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PROPOSED PLAN SITE 4 FORMER UNDERGROUND STORAGE TANKS, FREE PRODUCT, PETROLEUM, AND CHLORINATED SLOVENT-CONTAMINATED SOIL NWIRP BETHPAGE NY

10/01/2014

TETRA TECH

PROPOSED PLAN

Site 4 – Former Underground Storage Tanks Free Product, Petroleum- and Chlorinated Solvent-Contaminated Soil

Naval Weapons Industrial Reserve Plant
Bethpage, New York

Introduction

October 2014

This **Proposed Plan** identifies the preferred remedial alternative for cleaning up the contaminated soil and groundwater at Site 4 (Area of Concern [AOC] 22) – Former Underground Storage Tanks, Naval Weapons Industrial Reserve Plant (NWIRP), Bethpage, New York. This document provides the rationale for the preferred alternative and includes summaries of other cleanup alternatives evaluated for use at this site. The preferred alternative consists of **Land Use Controls (LUCs)**, steam injection with free product recovery, and biosparging. Although this site is being addressed primarily due to the presence of petroleum products, these products are co-mingled with **Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA)** hazardous substances (*i.e.,* chlorinated solvents and metals), which cannot be effectively separated from the petroleum products and therefore will also be addressed by remediation of the petroleum.

The Navy's **Environmental Restoration Program (ERP)** conducts its environmental cleanup work for the former NWIRP under CERCLA and the Defense Environmental Restoration Program. The Navy is the lead agency for the CERCLA cleanup. The **New York State Department of Environmental Conservation (NYSDEC)**, with assistance from the **New York State Department of Health (NYSDOH)**, is the lead state agency providing regulatory consultation to the Navy.

The Proposed Plan is a document that the Navy is issuing in accordance with the requirements of **CERCLA** §117(a) and the National Contingency Pan (NCP) §300.430(f)(2).

This Proposed Plan also summarizes information that can be found in greater detail in the June 2013 **Feasibility Study (FS)/Corrective Measures Study (CMS)** and other documents contained in the Administrative Record file for this site**.** The Navy encourages the public to review these documents to gain a more comprehensive understanding of the Site and remedial activities that have been conducted.

The Navy, in consultation with the NYSDEC pursuant to 10 United States Code (U.S.C.) §2705(a) and (b) and 42 U.S.C. §9620(f), will select a final remedy for the site after reviewing and considering all information submitted during the 45-day public comment period. The Preferred Alternative may be modified or another response action presented in this plan may be selected based on new information or public comments. Therefore, the public is encouraged to review and comment on all the alternatives presented in this Proposed Plan.

Mark Your Calendar for the Public Comment Period

Public Comment Period

October 24, 2014 to December 10, 2014

Submit Written Comments

The Navy will accept written comments on the Proposed Plan during the public comment period. To submit comments or obtain further information, please refer to the insert page.

Location of Information Repository

Bethpage Public Library
47 Powell Road
Bethpage, New York 11714
(516)931-3907

A public meeting is not anticipated to be needed for this Proposed Plan. If the community would like a public meeting to explain the Proposed Plan, please contact the Public Affairs Officer prior to the end of the public comment period.

Public Affairs Officer
Code 09PA
Naval Facilities Engineering Command, Mid-Atlantic
9742 Maryland Ave. Bldg. A81
Norfolk, VA 23511

The administrative record for the facility is maintained online at:

http://go.usa.gov/DyXF

Site History

Underground Storage Tanks (USTs) were formerly located near Plant 3 (Figure 1). The USTs reportedly contained Nos. 4 and 6 Fuel Oil and were removed sometime between 1980 and 1984. In 1997, this area was initially investigated by Northrop Grumman and designated as AOC 22. In 1999, the Navy included AOC 22 under the ERP and the site is now known as Site 4.

Figure 1 – Site 4 Location Map

Initial testing of the soil found that **Total Petroleum Hydrocarbons (TPH)** was detected at concentrations up to 18,000 milligram per kilogram (mg/kg) at depths near the water table (approximately 50 feet below ground surface [bgs]). Soil was also observed to contain free product (TPH). The petroleum hydrocarbons were **Diesel Range Organics (DRO),** which are consistent with the No. 6 fuel oils that were stored and most likely leaked from the former USTs. **Semi-volatile organic compounds (SVOCs)** were also detected in soil above New York State Criteria.

Monitoring wells were installed at Site 4 in areas where free product was observed. Groundwater samples from these monitoring wells contained concentrations of SVOCs, **volatile organic compounds (VOCs)**, and several metals above New York State Criteria. Floating free product was also observed in monitoring wells. The VOCs included chlorinated solvents and non-chlorinated fuels.

In 2003, an FS was prepared. At that time, the recommended alternative was to install a soil cover over the area (cap) to restrict subsurface excavation and groundwater usage, and evaluate the potential impacts on groundwater. Residual petroleum hydrocarbons would be slowly addressed through natural processes, including biodegradation. Based on comments from the NYSDEC requesting more active treatment and free product recovery, this alternative was not pursued.

In 2004, the Navy proceeded with a **Closed-Loop Bioreactor (CLB)** pilot-scale study. This system was an innovative technology that combined vapor extraction, air sparging, vacuum enhanced free product recovery, desorption of hydrocarbons from soil particles, and enhanced biodegradation via surfactant injection. To create a closed-loop system, the extracted soil vapor was treated, re-oxygenated, and re-injected. The pilot study was completed in the spring of 2006.

Pilot-Study soil samples were collected for chemical analysis. TPH concentrations at the 20-, 30-, and 40-foot depth intervals decreased over time, with reductions ranging from 76 percent at the 30-foot depth interval to 19 percent at the 50-foot depth interval. However, the TPH concentration at the 60-foot depth interval increased by 28 percent, suggesting that the CLB system caused a portion of the petroleum product to migrate downward through the soil column to below the water table. Additional monitoring wells were sampled throughout the pilot-scale study to evaluate potential migration of contaminants to groundwater from the treatment. The groundwater results indicated that there were no obvious impacts to groundwater from operation of the pilot-scale system.

