added as Appendix G and referenced in respective Other Findings sections. The following text was also added to the Other Findings section of the Five-Year Review Summary Form: **Per- and Polyfluoroalkyl Substances** The Navy is in the process of investigating per- and polyfluroalkyl substances (PFAS) from historical use of PFAS-containing materials. Potential exposure pathways are under control through existing remedy components (institutional controls and durable covers) and data indicate that there is likely no imminent CERCLA risk while PFAS are investigated under the CERCLA process. The following areas are under investigation for PFAS: • Parcels B-1, B-2, C, D-1, G, E, and E-2: A-aquifer groundwater • Parcel B-1: IR-10 (Battery and Metal Plating Shop) • Parcel C: Building 215, Fire Station • Parcel D-1: Poseidon Area (Buildings 377, 384, 385, and 387), IR-69 (Bilge Water Pump House), and IR-70 (Former drum and tank storage area) • Parcel G: IR-09 (Pickling and Plating Yard)

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			Key PFAS investigation milestones include: • Final Basewide Remedial Investigation (RI) Work Plan – 4/30/2025 • RI Fieldwork – Spring/Summer 2025 • Final Basewide RI Report – 8/31/2026
5	General	**Comment 5a**: With respect to protectiveness determinations, additional justification/evaluations for climate vulnerability should be presented in the Draft- Final Five-Year Review. Media of concern and associated exposure assumptions should be considered in the context of existing Institutional Controls and Engineering Controls or other remedy components to support the Navy's protectiveness statements. Otherwise, a "Protectiveness Deferred" determination may be most appropriate in the context of climate vulnerability. **Comment 5b:** There is an urgency to conduct parcel-specific climate vulnerability assessments at all parcels as soon as practical, with a prioritization of Parcel D-1, Parcel E, and Parcel E-2. The Draft Five-Year Review does not adequately support the parcel specific protectiveness determinations with respect to the findings in the Climate Resilience Assessment (CRA), Appendix A, and the site-specific data and information collected during the reporting period. The CRA is a screening-level assessment of climate-related hazards, their potential impacts, and whether vulnerabilities were identified that may impact the protectiveness of the remedies at HPNS. We acknowledge that this CRA is a screening or baseline assessment, but additional parcel-specific evaluation is required. Examples of the urgency for additional work include but are not limited to: • Transient inundation is likely to occur within the next 11 years at Parcel D-1, Parcel E, and Parcel E-2. • 11 years may not leave adequate time for planning if remedies require modifications to become or remain protective.	***General Response Regarding the Climate Resilience Assessment*** *Note that several changes were made to the CRA based on Agency, City of San Francisco and Public comments. Specific changes that address comments are provided in the responses below and additional changes can be reviewed in the Redline-Strike-out provided in the draft-final Five-Year Review.* The Navy Framework for CRA (2024) recommends that climate impacts on protectiveness determinations can be better evaluated with detailed site-specific studies have been conducted to verify projected impacts and vulnerabilities identified in the screening level CRA. As plans for these site-specific studies are developed, the agencies will have the opportunity to provide input. A prioritization meeting with the Navy and Agencies is proposed for November 2024. The following text has been added to the Other Findings for respective parcels (3.6.1.2, 4.6.1.2, 5.6.1.2, 6.6.1.2): The CRA estimates that groundwater emergence may occur in [IR-07/18, Parcel B-1, B-2, C, D-1, E, and E-2 wetland areas] by the year 2065. Additional site-specific assessments are planned which will include verifying mapping projections and evaluating the 2100 timeframe, at a minimum. However, protectiveness is only affected when increased CERCLA risk attributable to climate hazards has been identified (groundwater is likely to emerge and land use is such that receptors could be exposed and a future unacceptable health or ecological risk has been identified (data collected, validated, and evaluated following CERCLA risk assessment processes resulting in unacceptable risk to receptors). Where the potential for increased vapor intrusion is identified in other CERCLA documents, ARICs for VOCs are present, groundwater is being monitored, and removal of VOCs is occurring either through MNA or active remediation, thus reducing the potential for future

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		• As documented in Regional Water Board (M. Snow) email dated January 30, 2024, flooding/standing water observed January 23, 2024, at Parcel E may demonstrate that transient inundation predictions for 2035 are not conservative enough. • Observance of "sinkholes" attributed to tidal waters and subsidence near Buildings 205, 207, and 208 at Parcel C. • COCs and chemicals of potential concern (COPCs) in soil not currently saturated may be subject to mobilization with a small rise in groundwater elevation. Parcel-specific assessments should be conducted at all parcels. These concerns apply to: IR Site 07/18, Parcel B-1, Parcel B-2, Parcel C, Parcel UC-2, Parcel D-1, Parcel D-2, Parcel UC-1, Parcel G, Parcel E, Parcel E-2, and UC-3. However, Parcel D-1, Parcel E, and Parcel E-2 should be prioritized. **Additional Comment Received 6/4/2024** **Regional Water Board Response 5:** The Water Board generally concurs with these recommendations; however, we request the following response be addressed. Describe why Parcel UC-1, Parcel UC-2, Parcel UC-3, and Parcel D-2 were not included in the list of site-specific studies to address climate vulnerability. It is our understanding that while these parcels have less prioritization compared to other, more vulnerable site locations, they are still susceptible to climate vulnerability (e.g. transient inundation, groundwater rise, etc.) and should also be included for site-specific evaluations. Additionally, Site-specific climate vulnerability sturdies[sic] should be discussed in and presented on in parcel specific sections and tables for "Issues, Recommendations, and Follow-up Actions."	vapor intrusion by reducing the source. Therefore, the potential for groundwater emergence does not affect the protectiveness determination in this Five-Year Review. For Parcel E-2, the following text has been added: Although the Parcel E-2 remedy components such as the sea wall were designed for resilience through a 3-foot rise in sea level (similar to the 2065 scenario), a site-specific study is recommended to evaluate the longer-term scenarios such as 2100. The following text has been added to Other Findings for Parcel D-1: The CRA estimates that groundwater emergence may occur in Parcel D-1 by the year 2035. Additional site-specific assessments are planned which will include verifying mapping projections and evaluating the 2100 timeframe, at a minimum. Parcel D-1 will be prioritized and is scheduled to be initiated in 2025. The Water Board's concerns have been noted and will be considered in preparation for the site-specific studies. The Navy plans to conduct these studies at all parcels that are anticipated to be affected by SLR which includes: IR Site 07/18, Parcel B-1, Parcel B-2, Parcel C, Parcel D-1, Parcel G, Parcel E, and Parcel E-2. **Response to Additional Comment:** Parcel UC-3 was included in the CRA. Parcel UC-1, UC-2, and Parcel D-2 were not initially included in the CRA because the parcels had been transferred, however they were added into the Draft-Final CRA. The only impacts identified were minor flooding along the borders during a storm surge in 2065 at Parcels UC-1, UC-2, and D-2. Because the potential for groundwater emergence does not affect the protectiveness determination in this Five-Year Review (see above), the Other Findings sections of the Five-Year Review Summary Form and respective parcels are used to document matters that the BCT/FFA parties have determined are important to track. Changes based on this and comments made by DTSC are added above in Blue font. In addition to the changes listed

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			above for each respective parcel, the following changes have been made to the Other Findings section of the Five-Year Review Summary Form: **Climate Change** The Navy recognizes climate change is occurring and based on a screening level Climate Resilience Assessment (CRA) (**Appendix A**), sea level rise (SLR) is the major variable of climate change that could affect the remedies at HPNS. The CRA estimates that groundwater emergence may occur in Parcel D-1 by the year 2035 and in IR-07/18, Parcel B-1, B-2, C, D-1, E, and E-2 wetland areas by the year 2065. However, protectiveness is only affected when increased CERCLA risk attributable to climate hazards has been identified (groundwater is likely to emerge and land use is such that receptors could be exposed and a future unacceptable health or ecological risk has been identified (data collected, validated, and evaluated following CERCLA risk assessment processes resulting in unacceptable risk to receptors). Where the potential for increased vapor intrusion is identified in other CERCLA documents, areas requiring institutional controls (ARICs) for VOCs are present, groundwater is being monitored, and removal of VOCs is occurring either through MNA or active remediation, thus reducing the potential for future vapor intrusion by reducing the source. Therefore, the potential for groundwater emergence does not affect the protectiveness determination in this Five-Year Review. Based on the results of the CRA, the Navy will continue to monitor ongoing groundwater concentration and elevation data onsite through the Basewide Groundwater Monitoring Program (BGMP) and evaluate this data as it relates to the effectiveness of site remedies. The Navy will also regularly evaluate nearby tidal gauge data to verify SLR projections. Additional site-specific assessments are planned which will include verifying mapping projections and evaluating the 2100 timeframe. Parcel D-1 will be prioritized and is scheduled to be initiated in 2025. Additional studies are planned for remaining parcels and a meeting with the Navy and Agencies is planned for November 2024 to discuss the scope and priority of these studies as well as preparation of an adaptation plan, or similar document, if the site-specific studies show that CERCLA-type human health or ecological risk attributable to climate change requires adaptative measures.

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			Key climate change milestones include the following: • Scoping and Prioritization Meeting – 11/30/2024 • Initiation of Parcel D-1 Study – Spring 2025
Specific Comments			
1	Five Year Review Summary Form, Page XVII, and Section 1.1 Purpose and Approach, Section 2.1 Site Interviews	Page 1.1 text states, "[T]he Five-Year Review included a document and data review, required visual site inspections, and interviews." **Specific Comment 1**: The Regulatory Agency site inspection was not conducted until after the Draft Five-Year Review was submitted. Also, it is unclear why interviews were limited to Navy contractors and were not conducted with Navy personnel, Regulatory Agencies, local authorities, including San Francisco Department of Public Health (SFDPH), nearest neighbors, and/or community members; this is inconsistent with USEPA guidance (2001). The form should be updated to include January 23, 2024, the date of the Regulatory Agencies' Fifth Five-Year Review site inspection. Justification for why interviews were limited to Navy contractors should be provided. Also, interviews should be conducted with the Navy personnel, Regulatory Agencies, SFDPH, nearest neighbors, and/or community members and provided in the Draft-Final Five-Year Review.	EPA 2001, in Section 3.5.2 states "Interviews should be conducted, if necessary, to provide additional information about a site's status. The scope of interviews should be tailored to the remedy evaluation on a site-specific basis. Those interviewed may include the site manager; site personnel; Federal, State, and Tribal regulatory authorities; local officials; community action groups or associations; residents and businesses located near the site; and other pertinent organizations or individuals." Because the Navy retains control and access to the parcels under this Five-Year Review, the Navy focused interviews on personnel responsible for operating and conducting the remedial action as well as complying with ARICs and other restrictions on Base. While the Navy did not interview all stakeholders, the Navy did provide opportunities for stakeholder input and feedback as summarized below and added to Section 2.5: The following community engagement and opportunities for stakeholder feedback were provided by the Navy: • Meetings with Agencies and SFDPH to review parcel-specific findings and receive preliminary comments and feedback (5 biweekly 2-hour long meetings in February, March, and April) • Providing the Draft Five-Year Review for public inspection and comment from February 7, 2024 to May 7, 2024 • Public outreach to notify the community about the CRA and Five-Year Review: - 1/22/24 – Navy presentation to Hunters Point Shipyard Citizens Advisory Committee

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			- 2/26/24 – Email to Parcel A homeowner/resident points of contact for posting - 2/29/24 – Mailer to approximately 17,000 addresses - 3/1/24 – Outgoing informational message on HPNS Info Line - 3/1/24 – Mailer to approximately 90 community groups and organizations - 3/8/24 – Email to Parcel A homeowner/resident points of contact - 3/25/24 – Navy presentation to Hunters Point Shipyard Citizens Advisory Committee - 3/26/24 – Electronic newsletter to approximately 1,300 addresses - 4/11/24 – Email to Parcel A homeowner/resident points of contact - 3/18/24 – Electronic newsletter to approximately 1,280 addresses - Various meetings and discussions between Michael Pound and Shipyard Trust for the Arts members - Meeting announcement/materials on BRAC website - 4/1/24 – Outgoing information message on HPNS Info Line - 4/17/24 – Electronic newsletter to approximately 1,300 addresses - 4/22/24 – CRA Workshop (posterboards, presentation, and a question-and-answer session) - 4/27/24 to 4/28/24 – HPNS Bus Tours – information provided / questions answered about Five-Year Review and CRA (as appropriate with discussions) - 4/29/24 – Navy presentation to SF Shipyard (Parcel A) homeowners and residents; CRA workshop slide deck was included in presentation materials The January 23, 2024 site inspection with regulatory agencies was added to the Summary Form and Section 2.

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2	Five Year Review Summary Form, Page XVII; Section 1.1 Purpose and Approach, and Section 2.6, Next Five-Year Review	page 1-1 text states, "The triggering action for statutory Five-Year Reviews at HPNS was the date of mobilization for the remedial action (RA) activities at Parcel B, which was July 8, 1998. The triggering action for this Fifth Five-Year Review is the signature of the Fourth Five-Year Review, July 31, 2019 (Navy, 2019)". Section 2.6, page 2-2 text states, "[T]he next Five-Year Review is due to be finalized 5 years from the signature of this Five-Year Review, which is anticipated to be in 2029." **Specific Comment 2**: Per USEPA letter dated November 16, 2023, the Sixth Five- Year Review is due November 8, 2028; therefore, the Draft-Final Five-Year Review should be revised accordingly.	The May 2011 Navy/Marine Corps Policy for Conducting CERCLA Five-Year Reviews establishes subsequent signature dates for Five-Year Reviews as no more than five years from the date of the last signature (Section 5.2a, Navy 2011), therefore the signature date of the Sixth Five-Year Review will be July 31, 2029 (or 5 years from the signature date of this Five-Year Review). Reference: Navy. 2011. *Navy/Marine Corps Policy for Conducting Comprehensive Environmental Response, Compensation, and Liability Act Five-Year Reviews*. June.
3	Section 1.2 Environmental Restoration Program, and Figure 1-2 Installation Restoration Sites	page 1-2 the text states "In most cases, IR sites were identified by a two-digit number (for example, IR-02)," but depicted as single digits on Figure 1-2 for IR sites 1 through 9 instead of 01 through 09. **Specific Comment 3:** For clarity two-digit nomenclature for IR sites 01 through 09 should be used throughout the Five-Year Review. **Additional Comment Received 6/4/2024** **Regional Water Board Response Specific Comment 3:** could not be evaluated without the revisited document.	This change has been made.
4	Section 1.4.1 Per- and Polyfluoroalkyl Substances	page 1-7 text states "Because investigation of PFAS is ongoing and it has not yet been determined whether PFAS pose unacceptable risk that requires RA [Remedial Action], and because a remedy for PFAS has not yet been determined, a protectiveness determination cannot be made." **Specific Comment 4:** This is not consistent with USEPA Guidance (September 2012) regarding protectiveness statements for emerging contaminants. Per USEPA Guidance (September 2012) for emerging contaminants protectiveness is deferred. Unless parcel specific evaluations of existing PFAS concentrations, likely data gaps, media of concern, and exposure assumptions are conducted in the context of existing Institutional Controls, Engineering Controls, or other remedy	Please see response to Water Board Protectiveness Determination Comment #4

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		components to support the Navy's protectiveness statements, then "Deferred Protectiveness" is appropriate for sites with PFAS detections. See Protectiveness Determination Comment 4 above.	
5	Section 1.4.3.1 Progress Since the Fourth Five-Year Review	Discussion in this section was limited to the radiological retesting. **Specific Comment 5**: This section should be consistent with the issues, recommendations, and other findings as presented in the last Five-Year Review and not limited to radiological retesting. The Final Fourth Five-Year Review (2019) "Issues, Recommendation and Other Findings" included the following items: • SVE [soil vapor extraction] implementation in Parcels B-1 and C is reducing source mass, but with limited effectiveness due to diffusion-limited conditions in the subsurface. • The Regulatory Agencies do not agree with the Navy's risk assessment methodology used to reduce the ARICs [areas requiring institutional controls] for VOC [volatile organic compounds] vapors. • The Navy has determined that a significant portion of the radiological survey and remediation work completed to date was not reliable because of manipulation and/or falsification of data by one of its radiological contractors. A long-term protectiveness evaluation of the radiological RGs [remediation goals] has not yet been completed for this fourth Five-Year Review, and it is currently not known if the RAOs for radionuclides have been achieved in Parcels B-1, B-2, C, D-1, D-2, G, E, UC-1, UC-2, and UC-3. Specific updates for the SVE implementation at Parcels B-1 and C, as well as the status of the disagreement regarding the Navy's risk assessment methodology used to reduce the ARICs for VOC vapors from the Fourth Five-Year Review, including milestones and timelines, should be provided in the Draft-Final Fifth Five-Year Review.	The discussion in Section 1.4.3.1 was specific to the radiological issue identified in the previous five-year review because it was a basewide issue. The other parcel-specific issues identified in this comment are addressed in their respective sections. Specific updates for the SVE implementation and the status of the disagreement regarding the Navy's risk assessment methodology used to reduce ARICs for VOC vapors from the Fourth Five-Year Review, including milestones are provided for Parcel B-1 in Table 3-4, Parcel C in Table 4-5, and Parcel D-1 and G in Table 5-5. The status of the disagreement regarding the Navy's risk assessment methodology used to reduce the ARICs for VOC vapors has been updated on Table 3-5 as follows: ~~**Completed September 2023.**~~ **In Progress.** The work plan was finalized in September 2023 and excavation fieldwork is currently underway and will be completed in fall 2024 followed by a year of quarterly soil gas monitoring.

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6	Section 3.4.1.2, 3.4.2.2, 3.4.3.2, 4.4.1.2, 6.4.2.2	Provides information regarding remedy operations and maintenance for the durable covers and monument surveys. **Specific Comment 6a:** The 2023 monument surveys results were not provided, and the frequency of monument surveys is not specified in the Draft Five-Year Review. Provide the 2023 monument survey results in the Draft-Final Five-Year Review. **Specific Comment 6b**: Provide the frequency of the monument surveys by parcel, i.e., IR Site 07/18, Parcel B-1, Parcel B-2, Parcel C, and Parcel E-2. **Specific Comment 6c**: Consider increasing the frequency of monument surveys in support of evaluating impacts on the remedies due to sea level rise/groundwater rise. **Additional Comment Received 6/4/2024** **Regional Water Board Response Specific Comment 6a**: Consider the defining "negligible change" in the text e.g., "negligible change (i.e., less than 0.1 foot)."	**Response to Comment 6a:** Based on the negligible changes in elevation noted during the 2019 and January 2021 survey events, the January 2021 O&M Report recommended monument surveys need not be repeated until 2024-2025. The 2024 O&M report (reporting on inspection year 2023) repeats this recommendation under Section 2.9 Settlement Monument Surveys; therefore, no monuments were surveyed last year (2023). Following this logic, the next round of settlement monument surveys should be scheduled for this year (2024). The text in Section 3.4.1.2, Durable Cover Maintenance (IR-07/18) has been changed as follows: ~~Therefore, the next time Monument 2 will need to be surveyed is 2024. Monument 1 in IR-07/18 will be resurveyed in 2023.~~ Based on the negligible change (less than 0.1 foot) in historical survey monument elevations, the next round of settlement monument surveys will be in 2024. The text in Section 3.4.2.2, Durable Cover Maintenance (Parcel B-1) has been changed as follows: ~~Therefore, the next time Monument SM-1 will need to be surveyed is 2024. Monuments SM-2 and SM-3 will need to be resurveyed in 2023.~~ Based on the negligible change (less than 0.1 foot) in historical survey monument elevations, the next round of settlement monument surveys will be in 2024. The text in Section 3.4.3.2, Durable Cover Maintenance (Parcel B-2) has been changed as follows: ~~Monument SM-4 will be resurveyed in 2023.~~ Based on the negligible change (less than 0.1 foot) in historical survey monument elevations, the next round of settlement monument surveys will be in 2024. **Response to Comment 6b:** O&M plans for Parcels B-1 (Engineering/Remediation Resources Group, Inc. 2016), B-2 (INNOVEX-ERRG Joint Venture 2018), C (Tetra Tech EC, Inc. and Engineering/Remediation Resources Group, Inc. 2017), D-1, (APTIM 2018; 2019), and G (Arcadis U.S., Inc. 2014) and IR-07/18 (Engineering/Remediation Resources Group, Inc. 2012) specify that a survey of settlement monument elevations be performed if a difference in elevation of 0.1 foot or more is observed in survey data obtained

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			during the previous two years. If negligible changes (i.e., less than 0.1 foot) in monument elevation are observed during the two previous years, then the frequency of surveying can be decreased to once every five years. Currently all monuments are surveyed every 5 years based on previous data. **Response to Comment 6C:** The Navy may consider increasing the frequency of monument surveys based on site-specific studies. References: APTIM, 2018, *Final Post-Construction Operation and Maintenance Plan, Remedial Action in Parcel D-1,* Hunters Point Naval Shipyard, San Francisco, California, March. APTIM, 2019, *Final Addendum 01, Post-Construction Operation and Maintenance Plan, Remedial Action in Parcel D-1*, Hunters Point Naval Shipyard, San Francisco, California, July. Arcadis U.S., Inc., 2014, *Final Operation and Maintenance Plan for Parcel G*, Hunters Point Naval Shipyard, San Francisco, California, May 23 Engineering/Remediation Resources Group, Inc., 2012*, Final Operation and Maintenance Plan for Installation Restoration Sites 07 and 18 in Parcel B*, Hunters Point Naval Shipyard, San Francisco, California, October. Engineering/Remediation Resources Group, Inc., 2016, *Final Operation and Maintenance Plan for Parcel B-1,* Hunters Point Naval Shipyard, San Francisco, California, June. Gilbane Federal, 2018, *Final Operation and Maintenance Plan, Remedial Action, Parcel UC-3*, Hunters Point Naval Shipyard, San Francisco, CA, July. INNOVEX-ERRG Joint Venture, 2018*, Final Operation and Maintenance Plan for Parcel B-2*, Hunters Point Naval Shipyard, San Francisco, California, July. Tetra Tech EC, Inc. and Engineering/Remediation Resources Group, Inc., 2017, *Final Operation and Maintenance Plan for the Durable Covers in Parcel C*, Hunters Point Naval Shipyard, San Francisco, California, February. **Response to Additional Comment:** This has been added above in Blue font text and to the respective section in the Draft-Final Five-Year Review.

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7	Section 3.4.1.1 Remedy Implementation	page 3-7 text states "[S]ince at least 2009, concentrations of COCs and ROPCs [radionuclides of potential concern] have remained under their TLs [trigger levels], except for lead in September 2017 and March 2022 (TRWB, 2023). Concentrations of lead exceeded the TL but were within the same order of magnitude as the TL (14.44 µg/L) at two locations (23 and 23.9 µg/L) in March 2022 and were below laboratory detection limits during the September 2022 event (Appendix E, Figure 3-5)." **Specific Comment 7**: The Draft-Final Five-Year Review should provide a discussion of groundwater flow directions and include groundwater flow path depictions on Figure 3-5, and trend analysis for lead concentrations in wells IR07MW24A and IR07MW26A. With the fluctuating lead concentrations in groundwater and the lack of sentinel wells between the elevated concentrations in groundwater and the Bay, it is unclear if the remedy is adequately protective of ecological receptors and that lead is not being discharged to the Bay. **Additional Comment Received 6/4/2024** **Regional Water Board Response Specific Comments 7 and 11:** Response does not address the request with respect to the addition of a discussion of groundwater flow or request for depiction for groundwater flow paths on a figure. These requests will assist the public in understanding the relationship between groundwater, surface water, and contamination at the Parcels.	Because only two exceedances of lead were reported over the last 7 years of semiannual sampling, no additional action is recommended outside of routine monitoring at this time. The following text has been added to the second paragraph of the Groundwater Monitoring subsection of Section 3.4.1.1: …The TL exceedances have been infrequent during monitoring. <u>During the last five years, lead was reported below the TL in April 2019 and September 2020. Lead was below laboratory detection limits in September 2019, May 2020, March 2021, September 2021, and September 2022.</u> Note that the Five-Year Review also references the RAMP protocol when concentrations consistently exceed trigger levels: *However, if concentrations consistently exceed a TL, the Remedial Action Monitoring Plan (RAMP) provides several additional evaluations that may occur, including increasing the frequency of monitoring, monitoring farther downgradient, using site-specific detailed information to more accurately estimate attenuation, or implementing a selected remediation alternative for groundwater treatment (ChaduxTt, 2010).* **<u>Response to Additional Comment:</u>** General groundwater flow direction is discussed in **Section 3.2.1.2, 4.2.1.2, 5.2.1.2,** and **6.2.1.2** for both the A- and B-aquifers. Groundwater flow was not added to the figures to maintain consistency with the BGMP report exceedance figures.
8	Section 3.5.1, Question A: Is the Remedy Functioning as Intended by the Decision Document? and Section 3.5.1.3, Parcel B-2	with respect to IR Site 26, the Navy responded "yes" to Question A. **Specific Comment 8:** A "yes" response is inconsistent with the mercury exceedances in groundwater, as well as not adequately reflecting regulatory comments and concerns since the Forth Five-Year Review. The Draft-Final Fifth Five-Year Review should be revised to respond "No" to Question A. See Protectiveness Determination Comment 1 above. **Additional Comment Received 6/4/2024**	Please see response to Water Board's Protectiveness Determination General Comment #1. The multiple lines of evidence presented in the Five-Year Review suggest the concentrations observed in groundwater are unlikely to exceed 0.6 µg/L in Bay surface water. The Navy recognizes a lack of mercury data at the groundwater-surface water interface, therefore, a definitive "Yes" has been deleted and protectiveness has been changed to "Protectiveness Deferred".

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		Regional Water Board Response Specific Comment 8, 9, and 10: The responses do not adequately address Regional Water Board's concerns, refer to our evaluation of Response to Protectiveness Determination Comment 1 (General) above.	
9	Section 3.5.2	Question B: Are the Exposure Assumptions, Toxicity Data, Cleanup Levels, and Remedial Action Objectives Used at the Time of the Remedy Selection Still Valid? with respect to IR Site 26, the Navy responded "yes" to Question B. **Specific Comment 9**: It is not clear if the cleanup levels associated with mercury in groundwater are still valid. As the Navy has not responded to the Regional Water Board Letter dated March 14, 2022, regarding the development of the 0.6 µg/L as the Parcel B RD trigger level for mercury. The response to Question B may be "no" and the Navy should provide a response to the Regional Water Board's concerns with respect to the mercury trigger level to justify that the RAOs are still valid. See Protectiveness Determination Comment 1 above for additional details. **Additional Comment Received 6/4/2024** **Regional Water Board Response Specific Comment 8, 9, and 10:** The responses do not adequately address Regional Water Board's concerns, refer to our evaluation of Response to Protectiveness Determination Comment 1 (General) above.	The following text was added to Question B, Section 3.5.2.3: There have been no changes in site conditions or exposure parameters or mercury toxicity values that would call into question the selected trigger level of 0.6 µg/L, which is the background concentration of mercury in groundwater. The calculation methods and supporting information for this value are provided in the Estimation of Hunters Point Shipyard Groundwater Ambient Levels Technical Memorandum (PRC, 1996a). The approach to calculate these background ambient levels was agreed upon by the BCT and the use of this value in the ROD was also agreed upon by the BCT. Note that the document calculating background values is available in the administrative record: https://administrative-records.navfac.navy.mil/Public_Documents/SOUTHWEST/HUNTERS_POINT_NS/N00217_005639.PDF
10	Section 3.6 Issues, Recommendations, and Follow-up Actions and Table 3-8 Parcel B Issues, Recommendations, and Follow-up Actions	[This section] provides a summary of the Issues, Recommendations, and Follow-up Actions for Parcel B, including, Parcel B-2 IR Site 26. **Specific Comment 10**: There are outstanding Regulatory Agencies' comments and recommendations related to the remedy at Parcel B-2 IR Site 26 that were not included in this section or on this table, as detailed in the Protectiveness Determination Comment 1 above. The following issues need to be included in this section: 1) Metafix has failed to reduce mercury in groundwater to concentrations below the Parcel B RD trigger level and 2) elevated concentrations of mercury in	Please see response to Water Board's Protectiveness Determination General Comment #1.

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		groundwater are in "sentinel" wells, representing a discharge to the Bay. The recommendations and follow-up actions should include development of a new primary document work plan focused on alternative treatments and treatment methodologies as a priority to mitigate discharge of mercury to the Bay and ensure protectiveness. **Additional Comment Received 6/4/2024** **Regional Water Board Response Specific Comment 8, 9, and 10:** The responses do not adequately address Regional Water Board's concerns, refer to our evaluation of Response to Protectiveness Determination Comment 1 (General) above.	
11	Figure 3-5, Figures 4-4 through 4-7	The figures show exceedances of remediation goals in groundwater. **Specific Comment 11**: The figures showing exceedances of remediation goals in groundwater do not include groundwater flow direction. General groundwater flow direction arrows should be presented on figures that show exceedances of remediation goals for COCs in groundwater. **Additional Comment Received 6/4/2024** **Regional Water Board Response Specific Comments 7 and 11:** Response does not address the request with respect to the addition of a discussion of groundwater flow or request for depiction for groundwater flow paths on a figure. These requests will assist the public in understanding the relationship between groundwater, surface water, and contamination at the Parcels.	Figures showing the exceedances of RGs are consistent with the Final 2023 BGMP report and do not require modification. **Response to Additional Comment:** General groundwater flow direction is discussed in **Section 3.2.1.2, 4.2.1.2, 5.2.1.2,** and **6.2.1.2** for both the A- and B-aquifers. Groundwater flow was not added to the figures to maintain consistency with the BGMP report exceedance figures.
12	Section 4.2.1.1, 5.2.1.2, 6.2.1.1	Geology and Hydrogeology: Sections describe hydrogeologic characteristics including B-Aquifer. **Specific Comment 12**: B-Aquifer groundwater elevations are not provided in these sections. B-Aquifer groundwater elevation ranges should be provided in Section 4.2.1.1, Section 5.2.1.2, and Section 6.2.1.1.	B-Aquifer elevations were added as follows: Section 4.2.1.2 • B-Aquifer: The B-aquifer is present over an area of approximately 22 acres, or about 28 percent of Parcel C, in the east-central area. It is semiconfined by Bay Mud and Sandy Lean Clay (ECC-Insight, 2019). It is not present at Parcel UC-2. Groundwater elevations range from 1 foot below mean sea level (msl) in the eastern portion of Parcel C during spring and summer, to

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			4 to 5 feet above msl in the western portion of the parcel (TRBW, 2023). Groundwater flow is generally to the southeast. Section 5.2.1.2 • B-Aquifer: The B-aquifer consists of small laterally discontinuous permeable sediment lenses of gravel, sand, silty sand, or clayey sand intermingled with aquitard. The largest B-aquifer area is present near the center of the parcel (Parcel G) and is approximately 1,500 feet wide, 1,000 feet long and 20 to 30 feet thick. It is not present in Parcel D-2 and UC-1. Groundwater elevations range from 0 to 2 feet above msl through the majority of Parcel D-1 and the eastern portion of Parcel G, to an elevation of 3 to 4 feet above msl in the western portion of Parcel G (TRBW, 2023). Groundwater flow is generally to the southeast. Section 6.2.1.2 • B-Aquifer: Groundwater flow in the B-aquifer is generally toward the southeast. However, groundwater in Parcel E-2 from the B-aquifer flows west from the Panhandle Area to the adjacent offsite properties to the west (TRWB, 2022). Groundwater elevations range from 0 to 2 feet above msl along the western portion of Parcel E-2 and a maximum of 9 feet above msl in the eastern portion of Parcel E-2. Elevations range from 0 feet above msl in the eastern portion of Parcel E to 5 to 6 feet above msl in the central coastal area of Parcel E (TRBW, 2023). Reference: TRBW. 2023. 2022 Basewide Annual Groundwater Monitoring Report, Hunters Point Naval Shipyard, San Francisco, California. Final. December.
13	Section 4.4.1.1 Remedy implementation, Soil Excavation and Removal	The text discusses changes to the Remedial Action Work Plan (RAWP) based on the findings of Pre-RA investigation. For RU-C1 on page 4-6 the text states "[T]he Navy is evaluating options to treat the DNAPL source area and, subsequently, the associated groundwater plume." And for RU-C2 the text states "The Navy is evaluating a revised approach to achieve soil RAOs and address a potential ongoing source to A-aquifer groundwater (ECC-Insight, 2019)." On page 4-8	Section 4.4.1.1 has been revised to include which documents each respective study will be included in and the estimated schedule. The text has been revised as follows: **RU-C1:** [T]he Navy is evaluating options to treat the DNAPL source area at Building 253 and, subsequently, the associated groundwater plume. This work is anticipated in 2031.

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		for the Soil Vapor Extraction Monitoring the text states "[T]he Navy is in the process of reviewing the strategy for addressing soil gas at all Parcel C areas in conjunction with additional in situ groundwater remediation activities that are ongoing (ECCInsight and CDM Smith, 2019)." **Specific Comment 13**: The text discusses changes to the RAWP based on the findings of Pre-RA investigation but does not provide specificity regarding a timeline for how and when alternatives will be evaluated or provided for review. For clarity, Section 4.4.1.1 should be revised to indicate which documents these evaluations will be presented in and when they will be provided to the Regulatory Agencies for review.	**RU-C2**: The Navy is evaluating a revised approach to achieve soil RAOs and address a potential ongoing source to A-aquifer groundwater (ECC-Insight, 2019). The work plan is anticipated in fall of 2027 and fieldwork is anticipated in late 2027/early 2028. **RU-C4:** The Navy has initiated a study to evaluate the fractured water bearing zone (F-WBZ) in the vicinity of elevated TCE reported during basewide groundwater monitoring. The work plan is anticipated to be final in summer 2024 and fieldwork is anticipated in fall/winter 2024. Page 4-8 for the Soil Vapor Extraction Monitoring: "[T]he Navy is in the process of reviewing the strategy for addressing soil gas at all Parcel C areas in conjunction with additional in situ groundwater remediation activities that are ongoing (ECC-Insight, LLC and CDM Smith, 2019). The work plan for post-remediation soil gas surveys at Parcel C is anticipated for spring 2029, and fieldwork is anticipated in 2029-2030.
14	Section 4.4.1.2 Remedy Operations and Maintenance	as stated on page 4-14, "[A] 7-foot-deep void observed along the pier edge that allowed water to wash in and out with the tide may have contributed to the sinkholes;" a number of "sinkholes" were observed and for some their presence was attributed to tidal action. Additionally, the text states that, "Subsidence was noted near Buildings 205, 207, and 208 between Dry Dock 2 and Dry Dock 3 that required extensive repairs outside of routine O&M, and 100 feet of permanent chain-link fence was installed across Building 208 to secure the end of the pier." **Specific Comment 14**: It does not appear that existing Operations and Maintenance (O&M) methodologies are adequate to address these concerns. The Navy should provide the long-term strategies to address "sinkholes" and subsidence for Parcel C. **Additional Comment Received 6/4/2024** **Regional Water Board Response Specific Comment 14:** The text should be updated to notify the public of the plan and include schedule timeframes for addressing these erosional features.	The Navy acknowledges that shoreline degradation is affecting the integrity of the durable covers and is conducting a shoreline assessment to identify and recommend repairs and/or stabilization of structures and shoreline. Repairs of the larger eroded areas that were identified as being outside of the scope of routine O&M are included in the remedy as a whole; however, at this time, the repairs are being deferred until the radiological retesting has been completed to minimize generating extra waste and maximize efficiency. The use of the term "sinkholes" has been replaced with "subsidence areas" to use more technically accurate language. **Response to Additional Comment:** The following text has been added to the Durable Cover Operations and Maintenance section of Section 4.4.1.2: The Navy is currently conducting a shoreline assessment study to identify and recommend repairs and/or stabilization of structures and shoreline. The results of the study are pending and until results and recommendations are made, the magnitude and timeframe for repair is unknown at this time.

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15	Section 4.5.2 Question B	with respect to Parcel C, the Navy responded "yes" to Question B. **Specific Comment 15**: The response to Question B should be "uncertain" at this time because the connection and communication between hydrogeologic units within Parcel C is not fully understood. See Protectiveness Determination Comment 2 above for additional details. **Additional Comment Received 6/4/2024** **Regional Water Board Response Specific Comment 15:** The response does not address the Regional Water Boards comment; the data gaps will persist until the proposed investigations are complete therefore the response to Question B remains uncertain.	While data in the B-aquifer indicates VOCs are present at higher concentrations than at the time of the ROD, the concentrations reported in the B-Aquifer are lower than concentrations of the same constituents in the A-aquifer at the time of the ROD. The A-aquifer to surface water pathway was evaluated in the Parcel C ROD and concluded that only hexavalent chromium and zinc in groundwater may pose a potential risk to aquatic wildlife. **Response to Additional Comment:** Given that the B-aquifer was not included in the RAOs for Parcel C, this response has been changed to "uncertain" to reflect the data gap and deferred protectiveness determination. The text has been changed as follows: Uncertain. Based on the results of the ARAR evaluation, HHRA analysis, and ERA analysis discussed in the following sections, the exposure assumptions, toxicity data, cleanup levels, and RAOs used at the time of remedy selection are still valid for soil and A-aquifer groundwater. Although there have been some changes to toxicity values and risk assessment methods, these changes do not affect remedy protectiveness for soil and A-aquifer groundwater. However, chemicals were identified in the B-aquifer and F-WBZ groundwater that require additional investigation to determine if the exposure assumptions, toxicity data, cleanup levels, and RAOs at the time of remedy selection remain valid for these groundwater zones.
16	Section 4.6, and Table 4-8	provides a summary of the issues, recommendations, and follow-up actions for Parcel C. **Specific Comment 16**: Radiological retesting should not be the only issue presented in Section 4.6 and on Table 4-8. There are outstanding issues related to the characterization of hydrogeologic units within Parcel C. Further characterization to demonstrate that 1) remedies within the A-aquifer will be remediated by the selected remedy and not recontaminated by COCs within the B-aquifer and/or F-WBZ and 2) unacceptable discharges to the Bay are not and will not occur should be added to the "Issues" for Parcel C. Additionally, successful	Please see response to Water Board's Protectiveness Determination General Comment #2.

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		implementation of the Deep F-WBZ Investigation for Remedial Unit-C4 (RU-C4) and the planned B-Aquifer investigation should be included in the "Follow-up Actions" for Parcel C.	
17	Section 5.4.1.1 Remedy Implementation	page 5-7 text states that, "[T]he Parcel D-1 RAMP (ChaduxTt, 2011a) states that groundwater samples will be collected semiannually until at least two years after property redevelopment to ensure redevelopment activities do not mobilize metals that could migrate into the [B]ay." **Specific Comment 17**: Mobilization of metals should be considered due to potential groundwater rise, and monitoring should be reevaluated in this context for Parcel D-1. Groundwater monitoring for metals at Parcel D-1 should be continued beyond pending redevelopment and evaluated for continued monitoring due to groundwater rise.	Please see response to Water Board's Protectiveness Determination General Comment #5. Changes to monitoring components based on potential climate-related vulnerabilities will be considered during site-specific studies.
18	Section 6.4.2.1 Remedy Implementation - Soil, Sediment, and Debris Excavation, Consolidation, and/or Removal	page 6-13 text states, "[A]s part of the Phase 2 RA, the tidal and freshwater wetland areas were excavated and graded to the subgrade design as specified in the DBR [Design Basis Report] (ERRG, 2014)." **Specific Comment 18:** The full magnitude and extent of crystalline lead oxide and soil contaminated with lead above the hot spot cleanup goal must be addressed with further soil and groundwater sampling. The "white crystalline lead oxide particles" were neither delineated nor removed during construction of the freshwater wetland where it may intersect the Experimental Ship Shielding Range. The description of "crystalline lead oxide particles" encountered during freshwater wetland excavation was removed from the Final Phase II Remedial Action Construction Summary Report; however, that information remains relevant because the vertical extent of lead has not been characterized. The left-in-place lead contamination above the hot spot cleanup goal poses risks to wildlife and may cause lead discharges to the freshwater wetland or the Bay.	Please see response to Water Board's Protectiveness Determination General Comment #3.

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		Additional Comment Received 6/4/2024 **Regional Water Board Response Specific Comment 18, 19, 20, and 21:** The responses do not adequately address Regional Water Board's concerns, refer to our evaluation of Response to Protectiveness Determination Comment 3 (General) above.	
19	Section 6.4.2.1, Table 6-5, Appendix C	summarizes the remedy implementation, expected outcomes, and provides the site inspection details and photos for Parcel E-2. **Specific Comment 19**: Failure to implement portions of the remedy demonstrates that RAOs for ecological receptors have not been met in the short-term and deferred protectiveness is appropriate for Parcel E-2. In accordance with the 2018 RAWP, the Navy committed to installing a turbidity curtain to prevent potential discharges of sediment into the Bay for activities conducted within 250 feet of the shoreline as detailed in Section 11.3, Erosion and Sediment Control Measures, and Appendix E, CERCLA Stormwater Plan (SWP) Section 3.3.1, Non-Stormwater Controls. RAWP construction activities within the tidal influence zone included 1) placement, grading, and compaction of final soil cover and 2) installation of drainage piping features at the freshwater wetlands and near the shoreline retaining wall. A turbidity curtain was not deployed and evidence shows heavily disturbed soils throughout the shoreline area during the rainy season (see Appendix C, Site Inspection and Photograph Logs, Pages C-119 to C-126 – Site inspection photographs). Visibly turbid standing water along the shoreline revetment indicates a discharge of sediments to the Bay. **Additional Comment Received 6/4/2024** **Regional Water Board Response Specific Comment 18, 19, 20, and 21:** The responses do not adequately address Regional Water Board's concerns, refer to our evaluation of Response to Protectiveness Determination Comment 3 (General) above.	Please see response to Water Board's Protectiveness Determination General Comment #3.

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20	Section 6.4.2.1 and Table 6-5.	The text and table provide details regarding the Upland Slurry Wall including RAOs and performance metrics. **Specific Comment 20**: Per Regulatory Agencies' comments, water level and analytical data to demonstrate the Upland Slurry Wall is functioning as designed, as well as engineer certified as-built designs for the Upland Slurry Wall, as modified, need to be provided. The Upland Slurry Wall was not constructed in accordance with the final design and specifications. The unplanned 220-feet long by 10-feet deep gap in the Upland Slurry Wall may result in unintended consequences to the groundwater flow system and thus unacceptable discharges to the freshwater wetlands and the Bay. The Navy has allowed several years of time lapse without adequately showing that unacceptable discharges of leachate generated from groundwater contact with the landfill waste are being mitigated by collecting and analyzing groundwater data from the existing monitoring wells as requested by the Regulatory Agencies. See Protectiveness Determination Comment 3 for additional details. **Additional Comment Received 6/4/2024** **Regional Water Board Response Specific Comment 18, 19, 20, and 21:** The responses do not adequately address Regional Water Board's concerns, refer to our evaluation of Response to Protectiveness Determination Comment 3 (General) above.	Please see response to Water Board's Protectiveness Determination General Comment #3.
21	Section 6.6 Issues, Recommendations, and Follow-up Actions	provides a summary of issues, recommendations, and follow-up actions for Parcel UC-3. **Specific Comment 21:** Issues, recommendations, and follow-up actions should not be limited to Parcel UC-3 as there are outstanding issues for Parcel E-2 as documented in Regulatory Agencies' correspondence. See Protectiveness Determination Comment 3 above for additional details. The following should be added to "Issues" in Section 6.6: turbidity curtain not deployed during construction, stormwater best	Please see response to Water Board's Protectiveness Determination General Comment #3.

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		management practices/records keeping, Upland Slurry Wall not implemented as designed, as-built designs for changes to the Upland Slurry Wall not provided, methane mitigation and monitoring within the landfill, potential lead contamination in the wetlands, potential impacts to soil due to RCRA hazardous waste handling. The following "Recommendations and Follow-up Actions" should be added to Table 6-11: obtain as-built design drawings for the Upland Slurry Wall signed and stamped by a registered professional civil engineer in California, monitor water levels and collect analytical data to demonstrate the Upland Slurry Wall is functioning as designed, collect soil samples in the vicinity of RCRA hazardous waste piles, collect soil/groundwater samples within the wetland to demonstrate that lead has been adequately remediated, revise compliance monitoring and mitigation plan for methane at the landfill, and provide full records for stormwater best management practices for the duration of the implementation phases for the remedy at Parcel E-2. **Additional Comment Received 6/4/2024** **Regional Water Board Response Specific Comment 18, 19, 20, and 21:** The responses do not adequately address Regional Water Board's concerns, refer to our evaluation of Response to Protectiveness Determination Comment 3 (General) above.	
22	Appendix A, Section 1.0 Introduction	The Navy used the Department of Defense Regional Sea Level (DRSL, 2015) database to evaluate climate-related hazards, the most important of which is coastal flooding due to the site's proximity to the Bay. The DRSL considers scenarios for the years 2035, 2065, and 2100 and accounts for site specific adjustments, including vertical land movement. **Specific Comment 22a**: Of the two timeframes evaluated (2035 and 2065), vertical land movement was only considered for the 2065 scenario. Explain why the Navy doesn't evaluate vertical land movement in the 2035 scenario.	**Response to 22a.** DRSL (2015) considers vertical land movement (VLM) in its sea level rise projections for both 2035 and 2065, as estimated through local tide gauges and continuous GPS stations. However, at those installations like HPNS, where the projected VLM in 2035 is less than the estimated error in these measurements of 0.05 m (0.15 ft), VLM is assumed to be zero. Even if this low local VLM projection were to be included, it would not appreciably change the sea level rise projection by 2035 at HPNS. The following change was made to Appendix A Section 2.1: For HPNS, the highest GHG emissions and resulting SLR projections of 1.0 foot and 3.2 feet for the years 2035 and 2065, respectively (Table 2-1), are the most

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		Specific Comment 22b: Why isn't the 2100 scenario considered in this CRA? **Specific Comment 22c**: Justify the use of guidance dated 2015 when more current and site-specific guidance and sea level rise projections are available, such as the Ocean Protection Council (OPC) State of California Sea Level Rise Guidance (2018) and OPC Sea-Level Rise Action Plan (2022). **Additional Comment Received 6/4/2024** **Regional Water Board Response Specific Comment 22c:** Please clarify whether there is an associated date or timeline for this updated DRSL guidance.	conservative projections in DRSL and were used as the upper limit of the range evaluated in this assessment. DRSL (2015) ~~does~~ considers vertical land movement (VLM) in its sea level rise projections for both 2035 and 2065, as estimated through local tide gauges and continuous GPS stations. However, at those installations like HPNS, where the projected VLM in 2035 is less than the estimated error in these measurements of 0.05 m (0.15 ft), VLM is assumed to be zero. Even if this low local VLM projection were to be included, it would not appreciably change the sea level rise projection by 2035 at HPNS. The DRSL projections for 2065 take into account both SLR and land subsidence of 0.3 feet. **Response to 22b.** The following text was added to Section 2.1: The Navy plans to include the 2100 scenario during site-specific studies. **Response to 22c.** The following text was added to Section 2.1: DoD plans to update the DRSL guidance periodically, just as OPC is updating theirs. DoD uses DRSL projections for (1) Master Planning at installations for infrastructure protection and sustainability and (2) environmental protection planning. DoD is trying to maintain consistent maps for both. Simultaneously, the Navy is comparing DRSL projections with those from California OPC and verifying that the two projections are similar. In the case of Hunters Point, DRSL projections are similar to those of OPC (2018) and currently more conservative than those of the updated OPC (2024) projections. The DRSL projections are also consistent with DTSC's design goal of 3 ft of SLR by 2050. **Response to Additional Comment:** The DoD is reviewing the schedule for updating the projections used in the DRSL however, the completion date for updating the DRSL guidance is unknown.
23	Appendix A, Section 2.1, Sea Level Rise Projections	This section references a 30-year timeframe for a phased approach to plan for sea level rise, per the DTSC Draft Sea Level Rise Guidance (2023). Sea level rise projections of 1 foot for the year 2035, and 3.2 feet for 2065 were selected as the most conservative levels based on the DRSL report and are generally consistent with projections made in	**Response to 23a.** The following text was added to Section 2.1: The screening level CRA was conducted to identify potential vulnerabilities to further assess in site-specific studies. DTSC's and other climate change assessment guidance was considered in this CRA and will be considered further in the recommended

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		the OPC State of California Sea Level Rise Guidance which DTSC's Draft Guidance relies upon. **Specific Comment 23a**: While 30 years is referenced as a minimum planning timeframe for a phased approach, this document fails to mention that applies to a remedy that provides a minimum of 30 years of protection against sea level rise and that DTSC "prefers full action taken now to address future impacts, but will consider a phased adaptation approach on a case-by-case basis." **Specific Comment 23b:** The DTSC Draft Guidance states that "to ensure remedy resilience…evaluate projects based on sea level rise of 3.5 feet by 2050, and 6 feet by 2100," which are the recommended targets for minimum sea level rise planning and preparation, as presented in the OPC Sea-Level Rise Action Plan (2022). **Additional Comment Received 6/4/2024** **Regional Water Board Response Specific Comment 23b:** Note the OPC State of California Sea-Level Rise Action Plan (2022) lists 3.5 feet (ft) and 6 ft of sea level rise as target planning levels for resiliency by 2050 and 2100, respectively. Therefore, the DRSL projections should be benchmarked, or as close as possible, to the above Sea-Level Rise Action Plan criteria to factor in the need for a 2100 planning scenario, which is consistent with the current DTSC guidance.	site-specific studies that the regulatory agencies will have the opportunity to review and provide input on. **Response to 23b**. The following text was added to Section 2.1: The screening level CRA was conducted to identify potential vulnerabilities to further assess in site-specific studies. DTSC's and OPC's climate change assessment guidance was considered in this CRA and will be considered further in the recommended site-specific studies. Recently, OPC lowered its SLR projections for future years, so that makes the DRSL projections even more conservative. OPC (2024) is now projecting 0.4-0.7 ft of SLR in 2030-2040 and 1.4-2.2 ft in 2060-2070, this making the Navy's projections even more conservative. The Navy's highest projection of 3.2 ft SLR by 2035 is also close to DTSC's climate resilience goal of 3.5 ft SLR by 2050 (DTSC, 2023). As per DTSC guidance, the Navy will ensure that remedies are protective for the next 30 years. **Response to Additional Comment:** Comment acknowledged and will be taken into account for the site-specific studies.
24	Appendix A, Section 2.2 Seawater Inundation Impacts, Section 2.3 Storm Surges, Section 3.1 Groundwater Emergence, Figures 2-2, 2-3, 2-4, 2-5, 3-1,	the text states that "[F]igures 2-2 and 2-3 show the potential for permanent seawater inundation in 2035 and 2065, for the highest SLR scenarios in DRSL. Except for some marginal seawater encroachment at the edges of some parcels, no permanent seawater inundation is projected in any of the parcels during 2035 and 2065, under the highest SLR scenario." **Specific Comment 24**: No details are provided regarding which specific remedies, remedy components, or COCs may be impacted by this inundation. These concerns apply to storm surges, transient inundation, and groundwater emergence. The text should be revised to include which specific remedies, remedy components, and/or	Please see response to Water Board's Protectiveness Determination General Comment #5 and Water Board's Specific Comment #23a.

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	and 3-2	COCs will be impacted by permanent inundation, storm surges, or groundwater emergence. Additionally, figures should be revised to depict the locations of remedy and COC boundaries in relation to permanent inundation, storm surges, or groundwater emergence.	
25	Section 2.3 Storm Surges, Figure 2-4 and Figure 2-5	The transient inundation is shown to be extensive by 2035 as stated in the text, "[P]ortions of IR 7/18, and Parcels B-1, B-2, C, D-1, E, and the low-lying areas of E-2 are projected to be impacted." **Specific Comment 25**: Parcel specific evaluations should be initiated immediately due to concerns regarding transient inundation. Parcel D-1, Parcel E, and Parcel E-2 should be prioritized. Eleven years is a short time to assess existing remedies for resilience and implement changes if needed to prevent exposures. Additionally, this prediction may not be appropriately conservative, as similar inundation to that depicted in Figure 2-4 for Parcel E in 2035 was observed on January 23, 2024, as documented in the Regional Water Board's email to the Navy sent on January 30, 2024.	Please see response to Water Board's Protectiveness Determination General Comment #5 and Water Board's Specific Comment #23a.
26	Appendix A, Section 3.1 Groundwater Emergence	The mean sea level (MSL) is used as the datum to determine permanent sea level rise induced groundwater table rise, as used by the City of Alameda (2022). A 1:1 ratio of groundwater table rise to MSL rise was considered, and the projected groundwater rise was added to the baseline. **Specific Comment 26a**: In the Seawater Inundation Impacts section, mean high higher water (MHHW) is the standard elevation used as a baseline, and is the standard used in SLR mapping tools. SLR is added to the MHHW for evaluation for potential upland inundation. The MHHW should be applied instead of MSL for SLR calculations. **Specific Comment 26b**: The reference to the City of Alameda report from 2022 uses data from a 2020 report on "The Response of the Shallow Groundwater and Contaminants to Sea Level Rise" for the City of Alameda. The authors of this report have published more recent, and more applicable data that should be applied to this CRA - "Shallow Groundwater Response to Sea-Level Rise (Alameda, Marin,	**Response to 26a.** The increase in sea level (projected by both DRSL and OPC) is the same, whether the increase is applied to MSL or MHHW. The Navy is using MHHW as the baseline for assessing areas of seawater flooding. Therefore, an area is considered as flooded when it becomes subject to daily high tides. When assessing groundwater table rise, the same increase in sea level is applied to the highest groundwater level experienced at Hunters Point in the last 20 years. For groundwater assessment, this is the equivalent of applying a projected increase in sea level to high tide (MHHW) for seawater assessment. This will be clarified in the revised CRA. **Response to 26b**. We shall reference the more recent study on shallow groundwater response in the revised CRA in Section 3.1. The recent reference follows a similar methodology of approximating groundwater table rise as equivalent to sea level rise, as in the 2020 study, but covers larger areas around San Francisco. **Response to 26c**. The Navy's report does not use MSL as the baseline for mapping groundwater emergence. The CRA reviewed the past 20 years of

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		San Francisco, and San Mateo Counties)." The more recent report with county-specific data should be used. **Specific Comment 26c**: The above report does reference the MSL datum; however, this assessment fails to mention "the Bay water level elevation approximately <u>one foot above the mean tide line</u> was selected because fresh groundwater is usually found just above the mean tide line inland of coastal embayments." The additional foot above MSL should be accounted for in these projections of groundwater emergence. **Specific Comment 26d:** The CRA should explain how tidal fluctuations were accounted for in evaluating groundwater emergence, when "tidal fluctuations were observed from 150 to 500 feet inland from the [B]ay" within the A-Aquifer in both Parcels C and D, as stated in sections 4.2.1.2 and 5.2.1.2.	groundwater elevation data in the BGMP to find the historical high groundwater table in monitoring wells and elevated it by the projected sea level rise for each time step (2035 or 2065). The Text in Appendix A Section 3.1 has been modified as follows: To determine permanent SLR-induced groundwater table rise, ~~MSL was used as the datum.~~ a 1:1 ratio of groundwater table rise to ~~MSL~~ <u>sea level</u> rise was used, and the projected groundwater rise was added to a baseline as described in the next paragraph. **Response to 26d**. The text in the CRA was expanded to clarify the approach for mapping groundwater emergence in Appendix A Section 2.2.
27	Appendix A, Section 5.1 Assessment Methodology	The vulnerability assessment evaluates whether impacts identified in the CRA indicate a new exposure, and whether site COCs (chlorinated volatile organic compounds [CVOCs], heavy metals, polychlorinated biphenyls [PCBs], and polycyclic aromatic hydrocarbons [PAHs]) are identified as most likely to persist through 2035 and 2065. Potential vulnerabilities to both human and ecological receptors to heavy metals were identified due to groundwater emergence. **Specific Comment 27:** Explain why the other COCs, i.e., CVOCs, PCBs, and PAHs, do not present a threat to human health and the environment as groundwater emerges.	**Response**. The following text was added to Section 5.1: <u>Heavy metals are likely to persist at current (or post-remedy) levels in 2035 and 2065 and are potentially soluble in seawater and groundwater. Therefore, their potential to be mobilized through dissolution is identified as a vulnerability. Residual CVOCs (after ongoing or planned source treatment and removal) are not expected to persist through 2065 and their attenuation will be monitored through the ongoing monitoring program. PAHs and PCBs are relatively insoluble and their mobilization potential is only through erosion of soil. As HPNS has ubiquitous land covers (asphalt or vegetated soil), erosion of soil containing residual PAHs and PCBs is not identified as a vulnerability.</u>
28	Appendix A, Section 5.3.1 Potential New Exposure to CVOCs from Vapor Intrusion due to Groundwater	Where previous treatment of a CVOC source left behind residual mass, additional treatment is planned. By 2035 any residual CVOCs in groundwater are projected to attenuate below remedial goals. **Specific Comment 28**: This assumption should be reevaluated after additional treatment is performed, and well ahead of any projected groundwater emergence.	Please see response to Water Board's Protectiveness Determination General Comment #5 and Water Board's Specific Comment #27.

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	Table Rise to 3 feet bgs, Page A-20		
29	Appendix A, Section 5.3.4 Potential New Exposure to Subsurface Remedy Infrastructure to Saltwater Intrusion, Page A-21	The groundwater at many locations is high in "saltwater components, such as chloride" indicating that saltwater intrusion is an ongoing phenomenon. **Specific Comment 29**: A geochemical evaluation should be performed to evaluate how the site COCs detected in soil and groundwater will be affected by increasing salinity.	Please see response to Water Board's Protectiveness Determination General Comment #5.
30	Appendix A, Section 5.3.6 Parcel E-2 Remedy Resiliency	The Parcel E-2 landfill has design elements which will make the remedy resilient to sea level rise through 2065, including the addition of a 9-foot shoreline revetment and 3-foot sea wall. The planned construction of fresh and tidal wetlands is designed to store and transmit seawater, rain, and groundwater to mitigate sea level rise effects. **Specific Comment 30:** Consider the following in the remedy design and future monitoring and maintenance of the landfill: as groundwater becomes emergent, as it is projected in the CRA to do by 2035 with 1 foot of sea level rise, contaminated groundwater may enter the freshwater wetland impacting ecological receptors; the wetland may overflow its design footprint which can impact the nearby or surrounding protective landfill cap; and contaminated groundwater may overtop the downgradient slurry wall. Additionally, it is unclear how/why passive design elements alone are considered enough for resilience when active solutions such as hydraulic control may be needed to prevent migration of contaminants.	Parcel E-2 has been identified as a vulnerability in the CRA and will be further evaluated during site-specific studies. As with all site-specific studies, the regulatory agencies will have the opportunity to review and provide input on the scope.

No.	Location	Additional Regional Water Board Comment Dated June 4, 2024	Navy Response
		New Comment	
1	General	There was an expectation that the redline RTC revisions would include all relevant revisions for the purpose of evaluating the Navy response to Regulatory Agencies' comments, e.g., revised text, tables, and figures; however, these details have been inconsistently provided or not included in the RTCs. The Regulatory Agencies have identified several issues, recommendations, and follow-up actions that are necessary to inform and/or demonstrate effectiveness of existing remedies or for remedies in the implementation phase. Specific milestones (i.e., primary documents), schedules, and timeframes should be specified and included in the Draft-Final Five-Year Review. Sections 3.6 (Parcel B-2), 4.6 (Parcel C), 5.6 (Parcel D), and 6.6 (Parcel E-2), as well as Tables 3-4, 4-8, 5-8, and 6-11 need to be updated to provide the specific details requested by the Regulatory Agencies.	The expectation after the May 15 and 16 meetings with the agencies was that the Navy would revise the draft RTCs by May 24, the agencies would respond back to Navy on which comments they can agree with, or which still need additional work and then the Navy will prepare the red line strike out document and provide by June 14, 2024, with comments due back for the agencies by July 15, 2024. Issues, Recommendations, and milestones were added to Tables 3-9 (Parcel B), and 4-8 (Parcel C). Note that for Parcel C interim milestones were provided for the F-WBZ study but that the B-Aquifer groundwater study has not been contracted and the Navy elects not to include these interim dates. A footnote has been added to the Five-Year Review Summary form and Table 4-8: [1] The Parcel C B-aquifer study will also be conducted within the overall timeframe to meet the milestone date; however, because funding and contracts are not currently in place, the interim milestones are unavailable. Concerns and milestones for Parcel E-2 were added to Other Findings section as the Navy's protectiveness determination is Will Be Protective. Milestones for the Basewide PFAS RI work plan, fieldwork, and report were added to the updated Other Findings summary in the Five-Year Review Summary Form and to respective Other Findings sections for each Parcel. Milestones for the CRA (scoping and prioritization meeting and initiation of the Parcel D-1 study) were added to the Other Findings section of the Five-Year Review Summary Table.

Response to Comments	**Contract/CTO** N62470-21-D-0007; Contract Task Order No. N6247322F4930	**Responses By** Navy	
Comment By Michael Howley	**Code/Organization** Site Mitigation and Restoration Program – Berkely Office, Department of Toxic Substances Control (DTSC)	**Date** April 2024	
Project Title and Location Draft Fifth Five-Year Review Report, Hunters Point Naval Shipyard, San Francisco, California, November 2023		**Type of Review**	
		X	Draft
			Final
			Other

No.	Location	DTSC Comments Dated April 30, 2024	Navy Response
1	General	Throughout the document, references to the Fourth Five-Year Review Issues, Recommendations, and Follow-up Actions (e.g., Table 3-4) note that addenda were prepared to evaluate the Radiological Remediation Goals for soil and buildings. During the Fourth Five-Year Review, DTSC and CDPH deferred to the United States Environmental Protection Agency (USEPA) for resolution of comments on the Radiological Building Addendum. DTSC understands that the addendum may have been overcome by events and is no longer relevant as the Navy intends to demolish and dispose of the buildings in question, and that risk-based remediation goals would be moot. DTSC defers to USEPA for resolution of any outstanding issues related to the Fourth Five-Year Review Radiological Building Addendum.	The additional information about building demolition and Building Addendum applicability has been added to Section 1.4.3.1 as follows: … Following the recommendation from the Fourth Five-Year Review, the Navy issued addendums evaluating the long-term protectiveness of the RGs for soil and building structures, which concluded that the current RGs are protective for all future land users (Navy, 2020a, 2020b). There was Agency disagreement over the calculation methods for building RGs; however, the Navy is planning on demolishing all radiologically-impacted buildings at each Parcel in response to a letter from the City of San Francisco's Office of Community Investment and Infrastructure, dated February 3, 2022, requesting that, before transferring the remaining Navy-owned property at HPNS, the Navy must demolish all remaining buildings (both radiologically impacted and nonradiologically impacted) on that property except for five small structures on the National Historic Register (OCII, pers. comm., 2022). The demolition and disposal of radiologically-impacted buildings will be completed under CERCLA. Details for managing radiological building materials during demolition will be documented in work plans for regulatory agency review. Because this is not an issue affecting protectiveness but will require a post-ROD change to document the increased cost, Explanations of Significant Differences will be prepared for each Parcel, as appropriate. Radiological retesting is planned and/or

No.	Location	DTSC Comments Dated April 30, 2024	Navy Response
			currently underway to verify that the soil RGs, which were determined to be protective and remain valid, have been met for each parcel that was identified in the Fourth Five-Year Review. Reference: Office of Community Investment and Infrastructure (OCII). 2022. Personal communication (letter) to Kimberly A. Ostrowski, Director, Naval Facilities Engineering Command, Base Realignment and Closure Program Management Office, West. *RE: Demolition of the Existing Non-Historic Buildings at the former Hunters Point Naval Shipyard in San Francisco, California.* February 3.
2	Issues/ Recommendations	The Five-Year Review Summary Form and individual parcel recommendations (e.g., Table 4-8 for Parcel C) do not reflect the conclusions and recommendations of the Climate Resiliency Assessment (CRA). The CRA states: "if a vulnerability is projected to result in a potentially new exposure scenario for either human or ecological receptors through 2065, then an IR site-specific study is recommended to evaluate the potential Comprehensive environmental Response, Compensation, and Liability Act (CERCLA) risk to human and ecological receptors to inform the next Five-Year Review." The CRA then recommends such studies for Parcels IR 7/18, B-1, B-2, C, D-1, and E. Based on the results of the CRA, DTSC also believes this list should include Parcel E-2 (see comment 19 below). Each of these should be reflected in the Issues/Recommendations. The recommendations should include information on what is to be studied (see comments 12 and 13 below), what information or guidance may be relevant (see comment 11 below), and the anticipated completion date. **Additional Comment Received 6/3/2024** Per the Climate Resilience Assessment (CRA) in Appendix A, remedy resilience is likely to be impacted by sea level rise. More robust site-specific analyses are required based on results of this evaluation and therefore the Navy's RTCs propose a prioritization meeting in November 2024, with the first site-specific study, at Parcel D-1,beginning in 2025. DTSC requests a target month and year be specified for the first site-specific study scoping meeting, or that the Navy provide clarification in the RTCs that the proposed prioritization meeting includes planning for the details of the site-specific studies with the regulatory agencies. Per DTSC's 2023 Sea Level Rise Guidance, an adaptation plan is	***General Response Regarding the Climate Resilience Assessment*** *Note that several changes were made to the CRA based on Agency, City of San Francisco and Public comments. Specific changes that address comments are provided in the responses below and additional changes can be reviewed in the Redline-Strike-out provided in the draft-final Five-Year Review.* The Navy Framework for CRA (2024) recommends that climate impacts on protectiveness determinations can be better evaluated with detailed site-specific studies have been conducted to verify projected impacts and vulnerabilities identified in the screening level CRA. As plans for these site-specific studies are developed, the agencies will have the opportunity to provide input. A prioritization meeting with the Navy and Agencies is proposed for November 2024. The following text has been added to the Other Findings for respective parcels (3.6.1.2, 4.6.1.2, 5.6.1.2, 6.6.1.2): The CRA estimates that groundwater emergence may occur in [IR-07/18, Parcel B-1, B-2, C, D-1, E, and E-2 wetland areas] by the year 2065. Additional site-specific assessments are planned which will include verifying mapping projections and evaluating the 2100 timeframe, at a minimum. However, protectiveness is only affected when increased CERCLA risk attributable to climate hazards has been identified (groundwater is likely to emerge and land use is such that receptors could be exposed

No.	Location	DTSC Comments Dated April 30, 2024	Navy Response
		required because potential effects of sea level rise were witnessed during the January 2024 site visit and the CRA confirms future sea level rise impacts for the site. In adaptation planning, the remedy or action should be evaluated to determine adaptive capacity to sea level rise. Please include in the text that the upcoming site-specific/prioritization meetings will include discussion of an adaptation plan or a similar document.	and a future unacceptable health or ecological risk has been identified (data collected, validated, and evaluated following CERCLA risk assessment processes resulting in unacceptable risk to receptors). Where the potential for increased vapor intrusion is identified in other CERCLA documents, ARICs for VOCs are present, groundwater is being monitored, and removal of VOCs is occurring either through MNA or active remediation, thus reducing the potential for future vapor intrusion by reducing the source. Therefore, the potential for groundwater emergence does not affect the protectiveness determination in this Five-Year Review. For Parcel E-2, the following text has been added: Although the Parcel E-2 remedy components such as the sea wall were designed for resilience through a 3-foot rise in sea level (similar to the 2065 scenario), a site-specific study is recommended to evaluate the longer-term scenarios such as 2100. The following text has been added to Other Findings for Parcel D-1: The CRA estimates that groundwater emergence may occur in Parcel D-1 by the year 2035. Additional site-specific assessments are planned which will include verifying mapping projections and evaluating the 2100 timeframe, at a minimum. Parcel D-1 will be prioritized and is scheduled to be initiated in 2025. **Response to Additional Comment:** Text was added to the Other Findings section of the Five-Year Review summary form to discuss adaptation plan or similar document, if the site-specific studies show that CERCLA type human health or ecological risk attributable to climate change requires adaptative measures.
3	Issues/ Recommendations	Parcels B-1, B-2, C, D-1, E, E-2, and G should note in the respective Issues/Recommendations tables that the September 2023 *Final Site Inspection Report for the Basewide Investigation of Per- and Polyfluoroalkyl Substances (PFAS)* recommended further investigation for PFAS in soil and groundwater. The PFAS discussion sections of the Five-Year Review should reference the April 10, 2024, *USEPA Final PFAS National Primary Drinking Water Regulation*, and compare data collected in the Site Inspection Report to the USEPA	The incorporation and evaluation of PFAS in the HPNS FYR was conducted in accordance with Navy policy and guidance. The Navy Policy for Conducting Five Year Reviews (dated June 2011), under Section 5.5 Five Year Review Technical Assessment, Item (d)ii, states, *"Emerging contaminants which have not been previously investigated will only be assessed if (1) the contaminant is known or suspected due to site history, (2) peer reviewed toxicity criteria that can be used for*

No.	Location	DTSC Comments Dated April 30, 2024	Navy Response
		Regional Screening Levels (RSLs) and Maximum Contaminant Levels (MCLs) as applicable. While institutional controls may render the site short-term protective for human health risk, parcels with identified ecological receptors should be evaluated for deferred protection.	*risk assessment have been published, and (3) the contaminant may call into question the protectiveness of either the remedy or the RAOs."* Current Navy Guidance states that an emerging contaminant (EC) should only affect a protectiveness determination if the EC is present at a concentration posing a potential unacceptable risk at the site AND the existing remedy does not address the current or future exposure to the emerging contaminant. As the PFAS remedial investigation (RI) has not been initiated to confirm whether there is unacceptable CERCLA risk to human and/or ecological receptors from PFAS at HPNS, it is not appropriate yet to evaluate if the existing remedy remains protective. Once the RI human health and ecological risk assessment is completed, the Navy will evaluate any identified PFAS CERCLA risk in the context of the existing site remedies. For a Protectiveness Deferred determination, Navy guidance is that the teams should determine if there is sufficient information to conclude that all human and ecological risks are currently under control and no unacceptable exposures are occurring. The Draft Five-Year Review presents lines of evidence supporting that any potential exposure pathways to PFAS contaminants likely do not pose an imminent risk based on the current remedies in place including ICs for soil and groundwater that are in place throughout all parcels. These lines of evidence are summarized below: • As presented in Section 1.3.4.3, groundwater within the A-aquifer (and portions of the B-aquifer within Parcel C) is unsuitable for drinking water. Additionally, the City and County of San Francisco prohibits installation of domestic wells within city and county limits. • For soil, the Navy maintains durable covers and implements ICs to restrict human and terrestrial ecological receptor exposure to soil throughout all parcels at HPNS.

No.	Location	DTSC Comments Dated April 30, 2024	Navy Response
			The following text has been added to Section 1.4.1: Regarding the potential pathway of groundwater discharge to surface water and exposure to aquatic receptors in the bay, the Navy's CERCLA PFAS SI data and existing site remedies were evaluated by the Navy. The following information and data support there is likely no imminent CERCLA risk: • The highest PFAS concentrations were detected in wells in Parcel E-2 (including PFOA at 18 µg/L). This specific location is upgradient to the nearshore slurry wall and the slurry wall is designed to inhibit migration of COCs in groundwater to the bay. The cement-bentonite mixture is expected to inhibit PFAS based on how they inhibit VOCs. • The PFAS detections in other identified near shore perimeter groundwater wells across HPNS were 1 to 2 orders of magnitude lower than the highest concentration at Parcel E-2, the PFAS SI results at these wells ranged from 0.14 µg/L to a maximum concentration of 3.2 µg/L (PFOS). • Published ecological screening values for aquatic receptors (Argonne, 2021) are: - PFOS: 0.117 to 22.6 µg/L - PFOA: 6.12 to 1,580 µg/L In summary, based on the above lines of evidence, there is no known imminent risk from PFAS to human or ecological receptors at HPNS. In addition, parcel-specific discussions as Other Findings in Sections 3 through 6 present individual areas that were identified for further investigation under the SI, based on historical site use or data collected during previous investigations. Reference: Argonne National Laboratory (Argonne). 2021. Derivation of PFAS Ecological Screening Values. Environmental Science Division, Argonne National Laboratory. Completed under interagency agreement between the U.S. Department of Energy (DOE), Argonne National Laboratory (Argonne), and

No.	Location	DTSC Comments Dated April 30, 2024	Navy Response
			AFCEC. Final. September. https://www.denix.osd.mil/dodepa/denix-files/sites/85/2022/10/Final-PFAS-ESV-Report_Sept-2021_508.pdf The Navy has been preparing to implement the final rule within our cleanup program based on forthcoming Department of Defense (DoD) guidance. The Navy is committed to fulfilling PFAS cleanup responsibilities and will take necessary actions to implement the rule in accordance with CERCLA. As we move into the RI/FS phase for PFAS, CERCLA ARARs will be established including assessment of the Safe Drinking Water Act (SDWA). It is noted again, that the groundwater at HPNS is not suitable for use as drinking water and existing IC's prohibit the use as drinking water. **Additional Response based on Water Board New Comment #1. Included in this Comment Response for completeness:** Figures from the SI for each Parcel have been added as Appendix G and referenced in respective Other Findings sections. The following text was also added to the Other Findings section of the Five-Year Review Summary Form: **Per- and Polyfluoroalkyl Substances** The Navy is in the process of investigating per- and polyfluroalkyl substances (PFAS) from historical use of PFAS-containing materials. Potential exposure pathways are under control through existing remedy components (institutional controls and durable covers) and data indicate that there is likely no imminent CERCLA risk while PFAS are investigated under the CERCLA process. The following areas are under investigation for PFAS: • Parcels B-1, B-2, C, D-1, G, E, and E-2: A-aquifer groundwater • Parcel B-1: IR-10 (Battery and Metal Plating Shop) • Parcel C: Building 215, Fire Station • Parcel D-1: Poseidon Area (Buildings 377, 384, 385, and 387), IR-69 (Bilge Water Pump House), and IR-70 (Former drum and tank storage area) • Parcel G: IR-09 (Pickling and Plating Yard)

No.	Location	DTSC Comments Dated April 30, 2024	Navy Response
			Key PFAS investigation milestones include: • Final Basewide Remedial Investigation (RI) Work Plan – 4/30/2025 • RI Fieldwork – Spring/Summer 2025 • Final Basewide RI Report – 8/31/2026
4	Issues/ Recommendations, Parcel E-2	Although remedy construction at Parcel E-2 is ongoing, DTSC, the San Francisco Bay Regional Water Quality Control Board (Regional Water Board), and USEPA have raised concerns about multiple aspects of implementation that should be reflected here (see letters dated May 5, 2022, and December 8, 2022). The Five-Year Review should reflect Navy commitments to develop a Remedial Action Study Workplan to evaluate the integrity and performance of the upland slurry wall, as well as a commitment to revise the landfill gas monitoring plan to account for changes in monitoring well locations. In addition, the Navy should develop a work plan (primary document under the Federal Facilities Agreement) to evaluate groundwater and surface water near the freshwater wetlands to demonstrate that lead compounds are not leaching to the San Francisco Bay while the remainder of the remedy is constructed or that new contamination was not introduced from improperly managed stockpiles.	Because the Remedy at Parcel E-2 is currently under construction the Navy's protectiveness determination is "Will be Protective". The construction has prioritized components to address potential migration to the Bay first with the following components completed: • Hot spot removal, Nearshore slurry wall, Shoreline revetment • Soil excavation to create freshwater and tidal wetlands • Radiological characterization, installation of foundation soil layer in preparation of Phase III landfill cover installation • Final cover installation Because the remedy is complex and requires multiple phases for installation over a longer timeframe, the Navy has identified the following additional Other Findings (new section 6.6.1.5 and in the Five-Year Review Summary Table under Other Findings) to document the Navy's commitment to continue to construct the remedy as well as analyze currently available data in a timely manner on a schedule agreed to among the FFA parties for the remedy components that are in place. As discussed at the April 24, 2024 meeting, the specific minimum information and analysis needs of the FFA Regulatory Parties, including a detailed status of all wells, are forthcoming in a tri-agency letter, after which the FFA parties will meet to discuss specific tasks and schedules. As discussed informally and in EPA's comments, the Navy recognizes that EPA expects the Navy will immediately begin to evaluate the effect the landfill cap and slurry walls have on groundwater flow and contaminant concentration within the landfill, and potential impact on the San Francisco Bay:

No.	Location	DTSC Comments Dated April 30, 2024	Navy Response
			6.6.1.5 Parcel E-2 Other Findings The remedy at Parcel E-2 is complex and involves multiple phases of field work to install. A number of facilities that are important to understanding groundwater flow and contaminant concentrations have been completed or are substantially completed (for example, Nearshore Slurry Wall and landfill cover). The following is a summary of the remaining RA work, interim studies, and key milestones planned prior to completing the RACR: • Construct remaining components of the remedy including the permanent landfill gas system, freshwater and tidal wetlands, and groundwater monitoring network under the approved Final Work Plan (KEMRON, 2018): - Landfill Gas System (Phase IVa) anticipated in 11/30/2025. - Wetlands (Phase IVb) anticipated in 11/30/2027. • Modify the landfill gas monitoring program to include a monitoring probe (GMP54) outside of the newly installed landfill cover as a new compliance point by revising the appropriate primary document(s). The primary document(s) needing revision and the proposed schedule for revision will be further discussed with the FFA Regulatory Parties not later than 9/30/2024. • Document completion of the protective liner and final cover installation in the Phase III Remedial Action Construction Summary Report anticipated by 11/30/2024. • Conduct a study to evaluate the performance of the upland slurry wall as documented in the Post-Remedial Action Performance Evaluation Work Plan to evaluate the performance of the Upland Slurry Wall – Final 8/31/2024. Fieldwork is anticipated to be completed in 2024 and the Post-Construction Remedial Action Performance Report is anticipated by 12/31/2024. Water Board specific concerns and responses were added to the technical assessment for Parcel E-2 (Section 6.5.1, page 6-20 and 6-21) as follows:

No.	Location	DTSC Comments Dated April 30, 2024	Navy Response
			While the remedy is currently under construction, Agency concerns have been raised regarding the completed components: • **Concern: The Upland Slurry Wall was not installed as designed**. Geologic refusal was met along a 200-foot section of the planned wall at approximately 0 feet msl (10 feet shallower than the designed depth). The slurry wall was designed to minimize flow of offsite groundwater into the landfill and was designed as a "hanging wall" (not embedded into bedrock) with a french drain (which was installed according to the design) to prevent precipitation recharge and divert flow to the freshwater wetland. The material encountered was determined to be bedrock which has a lower permeability than the surrounding aquifer material. The draft final work plan to evaluate the Upland Slurry Wall performance is currently under way and work is anticipated to begin in 2025. • **Concern: The turbidity curtain was not used during remedy construction.** A 2,000-foot US Department of Transportation Type III offshore turbidity curtain was installed during shoreline work in accordance with the Design (ERRG, 2014) on November 30, 2016 as documented in the Phase II Remedial Action Construction Summary Report (Aptim, 2021). The turbidity curtain was removed after shoreline activities were completed, in accordance with the RAWP Appendix D, Environmental Protection Plan (CB&I, 2016) which states "During shoreline earthwork (revetment installation, wetlands excavation, and site grading), a turbidity curtain will be deployed as the BMP for sediment control." Upcoming nearshore work, such as wetland installation, will be conducted in accordance with the design and RAWP. • **Concern: The Navy has not provided all stormwater best practices documentation.** Navy provided the following final primary documents that contain stormwater best practices: Remedial Action Work Plans (RAWPs) (CB&I, 2016; KEMRON, 2018); Stormwater Protection Plan; and stormwater best practices monitoring documentation during construction (provided in the Phase I RACR [Gilbane, 2018a] and Phase II RACSR [APTIM, 2021],

No.	Location	DTSC Comments Dated April 30, 2024	Navy Response
			which will also be provided in the forthcoming Phase III RACSR [pending]). The Navy also responded to the Water Board's December 3, 2022, and January 11, 2023, and May 23, 2023 follow-up e-mail requests for stormwater records. • **Concern: There is not adequate documentation that lead was removed from the wetland areas and groundwater may be affected in the future.** Lead was removed from the tidal wetland areas according to the Phase II RAWP (KEMRON, 2018) and subsequent Fieldwork Variance #5 (Appendix G of APTIM, 2021). Exceedances shown on Figures 6 and 7 of the RACSR (APTIM, 2021) were initial samples prior to over-excavation to remove lead-impacted soils. Post-over-excavation samples were found to be below the RG. Additionally, the landfill cap geomembrane and geosynthetic clay liner layers prevent vertical infiltration of rainfall from reaching the underlying landfill waste and promoting leachate. The geocomposite drainage layer carries any flow that infiltrates through the vegetative layer to the perimeter ditches. The surface water from the eastern half of the site will be collected by the eastern perimeter ditch and will drain directly into the Bay through the culvert pipe at the southeast corner of the site. The surface water from the western half of the site will be collected by the western perimeter ditch and will flow into the freshwater wetlands with excess runoff draining through the freshwater wetlands outfall pipe into the Bay. The chemically contaminated soils near the freshwater wetlands were removed during previous hot spot excavations and excavations during Phase II subgrade preparations, with confirmation testing to show that they are below action limits in the Final RACSR for copper, lead, total PCBs, and total TPHs. There is no required tie into the underlying Bay Mud at the Wetlands Boundary. Refer to Detail 4 on Design Drawing C18 from the DBR for the cover termination at the wetlands boundaries. • **Concern: There may be impacts to soil due to RCRA hazardous waste handling in stockpiles during remedy installation**: Navy is planning, at agencies' request, to sample the soil under former

No.	Location	DTSC Comments Dated April 30, 2024	Navy Response
			Parcel E-2 stockpile locations now covered with radiological retesting radiological screening yard pads for metals to confirm that the stockpiles didn't impact the soils around them during storm events. This will be completed after the pads are removed. References: Engineering/Remediation Resources Group, Inc. (ERRG). 2014. Design Basis Report, Parcel E-2, Hunters Point Naval Shipyard, San Francisco, California. Final. August 15. CB&I Federal Services, LLC. (CB&I). 2016. Work Plan Shoreline Revetment; Site Grading and Consolidation of Excavated Soil, Sediment, and Debris; and Upland Slurry Wall Installation Remedial Action, Parcel E-2, Hunters Point Naval Shipyard, San Francisco, California. Final. October 12. KEMRON Environmental Services (KEMRON). 2018. Remedial Action Work Plan, Final Cove, Wetlands, and Landfill Gas Control and Containment System, Remedial Action Parcel E-2, Hunters Point Naval Shipyard, San Francisco, California. Final. December 26. Gilbane. 2018. Remedial Action Completion Report, Hot Spot Delineation and Excavation and Nearshore Slurry Wall Installation, Remedial Action, Parcel E-2, Hunters Point Naval Shipyard, San Francisco, California. June. APTIM. 2021. Remedial Action Construction Summary Report, Parcel E-2 (Phase II), Hunters Point Naval Shipyard, CA. April 6 *Note that revisions in the response above were made in blue font based on EPA's Additional Response received 6/5/2024 (See EPA Comment #3).*
5	Protectiveness Statements, Parcel B-2:	As stated in letters from DTSC, the Regional Water Board, and the USEPA dated August 20, 2021, and November 23, 2021, the agencies believe that the *in situ* stabilization remedy at IR-26 has failed to prevent mercury discharge to San Francisco Bay. Based on the information in the record, DTSC believes the remedy for Parcel B-2 should be deemed Not Protective. However, in a meeting with the regulatory agencies on April 25, 2024, the Navy presented evidence that exceedances of mercury thresholds in groundwater wells may not necessarily indicate exceedances at the Bay water point of compliance. The Navy acknowledged that data gaps remain and that protectiveness should	From the Navy's perspective, there are multiple lines of evidence presented in the Five-Year Review suggest the concentrations observed in groundwater are unlikely to exceed 0.6 µg/L in Bay surface water. However, as discussed in the April 25, 2024 meeting with Agency representatives (Regional Water Board, US EPA Region 9, and Department of Toxic Substances Control [DTSC]), the Navy agreed to "Protectiveness Deferred" determination. The Protectiveness Statement has been changed to:

No.	Location	DTSC Comments Dated April 30, 2024	Navy Response
		be deferred until additional investigation can be conducted. These data presented by the Navy on April 25, 2024, should be included in the assessment of Parcel B-2. This includes a comparison of parametric measurements of groundwater and surface water, an explanation of the data source of the mercury trigger level, and an explanation of any attenuation factor assumptions used in the analysis. The Issues/Recommendations tables should be updated to document the exceedances and data gaps, describe how the Navy intends to address them, and set an expected timeline for resolution of the data gaps and additional remedy implementation. If these revisions are made as described, DTSC would concur with a designation of Protectiveness Deferred.	A protectiveness determination cannot be made because there is uncertainty related to the concentrations of mercury discharging to the Bay from Parcel B-2, IR-26 groundwater. In order to make a protectiveness determination, the following actions needs to be made: evaluate all existing data to determine a path forward for additional data collection, remedy optimization, and/or additional remedial alternatives/treatment that have been screened for further evaluation. A primary document presenting the path forward will be finalized as soon as practicable but no later than October 31, 2025. The FFA parties will have discussions, as appropriate, prior to scoping and developing the primary document. The concerns raised by the Agencies regarding the success of the remedy have been added after the final paragraph of Section 3.4.3.1, discussion of In Situ Stabilization of Mercury in Groundwater at IR-26 as follows: After completion of the 3-year post-ISS treatment performance monitoring, the FFA regulatory agencies (EPA Region 9, DTSC, and Regional Water Board) released a tri-agency letter on November 23, 2021 which reiterated that "mercury concentrations in groundwater along the San Francisco Bay margin consistently exceed the trigger level. Therefore, in-situ stabilization (ISS) has failed to minimize or prevent unacceptable discharge of mercury to the San Francisco Bay. Consequently, additional treatment options need to be screened, evaluated, and pursued by the Navy via the development of a new primary document work plan." (EPA, DTSC, and Regional Water Board, 2021). As discussed at the April 25, 2024 meeting, the FFA regulatory parties assumed that the Navy has the authority to "optimize" ISS (e.g., use of a larger rig in areas of prior injection refusal) and the Navy recognizes that EPA does not oppose any Navy attempt to do so, as long as such action is timely and completed prior to July 31, 2025. As stated in the November 23, 2021 tri-agency letter, the Navy also recognizes that EPA continues to expect that additional treatment options need to be screened, evaluated, and pursued by the Navy.

No.	Location	DTSC Comments Dated April 30, 2024	Navy Response
			While there are continued exceedances of the TL in groundwater, the Navy believes the following provides lines of evidence that the residual concentrations in mercury in groundwater are not likely to result in a concentration above 0.6 µg/L in the Bay surface water: • Completion of source removal in 2008 via a time-critical removal action (Insight, 2009) • Partial success of the in-situ stabilization (ISS) as evidenced by reducing the extent of mercury exceedances of the TL from 3 performance monitoring locations to 2 performance monitoring locations and decreasing concentrations in one of the remaining locations (IR26MW49A). A time-series plot of data through 2023 for IR26MW49A, IR26MW51A, and IR26MW71A is presented on **Figure 3-7**. Mercury concentrations during the last 5 years of monitoring have been below historical maximums and are consistently below 10 times the HGAL. • The limited extent of impacted groundwater; IR26MW71A and IR26MW49A are approximately 45 feet apart and IR26MW49A is approximately 88 feet from IR26MW51A with no exceedances. • Comparison of groundwater quality parameters to Bay surface water quality parameters (temperature and dissolved oxygen, **Table 3-4**) indicate that the groundwater is not representative of Bay water because groundwater temperature is consistently warmer than surface water, and dissolved oxygen is consistently lower than surface water. However, because there is uncertainty in the concentration at the exposure point and because the ISS remedy did not reduce the concentration in groundwater to below 0.6 µg/L at all monitoring wells, additional data collection, remedy optimization, and/or additional remedial alternatives/treatment that have been screened for further evaluation are necessary to determine whether the remedy is protective of the Bay. Section 3.5.1.3 (Technical Question A, Is the remedy functioning as intended by the decision document) has been modified as follows:

No.	Location	DTSC Comments Dated April 30, 2024	Navy Response
			3.5.1.3 Parcel B-2 ~~Yes.~~ The ISS injections did not effectively reduce mercury in two locations (IR26MW49A and IR26MW71A) to below the TL of 0.6 µg/L. Although mercury continues to exceed TLs in groundwater collected from downgradient monitoring wells, data demonstrating that mercury concentrations in surface water (the ultimate receptor) are below the HGAL of 0.6 µg/L are lacking. The RAO is stated as follows: … [no change from existing text] ~~Protectiveness is not affected based on the following rationale:~~ Data at the groundwater-surface water interface has not been collected; however, from the Navy's perspective, it is not expected that mercury exceeds 0.6 µg/L based on the following rationale: • Source concentrations in soil have been removed during the IR-26 Mercury Removal TCRA (Insight, 2009). • Although dissolved mercury in groundwater exceeds the TL in two locations, Mann-Kendall analysis indicates it is decreasing at one location (KMJV, 2021), indicating partial success of the ISS remedy at minimizing migration to the surface water. • The TL is the Hunters Point groundwater ambient level (HGAL), which is not a risk-based concentration, formal RG, or ARAR according to the ROD Amendment (Navy, 2009). • The screening of groundwater data against the TL or other surface water benchmarks, such as the National Recommended Water Quality Criteria (NRWQC; USEPA, 2023), conservatively assumes that ecological receptors are directly exposed to measured concentrations in groundwater. However, there will be a mixing zone where groundwater interfaces with surface water. The extent of that zone is unknown, but mixing is expected to occur, and the concentrations would decrease with distance from the mixing zone and tidal action. Site-specific mixing factors can range from 1 to several thousand. For example, USEPA uses a default mixing and attenuation factor of 20 to address the dilution of soil leachate as it moves through the groundwater aquifer (USEPA, 1996).

No.	Location	DTSC Comments Dated April 30, 2024	Navy Response
			Furthermore, mixing studies conducted by State of Washington, Department of Ecology (2009) found that the majority of the reduction in porewater concentrations was because of dilution by surface water and averaged 90 percent (that is, a dilution factor of 0.1). Assuming a similar dilution factor, the maximum post-injection detected concentration of dissolved mercury (8.55 µg/L) would be 0.855 µg/L, which does not exceed the NRWQC of 0.94 µg/L (USEPA, 2023). • The post-treatment concentrations after 2018 have consistently been lower than 10 times the 0.6 µg/L TL at both IR26MW49A and IR26MW71A (**Figure 3-7**). • Groundwater quality parameters (temperature and dissolved oxygen) indicate that the water in sentinel wells IR26MW49A, IR26MW50A, IR26MW51A, and IR26MW71A are not representative of surface water (**Table 3-4**). Review of annual O&M inspections, historical documents… [no change from original text]. The following issue/recommendation has been added to the Five-Year Review Summary Table and Table 3-9 (Parcel B Issues, Recommendations, and Follow-up Actions): Issue: There is uncertainty related to the concentrations of mercury discharging to the Bay from Parcel B-2, IR-26 groundwater Recommendation: Evaluate all existing data to determine a path forward for additional data collection, remedy optimization, and/or remedial alternatives/treatment that have been screened for further evaluation. Prepare a primary document presenting the path forward. Milestone Date: 10/31/2025 Affects Protectiveness: Protectiveness Deferred *Note that revisions in the response above were made in blue font based on EPA's additional response (See EPA Comment #1). The date of July 31, 2025 was identified for the milestone date during the April 2024 meeting. It was determined after this meeting that since this is an FY25 project award, it would be affected by the financial brownout.*

No.	Location	DTSC Comments Dated April 30, 2024	Navy Response
			NAVFAC's financial system is being changed which not allow the award of FY25 projects to start until after December 31, 2024. Due to this uncontrollable issue, the Navy will require a date change to October 31, 2025. This date change is shorter than the duration of the brownout.
6	Protectiveness Statements, Parcel C:	DTSC believes Parcel C should be deemed Protectiveness Deferred until certain planned investigations can be completed. While remedy implementation is ongoing to address contamination in the A-Aquifer, the Navy has planned investigations of the B-Aquifer and Fractured Water-Bearing Zone and their potential communication with the A-Aquifer and the San Francisco Bay. The need for these investigations, along with vulnerabilities identified in the CRA, represent data gaps that must be addressed before the remedy can be deemed protective. In a meeting with regulatory agencies on April 25, 2024, the Navy agreed to a statement of Protectiveness Deferred for Parcel C and agreed to include these investigations in the Issues/Recommendations. **Additional Comment Received 6/3/2024:** The revised Parcel C Protectiveness Statement notes that investigation of the B-Aquifer and Fractured Water-Bearing Zone (F-WBZ) "will take approximately 5 years to complete." This statement should also note that the F-WBZ investigation work plan has already been reviewed by the regulatory agencies and further describe the anticipated milestones for field work, data collection, and reporting within that total five-year period.	Navy acknowledges that while, from the Navy's perspective, the remedy is protective of human health through active remediation, monitoring, and land use controls; additional information is needed to determine protectiveness for Bay receptors and has changed the remedy protectiveness determination to "Protectiveness Deferred" until such time the investigations are completed, and a protectiveness determination can be made. Specifically, the Navy will complete the Deep F-WBZ investigation for RU-C4 and the B-Aquifer and Upper F-WBZ investigation for RU-C2. The Draft-Final Five-Year Review Section 4.5.3 Technical Assessment Question C has been updated to incorporate agency concerns related to the hydrogeological communication between aquifer units at Parcel C, discharges to the Bay, and the investigations currently underway for the Deep F-WBZ in RU-C4, and planned for the B-Aquifer and Upper F-WBZ in the RU-C2 area to address these data needs as follows: Yes. The following information has come to light that could question the protectiveness of the remedy: • There have been detections of COCs from A-aquifer groundwater within the B-aquifer and F-WBZ groundwater and the connection and communication between hydrogeologic units within Parcel C is not fully understood. Therefore, further characterization of the Deep F-WBZ in RU-C4 and the B-aquifer and Upper F-WBZ in RU-C2 are required to demonstrate that remedies within the A-aquifer will be effective and not re-contaminated by COCs within the B-aquifer and F-WBZ and unacceptable discharges to the Bay are not and will not occur. The Protectiveness Statement has been changed to: A protectiveness determination cannot be made because there is uncertainty related to the hydrogeologic communication between the

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			A- and B-aquifers and whether discharge of chemicals present in the B-aquifer present potential unacceptable risks to Bay receptors. In order to make a protectiveness determination, the following action, at a minimum, needs to be made: complete investigations of the Bay Mud/Sandy Lean Clay aquitard, extent of chemicals in the B-aquifer and F-WBZ and use current ecological risk assessment methods and criteria, as appropriate, to assess potential impacts to Bay receptors. For the Deep F-WBZ, a draft-final workplan has been provided to the FFA Regulatory Parties. For RU-C2, B-aquifer data collection and Upper F-WBZ, as appropriate, are expected to commence coincident with the performance monitoring period. The FFA parties will have discussions, as appropriate, prior to scoping and developing primary documents, such as workplans. Depending on the results of the data analyses, the development of conceptual site models, and necessary steps, these actions could possibly be completed within the next 5 years, at which time, as appropriate, a protectiveness determination will be made. **Response to Additional Comment:** The following issue/recommendation has been added to the Five-Year Review Summary Table and Table 4-8 (Parcel C Issues, Recommendations, and Follow-up Actions) which includes the requested interim milestones: Issue: There have been detections of COCs from A-aquifer groundwater within the B-aquifer and F-WBZ groundwater and the connection and communication between hydrogeologic units within Parcel C is not fully understood. Therefore, further characterization is required to demonstrate that remedies within the A-aquifer will be effective and not re-contaminated by COCs within the B-aquifer and deep F-WBZ and unacceptable discharges to the Bay are not and will not occur. Recommendation: Complete investigations of the Bay Mud/Sandy Lean Clay aquitard, extent of chemicals in the B-aquifer and F-WBZ and use current ecological risk assessment methods and criteria to assess potential impacts to Bay receptors. Where warranted, additional actions or changes to the remedy will be recommended at the conclusion of these investigations.

