RECORD OF DECISION

MRP SITE 1 – FORMER CARR POINT SHOOTING RANGE

(OPERABLE UNIT 9)

NAVAL STATION NEWPORT
PORTSMOUTH, RHODE ISLAND

SEPTEMBER 2020

SEMS Doc ID 649554

TABLE OF CONTENTS

SECTION **PAGE NO.**

FIGURES

(presented at the end of the document)

NUMBER

TABLES

APPENDICES

ACRONYMS

µg/L	microgram(s) per liter
ARAR	Applicable or Relevant and Appropriate Requirement
AUF	Area Use Factor
bgs	below ground surface
BLL	Blood Lead Level
BRAC	Base Realignment and Closure
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act [as amended]
CFR	Code of Federal Regulations
COC	Chemical of Concern
COPC	Chemical of Potential Concern
CS	Confirmation Study
CSF	cancer slope factor
CSM	conceptual site model
CTE	Central Tendency Exposure
CZMA	Coastal Zone Management Act
DEC	[RIDEM] Direct Exposure Criteria
DFSP	Defense Fuel Supply Point
DGA	Data Gaps Assessment
DO	dissolved oxygen
DoD	Department of Defense
DRO	Diesel Range Organics
ED	Exposure Duration
EDI	Estimated Daily Intake
EPA	United States (U.S.) Environmental Protection Agency
EPCs	Exposure Point Concentrations
ERA	Ecological Risk Assessment
FFA	Federal Facility Agreement
FOD	frequency of detection
FS	Feasibility Study
GRO	Gasoline-Range Organics
HHRA	Human Health Risk Assessment
HI	Hazard Index
HQ	Hazard Quotient
IAS	Initial Assessment Study

IDW	Investigation derived waste
IEUBK	Integrated Exposure and Uptake Biokinetic
ILCR	incremental lifetime cancer risk
IRIS	Integrated Risk Information System
IUR	inhalation unit risk
LOAEL	Lowest Observed Adverse Effects Level
LTM	long-term monitoring
LUC	land use control
mg/kg	milligram(s) per kilogram
MNA	monitored natural attenuation
MOA	Mode of Action
MRP	Munitions Response Program
NAVSTA	Naval Station
NCP	National Oil and Hazardous Substances Pollution Contingency Plan, or National Contingency Plan
NETC	Naval Education and Training Center
NFA	no further action
NOAEL	No Observed Adverse Effects Level
NPL	National Priorities List
NTCRA	non-time critical removal action
NUSC	Naval Undersea Systems Center
NUWC	Naval Undersea Warfare Center
OFFTA	Old Fire Fighting Training Area
O&M	operation and maintenance
ORP	oxidation-reduction potential
OU	Operable Unit
PAH	polycyclic aromatic hydrocarbon
PCB	polychlorinated biphenyl
PPE	personal protective equipment
PRG	Preliminary Remediation Goal
PV	present value (a.k.a. present worth)
RAB	Restoration Advisory Board
RACR	remedial action closeout report
RBA	Relative Bioavailability
RAO	Remedial Action Objective
RD	Remedial Design

RfC	reference concentration
RfD	reference dose
RGs	Remediation Goals
RI	Remedial Investigation
RIDEM	Rhode Island Department of Environmental Management
RI CRMC	Rhode Island Coastal Resources Management Council
RME	Reasonable Maximum Exposure
ROD	Record of Decision
RV	recreational vehicle
SARA	Superfund Amendments and Reauthorization Act
SEV	Screening Ecotoxicity Values
SI	Site Investigation
SRA	Screening Risk Assessment
SVOC	Semivolatile Organic Compound
SWOS	Surface Warfare Officers School
TBC	“to be considered”
TCLP	Toxicity characteristic leaching procedure
TPH	Total petroleum hydrocarbon
TRV	Toxicity Reference Value
TSCA	Toxic Substances Control Act
TSDF	Treatment, Storage, and Disposal Facility
UCLs	Upper Confidence Limits
U.S.	United States
UU/UE	unlimited use and unrestricted exposure
VOC	volatile organic compound

1.0 DECLARATION

1.1 SITE NAME AND LOCATION

Munitions Response Program (MRP) Site 1 – Former Carr Point Shooting Range, also identified as Operable Unit (OU) 9, is a former recreational skeet-shooting range in the northern portion of the Naval Station (NAVSTA) Newport facility, located in Portsmouth, Rhode Island. This Record of Decision (ROD) addresses contaminated soils, groundwater, and sediment at MRP Site 1. A discussion of historical investigations at MRP Site 1 and neighboring Site 22 is provided in Section 2.2. This is the final ROD for MRP Site 1, which addresses all conditions that present an unacceptable risk to human health and the environment. NAVSTA Newport, formerly identified as the Naval Education and Training Center (NETC), has been assigned United States (U.S.) Environmental Protection Agency (EPA) Identification (ID) number RI6170085470.

1.2 STATEMENT OF BASIS AND PURPOSE

This decision document presents the Selected Remedy for soil, groundwater, and sediment at MRP Site 1 – Former Carr Point Shooting Range, OU9, as chosen by the Navy and EPA in accordance with provisions of the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) (*42 U.S.C. §9601 et seq),* as amended by the Superfund Amendments and Reauthorization Act (SARA), and to the extent practicable, the National Oil and Hazardous Substances Pollution Contingency Plan (NCP) (*40 C.F.R. Part 300)*. This decision is based on the Administrative Record file as listed in the Detailed Administrative Record Reference Table presented at the end of this ROD. The State of Rhode Island concurs with the Navy and EPA on the Selected Remedy for MRP Site 1 – Former Carr Point Shooting Range (OU9) (see Appendix A).

1.3 ASSESSMENT OF SITE

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; and from actual or threatened releases of pollutants or contaminants from this site which may present an imminent and substantial endangerment to public health, welfare or the environment. A CERCLA action is required because the **human health risk assessment (HHRA)** determined that there is unacceptable risk to human health posed by the concentrations detected in soil and groundwater at the site. An unacceptable risk was identified for concentrations of polychlorinated biphenyls (PCBs), semi-volatile organic compounds (SVOCs; primarily polycyclic aromatic hydrocarbons [PAHs]), 4,4'-DDT, arsenic, and chromium in surface and subsurface soil for potential future hypothetical residents and future on-site workers. An unacceptable risk under current and future scenarios for adolescent trespassers and recreational users was identified for concentrations of lead and PCBs in surface soil. Concentrations of PCBs in surface and subsurface soil also presented an unacceptable risk to future construction workers. Concentrations of manganese and cobalt in groundwater underlying MRP Site 1 pose potential unacceptable risks based on a future residential drinking water scenario. No unacceptable human health risks were identified for exposure to contaminated sediments (including shoreline media below the high tide line) or for consumption of shellfish exposed to sediment contamination.

The **ecological risk assessment (ERA)** identified a potential ecological risk for terrestrial vegetation and soil invertebrates, small mammals and birds (primarily due to ingestion of soil invertebrates), sediment invertebrates, and waterfowl. Risks identified for terrestrial vegetation and soil invertebrates in the upland

portion of the site were limited to localized areas within MRP Site 1. Concentrations of PCBs and pesticides driving the identified potential risks were found in the southwest upland shoreline portion of MRP Site 1 along the boundary with Site 22 (boundary shown on Figure 2), while elevated PAHs were found along the western fence along the upland shoreline. Potential upland risks to small birds and mammals were identified due to exposure to **Chemicals of Potential Concern (COPCs)**, including antimony, 4,4'-DDT, and PCBs in soils in the upland portions of MRP Site 1, but these risks were driven by concentrations found in a limited area of MRP Site 1 (along the upland shoreline adjacent to Site 22). Potential risks to benthic invertebrates were identified along the shoreline due to levels of lead detected in sediments in a limited subset of locations that exhibited toxicity in testing conducted during the completion of the ERA. Potential risks to diving ducks were identified due to the potential ingestion of a lead pellet in sediment. In addition, potential risks due to manganese and total PCBs in a limited area located just beyond an outfall from a former drain line running through the center of the vehicle storage area associated with adjacent Site 22 Carr Point Storage Area were identified.

1.4 DESCRIPTION OF SELECTED REMEDY

The major components of the Selected Remedy for soil and groundwater at MRP Site 1 – Former Carr Point Shooting Range (OU 9) include the following:

- Soil excavation and off-site disposal of contaminated soil in select areas containing exceedances of Rhode Island Department of Environmental Management (RIDEM) Remediation Regulation GA Leachability Criteria and human health and ecological Remedial Goals (RGs). This will include the removal and off-site disposal of concrete and other large debris observed along the shoreline (prior to shoreline embankment restoration) to facilitate soil excavation, and regrading of the surface to support continued use for recreational purposes.
- Installation of an asphalt (or equivalent layer) and soil cover to prevent direct contact with, as well as erosion and transport of, remaining soil exceeding RGs.
- Slope and soil stabilization to protect the cover using geotextile membrane, soil and rip rap for stability. The remedial action will be designed to prevent future migration of soil chemicals to neighboring surface water and sediment, and to limit environmental impacts, physical or otherwise, during and after construction efforts. The design will ensure no net loss of beach or flood storage and will include storm and sea level rise considerations. The remedy will be designed to withstand a 500-year storm and will meet substantive requirements of the Coastal Zone Management Act (CZMA).
- Long-term monitoring (LTM) of the cover, with additional monitored natural attenuation (MNA) associated with groundwater contaminants, including installation of monitoring wells for additional groundwater sampling and assessment (until groundwater cleanup standards are achieved). MNA has been estimated to take approximately 33 years to achieve the groundwater cleanup standards. MNA for each COC must occur as projected with appropriate assessment and reporting of conditions.
- Land use controls (LUCs) will be used to maintain cover protectiveness and to prevent use of the site for residential purposes while maintaining the current recreational use; require that any future work on the stabilized slope does not cause or result in a future release; and prevent the potable use of groundwater while groundwater Chemical of Concern (COC) concentrations are above RGs and include protection of existing monitoring wells.

The major components of the Selected Remedy for sediment at MRP Site 1 – Former Carr Point Shooting Range (OU9) include the following:

- Removal of offshore sediment containing lead above ecological RGs and lead pellets to reduce the risks from direct exposure to sediment and ingestion of lead pellets by ecological receptors.
- Removal of nearshore sediment (including near Outfall 2 at Site 22 Carr Point Storage Area) containing exceedances of ecological RGs.
- Limited backfill and grading along the shoreline, as necessary, to restore the shallow gradient that exists and mitigate steep changes in grade that may result from excavation activities.
- Dewatering of excavated sediment; treatment of water generated from the dewatering prior to discharge back to the Bay, as required; potential screening of lead pellets for off-site recycling; and off-site disposal of the excavated sediment.

Under the Selected Remedy, potential unacceptable human and ecological exposures to contaminated soil, groundwater, and sediment at MRP Site 1 will be eliminated through the combination of limited soil excavation and off-site disposal, installation of clean cover materials, slope stabilization, MNA for groundwater, select removal of impacted sediment, and LUCs. For sediment, a submerged aquatic vegetation survey of the remediation area will be conducted as part of remedial design activities (prior to initiation of the remedial action) for identification of protections needed during remedial actions as well as necessary restoration activities, in accordance with the ARARs. Following completion of sediment removal, sediment sampling within the remedial action will be conducted to evaluate the effectiveness of the remedial action in meeting RGs. Note that for soil and sediment excavation, discrete confirmatory sampling and analyses will be conducted in accordance with RIDEM policy to demonstrate compliance with the ROD cleanup criteria. These actions will also be supported by site inspections and five-year reviews as well as maintenance of the installed soil cover and slope stabilization.

Implementation of this remedy will allow for reuse similar to existing conditions, which includes use as a recreational vehicle (RV) campground for Navy and Department of Defense (DoD) personnel (refer to Section 2.8 for more details on current site use), as well as allowing the return of ecological functions without restrictions for the beach and sediment areas. The remedy is consistent with the overall cleanup strategy for NAVSTA Newport of restoring sites to support base operations, while ensuring protection of human health and the environment.

Note also that both CERCLA and CZMA strongly encourage early and active coordination between the federal agency and the relevant state agencies. The Navy will therefore continue its history of coordinating with RI CRMC through the remedial action for its sediment project work.

1.5 STATUTORY DETERMINATIONS

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

The Selected Remedy does not satisfy the statutory preference for treatment as a principal element of the remedy for the following reasons: 1) treatment options were less cost effective than other viable process options for remediating soils and groundwater, and 2) the fact that no source materials constituting principal threats have been identified at the site.

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 (UU/UE), a statutory review of the OU9 remedy will be conducted as part of the Base-wide CERCLA Five Year Review (the latest having been issued in December 2019), which is conducted at a minimum every 5 years, to ensure that the Selected Remedy is, or will be, protective of human health and the environment.

Human health and ecological risk assessments were conducted using CERCLA risk assessment methods and guidance. Accordingly, and based on the provisions of 40 Code of Federal Regulations (CFR) § 761.61(c), EPA has determined that the risk-based RGs for PCBs in soil and sediment developed for MRP Site 1 and the remedial measures selected to address risks posed by PCB-contaminated soil and sediment will meet the no unreasonable risk of injury standard in accordance with § 761.61(c) as described in Section 2.15 (Compliance with Applicable or Relevant and Appropriate Requirements (ARARs)) of this ROD.

Federal regulations that pertain to the cleanup require a determination that there is no practicable alternative to taking 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 aquatic 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 (excavation) of sediment, the removal of the contaminants through excavation will have long-term positive impacts on the marine environment. The Navy has also determined that short-term alteration of land within the 500-year floodplain is necessary to address contaminant risks, but that mitigation measures will be taken, as required, to address short-term impacts, while long-term impacts will be addressed by designing, constructing, and maintaining the asphalt (or equivalent layer) and soil cover to prevent the release of any underlying contamination in the event of up to a 500-year storm event. Note that there will be no net loss of flood storage capacity as the mean restoration grades will generally meet the mean existing grades, with some enhanced sloping for improved drainage, flood resiliency, and shoreline protection.

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 (then click Administrative Records; note that this link is case sensitive).

If contamination resulting from a CERCLA release and posing an unacceptable risk to human health or the environment is discovered after execution of this ROD, the Navy will undertake the necessary actions to ensure continued protection of human health and the environment.

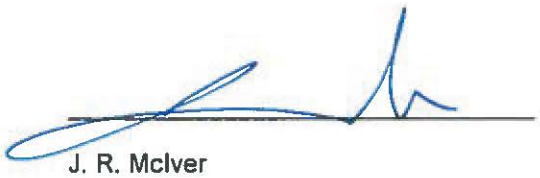
TABLE 1-1. ROD DATA CERTIFICATION CHECKLIST	
DATA	LOCATION IN ROD
Chemicals of concern (COCs) and their respective concentrations	Sections 2.7 and 2.9
Baseline risk represented by the COCs	Section 2.9
Remediation Goals (RGs) established for COCs and the basis for these levels	Section 2.10
How source materials constituting principal threats are addressed	Section 2.13
Current and reasonably anticipated future land use assumptions used in the risk assessment	Section 2.8
Potential land uses that will be available at the site as a result of the Selected Remedy	Section 2.14.3
Estimated capital, operation/operating and maintenance (O&M), and total present value (PV) costs; discount rate; and number of years over which the remedy costs are projected	Tables 2-7 and 2-8 and Appendix B
Key factors that led to the selection of the remedy	Section 2.14.1

1.7 AUTHORIZING SIGNATURES

1.7.1 Navy Signature

The signature provided below validates the Selected Remedy for MRP Site 1 – Former Carr Point Shooting Range (OU9), located at NAVSTA Newport in Portsmouth, Rhode Island, by the Navy and EPA. RIDEM concurs with the Selected Remedy, as indicated in Appendix A of this ROD.

Concur and recommend for implementation:



9/23/20

J. R. McIver
Captain, U.S. Navy
Commanding Officer
Naval Station Newport, Rhode Island

Date

1.7.2 EPA Region 1 Signature

The signature provided below validates the Selected Remedy for MRP Site 1 – Former Carr Point Shooting Range (OU9), located at NAVSTA Newport in Portsmouth, Rhode Island, by the Navy and 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 RGs for PCBs in soil and sediment developed for MRP Site 1 and the remedial measures selected to address risks posed by PCB- contaminated soil and sediment will meet the no unreasonable risk of injury standard in accordance with § 761.61(c) as described in Section 2.15 of this ROD. EPA reserves its right to modify this § 761.61(c) determination and/or to require additional remedial measures in the event of changes in site conditions or use, review of long-term monitoring results, or if any new information is presented that indicates these measures are no longer effective, including the discovery of additional PCB contamination or previously unknown conditions.

Concur and recommend for implementation:

BRYAN OLSON

Digitally signed by BRYAN OLSON
Date: 2020.09.30 10:03:10 -04'00'

_____ _____

Bryan Olson Date
Director, Superfund and Emergency Management Division
United States Environmental Protection Agency Region 1 – New England

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). 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.

NAVSTA Newport is an active military training facility and is expected to remain active for the foreseeable future. Fifty Navy, Marine Corps, Coast Guard, and US Army Reserve commands and activities 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. NAVSTA Newport has undergone a period of significant growth as a result of the 2005 Base Realignment and Closure (BRAC) recommendations. The major commands located at the NAVSTA facility include the Officer Training Command Newport, the Surface Warfare Officers School Command, the Naval Justice School, NUWC, Naval War College, and others.

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 responsibilities from NETC.

MRP Site 1 – Former Carr Point Shooting Range is situated within a coastal portion of NAVSTA Newport. It consists of approximately 4 acres of upland area along an estimated 500-foot bank of Narragansett Bay, located in Portsmouth, Rhode Island. Additionally, MRP Site 1 encompasses approximately 9 acres of offshore sediment within the adjacent East Passage of Narragansett Bay.

The site is bordered by Site 22, the Former Carr Point Storage Area, to the south, recreational baseball fields to the north, inactive railroad tracks and former Tank Farm 4 to the southeast, and the East Passage of the Narragansett Bay to the west. Refer to Figure 2 for the MRP Site 1 Study Area with surrounding sites and Figure 3 for site features and topography.

MRP Site 1 was formerly a recreational skeet-shooting range. From 1967 to 1973, the former Carr Point Shooting Range was used by Navy personnel and from 1975 to 1989, the facility was used by the Aquidneck Island Military Rod and Gun Club. Small Arms (i.e., shotguns) were discharged at moving targets (i.e., clay pigeons) over Narragansett Bay (see Figures 2 and 3). Remnants of the historical firing area still exist on-site (concrete pads, walkways, etc.) and historical records indicated the presence of three firing arcs and fans. The “arcs” refer to onshore areas where participants fired at the targets, and the “fan” refers to the landing areas

that were impacted by the lead shot (pellets) and target fragments (i.e., clay pigeons). The firing fans are primarily offshore; however, a portion of the firing fan overlaps with the shoreline and upland portion of the southwest corner. The area of target fragment and lead pellet accumulation ("target area") is estimated to extend about 300 feet from the shooting area and the downrange area of lead pellet accumulation ("overshoot area") extends another 600 feet beyond the target area. However, it should be noted that a minimal amount of lead pellets has been found beyond 600 feet from the shooting area. Refer to Figure 2 for the approximate layout of the former firing fan.

At the end of the access road which runs adjacent to Site 22 on the southwest side of the site, an area (see the label "Pole 45" on Figure 2) was filled in the 1960s, according to historical information. The source or type of fill was not documented. The area is also immediately adjacent to the former material storage area of Site 22; materials stored there included PCB transformers among other containers and drums.

Buildings that historically existed at or very near MRP Site 1 included Building 187 (Fire House), Building 213 (Fire Auxiliary Headquarters), and Building 233 (Club House), as well as buildings shown but not identified on historical utility drawings provided by the Navy. No buildings are currently present at MRP Site 1. Building 233 was the final building to be removed. It was demolished on March 15, 2011 as part of a non-time critical removal action (NTCRA). The former buildings are presented on Figure 3.

2.2 Site History and Enforcement Activities

Previous environmental investigations designed to evaluate environmental quality at the Former Carr Point Shooting Range are summarized in Table 2-1. Data evaluation indicated concentrations of contaminants in soil, groundwater, and sediment that exceed acceptable risk levels or state regulatory standards and background concentrations. The nature and extent of contamination is discussed in Section 2.7.

Table 2-1. Previous Investigations And Site Documentation

Investigation	Date	Description
National Priorities List (NPL) listing	1989	NAVSTA Newport (NETC at the time) was added to the National Priorities List.
Water Area Munitions Study (WAMS)	2003-2005	A Water Area Munitions Study (WAMS) was conducted for MRP Site 1, including a review of information from research and personal interviews related to historical conditions and site activities, and a visual survey for any evidence of munitions and explosives of concern (MEC) and munitions constituents (MC). A site inspection was recommended for soil due to the possibility of lead in soil along with other potential constituents related to the shooting range activities.
Site Investigation (SI)	2009-2010	A Site Investigation (SI) was performed under RIDEM Remediation Regulation and included investigation activities at MRP Site 1 and the adjacent Site 22. At MRP Site 1, soil and groundwater samples were collected for volatile organic compounds (VOCs), semi-volatile organic compounds (SVOCs), pesticides, PCBs, metals, and total petroleum hydrocarbons (TPH) – diesel range organics (DRO) and gasoline range organics (GRO) at limited locations. Additional soil samples were collected for lead and PAH analysis, as well as for propellants and SVOCs (including PAHs). Sediment samples were collected and sieved for counting of lead pellets and for analysis of PAHs and metals. Based on the results of the SI, elevated concentrations of PAHs and metals were detected in surface soil; elevated concentrations of PAHs were detected in subsurface soil;

TABLE 2-1. PREVIOUS INVESTIGATIONS AND SITE DOCUMENTATION		
INVESTIGATION	**DATE**	**DESCRIPTION**
		and elevated concentrations of PAHs and metals and lead pellets were detected in sediment in the firing fan.
Focused Risk Assessment	2010	A Focused Risk Assessment was conducted using the surface soil data from the SI and potential risks to human health were identified, most significantly near the shoreline. Based on the outcome of the risk assessment, a **Time Critical Removal Action (TCRA)** was performed to construct a 6-foot high chain link fence to limit access to the areas with PAH concentrations above the risk levels.
Non-Time Critical Removal Action (NTCRA)	2013	An NTCRA was performed to remove approximately 1,780 cubic yards of the most impacted soils from the former shooting range launching area. Excavation was conducted to a depth of 1 foot across the areas and based on confirmation sampling for PAHs and lead, excavation continued to a depth of 2 feet below surface grade in some areas (See Figure 3 for the excavation extent).
Remedial Investigation (RI)	2013-2014	An RI was performed to refine the extent of historical releases, as well as quantify potential risks posed by site contamination. Additional soil, sediment, and groundwater sampling was conducted. The RI Report included a **Human Health Risk Assessment (HHRA)** that indicated unacceptable risks to human health through exposure to chemicals of concerns (COCs) in soil and groundwater and an **Ecological Risk Assessment (ERA)** that indicated a potential unacceptable risk from exposure to COCs in surface soil and sediment.
Feasibility Study (FS)	2016-2018	Two separate FSs were completed for MRP Site 1. One FS focused on remedial alternatives for impacted soil and groundwater (finalized in September 2018), and the other FS evaluated remedial alternatives for impacted sediment (finalized in October 2018). During the FS, additional soil and groundwater data were collected and assessed from November 2016 to June 2017. This Soil and Groundwater Data Gaps Analyses (DGA) was performed to supplement the data collected during the RI, and to support the FS and Remedial Design RD). The FS identified preliminary remediation goals (PRGs), screened potential remedial technologies, and developed and evaluated remedial alternatives for soil and groundwater at MRP Site 1. The final soil and groundwater FS included detailed evaluation of three remedial alternatives to address contamination in soil and two remedial alternatives to address contamination in site groundwater. The final sediment FS included detailed evaluation of three remedial alternatives to address contamination in sediment.

Additional information is provided in the Detailed Administrative Record Reference Table included before the appendices at the end of this ROD.

Note that there have been no past or pending enforcement actions pertaining to the cleanup of MRP Site 1 – Former Carr Point Shooting Range (OU9).

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). Note that this address is case sensitive.

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. MRP Site 1 – Former Carr Point Shooting Range (OU9) 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 online information repository referenced above and in information repositories in the Middletown, Portsmouth, Jamestown, and Newport public libraries. For additional information about the Environmental Restoration Program at NAVSTA Newport, contact Mr. David Dorocz, Environmental Office, 1 Simonpietri Drive, NAVSTA Newport, Newport, Rhode Island, 02841 (david.dorocz@navy.mil).

In accordance with Sections 113 and 117 of CERCLA, the Navy provided a public comment period from March 6 to April 5, 2019, for the proposed remedial action described in the Proposed Plan for MRP Site 1 (OU9). A public meeting to present the Proposed Plan was held on March 20, 2019, 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 March 6 and 9, 2019. 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 is provided in Appendix E. Written comments were received during the 30-day comment period. The Navy's Responsiveness Summary is presented in Section 3.0 of this ROD.

2.4 SCOPE AND ROLE OF OPERABLE UNIT

MRP Site 1 – Former Carr Point Shooting Range (OU9) is part of a comprehensive environmental investigation and cleanup program currently being performed at NAVSTA Newport under CERCLA authority pursuant to the Federal Facility Agreement (FFA) dated March 23, 1992. Due to the history of munitions use, the CERCLA activities at MRP Site 1 are completed under the Navy Munitions Response Program.

Investigations at MRP Site 1 have indicated the presence of soil, groundwater, and sediment contamination that poses an unacceptable risk to current and potential future human receptors and ecological receptors. Note that sediment impacts near Outfall 2 at neighboring Site 22 have been included in the remedial action for MRP Site 1 and are incorporated into the sediment remedy. COCs associated with Site 22 are discussed in Section 2.10 along with MRP Site 1.

Consistent with the agreed-upon approach in the 2013 Risk Assessment Work Plan Technical Memorandum for the Former Carr Point Shooting Range, surface water data was not collected nor evaluated for human health or ecological receptors because contact with surface water is not considered to be a complete exposure pathway for the majority of NAVSTA Newport Sites. Exposure to surface water in Narragansett Bay is not considered to be a significant pathway of exposure to site-related chemicals for site receptors due to the tidal influence (i.e., dilution and various transport mechanisms; Resolution, 2013).

Previous actions taken in response to the contamination at MRP Site 1 are summarized in Table 2-1. The remedy documented in this ROD will achieve the Remedial Action Objectives (RAOs) for soil, groundwater, and

sediment at MRP Site 1, as listed in Section 2.10. Implementation of this remedy will allow for reuse similar to existing conditions and is consistent with the overall cleanup strategy for NAVSTA Newport of restoring sites to support base operations, while ensuring protection of human health and the environment.

Note that a separate, similar remedial action has been selected in a Record of Decision for soil and groundwater on neighboring Site 22 (NAVFAC, 2020). Furthermore, a remedial action is being developed for the former Cable Tap-Off Structure which is located on the eastern portion of MRP Site 1 (see Figure 3). This area is associated with electrical infrastructure on Tank Farm 4, and therefore, will be addressed as part of Tank Farm 4 response actions. Any required remedial actions for each of these areas will be coordinated during their respective planning stages when it is feasible to do so. Any coordinated activities will be described in the respective remedial designs to be reviewed by EPA and RIDEM.

2.5 PHYSICAL CHARACTERISTICS

A brief discussion of the physical characteristics of the site is provided below based on information provided in the RI Report (Resolution, 2015a).

The topographic profile of the Carr Point area is generally level with a mean elevation of approximately 25 feet above sea level, with embankments and slopes to the shoreline and beach portions. Portions of Carr Point may have historically been filled to level areas for use. For instance, on one plan an area of fill is located in the southwest area of MRP Site 1 boundary, between the site and the Site 22 boundary and its storage area fence line (approximately 10,000 square feet).

Ground cover is a predominately grass with shrubs and small trees along the north, east, and west perimeter. The western slope to the shoreline and the northern boundary are heavily vegetated.

There is also an asphalt driveway the bisects the property, and six gravel parking spaces approximately 100 feet long each for RVs on the site. Water and electric hookups are located adjacent to each of the RV parking spaces. Remnants for former site use, such as a concrete pad and buried utility lines, including a stormwater drain and utility manholes, exist throughout.

There are no inland surface water bodies within the boundary of MRP Site 1. Surface waters in the areas upgradient of the site (land occupied mostly by Tank Farms 3 and 4) drain primarily to Lawton Brook (the nearest inland surface water body located 0.3 miles to the southeast) and Norman's Brook, respectively. The former Carr Point Shooting Range is located in between these areas and overland flow discharges directly to Narragansett Bay.

MRP Site 1 is located within the 100-year (western portion) and 500-year floodplains (entire site) associated with Narragansett Bay. The extents of the floodplain boundaries are shown on Figure 3.

MRP Site 1 is located on the southeastern end of the Narragansett Basin over the Rhode Island formation. The rocks of the Narragansett Basin are non-marine sedimentary rocks of Pennsylvanian age, predominately conglomerates, sandstones, shales, and anthracite.

A dense basal till of silt with little to trace angular gravel is present in a 5 to 8 feet thick layer on the bedrock surface. Above the till is a fine to medium sand, which includes gravel in some locations. A fill layer of sand and gravel also exists, however there is little anthropogenic material (with the exception of a few observations of old asphalt pieces at select borings) and its composition is similar to the underlying fine to medium sand unit which

makes identifying the base of the fill difficult. Little organic matter is present except along the slope between the upland and bay/beach.

The bedrock at MRP Site 1 was encountered at 31 and 42 feet at MW-01D and MW-12D, respectively, and is predominately a weathered Phyllite. This is consistent with the bedrock elevation contours of MRP Site 1 and Site 22.

The measured depth to groundwater ranges from approximately 2.43 (MW-13) to 11.97 (MW-1) feet below ground surface (bgs) with a saturated thickness ranging from 19 to 32 feet over the bedrock surface encountered from 31 to 42 feet bgs. The groundwater becomes much shallower at the interface of the shoreline than along the eastern portion of the site. Overburden groundwater flow direction is to the west northwest toward Narragansett Bay. The groundwater has a propensity to flow upward from the bedrock into the overburden at the site, although a slight downward gradient was observed in a portion of the site during previous sampling.

Groundwater at the site is categorized by RIDEM as GA, suitable for potable use without treatment. Groundwater at the site is not currently being used for potable use, there are no drinking water wells present on site, and the site is served by the municipal water supply.

The shoreline consists of sand, gravel, and cobbles mixed with shell and debris. Some of the debris includes casings and pieces of shooting targets.

The ocean floor of the bay is relatively shallow in the vicinity of Carr Point, approximately 12 to 14 feet deep at 400 feet from the coast, with a gentle slope upwards to meet the shallow sloping coast. The beach itself is also a relatively shallow slope with evidence of swash marks on the sand. The waves range from spilling to moderately plunging, consistent with the shallow morphology of the near-coastal bay and shallow sloping beach. There are no visible or apparent sand bars or other barriers, which allows the wave energy to be concentrated at the coast. The substrate within the site and at reference locations consisted of sand and gravel with larger cobble becoming prominent towards the beach. Large (>1 foot) boulders were noted in several locations and a boulder field was delineated along the southern boundary of the firing fan, which included several larger rock outcrops visible at low tide. Cobbles, pebbles, gravel, and sand have also accumulated along the coast, in addition to the skeet fragments and seashells. The particle size distribution of seashells and skeet fragments is consistent with wave-dominated or tide-dominated shallow coasts. The larger particle sizes are closest to the shore and through the mean low tide zone, with finer particle sizes further upland, at the mean high tide zone.

These local estuary characteristics are consistent with a shallow current pattern that would move the fragments in a southeasterly direction from the bay to their present location south of the former launching area. There is evidence of longshore drift as well, from the north to the south along the coastline, as evidenced by the increased thickness of “shell hash” and fragment accumulation at the southern end of the beach. The local cuspate foreland also impacts the direction of wave energy. The cuspate foreland would be expected to create a pattern of coastal wave divergence to the south. The current characteristics, morphology, prevailing wind, and visual observations are consistent in supporting a conceptual site model (CSM) of skeet fragment transport and accumulation south of the former launching area. Fewer fragments are visible at or north of the former launching area and within the bay itself.

2.6 CONCEPTUAL SITE MODEL (CSM)

Former site uses that are believed to have resulted in contamination at MRP Site 1 include skeet range operations, filling, and other maintenance activities such as electrical transformer storage and weed growth control. The source of contamination related to skeet range operations include painted clay pigeons used as skeet range targets, associated clay pigeon fragments, and lead pellets, which were directly discharged to soil and sediment at the former skeet range areas.

The primary contaminants in soil include PAHs, PCBs, pesticides, and metals (including lead). The primary contaminants in sediment include PAHs and metals, as well as lead pellets, detected in sediment in the target and overshoot areas.

The most elevated concentrations of PAHs are present in soil within the firing arcs, likely due to the dispersion of clay pigeons. PAHs were also detected in sediment samples within the target area and overshoot area, with the highest concentrations located in samples nearest to the shoreline. Other areas of PAH-impacted soils are near asphalt and parking areas.

PCBs are present in soil near former transformers, including the portion of MRP Site 1 immediately adjacent to the former material storage area to the south (Site 22).

Elevated concentrations of lead and other metals in soil in the same area as the elevated PCB concentrations may be due to multiple sources and/or activities, including filling operations to level this portion of MRP Site 1. Lead was detected in sediment within the skeet target area and overshoot area, with the highest concentrations detected nearest to the shoreline. Elevated manganese and PCB concentrations are associated with near-shore sediments near Outfall 2 located on neighboring Site 22. As noted earlier, Site 22 was utilized for storage of transformers and other materials.

Lead pellets (2 to 4-millimeter in size) have been found within the firing fan at distances up to 600 feet from the shoreline. Pellet counts (pellets per cubic foot) in sediment ranged from 0 to 14,100 (0-1 feet deep), 0 to 10,800 (1-2 feet), and 0 to 2,600 (2-3 feet). Pellets were not found in abundance at locations closest to the shoreline, and none were counted beyond 600 feet from shore.

The source of pesticides in soil at MRP Site 1 is not well documented but is likely from the use of insect control and weed mitigation. These activities likely occurred when the firing range was active.

Elevated concentrations of two metals (cobalt and manganese) have been detected in MRP Site 1 groundwater in scattered locations that have not been associated with any specific source of contaminant release. Reducing conditions in groundwater were observed and can cause the increase in concentrations of metals in groundwater. Reducing conditions may exist due to naturally occurring or organic conditions in the subsurface as a result of natural materials (i.e. loam, vegetation decay, etc.) or organic contaminants present at or upgradient of MRP Site 1.

2.7 NATURE AND EXTENT AND FATE AND TRANSPORT OF CONTAMINATION

Past operations at MRP Site 1 – Former Carr Point Shooting Range were found to have resulted in the release of contaminants to surface soil, subsurface soil, groundwater, and sediment. This ROD addresses surface soil, subsurface soil, groundwater, and sediment and serves as the final ROD for MRP Site 1. COPCs were identified as part of the HHRA and ERA presented in the RI report (Section 6.0). COCs were determined after the risk

assessment process, as further discussed in Section 2.10 of this document. A summary of sample results for the MRP Site 1 soil, groundwater, and sediment COCs is presented in Table 2-2. Figure 4 shows soil sample locations that exceeded remedial goals and Figure 5 indicates existing well locations with groundwater concentrations above remedial goals. Figure 6 shows the sediment locations for MRP Site 1 and two Site 22 sediment locations that have exceedances of the selected remedial goals. For a full description of the nature and extent of contamination, refer to the RI reports (Resolution, 2015a/b) and to the discussion of supplemental post-RI data presented in the FS Report (Resolution, 2018a/b).

TABLE 2-2. SUMMARY OF MAXIMUM CONCENTRATIONS OF COCS

ANALYTE	MAX CONCENTRATION[1]	FOD[1]
Surface/Subsurface Soil (mg/kg) – Residential Use Scenario		
Benzo[a]anthracene	65 J	91/128 (71%)
Benzo[a]pyrene	80 J	89/128 (70%)
Benzo[b]fluoranthene	75 J	93/128 (73%)
Benzo[g,h,i]perylene	32 J	85/128 (66%)
Benzo[k]fluoranthene	74 J	80/128 (63%)
Chrysene	81 J	85/128 (66%)
Dibenz[a,h]anthracene	5.5	67/128 (52%)
Fluoranthene	100 J	97/128 (76%)
Indeno[1,2,3-c,d]pyrene	44 J	80/128 (63%)
Naphthalene	3 J	32/128 (25%)
Phenanthrene	86 J	94/128 (73%)
Pyrene	100 J	93/128 (73%)
4,4'-DDT	19 J	4/9 (44%)
Aroclor-1260	270 J	5/11 (45%)
Antimony	396 J	72/80 (90%)
Arsenic	130 J	115/115 (100%)
Chromium, total	34.2 J	115/115 (100%)
Lead	29900 J	127/127 (100%)
Manganese	5750 J	80/80 (100%)
Surface Soil (mg/kg) – Ecological Scenario		
4,4'-DDT	19 J	3/4 (75%)
Total PCBs	270 J	4/5 (80%)
Antimony	396 J	27/27 (100%)
Sediment (mg/kg) – Ecological Scenario		
Total PCBs	0.25	5/6 (83%)
Lead	4290 J	55/55 (100%)
Manganese	2930	6/6 (100%)
Groundwater (µg/L) – Residential Scenario		
Cobalt	9.5	6/6 (100%)
Manganese	1150	6/6 (100%)

Notes:
1. The maximum concentrations and frequencies of detection shown in this table are based on data collected prior to and included in the risk assessments and RI Reports (Resolution, 2015a/b). Supplemental post-RI soil and groundwater data collected in 2016-2017 and included in the FS (Resolution, 2018a/b) is not reflected on this table but was used to refine remedial extents. New maximum detections from 2016-2017 not presented in the table above include:

Soil: Dibenzo[a,h]anthracene – 6 mg/kg at SB410

2. Refer to the FS reports (Resolution, 2018a/b) for full analytical results with comparison to Preliminary Remediation Goals (PRGs). Appendix C in the Soil and Groundwater FS (Resolution, 2018a) includes a figure for each COC with highlighted sample locations representing PRG exceedances.

Max Conc – Maximum Concentration FOD – Frequency of Detection (percent)
mg/kg – milligrams per kilogram µg/L – micrograms per liter
J – the analyte was detected; however, the value is an estimated concentration (+ indicates bias)

2.7.1 Nature, Extent, Fate, and Transport of Contamination in Soil

Soil sampling locations from the RI, the earlier SI, and the post-RI sampling program are shown on Figure 4. The SI and RI data were used to develop a comprehensive conceptual site model to support the remedial action decisions.

PAHs have been encountered in shallow soil and subsurface soils. Locations with elevated concentrations of PAHs in soil include areas along the firing range, between the firing arcs and the shoreline, likely due to the dispersion of clay pigeons. There are visible pieces of targets remaining on the ground. Note that formerly impacted soil within the NTCRA area was excavated and removed. Other PAH-impacted areas are near asphalt and parking areas. Locations with the most elevated concentrations, some 1 to 2 orders of magnitude above most locations, are situated within the firing arcs, a short distance from the firing area along the shoreline. These locations specifically include SB209, SB211, SB212, and SB228, located along the western edge of the area. Additional surface soil samples were collected from 11 locations in the northwest corner of the site in March 2017 to further refine the extent of PAHs in the area of SB228 (SB407 through SB417).

PCBs were detected in soil samples collected near former transformers, including the portion of the site immediately adjacent to the former material storage area to the south (Site 22). PCBs are not considered constituents of concern from shooting operations but were included as part of a comprehensive assessment of potential impacts at the site. An elevated concentration of 270 mg/kg was detected at SB223 (0 to 1 feet) and 18 mg/kg at 3 to 4 feet bgs at that same location. Additional soil samples were collected from eight locations in the southwest corner of the site in March 2017 to further refine the horizontal and vertical extent of PCBs in the area of SB223 (SB401 through SB406, SB223 and OF003). The 2017 sample collected at SB223 was in the 4 to 6 foot depth interval and showed a low detection of PCBs (0.017 mg/kg) compared to that found previously in the shallower intervals (as noted above, 18 mg/kg in the 3 to 4 foot depth interval and 270 mg/kg in the 0 to 1 foot interval).

There were elevated concentrations of lead and other metals in the same area as the elevated PCB concentrations. This area may have been impacted by multiple sources and/or activities, including filling operations to level this portion of the site. Additional soil samples were collected from four locations in the southwest corner of the site in March 2017, three which showed high detections during RI sampling (SB223, SB224, and SB302) and one new one for extent purposes (OF003). Results were lower for the three locations which previously showed high detections.

PCBs present in the soil at MRP Site 1 are likely from the use, maintenance, and storage of transformers and their waste oils on the site several decades ago. Aroclor-1260, the primary Aroclor occurring on site, consists of a mix of generally highly chlorinated PCB congeners with 60% chlorine by mass. PCBs with heavy chlorination tend to be more hydrophobic and immobile than the lower chlorinated congeners. These heavily

chlorinated congeners are also less likely to dechlorinate due to microbial or other mechanisms. The PCBs are not likely to migrate much beyond their current locations.

The source of pesticides (e.g., 4,4'-DDT) in the soil at the site is not well documented but is likely from the use of vector control and weed mitigation. These activities likely occurred when the firing range was active. While the specific chemical properties of pesticides differ slightly, Target Compound List (TCL) pesticides are all organochlorine pesticides and share many of the same properties that govern their environmental fate and transport. Like PAHs and PCBs, pesticides are hydrophobic and therefore tend to bind to soil and sediment particles rather than be freely dissolved in pore waters. They have low vapor pressures and Henry's law constants meaning they are unlikely to readily volatilize under normal conditions.

PAHs are commonly found in the environment, stemming from petrogenic (associated with oils) and pyrogenic (associated with combustion) sources. The PAHs found at the MRP Site 1 are present most likely from the use of clay targets in the firing range area. Skeet or clay targets may contain up to 33% coal tar pitch and petroleum pitch, which are comprised of pyrogenic PAHs. The remaining composition is generally clay such as dolomitic limestone. Pyrogenic PAHs are generally characterized as having low vapor pressures, low water solubility, and high octanol/water partitioning coefficients. As such, PAHs are strongly sorbed to particles, particularly those with high organic carbon content. The potential for wind erosion is present, but the migration of these PAHs via volatilization or leaching is unlikely to be a major transport mechanism. Storm water runoff may also be an avenue of transport of soil contaminants to the neighboring Bay.

In clay targets, the PAHs tend to be stable; adsorbing to the limestone clay, further decreasing their potential transport and availability. Still, additional transport of PAHs may occur as target pieces are further crushed overtime and become wind-blown, are mobilized by wildlife, or mobilized by other mechanical means such as raking and grass mowing.

Most often at small arms firing ranges, lead is the primary risk driver due to the large amount of lead bullets and fragments deposited after years of use. At MRP Site 1, various types of gun ammunition may have been used, although a primary type was the lead-shot filled shotgun casing.

Lead from bullet fragments may be transported by the physical actions of storm water runoff, tidal fluctuation, wave action, and wind. This distribution would tend toward down-wind or down-current distribution. When exposed to moisture, an electrical connection may form causing galvanized corrosion of the metals. The oxidation of lead produces lead hydroxide and carbonate from elemental lead that will form a coating around bullet fragments. The rate of oxidation depends upon several factors including oxidation/reduction potential, pH, and oxygen content of the soil. While the presence of the coating around a bullet fragment limits further weathering, dissolution of the coating material can release lead to the soil. The dissolution of lead in the coating material dependents upon several factors including pH, eH, the presence of carbonate, sulfate, sulfide, phosphate, and chloride, and the organic matter content of the soil. One estimate by Jorgensen and Willems suggests that 1% of the lead in bullet fragments can enter the soil by this method per year (Jorgensen, 1987).

2.7.2 Nature, Extent, Fate, and Transport of Contamination in Groundwater

Common metals (specifically manganese and cobalt) were detected in groundwater at elevated concentrations in several on-site wells (see Figure 5 for existing monitoring well locations and well screen intervals). The concentrations of these metals are somewhat sporadic and do not appear to be attributable to a site-specific activity and/or release. Reducing conditions in the subsurface, based on field data collected, were observed

and such conditions can cause the increase in concentrations of these and other metals in the groundwater. Reducing conditions can be present based on naturally occurring organic materials and from organic compounds released at or upgradient of the site. Concentration ranges and exceedances for these compounds in the most recent sampling round (June 2017) were as follows:

- Cobalt ranged from non-detect (1.0 U µg/L) to 6.58 µg/L, with the highest concentration at MW-01.
- Manganese ranged from 1.7 J µg/L to 1,110 µg/L, with the higher concentrations at MW-12 (1,110 µg/L), MW-12D (808 µg/L), and MW-01D (455 µg/L).

The field parameters measured at MRP Site 1 indicate anaerobic reducing conditions in some of the wells. Low dissolved oxygen (DO) (<1 mg/L), negative oxidation-reduction potential (ORP), and the presence of ferrous iron at wells MW-01D, MW-01, MW-12, and MW-12D are characteristic of anaerobic reducing conditions. Reducing conditions are favorable for metals mobilization and the detections of cobalt and manganese correspond with wells that have these conditions. The remaining wells (MW-11 and MW-13) have higher DO (>1 mg/L) and low levels of ferrous iron indicative of aerobic oxidizing condition. Under oxidizing conditions, manganese and associated cobalt are relatively insoluble. Cobalt and manganese were detected at wells with oxidizing conditions, but at lower levels.

