TETRA TECH

C-NAVY-09-14-5410W

September 22, 2014

Ms. Kymberlee Keckler
United States Environmental Protection Agency, Region 1
5 Post Office Square, Suite 100
Boston, Massachusetts 02109-3912

Ms. Pamela Crump
Office of Waste Management
Rhode Island Department of Environmental Management
235 Promenade Street
Providence, Rhode Island 02908-5767

REFERENCE: CLEAN Contract No. N62470-08-D-1001
Contract Task Order No. WE61

SUBJECT: Transmittal of the Final, Executed Record of Decision
Site 19 – Former Derecktor Shipyard Marine Sediment
Operable Unit 5, Naval Station Newport, Newport, Rhode Island

Dear Ms. Keckler and Ms. Crump:

On behalf of Mr. James Gravette, U.S. Navy NAVFAC, I am providing to you each for your records two copies of the fully executed Record of Decision (ROD) for Site 19 Marine Sediment at Naval Station Newport, which is also known as Operable Unit (OU) 5 for the NETC Superfund Site, Newport, Rhode Island.

If you have any questions regarding this material, please do not hesitate to contact me at 978-474-8434.

Very truly yours,

Stephen S. Parker, LSP
Senior Project Manager

Enclosures

c: D. Barclift, NAVFAC (w/encl. – CD only)
S. Bird, NAVFAC (w/encl. – CD only)
K. Finkelstein (w/encl. – CD only)
G. Glenn, Tetra Tech (w/o encl.)
J. Gravette, NAVFAC (w/encl. - 1)
W. Johnson, NAVFAC (w/encl. - CD only)
K. Munney (w/encl. – CD only)
S. Parker, Tetra Tech (w/encl. - electronic only)
P. Steinberg, Mabbett Associates (w/encl. - 1)
D. Ward, NAVSTA (w/encl. - 2)
Administrative Record (RDM Data Manager – w/encl.- unbound)
File 112G02747-8.0 (w/encl. - unbound), 3.1 (w/o encl.)

Tetra Tech, Inc.
250 Andover Street, Suite 200, Wilmington, MA 01887-1048
Tel 978.474.8400 Fax 978.474.8499 www.tetratech.com

RECORD OF DECISION

SITE 19 – FORMER DERECKTOR SHIPYARD MARINE SEDIMENT OPERABLE UNIT 5

NAVAL STATION NEWPORT
MIDDLETOWN/NEWPORT, RHODE ISLAND
SEPTEMBER 2014

TABLE OF CONTENTS

SECTION **PAGE**

TABLES

NUMBER **PAGE**

TABLE OF CONTENTS (Continued)

TABLES (Continued)

FIGURES

ADMINISTRATIVE RECORD REFERENCE TABLE

APPENDICES

ACRONYMS

ADCP	Acoustic Doppler Current Profile
ARAR	Applicable or Relevant and Appropriate Requirement
AVS	acid-volatile sulfide
AWQC	Ambient Water Quality Criteria
BPRG	Baseline Preliminary Remediation Goal
BSAF	Biological Sediment Accumulation Factor
B&R	Brown & Root, Inc.
CDI	Chronic daily intake
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CFR	Code of Federal Regulations
cm/sec	Centimeter per second
COC	Contaminant of concern
COPC	Contaminant of potential concern
CS	Confirmation study
CSF	Cancer slope factor
CSM	Conceptual site model
CTE	central tendency exposure
CWA	Clean Water Act
DU	Decision Unit
E/E	Exposure/Effect
ENR	Enhanced Natural Recovery
EPA	United States Environmental Protection Agency
ERA	Ecological risk assessment
ER-L	Effects Range-Low
ER-M	Effects Range-Median
FEMA	Federal Emergency Management Agency
FFA	Federal Facility Agreement
FS	Feasibility Study
GRA	General Response Action
HHRA	Human Health Risk Assessment
HI	Hazard index
HMW	High molecular weight
HQ	Hazard Quotient
IAS	Initial Assessment Study
ID	Identification

ILCR	Incremental lifetime cancer risk
IR	Installation Restoration
LEDPA	Least Environmentally Damaging Practicable Alternative
LTM	Long-term monitoring
LUC	Land use control
mg/kg	Milligram per kilogram
MRP	Munitions Response Program
NAVSTA	Naval Station
NCP	National Oil and Hazardous Substances Pollution Contingency Plan
NETC	Naval Education and Training Center
NOAA	National Oceanic and Atmospheric Administration
NPL	National Priorities List
NPW	Net present worth
NTCRA	Non-Time-Critical Removal Action
NUSC	Naval Undersea Systems Center
NUWC	Naval Undersea Warfare Center
OFFTA	Old Fire Fighting Training Area
OU	Operable Unit
O&M	Operation and maintenance
PA	Preliminary Assessment
PAH	Polycyclic aromatic hydrocarbon
PCB	Polychlorinated biphenyl
POTW	Publicly owned treatment works
PRD	Pre-Remedial Design
PRG	Preliminary remediation goal
RAB	Restoration Advisory Board
RAO	Remedial Action Objective
RCRA	Resource Conservation and Recovery Act
RD	Remedial Design
RfD	Reference dose
RI	Remedial Investigation
RIDEM	Rhode Island Department of Environmental Management
RME	Reasonable maximum exposure
ROD	Record of Decision
SAP	Sampling and Analysis Plan
SEM	Simultaneously Extracted Metals
SF	Slope factor

SSI	Supplemental Sediment Investigation
SWAC	Surface-Area Weighted Average Concentration
SWOS	Surface Warfare Officers School
TBT	Tributyltin
TEV	Threshold effects value
TSCA	Toxic Substances Control Act
URI	University of Rhode Island
USCG	United States Coast Guard
µg/kg	Microgram per kilogram

1.0 DECLARATION

1.1 SITE NAME AND LOCATION

The Former Robert E. Derecktor Shipyard (Former Derecktor Shipyard), which is also known as Site 19, is an industrial port at Naval Station (NAVSTA) Newport, located in Newport and Middletown, Rhode Island. Site 19 includes two operable units (OUs): OU5, which is the marine sediment associated with the Former Derecktor Shipyard, and OU12, which is the on-shore area of the Former Derecktor Shipyard. This Record of Decision (ROD) is for Site 19, OU5, the Former Derecktor Shipyard Marine Sediment (Figure 1-1). NAVSTA Newport was formerly identified as the Naval Education and Training Center (NETC) and has been assigned United States Environmental Protection Agency (EPA) Identification (ID) number RI6170085470.

1.2 STATEMENT OF BASIS AND PURPOSE

This ROD presents the Selected Remedy for OU5 (Marine Sediment) of Site 19, the Former Derecktor Shipyard, as chosen by the Navy and EPA in accordance with provisions of the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), as amended by the Superfund Amendments and Reauthorization Act, and to the extent practicable, the National Oil and Hazardous Substances Pollution Contingency Plan (NCP). This decision is based on information contained in the Administrative Record for OU5 of Site 19, as listed in the Detailed Administrative Record Reference Table presented at the end of this ROD. The Rhode Island Department of Environmental Management (RIDEM) concurs with the Navy and EPA on the Selected Remedy for OU5, as shown in Appendix A.

1.3 ASSESSMENT OF SITE

The response action selected in this ROD is necessary to protect the public health and welfare or the environment from actual or threatened releases of hazardous substances into the environment. A CERCLA action is required because the human health risk assessment (HHRA) determined that concentrations of benzo(a)pyrene in shellfish pose 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), polychlorinated biphenyls (PCBs), and lead in sediment posing 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 will include safeguards to protect potential future receptors from this potential.

1.4 DESCRIPTION OF SELECTED REMEDY

The major components of the Selected Remedy for marine sediment (OU5) at the Former Derecktor Shipyard include the following:

- Conducting additional sediment sampling [i.e., Pre-Remedial Design (PRD) Sediment Sampling] prior to implementation of the remedial action to assess the 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 recently departed ex-Saratoga.

- At target open water areas, dredging and off-site disposal of sediment to depths of 1 or 2 feet, depending on the locations and depths of contamination that were identified in the 2012 Supplemental Sediment Investigation (SSI) report (and confirmed or revised based on the PRD Sediment Sampling effort), to reduce concentrations of contaminants of concern (COCs) to cleanup levels, based on surface-area weighted average concentrations (SWACs). Confirmation sampling will be conducted after dredging activities to ensure that cleanup levels have been achieved.

- At the target area underlying a pier (sub-pier area), installation of a 1-foot-thick engineered sand/gravel cap to isolate target area sediments that have COC concentrations exceeding cleanup levels, and monitoring of the capped area to ensure that COCs remaining beneath the pier are not re-exposed or migrating.

- Implementation of land use controls (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 - 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 through development of documented precautionary measures and safe work practices.

- Five-year reviews to assess the protectiveness of the cap component of the remedy and the LUCs established to protect the cap and to address potential asbestos in sediments.

The Selected Remedy eliminates potential unacceptable exposure of human and environmental receptors to contaminated sediment through a combination of: removal (dredging) and off-site disposal; construction of an engineered cap for under-pier areas; and LUCs and monitoring of the capped under-pier areas. Remedial actions for OU5 are not expected to adversely impact the current and reasonably anticipated future land use, which, for the shoreline and piers is industrial, and for the navigable waters, is commercial or recreational fishing. The Selected Remedy is expected to achieve substantial long-term risk reduction and to allow the property to be used for the reasonably anticipated future land use (industrial). This ROD documents the final remedial action decision for OU5 (marine sediment) at Site 19 and does not affect any other sites at NAVSTA Newport, including OU12 (on-shore area) at Site 19. Implementation of this remedy will allow for continued industrial use of the site, which is consistent with current use and the overall cleanup strategy for NAVSTA Newport of restoring sites to support base operations.

1.5 STATUTORY DETERMINATIONS

The Selected Remedy is protective of human health and the environment, complies with federal and state requirements that are applicable or relevant and appropriate to the remedial action, is cost-effective, and utilizes permanent solutions and alternative treatment (or resource recovery) technologies to the maximum extent practicable.

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, a statutory review will be conducted within 5 years of initiation of the remedial action and every 5 years thereafter to ensure that the Selected Remedy is, or will be, protective of human health and the environment.

Federal regulations that pertain to the cleanup require a determination that there is no practical alternative to implementing federal actions affecting federal jurisdictional wetlands, aquatic habitats, and floodplains, per Section 404 of the Clean Water Act (CWA) and Executive Orders 11990 (Protection of Wetlands) and 11988 (Protection of Floodplains), as incorporated under Federal Emergency Management Agency (FEMA) regulations. In accordance with the CWA, the Navy has determined that the Selected Remedy is the "Least Environmentally Damaging Practicable Alternative" (LEDPA) to protect wetland and floodplain resources because it provides the best balance of addressing contaminated media at the site, within and adjacent to wetlands and waterways, while minimizing both temporary and permanent alteration of wetlands and aquatic habitats on site. Although the Selected Remedy involves disturbance (dredging) of sediment, the removal of the contaminants through dredging will have long-term positive impacts on the marine environment.

This ROD also includes a finding by EPA Region 1's Director of the Office of Site Remediation and Restoration that the remedy selected in this ROD will address PCB-contaminated media in order to control risk of injury to health or the environment, in compliance with 40 Code of Federal Regulations

(CFR) §761.61(c), through the removal and off-site disposal of all PCB-contaminated sediment exceeding the cleanup goals on a surface-area weighted average basis.

1.6 ROD DATA CERTIFICATION CHECKLIST

Table 1-1 summarizes the locations of information required to be included in the ROD, as presented in Section 2.0, Decision Summary, and Appendix B, Cost Estimates. Additional information can be found in the Administrative Record file for NAVSTA Newport, available online at http://go.usa.gov/DyNw.

TABLE 1-1. ROD DATA CERTIFICATION CHECKLIST

DATA	LOCATION IN ROD
COCs and their respective concentrations	Sections 2.5 and 2.7
Baseline risk represented by the COCs	Section 2.7
Cleanup levels established for COCs and the basis for these levels	Section 2.8
How source materials constituting principal threats are addressed	Section 2.11
Current and reasonably anticipated future use assumptions	Section 2.6
Potential uses that will be available at the site as a result of the Selected Remedy	Section 2.12.3
Estimated capital, operation and maintenance (O&M), and total net present worth (NPW) costs; discount rate; and number of years over which the remedy costs are projected	Appendix B
Key factors that led to the selection of the remedy	Section 2.12.1

If contamination posing an unacceptable risk to human health or the environment is discovered after execution of this ROD and is shown to be the result of Navy activities, the Navy will undertake the necessary actions to ensure continued protection of human health and the environment.

1.7 (1 OF 2) AUTHORIZING SIGNATURES

The signature provided below validates the Selected Remedy for Site 19, OU5, which is the marine sediment at the Former Derecktor Shipyard at NAVSTA Newport in Newport/Middletown, Rhode Island, by the Navy. RIDEM concurs with the Selected Remedy, as indicated in Appendix A of this ROD.

Concur and recommend for implementation:

9/12/14

CAPT D.W. Mikatarian
Commanding Officer
Naval Station Newport, Rhode Island
U.S. Navy

Date

1.7 (2 OF 2) AUTHORIZING SIGNATURES

The signature provided below validates the Selected Remedy for Site 19, OU5, which is the marine sediment at the Former Derecktor Shipyard at NAVSTA Newport in Newport/Middletown, Rhode Island, by the EPA. RIDEM concurs with the Selected Remedy, as indicated in Appendix A of this ROD.

Human health and ecological risk assessments were conducted using CERCLA risk assessment methods and guidance. Accordingly, and based on the provisions of 40 CFR §761.61(c), EPA has determined that the risk-based cleanup goals for PCBs in sediment will meet the no unreasonable risk standard in accordance with §761.61(c) through: 1) the removal and off-site disposal of PCB-contaminated sediment to achieve cleanup goals on a surface-area weighted average basis; 2) through the placement of at least a one foot engineered cap over target sub-pier areas; 3) through the implementation of Land Use Controls to ensure that the cap is not disturbed; 4) through long-term monitoring of the protectiveness of the cap; and 5) by re-evaluating the sediment cap component of the remedy should reconstruction or demolition of Pier 2 occur.

Concur and recommend for implementation:

9/16/14

James T. Owens, III
Director, Office of Site Remediation and Restoration
Region 1 – New England
EPA

Date

2.0 DECISION SUMMARY

2.1 SITE NAME, LOCATION, AND BRIEF DESCRIPTION

NAVSTA Newport is located approximately 25 miles south of Providence, Rhode Island, primarily 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 majority of the facility layout follows the western shoreline of Aquidneck Island for nearly 6 miles, facing the eastern passage of Narragansett Bay (Figure 1-1). The major commands currently located at NAVSTA Newport include the NETC, Surface Warfare Officers School (SWOS) Command, Naval Undersea Warfare Center (NUWC), and Naval War College. Research, development, and training are the primary activities at NAVSTA Newport.

Site 19, the Former Derecktor Shipyard, is located at Coddington Cove in the central portion of NAVSTA Newport, as illustrated on Figure 1-1, and occupies land within both Middletown and Newport. It is composed of approximately 41 acres of shoreline land and improvements (OU12) and the adjacent deep water industrial port in Coddington Cove (OU5) that were formerly leased to Robert E. Derecktor Shipyards of Rhode Island, Inc. Physical features of the industrial port include two piers, each extending approximately 1,500 feet into Coddington Cove; an “L”-shaped stone breakwater; and a T-wharf, formerly housing Building A18, that extends approximately 800 feet into the cove. Together, the breakwater and T-wharf form a protected small-boat anchorage south of Piers 1 and 2. A sheet pile wall defines the shoreline along the shipyard property, deep water port area, and T-wharf. The two 1,500-foot-long piers are constructed of concrete decking supported by concrete piles with steel jackets. The eastern shoreline of Coddington Cove, along and north of the Former Derecktor Shipyard property, is approximately 3,200 feet long. Coddington Cove covers approximately 400 acres, and OU5, the off-shore investigation area of Site 19, measures approximately 110 acres.

The cove is protected to the north by the Coddington Cove breakwater, and to the southwest, the cove is surrounded by a combination of natural and altered shorelines. 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. Figure 2-1 depicts the primary site features.

Currently, both Pier 1 and Pier 2 have limited use and restricted load capacity. The sole use of Pier 1 was as a moorage for the aircraft carrier ex-Saratoga. However, the ex-Saratoga was moved from Pier 1 on August 21, 2014, and no future use of Pier 1 has been formally identified. Pier 2 is in active use for limited purposes by the Navy, United States Coast Guard (USCG), and National Oceanic and Atmospheric Administration (NOAA). Pier 2 houses the NUWC Periscope Shop and is a temporary homeport for three USCG ocean buoy tenders, a USCG maintenance team, the USCG pursuit vessel Tigershark, and one NOAA fisheries research vessel. Pier 2 is also occasionally used by visiting U.S. Navy and foreign Navy ships, and such use is anticipated to continue. There are currently no home-ported Navy ships at NAVSTA Newport.

In August 2014, the Navy conducted necessary but unanticipated repairs on Pier 2, which included the removal and replacement of damaged wooden fender pilings, which are affixed to the outboard sides of the pier and embedded vertically into the sediment. This operation included removal of 64 broken or damaged fender pilings, and installation of replacements as needed. This activity is believed to have impacted sediment contaminant distribution adjacent to Pier 2 as mapped in 2011 and 2012.

Both Piers 1 and 2 were recently identified for demolition by the NAVSTA Newport Planning Group; however, there are no funds yet made available for such demolition, and since that time, the Navy executed a Use Agreement with the USCG for their continued potential use of Pier 2. Therefore, Pier 2 is not currently identified for demolition.

A construction project is underway to improve the marginal wharf area (the bulkhead waterfront between Piers 1 and 2) to accommodate berthing of the three USCG ocean buoy tenders. This project includes removal of a piling-supported waterfront platform, and removal of underlying stone and substrate from the surrounding area. This activity could have had localized impact to sediment conditions at the shoreline adjacent to the site as mapped during the investigations conducted for Site 19, and described in this ROD. Contaminants in sediment were identified during past environmental assessments at the Former Derecktor Shipyard and were attributed to previous activities, mainly those activities undertaken by Robert E. Derecktor Shipyards of Rhode Island, Inc., mainly during their lease period from 1979 through 1992. Specifically, contaminants have been identified in sediment surrounding and beneath Piers 1 and 2 and in sediment south of the T-wharf.

NAVSTA Newport is an active facility, with environmental investigations and remedial efforts enforced by CERCLA funded under the Environmental Restoration, Navy program. The Navy is conducting its Installation Restoration (IR) Program (i.e., environmental investigation and remediation program) at NAVSTA Newport in accordance with a Federal Facility Agreement (FFA) between the Navy, EPA, and RIDEM. The Navy is the lead agency for the investigations and for specified cleanups of designated sites within the NAVSTA Newport property, and EPA and RIDEM provide oversight.

2.2 SITE HISTORY AND ENFORCEMENT ACTIVITIES

Previous environmental investigations designed to evaluate the environmental quality of marine sediment at the Former Derecktor Shipyard are summarized in Table 2-1. Results of these investigations indicated that concentrations of PAHs, PCBs, and lead in sediment exceed acceptable risk levels and/or state regulatory standards. Investigations also indicated the presence of asbestos in some sediment. The nature and extent of contamination identified in marine sediment is discussed in Section 2.5.

TABLE 2-1. PREVIOUS INVESTIGATIONS AND SITE DOCUMENTATION

INVESTIGATION	DATE	ACTIVITIES
National Priorities List (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 RI, 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.
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.
Marine ERA/Human Health Risk Assessment (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 was conducted for use in a future Feasibility Study (FS).
Sediment Sampling	2004	Additional sediment sampling at previous locations was conducted, and contaminants were again detected though at lower concentrations (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.

TABLE 2-1. PREVIOUS INVESTIGATIONS AND SITE DOCUMENTATION		
INVESTIGATION	DATE	ACTIVITIES
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 included tributyltin (TBT), zinc, copper, and asbestos (Figure 2-4). The results indicated that zinc, copper, and TBT 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.

*Additional information about terms in **blue text** is provided in the Administrative Record Reference Table included before the appendices at the end of this ROD.*

Robert E. Derecktor Shipyards of RI, 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 (TSCA), CERCLA, CWA, Resource Conservation and Recovery Act (RCRA), Clean Air Act, and Hazardous Transportation Act, for illegal disposal activities including the discharge of over 4,000 tons of pollutants into the bay.

2.3 COMMUNITY PARTICIPATION

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. These activities include regular technical and Restoration Advisory Board (RAB) meetings with local officials and the establishment of an online Information Repository for dissemination of information to the community (available through the web page at http://go.usa.gov/DyNw, then click "Administrative Records").

The Navy organized a RAB in 1990 to review and discuss NAVSTA Newport environmental issues with local community officials and concerned citizens. The RAB consists of representatives of the Navy, EPA, and RIDEM and members of the local community. The RAB has met frequently since its inception and now meets bi-monthly. OU5 investigation activities, results, and associated remedial decisions have been discussed at RAB meetings. Documents and other relevant information relied on in the remedy selection process are available for public review as part of the Administrative Record, located within the on-line information repository. For additional information about the IR Program at NAVSTA Newport, contact Ms. Lisa Rama, Public Affairs Office, 690 Peary Street, NAVSTA Newport, Newport, Rhode Island, 02841 (lisa.rama@navy.mil).

In accordance with Sections 113 and 117 of CERCLA, the Navy provided a public comment period from May 21 to June 20, 2014, for the proposed remedial action described in the Proposed Plan for OU5 at Site 19. A public meeting to present the Proposed Plan was held on May 21, 2014 at the Courtyard Marriott, 9 Commerce Drive, Middletown, Rhode Island. A **public notice** of the meeting and availability of documents was published in the *Newport Daily News* on May 17 and May 19, 2014. Immediately following the public informational meeting, the Navy held a public hearing to solicit public comments for the record. A transcript of the oral comments received during the public hearing was prepared and is available for review as part of the Former Derecktor Shipyard Administrative Record for OU5 (see Appendix F). Three comments were received during the public hearing, and no written comments were received during the 30-day comment period. The Navy's Responsiveness Summary is presented in Section 3 of this ROD.

2.4 SCOPE AND ROLE OF OPERABLE UNIT

OU5 of Site 19 is part of a comprehensive environmental investigation and cleanup program currently being performed at NAVSTA Newport under CERCLA authority pursuant to the FFA dated March 23, 1992. Fifteen IR sites have been identified at NAVSTA Newport. Each of these sites progresses through the cleanup process independently, and for the most part, the Selected Remedy for OU5 is not expected to have an impact on the strategy or progress of cleanup for the other sites at NAVSTA Newport: Because OU5 is adjacent to OU12 and both are part of Site 19, the OU5 remedy will need to be conducted in coordination with the OU12 remedy. However, other OUs at NAVSTA Newport should be unaffected by the activities at the site and the remedies conducted.

An Initial Assessment Study (IAS), completed in 1983, identified 18 sites where contamination was suspected to pose a threat to human health and the environment (EEI, 1983). This initial list of sites did not include Site 19 as it was added to the FFA list later, in 1993. Six of the 18 sites were investigated further in a Confirmation Study (CS) completed in 1986. A Remedial Investigation (RI) completed in 1992 included McAllister Point Landfill (Site 1), Melville North Landfill (Site 2), Old Fire Fighting Training Area (OFFTA) (Site 9), Tank Farm 4 (Site 12), and Tank Farm 5 (Site 13). The McAllister Point Landfill, Melville North Landfill, and Tank Farm 4 had been previously investigated as part of both the IAS and CS, and Tank Farm 5 was investigated during the IAS.

RODs have been signed for the McAllister Point Landfill (Site 1) and OFFTA (Site 9), the portion of Tank Farm 5 (Site 13) where Tanks 53 and 56 were located, the disposal areas of Tank Farms 4 and 5 (Sites 12 and 13, respectively), the Former Building 32 at Gould Island (Site 17), and the Naval Undersea Systems Center (NUSC) Disposal Site (Site 8). The Melville Water Tower (Site 21) was addressed through a Non-Time-Critical Removal Action (NTCRA). Seven additional sites are also being investigated, six under the IR Program: Tank Farm 1 (Site 7); Tank Farm 2 (Site 10); Tank Farm 3 (Site 11); Coddington Cove Rubble Fill Area (Site 4); Carr Point Storage Area (Site 22), and Coddington Point Debris Sites (Site 23). Another site, Carr Point Shooting Range, is being investigated as Site 1 under the Munitions Response Program (MRP).

There have been no previous remedial actions conducted in response to the contamination at OU5, Site 19. The remedy documented in this ROD will achieve the Remedial Action Objectives (RAOs) for OU5, as listed in Section 2.8. Implementation of this remedy will allow for continued industrial use of the site, continued limited port operations, and continued fishing in the waters adjacent to the site, which is consistent with current and reasonably anticipated future use and the overall cleanup strategy for NAVSTA Newport of restoring sites to support base operations.

2.5 SITE CHARACTERISTICS

Figure 2-2 presents the conceptual site model (CSM) for OU5, a graphical interpretation of contaminant sources, contaminant release mechanisms, transport routes, and receptors under current and future land use scenarios. Historical activities at Derecktor Shipyard have resulted in PAHs, PCBs, and lead in sediment at concentrations exceeding acceptable risk levels and/or state regulatory standards. The nature and extent of contamination at the site is described in Section 2.5.2, and the evaluated contaminant exposure pathways and potential human receptors under current and potential future land use scenarios are presented in Section 2.7.

2.5.1 Physical Characteristics

Physical site conditions are presented in this section. The information is summarized from data gathered during the PA, ERA, and SSI.

Because of the dynamic nature of the marine environment, the potential movement of sediment at the site was recognized as an important factor in evaluation of risk and remedial alternatives. Hydrographic evaluations were conducted, and bathymetry was evaluated in detail as part of both the ERA and the 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 ROD, 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 USCG stores buoys at the northern portion of the waterfront, and a project to reconstruct the bulkhead between Piers 1 and 2 for use as moorage for USCG buoy tenders is currently underway. 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 Building A18. Together, the breakwater and T-wharf form a protected small-boat anchorage south of the piers. A sheetpiling wall 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 CSM, 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 Hydrographic 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 Coddington Cove (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 evaluated in 2004 but have not been measured in detail.

During the SSI (Tetra Tech 2012), wave height, tidal elevation, water temperature, and current profile measurements were collected using Acoustic Doppler Current Profile (ADCP) 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. 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.

2.5.2 Nature and Extent and Fate and Transport of Contamination

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, which are further discussed in Section 2.7). The risk-driving COCs were benzo(a)pyrene, HMW PAHs, total PCBs, and lead. Most recently, sediment samples from OU5 were collected and analyzed for COCs during the SSI in 2011; this investigation is considered to be the most relevant based on the fact that it is the most recent investigation (documents most current conditions in a potentially dynamic environment) and because it provides the best coverage for sample locations (best density and most consistent distribution of samples). Table 2-2 presents a summary of SSI sediment results for COCs. The extent of COCs exceeding cleanup goals in marine sediment is presented on Figures 2-3A through 2-3C.

TABLE 2-2. SUMMARY OF SSI SAMPLE 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

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

2.5.3 Nature and Extent of Contamination in Sediment

The paragraphs below summarize the nature and extent of COCs that were selected by the risk assessment and the PRG development documents as identified in Table 2-1 above.

HMW PAHs

Of the 349 samples analyzed for HMW PAHs, 20 were reported to have concentrations greater than the PRG of 13,903 µg/kg. In the surface interval (0 to 12 inches), analysis of samples from stations J30 (south of the eastern end of Pier 2) and BE30 (south of the T-wharf) had total HMW PAH concentrations of 186,000 and 117,000 µg/kg, respectively, the two highest concentrations detected in SSI sediment samples. In surface sediment, other exceedances of the PRG were identified in samples collected beneath the eastern end of Pier 2, and at the south side and eastern end of Pier 1. These surface exceedances are consistent with the results of previous investigations; HMW PAHs were previously detected at elevated concentrations in 1993 and 2004 south of the T-wharf and in 1996 at the eastern end of Pier 2.

Exceedances of the PRG for HMW PAHs in the 12- to 24-inch interval were also identified in samples collected at the eastern ends of Pier 1 and Pier 2 and south of the T-wharf. The only two samples collected from this interval with total HMW PAH results greater than twice the PRG were located at the eastern end of Pier 1.

In the deepest interval (24 to 48 inches), total HMW PAHs were detected at concentrations greater than the PRG in one sample from beneath Pier 2 and in three samples collected from the area surrounding and beneath Pier 1. The exceedance at Pier 2 was less than twice the PRG. Elevated concentrations of total HMW PAHs were detected in samples collected from the eastern end and western/central portion of Pier 1. The total HMW PAH concentration in the sample from the eastern end was less than twice the PRG. At the western/central portion of the pier, total HMW PAH concentrations were between two and five times the PRG; it is likely that these concentrations are observed in deeper sediment because of localized deposition during the tenure of the inactive aircraft carriers).

Benzo(a)pyrene

Of the 349 samples collected, benzo(a)pyrene concentrations exceeded the PRG of 539 µg/kg in 46 samples. Benzo(a)pyrene concentrations exceeded its PRG in 20 samples collected from the surface interval, and reported concentrations were greater than twice the PRG in eight of those samples. The distribution of elevated benzo(a)pyrene concentrations was similar to the distribution of HMW PAHs in surface sediment but encompassed a greater area overall. The maximum benzo(a)pyrene concentrations of 8,800 and 9,000 µg/kg were detected in samples collected from station J30 (located south of the eastern end of Pier 2) and BE30 (located south of the T-wharf), respectively. Unlike HMW PAH concentrations that were relatively isolated, the elevated benzo(a)pyrene concentrations at these locations covered a greater area. Near station J30, the elevated levels extend approximately 100 feet north of Pier 2 and approximately 100 feet south of Pier 2. Near station BE30, samples with elevated benzo(a)pyrene concentrations extend across the area south of the T-wharf. Other locations where benzo(a)pyrene concentrations in surface sediment were greater than twice the PRG were stations Y30, located north of the eastern end of Pier 1, and AD13, located south of the center of Pier 1.

Areas with samples containing elevated benzo(a)pyrene concentrations in the 12- to 24-inch interval followed a similar pattern as the surface interval. Exceedances of greater than twice the PRG were observed at the eastern ends of Piers 1 and 2 and in the area south of the T-wharf. In general, the total area with concentrations exceeding the PRG was smaller than in the surface, and concentrations were lower.

Benzo(a)pyrene was observed in the 24- to 48-inch interval at levels exceeding the PRG at the eastern ends of the piers and south of the T-wharf, similar to the intervals above. Additionally, benzo(a)pyrene concentrations in samples collected from the western/central end of Pier 1 were present above the PRG.

PCBs

All 349 sediment samples were analyzed for PCBs, and the PCB PRG of 1,060 µg/kg was exceeded in 17 of the 349 samples. In surface sediment, the PRG was exceeded in eight samples, and in two of the eight samples, collected from south of the center and eastern end of Pier 2, PCB concentrations were measured at concentrations greater than twice the PRG. In the 12- to 24-inch interval, PCB concentrations were significantly lower. PCB concentrations exceeded the PRG in only five samples from this interval, and only one sample had a concentration greater than twice the PRG (which was the same location as a surface sediment exceedance, south of the eastern end of Pier 2). Four samples from the 24- to 48-inch interval reported PCB concentrations exceeding the PRG. The PCB concentration at only one of those four samples was greater than twice the PRG, and that sample was collected from south of the eastern end of Pier 1.

Lead

Lead analysis was performed on all 349 sediment samples, and 41 samples had lead concentrations in excess of the PRG (168 mg/kg). Concentrations of lead exceeded the PRG in 15 surface sediment samples, and in eight of these samples, concentrations greater than twice the PRG. Samples with the greatest lead concentrations were collected from south of the center and eastern end of Pier 2 and north and south of the center of Pier 1 (where the floating dry-docks were once located).

In the 12- to 24-inch interval, lead was detected at above the PRG in samples collected from the area around the eastern end of Pier 2 and again at the former locations of the floating dry-docks. In general, lead concentrations measured in samples from the 12- to 24-inch interval were less than those measured in the surface interval. In the 24- to 48-inch interval, lead was detected at concentrations exceeding the PRG in nine samples, and four of these concentrations were greater than twice the PRG. Two of the samples with the greatest lead concentrations were collected south of the eastern end of Pier 2, and the other two were collected from the western and eastern ends of Pier 1.

Asbestos

Asbestos was identified in sediment samples collected beneath Pier 1. While asbestos is not a COC at this site, it will be addressed as a part of this response action. Asbestos was reported at trace levels (less than 1 percent) in 22 samples and at 2 percent in two samples. The samples with the 2-percent results were collected from the 12- to 24-inch and 24- to 48-inch intervals at the eastern end of the pier.

2.6 CURRENT AND POTENTIAL FUTURE SITE AND RESOURCE USES

NAVSTA Newport is an active military training facility and is expected to remain active for the foreseeable future. Forty-two Naval and defense commands currently operate at NAVSTA Newport, which is one of the Navy's primary sites for training and educating officers, officer candidates, senior enlisted personnel, and midshipman candidates, and which is also used for conducting advanced undersea warfare and development systems activities. Tenant commands include the NUWC, Naval Warfare College, SWOS, Navy Warfare Development Command, Officer Training Command, Center for Service Support, Naval Academy Preparatory School, and Senior Enlisted Academy.

The NAVSTA Newport area has been used by the U.S. Navy since the Civil War era. Activities have increased during war times and later decreased as Naval forces were reorganized. Between 1900 and the mid-1970s, the facility was also used as a refueling depot. The Shore Establishment Realignment Program reorganization in April 1973 resulted in reductions in personnel, and the Navy excessed a large portion of the acreage of the original facility. NETC was subsequently established. In the mid-1990s, several new laboratories at the NUWC were constructed to provide research, development, testing, evaluation, engineering, and fleet support for submarines and underwater systems. In October 1998, NAVSTA Newport was established as the primary host command, taking over base operating support responsibilities from NETC.

The Former Derecktor Shipyard is part of the NAVSTA Newport facility located in Middletown and Newport, Rhode Island. OU5 is bounded by the OU12 of the site to the east and Coddington Cove to the north, south, and west. West of Coddington Cove is the East Passage of Narragansett Bay. The site was used in the past as home to the Commander Cruiser-Destroyer Force Atlantic and was the Newport, Rhode Island, location of Derecktor Shipyards, Inc., a tenant which utilized the space as an industrial port to construct and maintain ships. Buildings and structures associated with ship maintenance and construction have since been removed. Piers 1 and 2 currently have restricted load capacity; the T-wharf is in disrepair and is not used. A construction project to restore the bulkhead between Piers 1 and 2 is ongoing, and when complete, this area will serve as moorage for USCG buoy tenders.

Pier 2 currently houses the NUWC Periscope Shop and is temporary homeport for the three USCG ocean buoy tenders, a USCG maintenance team, the USCG pursuit vessel Tigershark, and one NOAA fisheries research vessel. Pier 2 is also occasionally used 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.

2.7 SUMMARY OF SITE RISKS

The risks summarized in this section are those for **potential receptors** indicated on Figure 2-2, which is based on unrestricted use of the site.

The baseline risk assessments estimate the site risks if no action were to be taken. The risk assessment results provide the basis for taking action and identify the contaminants and exposure pathways that need to be addressed by the remedial action. The results of the risk assessments can be found in the Marine

HHRA Off-Shore Areas of the Former Robert E. Derecktor Shipyard Report (B&R, 1998) and Marine ERA Report (SAIC and URI, 1997).

2.7.1 Human Health Risk

The quantitative HHRA was conducted using chemical concentrations detected in sediment. Risks to human health were evaluated in 1998 and re-evaluated by the project team during FS development to address various issues identified subsequent to the completion of the risk assessment in 1998. Risks were evaluated for exposure to COCs through ingestion of shellfish and direct exposure to sediment. Key steps in the risk assessment process included identification of contaminants of potential concern (COPCs), exposure assessment, toxicity assessment, and risk characterization. Tables that present the exposure point concentrations used in the HHRA and the associated results are presented in Appendix C.

2.7.1.1 Identification of COPCs

For this site, risks from exposure to contaminants in sediment were developed for ingestion of shellfish affected by the contaminants in sediment, and direct exposure to sediment. This required use of food-tissue exposure point concentrations converted with Biological Sediment Accumulation Factors (BSAFs) to model intake of contaminants from sediment to shellfish and then from shellfish to humans. As noted in the HHRA report, every chemical detected in shellfish (for the shellfish ingestion scenarios) and in sediment (for the trespasser scenario) in the 1993 - 1997 data set were selected as COPCs.

2.7.1.2 Exposure Assessment

During the **exposure assessment** step of the HHRA, current and potential future exposure pathways through which humans might come into contact with the COPCs identified in the previous step were evaluated. The results of the exposure assessment for OU5 were used to refine the CSM. Exposure scenarios for the HHRA were selected on the basis of the current and future anticipated uses of the site, in order to address all of the key human exposure media, and on discussions with EPA. The exposure scenarios in the HHRA included future ingestion of shellfish by recreational and subsistence fishermen, and current and future ingestion of and dermal contact with sediment by child and adult trespassers. Future human exposure to constituents in shellfish caught at the site are plausible given the current understanding that limited fishing for lobster does occur within Coddington Cove by commercial fishermen. To evaluate sediment exposure to trespassers swimming or wading in the cove south of the site, data from impacted sediments from the site was used to estimate exposure to sediment for this receptor.

TABLE 2-3. RECEPTORS AND EXPOSURE ROUTES EVALUATED IN HHRA

RECEPTOR	EXPOSURE ROUTE
Current and future fishermen (subsistence and child and adult recreational users)	Shellfish ingestion (lobster, clams, mussels)
Current and future trespassers (adults/children)	Sediment incidental ingestion Sediment dermal contact

2.7.1.3 Toxicity Assessment

The objective of the toxicity assessment is to identify the potential adverse health effects in exposed populations. Quantitative estimates of the relationship between the magnitude and type of exposures and the severity or probability of human health effects are defined for the identified COPCs. Quantitative toxicity values determined during this component of the risk assessment are integrated with outputs of the exposure assessment to characterize the potential for the occurrence of adverse health effects for each receptor group.

The toxicity values used to evaluate non-carcinogenic health effects for ingestion and dermal exposures are called reference doses (RfDs). RfDs are estimates of daily exposure levels for the human population that are likely to be without appreciable risk during a portion or all of a lifetime. RfDs are based on a review of available animal and/or human toxicity data, with adjustments for various uncertainties associated with the data. Carcinogenic effects are quantified using cancer slope factors (CSFs) for ingestion and dermal exposures, which are plausible upper-bound estimates of the probability of development of cancer per unit intake of chemical over a lifetime. The potential carcinogenic effects are calculated using available dose-response data from human and/or animal studies.

The toxicity criteria for the constituents selected as COPCs during the HHRA are presented in Appendix C.

2.7.1.4 Risk Characterization

During the risk characterization, the outputs of the exposure and toxicity assessments are combined to characterize the baseline risk (cancer risks and non-cancer hazards) at the site if no action was taken to address the contamination. Potential **cancer risks and non-cancer hazards** were calculated based on reasonable maximum exposure (RME) assumptions. The RME scenario assumes the maximum level of human exposure that could reasonably be expected to occur.

For carcinogens, risks are generally expressed as the incremental probability of an individual developing cancer over a lifetime as a result of exposure to the carcinogen. Excess lifetime cancer risk is calculated from the following equation:

$$\text{Cancer Risk} = \text{CDI} \times \text{SF}$$

where: Cancer Risk = a unitless probability (e.g., 2×10^{-5}) of an individual developing cancer
CDI = chronic daily intake averaged over 70 years (mg/kg-day)
SF = slope factor ($[\text{mg/kg-day}]^{-1}$)

These calculated risks are probabilities that are usually expressed in scientific notation (e.g., 1×10^{-6}). An excess lifetime cancer risk or incremental lifetime cancer risk (ILCR) of 1×10^{-6} under an RME scenario indicates that an individual experiencing the reasonable maximum exposure estimate has an "excess lifetime cancer risk" because it would be in addition to the risks of contracting cancer that individuals face from other causes. EPA's generally acceptable risk range for site-related exposures to COCs is 1×10^{-4} (1 in 10,000) to 1×10^{-6} (1 in 1 million).

Table 2-4 provides RME cancer risk estimates for the significant receptors and routes of exposure developed by taking into account various conservative assumptions about the frequency and duration of exposure for each receptor and also the toxicity of the COPCs. OU5 COPCs associated with carcinogenic risk include arsenic, PAHs, and PCBs. Total risk estimates for all applicable exposure routes range from 5.4×10^{-7} for adult trespasser to 5.7×10^{-4} for subsistence fishermen. These risk levels indicate that if no cleanup action was taken, the increased probabilities of developing cancer as a result of site-related exposure would range from approximately 7.7 in 10,000,000 to 5.7 in 10,000.

It is noted that there is a discrepancy in the FS for the estimated cancer risk for child trespassers exposed to sediment in a swimming/wading scenario. The FS cites a cancer risk of 9.9×10^{-7}, whereas the final risk assessment cites a cancer risk of 2.0×10^{-6}. This difference has been determined to be a result of a modified calculation on the manner in which the analytical data was expressed (wet weight vs. dry weight) that was changed between the draft final and final versions of the risk assessment, though the resulting difference is not significant, and would not affect selection of the remedy.

