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PROPOSED PLAN FOR SITE 11A BUILDING 3033 FORMER VEHICLE REPAIR FACILITY AND WASTE OIL TANK JEB LITTLE CREEK VA

08/01/2011

NAVFAC MID ATLANTIC

Proposed Plan

Site 11a: Building 3033 Former Vehicle Repair Facility and Waste Oil Tank

Joint Expeditionary Base Little Creek-Fort Story
Joint Expeditionary Base Little Creek
Virginia Beach, Virginia

August 2011

1 Introduction

This **Proposed Plan** describes the Preferred Alternative for addressing human health risks at **Environmental Restoration Program (ERP)** Site 11a, Building 3033 Former Vehicle Repair Facility and Waste Oil Tank, at Joint Expeditionary Base (JEB) Little Creek, Virginia Beach, Virginia herein after referred to as Site 11a. This Plan summarizes the remedial alternatives evaluated and provides the rationale for the selection of **groundwater** treatment through **enhanced reductive dechlorination (ERD)** and **land use controls (LUCs)** as the Preferred Alternative for Site 11a.

This Proposed Plan is issued jointly by the United States Navy (Navy), the lead agency for environmental restoration activities at JEB Little Creek-Fort Story, and the **United States Environmental Protection Agency (EPA)** Region III in consultation with the **Commonwealth of Virginia Department of Environmental Quality (VDEQ)**. The Proposed Plan fulfills the public participation responsibilities as required under Section 117(a) of the **Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA)** as amended, and Section 300.430(f)(2) of the **National Oil and Hazardous Substances Pollution Contingency Plan (NCP)**.

Detailed information documenting environmental investigations at Site 11a can be found in the **Remedial Investigation (RI)** (July 2010), RI Addendum (February 2011) and **Feasibility Study (FS)** (February 2011) and other documents contained in the **Administrative Record** file and Information Repository for JEB Little Creek-Fort Story (see the "Mark Your Calendar for the Public Comment Period" box below). This plan summarizes key information from the FS report, including all remedial options considered and detailed information for the Preferred Alternative. A glossary of key terms, which are identified in bold print the first time they appear, can be found at the end of this document.

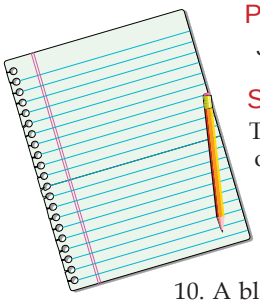
Details regarding the dates of the **public comment period**, the date and time of the public meeting, and the location of the Administrative Record file are included in the text box entitled "Mark Your Calendar for the Public Comment Period."

The Navy and EPA, in consultation with VDEQ, will make the final decision on the remedial approach for Site 11a after reviewing and considering all information submitted during the 45 day public comment period. The Preferred Alternative may be modified or another **remedial action** may be selected based on new information and/or public comments received. Therefore, public participation is encouraged.

2 Site Background

On October 1, 2009, Hampton Roads' first Joint Base was established. The Joint Base comprises the former Naval

Mark Your Calendar for the Public Comment Period



Public Comment Period

June 29 – August 12, 2011

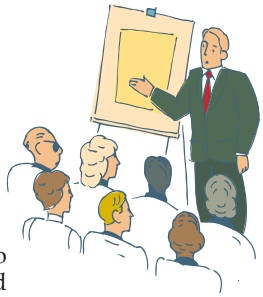
Submit Written Comments

The Navy will accept written comments on this Proposed Plan during the public comment period. To submit comments or obtain further information, please refer to the names and contact information included at the end of Section 10. A blank sheet has been added at the end of the document to be used for writing comments.

Attend the Public Meeting

July 18, 2011
Time: 7:00 pm

Virginia Beach Central Library
Folio Conference Room
4100 Virginia Beach Blvd
Virginia Beach, VA 23452



The Navy will hold a public meeting to explain the Proposed Plan. Verbal and written comments will be accepted at this meeting.

To Access the Administrative Record

Public Affairs Office
Naval Facilities Engineering Command, Mid-Atlantic
9742 Maryland Avenue, Building A-81
Norfolk, VA 23511
Phone: 757.341.1410

Location of Information Repository

Virginia Beach Central Library
4100 Virginia Beach Blvd
Virginia Beach, VA 23452
Phone: 757.385.0150

Amphibious Base (NAB) Little Creek (now referred to as JEB Little Creek) and the Army post Fort Story (now referred to as JEB Fort Story); the new name is JEB Little Creek-Fort Story. With the forming of this new command, the Navy assumes responsibility for managing both properties and will now merge public meetings regarding the ongoing environmental restoration. However, separate records will be maintained to ensure the integrity of ongoing efforts at both properties. When required for public notices and distributions, the former bases are identified as JEB Little Creek-Fort Story. For ERP documents, the bases will be referred to separately as JEB Little Creek and JEB Fort Story. This Proposed Plan contains information associated with the ERP at JEB Little Creek.

The former NAB Little Creek was commissioned in 1945 to train landing craft personnel for operational assignments. During the last 60 years, the facility has expanded in both the area and complexity of its mission.

JEB Little Creek consists of 2,215 acres located in the northwest portion of Virginia Beach, Virginia, adjacent to the Chesapeake Bay (Figure 1). The western boundary of JEB Little Creek borders the City of Norfolk, Virginia. JEB Little Creek is primarily an industrial facility that provides logistic and support services to 18 homeported ships and 155 shore-based resident commands.

The area surrounding the facility is low-lying and relatively flat. JEB Little Creek is bounded on the north by the Chesapeake Bay; on the west by residential communities and several marinas; on the south by Shore Drive, Lake Whitehurst, Little Creek Reservoir/Lake Smith, Norfolk International Airport, and residential development; and on the east by Lake Bradford.

2.1 Site Description and Background

Site 11a, Building 3033 Former Vehicle Repair Facility and Waste Oil Tank, is centrally located in the industrial area of JEB Little Creek near the intersection of 7th and E Streets (Figure 2). Site 11a was identified in 1998 when **volatile organic compounds (VOCs)** were detected in groundwater upgradient of ERP Site 11. Consequently, VOC groundwater contamination detected upgradient of Site 11 became identified in the **Federal Facility Agreement (FFA)** as Site 11a and was proposed for investigation under CERCLA.

The site consisted of former Buildings 3033 and 3034. Building 3033 was a 12-bay vehicle repair facility located immediately south of the current barracks building (Building 3606). Historical records document the presence of an underground waste oil tank associated with former building operations. The contents of the tank were not documented, and there is no record of solvent disposal. The tank was reportedly excavated and removed in 1988 under the Underground Storage Tank (UST) Program. Building 3034 was a garden supply center once located in what is now a grass-covered field. There are no documented releases associated with this building.

Figure 1 - Site Location Map

2.2 Previous Investigations and Actions

Environmental investigation efforts were initiated at JEB Little Creek (former NAB Little Creek) under the Navy Assessment and Control of Installation Pollutants Program by conducting an Initial Assessment Study in 1984 followed by a Round 1 Verification Step in 1986. An Interim RI was completed in 1991, and a Remedial Investigation/Feasibility Study (RI/FS) report was completed in 1994. Because of these investigations, Site 11, the School of Music Plating Shop, was identified as a site requiring further assessment of VOCs detected in groundwater. Site 11a was identified in 1998 when VOCs were detected in upgradient groundwater during Site 11 investigation activities. As a part of the Site 11 RI, groundwater samples were collected from what is now Site 11a to identify a potential upgradient source of VOCs. Following its inclusion in the FFA, Site 11a was characterized during several investigations and studies beginning in 2001. Detailed information from previous investigations conducted at Site 11a is available in the Administrative Record file for JEB Little Creek. A complete list of the documents included in the Administrative Record files can be obtained from the JEB Little Creek Environmental Restoration web site (https://portal.navfac.navy.mil/portal/page/portal/navfac/navfac_ww_pp/navfac_hq_pp/navfac_env_pp/env_restoration_installations/lant/midlant/jeblcfs) or by contacting the **Naval Facilities Engineering Command (NAVFAC) Public Affairs Office.** Table 1 summarizes site-specific investigations and studies.

