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UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
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Date: 23 August 2001 **Pages:** 1 of 27

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Re: Copy of Frank Fritz's comments on ROD for Sites 9 and 10 - NAB Little Creek

Comments:

If you have any questions or need any other information please feel free to call.

8/2 ' CRITIC COMMENTS

Insert 1-3A

The selected remedy for Sites 9 and 10 protects human health and the environment, complies with Federal and State requirements that are legally applicable or relevant and appropriate to the remedial action, is cost-effective and utilizes permanent solutions and alternative treatment (or resource recovery) technologies to the maximum extent practicable.

Insert 2-8A

("Upgradient" wells are located in areas of higher ground water elevation; "downgradient" wells are in areas of lower ground water elevation. Ground water tends to flow from upgradient locations to downgradient locations.)

Record of Decision

Site 9: Driving Range Landfill

Site 10: Sewage Treatment Plant Landfill

1.0 Declaration

1.1 Site Name and Location

Site 9 Driving Range Landfill

Site 10 Sewage Treatment Plant Landfill

Naval Amphibious Base (NAB), Little Creek

Virginia Beach, VA

USEPA ID: VA5170022482

1.2 Statement of Basis and Purpose

This decision document presents the Selected Remedy for Site 9 Driving Range Landfill and Site 10 Sewage Treatment Plant Landfill at the Naval Amphibious Base (NAB), Little Creek, Virginia Beach, VA. This determination has been made in accordance with the Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA), as amended by Superfund Amendments and Reauthorization Act of 1986 (SARA), and to the extent practicable, the National Oil and Hazardous Substances Pollution Contingency Plan (NCP). This decision is based on the Administrative Record file for this site.

The Commonwealth of Virginia concurs with the Selected Remedy.

1.3 Assessment of the Site

The response action selected in this Record of Decision (ROD) is necessary to protect the public health or welfare or the environment from actual or threatened releases of hazardous substances from the site(s) which may present an imminent and substantial endangerment to public health or welfare.

Remedial Investigation/Feasibility Study

1.4 Description of the Selected Remedy

The Navy has identified nine sites at NAB Little Creek that require RI/FS activities and that may require some type of remedial action to address risks. An additional 31 sites have been identified that will require a preliminary investigation or screening to evaluate possible contamination. It is anticipated that only a small number of these may ultimately require an

RI/FS and remedial action while the remainder will not require any further action. Another 90 sites have already undergone a desktop audit and will require no further action.

The nine RI/FS sites, which include Sites 9 and 10, are considered to be the highest priority sites. Sites 9 and 10 are the first two of these sites to complete the RI/FS process and to have a ~~preferred~~ remedy selected after NAB Little Creek was placed on the NPL. These two sites are two of three on-site landfills that the base has used to dispose of solid wastes throughout its history. They are being addressed first because landfill sites are typically considered to be the highest priority for remediation. The third landfill, Site 7, is to be the next site addressed.

Interim removal actions have been conducted at four sites to excavate contaminated soil that poses a current risk or represents a source of groundwater contamination. No removal actions have been found to be warranted at Sites 9 and 10.

The Selected Remedy for both Site 9 Driving Range Landfill and Site 10 Sewage Treatment Plant Landfill is institutional controls with long -term monitoring. The Selected Remedy will address all of the potential threats posed by Site 9 and Site 10 and will eliminate exposure pathways that may pose unacceptable human health or ecological risks from contamination at the sites. Based on the evaluation of site conditions, site-related risks, and legal requirements that may be applicable or relevant and appropriate requirements (ARARs), Remedial Action Objectives (RAOs) are achieved through institutional controls and long-term monitoring.

The greatest risks posed by sites 9 & 10 are related to the wastes that have been buried at the sites during their operation as base landfills. No potential residual contamination was identified in the surface soil that could pose threats to the health and safety of animals or people such as site workers and recreational visitors as the landfill cover is insufficient and was constructed with clean fill. Erosion of, or excavation into, the existing soil cover could pose a threat through direct contact with landfill contents. The waste and any contaminated soil may also pose a potential threat to the shallow groundwater quality beneath ~~and downgradient of~~ the landfill. The risks posed by these potential threats have been quantified in the BHHRA and Baseline Ecological Risk Assessment (BERA).

Creating institutional controls and performing long term monitoring provides the best alternative for eliminating current and future exposure pathways. Consequently, planned response actions include:

- Prohibiting activities that would involve digging ~~into the existing cover or~~ contents of the landfill
- Prohibiting ~~residential~~ use of the site
- Prohibiting ~~extraction~~ of the groundwater for ~~drinking water within the boundaries of the site~~
- Performing annual inspections of the soil cover
- Long-term monitoring in accordance with an approved long term monitoring plan

Institutional controls will effectively manage site risks by preventing direct ~~content~~ with landfill contents and groundwater below the current surface cover soil and by managing

and controlling surface water runoff and erosion of the surface soil cover at both sites. To maintain the soil cover, surface controls include earth grading to control stormwater runoff and erosion control measures to maintain vegetation. Annual inspections will be conducted as part of the long-term monitoring. Water is supplied to NAB Little Creek and surrounding area by the City of Virginia Beach, and groundwater is not used as a potable supply at NAB Little Creek. Institutional controls and prohibition of groundwater use, except for monitoring and testing within the boundary of the sites, will prevent exposure to the groundwater. Long-term monitoring will be conducted in accordance with an approved long-term monitoring plan and will ensure the identification and tracking of changes in groundwater quality and site risks by monitoring concentrations of ~~constituents~~ chemicals of concern in groundwater.

use plain English "people" "people, plants or animals"

The institutional control action for Sites 9 and 10 includes land-use restrictions to prevent redevelopment of the land within the boundary of the sites for uses that would pose unacceptable risks to receptors. This would include elimination of direct exposure to the waste and maintenance of the soil cover. The procedures used to assure the effectiveness of the land-use controls on a base-wide level will be documented in a Land Use Control Assurance Plan (LUCAP) that requires agreement with the Navy, the United States Environmental Protection Agency (USEPA), and Virginia Department of Environmental Quality (VDEQ). The specific measures implemented at Sites 9 and 10 are spelled out in a Land Use Control Implementation Plan (LUCIP).

~~The major components of the Selected Remedy are institutional controls and long-term groundwater monitoring.~~ repet.

1.4.1 Institutional Controls

Institutional controls at Sites 9 and 10 include land-use restrictions to prevent redevelopment of the land within the boundary of the sites for use in a manner that would pose an unacceptable risk to receptors. The following activities would be prohibited on the site: repet.

- Activities that would involve digging into the existing cover or contents of the landfill
- Using the site s for residential development
- Using the shallow aquifer groundwater beneath the sites for any purpose other than environmental monitoring and testing

Institutional controls also involve annual inspections of the existing cover to ensure the integrity and prompt repair of the soil cover.

1.4.2 Long-Term Monitoring

Long-term groundwater monitoring at Sites 9 and 10 will be conducted in accordance with an approved long-term monitoring plan.

1.5 Statutory Determinations

insert 1-3A

The Selected Remedy represents the maximum extent to which permanent solutions and treatment are practicable at these sites. The Selected Remedy provides the best balance of

trade-offs as compared to the other alternatives. In particular, the selected remedy (institutional controls with monitoring) provides a level of long-term protection equivalent to the low permeability cap, but at greatly reduced cost. The Selected Remedy is therefore the most cost-effective.

