RECORD OF DECISION

SITE 43 - DEMOLITION DEBRIS DISPOSAL AREA

NAVAL AIR STATION PENSACOLA, FLORIDA

NAVFAC
Naval Facilities Engineering Command

1.0 Declaration

This Record of Decision (ROD) presents the Selected Remedy for soil and groundwater at Site 43 – Demolition Debris Disposal Area at Naval Air Station (NAS) Pensacola, Pensacola, Florida, United States Environmental Protection Agency (USEPA) Facility ID number FL9170024567.

This ROD documents the final remedial action for Site 43 and does not include or affect any other sites at the facility. This decision is based on information contained in the Administrative Record for the site. Information not specifically summarized in this ROD or in its references but contained in the Administrative Record has been considered and is relevant to the selection of the remedy. Thus the ROD is based upon and relies upon the entire Administrative Record file for the site in making the decision.

The Site 43 remedial action was selected by the Navy, as the lead agency, in consultation with USEPA, the support agency, in accordance with the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), as amended by the Superfund Amendments and Reauthorization Act (SARA), and, to the extent practicable, the National Oil and Hazardous Substances Pollution Contingency Plan (NCP).

The Florida Department of Environmental Protection (FDEP) concurs with the Selected Remedy. Site 43 is part of a comprehensive environmental investigation and cleanup program currently being performed at NAS Pensacola under CERCLA authority pursuant to the Federal Facility Agreement (FFA) dated October 23, 1990. NAS Pensacola is an active facility, and environmental investigations and remediation at the base are funded under Environmental Restoration, Navy (ER,N).

Figure 1-1. Site 43 Location Map

Environmental investigations and activities at Site 43 included an initial site reconnaissance in 1992, geophysical survey in 1993, site characterization sampling in 1999, an Interim Remedial Action (IRA) in 2001 to remove metal debris and contaminated soil, a Remedial Investigation (RI) in 2005 and 2006, and a Feasibility Study (FS) in 2008. The Site Management Plan (SMP) for NAS Pensacola further details the schedule for CERCLA activities and is updated annually. There have been no cited violations under federal or state environmental law or any past or pending enforcement actions pertaining to the cleanup of Site 43.

The Selected Remedy eliminates unacceptable human health risks under current and reasonably anticipated future non-residential (recreational and commercial/industrial-type) use by removing or prohibiting exposure to soil with concentrations of carcinogenic polynuclear aromatic hydrocarbons

(cPAHs), represented in terms of benzo(a)pyrene equivalents (BaPEqs), and metals greater than FDEP industrial SCTLs and groundwater with concentrations of lead that exceed the FDEP Groundwater Cleanup Target Level (GCTL) and USEPA Action Level. Surface water and sediment are not associated with Site 43. The remediation of Site 43 will not adversely impact the reasonably anticipated future land use of the site, which is as a parking area and undeveloped open space.

1.1 SELECTED REMEDY

The response action selected in this ROD is necessary to protect the public health and welfare and the environment from actual or threatened releases of hazardous substances, pollutants, or contaminants into the environment that may present an imminent and substantial endangerment to public health or welfare. A CERCLA action is required because concentrations of cPAHs and metals (arsenic, barium, copper, lead, and vanadium) in surface and subsurface soil and concentrations of lead in groundwater at Site 43 exceed state and/or federal regulatory criteria for exposure to these chemicals.

The Selected Remedy for Site 43 consists of the following:

- Limited excavation of surface and subsurface soil with contaminant of concern (COC) concentrations greater than FDEP industrial SCTLs.
- Disposal of excavated soil at an off-site permitted landfill after off-site treatment, if required.
- Monitoring of groundwater to evaluate changes in lead concentrations and potential migration for 1 year.
- LUCs to restrict the site to non-residential use, to ensure maintenance of existing paved areas, to prohibit uncontrolled soil disturbance/excavation, and to prohibit groundwater use.

The Selected Remedy was chosen to meet Remedial Action Objectives (RAOs) based on evaluation of site conditions, site-related risks, anticipated future land use, and applicable or relevant and appropriate requirements (ARARs). The Selected Remedy is protective of human health and the environment, is cost-effective, and utilizes permanent solutions and alternative treatment (or resource recovery) technologies to the maximum extent practicable. In addition, removal of soil contamination is expected to result in decreases in concentrations of lead in groundwater. The Selected Remedy is expected to achieve significant long-term risk reduction and allow the property to be used for the reasonably anticipated future land use, which is non-residential.

Source materials constituting principal threat wastes, as defined by the USEPA (1991), are not present at Site 43. Based on the reasonably anticipated future land use of "non-residential", the limited amount of treatment (specifically, off-site treatment of soil with Toxicity Characteristic Leaching Procedure [TCLP] lead concentrations greater than regulatory criteria) was deemed appropriate.

Because this remedy will result in contaminated soil and groundwater remaining on site, LUCs will be instituted to ensure that RAOs are achieved by limiting site use to non-residential activities, ensuring maintenance of existing pavement, prohibiting uncontrolled soil disturbance/excavation, and prohibiting groundwater use.