3 Site Characteristics

The Site 11a characteristics are depicted on Figure 3 as a **conceptual site model (CSM)**. Site 11a consists of an open, grass-covered field used for recreation; Building 3606, a four-story barracks used as single residence lodging for active duty personnel; Building 3606A (Quarter Deck), a one-story building used primarily for administrative and recreational activities associated with the barracks; and an asphalt parking area. The topography of the site is flat; unpaved areas are landscaped with shrubs/bushes, grass, and several large trees along the northern and southern sides of Building 3606. There are no natural drainage features evident and no surface water bodies on or near the site. Stormwater drop inlets are present at the site that convey surface runoff to outfalls that discharge to surface water bodies present within JEB Little Creek.

Shallow groundwater (Columbia **aquifer**) at Site 11a is encountered from 5 to 10 feet below ground surface (bgs). The groundwater flow direction fluctuates based on weather events, but is predominantly to the southwest. Groundwater gradient underlying Site 11a is relatively flat and varies by less than 1 foot across the site. The average shallow groundwater flow velocity is estimated to be 2.4 feet per year. The Columbia aquifer is not currently used, and is not expected to be used, as a **potable** water supply. Potable water is provided to the base and surrounding community by the City of Virginia Beach. A

Figure 2 - Site 11a Boundary and Vicinity

Table 1 - Previous Studies and Investigations Summary

Previous Study / Investigation*	Date**	Investigation Activities
August 2001 Groundwater Investigation	2001	A groundwater investigation was conducted to investigate VOCs upgradient of Site 11 and define a potential source area. **Trichloroethene (TCE)** was the only VOC detected above the **Maximum Contaminant Level (MCL)**. Investigation results confirmed VOCs were present in groundwater upgradient of Site 11; however, a source was not identified. As a result of this investigation the Navy, EPA, and VDEQ agreed to separate the upgradient area of Site 11 into a new site, Site 11a.
Site 11a Supplemental Investigation	2002	Groundwater and soil sampling was conducted to delineate the nature and extent of contamination and identify a potential TCE source area within the soil at Site 11a. VOCs were not detected in the soil at concentrations likely contributing to VOC concentrations detected in groundwater. The supplemental investigation recommended additional investigation of VOCs in groundwater.
October 2003 Membrane Interface Probe Investigation	2003	Soil and groundwater were investigated to further delineate the VOC plume. Results indicated VOCs were present throughout the shallow groundwater (Columbia aquifer) in the northern portion of the plume and limited to the deeper portion of the aquifer toward the southwest indicating a potential source area located to the north. It was recommended additional groundwater sampling be conducted to assess the horizontal and vertical extent of VOCs in groundwater.
February 2004 Monitoring Well Installation and Groundwater Sampling	2004	Groundwater samples were collected to assess horizontal and vertical distribution of the VOC plume. **Tetrachloroethene (PCE)**, TCE, and **vinyl chloride** were detected at concentrations exceeding their corresponding MCLs; however, no notable differences in VOC concentrations with respect to depth were observed. It was recommended a treatability study be conducted to evaluate potential treatment technologies for remediation of VOCs in groundwater.
Site 11a Treatability Study	2005	A treatability study was conducted to test the effectiveness of in situ chemical oxidation (ISCO) in treating VOCs in groundwater. A mixture of ferrous sulfate, hydrochloric acid, and sodium persulfate followed by hydrogen peroxide were injected into the shallow groundwater. Baseline (pre-injection) and 1, 3, and 6-month post-injection groundwater sampling was conducted to evaluate the effectiveness of the substrate at reducing VOC concentrations. The results of the treatability study indicated that ISCO was not effective in reducing VOC concentrations consistently across the treatment area, likely a result of insufficient distribution of reagent in the aquifer.
Site 11a Remedial Investigation	2007	Groundwater and soil samples were collected to define the nature and extent of contamination and assess potential risks to human health and the environment. The RI concluded PCE, TCE, and **pentachlorophenol (PCP)** in groundwater pose potential risks to human health. No risk associated with exposure to soil was identified. Additionally, the RI concluded there were no unacceptable risks to **ecological receptors**. The RI recommended evaluation of the vapor intrusion pathway; further evaluation of PCP in groundwater; and development of an FS to evaluate potential remedial alternatives to mitigate unacceptable human health risks associated with exposure to groundwater at Site 11a.
Site 11a Data Gap Investigation	2009	Groundwater sampling was conducted to confirm the presence of PCP in groundwater. PCP was not detected, therefore the investigation concluded no PCP plume is present at the site and no remedial action for PCP is required.
Site 11a Remedial Investigation Addendum	2010	Subslab vapor and indoor air samples were collected to evaluate potential human health risks associated with exposure to groundwater emissions in indoor air via the vapor intrusion pathway. Results indicated there are no unacceptable risks to current or future occupants of Buildings 3606 and 3606A under existing building conditions and no action is warranted for vapor intrusion. However, due to detections of VOCs in subslab vapor and the potential for concentrations of groundwater COCs to temporarily increase during implementation of a remedial action, future degradation of existing building conditions may potentially increase the potential for unacceptable risks. Based on the presence of VOCs in shallow groundwater it was assumed that vapor intrusion would pose potential risks to occupants of hypothetical future buildings constructed at the site. The RI Addendum recommended vapor intrusion monitoring be conducted for Building 3606 and 3606A during implementation of the remedial action for groundwater and LUCs be implemented to maintain current building use and prevent future building construction at the site without further investigation/evaluation of the vapor intrusion pathway.
Site 11a Feasibility Study	2011	Eleven groundwater remediation technologies were screened for the development of remedial alternatives to mitigate potential human health risks associated with exposure to COCs in shallow groundwater. The technologies screened included institutional controls, long-term monitoring, in situ treatment [i.e. ISCO, ERD, air sparge/soil vapor extraction (AS/SVE), and pump and treat], and thermal treatment. Five remedial technologies were retained for further consideration based upon their potential to most effectively reduce contaminant concentrations with minimal impacts to land use, high implementability, and/or cost effectiveness given the chemical concentrations at the site. These technologies were combined to develop four remedial alternatives for detailed comparative analysis. The remedial alternatives evaluated in the FS are: 1) No action, 2) ERD, 3) ISCO and ERD, and 4) AS/SVE.

Notes: *The documents listed are available in the Administrative Record and provide detailed information used to support remedy selection at Site 11a. **Date investigation activities were conducted.

clay confining unit at a depth of about 20 to 30 feet bgs separates the Columbia aquifer from the underlying Yorktown aquifer. Groundwater wells at the base golf course located approximately 1,900 feet northwest of Site 11a provide water from the Yorktown aquifer for irrigation of the golf course.

3.1 Nature and Extent of Contamination

The suspected sources of contamination at Site 11a are former Building 3033 and its associated former UST. Although VOCs, semi-volatile organic compounds, pesticides, and inorganics were detected in the soil at Site 11a; concentrations are not indicative of a residual source of contamination to groundwater and no release to soil at the site has been documented. The **chemicals of concern (COCs)** identified at Site 11a are tetrachloroethene (PCE) and trichloroethene (TCE) in groundwater. The groundwater plume extends from the suspected source area south-southwest to 7th Street (Figure 2). TCE is the most horizontally extensive COC, while PCE is concentrated in the vicinity of the suspected source area.

The southern portion of the plume appears to be comingled with a separate VOC plume at ERP Site 11. Therefore, the extent of the southern boundary of the Site 11a groundwater plume is not clearly defined. Maximum concentrations of COCs are provided in Table 2.

