TETRA TECH

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Project Number 112G02698

Mr. Roberto Pagtalunan, P.E.
NAVFAC MIDLANT (Code OPTE3)
Environmental Restoration
Building Z144, Room 109
9742 Maryland Avenue
Norfolk VA 23511-3095

Reference: CLEAN Contract No. N62470-08-D-1001
Contract Task Order No. WE58

Subject: Final Executed Record of Decision
DU 5-1 at Site 13, Tank Farm 5, Naval Station Newport, Rhode Island

Dear Mr. Pagtalunan:

Tetra Tech is pleased to provide to you two copies of the final, executed Record of Decision for Site 13, which is part of Naval Station Newport, and is located in Middletown, Rhode Island. This site is also identified by the U.S. Environmental Protection Agency as Operable Unit (OU) 2 of the NETC Newport Superfund Site.

This document is being provided to the individuals below for their records. Please contact me at (978) 474-8434 or should you have any questions.

Sincerely,

Stephen S. Parker, LSP
Project Manager

Encl.

cc: S. Bird, NAVFAC (w/ encl. – 1)
P. Crump, RIDEM (w/encl. – 3)
W. Johnson, NAVFAC (w/ encl. – 1)
K. Keckler, USEPA (w/encl. – 3)
D. Moore, NAVSTA (w/ encl. – 2)
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RDM Data Manager, Tetra Tech (w/encl. – original, unbound)
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RECORD OF DECISION

DECISION UNIT 5-1
AT TANK FARM 5 - SITE 13
OPERABLE UNIT 2

NAVAL STATION NEWPORT,
MIDDLETOWN RHODE ISLAND
DECEMBER 2013

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ACRONYMS

ARAR	Applicable or Relevant and Appropriate Requirement
BERA	Baseline ecological risk assessment
bgs	Below ground surface
BSW	Bottom sediment and water
CDI	Chronic daily intake
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CFR	Code of Federal Regulations
COC	Contaminant of concern
COPC	Contaminant of potential concern
CS	Confirmation study
CSF	Cancer slope factor
CSGWPP	Comprehensive State Groundwater Protection Program
CSM	Conceptual site model
CTE	Central tendency exposure
DEC	Direct Exposure Criterion
DGA	Data Gaps Assessment
DU	Decision Unit
EPA	United States Environmental Protection Agency
EPC	Exposure point concentration
ERA	Ecological risk assessment
FFA	Federal Facility Agreement
FS	Feasibility Study
HHRA	Human Health Risk Assessment
HI	Hazard index
HQ	Hazard Quotient
IAS	Initial Assessment Study
ILCR	Incremental lifetime cancer risk
IR	Installation Restoration
IRIS	Integrated Risk Information System
IUR	Inhalation unit risk
LTM	Long-term monitoring
LUC	Land use control
MCL	Maximum Contaminant Level
MCLG	Maximum Contaminant Level goal
mg/kg	Milligram per kilogram

MNA	Monitored natural attenuation
NAVSTA	Naval Station
NCP	National Oil and Hazardous Substances Pollution Contingency Plan
NETC	Naval Education and Training Center
NPL	National Priorities List
NPW	Net present worth
NTCRA	Non-time critical removal action
NUSC	Naval Undersea Systems Center
NUWC	Naval Undersea Warfare Center
OU	Operable Unit
O&M	Operation and maintenance
OFFTA	Old Fire Fighting Training Area
OWS	Oil-water separator
PAH	Polycyclic aromatic hydrocarbon
PCB	Polychlorinated biphenyl
PRG	Preliminary remediation goal
RAB	Restoration Advisory Board
RAO	Remedial Action Objective
RD	Remedial Design
RfC	Reference concentration
RfD	Reference dose
RG	Remediation Goal
RI	Remedial Investigation
RIDEM	Rhode Island Department of Environmental Management
RME	Reasonable maximum exposure
ROD	Record of Decision
RSL	Regional Screening Level
SF	Slope factor
SWOS	Surface Warfare Officers School
SVOC	Semi-volatile organic compound
TF5	Tank Farm 5
TPH	Total petroleum hydrocarbons
UCL	Upper confidence limit
UPL	Upper predictive limit
UST	Underground storage tank
µg/L	Microgram per liter
VOC	Volatile organic compound

1.0 DECLARATION

1.1 SITE NAME AND LOCATION

Tank Farm 5 (TF5) is a former petroleum storage and distribution facility at Naval Station (NAVSTA) Newport, located in Middletown, Rhode Island. TF5 is additionally known as Operable Unit (OU) 2 and Site 13. This document focuses on a part of TF5 that is identified as Decision Unit (DU) 5-1, which is defined as the portion of TF5 where Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) contaminants were likely released based on historical records. NAVSTA Newport was formerly called the Naval Education and Training Center (NETC) and has been assigned United States Environmental Protection Agency (EPA) Identification (ID) number RI6170085470.

1.2 STATEMENT OF BASIS AND PURPOSE

This Record of Decision (ROD) presents the Selected Remedy for DU 5-1, as chosen by the Navy and EPA in accordance with CERCLA, as amended by the Superfund Amendments and Reauthorization Act and to the extent practicable, the National Oil and Hazardous Substances Pollution Contingency Plan (NCP). The Rhode Island Department of Environmental Management (RIDEM) concurs with the Selected Remedy, as demonstrated by the concurrence letter included in Appendix A. This decision is based on information contained in the Administrative Record for DU 5-1, listed in the Detailed Administrative Record Reference Table presented prior to the appendices of this report.

1.3 ASSESSMENT OF SITE

The response action selected in this ROD is necessary to protect the public health and welfare or the environment from actual or threatened releases of hazardous substances into the environment. A CERCLA action is required because arsenic, cobalt, iron, and manganese concentrations in groundwater pose unacceptable risk to hypothetical future residents. Additionally, arsenic is present in soil at concentrations exceeding state regulatory criteria and manganese is present in soil at concentrations posing risk to construction workers, and will be addressed by the remedy (unacceptable risk is defined as cancer risk greater than $1x10^{-4}$ or non-cancer hazard index of 1). The screening ecological risk assessment (ERA) did not identify unacceptable ecological risks to terrestrial or aquatic receptors exposed to chemical constituents at DU 5-1 and therefore action is not required to protect potential ecological receptors.

1.4 DESCRIPTION OF SELECTED REMEDY

The major components of the Selected Remedy for DU 5-1 include the following:

A permeable soil cover will be installed to isolate surface soils with concentrations of contaminants of concern (COCs) that exceed industrial remediation goals (RGs).

Groundwater will be monitored to verify that groundwater quality is not being adversely affected by COCs in site soils remaining at the site at concentrations that exceed the RGs.

MNA will document the expected reductions in metals in groundwater brought out of solution by natural geochemical processes.

LUCs will ensure that future use of the property is limited to industrial activities (residential and unrestricted recreational site use will be prohibited), prevent disturbance of the soil cover, assure that subsurface soils that are above RGs are not disturbed without appropriate precautions, restrict potential exposure to COCs in site groundwater, and to prohibit groundwater use until RGs have been achieved. LUCs will also protect components of the groundwater remedy (wells).

The Selected Remedy eliminates potential unacceptable human exposure to soil and groundwater through a combination of a permeable soil cover, MNA, long-term monitoring, and LUCs and will be supported by inspections and five-year reviews. Remedial actions at Site 13 DU 5-1 are not expected to adversely impact the current and reasonably anticipated future industrial land use. The Selected Remedy is expected to achieve substantial long-term risk reduction and allow the property to be used for the reasonably anticipated future land use. This ROD documents the final remedial action decision for DU 5-1 and does not affect any other sites at NAVSTA Newport, including the other DUs at TF5. Implementation of this remedy will allow for continued industrial use of the site, which is consistent with current use and the overall cleanup strategy for NAVSTA Newport of restoring sites to support base operations.

1.5 STATUTORY DETERMINATIONS

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

Because this remedy will result in hazardous substances, pollutants, or contaminants remaining on site in excess of levels that allow for unlimited use and unrestricted exposure, a statutory review will be conducted within 5 years of initiation of the remedial action and every 5 years thereafter to ensure that the remedy is, or will be, protective of human health and the environment.

Federal regulations that pertain to the cleanup require a determination that there is no practical alternative to 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), and as incorporated under Federal Emergency Management Agency regulations. In accordance with the CWA, the Navy has determined that the Selected Remedy is the Least Environmentally Damaging Practicable Alternative to protect wetland and floodplain resources because it provides the best balance of addressing contaminated soils within and adjacent to wetlands and waterways and minimizes both temporary and permanent alteration of wetlands and aquatic habitats on site. To the extent that the installation, monitoring, and maintenance of wells used for the groundwater component of the remedy may impact federal jurisdictional wetlands and floodplain, alteration of protected resource areas will be minimized, and mitigation will be implemented, as required.

1.6 ROD DATA CERTIFICATION CHECKLIST

Table 1-1 provides a summary of the specific ROD information that is presented in Section 2.0 of this document. Additional information can be found in the Administrative Record file for NAVSTA Newport, available online at http://go.usa.gov/DyNw.

TABLE 1-1. ROD DATA CERTIFICATION CHECKLIST

DATA	LOCATION IN ROD
COCs and their respective concentrations	Sections 2.5 and 2.7
Baseline risk represented by the COCs	Section 2.7
Cleanup levels established for COCs and the basis for these levels	Section 2.7 and 2.8
How source materials constituting principal threats are addressed	Section 2.11

Table 1-1. ROD Data Certification Checklist (cont.)

Data	Location in ROD
Current and reasonably anticipated future land use assumptions and current and potential future beneficial uses of groundwater used in the risk assessment	Section 2.6
Potential land and groundwater uses that will be available at the site as a result of the Selected Remedy	Section 2.12.3
Estimated capital, operation and maintenance (O&M), and total net present worth (NPW) costs; discount rate; and number of years over which the remedy costs are projected	Appendix B
Key factors that led to the selection of the remedy	Section 2.12.1

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

1.7 AUTHORIZING SIGNATURES

The signature provided below by the Navy validates the Selected Remedy for DU 5-1 at TF5 at NAVSTA Newport in Middletown, Rhode Island. RIDEM concurs with the Selected Remedy, as indicated in Appendix A of this ROD.

Concur and recommend for implementation:

1/7/14

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

The signature provided below by the EPA validates the Selected Remedy for DU 5-1 at TF5 at NAVSTA Newport in Middletown, Rhode Island. RIDEM concurs with the Selected Remedy, as indicated in Appendix A of this ROD.

Concur and recommend for implementation:

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

Date

2.0 DECISION SUMMARY

2.1 SITE NAME, LOCATION, AND BRIEF DESCRIPTION

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

TF5 is in the northern portion of the NAVSTA Newport facility, located in Middletown, Rhode Island, as shown on Figure 2-1. TF5 occupies approximately 85 acres and is the former location of eleven 2.5-million-gallon-capacity underground storage tanks (USTs) used to store #6 fuel oil, with two USTs (53 and 56) also used to store waste oil. The USTs were cleaned and demolished in place in the late 1990s. TF5 has also been used for several years for temporary storage of soil and construction materials generated by construction projects at NAVSTA Newport. DU 5-1 occupies approximately 6 acres at the northwestern corner of TF5 and is bounded to the north by Greene Lane, to the east by rest of TF5, to the south by the Navy Fire Fighting School (previously part of TF5), to the west by Defense Highway, beyond which lies Narragansett Bay, as shown on Figure 2-1.

The construction of TF5, circa 1942

TF5 is partially fenced, with signs posted at entrances restricting access to authorized personnel. Activities within TF5 are restricted to general industrial uses (i.e. temporary storage) and to seasonal bow hunting by permit authorized by the NAVSTA Newport Commanding Officer. There are no functional buildings at TF5. A derelict corrugated sheet metal shed measuring approximately 10' x10' in the northern portion of the property was investigated as a separate DU (DU 5-3) and is not described further in this document. Further investigations are ongoing in regard to the former USTs and fuel dispensing systems at TF5, upgradient of DU 5-1. These areas are being investigated under the Navy's Petroleum, Oil and Lubricants Program under state authority, not under CERCLA.

DU 5-1 includes a former oil-water separator (OWS) and associated discharge pipe and discharge area, as depicted on Figure 2-1. The OWS was originally constructed as a burning chamber for tank bottom sludge but was subsequently converted to an OWS fed by the bottom sediment and water (BSW) piping from each of the former USTs. Excess fluids were drained from the burn chamber/OWS to the wetland formed by Gomes Brook to the north/northwest of the OWS.

Contaminants in soil, groundwater, surface water, and sediment were identified during past environmental assessments at DU 5-1 and were attributed to previous activities including burn chamber/OWS discharges and fluids/sludge discharge via piping to the wetlands. Previous remedial efforts have occurred at DU 5-1 as a part of an investigatory removal action in 2004 and 2005, described in the Data Gaps Assessment (DGA) Report (Tetra Tech, 2012; Tetra Tech EC, 2007). The results of total petroleum hydrocarbon (TPH) analysis were the primary guide for the excavation activities, and only limited confirmation sampling for CERCLA contaminants was conducted during this removal action; the available analytical data were insufficient to perform a risk assessment.

NAVSTA Newport is an active facility, with environmental investigations and remedial efforts funded under the Environmental Restoration, Navy program. The Navy is conducting its Installation Restoration

(IR) Program (i.e., environmental investigation and remediation program) at NAVSTA Newport in accordance with a Federal Facility Agreement (FFA) between the Navy, EPA, and RIDEM. The FFA established the Navy as the lead agency for the investigation and specified cleanup of designated sites within the NAVSTA Newport property, with EPA and RIDEM providing oversight.

2.2 SITE HISTORY AND ENFORCEMENT ACTIVITIES

Previous environmental investigations designed to evaluate environmental quality at TF5 and DU 5-1 are summarized in Table 2-1. Results of these investigations indicated concentrations of metals in groundwater that exceed acceptable risk levels or state regulatory standards and background concentrations. The nature and extent of contamination identified in soil and groundwater is discussed in Section 2.5.

TABLE 2-1. PREVIOUS INVESTIGATIONS AND SITE DOCUMENTATION

INVESTIGATION	DATE	ACTIVITIES
Initial Assessment Study (IAS)	1983	The facility-wide IAS concluded that TF5 should be retained for further investigation due to burning of tank bottom sludge at the site.
National Priority List (NPL) listing	1989	NAVSTA Newport was listed on the EPA NPL as the NETC.
Remedial Investigation (RI)	1992	As part of an **RI** completed by the Navy for NETC Newport, soil, groundwater, surface water, sediment, and soil gas samples were collected across the site. Based on the results, additional studies were recommended to further define the extent of TPH in surface soils and to determine the significance of elevated metals concentrations in soil and groundwater. At TF5, borings and wells were installed and sampled to identify the presence of suspected sludge pits used for disposal of tank bottom sludge.
Tank Demolition	1996-1999	The Navy **demolished the OWS at the site and also cleaned and demolished in place the underground tanks** upgradient of DU 5-1 that had been used for fuel storage since the 1940s.
Site Investigation/ Removal Action	2004-2007	The Navy conducted an extensive **Site Investigation and removal action** for all of TF5. The work included investigating for possible former sludge disposal pits, assessing underground piping, demolishing and removing piping, and sampling other Review Areas. No evidence of former sludge pits was found.
Background Soil Investigation	2008	The Basewide **Background Soil Investigation** was conducted to provide a background data set for comparisons to soil and sediment data collected from all sites at NAVSTA Newport. The objective of the investigation was to identify levels of inorganics expected to be present had the various Navy activities not occurred. Both naturally occurring and anthropogenic metals were included in the study. Surface and subsurface soil samples were collected at off-site locations and included representative soil types mapped by the United States Department of Agriculture Natural Resources Conservation Service.

TABLE 2-1. PREVIOUS INVESTIGATIONS AND SITE DOCUMENTATION (CONT.)		
INVESTIGATION	**DATE**	**ACTIVITIES**
Data Gaps Investigation	2010	A **DGA** was conducted to provide up-to-date site-representative data for DU 5-1 to aid in determining residual risks to potential human and ecological receptors following the 2004 – 2007 removal action. The DGA included the establishment of Categories 1, 2, and 3 DUs, collection of soil, groundwater, surface water, and sediment samples, a baseline Human Health Risk Assessment (HHRA) and screening-level ERA. The **baseline HHRA** indicated potential unacceptable risk to receptors from soil and groundwater. The **screening ERA** indicated that a baseline ERA was not necessary because of limited potential ecological risks.
Feasibility Study (FS)	2013	The FS identified preliminary remediation goals (PRGs), screened potential remedial technologies, and developed and evaluated **remedial alternatives** for soil and groundwater at DU 5-1 based on information from previous investigations. The final FS presented three remedial alternatives to address contamination in soil and three remedial alternatives to address contamination in groundwater.

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

There have been no cited violations under federal or state environmental law or any past or pending enforcement actions pertaining to the cleanup of DU 5-1.

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 at http://go.usa.gov/DyNw).

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. DU 5-1 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. For additional information about the IR Program at NAVSTA Newport, contact Ms. Lisa Rama, Public Affairs Office, 690 Peary Street, NAVSTA Newport, Newport, Rhode Island, 02841 (lisa.rama@navy.mil).

In accordance with Sections 113 and 117 of CERCLA, the Navy provided a public comment period from November 20 to December 20, 2013, for the proposed remedial action described in the Proposed Plan for DU 5-1. A public meeting to present the Proposed Plan was held on November 20, 2013, at the Courtyard Marriott, 9 Commerce Drive in Middletown, Rhode Island. A **public notice** of the meeting and availability of documents was published in the *Newport Daily News* on November 13, 2013. Immediately following the public informational meeting, the Navy held a public hearing to solicit public comments for the record. A transcript of the oral comments received during the public hearing was prepared and is available for review as part of the DU 5-1 Administrative Record (see Appendix F). Three comments were received during the public hearing, and no written comments were received during the 30-day comment period. The Navy's Responsiveness Summary is presented in Section 3 of this ROD.

2.4 SCOPE AND ROLE OF OPERABLE UNIT

DU 5-1 is part of a comprehensive environmental investigation and cleanup program currently being performed at NAVSTA Newport under CERCLA authority pursuant to the FFA dated March 23, 1992. Fifteen IR sites have been identified at NAVSTA Newport. An IAS, completed in 1983, identified 18 sites where contamination was suspected to pose a threat to human health and the environment. Six of the 18 sites, not including TF5, were investigated further in a Confirmation Study (CS) completed in 1986. An RI was completed in 1992 and included McAllister Point Landfill (Site 1), Melville North Landfill (Site 2), Old Fire Fighting Training Area (OFFTA) (Site 9), Tank Farm 4 (Site 12), and TF5 (Site 13). The McAllister Point Landfill, Melville North Landfill, and Tank Farm 4 had been previously investigated as part of both the IAS and CS, and TF5 was investigated during the IAS.

Investigations at four of the five sites continued under the Department of Defense IR Program following the listing of NAVSTA Newport (then NETC) on the NPL in 1989. RODs have been signed for the McAllister Point Landfill and OFFTA, the portion of TF5 where Tanks 53 and 56 were located, Tank Farm 4, and the Naval Undersea Systems Center Disposal Site. The Melville Water Tower was addressed through a Non-Time Critical Removal Action (NTCRA). Nine additional sites (Tank Farm One, Tank Farm Two, Tank Farm Three, Coddington Cove Rubble Fill Area, Tank Farms Four and Five, Derecktor Shipyard, Building 32 at Gould Island, and Carr Point) are also being investigated under the IR Program. The McAllister Point Landfill, Melville North Landfill, and Tank Farm 4 had been previously investigated under RIDEM regulations during the IAS and CS, and TF5 was investigated during the IAS.

Investigations at DU 5-1 indicated the presence of groundwater contamination, resulting from past operating practices that poses unacceptable risk to potential future human receptors. In addition, arsenic and manganese concentrations in soil pose a risk within EPA's target risk range. Arsenic concentrations in soil exceed state cleanup criteria and are also greater than background levels and state criteria and manganese concentrations pose non-cancer risk to construction workers, and are greater than background levels for one of the soil types represented at the site. Therefore, arsenic and manganese in soil will be addressed by the remedy.

Previous actions taken in response to the contamination at DU 5-1 are summarized in Table 2-1. The remedy documented in this ROD will achieve the Remedial Action Objectives (RAOs) for DU 5-1, as listed in Section 2.8. Implementation of this remedy will allow for continued industrial use of the site, which is consistent with current and reasonably anticipated future use and the overall cleanup strategy for NAVSTA Newport of restoring sites to support base operations.

2.5 SITE CHARACTERISTICS

Figure 2-2 presents the DU 5-1 conceptual site model (CSM), a graphical interpretation of contaminant sources, contaminant release mechanisms, transport routes, and receptors under current and future land use scenarios. Historical activities at DU 5-1 have resulted in the presence of metals in soil and groundwater at concentrations that exceed acceptable risk levels or state regulatory standards. The nature and extent of contamination at the site is described in Section 2.5.2. The evaluated contaminant exposure pathways and potential human receptors under current and potential future land use scenarios are presented in Section 2.7.

2.5.1 Physical Characteristics

Site conditions, geology, and hydrogeology at DU 5-1 and TF5 are presented in this section. The information is summarized from data gathered during the RI, non-time critical removal actions, and DGA field investigations.

Setting and Conceptual Site Model

DU 5-1 is a 6-acre area, located in the northwestern corner of TF5. Gomes Brook bisects the site, flowing east to west. Gomes Brook is an intermittent stream and has associated wetland areas bounding its northern and southern sides. The brook flows in a westerly direction through a culvert and to discharges into Narragansett Bay just past the TF5 western boundary.

The CSM, developed in the RI and refined in the DGA and FS, shows that the OWS structure received drainage water and petroleum sludge through BSW piping that led from the upgradient tanks. After separating the petroleum from the water, the water was discharged to Gomes Brook and the associated wetland. Additionally, releases of petroleum to the ground at DU 5-1 have undergone natural biological degradation of this petroleum and created a reducing environment that favors the dissolution of metals (particularly iron and manganese) from soil and rock to groundwater, for subsequent migration with groundwater flow. Reducing conditions are also potentially an upgradient condition associated with petroleum releases at the former tank locations at TF5.

The site is heavily vegetated with invasive plants and secondary growth forest. TF5 is being evaluated for redevelopment as a wind farm and is currently used during a portion of the year for deer hunting under a NAVSTA Newport Bow Hunting program.

Geology

The overburden thickness at TF5 ranges from approximately 1 to 40 feet, generally increasing in flat-lying areas and becoming thinner on slopes. The thickest overburden is present in the areas immediately surrounding the former USTs where bedrock was blasted to accommodate tank construction efforts and where blasted materials were used as fill around the tank structures.

At TF5, overburden materials are classified as either glacial till or fill and are generally mixtures of silt, sand, gravel, boulders, and gravel-sized pieces of bedrock. In soil borings, fill material can be difficult to distinguish from native materials because fill typically appears to be surficial materials that originated from another part of the site or that resulted from the blasting of the bedrock during tank installation activities. The blasted bedrock is difficult to distinguish from weathered bedrock, and the weathered bedrock/overburden interface is difficult to determine due to the soft and extremely weathered nature of much of the bedrock. The density of the overburden generally varies from loose to medium but is not a reliable indicator of the nature of the overburden materials (native or fill). Bedrock underlying TF5 has been identified as a black/gray shale, slate, and/or phyllite, depending on the degree of metamorphism, and is encountered between approximately 1 and 40 feet below ground surface (bgs). Due to the highly weathered bedrock surface in some areas, it can be difficult to determine the exact depth of the bedrock/overburden contact, as noted above. Most of the bedrock encountered in borings can be easily broken along planes of bedding and/or foliation and is also highly fractured.

At DU 5-1, the overburden is dominated by sandy silts and silty sands, although some locations also include gravel mixed with these silts and sands. The gravelly materials are usually present deeper in the subsurface and/or directly above the bedrock surface, and the silts and sands occur more continuously and are more likely to be found near the ground surface

Bedrock within the DU 5-1 area, as encountered during the DGA, was characterized as fine-grained rock consisting of phyllite or shale depending on the degree of metamorphism. The upper surface of the bedrock is weathered, and the bedrock is typically soft, as evidenced by bedrock boreholes advanced using roller-bit drilling methods. The depth to weathered bedrock observed during drilling at DU 5-1 was between 1 and 9 feet. More competent bedrock was encountered within 1 and 8 feet below the top of weathered bedrock.

Hydrogeology

Depths to groundwater at TF5 range from approximately 2 to 15 feet bgs. **Groundwater flow** is in a northwesterly direction, generally following surface topography, and groundwater ultimately discharges into Narragansett Bay (Figure 2-1). Horizontal hydraulic gradients of 0.03 and 0.04 were calculated for TF5 bedrock and overburden, respectively, using May 2010 groundwater elevation data.

DU 5-1 is located in the most downgradient section of TF5, so groundwater entering DU 5-1 flows from the other parts of the Tank Farm located to the east/southeast. Groundwater from DU 5-1 discharges either to Gomes Brook or travels further through subsurface materials and eventually discharges into Narragansett Bay, just west of DU 5-1. The former OWS is located approximately 300 feet upgradient of Gomes Brook and the associated wetland, and groundwater flow from the former OWS area is generally northward towards the wetland but is influenced by the regional northwestern trend. The groundwater table at DU 5-1 ranged from approximately 4 to 18 feet bgs.

2.5.2 Nature and Extent and Fate and Transport of Contamination

Past operations in the area of DU 5-1 were found to have resulted in the release of contaminants to surface and subsurface soil and groundwater. Surface water and sediment were evaluated, and COCs were not identified within these site media. The presumed source, which has since been eliminated, was burned and unburned fuel sludge and by-products. Fuel sludge consisted of drainage water and petroleum sludge transported by BSW piping from the upgradient tanks. After separating the petroleum from the water in the OWS, the water was discharged to Gomes Brook and the associated wetland. In earlier years of operation, the sludge captured was burned in the chamber. Later, the sludge was removed and disposed of off-site, presumably at McAllister landfill or Melville North landfill. The nature and extent of contamination at DU 5-1 has been influenced by the following factors:

- Contaminants associated with the **burning of sludge** and from discharge of burned sludge to the wetland areas were likely released to the ground at and downgradient of the former burn chambers.
- Contaminants passing through the OWS would most likely have been released to Gomes Brook and entrained within wetland soils.
- The concentration and extent of contaminants were decreased significantly through removal of the burn chamber/OWS. Concentration and extent of contamination was further decreased through removal of the pipelines and the soil and sediment around the discharge areas at the wetland.

Contaminants of potential concern (COPCs) were identified as part of the HHRA presented in the DGA report. COCs were determined after the risk assessment process, as further discussed in Section 2.7 of this document. A summary of sample results for the DU 5-1 COCs is presented in Table 2-2. The extent of COCs exceeding cleanup goals in surface soil, subsurface soil, and groundwater is presented on Figures 2-3 through 2-5, respectively. Contaminants in surface water and sediment do not require remediation, as discussed further in Section 2.7. The nature and extent of contamination described in this section is limited to the media addressed by the chosen remedy. Only the contaminants in these media that require action under CERCLA are discussed. For a full description of the nature and extent in all media, refer to the DGA report (Tetra Tech, 2012).

TABLE 2-2. SUMMARY OF RI SAMPLE RESULTS FOR DU 5-1 COCS

COC	FREQUENCY OF DETECTION	CONCENTRATION RANGE
	Surface Soil	
Metals (mg/kg)		
Arsenic(2)	11/11	4.3 - 43.7
	Subsurface Soil	
Metals (mg/kg)		
Arsenic (2)	21/21	3.5 – 67.2
Manganese(1)	21/21	114 - 4220

TABLE 2-2. SUMMARY OF RI SAMPLE RESULTS FOR DU 5-1 COCS (CONT.)		
COC	FREQUENCY OF DETECTION	CONCENTRATION RANGE
	Groundwater	
Total and Dissolved Metals (µg/L)		
Arsenic(1)	5/6	0.59 – 8.8
Cobalt(1)	6/6	0.427 - 19
Iron(1)	6/6	128 – 24,300
Manganese(1)	6/6	82.4 – 2,520

Notes:
1) COC by Human Health Risk Assessment.
2) COC by exceeding State Criteria.
Mg/kg = Milligrams per kilogram.
µg/L = Micrograms per liter.

2.5.2.1 Nature and Extent of Contamination in Soil

During the DGA, soil samples were collected from 11 locations, with 11 surface soil and 21 subsurface soil samples were collected from 11 locations. These soil sampling locations are shown on Figures 2-3 and 2-4. Surface and subsurface soil samples were analyzed for volatile organic compounds (VOCs), semivolatile organic compounds (SVOCs), pesticides, polychlorinated biphenyls (PCBs), metals, TPH, and dioxins. Soil results were compared to EPA Regional Screening Levels (RSLs) for residential and industrial soils. SVOCs [mainly polycyclic aromatic hydrocarbons (PAHs)] and metals were the primary analyte groups detected and subsequently identified as COPCs. The full data set is provided in Appendix A of the FS Report (Tetra Tech, 2013).

Arsenic was detected at concentrations greater than screening levels at all sampling locations in both surface and subsurface soil. Arsenic exceeded both residential and industrial RSLs in all samples. Maximum concentrations of arsenic in both surface and subsurface soil were detected in borings near the former OWS/burning chamber. Manganese was detected in excess of its residential screening criterion in one subsurface soil sample (SB-970) located downgradient of the OWS near the terminus of Gomes Brook.

Background concentrations have been established for both arsenic and manganese in soils at NAVSTA Newport in an EPA-approved background study (Tetra Tech, 2008). Concentrations of metals in two soil types mapped by the United States Department of Agriculture at DU 5-1 were considered as potential background conditions for site soil. The combined background concentration for arsenic is calculated at 17 micrograms per kilogram (mg/kg) in surface soil and 24 mg/kg in subsurface soil for DU 5-1, and the combined background concentration for manganese is 1,214 mg/kg in subsurface soil for DU 5-1. These site-specific background concentrations are 95-percent upper predictive limit (UPL) values for these constituents in the four soil types that were mapped within DU 5-1 prior to development of TF5. Use of data from the represented soil types combined allows for consideration of the mixing of these soils during construction activities at the tank farm. However, based on the risk to the construction worker for manganese, two separate background concentrations were retained for the two soil types (448 mg/kg and 1086 mg/kg) present at the site, and established as two different PRGs for the two areas where those soils were mapped to be present prior to construction of the Tank Farm.

Statistical analyses of metals data in soil show that site concentrations of manganese are less than these calculated background concentrations in some areas based on chemistry of regional soil types.

Statistical analyses also show that site concentrations (95-percent upper confidence limit [UCL]) of arsenic are greater than background concentrations at this site.

2.5.2.2 Nature and Extent of Contamination in Groundwater

During the investigation of DU 5-1, groundwater samples were collected from four monitoring wells (MW-915, MW-916, MW-923 and MW-924; the fifth monitoring well, MW-917, was dry). MW-924 is located closest to the former OWS, and the remaining three wells are located along the former OWS discharge pipe, with MW-923 the next closest to the OWS and MW-915 the furthest downgradient. Groundwater samples were analyzed for VOCs, SVOCs, pesticides, PCBs, and total metals. Samples from two wells, MW-916 and MW-923, were analyzed for dissolved metals. Laboratory data were compared to RSLs for tap water and EPA Maximum Contaminant Levels (MCLs). No chemicals were detected in excess of MCLs in TF5 groundwater.

Arsenic, cobalt, and manganese concentrations in unfiltered groundwater samples exceeded RSLs. Arsenic was detected in excess of the RSL in all samples, cobalt was detected in excess of the RSL at MW-916 and MW-923, and manganese was detected in excess of the RSL at MW-915 and MW-923. MW-923 was the only location with arsenic, cobalt, and manganese RSL exceedances. In the filtered sample at MW-916, no metals were detected in excess of RSLs. At MW-923, filtered concentrations of arsenic, cobalt, and manganese exceeded the RSL and were consistent with total metals concentrations.

2.5.2.3 Evaluation of Sediment

Sediment samples were collected from 12 locations within Gomes Brook and associated wetlands and tributaries. Samples were analyzed for VOCs, SVOCs, dioxins, pesticides/PCBs and metals. Sample results were compared to EPA RSLs for residential soil and industrial soil. The complete dataset is provided in the FS report (Tetra Tech, 2013). Sediment was determined not to be a media of concern.

2.5.2.4 Evaluation of Surface Water

During the investigation surface water was collected from 11 locations within Gomes Brook and associated wetlands and tributaries. Samples were analyzed for VOCs, SVOCs, pesticides, PCBs and metals. Sample results were compared to EPA RSLs for tap water and EPA MCLs. The full dataset is presented in the FS report (Tetra Tech, 2013). Surface water was evaluated and not identified as a media of concern.

2.5.2.5 Fate and Transport

Metals tend to adsorb to soil particles and become soluble under reducing conditions. Metals are considered to be persistent in the environment. Metals adsorbed to soil particles present at the ground surface could be transported in runoff that occurs during precipitation events or through the wind erosion of soil. Such erosion is significantly reduced with the presence of a vegetative cover, as is the case in most portions of this site. Soluble metals may also be leached from soils into groundwater by infiltration of precipitation and through the seasonal rise and fall of the groundwater table. Once in groundwater, soluble metals will travel with groundwater flow. As groundwater migrates, some of the metals will undergo transformation processes that result in their return to an insoluble state. Reduction-oxidation, precipitation, and adsorption reactions can cause dissolved- phase metals ions to leave the aqueous phase.

2.6 Current and Potential Future Site and Resource Uses

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

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

DU 5-1 is part of the NAVSTA Newport facility located in Middletown, Rhode Island. The site is bounded by the Defense Highway to the west (beyond which is Narragansett Bay), Fire Fighting Training Area to the south, former fuel storage areas of TF5 to the east, and Greene's Lane to the north. Wetlands exist throughout and cover approximately 0.75 acres. The site was used in the past as part of the TF5 drainage system; it contained a former OWS and associated discharge pipes and discharge areas. These drainage structures have since been removed. Accordingly, the potential site use is industrial, although it is not currently used for any purpose, and will remain as such for the foreseeable future.

Groundwater underlying NAVSTA Newport is **not used for drinking water**. 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. DU 5-1 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 DU 5-1 is downgradient of any potential or existing water sources.

Groundwater flows to DU 5-1 from the upgradient portion of TF5. RIDEM has established a state groundwater classification system to protect its groundwater resources. DU 5-1 is in **RIDEM's GA groundwater classification area**. Groundwater classified as GA is presumed suitable for public or private drinking water use without treatment (RIDEM, 2010). In addition, per EPA groundwater remediation guidance, in states without an EPA-approved Comprehensive State Groundwater Protection Program (CSGWPP), such as Rhode Island, CERCLA groundwater remediation must meet federal drinking water standards [i.e., MCLs and non-zero Maximum Contaminant Level Goals (MCLGs)] and risk-based standards, or more stringent state groundwater standards, unless the water is non-potable.

2.7 Summary of Site Risks

The risks summarized in this section were those for **potential receptors** indicated on Figure 2-2, which is based on an unrestricted use of the site. Some media and receptors were later eliminated after review of subsequent data collected (Section 2.7.3).

The baseline risk assessment estimates the site risks if no action were to be taken. The risk assessment results provide the basis for taking action and identify the contaminants and exposure pathways that need to be addressed by the remedial action. An HHRA and screening-level ERA were conducted as part of the DGA Report in 2012 (Tetra Tech, 2012).

2.7.1 Human Health Risk

The quantitative HHRA was conducted using chemical concentrations detected in soil, groundwater, surface water, and sediment. 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 are presented in Appendix C.

2.7.1.1 Identification of COPCs

The available validated data collected during the field investigations were used to identify COPCs for DU 5-1. Both federal and RIDEM criteria were used for COPC selection. Federal criteria included EPA RSLs, EPA MCLs, and EPA Groundwater Screening Levels for Evaluating the Vapor Intrusion into Indoor Air from Groundwater and Soils. RIDEM criteria included Direct Exposure Criteria (DECs) for residential soil and GA groundwater objectives. For DU 5-1, **COPCs were identified** for soil, groundwater, surface water, and sediment during the HHRA.

Table C-1 in Appendix C presents exposure point concentrations (EPCs) for the COPCs identified for surface soil, subsurface soil, groundwater, surface water, and sediment. EPCs are the concentrations used in the risk assessment to estimate exposure and risk from each COPC. The following guidelines were used to calculate EPCs for DU 5-1 COPCs during the HHRA:

- For soil, surface water, and sediment, the 95-percent UCLs on the arithmetic means, which are based on the distribution of each data set, were selected as EPCs. EPCs were calculated by following EPA's Calculating UCL for EPC's at Hazardous Waste Sites and using EPA's ProUCL software Version 4.00.05 (2002 and 2010).

- For groundwater, in accordance with the EPA New England Risk Updates (1995) maximum groundwater concentrations were used as EPCs for reasonable maximum exposure (RME) scenarios, and average groundwater concentrations were used as EPCs for central tendency exposure (CTE) scenarios.

- Non-detected values were evaluated in accordance with the ProUCL guidance. The results of duplicate samples were averaged for purposes of calculating EPCs for COPCs in environmental media at DU 5-1. In calculating averages, if a chemical was identified in only one sample of a duplicate pair, the average was calculated using the detected value and one-half of the detection limit.

2.7.1.2 Exposure Assessment

During the **exposure assessment** step of the HHRA, current and potential future exposure pathways through which humans might come into contact with the COPCs identified in the previous step were evaluated. The results of the exposure assessment for DU 5-1 were used to refine the CSM. Surface soil, subsurface soil, groundwater, surface water, and sediment were identified as the media for evaluation. The evaluated potential exposure routes included inhalation of air or volatiles from soil and groundwater (including vapor intrusion into buildings); dermal contact with soil, sediment, surface water, and groundwater; and ingestion of soil, sediment, and groundwater. The HHRA considered receptor exposure under non-residential land use (construction and industrial workers and trespassers) and future hypothetical residential land use. Current and hypothetical future exposure pathways at DU 5-1 are summarized in Table 2-3. Exposure assumptions and other supporting information used in the HHRA are presented in Appendix C.