The potential for non-carcinogenic effects is evaluated by comparing an exposure level over a specified time period (e.g., a lifetime) to an RfD derived for a similar exposure period. An RfD represents a level to which an individual may be exposed that is not expected to cause any deleterious effect. The ratio of exposure to toxicity is called a Hazard Quotient (HQ). An HQ less than 1 indicates that a receptor's dose of a single contaminant is less than the RfD and that toxic non-carcinogenic effects from that chemical are unlikely. The hazard index (HI) is generated by adding the HQs for all chemicals that affect the same target organ (e.g., liver) or that act through the same mechanism of action within a medium or across all media to which a given individual may be reasonably exposed. A HI of 1 or less indicates that, based on the sum of all HQs from different contaminants and exposure routes, toxic non-carcinogenic effects from all contaminants are unlikely. A HI greater than 1 indicates that site-related exposures may present a risk to human health. The HQ is calculated as follows:

Non-cancer HQ = CDI / RfD

where: CDI = chronic daily intake (mg/kg-day)
RfD = reference dose (mg/kg-day)

CDIs and RfDs are expressed in the same units and represent the same exposure period (i.e., chronic, sub-chronic, or short-term).

Table 2-4 provides RME non-cancer HQs for each receptor and route of exposure and total HI values for all routes of exposure. Total HIs for all applicable exposure routes range from 0.0003 for adult trespassers dermal contact with sediment to 3.9 for ingestion of shellfish (lobster) by subsistence fishermen.

Table 2-4. Receptors and Calculated Risk

Receptor	Medium	Total Cancer Risk	Hazard Index
Child Recreational	Shellfish Ingestion	1.4E-05	<1
Adult Recreational	Shellfish Ingestion	4.4E-05	<1
Subsistence Fisherman	Shellfish Ingestion	**5.7E-04**	**3.9**
Adult Trespasser	Sediment	5.4E-07	<1
Child Trespasser	Sediment	2.0E-6	<1

Bolded values exceed EPA target risk range or target hazard (cancer risk of 1E-4 and non-cancer HI of 1).
Recreational scenario assumes recreational fishing at the site and three meals per year taken from the study area.
Subsistence fisherman scenario assumes 36 meals per year taken from the study area.
Ingestion of lobster, clams, and mussels were all evaluated and the maximum risk (for ingestion of lobster) is cited.
Risk estimates are presented for the COPCs as presented in the HHRA (Tetra Tech, 1998).

For the child recreational visitor and adult recreational visitor, all non-carcinogenic hazards under the RME scenario were less than or equal to unity (1). For the subsistence fisherman, non-carcinogenic risks for ingestion of blue mussels and lobster under both the RME and the central tendency exposure (CTE) are greater than 1.0. Additionally, non-carcinogenic hazards for ingestion of hard-shell clams under RME are greater than 1.0.

2.7.1.5 Summary of Human Health Risk

Risks to human health were evaluated under several exposure scenarios including ingestion of shellfish by recreational fishermen (adults and children) living at or near the site, and ingestion of shellfish by subsistence fishermen (adults).

Risks from Ingestion of Shellfish

The calculated cancer risks from shellfish ingestion were all within the EPA target risk range of 1E-4 to 1E-6 for all scenarios except the adult subsistence fishermen. This is the only scenario under which risks exceeded EPA's target risk range for carcinogens and exceeded a HI of 1.0 for non-carcinogens. The primary contributor to human health risk is from benzo(a)pyrene in lobster, hard-shell clams, and blue mussels and exposure to the human receptor through ingestion.

Sediment Risks

The calculated cancer risks to trespassers and recreational and subsistence fishermen from incidental ingestion of and dermal contact with site sediment are less than the EPA target risk range, and the HI is less than 1.0.

Risk Uncertainties

No major sources of uncertainty, other than those typically associated with risk assessment estimates, were identified for the OU5 HHRA.

2.7.2 Ecological Risk

The marine ERA was performed to identify risks to aquatic receptors exposed to site contaminants, as well as risk to terrestrial predators exposed through consumption of aquatic biota. The ERA evaluated risks to ecological receptors at and adjacent to the Former Derecktor Shipyard using data collected from sample stations presented on Figure 2-5 (excluding the 2004 sediment data, which is included on Figure 2-5). The ERA incorporated the assessment of the exposure and effects endpoints within a line-of-evidence framework. The eight lines of evidence evaluated in the exposure assessment were as follows:

1. Sediment HQ Adverse Exposure Ranking. Sediment HQs were established as an indication of risk to the benthic invertebrates by comparison to Effects Range-Low (ER-L) and Effects Range-Median (ER-M) screening values (Long et. al, 1990 and updates). HQs at each station were identified as high (equal to or exceeding two times the ER-M), intermediate (exceeding the ER-M), low (multiple constituents exceeding the ER-L but none exceeding the ER-M), or baseline (no more than one contaminant exceeded the ER-L).

2. Elutriate HQ Adverse Exposure Ranking. Sediment elutriate samples were analyzed to identify the transfer of contaminants from sediment to water when it is stirred up and suspended in the water column in an effort to simulate disturbance by ship traffic or storm events. Contaminant concentrations measured in water from sediment elutriate preparations suggested low overall probabilities of adverse effects at all stations by comparing the concentrations of contaminants in the supernatant greater than chronic and acute Ambient Water Quality Criteria (AWQCs).

3. Simultaneously Extracted Metals (SEM) Bioavailability Adverse Exposure Ranking. Measures of sediment acid-volatile sulfide (AVS) and SEM suggested possible but low exposures from bioavailable metals. Intermediate or higher adverse exposures due to divalent SEM metals were not generally evident at the site.

4. Tissue Concentration Ratio Adverse Exposure Ranking. Contaminant concentrations in target species (clams, mussels, lobster) from site sample stations were compared to tissue concentrations at reference stations to identify the probabilities of adverse exposure due to relatively high concentrations of chemicals in indigenous mussel tissue and intermediate concentrations in finfish, deployed mussels, and/or lobster.

5. Tissue Residue Adverse Effects Rankings. Probabilities of adverse effects from contaminants found in shellfish tissue were evaluated based on contaminant concentrations in tissue samples.

6. Laboratory Toxicity Adverse Effects Ranking. An overall adverse effects probability was measured by testing sediment toxicity to amphipods and sea urchin larvae under controlled laboratory tests.

7. Field Effects Ranking. An overall adverse effects ranking was identified for field effects indicators, which included benthic community structure, bivalve condition, hematopoietic neoplasia, Cytochrome P450 activity, and presence of fecal pollution indicators.

8. Avian Predator Effects Ranking. A food web model approach was used to determine potential adverse effects to avian aquatic predators. This model assumed that the target bird species were

feeding exclusively on the most contaminated of prey items available at each given station where such data was collected.

The lines of evidence described above were based on the analysis of exposure and effects data, as represented by the endpoints identified. The lines of evidence were then evaluated in combination to categorize the overall risk for each station. The following categorization of ecological risks was developed for the Former Derecktor Shipyard Marine ERA:

- *Baseline* risk was defined as the probability of adverse exposure and/or ecological effects equivalent to that from contamination and other environmental conditions not associated with the site.

- A *Low* probability of ecological risks suggests possible but minimal impacts based on some of the exposure- or effects-based lines of evidence although impacts are undetectable by the majority of exposure- and effects-based lines of evidence. Conditions of low risk probability typically lack demonstrable exposure-response relationships.

- An *Intermediate* probability of ecological risk is typically characterized by multiple exposure or effects lines of evidence, suggesting that measurable exposure or effects, but not both, are occurring at the site. Typically, quantitative exposure-response relationships are lacking. Intermediate risk probability may also be indicated if the spatial extent of apparent impact is highly localized (a single station) or if the impact occurs for periods of very limited duration.

- A *High* probability of ecological risk was assigned to areas where numerous lines of evidence suggest pronounced chemical exposure and effects, the spatial extent of apparent impact is great, the impact is likely to be persistent over long periods of time, and the available data support demonstrable exposure-response relationships.

A single ranking strategy for synthesizing the lines of evidence was used to obtain the probability of adverse Exposure/Effect (E/E) line designation to evaluate the data in a manner consistent with the risk definitions discussed above. The findings of exposure and effects lines were evaluated jointly by evaluating strength of exposure-response relationships and overall probability of adverse ecological risks according to sample station.

The environmental risk probabilities were estimated for each station for OU5 and are summarized as follows (see Figure 2-5):

- Stations DSY-27 and -29 were determined to pose high probabilities of risk to fish, shellfish, and seabirds from shipyard-related chemicals including PCBs, PAHs, TBT, copper, lead, and zinc. Plausible exposure-response relationships were observed for benthic community structure possibly affected by PAHs in sediment and for indigenous mussel condition possibly affected by PCBs in sediment.

- Stations DSY-24, 25, 26, 28, 31, 33, 40, and 41 (and one reference station) were determined to pose intermediate probabilities of risk to ecological receptors. Intermediate risks were assigned to these stations due to suggested but not quantifiable exposure-response relationships. In general, the same receptors and COPCs were observed at intermediate and high risk stations. However, elevated levels of PAHs were observed in mussels at stations DSY-25 and -26, north of the shipyard, and an elevated TBT concentration was present in sediment at station DSY-31. Seabirds may be at risk from PCBs in fish at station DSY-28.

- Stations DSY-30, -32, -34, -35, -36, -37, -38, and -39 were determined to pose low probabilities of risk to ecological receptors. Although data suggest possible adverse effects, COPC concentrations were low, and definitive exposure-response relationships were not observed.

Based on the above, the Marine ERA concluded that there was potential for multiple adverse effects primarily to the benthic community and less so to fish and seabirds from exposure to contaminants (PCBs, HMW PAHs, and lead) in sediment. Other constituents including TBT, zinc, and copper that were determined in the ERA to not be the primary risk drivers at the site were not evaluated for risk contribution at the time, though they were qualitatively evaluated again in 2012, as described in Table 2-1. Tables summarizing the Marine ERA and associated results are presented in Appendix D.

2.7.3 Basis for Action

Unacceptable risks were identified at OU5, including unacceptable cancer and non-cancer risk associated with exposure to benzo(a)pyrene through ingestion of shellfish via subsistence fishing and adverse effects to fish, shellfish, and seabirds from PCBs, HMW PAHs, and lead. Because unacceptable risks were identified under current and/or future use, the response action selected in this ROD is necessary to protect the public health or welfare or the environment from actual or threatened releases of hazardous substances into the environment.

In addition, asbestos was identified in sediment samples collected beneath Pier 1 where a known asbestos release occurred. 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.

2.8 Remedial Action Objectives (RAOs)

RAOs are medium-specific goals that define the objective of conducting remedial actions to protect human health and the environment. RAOs 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. RAOs typically serve as the design basis for the remedial alternatives described in Section 2.9.

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 basis as described in Section 2.9.1.

To address the potential for a future risk from exposure to asbestos at OU5 during implementation of the proposed remedy and 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.

Chemicals associated with unacceptable human health risk (ILCRs greater than 1×10^{-4} or HIs greater than 1) were identified as **COCs** that require remediation (Table 2-5). Chemicals found to pose greatest risk to ecological receptors were also identified as COCs that require remediation (Table 2-5).

PRGs were developed during the FS as target cleanup goals for remedial actions that, if met, would result in acceptable COC concentrations in the media of concern and thereby mitigate risks to human health and the environment. PRGs were established for the COCs identified (benzo(a)pyrene, HMW PAHs, PCBs, and lead) (SAIC, 1998). Candidate PRGs were developed for marine sediment for the COCs that contributed significantly to unacceptable risk to human health and adverse effects to ecological receptors.

For human receptors, cancer risks greater than 10^{-4} and/or non-cancer HIs greater than 1 were used as thresholds for each exposure pathway and land use scenario. Chemicals were not considered to be significant contributors to risk if their individual carcinogenic risk contribution was less than 1 x 10^{-6} or their non-carcinogenic HQ was less than 1. Acceptable concentrations based on risk were calculated to meet an ILCR of 1 x 10^{-6} and an HQ 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 (TEV), which is the concentration above which adverse effects to the receptor were deemed possible. The TEVs were developed for aquatic receptors based on the target acceptable risk values and reference station concentrations. The calculated values were identified as Baseline PRGs (BPRGs), 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. Details on the development of the PRGs are presented in the FS Report (Section 2.2.2 and Appendix A).

The recommended PRGs developed (SAIC, 1998) and presented in the FS have been retained as **cleanup levels** in this ROD. Cleanup levels for OU5 were selected for active remediation to support continued industrial use of the site, and future fishing as appropriate. Table 2-5 summarizes the COCs and cleanup levels selected for remediation at the site.

TABLE 2-5. OU5 CLEANUP LEVELS

CHEMICAL OF CONCERN	CLEANUP LEVEL	RISK ENDPOINT
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

2.9 DESCRIPTION OF ALTERNATIVES

To address potentially unacceptable human health and ecological risks associated at OU5, a **preliminary technology screening** evaluation was conducted in the FS. A number of treatment technologies and process options were initially screened based on their potential effectiveness, implementability, and cost, though some (treatment, sequestration, etc.) were eliminated, primarily due to their impracticality with respect to site-specific circumstances or due to the low levels and discontinuous distributions of contaminants at the site.

The technologies and process options retained after the initial screening were assembled into various alternatives for marine sediment. Consistent with the NCP, the no action alternative was evaluated as a baseline for comparison with other alternatives during the comparative analysis. The remedial alternatives developed in the FS for OU5 are presented in Section 2.9.2.

2.9.1 Determination of Surface-Area Weighted Average Concentrations (SWACs)

Integral to the selection of the remedy is the methodology used to select the areas of sediment requiring action in order to meet the RAOs. Through discussions with EPA and RIDEM, the Navy identified the sediment that causes excessive risk as that sediment where the SWACs of the site COCs exceed their respective cleanup levels. Due to the spatially discontinuous distribution of elevated levels of each COC (exceeding respective cleanup levels), and because there is also spatial discontinuity in the manner in which receptor populations could be exposed to the COCs, the project team determined that SWACs should be used to conservatively represent risk in the study area as a whole. By considering only the areas or "cells", depicted on Figures 2-3A through 2-3C, where cleanup levels are exceeded for each individual COC, an area-average approach was developed that is adequately conservative for the remedial action. Addressing contaminated sediment by reducing the SWACs ensures that cleanup levels are met where exposure can occur.

Before remedial action areas could be identified, a baseline SWAC for each COC-specific decision unit (DU) was calculated. The approach for calculating the baseline SWAC for each COC was as follows:

- Cells where the surface (0- to 1-foot depth) concentration of a COC exceeded its cleanup level were identified. Only those cells were included in the SWAC calculation.

- For each cell with a COC exceeding its cleanup level, the COC concentration was multiplied by the area of that cell. This effectively weighted each cell differently based on COC concentration and area.

- For each COC, the sum of those products (COC concentration multiplied by area) was calculated and then divided by the total area over which that COC concentration exceeded the cleanup level.

- The final result was a baseline SWAC based on only those cells where that COC exceeded its cleanup level.

$$\textit{SWAC (for each COC)} = \frac{(conc_1 * area_1)+(conc_2 * area_2)\ldots+(conc_n + area_n)}{area_1 + area_2 \ldots + area_n}$$

Remedial action areas (target areas) were identified for each COC as described above, and these separate areas were combined by adding the areas together to form a collection of discontinuous action areas to address all four COCs. The SWAC calculation was then used to test each alternative to determine if resulting SWAC concentrations met the cleanup goals. As target areas were selected, the concentrations in the SWAC calculation were revised based on the action specified in that alternative. For example, if a target area was dredged, the new surface concentration after dredging would be the concentration at the newly exposed surface. If that area was covered or capped with clean sand, the COC concentration for that area would be assumed to be "not detected", and would be given a hypothetical COC concentration of zero. As each target area was hypothetically selected for remedial action, the SWACs were recalculated and they continued to decrease until an adequate area and volume of sediment were addressed such that all SWACs for all COCs were projected to meet cleanup levels, thereby achieving RAOs.

Using this approach, some sediment with COCs exceeding cleanup goals will remain in place, but the resulting SWACs will be less than cleanup levels. Section 2.4 and Appendix D8 of the FS present example calculations for the SWACs.

2.9.2 Sediment Alternatives

To address COCs at OU5, a screening of General Response Actions (GRAs), remedial technologies, and process options was conducted as part of the FS. The technologies and process options retained from the detailed screening were assembled into five remedial alternatives for OU5. Consistent with the NCP, the no action alternative was evaluated as a baseline for comparison with other alternatives during the comparative analysis. Table 2-6 summarizes the major components and provides estimated costs for each of the remedial alternatives developed for OU5.

TABLE 2-6. SUMMARY OF REMEDIAL ALTERNATIVES EVALUATED

ALTERNATIVE	COMPONENTS	DETAILS	COST
No Action (Alternative 1)	None	No further actions would be taken.	**Capital**: $0 **O&M**: $0 **Five-Year Reviews:** $0 **Total 30-Year NPW**: $0
Enhanced Natural Recovery (ENR) through Thin Layer Cover, LUCs, and Monitoring (Alternative 2)	Enhanced Natural Recovery: Thin Layer Cover	A 6-inch layer of native sand or gravel material would be placed over the target areas to ultimately (after additional natural deposition) reduce SWACs of COCs to less than cleanup levels. Use of silt curtains would likely be required to control turbidity. The most appropriate cover material would be selected during the remedial design (RD). The final thickness of the cover would be between 6 and 12 inches. Visual inspection(s) would be conducted, as required, after completion of the remedy to document recovery of the benthic community.	**Capital**: $3,108,057 **Annual Costs** **O&M/LTM**: $39,182 (annual) **O&M/Five-Year Reviews:** $287,489 every 5 years **Total 30-Year NPW**: $5,222,851
	LUCs	LUCs would be established to prevent disturbance of the thin layer cover by requiring authorization for fishing and anchoring, to restrict traffic within Coddington Cove, and to prevent exposure to asbestos potentially present in any dredged shipyard sediment.	
	LTM and Five-Year Reviews	LTM would include annual sampling of sediment from the covered areas to ensure the continued effectiveness of the cover. Analysis would include sediment COCs (PCBs, HMW PAHs, and lead). A bathymetric survey would be conducted every 5 years to ensure that no substantial damage has occurred to the cover. Inspections would ensure that LUCs to maintain cover integrity continue to be implemented and enforced, and five-year reviews would summarize monitoring results.	
In-Situ Caps (Engineered Barriers), LUCs, and Monitoring (Alternative 3)	Engineered Cap	A minimum 1-foot-thick engineered layer of natural or synthetic material (cap) would be placed over target areas to isolate COCs and reduce SWACs to less than cleanup levels. Due to imprecision of the method for installing an engineered cap under water, a target 2-foot cap thickness would be required to ensure that the minimum 1-foot thickness is achieved. Visual inspection(s) would be conducted, as required, after completion of the remedy to document recovery of the benthic community. Silt curtains or other resuspension/particulate control systems would be used during placement of cap materials. To confirm proper cap placements and to document final grades, bathymetric surveys would be completed at all areas receiving a cap, before and after cap placement. The most appropriate cap material would be selected during the RD, and final cap thickness would range from 1 to 2 feet. The caps would contain contaminated sediment and prevent exposure to human and ecological receptors.	**Capital**: $4,939,678 **Annual Costs** **O&M/LTM**: $39,182 (annual) **O&M/Five-Year Reviews:** $439,433 every 5 years **Total 30-Year NPW**: $7,708,390
	LUCs	LUCs would be established to prevent disturbance of the cap by requiring authorization for fishing and anchoring, to restrict operational actions by large deep-draft vessels that may damage the cap, and to prevent exposure to asbestos potentially present in dredged shipyard sediment.	
	LTM and Five-Year Reviews	Same as Alternative 2	

TABLE 2-6. SUMMARY OF REMEDIAL ALTERNATIVES EVALUATED

ALTERNATIVE	COMPONENTS	DETAILS	COST
Combination Dredge / Backfill (open water); Cap (under Pier 2), LUCs and Monitoring (Alternative 4)	PRD Sediment Sampling	Conduct additional sediment sampling [i.e., PRD Sediment Sampling] prior to implementation of the remedial action to assess the contaminant re-distribution resulting from the disruption of the sea floor by Navy construction projects (Pier 2 fender pile replacement, and marginal wharf upgrade) conducted before finalizing this ROD, and within the footprint of the ex-Saratoga. The areas requiring dredging as part of the OU5 remedy may be revised depending on the sampling results and a revised SWAC. Details of the PRD Sediment Sampling will be included in a PRD Sampling and Analysis Plan (SAP).	**<u>Capital</u>**: $11,954,590 **<u>Annual Costs</u>** **<u>O&M/LTM</u>**: $34,355 (annual) **<u>O&M/Five-Year Reviews</u>:** $266,825 every 5 years **<u>Total 30-Year NPW</u>**: $13,795,406
	Dredging and Backfilling	Sediment would be dredged from target areas to a target depth of 1 foot. It is estimated that the open water dredging area would address approximately 191,655 square feet and would result in approximately 14,016 cubic yards of excavated dredge material. The same volume of clean sand, gravel, and fine sand would be placed in the dredged area as backfill to achieve SWACs below cleanup levels. Contaminated sediment would be dredged using methods selected to minimize water column turbidity, to be determined during the RD. During dredge and backfill operations, silt curtains or other appropriate resuspension/ particulate control systems would be used to help minimize potential adverse environmental effects that may occur due to resuspension of fine-grained sediments during remedial activities. Bathymetric surveys would also be completed: before dredging; after dredging, but before backfilling; and after backfilling. These surveys would be conducted to confirm that targeted dredging depths were reached and that backfilling returns the sediment surface to original grade. Water from the dewatering process would be treated as necessary prior to discharge into Narragansett Bay or a publicly owned treatment works (POTW). Visual inspection(s) would be conducted, as required, after completion of the remedy to document recovery of the benthic community.	
	Disposal	Dredged sediments would be dewatered on shore and/or on barges using gravity thickening and then mixed with Portland cement, lime, or another pozzolanic material to reduce the free water content of the sediment. The dredged sediments would require off-base landfill disposal. The dewatered and stabilized sediment samples would be analyzed to verify that the material meets applicable criteria before being transported for disposal. Existing sediment analytical data indicate COC concentrations are low enough that the material would likely meet requirements for disposal in a RCRA Subtitle D landfill without pre-treatment.	
	Engineered Cap Under Pier 2	Placement of a 1-foot engineered barrier (in-situ cap) in two target areas located beneath the eastern end of Pier 2, an area of approximately 83,574 square feet, requiring 8,794 cubic yards of cap material (this volume is estimated for a 2-foot-thick barrier required to ensure a minimum	

TABLE 2-6. SUMMARY OF REMEDIAL ALTERNATIVES EVALUATED

ALTERNATIVE	COMPONENTS	DETAILS	COST
		thickness of 1 foot during placement). It is assumed that the cap materials would be placed in at least two vertical lifts, to reduce mixing with silty sediments on the surface of the seafloor under the pier. During placement of the cap material, silt curtains or other appropriate resuspension/ particulate control systems would be used. Bathymetric surveys would also be completed at all areas receiving a cap, before and after placement, to confirm proper placement and thickness of the cap. The most appropriate cap material would be selected during the RD. The final thickness of the cap would range from 1 to 2 feet. The cap would contain contaminated sediment underneath Pier 2 and prevent exposure to sediment by human and ecological receptors.	
	LUCs	Short-term LUCs (i.e., Base instruction and signage) would be implemented to notify persons that shellfish should not be taken from within the OU until dredging and capping components of the remedy are completed. LUCs would be established to prevent disturbance of the cap beneath Pier 2 by requiring authorization for fishing and anchoring. 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. LUCs would also be implemented to ensure that dredged and backfilled areas are not significantly altered/disturbed in the future, preventing potential exposure. Additional LUCs would prevent exposure to asbestos potentially present in any sediment dredged as a part of this remedy, or other future project.	
	LTM and Five-Year Reviews	LTM and five-year reviews would be required to ensure long-term protectiveness at the capped areas beneath Pier 2 (LTM would not extend to areas of the site beyond the capped portion beneath Pier 2). Five-year reviews are also required to evaluate the continued protectiveness of the asbestos LUC. Annual sampling and analysis of sediment around the cap would be conducted to ensure that the RAOs continue to be met. LTM would also be conducted on dredged and backfilled areas to ensure that exposure concentrations remain less than cleanup levels as determined by SWAC calculation. Samples would be collected from the two capped areas under Pier 2 and from the open water dredged and backfilled areas. Analysis would include sediment COCs (PCBs, HMW PAHs including benzo(a)pyrene, and lead). A bathymetric survey would be conducted every 5 years to ensure that site activities and wave action are not compromising the cap beneath Pier 2. Annual inspections would ensure that the LUCs to maintain cap integrity continue to be implemented	

TABLE 2-6. SUMMARY OF REMEDIAL ALTERNATIVES EVALUATED

ALTERNATIVE	COMPONENTS	DETAILS	COST
		and enforced. The five-year reviews would summarize the results of the monitoring activities.	
Target Dredging (open water); Cap, LUCs, and Monitoring (beneath Pier 2) (Alternative 5)	PRD Sediment Sampling	Conduct additional sediment sampling [i.e., PRD Sediment Sampling] prior to implementation of the remedial action to assess the contaminant re-distribution resulting from the disruption of the sea floor by Navy construction projects (Pier 2 fender pile replacement, and marginal wharf upgrade) conducted before finalizing this ROD and within the footprint of the ex-Saratoga. The areas requiring dredging as part of the OU5 remedy may be revised depending on the sampling results and a revised SWAC. Details of the PRD Sediment Sampling will be included in a PRD SAP.	**Capital**: $16,980,477 **Annual Costs** **O&M/LTM** : $25,388 (annual) **O&M/Five-Year Reviews:** $181,025 every 5 years **Total 30-Year NPW**: $18,328,150
	Dredging	Dredging would be conducted in target areas to target depths between 1 and 2 feet to achieve SWACs below cleanup levels. Also, three additional target areas will be dredged due to specific concerns associated with past disposal activities by the shipyard and contaminants present in deeper sediment. The total dredging areas are estimated at approximately 251,279 square feet, with an associated dredged volume of approximately 27,646 cubic yards. During dredge operations, silt curtains or other appropriate particulate control systems would be used. Bathymetric surveys would also be completed before and after dredging to confirm that targeted dredging depths were reached. Sediment would be dredged using methods selected based on effectiveness and to minimize water column turbidity. The final determination of the most appropriate technique would be made during the RD. Water from the dewatering process would be treated as necessary prior to discharge into Narragansett Bay or a POTW. Visual inspection(s) would be conducted, as required after completion of the remedy to document recovery of the benthic community.	
	Disposal	Dredged sediments would be dewatered onshore and/or on barges using gravity thickening and then mixed with Portland cement, lime, or another pozzolanic material to reduce the free water content of the sediment. The dredged sediments would require off-base landfill disposal. The dewatered and stabilized sediment samples would be analyzed to verify that the material meets applicable criteria before being transported for disposal. Existing sediment analytical data indicate COC concentrations are low enough that the material would likely meet requirements for disposal in a RCRA Subtitle D landfill without pre-treatment.	
	Confirmation Sampling	Confirmation sampling would be conducted within dredged cells and within cells adjacent to the dredged cells. Details of the confirmation sampling will be included in RD and RAWP documents. These data would be used to recalculate SWACs for the open water area to represent post-dredging conditions. Specifically, confirmation sampling data from dredged cells would be utilized to calculate a SWAC for the dredged area only. If	

TABLE 2-6. SUMMARY OF REMEDIAL ALTERNATIVES EVALUATED			
ALTERNATIVE	COMPONENTS	DETAILS	COST
		this SWAC calculation indicates cleanup goals are met, the project will be considered complete. If not, the confirmation data from adjacent cells would be added to this SWAC calculation to moderate heterogeneity of sediment data and calculate a second SWAC. If this second SWAC calculation indicates that cleanup goals are met, the project will be considered complete. If not, the team will meet to determine an appropriate course of action. If the area surrounding any of the dredge cells was not previously sampled, a new cell (either 100 feet by 100 feet, or 200 feet by 200 feet, to be consistent with the size of the dredged cell) will be established at the appropriate position. If the adjacent area is a landform with no sediment present, no adjacent sample in that direction will be collected. Exact locations for post-dredge sampling will be determined based on the actual limits of dredging upon its completion. Confirmation samples will be collected from the 0- to 1-foot interval at each sample station and will be analyzed for COCs (HMW PAHs including benzo(a)pyrene, PCBs, and lead).	
	Engineered Cap Under Pier 2	Placement of a 1-foot engineered barrier (in-situ cap) in two target areas located beneath the eastern end of Pier 2, an area of approximately 83,574 square feet, requiring 8,794 cubic yards of cap material (this volume is estimated for a 2-foot-thick barrier required to ensure a minimum thickness of 1 foot during placement). It is assumed that the cap materials would be placed in at least two vertical lifts, to reduce mixing with silty sediments on the surface of the seafloor under the pier. During placement of the cap material, silt curtains or other appropriate resuspension/ particulate control systems would be used. Bathymetric surveys would also be completed at all areas receiving a cap, before and after placement, to confirm proper placement and thickness of the cap. The most appropriate cap material would be selected during the RD. The final thickness of the cap would range from 1 to 2 feet. The cap would contain contaminated sediment underneath Pier 2 and prevent exposure to sediment by human and ecological receptors.	
	LUCs	Short-term LUCs (i.e., Base instruction and signage) would be implemented to notify persons that shellfish should not be taken from within the OU until dredging and capping components of the remedy are completed. LUCs would be established to prevent disturbance of the cap beneath Pier 2 by requiring authorization for fishing and anchoring. 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. Additional LUCs would prevent exposure to asbestos potentially present in any sediment dredged as a part of this remedy, or other future project.	
	LTM and 5-Year Reviews	LTM and five-year reviews would be required to ensure long-term protectiveness at the capped	

TABLE 2-6. SUMMARY OF REMEDIAL ALTERNATIVES EVALUATED			
ALTERNATIVE	COMPONENTS	DETAILS	COST
		areas beneath Pier 2 (LTM would not extend to areas of the site beyond the capped portion beneath Pier 2). Five-year reviews are also required to evaluate the continued protectiveness of the asbestos LUC. Annual sampling and analysis of sediment around the cap would be conducted to ensure that the RAOs continue to be met. Samples would be collected from the two capped areas under Pier 2. Analysis would include sediment COCs (PCBs, HMW PAHs including benzo(a)pyrene, and lead). A bathymetric survey would be conducted every 5 years to ensure that site activities and wave action are not compromising the cap beneath Pier 2. Annual inspections would ensure that the LUCs to maintain cap integrity continue to be implemented and enforced. The five-year reviews would summarize the results of the monitoring activities.	

2.10 COMPARATIVE ANALYSIS OF ALTERNATIVES

Table 2-7 and subsequent text summarize the comparison of the OU5 remedial alternatives with respect to the **nine CERCLA evaluation criteria** outlined in the NCP at 40 CFR §300.430(e)(9)(iii) and categorized as threshold, primary balancing, and modifying criteria.

Additional information on the detailed comparison of remedial alternatives is presented in the FS.

2.10.1 Threshold Criteria

Overall Protection of Human Health and the Environment. All the remedial alternatives (except the no action alternative) were developed to reduce exposure through reductions in COC concentrations to cleanup levels, based on SWAC calculations presented in Section 2.9.1. Alternative 5 would provide the greatest protection of human health and the environment by providing for the greatest quantity of sediment removal. However, Alternative 4 would provide less protection by dredging less sediment in open water areas but using clean backfill after dredging to reduce projected SWACs to levels less than cleanup levels for all COCs. For both Alternatives 4 and 5, a cap under Pier 2 would result in the need for a LUC, but neither that control nor the cap itself would restrict the use of the port or the depths of the vessels utilizing the port or result in a residual risk of exposure to human and ecological receptors either in the long term or short term because of the combined presence of the cap and the pier over and around the capped sediments. If the pier is altered (removed or rebuilt), the LUC would require the design for that action to take into account removal (or recovering) of the sediments under the pier as needed. Short-term LUCs (i.e., Base instruction and signage) would be implemented to notify persons that shellfish should not be taken from within the OU until dredging and capping components of the remedy are completed.

TABLE 2-7: COMPARISON OF SEDIMENT CLEANUP ALTERNATIVES

	Alternative 1	Alternative 2	Alternative 3	Alternative 4	Alternative 5
ALTERNATIVE DESCRIPTION/COMPONENTS					
Evaluation Criteria	No Action	ENR Through Thin Layer Cover, LUCs, and Monitoring	In-Situ Cap, LUCs, and Monitoring	Dredge/Backfill (open water); Cap/LUCs and Monitoring (under Pier 2)	Dredge (open water); Cap/LUCs and Monitoring (under Pier 2)
ESTIMATED TIME FRAMES FOR CLEANUP (years)					
Time to achieve cleanup levels	NA	1[c]	1	1.5	1.5
CRITERIA ANALYSIS: **Threshold Criteria – Selected alternative must meet these criteria**					
Protects Human Health and the Environment – *Will it protect people and animal life? Is it permanent?*	⊘	○	●	●	●
Compliance with ARARs – *Does this alternative meet federal and state environmental laws, regulations, and requirements?*	⊘	●	●	●	●
Primary Balancing Criteria – Used to differentiate between alternatives meeting the threshold criteria above					
Provides Long-Term Effectiveness and Permanence – *Do risks remain onsite? If so, are the controls adequate and reliable?*	⊘	○	○	○	●
Reduces Mobility, Toxicity, and Volume Through Treatment – *Does the alternative reduce the harmful effects of the contaminants, their ability to spread, and the amount of contaminated material present?*	⊘	⊘	⊘	○[d]	○[d]
Provides Short-Term Protection – *How soon will risks be reduced? Are there short-term hazards to workers, residents, or the environment that could occur during cleanup?*	⊘	⊘	○	○	○
Implementability – *Is the alternative technically feasible? Are necessary goods and services (treatment equipment, space, etc.) available?*	●	○	●	●	●
Costs (see footnotes a and b) *Capital Costs (initial costs)*	$ 0	$ 3,108,057	$ 4,939,678	$ 11,954,590	$ 16,980,477
O&M Costs (total long-term, 30-year)	$ 0	$ 2,114,794	$ 2,768,712	$ 1,840,816	$ 1,847,673
Total Present Worth Cost (total cost)	$ 0	$ 5,222,851	$ 7,708,390	$ 13,795,406	$18,328,150
Modifying Criteria – May be used to modify recommended cleanup					
State Agency Acceptance – *Do state environmental agencies agree with Navy's recommended alternative?*	⊘	⊘	⊘	⊘	●
Community Acceptance – *What objections, modifications, or suggestions do the public offer during the public comment period?*	Not Applicable	Not Applicable	Not Applicable	Not Applicable	●

a - For purposes of cost estimation, all O&M costs represent 30-year time frames only. Actual total costs may be higher.
b - The five-year reviews are a component of the Newport facility-wide five-year reviews and costs for that are not included here.
c - Time estimate is for completion of Remedial Action; actual protectiveness will not be achieved until an additional 6 inches of sediment is naturally deposited, the time for which has not been estimated.
d - Limited treatment of dredged material to add bulking agents as thickeners for stabilization during transport and treatment of water extruded from dredged sediment prior to discharge to POTW or bay waters, as appropriate.

ARARs: Applicable or relevant and appropriate requirements

● Meets
○ Partially Meets
⊘ Does not meet

As stated in the FS report, Alternatives 2 and 3 could impact similar areas (approximately 340,000 square feet) whereas Alternative 4 would impact an area somewhat less (192,000 square feet dredged and 84,000 feet capped) and Alternative 5 is estimated to impact an area approximately similar to Alternatives 2 and 3 (251,000 square feet dredged and 84,000 feet capped). Implementation of Alternatives 3, 4, or 5 would destroy the existing biota over the target areas and could result in some re-suspension and migration of sediment COCs during remedy construction activities. Implementation of Alternative 2 would likely have slightly less deleterious effects on biota and habitat than Alternative 3 since the volume of cover material used would be less, and some of the benthic community would likely survive installation. Alternatives 4 and 5 would remove the benthic community in the dredged areas, though this community is expected to recover naturally at a rate that will depend somewhat on the substrate left behind. It is expected that the use of appropriate engineering controls to prevent migration of contaminants during remedial actions and mitigation of any protected habitats (if found) that become altered could reduce the long-term effects of these actions.

The thin layer cover that would be installed under Alternative 2 would occupy the interval considered the biotic zone, which is where most of the exposure to receptors takes place. After adequate cover accumulates, protection would be fully ensured by the further deposition of sediment over the top of this cover material. A time frame is not defined for achievement of protectiveness, and such a period could be greater than 30 years; monitoring of depositional rates, as included in the alternative, would provide more detailed information on the effectiveness of the remedy, which would be reviewed every 5 years as part of the five-year review process. These efforts, used collectively would ensure overall protection.

Off-site disposal of the sediment removed under Alternatives 4 and 5 would eliminate the need for long-term management of untreated sediments in open water areas on site that would be required under Alternatives 2 and 3 and this added effort provides added protection; however, under both alternatives, there would be some need for long-term management of untreated sediments left beneath Pier 2. Full encapsulation of sediment as a part of Alternative 3 (and Alternatives 4 and 5 beneath Pier 2) would provide more protection than that provided under Alternative 2.

Alternatives 4 and 5 require monitoring over time for a small portion of the site beneath Pier 2. Alternative 5 would remove a larger volume of sediment but is also likely to cause greater disruption, resuspension, and potential for COC migration during dredging. Alternative 3 is ranked as slightly less protective, acknowledging that more sediment with COC concentrations exceeding cleanup levels would remain on site, whereas Alternative 2 is ranked as least protective, though this protectiveness is expected to improve over time as the cover is enhanced naturally by monitored deposition. However, despite the improvement, Alternative 2 would remain less protective than Alternative 4 or 5. Alternatives 2 and 3 rely heavily upon LUCs to remain protective in the long term. Additionally, there is some uncertainty as to the effectiveness of Alternative 2 due to a lack of data regarding deposition rates within the study area.

Compliance with Applicable or Relevant and Appropriate Requirement (ARARs). ARARs include any federal or state standards, requirements, criteria, or limitations determined to be legally applicable or relevant and appropriate to the site or remedial action. Alternatives 2, 3, 4, and 5 could be performed in accordance with ARARs (refer to FS Tables 4-4 through 4-15). However, Alternative 2 might take an extended time to fully comply with chemical-specific ARARs because it relies on continued natural recovery to occur over time through sedimentation over the thin layer cover. Alternative 1 would not meet sediment cleanup levels that have been derived from federal and state water quality chemical-specific ARARs. Dredging and covering operations under Alternatives 2 through 5 are compliant with ARARs. Tables E-1 through E-3 presents the chemical-specific, location specific, and action–specific ARARs respectively for Alternative 5.

In accordance with the CWA, the Navy has determined that Alternative SD5 is the LEDPA because it provides the best overall balance of addressing contamination in sediment (permanently removing elevated concentrations of COCs) and minimizing alteration of the aquatic habitat. While the activities of sediment covering under Alternative SD2, installation of a cap over contaminated sediments under Alternative SD3, and sediment removal and backfill under Alternative SD4, all temporarily impact the surrounding aquatic habitat during implementation of the remedial action, Alternative SD5 would permanently remove contaminated sediment, which will be a long-term benefit to the restored marine environment. EPA has also issued a finding under TSCA that the removal and offsite disposal of PCB-contaminated sediment that exceeds the risk-based RG, along with the limited capping of contaminated sediments under Pier 2, under Alternative SD5 will not pose a risk to public health or the environment.

2.10.2 Primary Balancing Criteria

Long-Term Effectiveness and Permanence. Alternative 1 would neither be effective in the long-term nor permanent. Alternatives 3, 4, and 5 would offer similar degrees of reduction of the risks to the aquatic receptors although in different ways with varying levels of permanence. These alternatives reduce ecological exposure to COCs in surface sediment either through removal of that sediment and placement of backfill, addition of an engineered cap that acts as a new surface interval, or both removal of sediment without backfill or a combination of these actions.

Alternatives 4 and 5 would be considered the most effective in the long term, Alternative 5 slightly more so than Alternative 4 because Alternative 4 leaves significantly more contaminated sediment in place than Alternative 5. Under both Alternatives 4 and 5, SWACs are projected to be reduced to levels less than cleanup levels, but under Alternative 4, the use of backfill after dredging would require less total dredging to achieve projected SWACs. Under Alternative 5, no backfill is placed, so additional dredging would be required (additional sediment removed) to reach projected SWACs less than cleanup levels.

There is slightly less certainty in the long-term effectiveness and permanence of Alternative 3 because it was developed to achieve projected SWACs less than cleanup levels while heavily relying on LUCs to protect the remedy. LUCs would be effective in limiting human actions such as deep-draft ship traffic but LUCs would not be able to prevent disturbance of the cap from natural phenomena such as major storm events. Alternative 3 would provide the same level of protection as Alternative 4, because the long-term effectiveness of the cap would be maintained and managed through execution of the LUCs. The area to be capped is a low-energy marine environment, and there is a high potential that a well-designed cap would remain effective permanently though there is no guarantee against more severe storm events.