Cobalt occurs in Co+2 and Co+3 valence states. Its presence in groundwater systems is most commonly a function of co-precipitation and/or adsorption by iron and manganese oxide/oxyhydroxide minerals. Similar to arsenic, under reducing conditions, the iron and/or manganese in these minerals is reduced, the minerals dissociate, and the iron/manganese is present as a soluble ion in the water. When the minerals dissolve, the cobalt that is associated with them is also released into the groundwater. Under oxidizing conditions, as the iron and/or manganese form insoluble molecules which are removed from the groundwater, the cobalt is also removed. Cobalt is also affected by sorption to organic carbon. The effectiveness of all these sorption processes can be influenced by a number of factors, including the redox conditions, the pH, the presence of other dissolved ions, and the presence of organic carbon.

Manganese is a common occurrence in New England groundwater, and frequently detected with iron. Both iron and manganese are naturally occurring and rarely anthropogenic; instead, they are derived from the natural soils and geologic materials in the subsurface. Many metals are able to form ions of two or more valence states. Both iron and manganese are both metals that can occur in different valence states (Fe+2, Fe+3, and Mn+2, Mn+4). Both of these ions are affected by redox conditions. In simple terms, when groundwater is aerobic or oxidized, iron and manganese ions will each form molecules that are relatively insoluble. Conversely, under anaerobic or reducing conditions (when there is little or no oxygen in groundwater), they are dissociated and are present as soluble ions in groundwater. Therefore, these constituents tend to be present and mobile in groundwater that is anaerobic, but immobile and not present in groundwater that is aerobic.

2.7.3 Nature, Extent, Fate, and Transport of Contamination in Sediment

The primary source of contamination in sediment at MRP Site 1 is the lead shot from former shooting range activities. The primary release mechanism consists of direct discharge of materials to the sediment at the former shooting range areas.

A total of over 100 sediment samples were collected from dozens of locations within the skeet target and overshoot areas. Samples were collected from shallow locations (0 to 0.5 and 0 to 1-foot bgs) and from deeper locations (1 to 3 feet bgs). See Figure 6 for sediment sample locations.

Lead pellets were found at several sample locations within the skeet target area. Pellets were not found in abundance at locations closest to the shoreline. The majority of lead pellets are within the closest overshoot area, within 600 feet of the shoreline. The distribution of lead pellets is well-delineated on the northern, eastern, and western extents of the former target and overshoot areas. While the southern extent is not fully bound, lead pellet counts are not expected to be higher than the existing southern samples. Lead pellet concentrations (after averaging samples in the 0 to 1-foot depth range) ranged from 0 to approximately 4,700 pellets per square foot.

Lead was detected in samples collected within the skeet target area and the overshoot area. Highest concentrations were located in samples nearest to the shoreline, specifically at sample locations SD101, SD103, SD122, and SD129. Locations SD102, SD122, and SD124 were determined to contain levels of lead toxic to invertebrates as a result of the 28-day sediment toxicity tests described further in Section 2.10.

The majority of lead pellets found at MRP Site 1 are in the marine sediments. Marine sediments have their own unique characteristics that may influence the fate of lead in the pellets. Sediments tend to be oxidizing in the top few inches and reducing in deeper horizons. The oxidizing shallow sediments will tend to corrode the lead pellet, forming an oxidizing surface layer. With time, hydrocerussite mineral deposits will form a coating on the surface, limiting further corrosion. The coating can dissolve and release lead to the sediments as described above. In the deeper, reducing sediment conditions, sulfide produced from reducing bacteria will bind with lead to form galena, a practically insoluble form of lead.

The conditions in the deeper waters of MRP Site 1 are subtidal with depositional sediments. The pellets existing in this area are likely stable under reducing conditions. In the shallow intertidal portion of the shoreline, the constantly changing conditions and continuous disturbance of sand may cause some slow reduction of lead pellets leading to potential migration of low concentrations of lead to fine sediment and surface water. The wave actions in the intertidal area should mobilize lead pellets as well, moving them to the deeper, anaerobic sediment.

At the Site 22 Outfall 2 sediment area, which is included in the remedial action for MRP Site 1, sediment samples were collected from several depths at six locations. VOCs were detected (acetone and carbon disulfide) in 9 of the 24 samples at very low concentrations. SVOCs, primarily PAHs, were detected in nearly all the samples collected, with higher concentrations in the shallow depths. PCBs and pesticides were detected in almost all the samples collected in sediment, but at low concentrations. Metals were detected in all the samples collected, including concentrations of lead, arsenic, and chromium. Mercury was detected in only five of the 24 samples, with four samples being from one location (SD204).

PCBs are generally persistent in the environment, primarily due to their resistance to thermal and other degradation processes, low aqueous solubility and volatility, ability to substantially bioaccumulate in aquatic organisms, and high adsorptive affinity organic matter. They are typically highly resistant to biodegradation and when it does occur, it is a slow process.

PCBs present at MRP Site 1 and Site 22 are likely from the use, maintenance, and storage of transformers and their waste oils on the site several decades ago. Aroclor-1260, the primary Aroclor occurring on site, consists of a mix of generally highly chlorinated PCB congeners with 60% chlorine by mass. PCBs with heavy

chlorination tend to be more hydrophobic and immobile than the lower chlorinated congeners. These heavily chlorinated congeners are also less likely to dechlorinate due to microbial or other mechanisms. The PCBs are not likely to migrate much beyond their current locations, except possibly via erosion of sediment particulates.

2.8 CURRENT AND POTENTIAL FUTURE SITE AND RESOURCE USES

Beginning in 1995, and currently, a portion of MRP Site 1 is used as a RV campground for Navy and Department of Defense (DoD) personnel. An asphalt driveway bisects the property and provides access to six gravel parking spaces to the north, each approximately 100 feet long. Water (municipal) and electric hookups are located adjacent to each of the RV parking spaces. The upland portion of the site includes compacted gravel and a mostly level, partially vegetated surface with dense vegetation along the perimeter. There is an embankment separating the upland area and the shoreline. The shoreline consists of sand, gravel, and cobbles mixed with shell and debris. Some of the debris includes casings and pieces of shooting targets. Although there is a fence at the top of the embankment, there are footpaths around the end of the fence, which may be used to get from the upland area to the shoreline.

The RV Park is open from Memorial Day weekend through October for rental by DoD personnel and active/retired military and their families. While the maximum length of stay per family is typically two weeks, if camp sites are available, that length of stay may be longer. It is not available for use by the general public. Current workers within MRP Site 1 include RV Park management and maintenance workers. East of the asphalt drive is a grassy area that is primarily unused aside from a portable restroom that services the RV Park. Thus, current users are considered as workers, camp site users (unrestricted recreational users), construction workers and trespassers.

In the foreseeable future, MRP Site 1 is expected to continue as a RV campground. There are no plans for residential development of the site; however, hypothetical future residential use of the site was evaluated in the HHRA to determine if restrictions would be necessary (Section 2.9). Thus, future users are considered the same as current users, plus the potential residential user (hypothetically, should no land use controls be put in place).

Drinking water for NAVSTA Newport and most of the residents of Newport, Portsmouth, and Middletown is supplied and managed by the Newport Water Department, which receives its water supply from a series of seven surface water reservoirs located on Aquidneck Island and two surface water reservoirs on the mainland. MRP Site 1 is not within the watershed of any of the area supply reservoirs. Private wells located within 3 miles of NAVSTA Newport provide drinking water to approximately 4,800 of the estimated 10,000 people that live within 3 miles of NAVSTA Newport (Tetra Tech, 2004). Due to the near-coastal location, groundwater at MRP Site 1 is downgradient of any potential or existing water sources.

Groundwater movement in the overburden across the site is dominated by horizontal flow to the west and northwest toward Narragansett Bay. Groundwater at the site is categorized by RIDEM as GA, suitable for potable use without treatment, and EPA considers the aquifer as drinking water. However, groundwater at the site is not currently being used for potable use, there are no drinking water wells present on site, and the site has access to the municipal water supply.

2.9 SUMMARY OF SITE RISKS

A baseline risk assessment was performed to estimate the probability and magnitude of potential adverse human health and environmental effects from exposure to contaminants associated with the site assuming no remedial action was taken. It provides the basis for taking action and identifies the contaminants and exposure pathways that need to be addressed by the remedial action. The baseline health risk assessment followed a four step process: 1) hazard identification, which identified those hazardous substances which, given the specifics of the site, were of significant concern; 2) exposure assessment, which identified actual or potential exposure pathways, characterized the potentially exposed populations, and determined the extent of possible exposure; 3) toxicity assessment, which considered the types and magnitude of adverse health effects associated with exposure to hazardous substances, and 4) risk characterization and uncertainty analysis, which integrated the three earlier steps to summarize the potential and actual risks posed by hazardous substances at the site, including **carcinogenic and non-carcinogenic risks** and a discussion of the uncertainty in the risk estimates. A summary of those aspects of the human health risk assessment which support the need for remedial action is discussed below followed by a summary of the environmental risk assessment.

2.9.1 Human Health Risk Assessment

The quantitative HHRA was conducted using chemical concentrations detected in soil, groundwater, sediment, and shellfish tissue at MRP Site 1. Key steps in the risk assessment process included identification of COPCs, exposure assessment, toxicity assessment, and risk characterization. Tables summarizing data used in the HHRA and the associated results for primary risk drivers and pathways are included in Appendix C. Data and results for **receptors**, exposure pathways, and exposure units that were not risk drivers can be found in the RI Report (Resolution, 2015a). Note ecological risk assessment information is presented in 2.9.2 below.

Hazard Identification

Twenty of the approximately 56 chemicals detected in soil, groundwater, sediment, and shellfish tissue at MRP Site 1 were selected in the HHRA as COPCs. The COPCs were selected to represent potential site-related hazards based on toxicity, concentration, and mobility and persistence in the environment and can be found in Tables 2-1 through 2-6 of the HHRA (presented as Appendix A of the RI Report) (Resolution, 2015a). From this, a subset of chemicals were identified in the FS as presenting a potential unacceptable current or future risk and are referred to as the COCs in this ROD and summarized in Appendix C Tables C-1 through C-14 for surface soil, surface/subsurface soil, and groundwater (risks associated with human exposures to sediment and shellfish tissue were determined to not be actionable). These tables contain the Exposure Point Concentrations (EPCs) used to evaluate the reasonable maximum exposure (RME) scenario in the HHRA for the COCs. Estimates of average or central tendency exposure (CTE) concentrations for the COCs and all COPCs can be found in Tables 3-1, 3-2, 3-5, 3-7, and 3-8 of the HHRA (presented as Appendix A of the RI Report) (Resolution, 2015a).

Exposure Assessment

As part of the risk assessment included in the RI, assessment to various exposures are considered. These include current exposures that are based on existing conditions; therefore, current users are recreational users, site workers, trespassers and construction workers. Future exposures are also considered based on reasonable possible site use. Future users are site workers, construction workers, trespassers, recreational user and a

hypothetical resident. Together, these exposures are included in the assessment of risks and, ultimately, the remedy is designed to mitigate the associated risks for each of the future users.

Current and potential future site-specific pathways of exposure to COPCs were determined. Current exposure estimates are used to determine whether a threat exists based on existing exposure conditions at the site. Future exposure estimates are used to provide decision-makers with an understanding of potential future exposures and threats and may include a qualitative estimate of the likelihood of such exposures occurring. The extent, frequency, and duration of current or future potential exposures (also termed current and future users) were estimated for each pathway. From these exposure parameters, a daily intake level for each site-related chemical was estimated as described in the RI (Appendix A HHRA) and also in the FS (Appendix A Calculations of PRGs for MRP Site 1).

The upland portion of MRP Site 1 is currently used as a recreational vehicle (RV) campground for DoD personnel and has been used for camping since 1995. There are no existing buildings on site. The RV Park is open from Memorial Day weekend through October for rental by DoD personnel and active/retired military and their families. The park is not available for use by the general public. Other Navy personnel present at the MRP Site 1 include RV Park management and maintenance workers.

The upland portion of MRP Site 1 is mostly level and partially vegetated with dense vegetation along the perimeter. The entire site lies within the 500-year coastal floodplain of the Bay, with a portion of the site also located within the 100-year coastal floodplain. An embankment and fence separate the upland area and the shoreline. There are footpaths around the end of the fence that connect the upland area to the shoreline. The shoreline consists of sand, gravel, and cobbles mixed with shell and some miscellaneous debris. Some of the debris includes shotgun shell casings and pieces of shooting targets. The ocean floor of the bay is relatively shallow in the vicinity of Carr Point, approximately 12 to 14 feet deep at 400 feet from the coast, with a gentle slope upwards to meet the shallow sloping coast.

Groundwater at the site is not currently being used for potable use, there are no drinking water wells present on site, and the site is served by the municipal water supply. However, for purposes of the HHRA, it was assumed that potable wells could be installed under a hypothetical future use scenario.

For future land-use scenarios, it is assumed that there would be some level of construction to convert the area to the desired use. Therefore, it is assumed that current subsurface soils may be brought to the surface and become available for exposure by future receptors.

The following is a brief summary of the exposure pathways that were found to present a potential unacceptable risk (Incremental Lifetime Cancer Risk [ILCR] greater than 10^{-4} or a Hazard Index [HI] >1) at the site. A more thorough description of all exposure pathways evaluated in the risk assessment including estimates for the CTE exposure scenario and evaluations related to sediment direct contact and shellfish tissue ingestion, can be found in Section 4.2 and on Tables 4-1 through 4-8 of the HHRA (presented as Appendix A of the RI Report) (Resolution, 2015a). Exposure factors presented below are the same as those used to estimate potential risks and hazards in the HHRA, except as noted below. [1]

[1] The HHRA was completed in March 2015. In September 2015, EPA revised a 2014 Directive to update standard default exposure factors and frequently asked questions associated with these updates (located online at http://www.epa.gov/risk/superfund-risk-assessment-human-health-topics; items #22 and #23 of this web link, under “Exposure Assessment”). Three updates, an increase in the default worker

The following exposure pathways were found to present a potential unacceptable risk at MRP Site 1:

- Current Recreational User (adult and young child) with exposure to surface soil (by ingestion, dermal contact, and inhalation of fugitive dust).[2]
- Current/Future Trespasser (adolescent) with exposure to soil (by ingestion, dermal contact, and inhalation of fugitive dust).[3]
- Current/Future Construction Worker with exposure to soil (by ingestion, dermal contact, and inhalation of fugitive dust).[4]
- Future Onsite Worker with exposure to soil (by ingestion, dermal contact, and inhalation of dust).[5]
- Future Resident (adult and young child) with exposure to soil (by ingestion, dermal contact, and inhalation of fugitive dust). [6]
- Future Resident (adult and young child) with exposure to untreated site-wide groundwater (by ingestion and dermal contact).[7]

---

body surface area (from 3,470 cm^2 to 3,527 cm^2) and decreases in the default adult and child resident water surface areas (from 20,900 cm^2 and 6,378 cm^2 to 19,652 cm^2 and 6,365 cm^2, respectively), had not been accounted for in the HHRA. However, these updates would not change the results of the HHRA. Another update, inclusion of volatilization factors (VFs) for chemicals previously not considered volatile, had not been accounted for in the HHRA. Similarly, these VFs would not change the results of the HHRA. Revised values have been used during development of risk-based RGs, as appropriate.

[2] For current recreational user soil exposures, EDs of 20 years and 6 years, respectively, were presumed for an adult and young child. Body weights of 80 kg and 15 kg were used for the adult and young child, respectively. Dermal contact was assumed with 6,032 cm^2 of surface area for the adult and 2,373 cm^2 for the young child. An exposure frequency of 14 days/year was used for a combined ED of 26 years (note that a longer exposure frequency of a full year was assumed during cleanup level development, hence the Navy will manage risks to recreational users in a similar manner as potential residents [see Section 2.9.3]). Inhalation of fugitive dust originating from soil was assumed to occur for an exposure time of 24 hours/day. A recreational user was also evaluated for lead exposure using EPA's lead model for evaluating intermittent or variable exposures at lead sites. EPA default assumptions and an arithmetic mean EPC were used as inputs to the model. The fraction of daily outdoor time spent at the site vs. a secondary location was presumed to be 0.75, and the exposure frequency as a fraction of days/week spent at the site during the exposure period was presumed to be 0.5.

[3] Trespassers were assumed to contact surface soil under a current scenario and surface and subsurface soil under a future scenario in which subsurface soils may be brought to the surface. For current/future trespasser soil exposures, an exposure frequency of 52 days/year for an ED of 9 years was presumed for an adolescent. A body weight of 44 kg was used. Dermal contact was assumed with 3,624 cm^2 of surface area. Inhalation of fugitive dust originating from soil was assumed to occur for an exposure time of 4 hours/day.

[4] For current/future construction worker soil exposures, an exposure frequency of 250 days/year for an ED of 1 year was presumed. A body weight of 80 kg was used. Dermal contact was assumed with 3,470 cm^2 of surface area. Inhalation of fugitive dust originating from soil was assumed to occur for an exposure time of 8 hours/day.

[5] For future onsite worker soil exposures, an exposure frequency of 250 days/year for an ED of 25 years was presumed. A body weight of 80 kg was used. Dermal contact was assumed with 3,470 cm^2 of surface area. Inhalation of fugitive dust originating from soil was assumed to occur for an exposure time of 4 hours/day. Note that surface soil does not pose an unacceptable risk to current onsite workers as determined in the Human Health Risk Assessment in the RI (Resolution, 2015a).

[6] For future residential soil exposures, EDs of 20 years and 6 years, respectively, were presumed for an adult and young child. Body weights of 80 kg and 15 kg were used for the adult and young child, respectively. Dermal contact was assumed with 6,032 cm^2 of surface area for the adult and 2,373 cm^2 for the young child. An exposure frequency of 350 days/year was used for a combined ED of 26 years. Inhalation of fugitive dust was assumed to occur 24 hours/day for 350 days/year.

[7] For future residential exposures to untreated groundwater, drinking water ingestion rates of 2.5 L/day and 0.78 L/day for the adult and young child, respectively, were assumed. An exposure frequency of 350 days/year was used for a combined ED of 26 years (20 for the adult and 6 for the child). Dermal contact was assumed with 20,900 cm^2 of surface area for the adult, and 6,378 cm^2 for the young child. Showers/baths were assumed to occur 350 days/year for 0.71 hr/day for the adult and 0.54 hr/day for the young child. Inhalation during showers/baths was evaluated using the Andelman model with a volatilization factor of 0.5 L/m^3.

Toxicity Assessment

Carcinogenic Effects

The potential for exposure to a chemical to result in a carcinogenic effect is generally described by two factors: a statement reflecting the degree of confidence that the compound causes cancer in humans and a potency estimate, indicating how potent the chemical may be at causing cancer, with the general assumption that every exposure has some probability of resulting in cancer. The descriptor reflecting the degree of confidence that the compound causes cancer in humans may be either an alpha-numeric value or a narrative. Both are closely tied to the nature and extent of information available from human and animal studies. The cancer potency estimate is a quantitative measure of a compound's ability to cause cancer and is generally expressed as either a cancer potency factor or an inhalation unit risk (IUR) value. Cancer potency estimates and unit risk values are toxicity estimates developed by EPA based on epidemiological and/or animal studies and they reflect a conservative "upper bound" of the potency of the carcinogenic compound. That is, the true potency is unlikely to be greater than the potency described by EPA. Appendix C Table C-4 presents these cancer toxicity values and cancer classifications for the COCs.

In some cases, EPA may conclude that it is not appropriate to generate a cancer potency estimate or unit risk value given the mode of action of the known or suspect carcinogen. Currently, EPA's default procedure for characterizing cancer risk for compounds which may exhibit a threshold for carcinogenic effects mirrors the process used to describe the potential for adverse non-cancer effects described in the section which follows. This is substantiated by reviewing the cancer toxicity data relevant to the COCs at MRP Site 1 presented in Appendix C Table C-4. For example, as shown in Appendix C Table C-4, lead does not have an inhalation unit risk value (IUR). A summary of the cancer toxicity data relevant to the COCs at MRP Site 1 is presented in Appendix C Table C-4.

EPA's new Cancer Guidelines and Supplemental Guidance (March 2005) has been used as the basis for analysis of carcinogenicity risk assessment.

Non-Carcinogenic Effects and Non-Linear Carcinogenic Effects

For addressing non-carcinogenic effects and effects of carcinogenic compounds which exhibit a threshold, it is EPA's policy to assume that a safe exposure level exists, which is described by the reference dose (RfD) or reference concentration (RfC). RfDs and RfCs have been developed by EPA as estimates of a daily exposure that is likely to be without an appreciable risk of an adverse health effect when exposure occurs over the duration of a lifetime. RfDs and RfCs are derived from epidemiological and/or animal studies and incorporate uncertainty factors to help ensure that adverse health effects will not occur. The RfDs and RfCs relevant to the COCs at MRP Site 1 are presented in Appendix C Table C-5.

The toxicity values presented in Appendix Tables C-4 and C-5 are those used in the baseline HHRA, except for compounds where a toxicity update occurred since the baseline HHRA was completed in 2015 (PAHs). These updated toxicity values have been utilized in the following section (Risk Characterization) to calculate the presented **carcinogenic risks and non-carcinogenic hazards** for the applicable receptor populations as well as during development of risk-based performance standards (see Section 2.10 of this ROD).

Risk Characterization

The risk characterization combines the exposure estimate with the toxicity information to estimate the probability or potential that adverse health effects may occur if no action were to be taken at a site. A separate characterization is generated depending on the nature of the adverse effect. Cancer risks are generally expressed as a probability whereas the potential for adverse non-cancer effects (and carcinogenic effects resulting from non-linear mode of action [MOA] compounds) are described in terms of what is considered to be a safe exposure level.

For exposure to most known or potentially carcinogenic substances, EPA believes that as the exposure increases, the cancer risk increases. In characterizing risk to these types of carcinogenic compounds, a chemical- specific exposure level is generally multiplied with the cancer potency factor or IUR to estimate excess lifetime cancer risk as a result of exposure to site contaminants. To the extent that EPA has deemed that data are sufficient to apply the provisions of the 2005 Children's Supplemental Cancer Risk Guidelines, special consideration of the increased susceptibility to carcinogenic effects that children may have, was included in the risk characterization. The 2005 Children's Supplemental Cancer Guidelines were used to describe any such heightened susceptibility among potentially exposed children. Typically, the resulting cancer risk estimates are expressed in scientific notation as a probability (e.g., 1×10^{-6} or 1E-06 for 1/1,000,000) and indicate (using this example), that an average individual is not likely to have greater that a one in a million chance of developing cancer over 70 years as a result of site-related exposure (as defined) to the compound at the stated concentration.

All risks estimated represent an excess risk of cancer from exposures to contamination originating from MRP Site 1. These are risks above and beyond that which we face from other causes such as from cigarettes or ultra-violet radiation from the sun. The chance of an individual developing cancer from all other (non-site related) causes has been estimated to be as high as one in three. EPA generally views site related cancer risks in excess of 10^{-4} to 10^{-6} as unacceptable. Current EPA practice considers carcinogenic risks to be additive when assessing exposure to a mixture of hazardous substances.

In assessing the potential for adverse non-carcinogenic effects (and carcinogenic effects resulting from non-linear MOA compounds), a hazard quotient (HQ) is calculated by expressing the exposure (or the exposure concentration in the case of air exposures) as a ratio of the reference value (RfD or RfC). A HQ < 1 indicates that a receptor's exposure to a single contaminant is less than the safe value and that adverse effects are unlikely. Conversely, a HQ > 1 indicates that adverse effects as a result of exposure to the contaminant are possible. To account for additive effects resulting from exposure to more than one compound, an HI is generated by adding the HQs for all chemicals of concern that have the same or a similar mechanism or mode of action. As a conservative measure and a common practice, HQs are often added for all compounds of concern that affect the same organ or system (i.e., liver, nervous system) since the mechanism or mode of action is not always known. A HI < 1 would indicate that adverse effects are unlikely. Generally, HI values based on site-related exposure greater than 1 are viewed as unacceptable, and that remedial actions may be necessary to manage the effects to an HI less than 1 (see summaries below). It should be noted that the magnitude of the HQ or HI is not proportional to the likelihood that an adverse effect will be observed.

The following is a summary of the media and exposure pathways that were found to present an unacceptable risk exceeding EPA's cancer risk range and non-cancer threshold at MRP Site 1. Only those exposure pathways

identified as presenting a potential unacceptable risk requiring action are presented in this ROD. Readers are referred to Section 4.4 and Attachment G of the HHRA (presented as Appendix A of the RI Report) (Resolution, 2015a) for a more comprehensive risk summary (including calculated carcinogenic risks and non-carcinogenic hazards) of all exposure pathways evaluated for all COPCs and for estimates of the CTE risk scenario, although, as stated above, results presented below reflect changes to toxicity values which have occurred since the time of the calculations presented in the referenced document.

Recreational Exposure to Soil

Appendix C Table C-6 depicts the non-carcinogenic risk summary for soil evaluated to reflect current recreational exposure corresponding to the RME scenario. For the future young child and adult recreational user, the estimated potential non-carcinogenic risk exceeded the EPA acceptable target organ HI of 1. The exceedance is primarily due to Aroclor-1260 in surface soil.

Trespasser Exposure to Soil

Appendix C Tables C-7 and C-8 depict the non-carcinogenic risk summaries for surface soil evaluated to reflect current adolescent trespasser exposure and surface/subsurface soil evaluated to reflect potential future adolescent trespasser exposure corresponding to the RME scenario. For the current/future adolescent trespasser, the estimated potential non-carcinogenic risk exceeded the EPA acceptable target organ HI of 1. The exceedance is primarily due to Aroclor-1260 in surface and surface/subsurface soil.

Construction Worker Exposure to Soil

Appendix C Table C-9 depicts the non-carcinogenic risk summary for soil evaluated to reflect current/future construction worker exposure corresponding to the RME scenario. For the current/future construction worker, the estimated potential non-carcinogenic risk exceeded the EPA acceptable target organ HI of 1. The exceedance is primarily due to Aroclor-1260 in surface/subsurface soil.

Onsite Worker Exposure to Soil

Appendix C Tables C-10 and C-11 depict the carcinogenic and non-carcinogenic risk summaries for soil evaluated to reflect potential future onsite worker exposure corresponding to the RME scenario. For the future onsite worker, the estimated potential carcinogenic and non-carcinogenic risk exceeded the EPA acceptable risk range of 10^{-4} to 10^{-6} and a target organ HI of 1, respectively. The exceedances are primarily due to Aroclor-1260, carcinogenic PAHs, 4,4'-DDT, arsenic, and/or chromium (evaluated as hexavalent chromium) in surface/subsurface soil.

Residential Exposure to Soil

Appendix C Tables C-12 and C-13 depict the carcinogenic and non-carcinogenic risk summaries for soil evaluated to reflect potential future residential exposure corresponding to the RME scenario. For the future young child and adult resident, the estimated potential carcinogenic and non-carcinogenic risk exceeded the EPA acceptable risk range of 10^{-4} to 10^{-6} and a target organ HI of 1, respectively. The exceedances are primarily due to Aroclor-1260, carcinogenic PAHs, 4,4'-DDT, arsenic, and/or chromium (evaluated as hexavalent chromium) in surface/subsurface soil.

Residential Groundwater Use

Appendix C Table C-14 depicts the non-carcinogenic risk summary for the COCs in future residential wells evaluated to reflect potential future potable water exposure corresponding to the RME scenario, under the assumption that groundwater from MRP Site 1 is used as a source of potable water in the future. For the future resident using untreated groundwater as household water, non-carcinogenic risks exceeded the EPA acceptable risk range of 10^{-4} to 10^{-6} and/or a target organ HI of 1 for groundwater. The exceedances were due primarily to the presence of cobalt, and manganese in site groundwater.

Lead Evaluation

USEPA's model for evaluating Intermittent or Variable Exposures at Lead Sites (USEPA, 2003) Equation 8 was used to evaluate the hazard potential posed by exposure of an adolescent trespasser and recreational child. It is EPA policy to protect 95% of the sensitive population against blood lead levels (BLLs) in excess of 10 µg/dL blood (USEPA, 1994). Evaluations in the HHRA (Resolution, 2015a) also considered a BLL of 5 µg/dL blood. The lead evaluation indicated that the arithmetic mean lead concentration in surface soil at MRP Site 1 was greater than the screening level derived to be protective of a recreational child, indicating an estimated lead risk above the EPA target level of no more than 5% of the receptor population having BLL exceeding 10 µg/dL (and 5 µg/dL).

Uncertainties

The process of environmental sampling results in uncertainties, one of which is sampling procedures. Since it is not possible to sample the entire area of interest at a given site, several samples are taken from each medium within a site, and the results are considered to be representative of the chemicals present throughout the site. This assumption may overestimate or underestimate risk. Additional site samples were collected in soil after the HHRA was completed. While the additional soil data were not included in the HHRA, but rather only for extent refinement, none of the results were observed to be noticeably higher than previous detections evaluated in the HHRA and would not have changed the conclusions of the HHRA.

Similarly, the HHRA utilized groundwater data collected in December 2013 to evaluate site risks. Additional groundwater data collected after the HHRA was completed was used to evaluate attenuation and area-wide groundwater characteristics. The detections in the more recent sampling events would not have changed the conclusions of the HHRA.

Chromium in combined surface and subsurface soil was identified as a risk driver for the potential future onsite worker and hypothetical future residential exposure pathways. Chromium is most commonly present in the environment in the trivalent state because typical conditions in the environment favor the reduction of chromium from the hexavalent to the trivalent state. A subset of samples in each medium were analyzed for hexavalent chromium. Because hexavalent chromium was detected in soil, in accordance with the HHRA work plan (Resolution, 2013) risks associated with chromium were conservatively evaluated with the assumption that all total chromium in soil was of the more toxic hexavalent form. The evaluation of total chromium as 100% hexavalent chromium is overly conservative and leads to the overestimation of potential risk/HI for total chromium in soil.

USEPA guidance (USEPA, 2012) recommends the use of site-specific bioavailability data to adjust exposure estimates in site-specific HHRAs when the medium of exposure in the exposure assessment differs from the

medium of exposure associated with the toxicity value (i.e., cancer slope factor [CSF] and RfD). In the absence of reliable site-specific data, the default assumption is that the bioavailability of a chemical is the same in an exposure medium at a site (e.g., soil, water, etc.) as it is in the exposure medium used to derive the toxicity value. For arsenic, published toxicity values in USEPA's Integrated Risk Information System (IRIS) database are based upon exposure to arsenic in water (USEPA, 2018). Therefore, use of these toxicity factors without adjustment assumes that the bioavailability of arsenic in soil is the same as the bioavailability of arsenic in water (relative bioavailability [RBA] of 100%). However, recent bioavailability studies conducted in animal models show that bioavailability of arsenic in soil is typically less than that of highly water-soluble forms of arsenic (USEPA, 2012). Therefore, assuming an RBA of 100% for evaluation of arsenic in soil will result in an overestimation of risk. As a result of this recent research, USEPA released guidance recommending a default RBA for arsenic in soils of 60% be used where site-specific arsenic bioavailability assessment is not feasible (USEPA, 2012). An RBA of 60% (0.6) was used in this HHRA in accordance with USEPA guidance.

A published noncancer RfD is not available for Aroclor-1260. Therefore, in accordance with EPA's RAGS part A (USEPA, 1989), the RfD for Aroclor-1254 was used as a surrogate toxicity value to evaluate Aroclor-1260 in the HHRA. RAGS part A discusses use of one compound to estimate the activity of another structurally related compound for which specific data are lacking. Otherwise, the compound would not be included in the risk calculations and cumulative risk could be biased low. However, there are uncertainties associated with using Aroclor-1254 as a surrogate for Aroclor-1260. Since the PCB composition at MRP Site 1 may differ from the PCB composition for which the noncancer RfD for Aroclor-1254 is based, producing different toxicological responses, uncertainty is introduced by using this as a surrogate RfD.

Risk drivers were identified in groundwater based on its potential use as potable water by on-site workers and on-site residents under a hypothetical future use scenario. Groundwater at the site is not currently being used for potable use, there are no drinking water wells present on site, and the site is served by the municipal water supply. Therefore, the evaluation of groundwater as drinking water represents a conservative, health-protective future-use scenario.

2.9.2 Ecological Risk Assessment

An ERA was conducted with the primary objective being to evaluate whether COPCs attributable to past operations at MRP Site 1 have the potential to cause unacceptable adverse risk to ecological receptors. The ERA focused on surface soil and sediment exposure pathways. As part of the RI, a Tier 1 ecological Screening Risk Assessment (SRA) was performed. Based on the results of the Tier 1 ecological SRA, the Navy prepared a preliminary Tier 2, Step 3a Baseline ERA to further assess the potential for adverse effects to ecological receptors at MRP Site 1. Based on the results of the Tier 2, Step 3a ERA evaluation performed, the ecological exposures which showed potential risk were the following: terrestrial invertebrates and plants (surface soil; via benchmark comparison), small mammals and birds (surface soil; food-web modeling), benthic invertebrates (surface soil; via benchmark comparison and toxicity testing), and diving ducks (lead pellets in sediment; probability modeling). Details related to these exposures are presented below. Information regarding other exposure pathways may be found in the ERA (Appendix B of the RI Report; Resolution, 2015a). Additional details related to ecological receptors assumed to be representative of various site species are also included in the Newport risk assessment work plan (Resolution, 2013).

Identification of Chemicals of Potential Ecological Concern

Environmental data used in this ERA include surface soil and sediment collected between 2009 and 2014. The NAVSTA background soil data set was also considered in the ERA. The analytical data set considered in the ERA is described in more detail in Section 2 of Appendix B of the RI Report (Resolution, 2015a).

The primary objective for a Tier 1 SRA is to determine which, if any, exposure pathways and COPCs warrant further evaluation in a more refined ERA. The SRA included comparisons of maximum detected concentrations of chemicals against conservative media-specific benchmarks and food web modeling using conservative assumptions (e.g., animals only forage on-site) to determine which chemicals would be considered COPCs and to assess whether further evaluation was warranted for any exposure pathways and COPCs. Section 3.3 of Appendix B of the RI Report (Resolution, 2015a) presents the full conclusions and recommendations for the SRA. The Tier I SRA concluded that certain inorganic and organic COPCs at MRP Site 1 pose potential risk to plants, invertebrates, and/or wildlife and warranted further evaluation in Step 3a. Appendix C Table C-15 of this ROD presents frequency and range of detections for chemicals which were identified as COCs related to ecological risk at MRP Site 1 at the end of the Tier 2, Step 3a ERA.

Exposure Assessment

Terrestrial portions of MRP Site 1, including areas of maintained lawn, may provide habitat for ecological receptors such as plants, soil invertebrates, and small birds and mammals. However, pavement and gravel areas are unlikely to provide suitable habitat or foraging areas for many ecological receptors.

An intertidal gravel and sand beach extends along the western edge the site. Sub-tidal depositional sand is present offshore. The shoreline associated with Carr Point, extending north to Melville-North, is mapped as an inter-tidal sand beach with limited area of back beach. Along the majority of the shoreline, sediment is covered by stones and cobbles and may provide habitat for benthic invertebrates.

A survey was conducted in November 2013 using topside underwater video and divers to assess habitat complexity and ecological functions within the areas potentially impacted from historical activity at the site and to collect shellfish tissue for chemical analyses. The substrate within the site consisted of sand and gravel with larger cobble becoming prominent towards the beach. Large (>1 foot) boulders were noted in several locations and a boulder field was delineated along the southern boundary of the firing fan. Skeet fragments were not observed on the sea floor; however, fragments were seen on the beach above the water line during sampling at low tide. Shell hash was noted at every location during the habitat survey and the species of shellfish observed varied from location to location.

Dominant shellfish species included slipper shells (*Crepidula fornicata)*, quahogs (*Mercenaria mercenaria*), and blue mussels (*Mytilus edulis*). Other species observed included razor clams *(Silqua patula)*, bay scallops *(Aquipecten irradians)*, knobbed whelks *(Busycon carica)* and periwinkles *(Littorina littorea)*. Numerous large spider crabs (*Libinia emarginata)* were also observed. Algal cover was mixed from location to location with transient tufts of algae as well as affixed algae such as rock weed *(Ascophyllum nodosum)* and eelgrass (*Zoestra marina*). Algae were noted more frequently than eelgrass. Benthic biology samples were collected from two locations in December 2013 with polychaete annelids and molluscs (primarily *Crepidula*) being the most abundant organisms by count.

The findings from the habitat survey, shellfish collection efforts, and benthic biology evaluation indicate the presence of a variety of invertebrates which may serve as prey items for diving ducks and other birds potentially feeding within the Bay. Blue mussels and periwinkles observed at stations located closest to the shoreline also represent potential prey items for shorebirds and mammals foraging along the beach area. However, the cobble and large rocks present closer to shore may limit foraging success for some receptors because access to true sediment and benthic invertebrates may be physically challenging.

Complete exposure pathways identified in the ERA included: the uptake of COPCs from soil through roots (vegetation); ingestion of COPCs bound to soil (terrestrial invertebrates, birds, and mammals); ingestion of COPCs bound to sediment (benthic invertebrates, birds, and mammals); ingestion of COPCs through consumption of contaminated plants (herbivores and omnivores); direct contact with COPCs in sediment (benthic invertebrates), and ingestion of COPCs through consumption of contaminated prey (all predators).

EPCs for COPCs in soil, sediment, and prey were calculated in terms of Refined Maximum (the lower of either the 95 percent Upper Confidence Limits (UCL) or the maximum concentration). Appendix C Table C-15 presents EPCs for chemicals which were identified as COCs related to ecological risk at MRP Site 1. Average EPCs (arithmetic mean of detected concentrations) were not quantitatively evaluated in the ERA but are provided in Appendix C Table C-15 to provide additional context for the results.

Exposure of wildlife (i.e., birds and mammals) to site COPCs was estimated using food web models. Soil, sediment, and shellfish EPCs were entered into the food chain model to calculate an estimated daily intake (EDI) to which the receptor may be exposed. EPCs for prey items (other than shellfish) and plant tissue were estimated using appropriate uptake factors (refer to Appendix B of the RI Report; Resolution, 2015a). The food chain models quantified the EDIs by calculating the intake of COPCs via food ingestion and incidental soil or sediment ingestion, which were considered the primary exposure routes.

A probability model presented in USEPA guidance (2011) was used to assess the potential for bird to ingest lead pellets while foraging in the Bay adjacent to MRP Site 1 or along the shoreline. The probability model incorporated species-specific inputs obtained from the literature (i.e., number of grit particles in the gizzard, amount of time grit is retained in the gizzard), as well as the proportion of time the bird may foraging at the site, and a selected exposure period (i.e., a single day). The mourning dove and bobwhite quail were modeled for exposure to the pellets within the shoreline soil and the lesser scaup was modeled for exposure to pellets in the Bay up to 600 feet from the shoreline. During the FS, the Navy calculated the probability of consuming a single pellet from the surface sediment within the offshore exposure area to be 11.5%. Note that in the RI, the baseline evaluation was 7.2%, which was later updated in the FS as noted.

Ecological Effects Assessment

For soil invertebrates and plants, effects assessments included comparison of site surface soil concentrations to published screening ecotoxicity values (SEVs) and to background. Similarly, for benthic invertebrates, effects assessments included comparison of site surface sediment concentrations to published SEVs and to background. Appendix C Table C-15 of this ROD presents SEVs utilized for the effects assessment for soil invertebrates, plants, and benthic invertebrates.

Laboratory toxicity testing was also conducted using the amphipod *Leptocheirus plumulosus* to assess impacts on the survival, growth, and reproduction of benthic invertebrates after 28 days of exposure to sediment (per

the Newport risk assessment work plan [Resolution, 2013] as presented in Appendix D of the Sampling and Analysis Plan for Carr Point Storage Area [Resolution, 2014]).

Food web models were used to compare the EDIs for wildlife to published wildlife toxicity reference values (TRVs) and to background conditions.

For the evaluation of potential impacts to birds from the ingestion of lead pellets, ingestion of a single pellet was assumed to be a toxic event. This is a conservative assumption as studies have shown that in some species, multiple pellets did not result in significant mortality or other adverse effects and that concerns about bird exposures in upland ranges may be over-estimated (Tannenbaum, 2013).

Ecological Risk Characterization

The following risk characterization includes a brief summary of the environmental risks associated with surface soil and surface sediment, the basis of these risks, and how these risks were determined in the ERA. The ERA compared site data (EPCs) to ecotoxicological benchmark values (i.e., SEVs), evaluated EPCs through food web models, evaluated the results of site-specific toxicity testing, and conducted probability modeling to assess the potential for ingestion of lead pellets by birds. The ERA also included a comparison of site data against background data for both surface soil and sediment. The conclusions of the ERA are summarized below for each of the exposure pathways where it was determined that ecological risk is likely to be present.

HQs were calculated to estimate risks to plants, soil invertebrates, and benthic invertebrates exposed to contaminated media and to estimate risks to birds and mammals due to ingestion of contaminated media and food items. An HQ shows how much the concentration of a COPC exceeds its SEV or TRV. HQs were calculated as follows:

HQ = EPC or EDI / SEV or TRV

In general, HQs above 1 represent the degree to which the site exposure exceeded its toxicity benchmark.

Terrestrial Plants and Soil Invertebrates

The benchmark comparisons in the Tier 2, Step 3a evaluation indicated the potential for risks to terrestrial plants and soil invertebrates due to metals, pesticides, PAHs, and PCBs (see HQ calculations presented in Appendix C Table C-15 of this ROD); however, there are significant uncertainties about the true bioavailability and toxicity of these COPCs to plants and invertebrates.

Risks due to metals may be over-estimated based on the very conservative nature of the benchmarks, the low confidence in most benchmarks, and the fact that metals are probably less bioavailable and toxic in MRP Site 1 soils relative to the soils used in the toxicity tests on which the benchmarks are based.

The samples resulting in risks due to pesticides and PCBs are found within a limited portion of the site near the shoreline and the southern boundary with Site 22. Similarly, the PAH concentrations above the benchmarks occur only along the western fence line and the bank leading to the shore. Therefore, site-wide risks due to these COPCs are over-estimated by the elevated HQs.

In addition, clean fill was brought into the site following a 2013 removal effort and has replaced the native soil within a large portion of the open portion of the site. Samples removed during the 2013 sampling event were not included in the ERA. The clean fill data were not used quantitatively in the ERA, but this clean material now covers at least 25% of the area of the site and is not expected to pose a risk to ecological receptors. Therefore,

potential upland risks to plants and soil invertebrates are expected to be over-estimated by the calculations in the ERA and summarized in Appendix C Table C-15 of this ROD.

Benthic Invertebrates

The benchmark comparisons in the Tier 2, Step 3a evaluation indicated the potential for risks to benthic invertebrates due to lead (see HQ calculations presented in Appendix C Table C-15 of this ROD). Sediment lead levels within the site data set were also inconsistent with the site-specific background data set. The sediment toxicity testing results identified three shoreline locations that resulted in adverse impacts to the test organisms. These impacts are likely related to elevated concentrations of metals associated with firing range activities (e.g., lead) and the gravel substrate along the shoreline may have been an additional stressor for the test organisms.

Wildlife

For wildlife exposed to prey items from Narragansett Bay adjacent to MRP Site 1, no potential risks were identified in the Tier 2, Step 3a evaluation.

For wildlife exposed to COPCs in the upland portions of MRP Site 1, there are potential risks due to antimony, 4,4'-DDT, and Total PCBs, but these risks are only expected to occur within a limited area (i.e., along the shoreline near Site 22) (see HQ results presented in Appendix C Table C-15 of this ROD).

As stated above in the discussion of upland risks to plants and invertebrates, site-wide risks to upland wildlife are expected to be over-estimated. The samples with risks for PCBs and pesticides are found in limited areas (e.g., along the shoreline near Site 22) and the presence of clean backfill in a large portion of the open upland area reduces overall risks from exposure to COPCs. The open area where the fill has been placed likely represents usable ecological habitat that may be more attractive to birds and mammals than the portions of the site associated with the RVs and greater human activity.

The potential for ingestion of pellets exists for birds foraging along the shoreline and within Narragansett Bay adjacent to MRP Site 1. The probability model indicated that the potential for ingesting lead pellets is highest for diving ducks foraging within the Overshoot Area 300 - 600 feet from shore and lowest for the mourning dove foraging within the shoreline soil. However, there are uncertainties about how many pellets need to be ingested to cause harm and uncertainties related to what level of risk is acceptable.

2.9.3 Basis for Action

Potential unacceptable risks to human health were identified for a current recreational user scenario based on concentrations of lead and PCBs in surface soil; for a current/future adolescent trespasser scenario and current/future construction worker scenario based on concentrations of PCBs in soil; and for a future onsite worker scenario and hypothetical future residential scenario based on concentrations of PCBs, carcinogenic PAHs, 4,4'-DDT, and metals (arsenic and chromium) in soil. Additionally, potential unacceptable risks to human health were identified for future potable use of groundwater by residents due to concentrations of metals (cobalt and manganese) in site groundwater.