No.	Location	DTSC Comments Dated April 30, 2024	Navy Response
			Milestone Date: 7/31/2029 Interim Milestones: Completion of F-WBZ investigation fieldwork 11/30/2025, completion of the F-WBZ investigation report 11/30/2026[1] Affects Protectiveness: Protectiveness Deferred Footnote: [1] The Parcel C B-aquifer study will also be conducted within the overall timeframe to meet the milestone date; however, because funding and contracts are not currently in place, the interim milestones are unavailable. Note that additional revisions in the response above were made in blue font based on EPA's additional response (See EPA Comment #2).
7	General	The history of some Installation Restoration (IR) sites are not mentioned. For example, IR-A in Parcel B-1 was listed in Section 3.1 as an IR located in Former Parcel B but was no longer mentioned in the following description of the site in Section 3.1 or subsequent report sections. Please edit the Five-Year Review to include the history of all IRs. For each Parcel Letter, DTSC recommends creating an additional table listing the IRs and their history and status.	An IR Site summary table has been added to Section 1.2 where the IR sites are introduced and shown on Figure 1-2.
8	Section 6.4.1.1, Nonaqueous Phase Liquid Removal and Treatment	The text states, "ISS treatment will be initiated in winter 2023". Please revise the text to state when this in situ stabilization (ISS) treatment began or revise the anticipated initiation date.	This date has been revised to: ISS treatment will be initiated in August 2024.
9	Section 6.4.2.1, Durable Cover Installation & Landfill Gas Controls and Monitoring	This section states that the Phase 3 [Remedial Action (RA)] is "anticipated to be completed in summer 2023." Please revise the text to state if the Phase 3 RA was completed or revise the anticipated completion date. Please also update the subsequent paragraph, which describes construction planned "prior to spring 2024."	The text in Section 6.4.1.1 (Parcel E) has been revised as follows: **Nonaqueous Phase Liquid Removal and Treatment** A cement-bentonite slurry wall will be constructed at IR-03 and the surrounding area (Figure 6-3). Construction is planned for December 2024. ~~prior to spring 2024.~~ The text in Section 6.4.2.1 (Parcel E-2) has been revised as follows: **Soil, Sediment, and Debris Excavation, Consolidation, and/or Removal** During the Phase 3 RA, the contractor will build approximately 3.18 acres of tidal wetlands and approximately 1.59 acres of freshwater

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			wetlands in the Panhandle Area in accordance with the DBR (ERRG, 2014; KEMRON, 2018). The tidal and freshwater wetland installations are anticipated to be completed in 2027. **Durable Cover Installation** Durable covers at Parcel E-2 were ~~will be~~constructed under the Phase 3 RA, completed in fall 2023. ~~anticipated to be complete in summer 2023~~ **Landfill Gas Controls and Monitoring** During the Phase 3 RA, a new gas control and collection system (GCCS) will be installed, anticipated in 2024/2025~~summer 2023~~, consisting of active LFG extraction wells, …
10	Section 6.4.2, Landfill Gas Monitoring	This section describes recent detections of excess methane at a monitoring well and notes that readings continue to remain elevated to date. This section should be updated to reflect recent developments, including methane extraction, reduction of methane exceedances below action levels, and the installation of a confirmation well outside of the landfill boundary.	This section has been revised to summarize additional work related to methane extraction, reduction, and delineation and a technical memorandum will also be included as an appendix to this Five-Year Review. The following text was added to Section 6.4.2.2 under Landfill Gas Monitoring: On June 21, 2023, the Navy detected a methane gas reading above the State of California action level at an HPNS landfill gas monitoring probe (GMP-07). The probe is located inside the newly installed landfill cover and is no longer representative of a perimeter monitoring point. In order to confirm that the methane levels are below action levels at a boundary location, a new monitoring probe was installed on October 13, 2023 (GMP-54). Measurements were collected in October through December with no detections of methane with the exception of a reading of 0.1 percent on October 31, below the action level of 5 percent by volume. Details and data are provided in **Appendix H.** ~~landfill perimeter. It is approximately 200 feet southeast of the UCSF compound, which borders the Parcel E-2 boundary.~~
11	Appendix A, general comment	Elements of the CRA are not consistent with DTSC's 2023 draft Sea Level Rise (SLR) Guidance. Most significantly, DTSC's guidance calls for evaluating resiliency to 3 feet of SLR by 2050 and 6 feet by 2100. The CRA also does not evaluate king tide events or the interaction between sea level rise, groundwater rise, king tides, and/or storm events. Even so, this screening-level assessment recommends site-specific investigations. DTSC concurs with	The CRA uses SLR projections made in the DoD Regional Sea Level (DRSL) data base (Highest and Lowest greenhouse gas emissions scenarios). The Highest scenario is conservative and consistent with projections made by OPC (2018) for similar time steps, especially when accounting for the slight offset in timesteps (1 ft of SLR in Navy's DRSL for 2035 versus 0.8-1.3 ft in OPC for 2030-2040; 3.2 ft of SLR in Navy's

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		these recommendations and strongly urges the Navy to use DTSC's SLR guidance in these additional studies. **Additional Comment Received 6/3/2024:** DTSC appreciates the commitment to assessing sea-level rise impacts in the year 2100 in the site-specific assessments, consistent with DTSC's 2023 Sea-Level Rise Guidance. Please include in the Issues/Recommendations section, the Other Findings section, and the CRA that the Navy plans to evaluate the Year 2100 impacts as a next step in conjunction with the site-specific studies for all parcels. Please edit the RTC to indicate that such wording was added to the text and in which section. Include reference that the Year 2100 evaluation is consistent with the DTSC 2023 Sea Level Rise Guidance and the Ocean Protection Council's 2022 State Agency Sea-Level Rise Action Plan for California.	DRSL for 2065 versus 2.6-3.5 ft in OPC 2060-2070). Since then, OPC has lowered its projections for these years, so that makes the DRSL projections even more conservative. OPC (2024) is now projecting 0.4-0.7 ft of SLR in 2030-2040 and 1.4-2.2 ft in 2060-2070, this making the Navy's projections even more conservative. The Navy's highest projection of 3.2 ft SLR by 2065 is also close to DTSC's climate resilience guidance of 3.5 ft SLR by 2050. The Navy plans to evaluate the Year 2100 as a next step, in conjunction with site-specific studies. **Response to Additional Comment:** See response to Comment 2. Additional text, including the 2100 timeframe was added to the Five-Year Review Summary Form under Other Findings, Other findings for each Parcel. The following text was added to Section 6.1 of Appendix A: The Navy Framework for CRA (2024) recommends that climate impacts on protectiveness determinations can be better evaluated after detailed site-specific studies have been conducted to verify projected impacts and vulnerabilities identified in the screening level CRA. The CRA is a screening level assessment to identify potential vulnerabilities that can be further assessed in site-specific studies at HPNS. These site-specific studies and prioritization of parcels will be discussed with the agencies. Protectiveness statements in a Five-Year Review will be affected when site-specific studies show that an exposure pathway has the potential to be complete and a future unacceptable health or risk has been identified (data collected, validated, and evaluated following CERCLA risk assessment processes resulting in unacceptable risk to receptors). The Navy will assess Year 2100 projections in conjunction with site-specific studies. The CRA estimates that groundwater emergence may occur in several parcels by the year 2065. These mapping projections will be verified during site-specific studies. However, protectiveness is only affected when increased CERCLA risk attributable to climate hazards has been identified (groundwater is likely to emerge and land use is such that receptors could be exposed and a future unacceptable health or ecological risk has been identified (data collected, validated, and

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			evaluated following CERCLA risk assessment processes resulting in unacceptable risk to receptors).
12	Appendix A, general comment	During a public meeting and presentation on April 22, 2024, Navy staff (Arun Gavaskar, NAVFAC EXWC), discussing the evaluation of groundwater rise, noted to DTSC that the Navy had taken surface water conductivity measurements following storm events to assess potential communication between surface water and groundwater. These data and any other data collected for the CRA should be included and discussed for their use in the recommended site-specific follow-up studies. **Additional Comment Received 6/3/2024:** The comment response describes field measurements taken for surface water conductivity during the CRA to screen ponded surface water following storm events for similar characteristics to groundwater or Bay water. Please provide additional details on the locations of these conductivity measurements (i.e., which topographic trough), the units for readings recorded (i.e., in milliSiemens per meter), and the title and date of the deliverables reporting those data. If the Navy does not intend to report the data, please explain why not and describe how similar data collection efforts may be incorporated into the site-specific sea-level rise assessments.	After a storm event in March 2023, the Navy noted four locations of standing water. Conductivity of the standing water was measured to differentiate between rainwater and seawater. Conductivity in three of the locations in Parcels C, D-1, and E was low, indicating that the water was likely rainwater ponding in topographic troughs. A fourth ponding location in Parcel E, closer to the shoreline, showed relatively elevated conductivity. These locations will be further evaluated during site-specific studies. **Response to Additional Comment:** The following text was added to Section 4.0 of Appendix A: After a storm event in March 2023, the Navy noted four locations of standing water as follows: one in Parcel C, one in Parcel D-1, and two in Parcel E. As a preliminary trial, conductivity of the standing water was measured in an attempt to differentiate between rainwater and seawater, but no definitive determination could be made. Conductivity in three of the locations in Parcels C, D-1, and E was low, indicating that the water was likely rainwater ponding in troughs in asphaltic surfaces. The fourth ponding location in Parcel E, closer to the shoreline, showed elevated conductivity, but it was unclear if there was any seawater influence. Conductivity by itself may not be a good indicator of the source of flooding. These locations will be discussed more in the workplan for site-specific studies. The Parcel-specific O&M manuals discuss routine inspections and inspections following storms (intense rainfall events) as triggers for an additional inspection.
13	Appendix A, general comment	During the Five-Year Review Site Inspection on January 23, 2024, DTSC observed significant stormwater inundation in Parcel E. The submerged area was near the southern end of a bioswale, where 100-year storm events will cause transient inundation by 2035 (Figure 2-4) and groundwater is predicted to emerge by 2065 (Figure 3-2). Navy personnel (Doug Delong, CSO) noted that the bioswale floods routinely and appears to be tidally influenced. The CRA should recommend that follow-up studies evaluate the performance of	See response to DTSC Comment #12, the location within Parcel E is most likely a result of poor drainage because the remedy is still undergoing construction (durable covers) and will be graded so stormwater can runoff more efficiently. The Navy will evaluate this bioswale area during site specific studies. The following text was added to Section 6.6.1.2 for Parcel E:

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		bioswales to control stormwater inundation and the potential impact of tidal influence on groundwater to stormwater communication in the swales.	At Parcel E, during the January 23, 2024 Five-Year Review site inspection standing water was observed near the southern end of a bioswale. The source of the water was unclear and concerns were raised by the agency representatives whether this was climate-related flooding. There were rain events before the site visit and the area is undergoing final cover installation and grading which may have been causing poor drainage. This area will be evaluated during site-specific studies.
14	Appendix A, Section 2.3	The text states, "Storm events of a certain magnitude trigger an ad hoc inspection with repairs." DTSC requests further details on what defines the magnitude trigger, as well as ad hoc inspection details. DTSC notes that ad hoc inspections for storm events at or around the defined magnitude trigger should occur immediately after or near the end of the storm event due to the potential early signs of sea level rise. An inspection photo log detailing pictures and a map indicating direction of the view of the photos should be included to document the potential effects of early signs of sea level rise. **Additional Comment Received 6/3/2024** The comment response states that a major storm event that would trigger ad hoc inspections "is defined in the Parcel E-2 [Operations and Maintenance Plan (O&M Plan)] as '4.17 inches of precipitation or more over a 24-hour period (24-hour, 25-year storm).'" Section 2.6.1 of the most recent O&M Plan, *Final Operation and Maintenance Plan Remedial Action, Parcel UC-3*, dated July 2018, states that "Annual inspections will be performed during the rainy season, preferably after the first qualifying storm event, to enable determination of its effectiveness in providing drainage to the durable cover. A qualifying storm event is one that produces precipitation of 0.5 inches or more over a period of 48 hours." The 2012 *Interim Monitoring and Maintenance, Landfill Gas Control System, Parcel E-2 Landfill* similarly describes "a significant rain event (1/2 inch or greater)". Please advise if a different O&M Plan is referenced in the RTC or resolve the inconsistency.	The Parcel-specific O&M manuals discuss routine inspections and inspections following "hurricane-level" rainfall events as triggers for an additional inspection. A "major storm" is defined in the Parcel E-2 O&M plan as "4.17 inches of precipitation or more over a 24-hour period (24-hour, 25-year storm)." The following language has been added to the end of Appendix A, Section 2.3: Under the Emergency Response Plans included in the O&M manuals for Parcels B-1 (Engineering/Remediation Resources Group, Inc. 2016), B-2 (INNOVEX-ERRG Joint Venture 2018), C (Tetra Tech EC, Inc. and Engineering/Remediation Resources Group, Inc. 2017), D-1, (APTIM 2018; 2019), E-2 (ERRG, 2014) and G (Arcadis U.S., Inc. 2014) and IR-07/18 (Engineering/Remediation Resources Group, Inc. 2012), the following emergency response procedure is identified in the event of flooding [caused by intense storm events, high sea level, or wave action]: 1. Immediately conduct visual inspection of area to assess damage and potential impact. 2. In the event of safety hazard, immediately cordon off the affected area. 3. In the event of slope failure, contact contracted geotechnical consultant, as appropriate, to participate in an evaluation of problem area with 48 hours. If necessary, conduct a geotechnical investigation of the failure in order to develop a corrective action plan.

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			4. For damage or potential damage to components that affect site integrity, security, or safety, arrange repair or restoration within 2 weeks (weather and conditions permitting) to design conditions and in accordance with construction specifications. 5. Investigate preventive measures. 6. Notify Water Board, CalRecycle [for IR-07/18 and Parcel E-2], ROICC, DTSC, EPA, and CDPH. **Response to Additional Comment:** The O&M Plan referenced for Parcel E-2 is Section 4.1.2 of ERRG. 2014. *Preconstruction Operation and Maintenance Plan for Parcel E-2 Hunters Point Naval Shipyard San Francisco, California August 2014. Submitted as part of the Remediation Design Package for Parcel E-2.*
15	Appendix A, Section 3.1	The last paragraph states, "[groundwater table emergence] is projected to appear in several parcels by 2065." Please revise the text to list the expected parcels.	The text has been revised as follows: In summary, groundwater table emergence is expected to be minimal but present in Parcel D-1 by 2035 and is projected to appear in IR-07/18 and Parcels B-1, B-2, C, E, E-2 and G ~~several parcels~~ by 2065 in the highest SLR scenario. The Navy will track actual water table trends in the HPNS BGMP, to compare measurements to projections over time.
16	Appendix A, Section 5.1	The list of parcels with projected groundwater emergence in 2065 is missing Parcel E-2. Please revise.	Yes, Parcel E-2 has been added to the list of projected groundwater emergence in E-2.
17	Appendix A, Section 5.3.1	This section largely assumes that all volatile organic compound (VOC) plumes will be successfully remediated before climate impacts occur in 2035. This is not an appropriate assumption for such a screening level assessment. Given the complex nature of the site, past delays in remediation efforts, and the potential for site conditions or remediation goals to change in the future, this assessment should conservatively assume that vapor intrusion is a potential risk until such time as VOCs are fully mitigated to better inform future Five-Year Reviews.	The CRA projects that any residual petroleum-based VOCs will be successfully remediated by 2035 and chlorinated VOCs by 2065. Ongoing sampling of relevant monitoring wells will be used to verify these assumptions. The goal of the CRA is to evaluate whether climate hazards, such as sea level rise or groundwater level rise, have the potential to create new or increased exposure pathways. Vapor intrusion is already being considered in current CERCLA documents and there is no indication that any of the climate hazards will create new or increased vapor intrusion. Sewer lines have been removed near all the buildings in projected groundwater impacted areas. The Navy expects groundwater flow to be horizontal, even as sea level rises, and the

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			groundwater table potentially rises with it in nearshore areas. Therefore, the Navy does not expect any new or increased vapor intrusion pathways, beyond those already addressed in current CERCLA documents. The following text was added to Section 5.3.1 of Appendix A: The CRA projects that any residual petroleum-based volatile organic compounds will be successfully remediated by 2035 and CVOCs by 2065. Ongoing sampling of relevant monitoring wells will be used to verify these assumptions. The goal of the CRA is to evaluate whether climate hazards, such as sea level rise or groundwater level rise, have the potential to create new or increased exposure pathways. Vapor intrusion is already being considered in current CERCLA documents, sewer lines in impacted areas have been removed, and there is no indication that any of the climate hazards will create new or increased vapor intrusion.
18	Appendix A, Section 5.3.3	The text states: "Similarly, in Parcel B-2 (IR 26), annual monitoring indicates an exceedance for mercury, but additional remedies are planned to address that." As noted in comment 5 above, no such additional remedies have been selected. Please remove this sentence.	This sentence has been deleted.
19	Appendix A, Section 5.3.6	As noted in comment 4 above, the regulatory agencies have unaddressed concerns about the potential migration of lead contamination from groundwater to the freshwater wetlands. The vulnerability and resiliency assessment should be revised to assume that groundwater within 3 feet below ground surface (bgs), as identified in Figure 2-5, emerging groundwater in the freshwater wetland, and surface runoff from storms may be in contact with contaminated material.	Please see response to DTSC Comment #2.
20	Appendix A, Table 5-2	The impacts at Parcel E-2 are not consistent with the impacts identified in Table 2-3. The table should be updated to reflect the impacts in Table 2-3 and revised based on comment 19 above. Section 6.6.1.2 of the Five-Year Review should be similarly revised.	Not every impact in Table 2-3 results in a vulnerability in Table 5-2. However, in the case of Parcel E-2, Table 5-2 has been updated to be consistent with Table 2-3.

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21	Appendix A, Figure 3-1	The figure appears to indicate groundwater emergence at the northernmost point of the boundary between IR 7/18 and Parcel B-1, but this is not reflected in Table 2-2 or the text. Please confirm and revise as necessary.	The groundwater emergence projected by a highly conservative methodology in IR-07/18 and Parcel B-1 in 2035 is minimal and nearshore. These parcels are projected to encounter groundwater emergence more substantially in 2065 in the CRA (Appendix A) and these parcels have been identified as impacted in 2065 in Table 2-3 and text. The following text has been added in reference to the "No" in Table 2-2 for IR-07/18 and Parcel B-1: Although Figure 3-1 shows groundwater emergence in a small portion of IR-07/18 and B-1 coastline, the projection is highly conservative and shows a minimal area of impact nearshore in 2035. These parcels (IR 7/18 and B-1) are projected more clearly as impacted in the maps for 2065 and are identified as impacts for 2065 (along with Parcels B-2, C, D-1, E, and E-2)

Response to Comments	Contract/CTO N62470-21-D-0007; Contract Task Order No. N6247322F4930	Responses By Navy

Comment By **Andrew Bain**	Code/Organization **Northern California Federal Facilities Section, Superfund Division, EPA Region 9**	Date April 2024

Project Title and Location		**Type of Review**
Draft Fifth Five-Year Review Report, Hunters Point Naval Shipyard, San Francisco, California, November 2023	**X**	Draft
		Final
		Other

No.	Location	EPA Region 9 Comments Dated April 30, 2024	Navy Response
Climate Resilience Assessment Comments			
1	Climate Resiliency Assessment, Appendix A	The assessment looked at certain climate-related events and identified future, potential vulnerabilities to human and San Francisco Bay receptors from heavy metals and low-level radiological objects due to groundwater emergence. The draft CRA recommends that parcel-specific assessments be performed to determine if the projected climate change vulnerabilities increase CERCLA risk at this Site. However, the Navy does not specifically relate its CRA findings to each parcel's FYR protectiveness evaluation. Rather, the Navy makes generalized statements about projected climate impacts on a site-wide basis. In the Final Report, EPA recommends that the Navy commit to prioritize and commence parcel-specific climate vulnerability assessments prior to the Sixth FYR to address probable impacts anticipated as soon as 2035. Additionally, EPA acknowledges that the Navy's CRA document substantively applies EPA's Climate Vulnerability Assessment ("CVA") guidance criteria. However, the Navy only projects climate impacts through 2065, which is less conservative than the 100-year scenario EPA, as well as the state, use. Lastly, EPA requests that the Report formally include criteria for evaluating extreme precipitation event projections and correlation and analysis of groundwater contaminant concentrations, when collecting water-level elevation measurements.	***General Response Regarding the Climate Resilience Assessment*** *Note that several changes were made to the CRA based on Agency, City of San Francisco and Public comments. Specific changes that address comments are provided in the responses below and additional changes can be reviewed in the Redline-Strike-out provided in the draft-final Five-Year Review.* The Navy's CRA is a screening level assessment to identify potential vulnerabilities that can be further assessed in site-specific studies at HPNS. These site-specific studies and prioritization of parcels will be discussed with the agencies. Protectiveness statements in a Five-Year Review are only affected when the exposure pathway has the potential to be complete (groundwater is likely to emerge and land use is such that receptors could be exposed) and a future unacceptable health or risk has been identified (data collected, validated, and evaluated following CERCLA risk assessment processes resulting in unacceptable risk to receptors). The Navy will assess Year 2100 projections in conjunction with site-specific studies. Changes to the original RTCs based on DTSC comments are added in blue font text below. The Navy Framework for CRA (2024) recommends that climate impacts on protectiveness determinations can be better evaluated with detailed

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			site-specific studies have been conducted to verify projected impacts and vulnerabilities identified in the screening level CRA. As plans for these site-specific studies are developed, the agencies will have the opportunity to provide input. A prioritization meeting with the Navy and Agencies is proposed for November 2024. The following text has been added to the Other Findings for respective parcels (3.6.1.2, 4.6.1.2, 5.6.1.2, 6.6.1.2): The CRA estimates that groundwater emergence may occur in [IR-07/18, Parcel B-1, B-2, C, D-1, E, and E-2 wetland areas] by the year 2065. Additional site-specific assessments are planned which will include verifying mapping projections and evaluating the 2100 timeframe, at a minimum. However, protectiveness is only affected when increased CERCLA risk attributable to climate hazards has been identified (groundwater is likely to emerge and land use is such that receptors could be exposed and a future unacceptable health or ecological risk has been identified (data collected, validated, and evaluated following CERCLA risk assessment processes resulting in unacceptable risk to receptors). Where the potential for increased vapor intrusion is identified in other CERCLA documents, ARICs for VOCs are present, groundwater is being monitored, and removal of VOCs is occurring either through MNA or active remediation, thus reducing the potential for future vapor intrusion by reducing the source. Therefore, the potential for groundwater emergence does not affect the protectiveness determination in this Five-Year Review. For Parcel E-2, the following text has been added: Although the Parcel E-2 remedy components such as the sea wall were designed for resilience through a 3-foot rise in sea level (similar to the 2065 scenario), a site-specific study is recommended to evaluate the longer-term scenarios such as 2100. The following text has been added to Other Findings for Parcel D-1:

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			The CRA estimates that groundwater emergence may occur in Parcel D-1 by the year 2035. Additional site-specific assessments are planned which will include verifying mapping projections and evaluating the 2100 timeframe, at a minimum. Parcel D-1 will be prioritized and is scheduled to be initiated in 2025.

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1	Five-Year Review Summary Form, Protectiveness Statements, page xix, Parcel B-2, IR-26, Protectiveness Determination	Based on treatment efficacy uncertainties associated with the treatment for mercury in groundwater and the potential ecological impact on the San Francisco Bay, EPA does not support the Navy's *Short-term Protective* determination. Because of this uncertainty, and the agreed-upon need to enhance treatment delivery and/or explore other treatment options, EPA supports a Protectiveness Deferred determination. A *Short-Term Protective* determination is not appropriate because the MetaFix treatment for mercury in groundwater is not achieving its performance goals at two monitoring well locations, IR26MW49A and IR26MW71A. EPA recognizes, as documented by the Navy, that MetaFix could not be injected at certain locations due to limitations of the injection method. At our April 25, 2024, meeting, the Federal Facility Agreement (FFA) Parties discussed whether the Navy continues its plan to implement the enhanced delivery of Metafix, although the FFA regulatory parties believe that other treatment options need to be explored. The Navy agreed that the final *Fifth Five-Year Review Report* will include a date to submit a new FFA primary document, such as a technical memorandum. EPA expects the new primary document will be submitted as soon as practicable, and well ahead of the next Five-Year Review. Among other things, the new primary document should evaluate and analyze all available mercury groundwater monitoring data, including data collected from March 2018 to September 2022, and mercury exceedances at IR26MW49A and IR26MW71A, and propose next steps, including additional treatment options (tri-Agency letter of November 23, 2021). If the Navy is unable to commit to develop and provide a primary document within a timeline acceptable to the FFA regulatory parties, EPA may	From the Navy's perspective, there are multiple lines of evidence presented in the Five-Year Review suggest the concentrations observed in groundwater are unlikely to exceed 0.6 µg/L in Bay surface water. However, as discussed in the April 25, 2024 meeting with Agency representatives (Regional Water Board, US EPA Region 9, and Department of Toxic Substances Control [DTSC]), the Navy agreed to "Protectiveness Deferred" determination. The Protectiveness Statement has been changed to: A protectiveness determination cannot be made because there is uncertainty related to the concentrations of mercury discharging to the Bay from Parcel B-2, IR-26 groundwater. In order to make a protectiveness determination, the following actions needs to be made: evaluate all existing data to determine a path forward for additional data collection, remedy optimization, and/or additional remedial alternatives/treatment that have been screened for further evaluation. A primary document presenting the path forward will be finalized as soon as practicable but no later than July 31, 2025. The FFA parties will have discussions, as appropriate, prior to scoping and developing the primary document. The concerns raised by the Agencies regarding the success of the remedy have been added after the final paragraph of Section 3.4.3.1, discussion of In Situ Stabilization of Mercury in Groundwater at IR-26 as follows:

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		need to consider the effect that the continued lack of sufficient treatment performance, and groundwater mercury data and documentation may have on Parcel B-2. **Additional Comment Received 6/5/2024:** It is Navy's opinion, not necessarily shared by the FFA regulatory parties, that multiple lines of evidence are presented in the Five-Year Review that suggest the concentrations are unlikely to exceed 0.6 µg/L. A higher level of direct proof rather than indirect weight of evidence is needed to better determine impact to the Bay. At the April 25, 2024 meeting, the FFA regulatory parties, including EPA, expressed concern with a protracted Navy effort given the issue is over three years old. EPA expects that the Navy will complete the final primary document as soon as practicable and not later than the end of July 2025. The primary document must include additional treatment options that have been initially screened for further evaluation. EPA also expects discussions among the FFA parties, as appropriate, prior to scoping and developing the primary document. Please cite the date of the letter (November 23, 2021) and do not attempt to interpret what is meant by the tri-agency letter. EPA quotes the letter directly. As discussed at the April 25, 2024 meeting, the FFA Regulatory Parties assumed that the Navy has the authority to "optimize" ISS (e.g., use of a larger rig in areas of prior injection refusal), and EPA does not oppose any Navy attempt to do so, as long as such action is timely and completed prior to July 31, 2025. However, as stated in the November 23, 2021 triagency letter, EPA continues to expect that additional treatment options need to be screened, evaluated and pursued by the Navy. The Navy needs to acknowledge this. [With respect to the lines of evidence presented] Please reflect this is the Navy's belief/perspective. It is not necessarily shared by the FFA Regulatory Parties. The wording of what the Navy needs to do because of uncertainty is worded differently from that stated earlier (above). The wording needs to be consistent.	After completion of the 3-year post-ISS treatment performance monitoring, the FFA regulatory agencies (EPA Region 9, DTSC, and Regional Water Board) released a tri-agency letter on November 23, 2021 which reiterated that "mercury concentrations in groundwater along the San Francisco Bay margin consistently exceed the trigger level. Therefore, in-situ stabilization (ISS) has failed to minimize or prevent unacceptable discharge of mercury to the San Francisco Bay. Consequently, additional treatment options need to be screened, evaluated, and pursued by the Navy via the development of a new primary document work plan." (EPA, DTSC, and Regional Water Board, 2021). As discussed at the April 25, 2024 meeting, the FFA regulatory parties assumed that the Navy has the authority to "optimize" ISS (e.g., use of a larger rig in areas of prior injection refusal) and the Navy recognizes that EPA does not oppose any Navy attempt to do so, as long as such action is timely and completed prior to October 31, 2025. As stated in the November 23, 2021 tri-agency letter, the Navy also recognizes that EPA continues to expect that additional treatment options need to be screened, evaluated, and pursued by the Navy. While there are continued exceedances of the TL in groundwater, the Navy believes the following provides lines of evidence that the residual concentrations in mercury in groundwater are not likely to result in a concentration above 0.6 µg/L in the Bay surface water: • Completion of source removal in 2008 via a time-critical removal action (Insight, 2009) • Partial success of the in-situ stabilization (ISS) as evidenced by reducing the extent of mercury exceedances of the TL from 3 performance monitoring locations to 2 performance monitoring locations and decreasing concentrations in one of the remaining locations (IR26MW49A). A time-series plot of data through 2023 for IR26MW49A, IR26MW51A, and IR26MW71A is presented on **Figure 3-7**. Mercury concentrations during the last 5 years of monitoring

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		Please reflect it is the Navy's belief/perspective (not the FFA Regulatory Parties) that mercury exceedances are not expected.	have been below historical maximums and are consistently below 10 times the HGAL. • The limited extent of impacted groundwater; IR26MW71A and IR26MW49A are approximately 45 feet apart and IR26MW49A is approximately 88 feet from IR26MW51A with no exceedances. • Comparison of groundwater quality parameters to Bay surface water quality parameters (temperature and dissolved oxygen, **Table 3-4**) indicate that the groundwater is not representative of Bay water because groundwater temperature is consistently warmer than surface water, and dissolved oxygen is consistently lower than surface water. However, because there is uncertainty in the concentration at the exposure point and because the ISS remedy did not reduce the concentration in groundwater to below 0.6 µg/L at all monitoring wells, additional data collection, remedy optimization, and/or additional remedial alternatives/treatment that have been screened for further evaluation are necessary to determine whether the remedy is protective of the Bay. Section 3.5.1.3 (Technical Question A, Is the remedy functioning as intended by the decision document) has been modified as follows: ***3.5.1.3 Parcel B-2*** ~~Yes.~~ The ISS injections did not effectively reduce mercury in two locations (IR26MW49A and IR26MW71A) to below the TL of 0.6 µg/L. Although mercury continues to exceed TLs in groundwater collected from downgradient monitoring wells, data demonstrating that mercury concentrations in surface water (the ultimate receptor) are below the HGAL of 0.6 µg/L are lacking. The RAO is stated as follows: … [no change from existing text] ~~Protectiveness is not affected based on the following rationale:~~ Data at the groundwater-surface water interface has not been collected;

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			however, from the Navy's perspective, it is not expected that mercury exceeds 0.6 µg/L based on the following rationale: • Source concentrations in soil have been removed during the IR-26 Mercury Removal TCRA (Insight, 2009). • Although dissolved mercury in groundwater exceeds the TL in two locations, Mann-Kendall analysis indicates it is decreasing at one location (KMJV, 2021), indicating partial success of the ISS remedy at minimizing migration to the surface water. • The TL is the Hunters Point groundwater ambient level (HGAL), which is not a risk-based concentration, formal RG, or ARAR according to the ROD Amendment (Navy, 2009). • The screening of groundwater data against the TL or other surface water benchmarks, such as the National Recommended Water Quality Criteria (NRWQC; USEPA, 2023), conservatively assumes that ecological receptors are directly exposed to measured concentrations in groundwater. However, there will be a mixing zone where groundwater interfaces with surface water. The extent of that zone is unknown, but mixing is expected to occur, and the concentrations would decrease with distance from the mixing zone and tidal action. Site-specific mixing factors can range from 1 to several thousand. For example, USEPA uses a default mixing and attenuation factor of 20 to address the dilution of soil leachate as it moves through the groundwater aquifer (USEPA, 1996). Furthermore, mixing studies conducted by State of Washington, Department of Ecology (2009) found that the majority of the reduction in porewater concentrations was because of dilution by surface water and averaged 90 percent (that is, a dilution factor of 0.1). Assuming a similar dilution factor, the maximum post-injection detected concentration of dissolved mercury (8.55 µg/L) would be 0.855 µg/L, which does not exceed the NRWQC of 0.94 µg/L (USEPA, 2023).

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			• The post-treatment concentrations after 2018 have consistently been lower than 10 times the 0.6 µg/L TL at both IR26MW49A and IR26MW71A (**Figure 3-7**). • Groundwater quality parameters (temperature and dissolved oxygen) indicate that the water in sentinel wells IR26MW49A, IR26MW50A, IR26MW51A, and IR26MW71A are not representative of surface water (**Table 3-4**). Review of annual O&M inspections, historical documents… [no change from original text]. The following issue/recommendation has been added to the Five-Year Review Summary Table and Table 3-9 (Parcel B Issues, Recommendations, and Follow-up Actions): Issue: There is uncertainty related to the concentrations of mercury discharging to the Bay from Parcel B-2, IR-26 groundwater Recommendation: Evaluate all existing data to determine a path forward for additional data collection, remedy optimization, and/or remedial alternatives/treatment that have been screened for further evaluation. Prepare a primary document presenting the path forward. Milestone Date: 10/31/2025 Affects Protectiveness: Protectiveness Deferred **Response to Additional Comment:** The text has been updated as suggested by EPA's additional comment as denoted in blue font above. The date of July 31, 2025 was identified for the milestone date during the April 2024 meeting. It was determined after this meeting that since this is an FY25 project award, it would be affected by the financial brownout. NAVFAC's financial system is being changed which not allow the award of FY25 projects to start until after December 31, 2024. Due to this uncontrollable issue, the Navy will require a date change to October 31, 2025. This date change is shorter than the duration of the brownout.

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2	Five-Year Review Summary Form, Protectiveness Statements, page xix, Parcel C, B-aquifer, Protectiveness Determination	This comment addresses the B-aquifer characterization. EPA does not support the Navy's draft *Short-term Protective* determination but rather a *Protectiveness Deferred* determination because from EPA's perspective, for groundwater, information has come to light that calls into question the protectiveness of the remedy (Question C of the Report), and more information is needed to determine protectiveness and whether an unacceptable risk exists. In general, both the A-aquifer and B-aquifer (and bedrock) groundwater flows towards the San Francisco Bay. The Navy's cross-sections in the RU-C2 area confirm there are gaps or holes in the aquitard that enable communication between the A- and B-aquifers, and the Navy's data confirm there is contamination in the underlying B-aquifer at RU-C2 downgradient of the gaps or holes, and in the deep Fractured-Water Bearing Zone (deep F-WBZ) at RU-C4. Consequently, the A-aquifer cannot be isolated as protective. In response to FFA regulatory concerns, the Navy has agreed to, but has not initiated, a full and timely characterization of the B-aquifer in the RU-C2 area, including the upper F-WBZ below and in contact with the B-aquifer. The Navy has also agreed to monitor B-aquifer wells as part of performance monitoring of the groundwater treatment of the A-aquifer at RU-C2 (RAWP Phase III). With respect to the Deep F-WBZ at RU-C4, which was the subject of an informal dispute brought by the Regional Water Quality Control Board and EPA, the Navy has submitted a draft workplan to fully characterize the nature and extent of contamination and groundwater flow patterns to the San Francisco Bay. The workplan has not been finalized and work has not yet commenced. For the Final *Fifth Five-Year Review Report*, EPA requires a list of the primary documents that are anticipated to be developed to perform the full and timely characterization of the B-aquifer in the RU-C2 groundwater area, and the Navy's anticipated timeframe for developing these documents. An anticipated timeframe for the performance monitoring of the groundwater treatment at RU-C2 in both the A- and B-aquifers should also be provided. At the April 25, 2024, meeting, the Navy expressed agreement in concept that these commitments have been made. If the Navy is unable to commit to develop and provide the requested primary documents within a timeline acceptable to the	Navy acknowledges that while, from the Navy's perspective, the remedy is protective of human health through active remediation, monitoring, and land use controls; additional information is needed to determine protectiveness for Bay receptors and has changed the remedy protectiveness determination to "Protectiveness Deferred" until such time the investigations are completed, and a protectiveness determination can be made. Specifically, the Navy will complete the Deep F-WBZ investigation for RU-C4 and the B-Aquifer and Upper F-WBZ investigation for RU-C2. The Draft-Final Five-Year Review Section 4.5.3 Technical Assessment Question C has been updated to incorporate agency concerns related to the hydrogeological communication between aquifer units at Parcel C, discharges to the Bay, and the investigations currently underway for the Deep F-WBZ in RU-C4, and planned for the B-Aquifer and Upper F-WBZ in the RU-C2 area to address these data needs as follows: Yes. The following information has come to light that could question the protectiveness of the remedy: • There have been detections of COCs from A-aquifer groundwater within the B-aquifer and F-WBZ groundwater and the connection and communication between hydrogeologic units within Parcel C is not fully understood. Therefore, further characterization of the Deep F-WBZ in RU-C4 and the B-aquifer and Upper F-WBZ in RU-C2 are required to demonstrate that remedies within the A-aquifer will be effective and not re-contaminated by COCs within the B-aquifer and F-WBZ and unacceptable discharges to the Bay are not and will not occur. The Protectiveness Statement has been changed to: A protectiveness determination cannot be made because there is uncertainty related to the hydrogeologic communication between the A- and B-aquifers and whether discharge of chemicals present in the B-aquifer present potential unacceptable risks to Bay receptors. In order to make a protectiveness determination, the following action, at a

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		FFA regulatory parties, EPA reserves its right to reassess our evaluation of B-aquifer and Deep F-WBZ groundwater at Parcel C. **Additional Comment Received 6/5/2024:** Please clarify that this is the Navy's belief/perspective, not necessarily that of the FFA Regulatory Parties. The Navy states that it "…will complete the Deep FWBZ investigation for RU- C4 and the B-Aquifer investigation." This statement needs to clearly identify two separate investigations: the Deep FWBZ investigation in RU-C4 (which is the subject of the Water Board/EPA Informal Dispute, and which is currently in the "Draft Final Work Plan" stage) and the B-aquifer and underlying Upper F-WBZ in the RU-C2 area (still in development). The first component of the RU-C2 investigation has been agreed to by the Navy. The Navy has committed to collecting and evaluating B-aquifer data as part of the performance monitoring of the A-aquifer remedial action (as documented in the Navy's Response dated 2/8/24 to EPA's Item Nos. 1 and 2 dated 3/14/23 & 11/22/23 in Appendix H of the Final Parcel C Phase III Remedial Action at Rus C2 and C5, dated March 2024). The protectiveness statement does not include the development of a conceptual site model (CSM) of the A- and B-aquifers and shallow F-WBZ at RU-C2 and the deep F-WBZ at RU-C4. The statement should be revised to include the development of CSMs for both RU-C2 and RU-C4. As EPA discussed at the April 25, 2024 meeting, regarding RU-C2, the collection of B-aquifer and shallow F-WBZ data, as appropriate, should commence with the performance monitoring period, which EPA expects will be within the next two years. EPA also expects discussions among the FFA parties, as appropriate, prior to scoping and developing primary documents, such as workplans.	minimum, needs to be made: complete investigations of the Bay Mud/Sandy Lean Clay aquitard, extent of chemicals in the B-aquifer and F-WBZ and use current ecological risk assessment methods and criteria, as appropriate, to assess potential impacts to Bay receptors. For the Deep F-WBZ, a draft-final workplan has been provided to the FFA Regulatory Parties. For RU-C2, B-aquifer data collection and Upper F-WBZ, as appropriate, are expected to commence coincident with the performance monitoring period. The FFA parties will have discussions, as appropriate, prior to scoping and developing primary documents, such as workplans. Depending on the results of the data analyses, the development of conceptual site models, and necessary steps, these actions could possibly be completed within the next 5 years, at which time, as appropriate, a protectiveness determination will be made. **Response to Additional Comment:** The revisions suggested by the EPA have been made in the comment above as denoted in blue font. Additionally, the following issue/recommendation has been added to the Five-Year Review Summary Table and Table 4-8 (Parcel C Issues, Recommendations, and Follow-up Actions): Issue: There have been detections of COCs from A-aquifer groundwater within the B-aquifer and F-WBZ groundwater and the connection and communication between hydrogeologic units within Parcel C is not fully understood. Therefore, further characterization is required to demonstrate that remedies within the A-aquifer will be effective and not re-contaminated by COCs within the B-aquifer and deep F-WBZ and unacceptable discharges to the Bay are not and will not occur. Recommendation: Complete investigations of the Bay Mud/Sandy Lean Clay aquitard, extent of chemicals in the B-aquifer and F-WBZ and use current ecological risk assessment methods and criteria to assess potential impacts to Bay receptors. Where warranted, additional actions or changes to the remedy will be recommended at the conclusion of these investigations.

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			Milestone Date: 7/31/2029 Interim Milestones: Completion of F-WBZ investigation fieldwork 11/30/2025, completion of the F-WBZ investigation report 11/30/2026[1] Affects Protectiveness: Protectiveness Deferred Footnote: [1] The Parcel C B-aquifer study will also be conducted within the overall timeframe to meet the milestone date; however, because funding and contracts are not currently in place, the interim milestones are unavailable.
3	Five-Year Review Summary Form, Protectiveness Statements, page xxi, Parcel E-2, Protectiveness Determination	EPA agrees with the Navy's *Will Be Protective* determination, however, additional actions are requested in the Final *Fifth Five-Year Review Report*. For landfills of this nature, the presumptive remedy in both the CERCLA and RCRA programs is to "cap and contain the waste," and include appropriate environmental controls and monitoring for, at a minimum, stormwater, groundwater, and landfill gas. After a careful review and comparison of cleanup alternatives against EPA's nine evaluation criteria, the Parcel E-2 landfill ROD selected a remedy consistent with the presumptive remedy approach yet included several special design elements to account for the unique nature and location of this particular landfill. EPA agrees that Parcel E-2 is still undergoing remedy construction, including relatively minor work on the cover system, the completion of the landfill gas extraction and conveyance system, and the completion of the freshwater (FW) and tidal wetlands. Notwithstanding EPA's agreement that the remedy is still under construction, given that the Navy has deferred responding to Question A ("is the remedy functioning as intended by the decision documents?") in the Report, and given that certain fundamental landfill containment and control facilities, such as the nearshore slurry wall, the upland slurry wall, and the landfill cover system have been constructed, EPA has indicated that it is imperative that the Navy immediately begin to evaluate the effect the landfill cap and slurry walls have on groundwater flow and contaminant concentration within the landfill, and potential impact on the San Francisco Bay. The Navy needs to collect and analyze groundwater elevations and water quality in both the A- and B-aquifers	The Navy acknowledges that EPA agrees with the Will Be Protective determination as long as the minimum information and analysis needs of the FFA Regulatory Parties, including the detailed status of all planned and installed wells, are provided on an agreed upon schedule. Because the Remedy at Parcel E-2 is currently under construction the Navy's protectiveness determination is "Will be Protective". The construction has prioritized components to address potential migration to the Bay first with the following components completed: • Hot spot removal, Nearshore slurry wall, Shoreline revetment • Soil excavation to create freshwater and tidal wetlands • Radiological characterization, installation of foundation soil layer in preparation of Phase III landfill cover installation • Final cover installation Because the remedy is complex and requires multiple phases for installation over a longer timeframe, the Navy has identified the following additional Other Findings (new section 6.6.1.5 and in the Five-Year Review Summary Table under Other Findings) to document the Navy's commitment to continue to construct the remedy as well as analyze currently available data in a timely manner on a schedule agreed to among the FFA parties for the remedy components that are in place. As discussed at the April 24, 2024 meeting, the specific minimum

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		underlying the Parcel. The collection and more importantly the analysis of such data should not be deferred pending the completion of the remaining facilities. The FFA Parties need a clear and common understanding of the status of Parcel E-2 groundwater and leachate monitoring and extraction wells, French Drain sampling port, FW piezometers, and FW outfall. EPA also expects that as part of the evaluation, the Navy will produce, at a minimum, plume maps of contaminant concentrations, and groundwater contour maps showing flow direction in the A- and B-aquifers. For the Final *Fifth Five-Year Review Report*, EPA requires a list of the primary documents that are anticipated to be developed to perform the evaluation work, and the Navy's anticipated timeframe for developing those documents. At the April 25, 2024, meeting, the Navy expressed agreement in concept but awaits further information from the FFA regulatory parties, which is forthcoming in a tri-Agency letter. If the Navy is unable to provide the required list and schedule in the Final *Fifth Five-Year Review Report*, EPA may need to consider the effect that the lack of sufficient groundwater data and documentation may have on potential performance issues at Parcel E-2. In addition, EPA has conveyed, most recently at the April 25, 2024, meeting, that the Navy needs to amend the appropriate primary document to change/replace an existing compliance point for monitoring methane, an explosive gas, at the facility property boundary. At the April 25 meeting, the Navy agreed in principle and will propose the primary document that must be amended and an anticipated timeframe for modifying that primary document. **Additional Comment Received 6/5/2024:** As stated in our comments and at the April 25, 2024 meeting, it is EPA's position that if the Navy is unable to agree to the timely analysis of existing Parcel E-2 groundwater data, EPA may need to consider the effect this may have on potential performance issues at Parcel E-2 and our current protectiveness determination. As discussed, most recently at the April 25, 2024, meeting, the Navy needs to amend the appropriate primary document(s) to change/replace an existing	information and analysis needs of the FFA Regulatory Parties, including a detailed status of all wells, are forthcoming in a tri-agency letter, after which the FFA parties will meet to discuss specific tasks and schedules. As discussed informally and in EPA's comments, the Navy recognizes that EPA expects the Navy will immediately begin to evaluate the effect the landfill cap and slurry walls have on groundwater flow and contaminant concentration within the landfill, and potential impact on the San Francisco Bay: ***6.6.1.5 Parcel E-2 Other Findings*** The remedy at Parcel E-2 is complex and involves multiple phases of field work to install. A number of facilities that are important to understanding groundwater flow and contaminant concentrations have been completed or are substantially completed (for example, Nearshore Slurry Wall and landfill cover). The following is a summary of the remaining RA work, interim studies, and key milestones planned prior to completing the RACR: • Construct remaining components of the remedy including the permanent landfill gas system, freshwater and tidal wetlands, and groundwater monitoring network under the approved Final Work Plan (KEMRON, 2018): - Landfill Gas System (Phase IVa) anticipated in 11/30/2025 - Wetlands (Phase IVb) anticipated in 11/30/2027 • Modify the landfill gas monitoring program to include a monitoring probe (GMP54) outside of the newly installed landfill cover as a new compliance point by revising the appropriate primary document(s). The primary document(s) needing revision and the proposed schedule for revision will be further discussed with the FFA Regulatory Parties not later than 9/30/2024. • Document completion of the protective liner and final cover installation in the Phase III Remedial Action Construction Summary Report anticipated by 11/30/2024.

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		compliance point for monitoring methane, an explosive gas, at the facility property boundary. This is overdue and must be done as soon as practicable. We suggest the primary document(s) be identified and a draft schedule is developed for discussion with the FFA Regulatory Parties as soon as possible and not later than September 30, 2024. The Navy's informal exchange of one point of compliance with another, without amending the necessary primary document(s), is not acceptable. Our concerns stand and must be appropriately addressed: EPA has indicated that it is imperative that the Navy immediately begin to evaluate the effect the landfill cap and slurry walls have on groundwater flow and contaminant concentration within the landfill, and potential impact on the San Francisco Bay. The Navy needs to collect and analyze groundwater elevations and water quality in both the A- and B-aquifers underlying the Parcel. The collection and more importantly the analysis of such data should not be deferred pending the completion of the remaining facilities. The FFA Parties need a clear and common understanding of the status of Parcel E-2 groundwater and leachate monitoring and extraction wells, French Drain sampling port, FW piezometers, and FW outfall. EPA also expects that as part of the evaluation, the Navy will produce, at a minimum, plume maps of contaminant concentrations, and groundwater contour maps showing flow direction in the A- and B-aquifers. Except as noted, below, EPA is not providing comment or response on the Navy's inclusion, under "Navy Response (May 2024)" pertaining to EPA's comments of 4/30/2024, of "Water Board specific concerns." Irrespective, EPA's responses of 6/4/2024 presented herein stand. Regarding what the Navy notes, as stated at the April 25, 2024 meeting, the FFA Regulatory Parties expect that the Navy immediately begin to evaluate the effect the landfill cap and slurry walls have on groundwater flow and contaminant concentration within the landfill, and potential impact on the San Francisco Bay. The Navy needs to collect and analyze groundwater elevations and water quality in both the A- and B-aquifers underlying the Parcel. The collection and more importantly the analysis of such data should not be deferred pending the completion of the remaining facilities. The FFA Parties	• Conduct a study to evaluate the performance of the upland slurry wall as documented in the Post-Remedial Action Performance Evaluation Work Plan to evaluate the performance of the Upland Slurry Wall – Final 8/31/2024. Fieldwork is anticipated to be completed in 2024 and the Post-Construction Remedial Action Performance Report is anticipated by 12/31/2024. Water Board specific concerns and responses were added to the technical assessment for Parcel E-2 (Section 6.5.1, page 6-20 and 6-21) as follows: While the remedy is currently under construction, Agency concerns have been raised regarding the completed components: • **Concern: The Upland Slurry Wall was not installed as designed**. Geologic refusal was met along a 200-foot section of the planned wall at approximately 0 feet msl (10 feet shallower than the designed depth). The slurry wall was designed to minimize flow of offsite groundwater into the landfill and was designed as a "hanging wall" (not embedded into bedrock) with a french drain (which was installed according to the design) to prevent precipitation recharge and divert flow to the freshwater wetland. The material encountered was determined to be bedrock which has a lower permeability than the surrounding aquifer material. The draft final work plan to evaluate the Upland Slurry Wall performance is currently under way and work is anticipated to begin in 2025. • **Concern: The turbidity curtain was not used during remedy construction.** A 2,000-foot US Department of Transportation Type III offshore turbidity curtain was installed during shoreline work in accordance with the Design (ERRG, 2014) on November 30, 2016 as documented in the Phase II Remedial Action Construction Summary Report (Aptim, 2021). The turbidity curtain was removed after shoreline activities were completed, in accordance with the RAWP Appendix D, Environmental Protection Plan (CB&I, 2016) which states "During shoreline earthwork (revetment installation, wetlands excavation, and site grading), a turbidity curtain will be

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		need a clear and common understanding of the status of Parcel E-2 groundwater and leachate monitoring and extraction wells, French Drain sampling port, FW piezometers, and FW outfall. EPA also expects that as part of the evaluation, the Navy will produce, at a minimum, plume maps of contaminant concentrations, and groundwater contour maps showing flow direction in the A- and B-aquifers.	deployed as the BMP for sediment control." Upcoming nearshore work, such as wetland installation, will be conducted in accordance with the design and RAWP. • **Concern: The Navy has not provided all stormwater best practices documentation.** Navy provided the following final primary documents that contain stormwater best practices: Remedial Action Work Plans (RAWPs) (CB&I, 2016; KEMRON, 2018); Stormwater Protection Plan; and stormwater best practices monitoring documentation during construction (provided in the Phase I RACR [Gilbane, 2018a] and Phase II RACSR [APTIM, 2021], which will also be provided in the forthcoming Phase III RACSR [pending]). The Navy also responded to the Water Board's December 3, 2022, and January 11, 2023, and May 23, 2023 follow-up e-mail requests for stormwater records. • **Concern: There is not adequate documentation that lead was removed from the wetland areas and groundwater may be affected in the future.** Lead was removed from the tidal wetland areas according to the Phase II RAWP (KEMRON, 2018) and subsequent Fieldwork Variance #5 (Appendix G of APTIM, 2021). Exceedances shown on Figures 6 and 7 of the RACSR (APTIM, 2021) were initial samples prior to over-excavation to remove lead-impacted soils. Post-over-excavation samples were found to be below the RG. Additionally, the landfill cap geomembrane and geosynthetic clay liner layers prevent vertical infiltration of rainfall from reaching the underlying landfill waste and promoting leachate. The geocomposite drainage layer carries any flow that infiltrates through the vegetative layer to the perimeter ditches. The surface water from the eastern half of the site will be collected by the eastern perimeter ditch and will drain directly into the Bay through the culvert pipe at the southeast corner of the site. The surface water from the western half of the site will be collected by the western perimeter ditch and will flow into the freshwater wetlands with excess runoff draining through the freshwater wetlands outfall pipe into the Bay. The chemically contaminated soils near the

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			freshwater wetlands were removed during previous hot spot excavations and excavations during Phase II subgrade preparations, with confirmation testing to show that they are below action limits in the Final RACSR for copper, lead, total PCBs, and total TPHs. There is no required tie into the underlying Bay Mud at the Wetlands Boundary. Refer to Detail 4 on Design Drawing C18 from the DBR for the cover termination at the wetlands boundaries. • **Concern: There may be impacts to soil due to RCRA hazardous waste handling in stockpiles during remedy installation**: Navy is planning, at agencies' request, to sample the soil under former Parcel E-2 stockpile locations now covered with radiological retesting radiological screening yard pads for metals to confirm that the stockpiles didn't impact the soils around them during storm events. This will be completed after the pads are removed. The Navy understands that there is a pending data request and notes the following: • Groundwater elevations are available in the BGMP reports for all installed wells at Parcel E-2 • COC data for A- and B-aquifers are available in the BGMP for all installed wells at Parcel E-2 • Leachate testing is unavailable as the leachate ports have not yet been installed • Extraction well data, french drain sample port data, freshwater wetland piezometer and wetland outfall data is not available because these components have not yet been installed • Detailed plume and flow direction cannot be determined as the full monitoring well network has not been installed; However, groundwater modeling conducted during design planning supports the theoretical performance of the remedy. This is included in Appendix F of the RD (ERRG, 2014) The Final RAWP (KEMRON, 2018) covers all the remaining remedy installation elements in the RD/ROD. The Final RAMP for Parcel E-2

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			(ERRG, 2014b) will be used to monitor the remedy once its installation is completed. References: Engineering/Remediation Resources Group, Inc. (ERRG). 2014. Design Basis Report, Parcel E-2, Hunters Point Naval Shipyard, San Francisco, California. Final. August 15. ERRG, 2014b. Final Remedial Action Monitoring Plan, Parcel E-2, Hunters Point Naval Shipyard, San Francisco, California. August 15. CB&I Federal Services, LLC. (CB&I). 2016. Work Plan Shoreline Revetment; Site Grading and Consolidation of Excavated Soil, Sediment, and Debris; and Upland Slurry Wall Installation Remedial Action, Parcel E-2, Hunters Point Naval Shipyard, San Francisco, California. Final. October 12. KEMRON Environmental Services (KEMRON). 2018. Remedial Action Work Plan, Final Cove, Wetlands, and Landfill Gas Control and Containment System, Remedial Action Parcel E-2, Hunters Point Naval Shipyard, San Francisco, California. Final. December 26. Gilbane. 2018. Remedial Action Completion Report, Hot Spot Delineation and Excavation and Nearshore Slurry Wall Installation, Remedial Action, Parcel E-2, Hunters Point Naval Shipyard, San Francisco, California. June. APTIM. 2021. Remedial Action Construction Summary Report, Parcel E-2 (Phase II), Hunters Point Naval Shipyard, CA. April 6 **Response to Additional Comment:** The revisions suggested by the EPA have been made in the comment above as denoted in blue font.

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1	General	**Air Monitoring Program:** Throughout the HPNS Site, the Navy implements a robust dust control and air monitoring program. This program includes requirements for dust control activities, such as wetting soil during excavation and stockpiling, covering soil stockpiles with soil fixative, tarping loads of soil when transported, etc., in addition to monitoring real-time PM10, asbestos, radionuclides of concern, and filter-based PM10, Total Suspended Particulates, and metals. Air monitoring stations are placed throughout the site to evaluate community exposure. The FYR does not mention these activities, in spite of significant interagency and community coordination. Please add information about the Navy's dust control and air monitoring program, summarize data collected over the last five years and discuss the impact on short-term protectiveness. **Additional Comment Received 6/5/2024:** EPA appreciates the additional description about the site-wide air monitoring program implementation status and its importance to the regulatory and local communities.	Comment acknowledged; air monitoring program information was added to Section 1.4 as follows: **Section 1.4.4 Air Monitoring and Dust Control** Dust control is of paramount concern at HPNS and comprises two major goals of equal importance: (1) protection of worker safety and health, and (2) protection of the nearby community and public at large. A dust control plan is included in Remedial Action Work Plans (RAWPs) for all onsite activities that have the potential to generate dust, including, but not limited to, installing durable covers, installing landfill caps, conducting radiological retesting and trenching activities, and initiating building demolition. Dust mitigation measures include the following: track-out control to dislodge any dirt adhering to tires, wetting soil during earthmoving and /earth -disturbing activities and on stockpiles, minimizing the height from which soil is dropped during earthmoving activities, equipping trucks with tarping systems to cover loads during soil transport, minimizing truck traffic distances, and using real-time air monitoring. Air monitoring is performed to confirm worker safety and provide reasonable assurance of the protection of the surrounding residents in accordance with National Institute for Occupational Safety and Health-approved air sampling methodology. The following three types of air monitoring are conducted during intrusive construction activities: • Air quality monitoring for total suspended particulates, manganese, arsenic, lead, particulate matter less than 10 microns in diameter, and asbestos • Air monitoring for radionuclides of concern (ROCs) • Personnel monitoring The air quality sampling will be used to assess the status of air quality compliance and to evaluate modifications to project activities in the event of compliance concerns. Representative meteorological data for the general project areas, specifically wind speed and direction, are used to identify the most appropriate locations for the air monitoring

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			stations. Air samplers and monitoring stations are located in the most practical locations upwind and downwind from the project site according to available wind speed and direction data. In addition, real-time air monitors are employed to provide immediate information for dust levels present at the site perimeter. The Navy provides updates to the community via a public website (Navy, 2014). Available reports between November 2018 through November 2023 were reviewed for Parcels with earthmoving activities and Table 1-4 summarizes the type of work, date range, and findings during air monitoring. There were no major issues with air monitoring results identified during the monitoring period. Reference: Navy. 2024. *Documents: Air Monitoring.* https://www.bracpmo.navy.mil/BRAC-Bases/California/Former-Naval-Shipyard-Hunters-Point/Documents/#air-monitoring
2	The Fourth Five-Year Review, Parcel B Issues, Recommendations, and Follow-up Actions	There was a criticism of the Fourth FYR that has not been described in sufficient detail. EPA needs confirmation that this issue is addressed: "*The regulatory agencies do not agree with the Navy's risk assessment methodology used to reduce the ARICs for VOC vapors*." This is described in tables for Parcels B-1 and B-2, in Table 3-4 and elsewhere (e.g., Table 5-5, Fourth Five-Year Review Parcels D-1, D-2, UC-1, and G Issues, Recommendations, and Follow-up Actions, for Parcels D-1 and G). **Additional Comment Received 6/5/2024** The RTC refers to Section 8 ("Revised Preliminary Soil Gas Action Levels and Post-Removal Human Health Risk Assessment Methodology") of the Final Remedial Action Work Plan for Parcel B-1, IR Site 10, Building 123 (September 2023) for the Navy's approach to evaluating VI ARICs. Regarding the approach to establishing site-specific and chemical-specific soil-gas attenuation factors (AFsg) described in Section 8.3 of that 2023 document, EPA has multiple concerns with the technical defensibility of the approach. Section 8.3 (Tier 2) lists six bullets to describe elements of the approach to establishing site-specific AFsg values. Only one of these, bullet 2, addresses a scientifically defensible approach to establishing site-specific AFsg values, namely, the collection of co-	One of the objectives of the Final Remedial Action Work Plan for Parcel B-1, IR Site 10, Building 123 (September 2023) is to utilize post-Remedial Action (RA) soil gas data and compare to updated soil gas action levels (SGALs) to evaluate ARICs for VOC vapors. This is in accordance with the Fourth Five-Year Review recommendations. The revised preliminary residential SGALs will be used as a first-tier screening tool in the post-removal vapor intrusion (VI) Human Health Risk Assessment (HHRA) to determine grid blocks that may require additional evaluation. Based on the results of the first-tier data screening, a second-tier evaluation may be needed. The second-tier evaluation will involve use of site-specific or modeled attenuation factors based on site-specific chemical, microbial, and /or geotechnical data. Hence, the results of the post-RA VI HHRA will be used to evaluate the VI ARICs for IR-10 and will be presented in the IR-10 RACR. Details for this methodology is described in Section 8 of Final Remedial Action Work Plan for Parcel B-1, IR Site 10, Building 123 (September 2023).

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		located site-specific indoor air – subslab or near-source soil gas data. What is not mentioned in this bullet, but should be, is that the paired data should be collected contemporaneously in both cold and warm seasons with HVAC systems off and with a sufficient amount of paired data that statistically robust AFsg values could be determined, and the values should be consistent with the RME approach (i.e., not a central tendency approach). Such an empirical approach would likely be acceptable, pending evaluation of the work plan and resulting data by agency subject matter experts, including statisticians. Other bullets describe methods that are unacceptable for reasons that are briefly described here. Bullet 1 describes microbial studies of aerobic degradation of vinyl chloride, which is not the domain of attenuation factors based on mass transfer of a chemical between different media. Biological mitigation is addressed in the site-specific soil vapor concentrations themselves and should not be treated as a physical partitioning constant. In any case, it would need to be rigorously demonstrated that laboratory microbial studies have direct relevance to in situ conditions and that observed degradation parameters (e.g., kinetics) could be treated as constant without consideration of site-specific conditions (e.g., populations of metabolically active bacteria, temperature, moisture content, etc.). Use of the EPA spreadsheet adaptation of the Johnson and Ettinger (1991) model (bullet 4) would not be sufficiently representative of site-specific conditions to justify establishing AFsg values; note that the "JE_README" tab of the EPA J&E spreadsheet explicitly states in red, boldface font that "The J&E model does not replace the EPA VISLs [Vapor Intrusion Screening Levels]." Similarly, evaluation of soil lithology (bullets 3 and 5) is not sufficiently rigorous to quantitatively establish site-specific AFsg values. Published state-wide (California) empirical studies of attenuation factors are also not defensible for establishing site-specific AFsg values unless it can be definitively demonstrated that the state-wide database is applicable to the site of interest. In essence, site-specific AFsg values should be based on a robust database of site-specific measurements of paired indoor air – subslab or near-source soil vapor data. Further, it does not enhance a sense of objectivity to state the conclusions of studies before they are conducted; almost every bullet, including bullet 2, which describes empirical studies that have presumably not	Table 3-4 (now 3-5) has been updated to indicate that this issue/recommendation is ongoing, the work plan was finalized in September 2023 and fieldwork is underway. **Response to Additional Comment:** The Navy acknowledges that there is a disagreement with the approach presented in the Final Remedial Action Work Plan for Parcel B-1, IR Site 10, Building 123. However, reevaluating the SGALs and ARIC boundaries is not carried forward as an Issue/Recommendation in the Fifth Five-Year Review because the LUC RD lays out the pathway to modify the ARICs by the FFA signatories, implying that all need to agree on the change prior to making modifications to the ARIC. The following is an excerpt from the Parcel G LUC RD (emphasis added): > Alternatively, the ARIC for VOC vapors may be modified *by the FFA signatories* as the soil and groundwater contamination areas that are producing unacceptable vapor inhalation risks are reduced over time or in response to further soil, vapor, and groundwater sampling and analysis for VOCs that establishes that areas now included in the ARIC for VOC vapors do not pose an unacceptable potential exposure risk due to VOC vapors. This is also emphasized in current status to the Recommendation from the Fourth Five-Year Review for Parcel D: No changes to the VOC ARIC are planned for Parcel D-1 or G at this time. Because attenuation of VOCs is likely to occur, ARICs for VOC vapors, and likewise SGALs that are the basis of the ARICs, in Parcels D-1 and G will be re-evaluated during preparation for property transfer. While there is disagreement about the method to calculate the SGALs, which may affect ARIC boundaries, the final ARICs that will be surveyed and recorded in quitclaim deeds and covenants to restrict land use will be established in agreement with the BCT.

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		been conducted yet, states that the approach will "demonstrate that the USEPA (2015) generic AFsg of 0.03 is overly conservative" (or words to that effect).	
3	Section 3.5.1, Table 3-3, Section 4.4.1.1	Misrepresentation of evidence that TCE biodegradation is an effective remedy Multiple times in the document, (e.g., Section 3.5.1 "Question A: Is the remedy functioning as intended by the decision document?"; Table 3-3 "Parcel B Remedial Action Summary and Expected Outcomes"), the claim is made that: "*The presence of VC demonstrates that TCE biodegradation is occurring in groundwater in Parcel B-1 (TRBW, 2023).*" A similar statement is made for RU-C1 (Section 4.4.1.1, Remedy Implementation, p. 124): "*The presence of VC indicates that biodegradation is occurring*." Although appearance of VC may indicate that reductive dechlorination is occurring (or has occurred), it is not necessarily evidence that *in situ* biodegradation is working as intended. Stalling of biodegradation and accumulation of VC can pose more risk than the presence of the parent compound (TCE), as VC is a more potent carcinogen than PCE and TCE. **Additional Comment Received 6/5/2024:** Thank you for addressing the comment.	This statement has been removed from Section 3.5.1 in relation to Parcel B-1 groundwater. Note that the work being conducted at Building 123 will remove VOC source material. The discussion in Section 4.1.1.1 for RU-C1-1 has been changed to: "…Benzene, PCE, TCE, and VC exceeded RGs in March and benzene and PCE exceeded the RGs in September. PCE also exceeded ATC in March but not in September. ~~The presence of VC indicates that biodegradation is occurring.~~ Performance monitoring is expected to continue until data are statistically less than ATCs. Based on data up to December 2021 PCE data is statistically higher than the ATC; however, statistical trends indicate it is probably decreasing (IGI, 2023). Conditions are generally conducive to anaerobic degradation indicated by depleted dissolved oxygen (DO, less than 1 mg/L), presence of dissolved redox-sensitive metals (iron and manganese), and methane. The presence of ethene or ethane also indicates that complete biotic or abiotic degradation is occurring (IGI, 2023)."

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4	Five-Year Review Summary Form, Review Status, Triggering Action Date and Due Date, page xvii; and Section 2.6 Next Five-Year Review, pg. 2-2	As EPA outlined in its November 16, 2023, letter, the trigger action date is the Remedial Action Start date, not the signature date of the Fourth FYR. As such, the statutory due date for the Sixth FYR is November 8, 2028. Please correct the table to reflect the statutory due date. **Additional Comment Received 6/5/2024:** EPA continues to disagree with the Navy's interpretation about the signature date. We note that the Navy/Marine policy does not preclude conducting the subsequent FYR sooner, consistent with EPA's stated statutory policy and respectfully requests that the Navy reconsider its position.	The May 2011 Navy/Marine Corps Policy for Conducting CERCLA Five-Year Reviews establishes subsequent signature dates for Five-Year Reviews as no more than five years from the date of the last signature (Section 5.2a, Navy 2011), therefore the signature date of the Sixth Five-Year Review will be July 31, 2029 (or 5 years from the signature date of this Five-Year Review). This is further reiterated in a June 2014 memorandum *Five-year Review Procedures – Update to DoD Manual (DoDM) 4715.20 "Defense Environmental Restoration Program (DERP) Management," March 9, 2012.* Reference: Navy. 2011. *Navy/Marine Corps Policy for Conducting Comprehensive Environmental Response, Compensation, and Liability Act Five-Year Reviews*. June. Office of the Under Secretary of Defense. 2014. Memorandum Dated May 16, 2014. Subject: *Five-year Review Procedures – Update to DoD Manual (DoDM) 4715.20 "Defense Environmental Restoration Program (DERP) Management," March 9, 2012.* **Response to Additional Comment:** The Navy will take this request under advisement.

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5	Five-Year Review Summary Form, Issues/Recommendations, page xviii, second item, Changed Site Conditions, Parcel D-1, Other Findings	With regards to Radiological Objects, and other wastes left in place, and based on the Navy's initial evaluation for potential, permanent groundwater emergence impacts at Parcel D-1 in 2035 (p. 30 of the Report), EPA recommends that the Navy prioritize and commence a Parcel D-1 specific CRA vulnerability assessment study to address groundwater emergence prior to the Sixth FYR. **Additional Comment Received 6/5/2024:** EPA requests that the Navy commit to a specific date in 2025 to produce a primary document and begin scoping the monitoring well construction and ground elevation details in Parcel D-1 data (and in other Parcels projecting groundwater emergence).	During a site walkthrough in Parcel D-1 by the Navy CRA team on April 22, 2024, to ground truth some of the projections in the CRA (Appendix A), the Navy team could not identify any topographic features that would be indicative of the projected groundwater emergence in Parcel D-1. During follow on site-specific studies, the Navy will more closely examine monitoring well construction and ground elevation details in Parcel D-1 data (and in other Parcels projecting groundwater emergence as well). Site specific studies and prioritization of parcels will be discussed with the agencies. **Response to Additional Comment:** The Navy has committed to initiating the Parcel D-1 specific study by Spring 2025. This date has been added to the Other Findings summary in the Five-Year Review summary form and Section 5.6.1.2.
6	Section 1.1 Purpose and Approach, page 1-1, second paragraph, last line	See Comment 4 above.	See response to EPA Comment 4 above.
7	Section 1.4.1 Per and Polyfluoroalkyl Substances, pg. 1-7, 3rd paragraph, 1st line	The document states "Current exposure pathways for PFAS are potentially incomplete at HPNS." Immediately following, the document states that there is a prohibition to using drinking water yet provides no discussion of other potential exposure pathways, such as to the SF Bay environment. There's no discussion of what uncertainty leads the Navy to state that the exposure pathway is only "potentially" incomplete. Is this because the PFAS investigation is incomplete? Please provide additional discussion to explain the statement. **Additional Comment Received 6/5/2024:** EPA appreciates the clarification and agrees with the description.	This language has been replaced with lines of evidence supporting that there is currently no known imminent risk to PFAS for both human and ecological receptors. The term "potentially incomplete" was used as a CERCLA risk assessment has not been conducted to fully validate the current lines of evidence regarding potential exposures. Furthermore, even if a complete exposure pathway is present, that does not definitively indicate that there is unacceptable risk exposure to PFAS. Further evaluation will be conducted under the upcoming CERCLA PFAS RI to verify.

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8	Section 1.4.3.1 Progress since the Fourth Five-Year Review, page 1-9:	The addendum evaluating the protectiveness of remedial goals for building structures, as described, does not accurately reflect several important facts/updates. First, EPA did not approve this addendum nor the follow-on building re-testing workplans due to our collective inability to reconcile technical differences between the Navy's use of the RESRAD Build model and EPA's Building Preliminary Remediation Goal calculator. More importantly, based on a substantive change in building reuse plans and recent congressional authorization, the Navy is now preparing to demolish and dispose of all potentially radiologically impacted buildings, except two historical structures, rather than certify them for unrestricted reuse. The main objective moving forward, therefore, should be to ensure building materials are characterized sufficiently to help determine how to safely protect human health and the environment during demolition and how to dispose of the debris in a regulatory-compliant way. To that end, we appreciate that the Navy is working closely with the California Department of Public Health to identify the protocol the Navy will be using to clear buildings for disposal. Once clarified, while the ROD already contemplates building demolition as a part of the remedy, EPA recommends the FFA members more clearly document the approach that the Navy will be using for the disposal of the building materials, as well as the significantly increased disposal costs, in the appropriate post-ROD change document. **Additional Comment Received 6/5/2024:** EPA appreciates the clarification.	The additional information about building demolition and Building Addendum applicability has been added to Section 1.4.3.1 as follows: … Following the recommendation from the Fourth Five-Year Review, the Navy issued addendums evaluating the long-term protectiveness of the RGs for soil and building structures, which concluded that the current RGs are protective for all future land users (Navy, 2020a, 2020b). There was Agency disagreement over the calculation methods for building RGs; however, the Navy is planning on demolishing all radiologically-impacted buildings at each Parcel in response to a letter from the City of San Francisco's Office of Community Investment and Infrastructure, dated February 3, 2022, requesting that, before transferring the remaining Navy-owned property at HPNS, the Navy must demolish all remaining buildings (both radiologically impacted and nonradiologically impacted) on that property except for five small structures on the National Historic Register (OCII, pers. comm., 2022). The demolition and disposal of radiologically-impacted buildings will be completed under CERCLA. Details for managing radiological building materials during demolition will be documented in work plans for regulatory agency review. Because this is not an issue affecting protectiveness but will require a post-ROD change to document the increased cost, Explanations of Significant Differences will be prepared for each Parcel, as appropriate. Radiological retesting is planned and/or currently underway to verify that the soil RGs, which were determined to be protective and remain valid, have been met for each parcel that was identified in the Fourth Five-Year Review. Reference: Office of Community Investment and Infrastructure (OCII). 2022. Personal communication (letter) to Kimberly A. Ostrowski, Director, Naval Facilities Engineering Command, Base Realignment and Closure Program Management Office, West. *RE: Demolition of the Existing Non-Historic Buildings at the former Hunters Point Naval Shipyard in San Francisco, California.* February 3.

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9	Section 2.2 Site Inspections, pg. 2-1	Please update the narrative to indicate a second site inspection was provided on January 23, 2024, specifically for the benefit of the FFA regulators and city representatives. **Additional Comment Received 6/5/2024:** EPA appreciates acknowledgement of the addition.	This has been added.
10	Section 3.5.2.2	HHRA Analysis, Former Parcel B, pg. 75; Section 4.5.2.2 HHRA Analysis, Former Parcel C, pg. 132; Section 5.5.2.2 HHRA Analysis, Former Parcel D, pg. 191; and Section 6.5.2 Question B, Parcels E and E-2, pg. 244 The report contains vague references to changes in Construction Worker exposure scenario - "*There may be changes with HHRA analysis for the construction worker scenario.*" It is not clear specifically what change is being referred to. Please clarify in the draft final FYR. **Additional Comment Received 6/5/2024:** EPA appreciates the clarification.	The changes in the HHRA analysis for the construction worker would be associated with changes in construction worker exposure parameter values (such as skin surface area and body weight) and changes in toxicity values. Text in respective HHRA analyses (3.5.2.2, 4.5.2.2, and 5.5.2.2) has been added as follows: There may be changes with HHRA analysis for the construction worker scenario. Changes in exposure parameter values would likely only result in a small change to HHRA results since standard construction worker exposure factors have not changed significantly since the RI was prepared (not orders of magnitude). The following construction worker exposure parameter values have changed since the original HHRA was prepared: • The construction worker body weight used in the HHRA was 70 kilograms; however, the adult body weight used in HHRAs based on current USEPA guidance (USEPA, 2014) would be 80 kilograms. • The skin surface area for a construction worker exposed to soil used in the HHRA was 5,700 square centimeters (cm^2); however, based on current USEPA guidance (USEPA, 2014), a construction worker skin surface area exposed to soil is 3,527 cm^2. • The soil-to-skin adherence factor used in the HHRA for a construction worker was 0.8 milligram per cm^2, where the soil-to-skin adherence factor for a construction worker used in a current HHRA would be 0.3 milligram per cm^2 (the 95th percentile adherence factor for construction workers [USEPA, 2004]).

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			• The skin surface area for exposure to groundwater used in the HHRA was 2,370 cm^2. A current HHRA would use a skin surface area of 6,032 cm^2 (the weighted average of mean values for head, hands, forearms, and lower legs [USEPA, 2011]). • Additionally, for inhalation exposures for both groundwater and soil, inhalation toxicity values are now presented and used in milligram(s) per cubic meter (noncancer) or 1 microgram per cubic meter for cancer; therefore, the intake equations no longer incorporate inhalation rate. Toxicity values could result in larger changes (potential orders of magnitude changes), such as for TCE, for which toxicity values were updated in 2009 after the initial HHRA was completed. References: USEPA, 2004. Risk Assessment Guidance for Superfund Volume I: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment (Final). EPA/540/R/99/005. July. USEPA, 2011. Exposure Factors Handbook: 2011 Edition. National Center for Environmental Assessment, Washington, DC; EPA/600/R-09/052F. September. USEPA, 2014. Human Health Evaluation Manual, Supplemental Guidance: Update of Standard Default Exposure Factors, OSWER Directive 9200.1-120, February 6.
11	Section 3.7.3	Navy's Parcel B-2 Draft Protectiveness Determination – *Short-term Protective* EPA's Response – *Protectiveness Deferred*, as discussed above.	Comment acknowledged, see response to EPA Comment 1 (Navy's Draft Protectiveness Determinations for Parcels B-2, C, and E-2)
12	Section 4.7.1	Navy's Parcel C, Draft Protectiveness Determination – *Short-term Protective* EPA's Response – *Protectiveness Deferred,* as discussed above.	Comment acknowledged, see response to EPA Comment 2 (Navy's Draft Protectiveness Determinations for Parcels B-2, C, and E-2)

No.	Location	EPA Region 9 Comments Dated April 30, 2024	Navy Response
		Other Comments	
13	Section 6.7.1.2	Navy's Parcel E-2, Draft Protectiveness Determination – *Will Be Protective* EPA's Response – *Will Be Protective*, but additional actions are requested, as discussed above.	Comment acknowledged, see response to EPA Comment 3 (Navy's Draft Protectiveness Determinations for Parcels B-2, C, and E-2)

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REGION 9
SAN FRANCISCO, CA 94105

July 19, 2024

Via email only; hardcopy not to follow

Department of the Navy
Naval Facilities Engineering Systems Command Southwest
Base Realignment and Closure
Program Management Office West
Attn: Michael Pound, BEC
33000 Nixie Way, Bldg 50, Second Floor
San Diego, CA 92147
michael.j.pound.civ@us.navy.mil

Re: U.S. EPA Response to the *Draft Final Fifth Five-Year Review Report*, Hunters Point Naval Shipyard, Electronically Transmitted by Navy on June 18, 2024

Dear Mr. Pound,

The U.S. Environmental Protection Agency ("EPA") response to the *Draft Final Fifth Five-Year Review Report*, Hunters Point Naval Shipyard, transmitted on June 18, 2024, is below and attached (Attachment 1). EPA appreciates the Navy's efforts to make the document available to both the Federal Facility Agreement (FFA) regulatory parties and to the public for early review and discussion. EPA also acknowledges the collective commitment of all FFA parties to work together to address issues, as appropriate and feasible, prior to the release of the final document.

Our review and response focus on the protectiveness statements and related action items/schedules for Protectiveness Deferred determinations. Any lack of EPA comment on the narrative/statements contained in this *Draft Final Fifth Five-Year Review Report* should not be construed as EPA agreement or concurrence.

07/19/2024

Summary of Differences Between Navy Draft Final Protectiveness Determinations and EPA Position

Parcel	**Navy's Draft Final Protectiveness Determination**	**EPA's Position**
E-2	Will Be Protective	Protectiveness Deferred

Please see response under Parcel E-2, Attachment 1.

We look forward to our upcoming discussion on July 23, prior to the Navy's release of the final Fifth Five-Year Review Report. Please feel free to contact me at (415) 972-3167.

Sincerely,

Andrew Bain
Lead Remedial Project Manager
Northern California Federal Facilities Section
Superfund Division

attachments

cc: with attachments
Mary Snow, S.F. Regional Water Board
Michael Howley, DTSC

Attachment 1

EPA Response
Draft Final Fifth Five-Year Review Report, Hunters Point Naval Shipyard
Electronically Transmitted by Navy on June 18, 2024

Our review and response focus on the protectiveness statements and related action items/schedules for Protectiveness Deferred determinations. Any lack of EPA comment on the narrative/statements contained in the Fifth Five-Year Report should not be construed as EPA agreement or concurrence.

Summary of Differences Between Navy Draft Final Protectiveness Determinations and EPA Position

Parcel	**Navy's Draft Final Protectiveness Determination**	**EPA's Position**
E-2	Will Be Protective	Protectiveness Deferred

1. Climate Resiliency Assessment

   The Navy's revisions to prioritize the parcel-specific approach and timely characterization of the portions of the Site most likely to experience impacts first is appreciated. EPA has no further comment at this stage and for purposes of this Fifth Five-Year Review Report.

2. Five-Year Review Triggering Action Date and Due Date Is Not the Signature Date of the Fourth Five-Year Review Report

   EPA's long-standing position is that the statutory due date for the Sixth Five-Year Review Report is November 8, 2028, which is not reflected in this Five-Year Review Report. If the Navy does not agree with EPA, we suggest our respective attorneys need to resolve this issue. In the interim, EPA's comment of 4/30/2024 and 6/4/2024 stand (attached).

3. Parcel B-2 Draft Final Protectiveness Determination for Groundwater; Actions and Associated Schedules Remain Protracted

   In summary:

   a. EPA remains concerned that the Navy's efforts remain protracted, notwithstanding that the FFA regulatory parties raised the concern about mercury discharges to the Bay and the apparent failure of treatment several years ago. The tri-agency letter of November 23, 2021 (attached), stated "an indefinite period with no corrective action is

unacceptable to the FFA regulatory parties." EPA continues to expect a final primary document, as initially committed to by the Navy, by July 31, 2025. EPA expects that in order to meet the deadline for the final, the Navy will appropriately plan for submission of a draft and a draft final, and appropriately plan for the minimum FFA review time frames for such draft (45 days + 30 day extension with notice) and draft final (30 days), in addition to the time frame the Navy will need to respond to comments and revise the document.

b. EPA does not oppose any Navy attempt to optimize delivery of the ISS (e.g., use of a larger rig in areas of prior injection refusal) "as long as such action **is timely and completed prior to July 31, 2025**" (emphasis added), not October 31, 2025, the latter which the Navy incorrectly attributes to EPA.

c. The final primary document due on July 31, 2025, must include additional treatment options that have been initially screened for further evaluation. In addition, the final primary document should evaluate all existing data to determine a path forward. Any attempt to optimize delivery of the ISS should be completed prior to delivery of the final primary document, as the Navy already indicated it would do the former (i.e., via bigger rig) several years ago. EPA rejects a final primary document whose sole goal is to propose methods to enhance ISS delivery. See d., below.

d. EPA **does not agree** with the Navy's "Path Forward – Parcel B-2, Installation Restoration (IR) Site 26," dated June 2024 and presented at the June 13 Partnering Meeting (attached). This approach and schedule, which EPA rejects, does not appear to be reflected in the Draft Final Fifth Five-Year Review Report, but the Navy needs to confirm the latter in writing. EPA rejects a final primary document whose sole goal is to propose methods to enhance ISS delivery.

e. As the FFA regulatory parties stated in the tri-agency letter of November 23, 2021, "the continued discharge of mercury without additional remediation prevents FFA regulatory party acceptance of a future IR 26 Remedial Action Completion Report (RACR) and timely transfer of the property, and poses an ongoing threat to human health and the environment and compliance concern for the regulators."

f. EPA notes that mercury concentrations do not appear to be on any clear downward trend (see EPA's updated table, attached). The most recent concentration available to EPA for IR26MW49A is 5.55 ug/L and for IR26MW71A is 1.75 ug/L (PAL is 0.6 ug/L).

g. The Navy's proposed new Table 3-4 (comparison of groundwater quality parameters to Bay water quality parameters) appears very limited. A more appropriate place for the proposed table is the prospective primary document, not this Five-Year Review Report. This table is premature, warrants discussion with the FFA regulatory parties, and should be removed from this Five-Year Review Report.

h. The Navy does not provide a reference, rationale, or relevance for the comparison to "10 times the 0.6 µg/L TL." The Navy seems to be assuming, arbitrarily, a "dilution factor of 0.1." This topic is more appropriately included in the prospective primary document, warrants discussion with the FFA regulatory parties, and should be removed from this Five-Year Review Report.

i. EPA comments of 4/30/2024 and 6/4/2024 stand.

j. The Navy needs to perform more robust quality assurance and quality control of its Five-Year Review Report before release to the FFA regulatory parties and the public.

4. Parcel C Draft Final Protectiveness Determination for Groundwater

a. EPA appreciates the Navy's efforts via the Parcel C Phase III RAWP, the Navy's investigation of the deep F-WBZ, the latter in response to FFA regulatory party informal dispute, and the Navy's previous agreement, as documented in the Phase III RAWP, to fully characterize the B-aquifer and the underlying upper F-WBZ. To the extent there is inadvertent discrepancy between this document and the Phase III RAWP and/or the deep F-WBZ RAWP, EPA expects the RAWPs and our associated comments to prevail.

   EPA continues to expect that performance monitoring associated with the Parcel C RAWP, including the agreed to additional B-aquifer monitoring, can commence within approximately two years.

b. As stated previously, EPA will not review or comment on the Navy's "Water Board specific concerns" that the Navy inserted into its response to EPA's comments. This should not be construed as EPA agreement or consensus.

c. To help facilitate consistency, EPA's comments of 4/30/2024 and 6/4/2024 stand.

5. Parcel E-2 Draft Final Protectiveness Determination; EPA Changing Its Position to Protectiveness Deferred

a. As stated in our comments, and at the April 25, 2024, meeting, "it is EPA's position that if the Navy is unable to agree to the timely analysis of existing Parcel E-2 groundwater data, EPA may need to consider the effect this may have on potential performance issues at Parcel E-2 and **our current protectiveness determination**" (emphasis added). After review of the *Draft Final Fifth Five-Year Review Report* (i.e., this document), EPA has concluded that the Navy has not agreed to timely analysis of existing Parcel E-2 groundwater data. Accordingly, EPA is changing its position to "Protectiveness Deferred."

b. EPA has stated that "it is imperative that the Navy immediately begin to evaluate the effect the landfill cap and slurry walls have on groundwater flow and contaminant

concentration within the landfill, and potential impact on the San Francisco Bay." The collection and analysis of data should not be deferred pending the completion of the remaining facilities, which do not appear to be particularly integral to landfill closure as it pertains to groundwater (e.g., wetlands, and landfill gas conveyance). As EPA stated, as part of the evaluation, the Navy must produce, at a minimum, plume maps of contaminant concentrations, and groundwater contour maps showing flow direction in the A- and B-aquifers. EPA informally provided the Navy with a copy of "FFA Regulatory Party GWM Information and Analysis Minimum Needs From Navy, Parcel E-2" that will be attached to the forthcoming tri-agency letter referenced in EPA's earlier comments and in discussions.

c. EPA also stated that the FFA parties need a clear and common understanding of the status of Parcel E-2 groundwater and leachate monitoring and extraction wells, French Drain sampling port, FW piezometers, and FW outfalls. EPA informally provided the Navy with a copy of an Excel worksheet with the list of known (to the FFA regulatory parties) wells and the associated information needs that will be attached to the forthcoming tri-agency letter referenced in EPA's earlier comments and in discussions. Directing the FFA regulatory parties to the BGMP (typically over 20,000 pages) is neither helpful nor responsive.

d. The lack of appropriate data collection and analysis to evaluate the effect the landfill cap and slurry walls has on groundwater flow and contaminant concentration within the landfill, and potential impact on the San Francisco Bay will delay FFA regulatory party acceptance of a future Remedial Action Completion Report (RACR) and the timely transfer of the property, poses an ongoing threat to human health and the environment, and raises compliance concerns for the regulators.

e. Regarding methane exceedances, as the FFA regulatory parties have stated on numerous occasions, GMP-07A remains a compliance point until such time that the Navy amends, for FFA regulatory party review and comment, the appropriate primary document(s).

f. On page xx, EPA does not agree that a memo to the file is an appropriate post-ROD documentation of the change. This topic warrants discussion with the FFA regulatory parties, and its inclusion in this Five-Year Review Report should not be construed as agreement or consensus.

g. EPA comments of 4/30/2024 and 6/4/2024 stand.

U.S. EPA Response to Navy Draft RTCs (5-28-2024) U.S. EPA Comments (4-30-2024)
Draft Fifth Five-Year Review Report
Hunters Point Naval Shipyard, San Francisco, California, Dated November 2023

RTC Table 1 - Comments on the Navy's Draft Protectiveness Determinations for Parcels B-2, C, and E-2
EPA's Suggested RLSO to Help Address our Concerns are in Blue

No.	Location	U.S. EPA Comment (4/30/2024)	Navy Response (May 2024)	U.S. EPA Response (6/4/2024)
1	Five-Year Review Summary Form, Protectiveness Statements, page xix, Parcel B-2, IR-26, Protectiveness Determination	Based on treatment efficacy uncertainties associated with the treatment for mercury in groundwater and the potential ecological impact on the San Francisco Bay, EPA does not support the Navy's *Short-term Protective* determination. Because of this uncertainty, and the agreed-upon need to enhance treatment delivery and/or explore other treatment options, EPA supports a Protectiveness Deferred determination. A *Short-Term Protective* determination is not appropriate because the MetaFix treatment for mercury in groundwater is not achieving its performance goals at two monitoring well locations, IR26MW49A and IR26MW71A. EPA recognizes, as documented by the Navy, that MetaFix could not be injected at certain locations due to limitations of the injection method. At our April 25, 2024, meeting, the Federal Facility Agreement (FFA) Parties discussed whether the Navy continues its plan to implement the enhanced delivery of Metafix, although the FFA regulatory parties believe that other treatment options need to be explored. The Navy agreed that the final *Fifth Five-Year Review Report* will include a date to submit a new FFA primary document, such as a technical memorandum. EPA expects the new primary document will be submitted as soon as practicable, and well ahead of the next Five-Year Review. Among other things, the new primary document should evaluate and analyze all available mercury groundwater monitoring data, including data collected from March 2018 to September 2022, and mercury exceedances at IR26MW49A and IR26MW71A, and propose next steps, including additional treatment options (tri-Agency letter of November 23, 2021). If the Navy is unable to commit to develop and provide a primary document within a timeline	From the Navy's perspective, t~~T~~here are multiple lines of evidence presented in the Five-Year Review that suggest the concentrations observed in groundwater are unlikely to exceed 0.6 µg/L in Bay surface water. However, as discussed in the April 25, 2024 meeting with Agency representatives (Regional Water Board, US EPA Region 9, and Department of Toxic Substances Control [DTSC]), the Navy agreed to "Protectiveness Deferred" determination. The Protectiveness Statement has been changed to: A protectiveness determination cannot be made because there is uncertainty related to the concentrations of mercury discharging to the Bay from Parcel B-2, IR-26 groundwater. In order to make a protectiveness determination, the following actions needs to be made: evaluate all existing data to determine a path forward for additional data collection, remedy optimization, and/or additional remedial alternatives~~ction~~/treatment that have been screened for further evaluation. A ~~technical memorandum~~primary document presenting the path forward will be ~~prepared~~ finalized as soon as practicable and not later than~~by~~ July 31, 2025. The FFA parties will have discussions, as appropriate, prior to scoping and developing the primary document. The concerns raised by the Agencies regarding the success of the remedy have been added after the final paragraph of Section 3.4.3.1, discussion of In Situ Stabilization of Mercury in Groundwater at IR-26 as follows: After completion of the 3-year post-ISS treatment performance monitoring, the FFA R~~r~~egulatory	It is Navy's opinion, not necessarily shared by the FFA regulatory parties, that multiple lines of evidence are presented in the Five-Year Review that suggest the concentrations are unlikely to exceed 0.6 µg/L. A higher level of direct proof rather than indirect weight of evidence is needed to better determine impact to the Bay. At the April 25, 2024 meeting, the FFA regulatory parties, including EPA, expressed concern with a protracted Navy effort given the issue is over three years old. EPA expects that the Navy will complete the final primary document as soon as practicable and not later than the end of July 2025. The primary document must include additional treatment options that have been initially screened for further evaluation. EPA also expects discussions among the FFA parties, as appropriate, prior to scoping and developing the primary document. Please cite the date of the letter (November 23, 2021) and do not attempt to interpret what is meant by the tri-agency letter. EPA quotes the letter directly. As discussed at the April 25, 2024 meeting, the FFA Regulatory Parties assumed that the Navy has the authority to "optimize" ISS (e.g., use of a larger rig in

U.S. EPA Response to Navy Draft RTCs (5-28-2024) U.S. EPA Comments (4-30-2024)
Draft Fifth Five-Year Review Report
Hunters Point Naval Shipyard, San Francisco, California, Dated November 2023

RTC Table 1 - Comments on the Navy's Draft Protectiveness Determinations for Parcels B-2, C, and E-2 EPA's Suggested RLSO to Help Address our Concerns are in Blue				
No.	**Location**	**U.S. EPA Comment (4/30/2024)**	**Navy Response (May 2024)**	**U.S. EPA Response (6/4/2024)**
		acceptable to the FFA regulatory parties, EPA may need to consider the effect that the continued lack of sufficient treatment performance, and groundwater mercury data and documentation may have on Parcel B-2.	Parties~~agencies~~ (EPA Region 9, DTSC, and Regional Water Board) released a tri-agency letter on November 23, 2021 which reiterated that "mercury concentrations in groundwater along the San Francisco Bay margin consistently exceed the trigger level. Therefore, in-situ stabilization (ISS) has failed to minimize or prevent unacceptable discharge of mercury to the San Francisco Bay. Consequently, additional treatment options need to be screened, evaluated, and pursued by the Navy via the development of a new primary document work plan." ~~asserting that the remedy failed and was not protective of the Bay because of continuing exceedances of the trigger level (TL) (0.6 µg/L) at "sentinel" wells (IR26MW49A, IR26MW51A, and IR26MW71A) which are representative of a discharge to the Bay. Because the remedy did not achieve the 0.6 µg/L performance goal, the Agencies require that focused alternative treatments and treatment methodologies should be evaluated and, if warranted and accepted by the FFA regulatory parties, implemented (EPA, DTSC, and Regional Water Board, 2021).~~ As discussed at the April 25, 2024 meeting, the FFA regulatory parties assumed that the Navy has the authority to "optimize" ISS (e.g., use of a larger rig in areas of prior injection refusal) and the Navy recognizes that EPA does not oppose any Navy attempt to do so, as long as such action is timely and completed prior to July 31, 2025. As stated in the November 23, 2021 tri-agency letter, the Navy also recognizes that EPA	areas of prior injection refusal), and EPA does not oppose any Navy attempt to do so, as long as such action is timely and completed prior to July 31, 2025. However, as stated in the November 23, 2021 tri-agency letter, EPA continues to expect that additional treatment options need to be screened, evaluated and pursued by the Navy. The Navy needs to acknowledge this.

