Final

Remedial Action Completion Report for Parcels UC-1 and UC-2

Hunters Point Naval Shipyard
San Francisco, California

February 2013

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

Prepared by:
Engineering/Remediation Resources Group, Inc.
115 Sansome Street, Suite 200
San Francisco, California 94104

Prepared under:
Naval Facilities Engineering Command Southwest
Contract Number N62473-09-D-2608
Delivery Order 0009
Document Control Number ERRG-2608-0009-0006

Final
Remedial Action Completion Report for Parcels UC-1 and UC-2 Hunters Point Naval Shipyard San Francisco, California

February 2013

Contract No. N62473-09-D-2608, Delivery Order 0009
Document Control No. ERRG-2608-0009-0006

Prepared for:

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

Prepared by:

Engineering/Remediation Resources Group, Inc.
115 Sansome Street, Suite 200
San Francisco, California 94104
(415) 395-9974

Final
Remedial Action Completion Report for Parcels UC-1 and UC-2 Hunters Point Naval Shipyard San Francisco, California

Submitted by:
Engineering/Remediation Resources Group, Inc.

Signature	February 25, 2013 Date
Brad Hall, PG Name	Program Manager Title
Signature	February 25, 2013 Date
John Sourial, PE, CQE Name	Project Manager Title

CERTIFICATION

REGISTERED PROFESSIONAL ENGINEER
JOHN SOURIAL
C71674
EXP. 12/31/13
CIVIL
STATE OF CALIFORNIA

This document was prepared under the direction and supervision of a qualified Professional Engineer
John Sourial, PE, CQE
California Professional Engineer C71674

Executive Summary

This Remedial Action Completion Report (RACR) documents the completion of a remedial action (RA) to address chemicals of concern (COCs) in soil at Parcels UC-1 and UC-2, Hunters Point Naval Shipyard, San Francisco, California. The RA included installation and repair of durable covers, including soil covers, asphalt covers, and building foundations, that provide physical barriers to minimize exposure of humans and wildlife to potential COCs in soil. This RA was performed in accordance with the "Final Design Basis Report, Parcels UC-1 and UC-2, Hunters Point Shipyard, San Francisco, California" (ChaduxTt, 2010a). The RA construction was implemented between May 14, 2012, and September 18, 2012. This RACR also documents the achievement of all remedial action objectives (RAOs) for Parcels UC-1 and UC-2, as presented in the Final Records of Decision (RODs) for these parcels (Department of the Navy [Navy], 2009a and 2009b).

The following paragraphs summarize the RA work performed and the actions taken to achieve the RAOs prescribed for Parcels UC-1 and UC-2.

ES.1. SOIL AT PARCELS UC-1 AND UC-2

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 subsections describe the installation of each cover.

ES.1.1. Soil Covers

In accordance with the Remedial Design (ChaduxTt, 2010a), a 2-foot-thick soil cover was installed over previously vegetated areas. Two feet of existing soil was removed from previously vegetated areas so that the surface of the newly installed soil cover matched historical site grades. Clean imported soil used to construct the cover was subjected to analytical, geotechnical, and radiological testing in accordance with the project Sampling and Analysis Plan (SAP) (Appendix B of the RAWP, Engineering/Remediation Resources Group, Inc., 2012b). The SAP requirements for testing imported fill were developed based on the Department of Toxic Substances Control's (DTSC) Information Advisory for Clear Import Material (DTSC, 2001), import fill criteria for HPNS (Tetra Tech EC, Inc., 2006), remedial goals specified in the RODs (Navy, 2009a and 2009b), and the project's geotechnical specifications (ChaduxTt, 2010a). Imported soil was placed, graded, and compacted to design specifications. Once the required thickness of the final cover was achieved, as verified through field grade checking and surveying, erosion control blankets were placed on the surface of the final cover to minimize erosion during the vegetation establishment period. 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. The soil cover vegetation is currently being watered and inspected regularly to ensure healthy ground cover is established across the site.

ES.1.2. Asphalt Covers and Restored Building Foundations

In accordance with the Remedial Design, an 8-inch asphalt cover, comprising 4 inches (minimum) of asphaltic concrete (AC) and 4 inches (minimum) of aggregate base (AB), was installed to minimize exposure of humans and wildlife to potential COCs in underlying soil. Existing AC covers that were in good condition were left in place and incorporated into the final asphalt cover. Existing AC covers that had degraded were repaired by removing and replacing the AC; the AC and AB; or the AC, AB, and subgrade material, depending on the extent of the degradation. AC covers exhibiting minor cracking were restored by applying an asphalt seal to fill in the cracks. Concrete building foundations and sidewalks were also restored and incorporated into the durable cover. Cracks and penetrations in concrete covers were filled with non-shrink grout.

ES.2. RADIOLOGICALLY IMPACTED SITES AT PARCELS UC-1 AND UC-2

The Navy identified radiologically impacted sites, including buildings, equipment, and infrastructure, at Parcels UC-1 and UC-2 associated with the former use of general radioactive materials and decontamination of ships used during atomic weapons testing in the South Pacific (Naval Sea Systems Command, 2004). In 2004, Building 819 (including Building 823) was identified as radiologically impacted (Naval Sea Systems Command, 2004), but this building was subsequently surveyed and released from radiological concerns. The Navy conducted time-critical removal actions between 2006 and 2008 to address potential radioactive contamination in storm drains and sanitary sewer lines at Parcels UC-1 and UC-2 (ChaduxTt, 2010a). The potential radionuclides of concern suspected to be present at Parcels UC-1 and UC-2 included cesium-137, cobalt-60, plutonium-239, radium-226, strontium-90, thorium-232, tritium (hydrogen-3), and uranium-235 and are associated with buildings, sanitary sewer lines, and storm drain lines (Navy, 2009a and 2009b). The time-critical removal actions for radionuclides were completed, and the radiological remediation goals established in the RODs for Parcels UC-1 and UC-2 were met (DTSC, 2011; Navy, 2011).

ES.3. GROUNDWATER AT PARCELS UC-1 AND UC-2

No groundwater monitoring wells are present at Parcel UC-1, and areas of groundwater contamination are all downgradient from Parcel UC-1. The COCs in groundwater at Parcel UC-2 are volatile organic compounds (VOCs). The ROD for Parcel UC-2 identified monitored natural attenuation and institutional controls as the remedy for VOCs in groundwater at Parcel UC-2 (Navy, 2009b). Groundwater monitoring at Parcel UC-2 is currently performed under the basewide groundwater monitoring program.

ES.4. SOIL GAS AT PARCEL UC-2

The COCs in soil gas (i.e., vapor intrusion) at Parcel UC-2 are VOCs, primarily carbon tetrachloride and chloroform. The ROD for Parcel UC-2 addresses the future risks associated with COCs in soil gas through institutional controls that would apply across the contaminated area (i.e., Redevelopment Block 10) (Navy, 2009b). In 2010, the Navy implemented a focused soil gas survey to identify locations where concentrations of COCs in soil gas continued to exceed soil gas actions levels and to reevaluate the extent of VOC areas requiring institutional controls (ARICs) or requiring remediation (ChaduxTt, 2010a; Sealaska, 2011). The revised ARIC for soil gas at Parcel UC-2 will be published in the forthcoming "Final Technical Memorandum, Soil Vapor Investigation in Support of Vapor Intrusion Assessment for Parcels B, D-1, G, and UC-2."

ES.5. POST-CONSTRUCTION AND ONGOING ACTIVITIES

Following the completion of construction activities, the Navy inspected the RA work performed and the Base Realignment and Closure Environmental Coordinator certified the RA as completed. Vegetation is currently being established in accordance with the Operations and Maintenance Plan (OMP) and includes regular irrigation and plant growth inspections (Engineering/Remediation Resources Group, Inc., 2013). The OMP also describes the procedures to be implemented for monitoring and maintenance of the durable covers installed as part of this remedy and requirements to maintain land use controls. The Navy will perform ongoing maintenance and monitoring in accordance with the OMP until the time of property transfer. The Navy will also perform periodic compliance monitoring of institutional controls until the time of property transfer.

Table of Contents

EXECUTIVE SUMMARY ES-1

ES.1. Soil at Parcels UC-1 and UC-2 ..... ES-1

ES.1.1. Soil Covers ES-1

ES.1.2. Asphalt Covers and Restored Building Foundations ES-2

ES.2. Radiologically Impacted Sites at Parcels UC-1 and UC-2 ..... ES-2

ES.3. Groundwater at Parcels UC-1 and UC-2 ..... ES-2

ES.4. Soil Gas at Parcel UC-2 ..... ES-3

ES.5. Post-Construction and Ongoing Activities ES-3

SECTION 1. INTRODUCTION 1-1

1.1. Document Organization 1-1

1.2. Background Information 1-2

1.2.1. Site Location 1-2

1.2.2. History 1-2

1.2.3. Geology and Hydrogeology 1-3

1.2.4. Nature and Extent of Contamination 1-4

1.3. Project Overview 1-6

1.4. Construction Schedule 1-7

SECTION 2. REMEDIAL ACTION AND OBJECTIVES 2-1

2.1. RAOs for Parcel UC-1 2-1

2.2. RAOs for Parcel UC-2 2-2

SECTION 3. REMEDIAL ACTION CONSTRUCTION ACTIVITIES 3-1

3.1. Pre-Construction Meeting 3-1

3.2. General Site Controls 3-2

3.2.1. Site Access, Security, and Working Hours 3-2

3.2.2. Aboveground and Underground Utility Clearance 3-2

3.2.3. Land Surveying 3-3

3.2.4. Stormwater Pollution Prevention 3-3

3.2.5. Air Monitoring 3-4

3.2.6. Archaeological Monitoring 3-5

3.2.7. Traffic Routing and Control 3-5

3.3. Mobilization and Site Preparation 3-5
3.3.1. Equipment Mobilization 3-6
3.3.2. Establishment of Support and Construction Work Areas 3-6
3.3.3. Installation of Temporary Fence 3-7
3.3.4. Groundwater Monitoring Well Protection 3-7
3.4. Installation of Soil Cover 3-7
3.4.1. Demolition, Clearing, and Grubbing 3-8
3.4.2. Excavation of Slopes 3-8
3.4.3. Import of Soil Cover Materials 3-9
3.4.4. Placement and Compaction of Soil Cover Material 3-10
3.4.5. Installation of Erosion Control Blankets 3-11
3.4.6. Installation of Vegetation 3-12
3.5. Repair and Installation of Asphalt Cover 3-12
3.5.1. Identification of Repair Locations and Repair Types 3-13
3.5.2. Removal of Asphaltic Concrete Pavement and Aggregate Base 3-13
3.5.3. Removal of Subgrade 3-14
3.5.4. Installation of Subgrade and Aggregate Base 3-15
3.5.5. Installation of Asphaltic Concrete Pavement 3-16
3.5.6. Installation of Asphalt Overlay 3-16
3.5.7. Installation of Asphalt Seal 3-17
3.5.8. Drainage Improvements 3-17
3.5.9. Road Striping and Traffic Signs 3-18
3.6. Inspection and Repair of Building Foundations and Utility Corridors 3-18
3.7. Installation of Fence and Signs 3-18
3.8. Characterization, Management, and Disposal of Waste Stockpiles 3-19
3.9. Post-Construction Activities 3-20
3.9.1. Site Cleanup and Demobilization 3-20
3.9.2. Completion Inspections 3-20
3.9.3. Post-Construction (As-Built) Site Survey 3-21
3.9.4. Vegetation Establishment 3-21
3.10. Deviations and Modifications 3-21