In November 2010, soil borings were installed to further delineate the vertical extent of petroleum contamination in soil. Contamination was not detected below 71 feet bgs. Groundwater samples were also collected in April 2011 to characterize the current conditions of groundwater quality at Site 4. Groundwater concentrations of VOCs and metals, and one SVOC exceed **NYSDOH Maximum Contaminant Levels (MCLs)**. The VOCs consisted of tetrachloroethene, trichloroethene, vinyl chloride, benzene, and ethylbenzene. The vinyl chloride is a biodegradation product of tetrachloroethene and trichloroethene that formed in this area due to the presence of petroleum hydrocarbons. Cadmium was present at a concentration greater than the MCL. Iron and manganese were present at concentrations greater than secondary MCLs (based on aesthetics). The only SVOC exceedence was pentachlorophenol in a single monitoring well. With the exception of iron in two monitoring wells, contaminant concentrations have decreased since the December 2006 sampling event.

In 2010 and 2011, bench scale treatability studies were performed to evaluate the feasibility of using thermal and solvent-based extraction to allow recovery of the petroleum product above and below the water table. Solvents, such as diesel and a soybean-based solvent (**VertecBio Gold #4 [Vertec]**) were used to facilitate recovery of the product. Soil containing petroleum product from Site 4 was placed in columns to simulate subsurface conditions (Figure 2).

The studies found that when soil was heated, product was released, and the higher temperatures were observed to produce the most floating free product. Both solvents tested also released product from the

soils at ambient temperatures, with the Vertec releasing more product than the diesel.

Figure 2 – Bench Scale Treatability Study – Floating Free Product that formed on hot water

The bench scale study was successful in demonstrating that the free product can be desorbed from the soil when heated, or rinsed with either diesel or Vertec. Results from these bench scale treatability studies are detailed in Appendix B of the 2013 FS/CMS available in the Administrative Record.

Site Characteristics

Site 4 and the nearby vicinity are highly urbanized. Because of this, most of the natural physical features have been reshaped or destroyed. The topography of the activity is relatively flat with a gentle slope toward the south.

96 acres of the 105-acre Navy-owned property at the former NWIRP Bethpage were transferred to Nassau County in 2008. In 2011, Steel-Los III bought the majority of the property and is currently renovating the property to attract new tenants. Plant 3 is currently used for commercial and industrial purposes. Site 4, which the Navy has retained, is located south of Plant No. 3 and north of Building 03-35 (Figures 1 and 3).

Figure 3 – Site 4 and Areal Extent of Contamination

Nature and Extent of Contamination

The Site 4 groundwater contamination extends from near Plant 3 to Building 03-35. TPH and SVOCs have been detected in site soils. NYSDEC has not established TPH concentration-based criteria, but does regulate SVOC constituents associated with TPH and has established cleanup goals for these constituents. In addition, NYSDEC policies require treatment (removal) of TPH that forms free product. In general, a free product layer does not form when TPH results are less than 1,000 mg/kg. When the TPH results are greater than 10,000 mg/kg (1 percent), then a free product layer is more commonly observed.

The estimated volume of TPH-contaminated soil is approximately 6,800 cubic yards and contains 47 tons of TPH that is greater than 1,000 mg/kg. Of that volume, approximately 1,300 cubic yards of soil contains approximately 30 tons of TPH greater than 10,000 mg/kg. The areas are approximately 0.14 acres for soil with greater than 1,000 mg/kg TPH and 0.08 acres for soil with greater than 10,000 mg/kg TPH. The areal extent of contamination is presented on Figure 3. These areas correspond to locations in which there were both soil and groundwater contamination.

The extent of petroleum-based groundwater contamination is co-located with the 1,000 mg/kg contour (0.14 acres) that is presented on Figure 3. VOCs, SVOCs, and metals have been detected in groundwater and floating free product was observed in two monitoring wells (MW01 and MW02) since 1999. Evaluation of the groundwater data indicates that the floating free product may be acting as a continuing source of contamination. The vertical extent of groundwater contamination is from the water table (50 feet bgs) and is conservatively assumed to be limited to the maximum depth of TPH contamination (71 feet bgs). With the exception of one SVOC, pentachlorophenol detected in one monitoring well, there is no evidence of migration of these organics beyond the source area.

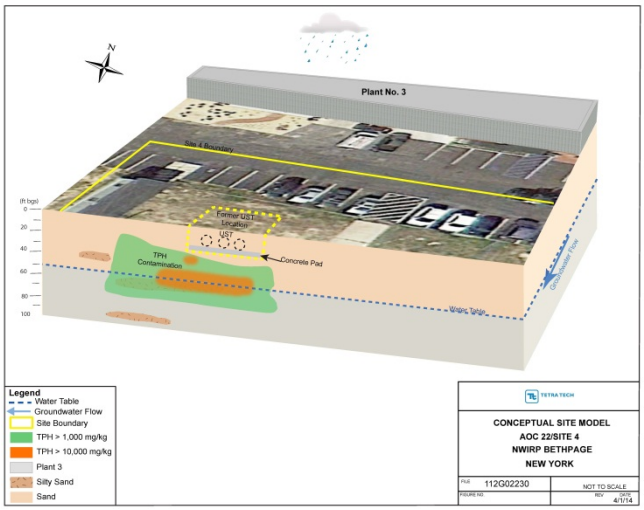
The chlorinated solvent-based groundwater contamination extends beyond the area of the petroleum-based groundwater contamination and is addressed by the Navy's Operable Unit (OU) No. 2 Record of Decision (ROD). However, these chlorinated solvents are co-mingled with Site 4 groundwater and the co-mingling has resulted in the formation of vinyl chloride in this area. Vinyl chloride is more toxic and mobile than its parent compounds of trichloroethene and tetrachloroethene. In addition, any action that addresses Site 4 soil and groundwater will also be impacted by these chlorinated solvents.