U.S. EPA Response to Navy Draft RTCs (5-28-2024) U.S. EPA Comments (4-30-2024)
Draft Fifth Five-Year Review Report
Hunters Point Naval Shipyard, San Francisco, California, Dated November 2023

RTC Table 1 - Comments on the Navy's Draft Protectiveness Determinations for Parcels B-2, C, and E-2 EPA's Suggested RLSO to Help Address our Concerns are in Blue				
No.	**Location**	**U.S. EPA Comment (4/30/2024)**	**Navy Response (May 2024)**	**U.S. EPA Response (6/4/2024)**
			continues to expect that additional treatment options need to be screened, evaluated, and pursued by the Navy. While there are continued exceedances of the TL in groundwater, the Navy believes the following provides lines of evidence that the residual concentrations in mercury in groundwater are not likely to result in a concentration above 0.6 µg/L in the Bay surface water: • Completion of source removal in 2008 via a time-critical removal action (Insight, 2009) • Partial success of the in-situ stabilization (ISS) as evidenced by reducing the extent of mercury exceedances of the TL from 3 locations to 2 and decreasing concentrations in one of the remaining locations (IR26MW49A). A time-series plot of data through 2023 for IR26MW49A, IR26MW51A, and IR26MW71A is presented on **Figure 3-6**. Mercury concentrations during the last 5 years of monitoring have been below historical maximums and are consistently below 10 times the HGAL. • The limited extent of impacted groundwater; IR26MW71A and IR26MW49A are approximately 45 feet apart and IR26MW49A is approximately 88 feet from IR26MW51A with no exceedances. • Comparison of groundwater quality parameters to Bay surface water quality parameters (temperature and dissolved oxygen, **Table 3-4**) indicate that the groundwater is not representative of Bay water	Please reflect this is the Navy's belief/perspective. It is not necessarily shared by the FFA Regulatory Parties.

U.S. EPA Response to Navy Draft RTCs (5-28-2024) U.S. EPA Comments (4-30-2024)
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No.	**Location**	**U.S. EPA Comment (4/30/2024)**	**Navy Response (May 2024)**	**U.S. EPA Response (6/4/2024)**
			because groundwater temperature is consistently warmer than surface water, and dissolved oxygen is consistently lower than surface water. However, because there is uncertainty in the concentration at the exposure point and because the ISS remedy did not reduce the concentration in groundwater to below 0.6 µg/L at all monitoring wells, additional data collection, remedy optimization, and/or additional ~~reevaluation of~~ remedial alternatives/treatment that have been screened for further evaluation are ~~is~~ necessary to determine whether the remedy is protective of the Bay. Section 3.5.1.3 (Technical Question A, Is the remedy functioning as intended by the decision document) has been modified as follows: ***3.5.1.3 Parcel B-2*** ~~Yes.~~ The ISS injections did not effectively reduce mercury in two locations (IR26MW49A and IR26MW71A) to below the TL of 0.6 µg/L. Although mercury continues to exceed TLs in groundwater collected from downgradient monitoring wells, data are lacking that demonstrate mercury concentrations in surface water (the ultimate receptor) are below the HGAL of 0.6 µg/L. The RAO is stated as follows: … [no change from existing text] ~~Protectiveness is not affected based on the following rationale:~~ Data at the groundwater-surface water interface has not been collected, however, from the Navy's perspective, it is not expected that mercury exceeds 0.6	The wording of what the Navy needs to do because of uncertainty is worded differently from that stated earlier (above). The wording needs to be consistent. Please reflect it is the Navy's belief/perspective (not the FFA Regulatory Parties) that mercury exceedances are not expected.

U.S. EPA Response to Navy Draft RTCs (5-28-2024) U.S. EPA Comments (4-30-2024)
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Hunters Point Naval Shipyard, San Francisco, California, Dated November 2023

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No.	**Location**	**U.S. EPA Comment (4/30/2024)**	**Navy Response (May 2024)**	**U.S. EPA Response (6/4/2024)**
			µg/L based on the following rationale: • Source concentrations in soil have been removed during the IR-26 Mercury Removal TCRA (Insight, 2009). • Although dissolved mercury in groundwater exceeds the TL in two locations, Mann-Kendall analysis indicates it is decreasing at one location (KMJV, 2021), indicating partial success of the ISS remedy at minimizing migration to the surface water. • The TL is the Hunters Point groundwater ambient level (HGAL), which is not a risk-based concentration, formal RG, or ARAR according to the ROD Amendment (Navy, 2009). The screening of groundwater data against the TL or other surface water benchmarks, such as the National Recommended Water Quality Criteria (NRWQC; USEPA, 2023), conservatively assumes that ecological receptors are directly exposed to measured concentrations in groundwater. However, there will be a mixing zone where groundwater interfaces with surface water. The extent of that zone is unknown, but mixing is expected to occur, and the concentrations would decrease with distance from the mixing zone and tidal action. Site-specific mixing factors can range from 1 to several thousand. For example, USEPA uses a default mixing and attenuation factor of 20 to address the dilution of soil leachate as it moves through the groundwater aquifer (USEPA, 1996). Furthermore, mixing studies conducted by State of Washington, Department of	

U.S. EPA Response to Navy Draft RTCs (5-28-2024) U.S. EPA Comments (4-30-2024)
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No.	**Location**	**U.S. EPA Comment (4/30/2024)**	**Navy Response (May 2024)**	**U.S. EPA Response (6/4/2024)**
			Ecology (2009) found that the majority of the reduction in porewater concentrations was because of dilution by surface water and averaged 90 percent (that is, a dilution factor of 0.1). Assuming a similar dilution factor, the maximum post-injection detected concentration of dissolved mercury (8.55 µg/L) would be 0.855 µg/L, which does not exceed the NRWQC of 0.94 µg/L (USEPA, 2023). • The post-treatment concentrations after 2018 have consistently been lower than 10 times the 0.6 µg/L TL at both IR26MW49A and IR26MW71A (**Figure 3-6**). • Groundwater quality parameters (temperature and dissolved oxygen) indicate that the water in "sentinel" wells IR26MW49A, IR26MW50A, IR26MW51A, and IR26MW71A are not representative of surface water (**Table 3-4**). Review of annual O&M inspections, historical documents… [no change from original text].	
2	Five-Year Review Summary Form, Protectiveness Statements, page xix, Parcel C, B- aquifer, Protectiveness Determination	This comment addresses the B-aquifer characterization. EPA does not support the Navy's draft *Short-term Protective* determination but rather a *Protectiveness Deferred* determination because from EPA's perspective, for groundwater, information has come to light that calls into question the protectiveness of the remedy (Question C of the Report), and more information is needed to determine protectiveness and whether an unacceptable risk exists. In general, both the A-aquifer and B-aquifer (and bedrock) groundwater flows towards the San Francisco Bay. The Navy's cross-sections in the RU-C2 area confirm there are gaps or	Navy acknowledges that while, from the Navy's perspective, the remedy is protective of human health through active remediation, monitoring, and land use controls; additional information is needed to determine protectiveness for Bay receptors and has changed the remedy protectiveness determination to "Protectiveness Deferred" until such time the investigations are completed, and a protectiveness determination can be made. Specifically, the Navy will complete the Deep F-WBZ investigation for RU- C4 and the B-Aquifer and Upper F-WBZ investigation for RU-C2~~investigation~~.	Please clarify that this is the Navy's belief/perspective, not necessarily that of the FFA Regulatory Parties. The Navy states that it "…will complete the Deep F-WBZ investigation for RU- C4 and the B-Aquifer investigation." This statement needs to clearly identify two separate investigations: the Deep F-WBZ investigation in RU-C4 (which is the subject of the Water Board/EPA Informal Dispute, and which is currently in the "Draft Final Work Plan" stage) and

U.S. EPA Response to Navy Draft RTCs (5-28-2024) U.S. EPA Comments (4-30-2024)
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		holes in the aquitard that enable communication between the A- and B-aquifers, and the Navy's data confirm there is contamination in the underlying B-aquifer at RU-C2 downgradient of the gaps or holes, and in the deep Fractured-Water Bearing Zone (deep F-WBZ) at RU- C4. Consequently, the A-aquifer cannot be isolated as protective. In response to FFA regulatory concerns, the Navy has agreed to, but has not initiated, a full and timely characterization of the B-aquifer in the RU-C2 area, including the upper F-WBZ below and in contact with the B-aquifer. The Navy has also agreed to monitor B-aquifer wells as part of performance monitoring of the groundwater treatment of the A-aquifer at RU-C2 (RAWP Phase III). With respect to the Deep F-WBZ at RU-C4, which was the subject of an informal dispute brought by the Regional Water Quality Control Board and EPA, the Navy has submitted a draft workplan to fully characterize the nature and extent of contamination and groundwater flow patterns to the San Francisco Bay. The workplan has not been finalized and work has not yet commenced. For the Final *Fifth Five-Year Review Report*, EPA requires a list of the primary documents that are anticipated to be developed to perform the full and timely characterization of the B-aquifer in the RU-C2 groundwater area, and the Navy's anticipated timeframe for developing these documents. An anticipated timeframe for the performance monitoring of the groundwater treatment at RU-C2 in both the A- and B-aquifers should also be provided. At the April 25, 2024, meeting, the Navy expressed agreement in concept that these commitments have been made. If the Navy is unable to commit to develop and provide the requested primary	The Draft-Final Five-Year Review Section 4.5.3 Technical Assessment Question C has been updated to incorporate agency concerns related to the hydrogeological communication between aquifer units at Parcel C, discharges to the Bay, and the ~~planned~~ investigations currently underway for the Deep F-WBZ in RU-C4, and planned for the B-Aquifer and Upper F-WBZ in the RU-C2 area to address these data needs as follows: Yes. The following information has come to light that could question the protectiveness of the remedy: • There have been detections of COCs from A-aquifer groundwater within the B-aquifer and F-WBZ groundwater and the connection and communication between hydrogeologic units within Parcel C is not fully understood. Therefore, further characterization of the Deep F-WBZ in RU-C4 and the B-Aquifer and Upper F-WBZ in RU-C2 are ~~is~~ required to demonstrate that remedies within the A-aquifer will be effective and not re-contaminated by COCs within the B-aquifer and ~~deep~~ F- WBZ and unacceptable discharges to the Bay are not and will not occur. The Protectiveness Statement has been changed to: A protectiveness determination cannot be made because there is uncertainty related to the hydrogeologic communication between the A- and B-aquifers and whether discharge of chemicals present in the B- aquifer present potential unacceptable risks to Bay receptors. In	the B-aquifer and underlying Upper F-WBZ in the RU-C2 area (still in development). The first component of the RU-C2 investigation has been agreed to by the Navy. The Navy has committed to collecting and evaluating B-aquifer data as part of the performance monitoring of the A-aquifer remedial action (as documented in the Navy's Response dated 2/8/24 to EPA's Item Nos. 1 and 2 dated 3/14/23 & 11/22/23 in Appendix H of the Final Parcel C Phase III Remedial Action at RUs C2 and C5, dated March 2024). The protectiveness statement does not include the development of a conceptual site model (CSM) of the A- and B-aquifers and shallow F-WBZ at RU-C2 and the deep F-WBZ at RU-C4. The statement should be revised to include the development of CSMs for both RU-C2 and RU-C4. As EPA discussed at the April 25, 2024 meeting, regarding RU-C2, the collection of B-aquifer and shallow F-WBZ data, as appropriate, should commence with the performance monitoring period, which EPA expects will be within the next two years. EPA also expects discussions among the FFA parties, as appropriate, prior to scoping and developing primary documents, such as workplans.

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Draft Fifth Five-Year Review Report
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RTC Table 1 - Comments on the Navy's Draft Protectiveness Determinations for Parcels B-2, C, and E-2 EPA's Suggested RLSO to Help Address our Concerns are in Blue				
No.	**Location**	**U.S. EPA Comment (4/30/2024)**	**Navy Response (May 2024)**	**U.S. EPA Response (6/4/2024)**
		documents within a timeline acceptable to the FFA regulatory parties, EPA reserves its right to reassess our evaluation of B-aquifer and Deep F-WBZ groundwater at Parcel C.	order to make a protectiveness determination, the following action, at a minimum, needs to be made: complete investigations of the Bay Mud/Sandy Lean Clay aquitard, extent of chemicals in the B-aquifer and F-WBZ and use current ecological risk assessment methods and criteria, as appropriate, to assess potential impacts to Bay receptors. For the Deep F-WBZ, a draft final workplan has been provided to the FFA Regulatory Parties. For RU-C2, B-Aquifer data collection and Upper F-WBZ, as appropriate, are expected to commence coincident with the performance monitoring period. The FFA parties will have discussions, as appropriate, prior to scoping and developing primary documents, such as workplans. Depending on the results of data analyses, the development of conceptual site models, and necessary next steps, ~~It is expected that~~ these actions could possibly be completed within the next ~~will take approximately~~ 5 years, at which time, as appropriate, ~~to complete, at which time~~ a protectiveness determination will be made.	
3	Five-Year Review Summary Form, Protectiveness Statements, page xxi, Parcel E-2, Protectiveness Determination	EPA agrees with the Navy's *Will Be Protective* determination, however, additional actions are requested in the Final *Fifth Five-Year Review Report*. For landfills of this nature, the presumptive remedy in both the CERCLA and RCRA programs is to "cap and contain the waste," and include appropriate environmental controls and monitoring for, at a minimum, stormwater, groundwater, and landfill gas. After a careful review and comparison of cleanup alternatives against EPA's nine evaluation criteria, the Parcel E-2 landfill ROD selected a remedy consistent with the presumptive remedy approach yet	The Navy acknowledges that EPA agrees with the Will Be Protective determination, as long as the minimum information and analysis needs of the FFA Regulatory Parties, including the detailed status of all planned and installed wells, are provided on an agreed upon schedule ~~with the caveats stated in this comment~~. Because the remedy is complex and requires multiple phases for installation over a longer timeframe, the Navy has identified the following additional Other Findings (new section 6.6.1.5) to document the Navy's commitment to	As stated in our comments and at the April 25, 2024 meeting, it is EPA's position that if the Navy is unable to agree to the timely analysis of existing Parcel E-2 groundwater data, EPA may need to consider the effect this may have on potential performance issues at Parcel E-2 and our current protectiveness determination. As discussed, most recently at the April 25, 2024, meeting, the Navy needs to amend the appropriate

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No.	Location	U.S. EPA Comment (4/30/2024)	Navy Response (May 2024)	U.S. EPA Response (6/4/2024)
		included several special design elements to account for the unique nature and location of this particular landfill. EPA agrees that Parcel E-2 is still undergoing remedy construction, including relatively minor work on the cover system, the completion of the landfill gas extraction and conveyance system, and the completion of the freshwater (FW) and tidal wetlands. Notwithstanding EPA's agreement that the remedy is still under construction, given that the Navy has deferred responding to Question A ("is the remedy functioning as intended by the decision documents?") in the Report, and given that certain fundamental landfill containment and control facilities, such as the nearshore slurry wall, the upland slurry wall, and the landfill cover system have been constructed, EPA has indicated that it is imperative that the Navy immediately begin to evaluate the effect the landfill cap and slurry walls have on groundwater flow and contaminant concentration within the landfill, and potential impact on the San Francisco Bay. The Navy needs to collect and analyze groundwater elevations and water quality in both the A- and B-aquifers underlying the Parcel. The collection and more importantly the analysis of such data should not be deferred pending the completion of the remaining facilities. The FFA Parties need a clear and common understanding of the status of Parcel E-2 groundwater and leachate monitoring and extraction wells, French Drain sampling port, FW piezometers, and FW outfall. EPA also expects that as part of the evaluation, the Navy will produce, at a minimum, plume maps of contaminant concentrations, and groundwater contour maps showing flow direction in the A- and B-aquifers. For the Final	continue to construct the remedy as well as ~~evaluate~~ analyze currently available ~~performance~~ data in a timely manner on a schedule agreed to among the FFA parties for the remedy components that are in place. As discussed at the April 24, 2024 meeting, the specific minimum information and analysis needs of the FFA Regulatory Parties, including a detailed status of all wells, are forthcoming in a tri-agency letter, after which the FFA parties will meet to discuss specific tasks and schedules. As discussed informally and in EPA's comments, the Navy recognizes that EPA expects the Navy will immediately begin to evaluate the effect the landfill cap and slurry walls have on groundwater flow and contaminant concentration within the landfill, and potential impact on the San Francisco Bay: ***6.6.1.5 Parcel E-2 Other Findings*** The remedy at Parcel E-2 is complex and involves multiple phases of field work to install. A number of facilities that are important to understanding groundwater flow and contaminant concentrations have been completed or are substantially completed (e.g., Nearshore Slurry Wall and landfill cover). The following is a summary of the remaining RA work and interim studies planned prior to completing the RACR: • Construct remaining components of the remedy including the permanent landfill gas system, freshwater and tidal wetlands, and groundwater monitoring network under the approved Final Work Plan (KEMRON, 2018):	primary document(s) to change/replace an existing compliance point for monitoring methane, an explosive gas, at the facility property boundary. This is overdue and must be done as soon as practicable. We suggest the primary document(s) be identified and a draft schedule is developed for discussion with the FFA Regulatory Parties as soon as possible and not later than September 30, 2024. The Navy's informal exchange of one point of compliance with another, without amending the necessary primary document(s), is not acceptable. Our concerns stand and must be appropriately addressed: EPA has indicated that it is imperative that the Navy immediately begin to evaluate the effect the landfill cap and slurry walls have on groundwater flow and contaminant concentration within the landfill, and potential impact on the San Francisco Bay. The Navy needs to collect and analyze groundwater elevations and water quality in both the A- and B-aquifers underlying the Parcel. The collection and more importantly the analysis of such data should not be deferred pending the completion of the remaining facilities. The FFA Parties need a clear and common understanding of the status of Parcel E-2 groundwater and leachate monitoring and extraction wells, French Drain sampling port, FW piezometers, and FW outfall. EPA also expects that as part of the

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RTC Table 1 - Comments on the Navy's Draft Protectiveness Determinations for Parcels B-2, C, and E-2
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		Fifth Five-Year Review Report, EPA requires a list of the primary documents that are anticipated to be developed to perform the evaluation work, and the Navy's anticipated timeframe for developing those documents. At the April 25, 2024, meeting, the Navy expressed agreement in concept but awaits further information from the FFA regulatory parties, which is forthcoming in a tri-Agency letter. If the Navy is unable to provide the required list and schedule in the Final *Fifth Five-Year Review Report*, EPA may need to consider the effect that the lack of sufficient groundwater data and documentation may have on potential performance issues at Parcel E-2. In addition, EPA has conveyed, most recently at the April 25, 2024, meeting, that the Navy needs to amend the appropriate primary document to change/replace an existing compliance point for monitoring methane, an explosive gas, at the facility property boundary. At the April 25 meeting, the Navy agreed in principle and will propose the primary document that must be amended and an anticipated timeframe for modifying that primary document.	○ Landfill Gas System (Phase IVa) anticipated in 4/2025 ○ Wetlands (Phase IVb) anticipated in 10/2027 • Modify the landfill gas monitoring program to include a monitoring probe (GMP54) outside of the newly installed landfill cover as ~~a~~the new compliance point by ~~preparing an addendum to~~ revising the appropriate primary document(s). The primary document(s) needing revision and the proposed schedule for revision will be further discussed with the FFA Regulatory Parties not later than September 30, 2024.~~e the compliance monitoring and mitigation plan for methane at the landfill.~~ • Document completion of the protective liner and final cover installation in the Phase III Remedial Action Construction Summary Report anticipated in 12/2024 • Conduct a study to evaluate the performance of the upland slurry wall as documented in the Post-Remedial Action Performance Evaluation Work Plan to evaluate the performance of the Upland Slurry Wall – Final 6/2024. Fieldwork is anticipated to be completed in 2024 and the Post-Construction RA Performance Report is anticipated in 3/2025. Water Board specific concerns (See Water Board Protectiveness Determinations General Comment #3) and responses were added to the technical assessment for Parcel E-2 (Section 6.5.1, page 6-19) as follows: While the remedy is currently under construction, Agency concerns have been raised regarding the completed	evaluation, the Navy will produce, at a minimum, plume maps of contaminant concentrations, and groundwater contour maps showing flow direction in the A- and B-aquifers. Except as noted, below, EPA is not providing comment or response on the Navy's inclusion, under "Navy Response (May 2024)" pertaining to EPA's comments of 4/30/2024, of "Water Board specific concerns." Irrespective, EPA's responses of 6/4/2024 presented herein stand.

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No.	**Location**	**U.S. EPA Comment (4/30/2024)**	**Navy Response (May 2024)**	**U.S. EPA Response (6/4/2024)**
			components: • **Concern: The Upland Slurry Wall was not installed as designed**. Geologic refusal was met along a 200-foot section of the planned wall at approximately 0 feet msl (10 feet shallower than the designed depth). The slurry wall was designed to minimize flow of offsite groundwater into the landfill and was designed as a "hanging wall" (not embedded into bedrock) with a french drain (which was installed according to the design) to prevent precipitation recharge and divert flow to the freshwater wetland. The material encountered was determined to be bedrock which has a lower permeability than the surrounding aquifer material. A work plan is under Agency review to evaluate the Upland Slurry Wall performance and work is anticipated to begin in 2025. • **Concern: The turbidity curtain was not used during remedy construction.** A 2,000-foot US Department of Transportation Type III offshore turbidity curtain was installed during shoreline work in accordance with the Design (ERRG, 2014) on November 30, 2016 as documented in the Phase II Remedial Action Construction Summary Report (Aptim, 2021). The turbidity curtain was removed after shoreline activities were completed, in accordance with the RAWP Appendix D, Environmental Protection Plan (CB&I, 2016) which states "During shoreline earthwork (revetment installation, wetlands excavation, and site grading), a turbidity curtain will be deployed as the BMP for sediment control."	

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No.	**Location**	**U.S. EPA Comment (4/30/2024)**	**Navy Response (May 2024)**	**U.S. EPA Response (6/4/2024)**
			• **Concern: The Navy has not provided all stormwater best practices documentation.** The Navy has provided the following final primary documents that contain stormwater best practices: Remedial Action Work Plans (RAWPs) (CB&I, 2016; KEMRON, 2018), Stormwater Protection Plan (ref), stormwater best practices monitoring documentation during construction is provided in the Phase I RACR (Gilbane, 2018) and Phase II RACSR (Aptim, 2021) and will also be provided in the forthcoming Phase III RACSR (Pending). The Navy has also responded to the Water Board's December 3, 2022 and January 11, 2023 follow-up e-mail request for stormwater records. • **Concern: There is not adequate documentation that lead was removed from the wetland areas and groundwater may be affected in the future.** Lead was removed from the tidal wetland areas in accordance with the Phase II RAWP (KEMRON, 2018) and subsequent Fieldwork Variance #5 (Appendix G of Aptim, 2021). Exceedances shown on Figures 6 and 7 of the RACSR (Aptim, 2021) were initial samples prior to over-excavation to remove lead- impacted soils, post-over-excavation samples were below the RG. Additionally, the landfill cap geomembrane and geosynthetic clay liner (GCL) layers prevent vertical infiltration of rainfall from reaching the underlying the landfill waste and promoting leachate. The Geocomposite drainage layer carries any flow that infiltrates through the vegetative layer to the perimeter ditches. The surface water from the eastern half of the	

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			site will be collected by the eastern perimeter ditch and will drain directly into the Bay through the culvert pipe at the southeast corner of the site. The surface water from the western half of the site will be collected by the western perimeter ditch and will flow into the Freshwater Wetlands with excess runoff draining through the Freshwater Wetlands Outfall pipe into the Bay. The chemically contaminated soils near the Freshwater Wetlands were removed during previous hot spot excavations and excavations during Phase II subgrade preparations, with confirmation testing to show that they are below action limits in the FINAL RASCR (Figure 6 attached) for copper, lead, total PCBs, and total TPHs. There is no required tie into the underlying Bay Mud at the Wetlands Boundary. See Detail 4 on Design Drawing C18 from the DBR (attached) for the cover termination at the Wetlands boundaries. • **Concern: There may be impacts to soil due to RCRA hazardous waste handling in stockpiles during remedy installation**: Navy is planning, at agencies' request, to sample the soil under former Parcel E-2 stockpile locations now covered with radiological retesting radiological screening yard (RSY) pads for metals to confirm that the stockpiles didn't impact the soils around them during storm events. This will be completed after the RSY pads are removed. The Navy understands that there is a pending data request and notes the following:	Regarding what the Navy notes, as stated at the April 25, 2024 meeting, the FFA Regulatory Parties expect

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			• Groundwater elevations are available in the BGMP reports for all installed wells at Parcel E-2 • COC data for A- and B-aquifers are available in the BGMP for all installed wells at Parcel E-2 • Leachate testing is unavailable as the leachate ports have not yet been installed • Extraction well data, french drain sample port data, freshwater wetland piezometer and wetland outfall data is not available because these components have not yet been installed • Detailed plume and flow direction cannot be determined as the full monitoring well network has not been installed; However, groundwater modeling conducted during design planning supports the theoretical performance of the remedy. This is included in Appendix F of the RD (ERRG, 2014) The Final RAWP (KEMRON, 2018) covers all the remaining remedy installation elements in the RD/ROD. The Final RAMP for Parcel E-2 (ERRG, 2014b) will be used to monitor the remedy once its installation is completed. References: Engineering/Remediation Resources Group, Inc. (ERRG). 2014. Design Basis Report, Parcel E-2, Hunters Point Naval Shipyard, San Francisco, California. Final. August 15. ERRG, 2014b. Final Remedial Action Monitoring Plan, Parcel E-2, Hunters Point Naval Shipyard, San Francisco, California. August 15.	that the Navy immediately begin to evaluate the effect the landfill cap and slurry walls have on groundwater flow and contaminant concentration within the landfill, and potential impact on the San Francisco Bay. The Navy needs to collect and analyze groundwater elevations and water quality in both the A- and B-aquifers underlying the Parcel. The collection and more importantly the analysis of such data should not be deferred pending the completion of the remaining facilities. The FFA Parties need a clear and common understanding of the status of Parcel E-2 groundwater and leachate monitoring and extraction wells, French Drain sampling port, FW piezometers, and FW outfall. EPA also expects that as part of the evaluation, the Navy will produce, at a minimum, plume maps of contaminant concentrations, and groundwater contour maps showing flow direction in the A- and B-aquifers.

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No.	**Location**	**U.S. EPA Comment (4/30/2024)**	**Navy Response (May 2024)**	**U.S. EPA Response (6/4/2024)**
			CB&I Federal Services, LLC. (CB&I). 2016. Work Plan Shoreline Revetment; Site Grading and Consolidation of Excavated Soil, Sediment, and Debris; and Upland Slurry Wall Installation Remedial Action, Parcel E-2, Hunters Point Naval Shipyard, San Francisco, California. Final. October 12. KEMRON Environmental Services (KEMRON). 2018. Remedial Action Work Plan, Final Cove, Wetlands, and Landfill Gas Control and Containment System, Remedial Action Parcel E-2, Hunters Point Naval Shipyard, San Francisco, California. Final. December 26. Gilbane. 2018. Remedial Action Completion Report, Hot Spot Delineation and Excavation and Nearshore Slurry Wall Installation, Remedial Action, Parcel E-2, Hunters Point Naval Shipyard, San Francisco, California. June. APTIM. 2021. Remedial Action Construction Summary Report, Parcel E-2 (Phase II), Hunters Point Naval Shipyard, CA. April 6	

RTC Table 2 - Other Comments				
No.	**Location**	**U.S. EPA Comment (4/30/2024)**	**Navy Response (May 2024)**	**U.S. EPA Response (6/4/2024)**
11	Section 3.7.3	Navy's Parcel B-2 Draft Protectiveness Determination – *Short-term Protective* EPA's Response – *Protectiveness Deferred*, as discussed above.	Comment acknowledged, see response to EPA Comment 1 (Navy's Draft Protectiveness Determinations for Parcels B-2, C, and E-2)	See EPA responses, above.
12	Section 4.7.1	Navy's Parcel C, Draft Protectiveness Determination – *Short-term Protective* EPA's Response – *Protectiveness Deferred,* as discussed above.	Comment acknowledged, see response to EPA Comment 2 (Navy's Draft Protectiveness Determinations for Parcels B-2, C, and E-2)	See EPA responses, above.

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RTC Table 2 - Other Comments				
No.	**Location**	**U.S. EPA Comment (4/30/2024)**	**Navy Response (May 2024)**	**U.S. EPA Response (6/4/2024)**
13	Section 6.7.1.2	Navy's Parcel E-2, Draft Protectiveness Determination – *Will Be Protective* EPA's Response – *Will Be Protective*, but additional actions are requested, as discussed above.	Comment acknowledged, see response to EPA Comment 3 (Navy's Draft Protectiveness Determinations for Parcels B-2, C, and E-2)	See EPA responses, above.

Department of Toxic Substances Control

November 23, 2021

Ms. Liz Roddy
Remedial Project Manager
NAVFAC BRAC PMO West
33000 Nixie Way
Bldg. 50, Floor 2
San Diego, CA 92147

Via e-mail only – hard copy not to follow

SUBJECT: Draft Final Remedial Action Construction Summary Report (RACSR), Parcel B-2 Installation Restoration (IR) Site 26, Groundwater Treatment (October 2021), Hunters Point Naval Shipyard, San Francisco; United States Environmental Protection Agency, California Department of Toxic Substances Control, and San Francisco Bay Regional Water Quality Control Board Reiteration of Position Letter on Ongoing, Unacceptable Mercury Discharges to the San Francisco Bay

Dear Ms. Roddy,

The United States Environmental Protection Agency (U.S. EPA), California Department of Toxic Substances Control (DTSC) and San Francisco Bay Regional Water Quality Control Board (RB2) are in receipt of the subject RACSR.

We regret but understand that the Navy could not allow more time for review and coordination among the Federal Facility Agreement (FFA) regulatory parties (e-mails, attached). Irrespective, the united position of U.S. EPA, DTSC, and RB2 has not changed from our letter of August 20, 2021 (attached), and is summarized, below. The agencies have also supplemented (attached) our August 20, 2021 letter.

1. Mercury concentrations in groundwater along the San Francisco Bay margin consistently exceed the trigger level. Therefore, in-situ stabilization (ISS) treatment has failed to minimize or prevent unacceptable discharge of mercury to San Francisco Bay. Consequently, additional treatment options need to be screened, evaluated, and pursued by the Navy via the development of a new primary document work plan. An indefinite period with no corrective action is unacceptable to the FFA regulatory parties.

   The continued discharge of mercury without additional remediation prevents FFA regulatory party acceptance of a future IR Site 26 Remedial Action Completion Report

November 23, 2021

(RACR) and timely transfer of the property, and poses an ongoing threat to human health and the environment and a compliance concern for the regulators.

2. It is of utmost importance to commence development of a new primary document work plan on focused alternative treatments and treatment methodologies.

   The Record of Decision does not allow for continued groundwater monitoring to enable achievement of Remedial Action Objectives (RAOs) if the selected remedy is not successful. Although the FFA regulatory parties appreciate the Navy's attempt to propose potential mitigative options in its letter of October 25, 2021, as we stated in our attached e-mail of November 15, 2021, "*we reaffirm the need for focused alternative treatments and treatment technologies (refer to our letter of August 20, 2021)*." Without such alternatives analysis, the FFA regulatory parties may have no choice but to determine that the remedial action is *not* protective of human health and the environment, before or during the next five-year review scheduled in 2023.

3. It is not acceptable that the Navy continues to write the RACSR as if it were a RACR by including statements that the RAOs have been achieved or are being achieved. Irrespective of the Navy's disclaimer, the FFA regulatory parties reject the use of the RACSR to make claims on the operating or performance success of the remedial action. As the FFA regulatory parties have reiterated since the inception of the RACSR for Parcel E2 over a year ago, such statements are inappropriate for the RACSR which was understood to be a construction summary report that documents the remedy has been put into place. These RACSRs are misleading to the public and could confuse successor regulatory staff.

   The FFA regulatory parties reject that the remedial action is successful, or has achieved or is making progress towards achieving the groundwater RAO. After an extended nearly 4-year performance and post-treatment monitoring period, the remedial action (the ISS treatment) has failed to minimize or prevent unacceptable discharges of mercury to San Francisco Bay.

   Please also note that the decision to change the interim-RACR at IR Site 26 to a RACSR was made unilaterally by the Navy. If the Navy continues to use RACSRs as RACRs then such RACSRs are primary documents, not secondary documents, and must be acknowledged and treated as such.

November 23, 2021

The FFA regulatory parties look forward to a collaborative path with the Navy to begin scoping focused alternative treatments and treatment methodologies. Accordingly, we will be in contact after the holidays to schedule a meeting to discuss the development of a new primary document work plan.

Sincerely,

Karen Ueno	Juanita Bacey	Jeff White
U.S. EPA	Berkeley Office	SF Bay
Region 9	DTSC	RWQCB

Attachments

Cc with Attachments:
Mr. Derek Robinson, Navy BRAC PMO West
Ms. Brooks Pauly, Navy BRAC PMO West
Mr. David Tanouye, SF Bay RWQCB
Ms. Phyllis Flack, SF Bay RWQCB
Ms. Amy Brownell, City of SF

November 23, 2021

Attachments to EPA/DTSC/RB2 Letter of November 23, 2021
Draft Final Remedial Action Construction Summary Report (RACSR), Parcel B-2 Installation Restoration Site 26, Groundwater Treatment (October 2021)
Hunters Point Naval Shipyard, San Francisco

November 23, 2021

Supplement to U.S. EPA/DTSC/RB2 Letter of August 20, 2021

1. The draft final RACSR continues to be written as a RACR by including statements demonstrating remedial action objectives are achieved or are being achieved, rather than as a construction summary report that demonstrates the remedial action has been put in place. This is misleading and unacceptable. The RACSR should not provide conclusions or opinions discussing achievement of goals or RAOs or operating performance success, as these should be discussed in a RACR. Some examples include the following.

    a. Executive Summary - The first paragraph states that the objectives of this RACSR are to document the remedial action construction and the ongoing post-treatment groundwater monitoring activities. Page xiii states, "[a]ccording to post-treatment performance monitoring and ongoing BGMP monitoring results, dissolved mercury concentrations indicate that the groundwater remedy, GW-3A, for IR Site 26 is reducing the groundwater levels of mercury and progress is being made toward achieving the groundwater RAO of preventing or minimizing the migration of mercury to San Francisco Bay." Notwithstanding the inappropriate insertion of such statement, the Navy's data do not show any apparent decreasing trend and the Navy concludes that there are "no statistically definable trends." Please also refer to our August 20, 2021 letter. Irrespective, references to achieving or progress in achieving goals or RAOs, or operating performance success are not appropriate for a RACSR, and all such references must be removed.
    b. Executive Summary - References to ISS treatment success indicated on page xiv are not appropriate for a RACSR and must be removed.

2. All unsupported statements and implications must be removed from the RACSR. Some examples include the following.

    a. Section 4.1.1 Dissolved Mercury – Implication that fluctuations of dissolved mercury in IR26MW71A may be related to localized releases of mercury present in native sediment.
    b. Section 4.1.2.1.1 Sulfide - "An increase in the sulfide concentration was not observed in groundwater samples collected from the five performance monitoring wells in the first quarter following the injection, indicating that sulfide either is not being formed or is being formed but complexed with other chemical species in the subsurface environment and made undetectable by the analytical methods."
    c. Section 4.1.2.2.1 Chloride - "Chloride informs the general site-specific reducing conditions but is not directly indicative of remedy performance. Higher chloride concentrations indicate reducing conditions."
    d. Section 4.2.1 SEM/EDS Results - "The absence of mercuric sulfide minerals more strongly supports the hypothesis that mercury is likely being immobilized through direct adsorption onto iron sulfides or co-precipitation with iron oxides and iron oxyhydroxides following the oxidation of ZVI."
    e. Section 5.1 Groundwater Monitoring – Statement that "[p]er the Amended Parcel B ROD chosen groundwater remedy, GW-3A, groundwater monitoring will continue until the RAO for mercury is met."

This is inaccurate and misleading. The ROD does not allow for continued groundwater monitoring to enable achievement of RAOs if the selected remedy is not successful. Moreover, the FFA regulatory parties have repeatedly stressed that this is not an acceptable option.

f. All statements or implications that the remedial action has achieved or is making progress in achieving goals, RAOs, or operating performance.

3. Section 4.4 - Conclusions - Fluctuating mercury concentrations are not an indication that reduction of concentrations or mass in groundwater is occurring.

4. Section 4.4 - Conclusion - The second to last paragraph states, "[i]n accordance with the chosen remedy GW-3A, groundwater monitoring will continue until the RAO's in the approved RODs are met." This is inaccurate and misleading. The ROD does not allow for continued groundwater monitoring to enable achievement of RAOs if the selected remedy is not successful. Moreover, the FFA regulatory parties have repeatedly stressed that this is not an acceptable option.

   The Navy's data do not support any apparent decreasing trend and the Navy, itself, concludes that there are "no statistically definable trends." Please also refer to our August 20, 2021 letter and No. 1, above.

5. Section 6.0 References - The references section should be revised to include all the references cited in the text.

November 23, 2021

From: Ueno, Karen
Sent: Friday, November 5, 2021 1:46 PM
To: Roddy, Elizabeth A CIV USN NAVFAC SW SAN CA (USA) <elizabeth.a.roddy3.civ@us.navy.mil>
Cc: juanita.bacey@dtsc.ca.gov; Flack, Phyllis@Waterboards <phyllis.flack@waterboards.ca.gov>; Pauly, Brooks CIV USN BRAC PMO SAN CA (USA) <brooks.pauly2.civ@us.navy.mil>; Robinson, Derek J CIV USN NAVFAC SW SAN CA (USA) <derek.j.robinson1.civ@us.navy.mil>; Macchiarella, Thomas L CIV USN COMNAVFACENGCOM DC (USA) <thomas.l.macchiarella.civ@us.navy.mil>; Chesnutt, John <Chesnutt.John@epa.gov>; Walsh, Kimberly@DTSC <Kimberly.Walsh@dtsc.ca.gov>; King, Nathan@Waterboards <Nathan.King@waterboards.ca.gov>; White, Jeff@Waterboards <jeff.white@waterboards.ca.gov>; Tanouye, David@Waterboards <david.tanouye@waterboards.ca.gov>
Subject: FFA Regulatory Party request for extension and proposed meeting with Navy - Draft IR-26 RACSR - Response to FFA Regulatory Party position letter on continued mercury discharges to SF Bay

Dear Liz,

On behalf of the FFA Regulatory Parties (U.S. EPA, DTSC, and RB2) we appreciate the Navy's letter outlining the Navy's recommendations to address the agencies' long-standing concern regarding the failure of ISS treatment at IR-26. Although we reaffirm the need for focused alternative treatments and treatment technologies (refer to our letter of August 20, 2021), we think a meeting to better understand the Navy's three proposals is warranted. Aspects of the three options presented in the Navy's letter may prove useful during evaluation of remedial alternatives.

First, however, the FFA regulatory parties are requesting an approximate 60-day extension to January 27, 2022 to review the Navy's proposal, the draft RTCs, and, as appropriate, the Draft Final RACSR. We note that due to the Navy's extensions, review of these documents is now coincident with the holidays, and some of us are on extended leave during this period. Given leave schedules and the need for the agencies to coordinate amongst ourselves, we hope the Navy understands our request for more time. Accordingly, we also prefer that the RTCs and the RACSR are not finalized until after the extended review period.

Notwithstanding our request to extend the review period for these documents, to facilitate our review and comments, the FFA regulatory parties would like meet with the Navy to better understand the Navy's three proposals. Please let us know which of the following work for the Navy (Navy contractors are also invited) and we will set up such meeting:

Friday, December 3, between 1:00 – 3:00 pm
Tuesday, December 7, between 11:00 am- 1:00 pm
Wednesday, December 8, between 11:00 am - 1:00 pm

Thank you.

November 23, 2021

From: Roddy, Elizabeth A CIV USN NAVFAC SW SAN CA (USA) <elizabeth.a.roddy3.civ@us.navy.mil>
Sent: Monday, October 25, 2021 4:51 PM
To: Ueno, Karen <Ueno.Karen@epa.gov>
Cc: juanita.bacey@dtsc.ca.gov; Flack, Phyllis@Waterboards <phyllis.flack@waterboards.ca.gov>; Pauly, Brooks CIV USN BRAC PMO SAN CA (USA) <brooks.pauly2.civ@us.navy.mil>; Robinson, Derek J CIV USN NAVFAC SW SAN CA (USA) <derek.j.robinson1.civ@us.navy.mil>; Macchiarella, Thomas L CIV USN COMNAVFACENGCOM DC (USA) <thomas.l.macchiarella.civ@us.navy.mil>; Chesnutt, John <Chesnutt.John@epa.gov>; Walsh, Kimberly@DTSC <Kimberly.Walsh@dtsc.ca.gov>; King, Nathan@Waterboards <Nathan.King@waterboards.ca.gov>; White, Jeff@Waterboards <jeff.white@waterboards.ca.gov>; Tanouye, David@Waterboards <david.tanouye@waterboards.ca.gov>; 'Amy Brownell' <Amy.Brownell@sfdph.org>
Subject: Draft IR-26 RACSR - Response to FFA Regulatory Party position letter on continued mercury discharges to SF Bay

Good Evening,

Thank you for sharing your comments and concerns in response to the Draft IR-26 Remedial Action Completion Summary Report. Over the last several months the Navy and other technical experts have evaluated your comments and developed a response letter in what we hope will help guide the discussion on a path forward for site closure at IR-26. The Navy team's earliest availability to meet will be the week of November 15th.

In addition we have provided response to comments, attached for your records. The Draft Final RACSR is scheduled for submittal electronically via email tomorrow, October 26th.

Thank you again for your continued support in moving this site toward successful remediation. Please let me know if you have any questions.

Very Respectfully,

Liz Roddy
Remedial Project Manager
NAVFAC BRAC PMO West
33000 Nixie Way
Bldg. 50, Floor 2
San Diego, CA 92147
(619) 524-5755
elizabeth.a.roddy3.civ@us.navy.mil

November 23, 2021

From: Ueno, Karen <Ueno.Karen@epa.gov>
Sent: Friday, August 20, 2021 4:56 PM
To: Roddy, Elizabeth A CIV USN NAVFAC SW SAN CA (USA) <elizabeth.a.roddy3.civ@us.navy.mil>
Cc: juanita.bacey@dtsc.ca.gov; Flack, Phyllis@Waterboards <phyllis.flack@waterboards.ca.gov>; Pauly, Brooks CIV USN BRAC PMO SAN CA (USA) <brooks.pauly2.civ@us.navy.mil>; Robinson, Derek J CIV USN NAVFAC SW SAN CA (USA) <derek.j.robinson1.civ@us.navy.mil>; Macchiarella, Thomas L CIV USN COMNAVFACENGCOM DC (USA) <thomas.l.macchiarella.civ@us.navy.mil>; Chesnutt, John <Chesnutt.John@epa.gov>; Walsh, Kimberly@DTSC <Kimberly.Walsh@dtsc.ca.gov>; King, Nathan@Waterboards <Nathan.King@waterboards.ca.gov>; White, Jeff@Waterboards <jeff.white@waterboards.ca.gov>; Tanouye, David@Waterboards <david.tanouye@waterboards.ca.gov>; 'Amy Brownell' <Amy.Brownell@sfdph.org>
Subject: [Non-DoD Source] Draft IR-26 RACSR - FFA Regulatory Party position letter on continued mercury discharges to SF Bay

Dear Liz,

Thank you for sharing the draft IR-26 RACSR. Please see the attached position letter from the FFA regulatory parties concerning the continued discharge of mercury to SF Bay. In sum:

> The ISS treatment has failed to minimize or prevent mercury migration to SF Bay and additional treatment options need to be screened, evaluated, and pursued by the Navy via the development of a new primary document work plan. An indefinite monitoring period with no corrective action, as proposed by the Navy in the subject RACSR, will result in continued discharges of mercury to SF Bay at concentrations that are unacceptable to the FFA regulatory parties.
>
> ***The continued discharge of mercury without additional remediation prevents FFA regulatory party acceptance of a future IR Site 26 RACR(s) and timely transfer of the property, and poses an ongoing threat to human health and the environment and a potential compliance concern for the regulators***.

We look forward to working with you on our proposed path forward.

From: Roddy, Elizabeth A CIV USN NAVFAC SW SAN CA (USA) <elizabeth.a.roddy3.civ@us.navy.mil>
Sent: Monday, November 15, 2021 3:00 PM
To: Ueno, Karen <Ueno.Karen@epa.gov>
Cc: juanita.bacey@dtsc.ca.gov; Flack, Phyllis@Waterboards <phyllis.flack@waterboards.ca.gov>; Pauly, Brooks CIV USN BRAC PMO SAN CA (USA) <brooks.pauly2.civ@us.navy.mil>; Robinson, Derek J CIV USN NAVFAC SW SAN CA (USA) <derek.j.robinson1.civ@us.navy.mil>; Macchiarella, Thomas L CIV USN COMNAVFACENGCOM DC (USA) <thomas.l.macchiarella.civ@us.navy.mil>; Chesnutt, John <Chesnutt.John@epa.gov>; Walsh, Kimberly@DTSC <Kimberly.Walsh@dtsc.ca.gov>; King, Nathan@Waterboards <Nathan.King@waterboards.ca.gov>; White, Jeff@Waterboards

November 23, 2021

<jeff.white@waterboards.ca.gov>; Tanouye, David@Waterboards <david.tanouye@waterboards.ca.gov>
Subject: RE: FFA Regulatory Party request for extension and proposed meeting with Navy - Draft IR-26 RACSR - Response to FFA Regulatory Party position letter on continued mercury discharges to SF Bay

Hello Karen,

The Navy is happy to meet with the FFA regulatory parties to discuss the three options presented in the Navy's letter dated October 25th, 2021. The Navy team will coordinate a meeting invite and send to all parties shortly falling on one of the three dates you've provided below.

In response to your request for a 60-day extension to review the Navy's proposal, the Draft RTCs and, as appropriate, the Draft Final RACSR, the Navy is unable to accommodate this request. Due to contractual constraints, the Navy cannot extend the period of performance (POP) for this contract task order any further. Previous delays in agreements to issue a RACR, which was later revised to a Draft RACSR, maximized the length of extensions for this particular contract. The current POP deadline is February 22nd, 2022. I understand the Holidays and leave schedules are the reason for the extension request. With that said, I am happy to discuss an alternative request for additional time to review the Draft Final RACSR and Draft RTCs that will accommodate the POP constraints. The current schedule for the Final RACSR is set for submittal on December 13th, 2021.

Please let me know if you have any questions.

Very Respectfully,

Liz Roddy
Remedial Project Manager
NAVFAC BRAC PMO West
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San Diego, CA 92147
(619) 524-5755
elizabeth.a.roddy3.civ@us.navy.mil

From: White, Jeff@Waterboards <Jeff.White@Waterboards.ca.gov>
Sent: Wednesday, November 17, 2021 10:49 AM
To: Roddy, Elizabeth A CIV USN NAVFAC SW SAN CA (USA) <elizabeth.a.roddy3.civ@us.navy.mil>; Ueno, Karen <Ueno.Karen@epa.gov>
Cc: juanita.bacey@dtsc.ca.gov; Flack, Phyllis@Waterboards <phyllis.flack@waterboards.ca.gov>; Pauly, Brooks CIV USN BRAC PMO SAN CA (USA) <brooks.pauly2.civ@us.navy.mil>; Robinson, Derek J CIV USN NAVFAC SW SAN CA (USA) <derek.j.robinson1.civ@us.navy.mil>; Macchiarella, Thomas L CIV USN COMNAVFACENGCOM DC (USA) <thomas.l.macchiarella.civ@us.navy.mil>; Chesnutt, John <Chesnutt.John@epa.gov>; Walsh, Kimberly@DTSC <Kimberly.Walsh@dtsc.ca.gov>; King, Nathan@Waterboards <Nathan.King@waterboards.ca.gov>; Tanouye, David@Waterboards <david.tanouye@waterboards.ca.gov>

November 23, 2021

Subject: RE: FFA Regulatory Party request for extension and proposed meeting with Navy - Draft IR-26 RACSR - Response to FFA Regulatory Party position letter on continued mercury discharges to SF Bay

Hi Liz,

On behalf of the DTSC, EPA, and Regional Water Board, I am requesting an extension to January 11, 2022 (from December 13, 2021), to complete our review of the Draft Final RACSR. We are hoping that the extended, intermediate date of January 11, 2022 will help the Navy's contractor meet its obligations prior to expiration of the POP, as well as provide us with enough time to complete document review/comment. Holidays and leave make it difficult, if not impossible, for us to meet the December 13, 2021 deadline.

Also, we request that our meeting to discuss remedial alternatives and the options presented in the Navy's October 25, 2021 letter, be deferred until after our comments on the Draft Final RACSR have been submitted to and reviewed by the Navy. Deferring the meeting will help us complete our review of and comments on the RACSR. We look forward to meeting with you in January.

Thank you,
Jeff

From: Roddy, Elizabeth A CIV USN NAVFAC SW SAN CA (USA) <elizabeth.a.roddy3.civ@us.navy.mil>
Sent: Thursday, November 18, 2021 6:06 PM
To: White, Jeff@Waterboards <jeff.white@waterboards.ca.gov>; Ueno, Karen <Ueno.Karen@epa.gov>
Cc: juanita.bacey@dtsc.ca.gov; Flack, Phyllis@Waterboards <phyllis.flack@waterboards.ca.gov>; Pauly, Brooks CIV USN BRAC PMO SAN CA (USA) <brooks.pauly2.civ@us.navy.mil>; Robinson, Derek J CIV USN NAVFAC SW SAN CA (USA) <derek.j.robinson1.civ@us.navy.mil>; Macchiarella, Thomas L CIV USN COMNAVFACENGCOM DC (USA) <thomas.l.macchiarella.civ@us.navy.mil>; Chesnutt, John <Chesnutt.John@epa.gov>; Walsh, Kimberly@DTSC <Kimberly.Walsh@dtsc.ca.gov>; King, Nathan@Waterboards <Nathan.King@waterboards.ca.gov>; Tanouye, David@Waterboards <david.tanouye@waterboards.ca.gov>
Subject: RE: FFA Regulatory Party request for extension and proposed meeting with Navy - Draft IR-26 RACSR - Response to FFA Regulatory Party position letter on continued mercury discharges to SF Bay

Hello Jeff,

After discussing the remaining timeline with our Contract Specialist and our Contractor, similar constraints due to the Holiday's and contract close out procedures present logistical challenges of our own. The Navy will proceed with current schedule for comment reviews due November 26th, 2021 and submitting the Final RACSR for IR-26 on December 13th, 2021.

The Navy can accept your request to postpone discussions on the Navy's proposed options for a path forward until after the Holidays. Please let me know if you have any additional questions.

Very Respectfully,

November 23, 2021

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Department of Toxic Substances Control

August 20, 2021

Ms. Liz Roddy
Remedial Project Manager
NAVFAC BRAC PMO West
33000 Nixie Way
Bldg. 50, Floor 2
San Diego, CA 92147

Via electronic mail – hard copy not to follow

SUBJECT: Draft Remedial Action Construction Summary Report (RACSR), Parcel B-2 Installation Restoration Site 26, Groundwater Treatment (March 2021), Hunters Point Naval Shipyard, San Francisco; United States Environmental Protection Agency, California Department of Toxic Substances Control, and San Francisco Bay Regional Water Quality Control Board Position Letter on Ongoing Mercury Discharges to the San Francisco Bay

Dear Ms. Roddy,

The United States Environmental Protection Agency (EPA), California Department of Toxic Substances Control (DTSC) and San Francisco Bay Regional Water Quality Control Board (RB2) are in receipt of the subject RACSR. Because it is a document for Navy purposes that the Navy independently decided to issue, we only performed a quick perusal primarily to evaluate certain statements and/or conclusions that would necessitate reiterating, as we have done herein, our overarching position on the ongoing discharge of mercury to the San Francisco (SF) Bay.

While we appreciate the disclaimer that the RACSR is not a Remedial Action Completion Report (RACR), we are concerned that the Navy draws RACR-like conclusions that the in-situ stabilization (ISS) treatment remedial action is making progress "toward achieving the groundwater RAO of preventing or minimizing the migration of mercury to SF Bay" (Executive Summary), and the path forward is indefinite continuation of post-treatment monitoring rather than evaluating and implementing additional treatment options. A RACSR is not the appropriate vehicle to make such remedial action determinations.

The FFA regulatory parties reject that the remedial action is either successful or making progress in achieving the groundwater remedial action objective (RAO). After an extended nearly 3-year performance and post-treatment monitoring period, the remedial action

(the ISS treatment) has failed to reduce mercury in groundwater to concentrations below 0.6 micrograms per liter (µg/L), the Parcel B Remedial Design (RD) trigger level.

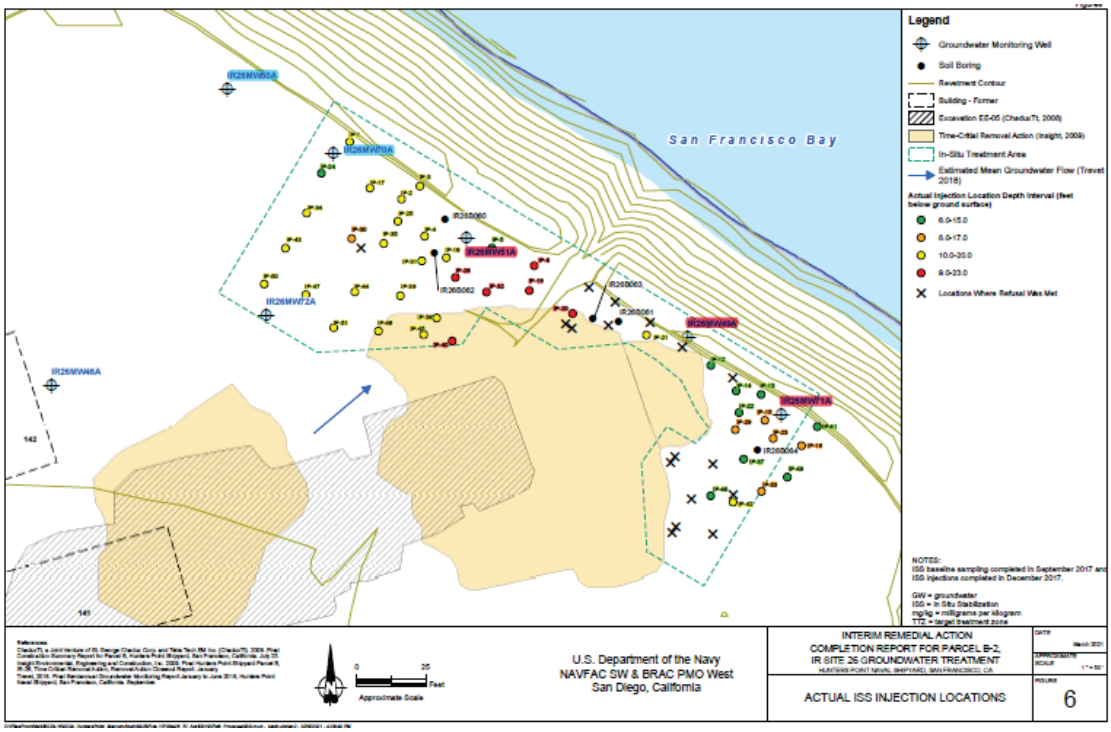
Our technical position and rationale on the remedial action (i.e., the ISS treatment) follow the brief background, below.

Background

According to the final *Work Plan for Parcel B-2, Installation Restoration Site 26 Groundwater Treatment, August 2017* (KMJV, 2017), the "primary objective of the groundwater treatment effort is to perform ISS of dissolved mercury to reduce mercury in groundwater at IR Site 26 to concentrations below the Parcel B Remedial Design (RD) trigger level of 0.6 micrograms per liter (µg/L)."

ISS treatment consisted of injecting Meta Fix compound into groundwater at select locations to "immobilize" mercury. Injections occurred in December 2017 at 43 of the planned 52 locations, with refusal reportedly preventing injection at 9 locations (see Figure 1, below). No alternative actions were proposed or taken to address areas where Meta Fix was not injected.

Figure 1: Meta Fix Injection and Rejection Locations (Source: Figure 6 Draft RACSR)



Data from five "sentinel" wells---IR26MW49A, IR26MW50A, IR26MW51A, IR26MW70A, IR26MW71A---that the Navy located and installed to determine the success of the ISS treatment (see Figure 2, below) were collected and presented in a Navy table (see Table

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1, below) and time series plot (see Figure 3, below). Please note that the Figure 3 time series plot that the Navy provided (Source: *Summary of July through December 2020 Semiannual Groundwater Monitoring Data and Exceedances in Groundwater, March 19, 2021*) only includes data collected via the Basewide Groundwater Monitoring Program (BGMP) and not the data from the 4 quarters of performance monitoring. To facilitate viewing, we modified the original time series plot to only show the 5 "sentinel" wells.

Figure 2: "Sentinel" Wells (Source: Figure 4 Draft RACSR)

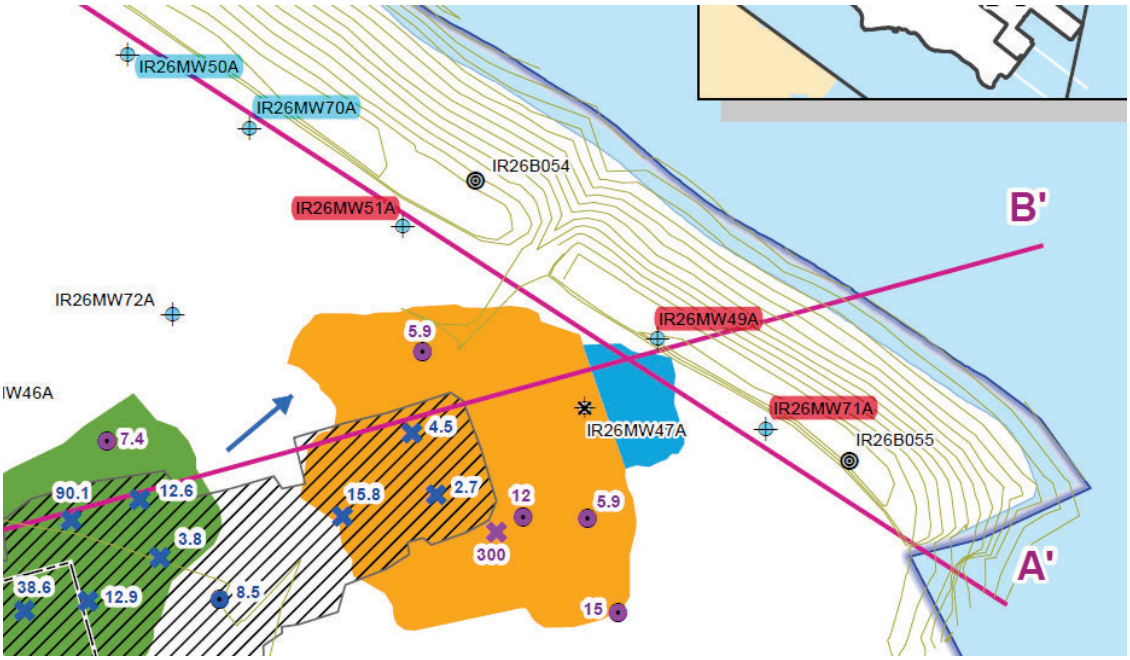

Table 1: Data Results for 5 Sentinel Wells Through September 2020 (Source: 03/09/2021 Email from Ms. Liz Roddy)

HPNS IR Site 26 Mercury Concentrations in Groundwater													
Sampling Event	Basewide Sept 2017	Baseline Sept 2017	Quarter 1 March 2018	Basewide Apr 2018	Quarter 2 June 2018	Basewide Sept 2018	Quarter 3 Sept 2018	Quarter 4 Dec 2018	BGMP Apr 2019	BGMP Sept 2019	BGMP June 2020*	BGMP Sept 2020	March 2021
Project Action Limit	0.6 ug/L	0.6 ug/L	0.6 ug/L	0.6 ug/L	0.6 ug/L	0.6 ug/L	0.6 ug/L	0.6 ug/L	0.6 ug/L	0.6 ug/L	0.6 ug/L	0.6 ug/L	0.6 ug/L
IR26MW49A	**3.38** (0.585)	**4.10**	**3.13 (4.8)**	**4.77 J (4.14)**	**6.36**	**6.95 J (4.65)**	**7.18**	**4.99**	**1.01 (1.47)**	**3.45**	0.494 J	**2.38**	Pending
IR26MW50A	0.5 U	0.100 U	0.5 U	0.1 U	0.100 U	0.100 U	0.100 U	0.100 U	0.1 U	0.2 U	0.2 U	0.2 U	Pending
IR26MW51A	**0.945**	**1.74**	0.5 U	0.092 J	0.1 U (0.1 U)	0.0580 U	0.1 U	**1.66**	0.1 U	0.2 U	0.2 U	0.2 U	Pending
IR26MW70A	NS	0.156 U (0.142 U)	0.5 U	NS	0.1 U	NS	0.1 U (0.1 U)	0.1 U	0.1 U	0.2 U (0.2 U)	0.2 U (0.2 U)	0.2 UJ	Pending
IR26MW71A	NS	**4.09**	0.5 U	NS	**8.55**	0.343 J	0.12 J	**2.6 (2.58)**	0.15	0.194 J	**1.72**	**1.47 (2.81)**	Pending

Notes:

All results from analysis using U.S. EPA Method 7470A for comparison
All results in micrograms per liter
Bold = result exceeds project action limit
U = analyte not detected at or above given detection limit
J = estimated value
NS = not sampled
BGMP = Basewide Groundwater Monitoring Program
HPNS = Hunters Point Naval Shipyard
Results in parentheses are duplicates.

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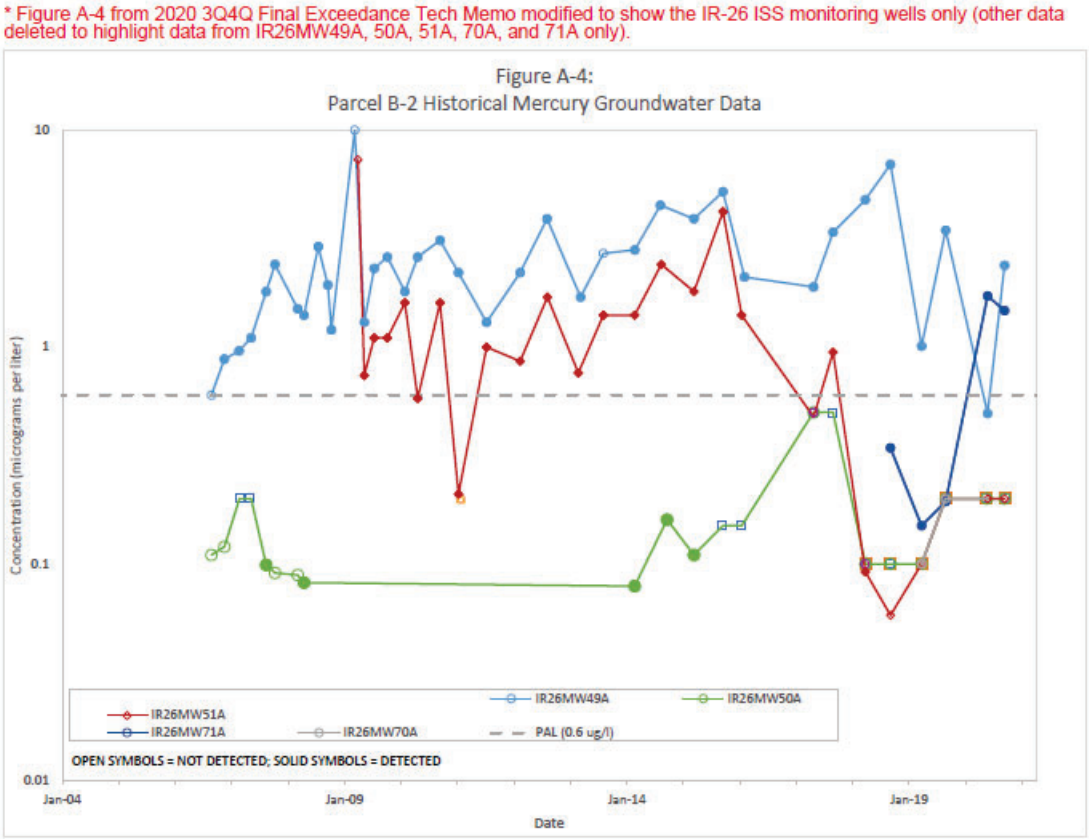
Figure 3: Time Series Plot of BGMP Data for 5 "Sentinel" Wells (Source: Figure A-4, *Summary of July through December 2020 Semiannual Groundwater Monitoring Data and Exceedances in Groundwater, March 19, 2021*)



Technical Position of EPA, DTSC, RB2

1. The ISS treatment has failed to minimize or prevent mercury migration to SF Bay and additional treatment options need to be screened, evaluated, and pursued by the Navy via the development of a new primary document work plan. An indefinite monitoring period with no corrective action, as proposed by the Navy in the subject RACSR, will result in continued discharges of mercury to SF Bay at concentrations that are unacceptable to the FFA regulatory parties.

   The continued discharge of mercury without additional remediation prevents FFA regulatory party acceptance of a future IR Site 26 RACR(s) and timely transfer of the property, and poses an ongoing threat to human health and the environment and a potential compliance concern for the regulators.

2. Despite over 10 post-treatment monitoring events (results from an 11th event are pending) over nearly three years, concentrations of dissolved mercury are not below or consistently

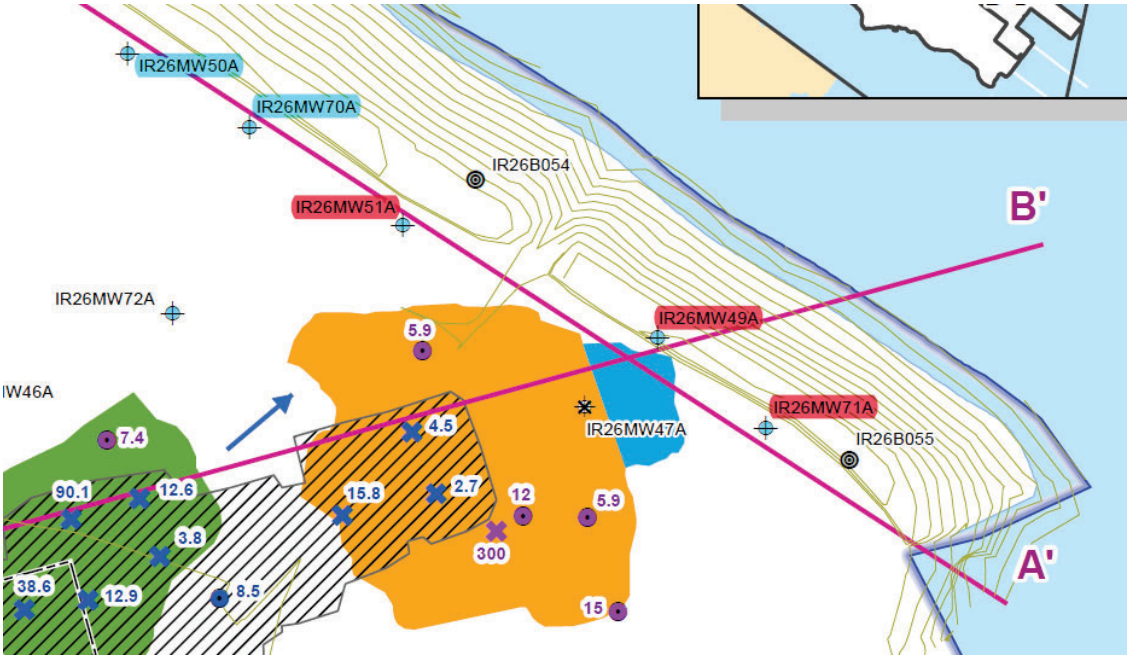
August 20, 2021

below the Parcel B RD trigger level of 0.6 µg/L at 3 of the 5 "sentinel" well locations---namely, at IR26MW49A, IR26MW51A, and IR26MW71A. Specifically, IR26MW49A has exceedances in 9 out of 10 post-treatment monitoring events; IR26MW51A has a troubling unexplained spike back up to the baseline level approximately midway in the post-treatment monitoring; and IR26MW71A has exceedances in 4 out of 9 post-treatment monitoring events, including in the two most recent events reported.

These data neither demonstrate success of the ISS treatment nor that the ISS is minimizing or preventing mercury migration to SF Bay. Moreover, as stated in the RACSR (Section 4), "tidal influence was not included as part of the groundwater study for the treatment of mercury concentrations at IR Site 26. However, it was observed that mercury concentrations fluctuated in groundwater samples collected from site monitoring wells." The RACSR provides a summary of the tidal status for the samples collected during the baseline and four quarterly events (but not for the samples collected via the BGMP), however it fails to evaluate whether or how mercury concentrations may be affected by differences in collection times (e.g., during low or high tides) and does not provide a recommendation for the BGMP to collect monitoring samples at consistent and optimal tidal cycles. As such, there are significant comparability and representativeness issues with these data and thus with the conclusions made on the effectiveness of treatment.

In sum, the ISS treatment has failed as a treatment technology to achieve the desired results. See Figure 2, Table 1, and Figure 3 presented again, below, for convenience.

Figure 2: "Sentinel" Wells (Source: Figure 4 Draft RACSR); IR26MW49A, IR26MW51A, and IR26MW71A in red



August 20, 2021

Table 1: Data Results for 5 Sentinel Wells Through September 2020 (Source: 03/09/2021 email from Ms. Liz Roddy); IR26MW49A, IR26MW51A, and IR26MW71A in shaded rows

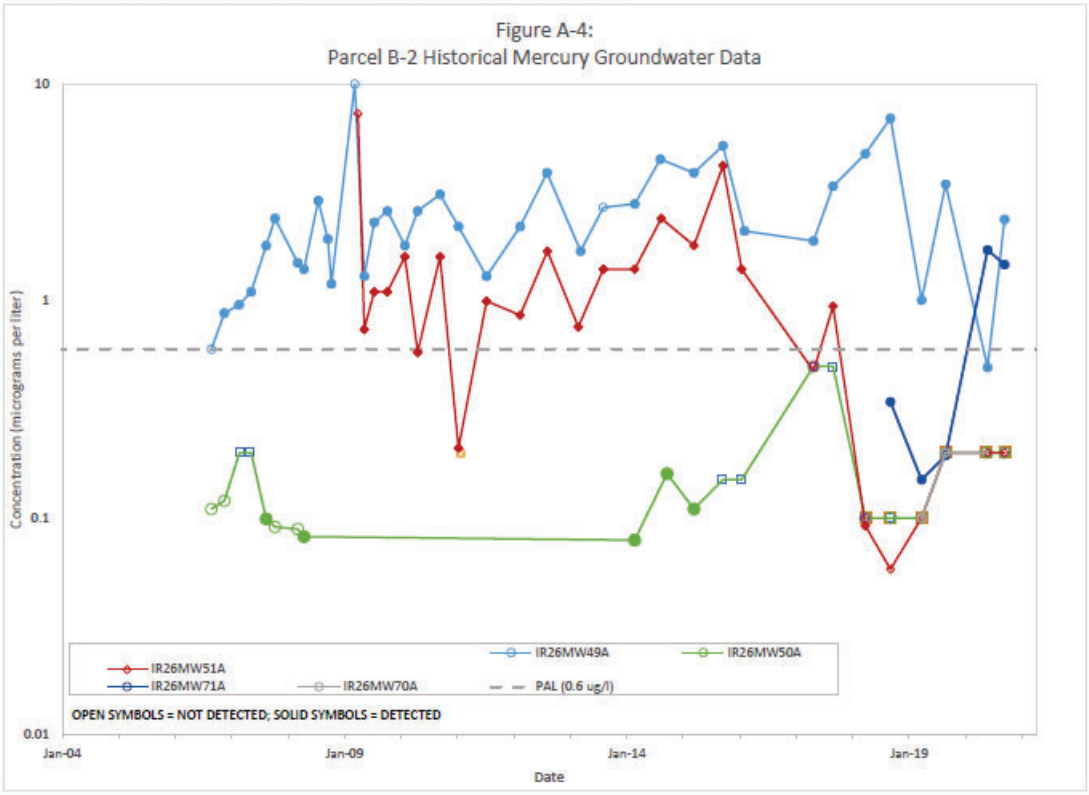
HPNS IR Site 26 Mercury Concentrations in Groundwater													
Sampling Event	Basewide Sept 2017	Baseline Sept 2017	Quarter 1 March 2018	Basewide Apr 2018	Quarter 2 June 2018	Basewide Sept 2018	Quarter 3 Sept 2018	Quarter 4 Dec 2018	BGMP Apr 2019	BGMP Sept 2019	BGMP June 2020*	BGMP Sept 2020	March 2021
Project Action Limit	0.6 ug/L	0.6 ug/L	0.6 ug/L	0.6 ug/L	0.6 ug/L	0.6 ug/L	0.6 ug/L	0.6 ug/L	0.6 ug/L	0.6 ug/L	0.6 ug/L	0.6 ug/L	0.6 ug/L
IR26MW49A	3.38 (0.585)	**4.10**	**3.13 (4.8)**	**4.77 J (4.14)**	**6.36**	**6.95 J (4.65)**	**7.18**	**4.99**	**1.01 (1.47)**	3.45	0.494 J	**2.38**	Pending
IR26MW50A	0.5 U	0.100 U	0.5 U	0.1 U	0.100 U	0.100 U	0.100 U	0.100 U	0.1 U	0.2 U	0.2 U	0.2 U	Pending
IR26MW51A	**0.945**	**1.74**	0.5 U	0.092 J	0.1 U (0.1 U)	0.0580 U	0.1 U	**1.66**	0.1 U	0.2 U	0.2 U	0.2 U	Pending
IR26MW70A	NS	0.156 U (0.142 U)	0.5 U	NS	0.1 U	NS	0.1 U (0.1 U)	0.1 U	0.1 U	0.2 U (0.2 U)	0.2 U (0.2 U)	0.2 UJ	Pending
IR26MW71A	NS	**4.09**	0.5 U	NS	**8.55**	0.343 J	0.12 J	**2.6 (2.58)**	0.15	0.194 J	**1.72**	**1.47 (2.81)**	Pending

Notes:

All results from analysis using U.S. EPA Method 7470A for comparison
All results in micrograms per liter
Bold = result exceeds project action limit
U = analyte not detected at or above given detection limit
J = estimated value
NS = not sampled
BGMP = Basewide Groundwater Monitoring Program
HPNS = Hunters Point Naval Shipyard
Results in parentheses are duplicates.

Figure 3: Time Series Plot of BGMP Data for 5 "Sentinel" Wells (Source: Figure A-4, *Summary of July through December 2020 Semiannual Groundwater Monitoring Data and Exceedances in Groundwater, March 19, 2021*)
IR26MW49A (light blue), IR26MW51A (red), and IR26MW71A (dark blue)

* Figure A-4 from 2020 3Q4Q Final Exceedance Tech Memo modified to show the IR-26 ISS monitoring wells only (other data deleted to highlight data from IR26MW49A, 50A, 51A, 70A, and 71A only).



August 20, 2021

3. The Navy's RACSR definition of "success" and decision not to pursue additional treatment do not comport with the Navy's own *Final Work Plan for Parcel B-2, Installation Restoration Site 26 Groundwater Treatment, August 2017- Project-Specific Sampling and Analysis Plan Parcel B-2, IR Site 26 Groundwater Treatment* (redline final of Sampling and Analysis Plan Worksheet #11, Step 5, excerpted below) which states the following:

> 2b. If post-ISS treatment concentrations of dissolved mercury in groundwater are greater than 0.6 µg/L by either U.S. EPA Method 7470A or U.S. EPA Method 1631E at wells (IR26MW49AIR26MW50A, IR26MW51, IR26MW70A, and IR26MW71A) ~~IR26MW49A and IR26MW51A~~along the revetment after four quarters of groundwater monitoring, the following steps will be performed with regards to ISS treatment:
>
> i. If after four consecutive quarters of monitoring, analytical results using U.S. EPA Method 1631E are at or below 0.6 µg/L, but exceed 0.6 µg/L using U.S. EPA Method 7470A while exhibiting a statistically significant decrease in concentration after treatment, then the ~~RAO~~ ISS treatment will be considered ~~met~~successful, and ~~no further remedial action for mercury in groundwater will be warranted~~the CERCLA response complete. Mercury concentrations in groundwater will continue to be monitored under the BGMP to evaluate long-term treatment effectiveness and potential latent reduction trends. If there is no demonstrable decline in dissolved mercury concentrations from baseline values, other methods to evaluate success may be considered such as offshore sediment pore water sampling.
>
> ~~i.~~ ii. If after four quarters of monitoring, analytical results are at or below 0.6 µg/L by U.S. EPA Method 7470A, but are greater than 0.6 µg/L by U.S. EPA Method 1631E, then the ~~RAO will be considered not met~~ISS treatment will not be considered successful, and further evaluation and/or treatment may be warranted.
>
> ~~ii.~~ iii. If after four quarters of monitoring, analytical results are greater than 0.6 µg/L by both U.S. EPA Method 1631E and U.S. EPA Method 7470A, then the ISS treatment will not be considered successful~~RAO will be considered not met~~, and further evaluation and/or treatment may be warranted.

In accordance with the Navy's own protocol, above, the ISS treatment has not proven successful and "further evaluation and/or treatment may be warranted."

4. It seems unlikely that mercury concentrations will further decrease as a result of Metafix, especially given the potential tidal flushing in the "sentinel" monitoring wells. The same 2017 final work plan (Section 3.3.3) referenced above states that "[f]ollowing ISS treatment, the anticipated duration to remove mercury from groundwater by precipitating mercury sulfide minerals is one to three months (Bower et al., 2008; Devasena et al., 2013; Xiong et al., 2009)." There have been nearly 36 months of post-treatment monitoring.

5. The ISS treatment has not achieved success in nearly three years (36 months) of post-treatment monitoring and therefore, focused alternative treatments and treatment methodologies should be evaluated and, if warranted and accepted by the FFA regulatory parties, implemented. In sum, the CERCLA path forward towards a RACR is to initiate a new primary document work plan to evaluate and implement alternative treatment options and treatment methodologies. The remedial action has not been shown to be successful or protective.

August 20, 2021

6. The RACSR makes unsubstantiated claims about the results of the Mann-Kendall test to support its determination of the success of the ISS treatment and decision not to pursue additional treatment options. According to the RACSR (Section 4), "[t]he Mann-Kendall test is a trend estimator that is specifically recommended for environmental data," and the Navy uses this test to conclude, "[f]or IR26MW49A, Mann-Kendall analysis indicated a decreasing trend in dissolved mercury concentrations. For IR26MW71A, insufficient evidence of a trend was indicated."

    a. Per the ProUCL 5.1 Technical Guide (EPA, 2015), "…trend tests correcting for seasonal/spatial variations and geostatistical methods are not available in the ProUCL software. For those methods, the user is referred to commercial software packages such as SAS®." Because samples were not consistently collected at low-low tide (i.e., the likely worst-case condition), the dataset used to conclude that there is a decreasing trend at IR26MW49A has an unknown source of variation, and the conclusion made for the trend at IR26MW49A using ProUCL software is not valid.

    b. The samples collected at high and low tide may not be comparable. These data need to be parsed and evaluated separately. If the BGMP data are used, then the tidal status of these data needs to be determined and parsed into the appropriate group of low or high tide datasets. (Note: Subdivisions of high and low tides include high-low and low-high creating 4 daily cycle components in total.)

    c. ***A study that includes collection of dissolved mercury at low and high tides within the same day needs to be performed to evaluate whether there is a tidal effect on the concentrations of mercury.***

7. Because this letter states ***our position*** on the ongoing discharge of mercury to the SF Bay, we request that your contractor does not respond to this position letter. Rather, we would appreciate that this letter is attached to your final RACSR document. At a minimum, it should be included in your administrative record.

8. It is of utmost importance to commence discussion on the development of a new primary document work plan on focused alternative treatments and treatment methodologies. ***Unmitigated discharge of mercury to SF Bay cannot continue.***

EPA, DTSC, and RB2 look forward to continuing a collaborative path forward with the Navy. We will be in contact in the coming weeks to schedule a meeting to discuss and initiate scoping of a new primary document work plan.

Sincerely,

Karen Ueno

Karen Ueno
U.S. EPA
Region 9

Juanita Bacey
Berkeley Office
DTSC

Phyllis Flack
SF Bay
RWQCB

August 20, 2021

Cc:
Mr. Derek Robinson, Navy BRAC PMO West
Ms. Brooks Pauly, Navy BRAC PMO West
Mr. Thomas Macchiarella, Navy BRAC PMO West
Mr. John Chesnutt, US EPA
Ms. Kim Walsh, DTSC
Mr. Nathan King, SF Bay RWQCB
Mr. David Tanouye, SF Bay RWQCB
Ms. Amy Brownell, City of SF Department of Public Health

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NAVFAC
Naval Facilities Engineering Command
FORMER HUNTERS POINT NAVAL SHIPYARD

Path Forward

Parcel B-2, Installation Restoration (IR) Site 26
Former Hunters Point Naval Shipyard (HPNS)
San Francisco, California

Base Realignment and Closure (BRAC) Cleanup Team (BCT) Meeting
June 2024

Meeting Objectives

- Review historical remedial actions
- Previous RA constraints of *in-situ* groundwater treatment at IR Site 26
- Proposed RA Path Forward
- Share IR Site 26 timeline for proposed remedial action
- Agency feedback on timeline and proposed remedial action

ROD Amendment for IR Site 26 (Navy, 2009)

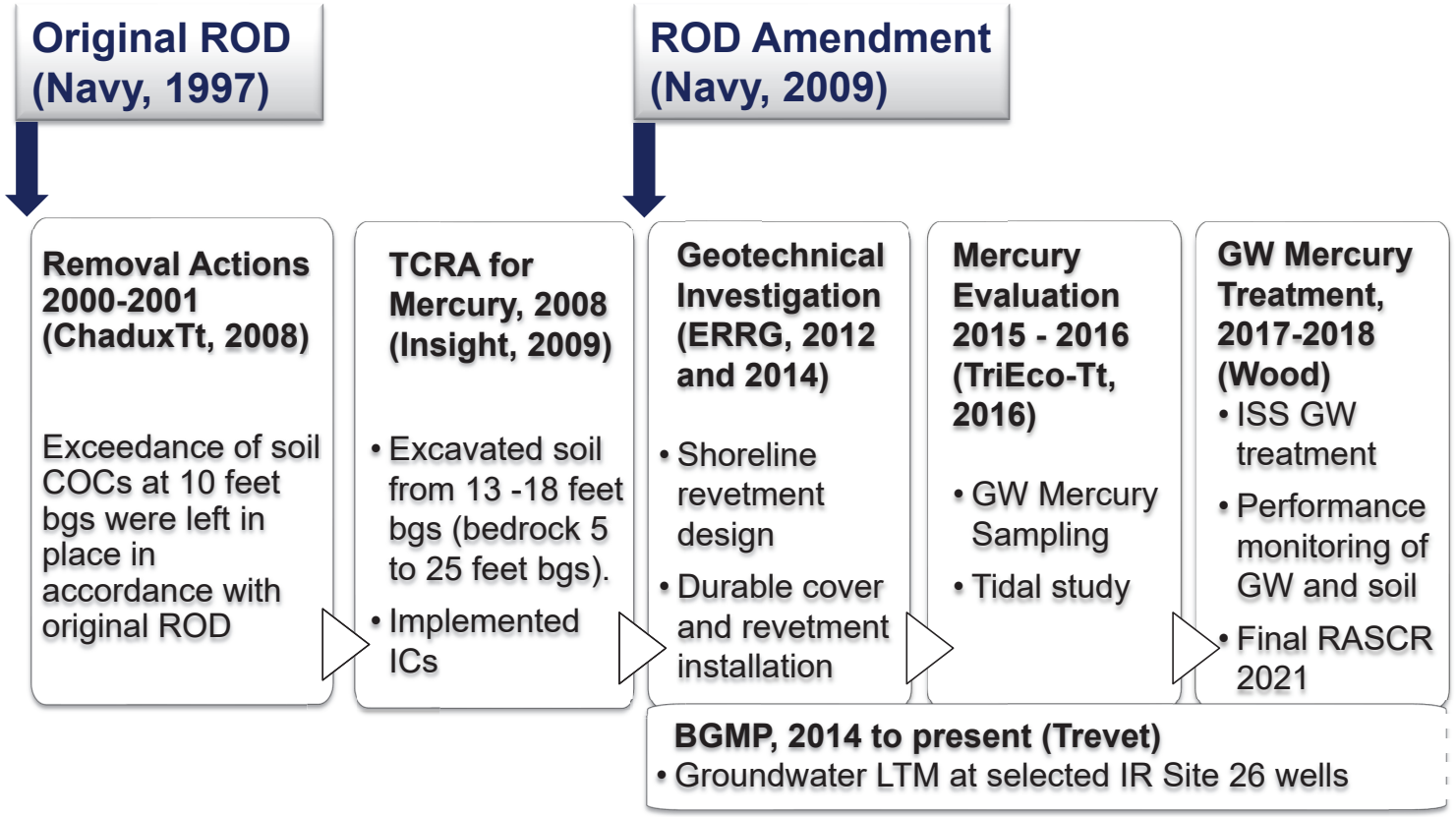
Remedial Action Objective (RAO)

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

Selected Remedy for groundwater:

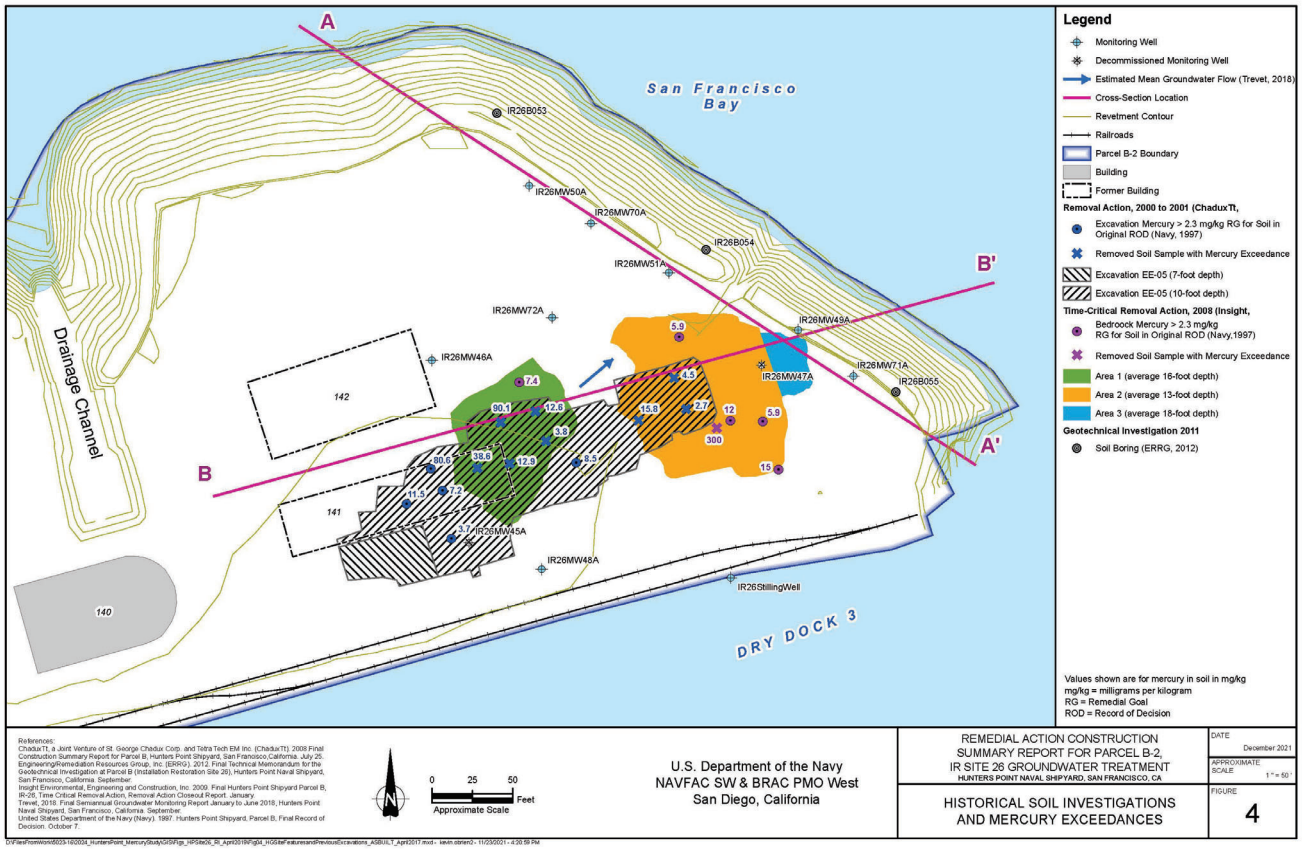
Alternative GW-3A: (1) in situ groundwater treatment using biodegradation substrate, (2) groundwater monitoring, and (3) ICs

Timeline of Navy Decision Documents and Investigations at IR Site 26



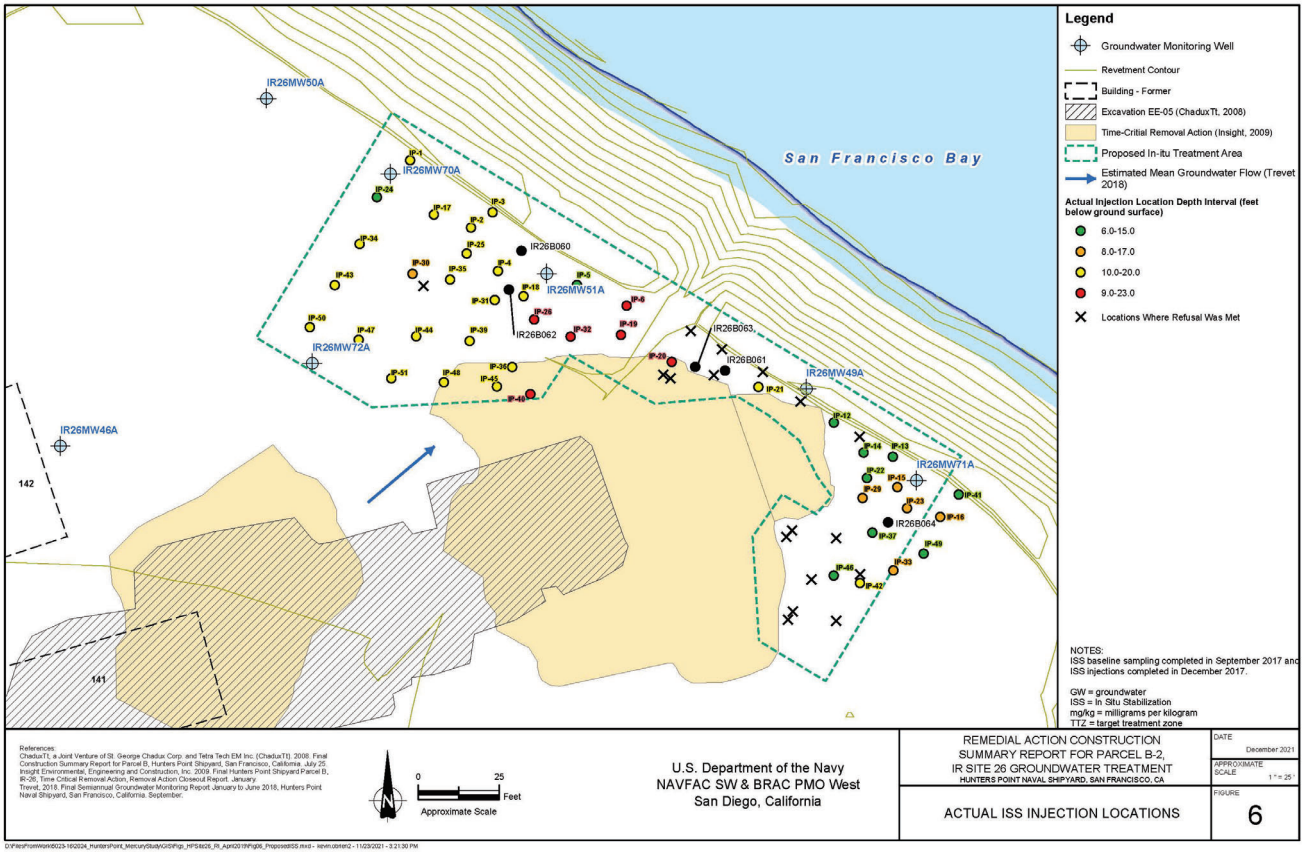
BRAC Program Management Office

Remedial Actions(Source Removal) at IR Site 26 (2000-2009)



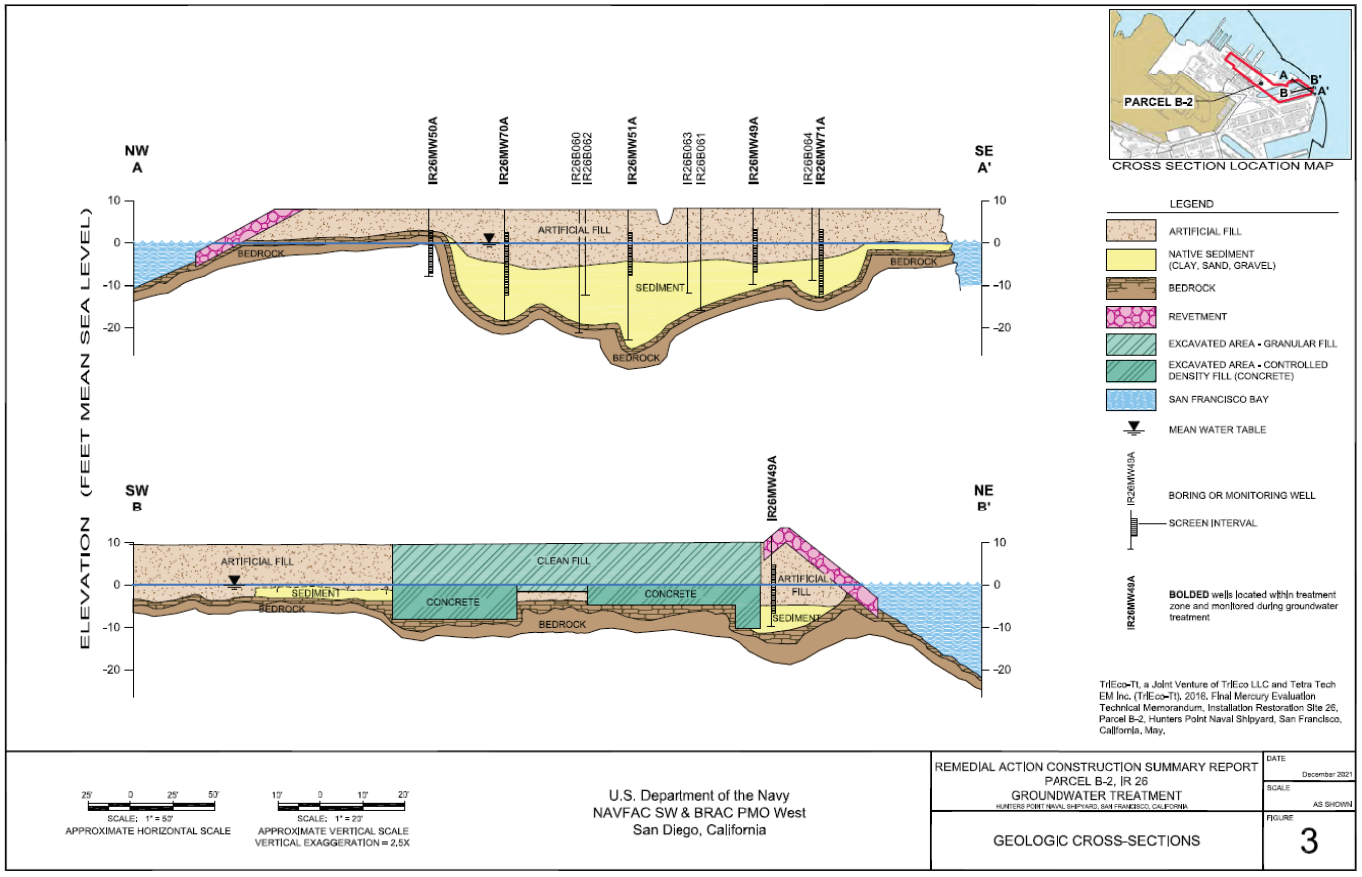
BRAC Program Management Office

Remedial Actions and Investigations at IR Site 26 (2000-2018)



BRAC Program Management Office

Remedial Actions(Source Removal) at IR Site 26 (2000-2009)



BRAC Program Management Office

Technical Constraints

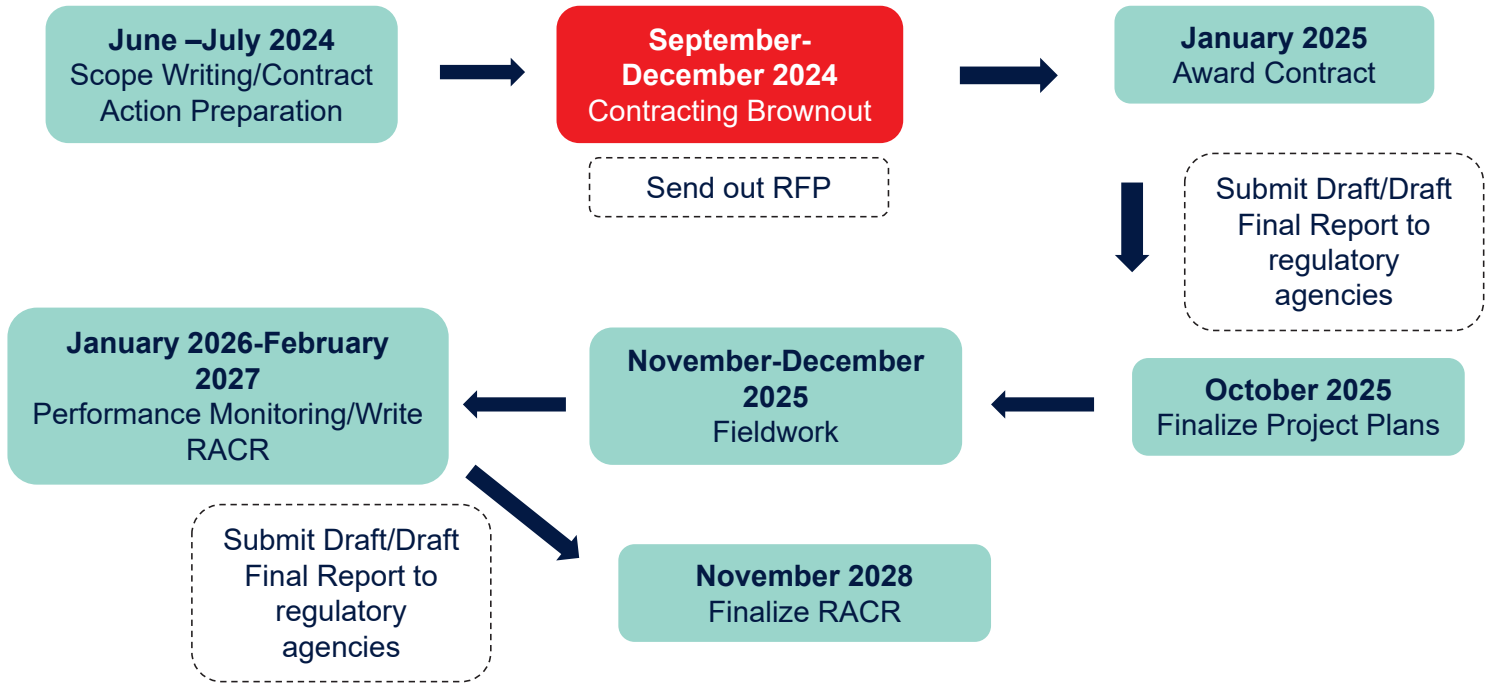
1. Injections were refused in area near the shoreline wells, likely due to Controlled Density Fill (CDF) footprint extending beyond the estimated plan view boundaries, or subsurface cobbles and riprap near the shoreline.
2. Large area to the West covered by an impermeable layer as seen in the tan shaded areas and black hashed areas on previous slide

Photo taken at 1426 hrs by Robert Castaneda. Northeast view photo showing stockpiles of rock removed from the Area 2 excavation.

