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Final
Proposed Remedial Action Plan
Q-Area Drum Storage Yard
Norfolk Naval Base
Norfolk, Virginia

site 3

Prepared for:
Atlantic Division
Naval Facilities Engineering Command
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1.0 Introduction

This Proposed Remedial Action Plan (PRAP) identifies the preferred alternative for a final remedial action for groundwater areas at the Q Area Drum Storage Yard (QADSY), Norfolk Naval Base, Norfolk, Virginia. This document is being issued by Atlantic Division, Naval Facilities Engineering Command (Navy), the lead agency for remedial activities, with assistance from the Norfolk Naval Base, and in consultation with the US Environmental Protection Agency (USEPA) and the Virginia Department of Environmental Quality (VDEQ), which are the support agencies for this remedial action.

The Navy is issuing this PRAP in accordance with the public notification requirements under Sections 113(k)(2)(B), 117(a), and 121(f)(1)(G) of the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) of 1980, as amended by the Superfund Amendments and Reauthorization Act of 1986 (SARA); 42 United States Code (USC) §§ 9613(k)(2)(B), 9617(a), and 9621(f)(1)(G). A glossary of terms is provided in Appendix A.

The PRAP objectives are to: 1) summarize relevant background information and environmental investigations; 2) describe the remedial alternatives evaluated by the Navy; 3) identify the Navy's preferred alternative; 4) explain the rationale for selecting the preferred alternative; 5) encourage the public to review and comment on each alternative evaluated; and 6) actively solicit community involvement in the final remedy selection.

Information presented in this PRAP is based on the results and findings of the Remedial Investigation/Feasibility Study (RI/FS) Report. These documents, as well as the site-related data used to support the preferred alternative, are contained in an Administrative Record File, which can be viewed at the following Information Repository location:

Kirn Library
City of Norfolk Main Library
301 City Hall Avenue
Norfolk, Virginia
(757) 664-7323

The Administrative Record File is also available for review at USEPA and VDEQ offices. A public notice will be issued announcing the date of the public comment period, and will include a public meeting at which the Navy will present the RI/FS findings and summarize each PRAP alternative. The Navy will also discuss the rationale for selecting the preferred alternative and will be available to interested citizens who wish to ask questions and/or provide comments.

A public meeting will be held if the Navy receives substantial public comments.

Comments presented during the public meeting and received during the public comment period will be considered and addressed by the Navy in a responsiveness summary, prior to selecting the final remedial alternative. The public comment period will be from 15 July to 15 August 1996. The Responsiveness Summary will be attached as an Appendix to the Record of Decision (ROD). Consequently, the plan for remedial action established in the ROD to be issued after the public comment period may be different from the preferred alternative presented in this PRAP. Therefore, the Navy, USEPA, and VDEQ encourage the public to review: 1) supporting documentation included in the Administrative Record File; 2) site-related documents contained in the Information Repository; and 3) each of the remedial alternatives identified in the FS Report.

2.0 Site Background

QADSY is located on the Norfolk Naval Base and is part of the Sewells Point Naval Complex (Figure 1). It is located in the northwest corner of the complex, within 1200 feet of both the Elizabeth River (to the west) and Willoughby Bay (to the northeast). The site is currently a relatively flat fenced area, paved with crushed gravel, and bounded by asphalt parking lots to the north and west.

The QADSY was created by a fill operation in the early 1950s and was used as a disposal area for the dredged materials from Willoughby Bay. Thousands of drums containing solvents, oils, lubricants, paint thinners, pesticides, and acids have been stored at the QADSY. Sometime between the June 1990 site visit and the initiation of the field investigation in September 1990, the drums were removed.

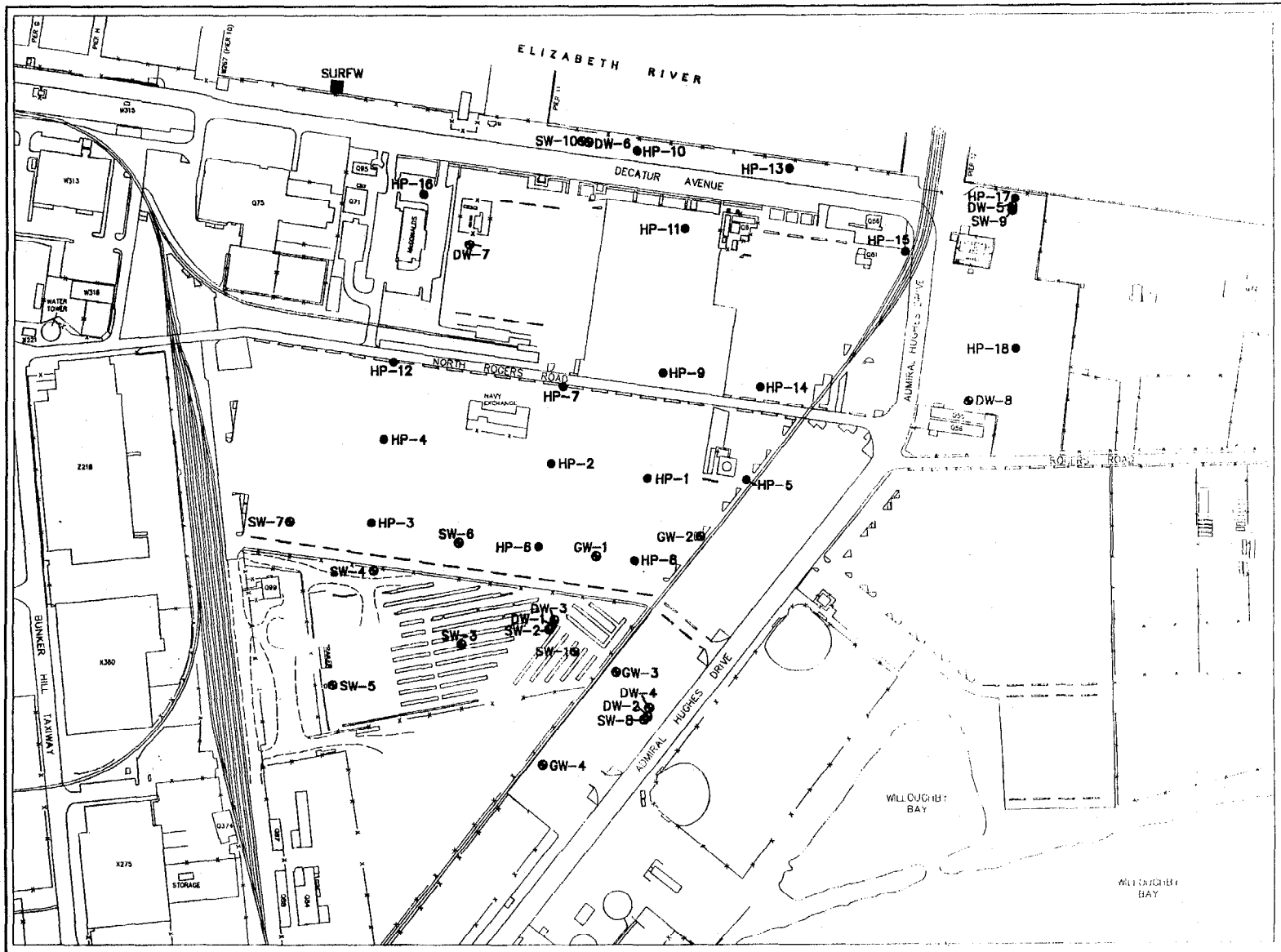
2.1 Installation History

The QADSY has been in use since its creation in the 1950s, and tens of thousands of drums have been stored at the site since that time (Malcolm Pirnie, 1988). A variety of materials were stored in 55-gallon steel drums, including petroleum products (such as oil lubricants), various organic solvents, paint thinners, some pesticides, formaldehyde, and acids. The site has not been used for drum storage since 1990.

