Naval Facilities Engineering Command Mid-Atlantic
Norfolk, Virginia

Remedial Action Completion Report

Site 00019 – Former Derecktor Shipyard
Marine Sediment, Operable Unit 5

Naval Station Newport
Newport, Rhode Island

September 2019

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REMEDIAL ACTION COMPLETION REPORT

SITE 00019 – FORMER DERECKTOR SHIPYARD
MARINE SEDIMENT OPERABLE UNIT 5

NAVAL STATION NEWPORT
NEWPORT, RHODE ISLAND

COMPREHENSIVE LONG-TERM
ENVIRONMENTAL ACTION NAVY (CLEAN) CONTRACT

Submitted to:
Department of the Navy
Naval Facilities Engineering Command Mid-Atlantic
9324 Virginia Avenue
Norfolk, Virginia 23511-3095

Submitted by:
Tetra Tech
5700 Lake Wright Drive, Suite 102
Norfolk, Virginia 23502

CONTRACT NUMBER N6247016D9008
CONTRACT TASK ORDER WE10

SEPTEMBER 2019

PREPARED UNDER THE DIRECTION OF:

STEPHEN PARKER, LSP
PROJECT MANAGER
TETRA TECH
SALEM, NEW HAMPSHIRE

APPROVED FOR SUBMISSION BY:

STEVEN H. RUFFING, P.E.
PROGRAM MANAGER
TETRA TECH
NORFOLK, VIRGINIA

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Table of Contents

List of Tables

List of Figures

Acronyms and Abbreviations

µg/kg	Microgram per kilogram
ARAR	Applicable and Relevant and Appropriate Requirement
CCR	Construction Completion Report
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
cm/sec	Centimeter per second
COC	Contaminant of concern
CST	Column settling tests
CTO	Contract Task Order
DoD	Department of Defense
DRET	Dredge elutriate tests
EOD	Explosive Ordnance Disposal
EPA	United States Environmental Protection Agency
ERA	Ecological Risk Assessment
ER, N	Environmental Restoration, Navy
ERP	Environmental Restoration Program
ESS-DR	Explosives Safety Submission-Determination Request
FFA	Federal Facility Agreement
FS	Feasibility Study
HHRA	Human Health Risk Assessment
HMW	High molecular weight
LUC	Land use control
mg/kg	Milligram per kilogram
NAVFAC	Naval Facilities Engineering Command

NAVSTA	Naval Station
NCP	National Oil and Hazardous Substances Pollution Contingency Plan
NETC	Naval Education and Training Center
NOSSA	Naval Ordnance Safety and Security Activity
NPL	National Priorities List
NUWC	Naval Undersea Warfare Center
OU	Operable Unit
PA	Preliminary Assessment
PAH	Polycyclic aromatic hydrocarbon
PCB	Polychlorinated biphenyl
PDI	Pre-design investigation
PRD	Pre-remedial design
PRG	Preliminary remedial goal
RAB	Restoration Advisory Board
RACR	Remedial Action Completion Report
RAO	Remedial action objective
RD	Remedial design
RIDEM	Rhode Island Department of Environmental Management
ROD	Record of Decision
SSI	Supplemental Sediment Investigation
SWAC	Surface-area weighted average concentration
TtEC	Tetra Tech EC, Inc.
URI	University of Rhode Island
USCG	United States Coast Guard

1.0 Overview

This Remedial Action Completion Report (RACR) for Site 19 – Former Derecktor Shipyard, Operable Unit (OU) 5 at Naval Station (NAVSTA) Newport, Rhode Island (formerly the Naval Education and Training Center [NETC]), was prepared to demonstrate that the remedy, as selected by the OU5 Record of Decision (ROD) (Navy, 2014), has been completed and that all remedial action objectives (RAOs) have been met. This RACR was prepared on behalf of the United States Naval Facilities Engineering Command (NAVFAC) by Tetra Tech, under Comprehensive Long-Term Environmental Action Navy Contract Number N6247016D9008, Contract Task Order (CTO) WE10.

This RACR was prepared in accordance with the Department of Defense (DoD) and United States Environmental Protection Agency (EPA) Joint Guidance on Recommended Streamlined Site Closeout and National Priority List (NPL) Deletion Process for DoD Facilities (2006). This RACR will demonstrate that the following criteria have been met at OU 5:

- All construction activities are complete.
- RAOs and cleanup goals stated in the OU5 ROD were met.
- Land use controls (LUCs) are in place, as appropriate.
- A final inspection or equivalent has been conducted.
- Site is protective of human health and the environment.
- EPA and Rhode Island Department of Environmental Management (RIDEM) have approved the RACR.

This RACR summarizes the remedial action conducted at OU5. In accordance with the Joint Guidance (DoD and EPA, 2006), this RACR references existing material to the maximum extent possible and does not duplicate language found in other reports. Detailed descriptions of the remedial action conducted are presented in the Construction Completion Report (CCR) (TtEC, 2018).

This section includes a brief description of OU5 and its history, major findings and results of site investigation activities, and the contaminants of concern (COCs) identified for the OU.

1.1 Site Description

NAVSTA Newport is located approximately 25 miles south of Providence, Rhode Island, on Aquidneck Island. The facility occupies approximately 1,000 acres, with portions of the facility located in the City of Newport and the Towns of Middletown, Portsmouth, and Jamestown, Rhode Island. The facility layout follows the western shoreline of Aquidneck Island for nearly 6 miles, facing the eastern passage of Narragansett Bay, as shown on Figure 1-1. The major commands currently located at NAVSTA Newport include the NETC, Surface Warfare Officers School Command, Naval Undersea Warfare Center (NUWC), and Naval War College. Research, development, and training are the primary activities at NAVSTA Newport. NAVSTA Newport has been assigned federal EPA identification number RI6170085470.

Site 19 - Former Derecktor Shipyard is composed of approximately 41 acres of shoreline land (OU12) and approximately 110 acres of the adjacent deep water industrial port in Coddington Cove (OU5) that were formerly leased to Robert E. Derecktor Shipyards of Rhode Island, Inc. A site plan is provided as Figure 1-2.

Contaminants in sediment were identified during past environmental assessments at the Former Derecktor Shipyard and were attributed to previous activities, primarily those activities undertaken by Robert E. Derecktor Shipyards of Rhode Island, Inc. during their lease period from 1979 through 1992. Specifically, contaminants were identified in sediment surrounding and beneath Piers 1 and 2 and in sediment south of the wharf.

The conceptual site model indicated chemical contaminants were discharged from the on-shore and pier-based shipyard operation areas to the marine sediment along the bulkhead areas of Coddington Cove and around Pier 1. The primary routes of contaminant transport from shipyard operations to marine sediment were likely overland runoff of paints, thinners, used sandblast grit, caustics, and polychlorinated biphenyls (PCBs) discharging to Coddington Cove through the storm drainage system; and direct release of contaminated materials into the cove from the shoreline, from former floating dry-docks (located north and south of the center of Pier 1) and from the former Greenport Ferry formerly docked south of the T-Wharf. Additional contaminants concentrated under and around Pier 2 may have migrated there from shipyard operations (painting, welding, sandblasting, and other ship building and maintenance activities).

Investigations at Site 19 indicated presence of contamination of marine sediment in localized areas surrounding Pier 1, Pier 2, and the T-wharf where the majority of shipyard operations took place. A Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA)-response action was required at Site 19 because the human health risk assessment (HHRA) determined that concentrations of benzo(a)pyrene in shellfish posed unacceptable risk to hypothetical future subsistence fishermen. Additionally, the marine ecological risk assessment (ERA) identified concentrations of high molecular weight (HMW) polycyclic aromatic hydrocarbons (PAHs), PCBs, and lead in sediment posed unacceptable risk to environmental receptors at multiple locations within OU5. Asbestos is also present in some sediment, and while there is no current risk associated with asbestos in sediment, there may be a potential future risk if the associated sediment were to be dredged and allowed to dry out, possibly resulting in inhalation of associated dust. Therefore, the response action required safeguards to protect potential future receptors from this potential exposure.

NAVSTA Newport is an active facility, with environmental investigations and remedial efforts funded under the Environmental Restoration, Navy (ER, N) program. The Navy is conducting its Environmental Restoration Program (ERP) (i.e., environmental investigation and remediation program) at NAVSTA Newport in accordance with the 1992 Federal Facility Agreement (FFA) between the Navy, EPA, and RIDEM. The FFA established the Navy as the lead agency for the investigation and specified cleanup of designated sites within the NAVSTA Newport property, with EPA and RIDEM providing oversight.

1.2 Site History and Enforcement Actions

Previous environmental investigations conducted to evaluate environmental quality at Site 19 are summarized in Table 1-1. Results of these investigations indicated concentrations of PAHs, PCBs and metals in marine sediments that exceed acceptable risk levels or state regulatory standards and background concentrations.

Table 1-1. Previous Investigations and Site Documentation

Investigation	Date	Activities
NPL listing	1989	NAVSTA Newport was listed on the EPA NPL as the NETC. Derecktor Shipyard was not initially identified as a site. Robert E. Derecktor Shipyards of Rhode Island, Inc. was a tenant at the property.
Preliminary Assessment (PA)	1993	A PA was conducted when the tenant departed. The PA concluded that shipyard operations generated large quantities of hazardous wastes including waste oil, paints, solvents, thinners, concentrated bases, and other waste solids and liquids that were improperly stored and disposed of (Halliburton NUS, 1993). Based on these conclusions, the Former Derecktor Shipyard was added to the FFA “Study Area” list.