Proposed RA Path Forward

- Mitigate dissolved Hg through targeted *in-situ* injections in the vicinity of IR26MW49A and –71A
- Metafix must come in direct contact with dissolved mercury to absorb it (ROI less than 7.5-feet). Prior Radius of Influence near monitoring wells:
  - IR26MW49A ~15-feet
  - IR26MW71A ~14-feet
- Previous injections were too shallow due to refusal; ensure targeted depths are met near sediment/bedrock contact
- Metafix injections were effective in locations where injections were successfully accomplished
- Quarterly performance monitoring at select wells and follow-on BGMP

Proposed Timeline



BRAC Program Management Office

Discussion

Questions? Comments?

HPNS IR Site 26 Mercury Concentrations in Groundwater													Data Appended to Original Table			
Sampling Event	**Basewide Sept 2017**	**Baseline Sept 2017**	**Quarter 1 March 2018**	**Basewide Apr 2018**	**Quarter 2 June 2018**	**Basewide Sept 2018**	**Quarter 3 Sept 2018**	**Quarter 4 Dec 2018**	**BGMP Apr 2019**	**BGMP Sept 2019**	**BGMP June 2020***	**BGMP Sept 2020**	**BGMP March 2021**	**BGMP Sept 2021**	**BGMP March 2022**	**BGMP Sept 2022**
Project Action Limit	**0.6 ug/L**	**0.6 ug/L**	**0.6 ug/L**	**0.6 ug/L**	**0.6 ug/L**	**0.6 ug/L**	**0.6 ug/L**	**0.6 ug/L**	**0.6 ug/L**	**0.6 ug/L**	**0.6 ug/L**	**0.6 ug/L**	**0.6 ug/L**	**0.6 ug/L**	**0.6 ug/L**	**0.6 ug/L**
IR26MW49A	**3.38** (0.585)	**4.10**	**3.13 (4.8)**	**4.77 J (4.14)**	**6.36**	**6.95 J (4.65)**	**7.18**	**4.99**	**1.01 (1.47)**	**3.45**	0.494 J	**2.38**	0.283 J **(2.16)**	**3.57**	**1.79 (1.4)**	**5.55**
IR26MW50A	0.5 U	0.100 U	0.5 U	0.1 U	0.100 U	0.100 U	0.100 U	0.100 U	0.1 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U
IR26MW51A	**0.945**	**1.74**	0.5 U	0.092 J	0.1 U (0.1 U)	0.0580 U	0.1 U	**1.66**	0.1 U	0.2 U	0.2 U	0.2 U	0.156 J	0.2 U	0.2 U	0.2 U
IR26MW70A	NS	0.156 U (0.142 U)	0.5 U	NS	0.1 U	NS	0.1 U (0.1 U)	0.1 U	0.1 U	0.2 U (0.2 U)	0.2 U (0.2 U)	0.2 UJ	0.2 U	0.2 U (0.2 U)	1.0 U	0.2 U (0.2 U)
IR26MW71A	NS	**4.09**	0.5 U	NS	**8.55**	0.343 J	0.12 J	**2.6 (2.58)**	0.15	0.194 J	**1.72**	**1.47 (2.81)**	**1.26**	**5.0**	**1.18**	**1.75**

Notes:
All results from analysis using U.S. EPA Method 7470A for comparison
All results in micrograms per liter
Bold = result exceeds project action limit
U = analyte not detected at or above given detection limit
J = estimated value
NS = not sampled
BGMP = Basewide Groundwater Monitoring Program
HPNS = Hunters Point Naval Shipyard
Results in parentheses are duplicates.

Response to Comments	Contract/CTO N62470-21-D-0007; Contract Task Order No. N6247322F4930	Responses By Navy

Comment By **Andrew Bain**	Code/Organization **Northern California Federal Facilities Section, Superfund Division, EPA Region 9**	Date July 2024

Project Title and Location		**Type of Review**
Draft-Final Fifth Five-Year Review Report, Hunters Point Naval Shipyard, San Francisco, California, June 18, 2024	**X**	Draft-Final
		Final
		Other

No.	Location	EPA Region 9 Comments Dated July 19, 2024	Navy Response
1	Climate Resiliency Assessment, Appendix A	The Navy's revisions to prioritize the parcel-specific approach and timely characterization of the portions of the Site most likely to experience impacts first is appreciated. EPA has no further comment at this stage and for purposes of this Fifth Five-Year Review Report.	Comment acknowledged.
2	--	<u>Five-Year Review Triggering Action Date and Due Date is Not the Signature Date of the Fourth Five-Year Review</u> EPA's long-standing position is that the statutory due date for the Sixth Five-Year Review Report is November 8, 2028, which is not reflected in this Five-Year Review Report. If the Navy does not agree with EPA, we suggest our respective attorneys need to resolve this issue. In the interim, EPA's comment of 4/30/2024 and 6/4/2024 stand (attached).	The Navy's signature date is in accordance with DoD policy. However, this does not preclude completing a five-year review sooner than five years. The Navy is open to continuing this discussion between our respective attorneys to come to a resolution.

No.	Location	EPA Region 9 Comments Dated July 19, 2024	Navy Response
4		<u>Parcel B-2 Draft Final Protectiveness Determination for Groundwater; Actions and Associated Schedules Remain Protracted</u> In summary: a. EPA remains concerned that the Navy's efforts remain protracted, notwithstanding that the FFA regulatory parties raised the concern about mercury discharges to the Bay and the apparent failure of treatment several years ago. The tri-agency letter of November 23, 2021 (attached), stated "an indefinite period with no corrective action is unacceptable to the FFA regulatory parties." EPA continues to expect a final primary document, as initially committed to by the Navy, by July 31, 2025. EPA expects that in order to meet the deadline for the final, the Navy will appropriately plan for submission of a draft and a draft final, and appropriately plan for the minimum FFA review time frames for such draft (45 days + 30 day extension with notice) and draft final (30 days), in addition to the time frame the Navy will need to respond to comments and revise the document.	a. The Navy understands the agencies' concern that the RAOs have not been met in all the groundwater monitoring wells at IR-26. The Navy is also concerned about the elevated mercury concentrations in monitoring wells IR26MW49A and IR26MW71A.
		b. EPA does not oppose any Navy attempt to optimize delivery of the ISS (e.g., use of a larger rig in areas of prior injection refusal) "as long as such action **is timely and completed prior to July 31, 2025**" (emphasis added), not October 31, 2025, the latter which the Navy incorrectly attributes to EPA.	b. To clarify, the Navy does not attribute the date change to October 31, 2025 to the EPA. The Navy has since resolved the issue by preparing a primary document that evaluates mercury remediation technologies in groundwater. See response to comment c.
		c. The final primary document due on July 31, 2025, must include additional treatment options that have been initially screened for further evaluation. In addition, the final primary document should evaluate all existing data to determine a path forward. Any attempt to optimize delivery of the ISS should be completed prior to delivery of the final primary document, as the Navy already indicated it would do the former (i.e., via bigger rig) several years ago. EPA rejects a final primary document whose sole goal is to propose methods to enhance ISS delivery. See d., below.	c. The Navy is preparing a primary document to evaluate remediation technologies to address mercury in groundwater. The document will be delivered to the agencies by October 31, 2024, as discussed in the July 2024 BCT Meeting.
		d. EPA **does not agree** with the Navy's "Path Forward – Parcel B-2, Installation Restoration (IR) Site 26," dated June 2024 and presented at the June 13 Partnering Meeting (attached). This approach and	d. The Protectiveness Statement and Issues and Recommendations for Parcel B-2 has been updated as follows to reflect the Navy's path forward:

No.	Location	EPA Region 9 Comments Dated July 19, 2024	Navy Response
		schedule, which EPA rejects, does not appear to be reflected in the Draft Final Fifth Five-Year Review Report, but the Navy needs to confirm the latter in writing. EPA rejects a final primary document whose sole goal is to propose methods to enhance ISS delivery.	**Protectiveness Statement** (Five-Year Review Summary Page and Section 3.7.3 of the Five-Year Review): *A protectiveness determination cannot be made because there is uncertainty related to concentrations of mercury potentially discharging to the Bay from Parcel B-2, IR-26 groundwater. In order to make a protectiveness determination, the following actions need to be made: (1) evaluate technologies for treating mercury in groundwater (2) apply the selected method that is within compliance of the selected remedy in the record of decision. A draft primary document presenting the evaluation of the technologies and the proposed treatment method will be provided to the FFA regulatory agencies for review by October 31, 2024. The Navy anticipates initiating field application of the selected treatment method by mid-July 2025. Contingencies will be discussed during development of the work plan and exercised as the need arises. The protectiveness determination will be re-evaluated in the Five-Year Review addendum based on information that becomes available after the completion of this FYR.* **Issues and Recommendations** (Five-Year Review Summary Page and Table 3-9 of the Five-Year Review): ***Issue:*** *The in-situ stabilization remedy for mercury in Parcel B-2, IR-26 groundwater did not reduce concentrations to below the 0.6 µg/L trigger level across the entire site and there is uncertainty related to the concentrations of mercury potentially discharging to the Bay from Parcel B-2, IR-26 groundwater.* ***Recommendation 1:*** *Prepare a primary document evaluating technologies for treating mercury in groundwater and presenting a proposed treatment method for FFA regulatory agency review.* ***Milestone:*** *10/31/2024* ***Recommendation 2:*** *Apply the selected treatment method in the field and initiate performance monitoring.* ***Milestone:*** *7/15/2025*
		e. As the FFA regulatory parties stated in the tri-agency letter of November 23, 2021, "the continued discharge of mercury without additional remediation prevents FFA regulatory party acceptance of a future IR 26 Remedial Action Completion Report (RACR) and timely	e. Comment acknowledged

No.	Location	EPA Region 9 Comments Dated July 19, 2024	Navy Response
		transfer of the property, and poses an ongoing threat to human health and the environment and compliance concern for the regulators."	
		f. EPA notes that mercury concentrations do not appear to be on any clear downward trend (see EPA's updated table, attached). The most recent concentration available to EPA for IR26MW49A is 5.55 ug/L and for IR26MW71A is 1.75 ug/L (PAL is 0.6 ug/L).	f. Comment acknowledged, future evaluation of the data, to be conducted as part of the protectiveness determination/FYR Addendum, will include statistical evaluation of the dataset to determine the trends.
		g. The Navy's proposed new Table 3-4 (comparison of groundwater quality parameters to Bay water quality parameters) appears very limited. A more appropriate place for the proposed table is the prospective primary document, not this Five-Year Review Report. This table is premature, warrants discussion with the FFA regulatory parties, and should be removed from this Five-Year Review Report.	g. This table was presented to the Agencies during the April 25, 2024 meeting and was requested for inclusion in this FYR by DTSC.
		h. The Navy does not provide a reference, rationale, or relevance for the comparison to "10 times the 0.6 µg/L TL." The Navy seems to be assuming, arbitrarily, a "dilution factor of 0.1." This topic is more appropriately included in the prospective primary document, warrants discussion with the FFA regulatory parties, and should be removed from this Five-Year Review Report.	h. The rationale for using a 0.1 dilution factor is presented in Section 3.5.1.3 in the fourth bullet citing a study by "State of Washington, Department of Ecology (2009) which found that the majority of the reduction in porewater concentrations was because of dilution by surface water and averaged 90 percent (that is, a dilution factor of 0.1)."
		i. EPA comments of 4/30/2024 and 6/4/2024 stand.	i. Comment acknowledged.
		j. The Navy needs to perform more robust quality assurance and quality control of its Five- Year Review Report before release to the FFA regulatory parties and the public.	j. Comment acknowledged. Reference: State of Washington, Department of Ecology. 2009. *High-resolution porewater sampling near the groundwater/surface water interface*. Publication No. 09-03-017. April.

No.	Location	EPA Region 9 Comments Dated July 19, 2024	Navy Response
4		Parcel C Draft Final Protectiveness Determination for Groundwater a. EPA appreciates the Navy's efforts via the Parcel C Phase III RAWP, the Navy's investigation of the deep F-WBZ, the latter in response to FFA regulatory party informal dispute, and the Navy's previous agreement, as documented in the Phase III RAWP, to fully characterize the B-aquifer and the underlying upper F-WBZ. To the extent there is inadvertent discrepancy between this document and the Phase III RAWP and/or the deep F-WBZ RAWP, EPA expects the RAWPs and our associated comments to prevail. EPA continues to expect that performance monitoring associated with the Parcel C RAWP, including the agreed to additional B-aquifer monitoring, can commence within approximately two years.	a. Comment acknowledged.
		b. As stated previously, EPA will not review or comment on the Navy's "Water Board specific concerns" that the Navy inserted into its response to EPA's comments. This should not be construed as EPA agreement or consensus.	b. There are no Water Board specific concerns in the Parcel C Protectiveness Determination comment (*EPA Comment 3 on Navy's Draft Protectiveness Determinations for Parcels B-2, C, and E-2*). Water Board concerns, as well as EPA and DTSC-specific responses that resulted in changes to the Five-Year Review text were incorporated into the responses to all Agency responses to provide the full extent of the changes to the Five-Year Review text.
		c. To help facilitate consistency, EPA's comments of 4/30/2024 and 6/4/2024 stand.	c. Comment acknowledged. Note that the protectiveness determination and milestone dates for the issues and recommendations for Parcel C have been updated as follows: **Protectiveness Statement** (Five-Year Review Summary Page and Section 4.7.1 of the Five-Year Review): *A protectiveness determination cannot be made because there is uncertainty related to the hydrogeologic communication between the A- and B-aquifers and whether discharge of chemicals present in the B-aquifer present potential unacceptable risks to Bay receptors. In order to make a protectiveness determination, the following action, at a minimum, needs to be made: (1) complete investigations of the (a) Bay Mud/Sandy Lean Clay aquitard, (b) extent of chemicals in the deep F-WBZ in RU-C4, and (c) extent of chemicals in the B-aquifer and F-WBZ in RU-C2 and (2) use current ecological risk assessment methods and criteria, as appropriate, to assess potential impacts to Bay receptors.*

No.	Location	EPA Region 9 Comments Dated July 19, 2024	Navy Response
			The estimated timeframe for each action is as follows: • *Complete investigations of the Bay Mud/Sandy Lean Clay aquitard, expected to occur by Fall 2026* • *Complete investigation of the extent of chemicals in the deep F-WBZ in RU-C4 expected to occur by Fall 2026* • *Complete investigation of the extent of chemicals in the B-aquifer and F-WBZ in RU-C2 expected to occur by Spring 2027* • *Assess potential impacts to Bay receptors, expected to occur by Fall 2026* *The FFA parties will have discussions, as appropriate, prior to scoping and developing primary documents, such as workplans, expected to occur in Fall 2025. The protectiveness determination will be re-evaluated in the addendum based on information that becomes available after the completion of this FYR.* *The RAOs for soil are met through hotspot excavation and disposal, durable covers, and ICs. Groundwater remediation is ongoing, and, once active treatment is complete, MNA will continue until COCs reach remediation goals (RGs). Until that time, ICs control exposure to groundwater. Radiological retesting is ongoing to confirm that levels in soil and structures are protective of human health.* **Issues and Recommendations Milestone update** (Five-Year Review Summary Page and Table 4-8 of the Five-Year Review): ***Milestone:*** *5/31/2027* *Interim Milestones:* *Five-Year Review Addendum 7/31/2025* *F-WBZ investigation fieldwork 11/30/2025* *F-WBZ investigation report 11/30/2026*

No.	Location	EPA Region 9 Comments Dated July 19, 2024	Navy Response
5		Parcel E-2 Draft Final Protectiveness Determination; EPA Changing Its Position to Protectiveness Deferred a. As stated in our comments, and at the April 25, 2024, meeting, "it is EPA's position that if the Navy is unable to agree to the timely analysis of existing Parcel E-2 groundwater data, EPA may need to consider the effect this may have on potential performance issues at Parcel E-2 and **our current protectiveness determination**" (emphasis added). After review of the *Draft Final Fifth Five-Year Review Report* (i.e., this document), EPA has concluded that the Navy has not agreed to timely analysis of existing Parcel E-2 groundwater data. Accordingly, EPA is changing its position to "Protectiveness Deferred."	a. There have been no changes in the Navy's commitments that have been made to the regulatory agencies since the April 25, 2024 meeting. The work plan for evaluating the upland slurry wall was submitted on July 11, 2024, which addresses one of the four primary issues discussed during the April 25 meeting. The Navy stated in the work plan transmittal letter that to the remaining three issues will be included in a forthcoming task order. As discussed during the July 23, 2024, meeting with FFA Regulatory Agencies, contract scope for the new task order will be discussed during a meeting scheduled for August 29, 2024, and the task order is anticipated to be awarded in January 2025. The Navy has revised the Parcel E-2 Other Findings (Five-Year Review Summary Form and Section 6.6.1.5 of the Five-Year Review) as follows: • *Evaluate the effect of landfill cap and slurry walls on groundwater including flow, leachate attenuation, and potential impact to the San Francisco Bay, anticipated after the approval of the Parcel E-2 Phase IV work plan by the FFA regulatory agencies, anticipated by Spring 2027.* • *Collect confirmation soil samples for lead in the wetland areas following the excavation, anticipated by Summer 2027.* • *Collect confirmation soil samples for PCBs, PAHs, pesticides and metals for the soil stockpile area, anticipated by Summer 2026.* • *Construct remaining components of the remedy including the permanent landfill gas system, freshwater and tidal wetlands, and groundwater monitoring network under the approved Final Work Plan (KEMRON, 2018):* – *Landfill Gas System (Phase IVa) anticipated in ~~11/30/2025~~ 11/30/2026* – *Wetlands (Phase IVb) anticipated in 11/30/2027* • *Modify the landfill gas monitoring program to include a monitoring probe (GMP54) outside of the ~~newly~~ recently expanded ~~installed~~ landfill cover as a new compliance point by revising the appropriate*

No.	Location	EPA Region 9 Comments Dated July 19, 2024	Navy Response
			primary document(s). The primary document(s) needing revision and the proposed schedule for revision will be further discussed with the FFA Regulatory Parties not later than 9/30/2024. • *Document completion of the protective liner and final cover installation in the Phase III Remedial Action Construction Summary Report anticipated by 11/30/2024.* • *Conduct a study to evaluate the performance of the upland slurry wall as documented in the Post-Remedial Action Performance Evaluation Work Plan to evaluate the performance of the Upland Slurry Wall – ~~Final 8/31/2024 Fieldwork is anticipated to be completed in 2024 and the Final Post-Construction Remedial Action Performance Report is anticipated by 12/31/2024.~~ Approval of the Final Workplan is anticipated by 11/15/2024, Fieldwork is anticipated to be completed in April 2025, Draft Report to Navy in October 2025 and the Final Post-Construction Remedial Action Performance Report is anticipated by March 2026.*
		b. EPA has stated that "it is imperative that the Navy immediately begin to evaluate the effect the landfill cap and slurry walls have on groundwater flow and contaminant concentration within the landfill, and potential impact on the San Francisco Bay." The collection and analysis of data should not be deferred pending the completion of the remaining facilities, which do not appear to be particularly integral to landfill closure as it pertains to groundwater (e.g., wetlands, and landfill gas conveyance). As EPA stated, as part of the evaluation, the Navy must produce, at a minimum, plume maps of contaminant concentrations, and groundwater contour maps showing flow direction in the A- and B-aquifers. EPA informally provided the Navy with a copy of "FFA Regulatory Party GWM Information and Analysis Minimum Needs From Navy, Parcel E-2" that will be attached to the forthcoming tri-agency letter referenced in EPA's earlier comments and in discussions.	b. Comment acknowledged. Navy has committed in the Five-Year Review to evaluating the effect of the landfill cap and slurry walls on groundwater by March 2026 (see a.). As discussed during the July 23, 2024 meeting with FFA regulatory agencies, Navy committed to providing the information that was in the spreadsheet and will respond to the tri-agency formal request when received.

No.	Location	EPA Region 9 Comments Dated July 19, 2024	Navy Response
		c. EPA also stated that the FFA parties need a clear and common understanding of the status of Parcel E-2 groundwater and leachate monitoring and extraction wells, French Drain sampling port, FW piezometers, and FW outfalls. EPA informally provided the Navy with a copy of an Excel worksheet with the list of known (to the FFA regulatory parties) wells and the associated information needs that will be attached to the forthcoming tri-agency letter referenced in EPA's earlier comments and in discussions. Directing the FFA regulatory parties to the BGMP (typically over 20,000 pages) is neither helpful nor responsive.	c. Comment acknowledged, Navy reiterates the response to (b)
		d. The lack of appropriate data collection and analysis to evaluate the effect the landfill cap and slurry walls has on groundwater flow and contaminant concentration within the landfill, and potential impact on the San Francisco Bay will delay FFA regulatory party acceptance of a future Remedial Action Completion Report (RACR) and the timely transfer of the property, poses an ongoing threat to human health and the environment, and raises compliance concerns for the regulators.	d. Comment acknowledged.
		e. Regarding methane exceedances, as the FFA regulatory parties have stated on numerous occasions, GMP-07A remains a compliance point until such time that the Navy amends, for FFA regulatory party review and comment, the appropriate primary document(s).	e. Comment acknowledged, as discussed in the response to *EPA Comment 3, Navy's Draft Protectiveness Determinations for Parcels B-2, C, and E-2* the Other Findings section for Parcel E-2 (Five-Year Review Summary Form and Section 6.6.1.5) has already been updated in the FYR as follows: *"Modify the landfill gas monitoring program to include a monitoring probe (GMP54) outside of the recently expanded landfill cover as a new compliance point by revising the appropriate primary document(s). The primary document(s) needing revision and the proposed schedule for revision will be further discussed with the FFA Regulatory Parties not later than 9/30/2024."*
		f. On page xx, EPA does not agree that a memo to the file is an appropriate post-ROD documentation of the change. This topic warrants discussion with the FFA regulatory parties, and its inclusion in this Five-Year Review Report should not be construed as agreement or consensus.	f. This text was updated to the following in the Five-Year Review Summary Form and Section 6.6.1.4: *The Navy intends to prepare post-ROD change documentation ~~in the form of a memo to file~~ to reflect this change.*
		g. EPA comments of 4/30/2024 and 6/4/2024 stand.	g. Comment acknowledged.

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Appendix J
Comments and Responses to City of San Francisco Department of Health Comments on Draft Five-Year Review Report and Climate Resilience Assessment

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City and County of San Francisco
DEPARTMENT OF PUBLIC HEALTH
ENVIRONMENTAL HEALTH

London N. Breed, Mayor
Grant Colfax, MD, Director of Health
Patrick Fosdahl, MS, REHS
Director, Environmental Health

April 12, 2024

Michael Pound
BRAC Environmental Coordinator, Hunters Point Shipyard
Base Realignment and Closure
Program Management Office West
33000 Nixie Way, Bldg 50, Suite 207
San Diego, CA 92147

Subject: **SFDPH Preliminary Comments on the Draft Climate Resilience Assessment, Appendix A of the Draft Fifth Five Year Review Report, Hunters Point Naval Shipyard, San Francisco, California, Dated November 2023**

Dear Michael Pound:

This letter is intended to provide San Francisco Department of Public Health's (SFDPH) preliminary comments on the Draft Climate Resilience Assessment (CRA), included as an appendix to the Draft Fifth Five Year Review (FYR) Report. We intend to submit additional comments on the entire FYR Report by the regulatory review period deadline. The inclusion of the CRA in the FYR Report provides an important "first step" evaluation of the potential impacts of sea level rise (SLR) and groundwater rise (GWR) on the Shipyard and, by extension, the health of Bayview-Hunters Point residents.

We recognize the immediate need and right for the public to be informed through transparent and inclusive communications from the Navy. The potential health impacts of contamination should be explained in plain language that is clear and concise. Accessibility to a more readable document will help community stakeholders better understand each step of the process and allow them to actively participate.

This letter also underscores the critical need for the Navy to begin further site-specific studies of all affected parcels as soon as possible with the goal of developing adequate responses to the threat of climate change. It is extremely important that the long-term protectiveness of all remedies at the Shipyard is maintained by the Navy, to ensure the highest possible standard of health and wellbeing for the Bayview-Hunters Point community.

General Comments:

1. **Parcel D-1 Vulnerability:** The findings of the CRA indicate that Parcel D-1 will be the first area in the Shipyard impacted by groundwater emergence in 2035, if not earlier. The impacts of SLR/GWR on Parcel D-1 have the potential to affect the long-term effectiveness of the selected remedy. Given the potential presence of radiological objects (ROs) within portions of the parcel, it is imperative that the Navy and regulatory agencies select Remedial Alternative R-2A (Excavation, Disposal, Survey, and ICs) as detailed in the February 2023 Focused Feasibility Study.

   Selecting the "full excavation" remedial alternative for Parcel D-1 would serve two primary purposes. Firstly, it aligns with the City's 2001 Proposition P Resolution, which calls on the Navy

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to clean up the Shipyard to the highest technically feasible and practical standards to protect future occupants and the public. Secondly, it provides additional confidence to the City and the public in response to the CRA's finding in Section 6.1 that the current asphalt cover may no longer offer sufficient protection due to permanent groundwater emergence at Parcel D-1, resulting in potential vulnerabilities to human and San Francisco Bay receptors from ROs.

Given the concerns noted above, the Navy should begin a site-specific study of Parcel D-1 as recommended in the CRA as soon as possible.

2. **Public Concerns Regarding Contaminant Mobilization:** Revise the CRA to address scientific and public concerns that soil and groundwater contaminants might migrate under different SLR/GWR scenarios. Section 5.0 (Vulnerability Assessment) partially addresses this issue, but additional clarity and detail are necessary. Specific recommendations are provided below:

    a. Develop new figures in the CRA that show the locations of known contaminants as they relate to SLR/GWR concerns. For example, figures could show the extent of volatile organic compound (VOC) plumes and Areas Requiring Institutional Controls (ARICs). Additional figures could show the extents of parcel-specific remedy components (e.g., durable covers and demarcation layers) as they relate to ubiquitous metals and other residual chemicals of concern (COCs), including petroleum hydrocarbons and potential ROs, that may remain in place in 2035 and 2065. Creating a layered figure showing these elements together would help support community understanding and education.

    b. Include tables for each parcel detailing the residual COCs, radionuclides of concern (ROCs), and ROs that may be present in soil and groundwater and discuss how these contaminants are being assessed as part of the CRA.

    c. Include supporting documentation as an exhibit to the CRA detailing the Navy's process for determining which COCs, ROCs, and ROs may become mobile under each SLR/GWR scenario – specify which contaminants are mobile and which are not. Additionally, identify any residual vadose zone contaminants that could potentially become mobile due to GWR.

    d. Provide the approach (using both monitoring and predictive methods) that the Navy will use to track SLR/GWR and contaminant mobility at the Shipyard. Include the triggers that will prompt action and remedy reassessment, if needed.

3. **Community Understanding:** The technical terms and figures used within the CRA can be difficult for members of the public to understand. Revising the text to remove these unnecessary terms will enhance comprehension and by extension confidence in the public that the Navy is taking the potential effects of SLR/GWR seriously. Inclusion of standalone figures that align with the style of the rest of the FYR will assist with better visualizing the potential impacts and vulnerabilities identified within the CRA. Specific recommendations are provided below:

    a. The existing figures are too technical and would be better served as an exhibit to the CRA. The titles of new figures should be simple and understandable (e.g., "Permanent Flooding Risk due to 1-foot of Sea Level Rise"). The Port of San Francisco has developed figures that depict vulnerability zones and areas of combined SLR/GWR risk as part of their Waterfront

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Flood Study in collaboration with the U.S. Army Corps of Engineers (see here). The Port's figures are formatted and presented in such a way that enables better community understanding.

b. Provide a new figure showing the extent of the Installation Restoration (IR) sites within the Shipyard. The CRA refers to the IR sites within each parcel when discussing potential vulnerabilities and future site-specific studies; however, they are not depicted in any figure for context.

c. Provide new figures showing geologic cross-sections of the different SLR/GWR scenarios discussed within the CRA (e.g., groundwater emergence, groundwater within 3 feet of ground surface, etc.) to assist in conceptually visualizing potential concerns. Similar examples are provided in the Port's Flood Study.

d. Revise Figure 3-3 to show monitoring wells that were included in the analysis but did not show groundwater level rise to within 3 feet of the ground surface. This will assist with understanding that all areas of the Shipyard were reviewed for GWR. In future site-specific studies, models should be generated to show the anticipated extent of near surface GWR.

e. Provide new figures illustrating the combined risk for shoreline inundation and groundwater emergence for both 2035 and 2065. These risk areas are already shown in the existing figures; combining this information will assist members of the public in visualizing the overall risk to the Shipyard from SLR/GWR. Similar examples are provided in the Port's Flood Study.

4. **Transferred Parcels:** The CRA does not include Parcels D-2, UC-1, and UC-2 in its evaluation of the potential impacts and vulnerabilities associated with SLR/GWR. Revise the CRA to include these parcels and provide relevant discussion of the effectiveness of the existing remedies at these parcels.

5. **Improving Analysis Transparency:** Revise the CRA to incorporate additional supporting information related to the analyses conducted, including the following items (at a minimum):

   a. Identification and qualifications of all involved organizations, academics, and consultants.

   b. All groundwater elevation data and base topographic files/maps.

   c. The current statistical trend graph depicting groundwater levels used to assess SLR/GWR at the Shipyard. Is there evidence indicating that GWR is presently occurring?

Specific Comments:

1. **Section 2.0, Impacts of Seawater Inundation:** Develop a new sub-section that identifies which parcels include existing remedy components that consider SLR (such as those associated with shoreline protection). Discuss the protectiveness of the remedy components considering the CRA findings and any additional site-specific studies needed to assess protectiveness.

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2. **Section 2.1, SLR Projections:** The CRA assumes 1.0 feet and 3.2 feet of SLR by 2035 and 2065, respectively, based projections provided by the Department of Defense's (DoD's) Regional Sea Level (DRSL) database.[1] The CRA does not include projected SLR for 2100, even though that assessment is included in both DTSC's Draft SLR Guidance document and the Port's Flood Study. We strongly urge the Navy to consider including the 2100 SLR projection, given that the project's useful life will be greater than 80 years. Additionally, the text of this sub-section should be revised to describe how the DRSL database uses regional data to inform on SLR projections.

3. **Section 2.1, SLR Projections:** Revise this sub-section to state that SLR projections used in future site-specific studies will be in agreement with FFA regulatory parties. The Navy's SLR projections should be consistent with those estimates being used along adjacent areas of the San Francisco Bay shoreline (e.g., the Port's Flood Study) to ensure consistency in vulnerability assessments and proposed protections.

4. **Section 3.0, SLR Impacts on Shallow Groundwater:** Develop a new sub-section to identify parcels with remedy components that already consider GWR, such as those associated with shoreline protection. Discuss the Navy's considerations regarding potential GWR-related vulnerabilities, including (1) geotechnical stability of the shoreline and shoreline structures and (2) hydrostatic uplift for buildings not slated for demolition. Indicate whether previous geotechnical assessments for these elements remain protective.

5. **Section 5.0, Vulnerability Assessment:** Develop new sub-sections that address ROC and RO vulnerabilities. The FYR's Conclusion section states (in part) that the CRA identified vulnerabilities to human receptors and San Francisco Bay receptors from low-level radiological objects, but the basis for that conclusion is not adequately described within the CRA.

6. **Section 5.0, Vulnerability Assessment**: Develop a new sub-section to identify existing groundwater plumes and discuss whether migration is anticipated to be a concern under different SLR/GWR scenarios. If some plume movement is anticipated, how much movement is acceptable before additional remedial actions are necessary? Are the anticipated movements limited to within the present-day boundaries of the Shipyard? Discuss how this relates to remediation timelines and residual COC concentrations anticipated to remain in place following remedy completion. Can these concerns be monitored by the existing Basewide Groundwater Monitoring Program (BGMP)? Include that these concerns will be assessed within the site-specific studies.

7. **Section 5.3.1, Potential New Exposure to CVOCs from Vapor Intrusion due to Groundwater Table Rise to 3 feet bgs:** The CRA indicates that chlorinated volatile organic compounds (CVOCs) in groundwater are projected to attenuate below remedial goals (RGs) by 2035; however, neither the CRA nor the FYR Report include timelines to support this assumption. Revise this sub-section to address this uncertainty and describe how this assumption will be tracked in future FYR Reports and site-specific studies recommended in the CRA.

8. **Section 5.3.1, Potential New Exposure to CVOCs from Vapor Intrusion due to Groundwater Table Rise to 3 feet bgs:** Revise this sub-section to include that future site-specific studies will discuss whether GWR within 3 feet of ground surface is anticipated to impact Areas Requiring

[1] https://drsl.serdp-estcp.org/sealevelrise/1440/feet

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Institutional Controls (ARICs) for vapor intrusion or preferential pathways post-transfer within each parcel, based on assumed remedial completion timelines.

9. **Section 5.3.5, Potential New Exposure of Bay Ecological Receptors to Heavy Metals, PCBs and PAHs from Erosion due to Storm Surges:** Revise this sub-section to discuss how the Navy will assess the condition of the durable covers following the occurrence of storm surges and waves. How will the Navy ensure that erosion is not occurring and that it is not impacting the San Francisco Bay or adjoining properties?

10. **Section 5.3.6, Parcel E-2 Remedy Resiliency:** Revise this section to discuss the potential influence of the Upland Slurry Wall on GWR in Parcel E-2. Community concerns have been expressed that conventional defensive structures, such as sea walls, may exacerbate flooding risks by creating a physical barrier that prevents risen groundwater from flowing out. If a potential vulnerability is identified, Section 6.0 should be updated to include a site-specific study of Parcel E-2. This study should assess potential impacts to off-site adjoining properties.

11. **Section 6.0, Conclusions and Recommendations:** The CRA should include specific, actionable, and measurable recommendations for the site-specific studies at the Shipyard. Detailed suggestions for these recommendations are provided below:

    a. Include a timeline for completing site-specific studies for each parcel. These studies must be prioritized as soon as possible, and, at minimum, the studies of each Parcel should be completed prior to the next FYR (anticipated in 2028). Parcel D-1 is anticipated to be vulnerable by 2035, if not earlier, which makes this study particularly pressing (refer to General Comment 1).

    b. Studies should be completed, at minimum, on a parcel-by-parcel basis if not a site-wide basis to accommodate for groundwater/contaminant interactions across parcels. The currently proposed IR approach neglects the presence of ubiquitous metals across the Shipyard and the possibility that VOC-impacts in soil vapor may not be confined to a specific IR site.

    c. Specify the minimum scope of the site-specific studies. Each study must include modeling of SLR/GWR; groundwater flow and emergence; overland flow and storm surge (i.e., flooding); and contaminant impacts/mobilization. The modeling must consider site-specific hydrogeology and geology at partially in-filled shoreline and upland areas, and specific remedy components (i.e., at slurry walls). Each study should include an assessment of contamination remaining in-place under durable covers and the impacts such climate vulnerabilities may have on the mobilization of contaminants. Site-specific study results should include an updated conceptual site model for each parcel.

    d. Include an assessment of contaminants that are not under CERCLA, including petroleum hydrocarbons and PFAS.

    e. Adequately address the question of long-term protectiveness of each parcel's current remedy and propose additional actions if the study's conclusion finds that long-term protectiveness may be lessened by SLR/GWR. Include an assessment of long-term

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protectiveness of ARICs for vapor intrusion concerns. Address how on-going monitoring at the Shipyard will complement the proposed actions.

f. Include a discussion of the CERCLA process and how much time will be needed to adjust a parcel's remedy if the site-specific study finds that the given remedy is no longer protective.

12. **Section 6.0, Conclusions and Recommendations:** The CRA states that changes in the five tidal gauge measurements nearest to the Shipyard (Alameda, Richmond, Redwood, Port Chicago, and San Francisco) and groundwater elevations at the Shipyard will be tracked to assess the impact of the projected vulnerabilities over time. At what gauge measurement or groundwater elevation measurement will the monitoring trigger action at the Shipyard parcels? Which criteria will be used to determine when a change in remedial implementation or action is needed?

Minor Comments:

1. **Consistency/Typos:** Please correct the following consistency and/or typos:

   a. Section 2.3, Storm Surges, Bullet 1: Remove the reference to Parcel F.

   b. Table 5-2: Please revise Table 5-2 to state that Parcel E-2 will be impacted by a 100-year storm to match the text and Table 2-3.

2. Figure 1-1: Define what "Adaptive Capacity" means.

Sincerely,

DocuSigned by:
3BD2BDDC0E36492...
Ryan Casey, P.E.
Engineer

Cc: Danielle Janda, Navy
Erica Schmandt, Navy
Jamie Egan, Jacobs
Andrew Bain, USEPA
Michael Howley, DTSC
Mary Snow, RWQCB
Susan Philip, DPH
Thor Kaslofsky, OCII
Lila Hussain, OCII
Christina Rain, Langan
Randy Brandt, Geosyntec Consultants

Response to Comments	Contract/CTO N62470-21-D-0007; Contract Task Order No. N6247322F4930	Responses By Navy
Comment By Ryan Casey, P.E. Engineer	Code/Organization San Francisco Department of Public Health (SFDPH) Environmental Health	Date April 2024

Project Title and Location		Type of Review
Draft Climate Resilience Assessment, Appendix A of the Draft Fifth Five-Year Review Report, Hunters Point Naval Shipyard, San Francisco, California, November 2023	X	Draft
		Final
		Other

No.	Location	SFDPH Preliminary Comments dated April 12, 2024	Navy Response
		General Comments	
1	General	**Parcel D-1 Vulnerability:** The findings of the CRA indicate that Parcel D-1 will be the first area in the Shipyard impacted by groundwater emergence in 2035, if not earlier. The impacts of SLR/GWR on Parcel D-1 have the potential to affect the long-term effectiveness of the selected remedy. Given the potential presence of radiological objects (ROs) within portions of the parcel, it is imperative that the Navy and regulatory agencies select Remedial Alternative R-2A (Excavation, Disposal, Survey, and ICs) as detailed in the February 2023 Focused Feasibility Study. Selecting the "full excavation" remedial alternative for Parcel D-1 would serve two primary purposes. Firstly, it aligns with the City's 2001 Proposition P Resolution, which calls on the Navy to clean up the Shipyard to the highest technically feasible and practical standards to protect future occupants and the public. Secondly, it provides additional confidence to the City and the public in response to the CRA's finding in Section 6.1 that the current asphalt cover may no longer offer sufficient protection due to permanent groundwater emergence at Parcel D-1, resulting in potential vulnerabilities to human and San Francisco Bay receptors from ROs. Given the concerns noted above, the Navy should begin a site-specific study of Parcel D-1 as recommended in the CRA as soon as possible.	The groundwater emergence maps in the CRA use a conservative rule of thumb (1:1) to identify potential areas of emergence. These maps provide an initial foundation for further research and modeling efforts to validate and refine the projections, and are being further validated through visits to areas of projected impact, observation of the ground topography, consolidation of monitoring well construction details, etc. Following this validation of projections, site-specific studies at Parcel D-1 and/or other parcels will be considered and discussed with the agencies. The recommendation in the CRA is to follow the identification of vulnerabilities in the CRA with site-specific studies to further validate them, conduct human-health and ecological risk assessments to determine whether the protectiveness statements in the five-year review will be impacted, and then assess remedial measures to address any human health or ecological risk.

No.	Location	SFDPH Preliminary Comments dated April 12, 2024	Navy Response
		General Comments	
2	General	**Public Concerns Regarding Contaminant Mobilization:** Revise the CRA to address scientific and public concerns that soil and groundwater contaminants might migrate under different SLR/GWR scenarios. Section 5.0 (Vulnerability Assessment) partially addresses this issue, but additional clarity and detail are necessary. Specific recommendations are provided below: a. Develop new figures in the CRA that show the locations of known contaminants as they relate to SLR/GWR concerns. For example, figures could show the extent of volatile organic compound (VOC) plumes and Areas Requiring Institutional Controls (ARICs). Additional figures could show the extents of parcel-specific remedy components (e.g., durable covers and demarcation layers) as they relate to ubiquitous metals and other residual chemicals of concern (COCs), including petroleum hydrocarbons and potential ROs, that may remain in place in 2035 and 2065. Creating a layered figure showing these elements together would help support community understanding and education. b. Include tables for each parcel detailing the residual COCs, radionuclides of concern (ROCs), and ROs that may be present in soil and groundwater and discuss how these contaminants are being assessed as part of the CRA. c. Include supporting documentation as an exhibit to the CRA detailing the Navy's process for determining which COCs, ROCs, and ROs may become mobile under each SLR/GWR scenario – specify which contaminants are mobile and which are not. Additionally, identify any residual vadose zone contaminants that could potentially become mobile due to GWR. d. Provide the approach (using both monitoring and predictive methods) that the Navy will use to track SLR/GWR and contaminant mobility at the Shipyard. Include the triggers that will prompt action and remedy reassessment, if needed.	The CRA is a screening level assessment. Items (a) through (d) will be considered during site-specific studies to further assess the vulnerabilities identified in the CRA and plans for these studies will be discussed with the agencies. The CRA already provides the basis for focusing on heavy metals in 2035 and 2065. Heavy metals are likely to persist at current (or post-remedy) levels in 2035 and 2065 and are potentially soluble in seawater and groundwater. Therefore, their potential to be mobilized through dissolution is identified as a vulnerability. Residual CVOCs (after ongoing or planned source treatment and removal) are not expected to persist through 2065 and their attenuation will be monitored through the ongoing monitoring program. PAHs and PCBs are relatively insoluble and their mobilization potential is only through erosion of soil. As HPNS has ubiquitous land covers (asphalt or vegetated soil), erosion of soil containing residual PAHs and PCBs is not identified as a vulnerability.
3	General	**Community Understanding:** The technical terms and figures used within the CRA can be difficult for members of the public to understand. Revising	For the benefit of the community, the Navy has tried to keep technical terms to a minimum in the CRA, especially in introductory and

No.	Location	SFDPH Preliminary Comments dated April 12, 2024	Navy Response
		General Comments	
		the text to remove these unnecessary terms will enhance comprehension and by extension confidence in the public that the Navy is taking the potential effects of SLR/GWR seriously. Inclusion of standalone figures that align with the style of the rest of the FYR will assist with better visualizing the potential impacts and vulnerabilities identified within the CRA. Specific recommendations are provided below: a. The existing figures are too technical and would be better served as an exhibit to the CRA. The titles of new figures should be simple and understandable (e.g., "Permanent Flooding Risk due to 1-foot of Sea Level Rise"). The Port of San Francisco has developed figures that depict vulnerability zones and areas of combined SLR/GWR risk as part of their Waterfront Flood Study in collaboration with the U.S. Army Corps of Engineers (see here). The Port's figures are formatted and presented in such a way that enables better community understanding. b. Provide a new figure showing the extent of the Installation Restoration (IR) sites within the Shipyard. The CRA refers to the IR sites within each parcel when discussing potential vulnerabilities and future site-specific studies; however, they are not depicted in any figure for context. c. Provide new figures showing geologic cross-sections of the different SLR/GWR scenarios discussed within the CRA (e.g., groundwater emergence, groundwater within 3 feet of ground surface, etc.) to assist in conceptually visualizing potential concerns. Similar examples are provided in the Port's Flood Study. d. Revise Figure 3-3 to show monitoring wells that were included in the analysis but did not show groundwater level rise to within 3 feet of the ground surface. This will assist with understanding that all areas of the Shipyard were reviewed for GWR. In future site-specific studies, models should be generated to show the anticipated extent of near surface GWR. e. Provide new figures illustrating the combined risk for shoreline inundation and groundwater emergence for both 2035 and 2065. These risk areas are already shown in the existing figures; combining this information will assist members of the public in visualizing the overall risk	concluding paragraphs in each section, while still providing enough technical detail to scientists among the stakeholders who are likely to read the CRA and evaluate its methodology. As the Navy progresses to site-specific studies, consideration will be given to Items (a) through (e), as the Navy continues to look for ways to make the CRA more relatable to the community.

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		to the Shipyard from SLR/GWR. Similar examples are provided in the Port's Flood Study.	
4	General	**Transferred Parcels:** The CRA does not include Parcels D-2, UC-1, and UC-2 in its evaluation of the potential impacts and vulnerabilities associated with SLR/GWR. Revise the CRA to include these parcels and provide relevant discussion of the effectiveness of the existing remedies at these parcels.	Parcels D-2, UC-1, and UC-2 are parcels that are much further upland and upgradient and maps in the CRA showing permanent seawater inundation and groundwater rise in 2035 and 2065 do not show these parcels as impacted. Parcels UC-1 and UC-2 show some areas of impact due to storm surge and this impact will be noted in the CRA.
5	General	**Improving Analysis Transparency:** Revise the CRA to incorporate additional supporting information related to the analyses conducted, including the following items (at a minimum): a. Identification and qualifications of all involved organizations, academics, and consultants. b. All groundwater elevation data and base topographic files/maps. c. The current statistical trend graph depicting groundwater levels used to assess SLR/GWR at the Shipyard. Is there evidence indicating that GWR is presently occurring?	a. The CRA was prepared in-house by the Navy's Engineering and Expeditionary Warfare Center (EXWC) Environmental Restoration Division in Port Hueneme, CA. The names and affiliations of all Navy and non-Navy peer reviewers will be provided in the Acknowledgments page. b. Topographic and monitoring well construction data are being validated and this process will continue through 2024. During the planning for site-specific studies, the reporting requirements for groundwater elevation and topographic data will be discussed. c. A preliminary statistical trend analysis did not show any evidence that groundwater rise was currently occurring. After data validation is complete, a more rigorous trend analysis will be presented as part of site-specific studies

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1	Section 2.0	**Impacts of Seawater Inundation:** Develop a new sub-section that identifies which parcels include existing remedy components that consider SLR (such as those associated with shoreline protection). Discuss the protectiveness of the remedy components considering the CRA findings and any additional site-specific studies needed to assess protectiveness.	The CRA is a screening level assessment to identify potential vulnerabilities that can be further assessed in site-specific studies at HPNS. These site-specific studies and prioritization of parcels will be discussed with the agencies. Protectiveness statements in a Five-Year Review are only affected when the exposure pathway has the potential to be complete (groundwater is likely to emerge and land use is such that receptors could be exposed) and a future unacceptable health or risk has been identified (data collected, validated, and evaluated following CERCLA risk assessment processes resulting in unacceptable risk to receptors).
2	Section 2.1	**SLR Projections:** The CRA assumes 1.0 feet and 3.2 feet of SLR by 2035 and 2065, respectively, based projections provided by the Department of Defense's (DoD's) Regional Sea Level (DRSL) database.[1] The CRA does not include projected SLR for 2100, even though that assessment is included in both DTSC's Draft SLR Guidance document and the Port's Flood Study. We strongly urge the Navy to consider including the 2100 SLR projection, given that the project's useful life will be greater than 80 years. Additionally, the text of this sub-section should be revised to describe how the DRSL database uses regional data to inform on SLR projections. [1] https://drsl.serdp-estcp.org/sealevelrise/1440/feet	The Navy will assess Year 2100 projections in conjunction with site-specific studies. More information on how global sea level rise projections were regionalized by DoD is provided in: Sweet, William (William Vanderveer); Obeysekera, Jayantha; Marburger, John H. (John Harmen); Knuuti, Kevin; Gill, Stephen; Hall, John S. Regional Sea Level Scenarios for Coastal Risk Management: Managing the Uncertainty of Future Sea Level Change and Extreme Water Levels for Department of Defense Coastal Sites Worldwide. HSDL - Regional Sea Level Scenarios for Coastal Risk Management: Managing the Uncertainty of Future Sea Level Change and Extreme Water Levels for Department of Defense Coastal Sites Worldwide This study is referenced in the HPNS CRA as the Hall 2016 report.

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3	Section 2.1	**SLR Projections:** Revise this sub-section to state that SLR projections used in future site-specific studies will be in agreement with FFA regulatory parties. The Navy's SLR projections should be consistent with those estimates being used along adjacent areas of the San Francisco Bay shoreline (e.g., the Port's Flood Study) to ensure consistency in vulnerability assessments and proposed protections.	The Navy uses the best available science and DOD/DON policy when determining SLR projections. The CRA uses SLR projections made in the DoD Regional Sea Level (DRSL) data base (Highest and Lowest greenhouse gas emissions scenarios). The Highest scenario is conservative and consistent with projections made by OPC (2018) for similar time steps, especially when accounting for the slight offset in timesteps (1 ft of SLR in Navy's DRSL for 2035 versus 0.8-1.3 ft in OPC for 2030-2040; 3.2 ft of SLR in Navy's DRSL for 2065 versus 2.6-3.5 ft in OPC 2060-2070). Since then, OPC has lowered its projections for these years, so that makes the DRSL projections even more conservative. OPC (2024) is now projecting 0.4-0.7 ft of SLR in 2030-2040 and 1.4-2.2 ft in 2060-2070, this making the Navy's projections even more conservative. The Navy's highest projection of 3.2 ft SLR by 2035 is also close to DTSC's climate resilience guidance of 3.5 ft SLR by 2050.
4	Section 3.0	**SLR Impacts on Shallow Groundwater:** Develop a new sub-section to identify parcels with remedy components that already consider GWR, such as those associated with shoreline protection. Discuss the Navy's considerations regarding potential GWR-related vulnerabilities, including (1) geotechnical stability of the shoreline and shoreline structures and (2) hydrostatic uplift for buildings not slated for demolition. Indicate whether previous geotechnical assessments for these elements remain protective.	The CRA provided in the Fifth Five-Year Review (Appendix A) is a first of its kind study in DoD with a screening level assessment of climate change hazards. The focus of this CRA is on assessment of the fate and transport of residual CoCs or protectiveness of remedies and any additional studies related to these issues will be discussed with the agencies as part of the planned site-specific studies.

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5	Section 5.0	**Vulnerability Assessment:** Develop new sub-sections that address ROC and RO vulnerabilities. The FYR's Conclusion section states (in part) that the CRA identified vulnerabilities to human receptors and San Francisco Bay receptors from low-level radiological objects, but the basis for that conclusion is not adequately described within the CRA.	Impacts of climate hazards on radiological objects was not part of the CRA. This aspect will be covered during site-specific studies, after the ongoing radiological studies and investigations are completed. Also, the radiological compounds involved are not very mobile in the environment because they are not very soluble in water. It appears that radium or strontium as a sulfate salt was likely the form used in the luminescent mixture in the dials and neither is very soluble. See: https://orau.org/health-physics-museum/collection/radioluminescent/index.html#:~:text=The%20radium%20was%20usually%20in,ZnS%20crystals%20under%20a%20microscope. for more information. Radium sulfate is considered to be insoluble in water. See: https://www.chemicalbook.com/ChemicalProductProperty_EN_CB01424924.htm#:~:text=Radium%20sulfate%20is%20insoluble%20in,the%20most%20insoluble%20sulfate%20known. As such, its migration into the groundwater would be very limited. Strontium sulfate too has very limited solubility in water.
6	Section 5.0	**Vulnerability Assessment:** Develop a new sub-section to identify existing groundwater plumes and discuss whether migration is anticipated to be a concern under different SLR/GWR scenarios. If some plume movement is anticipated, how much movement is acceptable before additional remedial actions are necessary? Are the anticipated movements limited to within the present-day boundaries of the Shipyard? Discuss how this relates to remediation timelines and residual COC concentrations anticipated to remain in place following remedy completion. Can these concerns be monitored by the existing Basewide Groundwater Monitoring Program (BGMP)? Include that these concerns will be assessed within the site-specific studies.	Assessing the hydrogeology at HPNS will be discussed with the agencies during the planning of the site-specific studies. The Navy's (Draft), *A Framework for Assessing Climate Resilience at the Navy's Environmental Restoration Sites*, March 28, 2024, suggests groundwater modeling and strategic monitoring as two possible approaches for further assessment of climate hazards and their impacts on site CoCs.

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7	Section 5.3.1	**Potential New Exposure to CVOCs from Vapor Intrusion due to Groundwater Table Rise to 3 feet bgs:** The CRA indicates that chlorinated volatile organic compounds (CVOCs) in groundwater are projected to attenuate below remedial goals (RGs) by 2035; however, neither the CRA nor the FYR Report include timelines to support this assumption. Revise this sub-section to address this uncertainty and describe how this assumption will be tracked in future FYR Reports and site-specific studies recommended in the CRA.	The CRA states that residual CVOCs (after ongoing or planned source treatment and removal) may persist until 2035, but are not expected to persist through 2065 and their attenuation will be monitored through the ongoing monitoring program. A 100 ppb chlorinated VOCs source should dissipate by approximately 99% over 41 years based on first-order decay and median point decay rates observed at chlorinated solvent natural attenuation sites (Newell et al., 2006). Newell, C. J., Cowie, I., McGuire, T. M., & McNab, W. W. (2006). Multiyear Temporal Changes in Chlorinated Solvent Concentrations at 23 Monitored Natural Attenuation Sites. Journal of Environmental Engineering, 132(6), 653–663. https://doi.org/10.1061/(asce)0733-9372(2006)132:6(653)
8	Section 5.3.1	**Potential New Exposure to CVOCs from Vapor Intrusion due to Groundwater Table Rise to 3 feet bgs:** Revise this sub-section to include that future site-specific studies will discuss whether GWR within 3 feet of ground surface is anticipated to impact Areas Requiring Institutional Controls (ARICs) for vapor intrusion or preferential pathways post-transfer within each parcel, based on assumed remedial completion timelines.	The CRA states that sewer lines near existing buildings have been removed. Text stating that vapor intrusion will be considered in applicable parcel-specific studies has been added.
9	Section 5.3.5	**Potential New Exposure of Bay Ecological Receptors to Heavy Metals, PCBs and PAHs from Erosion due to Storm Surges:** Revise this sub-section to discuss how the Navy will assess the condition of the durable covers following the occurrence of storm surges and waves. How will the Navy ensure that erosion is not occurring and that it is not impacting the San Francisco Bay or adjoining properties?	The CRA is a screening level assessment which will be used to identify where further assessment is needed and when. Impacts from storm surges will be addressed in accordance with the long-term monitoring (LTM) plan for each IR site or parcel. Storm events of a certain magnitude trigger an ad hoc inspection with repairs. Under the Emergency Response Plans included in the O&M manuals for Parcels B-1 (Engineering/Remediation Resources Group, Inc. 2016), B-2 (INNOVEX-ERRG Joint Venture 2018), C (Tetra Tech EC, Inc. and Engineering/Remediation Resources Group, Inc. 2017), D-1, (APTIM 2018; 2019), E-2 (ERRG, 2014b) and G (Arcadis U.S., Inc. 2014) and IR-07/18 (ERRG, 2012), the following emergency response

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			procedure is identified in the event of flooding [caused by intense storm events, high sea level, or wave action]: 1. Immediately conduct visual inspection of area to assess damage and potential impact. 2. In the event of safety hazard, immediately cordon off the affected area. 3. In the event of slope failure, contact contracted geotechnical consultant, as appropriate, to participate in an evaluation of problem area with 48 hours. If necessary, conduct a geotechnical investigation of the failure in order to develop a corrective action plan. 4. For damage or potential damage to components that affect site integrity, security, or safety, arrange repair or restoration within 2 weeks (weather and conditions permitting) to design conditions and in accordance with construction specifications. 5. Investigate preventive measures. 6. Notify Water Board, CalRecycle [for IR-07/18 and Parcel E-2], ROICC, DTSC, EPA, and CDPH. References: APTIM, 2018, Final Post-Construction Operation and Maintenance Plan, Remedial Action in Parcel D-1, Hunters Point Naval Shipyard, San Francisco, California, March. APTIM, 2019, Final Addendum 01, Post-Construction Operation and Maintenance Plan, Remedial Action in Parcel D-1, Hunters Point Naval Shipyard, San Francisco, California, July. Arcadis U.S., Inc., 2014, Final Operation and Maintenance Plan for Parcel G, Hunters Point Naval Shipyard, San Francisco, California, May 23 Engineering/Remediation Resources Group, Inc. (ERRG). 2012, Final Operation and Maintenance Plan for Installation Restoration Sites 07

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			and 18 in Parcel B, Hunters Point Naval Shipyard, San Francisco, California, October. ERRG. 2014b. Preconstruction Operation and Maintenance Plan for Parcel E-2 Hunters Point Naval Shipyard San Francisco, California. August 2014. ERRG. 2016, Final Operation and Maintenance Plan for Parcel B-1, Hunters Point Naval Shipyard, San Francisco, California, June. Gilbane Federal, 2018, Final Operation and Maintenance Plan, Remedial Action, Parcel UC-3, Hunters Point Naval Shipyard, San Francisco, CA, July. INNOVEX-ERRG Joint Venture, 2018, Final Operation and Maintenance Plan for Parcel B-2, Hunters Point Naval Shipyard, San Francisco, California, July. Tetra Tech EC, Inc. and Engineering/Remediation Resources Group, Inc., 2017, Final Operation and Maintenance Plan for the Durable Covers in Parcel C, Hunters Point Naval Shipyard, San Francisco, California, February
10	Section 5.3.6	**Parcel E-2 Remedy Resiliency:** Revise this section to discuss the potential influence of the Upland Slurry Wall on GWR in Parcel E-2. Community concerns have been expressed that conventional defensive structures, such as sea walls, may exacerbate flooding risks by creating a physical barrier that prevents risen groundwater from flowing out. If a potential vulnerability is identified, Section 6.0 should be updated to include a site-specific study of Parcel E-2. This study should assess potential impacts to off-site adjoining properties.	The CRA (Appendix A) is a screening assessment and does identify a vulnerability in Parcel E-2. The Navy is aware of the community's concerns from the public comments received. Further studies in this parcel will be discussed with the agencies as part of the site-specific studies planned.
11	Section 6.0	**Conclusions and Recommendations:** The CRA should include specific, actionable, and measurable recommendations for the site-specific studies at the Shipyard. Detailed suggestions for these recommendations are provided below: a. Include a timeline for completing site-specific studies for each parcel. These studies must be prioritized as soon as possible, and, at minimum,	The Navy will consider the suggestions in Items (a) through (f) during the planning of the site-specific studies with the agencies. The Navy continues to validate the maps and projections in the CRA through ground visits and observations, consolidation of monitoring well construction details, and evaluation of parcel-specific information.

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		the studies of each Parcel should be completed prior to the next FYR (anticipated in 2028). Parcel D-1 is anticipated to be vulnerable by 2035, if not earlier, which makes this study particularly pressing (refer to General Comment 1). b. Studies should be completed, at minimum, on a parcel-by-parcel basis if not a site-wide basis to accommodate for groundwater/contaminant interactions across parcels. The currently proposed IR approach neglects the presence of ubiquitous metals across the Shipyard and the possibility that VOC-impacts in soil vapor may not be confined to a specific IR site. c. Specify the minimum scope of the site-specific studies. Each study must include modeling of SLR/GWR; groundwater flow and emergence; overland flow and storm surge (i.e., flooding); and contaminant impacts/mobilization. The modeling must consider site-specific hydrogeology and geology at partially in-filled shoreline and upland areas, and specific remedy components (i.e., at slurry walls). Each study should include an assessment of contamination remaining in-place under durable covers and the impacts such climate vulnerabilities may have on the mobilization of contaminants. Site-specific study results should include an updated conceptual site model for each parcel. d. Include an assessment of contaminants that are not under CERCLA, including petroleum hydrocarbons and PFAS. e. Adequately address the question of long-term protectiveness of each parcel's current remedy and propose additional actions if the study's conclusion finds that long-term protectiveness may be lessened by SLR/GWR. Include an assessment of long-term protectiveness of ARICs for vapor intrusion concerns. Address how on-going monitoring at the Shipyard will complement the proposed actions. f. Include a discussion of the CERCLA process and how much time will be needed to adjust a parcel's remedy if the site-specific study finds that the given remedy is no longer protective.	

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12	Section 6.0	**Conclusions and Recommendations:** The CRA states that changes in the five tidal gauge measurements nearest to the Shipyard (Alameda, Richmond, Redwood, Port Chicago, and San Francisco) and groundwater elevations at the Shipyard will be tracked to assess the impact of the projected vulnerabilities over time. At what gauge measurement or groundwater elevation measurement will the monitoring trigger action at the Shipyard parcels? Which criteria will be used to determine when a change in remedial implementation or action is needed?	The Navy will track sea levels in the nearest five tidal gauges primarily to validate the SLR projections used in the CRA. Currently, all five gauges are tracking well below SLR projections, below the Highest and the Lowest projections in the DRSL range. California Ocean Protection Council (OPC) too has noted that and, in their most recent SLR (2024) guidance, have lowered their projections for 2050, 2060, and 2070, in some cases, by almost 1 foot. During site specific studies, the Navy will discuss the need for any further studies and any changes to remedies. Any changes to remedies will be considered if a site-specific risk assessment shows unacceptable risk to human health or environment.
Minor Comments			
1	Consistency/ Typos	Please correct the following consistency and/or typos: a. Section 2.3, Storm Surges, Bullet 1: Remove the reference to Parcel F. b. Table 5-2: Please revise Table 5-2 to state that Parcel E-2 will be impacted by a 100-year storm to match the text and Table 2-3.	The CRA (Appendix A) text and tables will be revised as suggested for consistency. a. Reference to Parcel F will be removed. b. Parcel E-2 will be identified as impacted in the text and tables.
2	Figure 1-1	Define what “Adaptive Capacity” means.	Adaptive capacity will be defined in the CRA as the ability of current natural and built infrastructure in its current form to withstand the impacts of a climate hazard, without creating any new exposure pathway.

City and County of San Francisco
DEPARTMENT OF PUBLIC HEALTH
ENVIRONMENTAL HEALTH

London N. Breed, Mayor
Grant Colfax, MD, Director of Health
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May 14, 2024

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San Diego, CA 92147

Subject: SFDPH Comments on the Draft Fifth Five-Year Review Report, Hunters Point Naval Shipyard, San Francisco, California, Dated November 2023

Dear Michael Pound:

The San Francisco Department of Public Health (SFDPH) appreciates the opportunity to review the U.S. Navy's (Navy) Draft Fifth Five Year Review (FYR) Report, as part of our ongoing commitment to support the health and wellbeing of the Bayview-Hunters Point community. The comments presented below are in addition to our letter dated April 12, 2024, and represent the collective perspectives of SFDPH's environmental health and civil engineering experts.

General Comments:

1. **Community Communications:** The Navy's communication with the public is often too technical, particularly when presenting to larger audiences. Speakers should use plain language and support their presentations with clear visual aids to enhance understanding for general audiences. Additionally, the Navy should promptly respond to public requests for information. Improving communication practices will help the Navy build a stronger relationship with the public.

2. **Parcel D-1 Vulnerability**: As stated in our April 12th comment letter, it is imperative that the Federal Facility Agreement (FFA) parties select Remedial Alternative R-2A (Excavation, Disposal, Survey, and Institutional Controls [ICs]) for Parcel D-1. Selecting the "full excavation" remedial alternative will ensure that radiological objects (ROs) are not mobilized in the future due to potential impacts from sea level rise (SLR) and groundwater rise (GWR) at the Shipyard. Specific recommendations to revise the FYR Report are provided below:

    a. Delete the last sentence in the second paragraph of the "Radiological Surveys and Remediation" sub-section (i.e., "The Focused FS to evaluate additional remedies…"). This sentence incorrectly implies that the remedy for Parcel D-1 has already been determined. The Proposed Plan, which has not yet been drafted, will recommend the Navy's preferred remedial alternative.

    b. The responses to "Question B" (sub-section 5.5.2) should be revised to acknowledge the newly identified potential route of exposure of ROs in fill material due to SLR/GWR.

HUNTERS POINT SHIPYARD PROGRAM
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Michael Pound
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3. **Maintenance & Repair of Durable Covers:** The sinkholes and subsided areas in Parcels B-1, C, and D-1 impact the short- and long-term protectiveness of the durable cover remedy. The Navy should explain the cause of the subsidence and outline its long-term plan for preventative maintenance and repair. Specific recommendations to revise sections 3.0, 4.0, and 5.0 of the FYR Report are provided below:

    a. The response to "Question A" should be adjusted given that the asphalt covers need repair in places, as described in each parcel's "Remedy Operations and Maintenance" sub-sections.

    b. Revise the "Durable Cover Maintenance" sub-sections to provide (1) more details regarding the maintenance performed to-date in the sinkhole and subsided areas of the asphalt cover and (2) a proposed timeline to implement preventative repairs. Define variances (if any) from the operating costs assumed in the decision documents.

    c. Update the figures to identify the areas impacted by sinkholes and subsidence. Revise the "Issues, Recommendations, and Follow-up Actions" tables to identify the steps that the Navy will take to prevent these issues from recurring. Fencing off affected areas is not an adequate solution.

4. **Protectiveness Determination:** Review and revise the "Statement of Protectiveness" sub-section for Parcels B1, B-2, and C to explain why the protectiveness determinations were changed from "Will be Protective" in the fourth FYR Report to "Short-Term Protective" in the fifth FYR Report.

5. **Climate Resilience Assessment Hazards**: Revise the "Other Findings" sub-section for each parcel and the FYR Summary Form to include a description of all potential hazards identified in the CRA, such as impacts from storm surge and GWR within 3 feet of ground surface. Discuss the findings of the CRA and recommendations for the completion of site-specific studies. Revise the text to state that site-specific studies are "planned" rather than "recommended" and include a brief description of the minimum scope and timeline for each study. Update the "Issues, Recommendations, and Follow-up Actions" table to reflect revisions made to text and to identify the site-specific studies as follow-up actions.

6. **Sea Wall and Shoreline Revetment:** Revise relevant sections that discuss sea walls and shoreline revetments to include the specific SLR projections that were used during the design-phase and whether shoreline revetments need to be reevaluated given recent updates to the estimates. State if any geotechnical stability analyses were performed during the design-phases that incorporated both SLR and GWR. Are any updates to the geotechnical analyses warranted based on changing projections? Provide copies of the associated geotechnical stability analysis calculations.

7. **Vinyl Chloride and Biodegradation:** Revise sections 3.0 and 4.0 to remove the statements that the presence of vinyl chloride "demonstrates" or "indicates" that biodegradation is occurring; or provide sufficient additional evidence to support these assertions. Although the presence of vinyl chloride indicates that biodegradation has occurred in the past, it does not necessarily indicate that biodegradation is still occurring at a given location.

8. **Parcel C Groundwater Remedy:** Additional remedial actions (RAs) are warranted at plumes that continue to exhibit either stable or inconclusive trends above remediation goals (RGs) since at

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least 2020 (i.e., RU-C1-1, RU-C2-2, RU-C2-3). Although the Navy states its intention to conduct additional RAs in RU-C1 and RU-C2 in general, the Navy should commit to action at these specific plumes. Furthermore, the Navy should review their overall groundwater remedial strategy, considering (1) the timeframes for reaching RGs and (2) the alternative actions required if plumes don't decrease. Revise the text in sub-section 4.4.1.1 to describe the next steps at each of these plumes to reach RGs.

9. **Building Demolition**: Revise relevant sections to address planned building demolition activities. Indicate that a durable cover will be installed where current buildings lack an existing cover component and state whether demolition will include addressing lead hazards in shallow soil, as applicable.

10. **Radiological Object Discoveries:** Revise the "Remedy Implementation" sub-sections for Parcels B-1 and C to discuss the ROs discovered recently during radiological re-testing activities. Revise the "Issues, Recommendations, and Follow-up Actions" tables (Tables 3-8 and 5-8) to reflect revisions to the text.

11. **Per-and-Polyfluorinated Alkyl Substances (PFAS) Impacts:** Revise the "Other Findings" sub-section for each parcel to indicate that the specific areas and media to be investigated for PFAS contamination will be finalized in future PFAS remedial investigation work plan(s). Update the "Issues, Recommendations, and Follow-up Actions" table for each parcel to reflect revisions made to text and to identify the remedial investigation work plan as a follow-up action.

12. **Methane Exceedances & Monitoring:** Revise section 6.0 to assess the protectiveness of the existing landfill cap and gas control system given the elevated concentrations of methane gas reported by the Navy within the past five years. Although the remedy isn't fully complete at Parcel E-2, the interim landfill gas control system constructed in 2003 remains operational. Specific recommendations to revise the FYR Report are provided below:

    a. Revise the response to "Question A" in sub-section 6.5.1 to address the functionality of the landfill cap and gas control system both currently in-place and anticipated to be completed.

    b. Revise the "Remedy Operations and Maintenance, Landfill Gas Monitoring" sub-section (section 6.4.2) to identify the locations of (1) the probe(s) where elevated concentrations of methane were detected above action levels (including GMP-07A) and (2) the newly installed perimeter monitoring probe (GMP-54). Describe the locations of the probes with respect to the landfill's northern and western boundaries and any nearby structures. Discuss the Navy's efforts to reduce methane concentrations at the probe(s) where elevated readings have been detected above action levels. Include the locations of the monitoring probes on a figure.

13. **Mercury Impacts to Groundwater and San Francisco Bay:** The on-going FFA party discussions regarding elevated mercury concentrations in groundwater at Parcel B-2 are not adequately addressed within Section 3.0. Specific recommendations to revise the FYR Report are provided below:

    a. The Mann-Kendall statistical conclusions referenced within sub-section 3.4.3.1 are not consistent with recent (2021 and 2022) groundwater sampling results; the draft 2022 remedial action monitoring report (RAMR) appears to show that mercury concentrations at

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monitoring well IR26MW49A are increasing. Revise this sub-section to include 2021/2022 groundwater monitoring data.

b. Revise the response to "Question A" in sub-section 3.5.1 to acknowledge (1) the August 20, 2021 Tri-Agency Letter statement that "[t]he FFA regulatory parties reject that the remedial action is either successful or making progress in achieving the groundwater remedial action objective (RAO)" and (2) the ongoing discussions between the FFA parties to reach a resolution to the detected mercury concentrations. Revise the "Issues, Recommendations, and Follow-up Actions" table to reflect revisions to the text.

c. The trigger level (TL) for mercury is listed in the FYR Report as 0.94 micrograms per liter (µg/L); however, the current (2019) RWQCB Tier 1 ESL is 0.025 µg/L and the RWQCB's Water Quality Control Plan (Basin Plan) for the San Francisco Bay includes values such as 0.03 milligrams of mercury per kilogram of fish. Revise the response to "Question B" in sub-section 3.5.2 to acknowledge this new information and discuss the impacts (if any) to protectiveness of the selected remedy.

14. **Technical Assessment "Question B":** Revise the response to "Question B" for each parcel to clarify and expand upon the Navy's technical assessment of human health risks as follows:

a. In the "HHRA Analysis" sub-section, provide a detailed evaluation of the protectiveness of RGs for all identified chemicals of concern (COCs) in a given parcel where current risk-based concentrations (e.g., RSL or VISL) are less than the RGs. For each COC, include (1) appropriate risk-based criteria, (2) whether the COC remaining below the durable cover is within an acceptable risk range, (3) the location(s) of concern, and (4) any relevant remedy component(s) that maintain protectiveness (as applicable). For example, in sub-section 5.5.2.2, discuss whether the lower vapor intrusion screening level (VISL) for trichloroethene (TCE) results in any additional VOC ARICs. For reference, review the fourth FYR Report for a good example of this type of evaluation.

b. Within the "HHRA Analysis" sub-section, include an evaluation of action levels for each COC in addition to RGs. Include an action levels column for reference in the "Chemicals of Concern and Remediation Goals" tables (Table 4-1, 5-1, and 6-1).

c. Within the "HHRA Analysis" sub-section, identify the COCs being referred to in the following statement regarding possible changes for construction worker exposure "…changes will not affect the RGs...because ICs require identification and management of potential risks to construction workers." For the affected COCs, provide a discussion regarding whether COCs remaining in place below the durable cover are within an acceptable risk management range. If special health & safety protocols differing from elsewhere at the Shipyard are needed, identify the affected locations. Also update the "Issues, Recommendations, and Follow-up Actions" table to identify the Navy's plan to tabulate COC concentrations for future use by health and safety professionals.

d. Provide a new subsection that evaluates the soil RGs and action levels based on leachability-based criteria (e.g., "soil leaching to groundwater screening levels" published by the RWQCB [2019]) considering the results of the CRA and potential new routes of exposure; assess if the protectiveness of any of the selected remedies will be impacted.

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15. **Changes to Areas Requiring Institutional Controls (ARICs) for VOCs:** The fourth FYR Report identified additional "proposed" VOC ARICs requiring further evaluation at Parcels B-1, B-2, D-1, and G. Revise the "Institutional Controls" sub-section for each affected parcel to discuss the differences between the VOC ARICs depicted in the fifth FYR Report compared to Appendix E of the fourth FYR Report. Review associated figures and confirm that the VOC ARICs are accurate (e.g., Figure 5-2 appears to be missing existing VOC ARICs). Revise the "Issues, Recommendations, and Follow-up Actions" tables (Tables 3-8 and 5-8) to reflect revisions to the text, if applicable.

16. **Redevelopment Plan Reference:** Update all relevant sections to reference the most recent 2018 Redevelopment Plan, instead of the 2010 Redevelopment Plan. Specifically, update the "Site Characterization – Land Use" sub-section and the "Remedial Action Summary and Expected Outcomes" table for each parcel with the latest Redevelopment Plan details.

Specific Comments:

1. **Section 4.4.1.1, Parcel C Remedy Implementation:** Section 4.4.1.1 describes the degradation conditions at plumes RU-C2-1, RU-C2-2, and RU-C2-3 as favorable, moderately conducive, and generally favorable (respectively). Revise the text to define each of these terms and discuss what the differences mean in terms of degradation. Does a "moderately conducive" condition mean that degradation may not be occurring at all or that degradation may only be occurring under certain circumstances?

2. **Section 4.4.1.1, Parcel C Remedy Implementation, Groundwater Monitoring:** Revise this sub-section to provide additional information on the status of the monitoring wells associated with groundwater plumes RU-C1-4 and RU-C5-2. The FYR Report states that these wells were added back to the monitoring program in 2021 at the request of the FFA regulatory parties. Is monitoring continuing at these wells? If not, include the date when FFA approval was received to discontinue monitoring.

3. **Section 4.4.1.1, Parcel C Remedy Implementation, Soil Excavation and Removal:** Revise this sub-section to explain why the sumps identified beneath Building 253 were not removed.

4. **Section 4.4.1.1, Parcel C Remedy Implementation, Groundwater Monitoring:** Revise the third bullet of the RU-C1 sub-section to clarify what the Navy plans to do to "address" the dense non-aqueous phase liquid (DNAPL) source area and dissolved groundwater plume at RU-C1-3.

5. **Section 4.4.1.1, Parcel C Remedy Implementation, Groundwater Monitoring:** Revise the first bullet of the RU-C2 sub-section to (1) state why there are no RAOs for the B-aquifer, (2) acknowledge the ongoing discussions between the FFA parties related to investigating the B-aquifer and the fractured bedrock water-bearing zone (F-WBZ) contamination, and (3) explain the significance of detecting tetrachloroethene (PCE) and other chlorinated compounds within the B-aquifer wells at RU-C2-1. Identify the pending resolution and next steps for investigation as a follow-up item in Table 4-8.

6. **Section 4.4.1.1, Parcel C Remedy Implementation, Groundwater Monitoring:** Monitored natural attenuation (MNA) continues at RU-C2-2; however, PCE concentrations continue to exhibit an increasing trend above both its RG and active treatment criterion (ATC). Revise the sub-section with a commitment by the Navy to perform additional assessment and RA at RU-C2-2.

Michael Pound
SFDPH Comments on the Draft Fifth Five Year Review Report, Hunters Point Naval Shipyard, San Francisco, California, Dated November 2023

7. **Section 4.4.1.1, Parcel C Remedy Implementation, Groundwater Monitoring:** In 2019, the FFA regulatory parties identified the need to further evaluate TCE impacts in the F-WBZ. A draft Work Plan was submitted to the FFA regulatory parties in 2022 and a draft final version is pending issuance by the Navy. Revise the RU-C4 sub-section and Table 4-8 to identify the next steps related to this planned investigation.

8. **Section 4.4.1.1, Parcel C Remedy Implementation, Groundwater Monitoring:** Revise the fifth bullet of the RU-C5 sub-section to include the conclusion made within the draft 2022 RAMR that "visual trends for source area monitoring well concentrations generally indicate that while some COCs initially decreased in concentration immediately after the 2021 RA, most have rebounded and some have increased above concentrations before the RA." Revise the text to include that additional RAs will be necessary if this increasing trend is confirmed, following additional monitoring.

9. **Section 4.5.1.1, Question A, Parcel C:** Revise this sub-section to (1) acknowledge that additional investigations and RAs under the 2010 ROD are needed for RU-C1, RU-C2, RU-C4, and RU-C5 and (2) provide a timeline for completion of these required activities. Update Table 4-8 to reflect revisions to text.

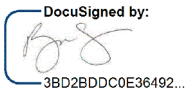
10. **Section 5.4.4.1, Parcel G Remedy Implementation, Groundwater Monitoring:** Revise this sub-section to describe the Parcel E IR-36 plume continuation onto Parcel G and the planned RA. Update applicable Parcel G figures to show plume continuation.

11. **Section 5.6.1.3, Site Management Strategy:** Revise this sub-section to provide further details regarding the meaning of the second bullet point (i.e., "The Navy is also planning to optimize…"). What are the Navy's intentions? If possible, include a specific example.

12. **Section 6.4.1.1, Parcel E Remedy Implementation, Soil Excavation and Removal:** Revise the first sentence of the second paragraph as follows – "…or upon the Navy's determination to limit excavation [with approval provided in writing by the FFA regulatory parties]." Additionally, include example criteria which might result in the Navy proposing to limit planned excavations.

13. **Section 6.4.2.1, Parcel E-2 Remedy Implementation, Belowground Barrier (Slurry Walls):** Revise this sub-section to incorporate an acknowledgement, as previously noted by the FFA regulatory parties, that (1) the installed Upland Slurry Wall (USW) deviated from its original design and is not functioning properly. Discuss both the deviation and the current measures the Navy is taking to address this matter.

Sincerely,



Ryan Casey, P.E.
Administrative Engineer

CC: Danielle Janda, Navy
Erica Schmandt, Navy
Jamie Egan, Jacobs
Andrew Bain, USEPA
Michael Howley, DTSC
Mary Snow, RWQCB
Susan Philip, DPH
Thor Kaslofsky, OCII
Lila Hussain, OCII
Christina Rain, Langan
Randy Brandt, Geosyntec

Response to Comments	**Contract/CTO** N62470-21-D-0007; Contract Task Order No. N6247322F4930	**Responses By** Navy
Comment By City & County of San Francisco	**Code/Organization** DPH	**Date** May 2024

Project Title and Location	**Type of Review**	
Draft Fifth Five-Year Review Report, Hunters Point Naval Shipyard, San Francisco, California, November 2023	**X**	Draft
		Final
		Other

No.	Location	City & County of San Francisco Comments Dated: May 14, 2024	Navy Response
1	General	**Community Communications:** The Navy's communication with the public is often too technical, particularly when presenting to larger audiences. Speakers should use plain language and support their presentations with clear visual aids to enhance understanding for general audiences. Additionally, the Navy should promptly respond to public requests for information. Improving communication practices will help the Navy build a stronger relationship with the public.	Comment noted.
2	General	**Parcel D-1 Vulnerability:** As stated in our April 12th comment letter, it is imperative that the Federal Facility Agreement (FFA) parties select Remedial Alternative R-2A (Excavation, Disposal, Survey, and Institutional Controls [ICs]) for Parcel D-1. Selecting the "full excavation" remedial alternative will ensure that radiological objects (ROs) are not mobilized in the future due to potential impacts from sea level rise (SLR) and groundwater rise (GWR) at the Shipyard. Specific recommendations to revise the FYR Report are provided below: a. Delete the last sentence in the second paragraph of the "Radiological Surveys and Remediation" sub-section (i.e., "The Focused FS to evaluate additional remedies…"). This sentence incorrectly implies that the remedy for Parcel D-1 has already been determined. The Proposed Plan, which has not yet been drafted, will recommend the	a. The sentence "*The Focused FS to evaluate additional remedies to address radiologically impacted soil at was finalized in 2023 (Innovex-ERRG Joint Venture, 2023) and the Proposed Plan and Amended ROD is pending."* Does not imply that the remedy has already been determined. However, the preceding sentence has been modified to: *Land use and activity restrictions are currently in place to prohibit land-disturbing activities throughout Parcel D-1 until the ~~LUC RD~~ remedy is amended to mitigate risk to human health relating to the potential presence of ROs in material below 2 feet.* b. The newly identified potential route of exposure is discussed in Other Findings because, while the screening level CRA identified the possibility of groundwater rise, it's based on conservative modeling

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		Navy's preferred remedial alternative. b. The responses to "Question B" (sub-section 5.5.2) should be revised to acknowledge the newly identified potential route of exposure of ROs in fill material due to SLR/GWR.	and requires additional verification before it can be determined that protectiveness is affected. Protectiveness, with respect to the Five-Year Review, is only affected when increased CERCLA risk attributable to climate hazards has been identified (groundwater is likely to emerge and land use is such that receptors could be exposed) and a future unacceptable health or ecological risk has been identified (data collected, validated, and evaluated following CERCLA risk assessment processes resulting in unacceptable risk to receptors).
3	General	**Maintenance & Repair of Durable Covers:** The sinkholes and subsided areas in Parcels B-1, C, and D-1 impact the short- and long-term protectiveness of the durable cover remedy. The Navy should explain the cause of the subsidence and outline its long-term plan for preventative maintenance and repair. Specific recommendations to revise sections 3.0, 4.0, and 5.0 of the FYR Report are provided below: a. The response to "Question A" should be adjusted given that the asphalt covers need repair in places, as described in each parcel's "Remedy Operations and Maintenance" sub-sections. b. Revise the "Durable Cover Maintenance" sub-sections to provide (1) more details regarding the maintenance performed to-date in the sinkhole and subsided areas of the asphalt cover and (2) a proposed timeline to implement preventative repairs. Define variances (if any) from the operating costs assumed in the decision documents. c. Update the figures to identify the areas impacted by sinkholes and subsidence. Revise the "Issues, Recommendations, and Follow-up Actions" tables to identify the steps that the Navy will take to prevent these issues from recurring. Fencing off affected areas is not an adequate solution.	Because the Navy currently controls access and exposure to the subsidence areas and is planning on making repairs, protectiveness is not affected. Therefore, the response to Question A will not be changed and it will not be added as an issue/recommendation affecting protectiveness. Repairs of the larger eroded areas that were identified as being outside of the scope of routine O&M are included in the remedy as a whole; however, at this time, the repairs are being deferred until the radiological retesting has been completed to minimize generating extra waste and maximize efficiency. The timing of these repairs is dependent on the retesting timeframe. The detailed repair method is discussed in the O&M documents referenced in the Five-Year Review. The following text has been added to the Durable Cover Operations and Maintenance section of Section 4.4.1.2: The Navy is currently conducting a shoreline assessment study to identify and recommend repairs and/or stabilization of structures and shoreline. The results of the study are pending and until results and recommendations are made, the magnitude and timeframe for repair is unknown at this time. The use of the term "sinkholes" has been replaced with "areas of erosion" or "subsidence areas" to use more technically accurate language.