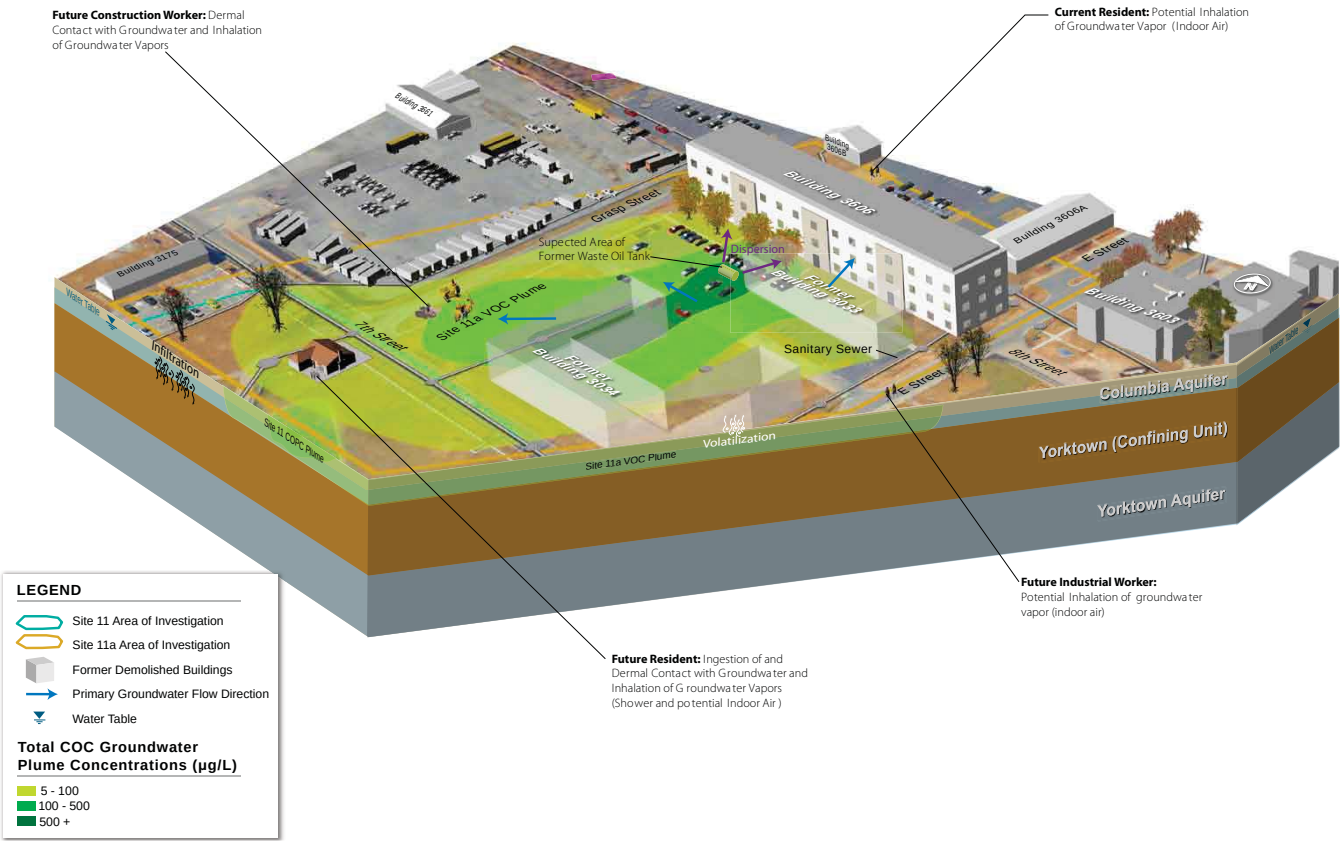


Figure 3 - Conceptual Site Model

Table 2 – Maximum Concentration for Chemicals of Concern

Chemical of Concern	Maximum Concentration (µg/L)
PCE	1,800
TCE	730

3.2 Fate and Transport of Contamination

As depicted in the CSM (Figure 3), the primary fate and **contaminant migration pathway** of COCs at Site 11a is dissolved VOC migration downgradient with groundwater flow. Secondary, less prominent fate and transport mechanisms for the COCs are dispersion from the source area, volatilization from groundwater to soil gas; and natural biodegradation of PCE to TCE , cis-1,2-dichloroethene, and vinyl chloride.

3.3 Principal Threats

"Principal threat wastes" are **source materials** that are considered to be highly toxic or highly mobile and that generally cannot be reliably contained or would present a significant risk to human health or the environment should they be exposed. The suspected original source for potential principal threat waste was removed with the demolition of Building 3033 and removal of the underground waste oil tank. Dissolved VOC concentrations are present in groundwater; however, contaminated groundwater is generally not considered principal threat waste. **Dense non-aqueous phase liquids (DNAPL)** have not been identified at Site 11a. Currently groundwater is not used as a public drinking water supply. Exposure to groundwater from construction activities is restricted by JEB Little Creek "dig permit" protocols that require facility personnel to consult with environmental staff prior to any subsurface intrusive activities. Based upon the absence of identified DNAPL and a lack of exposure, principal threat wastes are not present at Site 11a.

4 Scope And Role of Response Action

JEB Little Creek was placed on the **National Priorities List (NPL)** in May 1999. Site 11a is one of 12 ERP sites being addressed under CERCLA at JEB Little Creek. In addition to Site 11a, the following sites are currently in the RI/FS stage of the CERCLA process:

- Solid Waste Management Unit (SWMU) 3 – Pier 10 Sandblast Yard
- SWMU 7b – Small Boats Sandblast Yard (Desert Cove)

The following sites have a Final **Record of Decision (ROD)** in place:

- SWMU 7a: No Action ROD
- SWMU 8: No Action ROD
- Site 7: Action ROD for maintenance of the existing soil cover, LUCs, and groundwater monitoring

- Site 8: No Action ROD
- Sites 9 and 10: Action ROD for LUCs and groundwater monitoring
- Site 11: Action ROD for enhanced anaerobic bioremediation with LUCs and post-treatment groundwater monitoring
- Site 12: Action ROD for enhanced anaerobic bioremediation with LUCs and post-treatment groundwater monitoring
- Site 13: Action ROD for enhanced anaerobic bioremediation with LUCs and post-treatment groundwater monitoring

Seventeen sites, including Site 11a, were identified in the FFA as requiring further evaluation through desktop audits or site screening process investigations. Sixteen of the sites were evaluated and closeout documentation was prepared (Table 3). Site 11a was recommended for further investigation. The FFA also identified 105 sites for which no action under CERCLA is required due to the determination that the site poses no threat, or no potential threat to public health, welfare, or the environment or the site is addressed by other environmental programs. Seven Military Munitions Response Program (MMRP) sites were identified for Preliminary Assessment. Of the seven sites, two were concluded to require no action under CERCLA following completion of the preliminary assessment (Table 3). The five remaining sites were identified for further evaluation through desktop audits or site screening process investigations. Each site was evaluated and closeout documentation was prepared (Table 3). Details of these investigations are presented in the **Site Management Plan (SMP)** for JEB Little Creek, which is updated annually and available in the Administrative Record.

The Preferred Alternative presented in this Proposed Plan is intended to address all potential risks to human health and the environment at Site 11a, is intended to be the final remedy for the site, and does not directly include or affect any other sites at the facility.

5 Summary Of Site Risks

Detailed results of the **Human Health Risk Assessment (HHRA)** and **Ecological Risk Assessment (ERA)** conducted at Site 11a are presented in the RI report and RI Addendum report, which are available in the Administrative Record. Short descriptions of the risk calculation process are provided in the information boxes that accompany the following site-specific risk summaries.

5.1 Human Health Risk Summary

An HHRA was completed for Site 11a to evaluate potential human health risks associated with current adult resident exposure to surface soil; current adult resident and industrial worker exposure to indoor air; hypothetical future construction worker and adult or child resident exposure to soil and shallow groundwater; hypothetical future industrial worker, trespasser, and visitor exposure to soil; and hypothetical future adult resident and industrial worker exposure to indoor air. There is no surface water or sediment on or adjacent to the site. The exposure pathways evaluated were dermal contact, inhalation (showers, indoor air, and excavation), and ingestion of surface soil, subsurface soil, shallow groundwater, and shallow groundwater emissions in indoor air. Health risks are based on a conservative estimate of the potential **cancer risk** or the potential to cause other health effects not related to cancer (non-cancer hazard or **hazard index [HI]**). EPA identifies acceptable non-cancer hazard as an HI less than 1 or a cancer risk range of 10^{-4} (1 in 10,000 chance) to 10^{-6} (1 in 1,000,000 chance).