Since 1982, a number of investigations and reports have been conducted and prepared under various Navy programs to assess the nature and extent of contamination and contaminant migration.

The investigations addressed in this PRAP began with an Initial Assessment Study (IAS) in 1982 and ended with the comprehensive RI/FS performed in 1996.

During the IAS survey, evidence of considerable liquid leakage and spillage was noted throughout the site. In particular, the northern portion of the site was used to store damaged and leaking drums. Recommendations were made to install and sample (quarterly) three monitor wells; recommended analytes included oil and grease, volatile organic compounds (VOCs), pesticides, and polychlorinated biphenyls (PCBs). The IAS report (NEESA, February 1983) suggested that the wells be located downgradient of the QADSY, with specific attention to the leaking drum area.



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DATE 3-16-94	SCALE SHOWN	TITLE MONITOR WELL, HYDROPUNCH, AND WATER LOCATIONS Q AREA DRUM STORAGE YARD NORFOLK, VIRGINIA	
DRAWN BY LAL/DN	APPROVED BY		
JOB NO. 4921150	DWG. NO./ REV. NO. QDB / -	CLIENT NAVFAC – Q AREA	FIGURE 1

Subsequent to the IAS, the NACIP Program was redesigned as the Installation Restoration Program (IRP). The terminology and structure of the IRP were changed to conform to that of SARA. The RI Interim Report (Malcolm Pirnie, 1988) was designed to verify the existence of contamination, satisfying the site investigation requirement of SARA, but it does not meet the full requirements of an RI. The objective was to incorporate the RI Interim Report into a completed RI/FS document at a later date.

The initial site investigation for the interim RI was conducted in November and December 1983. Four monitor wells were installed at that time, and 12 soil samples were analyzed from four hand borings. A second round of groundwater sampling was performed in August 1984. Groundwater samples from the existing wells and 21 soil samples from seven locations were analyzed as part of the third round of sampling, performed in April 1986. The Navy analyzed eight soil samples in April 1986 following the groundwater event; this effort resulted in plans to remove the most contaminated soil as part of a 1989 military construction project. Finally, a fourth round of groundwater sampling occurred in June 1986.

2.2 QADSY RI Summary

The objective of the RI was to determine the nature and extent of contamination at the site, as well as locate and characterize the groundwater contamination both onsite and offsite. The complete results of the RI are presented in Volume I of this document, the RI report for the QADSY.

The RI field investigation was performed in two stages: (1) a 1990 groundwater and soil sampling event; and (2) 1992-1993 groundwater, 1992 soil, 1992 surface water, 1993 sediment, and 1995 soil and groundwater sampling events.

To fulfill the objectives of the RI, ESE performed the following tasks:

- A total of 18 monitor wells were installed. Ten of the wells comprise four well clusters. Each cluster consists of two or three wells that monitor the shallow and deep portions of the aquifer beneath the site. Subsurface soil samples were collected from wells SW-1 through SW-5.

- Surface soil samples were collected from 36 locations from the four study areas during the 1990 sampling event. Samples were collected from two intervals in 24 of the borings: 0 to 18 inches and 18 to 36 inches. A composite sample was taken from 0 to 36 inches in the remaining 12 borings.

- Subsurface samples were collected from eight locations during the 1992 sampling event to further delineate the extent of total petroleum hydrocarbon (TPH) contamination. Samples were collected from two intervals in the borings: 3 to 5 feet and 5 to 7 feet.

- During the May 1995 sampling event, surface soil samples were collected at 19 locations: 15 were analyzed to further delineate the extent of TPH contamination, and the remaining four were analyzed for VOCs, semi-volatile organic compounds (SVOCs), pesticides, PCBs, inorganic compounds (IOCs), and cyanide.

- Two sediment samples were collected from onsite storm drains.

- During the 1990 sampling event, groundwater samples were collected from the 10 new wells and from three existing wells installed as part of the IAS. During the 1992-1993 sampling event, groundwater was collected from five of the wells installed in 1990 and from the eight new wells installed in 1992. Groundwater samples were collected from the eight new wells in May 1995.

- 66 groundwater samples were collected from 18 locations using the hydropunch sampling technique in December 1992 and analyzed for trichloroethene (TCE), tetrachloroethene (PCE), and 1,2-dichloroethane (DCA) using a Photovac field gas chromatograph. At least two hydropunch samples were collected at each location. Groundwater samples were collected at 10-foot intervals beginning at 15 feet below surface. Hydropunch samples were collected until the contamination was below detection limits or two consecutive samples were detected at or below 5 micrograms per liter (μg/l).

- One surface water sample was collected from the Elizabeth River adjacent to the piers.

- Rising and falling head slug tests were used to determine the hydraulic conductivity of the aquifer. Continuous water level monitoring was conducted on one shallow and one deep well to determine tidal and recharge influences on the aquifer.

- The vertical flow regime between the aquifer and the Elizabeth River was determined by installing a piezometer at the end of one of the piers.

- A 72-hour drawdown test was performed to evaluate aquifer characteristics including specific capacity, transmissivity, storativity, and area of influence.

- Following the 1992 field investigation, MODFLOW®, a three-dimensional groundwater flow model, was used to determine groundwater flow lines at the site.

- Monitor well locations were surveyed to determine the elevation of each well; additional surveys were performed to develop accurate site maps.

- Two air sparging/soil vapor extraction (AS/SVE) pilot studies were performed in May 1995 to test the feasibility of a remediation system.

General conclusions were made based on the data obtained from the RI, as described in the following sections.

2.2.1 Hydrogeological Summary

The hydrogeologic investigation at the QADSY was conducted in three phases: new monitor wells and soil borings were installed and sampled between August and October 1990; existing monitor wells were sampled and the pump test was performed between January and February 1991; rising and falling head slug tests were performed during March 1991; five of the monitor wells installed in 1990 were sampled in October 1992; eight new wells were installed and sampled in January 1993; and continuous water levels were monitored for tidal effect in December 1992 and January 1993 for 34 days. The following general conclusions were made:

- A single, unconfined aquifer consisting of the Columbia and Yorktown aquifers has been identified at the site, ranging from approximately 7 feet below ground surface (bgs) to at least 75 feet bgs. A confining layer does not exist to separate the two aquifers.

- The aquifer consists of sands and silty sands (and fill material).

- Groundwater flow in the aquifer is generally to the west across the site.

- Groundwater average linear velocity in the aquifer averages 15 feet per year, but may vary greatly due to local changes in hydraulic gradient and hydraulic conductivity.

- Static water levels at the site are influenced up to 3 feet within the QADSY by the tides.

- The air sparging/soil vapor extraction (AS/SVE) pilot studies indicated that AS/SVE is a feasible remediation technique at the QADSY.

- The aquifer is contaminated with VOCs.

A generalized geologic section of the site is provided in Figure 3-3 of the RI report. Detailed information concerning the hydrogeology of QADSY is contained in the RI.

2.2.2 Nature and Extent of Contamination

A variety of contaminants have been identified at the site. A list of compounds of concern (target compounds) is provided in Section 4.0 of the RI report.

The following factors were considered when identifying the target compounds:

- Relation to known or suspected site activity
- Frequency of detection above background levels and/or relevant standards/criteria
- Frequency of detection above those mandated by NEESA Level C Protocols
- Compound presence in laboratory or field blanks

Several compounds identified at the site are recognized laboratory contaminants; they are not the focus of the FS and therefore are not relevant. In addition, the treatment proposed for PCE and TCE will also eliminate these compounds if they are present at low levels.

A brief summary follows of the sample results from each media investigated during the RI. Figures 2-1 and 2-2 of the RI report show the locations sampled during the investigation. Media included groundwater, surface soils, subsurface soils, sediment, and surface water. Figures 5-6 through 5-38 of the RI report show the location of the monitor wells and interpreted contaminant plumes. Additional details regarding the site can be found in Sections 3.0 through 8.0 of the RI Report.