TABLE 1-1. PREVIOUS INVESTIGATIONS AND SITE DOCUMENTATION

INVESTIGATION	DATE	ACTIVITIES
University of Rhode Island (URI) Investigation	1993	The Navy, in coordination with URI, performed initial sediment sampling at select locations within Coddington Cove and found that contaminants were present in marine sediment at elevated levels (Quinn et. al, 1994).
Marine ERA/ HHRA	1997/ 1998	Results of marine sediment and biota samples collected as part of the Marine ERA indicated potentially unacceptable risks present at the site due to contamination in sediment (SAIC and URI, 1997). This was followed up with the Stillwater Basin Evaluation (Tetra Tech NUS, 1998b) to focus evaluation in sediment near former Building 42. These data were also used in an HHRA that indicated unacceptable risks to human health through ingestion of shellfish (Tetra Tech NUS, 1998a).
Preliminary Remediation Goal (PRG) Development Document	1998	An assessment of potential risk-based PRGs (SAIC, 1998) was conducted for use in a future Feasibility Study (FS).
Supplemental Sediment Sampling & Report	2004	Additional sediment sampling at previously sampled locations was conducted, and contaminants were again detected at the same locations, though at lower concentrations than those identified in the baseline ERA (SAIC 1998) (Tetra Tech, 2005).
Asbestos Release	2005	Asbestos, in the form of thermal system insulation on steam pipes affixed to the underside of Pier 1, was released to the waters and the sediment under Pier 1, as pipes and pipe hangars deteriorated.
Supplemental Sediment Investigation (SSI)	2012	The site was divided into grid "cells" and sediment samples were collected from 119 locations representing cells between 100 x 100 feet and 200 x 200 feet to better quantify areas of sediments exceeding the PRGs established in 1998; surface sediment samples (0- to 12-inch interval) were collected at all 119 locations, 12- to 24-inch interval samples were collected at 117 locations, and 24- to 48-inch interval samples were collected at 113 locations. In total, 349 sediment samples were collected and analyzed for HMW PAHs (including benzo(a)pyrene), PCBs, and lead. Results were compared to the PRGs. Subsets of sediment samples were also analyzed for target constituents found during prior investigations. These constituents included tributyltin, zinc, copper, and asbestos. The results indicated that zinc, copper, and tributyltin were not present in site sediments at concentrations that warranted remedial action; asbestos was reported at trace levels (less than 1%) in most sediment samples, and at 2% in two samples under Pier 1 (Tetra Tech, 2012).
Feasibility Study (FS)	2014	The FS screened potential remedial technologies, and developed and evaluated remedial alternatives for OU5 based on information from previous investigations. The final FS presented five remedial alternatives to address contamination in marine sediment.

Robert E. Derecktor Shipyards of Rhode Island, Inc. was cited for multiple infractions and violations of both RIDEM and EPA environmental regulations. In 1987, Derecktor Shipyard pled guilty to criminal violations of the Toxic Substances Control Act, CERCLA, Clean Water Act, Resource Conservation and Recovery Act, Clean Air Act, and Hazardous Transportation Act, for illegal disposal activities including the discharge of over 4,000 tons of pollutants into the bay.

1.3 Site Characteristics

Historical activities at the Former Derecktor Shipyard have resulted in PAHs, PCBs, and lead in sediment at concentrations that exceed acceptable risk levels or state regulatory standards.

Site conditions, geology, and hydrogeology at OU5 are presented in this section. The information is summarized from data gathered during the PA, ERA, and SSI.

Setting and Conceptual Site Model

Site 19, the Former Derecktor Shipyard, is located on the shoreline of Coddington Cove in the central portion of NAVSTA Newport. Site 19 includes two OUs: OU12 encompasses approximately 41 acres of shoreline land and improvements, and OU5, the subject of this RACR, encompasses approximately 110 acres of marine sediment in the adjacent deep water industrial port. The on-shore area, OU12, consists of paved and unpaved surfaces used for parking and storage. The United States Coast Guard (USCG) stores buoys at the northern portion of the waterfront. OU5 physical features include two piers, each extending approximately 1,500 feet into Coddington Cove; an "L"-shaped stone breakwater; and a T-wharf, extending approximately 800 feet into the cove, which formerly housed a small wood-framed administration building (former Building A-18). Together, the breakwater and T-wharf form a protected small-boat anchorage south of the piers. A vertical sheet-pile wall and a section of rip-rap defines the shoreline along the shipyard property and deep water port areas and along the T-wharf. The two 1,500-foot piers are constructed of concrete decking supported by concrete piles with steel jackets. The eastern shoreline of Coddington Cove along the Former Derecktor Shipyard is approximately 3,200 feet long.

In its entirety, Coddington Cove covers an area of approximately 400 acres. The cove is protected to the north by the Coddington Cove breakwater. To the southwest, the cove is surrounded by a combination of natural and altered shoreline formed through natural erosion of landforms and Navy construction conducted during the period of their operation and use of this area. The southern shore of the cove is characterized by a gravel and stone beach that has a very gradual grade to the off-shore areas.

The conceptual site model, developed in the marine ERA and refined in the SSI and FS, indicates that chemical contaminants were discharged from the on-shore and pier-based shipyard operation areas to the marine sediment along the bulkhead areas of Coddington Cove and around Pier 1. Contaminants have also been found in marine sediment beneath and around Pier 2. The primary routes of contaminant transport from shipyard operations to marine sediment were likely overland runoff of paints, thinners, used sandblast grit, caustics and PCBs discharging to Coddington Cove through the storm drainage system and direct release of contaminated materials into the cove from the shoreline, former floating dry-docks, and former Greenport Ferry. Additional contaminants concentrated under and around Pier 2 may have migrated there from shipyard operations (painting, welding, sandblasting, and other ship building and maintenance activities).

Marine Hydrogeographic Information

A hydrographic survey was performed by URI in 1995 in support of the OU5 ERA to measure water current velocity and to take water column profiling measurements of conductivity, temperature, and depth to determine patterns of water circulation within Coddington Cove. This study evaluated the area during several different wind and tidal pattern cycles but did not account for seasonal variation of wind patterns and effects of winter storms. Results are reported in the ERA for the Former Derecktor Shipyard (SAIC and URI, 1997).

The 1995 hydrographic survey showed that the characteristic flow pattern occurs as a net counterclockwise circulation within the interior of Coddington Cove. On average, maximum bottom velocities were found to be greatest at the mouth of the cove and decreased in a counterclockwise manner following a general circulation pattern around the cove. Flow was such that, in general, the water column appeared well mixed vertically. High bottom velocities extending into the southeastern section of the cove were expected to prevent deposition of silt-sized particles, but water velocities between the piers and northeast of Pier 2 were generally sluggish, and these areas are expected to be depositional zones.

The 1995 study did not account for localized disturbances of sediments due to ship activity at the piers and bulkheads. It is recognized that, depending on depth of ship draft, propeller wash from ships maneuvering to and from the piers could disturb shallow surface sediments in and around these areas, some of the sediments could become resuspended during such activity. Subsequent data assessments identified expected areas of high energy and low energy based on anticipated high traffic areas and on projected future use of the property (Wood, 1998). High energy areas are those areas of the cove where there is a possibility for deposited sediment to be resuspended either through natural wave action or shipping traffic. These include areas along the piers and bulkheads at the waterfront. Because of the intermittent nature of ship traffic and decrease in use of the piers in recent years, direct effects of ship movement were briefly evaluated in 2004 (Tetra Tech, 2005).

During the SSI (Tetra Tech 2012), wave height, tidal elevation, water temperature, and current profile measurements were collected using Acoustic Doppler Current Profile recording instruments. In general, the findings indicated that during steady-state conditions, currents are tidally driven and that mean flow velocities range from 0.1 to 2.9 centimeters per second (cm/sec) and maximum flow velocities range from 7.3 to 29.3 cm/sec. Current speeds were found to be generally weak, and wind effects on currents during the study period were minimal. It was hypothesized that the shoreline and breakwater act to shelter the cove from the northeast and south, and the presence of other landforms in the bay prevent waves from developing significant heights when entering the cove from the western side (Tetra Tech, 2012).

Sediment Characteristics

Information collected during the ERA indicated that sediments in the Former Derecktor Shipyard were predominantly fine-grained at some stations (less than 40-percent sand content) and predominantly sandy (sand greater than 70 percent) at other stations (SAIC and URI, 1997). Surface sediments in Coddington Cove tended to be finer grained (contained more silt and clay) than underlying sandy sediments, probably due to the significantly decreased bottom energy and increased likelihood of fine-grained sediment deposition resulting from construction of the Coddington Cove breakwater in 1957.

As part of the SSI (Tetra Tech 2012), sediment cores were collected from a depth interval of 0 to 1 foot below sediment surface for grain-size analysis at 10 locations. At all 10 locations, the primary components were either sands (dominated by fine- or medium-grained sand) or silts. Clay was detected in all samples at percentages ranging from 8.7 to 23.5. Sediment stability and cohesion testing was conducted on cores collected from these 10 locations. The results of this testing indicated that each core had an unconsolidated surface layer of recently deposited material that could be easily disturbed, but below that, all cores were found to be vertically stratified, and all subsurface layers had significantly higher shear stress values than the unconsolidated surface layer, indicating relative stability.

1.4 Contaminants of Concern

Past operations at the Former Derecktor Shipyard were found to have resulted in the release of contaminants to the marine sediments of OU5 (in addition to on-shore soils and groundwater, addressed as OU12). The presumed sources of the contamination are the various shipyard operations including construction and maintenance of ships during the Derecktor lease, particularly sandblasting, painting, welding and assembly.

COCs were identified in the risk assessment reports and PRG development document (SAIC, 1998) (developed using the findings of the ERA and HHRA). The risk-driving COCs were benzo(a)pyrene, HMW PAHs, total PCBs, and lead. Sediment samples from OU5 were collected and analyzed for COCs during the SSI in 2011 to supplement the delineation of the extent of contamination initiated in the Risk Assessment Reports and to support the FS and ROD. Table 1-2 presents a summary of SSI sediment results for COCs.

TABLE 1-2. SUMMARY OF RESULTS FOR OU5 COCS

COC	Frequency of Detection	Concentration Range
Interval: 0 to 1 feet below sediment surface		
Benzo(a)pyrene	116/119	20 – 9,000 µg/kg
HMW PAHs	117/119	20 – 186,000 µg/kg
PCBs	56/119	40.1 – 17,000 µg/kg
Lead	119/119	2.3 – 1,410 mg/kg
Interval: 1 to 2 feet below sediment surface		
Benzo(a)pyrene	98/117	4.6 – 2,300 µg/kg
HMW PAHs	99/117	4.6 – 39,000 µg/kg
PCBs	47/117	49 – 2,760 µg/kg
Lead	117/117	2 – 918 mg/kg
Interval: 2 to 4 feet below sediment surface		
Benzo(a)pyrene	73/113	5.2 – 2,100 µg/kg
HMW PAHs	73/113	5.2 – 41,000 µg/kg
PCBs	40/113	32 – 2,600 µg/kg
Lead	113/113	1.8 – 842 mg/kg

Notes
mg/kg = Milligrams per kilogram.
µg/kg = Micrograms per kilogram.

Using the list of COCs presented above, cleanup levels were developed in the FS and then were retained as cleanup levels in the ROD. Cleanup levels for sediment at Former Derecktor Shipyard were selected for active remediation to support continued industrial use of the site, and future fishing as appropriate.