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

RECEPTOR	EXPOSURE ROUTE
Construction Workers (future land use)	Soil incidental ingestion Soil dermal contact Inhalation of air/dust emissions Groundwater incidental ingestion (during excavation) Groundwater dermal contact (during excavation) Groundwater inhalation of volatile organics (during excavation)

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

RECEPTOR	EXPOSURE ROUTE
Industrial Workers (current and future land use)	Soil incidental ingestion Soil dermal contact Inhalation of air/dust emissions
Adolescent Trespassers (current and future land use)	Soil incidental ingestion Soil dermal contact Inhalation of air/dust emissions Surface water dermal contact Sediment incidental ingestion Sediment dermal contact
Residents (Adults/Children) (hypothetical future land use)	Soil incidental ingestion Soil dermal contact Inhalation of air/dust emissions Direct ingestion of groundwater Groundwater dermal contact (showering/bathing) Inhalation of volatiles in groundwater (showering/bathing)
Unrestricted Recreational Users (Adults/Children) (hypothetical future land use)	Soil incidental ingestion Soil dermal contact Inhalation of air/dust emissions Surface water dermal contact Sediment incidental ingestion Sediment dermal contact

2.7.1.3 Toxicity Assessment

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

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

Although toxicity criteria can be found in several toxicological sources, EPA's Integrated Risk Information System (IRIS) online database is the preferred source of toxicity values. This database is continuously updated, and the presented values have been verified by EPA. The toxicity criteria for the constituents selected as COPCs during the HHRA are presented in Appendix C.

2.7.1.4 Risk Characterization

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

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

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

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

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

Table 2-4 C provides RME cancer risk estimates from the DU 5-1 HHRA for the significant receptors and routes of exposure developed by taking into account various conservative assumptions about the frequency and duration of exposure for each receptor and also about the toxicity of the COCs. DU 5-1 COCs associated with carcinogenic risk include arsenic and PAHs. Total risk estimates for all applicable exposure routes range from 7×10^{-11} for child recreational user ingestion of surface soil to 2×10^{-4} for hypothetical, lifelong resident ingestion of groundwater. These risk levels indicate that if no cleanup action was taken, the increased probabilities of developing cancer as a result of site-related exposure would range from approximately 7 in 100,000,000,000 to 2 in 10,000.

No unacceptable cancer risks were estimated for exposures to soil, surface water, or sediment at DU 5-1. The ILCRs for hypothetical future lifelong residents using groundwater at the site for domestic purposes exceeded the EPA target risk range. Arsenic was the major contributor to the ILCR for groundwater, although arsenic concentrations in groundwater from DU 5-1 were less than the MCL.

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

$$\text{Non-cancer HQ} = \text{CDI} / \text{RfD}$$

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

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

Table 2-4 provides RME non-cancer HQs for each receptor and route of exposure and total HI values for all routes of exposure. Total HIs for all applicable exposure routes range from 0.00004 for inhalation of surface soil by adolescent trespassers and hypothetical child and adult recreational users to 22 for ingestion of groundwater by hypothetical future child residents.

HIs for all receptors exposed to site-related COPCs in surface and subsurface soil, surface water or sediment under the RME scenario were less than or equal to unity (1), with the exception of construction workers exposed to soil. Manganese was the major contributor to the HI for construction workers; however, the concentration of manganese is less than applicable facility-specific soil background values (see Section 2.5.2.1).

The HI for hypothetical future child residents exposed to site soil exceeded 1 for the total of all the exposure routes; however, the HI for individual target organs was less than 1 and therefore the risk for this scenario is not considered to be unacceptable for non-cancer hazards. HIs for hypothetical future child residents using groundwater at DU 5-1 for domestic purposes exceeded unity (1). Arsenic, cobalt, iron, and manganese were the major contributors to the HI. HIs for hypothetical future adult residents using groundwater at DU 5-1 for domestic purposes exceeded unity (1). Cobalt and manganese were the major contributors to the HI.

2.7.1.5 Summary of Human Health Risk

The HHRA evaluated receptor exposure under hypothetical residential and non-residential (industrial, trespasser, and recreational) land use scenarios. Quantitative estimates of non-carcinogenic hazards and carcinogenic risks (HIs and ILCRs, respectively) were developed for potential human receptors. All receptors were evaluated for exposures to surface soil (0 to 1 foot bgs) and all soil (0 to 10 feet bgs), construction workers and hypothetical residents were also evaluated for exposures to groundwater, and adolescent trespassers and recreational users were also evaluated for exposures to surface water and sediment.

The HHRA for DU 5-1 indicates there are potentially unacceptable risks to some receptors from exposure to all soil (0 to 10 feet in depth) and from exposure to groundwater. There are no unacceptable risks to any receptors for exposure to surface soil only (0 to 1 foot), surface water, or sediment. The following potential risks were identified based on the indicated COCs:

- Construction workers could be affected by exposure to manganese in all soil.
- Child residents could be affected by exposure to arsenic, cobalt, iron, and manganese in groundwater.
- Adult residents could be affected by exposure to cobalt and manganese in groundwater.
- Lifelong residents could be affected by exposure to arsenic in groundwater, in addition to the child and adult resident risks stated above.

Table 2-4 below presents the calculated risks for the receptors identified above.

TABLE 2-4. RECEPTORS AND CALCULATED RISK

RECEPTOR	MEDIUM	TOTAL CANCER RISK	TOTAL NON-CANCER RISK (HAZARD INDEX)
Construction Worker	All Soil (0 - 10 Feet)	< 1E-4	**3**
Child Resident	Surface Soil (0 - 1 Foot)	< 1E-4	2 (target organ HIs <1)*
	All Soil (0 - 10 Feet)	< 1E-4	3 (target organ HIs <1)*
	Groundwater	1E-04	**22**

TABLE 2-4. RECEPTORS AND CALCULATED RISK (CONT.)			
RECEPTOR	MEDIUM	TOTAL CANCER RISK	TOTAL NON-CANCER RISK (HAZARD INDEX)
Adult Resident	Groundwater	1E-04	**7***
Lifelong Resident (Adults/Children)	Groundwater	**2E-04**	NA

Bolded values exceed EPA target risk range or target hazard.
*Non-cancer risks to residential receptors from soil cited did not exceed an HI of 1 for an individual target organ.
NA – Not applicable.

Soil Risks

HIs for all receptors exposed to site-related COPCs in surface and subsurface soil under the RME scenario were less than or equal to unity (1) for an individual target organ, with the exception of construction workers exposed to all soil. At DU 5-1, manganese in soil samples collected at boring SB-970 was the major contributor to the HI for construction workers.

Groundwater Risks

HIs for child and adult residents, hypothetically using groundwater at DU 5-1 for domestic purposes exceeded unity (1). Arsenic, cobalt, iron, and manganese were the major contributors to the HI for child residents, and cobalt and manganese were the major contributors to the HI for adult residents.

The ILCR for lifelong residents hypothetically using groundwater for domestic purposes was greater than EPA's target risk range. Arsenic was the major contributor to the ILCR.

Risk Uncertainties

No major sources of uncertainty, other than those typically associated with risk assessment estimates, were identified for the DU 5-1 HHRA.

2.7.2 Ecological Risk

A screening-level ERA was performed to identify the potential for ecological risks to terrestrial and aquatic receptors exposed to contaminants associated with DU 5-1. The screening-level ERA was conducted to determine contaminants of potential ecological concern and to assist in determining whether a baseline ecological risk assessment (BERA) should be conducted. Tables summarizing the ERA and associated results are presented in Appendix D.

Based on the limited potential ecological risks, overall low concentrations of most ecological COPCs, and the fact that most of those potential risks are due to PAHs at a single location at DU 5-1, it was concluded that no further evaluation of ecological risks was required and that no remedial actions were necessary to address ecological exposure (Tetra Tech, 2012).

2.7.3 Basis for Action

Unacceptable risks to human health and the environment were identified for future site exposure scenarios. The results of the HHRA indicated that unacceptable risks were associated with exposure to site groundwater by future residents (child, adult, and lifetime residents). Because unacceptable risks were identified under future land use scenarios, a response action is necessary to protect the public health or welfare or the environment from actual or threatened releases of hazardous substances into the environment that may present an imminent and substantial endangerment to public health or welfare.

Although concentrations of arsenic in soils did not contribute to calculated risk levels greater than the EPA target risk range, concentrations of arsenic in soil exceeded applicable background values and RIDEM DECs. Arsenic in soil that exceeds both the RIDEM DEC and site-specific background concentrations will be addressed as part of the site remedy.

Concentrations of manganese in soils did contribute to calculated risk levels greater than the EPA target risk range and concentrations of manganese exceeded applicable background values in some areas of the site based on one of the two soil types present. Therefore, manganese in soil that exceeds both the risk based cleanup goal and the soil-specific background concentrations will also be addressed as part of the site remedy.

2.8 REMEDIAL ACTION OBJECTIVES

RAOs are medium-specific goals that define the objective of conducting remedial actions to protect human health and the environment. RAOs specify the COCs, potential exposure routes and receptors, and acceptable concentrations (i.e., cleanup levels or RGs) for a site and provide a general description of what the cleanup will accomplish. RAOs typically serve as the design basis for the remedial alternatives described in Section 2.9.

The **RAOs for DU 5-1** are as follows:

- Prevent the ingestion of and direct contact with vadose zone soil containing site contaminants that pose unacceptable risk for residential and other unrestricted uses.
- Prevent exposure of construction workers to soils with site contaminants exceeding RGs.
- Prevent future migration of soil contaminants either to groundwater or adjacent wetlands/waterways.
- Prevent use of site groundwater until RGs have been achieved.
- Restore groundwater quality to its beneficial use.

These RAOs are based on current and reasonably anticipated future site use, which is industrial/commercial. Although the site is not currently used for residential or unrestricted recreational purposes and there are no plans for residential/ unrestricted recreational use of the property in the future, RGs for residential exposures have also been calculated to evaluate cleanup options that allow for unrestricted use and unlimited exposure of the site and to determine whether institutional controls are needed to control hypothetical future site uses.

Chemicals associated with unacceptable human health risk (ICLR greater than 1 x 10^{-4} or HI greater than 1) were identified as **COCs** that require remediation. No unacceptable ecological risks were identified, so no ecological COCs were identified. Arsenic detected at concentrations exceeding the RIDEM DEC for this constituent was also identified as a COC for remediation.

PRGs were developed during the FS as target cleanup goals for remedial actions that, if met, would result in acceptable COC concentrations in DU 5-1 media of concern and thereby mitigate risks to human health and the environment. PRGs were established for the COCs and also for CERCLA hazardous substances, pollutants, or contaminants that although not associated with unacceptable risk, were detected at concentrations exceeding RIDEM's soil DECs and/or Leachability Criteria. The process of developing PRGs and selecting cleanup levels from these PRGs is summarized below.

Candidate PRGs were developed for soil and groundwater for the COCs that contributed significantly to cancer risks greater than 10^{-4} and/or HIs greater than 1 for each exposure pathway in a land use scenario for a receptor group. Chemicals were not considered as significant contributors to risk if their individual carcinogenic risk contribution was less than 1 x 10^{-6} or their non-carcinogenic HQ was less than 1 (Appendix C). Acceptable concentrations based on risk were calculated to meet an ILCR of 1 x 10^{-6} and an HQ of 1 for carcinogens and non-carcinogens, respectively. These calculated concentrations were identified as candidate risk-based PRGs.

As stated above, constituents detected at concentrations exceeding RIDEM DECs were also identified as COCs for the site, and the associated DECs were identified as candidate Applicable or Relevant and Appropriate Requirement (ARAR)-based PRGs for these COCs.

The candidate PRGs were then compared to applicable facility-specific background concentrations if available (Tetra Tech, 2008). If the candidate PRG for a metal was less than the applicable background concentration, the PRG was revised to be equal to the background concentration.

Appendix C, Tables C-13 and C-14 summarize the COPCs, COCs, and development of PRGs and final cleanup levels in the FS. Table 2-5 and 2-6 summarize the COCs and cleanup levels selected for remediation at the site.

The PRGs developed in the FS have been retained as **cleanup levels** in this ROD. Cleanup levels for soil at Site 13 DU 5-1 were selected for active remediation to support continued industrial and restricted recreational use of the site. Residential cleanup levels were used to help determine the extent of LUCs. As detailed above, for each COC, the calculated 10^{-6} cancer risk value, RIDEM DEC, RIDEM Leachability Criterion, and background value were compared. The lesser of the calculated risk-based value, DEC, and Leachability Criterion was selected and compared to the background value. If the selected value was greater than the background value, the selected value was used as the cleanup level. If the selected value was less than the background value, the background value was used as the cleanup level. Cleanup levels for soil are in Appendix C, Table C-13, and are summarized in Table 2-5.

TABLE 2-5. CLEANUP LEVELS FOR SOIL

CHEMICAL OF CONCERN	SURFACE SOIL CLEANUP LEVEL (mg/kg)	BASIS FOR SELECTION	SUBSURFACE SOIL CLEANUP LEVEL (mg/kg)	BASIS FOR SELECTION
Residential Use Scenario				
Metals (mg/kg)				
Arsenic	17(d)	Background(a)	24(d)	Background(a)
Manganese	NA/NA(b)	NA	448/1086(b)(c)	Background(b)
Industrial Use Scenario				
Metals (mg/kg)				
Arsenic	17(c)(d)	Background(a)	24(c)(d)	Background(a)
Manganese	NA/NA(b)	NA	585/1086(b)(c)	Background(b)

(a) Arsenic background values 95% UPL are presented for combined background soils.
(b) Manganese values presented are 95% UPL values for two soil types (Ne/Pm) for which background was calculated.
(c) Subsurface soil RGs for industrial use soil are applicable only to the 0-2 foot interval if a land use control is applied.
(d) Cleanup goals adjusted based on background.

The cleanup levels for site groundwater were selected as the more stringent of the federal drinking water MCLs, federal risk-based standards, and RIDEM GA criteria, as developed in Appendix C, Table C-14, and summarized in Table 2-6. For COCs with no published MCLs, federal risk-based standards, or RIDEM GA criteria, the more stringent of the cancer risk or non-cancer hazard was selected.

TABLE 2-6. CLEANUP LEVELS FOR GROUNDWATER		
CHEMICAL OF CONCERN	CLEANUP LEVEL (µg/L)	BASIS FOR SELECTION
Residential Use Scenario		
Total and Dissolved Metals (µg/L)		
Arsenic	10[(a)]	MCL
Cobalt	3.3	Non-Cancer HI=1[(b)]
Iron	10,900	Non-Cancer HI=1[(b)]
Manganese	300	EPA Provisional Health Advisory[(c)]

(a) Site concentrations of arsenic do not exceed the MCL, which is selected as the cleanup level over the risk-based value.
(b) Risk-based cleanup levels are calculated for the risk-based COCs identified from the HHRA.
(c) The EPA health advisory is used in lieu of an enforceable standard.

2.9 DESCRIPTION OF ALTERNATIVES

To address potentially unacceptable human health risks associated with soil and groundwater at DU 5-1, a **preliminary technology screening** evaluation was conducted in the FS. A number of treatment technologies and process options for soil and groundwater were initially screened based on their potential effectiveness, implementability, and cost, but most were eliminated based on the type and volume of contamination at the site.

The technologies and process options retained after the initial screening were assembled into various alternatives for soil and groundwater. Consistent with the NCP, the no action alternatives were evaluated as baselines for comparison with other alternatives during the comparative analysis. The remedial alternatives developed in the FS for soil and groundwater are presented in Sections 2.9.1 and 2.9.2, respectively.

2.9.1 Soil Alternatives

To address COCs in soil, a screening of General Response Actions, remedial technologies, and process options was conducted as part of the FS. The technologies and process options retained from the detailed screening were assembled into three remedial alternatives for soil at DU 5-1. Consistent with the NCP, the no action alternative was evaluated as a baseline for comparison with other alternatives during the comparative analysis. Table 2-6 summarizes the major components and provides estimated costs for each of the remedial alternatives developed for DU 5-1 soil.

Alternative SO2 and SO3 could be implemented within 2 years of signing the ROD and would attain the RAOs pertaining to soil upon implementation. The RD and preparation of the construction work plan, LUC RD, and long-term monitoring (LTM)/management plan would be completed within the first year of signing the ROD, and construction activities would be expected to require several months after that.

2.9.2 Groundwater Alternatives

To address COCs in groundwater, a screening of General Response Actions, remedial technologies, and process options was conducted as part of the FS. The technologies and process options retained from the detailed screening were assembled into three remedial alternatives for groundwater at DU 5-1. Consistent with the NCP, the no action alternative was evaluated as a baseline for comparison with other alternatives during the comparative analysis. Table 2-7 summarizes the major components and provides estimated costs for each of the remedial alternatives developed for DU 5-1 groundwater.

TABLE 2-7. SUMMARY OF REMEDIAL ALTERNATIVES EVALUATED FOR SOIL				
ALTERNATIVE	**COMPONENTS**	**DETAILS**	**COST**	**TIME TO CLEANUP**
No Action (Alternative SO1)	None	No further actions would be taken. Five-year reviews of the no action decision would be required.	**Capital**: $0 **O&M**: $0 **5-Year Reviews**: $0** **Total 30-Year NPW**: $0	NA
Land Use Controls and Inspections, Long-Term Groundwater Monitoring, and Fencing and Signs. (Alternative SO2)	LUCs and Inspections	The intent of LUCs is to ensure that land uses (industrial and restricted recreational) do not change and to ensure that contact with COCs at concentrations that would cause an unacceptable risk under more intensive uses is prevented for the life of the remedy. LUCs will also provide controls for adequate protection to workers who may conduct excavations at the site. LUCs would cover the area where COCs remain in soil at levels exceeding residential cleanup levels. Periodic inspections of the site would be conducted to verify continued compliance with and effectiveness of the LUCs.	**Capital**: $64,349 **O&M**: $17,631 annually **5-Year Reviews**: $25,300** every 5 years **Total 30-Year NPW**: $568,099	1 Year
	Groundwater Monitoring	Groundwater monitoring would be conducted under this alternative to ensure that contaminants are not migrating. Specifically monitoring will be conducted to assure, that the COCs (arsenic and manganese) remaining in soil at concentrations exceeding cleanup levels are not leaching to groundwater at concentrations above federal drinking water standards and then migrating to downgradient surface water bodies.		
	Fencing and Signs	Fencing would restrict human access to areas where contaminants are present in excess of cleanup levels for industrial use in surface soil. Although access to TF5 is currently partially restricted by gates and fencing and DU 5-1 is bounded on the northern, western, and southern sides by a fence, additional fencing would be installed to secure the eastern boundary. Signage would consist of warning signs that would alert possible entrants to the presence of contaminated soil and to dig restrictions. Fencing and signage requirements and maintenance would be documented in the LUC Remedial Design (RD) prepared by the Navy.		
	Five-Year Reviews	Five-year reviews would be conducted by the Navy, EPA, and RIDEM until site conditions were restored to allow for unrestricted use and unlimited exposure.		

TABLE 2-7. SUMMARY OF REMEDIAL ALTERNATIVES EVALUATED FOR SOIL (CONT.)				
ALTERNATIVE	COMPONENTS	DETAILS	COST	TIME TO CLEANUP
Soil Containment/ Permeable Cover, LUCs and Inspections, Long-Term Groundwater Monitoring, and Signs (Alternative SO3)	Soil Cover	Surface soil with concentrations of arsenic exceeding industrial cleanup levels would be covered with a permeable soil cover constructed in accordance with requirements identified in RIDEM remediation regulations (Section 12.04). Approximately 1 acre of soil will be covered with a permeable soil cover. Subsurface soil with arsenic and manganese concentrations exceeding industrial cleanup levels are already covered by surface soil with arsenic concentrations less than cleanup levels. A design step to better delineate the extent of surface soils to be covered would include additional surface soil sampling for arsenic and manganese on a grid surrounding the former pipeline where cleanup levels were exceeded. The cover would be between 6 inches and 2 feet thick, depending on arsenic concentrations present. In accordance with RIDEM regulations, the area of the site with arsenic concentrations above 43 mg/kg would receive a cover 2 feet thick and the area of the site with arsenic concentrations above the cleanup level of 17 mg/kg but below 43 mg/kg would receive a cover 6 inches thick. The permeable soil cover would be seeded with a non-invasive grass seed mix. The area is anticipated to require little maintenance under the current and planned future use, other than to prevent disturbance of the soil cover by uncontrolled digging and construction.	**Capital**: $483,871 **O&M**: $17,631 annually **5-Year Reviews**: $25, 300** every 5 years **Total 30-Year NPW**: $987,621	1 Year
	LUCs and Inspections	The intent of LUCs is to ensure that land uses (industrial and restricted recreational) do not change and to ensure that contact with COCs at concentrations that would cause an unacceptable risk under more intensive uses is prevented for the life of the remedy. LUCs will also provide controls for adequate protection to workers who may conduct excavations at the site. Periodic inspections of the site would be conducted to verify that surface soil is not disturbed where industrial remediation goals are exceeded in subsurface soil and to assure continued compliance with and effectiveness of the LUCs.		
	Groundwater Monitoring	Same as Alternative SO2.		
	Five-Year Reviews	Same as Alternative SO2.		

**** Five-year reviews at this DU are a component of Newport facility-wide five-year reviews.**

TABLE 2-8. SUMMARY OF REMEDIAL ALTERNATIVES EVALUATED FOR GROUNDWATER

ALTERNATIVE	COMPONENTS	DETAILS	COST	TIME TO CLEANUP
No Action (Alternative GW1)	None	No further actions would be taken. Five-year reviews of the no action decision would be required.	**Capital**: $0 **O&M**: $0 **5-Year Reviews:** $0* **Total 30-Year NPW**: $0	NA
MNA, LUCs, and Inspections (Alternative GW 2)	MNA	Natural attenuation would rely on naturally occurring processes in the aquifer to reduce the toxicity, and mobility of COCs (arsenic, cobalt, iron and manganese) in groundwater. To demonstrate the effectiveness and provide documentation of such attenuation, a quarterly groundwater quality monitoring program would be implemented for the first 2 years to define seasonal trends, if any. After a trend in groundwater quality has been established, the Navy would request a change in monitoring frequency to an annual program. This program would allow confirmation of continued reduction in concentrations of COCs. MNA planning documents would be prepared with regulatory input to support implementation of the MNA program. Modeling has estimated the timeframe for MNA to be between 11 year and 23 years.	**Capital**: $61,963 **O&M**: $83,064 (Years 1 and 2) $20,766 (Years 3 to 30) **Annual Costs (Inspections):** $2,585 **5-Year Reviews:** $25, 300 every 5 years* **Present Worth**: $873,385	11 to 23 years
	LUCs and Inspections	LUCs would be implemented to control exposure to COCs in groundwater and to protect human health during the interim period until cleanup goals have been achieved in groundwater. Groundwater LUCs would prohibit installation of groundwater supply wells, including public and private drinking water wells and residential irrigation wells, and would prohibit any use of groundwater for drinking water purposes. Regular site inspections would be performed to verify continued implementation of LUCs until groundwater RGs have been achieved.		
	Five-Year Reviews	Five-year reviews would be conducted by the Navy, EPA, and RIDEM until site conditions were restored to allow for unrestricted use and unlimited exposure.		

TABLE 2-8. SUMMARY OF REMEDIAL ALTERNATIVES EVALUATED FOR GROUNDWATER (CONT.)				
ALTERNATIVE	COMPONENTS	DETAILS	COST	TIME TO CLEANUP
In-Situ Groundwater Treatment, Long-Term Groundwater Monitoring, and LUCs and Inspections (Alternative G W3)	In-Situ Treatment	An in-situ treatment process that encourages growth of sulfate reducing bacteria would be implemented to create a condition that will cause metals in groundwater to precipitate out of groundwater and become sequestered in the soil and bedrock and subsequently reduce concentrations of metals present in groundwater. Final treatment parameters would be determined based on a pilot study conducted during the design phase, but for costing purposes, it was assumed that treatment would involve precipitation of mobilized metals into insoluble metal sulfides via injection of a solution containing sulfate-reducing bacteria and appropriate nutrients into the subsurface in selected target treatment zones.	**Capital**: $1,276,775 **O&M**: $172,950(Yr 1) $172,950 (Yrs 2 & 3) $23,558 (Yrs 4 and after) **5-Year Reviews**: $23,500/5-years **Total 30-Year NPW**: $2,160,160	4+ Years
	Long-Term Monitoring (LTM)	Initial monitoring is required to determine a baseline, and monitoring during treatment to confirm response and manage injections is also necessary. After COC concentrations are below cleanup levels via the in-situ treatment described above (time-frame estimated at 4+ years), continued quarterly monitoring for 1 additional year would be required to identify any rebound of COCs in groundwater, then annual monitoring may be appropriate for the long term to verify that concentrations remain less than cleanup levels (estimated at 24 years). Long-term monitoring plans would be required to support implementation of the monitoring program during and after the treatment process.		
	LUCs and Inspections	Same as Alternative GW2.		
	Five-Year Reviews	Same as Alternative GW2.		

*** Five-year Reviews at this DU are a component of the Newport facility five-year reviews.**

Under Alternative GW2 and GW3, the RAO to prevent the use of site groundwater for human consumption would be achieved immediately upon implementation of LUCs. Both alternatives would attain the RAO of restoring groundwater quality to its beneficial use after COC concentrations reach cleanup goals through treatment or natural attenuation. The FS estimated that cleanup levels would be achieved in 11 to 23 years for GW2 and more than 4 years for GW3 (although it could take longer to permanently achieve cleanup levels based on implementability issues with the alternative). Groundwater currently is not used as a drinking water source, and there are no plans for such a use in the foreseeable future.

2.10 Comparative Analysis of Alternatives

Tables 2-10 and 2-11 and subsequent text in this section summarize the comparison of the remedial alternatives with respect to the **nine CERCLA evaluation criteria** outlined in the NCP at 40 CFR 300.430(e)(9)(iii) and categorized as threshold, primary balancing, and modifying criteria. Further information on the detailed comparison of remedial alternatives is presented in the Site FS.

2.10.1 Comparative Analysis of Soil Alternatives

Table 2-9 and subsequent text summarize the comparison of the soil remedial alternatives with respect to the **nine CERCLA evaluation criteria** outlined in the NCP at 40 CFR 300.430(e)(9)(iii) and categorized as threshold, primary balancing, and modifying criteria. Further information on the detailed comparison of remedial alternatives is presented in the FS.

Table 2-9. Summary of Comparative Analysis of Soil Alternatives

	Alternative SO1	Alternative SO2	Alternative SO3
ALTERNATIVE DESCRIPTION/COMPONENTS			
Evaluation Criterion	No Further Action	Land Use Controls and Inspections, Long-term Groundwater Monitoring, and Fencing and Signs.	Soil Containment / Permeable Cover, LUCs and Inspections, Long-term Groundwater Monitoring, and Signs
ESTIMATED TIME FRAME FOR CLEANUP (YEARS)			
Time to achieve cleanup goals	NA	1	1
***CRITERIA ANALYSIS:* Threshold Criteria – Selected alternative must meet these criteria**			
Overall Protection of Human Health	⃠	●	●
Compliance with ARARs	⃠	⃠	●
Primary Balancing Criteria – Used to differentiate between alternatives meeting threshold criteria			
Long-Term Effectiveness and Permanence	⃠	○	●
Reduction of Mobility, Toxicity, and Volume of Contaminants Through Treatment	⃠	⃠	⃠
Short-Term Effectiveness	⃠	○	○
Implementability	●	●	●
Costs[(a)(b)] Capital Costs O&M Costs Total Present Worth Cost	 $0 $0 $0	 $64,349 $503,750 $568,099	 $483,871 $503,750 $987,621
Modifying Criteria – May be used to modify recommended cleanup			
State Agency Acceptance	⃠	⃠	●
Community Acceptance	Not Applicable	Not Applicable	●

● Complies ○ Partially Complies ⃠ Does Not Comply

a For purposes of cost estimation, all O&M costs represent 30-year time frames only. Actual total costs may be higher.
b The five-year reviews at this DU are a component of the Newport facility five-year reviews.

2.10.1.1 Threshold Criteria

Overall Protection of Human Health and the Environment. The no action alternative, Alternative SO1, would not achieve the RAOs and therefore does not protect human health and the environment. Alternative SO3 would be the most effective at protecting human health and the environment because all soils exceeding cleanup levels would be isolated under at least six inches of clean soil cover. Alternative SO2 is less protective because it would rely only on institutional controls and fencing/signs to ensure that risk is reduced adequately. Both Alternatives SO3 and SO2 would prevent risk as long as the institutional controls are managed properly and restrictions are adhered to for as long as the soil COC concentrations exceed cleanup levels.

Alternative SO3 is the only alternative that places a physical barrier over the surface of the soil to prevent exposure. Both Alternatives SO2 and SO3 would include LUCs that provide protection by preventing exposure to contaminated soil remaining on site, and both alternatives include long-term groundwater monitoring.

Compliance with ARARs. ARARs include any federal or state standards, requirements, criteria, or limitations determined to be legally applicable or relevant and appropriate to the site or remedial action. Alternative SO3 meets chemical-specific, location-specific, and action-specific ARARs. The Navy has also determined that SO3 is the "Least Environmentally Damaging Practicable Alternative" under the Federal Clean Water Act. Alternative SO1 would not comply with ARARs because it does not prevent exposure to contaminated soil containing COCs at concentrations exceeding cleanup levels. Alternative SO2 would not meet chemical – specific ARARs.

2.10.1.2 Primary Balancing Criteria

Long-Term Effectiveness and Permanence. Alternative SO3 would have the greatest long-term effectiveness due to the presence of the soil cover. However, neither Alternatives SO2 nor SO3 are truly permanent because they rely on LUCs to restrict future use. Alternative SO1 would not be effective or provide permanent protection from contaminants.

Reduction in Toxicity, Mobility, or Volume Through Treatment. None of the soil alternatives involve reductions in the toxicity, mobility, or volume of contaminants through treatment.

Short-Term Effectiveness. Alternative SO1 would not involve any major construction activities that would expose construction workers, the surrounding community, and the environment to COC exposure; however, Alterative SO1 would not meet the RAOs. Alternative SO2 and SO3 would be effective in the short term because both alternatives would result in the short-term isolation of contaminants in soil in excess of cleanup levels. SO2 involves less interaction with the contaminated material and could be implemented.

Implementability. Alternative SO1 would be the easiest to implement because no action is required; however, it is not implementable in an administrative sense because it does not achieve the threshold criteria of protection of human health and the environment or achieving ARARs. Alternative SO2 would be more easily implemented than Alternative SO3 because of SO3 cover construction activities.

Cost. The estimated, 30-year, present worth cost is greatest for Alternative SO3 at $987,621and least for Alternative SO1 (no cost). The estimated, 30-year present worth for Alternative SO2 is $568,099.

2.10.1.3 Modifying Criteria

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

Community Acceptance. The public was notified of a formal public comment period, as described in Section 2.3, and was encouraged to participate in the process. No written comments were received during the formal public comment period (November 20 to December 20, 2013) for the Proposed Plan. The questions posed at the public meeting (informal session) on November 20, 2013, were general inquiries for informational purposes and were addressed at the public meeting. The formal public hearing, at which attendees were asked to state their comments for the record, took place immediately after the public meeting on November 20, 2013. These formal comments/questions and the Navy responses are summarized in Section 3.0. Oral comments were made by three people during the public hearing and were generally in support of the selected soil remedy. The transcript of the public hearing is provided in the Administrative Record for DU 5-1.

2.10.2 Comparative Analysis of Groundwater Alternatives

Table 2-10 and subsequent text in this section summarize the comparison of groundwater remedial alternatives with respect to the nine CERCLA evaluation criteria and categorized as threshold, primary balancing, and modifying criteria. Further information on the detailed comparison of remedial alternatives is presented in the FS.

Table 2-10. Summary of Comparative Analysis of Groundwater Alternatives

	Alternative GW1	Alternative GW2	Alternative GW3
ALTERNATIVE DESCRIPTION/COMPONENTS			
Evaluation Criterion	No Action	MNA, LUCs and Inspections	In-Situ Groundwater Treatment, Long-Term Groundwater Monitoring, and LUCs and Inspections
ESTIMATED TIME FRAME FOR CLEANUP (YEARS)			
Time to achieve cleanup goals	NA	11-23 years	4+ years
***CRITERIA ANALYSIS:* Threshold Criteria – Selected alternative must meet these criteria**			
Overall Protection of Human Health	⦸	●	●
Compliance with ARARs	⦸	●	●
Primary Balancing Criteria – Used to differentiate between alternatives meeting threshold criteria			
Long-Term Effectiveness and Permanence	⦸	○	○
Reduction of Mobility, Toxicity, and Volume of Contaminants through Treatment	⦸	⦸	●
Short-Term Effectiveness	⦸	○	○
Implementability	●	●	○
Costs (see footnotes a and b) Capital Costs (initial costs) O&M Costs (total 30-year) Total Present Worth Cost (total cost in today's dollars)	$0 $0 See soil alternatives	$62,000 $811,000 $873,000	$1,277,000 $883,000 $2,160,000

TABLE 2-10. SUMMARY OF COMPARATIVE ANALYSIS OF GROUNDWATER ALTERNATIVES (CONT.)			
	Alternative GW1	Alternative GW2	Alternative GW3
Modifying Criteria – May be used to modify recommended cleanup			
State Agency Acceptance	⦸	●	●
Community Acceptance	Not Applicable	●	Not Applicable

● Complies ○ Partially Complies ⦸ Does Not Comply

a For purposes of cost estimation, all O&M costs represent 30-year time frames only. Actual total costs may be higher.
b The five-year reviews at this DU are a component of the Newport facility five-year reviews.

2.10.2.1 Threshold Criteria

Overall Protection of Human Health and the Environment. Alternative GW2 will be protective of human health and the environment. Under this alternative, the levels of dissolved metals in the aquifer are expected to attenuate as the attenuation of petroleum at or upgradient of the site concludes and the natural geochemistry of the aquifer is restored. Until that time, LUCs would prevent exposure to groundwater. Alternative GW3 is expected to offer the same level of protection to human health and the environment but on a quicker timescale than GW2.

Under Alternative GW2 and GW3, the RAO to prevent the use of site groundwater for residential purposes would be achieved immediately upon implementation of LUCs. Both alternatives would attain the RAO to restore groundwater quality to its beneficial use when COC concentrations reach the cleanup levels through natural attenuation or treatment. Use of GW2 would allow natural processes to reduce the COC concentrations to below the cleanup levels, while GW3 would accomplish the same thing through detailed and somewhat elaborate treatment processes. Treatment processes can impact the groundwater at and downgradient of the site in other ways and these unexpected impacts can be problematic.

The FS estimated that cleanup levels would be achieved in 11 to 23 years for Alternative GW2 and 4 years or more for Alternative GW3, though there is uncertainty in the ability of GW3 to be effective in the long term due to potential contaminant rebound in the groundwater after termination of the treatment. Groundwater currently is not used as a drinking water source, and there are no plans for such a use in the foreseeable future. Therefore there is not a specific need for implementing treatment to reduce COC concentrations quickly as would be the primary benefit of implementation of GW3.

Alternative GW1 could become protective of human health and the environment if natural attenuation reduced COC concentrations to less than cleanup levels; however, there would be no monitoring to verify this. Additionally, there would be no controls in place in the short term to prevent residential use of groundwater prior to reaching the cleanup levels.

Compliance with ARARs. ARARs include any federal or state standards, requirements, criteria, or limitations determined to be legally applicable or relevant and appropriate to the site or remedial action. Alternatives GW2 and GW3 would both comply with location- and action-specific ARARs and TBCs to the same general degree.

Regulatory standards are currently met in groundwater. The Health Advisory for manganese is not met under the current condition, it is expected that it will be met over time after the attenuation of petroleum is completed and the redox conditions in the aquifer subside. This attenuation would be predicted and documented in Alternative GW2. It could be met under Alternative GW1, but the achievement would not be known since no monitoring would be conducted. Under Alternative GW3, treatment operations would artificially reduce manganese concentrations within the DU, but that may only be effective while the treatment system is operating.

2.10.2.2 Primary Balancing Criteria

Long-Term Effectiveness and Permanence. Alternative GW2 would provide effectiveness and permanence through LUCs and natural attenuation. Alternative GW1 would not be effective or prevent exposure to groundwater COCs.

The second RAO for groundwater, returning the aquifer to its designated beneficial use as a drinking water source, would be achieved under Alternative GW2 after an estimated maximum of 23 years (for overburden groundwater) and after 4 years under Alternative GW3, although there is uncertainty in the permanence of results from Alternative GW3, and additional treatment beyond that already identified in this FS may be required under this alternative.

Reduction in Toxicity, Mobility, or Volume Through Treatment. Neither Alternative GW1 nor GW2 provides reduction of toxicity, mobility, or volume of waste through treatment because no active treatment would be conducted. Reductions in COC mobility and toxicity in groundwater through natural attenuation is anticipated over the long term; however, under Alternative GW1, this reduction would not be verified or quantified. Alternative GW3 would reduce the toxicity, and mobility of COCs through in-situ bioprecipitation, more rapidly, as the conditions to precipitate the metals would be augmented by the treatment.

Short-Term Effectiveness. Implementation of Alternative GW1 would not result in risks to site workers or adversely impact the surrounding community or environment because no remedial activities would be performed.