Surface Soils:

- Fifty percent of the 0- to 3-foot samples from the QADSY were contaminated by petroleum hydrocarbons above the 100 parts per million (ppm) VDEQ action level. Two-thirds of the samples exceeded the 50 ppm VDEQ guideline for disposal of the soil as clean fill. Concentrations ranged from not detected to 4400 ppm. A hydrocarbon that closely matched the reference standard for compressor oil was the most common; other oils were less so. All of the 3- to 7-foot samples were below the 50 ppm VDEQ guideline.

- Soil VOC contamination is limited. Only the sample from location HM-9-2, at 32,000 micrograms per kilogram (μg/kg) PCE, exceeded the range for all other samples of 1000 μg/kg total VOCs. Other VOCs detected at much lower levels included: acetone, xylenes, 1,1-DCA, toluene, methylene chloride, 1,2-dichloroethene (DCE), 1,1,1-trichloroethane (TCA), TCE, 4-methyl-2-pentanone, and 1,1,2,2-tetrachloroethane (PCA).

- All detected toxic characteristic leachate procedure (TCLP) organics and IOCs were well below federal standards.

- Many of the compounds detected in the surface soils were also detected in the groundwater samples, including VOCs, TPH, and IOCs.

Groundwater:

- The contaminants present in the saturated zone were comparable to those observed in the soils and are typical of the type of contaminants stored at the site, except for TPH.

- Contamination appears to affect the upper 60 feet of the aquifer.

- The main groundwater contaminants of concern are the following chlorinated organics: PCE, TCE, 1,1,1-TCA, 1,1,-DCA, 1,1-DCE, 1,2-DCE, and acetone. Locally, some IOC concentrations were elevated (e.g., cadmium).

- As determined in the hydrogeological investigation, groundwater flows west across the site.

3.0 Scope and Role of Remedial Action

This PRAP addresses the final remedy for the QADSY. No further remedial action is determined to be necessary for the soil. AS/SVE remedial action is determined to be necessary for groundwater.

Remedial action objectives include protecting the groundwater and preventing inhalation of VOCs from impacted groundwater. The RI/FS addressed these objectives by removing chemical constituents from groundwater. The studies undertaken at the QADSY have shown that future commercial potential human health or environmental risks are associated with the groundwater.

Based on the careful consideration of the technical, environmental, institutional, public health, and cost criteria as presented in Section 6.0, and in keeping with the overall response strategy, the recommended remedial action for the QADSY at Norfolk Naval Base is AS/SVE.

The radius of influences at the QADSY site were calculated during a pilot study, but need to be readdressed during system installation with longer test periods to verify the number of wells to be installed. The operating system would then provide real scale data if future wells were required for ultimate clean up.

Due to the well spacing required, the number of wells and associated equipment is very large to effectively remediate the entire site. An alternative discussed with the Navy would position the AS and SVE wells on the downgradient edge of the plume paralleling the waterfront. This arrangement would provide a remediation zone prior to groundwater discharge to the Elizabeth River.

4.0 Summary of Site Risks

A risk assessment (RA) is a procedure that uses a combination of facts and assumptions to estimate the potential for adverse effects on human health and the environment from exposure to chemicals found at a site. The RA process for the QADSY involved consideration of chemicals of concern (COCs) in air, soil, sediment, surface water, and groundwater and how humans and animals can be exposed to these COCs.

No action for soil is relevant and appropriate at the QADSY because:

- IOC contamination appears to be inherited from the dredged material.
- The QADSY is not conducive to an ecological environment because it is in a highly industrial area and is mostly a paved parking lot.
- The future plans are for the unpaved area to be paved, which will subsequently eliminate this ecologic risk pathway.

In the RA, potential carcinogenic risks and non-carcinogenic health risks were calculated. Conservative assumptions were used in calculating potential risks that weigh in favor of protecting human health and the environment.

Potential risks to human health and environment were then evaluated with respect to carcinogenic and non-carcinogenic effects. USEPA's acceptable increased cancer risk range is $1.0x10^{-4}$ to $1.0x10^{-6}$ (one individual in 10,000 to one individual in 1,000,000) as established in the National Oil and Hazardous Substances Pollution Contingency Plan (NCP). The number $1.0x10^{-4}$ corresponds to a probability of one additional individual in 10,000 developing cancer from a lifetime (70 years) of exposure to chemicals on the installation.

A hazard index (HI) is used to determine whether individuals in a population could be adversely affected by non-carcinogenic chemicals. An HI exceeding 1.0 indicates a potential unacceptable risk and a possible concern for potential toxic effects.

The environmental or ecological risk assessment was conducted to determine if there are any potential/current or future adverse effects on plants and animals due to the presence of chemicals at the study areas. Potential risks were determined by evaluating the toxicity of the study area COCs and the potential exposure to those COCs.

An RA was generated in accordance with EPA region-wide and Region III guidance to assess the potential current and future human and ecological health risks associated with potential onsite

exposures at the QADSY, assuming no remedial action is implemented at the site. The risk results are then used to develop remedial goal objectives (RGOs), goals which remedial alternatives strive to achieve considering other factors such as feasibility and achievability.

The RA identified the primary site-related chemicals of potential concern (COPCs) at the QADSY. Based on past site operations and disposal activities at the site, the COPCs evaluated in the Human RA (HRA) and Ecological RA (ERA) include a subset of VOCs and IOCs. The data used in the RA are taken from ESE sampling events (1990-1993) and sampling events from different contractors (Malcolm Pirnie, 1983-1986 and Baker Environmental, 1995). The most recent and/or reliable data are used in the calculation of the exposure concentrations for the RA. The number of chemicals to be evaluated in the RAs was reduced using 1) EPA Region III methodology for risk-based concentration screening, 2) comparison of site and background soil concentrations, and 3) a screening for nutritionally essential chemicals.

In addition, TPH was detected at the site. Although this group of chemicals is useful for determining the extent of petroleum-based contamination, a quantitative risk evaluation was not performed as TPH represents a large group of chemicals, typically composed of long, straight-chain hydrocarbons of relatively low toxicity. However, to provide a conservative risk evaluation, the carcinogenic polynuclear aromatic halogens (PAHs) were used as a surrogate to evaluate TPH.

The exposure assessment identified significant human and ecological exposure pathways and population(s) based on the environmental fate/transport analysis; determines the exposure concentrations to potential receptors; and estimates the magnitude, duration, and frequency of exposure for each receptor (or receptor group). The primary exposure pathways evaluated in the HRA and ERA are as follows:

Human Exposure Pathways

Current Worker -- incidental ingestion and direct contact with site soils; inhalation of vapors volatilized from groundwater into indoor air

Future Worker -- incidental ingestion and direct contact with site soils; inhalation of vapors volatilized from groundwater into indoor air

Future Residential -- incidental ingestion and direct contact with site soils; inhalation of vapors volatilized from groundwater into indoor air

Ecological Exposure Pathways

Terrestrial -- ingestion of contaminated fish by great blue heron

Aquatic -- exposure to surrounding surface water and sediment by aquatic and benthic organisms

Domestic groundwater consumption is an incomplete human exposure pathway as the water below the QADSY site is not potable due to the high salinity of the water. Thus, this pathway, under the guidance of state and federal regulatory agencies, is not further evaluated in the RA. However, due to the presence of VOCs in groundwater beneath the site, inhalation of VOCs volatilized from groundwater into indoor air is evaluated.

The primary sources of toxicological data were from EPA-verified references. When an appropriate toxicological constant was not identified, current literature was reviewed to find appropriate toxicological data, which were used to calculate dose-response values using the methodologies outlined in EPA guidance documents.

The site-specific human carcinogenic and noncarcinogenic risk estimates are determined using the exposure concentrations and factors presented in the exposure assessment along with the dose-response information developed in the toxicity assessment. The potential carcinogenic risks are compared with the EPA target cumulative risk range of 1×10^{-6} (1 in 1,000,000) to 1×10^{-4} (1 in 10,000) [NCP, 40 Code of Federal Regulations (CFR) 300, 430:62].