Soil

Under future land use, the child resident cumulative non-cancer hazard (HI=1.1) from **reasonable maximum exposure (RME)** to combined surface and subsurface soil slightly exceeds EPA's target threshold of 1. However,

What is Human Health Risk and How is it Calculated?

A Human Health Risk Assessment (HHRA), which estimates the likelihood of health problems occurring if no cleanup action were taken, consists of the following four-step process:

Step 1: Analyze Contamination

Step 2: Estimate Exposure

Step 3: Assess Potential Health Dangers

Step 4: Characterize Site Risk

In **Step 1**, comparisons of the concentrations of site chemicals to scientific studies on the effects those chemicals have on people help identify which chemicals pose the greatest threat to human health.

In **Step 2**, the Navy considers different ways people might be exposed to chemicals, the concentrations, how often, and how long they may be exposed in order to assess a RME scenario that portrays the highest level of human exposure that could reasonably be expected to occur.

In **Step 3**, the Navy uses the information from Step 2, combined with toxicity information, to assess potential health risks. The Navy considers two types of risk: (1) cancer risk and (2) non-cancer hazard. The likelihood of any type of cancer resulting from a contaminated site is generally expressed as an upper bound probability: "1 in 10,000 chance" (for every 10,000 people that could be exposed, one extra cancer may occur because of exposure). For non-cancer health effects, the Navy calculates a "hazard index" (HI), which is the ratio between the "reference dose," (the dosage at which no adverse health effects are expected), and the RME. A "threshold level" (HI less than 1) exists below which non-cancer health effects are no longer predicted.

In **Step 4**, the Navy calculates whether site risks are high enough to cause health problems for people at or near the site. The results of the three previous steps are combined, evaluated, and summarized. The Navy adds up the potential risks from the individual contaminants and exposure pathways and calculates a total site risk.

Table 3 - Site and Preliminary Screening Area Closeout Summary

Site/Preliminary Screening Area	Investigation Activity	Determination	Closeout Documentation
Federal Facility Agreement Sites			
SWMU 30 – Leaking Above Ground Diesel Tank	Desktop evaluation and site visit.	Above ground storage tank (AST) and surrounding berm are in good condition. Further assessment will be conducted under Spill Prevention, Control, and Countermeasures (SPCC) Plan/AST Program.	Final June 2003 Tier I Partnering Team Meeting Minutes, Consensus Statement.
SWMU 96 – Scrap Metal Storage Area	Desktop evaluation and site visit.	Currently an active equipment storage area operated under facility protocols for maintaining best management practices (BMPs). No evidence of a CERCLA release. No further action required.	Final Closeout Report Appendix B Sites SWMUs 96, 97, 98, and 119, Naval Amphibious Base Little Creek, Virginia Beach, Virginia. September 2004.
SWMU 97 – Vehicle Maintenance Facility Storm Drain		Active storm drain operated under the facility Virginia Pollution Discharge Elimination System (VPDES) permit. No evidence of a CERCLA release. No further action required.	
SWMU 98 – Elevated Causeways Mechanic Shop Material Dispensing Area		No evidence of a CERCLA release. No further action required.	
SWMU 119 – Former Special Warfare Group 2 Electronics Shop	Groundwater samples collected.	No evidence of a CERCLA release or potential unacceptable risks. No further action is required.	
AOC H – Buildings 3109 and 3360 at Golf Course (Pesticide Mixing Area)	Soil samples collected.	Potential risks to human health and ecological receptors are minimal. No further action is required.	Final Close-Out Report Appendix B Sites Areas Of Concern – H, I, J, and Site 14, Naval Amphibious Base Little Creek, Virginia Beach, Virginia. March 2004.
AOC I – Eagle Haven Golf Course Pond	Soil and sediment samples collected.		
AOC J – Former "Burn Area" between IR Sites 9 and 10	Soil and groundwater samples collected.		
IR Site 14 – Old Pole Yard and Transformer Storage Area	Soil samples collected.		
SWMU 18 – Public Works Center Transportation Garage Spent Battery Shop, Collection Area	Desktop evaluation and site visit.	No evidence of a CERCLA release. No further action required.	Final April 2005 Tier I Partnering Team Meeting Minutes, Consensus Statement.
SWMU 116 – Morale, Welfare, and Recreation (MWR) Boat Maintenance Facility			
AOC D – PCB Transformer Leak			
SWMU 5 – Port Ops Boat Painting Area	Soil and groundwater samples collected	No evidence of a CERCLA release or potential unacceptable risks. No further action is required.	Final Site Screening Assessment Closeout Report SWMUs 5, 6, 13, and Site 6, Naval Amphibious Base Little Creek, Virginia Beach, Virginia. January 2006.
SWMU 6 – Seabee Area – CB124	Soil and groundwater samples collected.		
SWMU 13 – Former Pesticide Shop	Soil and groundwater samples collected.		
IR Site 6 – Special Boat Unit Battery Storage Yard	Soil and groundwater samples collected.		
Military Munitions Response Program Sites			
Chemical Defense Area	Desktop evaluation.	No evidence of a CERCLA release or potential unacceptable risks. No further action is required.	Final Preliminary Assessment, Naval Amphibious Base Little Creek. September 2007.
1942 Pistol Range			
Anti-Aircraft Target Rifle Range	Desktop evaluation and site visit.	Site screening area does not pose a threat or potential threat to public health, welfare, or the environment. Area removed from further study.	Final Site Screening Process Closeout Report, Anti-Aircraft Target Rifle Range, 1944 Pistol Range, and 1953 Pistol Range, Naval Amphibious Base Little Creek, Joint Expeditionary Base Little Creek-Fort Story, Virginia Beach, Virginia. September 2010.
1944 Pistol Range			
1953 Pistol Range			
Depth Charge Testing Area	Desktop evaluation.	Site screening area does not pose a threat or potential threat to public health, welfare, or the environment. Area removed from further study.	Final Site Screening Process Closeout Report, Depth Charge Testing Area, Naval Amphibious Base Little Creek, Joint Expeditionary Base Little Creek-Fort Story, Virginia Beach, Virginia. September 2010.
Former MWR Skeet Range	Soil and groundwater samples collected.	Site screening area does not pose a threat or potential threat to public health, welfare, or the environment. Area removed from further study.	Final Site Screening Process Report, Former Morale, Welfare, and Recreation Skeet Range, Naval Amphibious Base Little Creek, Joint Expeditionary Base Little Creek-Fort Story, Virginia Beach, Virginia. January 2011.

there are no individual compounds or target organ effects greater than 1. Exposure to site soil by a current/future adult resident and future lifetime (adult/child) resident would not result in any RME non-cancer hazards (maximum HI = 0.12) or cancer risks (maximum cancer risk = 9.7×10^{-6} above EPA's acceptable levels.). Therefore, there are no unacceptable risks associated with current/future resident exposure to soil.

Exposure to site soil by a future industrial worker, future construction worker, and future adult or adolescent trespasser or visitor would not result in any RME non-cancer hazards (maximum HI = 0.35) or cancer risks (maximum cancer risk = 2.5×10^{-6}) above EPA's acceptable levels. Therefore, the partnership of the Navy, EPA and VDEQ agree there are no unacceptable risks associated with exposure to site soil, and no further action is necessary for soil at Site 11a.

Shallow Groundwater

Risk estimates were calculated for future residents based on potable use of groundwater and for future construction worker exposure to groundwater in an open excavation. These exposures would result in cancer risks and non-cancer hazards above EPA's acceptable levels (Table 4). Risks and hazards are primarily associated with PCE, TCE, pentachlorophenol (PCP), and manganese.

PCP and manganese concentrations in groundwater resulted in cancer risks or non-cancer hazards above EPA's acceptable levels based on RME calculations. However, the potential risks or hazards are considered not unacceptable based on the following:

- PCP
  - There is no unacceptable risk based on **central tendency exposure (CTE)**.
  - PCP was detected in one sample during the RI/HHRA/ERA and was not detected in groundwater during subsequent sampling.
- Manganese
  - There is no unacceptable risk based on CTE.
  - Concentrations are below the **background** levels.