Alternatives GW2 and GW3 would achieve the first groundwater RAO immediately upon implementation of LUCs. The second RAO for groundwater would be achieved after an estimated maximum of 23 years under Alternative GW2, and after an estimated 4 years under Alternative GW3. There is uncertainty in the permanence of Alternative GW3 because additional treatment beyond that already identified in the FS may be required under this alternative, based on actual behavior of the site geochemistry over time.

Implementability. Alternative GW1 would be easiest to implement in a technical sense because no action would be conducted.

Alternative GW2 would be easily implemented because it would include minimal, if any, construction effort (e.g., potential new monitoring wells) and because of the relative simplicity and ease of conducting an LTM program. Administrative, management, and operational issues, and coordination with other agencies or acquiring permits under this alternative are also easily achievable. Future remedial actions would not be hindered by this alternative.

Alternative GW3 would be difficult to implement because there is no documented groundwater plume that can be targeted for treatment. It is assumed that further study would be required if this alternative were to be implemented to map groundwater flow and geochemical conditions at the site so that the treatment system can be properly designed and constructed for optimum operation.

Cost. The estimated, 30-year, present worth cost for Alternative GW2 is $873,385. The estimated, 30-year present worth cost for Alternative GW3 is more expensive, at $2,160,160.

2.10.2.3 Modifying Criteria

State Acceptance. State involvement has been solicited throughout the CERCLA process. RIDEM concurs with the Selected Remedy. RIDEM's concurrence letter is presented in Appendix A.

Community Acceptance. The public was notified of a formal public comment period, as described in Section 2.3, and was encouraged to participate in the process. No written comment letters were received during the formal public comment period (November 20 to December 20, 2013) for the Proposed Plan. The questions posed at the public meeting (informal session) on November 20, 2013 were general inquiries for informational purposes and were addressed at the public meeting. The formal public hearing, at which attendees were asked to state their comments for the record, took place immediately after the public meeting on November 20, 2013. These formal comments/questions and the Navy responses are summarized in Section 3.0. Oral/written comments were made by three people during the public comment period and were generally in support of the selected groundwater remedy. No objections to the proposed remedial alternative were voiced. The transcript of the public hearing is provided in the Administrative Record for the Site.

2.11 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 a significant risk to human health or the environment should exposure occur. A source material is a material that includes or contains hazardous substances, pollutants, or contaminants that act as a reservoir for migration of contamination to groundwater, surface water, or air, or acts as a source for direct exposure. At DU 5-1, the contaminant concentrations are not highly toxic or highly mobile; therefore, principal threat wastes are not present at the site.

2.12 SELECTED REMEDY

2.12.1 Rationale for Selected Remedy

The Selected Remedy for DU 5-1 is a combination of soil Alternative SO3 and groundwater Alternative GW2 and includes a soil cover, MNA of groundwater, LTM of groundwater, inspections, and LUCs. This combination of alternatives was selected because it provides the best balance with respect to the nine evaluation criteria and will allow for continued industrial use of the property.

The principal factors in the selection of this remedy included the following:

- Alternative SO3 provides a reasonable maximum protectiveness, given the current and anticipated future industrial use. The soil cover provides a better level of permanence than isolation with a fence (Alternative SO2). LUCs and groundwater monitoring will provide continued protection of human health and the environment by ensuring protection of workers conducting excavations, and that the property is not used for residential or unrestricted recreational purposes. Alternative SO3 is preferred because it is the most permanently protective option for addressing the current and potential future risks posed by the COCs and is consistent with the continued industrial/restricted recreational use of the site

- Alternative GW2 relies on MNA, which includes a long-term groundwater monitoring program to verify that natural attenuation processes are effectively reducing metals concentrations to the natural steady-state conditions. Alternative GW2 offers adequate protection and appropriate controls for the COCs that show relatively low toxicity at the concentrations measured, and it does not require elaborate manipulation of the site geochemistry through treatment, rather using the natural degradation process to be completed. Data typically required for an MNA remedy, showing a decreasing trend in contaminant concentrations has not been collected for this Site, however, MNA could be successful over time based on the evaluation of biodegradation parameters for this Site. While there is uncertainty in the amount of time required, there are currently no downgradient receptors at risk and no plans for use of the groundwater at the site. The time required will be re-evaluated at each five-year cycle to ensure improvement of the groundwater conditions through MNA and that the remedy remains protective. The Navy will seek a change to the remedy for groundwater at the site if MNA proves to be ineffective. The five-year review will assess whether adequate reductions in concentrations of COCs are evident based on monitoring data.

- Implementing LUCs will also ensure the continued protection of human health and the environment by prohibiting future use scenarios associated with unacceptable risks posed by soil (residential and unrestricted recreational uses) and by establishing requirements for current exposures to potential construction workers and hunters.

In accordance with Section 404 of the Clean Water Act, the Navy has determined that the Selected Remedy is the Least Environmentally Damaging Practicable Alternative to protect wetland resources because it provides the best balance of addressing contaminated soil within and adjacent to wetlands and waterways while minimizing both temporary and permanent alteration of wetlands and aquatic habitats on site.

2.12.2 Description of Selected Remedy

The following sections provide a detailed description of the selected remedy for soil and groundwater.

2.12.2.1 Description of Selected Soil Remedy

The Selected Soil Remedy, SO3, includes the following components, described below:

- Soil cover
- LUCs
- Monitoring

Alternative SO3 would render the site suitable for the planned continued industrial and restricted recreational use.

Soil Cover

Soil containing concentrations of arsenic at levels that exceed cleanup levels within the surface soil (0-2 feet) would be covered with a permeable soil cover (either 2 feet or 6 inches depending on arsenic concentrations in that area). Subsurface soils with manganese exceeding cleanup levels for industrial use are already covered by soil below the manganese cleanup levels. The cover would be approximately 2 feet thick in areas where arsenic levels in surface soil are greater than 43 mg/kg, and 6 inches where arsenic levels in surface soil are between 17 and 43 mg/kg. A design step to better delineate the extent of surface soils to be covered would include additional surface soil sampling for arsenic and manganese on a grid surrounding the former pipeline where cleanup levels were exceeded. The 2 foot cover would be comprised of one foot of compactable fill, six inches of sand, and six inches of topsoil seeded with a non-invasive grass seed mix, and the 6 inch cover would be comprised of 6 inches of topsoil seeded with a non-invasive grass mix. This cover system is based on RIDEM Remediation Regulations, Section 12.04 (RIDEM, 2011).

Monitoring

Groundwater monitoring will be conducted to ensure that COCs (arsenic and manganese) remaining in soil at concentrations exceeding cleanup levels are not leaching into groundwater.

LUCs and Five-Year Reviews

See Sections 2.12.2.3 and 2.12.2.4.

2.12.2.2 Description of Selected Groundwater Remedy

The Selected Groundwater Remedy Alternative GW2 includes the following components, described below:

- MNA
- LUCs to prevent residential uses of the groundwater and inspections to confirm LUCs are in place and effective until groundwater cleanup standards are achieved.
- Five-Year Reviews

Monitored Natural Attenuation

This remedy has been developed based on past releases of petroleum to the subsurface at and upgradient of DU 5-1 that are indirectly causing elevated concentrations of metals in groundwater. As the petroleum is degraded through natural bacterial action, a side effect is the creation of oxidation-reduction conditions in those release areas which liberates some metals from their natural sequestration in soil and rock. Based on these conditions, the degradation of petroleum is providing a geochemical condition that promotes greater than normal concentrations of metals (particularly manganese and iron) in groundwater at the site.

MNA will be implemented in accordance with the OSWER Directive, Use of Monitored Natural Attenuation at Superfund, RCRA Corrective Action, and Underground Storage Tank Sites, and other MNA guidance documents (USEPA, 1999). Natural attenuation will rely on naturally occurring processes within the aquifer to reduce the mass, toxicity, volume, or concentration of COCs in groundwater.

Based on site assessments, it is expected that elevated concentrations of metals (manganese, iron, and cobalt) that exceed cleanup levels are present as an indirect result of the biodegradation of petroleum at or upgradient of DU 5-1. Although arsenic contributes to unacceptable risk to the residential receptor, concentrations in groundwater are less than the MCL.

It is expected that as the petroleum biodegradation concludes, much of these dissolved metals will come out of solution and become immobilized in their particulate form. Such attenuation can occur through sequestration by precipitation or adsorption under favorable geochemical conditions to immobilized and/or occluded forms that are inaccessible to persons, even during residential use of groundwater.

To demonstrate the effectiveness of natural attenuation, a quarterly groundwater quality monitoring program will be implemented for the first 2 years to define seasonal trends, if any. After a trend in groundwater quality has been established, the Navy will request from EPA and RIDEM a change in monitoring frequency for review and approval to document continued decreases in the concentrations of COCs. This monitoring data will support the five-year review documentation and LUCs. The five-year review will evaluate the monitoring data to: (1) evaluate whether MNA is continuing, (2) to determine whether cleanup levels continue to be exceeded, and (3) to determine whether continuation of the LUCs and monitoring program is appropriate based on site geochemical conditions. **The time frame for this process is currently estimated at 11 to 23 years** based on a predicted rate for three volumes of groundwater to fully flow through the site's saturated zone. It is also assumed that groundwater monitoring stations will be established to document 1) whether the groundwater conditions at Tank Farm 5 remain favorable for MNA, 2) that a trend indicating the success of MNA is established and ensured, and 3) that MNA remains the most viable groundwater remediation alternative for DU 5-1. Based on results and trends documented in the Five-Year Review Report, the monitoring frequency could be modified, the monitoring network could be adjusted or expanded, or the remedy could be reconsidered.

A LTM plan and MNA SAP will be prepared to identify the wells to be sampled, analyses to be performed, and need for any new monitoring wells. For planning and costing purposes, it is anticipated that eight groundwater monitoring wells (4 existing wells and 4 newly installed wells) will be required for the monitoring program (Figure 2-7). Each monitoring event will include measurement of MNA parameters including: dissolved oxygen, oxidation-reduction potential, conductivity, ferrous iron, pH, hydrogen sulfide, sulfate, nitrite, nitrate, and the concentrations of the COCs (total and dissolved arsenic, manganese, iron, and cobalt). Other MNA parameters (i.e. total organic carbon, ammonia, methane ethane, orthophosphate, etc.) will be identified during the development of the SAP and included in the program as appropriate.

LUCs and Inspections

LUCs will be established to assure that the site and the site groundwater are not used for residential purposes. LUCs will be augmented by periodic inspections. A full description of LUCs is provided in Section 2.12.2.3 below.

Five-Year Reviews

Five-year reviews are required for the site since COCs will remain after the remedy is complete. A full description of the Five Year Review process and requirements is provided in Section 2.12.2.4, below.

2.12.2.3 Description of Land Use Controls

As part of the selected remedy, the Navy will implement LUCs to prevent exposure to COCs in soil and groundwater and to protect human health during the interim time period until remedial actions have achieved RAOs across the site. LUCs will be maintained for as long as conditions at the site do not allow for unrestricted use and unlimited exposure. As depicted on Figures 2-6 and 2-7, the LUC boundary is the perimeter of DU 5-1. Consistent with the RAOs developed for the site, the specific performance objectives for the LUCs are as follows:

- Prevent use of groundwater at the property for any consumptive purpose, including for household use, drinking water supply, or residential irrigation. Non-consumptive industrial use of the groundwater is allowable because groundwater currently meets enforceable drinking water standards including MCLs and non-zero MCLGs.

- Prevent excavation or intrusive use of the ground, monitoring wells, and any other components of the remedy, without proper engineering controls to prevent uncontrolled exposure of soil COCs that are present in the subsurface soil.

- Prevent residential or unrestricted recreational use of the site; assure that at least two feet of clean surface soil (0-2 feet) remains undisturbed in areas where remaining subsurface soil exceeds industrial cleanup levels.

- Establish requirements and conduct LUC compliance inspections described elsewhere in this section.

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

The LUCs will be established and implemented in accordance with the post-ROD LUC RD that will be prepared by the Navy as the LUC component of the remedy. Within 90 days of ROD signature, the Navy shall prepare and submit, for EPA and RIDEM review and approval, a LUC RD that shall contain LUC implementation actions, including maintenance, monitoring, and enforcement requirements that are consistent with the requirements of this ROD. LUCs will be developed in accordance with the Principles and Procedures for Specifying, Monitoring, and Enforcement of Land Use Controls and Other Post-ROD Actions, 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. If the property is transferred from the Navy to another federal owner, upon meeting the requirements for transfers under the site's FFA, Navy would ensure as part of the transfer process that the gaining agency is made aware of the existing controls and would take appropriate action to ensure that such controls remain in place. If the property is ever transferred to non-federal ownership, deed restrictions, meeting state property law standards, would be recorded that would incorporate the land use restrictions required by this ROD. Although the Navy may transfer the procedural LUC responsibilities to another party by contract, property transfer agreement, or through other means, the Navy shall retain ultimate responsibility for remedy integrity. LUCs will be maintained until the concentrations of hazardous substances in the soil and groundwater are at levels that allow for unrestricted use and exposure.

2.12.2.4 Five-Year Reviews

Because this remedy will result in hazardous substances, pollutants, or contaminants remaining on site in excess of levels that allow for unlimited use and unrestricted exposure, in accordance with Section 121(c) of CERCLA and NCP §300.430(f)(5)(iii)(c), a statutory review will be conducted within 5 years of the initiation of remedial action, and every 5 years thereafter, to ensure that the remedy continues to be protective of human health and the environment. During such reviews, the Navy, EPA, and state will review site conditions and monitoring data to determine whether the Selected Remedy is appropriate. Five-year reviews will be conducted until DU 5-1 conditions are restored such that the site is suitable for unrestricted use and unlimited exposure in accordance with CERCLA.

2.12.3 Expected Outcomes of Selected Remedy

The current industrial and restricted recreational land use, which will be supported by the Selected Remedy, is expected to continue at DU 5-1, 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, and the Selected Remedy will have no impact on current or future groundwater uses available at the site. However, per EPA groundwater remediation guidance, in states without an EPA-approved CSGWPP such as Rhode Island, CERLCA groundwater remediation must meet federal MCLs and risk-based standards, unless the water is non-potable. 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 and between 11 to 23 years for groundwater. Table 2-10 describes how the Selected Remedy mitigates risk and achieves RAOs for DU 5-1.

Table 2-11. How Selected Remedy Mitigates Risk and Achieves RAOs

Risk	RAO	Comments
Direct exposure to and ingestion of contaminated soil	Prevent the ingestion of and dermal contact with soil containing COCs at concentrations exceeding human health cleanup levels.	The soil cover will prevent potential human exposure to COCs in surface and subsurface soil, and LUCs will prohibit disturbance of the soil cover and prohibit site uses associated with unacceptable risk.
	Prevent exposure of industrial and restricted recreational users to soils with COC concentrations exceeding cleanup levels.	
	Identify any potential future migration of soil contaminants either to groundwater or adjacent wetlands/waterways.	
	Prevent exposure of construction workers to soils with COC concentrations exceeding cleanup levels.	
Ingestion of contaminated groundwater as a drinking water source	Prevent residential use of groundwater until cleanup levels have been achieved.	LUCs will prevent the residential use of site groundwater until cleanup levels are achieved. Non consumptive industrial uses are allowable since groundwater meets MCLs, non-zero MCLGs and more stringent state standards.
	Restore groundwater quality to its beneficial use.	MNA of the groundwater will reduce COC concentrations to cleanup levels within the DU 5-1 boundary.

The current industrial and restricted recreational use of the site is expected to continue for the foreseeable future, and it is not expected that modification or removal of the LUCs will be required. However, if proposed land use changes in the future and uses other than industrial/commercial-type activities are expected, additional remedial approaches may be required. Any modifications to LUCs will be conducted in accordance with provisions in the DU 5-1 LUC RD, CERCLA, and the NCP.

2.13 STATUTORY DETERMINATIONS

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

- **Protection of Human Health and the Environment** – The Selected Remedy is needed to prevent the identified unacceptable risks to human health associated with potential exposure to COCs in site soil and groundwater under current and future land use scenarios. The Selected Remedy for soil will be protective of human health and the environment through prevention of exposure to the COCs remaining in soil by the installation of a soil cover. The Selected Remedy for groundwater will be protective of human health and the environment through the reduction of COC concentrations in site groundwater to achieve cleanup levels. The Selected Remedy includes LUCs that will ensure the long-term effectiveness of the soil remedy and that will prevent exposure to contaminated groundwater until conditions are suitable for unlimited use and unrestricted exposure.

- **Compliance with ARARs** – The Selected Remedy will attain all identified federal and state ARARs, presented in Appendix E.

- **Cost-Effectiveness** – The Selected Remedy is a cost-effective alternative that allows for continued industrial and restricted 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[1].

- **Utilization of Permanent Solutions and Alternative Treatment Technologies or Resource Recovery Technologies to the Maximum Extent Practicable** – The Selected Remedy will be an effective and permanent means of reducing COC concentrations in a practical manner. The Selected Remedy includes soil cover, MNA and LTM of the groundwater plume. The Selected Remedy for soil does not include treatment.

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

2.14 DOCUMENTATION OF SIGNIFICANT CHANGES

CERCLA Section 117(b) requires an explanation of significant changes from the Selected Remedy presented in the Proposed Plan that was published for public comment. No significant changes to the remedy, as originally identified in the Proposed Plan, were necessary or appropriate. Formal comments received during the public comment period and the associated responses are provided in Section 3.0, Responsiveness Summary.

[1] Cost estimates presented in Appendix B 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.

3.0 RESPONSIVENESS SUMMARY

3.1 STAKEHOLDER COMMENTS AND LEAD AGENCY RESPONSES

Participants in the public meeting (informal session) held on November 20, 2013, included RAB members and representatives of the Navy, EPA, and RIDEM. The questions raised at the public meeting were general inquiries for informational purposes and were addressed at the public meeting. A formal public hearing was held immediately following the public meeting. Oral comments received during the public hearing and written comments received during the public comment period are summarized in Table 3-1. The complete transcript of the public hearing is included in the Administrative Record for DU 5-1.

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

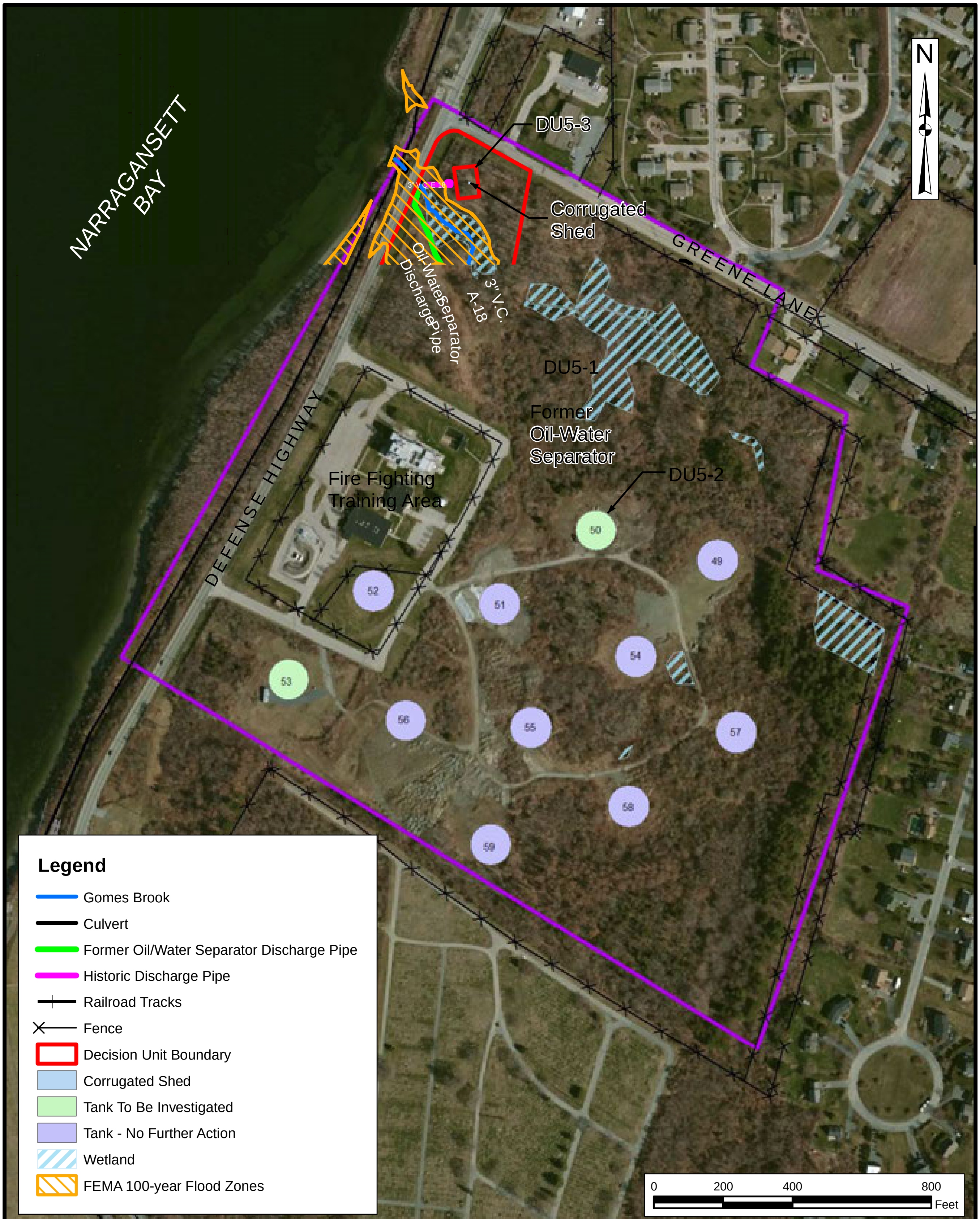
QUESTION/COMMENT	RESPONSE
Mr. David Brown, a Newport RAB member, commented that the SO3 remedy is a good start but the Navy should consider looking at the site as a small watershed/drainage area. Soil science and agronomics should be considered to evaluate types of vegetation needed so that cover materials don't collect in the wetland or get transported into the ocean. Thought should be put into which types of vegetation would work best to hold soil in place (i.e. prevent washout). Mr. Brown suggested input be sought from the USDA natural resources conservation.	Issues relating to the specifics of the cover materials are considered along with slope of the site, the sheet flow anticipated and the types of vegetation appropriate for soil cover. These considerations are typically accommodated in the remedial design process which is the next step after the Record Of Decision. The Navy will seek support from soil scientists as well as botanists for consideration of impacts to the wetland either directly or indirectly, and the design will provide assurances to protect from washout. The remedy includes provisions for inspections that will follow up over time to assure that the cover remains protective as designed and constructed.
Dr. Kathy Abbass, RAB member and Director of the Rhode Island Marine Archaeology Project, commented on the need to recognize the historical significance of the site although it has already been disturbed. Dr. Abbass doesn't think the remedy would impact these resources but wanted to note that the site was known as the Stoddard Property in the 18th century. Therefore, there is a possibility that historical materials are present in site soils and anyone conducting ground disturbing activities should keep an eye out for these materials. Dr. Abbass also noted that the Stoddard House foundation was not destroyed during the construction of the tank farm so it is potentially still present in the subsurface soil at the site.	A Stage 1A Cultural Resource Survey was conducted at this site within the last three years. However, the Navy will continue to look for any indication of culturally significant resources during construction activities.
Ms. Margaret Kirschner of Newport, Rhode Island commented that she appreciates the natural approach of using a soil cover and natural attenuation for groundwater. Ms. Kirschner expressed concern that the wetland and stream are bounded artificially by the site boundary and limits the wetland and stream from being viewed as a whole.	The observation is correct that the cover will terminate at the edge of the wetland. This is intended because the cover needs to prevent exposure to arsenic in soil though not the wetland sediment. This differentiation is made because risk is established for soil based on an expected rate of exposure to soil, whereas risk is not established for sediment for which there is a different (lower) expected rate of exposure.

3.2 TECHNICAL AND LEGAL ISSUES

No technical or legal issues associated with the DU 5-1 ROD were identified.

Figures

I:\02698\DD.ID.13\FINAL_ROD\TF5_ROD_SITEMAP_FIG1-3.MXD NEC/DWM 11/08/13



TETRA TECH

NAVAL STATION NEWPORT
MIDDLETOWN, RHODE ISLAND

SITE MAP

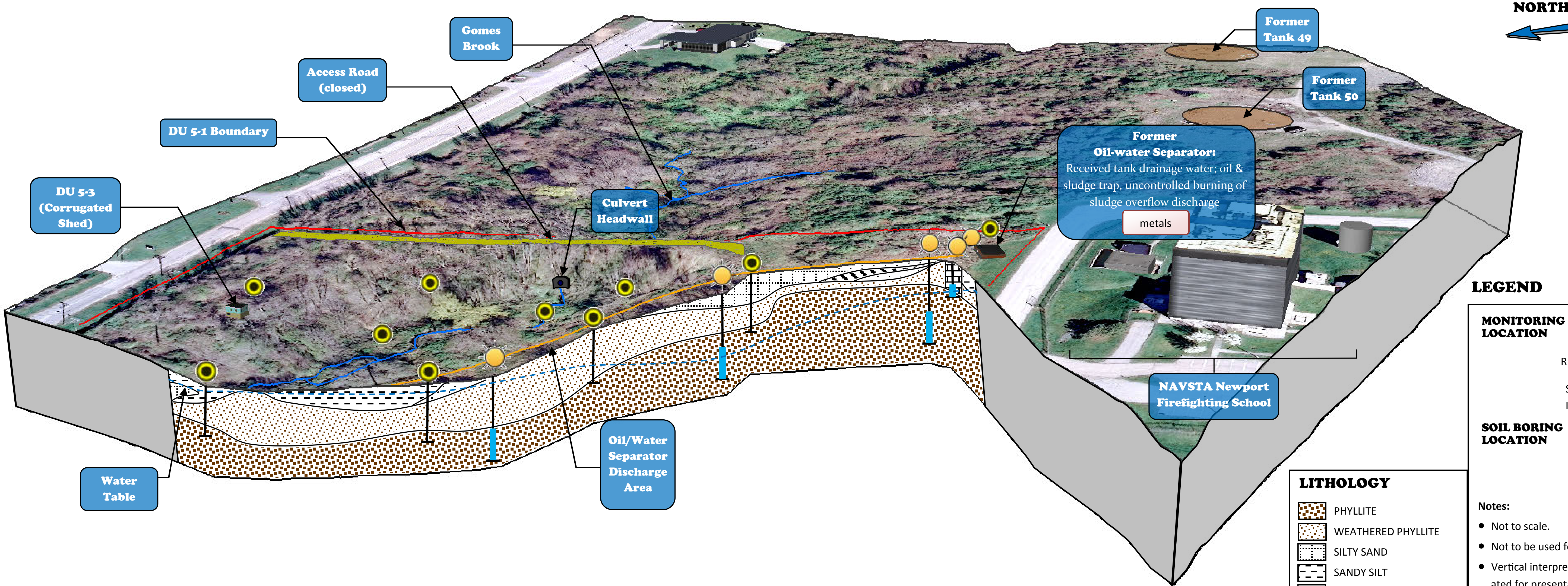
DU 5-1, SITE 13 - TANK FARM 5
RECORD OF DECISION

SCALE	PER SCALE BAR
FILE	I:\...\TF5_ROD_SITEMAP_FIG1-3.MXD
REV	0
DATE	11/08/13
FIGURE NUMBER	2-1

NAVAL STATION NEWPORT

SITE 13, TANK FARM 5, DECISION UNIT 5-1

NORTH



LEGEND

MONITORING WELL LOCATION

RISER PIPE

SCREENED INTERVAL

SOIL BORING LOCATION

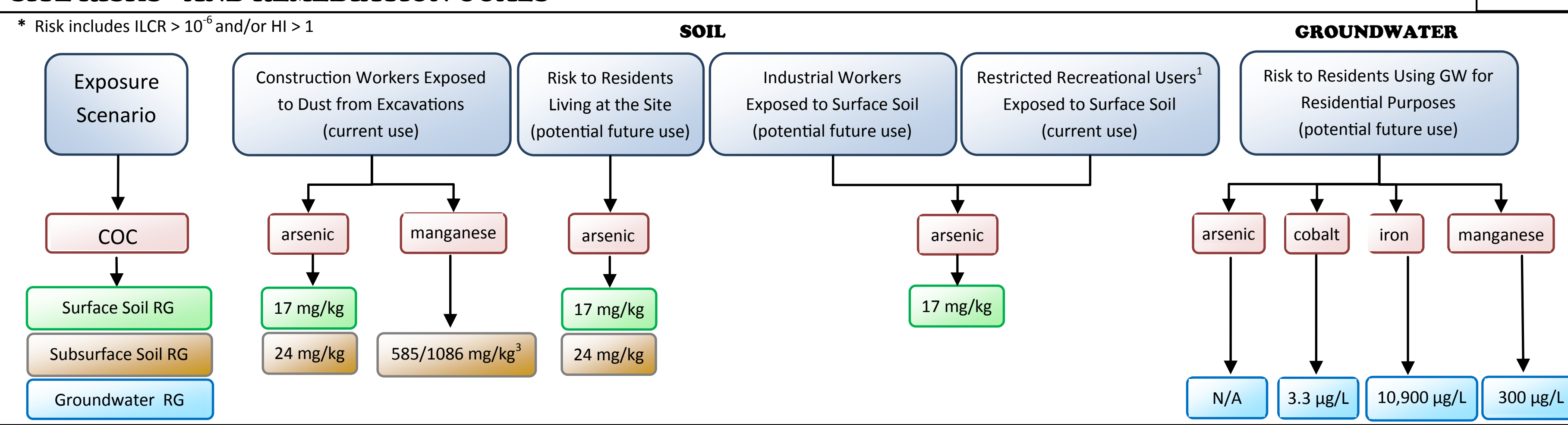
LITHOLOGY

- PHYLLITE
- WEATHERED PHYLLITE
- SILTY SAND
- SANDY SILT
- SAND
- SILTY SAND WITH GRAVEL
- FILL

Notes:

- Not to scale.
- Not to be used for design.
- Vertical interpretation is exaggerated for presentation.
- Lithology interpreted from Figure 1-6 of the Feasibility Study Report for DU 5-1.

SITE RISKS* AND REMEDIATION GOALS



Notes:

1. Restricted Recreational User exposure is similar to Industrial.
2. Federal Health Advisory.
3. RG adjusted based on manganese values for two soil types (Ne/Pm) for which background was calculated.

Acronyms

COC - Chemical of Concern

RG - Remediation Goal

N/A - Not Applicable, see ROD for details.

ILCR - Incremental Lifetime Cancer Risk

HI - Hazard Index

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Naval Station Newport
Middletown, Rhode Island

CONCEPTUAL SITE MODEL

Site 13, Tank Farm 5, DU 5-1
Record of Decision

File: O:\...Site 13\Category 1\ROD...	Scale: No Scale (perspective view)
Figure Number: 2-2	Date: 3/25/2013

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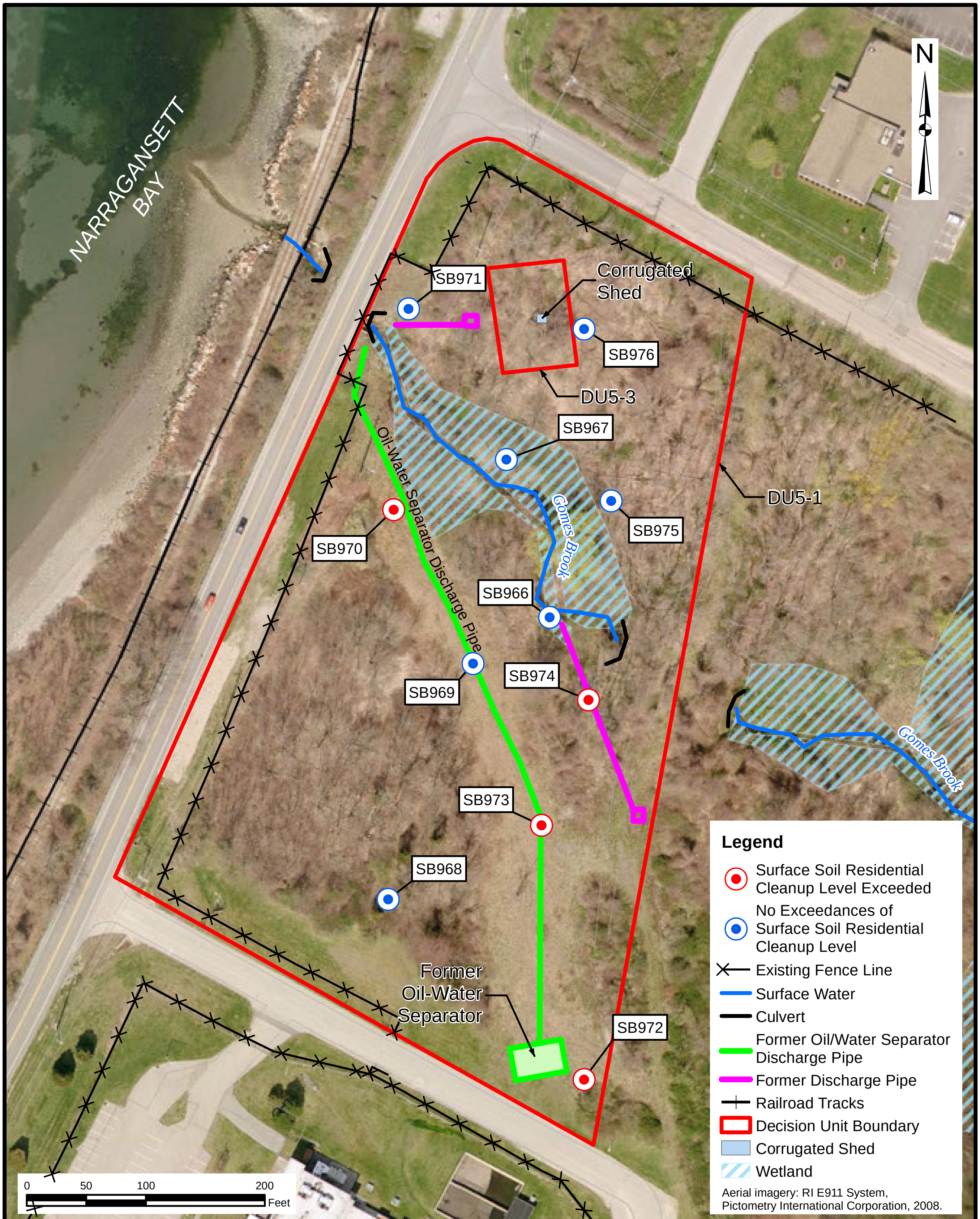

TETRA TECH

NAVAL STATION NEWPORT
MIDDLETOWN, RHODE ISLAND

EXCEEDANCES OF RESIDENTIAL CLEANUP LEVEL IN SURFACE SOIL

DECISION UNIT 5-1 - TANK FARM 5
RECORD OF DECISION

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FIGURE NUMBER	
2-3A	

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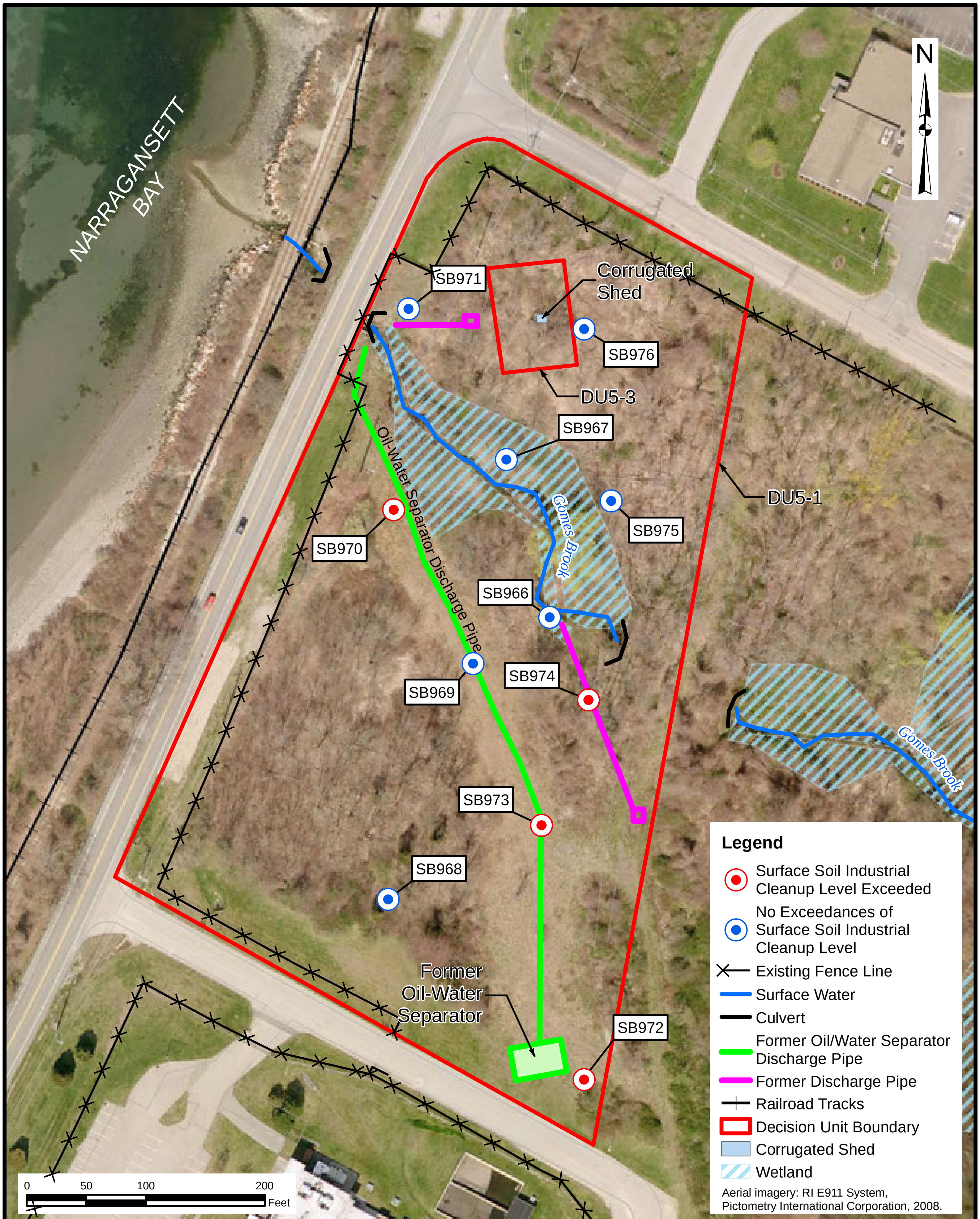