When a cumulative carcinogenic risk (risk associated with exposure to a mixture of chemicals) to an individual receptor under the assumed exposure conditions at a Superfund site exceeds 10^{-4}, CERCLA generally requires remedial action at the site (EPA, 1991). If the cumulative risk is less than 10^{-4}, action generally is not required but may be warranted if a chemical-specific standard that is risk based [e.g., the maximum contaminant level (MCL) or an ambient water quality criterion (AWQC)] is violated.

A risk-based remedial decision could be superseded by the presence of noncarcinogenic impact or environmental impact at the site as indicated by a hazard index (HI) greater the 1 for human noncarcinogenic exposures or an exceedance of an ecotoxicity quotient (EQ) of 1 for aquatic or terrestrial exposures.

4.1 Human Risk Characterization Results

The results of the HRA indicate that the following scenarios exceed either a cumulative risk of 10^{-4} or an HI of 1:

Exposure Scenario	Medium	Exceedance	COCs
Future Worker	Indoor air	Risk > 1 x 10^{-4}	carbon tetrachloride, chloroform, 1,1-dichloroethene, tetrachloroethene, trichloroethene, and vinyl chloride
		HI > 1	carbon tetrachloride
Future Residential (Lifetime)	Indoor air	Risk > 1 x 10^{-4}	carbon tetrachloride, chloroform, 1,1-dichloroethane, 1,1-dichloroethene, tetrachloroethene, 1,1,1-trichloroethane, trichloroethene, vinyl chloride
(Child)	Indoor air	HI > 1	carbon tetrachloride, 1,1-dichoroethane, 1,1,1-trichloroethane
	Soil	HI > 1	thallium

4.2 Ecological Risk Characterization Results

Terrestrial--The EQs associated with exposure of great blue heron to site contaminants due to ingestion of fish are all less than 1, suggesting that there is low potential for adverse effects to the great blue heron due to site-related chemicals in fish caught near the site.

Aquatic--The EQs for water- and sediment-dwelling aquatic organisms at QADSY are all less than 1, indicating that there is low potential for adverse effects to these aquatic organisms.

5.0 Remediation Goals

SARA 1986 requires that remedial actions attain a degree of contaminant cleanup that ensures protection of public health and the environment. Thus, the risk characterization results are used to identify whether site COPCs need to be reduced to acceptable health-based levels. The acceptable health-based levels are referred to as RGOs, which are chemical-specific concentration goals for individual chemicals for specific medium and reasonable land use combinations.

Based on the results of the risk characterization, future worker exposure to indoor air and future residential exposure to indoor air and soil resulted in a cumulative risk exceeding 10^{-4} and/or an HI exceeding 1. However, to provide a complete site analysis, RGOs are developed for all chemicals contributing an individual risk of at least 10^{-6} to a total of greater than 10^{-4} or on HI of at least 0.1 to a total HI of greater than 1. Ecological risk characterization results indicated that several IOCs in soil produced an excess EQ in mice and raccoon; therefore, RGOs were developed for these IOCs in soil based on these two receptors. In summary, RGOs are developed for the following chemicals to provide risk managers with the maximum risk-related media level options on which to develop remediation aspects of the FS:

Medium	Scenario	COCs	RGO
Groundwater	Future Worker	Carbon tetrachloride	2.7 µg/l
		chloroform	11.1 µg/l
		1,1-dichloroethene	0.38 µg/l
		tetrachloroethene	59.6 µg/l
		trichloroethene	48.9 µg/l
		vinyl chloride	0.08 µg/l
	Future Resident	Carbon tetrachloride	1.8 µg/l
		chloroform	7.4 µg/l
		1,1-dichloroethane	540 µg/l
		1,1-dichloroethene	0.26 µg/l
		tetrachloroethene	38.9 µg/l
		1,1,1-trichloroethane	3790 µg/l
		trichloroethene	32.6 µg/l
		vinyl chloride	0.05 µg/l
Soil	Future Resident	Thallium	12.5 mg/kg

The QADSY is located in a highly industrial area at the Norfolk Naval Base in Norfolk, Virginia. The future plan is to increase the fleet ship parking by paving the current 5-acre gravel area. There are no future building plans, although the recommended remedial action objectives are for the future worker. The future resident scenario is highly unlikely because of the location of the QADSY. The RGOs for the future commercial worker will be used to determine the preferred alternative selection.

6.0 Evaluation of Alternatives

The five alternatives evaluated for the QADSY include:

Alternative 1: No-Action, Institutional Controls

This no remedial action alternative consists of no treatment, containment, or removal of the contaminated media; implementing monitoring to determine access and exposure to contaminated groundwater; and continued water-use restrictions. The alternative involves installing groundwater monitor wells, analyzing groundwater samples, and additional contaminant transport modeling.

Alternative 2: Groundwater Collection, Treatment, and Onsite Discharge

Alternative 2 involves installing groundwater monitor wells, constructing a water treatment system, and discharging treated water to the Elizabeth River. The treatment system includes air stripping to remove VOCs. Discharge to the Elizabeth River will be via existing storm sewer lines.

Alternative 3: Groundwater Collection, Pretreatment, and Offsite Treatment and Discharge

This alternative includes installing groundwater monitor wells, pretreatment by air stripping to remove VOCs, and discharge to the Naval Base Industrial Waste Treatment Plant (IWTP).

Alternative 4: Collection, Onsite Treatment, Onsite Discharge, and In-Situ Treatment

Alternative 4 requires installing groundwater monitor wells, installing a water treatment system (air stripping), installing biologic nutrient and catalyst control units, followed by infiltration gallery into the aquifer to stimulate in-situ microbial degradation. The infiltration galleries will be constructed by excavating a pit, backfilling with coarse gravel, inserting drain line, covering with filter fabric, and backfilling to grade.

Alternative 5: Air Sparging/Soil Vapor Extraction

This alternative includes installing AS wells in conjunction with SVE wells to remove VOCs from both groundwater and adjacent soils.

The alternatives were evaluated for acceptable risk to human health and the environment. Alternative 1 will provide protection to human health, but will not be protective of the

environment. The remaining alternatives will provide protection to human health and the environment.

In accordance with the provisions set forth in CERCLA/SARA and the NCP, the Navy evaluated AS/SVE for the QADSY against nine established criteria. Overall protection of human health and the environment and attainment of applicable or relevant and appropriate requirements (ARARs) are threshold criteria and the primary objectives of a remedial action. In addition, criteria such as reduction of toxicity, mobility, and volume (TMV) through treatment of COCs; short- and long-term effectiveness; implementability; and cost are addressed. Finally, support agency and community acceptance must also be considered.

The following section contains a brief description of the purpose of each criteria. Subsequent sections profile the performance of the preferred alternative against the nine criteria, noting how it compares to the other remedial alternatives under consideration.

6.1 Explanation of Evaluation Criteria

6.1.1 Threshold Criteria

Overall Protection of Human Health and the Environment--Addresses whether a remedy provides adequate protection and describes how risks posed through each exposure pathway are eliminated, reduced, or controlled through treatment, engineering controls, and/or institutional controls.

Compliance with ARARs--Addresses whether a remedy will meet the requirements of other state and federal environmental laws and/or provide grounds for invoking a waiver.

6.1.2 Primary Balancing Criteria

Long-Term Effectiveness and Permanence--Refers to expected residual risk and the ability of a remedy to maintain reliable protection of human health and the environment over time, after response objectives have been achieved.

Reduction of TMV through treatment--Reflects the preference for remedies that permanently and significantly reduce the TMV of a chemical through treatment technologies that may be used in a remedy.

Short-Term Effectiveness--Addresses the period of time necessary for a remedy to achieve response objectives and considers the remedy's potential to create adverse effects to human health and the environment during the construction and implementation period.