In addition, asbestos was identified in sediment samples collected beneath Pier 1 where a known asbestos release occurred (Tetra Tech, 2012). While in place at the seafloor, this asbestos does not pose a current risk to human health or the environment since there is no opportunity for exposure, but there is a small potential for the asbestos-containing sediment to be brought to the surface where it may dry and pose a risk. Therefore, while asbestos is not a COC at this site, the Navy determined that it would be appropriate to include a response action for asbestos in sediment to address this concern.

For human receptors, cleanup levels were calculated based on risk to meet an incremental lifetime cancer risk of 1 x 10^{-6} and a hazard quotient of 1 for carcinogens and non-carcinogens, respectively. These calculated concentrations were identified as candidate risk-based PRGs (SAIC, 1998).

For ecological receptors, a quotient method was used that measures the ratio of the COC concentration detected in sediment over the threshold effects value, which is the concentration above which adverse effects to the receptor were deemed possible. The threshold effects values were developed for aquatic receptors based on the target acceptable risk values and reference station concentrations. The calculated values were identified as Baseline PRGs, which were then adjusted to ensure that the PRGs target the areas that pose the greatest potential for adverse effects. The resulting values, termed "recommended PRGs", were then selected as cleanup goals to achieve the greatest practical risk reduction among the identified receptor pathways.

Cleanup levels for sediment are summarized in Table 1-3.

TABLE 1-3. CLEANUP LEVELS FOR SEDIMENT

CHEMICAL OF CONCERN	CLEANUP LEVEL	BASIS FOR SELECTION
Lead	168 mg/kg	Toxicity to aquatic organisms from exposure to suspended sediment
Benzo(a)pyrene	539 µg/kg	Adverse human health effects (cancer risk greater than 10^{-4}) from ingestion of shellfish
Total HMW PAHs	13,903 µg/kg	Toxicity to aquatic organisms from exposure to bedded sediment
Total PCBs	1,060 µg/kg	Toxicity to aquatic organisms from exposure to suspended sediment

1.5 Current and Potential Future Site and Resource Uses

At the time of the ROD signature, Pier 2 currently housed the NUWC Periscope Shop and was temporary homeport for the three USCG ocean buoy tenders, a USCG maintenance team, the USCG pursuit vessel Tigershark, and one National Oceanic and Atmospheric Administration fisheries research vessel. Currently, most of these uses are still in place, though the ocean buoy tenders have been moved to a permanent berth on the bulkhead wall between Pier 1 and Pier 2 (Figure 1-2). Pier 2 is used as temporary berthing by visiting U.S. Navy and foreign Navy ships, and such transient use is anticipated to continue. There are currently no home-ported Navy ships at NAVSTA Newport.

Accordingly, the current site use is as an industrial port, and this use is expected to continue for the foreseeable future. It is also recognized that current and future use of the waters around the piers includes both commercial and recreational fishing, though the Navy currently holds authority to restrict these activities at their discretion.

2.0 Remedial Action Objectives and Selected Remedy

This section identifies the RAOs, selected remedy, and performance monitoring standards as specified in the ROD.

RAOs are medium-specific goals that define the objective of conducting remedial actions to protect human health and the environment, specify the COCs, potential exposure routes and receptors, and acceptable concentrations (i.e., cleanup levels) for a site, and provide a general description of what the cleanup will accomplish.

The RAOs for Site 19 marine sediment are as follows:

- Reduce human health risk associated with ingestion of shellfish impacted by benzo(a)pyrene by reducing exposure concentrations in sediment to achieve the established cleanup goals.
- Reduce risk to aquatic organisms from sediment impacted by lead, PCBs, and HMW PAHs by reducing exposure concentrations in sediment to achieve the established cleanup goals.

These RAOs are based on current and reasonably anticipated future site use (industrial use of the piers and the waterfront, and potential future commercial and recreational fishing). Demonstration of achieving cleanup goals will be determined on a surface-area weighted average concentration (SWAC) basis.

In addition, to address the potential for a future risk from exposure to asbestos at OU5 during future dredging of Site 19, the Navy will:

- Prevent exposure to potential asbestos in dredged shipyard sediment through development of documented precautionary measures and safe work practices.

Precautionary measures and safe work practices for sediment management during the RA were implemented during the remedial action and are incorporated into the remedial action work plan. Separately, precautionary measures and safe work practices for post remedial action work (long term monitoring and other sediment management operations) will be included in either a base instruction or the Land Use Control Remedial Design (LUC RD), both of which are to be finalized in October 2019.

As stated in the ROD, the selected remedy for OU5 includes the following components:

- Conduct sediment sampling [(i.e., pre-remedial design [PRD] sediment sampling) prior to implementation of the remedial action to assess localized contaminant re-distribution resulting from the disruption of the sea floor by Navy construction projects conducted before finalizing this ROD, and within the footprint of the former location of the ex-Saratoga. The areas requiring dredging as part of the OU5 remedy may be revised depending on the sampling results. Details of the PRD Sediment Sampling will be included in a PRD Sampling and Analysis Plan.

- Targeted open water dredging and off-site disposal of dredged sediment to reduce contaminant volume while meeting the cleanup goals on a SWAC basis.
- Confirmation sampling after dredging to verify that SWACs have reached cleanup goals.
- Installation of an engineered cap under portions of Pier 2 to provide protection from contaminants under the pier without demolition of the pier.
- Implementation of LUCs, including 1) short-term LUCs (i.e., Base instruction and signage) to notify persons that shellfish should not be taken from within the OU until the dredging and capping components of the remedy are completed; 2) permanent LUCs prohibiting unauthorized disturbance of the engineered sand/gravel cap installed at the target sub-pier area; therefore, any future proposed work to demolish or restore the pier below the water line or over the capped area that could undermine the cap’s integrity would require prior Navy, EPA, and RIDEM concurrence to avoid compromising the cap; and 3) permanent LUCs to minimize the potential for exposure to asbestos potentially present in dredged sediment documenting precautionary measures and safe work practices.
- Monitoring to ensure the cap under Pier 2 remains intact and protective.
- Establishment of a dewatering area onshore and/or on barges, and treatment of water from the dewatering process.
- Five-year reviews to assess the protectiveness of the cap and the LUCs.

3.0 Removal and Remedial Actions

This section briefly summarizes the CERCLA remedial action completed at OU5 between 2015 and 2018 in order to meet the RAOs described in Section 2. This work focused on the removal of contaminated sediment and installation of a subaqueous cap under a portion of Pier 2 at Site 19. Post-dredging confirmation sampling and analysis and SWAC modeling confirmed the successful removal of contaminated sediment concentrations above the cleanup criteria. In addition, this section provides a discussion of the long-term management of residual contamination remaining at OU5 following the CERCLA actions.

Complete details of the remedial action are included in the associated CCR.

3.1 Pre-Remedial Design Sediment Sampling

As identified in the ROD, a component of the OU5 remedy consisted of pre-dredge / pre-remedial design sampling. When initiated and reported, this effort was termed Pre-Design Investigation (PDI) sediment sampling. The PDI sediment sampling was conducted to augment the Supplemental Sediment Investigation (SSI) (Tetra Tech, 2012), which supported the FS. As a part of the SSI, the study area was divided into grid cells in size between 10,000 square feet to 40,000 square feet, and each cell was sampled to determine locations where sediment exceeded the PRG. Based on the SSI, the FS identified 19 cells to be addressed by target area dredging.

The PDI sampling was conducted in 2015: (1) to evaluate potential contamination within the footprint of the former location of the ex-Saratoga that was previously inaccessible to sampling during the SSI; and (2) to assess potential localized contaminant re-distribution resulting from the disruption of the sea floor by recent Navy construction projects at the Site (Pier 2 Fender Pile Replacement Project and Marginal Wharf Upgrade Project). Additional descriptions of these projects are located in the Final OU5 Remedial Design (RD) (Tetra Tech, 2015a).

In late March/early April 2015, the Phase 1 PDI was conducted, which included characterization of marine sediment at previously proposed sample locations that had been obstructed by the ex-Saratoga, and assessment of impact to contaminated sediment distribution as a result of recent (2014/2015) Navy construction projects at Pier 2. In addition, samples were collected for the purposes of conducting dredge elutriate tests (DRET) and column settling tests (CST) in support of the dredging program design. The PDI report was appended to the 60% RD (Tetra Tech 2015a).

A total of 40 sediment samples for chemical analysis were collected from 30 locations associated with the Pier 2 fender pile replacement locations and the ex-Saratoga footprint. In addition, two locations were sampled for geotechnical analyses including the DRET and CST. Nine of the planned sample locations could not be accessed during the Phase 1 PDI effort due to the presence of a USCG buoy tender undergoing repairs and due to waterfront improvement work being conducted.

The SWAC was recalculated for each of the COCs using the PDI data. As a result of the Phase 1 PDI and recalculated SWACs, additional dredging was determined to be appropriate beyond the original 19 target dredge cells that were identified in the ROD. The revised calculation resulted in a total of 20 cells to be dredged, in a slightly different configuration. The PDI data did not alter the footprint of the cap to be placed over the two cells under Pier 2. Figure 3-1 presents the final configuration of the dredge areas and cover areas.

The DRET analytical results provided by the PDI effort indicated that for most detected compounds, the majority of the total contaminant load was adsorbed to suspended sediment particles. The DRET and CST results concluded that the use of turbidity curtains and monitoring of turbidity would be adequate for the control of suspended solids migration.

A Phase 2 PDI was conducted in the fall of 2015 to collect a second round of pre-dredge sediment samples at one location obstructed during the Phase 1 PDI by a disabled USCG buoy tender and to finalize characterization of site sediments for tributyltin, zinc, copper, and asbestos (Resolution, 2016). These data did not alter the planned dredge program a second time.

The Dredge and Cap Cells established after the PDI steps are shown in Figure 3-1.

3.2 Bathymetric Surveying

Per the final RD, bathymetric surveys were completed between February 17, 2016 and April 20, 2018 to collected data before, during, and after dredging and confirm targeted dredging depths were reached. The pre-debris removal survey of all dredge cells, with the exception of cell C13, was performed on February 17, 2016. The pre-debris removal survey of cell C13 was completed on April 6, 2017.

Post-debris removal/pre-dredge surveys were completed between April and December 2016 to document the pre-dredge mud line surface elevations. Post-dredge surveying was completed in all dredge cells after completion of dredging activities between June 2016 and February 2017.