TETRA TECH

NAVAL STATION NEWPORT
MIDDLETOWN, RHODE ISLAND

EXCEEDANCES OF INDUSTRIAL CLEANUP LEVEL IN SURFACE SOIL

DECISION UNIT 5-1 - TANK FARM 5
RECORD OF DECISION

SCALE	
PER SCALE BAR	
FILE	
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REV	DATE
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FIGURE NUMBER	
2-3B	

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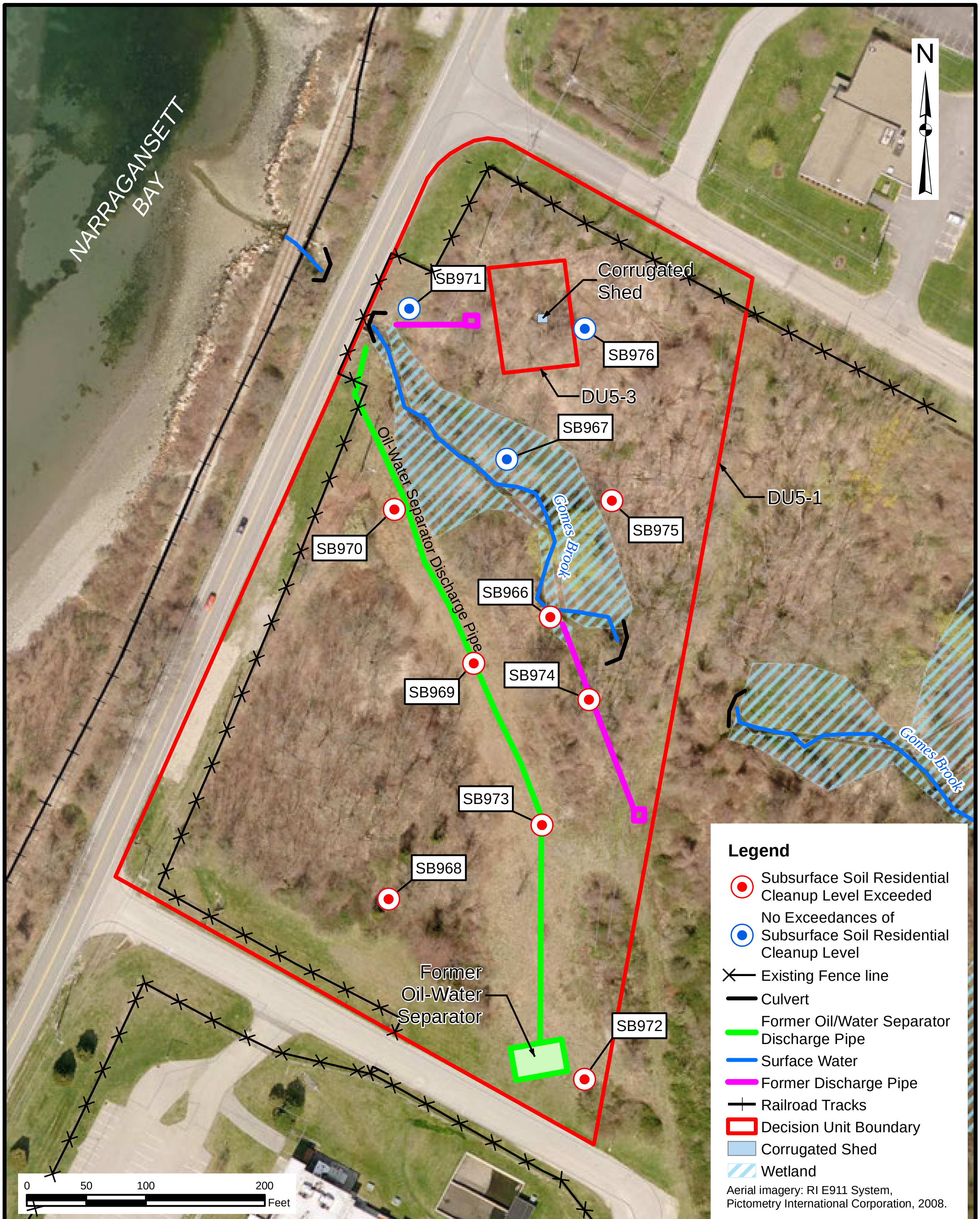

TETRA TECH

NAVAL STATION NEWPORT
MIDDLETOWN, RHODE ISLAND

EXCEEDANCES OF RESIDENTIAL CLEANUP LEVEL IN SUBSURFACE SOIL

DECISION UNIT 5-1 - TANK FARM 5
RECORD OF DECISION

SCALE	
PER SCALE BAR	
FILE	
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REV	DATE
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FIGURE NUMBER	
2-4A	

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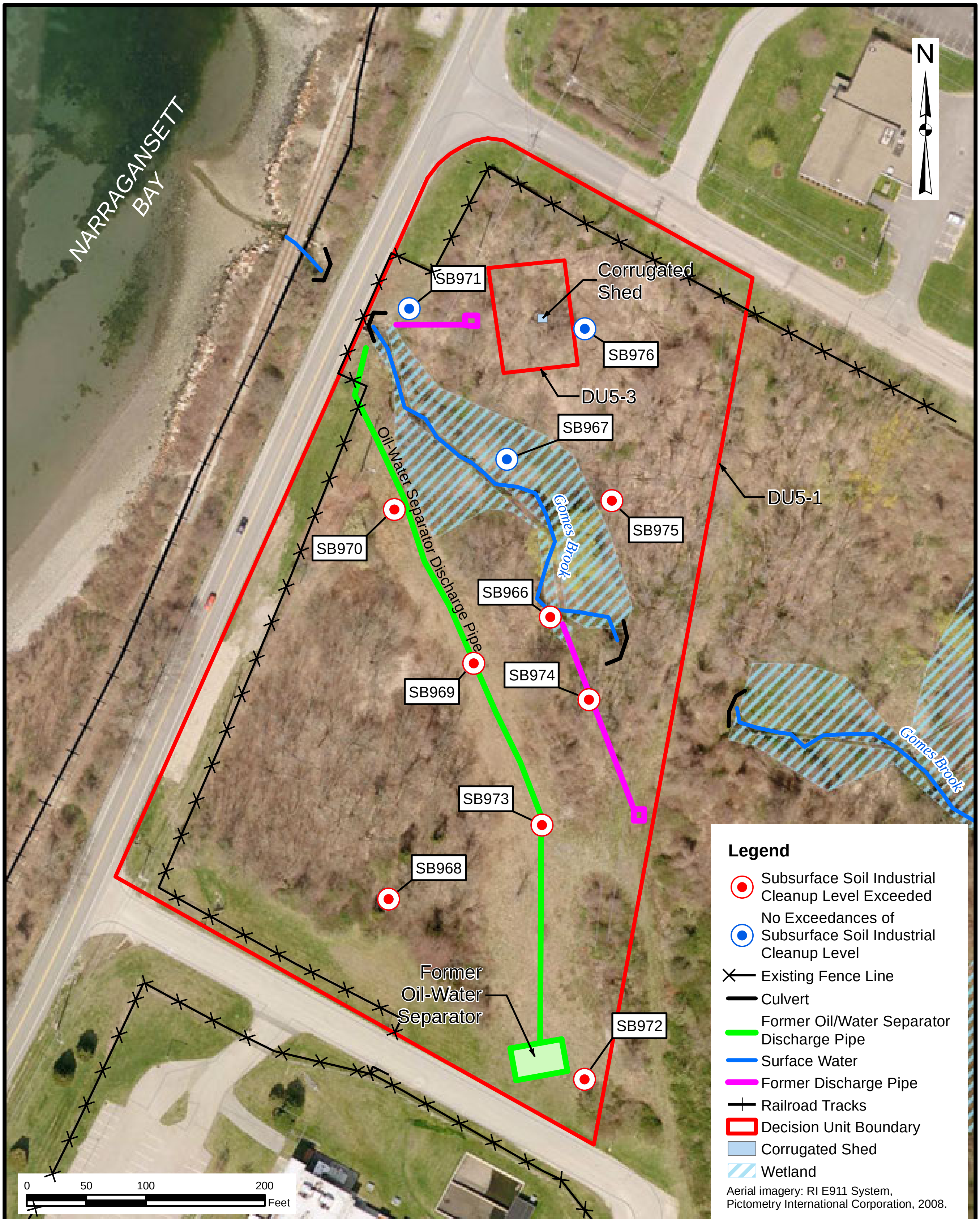

TETRA TECH

NAVAL STATION NEWPORT
MIDDLETOWN, RHODE ISLAND

EXCEEDANCES OF INDUSTRIAL CLEANUP LEVEL SUBSURFACE SOIL

DECISION UNIT 5-1 - TANK FARM 5
RECORD OF DECISION

SCALE	PER SCALE BAR
FILE	I:\...\TF5_INDSOILEXCEEDANCE LOCATIONS_FIG2-4B.MXD
REV 0	DATE 11/08/13
FIGURE NUMBER	2-4B

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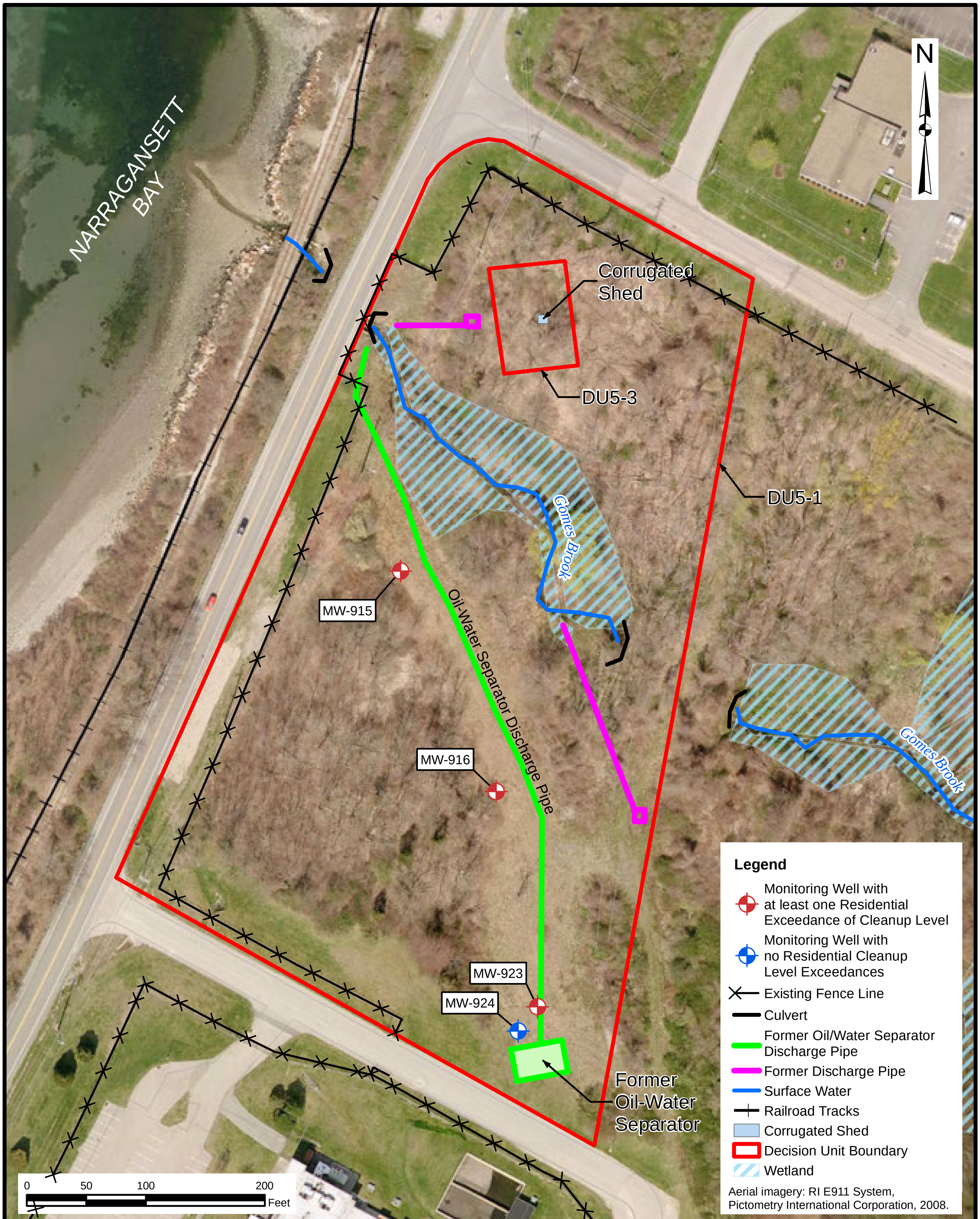

TETRA TECH

NAVAL STATION NEWPORT
MIDDLETOWN, RHODE ISLAND

EXCEEDANCES OF RESIDENTIAL CLEANUP LEVELS IN GROUNDWATER

DECISION UNIT 5-1 - TANK FARM 5
RECORD OF DECISION

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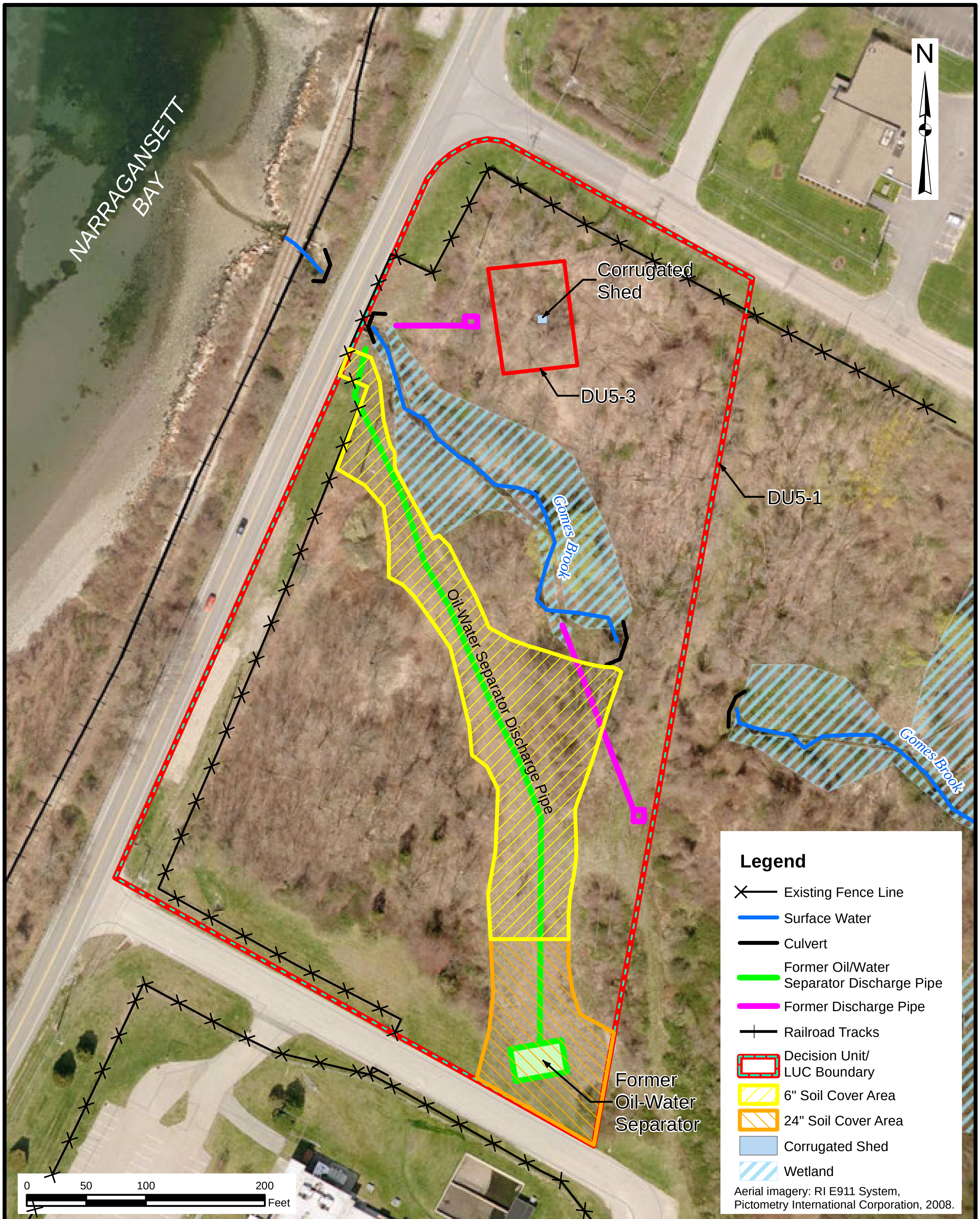
DATE	06/07/13
FIGURE NUMBER	2-5



TETRA TECH

NAVAL STATION NEWPORT
MIDDLETOWN, RHODE ISLAND

SOIL REMEDY (SO-3)

DECISION UNIT 5-1 - TANK FARM 5
RECORD OF DECISION

SCALE	PER SCALE BAR
FILE	I:\...\TF5_DU5-1SBMN_FIG2-6.MXD
REV	0
DATE	06/07/13
FIGURE NUMBER	2-6

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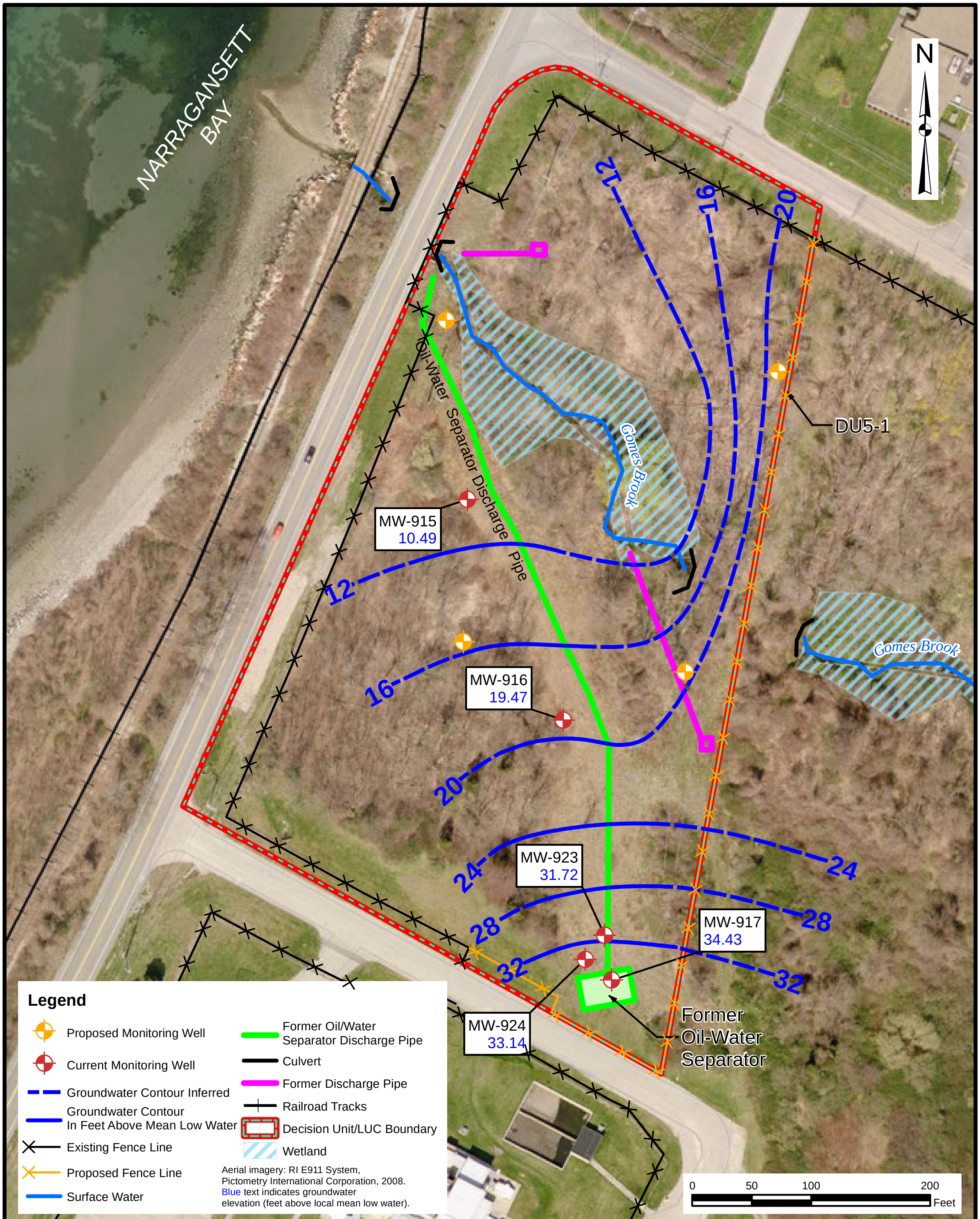

TETRA TECH	NAVAL STATION NEWPORT MIDDLETOWN, RHODE ISLAND **GROUNDWATER REMEDY (GW-2)** DECISION UNIT 5-1 - TANK FARM 5 RECORD OF DECISION	SCALE PER SCALE BAR FILE I:\...\TF5_DU5-1 GWREM_FIG2-7.MXD REV 0 DATE 06/07/13 FIGURE NUMBER 2-7

Administrative Record Reference Table

DETAILED ADMINISTRATIVE RECORD REFERENCE TABLE

Item	Reference Phrase in ROD	Location in ROD	Location of Information in Administrative Record
1	Remedial Investigation	Table 2-1	TRC. 1992. "Remedial Investigation, Naval Education and Training Center, Newport, Rhode Island". January.
2	demolished the OWS at the Site and also cleaned and demolished in-place the underground tanks	Table 2-1	Brown and Root Environmental, 1995. Process Piping Closure Assessment Report, Tank Farm 5. NAVSTA Newport, Rhode Island. Brown & Root Environmental Corporation, Final Tank Closure Assessment Reports, 1995. (11 reports).
3	Site Investigation and removal action	Table 2-1	Tetra Tech EC, 2007. Final Closeout Report for Sludge Disposal Trenches and Review Areas at Tank Farms 4 and 5, Naval Station Newport Portsmouth, Rhode Island. June 19.
4	Background Soil Investigation	Table 2-1	Tetra Tech, 2008. Basewide Background Study Report for Naval Station Newport, Newport, Rhode Island. Tetra Tech, Inc., King of Prussia, Pennsylvania. July.
5	Data Gaps Assessment	Table 2-1	Tetra Tech, 2012. Data Gaps Assessment Report for Installation Restoration Site 12 (Tank Farm 4) and 13 (Tank Farm 5) Category 1 Areas, Naval Station Newport, Newport RI. August.
6	Baseline Human Health Risk Assessment (HHRA)	Table 2-1	Tetra Tech, 2012.
7	Screening Ecological Risk Assessment (ERA	Table 2-1	Tetra Tech, 2012.
8	remedial alternatives	Table 2-1	Tetra Tech, 2013. Feasibility Study for DU 5-1 at Site 13 – Tank Farm 5, Naval Station Newport, Newport, Rhode Island. Final – December.
9	Public notice	Section 2.3	Newport Daily News. November 13 & 20, 2013
10	Groundwater flow	Section 2.5.1	Tetra Tech, 2012.
11	Burning of sludge	Section 2.5.2	Envirodyne Engineers, Inc. 1983. Initial Assessment Study, Naval Education and Training Center, Newport, Rhode Island. March.
12	not used for drinking water	Section 2.6	Envirodyne Engineers, Inc. 1983.
13	RIDEM's GA groundwater classification area	Section 2.6	RIDEM, 2010. Groundwater Quality Rules. State of Rhode Island and Providence Plantations Department of Environmental Management, Office of Water Resources. June.
14	potential receptors	Section 2.7	Tetra Tech, 2012.
15	COPCs were identified	Section 2.7	Tetra Tech, 2012.
16	exposure assessment	Section 2.7	Tetra Tech, 2012.
17	cancer risks and non-cancer hazards	Section 2.7	Tetra Tech, 2012.
18	RAOs for DU 5-1	Section 2.8	Tetra Tech, 2013.
19	COCs	Section 2.8	Tetra Tech, 2013.
20	PRGs	Section 2.8	Tetra Tech, 2012.
21	Cleanup levels	Section 2.8	Tetra Tech, 2013.

21	**preliminary technology screening**	Section 2.9	Tetra Tech, 2013.
22	**nine CERCLA evaluation criteria**	Section 2.10	Tetra Tech, 2013.
24	**The required timeframe for this process is estimated at 11-23 years**	Section 2.12.2.2	Tetra Tech, 2013.

ADDITIONAL REFERENCES

Tetra Tech EC, 2007. Final Closeout Report for Sludge Disposal Trenches and Review Areas at Tank Farms 4 and 5, Naval Station Newport Portsmouth, Rhode Island. June 19.

Tetra Tech, Inc. 2004. Five-Year Review for Naval Station Newport, Naval Station Newport, Newport, Rhode Island. Tetra Tech NUS, Inc., King of Prussia, Pennsylvania. December.

USEPA, 1995. New England Risk-Based Priority Setting Project Risk Identification Work Group Final Report. September.

USEPA, 1999. Use of Monitored Natural Attenuation at Superfund, RCRA Corrective Action, and Underground Storage Tank Sites. Office of Solid Waste and Emergency Response. OSWER Directive 9200.4-17P. April 21.

USEPA. 2002. Calculating Upper Confidence Limits for Exposure Point Concentrations at Hazardous Waste Sites. OSWER 9285.6-10. December.

USEPA, 2010. ProUCL Version 4.00.05 User Guide. Office of Research and Development, Washington, D.C. EPA/600/R 07/038, May.

Appendix A
Rhode Island Department of Environmental Management Concurrence Letter

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

31 December 2013

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

RE: Record of Decision for Decision Unit 5-1 at Site 13 - Tank Farm 5 (OU2)
Naval Station Newport, RI

Dear Mr. Owens:

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

In accordance with the FFA, the Department of Environmental Management (Department) has completed its review of the Record of Decision (ROD) for Decision Unit 5-1 at Site 13 – Tank Farm 5 (OU2) dated December 2013 at Naval Station Newport, RI. The Department of the Navy's selected alternative for the Site, as presented in the ROD, is the following: installation of a permeable soil cover to isolate surface soils with concentrations of arsenic exceeding cleanup levels; monitored natural attenuation (MNA) of metals in groundwater until groundwater cleanup standards are achieved; and implementation of land use controls (LUCs) to ensure that future use of the property is limited to industrial activities, to prevent disturbance of the soil cover, to ensure that subsurface soils are not disturbed without appropriate safety precautions, and to prohibit groundwater use until groundwater cleanup goals are achieved.

The Department has worked on this Site with the Department of the Navy and the Environmental Protection Agency from the early stages up through this important decision milestone. Based upon this Department's review of 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 aforementioned 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:

- The Navy will install a permeable soil cover that is 2 feet thick in areas where arsenic levels are greater than 43 mg/kg, and 6 inches thick where arsenic levels are between 17 and 43 mg/kg, in compliance with Section 12.04 of RIDEM's Remediation Regulations;
- If, after an appropriate amount of data has been collected, MNA is determined to be an ineffective remedy for the Site, the Navy will seek a change to the remedial action for groundwater, using an additional public notification and ROD amendment or Explanation of Significant Differences (ESD);
- The Navy will implement groundwater use restrictions and a long-term monitoring plan for the Site;
- The Navy will implement land use controls (LUCs) to prevent residential and unrestricted recreational uses of the Site;
- The Navy will conduct five-year reviews to ensure that the remedial actions for the Site continue to provide adequate protection of human health and the environment; and
- Finally, we urge the Navy to make every effort to assure that this remedy is implemented in a manner that allows the local community maximum participation in this process.

Thank you for providing us with an opportunity to review and concur with this significant Record of Decision.

Sincerely,

Janet Coit

Janet Coit
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Appendix B
Cost Estimates

TABLE B1
Cost Backup - Capital Costs
Soil Alternative SO3: Cover Surface Soils Exceeding Criteria, LUCs, and Inspections
Site 13, Tank Farm 5, DU 5-1
NAVAL STATION (NAVSTA) NEWPORT
NEWPORT, RI

			Unit Cost				Extended Cost				
Item	Quantity	Unit	Subcontract	Material	Labor	Equipment	Subcontract	Material	Labor	Equipment	Subtotal
1 DOUMENTS AND CONSTRUCTION PLANNING											
1.1 Prepare RAWP, HASP, Specs,	240	hr			$75.00		$0	$0	$18,000	$0	$18,000
1.2 Weltand restoration plan	75	hr			$75.00		$0	$0	$5,625	$0	$5,625
1.3 LUC RD	1	ls			$9,100.00		$0	$0	$9,100	$0	$9,100
1.4 LTM Work Plan	1	ls			$17,140.00		$17,140	$0	$0	$0	$17,140
2 PRE-DESIGN INVESTIGATION											
2.1 SAP preparation	1	ls			$14,900.00		$0	$0	$14,900	$0	$14,900
2.2 Sampling labor and materials	1	ls		$4,000.00	$16,500.00		$0	$4,000	$16,500	$0	$20,500
2.3 Analytical analysis of soil samples	1	ls	$2,184.00				$2,184	$0	$0	$0	$2,184
3 MOBILIZATION AND DEMOBILIZATION											
3.1 Equipment Mobilization/Demobilization	4	ea			$177.00	$610.00	$0	$0	$708	$2,440	$3,148
4 FIELD SUPPORT AND SITE ACCESS											
4.1 Storage Trailer	1	mo				$92.50	$0	$0	$0	$93	$93
4.2 Survey Support	2	day	$1,075.00				$2,150	$0	$0	$0	$2,150
4.3 Site Superintendent	14	day		$206.00	$384.64		$0	$2,884	$5,385	$0	$8,269
4.4 Site Health & Safety and QA/QC	14	day		$206.00	$307.68		$0	$2,884	$4,308	$0	$7,192
4.5 Underground Utility Clearance	1	ls	$10,525.00				$10,525	$0	$0	$0	$10,525
5 DECONTAMINATION											
5.1 Decontamination Services	1.0	ls		$1,220.00	$2,245.00	$1,550.00	$0	$1,220	$2,245	$1,550	$5,015
6 SITE PREPARATION											
6.1 Back-Hoe	2	day			$355.20	$1,784.00	$0	$0	$710	$3,568	$4,278
6.2 Skid-Steer	2	day			$333.40	$291.00	$0	$0	$667	$582	$1,249
6.3 Site Labor, (3 laborers)	2	day			$264.80		$0	$0	$530	$0	$530
6.4 Clear & Chip Brush	2	day			$333.40	$689.60	$0	$0	$667	$1,379	$2,046
6.5 Grub Stumps and Chip	1	day				$190.90	$0	$0	$0	$191	$191
6.6 Off-Site Disposal of Chipped Brush	10	ton	$45.00				$450	$0	$0	$0	$450
7 PLACE COVER AND SINAGE											
7.1 Back-Hoe	4	day			$355.20	$1,784.00	$0	$0	$1,421	$7,136	$8,557
7.3 Site Labor, (3 laborers)	4	day			$264.80		$0	$0	$1,059	$0	$1,059
7.4 Backfill, common fill	702	cy		$17.96			$0	$12,608	$0	$0	$12,608
7.5 Backfill, vegetative soil	842	cy		$27.67			$0	$23,298	$0	$0	$23,298
7.6 Revegetation, seed	45.4	msf	$77.50				$3,519	$0	$0	$0	$3,519
7.7 Dozer, 300 hp	4	day			$343.90	$1,592.00	$0	$0	$1,376	$6,368	$7,744
7.8 Compactor, 120 hp	4	day			$343.90	$560.60	$0	$0	$1,376	$2,242	$3,618
7.9 Install Sinage	4	ea		$350.00			$0	$1,400	$0	$0	$1,400
9 POST CONSTRUCTION COST											
9.1 Contractor Completion Report	150	hr			$75.00		$0	$0	$11,250	$0	$11,250
9.2 Remedial Action Closeout Report	200	hr			$75.00		$0	$0	$15,000	$0	$15,000
Subtotal							$35,968	$48,294	$110,825	$25,549	$220,636
Overhead on Labor Cost @ 30%									$33,248		$33,248
G & A on Labor, Material, Equipment, & Subs Cost @ 10%							$3,597	$4,829	$11,083	$2,555	$22,064
Tax on Materials and Equipment Cost @ 7.0%								$3,381		$1,788	$5,169
Total Direct Cost							$39,564	$56,504	$155,155	$29,892	$281,116
Indirects on Total Direct Cost @ 25%			(excluding transportation and disposal cost)								$70,279.01
Profit on Total Direct Cost @ 10%											$28,112
Subtotal											$379,507
Health & Safety Monitoring @ 2%											$7,590
Total Field Cost											$387,097
Engineering on Total Field Cost @ 5%											$19,355
Contingency on Total Field Cost @ 20%											$77,419
TOTAL CAPITAL COST											**$483,871**

TABLE B2
Cost Backup - Annual and Five - Year Costs
Soil Alternative SO3: Cover Surface Soils Exceeding Criteria, LUCs, and Inspections
Site 13, Tank Farm 5, DU 5-1
NAVAL STATION (NAVSTA) NEWPORT
NEWPORT, RI

Item	Item Cost years 1 - 30	Item Cost every 5 years	Notes
LUCs Inspection & Report	$2,350		One-day visit to verify LUCs with Report
Five -Year Review		$23,000	Assumes that this is a component of the NAVSTA Newport IRP Five Year Reivew
LTM	$13,678		
Subtotal	$16,028	$23,000	
Contingency @ 10%	$1,603	$2,300	Cost with contingency is used for Present Worth Analysis.
TOTAL	**$17,631**	**$25,300**	

TABLE B3
Cost Backup - Present Worth Analysis
Soil Alternative SO3: Cover Surface Soils Exceeding Criteria, LUCs, and Inspections
Site 13, Tank Farm 5, DU 5-1
NAVAL STATION (NAVSTA) NEWPORT
NEWPORT, RI

Year	Capital Cost	Annual Cost	Total Year Cost	Annual Discount Rate 2.0%	Present Worth
0	$483,871		$483,871	1.000	$483,871
1		$17,631	$17,631	0.980	$17,285
2		$17,631	$17,631	0.961	$16,946
3		$17,631	$17,631	0.942	$16,614
4		$17,631	$17,631	0.924	$16,288
5		$42,931	$42,931	0.906	$38,884
6		$17,631	$17,631	0.888	$15,656
7		$17,631	$17,631	0.871	$15,349
8		$17,631	$17,631	0.853	$15,048
9		$17,631	$17,631	0.837	$14,753
10		$42,931	$42,931	0.820	$35,218
11		$17,631	$17,631	0.804	$14,180
12		$17,631	$17,631	0.788	$13,902
13		$17,631	$17,631	0.773	$13,629
14		$17,631	$17,631	0.758	$13,362
15		$42,931	$42,931	0.743	$31,898
16		$17,631	$17,631	0.728	$12,843
17		$17,631	$17,631	0.714	$12,591
18		$17,631	$17,631	0.700	$12,344
19		$17,631	$17,631	0.686	$12,102
20		$42,931	$42,931	0.673	$28,891
21		$17,631	$17,631	0.660	$11,632
22		$17,631	$17,631	0.647	$11,404
23		$17,631	$17,631	0.634	$11,181
24		$17,631	$17,631	0.622	$10,961
25		$42,931	$42,931	0.610	$26,168
26		$17,631	$17,631	0.598	$10,536
27		$17,631	$17,631	0.586	$10,329
28		$17,631	$17,631	0.574	$10,127
29		$17,631	$17,631	0.563	$9,928
30		$42,931	$42,931	0.552	$23,701
				TOTAL PRESENT WORTH	**$987,621**

TABLE B4
Cost Backup: Capital Cost
Groundwater Alternative 2 - LUCs & MNA
Site 13 - Tank Farm 5, DU 5-1
NAVAL STATION (NAVSTA) NEWPORT
NEWPORT, RI

Item	Quantity	Unit	Unit Cost Subcontract	Unit Cost Material	Unit Cost Labor	Unit Cost Equipment	Extended Cost Subcontract	Extended Cost Material	Extended Cost Labor	Extended Cost Equipment	Subtotal
1 Capital Costs											
1.1 LUCs	1	ea			$9,100.00		$0	$0	$9,100	$0	$9,100
1.2 MNA Work Plan											
planning meeting (2 people)	16	hr			$85.00		$0	$0	$1,360	$0	$1,360
analytical specs	16	hr			$105.00		$0	$0	$1,680	$0	$1,680
SAP preperation (Draft/Final)	160	hr			$85.00		$0	$0	$13,600	$0	$13,600
misc supplies, equipment, copying etc.	1	ea		$500.00			$0	$500	$0	$0	$500
1.3 Drilling Subcontractor											
well installation oversight	30	hr			$85.00		$0	$0	$2,550	$0	$2,550
misc supplies, equipment, copying etc.	1	ea		$1,000.00		$1,500.00	$0	$1,000	$0	$1,500	$2,500
drilling subcontractor	2	day	$7,550.00				$15,100	$0	$0	$0	$15,100
. **Subtotal**							$15,100	$1,500	$28,290	$1,500	$46,390
G & A on Labor, Material, Equipment, & Subs Cost @ 10%							$1,510	$150	$2,829	$150	$4,639
Tax on Materials and Equipment Cost @ 6%								$90		$90	$180
Total Direct Cost							$1,510	$240	$2,829	$240	$51,209
Indirects on Total Direct Cost @ 0%											$0
Profit on Total Direct Cost @ 10%											$5,121
Subtotal											$56,330
Health & Safety Monitoring @ 0%											$0
Total Field Cost											$56,330
Contingency on Total Field Costs @ 10%											$5,633
Engineering on Total Field Cost @ 0%											$0
TOTAL CAPITAL COST											**$61,963**