Implementability--Represents the technical and administrative feasibility of a remedy, including the availability of materials and services required to implement a particular option.

Cost--Includes estimated expenditures associated with the construction (capital) and operation and maintenance (O&M) costs, both of which can be expressed in terms of present-worth costs and can also include cost sensitivity analysis to reflect uncertainties in estimating certain costing parameters.

6.1.3 Modifying Criteria

Support Agency Acceptance--Indicates whether, based on a review of the RI/FS, USEPA and VDEQ concur with the Preferred Alternative.

Community Acceptance--Considers comments expressed by members of the community during the public comment period. The comments will be assessed in the ROD following a review of comments received on the RI/FS and the proposed plan.

6.2 Overall Protection of Human Health and the Environment

Alternatives 2, 3, 4, and 5 will provide adequate protection to human health and the environment following contaminated groundwater treatment. Once treatment is completed, the risk to human health will be the same as the risk associated with background levels that currently exist at the site. Contaminants will be completely destroyed, providing overall protection to the environment.

Alternative 1 will provide protection to human health by eliminating exposure to groundwater; however, the alternative will not be protective of the environment because contaminants will remain in place.

6.3 Compliance with ARARs

Alternatives 2, 3, 4, and 5 will all meet chemical-specific ARARs following completion of the treatment phase. Alternative 1, however, will not meet ARARs because no remediation of the contaminants will occur and VDEQ exceedances will still exist in the upper aquifer. Treated groundwater under Alternative 2 will be discharged into Willoughby Bay at levels below chemical-specific ARARs.

Table 1 lists the ARARs applicable to a particular action and the requirements associated with the ARARs. Table 2 lists the to be considered requirements. Action-specific ARARs will also be met by Alternatives 2, 3, 4, and 5. Alternatives 2, 3, and 4 are not expected to exceed action-specific ARARs for air emissions from the air stripping towers. Alternative 5 is not expected to

exceed action-specific ARARs for air emissions from the vapor extraction system. Alternative 2 will meet ARARs for surface water discharges, and Alternative 4 should meet ARARs for treated groundwater infiltration.

6.4 Long-Term Effectiveness and Permanence

The alternatives, except the no-action alternative, remove contaminants from the site and do not leave any untreated waste or residuals that require managing to ensure an adequate level of protection. Groundwater monitoring will be required to confirm that contaminants were removed.

The no-action alternative will effectively reduce the potential for exposure to contaminants but will not eliminate exposure over the long term. This alternative leaves the contaminants in place and requires management beyond the implementation phase.

6.5 Reduction of TMV Through Treatment

Alternative 4 will provide the greatest degree of contaminant destruction and therefore the greatest degree of mobility, toxicity, and volume reduction. Alternatives 2 and 3 will also provide a similar reduction. However, Alternative 4 provides a greater degree of volume and mobility reduction due to the additional in-situ treatment of the VOCs in the area influenced by the extraction wells.

Alternatives 2, 3, and 4 provide hydraulic control of the Aquifer.

Alternative 5, through the removal of contaminants, vapors and extraction of air will provide a quick reduction in contaminant volume and therefore provide control of mobility, toxicity, and volume of contaminated groundwater.

Alternative 1 does not consist of any containment, collection, or treatment actions and will not reduce the mobility, toxicity, or volume of contaminants in the groundwater.

6.6 Short-Term Effectiveness

Alternatives 2 through 5 are more effective in reducing aquifer contamination than the no remedial action alternative. In alternatives 2, 3, and 4, this is because contaminated groundwater is extracted from the surficial aquifer, treated, and discharged by three different means: surface water, IWTP, and infiltration gallery. Alternative 5 effectively treats the contamination from the groundwater prior to discharge to the atmosphere. However, the no-action alternative may be equally effective in reducing exposure to contaminants if current water and land use restrictions are maintained.

Alternatives 2, 3, and 4 will have onsite emissions from air stripping and/or onsite discharge of treated water. Alternative 5 will have onsite emissions from vapor extractions. Alternative 1 will not affect the current exposure to workers and the community because no contaminated groundwater extraction will occur.

Alternative 4 will achieve remedial objectives quicker than Alternatives 2 and 3. The relative remedial rates cannot be determined until the completion of a Bioremediation/biological degradation/biological feasible study is conducted.

Alternative 5 does not include extraction of groundwater and has the least likelihood of uncontrolled contaminant release.

Alternative 1 will not meet the remedial response objectives over time.

6.7 Implementation

All of the remediation alternatives (1 through 5) for groundwater are technically feasible. Each alternative can be constructed and operated on existing reliable technologies that are both effective and proven. Alternatives 2, 3, and 4 involve standard groundwater extraction and wastewater treatment processes with monitored discharge or disposal. The exception is Alternative 4, which adds infiltration galleries with microbial degradation. However, until a biological treatability study is performed, the actual degradation rate and system parameters are unknown. Further, the permit/regulatory process to install and operate an infiltration gallery is not well defined.

The no-action alternative for groundwater is easiest to implement because water and land use restrictions are already in place, and long-term groundwater monitoring and surface water runoff monitoring are easy to put in operation.

Implementation of the remediation alternatives from an administrative standpoint is not anticipated to be a major concern because the QADSY is on Navy property. It is also surrounded by Navy property, so rights-of-way and easements should not be a problem. Permits from the Virginia regulatory agencies would be required for any air emissions from stripping towers.

6.8 Costs

Present worth cost for Alternative 5 is provided in Table 3. Alternative 5 has the lowest capital cost, except for Alternative 1, and the highest present worth.

The present worth costs were recalculated by considering the replacement of the capital expenditure items at half the performance period for those alternatives that have performance

periods greater than one year. Alternative 5 demonstrates the greatest sensitivity to the replacement cost because the capital expenditures are a greater portion of the alternative's present worth cost. There are no additional costs associated with implementing No Further Action.

6.9 USEPA and State Acceptance

USEPA and VDEQ concur with the implementation of AS/SVE of groundwater at the QADSY.

6.10 Community Acceptance

Community acceptance will be addressed in the ROD which will be prepared after receipt of public comments on this Proposed Plan and the RI/FS reports.

Table 1. Applicable or Relevant and Appropriate Requirements (ARARs)
Q-AREA Drum Storage Yard

Citation	Requirement	ARAR Determination	Comments
Federal/Contaminant-Specific			
Safe Drinking Water Act (42 USC 300(f) a. Maximum Contaminant Levels (MCLs) 40 CFR 141.11-141.16 b. Maximum Contaminant Level Goals (MCLGs) 40 CFR 141-50-141.51	Standards for protection of drinking water sources serving at least 25 persons. MCLs consider health factors, as well as economic and technical feasibility of removing a contaminant; MCLGs do not consider the technical feasibility of contaminant removal. For a given contaminant, the more stringent of MCLs or MCLGs is applicable unless the MCLG is zero, in which case the MCL applies.	Not applicable or relevant and appropriate because the water table aquifer is not used for potable consumption.	MCLs are not ARARs due to the following: 1) City of Norfolk prohibits the use of the water table aquifer; 2) The Columbia and Yorktown aquifers comprise the water table aquifer because no confining layer exists at the site; and 3) Yorktown becomes brackish with depth adjacent to surface water bodies (e.g., Elizabeth River and Willoughby bay) and is not suitable for consumption.
Federal/Location-Specific			
The Endangered Species Act of 1973 (16 USC 1531) (40 CFR Part 502)	Requires Action to conserve endangered and threatened species and their critical habitats.	Not applicable or relevant and appropriate.	Peregrine falcons have been seen on base; however, they been seen over one mile from the QADSY. There are no wetlands within 0.25 mile from the site.
Coastal Zone Management Act (16 USC 3501)	Conduct activities in a manner consistent with approved State management programs.	Not applicable or relevant and appropriate.	QADSY is not within a coastal zone designated by the Commonwealth of Virginia
National Historic Preservation Act (32 CFR Parts 229 and 229.4; 43 CFR Parts 107 and 171.1-5)	Develops procedures for the protection of archaeological resources.	Not applicable or relevant and appropriate.	QADSY is not on property included in or eligible for the National Register of Historic Places. Additionally, Sewalls point was created by a fill operation from dredge materials from Willoughby Bay.
Executive Order 11988 (Related to Floodplain Management)	Regulates activities located in a floodplain must comply with this Executive Order. Federal activities in floodplains must reduce the risk of flood loss, minimize the impact of floods on human safety, health and welfare, and preserve the natural environment served by floodplains.	Not applicable or relevant and appropriate.	QADSY is not within a floodplain
Federal/Action-Specific			
DOT Rules for Hazardous Materials Transport (40 CFR Parts 107 and 171.1-500)	Regulates the transport of hazardous waste materials including packaging, shipping and placarding.	Not applicable or relevant and appropriate	Remedial actions does not include offsite soil disposal.