Therefore, the partnership of the Navy, EPA, and VDEQ agree PCP and manganese in groundwater do not pose an unacceptable risk, and no further action is necessary for these constituents in shallow groundwater. However, further action is required to mitigate human health risk associated with PCE and TCE in shallow groundwater at Site 11a.

Indoor Air

Cancer risk estimates were calculated for current and future residents and industrial workers in Buildings 3606 and 3606A exposed to chlorinated VOCs in indoor air. VOCs

What is Ecological Risk and How is it Calculated?

An Ecological Risk Assessment (ERA) evaluates the potential risks to plants, animals, habitats, and communities and is conducted using a step-wise process (as outlined in Navy and EPA ERA policy and/or guidance), which includes decision points where agreement among stakeholders is reached to assess whether the process should be continued or terminated. The process continues until a final decision has been reached (that is, remedial action if unacceptable risks are identified or no further action if risks are acceptable). The process can also be iterative if data needs are identified at any step; the needed data are collected and the process re-starts at the point appropriate to the type of data collected. An ERA has three principal components:

1. **Problem Formulation Establishes the goals, scope, and focus of the ERA and includes:**
   - Compiling and reviewing existing information on the habitats, plants, and animals that are present on or near the site
   - Identifying and evaluating area(s) where site-related chemicals may be found (source areas) and at what concentrations
   - Evaluating potential movement (transport) of chemicals in the environment
   - Identifying possible exposure **media** (soil, air, water, sediment)
   - Evaluating if/how the plants and animals may be exposed (exposure pathways)
   - Evaluating routes of exposure (for example, ingestion)
   - Identifying specific **receptors** (plants and animals) that could be exposed
   - Specifying how the risk will be measured (assessment and measurement endpoints) for all complete exposure pathways
2. **Risk Analysis which includes:**
   - Exposure Estimate - An estimate of exposure concentrations. These include direct exposures to lower trophic level receptors (organisms low on the food chain, such as plants and insects), upper trophic level receptors (organisms higher on the food chain, such as birds and mammals), and indirect exposures (exposures via the food chain) for upper trophic level receptors.
   - Effects Assessment - An assessment of the concentrations of chemicals at which an adverse effect may occur.
3. **Risk Calculation or Characterization:**
   - The first two steps are used to estimate potential risk to plants and/or animals by comparing the exposure estimates with the effects thresholds.
   - Also included is an evaluation of the uncertainties (that is, potential degree of error) associated with the predicted risk estimate and their effects on ERA conclusions.

The three principal components of an ERA are implemented as an 8-step, 3-tier process as follows:

1. **Screening-Level ERA (Steps 1-2; Tier 1)** – The Screening-Level Ecological Risk Assessment (SLERA) conducts an assessment of ecological risk using the three steps described above and very conservative assumptions (such as, using maximum chemical concentrations).
2. **Baseline ERA (Steps 3-7; Tier 2)** – If potential risks are identified in the SLERA, a Baseline Ecological Risk Assessment (BERA) is typically conducted. The BERA is a reiteration of the three steps described above but uses more site-specific and realistic exposure assumptions, as well as additional methods not included in the SLERA, such as consideration of background concentrations. The BERA may also include the collection of site-specific data (such as, measuring the concentrations of chemicals in the tissues of organisms, for example, fish) to address key risk issues identified in the SLERA.
3. **Risk Management (Step 8; Tier 3)** – Step 8 develops recommendations of ways to address any unacceptable ecological risks that are identified in the BERA and may also include other activities, such as evaluating remedial alternatives.

Table 4 – Summary of Unacceptable Groundwater Risks

Exposure Route			Reasonable Maximum Exposure				Central Tendency Exposure			
Receptor	Cancer	Non-Cancer	Cancer Risk	Chemicals with Cancer Risks >10^{-4}	Hazard Index	Chemicals with Hazard Quotient >1	Cancer Risk	Chemicals with Cancer Risks >10^{-4}	Hazard Index	Chemicals with Hazard Quotient >1
Future Adult Resident	NA	Ingestion Dermal Inhalation	NA	NA	4	PCE	NA	NA	0.65	Individual Chemicals < 1
Future Child Resident	NA	Ingestion Dermal	NA	NA	9.1	PCE, TCE, Manganese[2]	NA	NA	2	Individual Chemicals < 1
Future Lifetime Resident	Ingestion Dermal Inhalation[1]	NA	4.5×10^{-3}	PCE, PCP[2]	NA	NA	2.2×10^{-4}	PCE	NA	NA
Future Construction Worker	Dermal Inhalation		2.0×10^{-4}	PCE	8.1	PCE, TCE	2.0×10^{-5}	Individual Chemicals < 10^{-4}	3.6	Individual Chemicals < 1

Notes: 1. NA- Not Applicable
2. [1]Inhalation Calculated for Adult Only
3. [2]Constituents not retained at COCs per the discussion presented in Section 5.1, Shallow Groundwater.

do not result in non-cancer effects; therefore these hazards were not evaluated. Current (maximum cancer risk = 5×10^{-6}) and future (maximum cancer risks = 5×10^{-5}) cancer risks to residents and industrial workers are within or below EPAs acceptable risk range. Therefore, the partnership of the Navy, EPA, and VDEQ agree there are no unacceptable risks associated with exposure to indoor air in existing occupied buildings under current building conditions. Future degradation of existing building conditions may increase the potential for unacceptable risks.

Due to the uncertainties associated with quantifying the risks associated with occupant exposure to indoor air in future hypothetical buildings; such as uncertainties with future building size, air exchange systems, and foundations; risks associated with this pathway were not quantitatively evaluated in the HHRA. Based on the presence of VOCs in the shallow groundwater, it is assumed that vapor intrusion from the shallow groundwater into indoor air could potentially pose unacceptable risks to future residents and industrial workers in future hypothetical buildings. Therefore, as a result of the potential for unacceptable risks resulting from existing building degradation or future hypothetical building construction, the partnership of the Navy, EPA, and VDEQ agree monitoring of the vapor intrusion pathway as part of the shallow groundwater remedy is warranted until potential human health risks associated with VOCs in shallow groundwater have been mitigated.

5.2 Ecological Risk Summary

The Screening ERA completed for Site 11a concluded that the site provides little terrestrial habitat and no viable aquatic habitats for potential ecological receptors; therefore, potential ecological risks are negligible based on the lack of significant exposure pathways.

6 Remedial Action Objectives

The Navy, EPA, and VDEQ determined that remedial action is necessary to protect public health, welfare, and the environment from actual or threatened releases of COCs in shallow groundwater within Site 11a. Therefore, the site-specific **Remedial Action Objectives (RAOs)** are to:

- Reduce concentrations of COCs in the source area and the downgradient plume to remediation goals [maximum contaminant levels (MCLs)] through treatment to the maximum extent practicable within a reasonable amount of time
- Prevent exposure to Site 11a groundwater and groundwater emissions in indoor air until concentrations of COCs have been reduced to levels that allow for unlimited use and unrestricted exposure

Preliminary remediation goals (PRGs) were developed for constituents with concentrations contributing to unacceptable risks and hazards from exposure to shallow groundwater within Site 11a. Based on the RI and RI Addendum, COCs were identified as those site-related constituents with cancer risks exceeding 1 in 10,000 or with HIs exceeding 1 (Table 4). The COCs are PCE and TCE. To achieve RAOs for unlimited use and unrestricted exposure, PRGs were established as the federal MCLs. PRGs are identified on Table 5.

Table 5 – Preliminary Remediation Goals

Chemical of Concern	PRG (µg/L)
PCE	5
TCE	5

7 Summary of Remedial Alternatives

The FS details the remedial alternatives developed and evaluated to address PCE and TCE in groundwater at Site 11a. The screening of groundwater remediation technologies identified the following alternatives for detailed evaluation and comparative analysis:

- Alternative 1: No Action
- Alternative 2: Enhanced Reductive Dechlorination (ERD)
- Alternative 3: In situ chemical oxidation (ISCO) and ERD
- Alternative 4: Air Sparging/Soil Vapor Extraction (AS/SVE)

A description of each remedial alternative is provided in Table 6. With the exception of the no action alternative (Alternative 1), each of the alternatives includes monitoring and the implementation of LUCs to prevent unacceptable risk from exposure to shallow groundwater and groundwater emissions in indoor air. The treatment of shallow groundwater may result in a temporary increase in the concentrations of PCE, TCE, and daughter products (cis-1,2- dichloroethene and vinyl chloride), resulting in potential short-term risks. Therefore, as a conservative measure, indoor air vapor intrusion monitoring will be conducted. Under the LUCs, restrictions will be implemented to ensure the current residential and industrial building uses are maintained and to prevent construction of additional structures at the site without the implementation of protective measures until the shallow groundwater PRGs (MCLs) have been met. Monitoring and LUCs would be maintained until the concentrations of hazardous substances in groundwater have been reduced to levels that allow for unlimited use and unrestricted exposure, with 5-year statutory reviews to ensure the protection of human health and the environment.