The remedy will result in hazardous substances, pollutants, or contaminants remaining on site at levels that do not allow for unlimited use and unrestricted exposure; therefore, in accordance with Section 121(c) of CERCLA and NCP §300.430(f)(5)(iii)(c), a statutory review will be conducted within 5 years of initiation of remedial action, and every 5 years thereafter, to ensure that the remedy continues to be protective of human health and the environment.

1.2 DATA CERTIFICATION CHECKLIST

The locations in Section 2.0, Decision Summary, of the information required to be included in the ROD are summarized in Table 1-1. Additional information can be found in the Administrative Record file for NAS Pensacola.

TABLE 1-1. ROD DATA CERTIFICATION CHECKLIST

DATA	LOCATION IN ROD
COCs and their respective concentrations	Sections 2.3 and 2.5
Risk represented by the COCs	Section 2.5
Cleanup levels established for COCs and the basis for these levels	Section 2.5 and 2.7
How source materials constituting principal threats are addressed	Section 2.6
Current and reasonably anticipated future land use assumptions used in the risk assessment	Section 2.4
Potential land and groundwater uses that will be available at the sites as a result of the Selected Remedy	Section 2.9.3
Estimated capital, operating and maintenance (O&M), and net present worth (NPW) costs; discount rate; and number of years over which the remedy costs are projected	Appendix B
Key factors that led to the selection of the remedy	Section 2.9.1

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

1.3 AUTHORIZING SIGNATURES

K. M. Nielsen

Kristina M. Nielsen, Cdr, CEC, U.S. Navy
NAS Pensacola

25 MAR 10

Date

Franklin E. Hill, Director
Superfund Division
USEPA Region 4

4/12/10

Date

2.0 Decision Summary

2.1 Site Description and History

NAS Pensacola is located in Escambia County, approximately 5 miles west of the Pensacola City limits. The approximately 5,000-acre installation was constructed in the 1800s. Currently, land use at NAS Pensacola consists of various military housing, training, and support facilities as well as a large industrial complex for major repairs and refurbishment of aircraft engines and frames.

Site 43 – Demolition Debris Disposal Area is located in a developed area in the eastern portion of NAS Pensacola at the southwestern corner of Murray and Taylor Roads and north of Road Q, which provides access to the Officer's Quarters. The site previously contained a tennis court and building foundation/basketball court; however, the tennis and basketball courts were removed in 2003. Prior to the most recent use as a recreational area, site use is unknown. The site encompasses approximately 180,000 square feet (4.1 acres), approximately 40,000 square feet of which are covered by a paved parking lot (see Figure 2-1). The remainder of the site is grass covered with scattered trees.

Environmental investigations at Site 43 began in December 1992 when a child using a metal detector discovered a partially exposed drum east of the tennis court, and subsequent site reconnaissance identified additional drums and smaller rusted metallic debris in the area. Odors, visible soil stains, or other indications of contaminant release were not observed. The area surrounding the drums was fenced to prevent general access until further investigations could be conducted. The precise locations of the debris disposal areas were unknown; however, approximate locations of several disposal areas were determined based on the results of subsequent investigations.

Figure 2-1. Site 43 – Demolition Debris Disposal Area

2.2 PREVIOUS INVESTIGATIONS

Table 2-1 provides brief summaries of previous investigations at Site 43. Figure 2-2 shows the site layout and previous sample locations.