As noted earlier, the RV Park is operated for rental by DoD personnel and active/retired military and their families. Additional input regarding site use was obtained during the FS process. While the maximum length of stay per family is typically two weeks (the original understanding of site use during the RI phase), if camp sites

are available, that length of stay may be longer than two weeks. The site is not available for use by the general public per signage posted. Current workers within MRP Site 1 include RV Park management and maintenance workers within the RV Park. For the recreational user, while there are some restrictions on usage during periods of higher activity, it is possible that users may be at the site for longer periods of time. This information lead to the use of [RIDEM] Direct Exposure Criteria (DECs) appropriate for unrestricted recreational use (discussed further below) during PRG development. Furthermore, as the exposure parameters are the same for hypothetical residents and recreational users, except for exposure frequency, in order for there to be no restrictions on length of stay at the site, the exposure frequency of the recreational user has been assumed to be a full year, resulting in the resident and recreational user PRGs being the same for this site.

A potential ecological risk exists at MRP Site 1 for small mammals and birds exposed to surface soil, primarily due to the ingestion of soil invertebrates. While the ERA concluded that there are potential risks to plants and invertebrates due to metals, pesticides, and PAHs, there are significant uncertainties about the true bioavailability and toxicity of these COPCs. The potential risks to plants and soil invertebrates are based on use of conservative screening values, especially with respect to pesticides. In addition, samples resulting in risks are generally found within a limited portion of the site and clean fill has been placed across approximately 25% of the site and is not expected to pose a risk to plants and invertebrates. For these reasons, the potential ecological risks to plants and soil invertebrates do not appear to be unacceptable at this site and actions are assumed to be unnecessary beyond those performed for other receptors.

A potential ecological risk exists for benthic invertebrates exposed to lead in surface sediments within Narragansett Bay adjacent to MRP Site 1. In addition, as indicated in the ERA for the adjacent Site 22 (Resolution, 2015b), there are risks to benthic invertebrates due to PCBs and manganese found in sediments in the vicinity of Outfall 2. Remedial action for these Site 22 sediments is being conducted as part of MRP Site 1 actions.

Diving ducks foraging in Narragansett Bay adjacent to MRP Site 1 between the shoreline and 600 feet from shore may ingest lead pellets during foraging activities. Pellets were not present in the firing fan beyond 600 feet from shore and ingestion probabilities for birds (i.e., mourning dove and bobwhite quail) exposed to pellets associated with shoreline soil were very low. Therefore, these areas and receptors do not warrant pellet-related remedial action.

Because potential unacceptable risks to human health and the environment 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, exceedances of ARAR and risk-based standards calculated using federal guidance classified as “to be considered” (TBC) will be addressed by the response action.

2.10 REMEDIAL ACTION OBJECTIVES (RAOS)

RAOs are medium-specific goals that define the objectives of remedial actions to protect human health and the environment. RAOs are developed to ensure compliance with ARARs. RAOs describe what the proposed site cleanup is expected to accomplish and serve as the design basis for the remedial alternatives.

Based on the potential pathways, receptors of concern, and current and potential future land use scenarios, the RAOs for soil, groundwater, and sediment at MRP Site 1 are provided below. Current users are recreational

users, site workers, trespassers and construction workers all of which are taken into consideration during the assessment of risks. Future users are site workers, construction workers, trespassers, recreational users and a hypothetical resident. Together, these exposures are included in the assessment of risks and, ultimately, the remedy is designed to mitigate the associated risks for each of the future users.

The RAOs for the protection of human health and the environment for soil and groundwater at MRP Site 1 are:

- Prevent exposure by future residents and other unrestricted site users to soils containing COCs that exceed human health RGs.
- Prevent exposure by current and future recreational users to soils containing COCs that exceed human health RGs.
- Prevent exposure by current and future site workers to soils containing COCs that exceed human health RGs.
- Prevent exposure by current and future trespassers to soils containing COCs that exceed human health RGs.
- Prevent exposure by future construction workers to soils containing COCs that exceed human health RGs.
- Prevent future migration of soil chemicals to groundwater (COCs above RIDEM Remediation Regulations GA leachability criteria) and neighboring surface water and sediment.
- Restore groundwater to beneficial reuse standards and prevent exposure by future residents to groundwater containing COCs that exceed human health RGs until groundwater cleanup standards are achieved.
- Prevent exposure by small mammals and birds to surface soil containing COCs that exceed ecological RGs.

The RAOs for the protection of human health and the environment for sediment at MRP Site 1 are:

- Reduce probability for diving duck ingestion of lead pellets in accessible sediment across the remedial exposure area in Narragansett Bay.
- Prevent exposure by benthic invertebrates to sediment with COCs that exceed the ecological RGs near the MRP Site 1 former target area and the localized impacted area associated with Outfall 2 at Site 22.

For MRP Site 1, cumulative 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. COCs were identified as those constituents contributing individual carcinogenic risks greater than 1×10^{-6} or non-carcinogenic HQs greater than 1. Additional COCs were identified for MRP Site 1 soil based on chemicals detected above RIDEM Remediation Regulation residential direct exposure criteria, ecological screening criteria, and/or GA leachability criteria.

Preliminary Remediation Goals (PRGs) were developed during the FS as target cleanup goals for remedial actions that, if met, would result in acceptable COC concentrations in soil, groundwater, and sediment at MRP Site 1 and thereby mitigate risks to human health and the environment and/or result in concentrations below exceedances of ARAR and risk-based standards calculated using federal guidance classified as TBC (see Appendix B in both FSs [Resolution, 2018a/b] and Appendix D of this ROD).

Acceptable concentrations based on risk were calculated to meet an ILCR of 1 x 10^{-6} and an HQ of 1 for carcinogenic and non-carcinogenic COCs, respectively. These calculated concentrations were identified as candidate risk-based PRGs in the FS (see Appendix C of this ROD and Appendix B in both FSs [Resolution, 2018a/b]). Additional ARAR-based COCs were identified by comparison to RIDEM Remediation Regulation DECs and Leachability Criteria. These criteria were identified as candidate ARAR-based PRGs.

The ERA (Appendix B of Resolution, 2015a) identified lowest observed adverse effects level- (LOAEL) based HQs above 1 for the bobwhite quail, meadow vole, American robin, and short-tailed shrew. Therefore, ecological PRGs have been developed for the site to prevent exposure to soils with site-related contaminant concentrations that may present risks to ecological receptors.

Because insectivores and omnivores are more highly exposed to soil-related constituents than herbivores (see exposure parameters in the ERA [Appendix B of Resolution, 2015a]), and thus had higher HQs in the ERA, risk-based PRGs were developed for the two most insectivorous receptors evaluated in the ERA – the short-tailed shrew and the American robin. The LOAEL-based HQs above 1 for the more herbivorous bobwhite quail and the meadow vole were only calculated for Total PCBs and the majority of the PCB dose for these receptors was from the small fraction of soil invertebrates in their diets. Therefore, the PRGs based on the shrew and the robin are also expected to be protective of more herbivorous small birds and mammals.

During the FS, ecological risk-based PRGs were developed using the food web equations presented in the MRP Site 1 ERA (Appendix B of Resolution, 2015a). PRGs were developed for the short-tailed shrew and the American robin based on the LOAEL-based TRVs and the exposure assumptions (e.g., body weight, ingestion rate, uptake factors) used in the Tier 2, Step 3A food web model (Resolution, 2015a). Consistent with the ERA, it is assumed that the shrew and robin obtain 100% of their diets from within the MRP Site 1 exposure area (area use factor [AUF] of 1), and that the robins that may breed on or near the site migrate out of the area during the winter months (robins from further north may overwinter in the area) and the shrew is present year round (exposure duration [ED] of 0.67 for the robin and 1 for the shrew). As discussed in the ERA, the robin was selected to model risk for birds at this site because it is a small bird with a small home range that feeds on plants and soil invertebrates. Other birds like gulls, while possibly staying at the site longer, have much larger home ranges and do not consume soil invertebrates possibly impacted by site COCs. Gulls exposed to shellfish and larger terrestrial herbivorous birds modeled in the ERA (i.e., bobwhite quail) showed minimal risks. The exposure duration for the robin was selected in the ERA because based on site conditions, it is unlikely that the site would provide sufficient terrestrial foraging habitat to exclusively support a community of small birds like the robin throughout a whole year.

As indicated in Appendix A of the FS (Resolution, 2018a), soil based PRGs are calculated for Total PCBs for the shrew and robin, respectively. The PRGs were developed using the ERA food web model assumptions and back-calculating to a soil concentration (i.e., the soil PRG) that resulted in an HQ equal to 1 based on the LOAEL-based TRV.

Typically, risk managers consider the range of PRGs derived for multiple receptors and different levels of protection. Based on the relatively low quality habitat available in the upland portion of MRP Site 1 (e.g., maintained lawn areas, paved and gravel parking areas) and the conservative nature of the food web (e.g., AUF of 1), a PRG derived from a no observed adverse effects level (NOAEL)-based TRV would be overly protective. Therefore, it was determined that the use of the LOAEL-based TRVs was appropriate for the

derivation of the PRGs. The lower of the PRGs derived for the short-tailed shrew and the American robin is recommended as the wildlife-based ecological PRG for each of the COCs. This corresponds to the following risk-based PRGs for soil derived based on the short-tailed shrew (see Appendix B of the soil and groundwater FS [Resolution, 2018a]):

- Antimony – 24.4 mg/kg
- Total PCBs – 0.89 mg/kg
- 4,4'-DDT – 7.5 mg/kg

The ecological PRGs discussed above have been considered in context with these additional values in the selection of the final recommended PRG. As indicated in Appendix B of the soil and groundwater FS (Resolution, 2018a), a value of 1 mg/kg is recommended as the selected ecological PRG for Total PCBs. Calculations presented in Appendix B of the soil and groundwater FS (Resolution, 2018a) also show that the 1 mg/kg is generally protective of the shrew on a risk basis. The selected ecological PRGs for antimony and 4,4'-DDT are the wildlife-based values listed above.

For ecological risks in sediment, 28-day sediment toxicity tests were conducted on ten site samples and three background/reference samples using the amphipod *Leptocheirus plumulosus*. Sediment bioassay results at most test locations were similar to background bioassay results; however, toxicity was identified for three near-shore locations (SD102, SD122, and SD124), i.e., bioassay results at these three locations were significantly different from background results. Therefore, the results of the sediment chemistry and toxicity tests were used to develop sediment PRGs that are protective of benthic invertebrates (see Appendix A of the sediment FS [Resolution, 2018b]). Lead was the only COC identified in sediment in the ERA as representative of toxicity. Therefore, a PRG was derived based on lead concentrations and is expected to capture potential impacts from the mixture of constituents present in the samples evaluated in the sediment toxicity tests (based on extent of lead PRG exceedances related to samples collected for toxicity tests). The recommended lead PRG was calculated as the lowest of the geometric means of all of the no effect and low effect concentrations derived from the sediment toxicity testing program, resulting in a lead PRG of 122 mg/kg.

The RAO associated with lead pellets establishes a risk reduction based on average pellet count in the exposure area. Therefore, a concentration-based PRG was not established which would require removal for any single sample result exceeding that set value. As discussed with the regulatory agencies, the risk reduction approach was utilized as a means to address management of presumed risks from the pellets. Note too that there are no published criteria for pellet count in soil or sediment.

The recommended PRGs developed and presented in the FS have been retained as **Remediation Goals (RGs)** in this ROD. RGs for soil were selected to be protective of ecological and hypothetical future residential use scenarios with considerations to leachability criteria. Note that the RGs selected for the hypothetical future residential use scenario are also protective of the other human receptors listed above in the RAOs (recreational users, site workers, trespassers, and construction workers). RGs for groundwater were selected to be protective for a residential potable use scenario and onsite worker ingestion (as drinking water) scenario. RGs developed for sediment were selected to be protective of ecological receptors. Evaluations performed in the HHRA and summarized in the FS show that there were no actionable risks determined for human exposures to sediment at the site. The RG for lead pellets was developed to reduce average pellet count in accessible sediment across

the remedial exposure area and reduce the risk of pellet ingestion by ecological receptors. This is discussed further below.

Tables 2-3, 2-4, and 2-5 summarize the COCs and respective RGs selected for remediation of soil, groundwater, and sediment, respectively. Exceedances of RGs for soil are indicated on Figure 4. Exceedances of groundwater RGs are indicated on Figure 5. Exceedances of sediment RGs are indicated on Figure 6.

TABLE 2-3. REMEDIATION GOALS FOR SOIL

COC	SELECTED RG (MG/KG)	BASIS
Residential Use Scenario		
Benzo(a)anthracene	0.9	Res. DEC
Benzo(a)pyrene	0.4	Res. DEC
Benzo(b)fluoranthene	0.9	Res. DEC
Benzo(g,h,i)perylene	0.8	Res. DEC
Benzo(k)fluoranthene	0.9	Res. DEC
Chrysene	0.4	Res. DEC
Dibenz(a,h)anthracene	0.4	Res. DEC
Fluoranthene	20	Res. DEC
Indeno(1,2,3-cd)pyrene	0.9	Res. DEC
Naphthalene	0.8	Leachability
Phenanthrene	40	Res. DEC
Pyrene	13	Res. DEC
4,4'-DDT	1.9	ILCR = 10^{-6}
PCBs	1	EPA Risk-Based Guidance
Antimony	10	Res. DEC
Arsenic	7	Res. DEC
Chromium, Total*	0.30	ILCR = 10^{-6}
Lead	150	Res. DEC
Manganese	390	Res. DEC
Ecological Scenarios		
4,4'-DDT	7.5	Short-tailed Shrew
PCBs	1	EPA Risk-Based Guidance
Antimony	24.4	Short-tailed Shrew

Notes:
* Assumed to be hexavalent chromium during the RI and human health risk assessment. Note that the evaluation of total chromium as 100% hexavalent chromium is overly conservative and leads to the overestimation of potential risk/HI for total chromium in soil. **While potential ecological risks were identified in limited areas of MRP Site 1, the ecological RGs are planned to be conservatively applied across MRP Site 1.

-Res DEC = RIDEM Remediation Regulation 250-RICR-140-30-1, Section 1.9.2(B)(1) and Table 1 (Residential and Industrial/Commercial Direct Exposure Criteria [DEC]);
-Leachability = RIDEM Remediation Regulation, 250-RICR-140-30-1, Section 1.9.2(B)(2) and Table 2 (GA Leachability Criteria);
-ILCR (Incremental Lifetime Cancer Risk) = RG value is risk based.
-EPA Risk-Based Guidance – Residential Use Scenario - A Guide on Remedial Actions at Superfund Sites with PCB Contamination, OSWER Directive #9355.4-01FS, August 1990
-EPA Risk-Based Guidance – Ecological Scenario – Total PCB soil concentration of 1 mg/kg has been selected as a protective level based on TSCA 40 CFR 761.61(c) risk-based cleanup level. See Appendix B of FS for Soil and Groundwater for RG development and basis.

TABLE 2-4. REMEDIATION GOALS FOR GROUNDWATER		
COC	SELECTED RG (MG/L)	BASIS
Cobalt	6.0	HQ = 1
Manganese	300	Health Adv.

Notes:
Health Adv. – RG basis is the Health Advisory on Manganese (EPA-822-R-04-003; January 2004)
HQ – Hazard Quotient, RG value is risk based.
µg/L – micrograms per liter

TABLE 2-5. REMEDIATION GOALS FOR SEDIMENT		
COC	SELECTED RG (MG/KG)	BASIS
Ecological Scenarios		
Lead[1]	122	Lowest of the geometric means of no- and low-effect concentrations in sediment toxicity testing
Manganese[2]	1,100	Ecological Risk Assessment Benchmark
Total PCBs[2]	0.18	Ecological Risk Assessment Benchmark*
Lead Pellets	No numeric RG selected - A qualitative goal established to reduce average pellet count in accessible sediment across the remedial exposure area	The Navy, in conjunction with the regulatory agencies, identified in the FS a remediation strategy to reduce the overall surface weighted average pellet count in the offshore area, which will result in a significantly reduced probability of incidental ingestion of pellets by the diving duck community that may forage offshore.[3]

*A Total PCB sediment concentration of 0.18 mg/kg has been selected as a protective level based on TSCA 40 CFR 761.61(c) risk-based cleanup level.
1. RG applies across the study area (see Figures 9 and 10).
2. RG only applies to a localized area of near-shore sediment near Outfall 2 related to Site 22 (see Figures 9 and 10).
3. Areas of sediment containing lead pellets were identified for remedial action based on the presence of lead above the lead preliminary remedial goal of 122 mg/kg, removal to address Site 22 concerns, and various pellet reduction scenarios to reduce the probability of a bird ingesting a pellet. The selected remedy would reduce the probability of ingestion from 11.5% to 1.9% and results in an 85% reduction in surface weighted average pellet count.

During the FS process, the Navy, EPA and RIDEM developed a sediment excavation strategy to reduce the probability for a diving duck ingesting a lead pellet in accessible sediment across the remedial exposure area in Narragansett Bay. The strategy incorporated the use of a probability model, which provided a useful tool for assessing the relative differences in key factors under different removal scenarios.

These factors included the post-remediation probability of a diving duck ingesting a lead pellet, the surface weighted average (SWA) pellet count potentially remaining in the surface interval following sediment remedial action, and sediment volume removed across the remedial exposure area.

Various pellet removal scenarios, referred to as Options 1-6a (summarized in Table 2-6 below), were established in the FS (Appendix A, Attachment A-1). These scenarios considered various horizontal and vertical extents of sediment removal options and identified the associated reductions in pellet counts and ingestion probabilities estimated for each removal option. The objective was to target an option that would provide a

substantial reduction in the potential for ingestion of a pellet, while minimizing the remedial action impact footprint within the Bay and disrupting the existing benthic environment.

After review of the results, the Navy, USEPA, and RIDEM agreed to apply the pellet reduction scenario modeled as Option 6a when developing remedial alternatives for evaluation in the FS. This option was considered to offer the best balance between volume of sediment removed, the post-remediation pellet ingestion probability, and the SWA pellet count potentially remaining while minimizing both temporary and permanent alteration of coastal wetland and aquatic habitats. This option will not require a cover or backfilling after excavation.

TABLE 2-6. SUMMARY OF FS SEDIMENT REMOVAL RISK REDUCTION OPTIONS

Option	Removal Area		Removal Depth (ft bss)	SWA of Lead Pellets per Cubic Foot		Probability of Ingestion		Sediment removal (CY)
	SF	% of area		Post Remediation	% Reduction	Post Remediation	% Reduction	
1	143,819	21.86%	0-1	994	7%	12.2%	-6% (increase)*	5,327
			0-2	739	31%	9.1%	21%	10,653
			0-3	654	39%	8.2%	29%	15,980
2	228,295	34.70%	0-1	873	19%	10.5%	9%	8,455
			0-2	377	65%	4.6%	60%	16,911
			0-3	213	80%	2.7%	77%	25,366
3	297,178	45.17%	0-1	824	23%	9.6%	17%	11,007
			0-2	277	74%	3.3%	72%	22,013
			0-3	96	91%	1.2%	90%	33,020
3a	339,614	51.62%	0-1	841	22%	9.7%	16%	12,578
			0-2	277	74%	3.2%	72%	25,157
			0-3	90	92%	1.1%	91%	37,735
4	354,943	53.95%	0-1	805	25%	8.9%	23%	13,146
			0-2	238	78%	2.7%	77%	26,292
			0-3	55	95%	0.6%	95%	39,438
5	72,633	11.04%	0-1	204	81%	2.3%	80%	29,918
	367,180	55.81%	0-2					
6	165,530	25.16%	0-1	149	86%	1.8%	84%	25,473
	174,083	26.46%	0-3					
6a	165,530	25.16%	0-1	158	85%	1.9%	83%	25,473
	174,083	26.46%	0-3					

Notes:
bss - below sediment surface
SF - square feet
CY - cubic yards
SWA – Surface Weighted Average

*Note that this value (-6%) is shown as a projected increase in in the probability of ingestion. For this area/option, the calculated density of pellets in the 1-2 interval is greater than the 0-1 interval. Hence, if only the 0-1-foot layer is removed under this option, the probability increases for that next interval. Refer also to Appendix A of the FS (Sediment).

2.11 DESCRIPTION OF ALTERNATIVES

To address potential unacceptable risks to human health and the environment and ARAR requirement exceedances at MRP Site 1, a **preliminary technology screening** evaluation was conducted for the FS stage (Resolution, 2018a/b). General response actions were developed to satisfy the RAOs and a number of remedial technologies and process options were initially screened based on their potential effectiveness, implementability, and cost. The technologies and process options retained after the initial screening were assembled into various remedial alternatives for soil and groundwater. Consistent with the NCP, the No Action alternative was evaluated as a baseline for comparison with other alternatives during the comparative analysis (Section 2.12). The remedial alternatives underwent an initial screening process resulting in the elimination of Alternative S-4 for soil, which consisted of excavation and off-site disposal of the full extent of soil in excess of RGs in order to achieve UU/UE. It did not appear advantageous to carry this Alternative through to the detailed analysis due to the costs associated with the alternative and the limited benefit as compared to the cost of remediation. The excessive costs (> $25 million in total costs) are due to the need to meet state criteria for all compounds detected in soil irrespective of site-specific calculated risks. Based on existing data, this would require excavation to depths to groundwater (10 feet on average). Such depths would present a physical challenge due to groundwater flow and tidal influence, as well as railroad track and highway support, and the amount of soil would exceed 100,000 tons by weight as estimated. A similar amount of clean backfill would be required to restore the site.

The **remedial alternatives** developed and evaluated in detail in the FSs for MRP Site 1 are presented below for soil (Section 2.11.1), groundwater (Section 2.11.2), and sediment (Section 2.11.3).

2.11.1 Soil Alternatives

Table 2-7 summarizes the major components and provides estimated costs for the soil remedial alternatives developed and evaluated in detail for MRP Site 1. Under Alternatives S-1, S-2 and S-3, five-year reviews would be conducted because contamination would remain in excess of levels that allow for UU/UE. Five-year reviews of MRP Site 1 would be conducted as part of the facility-wide five-year review process.

TABLE 2-7. SUMMARY OF REMEDIAL ALTERNATIVES EVALUATED FOR SOIL

ALTERNATIVE	COMPONENTS	DETAILS	COST
S-1 – No Action	None	No further actions would be taken other than statutorily required five-year reviews.	**Capital:** $0 **Five Year Review:** $0 **O&M:** $0 **Total Cost:** $0
S-2 – Select Soil Removal, Soil Cover, and Land Use Controls	Soil Removal and Disposal	Alternative S-2 would include removing the impacted shallow soil (2 feet) with RG exceedances and physically isolating remaining deeper impacted material below clean backfill, while maintaining the existing grade. Note that the 0 to 2-foot depth interval is assumed as the minimum based on RIDEM ARARs and is used for cost estimating purposes in the FS. For cost estimating purposes, an estimated 995 cubic yards of soil would be removed from the 0 to 4-foot interval across approximately 6,700 square feet in the southwest corner of the site due to exceedances of leachability criteria and RGs. In the northwestern corner of the site, approximately 100 cubic yards of soil would also be removed due to exceedances of	**Capital:** $2,744,000 **Five Year Review:** $27,000 **O&M:** $188,000 **Total 30-Year Present Worth:** $2,959,000

TABLE 2-7. SUMMARY OF REMEDIAL ALTERNATIVES EVALUATED FOR SOIL

ALTERNATIVE	COMPONENTS	DETAILS	COST
		leachability criteria and RGs. The removal would be completed from 0 to 2 feet bgs over an area of approximately 1,400 square feet. Note that stormwater/erosion controls will be included both pre- and post-construction to prevent migration of soil contaminants to surface water/sediment. An additional estimated 6,500 cubic yards of soil exceeding RGs would be excavated from the 0 to 2-foot interval across an impacted area of approximately 87,800 square feet. Excavation of arsenic impacted soil would be conducted on the eastern portion of MRP Site 1 to a depth of 6 inches and replaced with a topsoil backfill layer. Removal of impacted soil would result in a projected removal of approximately 670 cubic yards of soil across approximately 36,000 square feet. Prior to the excavation, erosion control measures (i.e., silt fences) would be installed around the excavation area. During the excavation, dust control and air monitoring would be performed, as necessary. All excavated soil would be stockpiled at an approved location, with controls and handling measures designed with considerations of storms and flood events to protect against structural failure, to keep water out, and to reduce effects of water entry. Details regarding stockpile management (e.g., stormwater controls and temporary covers) would be developed during the RD. Characterization samples would be collected from the soil to determine volumes for hazardous and non-hazardous waste. Characterization sampling for PCB-impacted soil would be completed prior to excavation. Excavated soil is expected to primarily be classified as non-hazardous waste for disposal at an approved offsite facility, with some disposed of as PCB soil. Prior to disposal, waste characterization samples would be collected from the stockpiled soil. Waste characterization sampling for PCB-impacted soil would be completed prior to excavation. Furthermore, additional pre-excavation samples will be collected for identifying soil that is potentially hazardous. Soil known to be characteristically hazardous will be managed separately. The excavated soil and debris would be transported and disposed of at off-site, licensed landfill or treatment facility(ies).	
	Soil Cover	Following excavation activities, a soil cover system comprised of a clean backfill layer would be placed over an area totaling approximately 95,900 square feet on the western side of the site. The cover system would consist of 2 feet of clean fill/soil and vegetation (grass). Areas managed under the substantive environmental standards promulgated in the state Remediation Regulations 250-RICR-140-30-1, Section 1 would receive a cover layer consisting of 6-inches of topsoil anticipated to cover 36,000 square feet. The backfill layer would prevent direct contact, erosion, and transport of remaining soil exceeding RGs (i.e., subsurface soil located at depths beneath the cover system. Additional backfill will be needed where soil was removed to 4 feet to address leachability.	

TABLE 2-7. SUMMARY OF REMEDIAL ALTERNATIVES EVALUATED FOR SOIL

ALTERNATIVE	COMPONENTS	DETAILS	COST
		Other materials may be used for backfill purposes (e.g., a geosynthetic liner and 1 foot of clean fill, topsoil, and vegetation), but for costing purposes, 2 feet of clean soil and vegetation has been assumed. The soil backfill layer would be constructed to achieve existing elevations and grades at the site. Erosion control measures would be required during placement of backfill and until the site is stabilized. The slope would be stabilized, including a geomembrane liner and rip rap, along the length of the shoreline (across an estimated area of 18,000 square feet) to further protect the backfill along the shoreline in the event of up to a 500-year storm within the floodplain. In addition, the floodplain topography will be restored to a similar grade so that there is no loss of flood storage capacity while improving drainage. Annual inspections would be completed in order to maintain the thickness of the backfill material and stabilized slope. The slope stabilization would be constructed to achieve existing elevations.	
	Land Use Controls (LUCs) and Inspections	LUCs would be implemented to prevent use of the site for residential purposes while maintaining the current recreational use and thus prevent exposure of such receptors to COCs in subsurface soil. LUCs would also be used to maintain backfill protectiveness. The LUCs would also require that any future work on the stabilized slope does not cause or result in a future release. Additionally, annual inspections and maintenance activities would be performed in order to monitor the backfill condition and stabilized slope. To implement LUCs, the Navy would prepare a LUC RD that would document the LUCs, O&M requirements, inspection requirements, and organizations responsible for implementation of the LUCs. Requirements for management of excavated soil as part of any future construction activities (including sampling and disposal of contaminated soils) at MRP Site 1 would also be included as part of the LUCs. LUCs would be developed in accordance with the Principles and Procedures for Specifying, Monitoring, and Enforcement of Land Use Controls and Other Post-ROD Actions (DoD, 2003), per letter dated January 16, 2004, from Alex A. Beehler, Assistant Deputy Under Secretary of Defense (Environment, Safety and Occupational Health), and the requirements of the FFA. As long as Navy retains ownership of the property, NAVSTA Newport enforces the LUCs and assures that each LUC is maintained appropriately by tracking it through a centralized tracking system. If the property is transferred from the Navy to another federal owner, upon meeting the requirements for transfers under the site's FFA, Navy would ensure as part of the transfer process that the gaining agency is made aware of the existing controls and would take appropriate action to ensure that such controls remain in place. If the property is ever transferred to non-federal ownership, deed restrictions, meeting state property law standards, would be recorded that would incorporate any land use	

TABLE 2-7. SUMMARY OF REMEDIAL ALTERNATIVES EVALUATED FOR SOIL

ALTERNATIVE	COMPONENTS	DETAILS	COST
		restrictions. 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 the responsibility under CERCLA and the FFA to enforce the LUC restrictions. LUCs will be maintained until the concentrations of hazardous substances, pollutants and contaminants in the soil are at levels that allow for unrestricted use and exposure.	
Alternative S-3 – Select Soil Removal, Soil and Asphalt Cover System, and Land Use Controls **[SELECTED REMEDY]**	Soil Removal and Disposal	Alternative S-3 would include removing the impacted shallow soil (2 feet) with RG exceedances and physically isolating remaining deeper impacted material below a soil and asphalt (or equivalent) cover system, while maintaining the existing grade. For cost estimating purposes, an estimated 995 cubic yards of soil would be removed from the 0 to 4-foot interval across approximately 6,700 square feet in the southwest corner of the site due to exceedances of leachability criteria and RGs. In the northwestern corner of the site, approximately 100 cubic yards of soil would also be removed due to exceedances of leachability criteria and RGs. The removal would be completed from 0 to 2 feet bgs over an area of approximately 1,400 square feet. Note that stormwater/ erosion controls will be included both pre- and post-construction to prevent migration of soil contaminants to surface water/sediment. An additional estimated 4,900 cubic yards of soil exceeding RGs would be excavated from the 0 to 2-foot interval across an impacted area of approximately 65,800 square feet on the western side of the site. An additional excavation would be completed from the 0 to 6-inch interval across an estimated area of 22,000 square feet to remove an estimated 400 cubic yards of soil. An arsenic and manganese-impacted area on the eastern side of the site will be managed under substantive environmental standards promulgated in the state Remediation Regulations 250-RICR-140-30-1, Section 1.13, pertaining to arsenic contaminated soil (utilizing a variance allowed under 250-RICR-140-30-1, Section 1.14.3, modifying applicability of special requirements to address the co-located manganese with the arsenic). Approximately 670 cubic yards of soil would be removed to a depth of 6 inches bgs over an area of approximately 36,000 square feet. This area would be backfilled with a soil cover system consisting of 6 inches of topsoil. All excavated soil would be stockpiled at an approved location, with controls and handling measures designed with considerations of storms and flood events to protect against structural failure, to keep water out, and to reduce effects of water entry. Details regarding stockpile management (e.g., stormwater controls and temporary covers) would be developed during the RD phase. Prior to disposal, waste characterization samples would be collected from the stockpiled soil. Per TSCA requirements for disposal of PCB-impacted	**Capital:** $2,591,000 **Five Year Review:** $27,000 **O&M:** $161,000 **Total 30-Year Present Worth:** $2,779,000

TABLE 2-7. SUMMARY OF REMEDIAL ALTERNATIVES EVALUATED FOR SOIL

ALTERNATIVE	COMPONENTS	DETAILS	COST
		soil, waste characterization sampling for PCB-impacted soil will be completed prior to excavation. Furthermore, additional pre-excavation samples may be collected for identifying soil that is potentially hazardous for stockpile handling purposes. Note that discrete confirmatory samples will be taken in all instances of excavation to demonstrate compliance with regulatory standards. This will be done in accordance with Section 5 of RIDEM's "Dig and Haul" policy. The excavated soil and debris would be transported and disposed of at off-site, licensed landfill or treatment facility(ies). Soil generated from the PCB excavation is assumed to be hazardous waste due to PCB concentrations above 50 mg/kg, and remaining soil generated is presumed to be non-hazardous for purposes of cost estimation. A cost sensitivity analysis included in the FS evaluated scenarios with higher volumes of hazardous waste.	
	Soil and Asphalt Cover	Following excavation activities, a cover system would be installed to isolate impacted subsurface soil. The cover would consist of 2 feet of clean fill/soil and vegetation (grass), with some locations covered a 6-inch thick layer of asphalt (or equivalent cover) to facilitate future site use. The soil cover extent is estimated to be 73,900 square feet. The asphalt/equivalent cover extent is estimated to be 22,000 square feet. The cover system would prevent direct contact, erosion, and transport of remaining soil exceeding RGs. Areas managed under the substantive environmental standards promulgated in the state Remediation Regulations 250-RICR-140-30-1, Section 1.13 would receive a cover layer consisting of 6 inches of topsoil over an extent of 36,000 square feet. The backfill layer would prevent direct contact, erosion, and transport of remaining soil exceeding RGs (i.e., subsurface soil located at depths beneath the cover system). Additional backfill will be needed where soil was removed to 4 feet to address leachability. Other materials may be used for covering purposes (e.g., a geosynthetic liner and 1 foot of clean fill, topsoil, and vegetation), but for costing purposes, 2 feet of clean soil and 6 inches of asphalt (including subbase) have been assumed. The thickness of the asphalt cover would be evaluated further during the design. To maintain the existing grade (and flood storage), any additional thickness needed would require additional excavation depth below planned paved areas. Unpaved areas of floodplain habitat will be restored with native species, soil and fill as applicable. Backfilled and covered areas would be constructed to achieve existing surface elevations, ensuring no net loss of flood storage capacity. Excavation beyond the soil-shoreline (beach) interface will be avoided. The cover system would be constructed to achieve existing elevations and grades at the site. In addition, the floodplain topography will be restored to a similar grade so that there is no loss of flood storage capacity, improved drainage and flood	

TABLE 2-7. SUMMARY OF REMEDIAL ALTERNATIVES EVALUATED FOR SOIL

ALTERNATIVE	COMPONENTS	DETAILS	COST
		resiliency. The design will ensure no net loss of beach or flood storage and will include storm and sea level rise considerations. The cover system will be constructed to withstand a 500-year storm. Both CERCLA and CZMA strongly encourage early and active coordination between federal agencies and the relevant state agencies. Navy will therefore coordinate with Rhode Island Coastal Resources Management Council (CRMC) throughout the remediation process. Erosion control measures would be required during installation of the cover system and until the site is stabilized. Slope stabilization, including a geomembrane liner and rip rap, would be performed along the length of the shoreline (across an estimated area of 18,000 square feet), to further protect the soil cover system and prevent contaminant release along the shoreline in the event of up to a 500-year storm within the floodplain. Annual inspections would be completed in order to evaluate and maintain the stabilized slope and the thickness of the backfill material. Erosion control measures would be required during installation of the cover and slope stabilization and until the site is stabilized.	
	LUCs and Inspections	LUCs would be implemented in order to prevent use of the site for residential purposes while maintaining the current recreational use and thus prevent exposure of such receptors to COCs in subsurface soil. LUCs would also be used to maintain cover protectiveness and also require that any future work on the stabilized slope does not cause or result in a future release. Additionally, annual inspections and maintenance activities would be performed in order to monitor the condition of the covered areas and stabilized slope. To implement LUCs, the Navy would prepare a LUC RD that would document the LUCs, O&M requirements, inspection requirements, and organizations responsible for implementation of the LUCs. Requirements for management of excavated soil as part of any future construction activities (including sampling and disposal of contaminated soils) at MRP Site 1 would also be included as part of the LUCs. LUCs would be developed in accordance with the Principles and Procedures for Specifying, Monitoring, and Enforcement of Land Use Controls and Other Post-ROD Actions (DoD, 2003), per letter dated January 16, 2004, from Alex A. Beehler, Assistant Deputy Under Secretary of Defense (Environment, Safety and Occupational Health), and the requirements of the FFA. As long as Navy retains ownership of the property, NAVSTA Newport enforces the LUCs and assures that each LUC is maintained appropriately by tracking it through a centralized tracking system. If the property is transferred from the Navy to another federal owner, upon meeting the requirements for transfers under the site's FFA, Navy would ensure as part of the transfer process that the gaining agency is made aware of the existing controls and would take appropriate action to ensure that such controls remain in place. If the	

TABLE 2-7. SUMMARY OF REMEDIAL ALTERNATIVES EVALUATED FOR SOIL			
ALTERNATIVE	COMPONENTS	DETAILS	COST
		property is ever transferred to non-federal ownership, deed restrictions, meeting state property law standards, would be recorded that would incorporate any land use restrictions. 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 the responsibility under CERCLA and the FFA to enforce the LUC restrictions. LUCs would be maintained until the concentrations of hazardous substances, pollutants and contaminants in the soil are at levels that allow for unrestricted use and exposure.	

2.11.2 Groundwater Alternatives

Table 2-8 summarizes the major components and provides estimated costs for the groundwater remedial alternatives developed and evaluated in detail for MRP Site 1. Under Alternatives GW-1 and GW-2, five-year reviews would be conducted until RAOs are achieved with groundwater concentrations reduced to acceptable levels for UU/UE. Five-year reviews of MRP Site 1 would be conducted as part of the facility-wide five-year review process.

TABLE 2-8. SUMMARY OF REMEDIAL ALTERNATIVES EVALUATED FOR GROUNDWATER			
ALTERNATIVE	COMPONENTS	DETAILS	COST
GW-1 – No Action	None	No further actions would be taken, except for statutorily required five-year reviews. Note that a "no action" alternative results in no mitigation of unacceptable risks and does not meet ARARs.	**Capital:** $0 **Five Year Review:** $0 **O&M:** $0 **Total Cost:** $0
GW-2 –Monitored Natural Attenuation and LUCs [SELECTED REMEDY]	Monitored Natural Attenuation	The Navy has determined that attenuation will achieve groundwater cleanup standards within a reasonable time period (approximately 33 years for metals), consistent with EPA guidance standards, and will conduct long-term monitoring to confirm the expected attenuation is taking place. MNA is expected to be a successful alternative over a long period due to removal of soil above leachability criteria. MNA for each COC must occur as projected with appropriate assessment and reporting of conditions. MNA would be conducted in order to support the LUCs and document any fluctuations in concentrations of contaminants in the groundwater. A quarterly groundwater quality monitoring program will be performed for the first two years at a minimum. Additional monitoring will occur as determined by Navy, EPA, and RIDEM. For cost estimation purposes, monitoring was assumed to occur quarterly for the first two years, and annually after that. MNA would be evaluated each year and with each five-year review as required by CERCLA. If the analytical data suggests that natural attenuation is not occurring, then the remedial alternative would be re-evaluated as appropriate. An MNA Plan would be prepared to identify the wells to be sampled, the analyses to be performed, and the need for any new monitoring wells. For cost estimating purposes, four existing wells would be utilized, and an additional four	**Capital:** $89,000 **Five Year Review:** $37,000 **O&M:** $898,000 **Total 35-Year Present Worth:** $1,024,000

TABLE 2-8. SUMMARY OF REMEDIAL ALTERNATIVES EVALUATED FOR GROUNDWATER			
ALTERNATIVE	COMPONENTS	DETAILS	COST
		would be installed to augment the MNA program, although the actual number of monitoring wells and frequency of sampling would be established in the MNA Plan. Screen depths are presented in Figure 5 with the existing well network. Installation and development of additional monitoring wells would be conducted by a drilling subcontractor; well development would be conducted to assure a good hydraulic connection with the aquifer. For costing purposes, each monitoring event would include measurement of DO, ORP, conductivity, pH, sulfate, nitrite, nitrate, temperature, alkalinity, ferrous iron, as well as total and dissolved iron, cobalt, and manganese. For costing purposes, it was assumed that attenuation of metals would take approximately 33 years based on data and site conditions assessed to date. The current conceptual site model for the site includes metals in groundwater from unknown sources. The conceptual site model would be evaluated each 5-year review period based on additional data collected; updates would be made regarding the source of the impacted groundwater and time to achieve remedial goals.	
	Land Use Controls and Inspections	LUCs would be implemented to prevent the potable use of groundwater while groundwater COC concentrations are above RGs, as well as include protection of monitoring wells. Additionally, periodic inspections and maintenance activities would be performed in order to monitor the condition of the wells. Inspections will take place semi-annually for the first two years of implementation and would be completed on an annual basis afterwards. To implement LUCs, the Navy would prepare a LUC RD that would document the LUCs, O&M requirements, inspection requirements, and organizations responsible for implementation of the LUCs.	

2.11.3 Sediment Alternatives

Table 2-9 summarizes the major components and provides estimated costs for the sediment remedial alternatives developed and evaluated in detail for MRP Site 1. Under Alternatives SED-1, SED-2 and SED-3, five-year reviews would be conducted because contamination would remain in excess of levels that pose an ecological risk. Under both Alternatives SED-2 and SED-3, periodic sampling events would be completed at 5 and 10 years post RA completion and documented in the five-year reviews. Five-year reviews of MRP Site 1 would be conducted as part of the facility-wide five-year review process.

TABLE 2-9. SUMMARY OF REMEDIAL ALTERNATIVES EVALUATED FOR SEDIMENT

ALTERNATIVE	COMPONENTS	DETAILS	COST
SED-1 – No Action	None	No further actions would be taken other than statutorily required five-year reviews. Note that a "no action" alternative results in no mitigation of unacceptable risks and does not meet ARARs.	**Capital:** $0 **Five Year Review:** $0 **O&M:** $0 **Total Cost:** $0
SED-2 – Sediment Removal [SELECTED REMEDY	Sediment Excavation & Disposal	Alternative SED-2 would include physically removing sediment containing lead pellets and lead and other COCs in order to reduce ingestion risk for ecological receptors. For cost purposes, it is assumed that sediment will be removed and disposed at an offsite facility. A pre-design investigation will be completed to further refine the extent of removal. In-situ sampling is planned for lead and lead pellets, plus PCBs, for this effort. The remedial design efforts will also include a submerged aquatic vegetation survey to determine a mitigation and	**Capital:** $6,036,000 **Five Year Review:** $95,000 **O&M:** $0 **Total 30-Year Present Worth:** $6,131,000

TABLE 2-9. SUMMARY OF REMEDIAL ALTERNATIVES EVALUATED FOR SEDIMENT

ALTERNATIVE	COMPONENTS	DETAILS	COST
		restoration strategy as needed during sediment excavation efforts and for post-construction care, in accordance with the ARARs. Prior to removal, control measures such as silt curtains would be installed. Any areas to be excavated in the intertidal zone may require barrier installation and dewatering (methods to be determined during design and remedial action planning). Approximately 21,800 cubic yards of sediment would be excavated from the off-shore area. Based on the existing site data, two off-shore areas would be excavated: approximately 65,600 square feet would be removed from the 0 to 1-foot interval to remove a total of 2,400 cubic yards of sediment, and approximately 174,000 square feet would be removed from the 0 to 3-foot interval for an additional 19,400 cubic yards of sediment. Approximately 4,600 cubic yards of sediment would be excavated from the near-shore area, which includes 3,200 cubic yards in the shoreline adjacent to MRP Site 1 and 1,400 cubic yards near Outfall 2 associated with Site 22. Based on the existing site data, two near-shore areas would be excavated: approximately 87,700 square feet would be removed from the 0 to 1-foot interval, and approximately 12,300 square feet would be removed from the 0 to 3-foot interval (due to exceedances of the manganese RG in each sample interval down to a depth of 3 feet), near Outfall 2 of Site 22. Removal of nearshore sediment is assumed to be completed through excavation from the shoreline. Sediment in deeper water will likely be removed by dredging equipment. Nearshore removals may be completed through a combination of excavation and some dredging based on accessibility to the shoreline as determined during the RD. All excavated sediment would be stockpiled at a location approved by RIDEM, EPA, and base personnel and allowed to dewater. Details regarding stockpile management (e.g., stormwater controls and temporary covers) would be developed during the RD phase in accordance with ARARs. The remedy may include mechanical screening of some sediment to remove lead pellets, if determined to be feasible in remedial design, to reduce disposal volumes and costs. Lead pellets would be transported offsite for recycling. Prior to disposal of sediments, waste characterization samples would be collected from the stockpiled sediment and characterized for disposal facility requirements. For costing purposes, 20% of excavated sediment has been assumed to be hazardous and will be determined through Toxicity characteristic leaching procedure (TCLP) analysis. Storage and handling of any hazardous sediments will be performed according to ARARs. Disposal characterization for PCB impacted sediments will be performed in-situ prior to excavation per TSCA requirements. All liquids resulting from the dewatering process will be collected, treated, and discharged in accordance with ARARs and other appropriate standards that will be determined during the RD phase. Some backfill and grading would occur along the shoreline, as necessary, to restore the shallow gradient	

TABLE 2-9. SUMMARY OF REMEDIAL ALTERNATIVES EVALUATED FOR SEDIMENT

ALTERNATIVE	COMPONENTS	DETAILS	COST
		that exists and mitigate steep changes in grade that may result from excavation activities. If anoxic conditions are shown to be present, additional fill or excavation modifications beyond typical sidewall sloping may be necessary. Following completion of the sediment removal action, sediment sampling within the remedial area will be conducted to evaluate the effectiveness of the remedial action in meeting RGs. Additional subsequent sampling events to evaluate the potential effects of remaining pellet migration to the shoreline will be conducted at 5 and 10 years post RA completion and documented in the five-year review reports. The need for additional sampling beyond 10 years will be determined jointly by the Navy, USEPA, and RIDEM. No LUCs would be needed for this alternative.	
SED-3 – Sediment Containment with Nearshore Removal	Sediment Excavation & Disposal	This alternative would achieve the RAO by isolating the off-shore lead pellets and lead in sediment from potential ecological receptors. Near-shore sediment removal would be completed to remove sediment with COC concentrations exceeding ecological RGs. A pre-design investigation will be completed to further refine the extent of removal. Approximately 4,600 cubic yards of sediment would be excavated from the near-shore area, which includes 3,200 cubic yards from the shoreline adjacent to MRP Site 1 and 1,400 cubic yards from an area near Outfall 2 associated with Site 22. Based on the existing site data, two areas would be excavated: approximately 87,700 square feet would be removed from the 0 to 1-foot interval, and approximately 12,300 square feet would be removed from the 0 to 3-foot interval (due to exceedances of the manganese RG in each sample interval down to a depth of 3 feet), near Outfall 2 of Site 22. Prior to removal, silt curtains would be installed. Any areas to be excavated in the intertidal zone may require barrier installation and dewatering (methods to be determined during design and remedial action planning). Removal of nearshore sediment is assumed to be completed through excavation from the shoreline. Note that the design may determine that cap construction in the near-shore area provides a cost-savings over excavation and disposal. However, as it will not be possible to place a cap directly adjacent to the water's edge without excavating material (due to bathymetry/tidal/flood storage concerns), it is currently assumed that all near-shore sediments will be excavated. All excavated sediment would be stockpiled at a location approved by RIDEM, EPA, and base personnel and allowed to dewater. Details regarding stockpile management (e.g., stormwater controls and temporary covers) would be developed during the RD phase in accordance with ARARs. Prior to disposal of near-shore sediments, waste characterization samples would be collected from the stockpiled sediment. For costing purposes, 20% of excavated sediment has been assumed to be hazardous and will be determined through TCLP analysis. Storage and handling of any hazardous sediments will be performed according to ARARs.	**Capital:** $4,230,000 **Five Year Review:** $1,281,000 **O&M:** $297,000 **Total Cost:** $5,808,000

TABLE 2-9. SUMMARY OF REMEDIAL ALTERNATIVES EVALUATED FOR SEDIMENT			
ALTERNATIVE	COMPONENTS	DETAILS	COST
		Disposal characterization for PCB impacted sediments will be performed in situ prior to excavation per TSCA requirements. All liquids resulting from the dewatering process will be collected, treated, and discharged in accordance with ARARs and other appropriate standards that will be determined during the RD phase. Backfill and grading would occur at the site to achieve existing bathymetry as close to existing conditions as possible. Backfill material must be of similar grain size to existing conditions.	
	Cap Construction	A subaqueous cap would be installed over an area of approximately 240,000 sq ft. A typical cover system could consist of 1 to 2 feet of clean sediment to prevent direct contact to the lead pellets and lead contained within the sediment. A 1- to 2-foot sediment cover over a geotextile barrier will provide protection from erosion caused by near shore transport processes. Large stones may be required in some locations in order to prevent erosion of the capping material. The subaqueous cap would be designed in order to remain protective throughout storm events including events up to a 500-year storm. Appropriate cover materials would be selected based on a predesign investigation (PDI) which includes a bathymetric survey, a tidal study to determine current velocities and depositional/eroding conditions, and a baseline submerged aquatic vegetation. It is possible that mitigation measures will be required to compensate for the lost flood storage due to the cap placement (to be determined during design).	
	Land Use Controls and Long-Term Monitoring	LUCs would be established to prevent disturbance of the cap by restriction of large and deep draft vessels, and signage in the area including signs on buoys would be used to dissuade recreational and other small vessels from anchoring and dragging of the cover system by recreational boaters and fisherman. Base security patrols would contact the Coast Guard if boaters are observed to be anchored in the area. LUC inspections would be required to ensure the land use is not changed, that large ships are not utilizing the area, and that the signage is maintained. Annual inspections would be conducted for the first five years to assess the condition of the containment cover (including cover thickness) and the surrounding area to ensure the protectiveness of the remedy. Frequency of inspections will be assessed after the first five years, but for cost purposes, is assumed to be once every five years. Contingency plans related to restoration success will be discussed as part of the design and O&M. Five-year reviews would be required and conducted as part of a facility-wide five-year review process. The Navy must submit an annual report to the regulatory agencies documenting that all of the restrictions are being met. The Navy is also required to take immediate action to correct any violations identified. This report must be submitted every year until such time as LUCs are no longer needed. The LUC would include provisions that would dictate how the LUC would be maintained if the Navy were to transfer ownership of the adjoining mainland areas. This would be developed during the LUC design.	