SECTION 4. ONGOING ACTIVITIES 4-1
4.1. Vegetation Establishment 4-1
4.2. Maintenance and Monitoring of Durable Covers 4-1

4.3. Groundwater Monitoring 4-2
4.4. Land Use Controls 4-2

SECTION 5. DEMONSTRATION OF COMPLETION 5-1

SECTION 6. COMMUNITY RELATIONS 6-1

SECTION 7. PROJECT COSTS 7-1

SECTION 8. CERTIFICATION STATEMENT 8-1

SECTION 9. REFERENCES 9-1

List of Figures

Figure 1. Site Location Map
Figure 2. Parcel Map
Figure 3. Durable Covers for Parcel UC-1
Figure 4. Durable Covers for Parcel UC-2
Figure 5. Typical Cover Cross Sections
Figure 6. Work and Support Zones
Figure 7. Roadway and Hillslope Restoration for Parcel UC-1
Figure 8. Roadway and Hillslope Restoration for Parcel UC-2

List of Tables

Table 1. Construction Schedule
Table 2. Durable Cover Repair Methods
Table 3. Groundwater Monitoring Well Survey Details
Table 4. Demonstration of Completion of Remedial Action Objectives for Parcel UC-1
Table 5. Demonstration of Completion of Remedial Action Objectives for Parcel UC-2

List of Appendices

Appendix A. Photographic Field Log
Appendix B. Stormwater Pollution Prevention Plan Documentation
Appendix C. Air Quality Monitoring Summary Report
Appendix D. Contractor Quality Control Documentation
Appendix E. Archaeological Screening Summary Report
Appendix F. As-Built Drawings
Appendix G. Backfill Acceptance Reports
Appendix H. Waste Disposal Information
Appendix I. Remedial Action Fact Sheet

Acronyms and Abbreviations

AB	aggregate base
AC	asphaltic concrete
APP	Accident Prevention Plan
ARICs	areas requiring institutional controls
ASTM	ASTM International
BMPs	best management practices
CCSF	City and County of San Francisco
CDPH	California Department of Public Health
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
COCs	chemicals of concern
CQC	Contractor Quality Control
CSO	Caretaker Site Office
DTSC	Department of Toxic Substances
ERRG	Engineering/Remediation Resources Group, Inc.
FFA	Federal Facilities Agreement
HHRA	human health risk assessment
HPNS	Hunters Point Naval Shipyard
LUCs	land use controls
MOA	Memorandum of Agreement
msl	mean sea level
Navy	Department of the Navy
O&M	operations and maintenance
OMP	Operations and Maintenance Plan
PAHs	polycyclic aromatic hydrocarbons
PCBs	polychlorinated biphenyls
PPE	personal protective equipment

RA	remedial action
RACR	Remedial Action Completion Report
RAOs	remedial action objectives
RAWP	Remedial Action Work Plan
RD	Remedial Design
RODs	Record of Decision
ROICCs	Resident Officers In Charge of Construction
RPM	Remedial Project Manager
SAP	Sampling and Analysis Plan
SARA	Superfund Amendments and Reauthorization Act
SG	subgrade
SWPPP	Stormwater Pollution Prevention Plan
TCRAs	time-critical removal actions
USA North	Underground Service Alert of Northern California
VOCs	volatile organic compounds

Section 1. Introduction

This Remedial Action Completion Report (RACR) documents the completion of a remedial action (RA) to address potential chemicals of concern (COCs) in soil at Parcel UC-1 and UC-2, Hunters Point Naval Shipyard (HPNS), San Francisco, California. The RA included installation and repair of durable covers, including soil covers, asphalt covers, and building foundations that provide physical barriers to minimize exposure of humans and wildlife to potential COCs in soil. This RA was performed in accordance with the "Final Design Basis Report, Parcel UC-1 and UC-2, Hunters Point Naval Shipyard, San Francisco, California" (ChaduxTt, 2010a). The remedial design (RD) was developed to address the soil remedial action objectives (RAOs) included in the Final Records of Decision (RODs) for Parcels UC-1 and UC-2 (Department of the Navy [Navy], 2009a and 2009b). This RACR also documents the achievement of RAOs for COCs in radiologically impacted sites, groundwater, and soil gas by describing previous investigations and removal actions conducted in Parcels UC-1 and UC-2.

This RACR complies with the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), as amended by the Superfund Amendments and Reauthorization Act (SARA) of 1986; the National Oil and Hazardous Substances Pollution Contingency Plan in Title 40 of the Code of Federal Regulations Part 300; and California Health and Safety Code, Section 6.8.

1.1. DOCUMENT ORGANIZATION

Section 1 provides (1) background for Parcels UC-1 and UC-2, (2) an overview of the RA activities that were performed at the parcels, and (3) the final construction schedule. Section 2 presents the RAOs that were identified in the RODs (Navy, 2009a and 2009b). Section 3 summarizes the materials and methods that were used to implement the RA. Section 4 describes activities currently ongoing at the parcels to maintain the remedy. Section 5 provides information that demonstrates completion of the RA described herein and the achievement of all RAOs that were identified in the RODs (Navy, 2009a and 2009b). Section 6 describes the community relations activities associated with the RA. Section 7 summarizes the costs to implement the RA. Section 8 presents the RACR certification statement. Section 9 lists all documents and supporting information used to prepare this RACR.

The following appendices provide additional information documenting the RA:

- Appendix A – Photographic Field Log
- Appendix B – Stormwater Pollution Prevention Plan (SWPPP) Documentation
- Appendix C – Air Quality Monitoring Summary Report

- Appendix D – Contractor Quality Control (CQC) Documentation
- Appendix E – Archaeological Screening Summary Report
- Appendix F – As-Built Drawings
- Appendix G – Backfill Acceptance Reports
- Appendix H – Waste Disposal Information
- Appendix I – Remedial Action Fact Sheet

1.2. BACKGROUND INFORMATION

The following subsections briefly describe HPNS and Parcels UC-1 and UC-2, including the location, history, geology and hydrogeology, and nature and extent of contamination.

1.2.1. Site Location

HPNS is located in the City and County of San Francisco (CCSF), California (Figure 1). HPNS encompasses 866 acres (420 acres on land and 446 acres under water in San Francisco Bay) in southeastern San Francisco on a peninsula that extends east into San Francisco Bay (Figure 1).

HPNS is currently divided into 11 parcels: B, C, D-1, D-2, E, E-2, F, G, UC-1, UC-2, and UC-3 (Figure 2). This RA focuses on two of those parcels: UC-1 and UC-2. Both parcels are located in the central portion of HPNS (Figure 2). Parcel UC-1 includes about 3.9 acres along Spear Avenue, and Parcel UC-2 includes about 3.9 acres along Fisher Avenue and a small portion of Robinson Street. Neither of the parcels borders the San Francisco Bay.

1.2.2. History

In 1940, the Navy obtained ownership of HPNS for shipbuilding, repair, and maintenance activities. After World War II, activities at HPNS shifted to submarine maintenance and repair. HPNS was also the site of the Naval Radiological Defense Laboratory. HPNS was deactivated in 1974 and remained relatively unused until 1976. Between 1976 and 1986, the Navy leased most of HPNS to Triple A Machine Shop, Inc., a private ship repair company. In 1987, the Navy resumed occupancy of HPNS (Navy, 2009a).

The HPNS property was placed on the National Priorities List in 1989, pursuant to CERCLA as amended by SARA, because past shipyard operations left hazardous substances on site. In 1991, HPNS was designated for closure pursuant to the Defense Base Closure and Realignment Act of 1990. Closure at HPNS involves cleanup of site contamination to make the property available for nondefense use (Navy, 2009a).

Historically, most of Parcels UC-1 and UC-2 have been paved with asphaltic concrete (AC). The historical subsurface storm drain and sanitary sewer utilities within these parcels were removed from beneath Spear and Fisher Avenues as part of the basewide ongoing time-critical removal action (TCRA) for radionuclides (Navy, 2006). The sloped portion of Parcels UC-1 and UC-2, which represents approximately 12 percent of the total area of these parcels, was historically vegetated with ice plant (*Carpobrotus edulis*). Two small buildings (819 and 823) are located on the western portion of Parcel UC-1 (Figure 3), and a small security guard station is located on the northern portion of Parcel UC-2 (Figure 4). Building 819 is a former sewage pumping station, and Building 823 is a former standby generator building. Neither building is currently in use.

The roadways at Parcels UC-1 and UC-2 have been in place since the original construction of HPNS in the 1940s. Minor portions of Parcels UC-1 and UC-2 were used as parking areas for nearby buildings, including Buildings 819 and 823 and Buildings 101 and 110, which are former barracks adjacent to Parcel UC-2 (Figure 4).

1.2.3. Geology and Hydrogeology

This section briefly summarizes the geologic and hydrogeologic conditions at HPNS and Parcels UC-1 and UC-2. Information in this section was obtained from the Design Basis Report (ChaduxTt, 2010a).

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 of Quaternary age; and the oldest, the Franciscan Complex bedrock, of Jurassic-Cretaceous age). In general, the stratigraphic sequence of these geologic units, from youngest (shallowest) to oldest (deepest), is as follows: Artificial Fill, Undifferentiated Upper Sand Deposits, Bay Mud Deposits, Undifferentiated Sedimentary Deposits, and Franciscan Complex Bedrock.