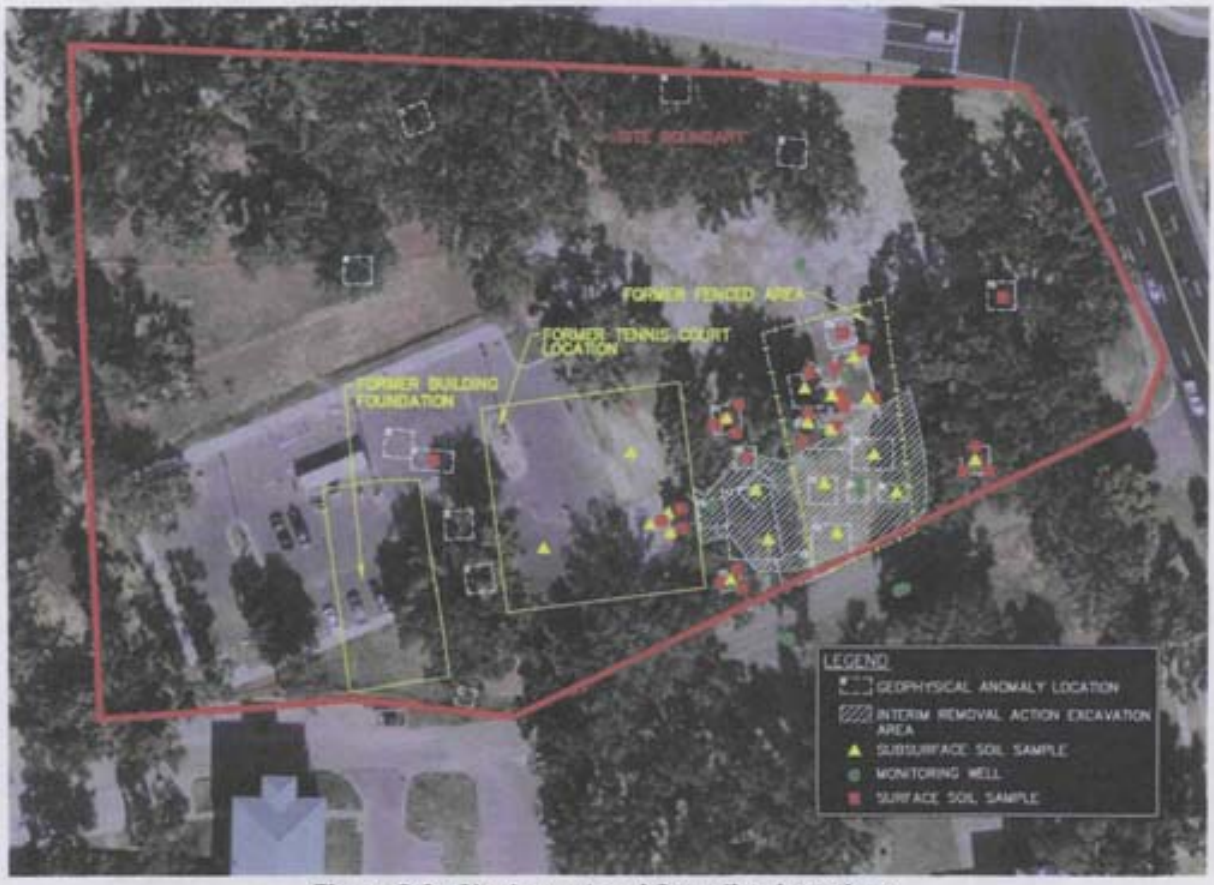

Figure 2-2. Site Layout and Sampling Locations

TABLE 2-1. PREVIOUS INVESTIGATIONS AND SITE DOCUMENTATION

INVESTIGATION	DATE	ACTIVITIES
Site Reconnaissance	1992	Conducted following **initial identification** of a drum to locate additional drums and metallic debris.
Geophysical Investigation	1994	Conducted to assess the size of the disposal area and number of drums buried in the area. Total of 25 **geophysical anomalies** identified; actual number of drums disposed in the area was not determined. Recommended that the drum disposal area and several anomalies outside of the disposal area be further investigated by test pitting or trenching.
Site Characterization Sampling	1999	Included surface and subsurface soil **sampling** from anomaly locations via test pitting and groundwater sampling from temporary micro wells. Drums with sufficient contents to sample had polynuclear aromatic hydrocarbons (PAHs) and metals at concentrations exceeding FDEP SCTLs. Surface soil samples and subsurface soil samples from beneath the drum disposal depth and deeper samples just above the water table were collected. Concentrations of PAHs and metals in surface and shallow subsurface soil samples exceeded FDEP SCTLs. Concentrations of iron and aluminum in groundwater samples exceeded FDEP GCTLs. Fourteen drums removed. An Interim Remedial Action (IRA) to remove metal debris and contaminated surface and subsurface soil was recommended.

TABLE 2-1. PREVIOUS INVESTIGATIONS AND SITE DOCUMENTATION		
INVESTIGATION	DATE	ACTIVITIES
Interim Remedial Action	2001	Included removal of 657 cubic yards of soil and debris including 20 to 25 rusted metal drums and drum parts and inert ornamental ordnance and munitions. Prior to the IRA, Remedial goals (RGs) were developed for some COCs using 95-percent upper confidence limits (UCLs) for surface soil, and COC concentrations in surface and subsurface soil samples collected prior to excavation these compared to these RGs to determine the extent of contamination requiring removal. RGs were re-evaluated and revised after excavation activities were completed, and it was determined that additional areas required excavation. Based on this information, the IRA Report recommended an RI/FS.
Remedial Investigation	2005-2006	Twenty surface soil samples were collected from the perimeter of the anomaly areas, and 40 subsurface soil samples (two each from 20 borings) were collected at geophysical anomaly/test pit locations. Subsurface soil samples at each boring were collected at the IRA soil excavation limit and at depths from 4 to 9 feet below land surface (bls). Soil samples were analyzed for Target Compound List (TCL) semivolatile organic compounds (SVOCs) and selected metals. Eight shallow and two deep monitoring wells were installed, and groundwater samples were collected from these wells and the five existing micro wells and analyzed for TCL volatile organic compounds (VOCs) and Target Analyte List (TAL) metals.
Feasibility Study	2008	Based on the nature and extent of soil and groundwater contamination determined during the RI, an FS was conducted to develop and evaluate soil and groundwater remedial alternatives.
Proposed Plan	2008	Presented the Navy's Preferred Alternative to address soil and groundwater.