Pre-capping bathymetric surveys were performed between August 2016 and August 2017. A single final post-cap bathymetric survey was performed on April 20, 2018 to document the final horizontal and vertical locations of the cap surface.

Pre-debris surveys of the dredge cells were performed by method of side scan sonar. Following completion of debris removal, single-beam bathymetric surveys of the dredge cells included a post-debris (pre-dredge) survey and a post-dredge (final) survey. Interim progress surveys were conducted nearly daily by Tetra Tech EC, Inc's (TtEC's) marine subcontractor during the dredging activities to monitor progress. Single-beam bathymetric surveys were also performed within the cells to be capped which included a pre-cap installation survey and a post-cap installation survey. Bathymetric and upland topographic surveys used the North American Vertical Datum (NAVD) 1988 vertical datum and the North American Datum (NAD) 1983 horizontal datum for all reporting. The pre-construction and final bathymetric surveys serve as record as-built drawings to document the effectiveness of the remedial action. The bathymetric surveys performed at each dredge/cap cell location were extended approximately 50 feet beyond the limits of work to ensure sufficient coverage. Areas where the 50 feet bathymetric survey limit was not achieved due to existing obstructions is noted on the drawings.

Bathymetric survey drawings for dredging and capping activities are presented in Appendix D of the CCR (TtEC, 2018).

3.3 Turbidity Management

The Final RD required measures to be taken to minimize negative impacts to the environmental impacts, including the re-suspension of potentially contaminated sediments dislodged by dredging and dispersed into the water column. The measures outlined in the RD included the use of turbidity curtains and the implementation of a turbidity monitoring plan to monitor the effects of dredging operations.

Dredging was performed by mechanical dredging means using an environmental bucket, in a manner to minimize water column turbidity. Prior to and during dredging operations, two layers of turbidity curtains were deployed around the sediment removal areas to contain sediment within the working areas. Type IV turbidity curtains that encircled the active work area were also utilized as primary curtains during sediment capping activities. Turbidity curtains were visually monitored, inspected, and maintained daily throughout the project. In addition, global positioning system coordinates were collected daily, or more frequently, when visual monitoring indicated lateral movement of greater than approximately 10 feet. All dredging and debris removal activities occurred within a secondary and primary turbidity curtain; capping activities occurred within a primary turbidity curtain. Dredging or debris removal activities were not performed during times of curtain maintenance or repair.

Real-time turbidity monitoring was performed during debris removal and dredging activities. Anchored turbidity monitoring equipment was deployed adjacent to the dredge/debris removal work area and consisted of two industry standard marine buoys with YSI EXO Turbidity Sensors on three water quality sondes (YSI EXO) (one sensor on each of three sondes), which was placed at three depths. One background buoy-mounted turbidity monitoring system, with three sondes to monitor three depths was also utilized. Turbidity monitoring was conducted near the surface, near the bottom (immediately above the bay floor during low tide conditions), and midway between upper and lower depths. Water depth measurements were made as the monitors were deployed to confirm that the sondes were placed at the appropriate depths. Debris removal and dredging activities were performed only while turbidity monitoring data was being collected and actively monitored. Work activities ceased when the action levels exceeded the background turbidity measurement plus 10 Nephelometric Turbidity Units. A detailed discussion of all aspects of turbidity management throughout the remedial action process can be found in the Construction Completion Report.

3.4 Debris Removal

The Final RD required subsurface debris identified by the PDI bathymetry and any additional debris within the dredge area to be removed.

Prior to dredging, debris identified in the pre-debris removal survey was removed using a barge-mounted crane. All debris removal operations were conducted within a primary and secondary turbidity curtain with turbidity monitoring. Once debris removal was completed, a post debris removal survey was conducted for each dredge cell area before the start of dredging. Debris removal activities were completed between March 23, 2016 and July 11, 2016.

TtEC removed 64.68 tons of debris, including concrete blocks or structures, lobster pots, pipe, cable and miscellaneous scrap steel, rope, industrial gas cylinders, and submerged pilings and/or wood, treated wood or wood-containing objects. With exception of the cylinders removed, debris was loaded onto a barge lined with geotextile fabric and Jersey barriers, transported to the onshore material handling area, and disposed at a Subtitle D solid waste landfill as nonhazardous waste, as per the sediment characterization associated with the debris location. No asbestos-containing material was encountered during the removal effort. A summary of the total tonnage of waste removed is provided in Table 3-1. A treated wood sample was collected as required by the disposal facility; laboratory reports are provided in Appendix E of the CCR.

A total of 32 industrial gas cylinders were removed and disposed at a facility (SET Environmental Inc. in Houston, Texas) licensed to handle these materials. Personnel trained in Occupational Safety and Health Administration, Resource Conservation and Recovery Act, and Department of Transportation regulations, including hazard recognition, were mobilized to ensure complete compliance in managing subject waste.

As part of debris removal activities, demolition of the remnant steel structure located southeast of the T-wharf was required to access all sediment in dredge cells BC30 and BE30. The dredge and cap cells are shown on Figure 3-1. The horizontal steel beams were cut to a manageable size and transported off site for recycling. A total of 21.17 tons of metal debris was sent off site to a Navy-approved recycling facility. Steel-encased concrete piles supporting the structure were left in place. Portions of the steel-encased concrete pilings broke off below the water surface during demolition of the structure. The remaining portion of the piles was left in place due to concerns about impacting the structural integrity of the bulkhead wall at this location.

TABLE 3-1. SUMMARY OF WASTE REMOVED

DISPOSAL FACILITY	WASTE TYPE	VOLUME
RIRRC Central Landfill - Johnston, RI	Dredged Sediment	41,370 Tons
	General debris	64.68 Tons
Turnkey Landfill - Rochester, NH	Dredged Sediment	1,581 Tons
SET Environmental, Houston TX	Gas Cylinders	32 Each
Exeter Scrap, Exeter, RI	Metal Recycling	21.17 Tons
Globalcycle, Inc. East Taunton MA (Treatment) and Covanta, Rochester MA (industrial re-use)	Water from dewatering operations	72,970 Gallons

3.5 Sediment Dredging

The Final RD required that dredging be performed using methods that maximize effectiveness in removal of contaminated sediment, and minimize negative environmental effects (e.g., sediment resuspension, release of contaminants from bedded and suspended sediment, residual contaminated sediment, and environmental risks).

A total of 29,011 cubic yards of sediment was removed from the dredge cells using a barge-mounted crane and a barge-mounted long-reach excavator, both equipped with environmental buckets. Figure 3-2 presents the dredge and cap areas as well as target and achieved dredge depths. In most dredge cells the actual average dredge depths were greater than the proposed depth as reported in the CCR (TtEC, 2018). The one exception was dredge cell Y30: The final dredge depth in cell Y30 was approximately 1 foot on average vs the target depth of two feet. The excavation in this area was terminated due to the presence of bedrock.

Suspect munitions items were discovered during dredging, as described in Section 3.10.

Sediment removal activities were completed following debris removal in each cell. The total removed volume of 29,011 cubic yards was determined through a comparison of pre- and post-dredge bathymetric surveys, which can be found in Appendix D of the CCR (TtEC, 2018). Dredged material that was disposed offsite included 42,950.35 tons of amended sediment, 43.19 tons of general debris (including 28.05 tons of construction debris), 21.17 tons of scrap metal, and 21.49 tons of treated wood (TtEC, 2018).

During dredging operations, the operator used an onboard computer and dredge software to monitor the horizontal and vertical progress of the dredging. The dredge operated in conjunction with a real-time kinematic/global positioning system, which permitted the dredge operator to monitor the position of the bucket for each removal taken along the dredge cut.

A post-dredge bathymetric survey, as detailed in Section 3.2, was then conducted to verify that the final design elevations had been achieved. Final elevations were not achieved in discrete areas of cells BD26, BE30, BC30, C21, C25, J30, L28, L26, and Y30. The dredge and cap cells are shown on Figure 3-1. Dredging elevations within these discrete locations were limited by firm subgrade soil conditions and debris embedded within the sea floor. Field memoranda detailing the findings within each of these cells can be found in Appendix D of the CCR (TtEC, 2018). A mutual decision was made by the Navy, USEPA, and RIDEM to proceed with confirmation sampling;

SWAC modeling (Appendix G of the CCR) confirmed that cleanup criteria has been met.

The dredged materials were dewatered on a barge and on shore by decanting followed by amendment with a pozzolanic material to reduce the free water content of the sediment. The dredged materials were placed into a deck barge which consisted of a combination of Jersey barriers and wood lined walls with draining scuppers lined with 8-ounce geotextile fabric. Initial sediment dewatering activities required holding the scow within the turbidity curtains for at least eight hours. Once the initial on-scow dewatering activities were performed the loaded deck barges were transported to the offloading area located at the southern end of OU12. A spill apron was constructed for offloading operations which prevented the offloading material handler bucket from swinging over open water. Dredged sediments were transported to the onshore primary sediment bin for dewatering and amendment with Calciment®. Sediment was moved to the secondary bin on an as needed basis for further amendment. A total of 2,200 tons of amendment material (Calciment®) was added to the sediment throughout the project. Amended sediment was loaded onto haul trucks for off-site disposal at the approved disposal facility(s). Table 3-1 presents a summary of waste removed from OU 5 during the remedial action.

3.6 Post-Dredge Confirmation Sediment Sampling

The Final RD (Tetra Tech 2015a) and Section 2.12.2 of the ROD (Navy, 2014) required confirmation sediment samples to be collected within the dredged cells and within cells adjacent to the dredged cells ("step-out cells") following dredging activities, to ensure that the cleanup levels established for COCs have been met.

Confirmation sediment sampling was conducted in the dredged cells and in cells adjacent to the dredged cells ("step-out cells") following dredging activities per approved Confirmatory Sampling Plan (TtEC, 2016a). This was performed to ensure the cleanup levels were achieved in accordance with sampling procedures detailed in the Sampling and Analysis Plan (Appendix L of the Final Remedial Action Work Plan [TtEC, 2016b]).

Sampling equipment included a Differential Global Positioning System (using USCG correctors), a vibratory corer with support equipment configured to penetrate up to 5 feet below sediment surface, and a push/slide hammer shoal penetration core sampler. Sampling operations were conducted from a shallow draft, purpose-built sampling vessel, which is configured with a 3-point mooring system, and a mechanized A-frame for handling the sampling equipment.