Table 1 (Continued)

Citation	Requirement	ARAR Determination	Comments
Resource Conservation and Recovery Act (RCRA) Subtitle C	Regulates the treatment, storage, and disposal of hazardous waste.	Applicable to remedial actions involving treatment, storage, or disposal of hazardous wastes.	Remediation may involve disposal of hazardous wastes
Identification and Listing of Hazardous Waste (40 CFR Part 261)	Regulations concerning determination of whether or not a waste is hazardous based on characteristics or listing.	Applicable in determining waste classification.	Some site contaminants are considered listed wastes.
Treatment, Storage, and Disposal (TSD) of Hazardous Waste (40 CFR Parts 262-265, 266)	Regulates the treatment, storage, and disposal of hazardous waste.	Applicable in the event that wastes on site are classified as hazardous.	Groundwater treatment activities related to hazardous waste will comply with regulations.
Manifest Systems, Recordkeeping, and Reporting (40 CFR Part 264, Subpart E)	Regulates manifest systems related to hazardous waste treatment, storage, and disposal.	Applicable to remedial actions where hazardous waste is generated or transported.	Remedial actions may include off-site disposal or treatment.
Releases from Solid Waste Management Units (40 CFR Part 264, Subpart F)	Regulates releases from solid waste management units.	Not applicable or relevant and appropriate.	Does not meet the definition of A SWMU.
Use and Management of Containers (40 CFR Part 264, Subpart I)	Regulates use and management of containers being stored at all hazardous waste facilities.	Not applicable or relevant and appropriate.	No containerized wastes are onsite. Remedial actions will not generate containerized wastes.
Resource Conservation and Recovery Act (RCRA) Subtitle D	Regulates the treatment, storage, and disposal of solid waste.	Not applicable or relevant and appropriate.	Remediation actions do not include treatment, storage, or disposal of solid waste.
National Emissions Standards for Hazardous Air Pollutants (NESHAPs) (40 CFR Part 61)	Standards promulgated under the Clean Air Act for significant sources of hazardous pollutants, such as vinyl chloride, benzene, trichloroethylene, dichlorobenzene, asbestos, and other hazardous substances. Considered for any source that has the potential to emit 10 tons of any hazardous air pollutant or 25 tons of a combination of hazardous air pollutants per year.	Applicable to potential releases of hazardous pollutants. Remedial actions (e.g. air stripping) may result in releasing hazardous air pollutants. Treatment design will include air emissions control equipment as required to comply with NESHAPs.	Air emissions from the treatment facility will not exceed air emission standards during the remedial design.

Table 1 (Continued)

Citation	Requirement	ARAR Determination	Comments
State/Contaminant-Specific			
Virginia Waster Quality Standards (VR 680-21-00)	Surface water quality standards based on water use and criteria class of surface water.	Applicable to remedial actions requiring discharge to surface water.	Effluent water from the treatment facility will be below VDEQ surface water standards.
Virginia Groundwater Standard (VR 680-21-04.3)	Established groundwater standards for State Antidegradation policy.	Not applicable or relevant and appropriate.	Groundwater concentrations are below the VDEQ groundwater standards.
Virginia Ambient Air Quality Standards (VAQS) (VR 120-03-01)	Primary and secondary air quality standards for particulate matter, sulfur oxides, carbon monoxide, nitrogen dioxide, and lead.	Applicable for remedial actions requiring discharge to the atmosphere.	Monitoring of air emissions from the treatment technology will comply with VAQS requirements
Virginia Emission Standards for Toxic Pollutants (VR 120-01)	Established acceptable limits for toxic pollutants by applying a 1/40 correction factor to the occupational standard Threshold Limit Value-Ceiling (TLV-Ceiling).	Applicable for remedial actions requiring discharge to the atmosphere.	Remedial design will determine air emissions from the treatment technology will not exceed emission standards.
Virginia Pollution Discharge Elimination System (VPDES (VR 680-14-01) Regulation and Virginia Water Protection Permit Regulations (VR 680-15-01)	Regulated point-source discharges through the VPDES permitting program. Permit requirements include compliance with corresponding water quality standards, establishment of a discharge monitoring system,a nd completion of regular discharge monitoring records.	Applicable to remedial actions requiring treated water discharge to surface water.	VPDES permit requirements will determine discharge limits of treated water to surface water.
State/Action-Specific			
Virginia Solid Waste Management Regulations (VR 672-20-10)	Regulates the disposal of solid wastes.	Not applicable or relevant and appropriate.	No solid wastes to be removed from the QADSY.
Virginia Hazardous Waste Regulations (VR 72-30-1 and VR 672-10-1, Part VII)	Regulates the transport of hazardous waste materials including packaging, shipping, and placarding.	Applicable to remedial action requiring off-site transportation of hazardous materials.	Remedial action may include off-site disposal treatment.
Virginia Hazardous Waste Management Regulations (VR 672-10-1)	Regulates the treatment, storage, and disposal of hazardous waste.	Applicable to remediation systems involving treatment, storage, or disposal of hazardous wastes.	Remedial action may include treatment, storage, or disposal of hazardous wastes.
Identification and Listing of Hazardous Waste (VR 672-10-1, Part III)	Regulations concerning determination of whether or not a waste is hazardous based on characteristics or listing.	Applicable to determining waste classification.	Some of the contaminants are considered listed wastes.
Manifest Systems, Recordkeeping, and Reporting (VR 672-10-1, Part X, Section 10.4)	Regulates manifest systems related to hazardous waste treatment, storage, and disposal.	Applicable to hazardous wastes is generated or transported during remediation.	Off-site disposal may be included during remedial actions.

Table 1 (Continued)

Citation	Requirement	ARAR Determination	Comments
Releases from Solid Waste Management Units (VR 672-10, Part X, Section 10.5)	Regulates releases from solid waste management units.	Not applicable or relevant and appropriate.	Does not meet the definition of A SWMU..
Use and Management of Containers (VR 672-10, Part X, Section 10.8)	Regulates use and management of containers being stored at all hazardous waste facilities.	Applicable to containers stored onsite.	Containerized wastes may be generated during remediation.
Virginia Stormwater Management Regulations (VR 215-02-00) and Virginia Erosion and Sediment Control Regulations (VR 625-02-00)	Regulates stormwater management and erosion/ sedimentation control practices that must be followed during land disturbing activities.	Applicable for remedial actions involving land disturbing activities.	Construction activities will comply to the Virginia Storm Water Management Plan.
Virginia Endangered Species Act (Code of Virginia 29.1-563)	Requires action to conserve endangered and threatened species and their critical habitats.	Not applicable or relevant and appropriate.	Peregrine falcons have been seen on base; however, they been seen over one mile from the QADSY. There are no wetlands within 0.25 mile from the site.
Virginia Wetlands Regulations (VR 450-01-0051)	Regulates activities that impact tidal wetlands.	Not applicable or relevant and appropriate.	There are no wetlands within 0.25 mile from the site.
Chesapeake Bay Preservation Area Designation and Management Regulations (VR 173-02-01)	Sets limitations in certain tidal and wetland areas for land-disturbing activities, removal of vegetation, use of impervious cover, E&S control, stormwater management, etc.	Not applicable or relevant and appropriate.	There are no wetlands within 0.25 mile from the site.
Coastal Management Plan - City of Norfolk	Activities within a Coastal Management Zone must be in compliance with local requirements.	Not applicable or relevant and appropriate.	QADSY is not located within a Coastal Management Zone.