None of the alternatives examined includes treatment as principal element, for several reasons. First, there is no principal threat waste at these sites that requires treatment. Second, treatment of the landfill contents is not practicable in a cost effective manner because of the large volume of waste (the landfills cover 24 acres). Third, treatment of the ground water contamination is not practicable in a cost-effective manner. Groundwater contamination, where present, occurs beneath the landfill in isolated wells and at low concentrations, below the relevant and appropriate Safe Drinking Water Act Maximum Contaminant Levels. No definable plume of contamination has been identified and no ground water contamination has been identified outside the perimeter of the landfill. For such low concentration ~~waste~~ contamination that poses a low level, long-term threat, the EPA does not generally expect to use treatment as a remedy. ~~Because this will result in hazardous substances, pollutants, or contaminants remaining on site, above levels that allow for unlimited use and unrestricted exposure, a statutory review will be conducted within 5 years after initiation of remedial action to ensure that the remedy protects or will protect human health and the environment.~~

Because ~~this~~ the Selected Remedy will result in hazardous substances, pollutants, or contaminants remaining on site above levels that allow for unlimited use and unrestricted exposure, a statutory review will be conducted within 5 years after initiation of remedial action to ensure that the remedy protects or will protect human health and the environment.

1.6 ROD Data Certification Checklist

The following information is included in the Decision Summary section of this ROD. Additional information can be found in the Administrative Record file for NAB Little Creek Site 9 and Site 10.

- Chemicals of concern (COCs) and their respective concentrations
- Baseline risk represented by the COCs
- Current and reasonably anticipated future land-use assumptions and current and potential future beneficial uses of groundwater used in the baseline risk assessment and ROD
- Potential land and groundwater use that will be available at the site as a result of the Selected Remedy
- Estimated capital, annual operation and maintenance (O&M), and total present worth costs; discount rate; and the number of years over which the remedy cost estimates are projected
- Key factors that led to selecting the remedy (i.e., a description of how the Selected Remedy provides the best balance of tradeoffs with respect to the balancing and modifying criteria, highlighting criteria key to the decision)

- Sites 9 and 10 do not contain "principal threat waste," that is, highly toxic or highly mobile waste which cannot be reliably contained or would pose a significant threat to human health or the environment if containment failed. Accordingly, this Record of Decision does not discuss a remedy for principal threat waste.

_____ _____

Steven W. Johnson, CAPT, CEC, USN
Regional Engineer
By direction of the Commander
Navy Region Mid-Atlantic

Date

_____ _____

Abraham Ferdas, Director
Hazardous Site Cleanup Division
U.S. USEPA - Region III

Date

media, contaminant migration pathways and the risks from site related contamination to humans, plants, and animals. The IAS recommended a confirmation study be performed at Site 9 and Site 10, to sample site soil and groundwater to verify the presence of contamination and determine the need for further characterization and/or remediation.

The IAS recommendation to conduct a confirmation study was based largely on the finding that contaminants from the disposal area may migrate toward surface water bodies with little attenuation and in a relatively short time because of high hydraulic conductivities in the water table aquifer and the lack of clays and organic material in the subsurface soil. The potentially affected surface water body at Sites 9 and 10 is the Chesapeake Bay. Delineation of an actual threat or risk was not possible due to the lack of site-specific hydrogeologic and groundwater quality data. The IAS recommended the installation of groundwater monitoring wells at six perimeter locations at Site 9 and at seven perimeter locations at Site 10.

is this a typo? why different numbers?

2.2.3.2 Round 1 Verification Step

The Round 1 Verification Step (RVS), which is the first step in the confirmation study process, was completed in October 1986 by CH2M HILL. As part of the RVS, six monitoring wells around the perimeter of Site 9 and eight monitoring wells around the perimeter of Site 10 were installed to facilitate the collection of groundwater samples and groundwater elevation data to determine groundwater flow directions. Groundwater, surface and subsurface soil samples were collected to investigate any environmental impact of contamination from the landfill waste at Sites 9 and 10. Surface water and sediment samples were collected to investigate impact on nearby surface water bodies and to determine whether contaminated runoff was migrating from the landfills. Subsurface soil samples also were collected to delineate the vertical extent of contamination in probable source areas. The results of the RVS Round 1 sampling and analysis activities indicated that little or no contamination was migrating from the Site 9 or Site 10 landfills via groundwater. The RVS recommended additional sampling to confirm these results.

2.2.3.3 Interim Remedial Investigation

Ebasco Environmental Consultants performed a second round of groundwater sampling at the sites in 1991 as part of the Interim Remedial Investigation (IRI) to confirm the interpretations presented in the RVS report. Based on a comparison of site contaminant concentrations to drinking water standards, the IRI determined that Site 9 and Site 10 were not releasing detectable levels of contamination to the underlying groundwater and that the landfills do not affect groundwater quality in this area. The IRI recommended no additional characterization or remediation was warranted based on the results of the sampling during the RVS and IRI. A limited program of groundwater monitoring was recommended as well as additional characterization for the surface soils, primarily those within the baseball diamonds and golf practice area at Site 10.

2.2.3.4 Remedial Investigation/ Feasibility Study

A Remedial Investigation/Feasibility Study (RI/FS) of Site 9 and Site 10 was conducted from 1993 through 1994 by Foster Wheeler Enviresponse (FWEI). The RI/FS included a Phase 1 Baseline Human Health Risk Assessment (BHHRA) that evaluated risks from site contaminants in accordance with current USEPA guidance and based on current land use at

the sites. The investigations included soil and groundwater sampling. Results of the RI/FS sampling and the BHHRA indicated no current risk posed by contaminants in soil at Site 10, but that groundwater was a potential medium of concern. The RI/FS recommended long-term groundwater monitoring and groundwater and land-use restrictions for Sites 9 and 10 to protect against any adverse risks to human health.

2.2.3.5 Revised Remedial Investigation/ Human Health Risk Assessment/Feasibility Study

A revised Remedial Investigation (RI), revised Human Health Risk Assessment (HHRA), and focused Feasibility Study (FS) for Sites 9 and 10 at NAB Little Creek was completed in February 2001 (CH2M HILL). The initial RI, HHRA, and preliminary feasibility study performed for these two sites by FWEI in 1994 was not reviewed by the USEPA. When the base was placed on the National Priorities List (NPL) in 1999, USEPA required that the HHRA for Sites 9 and 10 be rewritten in accordance with current USEPA guidelines, and that Sites 9 and 10 be included in the ecological risk assessment being conducted for NAB Little Creek. The revised RI/HHRA/FS has been developed in order to meet the regulatory requirements and to incorporate the additional long-term groundwater monitoring data from Sites 9 and 10 that has since been collected.

2.2.3.6 Current Investigations: Long-Term Groundwater Monitoring

A five-year semi-annual groundwater monitoring program was initiated at Sites 9 and 10 in 1996 in accordance with the recommendations in the 1994 RI/FS. Groundwater samples from the six Site 9 wells and the eight Site 10 wells were analyzed for Target Compound List (TCL) Volatile Organic Compounds (VOCs), Semi-volatile organic compounds (SVOCs), PCBs, total and dissolved Target Analyte List (TAL) metals, cyanide, sulfate, bicarbonate, and chloride for the first six rounds of sampling. Pesticides were added to the list of analytes for the subsequent monitoring events. A three-year summary report (finalized May 2000) was prepared after the sixth round of sampling was completed.