2.12 COMPARATIVE ANALYSIS OF ALTERNATIVES

Tables 2-10, 2-11, and 2-12 and subsequent text in this section summarize the comparison of the remedial alternatives for soil, groundwater, and sediment at MRP Site 1 against 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 FSs (Resolution, 2018a/b). Alternative S-1 (No Action), Alternative GW-1 (No Action), and Alternative SED-1 (No Action) do not meet the threshold criteria and therefore cannot be selected for a remedy.

2.12.1 Threshold Criteria

Overall Protection of Human Health and the Environment

Soil. Both Alternatives S-2 and S-3 include excavation, the installation of a cover system, and implementation of LUCs at the site, which adds protection to human health receptors and ecological receptors by removing the exposure pathway to impacted soil. Alternative S-3 removes less impacted soil in the footprint of the asphalt cover, leaving a higher volume of impacted soil on-site. As such, Alternative S-2 provides the greatest level of protection, followed by Alternative S-3. Alternative S-1 would not be protective of human health and the environment because contact with contaminated soil would not be prevented.

TABLE 2-10. COMPARISON OF CLEANUP ALTERNATIVES EVALUATED FOR SOIL

	ALTERNATIVE S-1	ALTERNATIVE S-2	ALTERNATIVE S-3 *
Alternative Description/Components			
Evaluation Criteria	No Action	Select Soil Removal, Soil Cover, and LUCs	Select Soil Removal, Soil and Asphalt Cover System, and LUCs
Estimated Timeframes for Cleanup			
Time to achieve remedial action objectives	NA	Approx. 1 year to implement remedial actions for protectiveness	Approx. 1 year to implement remedial actions for protectiveness
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?	⦸	⦸	⦸
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?	●	●	●

TABLE 2-10. COMPARISON OF CLEANUP ALTERNATIVES EVALUATED FOR SOIL

	ALTERNATIVE S-1	ALTERNATIVE S-2	ALTERNATIVE S-3 *
Alternative Description/Components			
Evaluation Criteria	No Action	Select Soil Removal, Soil Cover, and LUCs	Select Soil Removal, Soil and Asphalt Cover System, and LUCs
Cost (1) (2)			
Capital Cost	$0	$2,744,000	$2,591,000
Future O&M and Periodic Costs (PV)	$0	$188,000	$161,000
Five Year Reviews	$0	$27,000	$27,000
Total Present Worth Cost	$0	$2,959,000	$2,779,000
Modifying Criteria – May be used to modify recommended cleanup			
State Agency Acceptance – Do state environmental agencies agree with Navy's recommended alternative?	For State and Community Acceptance, see text below (2.12.3)		
Community Acceptance – What objections, modifications, or suggestions do the public offer during the public comment period?			

Notes:

1. For purposes of cost estimation, all future costs (periodic and O&M) represent 30-year time frames for Alternatives S-2 and S-3. Present Value (PV) of all future costs are provided. Actual total costs may be higher.
2. The five-year reviews for MRP Site 1 (OU9) are a component of the NAVSTA Newport facility five-year reviews

● Meets
⦸ Does Not Meet

ARARs: Applicable or Relevant and Appropriate Requirements
LUCs: Land Use Controls
O&M: Operation and Maintenance

* Alternative S-3 – Select Soil Removal, Soil and Asphalt Cover System, and LUCs is the Selected Remedy.

TABLE 2-11. COMPARISON OF CLEANUP ALTERNATIVES EVALUATED FOR GROUNDWATER		
	ALTERNATIVE GW-1	ALTERNATIVE GW-2 *
Alternative Description/Components		
Evaluation Criteria	No Action	Monitored Natural Attenuation and LUCs
Estimated Timeframes for Cleanup		
Time to achieve remedial action objectives	NA	Approx. 33 years[(1)]
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?	⦸	⦸
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?	●	●
Cost [(2) (3)]		
Capital Cost	$0	$89,000
Future O&M and Periodic Costs (PV)	$0	$898,000
Five Year Reviews	$0	$37,000
Total Present Worth Cost	$0	$1,024,000
Modifying Criteria – May be used to modify recommended cleanup		
State Agency Acceptance – Do state environmental agencies agree with Navy's recommended alternative?	For State and Community Acceptance, see text below (2.12.3)	
Community Acceptance – What objections, modifications, or suggestions do the public offer during the public comment period?		

Notes:

1. MNA has been estimated to take approximately 33 years to achieve the groundwater cleanup standards based on existing site data and site conditions as presented in the Feasibility Study (FS) (Resolution, 2018a).
2. For purposes of cost estimation, future O&M costs for Alternatives GW-2 are based on a 33-year timeframe and five-year review costs are based on a 35-year timeframe. Present Value (PV) of all future costs are provided. Actual total costs may be higher.
3. The five-year reviews for MRP Site 1 (OU9) are a component of the NAVSTA Newport facility five-year reviews.

● Meets
⦸ Does Not Meet
ARARs: Applicable or Relevant and Appropriate Requirements
O&M: Operation and Maintenance
* Alternative GW-2 – Long-Term Monitoring with Monitored Natural Attenuation is the Selected Remedy

TABLE 2-12. COMPARISON OF CLEANUP ALTERNATIVES EVALUATED FOR SEDIMENT

	ALTERNATIVE SED-1	ALTERNATIVE SED-2 *	ALTERNATIVE SED-3
Alternative Description/Components			
Evaluation Criteria	No Action	Sediment Removal	Sediment Containment with Nearshore Removal
Estimated Timeframes for Cleanup			
Time to achieve remedial action objectives	NA	Approx. 1 year to implement remedial actions for protectiveness	Approx. 1 year to implement remedial actions for protectiveness
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?	⦸	⦸(1)	⦸(1)
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?	●	●	●
Cost (1) (2)			
Capital Cost	$0	$6,036,000	$4,230,000
Future O&M and Periodic Costs (PV)	$0	$0	$297,000
Five Year Reviews	$0	$95,000	$1,281,000
Total Present Worth Cost	$0	$6,131,000	$5,808,000
Modifying Criteria – May be used to modify recommended cleanup			
State Agency Acceptance – Do state environmental agencies agree with Navy's recommended alternative?	For State and Community Acceptance, see text below (2.12.3)		
Community Acceptance – What objections, modifications, or suggestions do the public offer during the public comment period?			

Notes:
1. There may be treatment of water generated from the dewatering process prior to discharge back to the Bay and Alternative SED-2 also includes the option of screening of sediment to remove lead pellets.
2. For purposes of cost estimation, all future costs (periodic and O&M) represent 30-year time frames for Alternatives SED-2 and SED-3. Present Value (PV) of all future costs are provided. Actual total costs may be higher.
3. The five-year reviews for MRP Site 1 (OU9) are a component of the NAVSTA Newport facility five-year reviews.

● Meets
⦸ Does Not Meet
ARARs: Applicable or Relevant and Appropriate Requirements
LUCs: Land Use Controls
O&M: Operation and Maintenance
* Alternative SED-2 – Sediment Removal is the Selected Remedy

Groundwater. Alternative GW-2 protects human health by establishing LUCs that prevent the use of the site groundwater as drinking water. Over the longer term and under favorable geochemical conditions, manganese and cobalt are expected to be sequestered by precipitation or adsorption, to immobilized and/or occluded forms that are rendered harmless to receptors. Alternative GW-2 is considered the most effective at protecting human health. Alternative GW-1 would not be protective of human health because no action is taken to reduce risk for potential receptors. As such, Alternative GW-2 is the only alternative protective of human health and the environment.

Sediment. Alternative SED-2 is considered the most effective at protecting the ecological receptors. Under both Alternatives SED-2 and SED-3, all near-shore sediments with COC concentrations exceeding the ecological RGs would be permanently removed from the remediation area. While both Alternatives SED-2 and SED-3 would achieve the RAO related to lead pellet risk reduction, Alternative SED-2 would also remove lead pellets from the off-shore sediments and reduces the possibility of pellets becoming available in the future. The effectiveness of Alternative SED-3 would rely on structural capability and long-term maintenance of the cap. Alternative SED-1 would not be protective of the environment, because contact with contaminated sediment would not be prevented, nor would pellet ingestion.

Compliance with ARARs

Soil. Alternatives S-2 and S-3 would meet the chemical-specific, location-specific, and action-specific ARARs. Alternative S-1 does not comply with ARARs since it does not prevent exposure to soil with COC concentrations exceeding RGs. Alternatives S-2 and S-3 will meet the no unreasonable risk standard in accordance with TSCA regulations at § 761.61 (c) by establishing protective cleanup standards for PCBs in soil and preventing contact with any PCB contamination left in place that poses a human health or ecological risk. In addition, under both alternatives Land Use Controls will be used to prevent use of the site for residential purposes while maintaining the current recreational use. Both Alternatives S-2 and S-3 need to be designed, constructed, and maintained so that they remain protective of human health and the environment as described (e.g., do not release contaminants) in the event of up to a 500-year storm event and/or rising sea level. Also refer to Appendix D of the Soil and Groundwater FS (Resolution, 2018a).

Groundwater. Alternative GW-2 meets the chemical-specific, location-specific, and action-specific ARARs. Alternative GW-1 does not comply with ARARs since it does not prevent exposure to contaminated groundwater exceeding the RGs. Also refer to Appendix D of the Soil and Groundwater FS (Resolution, 2018a).

Sediment. Alternatives SED-2 and SED-3 would meet the chemical-specific, location-specific, and action-specific ARARs. The Navy has determined the that SED-2 is the least environmentally damaging practicable alternative under the Clean Water Act. Alternatives SED-2 and SED-3 will meet the no unreasonable risk standard in accordance with TSCA regulations at § 761.61 (c) by establishing protective cleanup standards for PCBs in sediments and dredging and disposing off-site any PCB-contaminated sediments that pose an ecological risk. Alternative SED-1 would not comply with ARARs since it would not prevent exposure to sediment with COC concentrations exceeding the RGs, nor reduce pellet ingestion risk. Also refer to Appendix C of the Sediment FS (Resolution, 2018b).

2.12.2 Primary Balancing Criteria

Long-Term Effectiveness and Permanence

Soil. In terms of mitigating risks remaining at the site after RAOs have been met, and for risks from management of residuals, Alternative S-2 has the highest long-term effectiveness. Alternative S-2 removes all shallow soil exceeding human health and ecological RGs, as well as deeper soils exceeding RIDEM Remediation Regulation GA leachability criteria, while Alternative S-3 removes a smaller volume of impacted shallow soil due to the reduced volume of soil removed in the footprint of the asphalt cover. Under Alternatives S-2 and S-3, contaminated subsurface soil remains at MRP Site 1. Alternatives S-2 and S-3 utilize controls to prevent exposure to contaminated soil to provide the desired long-term effectiveness. A future residential land use scenario would be prevented under Alternatives S-2 and S-3 while maintaining the current recreational use. Alternative S-1 is not effective and doesn't provide permanent protection from contaminants in soil.

Groundwater. Alternative GW-2 would provide effectiveness as long as the LUCs remain in place, or until natural attenuation processes reduce the groundwater COC concentrations to below human health RGs. Although not as effective on inorganics, natural attenuation is expected to permanently reduce groundwater contaminant concentrations to acceptable levels over time, and this would be consistently evaluated over time through the five-year review process. Alternative GW-1 is not effective and doesn't provide permanent protection from contaminants.

Sediment. In terms of risks remaining at the site after RAOs have been achieved, as well as reliability of controls, Alternative SED-2 has the highest long-term effectiveness as it would remove all near-shore sediment with ecological RG exceedances as well as remove off-shore sediments containing lead pellets and RG exceedances. Alternative SED-3 would also remove all near-shore sediment with RG exceedances, and addresses the off-shore sediments containing lead pellets and RG exceedances with a permanent cap. The residual risk is similar, as the extent of remediation is similar, although the cap material would not contain pellets, while the sediment remaining below the open excavation area may contain residual pellets. However, the reliability of maintaining subaqueous cover protectiveness via cap repairs, LUCs and signage (in Alternative SED-3) is considered slightly lower than an alternative with no need for cover maintenance (Alternative SED-2). For Alternative SED-3, the durability of the off-shore cap during storm events, propeller wash, vessel grounding, and other events is one uncertainty to be considered when comparing the alternatives. Alternative SED-1 is not effective and doesn't provide permanent protection from contaminants in sediment.

Reduction in Toxicity, Mobility, or Volume through Treatment

Soil. The alternatives evaluated do not utilize treatment processes. Therefore, the criteria for treatment is not met.

Groundwater. The alternatives evaluated do not utilize treatment processes. Therefore, the criteria for treatment have not been evaluated.

Sediment. There would be no treatment under Alternative SED-1. For Alternatives SED-2 and SED-3 there may be treatment of water generated from the dewatering process prior to discharge back to the Bay. Furthermore, for Alternative SED-2, if shown to be a cost savings, one option for processing off-shore sediments is to screen-out the lead pellets. Screening would allow the lead pellets to be recycled at an off-site facility and the residual sediments that are free of pellets could potentially be re-used on-site. If screening is found to be

economically viable, it is estimated that over 10 tons of lead could be recovered; however, processed sediment will be characterized to determine if reuse is appropriate.

Short-Term Effectiveness

Soil. The effectiveness of the remedial alternatives during construction and implementation are compared to one another in the following paragraphs.

Protection of Community and Workers During Remedial Action: Short-term risks include any additional risks to the community or workers at the site from exposures to COCs in soil as a result of construction measures and implementation of remedial activities. Since no construction activities or remedial actions are proposed under Alternative S-1, there are no additional short-term risks to the community or workers. Alternatives S-2 and S-3 include similar short-term risks to workers during the installation of the cover or backfill placement, with Alternative S-2 having increased short-term risks due to increased excavation activities. Alternatives S-2 and S-3 all involve truck traffic associated with materials entering and leaving the site. Alternative S-2 would have the most truck traffic due to the amount of soil to be removed and replaced, followed closely by Alternative S-3. These short-term community risks would be mitigated via proper traffic planning. The short-term worker risks associated with Alternatives S 2 and S-3 can be mitigated with the use of appropriate personal protective equipment (PPE) during construction activities and proper handling and management (i.e., engineering controls and contingency measures) of contaminated soil.

Environmental Impacts: The remedial alternatives evaluated differ in the magnitude of potential impacts to natural habitats. Since no construction activities or remedial actions are proposed under Alternative S-1, there are no additional short-term impacts to natural habitats. Alternatives S-2 and S-3 have similar environmental impacts based on extent of remediation and construction period.

Time to Achieve Remedial Goals: Alternative S-1 will never achieve remedial goals since no action will be undertaken. Alternative S-2 and S-3 would take a comparable amount of time to achieve the remedial goals, although based on anticipated soil excavation and transport of soil for disposal and backfill, Alternative S-3 would be completed in a quicker timeframe.

Based on the discussions above, Alternative S-1 has the lowest potential short-term impacts to the environment, community, and workers, since no action will be undertaken. Alternatives S-2 and S-3 have similar short-term impacts, although based on truck traffic and worker impacts, Alternative S-3 has the lowest impact.

Groundwater. The effectiveness of the remedial alternatives during implementation are compared to one another in the following paragraphs.

Protection of Community and Workers During Remedial Action: Short-term risks include any additional risks to the community or workers at the site from exposures to COCs as a result of construction measures and implementation of remedial activities. Since no construction activities or remedial actions are proposed under Alternative GW-1, there are no additional short-term risks to the community or workers. Under Alternative GW-2, short-term risks to workers would be mitigated through use of proper PPE. Minor short-term impacts to the community would be involved with Alternative GW-2 related to truck traffic associated with investigation-derived waste ([IDW], due to monitoring well installation) shipping.

Environmental Impacts: Implementation of LUCs and groundwater monitoring would not adversely impact the surrounding environment beyond minor habitat impacts due to monitoring well installation and sampling. These impacts would be mitigated to the maximum extent practicable.

Time to Achieve RAOs: For both alternatives, reduction of metals in groundwater is expected to be approximately 33 years based on existing site data and site conditions as presented in the FS, and the actual time will depend on trends developed during several years of monitoring during remediation. While it is expected that the time to achieve cleanup levels for GW-1 would be similar to GW-2, the progress for GW-1 would not be monitored.

Based on the discussions above, Alternative GW-2 has slightly more short-term impacts than GW-1.

Sediment. The effectiveness of the remedial alternatives during construction and implementation are compared to one another in the following paragraphs.

Protection of Community and Workers During Remedial Action: Short-term risks include any additional risks to the community or workers at the site from exposures to COCs in sediment as a result of construction measures and implementation of remedial activities. Since no construction activities or remedial actions are proposed under Alternative SED-1, there are no additional short-term risks to the community or workers. Alternatives SED-2 and SED-3 include similar short-term risks related to near-shore sediment removal/disposal. Alternative SED-2 has greater short-term risks to workers related to off-shore removal/processing. However, Alternative SED-3 has slightly lower risks to the community, as the amount of imported clean fill (for use as a subaqueous cover) is lower than the estimated amount of sediment to be removed under SED-2. The short-term risks associated with Alternatives SED-2 and SED-3 can be mitigated with the use of appropriate PPE during construction activities and proper handling, management (i.e., engineering controls and contingency measures) of contaminated sediment and carefully considered traffic control measures.

Environmental Impacts: The remedial alternatives evaluated differ in the magnitude of potential impacts to natural habitats. Since no construction activities or remedial actions are proposed under Alternative SED-1, there are no additional short-term impacts to natural habitats. Alternatives SED 2 and SED-3 have similar environmental impacts based on extent of remediation and construction period. For both SED-2 and SED-3 flora and fauna within the footprint of the work will have short-term impacts while the work is underway. Both Alternatives SED-2 and SED-3 would be designed to allow the ecological functions to return after the work is completed.

Both Alternatives SED-2 and SED-3 would likely take approximately 1 year to complete construction and achieve RAOs, while Alternative SED-1 would not achieve RAOs.

Based on the discussions above, Alternatives SED-2 and SED-3 have similar short-term effectiveness, while Alternative SED-1 is not effective, as it would not achieve RAOs.

Implementability

The alternatives with the highest degree of implementability would have the following characteristics from USEPA's FS guidance (USEPA, 1988):

- Require the lowest effort to construct, operate and maintain the technologies
- Include or consist only of the highest or most reliable technologies
- Require the lowest effort to undertake additional remedial actions, if necessary
- Include the fewest administrative hurdles for obtaining necessary permits, approvals and agreements
- Rely only minimally on off-site treatment, storage, and disposal facility (TSDF) services
- Require the least amount or quantity of necessary specialized equipment and/or personnel specialists
- Utilize commonly available technologies to the largest degree

Conversely, alternatives with lesser degrees of implementability will have lesser degrees of the characteristics discussed above. The first three bullets define the "technical feasibility" with regard to implementability of the alternative, the fourth bullet defines "administrative feasibility," and the remaining three bullets define the "availability of services and materials" with respect to the alternative. These three factors combine to provide the overall degree of implementability of the alternative.

In general, more complex remedial technologies are more difficult to implement and will have lesser degrees of overall implementability compared to other, less complex, alternatives. As a result, the No Action alternative (S-1, GW-1, SED-1) is typically considered the most implementable, and any additional alternatives are less implementable. However, it should be noted that none of the alternatives presented, when applied to these areas, are considered highly complex and are commonly implemented at similar environmental restoration sites.

Soil. The following paragraphs present more detailed evaluations of the comparison on implementability characteristics of the remedial alternatives for soil discussed in this ROD.

Technical Feasibility: Implementability with regard to the technical feasibility of an alternative includes an evaluation of three factors: 1) ability to construct, operate and maintain the technologies, 2) the reliability of the technologies, and 3) the ease of undertaking additional remedial actions, if warranted by site conditions determined after implementation of the remedy.

Alternative S-1 is the most technically feasible alternative. Alternatives S-2 and S-3 have comparable implementability due to similar extents of remediation. Excavation, LUCs, and cover systems are common technologies. Alternatives S-2 and S-3 both involve excavation; however, Alternative S-2 is slightly more complex due to the increased excavation volume. Both Alternatives S-2 and S-3 have LUCs and a cover system that require long-term inspections and/or maintenance. Both Alternatives S-2 and S-3 will face implementability issues with establishing covers within the floodplain that will not release contaminants in the event of up to a 500-year storm event, and both include geomembrane liners as part of the slope stabilization design to prevent contaminant release.

The ease of undertaking additional remedial actions, if warranted by future site conditions or requirements, is proportional to the degree or intensity of each remedy. Additional remedial actions would be more difficult to implement for Alternatives S-2 and S-3 due to the remaining contamination in the subsurface soils, and the cover system may need to be removed to conduct additional remedial actions.

Administrative Feasibility: Alternative S-1 would have no administrative requirements, other than five-year reviews. Both Alternatives S-2 and S-3 would require administrative approvals associated with five-year reviews and LUCs, which are also easily administered.

Availability of Services and Materials: Implementability with regard to the availability of services and materials includes an evaluation of three factors: 1) availability or usage of off-site TSDFs, 2) availability of necessary or specialized equipment or specialist personnel needed to implement the alternative, and 3) availability of prospective technologies required by the alternative. Each of these three factors is described for the alternatives.

Alternative S-1 would not require specialized equipment or personnel. Alternatives S-2 and S-3 would require off-site disposal of soil, with Alternative S-2 requiring disposing the largest amount of soil. All services and materials required for the remaining alternatives would be relatively easy to obtain. Finally, special technologies (i.e., proprietary technologies or technologies with more variables affecting ultimate effectiveness) are not proposed for any of the alternatives discussed in this FS. Adequately trained personnel (i.e., 40-hour Occupational Safety and Health Administration Hazardous Waste Operations and Emergency Response [OSHA HAZWOPER] certified) would be required to implement the proposed remedial alternatives. The contractor implementing the remedial alternatives would provide such personnel.

Based on the evaluations above, Alternative S-1 is considered the most implementable, followed by Alternatives S-3 and S-2. All remedial alternatives discussed in this FS can be implemented with relative ease.

Groundwater. The following paragraphs present more detailed evaluations of the comparison on implementability characteristics of the remedial alternatives for groundwater discussed in this ROD.

Technical Feasibility: Implementability with regard to the technical feasibility of an alternative includes an evaluation of three factors: 1) ability to construct, operate and maintain the technologies, 2) the reliability of the technologies, and 3) the ease of undertaking additional remedial actions, if warranted by site conditions determined after implementation of the remedy.

Alternative GW-1 would be implementable since no action would need to be taken. Alternative GW-2 is relatively easy to implement as monitoring well installation, sampling, and maintenance of monitoring wells, analysis of the samples, and performance of five-year reviews could readily be accomplished.

Administrative Feasibility: Alternative GW-2 would require administrative approvals associated with five-year reviews and LUCs, which are easily administered.

Availability of Services and Materials: Implementability with regard to the availability of services and materials includes an evaluation of three factors: 1) availability or usage of off-site TSDFs, 2) availability of necessary or specialized equipment or specialist personnel needed to implement the alternative, and 3) availability of prospective technologies required by the alternative. Each of these three factors is described for the alternatives.

Alternative GW-1 would not require specialized equipment or personnel. Alternative GW-2 would require personnel and equipment to perform the groundwater monitoring, which is easily implemented. Qualified commercial laboratory facilities are available to analyze groundwater samples. TSDFs are available for disposal of IDW associated with monitoring well installation. On-site special technologies (i.e., proprietary technologies or technologies with more variables affecting ultimate effectiveness) are not proposed for any of

the alternatives discussed in this FS, although qualified laboratory facilities may utilize proprietary technologies or technologies with more variables affecting ultimate effectiveness. Adequately trained personnel (i.e., 40-hour OSHA HAZWOPER certified) would be required to implement the proposed remedial alternatives. The contractor implementing the remedial alternatives would provide such personnel.

Based on the evaluations above, Alternative GW-1 is considered the most implementable, followed by GW-2.

Sediment. The following paragraphs present more detailed evaluations of the comparison on implementability characteristics of the remedial alternatives discussed in this FS.

Technical Feasibility: Implementability with regard to the technical feasibility of an alternative includes an evaluation of three factors: 1) ability to construct, operate and maintain the technologies, 2) the reliability of the technologies, and 3) the ease of undertaking additional remedial actions, if warranted by site conditions determined after implementation of the remedy.

Alternative SED-1 is the most technically feasible as it requires no action. Alternatives SED-2 and SED-3 have comparable implementability due to similar construction periods and extents of remediation. Excavation/dredging, mechanical sorting (if shown to be a cost savings), subaqueous capping, and LUCs are common technologies. Alternative SED-2 would require a larger on-shore sediment processing area than Alternative SED-3, with both potentially conflicting with scheduling of MRP Site 1/Site 22 upland remedial actions and ongoing/future site uses. Protection/monitoring/maintenance of the subaqueous cover in Alternative SED-3 is a more complex process compared to removal under SED-2. Alternative SED-3 involves a net filling of the water body and creates a slightly higher sediment elevation, which means achieving ARAR compliance for Alternative SED-3 may be more challenging compared to Alternative SED-2. In general, subaqueous caps can be reliable if properly designed and maintained and are not subjected to unexpected events (vessel grounding, extreme storm events).

The ease of undertaking additional remedial actions, if warranted by future site conditions or requirements, is proportional to the degree or intensity of each remedy. Since Alternative SED-2 would remove impacted sediment containing lead pellets to a depth of 1 foot with additional removal to a depth of 3 feet, additional remedial actions can be performed with relative ease. Additional remedial actions would be more difficult to implement for Alternative SED-3 due to the need to first remove the subaqueous cover.

Administrative Feasibility: Alternative SED-1 would have no administrative requirements, other than five-year reviews. Alternatives SED-2 and SED-3 would both require similar administrative coordination associated with excavation/dredging in Narragansett Bay. Alternative SED-2 would not require subaqueous cover inspections and LUCs and therefore has a higher degree of administrative feasibility.

Availability of Services and Materials: Implementability with regard to the availability of services and materials includes an evaluation of three factors: 1) availability or usage of off-site TSDFs, 2) availability of necessary or specialized equipment or specialist personnel needed to implement the alternative, and 3) availability of prospective technologies required by the alternative. Each of these three factors is described for the alternatives.

Alternative SED-1 would not require specialized equipment or personnel. Alternatives SED-2 and SED-3 would require off-site disposal of near-shore sediments, with Alternative SED-2 also potentially requiring recycling/disposal of lead pellets removed from off-shore sediments (if determined to be a cost savings). All

services and materials required for the alternatives would be relatively easy to obtain. Finally, special technologies (i.e., proprietary technologies or technologies with more variables affecting ultimate effectiveness) are not proposed for any of the alternatives discussed in this FS.

Based on the evaluations above, Alternative SED-1 is considered the most implementable, followed by Alternative SED-2. Alternative SED-3 would be the most difficult to implement of the three alternatives considered. However, all remedial alternatives discussed in this FS can be implemented with relative ease.

Cost

Soil. Alternative S-1 is considered the least expensive, followed by Alternatives S-3 and S-2 (shown below). The costs associated with the three alternatives are summarized as follows:

Cost Component	Alternative S-1	Alternative S-2	Alternative S-3 (Selected Alternative)
Capital Costs	$0	$2,744,000	$2,591,000
O&M	$0	$188,000	$161,000
Five-Year Reviews	$0	$27,000	$27,000
Total Cost[1]	$0	$2,959,000	$2,779,000

[1] Rounded to the nearest $1,000

Groundwater. Alternative GW-1 is considered the least expensive, followed by Alternatives GW-2 (shown below). The costs associated with the two alternatives are summarized as follows:

Cost Component	Alternative GW-1	Alternative GW-2 (Selected Alternative)
Capital Costs	$0	$89,000
O&M	$0	$898,000
Five-Year Reviews	$0	$37,000
Total Cost[1]	$0	$1,024,000

[1] Rounded to the nearest $1,000

Sediment. Alternative SED-1 is considered the least expensive, followed by Alternatives SED-3 and SED-2 (shown below). The costs associated with the three alternatives are summarized as follows:

Cost Component	Alternative SED-1	Alternative SED-2 (Selected Alternative)	Alternative SED-3
Capital Costs	$0	$6,036,000	$4,230,000
O&M	$0	$0	$297,000
Five-Year Reviews	$0	$95,000	$1,281,000
Total Cost[1]	$0	$6,131,000	$5,808,000

[1] Rounded to the nearest $1,000

2.12.3 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 the formal public comment period as described in Section 2.3 and encouraged to participate in the process. There were no formal comments recorded at the public hearing. Written comments were received by the Navy during the public comment period. The comments have been addressed in the Responsiveness Section of this ROD. While there were questions raised in the comments, and information shared related to design considerations, there were no specific objections to taking the actions proposed. Based on a review of the comments, the Navy does not plan to change the selected remedies presented in the Proposed Plan. Information presented in the comments will be considered during development of the RD. Refer to Section 3.0 for further discussion of comments received.

2.13 PRINCIPAL THREAT WASTE

The NCP at 40 CFR Section 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 an unacceptable 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 MRP Site 1 – Former Carr Point Shooting Range (OU9), the contaminant concentrations are not highly toxic or highly mobile; therefore, principal threat wastes are not present at the site.

2.14 SELECTED REMEDY

2.14.1 Rationale for Selected Remedy

The Selected Remedy for MRP Site 1 is **Alternative S-3: Select Soil Removal, Soil and Asphalt Cover System, and Land Use Controls**, **Alternative GW-2: Monitored Natural Attenuation and LUCs**, and **Alternative SED-2: Sediment Removal**. This combination was selected because it provides the best balance with respect to the nine evaluation criteria and will allow for continued use of the property consistent with existing uses.

When completed, Soil Alternative S-3, Groundwater Alternative GW-2, and Sediment Alternative SED-2 will be: (1) protective of human health and the environment (e.g., achieve the site-specific remedial action objectives); (2) comply with all applicable or relevant and state and federal environmental statutes and regulations; (3) provide long-term effectiveness; and (4) provide a cost-effective action that can be easily implemented using proven technology. These alternatives require engineering and/or land use controls that would prevent exposure to MRP Site 1 contaminants that pose a risk to human health or the environment. As such, these alternatives would achieve RAOs. While Alternatives S-2 and SED-3 would also achieve the RAOs if successfully implemented, these alternatives are either not as appropriate for planned site use (S-2, since S-3

provides for paved surfaces in support use as an RV park) or require significantly longer investment for a similar cost (SED-3) than the preferred alternatives.

2.14.2 Description of Selected Remedy

The Selected Remedy for soil (Alternative S-3) will allow for the current and planned continued use of MRP Site 1 and includes the following components (Table 2-5 and Figure 4):

- Focused excavation activities will be conducted to remove shallow soil (0-2 ft bgs), including an area which will be removed down to 4 feet bgs, containing exceedances of RIDEM Remediation Regulation GA leachability criteria and human health and ecological RGs in selected upland areas above the high tide line. Note that discrete, confirmation sample collection and analyses will be used at excavation limits, in accordance with RIDEM policy.
- Following excavation, the slope along the shoreline will be covered with a geotextile membrane, soil, and rip rap for stability (and for protection of the adjacent soil cover), following the removal of construction debris and associated contaminated soil. There will be no decrease in flood storage due to the slope work and no reduction in beach area.
- Following excavation activities, a cover will be installed consisting of a soil or asphalt system in a majority of MRP Site 1. The cover system will prevent direct contact, erosion, and transport of remaining soil exceeding RGs. Materials for the cover system will be determined during the remedial design and will consist of materials that will allow site reuse similar to existing conditions. The cover system will be constructed so that there is no loss of flood storage capacity by removing a soil volume equal to or greater than the volume of the cover system and by maintaining similar final grades. The Navy will design and maintain the cover system to prevent the release of any contaminants in up to a 500-year flood event.
- LUCs will be established to prevent use of the site for residential purposes while maintaining the current recreational use and thus prevent the exposure of such receptors to COCs in subsurface soil. LUCs will also be used to maintain cover protectiveness to prevent exposure to soils beneath the covered areas that exceed RGs. The LUCs would also require that any future work on the stabilized shoreline slope establish appropriate mitigation measures to prevent migration of contaminants to the offshore area. As part of the LUCs, signage will be designed and placed at the site for information related to site restrictions, such as digging below the clean cover.

Note that sample locations 3B-01, 3D-01, 4B-01, 4C-01, 4D-01, 5B-01, SW5-01, and SW6-01 only exceed RGs for total chromium. Because hexavalent chromium was detected in soil, in accordance with the HHRA work plan (Resolution, 2013) risks associated with chromium (from direct exposure to soil) were conservatively evaluated with the assumption that all total chromium in soil was of the more toxic hexavalent form. The evaluation of total chromium as 100% hexavalent chromium is overly conservative and leads to the overestimation of potential risk/HI for total chromium in soil. For planning purposes, it is assumed that locations with exceedances of total chromium RGs will be eliminated during a PDI that includes speciation of chromium detection.

Note also that both CERCLA and CZMA strongly encourage early and active coordination between the federal agency and the relevant state agencies. The Navy will therefore continue its history of coordinating with RI CRMC through the remedial action for its shoreline project work. The Selected Remedy for groundwater

(Alternative GW-2) will allow for the current and planned use of MRP Site 1 and includes the following components (Table 2-6 and Figure 5):

- The Navy has determined that attenuation will achieve groundwater cleanup standards within a reasonable time period (approximately 33 years for metals), consistent with EPA guidance standards, and will conduct long-term monitoring to evaluate the rate of attenuation against planned performance. MNA is expected to be a successful alternative over a long period due to removal of soil above leachability criteria. The MNA program will be designed to allow continuous evaluation of data trends to support annual LUC remedy assessments and five-year reviews. MNA progress will be periodically reviewed with EPA and RIDEM per the LUC RD.
- Establishment and enforcement of LUCs to prevent the use of groundwater as a potable supply until groundwater cleanup standards and remedial goals are achieved (including RIDEM GA objectives). The LUCs will also prevent disturbing the monitoring wells used for the remedy. Note that the soil component of the remedy will also require minimizing disturbance of the cover, so there will be additional physical restrictions on accessing the groundwater. Annual reporting will be part of the LUC activities.
- Monitoring wells will be installed and maintained in a manner to withstand potential damage from up to a 500-year storm and potential flood events for the duration of the monitoring program.

The Selected Remedy for sediment (Alternative SED-2) will allow for the current and planned use of MRP Site 1 and includes the following components (Table 2-7 and Figure 6):

- Removal of offshore sediment containing lead pellets and lead in sediment to reduce the ingestion risk for ecological receptors.
- Removal of nearshore sediment containing exceedances of ecological RGs.
- Off-site disposal of excavated sediment and placement of clean fill/sediment in nearshore area. The remedy may include mechanical screening of some sediment to remove lead pellets, if determined to be feasible in remedial design, to reduce disposal volumes and costs. Lead pellets would be transported offsite for recycling.
- Establish a material-handling area for the excavated sediment with any required dewatering treatment, as well as erosion, stormwater, and flood protection controls, as warranted.
- A pre-design investigation will be completed to further refine the extent of removal. In addition, a submerged aquatic vegetation survey will be conducted to assess if any sensitive aquatic habitats will be altered by the remedy. The remedial design will include mitigation efforts during construction and post-construction restoration needs per the ARARs.
- Prior to removal, silt curtains would be installed. Any areas to be excavated in the intertidal zone may require barrier installation and dewatering.
- Backfill and grading along the shoreline to restore the shallow gradient that exists, mitigate steep changes in grade, and restore impacted vegetation (as necessary) that may result from excavation efforts.
- Sediment sampling within the remedial area to evaluate the effectiveness of the remedial action in meeting RGs. Additional subsequent sediment sampling events to evaluate the potential effects of remaining pellet migration to the shoreline will be conducted at 5 and 10 years post-RA completion and

documented in the five-year review reports. The need for additional sampling beyond 10 years will be determined jointly by the Navy, USEPA, and RIDEM.

Note also that both CERCLA regulations and the CZMA strongly encourage early and active coordination between the federal agency and the relevant state agencies. The Navy will therefore continue its history of coordinating with RI CRMC through the remedial action for its sediment project work.

Because this remedy will result in hazardous substances, pollutants, or contaminants remaining on site in excess of levels that allow for unlimited use and unrestricted exposure, in accordance with Section 121(c) of CERCLA and NCP §300.430(f)(5)(iii)(c), a statutory review will be conducted within 5 years of the initiation of remedial action, and at least every 5 years thereafter, to ensure that the remedy continues to be protective of human health and the environment. During such reviews, the Navy, USEPA, and RIDEM will review site conditions and monitoring data to determine whether the Selected Remedy is appropriate. Five-year reviews will be conducted until MRP Site 1 conditions are restored such that the site is suitable for unrestricted use and unlimited exposure in accordance with CERCLA. The five-year reviews would be performed as part of the facility-wide five-year reviews. The last five-year review for the facility was conducted issued in December 2019.

2.14.3 Expected Outcomes of Selected Remedy

The current recreational use, which will be supported by the Selected Remedy, is expected to continue at MRP Site 1, and there are no other planned land uses in the foreseeable future. Groundwater at the site is not used and is not expected to be used in the future; however, groundwater remediation must meet federal and state drinking water standards, unless the water is non-potable. RIDEM classifies groundwater at MRP Site 1 to be GA, assumed safe for consumption without treatment. There are no socio-economic, community revitalization, or economic impacts or benefits associated with implementation of the Selected Remedy. RAOs for the site are anticipated to be achieved within approximately 1 year for soil, approximately 33 years for groundwater, and approximately 1 year for sediment. Table 2-13 describes how the Selected Remedy mitigates risk and achieves RAOs for MRP Site 1.

TABLE 2-13. HOW SELECTED REMEDY MITIGATES RISK AND ACHIEVES RAOS

RISK	RAO	COMMENTS
Direct exposure to and ingestion of contaminated soil	Prevent exposure by future residents and other unrestricted users to soils containing site chemicals that exceed human health RGs. Prevent exposure by current and future recreational users to soils containing COCs that exceed human health RGs. Prevent exposure by current and future site workers to soils containing site chemicals that exceed human health RGs. Prevent exposure by current and future adolescent trespassers to soils containing COCs that exceed human health RGs. Prevent exposure by future construction workers to soil containing site chemicals that exceed human health RGs.	The combination of select soil excavation and installation of soil and asphalt covers (or an equivalent material) will prevent direct contact with impacted soils with COCs above RGs. LUCs will be used to maintain cover protectiveness and to prevent use of the site for residential purposes while maintaining the current recreational use. As part of the LUCs, signage will be designed and placed at the site for information related to site restrictions, such as digging below the clean cover.
Migration of soil contaminants to	Prevent future migration of soil chemicals to groundwater and neighboring surface water and sediment.	The covers (soil and asphalt) and stabilized slope along the shoreline will prevent erosion and transport of soil that will remain following

TABLE 2-13. HOW SELECTED REMEDY MITIGATES RISK AND ACHIEVES RAOS		
RISK	**RAO**	**COMMENTS**
surface water and sediment		excavation with COCs. The cover will be designed, installed, and maintained to prevent any release of contamination in up to a 500-year storm event. LUCs will be used to maintain cover protectiveness and to require that any future work on the stabilized slope does not cause or result in a future release.
Migration of contaminants to groundwater	Prevent future migration of soil chemicals to groundwater and neighboring surface water and sediment.	Soil with COCs exceeding RIDEM Remediation Regulation GA Leachability Criteria will be removed.
Ingestion of groundwater as drinking water by future on-site worker and hypothetical resident; also, dermal contact by hypothetical resident	Restore groundwater to beneficial reuse standards. Prevent exposure by future residents and site workers to groundwater containing site chemicals that exceed respective RGs, until groundwater cleanup standards are achieved.	Monitored natural attenuation is expected to achieve the required restoration of groundwater to federal/state drinking water standards within a reasonable timeframe for all COCs (approximately 33 years for metals). LUCs will prevent the use of groundwater as drinking water until groundwater RGs are achieved.
Direct exposure to and ingestion of contaminated soil	Prevent exposure by insectivorous mammals and birds to surface soil containing COCs that exceed ecological RGs.	The combination of select soil excavation and installation of soil and asphalt covers will prevent direct contact with impacted soils with COCs above ecological RG for PCBs. LUCs will be used to maintain cover protectiveness.
Ingestion of lead pellets by ecological receptors	Reduce probability for diving duck ingestion of lead pellets in accessible sediment across the remedial exposure area in Narragansett Bay.	Excavation of sediment containing lead pellets will result in a reduction in the ingestion probability of a single lead pellet from 11.5% to 1.9% and results in an 85% reduction in surface weighted average pellet count. Periodic sampling would occur following completion of the remedy to ensure effectiveness of the remedy.
Direct exposure to contaminated sediment	Prevent exposure to benthic invertebrates to sediment with COCs that exceed the ecological RGs near MRP Site 1 former target area and the localized impacted area associated with Outfall 2 at Site 22.	Excavation and off-site disposal of sediment with COCs that exceed the ecological RGs will prevent exposure to ecological receptors.

2.15 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 is needed to prevent the identified unacceptable risks to human health and the environment associated with potential exposure to COCs in soil, groundwater, and sediment at MRP Site 1. The Selected Remedy for soil will be protective of human health and the environment through soil excavation and off-site disposal of soils containing COCs above RGs in select areas; installation of a cover system to prevent direct contact, erosion, and transport of remaining soil containing COCs above RGs; and LUCs to prevent residential and other unrestricted use to address soil that will remain above residential RGs, to require maintenance of the covers, and to require that any future work on the stabilized slope does not cause or result in a future release. The Selected Remedy for groundwater will be

protective of human health through the reduction via monitored natural attenuation of COCs in groundwater to achieve groundwater RGs and the implementation of LUCs to prevent use of groundwater as drinking water until RGs are met and prevent disturbance of the monitoring wells used for the remedy. The Selected Remedy for sediment will be protective of human health and the environment by implementing sediment excavation and off-site disposal that reduces the probability of ingestion of lead shot for ecological receptors and removal of exceedances of sediment RGs; and the implementation of periodic sampling to ensure the effectiveness of the remedy.