Fate and Transport of Contamination

A **Conceptual Site Model (CSM)** conveys what is known or suspected about contamination sources, release mechanisms, and the transport and fate of

those contaminants. It provides a basis for understanding contaminate fate and transport issues and assessing potential remedial technologies for the site. The CSM for Site 4 is presented in Figure 4.

Figure 4 - CSM



Contaminants of Concern (COCs) for soils consist of SVOCs and in particular **polynuclear aromatic hydrocarbons (PAHs)** that are associated with TPH. The primary pathways at this site are through excavation and potential direct contact to PAH-impacted soils, and contaminant migration from soil to groundwater followed by potential ingestion of contaminated groundwater. Because the petroleum-contaminated soils are encountered at depths below 20 feet bgs, it is unlikely that there would be human exposure through direct contact with contaminated soils. In addition, groundwater is not currently used as a potable water supply. The chlorinated solvents present in Site 4 groundwater that are in direct contact with Site 4 soil and the unsaturated soil would be potentially impacted by migration of chlorinated solvent-contaminated vapors from groundwater to the soil.

COCs for groundwater include SVOCs, VOCs, and metals. If ingested, groundwater poses a potential risk as an exposure route. VOCs in groundwater from other source areas are present including chlorinated VOCs. The chlorinated VOC contaminants are being addressed through implementation of the OU 2 groundwater ROD. However, the chlorinated VOC contaminants are co-mingled with the petroleum-based VOC contaminants. In addition, there is evidence that the petroleum hydrocarbons in site soil and groundwater are promoting the biodegradation of the chlorinated solvents and have resulted in the formation of vinyl chloride.

Principal Threats

Based on the results of previous investigations and the chemical and physical data, the source of the contamination associated with Site 4 is the USTs that reportedly contained No. 6 fuel oil and this material has come in contact with chlorinated solvents. Semi-solid free petroleum products are present near and below the groundwater table. This product is considered to be "principle threat wastes" because it is found at concentrations that pose a significant risk if an exposure scenario exists and promote the long-term formation of more toxic and mobile formation of chlorinated solvents such as vinyl chloride.

What is a "Principal Threat"?

The NCP establishes an expectation that the lead agency will use treatment to address the principal threats posed by a site whenever practical (NCP Section 300.430(a)(1)(iii)(A)). The "principal threat" concept is applied to the characterization of "source materials" at a **superfund** site. A source material is 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. Contaminated groundwater generally is not considered to be a source material; however, free floating product at the groundwater table may be viewed as a source material. Principal threat wastes are those source materials considered to be highly toxic or highly mobile that generally cannot be reliably contained, or would present a significant risk to human health or the environment should exposure occur. The decision to treat these wastes is made on a site-specific basis through a detailed analysis of the alternatives using the nine remedy selection criteria. This analysis provides a basis for making a statutory finding that the remedy employs treatment as a principal element.

Scope and Roles of the Action

This Proposed Plan presents the Navy's Preferred Alternative for addressing soil and groundwater contamination at Site 4. The Navy's cleanup strategy for Site 4 is summarized as follows:

- Implement LUCs. Access to site soils and/or groundwater would require notifications. Inspections would be required until cleanup goals are achieved.
- Injection of steam into the contaminated soil in order to release free product.
- Recover free product from a recovery well utilizing vacuum-induced bioslurping. Free product will be disposed or recycled offsite.
- Subsequent injection of air (biosparging) into the subsurface soils to provide oxygen to stimulate microbial activity and increase biological degradation.
- Monitor groundwater and soil at Site 4.
- Monitor and treat as needed soil, water, and vapor residues for chlorinated solvents and associated degradation products.

It is the current judgment of the Navy, in consultation with NYSDEC, that the preferred alternative identified in this Proposed Plan is necessary to protect the public health, welfare, and environment from actual or threatened releases of hazardous substances to the environment.

Site 4 is located south of Plant 3, a warehouse that is currently leased out for economic redevelopment. Upon successful remediation, Site 4 will be transferred to Nassau County. Future land use will most likely be used for commercial or industrial purposes.

Summary of Site Risks

Human Health Risk Assessment

A quantitative risk assessment was conducted for Site 4 using both risk-based soil and groundwater screening values in the 2013 FS/CMS. During this evaluation, chemicals exceeding these values were considered COCs. Maximum detections of chemicals in the soil were compared to United States Environmental Protection Agency (USEPA) **Regional Screening Levels (RSL)**, USEPA **Soil Screening Level (SSL)**, NYSDEC Unrestricted Use **Soil Cleanup Objectives (SCOs)**, and NYSDEC SCOs for the Protection of Groundwater. COCs in soil consist of PAHs that are associated with TPH. The maximum detections of the selected COCs for soil were used to develop site-specific risk calculations. The calculated **incremental life-time cancer risk (ILCR)** for a future resident exceeds $1X10^{-4}$ and the **hazard index (HI)** is less than 1. An ICLR greater than $1X10^{-4}$ or a HI greater than 1 is considered to be unacceptable under CERCLA. Benzo(a)pyrene was the primary contributor to the ILCR.

Maximum detections of chemicals in groundwater were compared to USEPA MCLs and NYSDOH MCLs. SVOCs, VOCs, and metals with concentrations exceeding MCLs are considered COCs and pose a potential unacceptable risk for residential exposure to groundwater through potential ingestion and dermal contact. Activities at the Site are restricted to prevent residential use of groundwater. The maximum detections of the selected COCs for groundwater were used to develop site-specific risk calculations. The calculated ILCR for a future resident exceeds $1X10^{-4}$ and the HI is greater than 1. Cadmium, cobalt, iron, and manganese were the non-carcinogenic contributors to the HI. Naphthalene and pentachlorophenol were the carcinogenic contributors to the ILCR. In addition, benzene, ethylbenzene, and xylenes are present at concentrations greater than NYSDOH MCLs. Of these chemicals, naphthalene, benzene, ethylbenzene, and xylene are associated with Site 4. The other groundwater COCs, to the extent not treated by the proposed remedial alternative, will be addressed with site-wide groundwater.