2.2.3.7 Follow-Up Surface Soil Sampling

An additional nine surface soil samples were collected in February 2000 from a depth of zero to 6 inches within Site 10 to characterize areas that were not sampled during the 1994 RI surface soil sampling. These data were analyzed to confirm consistency with surface soil data collected during the 1994 RI. However, the data were not validated in time to be used in the revised HHRA. As the data were consistent with previous data, it is expected that incorporation of the new surface soil sample data would not change the conclusions of the HHRA.

2.2.4 Enforcement Activities

NAB Little Creek was placed on the National Priorities List (NPL)in 1999. No enforcement activities have been recorded to date at either Site 9 or Site 10. Once finalized and instituted, the Federal Facilities Agreement (FFA) will provide for CERCLA directed enforcement activities at the sites.

2.3 Community Participation

In accordance with Sections 113 and 117 of CERCLA, the Navy provided a public comment period from March 28, 2001 through April 30, 2001 for the proposed remedial action described in the Feasibility Study and the Proposed Plan for Sites 9 and 10. No comments were receive from the public.

The NAB Little Creek Restoration Advisory Board (RAB) was formed in 1994. Meetings continue to be held to provide an information exchange among community members, the USEPA, Virginia Department of Environmental Quality (VDEQ), and the Navy. These meetings are open to the public and are held about every three months. A community relations program is being conducted through the installation restoration process. Public input is a key element in the decision-making process.

The Proposed Remedial Action Plan (PRAP) and Revised Remedial Investigation/Human Health Risk Assessment/Focused Feasibility Study are available to the Public in the Administrative Record and information repositories maintained at the Virginia Beach Public Library and the Bayside Area Library. The PRAP was available as of March 28, 2001. The final RI/FS is available in the Administrative Record.

A public meeting to present the PRAP for Sites 9 & 10 was held at NAB Little Creek, Drexler Hall on March 28, 2001. Public notice of the meeting and availability of documents was placed in *The Virginia Pilot* newspaper on March 17, 2001.

2.4 Scope and Role of Response Actions

NAB Little Creek occupies 2,147 acres in the northwest corner of Virginia Beach. ~~It is bounded by the Chesapeake Bay to the north, Lake Bradford to the east, Shore Drive (U.S. Highway 60) to the south and west. The western boundary of the base also coincides with the Norfolk city line. The western half of the base is primarily industrial, while the eastern half is occupied primarily by recreation facilities, commercial establishments and base housing.~~ NAB Little Creek has 11 sites that require additional investigation and potential remedial action. These sites are prioritized based on potential risk to humans and the environment. Investigations are ongoing or planned for each of these sites. An additional 30 sites are identified as low priority screening sites. A list of all sites can be found in the current version of the Site Management Plan, which is located in the Administrative Record. The Site Management Plan contains location, description, contaminants of concern, and clean-up status of each site. Sites 9 & 10 are included in the Site Management Plan.

All documentation related to Sites 9 and 10, as well as all Installation Restoration sites, is provided in the Administrative Record. ~~These sites are not part of a larger operable unit and~~ there have been no past or planned removal actions at either of the sites. The only remedial measures taken to date consist of a minimum 2-foot soil cover on the landfills.

The greatest risks posed by Sites 9 and 10 are related to the wastes that have been buried at the sites during their operation as base landfills. No potential residual contamination was identified in the surface soil that could pose threats to the health and safety of animals or people such as site workers and recreational visitors, as the landfill cover is sufficient and was constructed with clean fill. Erosion of, or excavation into, the existing soil cover could

pose a threat through direct contact with landfill contents. Drinking groundwater from beneath the landfills could pose a threat to human health. The risks posed by these potential threats have been quantified in the February 2001 HHRA and Baseline Ecological Risk Assessment (BERA).

spell out

Creating institutional controls and performing long-term monitoring provides the best alternative for eliminating current and future exposure pathways. Consequently, planned response actions include:

- Prohibiting activities that would involve digging into the existing cover or contents of the landfills
- Prohibiting ~~residential~~ use of the ~~landfills~~ sites for residential purposes
- Prohibiting the use of shallow groundwater directly beneath ~~the boundaries~~ of the landfills for any other purpose other than environmental monitoring and testing
- Performing annual inspections of the soil covers
- Long-term groundwater monitoring in accordance with an approved long-term monitoring plan.

2.5 Site Characteristics

2.5.1 Conceptual Site Model (CSM)

The conceptual exposure models shown in Figures 2-4 and 2-5 represent a graphical depiction of transport pathways, exposure media, exposure routes, and potential receptors for Sites 9 and 10, respectively.

use plain English

2.5.2 Site Overview

The Site 9 Landfill comprises approximately 6 acres in the northern portion of NAB Little Creek. The landfill area generally coincides with that of the currently operating driving range. The existing surface features include a relatively level and vegetated (grass turf) soil cover.

Site 10 is located in the northeast portion of NAB Little Creek due west of the Site 9 Driving Range Landfill. The landfill is approximately 18 acres. The ground surface of the site is currently covered with baseball diamonds and vegetated sand dunes.

The topography of both sites is nearly level with the exception of the dune areas north of both sites and west of the northern portion of Site 10. Elevations in some of the dune areas can reach 30 feet above msl or higher.

Sites 9 and 10 are located just south of the southern shore of the Chesapeake Bay. Other surface water bodies that adjoin portions of NAB Little Creek include Little Creek Cove, Chubb Lake, and Lake Bradford.

2.5.3 Surface and Subsurface Features

There are no underground storage tanks, above ground storage tanks, or drum storage areas within the boundaries of Sites 9 and 10. Surface structures at Site 9 include a golf equipment storage shed in the southwest corner of the site, a lighted tee box structure along the western boundary of the site, and a net fence held by utility poles covering the south boundary of the site. The only surface structures at Site 10 are the backstops and dugouts associated with the ball fields and several fences.

2.5.4 Sampling Strategy

Sampling strategy associated with the BHHRA and BERA for Sites 9 and 10 is summarized in Table 2-1 and lists the environmental samples collected at Sites 9 and 10 for evaluation in the risk assessment.

2.5.4.1 RI Data

(VOCs) (SVOCs) (TCL)

Six surface soil samples were collected at Site 9 and eight surface soil samples were collected at Site 10 during the RI and analyzed for Target Compound List volatile organic compounds, semi-volatile organic compounds, pesticides, and PCBs, and Target Analyte List metals. Four groundwater samples were collected at Site 9 and five groundwater samples were collected at Site 10 and analyzed for TCL VOCs and TAL total and dissolved metals. (TAL)

The surface soil samples collected at Sites 9 and 10 during the RI were evaluated in the HHRA. The groundwater samples collected during the RI were not evaluated quantitatively in the risk assessment because of the age of the data set. More recent groundwater data are available that are representative of current site conditions.

2.5.4.2 Long-Term Monitoring of Groundwater Data

At the time the risk assessment calculations were conducted, six rounds of groundwater samples had been collected, analyzed, and validated from Sites 9 and 10 as part of the Long-Term Groundwater Monitoring program at these sites. Six monitoring wells at Site 9 and eight monitoring wells at Site 10 are sampled during each round of long-term monitoring. The samples are analyzed for TCL VOCs, SVOCs, and PCBs, and TAL total and dissolved metals.

The groundwater samples collected during rounds 5 and 6 (May and December 1998) were quantitatively evaluated in the HHRA. These are the most current data that had been collected and validated at the time that the risk assessment process began, and are therefore considered to represent the best estimate of current exposures. These two rounds also represent groundwater conditions at different times of the year.