Compliance with ARARs - The Selected Remedy will attain all identified federal and state ARARs, as presented in Appendix D.

Toxic Substances Control Act (TSCA): Incorporated into this ROD is an EPA finding that the PCB- contaminated soil and sediment at addressed by this CERCLA remedy meets the definition of a PCB remediation waste, as defined under 40 C.F.R. Section 761.3 of regulations promulgated under TSCA, 15 U.S.C. § 2601 et seq., and thus are regulated for cleanup and disposal under 40 C.F.R. Part 761. Under 40 C.F.R. Section 761.61(c), EPA may authorize disposal of PCBs in a manner not otherwise specified, provided EPA determines that the disposal will not pose an unreasonable risk of injury to health or the environment.

The Navy solicited public comment on EPA's draft TSCA finding through the Proposed Plan and received no comments concerning the draft TSCA determination (see Section 3.1).

Consistent with TSCA regulatory requirements at 40 C.F.R. Section 761.61(c), EPA has reviewed the Administrative Record for the MRP Site 1 remedy, which includes the following activities: 1) for PCB-contaminated soil with equal or greater than 10 parts per million (ppm), the soil will be excavated and disposed of off-site disposal. Removal and off-site disposal of the ≥ 10 ppm PCB-contaminated soil will address potential human health risks posed to commercial/industrial workers and State GA soil leachability standards for PCB-contaminated soil within MRP Site 1; 2) In areas of the site that present a PCB exposure risk to unrestricted recreational use or to ecological receptors, surface soil with greater than or equal to 1 ppm PCBs will be excavated and disposed of off-site and an asphalt (or equivalent) or soil cover installed to prevent contact with any deeper PCB-contaminated soil; 3) Remaining areas of MRP Site with PCB-contaminated subsurface soil equal to or exceeding 1 ppm to less than 10 ppm PCBs that pose a risk for residential exposure will be addressed through land use controls that will restrict residential development and disturbance of the asphalt (or equivalent)/soil cover and 4) PCB-contaminated sediments that exceed the ecological remedial goal of 0.18 mg/kg PCBs will be dredged, dewatered, and disposed of off-site. The PCB cleanup standards are based on EPA human health and ecological risk assessments that have determined that the soil and sediment PCB cleanup levels established do not pose an unreasonable risk of injury to health or to the environment.

EPA has determined that the proposed excavation/off-site disposal of PCB-contaminated surface soil and subsurface soil exceeding industrial cleanup standards and State standards for soil leachability, on- site covering of remaining contaminated subsoil with an asphalt (or equivalent)/soil cover, and the dredging and off-site disposal of PCB-contaminated sediment exceeding ecological cleanup standards, as set out in the Administrative Record for MRP Site 1, will not pose an unreasonable risk of injury to health or the environment as long as the following conditions are met: 1. Any soil/sediment designated for either on-site or off-site disposal shall be tested for PCBs in situ, and depending on any PCB contamination identified, shall be managed as required under 40 C.F.R. Section 761.61 and disposed of in an off-site disposal facility licensed to accept the

level of PCB contaminated material identified; 2. Any water generated from excavations/dredging or dewatering of PCB-contaminated soils/sediments will be tested for PCBs and, depending on any PCB contamination identified, managed, treated (if required) and disposed of in compliance with TSCA requirements at 40 C.F.R. Section 761.79(b); 3. Water quality monitoring shall be performed during sediment dredging, dewatering and on-site management of excavated soil/sediment to ensure that water quality levels comply with the performance criteria specified in the ROD; 4. Air monitoring and appropriate dust suppression measures shall be implemented and maintained to ensure that airborne PCB levels are below levels of concern specified in the ROD during any excavation, dewatering, and management of excavated soil/sediment conducted prior to off-site disposal and during site work prior to construction completion of the asphalt (or equivalent)/soil covers over PCB-contaminated soils; 5. The PCB marking and storage requirements for PCB waste under § 761.40, 761.45, and 761.65 are implemented; 6. Land use restrictions shall be established to prohibit residential use (but permit the current recreational uses), to prohibit construction of buildings with subgrade features or basements within the asphalt (or equivalent)/soil cover area, and to require maintenance of the asphalt (or equivalent)/soil covers; and 7. A long-term monitoring and maintenance plan shall be developed and implemented for the asphalt (or equivalent)/soil covers and for groundwater to ensure effectiveness of the asphalt (or equivalent)/soil covers in eliminating direct exposure and ensuring no migration of PCBs from the covered areas.

EPA makes the above finding based on all information contained in the Administrative Record for MRP Site 1. EPA reserves its right to modify this § 761.61(c) determination and/or to require additional remedial measures in the event of changes in site conditions or use, review of long-term monitoring results, or if any new information is presented that indicates these measures are no longer effective, including the discovery of additional PCB contamination or previously unknown conditions.

Clean Water Act: 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 aquatic 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 (excavation) of sediment, the removal of the contaminants through excavation will have long-term positive impacts on the marine environment. The Navy solicited public comment on EPA's draft LEDPA determination through the Proposed Plan but did not receive any comments.

Federal Wetland and Floodplain Regulatory Standards: In compliance with federal floodplain management and wetland protection regulatory standards, the Navy solicited public comment concerning its selected remedy's work within federally designated floodplain and wetlands in the Proposed Plan. Comments received were addressed in the Responsiveness Summary (Section 3.1) and did not result in the Navy having to modify the proposed remedial action.

Cost-Effectiveness – The Selected Remedy is a cost-effective alternative that allows for continued recreational 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. These cost estimates are based on the conceptual designs evaluated during the FS. Line item quantities and costs may vary based on the engineering designs developed during the RD phase following this ROD.

Utilization of Permanent Solutions and Alternative Treatment Technologies or Resource Recovery Technologies to the Maximum Extent Practicable - The Navy, USEPA, and RIDEM have concluded that the Selected Remedy for soil, groundwater, and sediment represents the maximum extent to which permanent solutions and treatment technologies can be used in a practical manner. For soil, some contaminated soils will remain above ARAR and risk-based standards, but pose a relatively low long-term threat (i.e., not principal threat). Because there are no source materials at this site that constitute a principal threat, the Selected Remedy is not required to satisfy the statutory preference for remedies employing treatment that reduce the toxicity, mobility, or volume as a principal element. The Selected Remedy for soil, groundwater, and sediment includes LUCs, and provides the best balance of cost versus benefit to achieve the remedial goals. The Selected Remedy for soil and groundwater does not include treatment. The Selected remedy for sediment includes some potential treatment of water generated from sediment dewatering prior to discharge back to the Bay and an option to separate lead pellets from sediment for recycling, if practicable.

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 UU/UE, a statutory review will be conducted within 5 years after initiation of remedial action as part of the Base-wide CERCLA 5-year review (the latest having been issued in December 2019) and, at a maximum, every 5 years thereafter to ensure that the remedy is, or will be, protective of human health and the environment.

2.16 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. At this time, there are no significant changes to the selected remedy.

3.0 RESPONSIVENESS SUMMARY

The purpose of the Responsiveness Summary is to provide responses and information to all inquiries and concerns provided during the public review of the Proposed Plan for remediation of the Naval Station Newport's MRP Site 1 – Carr Point Former Shooting Range, Portsmouth, RI.

3.1 STAKEHOLDER COMMENTS AND LEAD AGENCY RESPONSES

The Navy issued the Proposed Plan for public review in March 2019 and the Navy, EPA and RIDEM conducted a public presentation and public hearing on March 20, 2019.

Participants in the public meeting included RAB members, general community 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 were received during the public hearing. In addition, written comments were received during the public comment period. Information about the selected remedy and responses to the comments and questions are provided below. The full set of written comments is included as Appendix E for reference.

The formal comments address the following topics:

1. Consideration of sea level rise, flood zones, and storm water controls
2. Current users, adult/child recreational users vs residential users
3. Remedial design considerations and additional sampling
4. Current site use
5. Site contaminant characterization - source of contamination, sampling boundaries, migration to Narragansett Bay, PCB concentrations in soil
6. Protection of adjacent utilities

Comment subjects with responses are provided as follows:

1. Concerns were raised that the soil remediation proposed for the upland portion of the site did not account for the possibility of 100-year and 500-year storms. Significant wave action and the effect of sea-level rise was also discussed as a long-term concern for the success of the proposed remedy. For instance, how is potential sea level rise considered? Can impermeable materials be considered?

   Navy Response: Because parts of MRP Site 1 exist within a 500-year coastal flood zone and within the 500-year floodplain of Norman's Brook, the remedy will be designed with consideration for storm surges up to a 500-year storm (which includes 100-year storms). The clean soil cover system within the 500-year coastal flood zone and floodplain will be designed, installed, and maintained to prevent any release of contaminants in up to a 500-year flood event. Additionally, the design will provide no loss to flood storage due to the remedy by removing only the volume of soil needed to place the cover materials. These considerations were included in the FS and cost estimates for addressing these issues were included.

   Current forecasts anticipate approximately 6 inches of sea level rise by 2033, and possibly 12 inches in 2050 (which can be seen here: (https://sealevelrise.org/states/rhode-island). A higher sea level would result in the potential for more storm-related impacts at the site. As noted above, the cover system will be designed with consideration for storm surges up to a 500-year storm. Annual inspections will be implemented to monitor the condition of the cover system to ensure the remedy remains protective of

human health and the environment. These inspections will be documented in the annual Land Use Control (LUC) inspection reports. The cover system and shoreline protections will be designed using best management practices (BMPs) to achieve the substantive requirements in the applicable/appropriate ARARs (such as the applicable sections of the State of Rhode Island Coastal Resources Management Council (CRMC) regulations at 650-RICR-20-00-1 (the Red Book), for instance) identified in Appendix D of the ROD. Potential BMPs that will be considered include reinforcing the shoreline with heavy stone to reduce erosion and installing geomembrane liner to prevent contamination from being transported out the side-slope. Final design will result in no loss of flood storage (retain similar mean elevations) while the site will also be regraded for improved drainage and flood resiliency.

Currently, asphalt pavement at the site is approximately 15% of the total surface area, and the Navy intends to replace that during remedial construction, resulting in approximately the same surface area covered by asphalt (or similar dense surface). During the remedial design, consideration for the use of permeable vs. impermeable materials as cover will be considered in combination with final planned use of the site as a Recreation Vehicle (RV) campground. For access, parking and use as an RV campground, stable ground surface that is not susceptible to rutting is the preferred option. The remedial design will include measures along the pavement edges to reduce uplift and scouring associated with stormwater flow.

Specific BMPs will be included in the Remedial Design and Remedial Action Work Plan and will be reviewed and collaboratively refined as needed among the Navy, EPA, RIDEM, and the remedial action contractor. Note that several ARARs are applicable to these issues. For instance, substantial requirements of the CZMA (650-RICR-20-1) apply to the shoreline and stormwater control aspects (see Appendix D for additional references). Both CERCLA and the federal Coastal Zone Management Act (CZMA) strongly encourage early and active coordination between federal agencies and the relevant state agencies. The Navy will therefore continue its history of coordinating with RI CRMC through completion of the remedial action.

2. A request for clarification regarding the difference between the recreational user and residential user exposure scenarios was made. Clarity was requested related to the residential scenario and recreational users, and whether each would be protected under the proposed remedy. Additionally, clarification regarding how current risk to recreational users was being mitigated, or if signage or barricades were warranted to prevent site access. Relatedly, some specific questions were “What is the difference between recreational and residential exposure scenarios? Will the proposed remedy be protective of both kinds of use? What is the current risk at the site, especially to children?”

   Navy Response: For most site evaluation purposes, risk assessors address a recreational user with short-term site access separately from a residential user, which tends to have a longer exposure period. For MRP Site 1, the Navy determined that the recreational user would be addressed the same as a residential user because of the potential for unrestricted use of the site for camping and recreational activities. The remedy will therefore be equally protective of both the recreational and residential users (both children and adults). Refer also to Sections 2.9.1 and 2.9.3 of the ROD text and additional details below.

   Note that based on the results of the 2010 focused risk assessment, the Navy identified potentially unacceptable cancer risks to the child, older child, and adult recreational user using the scenarios of two weeks per year over 5 years. Additionally, potentially unacceptable cancer risks were identified for the lifetime recreational user. Non-cancer hazards for all receptors were within acceptable levels. Risk were

associated with PAHs in surface soil. Locations demonstrating potentially unacceptable PAH related cancer risks were limited to the western portion of the RVCP adjacent to the shoreline embankment. Based upon these results, the Navy decided to conduct interim risk management activities prior to completing the RI.

The risk management activities included two interim removal actions. The first action conducted by the Navy was a Time-Critical Removal Action (TCRA). The TCRA (see Tetra Tech, 20128) consisted of installation of a 6-foot chain link fence to ensure access to those areas where surface soil posed a potentially unacceptable risk was restricted. The Navy conducts a TCRA when it considers an action can be completed within a very short time period, within weeks to months, based on the administrative requirements and severity of the risk. As a follow-on effort to the 2010 TCRA, the Navy conducted a non-time critical removal action (NTCRA) in 2013 to excavate and dispose of those surface soils potentially posing unacceptable risks to the RVCP users (TerranearPMC, September 2014). Soils within the removal area were excavated to a minimum of 1 foot below ground surface (bgs) and in some areas to 2 feet bgs. Following excavation, the area was backfilled with clean fill and seeded. Additionally, a new chain link fence was installed along the shoreline embankment to prevent exposure to COCs that may be present on the embankment (see Figure 3 of the ROD for NTCRA excavation extents and existing fencing). The removal action reduced risks in the camping area and prevent exposure to soils on the slope.

While there is currently an actionable risk at the site as identified in the 2015 RI (which occurred after the interim removal actions described above), a chain link fence with signage is present along the shoreline embankment to prevent exposure to the COCs present in soils along the embankment. Once the planned soil is removed in accordance with this ROD, and the clean soil cover is placed, the direct exposure risks will be mitigated for all users. The Navy will then maintain the remedy in accordance with the required Land Use Controls (LUC), to be prepared and implemented after remedy construction. The LUCs will prevent residential use (which includes the potential for deeper soil excavations and farming of soils) and provide site signage and information for recreational users to prevent future misuse of the site.

3. Does the planned remediation include a mechanism to perform additional sediment sampling if unanticipated conditions were encountered during dredging/excavation?

Navy Response**:** Yes. Following the ROD signature, the Remedial Design phase of the CERCLA process begins, which takes into consideration site specific conditions and the compliance with the Federal and State requirements (ARARs). Development of the MRP Site 1 Remedial Design is expected to begin in 2020 and provide the basis for the Navy to contract remedial action construction.

The Navy plans additional sampling and analyses to further refine the extent of remedial action and will include additional sediment sampling as part of this effort. Sediment samples will be analyzed to determine the quantity of lead pellets (pellets per cubic foot) and the concentration of lead in sediment. At select locations sediment samples will also be analyzed for parameters that may be used to assess on-shore reuse and off-site disposal options for sediment. The Navy will include the results of the additional sampling in the remedial design. If during remedial action construction, unforeseen or new circumstances are

[8] Tetra Tech. 2012. Non-time Critical Removal Action Memorandum, MRP Site 1, Former Carr Point Shooting Range, Naval Station Newport, Rhode Island. Tetra Tech NUS, Inc. September 17, 2012.

encountered, the need for additional sampling, dredging/excavation, etc. will be considered and conducted as necessary. The Navy will include such requirements in the remedial design.

4. It was asked if the rental policy for the Carr Point RV campground would require review to include a rental period limitation or disclosure regarding the contamination.

   Navy Response: There is currently a maximum stay limit of 14-days for camping space reservation. However, time can be added to a stay if no other reservation has been made for that space. As the 14-day maximum stay limit can be exceeded in certain cases, the Navy considers the recreational user as unrestricted for purposes of this remedy. Therefore, the future remedy will comply with cleanup standards which permit unrestricted use for the recreational user. These standards have been included as ARARs (see Table D-1 of the ROD; Rules and Regulations for the Investigation and Remediation of Hazardous Material Releases, for instance). See also the response to Item 2 above.

   During the design, specifically the development of the land use control documents, the Navy will include a means to inform site users of the site history and restrictions, such as digging below the surface. This may incorporate signs, plaques, pamphlets or similar means to providing the information for future users. This information is included in the description of Selected Remedy in the ROD, Section 2.14.2 and Table 2.13.

5. A comment was raised whether the source of contamination at the site was fully understood regarding on-site PCB sources and offsite groundwater sources that may migrate on-site. Concerns were raised regarding contaminant migration into Narragansett Bay and MNA as a remedy. Additionally, it was asked whether boundary conditions for the site were fully understood.

   Navy Response: For clarity, the response is divided into subsections below.

   PCBs: The potential sources of contamination at the site were determined during the preliminary assessment to be the former use as a skeet range and the former storage of transformers and related equipment on a portion of the site. Most of the PCB contamination is located cross-gradient of the campsites, near Site 22, likely from former storage of transformers in that area. Additional sampling plans are being developed to refine the extent of PCBs which require removal and determine disposal options. Navy has estimated that the extent of soil removal will be similar to the areas identified on Figure 6 of the Proposed Plan. These PCB concentrations are not likely related to former Pole 30, which exist at much lower concentrations and located much further away. Also, PCBs are expected to bind to soils and are not expected to leach to groundwater. To date, PCBs have not been detected in groundwater at or near the site.

   Also, a remedial action is being developed for the former Cable Tap-Off Structure which is located on the eastern portion of MRP Site 1 (see Figure 3 in the ROD). This area is associated with electrical infrastructure on Tank Farm 4, and is therefore, being addressed as part of Tank Farm 4 response actions. Because is it co-located with MRP Site 1 soils, the Navy will plan to conduct this removal action in advance of the installation of the final soil cover for MRP Site 1 remedy.

   Boundary Conditions: Contaminants detected in site media during the course of investigations, particularly lead, PCBs, and PAHs support the identified sources of contamination and do not indicate that additional sources may be present or other historic activities may have resulted in contamination. This information is documented in the RI report (Resolution, 2015). Note that the depictions of cleanup extents may be found

in ROD Figures 4, 5, and 6. However, additional figures showing extents of contamination may be found in the RI report (Resolution, 2015) and the FS reports (Resolution, 2018a and 2018b).

Over the course of the investigation process, the Navy collected nearly 200 soil samples to determine the nature and extent of contamination. Following excavation, the Navy will collect soil samples to ensure that cleanup goals have been met. A figure depicting all soil samples locations is included in the RI report and as Figure 4 in the ROD. The Navy will conduct additional soil sampling of the excavated soils to evaluate soil disposal options

Groundwater: It is acknowledged that groundwater sampling was not conducted from the area directly below the camp sites; however, it can be reasonably assumed that any contamination present in this portion of the site and upgradient would be represented in the three downgradient wells located along the edge of the site adjacent to the embankment. The assessment of groundwater included upgradient wells and downgradient wells, located along the embankment edge of the site. These wells represent impacts that may come from the site, and possibly from further upgradient, although this connection has not yet been completely evaluated. Future remedy selection at Tank Farm 4 may result in a combined long-term monitoring program for groundwater at both sites for a more comprehensive evaluation if it is determined that some degree of groundwater connection exists between these sites.

While metals were detected in site groundwater with the potential to migrate to surface water, the Navy, EPA and RIDEM determined during the sampling plan design that contact with surface water is not a complete exposure pathway due in part to tidal influence, such as dilution. An unacceptable risk to sediment and shellfish was not determined for human exposure scenarios. Ecological risks to lead in sediment was determined and impacted sediments will be removed as part of planned remediation efforts.

The Navy considered MNA an appropriate remedy, taking into consideration the available site information and evaluation criteria addressed in the FS. New wells may be placed, depending on design considerations, to enhance the MNA program if necessary. The program will include annual and periodic monitoring and evaluation of data for program enhancement as necessary.

6. Commenter is concerned about both a water main and potential impacts related to a water main break. Commenter notes age of water line, nearby schools and businesses as well as historic flood concerns.

Navy Response: Water main lines which run parallel to and traverse a portion of the site are located above the groundwater table both within and upgradient of the site and therefore would not be in contact with the groundwater. Additionally, the water lines are under pressure, as such, groundwater would not be expected to infiltrate any joints or in the pipe if it were present. The Navy maintains the high-pressure water main and provides regular pressure testing to identify leaks in the system. If identified, leaks and breaks are repaired immediately upon detection. During repairs, water lines are shut down and repair work includes water line flushing as an additional precaution.

For more information related to NAVSTA's water program, please contact the Water Program Manager, at (401) 841-6376. Note for additional reference that the Naval Station prepares annual reports referred to as the Naval Station Newport Drinking Water Consumer Confidence Report.

Costs for supplying clean potable water in case of a water main break have not been included in any alternative since this provision would be borne by the Navy outside of the CERCLA program. Long-term

inspections of the backfill and cover system will be conducted and, if a water main break damages this system, the operations and maintenance plan (still to be prepared) will provide for maintenance of a damaged cover system.

7. A commenter asked if sea level rise should be considered not just in the remedial design phase but in the feasibility study phase. Because, after all, how do you assess feasibility without looking at the effects of sea level rise and storm surge?

   The feasibility study includes several activities such as the development of remedial goals and remedial action objectives, development and evaluation of potential remedial actions, and estimates for costs of potential remedial actions. The soil removal land capping alternatives were developed to specifically address future flooding impacts by not decreasing flood storage capacity, and future erosion concerns with appropriate shoreline restoration. While estimated costs were developed for the remedial activities, details are generally left to the remedial design. Note too that contingency costs are included as part of the remedial estimate. The Navy expects the contingency cost to cover additional costs that may be necessary for other changes (for instance, if the shoreline restoration is adjusted due to new information resulting from the design (such as sea level rise impacts)). See also response Item 1 above.

   Note that the FS process was followed per Navy and EPA guidance. Potential remedies were developed and evaluated against the nine criteria described in the NCP, including Long-term Effectiveness and Permanence. While sea level rise was not an evaluation criterion in the FS, engineering judgement and optimization principles were applied to develop remedial alternatives that were implementable and could be effective in the long-term. Given the growing concerns and increasing scientific modeling information, future FS reports for shoreline sites may include sea level rise aspect when evaluating each remedial alternative.

8. A commenter mentioned that “comments are coming from residents that do not have who are not well versed in remediation, there is possibility of misunderstanding and possible disconnect on what could be critical issues… Will Naval Station Newport be willing to have a one on one discussion to ensure the issue raised is being articulated and properly resolved?”

   The Navy will continue to hold and attend bimonthly meetings of the Remedial Advisory Board (RAB). In addition, it is required to hold public outreach sessions for Proposed Plan reviews. The Navy and its partners at EPA and RIDEM can be reached anytime for questions. See the contact list below.

Mr. David Dorocz, Environmental Office
Building 1 CC, Code PRR4
1 Simonpietri Drive
Newport RI 02841-1512
(401) 841-7671
david.dorocz@Navy.mil

Mr. Joseph McCloud, Navy Project Manager
NAVFAC Mid-Atlantic
9324 Virginia Ave, Building N26
Norfolk, VA 23511-3095
(757) 341-2010
Joseph.mccloud@navy.mil

Ms. Jane Dolan, EPA Project Manager
USEPA Region 1
5 Post Office Square, Suite 100
Mail Code: OSRR07-3
Boston MA 02109
(617) 918-1272
Dolan.jane@epa.gov

Mr. Shawn Lowry, RIDEM Project Manager
RIDEM Office of Land Revitalization and Sustainable Materials Management
235 Promenade Street
Providence, RI 02908-5767
(401) 222-2797 x 7142
Shawn.Lowry@dem.ri.gov

Next Steps

The Navy, as Lead Agency for environmental cleanups at Navy/USMC installations, creates installation-specific Administrative Record Files that includes documents for all environmental cleanup sites on Navy/USMC installations. The Administrative Record for Naval Station Newport and can be accessed at the website below. Alternatively, you can search for "NAVSTA Newport Administrative Record" in your preferred search engine.

http://go.usa.gov/DyNw (then click Administrative Records; note that this link is case sensitive).

The following libraries will have the Final ROD available for public access. The front desk will be able to direct you to these documents.

Middletown Public Library 700 West Main Road Middletown Rhode Island (401) 846-1573	Newport Public Library 300 Spring Street, Newport Rhode Island (401) 847-8720	Portsmouth Public Library 2658 East Main Road Portsmouth Rhode Island (401) 683-9457

In addition, as noted, once the ROD is signed, the Navy initiates the remedial design process. The remedial design process includes the development of the physical plans and specifications for the remedy. The Navy will develop design details that provide the means by which the remediation activities will meet the ROD requirements, including ARARs. This design is conducted in several stages, from conceptual to final, and it provides the Navy, EPA, and RIDEM additional review and input on the final details and layout of the proposed remediation. As part of the post-ROD remedial design and remedial action review process the Navy conducts regular technical and Restoration Advisory Board (RAB) meetings with local officials and maintains an online Information Repository for dissemination of information to the community (available through the Web page noted above).

3.2 TECHNICAL AND LEGAL ISSUES

No technical or legal issues associated with the MRP Site 1 – Former Carr Shooting Range (OU9) ROD were identified

Administrative Record Reference Table

DETAILED ADMINISTRATIVE RECORD TABLE

ITEM	REFERENCE PHRASE IN ROD	LOCATION IN ROD	LOCATION OF INFORMATION IN ADMINISTRATIVE RECORD
1	**Site Investigation (SI) Report**	Table 2-1	Tetra Tech, 2010. *Site Investigation Report for Munitions Response Program Site 1 – Carr Point. NAVSTA Newport, RI. May.*
2	**Remedial Investigation (RI)**	Table 2-1	Resolution, 2015a. *Remedial Investigation Report, MRP Site 1 Carr Point Shooting Range, Naval Station Newport, Rhode Island. April 28.*
3	**Human Health Risk Assessment (HHRA)**	Table 2-1 and Section 2.9	Resolution, 2015a
4	**Ecological Risk Assessment (ERA)**	Table 2-1 and Section 2.9.1	Resolution, 2015a
5	**Feasibility Study (FS)**	Table 2-1	Resolution, 2018a. *Feasibility Study, MRP Site 1, Carr Point Shooting Range, Soil and Groundwater, Naval Station Newport, Portsmouth, Rhode Island* September. Resolution, 2018b. *Feasibility Study, MRP Site 1, Operable Unit 9, Carr Point Shooting Range, Sediment, Naval Station Newport, Portsmouth, Rhode Island* October.
6	**remedial alternatives**	Tables 2-7, 2-8, 2-9 and Section 2.11	Resolution, 2018a/b
7	**public notice**	Section 2.3	*Newport Daily News,* 2018
8	**receptors**	Sections 2.9.1 and 2.9.2	Resolution, 2015a
9	**Identification of Chemicals of Potential Concern (COPCs)**	Section 2.9.1	Resolution, 2015a
10	**exposure assessment**	Sections 2.9.1 and 2.9.2	Resolution, 2015a
11	**carcinogenic risks and non-carcinogenic hazards**	Section 2.9.1	Resolution, 2015a
12	**Remedial Action Objectives (RAOs)**	Section 2.10	Resolution, 2018a/b
13	**Chemicals of Concern (COCs)**	Table 2-2 and Section 2.10	Resolution, 2018a/b
14	**Preliminary Remediation Goals (PRGs)**	Section 2.10	Resolution, 2018a/b
15	**Remediation Goals (RGs)**	Section 2.10	Resolution, 2018a/b
16	**preliminary technology screening**	Section 2.11	Resolution, 2018a/b
17	**nine CERCLA evaluation criteria**	Section 2.12	Resolution, 2018a/b

ADDITIONAL REFERENCES

Jorgensen, S.S., and M. Willems. 1987. The fate of lead in soils: The transformation of lead pellets in shooting range soils. Ambio 16: 11-15.

Malcolm Pirnie, 2005. "Final Water Area Munitions Study, NAVSTA Newport Carr Point Shooting Range, Newport, Rhode Island." Prepared for Naval Facilities Engineering Command Engineering Field Activity, Northeast, Lester, Pennsylvania. October 2005.

NAVFAC, 2020. Record of Decision – Site 22 (OU10), Newport Carr Point Storage Area. June 2020.

Tannenbaum, L. 2013. Evidence of High Tolerance to Ecologically-Relevant Lead Shot Pellet Exposures by an Upland Bird. Human and Ecological Risk Assessment: An International Journal, DOI:10.1080/10807039.2012.746143

U.S. Environmental Protection Agency (USEPA). 1989. Risk Assessment Guidance for Superfund. Volume I: Human Health Evaluation Manual. Part A. Interim Final. EPA/540/1-89/002. December 1989.

USEPA. 1993. Provisional Guidance for Quantitative Risk Assessment of Polycyclic Aromatic Hydrocarbons. Office of Research and Development. Washington, DC. EPA/600/R-93/089. July 1993.

USEPA. 1994. Revised Interim Soil Lead Guidance for CERCLA Sites and RCRA Corrective Action Facilities. Office of Solid Waste and Emergency Response. Washington, D.C. OSWER Directive 9355.4-12. July 1994.

USEPA. 2003. Recommendations of the Technical Review Workgroup for Lead for an Approach to Assessing Risks Associated with Adult Exposures to Lead in Soil. Technical Review Workgroup for Lead, Washington DC. EPA-540-R-03-001.

USEPA. 2004a. USEPA version of the Johnson and Ettinger Model. GW-ADV-Feb04. Version 3.1. February 2004.

USEPA. 2004b. USEPA User's Guide For Evaluating Subsurface Vapor Intrusion into Buildings. Revised February 22, 2004.

USEPA. 2007. User's Guide for the Integrated Exposure Uptake Biokinetic Model for Lead in Children (IEUBK). Office of Superfund Remediation and Technology Innovation. EPA 9285.7-42. May 2007.

USEPA. 2011. Assessment of Methods for Estimating Risk to Birds from Ingestion of Contaminated Grit Particles. EPA/600/R-11/023.

USEPA. 2012. Compilation and Review of Data on Relative Bioavailability of Arsenic in Soil and Recommendations for Default Value for Relative Bioavailability of Arsenic in Soil Documents. OSWER Directive 9200.1-113. December 31, 2012.

Resolution. 2013. Risk Assessment Work Plan Technical Memorandum, NAVSTA Newport, Rhode Island. March 20, 2013.

Resolution, 2015a. Remedial Investigation Report, MRP Site 1, Carr Point Shooting Range, Naval Station Newport, Rhode Island. April 2015.

Resolution, 2015b. Remedial Investigation Report, IR Site 22 Carr Point Storage Area, Naval Station Newport, Rhode Island. September 2.

Resolution, 2018a. Feasibility Study, MRP Site 1, Carr Point Shooting Range, Soil and Groundwater, Naval Station Newport, Portsmouth, Rhode Island. September.

Resolution, 2018b. Feasibility Study, MRP Site 1, Operable Unit 9, Carr Point Shooting Range, Sediment, Naval Station Newport, Portsmouth, Rhode Island. October.

USEPA. 2018. Integrated Risk Information System (IRIS). Environmental Criterion and Assessment Office. Accessed October 2018.

Figures

IR/MRP Sites		
Site	**Site Name**	**Operable Unit**
Site 1	McAllister Point Landfill	OU 1, OU 4
Site 8	NUSC Disposal Area	OU 7
Site 9	Old Fire Fighting Training Area (OFFTA)	OU 3
Site 7	Tank Farm 1	OU 13
Site 10	Tank Farm 2	OU 14
Site 11	Tank Farm 3	OU 15
Site 12	Tank Farm 4	OU 11
Site 13	Tank Farm 5	OU 2
Site 17	Gould Island	OU 6
Site 19	Derecktor Shipyard	OU 5, OU 12
Site 22	Carr Point Storage Area	OU 10
MRP Site 1	Carr Point Shooting Range	OU 9
Site 23	Coddington Point Buried Debris Sites	OU 16
Site 24	DFSP Melville	TBD

AECOM

Drawn:	JB	06/06/2019
Approved:	MK	06/06/2019
Project #:	60517245	

Map Location

N

0 1,200 2,400

Scale in Feet

FIGURE 1
REGIONAL LOCATION

NAVSTA NEWPORT, RHODE ISLAND

Path: P:\Govt\Projects\NavyCLEAN AECOM-EnSafe JV\Newport\GIS\Projects\Carr_Point\Site_1\ROD\MXD\Fig_1_Regional_Location.mxd

AECOM

Drawn:	JB	6/6/2019
Approved:	NT	6/6/2019
Project #:	60517245	

Legend
- MRP Site 1 Boundary
- Topographic Contour Line (NAVD 88)
- Chain Link Fence
- Outfall

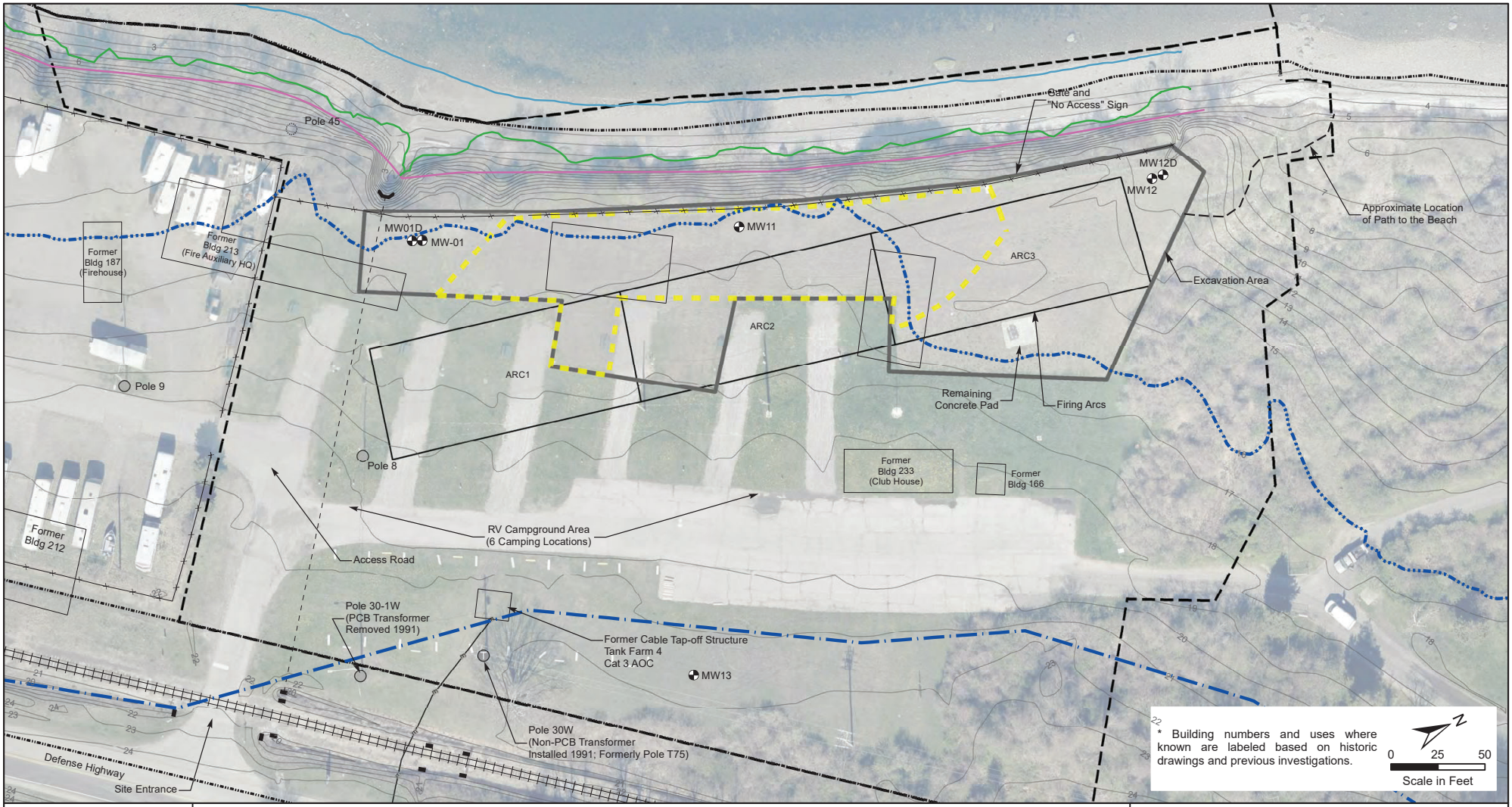
N

0 85 170
Scale in Feet

FIGURE 2
STUDY AREA

MRP SITE 1, CARR POINT
NAVSTA NEWPORT, RHODE ISLAND

Path: P:\Govt\Projects\NavyCLEAN AECOM-EnSafe JV\Newport\GIS\Projects\Carr_Point\Site_1\ROD\MXD\Fig_2_Study_Area.mxd



AECOM

Drawn:	JB	08/24/2020
Approved:	NT	08/24/2020
Project #:	60268619	

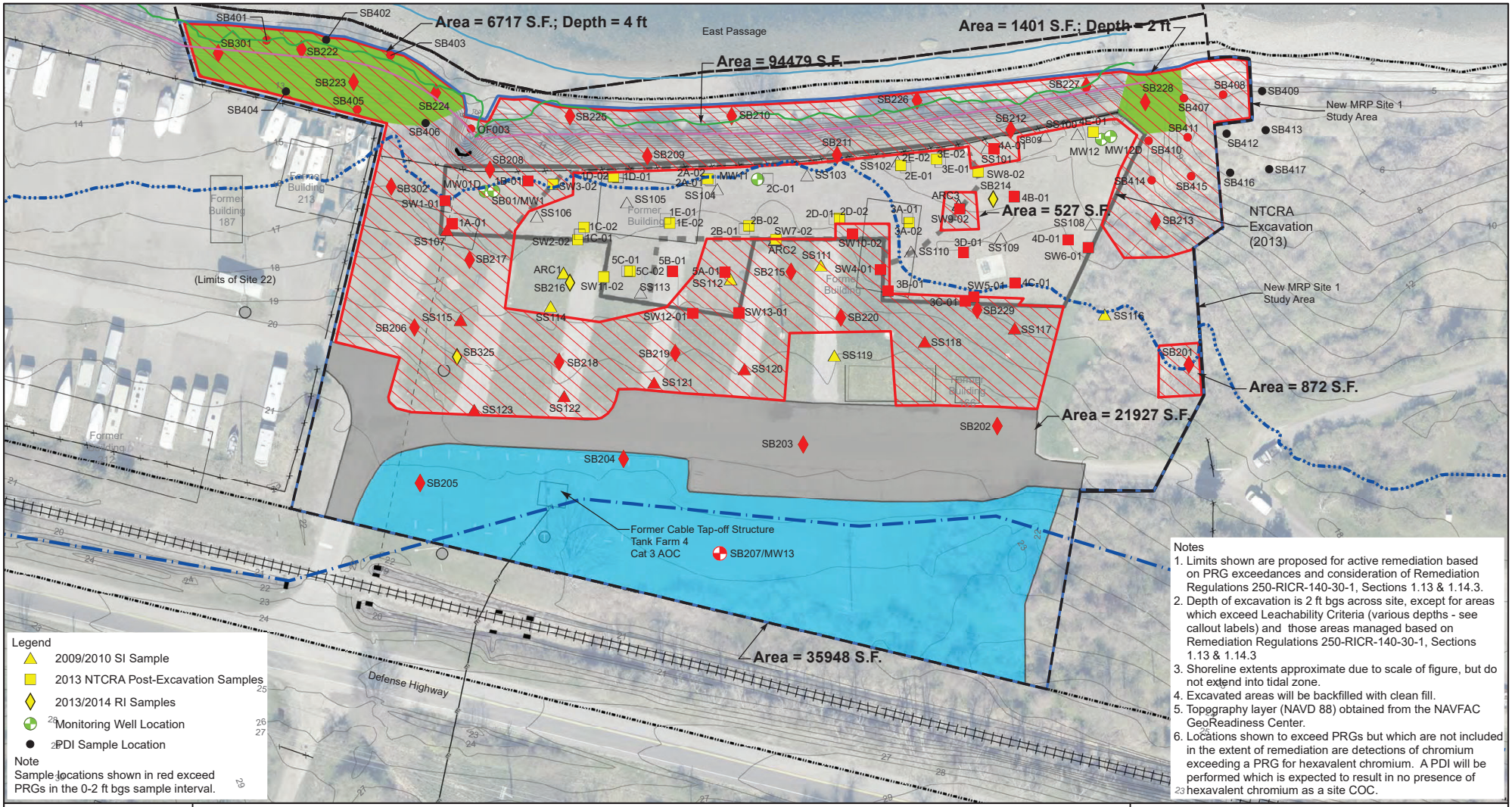
Legend

- Monitoring Well Location
- Utility Pole
- Utility Pole with Transformer
- Former Pole with Transformer
- MRP Site 1 Boundary
- Installation Boundary
- Outfall
- Stormwater Culvert
- Stormwater Pipeline
- Fence Line
- NTCRA 1 ft Excavation
- NTCRA 2 ft Excavation
- Topographic Contour Line (NAVD 88)
- 100-Year Flood Plain
- 500-Year Flood Plain
- Approximate High Water Line Estimated by Surveyor
- Approximate High Water Line Marked Via GPS June 2009
- Approximate Low Water Line

FIGURE 3
FORMER CARR POINT SHOOTING RANGE LAYOUT

MRP SITE 1, CARR POINT
NAVSTA NEWPORT, RHODE ISLAND

Path: \\USCHL1FP001\Data\Projects\Govt\Projects\NavyCLEAN AECOM-EnSafe JV\Newport\GIS\Projects\Carr_Point\Site_1\ROD\MXD\Fig_3_Former_Carr_Point_Shooting_Range_Layout.mxd



AECOM

Drawn:	JB	08/24/2020
Approved:	NT	08/24/2020
Project #:	60332323	

Proposed extent of 2 ft excavation and placement of 2 ft-thick backfill layer

Proposed Excavation Limits for soils exceeding RIDEM GA Leachability Criteria (area and depths noted above)

Remove asphalt and soil (6 inches) and cover with asphalt or equivalent (6 inches)

6-inch excavation with top soil backfill layer in accordance with Remediation Regulations 250-RICR-140-30-1, Sections 1.13 & 1.14.3. [COCs - arsenic and manganese]

100-Year Flood Plain

500-Year Flood Plain

Approximate High Water Line Estimated by Surveyor

Approximate High Water Line Marked Via GPS June 2009

Approximate Low Water Line

MRP Site 1 Boundary

Installation Boundary

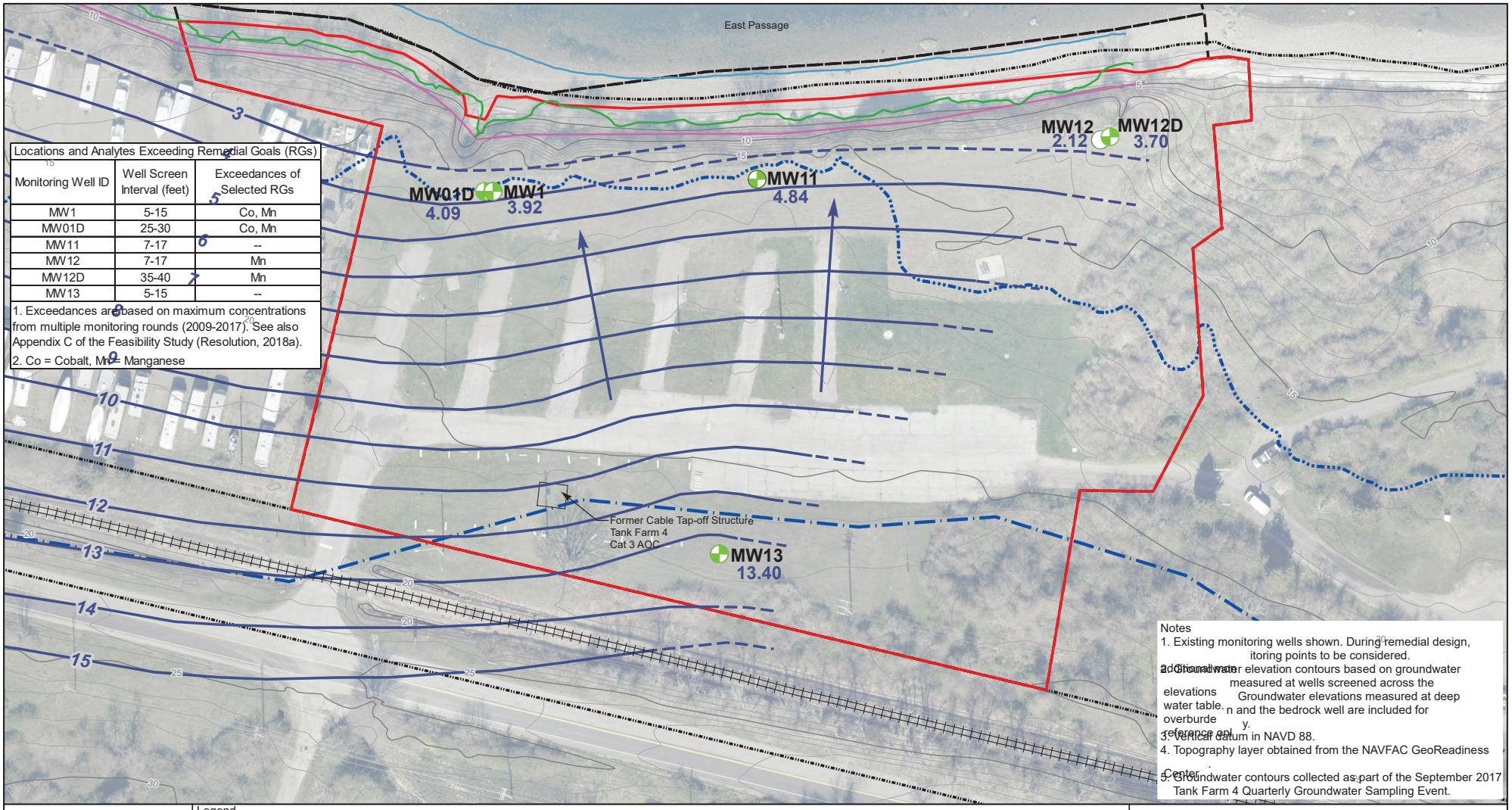
0 30 60

Scale in Feet

FIGURE 4
ALTERNATIVE S-3:
SELECT SOIL REMOVAL, COVER, AND LAND USE CONTROLS

MRP SITE 1, CARR POINT
NAVSTA NEWPORT, RHODE ISLAND

Path: \\USCHL1FP001\Data\Projects\Govt\Projects\NavyCLEAN AECOM-EnSafe JV\Newport\GIS\Projects\Carr_Point\Site_1\ROD\MXD\Fig_4_Selected_Soil_Remedy_Select_Soil_Removal_Soil_Asphalt_Cover_System_LUC.mxd



Locations and Analytes Exceeding Remedial Goals (RGs)		
Monitoring Well ID	Well Screen Interval (feet)	Exceedances of Selected RGs
MW1	5-15	Co, Mn
MW01D	25-30	Co, Mn
MW11	7-17	--
MW12	7-17	Mn
MW12D	35-40	Mn
MW13	5-15	--

1. Exceedances are based on maximum concentrations from multiple monitoring rounds (2009-2017). See also Appendix C of the Feasibility Study (Resolution, 2018a).
2. Co = Cobalt, Mn = Manganese

Notes
1. Existing monitoring wells shown. During remedial design, itoring points to be considered.
2. Groundwater elevation contours based on groundwater elevations measured at wells screened across the water table. Groundwater elevations measured at deep overburde n and the bedrock well are included for reference pol y.
3. Vertical datum in NAVD 88.
4. Topography layer obtained from the NAVFAC GeoReadiness Center .
5. Groundwater contours collected as part of the September 2017 Tank Farm 4 Quarterly Groundwater Sampling Event.