Confirmation sediment sampling was performed sequentially after the dredging was completed in individual dredge areas between January 10, 2017 and April 5, 2017. Within each area, multiple grab sediment core samples were collected from 0 to 1 foot below sediment surface and composited to form the confirmation samples. A total of 434 core grab samples were collected, which generated 111 composite samples. All composite samples collected within the dredge cells and step-out samples adjacent to the dredge cells were analyzed by an Environmental Laboratory Accreditation Program certified laboratory for total HMW PAHs, benzo(a)pyrene, total PCBs, and lead. Additional step-out samples were collected from locations outside the limits of the turbidity curtain, which was surveyed daily at each dredge cell location during dredging activities. This was done to account for any potentially contaminated sediment that may have migrated outside of the dredge cells due to changes in the turbidity curtain configuration or lateral movement of the curtain. Laboratory reports for the confirmation samples are provided in Appendix E of the CCR (TtEC, 2018). In addition, figures presenting the location and chemical concentrations of each confirmation sample and sample logs can be found in Appendix F of the CCR (TtEC, 2018).

As required in the ROD (Navy, 2014), confirmation sample results were used to recalculate SWACs to represent post-dredging conditions. These calculations were made in two stages, in accordance with team agreements. First, confirmation sampling data from dredged cells were utilized to calculate the SWAC for the dredged area only.

If the SWAC calculation indicated the cleanup goals were met, the dredged area would be considered complete. If not, the confirmation data from adjacent cells were added to the SWAC calculation to moderate heterogeneity of sediment data and a second SWAC was calculated. The first calculations showed that the SWAC values for the dredged area met the cleanup goals for all the COCs except lead. In the second step, calculating the SWAC values of the dredge area and step-out adjacent areas together resulted in a lead concentration well below its associated cleanup goal without a significant increase of the SWAC values for the other COCs.

A technical memorandum providing an assessment of the post-dredge sediment concentrations and results of the SWAC calculations is provided in Appendix G of the CCR (TtEC, 2018). Results of the assessment demonstrated a significant reduction in contaminant concentrations within the OU5 marine sediments and it was determined cleanup goals had been met.

3.7 Sediment Backfill

Dredging within cells BC30, BE30, and Y30 (Figure 3-1) required the removal of two feet of sediment (plus 1-foot overdredge for a total of 3 feet) adjacent to the marine bulkhead wall. It was determined by NAVFAC that after the removal of sediments to the design depths, the long term structural integrity of the wall could be compromised unless some bracing support to the bulkhead was provided As a result, TtEC backfilled the dredged footprint of these locations with 4- to 10-inch diameter rock to return the area to the pre-dredge elevation. As part of this effort, the existing remnant structure pipe piles were removed from cells BC30 and BE30 to eliminate the potential underwater hazards associated with working around the pipe piles.

Backfilling within these cells was conducted once dredging, post-dredge surveying, and confirmation sampling were completed. The appropriate thickness of the backfill material was monitored via bathymetry survey. All backfilling operations were conducted within a Type III turbidity curtain.

3.8 Cap Placement and Confirmation

The Final RD required placement of a minimum 1-foot thick engineered barrier (in-situ) over two target areas beneath the eastern end of Pier 2 to isolate contaminated sediments that could not be removed via dredging. Pier pilings located within the target areas restricted access and prevented use of traditional dredging equipment to complete the work. To ensure a minimum 1-foot thickness cap, a target thickness of 2 feet was used for construction.

The two-foot thick engineered barrier (in-situ cap) was placed within two target areas, G-25 and G-29 (see Figure 3-3), beneath the east end of Pier 2 between September 25, 2017 and April 4, 2018. The in-situ cap was constructed of 11,950.15 tons of D50 = 1.5-inch aggregate (American Association of State Highway and Transportation Officials M43-50) and placed throughout a 136,000-square foot area. The in-situ cap material was selected based on the conclusions and recommendations specified in the Sediment Cap Geotechnical Recommendations technical memorandum (TtEC, 2017), provided as Appendix I to the CCR.

The cap material specifications, provided in the memo, were based on a previous geotechnical investigation and testing of sediment samples collected from the Pier 2 cap areas. Slope stability analyses were also completed using bathymetry surveys and the sediment material properties, which were evaluated based on sediment testing. The total settlement of the sediments under the pier was also evaluated based on consolidation tests. In addition, erosion calculations were performed using previously reported steady-state conditions, the maximum wave velocity of a 100-year storm event, and the effects of prop wash. Modeling conducted during cap design indicated that 1.5-inch stone was required to meet scour concerns for all types of ships, except Expeditionary Fast Transport vessels, which required 3-inch stone. However, due to the unlikelihood of Expeditionary Fast Transport vessels docking in berths adjacent to the cap, 1.5-inch stone was employed. While Navy Port Operations did not agree to berthing restrictions, there was an observation that this class of vessel would not typically berth in the positions near the bulkhead wall.

The cap aggregate was sourced and screened off site at the Cranston, Rhode Island aggregate quarry. An off-site certification letter from the supplier stating the source was free of contaminants was submitted to the Navy and approved on November 8, 2017. Samples of the aggregate were collected from the material supplier (PJ Keating) for gradation analysis prior to cap placement. Samples were collected at a frequency of one per every 3,000 tons delivered.

Aggregate material was stockpiled adjacent to an upland track-mounted feeder and conveyor system. Aggregate material was loaded onto the barge via the track-mounted feeder and conveyor system. Aggregate was placed into a placement hopper, mixed to form an aggregate/water slurry, and pumped to the sediment cap placement area. Aggregate was placed with the assistance of divers to ensure controlled placement.

Aggregate was placed to create berms on the north, south, and west sides of G-25 and G-29 in a single two-foot lift. Once the berms outside the limits of the sediment cap cells were established, cap material was placed under the pier. The placement of the cap beneath the pier was completed in two lifts until the target two-foot thickness was achieved across the cap areas. The initial lift placed was 6 inches thick, followed by a second 18-inch lift to achieve the target two-foot thickness.

The post-cap surface elevation was obtained as described in Section 3.2. In addition, nine quality control test pits were performed within cell G-25 and eight test pits were conducted within cell G-29. These test pits verified that the completed cap in both grid cells met or exceeded the design thickness requirement of 24 inches. Results of the test pitting operation are provided in the CCR (TtEC, 2018).

3.9 Waste Management

The following waste streams were generated during construction activities:

- 43.19 tons of contaminated debris (creosote pilings, concrete, metal, and wood to be removed prior to dredging)
- 29,011 cubic yards of contaminated sediment (dredged sediment)
- 72,970 gallons of liquids from sediment dewatering and decontamination operations

Contaminated general debris including disposable personal protective equipment and sampling equipment was loaded into lined roll-off containers, transported and disposed at Rhode Island Resource Recovery Corporation Central Landfill located in Johnston, Rhode Island. Scrap metal was recycled at Exeter Scrap located in Exeter, Rhode Island.

Amended sediment was loaded into lined roll-off containers, transported and disposed at the Rhode Island Resource Recovery Corporation Central Landfill located in Johnston, Rhode Island and the Turnkey Landfill located in Rochester, New Hampshire.

A total of 72,970 gallons of wastewater generated during dewatering was transported off site for treatment at Globalcycle, Inc. located in Taunton, MA, and subsequently shipped off site to Covanta in Rochester, MA for reuse. The treated water is used to cool ash generated by incineration of trash in the waste-to-energy plant. Decontamination water generated from confirmation sediment sampling was contained on site in 55-gallon drums and disposed at Globalcycle, Inc.

Waste disposal documentation is provided in the CCR (TtEC, 2018).

3.10 Management of Suspected Munitions Items

On April 6, 2016, while dredging cell C21 on the north side of Pier 2, a suspect munition item was identified by the dredging subcontractor on the debris barge after having been brought to the surface during debris removal. The suspect munition item was initially identified under water as pipe debris by the diving subcontractor. As such, the item was brought to the surface of the barge, where the crew realized the item was a suspect munition item and all work was stopped at that time. Notifications were made to appropriate personnel, including Navy Port Operations, Navy FEAD, Navy Explosive Ordnance Disposal (EOD) and Naval Ordnance Safety and Security Activity (NOSSA). After inspecting the item, Navy EOD removed it from the work area to an unknown off-site location and directed TtEC to resume work. A follow-up conversation with Port Operations on April 7, 2016 confirmed the Navy EOD identified the item as an expended 5-inch powder case. A memo that summarized the finding and subsequent action taken was prepared and submitted to the Navy. Upon review of the information provided, NOSSA issued an Explosives Safety Submission-Determination Request (ESS-DR) (Ser N49/484) on April 12, 2016 which determined that an Explosives Safety Submission is not required in order to perform the sediment dredging within Site 19. NOSSA also outlined additional requirements that all personnel working at the site receive an Unexploded Ordnance Safety Awareness brief prior to operations. Additional requirements were also provided by NOSSA for the event that any munitions and explosives of concern or material potentially presenting an explosive hazard items were encountered. The requirements of the ESS-DR were implemented and sediment disturbing activities (debris removal) at Site 19 resumed on April 15, 2016.

On August 24, 2016, a suspect munition item was identified within the northwest corner of the primary sediment handling bin (located northeast of the T-Wharf). Procedures identified in paragraph 3 of the NOSSA ESS-DR letter Ser N49/484 dated April 12, 2016 were followed. Notifications were made to appropriate personnel including Navy EOD and NOSSA. After inspecting the item, Navy EOD removed it from the site and completed an EOD Incident Report. EOD determined the item was safe for transport and disposed of the item by detonation on August 25, 2016 at Fort Devens, MA EOD Range. After review of the information provided by the Explosives Safety Officer, NOSSA concurred with the continuation of dredging operations under the current ESS-DR (Ser N49/484) with the addition of "on-site construction support" performed by unexploded ordnance-qualified personnel as a conservative measure. Two unexploded ordnance-qualified personnel were mobilized to conduct construction oversight for identification of any potential munitions and explosives of concern or material potentially presenting an explosive hazard items. Work resumed on September 7, 2016.