At the request of the VDEQ, dioxin and furan analyses were conducted in samples collected from three of the groundwater monitoring wells sampled during the 9th round of long-term monitoring. Dioxin and furan analyses were conducted on samples collected from two downstream wells and one upstream well at Site 9. These analyses were conducted because in the past, incinerator ash was disposed of in the Site 9 landfill. The results indicate no detectable quantities of dioxins and furans in the downgradient wells (LS09-MW05 and LS09-MW06); however, a number of dioxins and furans were detected in the side-gradient

gradient INSERT 2-8A

well (LS09-MW04). Because the dioxins and furans were only detected in this well, it is assumed that these detections are not associated with Site 9. This data will be considered during future evaluations of the former incinerator site located in the vicinity of the side-gradient well, as this is the most likely source of any dioxins and furans found in well LS09-MW04.

2.5.4.3 Additional Surface Soil Sampling

An additional nine surface soil samples were collected in January 2000 from Site 10. These data were not validated in time for incorporation into the Sites 9 and 10 risk assessments. However, these data were reviewed and were found to be consistent with the 1994 RI surface soil data. Therefore, it is expected that incorporation of these data in the risk assessment would not change the conclusions of the risk assessment.

2.5.5 Sources of Contamination

The main source of contamination at Site 9 is the ash and solid waste placed in the landfill. For Site 10, the main source of contamination is the sewage sludge, industrial and household waste, and demolition debris placed in the landfill.

2.3 doesn't show zinc but shows Fe + As, Ba, Mn

what about 2.3, 2.4 + 2.5?

2.5.6 Types of Contamination

Table 2-2 identifies the chemicals that were selected as chemicals of concern (COCs) for each of the media at Sites 9 and 10. Inorganic chemicals (aluminum, cobalt, nickel, and zinc) are the COCs for Sites 9 and 10 surface soil. For Site 9 groundwater, 4-methylphenol and inorganic chemicals (antimony and zinc) are the COCs. Benzene and inorganic chemicals (cadmium, manganese, thallium, and zinc) are the COCs for Site 10 groundwater. Benzene and arsenic are the only carcinogenic COCs identified at Sites 9 and 10.

Tables 2-2 + 2-4 don't show Co, Ni or Zn. They do show As, Fe + Mn

2-5 shows Sb, As, Cr, Fe, Ni + Zn, TTD

2.5.7 Location of Contamination and Routes of Migration

2.5.7.1 Lateral and Vertical Extent of Contamination

The approximately 40,000 yd^3 of landfill ash and solid waste associated with Site 9 laterally extends over approximately six acres. A soil cover survey to determine the depth of waste was conducted in February 2000. Soil cover at the site ranges from 1 to 10 feet. Less than 18 inches of soil cover was encountered only on the south side of the site adjacent to the golf course. Waste observed at depths of less than 18 inches consisted of only glass shards, and may have been due to surface debris rather than landfill waste. Average soil cover at the 13 borings at which waste was encountered was 3 feet.

The approximately 46,500 yd^3 of sewage sludge, solid waste, and demolition debris associated with Site 10 extends laterally over approximately 18 acres. In February 2000, a soil cover survey was conducted to better define the vertical extent of the landfill. The soil cover of Site 10 samples ranged from one to greater than 10 feet. However, waste observed at locations with less than eighteen inches of soil cover was dissimilar to other Site 10 waste. Contamination at these locations consisted of stained sandy silt, sand, or gravel with a strong tar or petroleum odor. This is not believed to be site related. This type of contamination was observed only in the southwest portion of the site near the fenced vehicle parking lot.

The noncarcinogenic hazard (0.18) for site workers exposed to surface soil is below USEPA's target HI of 1.0. The carcinogenic risk (5×10^{-6}) for site workers exposed to surface soil is within USEPA's target risk range of 10^{-6} to 10^{-4}.

The noncarcinogenic hazards (0.076 and 0.38) for adults and children, who use the site for recreational activities, exposed to the surface soil are below USEPA's target HI of 1.0. The carcinogenic risks (2×10^{-6} for both) for adult and children recreational users exposed to surface soil are within USEPA's target risk range of 10^{-6} to 10^{-4}.

what is it? in plain English

Dieldrin and arsenic are the only hazardous substances detected in the surface soil at concentrations that exceed the soil to groundwater soil screening level. Dieldrin was detected in only one sample, and is therefore probably not a concern for leaching from the soil to groundwater. Arsenic was detected in all of the surface soil samples at a concentration above the SSL. However, arsenic has not been detected in groundwater at concentrations that result in an unacceptable risk to any of the receptors evaluated.

the

Site 9 Groundwater

Upper aquifer groundwater beneath Site 9 is not currently used as a potable water supply and will not likely be used as a potable water supply in the future. However, upper aquifer groundwater for drinking water was evaluated as a worst-case risk estimate. Risk estimates for exposure to groundwater were calculated for child and adult residents under potential future residential use of the site (Tables B-7 through B-9). Risk estimates for exposure to groundwater also were calculated for future industrial workers under industrial use of the site (Tables B-10 and B-11), assuming upper aquifer groundwater is used as a water supply for NAB Little Creek. Additionally, risk estimates were calculated for a construction worker exposed to groundwater in an open excavation or trench (Tables B-12 and B-13).

use of

beneath the landfills

beneath the landfill

The reasonable maximum exposure noncarcinogenic hazards associated with use of the groundwater as a potable residential water supply are above USEPA's target HI of 1.0. The HI for an adult and child resident are 5.4 and 13, respectively. This hazard is primarily associated with ingestion of antimony, iron, and manganese in the groundwater. However, the concentrations of both iron and manganese in the Site 9 groundwater have been shown to be consistent with background concentrations at NAB Little Creek.

beneath the landfill

The reasonable maximum exposure carcinogenic risk associated with use of the groundwater as a potable residential water supply is within USEPA's target risk range of 10^{-6} to 10^{-4}. The residential lifetime carcinogenic risk is 8×10^{-5}.

beneath the landfill

The reasonable maximum exposure noncarcinogenic hazard associated with ingestion of the groundwater by a future industrial worker (1.9) exceeds USEPA's target HI of 1.0. This hazard is primarily associated with ingestion of the iron and manganese detected in the upper aquifer groundwater. The RME carcinogenic risk to the industrial worker (2×10^{-5}) is within USEPA's target risk range.

spell out

beneath the landfill

The reasonable maximum exposure noncarcinogenic risk to a construction worker exposed to upper aquifer groundwater (0.41) is below USEPA's target HI. The RME carcinogenic risk (4×10^{-8}) is below USEPA's target risk range.

Central tendency HI estimates were calculated for the adult and child resident, and the industrial worker. These were the only receptors with RME HIs above USEPA's target

levels. The central tendency HIs for an adult resident (0.48) and industrial worker (0.31) are below USEPA's target level. The central tendency HI for a child resident (1.6) exceeds USEPA's target HI of 1.0, although none of the individual HQs exceed this level.