A thin layer of unconsolidated material overlies bedrock at Parcels UC-1 and UC-2. The unconsolidated materials include artificial fill, as well as native colluvium associated with the hillside above Fisher Avenue at Parcel UC-2. 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.

Parcel UC-1 consists of flat lowlands, with surface elevations between 9 and 12 feet above mean sea level (msl). Parcel UC-2 includes flat lowlands and steeper hillside areas; surface elevations range from 9 to 36 feet above msl. The parcels were constructed in the 1940s by placing borrowed fill material from various sources, including crushed serpentinite bedrock from the adjacent highlands and dredged sediments.

The hydrostratigraphic units present at Parcels UC-1 and UC-2 include the shallow A-aquifer and an upper bedrock water-bearing zone. The B-aquifer, present in other areas of HPNS, is not present at either parcel. The shallow A-aquifer exists mainly within the shallow bedrock and a thin layer of unconsolidated materials overlying the bedrock. Parcel UC-1 does not contain any groundwater monitoring wells. Based on wells in the adjacent Parcel G, the top of the A-aquifer in the area of Parcel UC-1 likely extends to about 15 feet below msl. The A-aquifer at Parcel UC-2 exists within the fractured bedrock, which is found beneath 10 to 15 feet of overlying colluvium and fill.

In general, groundwater flows radially away from the highlands north of Parcel UC-1 and west of Parcel UC-2 toward the shoreline. Groundwater flows generally to the south at Parcel UC-1 and to the east at Parcel UC-2, following the local topographic gradient toward San Francisco Bay.

1.2.4. Nature and Extent of Contamination

The Navy has identified activities associated with known or potential chemical releases at Parcels UC-1 and UC-2 and has conducted environmental investigations to identify and assess the nature and extent of contaminants in soil, radiologically impacted sites, groundwater, and soil gas. The following subsections briefly summarize the nature and extent of contamination at Parcels UC-1 and UC-2. The RODs (Navy, 2009a and 2009b) and the Final Feasibility Study Reports for Parcels C and D (SulTech, 2007 and 2008) provide more details on the nature and extent of contamination.

1.2.4.1. Soil at Parcels UC-1 and UC-2

The COCs in soil at Parcels UC-1 and UC-2 that pose a potential risk to human health based on current and reasonably anticipated future land uses are metals. Elevated concentrations of metals, including arsenic and manganese, are likely attributable to naturally occurring metals in the bedrock fill quarried to build the shipyard in the 1940s (ChaduxTt, 2010a).

1.2.4.2. Radiologically Impacted Sites at Parcels UC-1 and UC-2

The Navy identified radiologically impacted sites, including buildings, equipment, and infrastructure, at Parcels UC-1 and UC-2 associated with the former use of general radioactive materials and decontamination of ships used during atomic weapons testing in the South Pacific (Naval Sea Systems Command, 2004). In 2004, the Building 819 area (including Building 823) was identified as radiologically impacted (Naval Sea Systems Command, 2004), but this building was subsequently surveyed and released from radiological concerns (Navy, 2006). The Navy conducted TCRAs between 2006 and 2008 to address potential radioactive contamination in storm drains and sanitary sewer lines at Parcels UC-1 and UC-2 (ChaduxTt, 2010a). The potential radionuclides of concern suspected to be present at Parcels UC-1 and UC-2 included cesium-137, cobalt-60, plutonium-239, radium-226, strontium-90, thorium-232, tritium (hydrogen-3), and uranium-235 and are associated with buildings, sanitary sewer lines, and storm drain lines (Navy, 2009a and 2009b). The TCRAs for radionuclides were

completed, and the radiological remediation goals established in the RODs for Parcels UC-1 and UC-2 were met (Department of Toxic Substances Control [DTSC], 2011; Navy, 2011).

1.2.4.3. Groundwater at Parcels UC-1 and UC-2

No groundwater monitoring wells are present at Parcel UC-1, and areas of groundwater contamination at HPNS are all downgradient from Parcel UC-1. The COCs in groundwater at Parcel UC-2 are volatile organic compounds (VOCs). The ROD for Parcel UC-2 identified monitored natural attenuation and institutional controls as the remedy for VOCs in groundwater at Parcel UC-2 (Navy, 2009b). Groundwater monitoring at Parcel UC-2 is currently performed under the basewide groundwater monitoring program.

1.2.4.4. Soil Gas at Parcel UC-2

The COCs in soil gas (i.e., vapor intrusion) at Parcel and UC-2 are VOCs, primarily carbon tetrachloride and chloroform. The ROD for Parcel UC-2 addresses the future risks associated with COCs in soil gas through institutional controls that would apply across the contaminated area (i.e., Redevelopment Block 10) (Navy, 2009b). In 2010, the Navy implemented a focused soil gas survey to identify locations where concentrations of COCs in soil gas continued to exceed soil gas actions levels and to reevaluate the extent of VOC areas requiring institutional controls (ARICs) or requiring remediation (ChaduxTt, 2010a; Sealaska, 2011). Soil gas samples were collected at 5 to 6 feet below ground surface and analyzed for VOCs, and the following VOCs were reported in samples from Parcel UC-2:

- 1,2,4-Trimethylbenzene
- 1,3,5-Trimethylbenzene
- Acetone
- Benzaldehyde
- Benzene
- Carbon tetrachloride
- Chloroform
- Cyclohexane
- Ethyl cyclohexane
- Ethylbenzene
- Methylene chloride
- n-Propylbenzene
- Perchloroethene
- Toluene
- Trichloroethene
- Xylenes (m-, o-, and p-)

The revised soil gas ARIC for Parcel UC-2 will be published in the forthcoming "Final Technical Memorandum, Soil Vapor Investigation in Support of Vapor Intrusion Assessment for Parcels B, D-1, G, and UC-2."

1.3. PROJECT OVERVIEW

The RA was implemented at Parcels UC-1 and UC-2 to address potential COCs in soil. A durable cover was the remedy selected to minimize contact with COCs that may be present in Parcels UC-1 and UC-2, as presented in the RODs (Navy, 2009a and 2009b). The durable cover consists of vegetated soil covers, new or repaired asphalt covers, and repaired building foundations.

The primary design criterion for durable covers, as specified in the RODs, is to minimize human exposure to potentially contaminated soil (Navy, 2009a and 2009b). A 2-foot-thick soil cover was constructed along the western property boundary of Parcel UC-2 as part of this RA. This portion of the site is approximately 1.0 acre, or about 12 percent of the total area of Parcels UC-1 and UC-2. The soil cover is considered durable because it is designed to resist erosion, minimize incidental human contact with underlying soil, and would require deliberate and destructive action to cause a breach.

The existing asphalt pavement and concrete sidewalks, which cover approximately 88 percent of Parcels UC-1 and UC-2, meet this criterion where they are either intact or where they were repaired as part of this RA. The existing asphalt pavement and sidewalks, primarily existing roads, road shoulders, and parking areas, were repaired as necessary to create a continuous, intact durable cover over Parcels UC-1 and UC-2.

The existing building foundations are also considered a component of the durable cover. The existing building foundations minimize human contact with potentially contaminated soil beneath the former buildings. The building foundation covers are considered durable because they are nonerodible and would require deliberate and destructive actions to expose underlying soil. The building foundations were inspected and repaired, as needed, to ensure a continuous intact cover is maintained over Parcels UC-1 and UC-2.

In summary, this RA included installing the following durable covers over Parcels UC-1 and UC-2:

- Constructing a soil cover over the existing vegetated areas.
- Existing asphalt pavement not requiring repairs was left in place in its current condition and sealed. Existing concrete pads, concrete sidewalks, utilities, railroad tracks, and other permanent structures within intact paved areas were also left in place in their current condition and either sealed or incorporated into the durable covers.
- Filling cracks in existing asphalt pavement, concrete pads, and concrete sidewalks.
- Removing irreparable portions of the existing asphalt pavement and installing new aggregate base (AB) course and/or AC.
- Filling penetrations and cracks in existing building foundations, as needed to minimize contact with the underlying soil.

Figure 5 shows conceptual cross sections of the soil and asphalt covers, respectively.

1.4. CONSTRUCTION SCHEDULE

Table 1 summarizes the construction schedule for the RA. As detailed in Table 1, the construction portion of the RA started on May 14, 2012, and was completed on September 18, 2012.

Section 2. Remedial Action and Objectives

The RD for implementation of the RA at Parcels UC-1 and UC-2 (ChaduxTt, 2010a) was developed to address the RAOs established in the Final RODs (Navy, 2009a and 2009b), where applicable. The RAOs were based on attainment of regulatory requirements, standards, and guidance for contaminated media; COCs; potential receptors and exposure scenarios; and human health and ecological risks. Planned future land use was an important component in developing the RAOs. The RAOs for Parcels UC-1 and UC-2 are based on the San Francisco Redevelopment Agency's (currently known as the Successor Agency to the San Francisco Redevelopment Agency) 1997 reuse plan. The following subsections identify the RAOs that apply to the media in Parcels UC-1 and UC-2 soil (Navy, 2009a and 2009b).

2.1. RAOS FOR PARCEL UC-1

Soil RAOs:

1. Prevent exposure to metals in soil at concentrations above remediation goals developed in the human health risk assessment (HHRA) for the following exposure pathways:
   a. Ingestion of, outdoor inhalation of, and dermal exposure to surface and subsurface soil by industrial workers or construction workers
2. Prevent exposure to VOCs in soil gas at concentrations that would pose unacceptable risk via indoor inhalation of vapors. Remediation goals for VOCs to address exposure via indoor inhalation of vapors may be superseded based on COC identification information from future soil gas surveys. Future action levels would be established for soil gas, would account for vapors from both soil and groundwater, and would be calculated based on a cumulative risk level of 10^{-6} using the accepted methodology for risk assessments at HPNS.

RAOs for Radiologically Impacted Structures (storm drains and sanitary sewers) and Soil (associated with these structures):

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

Groundwater RAOs:

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.

2.2. RAOS FOR PARCEL UC-2

Soil RAOs:

1. Prevent or minimize exposure to inorganic chemicals (i.e., metals) in soil at concentrations exceeding remediation goals developed in the HHRA for the following exposure pathways:
   a. Ingestion of, outdoor inhalation of, and dermal exposure to surface and subsurface soil
   b. Ingestion of homegrown produce by residents in mixed-use and research and development blocks
2. Prevent or minimize exposure to VOCs in soil gas at concentrations that would pose unacceptable risk via indoor inhalation of vapors. Remediation goals for VOCs to address exposure via indoor inhalation of vapors may be superseded based on COC identification information from soil gas surveys that may be conducted in the future. Future action levels would be established for soil gas, would account for vapors from both soil and groundwater, and would be calculated based on a cumulative risk level of 10^{-6} using the accepted methodology for risk assessments at HPNS.