2.3 SITE CHARACTERISTICS

Physical Characteristics

Site 43 is located on the eastern slope of a shallow closed depression bound by paved roads on all four sides. Approximately 20 percent of the site is covered by a paved parking area, and the remainder is a maintained grassy area with scattered trees. Surface water features are not present at the site, and overland runoff is to the west into the depression. A designated wetland and drainage ditch located approximately 500 feet to the east of the site are the nearest surface water bodies.

Soils at Site 43 consist of fine to coarse excessively drained sands formed in sandy marine environments and characterized by rapid infiltration and slow runoff. Overburden materials encountered at Site 43 during the RI were typical of regional undifferentiated Pleistocene marine deposits made up of light brown to tan fine quartz sand with associated stringers and lenses of gravel and clay. From the ground surface to 4 feet bls, many areas of the site showed signs of disturbance either from waste disposal or 2001 IRA excavation activities. Below 4 feet, typical lithologies included medium to fine silty or clayey sand ranging from light gray or tan to dark brown in color. Significant clay or gravel horizons were not encountered. Regionally, overburden thickness ranges from approximately 30 to 800 feet; bedrock was not encountered during investigations at Site 43. Depths to groundwater ranged from approximately 12 to 16 feet bls during the RI, and groundwater flow was generally to the east.

Nature and Extent of Contamination

Contaminants at Site 43 appear to have resulted from undocumented disposal of solid waste including drums of unknown materials. The source and nature of materials and the time of disposal are unknown. Surface soil samples from 10 locations and subsurface soil from six locations had exceedances of residential and/or industrial SCTLs for arsenic, barium, copper, lead, vanadium, and/or cPAHs (see Figure 2-3). Concentrations in deeper subsurface soil samples, from depths greater than 4 feet bls, were less than SCTLs. Except for lead and PAHs, concentrations of other chemicals detected in surface and

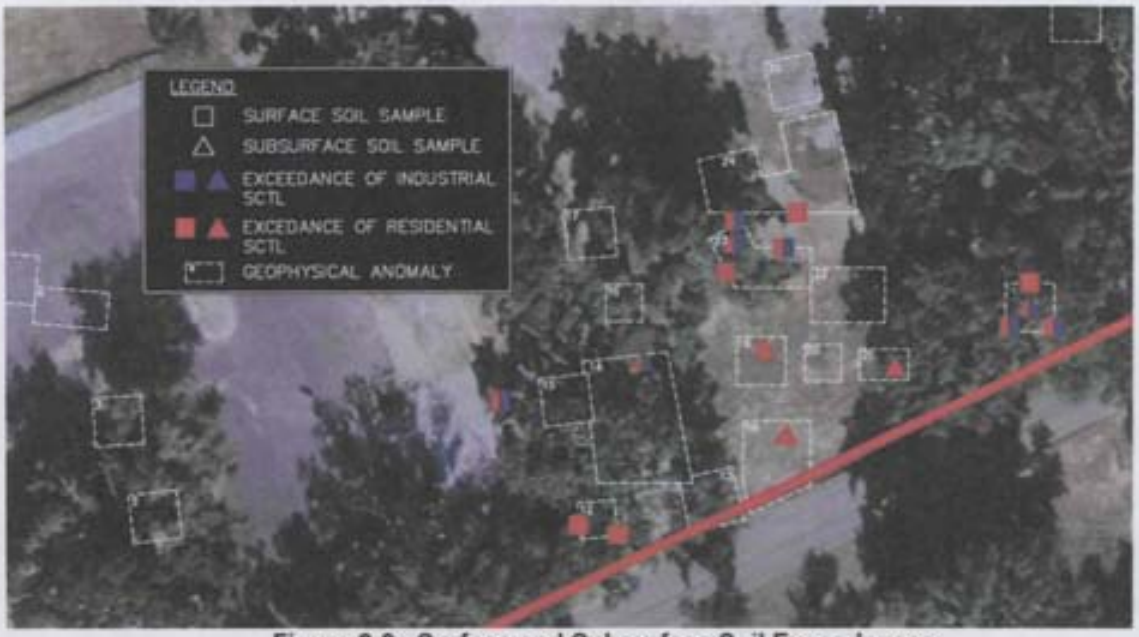

Figure 2-3. Surface and Subsurface Soil Exceedances

shallow subsurface soil exceeded only residential SCTLs. Concentrations of lead exceeded its industrial SCTL at five surface and two subsurface soil locations.

Groundwater contamination at Site 43 is limited to the shallow zone of the water table sand and gravel aquifer, which was encountered to the maximum depth of investigation at the site, approximately 50 feet bls. Concentrations of iron, lead, and manganese exceeded GCTLs in groundwater samples collected during the RI. However, only lead was believed to be a result of past disposal activities because iron and manganese appear to be a result of natural background conditions (Table 2-1), as evidenced by the site history, the groundwater flow direction and the resulting spatial distribution of these metals in groundwater.