Summary of Site 9 Total Risks Across Pathways and Media

Appendix B Tables B-14.RME through B-21, ~~reasonable maximum exposure~~ RME summarize the RME total potential risks to each receptor. Appendix B, Tables B-22.CT through B-24.CT summarize the central tendency total potential risks to each receptor that have RME risks that exceed USEPA benchmark levels. Total potential risks were summarized for a current/future site worker, future adult, child, and lifetime resident, future industrial worker, future construction worker, and future adult and child recreational user. Appendix B, Tables B-25.RME through B-29.CT show only the chemicals that contribute a hazard greater than 0.1 or a carcinogenic risk greater than 10^{-6} to receptors with noncarcinogenic hazards or carcinogenic risks greater than USEPA's benchmark levels of 1.0 for noncarcinogenic hazards and 10^{-4} for carcinogenic risks.

Current/Future Site Worker

The risk assessment assumed that a current/future site worker who collects golf balls at the driving range and mows the grass on the landfill would be exposed to site surface soil. The total RME HI and carcinogenic risk to site workers exposed to surface soil does not exceed USEPA target HI or carcinogenic risk levels. (Table B-14 RME).

Future Adult and Child Resident

Exposure to groundwater beneath the landfill would result in a hazard greater than USEPA's benchmark level for an adult and child resident (Tables B-15.RME and B-16.RME). This hazard is primarily associated with the antimony, iron, and manganese detected in the upper aquifer groundwater. However, the concentrations of iron and manganese are consistent with basewide background. A central tendency risk analysis was conducted for exposure to groundwater for the adult and child (Tables B-22.CT and B-23 CT). Although the central tendency HI is below 1.0 for the adult, the central tendency HI for the child slightly exceeds 1.0.

Exposure to groundwater beneath the landfill through potable use would result in a carcinogenic risk within USEPA's target risk range for lifetime residential exposure (Table B-17.RME).

Future Industrial Worker

For a future industrial worker, the total future reasonable maximum exposure HI is slightly greater than USEPA's benchmark level (Table B-18.RME). Although none of the individual hazardous substances contribute a HQ greater than 1.0, iron and manganese in groundwater beneath the landfill contribute the most to this HI. The reasonable maximum exposure carcinogenic risk to an adult industrial worker who ingests the groundwater does not exceed USEPA's target carcinogenic risk range.

The central tendency HI is within USEPA's benchmark level (Table B-24.CT).

This future industrial worker could also be the future site worker, and therefore, would be exposed to both the surface soil and groundwater. There are no risks associated with exposure to the surface soil above USEPA target levels. The only risks would be the noncarcinogenic hazard associated with exposure to groundwater beneath the landfill.

Future Construction Worker

Exposure to upper aquifer groundwater in an open excavation trench through dermal contact was evaluated for a future construction worker. The potential future reasonable maximum exposure risk to a construction worker exposed to groundwater in this way does not exceed USEPA's target carcinogenic risk or noncarcinogenic hazard levels (Table B-19.RME).

Future Adult and Child Recreational Users

The risk assessment assumed that the site may be used as a golf course or ball field in the future, and adults and children who use the site recreationally may be exposed to surface soil. The total reasonable maximum exposure HIs and carcinogenic risks to recreational users exposed to the surface soil do not exceed USEPA's target carcinogenic risk or HI levels (Tables B-20 RME and B-21 RME).

Site 10 Sewage Treatment Plant Landfill

Risks were evaluated for exposure to Site 10 surface soil and upper aquifer groundwater. Risk characterization tables are provided in Appendix C.

Site 10 Surface Soil

Reasonable maximum exposure risk estimates for exposure to surface soil were calculated for a current/future site worker and a current/future adult and child that use the site for recreational activities (Appendix C, Tables C-1 RME through C-3 RME, and Tables C-4 RME through C-6 RME). Exposure to surface soil via incidental ingestion and dermal contact was evaluated.

The HI (0.061) for site workers exposed to surface soil is below USEPA's target HI of 1.0. The carcinogenic risk ($2x10^{-6}$) for site workers exposed to surface soil is within USEPA's target risk range of 10^{-6} to 10^{-4}.

The noncarcinogenic hazards (0.061 and 0.30) for adult and child recreational users exposed to surface soil are below USEPA's target HI of 1.0. The carcinogenic risks ($2x10^{-6}$ and $3x10^{-6}$) for adult and children recreational users exposed to surface soil are within USEPA's target risk range of 10^{-6} to 10^{-4}.

Dieldrin and arsenic are the only hazardous substance detected in surface soil at concentrations that exceed the soil to groundwater soil screening level. Dieldrin was only detected in one sample, and is therefore probably not a concern for leaching from soil to groundwater. Arsenic was detected in all of the surface soil samples at a concentration above the soil screening level. However, the concentrations of arsenic found in the Site 10 surface soil are consistent with background levels.

Site 10 Groundwater

Upper aquifer groundwater beneath the site is not currently used as a potable water supply and will not likely be used as a potable water supply in the future. However, future use of upper aquifer groundwater beneath the site for drinking water was evaluated as a worst-case risk estimate. Risk estimates for exposure to groundwater were calculated for child and adult residents under potential future residential use of the site (Appendix C, Tables C-7 RME and C-8 RME and Table C-9.RME). It was assumed that a residential user would drink the water and bathe with it. Risk estimates for exposure to groundwater were also

does not make sense. please rewrite in plain English

Uncertainty

~~The risk measures used in risk assessments are not completely probable estimates of risk but are estimates given for a set of assumptions about exposure and toxicity. Thus,~~ It is important to specify the assumptions and uncertainties inherent in the risk assessment to place the risk estimates in proper perspective (USEPA, 1989).

Uncertainty in COC Selection

The sampling conducted at Sites 9 and 10 focused on areas of known or suspected contamination. Therefore, the uncertainty associated with sampling and the possibility of missing a contaminated location is expected to be minimal. The uncertainty associated with the data analysis is minimal because the data were fully validated prior to use in the risk assessment.

Uncertainty Associated with Exposure Assessment

Most of the exposure pathways evaluated for Sites 9 and 10 were assumed, and are not necessarily occurring and may not occur in the future. This is particularly true for the future potable use of groundwater scenario. The reliability of the values chosen for the exposure factors contributes substantially to the uncertainty of the resulting risk estimates. Because most of the exposure factors are worst-case or upper-bound assumptions, the resulting risks are worst-case and likely overestimate the actual risk.

Uncertainty Associated with Toxicity Assessment

There is a high degree of uncertainty in the noncarcinogenic toxicity criteria, and the magnitude of the uncertainty is based on the available scientific data for each compound. The noncarcinogenic toxicity factors are most likely an overestimate of actual toxicity. Carcinogenic Slope Factors (CSFs) developed by USEPA represent upper bound estimates. The true carcinogenic risk is likely to be less than the predicted value (USEPA, 1989).

The uncertainties associated with CSFs are mostly associated with the low dose extrapolation where carcinogenicity at low doses is assumed to be a straight-line response. This is a conservative assumption, which introduces uncertainty into slope factors that are extrapolated from this area of the dose-response curve. There is a large degree of uncertainty associated with the oral to dermal adjustment factors used to transform the oral RfDs and CSFs based on administered doses to dermal RfDs and CSFs based on absorbed doses.

Uncertainty in Risk Characterization

The uncertainties identified in each component of risk assessment ultimately contribute to uncertainty in risk characterization. The addition of risks and HIs across pathways and chemicals contributes to uncertainty based on the interaction of chemicals, such as the combined effects of two or more chemicals and susceptibility of exposed receptors.