RAOs for Radiologically Impacted Structures (storm drains and sanitary sewers) and Soil (associated with these structures):

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

Groundwater RAOs:

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.

Section 3. Remedial Action Construction Activities

This section summarizes construction activities to complete the RA, including installation of durable covers (i.e., soil covers, asphalt covers, and repair of building foundations) at Parcels UC-1 and UC-2. All construction activities were overseen by a qualified professional engineer and Contractor Quality Control (CQC) Manager, and all work was performed in accordance with the precautions, practices, and personal protective equipment (PPE) specified in the Accident Prevention Plan (APP) and Site Safety and Health Plan (SSHP) (Engineering/Remediation Resources Group, Inc. [ERRG], 2012a). The RA included the following work elements:

- Pre-construction meeting
- General site controls
- Mobilization and site preparation
- Installation of soil cover
- Repair and installation of asphalt covers
- Inspection and repair of building foundations and utility corridor
- Installation of perimeter fence and signs
- Characterization, management, and disposal of waste stockpiles
- Post-construction activities, including site cleanup demobilization, completion inspections, as-built site surveying, and vegetation establishment

Any deviations or modifications to the RA are discussed following the description of the specific work elements. Appendix A contains a photographic field log of the construction activities performed at the site.

3.1. PRE-CONSTRUCTION MEETING

The RA contractor hosted a pre-construction (kickoff) meeting on May 10, 2012. This meeting was attended by the Navy's Remedial Project Manager (RPM), the Resident Officers In Charge of Construction (ROICCs), and the Caretaker Site Office (CSO) representatives, along with the entire construction management team. During the meeting, the prime contractor arranged with the CSO representatives and ROICCs to establish locations or alignments for construction laydown areas, equipment staging areas, and haul routes. The prime contractor also reviewed the project planning documents and discussed their implementation plan and schedule.

3.2. GENERAL SITE CONTROLS

This section discusses site management and site controls, including:

- Site Access, Security, and Working Hours
- Aboveground and Underground Utility Clearance
- Land Surveying
- Stormwater Pollution Prevention
- Air Monitoring
- Archaeological Monitoring
- Traffic Routing and Controls

3.2.1. Site Access, Security, and Working Hours

Prior to mobilization, security passes were acquired for HPNS from the onsite Successor Agency to the San Francisco Redevelopment Agency office for all anticipated site workers and visitors. All field personnel, including subcontractors, checked in at the guard station when entering HPNS and were required to have an HPNS badge or an escort to enter the former shipyard.

Regular working hours were between 7:00 a.m. and 5:00 p.m., Monday through Friday, excluding federal holidays. Most work was performed during normal work hours. When work outside of regular working hours was required, the CSO representatives, ROICCs, and Navy RPM were consulted for approval prior to doing so. To minimize the disturbance to the neighboring community, work was performed during normal working hours as much as possible.

The original fence located on the northwest side of Fisher Avenue along the top of the slope of Parcel UC-2 was removed and replaced with temporary fence. Additional (temporary) fencing was mobilized and erected to enclose Parcels UC-1 and UC-2 during construction activities to prevent unauthorized access to the project sites (Figure 6). Field personnel inspected the site regularly to verify the integrity of the fence. The gates were secured during non-work hours. During work hours, site access was monitored and the gates remained closed to prevent unauthorized access. There were no incidents of theft or vandalism during this RA.

3.2.2. Aboveground and Underground Utility Clearance

Prior to conducting any subsurface activities, Underground Service Alert of Northern California (USA North) was notified of the planned excavation locations. USA North contacted the utility companies with publicly owned underground utilities in the vicinity to locate and clear the work area. An independent underground locating company was subcontracted to perform geophysical surveys in the areas where

subsurface work was performed. Results of the survey were used to support the prior identification of underground utilities and are presented in CQC Transmittal 14 (Appendix D).

A qualified electrician identified and inspected aboveground utilities prior to mobilization of equipment. Spotters were used in cases where live overhead power lines were present. Inactive power lines that could conflict with hillslope excavation were removed.

3.2.3. Land Surveying

Prior to the start of demolition or earthwork, a California-licensed land surveyor performed a pre-construction survey to verify the original topographical data, locate site features, and establish control points (photograph 1).

During construction, surveying was conducted on a regular basis to maintain ground control throughout the project area. Grade checking was performed throughout excavation work using string line techniques to confirm target elevations for placement of soil cover. A professional civil engineer oversaw all surveying and grade checking activities.

Photograph 1. Surveyors performing the pre-construction survey.

All site surveying was conducted to an accuracy of 0.1 foot horizontally and 0.01 foot vertically. All horizontal coordinates were based on the following surveying control datum: (basis of bearings) North American Datum 27 Zone-III. All vertical elevations were based on the following surveying control datum: (benchmark) National Geodetic Vertical Datum 29 (corrected).

3.2.4. Stormwater Pollution Prevention

Photograph 2. Environmental BMPs implemented and maintained throughout construction.

Environmental controls, including stormwater and construction best management practices (BMPs), were implemented in accordance with the project SWPPP (Appendix D of the Remedial Action Work Plan (RAWP) [ERRG, 2012b]). Environmental controls were maintained, as needed, throughout the entire duration of the project (photograph 2). Also, weekly, pre-storm, storm, and post-storm SWPPP inspections were performed and documented throughout the construction period. No unauthorized stormwater or non-stormwater

discharges occurred from the work area during construction. SWPPP inspection documentation spanning the period of construction (May 2012 through August 2012) is provided in Appendix B. BMP restoration and SWPPP inspections were performed under the operation and maintenance (O&M) phase of work until the established vegetation produced a stabilized condition, as defined by the Construction General Permit Order (2009-0009-DWQ).

3.2.5. Air Monitoring

Site-specific air monitoring stations were set up in each work area during mobilization and operated throughout the entire period of construction in accordance with the project Dust Control Plan included in Appendix E of the RAWP (ERRG, 2012b; photograph 3). Each monitoring station included separate monitoring systems for (1) total suspended particulates, arsenic, chromium, lead, and manganese; (2) particulate matter larger than 10 microns in size; and (3) asbestos. The Air Monitoring Summary Report provided in Appendix C describes (1) where and how air monitoring samples were collected, (2) what test methods were used to analyze air monitoring samples, and (3) how air monitoring data were evaluated.

Photograph 3. Setup of high-volume air monitoring station.

The report also summarizes data collected from the air monitoring stations and compares the air monitoring results with the established threshold criteria included in the project Dust Control Plan included in Appendix E of the RAWP (ERRG, 2012b). As shown in the summary report, no exceedances of airborne dust standards were recorded during construction activities.

In addition to upwind and downwind monitoring, work zone monitoring for dust was performed to protect site workers. The work zone monitoring data are included in the daily health and safety reports contained in the daily CQC documentation (Appendix D). Real-time dust monitoring was conducted by placing dust particulate meters upwind, downwind, and in the work zone throughout the construction period. The dust particulate meters were checked hourly throughout each workday, and the readings were recorded on daily air monitoring field logs (included in the daily CQC documentation provided in Appendix D). No exceedances of the project action levels were recorded during real-time dust monitoring throughout the construction period; therefore, no modifications were made to the dust control measures being implemented during the RA.

3.2.6. Archaeological Monitoring

In order to comply with the substantive requirements of Section 106 of the National Historic Preservation Act and its implementing regulations, Title 36 Code of Federal Regulations Part 800, the Navy assigned an archaeologist, who meets the Secretary of the Interior's qualification standards, to oversee excavation activities within archaeologically sensitive areas. This work complied with the terms of the January 1, 2000, Memorandum of Agreement between the Navy, Advisory Council on Historic Preservation, and State Historic Preservation Office. No archaeological resources were discovered during the RA. An Archaeological Monitoring Report describing the results of archaeological monitoring for the RA was prepared and is included in Appendix E.

3.2.7. Traffic Routing and Control

Onsite and offsite roads were used to mobilize and demobilize heavy equipment and to transport materials and equipment to and from HPNS. Traffic routes and controls were selected to maximize safety and convenience of motorists, pedestrians, and workers during construction activities. The project team worked closely with the ROICCs and CSO representatives to coordinate all construction activities that generated traffic to avoid conflicts with other activities on the base. Traffic routes were reviewed and modified, as necessary, throughout the period of construction.

Traffic controls were used to provide for the efficient completion of work activities in a safe working environment, while minimizing the impact on normal traffic flow. Traffic controls included:

- Loading and transporting materials, equipment, waste, or debris during off-peak hours to minimize disruptions to facility traffic.
- Reducing traffic by encouraging construction workers to carpool or vanpool to the site.
- Using cones, flags, signs, and other measures to facilitate loading and unloading of materials, as necessary.
- Certified flaggers were used when road paving hampered traffic in either direction.

Field personnel complied with the "Access and Haul Road Plan and Traffic Controls" included as Appendix E to the APP and SSHP (ERRG, 2012a). Extensive traffic routing coordination was performed with the tenants of the onsite San Francisco Police crime laboratory that occupy Building 606 because they were the entity most significantly affected by the rerouting of traffic.

3.3. MOBILIZATION AND SITE PREPARATION

This section discusses site management activities, including the following specific tasks:

- Equipment mobilization
- Establishment of support and construction work areas
- Installation of temporary fence

3.3.1. Equipment Mobilization

The following equipment and materials were mobilized to HPNS as needed for performance of this RA:

- Field trailer and mobile storage units
- Support equipment
- Portable toilets and hand wash stations
- Heavy equipment
- Traffic controls (e.g., flags, barricades, traffic delineators, and signs)
- PPE
- Decontamination supplies
- Spill response kits
- Hand tools
- Safety equipment (e.g., eyewash stations, first-aid kits, and dust monitors)
- Sampling and testing equipment (e.g., sampling supplies and testing devices)

All equipment was conspicuously marked for identification.

3.3.2. Establishment of Support and Construction Work Areas

Figure 6 shows the layout of the support and construction zones. The temporary field trailers were located in Building 123 in Parcel B. The field trailers were used to maintain all project plans and construction records, including the RAWP (ERRG, 2012b), contractor production reports, CQC documentation, and health and safety documentation, throughout the period of construction. The field trailers were also used to hold weekly CQC meetings and project team meetings.