Alternative 2 would provide long-term protection of ecological receptors though there is less certainty of this since the cover may not be able to be designed specifically for a 100 year storm. Additional monitoring of the cover and currents would be required to ensure the remedy remains protective. Overall, Alternative 2 is considered less effective than Alternatives 3, 4, or 5 due to the uncertainty surrounding the depositional qualities of the site.

Reduction in Toxicity, Mobility, or Volume through Treatment. Alternatives 1, 2, and 3 do not include any form of treatment and, therefore, do not meet this criterion. Alternatives 4 and 5 include limited treatment (stabilization) that could be conducted to reduce contaminant mobility before off-site disposal. In addition, for both Alternatives 4 and 5, there may be limited treatment of water that is generated from dredging operations or the dewatering of the excavated sediment before discharge or disposal.

Short-Term Effectiveness. The no action alternative (Alternative 1) would offer no short-term effectiveness. Implementation of Alternatives 2, 3, 4, and/or 5 would result in short-term human and environmental impacts from: short-term LUCs (Alternatives 4 and 5); capping (Alternatives 2, 3, 4, and 5); dredging/backfilling (Alternative 4); dredging (Alternative 5); and handling operations (Alternatives 4 and 5).

Alternatives 2 through 5 could be implemented within 2 years of signing the ROD and would attain the RAOs upon implementation. The RD and preparation of the construction work plan, LUC RD, and long-term monitoring (LTM)/management plan would be completed within the first year of signing the ROD, and construction activities are expected to require several additional months.

Alternative 5 would result in the greatest risk to the community and environment due to the larger quantity of sediment to be dredged and handled. Proper use of PPE would minimize human risks from direct contact with contaminated sediment. Use of appropriate engineering controls would reduce, but not eliminate, environmental impacts caused by resuspension and transport of sediment during capping or dredging and backfilling operations. Alternative 4 would have similar risks due to the similarity of the alternatives but to a lesser extent because there would be less volume dredged, handled, and disposed of. Under Alternatives 2 and 3, risk to the community or on-site workers would be minimal because contaminated sediment would remain in place (under covers or caps).

Short-term destruction of marine biota would occur under Alternatives 2, 3, 4, and 5, but natural processes would restore the natural communities. The short-term impacts would be similar for Alternatives 2, 3, 4, and 5, although these impacts would be greater for Alternatives 4 and 5 due to the increased level of activity. The rate of natural habitat restoration in the areas backfilled or capped would be highly dependent on the materials used, but would be the same between alternatives 2, 3, and 4.

Implementability. The no-action alternative is the most readily implementable in a technical sense because no activities would be required, though it would not be implementable in an administrative sense because it does not meet the threshold evaluation criteria for protecting human health and the environment and meeting ARARs.

Alternative 3 would be more difficult to implement than Alternative 2 because of the amount of material used for cover or cap. Both would involve using barges, scows, and other equipment to broadcast cover or cap materials over the target areas. These operations and the LTM program are implementable given the availability of services in the Rhode Island marine construction and the scientific/technical community. Placement of a thin layer cover would require transport and installation of substrate material and development and use of a staging area, but Alternative 2 would require less time and effort overall than Alternatives 3, 4, and 5. Installation of an engineered cap (Alternative 3) would require less time and effort than dredging (Alternatives 4 and 5).

Alternatives 4 and 5 would be more difficult to implement than Alternatives 2 and 3 because of the technical complication of dredging in open water areas. However, these alternatives would be implementable because of the availability of qualified marine contractors to conduct site dredging, backfilling, and capping activities using barge-mounted or shore-based equipment. Capping and dredging/backfill or dredging operations of this type would be moderately difficult to implement due to the imprecision of the technology and the location in relatively deep waters. Some margins of error (determination of the horizontal extents of a cap, dredging clean sediments, or not dredging contaminated sediments) would need to be accepted. Some restrictions on the seasonality of the dredging work might need to be adhered to though these would apply to all the alternatives except Alternative 1. Bathymetric surveys would need to be conducted during dredging, backfilling and capping operations to ensure that proper areas and depths were remedied, and these services are also readily available.

Alternative 5 would not require backfill after dredging, but this alternative would require dredging to greater depths, effectively providing almost a balance of implementability between Alternatives 4 and 5.

On-shore disposal for Alternatives 4 and 5 would be required and though requiring road or rail transport, is implementable. It is anticipated that adequate capacity would be available in landfills permitted to accept the site sediment; although, out of state disposal may be required. The chemical characteristics of the sediment are not anticipated to complicate the selection of an on-shore disposal facility; however, additional dewatering will be required, and a larger on-shore area would be required for processing and staging removed sediment prior to disposal.

Implementation of any of these alternatives would not prevent the implementation of any future remedial actions if required; however, the thin layer cover or cap systems proposed under Alternatives 2 and 3 may hinder future dredging operations or port maintenance, and capping beneath Pier 2 as specified under Alternatives 4 and 5 will need to be accommodated during future construction or demolition of the pier.

Cost. The estimated 30-year present worth cost is greatest for Alternative 5, at $18,328,150, and least for Alternative 1 (no cost). The estimated 30-year present worth for Alternative 2 is $5,222,851, for Alternative 3, is $7,708,390, and for Alternative 4, is $13,795,406.

2.10.3 Modifying Criteria

State Acceptance. State involvement has been solicited throughout the CERCLA process. RIDEM, as the designated state support agency in Rhode Island, concurs with the Selected Remedy. RIDEM's concurrence letter is presented in Appendix A.

Community Acceptance. The public was notified of a formal public comment period, as described in Section 2.3, and was encouraged to participate in the process. No written comments were received during the formal public comment period (May 21 to June 20, 2014) for the Proposed Plan. The questions posed at the public meeting (informal session) on May 21, 2014, were general inquiries for informational purposes and were addressed at the public meeting. The formal public hearing, at which attendees were asked to state their comments for the record, took place immediately after the public meeting on May 21, 2014. These formal comments/questions and the Navy responses are summarized in Section 3.0. The transcript of the public hearing is provided in the Administrative Record for Site 19.

2.11 PRINCIPAL THREAT WASTE

The NCP at 40 CFR §300.430(a)(1)(iii)(A) establishes an expectation that treatment will be used to address the principal threats posed by a site, wherever practicable. Principal threat wastes are those source materials considered to be highly toxic or highly mobile that generally cannot be reliably contained or that would present a significant risk to human health or the environment should exposure occur. A source material is a material that includes or contains hazardous substances, pollutants, or contaminants that act as a reservoir for migration of contamination to groundwater, surface water, or air, or acts as a source for direct exposure. At OU5, the contaminant concentrations are not highly toxic or highly mobile; therefore, principal threat wastes are not present at the site.

2.12 SELECTED REMEDY

2.12.1 Rationale for Selected Remedy

The Selected Remedy for OU5 is Alternative 5, target dredging in open water areas, cap target areas under Pier 2, short-term and permanent LUCs, and monitoring, which was selected because it offers the greatest level of protection while maintaining a balance among the nine evaluation criteria.

Alternative 5 achieves RAOs by dredging target open water areas and installing a cap (engineered barrier) at target areas beneath Pier 2. The open water areas will be dredged in an arrangement and to a depth such that the area-average COC concentrations remaining in sediment at the site will be less than the cleanup levels while not relying on backfill to reduce area average concentrations and while minimizing sediment left in place under covers or caps. PRD Sediment Sampling will be conducted to assess whether there has been any change to contaminated sediment distribution from recent Navy construction projects at the marginal wharf and Pier 2 and within the footprint of the ex-Saratoga. This alternative achieves cleanup levels by removing the most amount of contaminated sediment and only covering contaminated sediment where it cannot be removed.

In accordance with Section 404 of the CWA, the Navy has determined that Alternative 5 is the LEDPA to protect wetland and aquatic resources because it provides the best balance of addressing contaminated sediment within and adjacent to wetlands and waterways with minimizing both temporary and permanent alteration of aquatic habitats on site. Although each of the sediment cleanup options would impact aquatic habitats during cleanup activities, Alternative 5 will permanently remove COCs in sediment and will provide a cap over a limited area of contaminated sediments located under Pier 2 to achieve cleanup goals on a surface-area weighted average basis, which will be a long-term benefit to the aquatic habitat in the bay.

2.12.2 Description of Selected Remedy

The Selected Remedy includes the following components:

- Conduct additional sediment sampling [i.e., 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 SAP.

- Targeted open water dredging and off-site disposal of dredged sediment to reduce contaminant volume while meeting the cleanup goals on a surface-area weighted average 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 - 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 through development of documented precautionary measures and safe work practices.

- Monitoring to ensure the cap under Pier 2 remains intact and protective.

- Establishing a dewatering area onshore and/or on barges, and treating water from the dewatering process.

- Five-year reviews to assess the protectiveness of the cap component of the remedy and the LUCs established to protect the cap and to address potential asbestos in sediments.

The Selected Remedy will allow for the planned continued use of OU5.

<u>Pre-Remedial Design (PRD) Sediment Sampling</u>

Additional sediment sampling [i.e., PRD Sediment Sampling] will be conducted prior to implementation of the remedial action to assess the contaminant re-distribution resulting from the disruption of the sea floor by Navy construction projects (Pier 2 fender pile replacement, and marginal wharf upgrade) conducted before finalizing this ROD.

PRD Sediment Sampling will also be conducted within the footprint of the former location of the ex-Saratoga which departed from Pier 1 on August 21, 2014 and previously obstructed sediment sample positions. The areas requiring dredging as part of the OU5 remedy may be revised depending on the sampling results and a revised SWAC. Details of the PRD Sediment Sampling will be included in a PRD SAP.

<u>Dredging and Disposal</u>

Dredging will be conducted to a one-foot depth in eleven target areas, and to a two-foot depth in eight target areas (Figure 2-6). Dredging will be conducted over a total area of approximately 251,279 square feet, with an associated dredged volume of approximately 27,646 cubic yards. Dredging in these areas is expected to result in a minor increase in water depths. During dredging operations, silt curtains or other appropriate resuspension/particulate control systems will be used to minimize potential adverse environmental effects that may occur due to resuspension of fine-grained sediments during dredging activities. Bathymetric surveys will also be completed before dredging and after dredging to confirm that targeted dredging depths were reached. Sediment will be dredged using methods selected based on effectiveness and to minimize water column turbidity. The final determination of the most appropriate technique will be made during development of the RD. Visual inspection(s) will be conducted after completion of the remedy to document recovery of the benthic community in the dredge area.

Dredged materials to be transported off-base for disposal will be dewatered on barges and/or on shore by gravity thickening and then mixed with Portland cement, lime, or another pozzolanic material to reduce the free water content of the sediment. The resultant water from the dewatering process will be treated as necessary to meet applicable state and federal discharge standards prior to discharge into Narragansett Bay or to a POTW, as appropriate. If necessary, water will be treated by means of a portable clarifier and filtration system located either on a barge or on shore. The clarifier would remove inorganic constituents by precipitation. Unsettled metals precipitants and other suspended particles and fines would be removed by filtration. Any organic constituents (PAHs and PCBs) present are expected to be adsorbed onto the surface of the suspended particles and thereby be removed by filtration along with these particles. Based on available data, the need for additional treatment for dissolved chemicals is not anticipated; however, treatment requirements may be more completely evaluated through a pilot test conducted as part of the design. Dewatered and stabilized sediment samples will be collected and analyzed to verify that the material meets applicable criteria before being transported for landfill disposal. Evaluation of the existing sediment analytical data indicates that the contaminant levels are low enough that the material will likely meet requirements for disposal in a RCRA Subtitle D landfill without treatment. The process of dewatering will be fully developed in the design documents and/or the RD or RAWP documents.

Confirmation Sampling

Following dredging activities, confirmation sampling will be conducted to ensure that the RAOs are met. Confirmation sampling will be conducted within dredged cells and within cells adjacent to the dredged cells. Using this description as guidance, the final details of the confirmation sampling program will be developed during the RD in consultation with the Navy, EPA, and RIDEM.

These data would be used to recalculate SWACs for the open water area to represent post-dredging conditions. Specifically, confirmation sampling data from dredged cells would be utilized to calculate a SWAC for the dredged area only. If this SWAC calculation indicates cleanup goals are met, the project will be considered complete. If not, the confirmation data from adjacent cells would be added to this SWAC calculation to moderate heterogeneity of sediment data and calculate a second SWAC. If this second SWAC calculation indicates that cleanup goals are met, the project will be considered complete. If not, the team will meet to determine an appropriate course of action.

If the area surrounding any of the dredge cells was not previously sampled, a new cell (either 100 by 100 feet or 200 by 200 feet, to be consistent with the size of the adjacent dredged cell) will be created at the appropriate position. If the adjacent area is a landform with no sediment present, no adjacent sample in that direction will be collected. Exact locations for post-dredge sampling will be determined based on the actual limits of dredging after it is completed. Confirmation samples will be collected from the 0- to 1-foot interval at each sample station and analyzed for COCs (HMW PAHs including benzo(a)pyrene, PCBs, and lead). This post-excavation sampling and analysis approach is believed to be sufficiently conservative in determining that RAOs have been reached. The approach of sampling adjacent areas considers the origins of the contaminants as described in the CSM and the potential for migration of contaminants during dredging and compensates for the heterogeneity and variability of sediment.

Engineered Cap under Pier 2

This alternative also includes placement of a minimum 1-foot thick engineered barrier (in-situ cap) over two target areas beneath the eastern end of Pier 2 (Figure 2-6). An estimated area of approximately 83,574 square feet will be capped and will require 8,794 cubic yards of cap material. The projected volume of cap material is based on an estimate for a 2-foot-thick barrier, which will be a target thickness in the design to ensure a minimum 1-foot thickness. To place the cap, a slurry of sand and water will be pumped through a tremie pipe to the broadcast area, and the sand will be allowed to settle to the bottom. There will be difficulty in installing a cap with even thickness in these areas due to limited accessibility posed by the piling structure of the pier, and additional design elements will need to be used to compensate, which may result in a thicker cap in some areas. During placement of the cap material, silt curtains or other appropriate resuspension/particulate control systems will be used to minimize potential adverse environmental effects that may occur due to resuspension of fine-grained sediments during capping activities.

Bathymetric surveys will also be completed at both areas to be capped, before and after cap placement. These surveys will be used to confirm proper placement and thickness of the caps. Visual inspection(s) will be conducted at some appropriate time after completion of the remedy to document recovery of the benthic community in the dredge area.

The most appropriate cap material will be selected during the RD and will account for flow characteristics in the cap areas and sediment physical characteristics and bathymetry and will consider the requirement to withstand the force of a 100-year storm event. The final thicknesses of the caps will range from 1 to 2 feet, and the caps will extend slightly beyond the target areas due to sloping at the edges. Placement of the caps will act to contain contaminated sediment and prevent exposure to sediment by humans and ecological receptors.

Land Use Controls

LUCs will be implemented at OU5 through the development of a LUC RD document. Short-term LUCs (i.e., Base instruction and signage) would be implemented to notify persons that shellfish should not be taken from within the OU until dredging and capping components of the remedy are completed.

Permanent LUCs would be established to prevent disturbance of the cap by requiring authorization for any fishing, anchoring, or construction activities under the pier. In particular, LUCs will be designed to prevent disturbance of the cap beneath Pier 2 if alterations are made to the pier. Any future work, such as demolishing or restoring the pier below the water line or over the capped area that could undermine the cap's integrity will require the Navy or the DOD to obtain prior EPA Region 1 concurrence, in consultation with the State of Rhode Island. Inspections conducted at a minimum annual frequency will ensure that the LUCs that are implemented to maintain cap integrity continue to be effective.

To address the potential for a future risk from exposure to asbestos in the marine sediments during the implementation of the proposed remedy and future dredging at Site 19, the Navy will prevent exposure to potential asbestos in dredged shipyard sediment through development of documented precautionary measures and safe work practices. These safe work practices will be described in the LUC documentation established for the COCs that remain at the site under this alternative.

In addition, if OU5 is ever transferred out of federal control and if restrictions for Coddington Cove are deemed necessary to the continued viability of the remedy at that time, the Navy will as part of the transfer process coordinate with federal and state authorities to determine what use restrictions can be imposed on the cove, which is state owned, to prevent disturbance to areas with contaminated sediments managed under the caps. If piers are included as part of the property to be transferred, Navy will include in the deed or transfer documentation a restriction requiring that if future owners intend to make alterations to the pier(s) such as demolition, restoration, or any other work that could undermine the integrity of the sediment remedy, the new owner must first obtain EPA Region 1 concurrence, in consultation with RIDEM, and must conduct such work in a manner that does not compromise the remedy. Although the Navy may transfer the procedural LUC responsibilities to another party by contract, property transfer agreement, or through other means, the Navy will retain ultimate responsibility for remedy integrity. LUCs will be maintained until the concentrations of hazardous substances in the sediment are at such levels to allow for unlimited use and unrestricted exposure.

Long-Term Monitoring and Five-Year Reviews

Because the remedy uses caps beneath Pier 2 to isolate sediment, LTM and five-year reviews will be required to ensure long-term protectiveness in this area (LTM will not extend to areas of the site beyond the capped areas). Five-year reviews are also required to evaluate the continued protectiveness of the asbestos LUC. Annual sampling and analysis of sediment around the cap will be conducted to ensure that the remedy continues to meet RAOs. It is estimated that samples will be collected from the two capped areas under Pier 2 and analyzed for PCBs, HMW PAHs including benzo(a)pyrene, and lead. Actual sediment sample locations and analysis will be determined during the RD phase.

A single sampling event per year is anticipated to be sufficient to ensure that the cap material is not compromised. The results of the monitoring will be compiled, and an evaluation of the contamination and associated risks will be conducted as a part of the five-year reviews, which are required by CERCLA for sites where COCs at concentrations exceeding cleanup levels are allowed to remain. The monitoring data will be used to identify any changes in COC concentrations and to determine the need to increase or decrease the frequency of monitoring events or to implement more aggressive response actions at the site.

A multibeam bathymetric survey will be conducted every 5 years to ensure that typical activities at the site or wave action due to storms is not disturbing or compromising the cap areas beneath Pier 2.

2.12.3 Expected Outcomes of Selected Remedy

The current industrial land use, which will be supported by the Selected Remedy, is expected to continue at OU5, and there are no other planned land uses in the foreseeable future. There are no socio-economic, community revitalization, or economic impacts or benefits associated with implementation of the Selected Remedy. Table 2-8 describes how the Selected Remedy mitigates risk and achieves RAOs for OU5.

TABLE 2-8. HOW SELECTED REMEDY MITIGATES RISK AND ACHIEVES RAOS

RISK	RAO	COMMENTS
Ingestion of shellfish impacted by benzo(a)pyrene	Reduce human health risk associated with ingestion of shellfish impacted by benzo(a)pyrene by reducing exposure concentrations in sediment to achieve the cleanup goals.	Dredging sediment from target areas in open water and isolation of sediment beneath engineered caps at target areas beneath Pier 2 is expected to reduce SWACs for all COCs. In addition to removal and isolation of target areas, a monitoring program and LUCs will be established for capped areas to ensure appropriate maintenance and sustained protection.
Ecological risk to aquatic organisms from sediment impacted by lead, PCB, and HMW PAHs	Reduce risk to aquatic organisms from sediment impacted by lead, PCB, and HMW PAHs by reducing exposure concentrations in sediment to achieve the cleanup goals.	
Exposure to potential asbestos in dredged shipyard sediment (risk not quantified)	Prevent exposure to potential asbestos in dredged shipyard sediment through development of documented precautionary measures and safe work practices.	Exposure to potential asbestos in dredged shipyard sediment will be prevented through development of documented precautionary measures and safe work practices which will be described in the LUC documentation established for COCs remaining at the site.

The current industrial use of the site is expected to continue for the foreseeable future, and it is not expected that modification or removal of the LUCs will be required. However, if proposed land use changes in the future and uses other than industrial are anticipated, additional remedial approaches may be required. Any modifications to LUCs will be conducted in accordance with provisions in the OU5 LUC RD, the FFA, CERCLA, and the NCP.

2.13 STATUTORY DETERMINATIONS

In accordance with the NCP, the Selected Remedy meets the following statutory determinations:

- **Protection of Human Health and the Environment** – The Selected Remedy will achieve the RAOs for the protection of human health and the environment through bulk removal and isolation of target sediment, which is projected to reduce 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. Five-year reviews, monitoring, maintenance, and LUCs will not be required for uncapped areas throughout the site because the action will result in SWACs less than cleanup levels.

- **Compliance with ARARs** – The Navy has determined that the Selected Remedy is the LEDPA in compliance with the federal CWA, providing the best balance of addressing contaminated media at the site while minimizing both temporary and permanent alteration of wetlands/aquatic habitats. The Selected Remedy will attain all identified federal and state ARARs, as presented in Appendix E. Incorporated into this ROD is an EPA finding that the remedy selected will address PCB-contaminated media in order to control risk of injury to health or the environment in compliance with 40 CFR §761.61(c).

- **Cost-Effectiveness** – The Selected Remedy is a cost-effective alternative that allows for continued industrial use of the property. The costs are proportional to overall effectiveness by achieving an adequate amount of long-term effectiveness and permanence within a reasonable time frame. Detailed costs for the Selected Remedy are presented in Appendix B.

- **Utilization of Permanent Solutions and Alternative Treatment Technologies or Resource Recovery Technologies to the Maximum Extent Practicable** – The Selected Remedy will be an effective and permanent means of reducing COC concentrations in a practical manner. The Selected Remedy includes PRD Sediment Sampling, dredging and off-site disposal, subaqueous soil caps, LUCs, and LTM. The Selected Remedy does 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 discharge to the bay or a POTW.

- **Five-Year Review Requirement** – 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, 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, or will be, protective of human health and the environment. Five-year reviews will be required to evaluate the continued protectiveness of the cap under Pier 2 and the asbestos LUC.

2.14 DOCUMENTATION OF SIGNIFICANT CHANGES

CERCLA Section 117(b) requires an explanation of significant changes from the Selected Remedy presented in the Proposed Plan that was published for public comment.

After publication of the Proposed Plan, Navy construction projects were conducted along the waterfront between Piers 1 and 2 and around Pier 2 that potentially redistributed contaminated sediments within the OU. As a result, the Navy modified the remedy presented in the Proposed Plan to include additional sediment sampling (i.e., PRD Sediment Sampling effort) prior to the implementation of the remedial action to assess local contaminant re-distribution resulting from the disruption of the sea floor by Navy construction projects conducted before finalizing this ROD. The results of the PRD Sediment Sampling effort will be used to evaluate whether the areas requiring dredging as part of the OU5 remedy need to be revised.

Formal comments received during the public comment period and the associated responses are provided in Section 3.0, Responsiveness Summary.

3.0 RESPONSIVENESS SUMMARY

Participants in the public meeting (informal session) held on May 21, 2014, included RAB members and representatives of the Navy, EPA, and RIDEM. The questions raised at the public meeting were general inquiries for informational purposes and were addressed at the public meeting. A formal public hearing was held immediately following the public meeting. Oral comments received during the public hearing and written comments received during the public comment period are summarized in Table 3-1. The complete transcript of the public hearing is included in the Administrative Record for OU5.

TABLE 3-1. SUMMARY OF QUESTIONS FROM PUBLIC COMMENT PERIOD

QUESTION/COMMENT	RESPONSE
Margaret Kirschner from Newport observed that a distinction had been made in the origin of the contaminants while developing a remedy for the site and asked if it would make a difference in the remediation if that distinction had not been made? In particular, what would normally be found in sediment near piers considering the age of the site from World War II - is that distinction important, or, based on the work that was done, would all the contaminations have been found anyway?	Under CERCLA, the Navy is obligated to identify the risk from the contaminants that were released from the "Site" as defined as the former area leased by Robert E. Derecktor Shipyards of Rhode Island Inc., and address that risk in order to return the site to its planned future use. It is acknowledged that other contaminants are present in the area of the site and these are likely to pre-date the shipyard operations. Although the risk from both groups of contaminants was measured, and although specific contaminants were identified as target analytes to focus on for the remedy, it has been determined that removal of these contaminants will also result in the removal of the intermingled older contaminants from the same area. The removal will reduce risk overall and return the site to a reusable condition.
Kathy Abbass, PhD (Rhode Island Marine Archeology Project [RIMAP]) followed up on the previous comment and noted that the contaminants found are the same as what you find around shipyards elsewhere in the state. She noted that the Navy is responsible for cleaning this up, and asked that if the Navy has to clean this up, why doesn't this requirement expand to other areas that have used exactly the same kind of technology?	The observation is correct that the operations conducted (and contaminants found) at the Derecktor Shipyards site are common to industrial shipyards in other locations. This site was designated as a study area under CERCLA because of the history of violations and because the Naval Station was already identified as a CERCLA site. When the Navy determined that the area required cleanup, the RIDEM, U.S. EPA and the Navy collectively agreed to conduct a risk-based cleanup, as is compliant with Navy policies and with EPA oversight. Other industrial shipyards that are not on federal property may undergo similar cleanup efforts.
Dr. Abbass also provided reminders on historical matters that could pertain to the remedy : 1) Around the area where the chemical storage and fuel storage was, 200 years ago was a wetland and has obviously been filled in over the years. This may be important since it probably has whatever that structure is beneath it. 2) during removal the Navy may encounter isolated cultural finds that could be historically significant. She noted the presence of the historic wrecks including the Revolutionary War frigate, the Juneau, which RIMAP tentatively identified elsewhere, but noted expectation to find other materials from WW II which are historically significant (>50 yrs).	The comment is noted. The areas where dredging is expected to be conducted are formerly dredged areas (1950s) and as such significant sized historic artifacts are not anticipated to be found. However, the dynamics of the seafloor can move things and it is understood that smaller artifacts can possibly be found.

TABLE 3-1. SUMMARY OF QUESTIONS FROM PUBLIC COMMENT PERIOD (CON'T)	
QUESTION/COMMENT	RESPONSE
David Brown stated that he believed a competent job has been done in pinpointing the remaining site problems and remedial options, including the soil and the groundwater and offshore, and complemented the Navy on a thorough job.	The comment is noted, and the Navy appreciates the observation.
Mr. Brown also stated that he believed that the community may need a fuller picture of what the contaminant flows are from nearby offsite places and how they relate to Site 19. If there are inputs to the shoreline from offsite, and there are companion actions on these and on adjacent Navy sites, there would be larger benefit from the cleanup. Otherwise, the area could just be re-contaminated. On the Island where we're becoming very concerned about steering flows of water down into storm systems and treating it like a bowl, and preference is to allow water to percolate in to the ground (treating more upstream like a sponge). He suggested that during cleanup on Site 19, maybe you could at least try to nudge the Navy to have kind of a reduced runoff approach for its lands nearby.	The comment is noted, and the Navy joins the community concerns about handling surface water and storm drainage. The storm drain inputs to the remediation area are monitored regularly, and these monitoring efforts will become key to ensuring that the sediment does not become re-contaminated. In addition, the Navy has a program in place to reduce pollutants in runoff, and to reduce point discharges altogether. This program includes use of filtration systems where possible, and installation of groundwater recharge systems where new buildings are being developed. The importance of water resources is better understood every year, and that knowledge is being utilized not only in Rhode Island, but Navy-wide for management of storm drainage and water resources.
Margaret Kirschner (Newport) also asked about removal - When you remove target sites and you determine the extent of the removal based on the average remainder of the aggregate contamination, or could that be achieved by some other combination of removal? Can you achieve an acceptable aggregate result in the cove by other combinations of dredging.	A number of different dredging scenarios were developed and evaluated to determine if they could be used to achieve the goals of reuse without limitations on the future use of the port. The arrangement selected for Alternative 5 is the least expensive option to meet those goals, to reduce overall aggregate risk to all the receptors, from all the contaminants that most heavily impact the risk. Other arrangements could meet these goals, but the overall cost would be significantly higher, dredging additional sediment and transporting that sediment for disposal.

3.1 TECHNICAL AND LEGAL ISSUES

No additional technical or legal issues associated with the OU5 ROD were identified.

Figures

TETRA TECH

NAVAL STATION NEWPORT
NEWPORT, RHODE ISLAND

SITE LOCUS

SITE 19 - FORMER DERECKTOR SHIPYARD, OU5 - MARINE SEDIMENT
RECORD OF DECISION

SCALE	PER SCALE BAR
FILE	I:\...\DER_SITE_LOCATION_MAP.MXD
REV 0	DATE 06/10/14
FIGURE NUMBER	1-1

I:\02747\DD.DRIDER_HISTORIC_SITE_FEATURES.MXD MKB 06/10/14

TETRA TECH

NAVAL STATION NEWPORT
NEWPORT, RHODE ISLAND

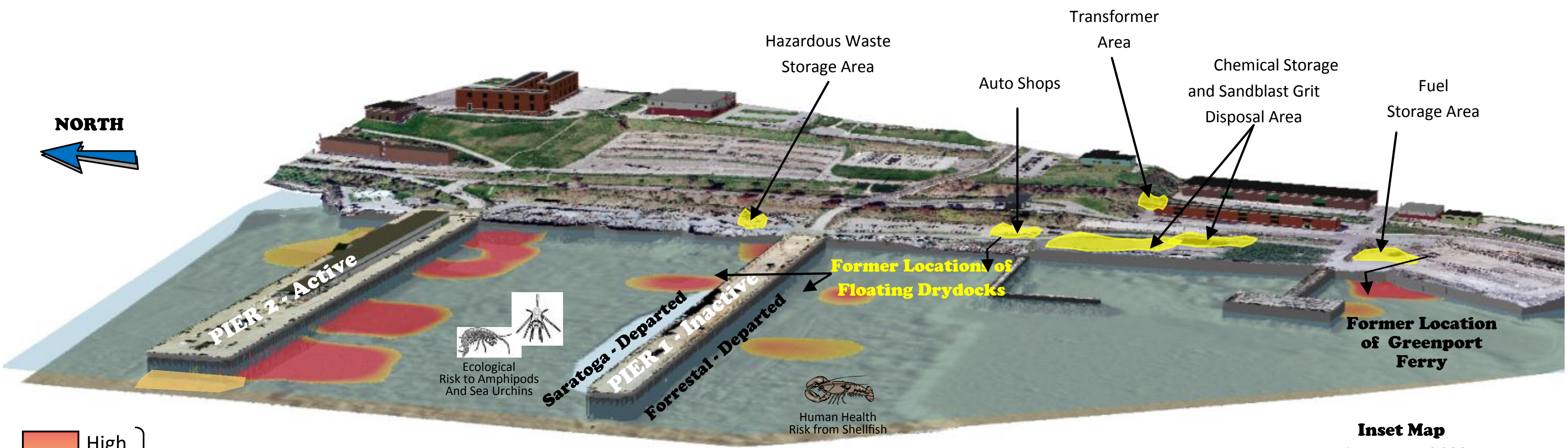
SITE PLAN

SITE 19 - FORMER DERECKTOR SHIPYARD, OU5 - MARINE SEDIMENT
RECORD OF DECISION

SCALE	
PER SCALE BAR	
FILE	
I:\...\DER_HISTORIC_SITE_FEATURES.MXD	
REV	DATE
0	06/10/14
FIGURE NUMBER	
2-1	

NAVAL STATION NEWPORT

SITE 19, FORMER DERECKTOR SHIPYARD, OU5—MARINE SEDIMENT



High
Low
Sum of the quotients calculated for all COCs:
Surface Concentration : PRG

Not to scale
Not to be used for design

Contaminant Source Areas

Inset Map
Extent of CSM

TETRA TECH

NAVAL STATION NEWPORT
NEWPORT, RHODE ISLAND

CONCEPTUAL SITE MODEL

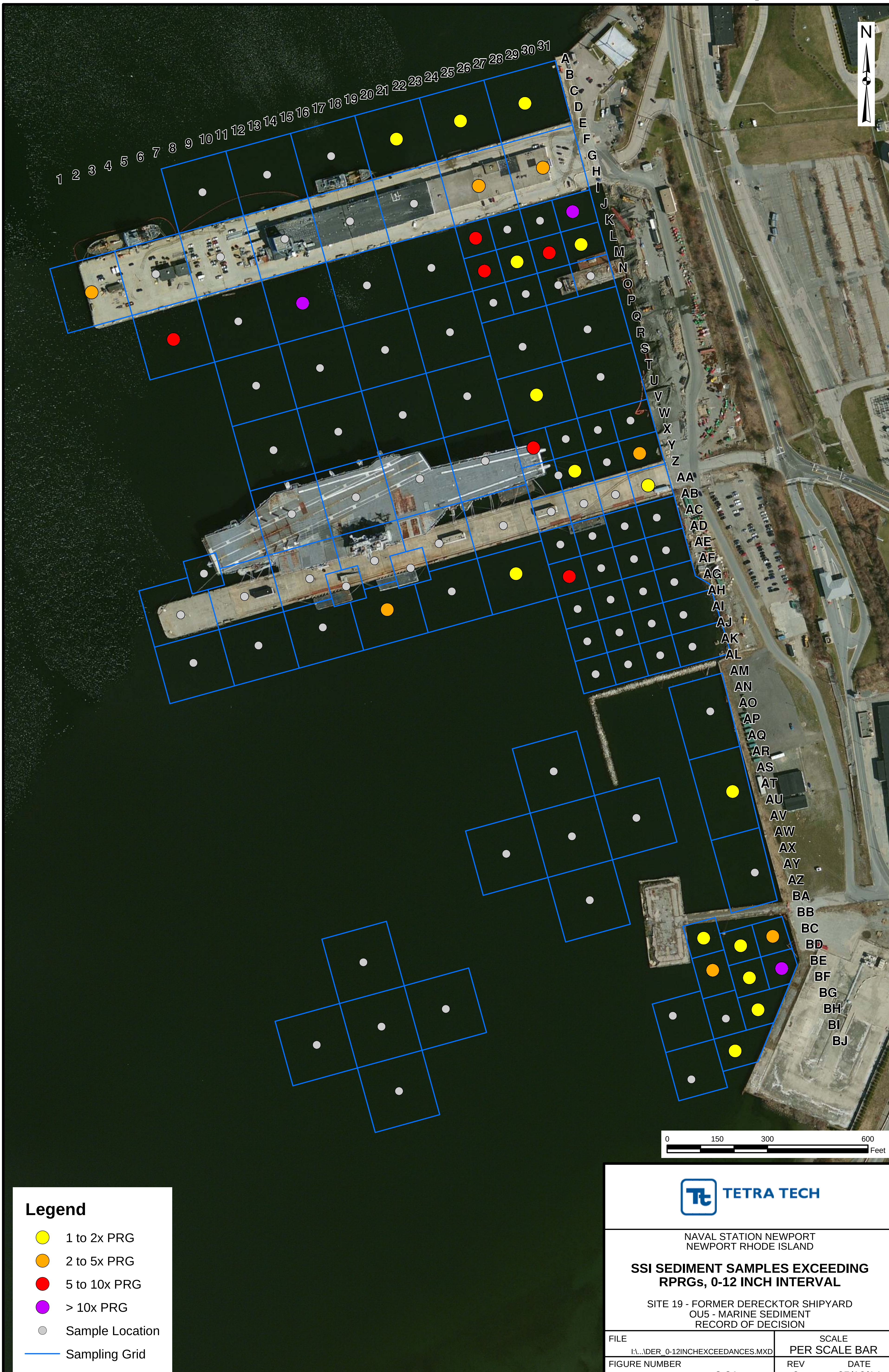
SITE 19—FORMER DERECKTOR SHIPYARD,
MARINE SEDIMENT
RECORD OF DECISION

File	No Scale (perspective view)
Figure Number 2-2	Date: 8-25-14

Site Risks and Remediation

Media	Risk	COC	PRG
Bedded Sediment	Risk to ecological receptors (benthic community)	HMW PAHs	13,903 µg/kg
Bedded Sediment	Risk to human receptors (ingestion of shellfish)	Benzo(a)pyrene	539µg/kg
Suspended Sediment	Risk to ecological receptors (pelagic community)	Lead	168 mg/kg
		PCBs	1060 µg/kg

I:\02747\DD.DR\DER_0-12INCHEXCEEDANCES.MXD NEC 05/16/14



TETRA TECH

NAVAL STATION NEWPORT
NEWPORT RHODE ISLAND

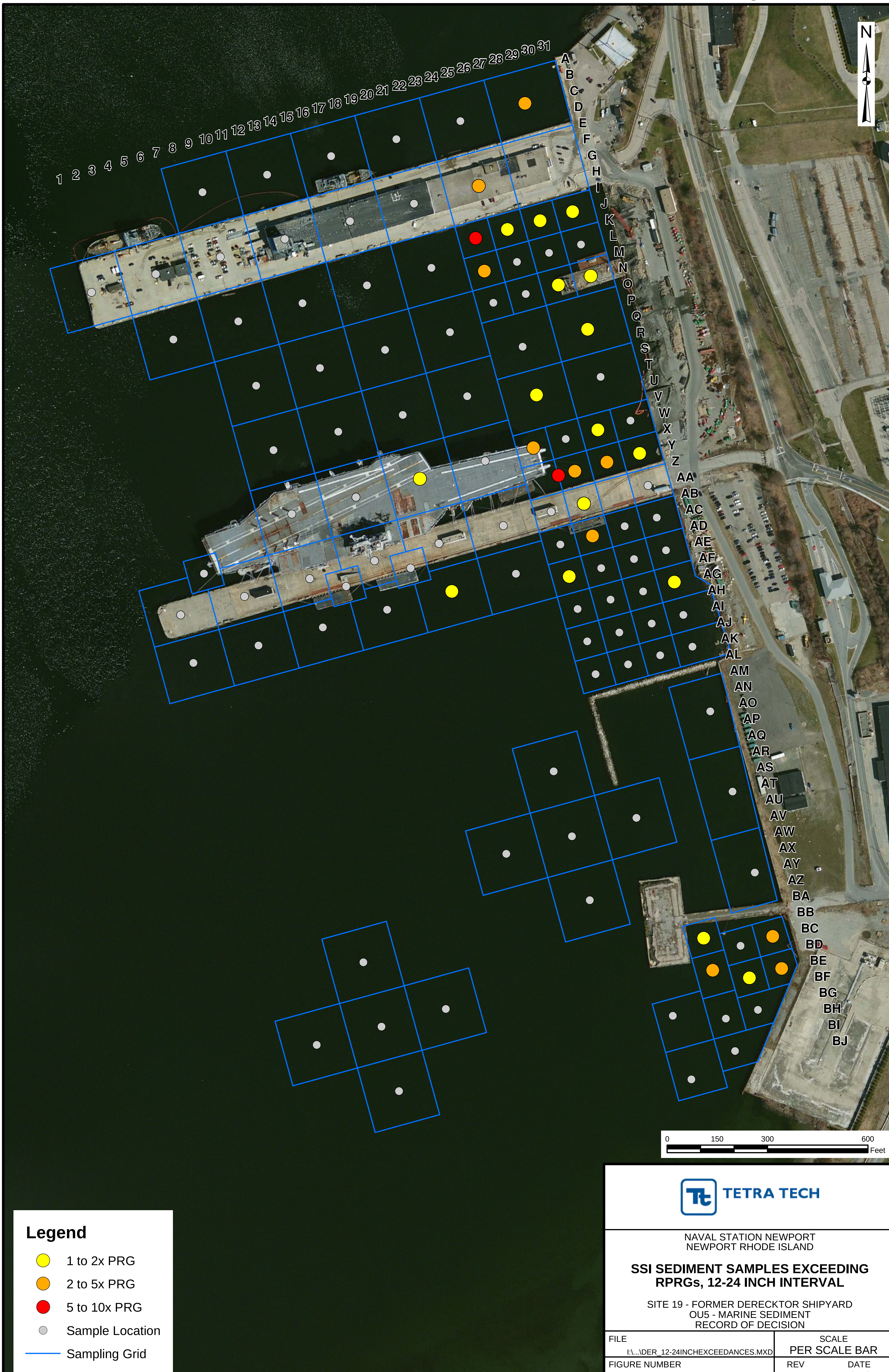
SSI SEDIMENT SAMPLES EXCEEDING RPRGs, 0-12 INCH INTERVAL

SITE 19 - FORMER DERECKTOR SHIPYARD
OU5 - MARINE SEDIMENT
RECORD OF DECISION

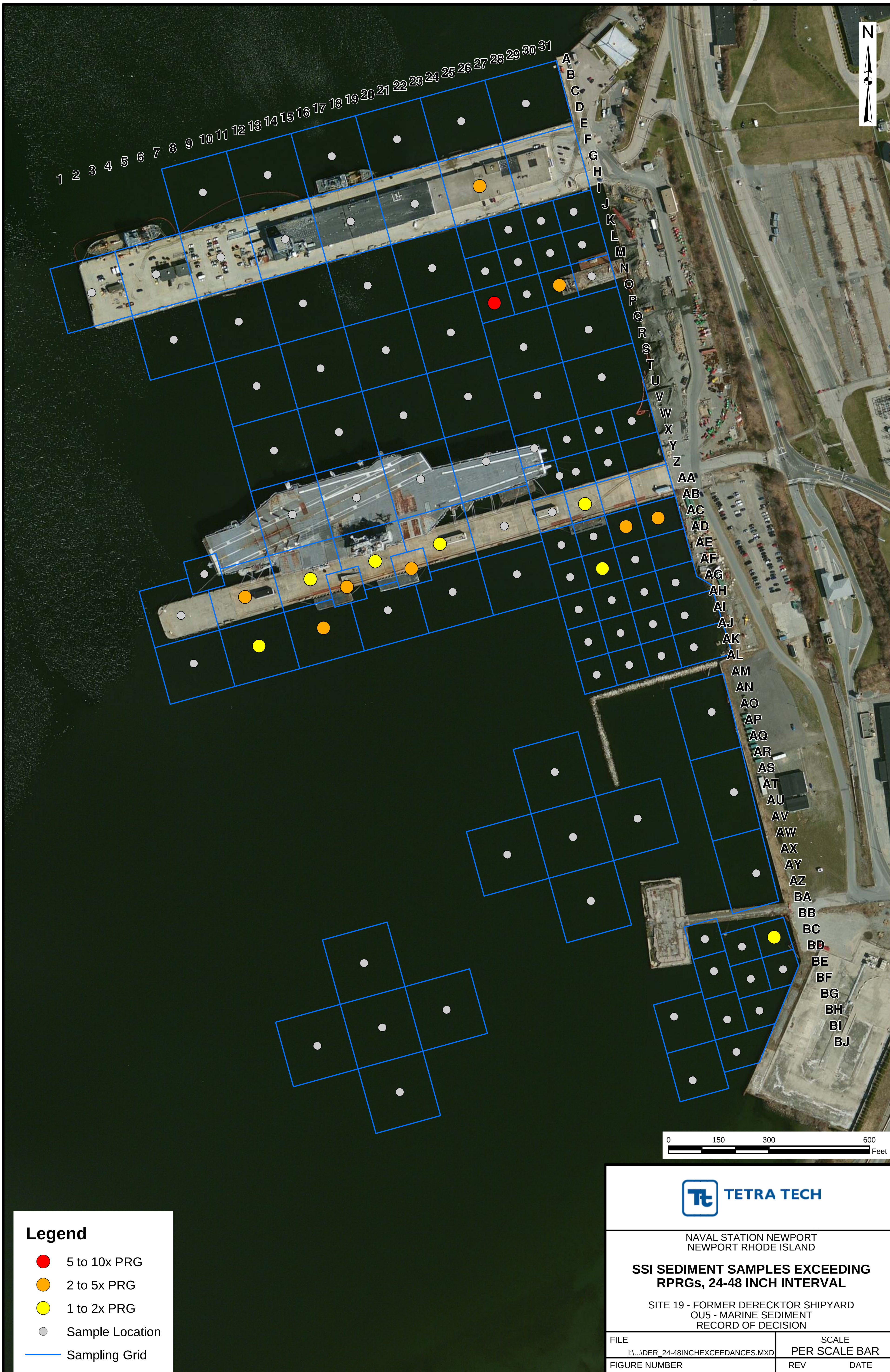
FILE	SCALE
I:\...\DER_0-12INCHEXCEEDANCES.MXD	PER SCALE BAR

FIGURE NUMBER	REV	DATE
2-3A	0	05/16/14

I:\02747\DD.DR\DER_12-24INCHEXCEEDANCES.MXD NEC 05/16/14



I:\02747\DD.DR\DER_24-48INCHEXCEEDANCES.MXD NEC 05/16/14



NAVAL STATION NEWPORT
NEWPORT RHODE ISLAND

SSI SEDIMENT SAMPLES EXCEEDING RPRGs, 24-48 INCH INTERVAL

SITE 19 - FORMER DERECKTOR SHIPYARD
OU5 - MARINE SEDIMENT
RECORD OF DECISION

FILE	SCALE
I:\...\DER_24-48INCHEXCEEDANCES.MXD	PER SCALE BAR

FIGURE NUMBER	REV	DATE
2-3C	0	05/16/14

I:\02747\DD.DR\DER_GRID.MXD DWM/NEC 05/16/14

Legend

Sediment Sample Locations/Analysis Performed

- HMW PAHs, PCBs, TBT, and Lead
- Zinc, Copper, HMW PAHs, PCBs, TBT, and Lead
- Zinc, Copper, Asbestos, HMW PAHs, PCBs, TBT, and Lead
- GeoPhysical Data

Note: All surface intervals (0-1 foot) were analyzed for TOC.