AECOM

Drawn:	JB	4/2020
Approved:	NT 08/2	08/24/2020
Project #:	60332323	

Legend

- Existing Monitoring Well available for MNA Program
- Groundwater Elevation Contour (NAVD 88 In Feet) (09/18/2017)
- Inferred Groundwater Elevation Contour (09/18/2017)
- Groundwater Flow Direction (09/18/2017)
- 13.40 Groundwater Elevation (NAVD88)(09/18/2017)
- 100-Year Flood Plain
- 500-Year Flood Plain
- Proposed Extent of Residential LUCs
- MRP Site 1 Boundary
- Installation Boundary
- Approximate High Water Line Estimated by Surveyor
- Approximate High Water Line Marked Via GPS June 2009
- Approximate Low Water Line

NAVD88 North American Vertical Datum 8 (NAVD88).

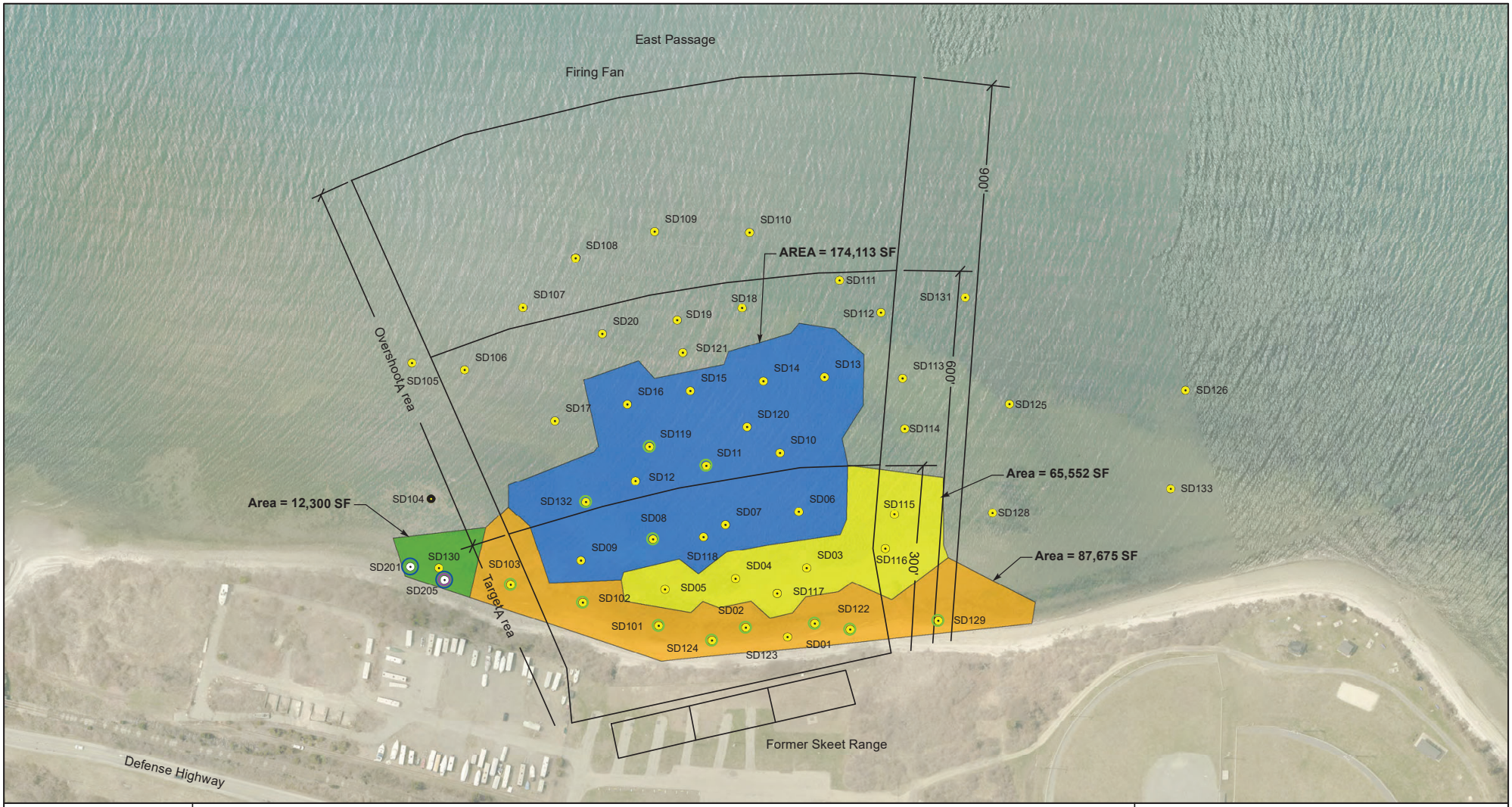
N

0 30 60

Scale in Feet

FIGURE 5
SELECTED GROUNDWATER REMEDY: MONITORED-NATURAL ATTENUATION AND LUCs
MRP SITE 1, CARR POINT
NAVSTA NEWPORT, RHODE ISLAND

Path: \\USCHL1FP001\Data\Projects\Govt\Projects\NavyCLEAN AECOM-EnSafe JV\Newport\GIS\Projects\Carr_Point\Site_1\ROD\MXD\Fig_5_Selected_Groundwater_Remedy_Monitored_Natural_Attenuation_LUCs.mxd



AECOM

Drawn:	JB	06/18/2019
Approved:	NT	06/18/2019
Project #:	60332323	

Legend

- Approximate Extent of Near-Shore Removal (0-1 ft)
- Approximate Extent of Near-Shore Removal (0-3 ft)
- Approximate Extent of Off-Shore Removal (0-1 ft)
- Approximate Extent of Off-Shore Removal (0-3 ft)
- Sediment Sample Location
- Site 22 RI Sediment Sample Location
- Contains PCB Concentrations Exceeding Site PRG of 0.18 mg/kg
- Contains Lead Concentrations Exceeding Site PRG of 122 mg/kg
- Contains Manganese Concentration Exceeding Site PRG of 1100 mg/kg

Note
SD-201 and SD-205 were sampled and evaluated as part of the Site 22 RI.

N

0 80 160
Scale in Feet

FIGURE 6
SELECTED SEDIMENT REMEDY: SEDIMENT REMOVAL

MRP SITE 1, CARR POINT
NAVSTA NEWPORT, RHODE ISLAND

\\USCHL1FP001\Data\Projects\Govt\Projects\NavyCLEAN AECOM-EnSafe JV\Newport\GIS\Projects\Carr_Point\Site_1\ROD\MXD\Fig_6_Selected_Sediment_Remedy_Sediment_Removal.mxd

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

September 25, 2020

Mr. Bryan Olson, Director
US EPA Region 1 – New England
Office of Site Remediation and Restoration
5 Post Office Square
Suite 100
Boston, MA 02109

RE: Record of Decision for MRP Site 1 – Carr Point Shooting Range
Naval Station Newport, RI

Dear Mr. Olson:

On March 23, 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 Record of Decision (ROD) for MRP Site 1 – Carr Point Shooting Range at Naval Station Newport, RI. The Department of the Navy's selected alternative for the Site, as presented in the ROD, includes the following:

- Excavation and off-site disposal of soils in exceedance of cleanup levels and GA leachability criteria, including the removal of concrete and other beach debris;

- Encapsulation of any remaining soils in exceedance of remedial goals. This includes a soil and asphalt layer and a shoreline revetment to prevent direct exposure and future contaminant migration due to erosion;

- Monitored natural attenuation (MNA) for groundwater contaminants, including the installation and assessment of groundwater monitoring wells, until groundwater cleanup standards are achieved;

- Implementation of land use controls (LUCs) to prevent residential use of the property, to prevent future releases and exposure to contamination, and to prohibit groundwater use until groundwater cleanup goals are achieved; and

- Excavation of nearshore and offshore sediment in exceedance of cleanup levels, including the potential screening of lead pellets for off-site recycling and the

dewatering and offsite disposal of excavated sediment, including erosion control measures such as silt curtains or other barriers and the treatment of the generated water as necessary.

The Department has worked on this Site with the Department of the Navy and the Environmental Protection Agency from the early stages through this important decision milestone. Based upon the Department's review of this ROD and the results of the remedial investigation activities conducted to date, we offer our concurrence on the decision. This concurrence is contingent upon all aspects of the MRP Site 1 ROD being implemented during design, construction, and operation of the remedy in a timely manner.

The Department wishes to emphasize the following aspects of the ROD.

- Prior to soil excavation, the Navy will collect in-situ waste characterization samples for PCB-impacted soil in accordance with the Toxic Substances Control Act (TSCA). After excavation, Navy will collect additional waste characterization samples as required by the chosen disposal facility.

- Prior to initiation of the remedial action, the Navy will conduct a pre-design investigation (PDI) in sediment to further refine the extent of removal. The PDI will include the analysis of lead, lead pellets, and PCBs.

- Prior to the initiation of the remedial action, Navy will conduct a submerged aquatic vegetation survey and develop an impact mitigation and restoration strategy in coordination with the Coastal Resources Management Council.

- To demonstrate regulatory compliance, all excavation areas will be subject to discrete confirmatory sampling.

- A planned excavation area identified as a "cable tap-off structure" associated with Tank Farm 4 is located within a planned excavation area of MRP Site 1. In the interests of efficiency and fiscal responsibility, these removal actions will be coordinated to the maximum extent practical.

- The removal of the concrete and other beach debris will be completed before the restoration of the shoreline embankment and cap installation.

- Navy will conduct any additional excavation required in the construction of the cap or revetment within areas planned for paving; excavations beyond the beach interface will be avoided.

- The remedy will ensure no loss of beach or flood storage. Since the site is located within the 500-year floodplain associated with Narragansett Bay, all components of the remedy will be designed to withstand a 500-year storm event and rising sea level. The Navy will follow best management practices, including but not limited to those discussed in the Rhode Island Stormwater Management Handbook.

- The Department emphasizes the important coordination with the Rhode Island Coastal Resources Management Council (CRMC) that has taken place on this project, particularly to identify those CRMC regulations that are Applicable or Relevant and Appropriate Requirements. The Department urges the Navy to inform the CRMC of its consistency determination for the project as soon as is feasible and stresses the need for continued communication and coordination with CRMC on CERCLA projects that affect the State's coastal zone.

- In accordance with the LUCs for this site, the Navy will conduct yearly inspections and five-year reviews to ensure that the remedial actions for the Site continue to be protective of human health and the environment. The Navy will also implement and maintain groundwater use restrictions and a long-term monitoring plan for the site.

- The Department recognizes that public outreach and community involvement are crucial components of remedy implementation. The Newport Restoration Advisory Board has taken particular interest in this site and has expressed numerous concerns related to climate change, sea level rise, and the increased threat of severe storms. Therefore, we urge EPA and Navy to make every effort to ensure that this remedy is implemented in a manner that allows the community maximum participation in this process.

The Department looks forward to working with the Navy and the USEPA toward our mutual goals of remediating this Site and addressing the remaining concerns at Naval Station Newport.

Sincerely,

Janet Coit
Director

cc: Terrence Gray, RIDEM
Leo Hellested, RIDEM
Matthew DeStefano, RIDEM
Nick Noons, RIDEM
Jane Dolan, USEPA Region I
Deborah Moore, NETC, Newport, RI
Neil Thurber, AECOM

Appendix B

Cost Estimates

Planning Cost Estimate Summary

Alternative: S-3 Select Soil Removal, Soil and Asphalt Cover System, and Land Use Controls

Site: Carr Point - MRP Site 1, NAVSTA Newport
Location: Portsmouth, Rhode Island
Phase: FS
Date: June 2018

Description: This alternative consists of excavating the majority of surface soil (0 to 2 ft) that exceeds PRGs and isolating a portion of the impacted area beneath a soil and asphalt cover system. Excavation of soils exceeding RIDEM GA Leachability Criteria will be completed. Portions of the site with arsenic impacts will be managed under the Remediation Regulations Rule 12.04 Part B (with variance). Additionally, this includes the installation of a soil and asphalt cover system, and the establishment of land use controls to restrict residential use and maintain cover protectiveness. This alternative includes maintenance for the cover layer, annual site inspections, and five-year reviews.

CAPITAL COSTS

Description			QTY	UNIT	UNIT COST	Total	Notes
Land Use Control Remedial Design (LUC RD)							
Prepare LUC RD (4 iterations)			1	LS	$25,000	$25,000	Estimated LUC development process
						$25,000	
Site Preparation and Management							
RA Contractor Work Plan			1	LS	$20,000	$20,000	
HASP			1	LS	$5,000	$5,000	
Equipment mobilization			1	LS	$5,000	$5,000	
Temporary facilities			1	LS	$5,000	$5,000	
Erosion control measures			700	LF	$4	$2,800	Approximate length along shoreline
Clearing and grubbing			25,000	SF	$1	$25,000	Assumed a fraction of the site, as some is already clear
						$62,800	
Excavation and Soil Cover System							
2-foot Excavations	Volume	4877 CY					65,833 SF * 2 ft depth / 27 ft^3/CY
	Surface Area	65,833 SF					Assumed extent based on current sampling data with the leachability areas removed. 72552 SF + 527SF + 872 SF - 6717 SF - 1401 SF. See Figure 3-2.
		1.51 Acre					
	Perimeter	2,460 feet					Estimate based on extent in Figure 3-2.
	Depth	2 feet					0 to 2 foot bgs removal
Southern Leachability Area (PCBs)	Volume	995 CY					6717 SF * 4 ft depth / 27 ft^3/CY
	Surface Area	6,717 SF					Assumed extent based on current sampling data. See Figure 3-2.
		0.15 Acre					
	Perimeter	405 feet					Estimate based on extent in Figure 3-2.
	Depth	4 feet					0 to 4 foot removal for the southern leachability area
Northern Leachability Excavation	Volume	104 CY					1401 SF * 2ft depth / 27 ft^3/CY
	Surface Area	1,401 SF					Assumed extent based on current sampling data. See Figure 3-2.
		0.03 Acre					
	Perimeter	155 feet					Estimate based on extent in Figure 3-2.
	Depth	2 feet					0 to 2 foot removal for the northern leachability area
6-inch Arsenic Excavation	Volume	666 CY					35,948 SF * 0.5 ft depth / 27 ft^3/CY
	Surface Area	35,948 SF					Assumed extent based on current sampling data with the leachability areas removed. See Figure 3-2.
		0.83 Acre					
	Perimeter	930 feet					Estimate based on extent in Figure 3-2.
	Depth	0.5 feet					6-inch soil removal
6-inch Excavation for Asphalt Cap	Volume	406 CY					21,927 SF * 0.5 ft depth / 27 ft^3/CY
	Surface Area	21,927 SF					Assumed extent based on current sampling data with the leachability areas removed. See Figure 3-2.
		0.50 Acre					
	Perimeter	1,200 feet					Estimate based on extent in Figure 3-2.
	Depth	0.5 feet					6-inch soil removal
Excavate soil (0-2 ft)			4,877	CY	$5	$24,383	
Excavate soil (South Leachability)			995	CY	$5	$4,976	
Excavate soil (North Leachability)			104	CY	$6	$623	
Excavate soil (6-inch)			1,072	CY	$5	$5,359	
Dust control and air monitoring			14	DAY	$1,000	$14,000	Estimated cost per day based on excavation (~500 CY/day)
Regrade cover area			109,899	SF	$0.50	$54,950	See Figure 3-2
Clean fill testing			17	EA	$800	$13,600	Estimate for VOCs, SVOCs, PCBs, pesticides, TPH, metals; 1 sample per 500 CY of fill type.
Furnish common fill			5,527	CY	$15	$82,907	Backfill assumed for costing to consist of a clean soil layer with grass. Topsoil layer is 6 inches thick. Remaining material is common fill (20% fluff factor).
Furnish topsoil			2,929	CY	$30	$87,884	
Install clean fill/topsoil			8,457	CY	$10	$84,566	
Install 6-inch Asphalt cap			21,927	SF	$3.45	$75,648	Value obtained from RACER (Version 11.4)
Seeding			87,972	SF	$0.20	$17,594	For upland areas. The asphalt cover and slope stabilization area is not included.
Survey to document final cover elevations			1	LS	$10,000	$10,000	
						$476,489	

Planning Cost Estimate Summary

Alternative: S-3 Select Soil Removal, Soil and Asphalt Cover System, and Land Use Controls

Shoreline Stabilization, Placement of Geotextile and Riprap						
Geomembrane		18,000	SF	$1.50	$77,487	Geomembrane layer beneath geotextile and riprap
Geotextile		18,000	SF	$0.20	$10,332	Geotextile layer between geomembrane and riprap layer
Riprap, 12" thick		667	CY	$52.50	$91,315	Estimated for shoreline slope protection; assume 12-inch thick layer of riprap across slope stabilization area extent; 18,000 SF * 1ft depth/ 27 ft3/CY
Installation		1	LS	$10,000	$10,000	Assumption for installing slope stabilization components
					$189,134	
Confirmation Sampling						
Laboratory analyses		240	EA	$400	$122,400	Estimate costs for PAHs, metals, PCBs, VOCs; Assume arsenic impacted area will not require confirmatory sampling.
						Sidewalls: 1 sample/ 25 feet Bottom: 1 sample/ 625 SF
Field supplies and equipment		1	EA	$1,500	$1,500	Allowance
Sample management and validation		40	HR	$100	$2,000	Allowance
					$125,900	
Waste Disposal						
Waste Characterization		8	EA	$800	$6,400	Estimate for VOCs, SVOCs, PCBs, pesticides, TPH, metals; 1 per 1000 CY.
T&D > 50 ppm PCB soil		1493	Ton	$185	$276,143	Assume volume from the Southern Leachability Area will be disposed as >50 ppm PCB TSCA waste based on existing data.
T&D non-haz soil		9078	Ton	$60	$544,685	1 CY = 1.5 Tons
					$827,228	
Post-Construction						
Contractor Completion Report		150	HR	$100	$15,000	
Remedial Action Completion Report		200	HR	$100	$20,000	Assumes 3 iterations for regulatory review/comment
					$35,000	
SUBTOTAL					$1,741,551	
Contingency	20%				$348,310	Presumed scope (10%)+ bid(10%)
SUBTOTAL					$2,089,861	
Project Management	6%				$125,392	Per USACE/USEPA Guide to Developing CEs during the FS
Remedial Design	10%				$208,986	Use maximum allowed for design services (10%)
Construction Management	8%				$167,189	Per USACE/USEPA Guide to Developing CEs during the FS
TOTAL CAPITAL COSTS (rounded to the nearest $1,000)					$2,591,000	

O&M COSTS

Description	QTY	UNIT	UNIT COST	Total	Notes
Allowance for maintenance	1	each	$2,500	$2,500	Allowance for Asphalt maintenance.
Annual LUC Site inspections (through year 30)	1	each	$2,500	$2,500	Assume component of the basewide LUC inspections.
SUBTOTAL				$5,000	
Contingency 0%				$0	
Project Management 10%				$500	
TOTAL O&M ANNUAL COSTS (rounded to the nearest $1,000)				$6,000	

PERIODIC COSTS

Description	QTY	UNIT	UNIT COST	Total	Notes
Five Year Review (through year 30)	6	each	$5,000	$30,000	Assume one component of base-wide 5-yr review
SUBTOTAL				$30,000	
TOTAL PERIODIC ANNUAL COSTS (rounded to the nearest $1,000)				$5,000	

PRESENT VALUE ANALYSIS

Cost Type	Year	Total Cost	Total Cost per Year	Discount Factor at 0.70%	Present Value	Notes
Capital Cost	0	$2,591,000	$2,591,000	1	$2,591,000	Discount rate of 0.7% is based on the 2015
O&M Cost	1 to 30	$180,000	$6,000	26.9746	$161,848	30-Year Real Interest Rate in Appendix C
Periodic Cost	5	$5,000	$5,000	0.9657	$4,829	of the White House Office of Management
	10	$5,000	$5,000	0.9326	$4,663	and Budget (OMB) Circular A-94, Revised
	15	$5,000	$5,000	0.9007	$4,503	November 2016
	20	$5,000	$5,000	0.8698	$4,349	
	25	$5,000	$5,000	0.8400	$4,200	
	30	$5,000	$5,000	0.8112	$4,056	
Total Present Value of Alternative (rounded to the nearest $1,000)					$2,779,000	

Planning Cost Estimate Summary

Alternative: GW-2 - Monitored Natural Attenuation and Land Use Controls

Site: Carr Point - MRP Site 1, NAVSTA Newport
Location: Portsmouth, Rhode Island
Phase: FS
Date: June 2018

Description: This alternative consists of establishing LUCs to prevent the use of groundwater as drinking water. Additionally this alternative would achieve RAOs by providing long-term groundwater monitoring and evaluation of groundwater attenuation. Five year reviews will be conducted to evaluate the remedy.

CAPITAL COSTS

Description		QTY	UNIT	UNIT COST	Total	Notes
Land Use Control Remedial Design (LUC RD)						
Prepare LUC RD (4 iterations)		1	LS	$10,000	$10,000	Estimated
					$10,000	
Site Preparation and Management						
MNA Work Plan		1	LS	$25,000	$25,000	
HASP		1	LS	$5,000	$5,000	
					$30,000	
Well Installation & Development						
Drilling Subcontractor		2	Day	$5,000	$10,000	Install 4 overburden wells
Well installation & development (one geologist, 3 days		1	LS	$2,550	$2,550	Based on $85/hr and 10 hr work days
Equipment, Misc. Supplies		1	LS	$2,500	$2,500	
					$15,050	
Post-Construction						
Contractor Completion Report		20	HR	$100	$2,000	
Remedial Action Completion Report		40	HR	$100	$4,000	
(2 iterations)					$6,000	
SUBTOTAL					$61,050	
Contingency	20%				$12,210	Scope (10%)+ Bid(10%)
SUBTOTAL					$73,260	
Project Management	6%				$4,396	
Remedial Design	10%				$7,326	
Construction Management	6%				$4,396	
TOTAL CAPITAL COSTS					$89,000	

Planning Cost Estimate Summary

Alternative: GW-2 - Monitored Natural Attenuation and Land Use Controls

O&M COSTS

Description		QTY	UNIT	UNIT COST	Total	Notes
LUCs						
LUC Site inspections (through year 33)		1	each	$500	$500	Inspections will be held semiannually for years 1-2 and annually for years 3-33.
SUBTOTAL					$500	
Contingency	10%				$50	
Project Management	10%				$50	
COST PER LUC SITE INSPECTION					$600	
Monitored Natural Attenuation: Labor & Materials						Assume 2 days, 2 people, 1 day of prep
Field work		60	HR	$85	$5,100	Based on $85/hr
Data Eval. & Draft Report		44	HR	$105	$4,620	
IDW Disposal		1	LS	$300	$150	
Comment Resolution		40	HR	$105	$4,200	
Misc supplies, copying, etc.		1	LS	$3,000	$3,000	
Monitored Natural Attenuation: Analytical						
Metals (Fe, Co, Mn) - dissolved & total		8	per sample	$108	$864	
DO, ORP, pH, Cond., Temp., Ferrous Iron (field)		8	per sample	$25	$200	
Sulfate, Nitrate/Nitrite, Alkalinity		8	per sample	$50	$400	
40% QA/QC & Data Validation		1	LS	$586	$586	
SUBTOTAL					$19,120	
Contingency	10%				$1,912	
Project Management	10%				$1,912	
COST PER MNA EVENT					$22,944	
TOTAL O&M ANNUAL COSTS: YEARS 1-2					$185,948	Quarterly Monitoring with Semiannual Inspections
TOTAL O&M ANNUAL COSTS: YEARS 3-33					$729,849	Annual Monitoring with Annual inspections
TOTAL O&M COSTS: YEARS 0-33					$915,797	

PERIODIC COSTS

Description	QTY	UNIT	UNIT COST	Total	Notes
Five Year Review (through year 35)	7	each	$5,000	$35,000	Assume one component of base-wide 5-yr review
SUBTOTAL				$35,000	
TOTAL PERIODIC ANNUAL COSTS				$6,000	

PRESENT VALUE ANALYSIS

Cost Type	Year	Total Cost	Total Cost per Year	Discount Factor at 0.70%	Present Value	Notes
Capital Cost	0	$89,000	$89,000	1	$89,000	Discount rate of 0.7% is based on the 2015
O&M Cost	1 to 2	$185,948	$92,974	1.9792	$184,014	30-Year Real Interest Rate in Appendix C
	3 to 33	$729,849	$26,066	27.3953	$714,087	of the White House Office of Management
Periodic Cost	5	$6,000	$6,000	0.9657	$5,794	and Budget (OMB) Circular A-94, Revised
	10	$6,000	$6,000	0.9326	$5,596	November 2016
	15	$6,000	$6,000	0.9007	$5,404	
	20	$6,000	$6,000	0.8698	$5,219	
	25	$6,000	$6,000	0.8400	$5,040	
	30	$6,000	$6,000	0.8112	$4,867	
	35	$6,000	$6,000	0.78337	$4,700	
Total Present Value of Alternative					$1,024,000	

Planning Cost Estimate Summary

Alternative: SED-2 Sediment Removal - Baseline Estimate

Site: MRP Site 1 - Carr Point Former Shooting Range Off-Shore Sediment
Location: Portsmouth, Rhode Island
Phase: FS
Date: June 2018

Description: Under this alternative, sediment excavation/dredging would remove all impacted sediments exceeding PRGs, as well as sediments containing high concentrations of lead pellets to reduce the ecological risk due to pellet ingestion. Sediments would be disposed of off-site per assumptions made in this FS. The near shore area would receive clean backfill for grading purposes, while the deeper dredge area would not receive backfill materials.

Note that cost savings may be achieved through the mechanical screening of some sediment to remove lead pellets, if determined to be feasible, to reduce disposal volumes and costs. Lead pellets would be transported off-site for recycling. Processed sediment would be characterized prior to determining if it is suitable for reuse as backfill. This potential cost savings would be evaluated further during design.

CAPITAL COSTS

Description	QTY	UNIT	UNIT COST	Total	Notes
Design Mobilization and Site Preparation					
Pre-design Investigation	1	LS	$100,000	$100,000	Bathymetric survey, tidal study, and baseline SAV survey.
RA Contractor Work Plan	1	LS	$20,000	$20,000	
HASP/dust & odor control plan	1	LS	$10,000	$10,000	
Equipment Mobilization/Demobilization	1	LS	$150,000	$150,000	Assumed allowance to mobilize dredging equipment and supplies
On Shore Sediment handling Facilities	1	LS	$100,000	$100,000	Haul roads, stock pile areas, load out areas
Mobilize Water Treatment Plant	1	LS	$40,000	$40,000	Simple filtration plant with discharge to ocean
Temporary facilities	1	LS	$10,000	$10,000	Allowance for office trailer and facilities.
Debris Sweep	5.5	Acre	$25,000	$137,500	Sweep area of debris/large rocks assumed to be dredging footprint.
Turbidity Control	2000	LF	$30	$60,000	Approximate length estimated to encapsulate dredging area with turbidity controls, plus additional contingency.
Erosion control measures	1500	LF	$4	$6,000	Approximate length along shoreline, plus additional contingency
				$633,500	
Construction QA/QC					
Suspended Solids Testing (during Dredging)	44	day	$500	$22,000	Sampling completed once per day
Turbidity Sampling (Dredging, Backfilling)	13	week	$1,000	$13,000	Sampling completed once per week
Bathymetric Survey (post dredge)	5	day	$6,000	$30,000	QC dredging process, baseline cost in PDI
				$65,000	
Near Shore Excavation					
Volume 4,614 CY					(87,675 sqft * 1 ft depth) + (12,300 sqft * 3 ft depth) / 27 ft3/CY
Surface Area 99,975 SF					Assumed extent based on current sampling data. See Figure 3-1.
2.3 acre					
Rate 700 CY per day					Assumed production rate
Timeframe 7 days					
Excavate near-shore sediment	4,614	CY	$30	$138,420	Typical rate of $10/CY tripled to account for tides and other complications
Transfer Sediment to Dewatering Area	4,614	CY	$6	$27,684	
Confirmatory Sampling	260	EA	$200	$52,000	Estimate for lead analysis and pellet count evaluation; bottom samples - 1 per 625 SF (25ft by 25ft grid); ~99,975 SF/ 625 SF ; perimeter samples - 1 per 25 ft - ~2,500 ft/25ft
Clean fill testing	10	EA	$800	$8,000	Estimate for VOCs, SVOCs, PCBs, pesticides, TPH, metals. One sample per 500 CY.
Furnish Backfill Material	5,306	CY	$35	$185,714	Excavation volume plus 15% fluff
Install clean fill	5,306	CY	$15	$79,592	
				$491,409	
Dredging					
Volume 21,774 CY					(174,113 sqft * 3 ft depth) + (65,552 sqft * 1 ft depth) / 27 ft3/CY
Surface Area 239,666 SF					Extent based on pellet removal in Appendix A. See Figure 3-1.
5.5 acre					
Rate 500 CY per day					Assumed production rate for a 2-CY Mechanical Dredge
Timeframe 44 days					
Dredging sediment	44	day	$16,000	$704,000	Minimal debris, no decontamination, relatively shallow water, relatively slow current; rate based on similar project pricing
Dredging Down Time	13	day	$3,500	$45,500	
Transport sediment to on shore dewatering area	21,774	CY	$10	$217,740	
Confirmatory Sampling	384	EA	$200	$76,800	Estimate for lead analysis and pellet count evaluation; bottom samples - 1 per 625 SF (25ft by 25ft grid); ~239,666 SF/ 625 SF
Placement and Support Barges	5	day	$7,000	$35,000	$7,000 for barge, clamshell, and RTK GPS for positioning
				$1,079,040	

Planning Cost Estimate Summary

Alternative: SED-2 Sediment Removal - Baseline Estimate

Disposal						
Waste Characterization		53	EA	$800	$42,400	Estimated cost for each 500 CY of soil proposed for T&D; Analysis for TCLP Lead, Total Lead, and sampling required by disposal facility.
Truck Loading of Sediment		26,388	CY	$6	$158,328	
Transport & Disposal Non-Haz Sediments		29,555	Ton	$45	$1,329,955	Assume 80% of waste is non-haz. Estimated 1.4 ton/CY, $40/ton, plus $5/ton for dewatering agent, non haz soil
Soil Treatment for excess water		36,943	Ton	$2	$73,886	
Transport & Disposal Haz Sediments		7,389	Ton	$70	$517,205	Assume 20% of the waste is haz. Estimated 1.4 ton/CY, $65/ton, plus $5/ton for dewatering agent, haz soil
Operation Water Treatment Plant		6	weeks	$10,000	$60,000	Includes operation, sampling and reporting, simple filtration system
					$2,181,774	
Post-Construction						
Contractor Completion Report		100	HR	$100	$10,000	
Remedial Action Completion Report (2 iterations)		300	HR	$100	$30,000	
					$40,000	
SUBTOTAL					**$4,490,723**	
Contingency	20%				**$898,145**	Scope (10%)+ Bid(10%)
SUBTOTAL					**$5,388,868**	
Project Management	4%				$215,555	Estimated
Remedial Design	4%				$215,555	Estimated
Construction Management	4%				$215,555	Estimated
TOTAL CAPITAL COSTS					**$6,036,000**	Rounded to nearest 1,000th

O&M COSTS

Description	**QTY**	**UNIT**	**UNIT COST**	**Total**	
No O&M costs are anticipated.					
TOTAL O&M ANNUAL COSTS				**$0**	

PERIODIC COSTS

Description	**QTY**	**UNIT**	**UNIT COST**	**Total**	**Notes**
Shoreline Assessment (years 5 and 10)	2	each	$50,000	$100,000	Allowance for assessment of shoreline conditions, post RA. FS estimate includes SAP development, shoreline inspection (notes and photographs), sampling at 5 locations for lead in shallow sediment, incorporate into 5-yr review report for upland portion of site. Details to be determine in RD.
SUBTOTAL				$100,000	
TOTAL PERIODIC COSTS OVER 30 year period				**$100,000**	

PRESENT VALUE ANALYSIS

	Year	**Total Cost**	**Total Cost per Year**	**Discount Factor at**	**Present Value**	**Notes**
Cost Type				**0.7%**		Discount rate of 0.7% is based on the 30-Year Real Interest Rate in Appendix C of the White House Office of Management and Budget (OMB) Circular A-94, Revised November 2016.
Capital Cost	0	$6,036,000	$6,036,000	1	$6,036,000	
Periodic Cost	5	$50,000	$50,000	0.9657	$48,286	
	10	$50,000	$50,000	0.9326	$46,631	
Total Present Value of Alternative					**$6,131,000**	Rounded to nearest 1,000th

Appendix C

Risk Assessment and Remedial Goal Development Tables

ROD RISK WORKSHEET

Table C-1

Summary of Chemical of Concern and Medium-Specific Exposure Point Concentration

Scenario Timeframe: Current
Medium: Soil
Exposure Medium: Surface Soil

Exposure Point	Chemical of Concern	Concentration Detected		Units	Frequency of Detection	Exposure Point Concentration	Exposure Point Concentration Units	Statistical Measure
		Minimum	Maximum					(1)
MRP Site 1								
	Aroclor-1260	0.016	270 J	mg/kg	3 / 5	270	mg/kg	Max
	Lead	6.5	29900 J	mg/kg	57 / 57	828	mg/kg	Mean

Key

(1) Statistics: Maximum Detected Value (Max); 95% UCL (95% UCL); Arithmetic Mean (Mean)

*Assumed to be hexavalent chromium during the RI and human health risk assessment.

The table represents the current chemicals of concern (COCs) and exposure point concentrations (EPCs) for each of the COCs detected in surface soil at MRP Site 1 (i.e., the concentrations that will be used to estimate the exposure and risk for each COC in surface soil). The table includes the range of concentrations detected for each COC, as well as the frequency of detection (i.e., the number of times the chemical was detected in the samples collected at the site), the EPC, and how the EPC was derived. This table indicates that Aroclor-1260 and lead are the only risk-based COCs in surface soil at MRP Site 1. The maximum detected concentration was used as the EPC for Aroclor-1260. The arithmetic mean concentration was used as the EPC for lead.

Source: A Guide to Preparing Superfund Proposed Plans, Records of Decision, and Other Remedy Selection Decision Documents (U.S. EPA, 1999)

Table C-2

Summary of Chemical of Concern and Medium-Specific Exposure Point Concentration

Scenario Timeframe: Future
Medium: Soil
Exposure Medium: Surface + Subsurface Soil

Exposure Point	Chemical of Concern	Concentration Detected		Units	Frequency of Detection	Exposure Point Concentration	Exposure Point Concentration Units	Statistical Measure (1)
		Minimum	Maximum					
MRP Site 1								
	Benzo(a)anthracene	0.00074	65 J	mg/kg	91 / 128	4.6	mg/kg	95% UCL
	Benzo(a)pyrene	0.00077	80 J	mg/kg	89 / 128	5.5	mg/kg	95% UCL
	Benzo(b)fluoranthene	0.00077	75 J	mg/kg	93 / 128	5.1	mg/kg	95% UCL
	Benzo(k)fluoranthene	0.00099	74 J	mg/kg	80 / 128	4.8	mg/kg	95% UCL
	Dibenz(a,h)anthracene	0.00073	5.5	mg/kg	67 / 128	0.42	mg/kg	95% UCL
	Indeno(1,2,3-cd)pyrene	0.00089	44 J	mg/kg	80 / 128	3.1	mg/kg	95% UCL
	4,4'-DDT	0.00074	19 J	mg/kg	4 / 9	19	mg/kg	Max
	Aroclor-1260	0.0098	270 J	mg/kg	5 / 11	270	mg/kg	Max
	Arsenic	0.48	130 J	mg/kg	115 / 115	16	mg/kg	95% UCL
	Chromium, Total*	5	34.2 J	mg/kg	115 / 115	13	mg/kg	95% UCL

Key

(1) Statistics: Maximum Detected Value (Max); 95% UCL (95% UCL); Arithmetic Mean (Mean)

*Assumed to be hexavalent chromium during the RI and human health risk assessment.

The table represents the future chemicals of concern (COCs) and exposure point concentrations (EPCs) for each of the COCs detected in surface and subsurface soil at MRP Site 1 (i.e., the concentrations that will be used to estimate the exposure and risk for each COC in surface and subsurface soil). The table includes the range of concentrations detected for each COC, as well as the frequency of detection (i.e., the number of times the chemical was detected in the samples collected at the site), the EPC, and how the EPC was derived. This table indicates that the carcinogenic PAHs (benzo(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, benzo(k)fluoranthene, dibenz(a,h)anthracene, and indeno(1,2,3-cd)pyrene), 4,4'-DDT, Aroclor-1260, arsenic, and chromium (assumed to be hexavalent chromium in the risk assessment) are the only risk-based COCs in surface and subsurface soil at MRP Site 1. The 95% UCL on the arithmetic mean was used as the EPC for the carcinogenic PAHs, arsenic, and chromium. The maximum detected concentrations were used as the EPCs for 4,4'-DDT and Aroclor-1260.

Source: A Guide to Preparing Superfund Proposed Plans, Records of Decision, and Other Remedy Selection Decision Documents (U.S. EPA, 1999)

ROD RISK WORKSHEET

Table C-3

Summary of Chemical of Concern and Medium-Specific Exposure Point Concentration

Scenario Timeframe: Future
Medium: Groundwater
Exposure Medium: Groundwater (drinking water)

Exposure Point	Chemical of Concern	Concentration Detected		Units	Frequency of Detection	Exposure Point Concentration	Exposure Point Concentration Units	Statistical Measure (1)
		Minimum	Maximum					
On-Site Groundwater								
	Cobalt	0.37 J	9.5	ug/L	6 / 6	9.5	ug/L	Max
	Manganese	59	1150	ug/L	6 / 6	1150	ug/L	Max

Key

(1) Statistics: Maximum Detected Value (Max); 95% UCL (95% UCL); Arithmetic Mean (Mean)

Multiple results from each on-site monitoring well were treated as discrete samples.

The table represents the future chemicals of concern (COCs) and exposure point concentrations (EPCs) for each of the COCs detected in on-site groundwater (i.e., the concentrations that will be used to estimate the exposure and risk for each COC in on-site groundwater). The table includes the range of concentrations detected for each COC, as well as the frequency of detection (i.e., the number of times the chemical was detected in the samples collected at the site), the EPC, and how the EPC was derived. This table indicates that the inorganic chemicals, cobalt and manganese are only risk-based COCs in on-site groundwater. The maximum detected concentration, identified assuming multiple results from each on-site monitoring well were treated as discrete samples, was used as the EPC for each of the COCs detected in groundwater.

Source: A Guide to Preparing Superfund Proposed Plans, Records of Decision, and Other Remedy Selection Decision Documents (U.S. EPA, 1999)

Table C-4

Cancer Toxicity Data Summary

Pathway: Ingestion, Dermal

Chemical of Concern	Oral Cancer Slope Factor	Dermal Cancer Slope Factor	Slope Factor Units	Weight of Evidence/Cancer Guideline Description	Source	Date (1) (MM/DD/YYYY)
Benzo(a)anthracene	1.0E-01	1.0E-01	$(mg/kg\text{-}day)^{-1}$	B2	IRIS	04/04/19
Benzo(a)pyrene	1.0E+00	1.0E+00	$(mg/kg\text{-}day)^{-1}$	B2	IRIS	04/04/19
Benzo(b)fluoranthene	1.0E-01	1.0E-01	$(mg/kg\text{-}day)^{-1}$	B2	IRIS	04/04/19
Benzo(k)fluoranthene	1.0E-02	1.0E-02	$(mg/kg\text{-}day)^{-1}$	B2	IRIS	04/04/19
Dibenz(a,h)anthracene	1.0E+00	1.0E+00	$(mg/kg\text{-}day)^{-1}$	B2	IRIS	04/04/19
Indeno(1,2,3-cd)pyrene	1.0E-01	1.0E-01	$(mg/kg\text{-}day)^{-1}$	B2	IRIS	04/04/19
4,4'-DDT	3.4E-01	3.4E-01	$(mg/kg\text{-}day)^{-1}$	B2	IRIS	04/04/19
Aroclor-1260	2.0E+00	2.0E+00	$(mg/kg\text{-}day)^{-1}$	B2	IRIS	04/04/19
Arsenic	1.5E+00	1.5E+00	$(mg/kg\text{-}day)^{-1}$	A	IRIS	04/04/19
Chromium, Total	5.0E-01	2.0E+01	$(mg/kg\text{-}day)^{-1}$	D	IRIS	04/04/19
Cobalt	N/A	N/A	N/A	N/A	N/A	N/A
Lead	N/A	N/A	N/A	B2	IRIS	04/04/19
Manganese	N/A	N/A	N/A	D	IRIS	04/04/19

Pathway: Inhalation

Chemical of Concern	Unit Risk	Units	Inhalation Cancer Slope Factor	Units	Weight of Evidence/Cancer Guideline Description	Source	Date (1) (MM/DD/YYYY)
Benzo(a)anthracene	6.0E-05	$(ug/m^3)^{-1}$	N/A	$(mg/kg\text{-}day)^{-1}$	B2	IRIS	04/04/19
Benzo(a)pyrene	6.0E-04	$(ug/m^3)^{-1}$	N/A	$(mg/kg\text{-}day)^{-1}$	B2	IRIS	04/04/19
Benzo(b)fluoranthene	6.0E-05	$(ug/m^3)^{-1}$	N/A	$(mg/kg\text{-}day)^{-1}$	B2	IRIS	04/04/19
Benzo(k)fluoranthene	6.0E-06	$(ug/m^3)^{-1}$	N/A	$(mg/kg\text{-}day)^{-1}$	B2	IRIS	04/04/19
Dibenz(a,h)anthracene	6.0E-04	$(ug/m^3)^{-1}$	N/A	$(mg/kg\text{-}day)^{-1}$	B2	IRIS	04/04/19
Indeno(1,2,3-cd)pyrene	6.0E-05	$(ug/m^3)^{-1}$	N/A	$(mg/kg\text{-}day)^{-1}$	B2	IRIS	04/04/19
4,4'-DDT	9.7E-05	$(ug/m^3)^{-1}$	N/A	$(mg/kg\text{-}day)^{-1}$	B2	IRIS	04/04/19
Aroclor-1260	5.7E-04	$(ug/m^3)^{-1}$	N/A	$(mg/kg\text{-}day)^{-1}$	B2	IRIS	04/04/19
Arsenic	4.3E-03	$(ug/m^3)^{-1}$	N/A	$(mg/kg\text{-}day)^{-1}$	A	IRIS	04/04/19
Chromium, Total	8.4E-02	$(ug/m^3)^{-1}$	N/A	$(mg/kg\text{-}day)^{-1}$	A	IRIS	04/04/19
Cobalt	9.0E-03	$(ug/m^3)^{-1}$	N/A	$(mg/kg\text{-}day)^{-1}$	B2	PPRTV	04/04/19
Lead	N/A	N/A	N/A	$(mg/kg\text{-}day)^{-1}$	B2	IRIS	04/04/19
Manganese	N/A	N/A	N/A	$(mg/kg\text{-}day)^{-1}$	D	IRIS	04/04/19

Table C-4

Cancer Toxicity Data Summary

Key

N/A: Not applicable

IRIS: Integrated Risk Information System, U.S. EPA

PPRTV: Provisional Peer-Reviewed Toxicity Value, U.S. EPA

EPA Group

A - Human carcinogen

B2 - Probable human carcinogen - indicates sufficient evidence in animals and inadequate or no evidence in humans

D - Not classifiable as a human carcinogen

(1) Date indicates when IRIS was last reviewed for the most current toxicity value.