The support area for equipment and material staging was also located inside and immediately outside of Building 123. This support area consisted of:

- A storage area for equipment and a laydown area for materials
- Lockable storage boxes for small equipment, materials, and sample processing supplies
- An area for onsite sanitary facilities and eyewash stations
- Dumpsters for construction debris and recyclable materials
- A parking area for non-construction vehicles

Potable water was procured from offsite sources (i.e., bottled water). Electrical power needs were satisfied with mobile gas-powered generators.

For the duration of the RA, the construction area, including Parcels UC-1 and UC-2 and the stockpile area in Parcel B, were maintained as a restricted access work zone to control unauthorized access to the work areas. Access to the construction work areas was controlled in accordance with the RAWP (ERRG, 2012b), and field personnel, including subcontractor personnel, complied with all precautions, practices, and PPE requirements to ensure health and safety, as specified in the APP and SSHP (ERRG, 2012a).

Support zones, exclusion zones, and the contaminant reduction zone were set up as specified in the APP (ERRG, 2012a). A wet and dry decontamination station, consisting of rumble strips, drain rock sump, sump pump, and a 1,000-gallon polyethylene water recycling tank, were installed in the contaminant reduction zone. However, only dry decontamination methods were needed to adequately decontaminate vehicles leaving the site during this RA. Therefore, no wash wastewater was generated during this RA.

3.3.3. Installation of Temporary Fence

Temporary fence panels were installed as described in Section 3.2.1 to delineate the work and support zones and to prevent unauthorized access to the construction site. The integrity of the temporary fencing was maintained throughout the construction period.

3.3.4. Groundwater Monitoring Well Protection

The three groundwater monitoring wells located along Robinson Street in Parcel UC-2 were protected throughout the construction period by leaving their original traffic-rated well boxes intact. The original well boxes protected the monitoring wells during mobilization and installation of the soil cover, when no work was performed near the wells. Two of the three well boxes were eventually removed and raised to match the new road elevation following installation of the asphalt cover. The third well box was not altered by this RA.

3.4. INSTALLATION OF SOIL COVER

Installation of the soil cover on Parcels UC-1 and UC-2 started on May 16, 2012. The soil cover was installed in accordance with the Final Design Basis Report (ChaduxTt, 2010a). The soil cover consists of approximately 2 feet of stabilized and vegetated clean fill. The following activities were completed during installation of the soil cover and are described in this section:

- Demolition, clearing, and grubbing
- Excavation of slopes (photograph 4)
- Import of soil cover materials
- Placement and compaction of soil cover material

Photograph 4. Hillslope excavation along Fisher Avenue.

- Installation of erosion control blankets
- Installation of vegetation

The as-built drawings depict the final soil cover grades (Appendix F).

3.4.1. Demolition, Clearing, and Grubbing

Prior to clearing and grubbing of hill slopes and other areas where the soil cover was installed, the existing fence parallel to Fisher Avenue was removed to create access to the hillside. Chain-link fence fabric and fence posts were removed using an excavator with a thumb attachment. Inactive irrigation lines were also removed. Following fence removal, all vegetation was cleared by hand or using an excavator. All fence and vegetation debris was transferred by dump truck to the designated stockpile area in Parcel B for temporary storage prior to disposal or recycling.

3.4.2. Excavation of Slopes

Before excavation work began, a pre-construction conditions survey was performed as described in Section 3.2.3. The survey allowed for documentation of original site grades to be matched by the new soil cover, identified the parcel boundaries used as the excavation limits, and allowed for establishment of control points and grade stakes to verify that design grades were achieved.

Excavation work started at the northwest end of Parcel UC-2 along Fisher Avenue and proceeded in a southwesterly direction along the hill slope. Excavations were performed using an excavator positioned at the bottom of the slope on Fisher Avenue. A minimum of 2 feet of soil was removed from each designated excavation location in most areas. In some areas, bedrock was encountered along the hill slope within 0.3 feet and 2 feet below original grade (see sheets C2-1 and C2-2 in Appendix F). Two feet of soil could not be removed in areas where bedrock was located within less than 2 feet of the original grade.

Photograph 5. Exposed bedrock on excavated hillslope.

Care was taken to not disturb the bedrock material that was uncovered because the bedrock potentially contains naturally occurring asbestos (photograph 5). Areas where bedrock was encountered are identified in the as-built drawings (Appendix F). Newly exposed hillslope soil was stabilized using soil stabilizer and tackifier at the end of each workday to control dust generation.

All excavated soil was loaded into dump trucks and transported to the stockpile area in Parcel B for future disposal. Soil piles were underlain and covered with plastic sheeting and surrounded with wattles when actively being created, as required by the project SWPPP (Appendix D of the RAWP [ERRG, 2012b]).

Trained grade checkers, with oversight of the CQC Manager (a licensed civil engineer), performed final verification of excavation grades (photograph 6). The verification of excavated grades is documented in the daily CQC documentation (Appendix D).

Photograph 6. Grade checker verifying excavation grades.

During slope excavation, a 1-inch-diameter metal pipe wrapped in asbestos-containing material was discovered at the top of the slope along Fisher Avenue, near the intersection with Horn Avenue. Upon discovery, the pipe was covered with plastic sheeting secured with sandbags and the area was cordoned off to restrict access until an asbestos abatement subcontractor could be mobilized to remove the asbestos-containing material. A licensed asbestos abatement contractor removed the pipe and any surrounding soil where asbestos-containing material had flaked off the pipe. The waste was triple wrapped in plastic, sealed with tape, and stored in the support zone until it was disposed of off site at a licensed disposal facility.

3.4.3. Import of Soil Cover Materials

Imported soil was approved for use following analytical, geotechnical, and radiological testing, in accordance with the project Sampling and Analysis Plan (SAP) (Appendix B of the RAWP [ERRG, 2012b]). The backfill sampling procedures were developed in accordance with the DTSC Information Advisory for Clean Imported Fill Material (DTSC, 2001), the HPNS basewide backfill acceptance procedure (Tetra Tech EC, Inc., 2010), the RODs (Navy, 2009a and 2009b), and the project specifications (ChaduxTt, 2010a). Trained sampling technicians, with oversight of the project chemist and CQC Manager, collected backfill samples. The project chemist and CQC Manager reviewed the sampling results to verify that the chemical and geotechnical specifications for each soil were met. One of the backfill materials tested exhibited concentration of iron and pH that exceeded the import fill criteria. The CQC Manager, the project chemist, and the Navy evaluated the exceedances and concluded they did not pose a hazard to future quality of groundwater and storm water. Therefore, the material was approved with the noted exceptions.

Appendix G contains the Navy-approved backfill acceptance reports for the two types of soil used to construct the soil cover.

Imported fill was transported to Parcels UC-1 and UC-2 by truck, as needed, and placed upon arrival to reduce the need to create large stockpiles of clean soil at the site (photograph 7). Direct placement of soil imported to the site by trucks minimized the risk of generating windblown dust and reduced stockpile erosion.

Photograph 7. Clean backfill imported by truck.

3.4.4. Placement and Compaction of Soil Cover Material

Photograph 8. Compaction of soil cover material with excavator wheel attachment.

Before placement and compaction of the cover material began, grade checkers installed grade stakes across the excavated areas to guide the installation of the cover. Throughout placement of soil, the grade checkers periodically restored grade stakes, as needed. The CQC Manager, a licensed professional engineer, oversaw all grade checking.

To install the soil cover, import fill trucks dumped soil where required in excavation areas. An excavator was used to distribute dumped soil across the excavation to a lift thickness of approximately 8 inches. The surface was then rolled with an excavator wheel attachment to achieve proper compaction (photograph 8). For the lower compacted layer of the soil cover (i.e., material at least 6 inches below final grade; identified as the nonerodible cover layer in the RD [ChaduxTt, 2010a]), each 8-inch lift was compacted to 85 percent or greater of the maximum dry density at ±2 percent of optimum moisture content in accordance with ASTM International (ASTM) Method D6938-10 (ASTM, 2010) and ASTM D1557-12 (ASTM, 2012), as specified in the RD (ChaduxTt, 2010a).

For the less compacted layer of the soil cover (i.e., material within 6 inches of the final grade; identified as the erosion-resistant cover layer in the RD [ChaduxTt, 2010a]), each lift was compacted to no greater than 85 percent of the maximum dry density at optimum moisture content in accordance with ASTM D6938-10 (ASTM, 2010) and ASTM D1557-12 (ASTM, 2012), as specified in the RD (ChaduxTt, 2010a). Compaction of the erosion-resistant cover layer was achieved using the bucket of the excavator, which created a smooth surface upon which to place the erosion control blankets.

The CQC Manager, a licensed professional civil engineer, oversaw all soil compaction testing and geotechnical analyses (photograph 9). A California-certified geotechnical testing laboratory performed the geotechnical tests. All certified field and laboratory geotechnical test results are included in the CQC documentation (Appendix D).

After placement of the clean soil cover, the drain rock and weep holes located behind the retaining wall in Parcel UC-2 were rehabilitated. To rehabilitate the retaining wall's drainage system, a 6-inch-wide by 2-foot-deep trench was excavated behind the retaining wall using hand tools. Filter fabric was then placed in the excavation and keyed into the hillside. Drain rock (1.5-inch) was then placed in the trench to the top of the retaining wall. Weep holes were checked for obstructions and cleaned out, as required. The retaining wall drain system was verified to be operational when watering of vegetation on the soil cover was performed.

Photograph 9. Nuclear density gauge and sand cone testing to verify soil cover compaction.

3.4.5. Installation of Erosion Control Blankets

Photograph 10. Installation of erosion control blanket over soil cover.

Erosion control blankets were installed across the entire vegetative cover upon completion of placement and compaction of import material (photograph 10). The erosion control blankets provide temporary erosion protection and structural support to surface soil during the vegetation establishment period. A shallow anchor trench was hand dug along the top and bottom of each slope where each erosion control blanket was to be installed. The edges of the erosion control blanket rolls were anchored into the trench with pins prior to backfilling. Erosion control blanket rolls were overlapped and shingled to prevent damage from sheet flow, in accordance with the manufacturer's installation instructions (Appendix D). Each roll was pinned to the soil using the manufacturer's

recommended pinning pattern and frequency. The CQC Manager verified the pin placement to ensure that the manufacturer's specifications were met.