For Alternative 3, separate treatments are considered for the source area and downgradient plume that could be implemented concurrently or in a phased approach, treating the source area first, followed by the downgradient plume.

8 Evaluation of Alternatives

The NCP identifies **nine evaluation criteria** for use in a comparative analysis of alternatives (Table 7). Each remedial alternative for Site 11a was evaluated against these criteria in the FS. The threshold criteria and primary balancing criteria associated with each alternative are illustrated in Table 8. Alternative 1 (no action) is required by the NCP and serves as a baseline against which the other alternatives are compared. Alternative 1 does not achieve RAOs and is not discussed in detail in the following sections.

8.1 Threshold Criteria

Protection of human health and the environment

Alternatives 2, 3, and 4 are all protective of human health and the environment as they reduce toxicity, mobility, and volume through treatment while preventing unacceptable risk exposures through LUCs.

Compliance with Applicable or Relevant and Appropriate Requirements

Alternatives 2, 3, and 4 are expected to comply with **Applicable or Relevant and Appropriate Requirements (ARARs)**. The key ARARs are generally the same for Alternatives 2, 3, and 4, with the following exceptions: Alternatives 2 and 3 require compliance with federal underground injection regulations; whereas Alternative 4 requires compliance with air emissions regulations.

8.2 Primary Balancing Criteria

Long-term effectiveness and permanence

Alternatives 2, 3, and 4 are expected to achieve long-term effectiveness and permanence once RAOs are met. Alternatives 2 and 3 are expected to be more effective than Alternative 4 because the injection of reagents is expected to condition the aquifer for continued degradation of COCs following termination of active treatment activities. Although degradation of COCs is not expected to continue following AS/SVE system (Alternative 4) shut down, the system could easily be restarted if necessary.

Reduction in toxicity, mobility, and volume

Alternatives 2, 3, and 4 are each expected to reduce toxicity, mobility, and volume. Each alternative has treatment components, which is the statutory preference.

Short-term effectiveness

Alternatives 2, 3, and 4 are expected to perform (achieve RAOs) equally given the site conditions. The short-term effectiveness associated with Alternatives 2 and 3 is similar with regard to impacts on the community, as both treatments rely on direct injection technology for implementation. Alternative 4 has a slightly higher risk of affecting the community, as the technology will rely on an ex-situ component to treat soil vapors. Alternatives 2 and 3 have a slightly higher risk to construction workers during implementation than Alternative 4 due to the handling and potential exposure to reagents, with Alternative 3 posing a higher risk due to use of oxidizing chemicals. Additionally, Alternative 3 has a slightly higher risk of creating environmental impacts than Alternatives 2 and 4 because it has the potential to temporarily mobilize naturally occurring metals.

Concerning sustainability, Alternative 2 ranks slightly higher than Alternative 3 since the reagent used is a

Table 6 - Description of Alternatives

Alternative	Component	Details	Cost
1-No Action	None	Allow the chemicals of concern (COCs) to breakdown naturally over time	Capital Cost = $0 Operation and Maintenance (O&M) Present Value = $0 Total Cost = $0
2- Enhanced Reductive Dechlorination (ERD)	In-situ biological treatment to enhance natural biodegradation Land Use Controls (LUCs) Performance and Long Term Monitoring	Electron donor source, which is generally the limiting factor, is provided to enhance naturally occurring reductive dechlorination process. Install two new monitoring wells Implement LUCs to prevent exposure and control changes in site use Regular monitoring performed to demonstrate that: • COC concentrations continue to decrease • Potentially toxic transformation products are not created at levels that are a threat to human health • Impacted area is not expanding • There are no changes in hydrogeologic, geochemical, or microbiological parameters that might reduce the effectiveness of the Remedial Action. • Temporary conditions do not result in COC concentrations in indoor air at levels that are a threat to building occupants	Capital Cost = $401,200 O&M Present Value = $2,580,000 Total Cost = $2,980,000
3- In situ chemical oxidation (ISCO) and ERD	In-situ chemical oxidant treatment in source area to oxidize COCs In-situ biological treatment to enhance natural biodegradation LUCs Performance and Long Term Monitoring	Injection of oxidizing agent to promote abiotic in-situ oxidation of COCs through reaction of oxidants with the COCs to produce innocuous substances such as carbon dioxide, water, and chloride. Electron donor source, which is generally the limiting factor, is provided to enhance naturally occurring reductive dechlorination process. Install two new monitoring wells Implement LUCs to prevent exposure and control changes in site use Regular monitoring performed to demonstrate that: • COC concentrations continue to decrease • Potentially toxic transformation products are not created at levels that are a threat to human health • Impacted area is not expanding • There are no changes in hydrogeologic, geochemical, or microbiological parameters that might reduce the effectiveness of the Remedial Action. • Temporary conditions do not result in COC concentrations in indoor air at levels that are a threat to building occupants.	Capital Cost = $582,400 O&M Present Value = $2,840,000 Total Cost = $3,420,000
4- Air Sparge/ Soil Vapor Extraction (AS/SVE)	In-situ biological treatment to induce volatilization of COCs and/ or aerobic biological degradation In-situ and ex-situ remedial technology used to withdraw and treat contaminant vapors from soil LUCs Performance and Long Term Monitoring	Installation of AS/SVE system in the source and downgradient edge of plume to inject air into the groundwater to induce volatilization of COCs in groundwater and enhance biodegradation. Pilot study in the source area followed by full-scale system installation in the source area and downgradient edges of the plume. Install two new monitoring wells. Implement LUCs to prevent exposure and control changes in site use. Regular monitoring performed to demonstrate that: • COC concentrations continue to decrease • Potentially toxic transformation products are not created at levels that are a threat to human health • Impacted area is not expanding • There are no changes in hydrogeologic or geochemical conditions that might reduce the effectiveness of the Remedial Action. • Temporary conditions do not result in COC concentrations in indoor air at levels that are a threat to building occupants. • O&M of the AS/SVE system	Capital Cost = $665,900 O&M Present Value = $2,970,000 Total Cost=$3,640,000

Table 7 - Nine Evaluation Criteria for Remedial Alternative Evaluation

CERCLA Criteria	Definition
Threshold Criteria	
Protection of human health and the environment	Addresses whether a remedy provides adequate protection and describes how risks posed through each pathway are eliminated, reduced, or controlled through mitigation, engineering controls, or institutional controls.
Compliance with ARARs	Addresses whether a remedy will meet all of the ARARs of other Federal and State environmental laws and/or justifies a waiver of the requirements.
Primary Balancing Criteria	
Long-term effectiveness and permanence	Addresses the expected residual risk and the ability of a remedy to maintain reliable protection of human health and the environment over time, once clean-up goals have been met.
Reduction in toxicity, mobility, or volume through treatment	Discusses the anticipated performance of the treatment technologies a remedy may employ.
Short-term effectiveness	Considers the period needed to achieve protection and any adverse impacts on human health and the environment that may be posed during the construction and implementation period, until clean-up goals are achieved.
Implementability	Evaluates the technical and administrative feasibility of a remedy, including the availability of materials and services needed to implement an option.
Present-worth cost	Compares the estimated initial, operations and maintenance, and present-worth costs.
Modifying Criteria	
State acceptance	Considers the State support agency comments on the Proposed Plan.
Community acceptance	Provides the public's general response to the alternatives described in the Proposed Plan, RI report, and FS report. The specific responses to the public comments are addressed in the "Responsiveness Summary" section of the ROD.