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4	General	**Protectiveness Determination:** Review and revise the "Statement of Protectiveness" sub-section for Parcels B1, B-2, and C to explain why the protectiveness determinations were changed from "Will be Protective" in the fourth FYR Report to "Short-Term Protective" in the fifth FYR Report.	The term "Will Be Protective" is used in the case where remedy construction is ongoing, current exposures are under control, and when construction is complete, the remedy will be protective (no issues were identified that would call into question the protectiveness of the remedy under construction). The "Will Be Protective" determination was used in the Fourth Five-Year Review for Parcels B-1, B-2, and C because portions of the remedy were in the process of being implemented. For this Fifth Five-Year Review, because the remedy has been completed or the majority of the remedy is in place (groundwater treatment, durable covers, ICs, and long-term monitoring) "Will Be Protective" is no longer appropriate to use. This Fifth Five-Year Review determined the remedy at B-1 to be Short Term Protective (the remedy is currently protective but additional radiological testing activities are needed to ensure long term protectiveness of the remedy). The remedies at B-2 and The B- Aquifer and Fractured Water Bearing Zone (F-WBZ) areas of Parcel C are "Protectiveness Deferred" (" (not enough data is available to make a protectiveness determination and the Navy will collect the data and prepare a Five-Year Review Amendment with the updated protectiveness determination).
5	General	**Climate Resilience Assessment Hazards**: Revise the "Other Findings" sub-section for each parcel and the FYR Summary Form to include a description of all potential hazards identified in the CRA, such as impacts from storm surge and GWR within 3 feet of ground surface. Discuss the findings of the CRA and recommendations for the completion of site-specific studies. Revise the text to state that site-specific studies are "planned" rather than "recommended" and include a brief description of the minimum scope and timeline for each study. Update the "Issues, Recommendations, and Follow-up Actions" table to reflect revisions made to text and to identify the site-specific studies as follow-up actions.	The following text has been added to the Other Findings for respective parcels (3.6.1.2, 4.6.1.2, 5.6.1.2, 6.6.1.2): The CRA estimates that groundwater emergence may occur in [IR-07/18, Parcel B-1, B-2, C, D-1, E, and E-2 wetland areas] by the year 2065. Additional site-specific assessments are planned which will include verifying mapping projections and evaluating the 2100 timeframe, at a minimum. However, protectiveness is only affected when increased CERCLA risk attributable to climate hazards has been identified (groundwater is likely to emerge and land use is such that receptors could be exposed and a future unacceptable health or ecological risk has been identified (data collected, validated, and evaluated following CERCLA risk assessment processes resulting in unacceptable risk to receptors). Where the

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			potential for increased vapor intrusion is identified in other CERCLA documents, ARICs for VOCs are present, groundwater is being monitored, and removal of VOCs is occurring either through MNA or active remediation, thus reducing the potential for future vapor intrusion by reducing the source. Therefore, the potential for groundwater emergence does not affect the protectiveness determination in this Five-Year Review. For Parcel E-2, the following text has been added: Although the Parcel E-2 remedy components such as the sea wall were designed for resilience through a 3-foot rise in sea level (similar to the 2065 scenario), a site-specific study is recommended to evaluate the longer-term scenarios such as 2100. The following text has been added to Other Findings for Parcel D-1: The CRA estimates that groundwater emergence may occur in Parcel D-1 by the year 2035. Additional site-specific assessments are planned which will include verifying mapping projections and evaluating the 2100 timeframe, at a minimum. Parcel D-1 will be prioritized and is scheduled to be initiated in 2025. In addition to the changes listed above for each respective parcel, the following changes have been made to the Other Findings section of the Five-Year Review Summary Form: Climate Change The Navy recognizes climate change is occurring and based on a screening level Climate Resilience Assessment (CRA) (**Appendix A**), sea level rise (SLR) is the major variable of climate change that could affect the remedies at HPNS. The CRA estimates that groundwater emergence may occur in Parcel D-1 by the year 2035 and in IR-07/18, Parcel B-1, B-2, C, D-1, E, and E-2 wetland areas by the year 2065. However, protectiveness is only affected when increased CERCLA risk attributable to climate hazards has been identified (groundwater is likely to emerge and land use is such that receptors could be exposed and a future unacceptable health or ecological risk has been identified (data collected, validated, and

No.	Location	City & County of San Francisco Comments Dated: May 14, 2024	Navy Response
			evaluated following CERCLA risk assessment processes resulting in unacceptable risk to receptors). Where the potential for increased vapor intrusion is identified in other CERCLA documents, areas requiring institutional controls (ARICs) for VOCs are present, groundwater is being monitored, and removal of VOCs is occurring either through MNA or active remediation, thus reducing the potential for future vapor intrusion by reducing the source. Therefore, the potential for groundwater emergence does not affect the protectiveness determination in this Five-Year Review. Based on the results of the CRA, the Navy will continue to monitor ongoing groundwater concentration and elevation data onsite through the Basewide Groundwater Monitoring Program (BGMP) and evaluate this data as it relates to the effectiveness of site remedies. The Navy will also regularly evaluate nearby tidal gauge data to verify SLR projections. Additional site-specific assessments are planned which will include verifying mapping projections and evaluating the 2100 timeframe. Parcel D-1 will be prioritized and is scheduled to be initiated in 2025. Additional studies are planned for remaining parcels and a meeting with the Navy and Agencies is planned for November 2024 to discuss the scope and priority of these studies as well as preparation of an adaptation plan, or similar document, if the site-specific studies show that CERCLA-type human health or ecological risk attributable to climate change requires adaptive measures. Key climate change milestones include the following: • Scoping and Prioritization Meeting – 11/30/2024 • Initiation of Parcel D-1 Study – Spring 2025 Additionally, Parcels UC-1, UC-2, and Parcel D-2 were not initially included in the CRA because the parcels had been transferred, however they were evaluated in the Final CRA. The only impacts identified were minor flooding along the borders during a storm surge in 2065 at Parcels UC-1, UC-2, and D-2.

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6	General	**Sea Wall and Shoreline Revetment:** Revise relevant sections that discuss sea walls and shoreline revetments to include the specific SLR projections that were used during the design-phase and whether shoreline revetments need to be reevaluated given recent updates to the estimates. State if any geotechnical stability analyses were performed during the design-phases that incorporated both SLR and GWR. Are any updates to the geotechnical analyses warranted based on changing projections? Provide copies of the associated geotechnical stability analysis calculations.	The SLR projections used in the remedy design for Parcel E-2 was added to the Five-Year Review as discussed in response to General Comment #5. No additional geotechnical evaluation was conducted for this five-year review as it is outside of the scope of the Five-Year Review. Geotechnical evaluations were conducted as part of the Design Basis Reports for the following parcels: • Parcel B-2 (ChaduxTt, 2010 – Attachment 3) • Parcel E-2 (ERRG, 2014 – Appendix E) • Parcel E (CES, 2018 – Appendix F) References: Engineering/Remediation Resources Group, Inc. (ERRG). 2014. Design Basis Report, Parcel E-2, Hunters Point Naval Shipyard, San Francisco, California. Final. August 15. Accessible at: https://administrative-records.navfac.navy.mil/Public_Documents/SOUTHWEST/HUNTERS_POINT_NS/N00217_005165.PDF ChaduxTt. 2011. Remedial Design Package, Parcel B (Excluding Installation Restoration Sites 7 and 18) Hunters Point Naval Shipyard, San Francisco, California. Revised Final. July. Accessible at: https://administrative-records.navfac.navy.mil/Public_Documents/SOUTHWEST/HUNTERS_POINT_NS/N00217_002262.PDF Construction Engineering Services, LLC. (CES). 2018a. Remedial Design Package, Parcel E, Hunters Point Naval Shipyard, San Francisco, California. Final. May. Accessible at: https://administrative-records.navfac.navy.mil/Public_Documents/SOUTHWEST/HUNTERS_POINT_NS/N00217_005931.PDF

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7	General	**Vinyl Chloride and Biodegradation:** Revise sections 3.0 and 4.0 to remove the statements that the presence of vinyl chloride "demonstrates" or "indicates" that biodegradation is occurring; or provide sufficient additional evidence to support these assertions. Although the presence of vinyl chloride indicates that biodegradation has occurred in the past, it does not necessarily indicate that biodegradation is still occurring at a given location.	This statement has been removed from Section 3.5.1 in relation to Parcel B-1 groundwater. Note that the work being conducted at Building 123 will remove VOC source material. The discussion in Section 4.1.1.1 for RU-C1-1 has been changed to: "…Benzene, PCE, TCE, and VC exceeded RGs in March and benzene and PCE exceeded the RGs in September. PCE also exceeded ATC in March but not in September. The presence of VC indicates that biodegradation has occurred in the past. Performance monitoring is expected to continue until data are statistically less than ATCs. Based on data up to December 2021 PCE data is statistically higher than the ATC; however, statistical trends indicate it is probably decreasing (IGI, 2023). Conditions are generally conducive to anaerobic degradation indicated by depleted dissolved oxygen (DO, less than 1 mg/L), presence of dissolved redox-sensitive metals (iron and manganese), and methane. The presence of ethene or ethane also indicates that complete biotic or abiotic degradation is occurring (IGI, 2023)."
8	General	**Parcel C Groundwater Remedy:** Additional remedial actions (RAs) are warranted at plumes that continue to exhibit either stable or inconclusive trends above remediation goals (RGs) since at least 2020 (i.e., RU-C1-1, RU-C2-2, RU-C2-3). Although the Navy states its intention to conduct additional RAs in RU-C1 and RU-C2 in general, the Navy should commit to action at these specific plumes. Furthermore, the Navy should review their overall groundwater remedial strategy, considering (1) the timeframes for reaching RGs and (2) the alternative actions required if plumes don't decrease. Revise the text in sub-section 4.4.1.1 to describe the next steps at each of these plumes to reach RGs.	Section 4.4.1.1 has been revised to include which documents each respective study will be included in and the estimated schedule. The text has been revised as follows: **RU-C1:** [T]he Navy is evaluating options to treat the DNAPL source area at Building 253 and, subsequently, the associated groundwater plume. This work is anticipated in 2031. **RU-C2**: The Navy plans to address the soil RAOs for the potential ongoing A-aquifer groundwater source (ECC-Insight, 2019) as documented in the approved in the Parcel C Phase III Work Plan. Fieldwork is anticipated in late 2027/early 2028. Page 4-8 for the Soil Vapor Extraction Monitoring: "[T]he Navy is in the process of reviewing the strategy for addressing soil gas at all Parcel C areas in conjunction with additional in situ groundwater remediation activities that are ongoing (ECC-Insight and CDM Smith, 2019). The work plan for post-remediation soil gas surveys at Parcel C is anticipated for spring 2029, and fieldwork is anticipated in 2029-2030.

9	General	**Building Demolition**: Revise relevant sections to address planned building demolition activities. Indicate that a durable cover will be installed where current buildings lack an existing cover component and state whether demolition will include addressing lead hazards in shallow soil, as applicable.	Building demolition would be required to comply with applicable federal and state requirements as well as the ICs for each parcel. Details regarding building demolition will be developed during work planning which has yet to be completed, therefore cannot be included in the Five-Year Review. The additional information about building demolition and Building Addendum applicability has been added to Section 1.4.3.1 as follows: … Following the recommendation from the Fourth Five-Year Review, the Navy issued addendums evaluating the long-term protectiveness of the RGs for soil and building structures, which concluded that the current RGs are protective for all future land users (Navy, 2020a, 2020b). There was Agency disagreement over the calculation methods for building RGs; however, the Navy is planning on demolishing all radiologically-impacted buildings at each Parcel in response to a letter from the City of San Francisco's Office of Community Investment and Infrastructure, dated February 3, 2022, requesting that, before transferring the remaining Navy-owned property at HPNS, the Navy must demolish all remaining buildings (both radiologically impacted and nonradiologically impacted) on that property except for five small structures on the National Historic Register (OCII, pers. comm., 2022). The demolition and disposal of radiologically-impacted buildings will be completed under CERCLA. Details for managing radiological building materials during demolition will be documented in work plans for regulatory agency review. Because this is not an issue affecting protectiveness but will require a post-ROD change to document the increased cost, Explanations of Significant Differences will be prepared for each Parcel, as appropriate. Radiological retesting is planned and/or currently underway to verify that the soil RGs, which were determined to be protective and remain valid, have been met for each parcel that was identified in the Fourth Five-Year Review. Reference: Office of Community Investment and Infrastructure (OCII). 2022. Personal communication (letter) to Kimberly A. Ostrowski, Director, Naval Facilities Engineering Command, Base Realignment and Closure Program Management Office, West. *RE: Demolition of the Existing Non-Historic Buildings at the former Hunters Point Naval Shipyard in San Francisco, California.* February 3.

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10	General	**Radiological Object Discoveries:** Revise the "Remedy Implementation" sub-sections for Parcels B-1 and C to discuss the ROs discovered recently during radiological re-testing activities. Revise the "Issues, Recommendations, and Follow-up Actions" tables (Tables 3-8 and 5-8) to reflect revisions to the text.	Comment acknowledged. There is a data cutoff for each Five-Year review and the radiological object discoveries fall outside of this date (11/1/2023) and does not have an immediate effect on human health or the environment. The discovery of the radiological object will be incorporated in the radiological RACR and next Five-Year Review.
11	General	**Per- and-Polyfluorinated Alkyl Substances (PFAS) Impacts:** Revise the "Other Findings" sub- section for each parcel to indicate that the specific areas and media to be investigated for PFAS contamination will be finalized in future PFAS remedial investigation work plan(s). Update the "Issues, Recommendations, and Follow-up Actions" table for each parcel to reflect revisions made to text and to identify the remedial investigation work plan as a follow-up action.	The following was added to the Five-Year Review Summary Form under Other Findings: Per- and Polyfluoroalkyl Substances The Navy is in the process of investigating per- and polyfluroalkyl substances (PFAS) from historical use of PFAS-containing materials. Potential exposure pathways are under control through existing remedy components (institutional controls and durable covers) and data indicate that there is likely no imminent CERCLA risk while PFAS are investigated under the CERCLA process. The following areas are under investigation for PFAS: • Parcels B-1, B-2, C, D-1, G, E, and E-2: A-aquifer groundwater • Parcel B-1: IR-10 (Battery and Metal Plating Shop) • Parcel C: Building 215, Fire Station • Parcel D-1: Poseidon Area (Buildings 377, 384, 385, and 387), IR-69 (Bilge Water Pump House), and IR-70 (Former drum and tank storage area) • Parcel G: IR-09 (Pickling and Plating Yard) <u>Key PFAS investigation milestones include:</u> • Final Basewide Remedial Investigation (RI) Work Plan – 4/30/2025 • RI Fieldwork – Spring/Summer 2025 • Final Basewide RI Report – 8/31/2026

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12	General	**Methane Exceedances & Monitoring:** Revise section 6.0 to assess the protectiveness of the existing landfill cap and gas control system given the elevated concentrations of methane gas reported by the Navy within the past five years. Although the remedy isn't fully complete at Parcel E-2, the interim landfill gas control system constructed in 2003 remains operational. Specific recommendations to revise the FYR Report are provided below: a. Revise the response to "Question A" in sub-section 6.5.1 to address the functionality of the landfill cap and gas control system both currently in-place and anticipated to be completed. b. Revise the "Remedy Operations and Maintenance, Landfill Gas Monitoring" sub-section (section 6.4.2) to identify the locations of (1) the probe(s) where elevated concentrations of methane were detected above action levels (including GMP-07A) and (2) the newly installed perimeter monitoring probe (GMP-54). Describe the locations of the probes with respect to the landfill's northern and western boundaries and any nearby structures. Discuss the Navy's efforts to reduce methane concentrations at the probe(s) where elevated readings have been detected above action levels. Include the locations of the monitoring probes on a figure.	The Five-Year Review has been revised to summarize additional work related to methane extraction, reduction, and delineation and a technical memorandum has been added to this Five-Year Review. The following text was added to Section 6.4.2.2 under Landfill Gas Monitoring: On June 21, 2023, the Navy detected a methane gas reading above the State of California action level at an HPNS landfill gas monitoring probe (GMP-07). The probe is located inside the newly installed landfill cover and is no longer representative of a perimeter monitoring point. In order to confirm that the methane levels are below action levels at a boundary location, a new monitoring probe was installed on October 13, 2023 (GMP-54). Measurements were collected in October through December with no detections of methane with the exception of a reading of 0.1 percent on October 31, below the action level of 5 percent by volume. Details and data are provided in **Appendix G.** ~~landfill perimeter. It is approximately 200 feet southeast of the UCSF compound, which borders the Parcel E-2 boundary.~~
13	General	**Mercury Impacts to Groundwater and San Francisco Bay:** The on-going FFA party discussions regarding elevated mercury concentrations in groundwater at Parcel B-2 are not adequately addressed within Section 3.0. Specific recommendations to revise the FYR Report are provided below: a. The Mann-Kendall statistical conclusions referenced within sub-section 3.4.3.1 are not consistent with recent (2021 and 2022) groundwater sampling results; the draft 2022 remedial action monitoring report (RAMR) appears to show that mercury concentrations at monitoring well IR26MW49A are increasing. Revise this sub-section to include 2021/2022 groundwater monitoring data. b. Revise the response to "Question A" in sub-section 3.5.1 to acknowledge (1) the August 20, 2021 Tri-Agency Letter statement that "[t]he FFA	From the Navy's perspective, there are multiple lines of evidence presented in the Five-Year Review suggest the concentrations observed in groundwater are unlikely to exceed 0.6 µg/L in Bay surface water. However, as discussed in an April 25, 2024 meeting with Agency representatives (Regional Water Board, US EPA Region 9, and Department of Toxic Substances Control [DTSC]), the Navy agreed to "Protectiveness Deferred" determination. Several changes to the discussion related to Parcel B-2 were made and are provided after responses to specific comments. a. Additional monitoring data was added to the evaluation (see below) b. The concerns raised by the agencies have been added (see below)

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		regulatory parties reject that the remedial action is either successful or making progress in achieving the groundwater remedial action objective (RAO)" and (2) the ongoing discussions between the FFA parties to reach a resolution to the detected mercury concentrations. Revise the "Issues, Recommendations, and Follow-up Actions" table to reflect revisions to the text. c. The trigger level (TL) for mercury is listed in the FYR Report as 0.94 micrograms per liter (µg/L); however, the current (2019) RWQCB Tier 1 ESL is 0.025 µg/L and the RWQCB's Water Quality Control Plan (Basin Plan) for the San Francisco Bay includes values such as 0.03 milligrams of mercury per kilogram of fish. Revise the response to "Question B" in sub-section 3.5.2 to acknowledge this new information and discuss the impacts (if any) to protectiveness of the selected remedy.	c. The trigger level for mercury is 0.6 µg/L as listed in the ROD. The 0.94 µg/L National Recommended Water Quality Criteria (NRWQC) concentration was presented as an additional comparison level to put the groundwater concentrations in context. The Protectiveness Statement has been changed to: A protectiveness determination cannot be made because there is uncertainty related to the concentrations of mercury discharging to the Bay from Parcel B-2, IR-26 groundwater. In order to make a protectiveness determination, the following actions needs to be made: evaluate all existing data to determine a path forward for additional data collection, remedy optimization, and/or additional remedial alternatives/treatment that have been screened for further evaluation. A primary document presenting the path forward will be finalized as soon as practicable but no later than July 31, 2025. The FFA parties will have discussions, as appropriate, prior to scoping and developing the primary document. The concerns raised by the Agencies regarding the success of the remedy have been added after the final paragraph of Section 3.4.3.1, discussion of In Situ Stabilization of Mercury in Groundwater at IR-26 as follows: After completion of the 3-year post-ISS treatment performance monitoring, the FFA regulatory agencies (EPA Region 9, DTSC, and Regional Water Board) released a tri-agency letter on November 23, 2021 which reiterated that "mercury concentrations in groundwater along the San Francisco Bay margin consistently exceed the trigger level. Therefore, in-situ stabilization (ISS) has failed to minimize or prevent unacceptable discharge of mercury to the San Francisco Bay. Consequently, additional treatment options need to be screened, evaluated, and pursued by the Navy via the development of a new primary document work plan." (EPA, DTSC, and Regional Water Board, 2021). As discussed at the April 25, 2024 meeting, the FFA regulatory parties assumed that the Navy has the authority to "optimize" ISS (e.g., use of a larger rig in areas of prior injection refusal) and the Navy recognizes that EPA does not oppose any Navy attempt to do so, as long as such action is

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			timely and completed prior to July 31, 2025. As stated in the November 23, 2021 tri-agency letter, the Navy also recognizes that EPA continues to expect that additional treatment options need to be screened, evaluated, and pursued by the Navy. While there are continued exceedances of the TL in groundwater, the Navy believes the following provides lines of evidence that the residual concentrations in mercury in groundwater are not likely to result in a concentration above 0.6 µg/L in the Bay surface water: • Completion of source removal in 2008 via a time-critical removal action (Insight, 2009) • Partial success of the in-situ stabilization (ISS) as evidenced by reducing the extent of mercury exceedances of the TL from 3 performance monitoring locations to 2 performance monitoring locations and decreasing concentrations in one of the remaining locations (IR26MW49A). A time-series plot of data through 2023 for IR26MW49A, IR26MW51A, and IR26MW71A is presented on **Figure 3-7**. Mercury concentrations during the last 5 years of monitoring have been below historical maximums and are consistently below 10 times the HGAL. • The limited extent of impacted groundwater; IR26MW71A and IR26MW49A are approximately 45 feet apart and IR26MW49A is approximately 88 feet from IR26MW51A with no exceedances. • Comparison of groundwater quality parameters to Bay surface water quality parameters (temperature and dissolved oxygen, **Table 3-4**) indicate that the groundwater is not representative of Bay water because groundwater temperature is consistently warmer than surface water, and dissolved oxygen is consistently lower than surface water. However, because there is uncertainty in the concentration at the exposure point and because the ISS remedy did not reduce the concentration in groundwater to below 0.6 µg/L at all monitoring wells, additional data collection, remedy optimization, and/or additional remedial alternatives/treatment that have been screened for further

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			evaluation are necessary to determine whether the remedy is protective of the Bay. Section 3.5.1.3 (Technical Question A, Is the remedy functioning as intended by the decision document) has been modified as follows: 3.5.1.3 Parcel B-2 ~~Yes.~~ The ISS injections did not effectively reduce mercury in two locations (IR26MW49A and IR26MW71A) to below the TL of 0.6 µg/L. Although mercury continues to exceed TLs in groundwater collected from downgradient monitoring wells, data demonstrating that mercury concentrations in surface water (the ultimate receptor) are below the HGAL of 0.6 µg/L are lacking. The RAO is stated as follows: … [no change from existing text] ~~Protectiveness is not affected based on the following rationale:~~ Data at the groundwater-surface water interface has not been collected; however, from the Navy's perspective, it is not expected that mercury exceeds 0.6 µg/L based on the following rationale: • Source concentrations in soil have been removed during the IR-26 Mercury Removal TCRA (Insight, 2009). • Although dissolved mercury in groundwater exceeds the TL in two locations, Mann-Kendall analysis indicates it is decreasing at one location (KMJV, 2021), indicating partial success of the ISS remedy at minimizing migration to the surface water. • The TL is the Hunters Point groundwater ambient level (HGAL), which is not a risk-based concentration, formal RG, or ARAR according to the ROD Amendment (Navy, 2009). • The screening of groundwater data against the TL or other surface water benchmarks, such as the National Recommended Water Quality Criteria (NRWQC; USEPA, 2023), conservatively assumes that ecological receptors are directly exposed to measured concentrations in groundwater. However, there will be a mixing zone where groundwater interfaces with surface water. The extent of that zone is unknown, but mixing is expected to occur, and the concentrations

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			would decrease with distance from the mixing zone and tidal action. Site-specific mixing factors can range from 1 to several thousand. For example, USEPA uses a default mixing and attenuation factor of 20 to address the dilution of soil leachate as it moves through the groundwater aquifer (USEPA, 1996). Furthermore, mixing studies conducted by State of Washington, Department of Ecology (2009) found that the majority of the reduction in porewater concentrations was because of dilution by surface water and averaged 90 percent (that is, a dilution factor of 0.1). Assuming a similar dilution factor, the maximum post-injection detected concentration of dissolved mercury (8.55 µg/L) would be 0.855 µg/L, which does not exceed the NRWQC of 0.94 µg/L (USEPA, 2023). • The post-treatment concentrations after 2018 have consistently been lower than 10 times the 0.6 µg/L TL at both IR26MW49A and IR26MW71A (**Figure 3-7**). • Groundwater quality parameters (temperature and dissolved oxygen) indicate that the water in sentinel wells IR26MW49A, IR26MW50A, IR26MW51A, and IR26MW71A are not representative of surface water (**Table 3-4**). Review of annual O&M inspections, historical documents… [no change from original text]. The following issue/recommendation has been added to the Five-Year Review Summary Table and Table 3-9 (Parcel B Issues, Recommendations, and Follow-up Actions): Issue: There is uncertainty related to the concentrations of mercury discharging to the Bay from Parcel B-2, IR-26 groundwater Recommendation: Evaluate all existing data to determine a path forward for additional data collection, remedy optimization, and/or remedial alternatives/treatment that have been screened for further evaluation. Prepare a primary document presenting the path forward. Milestone Date: 10/31/2025 Affects Protectiveness: Protectiveness Deferred

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14.	General	**Technical Assessment "Question B":** Revise the response to "Question B" for each parcel to clarify and expand upon the Navy's technical assessment of human health risks as follows: a. In the "HHRA Analysis" sub-section, provide a detailed evaluation of the protectiveness of RGs for all identified chemicals of concern (COCs) in a given parcel where current risk-based concentrations (e.g., RSL or VISL) are less than the RGs. For each COC, include (1) appropriate risk-based criteria, (2) whether the COC remaining below the durable cover is within an acceptable risk range, (3) the location(s) of concern, and (4) any relevant remedy component(s) that maintain protectiveness (as applicable). For example, in sub-section 5.5.2.2, discuss whether the lower vapor intrusion screening level (VISL) for trichloroethene (TCE) results in any additional VOC ARICs. For reference, review the fourth FYR Report for a good example of this type of evaluation. b. Within the "HHRA Analysis" sub-section, include an evaluation of action levels for each COC in addition to RGs. Include an action levels column for reference in the "Chemicals of Concern and Remediation Goals" tables (Table 4-1, 5-1, and 6-1). d. Within the "HHRA Analysis" sub-section, identify the COCs being referred to in the following statement regarding possible changes for construction worker exposure "…changes will not affect the RGs...because ICs require identification and management of potential risks to construction workers." For the affected COCs, provide a discussion regarding whether COCs remaining in place below the durable cover are within an acceptable risk management range. If special health & safety protocols differing from elsewhere at the Shipyard are needed, identify the affected locations. Also update the "Issues, Recommendations, and Follow-up Actions" table to identify the Navy's plan to tabulate COC concentrations for future use by health and safety professionals. e. Provide a new subsection that evaluates the soil RGs and action levels based on leachability- based criteria (e.g., "soil leaching to groundwater screening levels" published by the RWQCB [2019]) considering the	a) As indicated in the Five-Year Review text for Technical Assessment Question B, the protectiveness of the RGs was evaluated by comparing the RGs that were developed for the project as human health protective levels to risk-based screening levels based on current toxicity and exposure assumptions consistent with the exposure scenarios used to develop the RGs. The RGs that exceed current risk-based screening levels were identified on the comparison tables, as referenced in the text. The text did not discuss each RG/chemical individually, but directed the reader to the table providing the values and the comparison. If the current risk-based levels are higher or similar to the RGs, the RGs are considered protective based on current risk assessment practices. As discussed in the FYR, in some cases the current risk-based levels are lower than the RGs, indicating if a receptor is exposed to the media at the RG there could potentially be unacceptable risks. However, as also discussed in the FYR, ICs and/or durable covers are in place in these cases limiting potential exposure, and therefore since there can be no exposure, there is no unacceptable risk and protectiveness remains. Risk evaluations were not performed to evaluate exposure to the material beneath the durable cover (to determine if the COC remining below the durable cover is within an acceptable risk range) as there is no current exposure to the material remaining below the durable cover and therefore no unacceptable risk. Data was not compared to the current risk-based screening levels, the evaluation of protectiveness was performed by evaluating the protectiveness of the remedy. b) The action levels are used as criteria to guide active remediation within applicable areas of Parcel C and are not specified in the respective ROD as an ARAR, human health or environmental risk-based value. Therefore, it is not appropriate to evaluate the action levels in Question B. c) The changes in the HHRA analysis for the construction worker would be associated with changes in construction worker exposure parameter values (such as skin surface area and body weight) and

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		results of the CRA and potential new routes of exposure; assess if the protectiveness of any of the selected remedies will be impacted.	changes in toxicity values. Text in respective HHRA analyses (3.5.2.2, 4.5.2.2, and 5.5.2.2) has been added as follows: There may be changes with HHRA analysis for the construction worker scenario. Changes in exposure parameter values would likely only result in a small change to HHRA results since standard construction worker exposure factors have not changed significantly since the RI was prepared (not orders of magnitude). The following construction worker exposure parameter values have changed since the original HHRA was prepared: • The construction worker body weight used in the HHRA was 70 kg, however, the adult body weight used in HHRAs based on current EPA guidance (EPA, 2014) would be 80 kg. • The skin surface area for a construction worker exposed to soil used in the HHRA was 5,700 cm^2, however based on current EPA guidance (EPA, 2014), a construction worker skin surface area exposed to soil is 3,527 cm^2. • The soil to skin adherence factor used in the HHRA for a construction worker was 0.8 mg/cm^2, the soil to skin adherence factor for a construction worker used in a current HHRA would be 0.3 mg/cm^2 (the 95th percentile adherence factor for construction workers, from EPA, 2004). • The skin surface area for exposure to groundwater used in the HHRA was 2,370 cm^2. A current HHRA would use a skin surface area of 6,032 cm^2 (the weighted average of mean values for head, hands, forearms, and lower legs, from EPA, 2011). • Additionally, for inhalation exposures for both groundwater and soil, inhalation toxicity values are now presented and used in mg/m^3 (non-cancer) or $1/(\mu g/m^3)$ for cancer, and therefore the intake equations no longer incorporate inhalation rate. Toxicity values could result in larger changes (potential orders of magnitude changes), such as for TCE, for which toxicity values were updated in 2009 after the initial HHRA was completed.

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			References: EPA, 2004. Risk Assessment Guidance for Superfund Volume I: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment (Final). EPA/540/R/99/005. July. EPA, 2011. Exposure Factors Handbook: 2011 Edition. National Center for Environmental Assessment, Washington, DC; EPA/600/R-09/052F. September. EPA, 2014. Human Health Evaluation Manual, Supplemental Guidance: Update of Standard Default Exposure Factors, OSWER Directive 9200.1-120, February 6. d) The CRA was a screening-level evaluation and the type of assessment requested is not feasible for this Five-Year Review. This suggestion will be considered when developing the planned site-specific studies.
15	General	**Changes to Areas Requiring Institutional Controls (ARICs) for VOCs:** The fourth FYR Report identified additional "proposed" VOC ARICs requiring further evaluation at Parcels B-1, B-2, D-1, and G. Revise the "Institutional Controls" sub-section for each affected parcel to discuss the differences between the VOC ARICs depicted in the fifth FYR Report compared to Appendix E of the fourth FYR Report. Review associated figures and confirm that the VOC ARICs are accurate (e.g., Figure 5-2 appears to be missing existing VOC ARICs). Revise the "Issues, Recommendations, and Follow-up Actions" tables (Tables 3-8 and 5-8) to reflect revisions to the text, if applicable.	The existing and ARICs requiring further evaluation based on the Fourth Five-Year Review have been added to **Figures 1-4, 3-2**, and **5-2**. One of the objectives of the Final Remedial Action Work Plan for Parcel B-1, IR Site 10, Building 123 (September 2023) is to utilize data post-Remedial Action (RA) soil gas data and compare to updated soil gas action levels (SGALs) to evaluate ARICs for VOC vapors. This is in accordance with the Fourth Five-Year Review recommendations. The revised preliminary residential SGALs will be used as a first-tier screening tool in the post-removal vapor intrusion (VI) Human Health Risk Assessment (HHRA) to determine grid blocks that may require additional evaluation. Based on the results of the first-tier data screening, a second-tier evaluation may be needed. The second-tier evaluation will involve use of site-specific or modeled attenuation factors based on site-specific chemical, microbial, and /or geotechnical data. Hence, the results of the post-RA VI HHRA will be used to evaluate the VI ARICs for IR-10 and will be presented in the IR-10 RACR. Details for this methodology is described in Section 8 of Final Remedial Action Work Plan for Parcel B-1, IR Site 10, Building 123 (September 2023).

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			Table 3-4 (now 3-5) has been updated to indicate that this issue/recommendation is ongoing, the work plan was finalized in September 2023 and fieldwork is underway. Reevaluating the SGALs and ARIC boundaries is not carried forward as an Issue/Recommendation in the Fifth Five-Year Review because the LUC RD lays out the pathway to modify the ARICs by the FFA signatories, implying that all need to agree on the change prior to making modifications to the ARIC. The following is an excerpt from the Parcel G LUC RD (emphasis added): Alternatively, the ARIC for VOC vapors may be modified *by the FFA signatories* as the soil and groundwater contamination areas that are producing unacceptable vapor inhalation risks are reduced over time or in response to further soil, vapor, and groundwater sampling and analysis for VOCs that establishes that areas now included in the ARIC for VOC vapors do not pose an unacceptable potential exposure risk due to VOC vapors. This is also emphasized in current status to the Recommendation from the Fourth Five-Year Review: No changes to the VOC ARIC are planned for Parcel D-1 or G at this time. Because attenuation of VOCs is likely to occur, ARICs for VOC vapors, and likewise SGALs that are the basis of the ARICs, in Parcels D-1 and G will be re-evaluated during preparation for property transfer. While there is disagreement about the method to calculate the SGALs, which may affect ARIC boundaries, the final ARICs that will be surveyed and recorded in quitclaim deeds and covenants to restrict land use will be established in agreement with the BCT.

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16	General	**Redevelopment Plan Reference:** Update all relevant sections to reference the most recent 2018 Redevelopment Plan, instead of the 2010 Redevelopment Plan. Specifically, update the "Site Characterization – Land Use" sub-section and the "Remedial Action Summary and Expected Outcomes" table for each parcel with the latest Redevelopment Plan details.	References to the 2018 Redevelopment Plan were made to all Site Characterization – Land Use subsections. The following changes have been made to the Remedial Action Summary and Expected Outcome tables: • Table 3-3 Parcel B: **Planned future use**: Predominantly residential and shoreline open space • Table 4-3: Parcel C: **Planned future use**: Multi-use, including areas of predominantly arts related/commercial/ retail/ residential and research and development and shoreline open space • Table 4-4: Parcel UC-2: **Planned future use**: Multi-use, including mixed residential/arts/ commercial/retail and research and development (industrial) • Table 5-3: Parcel D-1 and UC-1: **Planned future Use:** Multi-use including residential, research and development, and open space. • Table 5-4: Parcel G: **Planned future Use:** Multi-use including residential, research and development, and open space. • Table 6-4: Parcel E: **Planned future use**: Shoreline open space, and multi-use including residential, research and development, and open space. • Table 6-5: Parcel E-2: **Planned future use:** Shoreline open space • Table 6-6: Parcel UC-3: **Planned future use**: Multi-use including residential, research and development, and open space.
1	Specific	**Section 4.4.1.1, Parcel C Remedy Implementation:** Section 4.4.1.1 describes the degradation conditions at plumes RU-C2-1, RU-C2-2, and RU-C2-3 as favorable, moderately conducive, and generally favorable (respectively). Revise the text to define each of these terms and discuss what the differences mean in terms of degradation. Does a "moderately conducive" condition mean that degradation may not be occurring at all or that degradation may only be occurring under certain circumstances?	The concentrations of COCs are the primary indicators of degradation. The text referenced is a line of evidence supporting monitored natural attenuation as a qualitative description of the aquifer conditions under which degradation of COCs can occur. Moderately conducive means that the conditions in the aquifer are such that degradation can occur but not a definitive indicator that it is occurring.

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2	Specific	**Section 4.4.1.1, Parcel C Remedy Implementation, Groundwater Monitoring:** Revise this sub- section to provide additional information on the status of the monitoring wells associated with groundwater plumes RU-C1-4 and RU-C5-2. The FYR Report states that these wells were added back to the monitoring program in 2021 at the request of the FFA regulatory parties. Is monitoring continuing at these wells? If not, include the date when FFA approval was received to discontinue monitoring.	The sentence has been revised to: B-aquifer monitoring was reinstated and is ongoing.
3	Specific	**Section 4.4.1.1, Parcel C Remedy Implementation, Soil Excavation and Removal:** Revise this sub- section to explain why the sumps identified beneath Building 253 were not removed.	The subsection was revised to: the suspected source (sumps within Building 253) was confirmed with the identification of dense nonaqueous phase liquid (DNAPL) in the center of the former paint room (within Building 253), which was outside of the scope of the RA; consequently…
4	Specific	**Section 4.4.1.1, Parcel C Remedy Implementation, Groundwater Monitoring:** Revise the third bullet of the RU-C1 sub-section to clarify what the Navy plans to do to "address" the dense non- aqueous phase liquid (DNAPL) source area and dissolved groundwater plume at RU-C1-3.	The Navy has plans to address the DNAPL under Building 253. The DNAPL is the likely source of the RU-C1 plume. This NAPL area was not discovered at the time of the Parcel C ROD signature. Consequently, the planning and implementation of a remedy has not been definitively set. Remediation of the DNAPL source area under Building 253, is necessary before addressing the dissolved groundwater plume.
5	Specific	**Section 4.4.1.1, Parcel C Remedy Implementation, Groundwater Monitoring:** Revise the first bullet of the RU-C2 sub-section to (1) state why there are no RAOs for the B-aquifer, (2) acknowledge the ongoing discussions between the FFA parties related to investigating the B-aquifer and the fractured bedrock water-bearing zone (F-WBZ) contamination, and (3) explain the significance of detecting tetrachloroethene (PCE) and other chlorinated compounds within the B-aquifer wells at RU-C2-1. Identify the pending resolution and next steps for investigation as a follow-up item in Table 4-8.	The following change was made to the first bullet of RU-C2: • Monitoring in the B-aquifer was discontinued in September 2020 because there were no RAOs for the B-aquifer in the ROD due to the beneficial reuse exemption discussed in **Section 1.3.4.2** (Navy, 2010); The following response was provided to the Agencies in regards to the Parcel C evaluation as a whole which addresses this comment: Navy acknowledges that while, from the Navy's perspective, the remedy is protective of human health through active remediation, monitoring, and land use controls; additional information is needed to determine protectiveness for Bay receptors and has changed the remedy protectiveness determination to "Protectiveness Deferred" until such time the investigations are completed, and a protectiveness determination can be made. Specifically, the Navy will complete the Deep

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			F-WBZ investigation for RU-C4 and the B-Aquifer and Upper F-WBZ investigation for RU-C2. The Draft-Final Five-Year Review Section 4.5.3 Technical Assessment Question C has been updated to incorporate agency concerns related to the hydrogeological communication between aquifer units at Parcel C, discharges to the Bay, and the investigations currently underway for the Deep F-WBZ in RU-C4, and planned for the B-Aquifer and Upper F-WBZ in the RU-C2 area to address these data needs as follows: Yes. The following information has come to light that could question the protectiveness of the remedy: • There have been detections of COCs from A-aquifer groundwater within the B-aquifer and F-WBZ groundwater and the connection and communication between hydrogeologic units within Parcel C is not fully understood. Therefore, further characterization of the Deep F-WBZ in RU-C4 and the B-aquifer and Upper F-WBZ in RU-C2 are required to demonstrate that remedies within the A-aquifer will be effective and not re-contaminated by COCs within the B-aquifer and F-WBZ and unacceptable discharges to the Bay are not and will not occur. The Protectiveness Statement has been changed to: A protectiveness determination cannot be made because there is uncertainty related to the hydrogeologic communication between the A- and B-aquifers and whether discharge of chemicals present in the B-aquifer present potential unacceptable risks to Bay receptors. In order to make a protectiveness determination, the following action, at a minimum, needs to be made: complete investigations of the Bay Mud/Sandy Lean Clay aquitard, extent of chemicals in the B-aquifer and F-WBZ and use current ecological risk assessment methods and criteria, as appropriate, to assess potential impacts to Bay receptors. For the Deep F-WBZ, a draft-final workplan has been provided to the FFA Regulatory Parties. For RU-C2, B-aquifer data collection and Upper F-WBZ, as appropriate, are expected to commence coincident with the performance monitoring period. The FFA parties will have discussions, as appropriate,

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			prior to scoping and developing primary documents, such as workplans. Depending on the results of the data analyses, the development of conceptual site models, and necessary steps, these actions could possibly be completed within the next 5 years, at which time, as appropriate, a protectiveness determination will be made. Response to Additional Comment: The following issue/recommendation has been added to the Five-Year Review Summary Table and Table 4-8 (Parcel C Issues, Recommendations, and Follow-up Actions): Issue: There have been detections of COCs from A-aquifer groundwater within the B-aquifer and F-WBZ groundwater and the connection and communication between hydrogeologic units within Parcel C is not fully understood. Therefore, further characterization is required to demonstrate that remedies within the A-aquifer will be effective and not re-contaminated by COCs within the B-aquifer and deep F-WBZ and unacceptable discharges to the Bay are not and will not occur. Recommendation: Complete investigations of the Bay Mud/Sandy Lean Clay aquitard, extent of chemicals in the B-aquifer and F-WBZ and use current ecological risk assessment methods and criteria to assess potential impacts to Bay receptors. Where warranted, additional actions or changes to the remedy will be recommended at the conclusion of these investigations. Milestone Date: 7/31/2029 Interim Milestones: Completion of F-WBZ investigation fieldwork 11/30/2025, completion of the F-WBZ investigation report 11/30/2026[1] Affects Protectiveness: Protectiveness Deferred Footnote: [1] The Parcel C B-aquifer study will also be conducted within the overall timeframe to meet the milestone date; however, because funding and contracts are not currently in place, the interim milestones are unavailable.

No.	Location	City & County of San Francisco Comments Dated: May 14, 2024	Navy Response
6	Specific	**Section 4.4.1.1, Parcel C Remedy Implementation, Groundwater Monitoring:** Monitored natural attenuation (MNA) continues at RU-C2-2; however, PCE concentrations continue to exhibit an increasing trend above both its RG and active treatment criterion (ATC). Revise the sub-section with a commitment by the Navy to perform additional assessment and RA at RU-C2-2.	See response to General Comment #8.
7	Specific	**Section 4.4.1.1, Parcel C Remedy Implementation, Groundwater Monitoring:** In 2019, the FFA regulatory parties identified the need to further evaluate TCE impacts in the F-WBZ. A draft Work Plan was submitted to the FFA regulatory parties in 2022 and a draft final version is pending issuance by the Navy. Revise the RU-C4 sub-section and Table 4-8 to identify the next steps related to this planned investigation	See response to General Comment #8 and Specific Comment #5.
8	Specific	**Section 4.4.1.1, Parcel C Remedy Implementation, Groundwater Monitoring:** Revise the fifth bullet of the RU-C5 sub-section to include the conclusion made within the draft 2022 RAMR that "visual trends for source area monitoring well concentrations generally indicate that while some COCs initially decreased in concentration immediately after the 2021 RA, most have rebounded and some have increased above concentrations before the RA." Revise the text to include that additional RAs will be necessary if this increasing trend is confirmed, following additional monitoring.	The requested language has been added at the end of the referenced bullet as follows: Visual trends for source area monitoring well concentrations generally indicate that while some COCs initially decreased in concentration immediately after the 2021 RA, most have rebounded and some have increased above concentrations before the RA. The need for additional RAs will be evaluated based on the decision criteria established in the RAMP.
9	Specific	**Section 4.5.1.1, Question A, Parcel C:** Revise this sub-section to (1) acknowledge that additional investigations and RAs under the 2010 ROD are needed for RU-C1, RU-C2, RU-C4, and RU-C5 and (2) provide a timeline for completion of these required activities. Update Table 4-8 to reflect revisions to text.	See response to General Comment #8 and Specific Comment #5.

No.	Location	City & County of San Francisco Comments Dated: May 14, 2024	Navy Response
10	Specific	**Section 5.4.4.1, Parcel G Remedy Implementation, Groundwater Monitoring:** Revise this sub- section to describe the Parcel E IR-36 plume continuation onto Parcel G and the planned RA. Update applicable Parcel G figures to show plume continuation.	A review of Parcel E IR-36 data collected as part of the BGMP shows that the only exceedances within the last 7 years are for vinyl chloride in monitoring well IR36MW237A. The last time it exceeded was in 2020 and the exceedance was delineated by other IR36 A-aquifer monitoring wells so there is no reason to think it is going into Parcel G. The remedial action for IR-36, Building 406 is described throughout Section 6.4.1.1 Parcel E Remedy Implementation.
11	Specific	**Section 5.6.1.3, Site Management Strategy:** Revise this sub-section to provide further details regarding the meaning of the second bullet point (i.e., "The Navy is also planning to optimize…"). What are the Navy's intentions? If possible, include a specific example.	Optimize, in this case, means to balance the cost of continued monitoring at the frequency and locations with the land use. It could mean decreasing or increasing depending on whether land use changes that could affect exposure. For example, reducing monitoring frequency when the parcel is awaiting transfer and is generally unused and increasing frequency upon transfer and land use changes from construction or other activities.
12	Specific	**Section 6.4.1.1, Parcel E Remedy Implementation, Soil Excavation and Removal:** Revise the first sentence of the second paragraph as follows – "…or upon the Navy's determination to limit excavation [with approval provided in writing by the FFA regulatory parties]." Additionally, include example criteria which might result in the Navy proposing to limit planned excavations.	This clarification was added as requested. There are no example criteria at this time and excavation limitations will be handled on a case by case basis.
13	Specific	**Section 6.4.2.1, Parcel E-2 Remedy Implementation, Belowground Barrier (Slurry Walls):** Revise this sub-section to incorporate an acknowledgement, as previously noted by the FFA regulatory parties, that (1) the installed Upland Slurry Wall (USW) deviated from its original design and is not functioning properly. Discuss both the deviation and the current measures the Navy is taking to address this matter.	Additional information about the concerns raised by the FFA regulatory parties about the upland slurry wall has been added to the Technical Assessment Question A (6.5.1): • **Concern: The Upland Slurry Wall was not installed as designed**. Geologic refusal was met along a 200-foot section of the planned wall at approximately 0 feet msl (10 feet shallower than the designed depth). The slurry wall was designed to minimize flow of offsite groundwater into the landfill and was designed as a "hanging wall" (not embedded into bedrock) with a french drain (which was installed according to the design) to prevent precipitation recharge and divert flow to the freshwater wetland. The material encountered was

No.	Location	City & County of San Francisco Comments Dated: May 14, 2024	Navy Response

			determined to be bedrock which has a lower permeability than the surrounding aquifer material. The draft final work plan to evaluate the Upland Slurry Wall performance is currently under way and work is anticipated to begin in 2025.
			
			Because the remedy is complex and requires multiple phases for installation over a longer timeframe, the Navy has identified the following additional Other Findings (new section 6.6.1.5) to document the Navy's commitment to continue to construct the remedy as well as evaluate available performance data for the remedy components that are in place:
			
			6.6.1.5 Parcel E-2 Other Findings
			
			The remedy at Parcel E-2 is complex and involves multiple phases of field work to install. A number of facilities that are important to understanding groundwater flow and contaminant concentrations have been completed or are substantially completed (for example, Nearshore Slurry Wall and landfill cover). The following is a summary of the remaining RA work, interim studies, and key milestones planned prior to completing the RACR:
			
			• Construct remaining components of the remedy including the permanent landfill gas system, freshwater and tidal wetlands, and groundwater monitoring network under the approved Final Work Plan (KEMRON, 2018):
			  o Landfill Gas System (Phase IVa) anticipated in 11/30/2025
			  o Wetlands (Phase IVb) anticipated in 11/30/2027
			• Modify the landfill gas monitoring program to include a monitoring probe (GMP54) outside of the newly installed landfill cover as a new compliance point by revising the appropriate primary document(s). The primary document(s) needing revision and the proposed schedule for revision will be further discussed with the FFA Regulatory Parties not later than 9/30/2024.
			• Document completion of the protective liner and final cover installation in the Phase III Remedial Action Construction Summary Report anticipated by 11/30/2024.

No.	Location	City & County of San Francisco Comments Dated: May 14, 2024	Navy Response
			• Conduct a study to evaluate the performance of the upland slurry wall as documented in the Post-Remedial Action Performance Evaluation Work Plan to evaluate the performance of the Upland Slurry Wall – Final 8/31/2024. Fieldwork is anticipated to be completed in 2024 and the Post-Construction Remedial Action Performance Report is anticipated by 12/31/2024.

City and County of San Francisco
DEPARTMENT OF PUBLIC HEALTH
ENVIRONMENTAL HEALTH

London N. Breed, Mayor
Grant Colfax, MD, Director of Health
Patrick Fosdahl, MS, REHS
Director, Environmental Health

July 18, 2024

Michael Pound
BRAC Environmental Coordinator, Hunters Point Shipyard
Base Realignment and Closure
Program Management Office West
33000 Nixie Way, Building 50, Suite 207
San Diego, CA 92147

Subject: **SFDPH Comments on the Draft Final Fifth Five-Year Review Report, Hunters Point Naval Shipyard, San Francisco, California, Dated July 2024**

Dear Michael Pound:

The following comments are made with respect to the Navy's responses (received on July 2, 2024) to our May 14, 2024, comment letter (SFDPH Comments on the Draft Fifth Five-Year Review Report). As of the date of this letter, we have not received the Navy's responses to our April 12, 2024, comment letter (SFDPH Preliminary Comments on the Draft Climate Resilience Assessment, Appendix A of the Draft Fifth Five Year Review Report).

General Comments:

1. **Comment in Response to General Comment #3 – Maintenance & Repair of Durable Covers:** Given that subsidence areas are not limited to Parcel C, revise the Remedy Operations and Maintenance sections for Parcels B and D-1 to include shoreline assessments as well. Include the statement added to Section 4.4.1.2 that, "[t]he Navy is currently conducting a shoreline assessment study to identify and recommend repairs and/or stabilization of structures and shoreline." Continued subsidence without preventative maintenance or repairs will have an unacceptable impact on the long-term effectiveness of the durable cover remedy. We recommend that the Navy also considers conducting a base-wide shoreline assessment given that subsidence areas may be occurring with a greater frequency in recent years.

2. **Comment in Response to General Comment #5 – General Climate Resilience Assessment Hazards:** We appreciate the Navy's inclusion of key climate change milestones within the Draft Final Fifth Five-Year Review (FYR) Report. Given the importance of sea level rise (SLR) and groundwater rise (GWR) for the future redevelopment of the Shipyard and the collaborative partnership between the City and the Navy, we look forward to participating in the Scoping and Prioritization Meeting on November 30, 2024. As the future recipients of the property, and given that SLR/GWR issues will continue post-transfer, it is critical for the City to understand and contribute to the design and scoping of the site-specific studies and eventual installation of mitigation measures. We look forward to actively contributing our expertise and insights during this process.

3. **Comment in Response to General Comment #6 – Sea Wall and Shoreline Revetment:** The geotechnical stability of the sea wall and shoreline revetments have the potential to be impacted

HUNTERS POINT SHIPYARD PROGRAM
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Michael Pound
SFDPH Comments on the Draft Final Fifth Five Year Review Report, Hunters Point Naval Shipyard, San Francisco, California, Dated July 2024

under predicted SLR and GWR scenarios, calling into question the long-term protectiveness of the remedy. The Navy should include an assessment of this potential risk in the site-specific studies, including an updated geotechnical stability analysis, if warranted.

4. **Comment in Response to General Comment #9 – Building Demolition:** We understand that work plans for building demolition have not been developed yet and therefore those details are not included as part of this FYR Report. However, at minimum, the Navy should commit to (1) an assessment of potential soil-lead hazards in shallow soil adjacent to buildings with lead-based paint in areas proposed for future residential use in the 2018 Redevelopment Plan, and (2) installing durable covers in former building footprints to ensure remedy completeness.

5. **Comment in Response to General Comment #14 – Technical Assessment "Question B":** Per the Navy's response, we understand that remedial goal/chemical data was not compared to the current risk-based screening levels because the evaluation of protectiveness was performed by evaluating the protectiveness of the remedy. However, the EPA's FYR Guidance[1] recommends evaluating changes in standards and risk prior to evaluating whether the remedy remains protective. Changes in risk-based concentration levels, particularly those based on toxicity criteria, which might result in orders of magnitude changes to the remedial goals (e.g., trichloroethene, vinyl chloride), are important considerations for the long-term protectiveness of the remedy and future redevelopment activities. These changes need to be evaluated in a timely manner and presented transparently. Delaying the re-evaluation of the protectiveness of the remedy due to changes in risk-based levels may result in unexpected additional cleanup activities, which could extend property transfer timeframes and eventual redevelopment. We urge the Navy to follow the EPA's FYR Guidance and perform the re-evaluation prior to the next FYR Report.

   Additionally, the Navy's conclusions relevant to potential construction worker exposure (e.g., utility workers) appear to conflict with remedial action objectives that prioritize cleanup rather than risk management. We ask that the Navy provide an additional evaluation prior to the next FYR Report of this updated exposure scenario so that the City can review and comment on the proposed risk management approach.

6. **Comment in Response to General Comment #16 – Redevelopment Plan Reference:** Revise the note on Figure 1-3 to as follows: "[The] Land Use Districts shown on this figure were applicable at the time [when] risk evaluations and [the] development of institutional controls for future use were completed [and may not be reflective of the current 2018 Redevelopment Plan]." for clarification. In addition to updating the citations in the FYR Report, revise the following sections to reflect the land uses described within the 2018 Redevelopment Plan:

   a. Revise Section 3.2.2.2 as follows: "Based on the City and County of San Francisco's reuse plan as currently amended (SFRA, 1997; OCII, 2018), Parcel B [land uses will include residential, institutional, retail sales and services, civic, arts and entertainment, parks and recreation, and office uses. The land use at IR-07/18 will be limited to parks and open space.]"

   b. Revise Section 4.2.2.2 as follows: "According to the Redevelopment Plan (SFRA, 1997; OCII, 2018), Parcel C [land uses will include office and industrial, multi-media and digital arts, hotel, retail sales and services, residential (select areas; see redevelopment plan), civic, arts and

[1] USEPA, 2001. Comprehensive Five-Year Review Guidance, OSWER 9355.7-03B-P. June.

Michael Pound
SFDPH Comments on the Draft Final Fifth Five Year Review Report, Hunters Point Naval Shipyard, San Francisco, California, Dated July 2024

entertainment, parks and recreation, and institutional uses.] The area along the eastern portion of Parcel C bounded by the bay will be set aside [for parks and] open space."

c. Revise Section 5.2.2.2 as follows: "According to the Redevelopment Plan (SFRA, 1997; OCII, 2018), Parcel D-1 [land use will predominantly include parks and open space; however, land use in the northern portion of the parcel will be identical to Parcels D-2, G, and UC-1. Land use at Parcels D-2, G, and UC-1 will include office and industrial, hotel, infrastructure/utility, multi-media and digital arts, institutional, civic, arts and entertainment, residential, parks and recreation uses (if not subject to applicable environmental restrictions).]"

d. Revise Section 6.2.2.2 as follows: "[According to the Redevelopment Plan (SFRA, 1997; OCII, 2018), Parcel E land use will include office and industrial, hotel, infrastructure/utility, multi-media and digital arts, institutional, civic, arts and entertainment, residential, and parks and recreation uses (if not subject to applicable environmental restrictions). The land use at Parcel E-2 will be limited to parks and open space.]"

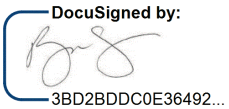
Specific Comments:

1. **Comment in Response to Specific Comment #11 – Section 5.6.1.3, Site Management Strategy:** We appreciate the Navy's clarification in their response. Please revise the second bullet in Section 5.6.1.3 to include this explanation (i.e., "Optimize...means to balance the cost of continued monitoring at the frequency and locations within the land use. It could mean decreasing or increasing depending on whether land use changes that could affect exposure...").

Additional Comments:

1. **Issues Recommendations and Follow-up Actions Tables:** The Issues, Recommendations and Follow-up Actions tables in Sections 3.0 through 6.0 are a useful tool for tracking and understanding important ongoing issues within each Parcel that require assessment within the FYR framework. We recommend that the Navy include the following issues in the tables: PFAS remedial investigation activities, site-specific climate resilience assessments, shoreline assessment for subsidence areas, changes to areas requiring institutional controls (ARICs) for VOCs, and tabulated chemical of concern (COC) concentrations for future use by health and safety professionals (as stated in the Site Management Strategy sections).

Sincerely,



Ryan Casey, P.E.
Administrative Engineer

CC: Danielle Janda, Navy
Erica Schmandt, Navy
Jamie Egan, Jacobs
Andrew Bain, USEPA
Michael Howley, DTSC
Mary Snow, RWQCB
Susan Philip, DPH
Thor Kaslofsky, OCII
Lila Hussain, OCII
Christina Rain, Langan
Randy Brandt, Geosyntec

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Response to Comments	Contract/CTO N62470-21-D-0007; Contract Task Order No. N6247322F4930	Responses By Navy	
Comment By **City & County of San Francisco**	Code/Organization **DPH**	Date July 2024	
Project Title and Location **SFDPH Comments on the Draft Final Fifth Five-Year Review Report, Hunters Point Naval Shipyard, San Francisco, California, Dated July 2024**		**Type of Review**	
		X	Draft
			Final
			Other

No.	Location	City & County of San Francisco Comments Dated: July 18, 2024	Navy Response
1	General	**Comment in Response to General Comment #3 – Maintenance & Repair of Durable Covers** Given that subsidence areas are not limited to Parcel C, revise the Remedy Operations and Maintenance sections for Parcels B and D-1 to include shoreline assessments as well. Include the statement added to Section 4.4.1.2 that, "[t]he Navy is currently conducting a shoreline assessment study to identify and recommend repairs and/or stabilization of structures and shoreline." Continued subsidence without preventative maintenance or repairs will have an unacceptable impact on the long-term effectiveness of the durable cover remedy. We recommend that the Navy also considers conducting a base-wide shoreline assessment given that subsidence areas may be occurring with a greater frequency in recent years.	This language was added to Sections 3.4.2.2 (Parcel B-1), 3.4.2.3 (Parcel B-2), and 5.4.1.2 (Parcel D-1).

No.	Location	City & County of San Francisco Comments Dated: July 18, 2024	Navy Response
2		**Comment in Response to General Comment #5 – General Climate Resilience Assessment Hazards:** We appreciate the Navy's inclusion of key climate change milestones within the Draft Final Fifth Five-Year Review (FYR) Report. Given the importance of sea level rise (SLR) and groundwater rise (GWR) for the future redevelopment of the Shipyard and the collaborative partnership between the City and the Navy, we look forward to participating in the Scoping and Prioritization Meeting on November 30, 2024. As the future recipients of the property, and given that SLR/GWR issues will continue post-transfer, it is critical for the City to understand and contribute to the design and scoping of the site-specific studies and eventual installation of mitigation measures. We look forward to actively contributing our expertise and insights during this process.	Comment Acknowledged
3	General	**Comment in Response to General Comment #6 – Sea Wall and Shoreline Revetment** The geotechnical stability of the sea wall and shoreline revetments have the potential to be impacted under predicted SLR and GWR scenarios, calling into question the long-term protectiveness of the remedy. The Navy should include an assessment of this potential risk in the site-specific studies, including an updated geotechnical stability analysis, if warranted.	Comment Acknowledged
4	General	**Comment in Response to General Comment #9 – Building Demolition** We understand that work plans for building demolition have not been developed yet and therefore those details are not included as part of this FYR Report. However, at minimum, the Navy should commit to (1) an assessment of potential soil-lead hazards in shallow soil adjacent to buildings with lead-based paint in areas proposed for future residential use in the 2018 Redevelopment Plan, and (2) installing durable covers in former building footprints to ensure remedy completeness.	Comment acknowledged

No.	Location	City & County of San Francisco Comments Dated: July 18, 2024	Navy Response
5	General	**Comment in Response to General Comment #14 – Technical Assessment "Question B"** Per the Navy's response, we understand that remedial goal/chemical data was not compared to the current risk-based screening levels because the evaluation of protectiveness was performed by evaluating the protectiveness of the remedy. However, the EPA's FYR Guidance[1] recommends evaluating changes in standards and risk prior to evaluating whether the remedy remains protective. Changes in risk-based concentration levels, particularly those based on toxicity criteria, which might result in orders of magnitude changes to the remedial goals (e.g., trichloroethene, vinyl chloride), are important considerations for the long-term protectiveness of the remedy and future redevelopment activities. These changes need to be evaluated in a timely manner and presented transparently. Delaying the re-evaluation of the protectiveness of the remedy due to changes in risk-based levels may result in unexpected additional cleanup activities, which could extend property transfer timeframes and eventual redevelopment. We urge the Navy to follow the EPA's FYR Guidance and perform the re-evaluation prior to the next FYR Report. Additionally, the Navy's conclusions relevant to potential construction worker exposure (e.g., utility workers) appear to conflict with remedial action objectives that prioritize cleanup rather than risk management. We ask that the Navy provide an additional evaluation prior to the next FYR Report of this updated exposure scenario so that the City can review and comment on the proposed risk management approach. [1] USEPA, 2001. Comprehensive Five-Year Review Guidance, OSWER 9355.7-03B-P. June.	Comment acknowledged. The Navy would like to clarify that the RGs/concentrations were compared to the current risk-based screening levels for groundwater because the remedies are ongoing and the goal is to meet the RGs. They were not evaluated for soil because changes in the toxicity for soil COCs does not affect remedy protectiveness because the remedy is to prevent exposure to soil with COCs above the RG through durable covers, which are implemented parcel-wide and ICs require maintenance of these covers to continue to prevent exposure to COCs in soil. Regarding the construction worker scenario. The Five-Year Review acknowledges the potential changes in toxicity but again, these changes are accounted for by the ICs as discussed in the following text in Technical Assessment Question B: *However, those changes will not affect the RGs for the construction worker scenario identified in the ROD because ICs require identification and management of potential risks to construction workers through the preparation and approval of plans and specifications for all construction activities that may pose unacceptable exposure to construction workers.*

No.	Location	City & County of San Francisco Comments Dated: July 18, 2024	Navy Response
6	General	**Comment in Response to General Comment #16 – Redevelopment Plan Reference** Revise the note on Figure 1-3 to as follows: "[The] Land Use Districts shown on this figure were applicable at the time [when] risk evaluations and [the] development of institutional controls for future use were completed [and may not be reflective of the current 2018 Redevelopment Plan]." For clarification. In addition to updating the citations in the FYR Report, revise the following sections to reflect the land uses described within the 2018 Redevelopment Plan: Revise Section 3.2.2.2 as follows: "Based on the City and County of San Francisco's reuse plan as currently amended (SFRA, 1997; OCII, 2018), Parcel B [land uses will include residential, institutional, retail sales and services, civic, arts and entertainment, parks and recreation, and office uses. The land use at IR-07/18 will be limited to parks and open space.]" Revise Section 4.2.2.2 as follows: "According to the Redevelopment Plan (SFRA, 1997; OCII, 2018), Parcel C [land uses will include office and industrial, multi-media and digital arts, hotel, retail sales and services, residential (select areas; see redevelopment plan), civic, arts and entertainment, parks and recreation, and institutional uses.] The area along the eastern portion of Parcel C bounded by the bay will be set aside [for parks and] open space." Revise Section 5.2.2.2 as follows: "According to the Redevelopment Plan (SFRA, 1997; OCII, 2018), Parcel D-1 [land use will predominantly include parks and open space; however, land use in the northern portion of the parcel will be identical to Parcels D-2, G, and UC-1. Land use at Parcels D-2, G, and UC-1 will include office and industrial, hotel, infrastructure/utility, multi-media and digital arts, institutional, civic, arts and entertainment, residential, parks and recreation uses (if not subject to applicable environmental restrictions).]" Revise Section 6.2.2.2 as follows: "[According to the Redevelopment Plan (SFRA, 1997; OCII, 2018), Parcel E land use will include office and industrial, hotel, infrastructure/utility, multimedia and digital arts, institutional, civic, arts and entertainment, residential, and parks and recreation uses (if not	The changes have been made as requested.

No.	Location	City & County of San Francisco Comments Dated: July 18, 2024	Navy Response
		subject to applicable environmental restrictions). The land use at Parcel E-2 will be limited to parks and open space.]"	
1	Specific	**Comment in Response to Specific Comment #11 – Section 5.6.1.3, Site Management Strategy** We appreciate the Navy's clarification in their response. Please revise the second bullet in Section 5.6.1.3 to include this explanation (i.e., "Optimize...means to balance the cost of continued monitoring at the frequency and locations within the land use. It could mean decreasing or increasing depending on whether land use changes that could affect exposure...").	Revision was made as requested.
1	Additional	**Issues Recommendations and Follow-up Actions Tables:** The Issues, Recommendations and Follow-up Actions tables in Sections 3.0 through 6.0 are a useful tool for tracking and understanding important ongoing issues within each Parcel that require assessment within the FYR framework. We recommend that the Navy include the following issues in the tables: PFAS remedial investigation activities, site-specific climate resilience assessments, shoreline assessment for subsidence areas, changes to areas requiring institutional controls (ARICs) for VOCs, and tabulated chemical of concern (COC) concentrations for future use by health and safety professionals (as stated in the Site Management Strategy sections).	Comment acknowledged. The Issues, Recommendations, and Follow-up Actions tables for each section are specific to issues affecting protectiveness. The Navy has added these "Other Findings" (findings in the Five-Year Review that are relevant to the Navy, Agencies, and/or Stakeholders but that do not affect protectiveness) to the Five-Year Review summary form in the Executive Summary.

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Appendix K
Responses to Public Comments on Draft Five-Year Review Report and Climate Resilience Assessment

(*Per Navy guidance, all personal identifiable information received from private citizens was removed from Appendix K to help protect the privacy of the private citizens who submitted comments on the Draft Fifth Five-Year Review. Types of information removed included names, e-mail address, mailing addresses, phone numbers, etc.*)

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Review On Fifth Five-Year Review Hunters Point Naval Shipyard Report By ALL THINGS BAYVIEW

1. Parcel Division and Cleanup Oversight Concern: Although dividing the site into parcels enables focused cleanup operations, this strategy may inadvertently lead to gaps in managing cross-parcel contamination risks and achieving a comprehensive ecosystem restoration. The potential for contaminants to migrate between parcels due to factors like water flow, air transport, and human activities poses a challenge to the isolated parcel approach. Moreover, the current strategy may not fully account for the interconnectedness of the ecosystem, potentially overlooking opportunities for holistic environmental recovery.

To enhance the effectiveness of the remediation efforts at HPNS, there is a pressing need for a more cohesive strategy that bridges the gaps between individual parcel cleanup efforts. A concerted effort to understand and mitigate cross-parcel contamination risks is imperative. This would involve detailed mapping of contamination flow paths, robust monitoring systems to track the movement of pollutants across parcel boundaries, and collaborative remediation plans that address the site's environmental challenges in a unified manner. Furthermore, adopting an ecosystem-based approach to restoration could offer a more comprehensive solution, one that not only focuses on removing contaminants but also on restoring the natural habitat and biodiversity of the area. Such an approach would acknowledge the interdependence of soil, water, and biological resources across the site, aiming for a restoration outcome that revitalizes the entire HPNS ecosystem. This shift towards integrated management and ecosystem-based restoration strategies would not only address the immediate concerns of contamination and environmental degradation but also pave the way for a sustainable future for HPNS, turning it into a model for large-scale environmental remediation projects.

2. Strengthening Radiological Safety and Expanding Climate Resilience

The proactive stance towards radiological safety and climate resilience within the Hunters Point Naval Shipyard (HPNS) remediation efforts marks a significant advancement in addressing long-term environmental and health risks. Setting explicit timelines for the retesting of radiological conditions signifies a commitment to thoroughness and transparency, ensuring public trust in the remediation process. Similarly, incorporating climate change projections into the planning stages reflects an acknowledgment of the evolving nature of environmental risks and the need for adaptive remediation strategies.

The identification of Radiological Objects (ROs) raises questions about the initial assessment of radiological hazards and suggests that these risks may have been underestimated. This discovery highlights the complexity of radiological contamination and the challenges in predicting its full extent. Concurrently, while the initiatives for climate resilience are commendable, they currently offer a narrow focus on specific climate change effects, potentially overlooking broader ecological and environmental impacts that could influence the site's remediation effectiveness in the long term.

Addressing these concerns necessitates a multifaceted approach. For radiological safety, it is imperative to refine assessment protocols to encompass a broader spectrum of potential hazards, including those that may not have been fully considered in previous evaluations. This involves not only a thorough re-examination of known contaminated areas but also a proactive search for previously unidentified radiological hazards, using advanced detection technologies and methodologies. Enhancing the radiological assessment framework will ensure a more accurate understanding of the site’s conditions, enabling the formulation of comprehensive remediation strategies.

Regarding climate resilience, expanding the scope of planning to cover a wider array of climate impact scenarios is essential. This expansion should include considerations of how different climate change outcomes, such as increased precipitation, temperature fluctuations, and extreme weather events, could interact with the site’s specific environmental and contamination dynamics. Integrating these broader climate projections into the remediation planning process will allow for the development of more robust and flexible strategies, capable of adapting to a range of future conditions. Strengthening the site’s resilience to climate change not only protects the progress of the remediation efforts but also ensures the long-term safety and health of the surrounding community and ecosystem.

3. Enhancing Community Engagement and Clarity in Protectiveness Statements

The efforts towards robust community engagement and the provision of detailed protectiveness statements for each parcel at Hunters Point Naval Shipyard (HPNS) significantly contribute to the transparency and integrity of the remediation process. These actions are fundamental in building and maintaining trust with the Bayview community, providing residents with a clear understanding of the safety and environmental health of their surroundings. The detailed protectiveness

statements serve as a crucial communication tool, offering insights into the current state and effectiveness of the remediation measures in place.

While the report outlines commendable steps towards community engagement and clarity in the remediation's effectiveness, there remains a gap in facilitating deeper, more meaningful community participation in the remediation oversight and decision-making processes. The current engagement strategies may not fully capture the breadth of community concerns or allow for their substantive influence on remedial planning and execution. This gap highlights a missed opportunity for leveraging community insights and fostering a collaborative remediation effort.

Addressing this concern necessitates the establishment of a community advisory board that is integrally involved in the remediation process. This board should comprise diverse community representatives, including residents, local business owners, environmental activists, and public health experts, ensuring a broad spectrum of perspectives and concerns are represented. By playing an active role in reviewing and providing feedback on remediation plans, progress reports, and protectiveness statements, the community advisory board would ensure that the voices of those most affected by the site's environmental issues are not just heard but are influential in shaping remediation efforts. Such a board would act as a bridge between the Navy, remediation teams, and the community, enhancing the transparency, accountability, and responsiveness of the cleanup process. It would also serve to validate the remediation's progress and effectiveness from a community perspective, thereby strengthening public trust and cooperation in achieving a safe and healthy environment for Bayview residents.

4. Advancing Sustainability in Redevelopment Efforts

The transition of various parcels at Hunters Point Naval Shipyard (HPNS) towards the completion of their remediation phases brings into focus the opportunity for sustainable redevelopment. This pivotal phase represents not just an endpoint for cleanup efforts but the beginning of a transformative journey towards a rejuvenated and sustainable landscape. The emphasis on embedding sustainability principles within the redevelopment plans is commendable, indicating a holistic vision that extends beyond remediation to include the future vitality and resilience of the community and environment.

While the strategic intent to incorporate sustainability into the redevelopment of HPNS is clear, there is a noticeable gap in the explicit detailing of these sustainability principles within the planning documents. Specifically, there's a need for greater clarity on the integration of green infrastructure, the utilization of renewable energy sources, and the creation of community-accessible green spaces. The current level of detail may not sufficiently convey the depth of commitment to environmental sustainability or provide a clear roadmap for achieving these objectives.

To bridge this gap, it is imperative that the redevelopment plans not only espouse the principles of sustainability but also lay out a concrete strategy complete with specific targets, benchmarks, and timelines. This strategy should detail the incorporation of green infrastructure elements, such as permeable pavements, rain gardens, and green roofs, that contribute to stormwater management and biodiversity. Similarly, the plans should explicitly address the integration of renewable energy solutions, aiming to significantly reduce the carbon footprint of new developments. Furthermore, the commitment to creating community-accessible green spaces should be elaborated, specifying the extent, features, and accessibility of these spaces to ensure they meet the recreational and social needs of the community while enhancing local ecology.

By articulating these sustainability targets and benchmarks with greater specificity, HPNS redevelopment plans will not only align with global best practices in urban renewal and environmental stewardship but also resonate more deeply with community aspirations for a sustainable and thriving future. This approach underscores a commitment to not just remediate past environmental damages but to reimagine and reconstruct the shipyard area as a model of sustainable urban living, thereby setting a benchmark for similar projects worldwide.

5. To augment the ongoing efforts, it is crucial to integrate these enhancements:

- Developing more robust mechanisms for community involvement to ensure their voices significantly influence remediation planning and decision-making processes.

- Clear articulation of sustainability principles in the redevelopment of parcels, with specific targets and benchmarks that align with environmental sustainability and community well-being goals.

All Things Bayview

Continued Public Comments on the Navy's FYR 4/5/2024

1. Given the concentration of existing toxic contamination sites, it is pertinent to project hazards based on more than conservation projections. Closed sites where clean up may or may not occur in the future contains residual contaminants and will be vulnerable to rising groundwater.

2. Only one parcel is identified as being impacted by permanent groundwater emergence in the near- term (2035). We urge the Navy to consider the work of Dr. Raymond Tompkins that examines past and present-day vulnerabilities and the risk assessment of unpredictable, toxic plume migration.

3. Transient climate change phenomena have a high probability of occurring and causing damage within these parcels. More should be done in terms of preventative climate resilience in addition to regular maintenance, specifically the installation of climate resilient infrastructure.

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COMMENTS to the *HPNS DRAFT FIFTH FIVE YEAR REVIEW REPORT*

Submitted via email to: **HPNS_FYR_Comments@us.navy.mil**

Berkeley Law's Environmental Law Clinic submits these comments to the Navy's *Draft Fifth Five Year Review Report*, Hunters Point Naval Shipyard ("HPNS" or "Shipyard") San Francisco, California, November 2023 ("*Draft Review*"), on behalf of Greenaction for Health and Environmental Justice ("Greenaction") and its members and constituents in Bayview Hunters Point, San Francisco, and other communities around San Francisco Bay.

I. INTRODUCTION

Greenaction is a multiracial grassroots organization founded and led by local leaders from low-income and working class urban, rural, and indigenous communities. Its mission is to fight environmental racism and injustice and build a clean, healthy, and just future for all. Greenaction has been involved in health and environmental justice advocacy in Bayview Hunters Point ("BVHP"), a community disproportionately impacted by pollution, since Greenaction was founded in 1997. BVHP residents have borne the brunt of the impacts of the toxic and radioactive waste at the Shipyard. As such, they have a direct, personal, and long-standing interest in assuring a cleanup of the Superfund site that protects human health and the environment in the short and long term.

The *Draft Review's* Climate Resilience Assessment ("CRA") is inadequate. It fails to use the most current data and projects forward only to 2065, an arbitrary date supported by no rationally defensible reasons when the planned Shipyard development will be occupied well beyond that date.

The *Draft Review's* radiological sections are flawed and fundamentally dishonest.

The Comprehensive Environmental Response, Compensation, and Liability Act ("CERCLA"), 42 U.S.C. 9601, *et. seq*., the National Contingency Plan ("NCP"), 40 C.F.R 300.400, *et. seq*., and the Federal Facilities Agreement ("FFA"),[1] govern this cleanup. They require that responsible parties act in good faith; there is an inherent obligation to tell the truth. For example, cleanup decisions must be supported by facts, by data in the record. Those facts must be true, not fraudulent, or misleading.

Instead of acting in good faith, the Navy has consistently misled the public throughout the cleanup, a practice it unfortunately continues in its *Draft Review*.

[1] *Federal Facilities Agreement for Naval Station Treasure Island – Hunters Point Annex* ("FFA").

A glaring example of the Navy's bad faith is that, despite five years' notice and without factual or legal justification, it simply ignored the statutory deadline for its *Fourth Five Year Review ("Fourth FYR")*, publishing it approximately nine (9) months late. The Navy further violated the law by publishing three *Fourth FYR Addenda*, the last of which issued approximately twenty (20) months after the deadline. Now, the Navy has the audacity to grant itself an ongoing extension, to institutionalize its *Fourth FYR* deadline violations by repeating them in its *Draft Review*. Rather than reverting to the lawful deadline, November 8, 2023, which the Navy has already blown past, the Navy says it will publish its *Final Fifth FYR* in July 2024.

The Navy's treatment of Congressionally mandated deadlines illustrates the contempt it has shown for the law throughout this cleanup.

The Navy's primary five-year review obligation is to assure the remedy remains protective. The Navy generally claims radiological remedies "will be protective,"[1] when radiological retesting is done. However, the Navy has no factual basis for those claims.

Undisclosed in the *Draft Review* is that the Navy's radiological contractor, Tetra Tech EC, Inc., (TtEC") committed fraud, all its data had to be discarded, and the Navy only intends to retest one-third of the soil remediation Tetra Tech did. Even if that one-third retesting found no contamination – which it **has** in all three Parcels undergoing retesting to date – the Navy would have no data on which to base a protectiveness determination in the other two-thirds.

Greenaction, among others, has always insisted that 100% retesting of Tetra Tech's work is necessary to rectify the fraud. The *Draft Review* is not honest enough to even mention the distinction between one-third retesting and 100% retesting or its significance to protectiveness.

CERCLA requires 100% retesting. Without it, a data-driven long-term protectiveness determination is impossible.

As described further below, the Navy's own agreement also requires 100% retesting. But the Navy has spent the last three years attempting to **invalidate its own data**! Characteristically, the *Draft Review* fails to even acknowledge the agreement, that retesting in 2021 found radiological contamination triggering 100% retesting, or that the Navy has reneged on its agreement in violation of the retesting work plans.

If the Navy insists it will do only one-third soil retesting, it must articulate what data it is relying on in making any representations about protectiveness of the two-thirds of soil it did not or will not test.

[1] See Table 1.1.

II. RADIOLOGICAL COMMENTS

A. All Shipyard Sites Should Be Identified As "Radiologically Impacted" Until Demonstrated Otherwise

Much of the radioactive contamination at HPNS comes from sandblasting ships involved in atomic weapons testing, leaving dangerous residual radioactive contamination at the site, and from the Naval Radiological Defense Laboratory (NRDL), which operated from 1948 to 1960. Radioactive contamination was spread through the Shipyard by air, water, and other activities (i.e., physical tracking from truck tires, shoes, and animals) at a time when little thought was given to containing radiation and there were few safety precautions.

Radioactive contamination did not neatly conform to the artificial boundaries of the Shipyard or, within it, to the boundaries of Parcels the Navy assigned in later decades to facilitate the cleanup.

Furthermore, the Navy has repeatedly declared – definitively – that Shipyard sites were **not** radioactively contaminated when that turned out not to be true. For example, the Parcel B Record of Decision identified no radiological impacts in Parcel B, requiring no radiological remediation.

But the Navy was dangerously wrong; Parcel B **was** radiologically impacted. The ROD had to be amended to address radiological contamination and remediation.

More recently, the *Draft Review* admits that:

> ROs [radiological objects] were identified during excavation and remediation of soil in areas **that were not considered radiologically impacted**. There is a high degree of confidence that discrete ROs were removed to a depth of 2 feet below ground surface (bgs). However, there is a potential for ROs to be present in material below 2 feet bgs where shoreline expansion has occurred since 1946. (Emphasis added, p. 5-37.)

The unexpected nature of this discovery highlights that the Navy has not properly characterized whether all Shipyard locations are radiologically "impacted." It must revisit the issue in light of the facts and identify all parcels and sites as "radiologically impacted," until and unless it can demonstrate with defensible scientific data that any particular site is not impacted.

The Navy must test for radioactive contamination in all areas of the Shipyard and because radiation may have been spread beyond the Shipyard, beyond its boundaries, as well.

B. The Navy Continues to Mislead the Public

The Navy's contempt for the law and its agreements extends to the Navy's public participation obligations. By continuing to mislead, the Navy deprives the public of the ability to comment meaningfully on the Navy's *Draft Review*.

The Navy misleads primarily through omission. A reader of the *Draft Review* and the two *FYRs* that preceded it would never learn about TtEC's fraud, for example. The Navy did not mention it in the *Third* or *Fourth FYRs*.

Accordingly, in its 2018 comments to the *Draft Fourth FYR*, Greenaction stated: "The Navy must not be allowed to mislead the public and regulators by dismissing the fraud's impact on the clean-up."[2] Unfortunately, the *Draft Review* **continues** to ignore the impact of the fraud on the clean-up, presenting an incomplete and misleading narrative.

The Navy has misled the public by omitting the entire history of the radiological remediation, including that:

- TtEC committed fraud and violated quality assurance and quality control requirements;
- The Navy allowed TtEC to investigate and clear itself;
- The Navy defended TtEC for six years after the fraud was discovered, claiming its **invalid** data was **valid**;
- The Navy did its own evaluation of TtEC data and found much more evidence of fraud than TtEC did;
- Regulators did an independent data review and found that data from one parcel was 97% suspect, and another was 90% suspect;
- The Navy agreed, after six years of defending TtEC's data, to discard it as unreliable;
- The Navy and EPA decided, despite vociferous public objections, to a retesting plan that required only one-third soil retesting, with the proviso that if any contamination was found, that finding would trigger 100% soil retesting;
- Contamination **was** found in all three parcels retested, including 23 strontium 90 ("Sr-90") samples from 9 different Parcel G locations that exceeded the remedial goals; and
- The Navy has spent three years attempting to **invalidate** its own **valid data** to renege on its retesting agreement.

The *Draft Review* omits more than a decade of the cleanup's history. Rather than acknowledge the fraud and its impact, the Navy merely says, "evaluations determined previous data were unreliable,"[3] and cites "uncertainty with a portion of the radiological survey and remediation work."[4]

[2] Greenaction, *Comments to the* Draft 5 Year Review Hunters Point Naval Shipyard (2018), p. 12.
[3] See, for example, pp. xviii, 3-45, 4-45, 5-37, 6-57.
[4] See, for example, pp. xviii, 3-45, 4-19, 4-45, 5-16, 5-37, 6-12, 6-57.

To describe what regulators found – Parcels with 97% and 90% defective data – as "uncertainty" in a "portion" of the work is grossly misleading.

Considering that EPA and others, including Greenaction, have repeatedly pointed out these omissions through multiple *FYRs*, these omissions are clearly intentional.

In sum, the Navy omits any facts that do not support its desired conclusion: that no further remediation will be required no matter what retesting finds.

C. Radiological Retesting

The Navy proposed and EPA approved three related work plans to retest the TtEC's work: the June 2018, *Final Parcel G Removal Site Evaluation Work Plan*; the April 2022, *Final Parcel B Removal Site Evaluation Work Plan*; and the August 2022, *Final Parcel C Removal Site Evaluation Work Plan* (collectively, the "*Retesting Work Plans*").

The *Retesting Work Plans* each memorialized the retesting agreement:

> For Phase 1, 100 percent of soil will be re-excavated and characterized at 33 percent of trench units (TUs) associated with former sanitary sewers and storm drains in Parcel G. Soil sampling and scanning at the remaining 67 percent of TUs will be performed as part of Phase 2 to increase confidence that current site conditions comply with the Parcel G ROD RAO. **The Navy will re-excavate 100 percent of Phase 2 TUs if contamination is identified in Phase 1 TUs**. (Emphasis added.)[5]

1. Strontium-90 Exceedances Were Identified in Parcel G Retesting

Using approved EPA methods, retesting in 2021 in Parcel G found at least 23 samples, from 9 different trench units, exceeding the strontium 90 ("Sr-90") remediation goal, 0.331 picocuries per gram ("pCi/g").

Instead of accepting its own sampling results and living up to its 100% retesting agreement, the Navy made false claims about the Sr-90 results. These claims include that the results were (1) false positives; (2) within "background" radiation levels; (3) invalid data; and (4) not considered a risk to human health or the environment.

All these falsehoods served a single purpose: to invalidate the Sr-90 exceedances and avoid triggering 100% retesting.

However, EPA objected to the Navy's attempt to invalidate the Sr-90 results. In September 2021 emails obtained through the Freedom of Information Act ("FOIA"), EPA stated: "**[t]he previous strontium-90 results are valid data**. It's inaccurate to suggest the data were not

[5] *Final Parcel G Removal Site Evaluation Work Plan*, Former Hunters Point Naval Shipyard, June 2019, p. 3-5. *Final Parcel B Removal Site Evaluation Work Plan*, Former Hunters Point Naval Shipyard, April 2022, p 3-5*; Final Parcel C Removal Site Evaluation Work Plan,* Former Hunters Point Naval Shipyard, August 2022, p. 3-6.

precise enough. EPA has been clear that in the absence of convincing evidence, we cannot support using the new data to supersede existing results."[6] (Emphasis added.)

The *Draft Review* ignores the Sr-90 findings.

2. Radioactive Objects Were Found in Parcels B & C Retesting

The Navy also found radiological contamination in Parcels B and C. At a public meeting on September 25, 2023, the Navy disclosed scanning of Parcel C soil, previously "remediated" by TtEC, found an easily identifiable, radioactive "deck marker." At a public meeting on December 4, 2023, the Navy disclosed it found a radioactive object in Parcel B soil, a glass object contaminated with Radium-226.

These findings are also ignored in the *Draft Review*. Like the Sr-90 exceedances the Navy would rather not mention, these omissions indicate the Navy's determination to keep inconvenient facts out of the record.

3. The Navy Reneges on the Retesting Work Plan

Three years after the SR-90 was found exceeding remedial goals, the Navy still refuses to accept the exceedances as valid data. It has announced it is conducting an Sr-90 "verification study," which it plans to release in June 2024.[7]

There is no mention of this study in the *Draft Review*. If the Navy releases the verification study in June 2024, that will be a month **after** the comment period for the *Draft Review* closes on May 7, 2024. This precludes public comments about the Sr-90 study and deprives the public from exercising their public participation rights.

4. The Navy Violates Its Duty to Assure Protectiveness

CERCLA requires *FYRs* to "assure that human health and the environment are being protected by the remedial action being implemented" – in the present tense. (Emphasis added.)

The Navy has consistently, and improperly, deferred this requirement.

The *Draft Review* claims, "This report is intended to identify issues that may **prevent a particular remedy from functioning as designed, which could affect the protection of human health and the environment** should exposure occur." (Emphasis added, p. xv.)

But it fails to do so.

First, assurance is binary. Either the remedy meets CERCLA's long-term protectiveness standards, or it does not. The *Draft Review* makes neither of these assertions. Instead, its

[6] EPA email message to the Navy, RE: HPNS Timely Topic, Sep. 23, 2021.
[7] Navy Presentation to HPNS Citizens Advisory Committee, Strontium 90 Verification Timeline, March 25, 2024, slide 10, https://hpscac.net/wp-content/uploads/2024/03/HPNS-Update_HPSCAC_25Mar2024-1.pdf.

Protectiveness Statements misleadingly claim that remedial actions at Parcels B, C, D, and G are "short-term protective." These claims are based on access controls, such as fences, signage, and caps, to restrict access to contaminated sites.

By focusing on "short-term protectiveness," the Navy **again** improperly defers its protectiveness determination as it did in its *Fourth FYR*, which promised it would be addressed in the *Fifth FYR*.[8] Now that time has come, but rather than stating the obvious truth – that the remedy is **not** protective of human health and the environment – the Navy defers it once again, defeating the entire purpose of five year reviews.

Second, as mentioned above, the *Draft Review* ignores the single most important factor that "may prevent a particular remedy from functioning as designed, which could affect the protection of human health and the environment should exposure occur," the TtEC fraud.

Instead of addressing long-term protectiveness, the Navy makes short-term claims, as summarized in the *Draft Review*:

> Based on this Fifth Five-Year Review, the remedy at IR-07/18 is Protective, the remedies at Parcels B-1, B-2, C, UC-2, D-1, D-2, UC-1, G, and UC-3 are Short-Term Protective because there are no current uncontrolled exposures, and the remedies at Parcels E and E-2 Will be Protective upon completion of remedy construction. (p. xv.)

This passage contains no statement that the remedies are protective in the long term or, except for Parcels E and E-2, will be. Similarly, in its Protectiveness Statements, the Navy only discusses short term protectiveness, deferring the long term "until retesting is complete:"

> Radiological retesting is ongoing to **confirm** that levels in soils and structures are protective of human health. **Until retesting is complete**, short-term protectiveness is met through Navy controls such as access to the parcel through fencing, locked gates, and ICs (restricting intrusive work and maintaining durable covers). (Parenthesis in original, emphasis added, p. xix.)[9]

However, what the Navy is "confirming" is unclear. In 2018, the Navy discarded all TtEC's data, at least nominally. The Navy has no valid radiological testing data to "confirm." No long-term remedy can be protective unless 100% retesting of TtEC's work is done and any remediation it identifies as needed is completed.

Neither CERCLA nor EPA guidance allow using short-term protectiveness to substitute for long term protectiveness. CERCLA requires both. Temporary measures are insufficient to satisfy long-term protectiveness. Fencing off and/or covering over contamination is not a permanent "remedial action being implemented," they are not CERCLA removal or remedial actions. The *Draft Review* does not assure the remedy is protective for future families who may live on the Parcels for decades to come.

[8] See *Draft Review*, pp. 1-8, 1-9.
[9] See, for example, pp. xix, xx, xxi, xxii, 3-22, 3-23, 4-20, 4-21, 5-17, 5-18, 6-24.

Furthermore, as discussed further below, the Navy has failed to demonstrate that its remedial goals for buildings and soil meet the current CERCLA risk range, and the Navy has no intention of doing so until after the retesting is complete.

Accordingly, there is no valid data on which to base any assertion that the remedy is protective of human health and the environment in the long-term. For some Parcels, it may have soil data, but only in one-third of the soil tested. The Navy has not released this data. Nor has it released retesting data from buildings.

The Navy will never be able to assure long-term protectiveness with incomplete data. It must retest and if necessary, re-remediate 100% of TtEC's work to satisfy CERCLA.

In fact, the retesting data the Navy has, no matter how incomplete, indicates that the remedy does **not** meet the Shipyard's remedial goals; 23 samples from Parcel G exceed the remedial goals for Strontium 90.

Therefore, the *Draft Review* must state the remedy is **not** protective of human health and the environment and then detail the steps necessary to achieve protectiveness and the timeline within which it will be accomplished.

D. The *Draft Review* Violates the FFA and EPA Guidance

On January 22, 1992, the Navy, the EPA, and the Department of Toxic Substances for the State of California entered into the Federal Facilities Agreement for Naval Station Treasure Island – Hunters Point Annex ("FFA").

Section 1, "Purposes of the Agreement," states that the purpose of the FFA is to:

> Establish a procedural framework and schedule for developing, implementing and monitoring appropriate response actions at the Site **in accordance with** the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), the National Contingency Plan (NCP), **Superfund guidance and policy**, the Resource Conservation and Recovery Act (RCRA), RCRA guidance and policy, and applicable State law…. (Emphasis added).

In other words, the parties agreed EPA CERCLA guidances would be mandatory.

EPA has published numerous guidances, including its *Comprehensive Five-Year Review Guidance*, which "provide[s] an approach for conducting five-year reviews, facilitate consistency across the ten EPA regions, clarify current policy, and discuss the roles and responsibilities of various entities in conducting or supporting five-year reviews."

The Navy has failed to act in accord with this guidance by failing to: 1) determine whether there have been changes in toxicity or other contaminant characteristics that need to be investigated; 2) identify "recent toxicity data and their sources"; 3) investigate whether the exposure assumptions, toxicity data, and cleanup levels are still valid; 4) recalculate risk

assessment to account for changes in standards and/or toxicity data; and 5) investigate the question, "Has any other information come to light that could call into question the protectiveness of the remedy?"

Although the *Draft Review* acknowledges that "there have been some changes to toxicity values and risk assessment methods," the Navy summarily dismisses them, concluding they "do not affect remedy protectiveness." However, the Navy failed to adequately explain **why** the changes do not affect protectiveness, failing to justify this conclusion; it cites no facts, data, or calculations, as required by EPA's guidance.

E. The Navy Failed to Update Risk Calculations (PRGs) Yet Again

In the *Draft Review*, the Navy claims it updated the risk calculations:

> Following the recommendation from the Fourth Five Year Review, the Navy issued addendums evaluating the long-term protectiveness of the RGs [remedial goals] for soil and building structures, which **concluded that the current RGs are protective** for all future land users (Navy, 2020a, 2020b). (Parenthesis in original, emphasis added, p. 1-9.)

However, like much of the *Draft Review*, the Navy's history of the *Fourth FYR Addenda* is misleading.

EPA insisted the Navy update the PRGs in comments to the *Draft Fourth FYR*. For reasons that have never been made public, after the *Draft Fourth FYR* was "finalized," the Navy issued the three *addenda* cited above, purporting to validate the RGs.

1. Soil Remedial Goals

The soil remedial goals were adopted in 2006. The two soil *addenda* purported to demonstrate that the Navy did both RESRAD[10] and PRG calculations. According to the Navy, they verified the remedial goals' protectiveness.

But The Navy's calculations fell outside of the acceptable CERCLA risk range ($1x10^{-4}$ to $1x10^{-6}$). For example, according to the *Addendum*, the remedial goal for Cobalt-60, 0.0361 pCi/g, translates to an excess lifetime cancer risk of 1.7 in a million, nearing twice the limit for CERCLA risk's "starting point" of 1 in a million. The Navy failed to include any facts justifying exceeding a $1x10^{-6}$ risk, as required by EPA guidance.

On or about November 15, 2019, EPA sent the Navy its *EPA Review of the Draft Addendum to the Fourth Five Year Review Evaluating Radiological Remediation Goals for Soil*, a comment letter unambiguously stating the 2019 Soil Addendum failed to meet its obligation to assure protectiveness: "[**A]t this time, EPA cannot verify that the soil radiological**

[10] RESRAD is a computer model developed by Argonne National Laboratory and sponsored by the Department of Energy to evaluate doses from residual radioactivity in nuclear power plants. It is not an approved EPA CERCLA method or guidance.

remediation goals are protective of human health for long-term protectiveness." (Emphasis in original.)

The Navy posted a statement on its website less than two weeks later, on November 26, 2019, stating, "EPA recently concurred on the protectiveness determinations in the Navy's Five-Year Review."

Like many other examples, this statement was misleading.

By letter of August 18, 2020, the Navy approved implementing the June 2019 *Parcel G Removal Site Evaluation Work Plan*, as supplemented by the July 2020 *Parcel G Removal Site Evaluation Work Plan Addendum*. The letter also responded to the *2020 Soil Addendum*, which, according to the EPA's letter, was prepared "to evaluate the long-term protectiveness of the soil radiological remediation goals." But rather than assuring the remedies **are** protective, the *Addendum* claimed radiological remedial goals are **expected to be**:

> Using RESRAD and the PRG Calculator to estimate the maximum radiation dose and risk to residents from exposures to Hunters Point soils has verified that **the soil radiation remediation goals are expected to be protective** for all future land users. (Emphasis added.)

In other words, the Navy **predicts** the remedial goals will be verified sometime in the future, once again "kicking the can" of the PRG/RESRAD dispute – which has been going on for at least **six years** – "down the road" yet again.

EPA's August 18, 2020, letter clearly states the PRG/RESRAD dispute has **not** been settled. Speaking of the *2020 Soil Addendum*, EPA wrote:

> **The FYR Addendum does not complete the long-term protectiveness evaluation of the soil radiological remediation goals**. Instead, the FYR Addendum describes Navy plans to further evaluate cancer risk **after the radiological retesting data are available**. (Emphasis added.)