Table 2. To Be Considered (TBC) Requirements

Citation	Requirement	ARAR Determination	Comments
Federal/Contaminant-Specific			
Reference Doses (RfDs), EPA Office of Research and Development	Presents non-enforceable toxicity data for specific chemicals for use in public health assessments to characterize risks due to exposure to contaminants.	TBC requirement for the public health assessment.	The quantitative risk assessment (RA) evaluated human health risks.
Carcinogenic Potency Factors, EPA Environmental Criteria and Assessment Office; EPA Carcinogen Assessment Group	Presents non-enforceable toxicity data for specific chemicals for use in public health assessments to compute the individual incremental cancer risk resulting from exposure to carcinogens.	TBC requirement for the public health assessment.	The quantitative risk assessment (RA) evaluated human health risks.
Health Advisories, EPA Office of Drinking Water	Non-enforceable guidelines for chemicals that may intermittently be encountered in public water supply systems. Available for short- or long-term exposure for a child and/or adult.	TBC requirement for the public health assessment.	The quantitative risk assessment (RA) evaluated human health risks.
Federal/Location-Specific			
RCRA Subtitle C Landfills (40 CFR Part 264, Subpart N)	Regulates owners and operators of facilities that dispose hazardous wastes in landfills.	TBC to evaluate compliance of off-site landfills.	TBC for remedial actions will not involve disposal at off-site landfills.
Groundwater Protection Strategy	EPA policy to protect groundwater for its highest present or potential beneficial use. The strategy designates three categories of groundwater: Class 1 - Special Ground Waters Class 2 - Current and Potential Sources of Drinking Water and Waters Having Other Beneficial Uses Class 3 - Groundwater Not a Potential Source of Drinking Water and of Limited Beneficial Use	TBC requirement	Groundwater in the water table aquifer consists of the Columbia and Yorktown aquifers at the QADSY and is considered as Class 3.
Federal/Action-Specific			
National Ambient Air Quality Standards (NAAQS) (40 CFR 50)	Standards for the following six criteria pollutants: particulate matter; sulfur dioxide; carbon monoxide; ozone; nitrogen dioxide; and lead. The attainment and maintenance of these standards are required to protect the public health and welfare.	TBC requirements for remedial actions that discharge into to the atmosphere. The treatment system will include equipment to control air emissions to comply with NAAQS.	Remedial actions will include monitoring air emissions from the treatment system with NAAQS requirements.

Table 2 (Continued)

Citation	Requirement	ARAR Determination	Comments
Control if Air Emissions from Superfund Air Strippers at Superfund Ground Water Sites (OSWER Directive 9355.0-28)	Guidance that establishes criteria as to whether air emission controls are necessary for air strippers. A maximum 3 lbs/hr or 15 lbs/day or 10 tons/yr of VOC emissions is allowable; air pollution controls are recommended for any emissions in excess of these quantities.	TBC requirement	TBC if the remedial action includes air stripping.
State/Contaminant-Specific			
RCRA Subtitle C Landfills (VR 672-10, Part X, Section 10.13)	Regulates owners and operators of facilities that dispose hazardous wastes in landfills.	TBC to evaluate compliance of off-site landfills.	TBC for remedial actions will not involve disposal at off-site landfills.

Table 3. Cost Estimate for Air Sparging Vapor Extraction

Element/Item		Unit	Unit Cost	Total Cost
CAPITAL:				
Mobilization		LS	$30,000	$30,000
Monitoring, Sampling, testng , Analysis		LS	$31,000	$31,000
Site Work		LS	$12,000	$12,000
Surface Water Collection		LS	$6,000	$6,000
Ground water Collection and Control		LS	$139,000	$139,000
Gas Vapor Collection and Control		LS	$36,000	$36,000
Onsite Treatment		LS	$160,000	$160,000
Disopsal (on site)		LS	$400,000	$400,000
Dispoasl (commericial)		LS	$38,000	$38,000
Site Restoration		LS	$17,500	$17,500
Profit and Overhead		LS	$400,000	$400,000
			SUB TOTAL	$1,269,500
O&M				
Annual				
Labor	4160	HR	$50	$208,000
Electricity	12	MNTH	$15,000	$180,000
Materials	12	MNTH	$500	$6,000
Monitoring (weekly)				
Sampling - Analytical	20	EA	$600	$12,000
Sampling - Labor	20	HR	$50	$1,000
Report	96	HR	$50	$4,800
			SUB TOTAL	$411,800
Periodic Costs (every 5 years)				
Site Review and Public Health Assmnt.	120	HR	$75	$9,000
			SUB TOTAL	$9,000
PRESENT WORTH (5% over 15 years)				
Present Worth Capital				$1,269,500
Present Worth Annual O&M				$4,274,343
Present Worth Periodic O&M				$22,346
Contingencies (15%)				$834,928
TOTAL PRESENT WORTH				$6,401,118

7.0 Summary of the Preferred Alternative

Based on the careful consideration of the technical, environmental, institutional, public health, and cost criteria as presented in Section 6.0, and in keeping with the overall response strategy, the recommended remedial action alternative for the QADSY is AS/SVE.

CERCLA, as amended by SARA, suggests that a remedial action should be selected "that is protective of human health and the environment, that is cost effective, and that utilizes permanent solutions and alternative treatment technologies or resource recovery technologies to the maximum extent practicable."

The results of the RA indicated that, for the future commercial use scenario, groundwater at the QADSY poses an elevated carcinogenic (risk is 9E-04) and non-carcinogenic risks (HI of 4). The QADSY is located in a highly industrial area at the Norfolk Naval Base in Norfolk, Virginia. The present future plan at the QADSY is to increase the fleet ship parking by paving the current five acre gravel area. There are no future building plans although the recommended remedial action objectives are for the future worker. The future resident scenario is highly unlikely because of the location of the QADSY (refer to Section 4.0 of this document for a description of this RA). This RA showed that under a worker exposure scenario, potential risks to human health are within the acceptable range. The QADSY will use the future commercial scenario for its preferred alternative selection.

All of the remediation alternatives for groundwater are technically feasible. The actual degradation rate and system parameters are unknown until a biologic treatability study is performed for Alternative 4. The operational permit process for the infiltration gallery is not well defined.

Due the number of AS/SVE wells require, Alternative 5 would not be an economically viable option. A desirable alternative discussed with the Navy would position the AS and SVE wells on the downgradient edge of the plume paralleling the waterfront. This arrangement would provide a remediation zone prior to groundwater migration to the Elizabeth River.

A small scale pilot test will be conducted to develop design parameters for a full scale AS/SVE system.

Given the installation-specific conditions discussed above combined with the undefined permit requirement from numerous regulations for Alternative 4, Alternative 5 AS/SVE will be more quickly accomplished and more protective of human health and the environment. Therefore, AS/SVE is the recommended remedial alternative for the QADSY.

8.0 Community Participation

The Navy relies on public input so that the alternative selected for each NPL site meets the needs and concerns of the community. To ensure that the community's concerns are being thoroughly addressed, the Proposed Plan will have a public comment period. During this time, the public is encouraged to submit comments on the Proposed Plan to the Navy. The Navy, in consultation with USEPA and VDEQ, may modify the Preferred Alternative; select another response action; or develop another alternative, if warranted by public comments and/or presentation of substantial new information.