Comparison of the site data to background data was not used as a criterion in the selection of the COCs. Therefore, some of the hazardous substances that have been retained as COCs and carried through the risk assessment are present at concentrations consistent with background conditions at NAB Little Creek. A statistical comparison of the site data to background data was performed as part of the uncertainty assessment and is presented in detail in Section 3.6.1.5 of the RI/FS (CH2M HILL, February 2001). Manganese is the only

Site 9 surface soil COC that is present at Site 9 at a concentration statistically similar to the background concentration. The elimination of manganese as a Site 9 surface soil COC would not alter the results of the risk assessment. Iron and manganese are the Site 9 groundwater COCs that are present at concentrations statistically similar to background. Although the HI to the child and adult resident would be reduced, it would still be above USEPA's target HI of 1.0. The HI to the industrial worker exposed to groundwater would be below 1.0 if manganese and iron were not considered COCs.

Arsenic is the only Site 10 surface soil COC that is present at a concentration statistically similar to background. Arsenic is the only carcinogenic COC; therefore, there would be no carcinogenic risks if arsenic were not considered a COC. Elimination of arsenic as a surface soil COPC would not affect the results of the noncarcinogenic hazard evaluation. Arsenic and iron are the Site 10 groundwater COCs that are present at concentrations statistically similar to background. Elimination of arsenic as a groundwater COC would result in no carcinogenic risks above 10-4 (i.e., no more unacceptable risks to the child/adult resident and industrial worker due to contact with Site 10 groundwater). Although the HIs would be lower for all of the receptors, they would still exceed 1.0 for the receptors in which they do if arsenic and iron are considered COCs.

2.7.2 Summary of Ecological Risk Assessment

A multi-site baseline ecological risk assessment (BERA) is being conducted for NAB Little Creek that addresses Sites 9 and 10 (CH2M HILL, March 2001) as well as all other IR sites that are undergoing or have undergone remedial investigations. The BERA is being conducted separately from this Revised RI/HHRA/FS for Sites 9 and 10 (CH2M HILL, February 2001). The findings of the ERA are summarized in this section and are taken into consideration in the evaluation and recommendations of the Feasibility Study for Sites 9 and 10.

A hazard quotient (HQ) is used to evaluate ecological risks; at or below an HQ of 1, adverse effects to ecological receptors are not expected. For Sites 9 and 10, risks were evaluated for terrestrial habitats related to the landfills' surface and the aquatic habitats in the Chesapeake Bay that may be affected by discharges of site-related contaminants in the groundwater.

The risks from surface soil for both sites are low to negligible. The four metals at Site 9 and five metals at Site 10 that were present above ecological risk-based screening levels in the soil were all consistent with background concentrations. Two metals at Site 9 (aluminum and zinc) and four metals at Site 10 (aluminum, cobalt, nickel, and zinc) were regularly detected in the groundwater at levels above ecological risk-based screening criteria; however, these chemicals are expected to have no adverse affects on aquatic organisms present in the bay. This is because as groundwater discharges to the surface water in the bay downgradient of the sites it is diluted by at least a factor of 10. The resulting concentrations would be below the ecological risk-based screening criteria.

The response action selected in this Record of Decision is necessary to protect the public health or welfare or the environment from actual or threatened releases of hazardous substances into the environment.

2.8 Remedial Action Objectives

The level of contamination and the potential exposure routes were considered in defining the site-specific remedial action objectives (RAOs) for protecting public health and the environment. The future protection of environmental resources and the means of minimizing long-term disruption to current and future facility operations were also considered. The site-specific RAOs for Sites 9 and 10 are as follows:

- Prevent or minimize direct contact of human and ecological receptors with landfill contents
- Prevent unacceptable risks to potential receptors from the groundwater beneath the landfills
- Control surface water runoff and erosion

The revised HHRA presented in Section 2.7.1, concluded that no unacceptable risk is posed by contaminants in the soil at Sites 9 or 10. Potential risks from the potable use of groundwater at Sites 9 and 10 were identified.

Under the selected remedy, institutional controls will be employed to prevent any future use of the water-table aquifer beneath the sites as a potable water source. Extraction of groundwater will be restricted to environmental monitoring and testing.

2.9 Description of Alternatives

Three remedial alternatives were developed to address risk associated with soil and groundwater contamination at Sites 9 and 10. The remedial alternatives are discussed in detail in the Feasibility Study (CH2M HILL, February 2001). Each alternative, with the possible exception of the no-action alternative, was developed to meet the RAOs.

2.9.1 Alternative 1 – No Action.

The no-action alternative is required to be evaluated by the NCP and serves as the "baseline" alternative. All other remedial action alternatives are judged against the no-action alternative. Under this alternative, no additional controls or remedial technologies would be implemented and no further site-related monitoring or maintenance would be conducted. CERCLA (Section 121(c)), as amended by the Superfund Amendments Reauthorization Act (SARA, 1986), requires that the site be reviewed every 5 years since contamination (i.e., landfill contents) would remain on site. With the exception of the costs to prepare the five-year review, there are no capital or operation and maintenance (O&M) costs related to this alternative.

2.9.2 Alternative 2 - Institutional Controls with Long-Term Monitoring

The institutional controls with long-term monitoring alternative consists of administrative measures (land-use restrictions, annual inspections) with long-term monitoring conducted to ensure there is no degradation of groundwater quality at the site. The major components of this alternative are:

- Institutional controls
- Long-term groundwater monitoring
- Post-closure requirements

a The capital costs associated with this alternative are $20,000 for each site to prepare a Land Use Control Assurance Plan and a survey plat and to post signs. The annual O&M costs for each site are estimated to be $35,000 for the first 5 years, and $20,000 for each successive year as it is expected that the groundwater monitoring requirements would be reduced after 5 years. The total present worth-cost is estimated to be $400,000 for each site.

2.9.2.1 Institutional Controls

Institutional controls at Sites 9 and 10 include land-use restrictions to prevent redevelopment of the land within the boundary of the sites for use in a manner that would pose an unacceptable risk to receptors. The following institutional controls would be placed on the site:

- Activities that would involve digging into the existing cover or contents of the landfill would be ~~restricted~~ prohibited
- The use of the site for residential ~~development~~ purposes would be prohibited.
- Use of the shallow aquifer groundwater directly beneath the ~~sites~~ landfills would be prohibited for any purpose other than environmental monitoring and testing.
- The Navy shall produce a survey plat, prepared by a professional land surveyor registered by the Commonwealth of Virginia, indicating the location and dimensions of Sites 9 and 10 and the extent of soil and ground water contamination. The precise boundaries of the areas in which residential use is prohibited shall be fixed during the development of the Land Use Control Implementation Plan (LUCIP) described later in this section.
- The Navy shall generate a plat incorporating these restrictions and submit it to the Virginia Circuit Court for the limited purpose of providing public notice of the environmental conditions of and limitations on the use of property. No property right or interest is intended to be nor shall be created by such notice. Further, the filing of the notice would create no independent enforcement authorities in the Commonwealth of Virginia or by third parties.
- Navy-specific procedures would also be implemented by incorporating the above restrictions into a base master plan or similar document.
- Institutional controls shall also involve annual inspections of the existing soil cover to ensure the integrity and prompt repair of the soil cover.