TETRA TECH

NAVAL STATION NEWPORT
NEWPORT, RHODE ISLAND

SSI SAMPLING LOCATIONS AND REFERENCE GRID

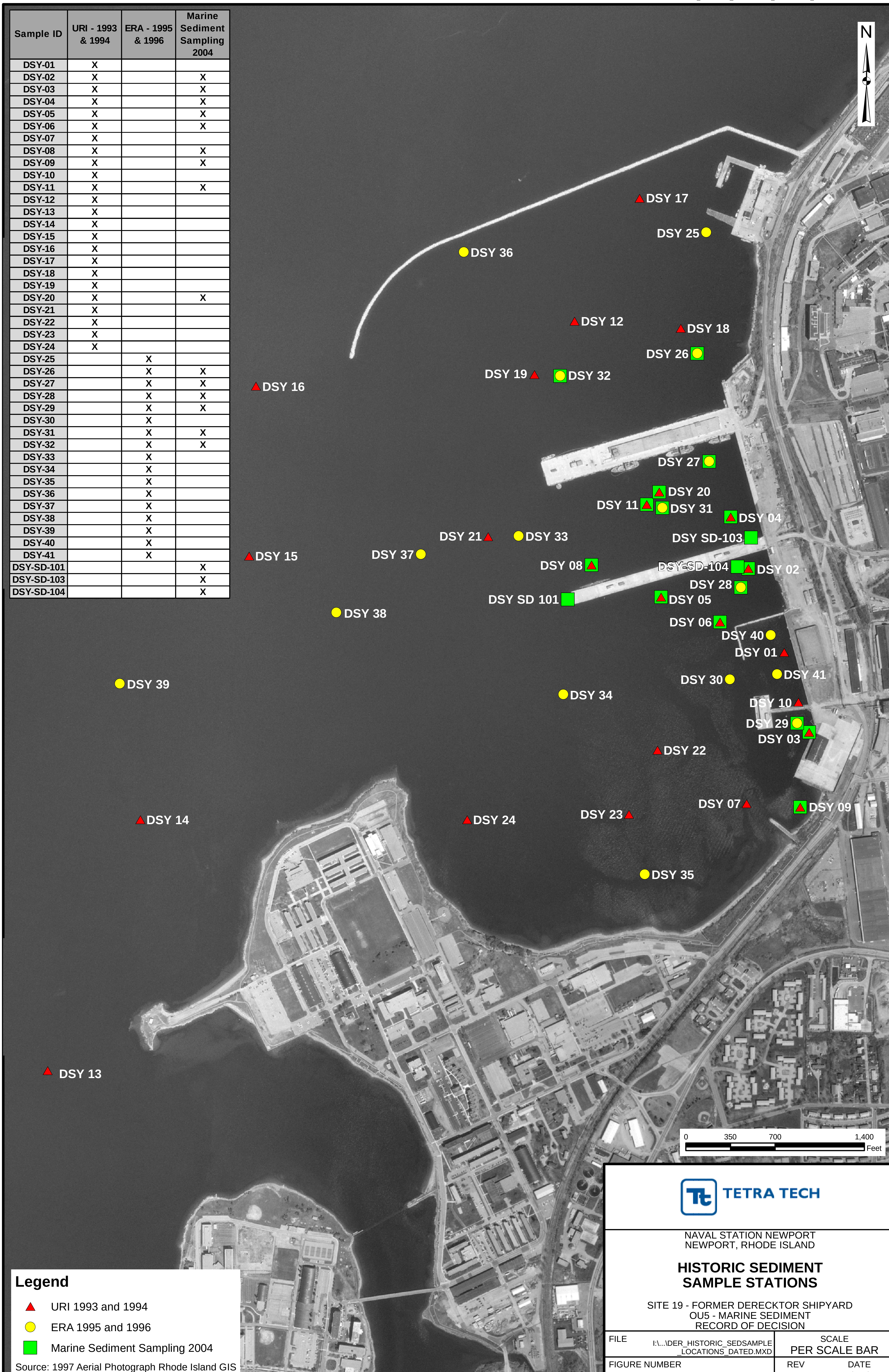
SITE 19 - FORMER DERECKTOR SHIPYARD
OU5 - MARINE SEDIMENT
RECORD OF DECISION

FILE	SCALE
I:\..\DER_GRID.MXD	PER SCALE BAR

FIGURE NUMBER	REV	DATE
2-4	0	05/16/14

I:\02747\DD.DR\DER_HISTORIC_SEDSAMPLE_LOCATIONS_DATED.MXD NEC 05/16/14

Sample ID	URI - 1993 & 1994	ERA - 1995 & 1996	Marine Sediment Sampling 2004
DSY-01	X		
DSY-02	X		X
DSY-03	X		X
DSY-04	X		X
DSY-05	X		X
DSY-06	X		X
DSY-07	X		
DSY-08	X		X
DSY-09	X		X
DSY-10	X		
DSY-11	X		X
DSY-12	X		
DSY-13	X		
DSY-14	X		
DSY-15	X		
DSY-16	X		
DSY-17	X		
DSY-18	X		
DSY-19	X		
DSY-20	X		X
DSY-21	X		
DSY-22	X		
DSY-23	X		
DSY-24	X		
DSY-25		X	
DSY-26		X	X
DSY-27		X	X
DSY-28		X	X
DSY-29		X	X
DSY-30		X	
DSY-31		X	X
DSY-32		X	X
DSY-33		X	
DSY-34		X	
DSY-35		X	
DSY-36		X	
DSY-37		X	
DSY-38		X	
DSY-39		X	
DSY-40		X	
DSY-41		X	
DSY-SD-101			X
DSY-SD-103			X
DSY-SD-104			X



Legend

- ▲ URI 1993 and 1994
- ● ERA 1995 and 1996
- ■ Marine Sediment Sampling 2004

Source: 1997 Aerial Photograph Rhode Island GIS

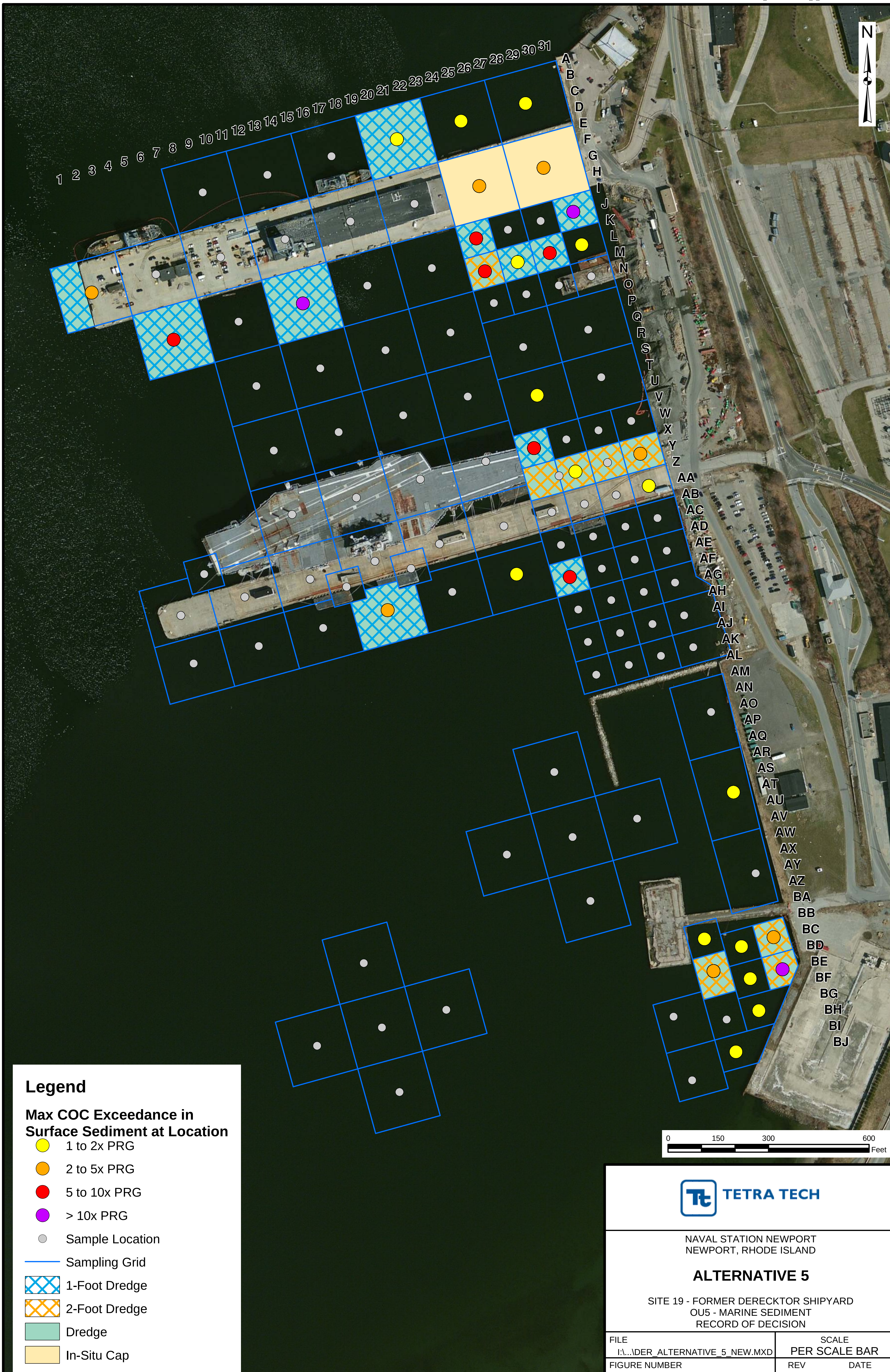
TETRA TECH

NAVAL STATION NEWPORT
NEWPORT, RHODE ISLAND

HISTORIC SEDIMENT SAMPLE STATIONS

SITE 19 - FORMER DERECKTOR SHIPYARD
OU5 - MARINE SEDIMENT
RECORD OF DECISION

FILE	I:\...\DER_HISTORIC_SEDSAMPLE_LOCATIONS_DATED.MXD	SCALE PER SCALE BAR	
FIGURE NUMBER	2-5	REV 0	DATE 05/16/14



TETRA TECH

NAVAL STATION NEWPORT
NEWPORT, RHODE ISLAND

ALTERNATIVE 5

SITE 19 - FORMER DERECKTOR SHIPYARD
OU5 - MARINE SEDIMENT
RECORD OF DECISION

FILE	SCALE
I:\...\DER_ALTERNATIVE_5_NEW.MXD	PER SCALE BAR

FIGURE NUMBER	REV	DATE
2-6	0	05/16/14

Administrative Record Reference Table

DETAILED ADMINISTRATIVE RECORD REFERENCE TABLE

ITEM	REFERENCE PHRASE IN ROD	LOCATION IN ROD	LOCATION OF INFORMATION IN ADMINISTRATIVE RECORD
1	**Preliminary Assessment**	Table 2-1	Halliburton NUS Corp., 1993. Preliminary Site Assessment Report. May.
2	**Marine Ecological Risk Assessment**	Table 2-1	SAIC and URI, 1997. Final Derecktor Shipyard Ecological Risk Assessment Report. May.
3	**Marine Human Health Risk Assessment**	Table 2-1	Tetra Tech NUS, 1998. Marine Human Health Risk Assessment Off Shore Areas of Former Robert E. Derecktor Shipyard. September.
4	**Stillwater Basin Evaluation**	Table 2-1	Tetra Tech NUS, 1998b. Stillwater Basin Evaluation Report, Former Robert E. Derecktor Shipyard/Coddington Cove, NAVSTA, Rhode Island, December.
5	**Supplemental Sediment Investigation**	Table 2-1	Tetra Tech, 2012. Final Supplemental Sediment Investigation Report for IR Site 19, Former Derecktor Shipyard. December.
6	**Feasibility Study**	Table 2-1	Tetra Tech, 2014. Feasibility Study for Site 19 – Former Derecktor Shipyard Marine Sediment NAVSTA Newport. February.
7	**Remedial Alternatives**	Table 2-1	Tetra Tech, 2014.
8	**Public notice**	Section 2.3	Newport Daily News June 17, 2014
10	**Hydrographic Survey**	Section 2.5.1	SAIC and URI, 1997; SVMS, 2006. Hydrographic Survey Pier 1 Naval Station Newport RI for Global – A 1st Flagship Company Naval Inactive Ships Maintenance Office, May.
11	**potential receptors**	Section 2.7	Tetra Tech, 2014.
12	**Exposure assessment**	Section 2.7.1.2	Tetra Tech, 2014.
13	**cancer risks and non-cancer hazards**	Section 2.7.1.4	Tetra Tech, 2014.
14	**RAOs**	Section 2.8	Tetra Tech, 2014.
15	**COCs**	Section 2.8	Tetra Tech, 2014.
16	**PRGs**	Section 2.8	SAIC, 1998. PRGs for Derecktor Shipyard/Coddington Cove, Prepared under contract to Tetra Tech NUS Corp. August.
17	**Cleanup Levels**	Section 2.8	Tetra Tech, 2014.
18	**Preliminary Technology Screening**	Section 2.9	Tetra Tech, 2014
19	**Nine CERCLA Evaluation Criteria**	Section 2.10	Tetra Tech, 2014

ADDITIONAL REFERENCES

Sea Vision Marine Services LLC (SVMS), 2006. "Hydrographic Survey Pier 1 Naval Station Newport, RI" for Global – A 1st Flagship Company Naval Inactive Ships Maintenance Office. May.

Appendix A
Rhode Island Department of Environmental Management Concurrence Letter

RHODE ISLAND
DEPARTMENT OF ENVIRONMENTAL MANAGEMENT
235 Promenade Street, Providence, RI 02908-5767 TDD 401-222-4462

11 September 2014

Mr. James T. Owens, III, Director
U.S. EPA – New England Region
Office of Site Remediation and Restoration
5 Post Office Square
Suite 100 (OSRR 07-3)
Boston, MA 02109-3912

RE: Record of Decisions for Site 19 – Former Derecktor Shipyard Marine Sediment (OU5) and Onshore Derecktor Shipyard (OU12) Soil and Groundwater
Naval Station Newport, RI

Dear Mr. Owens:

On 23 March 1992 the State of Rhode Island entered into a Federal Facilities Agreement (FFA) with the Department of the Navy and the Environmental Protection Agency. One of the primary goals of the FFA is to ensure that the environmental impacts associated with past activities at Naval Station Newport located in Newport, Rhode Island are thoroughly investigated and that appropriate actions are taken to protect human health and the environment.

In accordance with the FFA, the Department of Environmental Management (Department) has completed its review of the September 2014 Record of Decisions (RODs) for both operable units (OUs) at Site 19 – Former Derecktor Shipyard Marine Sediment (OU5) and Onshore Derecktor Shipyard (OU12) Soil and Groundwater, located at Naval Station Newport, RI.

The Department of the Navy's selected alternative for OU5, as presented in the ROD, is the following: dredging target open water areas and disposal of the dredged sediment at an offsite landfill, installation of a one-foot thick engineered sand/gravel cap at target sub-pier areas under Pier 2, long-term monitoring of the capped sub-pier areas, and implementation of land use controls (LUCs) to prohibit disturbance of the engineered sand/gravel cap and to minimize potential exposure to asbestos in dredged sediment.

The Department of the Navy's selected alternative for OU12, as presented in the ROD, is the following: rehabilitation of existing cover material (soil, concrete or pavement) and installation of a new six-inch soil cover in select areas, monitored natural attenuation (MNA) of groundwater with long-term monitoring, long-term maintenance and inspections, and land use controls (LUCs).

The Department has worked on this Site with the Department of the Navy and the Environmental Protection Agency from the early stages up through this important decision milestone. Based upon this Department's review of these RODs and the results of the remedial investigation activities conducted to date, we offer our concurrence on both of these decisions. This concurrence is contingent upon all aspects of the aforementioned RODs being implemented during design, construction, and operation of the remedies in a timely manner.

The Department wishes to emphasize the following aspects of the RODs:

Former Derecktor Shipyard Marine Sediment (OU5):

- The Navy will conduct a pre-design investigation of the marine sediment to determine whether recent construction activities have modified any of the areas targeted for dredging;

- The Navy will conduct confirmation sampling in open water areas to ensure that cleanup levels have been met on an area-average basis, and in capped areas to ensure that COCs left beneath the pier do not migrate into the cap during placement or migrate after capping;

- The Navy will implement a long-term monitoring plan for the capped sub-pier areas to ensure that COCs remaining beneath the pier are not re-exposed or migrating;

- The Navy will implement LUCs to ensure that the capped sub-pier areas will be protected or addressed in another manner if Pier 2 is ever reconstructed or demolished;

- The Navy will establish safe work practices in the LUC documentation that require future dredging and pier/waterfront maintenance and construction projects to consider the presence of potential asbestos to ensure that dredge spoils are handled appropriately;

Onshore Derecktor Shipyard (OU12) Soil and Groundwater:

- The Navy will conduct a pre-design investigation of the North Waterfront Area to determine whether contaminant risks are present above remedial goals due to the recent construction activities at the Site; the remedy may need to be modified based on the pre-design sampling results;

- The Navy will implement interim LUCs to prevent exposure to asbestos and sediment-related contaminants in the North Waterfront Area;

- The Navy will implement groundwater use restrictions and a long-term monitoring plan for the Site;

- If, after an appropriate amount of data has been collected, MNA is determined to be an ineffective remedy for addressing chlorinated solvents and/or metals in groundwater, the Navy will seek a change to the remedial action for groundwater, using an additional public notification and ROD amendment or Explanation of Significant Differences (ESD);

- The Navy will implement LUCs to prevent residential and unrestricted recreational uses of the Site; and

- The Navy will implement LUCs to require long-term maintenance and inspections of the new and existing cover material (soil, concrete or pavement) and the monitoring wells.

As stated in the RODs for both OUs, the Navy will conduct five-year reviews to ensure that the remedial actions for the Site continue to provide adequate protection of human health and the environment.

RIDEM would like to thank the Navy for their diligence in investigating this site and working with the affected stakeholders by considering their concerns in the decision-making process. We urge the Navy to make every effort to continue to consider such concerns and endeavor to have these remedies implemented in a manner that allows the local community maximum participation in this process.

Sincerely,

Janet Coit
Director

cc: Terrence Gray, RIDEM
Leo Hellested, RIDEM
Matthew DeStefano, RIDEM
Richard Gottlieb, RIDEM
Pamela Crump, RIDEM
Lynne Jennings, USEPA
Kymberlee Keckler, USEPA
James Gravette, Navy

Appendix B
Cost Estimate

TABLE B-1
NAVAL STATION NEWPORT
NEWPORT, RI
Site 19 - Derecktor Shipyard Marine Sediment
Alternative SD5: Target Dredging (open water); Cap, LUCs, and Monitoring (under Pier 2).
Capital Cost Detail Sheet

Item	Quantity	Unit	Unit Cost Subcontract	Unit Cost Material	Unit Cost Labor	Unit Cost Equipment	Extended Cost Subcontract	Extended Cost Material		
1 PROJECT PLANNING & DOCUMENTS										
1.1 Prepare Design Documents and Specs	1,200	hr			$37.00		$0	$0		
1.2 Prepare Permits and RA Work Plans	500	hr			$37.00		$0	$0		
1.3 Prepare LUCs	250	hr			$50.00		$0	$0		
1.4 Prepare LTM Plans & SAP	250	hr			$50.00		$0	$0		
2 MOBILIZATION AND DEMOBILIZATION										
2.1 Equipment Mobilization/Demobilization	1	ls	$1,175,000.00				$1,175,000	$0		
2.2 Silt Curtain Purchase and Management	1	ls	$150,000.00				$150,000	$0		
3 SITE PREPARATION										
3.1 Debris Removal	3,600	ton	$300.00				$1,080,000	$0		
3.2 Multibeam Bathymetric Survey (open water)	19	ea	$6,000.00				$114,000	$0		
3.3 Singlebeam Bathymetric Survey (sub-pier)	2	ea	$10,000.00				$20,000	$0		
4 DREDGING										
4.1 Dredging (mechanical and hydraulic)	27,646	cy	$59.35				$1,640,790	$0		
4.2 Water Quality Monitoring (dredging)	27,646	cy	$4.75				$131,319	$0		
4.3 Transportation and Offsite Disposal (RCRA-D)	41,469	ton	$166.67				$6,911,638	$0		
4.4 Multibeam Bathymetric Survey (post dredge)	19	ea	$6,000.00				$114,000	$0		
5 CAPPING										
5.1 Sub-Pier Capping (2 foot engineered cap)	8,794	cy	$133.49				$1,173,911	$0		
5.2 Water Quality Monitoring	8,794	cy	$4.75				$41,772	$0		
6 POST CONSTRUCTION COSTS										
6.1 Contractor Completion Report	500	hr			$37.00		$0	$0		
6.2 Remedial Action Closeout Report	500	hr			$37.00		$0	$0		
6.3 Singlebeam Bathymetric Survey (sub-pier)	2	ea	$10,000.00				$20,000	$0		
7 CONFIRMATION SAMPLING										
7.1 Prepare SAP, Procure Subcontracts	120	hr			$75.00		$0	$0		
7.2 Marine Sediment Sampling Services	1	ls	$12,000.00				$12,000	$0		
7.3 Sample Analysis	65	ea	$360.00				$23,400	$0		
7.4 Prepare Report	100	hr			$75.00		$0	$0		
Subtotal							$12,607,829	$0	$	
Overhead on Labor cost - 30%										
G & A on labor - 10%	G&A on construction items included in LS costs above.						$0	$0		
Tax on material and Equipment - 7%								$0		
Total Direct Cost							$12,607,829	$0	$	
Indirects on total direct cost - 25%	Included in construction costs above									
Profit on total direct cost - 10%	Included in construction costs above									
Subtotal										
Health & Safety Monitoring @	2%									
Total Field Cost										
Engineering and Oversight on Total Field Cost @	10%									
Contingency on Total Field Cost @	20%									
TOTAL CAPITAL COST										

Source: APEX CO 12/19/13

TABLE B-2
NAVAL STATION NEWPORT
NEWPORT, RI
Site 19 - Derecktor Shipyard Marine Sediment
Alternative SD5: Target Dredging (open water); Cap, LUCs, and Monitoring (under Pier 2).
Long Term Costs

Item	Quantity	Unit	Unit Cost: Subcontract	Unit Cost: Material	Unit Cost: Labor	Unit Cost: Equipment	Subtotal
ANNUAL COSTS							
1 YEARLY SITE INSPECTION/VISIT - Assume out of town travel to site, for interviews with site personnel and to ensure implementation of LUCs.							
1.1 Rental Car	1	day				$100.00	
1.2 Field Labor	12	hour			$75.00		
1.3 Report Production	16	hour			$85.00		
1.4 Miscelaneous Supplies, Copying, etc.	1	ls		$500.00			
2 SEDIMENT SAMPLING - Labor, materials, and analytical costs to conduct LTM sediment sampling (approximately 3 samples plus QC) throughout covered areas of the site.							
2.1 Rental Car	2	day				$100.00	
2.2 Field Labor	20	hour			$75.00		
2.3 Marine Sampling Services	1	ls	$3,000.00				
2.4 IDW Disposal	1	ls	$500.00				
2.5 Miscelaneous Supplies, Copying, etc.	1	ls		$1,500.00			
2.6 PCBs Sample Analysis	5	ea	$80.00				
2.7 PAHs Sample Analysis	5	ea	$150.00				
2.8 Lead Sample Analysis	5	ea	$130.00				
2.9 QA & QC Data Validation (40% of analysis cost)	1	ls			$720.00		
2.10 Report Preparation & Submittal	1	ls			$5,500.00		
2.1 Report Comment Response and Republication	1	ls			$5,500.00		
TOTAL ANNUAL COST							
10% CONTINGENCY							
TOTAL ANNUAL							
FIVE YEAR COSTS							
1 FIVE YEAR REVIEW - Assumes that five year review for this site is a component of other for NAVSTA Newport and that only one 5 year review will be required during each cycle.							
1.1 Report LTM results and remedy assessment in 5 Year Review	1	ls			$23,000.00		
2 FIVE YEAR BATHYMETRIC SURVEY / CAP INSPECTION							
2.1 Sub-Pier Areas	2	ea	$10,000.00				
3 CAP MAINTENANCE AND REPAIRS							
3.1 10% of total capital cost for capping (#5 Capital Cost Detail)	1	ls	$121,568.26				
TOTAL 5 YEAR COST							
10% CONTINGENCY							
TOTAL FIVE YEAR							

TABLE B-3
NAVAL STATION NEWPORT
NEWPORT, RI
Site 19 - Derecktor Shipyard Marine Sediment
Alternative SD5: Target Dredging (open water); Cap, LUCs, and Monitoring (under Pier 2).
Present Worth Analysis

Year	Capital Cost	Annual Cost	Total Year Cost	Annual Discount Rate 2.0%	Pres Wo
0	$16,980,477		$16,980,477	1.000	$16,980,
1		$25,388	$25,388	0.980	$24,890
2		$25,388	$25,388	0.961	$24,402
3		$25,388	$25,388	0.942	$23,924
4		$25,388	$25,388	0.924	$23,455
5		$206,413	$206,413	0.906	$186,
6		$25,388	$25,388	0.888	$22,544
7		$25,388	$25,388	0.871	$22,102
8		$25,388	$25,388	0.853	$21,668
9		$25,388	$25,388	0.837	$21,244
10		$206,413	$206,413	0.820	$169,
11		$25,388	$25,388	0.804	$20,419
12		$25,388	$25,388	0.788	$20,018
13		$25,388	$25,388	0.773	$19,626
14		$25,388	$25,388	0.758	$19,241
15		$206,413	$206,413	0.743	$153,
16		$25,388	$25,388	0.728	$18,494
17		$25,388	$25,388	0.714	$18,131
18		$25,388	$25,388	0.700	$17,776
19		$25,388	$25,388	0.686	$17,427
20		$206,413	$206,413	0.673	$138,
21		$25,388	$25,388	0.660	$16,750
22		$25,388	$25,388	0.647	$16,422
23		$25,388	$25,388	0.634	$16,100
24		$25,388	$25,388	0.622	$15,784
25		$206,413	$206,413	0.610	$125,
26		$25,388	$25,388	0.598	$15,171
27		$25,388	$25,388	0.586	$14,874
28		$25,388	$25,388	0.574	$14,582
29		$25,388	$25,388	0.563	$14,296
30		$206,413	$206,413	0.552	$113,
				TOTAL PRESENT WORTH	**$18,32**

Appendix C
Human Health Risk Assessment Summary Tables

DOSE-RESPONSE PARAMETERS - CARCINOGENIC EFFECTS
CHEMICALS OF POTENTIAL CONCERN
MARINE HUMAN HEALTH RISK ASSESSMENT
FORMER DERECKTOR SHIPYARD
NETC - NEWPORT, RHODE ISLAND

COPC	SF Oral 1/(mg/kg)/day		Weight of Evidence	Type of Cancer	SF Basis/ Source
Semivolatiles					
1,6,7-trimethylnaphthalene	NA				NA/IRIS,HEAST
1-methylnaphthalene	NA				NA/IRIS,HEAST
1-methylphenanthrene	NA				NA/IRIS,HEAST
2,6-dimethylnaphthalene	NA				NA/IRIS,HEAST
2-methylnaphthalene	NA				NA/IRIS,HEAST
acenaphthene	NA				NA/IRIS,HEAST
acenapthylene	NA				NA/IRIS,HEAST
anthracene	NA				NA/IRIS,HEAST
benz(a)anthracene	7.3E-01	E	B2	Forestomach	Diet/IRIS
benzo(a)pyrene	7.3E+00		B2	Forestomach	Diet/IRIS
benzo(b,j,k)flouranthene*	7.3E-01	E	B2	Forestomach	Diet/IRIS
benzo(e)pyrene	NA				NA/IRIS,HEAST
benzo(g,h,i)perylene	NA				NA/IRIS,HEAST
biphenyl	NA				NA/IRIS,HEAST
chrysene	7.3E-03	E	B2	Forestomach	Diet/IRIS
dibenz(a,h)anthracene	7.3E+00	E	B2	Forestomach	Diet/IRIS
fluoranthene	NA				NA/IRIS,HEAST
fluorene	NA				NA/IRIS,HEAST
hexachlorobenzene	1.6E+00		B2	Liver, Thyroid, Kidney	Water/IRIS
indeno(1,2,3-cd)pyrene	7.3E-01	E	B2	Forestomach	Diet/IRIS
naphthalene	NA				NA/IRIS,HEAST
perylene	NA				NA/IRIS,HEAST
phenanthrene	NA				NA/IRIS,HEAST
pyrene	NA				NA/IRIS,HEAST
Pesticides/PCBs					
Polychlorinated biphenyls	2.0E+00		B2	Liver	Diet/IRIS
Aldrin	1.7E+01		B2	Liver	Diet/IRIS
Mirex	1.8E+00	W	B2		
DDE	3.4E-01		B2	Liver	Diet/IRIS
Metals					
aluminum	NA				NA/IRIS,HEAST
arsenic	1.5E+00		A	Skin	Water/IRIS
cadmium	NA				NA/IRIS,HEAST
chromium	NA		D		NA/IRIS,HEAST
copper	NA		D		NA/IRIS,HEAST
iron	NA				NA/IRIS,HEAST
lead	NA		B2	Kidney	NA/IRIS,HEAST
manganese (food)	NA		D		NA/IRIS,HEAST
mercury	NA		D		NA/IRIS,HEAST
nickel	NA				NA/IRIS,HEAST
silver	NA		D		NA/IRIS,HEAST
zinc	NA		D		NA/IRIS,HEAST
Butyltins					
Dibutyltin	NA				NA/IRIS,HEAST
Tributyltin	NA				NA/IRIS,HEAST

COPC = Chemical of Potential Concern
SF = Slope Factor
IRIS = Integrated Risk Information System (EPA, 1997a)
HEAST = Health Effects Assessment Summary Tables (EPA, 1997b)
NA = Not Available
E = EPA-NCEA Regional Support provisional service
W = Withdrawn from IRIS or HEAST
* = Benzo(b,j,k)fluoranthene is a combination of Benzo(b)fluoranthene & Benzo(k)fluoranthene & Benzo(j)fluoranthene, the value used for the carcinogenic risk assessment represents the toxicity of Benzo(b)fluoranthene

APPENDIX C
TABLE C-2
DOSE-RESPONSE PARAMETERS - NONCARCINOGENIC EFFECTS
CHEMICALS OF POTENTIAL CONCERN
MARINE HUMAN HEALTH RISK ASSESSMENT
FORMER DERECKTOR SHIPYARD
NETC-NEWPORT, RHODE ISLAND

COPC	RfD Oral (mg/kg)/day	Confidence Level	Type Critical Effect	Oral RfD Basis/Source	Uncertainty Factor	Modifying Factor
Semivolatiles						
1,6,7-trimethylnaphthalene	NA			NA/IRIS,HEAST		
1-methylnaphthalene	4.0E-02		Decreased Body Weight Gain	Gavage/HEAST	10000	NA
1-methylphenanthrene	NA			NA/IRIS,HEAST		
2,6-dimethylnaphthalene	NA			NA/IRIS,HEAST		
2-methylnaphthalene	4.0E-02		Decreased Body Weight Gain	Gavage/HEAST	10000	NA
acenaphthene	6.0E-02	Low	Hepatotoxicity	Gavage/IRIS	3000	1
acenapthtylene	NA			NA/IRIS,HEAST		
anthracene	3.0E-01	Low	None Observed	Gavage/IRIS	3000	1
benz(a)anthracene	NA			NA/IRIS,HEAST		
benzo(a)pyrene	NA			NA/IRIS,HEAST		
benzo(b,j,k)flouranthene	NA			NA/IRIS,HEAST		
benzo(e)pyrene	NA			NA/IRIS,HEAST		
benzo(g,h,i)perylene	NA			NA/IRIS,HEAST		
biphenyl	5.0E-02	Medium	Kidney Damage	Diet/IRIS,HEAST	100	10
chrysene	NA			NA/IRIS,HEAST		
dibenz(a,h)anthracene	NA			NA/IRIS,HEAST		
fluoranthene	4.0E-02	Low	Kidney, Liver, Blood	Gavage/IRIS	3000	1
fluorene	4.0E-02	Low	Hematological Effects	Gavage/IRIS	3000	1
hexachlorobenzene	8.0E-04	Medium	Liver	Diet/IRIS,HEAST	100	1
indeno(1,2,3-cd)pyrene	NA			NA/IRIS,HEAST		
naphthalene	4.0E-02		Decreased Body Weight Gain	Gavage/Heast	1000	NA
perylene	NA			NA/IRIS,HEAST		
phenanthrene	NA			NA/IRIS,HEAST		
pyrene	3.0E-02	Low	Kidney Effects	Gavage/IRIS	3000	1
Pesticides/PCBs						
Polychlorinated biphenyls	NA			NA/IRIS,HEAST		
PCBs as Aroclor-1254	2.0E-05	Medium	Ocular, Skin, Decreased Antibody Responses in Erythrocytes	Diet/IRIS	300	
Aldrin	3.0E-05	Medium	Liver, Central Nervous System	Diet/IRIS		
Mirex	2.0E-04	High	Liver	Diet/IRIS,HEAST	300	1
DDE	NA			NA/IRIS,HEAST		
Metals						
aluminum	1.0E+00 E			EPA/NCEA		
arsenic	3.0E-04	Medium	Hyperpgmentation, Keratosis, Vascular Effects	Water/IRIS	3	1
cadmium	1.0E-03	High	Proteinurea	Diet/IRIS	10	1
chromium	5.0E-03	Low	None Observed	Water/IRIS	500	1
copper	4.0E-02		Local GI Irritation	Oral/HEAST	NA	NA
iron	3.0E-01 E		Pancreas and Liver	EPA/NCEA		
lead	NA			NA/IRIS,HEAST		
manganese (food)	1.4E-01		Central Nervous System	Diet/IRIS	1	1
mercury	3.0E-04		Kidney	Oral/HEAST	1000	NA
nickel	2.0E-02	Medium	Reduced Body and Organ Weight	Diet/IRIS	300	1
silver	5.0E-03	Low	Dermal Effects	Diet/IRIS	3	1
zinc	3.0E-01	Medium	Anemia	Diet/IRIS	3	1
Butyltins						
Dibutyltin	NA			NA/IRIS,HEAST		
Tributyltin	3.0E-04	High	Immunosupression	Diet/IRIS,HEAST	100	1

COPC = Chemical of Potential Concern
RfD = Reference Dose
IRIS = Integrated Risk Information System (EPA, 1997a)
HEAST = Health Effects Assessment Summary Tables (EPA, 1997b)
NA = Not Available
E = EPA-NCEA Regional Support provisional service
W = Withdrawn from IRIS or HEAST

EXPOSURE POINT CONCENTRATIONS - RME AND CTE - HARD CLAMS
MARINE HUMAN HEALTH RISK ASSESSMENT
FORMER DERECKTOR SHIPYARD
NETC - NEWPORT, RHODE ISLAND

Substance	Exposure Point Concentration RME	Exposure Point Concentration CTE
aluminum	14.1624	9.772
arsenic	1.3104	0.945
cadmium	0.126	0.09828
chromium	0.3444	0.2772
copper	2.0132	1.47
iron	35.9408	23.1
manganese	2.7902	1.918
mercury	0.023464	0.01904
nickel	0.5586	0.2296
silver	0.1932	0.04186
zinc	18.3876	14.42
acenaphthene	0.914564	0.3906
anthracene	4.250022	2.324
benz(a)anthracene	18.6032	7.56
benzo(a)pyrene	6.298936	3.304
benzo(b,j,k)fluoranthene	18.035	7.112
chrysene	9.4318	5.04
fluoranthene	25.004756	12.334
fluorene	1.11321	0.4984
indeno(1,2,3-cd)pyrene	3.761744	1.1186
pyrene	27.601056	12.642
PCB 101 (2 2'3 5 5')	3.0289	1.834
PCB 105 (2 3 3'4 4')	34.219528	4.564
PCB 118 (2 3'4 4'5)	2.581096	1.582
PCB 128 (2 2'3 3'4 4')	0.915642	0.518
PCB 138 (2 2'3 4 4'5)	6.621356	4.004
PCB 153 (2 2'4 4'5 5')	7.864682	5.572
PCB 170 (2 2'3 3'4 4'5)	1.568882	0.9282
PCB 18 (2 2'5)	0.42161	0.2548
PCB 180 (2 2'3 4 4'5 5')	3.66338	2.492
PCB 187 (2 2'3 4'5 5'6)	2.872072	2.03
PCB 195 (2 2'3 3'4 4'5 6)	0.567336	0.3052
PCB 206 (2 2'3 3'4 4'5 5'6)	1.131102	0.8316
PCB 209 (2 2'3 3'4 4'5 5'6 6')	1.380484	0.7266
PCB 28 (2 4 4')	3.372292	1.2684
PCB 44 (2 2'3 5')	1.65011	0.4774
PCB 52 (2 2'5 5)	1.626184	0.8638
PCB 66 (2 3'4 4')	3.124912	1.652
PCB Sum of Congeners*	66.536	29.68
hexachlorobenzene	0.39522	0.11466
mirex	0.148778	0.08092
o,p'-DDE	0.536256	0.168
p,p'-DDE	0.664902	0.413
tributyltin	9.3996	6.482