The public is encouraged to review and comment on all the alternatives in the FS Report. All public comments will be included with appropriate responses in the responsiveness summary which will be included in the public record. Although the Navy has recommended a Preferred Alternative, no final decision will be rendered until all public comments have been thoroughly reviewed and evaluated. The final alternative selected will be documented in a ROD, which contains a detailed description of the final remedial action, outlines the Navy's decision-making process and thoroughly responds to community input solicited during the formal comment period to be held from 15 July 1996 to 15 August 1996.

8.1 Information Repositories

Additional information concerning each aspect of the Navy's environmental program is available at the established Information Repository located at the following:

Larchmont Public Library
6525 Hampton Blvd.
Norfolk, VA
(757) 441-5335

Mary Pretlow Public Library
9640 Gramby Street
Norfolk, VA
(757) 441-1750

Naval Station Library
Building C-9, Bacon Avenue
Norfolk, VA
(757) 445-2740

Information is also available for review at USEPA and VDEQ offices.

8.2 Public Comment Invited

A public meeting will be held if the Navy receives substantial public comment.

The Navy encourages citizens to review site related documents and submit written comments to:

Commander, Naval Base, Norfolk
Public Affairs Office
1520 Gilbert Street, Suite 2200
Norfolk, VA 23511-2797
ATTN: Ms. Ruth Reich

If you have any questions about the QADSY or this PRAP, please contact one of the following individuals:

Atlantic Division, Naval Facilities Engineering Command
Remedial Project Manager
Mr. David Forsythe
1510 Gilbert Street
Norfolk, VA 23511-2699
(757) 322-4782

Remedial Project Manager
USEPA, Region III
Mr. Harry Harbold
841 Chestnut Building
Philadelphia, PA 19107
(215) 566-3203

Virginia Department of Environmental Quality
Mr. Steve Mihalko
629 East Main Street, 4th Floor
Richmond, VA 23240-0009
(804) 698-4202

Commander, Naval Base, Norfolk
Public Affairs Office
1530 Gilbert Street, Suite 2200
Norfolk, VA 23511-2797
ATTN: Ms. Ruth Reich

9.0 References

Malcolm Pirnie. 1988. Installation Restoration Program, Remedial Investigations, Interim Report, Naval Base, Norfolk, Virginia.

Neesa. 1983. Initial Assessment Study, Q-Area Drum Storage Yard, Norfolk Naval Base, Norfolk, Virginia.

US Environmental Protection Agency (EPA). 1991. Role of the Baseline Risk Assessment in Superfund Remedy Selection Decisions. Office of Solid Waste and Emergency Response, Washington, DC. OSWER Directive 9355.0-30. April 22, 1991.

Appendix A

Glossary of Terms

Administrative Record File: A file that contains the information used to make a decision on the selection of a response action under CERCLA. The file is established at or near a National Priority List site and is available for public review.

Applicable or Relevant and Appropriate Requirements (ARARs): Any state or federal law or regulation that pertains to the protection of human health and the environment in addressing certain site conditions or using a particular cleanup technology at an NPL site. The Navy must consider whether a remedial alternative meets ARARs as part of the process for selecting a cleanup alternative for an NPL site.

Aquifer: A layer of soil or rock that can supply usable quantities of groundwater. Aquifers can be used as a source of water for drinking, irrigation, and industrial purposes.

Carcinogenic: Term used to describe chemicals or substances that are known or suspected to cause cancer in humans based on observed health effects in humans or existing data from animal laboratory tests.

Chemicals of Concern (COCs): Site-related chemicals that pose critical health concerns to environmental receptors because of their toxicity and potential for exposure. Although many chemicals at a site may pose a risk to human health and the environment, COCs represent those constituents that contribute the majority of risk.

Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA): A federal law enacted in 1980 and subsequently modified by the Superfund Amendments and Reauthorization Act of 1986 (SARA). This act resulted in the creation of a trust fund, commonly known as "Superfund," which provides money to investigate and clean up abandoned or uncontrolled hazardous waste sites. In the case of federal facilities such as Norfolk Naval Base, the Navy is responsible for financing investigation and cleanup activities.

Ecotoxicity Quotient (EQ): A value used to evaluate the potential for adverse effects on environmental receptors. The EQ relates concentrations of chemicals of concern in the environment to establish benchmark concentrations.

Exposure Pathways: The routes by which chemicals reach **receptors**. These routes may include (for example) the route of transport from the soil to the surface water to recreational use by people, and thus exposure to the chemical.

Feasibility Study (FS): A study that supports the selection of a remedial action at an NPL site. The FS identifies, develops, and evaluates several alternatives for addressing contamination.

Geologic Unit: A rock/soil mass classified as a group based on shared characteristics of the rocks and soils.

Groundwater: Water that is present in the open spaces between soil particles (silt, sand, gravel) and/or rock fractures below the ground surface.

Hazard Index (HI): An indicator of the potential for a hazardous substance to cause noncancerous health effects in humans. The HI is calculated by dividing worst-case human exposure estimates to a particular substance by exposure levels that USEPA has determined to be acceptable. Any result of this calculation that is greater than 1.0 is considered to represent an unacceptable risk.

Hydrogeology: The study of groundwater and aquifers.

Hydrogeologic Unit: A geologic unit that contains groundwater.

Information Repository: A location where documents and data related to an NPL site investigation and response actions are maintained to allow the public access to this material.

Milligrams per Kilogram (mg/kg): A unit of measure used to show concentrations of chemicals in dry materials such as soil, sediment, or sludge. This unit (mg/kg) is equal to parts per million. As a conceptual example, 1 mg/kg is equivalent to one dollar in a stack of one million dollars.

National Oil and Hazardous Substances Pollution Contingency Plan (NCP): A federal regulation that outlines the procedures that must be followed under the Superfund Program. The NCP was most recently revised in 1990.

National Priorities List (NPL): USEPA's list sites that warrant further investigation to assess the nature and extent of public health and environmental risks associated with the site and to determine what remedial action, if any, may be appropriate.

Non-carcinogenic: The term used to describe chemicals or substances that are not known or suspected to cause cancer in humans. This term generally refers to chemicals that may not cause cancer, but may produce other unwanted health effects.

Preferred Alternative: The remedial alternative initially proposed for implementation as a result of the screening process conducted during the FS.

Receptor: A human, animal, or plant that could potentially receive exposure to chemicals resulting from the chemicals migration from hazardous waste sites.

Record of Decision (ROD): A legal document that describes in detail the remedy selected for an entire NPL site or a particular operable unit. The ROD summarizes the results of the RI/FS and includes a formal response to comments supplied by the public.

Remediation Goals: Remedial action objectives and remediation goals are the target cleanup levels for chemicals at contaminated site.

Remedial Investigation (RI): A study that supports the selection of a remedial action at a Superfund site. The RI identifies the nature, magnitude and extent of contamination associated with a Superfund site.

Responsiveness Summary: Comments presented during the public meeting and received during the public comment period that are considered and addressed by the Navy.

Risk Assessment Guidance for Superfund (RAGS): A document produced by the USEPA as a guide for conducting risk assessments under Superfund.

Sediment: Soil and other material that settles to the bottom of a stream, creek, or lake.

Source Areas: The areas where waste was once handled (treated, stored, disposed of, etc.) which later acts as a source for contaminants.

Superfund Amendments and Reauthorization Act of 1986 (SARA): This act modified CERCLA and resulted in the creation of a trust fund commonly known as "Superfund" which provides money to investigate and cleanup abandoned or uncontrolled hazardous waste sites.

Surface Water: Water on the earth's surface such as streams, ponds, and lakes.

Toxicity, Mobility, and Volume (TMV): Three indicators of chemical presence and movement in the environment. These indicators are used to assess the current and future concentrations of chemicals in the environment and determine how harmful these chemicals may be to human health and the environment.

Volatile Organic Compounds (VOCs): Organic liquids that readily evaporate under atmospheric conditions and exhibit varying degrees of solubility in water. Examples of VOCs detected at the QADSY include trichloroethene (TCE) and tetrachloroethene (PCE).