Within 180 days following the execution of this ROD, the Navy, with the concurrence of EPA Region III and in consultation with the Commonwealth of Virginia, shall develop a Memorandum of Agreement on Land Use Control (MOALUC) for NAB Little Creek. The MOALUC shall contain base-wide periodic inspection, condition certification and agency notification procedures designed to ensure the maintenance of any site specific Land Use Controls (LUCs) deemed necessary for future protection of human health and the

environment, including the institutional controls selected in this ROD. A fundamental premise underlying execution of the MOALUC is that, through the Navy's substantial good-faith compliance with procedures called for therein, reasonable assurances will be provided to USEPA and the Commonwealth of Virginia as to the permanency of those remedies, which include the use of specific LUCs.

Although the terms and conditions of the MOALUC will not be specifically incorporated or made enforceable as to this or any other ROD, it is understood and agreed by the Navy, USEPA, and the Commonwealth of Virginia that the contemplated permanence of the remedy reflected herein shall be dependent upon the Navy's good-faith compliance with the MOALUC. Should such compliance not occur or should the MOALUC be terminated, it is understood that the protectiveness of the remedy concurred in may be reconsidered and that additional measures may need to be taken to ensure necessary future protection of human health and the environment.

Within 90 days of the execution of this ROD, the Navy shall develop a Land Use Control Implementation Plan (LUCIP) for Sites 9 and 10 with the concurrence of EPA Region III and in consultation with the Commonwealth of Virginia. The LUCIP shall include:

(1) A description and the location of Sites 9 and 10, including a map, a description of the approximate size and a description of the ~~Contaminates~~ Chemicals of Concern (COCs);

(2) The Institutional Controls selected above;

(3) The particular controls and mechanisms to achieve these goals;

(4) A reference to this ROD; and;

(5) Any other pertinent information.

2.9.2.2 Long-Term Monitoring

Long-term monitoring at Sites 9 and 10 would involve groundwater monitoring in accordance with an approved long term monitoring plan for at least 5 years. The current 5-year groundwater monitoring program that was initiated in 1996 would be considered as part of the monitoring program.

2.9.2.3 Post-Closure Requirements

As with Alternative 1, 5-year site reviews must be conducted under this alternative, as required by the NCP, since contamination (i.e., landfill contents) will remain on site.

2.9.3 Alternative 3 - Low-Permeability Cap

Alternative 3, a containment alternative, involves the installation of a cap over the entire area of each of the landfills. No landfill contents will be excavated or relocated. Any exposed landfill debris will remain in place, and will be covered by the proposed landfill cap. Construction of the cap may require the demolition of several structures around the site, especially at Site 10. Costs for the demolition of the structures were not included in cost estimates for Alternative 3. The major components of this alternative are:

- Construction of a low permeability cap

2.9.3.5 Long-Term Monitoring

Long-term monitoring at Sites 9 and 10 would involve groundwater monitoring in accordance with an approved long-term groundwater monitoring plan for at least 5 years.

2.9.3.6 Post-Closure Requirements

As with Alternatives 1 and 2, five-year site reviews will need to be conducted, as required by the NCP, since contamination (i.e., landfill contents) will remain onsite.

2.9.3.7 Reconstruction of Recreation Facilities

After the cap is constructed on top of the existing soil cover, the existing driving range and baseball diamond facilities will be re-established. Costs for the reconstruction of the recreational facilities were not included in cost estimates for Alternative 3.

Common elements and distinguishing features of each alternative is presented in Table 2-20 below.

TABLE 2-20
Features of Alternatives for Sites 9 and 10

Does not meet all

Alternative	Main Components	Applicable Standards	Present Worth Cost
1- No Action	Existing 2 feet of soil cover	Meets All ARARs Does not guard against future risks Does not track ground-water quality	$0
2- Institutional Controls with Long-term Monitoring	Institutional controls Long-term monitoring Annual soil cover inspections	Meets all ARARs Guards against future risk Tracks groundwater quality	$400,000 (Site 9) $400,000 (Site 10)
3- Low-Permeability Cap	Installation of cap over existing 2 feet of soil cover Reconstruction of recreational facilities Installation of stormwater controls Institutional controls Long-term monitoring Annual soil cover inspections	Meets all ARARs Guards against future risk Tracks groundwater quality	$1,150,000 (Site 9)* $2,730,000 (Site 10)*

* Note: Costs for reconstruction of recreational facilities and demolition of buildings not included

2.12.1.2 Site 10

Institutional controls with long-term monitoring is the selected remedial action for Site 10 because it achieves the remedial action objectives, meets the ARARs, guards against future risk, and is cost-effective. While Alternative 3 also meets the RAOs and ARARs, it adds little to no benefit over Alternative 2 for a substantial additional cost. In addition, the use of groundwater at Site 10 is unlikely and, based on seasonal high water table elevations and depth of waste, the landfill wastes are in contact with the water table; therefore, the benefit of reducing infiltration from a low-permeability cap is small. Alternative 1 currently meets the RAOs and ARARs, but does not provide for long-term groundwater quality tracking or guard against future risk.

2.12.2 Description of the Selected Remedy

The selected remedy for both Site 9 and Site 10 of institutional controls with long-term monitoring consists of administrative measures (land-use restrictions, annual inspections) with long-term monitoring conducted to ensure there is no degradation of groundwater quality at the site.

2.12.2.1 Institutional Controls

Institutional controls at Sites 9 and 10 include land-use restrictions to prevent redevelopment of the land within the boundary of the sites for use in a manner that would pose an unacceptable risk to receptors. The following institutional controls would be placed on the site:

- Activities that would involve digging into the existing cover or contents of the landfill would be ~~restricted~~ prohibited.
- The use of the site for residential ~~development~~ purposes would be prohibited.
- Use of the shallow aquifer groundwater directly beneath the ~~sites~~ landfills would be prohibited for any purpose other than environmental monitoring and testing.
- The Navy shall produce a survey plat, prepared by a professional land surveyor registered by the Commonwealth of Virginia, indicating the location and dimensions of Sites 9 and 10 and the extent of soil and ground water contamination. The precise boundaries of the areas in which residential use is prohibited shall be fixed during the development of the Land Use Control Implementation Plan (LUCIP) described later in this section.
- The Navy shall generate a plat incorporating these restrictions and submit it to the Virginia Circuit Court for the limited purpose of providing public notice of the environmental conditions of and limitations on the use of property. No property right or interest is intended to be nor shall be created by such notice. Further, the filing of the notice would create no independent enforcement authorities in the Commonwealth of Virginia or by third parties.
- Navy-specific procedures would also be implemented by incorporating the above restrictions into a base master plan or similar document.

and enforcing these institutional controls.

- Institutional controls shall also involve annual inspections of the existing soil cover to ensure the integrity and prompt repair of the soil cover.

Within 180 days following the execution of this ROD, the Navy, with the concurrence of EPA Region III and in consultation with the Commonwealth of Virginia, shall develop a Memorandum of Agreement on Land Use Control (MOALUC) for NAB Little Creek. The MOALUC shall contain base-wide periodic inspection, condition certification and agency notification procedures designed to ensure the maintenance of any site specific Land Use Controls (LUCs) deemed necessary for future protection of human health and the environment, including the institutional controls selected in this ROD. A fundamental premise underlying execution of the MOALUC is that, through the Navy's substantial good-faith compliance with procedures called for therein, reasonable assurances will be provided to USEPA and the Commonwealth of Virginia as to the permanency of those remedies, which include the use of specific LUCs.