3.11 Long-Term Management

The long-term management of residual contamination that remains following the OU5 remedial action includes the following components:

- Implementation of LUCs
- Monitoring and Maintenance of the sediment cap
- Five Year Reviews

Implementation of LUCs – The ROD selected LUCs including institutional controls and engineering controls as components of the final remedy for OU5, to control or restrict certain types of property uses (Navy, 2014). The LUCs included in the selected remedy will be maintained until concentrations of the CERCLA COCs have been reduced to cleanup goals (on a surface-area weighted average) that allow for unlimited use and unrestricted exposure in the Site 19 OU5 Marine Sediment LUC Area. The ROD also requires the Navy to implement precautionary measures to prevent potential exposure to asbestos that could be present in dredged OU5 sediments. Institutional controls and engineering controls have been implemented to ensure that the LUC performance objectives described below are met.

- Mitigate potential exposure to contaminants in shellfish by discouraging shellfishing in the Marine Sediment LUC Area until dredging and capping components of the remedy have been completed.
- Prevent any unauthorized disturbance of the engineered cap installed under Pier 2 as part of the remedy.
- Prevent exposure to potential asbestos in dredged shipyard sediment through development of documented precautionary measures and safe work practices enforced by the LUC documentation.

It is noted that the first performance objective above is no longer required, as the dredging was completed in February 2017 and capping components of the remedy were completed in April 2018.

Monitoring and Maintenance of the Sediment Cap – Monitoring of the capped surface is described in the Long-Term Management Plan (Draft Final rev July 2019; Final anticipated September 2019). Bathymetry monitoring will be conducted three times per year for the first five years after construction. Post construction monitoring began in April 2018 and will continue through October 2023, at which time the monitoring plan will be reviewed and revised if appropriate. Monitoring results will be compiled into annual reports. If disturbances to the sediment cap are identified during the annual LUC inspections or otherwise discovered, corrective actions will be taken to repair the deficient areas in order to maintain the protectiveness of the sediment cap.

Five-Year Reviews - Because this remedy will result in hazardous substances, pollutants, or contaminants remaining on site in excess of levels that allow for unlimited use and unrestricted exposure, in accordance with Section 121(c) of CERCLA and

National Oil and Hazardous Substances Pollution Contingency Plan (NCP) §300.430(f)(5)(iii)(c), a statutory review will be conducted within 5 years of the initiation of remedial action, and every 5 years thereafter, to ensure that the remedy continues to be protective of human health and the environment. During such reviews, the Navy, EPA, and state will review site conditions and the LUC compliance inspection information and monitoring data to determine whether continued implementation of the Selected Remedy is appropriate. Five-year reviews will be required to evaluate the continued protectiveness of the cap under Pier 2, and of the LUCs in place. Five-year reviews will be conducted until OU5 conditions are restored such that the site is suitable for unrestricted use and unlimited exposure in accordance with CERCLA.

3.12 Cost of the Remedial Action

The cost of the remedial action is summarized in Table 3-2. Line items presented include indirect costs, contingencies, and safety monitoring as they are described in Table B-1 of the ROD, Appendix B. The total actual cost reported is higher than the 2013 estimate, but within the acceptable range of +50% / -30% as described in CERCLA RI/FS guidance (U.S. EPA 1988).

TABLE 3-2: SUMMARY OF COST OF THE REMEDIAL ACTION

COST ITEM	TOTAL LOADED COST
1. Project Planning and Documents	$ 103,733.00
2. Mobilization/Demobilization	$ 1,039,564
3. Site Preparation	$ 805,883
4. Dredging (includes disposal)	$ 14,818,143
5. Capping	$ 2,443,946
6. Post Construction Reporting	$ 51,033
7. Confirmation Sampling	$ 549,055
Total	**$ 19,811,357**

4.0 Demonstration of Completion

The following components of the remedy were completed to address sediment contamination within the boundary of OU5 of Site 19:

- Sediment was dredged and transported off site for disposal. The extent of these areas was determined by laboratory data collected during the two PDIs (Tetra Tech 2015b; Resolution Consultants 2016) as part of the RD and using prior investigation data as appropriate. Confirmatory sample results, using SWAC model, demonstrates that the cleanup goals have been met.

- Contaminated sediment beneath Pier 2 was covered using an engineered cap to prevent exposure to underlying contaminants.

- Other contaminants and debris encountered, including concrete blocks, lobster pots, pipe, suspected munitions items, and miscellaneous scrap were removed, characterized, and transported off site for disposal at an approved disposal facility.

- Implementing, enforcing, and ensuring compliance with LUCs through inspections will prevent exposure to COCs remaining at concentrations exceeding cleanup levels in sediment.

- Enforcing LUCs in accordance with the LUC RD. Enforcement of LUCs is the responsibility of the Navy and is documented through the annual LUC inspection. Any required corrective actions based on the LUC inspections are the responsibility of the Navy.

- Long-term monitoring of the engineered cap will ensure the cap integrity is maintained to prevent release of COCs that remain on site.

- LUCs and LUC inspections will restrict activities that could disturb the engineered cap under Pier 2 or compromise the integrity of the remedy including, but not limited to, shellfishing, alteration or demolition of Pier 2 below the waterline or over the capped area, and dredging.

- Project-specific precautionary measures and safe work practices will ensure workers are not exposed to asbestos potentially present in sediment if such work requires removing and/or handling sediment.

- Five-year site reviews will be conducted to confirm that the remedy documented in the ROD remains protective of human health and the environment. The five-year reviews for OU5 will be conducted concurrently with those for other ERP sites at the base. The next five-year review is anticipated to be completed in the calendar year of 2019.

All remedial action components of the selected remedy have been completed, as detailed in the Final CCR, including as-built surveys (TtEC, 2018) and this RACR. The OU5 LUC RD (Tetra Tech, 2018a) and the Long Term Management Plan (NAVFAC, 2019) have been developed and are being implemented.

In accordance with the NCP, the completed remedial action met the following statutory determinations:

- **Protection of Human Health and the Environment** – The remedial action achieved the RAOs for the protection of human health and the environment through bulk removal and isolation of target sediment, which reduced SWACs to less than cleanup levels for all COCs. LUCs, long-term maintenance, monitoring, and five-year reviews will be required for capped areas beneath Pier 2. LUCs and five-year reviews specific to the potential presence of asbestos in sediment will be required for the uncapped areas at the site. Other long term actions pertaining to the chemical COCs are not required for uncapped areas because the action resulted in SWACs less than cleanup levels.

- **Compliance with Applicable and Relevant and Appropriate Requirements (ARARs)** – The remedial action was determined to be the least environmentally damaging practicable alternative in consideration of the federal Clean Water Act, providing the best balance of addressing contaminated media at the site while minimizing both temporary and permanent alteration of wetlands/aquatic habitats. The remedial action met the substantive requirements of applicable federal and state ARARs, as presented in the ROD.

- **Cost-Effectiveness** – The remedial action was determined to be the most cost-effective alternative that allowed for continued industrial use of the property and represented the most reasonable value for the cost. The costs were proportional to overall effectiveness by achieving an adequate amount of long-term effectiveness and permanence within a reasonable time frame.

- **Utilization of Permanent Solutions and Alternative Treatment Technologies or Resource Recovery Technologies to the Maximum Extent Practicable** – The remedial action was an effective and permanent means of reducing COC concentrations in a practical manner. The remedial action included PRD sediment sampling (documented in the PDI reports), dredging and off-site disposal, subaqueous sediment caps, LUCs, and long-term monitoring. The remedial action did not include treatment, except limited treatment of sediment before off-site disposal through bulking, and treatment of water generated through dredging operations and the dewatering process before discharging to the bay or a publicly owned treatment works.

- **Five-Year Review Requirement** – Because the remedial action resulted in hazardous substances, pollutants, or contaminants remaining on site in excess of levels that allow for unlimited use and unrestricted exposure, a statutory review will be conducted within 5 years after initiation of remedial action and every 5 years thereafter to ensure that the remedy is protective of human health and the environment. Five-year reviews will be required to evaluate the continued protectiveness of the cap under Pier 2.

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5.0 Ongoing Activities

Ongoing activities being conducted by the Navy include LUCs, long-term monitoring, and five-year reviews. These activities are summarized below.

5.1 Land Use Controls

The ROD selected LUCs, including institutional controls and engineering controls, as a component of the final remedy for OU5 to restrict certain types of property uses. LUCs on real property at OU5 will be maintained as long as concentrations of sediment COCs exceed levels that allow for unlimited use/unrestricted exposure. LUC boundaries are documented in the LUC RD. The LUC performance objectives are as follows:

- Mitigate potential exposure to contaminants in shellfish by discouraging shellfishing in the Marine Sediment LUC Area until dredging and capping components of the remedy have been completed.
- Prevent any unauthorized disturbance of the engineered cap installed under Pier 2 as part of the remedy.
- Prevent exposure to potential asbestos in dredged shipyard sediment through development of documented precautionary measures and safe work practices.

It is noted that the first performance objective above is no longer required, as the dredging was completed in February 2017 and capping components of the remedy were completed in April 2018.

The LUC implementation actions including monitoring and enforcement requirements are provided in the LUC RD prepared by the Navy as the LUC component of the overall RD. Regular site inspections will be performed to verify the continued maintenance of LUCs until the cleanup levels have been achieved.

The LUCs were established and implemented in accordance with the post-ROD LUC RD. LUCs were developed in accordance with the Principles and Procedures for Specifying, Monitoring and Enforcement of Land Use Controls and Other Post-ROD Actions (DON 2003), the FFA, the ROD, and applicable Navy directives.

If the property is transferred from the Navy to another federal owner, upon meeting the requirements for transfers under the site’s FFA, Navy would ensure as part of the transfer process that the gaining agency is made aware of the existing controls and would take appropriate action to ensure that such controls remain in place. If the property is ever transferred to non-federal ownership, deed restrictions, meeting state property law standards, would be recorded that would incorporate the land use restrictions called for under the ROD. Although the Navy may transfer the procedural LUC responsibilities to another party by contract, property transfer agreement, or through other means, the Navy shall retain ultimate responsibility for remedy integrity. LUCs will be maintained until the concentration of hazardous substances in sediment are at levels that allow for unlimited use/unrestricted exposure.

5.2 Long-Term Monitoring

Sediment cap monitoring is being conducted to ensure that COCs remaining in site sediment at concentrations exceeding (unrestricted) cleanup levels are isolated by the engineered cap. A long-term monitoring work plan is in development (Tetra Tech, 2018b), with input from RIDEM and USEPA. Bathymetry monitoring will be conducted three times per year for the first five years after construction to verify stability and height of the cap. Post construction monitoring began in April 2018 and will continue through October 2023. The monitoring plan will be reviewed as part of the 2024 Five Year Review. Monitoring results will be compiled into annual reports to identify trends and any areas requiring repair. Thresholds and details on monitoring are described in the Long Term Management Plan.