3.4.6. Installation of Vegetation

Prior to installation of vegetation, a sample of the topsoil was collected and submitted to an agricultural laboratory to test the composition of the soil. The results of the composition test revealed that no additional fertilizer was needed to sustain plant growth. The following live plant species were installed on the soil cover in accordance with the RD (ChaduxTt, 2010a):

- Beach strawberry *(Fragaria chiloensis)*
- California poppy *(Eschscholzia californica)*
- Summer lupine *(Lupinus formosus)*

Photograph 11. Installation of live plants by hand on soil cover.

Plant locations were marked out on the ground and installed by hand in accordance with the planting schedule specified in the RD (photograph 11; ChaduxTt, 2010a). At each plant location, the erosion control blanket was cut in a cross pattern. Then, a hole large enough to accommodate the root ball was dug and the plant was placed inside the hole. Soil was then replaced around the plan root ball and stem and compacted by hand. The erosion control fabric flaps were then replaced around the plant to stabilize the cover surface around the base of the plant. The CQC Manager oversaw installation of plants to ensure that the planting frequency and installation practices conformed to the design requirements.

3.5. REPAIR AND INSTALLATION OF ASPHALT COVER

Robinson Street, Spear Avenue, and Fisher Avenue at Parcels UC-1 and UC-2 consisted of asphalt with varying degrees of degradation that required rehabilitation to achieve the RAOs identified in the RODs (Navy, 2009a and 2009b). All paved surfaces on these roadways were repaired in accordance with the RD, as described in the following subsections (ChaduxTt, 2010a).

This section describes the following activities associated with repair and installation of the asphalt cover:

- Identification of repair locations and repair types
- Removal of AC pavement and AB
- Removal of subgrade (SG)
- Installation of SG and AB
- Installation of AC pavement
- Installation of asphalt overlay
- Installation of asphalt seal
- Drainage improvements
- Road striping and traffic signs

Figures 7 and 8 and the as-built drawings (Appendix F) identify the paved areas that received the different repair treatments and the final site grades.

3.5.1. Identification of Repair Locations and Repair Types

A visual inspection was performed to identify sections of roadway that did not meet the durability standards outlined in the RD (ChaduxTt, 2010a). The CQC Manager, a registered professional civil engineer, was responsible for identifying portions of the pavement that required repairs or replacement to meet the project specifications. Once identified, the necessary repairs were made to achieve the performance standards specified in the RD (ChaduxTt, 2010a). Table 2 summarizes the visual observation criteria used by the CQC Manager in selecting the appropriate repair methods for the various levels of asphalt degradation. The following subsections (as referenced in Table 2) provide detail on how each of the proposed repairs was made.

3.5.2. Removal of Asphaltic Concrete Pavement and Aggregate Base

A grinding machine was mobilized to Parcels UC-1 and UC-2 on August 14, 2012 (photograph 12). The grinding machine was used to mill away the original asphalt to varying depths based on the degree of degradation (see sheets C2-1 and C2-2 in Appendix F). The grinding machine milled 4 inches in locations where only the AC needed to be replaced. An 8-inch grind was performed in locations where both the AC and AB needed to be replaced. A conveyor belt was used to transfer AC and AB rubble generated by the grinding machine into dump trucks, which transported the waste to the

Photograph 12. Grinding of damaged asphalt pavement.

designated stockpile area in Parcel B. Stockpile BMPs were implemented to prevent migration of sediment and pollutants from the AC and AB rubble piles in accordance with the SWPPP (Appendix D of the RAWP [ERRG, 2012b]). Dust control measures and monitoring were implemented throughout grinding activities in accordance with the Dust Control Plan (Appendix E of the RAWP [ERRG, 2012b]).

3.5.3. Removal of Subgrade

SG was removed in areas where original asphalt was observed to be sagging below the surrounding grade (photograph 13). The areas where SG was removed were delineated with spray paint, and a walk-behind saw cutter was used to cut clean edges into the original AC to minimize disturbance to the surrounding original AC during removal of the SG. An excavator directly loaded the removed SG spoils into dump trucks at the area of concern. The CQC Manager, a licensed professional engineer, oversaw all SG removal activities to ensure that all SG areas requiring replacement were removed to an appropriate depth. During the excavation process, the CQC Manager visually observed the competency of existing SG material, such as the ease with which the material could be scarified and removed by heavy equipment, to identify the final removal depth. The original (undisturbed) road base beneath the excavated SG material was visibly different in appearance, strength, and competency than the surficial road base material. The only SG material that required removal was loose and oversaturated material that had been disturbed by previous Navy actions, and that had not been compacted to the level of the original road base material beneath it. SG removal depths varied by area and ranged between 6 and 24 inches (see sheets C2-1 and C2-2 in Appendix F). SG was primarily removed in areas that align with former sewer and storm drain lines.

Photograph 13. Asphalt subgrade excavation in areas where former asphalt pavement was sagging below the surrounding grade.

Dump trucks were used to move the excavated SG spoils to the stockpile management area in Parcel B, and stockpile BMPs were implemented in accordance with the SWPPP (Appendix D of the RAWP [ERRG, 2012b]). During removal of SG, dust control and monitoring measures were implemented in accordance with the Dust Control Plan (Appendix E of the RAWP [ERRG, 2012b]). Newly excavated subgrade repair areas were stabilized using soil stabilizer and tackifier at the end of each workday.

3.5.4. Installation of Subgrade and Aggregate Base

Photograph 14. Compacting aggregate base using a smooth drum compactor.

Approved SG and AB material were imported and directly loaded into each excavated location via dump truck. Appendix G provides the backfill acceptance reports for each of these materials (i.e., clean backfill and recycled AB). Each material was installed in accordance with the design specifications in the RD (ChaduxTt, 2010a). SG material was placed at the bottom of each excavation and compacted in 6-inch lifts to no less than 95 percent of maximum dry density at ±3 percent of optimum moisture content. A small bulldozer was used to move and grade the material, while a sheepsfoot compactor was used to achieve the specified compaction (photograph 14). AB was placed on top of the SG material in each excavation and compacted to a depth of 4 inches below final grade. A smooth drum compactor was used to create a smooth working surface in preparation for placement of AC. A grade checker confirmed that AB was installed to within 4 inches below final grade in preparation for the replacement AC. The CQC Manager, a licensed professional civil engineer, oversaw all installation and compaction testing of SG and AB. Compaction results are included in the CQC submittals (see Appendix D).

During preparation of the subgrade, the traffic-rated well boxes for two of the three groundwater monitoring wells (IR06MW54F and IR06MW56F) located along Robinson Street in Parcel UC-2 were raised to match the final grade of the surrounding asphalt. Areas around these wells were sawcut and removed. After which, new concrete pads were poured and new traffic-rated well boxes were set in the concrete at the new asphalt elevation, so the well boxes would be flush with the surrounding road grade. None of the well casings were modified or extended during this process, thus the top-of-casing elevations used to measure the depth to groundwater in these wells did not change. Table 3 presents the survey elevations for the monitoring well box lids prior to and following construction. The well casing and the original traffic-rated well box for monitoring well IR06MW55F were not modified during this RA because the asphalt surface surrounding the well was not modified during restoration of the asphalt cover.

3.5.5. Installation of Asphaltic Concrete Pavement

AC was placed on smooth working surfaces comprising either original or new AB. Before installing new AC on the compacted AB, the area was swept with a commercial street sweeper to remove loose material on the surface to be paved. AC meeting the project specifications was imported from a nearby AC manufacturing plant using dump trucks. The AC was loaded directly into an AC paving machine as it applied 2-inch lifts of AC over the areas to be paved. Each lift was placed and compacted with a smooth drum roller until the AC was 4 inches thick (i.e., two lifts thick). The CQC Manager, a licensed professional civil engineer, oversaw installation of the AC. A third-party company (and a certified offsite laboratory) tested all installed AC to verify that the material type and placement met the requirements of the design specification in the RD (photograph 15; ChaduxTt, 2010a). AC testing results are included in the CQC submittals (see Appendix D).

Photograph 15. Coring to collect AC sample for offsite analysis by a certified material testing laboratory.

3.5.6. Installation of Asphalt Overlay

Asphalt overlay was applied to areas where small- to medium-sized cracks (i.e., 1/4 inch to 3/4 inch wide) were identified. Prior to installation of asphalt overlay, the damaged areas were swept with a commercial street sweeper to clean the surface from miscellaneous debris. An SS-1 emulsion tack coat binding agent was placed over the original AC to provide cohesion between the original AC and the new AC overlay material. Prior to installation, the CQC Manager verified that the binding agent used met the design specification in the RD (ChaduxTt, 2010a) (see Transmittal 26 in Appendix D). A paving machine applied the overlay as a single 1.5-inch-thick lift of asphaltic mixture with a maximum aggregate size of 1/2 inch, in accordance with the project specifications (ChaduxTt, 2010a). Compaction was performed with a smooth drum roller following application of the 1.5-inch-thick AC overlay. The CQC Manager, a licensed professional civil engineer, oversaw installation of the AC overlay. A third-party testing company (and a certified offsite laboratory) tested the installed AC overlay to verify that the material and placement met the design specification in the RD (ChaduxTt, 2010a). AC testing results are included in the CQC submittals (see Appendix D).

3.5.7. Installation of Asphalt Seal

Photograph 16. Asphalt seal application at intersection of Spear Avenue and Crisp Road.

Asphalt seal was used to preserve and restore existing intact asphalt (photograph 16). Asphalt seal was applied to areas where only hairline cracks were present in the original AC surface. The seal is a blend of asphaltic emulsion mineral fibers and polymers formulated to fill voids and provide a smooth, black surface. Before applying asphalt seal to a given location, a commercial street sweeper washed and swept the original AC to improve cohesion of the seal to the original asphalt surface. Prior to application, the CQC Manager verified that the asphalt seal product met the requirements in the project specifications (ChaduxTt, 2010a). Asphalt seal was applied by a sealing machine and broom-finished by hand. The CQC Manager, a licensed professional civil engineer, oversaw all asphalt-sealing activities to ensure proper application and coverage were achieved. All paved areas at Parcels UC-1 and UC-2, where pavement was in good condition and new AC was not applied, were treated with an asphalt seal.