Although the terms and conditions of the MOALUC will not be specifically incorporated or made enforceable as to this or any other ROD, it is understood and agreed by the Navy, USEPA, and the Commonwealth of Virginia that the contemplated permanence of the remedy reflected herein shall be dependent upon the Navy's good-faith compliance with the MOALUC. Should such compliance not occur or should the MOALUC be terminated, it is understood that the protectiveness of the remedy concurred in may be reconsidered and that additional measures may need to be taken to ensure necessary future protection of human health and the environment.

Within 90 days of the execution of this ROD, the Navy shall develop a Land Use Control Implementation Plan (LUCIP) for Sites 9 and 10 with the concurrence of EPA Region III and in consultation with the Commonwealth of Virginia. The LUCIP shall include:

(1) A description and the location of Sites 9 and 10, including a map, a description of the approximate size and a description of the ~~Contaminates~~ Chemicals of Concern (COCs);

(2) The Institutional Controls selected above;

(3) The particular controls and mechanisms to achieve these goals;

(4) A reference to this ROD; and;

(5) Any other pertinent information.

2.12.2.2 Long-Term Monitoring

Long-term monitoring at Sites 9 and 10 would involve groundwater monitoring in accordance with an approved plan for at least 5 years. The current 5-year groundwater monitoring program that was initiated in 1996 would be considered as part of the monitoring program.

2.12.2.3 Post-Closure Requirements

As with Alternative 1, 5-year site reviews must be conducted under this alternative, as required by the NCP, since contamination (i.e., landfill contents) will remain on site.

remedial alternative was determined to be proportional to its costs and hence this alternative represents a reasonable value for the money to be spent.

The total estimated present-worth cost of the Selected Remedy for each site is $400,000. The total estimated present-worth cost of Alternative 3 (low-permeability cap) for Site 9 is $1,150,000 and for Site 10 is $2,730,000. The selected remedy is cost-effective because it provides protection of human health and the environment that is proportional to the cost. The selected remedy minimizes short-term environmental impacts, provides long-term protection of human health and the environment, and meets all identified ARARs.

Groundwater risks at Sites 9 and 10 are relatively low, and the shallow groundwater is naturally of poor quality and not used as a potable supply. Therefore, the associated risks and significantly higher cost of installing a low- permeability cap, as a means of reducing the risks is not warranted. Additionally, while a low-permeability cap remedy also meets the RAOs and ARARs, the benefit of reducing infiltration to a naturally poor quality aquifer adds little to no benefit for a substantial additional cost.

2.13.4 Utilization of Permanent Solutions and Alternative Treatment Technologies or Resource Recovery Technologies to the Maximum Extent Practicable

The Navy and USEPA have determined that the Selected Remedy represents the maximum extent to which permanent solutions and treatment technologies can be utilized in a practicable matter at Sites 9 and 10. Of those alternatives that are protective of human health and the environment and comply with ARARs, The Navy and USEPA have determined that the Selected Remedy provides the best balance of trade-offs in terms of the balancing criteria, while also considering the statutory preference for treatment as a principal element and bias against off-site treatment and disposal, and considering state and community acceptance. the

~~The selected remedy represents the maximum extent to which permanent solutions and treatment are practicable at these sites. The selected remedy provides the best balance of trade-offs as compared to the other alternatives.~~ In particular, the selected remedy (institutional controls with monitoring) provides a level of long-term protection equivalent to the low permeability cap, but at greatly reduced cost. The selected remedy is therefore the most cost-effective.

None of the alternatives examined includes treatment as principal element, for several reasons. First, there is no principal threat waste at these sites that requires treatment. Second, treatment of the landfill contents is not practicable in a cost effective manner because of the large volume of waste (the landfills cover 24 acres). Third, treatment of the groundwater contamination is not practicable in a cost-effective manner. Groundwater contamination, where present, occurs beneath the landfill in isolated wells and at low concentrations, below the relevant and appropriate Safe Drinking Water Act Maximum Contaminant Levels. No definable plume of contamination has been identified and no ground water contamination has been identified outside the perimeter of the landfill. For such low concentration ~~waste~~ that poses a low level, long-term threat, the EPA does not generally expect to use treatment as a remedy.

contamination

3.0 Responsive Summary

In accordance with the Sections 113 and 117 of CERCLA, the Navy provide a public comment period from March 28, 2001 through April 30, 2001 for the proposed remedial action described in the Feasibility Study and the Proposed Plan for Sites 9 and 10. Public input is a key element in the decision making process.

The Proposed Remedial Action Plan is to the public in the Administrative Record. The Revised Remedial Investigation/Human Health Risk Assessment/Focused Feasibility Study is also available in the Administrative Record. The information repositories for the Administrative Record are maintained at the Virginia Beach Central Library (4100 Virginia Beach Boulevard, Virginia Beach, Virginia 23452) and the Bayside Area Library (956 Independence Boulevard, Virginia Beach, Virginia 23455). The Proposed Remedial Action Plan was available on March 28, 2001.

A public meeting to present the Proposed Remedial Action Plan for Sites 9 and 10 was held at NAB Little Creek, Drexler Manor, on March 28, 2001. Public notice of the meeting and availability of documents was placed in *The Virginia Pilot* newspaper on March 17, 2001.

No written comments, concerns, or questions were received by the Navy, USEPA, or the Commonwealth of Virginia during the public comment period. No one from the public attended the public meeting to present the Proposed Plan for Sites 9 & 10 to ~~answer~~ any ask questions on the Proposed Plan ~~and~~ or on the documents in the information repositories.

Appendix D
Federal Location-Specific ARARs
Feasibility Study of Site 9 and Site 10 at NAB Little Creek

Location	Requirement	Prerequisite	Citation	ARAR Determination	Comment
Endangered Species Act of 1978*					
Endangered species	Action to ensure that any action is not likely to jeopardize the continued existence of endangered or threatened species or adversely affect its critical habitat.	Applies to actions that affect endangered or threatened species or their habitat.	16 USC 1536(a), 1538, 1539 50 CFR Part 402	Relevant and appropriate.	No state or federally listed threatened or endangered species were found to exist at NAB Little Creek. Two rare plant species were found at the base, however. Therefore, the requirements of the Endangered Species Act of 1973 (16 USC 1536(a)) are relevant and appropriate to remediation activities occurring at Site 9 and 10. To meet this requirement, restricted access signs will be put up at each landfill.
Migratory bird area	Protects almost all species of native birds in the U.S. from unregulated taking which can include poisoning at hazardous waste sites	Presence of migratory birds	16 USC Section 703	Applicable	Migratory birds are encountered at Site 9 and 10. These requirements are applicable to any response actions that could result in unregulated "taking" of native birds. To meet this requirement, restricted access signs will be put up at each landfill
Environmentally and Economically Beneficial Landscape Practices on Federal Landscaped Grounds	Establishes guidelines to assist federal agencies in the implementation of environmentally and economically beneficial landscape practices	Landscaping on federal grounds	60 FR 40837 (August 10, 1995)	To-be-considered	Native drought-tolerant species will be used to cover the landfills in furtherance of this order. ~~To meet this requirement, restricted access signs will be put up at each landfill~~

* Statutes and policies, and their citations, are provided as headings to identify general categories of potential ARARs for the convenience of the reader. Listing the statutes and policies does not indicate that DON accepts the entire statutes or policies as potential ARARs. Specific potential ARARs are addressed in the table below each general heading; only substantive requirements of the specific citations are considered potential ARARs.

ARARs - Applicable or relevant and appropriate requirements.
CFR - Code of Federal Regulations.
USC - United States Code.
FR – Federal Regulation