Ecological Risk Assessment

Over 90 percent of NWIRP Bethpage is covered by buildings, impermeable parking areas, roadways, and other development. No natural aquatic habitat exists on the NWIRP. Since the areas surrounding Site 4 have been developed for commercial industrial use, there are no noted risks to ecological receptors and no formal ecological risk assessment was prepared.

Remedial Action Objectives

The Remedial Action Objectives are statements that define the extent to which sites require cleanup to protect human health and the environment and comply with **Applicable or Relevant and Appropriate Requirements (ARARs)**. The Remedial Action Objectives for soil and groundwater are as follows:

- Prevent human exposure to soil contamination higher than **Preliminary Cleanup Goals (PCGs)**.
- Prevent leaching of contaminants that would result in groundwater concentrations exceeding PCGs.

To address these risks, PCGs for soil were developed based on USEPA RSLs and SSLs, and NYSDEC SCOs.

Table 1 – Soil Preliminary Cleanup Goals

Chemical of Concern	PCG (µg/kg)
SVOCs	
2-Methylnaphthalene	140
Acenaphthene	4,100
Benzo(a)anthracene	1,000
Benzo(a)pyrene	350
Benzo(b)fluoranthene	1,000
Chrysene	1,000
Fluorene	30,000
Indeno(1,2,3-cd)pyrene	500
Naphthalene	47
Pyrene	9,500

µg/kg – microgram per kilogram.

PCGs for groundwater were developed based on USEPA MCLs and NYSDOH MCLs**.**

Table 2 – Groundwater Preliminary Cleanup Goals

Chemical of Concern	PCG (µg/L)
SVOCs	
Naphthalene	14
VOCs	
Benzene	5
Ethylbenzene	5
Xylenes (total)	5

µg/L – microgram per liter.

What is Human Health Risk and How is it Calculated?

A human health risk assessment estimates the "baseline risk." This is an estimate of the likelihood of health problems occurring if no cleanup action were taken at a site. To estimate the baseline risk at a site, the Navy performs 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**, the Navy looks at the concentrations of contaminants found at a site as well as past scientific studies on the effects these contaminants have had on people (or animals, when human studies are unavailable). Comparisons between site-specific concentrations and concentrations reported in past studies help the Navy to determine which contaminants are most likely to pose the greatest threat to human health.

In **Step 2**, the Navy considers the different ways that people might be exposed to the contaminants identified in Step 1, the concentrations that people might be exposed to, and the potential frequency (how often) and length of exposure. Using this information, the Navy calculates a "reasonable maximum exposure (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 information on the toxicity of each chemical to assess potential health risks. The Navy considers two types of risk: (1) cancer risk, and (2) noncancer risk. The likelihood of any kind of cancer resulting from a contaminated site is generally expressed as an upper bound probability. Under CERCLA, the target risk range for establishing cleanup goals is 1 in 10,000 to 1 in 1,000,000. In other words, for every 10,000 or 1,000,000 people that could be exposed, one extra cancer may occur as a result of exposure to site contaminants. An extra cancer case means that one more person could get cancer than normally would be expected to from all other causes. For noncancer health effects, the Navy calculates a "hazard index." The **hazard index** represents the ratio between the "reference dose", the dosage at which no adverse health effects are expected to occur, and the "reasonable maximum exposure", the estimated maximum exposure level for a given category of individuals coming into contact with contaminants at the Site. The key concept here is that a "threshold level" (measured usually as a hazard index of less than 1) exists below which noncancer health effects are no longer predicted.

In **Step 4**, the Navy determines whether site risks are great 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.

Summary of Remedial Alternatives

Remedial alternatives that address the potential risks associated with contaminated soil and groundwater at Site 4 and achieve RAOs were developed. In order to develop these alternatives, possible remedial activities were screened for effectiveness, implementability and cost. Based upon the results of the detailed screening of potential remediation technologies, seven remedial alternatives were developed and are described as follows.

Alternative 1: No Action
Regulations implementing CERCLA generally require that the "No Action" alternative be evaluated generally to establish a baseline for comparison. Under this alternative, the Navy would take no action to prevent potential exposure to contaminated soil and groundwater. Additionally, the No Action alternative does not include monitoring groundwater and soil or five-year reviews.

Alternative 2: Monitored Natural Attenuation and Land Use Controls
This alternative consists of **monitored natural attenuation (MNA)** and LUCs. LUCs would target areas that require notifications and inspections until PCGs are achieved. The Navy is planning on transferring its property to Nassau County for economic redevelopment and the transfer documents would restrict groundwater use and identify areas of contamination. Except for Alternative 1 and 6, LUCs are included as part of the remedy until the cleanup levels are achieved. MNA is a combination of natural processes occurring at a site that results in a decrease concentration of the COCs with time or distance from a source. Groundwater samples would be collected from the existing monitoring network annually and soil samples would be collect every ten years until PCGs are achieved.

Alternative 3 – Steam Injection and Free Product Recovery
This alternative consists of steam injection, free product recovery, LUCs, and monitoring. Steam would be injected into saturated and unsaturated soils with concentrations of TPH greater than 1,000 mg/kg to temperatures ranging from 100 to 200 degrees Fahrenheit. This heating and agitation would release free product from the soil. VOCs and SVOCs will also be stripped from the source area. A free product recovery system will utilize vacuum-induced bioslurping to extract floating free product from recovery wells. Free product will be disposed offsite and groundwater will be treated with vapor phase **granular activated carbon (GAC)** and discharged to the sanitary sewer.

Steam injection would occur over a four-year time period and free product recovery would occur five days a month over the same four-year time period. Groundwater monitoring would be conducted annually

and soil samples would be collected twice over a 16-year period.