Again, the Navy improperly deferred its protectiveness determination until some future evaluation. It does not even venture a guess as to when that might be.

The *Fourth FYR Addenda* also deferred all consideration of cumulative risk. The *2020 Soil Addendum* states:

> The Navy will continue to evaluate risk during remedial investigations to verify that **combined risks** due to site-related contamination (i.e., radiation, volatile organic compounds, metals, etc.) achieve appropriate protectiveness standards. (Emphasis added.)

EPA's August 18, 2020, letter addressed deferring the cumulative risk and found it necessary to remind the Navy of EPA's so-far frustrated expectations:

> In this planned **future evaluation**, the Navy **will evaluate the retesting data** to ensure that the additive risk from multiple radiological and chemical contaminants, if present, is within the EPA cancer risk management range. We expect the Navy to examine site-related health risks and risks inclusive of background. Consistent with EPA guidance, we expect the Navy to provide a clear justification for any cancer risks above 1×10^{-4}.

Left unsaid by EPA was that the *2020 Soil Addendum* did not demonstrate the soil remedial goal remained within the CERCLA risk range.

The remedial goals have not been updated since 2006, while EPA's default Preliminary Remediation Goals have been updated, most recently in 2023.

Following is a chart comparing the EPA 2023 default soil PRGs and the remedial goals the Navy adopted in 2006 and continues to use. The EPA default PRGs are orders of magnitude more protective than the Navy's remedial goals.

SOIL RELEASE CRITERIA COMPARISON – Residential – 1997 to 2023

Radionuclide	HPNS (2006)	EPA 2/20/23
Americium-241	1.36	.4800
Cesium-137	0.113	.0401
Cobalt-60	0.0361	.0285
Europium-152	0.13	.0384
Europium-154	0.23	.0467
Plutonium-239	2.59	.4450
Radium-226	1.0	.00192
Strontium-90	0.331	.00477
Thorium-232	1.69	.00170
Tritium	2.28	no value listed
Uranium 235+D	0.195	no value listed

The Navy needs to explain to the general public, using non-technical, commonly understood language, how the 2006 remedial goals could still be protective considering that the 2023 defaults are orders of magnitude lower than the remedial goals. The Navy must update the PRGS, "showing the arithmetic" to the public to justify the PRGs that result from proper application of the PRG calculators.

2. Building Remedial Goals

EPA's comments to the *Draft Review* clearly state the Navy's submission of the *Fourth FYR Building Addendum* did not satisfy its demands the Navy update the building PRGs:

> **EPA did not approve this addendum** nor the follow-on building re-testing workplans due to our collective inability to reconcile technical differences between the Navy's use

> of the RESRAD Build model and EPA's Building Preliminary Remediation Goal calculator. (Emphasis added.)
>
> EPA then explains the Navy changed the remedy:
>
> More importantly, based on a substantive change in building reuse plans and recent congressional authorization, the Navy is now preparing to demolish and dispose of all potentially radiologically impacted buildings, except two historical structures, rather than certify them for unrestricted reuse.

The RESRAD/PRG dispute having apparently been mooted out, EPA urged the Navy to "ensure building materials are characterized sufficiently to help determine how to safely protect human health and the environment during demolition and how to dispose of the debris in a regulatory-compliant way."

However, as EPA notes, not all buildings are being demolished. Two historical structures will not be demolished. There are also approximately three other historical buildings in other Parcels that will not be demolished. Accordingly, unless the Navy can demonstrate that none of the historical buildings were radiologically impacted, the PRG/RESRAD dispute remains. The Navy must update its building remedial goals as part of this *Fifth FYR*.

3. Other Deficiencies

The risk calculations in the *Fourth FYR Addenda* are misleading because of the Navy's misuse of "institutional controls" ("ICs"). For example, the Navy's risk calculations exclude all risk to future residents from consuming homegrown food. The Navy justifies this by ICs which prohibit growing plants except in raised boxes, to be enforced through deed notices.

However, the ICs are insufficient to assure long-term protectiveness. First, EPA's guidance, *PRG User's Guide*, allows for exposure pathways like those from homegrown food to be switched off only if "a route of exposure . . . is considered to be unreasonable at their site, both currently and in the future."

It is unreasonable to assume future residents will forever garden only in raised beds if that limitation is enforced merely by deed notices. And even if all residents were made aware of the institutional controls and tried to comply, it is unreasonable to assume that raised beds will continue to be protective in perpetuity.

Second, the Navy has never provided a realistic plan to realistically enforce the ICs continuously in the future. All discussion of implementation of IC's has been deferred until the Land Use Controls Remedial (LUC) design reports become effective, upon property transfer. (*Draft Review*. p. 1-6.)

Furthermore, the Navy's protectiveness calculations failed to calculate total risk from the sum of all radionuclides. It also failed to sum the radiological risks with chemical risks.

There is no factual justification for deferring assessing cumulative risk until after the retesting is completed, particularly if the Navy does only one-third retesting of soil.

Finally, the Navy has not properly justified its background radiation calculations, as it improperly took background samples at Shipyard sites that were likely radiologically impacted.

F. The Navy Violated the Law by Not Responding to Comments to the *Draft Fourth FYR*

Greenaction submitted substantial, detailed comments to the *Draft Fourth FYR* during the public comment period relating to radiological issues and the impact of global warming on the remedy. They are attached hereto and incorporated herein by reference as Exhibit 1.

CERCLA and the NCP require that the Navy respond to such comments, pursuant to 42 U.S.C. § 9617(b), and 40 C.F.R. 300.430(f)(3)(i), respectively. The FFA also requires it.

The Navy did not respond to Greenaction's comments to the *Draft Fourth FYR*, in violation of CERCLA, the NCP and the FFA.

The Navy must not repeat its *Fourth FYR* violations and respond to all comments to the *Draft Review*.

The Navy must explain in response to our comments why it has omitted virtually all the key facts about the history of radiological remediation, fraud, and retesting.

It must also respond with rational reasons why it has spent the last three years attempting to invalidate its own data, if there are any, other than that the Navy seeks to repudiate its retesting agreements and will do whatever it takes to get out from under them.

G. The Navy Is Still Relying on TtEC's Discredited Data

Considering EPA found 97% of TtEC's data to be unreliable in one Parcel and 90% unreliable in another,[11] there are no rational reasons for the Navy to continue to cite or rely on TtEC data.

However as with the *Fourth FYR*, the Navy improperly continues to rely on TtEC data. The Index of the *Fourth FYR* listed 117 TtEC documents, 91 of which are entitled either "Final" or "Final Final" status surveys. In the *Draft Review*, the Navy continues to rely on TtEC data. The Index lists 26 Tetra Tech, EC Inc. documents, most of them relating to radiological remediation.

The Navy should either excise all references to TEC data or specify what data it is citing from TtEC and justify its use by demonstrating it is not tainted by fraud and/or quality assurance and quality assurance deficiencies.

[11] December 27, 2017, letter from John Chestnutt (EPA) to George ("Pat") Brooks (Navy) accompanying EPA Final Comments on Draft Navy Radiological Data Evaluation Parcels B & G Report (December 27, 2017), p. 1.

III. COMMENTS ON the CLIMATE RESILIENCE ASSESSMENT

Greenaction and its community partners are extremely disappointed that the Navy continues to proceed with capping radioactive and toxic waste at this shoreline site. The Navy's continued reliance on capping and seawalls is unacceptable and a recipe for disaster. It is also in defiance of and contradictory to the Superfund law's mandate that a remedy must remain protective. The current remediation methods for multiple parcels includes capping radioactive and toxic waste along the shoreline, which will NOT remain protective when inundated and flooded by groundwater and sea level rise. **We cannot accept an inadequate cleanup that includes capping of waste where it will be flooded and spread into communities and the environment.**

Comment one – The Five Year Review must use the government's scientific projections when planning for risks before and beyond 2065.

Sea-level and Bay-level Rise

Sea level rise and groundwater rise does not have an endpoint in sight. In fact, the Navy's planning only until 2065 makes it the only such agency to pretend it is not currently necessary to plan beyond 2065. All the relevant regional, state, and federal agencies involved with this issue are using higher sea level rise projections, and a longer time period as well, for planning.

The HPNS Superfund site is located directly on the shoreline of San Francisco Bay. Sea level rise and groundwater rise will cause negative and potentially devastating impacts to the health of adjacent communities and San Francisco Bay.

The Navy's Climate Resilience Assessment ("CRA*"*) section of the *Draft Review* improperly uses sea-level rise ("SLR") projections of 1.0 feet by 2035 and 3.2 feet by 2065. These projections are too low to adequately assess the risk of sea level rise or the resilience of the proposed and current remediation.

The latest report from the Ocean Protection Council ("OPC") recommends sea level rise planning should use projections of 0.8ft- 1.2ft by 2050 and 3.1ft- 6.6ft by 2100.

To protect the environment and communities living on the shoreline, all development, adaptation plans, and related activity on the shoreline must plan and prepare for the worst-case scenario and highest projections. This is not just an issue of potential flooding infrastructure but also potential inundation and spreading of toxic and radioactive waste, including atomic bomb residue.

The CRA does not follow all the requirements of DTSC's *Sea Level Rise Vulnerability Assessment* ("SLRVA"). As their *Sea Level Rise Guidance* states: "The initial SLRVA should be based on the California SLR Work Plan recommendation to assess pathways to resiliency to 3.5 feet of SLR by 2050 and 6.0 feet by 2100."[12]

[12] State of California Sea Level Rise Guidance: 2024 Science and Policy Update https://opc.ca.gov/wp-content/uploads/2024/01/SLR-Guidance-DRAFT-Jan-2024-508.pdf.

Instead, the CRA only includes projections until 2065. It is not adequate, and indeed, is extremely reckless and unscientific, to dismiss projections beyond 2065 and ignore the risks associated with higher projections until the next Five Year Review. The remediation methods for cleaning this site must remain protective indefinitely and prioritize the health and safety of the community and the environment. The CRA must be redone to include projections until at least 2100. And there must be additional opportunities for public participation once the revision of the CRA to include projections into 2100 takes place.

Groundwater Rise

Dr. Kristina Hill, an esteemed University of California Berkeley Professor and expert who studies groundwater rise, found that rising groundwater can infiltrate underground pipes, alter foundations, require underground waterproofing, remobilize old soil contaminants, emerge as surface water, and cause flooding.[13] She also concluded that:

> With 1 meter of sea level rise, we can expect to see about 18,000 acres of flooded land (saltwater). [Their] map analysis shows that about 26,000 additional acres are at risk of flooding from freshwater groundwater, rising up through the soil. Even if we build walls and levees to protect from saltwater, groundwater flooding could still affect as much as 37,000 acres of what today is dry land.[14]

Dr. Hill's report is referring to the entire San Francisco Bay shoreline, but it highlights just how massive an impact groundwater rise can have. The CRA states the "historical high groundwater table from December 2012 was used as the baseline [to identify areas that may experience a groundwater table rise to a depth of 3 feet below ground surface.]" (p. A-15,16). Using data from more than a decade ago is unacceptable when this assessment is supposed to identify risks far into the future.

Comment two – Capping contamination or using "durable" covers cannot be an acceptable form of remediation at the HPNS because of the risk associated with sea level rise, groundwater rise and inundation, and increased flooding from storms.

Rising sea levels, rising groundwater, human, animal, and seismic activity all increase the risk of caps deteriorating and losing effectiveness. It is highly likely that contamination will come in contact with groundwater and threaten the health of community members, as well as the health of Bay ecosystems and its environment. With sea level rise, groundwater rise, and associated flooding, durable covers, capping, and containment of waste cannot be an acceptable form of remediation. This is especially true when there is radioactive contamination remaining at the site.

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[13] *Rising coastal groundwater as a result of sea-level rise will influence contaminated coastal sites and underground infrastructure*, by Dr. Kristina Hill, et al: https://d197for5662m48.cloudfront.net/documents/publicationstatus/139385/preprint_pdf/5480722e3998464796727ca6838328de.pdf. p. 7.
[14] *Id*., p. 22.

There must not be any risk of exposure to toxic and radioactive contamination from an improper cleanup based on defective science. The *Draft Review* relies on monitoring to detect if the caps are working properly. However, once a monitor detects leaks, damage has already been done and contamination has begun to spread. Conducting maintenance on these leaks will also grow increasingly difficult as the site becomes temporarily or permanently flooded or covered by development. The facts are clear: capped waste will eventually be flooded, and at some point in the future, likely under water. That would be a major environmental disaster.

It would be impossible and near useless to try to monitor "durable" covers and capped contamination if and when the site becomes flooded, perhaps permanently. Using capping as a form of remediation for this cleanup, or any cleanup project along the shoreline, is a temporary fix that cannot protect surrounding communities and environments from exposure when the site is flooded. Capping waste requires monitoring and maintenance indefinitely.

Removing and/or treating the waste on-site will allow for less monitoring and maintenance.

Capping contamination rather than completely removing it leaves the Bayview Hunters Point community in close proximity to toxic and radioactive waste. Generations from Bayview Hunters Point have experienced environmental harm, a variety of pollution, poor air quality and toxic exposure as a result of living next to the Shipyard Superfund site. This community deserves a clean, safe, and healthy environment **now.**

The Hunters Point Naval Shipyard [Census Tract: 6075980600] ranks in the 83rd percentile for the overall CalEnviroScreen 4.0 Percentile score, which is based on pollution burden and population characteristics. Some census tracts surrounding the Shipyard rank even higher, since there is a higher population density, as reflected in the following table:

Census Tract	CalEnviroScreen 4.0 Percentile
6075023103	88
6075023200	92
6075023400	84
6075061000	76

EPA's guidance, *Citizen's Guide to Capping*, states that, "A cap will continue to isolate contamination **as long as it does not erode or develop cracks or holes that allow water to reach the contaminated material**."[15] (Emphasis added.) This simple guideline should be enough to prove that capping along the shoreline, where we can expect over 6 ft of sea level rise,

[15] EPA *Citizen Guide to Capping*: https://19january2017snapshot.epa.gov/sites/production/files/2015-04/documents/a_citizens_guide_to_capping.pdf.

will not be protective. Caps will eventually erode or develop cracks that can result in migration of contamination into the environment.

Comment three – Flooding has already occurred at the HPNS and has already threatened the health and safety of the surrounding community and environment.

During the heavy rains in early 2023, Greenaction staff observed large areas of flooding in the Shipyard, including pools of water that lasted weeks and perhaps months in some areas. The Navy cannot defer considering the threat of flood-caused mobilization of contamination to a future time; the problem is already here. Contamination can be mobilized and spread by storm flooding and spread into community spaces, environments, and ecosystems. Some flooding also occurred in early 2024 during the heavy rains and atmospheric rivers.

Comment four – As this is a shoreline contaminated site in a heavily impacted community subject to sea level rise and groundwater rise, the entire site must be completely cleaned up to residential standards, with no contamination remaining on-site.

The HPNS Superfund Site is at extreme risk of permanent flooding from sea level rise and groundwater rise. The cleanup should be as close to a 100% cleanup as possible, no matter what the future land use may be. Leaving toxic and radioactive waste at the site has the potential to harm the entire Bay, including all other San Francisco Bay shoreline communities. There is no excuse for leaving hazardous waste on the shoreline when there is a high chance of flooding and inundation in the future. The site also must be completely cleaned because the surrounding Bayview Hunters Point community has long been harmed by exposure to dangerous chemicals, radiation, and pollution. They deserve a clean environment.

Comment five – Pursue and research safe, alternative treatment technologies that do not leave toxic and radioactive waste along the shoreline.

Greenaction urges the Navy and government regulatory agencies to pursue the use of safe, alternative treatment technologies to the extent possible during site mitigation as an alternative to dumping or burning toxic waste at disposal sites in other vulnerable communities.

The Navy stated in its latest bus tours that it plans to transport and dispose of waste from the Shipyard at the Kettleman Hills disposal facility. It is unacceptable, negligent, and unjust to dispose of the hazardous waste in dumps operating on expired permits, like Kettleman Hills.

Hazardous waste must also not be shipped out of state to locations where there are fewer restrictions on how hazardous waste is stored and managed. The Navy and EPA are responsible for treating the site and disposing of waste in a way that does not move the environmental burden and pollution from one community to another.

IV. CONCLUSION

Widespread fraud and quality assurance/quality control deficiencies, a botched cleanup and lack of proper regulatory oversight have compromised the cleanup of the HPNS contamination. This *Draft Review* is the time and process to re-evaluate the remedies because:

- They are not protective of public health or the environment,
- The remedial goals are outdated,
- The Navy only intends to retest one-third of the soil remediation done by Tetra Tech, and
- The remedies do not reflect latest scientific consensus on expected sea level rise due to climate change.

These comments highlight serious flaws and omissions in the *Draft Review* that must be corrected, including inadequate consideration of the impact of the radiological fraud on the cleanup.

The *Draft Review*'s remedy analysis also fails to adequately address rising sea levels due to climate change which threaten San Francisco Bay and its waterfront. The threat that rising Bay levels could inundate portions of the shipyard, including Parcel E-2, is real and foreseeable, as is the inadequate revetment and retaining wall design that will not provide adequate protection from contaminants reaching the Bay. As Greenaction stressed in its comments to the *Fourth FYR*, these climate change threats must be addressed, not ignored.

The Navy must plan for – not underplay – predictable risks such as those posed by global warming, especially at Parcel E-2, where buried contamination is extensive and will continue to be toxic far into the future. If the Navy gets it wrong because of its refusal to factor up-to-date science into the five-year review, it could unleash a catastrophe to public health and the environment. As more and more data on sea-level and Bay-level rise emerges, the Navy must reconsider and conclude that the buried hazardous and radioactive waste at Parcel E 2 needs to be removed from proximity to residents and the rising Bay.

The *Draft Review* needs to be revised to incorporate up-to-date science and public health

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data. Common sense and environmental justice require that remedies be reappraised. Revised remedies must prioritize removal of all hazardous and radioactive contamination from the Shipyard.

Respectfully Submitted, May 7, 2024

Steven J Castleman

Supervising Attorney
Environmental Law Clinic
Attorney for Greenaction for Health and Environmental Justice

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EXHIBIT 1

Greenaction's Comments to the *Draft Fourth Five Year Review*

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GOLDEN GATE UNIVERSITY | School of Law
Environmental Law and Justice Clinic

TO: **Derek Robinson, HPNS BRAC Environmental Coordinator**
Department of the Navy
BRAC Program Management Office West
derek.j.robinson1@navy.mil

FROM: **Greenaction for Health and Environmental Justice**
Environmental Law and Justice Clinic, Golden Gate University School of Law

RE: **Comments to the *Draft 5 Year Review Hunters Point Naval Shipyard, San Francisco, California, June 2018***

DATE: **September 7, 2018**

I. INTRODUCTION

The Environmental Law and Justice Clinic of the Golden Gate University School of Law submits these comments to NAVFAC's *Draft Parcel G Removal Site Evaluation Work Plan, Former Hunters Point Naval Shipyard, San Francisco, California, June 2018* ("*Draft Review*"), on behalf of Greenaction for Health and Environmental Justice ("Greenaction") and its members and constituents in Bayview Hunters Point, San Francisco and in other communities located along San Francisco Bay.

Greenaction is a multiracial grassroots organization founded and led by grassroots leaders from low-income and working class urban, rural, and indigenous communities. Our mission to fight environmental racism and injustice and build a clean, healthy and just future for all. Greenaction has been involved in health and environmental justice advocacy in Bayview Hunters Point since it was founded in 1997. This low-income community of color continues to be negatively and disproportionately impacted by pollution, gentrification, health disparities, and other forms of environmental, social and economic injustice.

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Bayview Hunters Point residents have borne the brunt of the impacts of the toxic and radioactive waste at the Hunters Pont Naval Shipyard ("HPNS"). As such, they have a direct, personal and long-standing interest in assuring the maximal cleanup of the Superfund site.

A. The Community Doubts the Navy's Commitment To Rebuilding Trust

"The fraud and uncertainty surrounding Tt EC's work at HPNS has caused a complete loss of trust in the Navy by the local community."[1] This is not a member of Greenaction speaking. This is the Navy's Laura Duchnak, BRAC PMO's Director. She's right.

Unfortunately, though the Navy acknowledges it has lost all credibility, it remains adamant that it will do nothing to address or correct it. It continues to downplay the fraud and its effects on the cleanup. It promises one thing but delivers another. It has not taken the evidence of previous contamination in Parcel A at all seriously.

If the Navy truly wants to start to repair relations with the community, it must take actions that demonstrate in concrete terms how it will change its approach. This is not just another cleanup; it's a cleanup tainted by massive fraud.

As Ms. Duchnak's letter said, the fraud "had far-reaching consequences for the United States, its employees, the City of San Francisco, the local residents, and the taxpayers." The Navy should act like it. The loss of trust extends to the hazardous waste cleanup as well.

The revisions of the *Draft Parcel G Work Plan* and this *Draft Review* are likely to be the first two tests of the Navy's willingness to change course. Will it live up to the promises it made to the community to resample all Tetra Tech's work? Will it incorporate

[1] *Victim Impact Statement in the Matter of US v. Hubbard*, Mach 15, 2018, attached as Appendix IV.

the community's concerns into its final work plan and five-year review? Or will it betray the community's trust yet again?

B. The *Draft Review* Does Not Comply with Navy Policy

The Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA § 121(c) sets forth the requirement for a five-year review:

> 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.

Similarly, Title 40 Code of Federal Regulations §300.430(f)(4)(ii)] 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.

To implement five-year reviews at properties owned by the Navy, it promulgated a policy, *Department of Navy Policy for CERCLA Five-Year Reviews.*

This Fourth Five-Year Review states its objective: "The purpose of the fourth five-year review is to provide an update on the status of remedial actions (RAs) and post-RA activities implemented since the third five-year review, evaluate whether these RAs and post-RA activities are protective of human health and the environment,

and assess the progress toward meeting the recommendations made in the third five-year review."[2]

Unfortunately the *Draft Review* neither complies with the *Department of Navy Policy for CERCLA Five-Year Reviews* nor the intention stated above. For example, paragraph 9a of the policy states, "The Five Year Report should; 1) clearly state whether the remedy is or is expected to be protective, 2) document any deficiencies identified during the review, and 3) recommend specific actions to ensure that a remedy will be or will continue to be protective." (Emphasis added, p. 4).

As further detailed below, the *Draft Review* fails in its most basic function – identifying whether the remedies are protective. Rather, it equivocates. *The Draft Review* must clearly state that the radiological remedies are NOT currently protective. And if the Navy states that the remedies "will be" protective, it should detail what "specific actions" will be taken, parcel by parcel, to assure that will be the case, as required by Navy policy.

Furthermore, the policy's paragraph 9b states, "Where necessary, five year review reports should contain descriptions of follow up actions needed to achieve, or to continue to ensure protectiveness. Along with these recommendations, the report should list a timetable for performing the actions…"

The *Draft Review* fails to contain descriptions of the specific actions the Navy will take to achieve protectiveness. All it says is that the Navy intends to kick that can down the road until 2023. There is no explanation why what the Navy knows now is excluded; it must be included.

The Navy must revise the *Draft Review* to comply with CERCLA's plain language and to comply with its own policies.

[2] *Draft 5 Year Review Hunters Point Naval Shipyard, San Francisco, California,* June 2018, p. 1-1.

II. RADIOLOGICAL – General Comments

A. Facts – The Navy Must Tell the Whole Truth

The *Draft Review* is similar to the *Draft Parcel G Work Plan* before it in the way it: mischaracterizes the facts; minimizes the effects of Tetra Tech's radiological fraud and its impact on the remediation; and abandons its public promises.

Emblematic of the Navy's recasting of facts are these remarkable assertions:

> The Navy has completed an extensive review of the radiological remediation documents and data as part of its evaluation of the potential contractor manipulation and/or falsification of data and has identified the areas where resurveying for radionuclides is required to address all issues discovered during the Navy's evaluation. Any available information on the status of the review and discoveries made by the Navy were considered during the development of this five-year review. (p. 5-3.)

The Navy pretends it proactively has done everything it can to investigate and redress the fraud, when nothing could be further from the truth. The Navy makes it plain in this review that it still does not believe comprehensive sampling is necessary. Crucially, the Navy actions were limited to a document review – Tetra Tech's discredited documents, no less.[3] Only when one parses the paragraph can one see the Navy's true intentions.

Start with the phrase, "potential contractor manipulation and/or falsification of data." Despite numerous sworn whistleblower affidavits attesting to widespread fraud, despite the Navy's own data review revealing evidence of fraud in approximately 40% of samples in Parcels B and G, despite the EPA finding that the Navy's data review missed about half the data problems,[4] and despite two criminal convictions of Tetra Tech supervisors – the very supervisors identified as culpable in the whistleblowers' testimony – the Navy still insists the fraud was "potential."

---

[3] The Navy has provided only two of the 117 Tetra Tech documents listed in the *Draft Review's* "References." See Section IIC below.

[4] The contractor(s) that missed half the data problems have demonstrated their undependability. The Navy should commit to obtaining different contractors that the Navy, the community and the regulators can have confidence in.

The Navy claims it "has identified the areas where resurveying for radionuclides is required to address all issues discovered during the Navy's evaluation." That is simply false, unless by "all areas" the Navy means all of Parcels A, B, C, D, E, G, UC-1, UC-2 and UC-3. If the Navy truly has identified answers to all issues arising from the Tetra Tech Fraud, why are they not included in the Draft Review? The Navy should identify " the areas where resurveying for radionuclides is required" on maps of each parcel. (Also see section III (I) below regarding Figure 3-13.)

So far the Navy has proposed resurveying only in one Parcel, Parcel G. The *Draft Work Plan* for that project was so roundly criticized by comments made to it by EPA that it was unresponsive to its concerns that it threatens to invoke the dispute-resolution clauses of the Federal Facilities Agreement (FFA) if the Navy continues to ignore them: "Without the requested changes, the approach will not provide the necessary confidence level to establish when Parcel G would be suitable for redevelopment, and EPA may invoke the dispute resolution process described in the FFA."

Then the Navy claims "any available information" was considered, but only "any available information" from the data review, that is, any available Tetra Tech data. Pointedly, the Navy cannot claim that it considered "any available information" without that tremendously narrowing qualification.

Among the "available information" the Navy ignores are: all of the whistleblowers' sworn statements filed in support of Greenaction's state and federal petitions to revoke Tetra Tech's licenses;[5] eyewitness and documentary evidence, including sampling documents and test results demonstrating there were elevated levels of radionuclides in Parcel A's sanitary and storm water sewer systems that should have been investigated but never were;[6] lists of approximately 50 additional witnesses who the Navy should interview;[7] and BRAC's own victim impact statement in the criminal cases

[5] The federal petition and its supporting documents are incorporated herein and are available at: https://www.dropbox.com/sh/1gfn7ja0fc3c5l6/AAD7-9qzmbhhUTkGvpN4p_Xua?dl=0. The state petition and its supporting documents are incorporated herein and are available at: https://www.dropbox.com/sh/zh2pknpgvuucjp0/AAA-1xjCHxjVtQ_s8wvTpm9Za?dl=0.
[6] See Appendix VI, Rad Survey Results.
[7] See Appendix VII, emails from ELJC to the Navy.

against Tetra Tech's former supervisor Justin Hubbard. In a March 15, 2018 letter, Laura Duchnak, the Director of BRAC PMO, wrote of the impact of Tetra Tech's fraud:

> The redevelopment of HPNS was supposed to revitalize the community and provide jobs and
> affordable housing; all of that is now on hold indefinitely as the Navy and the regulatory
> agencies have determined that TtEC's work is unreliable.
>
> The total cost for the database evaluation, work plan preparation, and preliminary field work *is* approximately $8.8M.... The EPA has indicated that it would require all work to be reperformed as originally contracted. However, these discussions are not final. The Navy's best estimates for required re-work costs currently range from $1OOM to $3OOM.
>
> In sum, the Navy has expended $272.8 M to date paying TtEC for their work at HPNS, identifying the fraud, and taking measures to prevent further fraud. Depending on the cost of required re-work, this number will certainly rise to $372.8 M and is likely to rise as high as $572.8 M. This amount of money would buy a new Littoral Combat ship. It is nearly half of the Navy's total expenditures for *all* environmental clean-up activities at HPNS through fiscal year 2017 ($991.1 M).
>
> Mr. Hubbard's actions had far-reaching consequences for the United States, its employees,
> the City of San Francisco, the local residents, and the taxpayers.[8]

Ms. Duchnak does not discuss "potential" fraud. It is actual and extensive. The more the Navy soft-pedals the fraud, the less credibility it has. If the fraud is real enough to have had the effect Ms. Duchnak describes, it is well past time for the Navy to drop references to "potential" fraud.

[8] See Appendix IV.

Finally, the Navy claims credit for "discoveries made by the Navy." The Navy did make one important discovery, it's true. Its employee flagged the low Potassium-40 (K-40) data that first raised the issue of fraud. But after that, the Navy closed its "eyes" and "ears." It made no further "discoveries." Rather, it ignored them.

In June 2016, for example, Anthony Smith, one of the whistleblowers, took the Navy and regulators on a tour of the shipyard during which he detailed some of the fraudulent activities he participated in. The Navy has never, to this day, spoken to him to follow up.

More than a year before this *Draft Review* was released, on June 29, 2017, Greenaction filed its NRC Petition seeking to revoke Tetra Tech's federal license, supported by affidavits signed under penalty of perjury by numerous former radiation workers at HPNS who have come forth to blow the whistle on Tetra Tech's fraud and the Navy's complicity in it. They detailed six types of fraud: (1) fake sampling, in which soil samples were reported to have been taken at one location when they were actually taken from another; (2) samples and their analytical results were discarded because they came back too "hot;" (3) scanning data were altered to make them appear acceptable; (4) building survey data were fabricated; (5) radioactive material in soil was inadequately remediated, resulting in potentially contaminated soil being used as backfill for trenches at the Shipyard; and (6) Portal Monitor procedures were altered resulting in potentially radioactively-contaminated soil being allowed to be shipped offsite to points unknown.[9]

Greenaction obtained sworn affidavits from Archie Jackson, Bert Bowers, Susan Andrews, Arthur Jahr, Richard Stoney and Robert McLean, each of whom documented improper activities. Their statements are readily available, as they are exhibits in support of its June 2017 NRC Petition. Greenaction has repeatedly urged the Navy to interview them. The Navy has never, to this day, done so. Sadly, Mr. Jahr has since passed away; any untapped knowledge he may have had is now gone forever.

[9] See NRC Petition, p. 1.

Greenaction also provided the Navy with two lists of additional witnesses, totaling approximately 50 people. The Navy ignored them. To the best of our knowledge, none of these witnesses have ever been contacted, despite more than a year's urging that the Navy interview them.

Instead of doing what was called for – investigating the full extent of the fraud's impact on the cleanup – the Navy allowed Tetra Tech to *investigate itself*, and accepted its self-serving and false claims the fraud was minimal and closed its eyes and ears to the whistleblowers.

Rather than conduct a meaningful investigation, the Navy spent months and $8.8 million, according to Ms. Duchnak, on a "data review," whose purpose was not to find if more fraud took place, but rather to statistically validate Tetra Tech's bogus data. However, in results that were hugely surprising to the Navy but to no one else who has followed the disastrous radiation remediation, the data review not only supported the whistleblowers' testimony, it found much more evidence of potential fraud than even the whistleblowers said – approximately 40%!

Even these remarkable findings underplayed the full extent of the evidence of fraud. The EPA's review of precisely the same data found more than double the data problems the Navy did. EPA's review of data from Parcel G trench units, for example, found a whopping 97% of the data were questionable – virtually all of it.

In addition, two Tetra Tech supervisors have pled guilty to federal charges arising from their role in the fraud and are currently serving eight-month sentences. More charges may be forthcoming.

Despite the plethora of proof, however, the Navy continues to treat the proven facts as mere allegations. Two years ago they were allegations. In the ensuing time those allegations have been proven.

Forced to confront irrefutable proof dashing the Navy's hope that Tetra Tech's data was salvageable, in December 2017 it finally announced the inevitable conclusion it

had been seeking to avoid all along; all of Tetra Tech's data has to be thrown out. The Navy's point man on the project, Derek Robinson, promised multiple times publicly that all Tetra Tech's work would be redone, starting with resampling all locations where the fraudulent firm worked.

EPA heard the same promises Greenaction members did. Here's how Lily Lee, the EPA's HPNS Site Manager described what the Navy said in her interview for the *Draft Review*: "*The Navy, as the lead on cleanup, has responded through a comprehensive radiological data evaluation, increased oversight of ongoing radiological work, development of plans to resample all radiological survey units on site that involved Tetra Tech EC Inc., and increased community involvement outreach.*" (Italics in original, underline added.) Similarly, as Angeles Herrera, the Assistant Director of EPA's Superfund Division, Federal Facility and Site Cleanup Branch, wrote in his August 14, 2018 transmittal letter of the EPA's comments to the *Draft Parcel G Work Plan*, "The Navy has agreed to retest all of the survey units where Tetra Tech EC Inc. did previous radiological work." (Emphasis added.)

"Resample all survey units" was what the Navy promised.

As we pointed out in our comments to the *Draft Parcel G Work Plan*, the Navy has once again demonstrated that its promises are false. Rather than live up to its promises, the Navy's draft plan only intends to resample a small percentage of survey units. It must not be allowed to get away with reneging on its promises when it comes to either the *Parcel G Work Plan* or this *Draft Review*: it must commit to resampling all Tetra Tech's work.

This *Draft Review*, however, fails to even acknowledge *the Draft Parcel G Work Plan* exists, let alone disclose the extremely limited sampling and scanning it contemplates.

This *Draft Review* was published more than six months after the Navy finally abandoned its efforts to salvage Tetra Tech's data through its data review. Yet there is scant mention of the sequence of events leading to the status that is supposed to be

reported in a Five-Year Review. No mention that the fraud was discovered in 2012. No mention that Tetra Tech admitted to fraud in 2014. No mention that whistleblowers came forward in 2016. No mention of their testimony proving widespread fraud. No mention that the Navy believed a fraudulent firm more than whistleblowers' statements under oath. No mention of the disastrous (to the Navy) results of the data review. No mention of EPA's finding that the Navy's data review missed half the data problems. No mention that the Navy has admitted all Tetra Tech's data is being thrown out. No mention of the Navy's public promises to finally own up to the fraud and do what should have been clear from the beginning; start over. No mention that the Navy's *Draft Parcel G Work Plan* reneges on the Navy's multiple promises to retest all Tetra Tech's work and only test one-third of the trench units and one-half of the buildings.

Here is the bureaucratese the Navy employs instead, using Parcel B-1 as an example: "The remedies completed to date for Parcel B-1 are protective of human health and the environment, noting that the radiological removal actions are being retested." Identical language is used in Section 8, Protectiveness Statement, for Parcels B-2 C, D-2, E, G, UC-1, UC-2 and UC-3.

These statements are false. Given that the Navy has publicly and repeatedly stated it will no longer rely on any Tetra Tech data, there is no factual basis for claiming the radiological remedies "completed" by Tetra Tech are "protective of human health and the environment." This can only be true if the Navy relies on Tetra Tech's discredited data – data even the Navy now agrees, however reluctantly, is useless. As we return to in our comments on Protectiveness Statements (see section II G below), the only accurate answer to the question of protectiveness is "no". There are no data demonstrating protectiveness whatsoever. Unless and until all of Tetra Tech's work is properly and comprehensively resampled and, where necessary, re-remediated, the Navy cannot claim radiological protectiveness.

The phrase, "noting that the radiological removal actions are being retested," does not substitute for the Navy's duty to be factually accurate in its Statement of Protectiveness. "Noting" that all of Tetra Tech's work must be redone is like saying that

the Navy's oversight was exemplary, "noting that the Navy squandered more than $200 million and more than a decade."

The Navy must not be allowed to mislead the public and regulators by dismissing the fraud's impact on the cleanup anymore.

B. Parcel A

The *Draft Review* completely excludes Parcel A: "Parcel A is not discussed in this report because the parcel required no action under CERCLA." (p.1-2).The reason Parcel A "required no action under CERCLA" is because the Navy did an incompetent job investigating the possibility of radiological contamination there.

Earlier this year, Greenaction brought forth both eyewitness and documentary evidence – including sample results – proving the original Parcel A storm water and sanitary sewer systems contained elevated levels of radionuclides that should have been investigated but never were. Greenaction has requested that the Navy and regulators report all information they have concerning what happened to the Parcel A sewers and their associated soils. The sewer pipes may have been disposed of illegally; it is so far unknown whether contaminated pipes were disposed of at facilities not licensed for radioactive waste. Greenaction has developed information indicating the soils from the Parcel A sewer systems were essentially "pushed over" the hill atop Parcel A into neighboring locations as part of grading Parcel A prior to development. We have asked both EPA and the Navy to investigate. So far as we know, both have flatly refused.

A description of an investigation of Parcel A's sewer systems and associated soils must be added into the *Draft Review*.

C. Reliance on Tetra Tech Data

The Navy improperly continues to rely on Tetra Tech data for the Five-Year Review despite already agreeing to discard it. The Index of the review lists 117 Tetra Tech, EC Inc. documents, 91 of which are entitled either "Final" or "Final Final" status

surveys, none of which have been made available to the public. Greenaction has requested these documents in writing but the Navy refuses to provide them. Accordingly, Greenaction has requested them through a Freedom of Information (FOIA) request.

There are no rational reasons the Navy should rely on or cite any of Tetra Tech's discredited data for any purpose. The *Draft Review* should be scrubbed of all Tetra Tech radiological data; all Tetra Tech documents listed in the References should be excised.

D. Investigating Soil That Was Improperly Allowed to Leave HPNS

Greenaction has provided credible evidence to the Navy that soil, improperly scanned at Radiological Screening Yard ("RSY") pads or the Portal Monitor, or both, resulted in a significant amount of potentially radiologically contaminated soil being permitted to exit Hunters Point Naval Shipyard improperly. Some of the soil was allegedly disposed of at landfills not licensed for low-level radioactive waste around the San Francisco Bay Area. (See NRC Petition, pp. 22-25.)

It is incumbent on the Navy to track down that soil and take appropriate actions to insure that unwitting people are not exposed to radioactive contamination that originated at HPNS. The *Draft Review* should include a statement that the Navy will investigate and will publish a plan to do so that will be open to public comment.

III. RADIOLOGICAL COMMENTS - Specific

A. Section 1 – Introduction

The Introduction kicks off the litany of half-truths that litter the Navy's *Draft Review*. It claims it, "identifies issues found during this fourth five-year review and recommendations to address them."

In addition to the issues already mention in section IA above, the *Draft Review* elides the Navy's own lack of oversight in permitting the fraud to take place under its nose for years, and the regulatory agencies' failures of oversight as well. The Navy should own up to the ugly truth, not attempt to bury it.

B. Section 2 – Site Background

Section 2.5.2 of the *Draft Review*, Future Land Uses, fails to acknowledge that during the five-year review period the proposed use of Parcel G was changed from almost no residential use to the entire parcel being open to residential use. Nowhere in the *Draft Review* is there are discussion of how this changed use will impact the remediation.[10]

C. Section 3 – Response Action Summary

The introduction to Section 3 states that Section 3, among other things, "describes the implementation status of the selected remedy for each parcel." (p. 3-1). But this is manifestly untrue when it comes to the radiological remedies.

The *Draft Review* provides virtually no information about the status of the re-investigation of Tetra Tech's work. Although the Navy released a *Draft Parcel G Work Plan* in June 2018, a month before the release of the *Draft Review*, there is not a single mention of it.

The information about the other parcels is just as scant. Although the Navy announced publicly at the end of 2017 that all of Tetra Tech's work would be redone, the *Draft Review* says absolutely nothing about when draft work plans for the other parcels will be released; what the resampling strategies will be; a timeline for all such actions; or anything else.

The only thing the *Draft Review* says is that "All radiological work is currently being reviewed to determine if current site conditions are compliant with the RAOs." (Section 3.3.2.1, p. 3-12, for parcel B, for example). What the "review" consists of is not addressed, as if the Navy has no idea what to do and as if it hasn't already decided exactly what to do.

The Navy must acknowledge the truth; none of the sites Tetra Tech worked on are compliant with the RAOs. The Navy must also abide by what it has promised publicly in

[10] *Feasibility Assessment for Evaluating Areas with Residential Land Use Restrictions, Parcel G, Hunters Point Naval Shipyard*, San Francisco, California, Nov. 30, 2016.

more than one forum: all Tetra Tech's data have to be thrown out and the Navy must start over. All areas Tetra Tech worked on have to be resampled and if necessary, re-remediated, as the Navy has promised.

While the *Draft Review* omits essential information, it includes irrelevant data as if it were "factual." For example, the Navy congratulates itself on all the work that has been done; in Parcel C, for example, the Navy touts all that was accomplished: "Radiological surveys and remediation have been performed for all radiologically impacted buildings (203, 205 and discharge tunnel, 211, 214, 224, 241, 253, 271, and 272), storm drains, and sanitary sewers, except for Buildings 211 and 253. In total, 37,572 cubic yards of soil was removed from 19,260 linear feet of sanitary sewer and storm drain lines; approximately 987 cubic yards of soil was disposed off site as LLRW (TtEC, 2016d)." (p. 3-18.) Similar summaries are included as to the other parcels as well.

But all that work was done by Tetra Tech. None of the work they claim to have done can be relied on. It all has to be resampled. So why does the Navy list these actions as if they were accomplishments? They are not. Instead, the Navy's summaries of how much dirt was moved, how many buildings were scanned, etc., only serve to illustrate the enormous impact of the fraud on the cleanup. What the Navy fails to say is that each and every one of those "accomplishments" are useless because Tetra Tech's data are useless.

These so-called accomplishments should be removed from the *Draft Review*. They have no relevance to assuring protectiveness.

D. Section 4 – Progress Since Last Review

Failure to address the Tetra Tech fraud in this, the *Draft Fourth Five-Year Review*, continues its omission in the *Third Five-Year Review* ("*Third Review*"), completed in November 2013. The original suspicions about Tetra Tech were raised a year before, in 2012. Yet nowhere in the *Third Review* is there the slightest hint that Tetra Tech's data might be fraudulent. None of the recommendations for any of the parcels in the *Third Review* include any mention of the discovery of the fraud or what the Navy did about it

between its discovery and the release of the *Third Review*. The Third Review included no recommendations at all concerning the fraud the Navy already knew about.

In Parcel D-2, for example, the *Third Five-Year Review* omitted a protectiveness statement "because the parcel was deemed to require no further action following completion of radiological remediation." (4.5, p. 4-3). But all Tetra Tech's data should have been suspect in 2012, calling into question the "completion of radiological remediation."

When it comes to the radiological fraud, the Navy played "hide the ball" in 2013 and obviously intends no change now. The Navy must be required to tell the whole truth about the radiological disaster it allowed to happen. It must not be allowed to dodge the truth or its responsibility any longer.

E. Section 5 – Five-Year Review Process

Section 5.2, Document and Data Review, states, "As part of this five-year review, documents and data related to remedy implementation were reviewed for each parcel. The reviews primarily focused on (1) documents and data that provide information on the technical and regulatory considerations that led to remedy selection and implementation, (2) documents that demonstrate remedy completion, and (3) documents and parcel-specific data that demonstrate the remedies continue to be protective of human health and the environment." (p. 5-2.)

This is a microcosm of all that is wrong with the Navy's approach to the post-Tetra Tech period. The Navy admits it doesn't take a dispassionate, objective view. It focuses on "documents that demonstrate remedy completion." It should be focusing on all relevant documents and data, whether they demonstrate compliance or not, especially if not.

And, when it comes to Tetra Tech's work, "parcel-specific data that demonstrate the remedies continue to be protective" are non-existent. It's all unreliable. None can demonstrate protectiveness or anything else.

Furthermore, the Fourth Five Year Review fails to look forward. It must discuss the need to amend all the existing RODs as they relate to radiological contamination, and Parcels E and E-2 for chemical contaminants. The current five year review process is the appropriate place to discuss the need for ROD amendments to account for new circumstances.

In fact, the Navy has done precisely that in the past. For example, it discussed the possibility of an amendment to the Parcel B ROD in the First Five Year Review: "The future RA process for Parcel B could include a technical memorandum in support of a ROD amendment, a proposed plan (with community involvement), a ROD amendment, RD, and RA, followed by closeout activities." The Parcel B ROD was eventually amended, in part because of the recommendation made in the first review:

In 2007-2008, the Navy prepared two technical memoranda…in support of amending the ROD as recommended by the First 5-year review. These memoranda provided the technical foundation for identification of revised remedial alternatives and preparation of a proposed plan and subsequent amended ROD for Parcel B. (Second Five Year Review at 3.5.8).

The *Draft* Review should provide recommendations for the steps to be taken in the coming five years, informed by which new information that was not considered when the RODs were approved.

F. Section 6 – Technical Assessment

The *Draft Review* is internally inconsistent. For example, Section 6 states, "Published documents report the completion of radiological surveys and remediation in IR-07/18 and Parcels B-1, B-2, C, D-1, D-2, E, G, UC-1, UC-2, and UC-3." (p. 6-6.)

Section 6.1.6, Radiological Surveys and Remediation, asks, "*Are the radiological surveys and remediation remedies implemented in IR-07/18 and Parcels B-1, B-2, C, D-1, D-2, E, G, UC-1, UC-2, and UC-3 functioning as intended by the decision documents?* YES (for IR-07/18 and Parcel D-1); NO (for Parcels B-1, B-2, C, D-2, E, G, UC-1, UC-2, and UC-3).P. 6-6).

Again, the Navy cannot claim that remediation has been "completed" but in the next breath admit, "Well, not really." Having determined under public pressure and the insistence of the EPA that all Tetra Tech data are unreliable, the Navy must drop any pretense that radiological work was "completed." The *Draft Review* should consistently say that none of Tetra Tech's work was "completed" and that the remedies it implemented are not protective.

As stated above, The Navy downplays the fraud throughout, including in Section 6. For example, it states, "In January 2018, the Navy determined that a significant portion of the radiological survey and remediation work completed to date was compromised by potential manipulation and/or falsification of data by one of its radiological remediation contractors. Compromised data were identified in reports associated with Parcels B-1, B-2, C, D-2, E, G, UC-1, UC-2, and UC-3. Again, this is an understatement. "A significant portion" of Tetra Tech's data was not compromised; all of it was. And characterizing the fraud as "potential" is belied by the facts, including those provided by BRAC's boss. It is past time for the Navy to stop denying that the fraud actually took place.

In Section 6.2.3, Changes in Risk Assessment Methods, the Navy claims it can substitute a 2014 EPA supplemental guidance in place of the risk assessment and, without proof, further claims equivalency: "Use of these updated default exposure parameters in place of the original values used in the risk assessments for each of the parcels primarily results in increasing the RBCs for the adult receptors. The increase is not significantly different from the values estimated in the original risk assessments. As such, EPA changes to default exposure parameters do not affect the protectiveness of the remedies." (p. 6-12.)

However, as the EPA made quite clear in its comments to the *Draft Parcel G Work Plan*, this substitution is improper; it impermissibly changes the ROD:

> At this stage of the CERCLA process, the cleanup goals have already been legally established. A new Radiation Risk Assessment is ordinarily only performed as part of a Five-Year Review to evaluate whether or not the original RG's are still protective. EPA has separately recommended that the Navy conduct this review, and, if any of the RGs are found to be no longer protective using the most current risk calculators, propose amendments to the Parcel G ROD to ensure protectiveness. For the current work plan, however, the current RGs still govern the cleanup and if any material is found on Parcel G that exceeds the RGs established in the Parcel G ROD for the ROCs, excluding naturally occurring and anthropogenic background, the material should be removed and disposed of in accordance with the ROD and other applicable laws and regulations. (p.3.)

On the other hand, Greenaction would welcome it if the Navy did formally what it is attempting to do by sleight of hand – reopen the ROD to include newer, more protective standards. We urge the Navy to accept EPA's suggestion that as part of the five-year review, it formally reassess the standards set in the nine-year-old ROD to make them more protective.

G. Section 7- Issues Recommendations and Other Findings

The *Draft Review* claims in Section 7 that, "It is anticipated that the radiological rework will span 5 years and be completed prior to the next five-year review." (p. 7-2.) This is yet another example of the Navy's wishful thinking. Consider that: the Navy claims it can redo more than a decade's work by Tetra Tech in less than half that time; to date the Navy still has not obtained an approved work plan for even a single parcel that needs to be reworked, nine months after the Navy finally acknowledged it would be necessary; and the Navy includes no timeline whatsoever detailing what activities will take place or when. Finally, consider this statement from Ms. Duchnak's victim impact statement: "The Navy estimates that the fraud committed by Mr. Hubbard and others has set back the planned transfer of HPNS property to the City by an approximate decade."

The Navy needs to stop stating hope as fact. It cannot claim in the *Draft Review* that the project will be delayed five years, when BRAC's boss says it will be double that.

It is this kind of transparently false optimism that continues to taint the Navy's relations with the community.

Section 7 also states that the "Navy has determined that a significant portion" of Tetra Tech's data was compromised. (p. 7-2.) As mentioned before, this is, at best, an understatement. All of Tetra Tech's data are compromised. The Navy admitted that publicly more than nine months ago. The *Draft Review* must say that clearly and without evasion.

H. Section 8 - Protectiveness Statement

The *Draft Review* repeats the following uninformative statement it makes as to Parcel B-1: "The remedies completed to date for Parcel B-1 are protective of human health and the environment, noting that the radiological removal actions are being retested." (p. 8.1.) The identical language is used in reference to Parcels B-2, C, G, UC-1, UC-2 and UC-3. (pp. 8-1 through 8-4.)

The Five-Year Review must be factual. It must start by admitting the radiological remedies in those parcels are not currently protective. This is the inevitable conclusion of the EPA's critique of the Navy's data review. And it must acknowledge that the "radiological removal actions" will be retested, not that they "are being retested." The Navy has not obtained regulatory approval for any retesting yet. And if the Navy refuses to accede to the EPA suggestions in its comments to the *Draft Parcel G Work Plan*, any retesting may have to await completion of the FFA's mandated dispute resolution process, further delaying when the Navy can truthfully claim the parcels "are being retested." As stated above, the revised *Draft Review* should describe the radiological work the Navy intends to do in response to the fraud in each parcel, along with a timeline of activities.

The protectiveness statements for Parcels D-1 and D-2 are equally dishonest. The *Draft Review* says the remedy for D-1 "is expected to be protective." (p. 8-3.) Of course, the Navy has "expected" a lot that did not turn out to be true. It expected Tetra Tech to do a proper job. It expected that it had the capacity to adequately supervise Tetra Tech. It expected to obtain free clearance in multiple parcels by now. Regulators and the public

have no reason to believe that the Navy will meet its expectations – it has not so far and, if the *Draft Parcel G Work Plan* and the *Draft Review* are any indication, the Navy has learned nothing from the Tetra Tech fraud and will blithely continue as it has done so far.

As to Parcel D-2, the Navy follows the template it used in Section 3; cite all the "work" it has done and then add the *non sequitor*, "Radiological surveys and removal actions completed in Parcel D-2 were potentially compromised, and corrective actions are required to determine if the RAOs have been achieved." It does not matter how many cubic yards of soil remediation were fraudulently "completed," though it is instructive of the impact of the Navy allowing the fraud to take place over so many years.

I. Figures

Figures 3 through13 are inaccurate. Each purports to show an "Overview of Remedy Components," for a specific parcel. Yet none includes radiological components; none of the figure's "legends" even reference radioactivity.

The Navy knows where Tetra Tech (as well as other radiological contractors) worked and can include such information. For example, the sewer systems have been identified as major radiological remediation sites. The Navy can and should include anticipated radiological work either in these figures or create separate radiological overviews of remedy components.

IV. NON-RADIOLOGICAL

A. The Draft Review Must Evaluate Protectiveness Consistent with Up-to Date, Scientific Sea and Bay-Level Rise Projections

The *Draft Review* surprisingly and unacceptably fails to consider essential new data that was not available when the remedies were selected. The most important missing data are the latest scientific projections of sea-level rise. Because of the intense toxicity of the hazardous and radioactive wastes (including residue from atomic bomb testing) that current remedies leave capped onsite, and the persistence of

that toxicity, the Navy courts long-term disaster if its Bay-level rise assumptions are wrong. The *Draft Review* must not only evaluate protectiveness in light of estimates of Bay-level rise in the coming decades, but its threat from Bay-level rise centuries into the future as well. If the Navy is wrong now and global warming causes the Bay to rise enough to overwhelm current remedies, the health of nearby residents, subsistence fishers, people recreating on the proposed "open space" and the hundreds of thousands of people living along the San Francisco Bay will all be at unacceptable risk.

State of California governmental agencies have done extensive research, analysis and reporting on the latest projections for rising sea levels – yet the *Draft Review* appears to have ignored this important science.

The San Francisco Bay Conservation and Development Commission (BCDC) is a planning and regulatory agency with regional authority over San Francisco Bay, the Bay's shoreline band, and the Suisun Marsh. BCDC was created in 1965 and is the nation's oldest coastal zone regulatory agency. Its mission is to protect and enhance San Francisco Bay and to encourage the Bay's responsible and productive use for this and future generations. BCDC leads the Bay Area's ongoing multi-agency regional effort to address the impacts of rising sea level on shoreline communities and assets.

BCDC's Adapting to Rising Tides project (ART) (http://www.adaptingtorisingtides.org/) started in 2010 when BCDC and NOAA's Office for Coastal Management brought together local, regional, state and federal agencies and organizations as well as non-profit and private associations for a collaborative planning project along the Alameda County shoreline. The project worked to identify how anticipated current and future flooding associated with global warming will affect communities, infrastructure, ecosystems and the economy.

Since then, the ART has continued to both lead and support multi-sector and cross-jurisdictional projects that build both local and regional capacity in the Bay Area

to plan for and implement adaptation. These efforts have enabled ART to test and refine adaptation planning methods (ART Approach) to integrate sustainability and transparent decision-making from start to finish, and foster robust collaborations that lead to action on adaptation. BCDC has conducted extensive scientific research. Its sea level rise projections and mapping are widely accepted as sound by government agencies. Adapting to Rising Tides Bay Area Sea Level Rise Analysis and Mapping Project has the latest data that the Navy must use in development of revised remedies to continue to assure protectiveness into the future.[11]

The State of California Ocean Protection Council's (OPC) *2018 State of California Sea Level Rise Guidance* is also vitally important to consider in developing safe remedies.[12]

The 2018 update of the Guidance was created by the OPC, California Natural Resources Agency, Governor's Office of Planning and Research, and the California Energy Commission. The Guidance provides the best available data on sea level rise projections for California which should be used by state agencies and local governments in their planning, permitting, and investment decisions.

The Remediation Design for Parcel E-2 is deficient given updated sea level rise projections. In Section 6.3 (Technical Assessment Question C, pp. 6-15), the *Draft Review* states:

> The estimated sea-level rise in San Francisco under three future greenhouse gas emission scenarios (referred to as representative concentration pathways [RCPs]) is summarized below:
> - RCP 8.5 is consistent with a future in which there are no significant global efforts to limit or reduce emissions. In 2100, the likely sea-level rise associated with this scenario ranges from 1.6 to 3.4 feet.

[11] See http://www.adaptingtorisingtides.org/project/regional-sea-level-rise-mapping-and-shoreline-analysis/) and http://www.adaptingtorisingtides.org/wp-content/uploads/2018/07/BATA-ART-SLR-Analysis-and-Mapping-Report-Final-20170908.pdf
[12] http://www.opc.ca.gov/webmaster/ftp/pdf/agenda_items/20180314/Item3_Exhibit-A_OPC_SLR_Guidance-rd3.pdf

- RCP 4.5 is a moderate emissions reduction scenario and assumes that global greenhouse gas emissions will be curtailed. In 2100, the likely sea-level rise associated with this scenario ranges from 1.2 to 2.7 feet.
- RCP 2.6 is a stringent emissions reduction scenario and assumes that global greenhouse gas emissions will be significantly curtailed. In 2100, the likely sea-level rise associated with this scenario ranges from 1.0 to 2.4 feet.

Based on the information above, a contingency of up to a 3-foot increase in sea level was considered in designing the crest elevation for Parcels E and E-2.

No other information has been identified to suggest that the remedies may not be protective of human health or the environment. (p. 6-15.)

The assumption greenhouse gas emissions will curtail is speculative at best, and should not be used as a guideline in remediation planning. This is especially true with the current EPA's efforts to abandon stringent greenhouse gas and other emissions limits from coal fired power plants and other industries.

BCDC's "Adapting to Rising Tides Bay Area Sea Level Rise Analysis and Mapping Project" outlines a range of likely sea level rise scenarios (see Appendix III, p. 13). The upper bound of these scenarios is 5.5 feet (66 inches) sea level rise by the year 2100. Adapting to Rising Tides also considers a 100-year extreme tide (see appendix III, p. 15), which is the coastal water level elevation that has a 1 percent chance of occurring in any given year. A 5.5 feet (66 inches) sea level rise with the 100-year extreme tide would create a tide 9 feet (108 inches) above Mean Higher High Water (MHHW, the average of the high water mark of each tidal day observed over the National Tidal Datum Epoch).

Even minimal risk of catastrophic events must be considered and planned for due to the dangerous radioactive and contamination in close proximity to people and the Bay.

According to the 2018 State of California Sea-Level Rise Guidance (Appendix II, p. 57):

- Sea level rise will reach 5.7 to 6.9 feet by 2100 under the medium to high risk aversion scenario.
- Sea level rise will reach 10.2 feet by 2100 under the H++ scenario (detailed below).

The 2018 State of California Sea-Level Rise Guidance suggests that projects with a lifespan beyond 2050, that have a low-tolerance for risk (i.e., hazardous waste & toxic storage sites) should use H++ scenario. H++ scenarios can be considered the "worst-case" possibility and describe an extreme sea level rise scenario that would result from a catastrophic event (i.e., the collapse of the West Antarctic ice sheet), especially under high emission scenarios. **T**he projected sea level rise under the H++ scenario is 10.2 feet by 2100.

The projections used by the *Draft Review* are inadequate because they do not consider the most up to date sea level rise projections or consider a future in which emissions will increase. The State of California Sea Level Rise Guidance 2018 Update has estimated the chance of sea level rise meeting or exceeding various heights in various years (see Appendix I, p. 58). It estimates these percentages under two scenarios: one in a future with low carbon emissions and one in a future with high carbon emissions. The likeliness of sea level rise exceeding 3 feet by 2100 under a future with low emissions is 7%. The likeliness of sea level rise to exceed 3 feet by 2100 with high future emissions is 28%. So, the current design has a 7-28% chance of failure due to sea level rise by 2100, depending on the future carbon emissions. This risk is unacceptable.

> The risk of flooding and inundation is especially important for Parcel E-2, due to its history of disposal of hazardous and radioactive waste. According to Adapting to Rising Tides, Sea level rise and storm events may cause flooding or groundwater intrusion to contaminated sites and landfill waste containment systems. Temporary or permanent surface flooding, erosive tidal or wave energy, and elevated groundwater levels could cause the release of

> hazardous substances with potentially significant consequences on public health, the environment, and the local economy.[13]

The release of any amount of toxic or radioactive substances in Hunters Point would be detrimental because the community is already disproportionately burdened by a multitude of environmental hazards, and would have a significant negative impact on the entire Bay ecosystem.

Both BCDC and the State of California Sea-Level Rise Guidance project sea level rise to surpass the 3-foot mark accounted for in the Navy's design considerations. Three feet above mean sea level is generally considered in the middle of the likely range of sea level rise by 2100. When planning for construction in an area that is as dangerous when flooded as Parcels E and E2 with all the toxic waste they contain, the upper bound of all sea level rise scenarios should be used, which according to BCDC is 9 feet and according to State of California Sea-Level Rise Guidance is 10.2 feet.

Accordingly, the remedies that could be affected by sea-level rise significantly higher than the unreasonably low assumptions made by the Navy must be reconsidered in this review.

A. Potential Flooding of the Revetment Wall Must Be Considered

As depicted in the Engineering/Remediation Resources Group, Inc.'s Shoreline Revetment Detail the highest point of the design is the concrete sea wall, standing at approximately 7 feet above mean sea level. This height is insufficient in light of current updated scientific sea level rise projections referenced above. Combined with the possibility of high tides, king tides, storm surges, wind driven waves and El Nino, all of the sea level rise possibilities outlined in the previous section indicate there is a strong likelihood of the currently designed sea wall flooding.

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[13] SF BCDC Adapting to Rising Tides. "Contaminated Lands", p. 1. http://www.adaptingtorisingtides.org/portfolio/contaminated-lands/

Remedial design should reflect the possibility which would most effectively protect the residents of Bayview Hunters Point. Considering the catastrophic health hazards which could result from Parcel E-2 flooding, the H++ scenario should be used, accounting for sea level rise of 10.2 feet by 2100. In conclusion, the construction of a revetment sea wall at 7 foot is inadequate, and will likely expose additional contaminants to a community and San Francisco Bay that are already overburdened with multiple environmental hazards.

B. Concerns about Slurry Wall Construction

The *Draft Review* does not address the effect of sea level rise on slurry walls. As sea levels rise, the levels of ground water tables rise as well. Nor does it account for how the rise of groundwater will affect the integrity of the slurry walls. The design process seems to be using current groundwater levels, but not planning for new levels/flow directions/pressures. The effective life cycle of these slurry walls is not addressed, and if it is more than 10-15 years, which it well should be, these sea level rise outcomes should be a major design consideration. This also of course impacts the "remedy" of leaving contamination buried at the waterfront.

Constructing a slurry wall on fractured bedrock is a poorly engineered idea which fails to provide a long term solution. While the review indicates that the land is not an aquifer due to its limited flow capability, ineffectiveness remains. Regardless of the depth of the slurry wall, water will percolate through the cracks of the bedrock on which the slurry wall sits. This will enable the interaction of the contaminated landfill groundwater with both the San Francisco Bay water and surrounding uncontaminated groundwater.

The *Draft Review* additionally fails to address any seismic activity that may occur, which could both destroy the slurry wall and potentially further fracture the bedrock. This should be a major concern as San Francisco is right on the San Andreas

Fault and, is highly susceptible to major, potentially catastrophic earthquakes like the one on April 18, 1906.

The Navy's reliance on below-ground barriers and capping of contaminated soil with a few feet of barriers are not safe or sustainable remedies for the extremely contaminated land of Parcel-E and E 2. In particular, caps are extremely vulnerable to flooding with increased water levels caused by sea level rise.

C. The Slurry Wall Will Not Stop Rising Groundwater Inundation of Contamination

Increased water levels in the Bay and storm surges are not the only flooding and inundation threat to the "remedy" of leaving buried contaminated waste so close to the Bay. As sea levels rise, so will groundwater.

A study by the US Geological Survey and Yale University states "...as sea level rises, so will groundwater levels, and since underground infrastructure - including sewer pipes and utility equipment - was built with historical groundwater levels in mind, this could lead to expensive headaches for coastal communities."[14]

A slurry wall and capping on top of contamination will do nothing to prevent rising groundwater from inundating and potentially flooding the area, resulting in an environmental and health disaster.

D. The Vulnerability of Bayview Hunters Point Residents to Pollution Must Be Factored Into the Review

The Navy's remediation of the Shipyard Superfund Site must continue to be protective of health and the environment. It must be based on science and take into account the current reality of the health crisis and environmental conditions at and

[14] http://www.climatecentral.org/blogs/sea-level-rise-may-raise-groundwater-levels

near the site, including Bayview Hunters Point, and how potential failure of remedies at the shipyard could significantly exacerbate them.
Unfortunately, the approved remedies do not take into consideration the well-documented health vulnerabilities of residents. Remedies must be based on facts, not on abstract "health" levels that are not appropriate for Bayview Hunters Point.

It is a well-established fact that Bayview Hunters Point is heavily impacted by decades of pollution from industry and the military, as well as from two freeways, the City's main sewage treatment plant, dozens of contamination sites, freight transport, the Port of San Francisco, and under-regulated and unregulated businesses operating with little or no government oversight.

In January 2017, the Office of Environmental Health Hazard Assessment (OEHHA), on behalf of the California Environmental Protection Agency (CalEPA), released Version 3.0 of the California Communities Environmental Health Screening Tool (CalEnviroScreen). CalEnviroScreen identifies California communities by census tract that are disproportionately burdened by, and vulnerable to, multiple sources of pollution. CalEnviroScreen measures vulnerability through evaluating and quantifying pollution exposures, environmental effects, sensitive populations and socioeconomic factors.

CalEnviroScreen 3.0 found that BVHP is one of the communities in the entire state most at risk from pollution, and concluded that it has a higher pollution burden than 90% of the state.

CalEnviroScreen 3.0, quantifies this community's significant exposure to environmental hazards, ranking it in the 99th percentile for diesel Particulate Matter, 98th percentile for groundwater threats, and 86th percentile for hazardous waste. It found BVHP to be in the 98th percentile for asthma.

Based on the facts regarding these significant and alarming vulnerabilities, the remedies set forth in the various RODs must be re-evaluated and new, more protective remedies adopted. The appropriate health protective remedies will require an expanded, comprehensive and safe cleanup and removal of as much of the hazardous and radioactive waste as possible from the site – not merely capping waste in place. Leaving radioactive and hazardous wastes buried at the Superfund Site, next to existing and proposed neighborhoods, under what is proposed to be recreational "open space," and next to the San Francisco Bay waterfront threatened by rising sea levels – projected to be as more than 5 feet by 2100 under "moderate" assumptions and climbing even higher in future centuries - is purely reckless and unacceptable.

E. The Entire Shipyard Superfund Site and Adjacent Areas Must Be Comprehensively Retested, With Independent Community Oversight

The Navy must carry through with its public commitment to properly retest all areas, not just some areas, where Tetra Tech did radiological work at the Shipyard. The Navy and other government agencies must test the entire Shipyard Site and adjacent areas, including any locations that information provided by whistleblowers, residents and other reliable sources indicate may have been contaminated from Shipyard operations.

Scanning is insufficient and unacceptable if not combined with comprehensive core sampling. Testing must be thorough and comprehensive:

a. Radiological core sampling must be conducted of the entire site and adjacent areas. It is imperative that all core samples go at least 9 feet beneath the surface, .

b. The core sampling should create a 2m x 2m mapping grid,

c. All core sampling must follow split sampling protocols.

d. All ground water should be tested for radiation contamination, including aquifers A and B,

e. The Navy must immediately begin working with the State of California and the Bay Area Air Quality Management District to develop and implement standards for fugitive radiological dust, and

f. Radiologically contaminated soil should be marked with an orange colored dye. Applying this would explicitly identify important areas, help prevent accidental shipments of radioactive soil to landfills, and act as a dust suppression measure.

F. Land Use

Simply stated. kids and other residents should not live, work or play next to or on top of hazardous and radioactive waste. The effect of a botched and inadequate cleanup reverberate far beyond the shipyard, impacting nearby San Francisco neighborhoods, the Bay itself and all who enjoy it and rely upon it, including subsistence fishers, and communities along the Bay.

We call on the Navy and regulatory agencies to reconsider the RODs, as part of this five-year review, to incorporate newer and more protective cleanup standards and a comprehensive remediation.

B. CONCLUSION

The widespread fraud and botched cleanup, the lack of proper regulatory oversight, the lack of transparency and the government's inappropriate relationship with mega-developer Lennar/Five Points have undermined a proper cleanup of the contamination and resulted in the reckless and unscientific "remedies" being evaluated in the *Draft Review*. This is the time and process to re-evaluate the "remedies" because they:

- are not protective of public health or the environment,

- do not take into account the fact that Bayview Hunters Point residents have been found by the State of California to be highly at risk and vulnerable to pollution due to health, environmental and socio-economic indicators,
- endanger San Francisco Bay,
- are based in significant part on "data" produced by Tetra Tech despite the widespread fraud committed by that company during years of "remediation" work at the Superfund site,
- are not based on the pending large scale retesting of much of the Superfund Site which has not yet begun, and
- do not reflect latest scientific consensus on expected sea level rise due to climate change.

Our comments highlight serious flaws and omissions in the Navy's review that must be corrected. These flaws include, among others, inadequate consideration of the impact of the radiological fraud on the cleanup and outdated assumptions which will particularly impact the large amounts of hazardous and radioactive waste buried at Parcel E-2; the *Draft Review's* remedy analysis fails to adequately address rising sea levels due to climate change which threaten San Francisco Bay and its waterfront. The threat that rising Bay levels could inundate portions of the shipyard including Parcel E-2, as well as an inadequate revetment design that will not provide adequate protection from contaminants reaching the Bay are real and must be addressed.

The ROD remedies that are subject to the five-year review must be revised as part of this review process to incorporate the entirely foreseeable effects of significant new information, not available when the RODs were adopted. This includes the impact of the radiological fraud and the substantial and growing threat that Bay-level rise presents to the future integrity of remedies selected years ago.

We have already seen the consequences of the Navy's failure to anticipate foreseeable risks. In August 2000, local residents observed strange-colored smoke from what appeared to be a fire burning underground in Parcel E-2. This subsurface

fire burned for months, with plumes of smoke readily visible to affected residents, some of whom report adverse respiratory affects. The smoke also affected shipyard workers and the police personnel based there. The Navy failed to properly inform the public about the health risks for the better part of three weeks after the fire broke out.[15] That an underground chemical fire erupted and burned for months in a supposedly stable capped "remedy" highlights the risks to protectiveness from leaving highly toxic waste buried on site.

The Navy must plan for – not underplay - predictable risks such as those posed by global warming, especially at Parcel E-2, where buried contamination is extensive and will continue to be toxic far into the future. If the Navy gets it wrong as a result of its refusal to factor up-to-date science into the five-year review, it could unleash a catastrophe to the public health and the environment. As more and more data on sea-level and Bay-level rise emerges, the Navy must reconsider and conclude that the buried hazardous and radioactive waste at Parcel E_2 needs to be removed from proximity to residents and the rising Bay.

The *Draft Five-Year Review* needs to be redone to incorporate up-to-date science and public health data. Common sense and environmental justice require that remedies be revisited as part of the five-year review and revised remedies must prioritize removal of any and all hazardous and radioactive waste and contamination from the site.

[15] *Navy Owns Up to Monthlong Toxic Fire at Hunters Point, SFGate, Sept. 11, 2000, https://www.sfgate.com/bayarea/matier-ross/article/Navy-Owns-Up-to-Monthlong-Toxic-Fire-at-Hunters-2739820.php*

Appendices

Appendix I. Probability that Sea-Level Rise will meet or exceed a particular height (in feet) in San Francisco (State of California Sea-Level Rise Guidance 2018 Update, p. 58)

The chart below displays the chances sea level rise will meet or exceed a certain height by the year listed.

SAN FRANCISCO - High emissions (RCP 8.5)

	Probability that sea-level rise will meet or exceed... (excludes H++)									
	1 FT.	2 FT.	3 FT.	4 FT.	5 FT.	6 FT.	7 FT.	8 FT.	9 FT.	10 FT.
2030	0.1%									
2040	3.3%									
2050	31%	0.4%								
2060	65%	3%	0.2%	0.1%						
2070	84%	13%	1.2%	0.2%	0.1%					
2080	93%	34%	5%	0.9%	0.3%	0.1%	0.1%			
2090	96%	55%	14%	3%	0.9%	0.3%	0.2%	0.1%	0.1%	
2100	96%	70%	28%	8%	3%	1%	0.5%	0.3%	0.2%	0.1%
2150	100%	96%	79%	52%	28%	15%	8%	4%	3%	2%

SAN FRANCISCO - Low emissions (RCP 2.6)

	Probability that sea-level rise will meet or exceed... (excludes H++)									
	1 FT.	2 FT.	3 FT.	4 FT.	5 FT.	6 FT.	7 FT.	8 FT.	9 FT.	10 FT.
2060	43%	1.4%	0.2%							
2070	62%	4%	0.6%	0.2%						
2080	74%	11%	2%	0.4%	0.2%	0.1%				
2090	80%	20%	3%	1.0%	0.4%	0.2%	0.1%	0.1%		
2100	84%	31%	7%	2%	0.8%	0.4%	0.2%	0.1%	0.1%	
2150	93%	62%	31%	14%	7%	4%	2%	2%	1%	1%

Appendix II. Projected Sea-Level Rise (in feet) for San Francisco (State of California Sea-Level Rise Guidance, p. 57)

The chart below portrays the probabilistic projections for sea-level rise height, along with the H++ scenario (shown in the far right, blue column), as seen in the Rising Seas Report.

		Probabilistic Projections (in feet) (based on Kopp et al. 2014)				H++ scenario (Sweet et al. 2017) *Single scenario
		MEDIAN	LIKELY RANGE	1-IN-20 CHANCE	1-IN-200 CHANCE	
		50% probability sea-level rise meets or exceeds...	66% probability sea-level rise is between...	5% probability sea-level rise meets or exceeds...	0.5% probability sea-level rise meets or exceeds...	
			Low Risk Aversion		Medium - High Risk Aversion	Extreme Risk Aversion
High emissions	2030	0.4	0.3 - 0.5	0.6	0.8	1.0
	2040	0.6	0.5 - 0.8	1.0	1.3	1.8
	2050	0.9	0.6 - 1.1	1.4	1.9	2.7
Low emissions	2060	1.0	0.6 - 1.3	1.6	2.4	
High emissions	2060	1.1	0.8 - 1.5	1.8	2.6	3.9
Low emissions	2070	1.1	0.8 - 1.5	1.9	3.1	
High emissions	2070	1.4	1.0 - 1.9	2.4	3.5	5.2
Low emissions	2080	1.3	0.9 - 1.8	2.3	3.9	
High emissions	2080	1.7	1.2 - 2.4	3.0	4.5	6.6
Low emissions	2090	1.4	1.0 - 2.1	2.8	4.7	
High emissions	2090	2.1	1.4 - 2.9	3.6	5.6	8.3
Low emissions	2100	1.6	1.0 - 2.4	3.2	5.7	
High emissions	2100	2.5	1.6 - 3.4	4.4	6.9	10.2
Low emissions	2110*	1.7	1.2 - 2.5	3.4	6.3	
High emissions	2110*	2.6	1.9 - 3.5	4.5	7.3	11.9
Low emissions	2120	1.9	1.2 - 2.8	3.9	7.4	
High emissions	2120	3	2.2 - 4.1	5.2	8.6	14.2
Low emissions	2130	2.1	1.3 - 3.1	4.4	8.5	
High emissions	2130	3.3	2.4 - 4.6	6.0	10.0	16.6
Low emissions	2140	2.2	1.3 - 3.4	4.9	9.7	
High emissions	2140	3.7	2.6 - 5.2	6.8	11.4	19.1
Low emissions	2150	2.4	1.3 - 3.8	5.5	11.0	
High emissions	2150	4.1	2.8 - 5.8	7.7	13.0	21.9

Appendix III. San Francisco Sea Level Rise Scenarios (Bay Conservation and Development Commission's Adapting to Rising Tides Bay Area Sea Level Rise Analysis and Mapping Project, Final Report 2017, Pages 13-15)

The first six scenarios (12, 24, 36, 48, 52, and 66 inches of SLR above MHHW) relate directly to the NRC SLR estimates, and they capture a broad range of scenarios between the most-likely scenario and the high end of the uncertainty range at both mid-century and the end of the century:

1. 12-inch SLR ≈ 2050 most-likely SLR scenario
2. 24-inch SLR = 2050 high end of the range; or an existing 5-year extreme tide
3. 36-inch SLR = 2100 most-likely SLR scenario; or an existing 50-year extreme tide
4. 48-inch SLR ≈ 2100 upper 85 percent confidence interval; or 6 inches of SLR plus a 100-year extreme tide
5. 52-inch SLR ≈ 12-inch SLR plus 100-year extreme tide
6. 66-inch SLR = 2100 upper-end SLR scenario; or 24-inch SLR plus 100-year extreme tide

Inundation maps were also created for Bay water level elevations of 77, 84, 96, and 108 inches above MHHW. These levels are above current predictions for SLR likely to occur by 2100, but they are helpful in illustrating short-term flooding that could occur when extreme tides are coupled with SLR:

7. 77 inches above MHHW ≈ 36-inch SLR plus 100-year extreme tide
8. 84 inches above MHHW ≈ 48-inch SLR plus 50-year extreme tide
9. 96 inches above MHHW ≈ 66-inch SLR plus 25-year extreme tide
10. 108 inches above MHHW ≈ 66-inch SLR plus 100-year extreme tide

Sea Level Rise Scenario	Daily Tide	Extreme Tide (Storm Surge)						
	+SLR (in)	1yr	2yr	5yr	10yr	25yr	50yr	100yr
	Water Level above MHHW (in)							
Existing Conditions	0	12	19	23	27	32	36	41
MHHW + 6"	6	18	25	29	33	38	42	47
MHHW + 12"	12	24	31	35	39	44	48	53
MHHW + 18"	18	30	37	41	45	50	54	59
MHHW + 24"	24	36	43	47	51	56	60	65
MHHW + 30"	30	42	49	53	57	62	66	71
MHHW + 36"	36	48	55	59	63	68	72	77
MHHW + 42"	42	54	61	65	69	74	78	83
MHHW + 48"	48	60	67	71	75	80	84	89
MHHW + 52"	52	64	71	75	79	84	88	93
MHHW + 54"	54	66	73	77	81	86	90	95
MHHW + 60"	60	72	79	83	87	92	96	101
MHHW + 66"	66	78	85	89	93	98	102	107

APPENDIX IV

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DEPARTMENT OF THE NAVY
BASE REALIGNMENT AND CLOSURE
PROGRAM MANAGEMENT OFFICE
33000 NIXIE WAY, BLDG 50 STE 207
SAN DIEGO, CA 92147

5820
Ser BPMO/003
March 15, 2018

The Honorable James Donato
United States District Court
Northern District of California
Federal Building and Courthouse
450 Golden Gate Avenue
San Francisco, California

Dear Judge Donato:

SUBJECT: VICTIM IMPACT STATEMENT IN THE MATTER OF U. S. V. HUBBARD

The Department of the Navy has been designated a crime victim under 18 U.S.C. § 3771 as a result of the fraud committed by Mr. Hubbard, a former employee of Tetra Tech EC Inc. (Tt EC), and others. The Navy contracted Tt EC to prepare planning documents, investigate radiological contamination, conduct remediation, dispose of radioactive waste, and document their activities to support closure of radiologically-impacted sites and buildings at Hunters Point Naval Shipyard (HPNS) from 2003 to 2014. These activities were necessary prior to the Navy turning HPNS over to the City of San Francisco for redevelopment. The fraud committed by Mr. Hubbard and other Tt EC employees has caused not only a substantial financial loss to the Navy, but harm to the Navy's reputation, and it has cost the Navy substantial resources and time. The purpose of this statement is to give the Court a sense of the magnitude of the negative impact of this fraudulent conduct and how it has made the accomplishment of both the Navy's and the City's goals more difficult. Because of the widespread and continuing harm that he has caused the Navy, we ask that you award Mr. Hubbard a substantial sentence.

While the fraud committed by Mr. Hubbard and others has caused the Navy concrete and measurable monetary loss (addressed below), this fraud has also caused significant harm to the Navy that is much more difficult to quantify - but very real. The fraud and uncertainty surrounding Tt EC's work at HPNS has caused a complete loss of trust in the Navy by the local community. The new residents at HPNS are understandably anxious for their safety, and this has required additional effort by the Navy and regulators to address these concerns. The transfer of the property to the City will be delayed by many years, and the Navy has had to address the ire and frustration of the Mayor's Office, the Supervisor's Office, and local Congressional staffs. The redevelopment of HPNS was supposed to revitalize the community and provide jobs and affordable housing; all of that is now on hold indefinitely as the Navy and the regulatory agencies have determined that Tt EC's work is unreliable. The frustrations of these local constituencies have been channeled into a strong activist element which has made the Navy's public meetings tense, aggressive and explosive.

5820
Ser BPMO/003
March 15, 2018

The fraud committed by Mr. Hubbard and others has also led to negative national media attention. The effort to respond to this negative media attention has required increased staffing to answer questions, prepare for interviews, and conduct risk communication training – all of which pulled Navy staff away from their primary duties and caused collateral impacts to other Navy bases and projects.

In addition to responding to the media, correcting misinformation, and responding to the concerns of the public and politicians, the Navy's Base Realignment and Closure (BRAC) Office created a special Review Team to assess the fraud allegations, determine what level of additional site investigation was needed, perform sampling, and then incorporate these findings into a new Work Plan for HPNS. These activities diverted significant numbers of BRAC employees from their normal duties, causing additional disruption to numerous other Navy projects across the country. This diversion of personnel and resources resulted in delays and increased costs for these other projects and resulted in constant stress on the Navy staff over a sustained period of time. The efforts of the Review Team and other similar efforts (including legal and contract dispute efforts, technical re-calculations, political briefings to the City and Congressional delegations, and constant communication up and down the Navy chain of Command), has cost Navy personnel hundreds if not thousands of hours of additional work. The Navy estimates that the fraud committed by Mr. Hubbard and others has set back the planned transfer of HPNS property to the City by an approximate decade. This means not only lost development opportunities for the City and the local community, but continued cost to the Navy to hold and maintain the property.

The fraud has also caused a loss of confidence by the regulatory community (both EPA and California State regulators) regarding the Navy's radiological remediation program and the Navy's competence to implement it. The EPA has expressed to the Navy that they no longer have confidence in the work performed by Tt EC at HPNS, as well as at other Navy radiological sites including those located at Treasure Island and Alameda in the San Francisco Bay Area. The Navy now faces an uphill struggle to rehabilitate itself from this negative connotation in the regulatory community. It will take years to rebuild this credibility.

As I indicated above, the negative fiscal impact to the Navy of the fraud committed by Mr. Hubbard and others at HPNS is consequential, and continues to be assessed. The Navy awarded sixteen contract task orders to address radiological work at HPNS to Tt EC. To date, the Navy has paid Tt EC $261.8M for work performed at HPNS. Due to the uncovered fraud, all of this work has been called into question and may need to be re-performed. After discovering evidence of Tt EC data falsification/manipulation, and becoming aware of allegations from former Tt EC employees/subcontractors, the Navy hired an independent contractor (Battelle) to provide daily onsite radiological quality assurance for all Navy contractors performing radiological work at HPNS. This cost approximately $2.2M. The Navy also hired CH2MHill to re-evaluate the work performed and documented by Tt EC at HPNS. CH2MHill reviewed Tt EC's radiological

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database for buildings and soil sites for falsification/manipulation using a variety of statistical and logic tests. This analysis provided evidence of previously-undiscovered data falsification and manipulation, which prompted the Navy to begin preparing work plans for an independent analysis of the worksite. The total cost for the database evaluation, work plan preparation, and preliminary field work is approximately $8.8M. The Navy is currently working with federal and state regulatory agencies to determine the extent of rework that will be necessary at HPNS in order for the Navy to obtain the required "free release" from the regulatory agencies to turn the property over to the City. The EPA has indicated that it would require all work to be re-performed as originally contracted. However, these discussions are not final. The Navy's best estimates for required re-work costs currently range from $100M to $300M.

In sum, the Navy has expended $272.8 M to date paying Tt EC for their work at HPNS, identifying the fraud, and taking measures to prevent further fraud. Depending on the cost of required re-work, this number will certainly rise to $372.8 M and is likely to rise as high as $572.8 M. This amount of money would buy a new Littoral Combat ship. It is nearly half of the Navy's total expenditures for ***all*** environmental clean-up activities at HPNS through fiscal year 2017 ($991.1 M). This is money that could otherwise have been used by the Navy to train sailors, build ships, purchase aircraft, – in short, to perform the Navy's core mission of fighting the country's wars, deterring aggression, and maintaining the freedom of the seas.

The fraud committed by Mr. Hubbard and others has undermined the taxpayer's trust in the Navy as a good financial steward. Taxpayers trust that the Navy only asks for what it needs, knowing that there are many other important and vital uses for limited funds. The Navy invests an enormous amount of time, energy, and pride in building this trust, and because of that, the military is generally considered one of the most trusted institutions in America. But it only takes the misconduct of a few individuals to erode that essential trust - misconduct like Mr. Hubbard's.

Mr. Hubbard's actions had far-reaching consequences for the United States, its employees, the City of San Francisco, the local residents, and the taxpayers. The Navy therefore respectfully requests that the Court consider a severe sentence for Mr. Hubbard that is commensurate with the adverse impacts of his fraud upon the Navy.

Sincerely,

Laura Duchnak

LAURA DUCHNAK
Director

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APPENDIX V

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DECLARATION OF STEVEN J. CASTLEMAN

1. My name is Steven J. Castleman. I am an attorney licensed to practice law in the State of California. Together with my co-counsel, David Anton, I represent Greenaction for Health and Environmental Justice in this action and a Petition seeking to revoke the federal Materials License of Tetra Tech, EC, Inc. ("Tetra Tech"), License number 29-31396-01, issued by Nuclear Regulatory Commission ("NRC"). The Petition is pending before the Executive Director for Operations of the NRC. That Petition (Exhibit 1 to this action), supported by statements under penalty of perjury, demonstrates Tetra Tech engaged in widespread fraud, including reporting fraudulent sampling and scanning data, which has compromised the remediation of radioactive contamination at the Hunters Point Naval Shipyard in San Francisco, California ("Shipyard").
2. The U.S. Navy hired contractors to review the data reported by Tetra Tech in an attempt to ascertain which, if any, of those data are reliable. One or more of those contractors wrote the reports entitled *Draft Radiological Data Evaluation Findings Report for Parcels B and G Soil*, dated September 2017, which is attached to the Supplemental Filing as Exhibit 1 and *Draft Radiological Data Evaluation Findings Report for Parcels C and E Soil*, dated December 2017, which is attached to the Supplemental Filing as Exhibit 1. It supplements the evidence of fraud and was not known at the time of the filing of the Petition.
3. On January 12, 2018, I had a telephone conversation with Dr. Kathryn A. Higley, a Professor and Head of the School of Nuclear Science and Engineering in the College of

Engineering at Oregon State University. She has been hired by the U.S. Navy to act as a Community Technical Liaison for the radiation cleanup at the Shipyard.

4. During our phone conversation, Dr. Higley told me that the Navy has concluded, after data reviews including the one represented by Exhibit 1, that virtually all of the data reported by Tetra Tech is suspect. Later in our conversation she qualified what she said, saying a substantial but undefined proportion of Tetra Tech's data was "to a large extent useless." She also informed me that substantial re-sampling and re-scanning will be required to determine the full impact of Tetra Tech's fraud on the cleanup and the planning process for that project is currently under way.
5. On January 31, 2018, I attended a Community Open House meeting hosted by the Navy concerning the Hunters Point Shipyard radiological cleanup. Prior to the meeting I had a conversation with Derek Robinson, of the Navy's Base Realignment and Closure Program Management Office West ("BRAC PMO West"). He is the person in charge of the cleanup of the shipyard on behalf of the Navy. During our conversation, Mr. Robinson confirmed what Dr. Higley told me; the Navy had lost confidence in the Tetra Tech data. Mr. Robinson also said that the Navy was going to treat all Tetra Tech's data as unreliable and resample all locations where Tetra Tech did radiological work.
6. I declare under penalty of perjury that the foregoing is true and correct.

June 26, 2018

Steven J. Castleman
Attorney at Law

Date

APPENDIX VI

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Steven Castleman

From: Steven Castleman
Sent: Tuesday, January 30, 2018 4:26 PM
To: 'Robinson, Derek J CIV NAVFAC HQ, BRAC PMO'
Cc: David Anton; 'Bradley Angel'; brian@greenaction.org
Subject: List of Witnesses/Meeting Request
Attachments: Witness list for Navy-2.pdf

Mr. Robinson,

Attached is the list of potential witnesses to the Tetra Tech fraud who should be interviewed.

The descriptions of what they know are based on information developed from other witnesses; they are not meant to limit the subject matter of interviews, but rather to act as a starting point for inquiry. Trained, professional investigators should be hired who will seek to learn **all** the witnesses know about Tetra Tech's fraudulent activities and who will follow up on any additional leads that result from such interviews.

I will await your response to our meeting request.

See you tomorrow evening.

Sincerely,

Steve Castleman

From: Robinson, Derek J CIV NAVFAC HQ, BRAC PMO [mailto:derek.j.robinson1@navy.mil]
Sent: Tuesday, January 30, 2018 8:06 AM
To: Steven Castleman
Subject: RE: Meeting Request/List of Witnesses

Dear Mr. Castleman,

I will not be able to meet this week, but have been discussing your request internally and should have a response by early next week.

Thank you for your patience.

Best Regards,

Derek J. Robinson, PE
BRAC Environmental Coordinator
Navy BRAC PMO West
33000 Nixie Way; Bldg 50
San Diego CA 92147
Desk Phone: 619-524-6026

-----Original Message-----
From: Steven Castleman [mailto:scastleman@ggu.edu]
Sent: Monday, January 29, 2018 11:54 AM
To: Robinson, Derek J CIV NAVFAC HQ, BRAC PMO
Subject: [Non-DoD Source] Meeting Request/List of Witnesses

Mr. Robinson,

I told you I would get you a list by last Friday of percipient witnesses that should be interviewed in the Tetra Tech case. Unfortunately, It that will have to be delayed until later this afternoon or tomorrow because I have gotten tied up on other pressing matters. I apologize for the delay.

On a different subject, are you able to meet this Thursday or Friday? If not, can we schedule a meeting that fits with your calendar?

Thank you.

Steve Castleman

Visiting Associate Professor & Staff Attorney

Environmental Law and Justice Clinic

415-442-6675 | scastleman@ggu.edu <mailto:scastleman@ggu.edu>

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Steven Castleman

From: Steven Castleman
Sent: Friday, February 16, 2018 1:08 PM
To: 'Robinson, Derek J CIV NAVFAC HQ, BRAC PMO'
Cc: 'Bradley Angel'; brian@greenaction.org; David Anton; 'Fairbanks, Brianna'; 'lee.lily@epa.gov'
Subject: Additional Witnesses
Attachments: 2.16.18.ltr.robinson.pdf

Dear Mr. Robinson,

Attached please find a letter to you supplementing the witness list I sent you on January 30, 2018. It contains 5 additional names, all of whom worked in the on-site laboratory and whom we have reason to believe have personal knowledge of improper sample and data manipulation.

The letter also seeks a response to our August 2017 request for a meeting with you.

Steve Castleman
Visiting Associate Professor & Staff Attorney
Environmental Law and Justice Clinic
415-442-6675 | scastleman@ggu.edu

GOLDEN GATE UNIVERSITY SCHOOL OF LAW
536 Mission Street • San Francisco • CA 94105

APPENDIX VII

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RADIOLOGICAL SURVEY REPORT

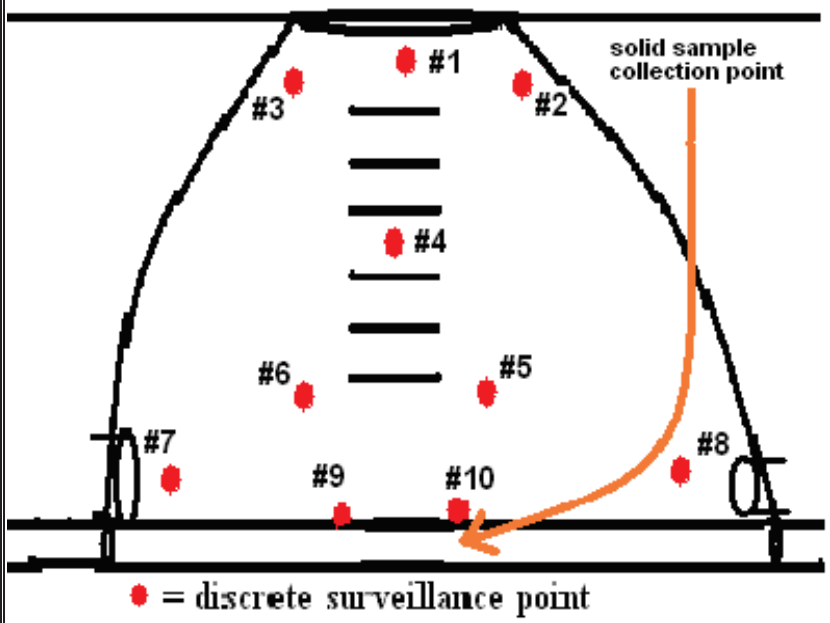
NWTS #:Par A M/H Bkg Brick 012804 Page __1_ of __1_

DATE:	January 28, 2004	INSTRUMENTATION USED				
TIME:	0800 hours	MODEL	S/N	EFF.%	BKRD	CAL. DUE DATE
SURVEYOR:	Bert Bowers	Ludlum: 19	101733	N/A	5-10 µR/hr	October 1, 2004
LOCATION:	Manhole, Par A (brick)	Ludlum: 2350-1	82955	N/A	10,514 CPM	August 21, 2004
REVIEWED BY:	Daryl DeLong	Ludlum: 2360	178154	α 12% β 6%	2 CPM 255CPM	October 13, 2004

µR dose rates = µR/hr; α, β & γ survey results = CPM

PURPOSE OF SURVEY:
Establish background reference area/levels (from non-impacted M/H location) similar to M/H's to be accessed for pneumatic plug installation (i/s sanitary sewer system).