Concentrations of iron and manganese in groundwater are not attributed to the site disposal area because the spatial distribution of concentrations does not match the layout of the disposal activity area and the groundwater flow characteristics. The detected concentrations of iron and manganese in groundwater samples collected from monitoring wells located within and hydraulic downgradient of the disposal activity area should be affected by site contamination and this is not the case. Monitoring well PEN-43-10S located upgradient of the disposal activity area (Figure 2-2) contained iron at a concentration higher than that detected at the source area monitoring wells PEN-43-05S and PEN-43-05D and higher than hydraulic downgradient monitoring well PEN-43-13S. Monitoring well PEN-43-09S located adjacent to the upgradient boundary of the disposal activity area had an iron concentration higher than those collected from monitoring wells located in the center of the disposal area. And finally, monitoring wells PEN-43-07S and PEN-43-06S located away from the disposal activity area and hydraulically side gradient to the disposal activity area contained manganese at concentrations higher than all other on-site monitoring wells, except PEN-43-06S. The hydraulically side gradient monitoring wells should not have been impacted by the disposal activities and therefore, the iron or manganese are not attributable to the disposal activity.

Lead was detected in only two groundwater samples collected at Site 43, and only the concentrations in one well exceeded the GCTL. The well with the lead exceedance is located in an area where surface and subsurface soil lead concentrations exceeded residential and industrial SCTLs (see Figure 2-4).

Inorganics such as arsenic, barium, copper, lead, and vanadium are highly persistent contaminants that, when released to the environment, generally adsorb to the soil matrix and remain bound to particulate

matter. PAHs are also considered to be persistent in the environment and are much more likely to bind to soil than to go into solution. Because of their persistence and tendency to adhere to soil particles, PAHs and metals tend to migrate from source areas via bulk movement processes (e.g., surface runoff and wind erosion) and, if leaching from soil to groundwater occurs, it usually results in transportation over relatively short distances. The presence of these chemicals in subsurface soil and groundwater at the site is more likely due to releases from buried drums than leaching from the surface.

2.4 Current and Potential Future Land and Resource Uses

NAS Pensacola is an active military facility and is expected to remain active for the foreseeable future. Current land use at NAS Pensacola consists of various aviation-related military housing, training, and support facilities and large industrial complexes for major repairs and refurbishment of aircraft engines and frames. Other land uses on base include training activities, equipment and materials storage, maintenance areas, and recreational facilities for military personnel. Land use in the off-base areas adjacent to NAS Pensacola is primarily residential.

Figure 2-4. Groundwater Exceedances

Site 43 is located in a developed area of the base adjacent to several military housing areas. Recreational users and maintenance workers are expected to use the site currently and for the foreseeable future. On-site wildlife may temporarily use Site 43, but due to lack of suitable cover, wildlife use is assumed to be infrequent. Non-residential and recreational use of the site is expected to continue for the foreseeable future. The NAS Pensacola Master Plan identifies the planned future use of the site as open space, indicating that no future development or construction activities are planned for the site. If future land use at Site 43 differs from the reasonably anticipated land use, the Navy will reassess risks appropriate to the future use.

The nearest potable water well to Site 43 is located approximately 1,600 feet west-southwest. The main source of potable water for the base is the Navy-owned well field located at Naval Technical Training Center (NTTC) Corry Station, which is located approximately 3 miles north of NAS Pensacola on the northern (opposite) side of Bayou Grande. No surface water bodies are located within the site boundaries.

2.5 SUMMARY OF SITE RISKS

The baseline risk assessment estimates what risks the site poses if no action was taken. It provides the basis for taking action and identifies the contaminants and exposure pathways that need to be addressed by the remedial action. A human health risk assessment (HHRA) and ecological risk assessment (ERA) were conducted as part of the RI (TtNUS, 2006), as summarized below.

2.5.1 Summary of Human Health Risk

The quantitative HHRA was conducted using chemical concentrations detected in surface soil, subsurface soil, and groundwater samples collected at Site 43 and using both USEPA and State of Florida regulations and guidelines for HHRA. Key steps in the risk assessment process included identification of **chemicals of potential concern** (COPCs), exposure assessment, toxicity assessment, and risk characterization. COPCs other than lead (discussed below) were selected for quantitative evaluation based on comparisons of maximum surface and subsurface soil concentrations to USEPA Region 9 residential Preliminary Remediation Goals (PRGs) (risk-based screening levels for residential exposure) and USEPA generic Soil Screening Levels (SSLs) for inhalation of volatiles and fugitive dusts, and based on comparisons of maximum groundwater concentrations to Region 9 tap water PRGs and federal drinking water Maximum Contaminant Levels (MCLs).