Inorganics are in mg/kg, Organics are in ug/kg, wet weight
RME = Reasonable Maximum Exposure
CTE = Central Tendency Exposure
* = PCB Sum of the Congeners Exposure Point Concentrations are used to estimate Noncarcinogenic Risks as Aroclor-1254 as Aroclor-1254

EXPOSURE POINT CONCENTRATIONS - RME AND CTE - BLUE MUSSELS
MARINE HUMAN HEALTH RISK ASSESSMENT
FORMER DERECKTOR SHIPYARD
NETC - NEWPORT, RHODE ISLAND

Substance	Exposure Point Concentration RME	Exposure Point Concentration CTE
aluminum	52.1668	20.16
arsenic	1.7584	1.015
cadmium	0.2604	0.12152
chromium	0.441	0.3724
copper	2.086	1.0738
iron	61.2066	37.1
lead	0.8134	0.2282
manganese	5.3648	2.338
mercury	0.039088	0.02422
nickel	0.7616	0.3136
zinc	19.9178	15.12
1-methylnaphthalene	2.081548	0.6776
2-methylnaphthalene	3.930346	1.204
acenaphthene	2.19268	0.4368
acenaphthylene	12.531904	5.404
anthracene	33.190906	13.342
benz(a)anthracene	145.61148	31.22
benzo(a)pyrene	76.726482	14
benzo(g,h,i)perylene	20.665694	4.746
benzo(b,j,k)fluoranthene	323.4	63.28
1,1-biphenyl	1.805272	0.728
chrysene	87.612014	25.2
dibenz(a,h)anthracene	6.954248	1.2656
fluoranthene	183.4	67.06
fluorene	5.480636	2.898
indeno(1,2,3-cd)pyrene	16.929542	3.724
phenanthrene	38.147088	16.1
pyrene	145.6	49.56
PCB 101 (2 2'3 5 5')	7.94962	5.432
PCB 105 (2 3 3'4 4')	1.3489	0.9156
PCB 118 (2 3'4 4'5)	6.236454	4.046
PCB 128 (2 2'3 3'4 4')	3.220644	2.324
PCB 138 (2 2'3 4 4'5)	17.610152	11.844
PCB 153 (2 2'4 4'5 5')	24.198342	16.8
PCB 170 (2 2'3 3'4 4'5)	0.66073	0.4564
PCB 18 (2 2'5)	0.874412	0.3486
PCB 180 (2 2'3 4 4'5 5')	3.865484	2.184
PCB 187 (2 2'3 4'5 5'6)	7.802774	5.544
PCB 195 (2 2'3 3'4 4'5 6)	0.41608	0.1526
PCB 206 (2 2'3 3'4 4'5 5'6)	0.767886	0.4466
PCB 209 (2 2'3 3'4 4'5 5'6 6')	1.162056	0.5152
PCB 28 (2 4 4')	2.293914	1.456
PCB 44 (2 2'3 5')	1.547308	1.022
PCB 52 (2 2'5 5)	3.059574	2.198
PCB 66 (2 3'4 4')	0.576996	0.308
PCB 8 (2 4)	1.049426	0.5866
PCB Sum of Congeners*	80.4002	56.28
mirex	0.516796	0.3304
o,p'-DDE	1.252986	0.7644
p,p'-DDE	1.700958	1.2278
naphthalene	25.638774	7.854
dibutyltin	5.7232	0.8988
tributyltin	136.7814	20.3

Inorganics are in mg/kg, Organics are in ug/kg, wet weight

RME = Reasonable Maximum Exposure

CTE = Central Tendency Exposure

* = PCB Sum of the Congeners Exposure Point Concentrations are used to estimate Noncarcinogenic Risks as Aroclor-1254

EXPOSURE POINT CONCENTRATIONS - RME AND CTE - LOBSTER
MARINE HUMAN HEALTH RISK ASSESSMENT
FORMER DERECKTOR SHIPYARD
NETC - NEWPORT, RHODE ISLAND

Substance	Exposure Point Concentration RME	Exposure Point Concentration CTE
aluminum	4.35456	0.7098
arsenic	4.0096	3.108
cadmium	0.0784	0.0455
chromium	0.3024	0.266
copper	27.5646	17.78
iron	11.4296	5.558
manganese	0.6356	0.406
mercury	0.06356	0.04494
nickel	0.2632	0.2086
silver	0.9618	0.6636
zinc	23.996	16.8
1-methylnaphthalene	1.856442	0.9688
2-methylnaphthalene	2.083774	1.253
acenaphthene	4.555992	0.6706
anthracene	1.148714	0.5824
benz(a)anthracene	4.060714	1.0122
benzo(a)pyrene	4.021598	1.2068
benzo(b,j,k)fluoranthene	8.5345	3.248
1,1-biphenyl	1.9929	0.658
chrysene	5.402124	1.365
fluoranthene	14.06818	6.664
fluorene	2.088296	0.3528
indeno(1,2,3-cd)pyrene	1.47945	0.3822
pyrene	17.302404	7.98
PCB 101 (2 2'3 5 5')	5.23306	1.764
PCB 105 (2 3 3'4 4')	29.20855	6.342
PCB 118 (2 3'4 4'5)	9.650522	4.41
PCB 128 (2 2'3 3'4 4')	1.734278	0.7546
PCB 138 (2 2'3 4 4'5)	9.965172	5.222
PCB 153 (2 2'4 4'5 5')	13.87477	7.392
PCB 170 (2 2'3 3'4 4'5)	1.71143	1.001
PCB 18 (2 2'5)	1.501584	0.441
PCB 180 (2 2'3 4 4'5 5')	4.793432	2.394
PCB 187 (2 2'3 4'5 5'6)	4.409538	2.212
PCB 195 (2 2'3 3'4 4'5 6)	0.656516	0.413
PCB 206 (2 2'3 3'4 4'5 5'6)	1.00989	0.7714
PCB 209 (2 2'3 3'4 4'5 5'6 6')	0.809424	0.5908
PCB 28 (2 4 4')	5.711846	1.3314
PCB 44 (2 2'3 5')	1.21184	0.658
PCB 52 (2 2'5 5)	1.83351	1.1914
PCB 66 (2 3'4 4')	2.715174	1.736
PCB 8 (2 4)	1.019844	0.3654
PCB Sum of Congeners*	60.238	38.78
hexachlorobenzene	0.175952	0.10948
mirex	0.21665	0.11396
o,p'-DDE	0.99239	0.1736
p,p'-DDE	1.37137	0.8624
naphthalene	4.928602	1.624

Inorganics are in mg/kg, Organics are in ug/kg, wet weight

EXPOSURE POINT CONCENTRATIONS - SEDIMENT SAMPLE DSY-29-S
MARINE HUMAN HEALTH RISK ASSESSMENT
FORMER DERECKTOR SHIPYARD
NETC - NEWPORT, RHODE ISLAND

Substance	Exposure Point Concentration
aluminum	37147.5
arsenic	12.46
cadmium	1.45
chromium	86.5
copper	157.75
iron	35452.5
lead	185.9
manganese	282.25
mercury	0.5
nickel	34.75
silver	0.79
zinc	392.75
1,6,7-trimethylnaphthalene	27.94
1-methylnaphthalene	50.07
1-methylphenanthrene	266.56
2,6-dimethylnaphthalene	112.32
2-methylnaphahalene	73.47
acenaphthene	188.59
acenaphthylene	300.15
anthracene	1220
benz(a)anthracene	2700
benzo(a)pyrene	2380
benzo(b,j,k)fluoranthene	5350
benzo(e)pyrene	1950
benzo(g,h,i)perylene	1110
1,1-biphenyl	29.91
chrysene	2800
dibenz(a,h)anthracene	317.43
fluoranthene	4970
fluorene	293.64
indeno(1,2,3-cd)pyrene	1020
naphthalene	76.08
perylene	610.95
phenanthrene	1609.54
pyrene	5300
PCB 101 (2 2'3 5 5')	16.7
PCB 105 (2 3 3'4 4')	6.61
PCB 118 (2 3'4 4'5)	18.38
PCB 128 (2 2'3 3'4 4')	5.14
PCB 138 (2 2'3 4 4'5)	27.04
PCB 153 (2 2'4 4'5 5')	22.8
PCB 170 (2 2'3 3'4 4'5)	7.25
PCB 18 (2 2'5)	0.68
PCB 180 (2 2'3 4 4'5 5')	13.79
PCB 187 (2 2'3 4'5 5'6)	8.54
PCB 195 (2 2'3 3'4 4'5 6)	3.83
PCB 206 (2 2'3 3'4 4'5 5'6)	17.39
PCB 209 (2 2'3 3'4 4'5 5'6 6')	105.27
PCB 28 (2 4 4')	1.66
PCB 44 (2 2'3 5')	3.94
PCB 52 (2 2'5 5)	9.69
PCB 66 (2 3'4 4')	3.87
PCB 8 (2,4)	0.6
PCB Sum of Congeners*	273.19
aldrin	0.1
hexachlorobenzene	0.16
mirex	0.1
o,p'-DDE	4.96
p,p'-DDE	6.29
dibutyltin	20.58
monobutyltin	8.65
tetrabutyltin	0.5
tributyltin	60.89

Inorganics are in mg/kg, Organics are in ug/kg, dry weight
* = PCB Sum of the Congeners Exposure Point Concentrations are used to estimate Noncarcinogenic Risks as Aroclor-1254

APPENDIX C
TABLE C-7
SUMMARY OF CANCER RISKS AND HAZARD INDICES
MARINE HUMAN HEALTH RISK ASSESSMENT
FORMER DERECKTOR SHIPYARD
NETC - NEWPORT, RHODE ISLAND

	Child Resident		Adult Resident		Subsistence Fisherman		Trespasser Child	Trespasser Adult
Exposure Scenario	RME	CTE	RME	CTE	RME	CTE	RME	RME
CANCER RISKS								
Ingestion of Hard Shell Clams	**5.1E-06**	**3.4E-06**	**1.6E-05**	**1.1E-05**	**2.0E-04**	**1.4E-04**	NA	NA
Ingestion of Blue Mussels	**1.0E-05**	**4.2E-06**	**2.8E-05**	**1.3E-05**	**3.3E-04**	**1.6E-04**	NA	NA
Ingestion of Lobster	**1.4E-05**	**1.1E-05**	**4.4E-05**	**3.4E-05**	**5.7E-04**	**4.4E-04**	NA	NA
Sediment Ingestion and Dermal Contact	NA	NA	NA	NA	NA	NA	**2.0E-06**	5.5E-07
NONCANCER RISKS								
Ingestion of Hard Shell Clams	2.2E-01	1.4E-01	1.4E-01	8.9E-02	**1.9E+00**	**1.2E+00**	NA	NA
Ingestion of Blue Mussels	4.0E-01	1.9E-01	2.6E-01	1.3E-01	**3.3E+00**	**1.6E+00**	NA	NA
Ingestion of Lobster	4.6E-01	3.4E-01	3.0E-01	2.2E-01	**3.9E+00**	**2.9E+00**	NA	NA
Sediment Ingestion and Dermal Contact	NA	NA	NA	NA	NA	NA	1.3E-01	6.9E-03

Bold Text indicates significant risks (i.e. cancer risk > 1.00E-06 or noncancer hazard index > 1.0)
RME = Reasonable Maximum Exposure
CTE = Central Tendency Exposure

APPENDIX C
TABLE C-8
ESTIMATED RME CANCER RISKS - HARD CLAM INGESTION USING EPC = Maximum
MARINE HUMAN HEALTH RISK ASSESSMENT
FORMER DERECKTOR SHIPYARD
NETC - NEWPORT, RHODE ISLAND

Exposure Point Concentration*	Substance	Estimated Incremental Cancer Risk		
		Child Resident	Adult Resident	Subsistence Fisherman
		Ingestion	Ingestion	Ingestion
14.1624	aluminum	NT	NT	NT
1.3104	**arsenic**	**4.27E-06**	**1.38E-05**	**1.81E-04**
0.126	cadmium	NT	NT	NT
0.3444	chromium	NT	NT	NT
2.0132	copper	NT	NT	NT
35.9408	iron	NT	NT	NT
2.7902	manganese	NT	NT	NT
0.023464	mercury	NT	NT	NT
0.5586	nickel	NT	NT	NT
0.1932	silver	NT	NT	NT
18.3876	zinc	NT	NT	NT
0.914564	acenaphthene	NT	NT	NT
4.250022	anthracene	NT	NT	NT
18.6032	**benz(a)anthracene**	2.94E-08	9.56E-08	**1.24E-06**
6.298936	**benzo(a)pyrene**	9.98E-08	3.23E-07	**4.21E-06**
18.035	**benzo(b,j,k)fluoranthene**	2.85E-08	9.27E-08	**1.21E-06**
9.4318	chrysene	1.50E-10	4.84E-10	6.30E-09
25.004756	fluoranthene	NT	NT	NT
1.11321	fluorene	NT	NT	NT
3.761744	indeno(1,2,3-cd)pyrene	5.96E-09	1.93E-08	2.52E-07
27.601056	pyrene	NT	NT	NT
3.0289	PCB 101 (2 2'3 5 5')	1.31E-08	4.27E-08	5.54E-07
34.219528	**PCB 105 (2 3 3'4 4')**	1.48E-07	4.82E-07	**6.27E-06**
2.581096	PCB 118 (2 3'4 4'5)	1.12E-08	3.64E-08	4.73E-07
0.915642	PCB 128 (2 2'3 3'4 4')	3.98E-09	1.29E-08	1.68E-07
6.621356	**PCB 138 (2 2'3 4 4'5)**	2.87E-08	9.32E-08	**1.21E-06**
7.864682	**PCB 153 (2 2'4 4'5 5')**	3.42E-08	1.11E-07	**1.44E-06**
1.568882	PCB 170 (2 2'3 3'4 4'5)	6.80E-09	2.21E-08	2.87E-07
0.42161	PCB 18 (2 2'5)	1.83E-09	5.94E-09	7.73E-08
3.66338	PCB 180 (2 2'3 4 4'5 5')	1.60E-08	5.17E-08	6.71E-07
2.872072	PCB 187 (2 2'3 4'5 5'6)	1.25E-08	4.05E-08	5.26E-07
0.567336	PCB 195 (2 2'3 3'4 4'5 6)	2.46E-09	7.99E-09	1.04E-07
1.131102	PCB 206 (2 2'3 3'4 4'5 5'6)	4.91E-09	1.60E-08	2.07E-07
1.380484	PCB 209 (2 2'3 3'4 4'5 5'6 6'	5.99E-09	1.95E-08	2.53E-07
3.372292	PCB 28 (2 4 4')	1.47E-08	4.75E-08	6.17E-07
1.65011	PCB 44 (2 2'3 5')	7.17E-09	2.32E-08	3.02E-07
1.626184	PCB 52 (2 2'5 5)	7.06E-09	2.30E-08	2.98E-07
3.124912	PCB 66 (2 3'4 4')	1.36E-08	4.41E-08	5.73E-07
66.5359	**PCB Sum of the Congeners**	3.33E-07	**1.08E-06**	**1.40E-05**
0.39522	hexachlorobenzene	1.37E-09	4.45E-09	5.80E-08
0.148778	mirex	5.81E-10	1.89E-09	2.45E-08
0.536256	o,p'-DDE	3.96E-10	1.28E-09	1.67E-08
0.664902	p,p'-DDE	4.90E-10	1.60E-09	2.07E-08
9.3996	tributyltin	NT	NT	NT
	TOTAL RISK:	**5.09E-06**	**1.58E-05**	**2.01E-04**

Bold Text indicates those chemicals which are significant contributors (i.e. cancer risk > 1.00E-06) to the cancer risk

The cancer risks for PCBs (total) are as follows: Child (6.66E-07), Adult (2.16E-06), and Fisherman (2.80E-05)

EPC = Exposive Point Concentration

NT - Risk not calculated: No toxicity factor available for this compound

*** wet weight**

APPENDIX C
TABLE C-9

ESTIMATED RME CANCER RISKS - INDIGENOUS BLUE MUSSELS USING EPC = Maximum
MARINE HUMAN HEALTH RISK ASSESSMENT
DERECKTOR SHIPYARD - OFFSHORE
NEWPORT, RHODE ISLAND

Exposure Point Concentration*	Substance	Estimated Incremental Cancer Risk		
		Child Resident Ingestion	Adult Resident Ingestion	Subsistence Fisherman Ingestion
52.1668	aluminum	NT	NT	NT
1.7584	**arsenic**	**5.73E-06**	**1.86E-05**	**2.42E-04**
0.2604	cadmium	NT	NT	NT
0.441	chromium	NT	NT	NT
2.086	copper	NT	NT	NT
61.2066	iron	NT	NT	NT
5.3648	manganese	NT	NT	NT
0.039088	mercury	NT	NT	NT
0.7616	nickel	NT	NT	NT
19.9178	zinc	NT	NT	NT
2.081548	1-methylnaphthalene	NT	NT	NT
3.930346	2-methylnaphthalene	NT	NT	NT
2.19268	acenaphthene	NT	NT	NT
33.190906	anthracene	NT	NT	NT
145.61148	**benz(a)anthracene**	2.31E-07	7.49E-07	**9.73E-06**
76.726482	**benzo(a)pyrene**	**1.22E-06**	**3.95E-06**	**5.12E-05**
323.4	**benzo(b,j,k)fluoranthene**	**2.25E-06**	**7.30E-06**	**9.48E-05**
1.805272	1,1-biphenyl	NT	NT	NT
87.612014	chrysene	1.39E-09	4.51E-09	5.85E-08
6.954248	**dibenz(a,h)anthracene**	1.10E-07	3.57E-07	**4.65E-06**
183.4	fluoranthene	NT	NT	NT
5.480636	fluorene	NT	NT	NT
16.929542	**indeno(1,2,3-cd)pyrene**	2.69E-08	8.71E-08	**1.13E-06**
145.6	pyrene	NT	NT	NT
7.94962	**PCB 101 (2 2'3 5 5')**	3.44E-08	1.12E-07	**1.46E-06**
1.3489	PCB 105 (2 3 3'4 4')	5.85E-09	1.90E-08	2.46E-07
6.236454	**PCB 118 (2 3'4 4'5)**	2.70E-08	8.79E-08	**1.14E-06**
3.220644	PCB 128 (2 2'3 3'4 4')	1.40E-08	4.54E-08	5.89E-07
17.610152	**PCB 138 (2 2'3 4 4'5)**	7.64E-08	2.48E-07	**3.22E-06**
24.198342	**PCB 153 (2 2'4 4'5 5')**	1.05E-07	3.42E-07	**4.44E-06**
0.66073	PCB 170 (2 2'3 3'4 4'5)	2.87E-09	9.31E-09	1.21E-07
0.874412	PCB 18 (2 2'5)	3.79E-09	1.23E-08	1.60E-07
3.865484	PCB 180 (2 2'3 4 4'5 5')	1.68E-08	5.45E-08	7.08E-07
7.802774	**PCB 187 (2 2'3 4'5 5'6)**	3.39E-08	1.10E-07	**1.43E-06**
0.41608	PCB 195 (2 2'3 3'4 4'5 6)	1.81E-09	5.87E-09	7.62E-08
0.767886	PCB 206 (2 2'3 3'4 4'5 5'6)	3.33E-09	1.08E-08	1.40E-07
1.162056	PCB 209 (2 2'3 3'4 4'5 5'6 6')	5.04E-09	1.64E-08	2.13E-07
2.293914	PCB 28 (2 4 4')	9.95E-09	3.23E-08	4.20E-07
1.547308	PCB 44 (2 2'3 5')	6.72E-09	2.18E-08	2.83E-07
3.059574	PCB 52 (2 2'5 5)	1.33E-08	4.31E-08	5.60E-07
0.576996	PCB 66 (2 3'4 4')	2.51E-09	8.13E-09	1.06E-07
1.049426	PCB 8 (2 4)	4.55E-09	1.48E-08	1.92E-07
80.40018	**PCB Sum of the Congeners**	3.67E-07	**1.19E-06**	**1.55E-05**
0.516796	mirex	2.02E-09	6.55E-09	8.53E-08
1.252986	o,p'-DDE	9.24E-10	3.00E-09	3.91E-08
1.700958	p,p'-DDE	1.25E-09	4.07E-09	5.29E-08
25.638774	naphthalene	NT	NT	NT
136.7814	tributyltin	NT	NT	NT
	TOTAL RISK:	**1.03E-05**	**2.75E-05**	**3.27E-04**

Bold Text indicates those chemicals which are significant contributors (i.e. cancer risk > 1.00E-06) to the cancer risk
The cancer risks for PCBs (total) are as follows: Child (7.34E-07), Adult (2.38E-06), and Fisherman (3.10E-05)
EPC = Exposure Point Concentration
NT - Risk not calculated: No toxicity factor available for this compound
* wet weight

APPENDIX C
TABLE C-10
ESTIMATED RME CANCER RISKS - LOBSTER INGESTION USING EPC = MAXIMUM
MARINE HUMAN HEALTH RISK ASSESSMENT
FORMER DERECKTOR SHIPYARD
NETC - NEWPORT, RHODE ISLAND

Exposure Point Concentration*	Substance	Estimated Incremental Cancer Risk		
		Child Resident Ingestion	Adult Resident Ingestion	Subsistence Fisherman Ingestion
4.35456	aluminum	NT	NT	NT
4.0096	**arsenic**	**1.30E-05**	**4.24E-05**	**5.50E-04**
0.0784	cadmium	NT	NT	NT
0.3024	chromium	NT	NT	NT
27.5646	copper	NT	NT	NT
11.4296	iron	NT	NT	NT
0.6356	manganese	NT	NT	NT
0.06356	mercury	NT	NT	NT
0.2632	nickel	NT	NT	NT
0.9618	silver	NT	NT	NT
23.996	zinc	NT	NT	NT
1.856442	1-methylnaphthalene	NT	NT	NT
2.083774	2-methylnaphthalene	NT	NT	NT
4.555992	acenaphthene	NT	NT	NT
1.148714	anthracene	NT	NT	NT
4.060714	benz(a)anthracene	6.43E-09	2.09E-08	2.72E-07
4.021598	**benzo(a)pyrene**	6.37E-08	2.07E-07	**2.69E-06**
8.5345	benzo(b,j,k)fluoranthene	1.35E-08	4.38E-08	5.71E-07
1.9929	1,1-biphenyl	NT	NT	NT
5.402124	chrysene	8.55E-11	2.77E-10	3.61E-09
14.06818	fluoranthene	NT	NT	NT
2.088296	fluorene	NT	NT	NT
1.47945	indeno(1,2,3-cd)pyrene	2.34E-09	7.60E-09	9.90E-08
17.302404	pyrene	NT	NT	NT
5.23306	PCB 101 (2 2'3 5 5')	2.27E-08	7.38E-08	9.59E-07
29.20855	**PCB 105 (2 3 3'4 4')**	1.27E-07	4.12E-07	**5.35E-06**
9.650522	**PCB 118 (2 3'4 4'5)**	4.19E-08	1.36E-07	**1.76E-06**
1.734278	PCB 128 (2 2'3 3'4 4')	7.53E-09	2.45E-08	3.18E-07
9.965172	**PCB 138 (2 2'3 4 4'5)**	4.33E-08	1.40E-07	**1.82E-06**
13.87477	**PCB 153 (2 2'4 4'5 5')**	6.02E-08	1.96E-07	**2.55E-06**
1.71143	PCB 170 (2 2'3 3'4 4'5)	7.43E-09	2.41E-08	3.14E-07
1.501584	PCB 18 (2 2'5)	6.51E-09	2.11E-08	2.74E-07
4.793432	PCB 180 (2 2'3 4 4'5 5')	2.09E-08	6.75E-08	8.78E-07
4.409538	PCB 187 (2 2'3 4'5 5'6)	1.92E-08	6.22E-08	8.08E-07
0.656516	PCB 195 (2 2'3 3'4 4'5 6)	2.86E-09	9.25E-09	1.20E-07
1.00989	PCB 206 (2 2'3 3'4 4'5 5'6)	4.38E-09	1.43E-08	1.85E-07
0.809424	PCB 209 (2 2'3 3'4 4'5 5'6 6'	3.51E-09	1.14E-08	1.48E-07
5.711846	**PCB 28 (2 4 4')**	2.48E-08	8.05E-08	**1.05E-06**
1.21184	PCB 44 (2 2'3 5')	5.26E-09	1.71E-08	2.23E-07
1.83351	PCB 52 (2 2'5 5)	7.95E-09	2.59E-08	3.36E-07
2.715174	PCB 66 (2 3'4 4')	1.18E-08	3.82E-08	4.97E-07
1.019844	PCB 8 (2 4)	4.42E-09	1.44E-08	1.86E-07
60.238	**PCB Sum of the Congeners**	4.21E-07	**1.37E-06**	**1.78E-05**
0.175952	hexachlorobenzene	6.10E-10	1.99E-09	2.58E-08
0.21665	mirex	8.46E-10	2.74E-09	3.57E-08
0.99239	o,p'-DDE	7.32E-10	2.38E-09	3.09E-08
1.37137	p,p'-DDE	1.01E-09	3.29E-09	4.27E-08
4.928602	naphthalene	NT	NT	NT
	TOTAL RISK:	**1.40E-05**	**4.44E-05**	**5.72E-04**

Bold Text indicates those chemicals which are significant contributors (i.e. cancer risk > 1.00E-06) to the cancer risk

The cancer risks for PCBs (total) are as follows: Child (8.42E-07), Adult (2.74E-06), and Fisherman (3.56E-05)

EPC = Exposure Point Concentration

NT - Risk not calculated: No toxicity factor available for this compound

*wet weight

APPENDIX C
TABLE C-11
ESTIMATED RME NONCARCINOGENIC RISKS - HARD CLAM INGESTION USING EPC = MAXIMUM
MARINE HUMAN HEALTH RISK ASSESSMENT
FORMER DERECKTOR SHIPYARD
NETC - NEWPORT, RHODE ISLAND

Exposure Point Concentration*	Substance	Estimated Incremental Noncarcinogenic Risk		
		Child Resident	Adult Resident	Subsistence Fisherman
		Ingestion	Ingestion	Ingestion
14.1624	aluminum	3.58E-04	2.32E-04	3.02E-03
1.3104	arsenic	1.11E-01	7.18E-02	9.34E-01
0.126	cadmium	3.19E-03	2.07E-03	2.69E-02
0.3444	chromium	1.75E-03	1.13E-03	1.47E-02
2.0132	copper	1.27E-03	8.27E-04	1.08E-02
35.9408	iron	3.04E-03	1.97E-03	2.56E-02
2.7902	manganese	5.04E-04	3.28E-04	4.26E-03
0.023464	mercury	5.94E-03	3.86E-03	5.01E-02
0.5586	nickel	7.07E-04	4.59E-04	5.96E-03
0.1932	silver	9.79E-04	6.36E-04	8.26E-03
18.3876	zinc	1.55E-03	1.01E-03	1.31E-02
0.914564	acenaphthene	3.86E-07	2.51E-07	3.26E-06
4.250022	anthracene	3.58E-07	2.32E-07	3.02E-06
18.6032	benz(a)anthracene	NT	NT	NT
6.298936	benzo(a)pyrene	NT	NT	NT
18.035	benzo(b,j,k)fluoranthene	NT	NT	NT
9.4318	chrysene	NT	NT	NT
25.004756	fluoranthene	1.58E-05	1.03E-05	1.34E-04
1.11321	fluorene	7.04E-07	4.58E-07	5.95E-06
3.761744	indeno(1,2,3-cd)pyrene	NT	NT	NT
27.601056	pyrene	2.32E-05	1.51E-05	1.96E-04
3.0289	PCB 101 (2 2'3 5 5')	NT	NT	NT
34.219528	PCB 105 (2 3 3'4 4')	NT	NT	NT
2.581096	PCB 118 (2 3'4 4'5)	NT	NT	NT
0.915642	PCB 128 (2 2'3 3'4 4')	NT	NT	NT
6.621356	PCB 138 (2 2'3 4 4'5)	NT	NT	NT
7.864682	PCB 153 (2 2'4 4'5 5')	NT	NT	NT
1.568882	PCB 170 (2 2'3 3'4 4'5)	NT	NT	NT
0.42161	PCB 18 (2 2'5)	NT	NT	NT
3.66338	PCB 180 (2 2'3 4 4'5 5')	NT	NT	NT
2.872072	PCB 187 (2 2'3 4'5 5'6)	NT	NT	NT
0.567336	PCB 195 (2 2'3 3'4 4'5 6)	NT	NT	NT
1.131102	PCB 206 (2 2'3 3'4 4'5 5'6)	NT	NT	NT
1.380484	PCB 209 (2 2'3 3'4 4'5 5'6 6')	NT	NT	NT
3.372292	PCB 28 (2 4 4')	NT	NT	NT
1.65011	PCB 44 (2 2'3 5')	NT	NT	NT
1.626184	PCB 52 (2 2'5 5)	NT	NT	NT
3.124912	PCB 66 (2 3'4 4')	NT	NT	NT
66.536*	PCBs as Aroclor-1254	8.45E-02	5.47E-02	7.14E-01
0.39522	hexachlorobenzene	1.25E-05	8.12E-06	1.06E-04
0.148778	mirex	1.89E-05	1.22E-05	1.60E-04
0.536256	o,p'-DDE	NT	NT	NT
0.664902	p,p'-DDE	NT	NT	NT
9.3996	tributyltin	7.94E-03	5.15E-03	6.69E-02
	TOTAL RISK:	2.22E-01	1.44E-01	**1.88E+00**

Bold Text indicates those chemicals which are significant contributors (i.e. HI > 1.0) to the noncancer risk

* = Sum of the maximum concentrations of the PCB Congeners

EPC = Exposure Point Concentration

NT - Risk not calculated: No toxicity factor available for this compound

*wet weight

APPENDIX C
TABLE C-12
ESTIMATED RME NONCARCINOGENIC RISKS -
INDIGENOUS BLUE MUSSELS USING EPC = Maximum
MARINE HUMAN HEALTH RISK ASSESSMENT
FORMER DERECKTOR SHIPYARD
NETC - NEWPORT, RHODE ISLAND

Exposure Point Concentration[1]	Substance	Estimated Noncarcinogenic Risk		
		Child Resident	Adult Resident	Subsistence Fisherman
		Ingestion	Ingestion	Ingestion
52.1668	aluminum	1.32E-03	8.58E-04	1.11E-02
1.7584	**arsenic**	1.48E-01	9.63E-02	**1.25E+00**
0.2604	cadmium	6.59E-03	4.28E-03	5.56E-02
0.441	chromium	2.23E-03	1.46E-03	1.89E-02
2.086	copper	1.32E-03	8.57E-04	1.11E-02
61.2066	iron	5.17E-03	3.36E-03	4.35E-02
5.3648	manganese	9.70E-04	6.30E-04	8.19E-03
0.039088	mercury	9.90E-03	6.43E-03	8.36E-02
0.7616	nickel	9.65E-04	6.26E-04	8.13E-03
19.9178	zinc	1.68E-03	1.09E-03	1.41E-02
2.081548	1-methylnaphthalene	1.32E-06	8.55E-07	1.11E-05
3.930346	2-methylnaphthalene	2.49E-06	1.61E-06	2.10E-05
2.19268	acenaphthene	9.25E-07	6.01E-07	7.81E-06
33.190906	anthracene	2.80E-06	1.82E-06	2.37E-05
145.61148	benz(a)anthracene	NT	NT	NT
76.726482	benzo(a)pyrene	NT	NT	NT
323.4	benzo(b,j,k)fluoranthene	NT	NT	NT
1.805272	1,1-biphenyl	9.14E-07	5.94E-07	7.71E-06
87.612014	chrysene	NT	NT	NT
6.954248	dibenz(a,h)anthracene	NT	NT	NT
183.4	fluoranthene	1.16E-04	7.53E-05	9.80E-04
5.480636	fluorene	3.47E-06	2.25E-06	2.93E-05
16.929542	indeno(1,2,3-cd)pyrene	NT	NT	NT
145.6	pyrene	1.23E-04	7.98E-05	1.04E-03
7.94962	PCB 101 (2 2'3 5 5')	NT	NT	NT
1.3489	PCB 105 (2 3 3'4 4')	NT	NT	NT
6.236454	PCB 118 (2 3'4 4'5)	NT	NT	NT
3.220644	PCB 128 (2 2'3 3'4 4')	NT	NT	NT
17.610152	PCB 138 (2 2'3 4 4'5)	NT	NT	NT
24.198342	PCB 153 (2 2'4 4'5 5')	NT	NT	NT
0.66073	PCB 170 (2 2'3 3'4 4'5)	NT	NT	NT
0.874412	PCB 18 (2 2'5)	NT	NT	NT
3.865484	PCB 180 (2 2'3 4 4'5 5')	NT	NT	NT
7.802774	PCB 187 (2 2'3 4'5 5'6)	NT	NT	NT
0.41608	PCB 195 (2 2'3 3'4 4'5 6)	NT	NT	NT
0.767886	PCB 206 (2 2'3 3'4 4'5 5'6)	NT	NT	NT
1.162056	PCB 209 (2 2'3 3'4 4'5 5'6 6')	NT	NT	NT
2.293914	PCB 28 (2 4 4')	NT	NT	NT
1.547308	PCB 44 (2 2'3 5')	NT	NT	NT
3.059574	PCB 52 (2 2'5 5)	NT	NT	NT
0.576996	PCB 66 (2 3'4 4')	NT	NT	NT
1.049426	PCB 8 (2 4)	NT	NT	NT
80.4002*	PCBs as Aroclor-1254	1.02E-01	6.60E-02	8.58E-01
0.516796	mirex	6.54E-05	4.24E-05	5.52E-04
1.252986	o,p'-DDE	NT	NT	NT
1.700958	p,p'-DDE	NT	NT	NT
25.638774	naphthalene	1.62E-05	1.05E-05	1.37E-04
136.7814	tributyltin	1.15E-01	7.49E-02	9.74E-01
	TOTAL RISK:	3.96E-01	2.56E-01	**3.34E+00**

Bold Text indicates those chemicals which are significant contributors (i.e. HI > 1.0) to the noncancer risk

* = Sum of the maximum concentrations of the PCB Congeners

NT - Risk not calculated: No toxicity factor available for this compound

[1]wet weight

APPENDIX C
TABLE C-13
ESTIMATED RME NONCARCINOGENIC RISKS - LOBSTER INGESTION USING EPC = MAXIMUM
MARINE HUMAN HEALTH RISK ASSESSMENT
FORMER DERECKTOR SHIPYARD
NETC - NEWPORT, RHODE ISLAND

Exposure Point Concentration[1]	Substance	Estimated NonCarcinogenic Risks		
		Child Resident	Adult Resident	Subsistence Fisherman
		Ingestion	Ingestion	Ingestion
4.35456	aluminum	1.10E-04	7.15E-05	9.31E-04
4.0096	**arsenic**	3.39E-01	2.20E-01	**2.86E+00**
0.0784	cadmium	1.99E-03	1.29E-03	1.68E-02
0.3024	chromium	1.53E-03	9.94E-04	1.29E-02
27.5646	copper	1.75E-02	1.13E-02	1.47E-01
11.4296	iron	9.65E-04	6.26E-04	8.15E-03
0.6356	manganese	1.15E-04	7.46E-05	9.70E-04
0.06356	mercury	1.61E-02	1.04E-02	1.36E-01
0.2632	nickel	3.33E-04	2.17E-04	2.81E-03
0.9618	silver	4.87E-03	3.16E-03	4.12E-02
23.996	zinc	2.03E-03	1.31E-03	1.71E-02
1.856442	1-methylnaphthalene	1.17E-06	7.63E-07	9.91E-06
2.083774	2-methylnaphthalene	1.32E-06	8.57E-07	1.11E-05
4.555992	acenaphthene	1.92E-06	1.25E-06	1.62E-05
1.148714	anthracene	9.69E-08	6.30E-08	8.18E-07
4.060714	benz(a)anthracene	NT	NT	NT
4.021598	benzo(a)pyrene	NT	NT	NT
8.5345	benzo(b,j,k)fluoranthene	NT	NT	NT
1.9929	1,1-biphenyl	1.01E-06	6.80E-07	8.51E-06
5.402124	chrysene	NT	NT	NT
14.06818	fluoranthene	8.90E-06	5.78E-06	7.52E-05
2.088296	fluorene	1.32E-06	8.58E-07	1.12E-05
1.47945	indeno(1,2,3-cd)pyrene	NT	NT	NT
17.302404	pyrene	1.46E-05	9.48E-06	1.23E-04
5.23306	PCB 101 (2 2'3 5 5')	NT	NT	NT
29.20855	PCB 105 (2 3 3'4 4')	NT	NT	NT
9.650522	PCB 118 (2 3'4 4'5)	NT	NT	NT
1.734278	PCB 128 (2 2'3 3'4 4')	NT	NT	NT
9.965172	PCB 138 (2 2'3 4 4'5)	NT	NT	NT
13.87477	PCB 153 (2 2'4 4'5 5')	NT	NT	NT
1.71143	PCB 170 (2 2'3 3'4 4'5)	NT	NT	NT
1.501584	PCB 18 (2 2'5)	NT	NT	NT
4.793432	PCB 180 (2 2'3 4 4'5 5')	NT	NT	NT
4.409538	PCB 187 (2 2'3 4'5 5'6)	NT	NT	NT
0.656516	PCB 195 (2 2'3 3'4 4'5 6)	NT	NT	NT
1.00989	PCB 206 (2 2'3 3'4 4'5 5'6)	NT	NT	NT
0.809424	PCB 209 (2 2'3 3'4 4'5 5'6 6'	NT	NT	NT
5.711846	PCB 28 (2 4 4')	NT	NT	NT
1.21184	PCB 44 (2 2'3 5')	NT	NT	NT
1.83351	PCB 52 (2 2'5 5)	NT	NT	NT
2.716174	PCB 66 (2 3'4 4')	NT	NT	NT
1.019844	PCB 8 (2 4)	NT	NT	NT
60.238	PCBs as Aroclor-1254	7.63E-02	4.94E-02	6.42E-01
0.175952	hexachlorobenzene	5.57E-06	3.61E-06	4.70E-05
0.21665	mirex	2.74E-05	1.78E-05	2.31E-04
0.99239	o,p'-DDE	NT	NT	NT
1.37137	p,p'-DDE	NT	NT	NT
4.928602	naphthalene	3.12E-06	2.03E-06	2.63E-05
	TOTAL RISK:	4.60E-01	2.99E-01	**3.88E+00**

Bold Text indicates those chemicals which are significant contributors (i.e. HI > 1.0) to the noncancer risk

* = Sum of the maximum concentrations of the PCB Congeners

EPC = Exposure Point Concentration

NT - Risk not calculated: No toxicity factor available for this compound

(1)wet weight

Appendix D
Ecological Risk Assessment Summary Tables

TABLE 6.1-1. Results of Simultaneously Extractable Metal (SEM) and Acid Volatile Sulfide (AVS) measurements in sediments and qualitative evaluation of divalent metal bioavailability for the Derecktor Shipyard/Coddington Cove (DSY) study area and the Jamestown Potter Cove (JPC) reference locations.

Station	AVS[1] (µMole/g dry)	SEM[1] (µMole/g dry)	SEM[1] FLAG[2]	SEM/AVS Ratio	SEM/AVS FLAG[2]	SEM-AVS (µMole/g dry)	SEM-AVS FLAG[2]	Risk Ranking[3]
DSY-25	24.6	2.88	-	0.12	-	-21.7	-	-
DSY-26	4.08	1.18	-	0.29	-	-2.89	-	-
DSY-27	176.4	12.1	+	0.07	-	-164.4	-	+
DSY-28	63.0	7.47	+	0.12	-	-55.5	-	+
DSY-29	183.2	7.57	+	0.04	-	-175.6	-	+
DSY-30	25.0	5.51	+	0.22	-	-19.5	-	+
DSY-31	50.1	2.79	-	0.06	-	-47.3	-	-
DSY-32	17.2	2.70	-	0.16	-	-14.5	-	-
DSY-33	0.79	1.86	-	2.36	+	1.07	-	+
DSY-34	29.5	1.43	-	0.05	-	-28.1	-	-
DSY-35	1.35	1.02	-	0.76	+	-0.32	-	+
DSY-36	36.9	1.44	-	0.04	-	-35.5	-	-
DSY-37	2.39	2.77	-	1.16	+	0.38	-	+
DSY-38	29.8	1.91	-	0.06	-	-27.9	-	-
DSY-39	21.7	2.43	-	0.11	-	-19.2	-	-
DSY-40	18.8	2.16	-	0.12	-	-16.6	-	-
DSY-41	4.52	1.31	-	0.29	-	-3.21	-	-
JPC-1	1.92	0.73	-	0.38	-	-1.19	-	-
JPC-2	0.75	0.89	-	1.19	+	0.14	-	+

1 - Mean of two replicates per station.
2 - SEM Codes: SEM Conc. > 5 µmol/g = "+"; SEM/AVS > 0.5 = "+" ; SEM-AVS > 5 µmol/g = "+".
3 - Overall Risk Ranking: "-" = no exposure, "+" = exposure seen in one indicator, "++" = exposure seen in two indicators, "+++" = exposure in all indicators.