The slope factor for benzo(a)pyrene, along with the appropriate relative potency factor (USEPA, 1993), used for the other carcinogenic PAHs.

The slope factor and unit risk for the carcinogenic PAHs are different than those used in the baseline HHRA. Results presented on Risk Summary tables use the revised toxicity values along with site-specific exposure parameters from the baseline HHRA.

Slope factor and unit risk for hexavalent chromium used for chromium, total.

For PCBs, the RME slope factor presented represents the upper-bound slope factor for high risk and persistence situations.

Age-dependent adjustment factors are used in conjunction with toxicity values, as appropriate, for carcinogenic PAHs.

This table provides the carcinogenic risk information which is relevant to the contaminants of concern in soil and groundwater. At this time, slope factors are not available for the dermal route of exposure. Thus, the dermal slope factors used in this assessment have been extrapolated from oral values. An adjustment factor is sometimes applied, and is dependent upon how well the chemical is absorbed via the oral route. Adjustments are particularly important for chemicals with less than 50% absorption via the ingestion route. However, adjustment is not necessary for most of the chemicals evaluated at this site. Therefore, the same values presented above were used as the dermal carcinogenic slope factors for these contaminants. Chromium (evaluated as hexavalent chromium at this site) is the only COC which was adjusted.

Source: A Guide to Preparing Superfund Proposed Plans, Records of Decision, and Other Remedy Selection Decision Documents (U.S. EPA, 1999)

Table C-5

Non-Cancer Toxicity Data Summary

Pathway: Ingestion, Dermal

Chemical of Concern	Chronic/ Subchronic	Oral RfD Value	Oral RfD Units	Dermal RfD	Dermal RfD Units	Primary Target Organ	Combined Uncertainty / Modifying Factors	Sources of RfD: Target Organ	Dates of RfD: Target Organ (1) (MM/DD/YYYY)
Benzo(a)anthracene	Chronic	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Benzo(a)pyrene	Chronic	3E-04	mg/kg-day	3E-04	mg/kg-day	Developmental	300	IRIS	04/04/19
Benzo(b)fluoranthene	Chronic	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Benzo(k)fluoranthene	Chronic	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Dibenz(a,h)anthracene	Chronic	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Indeno(1,2,3-cd)pyrene	Chronic	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
4,4'-DDT	Chronic	5.0E-04	mg/kg-day	5.0E-04	mg/kg-day	Liver	100	IRIS	04/04/19
Aroclor-1260	Chronic	2.0E-05	mg/kg-day	2.0E-05	mg/kg-day	Eye, Nails, Immune	300	IRIS	04/04/19
Arsenic	Chronic	3.0E-04	mg/kg-day	3.0E-04	mg/kg-day	Skin, Vascular	3	IRIS	04/04/19
Chromium, Total	Chronic	3.0E-03	mg/kg-day	7.5E-05	mg/kg-day	None reported	900	IRIS	04/04/19
Cobalt	Chronic	3.0E-04	mg/kg-day	3.0E-04	mg/kg-day	Thyroid	3000	PPRTV	04/04/19
Lead	Chronic	N/A	N/A	N/A	N/A	N/A	N/A	IRIS	04/04/19
Manganese	Chronic	2.4E-02	mg/kg-day	9.6E-04	mg/kg-day	Nervous System	3	IRIS	04/04/19

Table C-5

Non-Cancer Toxicity Data Summary

Pathway: Inhalation

Chemical of Concern	Chronic/ Subchronic	Inhalation RfC	Inhalation RfC Units	Inhalation RfD	Inhalation RfD Units	Primary Target Organ	Combined Uncertainty / Modifying Factors	Sources of RfC: RfD: Target Organ	Dates (MM/DD/YYYY)
Benzo(a)anthracene	Chronic	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Benzo(a)pyrene	Chronic	2E-03	ug/m^3	N/A	N/A	Developmental	3000	IRIS	04/04/19
Benzo(b)fluoranthene	Chronic	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Benzo(k)fluoranthene	Chronic	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Dibenz(a,h)anthracene	Chronic	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Indeno(1,2,3-cd)pyrene	Chronic	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
4,4'-DDT	Chronic	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Aroclor-1260	Chronic	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Arsenic	Chronic	1.5E-02	ug/m^3	N/A	N/A	Developmental	30	CalEPA	04/04/19
Chromium, Total	Chronic	1.0E-01	ug/m^3	N/A	N/A	Respiratory	300	IRIS	04/04/19
Cobalt	Chronic	6.0E-03	ug/m^3	N/A	N/A	Respiratory	300	PPRTV	04/04/19
Lead	Chronic	N/A	N/A	N/A	N/A	N/A	N/A	IRIS	04/04/19
Manganese	Chronic	5.0E-02	ug/m^3	N/A	N/A	Nervous System	1000	IRIS	04/04/19

Key

N/A: No information available

IRIS: Integrated Risk Information System, U.S. EPA

CalEPA: California Environmental Protection Agency, Office of Environmental Health Hazard Assessment

(1) Date indicates when IRIS was last reviewed for the most current toxicity value.

The RfD for Aroclor 1254 was used as a surrogate for Aroclor 1260 (High risk and persistence; upper-bound slope factor).

The RfD and RfC for benzo(a)pyrene is different than that used in the baseline HHRA. Results presented on Risk Summary tables use the revised RfD along with site-specific exposure parameters from the baseline HHRA.

This table provides non-carcinogenic risk information which is relevant to the contaminants of concern in soil and groundwater. Six of the COCs have oral toxicity data indicating their potential for adverse non-carcinogenic health effects in humans. Chronic toxicity data available for the six COCs for oral exposures have been used to develop chronic oral reference doses (RfDs), provided in this table. The available chronic toxicty data indicate that benzo(a)pyrene and arsenic are developmental toxicants, 4,4'-DDT affects the liver, PCBs affect the immune system, eyes and nails, manganese affects the central nervous system, arsenic affects the skin and vascular system, and chromium affects the respiratory system. A reference dose is not available for lead. Dermal RfDs are not available for any of the COCs. As was the case for the carcinogenic data, dermal RfDs can be extrapolated from oral RfDs by applying an adjustment factor as appropriate. Oral RfDs were adjusted for COCs with less than 50% absorption via the ingestion route (benzo(a)pyrene, 4,4'-DDT, PCBs, arsenic, chromium [evaluated as hexavalent chromium at this site], and manganese) to derive dermal RfDs for these COCs. Inhalation reference concentrations (RfCs) are available for four COCs evaluated for the inhalation pathway.

Source: A Guide to Preparing Superfund Proposed Plans, Records of Decision, and Other Remedy Selection Decision Documents (U.S. EPA, 1999)

Table C-6

Risk Characterization Summary - Non-Carcinogens

Scenario Timeframe: Current
Receptor Population: Recreational User
Receptor Age: Young Child/Adult

Medium	Exposure Medium	Exposure Point	Chemical of Concern	Primary Target Organ	Non-Carcinogenic Hazard Quotient			
					Ingestion	Inhalation	Dermal	Exposure Routes Total
Soil	Surface Soil	MRP Site 1	Aroclor-1260	Eye, Nails, Immune	7E+00	N/A	2E+00	9E+00
							Hazard Index Total =	9E+00
							Immune System Hazard Index =	9E+00
							Eye Hazard Index =	9E+00
							Nails Hazard Index =	9E+00

Key

N/A - Toxicity criteria are not available to quantitatively address this route of exposure.

-- Route of exposure is not applicable to this medium.

This table provides hazard quotients (HQs) for each route of exposure and the hazard index (sum of the hazard quotients) for all routes of exposure for current young child and adult recreational users exposed to surface soil at MRP Site 1. The Risk Assessment Guidance for Superfund (RAGS) states that, generally, a hazard index (HI) of greater than 1 indicates the potential for adverse noncancer effects. The estimated target organ HIs of 9 indicate that the potential for adverse effects could occur from exposure to contaminated surface soil containing Aroclor-1260. Results presented use current toxicity values along with site-specific exposure parameters from the baseline HHRA.

Source: A Guide to Preparing Superfund Proposed Plans, Records of Decision, and Other Remedy Selection Decision Documents (U.S. EPA, 1999)

Table C-7

Risk Characterization Summary - Non-Carcinogens

Scenario Timeframe: Current
Receptor Population: Trespasser
Receptor Age: Adolescent

Medium	Exposure Medium	Exposure Point	Chemical of Concern	Primary Target Organ	Non-Carcinogenic Hazard Quotient			
					Ingestion	Inhalation	Dermal	Exposure Routes Total
Soil	Surface Soil	MRP Site 1	Aroclor-1260	Eye, Nails, Immune	4E+00	N/A	2E+00	7E+00
							Hazard Index Total =	7E+00
							Immune System Hazard Index =	7E+00
							Eye Hazard Index =	7E+00
							Nails Hazard Index =	7E+00

Key

N/A - Toxicity criteria are not available to quantitatively address this route of exposure.

-- Route of exposure is not applicable to this medium.

This table provides hazard quotients (HQs) for each route of exposure and the hazard index (sum of the hazard quotients) for all routes of exposure for current adolescent trespassers exposed to surface soil at MRP Site 1. The Risk Assessment Guidance for Superfund (RAGS) states that, generally, a hazard index (HI) of greater than 1 indicates the potential for adverse noncancer effects. The estimated target organ HIs of 7 indicate that the potential for adverse effects could occur from exposure to contaminated surface soil containing Aroclor-1260. Results presented use current toxicity values along with site-specific exposure parameters from the baseline HHRA.

Source: A Guide to Preparing Superfund Proposed Plans, Records of Decision, and Other Remedy Selection Decision Documents (U.S. EPA, 1999)

Table C-8

Risk Characterization Summary - Non-Carcinogens

Scenario Timeframe: Future
Receptor Population: Trespasser
Receptor Age: Adolescent

Medium	Exposure Medium	Exposure Point	Chemical of Concern	Primary Target Organ	Non-Carcinogenic Hazard Quotient			
					Ingestion	Inhalation	Dermal	Exposure Routes Total
Soil	Surface and Subsurface Soil	MRP Site 1	Aroclor-1260	Eye, Nails, Immune	4E+00	N/A	2E+00	7E+00
							Hazard Index Total =	7E+00
							Immune System Hazard Index =	7E+00
							Eye Hazard Index =	7E+00
							Nails Hazard Index =	7E+00

Key

N/A - Toxicity criteria are not available to quantitatively address this route of exposure.

-- Route of exposure is not applicable to this medium.

This table provides hazard quotients (HQs) for each route of exposure and the hazard index (sum of the hazard quotients) for all routes of exposure for future adolescent trespassers exposed to surface and subsurface soil at MRP Site 1. The Risk Assessment Guidance for Superfund (RAGS) states that, generally, a hazard index (HI) of greater than 1 indicates the potential for adverse noncancer effects. The estimated target organ HIs of 7 indicate that the potential for adverse effects could occur from exposure to contaminated surface and subsurface soil containing Aroclor-1260. Results presented use current toxicity values along with site-specific exposure parameters from the baseline HHRA.

Source: A Guide to Preparing Superfund Proposed Plans, Records of Decision, and Other Remedy Selection Decision Documents (U.S. EPA, 1999)

Table C-9

Risk Characterization Summary - Non-Carcinogens

Scenario Timeframe: Current/Future
Receptor Population: Construction Worker
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Chemical of Concern	Primary Target Organ	Non-Carcinogenic Hazard Quotient			
					Ingestion	Inhalation	Dermal	Exposure Routes Total
Soil	Surface and Subsurface Soil	MRP Site 1	Aroclor-1260	Eye, Nails, Immune	1E+01	N/A	6E+00	2E+01
							Hazard Index Total =	2E+01
							Immune System Hazard Index =	2E+01
							Eye Hazard Index =	2E+01
							Nails Hazard Index =	2E+01

Key

N/A - Toxicity criteria are not available to quantitatively address this route of exposure.

-- Route of exposure is not applicable to this medium.

This table provides hazard quotients (HQs) for each route of exposure and the hazard index (sum of the hazard quotients) for all routes of exposure for current/future construction workers exposed to surface and subsurface soil at MRP Site 1. The Risk Assessment Guidance for Superfund (RAGS) states that, generally, a hazard index (HI) of greater than 1 indicates the potential for adverse noncancer effects. The estimated target organ HIs of 20 indicate that the potential for adverse effects could occur from exposure to contaminated surface and subsurface soil containing Aroclor-1260. Results presented use current toxicity values along with site-specific exposure parameters from the baseline HHRA.

Source: A Guide to Preparing Superfund Proposed Plans, Records of Decision, and Other Remedy Selection Decision Documents (U.S. EPA, 1999)

ROD RISK WORKSHEET

Table C-10

Risk Characterization Summary - Carcinogens

Scenario Timeframe: Future
Receptor Population: Onsite Worker
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Chemical of Concern	Carcinogenic Risk				
				Ingestion	Inhalation	Dermal	External (Radiation)	Exposure Routes Total
Soil	Surface and Subsurface Soil	MRP Site 1						
			Benzo(a)anthracene	1E-07	8E-12	8E-08	--	2E-07
			Benzo(a)pyrene	2E-06	1E-10	9E-07	--	3E-06
			Benzo(b)fluoranthene	2E-07	9E-12	8E-08	--	2E-07
			4,4-DDT	2E-06	6E-11	2E-07		2E-06
			Aroclor-1260	2E-04	5E-09	1E-04	--	3E-04
			Arsenic	5E-06	2E-09	9E-07	--	5E-06
			Chromium, Total	2E-06	3E-08	N/A	--	2E-06
							Total Risk =	3E-04

Key

-- Route of exposure is not applicable to this medium.

N/A - Toxicity criteria are not available to quantitatively address this route of exposure.

This table provides risk estimates for the significant routes of exposure for a future onsite worker exposed to surface and subsurface soil at MRP Site 1. These risk estimates are based on a reasonable maximum exposure and were developed by taking into account various conservative assumptions about the frequency and duration of a future onsite worker's exposure to surface and subsurface soil, as well as the toxicity of the COCs (benzo(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, 4,4'-DDT, Aroclor-1260, arsenic, and chromium [evaluated as hexavalent chromium]). The total risk from exposure to contaminated soil at MRP Site 1 to future onsite workers is estimated to be 3×10^{-4}. The COCs contributing most to this risk level are benzo(a)pyrene, 4,4'-DDT, Aroclor-1260, arsenic, and chromium [evaluated as hexavalent chromium] in soil. This risk level indicates that if no clean-up action is taken, an individual would have an increased probability of 3 in 10,000 of developing cancer as a result of site-related exposure to the COCs in soil. Results presented use current toxicity values along with site-specific exposure parameters from the baseline HHRA.

Source: A Guide to Preparing Superfund Proposed Plans, Records of Decision, and Other Remedy Selection Decision Documents (U.S. EPA, 1999)

Table C-11

Risk Characterization Summary - Non-Carcinogens

Scenario Timeframe: Future
Receptor Population: Onsite Worker
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Chemical of Concern	Primary Target Organ	Non-Carcinogenic Hazard Quotient			
					Ingestion	Inhalation	Dermal	Exposure Routes Total
Soil	Surface and Subsurface Soil	MRP Site 1	Aroclor-1260	Eye, Nails, Immune	1E+01	N/A	7E+00	2E+01
							Hazard Index Total =	2E+01
							Immune System Hazard Index =	2E+01
							Eye Hazard Index =	2E+01
							Nails Hazard Index =	2E+01

Key

N/A - Toxicity criteria are not available to quantitatively address this route of exposure.

-- Route of exposure is not applicable to this medium.

This table provides hazard quotients (HQs) for each route of exposure and the hazard index (sum of the hazard quotients) for all routes of exposure for future onsite workers exposed to surface and subsurface soil at MRP Site 1. The Risk Assessment Guidance for Superfund (RAGS) states that, generally, a hazard index (HI) of greater than 1 indicates the potential for adverse noncancer effects. The estimated target organ HIs of 20 indicate that the potential for adverse effects could occur from exposure to contaminated surface and subsurface soil containing Aroclor-1260. Results presented use current toxicity values along with site-specific exposure parameters from the baseline HHRA.

Source: A Guide to Preparing Superfund Proposed Plans, Records of Decision, and Other Remedy Selection Decision Documents (U.S. EPA, 1999)

ROD RISK WORKSHEET

Table C-12

Risk Characterization Summary - Carcinogens

Scenario Timeframe: Future
Receptor Population: Resident
Receptor Age: Young Child/Adult

Medium	Exposure Medium	Exposure Point	Chemical of Concern	Carcinogenic Risk				
				Ingestion	Inhalation	Dermal	External (Radiation)	Exposure Routes Total
Soil	Surface and Subsurface Soil	MRP Site 1						
			Benzo(a)anthracene	3E-06	3E-11	9E-07	--	4E-06
			Benzo(a)pyrene	3E-05	4E-10	1E-05	--	5E-05
			Benzo(b)fluoranthene	3E-06	3E-11	1E-06	--	4E-06
			Benzo(k)fluoranthene	3E-07	3E-12	1E-07	--	4E-07
			Dibenz(a,h)anthracene	3E-06	3E-11	8E-07	--	3E-06
			Indeno(1,2,3-cd)pyrene	2E-06	2E-11	6E-07	--	3E-06
			4,4-DDT	9E-06	1E-10	8E-07	--	1E-05
			Aroclor-1260	8E-04	8E-09	3E-04	--	1E-03
			Arsenic	2E-05	4E-09	3E-06	--	2E-05
			Chromium, Total	4E-05	1E-07	N/A	--	4E-05
							Total Risk =	1E-03

Key

-- Route of exposure is not applicable to this medium.

N/A - Toxicity criteria are not available to quantitatively address this route of exposure.

This table provides risk estimates for the significant routes of exposure for the future young child and adult resident exposed to surface and subsurface soil at MRP Site 1. These risk estimates are based on a reasonable maximum exposure and were developed by taking into account various conservative assumptions about the frequency and duration of a young child's and adult's exposure to surface and subsurface soil as well as the toxicity of the COCs (benzo(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, benzo(k)fluoranthene, dibenz(a,h)anthracene, indeno(1,2,3-cd)pyrene, 4,4'-DDT, Aroclor-1260, arsenic, and chromium [evaluated as hexavalent chromium]). The total risk from exposure to contaminated soil at MRP Site 1 to future residents is estimated to be 1×10^{-3}. The COCs contributing most to this risk level are Aroclor-1260 and benzo(a)pyrene in soil. This risk level indicates that if no clean-up action is taken, an individual would have an increased probability of 1 in 1,000 of developing cancer as a result of site-related exposure to the COCs in soil. Results presented use current toxicity values along with site-specific exposure parameters from the baseline HHRA.

Source: A Guide to Preparing Superfund Proposed Plans, Records of Decision, and Other Remedy Selection Decision Documents (U.S. EPA, 1999)

ROD RISK WORKSHEET

Table C-13

Risk Characterization Summary - Non-Carcinogens

Scenario Timeframe: Future
Receptor Population: Resident
Receptor Age: Young Child/Adult

Medium	Exposure Medium	Exposure Point	Chemical of Concern	Primary Target Organ	Non-Carcinogenic Hazard Quotient			
					Ingestion	Inhalation	Dermal	Exposure Routes Total
Soil	Surface and Subsurface Soil	MRP Site 1	Aroclor-1260	Eye, Nails, Immune	2E+02	N/A	6E+01	2E+02
							Hazard Index Total =	2E+02
							Immune System Hazard Index =	2E+02
							Eye Hazard Index =	2E+02
							Nails Hazard Index =	2E+02

Key

N/A - Toxicity criteria are not available to quantitatively address this route of exposure.

-- Route of exposure is not applicable to this medium.

This table provides hazard quotients (HQs) for each route of exposure and the hazard index (sum of the hazard quotients) for all routes of exposure for future residents exposed to surface and subsurface soil at MRP Site 1. The Risk Assessment Guidance for Superfund (RAGS) states that, generally, a hazard index (HI) of greater than 1 indicates the potential for adverse noncancer effects. The estimated target organ HIs of 20 indicate that the potential for adverse effects could occur from exposure to contaminated surface and subsurface soil containing Aroclor-1260. Results presented use current toxicity values along with site-specific exposure parameters from the baseline HHRA.

Source: A Guide to Preparing Superfund Proposed Plans, Records of Decision, and Other Remedy Selection Decision Documents (U.S. EPA, 1999)

Table C-14

Risk Characterization Summary - Non-Carcinogens

Scenario Timeframe: Future
Receptor Population: Resident
Receptor Age: Young Child/Adult

Medium	Exposure Medium	Exposure Point	Chemical of Concern	Primary Target Organ	Non-Carcinogenic Hazard Quotient			
					Ingestion	Inhalation	Dermal	Exposure Routes Total
Groundwater	Groundwater (Drinking Water)	MW-01D	Cobalt	Thyroid	2E+00	--	N/A	2E+00
			Manganese	Nervous System	2E+00	--	N/A	2E+00
							Hazard Index Total =	4E+00
							Thyroid Hazard Index =	2E+00
							Nervous System Hazard Index =	2E+00
Groundwater	Groundwater (Drinking Water)	MW-12	Manganese	Nervous System	2E+00	--	N/A	2E+00
							Hazard Index Total =	2E+00
							Nervous System Hazard Index =	2E+00
Groundwater	Groundwater (Drinking Water)	MW-12D	Manganese	Nervous System	2E+00	--	N/A	2E+00
							Hazard Index Total =	2E+00
							Nervous System Hazard Index =	2E+00

Key

N/A - Toxicity criteria are not available to quantitatively address this route of exposure.

-- Route of exposure is not applicable to this medium.

This table provides hazard quotients (HQs) for each route of exposure and the hazard index (sum of the hazard quotients) for all routes of exposure for the future resident exposed to on-site groundwater used as household water. The Risk Assessment Guidance for Superfund (RAGS) states that, generally, a hazard index (HI) of greater than 1 indicates the potential for adverse noncancer effects. The estimated target organ HIs of 2 indicate that the potential for adverse effects could occur from exposure to contaminated groundwater containing cobalt and manganese. Results presented use current toxicity values along with site-specific exposure parameters from the baseline HHRA.

Source: A Guide to Preparing Superfund Proposed Plans, Records of Decision, and Other Remedy Selection Decision Documents (U.S. EPA, 1999)

Table C-15

Ecological Risk Summary

MRP Site 1

Medium: Surface Soil

	Frequency of Detection	Range of Detected Concentrations	Average (arithmetic mean) EPC [a]	Refined Maximum EPC [b]	Soil Invert. SEV [c]	Invert. SEV Source [c]	Maximum Invert. HQ [d]	Average Invert HQ [d]	Plant SEV [c]	Plant SEV Source [c]	Maximum Plant HQ [d]	Average Plant HQ [d]	COC Flag Y or N [h]
Semivolatile Organics (mg/Kg)													
TOTAL HMW PAHs	58 / 58	0.0043 - 650	23.6	75.5	18	Eco-SSL (inverts)	4.2	1.3	20	ORNL (plants)	3.8	1.2	N
TOTAL LMW PAHs	57 / 58	0.0051 - 140	4.2	28.9	29	Eco-SSL (inverts)	1.0	0.14	20	ORNL (plants)	1.4	0.21	N
Pesticides (mg/Kg)													
4,4-DDT	3 / 4	0.0061 - 19	6.3000	19	12	CCME (commercial)	1.6	0.53	12	CCME (commercial)	1.58	0.53	N
ENDOSULFAN I	1 / 4	0.0015 - 0.0015	0.0015	0.0015	0.00001	TV (unspecified)	150.0	150	0.00001	TV (unspecified)	150	150	N
ENDOSULFAN II	1 / 4	0.00032 - 0.00032	0.000	0.0003	0.00001	TV (unspecified)	32	32	0.00001	TV (unspecified)	32	32	N
ENDOSULFAN SULFATE	2 / 4	0.0021 - 12	6.000	12	0.00001	TV (unspecified)	1200000	600000	0.00001	TV (unspecified)	1200000	600000	N
ENDRIN	1 / 4	0.00180 - 0.0018	0.0018	0.0018	0.001	USEPA R4 (unspecified)	1.8	1.8	0.001	USEPA R4 (unspecified)	1.8	1.8	N
ENDRIN KETONE	1 / 4	0.0016 - 0.0016	0.0016	0.0016	0.001	USEPA R4 (unspecified)	1.6	1.6	0.001	USEPA R4 (unspecified)	1.6	1.6	N
Inorganics (mg/Kg)													
ANTIMONY	27 / 27	0.05 - 396	23.0	92.5	78	Eco-SSL (inverts)	1.2	0.29	5	ORNL (plants)	18.5	4.6	N
ARSENIC	45 / 45	1.2 - 130.0	12.50	25.2	60.0	Eco-SSL (inverts)	0.42	0.21	18	Eco-SSL (plants)	1.4	0.7	N
CHROMIUM, TOTAL	45 / 45	5 - 30.1	12.6	13.8	0.4	ORNL (inverts)	35	32	1	ORNL (plants)	14	13	N
COBALT	27 / 27	6.4 - 24.5	12.4	14.2	20	USEPA R4 (unspecified)	0.71	0.62	13	Eco-SSL (plants)	1.1	1.0	N
COPPER	27 / 27	9.2 - 256	38.1	81	80	Eco-SSL (inverts)	1.0	0.5	70	Eco-SSL (plants)	1.2	0.5	N
IRON	27 / 27	16100 - 88500	32600	37470	200	USEPA R4 (microbes)	187	163	pH<5, pH>8	Eco-SSL	[e]	[e]	N
LEAD	57 / 57	6.5 - 29900	828	3,241	1700	Eco-SSL (inverts)	1.9	0.49	120	Eco-SSL (plants)	27.0	6.9	N
MANGANESE	27 / 27	242 - 929	482	535	450	Eco-SSL (inverts)	1.2	1.1	220	Eco-SSL (plants)	2.4	2.2	N
ZINC	27 / 27	33.6 - 433	103	166	120	Eco-SSL (inverts)	1.4	0.86	160	Eco-SSL (plants)	1.0	0.6	N
PCBs (mg/Kg)													
Total PCBs	4 / 5	0.016 - 270	68	270	33	CCME (commercial)	8.2	2.0	40	ORNL (plants)	6.8	1.7	N

Analyte	Frequency of Detection	Range of Detected Concentrations	Average (arithmetic mean) EPC [a]	Refined Maximum EPC [b]	NOAEL Maximum HQ - Quail [f]	NOAEL Maximum HQ - Robin [f]	NOAEL Maximum HQ - Vole [f]	NOAEL Maximum HQ - Shrew [f]	LOAEL Maximum HQ - Quail [f]	LOAEL Maximum HQ - Robin [f]	LOAEL Maximum HQ - Vole [f]	LOAEL Maximum HQ - Shrew [f]	COC Flag Y or N [h]
Inorganics (mg/Kg)													
ANTIMONY	27 / 27	0.05 - 396	23.0	92.5	NC	NC	18.9	177	NC	NC	0.4	3.8	Y
Pesticides (mg/Kg)													
4,4'-DDT	3 / 4	0.0061 - 19	6.3000	19	NA	17.4	2.2	84.1	NA	1.5	0.058	2.2	Y
PCBs (mg/Kg)													
Total PCBs	25 / 35	0.0064 - 45	5.8	22.7	12.2	366	81	3003	1.2	36.6	8.1	300	Y

Table C-15

Ecological Risk Summary

MRP Site 1
Medium: Surface Sediment

Analyte	Frequency of Detection	Range of Detected Concentrations	Average (arithmetic mean) EPC [a]	Refined Maximum EPC [b]	Sediment SEV [c]	Invert. SEV Source [c]	Maximum Benthic Invert. HQ [d]	Average Benthic Invert HQ [d]	Sediment Toxicity Testing Results (28 day *Leptocheirus plumulosus* test)	COC Flag Y or N [h]
Inorganics (mg/Kg)										
Lead	55 / 55	5.2 - 4290	210	595	218	NOAA ERM (marine)	2.7	1.0	Toxicity identified in three nearshore samples with elevated lead levels (SD102, SD122, and SD124)	Y

Analyte and Exposure Area	Sum of Lead Pellets (2-4 mm)	Sum of Grit Sized (2-4 mm) Material	Percent Lead Pellet by Count	Receptor	Probability of Ingesting One Pellet in a Day	COC Flag Y or N [h]
Lead Pellets						
Shoreline Soil	201	82082.0	0.24%	Mourning Dove	0.0011%	N
Shoreline Soil	201	82082.0	0.24%	Bobwhite Quail	0.040%	N
Target Area	673	154072	0.44%	Lesser Scaup	1.5%	Y
Overshoot Area [300-600 ft]	1236	73971	1.7%	Lesser Scaup	7.2%	Y

Notes:
[a] Average (arithmetic mean) was calculated using only detected concentrations.
[b] Refined maximum EPCs represent UCLs or maximum detected concentrations if UCLs could not be calculated.
[c] SEVs identified for terrestrial plants and soil invertebrates and for benthic invertebrates (see Attachment C of the ERA for further details).
[d] Hazard quotient (HQ) for soil invertebrates, plants , and benthic invertebrates is the EPC divided by the SEV.
[e] pH reported in surface soil at 5.9 SU. pH in deeper samples ranged from 5.1 to 5.4 SU.
[f] HQs for Bobwhite Quail, American Robin, Meadow Vole, and Short-tailed Shrew determined via food-web modeling. See Attachment L of the ERA for exposure parameters and assumptions.
[g] Probability modeling for lead ingestion presented in Attachment M of the ERA.
[h] Refer to text for discussion on actionable risk.
CCME - Canadian Council of Ministers of the Environment (2002). Commercial value based on direct contact.
Eco-SSL - Ecological Soil Screening Level. Derived by USEPA according to USEPA guidance (2005a).
EPC - Exposure Point Concentration
ERA - Ecological Risk Assessment.
ERM - Effects Range Median ((Marine - Long, et al., 1995).
HMW - High Molecular Weight.
HQ - Hazard Quotient.
LMW - Low Molecular Weight.
LOAEL - Low Observed Adverse Effect Level.
mg/Kg - milligram per kilogram
mm - millimieter.
NA - Not Applicable (not a chemical of potential concern for the quail).
NC - Not Calculated (avian toxicity value not available).
NOAA - National Oceanic and Atmospheric Administration.
NOAEL - No Observed Adverse Effects Level
ORNL - Oak Ridge National Laboratory (Efroymson, et al., 1997a and b).
SEV - Screening Ecotoxicity Value
TV - Target Value (Dutch standards presented in Buchman, 2008).
UCL - Upper Confidence Limit
USEPA - United States Environmental Protection Agency.
USEPA R4 - USEPA Region 4 recommended ecological screening values for soil (USEPA, 2001c).

Appendix D

ARARs And To Be Considered Guidance

Chemical-Specific ARARs and TBCs
MRP Site 1, Carr Point Shooting Range,
Alternative S-3: Select Soil Removal, Soil and Asphalt Cover System, and Land Use Controls

Requirement	Citation	Status	Requirement Synopsis	Action to Be Taken to Attain Requirement
Federal				
Human Health Assessment Cancer Slope Factors (CSFs)	None	To Be Considered	CSFs are estimates of the upper-bound probability of an individual developing cancer as a result of a lifetime exposure to a particular concentration of a potential carcinogen.	Used to compute the potential carcinogenic risks caused by exposure to contaminants in site media. Risks due to carcinogens will be addressed through select soil removal, the installation of a cover and implementation of LUCs to restrict land use to prevent exposure to potential receptors.
EPA Risk Reference Doses (RfDs)	None	To Be Considered	Guidance used to compute human health hazard resulting from exposure to non-carcinogens in site media. RfDs are considered to be the levels unlikely to cause significant adverse health effects associated with a threshold mechanism of action in human exposure for a lifetime.	Used to calculate potential non-carcinogenic hazards caused by exposure to contaminants in site media. Hazards due to non-carcinogens will be addressed through select soil removal, the installation of a cover and implementation of LUCs to restrict land use to prevent exposure to potential receptors.
Guidelines for Carcinogenic Risk Assessment	EPA/630/P-03/001F (March 2005)	To Be Considered	These guidelines provide guidance on conducting risk assessments involving carcinogens.	Used to calculate potential carcinogenic risks caused by exposure to contaminants in site media. Risks due to carcinogens will be addressed through select soil removal, the installation of a cover and implementation of LUCs to restrict land use to prevent exposure to potential receptors.
Supplemental Guidance for Assessing Susceptibility from Early-Life Exposure to Carcinogens	EPA/630/R-03/003F(March 2005)	To Be Considered	This provides guidance on assessing risk to children from carcinogens.	Used to calculate potential carcinogenic risks to children caused by exposure to contaminants in site media. Carcinogenic risks assessed through this guidance will be addressed through select soil removal, the installation of a cover and implementation of LUCs to restrict land use to prevent exposure to potential receptors.
Recommendations of the Technical Review Workgroup for Lead for an approach to Assessing Risks Associated with Adult Exposure to Lead In Soil	EPA-540-R-03-001 (January 2003)	To Be Considered	EPA Guidance for evaluating risks posed by lead in soil.	Used to calculate potential risks caused by exposure to lead in soil. Risks assessed through this guidance will be addressed through select soil removal, the installation of a cover and implementation of LUCs to restrict land use to prevent exposure to potential receptors.

Chemical-Specific ARARs and TBCs
MRP Site 1, Carr Point Shooting Range,
Alternative S-3: Select Soil Removal, Soil and Asphalt Cover System, and Land Use Controls

Requirement	Citation	Status	Requirement Synopsis	Action to Be Taken to Attain Requirement
Transmittal of Update to Adult Lead Methodology's Default Baseline Blood Lead Concentration and Geometric Standard Deviation Parameters	OLEM Directive 9285.6-56 (5/17/2017)	To Be Considered	The recommendations in this guidance provide the technical basis for updating the default baseline blood lead concentration and default geometric standard deviation input parameters of the Adult Lead Methodology and maternal blood lead concentration in the Integrated Exposure Uptake Biokinetic Model.	Used to calculate potential risks caused by exposure to lead in soil. Risks assessed through this guidance will be addressed through select soil removal, the installation of a cover and implementation of LUCs to restrict land use to prevent exposure to potential receptors.
EPA Guidance on Remedial Actions for Superfund Sites with PCB Contamination	EPA/540/G-90/007 (August 1990)	To Be Considered	EPA guidance for evaluating risks posed by PCBs.	Used to calculate potential human health and ecological risks caused by exposure to PCBs in site soil. Risks due to PCBs will be addressed through excavation of soils and cover placement. Additionally, LUCs will be established to restrict land use to protect the cover and prevent exposure to potential receptors from any remaining PCB-contaminated soil.
Toxicological Benchmarks for Wildlife: 1996 Revision	Sample et al., 1996	To Be Considered	The toxicological benchmark is the value above which effects are generally observed in wildlife.	Used to calculate potential ecological risks caused by exposure to contaminants in site soil. Risks will be addressed through excavation of soils and cover placement. Additionally, LUCs will be established to restrict land use to protect the cover and prevent exposure to potential receptors from any remaining contaminated soil.
Ecological Soil Screening Level for Antimony, Interim Final	OSWER Directive 9285.7-61, February 2005	To Be Considered	The screening level is the value above which effects are generally observed in wildlife.	Used to calculate potential ecological risks caused by exposure to contaminants in site soil. Risks will be addressed through excavation of soils and cover placement. Additionally, LUCs will be established to restrict land use to protect the cover and prevent exposure to potential receptors from any remaining contaminated soil.

Chemical-Specific ARARs and TBCs
MRP Site 1, Carr Point Shooting Range,
Alternative S-3: Select Soil Removal, Soil and Asphalt Cover System, and Land Use Controls

Requirement	Citation	Status	Requirement Synopsis	Action to Be Taken to Attain Requirement
Ecological Soil Screening Level for DDT and Metabolites, Interim Final	OSWER Directive 9285.7-57, April 2007	To Be Considered	The screening level is the value above which effects are generally observed in wildlife.	Used to calculate potential ecological risks caused by exposure to contaminants in site soil. Risks will be addressed through excavation of soils and cover placement. Additionally, LUCs will be established to restrict land use to protect the cover and prevent exposure to potential receptors from any remaining contaminated soil.
State				
Rules and Regulations for the Investigation and Remediation of Hazardous Material Releases – Soil Direct Exposure and Leachability Criteria	250-RICR-140-30-1, Section 1.9.2(B)(1) & Table 1 (Direct Exposure) and 1.9.2(B)(2) and Table 2 (Leachability)	Applicable	These regulations set remediation standards to prevent direct contact with contaminated soil and leaching of soil contaminants to groundwater resulting from the unpermitted release of hazardous material in Rhode Island. These standards are applicable to a CERCLA remedy when they are more stringent than federal standards.	Soil Direct Exposure Criteria and GA Leachability Criteria were used in the development of RGs for soil when more stringent than federal standards. The action to be taken under this alternative for soil at the site will meet the remediation regulations through excavation of limited areas of soil, including those which exceed the Leachability Criteria, placement of a cover over the extent of impacted soil, and implementation of LUCs.

Location-Specific ARARs and TBCs
MRP Site 1, Carr Point Shooting Range
Alternative S-3: Select Soil Removal, Soil and Asphalt Cover System, and Land Use Controls

Requirement	Citation	Status	Requirement Synopsis	Action to Be Taken to Attain Requirement
Federal				
Protection of Wetlands	44 CFR Part 9	Relevant and Appropriate	Per the FEMA regulations (44 CFR Part 9; incorporating requirements under Executive Order 11990), federal agencies are required to avoid adversely impacting federal jurisdictional wetlands unless there is no practicable alternative with lesser effects and the proposed action includes all practicable measures to minimize harm to federal jurisdictional wetlands that may result from such use.	To the extent federal jurisdiction wetlands exist within areas to be excavated and covered, action to be taken will minimize alterations to protected resource areas. Mitigation measures, as required, will be taken to compensate for resource areas impacted by remedial actions. In compliance with these regulations, the Navy solicited public comment in the Proposed Plan concerning the selected remedy's potential impacts to wetland resources. No comments were received.
Floodplain Management	44 CFR Part 9	Relevant and Appropriate	Per the FEMA regulations (44 CFR Part 9; incorporating requirements under Executive Order 11988), federal agencies are required to avoid long- and short-term adverse impacts associated with the occupancy and modification of federally designated 100-year and 500-year floodplain wherever there is a practicable alternative.	Portions of the site exist within the 500-year coastal flood zone. Available practicable means will be used to reduce the risk of flood loss, to minimize the impact of floods, to prevent the release of soil contaminants under the cover in the event of up to a 500-year flood event, and to restore and preserve the floodplains disturbed by remedial actions. In compliance with these regulations, the Navy solicited public comment in the Proposed Plan concerning the selected remedy's potential impacts to floodplain resources. Comments received were addressed in the Responsiveness Summary (Section 3.1) and did not result in the Navy having to modify the proposed remedial action. The cover within the 500-year floodplain will be installed at the current grade so that there is no loss of flood storage capacity.
Endangered Species Act	16 USC 1531 *et. seq.*, 50 CFR Part 200, 50 CFR Part 402	Applicable	Requires protection of threatened and endangered species.	The Navy will ensure that remedial activities will be conducted to minimize disturbance to adjacent aquatic habitats in Narragansett Bay that may be used by the federally endangered Atlantic Sturgeon, loggerhead turtle, and Kemp's Ridley turtle. Erosion and sediment controls during any construction and site restoration (revegetation of unpaved surfaces) will prevent impacts to habitats in the Bay.

Location-Specific ARARs and TBCs
MRP Site 1, Carr Point Shooting Range
Alternative S-3: Select Soil Removal, Soil and Asphalt Cover System, and Land Use Controls

Requirement	Citation	Status	Requirement Synopsis	Action to Be Taken to Attain Requirement
Coastal Zone Management Act	16 USC §1456(c)(1)(A)	Applicable	Federal agencies shall evaluate proposed actions that affect any land or water or natural resource of the coastal zone to ensure such actions are consistent to the maximum extent practicable with the enforceable policies of approved State management programs.	Remedial actions must be carried out in a manner consistent to the maximum extent practicable with the substantive requirements of Rhode Island's enforceable policies.
State				
Solid Waste Regulation No. 2 Solid Waste Landfills – Flood Plain, Wetlands, Coastal Restrictions	250-RICR-140-05-2, Section 2.3.14	Relevant and Appropriate	Standards for protecting floodplains, wetlands and water quality.	Covers over contaminated soils will be constructed and maintained to meet floodplain standards and protect coastal resources.
Coastal Management Regulations; Filling, removing, or grading of coastal shoreline features	650- RICR- 20-00-1, Section 1.3.1(B)(3)(a)	Applicable	Standards for the protection of coastal shoreline features relating to filling, removing, or grading.	Any remedial work involving the filling, removing, or grading of shoreline features will meet the substantive requirements of this section (maximum grade of 30%, all fill will be clean, etc.)
Coastal Management Regulations; Treatment of sewage and stormwater	650- RICR- 20-00-1, Section 1.3.1(F)(1)(a), (d), (f), (g), and (h); and Section 1.3.1(F)(4)(g) and (n)	Applicable	Standards for the treatment of sewage and stormwater	Remedial work will need to meet the substantive requirements relating to stormwater management.
Coastal Management Regulations; Construction of shoreline protection facilities	650- RICR- 20-00-1, Section 1.3.1(G)(1), (3)-(6)	Applicable	Standards for constructing shoreline protection facilities, like revetments.	Any remedial work involving the construction of revetments must conform to the substantive requirements regarding shoreline protection facilities.

Action-Specific ARARs and TBCs
MRP Site 1, Carr Point Shooting Range
Alternative S-3: Select Soil Removal, Soil and Asphalt Cover System, and Land Use Controls

Requirement	Citation	Status	Requirement Synopsis	Action to Be Taken to Attain Requirement
Federal				
Clean Air Act (CAA), Hazardous Air Pollutants; National Emission Standards for Hazardous Air Pollutants (NESHAPS)	42 U.S.C. § 112(b)(1); 40 C.F.R. Part 61	Applicable	The regulations establish emissions standards for 189 hazardous air pollutants. Standards set for dust and other release sources.	If the excavation of contaminated soil and cover installation generates regulated air pollutants, then measures will be implemented to meet these standards.
Clean Water Act National Recommended Water Quality Criteria	EPA-822-R-02-047, USEPA (2002), Office of Water, Office of Science and	To Be Considered	National Recommended Water Quality Criteria (NRWQC) are provided by EPA for chemicals for both the protection of human health and the protection of aquatic life. Adopted by the State in developing its Water Quality Regulations (see below).	Excavation/backfill and covering must be conducted so that there are no exceedances of NRWQC in adjacent waters. Water quality standards used to develop monitoring standards during the active remedial period.
Clean Water Act – National Pollutant Discharge Elimination System (NPDES),	40 C.F.R. Parts 122 and 125	Applicable	Includes stormwater standards for activities disturbing more than one acre.	Best management practices will be used to meet stormwater standards during the remedial action.
Toxic Substances Control Act (TSCA)	15 U.S.C. 2601 *et seq.*; PCB Remediation Waste 40 C.F.R 761.61(c)	Applicable	This section of the TSCA regulations provides risk-based cleanup and disposal options for PCB remediation waste based on the risks posed by the concentrations at which the PCBs are found. Risk-based disposal methods must not pose an unreasonable risk of injury to health or the environment.	Soil exceeding identified PCB cleanup levels will be excavated and disposed of off-site. For any PCB-contaminated soil exceeding risk standards remaining in the subsurface soil, the cover will be protective in preventing exposures to PCBs and LUCs will be established to prevent disturbance of the cover and residential use. The excavation, transportation, and management of PCB contaminated media will be performed in a manner to comply with TSCA, including air monitoring during remedial activities. (continues below)

Action-Specific ARARs and TBCs
MRP Site 1, Carr Point Shooting Range
Alternative S-3: Select Soil Removal, Soil and Asphalt Cover System, and Land Use Controls

Requirement	Citation	Status	Requirement Synopsis	Action to Be Taken to Attain Requirement
				In compliance with TSCA regulatory requirements the ROD includes a determination by the Director, EPA Region 1, Superfund and Emergency Response Division, that the selected remedy will pose no unreasonable risk to human health or the environment through soil excavation and off-site disposal of PCB-contaminated soil in select areas and installation of an asphalt (or equivalent layer) and soil cover to prevent direct contact with, as well as erosion and transport of, remaining areas with PCB concentrations greater than the residential RG. Land Use Controls will be used to maintain cover protectiveness and to prevent use of the site for residential purposes while maintaining the current recreational use. Public comment was solicited through the Proposed Plan concerning EPA's draft TSCA determination and no comments were received.
State				
Clean Air Act - Fugitive Dust Control	R.I.G.L. 23-23 et seq.; 250-RICR-120-05-5	Applicable	Requires control of dust during alternatives that include removal and handling of soil to prevent material from becoming airborne.	Remediation activities, including excavation activities and construction/maintenance of the cover systems, could potentially result in fugitive dust. Appropriate measures would need to be taken to prevent particulate matter from becoming airborne.
Clean Air Act - Emissions Detrimental to Persons or Property	R.I.G.L. 23-23 et seq.; 250-RICR-120-05-7	Applicable	Prohibits emissions of contaminants which may be injurious to humans, plant or animal life, or cause damage to property, or which unreasonably interfere with the enjoyment of life and property.	Remediation activities may result in emissions. Appropriate measure would need to be taken to comply with these regulations. For this requirement, an air monitoring program will be developed during remedial design. Air monitoring thresholds will be established for use during remedial construction activities, specifically to monitor possible emissions of COCs as dust and as volatile organic compounds. Threshold exceedances would require actions such as dust suppression to mitigate these issues.
Regulations for Solid Waste Management Facilities - Dust Control	250-RICR-140-05-1, Section 1.9(K)	Relevant and Appropriate	Dust control requirements for solid waste management facilities.	Dust will be controlled at the site during excavation and cover construction and during maintenance activities.