Alternative 4 – Biosparging with Steam Injection and Free Product Recovery
This alternative consists of steam injection, free product recovery, LUCs, and monitoring, followed by biosparging. Steam injection and free product recovery would be used as described in Alternative 3. However, this alternative targets only the unsaturated soil with TPH concentrations greater than 10,000 mg/kg. Biosparging would be utilized to treat unsaturated soils with TPH concentrations greater than 1,000 mg/kg and saturated soil with concentrations greater than 10,000 mg/kg. During biosparging, air is injected into the subsurface to provide additional oxygen to stimulate microbial activity which breaks down volatile compounds. This process is referred to as biological degradation. Vapors produced by this process will be extracted and treated by GAC.

Steam injection would occur over a 12 month period and the free product recovery system will operate 2 days every month for 12 months. Monitoring would be conducted annually and soil samples would be collected twice over a 10-year period.

Alternative 5 – Solvent Extraction and Free Product Recovery with Biosparging
This alternative consists of solvent injection, free product recovery, biosparging, LUCs and monitoring. The solvent selected from this remedy is Vertec. It would be injected above and below the water table to saturated soil with concentrations of TPH greater than 10,000 mg/kg. Vertec will absorb free product and flow to the top of the water table where it can be removed through a free product recovery system. This free product system differs from Alternative 3 and 4, in that submersible pumps would be used in recovery wells rather than vacuum-induced bioslurping.

A total of 120,000 gallons of Vertec would be required to treat approximately 9,800 gallons of TPH. Remaining Vertec and TPH would be treated with biosparging. Like Alternative 4, air will be injected into the subsurface to increase biodegradation.

Solvent injection and product recovery will occur over two years and the biosparge system will operate for four years. Soil sampling will be conducted twice over the same four year time period. Monitoring would be conducted annually for ten years.

Alternative 6A – Excavation and Disposal of Soils greater than 1,000 mg/kg of TPH
This alternative consists of excavation of soil containing concentrations of TPH greater than 1,000 mg/kg, off-site disposal, backfill of clean soil, and monitoring. An area of 80 by 100 feet would be excavated to a depth of 71 feet bgs. Because of the depth and the close proximity of buildings, shoring would be required prior to excavation. Shoring is the process in which the walls of the excavation are braced with steel or plywood, in order to prevent collapse.

Since the excavation extends approximately 20 feet below the water table, soil would have to be dewatered. Water released from the soil during the dewatering process would be treated or disposed off-site. Approximately 21,000 cubic yards of soil would be removed and approximately 7,000 cubic yards of soil containing 47 tons of TPH would be disposed off-site. The remaining volume of soil will be re-used as backfill. Additional clean backfill would also be transferred to the site.

Soil samples would be collected from the bottom of the excavation to confirm that PCGs have been met. Groundwater monitoring would be conducted for four years after the excavation.

Alternative 6B – Excavation and Disposal of Soils greater than 10,000 mg/kg of TPH.
Like Alternative 6A, this alternative consists of excavating soil, off-site disposal, backfilling with clean soil, and monitoring. However, only soils with concentrations of TPH greater than 10,000 mg/kg will be excavated and disposed off-site. Soil containing concentrations of TPH less than 10,000 mg/kg will remain in place. Approximately 8,000 cubic yards of soil would be excavated, of which approximately 1,400 cubic yards containing 30 tons of TPH would be disposed off-site. The remaining soil would be reused as backfill and additional clean fill will be transported to the site.

Soil samples would also be collected from the bottom of the excavation to confirm that PCGs have been met. Groundwater monitoring would be conducted for 12 years after the excavation.

Evaluation of Alternatives

The remedial alternatives were analyzed in detail and compared to each other using seven of the nine criteria provided in the NCP (40 CFR 300.430 (e)(9)(iii). An evaluation of the seven site-wide alternatives is provided in Table 3, in accordance with the criteria as follows:

Threshold Criteria
- Overall Protection of Human Health and the Environment
- Compliance with ARARs

Primary Balancing Criteria
- Long-term Effectiveness and Performance
- Reduction of Contaminant Toxicity, Mobility, or Volume through Treatment
- Short-term Effectiveness
- Implementability
- Cost

The remaining two criteria, State Acceptance and Community Acceptance, referred to as Modifying Criteria, are also considered in selecting a remedy. NYSDEC has been consulted in selecting the preferred alternative but final State comments will not be submitted until after the community has had an opportunity to submit comments on this proposed plan. Community Acceptance is evaluated based on comments received during the comment period. Additional information on the evaluation criteria can be found on page 10 “How are Remedial Alternatives Evaluated”.

Summary of the Preferred Alternative

The Navy’s preferred alternative for Site 4 is Alternative 4. This alternative is expected to be protective of human health and the environment. Steam injection would reduce TPH and PAH contamination in soil by mobilizing and removing free product. Biosparging will then volatilize and promote degradation of residual VOCs, TPH, and PAHs, in soil and groundwater, until PCGs are met. Achieving the PCGs in soil would meet the NYSDEC Soil Cleanup Objectives (6 NYCRR, Part 375-6, Table 375.6-8(b)). Achieving the PCGs in groundwater would meet 10 NYCRR Part 5, Subpart 5-1 - drinking water standards. Off gases and waste water including those contaminated with chlorinated solvents and associated degradation products generated during free product recovery and biosparging would be treated via vapor phase and liquid phase GAC treatment systems ensuring that emissions meet the New York air quality standards (6 New York Codes, Rules and Regulations [NYCRR] Part 212.9), Underground Injection Control Program (40 CFR 144.81 and .82), and groundwater quality standards (10 NYCRR Part 5, Subpart 5-1). In addition, collected product and waste would comply with NYSDEC bulk storage regulations (6 NYCRR 112.3 and -.6 and 6 NYCRR Parts 615.8 to -.14).

The top 20 feet contain little to no contamination, and would act as a barrier to the contaminated soil. LUCs would be implemented to restrict use of deeper soils and groundwater (greater than 25 feet bgs). Deed notifications and restrictions would remain in place until PCGs are met. Monitoring would determine the effectiveness of the remedy, and would be protective of the environment by detecting potential migration of soil contaminants to the groundwater. However, many of the contaminants have limited mobility, so significant migration of contamination into groundwater is not expected.