For lead, the USEPA-recommended value of 400 mg/kg for lead-contaminated soil in a residential setting where children are frequently present (USEPA, 1994b) was used as the screening value for lead in soil, and the Florida GCTL and USEPA Action Level of 15 µg/L was used as the screening value for lead in groundwater. Chemicals identified as potential threats to human health after initial screening are identified as COPCs and evaluated in the baseline risk assessment. Site 43 human health COPCs identified based on these comparisons included cPAHs, arsenic, barium, copper, lead, and vanadium in surface and subsurface soil and chloroform, iron, lead, and manganese in groundwater.

During the **exposure assessment** using USEPA methodology, current and potential future exposure pathways through which people might come into contact with the COPCs identified in the previous step were evaluated. The results of the exposure assessment for Site 43 were used to refine the conceptual site model (CSM) (Figure 2-5), which identifies potential contaminant sources, contaminant release mechanisms, transport routes, and receptors under current and future land use scenarios. Exposures to surface soil contamination via dermal contact (skin exposure), incidental ingestion (swallowing small amounts of soil), and inhalation (breathing) are the only current exposure pathways, and current receptors include site maintenance (e.g., groundskeeping) workers and adult and adolescent recreational users/trespassers.

Figure 2-5. Conceptual Site Model

In addition to current receptors, potential future receptors include construction workers, occupational workers, and hypothetical child and adult residents. Potential soil exposure routes for these receptors also include incidental ingestion, dermal contact, and/or inhalation, and potential groundwater exposure routes evaluated include ingestion and inhalation by hypothetical future residents only. The future residential scenario was quantitatively evaluated in the risk assessment for decision-making purposes, although this scenario is unlikely at NAS Pensacola. Future residential exposure to groundwater is possible only if drinking water wells were installed on the site in the future, which is very unlikely because the main source of water for the base is a well field located approximately 3 miles north of NAS Pensacola. Current and hypothetical future exposure pathways at Site 43 are summarized in Table 2-2.

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

RECEPTORS	EXPOSURE ROUTES
Adult and Adolescent Trespassers/Recreational Users (current and future land use)	Soil dermal contact (surface soil) Soil ingestion (surfacessoil) Inhalation of air/dust/emissions (surface soil)
Maintenance Workers (current and future land use)	Soil dermal contact (surface soil) Soil ingestion (surface soil) Inhalation of air/dust/emissions (surface soil)
Construction Workers (future land use)	Soil dermal contact (surface and subsurface soil) Soil ingestion (surface and subsurface soil) Inhalation of air/dust/emissions (surface and subsurface soil)

TABLE 2-2. RECEPTORS AND EXPOSURE ROUTES EVALUATED IN HHRA	
RECEPTORS	**EXPOSURE ROUTES**
Occupational Workers (future land use)	Soil dermal contact (surface soil)[1] Soil ingestion (surface soil)[1] Inhalation of air/dust/emissions (surface soil)[1]
Residents (Adults/Children) (future land use)	Soil dermal contact (surface soil)[1] Soil ingestion (surface soil)[1] Inhalation of air/dust/emissions (surface soil)[1] Groundwater ingestion Groundwater inhalation

1 Occupational workers and residents are also evaluated for exposure to COPCs in subsurface soil. This scenario is included to account for the possibility that subsurface soil could be brought to the surface in future excavation projects.

Toxicity assessment involves identifying the types of adverse health effects caused by exposure to site COPCs and determining the relationship between the magnitude of exposure and the severity of adverse effects (i.e., dose-response relationship) for each COPC. Potential health effects are contaminant specific and may include an increased risk of developing cancer or non-cancer effects such as changes in normal functions of organs or organ systems. Some contaminants cause both cancer and non-cancer effects. Based on the quantitative dose-response relationships determined, toxicity values for both cancer (cancer slope factor [CSF]) and non-cancer (reference dose [RfD]) effects were derived and used to estimate the potential for adverse cancer and non-cancer effects based on reasonable maximum exposure (RME), which assumes the maximum level of human exposure that could reasonably be expected to occur.

During the risk characterization, the outputs of the exposure and toxicity assessments are combined to characterize the baseline risk (**cancer risks and non-cancer hazards**) at the site if no action was taken to address the contamination. Cancer risk estimates (incremental lifetime cancer risks [ILCRs]) developed for construction workers and maintenance workers exposed to COPCs in surface and subsurface soil were less than $1x10^{-6}$. Total ILCRs for full-time occupational workers, lifelong recreational users, and future residents hypothetically exposed to COPCs in soil and groundwater were within the USEPA target risk range of $1x10^{-4}$ to $1x10^{-6}$ (1 in 10,000 to 1 in 1,000,000 additional chance of developing cancer) but were greater than the FDEP target risk of 1×10^{-6}.

The primary risk drivers were carcinogenic PAHs and arsenic in soil and chloroform in groundwater. However, there is considerable uncertainty associated with the risks calculated for arsenic and chloroform. Site 43 arsenic concentrations exceeded facility background concentrations but are within the range of naturally occurring concentrations in the United States (average Site 43 soil concentration was approximately 3 milligrams per kilogram [mg/kg]). In addition, the soil background data set for NAS Pensacola includes data from only two locations, and therefore background levels may not be adequately characterized. Chloroform was detected in only 2 of 12 samples at a maximum concentration significantly less than the USEPA MCL and Florida GCTL.