TABLE B5
Cost Backup: Annual and Five Year Costs
Groundwater Alternative 2 - LUCs & MNA
Site 13 - Tank Farm 5, DU 5-1
NAVAL STATION (NAVSTA) NEWPORT
NEWPORT, RI

Item	Item Cost Years 1-2	Item Cost Years 3-30	Item Cost every 5 years	Notes
Annual Site Inspection & Report, Years 1-30	$2,350	$2,350		Labor and supplies once a year to inspect Land Use Controls with report
Groundwater Sampling, Analysis and Report (Year 1 - 2)	$83,064			LUCs and Monitoring at 8 monitoring wells, Quarterly
Groundwater Sampling, Analysis and Report (Year 3-30)		$20,766		LUCs and Monitoring at 8 monitoring wells (annually)
Five Year Review			$23,000	Assumes five year review is a component of the Newport Five Year Review
Subtotal	$85,414	$23,116	$23,000	
Contingency @ 10%	$8,541	$2,312	$2,300	
TOTAL	**$93,955**	**$25,428**	**$25,300**	

TABLE B6
Cost Backup: Present Worth Cost
Groundwater Alternative 2 - LUCs & MNA
Site 13 - Tank Farm 5, DU 5-1
NAVAL STATION (NAVSTA) NEWPORT
NEWPORT, RI

Year	Capital Cost	Annual Cost	Total Year Cost	Annual Discount Rate 2.0%	Present Worth
0	$61,963	$0	$61,963	1.000	$61,963
1		$93,955	$93,955	0.980	$92,113
2		$93,955	$93,955	0.961	$90,307
3		$25,428	$25,428	0.942	$23,961
4		$25,428	$25,428	0.924	$23,491
5		$50,728	$50,728	0.906	$45,946
6		$25,428	$25,428	0.888	$22,579
7		$25,428	$25,428	0.871	$22,136
8		$25,428	$25,428	0.853	$21,702
9		$25,428	$25,428	0.837	$21,277
10		$50,728	$50,728	0.820	$41,614
11		$25,428	$25,428	0.804	$20,450
12		$25,428	$25,428	0.788	$20,049
13		$25,428	$25,428	0.773	$19,656
14		$25,428	$25,428	0.758	$19,271
15		$50,728	$50,728	0.743	$37,691
16		$25,428	$25,428	0.728	$18,523
17		$25,428	$25,428	0.714	$18,159
18		$25,428	$25,428	0.700	$17,803
19		$25,428	$25,428	0.686	$17,454
20		$50,728	$50,728	0.673	$34,138
21		$25,428	$25,428	0.660	$16,777
22		$25,428	$25,428	0.647	$16,448
23		$25,428	$25,428	0.634	$16,125
24		$25,428	$25,428	0.622	$15,809
25		$50,728	$50,728	0.610	$30,920
26		$25,428	$25,428	0.598	$15,195
27		$25,428	$25,428	0.586	$14,897
28		$25,428	$25,428	0.574	$14,605
29		$25,428	$25,428	0.563	$14,319
30		$50,728	$50,728	0.552	$28,005
				TOTAL PRESENT WORTH	**$873,385**

Appendix C
Human Health Risk Assessment Summary Tables

TABLE C-1
EXPOSURE POINT CONCENTRATIONS
SITE 13 - TANK FARM 5, DU 5-1
NAVSTA NEWPORT, MIDDLETOWN, RHODE ISLAND

Parameter	Tank Farm 5					
	Surface Soil (0 - 1 feet) (mg/kg)	Surface/ Subsurface (mg/kg)	Groundwater		Surface Water (ug/L)	Sediment (mg/kg)
			RME (ug/L)	CTE (ug/L)		
Volatile Organic Compounds						
Benzene	NA	NA	1.2(1)	1.2(1)	NA	NA
Chloroform	NA	NA	NA	NA	1(1)	NA
Semivolatile Organic Compounds						
Benzo(a)anthracene	0.097(4)	0.036(5)	NA	NA	0.151(6)	0.44(4)
Benzo(a)pyrene	0.119(4)	0.046(5)	NA	NA	0.16(1)	0.54(4)
Benzo(b)fluoranthene	0.204(4)	0.073(5)	NA	NA	0.15(6)	0.57(7)
Benzo(g,h,i)perylene	NA	NA	NA	NA	NA	NA
Benzo(k)fluoranthene	NA	NA	NA	NA	NA	NA
Chrysene	NA	NA	NA	NA	NA	0.64(4)
Dibenzo(a,h)anthracene	0.022(5)	0.01(6)	NA	NA	NA	0.12(7)
Fluoranthene	NA	NA	NA	NA	NA	NA
Indeno(1,2,3-cd)pyrene	0.089(4)	0.03(6)	NA	NA	0.11(1)	0.38(7)
Naphthalene	NA	NA	NA	NA	1.5(1)	NA
Pyrene	NA	NA	NA	NA	NA	NA
Pesticides/PCBs						
Endrin Aldehyde	NA	NA	NA	NA	NA	NA
Dioxins/Furans						
2,3,7,8-TCDD TEQs	0.0000041(7)	0.0000042(7)	NA	NA	NA	0.000009(7)
Inorganics						
Aluminum	NA	NA	1,480(1)	1,480(1)	852(1)	10,660(7)
Arsenic	26.4(4)	29.8(4)	8.8(1)	2.9	0.275(6)	62.5(9)
Beryllium	0.495(7)	NA	NA	NA	NA	0.63(7)
Chromium	NA	NA	NA	NA	NA	17(7)
Cobalt	10.3(7)	15.4(7)	19(1)	11.1(10)	NA	47.7(9)
Iron	25,700(7)	37,930(11)	24,300(1)	11,070(10)	1,068(5)	87,800(9)
Manganese	343(7)	1,053(9)	2,510(1)	1,168(10)	NA	437(12)
Thallium	NA	2.6(4)	NA	NA	NA	NA

Notes:
NA - Not applicable. Not a COPC for this media.
RME - Reasonable maximum exposures
CTE - Central Tendency exposures
1 - Maximum Detected Concentration
2 - 99% KM (Chebyshev)
3 - 97.5% KM (Chebyshev)
4 - 95% Approximate Gamma
5 - 95% KM (BCA)
6 - 95% KM (t)

TABLE C-2
SUMMARY OF EXPOSURE INPUT PARAMETERS
REASONABLE MAXIMUM EXPOSURES
SITE 13 - TANK FARM 5, DU 5-1
NAVSTA NEWPORT, MIDDLETOWN, RHODE ISLAND

Exposure Parameter	Construction Worker	Industrial Worker	Adolescent Trespasser	Child Recreational User	Adult Recreational User	Child Resident	Adult Resident
All Exposures							
ED (years)	1[1]	25[2,3]	12[4]	6[2]	24[2]	6[2,3]	24[2,3]
BW (kg)	70[2]	70[2,3]	50[2]	15[2]	70[2]	15[2,3]	70[2,3]
AT_n (days)	365[5]	9,125[3,5]	4,380[5]	2,190[5]	8,760[5]	2,190[3,5]	8,760[3,5]
AT_c (days)	25,550[5]	25,550[3,5]	25,550[5]	25,550[5]	25,550[5]	25,550[3,5]	25,550[3,5]
Incidental Ingestion/Dermal Contact with Soil							
C_{soil} (mg/kg)	Maximum or 95% UCL[6]	Maximum or 95% UCL[6]	Maximum or 95% UCL[6]	Maximum or 95% UCL[6]	Maximum or 95% UCL[6]	Maximum or 95% UCL[6]	Maximum or 95% UCL[6]
IR (mg/day)	330[2]	100[2]	100[2]	200[2]	100[2]	200[2,3]	100[2,3]
EF-Soil (days/year)	130[7]	250[3,8]	48[9]	48[9]	48[9]	350[3,10]	350[3,10]
FI (unitless)	1	1	1	1	1	1	1
SA (cm^2/day)	3,300[8]	3,300[8]	4,050[11]	2,800[8]	5,700[8]	2,800[8]	5,700[8]
AF (mg/cm^2)	0.3[8]	0.2[8]	0.4[8]	0.2[8]	0.07[8]	0.2[8]	0.07[8]
ABS (unitless)	chemical-specific[8]	chemical-specific[8]	chemical-specific[8]	chemical-specific[8]	chemical-specific[8]	chemical-specific[8]	chemical-specific[8]
CF (kg/mg)	1E-06	1E-06	1E-06	1E-06	1E-06	1E-06	1E-06
Inhalation Fugitive Dust/Volatile Emissions from Soil							
C_{air} (mg/m^3)	calculated[1]	calculated[1]	calculated[1]	calculated[1]	calculated[1]	calculated[1]	calculated[1]
ET (hours/day)	8[7]	8[12]	8[9]	8[9]	8[9]	24	24
EF-Soil (days/year)	130[7]	250[8]	48[9]	48[9]	48[9]	350[3,10]	350[3,10]
PEF (m^3/kg)	1.4E+06[1]	1.1E+10[13]	1.1E+10[13]	1.1E+10[13]	1.1E+10[13]	1.1E+10[13]	1.1E+10[13]
Ingestion/Dermal Contact with Groundwater							
C_{gw} (µg/L)	Maximun	NA	NA	NA	NA	Maximun	Maximun
IR_{gw} (L/day)	0.05[14]	NA	NA	NA	NA	1.29[2]	2.0[2]
EF (days/year)	130[7]	NA	NA	NA	NA	350[10]	350[10]
ET (hours/day) and t_{event} (hours/event)	8[7]	NA	NA	NA	NA	1.0[8]	0.58[8]
EV (events/day)	1[14]	NA	NA	NA	NA	1[14]	1[14]
A (cm^2/day)	3,300[8]	NA	NA	NA	NA	6,600[8]	18,000[8]
Kp (cm/hour), t* (hour/event), □ (hour), and B (unitless)	chemical-specific[8]	NA	NA	NA	NA	chemical-specific[8]	chemical-specific[8]

TABLE C-2
SUMMARY OF EXPOSURE INPUT PARAMETERS
REASONABLE MAXIMUM EXPOSURES
SITE 13 - TANK FARM 5, DU 5-1
NAVSTA NEWPORT, MIDDLETOWN, RHODE ISLAND

Exposure Parameter	Construction Worker	Industrial Worker	Adolescent Trespasser	Child Recreational User	Adult Recreational User	Child Resident	Adult Resident
Inhalation of Volatile Emissions from Groundwater							
C_{air} (mg/m^3)	calculated[15]	NA	NA	NA	NA	NA	NA
ET (hours/day)	8[7]	NA	NA	NA	NA	NA	NA
EF (days/year)	130[7]	NA	NA	NA	NA	NA	NA
Dermal Contact with Surface Water							
C_{sw} (µg/L)	NA	NA	Maximum or 95% UCL[6]	Maximum or 95% UCL[6]	Maximum or 95% UCL[6]	NA	NA
EF (days/year)	NA	NA	48[9]	48[9]	48[9]	NA	NA
ET (hours/day) and t_{event} (hours/event)	NA	NA	1[14]	1[14]	1[14]	NA	NA
EV (events/day)	NA	NA	1[14]	1[14]	1[14]	NA	NA
A (cm^2/day)	NA	NA	4,050[11]	2,800[8]	6,880[16]	NA	NA
K_p (cm/hour)	NA	NA	chemical-specific[8]	chemical-specific[8]	chemical-specific[8]	NA	NA
t* (hour/event), □(hour), and B (unitless)	NA	NA	chemical-specific[8]	chemical-specific[8]	chemical-specific[8]	NA	NA
CF (L/cm^3)	NA	NA	1E-03	1E-03	1E-03	NA	NA
Incidental Ingestion/Dermal Contact with Sediment							
C_{sed} (mg/kg)	NA	NA	Maximum or 95% UCL[6]	Maximum or 95% UCL[6]	Maximum or 95% UCL[6]	NA	NA
IR (mg/day)	NA	NA	100[2]	200[2]	100[2]	NA	NA
EF-Sediment (days/year)	NA	NA	48[9]	48[9]	48[9]	NA	NA
FI (unitless)	NA	NA	1	1	1	NA	NA
SA (cm^2/day)	NA	NA	4,050[11]	2,800[8]	6,880[16]	NA	NA
AF (mg/cm^2)	NA	NA	1[8]	0.2[8]	0.07[8]	NA	NA
ABS (unitless)	NA	NA	chemical-specific[8]	chemical-specific[8]	chemical-specific[8]	NA	NA
CF (kg/mg)	NA	NA	1E-06	1E-06	1E-06	NA	NA

TABLE C-2
SUMMARY OF EXPOSURE INPUT PARAMETERS
REASONABLE MAXIMUM EXPOSURES
SITE 13 - TANK FARM 5, DU 5-1
NAVSTA NEWPORT, MIDDLETOWN, RHODE ISLAND

Exposure Parameter	Construction Worker	Industrial Worker	Adolescent Trespasser	Child Recreational User	Adult Recreational User	Child Resident	Adult Resident

Notes:

A	Skin surface area available for contact	ED	Exposure duration
ABS	Absorption factor	EF	Exposure frequency
AF	Soil-to-skin adherence factor	ET	Exposure time
AT_c	Averaging time for carcinogenic effects	EV	Event frequency
AT_n	Averaging time for noncarcinogenic effects	FI	Fraction ingested from contaminated source
B	Bunge Model partitioning coefficient	IR	Ingestion rate (soil or groundwater)
BW	Body weight	K_p	Permeability coefficient from water through skin
CF	Conversion factor	SA	Skin surface area available for contact
CR	Contact rate	PEF	Particulate emission factor
$C_{soil/sed}$	Exposure concentration for soil/sediment	□	Lag time
$C_{gw/sw}$	Exposure concentration for groundwater/surface water	t*	Time it takes to reach steady-state conditions
C_{air}	Exposure concentration for air	t_{event}	Duration of event

1 - USEPA, 2002: Supplemental Guidance for Developing Soil Screening Levels for Superfund Sites. OSWER 9365.4-24.
2 - USEPA, 1997: Exposure Factors Handbook. EPA/600/8-95/002FA.
3 - Rhode Island Department of Environmental Management, DEM-DSR-01-93, February 2004.
4 - Adolescent ages 7 to 18 years old.
5 - USEPA, 1989: Risk Assessment Guidance for Superfund. Vol 1: Human Health Evaluation Manual, Part A.
6 - USEPA, 2002. Calculating Upper Confidence Limits for Exposure Point Concentrations at Hazardous Waste Sites. OSWER 9285.6-10.
7 - Assumes a 26 week construction project over a course of one year.
8 - USEPA, 2004: Risk Assessment Guidance for Superfund (Part E, Supplemental Guidance for Dermal Risk Assessment) Final. PA/540/R/99/005.
9 - Assumes 4 days a week for 12 weeks.
10 - Although USEPA Region 1 Risk Update No. 2 August 1994 recommends an exposure frequency of 150 days/year, this RI will follow national guidance per USEPA Region I direction September 28, 2006.
11 - Assumes 31 percent of the average total surface area of 1.31 m2 for females and males, ages 7 through 17 years (USEPA, 1997).
12 - Length of a typical work day.
13 - USEPA, 2010: Soil Screening Guidance calculation Internet site at http://risk.lsd.ornl.gov/calc_start.htm. Site-specific values for Hartford, Connecticut.
14 - Professional judgment.
15 - VDEQ September 2004. Virginia Department of Environmental Quality (VDEQ, online -http://www.deq.state.va.us/brownfieldweb/vrp.html).
16 - Assumes 38 percent of the total body surface area.

TABLE C-3
INTERMEDIATE VARIABLES FOR CALCULATING DERMAL ABSORPTION
SITE 13 - TANK FARM 5, DU 5-1
NAVSTA NEWPORT, MIDDLETOWN, RHODE ISLAND

Chemical of Potential Concern	Media	Dermal Absorption Fraction (soil)	FA	Kp		T(event)		Tau		T*		B
			Value	Value	Units	Value	Units	Value	Units	Value	Units	Value
Volatile Organic Compounds												
Benzene	Groundwater	NA	1	1.5E-02	cm/hr	(1)	hr	2.9E-01	hr	7.0E-01	hr	5.1E-02
Chloroform	Surface Water	NA	1	6.8E-03	cm/hr	(1)	hr	5.0E-01	hr	1.2E+00	hr	2.9E-02
Semivolatile Organic Compounds												
Benzo(a)anthracene	Soil, Surface Water, Sediment	0.13	NA(2)	NA(2)	NA(2)	NA(2)	NA(2)	NA(2)	NA(2)	NA(2)	NA(2)	NA(2)
Benzo(a)pyrene	Soil, Surface Water, Sediment	0.13	NA(2)	NA(2)	NA(2)	NA(2)	NA(2)	NA(2)	NA(2)	NA(2)	NA(2)	NA(2)
Benzo(b)fluoranthene	Soil, Surface Water, Sediment	0.13	NA(2)	NA(2)	NA(2)	NA(2)	NA(2)	NA(2)	NA(2)	NA(2)	NA(2)	NA(2)
Benzo(g,h,i)perylene	Soil	0.13	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Benzo(k)fluoranthene	Soil	0.13	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Chrysene	Soil, Sediment	0.13	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Dibenzo(a,h)anthracene	Soil, Sediment	0.13	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Fluoranthene	Soil	0.13	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Indeno(1,2,3-cd)pyrene	Soil, Surface Water, Sediment	0.13	NA(2)	NA(2)	NA(2)	NA(2)	NA(2)	NA(2)	NA(2)	NA(2)	NA(2)	NA(2)
Naphthalene	Groundwater, Surface Water	0.13	1	4.7E-02	cm/hr	(1)	hr	5.6E-01	hr	1.3E+00	hr	2.0E-01
Pyrene	Soil	0.13	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Pesticides/PCBs												
Aroclor-1254	Soil	0.14	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Endrin Aldehyde	Groundwater	NA	0.8	5.1E-03	cm/hr	(1)	hr	1.4E+01	hr	3.4E+01	hr	3.8E-02
Dioxins/Furans												
2,3,7,8-TCDD Equivalents	Soil, Sediment	0.03	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Inorganics												
Aluminum	Soil, Groundwater, Surface Water, Sediment	0	1	1.0E-03	cm/hr	NA	NA	NA	NA	NA	NA	NA
Arsenic	Soil, Groundwater, Surface Water, Sediment	0.03	1	1.0E-03	cm/hr	NA	NA	NA	NA	NA	NA	NA
Beryllium	Soil, Sediment	0	1	1.0E-03	cm/hr	NA	NA	NA	NA	NA	NA	NA
Chromium	Soil, Sediment	0	1	2.0E-03	cm/hr	NA	NA	NA	NA	NA	NA	NA
Cobalt	Soil, Groundwater, Sediment	0	1	1.0E-03	cm/hr	NA	NA	NA	NA	NA	NA	NA
Iron	Soil, Groundwater, Surface Water, Sediment	0	1	1.0E-03	cm/hr	NA	NA	NA	NA	NA	NA	NA
Manganese	Soil, Groundwater, Sediment	0	1	1.0E-03	cm/hr	NA	NA	NA	NA	NA	NA	NA
Thallium	Soil, Sediment	0	1	1.0E-03	cm/hr	NA	NA	NA	NA	NA	NA	NA

TABLE C-3
INTERMEDIATE VARIABLES FOR CALCULATING DERMAL ABSORPTION
SITE 13 - TANK FARM 5, DU 5-1
NAVSTA NEWPORT, MIDDLETOWN, RHODE ISLAND

Chemical of Potential Concern	Media	Dermal Absorption Fraction (soil)	FA	Kp		T(event)		Tau		T*		B
			Value	Value	Units	Value	Units	Value	Units	Value	Units	Value

Notes:
All values from EPA's Risk Assessment Guidance for Superfund Volume 1: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment) Final, July 2004.
1 - T(event) is 8 hrs for RME and 4 hrs for CTE for the construction worker; 1 hr for RME and 0.33 hrs for hypothetical child residents; and 0.58 hrs for RME and 0.25 hr for CTE for hypothetical adult residents.
2 - RAGS Part E recommends not attempting to quantify risk because contaminants are outside the effective predictive domain of the model.
FA = Fraction Absorbed Water
Kp = Dermal Permeability Coefficient of Compound in Water
T(event) = Event Duration
Tau = Lag Time
T* = Time to Reach Steady-State
B = Dimensionless Ratio of the Permeability Coefficient of a Compound Through the Stratum Corneum Relative to its Permeability Coefficient Across the Viable Epidermis
NA = Not applicable.

TABLE C-4
CHEMICAL PROPERTIES FOR VOLATILIZATION FROM
SOIL/GROUNDWATER TO OUTDOOR AIR MODELS
SITE 13 - TANK FARM 5, DU 5-1
NAVSTA NEWPORT, MIDDLETOWN, RHODE ISLAND

Chemical	Molecular Weight (g/mole)	Organic Carbon Partition Coefficient (cm^3/g)	Air Diffusivity (cm^2/sec)	Water Diffusivity (cm^2/sec)	Solubility Limit (mg/L)	Henry's Law Constant (Dimensionless)	Henry's Law Constant ($atm\text{-}m^3/mol$)
Benzene	7.81E+01	1.46E+02	9.00E-02	1.00E-05	1.79E+03	2.30E-01	5.55E-03
Chloroform	1.19E+02	3.18E+01	7.70E-02	1.10E-05	7.95E+03	1.50E-01	3.67E-03
Naphthalene	1.28E+02	1.54E+03	6.00E-02	8.40E-06	3.10E+01	1.80E-02	4.40E-04

Source:
USEPA 2010: USEPA Regional Screening Levels for Chemical Contaminants at Superfund Sites, May 2010.

TABLE C-5
INPUT PARAMETERS FOR CALCULATION OF THE
VOLATILIZATION FROM SOIL TO OUTDOOR AIR MODELS
SITE 13 - TANK FARM 5, DU 5-1
NAVSTA NEWPORT, MIDDLETOWN, RHODE ISLAND

Parameter	Definition	Value	Reference
Q/C	Inverse of mean concentration at center of source (g/m^2-s per kg/m^3).	73.95045	USEPA, 2010
T	Exposure interval (seconds).	9.5E+08	USEPA, 2002
pb	Dry soil bulk density (g/cm^3).	1.5	USEPA, 2002
ps	Soil particle density (g/cm^3).	2.65	USEPA, 2002
θw	Water-filled soil porosity (L_{pore}/L_{soil}).	0.15	USEPA, 2002
n	Total soil porosity (L_{pore}/L_{soil}).	0.434	USEPA, 2002
Di	Diffusivity in air (cm^2/sec).	Chemical specific	USEPA, 2002
H'	Dimensionless Henry's Law Constant.	Chemical specific	USEPA, 2002
S	Solubility limit (mg/L)	Chemical specific	USEPA, 2002
Dw	Diffusivity in water (cm^2/sec).	Chemical specific	USEPA, 2002
Koc	Soil organic carbon partition coefficient (cm^3/g).	Chemical specific	USEPA, 2002
foc	Fraction organic carbon in soil (g/g).	0.006	USEPA, 2002

Notes:
Chemical specific values are presented in Table 6-26.
USEPA 2002: Supplemental Guidance for Developing Soil Screening Levels for Superfund Sites. OSWER 9355.4-24.
USEPA, 2010: Soil Screening Guidance calculation Internet site at http://rais.ornl.gov/epa/ssl1.shtml.
Site-specific values for Hartford, Connecticut.

TABLE C-6
NON-CANCER TOXICITY DATA - ORAL/DERMAL
SITE 13 - TANK FARM 5, DU 5-1
NAVSTA NEWPORT, MIDDLETOWN, RHODE ISLAND

Chemical of Potential Concern	Chronic/ Subchronic	Oral RfD		Oral Absorption Efficiency for Dermal[1]	Absorbed RfD for Dermal[2]		Primary Target Organ(s)	Combined Uncertainty/Modifying Factors	RfD:Target Organ(s)	
		Value	Units		Value	Units			Source(s)	Date(s) (MM/DD/YYYY)
Volatile Organic Compounds										
Benzene	Chronic	4.0E-03	mg/kg/day	1	4.0E-03	mg/kg/day	Blood	300/1	IRIS	1/14/2011
Chloroform	Chronic	1.0E-02	mg/kg/day	1	1.0E-02	mg/kg/day	Liver	100/1	IRS	1/14/2011
Semivolatile Organic Compounds										
Benzo(a)anthracene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Benzo(a)pyrene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Benzo(b)fluoranthene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Benzo(g,h,i)perylene[3]	Chronic	3.0E-02	mg/kg/day	1	3.0E-02	mg/kg/day	Kidney	3000/1	IRIS	1/14/2011
Benzo(k)fluoranthene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Chrysene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Dibenzo(a,h)anthracene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Fluoranthene	Chronic	4.0E-02	mg/kg/day	1	4.0E-02	mg/kg/day	Liver	3000/1	IRIS	1/14/2011
Indeno(1,2,3-cd)pyrene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Naphthalene	Chronic	2.0E-02	mg/kg/day	1	2.0E-02	mg/kg/day	Body Weight	3000/1	IRIS	1/14/2011
Pyrene	Chronic	3.0E-02	mg/kg/day	1	3.0E-02	mg/kg/day	Kidney	3000/1	IRIS	1/14/2011
Pesticides/PCBs										
Aroclor-1254	Chronic	2.0E-05	mg/kg/day	1	2.0E-05	mg/kg/day	Autoimmune	300/1	IRIS	1/14/2011
Endrin Aldehyde[4]	Chronic	3.0E-04	mg/kg/day	1	3.0E-04	mg/kg/day	Liver	100/1	IRIS	1/14/2011
Dioxins/Furans										
2,3,7,8-TCDD	Chronic	1.0E-09	mg/kg/day	1	1.0E-09	mg/kg/day	Developmental	NA	ATSDR	12/1998
Inorganics										
Aluminum	Chronic	1.0E+00	mg/kg/day	1	1.0E+00	mg/kg/day	CNS	100	PPRTV	10/23/2006
Arsenic	Chronic	3.0E-04	mg/kg/day	1	3.0E-04	mg/kg/day	Skin, CVS	3/1	IRIS	1/14/2011
Beryllium	Chronic	2.0E-03	mg/kg/day	0.007	1.4E-05	mg/kg/day	GS	300/1	IRIS	1/14/2011
Hexavalent Chromium	Chronic	3.0E-03	mg/kg/day	0.025	7.5E-05	mg/kg/day	Fetotoxicity, GS, Bone	300/3	IRIS	1/14/2011
Cobalt	Chronic	3.0E-04	mg/kg/day	1	3.0E-04	mg/kg/day	Blood	NA	PPRTV	8/25/2008
Iron	Chronic	7.0E-01	mg/kg/day	1	7.0E-01	mg/kg/day	GS	1.5	PPRTV	9/11/2006
Manganese (soil)[3]	Chronic	7.0E-02	mg/kg/day	0.04	2.8E-03	mg/kg/day	CNS	1/1	IRIS	1/14/2011
Manganese (water)[3]	Chronic	2.4E-02	mg/kg/day	0.04	9.6E-04	mg/kg/day	CNS	1/3	IRIS	1/14/2011
Thallium	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

Notes:

1 - U.S. EPA, 2004: Risk Assessment Guidance for Superfund (Part E, Supplemental Guidance for Dermal Risk Assessment) Interim. EPA/540/R/99/005.

2 - Adjusted dermal RfD = Oral RfD x Oral Absorption Efficiency for Dermal.

3 - Adjusted IRIS value in accordance with USEPA Region I Risk Update Number 4, November 1996.

4 - Values are for Enrdin.

Definitions:

ATSDR = Agency for Toxic Substances and Disease Registry.
CNS = Central Nervous System
CVS = Cardiovascular system
GS = Gastrointestinal
IRIS = Integrated Risk Information System
NA = Not Available.
PPRTV = Provisional Peer Reviewed Toxicity Value.

TABLE C-7
NON-CANCER TOXICITY DATA - INHALATION
SITE 13 - TANK FARM 5, DU 5-1
NAVSTA NEWPORT, MIDDLETOWN, RHODE ISLAND

Chemical of Potential Concern	Chronic/ Subchronic	Inhalation RfC		Extrapolated RfD[1]		Primary Target Organ(s)	Combined Uncertainty/Modifying Factors	RfC : Target Organ(s)	
		Value	Units	Value	Units			Source(s)	Date(s) (MM/DD/YYYY)
Volatile Organic Compounds									
Benzene	Chronic	3.0E-02	mg/m^3	8.6E-03	(mg/kg/day)	Blood	300/1	IRIS	1/14/2011
Chloroform	Chronic	9.8E-02	mg/m^3	2.8E-02	(mg/kg/day)	Liver	NA	ATSDR	9/1997
Semivolatile Organic Compounds									
Benzo(a)anthracene	NA	NA	NA	NA	NA	NA	NA	NA	NA
Benzo(a)pyrene	NA	NA	NA	NA	NA	NA	NA	NA	NA
Benzo(b)fluoranthene	NA	NA	NA	NA	NA	NA	NA	NA	NA
Benzo(g,h,i)perylene	NA	NA	NA	NA	NA	NA	NA	NA	NA
Benzo(k)fluoranthene	NA	NA	NA	NA	NA	NA	NA	NA	NA
Chrysene	NA	NA	NA	NA	NA	NA	NA	NA	NA
Dibenzo(a,h)anthracene	NA	NA	NA	NA	NA	NA	NA	NA	NA
Fluoranthene	NA	NA	NA	NA	NA	NA	NA	NA	NA
Indeno(1,2,3-cd)pyrene	NA	NA	NA	NA	NA	NA	NA	NA	NA
Naphthalene	Chronic	3.0E-03	mg/m^3	8.6E-04	(mg/kg/day)	Nasal	3000/1	IRIS	1/14/2011
Pyrene	NA	NA	NA	NA	NA	NA	NA	NA	NA
Pesticides/PCBs									
Aroclor-1254	NA	NA	NA	NA	NA	NA	NA	NA	NA
Endrin Aldehyde	NA	NA	NA	NA	NA	NA	NA	NA	NA
Dioxins/Furans									
2,3,7,8-TCDD	Chronic	4.0E-08	mg/m3	1.1E-08	(mg/kg/day)	Liver, Respiratory, Developmental	NA	Cal EPA	9/2009
Inorganics									
Aluminum	Chronic	5.0E-03	mg/m3	1.4E-03	(mg/kg/day)	CNS	300	PPRTV	10/23/2006
Arsenic	Chronic	1.5E-05	mg/m3	4.3E-06	(mg/kg/day)	NA	NA	Cal EPA	9/2009
Beryllium	Chronic	2.0E-05	mg/m3	5.7E-06	(mg/kg/day)	Lungs	10/1	IRIS	1/14/2011
Hexavalent Chromium	Chronic	1.0E-04	mg/m^3	2.9E-05	(mg/kg/day)	Lungs	300/1	IRIS	1/14/2011
Cobalt	Chronic	6.0E-06	mg/m^3	1.7E-06	(mg/kg/day)	Lungs	NA	PPRTV	8/25/2008
Iron	NA	NA	NA	NA	NA	NA	NA	NA	NA
Manganese	Chronic	5.0E-05	mg/m^3	1.4E-05	(mg/kg/day)	CNS	1000/1	IRIS	1/14/2011
Thallium	NA	NA	NA	NA	NA	NA	NA	NA	NA

Notes:
1 - Extrapolated RfD = RfC *20m^3/day / 70 kg

NA = Not Applicable

Definitions:

ATSDR = Agency for Toxic Substances and Disease Registry.

CNS = Central Nervous System

Cal EPA = California Environmental Protection Agency, Technical Support Document for Describing Available Cancer Slope Factors, September 2009.

IRIS = Integrated Risk Information System

PPRTV = Provisional Peer Reviewed Toxicity Value.

TABLE C-8
CANCER TOXICITY DATA - ORAL/DERMAL
SITE 13 - TANK FARM 5, DU 5-1
NAVASTA NEWPORT, MIDDLETOWN, RHODE ISLAND

Chemical of Potential Concern	Oral Cancer Slope Factor		Oral Absorption Efficiency for Dermal[1]	Absorbed Cancer Slope Factor for Dermal[2]		Weight of Evidence/ Cancer Guideline Description	Oral CSF	
	Value	Units		Value	Units		Source(s)	Date(s) (MM/DD/YYYY)
Volatile Organic Compounds								
Benzene	5.5E-02	$(mg/kg/day)^{-1}$	1	5.5E-02	$(mg/kg/day)^{-1}$	A / Known human carcinogen	IRIS	1/14/2011
Chloroform	3.1E-02	$(mg/kg/day)^{-1}$	1	3.1E-02	$(mg/kg/day)^{-1}$	B2 / Probable human carcinogen	Cal EPA	9/2009
Semivolatile Organic Compounds								
Benzo(a)anthracene[3]	7.3E-01	$(mg/kg/day)^{-1}$	1	7.3E-01	$(mg/kg/day)^{-1}$	B2 / Probable human carcinogen	USEPA(1)	7/1993
Benzo(a)pyrene[3]	7.3E+00	$(mg/kg/day)^{-1}$	1	7.3E+00	$(mg/kg/day)^{-1}$	B2 / Probable human carcinogen	IRIS	1/14/2011
Benzo(b)fluoranthene[3]	7.3E-01	$(mg/kg/day)^{-1}$	1	7.3E-01	$(mg/kg/day)^{-1}$	B2 / Probable human carcinogen	USEPA(1)	7/1993
Benzo(g,h,i)perylene	NA	NA	NA	NA	NA	D (Not classifiable as to human carcinogenicity)	IRIS	1/14/2011
Benzo(k)fluoranthene[3]	7.3E-02	$(mg/kg/day)^{-1}$	1	7.3E-02	$(mg/kg/day)^{-1}$	B2 / Probable human carcinogen	USEPA(1)	7/1993
Chrysene[3]	7.3E-03	$(mg/kg/day)^{-1}$	1	7.3E-03	$(mg/kg/day)^{-1}$	B2 / Probable human carcinogen	USEPA(1)	7/1993
Dibenzo(a,h)anthracene[3]	7.3E+00	$(mg/kg/day)^{-1}$	1	7.3E+00	$(mg/kg/day)^{-1}$	B2 / Probable human carcinogen	USEPA(1)	7/1993
Fluoranthene	NA	NA	NA	NA	NA	D (Not classifiable as to human carcinogenicity)	IRIS	1/14/2011
Indeno(1,2,3-cd)pyrene[3]	7.3E-01	$(mg/kg/day)^{-1}$	1	7.3E-01	$(mg/kg/day)^{-1}$	B2 / Probable human carcinogen	USEPA(1)	7/1993
Naphthalene	NA	NA	NA	NA	NA	C / Inadequate data of carcinogenicity in humans	IRIS	1/14/2011
Pyrene	NA	NA	NA	NA	NA	D (Not classifiable as to human carcinogenicity)	IRIS	1/14/2011
Pesticides/PCBs								
Aroclor-1254	2.0E+00	$(mg/kg/day)^{-1}$	1	2.0E+00	$(mg/kg/day)^{-1}$	B2 / Probable human carcinogen	USEPA(2)	9/1996
Endrin Aldehyde	NA	NA	NA	NA	NA	NA	NA	NA
Dioxins/Furans								
2,3,7,8-TCDD	1.3E+05	$(mg/kg/day)^{-1}$	1	1.3E+05	$(mg/kg/day)^{-1}$	B2 / Probable human carcinogen	Cal EPA	9/2009
Inorganics								
Aluminum	NA	NA	NA	NA	NA	NA	NA	NA
Arsenic	1.5E+00	$(mg/kg/day)^{-1}$	1	1.5E+00	$(mg/kg/day)^{-1}$	A	IRIS	1/14/2011
Beryllium	NA	NA	NA	NA	NA	Carcinogenic potential cannot be determined	IRIS	1/14/2011
Hexavalent Chromium[3]	5.0E-01	$(mg/kg/day)^{-1}$	0.025	2.0E+01	$(mg/kg/day)^{-1}$	A / Known human carcinogen	NJDEP	4/8/2009
Cobalt	NA	NA	NA	NA	NA	NA	NA	NA
Iron	NA	NA	NA	NA	NA	NA	NA	NA
Manganese	NA	NA	NA	NA	NA	D (Not classifiable as to human carcinogenicity)	IRIS	1/14/2011
Thallium	NA	NA	NA	NA	NA	Inadequate information to assess carcinogenic potential	IRIS	1/14/2011

TABLE C-8
CANCER TOXICITY DATA - ORAL/DERMAL
SITE 13 - TANK FARM 5, DU 5-1
NAVASTA NEWPORT, MIDDLETOWN, RHODE ISLAND

Chemical of Potential Concern	Oral Cancer Slope Factor		Oral Absorption Efficiency for Dermal[1]	Absorbed Cancer Slope Factor for Dermal[2]		Weight of Evidence/ Cancer Guideline Description	Oral CSF	
	Value	Units		Value	Units		Source(s)	Date(s) (MM/DD/YYYY)

Notes:
1 - USEPA, 2004: Risk Assessment Guidance for Superfund (Part E, Supplemental Guidance for Dermal Risk Assessment) Interim. EPA/540/R/99/005.
2 - Adjusted cancer slope factor for dermal = Oral cancer slope factor / Oral Absorption Efficiency for Dermal.
3 - The carcinogenic PAHs and hexavalent chromium are considered to act via the mutagenic mode of action. These chemicals are evaluated in accordance with USEPA's Supplemental Guidance for Assessing Susceptibility from Early-Life Exposure to Carcinogens (2005).