Table 3 – Ranking of Alternatives

Criterion	Alternative 2 Land Use Controls and Monitored Natural Attenuation	Alternative 3 Steam Injection and Free Product Recovery	Alternative 4 Biosparging with Steam Injection and Free Product Recovery	Alternative 5 Solvent Extraction and Free Product Recovery with Biosparging	Alternative 6A Excavation and Disposal of Soils Greater than 1,000 mg/kg TPH	Alternative 6B Excavation and Disposal of Soils Greater than 10,000 mg/kg TPH
Overall Protection of Human Health and the Environment	●	◊	◊	◊	◊	◊
Compliance with ARARs	●	◊	◊	◊	◊	◊
Long-term Effectiveness and Performance	◊	◊	◊	◊	◊	◊
Reduction of Toxicity, Mobility, or Volume through Treatment.	NA	●	◊	●	NA	NA
Short-term Effectiveness	○	○	◊	◊	◊	●
Implementability	◊	●	●	○	○	○
Time to Reach RAO (years)	30 years	16 years	10 years	10 years	4 years	14 years
Cost						
Capital	$30,000	$1,800,000	$1,800,000	$1,600,000	$7,800,000	$4,100,000
O&M	$35,000 to $85,000 per/year	$35,000 to $320,000 per/year	$35,000 to $350,000 per/year	$35,000 to $840,000 per/year	$35,000 to $65,000 per/year	$35,000 to $65,000 per/year
Net Present Value	$1,100,000	$3,400,000	$2,900,000	$3,700,000	$8,000,000	$4,500,000

NA = Not Achieved ○ = Low Ranking ● = Moderate Ranking ◊ = High Ranking

Alternative 4 would be effective in the long-term. Once the TPH and associated PAHs are removed from the site and residual chemicals are allowed to attenuate, there would be no continuing formation of vinyl chloride and no significant remaining site risks.

The thermal/free product recovery system would be designed to remove approximately 7,900 gallons of TPH during operation. Remaining contaminants would be treated through biodegradation (14 tons of TPH). In the short-term, workers may be exposed to contamination and high heat while implementing the remedy. However, this would be controlled by use of personal protection equipment and compliance with site specific health and safety procedures. Depending on the effectiveness of the remedy, RAOs are anticipated to be achieved approximately four to ten years after the start of treatment.

The estimated capital cost and **present value** cost of the Preferred Alternative is $1,800,000 and $2,900,000, respectively. Annual costs vary, based on the activity being conducted in each year and range from steam injection/product recovery costs of $200,000 per year (2 years) to inspections and LUCs cost of approximately $30,000 per year (over ten years).

Based on the information currently available, the Navy believes the Preferred Alternative meets the threshold criteria and provides the best balance of tradeoffs among the other alternatives with respect to the seven criteria outlined above. The Navy expects the Preferred Alternative to satisfy the following statutory requirements of CERCLA §121(b): 1) be protective of human health and the environment; 2) comply with ARARs; 3) be cost-effective; 4) utilize permanent solutions and alternative treatment technologies to the maximum extent practicable; 5) satisfy the preference of treatment as a principle element. The preferred Alternative can change in response to state and public comments or new information.

Community Participation

The Navy seeks input from the community on all Proposed Plans. A public comment period has been set for October 24, 2014 to December 10, 2014 to provide an opportunity for public participation in the remedy selection process for the Site. A public meeting is not anticipated to be needed for this Proposed Plan. If the community would like a public meeting to explain the Proposed Plan, please contact the Public Affairs Officer prior to the end of the comment period.

The Navy, in consultation with NYSDEC, may modify the preferred alternatives or select another alternative presented in this Proposed Plan based on new information or public comments. Therefore, the public is encouraged to review and comment on all of the alternatives identified here. Comments will be summarized and responses provided in the Responsiveness Summary section of the ROD. The ROD is the Navy's final selection of the remedy for this site. Written comments may be sent to the Public Affairs Officer at the address below.

During the comment period, interested parties may submit written comments to the following address:

Public Affairs Officer
Code 09PA
Naval Facilities Engineering Command, Mid-Atlantic
9742 Maryland Ave. Bldg. A81
Norfolk, VA 23511

For More Information

This Proposed Plan summarizes information that can be found in greater detail in the FS for this site. This and other site documents, which form the Administrative Record for this Proposed Plan, are available online at http://go.usa.gov/DyXF. A copy of the ROD, which selects the final remedy and includes the Responsiveness Summary, will also be made available on the website.

How are Remedial Alternatives Evaluated?

The remedial alternatives were analyzed in detail and compared to each other using seven of the nine criteria provided in the National Oil and Hazardous Substance Pollution Contingency Plan (NCP) (40 CFR 300.430 (e)(9)(iii). These nine criteria are as follows:

Threshold Criteria

- Overall Protection of Human Health and the Environment
- Compliance with Applicable or Relevant and Appropriate Requirements (ARARs)

Primary Balancing Criteria

- Long-term Effectiveness and Permanence
- Reduction of Contaminant Toxicity, Mobility, or Volume through Treatment
- Short-term Effectiveness
- Implementability
- Cost

The remaining two criteria, State Acceptance and Community Acceptance, referred to as Modifying Criteria, are also considered in selecting a remedy. NYSDEC has been consulted in selecting the preferred alternative but final State comments will not be submitted until after the community has had an opportunity to participate in the selection process. Community Acceptance is evaluated based on comments received during the public comment period. (See text box, *Let Us Know What You Think!,* on page 1.)

Overall Protection of Human Health and the Environment

Alternatives must be assessed for adequate protection of human health and environment, in both the short and long terms, from unacceptable risks posed by hazardous substances or contaminants present at the site by eliminating, reducing, or controlling exposure to concentrations exceeding remediation goals. Overall protection draws on the assessments of other evaluation criteria, especially long-term effectiveness and permanence, short-term effectiveness, and compliance with ARARs.