APPENDIX D
TABLE D-2 - FORMERLY:

Table 6.2-1a. Tissue Concentration Ratio (TCR) Rankings for Target Receptors for the Derecktor Shipyard Marine ERA by Station[1].

Station	Species[2]	2-Methylnaphthalene	Acenaphthene	Acenaphthylene	Anthracene	Benzo(a)anthracene	Benzo(a)pyrene	Chrysene	Dibenz(a,h)anthracene	Fluoranthene	Fluorene	HMW PAHs	LMW PAHs	Naphthalene	Phenanthrene	Pyrene	Total PAHs	Total PCBs	p,p'-DDE	Tributyltin	Arsenic	Cadmium	Chromium	Copper	Lead	Mercury	Nickel	Silver	Zinc	Risk Ranking[3]
DSY-24	IBM			-	-	-	-	-		-	-	-	-		-	-	-	+	+	-	+	++	+	-	+	+	+		-	++
DSY-25	IBM			++	+++	++	++	++		+++	+	+++	++		++	++	++	+	-	-	+	+	+	+		-	-		+	+++
	LOB									++		++	-			++	+	+	-		+	+	+	+	-	-	+	+	-	++
DSY-26	CN		++				++			++	+	++	-		++	+	-	+	+	-	+	-	+	-	-	-		-	+	++
	DM		+	+	+	+		+		++		++	+		+	++	+	++	+	+	-	+	-	+	-	+	-		+	++
	IBM			++	+++	+++	+++	+++		+++	+	+++	++		++	+++	+++	+	+	-	+	+	+	-		-			-	+++
DSY-27	IBM			+	++	++	+	++		+++	+	++	++		++	+++	++	+	+	++	+	+	+	+	+	-	+		+	+++
	LOB				+					++		++	+		+	++	++	+	+		-	+	+	+	-	+	-	+	+	++
DSY-28	CN	-	++	-			-			++	+	++	-		+	+	+	++	+	+	+	+	-	-		-		-	+	++
	DM				-	+		+		+		+	-		+	+	-	+		-	+	+	+	+		-	+		+	+
	IBM			+	++	+	+	+		++	+	+	+		++	+	+	+	+	-	-	+	+	-		-			+	++
	LOB				-					++		++	+		+	++	++	+	+											++
DSY-29	CN	-	++				++			++	+	++	+		++	+	-	++	++	+	+	+	-	+	+	-			+	++
	DM		+	-	+	+		+		+		+	+		+	+	+	+	+	-	+	+	-	-	-	+	-		-	+
	LOB									++	+	++	+		+	++	+	-	+		+	+	+	-	-	+	+	+	+	++
DSY-31	DM				+	+		+		+		+	-		+	+	+	+	+	-	-	-	-	-	-	-	-		+	+
	PM				+	+	+	+		+		+	-		-	+	+	+	-	-	-	+	-	+	-	+			-	+
DSY-32	PM			+	+	-	+	-		+		+	-		-	+	+	-	-		-	-	-	-	+	+			-	+
DSY-33	DM									+		-	-			+	-	+	+	-	+	+	+	-	-	-	-		+	+
	LOB									+		+	+		+	++	+	+	+		+	-	+	-	+	-	+	+	-	++
	PM				-	-	-	-		-	-	-	-		-	-	-	-	-	-	-	+	-	-		+			-	+
DSY-34	PM				-	-	-	-		-	-	-	-		+	-	-	-	-	-	-	+	-	-	-	+			-	+
DSY-35	IBM				+	-		+		+	-	+	+		+	+	+	+	+	-	+	+	+	-	-	-			+	+
	LOB				-					+		+	-		-	+	-	-	-		-	+	+	+	+	+	-	+	-	+
	MM					+	+	-		+	+	+	+		++	+	+	+	-	++	-	-	+	-		-	+		-	++
	PM				-	-	-	-		+	-	-	-		+	-	-	-	-		-	+	-	-	-	-			+	+
DSY-36	CN									++	+	+	-		+	+	-	++	++	-	+	+	-	-	+	-			+	++
	IBM			-	+	-	-	+		+	-	+	-		+	+	-	+	+	-	+	-	+	-		+	+		-	+
	LOB				+					++		++	-		+	++	+	+	-		-		+	-	+	+	-	-	+	++
	PM				+	-	+	+		+		+	-		+	+	+	-	-	-	-	+	+	-	-	+			+	+
DSY-37	PM				+	+	+	+		+		+	+		+	+	+	+	-		-	-	-	-	+	+			-	+
DSY-38	DM			-	-	-	-	-		-		-	-		-	-	-	+	+	-	+	-	+	+	-	-	-		-	+
	LOB				-					+		-	-		-	-	-	-	+		+	+	+	+	-	+	+	+	+	+
	PM			-	-	-	-	-		-	-	-	-		-	-	-				-	-	-	-		+			+	+
DSY-39	DM		+	-		-		-	+	-		-	-			-	-	+	+	-	+	-	+	-		-	-		+	+
	LOB				-					-		-	-		-	-	-	+	-		-	+	+	+	-	+	-	-	+	+
DSY-40	DM		+	+	+	+		-		+		+	+		+	+	+	+	+	-	+	-	+	-	+	-	-		+	+
	IBM			+	+	-	-	-		+	-	-	+		+	+	-	+	+	-	-	+	+	-	+	-			+	+
DSY-41	MM			+	+		++			++	+	+	+		+	++	+	+	+	+	-	+	-	+	-	-			-	++
	PM			+	+	-	-	-		+	+	+	-		-	+	-	-	-		-	+	-	-		+			-	+

1 - Species/Station-specific Rankings: TCR>10 = "+++"; TCR>3 = "++"; TCR>1 = "+"; TCR<1 or TCR=1 = "-".

2 - Species: CN=cunner; DM=deployed mussels; IBM=indigenous blue mussels; LOB=lobster; MM=*Mercenaria mercenaria*; PM=*Pitar morrhuana*

3 - Risk Ranking = maximum of species/station-specific rankings.

TCR = ratio of CoC concentration in an organism at the sampling location to the same organism at the reference location.

APPENDIX D
TABLE D-3 - FORMERLY:

Table 6.2-1b. Tissue Concentration Ratio (TCR) Rankings for Target Receptors for the Derecktor Shipyard Marine ERA by Species[1]

Species[2]	Station	2-Methylnaphthalene	Acenaphthene	Acenaphthylene	Anthracene	Benzo(a)anthracene	Benzo(a)pyrene	Chrysene	Dibenz(a,h)anthracene	Fluoranthene	Fluorene	HMW PAHs	LMW PAHs	Naphthalene	Phenanthrene	Pyrene	Total PAHs	Total PCBs	p,p'-DDE	Tributyltin	Arsenic	Cadmium	Chromium	Copper	Lead	Mercury	Nickel	Silver	Zinc	Risk Ranking[3]
CN	DSY-26		++				++			++	+	++	-		++	+	-	+	+	-	+	-	+	-	-	-		-	+	++
	DSY-28	-	++	-			-			++	+	++	-		+	+	+	++	+	+	+	+	-	-		-		-	+	++
	DSY-29	-	++				++			++	+	++	+		++	+	-	++	++	+	+	+	-	+	+	-			+	++
	DSY-36									++	+	+	-		+	+	-	++	++	-	+	+	-	-	+	-			+	++
DM	DSY-26		+	+	+	+		+		++		++	+		+	++	+	++	+	+	-	+	-	+	-	+	-		+	++
	DSY-28				-	+		+		+		+	-		+	+	-	+		-	+	+	+	+		-	+		+	+
	DSY-29		+	-	+	+		+		+		+	+		+	+	+	+	+	-	+	+	-	-	-	+	-		-	+
	DSY-31				+	+		+		+		+	-		+	+	+	+	+	-	-	-	-	-	-	-	-		+	+
	DSY-33									+		-	-			+	-	+	+	-	+	+	+	-	-	-	-		+	+
	DSY-38			-	-	-	-	-		-		-	-		-	-	-	+	+	-	+	-	+	+	-	-	-		-	+
	DSY-39		+	-		-		-	+	-		-	-			-	-	+	+	-	+	-	+	-		-	-		+	+
	DSY-40		+	+	+	+		-		+		+	+		+	+	+	+	+	-	+	-	+	-	+	-	-		+	+
IBM	DSY-24			-	-	-	-	-		-	-	-	-		-	-	-	+	+	-	+	++	+	-	+	+	+		-	++
	DSY-25			++	+++	++	++	++		+++	+	+++	++		++	++	++	+	-	-	+	+	+	+		-	-		+	+++
	DSY-26			++	+++	+++	+++	+++		+++	+	+++	++		++	+++	+++	+	+	-	+	+	+	-		-			-	+++
	DSY-27			+	++	++	+	++		+++	+	++	++		++	+++	++	+	+	++	+	+	+	+	+	-	+		+	+++
	DSY-28			+	++	+	+	+		++	+	+	+		++	+	+	+	+	-	-	+	+	-		-			+	++
	DSY-35				+	-		+		+	-	+	+		+	+	+	+	+	-	+	+	+	-	-	-			+	+
	DSY-36			-	+	-	-	+		+	-	+	-		+	+	-	+	+	-	+	-	+	-		+	+		-	+
	DSY-40			+	+	-	-	-		+	-	-	+		+	+	-	+	+	-	-	+	+	-	+	-			+	+
LOB	DSY-25									++		++	-			++	+	+	-		+	+	+	+	-	-	+	+	-	++
	DSY-27				+					++		++	+		+	++	++	+	+		-	+	+	+	-	+	-	+	+	++
	DSY-28				-					++		++	+		+	++	++	+	+											++
	DSY-29									++	+	++	+		+	++	+	-	+		+	+	+	-	-	+	+	+	+	++
	DSY-33									+		+	+		+	++	+	+	+		+	-	+	-	+	-	+	+	-	++
	DSY-35				-					+		+	-		-	+	-	-	-		-	+	+	+	+	+	-	+	-	+
	DSY-36				+					++		++	-		+	++	+	+	-		-		+	-	+	+	-	-	+	++
	DSY-38				-					+		-	-		-	-	-	-	+		+	+	+	+	-	+	+	+	+	+
	DSY-39				-					-		-	-		-	-	-	+	-		-	+	+	+	-	+	-	-	+	+
MM	DSY-35					+	+	-		+	+	+	+		++	+	+	+	-	++	-	-	+	-		-	+		-	++
	DSY-41			+	+		++			++	+	+	+		+	++	+	+	+	+	-	+	-	+	-	-			-	++
PM	DSY-31				+	+	+	+		+		+	-		-	+	+	+	-	-	-	+	-	+	-	+			-	+
	DSY-32			+	+	-	+	-		+		+	-		-	+	+	-	-		-	-	-	-	+	+			-	+
	DSY-33				-	-	-	-		-	-	-	-		-	-	-	-	-	-	-	+	-	-		+			-	+
	DSY-34				-	-	-	-		-	-	-	-		+	-	-	-	-	-	-	+	-	-	-	+			-	+
	DSY-35				-	-	-	-		+	-	-	-		+	-	-	-	-		-	+	-	-	-	-			+	+
	DSY-36				+	-	+	+		+		+	-		+	+	+	-	-	-	-	+	+	-	-	+			+	+
	DSY-37				+	+	+	+		+		+	+		+	+	+	+	-		-	-	-	-	+	+			-	+
	DSY-38			-	-	-	-	-		-	-	-	-		-	-	-				-	-	-	-		+			+	+
	DSY-41			+	+	-	-	-		+	+	+	-		-	+	-	-	-		-	+	-	-		+			-	+

1 - Species/Station-specific Rankings: TCR>10 = "+++"; TCR>3 = "++"; TCR>1 = "+"; TCR<1 or TCR=1 = "-".
2 - Species: CN=cunner; DM=deployed mussels; IBM=indigenous blue mussels; LOB=lobster; MM=*Mercenaria mercenaria*; PM=*Pitar morrhuana*.
3 - Risk Ranking = maximum of species/station-specific rankings.
TCR = ratio of CoC concentration in an organism at the sampling location to the same organism at the reference location.

Table 6.2-2. Tissue Screening Concentration (TSC) benchmarks for evaluation of CoC impacts on target species for the Derecktor Shipyard Marine ERA.

Chemical Class	Analyte	Tissue[1] Screening Conc., (µg/g wet)
Metals	Arsenic	1.6
	Cadmium	0.042
	Chromium	0.18
	Copper	0.17
	Lead	0.064
	Mercury	0.12
	Nickel	0.33
	Silver	0.37
	Zinc	2.8
PAHs	Acenaphthene	126
	Acenaphthylene	4.5
	Anthracene	18
	Benzo(a)anthracene	173
	Benzo(a)pyrene	416
	Benzo(b)fluoranthene	419
	Benzo(g,h,i)perylene	1,009
	Benzo(k)fluoranthene	416
	Chrysene	173
	Dibenz(a,h)anthracene	167
	Fluoranthene	18
	Fluorene	11
	Indeno(1,2,3-cd)pyrene	1,009
	Naphthalene	6.5
	Phenanthrene	12
	Pyrene	42
PCBs	Sum PCB Congeners x 2	0.44
Pesticides	Aldrin	0.71
	Hexachlorobenzene	32
	Mirex	0.018
	o,p'-DDE	0.054
	p,p'-DDE	0.054
TBT	Tributyltin	4.1E-03

[1]Shepard, (1995)

Table 6.2-3a. Tissue Screening Concentration Hazard Quotients (TSC-HQ) Rankings for Target Receptors for the Derecktor Shipyard Marine ERA **by Station**[1].

Station	Species[2]	Acenaphthene	Acenaphthylene	Anthracene	Benzo(a)anthracene	Benzo(a)pyrene	Benzo(b,j,k)fluoranthene	Benzo(g,h,i)perylene	Chrysene	Dibenz(a,h)anthracene	Fluoranthene	Fluorene	Indeno(1,2,3-cd)pyrene	Naphthalene	Phenanthrene	Pyrene	Total PCBs	p,p'-DDE	Tributyltin	Arsenic	Cadmium	Chromium	Copper	Lead	Mercury	Nickel	Silver	Zinc	Risk Ranking[3]
DSY-24	IBM	-	-	-		-	-	-		-	-	-	-	-	-	-	-	-	-	-	+	+	+	+	-	+	-	+	+
DSY-25	IBM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	+	+	+	-	-	-	-	+	+
	LOB	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	+	+	+	+++	-	-	-	+	+	+++
DSY-26	CN	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	+	+	++	+	-	-	-	+	++
	DM	-	-	-	-	-	-	-	-	-	-	-	-		-	-	-	-	-	-	+	+	+	+	-	-	-	+	+
	IBM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	+	+	+	-	-	-	-	+	+
DSY-27	IBM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	+	+	++	+	-	+	-	+	++
	LOB	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	+	-	+	+++	-	-	-	+	+	+++
DSY-28	CN	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	+	-	++	-	-	-	-	+	++
	DM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	+	+	+	+	-	-	+	-	+	+
	IBM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	+	+	-	-	-	-	-	+	+
	LOB	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-										-
DSY-29	CN	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	+	-	-	-	+	+	++	+	-	-	-	+	++
	DM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	+	+	+	+	-	+	-	+	+
	LOB	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	+	+	+	+++	-	-	-	+	+	+++
DSY-31	DM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	+	+	+	+	-	-	-	+	+
	PM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	+	-	-	-	+	+	+	+	-	+	-	+	+
DSY-32	PM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	+	+	+	+	-	-	-	+	+
DSY-33	DM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	+	+	+	+	-	-	-	+	+
	LOB	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	+	-	+	+++	+	-	-	+	+	+++
	PM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	+	-	+	-	-	-	-	+	+
DSY-34	PM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	+	+	+	+	-	-	-	+	+
DSY-35	IBM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	+	+	+	+	-	-	-	+	+
	LOB	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	+	+	+	+++	+	-	-	+	+	+++
	MM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	+	+	+	-	-	+	-	+	+
	PM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	+	+	+	+	-	-	-	+	+
DSY-36	CN	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	+	-	++	+	-	-	-	+	++
	IBM	-	-	-	-	-	-	-	-	-	-	-	-		-	-	-	-	-	-	+	+	+	-	-	+	-	+	+
	LOB	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	+	-	+	++	-	-	-	+	+	++
	PM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	+	+	+	+	-	-	-	+	+
DSY-37	PM	-	-	-		-	-	-		-	-	-	-		-	-	+	-	-	-	-	-	+	+	-	-	-	+	+
DSY-38	DM	-	-	-	-	-	-	-	-	-	-	-	-		-	-	-	-	-	-	+	+	+	+	-	+	-	+	+
	LOB	-	-	-	-	-	-	-	-	-	-	-	-		-	-	-	-	-	+	+	+	+++	-	-	-	+	+	+++
	PM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	+	+	+	-	-	-	-	+	+
DSY-39	DM	-	-	-	-	-	-	-	-	-	-	-	-		-	-	-			-	-	+	+	-	-	+	-	+	+
	LOB	-	-	-	-	-	-	-	-	-	-	-	-		-	-	-	-	-	+	+	+	+++	-	-	-	-	+	+++
DSY-40	DM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	+	+	+	+	-	+	-	+	+
	IBM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-				-	+	+	+	+	-	-	-	+	+
DSY-41	MM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	+	+	++	+	-	-	-	+	++
	PM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	+	+	+	-	-	-	-	+	+
JPC-1	CN[4]	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	+	+	++	+	-	-	-	+	++
	DM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	+	+	+	-	-	+	-	+	+
	IBM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	+	+	+	+	-	-	-	+	+
	LOB	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	+	-	+	+++	-	-	-	-	+	+++
	MM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	+	+	+	+	-	-	-	+	+
	PM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	+	+	+	+	-	-	-	+	+
CHC-1	CN	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	+	-	++	+	-	-	-	+	++
	DM	-	-	-		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	+	+	+	+	-	+	-	+	+
	IBM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	+	+	+	+	-	+	-	+	+
	LOB	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	+	-	+	+++	-	-	-	+	+	+++

1 - Species/Station-specific Rankings: TSC-HQ>40 = "+++"; TSC-HQ>10 = "++"; TSC-HQ>1 = "+"; TSC-HQ<1 or TSC-HQ=1 = "-".

2 - Species: CN=cunner; DM=deployed mussels; IBM=indigenous blue mussels; LOB=lobster; MM=*Mercenaria mercenaria*; PM=*Pitar morrhuana*.

3 - Risk Ranking = maximum of species/station-specific rankings.

4 - Cunner measurements not available at JPC-1; values are for mummichog.

TSC-HQ = CoC Tissue Wet Weight/TSC Benchmark. TSC Benchmarks are presented in Table 6.2-2.

DSY=Derecktor Shipyard; JPC=Jamestown Potter Cove; CHC=Castle Hill Cove.

Table 6.2-3b. Tissue Screening Concentration Hazard Quotients (TSC-HQ) Rankings for Target Receptors for the Derecktor Shipyard Marine ERA **by Species**[1].

Station	Species[2]	Acenaphthene	Acenaphthylene	Anthracene	Benzo(a)anthracene	Benzo(a)pyrene	Benzo(b,j,k)fluoranthene	Benzo(g,h,i)perylene	Chrysene	Dibenz(a,h)anthracene	Fluoranthene	Fluorene	Indeno(1,2,3-cd)pyrene	Naphthalene	Phenanthrene	Pyrene	Total PCBs	p,p'-DDE	Tributyltin	Arsenic	Cadmium	Chromium	Copper	Lead	Mercury	Nickel	Silver	Zinc	Risk Ranking[3]
DSY-26	CN	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	+	+	++	+	-	-	-	+	++
DSY-28		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	+	-	++	-	-	-	-	+	++
DSY-29		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	+	-	-	-	+	+	++	+	-	-	-	+	++
DSY-36		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	+	-	++	+	-	-	-	+	++
JPC-1[4]		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	+	+	++	+	-	-	-	+	++
CHC-1		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	+	-	++	+	-	-	-	+	++
DSY-26	DM	-	-	-	-	-	-	-	-	-	-	-	-		-	-	-	-	-	-	+	+	+	+	-	-	-	+	+
DSY-28		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	+	+	+	+	-	-	+	-	+	+
DSY-29		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	+	+	+	+	-	+	-	+	+
DSY-31		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	+	+	+	+	-	-	-	+	+
DSY-33		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	+	+	+	+	-	-	-	+	+
DSY-38		-	-	-	-	-	-	-	-	-	-	-	-		-	-	-	-	-	-	+	+	+	+	-	+	-	+	+
DSY-39		-	-	-	-	-	-	-	-	-	-	-	-		-	-	-			-	-	+	+	-	-	+	-	+	+
DSY-40		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	+	+	+	+	-	+	-	+	+
JPC-1		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	+	+	+	-	-	+	-	+	+
CHC-1		-	-	-		-	-	-		-	-	-	-	-	-	-	-	-	-	-	+	+	+	+	-	+	-	+	+
DSY-24	IBM	-	-	-		-	-	-		-	-	-	-	-	-	-	-	-	-	-	+	+	+	+	-	+	-	+	+
DSY-25		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	+	+	+	-	-	-	-	+	+
DSY-26		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	+	+	+	-	-	-	-	+	+
DSY-27		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	+	+	++	+	-	+	-	+	++
DSY-28		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	+	+	-	-	-	-	-	+	+
DSY-35		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	+	+	+	+	-	-	-	+	+
DSY-36		-	-	-	-	-	-	-	-	-	-	-	-		-	-	-	-	-	-	+	+	+	-	-	+	-	+	+
DSY-40		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-				-	+	+	+	+	-	-	-	+	+
JPC-1		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	+	+	+	+	-	-	-	+	+
CHC-1		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	+	+	+	+	-	+	-	+	+
DSY-25	LOB	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	+	+	+	+++	-	-	-	+	+	+++
DSY-27		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	+	-	+	+++	-	-	-	+	+	+++
DSY-28		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-										-
DSY-29		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	+	+	+	+++	-	-	-	+	+	+++
DSY-33		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	+	-	+	+++	+	-	-	+	+	+++
DSY-35		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	+	+	+	+++	+	-	-	+	+	+++
DSY-36		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	+	-	+	++	-	-	-	+	+	++
DSY-38		-	-	-	-	-	-	-	-	-	-	-	-		-	-	-	-	-	+	+	+	+++	-	-	-	+	+	+++
DSY-39		-	-	-	-	-	-	-	-	-	-	-	-		-	-	-	-	-	+	+	+	+++	-	-	-	-	+	+++
JPC-1		-	-	-		-	-	-		-	-	-	-	-	-	-	-	-	-	+	-	+	+++	-	-	-	-	+	+++
CHC-1		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	+	-	+	+++	-	-	-	+	+	+++
DSY-35	MM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	+	+	+	-	-	+	-	+	+
DSY-41		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	+	+	++	+	-	-	-	+	++
JPC-1		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	+	+	+	+	-	-	-	+	+
DSY-31	PM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	+	-	-	-	+	+	+	+	-	+	-	+	+
DSY-32		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	+	+	+	+	-	-	-	+	+
DSY-33		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	+	-	+	-	-	-	-	+	+
DSY-34		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	+	+	+	+	-	-	-	+	+
DSY-35		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	+	+	+	+	-	-	-	+	+
DSY-36		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	+	+	+	+	-	-	-	+	+
DSY-37		-	-	-		-	-	-		-	-	-	-		-	-	+	-	-	-	-	-	+	+	-	-	-	+	+
DSY-38		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	+	+	+	-	-	-	-	+	+
DSY-41		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	+	+	+	-	-	-	-	+	+
JPC-1		-	-	-	-	-	-	-	-	-	-	-	-		-	-	-	-	-	-	+	+	+	+	-	-	-	+	+

1 - Species/Station-specific Rankings: TSC-HQ>40 = "+++"; TSC-HQ>10 = "++"; TSC-HQ>1 = "+"; TSC-HQ<1 or TSC-HQ=1 = "-".

2 - Species: CN=cunner; DM=deployed mussels; IBM=indigenous blue mussels; LOB=lobster; MM=*Mercenaria mercenaria*; PM=*Pitar morrhuana*.

3 - Risk Ranking = maximum of species/station-specific rankings.

4 - Cunner measurements not available at JPC-1; values are for mummichog.

TSC-HQ = CoC Tissue Wet Weight/TSC Benchmark. TSC Benchmarks are presented in Table 6.2-2.

DSY=Derecktor Shipyard; JPC=Jamestown Potter Cove; CHC=Castle Hill Cove.

APPENDIX D
TABLE D-7 - FORMERLY:

Table 6.2-4. Critical Body Residue (CBR) benchmarks used for assessment of risks to aquatic receptors from tissue residues for the Derecktor Shipyard Marine Ecological Risk Assessment.[1]

Compound	Mol. wt (µg/µMol)	*Test Species*	Group	Effect	CBR Chronic (µMol/g dry wt)	Comment	Reference
Arsenic	74.9	*Daphnia magna*	Crustacean	10% density loss - 3wk	2.3	(a)	1
Cadmium	112.4	*Hyallela azteca*	Amphipod	80% mortality- 10wk	0.27		2
Chromium	52.0	*Daphnia magna*	Crustacean	10% density loss - 3wk	5.4		1
Mercury	200.6	*Hyallela azteca*	Amphipod	80% mortality- 10wk	0.45	(a)	3
Copper	63.6	*Hyallela azteca*	Amphipod	71% mortality- 10wk	1.4	(a)	3
Lead	207.2	*Hyallela azteca*	Amphipod	69% mortality- 10wk	0.72	(a)	3
Nickel	58.7	*Neanthes arenaceodentata*	polychaete worm	acute mortality- 10d	1.8	(b)	4
Silver	109.7	*Corbicula fluminea*	bivalve mollusc	50% reduced growth - 3wk	1.1	(a)	5
Zinc	6.7	*Hyallela azteca*	Amphipod	65% mortality- 10wk	62.5	(a)	1
Total PAHs	202.6	*Mytilus edulis*	bivalve mollusc	reduced feeding rate	0.40	(a)	7
p,p'-DDE	318	*Salmo truta*	fish	egg hatchability	1.1	(a,c)	8
Tributyltin	325.50	*Mytilus edulis*	bivalve mollusc	reduced feeding rate	0.03	(a)	9
Total PCBs	347.5	*Pimephales promelas*	fish	reduced fecundity	0.20	(a)	10

1 - converted to dry weight assuming $CBR_{dry\ wt} = CBR_{wet\ wt} \times 5$;

(a) value reported on mass basis (e.g. µg/g) - converted to volume basis (µMol/g)

(b) converted to chronic value assuming chronic CBR = acute CBR/10.

(c) Reported concentration = NOAEL, converted to LOAEL, assuming LOAEL= NOAEL x 10.

References:

1 - Enserink, Mass-Diepeveen and Van Leeuwen, 1991.
2 - Borgmann *et al.*, 1991.
3 - Borgmann, Norwood, and Clarke, 1993.
4 - Pesch *et al.*, 1995.
5 - Diamond *et al.*, 1990.
6 - Harkey, Kane-Driscoll and Landrum, 1995.
7 - Arnold and Biddinger, 1995.
8 - Mac *et al.*, 1981.
9 - Widdows *et al.*, 1990.
10 - USACE, 1995.

Table 6.2-5a. Critical Body Residue Hazard Quotients (CBR-HQ) Rankings for Target Receptors for the Derecktor Shipyard Marine Ecological Risk Assessment **by Station**[1].

		Organics				Metals[3D]									
Station	Species[2]	Total PAHs[3A]	Total PCBs[3A]	Pesticides[3B]	Butyltins[3C]	Arsenic	Cadmium	Chromium	Copper	Lead	Mercury	Nickel	Silver	Zinc	Risk Ranking[4]
DSY-24	IBM	-	-	-	-	-	-	-	-	-	-	-	-	+	+
DSY-25	IBM	-	-	-	-	-	-	-	-	-	-	-	-	+	+
	LOB	-	-	-	-	-	-	-	+	-	-	-	-	+	+
DSY-26	CN	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	DM	-	-	-	-	-	-	-	-	-	-	-	-	+	+
	IBM	-	-	-	-	-	-	-	-	-	-	-	-	+	+
DSY-27	IBM	-	-	-	-	-	-	-	-	-	-	-	-	+	+
	LOB	-	-	-	-	-	-	-	+	-	-	-	-	+	+
DSY-28	CN	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	DM	-	-		-	-	-	-	-	-	-	-	-	+	+
	IBM	-	-	-	-	-	-	-	-	-	-	-	-	+	+
	LOB	-	-	-	-										-
DSY-29	CN	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	DM	-	-	-	-	-	-	-	-	-	-	-	-	+	+
	LOB	-	-	-	-	-	-	-	+	-	-	-	-	+	+
DSY-31	DM	-	-	-	-	-	-	-	-	-	-	-	-	+	+
	PM	-	-	-	-	-	-	-	-	-	-	-	-	+	+
DSY-32	PM	-	-	-		-	-	-	-	-	-	-	-	+	+
DSY-33	DM	-	-	-	-	-	-	-	-	-	-	-	-	+	+
	LOB	-	-	-	-	-	-	-	-	-	-	-	-	+	+
	PM	-	-	-	-	-	-	-	-	-	-	-	-	+	+
DSY-34	PM	-	-	-	-	-	-	-	-	-	-	-	-	+	+
DSY-35	IBM	-	-	-	-	-	-	-	-	-	-	-	-	+	+
	LOB	-	-	-	-	-	-	-	+	-	-	-	-	+	+
	MM	-	-	-	-	-	-	-	-	-	-	-	-	+	+
	PM	-	-	-		-	-	-	-	-	-	-	-	+	+
DSY-36	CN	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	IBM	-	-	-	-	-	-	-	-	-	-	-	-	+	+
	LOB	-	-	-	-	-	-	-	-	-	-	-	-	+	+
	PM	-	-	-	-	-	-	-	-	-	-	-	-	+	+
DSY-37	PM	-	-	-		-	-	-	-	-	-	-	-	+	+
DSY-38	DM	-	-	-	-	-	-	-	-	-	-	-	-	+	+
	LOB	-	-	-	-	-	-	-	+	-	-	-	-	+	+
	PM	-				-	-	-	-	-	-	-	-	+	+
DSY-39	DM	-	-	-	-	-	-	-	-	-	-	-	-	+	+
	LOB	-	-	-	-	-	-	-	++	-	-	-	-	+	++
DSY-40	DM	-	-	-	-	-	-	-	-	-	-	-	-	+	+
	IBM	-	-	-	-	-	-	-	-	-	-	-	-	+	+
DSY-41	MM	-	-	-	-	-	-	-	-	-	-	-	-	+	+
	PM	-	-	-		-	-	-	-	-	-	-	-	+	+
JPC-1	CN[5]	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	DM	-	-	-	-	-	-	-	-	-	-	-	-	+	+
	IBM	-	-	-	-	-	-	-	-	-	-	-	-	+	+
	LOB	-	-	-	-	-	-	-	+	-	-	-	-	+	+
	MM	-	-	-	-	-	-	-	-	-	-	-	-	+	+
	PM	-	-	-	-	-	-	-	-	-	-	-	-	+	+
CHC-1	CN	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	DM	-	-	-	-	-	-	-	-	-	-	-	-	+	+
	IBM	-	-	-	-	-	-	-	-	-	-	-	-	+	+
	LOB	-	-	-	-	-	-	-	+	-	-	-	-	+	+

1 - Analyte-specific Rankings: CBR-HQ< 1= "-"; CBR-HQ>1 = +; CBR-HQ>3 = "++"; CBR-HQ>40 = "+++"

2 - Species: CN=cunner; DM=deployed mussels; IBM=indigenous blue mussels; LOB=lobster; MM=*Mercenaria mercenaria*; PM=*Pitar morrhuana*.

3 - Critical Body Residues Benchmarks: See Table 6.2-3.

4 - Species/Station-specific Rankings: maximum of analyte-specific rankings.

5 - Cunner measurements not available at JPC-1; values are for mummichog.

CBR-HQ = measured CBR/CBR Benchmark. CBR Benchmarks presented in Table 6.2-4.

DSY=Derecktor Shipyard; JPC=Jamestown Potter Cove; CHC=Castle Hill Cove.

Table 6.2-5b. Critical Body Residue Hazard Quotients (CBR-HQ) Rankings for Target Receptors for the Derecktor Shipyard Marine Ecological Risk Assessment **by Species**[1].

		Organics				Metals[3D]									
Station	Species[2]	Total PAHs[3A]	Total PCBs[3A]	Pesticides[3B]	Butyltins[3C]	Arsenic	Cadmium	Chromium	Copper	Lead	Mercury	Nickel	Silver	Zinc	Risk Ranking[4]
DSY-26	CN	-	-	-	-	-	-	-	-	-	-	-	-	-	-
DSY-28		-	-	-	-	-	-	-	-	-	-	-	-	-	-
DSY-29		-	-	-	-	-	-	-	-	-	-	-	-	-	-
DSY-36		-	-	-	-	-	-	-	-	-	-	-	-	-	-
JPC-1[5]		-	-	-	-	-	-	-	-	-	-	-	-	-	-
CHC-1		-	-	-	-	-	-	-	-	-	-	-	-	-	-
DSY-26	DM	-	-	-	-	-	-	-	-	-	-	-	-	+	+
DSY-28		-	-		-	-	-	-	-	-	-	-	-	+	+
DSY-29		-	-	-	-	-	-	-	-	-	-	-	-	+	+
DSY-31		-	-	-	-	-	-	-	-	-	-	-	-	+	+
DSY-33		-	-	-	-	-	-	-	-	-	-	-	-	+	+
DSY-38		-	-	-	-	-	-	-	-	-	-	-	-	+	+
DSY-39		-	-	-	-	-	-	-	-	-	-	-	-	+	+
DSY-40		-	-	-	-	-	-	-	-	-	-	-	-	+	+
JPC-1		-	-	-	-	-	-	-	-	-	-	-	-	+	+
CHC-1		-	-	-	-	-	-	-	-	-	-	-	-	+	+
DSY-24	IBM	-	-	-	-	-	-	-	-	-	-	-	-	+	+
DSY-25		-	-	-	-	-	-	-	-	-	-	-	-	+	+
DSY-26		-	-	-	-	-	-	-	-	-	-	-	-	+	+
DSY-27		-	-	-	-	-	-	-	-	-	-	-	-	+	+
DSY-28		-	-	-	-	-	-	-	-	-	-	-	-	+	+
DSY-35		-	-	-	-	-	-	-	-	-	-	-	-	+	+
DSY-36		-	-	-	-	-	-	-	-	-	-	-	-	+	+
DSY-40		-	-	-	-	-	-	-	-	-	-	-	-	+	+
JPC-1		-	-	-	-	-	-	-	-	-	-	-	-	+	+
CHC-1		-	-	-	-	-	-	-	-	-	-	-	-	+	+
DSY-25	LOB	-	-	-	-	-	-	-	+	-	-	-	-	+	+
DSY-27		-	-	-	-	-	-	-	+	-	-	-	-	+	+
DSY-28		-	-	-	-										-
DSY-29		-	-	-	-	-	-	-	+	-	-	-	-	+	+
DSY-33		-	-	-	-	-	-	-	-	-	-	-	-	+	+
DSY-35		-	-	-	-	-	-	-	+	-	-	-	-	+	+
DSY-36		-	-	-	-	-	-	-	-	-	-	-	-	+	+
DSY-38		-	-	-	-	-	-	-	+	-	-	-	-	+	+
DSY-39		-	-	-	-	-	-	-	++	-	-	-	-	+	++
JPC-1		-	-	-	-	-	-	-	+	-	-	-	-	+	+
CHC-1		-	-	-	-	-	-	-	+	-	-	-	-	+	+
DSY-35	MM	-	-	-	-	-	-	-	-	-	-	-	-	+	+
DSY-41		-	-	-	-	-	-	-	-	-	-	-	-	+	+
JPC-1		-	-	-	-	-	-	-	-	-	-	-	-	+	+
DSY-31	PM	-	-	-	-	-	-	-	-	-	-	-	-	+	+
DSY-32		-	-	-		-	-	-	-	-	-	-	-	+	+
DSY-33		-	-	-	-	-	-	-	-	-	-	-	-	+	+
DSY-34		-	-	-	-	-	-	-	-	-	-	-	-	+	+
DSY-35		-	-	-		-	-	-	-	-	-	-	-	+	+
DSY-36		-	-	-	-	-	-	-	-	-	-	-	-	+	+
DSY-37		-	-	-		-	-	-	-	-	-	-	-	+	+
DSY-38		-				-	-	-	-	-	-	-	-	+	+
DSY-41		-	-	-		-	-	-	-	-	-	-	-	+	+
JPC-1		-	-	-	-	-	-	-	-	-	-	-	-	+	+

1 - Analyte-specific Rankings: CBR-HQ< 1= "-"; CBR-HQ>1 = +; CBR-HQ>3 = "++"; CBR-HQ>40 = "+++"

2 - Species: CN=cunner; DM=deployed mussels; IBM=indigenous blue mussels; LOB=lobster; MM=*Mercenaria mercenaria*; PM=*Pitar morrhuana*.

3 - Critical Body Residues Benchmarks: See Table 6.2-3.

4 - Species/Station-specific Rankings: maximum of analyte-specific rankings.

5 - Cunner measurements not available at JPC-1; values are for mummichog.

CBR-HQ = measured CBR/CBR Benchmark. CBR Benchmarks presented in Table 6.2-4.

DSY=Derecktor Shipyard; JPC=Jamestown Potter Cove; CHC=Castle Hill Cove.

APPENDIX D
TABLE D-10 - FORMERLY:

Table 6.2-6. Tissue Residue Effects Rankings for species collected from the Derecktor Shipyard/Coddington Cove (DSY) study area and Jamestown Potter Cove (JPC) and Castle Hill Cove (CHC) reference locations.

Station	Cunner			Deployed Mussels			Indigenous Mussels			Lobster			*Mercenaria*			*Pitar*		
	TCS-HQ[1]	CBR-HQ[2]	Risk Ranking[3]	TCS-HQ[1]	CBR-HQ[2]	Risk Ranking[3]	TCS-HQ[1]	CBR-HQ[2]	Risk Ranking[3]	TCS-HQ[1]	CBR-HQ[2]	Risk Ranking[3]	TCS-HQ[1]	CBR-HQ[2]	Risk Ranking[3]	TCS-HQ[1]	CBR-HQ[2]	Risk Ranking[3]
DSY-24							+	+	+									
DSY-25							+	+	+	+++	+	+++						
DSY-26	++	-	++	+	+	+	+	+	+									
DSY-27							++	+	++	+++	+	+++						
DSY-28	++	-	++	+	+	+	+	+	+	-	-	-						
DSY-29	++	-	++	+	+	+				+++	+	+++						
DSY-30																		
DSY-31				+	+	+										+	+	+
DSY-32																+	+	+
DSY-33				+	+	+				+++	+	+++				+	+	+
DSY-34																+	+	+
DSY-35							+	+	+	+++	+	+++	+	+	+	+	+	+
DSY-36	++	-	++				+	+	+	++	+	++				+	+	+
DSY-37																+	+	+
DSY-38				+	+	+				+++	+	+++				+	+	+
DSY-39				+	+	+				+++	++	+++						
DSY-40				+	+	+	+	+	+									
DSY-41													++	+	++	+	+	+
JPC-1[4]	++	-	++	+	+	+	+	+	+	+++	+	+++	+	+	+	+	+	+
CHC-1	++	-	++	+	+	+	+	+	+	+++	+	+++						

1 - TSC-HQ = Tissue Screening Concentration Hazard Quotients; see Table 6.2-3b.
2 - CBR-HQ = Critical Body Residue Hazard Quotients; see Table 6.2-5b.
3 - Species-specific Tissue Residue Effects ranking = maximum of indicator-specific rankings.
4 - Cunner measurements not available at JPC-1; values are for mummichog.

APPENDIX D
TABLE D-11 - FORMERLY:

Table 6.3-1. Documentation of Avian Aquatic Receptor Exposure Factors for the Derecktor Shipyard Marine ERA.

Receptor Group	Body Weight (BW; kg)	Food Consumption Rate (FCR; kg dry wt/day)	On-site Feeding Area: Foraging Area Ratio (a/fa)	Migration Factor (MF)	Feeding Fraction, FF (kg prey/kg total diet)	Exposure Factor[1] (EF; kg dry wt/day)
Herring gull	1.00 (EPA, 1993)	0.50 Estimated using allometric equation specific for seabirds: $FCR = 0.495BW^{0.704}$ (Nagy et al., 1987)	1.0 Assumes receptor feeds exclusively at site.	0.6 Spring/Fall Feb. - Aug. NW Atlantic populations (Burger, 1982)	1.0 Target receptors: Cunner Deployed blue mussels Indigenous blue mussels Lobster *Mercenaria mercenaria* *Pitar morrhuana*	0.30
Great Blue Heron	2.23 (EPA, 1993)	0.42 Estimated using allometric equation specific for herons: $\log FCR = 0.966 * \log BW - 0.64$ (Kushlan, 1978, cited in EPA, 1993)	1.0 Assumes receptor feeds exclusively at site.	0.7 Spring/Fall Mar. - Oct. Northern U.S. (Palmer, 1962)	1.0 Target receptors: Cunner Deployed blue mussels Indigenous blue mussels Lobster *Mercenaria mercenaria* *Pitar morrhuana*	0.28

1 - EF = FCR * a/fa * MF * FF

APPENDIX D
TABLE D-12 - FORMERLY:

Table 6.3-2. Documentation of Toxicity Reference Values (TRVs) used for calculation of risks to Avian Aquatic Receptors of Concern (RoC) consuming prey in the Derecktor Shipyard/Coddington Cove study area.