Action-Specific ARARs and TBCs
MRP Site 1, Carr Point Shooting Range
Alternative S-3: Select Soil Removal, Soil and Asphalt Cover System, and Land Use Controls

Requirement	Citation	Status	Requirement Synopsis	Action to Be Taken to Attain Requirement
Soil Erosion and Sediment Control Handbook, 2016	-	To Be Considered	Identifies soil erosion and sediment control (E & SC) requirements for construction activities involving land-disturbance activities.	E & SCs will be used during soil disturbance activities, such as excavation.
Water Pollution Control, Water Quality Regulations	R.I.G.L. 46-12 et seq.; 250-RICR-150-05-1, Sections 1.9 and 1.10	Applicable	Provides water classification for surface waters in Rhode Island and sets ambient water quality criteria for toxic substances and governs water quality impacts associated with site activities.	Excavation and covering must be conducted so that there are no exceedances of water quality standards in adjacent waters, confirmed through surface water quality monitoring, if required.
Water Pollution Control – Pollution Discharge Elimination Systems	R.I.G.L. 46-12 et seq.; 250-RICR-150-10-1, Sections 1.16, 1.32, and 1.34	Applicable	If remedial actions include surface water discharges, these discharge standards are not to be exceeded during remedial activities. If remedial actions disturb more than one acre of land, the remedial actions will comply with the stormwater provisions of these regulations.	Best management practices will be used to meet stormwater standards during the remedial action.
Stormwater Management, Design, and Installation Rules	250-RICR-150-10-8	Applicable	Provide standards for planning, designing and installing effective stormwater best management practices (BMPs) to effectively manage the impacts of stormwater and prevent adverse impacts to water quality, habitat and flood storage capacity.	Best management practices will be used to meet stormwater standards during the remedial action.
Rhode Island Stormwater Design and Installation Standards Manual (2015)		To Be Considered	This manual has been prepared to assist in planning, designing and implementing effective stormwater best management practices for the development and redevelopment of properties in Rhode Island.	Best management practices will be used to meet stormwater standards during the remedial action.
Rules and Regulations for Hazardous Waste Management, Hazardous Waste Determination	R.I.G.L. 23-9.1 et seq.; 250-RICR-140-10-1, Section 1.7.3	Applicable	Any person who generates a solid waste shall determine if the waste is a hazardous waste, either by being listed, exhibiting a hazardous characteristic, or meeting the definition of a "Rhode Island Waste".	These regulations apply to all waste generated during actions at the site, such as excavated soil, and will be used when determining whether or not a solid waste is hazardous.

Action-Specific ARARs and TBCs
MRP Site 1, Carr Point Shooting Range
Alternative S-3: Select Soil Removal, Soil and Asphalt Cover System, and Land Use Controls

Requirement	Citation	Status	Requirement Synopsis	Action to Be Taken to Attain Requirement
Rules and Regulations for Hazardous Waste Management, Standards for Generators of Hazardous Waste	R.I.G.L. 23-9.1 et seq.; 250-RICR-140-10-1, Section 1.7	Applicable	Establishes handling and pre-transport requirements for hazardous waste.	These regulations would apply to any waste generated at the site that is determined to be hazardous, such as excavated soil.
Solid Waste Regulations – Sedimentation and Erosion Control	250-RICR-140-05-2, Section 2.1.4	Relevant and Appropriate	Requires development of a "Sedimentation and Erosion Control Plan."	Sedimentation and erosion controls will be implemented during the construction and maintenance of the cover systems.
Solid Waste Regulations – Vegetated Top Cover	250-RICR-140-05-2, Section 2.2.12(A)(4)	Relevant and Appropriate	Contains requirements for construction and maintenance of the vegetative cover final cover system.	The vegetated areas of cover will include appropriate vegetation requirements of a soil cover in compliance with these standards.
Solid Waste Regulations –Cover Permeability	250-RICR-140-05-2, Section 2.3.4(C)	Relevant and Appropriate	Outlines the requirements for the maintenance and permeability of cover material.	The substantive requirements of this section of the regulations will be met by maintaining a cover that has been determined to provide an adequate barrier for the contaminants remaining in the soil.
Solid Waste Regulations – Surface Water Drainage	250-RICR-140-05-2, Section 2.3.10	Relevant and Appropriate	Contains requirements for surface water drainage off of solid waste covers.	The substantive requirements of this section of the regulations will be met through design of appropriate surface drainage considerations for the cover. The cover system would be designed to prevent erosion, sedimentation, and standing water on the cover. Minimum slope requirements for solid waste landfills have been determined not relevant or appropriate for a soil cover which is not intended to reduce infiltration.
Solid Waste Regulations – Groundwater Monitoring Wells	250-RICR-140-05-2, Section 2.1.8(b)(8)	Relevant and Appropriate	Contains requirements for construction and development of monitoring wells to monitor a solid waste landfill	Monitoring wells will be installed and maintained to monitor the continuing protectiveness of the cover remedy (may also be used for the groundwater component of the remedy).

Action-Specific ARARs and TBCs
MRP Site 1, Carr Point Shooting Range
Alternative S-3: Select Soil Removal, Soil and Asphalt Cover System, and Land Use Controls

Requirement	Citation	Status	Requirement Synopsis	Action to Be Taken to Attain Requirement
Rules and Regulations for the Investigation and Remediation of Hazardous Material Releases	250-RICR-140-30-1, Section 1.13, Special Requirements for Managing Arsenic in Soil	Applicable	Establishes technical options, such as removal and/or cover designs, for managing various concentrations of arsenic in soil	For soils east of the current parking lot, the cover will be designed based on the requirements appropriate for the arsenic concentrations detected in the area.
Rules and Regulations for the Investigation and Remediation of Hazardous Material Releases	250-RICR-140-30-1, Section 1.14.3, modifying applicability of special requirements for managing Arsenic under Section 1.13	Applicable	Variance provisions under Section 1.14.3 may modify requirements under Section 1.13 that the remedial options provided for soils with only arsenic could apply to soils with another contaminant which is similar to background conditions. Regulatory variances may be granted if the proposed remedy: A. provides protection to human health and the environment equivalent to that which is provided by these regulations; B. does not result in exceedances of applicable remedial objectives as described in Section 1.9 (RISK MANAGEMENT) beyond the control of the performing party; C. does not endanger the public health and safety; D. does not significantly interfere with the public use and enjoyment of any recreational resource; E. does not significantly adversely impact any surface water or any groundwater, or cause contamination of any drinking water supply or tributary thereto; and F. does not violate any provisions of any pertinent federal or state statutes, rules or regulations regarding air, land or water resources.	Soils east of the current parking lot contain arsenic at concentrations of concern which would typically be addressed under Section 1.13. However, manganese has also been detected at concentrations above regulatory levels. Based on a review of area concentrations, the manganese detected in this area appears to be similar to concentrations ubiquitous to the area. The technical requirements under Section 1.13 which are appropriate for the existing concentrations of arsenic have been determined to also be appropriate for the manganese in that area and will meet the variance requirements under these regulations.

Action-Specific ARARs and TBCs
MRP Site 1, Carr Point Shooting Range
Alternative S-3: Select Soil Removal, Soil and Asphalt Cover System, and Land Use Controls

Requirement	Citation	Status	Requirement Synopsis	Action to Be Taken to Attain Requirement
Rules and Regulations for the Investigation and Remediation of Hazardous Material Releases – Institutional Controls	250-RICR-140-30-1, Section 1.9.9	Applicable	Requires environmental land usage restrictions for all properties subject to final decisions which result in levels of hazardous substances greater than those protective against direct exposure associated with residential land usage or are subject to any final decisions based solely or in part on the limitation of reasonably foreseeable exposures to hazardous substances in any media.	LUCs will prevent disturbance of the cover system and any other component of the selected alternative.
Drilling of Drinking Water Wells	RI Plumbing Code (RISBC)-3 3.5; 510-RICR-00-00-3, Table 608.17.1	Applicable	Prohibits installing drinking water wells near pollution sources or potential contamination sources.	LUCs will prevent the installation of groundwater wells within the site boundary until remedial goals are met.
RIDEM Dig and Haul Policy	RIDEM Policy Memo 2012-01 (Revised February 20, 2019). Section V. Points of Compliance	To Be Considered	Provides guidance for the excavation and handling of contaminated soils within the State of Rhode Island.	During excavation and removal efforts, the procedures presented in this document related to compliance sampling will be included in the remedial design for the demonstration of soil removal completion per the ROD.

Chemical-Specific ARARs and TBCs
MRP Site 1, Carr Point Shooting Range
Alternative GW-2: Monitored Natural Attenuation and Land Use Controls

Requirement	Citation	Status	Requirement Synopsis	Action to Be Taken to Attain Requirement
Federal				
EPA Risk Reference Doses (RfDs)	None	To Be Considered	Guidance used to compute human health hazard resulting from exposure to non-carcinogens in site media. RfDs are considered to be the levels unlikely to cause significant adverse health effects associated with a threshold mechanism of action in human exposure for a lifetime.	Used to calculate potential non-carcinogenic hazards caused by exposure to contaminants in site media. MNA is expected to reduce COC concentrations below these risk-based standards within approximately 33 years. LUCs will restrict exposure to contaminants in groundwater exceeding risk levels for drinking water until groundwater cleanup standards are achieved.
Safe Drinking Water Act, National Primary Drinking Water Regulations – Maximum Contaminant Levels (MCLs)	40 Code of Federal Regulations (CFR) 141 Subpart G	Relevant and Appropriate	Established maximum contaminant levels for common organic and inorganic contaminants applicable to public drinking water supplies. Used as relevant and appropriate cleanup standards for aquifers and surface water bodies which are potential drinking water sources.	MNA is expected to reduce COC concentrations below RGs within approximately 33 years. LUCs will restrict exposure to contaminants in groundwater and will prevent use of site groundwater as drinking water until groundwater cleanup standards are achieved.
Safe Drinking Water Act, National Primary Drinking Water Regulations – Maximum Contaminant Level Goals (MCLGs)	40 CFR 141 Subpart F	Relevant and Appropriate	Established maximum contaminant level goals (MCLGs) for public water supplies. MCLGs are health goals for drinking water sources. These unenforceable health goals are available for a number of organic and inorganic compounds.	MNA is expected to reduce COC concentrations below RGs within approximately 33 years. LUCs will restrict exposure to contaminants in groundwater and will prevent use of site groundwater as drinking water until groundwater cleanup standards are achieved
Drinking Water Health Advisory for Manganese (EPA Office of Drinking Water), 2004	None	To Be Considered	Health Advisories are estimates of risk from consumption of contaminated drinking water. They consider non-carcinogenic effects only. To be considered for contaminants in groundwater that may be used for drinking water purposes, where the standard is more conservative than either federal or state statutory or regulatory standards. The Health Advisory standard for manganese is 0.3 mg/L.	Health advisory will be used to evaluate the non-carcinogenic risk resulting from exposure to manganese. MNA is expected to reduce COC concentrations below these risk-based standards within approximately 33 years. LUCs will restrict exposure to contaminants in groundwater exceeding risk levels for drinking water until groundwater cleanup standards are achieved.

Chemical-Specific ARARs and TBCs
MRP Site 1, Carr Point Shooting Range
Alternative GW-2: Monitored Natural Attenuation and Land Use Controls

Requirement	Citation	Status	Requirement Synopsis	Action to Be Taken to Attain Requirement
State				
Rules and Regulations for the Investigation and Remediation of Hazardous Material Releases – Groundwater Criteria	250-RICR-140-30-1, Section 1.9.3(A) and Table 3 [GA Groundwater] and Table 4 [GB Groundwater]	Applicable	These regulations set remediation standards to prevent exposure to contaminated groundwater classified as either GA (drinking water) or GB (non-drinking water, including from vapor exposure) from the unpermitted release of hazardous material in Rhode Island. These standards are applicable when they are more stringent than the federal standards.	MNA is expected to reduce COC concentrations below these standards (when more stringent than federal standards) within approximately 33 years. Annual LUC reports and Five-Year Reviews will provide status updates on MNA rates and notification of changes in these conditions. LUCs will restrict exposure to contaminants in groundwater exceeding risk levels for drinking water until groundwater cleanup standards are achieved.
Groundwater Quality Rules - Groundwater Quality Standards and Preventive Action Limits	250-RICR-150-05-3, Section 3.11	Applicable	Defines requirements to protect and restore groundwater quality to drinking water use or beneficial uses. Provides classification of groundwater throughout the state. Sets groundwater remediation standards for drinking water (GAA and GA) and non-drinking water (GB) groundwater classes. These standards are applicable when they are more stringent than federal standards.	MNA will meet state groundwater standards, when more stringent than federal standards, for each COC at a rate equal to or greater than current projections. Annual LUC reports and Five-Year Reviews will provide status updates on MNA rates and notification of changes in these conditions. LUCs will restrict exposure to contaminants in groundwater exceeding regulatory standards for groundwater until groundwater cleanup standards are achieved. Groundwater is classified as GA.

Location-Specific ARARs and TBCs
MRP Site 1, Carr Point Shooting Range
Alternative GW-2: Monitored Natural Attenuation and Land Use Controls

Requirement	Citation	Status	Requirement Synopsis	Action to Be Taken to Attain Requirement
Federal				
Protection of Wetlands	44 CFR Part 9	Relevant and Appropriate	Per the FEMA regulations (44 CFR Part 9; incorporating requirements under Executive Order 11990), federal agencies are required to avoid adversely impacting federal jurisdictional wetlands unless there is no practicable alternative with lesser effects and the proposed action includes all practicable measures to minimize harm to federal jurisdictional wetlands that may result from such use.	To the extent federal jurisdiction wetlands exist within areas to be altered by well installation or access ways, action to be taken will minimize alterations to protected resource areas. Mitigation measures, as required, will be taken to compensate for resource areas impacted by remedial actions. In compliance with these regulations, the Navy solicited public comment in the Proposed Plan concerning the selected remedy's potential impacts to wetland resources. No comments were received.
Floodplain Management	44 CFR Part 9	Relevant and Appropriate	Per the FEMA regulations (44 CFR Part 9; incorporating requirements under Executive Order 11988), federal agencies are required to avoid long- and short-term adverse impacts associated with the occupancy and modification of federally designated 100-year and 500-year floodplain wherever there is a practicable alternative.	Portions of the site where monitoring wells need to be installed/maintained exist within the 500-year coastal flood zone. Available practicable means will be used to reduce the risk of flood damage to wells, and to restore and preserve the floodplains disturbed by remedial actions. In compliance with these regulations, the Navy solicited public comment in the Proposed Plan concerning the selected remedy's potential impacts to floodplain resources. Comments received were addressed in the Responsiveness Summary (Section 3.1) and did not result in the Navy having to modify the proposed remedial action.
Endangered Species Act	16 USC 1531 *et. seq.*, 50 CFR Part 200, 50 CFR Part 402	Applicable	Requires protection of threatened and endangered species.	The Navy will ensure that remedial activities will be conducted to minimize disturbance to adjacent aquatic habitats in Narragansett Bay that may be used by the federally endangered Atlantic Sturgeon, loggerhead turtle, and Kemp's Ridley turtle. Erosion and sediment controls during any construction and site restoration (revegetation of unpaved surfaces) will prevent impacts to habitats in the Bay.

Location-Specific ARARs and TBCs
MRP Site 1, Carr Point Shooting Range
Alternative GW-2: Monitored Natural Attenuation and Land Use Controls

Requirement	Citation	Status	Requirement Synopsis	Action to Be Taken to Attain Requirement
Coastal Zone Management Act	16 USC §1456(c)(1)(A)	Applicable	Federal agencies shall evaluate proposed actions that affect a natural resource of the coastal zone to ensure such actions are consistent to the maximum extent practicable with the enforceable policies of approved State management programs.	Although the federal facility is excluded by law from Rhode Island's coastal zone, remedial actions may occur off the facility or may cause impacts off the facility into Rhode Island's coastal zone. In that case, the Navy will ensure remedial actions are consistent to the maximum extent practicable with the substantive requirements of Rhode Island's enforceable policies.
State				
Coastal Management Regulations; Filling, removing, or grading of coastal shoreline features	650- RICR- 20-00-1, Section 1.3.1(B)(3)(a)	Applicable	Standards for the protection of coastal shoreline features relating to filling, removing, or grading.	Any remedial work involving the filling, removing, or grading of shoreline features will meet the substantive requirements of this section (maximum grade of 30%, all fill will be clean, etc.)
Coastal Management Regulations; Treatment of sewage and stormwater	650- RICR- 20-00-1, Section 1.3.1(F)(1)(a), (d), (f), (g), and (h); and Section 1.3.1(F)(4)(g) and (n)	Applicable	Standards for the treatment of sewage and stormwater	Remedial work will need to meet the substantive requirements relating to stormwater management.
Coastal Management Regulations; Construction of shoreline protection facilities	650- RICR- 20-00-1, Section 1.3.1(G)(1), (3)-(6)	Applicable	Standards for constructing shoreline protection facilities, like revetments.	Any remedial work involving the construction of revetments must conform to the substantive requirements regarding shoreline protection facilities.

Action-Specific ARARs and TBCs
MRP Site 1, Carr Point Shooting Range
Alternative GW-2: Monitored Natural Attenuation and Land Use Controls

Requirement	Citation	Status	Requirement Synopsis	Action to Be Taken to Attain Requirement
Federal				
EPA Groundwater Protection Strategy	August 1984; NCP Preamble, Vol. 55, No. 46, March 8, 1990, 40 CFR 300, p. 8733); Guidelines for Ground-Water Classification (November 1986)	To Be Considered	The Groundwater Protection Strategy provides a common reference for preserving clean groundwater and protecting the public health against the effects of past contamination. Guidelines for consistency in groundwater protection programs focus on the highest beneficial use of a groundwater aquifer.	LUCs will restrict exposure to contaminants in groundwater exceeding risk level and will prevent use of site groundwater as drinking water until groundwater cleanup standards are achieved. MNA is expected to reduce COC concentrations below RGs in approximately 33 years.
Use of Monitored Natural Attenuation at Superfund, RCRA Corrective Action, and Underground Storage Tank Sites	OSWER Directive 9200.4-17P (April 21, 1999)	To Be Considered	EPA guidance regarding the use of monitored natural attenuation for the cleanup of contaminated soil and groundwater. In particular, a reasonable timeframe to achieve cleanup standards through monitored attenuation would be comparable to that achieved by active restoration.	The effectiveness of this alternative will be assessed during each five-year review. MNA has been estimated to achieve groundwater cleanup standards in approximately 33 years.
State				
Drilling of Drinking Water Wells	RI Plumbing Code (RISBC)-3 3.5; 510-RICR-00-00-3, Table 608.17.1	Applicable	Prohibits installing drinking water wells near pollution sources or potential contamination sources.	LUCs will prevent the installation of potable groundwater wells at the site until groundwater cleanup standards are achieved.
Groundwater Quality Rules – Construction Standards for Monitoring Wells, and Abandonment Procedures for Private Drinking Water Wells, Monitoring Wells, Piezometers, and other Subsurface Borings	250-RICR-150-05-3, Section 3.22	Applicable	Identifies construction standards for monitoring wells, and abandonment procedures for private drinking water wells, monitoring wells, piezometers, and other subsurface borings.	Monitoring wells will be installed and abandoned in accordance with these standards.

Action-Specific ARARs and TBCs
MRP Site 1, Carr Point Shooting Range
Alternative GW-2: Monitored Natural Attenuation and Land Use Controls

Requirement	Citation	Status	Requirement Synopsis	Action to Be Taken to Attain Requirement
Rules an Regulations for Hazardous Waste Management, Hazardous Waste Determination	R.I.G.L. 23-9.1 et seq.; 250-RICR-140-10-1, Section 1.7.3	Applicable	Any person who generates a solid waste shall determine if the waste is a hazardous waste, either by being listed, exhibiting a hazardous characteristic, or meeting the definition of a "Rhode Island Waste".	These regulations apply to all waste generated during actions at the site, such as investigation-derived waste (IDW) from monitoring. Will be used when determining whether or not a solid waste is hazardous.
Rules and Regulations for Hazardous Waste Management, Standards for Generators of Hazardous Waste	R.I.G.L. 23-9.1 et seq.; 250-RICR-140-10-1, Section 1.7	Applicable	Establishes handling and pre-transport requirements for hazardous waste.	These regulations would apply to any waste generated at the site that is determined to be hazardous, such as IDW from monitoring.
Solid Waste Regulations – Groundwater Monitoring Wells	250-RICR-140-05-2, Section 2.1.8(b)(8)	Relevant and Appropriate	Contains requirements for construction and development of monitoring wells to monitor a solid waste landfill	Monitoring wells will be installed and maintained to monitor the continuing protectiveness of the cover remedy in protecting groundwater quality.

Chemical-Specific ARARs and TBCs
MRP Site 1, Carr Point Shooting Range
Alternative SED-2: Sediment Removal

Requirement	Citation	Status	Requirement Synopsis	Action to Be Taken to Attain Requirement
Federal				
NOAA Effects Range-Low (ERL) and Effects Range-Median (ERM) values for marine and estuarine sediments	Long et al., 1995; Long and Morgan, 1990	To Be Considered	The ERL value is equivalent to the lower 10th percentile of the available toxicity data, which is estimated to be the approximate concentration at which adverse effects are likely to occur in sensitive life stages and/or species of sediment-dwelling organisms. The ERM is the value above which effects are generally observed.	Used to compute the potential ecological risks caused by exposure to contaminants in sediment. Risks will be addressed through excavation of impacted sediments.
NOAA Screening Quick Reference Tables, Upper Effects Threshold (UET)	Buchman, 2008	To Be Considered	UETs represent the lowest Apparent Effects Thresholds (AET) from a compilation of endpoints.	Used to compute the potential ecological risks caused by exposure to contaminants in sediment. Risks will be addressed through excavation of impacted sediments.
EPA Guidance on Remedial Actions for Superfund Sites with PCB Contamination	EPA/540/G- 90/007 (August 1990)	To Be Considered	EPA guidance for evaluating risks posed by PCBs.	Used to calculate potential human health and ecological risks caused by exposure to PCBs in site sediment. Risks due to PCBs will be addressed through dredging and off-site disposal of PCB contaminated sediments exceeding sediment PCB RGs calculated using this guidance.

Location-Specific ARARs and TBCs
MRP Site 1, Carr Point Shooting Range
Alternative SED-2: Sediment Removal

Requirement	Citation	Status	Requirement Synopsis	Action to Be Taken to Attain Requirement
Federal				
Protection of Wetlands	44 CFR Part 9	Relevant and Appropriate	This Order requires Federal agencies to take action to avoid adversely impacting wetlands wherever possible, to minimize wetlands destruction and to preserve the values of wetlands, and to prescribe procedures to implement the policies and procedures of this Executive Order.	Action to be taken will minimize alterations to protected resource areas. Mitigation measures will be performed as appropriate. In compliance with these regulations, the Navy solicited public comment in the Proposed Plan concerning the selected remedy's potential impacts to wetland resources. No comments were received.
Floodplain Management	44 CFR Part 9	Relevant and Appropriate	The Order requires Federal agencies to avoid occupancy and modification of a floodplain and avoid support of floodplain development wherever there is a practicable alternative.	Available practicable means will be used to reduce the risk of flood loss, to minimize the impact of floods, and to restore and preserve the floodplains. Facilities on-shore to process and store dredge sediment within the 500-year coastal floodplain will be designed, constructed and managed not to release contamination during storms, up to a 500-year event. In compliance with these regulations, the Navy solicited public comment in the Proposed Plan concerning the selected remedy's potential impacts to floodplain resources. Comments received were addressed in the Responsiveness Summary (Section 3.1) and did not result in the Navy having to modify the proposed remedial action.
Clean Water Act – Section 404(b)(1) Guidelines for specification of disposal sites for dredged or fill material	40 CFR Part 230	Applicable	These guidelines outline requirements for the discharge of dredged or fill materials into surface waters.	This alternative would involve excavation and filling of federal jurisdictional wetland resources and waters of the United States. Filling or discharge into wetland resource areas will only occur where there is no other practicable alternative and any adverse impacts to aquatic ecosystems will be mitigated. The Navy has identified that Alt SED-2 is the least environmentally damaging practicable alternative (LEDPA) for protecting wetland resource areas. The Navy solicited public comments on its draft LEDPA determination in the Proposed Plan and no comments were received. Any treated sediments will need to meet reuse standards before being reused as backfill so as not to impair water quality or other protected interests under the ARAR.

Location-Specific ARARs and TBCs
MRP Site 1, Carr Point Shooting Range
Alternative SED-2: Sediment Removal

Requirement	Citation	Status	Requirement Synopsis	Action to Be Taken to Attain Requirement
Rivers and Harbors Act, Section 10	33 USC Part 403, 33 CFR Parts 322	Applicable	Sets forth criteria for obstructions and alterations of navigable waters.	This alternative may require installation of access restriction markers during remedial activities. These actions will be performed in compliance with the substantive environmental requirements of the statute.
Magnuson – Stevens Act	16 USC 1851 Section 305(b)(2)	Applicable	This regulation requires that federal agencies conduct activities in a manner designed to minimize adverse effects to designated essential fish habitat (EFH).	Dredging will be conducted in a manner designed to minimize adverse effects to EFH.
Fish and Wildlife Coordination Act	16 USC Part 661 *et. seq.*	Applicable	This regulation requires that Dredging activities will be undertaken in a manner to prevent, mitigate, or compensate for dredge-related losses of endangered species, fish and wildlife resources.	Dredging activities will be undertaken in a manner to prevent, mitigate, or compensate for dredge-related losses of endangered species, fish and wildlife resources.
Endangered Species Act	16 USC 1531 *et. seq.*, 50 CFR Part 200, 50 CFR Part 402	Applicable	Requires protection of threatened and endangered species	The Navy will ensure that remedial activities will be conducted to minimize disturbance to the federally endangered Atlantic Sturgeon, loggerhead turtle, and Kemp's Ridley turtle and their aquatic habitats in Narragansett Bay. Best management practices, including turbidity and sediment controls, will be implemented during dredging and other remedial activities in the Bay which will prevent impacts to protected species and their habitats.
Coastal Zone Management Act	16 USC Parts 1451 *et. seq.*	Applicable	Federal agencies shall evaluate proposed actions that affect any land or water or natural resource of the coastal zone to ensure such actions are consistent to the maximum extent practicable with the enforceable policies of approved State management programs.	Remedial actions will occur in Rhode Island's coastal waters that are within the jurisdiction of the statute. The Navy will ensure remedial actions are consistent to the maximum extent practicable with the substantive requirements of Rhode Island's enforceable policies.

Location-Specific ARARs and TBCs
MRP Site 1, Carr Point Shooting Range
Alternative SED-2: Sediment Removal

Requirement	Citation	Status	Requirement Synopsis	Action to Be Taken to Attain Requirement
State				
Coastal Management Regulations; Dredging	RIGL 46-23-1 *et seq*; 650-RICR-20-00-1, Section 1.3.1(B)(3)(a); 1.3.1(I)(4)(c) and (d) & 5(b)(1) thru (3); 1.3.1(R)(1) and (3)(a-d).	Applicable	Standards for dredge projects that address turbidity controls; minimizing odors and impacts to fish and shellfish; the design of bottom and side slopes of dredged areas, and avoiding impacts to adjacent shoreline protection facilities and/or coastal features; survey for the identification of submerged aquatic vegetation, minimization of impacts to the extent practicable, and restoration.	Sediment dredging and backfilling of shallow dredged areas will be designed and implemented to achieve these standards. A submerged aquatic vegetation survey of the remediation area will be conducted as part of remedial design activities (prior to initiation of the remedial action) for identification of protections needed during remedial actions as well as necessary restoration activities.
Coastal Management Regulations; Coastal Wetland Mitigation	RIGL 46-23-1 et seq; 650-RICR-20-00-1, Section 1.3.1(L)(1)(c) and (h) thru (j) and (5)(a)	Applicable	Establishes mitigation standards for projects that alter coastal resources.	Mitigation, to the extent required, for impacts resulting from the remedial dredging will be carried out in place. It is expected that marine aquatic habitats altered by the remedial dredging and backfilling will naturally re-establish upon completion of the remedial action.

Action-Specific ARARs and TBCs
MRP Site 1, Carr Point Shooting Range
Alternative SED-2: Sediment Removal

Requirement	Citation	Status	Requirement Synopsis	Action to Be Taken to Attain Requirement
Federal				
Toxic Substances Control Act (TSCA)	15 U.S.C. 2601 *et seq.*; PCB Remediation Waste 40 C.F.R 761.61(c)	Applicable	This section of the TSCA regulations provides risk-based cleanup and disposal options for PCB remediation waste based on the risks posed by the concentrations at which the PCBs are found. Risk-based disposal methods must not pose an unreasonable risk of injury to health or the environment.	All sediment exceeding identified PCB cleanup levels at the site will be excavated and disposed of off-site. The excavation, transportation, and management of PCB contaminated media will be performed in a manner to comply with TSCA, including air monitoring during remedial activities. In compliance with TSCA regulatory requirements the ROD includes a determination by the Director, EPA Region 1, Superfund and Emergency Response Division, that the selected remedy will pose no unreasonable risk to human health or the environment through excavation and off-site disposal of PCB-contaminated sediment. Public comment was solicited through the Proposed Plan concerning EPA's draft TSCA determination and no comments were received.
Clean Water Act National Recommended Water Quality Criteria	EPA-822-R-02-047, USEPA (2002), Office of Water, Office of Science and	To Be Considered	NRWQC are provided by EPA for chemicals for both the protection of human health and the protection of aquatic life. Adopted by the State in developing its Water Quality Regulations (see below).	Best management practices, including turbidity and sediment controls, during dredging operations and other remedial activities in the Bay under this alternative so that there are no exceedances of NRWQC. Water quality standards will be used to develop monitoring standards during the active remedial period under this alternative.
Clean Water Act – National Pollutant Discharge Elimination System (NPDES)	40 C.F.R. Parts 122 and 125	Applicable	Establishes the specifications for discharging pollutants from any point source into the waters of the U.S.	Any water discharged to surface water bodies during remedial activities will comply with this regulation.
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 5, In-situ Capping; Chapter 6, Dredging and Excavation; Chapter 7, Remedy Selection; and Chapter 8, Long- term Monitoring.	The excavation and disposal of all sediments exceeding RGs off-site will meet guidance standards for remediating contaminated sediments. Any reuse of treated sediments needs to be protective of human health and the environment.

Action-Specific ARARs and TBCs
MRP Site 1, Carr Point Shooting Range
Alternative SED-2: Sediment Removal

Requirement	Citation	Status	Requirement Synopsis	Action to Be Taken to Attain Requirement
State				
Soil Erosion and Sediment Control Handbook, 2016	-	To Be Considered	Identifies soil erosion and sediment control (E & SC) requirements for construction activities involving land-disturbance activities.	E & SCs will be used during sediment disturbance activities, such as excavation.
Rules and Regulations for Dredging and Management of Dredged Materials	250-RICR-150-05-2, Section 2.5 (B-E), Section 2.7 (C-F), Section 2.9 (B & C), Section 2.11(A), and Section 2.12 (E.1 & E.2)	Applicable	Addresses dredging activities and disposal of dredge spoils.	Sediment removal, dewatering, management and reuse as backfill will comply with the substantive requirements of these standards.
Rules and Regulations for Hazardous Waste Management, Hazardous Waste Determination	R.I.G.L. 23-9.1 et seq.; 250-RICR-140-10-1, Section 1.7.3	Applicable	Any person who generates a solid waste shall determine if the waste is a hazardous waste, either by being listed, exhibiting a hazardous characteristic, or meeting the definition of a "Rhode Island Waste".	These regulations apply to all waste generated during actions at the site, such as excavated sediment, and will be used when determining whether or not a solid waste is hazardous.
Rules and Regulations for Hazardous Waste Management, Standards for Generators of Hazardous Waste	R.I.G.L. 23-9.1 et seq.; 250-RICR-140-10-1, Section 1.7	Applicable	Establishes handling and pre-transport requirements for hazardous waste.	These regulations would apply to any waste generated at the site that is determined to be hazardous, such as excavated sediment.
Water Pollution Control, Water Quality Regulations	R.I.G.L. 46-12 et seq.; 250-RICR-150-05-1, Sections 1.9 , 1.10, 1.11, 1.13, and 1.26	Applicable	Provides water classification for surface waters in Rhode Island and sets ambient water quality criteria for toxic substances and governs water quality impacts associated with Site activities.	Best management practices, including turbidity and sediment controls, during dredging operations and other remedial activities in the Bay under this alternative so that there are no exceedances of water quality standards, confirmed through surface water quality monitoring, if required. Any drainage from the temporary sediment storage area and any dewatering discharge would be treated as required to meet this requirement prior to discharge into Narragansett Bay.

Action-Specific ARARs and TBCs
MRP Site 1, Carr Point Shooting Range
Alternative SED-2: Sediment Removal

Requirement	Citation	Status	Requirement Synopsis	Action to Be Taken to Attain Requirement
Water Pollution Control - Pollution Discharge Elimination Systems	R.I.G.L. 46-12 et seq.; 250-RICR-150-10-1, Sections 1.16, 1.32, and 1.34	Applicable	If remedial actions include surface water discharges, these discharge standards are not to be exceeded during remedial activities. If remedial actions disturb more than one acre of land, the remedial actions will comply with the stormwater provisions of these regulations.	Any water discharged to surface water bodies during remedial activities such as sediment dewatering or screening of lead pellets from sediment will comply with this regulation. Best management practices will be used to meet stormwater standards during the remedial action.
Clean Air Act – Fugitive Dust Control	R.I.G.L. 23-23 et seq.; 250-RICR-120-05-5	Applicable	Requires control of dust during alternatives that include removal and handling of soil and sediment to prevent material from becoming airborne.	Controls would be used during storage and handling of sediment to prevent material from becoming airborne.
Clean Air Act - Emissions Detrimental to Persons or Property	R.I.G.L. 23-23 et seq.; 250-RICR-120-05-7	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, dewatering, or screening of lead pellets will be used to assess compliance with these standards if threshold levels are reached. For this requirement, an air monitoring program will be developed during remedial design. Air monitoring thresholds will be established for use during remedial construction activities, specifically to monitor possible emissions of COCs as dust. Threshold exceedences would require actions such as dust suppression to mitigate these issues.
Clean Air Act – Air Toxics	R.I.G.L. 23-23 et seq.; 250-RICR-120-05-22	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, screening of lead pellets, and stockpiling would be controlled.
Identification and Management of Aquatic Invasive Species		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 and spread of aquatic invasive species.

Appendix E

Public Hearing Transcript and Public Comments

NAVAL STATION NEWPORT
FORMER CARR POINT STORAGE AREA
(OPERABLE UNIT 10)
PROPOSED PLAN
PUBLIC HEARING

Wednesday, March 20, 2019
Courtyard Marriott
9 Commerce Drive
Middletown, RI 02842
8:42 p.m.

Neil Thurber of AECOM

P R O C E E D I N G S

MR. THURBER: So the comment period is open. Would anybody like to make a comment?

MR. GRIEB: Tom Grieb, G-R-I-E-B. I'm from Portsmouth, if that matters. And I'm concerned that the soil -- the upland portion of the soil remediation doesn't take into account the possibility of storms.

I noticed that the 500 year storm level is almost the entire site. I don't know -- here, it doesn't show it, but in my area, the 100 year and the 500 year are basically the same. And, in the last ten years, I've seen 200 year level storms in my area.

Any remediation has an asphalt cap, and any significant wave action is very likely to completely remove the asphalt cap in this area. And it would seem to me that that's not an effective remediation. That's it.

MS. UJIFUSA: My name is Linda Ujifusa, U-J-I-F-U-S-A. I'm on the

Portsmouth Town Council. And I guess my comments would, one, mimic what Mr. Grieb has just said and that is that the -- that the sea level rise should be considered not just in the remedial design phase but in the feasibility study phase. Because, after all, how do you assess feasibility without looking at the effects of sea level rise and storm surge, etc.?

That brings up the related issue that he brought up which is that you are not considering designs that include permeable surfaces, which would be solutions that are more attuned to people who are concerned about sea level rise and are certainly not, you know, so far out that you should -- or futuristic that they should not be considered.

I think most people who are concerned about storm water run-off and things like that are already considering looking -- always, always installing permeable surfaces wherever possible.

And then also I was concerned with the

fact that there is no separate analysis in your presentation about future recreational users, and that really needs to be put in. Because the fundamental question that anybody who doesn't really pay very close attention is, are the people who are camping near Carr Point and who are going to be playing in that area going to be at any kind of risk.

And so these would be the -- those would be the recreational users, and that has to be a separate analysis that should be like this central analysis. And it is confusing to say that their situation is -- has been folded into the consideration of people who are going to be permanent residents, because permanent residents aren't going to be there. And so, of course, you're not going to clean the site up to the permanent resident level. But what level are you going to clean it up to to take account of these recreational users?

And then a third thing is that I feel like there does need to be some recognition

that juveniles will -- children will be most exposed to this site in a recreational situation, and so I want to see the kind of safety or the level of safety that you're establishing with your remediation plan for children because that -- those are the people who -- those are the types of age groups that would most likely be using the site.

And then I think the question that was or the issue that was raised about core samples is interesting. I would like to know whether you are doing a rolling analysis so that, for example, as you start to dig away or install, you can -- you have some mechanism of saying, Gosh, it looks a lot different here than -- as we're digging than it did when we were digging earlier, so we should maybe take more core samples.

So I would hope that you have a rolling analysis that allows you to be flexible and take more core analyses if you find that the situation is significantly different than what you might have found in

earlier core samples.

So I think that is it. I feel very sympathetic to your task. Having worked at the EPA myself for a few years, I know that being an RPM is very difficult, and I thank you for listening.

MR. THURBER: Thank you. Any other comments?

MS. KIRSCHNER: My name is Margaret Kirschner, and I also would like to thank everyone on this project, because it's a lot of work, and the reports are very thorough.

I do think that there should be a look at the policy at the point of renting out these camping spots, just some disclosure perhaps or a limit to the two weeks, something appropriate to the new information that you've discovered and that -- so that you have a chance to -- so that people can make an informed decision. I feel that would be helpful to campers before you can remediate the site. Thank you.

MS. UJIFUSA: Just one last thing, because Margaret's question raises this

question for me. I know that when, you know, there's a site that's contaminated you would immediately like put up the yellow tape to keep people away if you thought there was a danger.

I'm assuming that people already have done some sort of analysis to tell us that you don't need to do that. Is that true, like you've already done some sort of site analysis so that we can say we don't need to keep people out, they can keep coming in, it's safe enough?

Is there like an initial -- do you know what I'm saying? Oh, and you don't answer. But so if you could do that kind of analysis -- and it goes to what Margaret was saying, if it isn't safe, it almost has to be more than a sign that says you're swimming at your own risk. It should maybe be that you put up a fence to keep the -- at least make an attempt to keep people from, you know, being exposed.

So I would hope that that kind of -- I can't remember the name of the group that

goes out and does it urgently, but it feels like, you know, you do have that capability of having people come right away to make sure that there's not -- you know, we can put a stop to any immediate present risk.

MR. THURBER: Any other additional comments? Okay. So we can conclude the public hearing portion.

(Approximately 30 seconds of silence elapsed.)

(Whereupon the public hearing was concluded at 8:52 p.m.)

C E R T I F I C A T E

STATE OF RHODE ISLAND

NEWPORT COUNTY, sc.

I, Janet Chase, Certified Shorthand Reporter and Appointed Commissioner in and for the State of Rhode Island, do hereby certify that the foregoing transcript of the hearing held on Wednesday, March 20, 2019, is true and accurate to the best of my knowledge, skill and ability.

IN WITNESS WHEREOF, I have hereunto set my hand and seal this 27th day of March, 2019

Janet Chase

_____

Janet Chase, CSR
Appointed Commissioner

My commission expires: June 30, 2019

Attachment to public hearings notes above (this page includes comments submitted via email to the public affairs office after the MRP Site 1 public hearing on March 20, 2019)

USE THIS SP CE T WR ITE Y UR MMENTS

The Navy encourages y w itten mments on the Proposed Pla f r Site 22 - Former Carr Poi t Storage A ea, perable Unit 10, at NAVSTA Newport. Y can use the form below to send w itten comments. If y have questions about how to comment, please call the Navy's Public Affairs Office (Ms. Lisa Rama) at (401) 841-3538. This f m is provided for y c onvenience. Please mail this fo m addition al sheets of w itten comments, postmarked no later than April 5th 2019 to:

Ms. Lisa Rama
Naval Station Newport
Public Affairs Office
690 Peary Street
Newport, RI 02841
Fax: (401) 841-2265
email to : lisa.rama@navy.mil

I learned of this public hearing remed ation solution for Site 22 - Carrs Point Storage Area (Operable Unit 10) on November 14, 2018, but was unable to attend the public hearing. So I sent in Public Commen both by Email and USPS mail before November 30, 2018. I attended the March 20 RAB public hearing on Carr Point and can not access my comment.

It is my belief that the source of these contam nation is unknown and what we are seeing in Figures 6 thru 9 is only the resultant symptom not the cause. My concern over the proposed cleanup plan for MRS Site1 Carr Point Shooting Range still remains over the all contamination at is ge tting nto the groundwater and leaching to the Bay. Those indication tell me the groundwater is contaminated somewhere of site and is being transferred quickly in the backfill material around the water lines. From Figure 4 s ws P le 30-1W 1 PCB transformer on the southeast corner of the site. Can that one transformer produce contaminations at levels seen today after being rem ved 20 years earlier? Alternative GW2 (page19) the Navy believes is the proper remed ation process, I would believe it also the contamina es were all s urced with in the site, tha is not my belief.

Groundwater seems to be the vehicle at is m v ng many contamination PCB, PAH, and metals in o the Narragansett Bay. The 4 acres site and the **proposed excavation and capp ng w h asphalt is not a sound solution in my m nd, w ll be destroyed hurricane wave action.** From Figure 6 and 7 the green areas appear to show PCB and PAH contamination only at the outside limits of the site. The acreage seems too small to produce groundwater su fic ent to produce contam nation PCB, PAH and metals contamination appearing on the shore at the N rth and South boundaries of the site. That backfill material is virtual pipe of contamina n t at is being ydrolicly forced through earth tha has not been disturbed. It is also inconsisten on Figures 6 and 7 that PCB and PAH in the groundwater does not appear across the beach head of the whole site, groundwater should leach equally the Bay. **The PCB and PAH not being found ex ept at the boundaries leads me to believe there is under s mpling all over the site, in particular he campsites where the potable water lines are nd the m n w er lines on Berm Road.** These PCB and PHA surrounding the waterlines means tha when there is a break in the potable water service those r inogens w ll be in the w er service to all on that w er service. Those potable waterlines feed businesses, homes, and a schools are at what I would call a very high risk and high probability because of the age of the system. Just monitoring for 33 years is another unacceptable s lution never mind a bad best practice from agencies tha are hired to clean up the property and ultimately protect life both animal and human.

Paul Kesson
3241 East Main Road
Portsm uth RI

Attachment to public hearings notes above (this page includes comments submitted via email to the public affairs office after the MRP Site 1 public hearing on March 20, 2019)

USE THIS SP CE T WR ITE Y UR MMENTS

The Navy encourages y w itten mments on the Proposed Pla f r Site 22 - Former Carr Poi t Storage A ea, perable Unit 10, at NAVSTA Newport. Y can use the form below to send w itten comments. If y have questions about how to comment, please call the Navy's Public Affairs Office (Ms. Lisa Rama) at (401) 841-3538. This f m is provided for y c onvenience. Please mail this fo m addition al sheets of w itten comments, postmarked no later than April 5th 2019 to:

Ms. Lisa Rama
Naval Station Newport
Public Affairs Office
690 Peary Street
Newport, RI 02841
Fax: (401) 841-2265
email to : lisa.rama@navy.mil

I learned of this public hearing remed ation solution for Site 22 - Carrs Point Storage Area (Operable Unit 10) on November 14, 2018, but was unable to attend the public hearing. So I sent in Public Commen both by Email and USPS mail before November 30, 2018. I attended the March 20 RAB public hearing on Carr Point and can not access my comment.

As the "Process" was explained in the March 20, 2019 any and all commen s will be answered in the Decision of Record, DOR. The comments valid or not are not be viewed by the person sending in commen s to see if the next phase is addressing previous concerns. I asked how many comments were sent in during the last comment period, no one in the room could answer tha question.

My concern is tha Naval Station (NAVSTA) Newport has hired subject ma ter experts and comments are coming from residen s that do not have who are not well versed in remed ation, there is possibility of misunderstanding and possible disconnec on what could be critical issues.

It is my recommendation that each and every comment written as well as taken during the "verbal public comment period". **Will Naval Station (NAVSAC) Newport be willing to have a one on one discussion to insure the issue raised is being articulated and properly resolved?**

Paul Kesson
3241 East Main Road
Portsm uth RI 02871
1-401-683-4231
ema l kesson@att.ne