Compliance with ARARs

Alternatives must be assessed to determine whether they attain ARARs under federal environmental laws and state environmental or facility siting laws. If one or more regulations that are applicable cannot be complied with, a waiver must be invoked in accordance with CERCLA. Grounds for invoking a waiver are listed in CERCLA would depend on site circumstances and alternative remedial approaches.

Long-Term Effectiveness and Permanence

Alternatives must be assessed for the long-term effectiveness and permanence they offer, along with the degree of certainty that the alternative will prove successful. Factors to be considered, as appropriate, include the following:

<u>Magnitude of Residual Risk</u> - Risk posed by untreated waste or treatment residuals at the conclusion of remedial activities. The characteristics of residuals should be considered to the degree that they remain hazardous, taking into account their volume, toxicity, mobility, and propensity to bioaccumulate.

<u>Adequacy and Reliability of Controls</u> - Controls such as containment systems and institutional controls that are necessary to manage treatment residuals and untreated waste must be shown to be reliable. In particular, the uncertainties associated with land disposal for providing long-term protection from residuals, assessment of the potential need to replace technical components of the alternative (such as a cap, a slurry wall, or a treatment system), and potential exposure pathways and risks posed if the remedial action would need replacement must be considered.

Reduction of Toxicity, Mobility, or Volume through Treatment

The degree to which the alternative employs recycling or treatment that reduces the toxicity, mobility, or volume will be assessed, including how treatment is used to address the principal threats posed by the site. Factors to be considered, as appropriate, include the following:

- The treatment or recycling processes the alternative employs and the materials that they will treat.
- The amount of hazardous substances, pollutants, or contaminants that will be destroyed, treated, or recycled.
- The degree of expected reduction in toxicity, mobility, or volume of hazardous substances due to treatment or recycling and the specification of which reduction(s) is occurring.
- The degree to which the treatment is irreversible.
- The type and quantity of residuals that will remain following treatment considering the persistence, toxicity, mobility, and propensity to bioaccumulate of such hazardous substances and their constituents.
- The degree to which treatment reduces the inherent hazards posed by principal threats at the site.

Short-Term Effectiveness

The short-term impacts of the alternative are assessed considering the following:

- Short-term risks that might be posed to the community during implementation.
- Potential impacts on workers during remedial action, and the effectiveness and reliability of protective measures.
- Potential environmental impacts of the remedial action, and the effectiveness and reliability of mitigative measures during implementation.
- Time until protection is achieved.

Implementability

The ease or difficulty of implementing the alternatives is assessed by considering the following types of factors, as appropriate:

- Technical feasibility, including technical difficulties and unknowns associated with the construction and operation of a technology, the reliability of the technology, ease of undertaking additional remedial actions, and ability to monitor the effectiveness of the remedy.
- Administrative feasibility, including activities needed to coordinate with other offices and agencies, and the ability and time required to obtain necessary approvals and permits from other agencies (for off-site actions).
- Availability of services and materials, including the availability of adequate off-site treatment, storage capacity, and disposal capacity and services, availability of necessary equipment and specialists and necessary additional resources, availability of services and materials, and availability of prospective technologies.

Cost

Capital costs to be considered include direct and indirect costs, annual O&M costs, and net present worth (NPW) of the capital and O&M costs. The NPW for the alternatives is calculated using a discount rate of 2.8 percent based on the Office of Management and Budget Circular A-94 updated in March 2008. The cost estimate accuracy range is expected to be plus 50 percent to minus 30 percent of the actual cost.

State Acceptance

The state's concerns that must be assessed include the following:

- The state's position and key concerns related to the preferred alternative and other alternatives
- State comments on ARARs or the proposed use of waivers

These concerns cannot be evaluated until the NYSDEC has reviewed and commented on the FS. These concerns will be discussed, to the extent possible, in the Proposed Plan to be issued for public comments.

Community Acceptance

This assessment consists of responses of the community to the Proposed Plan and includes determining which components of the alternatives interested persons in the community support, have reservations about, or oppose. This assessment can be completed after comments on the Proposed Plan are received from the public.

GLOSSARY

Administrative Record: An official compilation of site-related documents, data, reports, and other information that are considered important to the status of and decisions made relative to a Superfund site. The public has access to this material.

Applicable or Relevant and Appropriate Requirements (ARARs): Cleanup standards promulgated under federal environmental or state environmental and facility siting laws.

Biodegradation: the use of microorganisms to transform or alter, through metabolic or enzymatic action, hazardous organic contaminants into nonhazardous substances.

Biosparging: Air is injected into the subsurface to provide additional oxygen to promote/increase biological degradation.

Chemical of Concern (COC): A contaminant found in site-specific media, deemed by the human health assessment estimation calculation rules to be a compound potentially contributing to human health risk. Chemicals are selected to represent site contamination.

Closed-Loop Bioreactor (CLB): The CLB system consisted of vapor extraction, air sparging, vacuum enhanced product recovery, desorption of hydrocarbons from soil particles, and enhanced bio-degradation via surfactant injection. The CLB System targeted the vadose and saturated soil zone. Air from the groundwater sparge points to vadose injection and vacuum extraction wells was continuously circulated, creating a closed-loop system.

Comprehensive Environmental Response, Compensation, and Liability Act of 1980, as amended (CERCLA), 42 U.S.C. §§ 9601 to 9675: Commonly referred to as Superfund Law., CERCLA is a federal law which was passed in 1980 and amended in 1986 and again in 2002. CERCLA created a special tax that was placed in a trust fund to investigate and cleanup abandoned or uncontrolled hazardous waste sites that endanger public health and safety or the environment.

Comment Period: A time for the public to review and comment on various documents and actions taken. A minimum of a 30-day comment period is held to allow community members to review the Administrative Record file and review and comment on the Proposed Plan.

Contaminant: Any physical, biological, chemical or radiological substance or matter that, at a high enough concentration, could be harmful to human health or to the environment.