Chemical Class	Target Analyte	RECEPTOR: RoC[D]	RECEPTOR: BW[1] (kg)	TEST SPECIES DATA: Test Species	BW (Kg)	Endpoint	Endpoint Value[2]	Reference	Safety Factor[3]	Benchmark NOAEL[B]	TOXICITY REFRENCE VALUES (TRVs): RoC TRV-DOSE[4]	FCR[5]	Food Factor f[6]	RoC TRV-EPC[C,7]
MET	Arsenic[E]	Gull	1.00	Mallard duck	1.000	Chronic NOAEL	5.14	Opresko et al. 1995	1	5.14	5.14	0.61	0.61	8.42
		Heron	2.23	Mallard duck	1.000	Chronic NOAEL	5.14	Opresko et al. 1995	1	5.14	3.93	1.07	0.48	8.18
	Cadmium[F]	Gull	1.00	Mallard duck	1.000	Chronic NOAEL	1.15	Opresko et al. 1995	1	1.15	1.15	0.61	0.61	1.89
		Heron	2.23	Mallard duck	1.000	Chronic NOAEL	1.15	Opresko et al. 1995	1	1.15	0.88	1.07	0.48	1.83
	Chromium[G]	Gull	1.00	Black duck	1.250	Chronic NOAEL	1.00	Opresko et al. 1995	1	1.00	1.08	0.61	0.61	1.77
		Heron	2.23	Black duck	1.250	Chronic NOAEL	1.00	Opresko et al. 1995	1	1.00	0.82	1.07	0.48	1.72
	Copper[H]	Gull	1.00	Chicken, 1-70 days old	0.534	Chronic NOAEL	47.0	Opresko et al. 1995	1	47.0	38.1	0.61	0.61	62.6
		Heron	2.23	Chicken, 1-70 days old	0.534	Chronic NOAEL	47.0	Opresko et al. 1995	1	47.0	29.2	1.07	0.48	60.7
	Lead[I]	Gull	1.00	American kestrel	0.130	Chronic NOAEL	3.85	Opresko et al. 1995	1	3.85	1.95	0.61	0.61	3.20
		Heron	2.23	American kestrel	0.130	Chronic NOAEL	3.85	Opresko et al. 1995	1	3.85	1.49	1.07	0.48	3.11
	Mercury[J]	Gull	1.00	Japanese Quail	0.150	Chronic NOAEL	0.45	Opresko et al. 1995	1	0.45	0.24	0.61	0.61	0.39
		Heron	2.23	Japanese Quail	0.150	Chronic NOAEL	0.45	Opresko et al. 1995	1	0.45	0.18	1.07	0.48	0.38
	Nickel[K]	Gull	1.00	Mallard duck, 1-90 days ol	0.782	Chronic NOAEL	77.4	Opresko et al. 1995	1	77.4	71.3	0.61	0.61	117
		Heron	2.23	Mallard duck, 1-90 days ol	0.782	Chronic NOAEL	77.4	Opresko et al. 1995	1	77.4	54.6	1.07	0.48	114
	Silver	Gull	1.00	Mallard duck (juvenile)	0.600	4 wk. NOAEL	8.30	Van Vleet 1982	10	0.83	0.70	0.61	0.61	1.15
		Heron	2.23	Mallard duck (juvenile)	0.600	4 wk. NOAEL	8.30	Van Vleet 1982	10	0.83	0.54	1.07	0.48	1.11
	Zinc[L]	Gull	1.00	White Leghorn Hens	1.935	Chronic NOAEL	14.5	Opresko et al. 1995	1	14.5	18.1	0.61	0.61	29.64
		Heron	2.23	White Leghorn Hens	1.935	Chronic NOAEL	14.5	Opresko et al. 1995	1	14.5	13.8	1.07	0.48	28.77
PAH	1,6,7-Trimethylnaphthalene			No Data										
	1-Methylnaphthalene			No Data										
	1-Methylphenanthrene			No Data										
	2,6-Dimethylnaphthalene			No Data										
	2-Methylnaphthalene	Gull	1.00	Mallard duck	1.000	7 mo LOAEL	600	See Naphthalene	10	60	60.0	0.61	0.61	98.4
		Heron	2.23	Mallard duck	1.000	7 mo LOAEL	600	See Naphthalene	10	60	45.9	1.07	0.48	95.5
	Acenaphthene	Gull	1.00	Red-winged blackbird	0.065	Acute LD_{50}	101	Schafer et al. 1983	80	1.26	0.51	0.61	0.61	0.83
		Heron	2.23	Red-winged blackbird	0.065	Acute LD_{50}	101	Schafer et al. 1983	80	1.26	0.39	1.07	0.48	0.81
	Acenapthylene	Gull	1.00	Red-winged blackbird	0.065	Acute LD_{50}	101	See Acenaphthene	80	1.26	0.51	0.61	0.61	0.83
		Heron	2.23	Red-winged blackbird	0.065	Acute LD_{50}	101	See Acenaphthene	80	1.26	0.39	1.07	0.48	0.81
	Anthracene	Gull	1.00	Red-winged blackbird	0.065	Acute LD_{50}	111	Schafer et al. 1983	80	1.39	0.56	0.61	0.61	0.92
		Heron	2.23	Red-winged blackbird	0.065	Acute LD_{50}	111	Schafer et al. 1983	80	1.39	0.43	1.07	0.48	0.89
	Benz[a]anthracene			No Data										
	Benzo[a]pyrene			No Data										
	Benzo[b]fluoranthene			No Data										
	Benzo(e)pyrene			No Data										
	Benzo(g,h,i)perylene			No Data										
	Benzo[k]fluoranthene			No Data										
	Biphenyl			No Data										
	Chrysene			No Data										
	Dibenz[a,h]anthracene			No Data										
	Fluoranthene			No Data										
	Fluorene	Gull	1.00	Red-winged blackbird	0.065	Acute LD_{50}	101	Schafer et al. 1983	80	1.26	0.51	0.61	0.61	0.83
		Heron	2.23	Red-winged blackbird	0.065	Acute LD_{50}	101	Schafer et al. 1983	80	1.26	0.39	1.07	0.48	0.81
	Indeno[1,2,3-cd]pyrene		0.08	No Data										
	Naphthalene	Gull	1.00	Mallard duck	1.000	7 mo LOAEL	600	Eisler 1987	10	60	60.0	0.61	0.61	98.4
		Heron	2.23	Mallard duck	1.000	7 mo LOAEL	600	Eisler 1987	10	60	45.9	1.07	0.48	95.5
	Perylene													
	Phenanthrene	Gull	1.00	Mallard duck	1.000	7 mo LOAEL	600	Eisler 1987	10	60	60.0	0.61	0.61	98.4
		Heron	2.23	Mallard duck	1.000	7 mo LOAEL	600	Eisler 1987	10	60	45.9	1.07	0.48	95.5
	Pyrene			No Data										
PCB	Total PCBs (c)	Gull	1.00	Ring-necked pheasant	1.000	Chronic NOAEL	0.18	Opresko et al. 1995[A]	1	0.18	0.18	0.61	0.61	0.30
		Heron	2.23	Ring-necked pheasant	1.000	Chronic NOAEL	0.18	Opresko et al. 1995[A]	1	0.18	0.14	1.07	0.48	0.29
PST	Aldrin	Gull	1.00	Ring-necked pheasant (juv)	0.800	7 wk. NOAEL	0.05	Hall et al. 1971	10	0.005	0.005	0.61	0.61	0.008
		Heron	2.23	Ring-necked pheasant (juv)	0.800	7 wk. NOAEL	0.05	Hall et al. 1971	10	0.005	0.004	1.07	0.48	0.007
	Hexachlorobenzene			No Data										
	Mirex			No Data										
	o,p'-DDE			No Data										
	p,p'-DDE	Gull	1.00	Mallard duck	1.000	1.5 yr. NOAEL	1.36	Heath et al. 1972	1	1.36	1.36	0.61	0.61	2.23
		Heron	2.23	Mallard duck	1.000	1.5 yr. NOAEL	1.36	Heath et al. 1972	1	1.36	1.04	1.07	0.48	2.17
BT	Monobutyltin			No Data										
	Dibutyltin			No Data										
	Tributyltin	Gull	1.00	Japenese Quail	0.150	Chronic NOAEL	6.80	Van Vleet 1982	1	6.8	3.61	0.61	0.61	5.93
		Heron	2.23	Japenese Quail	0.150	Chronic NOAEL	6.80	Van Vleet 1982	1	6.8	2.77	1.07	0.48	5.75

1 - body weight, 2 - (mg CoC/kg-bw/day); 3 - Conversion factor for non-Chronic NOAEL data; 4 - test species NOAELx(bw test/bw Roc)$^{1/3}$; see Section 6.3; 5 - Food Consumption Rate (kg prey/day); see Section 6.3; 6 - FCR/BW_{RoC} body weight; 7 - RoC NOAEL/f; EPC=Exposure Point Concentratoin. A) Based on Arochlor 1254 toxicity; B) NOAEL = No Observable Effect Level (mg CoC/kg-RoC/day); C) NOAEL level for CoC concentration in food (mg CoC/kg prey dry weight); D) Receptor of Concern; E) assumed to be in the form of sodium arsenite, F) assumed to be in the form of cadmium chloride; G) assumed to be in the form of Cr(+3), H) assumed to be in the form of copper oxide, I) assumed to be in the form of metal, J) assumed to be in the form of mercuric chloride. K) assumed to be in the form of nickel sulfate, L) assumed to be in the form of zinc sulfate

Table 6.3-3. Qualitative summary of CoC risks to Avian Aquatic Receptors consuming prey in the Derecktor Shipyard/Coddington Cove (DSY) study area and Jamestown Potter Cove (JPC) and Castle Hill Cove (CHC) reference locations.

A. Herring Gull HQ (Benchmark = TRV-EPC).

Station	Species	Arsenic	Cadmium	Chromium	Copper	Lead	Mercury	Nickel	Silver	Zinc	2-Methylnaphthalene	Acenaphthene	Acenaphthylene	Anthracene	Fluorene	Naphthalene	Phenanthrene	Total PCBs	Aldrin	p,p'-DDE	Tributyltin	Risk Ranking
DSY-26	CN	-	-	-	-	-	-	-	-	+	-	-	-	-	-	-	-	+	-	-	-	+
DSY-28	CN	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	++	-	-	-	++
DSY-29	CN	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	++	-	-	-	++
DSY-36	CN	-	-	-	-	-	-	-	-	+		-	-	-	-		-	++	-	-	-	++
JPC-1	CN	-	-	+	-	-	-	-	-	+	-	-	-	-	-	-	-	+	-	-	-	+
CHC-1	CN	-	-	-	-	-	-	-	+	-	-	-	-	-	-	-	-	+	-	-	-	+
DSY-26	DM	-	-	+	-	-	-	-	-	+	-	-	-	-	-	-	-	+	-	-	-	+
DSY-28	DM	+	-	+	-	-	-	-	+	+	-	-	-	-	-	-	-	+	-		-	+
DSY-29	DM	+	-	+	-	-	-	-	-	+	-	-	-	-	-	-	-	+	-	-	-	+
DSY-31	DM	-	-	+	-	-	-	-	-	+	-	-	-	-	-	-	-	+	-	-	-	+
DSY-33	DM	+	-	+	-	-	-	-	-	+	-	-	-	-	-	-	-	+	-	-	-	+
DSY-38	DM	-	-	+	-	-	-	-	+	+		-	-	-	-		-	+	-	-	-	+
DSY-39	DM	+	-	+	-	-	-	-	-	+	-	-	-	-	-	-	-	+	-	-	-	+
DSY-40	DM	-	-	+	-	-	-	-	-	+	-	-	-	-	-	-	-	+	-	-	-	+
JPC-1	DM	-	-	+	-	+	-	-	-	+		-	-	-	-		-	+	-	-	-	+
CHC-1	DM	-	-	-	-	-	-	-	-	+	-	-	-	-	-	-	-	+	-	-	-	+
DSY-24	IBM	+	-	+	-	+	-	-	-	+		-	-	-	-		-	+	-	-	-	+
DSY-25	IBM	+	-	+	-	-	-	-	-	+	-	-	-	-	-	-	-	+	-	-	-	+
DSY-26	IBM	-	-	+	-	-	-	-	-	+	-	-	-	-	-	-	-	+	-	-	-	+
DSY-27	IBM	-	-	+	-	-	-	-	-	+	-	-	-	-	-	-	-	+	-	-	-	+
DSY-28	IBM	-	-	+	-	-	-	-	-	+	-	-	-	-	-	-	-	+	-	-	-	+
DSY-35	IBM	-	-	+	-	-	-	-	-	+	-	-	-	-	-	-	-	+	-	-	-	+
DSY-36	IBM	-	-	+	-	-	-	-	-	+		-	-	-	-		-	+	-	-	-	+
DSY-40	IBM	-	-	+	-	-	-	-	-	+	-	-	-	-	-	-	-	+	-	-	-	+
JPC-1	IBM	+	-	-	+	-	-	-	+	+	-	-	-	-	-	-	-	+	-	-	-	+
CHC-1	IBM	-	-	+	-	-	-	-	-	+	-	-	-	-	-	-	-	+	-	-	-	+
DSY-25	LOB	+	-	-	+	-	-	-	+	+	-	-	-	-	-	-	-	+	-	-	-	+
DSY-27	LOB	+	-	+	+	-	+	-	+	+	-	-	-	-	-	-	-	+	-	-	-	+
DSY-28	LOB										-	-	-	-	-	-	-	+	-	-	-	+
DSY-29	LOB	+	-	-	+	-	-	-	+	+	-	-	-	-	-	-	-	+	-	-	-	+
DSY-33	LOB	+	-	+	-	-	-	-	+	+	-	-	-	-	-	-	-	+	-	-	-	+
DSY-35	LOB	+	-	+	+	-	-	-	+	+		-	-	-	-		-	+	-	-	-	+
DSY-36	LOB	+	-	+	-	-	-	-	+	+		-	-	-	-		-	+	-	-	-	+
DSY-38	LOB	+	-	+	+	-	-	-	+	+	-	-	-	-	-	-	-	-	-	-	-	+
DSY-39	LOB	+	-	-	+	-	+	-	-	+	-	-	-	-	-	-	-	+	-	-	-	+
JPC-1	LOB	-	-	-	-	-	-	-	-	+	-	-	-	-	-	-	-	+	-	-	-	+
CHC-1	LOB	+	-	-	+	-	-	-	+	+	-	-	-	-	-	-	-	+	-	-	-	+
DSY-35	MM	-	-	+	-	-	-	-	-	+	-	-	-	-	-	-	-	-	-	-	-	+
DSY-41	MM	-	-	-	-	-	-	-	+	+	-	-	-	-	-	-	-	-	-	-	-	+
JPC-1	MM	-	-	+	-	-	-	-	-	+	-	-	-	-	-	-	-	-	-	-	-	+
DSY-31	PM	+	-	+	-	-	-	-	-	+	-	-	-	-	-	-	-	+	-	-	-	+
DSY-32	PM	-	-	-	-	-	-	-	+	+	-	-	-	-	-	-	-	+	-	-		+
DSY-33	PM	-	-	+	-	-	-	-	-	+	-	-	-	-	-	-	-	+	-	-	-	+
DSY-34	PM	+	-	+	-	-	-	-	-	+	-	-	-	-	-	-	-	+	-	-	-	+
DSY-35	PM	+	-	+	-	-	-	-	-	+	-	-	-	-	-	-	-	+	-	-		+
DSY-36	PM	-	-	+	-	-	-	-	-	+	-	-	-	-	-	-	-	+	-	-	-	+
DSY-37	PM	-	-	-	-	-	-	-	-	+		-	-	-	-		-	+		-		+
DSY-38	PM	-	-	+	-	-	-	-	-	+	-	-	-	-	-	-	-					+
DSY-41	PM	-	-	+	-	-	-	-	-	+	-	-	-	-	-	-	-	-	-	-		+
JPC-1	PM	+	-	+	-	-	-	-	-	+	-	-	-	-	-	-	-	-	-	-	-	+

TRV = Toxicity Reference Value; data from Table 6.3-2 EPC = Exposure Point Concentration (Prey Species Concentration); Data from Appendix A2.

HQ = Hazard Quotient = Prey EPC/TRV-EPC; Risk Ranking: HQ>1 = "+", HQ>10 = "++", HQ>20 = "+++"

Table 6.3-3 (continued). Qualitative summary of CoC risks to Avian Aquatic Receptors consuming prey in the Derecktor Shipyard/Coddington Cove (DSY) study area and Jamestown Potter Cove (JPC) and Castle Hill Cove (CHC) reference locations.

B. Herring Gull HQ (Benchmark = TRV-Dose).

Station	Species	Arsenic	Cadmium	Chromium	Copper	Lead	Mercury	Nickel	Silver	Zinc	2-Methylnaphthalene	Acenaphthene	Acenaphthylene	Anthracene	Fluorene	Naphthalene	Phenanthrene	Total PCBs	Aldrin	p,p'-DDE	Tributyltin	Risk Ranking
DSY-26	CN	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	+	-	-	-	+
DSY-28	CN	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	+	-	-	-	+
DSY-29	CN	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	+	-	-	-	+
DSY-36	CN	-	-	-	-	-	-	-	-	-		-	-	-	-		-	+	-	-	-	+
JPC-1	CN	-	-	-	-	-	-	-	-	+	-	-	-	-	-		-	+	-	-	-	+
CHC-1	CN	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	+	-	-	-	+
DSY-26	DM	-	-	-	-	-	-	-	-	+	-	-	-	-	-	-	-	+	-	-	-	+
DSY-28	DM	-	-	-	-	-	-	-	-	+	-	-	-	-	-	-	-	+	-		-	+
DSY-29	DM	-	-	-	-	-	-	-	-	+	-	-	-	-	-	-	-	+	-	-	-	+
DSY-31	DM	-	-	-	-	-	-	-	-	+	-	-	-	-	-	-	-	+	-	-	-	+
DSY-33	DM	-	-	-	-	-	-	-	-	+	-	-	-	-	-	-	-	+	-	-	-	+
DSY-38	DM	-	-	-	-	-	-	-	-	+		-	-	-	-		-	-	-	-	-	+
DSY-39	DM	-	-	-	-	-	-	-	-	+	-	-	-	-	-	-	-	-	-	-	-	+
DSY-40	DM	-	-	-	-	-	-	-	-	+	-	-	-	-	-	-	-	-	-	-	-	+
JPC-1	DM	-	-	-	-	-	-	-	-	+		-	-	-	-		-	-	-	-	-	+
CHC-1	DM	-	-	-	-	-	-	-	-	+	-	-	-	-	-	-	-	-	-	-	-	+
DSY-24	IBM	-	-	-	-	-	-	-	-	+		-	-	-	-		-	+	-	-	-	+
DSY-25	IBM	-	-	-	-	-	-	-	-	+	-	-	-	-	-	-	-	-	-	-	-	+
DSY-26	IBM	-	-	-	-	-	-	-	-	+	-	-	-	-	-	-	-	+	-	-	-	+
DSY-27	IBM	-	-	-	-	-	-	-	-	+	-	-	-	-	-	-	-	+	-	-	-	+
DSY-28	IBM	-	-	-	-	-	-	-	-	+	-	-	-	-	-	-	-	+	-	-	-	+
DSY-35	IBM	-	-	-	-	-	-	-	-	+	-	-	-	-	-	-	-	+	-	-	-	+
DSY-36	IBM	-	-	-	-	-	-	-	-	+		-	-	-	-		-	+	-	-	-	+
DSY-40	IBM	-	-	-	-	-	-	-	-	+	-	-	-	-	-	-	-	+	-	-	-	+
JPC-1	IBM	+	-	-	+	-	-	-	-	+	-	-	-	-	-	-	-	-	-	-	-	+
CHC-1	IBM	-	-	-	-	-	-	-	-	+	-	-	-	-	-	-	-	-	-	-	-	+
DSY-25	LOB	+	-	-	+	-	-	-	+	+	-	-	-	-	-	-	-	-	-	-	-	+
DSY-27	LOB	+	-	-	+	-	-	-	+	+	-	-	-	-	-	-	-	+	-	-	-	+
DSY-28	LOB										-	-	-	-	-	-	-	+	-	-	-	+
DSY-29	LOB	+	-	-	-	-	-	-	+	+	-	-	-	-	-	-	-	-	-	-	-	+
DSY-33	LOB	+	-	-	-	-	-	-	+	+	-	-	-	-	-	-	-	-	-	-	-	+
DSY-35	LOB	-	-	-	+	-	-	-	+	+		-	-	-	-		-	-	-	-	-	+
DSY-36	LOB	+	-	-	-	-	-	-	+	+		-	-	-	-		-	+	-	-	-	+
DSY-38	LOB	+	-	-	+	-	-	-	+	+	-	-	-	-	-	-	-	-	-	-	-	+
DSY-39	LOB	+	-	-	+	-	-	-	-	+	-	-	-	-	-	-	-	+	-	-	-	+
JPC-1	LOB	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	+	-	-	-	+
CHC-1	LOB	+	-	-	-	-	-	-	+	+	-	-	-	-	-	-	-	-	-	-	-	+
DSY-35	MM	-	-	-	-	-	-	-	-	+	-	-	-	-	-	-	-	-	-	-	-	+
DSY-41	MM	-	-	-	-	-	-	-	-	+	-	-	-	-	-	-	-	-	-	-	-	+
JPC-1	MM	-	-	-	-	-	-	-	-	+	-	-	-	-	-	-	-	-	-	-	-	+
DSY-31	PM	-	-	-	-	-	-	-	-	+	-	-	-	-	-	-	-	+	-	-	-	+
DSY-32	PM	-	-	-	-	-	-	-	-	+	-	-	-	-	-	-	-	-	-	-		+
DSY-33	PM	-	-	-	-	-	-	-	-	+	-	-	-	-	-	-	-	-	-	-	-	+
DSY-34	PM	-	-	-	-	-	-	-	-	+	-	-	-	-	-	-	-	-	-	-	-	+
DSY-35	PM	-	-	-	-	-	-	-	-	+	-	-	-	-	-	-	-	-	-	-		+
DSY-36	PM	-	-	-	-	-	-	-	-	+	-	-	-	-	-	-	-	-	-	-	-	+
DSY-37	PM	-	-	-	-	-	-	-	-	+		-	-	-	-		-	-		-		+
DSY-38	PM	-	-	-	-	-	-	-	-	+	-	-	-	-	-	-	-					+
DSY-41	PM	-	-	-	-	-	-	-	-	+	-	-	-	-	-	-	-	-	-	-		+
JPC-1	PM	-	-	-	-	-	-	-	-	+	-	-	-	-	-	-	-	-	-	-	-	+

TRV = Toxicity Reference Value; data from Table 6.3-2. Data from Appendix A2.

HQ = Hazard Quotient = Prey Dose/TRV-Dose; Dose = prey concentration X 0.3; Risk Ranking: HQ>1 = "+", HQ>10 = "++", HQ>20 = "+++".

Table 6.3-3 (continued). Qualitative summary of CoC risks to Avian Aquatic Receptors consuming prey in the Derecktor Shipyard/Coddington Cove (DSY) study area and Jamestown Potter Cove (JPC) and Castle Hill Cove (CHC) reference locations.

C. Great Blue Heron HQ (Benchmark = TRV-EPC).

Station	Species	Arsenic	Cadmium	Chromium	Copper	Lead	Mercury	Nickel	Silver	Zinc	2-Methylnaphthalene	Acenaphthene	Acenaphthylene	Anthracene	Fluorene	Naphthalene	Phenanthrene	Total PCBs	Aldrin	p,p'-DDE	Tributyltin	Risk Ranking
DSY-26	CN	-	-	-	-	-	-	-	-	+	-	-	-	-	-	-	-	+	-	-	-	+
DSY-28	CN	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	++	-	-	-	++
DSY-29	CN	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	++	-	-	-	++
DSY-36	CN	-	-	-	-	-	-	-	-	+		-	-	-	-		-	++	-	-	-	++
JPC-1	CN	-	-	-	-	-	-	-	-	+	-	-	-	-	-	-	-	+	-	-	-	+
CHC-1	CN	-	-	-	-	-	-	-	+	-	-	-	-	-	-	-	-	+	-	-	-	+
DSY-26	DM	-	-	+	-	-	-	-	-	+	-	-	-	-	-	-	-	+	-	-	-	+
DSY-28	DM	+	-	+	-	-	-	-	+	+	-	-	-	-	-	-	-	+	-		-	+
DSY-29	DM	+	-	+	-	-	-	-	-	+	-	-	-	-	-	-	-	+	-	-	-	+
DSY-31	DM	-	-	+	-	-	-	-	-	+	-	-	-	-	-	-	-	+	-	-	-	+
DSY-33	DM	+	-	+	-	-	-	-	-	+	-	-	-	-	-	-	-	+	-	-	-	+
DSY-38	DM	-	-	+	-	-	-	-	+	+		-	-	-	-		-	+	-	-	-	+
DSY-39	DM	+	-	+	-	-	-	-	-	+	-	-	-	-	-	-	-	+	-	-	-	+
DSY-40	DM	-	-	+	-	-	-	-	-	+	-	-	-	-	-	-	-	+	-	-	-	+
JPC-1	DM	-	-	+	-	-	-	-	-	+	-	-	-	-	-	-	-	+	-	-	-	+
CHC-1	DM	-	-	+	-	-	-	-	-	+	-	-	-	-	-	-	-	+	-	-	-	+
DSY-24	IBM	+	+	+	-	+	-	-	-	+		-	-	-	-		-	+	-	-	-	+
DSY-25	IBM	+	-	+	-	-	-	-	-	+	-	-	-	-	-	-	-	+	-	-	-	+
DSY-26	IBM	+	-	+	-	-	-	-	-	+	-	-	-	-	-	-	-	+	-	-	-	+
DSY-27	IBM	-	-	+	-	-	-	-	-	+	-	-	-	-	-	-	-	+	-	-	-	+
DSY-28	IBM	-	-	+	-	-	-	-	-	+	-	-	-	-	-	-	-	+	-	-	-	+
DSY-35	IBM	-	-	+	-	-	-	-	-	+	-	-	-	-	-	-	-	+	-	-	-	+
DSY-36	IBM	-	-	+	-	-	-	-	-	+		-	-	-	-		-	+	-	-	-	+
DSY-40	IBM	-	-	+	-	-	-	-	-	+	-	-	-	-	-	-	-	+	-	-	-	+
JPC-1	IBM	-	-	+	-	+	-	-	-	+		-	-	-	-		-	+	-	-	-	+
CHC-1	IBM	-	-	+	-	-	-	-	-	+	-	-	-	-	-	-	-	+	-	-	-	+
DSY-25	LOB	+	-	-	+	-	-	-	+	+	-	-	-	-	-	-	-	+	-	-	-	+
DSY-27	LOB	+	-	+	+	-	+	-	+	+	-	-	-	-	-	-	-	+	-	-	-	+
DSY-28	LOB										-	-	-	-	-	-	-	+	-	-	-	+
DSY-29	LOB	+	-	-	+	-	-	-	+	+	-	-	-	-	-	-	-	+	-	-	-	+
DSY-33	LOB	+	-	+	-	-	-	-	+	+	-	-	-	-	-	-	-	+	-	-	-	+
DSY-35	LOB	+	-	+	+	-	-	-	+	+		-	-	-	-		-	+	-	-	-	+
DSY-36	LOB	+	-	+	-	-	-	-	+	+		-	-	-	-		-	+	-	-	-	+
DSY-38	LOB	+	-	+	+	-	-	-	+	+	-	-	-	-	-	-	-	+	-	-	-	+
DSY-39	LOB	+	-	-	+	-	+	-	-	+	-	-	-	-	-	-	-	+	-	-	-	+
JPC-1	LOB	+	-	-	+	-	-	-	+	+	-	-	-	-	-	-	-	+	-	-	-	+
CHC-1	LOB	+	-	-	+	-	-	-	+	+	-	-	-	-	-	-	-	+	-	-	-	+
DSY-35	MM	-	-	+	-	-	-	-	-	+	-	-	-	-	-	-	-	-	-	-	-	+
DSY-41	MM	-	-	+	-	-	-	-	+	+	-	-	-	-	-	-	-	-	-	-	-	+
JPC-1	MM	-	-	+	-	-	-	-	-	+	-	-	-	-	-	-	-	-	-	-	-	+
DSY-31	PM	+	-	+	-	-	-	-	-	+	-	-	-	-	-	-	-	+	-	-	-	+
DSY-32	PM	-	-	+	-	-	-	-	+	+	-	-	-	-	-	-	-	+	-	-		+
DSY-33	PM	-	-	+	-	-	-	-	-	+	-	-	-	-	-	-	-	+	-	-	-	+
DSY-34	PM	+	-	+	-	-	-	-	-	+	-	-	-	-	-	-	-	+	-	-	-	+
DSY-35	PM	+	-	+	-	-	-	-	-	+	-	-	-	-	-	-	-	+	-	-		+
DSY-36	PM	-	-	+	-	-	-	-	-	+	-	-	-	-	-	-	-	+	-	-	-	+
DSY-37	PM	-	-	+	-	-	-	-	-	+		-	-	-	-		-	+		-		+
DSY-38	PM	-	-	+	-	-	-	-	-	+	-	-	-	-	-	-	-					+
DSY-41	PM	-	-	+	-	-	-	-	-	+	-	-	-	-	-	-	-	-	-	-		+
JPC-1	PM	+	-	+	-	-	-	-	-	+	-	-	-	-	-	-	-	-	-	-	-	+

TRV = Toxicity Reference Value; data from Table 6.3-2. EPC = Exposure Point Concentration (Prey Species Concentration); Data from Appendix A2.

HQ = Hazard Quotient = Prey EPC/TRV-EPC; Risk Ranking: HQ>1 = "+", HQ>10 = "++", HQ>20 = "+++".

Table 6.3-3 (continued). Qualitative summary of CoC risks to Avian Aquatic Receptors consuming prey in the Derecktor Shipyard/Coddington Cove (DSY) study area and Jamestown Potter Cove (JPC) and Castle Hill Cove (CHC) reference locations.

D. Great Blue Heron HQ (Benchmark = TRV-Dose).

Station	Species	Arsenic	Cadmium	Chromium	Copper	Lead	Mercury	Nickel	Silver	Zinc	2-Methylnaphthalene	Acenaphthene	Acenaphthylene	Anthracene	Fluorene	Naphthalene	Phenanthrene	Total PCBs	Aldrin	p,p'-DDE	Tributyltin	Risk Ranking
DSY-26	CN	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	+	-	-	-	+
DSY-28	CN	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	+	-	-	-	+
DSY-29	CN	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	+	-	-	-	+
DSY-36	CN	-	-	-	-	-	-	-	-	+		-	-	-	-		-	+	-	-	-	+
JPC-1	CN	-	-	-	-	-	-	-	-	+	-	-	-	-	-	-	-	+	-	-	-	+
CHC-1	CN	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	+	-	-	-	+
DSY-26	DM	-	-	-	-	-	-	-	-	+	-	-	-	-	-	-	-	+	-	-	-	+
DSY-28	DM	+	-	-	-	-	-	-	-	+	-	-	-	-	-	-	-	+	-		-	+
DSY-29	DM	-	-	-	-	-	-	-	-	+	-	-	-	-	-	-	-	+	-	-	-	+
DSY-31	DM	-	-	-	-	-	-	-	-	+	-	-	-	-	-	-	-	+	-	-	-	+
DSY-33	DM	-	-	-	-	-	-	-	-	+	-	-	-	-	-	-	-	+	-	-	-	+
DSY-38	DM	-	-	-	-	-	-	-	-	+		-	-	-	-		-	+	-	-	-	+
DSY-39	DM	-	-	+	-	-	-	-	-	+	-	-	-	-	-	-	-	-	-	-	-	+
DSY-40	DM	-	-	-	-	-	-	-	-	+	-	-	-	-	-	-	-	+	-	-	-	+
JPC-1	DM	-	-	-	-	-	-	-	-	+		-	-	-	-		-	+	-	-	-	+
CHC-1	DM	-	-	-	-	-	-	-	-	+	-	-	-	-	-	-	-	-	-	-	-	+
DSY-24	IBM	-	-	+	-	+	-	-	-	+		-	-	-	-		-	+	-	-	-	+
DSY-25	IBM	-	-	+	-	-	-	-	-	+	-	-	-	-	-	-	-	+	-	-	-	+
DSY-26	IBM	-	-	-	-	-	-	-	-	+	-	-	-	-	-	-	-	+	-	-	-	+
DSY-27	IBM	-	-	-	-	-	-	-	-	+	-	-	-	-	-	-	-	+	-	-	-	+
DSY-28	IBM	-	-	-	-	-	-	-	-	+	-	-	-	-	-	-	-	+	-	-	-	+
DSY-35	IBM	-	-	-	-	-	-	-	-	+	-	-	-	-	-	-	-	+	-	-	-	+
DSY-36	IBM	-	-	-	-	-	-	-	-	+		-	-	-	-		-	+	-	-	-	+
DSY-40	IBM	-	-	-	-	-	-	-	-	+	-	-	-	-	-	-	-	+	-	-	-	+
JPC-1	IBM	+	-	-	+	-	-	-	+	+	-	-	-	-	-	-	-	-	-	-	-	+
CHC-1	IBM	-	-	-	-	-	-	-	-	+	-	-	-	-	-	-	-	-	-	-	-	+
DSY-25	LOB	+	-	-	+	-	-	-	+	+	-	-	-	-	-	-	-	-	-	-	-	+
DSY-27	LOB	+	-	-	+	-	-	-	+	+	-	-	-	-	-	-	-	+	-	-	-	+
DSY-28	LOB										-	-	-	-	-	-	-	+	-	-	-	+
DSY-29	LOB	+	-	-	-	-	-	-	+	+	-	-	-	-	-	-	-	-	-	-	-	+
DSY-33	LOB	+	-	-	-	-	-	-	+	+	-	-	-	-	-	-	-	-	-	-	-	+
DSY-35	LOB	+	-	-	+	-	-	-	+	+		-	-	-	-		-	-	-	-	-	+
DSY-36	LOB	+	-	-	-	-	-	-	+	+		-	-	-	-		-	+	-	-	-	+
DSY-38	LOB	+	-	-	+	-	-	-	+	+	-	-	-	-	-	-	-	-	-	-	-	+
DSY-39	LOB	+	-	-	+	-	-	-	-	+	-	-	-	-	-	-	-	+	-	-	-	+
JPC-1	LOB	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	+	-	-	-	+
CHC-1	LOB	+	-	-	-	-	-	-	+	+	-	-	-	-	-	-	-	-	-	-	-	+
DSY-35	MM	-	-	-	-	-	-	-	-	+	-	-	-	-	-	-	-	-	-	-	-	+
DSY-41	MM	-	-	-	-	-	-	-	-	+	-	-	-	-	-	-	-	-	-	-	-	+
JPC-1	MM	-	-	-	-	-	-	-	-	+	-	-	-	-	-	-	-	-	-	-	-	+
DSY-31	PM	-	-	-	-	-	-	-	-	+	-	-	-	-	-	-	-	+	-	-	-	+
DSY-32	PM	-	-	-	-	-	-	-	-	+	-	-	-	-	-	-	-	-	-	-		+
DSY-33	PM	-	-	-	-	-	-	-	-	+	-	-	-	-	-	-	-	+	-	-	-	+
DSY-34	PM	-	-	-	-	-	-	-	-	+	-	-	-	-	-	-	-	-	-	-	-	+
DSY-35	PM	-	-	-	-	-	-	-	-	+	-	-	-	-	-	-	-	-	-	-		+
DSY-36	PM	-	-	-	-	-	-	-	-	+	-	-	-	-	-	-	-	+	-	-	-	+
DSY-37	PM	-	-	-	-	-	-	-	-	+		-	-	-	-		-	-		-		+
DSY-38	PM	-	-	-	-	-	-	-	-	+	-	-	-	-	-	-	-					+
DSY-41	PM	-	-	-	-	-	-	-	-	+	-	-	-	-	-	-	-	-	-	-		+
JPC-1	PM	-	-	-	-	-	-	-	-	+	-	-	-	-	-	-	-	-	-	-	-	+

TRV = Toxicity Reference Value: data from Table 6.3-2. Data from Appendix A2.

HQ = Hazard Quotient = Prey Dose/TRV-Dose; Dose = prey concentration X 0.28; Risk Ranking: HQ>1 = "+", HQ>10 = "++", HQ>20 = "+++"

Table 6.3-4 (continued). Overall qualitative summary of CoC risks to Avian Aquatic Receptors consuming prey in the Derecktor Shipyard/Coddington Cove (DSY) study area and Jamestown Potter Cove (JPC) and Castle Hill Cove (CHC) reference locations.

B. Great Blue Heron

	Cunner			Deployed Mussels			Indigenous Mussels			Lobster			*Mercenaria*			*Pitar*			
Station	HQ-EPC[1]	HQ-Dose[2]	Risk Ranking[3]	HQ-EPC	HQ-Dose	Risk Ranking	HQ-EPC	HQ-Dose	Risk Ranking	HQ-EPC	HQ-Dose	Risk Ranking	HQ-EPC	HQ-Dose	Risk Ranking	HQ-EPC	HQ-Dose	Risk Ranking	Overall Exposure Ranking .
DSY-24							+	+	+										+
DSY-25							+	+	+	+	+	+							+
DSY-26	+	+	+	+	+	+	+	+	+										+
DSY-27							+	+	+	+	+	+							+
DSY-28	++	+	++	+	+	+	+	+	+	+	+	+							++
DSY-29	++	+	++	+	+	+				+	+	+							++
DSY-30																			
DSY-31				+	+	+										+	+	+	+
DSY-32																+	+	+	+
DSY-33				+	+	+				+	+	+				+	+	+	+
DSY-34																+	+	+	+
DSY-35							+	+	+	+	+	+	+	+	+	+	+	+	+
DSY-36	++	+	++				+	+	+	+	+	+				+	+	+	++
DSY-37																+	+	+	+
DSY-38				+	+	+				+	+	+				+	+	+	+
DSY-39				+	+	+				+	+	+							+
DSY-40				+	+	+	+	+	+										+
DSY-41													+	+	+	+	+	+	+
JPC-1[4]	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
CHC-1	+	+	+	+	+	+	+	+	+	+	+	+							+

1 - HQ-EPC = EPC/TRV-EPC; see Table 6.3-3.

2 - HQ-Dose = Dose/TRV-Dose; see Table 6.3-3.

3 - Species-specific ranking = maximum of indicator-specific rankings.

4 - Cunner measurements not available at JPC-1; values are for mummichog.

Table 6.3-4. Overall qualitative summary of CoC risks to Avian Aquatic Receptors consuming prey in the Derecktor Shipyard/Coddington Cove (DSY) study area and Jamestown Potter Cove (JPC) and Castle Hill Cove (CHC) reference locations.

A. Herring Gull

	Cunner			Deployed Mussels			Indigenous Mussels			Lobster			*Mercenaria*			*Pitar*			
Station	HQ-EPC[1]	HQ-Dose[2]	Risk Ranking[3]	HQ-EPC	HQ-Dose	Risk Ranking	HQ-EPC	HQ-Dose	Risk Ranking	HQ-EPC	HQ-Dose	Risk Ranking	HQ-EPC	HQ-Dose	Risk Ranking	HQ-EPC	HQ-Dose	Risk Ranking	Overall Exposure Ranking
DSY-24							+	+	+										+
DSY-25							+	+	+	+	+	+							+
DSY-26	+	+	+	+	+	+	+	+	+										+
DSY-27							+	+	+	+	+	+							+
DSY-28	++	+	++	+	+	+	+	+	+	+	+	+							++
DSY-29	++	+	++	+	+	+				+	+	+							++
DSY-30																			
DSY-31				+	+	+										+	+	+	+
DSY-32																+	+	+	+
DSY-33				+	+	+				+	+	+				+	+	+	+
DSY-34																+	+	+	+
DSY-35							+	+	+	+	+	+	+	+	+	+	+	+	+
DSY-36	++	+	++				+	+	+	+	+	+				+	+	+	++
DSY-37																+	+	+	+
DSY-38				+	+	+				+	+	+				+	+	+	+
DSY-39				+	+	+				+	+	+							+
DSY-40				+	+	+	+	+	+										+
DSY-41													+	+	+	+	+	+	+
JPC-1[4]	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
CHC-1	+	+	+	+	+	+	+	+	+	+	+	+							+

1 - HQ-EPC = EPC/TRV-EPC; see Table 6.3-3.
2 - HQ-Dose = Dose/TRV-Dose; see Table 6.3-3.
3 - Species-specific ranking = maximum of indicator-specific rankings.
4 - Cunner measurements not available at JPC-1; values are for mummichog.

APPENDIX D
TABLE D-19 - FORMERLY:

Table 6.6-1. Summary of Exposure-based Weights of Evidence for the Derecktor Shipyard Marine Ecological Risk Assessment.