IRIS = Integrated Risk Information System.

NA = Not Available.

Cal EPA = California Environmental Protection Agency, Technical Support Document for Describing Available Cancer Slope Factors, September 2009.

NJDEP = New Jersey Department of Environmental Protection, Derivation of Ingestion-Based Soil Remediation Criterion for Cr^{+6} Based on the NTP Chronic Bioassay Data for Sodium Dichromate Dihydrate, April 8, 2009.

USEPA(1) = OSWER Directive No.9285.7-75.

USEPA(2) = USEPA, PCBs: Cancer Dose-Response Assessment and Applications to Environmental Mixtures, September 1996, EPA/600/P-96/001F.

TABLE C-9
CANCER TOXICITY DATA - INHALATION
SITE 13 - TANK FARM 5, DU 5-1
NAVSTA NEWPORT, MIDDLETOWN, RHODE ISLAND

Chemical of Potential Concern	Unit Risk		Inhalation Cancer Slope Factor[1]		Weight of Evidence/ Cancer Guideline Description	Unit Risk : Inhalation CSF	
	Value	Units	Value	Units		Source(s)	Date(s) (MM/DD/YYYY)
Volatile Organic Compounds							
Benzene	7.8E-06	$(ug/m^3)^{-1}$	2.7E-02	$(mg/kg/day)^{-1}$	A / Known human carcinogen	IRIS	1/14/2011
Chloroform	2.3E-05	$(ug/m^3)^{-1}$	8.1E-02	$(mg/kg/day)^{-1}$	B2 / Probable human carcinogen	IRIS	1/14/2011
Semivolatile Organic Compounds							
Benzo(a)anthracene[2]	1.1E-04	$(ug/m^3)^{-1}$	3.9E-01	$(mg/kg/day)^{-1}$	NA	Cal EPA(1)	9/2009
Benzo(a)pyrene[2]	1.1E-03	$(ug/m^3)^{-1}$	3.9E+00	$(mg/kg/day)^{-1}$	NA	Cal EPA(1)	9/2009
Benzo(b)fluoranthene[2]	1.1E-04	$(ug/m^3)^{-1}$	3.9E-01	$(mg/kg/day)^{-1}$	NA	Cal EPA(1)	9/2009
Benzo(g,h,i)perylene	NA	NA	NA	NA	D / Not classifiable as to human carcinogenicity	IRIS	1/14/2011
Benzo(k)fluoranthene[2]	1.1E-04	$(ug/m^3)^{-1}$	3.9E-01	$(mg/kg/day)^{-1}$	NA	Cal EPA(1)	9/2009
Chrysene[2]	1.1E-05	$(ug/m^3)^{-1}$	3.9E-02	$(mg/kg/day)^{-1}$	NA	Cal EPA(1)	9/2009
Dibenzo(a,h)anthracene[2]	1.2E-03	$(ug/m^3)^{-1}$	4.2E+00	$(mg/kg/day)^{-1}$	NA	Cal EPA(1)	9/2009
Fluoranthene	NA	NA	NA	NA	D / Not classifiable as to human carcinogenicity	IRIS	1/14/2011
Indeno(1,2,3-cd)pyrene[2]	1.1E-04	$(ug/m^3)^{-1}$	3.9E-01	$(mg/kg/day)^{-1}$	NA	Cal EPA(1)	9/2009
Naphthalene	3.4E-05	$(ug/m3)^{-1}$	1.2E-01	$(mg/kg/day)^{-1}$	C/ Possible Human Carcinogen	Cal EPA(2)	8/2004
Pyrene	NA	NA	NA	NA	D / Not classifiable as to human carcinogenicity	IRIS	1/14/2011
Pesticides/PCBs							
Aroclor-1254	5.7E-04	$(ug/m^3)^{-1}$	2.0E+00	$(mg/kg/day)^{-1}$	B2 / Probable human carcinogen	USEPA(2)	9/1996
Endrin Aldehyde	NA	NA	NA	NA	NA	NA	NA
Dioxins/Furans							
2,3,7,8-TCDD	3.8E+01	$(ug/m^3)^{-1}$	2.0E+00	$(mg/kg/day)^{-1}$	B2 / Probable human carcinogen	Cal EPA(1)	9/2009
Inorganics							
Aluminum	NA	NA	NA	NA	NA	NA	NA
Arsenic	4.3E-03	$(ug/m^3)^{-1}$	1.5E+01	$(mg/kg/day)^{-1}$	A / Known human carcinogen	IRIS	1/14/2011
Beryllium	2.4E-03	$(ug/m^3)^{-1}$	8.4E+00	$(mg/kg/day)^{-1}$	B1 / Probable human carcinogen	IRIS	1/14/2011
Hexavalent Chromium[2]	8.4E-02	$(ug/m^3)^{-1}$	2.9E+02	$(mg/kg/day)^{-1}$	A / Known human carcinogen	IRIS	1/14/2011
Cobalt	9.0E-03	$(ug/m^3)^{-1}$	3.2E+01	$(mg/kg/day)^{-1}$	NA	PPRTV	8/25/2008
Iron	NA	NA	NA	NA	NA	NA	NA
Manganese	NA	NA	NA	NA	D / Not classifiable as to human carcinogenicity	IRIS	1/14/2011
Thallium	NA	NA	NA	NA	Inadequate information to assess carcinogenic potential	IRIS	1/14/2011

TABLE C-9
CANCER TOXICITY DATA - INHALATION
SITE 13 - TANK FARM 5, DU 5-1
NAVSTA NEWPORT, MIDDLETOWN, RHODE ISLAND

Chemical of Potential Concern	Unit Risk		Inhalation Cancer Slope Factor[(1)]		Weight of Evidence/ Cancer Guideline Description	Unit Risk : Inhalation CSF	
	Value	Units	Value	Units		Source(s)	Date(s) (MM/DD/YYYY)

Notes:

1 - Inhalation CSF = Unit Risk * 70 kg / 20m^3/day.

2 - The carcinogenic PAHs and hexavalent chromium are considered to act via the mutagenic mode of action. These chemicals are evaluated in accordance with USEPA's Supplemental Guidance for Assessing Susceptibility from Early-Life Exposure to Carcinogens (2005).

Definitions:

Cal EPA = California Environmental Protection Agency.

IRIS = Integrated Risk Information System.

NA = Not Available.

USEPA(1) = OSWER Directive No.9285.7-75.

USEPA(2) = USEPA, PCBs: Cancer Dose-Response Assessment and Applications to Environmental Mixtures, September 1996, EPA/600/P-96/001F.

Cal EPA(1) = California Environmental Protection Agency, Technical Support Document for Describing Available Cancer Slope Factors, September 2009.

Cal EPA(2) = Adoption of Unit Risk Values for Naphthalene, August 2004.

PPRTV = Provisional Peer Reviewed Toxicity Value.

TABLE C-10
SUMMARY OF CANCER RISKS AND HAZARD INDICES
REASONABLE MAXIMUM EXPOSURES
SITE 13 - TANK FARM 5, DU 5-1
NAVSTA NEWPORT, MIDDLETOWN, RHODE ISLAND

Receptor	Media	Exposure Route	Cancer Risk	Chemicals with Cancer Risks > 10^{-4}	Chemicals with Cancer Risks > 10^{-5} and ≤ 10^{-4}	Chemicals with Cancer Risks > 10^{-6} and ≤ 10^{-5}	Hazard Index	Chemicals Contributing to an Target Organ HI > 1
Construction Workers	Surface Soil (0 - 1 Feet)	Incidental Ingestion	1E-06	--	--	--	0.3	--
		Dermal Contact	1E-07	--	--	--	0.02	--
		Inhalation	3E-07	--	--	--	0.9	--
		Total	1E-06	--	--	--	1	--
	All Soil (0 - 10 Feet)	Incidental Ingestion	1E-06	--	--	--	0.4	--
		Dermal Contact	1E-07	--	--	--	0.02	--
		Inhalation	3E-07	--	--	--	2	Manganese
		Total	2E-06	--	--	--	3	Manganese
	Groundwater	Incidental Ingestion	5E-08	--	--	--	0.06	--
		Dermal Contact	3E-08	--	--	--	0.4	--
		Inhalation	7E-10	--	--	--	0.0002	--
		Total	8E-08	--	--	--	0.4	--
	Total Surface Soil and Groundwater		1E-06				2	
	Total All Soil and Groundwater		2E-06				3	
Industrial Workers	Surface Soil (0 - 1 Feet)	Incidental Ingestion	1E-05	--	--	Arsenic	0.2	--
		Dermal Contact	3E-06	--	--	Arsenic	0.02	--
		Inhalation	2E-09	--	--	--	0.0002	--
		Total	2E-05	--	Arsenic	--	0.2	--
	All Soil (0 - 10 Feet)	Incidental Ingestion	2E-05	--	Arsenic	--	0.2	--
		Dermal Contact	3E-06	--	--	Arsenic	0.02	--
		Inhalation	2E-09	--	--	--	0.0005	--
		Total	2E-05	--	Arsenic	--	0.2	--
Adolescent Trespassers	Surface Soil (0 - 1 Feet)	Incidental Ingestion	2E-06	--	--	Arsenic	0.04	--
		Dermal Contact	1E-06	--	--	--	0.01	--
		Inhalation	1E-10	--	--	--	0.00004	--
		Total	3E-06	--	--	Arsenic	0.06	--
	All Soil (0 - 10 Feet)	Incidental Ingestion	2E-06	--	--	Arsenic	0.06	--
		Dermal Contact	1E-06	--	--	--	0.01	--
		Inhalation	2E-10	--	--	--	0.0001	--
		Total	3E-06	--	--	Arsenic	0.07	--
	Surface Water	Dermal Contact	2E-09	--	--	--	0.0001	--
		Total	2E-09	--	--	--	0.0001	--
	Sediment	Incidental Ingestion	5E-06	--	--	Arsenic	0.1	--
		Dermal Contact	9E-06	--	--	Benzo(a)pyrene, Arsenic	0.07	--
		Total	1E-05	--	--	Benzo(a)pyrene, Arsenic	0.2	--
	Total Surface Soil, Surface Water, and Sediment		2E-05				0.3	
	Total All Soil, Surface Water, and Sediment		2E-05				0.3	
Child Recreational Users	Surface Soil (0 - 1 Feet)	Incidental Ingestion	7E-06	--	--	Arsenic	0.3	--
		Dermal Contact	9E-07	--	--	--	0.01	--
		Inhalation	7E-11	--	--	--	0.00004	--
		Total	8E-06	--	--	Arsenic	0.3	--
	All Soil (0 - 10 Feet)	Incidental Ingestion	7E-06	--	--	Arsenic	0.4	--
		Dermal Contact	7E-07	--	--	--	0.02	--
		Inhalation	9E-11	--	--	--	0.0001	--
		Total	8E-06	--	--	Arsenic	0.4	--
	Surface Water	Dermal Contact	2E-09	--	--	--	0.0003	--
		Total	2E-09	--	--	--	0.0003	--
	Sediment	Incidental Ingestion	2E-05	--	--	Benzo(a)pyrene, Arsenic	0.9	--
		Dermal Contact	3E-06	--	--	--	0.03	--
		Total	2E-05	--	Arsenic	Benzo(a)pyrene	0.9	--
	Total Surface Soil, Surface Water, and Sediment		3E-05				1	
	Total All Soil, Surface Water, and Sediment		3E-05				1	

TABLE C-10
SUMMARY OF CANCER RISKS AND HAZARD INDICES
REASONABLE MAXIMUM EXPOSURES
SITE 13 - TANK FARM 5, DU 5-1
NAVSTA NEWPORT, MIDDLETOWN, RHODE ISLAND

Receptor	Media	Exposure Route	Cancer Risk	Chemicals with Cancer Risks $> 10^{-4}$	Chemicals with Cancer Risks $> 10^{-5}$ and $\leq 10^{-4}$	Chemicals with Cancer Risks $> 10^{-6}$ and $\leq 10^{-5}$	Hazard Index	Chemicals Contributing to an Target Organ HI > 1
Adult Recreational Users	Surface Soil (0 - 1 Feet)	Incidental Ingestion	3E-06	--	--	Arsenic	0.03	--
		Dermal Contact	4E-07	--	--	--	0.002	--
		Inhalation	3E-10	--	--	--	0.00004	--
		Total	3E-06	--	--	Arsenic	0.03	--
	All Soil (0 - 10 Feet)	Incidental Ingestion	3E-06	--	--	Arsenic	0.04	--
		Dermal Contact	4E-07	--	--	--	0.003	--
		Inhalation	4E-10	--	--	--	0.0001	--
		Total	3E-06	--	--	Arsenic	0.04	--
	Surface Water	Dermal Contact	4E-09	--	--	--	0.0002	--
		Total	4E-09	--	--	--	0.0002	--
	Sediment	Incidental Ingestion	7E-06	--	--	Arsenic	0.10	--
		Dermal Contact	1E-06	--	--	--	0.006	--
		Total	9E-06	--	--	Arsenic	0.1	--
	Total Surface Soil, Surface Water, and Sediment		1E-05				0.1	
	Total All Soil, Surface Water, and Sediment		1E-05				0.1	
Lifelong Recreational Users (Child and Adults)	Surface Soil (0 - 1 Feet)	Incidental Ingestion	1E-05	- -	- -	Arsenic	NA	- -
		Dermal Contact	1E-06	- -	- -	- -	NA	- -
		Inhalation	4E-10				NA	- -
		Total	1E-05	- -	- -	Arsenic	NA	- -
	All Soil (0 - 10 Feet)	Incidental Ingestion	1E-05	- -	- -	Arsenic	NA	- -
		Dermal Contact	1E-06	- -	- -	- -	NA	- -
		Inhalation	5E-10	- -	- -	- -	NA	- -
		Total	1E-05	- -	- -	Arsenic	NA	- -
	Surface Water	Dermal Contact	5E-09				NA	- -
		Total	5E-09				NA	- -
	Sediment	Incidental Ingestion	3E-05		Arsenic	Benzo(a)pyrene	NA	- -
		Dermal Contact	4E-06			Arsenic	NA	- -
		Total	3E-05		Arsenic	Benzo(a)pyrene	NA	- -
	Total Surface Soil, Surface Water, and Sediment		4E-05				NA	
	Total All Soil, Surface Water, and Sediment		4E-05				NA	
Child Residents	Surface Soil (0 - 1 Feet)	Ingestion	5E-05	--	Arsenic	Benzo(a)pyrene	2	Target Organs HI < 1
		Dermal Contact	7E-06	--	--	Benzo(a)pyrene, Arsenic	0.1	--
		Inhalation	2E-09	--	--	--	0.0009	--
		Total	6E-05	--	Arsenic	Benzo(a)pyrene	2	Target Organs HI < 1
	All Soil (0 - 10 Feet)	Ingestion	5E-05	--	Arsenic	Benzo(a)pyrene	3	Target Organs HI < 1
		Dermal Contact	5E-06	--	--	Arsenic	0.1	--
		Inhalation	2E-09	--	--	--	0.002	--
		Total	6E-05	--	Arsenic	Benzo(a)pyrene	3	Target Organs HI < 1
	Groundwater	Ingestion	1E-04	--	Arsenic	--	21	Cobalt, Manganese, Arsenic, Iron
		Dermal Contact	5E-07	--	--	--	1	--
		Inhalation	5E-07	--	--	--	0.03	--
		Total	1E-04	--	Arsenic	--	22	Cobalt, Manganese, Arsenic, Iron
	Total Surface Soil and Groundwater		2E-04				24	
	Total All Soil and Groundwater		2E-04				25	

TABLE C-10
SUMMARY OF CANCER RISKS AND HAZARD INDICES
REASONABLE MAXIMUM EXPOSURES
SITE 13 - TANK FARM 5, DU 5-1
NAVSTA NEWPORT, MIDDLETOWN, RHODE ISLAND

Receptor	Media	Exposure Route	Cancer Risk	Chemicals with Cancer Risks > 10^{-4}	Chemicals with Cancer Risks > 10^{-5} and ≤ 10^{-4}	Chemicals with Cancer Risks > 10^{-6} and ≤ 10^{-5}	Hazard Index	Chemicals Contributing to an Target Organ HI > 1
Adult Residents	Surface Soil (0 - 1 Feet)	Ingestion	2E-05	--	Arsenic	--	0.2	--
		Dermal Contact	3E-06	--	--	Arsenic	0.02	--
		Inhalation	6E-09	--	--	--	0.0009	--
		Total	2E-05	--	Arsenic	--	0.2	--
	All Soil (0 - 10 Feet)	Ingestion	2E-05	--	Arsenic	--	0.3	--
		Dermal Contact	3E-06	--	--	Arsenic	0.02	--
		Inhalation	8E-09	--	--	--	0.002	--
		Total	2E-05	--	Arsenic	--	0.3	--
	Groundwater	Ingestion	1E-04	--	Arsenic	--	6	Cobalt, Manganese
		Dermal Contact	7E-07	--	--	--	0.4	--
		Inhalation	6E-07	--	--	--	0.008	--
		Total	1E-04	--	Arsenic	--	7	Cobalt, Manganese
	Total Surface Soil and Groundwater		1E-04				7	
	Total All Soil and Groundwater		2E-04				7	
Lifelong Residents (Child and Adults)	Surface Soil (0 - 1 Feet)	Ingestion	7E-05	--	Arsenic	Benzo(a)pyrene	NA	- -
		Dermal Contact	9E-06	--	--	Benzo(a)pyrene, Arsenic	NA	- -
		Inhalation	8E-09	--	--	--	NA	
		Total	8E-05	--	Arsenic	Benzo(a)pyrene	NA	- -
	All Soil (0 - 10 Feet)	Ingestion	7E-05	--	Arsenic	Benzo(a)pyrene	NA	- -
		Dermal Contact	8E-06	--	--	Arsenic	NA	- -
		Inhalation	1E-08	--	--	--	NA	- -
		Total	8E-05	--	Arsenic	Benzo(a)pyrene	NA	- -
	Groundwater	Ingestion	2E-04	Arsenic	--	--	NA	- -
		Dermal Contact	1E-06	--	--	--	NA	- -
		Inhalation	1E-06	--	--	--	NA	- -
		Total	2E-04	Arsenic	--	--	NA	- -
	Total Surface Soil and Groundwater		3E-04				NA	
	Total All Soil and Groundwater		3E-04				NA	

Notes:
NA - Not applicable.

TABLE C-11
RISKS ASSOCIATED WITH NATURALLY OCCURING CHEMICALS
SITE 13 - TANK FARM 5, DU 5-1
NAVSTA NEWPORT, MIDDLETOWN, RHODE ISLAND

Receptor	Reasonable Maximum Exposures		Central Tendency Exposure	
	ILCR	HI	ILCR	HI
CONSTRUCTION WORKERS				
Surface Soil				
Site Risk(1)	1E-06	1	5E-07	0.3
Background Risk(2)	1E-06	0.2	3E-07	0.04
Site + Background Risk(3)	3E-06	1	7E-07	0.3
All Soil				
Site Risk	2E-06	3	5E-07	0.6
Background Risk	1E-06	0.2	3E-07	0.04
Site + Background Risk	3E-06	3	8E-07	0.6
Groundwater	8E-08	0.4	9E-09	0.08
Site Totals				
Total Surface Soil and Groundwater	1E-06	2	5E-07	0.4
Total All Soil and Groundwater	2E-06	3	5E-07	0.7
Site and Background Totals				
Total Surface Soil and Groundwater	3E-06	2	7E-07	0.4
Total All Soil and Groundwater	3E-06	3	8E-07	0.7

INDUSTRIAL WORKERS				
Surface Soil				
Site Risk	2E-05	0.2	2E-06	0.07
Background Risk	2E-06	0.01	3E-07	0.005
Site + Background Risk	2E-05	0.2	3E-06	0.08
All Soil				
Site Risk	2E-05	0.2	3E-06	0.1
Background Risk	2E-06	0.01	3E-07	0.005
Site + Background Risk	2E-05	0.2	3E-06	0.1

ADOLESCENT TRESPASSERS				
Surface Soil				
Site Risk	3E-06	0.06	3E-07	0.01
Background Risk	2E-07	0.003	3E-08	0.0008
Site + Background Risk	3E-06	0.06	3E-07	0.01
All Soil				
Site Risk	3E-06	0.07	3E-07	0.02
Background Risk	3E-07	0.003	3E-08	0.0008
Site + Background Risk	4E-06	0.07	3E-07	0.02
Surface Water	2E-09	0.0001	2E-10	0.00004
Sediment	1E-05	0.2	3E-06	0.07
Site Totals				
Total Surface Soil, Surface Water and Sediment	2E-05	0.3	3E-06	0.08
Total All Soil, Surface Water and Sediment	2E-05	0.3	3E-06	0.08
Site and Background Totals				
Total Surface Soil, Surface Water and Sediment	2E-05	0.3	3E-06	0.08
Total All Soil, Surface Water and Sediment	2E-05	0.3	3E-06	0.08

TABLE C-11
RISKS ASSOCIATED WITH NATURALLY OCCURING CHEMICALS
SITE 13 - TANK FARM 5, DU 5-1
NAVSTA NEWPORT, MIDDLETOWN, RHODE ISLAND
PAGE 2 OF 4

Receptor	Reasonable Maximum Exposures		Central Tendency Exposure	
	ILCR	HI	ILCR	HI
CHILD RECREATIONAL USERS				
Surface Soil				
Site Risk	8E-06	0.3	6E-07	0.08
Background Risk	8E-07	0.02	7E-08	0.005
Site + Background Risk	9E-06	0.3	7E-07	0.08
All Soil				
Site Risk	8E-06	0.4	6E-07	0.1
Background Risk	8E-07	0.02	7E-08	0.005
Site + Background Risk	9E-06	0.4	7E-07	0.1
Surface Water	2E-09	0.0003	2E-10	0.00009
Sediment	2E-05	0.9	2E-06	0.2
Site Totals				
Total Surface Soil, Surface Water and Sediment	3E-05	1	3E-06	0.3
Total All Soil, Surface Water and Sediment	3E-05	1	3E-06	0.3
Site and Background Totals				
Total Surface Soil, Surface Water and Sediment	3E-05	1	3E-06	0.3
Total All Soil, Surface Water and Sediment	3E-05	1	3E-06	0.3

ADULT RECREATIONAL USERS				
Surface Soil				
Site Risk	3E-06	0.03	2E-07	0.008
Background Risk	3E-07	0.002	3E-08	0.0006
Site + Background Risk	3E-06	0.04	2E-07	0.009
All Soil				
Site Risk	3E-06	0.04	2E-07	0.01
Background Risk	4E-07	0.002	3E-08	0.0005
Site + Background Risk	4E-06	0.05	3E-07	0.01
Surface Water	4E-09	0.0002	3E-10	0.00005
Sediment	9E-06	0.1	6E-07	0.03
Site Totals				
Total Surface Soil, Surface Water and Sediment	1E-05	0.1	8E-07	0.03
Total All Soil, Surface Water and Sediment	1E-05	0.1	9E-07	0.04
Site and Background Totals				
Total Surface Soil, Surface Water and Sediment	1E-05	0.1	9E-07	0.03
Total All Soil, Surface Water and Sediment	1E-05	0.1	9E-07	0.04

TABLE C-11
RISKS ASSOCIATED WITH NATURALLY OCCURING CHEMICALS
SITE 13 - TANK FARM 5, DU 5-1
NAVSTA NEWPORT, MIDDLETOWN, RHODE ISLAND

Receptor	Reasonable Maximum Exposures		Central Tendency Exposure	
	ILCR	HI	ILCR	HI
LIFELONG RECREATIONAL USERS				
Surface Soil				
Site Risk	1E-05	NA	8E-07	NA
Background Risk	1E-06	NA	9E-08	NA
Site + Background Risk	1E-05	NA	9E-07	NA
All Soil				
Site Risk	1E-05	NA	9E-07	NA
Background Risk	1E-06	NA	1E-07	NA
Site + Background Risk	1E-05	NA	1E-06	NA
Surface Water	5E-09	NA	5E-10	NA
Sediment	3E-05	NA	3E-06	NA
Site Totals				
Total Surface Soil, Surface Water and Sediment	4E-05	NA	3E-06	NA
Total All Soil, Surface Water and Sediment	4E-05	NA	3E-06	NA
Site and Background Totals				
Total Surface Soil, Surface Water and Sediment	4E-05	NA	3E-06	NA
Total All Soil, Surface Water and Sediment	4E-05	NA	3E-06	NA

CHILD RESIDENTS				
Surface Soil				
Site Risk	6E-05	2	6E-06	0.7
Background Risk	6E-06	0.2	7E-07	0.05
Site + Background Risk	6E-05	2	7E-06	0.8
All Soil				
Site Risk	6E-05	3	6E-06	1
Background Risk	6E-06	0.1	7E-07	0.05
Site + Background Risk	6E-05	3	7E-06	1
Groundwater	1E-04	22	6E-06	6
Site Totals				
Total Surface Soil and Groundwater	2E-04	24	1E-05	6
Total All Soil and Groundwater	2E-04	25	1E-05	7
Site and Background Totals				
Total Surface Soil and Groundwater	2E-04	24	1E-05	7
Total All Soil and Groundwater	2E-04	25	1E-05	7

TABLE C-11
RISKS ASSOCIATED WITH NATURALLY OCCURING CHEMICALS
SITE 13 - TANK FARM 5, DU 5-1
NAVSTA NEWPORT, MIDDLETOWN, RHODE ISLAND

Receptor	Reasonable Maximum Exposures		Central Tendency Exposure	
	ILCR	HI	ILCR	HI
ADULT RESIDENTS				
Surface Soil				
Site Risk	2E-05	0.2	2E-06	0.08
Background Risk	3E-06	0.02	3E-07	0.006
Site + Background Risk	3E-05	0.3	2E-06	0.08
All Soil				
Site Risk	2E-05	0.3	2E-06	0.1
Background Risk	3E-06	0.02	3E-07	0.005
Site + Background Risk	3E-05	0.3	2E-06	0.1
Groundwater	1E-04	7	8E-06	2
Site Totals				
Total Surface Soil and Groundwater	1E-04	7	1E-05	2
Total All Soil and Groundwater	2E-04	7	1E-05	2
Site and Background Totals				
Total Surface Soil and Groundwater	2E-04	7	1E-05	2
Total All Soil and Groundwater	2E-04	7	1E-05	2

LIFELONG RESIDENTS				
Surface Soil				
Site Risk	8E-05	NA	8E-06	NA
Background Risk	8E-06	NA	9E-07	NA
Site + Background Risk	9E-05	NA	9E-06	NA
All Soil				
Site Risk	8E-05	NA	8E-06	NA
Background Risk	9E-06	NA	9E-07	NA
Site + Background Risk	9E-05	NA	9E-06	NA
Groundwater	2E-04	NA	1E-05	NA
Site Totals				
Total Surface Soil and Groundwater	2E-04	NA	2E-05	NA
Total All Soil and Groundwater	3E-04	NA	2E-05	NA
Site and Background Totals				
Total Surface Soil and Groundwater	3E-04	NA	2E-05	NA
Total All Soil and Groundwater	3E-04	NA	2E-05	NA

Notes:
ILCR = Incremental Lifetime Cancer Risk
HI = Hazard Index
1 - Cancer risk or hazard index from only site-related chemicals detected at concentrations exceeding screening levels.
2 - Cancer risk or hazard index from only chemicals present at naturally ocurring levels detected at concentrations exceeding screening levels. Aluminum and chromium were within background levels in surface soil, and aluminum, beryllium, and chromium were identified as being within background levels in subsurface soil. No background samples are available for groundwater, surface water, and sediment.
3 - Cancer risk or hazard index from all chemicals detected at concentrations exceeding screening levels.

TABLE C-12
CHEMICALS RETAINED AS CHEMICALS OF CONCERN
SITE 13 - TANK FARM 5, DU 5-1
NAVSTA NEWPORT, MIDDLETOWN, RHODE ISLAND
PAGE 1 OF 1

Chemical	Receptor								
	Construction Workers	Industrial Workers	Adolescent Trespassers	Child Recreational Users	Adult Recreational Users	Lifelong Recreational Users	Child Residents	Adult Residents	Lifelong Residents
Surface Soil									
No COCs identified for surface soil.									
All Soil									
Manganese	X								
Groundwater									
Arsenic							X		X
Cobalt							X	X	
Iron							X		
Manganese							X	X	
Surface Water									
No COCs identified for surface water.									
Sediment									
No COCs identified for sediment.									

A chemical is retained as a COC if it contributed to a total cancer risk greater than 1×10^{-4} or to a target organ hazard index greater than 1.

TABLE C-13
SELECTION OF PRGs - SOIL
SITE 13 - TANK FARM 5, DU 5-1
NAVSTA NEWPORT, MIDDLETOWN, RHODE ISLAND

PARAMETER (COPCs) (mg/kg)	Site Data [1]				PRGs					BACKGROUND [3]		Surface Soil		Subsurface Soil	
	Surface Soil (0-1 foot)		All Soil (0-10 feet)		Risk-Based PRGs [2]		ARAR-Based PRGs								
	Conc.	FOD	Conc.	FOD	Cancer	Non-Cancer	RIDEM DEC	RIDEM LC	EPA	Surface Soil	Subsurface Soil	Selected PRGs	Comment	Selected PRGs	Comment
Residential															
benzo(a)anthracene	0.097	11/11	0.036	15/32	NA	NA	0.9	NA	NA	0.158	NA	NA	6	NA	6
benzo(a)pyrene	0.119	11/11	0.046	15/32	NA	NA	0.4	240	NA	0.155	NA	NA	6	NA	6
benzo(b)fluoranthene	0.204	11/11	0.073	16/32	NA	NA	0.9	NA	NA	0.099	NA	NA	6	NA	6
dibenzo(a,h)anthracene	0.022	7/11	0.01	7/32	NA	NA	0.4	NA	NA	NA	NA	NA	6	NA	6
indeno(1,2,3-cd)pyrene	0.089	11/11	0.03	14/32	NA	NA	0.9	NA	NA	NA	NA	NA	6	NA	6
benzo(a)pyrene equivalents	NA	11/11	NA	17/32	NA	NA	NA	NA	NA	NA	NA	NA	6	NA	6
1,2,3,4,6,7,8,9-OCDD	NA [4]	11/11	NA [4]	22/22	NA	NA	NA	NA	NA	NA	NA	NA	4,6	NA	6
2,3,7,8-TCDD TEQs	0.0000041	11/11	0.0000042	22/22	NA	NA	NA	NA	NA	NA	NA	NA	6	NA	4,6
arsenic	26.410	11/11	29.8	32/32	NA	NA	7	NA	NA	17	24	17	5	24	5
beryllium	0.495	11/11	0.414	32/32	NA	NA	1.5	0.6 [9]	NA	0.62	0.64	NA	6	NA	6
cobalt	10.3	11/11	15.4	32/32	NA	NA	NA	NA	NA	9.6	15.7	NA	6	NA	6
iron	25703	11/11	37930	32/32	NA	NA	NA	NA	NA	28404	34880	NA	6	NA	6
manganese	342.7	11/11	1053	32/32	NA	NA	390	NA	NA	261/489[10]	448/1086[10]	NA/NA	6	448/1086	10
thallium	2.065	11/11	2.6	31/32	NA	NA	5.5	0.1 [9]	NA	NA	NA	NA	6,9	NA	6
Industrial															
benzo(a)anthracene	0.097	11/11	0.036	15/32	NA	NA	7.8[8]	NA	NA	0.158	NA	NA	6	NA	6
benzo(a)pyrene	0.119	11/11	0.046	15/32	NA	NA	0.8[8]	NA	NA	0.155	NA	NA	6	NA	6
benzo(b)fluoranthene	0.204	11/11	0.073	16/32	NA	NA	7.8[8]	NA	NA	0.099	NA	NA	6	NA	6
dibenzo(a,h)anthracene	0.022	7/11	0.01	7/32	NA	NA	0.8[8]	NA	NA	NA	NA	NA	6	NA	6
indeno(1,2,3-cd)pyrene	0.089	11/11	0.03	14/32	NA	NA	7.8[8]	NA	NA	NA	NA	NA	6	NA	6
benzo(a)pyrene equivalents	NA	11/11	NA	17/32	NA	NA	NA	NA	NA	NA	NA	NA	6	NA	6
1,2,3,4,6,7,8,9-OCDD	NA [4]	11/11	NA [4]	22/22	NA	NA	NA	NA	NA	NA	NA	NA	6	NA	6
2,3,7,8-TCDD TEQs	0.0000041	11/11	0.0000042	22/22	NA	NA	NA	NA	NA	NA	NA	NA	4,6	NA	4,6
arsenic	26.410	11/11	29.8	32/32	NA	NA	7[8]	NA	NA	17	24	17	5	24	5,8
beryllium	0.495	11/11	0.414	32/32	NA	NA	1.5[8]	NA	NA	0.62	0.64	NA	6	NA	6
cobalt	10.3	11/11	15.4	32/32	NA	NA	NA	NA	NA	9.6	15.7	NA	6	NA	6
iron	25703	11/11	37930	32/32	NA	NA	NA	NA	NA	28404	34880	NA	6	NA	6
manganese	342.7	11/11	1053	32/32	NA	585	10000[8]	NA	NA	261/489[10]	448/1086[10]	NA/NA	6	585/1086	10
thallium	2.065	11/11	2.6	31/32	NA	NA	140[8]	NA	NA	NA	NA	NA	6	NA	6

TABLE C-13
SELECTION OF PRGs - SOIL
SITE 13 - TANK FARM 5, DU 5-1
NAVSTA NEWPORT, MIDDLETOWN, RHODE ISLAND

Notes:

PRG Selection was as follows: The lowest PRG value was compared to the site concentration (surface and subsurface); if the site concentration exceeded the lowest PRG, that value was selected as the PRG and then adjusted to background

Yellow shaded Values are selected PRGs for COCs

Bold - parameters are COPCs that were retained as COCs through the HHRA in the Data Gaps Assessment Report

FOD - Frequency of Detection

DEC - RIDEM Direct Exposure Criteria

Site Concentration is 95% UCLs calcuated in the data report

(1) EPCs used to represent site data are presented in Table 3.6 (RME) of Appendix H-2 of the Data Gaps Assessment Report

(2) Risk-based PRGs are calculated and presented in Appendix B of this FS report.

(3) Background data 95% UPLs are presented for combined background soils, refer to Appendix B, Attachment B2 and Table 2-8

(4) Dioxin-like congeners are evaluated together as a toxicity equivalency quotient (TEQ)

(5) PRG adjusted based on background: If Site concentration does not exceed the PRG, then the constituent is not a COC.

(6) Constituent does not pose risk* and does not exceed any ARAR.

(7) PRGs are not calculated for TPH Under CERCLA

(8) Industrial DECs are applicable to surface soil (0-2 foot in depth)

(9) Leachability criteria for metals in soil are minimum concentrations that could provide an exceedance of the aqueous criteria cited in RIDEM Regulations, they do not reflect actual conditions.

(10) Two background values based on two background soil types (Ne/Pm) present.