Survey Results



#	α	β	γ	µR
1	2	317	15996	5
2	4	349	15549	5
3	4	325	16502	7
4	3	419	16022	6
5	4	348	15858	6
6	2	365	15758	6
7	2	300	16384	6
8	0	378	16304	7
9	1	335	15635	5
10	2	334	18530	10
n/a	n/a	n/a	n/a	n/a
n/a	n/a	n/a	n/a	n/a
n/a	n/a	n/a	n/a	n/a
n/a	n/a	n/a	n/a	n/a
n/a	n/a	n/a	n/a	n/a
n/a	n/a	n/a	n/a	n/a
n/a	n/a	n/a	n/a	n/a
n/a	n/a	n/a	n/a	n/a
n/a	n/a	n/a	n/a	n/a
n/a	n/a	n/a	n/a	n/a

Remarks: Composite sample collected from w/i manhole trench

New World Technology FORM NWT-001

Gamma Spectroscopy Results

Sample results given in (pCi/g)

NWT Field Report

Ufo ID	Sample Description
2N000031	Parcel A - 01(concrete) 259g 1/28/04 8:40

Dry Weight (g)	Time Counted (s)	Operator	Date Acquired	Time Acquired
259	2699.1	Paul Wall	02-Feb-04	11:59:35 AM

Library Path	Reviewed By:	Date Sampled	Time Sampled
Hunter's Point 1.Lib		28-Jan-04	8:40:00 AM

Nuclide	Net Activity	MDA	Uncertainty	Soil DCGL
AC-228	7.1877E-01	2.2938E-01	4.9014E-01	*NA
AM-241	*<MDA	1.9088E-01	**	7.8000E+00
BI-212	*<MDA	6.0497E-01	**	*NA
BI-214	3.3371E-01	1.6542E-01	2.2379E-01	*NA
CO-60	1.9866E-02	1.5430E-02	3.4409E-02	4.2000E-01
Cs-137	*<MDA	9.6968E-02	**	1.3000E-01
EU-152	2.8179E-01 *F	1.2557E-01	2.2543E-01	1.3000E-01
EU-154	1.0062E-01	9.2507E-02	8.6375E-02	2.3000E-01
K-40	6.3481E+00	1.5329E+00	2.7700E+00	*NA
PA-234	*<MDA	1.1496E-01	**	*NA
PB-212	2.8228E-01	1.1802E-01	2.4798E-01	*NA
PB-214	5.1734E-01	1.6069E-01	3.2927E-01	*NA
RA-226	2.9653E+00	1.2805E+00	3.3784E+00	2.0000E+00
Th-230	2.2995E+01	1.3831E+01	4.9315E+01	*NA
Th-232	1.2421E+01	2.0385E+01	**	*NA
TH-234	1.1117E+00	1.8065E+00	**	*NA
Tl-208	*<MDA	5.4340E-02	**	*NA
U-235	5.9660E-01 #F	3.4542E-01	9.9026E-01	5.7000E-01

***F=Failed energy identification fraction and key energy tests demonstrating non-existence of the nuclide**

#F = All energy peakes determining this isotope had bad poisson shape; this distortion signifies non-existence of the radionuclide

***<DCGL=Nuclide failed key line energy and shape tests and is determined not to be present in sample**

***<MDA = Activity for this Nuclide is less than the Minimum Detectable Activity (MDA)**

**** = Activity for this Nuclide is less than the MDA, therefore no Uncertainty is neccesary**

***NA = No DCGL available for this Nuclide**

Monday, March 15, 2004

Gamma Spectroscopy Results

Sample results given in (pCi/g)

NWT Field Report

Ufo ID	Sample Description
2N000030	Parcel A - 02 259g 1/28/04 8:35

Dry Weight (g)	Time Counted (s)	Operator	Date Acquired	Time Acquired
259	2698.88	Paul Wall	02-Feb-04	10:58:20 AM

Library Path	Reviewed By:	Date Sampled	Time Sampled
Hunter's Point 1.Lib		09-Feb-04	8:30:00 AM

Nuclide	Net Activity	MDA	Uncertainty	Soil DCGL
AC-228	*<MDA	4.5302E-01	**	*NA
AM-241	6.0949E-02	2.1121E-01	**	7.8000E+00
BI-212	1.0652E+00	6.4706E-01	1.0652E+00	*NA
BI-214	8.6659E-01	1.7318E-01	4.8374E-01	*NA
CO-60	2.6491E-03	1.5431E-02	**	4.2000E-01
Cs-137	*<MDA	1.0565E-01	**	1.3000E-01
EU-152	1.9823E-01 *F	1.4611E-01	2.3041E-01	1.3000E-01
EU-154	1.3078E-01	9.7271E-02	2.6244E-01	2.3000E-01
K-40	1.2301E+01	1.5329E+00	3.3491E+00	*NA
PA-234	3.4336E-01	2.3155E-01	5.9886E-01	*NA
PB-212	1.1345E+00	1.4311E-01	3.1889E-01	*NA
PB-214	1.1768E+00	1.5021E-01	4.4135E-01	*NA
RA-226	3.1165E+00	1.4884E+00	4.0652E+00	2.0000E+00
Th-230	*<MDA	1.2723E+01	**	*NA
Th-232	2.6165E+01	2.4733E+01	4.5565E+01	*NA
TH-234	*<MDA	1.8332E+00	**	*NA
Tl-208	*<MDA	7.7685E-02	**	*NA
U-235	6.1342E-01 #F	3.5179E-01	9.7145E-01	5.7000E-01

***F=Failed energy identification fraction and key energy tests demonstrating non-existence of the nuclide**

#F = All energy peakes determining this isotope had bad poisson shape; this distortion signifies non-existence of the radionuclide

***<DCGL=Nuclide failed key line energy and shape tests and is determined not to be present in sample**

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**** = Activity for this Nuclide is less than the MDA, therefore no Uncertainty is neccesary**

***NA = No DCGL available for this Nuclide**

Monday, March 15, 2004

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May 7, 2024

To: U.S. Navy

Delivered via email to **Michael Pound, BRAC Environmental Coordinator**

Cc: HPNS_FYR_Comments@us.navy.mil

Re: Hunters Point Naval Shipyard Fifth Five Year Review Report

Dear Mr. Pound:

The Surfrider Foundation is a grassroots environmental nonprofit organization dedicated to the protection and enjoyment of the world's ocean, waves and beaches for all people. On behalf of Surfrider Foundation's San Francisco Chapter and our 1,117 chapter members, as well as 3 other Surfrider chapters in the Bay Area, we submit the following comments detailing our concerns around the Hunters Point Naval Shipyard (HPNS) cleanup efforts. Surfrider has reviewed the latest Five Year Review Report, in particular the Climate Resilience Assessment (CRA), and has determined that the Sea Level Rise Vulnerability Assessment (SLRVA) is wholly inadequate and does not take advantage of best science currently being applied as standard to California coastal development projects. We are very concerned that the implications to public health may be dramatically underestimated as a result. Surfrider details our concerns below.

Sea Level Rise is Not Properly Considered

The SLRVA provides an unreliable and unrealistic estimate of future sea level rise for the following reasons:

- Does not use the best available science as presented in the State of California's 2024 Sea Level Rise Guidance Document. The SLRVA should immediately adjust to referencing the updated document.
- Does not consider sea level rise over the lifetime of development and remediation projects that will be based on the findings of this assessment. The SLRVA should consider SLR through 2100.
- Does not consider numerous combined climate impacts and local environmental factors that affect the impact of sea level rise on flooding and groundwater rise. The assessment must include an evaluation of the combined impacts of projected wave runup, storm surge, rainfall, and erosion.

- Does not discuss local environmental factors such as tidal flux and land subsistence. Both should be considered due to the enormous potential influence they could reasonably be expected to have on this site.
- Relies on the assumed perpetuated existence of a seawall to determine future flood risks. This is not best practice in California. Vulnerability should be assessed assuming the seawall doesn't exist (and may fail.)

Any development being considered in coastal California in light of climate change is expected to include the key considerations listed above. The fact that they are missing from an SLRVA adjacent to San Francisco Bay — which is hydrologically complex and subject to relatively significant impacts caused by climate change — is unacceptable. It is nothing short of alarming that these variables are missing from a SLRVA that will directly influence how a community already overburdened with pollution will plan for potential toxic waste mobilization in their neighborhood.

The SLRVA does not incorporate the best available science regarding future SLR estimates. The HPNS CRA used the SLR projections of 1.0 feet and 3.2 feet for the years 2035 and 2065, respectively, to predict the upper limit of the range of SLR scenarios evaluated. These projections were based on the 2018 Update of the State of California Sea Level Rise Guidance Document. Since then, there have been significant advancements in scientific understanding and ability to project future sea level rise. The Ocean Protection Council's newly updated 2024 Sea Level Rise Guidance Document represents best available sea level rise science in California and should be the referenced document.[1] We note that while the latest guidance document projects a lower amount of sea level rise by 2050 (1 foot of sea level rise by 2050) this is not representative of an overall trend towards lower-than-expected rates of sea level rise. Rather, acceleration of rates is likely to happen closer towards the end of the century — which is still well within the lifetime of development considerations that will be made in relation to this assessment.

Additionally, the SLRVA only predicts SLR at 2035 and 2065. These timeframes do not adequately address the timeframes that the proposed development will endure. Any structure built today must be assessed for at least a fifty-year lifespan, and more realistically at least 70 years. The lifetime of the development should be considered in part because sea level rise is expected to increase sharply after 2050: The 2024 Sea Level Rise Guidance document estimates 6 feet around 2100. As sea level rise quickly accelerates, opportunities to adapt or 'deal with it' will become dramatically limited. It is important to plan realistically for the future now in order to facilitate phased adaptation opportunities over time.

The SLRVA also does not appear to model for any combined climate impacts due to wave runup, storm surge, rainfall, erosion, or other potential variables that are known to dramatically increase the impacts of flooding and groundwater rise related to sea level rise. Recent research[2] studying combined climate impacts in coastal California shows that waves are getting bigger, which intensifies the impact of wave runup on flooding and intrusion into the

[1] State of California Sea Level Rise Guidance: 2024 Science and Policy Update
[2] Bromirski, Peter D, Climate-Induced Decadal Ocean Wave Height Variability From Microseisms: 1931–2021

groundwater table. This is a potentially significant variable at BVHP due to the exposure of the Bay to aggressive Pacific swells. Studies also show that California's atmospheric rivers, which in recent years have brought several inches of rainfall per year to the Bay Area, are also getting more intense, which will bring more rainfall to BVHP in a shorter amount of time[3]. In parts of BVHP, groundwater mixed with toxic contaminants sits only one foot from the soil surface, and large rain events could have a dramatic impact on whether and how quickly the water table (and the toxic waste within it) reaches the surface. Proper analysis of these combined climate risks and their interaction with sea level rise would undoubtedly affect the anticipated location and amount of flooding that can be expected in Bayview Hunters Point.

The SLRVA also fails to discuss basic environmental factors, such as tidal flux and land subsistence, which are known to affect flood risk in California. Tidal influxes in the Bay Area are some of the most dramatic in coastal California — tidal influxes alone can be responsible for 9 feet of lateral shift in the tide line. Land subsistence should also be discussed as part of this SLRVA given that much of the area in BVHP sits on top of infill that would be dramatically upset by subsistence.

Finally, it is not appropriate to base any SLRVA off the assumed existence and functioning of a seawall. The SLRVA should assess the impacts of SLR without a seawall in order to understand the actual risks of SLR in the area, which is important for general considerations and also should the seawall fail due to a catastrophic event (earthquakes, tsunamis, floods, or fires and explosions).

Groundwater Rise Assessment is not Adequate

Surfrider is gravely concerned with how sea-level and groundwater rise will affect shallow groundwater and soil contamination in the parcels. We fear that rising groundwater threatens to damage the future infrastructure of the Shipyard and expose future residents to hazardous substances. We also have grave concerns about impacts to surrounding bay ecosystems and wildlife should these toxic substances be released. We consider a thorough groundwater rise analysis of paramount importance to mitigating these risks.

Surfrider has major concerns with the methodologies used to predict groundwater rise. Models of coastal groundwater and contaminant movement should be constructed as a synthesis that includes tidal effects on a range of geochemical conditions, interactions with urban infrastructure or heterogeneous fill materials, and contaminant movement.[4] **The Navy's groundwater rise assessment is instead based only on calibrating the current groundwater table to projected SLR and does not include the synthesis of contaminant movement with impacts of intensifying storms expected with climate change**. This likely results in an under-reporting of realistic impacts and potentially inaccurate assumptions about where toxic waste may be

[3] Gershunov, A., Shulgina, T., Clemesha, R.E.S. *et al.* Precipitation regime change in Western North America: The role of Atmospheric Rivers. *Sci Rep* 9, 9944 (2019). https://doi.org/10.1038/s41598-019-46169-w
[4] Hill et al., Earth's Future (2023)

mobilized. This is particularly worrisome given that many of the proposed remedies are extremely site specific.

Surfrider is also concerned that the Navy's assessment does not adequately incorporate the effects of heavy rainfall. In addition to a gradual rise in baseline groundwater, heavy rains could cause drastic increases in groundwater levels.[5] Soil saturation also reduces the ability of the soil to absorb rainwater, which can lead to flooding and liquefaction risk. At a minimum the Navy should conduct more frequent sampling at its monitoring wells, particularly after storms, to better assess groundwater rise and/or find another way to incorporate the impact of more intensifying storms on the rise of the groundwater table.

The Climate Resilience Assessment estimates that groundwater emergence from SLR may occur within Parcel E by the year 2065 (Appendix A). This estimate does not appear to take into consideration the combined impacts due to rainfall, wave runup, storm surge, erosion, tidal flux or other potential variables that could increase SLR. **The Navy's SLR assessment must include rainfall impacts on groundwater elevation as well as tidal and other marine influences, and consider erosion and inundation impacts from rising tributary water levels during storm events.** Surfrider requests a more robust assessment that takes into account these variables, not just for Parcel E but for all sites.

As recommended in the San Francisco Civil Grand Jury Report (2022), Surfrider asks that the **Navy create detailed maps of the groundwater surface at the Shipyard site under different sea-level rise scenarios, including combined impacts due to wave runup, storm surge, erosion, tidal flux or other potential variables that could increase SLR.** The maps should take into account planned changes to the site, such as shoreline structures and the addition of clean soil, and carefully map projected groundwater flows and the locations of known contaminants.

Independent Study is Needed

The Navy is recommending a site-specific study at Parcel E to assess whether the projected climate change vulnerabilities are likely to result in additional CERCLA risk. There are no further details regarding who would perform the study. T**he Surfrider Foundation agrees with the Grand Jury recommendation that the Navy make water level data available to expert, independent scientists.** The Navy should commission a detailed, professional study similar to that conducted by the City of Alameda.[6] Experts should have access to the groundwater monitoring wells to extract local groundwater data from multiple sources to create a detailed map of the groundwater surface under the wettest, most flood-prone current conditions. Based on this data, the study should involve rigorous modeling to predict how that groundwater surface would rise under a progressively more severe set of sea-level rise scenarios. The timeframe for the

[5] May et al, Shallow Groundwater Response to Sea-Level Rise: Alameda, Marin, San Francisco, and San Mateo Counties. Pathways Climate Institute and San Francisco Estuary Institute.
[6] City of Alameda, "The Response of the Shallow Groundwater Layer and Contaminants to Sea Level Rise," 2020

modeling data should extend out to the end of the century. The study should evaluate future risks posed by groundwater flooding in known areas of contaminated soil.

Remedy Design is not Adequate

Capping of waste near communities threatened by rising sea levels and rising groundwater is not an adequate solution. Given the deficiencies in the SLRVA, we harbor major concerns about capping as a leading component of the remedy design as capping is not inherently designed to withstand exaggerated groundwater rise. We similarly question the capabilities of the seawall, slurry walls and freshwater and tidal wetlands proposed to make the remedy design resilient through the year 2065 because those remedies may be dramatically weakened by higher (and likely more realistic) flood scenarios than the CRA currently plans for. Even without more accurate sea level and groundwater rise modeling, the CRA identifies potential problems with the proposed remedies as soon as 2035. The CRA identified the following potential pitfalls that may be attributable to climate change:

- In 2035, limited impact from permanent groundwater emergence is projected to occur in Parcel D-1 (Figure 3-1 and Table 2-2).
- In 2065, limited impacts from permanent groundwater emergence are projected to occur in Installation Restoration (IR) Sites 7 and 18 (IR 7/18), Parcels B-1 and B-2, C, D-1, E and E-2 (Figure 3-2 and Table 2-2).

The HPNS CRA also identified the following potential vulnerabilities resulting from other impacts previously identified:

- In 2035, a potential vulnerability to human receptors from permanent groundwater emergence at Parcel D-1.
- In 2065, potential vulnerability to human receptors at the current ground surface from heavy metals due to groundwater emergence at IR 7/18, Parcels B-1, B-2, C, D-1, and E.
- In 2065, potential vulnerability to San Francisco Bay receptors from heavy metals due to groundwater emergence at IR 7/18, Parcels B-1, B-2, C, D-1, and E.

In addition, we also note that the mobilization of Volatile Organic Compounds (VOC) is a risk unstudied in the CRA. As Dr. Kristina Hill notes in Earth's Future (2023), VOCS can penetrate underground utility trenches and sewer pipes — which is a legitimate risk in BVHP. This represents a contamination 'mobilization pathway' that could have dramatic public health implications. This risk is exacerbated when water intrudes on sewage and stormwater infrastructure — a reasonable risk to anticipate with groundwater and sea level rise.

The CRA findings in addition to others that Surfrider and community members are identifying indicate the need for enhanced cleanup as well as reconsideration of whether these parcels should be developed for people to actually live in. A more equitable vision for BVHP may be to set

aside more areas for wetland and native plant restoration and allow for bioremediation, including phytoremediation, to address the toxic substances over time. Given the reality of SLR and groundwater rise, much of this area appears to be unsuitable to permanent infrastructure. Indeed, many local governments are now recognizing the need to relocate coastal infrastructure inland to allow space for the dynamic shoreline to calibrate to sea level rise.

A better future for HPNS may be to showcase how polluted sites can be cleaned up and restored in a way that allows nature to help mitigate the impacts of rising seas. Based on some feedback from the community that Surfrider is aware of, we support a full and equitable cleanup that also:

- Avoids open-trucking contaminated soil through neighborhoods.
- Avoids relocation of toxic waste to other disproportionately burdened communities.
- Evaluates and employs emerging technologies to better address the soil and water toxicity. A high temperature electrothermal process should be evaluated as a safe and affordable technology.
- Establishes a local toxics cleanup facility to treat soil onsite.

Conclusion

Surfrider appreciates the Navy embarking on a CRA at Bayview Hunters Point. We are very concerned about the outstanding public health risks that stem from toxic contamination mobilized by groundwater rise. We therefore strongly encourage the Navy to strengthen its SLRVA to at least mimic standard sea level rise vulnerability analyses in California, and to adjust its perspective on available remedies accordingly. We hope to support the Navy and community-based organizations who have long been exposed to and working on this issue towards a science-based and ethical assessment of sea level rise vulnerabilities in the area.

Sincerely,

Nina Atkind
San Francisco Chapter Manager
Surfrider Foundation

Elizabeth M. Taylor, Esq.
Of Counsel
Surfrider Foundation

Laura Walsh
California Policy Manager
Surfrider Foundation

Date: March 18,2024

Michael Pound
BRAC Environmental Coordinator
33000 Nixie Way, Bldg. 50
San Diego, CA 92147

Re: **Response to Hunters Point Naval Shipyard Five Year Review**

Dear Mr. Pound:

The Navy's Fifth Five-Year Review related to Hunters Point Naval Shipyard (HPNS) does not detail sufficient remediation and real assurances that the area surrounding Hunters Point Naval Shipyard will ever be safe for human occupation. It is *not* safe for current and future residents of Bayview/Hunters Point or for the entirety of the Bay Area as the radioactive particulate matter from the Shipyard spreads through the windy San Francisco Bay Area air and other toxins seep into the soil and leech into the groundwater and migrate into the San Francisco Bay.

The Fifth Five-Year Review plan begins by stating that its objective is to evaluate the selected remedies at these sites and parcels and determine whether the remedies **remain protective** of human health and the environment in accordance with the requirements set forth in each of the [Records of Decision] (ROD)." This statement implies that the remedies are already protective and it is just a matter of ensuring they *remain* so. This is a false representation of the status of the toxic contamination. Your recommendations from this report, as stated on page xviii are as follows:

> Radiological objects (ROs) were identified during excavation and remediation of soil in areas that were not considered radiologically impacted. There is a high degree of confidence that discrete ROs were removed to a depth of 2 feet below ground surface (bgs). However, there is a potential for ROs to be present in material below 2 feet bgs where shoreline expansion has occurred since 1946.

Your recommendation is to "Evaluate additional remedies to address the potential presence of ROs in material 2 feet bgs and prepare the appropriate post-ROD documentation."

This is vague and unspecific, leaving the community with no way to measure the extent of the danger or the progress of any remediation. Your report then gives a nod to climate change and the effects of rising water; yet your plan is just to put a "durable cover" over the toxic sites and put in protective fencing. You say in the future you will build a sea wall and monitor the landfill gas. Your report speaks to the need to continually check these "durable asphalt covers" for cracks and shifting. The Navy's plan does not state that it will do this monitoring *in perpetuity* to ensure immediate remediation when these durable covers start cracking and shifting, exposing the toxic materials. The same assurances are not given for "repairing" the

foundations of buildings with the goal of sealing the foundations so the toxic soil will not be exposed. This review does not address what happens when there is an earthquake or even less dramatic events that shift the buildings on their foundations. The Navy must be responsible in perpetuity to fix it.

Moreover, after publishing in the newspaper and in mailouts you sent to the residents of Bayview/Hunters Point that the public inspection and comment period would run until **April 7, 2024**, you changed the deadline online at your site to March 31, 2024, which cuts an entire week off the comment period. Please correct your date online so that it is consistent with the mailers.

As the San Francisco Civil Grand Jury reported in July 2022, the coming impacts of climate change will release heavy metals and other contaminants inland and into the Bay, and within our lifetimes, the blight, which the dwindling community that once made up the workers and their families in the Bayview has long warned us about, will spread to the rest of the Bay. Simply putting a cover on it when you are not digging down far enough to remove the tainted soil and the radioactive objects buried within it, putting up a fence warning the rising water to stay out and building a sea wall are insufficient. The Navy's assessment of future concerns from rising groundwater makes clear that below the Navy's "protective covering," they are leaving heavy metals, such as mercury and zinc. When coupled with the concerns regarding ongoing maintenance to ensure no cracking or leaking of these covers or breaches in a landfill cover, **the Navy must remove the heavy metals**, not just cover them over.

The report also states that the Navy and the EPA have identified certain Per- and Polyfluoroalkyl (PFAS) compounds as emerging chemicals of environmental concern on the parcels and that the Navy is in the *process of implementing corrective actions*. Yet, there will not be another report for five years. The presence of PFAS could not have been a surprise to the Navy, given the presence of PFAS on military bases nationwide. This is additional toxic exposure for the population. The PFAS compounds must be removed from these parcels. The community in Bayview Hunters Point has long dealt with deadly cancers, chronic illness, reduced quality of life and a shorter life span than surrounding residents of San Francisco. The rest of the residents of San Francisco and the Bay Area are also being placed in harm's way.

San Francisco voters overwhelmingly passed (over 86%) Proposition P over 20 years ago to ensure ***that the U.S. Navy cleaned up the HPNS to the highest standards***; yet that is not even mentioned in your report. Your clean-up efforts have not even come close to those standards.

The Navy declared Parcel A properly cleaned up; yet Strontium-90, a known causative agent for bone cancer, and other radionuclide and chemical toxins (many carcinogenic) continue to surface in soil and groundwater testing. Strontium 90 and these other toxins must be removed from Parcel A.

The report claims the objectives for remediation of Parcel B are being met, but the Navy won't actually finish even the retesting until 2025 and the report begins by identifying the area as posing "Unacceptable risk to industrial workers from exposure to metals and [semi-volatile organic compounds (SVOCs)]," let alone not being cleaned up to residential standards. The idea

of developing this area *at all* for residential use is unacceptable. The same can be said for Parcels C and D.

For Parcel G the report calls for complete radiological retesting.

The Navy hired Tetra Tech to clean up Hunters Point. Yet, in 2018 two Tetra Tech supervisors pleaded guilty to falsifying records of soil samples, showing it was NOT cleaned up, and they went to prison. The Navy sued Tetra Tech for return of monies it had paid them, but the Navy did not then pursue another full-scale plan for clean up as evidenced by this report.

I demand that all Parcels be cleaned up to the highest standards and that there be no land transfers or development until Proposition P is fully implemented.

Sincerely,

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Gray Panthers of San Francisco
Public Comment Navy's 5th Five-Year Review
April 28, 2024

Background: Twenty-four years ago, San Francisco voters passed Proposition P, demanding that the shipyard be cleaned to the highest EPA standard for unrestricted use. In 2022, the San Francisco Grand Jury highlighted concerns about sea level rise spreading contaminants beyond the Hunters Point Superfund site. And in Dec 2023, GreenAction noticed Navy with intent to sue for retesting.

Gray Panthers of San Francisco support SF voters and the Bayview Hunters Point Community, advocating for 100% cleanup, not capping of radioactive and toxic waste, and 100% retesting of Tetra Tech's fraudulent work. The EPA found most Tetra Tech soil samples on a large portion of the site unreliable. Despite confirmed falsification, Tetra Tech has not been held accountable, delaying cleanup progress and worsening community health effects. For immediate action we demand:

Dust Curtains: Immediate action is needed, specifically, installing industrial-grade dust barriers along the A-2 and E-2 western fenceline to reduce community exposure to airborne matter.

Full Disclosure: Potential homebuyers must be provided with full disclosure of the site status, history and cleanup goals.

5th 5-Year Review Draft: The review raises more unknowns than knowns, with nearly $1.5 billion spent to date. The Navy's Fifth Five-Year Review (Draft) for the Hunters Point Naval Shipyard (HPNS) Federal Superfund Site has faced criticism, particularly regarding its effectiveness in protecting residents and workers from hazardous substances. The review evaluates superfund cleanup sites like HPNS every five years, focusing on three questions. (with our answers in **BOLD)**

1. Is the remedy functioning as intended? **UNKNOWN**
2. Are the original exposure assumptions and cleanup levels still valid? **NO**
3. Has any new information emerged that could question the protectiveness of the remedy? **YES**

Not Protective: Protectiveness Statements for site parcels relying on incomplete data are deemed invalid. Parcels should not be considered protective until work is complete and validated.

Back to the Drawing Board: The Navy acknowledges climate change as a significant factor affecting proposed remedies. Capping radioactive and toxic waste is insufficient against predicted sea level rise by 2065.

No Gardening Allowed: Strategies like avoiding soil disturbance and using raised bed gardening are inadequate for future residential use. There's no guarantee soil won't be disturbed by future activity.

Submitted by:
Ann Colichidas, BVHP Activism Leader on behalf of the Gray Panthers Board

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From:
Sent: Tuesday, June 11, 2024 12:36 PM
To: HPNS FYR Comments <hpns_fyr_comments@us.navy.mil>; Meredith.Williams@dtsc.ca.gov <Meredith.Williams@dtsc.ca.gov>; yana.garcia@calepa.ca.gov <yana.garcia@calepa.ca.gov>; guzman.martha@epa.gov <guzman.martha@epa.gov>
Subject: [Non-DoD Source] Cleanup of Bayview Hunters Point Superfund Site

Dear US EPA, US Navy, CalEPA, and Department of Toxic Substance Control,

My name is and I am a member of 350 Bay Area, an organization committed to pushing towards a healthier climate for the future.

I am writing to call for the complete cleanup, not capping, of the radioactive waste at the Hunters Point Naval Shipyard Superfund Site. The Bayview Hunters Point community has suffered negative health impacts for decades due to the inadequate cleanup process at this site. Capping contamination does not protect against rising groundwater's dangerous mobilization of hazardous materials from the bottom up, as research has shown.

I am calling on your agencies to reject capping at the Hunters Point Naval Shipyard and follow through with a complete cleanup to the most possible extent. We cannot wait for the next Five Year Review to take meaningful action as we are nearing the point of no return of climate change, it needs to happen now.

For the health of our communities and environmental justice,

Sincerely,

From:
Sent: Wednesday, March 13, 2024 3:06 PM
To: HPNS FYR Comments <hpns_fyr_comments@us.navy.mil>
Cc: greenaction@greenaction.org <greenaction@greenaction.org>
Subject: [Non-DoD Source] Cleanup of hazardous contamination at the Hunters Point Naval Shipyard Superfund Site

Dear US EPA, US Navy, CalEPA, and DTSC,

I am writing to call for the complete cleanup, not capping, of the Hunters Point Naval Shipyard Superfund Site. The Bayview Hunters Point community has suffered negative health impacts for decades due to the inadequate cleanup process at this site. Capping contamination does not protect against rising groundwater's dangerous mobilization of hazardous materials from the bottom up. Please read the SF Chronicle article titled, "Toxic groundwater, sea level rise latest challenges in long-running S.F. shipyard cleanup" as it highlights this point.

I am calling on your agencies to reject capping at the Hunters Point Naval Shipyard and follow through with a complete cleanup to the extent humanly possible. We cannot wait for the next Five Year Review to take meaningful action, it needs to happen now.

For the health of our communities and environmental justice,

Bayview resident

From:
Sent: Wednesday, May 8, 2024 10:24 AM
To: HPNS FYR Comments <hpns_fyr_comments@us.navy.mil>
Subject: [Non-DoD Source] Comment re. Hunters Point Naval Shipyard Clean Up

I hereby submit this comment in re "Naval Facilities Engineering Systems Command Southwest BRAC PMO West San Diego, California Draft Fifth Five-Year Review Report Hunters Point Naval Shipyard San Francisco, California November 2023; Contract Number: N62470-21-D-0007; Contract Task Order No. N6247322F4930, July 2024; (This report documents the Fifth Five-Year Review for the Hunters Point Naval Shipyard that includes Installation Restoration (IR) Sites 7 and 18, and Parcels B-1, B-2, C, D-1, D-2, E, E-2, G, UC-1, UC-2, and UC-3 as required by the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) in accordance with CERCLA § 121(c), as amended, and the National Oil and Hazardous Substances Pollution Contingency Plan, Part 300.430(f)(4)(ii) of the Code of Federal Regulations)".

Background:

In 2000, San Francisco voters passed Proposition P, demanding that the shipyard be cleaned to the highest EPA standard for unrestricted use.

In 2022, the San Francisco Grand Jury highlighted concerns about sea level rise spreading contaminants beyond the Hunters Point Superfund site.

Comment

I support the SF voters and the Bayview Hunters Point Community in advocating **100% cleanup (not capping)** of radioactive and toxic waste, and **100% retesting**to replace Tetra Tech's fraudulent work. The EPA found most Tetra Tech soil samples on a large portion of the site to be unreliable. Despite confirmed falsification, Tetra Tech has not been held accountable. This failure has delayed the cleanup's progress and worsened community health effects.

Dust Curtains: Immediate action is needed, specifically, installing industrial-grade dust barriers along the A-2 and E-2 western fenceline to reduce community exposure to airborne matter.

Full Disclosure: Potential homebuyers must be provided with full disclosure of the site status, history and cleanup goals.

Current (5th 5-Year) Review Draft: The review raises more unknowns than knowns, with nearly $1.5 billion spent to date. The Navy's Fifth Five-Year Review (Draft) for the Hunters Point Naval Shipyard (HPNS) Federal Superfund Site has faced criticism, particularly regarding its effectiveness in protecting residents and workers from hazardous substances. The review evaluates superfund cleanup sites like HPNS every five years, focusing on three questions. (my answers in **BOLD)**

1. Is the remedy functioning as intended? **UNKNOWN**
2. Are the original exposure assumptions and cleanup levels still valid? **NO**
3. Has any new information emerged that could question the protectiveness of the remedy? **YES**

Not protective: Protectiveness Statements for site parcels relying on incomplete data are not valid. Parcels should not be considered protective until work is complete and validated.

Ignores climate change: The Navy acknowledges climate change as a significant factor affecting proposed remedies. Capping radioactive and toxic waste is insufficient against predicted sea level rise by 2065.

No gardening is safe: Strategies like avoiding soil disturbance and using raised bed gardening are inadequate for future residential use. There is no guarantee that soil won't be disturbed by future activity.

From:
Sent: Tuesday, June 11, 2024 12:37 PM
To: guzman.martha@epa.gov <guzman.martha@epa.gov>; HPNS FYR Comments <hpns_fyr_comments@us.navy.mil>; yana.garcia@calepa.ca.gov <yana.garcia@calepa.ca.gov>; Meredith.Williams@dtsc.ca.gov <Meredith.Williams@dtsc.ca.gov>
Subject: [Non-DoD Source] Demand a Full Cleanup of Bayview Hunters Point Superfund Site!

Dear US EPA, US Navy, CalEPA, and Department of Toxic Substance Control,

I am writing to call for the complete cleanup, not capping, of the Hunters Point Naval Shipyard Superfund Site. The Bayview Hunters Point community has suffered negative health impacts for decades due to the inadequate cleanup process at this site. Capping contamination does not protect against rising groundwater's dangerous mobilization of hazardous materials from the bottom up, as research has shown.

I am calling on your agencies to reject capping at the Hunters Point Naval Shipyard and follow through with a complete cleanup to the extent humanly possible. We cannot wait for the next Five Year Review to take meaningful action, it needs to happen now.

For the health of our communities and environmental justice,

From:
Sent: Tuesday, May 7, 2024 11:47 AM
To: HPNS FYR Comments <hpns_fyr_comments@us.navy.mil>
Subject: [Non-DoD Source] Full cleanup not capping of Hunter's Point Naval Shipyard Superfund site

Dear US EPA, US Navy, CalEPA, and DTSC,
I am writing to call for the complete cleanup, not capping, of the Hunters Point Naval Shipyard Superfund Site. The Bayview Hunters Point community has suffered negative health impacts for decades due to the inadequate cleanup process at this site. Capping contamination does not protect against rising groundwater's dangerous mobilization of hazardous materials from the bottom up. Please read the SF Chronicle article titled, "Toxic groundwater, sea level rise latest challenges in long-running S.F. shipyard cleanup" as it highlights this point.
I am calling on your agencies to reject capping at the Hunters Point Naval Shipyard and follow through with a complete cleanup to the extent humanly possible. We cannot wait for the next Five Year Review to take meaningful action, it needs to happen now.
For the health of our communities and environmental justice,

Thank you,

From:
Sent: Tuesday, June 11, 2024 12:36 PM
To: HPNS FYR Comments <hpns_fyr_comments@us.navy.mil>; Meredith.Williams@dtsc.ca.gov <Meredith.Williams@dtsc.ca.gov>; yana.garcia@calepa.ca.gov <yana.garcia@calepa.ca.gov>; guzman.martha@epa.gov <guzman.martha@epa.gov>
Subject: [Non-DoD Source] Full Cleanup of Bayview Hunters Point Superfund Site Needed!

Dear US EPA, US Navy, CalEPA, and Department of Toxic Substance Control,

I am writing to call for the complete cleanup, not capping, of the Hunters Point Naval Shipyard Superfund Site. I am a third Generation Bay Area Resident and the health and safety burden that the Bayview Hunters Point community has suffered for decades due to the inadequate cleanup process at this site is frankly, appalling. I've talked to so many people who have shared that their family members are sick from living there, and that not enough is being done.

Climate change is rapidly affecting our world, and we need to be realistic about the impact it will have on our communities if we do not swiftly address these issues. Capping contamination does not protect against rising groundwater's dangerous mobilization of hazardous materials from the bottom up, as research has shown.

I am calling on your agencies to reject capping at the Hunters Point Naval Shipyard and follow through with a complete cleanup to the extent humanly possible. We cannot wait for the next Five Year Review to take meaningful action, it needs to happen now.

For the health of our communities and environmental justice,

--

350 Bay Area & 350 Bay Area Action

Take Climate Action! Join our monthly meetings Make a donation

From:
Sent: Sunday, March 17, 2024 12:50 PM
To: HPNS FYR Comments <hpns_fyr_comments@us.navy.mil>; Meredith.Williams@dtsc.ca.gov <Meredith.Williams@dtsc.ca.gov>; yana.garcia@calepa.ca.gov <yana.garcia@calepa.ca.gov>; guzman.martha@epa.gov <guzman.martha@epa.gov>
Subject: [Non-DoD Source] Full Cleanup, NOT CAPPING, of Hunters Point Naval Shipyard Superfund Site

Dear US EPA, US Navy, CalEPA, and DTSC,

I am writing to call for the complete cleanup, not capping, of the Hunters Point Naval Shipyard Superfund Site. The Bayview Hunters Point community has suffered negative health impacts for decades due to the inadequate cleanup process at this site. Capping contamination does not protect against rising groundwater's dangerous mobilization of hazardous materials from the bottom up. Please read the SF Chronicle article titled, "Toxic groundwater, sea level rise latest challenges in long-running S.F. shipyard cleanup" as it highlights this point.

I am calling on your agencies to reject capping at the Hunters Point Naval Shipyard and follow through with a complete cleanup to the extent humanly possible. We cannot wait for the next Five Year Review to take meaningful action, it needs to happen now.

For the health of our communities and environmental justice,

Sincerely,

San Francisco Resident

From:
Sent: Thursday, March 14, 2024 10:07 PM
To: HPNS FYR Comments <hpns_fyr_comments@us.navy.mil>; Meredith.Williams@dtsc.ca.gov <Meredith.Williams@dtsc.ca.gov>; yana.garcia@calepa.ca.gov <yana.garcia@calepa.ca.gov>; guzman.martha@epa.gov <guzman.martha@epa.gov>
Subject: [Non-DoD Source] Full Cleanup, NOT CAPPING, of Hunters Point Naval Shipyard Superfund Site

Dear US EPA, US Navy, CalEPA, and DTSC,

I am writing to call for the complete cleanup, not capping, of the Hunters Point Naval Shipyard Superfund Site. The Bayview Hunters Point community has suffered negative health impacts for decades due to the inadequate cleanup process at this site.

Failing to do a complete cleanup only furthers the historical environmental racism against the historically Black community. To this day, buildings and even schools in the area are cordoned off because of the **toxic** and hazardous conditions.

Capping contamination does not protect against rising groundwater's dangerous mobilization of hazardous materials from the bottom up. Please read the SF Chronicle article titled, "Toxic groundwater, sea level rise latest challenges in long-running S.F. shipyard cleanup" as it highlights this point.

I am calling on your agencies to reject capping at the Hunters Point Naval Shipyard and follow through with a complete cleanup to the extent humanly possible. We cannot wait for the next Five Year Review to take meaningful action, it needs to happen now.

Thank you,
(member of West Side Tenants Association)

From:
Sent: Thursday, March 14, 2024 8:32 AM
To: HPNS FYR Comments <hpns_fyr_comments@us.navy.mil>; Meredith.Williams@dtsc.ca.gov <Meredith.Williams@dtsc.ca.gov>; yana.garcia@calepa.ca.gov <yana.garcia@calepa.ca.gov>; guzman.martha@epa.gov <guzman.martha@epa.gov>
Subject: [Non-DoD Source] Full Cleanup, NOT CAPPING, of Hunters Point Naval Shipyard Superfund Site

Dear US EPA, US Navy, CalEPA, and DTSC,

I am writing to call for the complete cleanup, not capping, of the Hunters Point Naval Shipyard Superfund Site. The Bayview Hunters Point community has suffered negative health impacts for decades due to the inadequate cleanup process at this site. Capping contamination does not protect against rising groundwater's dangerous mobilization of hazardous materials from the bottom up. See Toxic groundwater, sea level rise latest challenges in long-running S.F. shipyard cleanup

I am calling on your agencies to reject capping at the Hunters Point Naval Shipyard and follow through with a complete cleanup to the extent humanly possible. We cannot wait for the next Five Year Review to take meaningful action, it needs to happen now.

For the health of our communities and environmental justice,

From:
Sent: Friday, March 15, 2024 1:19 PM
To: HPNS FYR Comments <hpns_fyr_comments@us.navy.mil>; Meredith.Williams@dtsc.ca.gov <Meredith.Williams@dtsc.ca.gov>; yana.garcia@calepa.ca.gov <yana.garcia@calepa.ca.gov>; guzman.martha@epa.gov <guzman.martha@epa.gov>
Subject: [Non-DoD Source] Full Cleanup, NOT CAPPING, of Hunters Point Naval Shipyard Superfund Site

Dear US EPA, US Navy, CalEPA, and DTSC,

I am writing to call for the complete cleanup, not capping, of the Hunters Point Naval Shipyard Superfund Site. The Bayview Hunters Point community has suffered negative health impacts for decades due to the inadequate cleanup process at this site. Capping contamination does not protect against rising groundwater's dangerous mobilization of hazardous materials from the bottom up. Please read the SF Chronicle article titled, "Toxic groundwater, sea level rise latest challenges in long-running S.F. shipyard cleanup" as it highlights this point.

I am calling on your agencies to reject capping at the Hunters Point Naval Shipyard and follow through with a complete cleanup to the extent humanly possible. We cannot wait for the next Five Year Review to take meaningful action, it needs to happen now.

For the health of our communities and environmental justice,

San Francisco, CA 94114

From:
Sent: Sunday, March 17, 2024 2:11 PM
To: HPNS FYR Comments <hpns_fyr_comments@us.navy.mil>; Meredith.Williams@dtsc.ca.gov <Meredith.Williams@dtsc.ca.gov>; yana.garcia@calepa.ca.gov <yana.garcia@calepa.ca.gov>; guzman.martha@epa.gov <guzman.martha@epa.gov>
Subject: [Non-DoD Source] Full Cleanup, NOT CAPPING, of Hunters Point Naval Shipyard Superfund Site

Dear US EPA, US Navy, CalEPA, and DTSC,

I am writing to call for the complete cleanup, not capping, of the Hunters Point Naval Shipyard Superfund Site. The Bayview Hunters Point community has suffered negative health impacts for decades due to the inadequate cleanup process at this site. Capping contamination does not protect against rising groundwater's dangerous mobilization of hazardous materials from the bottom up. Please read the SF Chronicle article titled, "Toxic groundwater, sea level rise latest challenges in long-running S.F. shipyard cleanup" as it highlights this point (https://www.sfchronicle.com/sf/article/s-f-hunters-point-shipyard-toxic-water-cleanup-18762183.php).

I am calling on your agencies to reject capping at the Hunters Point Naval Shipyard and follow through with a complete cleanup to the extent humanly possible. We cannot wait for the next Five Year Review to take meaningful action; it needs to happen now.

For the health of our communities and environmental justice,

San Francisco

From:
Sent: Wednesday, March 13, 2024 3:36 PM
To: HPNS FYR Comments <hpns_fyr_comments@us.navy.mil>; Meredith.Williams@dtsc.ca.gov <Meredith.Williams@dtsc.ca.gov>; yana.garcia@calepa.ca.gov <yana.garcia@calepa.ca.gov>; guzman.martha@epa.gov <guzman.martha@epa.gov>
Subject: [Non-DoD Source] Full Cleanup, NOT CAPPING, of Hunters Point Naval Shipyard Superfund Site

Dear US EPA, US Navy, CalEPA, and DTSC,

I am a San Francisco resident writing to call for the complete cleanup, not capping, of the Hunters Point Naval Shipyard Superfund Site. The Bayview Hunters Point community has suffered negative health impacts for decades due to the inadequate cleanup process at this site. Capping contamination does not protect against rising groundwater's dangerous mobilization of hazardous materials from the bottom up. Please read the SF Chronicle article titled, "Toxic groundwater, sea level rise latest challenges in long-running S.F. shipyard cleanup" as it highlights this point.

I am calling on your agencies to reject capping at the Hunters Point Naval Shipyard and follow through with a complete cleanup to the extent humanly possible. We cannot wait for the next Five Year Review to take meaningful action, it needs to happen now.

For the health of our communities and environmental justice,

From:
Sent: Friday, March 15, 2024 10:53 AM
To: HPNS FYR Comments <hpns_fyr_comments@us.navy.mil>; Meredith.Williams@dtsc.ca.gov <Meredith.Williams@dtsc.ca.gov>; yana.garcia@calepa.ca.gov <yana.garcia@calepa.ca.gov>; guzman.martha@epa.gov <guzman.martha@epa.gov>
Subject: [Non-DoD Source] Hunters Point Naval Shipyard clean-up

Dear US EPA, US Navy, CalEPA, and DTSC,

I am writing to call for the complete cleanup, not capping, of the Hunters Point Naval Shipyard Superfund Site. The Bayview Hunters Point community has suffered negative health impacts for decades due to the inadequate cleanup process at this site. Capping contamination does not protect against rising groundwater's dangerous mobilization of hazardous materials from the bottom up. Please read the SF Chronicle article titled, "Toxic groundwater, sea level rise latest challenges in long-running S.F. shipyard cleanup" as it highlights this point.

I am calling on your agencies to reject capping at the Hunters Point Naval Shipyard and follow through with a complete cleanup to the extent humanly possible. We cannot wait for the next Five Year Review to take meaningful action, it needs to happen now.

For the health of our communities and environmental justice,

San Francisco neighbor

From:
Sent: Friday, March 15, 2024 9:57 AM
To: HPNS FYR Comments <hpns_fyr_comments@us.navy.mil>; Meredith.Williams@dtsc.ca.gov <Meredith.Williams@dtsc.ca.gov>; yana.garcia@calepa.ca.gov <yana.garcia@calepa.ca.gov>; guzman.martha@epa.gov <guzman.martha@epa.gov>
Subject: [Non-DoD Source] Re: Full Cleanup, NOT CAPPING, of Hunters Point Naval Shipyard Superfund Site

Dear US EPA, US Navy, CalEPA, and DTSC,

I am writing to call for the complete cleanup, not capping, of the Hunters Point Naval Shipyard Superfund Site. The Bayview Hunters Point community has suffered negative health impacts for decades due to the inadequate cleanup process at this site. Capping contamination does not protect against rising groundwater's dangerous mobilization of hazardous materials from the bottom up. Please read the SF Chronicle article titled, "Toxic groundwater, sea level rise latest challenges in long-running S.F. shipyard cleanup" as it highlights this point.

I am calling on your agencies to reject capping at the Hunters Point Naval Shipyard and follow through with a complete cleanup to the extent humanly possible. We cannot wait for the next Five Year Review to take meaningful action, it needs to happen now.

For the health of our communities and environmental justice,

From:
Sent: Saturday, March 16, 2024 4:11 PM
To: HPNS FYR Comments <hpns_fyr_comments@us.navy.mil>; Meredith.Williams@dtsc.ca.gov <Meredith.Williams@dtsc.ca.gov>; yana.garcia@calepa.ca.gov <yana.garcia@calepa.ca.gov>; guzman.martha@epa.gov <guzman.martha@epa.gov>
Subject: [Non-DoD Source] Re: Full Cleanup, NOT CAPPING, of Hunters Point Naval Shipyard Superfund Site

Dear US EPA, US Navy, CalEPA, and DTSC,

I am writing to call for the complete cleanup, not capping, of the Hunters Point Naval Shipyard Superfund Site. The Bayview Hunters Point community has suffered negative health impacts for decades due to the inadequate cleanup process at this site. Capping contamination does not protect against rising groundwater's dangerous mobilization of hazardous materials from the bottom up. Please read the SF Chronicle article titled, "Toxic groundwater, sea level rise latest challenges in long-running S.F. shipyard cleanup" as it highlights this point.

I am calling on your agencies to reject capping at the Hunters Point Naval Shipyard and follow through with a complete cleanup to the extent humanly possible. We cannot wait for the next Five Year Review to take meaningful action, it needs to happen now.

Our neighbors in The Bayview Hunters Point community deserves to be free from environmental racism, including exposure to toxic and radioactive contamination.

For the health of our communities and environmental justice,

San Francisco, California

From:
Sent: Monday, March 18, 2024 8:43 AM
To: HPNS FYR Comments <hpns_fyr_comments@us.navy.mil>; Meredith.Williams@dtsc.ca.gov <Meredith.Williams@dtsc.ca.gov>; yana.garcia@calepa.ca.gov <yana.garcia@calepa.ca.gov>; guzman.martha@epa.gov <guzman.martha@epa.gov>
Subject: [Non-DoD Source] Re: Full Cleanup, NOT CAPPING, of Hunters Point Naval Shipyard Superfund Site

Dear US EPA, US Navy, CalEPA, and DTSC,

I am writing to call for the complete cleanup, not capping, of the Hunters Point Naval Shipyard Superfund Site. The Bayview Hunters Point community has suffered negative health impacts for decades due to the inadequate cleanup process at this site. Capping contamination does not protect against rising groundwater's dangerous mobilization of hazardous materials from the bottom up. Please read the SF Chronicle article titled, "Toxic groundwater, sea level rise latest challenges in long-running S.F. shipyard cleanup" as it highlights this point.

I am calling on your agencies to reject capping at the Hunters Point Naval Shipyard and follow through with a complete cleanup to the extent humanly possible. We cannot wait for the next Five Year Review to take meaningful action, it needs to happen now.

Best,

From:
Sent: Friday, March 15, 2024 8:38 PM
To: HPNS FYR Comments <hpns_fyr_comments@us.navy.mil>; Meredith.Williams@dtsc.ca.gov <Meredith.Williams@dtsc.ca.gov>; yana.garcia@calepa.ca.gov <yana.garcia@calepa.ca.gov>; guzman.martha@epa.gov <guzman.martha@epa.gov>
Subject: [Non-DoD Source] Re: Full Cleanup, NOT CAPPING, of Hunters Point Naval Shipyard Superfund Site

Dear US EPA, US Navy, CalEPA, and DTSC,

I am writing to call for the complete cleanup, not capping, of the Hunters Point Naval Shipyard Superfund Site. The Bayview Hunters Point community has suffered negative health impacts for decades due to the inadequate cleanup process at this site. Capping contamination does not protect against rising groundwater's dangerous mobilization of hazardous materials from the bottom up. Please read the SF Chronicle article titled, "Toxic groundwater, sea level rise latest challenges in long-running S.F. shipyard cleanup" as it highlights this point.

I am calling on your agencies to **reject capping at the Hunters Point Naval Shipyard and follow through with a complete cleanup** to the extent humanly possible. We cannot wait for the next Five Year Review to take meaningful action, it needs to happen now.

For the health of our communities and environmental justice,

longtime resident of San Francisco

From:
Sent: Wednesday, March 13, 2024 10:23 PM
To: HPNS FYR Comments <hpns_fyr_comments@us.navy.mil>
Cc: Meredith.Williams@dtsc.ca.gov <Meredith.Williams@dtsc.ca.gov>; yana.garcia@calepa.ca.gov <yana.garcia@calepa.ca.gov>; guzman.martha@epa.gov <guzman.martha@epa.gov>
Subject: [Non-DoD Source] Re: Full Cleanup, NOT CAPPING, of Hunters Point Naval Shipyard Superfund Site

Dear US EPA, US Navy, CalEPA, and DTSC,

I am writing to call for the complete cleanup, not capping, of the Hunters Point Naval Shipyard Superfund Site. The Bayview Hunters Point community has suffered negative health impacts for decades due to the inadequate cleanup process at this site. Capping contamination does not protect against rising groundwater's dangerous mobilization of hazardous materials from the bottom up. Please read the SF Chronicle article titled, "Toxic groundwater, sea level rise latest challenges in long-running S.F. shipyard cleanup" as it highlights this point.

I am calling on your agencies to reject capping at the Hunters Point Naval Shipyard and follow through with a complete cleanup to the extent humanly possible (as San Francisco voters passed overwhelmingly in the year 2000). We cannot wait for the next Five Year Review to take meaningful action, it needs to happen now.

For the health of our communities and environmental justice,

From:
Sent: Tuesday, June 11, 2024 12:47 PM
To: HPNS FYR Comments <hpns_fyr_comments@us.navy.mil>; meredith.williams@dtsc.ca.gov <meredith.williams@dtsc.ca.gov>; yana.gracia@calepa.ca.gov <yana.gracia@calepa.ca.gov>; guzman.martha@epa.gov <guzman.martha@epa.gov>
Subject: [Non-DoD Source] Regarding Full cleanup of Bayview Hunters point superfund site.

Dear US EPA, US Navy, CalEPA, and Department of Toxic Substance Control,

I hope you are all having a great week.
While we are enjoying our week, our fellow humans at Hunters Point Naval Shipyard are suffering with negative health impacts, I felt disheartening learning about all the impacts.

I am writing to call for the complete cleanup, not capping, of the Hunters Point Naval Shipyard Superfund Site. The Bayview Hunters Point community has suffered negative health impacts for decades due to the inadequate cleanup process at this site. Capping contamination does not protect against rising groundwater's dangcrous mobilization of hazardous materials from the bottom up, as research has shown.
I am calling on your agencies to reject capping at the Hunters Point Naval Shipyard and follow through with a complete cleanup to the extent humanly possible. We cannot wait for the next Five Year Review to take meaningful action, it needs to happen now.

For the health of our communities and environmental justice.

Thanks,

From:
Sent: Sunday, March 17, 2024 1:46 PM
To: HPNS FYR Comments <hpns_fyr_comments@us.navy.mil>
Subject: [Non-DoD Source] Urgent: Hunters Point Naval Shipyard Superfund clean up

Dear US EPA, US Navy, CalEPA, and DTSC,

I am writing to call for the complete cleanup, not capping, of the Hunters Point Naval Shipyard Superfund Site. The Bayview Hunters Point community has suffered negative health impacts for decades due to the inadequate cleanup process at this site. Capping contamination does not protect against rising groundwater's dangerous mobilization of hazardous materials from the bottom up. Please read the SF Chronicle article titled, "Toxic groundwater, sea level rise latest challenges in long-running S.F. shipyard cleanup" as it highlights this point.

I am calling on your agencies to reject capping at the Hunters Point Naval Shipyard and follow through with a complete cleanup to the extent humanly possible. We cannot wait for the next Five Year Review to take meaningful action, it needs to happen now.

For the health of our communities and environmental justice,
Regards,

From:
Sent: Tuesday, June 11, 2024 12:32 PM
To: HPNS FYR Comments <hpns_fyr_comments@us.navy.mil>; Meredith.Williams@dtsc.ca.gov <Meredith.Williams@dtsc.ca.gov>; yana.garcia@calepa.ca.gov <yana.garcia@calepa.ca.gov>; guzman.martha@epa.gov <guzman.martha@epa.gov>
Subject: [Non-DoD Source] Concern

Dear US EPA, US Navy, CalEPA, and Department of Toxic Substance Control,

I am writing to call for the complete cleanup, not capping, of the Hunters Point Naval Shipyard Superfund Site. The Bayview Hunters Point community has suffered negative health impacts for decades due to the inadequate cleanup process at this site. Capping contamination does not protect against rising groundwater's dangerous mobilization of hazardous materials from the bottom up, as research has shown.

I am calling on your agencies to reject capping at the Hunters Point Naval Shipyard and follow through with a complete cleanup to the extent humanly possible. We cannot wait for the next Five Year Review to take meaningful action, it needs to happen now.

For the health of our communities and environmental justice,

From:
Sent: Tuesday, June 11, 2024 12:38 PM
To: HPNS FYR Comments <hpns_fyr_comments@us.navy.mil>; meredith.williams@dtsc.ca.gov <meredith.williams@dtsc.ca.gov>; yana.garcia@calepa.ca.gov <yana.garcia@calepa.ca.gov>; guzman.martha@epa.gov <guzman.martha@epa.gov>
Subject: [Non-DoD Source] Hunters Point Cleanup

I am writing to call for the complete cleanup - and not capping - of the Hunters Point Naval Shipyard Superfund Site. The Bayview Hunters Point community has suffered negative health impacts for generations due to inaction and inadequate cleanup at the site. Capping contamination does not protect against the reality of climate change - namely that rising groundwater is causing toxic materials to surface leading to toxic exposure for habitants in the area.

I am calling on your agencies to reject capping at the Hunters Point Naval Shipyard and follow through with a complete cleanup to the extent humanly possible. We cannot wait for the next Five Year Review to take meaningful action. It must happen now.

I appreciate your time and attention to this important matter!

From: Ahimsa Porter Sumchai MD <ahimsaportersumchaimd@hunterspointcommunitybiomonitoring.net>
Sent: Saturday, February 24, 2024 1:54 PM
To: info sfhpns.com <info@sfhpns.com>; Admin HPS CAC <info@hpscac.com>; Grant Colfax <grant.colfax@sfdph.org>; Susan.Philip@sfdph.org; Health commission <healthcommission.dph@sfdph.org>; Keith Seidel <keith.seidel@sfdph.org>; MayorLondonBreed@sfgov.org; Shamann Walton <Shamann.Walton@sfgov.org>; Aaron.Peskin@sfgov.org; board Of supervisors <boardofsupervisors@sfgov.org>; Tomas@CDPH Aragon <Tomas.Aragon@cdph.ca.gov>; susan.fanelli@cdph.ca.gov; biomonitoring@OEHHA biomonitoring <biomonitoring.biomonitoring@oehha.ca.gov>; Meredith Williams <Meredith.Williams@dtsc.ca.gov>; michael.j.pound.civ@us.nav.mil; michael.howley@dtsc.ca.gov; Wayne Praskins <Praskins.Wayne@epa.gov>; John Chesnutt <Chesnutt.John@epa.gov>; Michael Regan <regan.michael@epa.gov>; CityAttorney <cityattorney@sfcityatty.org>; districtattorney@sfgov.org; Gavin Newsom <Gavin.Newsom@gov.ca.gov>
Cc:

Subject: Not Protective! Findings of the HPNS 5th Five Year Review - for publication
Importance: High

Download full resolution images
Available until Mar 25, 2024

Click to Download
Findings HPNS 5th Five Year Review - Not Protective.pdf
19.8 MB

From:
Sent: Friday, May 3, 2024 11:46 AM
To: HPNS FYR Comments <hpns_fyr_comments@us.navy.mil>
Subject: [Non-DoD Source] Public comment on the US Navy's 5th Five-Year Review of Bay View Hunters Point Contamination remediation (Dr. Teresa Palmer)

I am hearby submitting my public comment (below) on the following document: "Naval Facilities Engineering Systems Command Southwest BRAC PMO West San Diego, California Draft Fifth Five-Year Review Report Hunters Point Naval Shipyard San Francisco, California November 2023; Contract Number: N62470-21-D-0007; Contract Task Order No. N6247322F4930, July 2024; (This report documents the Fifth Five-Year Review for the Hunters Point Naval Shipyard that includes Installation Restoration (IR) Sites 7 and 18, and Parcels B-1, B-2, C, D-1, D-2, E, E-2, G, UC-1, UC-2, and UC-3 as required by the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) in accordance with CERCLA § 121(c), as amended, and the National Oil and Hazardous Substances Pollution Contingency Plan, Part 300.430(f)(4)(ii) of the Code of Federal Regulations)".

As a physician and long time San Franciscan I am shocked and angry that the clean up of Bay View Hunters Point has been dragged out for so many decades. The cost in sickness and in death, which is ongoing, to our community members has been and is being largely ignored.

I support San Francisco voters and the Bayview Hunters Point Community in advocating for 100% cleanup (not capping) of radioactive and toxic waste, and 100% retesting to replace Tetra Tech's fraudulent work. The EPA found most Tetra Tech soil samples on a large portion of the site to be unreliable. Despite confirmed falsification, Tetra Tech has not been held accountable, thus delaying the cleanup's progress and worsening community health effects.

Dust Curtains: Immediate action is needed, specifically, installing industrial-grade dust barriers along the A-2 and E-2 western fenceline to reduce community exposure to airborne matter.

Full Disclosure: Potential homebuyers must be provided with full disclosure of the site status, history and cleanup goals.

5th 5-Year Review Draft: The review raises more unknowns than knowns, with nearly $1.5 billion spent to date. The Navy's Fifth Five-Year Review (Draft) for the Hunters Point Naval Shipyard (HPNS) Federal Superfund Site has faced criticism, particularly regarding its effectiveness in protecting residents and workers from hazardous substances. The review evaluates superfund cleanup sites like HPNS every five years, focusing on three questions. (with answers in **BOLD)**

1. Is the remedy functioning as intended? **UNKNOWN**
2. Are the original exposure assumptions and cleanup levels still valid? **NO**
3. Has any new information emerged that could question the protectiveness of the remedy? **YES**

Not Protective: Protectiveness Statements for site parcels relying on incomplete data are deemed invalid. Parcels should not be considered protective until work is complete and validated.

Back to the Drawing Board: The Navy acknowledges climate change as a significant factor affecting proposed remedies. Capping radioactive and toxic waste is insufficient against predicted sea level rise by 2065.

No Gardening Allowed: Strategies like avoiding soil disturbance and using raised bed gardening are inadequate for future residential use. There's no guarantee soil won't be disturbed by future activity.

Thankyou:

Family Medicine/Geriatrics

From:
Sent: Friday, May 3, 2024 11:07 AM
To: HPNS FYR Comments <hpns_fyr_comments@us.navy.mil>
Cc: SF Gray Panthers Board <sf-gray-panthers-board@googlegroups.com>; graypanther-sf <graypanther-sf@sonic.net>
Subject: [Non-DoD Source] Public comment on the US Navy's 5th Five-Year Review of Bay View Hunters Point Contamination remediation (from SF Gray Panthers Board member)

Board member of Gray Panthers of San Francisco, Public Comment on Navy's 5th Five-Year Review of Bay View Hunters Point Contamination remediation; Submitted on May 3, 2024 (Deadline for public comments: May 7, 2024):

I am hearby submitting my public comment (below) on the following document: "Naval Facilities Engineering Systems Command Southwest BRAC PMO West San Diego, California Draft Fifth Five-Year Review Report Hunters Point Naval Shipyard San Francisco, California November 2023; Contract Number: N62470-21-D-0007; Contract Task Order No. N6247322F4930, July 2024; (This report documents the Fifth Five-Year Review for the Hunters Point Naval Shipyard that includes Installation Restoration (IR) Sites 7 and 18, and Parcels B-1, B-2, C, D-1, D-2, E, E-2, G, UC-1, UC-2, and UC-3 as required by the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) in accordance with CERCLA § 121(c), as amended, and the National Oil and Hazardous Substances Pollution Contingency Plan, Part 300.430(f)(4)(ii) of the Code of Federal Regulations)".

My public comment is:

Background: Twenty-four years ago, San Francisco voters passed Proposition P, demanding that the shipyard be cleaned to the highest EPA standard for unrestricted use. In 2022, the San Francisco Grand Jury highlighted concerns about sea level rise spreading contaminants beyond the Hunters Point Superfund site.

I and the Gray Panthers of San Francisco support the SF voters and the Bayview Hunters Point Community in advocating for 100% cleanup (not capping) of radioactive and toxic waste, and 100% retesting to replace Tetra Tech's fraudulent work. The EPA found most Tetra Tech soil samples on a large portion of the site to be unreliable. Despite confirmed falsification, Tetra Tech has not been held accountable, thus delaying the cleanup's progress and worsening community health effects.

Dust Curtains: Immediate action is needed, specifically, installing industrial-grade dust barriers along the A-2 and E-2 western fenceline to reduce community exposure to airborne matter.

Full Disclosure: Potential homebuyers must be provided with full disclosure of the site status, history and cleanup goals.

5th 5-Year Review Draft: The review raises more unknowns than knowns, with nearly $1.5 billion spent to date. The Navy's Fifth Five-Year Review (Draft) for the Hunters Point Naval Shipyard (HPNS) Federal Superfund Site has faced criticism, particularly regarding its effectiveness in protecting residents and workers from hazardous substances. The review evaluates superfund cleanup sites like HPNS every five years, focusing on three questions. (with answers in **BOLD)**

1. Is the remedy functioning as intended? **UNKNOWN**
2. Are the original exposure assumptions and cleanup levels still valid? **NO**
3. Has any new information emerged that could question the protectiveness of the remedy? **YES**

Not Protective: Protectiveness Statements for site parcels relying on incomplete data are deemed invalid. Parcels should not be considered protective until work is complete and validated.

Back to the Drawing Board: The Navy acknowledges climate change as a significant factor affecting proposed remedies. Capping radioactive and toxic waste is insufficient against predicted sea level rise by 2065.

No Gardening Allowed: Strategies like avoiding soil disturbance and using raised bed gardening are inadequate for future residential use. There's no guarantee soil won't be disturbed by future activity.

Thank you very much for accepting and putting my public comment above into the public record. (And I want to thank fellow SF Gray Panther Board member Ann Colichidas for her leadership as our SF Gray Panthers' "Environmental Racism" activism leader, whose research has informed my public comment, above).

-Sincerely, SF Gray Panthers Board member

From:
Sent: Sunday, March 24, 2024 2:04 PM
To: HPNS FYR Comments <hpns_fyr_comments@us.navy.mil>; Meredith.Williams@dtsc.ca.gov <Meredith.Williams@dtsc.ca.gov>; yana.garcia@calepa.ca.gov <yana.garcia@calepa.ca.gov>; guzman.martha@epa.gov <guzman.martha@epa.gov>
Subject: [Non-DoD Source] Re: Full Cleanup, NOT CAPPING, of Hunters Point Naval Shipyard Superfund Site

Dear US EPA, US Navy, CalEPA, and DTSC,

I am writing to call for the complete cleanup, not capping, of the Hunters Point Naval Shipyard Superfund Site. The Bayview Hunters Point community has suffered negative health impacts for decades due to the inadequate cleanup process at this site. Capping contamination does not protect against rising groundwater's dangerous mobilization of hazardous materials from the bottom up. Please read the SF Chronicle article titled, "Toxic groundwater, sea level rise latest challenges in long-running S.F. shipyard cleanup," as it highlights this point.

I am calling on your agencies to reject capping at the Hunters Point Naval Shipyard and follow through with a complete cleanup to the extent humanly possible. We cannot wait for the next Five-Year Review to take meaningful action; it needs to happen now.

For the health of our communities and environmental justice,

From:
Sent: Tuesday, March 19, 2024 6:14 AM
To: HPNS FYR Comments <hpns_fyr_comments@us.navy.mil>; Meredith.Williams@dtsc.ca.gov <Meredith.Williams@dtsc.ca.gov>; yana.garcia@calepa.ca.go <yana.garcia@calepa.ca.go>; guzman.martha@epa.gov <guzman.martha@epa.gov>
Subject: [Non-DoD Source] Re: Full Cleanup, NOT CAPPING, of Hunters Point Naval Shipyard Superfund Site

Dear US EPA, US Navy, CalEPA, and DTSC,

I am writing to call for the complete cleanup, not capping, of the Hunters Point Naval Shipyard Superfund Site. The Bayview Hunters Point community has suffered negative health impacts for decades due to the inadequate cleanup process at this site. Capping contamination does not protect against rising groundwater's dangerous mobilization of hazardous materials from the bottom up. Please read the SF Chronicle article titled, "Toxic groundwater, sea level rise latest challenges in long-running S.F. shipyard cleanup" as it highlights this point.

I am calling on your agencies to reject capping at the Hunters Point Naval Shipyard and follow through with a complete cleanup to the extent humanly possible. We cannot wait for the next Five Year Review to take meaningful action, it needs to happen now.

Thank you,

From:
Sent: Thursday, March 21, 2024 11:01 AM
To: HPNS FYR Comments <hpns_fyr_comments@us.navy.mil>; Meredith.Williams@dtsc.ca.gov <Meredith.Williams@dtsc.ca.gov>; yana.garcia@calepa.ca.gov <yana.garcia@calepa.ca.gov>; guzman.martha@epa.gov <guzman.martha@epa.gov>
Subject: [Non-DoD Source] Full Cleanup, NOT CAPPING, of Hunters Point Naval Shipyard Superfund Site

Dear US EPA, US Navy, CalEPA, and DTSC,
As a retired nurse I have also been concerned about the effects of the environment on people's health. I am writing to call for the complete cleanup, not capping, of the Hunters Point Naval Shipyard Superfund Site. The Bayview Hunters Point community has suffered negative health impacts for decades due to the inadequate cleanup process at this site. Capping contamination does not protect against rising groundwater's dangerous mobilization of hazardous materials from the bottom up. Please read the SF Chronicle article titled, "Toxic groundwater, sea level rise latest challenges in long-running S.F. shipyard cleanup" as it highlights this point.

https://www.sfchronicle.com/sf/article/s-f-hunters-point-shipyard-toxic-water-cleanup-18762183.php?link_id=2&can_id=aa9c7a1018f06fe1822ed5044f8b5868&source=email-curbside-charging-shipyard-cleanup-solar-energy&email_referrer=email_2244616&email_subject=curbside-charging-shipyard-cleanup-solar-energy

I am calling on your agencies to reject capping at the Hunters Point Naval Shipyard and follow through with a complete cleanup to the extent humanly possible. We cannot wait for the next Five Year Review to take meaningful action, it needs to happen now.

For the health of our communities and environmental justice,

From: >
Sent: Monday, March 18, 2024 9:47 AM
To: HPNS FYR Comments <hpns_fyr_comments@us.navy.mil>; Meredith.Williams@dtsc.ca.gov <Meredith.Williams@dtsc.ca.gov>; yana.garcia@calepa.ca.gov <yana.garcia@calepa.ca.gov>; guzman.martha@epa.gov <guzman.martha@epa.gov>
Subject: [Non-DoD Source] Re: Full Cleanup, NOT CAPPING, of Hunters Point Naval Shipyard Superfund Site

Dear US EPA, US Navy, CalEPA, and DTSC,

I am writing to call for the complete cleanup, not capping, of the Hunters Point Naval Shipyard Superfund Site. The Bayview Hunters Point community has suffered negative health impacts for decades due to the inadequate cleanup process at this site. Capping contamination does not protect against rising groundwater's dangerous mobilization of hazardous materials from the bottom up. Please read the SF Chronicle article titled, "Toxic groundwater, sea level rise latest challenges in long-running S.F. shipyard cleanup" as it highlights this point.

I am calling on your agencies to reject capping at the Hunters Point Naval Shipyard and follow through with a complete cleanup to the extent humanly possible. We cannot wait for the next Five Year Review to take meaningful action, it needs to happen now.

For the health of our communities and environmental justice,

From:
Sent: Monday, March 18, 2024 3:12 PM
To: HPNS FYR Comments <hpns_fyr_comments@us.navy.mil>; Meredith.Williams@dtsc.ca.gov <Meredith.Williams@dtsc.ca.gov>; yana.garcia@calepa.ca.gov <yana.garcia@calepa.ca.gov>; guzman.martha@epa.gov <guzman.martha@epa.gov>
Subject: [Non-DoD Source] Re: Full Cleanup, NOT CAPPING, of Hunters Point Naval Shipyard Superfund Site

Dear US EPA, US Navy, CalEPA, and DTSC,

As a high schooler whose friends frequently go urban exploring in the polluted areas of Hunter's Point, I am writing to call for the complete cleanup, not capping, of the Hunters Point Naval Shipyard Superfund Site.

The Bayview Hunters Point community has suffered negative health impacts for decades due to the inadequate cleanup process at this site, and I'm concerned for the health of the many high schoolers that go exploring there. Capping contamination does not protect against rising groundwater's dangerous mobilization of hazardous materials from the bottom up. Please **read the SF Chronicle article** titled, "Toxic groundwater, sea level rise latest challenges in long-running S.F. shipyard cleanup" as it highlights this point.

I am calling on your agencies to reject capping at the Hunters Point Naval Shipyard and follow through with a complete cleanup to the extent humanly possible. We cannot wait for the next Five Year Review to take meaningful action, it needs to happen now.

For the health of our communities and environmental justice,

High School Senior | San Francisco, cA

From:
Sent: Thursday, March 21, 2024 2:36 PM
To: HPNS FYR Comments <hpns_fyr_comments@us.navy.mil>
Subject: [Non-DoD Source] Full Cleanup, NOT CAPPING, of Hunters Point Naval Shipyard Superfund Site

Dear Mr. Michael Pound (US Navy):

I am writing to call for the complete cleanup, not capping, of the Hunters Point Naval Shipyard Superfund Site. As an underserved, the Bayview Hunters Point community has suffered negative health impacts for decades due to the inadequate cleanup process at this site. Capping contamination does not protect against rising groundwater's dangerous mobilization of hazardous materials from the bottom up. Please read the SF Chronicle article titled, "Toxic groundwater, sea level rise latest challenges in long-running S.F. shipyard cleanup" as it highlights this point.

I am calling on your agencies to reject capping at the Hunters Point Naval Shipyard and follow through with a complete cleanup to the extent humanly possible. We cannot wait for the next Five Year Review to take meaningful action, it needs to happen now.

For the health of our communities and environmental justice,

San Francisco, CA 94121

From:
Sent: Sunday, May 5, 2024 11:45 PM
To: HPNS FYR Comments <hpns_fyr_comments@us.navy.mil>
Subject: [Non-DoD Source] re "Naval Facilities Engineering Systems Command Southwest BRAC PMO West San Diego, California Draft Fifth Five-Year Review Report Hunters Point Naval Shipyard San Francisco, California November 2023

I hereby submit this comment in re "Naval Facilities Engineering Systems Command Southwest BRAC PMO West San Diego, California Draft Fifth Five-Year Review Report Hunters Point Naval Shipyard San Francisco, California November 2023; Contract Number: N62470-21-D-0007; Contract Task Order No. N6247322F4930, July 2024; (This report documents the Fifth Five-Year Review for the Hunters Point Naval Shipyard that includes Installation Restoration (IR) Sites 7 and 18, and Parcels B-1, B-2, C, D-1, D-2, E, E-2, G, UC-1, UC-2, and UC-3 as required by the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) in accordance with CERCLA § 121(c), as amended, and the National Oil and Hazardous Substances Pollution Contingency Plan, Part 300.430(f)(4)(ii) of the Code of Federal Regulations)".

Background:

In 2000, San Francisco voters passed Proposition P, demanding that the shipyard be cleaned to the highest EPA standard for unrestricted use.

In 2022, the San Francisco Grand Jury highlighted concerns about sea level rise spreading contaminants beyond the Hunters Point Superfund site.

Comment

I support the SF voters and the Bayview Hunters Point Community in advocating **100% cleanup (not capping)** of radioactive and toxic waste, and **100% retesting** to replace Tetra Tech's fraudulent work. The EPA found most Tetra Tech soil samples on a large portion of the site to be unreliable. Despite confirmed falsification, Tetra Tech has not been held accountable. This failure has delayed the cleanup's progress and worsened community health effects.

Dust Curtains: Immediate action is needed, specifically, installing industrial-grade dust barriers along the A-2 and E-2 western fenceline to reduce community exposure to airborne matter.

Full Disclosure: Potential homebuyers must be provided with full disclosure of the site status, history and cleanup goals.

Current (5th 5-Year) Review Draft: The review raises more unknowns than knowns, with nearly $1.5 billion spent to date. The Navy's Fifth Five-Year Review (Draft) for the Hunters Point Naval Shipyard (HPNS) Federal Superfund Site has faced criticism, particularly regarding its effectiveness in protecting residents and workers from hazardous substances. The review evaluates superfund cleanup sites like HPNS every five years, focusing on three questions. (my answers in **BOLD)**

1. Is the remedy functioning as intended? **UNKNOWN**
2. Are the original exposure assumptions and cleanup levels still valid? **NO**
3. Has any new information emerged that could question the protectiveness of the remedy? **YES**

Not protective: Protectiveness Statements for site parcels relying on incomplete data are not valid. Parcels should not be considered protective until work is complete and validated.

Ignores climate change: The Navy acknowledges climate change as a significant factor affecting proposed remedies. Capping radioactive and toxic waste is insufficient against predicted sea level rise by 2065.

No gardening is safe: Strategies like avoiding soil disturbance and using raised bed gardening are inadequate for future residential use. There is no guarantee that soil won't be disturbed by future activity.

Environmental engineer and sf resident

From:
Sent: Friday, March 15, 2024 9:52 AM
To: HPNS FYR Comments <hpns_fyr_comments@us.navy.mil>; Meredith.Williams@dtsc.ca.gov <Meredith.Williams@dtsc.ca.gov>; yana.garcia@calepa.ca.gov <yana.garcia@calepa.ca.gov>; guzman.martha@epa.gov <guzman.martha@epa.gov>
Subject: [Non-DoD Source] Re: Full Cleanup, NOT CAPPING, of Hunters Point Naval Shipyard Superfund Site

Dear US EPA, US Navy, CalEPA, and DTSC,

I am writing to call for the complete cleanup, not capping, of the Hunters Point Naval Shipyard Superfund Site. The Bayview Hunters Point community has suffered negative health impacts for decades due to the inadequate cleanup process at this site. Capping contamination does not protect against rising groundwater's dangerous mobilization of hazardous materials from the bottom up. Please read the SF Chronicle article titled, "Toxic groundwater, sea level rise latest challenges in long-running S.F. shipyard cleanup" as it highlights this point.

I am calling on your agencies to reject capping at the Hunters Point Naval Shipyard and follow through with a complete cleanup to the extent humanly possible. We cannot wait for the next Five Year Review to take meaningful action, it needs to happen now.

For the health of our communities and environmental justice,

San Francisco, CA 94121

From:
Sent: Thursday, March 21, 2024 2:36 PM
To: HPNS FYR Comments <hpns_fyr_comments@us.navy.mil>
Subject: [Non-DoD Source] Full Cleanup, NOT CAPPING, of Hunters Point Naval Shipyard Superfund Site

Dear Mr. Michael Pound (US Navy):

I am writing to call for the complete cleanup, not capping, of the Hunters Point Naval Shipyard Superfund Site. As an underserved, the Bayview Hunters Point community has suffered negative health impacts for decades due to the inadequate cleanup process at this site. Capping contamination does not protect against rising groundwater's dangerous mobilization of hazardous materials from the bottom up. Please read the SF Chronicle article titled, "Toxic groundwater, sea level rise latest challenges in long-running S.F. shipyard cleanup" as it highlights this point.

I am calling on your agencies to reject capping at the Hunters Point Naval Shipyard and follow through with a complete cleanup to the extent humanly possible. We cannot wait for the next Five Year Review to take meaningful action, it needs to happen now.

For the health of our communities and environmental justice,

San Francisco, CA 94121

From:
Sent: Sunday, May 5, 2024 9:50 PM
To: HPNS FYR Comments <hpns_fyr_comments@us.navy.mil>
Subject: [Non-DoD Source] 100% cleanup (not capping) in Bayview Hunters Point

I support the SF voters and the Bayview Hunters Point Community in advocating **100% cleanup (not capping)** of radioactive and toxic waste, and **100% retesting** to replace Tetra Tech's fraudulent work. The EPA found most Tetra Tech soil samples on a large portion of the site to be unreliable. Despite confirmed falsification, Tetra Tech has not been held accountable. This failure has delayed the cleanup's progress and worsened community health effects.

Dust Curtains: Immediate action is needed, specifically, installing industrial-grade dust barriers along the A-2 and E-2 western fenceline to reduce community exposure to airborne matter.

Full Disclosure: Potential homebuyers must be provided with full disclosure of the site status, history and cleanup goals.

Current (5th 5-Year) Review Draft: The review raises more unknowns than knowns, with nearly $1.5 billion spent to date. The Navy's Fifth Five-Year Review (Draft) for the Hunters Point Naval Shipyard (HPNS) Federal Superfund Site has faced criticism, particularly regarding its effectiveness in protecting residents and workers from hazardous substances. The review evaluates superfund cleanup sites like HPNS every five years, focusing on three questions.Not protective: Protectiveness Statements for site parcels relying on incomplete data are not valid. Parcels should not be considered protective until work is complete and validated.

Ignores climate change: The Navy acknowledges climate change as a significant factor affecting proposed remedies. Capping radioactive and toxic waste is insufficient against predicted sea level rise by 2065.

No gardening is safe: Strategies like avoiding soil disturbance and using raised bed gardening are inadequate for future residential use. There is no guarantee that soil won't be disturbed by future activity.

Sincerely,

San Francisco

From:
Sent: Wednesday, May 1, 2024 7:50 AM
To: HPNS FYR Comments <hpns_fyr_comments@us.navy.mil>
Subject: [Non-DoD Source] Hunter's Point Superfund Site Comment

To Whom It May Concern,

The Navy's clean up efforts at the Hunter's Point Superfund Site has not been effective in protecting residents and workers from hazardous substances. Rates of cancer and asthma in Hunter's Point exceed other areas of the city. The threat of future sea level rise will only make the effects of toxic substances worse in the coming years.

The Navy needs to execute and expedite a thorough clean up to the most stringent standards. This neglected area of the city needs to be toxin free for its residents! This travesty would not be tolerated in other parts of the city.

San Francisco

From:
Sent: Sunday, May 5, 2024 5:04 PM
To: HPNS FYR Comments <hpns_fyr_comments@us.navy.mil>
Subject: [Non-DoD Source] Comment re: 5th Five-Year Review of Bay View Hunters Point Contamination remediation

With regard to "Naval Facilities Engineering Systems Command Southwest BRAC PMO West San Diego, California Draft Fifth Five-Year Review Report Hunters Point Naval Shipyard San Francisco, California November 2023; Contract Number: N62470-21-D-0007; Contract Task Order No. N6247322F4930, July 2024; (This report documents the Fifth Five-Year Review for the Hunters Point Naval Shipyard that includes Installation Restoration (IR) Sites 7 and 18, and Parcels B-1, B-2, C, D-1, D-2, E, E-2, G, UC-1, UC-2, and UC-3 as required by the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) in accordance with CERCLA § 121(c), as amended, and the National Oil and Hazardous Substances Pollution Contingency Plan, Part 300.430(f)(4)(ii) of the Code of Federal Regulations)" this comment is hereby submitted.

Background:

In 2000, San Francisco voters passed Proposition P, demanding that the shipyard be cleaned to the highest EPA standard for unrestricted use.

In 2022, the San Francisco Grand Jury highlighted concerns about sea level rise spreading contaminants beyond the Hunters Point Superfund site.

Comment

I support San Francisco voters (Proposition P, 2000, demanding remediation to highest EPA standard for unrestricted use) and the Bayview Hunters Point Community in advocating **100% cleanup (not capping)** of radioactive and toxic waste, and **100% retesting** to replace Tetra Tech's fraudulent work. In reviewing a large part of the contamination site, EPA found most Tetra Tech soil samples unreliable. Indeed, deliberate falsification by Tetra Tech has been confirmed. Failure to address this falsification has delayed the cleanup's progress and worsened community health effects.

Dust Curtains: Immediate installation of industrial-grade dust barriers along the A-2 and E-2 western fenceline is required to reduce community exposure to airborne matter.

Full Disclosure: Potential buyers of homes in the area must be provided with full disclosure of the site status, history and cleanup goals.

Current (5th 5-Year) Review Draft: The review raises more questions than it answers, despite nearly $1.5 billion spent to date.

The Navy's Fifth Five-Year Review (Draft) for the Hunters Point Naval Shipyard (HPNS) Federal Superfund Site has caused criticism for failure to address the project's ineffectiveness in protecting residents and workers from hazardous substances. The review evaluates superfund cleanup sites like HPNS every five years, focusing on three questions. My answers (in **BOLD)** reflect my view that the draft needs revision.

1. Is the remedy functioning as intended? **UNKNOWN**
2. Are the original exposure assumptions and cleanup levels still valid? **NO**
3. Has any new information emerged that could question the protectiveness of the remedy? **YES**

Not protective: Protectiveness Statements for site parcels relying on incomplete data are not valid. Parcels should not be considered protective until work is complete and validated.

Ignores climate change: The Navy acknowledges climate change as a significant factor affecting proposed remedies. Capping radioactive and toxic waste is insufficient against predicted sea level rise by 2065.

No gardening is safe: Strategies like avoiding soil disturbance and using raised bed gardening are inadequate for future residential use. There is no guarantee that soil won't be disturbed by future activity.

From:
Sent: Thursday, April 18, 2024 6:21 PM
To: HPNS FYR Comments <hpns_fyr_comments@us.navy.mil>
Subject: [Non-DoD Source] Re: Full Cleanup, NOT CAPPING, of Hunters Point Naval Shipyard Superfund Site

April 17, 2024

Dear Mr. Michael Pound,

I am writing to call for the complete cleanup, not capping, of the Hunters Point Naval Shipyard Superfund Site. The Bayview Hunters Point community has suffered negative health impacts for decades due to the inadequate cleanup process at this site. Capping contamination does not protect against rising groundwater's dangerous mobilization of hazardous materials from the bottom up. This has been an issue for far too long. Please don't wait until investors come in to gentrify the place for people of privilege to move in. All our residents deserve a healthy, clean place to call home.

I am calling on your agencies to reject capping at the Hunters Point Naval Shipyard and follow through with a complete cleanup to the extent humanly possible. We cannot wait for the next Five Year Review to take meaningful action, it needs to happen now.

For the health of our communities and environmental justice,

From:
Sent: Wednesday, April 17, 2024 7:00 AM
To: HPNS FYR Comments <hpns_fyr_comments@us.navy.mil>; Meredith.Williams@dtsc.ca.gov <Meredith.Williams@dtsc.ca.gov>; yana.garcia@calepa.ca.gov <yana.garcia@calepa.ca.gov>; guzman.martha@epa.gov <guzman.martha@epa.gov>
Subject: [Non-DoD Source] Full Cleanup, NOT CAPPING, of Hunters Point Naval Shipyard Superfund Site

Dear US EPA, US Navy, CalEPA, and DTSC,

I am writing to call for the complete cleanup, not capping, of the Hunters Point Naval Shipyard Superfund Site. The Bayview Hunters Point community has suffered negative health impacts for decades due to the inadequate cleanup process at this site. Capping contamination does not protect against rising groundwater's dangerous mobilization of hazardous materials from the bottom up. Please read the SF Chronicle article titled, "Toxic groundwater, sea level rise latest challenges in long-running S.F. shipyard cleanup" as it highlights this point.

I am calling on your agencies to reject capping at the Hunters Point Naval Shipyard and follow through with a complete cleanup to the extent humanly possible. We cannot wait for the next Five Year Review to take meaningful action, it needs to happen now.

For the health of our communities and environmental justice,

From:
Sent: Thursday, March 28, 2024 1:45 PM
To: HPNS FYR Comments <hpns_fyr_comments@us.navy.mil>
Cc:

Subject: [Non-DoD Source] San Francisco Civil Grand Jury Findings and Recommendation from 2021-2022

The City of San Francisco Civil Grand Jury is a government oversight panel of volunteers who serve for one year. It makes findings and recommendations based on its investigations. Here is the link to the entire report:
Buried Problems and a Buried Process: The Hunters Point Naval Shipyard in a Time of Climate Change.

The Hunters Point Naval Shipyard is a Superfund site on the southeastern shore of San Francisco. The Navy, overseen by EPA and state regulators, has been cleaning up radiological and chemical contamination in the Shipyard for over thirty years. As the cleanup is completed and approved, the Navy has agreed to transfer the property to the City in stages to create San Francisco's biggest housing development. A developer, working with the San Francisco Office of Community Infrastructure and Investment, plans to build thousands of homes at the Shipyard, along with office towers, parks, a school and millions of feet of commercial space. The Civil Grand Jury began this investigation with a question about the potential impact of groundwater rise due to climate change on the future of the Shipyard. Over the past decade, new coastal adaptation science has emerged to show the ways shallow groundwater reacts to sea level rise. In brief, as the sea level rises, shallow groundwater near the shore rises with it, and can cause flooding, damage infrastructure, and mobilize any contaminants in the soil. The Jury asked if rising groundwater could pose special risks to health and safety in the low-lying, heavily polluted landscape of the Shipyard. The Jury learned that experts believe the Shipyard's soil and topography make it very likely that shallow groundwater there will be strongly affected by sea level rise. **The Jury further found that rising groundwater in the Shipyard could interact in dangerous ways with future infrastructure, and with hazardous toxins the Navy plans to leave buried in the soil. We wanted to know if this new science and these risks had been taken into account by the City, by OCII, or by the Navy and its regulators. We found that they had not.** To address this lack of information, the Jury recommends that the City hire expert scientists to examine these risks in detail. The City of Alameda set an example with a recent study predicting how shallow groundwater on the island would react to sea level rise, and how rising groundwater might interact with contaminants at different sites. The Jury recommends that San Francisco, acting through the Office of Resilience and Capital Planning, commission a similar independent study specific to the Shipyard, so that future development plans can be informed by a thorough, professional analysis of rising groundwater there. The Jury also wished to issue recommendations about how such a groundwater study might help improve the Shipyard cleanup. But the Jury cannot issue recommendations to the Navy or to the EPA and state regulators, and so looked for a solution that could come from inside the City. The Jury discovered that the process that governs the cleanup is forbiddingly complex, and essentially invisible within the City. Yet the stakes for San Francisco in that process—for health, The Hunters Point Naval Shipyard in a Time of Climate Change 3 for environmental safety, and for the resilience of future development in the Shipyard—are enormous. But hardly anyone in the City is paying attention. Within the City, expertise about the Superfund process that governs the cleanup exists only in the San Francisco Department of Public Health's Hunters Point Shipyard Program, a program that until recently had only one employee. Several other departments in the City have familiarity with the science of groundwater rise and might have flagged the risks to the Shipyard, but these departments are unfamiliar with the cleanup and the

Superfund process, and do not communicate with SFDPH about the Shipyard. This leaves the City poorly prepared to address emerging issues such as groundwater rise at the Shipyard—or any other risks the Navy and its regulators may overlook. There is no mechanism in place to discover such issues, to develop a response, or to follow through with the Navy and regulators to a resolution. The Jury recommends that the Board of Supervisors create, without delay, a permanent Hunters Point Shipyard Cleanup Oversight Committee, made up of representatives from City departments with pertinent expertise. This committee should proactively look out for the City's best interests in the cleanup. It should perform general due diligence, and communicate the City's concerns to the Navy and regulators ahead of major decision-making about the cleanup. To address the opacity of the Superfund governance process, the Jury recommends that SFDPH create all necessary explanatory materials to support the work of the Shipyard Cleanup Oversight Committee. To ensure that the Committee is informed about key cleanup decision points with enough time to weigh in, the Jury recommends that a representative of SFDPH appear before the Committee frequently for briefing. Finally, to return to where this report started, the Jury recommends that the Cleanup Oversight Committee review the results of the recommended groundwater rise study, determine what it means for the future of the Shipyard, and respectfully but assertively share the City's position with the Navy, EPA, and state regulators. The intersection of rising ground water and buried contaminants poses a credible risk to human health and well-being. Given the rapidity with which the climate is changing, the City needs to take immediate and sustained action to protect its residents.

These are the SF Grand Jury Findings and Recommendations:

FINDINGS AND RECOMMENDATIONS

Findings

F1: In the Hunters Point Shipyard, shallow groundwater rising with sea level rise and residual hazardous substances pose serious but poorly understood risks that should concern the City and County of San Francisco, the Navy, future developers, future property owners, and future residents.

F2: The Federal Facility Agreement signatories have neglected to investigate how groundwater rise may lessen the effectiveness of the Navy's cleanup at the Hunters Point Shipyard Superfund site.

F3: The process governing the cleanup at the Shipyard encompasses decisions and value judgments that matter to all San Franciscans, but the extremely technical nature of the process inhibits City leaders and citizens alike from understanding it, or even knowing what is at stake.

F4: Despite the enormous stakes of the process governing the Shipyard cleanup, there is little understanding of the process throughout the City, or even that the City can influence this process.

F5: The City and County of San Francisco is poorly prepared to discover new information pertinent to the Shipyard cleanup, to proactively look for risks and problems overlooked or under-prioritized by the Federal Facility Agreement signatories, or to develop responses to new information or problems..

F6: No proactive mechanism exists for the City and County of San Francisco to articulate its interests and concerns about the cleanup for the Federal Facility Agreement signatories, nor does a mechanism exist for the City to monitor progress towards obtaining satisfactory responses to such interests and concerns from the signatories.

Recommendations

R1: By September 1st, 2022, the Mayor and/or the City Administrator should direct the Office of Resilience and Capital Planning, in collaboration with the Department of Public Health, to commission and manage an independent, third-party study of Hunters Point Shipyard to predict the future shallow groundwater surface, groundwater flows, and potential interactions of groundwater with hazardous materials and planned modifications to the site under multiple sea level rise scenarios. (F1) The Hunters Point Naval Shipyard in a Time of Climate Change 37

R2: The Mayor and the Board of Supervisors should collaborate to provide funding for the study recommended in R1, in the Fiscal Year 22-23 budget, or by October 1st, 2022. (F1) R3: By October 1st, 2022, the Board of Supervisors should pass an ordinance to create a permanent Hunters Point Shipyard Cleanup Oversight Committee that includes the Controller or their designee, relevant technical experts from the Public Utilities Commission and the Department of Public Works, and representatives from other relevant City departments, to perform due diligence on behalf of the City and County of San Francisco into the Federal Facility Agreement signatories' decision-making, and to prepare an agenda of questions and requests to be communicated to the signatories by the Department of Public Health in advance of major cleanup document releases. (

F4, F5, F6) R4: By October 1st, 2022, the Mayor should direct the Department of Public Health to support the Cleanup Oversight Committee in its due diligence function by providing explanatory materials and briefings about cleanup governance documents and the discourse among Federal Facility Agreement signatories, as well as additional materials at the request of the Committee. (F3)

R5: By October 1st, 2022, the Mayor and the Board of Supervisors should collaborate to ensure that funding is available to generate the material specified in R4, in the Fiscal Year 22-23 budget or by October 1st, 2022, and in future budgets. (F3)

R6: From October 1st, 2022 and going forward, whenever there are outstanding questions and requests to the Federal Facility Agreement signatories, and especially during the lead-up to major cleanup document releases, a member of the management chain overseeing the Hunters Point Shipyard Program in the Department of Public Health should appear before the Shipyard Cleanup Oversight Committee at regular intervals to report on discussions with the Federal Facility Agreement signatories. (F6)

R7: By March 1st, 2023, the Hunters Point Shipyard Cleanup Oversight Committee should prepare a report on its recommended requests for the Federal Facility Agreement signatories based on the groundwater study recommended in R1, and deliver that report to the Board of Supervisors, the Mayor, and the Department of Public Health.

Please submit these comments, findings and recommendations into the public record.
Thank you,

Member of the SF Civil Grand Jury 2021-2022

From:
Sent: Tuesday, March 26, 2024 5:29 PM
To: HPNS FYR Comments <hpns_fyr_comments@us.navy.mil>; Meredith Williams <meredith.williams@dtsc.ca.gov>; Yana Garcia <yana.garcia@calepa.ca.gov>; Martha Guzman <guzman.martha@epa.gov>
Subject: [Non-DoD Source] A Full Cleanup at the BVHP Superfund Site Is the Only Ethical Course of Action

Dear US EPA, US Navy, CalEPA, and Department of Toxic Substance Control,

I am writing to urge for the thorough remediation, rather than simply capping, of the Hunters Point Naval Shipyard Superfund Site. The Bayview Hunters Point neighborhood has endured adverse health effects for many years due to the inadequate cleanup efforts at this location. It has been demonstrated through research that capping the contamination does not adequately safeguard against the toxic materials being moved from the bottom up by rising groundwater.