Sediment Hazard Quotients (HQs)[1] — PAHs[1A]

Station	2-Methylnaphthalene	Acenaphthene	Acenaphthylene	Anthracene	Benzo(a)anthracene	Benzo(a)pyrene	Chrysene	Dibenz(a,h)anthracene	Fluoranthene	Fluorene	HMW PAHs	LMW PAHs	Naphthalene	Phenanthrene	Pyrene	Total PAHS
DSY-24																
DSY-25	-	+	+	+	+	-	+	-	-	+	+	+	-	+	-	+
DSY-26	-	-	+	+	+	+	+	-	+	+	+	+	-	+	+	+
DSY-27	-	+	+	+	+	+	+	+	+	+	+	+	-	+	+	+
DSY-28	-	+	+	+	+	-	-	+	-	+	+	+	-	-	-	+
DSY-29	+	+	+	++	++	++	++	++	+	+	++	++	-	++	+++	+
DSY-30	+	+	+	+	+	+	+	+	+	+	+	+	-	+	+	+
DSY-31	-	+	+	+	+	-	+	-	-	+	+	+	-	-	+	+
DSY-32	-	-	+	+	+	+	+	+	-	+	+	+	-	-	+	+
DSY-33	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
DSY-34	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
DSY-35	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
DSY-36	-	-	+	+	-	-	-	-	-	-	+	-	-	-	-	-
DSY-37	-	-	-	+	-	-	-	-	-	-	-	-	-	-	-	-
DSY-38	-	-	-	+	-	-	-	-	-	-	-	-	-	-	-	-
DSY-39	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
DSY-40	-	+	+	+	-	-	+	-	+	+	+	+	-	+	+	+
DSY-41[6]	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
JPC-1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
JPC-2																
CHC-1																

Sediment Hazard Quotients (HQs)[1] — PCBs[1], PST[1A], BT[1B], Metals[1A]

Station	PCBs[1]: Total PCBs	PST[1A]: p,p'-DDE	BT[1B]: Tributyltin	Arsenic	Cadmium	Chromium	Copper	Lead	Mercury	Nickel	Silver	Zinc	Exposure Ranking[5]
DSY-24													
DSY-25	+	-	-	-	-	-	-	-	-	+	-	-	+
DSY-26	+	-	-	+	-	-	+	-	-	-	-	-	+
DSY-27	+++	+	+	+	-	+	+	+	+	+	-	++	+++
DSY-28	+	-	++	+	-	-	+	+	+	+	-	+	+
DSY-29	+++	+	++	+	+	+	+	+	+	+	-	+	+++
DSY-30	++	+	+	+	+	-	+	+	+	+	-	+	+
DSY-31	++	-	+++	+	-	-	+	+	+	+	-	+	+++
DSY-32	++	+	-	+	-	+	+	+	+	+	-	+	+
DSY-33	+	-	-	-	-	-	-	-	-	-	-	-	-
DSY-34	+	-	-	+	-	-	-	+	+	-	-	-	+
DSY-35	-	-	-	-	-	-	-	-	-	-	-	-	-
DSY-36	+	+	+	+	-	+	+	+	+	+	-	-	+
DSY-37	+	-	-	-	-	-	-	+	+	-	-	-	+
DSY-38	+	-	-	+	-	-	-	+	+	+	-	-	+
DSY-39	+	-	-	-	-	-	-	+	-	-	-	-	+
DSY-40	+	-	-	-	-	-	-	-	+	-	-	-	+
DSY-41[6]	-	-	-	+	-	-	-	-	-	-	-	-	-
JPC-1	-	-	-	-	-	-	-	-	+	-	-	-	-
JPC-2			-	-	-	-	-	+	-	-	-	-	-
CHC-1													

Elutriate HQs[2], SEM[3] and Tissue Concentration Ratios[4]

Station	Elutriate: Total PCBs	Elutriate: Arsenic	Elutriate: Copper	Elutriate: Lead	Elutriate: Exposure Ranking[5]	SEM[3]: Exposure Ranking[5]	Cunner	Deployed Mussels	Indigenous Mussels	Lobster	Mercenaria	Pitar	Tissue: Exposure Ranking[5]
DSY-24									++				++
DSY-25	+	-	+		+	-			+++	++			+++
DSY-26						-	++	++	+++				+++
DSY-27	+				+	+			+++	++			+++
DSY-28						+	++	+	++	++			++
DSY-29	+			+	+	+	++	+		++			++
DSY-30						+							
DSY-31	-	-	++	+	+	-		+				+	+
DSY-32	+	-	+	+	+	-						+	+
DSY-33	+	-	+	-	+	+		+		++		+	+
DSY-34						-						+	+
DSY-35						+			+	+	++	+	+
DSY-36	-	+	+	+	+	-	++		+	++		+	++
DSY-37	+	-	+	+	+	+						+	+
DSY-38	-	+	+	+	+	-		+		+		+	+
DSY-39	-	++	+	+	+	-		+		+			+
DSY-40	+	-	+	+	+	-		+	+				+
DSY-41[6]					+	-					++	+	+
JPC-1	+	-	+	-	+	-							
JPC-2						+							
CHC-1													

PAH = Polycyclic Aromatic Hydrocarbons; PCB = Polychlorinated Biphenyls; PST = Pesticides; BT = Butyltins; SEM = Simultaneously Extractable Metals; WQC = EPA Water Quality Criteria; LMW = Low Molecular Weight; HMW = High Molecular Weight.

Exposure rankings for stations for which only one indicator observation was available are equal to the indicator observation ranking.

1- Benchmark for PCBs, PAHs, PST = NOAA ER-L/ER-M (Long et al., 1995); TBT benchmark = 5 ng Sn/g dry wt. (lower, Macauley et al., 1994) and 50 ng Sn/g dry wt. (upper).

1A - Hazard Quotient Codes for Sediment Concentrations: < ER-L = "-" ; ER-L to ER-M = "+" ; >=ER-M = "++"; >=2x ER-M = "+++".

1B - Tributyltin Codes: lower HQ<1 = "-"; lower HQ>=1 = "+"; upper HQ>=1 = "++"; upper HQ>=2 = "+++".

2 - Analytes included for which WQC are available and CoCs were above detection.
Hazard Quotient Codes for Elutriate Concentrations: < WQC-Chronic = - ; WQC-Chronic to Acute = "+" ; > WQC-Acute = "++"; "+++" = > 2 x WQC-Acute.

3 - SEM Bioavailability Codes (see Table 6.1-1).
Exposure Ranking: "-" = no exposure, "+" = exposure seen in one indicator, "++" = exposure seen in two indicators, "+++" = exposure in all indicators.

4 - Site vs. Reference Tissue Concentration Ratios (TCRs; Table 6.2-1).
TCR Codes: TCR>=10 = "+++"; TCR>=3 = "++"; TCR>1 = "+"; TCR<1 or TCR=1 = "-".

5 - Exposure Ranking: "+++" = intermediate (++) or higher exposure observed for two or more indicators, one of which indicates high (+++) exposure; "++" = intermediate (++) exposure observed for two or more indicators or high (+++) exposure for one indicator; "+" = low (+) exposure observed for two or more indicators or intermediate (++) exposure for one indicator; "-" = low (+) exposure observed for only one indicator or no exposure for all indicators. See text in Section 6.6.

6 - No data available for elutriate exposure at Station DSY-41; ranking assumed to be the same as Station DSY-40 due to spatial proximity to Station DSY-40.

APPENDIX D
TABLE D-20 - FORMERLY:

Table 6.6-2. Summary of Effects-based Weights of Evidence for the Derecktor Shipyard Marine Ecological Risk Assessment.

Station	Tissue Residue Effects[1]							Laboratory Toxicity[2]				Field Effect Indicators[3]						Avian Predator[4]		
	Cunner	Deployed Mussels	Indigenous Mussels	Lobster	*Mercenaria*	*Pitar*	Effects Ranking[5]	*Ampelisca* Survival	*Arbacia* Fertilization	*Arbacia* Development	Effects Ranking[5]	Benthic Community Structure[3A]	Bivalve Condition Index[3B]	Hematopoietic neoplasia[3C]	Cytochrome P450[3D]	Fecal Pollution Indicators[3E]	Effects Ranking[5]	Herring Gull	Great Blue Heron	Effects Ranking[5]
DSY-24			+				+						-				-	+	+	+
DSY-25			+	+++			++	-	-	•++	+	+++	-		+		++	+	+	+
DSY-26	++	+	+				+	-	-	•+++	++	-	++	++	+	++	++	+	+	+
DSY-27			++	+++			+++	•+	-	-	-	+++	-		+		++	+	+	+
DSY-28	++	+	+	-			+	•+	-	•+++	++	+	-		+	-	+	++	++	++
DSY-29	++	+		+++			+++	-	-	•+++	++	+++	++	+	+++	+	+++	++	++	++
DSY-30								-	-	-	-	+			+		+			
DSY-31		+				+	+	-	-	•++	+	-	++	-	+	-	+	+	+	+
DSY-32						+	+	-	-	•++	+	+++			+		++	+	+	+
DSY-33		+		+++		+	++	-	-	•++	+	-	++		-	++	++	+	+	+
DSY-34						+	+	-	-	-	-	+			-		-	+	+	+
DSY-35			+	+++	+	+	++	-	-	-	-	+	-	-	-		-	+	+	+
DSY-36	++		+	++		+	+	-	-	•+	-	++	-	-	+		+	++	++	++
DSY-37						+	+	-	-	•++	+	-			-		-	+	+	+
DSY-38		+		+++		+	++	-	-	•++	+	++	-		-	+	+	+	+	+
DSY-39		+		+++			++	-	-	•++	+	++	-		-	+	+	+	+	+
DSY-40		+	+				+	-	-	•+	-	++	-	+	+	+++	+++	+	+	+
DSY-41[6]					++	+	+	-	-	•++	+	+++			-	+++	+++	+	+	+
JPC-1	++	+	+	+++	+	+	+++	-	-	-	-	-	-		-	+	-	+	+	+
JPC-2								-	-	-	-	-					-	+	+	+
CHC-1	++	+	+	+++			+++						-			+	-			

Effects rankings for stations for which only one indicator observation was available are equal to the indicator observation ranking.
1- Assessment of possible adverse effects due to CoCs in target species tissues; see Table 6.2-4.
2- Reduced survival, fertilization or development in bioassay species exposed to sediments or sediment elutriates. See Table 5.2-1 for test-specific ranks.
3- Reduced fitness in field species exposed to sediments or sediment elutriates.
3A - see Tables 5.3-1 and 5.3-2.
3B - see Figure 5.3-9.
3C - see Table 5.3-4.
3D - see Section 6.5 text and Figure 6.5-9.
3E - see Table 5.3-5.
4 - Toxicity Reference Value Hazard Quotient (TRV-HQ); see Table 6.3-4.
5 - Effects Ranking: "+++" = intermediate (++) or higher effect observed for two or more indicators, one of which indicates high (+++) effect;
"++" = intermediate (++) effect observed for two or more indicators or high (+++) effect for one indicator; "+" = low (+) effect observed for two or more indicators or intermediate (++) effect for one indicator; "-" = low (+) effect observed for only one indicator or no effect for all indicators. See text in Section 6.6.
6 - No data available for fecal pollution indicator effects at Station DSY-41; ranking assumed to be the same as Station DSY-40 due to spatial proximity to Station DSY-40.

Table 6.6-3. Overall Summary of Exposure and Effects-based Weights of Evidence and Characterization of Risk for the Derecktor Shipyard Marine Ecological Risk Assessment.

	WEIGHTS OF EVIDENCE										
	EXPOSURE					EFFECTS					
Station	Sediment Hazard Quotients[1]	Elutriate HQs[2]	SEM and AVS[3]	Tissue Conc. Ratio[4]	Rank[9]	Tissue Residue Effects[5]	Laboratory Toxicity[6]	Field Effects[7]	Avian Predators[8]	Rank[9]	Overall Risk Probability Ranking[10]
DSY-24				++	I	+		-	+	L	Intermediate
DSY-25	+	+	-	+++	I	++	+	++	+	I	Intermediate
DSY-26	+		-	+++	I	+	++	++	+	I	Intermediate
DSY-27	+++	+	+	+++	H	+++	-	++	+	H	High
DSY-28	+		+	++	L	+	++	+	++	I	Intermediate
DSY-29	+++	+	+	++	H	+++	++	+++	++	H	High
DSY-30	+		+		L		-	+		B	Low
DSY-31	+++	+	-	+	I	+	+	+	+	L	Intermediate
DSY-32	+	+	-	+	L	+	+	++	+	L	Low
DSY-33	-	+	+	+	L	++	+	++	+	I	Intermediate
DSY-34	+		-	+	L	+	-	-	+	L	Low
DSY-35	-		+	+	L	++	-	-	+	L	Low
DSY-36	+	+	-	++	L	+	-	+	++	L	Low
DSY-37	+	+	+	+	L	+	+	-	+	L	Low
DSY-38	+	+	-	+	L	++	+	+	+	L	Low
DSY-39	+	+	-	+	L	++	+	+	+	L	Low
DSY-40	+	+	-	+	L	+	-	+++	+	I	Intermediate
DSY-41	-	+	-	+	L	+	+	+++	+	I	Intermediate
JPC-1	-	+	-		B	+++	-	-	+	I	Low
JPC-2	-		+		B		-	-	+	B	Baseline
CHC-1						+++		-		I	Intermediate

1- Sediment Hazard Quotient Risk Ranking: see Table 6.6-1.
2- Elutriate Hazard Quotient Risk Ranking: see Table 6.6-1.
3- SEM and AVS Risk Ranking: see Table 6.6-1.
4- Tissue Concentration Ratios Risk Ranking: see Table 6.6-1.
5- Tissue-based Risk Ranking: Based on Site vs. Reference Tissue Concentration Ratio (Table 6.6-1), Tissue Screening Concentration (Table 6.6-2) and Critical Body Residues (Table 6.6-2).
6- Laboratory Toxicity Risk Ranking: see Table 6.6-2.
7- Field Effects Ranking: Based on results of Condition Index, Benthic Community Structure, Hematopoietic neoplasia, cytochrome P450, and fecal pollution indicators; see Table 6.6-2.
8- Avian Predator effects ranking based on Toxicity Reference Value Hazard Quotients; see Table 6.6-2.
9- Overall Exposure/Effects (E/E) Ranking:
B = Baseline Risk; L = Low Risk Probability; I = Intermediate Risk Probability; H = High Risk Probability.
Rankings for stations for which only one WoE observation was available are equal to the WoE observation ranking.
B = Low (+) E/E ranking observed for only one indicator or baseline E/E ranking observed for all indicators;
L = Intermediate (++) E/E ranking observed for only one indicator or low (+) E/E ranking observed for two or more indicators;
I = High (+++) E/E ranking observed for only one indicator or intermediate (++) E/E ranking observed for two or more indicators;
H = Intermediate (++) or greater E/E ranking observed for two indicators including high (+++) E/E ranking observed for one indicator.
10- Overall Risk Ranking (See also Section 6.6):
Baseline = No greater than Baseline (B) ranking for E/E WoE summaries;
Low = No greater than Low (L) ranking for E/E WoE summaries, or Intermediate (I) ranking for one WoE summary and no greater than Baseline (B) ranking for the other WoE summary;
Intermediate = No greater than Intermediate (I) ranking for E/E WoE summaries, or High (H) ranking for one WoE and no greater than Low (L) ranking for the other WoE summary;
High = High (H) ranking for one WoE summary and Intermediate (I) or greater ranking for the other WoE summary.

Appendix E
ARARs and To Be Considered Guidance

TABLE E-1
ASSESSMENT OF CHEMICAL-SPECIFIC ARARs AND TBCs –
SEDIMENT ALTERNATIVE 5: DREDGE (OPEN WATER), CAP AND MONITORING (BENEATH PIER 2)
RECORD OF DECISION
SITE 19 – DERECKTOR SHIPYARD MARINE SEDIMENT
NAVSTA NEWPORT, NEWPORT, RHODE ISLAND
PAGE 1 OF 2

Requirement	Citation	Status	Synopsis of Requirement	Action to Be Taken to Attain ARAR
Federal				
EPA Human Health Assessment Cancer Slope Factors (CSFs)	None	To Be Considered	These are guidance values used to evaluate the potential carcinogenic hazard caused by exposure to contaminants.	Used to compute the individual incremental cancer risk resulting from exposure to carcinogenic contaminants in site media. Removal of contaminated sediment by dredging and capping under Pier 2 will prevent exposure to target area sediments, in order to meet RAOs.
Guidance for Carcinogen Risk Assessment	EPA/630/P-03/001F (March 2005)	To Be Considered	Guidance for assessing cancer risk.	Used to calculate potential carcinogenic risks caused by exposure to contaminants. Removal of contaminated sediment by dredging and capping under Pier 2 will prevent exposure to target area sediments, in order to meet RAOs.
Reference Doses (RfDs)	None	To Be Considered	Guidance values used to evaluate potential non-carcinogenic hazards caused by exposure to contaminants.	RfDs will be used to characterize non-carcinogenic risks associated with residual COC concentrations and develop site-specific risk-based PRGs. Removal of contaminated sediment by dredging and capping under Pier 2 will prevent exposure to target area sediments, in order to meet RAOs.
Supplemental Guidance for Assessing Susceptibility from Early-Life Exposure to Carcinogens	EPA/630/R-03/003F (March 2005)	To Be Considered	Guidance of assessing cancer risks to children.	Used to calculate potential carcinogenic risks to children caused by exposure to contaminants. Removal of contaminated sediment by dredging and capping under Pier 2 will prevent exposure to target area sediments, in order to meet RAOs.

TABLE E-1
ASSESSMENT OF CHEMICAL-SPECIFIC ARARs AND TBCs –
SEDIMENT ALTERNATIVE 5: DREDGE (OPEN WATER), CAP AND MONITORING (BENEATH PIER 2)
RECORD OF DECISION
SITE 19 – DERECKTOR SHIPYARD MARINE SEDIMENT
NAVSTA NEWPORT, NEWPORT, RHODE ISLAND

Requirement	Citation	Status	Synopsis of Requirement	Action to Be Taken to Attain ARAR
Federal (continued)				
National Oceanographic and Atmospheric Administration (NOAA) Incidence of Adverse Biological Effects within Ranges of Chemical Concentration in Marine and Estuarine Sediments, Long, *et al.*, 1995	None	To Be Considered	Guidance on concentration ranges of contaminants in sediment that correspond to the likelihood of adverse effects to organisms.	Used to establish sediment cleanup standards. Removal of contaminated sediment by dredging and capping under Pier 2 will prevent exposure to target area sediments, in order to meet RAOs.
State				
There are no state Chemical-Specific ARARs for Sediment.				

TABLE E-2
ASSESSMENT OF LOCATION-SPECIFIC ARARs AND TBCs –
SEDIMENT ALTERNATIVE 5: DREDGE (OPEN WATER), CAP AND MONITORING (BENEATH PIER 2)
RECORD OF DECISION
SITE 19 – DERECKTOR SHIPYARD MARINE SEDIMENT
NAVSTA NEWPORT, NEWPORT, RHODE ISLAND

Requirement	Citation	Status	Synopsis of Requirement	Action to Be Taken to Attain ARAR
Federal				
Clean Water Act -Section 404 (b)(1) Guidelines for Specification of Disposal Sites for Dredged or Fill Material	40 Code of Federal Regulations (CFR) 230 and 33 CFR 322 and 323	Applicable	Under this requirement, no activity that adversely affects a wetland shall be permitted if a practicable alternative with lesser effects is available. If activity takes place, impacts must be minimized to the maximum extent. Controls discharges of dredged or fill material to protect aquatic ecosystems. Filling or discharge of dredged material will only occur where there is no other practicable alternative and any adverse impacts to aquatic ecosystems will be mitigated. Under these standards the Navy must solicit public comment through the Proposed Plan on its finding that one of the alternatives is the Least Environmentally Damaging Practicable Alternative.	Dredging operations, including sediment dewatering, will be conducted in a manner that will minimize impacts to navigable waters. Water will be treated before discharge within the dredge area to meet applicable standards. There is no practicable alternative to the discharge of treated water to navigable waters. The dredging and dewatering components will meet the substantive environmental requirements of these standards. In addition, the capping of contaminated sediments under Pier 2 will be conducted in compliance with these standards. The Navy has identified Alternative SD5 as the Least Environmentally Damaging Practicable Alternative with respect to the aquatic ecosystem because it provides the best balance of addressing contaminated sediment within the marine waterway (permanent removal/limited capping) and minimizing alteration of the aquatic habitat. No negative comments were received during the public comment period concerning this LEDPA finding.
Rivers and Harbors Act	33 United States Code (USC) § 403; 33 Code of Federal Regulations (CFR) Part 320 and 322	Relevant and Appropriate	Sets forth criteria for obstructions and alterations of navigable waters.	Installation of access restriction markers during dredging activities will be performed in compliance with the substantive requirements of the statute. Any work on piers or other structures regulated under the Act, in areas of contaminated sediments within the OU, will meet the substantive environmental requirements of the Act and its regulations, including protecting wetland and aquatic resources, fish and wildlife habitat, and water quality.

Requirement	Citation	Status	Synopsis of Requirement	Action to Be Taken to Attain ARAR
Federal (continued)				
Fish and Wildlife Coordination Act	16 USC 661 *et. seq.*	Applicable	Requires Federal agencies involved in actions that will result in the control or structural modification of any stream or body of water for any purpose to take action to protect fish and wildlife resources that may be affected by the action. The Navy must coordinate with appropriate federal and state resource agencies to ascertain the means and measures necessary to mitigate, prevent, and compensate for project related losses of fish and wildlife resources and to enhance the resources.	Dredging open water areas and capping under Pier 2 will impact the waters of the United States. Federal and state fish and wildlife officials would be consulted on how to minimize impacts of any remedial activities on any fish, wildlife, and endangered species.
Endangered Species Act (ESA)	16 USC § 1531 *et seq.*, 50 CFR Parts 200 and 402	Applicable	Regulates activities affecting federally-listed endangered or threatened species, or adversely modifying or destroying their critical habitat. The Atlantic Sturgeon has been listed as an Endangered Species in the region including Narragansett Bay.	The Navy will consult with the appropriate federal resource agencies to ensure that dredging open water areas and capping under Pier 2 will be conducted to minimize disturbance to aquatic habitats in Narragansett Bay that may be used by the federally endangered Atlantic Sturgeon.

Requirement	Citation	Status	Synopsis of Requirement	Action to Be Taken to Attain ARAR
Federal (continued)				
Floodplain Management and Protection of Wetlands	44 CFR Part 9	Relevant and Appropriate	FEMA regulations that set forth the policy, procedure and responsibilities to implement and enforce Executive Order 11988, Floodplain Management, and Executive Order 11990, Protection of Wetlands.	Remedial activities conducted within the 100-year coastal storm floodplain, including sediment dewatering areas, or within federal jurisdictional wetlands and aquatic habitats will be implemented in compliance with these standards. During remedial design, the effects of sediment remedial actions on federal jurisdictional wetlands will be evaluated. All practicable means will be used to minimize harm to the wetlands. Wetlands disturbed by sediment remediation and limited monitoring will be mitigated in accordance with requirements. Shoreline sediment handling and dewatering operations within the coastal floodplain will be designed and implemented to be protective of floodplain and other coastal resources. The Navy solicited public comment as part of the proposed plan on the measures taken through the remedial action to protect floodplain and wetland/aquatic habitat resources and did not receive any negative comments.
Coastal Zone Management Act	16 USC §1451 *et. seq*.	Applicable	Requires that any actions must be conducted in a manner consistent with NOAA-approved state coastal management programs.	The site is located next to a coastal zone management area; therefore, applicable coastal zone management requirements need to be addressed.
State				
Coastal Resources Management	Rhode Island General Laws (RIGL) 46-23-1 *et seq.*	Applicable	Sets standards for management and protection of coastal resources. Jurisdiction includes areas within 200 feet of coastal features, within 50 feet of wetlands under the jurisdiction of the CRMC, and floodplains.	The entire site is located next to a coastal resource management area, therefore, activities conducted under this alternative would be conducted in compliance with applicable coastal resource management requirements.

Requirement	Citation	Status	Synopsis of Requirement	Action to Be Taken to Attain ARAR
Federal				
Toxic Substances Control Act - PCB Remediation Waste	40 Code of Federal Regulations (CFR) 761.61(c)	Applicable	Risk-based standards for the sampling, cleanup, or disposal of PCB remediation waste. Written approval for the proposed risk-based clean-up will be obtained from the Director, Office of Site Remediation and Restoration, EPA Region I.	Standards apply to sampling, cleanup, and disposal. The Navy solicited public comment in the Proposed Plan about the finding that the proposed remedy for PCB contamination at the Site will not pose an unreasonable risk of injury to health or the environment. An EPA finding that the remedy meets these standards is included in the Record of Decision. Removal and off-site disposal of the sediment containing PCBs exceeding risk-based PCB cleanup goals developed for this site, the capping of contaminated sediments under Pier 2, and long-term monitoring of the cap will achieve these standards.
CWA, Section 402, National Pollution Discharge Elimination System (NPDES)	33 USC § 1342; 40 CFR 122 through 125	Applicable	These standards govern point source discharges of pollutants to surface water. Substantive requirements under NPDES are written such that state and federal NRWQC are met. Permits are required for offsite discharges. RI Standards apply to POTWs and includes storm water requirements for construction projects that disturb over one acre.	Standards for discharging of dewatering liquid to surface waters at the site will be met by treatment of water from dewatering sediment prior to discharge. If over 1 acre of soil is disturbed, then the storm water regulations for small construction activities will be met.
Clean Water Act; General Pretreatment Regulations for Existing and New Sources of Pollution	33 USC 1251 et seq., 40 CFR. Part 403	Applicable	Standards for direct discharge of wastewater into a Publicly Owned Treatment Works (POTW).	These standards will apply if water from the remedial action such as from dewatering is discharged to a POTW.
Contaminated Sediment Remediation Guidance for Hazardous Waste Sites	OSWER 9355.0-85, (December 2005)	To Be Considered	This document provides technical and policy guidance for making remedy decisions for contaminated sediment sites. Issues addressed include: Chapter 4, Monitored Natural Recovery; Chapter 5, In-situ Capping; Chapter 6, Dredging and Excavation; Chapter 7, Remedy Selection; and Chapter 8, Long-term Monitoring.	The dredging open water areas and capping under Pier 2 operations will be developed using methods described in this document.

Requirement	Citation	Status	Synopsis of Requirement	Action to Be Taken to Attain ARAR
Federal (continued)				
Clean Water Act, National Recommended Water Quality Criteria (NRWQC)	33 USC § 1251 *et seq.*; 40 CFR 122.44	Applicable	Federal NRWQC are health-based and ecologically based criteria developed for carcinogenic and non-carcinogenic compounds.	These are standards for water quality monitoring that would be conducted to ensure that these criteria are not exceeded during dredging, capping, dewatering activities or any work in areas of contaminated sediments within the OU.
Coast Guard Anchorage Ground and Regulated Navigation Area Rules	33 CFR Part 165	To Be Considered for the area under a permanent structure. (Applicable once a Rule for the LUC area is promulgated)	The Coast Guard may promulgate site-specific rules to establish federal anchorage areas and regulated navigation areas (RNAs). Once promulgated such a rule is also the basis for the National Oceanic and Atmospheric Administration (NOAA) to revise navigation charts to show the restricted area.	Under this alternative, the LUC is necessary for the area under the existing Pier 2, which is a shoreline structure. Because the LUC is not for a navigable waterway, it would not be necessary to apply to this rule unless the pier was demolished and the water became navigable. Therefore, if, in the future, the Navy demolishes Pier 2, excesses the property to a private owner, and leaves the sediment in place underneath with the cover intact, it will then explore the option of coordinating with the Coast Guard retaining the existing Restricted Area for the purpose of implementing LUCs. The Restricted Area is a federally enforceable restriction to protect the LUC area from disturbance and to delineate the area of the LUCs on federal navigation charts.
Corps of Engineers, Danger Zone and Restricted Areas: Narragansett Bay, East Passage, Coddington Cove, Naval Station Newport, Naval Restricted Area, Newport, Rhode Island	33 CFR §334.81	Applicable	All persons, swimmers, vessels and other craft, except those vessels authorized by the Navy or Coast Guard and local or state law enforcement vessels, are prohibited from entering the restricted area without specific permission from the Command Officer.	Enforceable basis for preventing unauthorized vessels and fisherman from entering the area where sediment caps/covers are installed or where there is a risk from consumption of contaminated seafood.

Requirement	Citation	Status	Synopsis of Requirement	Action to Be Taken to Attain ARAR
Federal (continued)				
Clean Air Act (CAA), National Emission Standards for Hazardous Air Pollutants (NESHAPS); National Emission Standards for Asbestos	42 U.S.C. §§7411, 7412; 40 C.F.R. Part 61, Subpart M	Applicable	Establish standards for demolition of facilities containing asbestos, managing existing asbestos, and for disposal of asbestos contaminated waste.	Any future maintenance or demolition of the piers where asbestos is present, must be conducted in accordance with these standards. To address the potential for a future risk from exposure to asbestos in the marine sediments during the implementation of the proposed remedy and future dredging within the OU, the Navy will prevent exposure to potential asbestos in dredged shipyard sediment through development of documented precautionary measures and safe work practices.
Clean Air Act (CAA), National Emission Standards for Hazardous Air Pollutants (NESHAPS), Standards for Inactive waste disposal sites for asbestos mills and manufacturing and fabricating operations	42 U.S.C. §§7411, 7412; 40 C.F.R. §61.151	Relevant and Appropriate	NESHAPS standards for preventing air releases from inactive asbestos disposal sites, including cover standards, dust suppression, and land use controls.	For areas of sediments under the piers where asbestos is present, that will be capped/covered substantive requirements of these standards and land use controls will be established to address health and safety requirements to maintain the cover and to address any potential asbestos exposure if the cover is disturbed. To address the potential for a future risk from exposure to asbestos in the marine sediments during the implementation of the proposed remedy and future dredging within the OU, the Navy will prevent exposure to potential asbestos in dredged shipyard sediment through development of documented precautionary measures and safe work practices.
Framework for Investigating Asbestos-Contaminated Superfund Sites	OSWER Directive #9200.0-68 (Sept. 2008)	To Be Considered	Guidance on investigating and characterizing the potential human exposure from asbestos contamination at Superfund sites.	Guidance will be used to establish procedures for sampling for asbestos if areas of potential sediment contamination are disturbed in the future.

Requirement	Citation	Status	Synopsis of Requirement	Action to Be Taken to Attain ARAR
State				
Standards for Identification and Listing of Hazardous Waste	Rules and Regulations for Hazardous Waste Management, Code of Rhode Island Rules (CRIR), 12-030-003, Rule 5.8	Applicable	Defines the listed and characteristic hazardous wastes.	These regulations would apply when determining whether or not a solid waste is hazardous, either by being listed or by exhibiting a hazardous characteristic.
Standards for Generators of Hazardous Waste	Rules and Regulations for Hazardous Waste Management, CRIR 12-030-003, Rule 5.2, 5.3, and 5.4	Applicable	Establishes manifesting and pre-transport requirements for hazardous waste.	These regulations would apply to all wastes generated during dredging or other work in contaminated sediments within the OU that is determined to be hazardous.
Rules and Regulations for Dredging and the Management of Dredged Material	DEM-OWR-DR-02-03, Sections 5, 6, 7, 8, 9, and 11	Applicable	Standards to ensure that dredging in the marine environment and management of the associated dredged material is conducted in a manner which is protective of groundwater and surface water quality so as to ensure the continued viability and integrity of drinking water and fish and wildlife resources. Establish standards and criteria governing the dewatering of dredged material for upland use or disposal.	Dredging and capping under Pier 2 operations, including dewatering, will be conducted in accordance with the substantive requirements of these standards.
Clean Air Act - Fugitive Dust Control	CRIR 12-31-05	Applicable	Requires that reasonable precautions be taken to prevent particulate matter from becoming airborne.	Controls would be used during storage and handling of sediment and capping material to prevent material from becoming airborne.

Requirement	Citation	Status	Synopsis of Requirement	Action to Be Taken to Attain ARAR
State (continued)				
Clean Air Act - Emissions Detrimental to Persons or Property	CRIR 12-31-07	Applicable	Prohibits emissions of contaminants which may be injurious to humans, plant or animal life or cause damage to property or which reasonably interferes with the enjoyment of life and property.	Monitoring of air emissions during dredging and dewatering will be used to assess compliance with these standards if threshold levels are reached.
Clean Air Act - Air Toxics	CRIR 12-31-22	Applicable	Prohibits the emission of specified contaminants at rates which would result in ground level concentrations greater than acceptable ambient levels or acceptable ambient levels as set in the regulations.	Emissions of hydrogen sulfide during dredging, dewatering, and stockpiling would be controlled.
Water Quality Regulations	Water Quality Regulations, CRIR 12-190-001	Applicable	Establishes water use classification and water quality criteria for waters of the state.	Remedial work, including dredging, capping, dewatering, or any work in contaminated sediments within the OU, will be conducted in a manner as to minimize degradation of water quality. Any drainage from the temporary sediment storage area and any dewatering discharge would be treated as required to meet this requirement and discharged into Narragansett Bay.
Water Pollution Control – Pollutant Discharge Elimination System (PDES)	Regulations of Rhode Island Pollutant Discharge Elimination System	Applicable	Contains applicable effluent monitoring requirements, and standards and special conditions for discharges. These regulations also include storm water standards applicable if shoreland staging, processing and stockpiling areas disturb more than one acre.	Discharge of water to surface water from remedial activities, such as dewatering of sediment will meet these standards. If over 1 acre of soil is disturbed, then the storm water regulations for small construction activities will be met.
Pretreatment Regulations	RIGL 46-12, 42-17.1, 42-45	Applicable	Rhode Island standards for discharge to POTWs.	These standards will apply if water from the remedial action such as from dewatering is discharged to a POTW.
Rhode Island Soil Erosion and Sediment Control (SESC) Manual	None	Applicable	RIGL Erosion and Sediment Control Act places enforcement of soil erosion and sediment control at the local level. The SESC Manual is the primary guidance document.	An erosion and sediment control plan will be prepared according to the SESC Manual for all activities with land disturbance, including stockpiling dredged material or capping material.

Requirement	Citation	Status	Synopsis of Requirement	Action to Be Taken to Attain ARAR
State (continued)				
Identification and Management of Aquatic Invasive Species	None	To Be Considered	Guidance on addressing aquatic invasive species in Rhode Island.	Remedial work in the Bay will be conducted in a manner to prevent the establishment or spread of aquatic invasive species.

Appendix F
Public Hearing Transcript and Response to Public Comments

PUBLIC HEARING

RE: PROPOSED PLANS, OU 5 and OU 12, SITE 19

FORMER DERECKTOR SHIPYARD

WEDNESDAY, MAY 21, 2014

COURTYARD BY MARRIOTT

9 COMMERCE DRIVE, MIDDLETOWN, RHODE ISLAND

Leavitt Reporting, Inc.

119 Broad Street
Weymouth, MA 02188
www.leavittreporting.com

Tel. 781-335-6791
Fax: 781-335-7911
leavittreporting@comcast.net

Hearings ◆ Conferences ◆ Legal Proceedings

(The Public Hearing regarding Proposed Plans of Site 19, Former Derecktor Shipyard)

MR. STEPHEN PARKER: It's 7:40, and so the next part of this is to hold the Public Hearing, during which we will hear your comments on the two Proposed Plans, one for OU 5 and the other for OU 12 which are part of Site 19 at the Former Derecktor Shipyard.

So if you have a comment, please just state your name and who you represent, and then give us your comment, and we will ensure that it's recorded for the record and published in the responsive summary. I'll open it to the floor.

MS. MARGARET KIRSCHNER: I'll ask something I didn't ask a moment ago. This is Margaret Kirschner from Newport.

There's a clear distinction about the source of the contamination being from the Derecktor years. I'm wondering, would it make a difference in the work or the plan or the remediation if that distinction had not been made? You know, just general pier operations, what would normally be found in that sort of environment, considering the age of the site from World War II, is that distinction important, or, based on the work that was done, would all the contaminants have been found anyway?

MR. PARKER: Okay. Thanks. That's a good comment. Good question.

MS. KATHY ABBASS: I'm Kathy Abbass with the Rhode Island Marine Archeology Project.

I would like to follow up. The kinds of things they have always said they found is exactly the kind of stuff that you find around shipyards elsewhere in the state. It's just that the Navy is responsible for cleaning this up. I understand, because I had asked that very early on, if you're making the Navy clean this up, why aren't you doing that at other areas of the Shipyard that have used exactly the same kind of technology? That's an issue that's outside what we are discussing here tonight.

But I did want to remind you of a couple of historical things that I always bring to your attention. One is that around the area where the chemical storage and fuel storage was, that originally 200 years ago had been a wetland to begin with, and so that has obviously been filled in over the years. There's still a little stream in there and the culvert that goes under the railroad tracks and all of that. So I presume when you're doing the monitoring and all of that that you'll pay attention to the fact that was a wetland and it probably has whatever that structure is beneath it.

The other thing is what you could find when you're doing your removal: isolated cultural finds that could be historically significant. I don't think the area you're working in is where the Revolutionary War frigate, the Juneau, was lost because I think we found her elsewhere, but there could be materials from World War II that could come up when you're doing that. You might want to just pay attention to that because to be historically significant now means it has to be older than fifty years. Now World War II is in that category, too.

I do note from other areas around the Base and elsewhere that one of the things that Navy guys love to do is take their coffee mugs out and throw them into the water when they were through with them instead of going back and taking them and washing them. So, I mean, there's a lot of that kind of debris to be found. We actually found a lot of it. So you might just keep an eye out for that sort of thing.

MR. PARKER: Thank you.

MR. DAVID BROWN: David Brown, just a farm boy, became an agricultural economist, quite a bit with watersheds and that kind of thing.

Point Number 1, I think a competent job has been done in pinpointing the remaining site problems and remedial options, including the soil and the groundwater and offshore, so I think you have done a pretty thorough job.

On the groundwater and, in turn, offshore, I think we may need a fuller picture of what the flows are and to what extent there are flows from nearby offsite places and what's happening to the water that's on Site 19 and really whether it's just staying there and to what extent it's flowing into the contaminated offshore area.

If it's like a bowl, then maybe the cleanup becomes neater. But if it's like a flow and going out still and a lot of it is coming from offshore, that implies, to me, having a companion action on adjacent Navy sites, even on the civilian sites upstream, up the hill, to try to reduce the flows that are coming down onto Site 19 or into Site 19, either surface water or groundwater. And I know this means working between programs, but more and more people who are with it, organizations, are not just thinking stovepipes of agencies, but how to do it in sync. Otherwise, the cleanup you do will be kind of a waste of money if it's just got more stuff coming down. And, in turn, this would fit what's happening on the Island where we're becoming very concerned about steering flows of water down into storm systems and treating it like a bowl, but treating more upstream like a sponge, how to absorb runoff.

So you have a lot of houses and Navy housing, and so on. This gets into Dave's area (Dave Dorocz, Public Works). That while you're at the cleanup on Site 19, maybe you could at least try to nudge the Navy to have kind of a reduced runoff approach for its lands nearby. And forget whether it's one agency or another or one program or another. I've been in programs wherein inter-agency cooperation have been able to be worked out without necessarily having a fixed mandate to do it.

MR. PARKER: Thank you.

Anything else? I'll take silence as a no.

MS. KIRSCHNER: Can I ask another question? In the bay, in the cove, when you remove target sites and you determine the extent of the removal based on the average remainder of the, like an aggregate contamination, is that correct, is that achieved in one design of, for instance, the targeted sites that you chose, or could that be achieved by some other combination of removal? Is that a broad approach -- Can you achieve an acceptable aggregate result in the cove by other combinations of dredging, for instance, with that sort of treatment of your samples? And I could maybe write my question or discuss it, I could discuss it with you.

MR. PARKER: I understand what you're asking.

MS. KIRSCHNER: It's kind of a general process question.

MR. PARKER: I understand.

All right. Well, if there's nothing else, close the hearing. I want to thank everybody for coming and enduring the long discussions. That's it. Thank you.

(At 7:56 p.m. the hearing was adjourned.)

REPORTER'S CERTIFICATION

I hereby certify that the foregoing 7 pages contain a true and correct transcript of all my stenographic notes to the best of my ability taken in the matter of the Former Derecktor Shipyard held at the Courtyard by Marriott on Wednesday, May 21, 2014.

RUTH E. HULKE, CSR NO. 114893

SIGN-IN SHEET

SITE 19 PROPOSED PLAN
OU5 AND 0U12
PUBLIC MEETING AND HEARING
NAVAL STATION NEWPORT, NEWPORT RI
MAY 21, 2014

NAME	TOWN/AFFILIATION	TELEPHONE NO.
Mark Kauffman	Resolution / Navy	978-905-2262
Dave Dorocz	NAVSTA NEWPORT	401-841-7071
Winoma Johnson	NAVFAC MIDLANT	757-341-2008
Darlene Ward	Naval Station Newport	401 841 6376
Claudia [illegible]	Ports. Cons. Comm.	401-683-0085
Deb Moore	NAVSTA NPT	401 841-7790
Pamela Crump	RIDEM	401-222-2797
David Brown	Newport	401-848-9427
THURSTON GRAY	PORTSMOUTH	
Kathy Abbass	Bristol	401 253 2094
Roberto Pagtalunan	Navfac Midlant	757-341-2010
Manuel Marques	CIV - MIDDLETOWN	401-486-8651