* Risk: Cancer risk exceeding 1E-6, and non cancer risk hazard quotient of 1

TABLE C-14
SELECTION OF PRGs - GROUNDWATER
SITE 13 - TANK FARM 5, DU 5-1
NAVSTA NEWPORT, MIDDLETOWN, RHODE ISLAND

PARAMETER (COPCs) (ug/L)	Site Data [1]		PRGs				Selected PRGs	Comment
	Groundwater		Risk-Based PRGs [2]		ARAR-Based PRGs			
	Conc.	FOD	Cancer	Non-Cancer	RIDEM GA	EPA [6]		
Residential								
benzene	1.2(J)	1/4	NA	NA	5	5	5	3
aluminum	1480	1/4	NA	NA	NA	NA	NA	3
arsenic	8.8	4/4	0.039	3.3	10	10	10	4
cobalt	19	4/4	NA	3.3	NA	NA	3.3	
iron	24300	4/4	NA	10900	NA	NA	10900	
manganese	2510	4/4	NA	320	NA	300[5]	300	
Industrial								
None	NA	NA	NA	NA	NA	NA	NA	NA

Bold - parameters are COPCs that were retained as COCs through the HHRA in the Data Gaps Assessment Report
FOD - Frequency of Detection
MCL - EPA Maximum Concentration Level
Site Concentration is 95% UCLs calcuated in the data report

(1) Site concentrations are maximums
(2) Risk-based PRGs are calculated and presented in Appendix B of this FS report.
(3) Constituent does not pose risk* and does not exceed any ARAR.
(4) Arsenic does not exceed the MCL; therefore, it is not a COC.
(5) The EPA health advisory is presented for informational purposes.
(6) The EPA ARAR-based PRGs are MCLs unless otherwise noted.
* Risk: Cancer risk exceeding 1E-6, and non cancer risk hazard quotient of 1

Appendix D
Ecological Risk Assessment Summary Tables

TABLE D-1
SURFACE SOIL COPC SELECTION
SITE 13 - TANK FARM 5, DU 5-1
NAVSTA NEWPORT, MIDDLETOWN, RHODE ISLAND

Chemical	Frequency of Detection	Minimum Concentration[1]	Maximum Concentration[1]	Sample of Maximum Concentration[1]	95% UCL	Average of Positive Results[1]	Ecological Effects Quotient[2]				Rationale for Invertebrate/ Plant Deletion or Selection	Retain for Food Chain Modeling?
							Invertebrates[3]	Plants[3]	Avian[4]	Mammals[4]		
Volatile Organics (ug/kg)												
ACETONE	7/11	6 J	65 J	TF5-SB-968-0001	37.27	33.3	NA	NA	NA	2.6E-02	NSL	YES
ISOPROPYLBENZENE	1/11	6.2	6.2	TF5-SB-969-0001	N/A	6.2	NA	NA	NA	NA	NSL	YES
TOLUENE	1/11	1.8 J	1.8 J	TF5-SB-968-0001	N/A	1.8	2.4E-05	2.4E-05	1.3E-06	1.3E-06	BSL	NO
Semivolatile Organics (ug/kg)												
ACENAPHTHENE	3/11	4.2	7.7	TF5-SB-967-0001	7.7	5.7	2.7E-04	3.9E-04	NA	7.7E-05	BSL	YES
ACENAPHTHYLENE	4/11	7.6	26 J	TF5-SB-970-0001	15.82	14.4	9.0E-04	NA	NA	2.6E-04	BSL/NSL	YES
ANTHRACENE	7/11	4.5	27	TF5-SB-967-0001	14.85	12.9	9.3E-04	NA	NA	2.7E-04	BSL/NSL	YES
BENZALDEHYDE	1/11	73 J	73 J	TF5-SB-975-0001	N/A	73	NA	NA	NA	NA	NSL	YES
BENZO(A)ANTHRACENE	11/11	5.9	230	TF5-SB-967-0001	96.73	46.8	1.3E-02	NA	NA	2.1E-01	BSL/NSL	YES
BENZO(A)PYRENE	11/11	6.4	300	TF5-SB-967-0001	118.5	55.8	1.7E-02	NA	NA	2.7E-01	BSL/NSL	YES
BENZO(B)FLUORANTHENE	11/11	10	530 J	TF5-SB-967-0001	203.6	92.7	2.9E-02	NA	NA	4.8E-01	BSL/NSL	YES
BENZO(G,H,I)PERYLENE	11/11	4.4	270	TF5-SB-967-0001	101.3	48	1.5E-02	NA	NA	2.5E-01	BSL/NSL	YES
BENZO(K)FLUORANTHENE	11/11	4.6 J	200 J	TF5-SB-967-0001	74.33	36.4	1.1E-02	NA	NA	1.8E-01	BSL/NSL	YES
BIS(2-ETHYLHEXYL)PHTHALATE	1/11	58 J	58 J	TF5-SB-970-0001	N/A	58	5.8E-01	5.8E-01	NA	6.3E-02	BSL	YES
CHRYSENE	11/11	8.4	300	TF5-SB-967-0001	122.6	60.3	1.7E-02	NA	NA	2.7E-01	BSL/NSL	YES
DIBENZO(A,H)ANTHRACENE	7/11	4.3	57 J	TF5-SB-967-0001	21.76	17.4	3.2E-03	NA	NA	5.2E-02	BSL/NSL	YES
FLUORANTHENE	11/11	13	600	TF5-SB-967-0001	237.4	112	2.1E-02	NA	NA	6.0E-03	BSL/NSL	YES
FLUORENE	3/11	5.5	11	TF5-SB-967-0001	11	8.7	3.8E-04	NA	NA	1.1E-04	BSL/NSL	YES
INDENO(1,2,3-CD)PYRENE	11/11	4	240 J	TF5-SB-967-0001	89.18	41.4	1.3E-02	NA	NA	2.2E-01	BSL/NSL	YES
PHENANTHRENE	11/11	4.4	200	TF5-SB-967-0001	89.91	44.9	6.9E-03	NA	NA	2.0E-03	BSL/NSL	YES
PYRENE	11/11	11	430	TF5-SB-967-0001	179.8	87.4	2.4E-02	NA	NA	3.9E-01	BSL/NSL	YES
TOTAL PAHS	11/11	72.6 J	3410 J	TF5-SB-967-0001	1373	653	NA	NA	NA	NA	NA	NA
Pesticides/PCBs (ug/kg)												
4,4'-DDD	1/11	5.1	5.1	TF5-SB-967-0001	N/A	5.1	4.3E-04	4.3E-04	5.5E-02	2.4E-01	BSL	NO
4,4'-DDE	2/11	5.5	6.6	TF5-SB-971-0001	6.6	6.1	5.5E-04	5.5E-04	7.1E-02	3.1E-01	BSL	NO
4,4'-DDT	1/11	5.6 J	5.6 J	TF5-SB-971-0001	N/A	5.6	4.7E-04	4.7E-04	6.0E-02	2.7E-01	BSL	NO
AROCLOR-1254	1/11	39	39	TF5-SB-973-0001	N/A	39	1.2E-03	1.2E-03	3.0E+01	3.0E+01	BSL	YES
TOTAL DDD/DDE/DDT	2/11	10.6	12.2 J	TF5-SB-971-0001	12.2	11.4	1.0E-03	1.0E-03	1.3E-01	5.8E-01	BSL	NO
Dioxins (ng/kg)												
TEQ BIRD	11/11	0.324 J	4.62 J	TF5-SB-975-0001	2.451	1.76	NA	NA	NA	NA	NSL	YES
TEQ MAMMAL	11/11	1 J	5.98 J	TF5-SB-975-0001	4.033	3.13	NA	NA	NA	NA	NSL	YES
Inorganics (mg/kg)												
ALUMINUM	11/11	5460	9740	TF5-SB-969-0001	8499	7800	NA	pH	NA	NA	NSL/ASL	YES
ARSENIC	11/11	4.3 J	43.7	TF5-SB-972-0001	26.41	16.4	7.3E-01	2.4E+00	1.0E+00	9.5E-01	BSL/ASL	YES
BARIUM	11/11	9.5 J	23.7	TF5-SB-967-0001	18.36	15.8	7.2E-02	4.7E-02	NA	1.2E-02	BSL	YES
BERYLLIUM	11/11	0.33	0.55 J	TF5-SB-975-0001	0.495	0.45	1.4E-02	5.5E-02	NA	2.6E-02	BSL	YES
CADMIUM	10/11	0.1	0.33	TF5-SB-974-0001	0.232	0.20	2.4E-03	1.0E-02	4.3E-01	9.2E-01	BSL	NO
CALCIUM	11/11	166 J	1710 J	TF5-SB-970-0001	1078	783	NA	NA	NA	NA	NUT	NO
CHROMIUM	11/11	5.6	12.8	TF5-SB-969-0001	10.7	9.5	2.0E-01	2.0E-01	4.9E-01	3.8E-01	BSL	NO
COBALT	11/11	2.2 J	13.2 J	TF5-SB-969-0001	10.3	8.2	NA	1.0E+00	1.1E-01	5.7E-02	NSL/ASL	NO

TABLE D-1
SURFACE SOIL COPC SELECTION
SITE 13 - TANK FARM 5, DU 5-1
NAVSTA NEWPORT, MIDDLETOWN, RHODE ISLAND

Chemical	Frequency of Detection	Minimum Concentration(1)	Maximum Concentration(1)	Sample of Maximum Concentration(1)	95% UCL	Average of Positive Results(1)	Ecological Effects Quotient(2)				Rationale for Invertebrate/ Plant Deletion or Selection	Retain for Food Chain Modeling?
							Invertebrates (3)	Plants(3)	Avian(4)	Mammals(4)		
COPPER	11/11	7.5	24.2	TF5-SB-967-0001	15.51	12.9	3.0E-01	3.5E-01	8.6E-01	4.9E-01	BSL	NO
IRON	11/11	11500	33700	TF5-SB-969-0001	25703	21800	NA	pH	NA	NA	NSL/ASL	YES
LEAD	11/11	9.3 J	33.3 J	TF5-SB-968-0001	26.66	21.7	2.0E-02	2.8E-01	3.0E+00	5.9E-01	BSL	YES
MAGNESIUM	11/11	824 J	2320 J	TF5-SB-969-0001	1876	1600	NA	NA	NA	NA	NUT	NO
MANGANESE	11/11	95.8 J	462	TF5-SB-974-0001	342.7	274	1.0E+00	2.1E+00	1.1E-01	1.2E-01	ASL	NO
MERCURY	2/11	0.019 J	0.12	TF5-SB-968-0001	0.12	0.07	1.0E-02	1.0E-02	NA	7.6E-02	BSL	YES
NICKEL	11/11	6.8 J	22.6	TF5-SB-974-0001	19.02	16	8.1E-02	5.9E-01	1.1E-01	1.7E-01	BSL	NO
POTASSIUM	11/11	142 J	388 J	TF5-SB-966-0001	263.6	226	NA	NA	NA	NA	NUT	NO
SELENIUM	6/11	2.9 J	4.2	TF5-SB-974-0001	3.636	3.6	1.0E+00	8.1E+00	3.5E+00	6.7E+00	ASL	YES
SILVER	8/11	0.095 J	0.21	TF5-SB-968-0001, TF5-SB-972-0001, TF5-SB-974-0001	0.189	0.172	NA	3.8E-04	5.0E-02	1.5E-02	NSL/BSL	NO
SODIUM	6/11	19.3 J	53.9 J	TF5-SB-966-0001	37.44	35.1	NA	NA	NA	NA	NUT	NO
THALLIUM	11/11	0.65 J	2.5	TF5-SB-973-0001	2.065	1.72	1.8E+00	1.8E+00	NA	4.4E+01	ASL	YES
VANADIUM	11/11	10.9 J	24 J	TF5-SB-968-0001	17.42	15.3	1.8E-01	1.8E-01	3.1E+00	8.6E-02	BSL	YES
ZINC	11/11	18.4 J	69.5	TF5-SB-967-0001	50.53	42	5.8E-01	4.3E-01	1.5E+00	8.8E-01	BSL	YES

NA = Not Applicable/Value not able to be calculated

1 - Sample and duplicate were averaged for the minimum, maximum, and average concentrations.
2 - Ecological effects quotients were calculated by dividing the maximum detected concentration by the COPC screening level. Values are unitless. The screening levels are provided in Appendix I of the DGA report.
3 - Cells are shaded if the chemical was retained as a COPC for that receptor.
4 - Shading for wildlife receptors indicates that the chemical was retained for food chain modeling. If a screening level was not available for a wildlife receptor or the chemical was retained for the other wildlife receptor, the chemical was retained for food chain modeling .

Associated Samples:
TF5-SB-966-0001
TF5-SB-967-0001
TF5-SB-968-0001
TF5-SB-969-0001
TF5-SB-970-0001
TF5-SB-971-0001
TF5-SB-972-0001
TF5-SB-973-0001
TF5-SB-974-0001
TF5-SB-975-0001
TF5-SB-976-0001

Rationale Codes
For Selection as a COPC:
ASL = Above COPC screening level
NSL = No screening level
For Elimination as a COPC:
BSL = Below COPC screening level
NUT = Essential nutrient

TABLE D-2
SEDIMENT COPC SELECTION
SITE 13 - TANK FARM 5, DU 5-1
NAVSTA NEWPORT, MIDDLETOWN, RHODE ISLAND

Chemical	Frequency of Detection	Minimum Concentration[1]	Maximum Concentration[1]	Sample of Maximum Concentration[1]	95% UCL	Average of Positive Results[1]	Ecological Screening Level	Source of Screening Level[2]	Ecological Effects Quotient[3]	Rationale for COPC Selection/ Deletion	Retain for Food Chain Modeling?
Volatile Organics (µg/kg)											
1,2-DICHLOROBENZENE	1/12	1.6 J	1.6 J	TF5-SD-913-0006	NA	1.6	340	SQB	0.005	BSL	YES
ACETONE	11/12	13.4 J	200 J	TF5-SD-918-0006	114.8	88	8.7	SCV[4]	23.0	ASL	YES
CARBON DISULFIDE	1/12	3.9 J	3.9 J	TF5-SD-921-0006	NA	3.9	0.85	SCV	4.6	ASL	YES
Semivolatile Organics (µg/kg)											
2,4-DIMETHYLPHENOL	1/12	3.5	3.5	TF5-SD-919-0006	NA	3.5	18	NOAA	0.2	BSL	YES
2-METHYLNAPHTHALENE	10/12	3.6	210	TF5-SD-913-0006	101.2	32	20.2	NOAA[5]	10.4	ASL	YES
2-METHYLPHENOL	2/12	3.5	12	TF5-SD-918-0006	5.931	7.75	12	SCV	1.0	BSL	YES
4-METHYLPHENOL	9/12	3.8	21	TF5-SD-921-0006	9.735	8.31	NA	NA	NA	NSL	YES
ACENAPHTHENE	12/12	7.2	48	TF5-SD-913-0006	29.99	21	290	NOAA	0.2	BSL	YES
ACENAPHTHYLENE	12/12	6.6	110	TF5-SD-913-0006	49.81	32	160	NOAA	0.7	BSL	YES
ANTHRACENE	12/12	29	150	TF5-SD-922-0006	101.5	72.7	57.2	TEC	2.6	ASL	YES
ATRAZINE	1/12	4.6 J	4.6 J	TF5-SD-918-0006	N/A	4.6	NA	NA	NA	NSL	YES
BENZO(A)ANTHRACENE	12/12	33 J	650	TF5-SD-921-0006	443.8	279	108	TEC	6.0	ASL	YES
BENZO(A)PYRENE	12/12	42	780	TF5-SD-921-0006	539.6	348	150	TEC	5.2	ASL	YES
BENZO(B)FLUORANTHENE	12/12	72 J	1000	TF5-SD-924-0006	571	431	1800	NOAA[6]	0.6	BSL	YES
BENZO(G,H,I)PERYLENE	12/12	32	630	TF5-SD-924-0006	387.1	286	170	OMOE	3.7	ASL	YES
BENZO(K)FLUORANTHENE	12/12	29 J	860	TF5-SD-921-0006	477.3	334	240	OMOE	3.6	ASL	YES
BIS(2-ETHYLHEXYL)PHTHALATE	11/12	41 J	410	TF5-SD-921-0006	238.6	182	750	NOAA	0.5	BSL	YES
CARBAZOLE	7/12	36 J	100	TF5-SD-921-0006, TF5-SD-924-0006	84.05	65.1	NA	NA	NA	NSL	YES
CHRYSENE	12/12	51	890	TF5-SD-924-0006	637.2	411	166	TEC	5.4	ASL	YES
DIBENZO(A,H)ANTHRACENE	12/12	8.7	180	TF5-SD-921-0006	121	91.4	33	TEC	5.5	ASL	YES
FLUORANTHENE	12/12	100	1800	TF5-SD-921-0006, TF5-SD-924-0006	1093	780	423	TEC	4.3	ASL	YES
FLUORENE	12/12	14	120	TF5-SD-913-0006	57.77	39.6	77.4	TEC	1.6	ASL	YES
INDENO(1,2,3-CD)PYRENE	12/12	29	660	TF5-SD-924-0006	379.8	276	200	OMOE	3.3	ASL	YES
NAPHTHALENE	11/12	3.92	130	TF5-SD-913-0006	64.63	21.7	176	TEC	0.7	BSL	YES
PENTACHLOROPHENOL	1/12	34	34	TF5-SD-919-0006	NA	34	17	NOAA	2.0	ASL	YES
PHENANTHRENE	12/12	130	690	TF5-SD-921-0006	444.4	344	204	TEC	3.4	ASL	YES
PHENOL	6/12	2.52	8.7	TF5-SD-921-0006	6.975	6.3	48	NOAA	0.2	BSL	YES
PYRENE	12/12	85	1300	TF5-SD-921-0006, TF5-SD-924-0006	815.8	598	195	TEC	6.7	ASL	YES
TOTAL PAHS	12/12	746 J	9290	TF5-SD-921-0006	5916	4390	1610	TEC	5.8	ASL	YES
Pesticides (ug/kg)											
4,4'-DDD	2/12	3.4 J	3.62 J	TF5-SD-923-0006-AVG	3.62	3.51	4.88	TEC	0.7	BSL	YES
4,4'-DDE	4/12	3.9	5.4	TF5-SD-922-0006	4.883	4.7	3.16	TEC	1.7	ASL	YES
4,4'-DDT	3/12	3.4	15	TF5-SD-922-0006	15	7.57	4.16	TEC	3.6	ASL	YES
ALDRIN	1/12	2.6	2.6	TF5-SD-922-0006	NA	2.6	2	OMOE	1.3	ASL	YES
ALPHA-BHC	1/12	2.1	2.1	TF5-SD-922-0006	NA	2.1	6	OMOE	0.4	BSL	YES
AROCLOR-1260	5/12	40 J	78 J	TF5-SD-922-0006	59.32	58	59.8	TEC	1.3	ASL	YES
ENDRIN ALDEHYDE	2/12	2.92 J	3.5	TF5-SD-924-0006	3.086	3.21	2.22	TEC	1.6	ASL	YES
ENDRIN KETONE	3/12	2.82	11	TF5-SD-922-0006	11	5.74	2.22	TEC	5.0	ASL	YES
GAMMA-CHLORDANE	1/12	4.9 J	4.9 J	TF5-SD-922-0006	NA	4.9	3.24	TEC	1.5	ASL	YES
TOTAL DDD/DDE/DDT	6/12	3.4 J	20.4 J	TF5-SD-922-0006	8.438	8.09	5.28	TEC	3.9	ASL	YES

TABLE D-2
SEDIMENT COPC SELECTION
SITE 13 - TANK FARM 5, DU 5-1
NAVSTA NEWPORT, MIDDLETOWN, RHODE ISLAND

Chemical	Frequency of Detection	Minimum Concentration[1]	Maximum Concentration[1]	Sample of Maximum Concentration[1]	95% UCL	Average of Positive Results[1]	Ecological Screening Level	Source of Screening Level[2]	Ecological Effects Quotient[3]	Rationale for COPC Selection/ Deletion	Retain for Food Chain Modeling?
Dioxins (ng/kg)											
TEQ FISH	12/12	0.526 J	10.9 J	TF5-SD-924-0006	6.315	4.55	NA	NA	NA	NSL	YES
Inorganics (mg/kg)											
ALUMINUM	12/12	4500	12600	TF5-SD-917-0006	10657	9360	25500	NOAA	0.5	BSL	YES
ARSENIC	12/12	10.5	121	TF5-SD-914-0006	62.49	23.5	9.79	TEC	12.4	ASL	YES
BARIUM	12/12	12 J	47.2 J	TF5-SD-924-0006	34.36	28.9	48	NOAA[6]	1.0	BSL	YES
BERYLLIUM	12/12	0.24 J	1.1 J	TF5-SD-914-0006	0.627	0.509	NA	NA	NA	NSL	YES
CADMIUM	12/12	0.25 J	2	TF5-SD-914-0006	0.871	0.612	0.99	TEC	2.0	ASL	YES
CALCIUM	11/12	813 J	3680 J	TF5-SD-924-0006	2303	1940	NA	NA	NA	NUT	NO
CHROMIUM	12/12	6.9 J	18.8 J	TF5-SD-914-0006	16.99	15	43.4	TEC	0.4	BSL	YES
COBALT	12/12	5.55	95	TF5-SD-914-0006	47.73	16.4	50	NOAA	1.9	ASL	YES
COPPER	12/12	4.9	43	TF5-SD-918-0006	32.36	26.1	31.6	TEC	1.4	BSL	YES
IRON	12/12	15300	166000	TF5-SD-914-0006	87789	35800	20000	OMOE	8.3	ASL	YES
LEAD	12/12	11.5 J	95.8 J	TF5-SD-918-0006	62.37	49.9	35.8	TEC	2.7	ASL	YES
MAGNESIUM	12/12	784	3050	TF5-SD-922-0006	2655	2290	NA	NA	NA	NUT	NO
MANGANESE	12/12	112	982	TF5-SD-914-0006	437.1	292	460	OMOE	2.1	ASL	YES
MERCURY	12/12	0.0145 J	0.19 J	TF5-SD-918-0006	0.114	0.0877	0.18	TEC	1.1	ASL	YES
NICKEL	12/12	13.4	127	TF5-SD-914-0006	72.14	34.2	22.7	TEC	5.6	ASL	YES
POTASSIUM	12/12	193 J	546	TF5-SD-924-0006	402.1	339	NA	NA	NA	NUT	NO
SILVER	2/12	0.14 J	0.278 J	TF5-SD-923-0006-AVG	0.183	0.209	0.5	OMOE	0.6	BSL	YES
SODIUM	12/12	30.2 J	252	TF5-SD-918-0006	158.9	119	NA	NA	NA	NUT	NO
THALLIUM	4/12	0.33 J	1.7 J	TF5-SD-924-0006	0.887	0.795	NA	NA	NA	NSL	YES
VANADIUM	12/12	6.6 J	27.3	TF5-SD-918-0006	22.08	18.6	57	NOAA[6]	0.5	BSL	YES
ZINC	12/12	63.8	190	TF5-SD-924-0006	132	112	121	TEC	1.6	ASL	YES
Miscellaneous Parameters											
PH (S.U.)	12/12	4.7	6.4	TF5-SD-922-0006	NA	5.62	NA	NA	NA	NA	NA
TOTAL ORGANIC CARBON (MG/KG)	12/12	20000	60000	TF5-SD-918-0006	NA	40100	NA	NA	NA	NA	NA

NA = Not Applicable/Value not able to be calculated

1 - Sample and duplicate were averaged for the minimum, maximum, and average concentrations.

2 - The sources for the ecological screening levels in order of preference is as follows:

TEC- MacDonald, D.D., C.G. Ingersoll, and T.A. Berger. 2000. Development and Evaluation of Consensus-Based Sediment Quality Guidelines for Freshwater Ecosystems. Archives of Environmental Contamination and Toxicology. Vol. 39, pp. 20-31.

OMOE - OMOE 1993. Guidelines for the Protection and Management of Aquatic Sediment Quality in Ontario. Ministry of Environment and Energy. August.

NOAA - Buchman, M. F., 2008. NOAA Screening Quick Reference Tables, NOAA OR&R Report 08-1, Seattle, WA, Office of Response and Restoration Division, National Oceanic and Atmospheric Administration. http://response.restoration.noaa.gov/cpr/sediment/squirt/squirt.html

SCV - Jones, D.S., G.W. Suter II, and R.N. Hull. 1997. Toxicological Benchmarks for Screening Contaminants of Potential Concern for Effects on Sediment-Associated Biota: 1997 Revision. Oak Ridge National Laboratory. ES/ER/TM-95/R4. November.

3 - Ecological effects quotients were calculated by dividing the maximum detected concentration by the COPC screening level. Values are unitless. Cells are shaded if the chemical was retained as a COPC.

4 - Polar nonionic chemical for which the secondary chronic value is likely to be conservative.

5 - Saltwater TEL value.

6 - Saltwater AET value.

Associated Samples:

TF5-SD-913-0006	TF5-SD-916-0006	TF5-SD-919-0006	TF5-SD-922-0006
TF5-SD-914-0006	TF5-SD-917-0006	TF5-SD-920-0006	TF5-SD-923-0006-AVG
TF5-SD-915-0006	TF5-SD-918-0006	TF5-SD-921-0006	TF5-SD-924-0006

Rationale Codes
For Selection as a COPC:
ASL = Above COPC screening level
NSL = No screening level
For Elimination as a COPC:
BSL = Below COPC screening level
NUT = Essential nutrient

TABLE D-3
SURFACE WATER COPC SELECTION
SITE 13 - TANK FARM 5, DU 5-1
NAVSTA NEWPORT, MIDDLETOWN, RHODE ISLAND

Chemical	Frequency of Detection	Minimum Concentration(1)	Maximum Concentration(1)	Sample of Maximum Concentration(1)	Average of Positive Results(1)	Ecological Screening Level	Source of Screening Level(2)	Ecological Effects Quotient(3)	Rationale for COPC Selection/ Deletion
Volatile Organics (µg/L)									
CHLOROFORM	1/11	1	1	TF5-SW-918-0310	1	32	RIDEM	0.03	BSL
Semivolatile Organics (µg/L)									
2-METHYLNAPHTHALENE	2/11	0.25	3.3	TF5-SW-919-0310	1.78	330	NOAA	0.01	BSL
ACENAPHTHENE	1/11	0.36	0.36	TF5-SW-919-0310	0.36	1.9	RIDEM	0.2	BSL
ACENAPHTHYLENE	1/11	0.82	0.82	TF5-SW-919-0310	0.82	5.8	NOAA	0.14	BSL
ANTHRACENE	1/11	0.11	0.11	TF5-SW-919-0310	0.11	0.73	SCV	0.2	BSL
BENZO(A)ANTHRACENE	6/11	0.11 J	0.2 J	TF5-SW-917-0310	0.152	0.027	SCV	7	ASL
BENZO(A)PYRENE	2/11	0.13	0.16	TF5-SW-918-0310	0.145	0.014	SCV	11	ASL
BENZO(B)FLUORANTHENE	4/11	0.11	0.25	TF5-SW-918-0310	0.158	9.07	NOAA	0.03	BSL
BENZO(G,H,I)PERYLENE	1/11	0.13	0.13	TF5-SW-918-0310	0.13	7.64	NOAA	0.02	BSL
BENZO(K)FLUORANTHENE	1/11	0.15	0.15	TF5-SW-918-0310	0.15	30	NOAA(4)	0.01	BSL
CHRYSENE	4/11	0.11	0.18	TF5-SW-918-0310	0.138	30	NOAA(4)	0.01	BSL
FLUORANTHENE	6/11	0.12	0.36	TF5-SW-918-0310	0.24	4.4	RIDEM	0.1	BSL
FLUORENE	1/11	1.3	1.3	TF5-SW-919-0310	1.3	3.9	SCV	0.3	BSL
INDENO(1,2,3-CD)PYRENE	1/11	0.11	0.11	TF5-SW-918-0310	0.11	4.31	NOAA	0.03	BSL
NAPHTHALENE	2/11	0.59	1.5	TF5-SW-919-0310	1.04	2.6	RIDEM	0.6	BSL
PHENANTHRENE	10/11	0.075	1.1	TF5-SW-919-0310	0.25	6.3	SCV	0.2	BSL
PYRENE	5/11	0.13	0.3	TF5-SW-917-0310	0.224	0.025	NOAA	12	ASL
TOTAL PAHS	10/11	0.11	9.26 J	TF5-SW-919-0310	1.6	30	NOAA(4)	0.3	BSL
Inorganics (ug/L)									
ALUMINUM	1/11	852	852	TF5-SW-918-0310	852	87	NRWQC	9.8	ASL
ARSENIC	5/11	0.244 J	0.299 J	TF5-SW-919-0310	0.28	150	NRWQC	0.002	BSL
BARIUM	11/11	7.9	11	TF5-SW-918-0310	9.16	4	SCV	2.8	ASL
CALCIUM	11/11	11400	17700	TF5-SW-915-0310	15000	NA	NA	NA	NUT
COBALT	11/11	0.274 J	0.564 J	TF5-SW-919-0310	0.364	23	SCV	0.02	BSL
COPPER	11/11	0.9 J	3.3	TF5-SW-915-0310	1.8	9	NRWQC	0.4	BSL
IRON	7/11	215	2930	TF5-SW-918-0310	725	1000	NRWQC	2.9	ASL
LEAD	11/11	0.193 J	0.533 J	TF5-SW-915-0310	0.289	2.5	NRWQC	0.2	BSL
MAGNESIUM	11/11	5250	8250	TF5-SW-915-0310	6400	NA	NA	NA	NUT
NICKEL	11/11	1.6	5.4	TF5-SW-918-0310	3.23	52	NRWQC	0.1	BSL
POTASSIUM	11/11	1170	2760	TF5-SW-918-0310	2050	NA	NA	NA	NUT
SELENIUM	11/11	0.168 J	0.256 J	TF5-SW-917-0310	0.21	5	NRWQC	0.05	BSL
SODIUM	11/11	22500	39600	TF5-SW-915-0310	30600	NA	NA	NA	NUT

TABLE D-3
SURFACE WATER COPC SELECTION
SITE 13 - TANK FARM 5, DU 5-1
NAVSTA NEWPORT, MIDDLETOWN, RHODE ISLAND

NA = Not Applicable/Value not able to be calculated

1 - Sample and duplicate were averaged for the minimum, maximum, and average concentrations.
2 - The sources for the ecological screening levels in order of preference is as follows:
NRWQC - USEPA, 2009. National Recommended Water Quality Criteria: 2009. Office of Water.
RIDEM - Rhode Island Deprtment of Environmental Management (RIDEM) 2006. Ambient Water Quality Criteria and Guidelines. Water Resources Division. July.
SCV - Suter, G.W. II. and C.L. Tsao. 1996. Toxicological Benchmarks for Screening Potential Constituents of Concern for Effects on
Aquatic Biota:1996 Revision. Environmental Sciences Division, Oak Ridge National Laboratory. ES/ER/TM-96/R2.
NOAA - Buchman, M. F., 2008. NOAA Screening Quick Reference Tables, NOAA OR&R Report 08-1, Seattle, WA, Office of Response and Restoration Division,
National Oceanic and Atmospheric Administration.
3 - Ecological effects quotients were calculated by dividing the maximum detected concentration by the COPC screening level. Values are unitless.
Cells are shaded if the chemical was retained as a COPC.
4 - Value is calculated based on the Acute Saltwater value, which was divided by a factor of ten for a chronic value conversion.

Associated Samples:

TF5-SW-914-0310	TF5-SW-920-0310
TF5-SW-915-0310	TF5-SW-921-0006
TF5-SW-916-0310	TF5-SW-922-0006
TF5-SW-917-0310	TF5-SW-923-0006-AVG
TF5-SW-918-0310	TF5-SW-924-0006
TF5-SW-919-0310	

Rationale Codes
For Selection as a COPC:
ASL = Above COPC screening level
NSL = No screening level
For Elimination as a COPC:
BSL = Below COPC screening level
NUT = Essential nutrient

TABLE D-4
TERRESTRIAL FOOD CHAIN MODEL - CONSERVATIVE SCENARIO
INVERTIVOROUS AND HERBIVOROUS RECEPTORS
SITE 13 - TANK FARM 5, DU 5-1
NAVSTA NEWPORT, MIDDLETOWN, RHODE ISLAND

	Herbivorous Receptors EEQs				Invertivorous Receptors EEQs			
	Bobwhite Quail		Meadow Vole		American Robin		Short-Tailed Shrew	
Chemical	**NOAEL**	**LOAEL**	**NOAEL**	**LOAEL**	**NOAEL**	**LOAEL**	**NOAEL**	**LOAEL**
Volatile Organics								
ACETONE	1.8E-06	1.8E-07	3.8E-03	7.5E-04	6.1E-07	6.1E-08	7.1E-04	1.4E-04
CHLOROFORM	NV	NV	2.9E-05	1.1E-05	NV	NV	1.9E-05	7.0E-06
ISOPROPYLBENZENE	NV	NV	6.4E-05	2.1E-05	NV	NV	6.2E-05	2.1E-05
Semivolatile Organics								
2-METHYLNAPHTHALENE	2.4E-04	2.4E-05	2.2E-05	4.1E-06	2.6E-04	2.6E-05	1.4E-05	2.6E-06
ACENAPHTHENE	1.3E-02	1.3E-03	4.2E-04	7.7E-05	1.0E-03	1.0E-04	2.0E-05	3.7E-06
ACENAPHTHYLENE	1.2E-03	1.2E-04	3.7E-05	6.8E-06	4.8E-02	4.8E-03	9.7E-04	1.8E-04
ANTHRACENE	1.4E-03	1.4E-04	4.0E-05	7.3E-06	5.6E-03	5.6E-04	1.1E-04	2.0E-05
BENZALDEHYDE	NV	NV	7.2E-04	3.6E-04	NV	NV	4.0E-04	2.0E-04
BENZO(A)ANTHRACENE	3.2E-03	3.2E-04	6.5E-03	1.0E-04	3.3E-02	3.3E-03	6.5E-02	1.0E-03
BENZO(A)PYRENE	4.3E-03	4.3E-04	8.9E-03	1.4E-04	3.6E-02	3.6E-03	7.1E-02	1.1E-03
BENZO(B)FLUORANTHENE	1.3E-02	1.3E-03	3.3E-02	5.2E-04	1.2E-01	1.2E-02	2.4E-01	3.9E-03
BENZO(G,H,I)PERYLENE	6.4E-03	6.4E-04	1.7E-02	2.7E-04	6.8E-02	6.8E-03	1.4E-01	2.2E-03
BENZO(K)FLUORANTHENE	3.0E-03	3.0E-04	6.5E-03	1.0E-04	4.5E-02	4.5E-03	9.1E-02	1.5E-03
BIS(2-ETHYLHEXYL)PHTHALATE	1.1E-03	1.1E-04	3.0E-05	3.0E-06	9.8E-03	9.8E-04	3.5E-04	3.5E-05
CHRYSENE	3.9E-03	3.9E-04	7.7E-03	1.2E-04	5.9E-02	5.9E-03	1.2E-01	1.9E-03
DIBENZO(A,H)ANTHRACENE	8.1E-04	8.1E-05	1.7E-03	2.7E-05	1.1E-02	1.1E-03	2.3E-02	3.7E-04
FLUORANTHENE	2.0E-02	2.0E-03	5.4E-04	1.0E-04	1.6E-01	1.6E-02	3.0E-03	5.5E-04
FLUORENE	9.8E-03	9.8E-04	3.2E-04	5.8E-05	8.7E-03	8.7E-04	1.8E-04	3.3E-05
INDENO(1,2,3-CD)PYRENE	3.2E-03	3.2E-04	6.2E-03	9.9E-05	5.9E-02	5.9E-03	1.2E-01	1.9E-03
NAPHTHALENE	1.1E-04	1.1E-05	1.0E-05	1.9E-06	1.2E-04	1.2E-05	6.5E-06	1.2E-06
PHENANTHRENE	1.8E-02	1.8E-03	5.4E-04	1.0E-04	3.0E-02	3.0E-03	5.7E-04	1.1E-04
PYRENE	2.0E-02	2.0E-03	5.8E-02	9.3E-04	6.6E-02	6.6E-03	1.3E-01	2.1E-03
Pesticides/PCBs								
AROCLOR-1254	3.5E-03	3.5E-04	2.9E-03	2.9E-04	5.6E-01	5.6E-02	9.8E-01	9.8E-02
TOTAL AROCLOR	3.3E-03	3.3E-04	2.2E-03	2.2E-04	5.6E-01	5.6E-02	9.8E-01	9.8E-02
Dioxins								
TEQ BIRD	5.0E-03	5.0E-04	NV	NV	1.2E+00	1.2E-01	NV	NV
TEQ MAMMAL	NV	NV	2.4E-02	2.4E-03	NV	NV	1.4E+01	1.4E+00
Inorganics								
ALUMINUM	1.4E+00	1.4E-01	2.1E+01	2.1E+00	4.0E+00	4.0E-01	8.0E+01	8.0E+00
ARSENIC	3.6E-01	1.8E-01	3.2E-01	7.4E-02	7.7E-01	3.8E-01	4.9E-01	1.1E-01
BARIUM	3.6E-02	1.8E-02	9.6E-03	6.0E-03	4.7E-02	2.3E-02	6.0E-03	3.7E-03
BERYLLIUM	NV	NV	8.2E-02	6.5E-02	NV	NV	8.3E-03	6.5E-03
COBALT	2.7E-02	1.1E-02	7.9E-03	3.1E-03	8.0E-02	3.3E-02	2.9E-02	1.1E-02
COPPER	2.7E-01	3.1E-02	1.5E-01	1.0E-02	6.5E-01	7.6E-02	2.5E-01	1.7E-02
IRON	5.3E+00	5.3E-01	3.2E+00	3.2E-01	1.3E+01	1.3E+00	7.8E+00	7.8E-01
LEAD	4.2E-01	1.5E-02	7.0E-02	1.8E-03	1.9E+00	6.9E-02	3.3E-01	8.4E-03
MERCURY	1.0E+01	1.0E+00	2.1E+00	4.2E-01	1.4E+01	1.4E+00	1.8E+00	3.6E-01
NICKEL	6.7E-02	2.4E-02	1.2E-01	1.4E-02	6.7E-01	2.4E-01	1.5E+00	1.8E-01
SELENIUM	1.1E+00	4.0E-01	2.0E+00	4.4E-01	1.9E+00	6.6E-01	2.1E+00	4.5E-01
THALLIUM	NV	NV	1.3E+00	1.3E-01	NV	NV	3.7E+01	3.7E+00
VANADIUM	1.1E+00	2.2E-01	2.3E-02	1.0E-02	2.3E+00	4.7E-01	4.4E-02	2.0E-02
ZINC	9.6E-02	3.7E-02	7.7E-02	2.0E-02	8.7E-01	3.3E-01	4.9E-01	1.2E-01

Cells are shaded if the value is greater than 1.0
NV- Value Not Available/Not Able to be Calculated
NOAEL - No Observed Adverse Effects Level
LOAEL - Lowest Observed Adverse Effects Level
EEQ - Ecological Effects Quotient

TABLE D-5
TERRESTRIAL FOOD CHAIN MODEL - CONSERVATIVE SCENARIO PISCIVOROUS RECEPTORS
SITE 13 - TANK FARM 5, DU 5-1
NAVSTA NEWPORT, MIDDLETOWN, RHODE ISLAND