Corrective Measures Study (CMS): A corrective measures study (CMS) involves the identification and evaluation of remedial alternatives (i.e. remedies) for performing corrective action at one or more solid waste management units at a Resource Conservation and Recovery Act (RCRA) facility. It is prepared by the facility owner/operator with guidance or oversight from EPA or an authorized State.

Conceptual Site Model (CSM): A CSM conveys what is known or suspected about contamination sources, release mechanisms, and the transport and fate of those contaminants. The CSM is derived from available data and accepted principles of contaminate fate and transport.

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

Granulated Activated Carbon (GAC): Groundwater or vapor is passed through granulated activated carbon (GAC) for treatment. GAC is used to remove contaminants by adsorption.

Groundwater: Water beneath the ground surface that fills spaces between materials such as sand, soil or gravel to the point of saturation. In aquifers, groundwater occurs in quantities sufficient enough for drinking water, irrigation and other uses. As groundwater flows towards its point of discharge, it may transport substances that have percolated downward from the ground surface as it flows towards its point of discharge.

Hazard Index (HI): The sum of chemical-specific Hazard Quotients. A Hazard Index of greater than 1 is associated with an increased level of concern about adverse non-cancerous health effects.

Hazard Quotient: Exposure to a particular non-carcinogenic chemical may present a risk.

Human Health Risk Assessment: An evaluation of the risk posed to human health should remedial activities not be implemented.

Incremental Lifetime Cancer Risk (ILCR): Exposure to a particular carcinogenic chemical may

present an increased risk of developing 1 additional case of cancer in 10,000. The EPA acceptable range is $1X10^{-6}$ to $1X10^{-4}$.

Information Repository: A file containing information, technical reports and reference documents developed for a site undergoing cleanup. This file is usually maintained in a place with convenient public access, such as a public library.

Land Use Controls (LUCs): Non-engineered instruments such as administrative and/or legal controls that minimize potential for human exposure to contamination and protect the integrity of the remedy.

Maximum Contaminant Level (MCL): USEPA-published (promulgated as law) maximum concentration level for contaminants found in water in a public water supply system.

Monitoring: Ongoing collection of information about the environment that helps gauge the effectiveness of a cleanup action. This includes the collection of samples with laboratory analysis for the contaminants of interest.

Monitored Natural Attenuation: Natural processes that occur at a site that results in a decrease in concentrations of COPCs with time or distance from a source.

National Contingency Plan; National Oil and Hazardous Substance Pollution Contingency Plan (NCP): The NCP is codified in 40 C.F.R. Part 300. The purpose of the NCP is to provide the organizational structure and procedures for preparing for and responding to discharges of oil and releases of hazardous substances, pollutants or contaminants.

New York State Department of Environmental Conservation (NYSDEC): The state agency responsible for administration and enforcement of environmental regulations.

Organic Compounds: These are naturally occurring or man-made chemicals containing carbon. Volatile organics can evaporate more quickly than semivolatile organics. Some organic compounds may cause cancer; however, their strength as a cancer-causing agent can vary widely. Other organics may not cause cancer but may be toxic. The concentrations that cause harmful effects can also vary widely.

Preliminary Cleanup Goals (PCGs): Preliminary Cleanup Goals are generally selected from the most stringent State and Federal criteria.

Proposed Plan: A plan which summarizes the preferred cleanup strategy and rationale. It also reviews the alternative(s) presented in detail in the FS. The Proposed Plan may be prepared either as a fact sheet or a separate document. The preparation of a Proposed Plan is a public participation requirement of CERCLA and the National Contingency Plan.

Record of Decision (ROD): An official public document that explains which cleanup alternatives was selected. The ROD is based on information and technical analysis generated during the RI/FS process and considers public comments and community concerns raised upon the issuance of the Proposed Plan. The ROD explains the remedy selection process and is issued following the conclusion of the public comment period.

Remedial Action: The actual construction or implementation phase that follows the remedial design for the selected cleanup alternative at a site.

Remedial Action Objective (RAO): An objective selected in the FS, against which all potential remedial actions are judged.

Resource Conservation and Recovery Act, as amended, (RCRA), 42 U.S.C. §§ 6901-6939(e): A federal law which ensures 1) the proper management of hazardous waste from the point of generation until final disposal and 2) that an owner and operator of a hazardous waste treatment, storage and disposal facility investigates and cleans up and releases necessary to protect human health and the environment.

Responsiveness Summary: A summary of oral and written public comments received during a comment period following issuance of the Proposed Plan and the responses to these. The responsiveness summary is an important part of the ROD, highlighting community concerns for decision makers.

Risk Assessment: This process evaluates and estimates the current and future potential for adverse human health or environmental effects resulting from exposure to contaminants.

Regional Screening Levels (RSL): USEPA-published (promulgated as law) regional screening levels for contaminants found in soil.

Soil Cleanup Objectives (SCO): NYSDEC-published cleanup levels for contaminants found in soil

Source Area: The zone of highest soil or groundwater concentrations, or both, of the chemicals of concern. The area considered to be the point of release.

Soil Screening Level (SSL): USEPA risk-based soil screening levels (SSLs) that were designed to be protective of groundwater at most sites.

Superfund: Another term used to refer to CERCLA.

United States Environmental Protection Agency (USEPA): The federal agency responsible for administration and enforcement of environmental regulations.

Vertec: Vertec is a biobased solvent derived from soybean. This solvent is biodegradable and non-hazardous under RCRA.

Please print or type your comments for the Proposed Plan for Site 4 below.

Mark Your Calendar for the Public Comment Period

Public Comment Period

October 24, 2014 to December 10, 2014.

Submit Written Comments

The Navy will accept written comments to the Proposed Plan during the Public Comment period.

A public meeting is not anticipated to be needed for this Proposed Plan. If the community would like a public meeting to explain the Proposed Plan, please contact Public Affairs Officer prior to the end of the public comment period.

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Public Affairs Officer
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