Table 8 - Relative Ranking of Alternatives

Alternative	Alternative 1 No Action	Alternative 2 ERD	Alternative 3 ISCO & ERD	Alternative 4 AS/SVE
Threshold Criteria				
Protection of Human Health and the Environment	❍	●	●	●
Compliance with ARARs	❍	●	●	●
Primary Balancing Criteria				
Long-term Effectiveness and Permanence	❍	●	●	●
Reduction in Toxicity, Mobility, or Volume	❍	●	●	●
Short-Term Effectiveness	❍	●	◉	◉
Implementability	●	●	●	◉
Total Present-Worth Cost	$0	$2,980,000	$3,420,000	$3,640,000

Ranking: ● High ◉ Moderate ❍ Low

Rankings are provided as qualitative descriptions of the relative compliance of each alternative with the criteria

naturally derived material; therefore resulting in lower resource consumption. Alternative 4 ranks lower than Alternatives 2 and 3 because it has higher energy consumption, greenhouse gas emissions, and resource consumption associated with system installation and ongoing electrical energy input to power the AS/SVE system.

Implementability

Alternatives 2, 3, and 4 can each be implemented using standard and widely available technologies. Alternatives 2 and 3 can be implemented using similar technologies for the construction component and both require similar levels of operation. Alternative 4 is less implementable because the technology is more difficult to construct and requires increased operation and maintenance of the treatment system. Additionally, due to the shallow water table, successful implementation of the alternative would require the system to be operated under a low vacuum pressure to minimize water recovery into the SVE system, potentially resulting in additional maintenance. Consequently, the SVE wells will achieve a smaller radius of influence with some short circuiting to the surface, lowering the effectiveness of the treatment system.

Cost

The estimated capital cost for implementation of Alternative 2 ($401,200) is less than Alternative 3 ($582,400) and 4 ($665,900). The estimated present value cost, factoring in a 30 year O&M period for each alternative, is $3 million for Alternative 2, less than the estimated present value costs for Alternatives 3 ($3.4 million) and 4 ($3.6 million).

8.3 Modifying Criteria

State Acceptance

State involvement has been solicited throughout the CERCLA and remedy selection process. VDEQ, as the designated State support agency in Virginia, has reviewed this Proposed Plan and has given concurrence on the preferred alternative. The preferred alternative, Alternative 2 (ERD), is consistent with the VDEQ's preference for active treatment of the shallow groundwater VOC plume.

Community Acceptance

A public meeting will be held on July 18, 2011 at 7:00 pm to present the Proposed Plan and answer community questions regarding the proposed remedial action at Site 11a.

9 Preferred Alternative

Based on the comparative analysis, the Preferred Alternative is Alternative 2, consisting of ERD and post-injection monitoring of natural degradation processes (Figure 4). LUCs will be maintained to prevent exposure to groundwater and groundwater emissions in indoor air and prohibit the withdrawal of groundwater, except for envi-

Figure 4 - Conceptual Remedy Layout

ronmental monitoring, within the boundaries of Site 11a until the concentrations of hazardous substances in the groundwater have been reduced to remediation goals (MCLs) that allow for unlimited use and unrestricted exposure.

Alternative 2 was chosen over Alternatives 3 and 4 based on the following. Each alternative except for Alternative 1 is protective of human health and the environment, will achieve RAOs, comply with ARARs, and is expected to reduce toxicity, mobility, and volume through active treatment. However, Alternative 4 is less effective than Alternatives 2 and 3 in reducing the toxicity, mobility, and volume of COCs over time, is more difficult to implement, poses a higher risk to the community during implementation, and consumes more available resources. Alternative 2 was selected over Alternative 3 based on the lower risk to workers during implementation, lower resource consumption, and lower associated cost.

Based on information currently available, the Navy and EPA believes the Preferred Alternative meets the threshold criteria and provides the best balance of tradeoffs with respect to the balancing and modifying criteria. The Navy and EPA expects the Preferred Alternative satisfies the statutory requirements of CERCLA Section 121(b): 1) protection of human health and the environment, 2) compliance with ARARs, 3) cost-effective, 4) utilize permanent solutions and alternative treatment technologies to the maximum extent practicable, and 5) satisfy the preference for treatment as a principal element. The Preferred Alternative will be re-evaluated as appropriate in response to public comment or new information.

Although the effectiveness of treatment of COCs in groundwater will be measured by comparison to PRGs, which are listed as the MCLs, the remedial technology is not guaranteed to reduce concentrations at or below MCLs across the site. However, natural attenuation processes will continue to reduce concentrations over time. Initial effectiveness of the remedial technology (ERD) will be evaluated through periodic groundwater performance monitoring following substrate injection. Long-term reduction in COC concentrations will be monitored as part of a long-term monitoring plan designed to evaluate the achievement of RAOs overtime, the need for additional action, and site exit strategies. Additionally, as required by CERCLA, five-year reviews will be conducted to assess the effectiveness of the remedy. The need for LUCs to prevent exposure and ensure protection will be periodically reassessed as COC concentrations are reduced over time.

10 Community Participation

The Navy and EPA provide information regarding environmental cleanups at JEB Little Creek to the public through the Restoration Advisory Board (RAB), public meetings, the Administrative Record file for the site, and announcements published in *The Virginian-Pilot* newspaper. The public is encouraged to gain a more comprehensive understanding of Site 11a and the ERP. The public comment period for this Proposed Plan is from June 29 to August 12, 2011 and a public meeting will be held July 18, 2011 at 7:00 pm (see Page 1 of this report for details). Minutes of the public meeting will be included in the Administrative Record file. The Navy will summarize and respond to comments in a responsiveness summary, which will become a part of the official ROD and will also be included in the Administrative Record file.

During the public comment period, interested parties may request additional information or submit written comments to the following individual:

Mr. Bryan Peed
NAVFAC MIDLANT
1510 Gilbert Street
Building N-26, Room 3300
Norfolk, VA 23511-3095
Phone: (757) 341-0480
Email: Bryan.Peed@navy.mil

Additional information may also be obtained by contacting the following individuals:

Mr. Jeffrey Boylan, Code 3HS11
US EPA (Region III)
1650 Arch Street
Philadelphia, PA 19103-2029
Phone: (215) 814-2094
Email: Boylan.Jeffrey@epa.gov

Mr. Paul Herman, P.E.
Virginia Dept. of Environmental Quality
629 East Main Street
Richmond, VA 23219
Phone: (804) 698-4464
Email: peherman@deq.virginia.gov

Glossary

This glossary defines in non-technical language the more commonly used environmental terms appearing in this Proposed Plan. The definitions do not constitute the Navy's, EPA's, or VDEQ's official use of terms and phrases for regulatory purposes, and nothing in this glossary should be construed to alter or supplant any other federal or Commonwealth document. Official terminology may be found in the laws and related regulations as published in such sources as the Congressional Record, Federal Register, and elsewhere.

Administrative Record (AR): Site information is compiled in an Administrative Record and placed in the general ERP information repository for public review.

Applicable or Relevant and Appropriate Requirements (ARARs): These are Federal or State environmental rules and regulations.

Aquifer: Underground bed of soil or rock from which groundwater can be usefully extracted.

Background: The concentration of a naturally occurring or manmade contaminant, such as a metal, found in groundwater, soil, sediment, and surface water in areas not affected by spills, releases, or other site-specific activities. Background concentrations of some inorganics and other contaminants are often at levels that may pose a risk to human health or the environment. These background-related risks are considered (that is, subtracted) when calculating the risk posed by site conditions.

Cancer risk: Cancer risks are expressed as a number reflecting the increased chance that a person will develop cancer if exposed to chemicals or substances. For example, EPA's acceptable risk range for Superfund sites is 1×10^{-4} to 1×10^{-6}, meaning there is 1 additional chance in 10,000 (1×10^{-4}) to 1 additional chance in 1 million (1×10^{-6}) that a person will develop cancer if exposed to a site that is not remediated.

Central tendency exposure (CTE): Mean concentration of site data is used as an exposure concentration in the risk assessment.

Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA): A Federal law, commonly referred to as the "Superfund" Program, passed in 1980 and amended by the Superfund Amendments and Reauthorization Act of 1986. CERCLA provides for cleanup and emergency response in connection with existing inactive hazardous waste disposal sites that endanger public health and safety or the environment.

Conceptual site model (CSM): A description of a site and its environment that is based on existing knowledge and that assists in planning, interpreting data, and communicating. It describes sources of contamination (e.g., spills) and receptors (e.g., humans) and the interaction that link the two.

Chemicals of Concern (COCs): A chemical that based upon comparison to regulatory screening criteria has potential to pose unacceptable risks or hazards to receptors at the site.

Contaminant migration pathway: The route that site contaminants may take to get from the source of contamination to a human being, animal, or plant.

Dense non-aqueous phase liquid (DNAPL): A liquid that is denser than water and does not dissolve or mix easily in water.

Ecological Risk Assessment (ERA): An evaluation of the risk posed to the environment if remedial activities are not performed at the site.

Enhanced reductive dechlorination (ERD): An anaerobic (i.e., without oxygen) process in which an electron donor source is injected into the subsurface to allow chlorine atoms on a parent chlorinated VOC molecule to be sequentially replaced with hydrogen and break down COCs.

Environmental Restoration Program (ERP): The Navy, as the lead agency, acts in partnership with EPA and VDEQ to address environmental investigations at the facility through the ERP. The current ERP is consistent with CERCLA and applicable state environmental laws.

Feasibility Study (FS): Analysis of the practicability of a remedial proposal. The FS usually recommends the selection of a cost-effective alternative.

Federal Facility Agreement (FFA): A written agreement among the Navy, EPA, and VDEQ for environmental remediation. The FFA outlines the roles and responsibilities of each party, and sets timetables for cleanup actions.

Groundwater: Subsurface water that occurs in soil and in geologic formations that are fully saturated.

Hazard Index (HI): A number indicative of non-carcinogenic health effects that is the ratio of the existing level of exposure to an acceptable level of exposure. A value equal to or less than one indicates that the human population is not likely to experience adverse effect.

Hazard Quotient (HQ): HQs are used to evaluate non-carcinogenic health effects and ecological risks. A value equal to or less than one indicates that the human or ecological populations are not likely to experience adverse effects.

Human Health Risk Assessment (HHRA): An evaluation of the risk posed to human health if remedial activities are not implemented.

Information Repository: A file containing information, technical reports, and reference documents regarding an NPL site. This file is usually maintained at a location with easy public access, such as a public library.

Land Use Controls (LUCs): Physical, legal, or administrative methods that restrict the use of or limits access to property to reduce risks to human health and the environment.

Maximum contaminant levels (MCL): Enforceable standards that apply to public water systems, developed by EPA. The highest level of a contaminant that is allowed in drinking water.

Media (singular, medium): Soil, groundwater, surface water, or sediment at a site.

Membrane Interface Probe: A direct-push sensor probe used for the collection of real-time data regarding the magnitude and distribution of VOCs in soil and groundwater.

National Oil and Hazardous Substances Pollution Contingency Plan (NCP): Provides the organizational structure and procedures needed to prepare for and respond to discharges of oil and releases of hazardous substances, pollutants, and contaminants.

National Priorities List (NPL): A list developed by the EPA of uncontrolled hazardous substance release sites in the United States that are considered priorities for long-term remedial evaluation and response.

Naval Facilities Engineering Command (NAVFAC): Global organization that provides planning, design, and construction of shore facilities for U.S. Navy activities around the world.

Non-cancer hazard: Adverse human health effects other than cancer that are caused by contaminants present at a site. Non-cancer hazards are expressed as a quotient that compares the existing level of exposure to the acceptable level of exposure. There is a level of exposure (the reference dose) below which it is unlikely for even a sensitive population to experience adverse health effects. EPA's threshold level for non-cancer hazards at Superfund sites is 1, meaning that if the exposure exceeds the threshold; there may be a concern for potential non-cancer effects.

Pentachlorophenol (PCP): Manufactured chemical used as a pesticide and wood preservative.

Plume: A space in air, water, or soil containing pollutants released from a point source.

Potable: Any liquid that is considered safe for drinking.

Preliminary remediation goals (PRG): Chemical-specific concentration goals for specific media and land use combinations that serve as a target to use during the initial development, analysis, and selection of cleanup alternatives. These goals should both be protective of human health and the environment and comply with all ARARs for all exposure pathways being addressed.

Present-Worth Cost: Total cost, in current dollars, of the remedial action. The present-worth cost includes capital costs required to implement the remedial action, as well as the cost of long-term operations, maintenance, and monitoring.

Proposed Plan: A document that presents and requests public input regarding a proposed cleanup alternative.

Public comment period: The time allowed for the members of an affected community to express views and concerns regarding an action proposed to be taken by the Navy and EPA, such as a rulemaking, permit, or Superfund-remedy selection.

Reasonable maximum exposure (RME): The highest level of site chemical concentrations a human can reasonably be exposed to under different exposure scenarios.

Receptor: Humans, animals, or plants that may be exposed to risks from contaminants related to a given site.

Record of Decision (ROD): A legal document that describes the cleanup action or remedy selected for a site, the basis for choosing that remedy, and public comment on the considered selected remedy.

Remedial Action: A cleanup method proposed or selected to address contaminants at a site.

Remedial Action Objectives (RAOs): Objectives of remedial actions that are developed based on contaminated media, COCs, potential receptors and exposure scenarios, human health and ecological risk assessment, and attainment of regulatory cleanup levels, if any exist.

Remedial Investigation (RI): A study that supports the selection of a remedy where hazardous substances have been disposed of or released. The RI identifies the nature and extent of contamination at the facility.

Site: The area of the facility where a hazardous substance, hazardous waste, hazardous constituent, pollutant, or contaminant from the facility has been deposited, stored, disposed of, placed; has migrated; or otherwise come to be located.

Site Management Plan (SMP): An annual report that provides a management tool for Naval Facilities Engineering Command, VDEQ, EPA, and consultants for use in planning, scheduling, and setting priorities for environmental remedial response activities to be conducted at a base. The SMP establishes schedules and conceptual approaches for continued CERCLA activities.

Source material: Material that includes or contains hazardous substances, pollutants or contaminants that act as a reservoir for migration of contamination to groundwater, to surface water, to air, or acts as a source for direct exposure.

Tetrachloroethene (PCE): VOC typically used as a solvent in industrial or dry cleaning applications.

Trichloroethene (TCE): VOC typically used as a solvent in industrial applications.

United States Environmental Protection Agency (EPA): The Federal agency responsible for administration and enforcement of CERCLA (and other environmental statutes and regulations), and with final approval authority for the Selected Remedy.

Commonwealth of Virginia Department of Environmental Quality (VDEQ): The Commonwealth agency responsible for administration and enforcement of environmental regulations.

Volatile organic compound (VOC): A compound that easily vaporizes and has low water solubility. Many VOCs are manufactured chemicals that are associated with paint, solvents, and petroleum. VOCs are common groundwater contaminants.

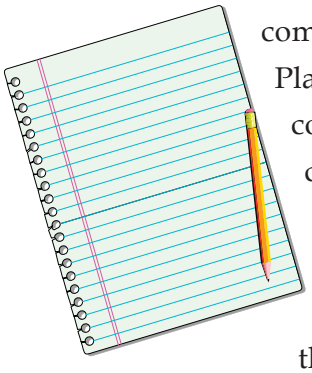
Please print or type your comments for Site 11a Proposed Plan below.

Mark Your Calendar for the Public Comment Period

Public Comment Period

June 29 - August 12, 2011

Submit Written Comments



The Navy will accept written comments on this Proposed Plan during the public comment period. To submit comments or obtain further information, please refer to the names and contact information included at the end of Section 10. A blank sheet has been added at the end of the document to be used for writing comments.

Attend the Public Meeting

July 18, 2011 at 7:00 pm

Virginia Beach Central Library
Folio Conference Room
4100 Virginia Beach Blvd
Virginia Beach, Virginia 23452

The Navy will hold a public meeting to explain the Proposed Plan. Verbal and written comments will be accepted at this meeting.

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Place stamp here

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