Non-cancer risk estimates (total hazard indices [HIs]) developed on a target organ/effect basis for all receptors evaluated were less than unity (1.0). Consequently, adverse non-carcinogenic health effects are not anticipated under the conditions established in the exposure assessment.

Because published toxicity criteria are not available for lead, **exposure to lead in soil** was evaluated by the Integrated Exposure Uptake Biokinetic (IEUBK) Model and Technical Review Workgroup (TRW) Adult Lead Model for residential and non-residential exposure scenarios, respectively, as recommended by USEPA. The blood-lead concentration of a receptor is considered a key indicator of the potential for adverse health effects from lead contamination. The IEUBK and TRW models calculate the probability of a receptor's blood-lead level exceeding 10 micrograms per deciliter (µg/dL), the minimum concentration considered to be a "concern." In addition, the USEPA goal is to limit the risk (i.e., probability) of

exceeding a 10 µg/dL blood-lead concentration to 5 percent. Average lead concentrations at Site 43, as well as default parameters for some input parameters, were used in the evaluations.

The IEUBK Model for lead is designed to estimate blood levels of lead in children (under 7 years of age), and using the TRW model, adult exposure to lead in soil is addressed by evaluating the relationship between site soil lead concentrations and blood-lead concentrations in the developing fetuses of adult women. No models are currently available to evaluate periodic exposure of adolescent trespassers/recreational users to lead; therefore, the results of the IEUBK Model for children were used to qualitatively assess exposure of this receptor because potential adverse effects from exposure to lead are expected to be of a lesser magnitude for adolescent trespassers than for children. **Results** of the IEUBK and TRW Adult Lead Model analyses, as summarized in Table 2-3, indicate that exposure to average lead concentrations in surface and subsurface soil and the maximum concentration in groundwater would result in risks (probabilities) exceeding USEPA benchmarks.

TABLE 2-3. IEUBK AND ADULT LEAD MODEL RESULTS

RECEPTOR	PREDICTED BLOOD-LEAD LEVEL (µG/DL)	PROBABILITY THAT BLOOD-LEAD LEVEL WILL EXCEED 10 µG/DL	EXCEEDS USEPA GOAL?
Surface Soil - average concentration = 1,080 mg/kg[1]			
Child Resident	9.972	49.765	Yes
Full-Time Worker	3.1 – 3.3	4.1 – 7.0	Yes
Construction Worker	4.7 – 4.9	12.3 – 16.3	Yes
Recreational User	2.1 – 2.3	1.3 – 3.1	No
Subsurface Soil - average concentration = 274 mg/kg[1]			
Child Resident	4.049	2.72	No
Full-Time Worker	1.9 -2.1	0.9 – 2.3	No
Construction Worker	2.3 – 2.5	1.7 – 3.7	No
Subsurface Soil - hot spot average concentration = 1,355 mg/kg[2]			
Child Resident	11.662	62.822	Yes
Groundwater - maximum concentration = 29.9 µg/L			
Child Resident	5.242	8.469	Yes

1 Average concentration across the entire site.
2 Average of six samples collected in or near the IRA excavation area from 2 to 4 feet bls.

The **risk characterization** also evaluated risks from soil exposure to a hypothetical future resident and typical industrial worker using FDEP SCTLs for residential and industrial land use scenarios, respectively, and risks from groundwater exposure using GCTLs. Risks to hypothetical future recreational users were evaluated using SCTLs specifically developed for Site 43. The risk assessment included direct comparisons to GCTLs and direct contact SCTLs and comparisons to SCTLs modified (i.e., apportioned) per Florida guidance to take into account cumulative effects from multiple carcinogens or from multiple non-carcinogens acting on the same organ. Based on this evaluation, **unacceptable risks were identified for soil** due to cPAHs (recreational, industrial, and residential SCTLs), lead (industrial and residential SCTLs), and arsenic, barium, copper, and vanadium (residential SCTLs) (see Table 2-4). For groundwater, elevated risks were identified for **iron, lead, and manganese**. Iron and manganese were identified as groundwater COPCs because maximum concentrations exceeded USEPA secondary MCLs and FDEP secondary GCTLs. However, only lead was retained as a COC because iron and manganese appear to be a result of natural background conditions, as evidenced by site history and the spatial distribution of these metals in relation to groundwater flow at the site.