3.5.8. Drainage Improvements

Although not specified as a requirement in the RD (ChaduxTt, 2010a) and not directly required to meet the RAOs in the RODs (Navy, 2009a and 2009b), the Navy made reasonable efforts to improve drainage at Parcels UC-1 and UC-2 to minimize future ponding of rainwater that might compromise the lifespan of the new asphalt cover. To improve site drainage, the most significant topographic depressions along Fisher and Spear Avenues were filled with asphalt so they more closely matched the surrounding final grades. Additionally, new AC was sloped to the extent practicable toward existing drain inlets in the roadways and drain inlets were cleared of debris to improve their ability to convey water to the drainage swales in Parcels C and G. Also, existing curbs and gutters were inspected to ensure they were intact and would adequately prevent water from eroding the new soil cover. Where damaged or missing, new AC curb was installed (photograph 17). The CQC Manager, a licensed professional civil engineer, prescribed all drainage improvements following an evaluation of the pre-construction survey data and inspections and in consultation with the Navy RPM.

Photograph 17. New AC curb installed where damaged or missing.

3.5.9. Road Striping and Traffic Signs

Following installation of the asphalt cover, new road stripes were painted on all roadways and new traffic signs were installed. The CSO representatives and the ROICCs approved the road striping plan prior to implementation (Appendix D).

3.6. INSPECTION AND REPAIR OF BUILDING FOUNDATIONS AND UTILITY CORRIDORS

Parcels UC-1 and UC-2 contain the following three buildings: Buildings 819 and 823 and the security guard shed. The CQC Manager, a licensed professional civil engineer, carefully inspected the building foundations for cracks or other damage (e.g., signs of crumbling or wear). Three penetrations were identified in the foundation of Building 823. The penetrations were filled with non-shrink grout in accordance with Specifications Section 03 30 00, "Concrete" (ChaduxTt, 2010a). All other building foundations were found to be intact and in good condition.

The CQC Manager also inspected abandoned utility corridors, trenches, chases, and conduits for cracking and damage. Utility corridors and chases within the roadways (i.e., with traffic-rated covers) were sealed or paved over. Some utility lids were not intact (e.g., had missing or compromised steel plates), thus they could not be incorporated into the AC cover. The lids of those features were repaired with additional steel and welded shut to prevent access. The original steel grates covering the underground vault near Building 819 were also welded together to prevent access. The CQC Manager, a licensed professional civil engineer, oversaw all sealing of underground features.

3.7. INSTALLATION OF FENCE AND SIGNS

Photograph 18. Installation of fence posts along top of hillslope.

All fences removed during implementation of the RA were replaced with new fences following construction of the durable covers (photograph 18). A new fence was constructed along the western property boundary of Parcel UC-2 at the crest of the hillslope. This fence prevents access to the hill slope from the Building 101 and Building 110 parking lot in adjacent non-Navy property. The CQC Manager, a licensed professional civil engineer, verified that the fence alignment, materials, and installation procedures conformed to the design drawings and specifications.

Informational signs were placed along the new fence alignment to deter unauthorized access or digging into the soil cover while the property is under Navy ownership (photograph 19). The sign locations and their content are shown in the as-built drawings (see sheets C4-1 and C4-2 in Appendix F).

Photograph 19. Informational sign installed along new fence.

During construction of the soil cover, a dilapidated guardrail was removed from the corner of Horn and Robinson Streets. The guardrail was replaced with a new one that follows the same alignment.

3.8. CHARACTERIZATION, MANAGEMENT, AND DISPOSAL OF WASTE STOCKPILES

Stockpiles generated during implementation of the RA were kept separate within the stockpile management area located in Parcel B. Each stockpile was placed on a polyethylene liner to prevent any contamination of pavement or soil beneath the pile. Each stockpile was covered with soil stabilizer or polyethylene sheeting to prevent any dust migration. BMPs, including fiber roles, were installed around the base of the stockpiles and sandbags were used to ensure that piles remained covered. All stockpiles were maintained in accordance with the SWPPP (Appendix D of the RAWP [ERRG, 2012b]).

Characterization samples were collected from each stockpile in accordance with the SAP (Appendix B of the RAWP [ERRG, 2012b]). Discrete samples collected from each stockpile were analyzed for metals, VOCs, semivolatile organic compounds, pesticides, PCBs, and total petroleum hydrocarbons, as dictated by the waste disposal facilities.

Final offsite transportation and disposal of waste stockpiles was managed under the basewide waste transportation and disposal contract. The RA contractor coordinated with the basewide waste transportation and disposal contractor, as well as the CSO representatives and the ROICCs, to ensure that all wastes generated were appropriately stored, hauled off site, and disposed of. Following waste characterization, soil was loaded into trucks and hauled to the appropriate disposal facility based on its waste classification. Waste hauling trucks were decontaminated and covered prior to leaving HPNS to ensure that no waste was blown out of trucks or was tracked off site on truck tires. Trucks were decontaminated using dry decontamination methods, and no wash wastewater was generated during the process. In total, approximately 8,371 tons of Class II nonhazardous waste, including 8,147 tons of soil and 224 tons of vegetation, was removed. An additional 2,919 (approximate) tons of asphalt rubble was generated from grinding operations. This material is currently stockpiled in Parcel B and will be reused

by contractors at HPNS as base material for temporary roads in the future. Appendix H includes waste profiling and disposal documentation.

3.9. POST-CONSTRUCTION ACTIVITIES

The following post-construction activities were performed after the RA:

- Site cleanup and demobilization
- Completion inspections
- Post-construction (as-built) site survey
- Vegetation establishment

The following subsections discuss each post-construction activity.

3.9.1. Site Cleanup and Demobilization

A final site cleanup was performed after completion of construction. All waste materials, rubbish, and debris resulting from construction activities were removed. Upon finishing site cleanup, the CSO representatives and ROICCs completed a site inspection and concurred that site cleanup was complete. All equipment, personnel, facilities, and equipment related to the RA were then demobilized from the worksite.

3.9.2. Completion Inspections

Completion inspections included a pre-final inspection and a final acceptance inspection. The inspections were performed in accordance with the CQC Plan (Appendix A of the RAWP [ERRG, 2012b]), as described below.

The Project Manager, CQC Manager, CSO representatives, and the ROICCs performed the pre-final inspection on September 8, 2012. The CQC Manager generated a punchlist of the items identified during the pre-final inspection and follow-up inspection to ensure that all punchlist items were completed. When all punchlist items were completed, the CQC Manager notified the Navy RPM, CSO representatives, and ROICCs that the parcels were ready for their inspection and the final acceptance inspection was scheduled.

The final acceptance inspection was completed on September 18, 2012, and was attended by the Project Manager, the CQC Manager, CSO representatives, and the ROICCs. All Navy parties verified the completion of the punchlist items and signed the final acceptance documentation.

Appendix D provides copies of the pre-final inspection and final acceptance inspection forms.

3.9.3. Post-Construction (As-Built) Site Survey

A California-licensed land surveyor performed the post-construction (as-built) survey to document as-built conditions, including final site grades, installation locations, and elevations of key site features. The results of the post-construction survey were used to generate as-built drawings included in Appendix F. The post-construction survey was conducted to an accuracy of 0.1 foot horizontally and 0.01 foot vertically. All horizontal coordinates were based on the following surveying control datum: (basis of bearings) North American Datum 27 Zone-III. All vertical elevations were based on the following surveying control datum: (benchmark) National Geodetic Vertical Datum 29 (corrected).

Photograph 20. Stamped settlement monument medallion.

Four settlement monuments were installed on the final cover at the locations specified by the RD (photograph 20; ChaduxTt, 2010a). Surveyors recorded monument locations and elevations on medallions affixed to the settlement monuments after they were installed. The settlement monuments will be surveyed in accordance with the Operations and Maintenance Plan (OMP) to assess the magnitude of settlement of the durable cover, if any, during the O&M period (ERRG, 2013).

3.9.4. Vegetation Establishment

The vegetation establishment period began as soon as the plants were installed on the soil covers in July 2012, and will continue until the entire cover is vegetated and stabilized by plants. To satisfy the vegetation establishment requirements specified by the RD (ChaduxTt, 2012a), a temporary irrigation system was installed to efficiently water the vegetated soil cover. Vegetation will be periodically inspected to assess plant growth until vegetation is fully established. Dead or dying plants will be replaced, as needed, during the vegetation establishment period to ensure that proper coverage is achieved. Vegetation establishment inspections and watering are performed by the CQC Manager, CQC Officers, and the Project Superintendent.

3.10. DEVIATIONS AND MODIFICATIONS

Construction activities were performed in accordance with the RD (ChaduxTt, 2010a) and RAWP (ERRG, 2012b), except for the single deviation discussed in this section. As discussed in Section 3.4.2, bedrock was encountered while performing excavations of the hill slope on the west portion of Parcel UC-2. The original design called for excavation of 2 feet of soil and backfilling with 2 feet of clean soil to provide a durable cover. In some areas, bedrock was encountered within 0.3 feet and 2 feet below the original grade before the target depths were reached. The design also indicated if bedrock was

encountered, to clear and leave the bedrock exposed without placing a durable cover over it. To make the slope of the soil cover uniform, the contractor placed and graded backfill material over areas where bedrock was encountered on the hill slope, so no dips or valleys would be visible. The resulting soil cover in areas where bedrock was encountered may not be 2 feet thick in areas where bedrock was encountered within less than 2 feet of the original grade. The Navy RPM, the design engineer, and the ROICCs approved this approach. Also, the regulatory agencies were informed of this approach at a Base Realignment and Closure Cleanup Team meeting held on June 28, 2012.

Section 4. Ongoing Activities

Ongoing activities associated with the remedy at Parcels UC-1 and UC-2 include vegetation establishment; operation, maintenance, and monitoring of the durable covers; groundwater monitoring; and implementation and monitoring of the land use controls (LUCs). The following subsections describe each of these ongoing activities.

4.1. VEGETATION ESTABLISHMENT

Vegetation establishment will continue until the entire cover is vegetated and stabilized by plants. A temporary irrigation system was installed to efficiently water the vegetated soil cover. Vegetation will be periodically inspected to assess plant growth until vegetation is fully established. Dead or dying plants will be replaced, as needed, during the vegetation establishment period to ensure that proper coverage is achieved. See Section 3.9.4 for additional details on vegetation establishment.

4.2. MAINTENANCE AND MONITORING OF DURABLE COVERS

Maintenance and monitoring of the remedy implemented at Parcels UC-1 and UC-2 were started following completion of the RA in September 2012 and are ongoing. Maintenance and monitoring of the remedy will initially be implemented in accordance with the pre-construction OMP (ChaduxTt, 2010b). Long-term maintenance and monitoring will be performed in accordance with the post-construction OMP (ERRG, 2013). The OMP describes the long-term maintenance and monitoring requirements for the durable covers at Parcels UC-1 and UC-2, thus it fulfills the substantive requirements of the applicable or relevant and appropriate requirements related to maintenance and monitoring for soil and durable covers in the RODs (Navy, 2009a and 2009b).