5.3 Five-Year Reviews

Because this remedy will result in hazardous substances, pollutants, or contaminants remaining on site in excess of levels that allow for unlimited use and unrestricted exposure, in accordance with Section 121(c) of CERCLA and NCP §300.430(f)(5)(iii)(c), a statutory review will be conducted within 5 years of the initiation of remedial action, and every 5 years thereafter, to ensure that the remedy continues to be protective of human health and the environment. During such reviews, the Navy, EPA, and state will review site conditions and the LUC compliance inspection information and monitoring data to determine whether continued implementation of the Selected Remedy is appropriate. Five-year reviews will be conducted until OU5 conditions are restored such that the site is suitable for unlimited use/unrestricted exposure in accordance with CERCLA. Currently the Five-Year Review is conducted for all of the NAVSTA Newport sites, therefore, OU5 is included in the basewide five-year review anticipated in December 2019.

6.0 Community Relations

The Navy performs public participation activities in accordance with CERCLA and the NCP throughout the site cleanup process at NAVSTA Newport. The Navy has a comprehensive community relations program for NAVSTA Newport, and community relations activities are conducted in accordance with the NAVSTA Newport Community Involvement Plan (NAVFAC, 2016). These activities include regular technical and Restoration Advisory Board (RAB) meetings with local officials and the establishment of an Information Repository at local libraries for dissemination of information to the community.

The Navy organized a RAB (previously referred to as a Technical Review Committee) in 1988 to review and discuss NAVSTA Newport environmental issues with local community officials and concerned citizens. The RAB consists of representatives of the Navy, EPA Region 1, RIDEM, local officials, and members of the community. The RAB has met frequently since its inception and as of 2018, it meets bi-monthly. Site 19 investigation activities, results, and associated remedial decisions have been discussed at RAB meetings. Information Repositories for NAVSTA Newport have been established at the Middletown Free Library in Middletown, Rhode Island; Newport Public Library in Newport, Rhode Island; and Portsmouth Free Library Association in Portsmouth, Rhode Island. Documents and other relevant site information, including a copy of the Administrative Record Index, are available for public review at the Information Repositories. For access to the Administrative Record or additional information about the ER, N at NAVSTA Newport, contact: Lisa Rama, Public Affairs Office, 690 Peary Street, Naval Station Newport, Newport, Rhode Island, 02841-1512, 401-841-3538. In addition, the Administrative Record is available for review on line at the following internet site:

http://go.usa.gov/DyNw

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7.0 Certification Statement

I certify that this RACR memorializes the completion of the remedial action construction and achievement of the RAOs at OU5 at ERP Site 19, NAVSTA Newport, Rhode Island. The remedial action construction at ERP Site 19 OU5 was implemented pursuant to CERCLA, and as documented in the ROD (Navy, 2014).

acting | 27 SEP 19

CAPT Ian Johnson | **Date**

Commanding Officer

Naval Station Newport, Rhode Island

U.S. Navy

[CDR Alvaro Lima, Acting]

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8.0 References

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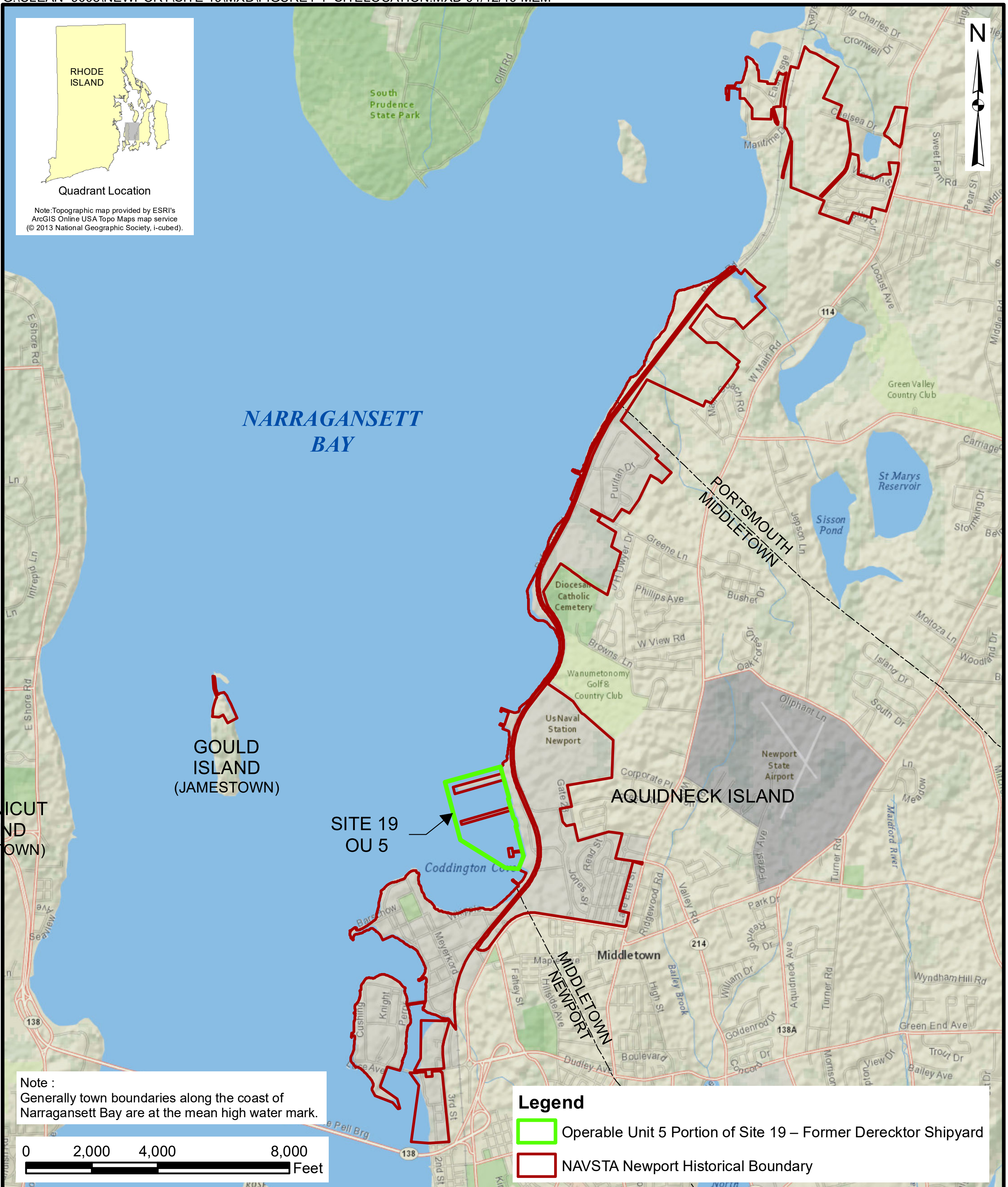
G:\CLEAN_9008\NEWPORT\SITE 19\MXD\FIGURE1-1_SITELOCATION.MXD 04/12/19 MEM



NAVFAC

NAVAL STATION NEWPORT
MIDDLETOWN/NEWPORT, RHODE ISLAND

SITE LOCATION

SITE 19 - OFF-SHORE DERECKTOR SHIPYARD, OU5
REMEDIAL ACTION COMPLETION REPORT

SCALE	
PER SCALE BAR	
FILE	
Figure1-1_SiteLocation.mxd	
REV	DATE
0	04/12/19
FIGURE NUMBER	
1-1	