	Piscivorous Receptor EEQs			
	Green Heron		Mink	
Chemical	NOAEL	LOAEL	NOAEL	LOAEL
Volatile Organics				
1,2-DICHLOROBENZENE	NV	NV	5.4E-06	5.4E-07
ACETONE	5.6E-06	5.6E-07	8.1E-03	1.6E-03
CHLOROFORM	NV	NV	1.5E-05	5.4E-06
CARBON DISULFIDE	NV	NV	1.3E-04	6.2E-05
Semivolatile Organics				
2,4-DIMETHYLPHENOL	NV	NV	2.8E-04	5.7E-05
2-METHYLNAPHTHALENE	5.9E-02	5.9E-03	1.3E-03	2.4E-04
2-METHYLPHENOL	NV	NV	9.8E-04	3.3E-04
4-METHYLPHENOL	NV	NV	NV	NV
ACENAPHTHENE	4.1E-03	4.1E-04	9.3E-05	1.7E-05
ACENAPHTHYLENE	9.4E-03	9.4E-04	2.1E-04	3.9E-05
ANTHRACENE	1.3E-02	1.3E-03	2.9E-04	5.3E-05
ATRAZINE	NV	NV	5.3E-04	7.5E-05
BENZO(A)ANTHRACENE	5.5E-02	5.5E-03	1.3E-01	2.1E-03
BENZO(A)PYRENE	6.6E-02	6.6E-03	1.6E-01	2.5E-03
BENZO(B)FLUORANTHENE	8.5E-02	8.5E-03	2.0E-01	3.3E-03
BENZO(G,H,I)PERYLENE	5.3E-02	5.3E-03	1.3E-01	2.1E-03
BENZO(K)FLUORANTHENE	7.3E-02	7.3E-03	1.8E-01	2.8E-03
BIS(2-ETHYLHEXYL)PHTHALATE	2.1E-01	2.1E-02	9.1E-03	9.1E-04
CARBAZOLE	8.5E-03	8.5E-04	1.9E-04	3.5E-05
CHRYSENE	7.5E-02	7.5E-03	1.8E-01	2.9E-03
DIBENZO(A,H)ANTHRACENE	1.5E-02	1.5E-03	3.7E-02	5.9E-04
FLUORANTHENE	1.5E-01	1.5E-02	3.4E-03	6.3E-04
FLUORENE	1.0E-02	1.0E-03	2.3E-04	4.3E-05
INDENO(1,2,3-CD)PYRENE	5.6E-02	5.6E-03	1.3E-01	2.2E-03
NAPHTHALENE	1.1E-02	1.1E-03	2.5E-04	4.7E-05
PENTACHLOROPHENOL	2.9E-03	3.7E-04	1.6E-03	6.1E-04
PHENANTHRENE	5.9E-02	5.9E-03	1.3E-03	2.4E-04
PHENOL	NV	NV	3.8E-05	2.3E-05
PYRENE	1.1E-01	1.1E-02	2.6E-01	4.2E-03
Pesticides/PCBs				
4,4'-DDD	2.6E-03	2.2E-04	3.0E-03	7.9E-05
4,4'-DDE	1.0E-01	8.6E-03	1.1E-01	3.0E-03
4,4'-DDT	6.2E-02	5.2E-03	6.9E-02	1.8E-03
ALDRIN	NV	NV	9.4E-03	1.9E-03
ALPHA-BHC	3.8E-03	9.4E-04	1.1E-01	1.1E-02
AROCLOR-1260	4.5E-01	4.5E-02	8.5E-01	8.5E-02
ENDRIN ALDEHYDE	3.5E-01	3.5E-02	2.8E-02	2.8E-03
ENDRIN KETONE	1.1E+00	1.1E-01	8.6E-02	8.6E-03
GAMMA-CHLORDANE	2.8E-03	5.7E-04	9.5E-04	4.8E-04
TOTAL AROCLOR	4.5E-01	4.5E-02	8.5E-01	8.5E-02
TOTAL CHLORDANE	2.8E-03	5.7E-04	9.5E-04	4.8E-04
TOTAL DDD/DDE/DDT	3.9E-01	3.2E-02	4.2E-01	1.1E-02
Dioxins				
TEQ FISH	1.7E-02	1.7E-03	2.2E-01	2.2E-02
Inorganics				
ALUMINUM	1.9E+01	1.9E+00	7.9E+02	7.9E+01
ARSENIC	6.2E+00	3.1E+00	1.0E+01	2.3E+00
BARIUM	3.7E-01	1.8E-01	1.1E-01	6.9E-02
BERYLLIUM	NV	NV	2.5E-01	2.0E-01
CADMIUM	1.7E+00	3.9E-01	2.3E+00	2.6E-01
CHROMIUM	5.7E-01	9.7E-02	4.9E-01	2.0E-02
COBALT	2.0E+00	8.4E-01	1.6E+00	6.1E-01

TABLE D-5
TERRESTRIAL FOOD CHAIN MODEL - CONSERVATIVE SCENARIO PISCIVOROUS RECEPTORS
SITE 13 - TANK FARM 5, DU 5-1
NAVSTA NEWPORT, MIDDLETOWN, RHODE ISLAND

	Piscivorous Receptor EEQs			
	Green Heron		Mink	
Chemical	NOAEL	LOAEL	NOAEL	LOAEL
COPPER	8.7E+00	1.0E+00	4.5E+00	3.1E-01
IRON	2.7E+02	2.7E+01	4.0E+02	4.0E+01
LEAD	6.0E+00	2.2E-01	1.6E+00	4.0E-02
MANGANESE	8.9E-01	4.3E-01	2.3E+00	8.1E-01
MERCURY	1.3E+01	1.3E+00	1.9E+00	3.9E-01
NICKEL	7.0E+00	2.5E+00	2.0E+01	2.3E+00
SELENIUM	9.7E-05	3.4E-05	3.9E-04	8.5E-05
SILVER	2.2E-02	7.5E-04	5.6E-03	2.8E-04
THALLIUM	NV	NV	2.8E+01	2.8E+00
VANADIUM	1.3E+01	2.6E+00	7.9E-01	3.5E-01
ZINC	3.4E+00	1.3E+00	2.1E+00	5.4E-01

Cells are shaded if the value is greater than 1.0
NV- Value Not Available/Not Able to be Calculated
NOAEL - No Observed Adverse Effects Level
LOAEL - Lowest Observed Adverse Effects Level
EEQ - Ecological Effects Quotient

TABLE D-6
TERRESTRIAL FOOD CHAIN MODEL - AVERAGE SCENARIO
INVERTIVOROUS AND HERBIVOROUS RECEPTORS
SITE 13 - TANK FARM 5, DU 5-1
NAVSTA NEWPORT, MIDDLETOWN, RHODE ISLAND

	Herbivorous Receptors EEQs				Invertivorous Receptors EEQs			
	Bobwhite Quail		Meadow Vole		American Robin		Short-Tailed Shrew	
Chemical	NOAEL	LOAEL	NOAEL	LOAEL	NOAEL	LOAEL	NOAEL	LOAEL
Dioxins								
TEQ BIRD	8.9E-04	8.9E-05	NV	NV	2.9E-01	2.9E-02	NV	NV
TEQ MAMMAL	NV	NV	3.2E-03	3.2E-04	NV	NV	4.0E+00	4.0E-01
Inorganics								
IRON	1.3E+00	1.3E-01	4.1E-01	4.1E-02	3.8E+00	3.8E-01	2.1E+00	2.1E-01
LEAD	1.6E-01	5.7E-03	2.1E-02	5.2E-04	1.2E+00	4.3E-02	2.2E-01	5.5E-03
MERCURY	1.0E+00	1.0E-01	1.2E-01	2.4E-02	1.2E+01	1.2E+00	1.5E+00	2.9E-01
NICKEL	2.5E-02	9.0E-03	3.5E-02	4.0E-03	4.7E-01	1.7E-01	1.1E+00	1.2E-01
SELENIUM	6.3E-01	2.2E-01	7.3E-01	1.6E-01	1.3E+00	4.7E-01	1.5E+00	3.3E-01
THALLIUM	NV	NV	2.2E-01	2.2E-02	NV	NV	2.5E+01	2.5E+00
VANADIUM	2.6E-01	5.3E-02	3.4E-03	1.5E-03	7.9E-01	1.6E-01	1.9E-02	8.4E-03
ZINC	5.4E-02	2.1E-02	2.8E-02	7.0E-03	7.0E-01	2.7E-01	3.7E-01	9.3E-02

Cells are shaded if the value is greater than 1.0
Only chemicals with EEQs > 1.0 in the conservative food chain model are presented in this table.
NV- Value Not Available/Not Able to be Calculated
NOAEL - No Observed Adverse Effects Level
LOAEL - Lowest Observed Adverse Effects Level
EEQ - Ecological Effects Quotient

TABLE D-7
TERRESTRIAL FOOD CHAIN MODEL - AVERAGE SCENARIO
PISCIVOROUS RECEPTORS
SITE 13 - TANK FARM 5, DU 5-1
NAVSTA NEWPORT, MIDDLETOWN, RHODE ISLAND

	Piscivorous Receptor EEQs			
	Green Heron		Mink	
Chemical	NOAEL	LOAEL	NOAEL	LOAEL
Pesticides/PCBs				
ENDRIN KETONE	1.0E+00	1.0E-01	3.2E-02	3.2E-03
Inorganics				
ALUMINUM	1.4E+01	1.4E+00	2.5E+02	2.5E+01
ARSENIC	7.6E-01	3.8E-01	5.8E-01	1.3E-01
CADMIUM	5.5E-02	1.3E-02	3.2E-02	3.6E-03
CHROMIUM	1.4E-01	2.3E-02	5.6E-02	2.3E-03
COBALT	9.3E-01	3.9E-01	2.9E-01	1.1E-01
COPPER	1.8E+00	2.1E-01	3.9E-01	2.6E-02
IRON	1.3E+02	1.3E+01	7.8E+01	7.8E+00
LEAD	6.6E-01	2.4E-02	8.9E-02	2.3E-03
MANGANESE	3.6E-01	1.7E-01	3.8E-01	1.3E-01
MERCURY	3.0E+00	3.0E-01	1.8E-01	3.6E-02
NICKEL	8.2E-01	2.9E-01	1.0E+00	1.2E-01
THALLIUM	NV	NV	5.4E+00	5.4E-01
VANADIUM	9.5E+00	1.9E+00	2.4E-01	1.0E-01
ZINC	5.6E-01	2.2E-01	1.5E-01	3.7E-02

Cells are shaded if the value is greater than 1.0
NV- Value Not Available/Not Able to be Calculated
NOAEL - No Observed Adverse Effects Level
LOAEL - Lowest Observed Adverse Effects Level
EEQ - Ecological Effects Quotient

TABLE D-8
SUMMARY OF COPCS FOR ECOLOGICAL RISKS RETAINED AFTER STEP 3A
SITE 13 - TANK FARM 5, DU 5-1
NAVSTA NEWPORT, MIDDLETOWN, RHODE ISLAND

Assessment Endpoint	Tank Farm 5
Soil Invertebrates	None
Terrestrial Plants	None
Sediment Invertebrates	None
Aquatic Organisms	None
Herbivorous Mammals	None
Herbivorous Birds	None
Invertivorous Mammals	None
Invertivorous Birds	None
Piscivorous Mammals	None
Piscivorous Birds	None

Appendix E
ARARs

TABLE E-1
ASSESSMENT OF CHEMICAL-SPECIFIC ARARs AND TBCs
SOIL ALTERNATIVE SO3 – SOIL COVER, LUCs AND INSPECTIONS, LONG-TERM GROUNDWATER MONITORING AND SIGNS
DU 5-1 AT SITE 13 - TANK FARM 5
NAVSTA NEWPORT, MIDDLETOWN, RHODE ISLAND

Requirement	Citation	Status	Synopsis of Requirement	Action to Be Taken to Attain ARAR
Federal				
Environmental Protection Agency (EPA) Human Health Assessment Cancer Slope Factors (CSFs)	None	To Be Considered (TBC)	These are guidance values used to evaluate the potential carcinogenic hazard caused by exposure to contaminants.	Used to compute the individual incremental cancer risk resulting from exposure to carcinogenic contaminants in site media. Soil cover and Land Use Controls (LUCs) will prevent exposure to site contaminants exceeding cleanup levels.
Reference Dose (RfD)	None	TBC	Guidance used to compute human health hazard resulting from exposure to non-carcinogens in site media.	Used to calculate potential non-carcinogenic hazards caused by exposure to contaminants. Soil cover and LUCs will prevent exposure to site contaminants exceeding cleanup levels.
Guidelines for Carcinogen Risk Assessment	EPA/630/P-03/001F (March 2005)	TBC	Guidance for assessing cancer risk.	Used to calculate potential carcinogenic risks caused by exposure to contaminants. Soil cover and LUCs will prevent exposure to site contaminants exceeding risk levels.
Supplemental Guidance for Assessing Susceptibility from Early-Life Exposure to Carcinogens	EPA/630/R-03/003F (March 2005)	TBC	Guidance of assessing cancer risks to children.	Used to calculate potential carcinogenic risks to children caused by exposure to contaminants. Soil cover and LUCs will prevent exposure to site contaminants exceeding cleanup levels.

TABLE E-1
ASSESSMENT OF CHEMICAL-SPECIFIC ARARs AND TBCs
SOIL ALTERNATIVE SO3 – SOIL COVER, LUCs AND INSPECTIONS, LONG-TERM GROUNDWATER MONITORING AND SIGNS
DU 5-1 AT SITE 13 - TANK FARM 5
NAVSTA NEWPORT, MIDDLETOWN, RHODE ISLAND

Requirement	Citation	Status	Synopsis of Requirement	Action to Be Taken to Attain ARAR
State				
State of Rhode Island Rules and Regulations for the Investigation and Remediation of Hazardous Material Releases (Short Title: Remediation Regulations)	CRIR 12-180-001, DEM-DSR-01-93, Section 8.02, and 8.03 (with the exception of 8.02A(iv)-TPH)	Applicable	These regulations set remediation standards for contaminated media. These standards are applicable to a CERCLA remedy when they are more stringent than federal standards. Establishes criteria for groundwater and both direct contact and leachability of contaminants in soil.	A minimum two-foot cover of clean material will be maintained over subsurface soils left on site that exceed industrial/commercial direct contact standards for manganese. LUCs will prevent exposure to Site contaminant concentrations exceeding residential standards.
Rules and Regulations for the Investigation and Remediation of Hazardous Material Releases (Short Title: Remediation Regulations)	CRIR 12-180-001, DEM-DSR-01-93, Section 12.04 B. ii. and C. ii.	Applicable	When arsenic is the only COC present, encapsulation of existing soils with Clean Soil is acceptable.	Arsenic is the only COC in surface soil, and permeable cover will be installed in accordance with the cited regulations: where arsenic concentrations in surface soils are between background and 43 ppm, a six inch soil cover will be used. Where arsenic concentrations are greater than 43 mg/kg, a 2 foot soil cover will be used.

TABLE E-2
ASSESSMENT OF LOCATION-SPECIFIC ARARs AND TBCs
SOIL ALTERNATIVE SO3 – SOIL COVER, LUCS AND INSPECTIONS, SIGNS
DU 5-1 AT SITE 13 - TANK FARM 5
NAVSTA NEWPORT, NEWPORT, RHODE ISLAND

Requirement	Citation	Status	Synopsis of Requirement	Action to Be Taken to Attain ARAR
Federal				
Floodplain Management and Protection of Wetlands	44 Code of Federal Regulations (CFR) 9	Relevant and Appropriate	Federal Emergency Management Agency (FEMA) regulations that set forth the policy, procedure and responsibilities to implement and enforce Executive Order 11988, Floodplain Management, and Executive Order 11990, Protection of Wetlands.	Remedial activities conducted within the 100-year floodplain or within federal jurisdictional wetlands and aquatic habitats will be implemented in compliance with these standards. During the remedial design stage, the effects of soil remedial actions on federal jurisdictional wetlands will be evaluated. All practicable means will be used to minimize harm to the wetlands. Wetlands disturbed by soil remediation will be mitigated in accordance with requirements. Remedial activities and placement of soil cover will take place in or near floodplains. Public comment has been sought, see responsiveness summary.

Requirement	Citation	Status	Synopsis of Requirement	Action to Be Taken to Attain ARAR
Federal (cont.)				
Clean Water Act	Section 404(b)(1) Guidelines for Specification of Disposal Sites for Dredged or Fill Material, 40 CFR 230	Applicable	These regulations outline the requirements for the discharge of dredged or fill materials into surface waters including federal jurisdictional wetlands. No activity that impacts waters of the United States shall be permitted if a practicable alternative that has less adverse impact exists. If there is no other practicable alternative, the impacts must be mitigated.	The Selected Remedy will involve the placement of a soil cover in the vicinity of wetlands. Remedial activities will be designed to avoid wetlands and any adverse impacts will be mitigated. The Navy has determined that this is the Least Environmentally Damaging Practicable Alternative to protect wetland resources because it provides the best balance of addressing contaminated soil adjacent to wetlands and waterways with minimizing both temporary and permanent alteration of wetlands and aquatic habitats on site. The Navy solicited public comment on its determination in the Proposed Plan and received no negative public comments.

Requirement	Citation	Status	Synopsis of Requirement	Action to Be Taken to Attain ARAR
State				
Freshwater Wetlands Act; DEM Rules and Regulations Governing the Administration and Enforcement of the Freshwater Wetlands Act (December 2010)	Rhode Island Freshwater Wetlands Act (RIGL) 2-1-18 through 2-1-20.2 Rules 4.00 and 5.00.	Applicable	Rules and regulations governing the administration and enforcement of the Fresh Water Wetlands Act. Defines and establishes provisions for the protection of swamps, marshes, and other freshwater wetlands in the state. Actions are required to prevent the undesirable drainage, excavation, filling, alteration, encroachment or any other form of disturbance or destruction of a wetland. Also establishes standards for land within 50 feet of the edge of state-regulated wetlands.	Installation of a permeable soil cover will be conducted to minimize the disturbance of state jurisdictional wetland and perimeter wetland.

TABLE E-3
ASSESSMENT OF ACTION-SPECIFIC ARARs AND TBCs
SOIL ALTERNATIVE SO3 – SOIL COVER, LUCs AND INSPECTIONS, SIGNS
DU 5-1 AT SITE 13 - TANK FARM 5
NAVSTA NEWPORT, NEWPORT, RHODE ISLAND

Requirement	Citation	Status	Synopsis of Requirement	Action to Be Taken to Attain ARAR
Federal				
Clean Water Act – National Pollutant Discharge Elimination System (NPDES) – Storm Water from Construction Activity	40 CFR 122.26	Applicable	Includes storm water standards for construction activities disturbing more than one acre.	Installation of the cover may disturb more than one-acre. Best management practices will be used to meet storm water standards during the remedial action.
Management of Undesirable Plants on Federal Lands	7 U.S.C. §2814	Relevant and Appropriate	Requires federal agencies to establish integrated management systems to control or contain undesirable plant species on federal lands.	Measures will be taken to control invasive plants during the remedial response. An invasive species control plan will be developed and included in the remedial action work plan. The long term maintenance will be transitioned to NAVSTA after the remedy is in place, for inclusion into a base-wide program for controlling undesirable plants.

Requirement	Citation	Status	Synopsis of Requirement	Action to Be Taken to Attain ARAR
State				
Clean Air Act - Fugitive Dust Control	Rhode Island General Law (RIGL) 23-23 *et seq.*; Code of Rhode Island Rules (CRIR) 12-31-05	Applicable	Requires that reasonable precaution be taken to prevent particulate matter from becoming airborne.	Temporary storage, placement, and final grading of soil for cover will be conducted in a manner to prevent material from becoming airborne, through use of engineering controls such as water sprays.
Soil Erosion and Sediment Control Handbook, 1989	-	TBC	Identifies soil erosion and sediment control (E&SC) requirements construction activities involving land-disturbance activities.	E&SC controls will be used during soil disturbance activities, such as placement of soil cover.
Water Pollution Control - Pollution Discharge Elimination System – Storm Water from Construction Activity	RIGL 42-16 et seq.; CRIR 12-190-003, Rule 31	Applicable	Includes storm water requirements for construction projects that disturb over one acre.	Installation of the cover may disturb more than one acre. Best management practices will be used to meet storm water standards during the remedial action.
Rhode Island Solid Waste Regulations – Dust Control	Department of Environmental Management (DEM) Office of Waste Management (OWM)-SW0401, 1.7.10	Relevant and Appropriate	Requires dust control.	Dust must be controlled at the site during cover construction and during maintenance activities.
Rhode Island Solid Waste Regulations – Sedimentation and Erosion Control	DEM OWM-SW0401, 2.1.04	Relevant and Appropriate	Requires a "Sedimentation and Erosion Control Plan" be developed.	An erosion and sediment control plan will be developed for this site in accordance with the substantive requirements of this section. The Remedial Design (RD) and the Remedial Action Work Plan (RAWP), to be developed for this cleanup, will contain the specific erosion and sediment controls requirements for the remedial construction.

Requirement	Citation	Status	Synopsis of Requirement	Action to Be Taken to Attain ARAR
State (cont.)				
Rhode Island Solid Waste Regulations – Vegetated Top Cover	DEM OWM-SW0401, 2.2.12 (d) (1) and 2.2.12 (d) (2) (ii)(iii) and (v).	Relevant and Appropriate	Contains requirements for construction and maintenance of the vegetative cover final cover system.	Remedies including cover systems will include appropriate vegetation requirements of a soil cover in compliance with these standards.
Rhode Island Solid Waste Regulations – Cover Permeability	DEM OWM-SW0401, 2.3.04(e), (f)	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.
Rhode Island Solid Waste Regulations – Surface Water Drainage	DEM OWM-SW0401, 2.3.10	Relevant and Appropriate	Contains requirements for surface water drainage.	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.
Rhode Island Solid Waste Regulations – Siting in and Adjacent to Wetlands and Floodplains	DEM OWM-SW0401, 2.3.14	Relevant and Appropriate	Provides requirements for new solid waste landfill units and expansions that impact wetlands and coastal wetlands, coastal flood zones, etc.	This alternative will involve alteration of land within wetlands (as defined by RIDEM). The substantive requirements of this section of the regulations will be met by protecting adjacent wetland and floodplain resources during construction and maintenance of a cover over soil containing contaminants above cleanup levels. The RD and RAWP will be developed and will provide specific requirements to meet the substantive requirements of this section.

Requirement	Citation	Status	Synopsis of Requirement	Action to Be Taken to Attain ARAR
State (cont.)				
Rhode Island Solid Waste Regulations – Closure in "Unstable Areas"	DEM OWM-SW0401, 2.3.23	Relevant and Appropriate	Provides requirements for closure of solid waste units in "unstable areas", interpreted to include wetland and floodplains.	This alternative establishes a soil cover within and/or adjacent to "unstable areas." The substantive requirements of this section of the regulations will be met through cover design that prevents the release of contaminants during a 100-year flood event.
Rhode Island Solid Waste Regulations – Long-term Monitoring	DEM OWM-SW0401, 2.1.08 (c)	Relevant and Appropriate	Contains requirements for monitoring wells.	The substantive requirements of this section of the regulations will be met by maintaining monitoring wells for the purpose of monitoring groundwater conditions at the site. A Long Term Monitoring Plan (LTMP) will be developed and be directed by a work plan that will contain the specific monitoring requirements.
Rhode Island Solid Waste Regulations – Compliance Boundaries	DEM OWM-SW0401, 2.3.05	Relevant and Appropriate	Establishes requirement for compliance boundary for pollution of ground waters or surface waters.	Because this remedy leaves contamination in place, groundwater monitoring will be conducted to assure that no contaminants are transported to the groundwater
Rhode Island Solid Waste Regulations - Monitoring Wells	DEM OWM-SW0401, 2.3.11	Relevant and Appropriate	Contains requirements for monitoring wells.	The substantive requirements of this section of the regulations will be met by having and maintaining monitoring wells for the purpose of monitoring groundwater conditions by the soil cover and the waste management area. A Long Term Monitoring Plan (LTMP) will be developed for groundwater and be directed by a work plan that will contain the specific monitoring well requirements.

TABLE E-4
CHEMICAL-SPECIFIC ARARs AND TBCs:
GROUNDWATER ALTERNATIVE GW2 – MONITORED NATURAL ATTENUATION AND LUCS AND INSPECTIONS
DU 5-1 AT SITE 13 - TANK FARM 5
NAVSTA NEWPORT, MIDDLETOWN, RHODE ISLAND

Requirement	Citation	Status	Synopsis of Requirement	Action to be Taken to Attain ARAR
Federal				
Environmental Protection Agency (EPA) Human Health Assessment Cancer Slope Factors (CSFs)	None	To Be Considered (TBC)	Guidance values used to evaluate the potential carcinogenic hazard caused by exposure to contaminants.	Used to compute the individual incremental cancer risk resulting from exposure to carcinogenic contaminants in site media. Land Use Controls (LUCs) will temporarily prevent exposure to contaminants in groundwater exceeding risk levels, and MNA will attain cleanup levels within a reasonable time frame.
Reference Dose (RfD)	None	TBC	Guidance used to compute human health hazard resulting from exposure to non-carcinogens in site media.	Used to calculate potential non-carcinogenic hazards caused by exposure to contaminants. LUCs will temporarily prevent exposure to contaminants in groundwater exceeding risk levels, and MNA will attain cleanup levels within a reasonable time frame.
Guidelines for Carcinogen Risk Assessment	EPA/630/P-03/001F (March 2005)	TBC	Guidance for assessing cancer risks.	Used to calculate potential carcinogenic risks caused by exposure to contaminants. LUCs will temporarily prevent exposure to contaminants in groundwater exceeding risk levels, and MNA will attain cleanup levels within a reasonable time frame.
Supplemental Guidance for Assessing Susceptibility from Early-Life Exposure to Carcinogens	EPA/630/R-03/003F (March 2005)	TBC	Guidance for assessing cancer risks to children.	Used to calculate potential carcinogenic risks to children caused by exposure to contaminants. LUCs will temporarily prevent exposure to contaminants in groundwater exceeding risk levels, and MNA will attain cleanup levels within a reasonable time frame.

Requirement	Citation	Status	Synopsis of Requirement	Action to be Taken to Attain ARAR
Federal (Continued)				
Safe Drinking Water Act, National Primary Drinking Water Regulations - Maximum Contaminant Levels (MCLs)	40 Code of Federal Regulations (CFR) 141 Subparts B and G	Relevant and Appropriate	Establishes maximum contaminant levels (MCLs) 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 that are potential drinking water sources.	Concentrations of contaminants of concern (COCs) are already less than MCLs. LUCs will prevent residential use of groundwater. The MCLs will be used as groundwater monitoring standards. Groundwater monitoring may continue after the groundwater cleanup levels are achieved because of the presence of subsurface soil contamination. If contamination levels in soil and groundwater are reduced such that no unacceptable risk remains, groundwater monitoring can stop.
Safe Drinking Water Act, National Primary Drinking Water Regulations - Maximum Contaminant Level Goals (MCLGs)	40 CFR 141 Subpart F	Relevant and Appropriate	Establishes 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 chemicals.	Concentrations of contaminants are already less than non-zero MCLGs. The MCLGs will be used as groundwater monitoring standards. LUCs will prevent residential use of groundwater. Groundwater monitoring may continue after the groundwater cleanup levels are achieved because of the presence of subsurface soil contamination. Monitoring will verify that non-zero MCLGs are not exceeded. (The MCLG for arsenic is zero.) If contamination levels in soil and groundwater are reduced such that no unacceptable risk remains, groundwater monitoring can stop.
Drinking Water Health Advisory for Manganese (EPA Office of Drinking Water), 2004	None	TBC	Health Advisories are estimates of risk from consumption of contaminated drinking water and consider non-carcinogenic effects only. To be considered for contaminants in groundwater that may be used for drinking water purposes. The Health Advisory standard for manganese is 0.3 mg/L.	Health advisory will be used as groundwater monitoring standards. Groundwater monitoring may continue after the groundwater cleanup levels are achieved because of the presence of manganese and arsenic in subsurface soils. If contaminant levels in soil and groundwater are reduced such that no unacceptable risk remains, groundwater monitoring can stop.

TABLE E-4
CHEMICAL-SPECIFIC ARARs AND TBCs:
GROUNDWATER ALTERNATIVE GW2 – MONITORED NATURAL ATTENUATION AND LUCS AND INSPECTIONS
DU 5-1 AT SITE 13 - TANK FARM 5
NAVSTA NEWPORT, MIDDLETOWN, RHODE ISLAND

Requirement	Citation	Status	Synopsis of Requirement	Action to be Taken to Attain ARAR
State				
Rules and Regulations for the Investigation and Remediation of Hazardous Material Releases (Short Title: Remediation Regulations)	Code of Rhode Island Rules (CRIR) 12-180-001, DEM-DSR-01-93, Section 8.02, and 8.03 (with the exception of 8.02A(iv)-TPH)	Applicable	These regulations set remediation standards for contaminated media. These standards are applicable to a CERCLA remedy when they are more stringent than federal standards, though for this site, no COCs are identified for which state standards are more stringent than federal standards.	Concentrations of COCs (arsenic, cobalt, iron and manganese) are already less than State GA Groundwater Objectives. LUCs will temporarily prevent exposure to contaminants in groundwater exceeding risk levels and MNA will attain cleanup levels in a reasonable time frame. Periodic monitoring to be conducted as part of MNA will verify that Groundwater Objectives for these COCs are not exceeded.

TABLE E-5
ASSESSMENT OF LOCATION-SPECIFIC ARARs AND TBCs - GROUNDWATER ALTERNATIVE GW2 - MONITORED NATURAL ATTENUATION AND LUCs AND INSPECTIONS
DU 5-1 AT SITE 13- TANK FARM 5
NAVSTA NEWPORT, MIDDLETOWN, RHODE ISLAND

Requirement	Citation	Status	Synopsis of Requirement	Action to be Taken to Attain ARAR
Federal				
Floodplain Management and Protection of Wetlands	44 Code of Federal Regulations (CFR) 9	Relevant and Appropriate	Federal Emergency Management Agency (FEMA) regulations that set forth the policy, procedure and responsibilities to implement and enforce Executive Order 11988, Floodplain Management, and Executive Order 11990, Protection of Wetlands.	Remedial activities (construction of groundwater monitoring wells) conducted within the 100-year floodplain or within federal jurisdictional wetlands and aquatic habitats will be implemented in compliance with these standards. During the remedial design stage, the effects of MNA on federal jurisdictional wetlands will be evaluated. All practicable means will be used to minimize harm to the wetlands. Wetlands disturbed by MNA activities will be mitigated in accordance with requirements. Remedial activities will take place in or near floodplains. Public comment has been solicited, refer to the responsiveness summary.
State				
Rules and Regulations Governing the Administration and Enforcement of the Freshwater Wetlands Act (December 2010)	Rhode Island Freshwater Wetlands Act Rhode Island General Law (RIGL) 2-1-18 through 2-1-20.2; Rules 4.00 and 5.00	Applicable	Rules and regulations governing the administration and enforcement of the Fresh Water Wetlands Act. Defines and establishes provisions for the protection of swamps, marshes and other freshwater wetlands in the state. Actions are required to prevent the undesirable drainage, excavation, filling, alteration, encroachment or any other form of disturbance or destruction to a wetland. Also establishes standards for land within 50 feet of the edge of state-regulated wetlands.	Any installation or maintenance of monitoring wells will be conducted to minimize the disturbance of state jurisdictional wetland and perimeter wetland.

TABLE E-6
ASSESSMENT OF ACTION-SPECIFIC ARARs AND TBCs - GROUNDWATER ALTERNATIVE GW2 - MONITORED NATURAL ATTENUATION AND LUCS AND INSPECTION
DU 5-1 AT SITE 13 - TANK FARM 5
NAVSTA NEWPORT, MIDDLETOWN, RHODE ISLAND

Requirement	Citation	Status	Synopsis of Requirement	Action to be Taken to Attain ARAR
Federal				
Environmental Protection Agency (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 (TBC)	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.	Risk-based standards will be met through MNA within the time frame identified in the text. LUCs will be maintained throughout this period to prevent groundwater use until the cleanup levels are met, and monitoring will confirm that concentrations remain below cleanup levels over time.
Use of Monitored Natural Attenuation (MNA) at Superfund, RCRA Corrective Action, and Underground Storage Tank Sites	OSWER Directive 9200.4-17P (April 21, 1999)	TBC	EPA guidance regarding the use of MNA for the cleanup of contaminated soil and groundwater. In particular, the guidance explains that a reasonable time frame for achieving cleanup levels through MNA would be comparable to that which could be achieved through active restoration.	MNA is expected to take approximately 11-23 years to achieve groundwater cleanup levels. The time required will be re-evaluated at each five-year review to verify improvement of the groundwater conditions through MNA and that the remedy remains protective.

TABLE E-6
ASSESSMENT OF ACTION-SPECIFIC ARARs AND TBCs - GROUNDWATER ALTERNATIVE GW2 - MONITORED NATURAL ATTENUATION AND LUCS AND INSPECTION
DU 5-1 AT SITE 13 - TANK FARM 5
NAVSTA NEWPORT, MIDDLETOWN, RHODE ISLAND

Requirement	Citation	Status	Synopsis of Requirement	Action to be Taken to Attain ARAR
State				
Standards for Identification and Listing of Hazardous Waste	Rules and Regulations for Hazardous Waste Management, Code of Rhode Island Rules (CRIR), 12-030-003, Rule 5.8	Applicable	Rhode Island is delegated to administer the federal Resource Conservation and Recovery Act (RCRA) statute through its state regulations. Defines the listed and characteristic hazardous wastes.	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. IDW is not expected to be hazardous.
Standards for Generators of Hazardous Waste	Rules and Regulations for Hazardous Waste Management, CRIR 12-030-003, Rule 5.2, 5.3, and 5.4	Applicable	Establishes accumulation, manifesting, 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. IDW is not expected to be hazardous.
Drilling of Drinking Water Wells; Rules and Regulations Governing the Enforcement of Chapter 46-13.2 Relating to the Drilling of Drinking Water Wells	Rule 7.01	Applicable	Prohibits installing drinking water wells near pollution sources or potential contamination sources.	LUCs would prevent the installation of residential groundwater wells near pollution sources or potential contamination sources.
Rules and Regulations for Groundwater Quality (Well Standards)	Rhode Island General Law (RIGL) Ch. 46-12, Section 46-12-2; Ch. 46-13.1, Ch. 23-18.9, Sec. 23-18-9.1; Appendix 1	Applicable	Identifies the standards and specification that must be followed for the installation or abandonment of monitoring wells.	Applies to the abandonment of existing monitoring wells.
Soil Erosion and Sediment Control Handbook, 1989	-	TBC	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 well installation.

Appendix F
Public Meeting Transcripts

Proposed Plan

Decision Unit 5-1 at Site 13 - Tank Farm 5

Operable Unit 2

Naval Station Newport

Middletown, Rhode Island

Courtyard Marriott

9 Commerce Drive

Middletown, RI

Wednesday

November 20, 2013

8:15 p.m.

Leavitt Reporting, Inc.

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Hearings ◆ Conferences ◆ Legal Proceedings

MR. PARKER: This is the hearing for the proposed plan for Decision 5-1 at Site 13 which is part of Tank Farm 5. The public hearing is open for a period of time that anybody wants to make any comments. If you decide to make a verbal comment tonight, please identify yourself with your name, whom you are representing, and feel free to make a comment. I will not be able to respond to your comments tonight. We'll respond in writing at the conclusion of the comment period which is December 20th. So without any further ado, I will open it up to the floor. Again, please state your name for the record and speak clearly for Carol. Thank you.

MR. BROWN: David Brown, member of the RAB from the beginning in 1995 and also farm containment agricultural economist having majored in ground use before. I think this is a good start but it's sort of half baked as far as solutions, mainly engineering. And I think it would benefit from looking at it more as a small water drainage area and thinking about possible spillage, like Hurricane Storm Sandy last year. And thinking what would happen when you have stuff coming downstream from the main and so on, and from the rest of the Tank Farm 5, and then thinking what does this imply for the kinds of cover, what would happen to the cover that you put, would there be some vegetation types that would hold or just get washed out, or is it better to have a little catching and let that stuff stay, not go into the ocean.

And so I think there needs to be input, could well be input from good soil management.

MR. PARKER: Thank you.

DOCTOR ABBASS: My name is Doctor Kathy Abbass. I'm a RAB member since 1995 as well. I'm also director of the Rhode Island Marine Archeology Project that does a lot of military and naval history in the state. And I'm always concerned about these properties and what might be disturbed that could be of a historical significance.

That particular piece of property has already been badly disturbed so I don't think that is going to be much of an issue. I just want to remind you that that was the Stoddard property in the 18th century. Stoddard Landing is the property across the street. That is where they want to put that park in now, and that's where the British and Hessian troops came ashore during the American Revolution in the occupation of the Island of Aquidneck.

So there is a possibility there could be historical materials found in the grounds nearby. So whatever you do that is disturbing the ground just keep an eye out. I don't think likely, but it's a possibility. By the way the Stoddard house, supposedly the foundations are still out there. They weren't destroyed during the construction of the tank farm.

And as a black side of history, that is the place where the Stoddard women were abused by Hessian troops in the revolutionary war. And in the 18th century saying abused was a different abused than we would use today.

That's a history lesson. It's a significant piece of property historically.

MR. PARKER: Thank you.

MS. KIRSCHNER: I would like to make a comment. I'm Margaret Kirschner. I appreciate the natural approach to soil as being the cover where possible. I appreciate a natural attenuation process. I am concerned that a wetland area and a stream is bounded by the site boundaries. I think that that's kind of an artificial boundary that is limiting the stream from being viewed as a whole, especially the across the road part that is going into the bay. And as Dave mentioned the other route that is part of another site. I think it would be nice to describe, to connect the two sites that might be affected by the same contaminants, and the site boundary might not allow us to do that.

MR. PARKER: Thank you.

Anybody else? I guess I'll say that we are going to close the hearing then. And again, remind you that you are welcome to provide written comments in accordance with what is written in here, in the proposed plan for the record.

I thank everybody for coming. I'm going to close the hearing. Feel free to continue discussion. I'm available for questions.

(The proceedings adjourned at 8:26 p.m.)

C E R T I F I C A T E

I hereby certify that the foregoing 5 pages contain a full, true and correct transcription of all my stenographic notes to the best of my ability taken in the above-captioned matter at said time and place.

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Carol DiFazio
Registered Professional Reporter