The OMP includes:

- A description of inspection, maintenance, and repair of the durable covers at Parcels UC-1 and UC-2
- A list and copies of the manufacturers' cut sheets
- As-built construction drawings and O&M-related specifications
- A maintenance schedule
- Guidance for inspection of signs, drainage features, erosion control, final grade, and the condition of the durable covers

- Potential repair procedures that may be necessary during the life of the covers
- Reporting requirements

4.3. GROUNDWATER MONITORING

Groundwater monitoring is ongoing under the existing basewide groundwater monitoring program. Periodic monitoring reports are published that describe the monitoring results and compare the results to the RAOs established in the RODs (Navy, 2009a and 2009b). Groundwater monitoring will continue until RAOs for groundwater are met.

4.4. LAND USE CONTROLS

The RODs require implementation of land use restrictions to limit exposure of future landowners or users of the property to hazardous substances and to maintain the integrity of the remedy (Navy, 2009a and 2009b). The LUC objectives will be met by controlling access to the property until the time of transfer.

The activity and land use restrictions described in the LUC RD Report (ChaduxTt, 2010c) will be incorporated into the Quitclaim Deed and Covenant to Restrict Use of Property and will take effect upon transfer to the CCSF and issuance of those documents.

Throughout the O&M period, inspections will be performed to verify that the requirements specified in the Institutional Control (IC) Compliance Monitoring Report are met (ChaduxTt, 2010c).

Section 5. Demonstration of Completion

The RA is deemed to be complete when all the RAOs are met. Tables 4 and 5 summarize the RAOs for Parcels UC-1 and UC-2 and how they were achieved through proper implementation and satisfactory completion of the final remedy in accordance with the RD, and will continue to be achieved through development and implementation of the OMP and ICs.

Section 6. Community Relations

Prior to the start of work, the RAWP was made available to the public at two local repositories, including the CCSF Main Library and the HPNS Library (located in the Bayview/Hunters Point community).

To implement the RA, the RA contractor needed to access Parcel UC-2 from the parking lot surrounding Buildings 101 and 110, which is located on adjacent non-Navy property. The adjacent non-Navy property is currently leased to the CCSF's developer. The developer, in turn, leases Buildings 101 and 110 to a private entity that rents building space to the current building tenants. Prior to mobilization, the RA contractor coordinated access to the parking lot surrounding Buildings 101 and 110 with the developer, the building lessees and tenants, and the Navy CSO representative. On May 3, 2012, a Memorandum of Agreement (MOA) between the Navy and the property management company was established with and accepted by both parties. The MOA established the logistics and approach for working within the parking lot above the slope along Fisher Avenue near Buildings 101 and 110. During development of the MOA (or Work Notice), the RA contractor and the property management representatives collaborated to resolve any potential issues that might inconvenience the tenants of Buildings 101 and 110. The MOA also established substantive conditions needed to ensure that the Navy's use of a portion of the parking lot during the RA did not adversely impact the property or the current property developer, lessor, lessees, and tenants. The MOA provided information to the tenants and property management on (1) the project schedule, (2) areas of encroachment that might affect current access and egress and accessibility to the buildings and associated parking areas, and (3) key contractor personnel that can be contacted to respond to inquiries about the work being performed or to resolve issues that may arise during the construction period. The property management company distributed the MOA (or Work Notice) to every tenant in Buildings 101 and 110 prior to construction. The cooperation and coordination between the Navy and the tenants of Buildings 101 and 110 were seamless and did not result in any significant disruptions to the tenants of Buildings 101 and 110.

A community meeting was held on August 22, 2012, during implementation of the RA, to describe the nature of the remedy selected for Parcels UC-1 and UC-2, to update the community on the progress of the RA work being performed, to inform the community about the monitoring and protective measures being implemented to protect nearby residents and the local environment throughout the RA, and to allow the community to ask questions or express concerns about implementation of the RA. In addition, all meeting attendees were invited to join a breakout session to discuss and ask questions about the RA being performed with the Navy and the regulatory agencies.

A Fact Sheet was created to describe the work performed as part of the RA and to document successful completion of the RA. The Fact Sheet is included in Appendix I and will be distributed electronically and in hard copy to the HPNS community mailing list following final acceptance of this RACR. The HPNS distribution list contains approximately 2,500 recipients.

Section 7. Project Costs

The approximate costs to perform the RA are provided below. It should be noted that the cost summary below does not include the costs associated with maintenance and monitoring of the remedy.

Project Element	Cost
Pre-Construction Documents	$89,000
Labor	$743,000
Materials	$395,000
Equipment	$158,000
Subcontractors	$1,416,000
Waste Disposal	$441,000
Post-Construction Documents	$47,000
Total	*$3,289,000*

The actual RA implementation costs differed significantly from the estimated cost of $883,612 provided in the RD (ChaduxTt, 2010a). The difference in cost occurred because the condition of the asphalt covers in Parcels UC-1 and UC-2 had degraded significantly between the time the RD was developed in 2010 and the RA was implemented in 2012. The cost estimate in the RD assumed that most of the roadway could be repaired by filling and sealing cracks, and that only 2 percent of the roadway would require replacement of asphalt. At the time of the RA, approximately 14 percent of the roadway required subgrade repairs or replacement, 41 percent of the roadway required asphalt replacement, and 58 percent required asphalt overlay. This discrepancy between the RD estimates and actual conditions during implementation of the RA resulted in additional labor, equipment, material, and disposal costs. The following table compares the most significant discrepancies in the asphalt repair assumptions, which resulted in the large discrepancy in cost between the RD and the RA.

Repair Method	RD Estimate (ft^2)	Actual RA Areas (ft^2)
AC Overlay	16,200	129,020
AC Replacement	10,800	93,548
AB Replacement	0	16,663
SG Repair	0	14,590

Section 8. Certification Statement

I certify that this RACR memorializes the completion of construction activities to implement the RA at Parcels UC-1 and UC-2 at the former HPNS. The RA was implemented pursuant to the RODs for Parcels UC-1 and UC-2 (Navy, 2009a and 2009b), the RD for Parcels UC-1 and UC-2 (ChaduxTt, 2010a), and in accordance with the Final RAWP (ERRG, 2012b). No additional construction activities for remediated areas are anticipated at this time, thus the RA is deemed complete. Maintenance and monitoring of the remedy will be performed in accordance with the Pre-Construction OMP (ChaduxTt, 2010b) until the Post-Construction OMP is finalized in March 2013. The LUC objectives will be met using access controls and signs until the time of property transfer. The activity and land use restrictions described in the LUC RD Report (ChaduxTt, 2010c) will be incorporated into the Quitclaim Deed and Covenant to Restrict Use of Property and will take effect upon transfer and issuance of those documents.

Mr. Keith Forman
BRAC Environmental Coordinator
Hunters Point Naval Shipyard

Date

Section 9. References

ASTM International (ASTM). ASTM D6938 – 10, "Standard Test Method for In-Place Density and Water Content of Soil and Soil-Aggregate by Nuclear Methods (Shallow Depth)."

ASTM, 2012. ASTM D 1557-12, "Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Modified Effort, (56,000 ft-lbf/ft3 [2,700 kN-m/m3])."

ChaduxTt, 2010a. "Final Remedial Design Package, Parcels UC-1 and UC-2, Hunters Point Shipyard, San Francisco, California." December.

ChaduxTt, 2010b. "Final Preconstruction Operation and Maintenance Plan, Parcels UC-1 and UC-2, Hunters Point Shipyard, San Francisco, California." December.

ChaduxTt, 2010c. "Final Land Use Control Remedial Design, Parcels UC-1 and UC-2, Hunters Point Shipyard, San Francisco, California." December.

Department of Toxic Substances Control (DTSC), 2001. "Information Advisory, Clean Imported Fill Material." October. Available Online at: <http://www.dtsc.ca.gov/Schools/index.cfm#Fact_Sheets_and_General_Information>.

DTSC, 2011. "Radiological Free Release for Parcels UC-1 and UC-2, Hunters Point Shipyard, San Francisco, California." September 14.

Department of the Navy (Navy), 2006. "Final Basewide Radiological Removal Action, Action Memorandum, Revision 2006, Hunters Point Shipyard, San Francisco, California." April 21.

Navy, 2009a. "Final Record of Decision for Parcels D-1 and UC-1, Hunters Point Shipyard, San Francisco, California." July 24.

Navy, 2009b. "Final Record of Decision for Parcel UC-2, Hunters Point Shipyard, San Francisco, California." October 28.

Navy, 2011. "Final Removal Action Completion Report for Parcels UC-1 and UC-2, Hunters Point Shipyard, San Francisco, California." March 2.

Navy, 2012. "Hunters Point Naval Shipyard, Base Realignment and Closure Team Cleanup Team Meeting Minutes, June 28, 2012." July.

Engineering/Remediation Resources Group (ERRG), 2012a. "Accident Prevention Plan for Remedial Action in Parcels UC-1 and UC-2, Hunters Point Naval Shipyard, San Francisco, California." March 2.

ERRG, 2012b. "Remedial Action Work Plan for the Remedial Action of Parcels UC-1 and UC-2, Hunters Point Naval Shipyard, San Francisco, California." June.

ERRG, 2013. "Draft Operation and Maintenance Plan, Parcels UC-1 and UC-2, Hunters Point Naval Shipyard, San Francisco, California." January 25.

Naval Sea Systems Command, 2004. "Historical Radiological Assessment, Volume II, History of the Use of General Radioactive Materials 1939–2003." August.

Sealaska, 2011. "Draft Phase I Technical Memorandum for Soil Vapor Intrusion at Parcels B, D-1, G, and UC-2, Hunters Point Naval Shipyard, San Francisco, California." July.

SulTech, 2007. "Revised Final Feasibility Study for Parcel D, Hunters Point Shipyard, San Francisco, California." November 30.

SulTech, 2008. "Final Feasibility Study Report for Parcel C, Hunters Point Shipyard, San Francisco, California." July 31.

Tetra Tech EC, Inc., 2006. "Hunters Point Shipyard Project Backfill Review and Acceptance Procedure, HPO-Tt-0270, Revision 1." April.

Tetra Tech EC, Inc., 2010. "Final Basewide Dust Control Plan, Revision 1, Hunters Point Shipyard, San Francisco, California." November 29.