NAVFAC

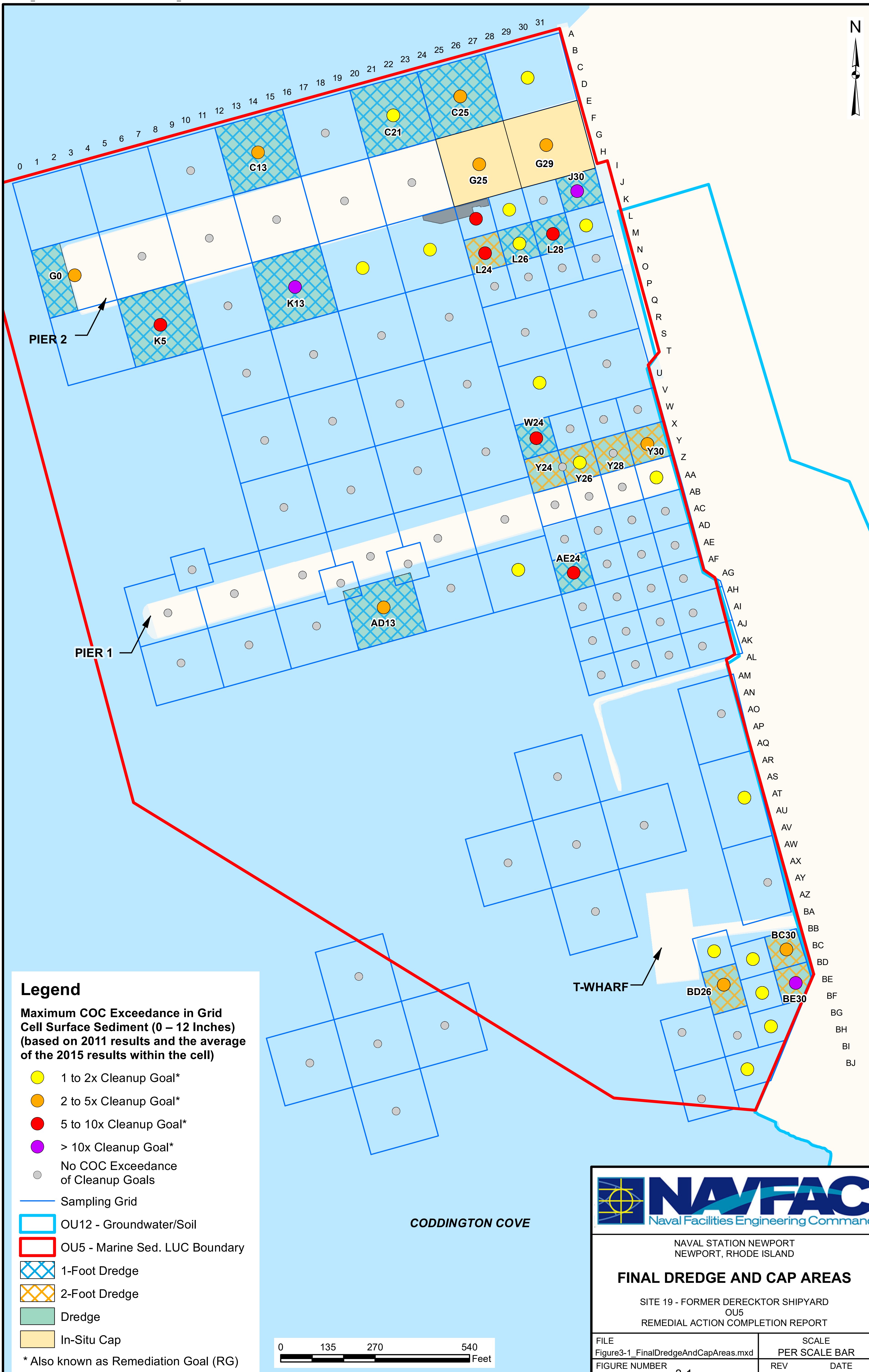
NAVAL STATION NEWPORT
NEWPORT, RHODE ISLAND

SITE PLAN

SITE 19 - FORMER DERECKTOR SHIPYARD, OU5
REMEDIAL ACTION COMPLETION REPORT

SCALE	PER SCALE BAR
FILE	DER_SITE_PLAN.MXD
REV 0	DATE 07/26/19
FIGURE NUMBER	1-2

G:\CLEAN_9008\NEWPORT\SITE 19\MXD\FIGURE3-1_FINALDREDGEANDCAPAREAS.MXD 04/12/19 MEM



NAVFAC
Naval Facilities Engineering Command

NAVAL STATION NEWPORT
NEWPORT, RHODE ISLAND

FINAL DREDGE AND CAP AREAS

SITE 19 - FORMER DERECKTOR SHIPYARD
OU5
REMEDIAL ACTION COMPLETION REPORT

FILE	SCALE
Figure3-1_FinalDredgeAndCapAreas.mxd	PER SCALE BAR

FIGURE NUMBER	REV	DATE
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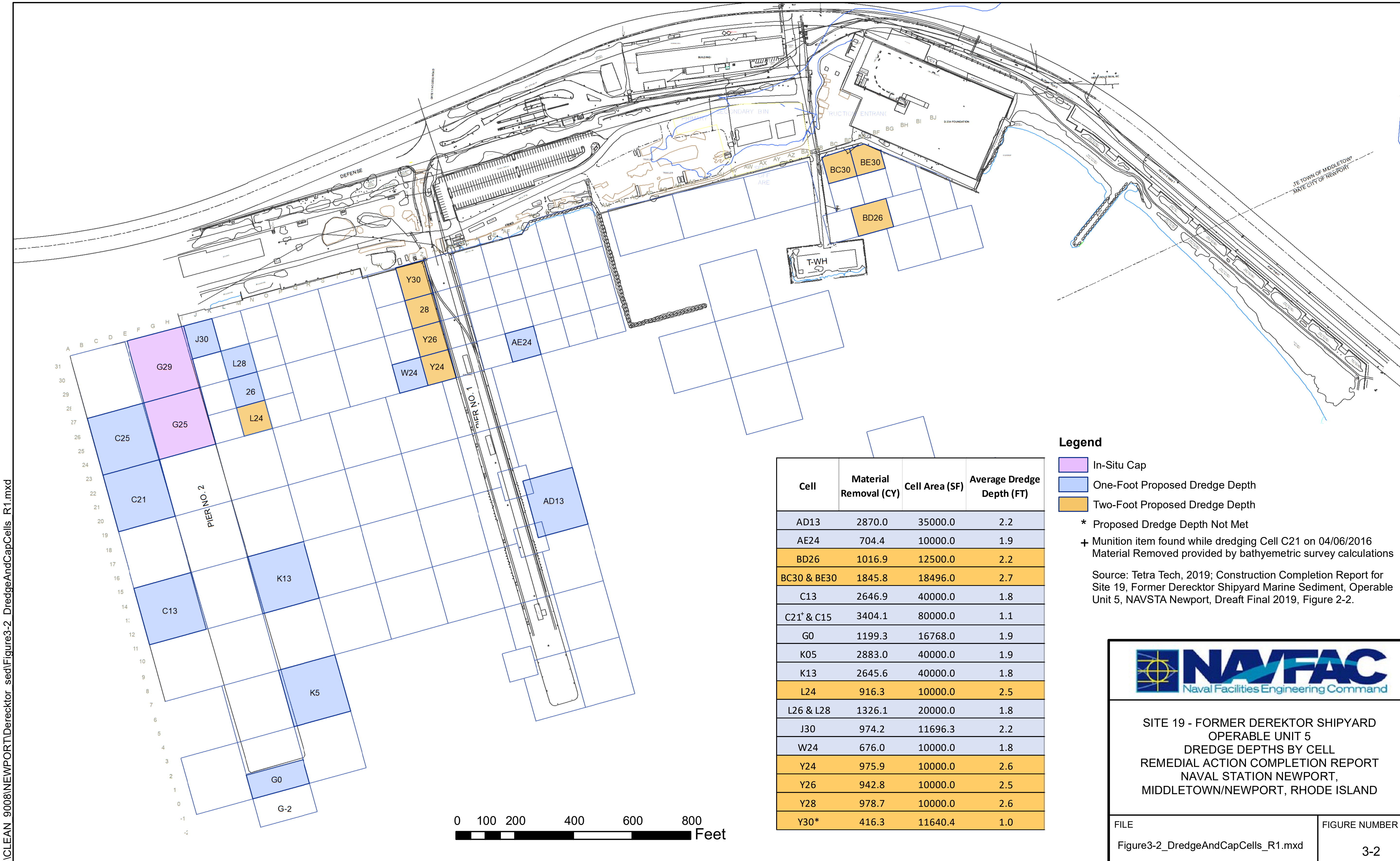

Cell	Material Removal (CY)	Cell Area (SF)	Average Dredge Depth (FT)
AD13	2870.0	35000.0	2.2
AE24	704.4	10000.0	1.9
BD26	1016.9	12500.0	2.2
BC30 & BE30	1845.8	18496.0	2.7
C13	2646.9	40000.0	1.8
C21+ & C15	3404.1	80000.0	1.1
G0	1199.3	16768.0	1.9
K05	2883.0	40000.0	1.9
K13	2645.6	40000.0	1.8
L24	916.3	10000.0	2.5
L26 & L28	1326.1	20000.0	1.8
J30	974.2	11696.3	2.2
W24	676.0	10000.0	1.8
Y24	975.9	10000.0	2.6
Y26	942.8	10000.0	2.5
Y28	978.7	10000.0	2.6
Y30*	416.3	11640.4	1.0

Legend

- In-Situ Cap
- One-Foot Proposed Dredge Depth
- Two-Foot Proposed Dredge Depth

* Proposed Dredge Depth Not Met

\+ Munition item found while dredging Cell C21 on 04/06/2016

Material Removed provided by bathyemetric survey calculations

Source: Tetra Tech, 2019; Construction Completion Report for Site 19, Former Derecktor Shipyard Marine Sediment, Operable Unit 5, NAVSTA Newport, Dreaft Final 2019, Figure 2-2.

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SITE 19 - FORMER DEREKTOR SHIPYARD
OPERABLE UNIT 5
DREDGE DEPTHS BY CELL
REMEDIAL ACTION COMPLETION REPORT
NAVAL STATION NEWPORT,
MIDDLETOWN/NEWPORT, RHODE ISLAND

FILE: Figure3-2_DredgeAndCapCells_R1.mxd

FIGURE NUMBER: 3-2

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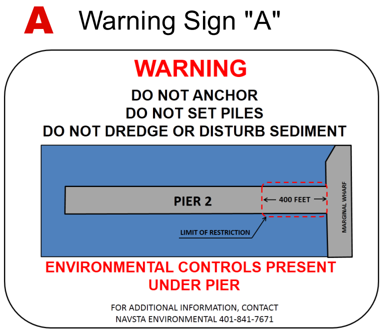
G:\CLEAN_9008\NEWPORT\SITE 19\MXD\FIGURE3-2_DER_MARINE_SED_LUC-ROD.MXD MC 2/11/2019

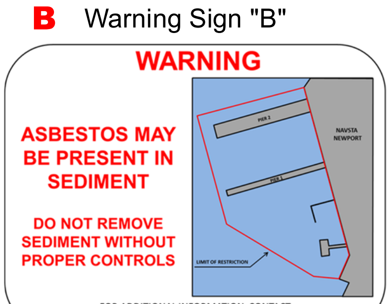
Notes:
1. All signs will be two-sided to show warnings to both water-side and land-side.
2. The Marine Sediment LUC Area restriction will remain in effect to ensure that the asbestos in sediment management requirements will stay in place.
3. Aerial photograph provided by ESRI's ArcGIS On line World Imagery map service 9/13/2017 image date.
4. The exact east boundary of OU5 (shown as points 1 through 12) is the mean high water elevation at the bulkhead wall or shoreline.

Legend

A Warning Sign "A"



B Warning Sign "B"



Engineered Cap As-Built

Engineered Cap LUC Area

Site 19 OU5 Marine Sediment LUC Area

Engineered Cap Under Pier 2 LUC Area		
Point No.	Easting	Northing
02	379030.03	163247.14
03	379088.81	163048.93
16	378647.22	163135.33
17	378704.82	162936.77
Coordinates are provided in NAD 1983		

OU5 LUC Boundary Points		
Point No.	Easting	Northing
01	378981.57	163436.11
02	379030.03	163247.14
03	379088.81	163048.93
04	379118.19	163057.41
05	379266.38	162511.13
06	379234.83	162473.56
07	379393.93	161887.32
08	379425.09	161864.65
09	379482.39	161645.54
10	379457.86	161631.08
11	379707.69	160731.17
12	379541.23	160341.73
13	379135.93	160376.51
14	377762.87	161221.56
15	377298.48	162969.97
Coordinates are provided in NAD 1983		

NAVFAC Naval Facilities Engineering Command

NAVAL STATION NEWPORT
NEWPORT, RHODE ISLAND

MARINE SEDIMENT LAND USE CONTROL AREA

SITE 19 - FORMER DERECKTOR SHIPYARD, OU5
REMEDIAL ACTION COMPLETION REPORT

FILE	SCALE	
DER_MARINE_SED_LUC-R2.MXD	PER SCALE BAR	
FIGURE NUMBER	REV	DATE
3-3	0	02/11/19