I implore your agencies to refrain from implementing capping measures at the Hunters Point Naval Shipyard and instead commit to a comprehensive cleanup to the greatest extent possible. We cannot afford to delay meaningful action until the next Five Year Review; action must be taken now.

This is imperative for the well-being of our communities and for the cause of environmental justice.

Thanks,

From:
Sent: Tuesday, March 26, 2024 5:32 PM
To: HPNS FYR Comments <hpns_fyr_comments@us.navy.mil>; Meredith.Williams@dtsc.ca.gov <Meredith.Williams@dtsc.ca.gov>; yana.garcia@calepa.ca.gov <yana.garcia@calepa.ca.gov>; guzman.martha@epa.gov <guzman.martha@epa.gov>
Subject: [Non-DoD Source] Full Cleanup of Bayview Hunters Point Superfund Site

Dear US EPA, US Navy, CalEPA, and Department of Toxic Substance Control,

I am , a third-year Advertising and Design at the University of San Francisco. I am from Richmond, Virginia, and I have enjoyed my time living in the Bay Area these last three years. I love San Francisco for its rich natural beauty in areas like the Presidio and its strong sense of community and togetherness. These reasons lead me to why I am writing this email to you today:

I am calling for the complete cleanup, not capping, of the Hunters Point Naval Shipyard Superfund Site. The BVHP community has experienced immense negative health impacts for years due to the inadequate cleanup process at this site. Capping contamination does not protect against rising groundwater's dangerous mobilization of hazardous materials from the bottom up, as research has shown. Rising sea levels and other climate change impacts will likely surface the buried toxic materials at BVHP.

I am calling on your agencies to reject capping at the Hunters Point Naval Shipyard and follow through with a complete cleanup to the extent humanly possible. We cannot wait for the next Five Year Review to take meaningful action, it needs to happen now.

For the health of our local communities and environmental justice,

From:
Sent: Tuesday, March 26, 2024 5:55 PM
To: HPNS FYR Comments <hpns_fyr_comments@us.navy.mil>; Meredith.Williams@dtsc.ca.gov <Meredith.Williams@dtsc.ca.gov>; yana.garcia@calepa.ca.gov <yana.garcia@calepa.ca.gov>; guzman.martha@epa.gov <guzman.martha@epa.gov>
Subject: [Non-DoD Source] Demanding a Comprehensive Cleanup of Bayview Hunters Point Superfund Site

Dear US EPA, US Navy, CalEPA, and Department of Toxic Substance Control,

Can you imagine your home being unsafe to live in? The residents of Bayview Hunters Point live this reality by facing the threat of toxic water due to a failure of responsible action. Consequently, I am writing to call for the complete cleanup — not capping — of the Hunters Point Naval Shipyard Superfund Site. The Bayview Hunters Point community has already and will continue to suffer negative health impacts for decades because of the inadequate cleanup process at this site. Capping contamination fails to protect against rising groundwater's dangerous mobilization of hazardous materials from the bottom up, as research has shown.

I am calling on your agencies to reject capping at the Hunters Point Naval Shipyard and follow through with a complete cleanup to the extent humanly possible. We cannot wait for the next Five Year Review to take meaningful action, it needs to happen now.

For the health of our communities and environmental justice,

From:
Sent: Tuesday, March 26, 2024 5:29 PM
To: HPNS FYR Comments <hpns_fyr_comments@us.navy.mil>; Meredith.Williams@dtsc.ca.gov <Meredith.Williams@dtsc.ca.gov>; yana.garcia@calepa.ca.gov <yana.garcia@calepa.ca.gov>; guzman.martha@epa.gov <guzman.martha@epa.gov>
Subject: [Non-DoD Source] Full Cleanup of Bayview Hunters Point Shipyard

Dear US EPA, US Navy, CalEPA and Department of Toxic Substances Control,

I am a resident of San Francisco writing to call for the complete cleanup, not capping, of the Hunters Point Naval Shipyard Site. The Bayview Hunters Point community has long called for a complete cleanup due to suffering negative health impacts from the contaminated shipyard site, and it is well past time to take effective action for the sake of human health. Thus far, the cleanup process at the site has been inadequate and has continued to leave residents facing dangerous conditions. Capping the site will not protect against rising groundwater's mobilization of hazardous materials from the bottom up, as research has shown. Please do not let this be another instance where the concerns of the Bayview Hunters Point community are passed over and dangerous conditions are allowed to persist.

We are calling on your agencies to reject capping at the Hunters Point Naval Shipyard and follow through with a complete cleanup to the extent humanly possible. We (and the Bayview Hunters Point community) do not deserve to wait for the next Five Year Review for meaningful action to take place. It needs to happen now, and you have the opportunity to make a difference.

Sincerely,

Class of 2021

From:
Sent: Tuesday, March 26, 2024 5:26 PM
To: HPNS FYR Comments <hpns_fyr_comments@us.navy.mil>; Meredith Williams <meredith.williams@dtsc.ca.gov>; Yana Garcia <yana.garcia@calepa.ca.gov>; Martha Guzman <guzman.martha@epa.gov>
Subject: [Non-DoD Source] End Shipyard Contamination in Bayview Hunters Point

Dear US EPA, US Navy, CalEPA, and Department of Toxic Substance Control,

I am writing to call for the complete cleanup, not capping, of the Hunters Point Naval Shipyard Superfund Site. The Bayview Hunters Point community has suffered negative health impacts for decades due to the inadequate cleanup process at this site. Capping contamination does not protect against rising groundwater's dangerous mobilization of hazardous materials from the bottom up, as research has shown.

I am calling on your agencies to reject capping at the Hunters Point Naval Shipyard and follow through with a complete cleanup to the extent humanly possible. We cannot wait for the next Five Year Review to take meaningful action, it needs to happen now.

For the health of our communities and environmental justice,

10th Grade

From:
Sent: Tuesday, March 26, 2024 5:25 PM
To: HPNS FYR Comments <hpns_fyr_comments@us.navy.mil>; meredith.williams@dtsc.ca.gov <meredith.williams@dtsc.ca.gov>; yana.garcia@calepa.ca.gov <yana.garcia@calepa.ca.gov>; guzman.martha@epa.gov <guzman.martha@epa.gov>
Subject: [Non-DoD Source] A swiftie says hi

Dear US EPA, US Navy, CalEPA, and Department of Toxic Substance Control,

I'm a huge Swiftie, fantasy reader, and religious voter. And I DEMAND that you clean up, NOT COVER UP the Hunters Point Naval Shipyard Superfund Site.

I am writing to call for the complete cleanup, not capping, of the Hunters Point Naval Shipyard Superfund Site. The Bayview Hunters Point community has suffered negative health impacts for decades due to the inadequate cleanup process at this site. Capping contamination does not protect against rising groundwater's dangerous mobilization of hazardous materials from the bottom up, as research has shown.

I am calling on your agencies to reject capping at the Hunters Point Naval Shipyard and follow through with a complete cleanup to the extent humanly possible. We cannot wait for the next Five Year Review to take meaningful action, it needs to happen now.

For the health of our communities and environmental justice,

Best,

From:
Sent: Monday, March 18, 2024 2:36 PM
To: HPNS FYR Comments <hpns_fyr_comments@us.navy.mil>;

Subject: [Non-DoD Source] Building 123 Demolition, and Reclamation Schedule

Dear BRAC Environmental Committee,
Thank you for communicating with us regarding the upcoming project to dismantle Building 123, and undertake toxic soil reclamation, etc.
I am a long-term tenant on Parcel B, and have concerns, and a thought, concerning the order in which these operations can take place.
Simply put:
Why not leave the wood-framed structure in place, wrap the building with protective sheeting, and perform all the concrete slab demolition, and toxic soil reclamation BEFORE tearing down the building?
This would hold in all the dust until AFTER the ground has been excavated, and re-covered, preventing massive amounts dust from blowing around the base, and the surrounding Bayview neighborhood.
It is clear, even without the recent. extremely high winds gusts, that dust blows all around frequently.
Tenting the structure, and closing-in the excavation operations makes perfect sense. It would cut down noise as well.
Thank you for considering this idea. Please forward this to the appropriate project management team for their review. Who knows, this approach may already be under consideration by your team.
We hope that such a plan will be adopted, for the benefit of us all.

Best,

From:
Sent: Wednesday, May 8, 2024 3:15 PM
To: HPNS FYR Comments <hpns_fyr_comments@us.navy.mil>
Subject: [Non-DoD Source] Navy's 5 year review of the contamination in the Bay View Hunters Point neighborhood

To the US Navy,

I hereby submit this comment in re "Naval Facilities Engineering Systems Command Southwest BRAC PMO West San Diego, California Draft Fifth Five-Year Review Report Hunters Point Naval Shipyard San Francisco, California November 2023; Contract Number: N62470-21-D-0007; Contract Task Order No. N6247322F4930, July 2024; (This report documents the Fifth Five-Year Review for the Hunters Point Naval Shipyard that includes Installation Restoration (IR) Sites 7 and 18, and Parcels B-1, B-2, C, D-1, D-2, E, E-2, G, UC-1, UC-2, and UC-3 as required by the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) in accordance with CERCLA § 121(c), as amended, and the National Oil and Hazardous Substances Pollution Contingency Plan, Part 300.430(f)(4)(ii) of the Code of Federal Regulations)".

Background:

In 2000, San Francisco voters passed Proposition P, demanding that the shipyard be cleaned to the highest EPA standard for unrestricted use.

In 2022, the San Francisco Grand Jury highlighted concerns about sea level rise spreading contaminants beyond the Hunters Point Superfund site.

Comment

I support the SF voters and the Bayview Hunters Point Community in advocating **100% cleanup (not capping)** of radioactive and toxic waste, and **100% retesting** to replace Tetra Tech's fraudulent work. The EPA found most Tetra Tech soil samples on a large portion of the site to be unreliable. Despite confirmed falsification, Tetra Tech has not been held accountable. This failure has delayed the cleanup's progress and worsened community health effects.

Dust Curtains: Immediate action is needed, specifically, installing industrial-grade dust barriers along the A-2 and E-2 western fenceline to reduce community exposure to airborne matter.

Full Disclosure: Potential homebuyers must be provided with full disclosure of the site status, history and cleanup goals.

Current (5th 5-Year) Review Draft: The review raises more unknowns than knowns, with nearly $1.5 billion spent to date. The Navy's Fifth Five-Year Review (Draft) for the Hunters Point Naval Shipyard (HPNS) Federal Superfund Site has faced criticism, particularly regarding its effectiveness in protecting residents and workers from hazardous substances. The review evaluates superfund cleanup sites like HPNS every five years, focusing on three questions. (my answers in **BOLD)**

1. Is the remedy functioning as intended? **UNKNOWN**
2. Are the original exposure assumptions and cleanup levels still valid? **NO**
3. Has any new information emerged that could question the protectiveness of the remedy? **YES**

Not protective: Protectiveness Statements for site parcels relying on incomplete data are not valid. Parcels should not be considered protective until work is complete and validated.

Ignores climate change: The Navy acknowledges climate change as a significant factor affecting proposed remedies. Capping radioactive and toxic waste is insufficient against predicted sea level rise by 2065.

No gardening is safe: Strategies like avoiding soil disturbance and using raised bed gardening are inadequate for future residential use. There is no guarantee that soil won't be disturbed by future activity.

Sincerely,

Oakland, CA 94611

Response to Comments	Contract/CTO N62470-21-D-0007; Contract Task Order No. N6247322F4930	Responses By Navy

Comment By **Public**	Code/Organization **Public**	Date April 2024

Project Title and Location		Type of Review
Draft Fifth Five-Year Review Report, Hunters Point Naval Shipyard, San Francisco, California, November 2023	X	Draft
		Final
		Other

No.	Public Comments Dated March, April, and May 2024	Navy Response
1	Parcel Division and Cleanup Oversight Concern: Although dividing the site into parcels enables focused cleanup operations, this strategy may inadvertently lead to gaps in managing cross-parcel contamination risks and achieving a comprehensive ecosystem restoration. The potential for contaminants to migrate between parcels due to factors like water flow, air transport, and human activities poses a challenge to the isolated parcel approach. Moreover, the current strategy may not fully account for the interconnectedness of the ecosystem, potentially overlooking opportunities for holistic environmental recovery. To enhance the effectiveness of the remediation efforts at HPNS, there is a pressing need for a more cohesive strategy that bridges the gaps between individual parcel cleanup efforts. A concerted effort to understand and mitigate cross-parcel contamination risks is imperative. This would involve detailed mapping of contamination flow paths, robust monitoring systems to track the movement of pollutants across parcel boundaries, and collaborative remediation plans that address the site's environmental challenges in a unified manner. Furthermore, adopting an ecosystem-based approach to restoration could offer a more comprehensive solution, one that not only focuses on removing contaminants but also on restoring the natural habitat and biodiversity of the area. Such an approach would acknowledge the interdependence of soil, water, and biological resources across the site, aiming for a restoration outcome that revitalizes the entire HPNS ecosystem. This shift towards integrated management and ecosystem-based restoration strategies would not only address the immediate concerns of contamination and environmental degradation but also pave the way for a sustainable future for HPNS, turning it into a model for large-scale environmental remediation projects.	The Navy agrees with a sustainable approach to environmental remediation and understands the community concerns with regard to dividing HPNS into parcels to better help focus environmental cleanup activities. To address the potential for contamination originating from one parcel to impact other nearby parcels, the Navy's robust groundwater monitoring system at HPNS includes over 200 monitoring wells managed under the Basewide Groundwater Monitoring Program (BGMP) that has mapped the A and B aquifers that run under the property. Per the BGMP, groundwater is sampled, and results are analyzed, providing information on individual parcels and across HPNS. The CRA does mention that one of the impacts of sea level rise is groundwater table rise. As part of the planning for site specific studies, the Navy plans to discuss with the agencies additional studies to evaluate any changes in groundwater flow patterns and any consequent implications for cross-parcel impacts.

No.	Public Comments Dated March, April, and May 2024	Navy Response
2	Strengthening Radiological Safety and Expanding Climate Resilience The proactive stance towards radiological safety and climate resilience within the Hunters Point Naval Shipyard (HPNS) remediation efforts marks a significant advancement in addressing long- term environmental and health risks. Setting explicit timelines for the retesting of radiological conditions signifies a commitment to thoroughness and transparency, ensuring public trust in the remediation process. Similarly, incorporating climate change projections into the planning stages reflects an acknowledgment of the evolving nature of environmental risks and the need for adaptive remediation strategies. The identification of Radiological Objects (ROs) raises questions about the initial assessment of radiological hazards and suggests that these risks may have been underestimated. This discovery highlights the complexity of radiological contamination and the challenges in predicting its full extent. Concurrently, while the initiatives for climate resilience are commendable, they currently offer a narrow focus on specific climate change effects, potentially overlooking broader ecological and environmental impacts that could influence the site's remediation effectiveness in the long term. Addressing these concerns necessitates a multifaceted approach. For radiological safety, it is imperative to refine assessment protocols to encompass a broader spectrum of potential hazards, including those that may not have been fully considered in previous evaluations. This involves not only a thorough re-examination of known contaminated areas but also a proactive search for previously unidentified radiological hazards, using advanced detection technologies and methodologies. Enhancing the radiological assessment framework will ensure a more accurate understanding of the site's conditions, enabling the formulation of comprehensive remediation strategies. Regarding climate resilience, expanding the scope of planning to cover a wider array of climate impact scenarios is essential. This expansion should include considerations of how different climate change outcomes, such as increased precipitation, temperature fluctuations, and extreme weather events, could interact with the site's specific environmental and contamination dynamics. Integrating these broader climate projections into the remediation planning process will allow for the development of more robust and flexible strategies, capable of adapting to a range of future conditions. Strengthening the site's resilience to climate change not only protects the progress of the remediation efforts but also ensures the long-term safety and health of the surrounding community and ecosystem.	The Navy understands the communities concern with regard to both radiological testing and cleanup and climate impacts. The radiological program is a robust program that uses instruments and methods standard within the industry for identifying and removing radiological contamination. The Navy cleanup approach is scientific, methodical, and comprehensive and follows established federal and state guidance. The Navy conducts extensive testing and review of data before making decisions, and an independent third-party quality assurance contractor oversees all fieldwork and reviews chain-of-custody. In addition to reviewing all Navy work plans and report, the regulatory agencies also conduct independent sampling to confirm Navy results. In addition, a radiological health and safety expert is available to the Navy and members of the community to review results, answer questions, and address concerns. With regard to the discovery of radiological objects, the Navy shares information and updates as soon as practicable with members of the community at meetings and in fact sheets which can be found on the Navy website at Former Naval Shipyard Hunters Point (navy.mil). The Navy has considered climate impacts such as rising sea levels in the development of their remedy designs for several years. The Navy conducted a climate resilience assessment (CRA) as part of this Five-Year Review document and is committed to discussing follow-on site-specific studies with the agencies. The basewide CRA is an initial screening tool used to identify areas which may be impacted first or most severely by the impacts of climate change. The Navy will discuss with the regulatory agencies additional more in-depth climate change modeling following the finalized of the Five-Year Review and will consider potential impacts to HPNS remedies and remaining onsite contaminants as a result of various climate-related hazards. As the site-specific plans are developed, this information will be shared with the community at regulatory scheduled Mayor's Hunters Point Shipyard Citizens Advisory Committee (HPSCAC) meetings and/or via information factsheets posted on the Navy 's website.

No.	Public Comments Dated March, April, and May 2024	Navy Response
3	Enhancing Community Engagement and Clarity in Protectiveness Statements The efforts towards robust community engagement and the provision of detailed protectiveness statements for each parcel at Hunters Point Naval Shipyard (HPNS) significantly contribute to the transparency and integrity of the remediation process. These actions are fundamental in building and maintaining trust with the Bayview community, providing residents with a clear understanding of the safety and environmental health of their surroundings. The detailed protectiveness statements serve as a crucial communication tool, offering insights into the current state and effectiveness of the remediation measures in place. While the report outlines commendable steps towards community engagement and clarity in the remediation's effectiveness, there remains a gap in facilitating deeper, more meaningful community participation in the remediation oversight and decision-making processes. The current engagement strategies may not fully capture the breadth of community concerns or allow for their substantive influence on remedial planning and execution. This gap highlights a missed opportunity for leveraging community insights and fostering a collaborative remediation effort. Addressing this concern necessitates the establishment of a community advisory board that is integrally involved in the remediation process. This board should comprise diverse community representatives, including residents, local business owners, environmental activists, and public health experts, ensuring a broad spectrum of perspectives and concerns are represented. By playing an active role in reviewing and providing feedback on remediation plans, progress reports, and protectiveness statements, the community advisory board would ensure that the voices of those most affected by the site's environmental issues are not just heard but are influential in shaping remediation efforts. Such a board would act as a bridge between the Navy, remediation teams, and the community, enhancing the transparency, accountability, and responsiveness of the cleanup process. It would also serve to validate the remediation's progress and effectiveness from a community perspective, thereby strengthening public trust and cooperation in achieving a safe and healthy environment for Bayview residents.	The Navy appreciates and welcomes community interest in the environmental cleanup at HPNS. The Navy takes a proactive role in community outreach activities, including presentations every other month to the Mayor's Hunters Point Shipyard Citizens Advisory Committee (HPSCAC) which is a forum for the community to hear about technical topics, schedule updates, and give them opportunities to engage with the Navy representatives directly. In addition, the Navy does quarterly presentations to homeowners and residents of the San Francisco Shipyard community on former Parcel A property, development of a variety of factsheets on technical topics, bus tours to present technical information through hands-on demonstrations and photo tours to capture images of the former shipyard, presentations at identified community group meetings and events, a formal community comment period on the Fifth Five-Year Review, individual and small group discussions with stakeholders, and focus group discussions with community members to gather insights and feedback on how the Navy can best communicate with the community regarding the ongoing environmental cleanup at HPNS. The Navy sends electronic newsletters to about 1,300 subscribed email addresses, and offers an information line in English, Spanish, and Chinese that is broadly advertised in Navy outreach materials. Technical documents are available for public review on the Navy's website and at local Information Repositories when available for public comment. In addition, the Navy has conducted community surveys at least every two years since 2010 to understand the best ways to share information with members of the community and gather current issues, concerns, and interests. Members of the community are encouraged to participate in HPSCAC meetings, events, site tours, and surveys to learn more, ask questions, and share feedback. The local community is also invited to reach out to the Navy directly via email BRAC Environmental Coordinator, the information hotline (415-295-4742) or general email account (info@sfhpns.com). In addition, the public is encouraged to review Navy documents in the same capacity as a restoration advisory board (RAB). The comprehensive approach to community participation in Hunters Point neighborhoods has resulted in increased opportunities for public participation and exceeds outreach activities outlined in the DoD's Restoration Advisory Board guidelines.

No.	Public Comments Dated March, April, and May 2024	Navy Response
4	Advancing Sustainability in Redevelopment Efforts The transition of various parcels at Hunters Point Naval Shipyard (HPNS) towards the completion of their remediation phases brings into focus the opportunity for sustainable redevelopment. This pivotal phase represents not just an endpoint for cleanup efforts but the beginning of a transformative journey towards a rejuvenated and sustainable landscape. The emphasis on embedding sustainability principles within the redevelopment plans is commendable, indicating a holistic vision that extends beyond remediation to include the future vitality and resilience of the community and environment. While the strategic intent to incorporate sustainability into the redevelopment of HPNS is clear, there is a noticeable gap in the explicit detailing of these sustainability principles within the planning documents. Specifically, there's a need for greater clarity on the integration of green infrastructure, the utilization of renewable energy sources, and the creation of community- accessible green spaces. The current level of detail may not sufficiently convey the depth of commitment to environmental sustainability or provide a clear roadmap for achieving these objectives. To bridge this gap, it is imperative that the redevelopment plans not only espouse the principles of sustainability but also lay out a concrete strategy complete with specific targets, benchmarks, and timelines. This strategy should detail the incorporation of green infrastructure elements, such as permeable pavements, rain gardens, and green roofs, that contribute to stormwater management and biodiversity. Similarly, the plans should explicitly address the integration of renewable energy solutions, aiming to significantly reduce the carbon footprint of new developments. Furthermore, the commitment to creating community-accessible green spaces should be elaborated, specifying the extent, features, and accessibility of these spaces to ensure they meet the recreational and social needs of the community while enhancing local ecology. By articulating these sustainability targets and benchmarks with greater specificity, HPNS redevelopment plans will not only align with global best practices in urban renewal and environmental stewardship but also resonate more deeply with community aspirations for a sustainable and thriving future. This approach underscores a commitment to not just remediate past environmental damages but to reimagine and reconstruct the shipyard area as a model of sustainable urban living, thereby setting a benchmark for similar projects worldwide.	The Navy understands your concern and appreciation for the incorporation of sustainability in the redevelopment of HPNS. Navy remedies are developed and constructed to meet the City of San Francisco's/Office of Community Investment and Infrastructure (OCII) (2018) redevelopment plan for HPNS; the Navy does not have input on future site redevelopment or the incorporation of sustainable practices. Questions and concerns on redevelopment and sustainability should be directed to SFDPH or OCII, which is responsible for redevelopment and reuse of the property. The Navy will continue to work with SFDPH and OCII throughout the remedial action phases of the project and through property transfer.

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5	To augment the ongoing efforts, it is crucial to integrate these enhancements: Developing more robust mechanisms for community involvement to ensure their voices significantly influence remediation planning and decision-making processes. Clear articulation of sustainability principles in the redevelopment of parcels, with specific targets and benchmarks that align with environmental sustainability and community well-being goals.	Community input as to the remediation planning and decision-making process is included as part of the CERCLA process. The Navy welcomes suggestions regarding methods for improving engagement with the community, The Navy takes a proactive role in community outreach activities, including presentations every other month to the Mayor's Hunters Point Shipyard Citizens Advisory Committee (HPSCAC) which is a forum for the community to hear about technical topics, schedule updates, and give them opportunities to engage with the Navy representatives directly. The Navy appreciates the concern and interest in incorporating sustainability in the redevelopment of HPNS. Navy remedies are developed and constructed to meet the City of San Francisco's/OCII (2018) redevelopment plan for HPNS; the Navy does not have input on future site redevelopment or the incorporation of sustainable practices. Questions and concerns on redevelopment and sustainability should be directed to SFDPH or OCII, which is responsible for redevelopment and reuse of the property. The Navy will continue to work with SFDPH and OCII throughout the remedial action phases of the project and through property transfer.
6	Given the concentration of existing toxic contamination sites, it is pertinent to project hazards based on more than conservation projections. Closed sites where clean up may or may not occur in the future contains residual contaminants and will be vulnerable to rising groundwater.	Under the CRA, project hazards were evaluated for all environmental cleanup sites at HPNS, including both active and closed environmental cleanup sites. Conservative projections were used, as they generally reference the worst-case scenario in response to the effects of rising sea level or groundwater inundation at sites across HPNS.

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7	Only one parcel is identified as being impacted by permanent groundwater emergence in the near- term (2035). We urge the Navy to consider the work of Dr. Raymond Tompkins that examines past and present-day vulnerabilities and the risk assessment of unpredictable, toxic plume migration.	The Navy will discuss additional climate resilience studies and modeling in areas at HPNS identified as potentially impacted. The work will be conducted according to guidance established by regulatory agencies, DoD, and industry best practices, using the best available science from peer-reviewed sources. The Tompkins study will be evaluated in addition to other relevant climate studies for future modeling efforts.
8	Transient climate change phenomena have a high probability of occurring and causing damage within these parcels. More should be done in terms of preventative climate resilience in addition to regular maintenance, specifically the installation of climate resilient infrastructure.	The Navy has incorporated climate resilient infrastructure (including for transient storms) within the design of the remediation remedies for many years. Examples of this type of infrastructure include rock revetment walls along the shorelines of many parcels, a seawall on Parcel E-2, the landfill cap, and the upcoming development of wetlands on Parcel E-2 to help capture and contain excess water. Additional impacts from transient phenomena (such as storms) will be discussed with the agencies as part of site-specific studies. This information will be communicated with the community at HPSCAC meetings and via information factsheets.
9	I and the Gray Panthers of San Francisco support the SF voters and the Bayview Hunters Point Community in advocating for 100% cleanup (not capping) of radioactive and toxic waste, and 100% retesting to replace Tetra Tech's fraudulent work. The EPA found most Tetra Tech soil samples on a large portion of the site to be unreliable. Despite confirmed falsification, Tetra Tech has not been held accountable, thus delaying the cleanup's progress and worsening community health effects.	The Navy has developed a robust radiological retesting plan and has been implementing the plan for several years. The approach for retesting has been approved by United States Environmental Protection Agency (USEPA), California Department of Toxic Substances (DTSC), and California Department of Public Health (CDPH) who are overseeing the work. With respect to 100% cleanup versus capping, the Navy in coordination with state and federal agencies have concurred on the proposed cleanup plans to address onsite contamination. These plans include treating and/or removing soils and groundwater for many types of contaminants until cleanup goals are met. The Navy evaluates cleanup options at the Feasibility Study stage within the CERCLA process using the National Oil and Hazardous Substances Contingency Plan nine criteria. The Navy and agencies agreed to leave waste onsite in areas that have engineered controls and institutional controls that will prevent inadvertent access to those areas and restrict the use of these areas to recreational use. Additionally, these areas will continue to be monitored to ensure that all remaining wastes stay properly contained. Types of institutional or engineering controls used at HPNS in addition to the cap/cover include prohibiting drinking water wells, excavation without proper oversight and approval, and inspection/repair/and long-term

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		monitoring of the cap/cover. The monitoring data collected and evaluated by the Navy at each capped site are provided to the state and federal agencies (such as the USEPA, DTSC, San Francisco Regional Water Quality Control Board [Water Board] and SFDPH) for review and comment. Implementation of cleanup remedial actions is still ongoing. On parcels where a durable cover is part of the remedy, the cover will be monitored, maintained, and repaired even after property transfer is complete. The specifics of who will conduct the monitoring and maintenance on a property following transfer will be negotiated during the property transfer process between the Navy, City of San Francisco, and regulatory agencies and will largely depend on the types of institutional controls which will remain in place. The Navy has a robust maintenance and monitoring program that repairs the durable cover to help maintain the remedy.
10	Immediate action is needed, specifically, installing industrial-grade dust barriers along the A-2 and E-2 western fenceline to reduce community exposure to airborne matter.	The Navy appreciates the community's concern regarding airborne dust. This concern is one of the reasons why the majority of the site is covered in asphalt or clean soil in order to minimize fugitive dust. Additionally, any active remediation projects that may involve dust is mitigated at the site with engineering controls and monitored utilizing upwind and downwind air and dust monitoring stations. The air monitoring results are posted to the Navy's website at Base Realignment and Closure (BRAC) Program Management Office > BRAC Bases > California > Former Naval Shipyard Hunters Point > Documents (navy.mil).
11	Potential homebuyers must be provided with full disclosure of the site status, history and cleanup goals.	Residential homes are located on land not owned by the Navy and comments regarding disclosure documentation to potential homeowners should be directed to the City of San Francisco or the developer. Residents should contact the SFDPH/OCII/developer regarding additional disclosures available for residents living on former HPNS Parcel A.
12	5th 5-Year Review Draft: The review raises more unknowns than knowns, with nearly $1.5 billion spent to date. The Navy's Fifth Five-Year Review (Draft) for the Hunters Point Naval Shipyard (HPNS) Federal Superfund Site has faced criticism, particularly regarding its effectiveness in protecting residents and workers from hazardous substances. The review evaluates superfund cleanup sites like HPNS every five years, focusing on three questions. (with answers in **BOLD**)	The Navy is required to review the remedies at HPNS every five years as part of the Five-Year Review process. The goal of the Five-Year Review is to evaluate whether cleanup is being implemented as designed and if the public and environmental continue to be protected from site contaminants. The Navy works with the regulatory agencies to develop protectiveness statements for each parcel. Each of the questions posed in the comment are

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	1. Is the remedy functioning as intended? **UNKNOWN** 2. Are the original exposure assumptions and cleanup levels still valid? **NO** 3. Has any new information emerged that could question the protectiveness of the remedy? **YES**	being evaluated within the 5YR and are addressed under the CERCLA process as required.
13	Protectiveness Statements for site parcels relying on incomplete data are deemed invalid. Parcels should not be considered protective until work is complete and validated.	The Navy understands your concern; however, parcels can still be protective of human health and the environment if there is a chance for human and ecological receptors to come into contact with onsite waste. This does not mean that the work is complete, only that there is no exposure to contamination while the work is ongoing.
14	The Navy acknowledges climate change as a significant factor affecting proposed remedies. Capping radioactive and toxic waste is insufficient against predicted sea level rise by 2065.	The Navy is evaluating climate change as part of this Five-Year Review and has already committed to conducting additional studies and modeling in areas where climate change may impact the site.
15	Strategies like avoiding soil disturbance and using raised bed gardening are inadequate for future residential use. There's no guarantee soil won't be disturbed by future activity.	The sites will be transferred to the City of San Francisco following completion of remedy installation. As part of that transfer, certain land restrictions will be put into place to restrict onsite residents from planting a garden on native soil beneath the engineered asphalt caps. On parcels where institutional controls are part of the remedy, the controls (such as the use of planter boxes) will be monitored after property transfer is complete. The specifics of who will conduct the monitoring and maintenance on a property following transfer will be negotiated during the property transfer process between the Navy, City of San Francisco, and regulatory agencies and will largely depend on the types of institutional controls which will remain in place. Currently, the Navy has a robust maintenance and monitoring program that inspects the various aspects of the institutional controls on a regular basis.

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16	Why not leave the wood-framed structure in place, wrap the building with protective sheeting, and perform all the concrete slab demolition, and toxic soil reclamation BEFORE tearing down the building? This would hold in all the dust until AFTER the ground has been excavated, and re-covered, preventing massive amounts dust from blowing around the base, and the surrounding Bayview neighborhood. It is clear, even without the recent. extremely high winds gusts, that dust blows all around frequently. Tenting the structure, and closing-in the excavation operations makes perfect sense. It would cut down noise as well.	The Navy appreciates the ideas presented in this comment with regard to Building 123. All mitigation efforts have been evaluated extensively by Navy experts and contractors and review and approved by the regulators. Unfortunately, removal of the concrete pad without removal of the wood building frame was not feasible. The safest method for removing the subsurface contamination at Building 123 is to remove the entirety of the building. During the demolition the dust is controlled under the approved air and dust monitoring control plan.
17	One commentor provided a variety of web links to news articles about HPNS; however, no comments relevant to the Fifth FYR were received, and a response is not possible.	

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18	Your recommendations from this report, as stated on page xviii are as follows: Radiological objects (ROs) were identified during excavation and remediation of soil in areas that were not considered radiologically impacted. There is a high degree of confidence that discrete ROs were removed to a depth of 2 feet below ground surface (bgs). However, there is a potential for ROs to be present in material below 2 feet bgs where shoreline expansion has occurred since 1946. Your recommendation is to "Evaluate additional remedies to address the potential presence of ROs in material 2 feet bgs and prepare the appropriate post-ROD documentation." This is vague and unspecific, leaving the community with no way to measure the extent of the danger or the progress of any remediation. Your report then gives a nod to climate change and the effects of rising water; yet your plan is just to put a "durable cover" over the toxic sites and put in protective fencing. You say in the future you will build a sea wall and monitor the landfill gas. Your report speaks to the need to continually check these "durable asphalt covers" for cracks and shifting. The Navy's plan does not state that it will do this monitoring in perpetuity to ensure immediate remediation when these durable covers start cracking and shifting, exposing the toxic materials. The same assurances are not given for "repairing" the foundations of buildings with the goal of sealing the foundations so the toxic soil will not be exposed. This review does not address what happens when there is an earthquake or even less dramatic events that shift the buildings on their foundations. The Navy must be responsible in perpetuity to fix it.	The statement summarizes the overall recommendation to proceed with the CERCLA process. The details related to the remedy evaluation will be provided in the Proposed Plan that will be available for public comment when prepared. The recommendation in the CRA is to follow the identification of vulnerabilities in the CRA with site-specific studies to further validate them, conduct human-health and ecological risk assessments to determine whether the protectiveness statements in the Five-Year Review will be impacted, and then assess remedial measures to address any human health or ecological risk. The land use control remedial designs for each parcel include requirements for maintaining and enforcing compliance with institutional controls in perpetuity. The institutional controls are described in Section 1.3.4.2 which states that these controls "will be incorporated into the Quitclaim Deed and Covenant to Restrict Use of Property and will take effect upon transfer to the City and County of San Francisco's OCII and issuance of those documents". This includes maintaining the durable covers in accordance with their respective Operations and Maintenance (O&M) plans. These plans are referenced in their respective Five-Year Review sections (3.4.1.2, 3.4.2.2, 3.4.3.2, 4.4.1.2, 4.4.2.2, 5.4.1.2, 5.4.2.2, and 5.4.3.2) and are publicly available in the Administrative Record. The O&M plans describe requirements for routine inspections and maintenance as well as emergency inspections and repairs. On parcels where a durable cover is part of the remedy, the cover will be monitored, maintained, and repaired even after property transfer is complete. The specifics of who will conduct the monitoring and maintenance on a property following transfer will be negotiated during the property transfer process between the Navy, City of San Francisco, and regulatory agencies and will largely depend on the types of institutional controls which will remain in place. Currently, the Navy has a robust maintenance and monitoring program that repairs the durable cover to help maintain the remedy.

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19	After publishing in the newspaper and in mailouts you sent to the residents of Bayview/Hunters Point that the public inspection and comment period would run until April 7, 2024, you changed the deadline online at your site to March 31, 2024, which cuts an entire week off the comment period. Please correct your date online so that it is consistent with the mailers.	The Navy public comment period was extended until May 7, 2024. This was advertised in public notices published in the San Francisco chronicle and through various community outreach communications.
20	Public comment letter suggesting that the Navy has not adequately addressed the site contamination with statements such as the following: • San Francisco voters overwhelmingly passed (over 86%) Proposition P over 20 years ago to ensure that the U.S. Navy cleaned up the HPNS to the highest standards; yet that is not even mentioned in your report. Your cleanup efforts have not even come close to those standards. • Simply putting a cover on it when you are not digging down far enough to remove the tainted soil and the radioactive objects buried within it, putting up a fence warning the rising water to stay out and building a sea wall are insufficient. The Navy's assessment of future concerns from rising groundwater makes clear that below the Navy's "protective covering," they are leaving heavy metals, such as mercury and zinc.	Refer to response to comment #9 above. The Navy performs cleanup under CERCLA law which is driven by risk-based scenarios while also considering property re-use. The Navy is committed to working within that framework while ensuring there is no unacceptable risk to human health and the environment now or in the future.
21	Public comment letter suggesting that the Navy has not adequately addressed the site contamination with statements such as the following: • The report also states that the Navy and the EPA have identified certain Per and Polyfluoroalkyl (PFAS) compounds as emerging chemicals of environmental concern on the parcels and that the Navy is in the process of implementing corrective actions. Yet, there will not be another report for five years. The presence of PFAS could not have been a surprise to the Navy, given the presence of PFAS on military bases nationwide. This is additional toxic exposure for the population. • The Navy declared Parcel A properly cleaned up; yet Strontium-90, a known causative agent for bone cancer, and other radionuclide and chemical toxins (many carcinogenic) continue to surface in soil and groundwater testing. • The report claims the objectives for remediation of Parcel B are being met, but the Navy won't actually finish even the retesting until 2025. The idea of developing this area at all for residential use is unacceptable. The same can be said for Parcels C and D.	The Navy is currently preparing a remedial investigation work plan to assess the extent of PFAS contamination on HPNS. The draft work plan is scheduled to be issued in 2025. The report will be developed in collaboration with and reviewed by the regulatory agencies. To date there is no known exposure of PFAS to the population. Parcel A has completed remedial actions and was subsequently transferred to the City of San Francisco for redevelopment. There is no history of radiological use on Parcel A and the Navy is not aware of soil or groundwater samples on Parcel A containing strontium-90. With respect to Parcels B, C, and D, the Navy is working with the regulatory agencies to meet the cleanup objectives identified for each site based on the proposed future reuse. Residential development will only be completed if the cleanup objectives are met and the regulatory agencies agree.

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22	The Sea Level Rise Vulnerability Assessment (SLRVA) provides an unreliable and unrealistic estimate of future sea level rise for the following reasons: • Does not use the best available science as presented in the State of California's 2024 Sea Level Rise Guidance Document. The SLRVA should immediately adjust to referencing the updated document. • Does not consider sea level rise over the lifetime of development and remediation projects that will be based on the findings of this assessment. The SLRVA should consider SLR through 2100. • Does not consider numerous combined climate impacts and local environmental factors that affect the impact of sea level rise on flooding and groundwater rise. The assessment must include an evaluation of the combined impacts of projected wave runup, storm surge, rainfall, and erosion. • Does not discuss local environmental factors such as tidal flux and land subsistence. Both should be considered due to the enormous potential influence they could reasonably be expected to have on this site. • Relies on the assumed perpetuated existence of a seawall to determine future flood risks. This is not best practice in California. Vulnerability should be assessed assuming the seawall doesn't exist (and may fail.) • Any development being considered in coastal California in light of climate change is expected to include the key considerations listed above. The fact that they are missing from an SLRVA adjacent to San Francisco Bay — which is hydrologically complex and subject to relatively significant impacts caused by climate change — is unacceptable. It is nothing short of alarming that these variables are missing from a SLRVA that will directly influence how a community already overburdened with pollution will plan for potential toxic waste mobilization in their neighborhood.	• The Navy has used sea level rise projections by eminent scientists assembled by DoD (Hall, 2016) and that are available in the DRSL database. These are installation-specific, rather than regional, projections and are consistent with DTSC's resilience target of 3.5 ft of sea level rise by 2050. Consequently, it reflects the best available science that DoD plans to update periodically (Hall, 2016). After the CRA was included in the Draft FYR, the California OPC prepared updated 2024 guidance with much lower sea level rise projections for future years. The Navy's DRSL projections are more conservative. Reference: Hall, J.S. (2016). *CARSWG-Regional Sea Level Scenarios for coastal Risk Management: Managing the Uncertainty of Future Sea Level Change and Extreme Water Levels for Department of Defense Coastal Sites Worldwide.* U.S. Department of Defense, Strategic Environmental Research and Development Program • The Navy plans to assess the Year 2100 impacts as part of site-specific studies that will be discussed with the agencies. • The CRA already assesses projected storm surge impacts combined with sea level rise in the Years 2035 and 2065. Tide gauge data were used to provide quantitative estimates for extreme water levels resulting from storms and tides. Extreme still water level estimates are provided for different annual chance events whose probabilities are contingent on the underlying SLR scenario assumptions. The EWLs include the effects of tides and storm surge, occurring on top of rising seas as specified in the five SLR scenarios. They do not include the effects of waves. Other combined impacts will be discussed with the agencies as part of the planning for site-specific studies. • DRSL (2015) does consider vertical land movement (VLM) in its sea level rise projections for both 2035 and 2065, as estimated through local tide gauges and continuous GPS stations. Both will be considered during planning of the site-specific studies. • In a careful approach, the Navy's CRA considers the seawall when assessing inundation due to sea level rise and storm surges, but not when assessing the impact of rising sea levels on rising groundwater levels. These are the primary design criteria that were used in designing the shoreline protection in Parcel E/E-2 (CES. 2018. Final Design Basis Report,

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		Parcel E, Hunters Point Naval Shipyard, San Francisco, California.): – The range in water levels due to tidal fluctuations and potential sea level rise. – The impact of anticipated maximum wave energy – The need to encapsulate all potentially contaminated sediment and therefore extend the shoreline protection needs to the offshore parcel boundary – The need to minimize filling the bay with riprap – The planned use of the area as open public space, and the possibility for foot traffic along the shoreline – The requirement to minimize negative impacts to the bay and intertidal zone • The CRA in Appendix A is a first of its kind screening level assessment of climate change hazards within the Navy and DoD. Refinements to the CRA to include other factors will be discussed with the agencies during the planning for site-specific studies.
23	The SLRVA does not incorporate the best available science regarding future sea level rise (SLR) estimates. The HPNS CRA used the SLR projections of 1.0 feet and 3.2 feet for the years 2035 and 2065, respectively, to predict the upper limit of the range of SLR scenarios evaluated. These projections were based on the 2018 Update of the State of California Sea Level Rise Guidance Document. Since then, there have been significant advancements in scientific understanding and ability to project future sea level rise. The Ocean Protection Council's newly updated 2024 Sea Level Rise Guidance Document represents best available sea level rise science in California and should be the referenced document. We note that while the latest guidance document projects a lower amount of sea level rise by 2050 (1 foot of sea level rise by 2050) this is not representative of an overall trend towards lower-than-expected rates of sea level rise. Rather, acceleration of rates is likely to happen closer towards the end of the century — which is still well within the lifetime of development considerations that will be made in relation to this assessment.	DoD plans to update the DRSL guidance periodically, just as OPC is updating theirs periodically. The Navy is comparing DRSL projections with those from California OPC and verifying that the two projections are similar. In the case of Hunters Point, DRSL projections are similar to those of OPC (2018) and currently more conservative than those of the updated OPC (2024) projections. The DRSL projections are also consistent with DTSC's design goal of 3.5 ft of SLR by 2050. The Navy has a considerable stake in obtaining accurate sea level rise projections, based on the best available science, given its interests in navigation and coastal infrastructure. In the latest (2024) OPC guidance, not only has the 2050 Intermediate-High sea level rise projection dropped from 1.9 ft to 1.0 ft for San Francisco Bay Area, but the 2100 projection has dropped from 6.9 ft to 4.8 ft. The Navy plans to assess the Year 2100 during the site-specific studies that are being discussed with the agencies.

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24	The SLRVA only predicts SLR at 2035 and 2065. These timeframes do not adequately address the timeframes that the proposed development will endure. Any structure built today must be assessed for at least a fifty-year lifespan, and more realistically at least 70 years. The lifetime of the development should be considered in part because sea level rise is expected to increase sharply after 2050: The 2024 Sea Level Rise Guidance document estimates 6 feet around 2100. As sea level rise quickly accelerates, opportunities to adapt or 'deal with it' will become dramatically limited. It is important to plan realistically for the future now in order to facilitate phased adaptation opportunities over time.	The Navy plans to include the 2100 scenario during site-specific studies. The CRA in Appendix A was a first step by the Navy (and DoD) in addressing a very complex set of hazards, the projections for which are changing from time to time (e.g., OPC 2024 versus OPC 2018). The Navy will continue to assess these climate hazards using best available science as it proceeds to site-specific studies, the plans for which are being discussed with the agencies.
25	The SLRVA also does not appear to model for any combined climate impacts due to wave runup, storm surge, rainfall, erosion, or other potential variables that are known to dramatically increase the impacts of flooding and groundwater rise related to sea level rise. Recent research studying combined climate impacts in coastal California shows that waves are getting bigger, which intensifies the impact of wave runup on flooding and intrusion into the groundwater table. This is a potentially significant variable at BVHP due to the exposure of the Bay to aggressive Pacific swells. Studies also show that California's atmospheric rivers, which in recent years have brought several inches of rainfall per year to the Bay Area, are also getting more intense, which will bring more rainfall to BVHP in a shorter amount of time. In parts of BVHP, groundwater mixed with toxic contaminants sits only one foot from the soil surface, and large rain events could have a dramatic impact on whether and how quickly the water table (and the toxic waste within it) reaches the surface. Proper analysis of these combined climate risks and their interaction with sea level rise would undoubtedly affect the anticipated location and amount of flooding that can be expected in Bayview Hunters Point.	Assessing the impacts from combined climate hazards will be discussed with the agencies during the planning of the site-specific studies.
26	The SLRVA also fails to discuss basic environmental factors, such as tidal flux and land subsistence, which are known to affect flood risk in California. Tidal influxes in the Bay Area are some of the most dramatic in coastal California — tidal influxes alone can be responsible for 9 feet of lateral shift in the tide line. Land subsistence should also be discussed as part of this SLRVA given that much of the area in BVHP sits on top of infill that would be dramatically upset by subsistence.	DRSL (2015) does consider vertical land movement (VLM) in its sea level rise projections for both 2035 and 2065, as estimated through local tide gauges and continuous GPS stations. Both will be considered during planning of the site-specific studies

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27	It is not appropriate to base any SLRVA off the assumed existence and functioning of a seawall. The SLRVA should assess the impacts of SLR without a seawall in order to understand the actual risks of SLR in the area, which is important for general considerations and also should the seawall fail due to a catastrophic event (earthquakes, tsunamis, floods, or fires and explosions).	In a careful approach, the Navy's CRA considers the seawall when assessing inundation due to sea level rise and storm surges, but not when assessing the impact of rising sea levels on rising groundwater levels.
28	Surfrider has major concerns with the methodologies used to predict groundwater rise. Models of coastal groundwater and contaminant movement should be constructed as a synthesis that includes tidal effects on a range of geochemical conditions, interactions with urban infrastructure or heterogeneous fill materials, and contaminant movement.4 The Navy's groundwater rise assessment is instead based only on calibrating the current groundwater table to projected SLR and does not include the synthesis of contaminant movement with impacts of intensifying storms expected with climate change. This likely results in an under-reporting of realistic impacts and potentially inaccurate assumptions about where toxic waste may be mobilized.	The Navy's approach is conservative and assumes that every 1 foot of sea level rise will be accompanied by 1 foot of groundwater table rise, everywhere on the installation. In actuality, all other factors, especially distance from the shoreline (and tidal influence), will tend to wane further inland. Other, more detailed, groundwater modeling will be discussed with the agencies during site-specific studies.
29	Surfrider is also concerned that the Navy's assessment does not adequately incorporate the effects of heavy rainfall. In addition to a gradual rise in baseline groundwater, heavy rains could cause drastic increases in groundwater levels. Soil saturation also reduces the ability of the soil to absorb rainwater, which can lead to flooding and liquefaction risk. At a minimum the Navy should conduct more frequent sampling at its monitoring wells, particularly after storms, to better assess groundwater rise and/or find another way to incorporate the impact of more intensifying storms on the rise of the groundwater table.	Much of HPNS is covered with impermeable asphalt covers or buildings. In Parcel E-2, much of the land surface is covered with the impervious landfill cap and wetlands. As such, not much recharge of rainwater is expected to groundwater. Some parts of HPNs have a 2-foot or 3-foot thick vegetated clean soil cover through which groundwater could rise in a storm.
30	The Climate Resilience Assessment (CRA) estimates that groundwater emergence from SLR may occur within Parcel E by the year 2065 (Appendix A). This estimate does not appear to take into consideration the combined impacts due to rainfall, wave runup, storm surge, erosion, tidal flux or other potential variables that could increase SLR. The Navy's SLR assessment must include rainfall impacts on groundwater elevation as well as tidal and other marine influences, and consider erosion and inundation impacts from rising tributary water levels during storm events. Surfrider requests a more robust assessment that takes into account these variables, not just for Parcel E but for all sites.	The potential for inundation due to storm surges has been discussed in the CRA for 2035 and 2065. Because much of HPNS is covered by impervious surfaces (asphalt or buildings), there is very little recharge expected to groundwater during rainstorms. Extreme weather impacts will be discussed with the agencies during the planning for site specific studies.

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31	As recommended in the San Francisco Civil Grand Jury Report (2022), Surfrider asks that the Navy create detailed maps of the groundwater surface at the Shipyard site under different sea-level rise scenarios, including combined impacts due to wave runup, storm surge, erosion, tidal flux or other potential variables that could increase SLR. The maps should take into account planned changes to the site, such as shoreline structures and the addition of clean soil, and carefully map projected groundwater flows and the locations of known contaminants.	The CRA makes preliminary assessments of groundwater table rise, using similar methodologies to the ones used by other regional entities, such as the City of Alameda. More detailed assessment of the groundwater flow response to climate change hazards will be discussed with the agencies during site-specific studies.
32	Capping of waste near communities threatened by rising sea levels and rising groundwater is not an adequate solution. Even without more accurate sea level and groundwater rise modeling, the CRA identifies potential problems with the proposed remedies as soon as 2035. The CRA identified the following potential pitfalls that may be attributable to climate change: • In 2035, limited impact from permanent groundwater emergence is projected to occur in Parcel D-1 (Figure 3-1 and Table 2-2). • In 2065, limited impacts from permanent groundwater emergence are projected to occur in Installation Restoration (IR) Sites 7 and 18 (IR 7/18), Parcels B-1 and B-2, C, D-1, E and E-2 (Figure 3-2 and Table 2-2). The HPNS CRA also identified the following potential vulnerabilities resulting from other impacts previously identified: • In 2035, a potential vulnerability to human receptors from permanent groundwater emergence at Parcel D-1. • In 2065, potential vulnerability to human receptors at the current ground surface from heavy metals due to groundwater emergence at IR 7/18, Parcels B-1, B-2, C, D-1, and E. • In 2065, potential vulnerability to San Francisco Bay receptors from heavy metals due to groundwater emergence at IR 7/18, Parcels B-1, B-2, C, D-1, and E. In addition, we also note that the mobilization of Volatile Organic Compounds (VOC) is a risk unstudied in the CRA. The CRA findings in addition to others that Surfrider and community members are identifying indicate the need for enhanced cleanup as well as reconsideration of whether these parcels should be developed for people to actually live in. A more equitable vision for BVHP may be to set aside more areas for wetland and native plant restoration and allow for bioremediation, including phytoremediation, to address the toxic substances over time. Given the reality of SLR and groundwater rise, much of this area appears to be	This comment brings up many interesting issues. The Navy is and has been discussing many of these questions with the agencies. The screening level assessment in the CRA indicates that most impacts, including seawater inundation, are projected to occur on the seaward side of residential areas. Using a highly conservative methodology, groundwater table rise is projected in many parcels, but is expected to attenuate exponentially with distance from the shoreline. Additional assessments will be discussed with the agencies as part of the planning for site-specific studies to evaluate these impacts. Groundwater emergence projected in 2035 in D-1 will be an initial focus, with more scrutiny of the topography and groundwater levels. On the particular question of chlorinated volatile organic compounds (CVOCs), residual CVOCs (after ongoing or planned source treatment and removal) are not expected to persist through 2065 and their attenuation will be monitored through the ongoing monitoring program. For example, a 100 parts per billion (ppb) chlorinated VOC source should dissipate by approximately 99% over 41 years based on first-order decay and median point decay rates observed at chlorinated solvent natural attenuation sites (Newell et al., 2006). Reference: Newell, C. J., Cowie, I., McGuire, T. M., & McNab, W. W. (2006). Multiyear Temporal Changes in Chlorinated Solvent Concentrations at 23 Monitored Natural Attenuation Sites. Journal of Environmental Engineering, 132(6), 653–663. https://doi.org/10.1061/(asce)0733-9372(2006)132:6(653).

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	unsuitable to permanent infrastructure. Indeed, many local governments are now recognizing the need to relocate coastal infrastructure inland to allow space for the dynamic shoreline to calibrate to sea level rise.	
33	We therefore strongly encourage the Navy to strengthen its SLRVA to at least mimic standard sea level rise vulnerability analyses in California, and to adjust its perspective on available remedies accordingly.	For 2035 and 2065, the CRA starts with sea level rise projections that are more conservative than the latest projections in the California OPS (2024) guidance and seawater inundation and storm surge assessments therein are based on these conservative projections. The CRA is also consistent with the DTSC (2023) targets for sea level rise resilience of 3.5 ft by 2050. The Navy is planning to discuss additional studies (including an assessment of sea level rise in 2100) with the agencies as part of the planning for site-specific studies, as a follow on to the CRA.
34	A better future for HPNS may be to showcase how polluted sites can be cleaned up and restored in a way that allows nature to help mitigate the impacts of rising seas. Based on some feedback from the community that Surfrider is aware of, we support a full and equitable cleanup that also: • Avoids open-trucking contaminated soil through neighborhoods. • Avoids relocation of toxic waste to other disproportionately burdened communities. • Evaluates and employs emerging technologies to better address the soil and water toxicity. A high temperature electrothermal process should be evaluated as a safe and affordable technology. • Establishes a local toxics cleanup facility to treat soil onsite.	The Navy understands the communities' concerns as stated in the comment. The cleanup technologies used for remediation are evaluated within the Feasibility Study and some sites on HPNS do use in-situ technologies to cleanup contamination in-place; however, sometimes the type, location, or concentration of the contamination necessitate excavation of the contamination. When excavation is needed, the Navy does evaluate barging contamination offsite via ships to minimize trucking impacts. When trucking is used, the Navy employs various techniques, such as tarping, rumble strips, and tire cleaning, to minimize the impacts of trucks on the surrounding community.
35	Several comments concerned the recommendations and findings included in the City of San Francisco Civil Grand Jury report.	The Navy has reviewed the recommendations and findings as they relate to the San Francisco Civil Grand Jury report and will continue to work with the City of San Francisco as part of the cleanup process and future land transfer.
36	The Navy found strontium-90 (Sr-90) exceedances in 23 soil samples in summer 2021. Regulatory agencies insisted the measurements were valid, but approved the Navy's change to the testing method, the most important part of which was hidden from the public. Using the new method, the Navy still found exceedances, and even after recounting those, still saw exceedances. The Navy then blamed those exceedances on its own purported failure to eliminate Pb-210/Bi-210 interference, even though the testing method specifically took into account the possibility of such interference and included steps to eliminate it. Now the Navy wants to use total beta strontium as its primary	The Navy is currently evaluating the laboratory method used to identify strontium-90 in soil collected from Parcel G radiological retesting investigation. This study is ongoing at the time of this Five-Year Review and final conclusions on the sampling method will be documented in reports issued later in 2024. Because the study remains ongoing, the final results and assessments of the study cannot be incorporated to this report prior to the deadline for this Five-Year Review Report. Currently, the overall protectiveness from radiological constituents remains intact at Parcel G and

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	screening method, and only measure for Sr-90 using a revised method as a confirmation. Taken together – and keeping in mind the scandal that led to this retesting in the first place – this string of events is highly suspicious and not only warrants further investigation, but at the bare minimum necessitates inclusion in the Navy's draft five year review. The public needs to be aware that the Navy has continually obfuscated information that is critical to the community's health, and has so far enacted a botched retesting of Parcel G at best, and fraudulent (again) at worst. The outright exclusion of the Sr-90 issue from the draft review is completely unacceptable.	there is no opportunity for offsite exposure to human receptors or the environment. Additionally, the institutional and engineering controls currently being implemented onsite, including fencing, security measures, air monitoring, and dust suppression, ensure protectiveness remains at all times.
37	After the Navy released the Fourth Five Year Review in 2019, the EPA and Navy engaged in a dispute over the protectiveness of the building remediation goals. In short, the EPA objected to the Navy's use of RESRAD to calculate protectiveness and told the Navy to use the EPA Building Preliminary Remediation Goal (BPRG) calculator. The Navy refused, and the two parties were unable to resolve the disagreement. Under CERCLA and the Federal Facilities Agreement for HPNS, the Navy is required to use EPA guidance or gain EPA approval for an approach that would be equally protective, yet it has failed to do so. Publicly, there has been little to no disclosure of the dispute since 2020, but CBG has greater insight into the disagreement due to a FOIA request filed by Public Employees for Environmental Responsibility (PEER). Recently, PEER sent an updated request to EPA to capture any communications between the Navy and EPA since May 2021. In response, an EPA official wrote that, "the Navy has moved away from keeping the remaining buildings at the site except for five buildings that are on the National Historic Register… The goal now is to demolish 77 non-radiologically impacted and 25 potentially radiologically impacted buildings at HPNS." However, despite this apparent (and huge) change in the buildings remedy, there is no mention of it in the Navy's draft review. The shift from remediation to demolition of such a large number of buildings is a monumental decision – and elevates the importance of disposing the contaminated building material in a safe manner. Similarly to the shift in the remedy itself, there is no further discussion of building material disposal or any changes to the building RGs for the five buildings still set to be retained. These three issues – the change in remedy, how the demolished building material will be disposed of, and questions surrounding the adequacy of RGs for the buildings that will remain are all clearly ones that the public needs to not only be made aware of but given the chance to comment on. These matters should have been addressed in this draft FYR.	Any activities for the demolition and disposal of radiologically-impacted buildings is currently being planned for completion under the CERCLA process. Potential demolition activities under the FY23 congressional authorization remains in the early planning stages. Radiological retesting is planned and/or currently underway to verify that the soil remedial goals, which were determined to be protective and remain valid, have been met for each parcel that was identified in the Fourth Five-Year Review. Details for managing radiological building materials during demolition will be documented in work plans for regulatory agency review, as well as any appropriate post-ROD change documentation, as necessary. A discussion of this issue has been added to Section 1.4.3.1. The Navy will follow all applicable laws and regulations for any activity undertaken pursuant to this congressional authorization.

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38	The draft review does not adequately assess the protectiveness of soil remediation goals. Instead, the draft review leans on the radiological addendum that was released as part of the Fourth FYR – which incorrectly asserted that the RGs were protective of human health. The draft review states that the addendum "concluded that the current RGs are protective for all future land users." Of course, the RGs are not protective for all future land users; the Navy refused to run the risk calculations with the appropriate inputs for all such uses. The statement is false for a number of other reasons, in part because of its failure to acknowledge that EPA concluded it could not affirm the protectiveness of the soil PRGs, and that the Navy's own risk estimates for its soil RGs in its Fourth FYR were higher than EPA's general upper limit of the acceptable range. The only section of the draft review that includes any new information about the protectiveness of the RGs is Appendix F. The appendix displays results from the EPA's new Peak PRG calculation method, evaluating the Navy's RGs for HPNS. The results seem to show that the Navy's estimate of cumulative risk for all ROCs remains virtually unchanged. Remarkably, the Navy's own new estimate of total risk is again over the acceptable limit. The Navy estimates total risk from its soil RGs (see p. 531 of the draft FYR) as 2.7 x 10-4, about three times the 1 x 10-4 general upper limit to the risk range. And the Navy only gets to that figure by leaving out the background for radium, which is required to be considered in establishing risk from RGs. When background is included for radium's RG, the total risk goes, using the Navy's calculational assumptions, up to 3.48 x 10-4, well above the acceptable risk range. The listed RG for Radium-226 (Ra-226) is 1 pCi/g, when it should be 1 pCi/g above background. The Navy has continuously failed to correctly apply this rule, and the draft review is no exception. The correct RG should be 1.861 pCi/g, as described in the most recent retesting work plan, the "Removal Site Evaluation Work Plan, Parcels D-2, UC-1, UC-2, and UC-3," released in 2023. A footnote for Ra-226 in the work plan states that "Remediation goal is 1 pCi/g above background per agreement with USEPA…Ra-226 background for definitive data is 0.861 pCi/g based on the off-site BTV determined in the Final Background Soil Study Report".	As stated in response to comments from Addendum to the Fourth Five Year Review, Evaluation of Radiological Remedial Goals for Soil (June 2020): "While estimated risks for soils or buildings contaminated at the remedial goal may indeed exceed 1 in 10,000, the Navy will demonstrate that the final risk from exposures upon property release, including the risk from chemicals and other radionuclides, will achieve the CERCLA risk range. As discussed earlier, final site-specific data will be used to demonstrate the documented remedy was both achieved and is protective." Public comments were solicited during the Proposed Plans developed for Parcel B (July 2008), Parcel C (March 2009), Parcels D/G (September 2008), and Parcel E/E-2 (February 2013), which presented the risk levels for the various parcels. Public comments reported concerns that risk exceeding 1 in 10,000 (1x10-4) combined with chemical contaminant risks may exceed risk thresholds. As stated in the 40 CFR 300.340(e), "For known or suspected carcinogens, acceptable exposure levels are generally concentration levels that represent an excess upper bound lifetime cancer risk to an individual of between 10−4 and 10−6. In cases involving multiple contaminants or pathways where attainment of chemical [radiological]-specific ARARs will result in cumulative risk in excess of 10−4, [factors related to technical limitations such as detection/quantification limits for contaminants; factors related to uncertainty; and other pertinent information] may be considered when determining the cleanup level to be attained." These factors, along with inter-agency agreements, were considered in the development of the current radiological remedial goals, therefore 1.861pCi/g RG is not applicable.

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39	The Navy's insistence on including inappropriate inputs skews the calculations. The scenario chosen by the Navy is resident without garden, which disregards the fact that there is no actual land use restriction on future residents growing produce in their gardens. The only restriction adopted to date is a requirement that gardens be in raised beds, but roots of plants penetrate far deeper than the raised bed and thus into remaining contamination. A hypothetical restriction requiring impermeable bottoms to such beds has never been actually adopted, and were it to be so, would be meaningless, as there is no realistic way to enforce it. When one includes the correct exposure scenario, residential with garden, and the correct RG for Ra-226, the excess cancer risk is staggering, and much greater than the Navy is asserting it is, 1.96 x 10-3, or about twenty times higher than the upper limit of the acceptable risk range.	The scenario residential use without gardens is appropriate for planned future use because institutional controls preclude gardening and/or prevent contact with native soil. The institutional control for IR-07/18, and Parcels B-1, B-2, C, UC-2, D-1, G, E-2, and UC-3 prohibits growing vegetables, fruits, or any edible items in native soil for human consumption. The institutional control for Parcel E prohibits: "Growing any edible items (beneath the durable cover) unless grown in raised beds or containers (above the durable cover), with imported clean soil, and with a bottom that prevents the roots from penetrating the durable cover."
40	The Navy must amend the draft review to correctly apply the 'above background' rule to the Ra-226 RG and use the resident scenario with the garden pathway turned on, to accurately evaluate excess cancer risk from radiological contamination. Furthermore, the Navy is required to add the risks from chemical contamination in its risk calculations. Nowhere in the draft review are the risks from chemical contamination evaluated – and their exclusion in this section dilutes the true excess cancer risk even more than it already is. When they are included, risks from the RGs are substantially higher, and likely exceed protectiveness requirements by a considerable amount.	The Navy background concentrations for radiological constituents are extremely conservative. Additionally, the Navy disagrees with modeling for a garden pathway as there gardening within the native soil will not be permitted. As previously stated in the response to community comment on the Fourth Five Year Review, Evaluation of Radiological Remedial Goals for Soil (June 2020); "While estimated risks for soils or buildings contaminated at the remedial goal may indeed exceed 1 in 10,000, the Navy will demonstrate that the final risk from exposures upon property release, including the risk from chemicals and other radionuclides, will achieve the CERCLA risk range. As discussed earlier, final site-specific data will be used to demonstrate the documented remedy was both achieved and is protective."
41	The Navy's analysis of the impacts that climate change will have on the shipyard is deficient. While the analysis does acknowledge that climate change could cause contaminated groundwater to rise to the surface, it does not delve far enough into what that process could look like. • Sea level rise, storm surge, and seawater inundation are all only projected through 2065. Such a limited timeline does not take into account the even worse effects that will be felt by future shipyard residents decades later – it is a certainty that the same structures to be built by the redevelopment will exist far beyond 2065, necessitating a much longer timeline when projecting climate change's effects. • Furthermore, sea level rise, storm surge, and seawater inundation are all intricately	The Navy's SLRVA projects that groundwater will rise and emerge at the ground surface in some places, but more studies are required to determine whether the rising groundwater will contain any contaminants or not. In many cases, it is likely that the rising groundwater table will consist of shallow groundwater flowing from cleaner upgradient areas. The Navy will discuss additional assessments of climate impacts (including groundwater rise and extreme weather impacts) with the agencies as part of the planning for site-specific studies. • An assessment of climate impacts in the Year 2100 will be conducted in conjunction with site-specific studies

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	linked, but are treated separately by the Navy's analysis. This distinction cannot be justified, as the combined effects of all three forces present much more risk than any single one does. Any analysis of sea level rise, storm surge, and seawater inundation must be conducted in a holistic manner, so as to capture the true danger of the three issues. • Another concern that is overlooked in its Climate Resilience Assessment (CRA) is the movement of groundwater – the Navy assumes that sea level rise will uniformly push groundwater towards the surface, while in reality the process is more complicated than that. Rising groundwater could drive contaminants to other areas of the shipyard, or into the Bay itself. The effects of the asymmetrical distribution of rising groundwater as a result of sea level rise must be analyzed by the Navy. • Also on the issue of groundwater, the possibility that the rise of groundwater will affect the thin asphalt and soil covers used to supposedly keep contamination from the surface should be examined. Already the covers have the potential to be affected by cracking, burrowing animals, and plant uptake - rising groundwater could make the already-ineffective remedy even more so. • Lastly, the possibility that the biological and chemical composition of sub-marine environments will be altered by the increase in saltwater intrusion increases goes unmentioned in the Navy's assessment. Section 5.3.4 of the CRA discusses the effects of saltwater intrusion on subsurface remedies throughout the shipyard – and comes to the conclusion that "all parcels at HPNS are resilient to this potential exposure scenario – but there is no real consideration of the range of dangers that saltwater intrusion may present.	• The Navy's CRA does look at combined effects in many cases. For example, the storm surge impacts projected in 2035 and 2065 are based on the mean sea levels and tides (and land subsidence) expected in those future years. Other potential combinations will be discussed with the agencies during site specific studies. • The CRA is a screening level tool and has assessed groundwater table rise using conservative rules of thumb, similar to the those used in similar studies (e.g., City of Alameda study). More detailed groundwater rise studies will be discussed with the agencies during the planning for site-specific studies. Reference: City of Alameda. (2022). Climate Adaptation and Hazard Mitigation Plan. Alameda. • More detailed studies of groundwater rise impacts will be discussed with the agencies during the planning for site-specific studies. • The conductivity measurements in base wide monitoring wells noted in the Basewide Groundwater Monitoring Plan (BGMP) (2022 and earlier years) show that saltwater intrusion on the HPNS peninsula has been relatively limited so far, with most inland and many shoreline wells indicating the low conductivity characteristic of freshwater. The CRA mentions that there is no subsurface remedy infrastructure projected to remain in 2035 and 2065 that may be impacted by saltwater intrusion, if that were to occur. There are no subsurface pump-and-treat and soil vapor extraction (SVE) components projected to remain by those times. Monitoring wells are designed to withstand a certain level of salinity.
42	Outstanding issues from the 4th FYR that remain unresolved in the 5th FYR: • **Failure to Examine the Systemic Failure of the Cleanup Process Evidenced by the Tetra Tech Scandal** – Just as in the Fourth FYR, the Navy's latest draft review fails to discuss, beyond a passing comment, the scandal that casts a shadow over much of everything that occurred in the cleanup to date. • **Failure to Include Parcel A in the Five-Year Review at All** – The exclusion of Parcel A from any evaluation in the draft review is unsurprising, but disappointing, nonetheless. The parcel was long ago declared non-impacted, without any kind of soil testing, and only a few building tests. • **Drastically Reduced List of Radionuclides of Concern** – The draft review does not	The conclusion of the Fourth Five-Year Review was that the data falsification called into question the radiological component of the remedy for Parcels B-1, B-2, C, D-1, D-2, G, UC-1, UC-2, and UC-3. Because radiological retesting has not been completed to confirm that remaining soils are below the remedial goals, this issue was retained as affecting future protectiveness. The pending litigation associated with the radiological retesting does not impact the protectiveness of the current remedial activities and therefore was not included in the Fifth Five-Year Review. Parcel A has been transferred to the City of San Francisco is no longer part of the HPNS CERCLA program and not subject to inclusion in the Fifth Five-Year Review. Furthermore, Parcel A received a no further action status

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	include any analysis of the decision to greatly reduce the list of HPNS radionuclides of concern (ROCs). In the 2004 Historical Radiological Assessment (HRA), the list included about 100 (33 long-lived) to only a handful in the Parcel G, Parcel C, and Parcel UC-1, UC-2, UC-3, & D-2 retesting plans. • **90% of HPNS Arbitrarily Removed from Scope of Measurements and Cleanup** – The 2004 HRA arbitrarily designated 90% of the shipyard to be exempt from any kind of cleanup. This questionable decision has never – in this draft review or otherwise – been appropriately explained. • **Radioactive Sandblast Grit** – As in the previous FYR, the Navy only mentions that removal actions of sandblast grit have been carried out at the site. It fails to mention the full scope of the sandblast grit issue: that the Navy does not really know where much of it is, and that the site itself could have been partly made out of radioactive grit. Sandblast grit and the dangers it may present should be more closely examined in the review. • **Navy Further Weakening an Already Inadequate Remedial Method** – The Fourth FYR made the admission that soil vapor extraction (SVE) was having trouble effectively reducing source mass of volatile organic carbons (VOCs) due to the conditions in the subsurface of the soil. This draft review makes the same assessment, stating that "SVE implementation in Parcels B-1 and C is reducing source mass, but with limited effectiveness due to diffusion-limited conditions in the subsurface. Although Institutional Controls (ICs) will maintain future protectiveness, source removal inefficiency is extending the period within which SVE will be implemented." Furthermore, regulatory agencies, as they did in 2019, do not agree "with the Navy's risk assessment methodology used to reduce the [Areas Requiring Institutional Controls (ARICs)] for VOC vapors." Therefore, the Navy is both relying on ICs on the one hand and reducing the area for which they deem ICs necessary, by way of a manipulated risk assessment, all because the original remedy of actually cleaning up the VOCs isn't working. This juxtaposition and its implications on protecting human health need to be further investigated in this review. • **Soil and Asphalt Covers** – Soil and asphalt covers are mentioned frequently throughout the draft review, but no words are dedicated to an interrogation of their effectiveness. Part of the introduction of these comments exposed that contamination can easily penetrate soil and asphalt covers, rising to the surface one way or another and putting human health at risk. Furthermore, development of the site will	designation under CERCLA and therefore is not subject to 5YRs. The 2004 HRA identified all potential radionuclides of concern on HPNS. Through additional research and testing, the list was narrowed down to the radionuclides of concern identified in the 2006 Action Memorandum and Parcel specific RODs. The radionuclides of concern were developed in coordination with regulatory agencies review and oversight. The conclusions of the 2004 HRA regarding where radionuclides were used onsite was based on historical research and personnel interviews. These conclusions, along with inter-agency agreements, were considered in the development of the current radiological remedial goals. Sandblast grit has not been identified as a potential contaminant or contaminant source on HPNS. Consistent with the Five-Year Review process, Section 3.4.4, 4.4.3, and 5.4.5 *Progress Since the Last Five -Review* restates verbatim issues identified in the previous Five-Year Review. This is followed up with Navy activities, actions, and assessments to address the issue from the previous Five-Year Review. Although soil characteristics have limited the desired effectiveness of the SVE, the Navy continues to work with the regulatory agencies to optimize remedial actions where SVE systems have had limited effectiveness. For example, at IR10, the Navy has taken a proactive approach of building/foundation demolition, followed by excavation and confirmation sampling in order to reduce or eliminate the source area. The review of the soil and asphalt covers is discussed in each respective Parcel's Operations and Maintenance sections which evaluates the last Five-Year Review cycle operations and maintenance results. The concern over redevelopment is noted, the institutional controls require the following (from Table 1-2 of the Five Year Review): *Restricted activities must be conducted in accordance with the Covenant(s) to Restrict Use of Property, Quitclaim Deed(s), O&M Plan(s), LUC RD Report, Parcel-specific RMP(s), and, if required, any other work plan or document approved in accordance with these referenced documents:* *a. "Land disturbing activity" includes, but is not limited to, the following: (1) excavation of soil, (2) construction of roads, utilities, facilities, structures, and appurtenances of any kind, (3) demolition or removal of "hardscape" (for example, concrete roadways, parking lots, foundations, and*

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	necessitate tearing up whatever covers might exist. In light of those revelations, it is no surprise that the Navy is unwilling to include their own analysis, which would undeniably come to the same conclusion. Nonetheless, the Navy still must investigate whether just covering up rather than cleaning up contamination is truly protective, particularly over the lifetime of the contaminants, based on the most current information.	*sidewalks), (4) any activity that involves movement of soil to the surface from below the surface of the land, and (5) any other activity that causes or facilitates the movement of known contaminated groundwater.* *b. Alteration, disturbance, or removal of any component of a response or cleanup action (including but not limited to pump-and-treat facilities, revetment walls and shoreline protection, and soil cap/containment systems); groundwater extraction, injection, and monitoring wells and associated piping and equipment; or associated utilities.*
43	The Fifth Five Year Review Report (Draft Review) on Climate Resilience Assessment ("CRA") is inadequate. It fails to use the most current data and projects forward only to 2065, an arbitrary date supported by no rationally defensible reasons when the planned Shipyard development will be occupied well beyond that date.	The CRA provided in the Fifth Five-Year Review (Appendix A) is intended to be a screening level assessment of climate change hazards. The Navy plans to assess site resilience up to the Year 2100 during site-specific studies. DoD plans to update the DRSL guidance periodically, just as OPC is updating theirs periodically. The Navy is comparing DRSL projections with those from California OPC and verifying that the two projections are similar. In the case of Hunters Point, DRSL projections are similar to those of OPC (2018) and currently more conservative than those of the updated OPC (2024) projections. The DRSL projections are also consistent with DTSC's design goal of 3.5 ft of SLR by 2050. The Navy has a considerable stake in obtaining accurate sea level rise projections, based on the best available science, given its interests in navigation and coastal infrastructure.
44	Despite five years' notice and without factual or legal justification, it simply ignored the statutory deadline for its Fourth Five Year Review ("Fourth FYR"), publishing it approximately nine (9) months late. The Navy further violated the law by publishing three Fourth FYR Addenda, the last of which issued approximately twenty (20) months after the deadline. Now, the Navy has the audacity to grant itself an ongoing extension, to institutionalize its Fourth FYR deadline violations by repeating them in its Draft Review. Rather than reverting to the lawful deadline, November 8, 2023, which the Navy has already blown past, the Navy says it will publish its Final Fifth FYR in July 2024.	The June 2, 2014 Memorandum from the Office of the Under Secretary of Defense for Five-year Review Procedures – Update to DoD Manual (DODM) 4715.20, "Defense Environmental Restoration Program (DERP) Management dated March 9, 2012 establishes subsequent signature dates for Five-Year Reviews as no more than five years from the date of the last signature (Page 44-45, Enclosure 3, paragraph 5 [b][1]). EPA guidance also establishes subsequent Five-Year Reviews as due by or before the date of the prior Five-Year Review. OSWER 9355.7-03B-P section 1.3.3 ("For reviews led by other Federal agencies, States, or Tribes, and where EPA has a concurrence role, the trigger for subsequent reviews corresponds to EPA's concurrence signature date of the preceding Five-Year Review report."

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45	The Draft Review's radiological sections are flawed and fundamentally dishonest. The Navy has consistently misled the public throughout the cleanup, a practice it unfortunately continues in its Draft Review. Greenaction, among others, has always insisted that 100% retesting of Tetra Tech's work is necessary to rectify the fraud. The Draft Review is not honest enough to even mention the distinction between one-third retesting and 100% retesting or its significance to protectiveness. CERCLA requires 100% retesting. Without it, a data-driven long-term protectiveness determination is impossible. The Navy's own agreement also requires 100% retesting. But the Navy has spent the last three years attempting to invalidate its own data! Characteristically, the Draft Review fails to even acknowledge the agreement. If the Navy insists it will do only one-third soil retesting, it must articulate what data it is relying on in making any representations about protectiveness of the two-thirds of soil it did not or will not test.	Comment noted. The Navy disagrees with the commenter's characterization of the draft review. The retesting cleanup work plan was developed by the Navy and reviewed by USEPA, DTSC, and CDPH. Commenter's characterization of CERCLA is noted. Commenter does not provide any citation to support this legal conclusion
46	The Navy's primary five-year review obligation is to assure the remedy remains protective. The Navy generally claims radiological remedies "will be protective," when radiological retesting is done. However, the Navy has no factual basis for those claims.	The radiological retesting is ongoing at the time of this Fifth Five-Year Review. Based on the Navy work plans, further testing and associated analytical results would provide the factual basis that the site is protective once the retesting is done. This would need to be collaborated with the regulatory agencies before a site protectiveness determination is made.
47	All Shipyard Sites Should Be Identified As "Radiologically Impacted" Until Demonstrated Otherwise - The unexpected nature of the discovery of radiological objects identified during excavation and remediation of soil in areas that were not considered radiologically impacted, highlights that the Navy has not properly characterized whether all Shipyard locations are radiologically "impacted." It must revisit the issue in light of the facts and identify all parcels and sites as "radiologically impacted," until and unless it can demonstrate with defensible scientific data that any particular site is not impacted. The Navy must test for radioactive contamination in all areas of the Shipyard and because radiation may have been spread beyond the Shipyard, beyond its boundaries, as well.	Comment noted. Radiological retesting is planned and/or currently underway to verify that the soil remedial goals, which were determined to be protective and remain valid, have been met for each parcel that was identified in the Fourth Five-Year Review. Radiologically impacted areas are identified during the remedial investigation phase of CERCLA. Remediation is conducted under CERCLA and the Navy follows all applicable laws and regulations.

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48	The Navy Continues to Mislead the Public - The Navy misleads primarily through omission. The Navy has misled the public by omitting the entire history of the radiological remediation. The Draft Review omits more than a decade of the cleanup's history. Rather than acknowledge the fraud (Tetra Tech) and its impact, the Navy merely says, "evaluations determined previous data were unreliable," and cites "uncertainty with a portion of the radiological survey and remediation work."	Refer to response to comment #42 above.
49	Radiological Retesting – • The Draft Review ignores the Sr-90 results during retesting in 2021 at Parcel G. • The Navy also found radiological contamination in Parcels B and C. These findings are also ignored in the Draft Review. • Three years after the SR-90 was found exceeding remedial goals, the Navy still refuses to accept the exceedances as valid data. It has announced it is conducting an Sr-90 "verification study," which it plans to release in June 2024. There is no mention of this study in the Draft Review.	Refer to response to comment #36 above.
50	The Navy Violates Its Duty to Assure Protectiveness - The Draft Review claims, "This report is intended to identify issues that may prevent a particular remedy from functioning as designed, which could affect the protection of human health and the environment should exposure occur." But it fails to do so. The Draft Review Protectiveness Statements misleadingly claim that remedial actions at Parcels B, C, D, and G are "short-term protective." These claims are based on access controls, such as fences, signage, and caps, to restrict access to contaminated sites. By focusing on "short-term protectiveness," the Navy again improperly defers its protectiveness determination as it did in its Fourth FYR, which promised it would be addressed in the Fifth FYR. Now that time has come, but rather than stating the obvious truth – that the remedy is not protective of human health and the environment – the Navy defers it once again, defeating the entire purpose of five-year reviews. Instead of addressing long-term protectiveness, the Navy makes short-term claims, as summarized in the Draft Review: Based on this Fifth Five-Year Review, the remedy at IR-07/18 is Protective, the remedies at Parcels B-1, B-2, C, UC-2, D-1, D-2, UC-1, G, and UC-3 are Short-Term Protective because there are no current uncontrolled exposures, and the remedies at Parcels E and E-2 Will be Protective upon completion of remedy construction. This passage contains no statement that the remedies are protective in the long term or, except for Parcels E and E-2, will be. Similarly, in its Protectiveness Statements, the Navy	Comment noted. The Navy is committed to protecting human health and the environment using the best available science in a cost-effective manner as Congress allocates funding. Because the Navy has remedy components in place that prevent current exposures, it would be inaccurate to describe the remedy as Not Protective. To address a remedy component issue that could potentially affect future protectiveness the Five-Year Review process provides for consideration of Short-Term Protective or Deferred. Short-Term Protective is considered when site conditions are adequately characterized such that plans for optimization or corrective measures can be implemented to address the remedy component that is not functioning as intended. EPA guidance provides that "A protective determination of 'short-term protective' is typically used when the answers to Questions A, B and C provide sufficient data and documentation to conclude that the human and ecological exposures are currently under control and no unacceptable risks are occurring. However, the data and/or documentation review also raise issues that could impact future protectiveness or remedy performance but not current protectiveness." Deferred is considered when information is needed to better characterize site conditions such that appropriate optimization approaches or corrective measures can be identified. Because current

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	only discusses short term protectiveness, deferring the long term "until retesting is complete:" Radiological retesting is ongoing to confirm that levels in soils and structures are protective of human health. Until retesting is complete, short-term protectiveness is met through Navy controls such as access to the parcel through fencing, locked gates, and ICs (restricting intrusive work and maintaining durable covers). Neither CERCLA nor EPA guidance allow using short-term protectiveness to substitute for long term protectiveness. CERCLA requires both. Temporary measures are insufficient to satisfy long-term protectiveness. Fencing off and/or covering over contamination is not a permanent "remedial action being implemented," they are not CERCLA removal or remedial actions. The Draft Review does not assure the remedy is protective for future families who may live on the Parcels for decades to come.	exposures are under control a determination of Short-Term Protective is appropriate while radiological retesting of parcels B-1, D-1, D-2, G, UC-1, UC-2, and UC-3 is conducted. In collaboration with regulatory agencies, the Navy modified the protectiveness determination for Parcels B-2, and C to protectiveness Deferred and outlined the steps to obtain the data needed to identify optimization approaches and/or corrective measures that will facilitate cleanup and provide long-term protectiveness.
51	The Navy has failed to demonstrate that its remedial goals for buildings and soil meet the current CERCLA risk range, and the Navy has no intention of doing so until after the retesting is complete. There is no valid data on which to base any assertion that the remedy is protective of human health and the environment in the long-term. For some Parcels, it may have soil data, but only in one-third of the soil tested. The Navy has not released this data. Nor has it released retesting data from buildings. The Draft Review must state the remedy is not protective of human health and the environment and then detail the steps necessary to achieve protectiveness and the timeline within which it will be accomplished.	Refer to response to comment #38. Consistent with the Five-Year Review Process, a "Not Protective" determination is considered when there are current uncontrolled exposures occurring. Because the Navy controls access and use of the sites with institutional controls and durable covers (physical barriers) that prevent current uncontrolled exposures, a "Not Protective" determination is inaccurate and inconsistent with the Five-Year Review process. Because current exposures are under control a determination of Short-Term Protective is appropriate while radiological retesting of parcels B-1, D-1, D-2, G, UC-1, UC-2, and UC-3 is conducted.
52	The Draft Review Violates the FFA and EPA Guidance - On January 22, 1992, the Navy, the EPA, and the Department of Toxic Substances for the State of California entered into the Federal Facilities Agreement for Naval Station Treasure Island – Hunters Point Annex ("FFA"). The parties agreed EPA CERCLA guidances would be mandatory. The Navy has failed to act in accord with this guidance by failing to: 1) determine whether there have been changes in toxicity or other contaminant characteristics that need to be investigated; 2) identify "recent toxicity data and their sources"; 3) investigate whether the exposure assumptions, toxicity data, and cleanup levels are still valid; 4) recalculate risk assessment to account for changes in standards and/or toxicity data; and 5) investigate the question, "Has any other information come to light that could call into question the protectiveness of the remedy?" The Draft Review acknowledges that "there have been some changes to toxicity values	Commenter's characterization of the law is noted. Comment noted. Navy disagrees with the commenter's assertion that Navy has failed to act in accord with [CERCLA] guidance: As indicated in the Five-Year Review text for Technical Assessment Question B, the protectiveness of the RGs was evaluated by comparing the remedial goals that were developed for the project as human health protective levels to risk-based screening levels based on current toxicity and exposure assumptions consistent with the exposure scenarios used to develop the remedial goals. The remedial goals that exceed current risk-based screening levels were identified on the comparison tables, as referenced in the text. The text directed the reader to the table providing the values and the comparison. If the current risk-based levels are higher or similar to the

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	and risk assessment methods," the Navy summarily dismisses them, concluding they "do not affect remedy protectiveness." However, the Navy failed to adequately explain why the changes do not affect protectiveness, failing to justify this conclusion; it cites no facts, data, or calculations, as required by EPA's guidance.	remedial goals, the remedial goals are considered protective based on current risk assessment practices. As discussed in the Five-Year Review, in some cases the current risk-based levels are lower than the remedial goals, indicating if a receptor is exposed to the media at the RG there could potentially be unacceptable risks. However, as also discussed in the Five-Year Review, institutional controls and/or durable covers are in place in these cases limiting potential exposure, and therefore since there can be no exposure, there is no unacceptable risk and protectiveness remains. Risk evaluations were not performed to evaluate exposure to the material beneath the durable cover (to determine if the COC remaining below the durable cover is within an acceptable risk range) as there is no current exposure to the material remaining below the durable cover and therefore no unacceptable risk. Data was not compared to the current risk-based screening levels, the evaluation of protectiveness was performed by evaluating the protectiveness of the remedy. The respective Remedy Implementation and Remedy Operations and Maintenance sections of the Five-Year Review provide supporting information and evidence to the effectiveness of the remedy components that are used in the Technical Assessment section.
53	The Navy Failed to Update Risk Calculations (PRGs) Yet Again - In the Draft Review, the Navy claims it updated the risk calculations: Following the recommendation from the Fourth Five Year Review, the Navy issued addendums evaluating the long-term protectiveness of the RGs [remedial goals] for soil and building structures, which concluded that the current RGs are protective for all future land users. Like much of the Draft Review, the Navy's history of the Fourth FYR Addenda is misleading. After the Draft Fourth FYR was "finalized," the Navy issued three addenda purporting to validate the RGs.	Please refer to Comment #37, which discusses soil Preliminary Remediation Goals.

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54	In the Draft Review, the Navy claims it updated the risk calculations: Following the recommendation from the Fourth Five Year Review, the Navy issued addendums evaluating the long-term protectiveness of the RGs [remedial goals] for soil and building structures, which concluded that the current RGs are protective for all future land users. The remedial goals have not been updated since 2006, while EPA's default Preliminary Remediation Goals have been updated, most recently in 2023. The Navy needs to explain to the general public, using non-technical, commonly understood language, how the 2006 remedial goals could still be protective considering that the 2023 defaults are orders of magnitude lower than the remedial goals. The Navy must update the PRGS, "showing the arithmetic" to the public to justify the PRGs that result from proper application of the PRG calculators.	In the Fourth Five-Year Review addendum (Navy, 2020) and, as part of this Fifth Five-Year Review, the Navy evaluated protectiveness of the RGs by calculating the potential risks from the most conservative scenario: residential exposure to uniformly distributed levels of ROCs in soil. This was performed by inputting the RGs and site-specific/exposure-specific assumptions, which are provided in the Addendum and in Appendix F of the Fifth Five-Year Review, into the RESRAD-ONSITE computer model (for the Addendum) and the EPA's preliminary remedial goal (PRG) calculator (both for the Addendum and Fifth Five-Year Review) to evaluate whether the RGs would result in risks within or below the NCP risk range (10^{-6} to 10^{-4}). The risks for each ROC were generally within the risk management range with the exception of radium and thallium which were slightly above 1×10^{-4}. However, since the site is not uniformly contaminated, the actual risks from exposure to radionuclides in HPNS soils are expected to be considerably less than these maximum values. With regard to exceeding the recommended risk range: As stated in the 40 CFR 300.340(e) for CERCLA, "For known or suspected carcinogens, acceptable exposure levels are generally concentration levels that represent an excess upper bound lifetime cancer risk to an individual of between 10^{-4} and 10^{-6}. In cases involving multiple contaminants or pathways where attainment of chemical [radiological]-specific ARARs will result in cumulative risk in excess of 10^{-4}, [factors related to technical limitations such as detection/quantification limits for contaminants; factors related to uncertainty; and other pertinent information] may be considered when determining the cleanup level to be attained." These factors, along with inter-agency agreements, were considered in the development of the current RGs. While estimated risks for soils at the RGs may indeed exceed 1×10^{-4}, the Navy will demonstrate that the final risk from exposures upon property release, including the risk from chemicals and other radionuclides, will achieve the CERCLA risk range. Final site-specific data will be used to demonstrate the documented remedy was both achieved and is protective.

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55	EPA's comments to the Draft Review clearly state that the Navy's submission of the Fourth FYR Building Addendum did not satisfy its demands that the Navy update the building PRGs. EPA then explains the Navy changed the remedy. Based on a substantive change in building reuse plans and recent congressional authorization, the Navy is now preparing to demolish and dispose of all potentially radiologically impacted buildings, except two historical structures, rather than certify them for unrestricted reuse. Unless the Navy can demonstrate that none of the historical buildings were radiologically impacted, the PRG/RESRAD dispute remains. The Navy must update its building remedial goals as part of this Fifth FYR.	Commenter's factual and legal characterizations of this issue are noted. Navy disagrees with such characterizations to the extent commenter alleges that Navy has failed to act in compliance with applicable law or regulation or that such characterizations are not a complete and/or accurate characterization of the law or facts. As noted in the comment, there is congressional authorization to demolish/dismantle certain structures at HPNS. Any demolition activities undertaken by Navy at HPNS pursuant to this congressional authorization or otherwise would be undertaken in accordance with all applicable laws and regulations.
56	Other Deficiencies (page 12) 1. The Navy misuses "institutional controls". ICs are insufficient to assure long-term protectiveness. 2. The Navy has never provided a realistic plan to realistically enforce the ICs continuously in the future. Implementation of ICs has been deferred until property transfer. 3. The Navy's protectiveness calculations failed to calculate total risk from the sum of all radionuclides and to sum the radiological risks with chemical risks. 4. The Navy has not properly justified its background radiation calculations, as it improperly took background samples at Shipyard sites that were likely radiologically impacted.	1. The Navy disagrees with the conclusion that ICs are insufficient to assure long-term protectiveness. ICs are selected as part of the CERCLA remedy selection process and are used when its either economically or technically impractical to removal all residual contamination. 2. See response to comment #15 3. The Navy will evaluate final risk from exposures upon completion of the remedial action to meet the project remedial goals. 4. The Navy worked with the regulatory agencies to develop its background study and disagrees with the claim that they were improperly collected.
57	The Navy must not repeat its Fourth FYR violations and respond to all comments to the Draft Review.	Per OSWER 9355.7-03B-P, the only required community outreach activities associated with a Five-Year Review include community notice of the start of the Five-Year Review process and community notice of the completion of the Five-Year Review process. The Navy has prepared response to comments and provided responses to all community comments.
58	In the Draft Review, the Navy continues to rely on Tetra Tech data. The Navy should either excise all references to TEC data or specify what data it is citing from Tetra Tech and justify its use by demonstrating it is not tainted by fraud and/or quality assurance and quality assurance deficiencies.	Tetra Tech is a large company with various divisions and work from the Tetra Tech EM division or its joint ventures has not been called into question or deemed unreliable.

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59	The current remediation methods for multiple parcels includes capping radioactive and toxic waste along the shoreline, which will NOT remain protective when inundated and flooded by groundwater and sea level rise. Following are comments on the climate resilience assessment: 1. The Five-Year Review must use the government's scientific projections when planning for risks before and beyond 2065 – sea level rise, bay level rise, groundwater rise. 2. Capping contamination or using "durable" covers cannot be an acceptable form of remediation at the HPNS because of the risk associated with sea level rise, groundwater rise and inundation, and increased flooding from storms. 3. Flooding has already occurred at the HPNS and has already threatened the health and safety of the surrounding community and environment. 4. As this is a shoreline contaminated site in a heavily impacted community subject to sea level rise and groundwater rise, the entire site must be completely cleaned up to residential standards, with no contamination remaining on-site. 5. Pursue and research safe, alternative treatment technologies that do not leave toxic and radioactive waste along the shoreline.	Additional groundwater level and flow assessment will be discussed with the agencies as part of site-specific studies and communicated with the community. 1. The CRA in the FYR uses best available science, including climate hazard projections made by prominent organizations like SERDP, FEMA, NOAA, etc. and that are consistent with guidance from regional sources like California OPC and DTSC. Methodologies used are similar to ones recommended in peer-reviewed literature or used by relevant organizations like the City of Alameda. 2. The CRA is a screening level assessment of these multiple hazards – sea level rise, groundwater rise, storms, etc. A more detailed assessment will be conducted during site-specific studies that are being discussed with the agencies. 3. The Navy will discuss more detailed evaluation of flooding with agencies, as part of the planning for site-specific studies. 4. The CRA is a first step towards assessing climate change hazards at a DoD or former DoD installation. Next steps are being discussed with the agencies, as part of site-specific studies. The Navy is committed to addressing any unacceptable risk to human health or environment, using best available science and in discussion with the regulatory agencies.