TABLE 2-4. RESULTS OF FLORIDA RISK ASSESSMENT			
COC	EPC	SCTL	ILCR
Residential Exposure to Surface Soil			
cPAHs	0.2	0.1	2.0×10^{-6}
Arsenic	8	2.1	2.8×10^{-6}
Residential Exposure to Subsurface Soil			
cPAHs	0.2	0.1	2.0×10^{-5}
Arsenic	3	2.1	1.4×10^{-6}
Lifelong Recreational User Exposure to Surface Soil			
Arsenic	8	6.2	1.3×10^{-6}
Industrial Exposure to Subsurface Soil			
cPAHs	2	0.7	2.9×10^{-6}
Lifelong Recreational User Exposure to Subsurface Soil			
cPAHs	2	0.83	2.4×10^{-6}

Exposure point concentrations (EPCs) and SCTLs in mg/kg.

A major source of uncertainty associated with soil risk estimates was the use of maximum and UCL concentrations across the entire site, which likely overestimated risks because maximum COC concentrations occur in several local "hotspot" areas at the site. In addition, arsenic concentrations in soil exceeded facility background concentrations but were within naturally occurring levels in the United States (average Site 43 soil concentration was approximately 3 mg/kg). In addition, the soil background data set for NAS Pensacola consists of only two locations and therefore background levels may not be adequately characterized. For groundwater, although unacceptable risks were identified, chloroform was detected in only 2 of 12 samples, and the maximum concentration was significantly less than the USEPA MCL and Florida GCTL.

Total ILCRs for all receptors evaluated were less than or within the USEPA target risk range of $1x10^{-6}$ to $1x10^{-4}$, and non-cancer risk estimates (total HIs) developed on a target organ/effect basis for all receptors evaluated were less than unity (1.0). However, risks to industrial workers (subsurface soil), lifelong recreational users (surface soil), and hypothetical future residents (surface and subsurface soil and shallow groundwater) were greater than the FDEP target risk range of $1x10^{-6}$. For lead, results of the IEUBK and TRW adult lead model analyses indicate that exposure to average lead concentrations in surface and subsurface soil and the maximum detected concentration in groundwater would result in risks (i.e., probabilities) exceeding USEPA benchmarks.

2.5.2 Summary of Ecological Risk

A **screening-level ERA**, consisting of Steps 1 through 3a of the Navy's ERA process, was completed at Site 43. In Step 1 (problem formulation), the environmental setting, chemical fate and transport, ecotoxicity and potential receptors, and complete exposure pathways (see Figure 2-5) were considered to develop an ecological CSM and assessment and measurement endpoints. Complete exposure pathways and routes of entry into biota at Site 43 include direct contact with soil (soil invertebrates and terrestrial vegetation), ingestion of soil (soil invertebrates and birds and small mammals), and ingestion of contaminated food items (birds and small mammals). Ecological receptors are not directly exposed to contaminants in groundwater at the site, and surface water is not present at or near Site 43. Contaminant migration pathways applicable at this site include erosion and infiltration. Because the site is largely covered by turf grass, wind erosion and airborne transport of dust was considered a negligible pathway for terrestrial animals and aerial deposition was considered a negligible pathway for plants and animals. However, if surface soil is disturbed through activities such as excavation, soils could serve as a source for airborne transport of contaminants, and soil contaminants could then be transported to downwind locations. Soil erosion due to storm water runoff is probably minimal at Site 43 due to the essentially level terrain and vegetation cover.

In Step 2, maximum concentrations of chemicals detected in surface soil at Site 43 were compared to USEPA Ecological Soil Screening Levels (Eco-SSLs) for chemicals with Eco-SSLs and to USEPA Region 4 Ecological Screening Values (ESVs) (2001) for all other detected chemicals. Hazard quotients (HQs) were calculated to characterize the potential for chemicals to pose ecological risk using conservative exposure assumptions. HQs represent a ratio of the exposure level to an ecological effects level and are an estimate of potential risk. If the maximum concentration was less than the Eco-SSL (or the ESV) (HQ less than 1.0), the chemical was eliminated from further consideration. If the maximum concentration equaled or exceeded the screening level (HQ greater than 1.0), or if a screening level was not available, the chemical was considered an ecological COPC and was retained for further assessment. Four inorganics (barium, copper, lead, and vanadium), three individual PAHs (benzo(a)pyrene, fluoranthene, and pyrene), and total PAHs were retained as COPCs because their maximum concentrations exceeded screening values. Ten other PAHs and bis(2-ethylhexyl) phthalate were retained as COPCs because screening levels were not available.

To evaluate potential risks to representative receptors from ingested doses of surface soil COPCs that are known to bioaccumulate or biomagnify (USEPA, 2000) food-chain modeling was conducted as part of the Step 3A refinement process. The assessment endpoints associated with the food-chain modeling were the protection of insectivorous birds, represented by the American robin, and insectivorous mammals, represented by the short-tailed shrew, from adverse effects of COPCs on growth, survival, and reproduction. Large terrestrial carnivorous birds and mammals were not selected as assessment endpoints because of the developed nature of the site and its small size compared to the typical foraging areas of carnivorous animals. Omnivores and herbivores were not selected as assessment endpoints because exposure to site COPCs is greater for insectivores than for omnivores and herbivores. Based on food-chain modeling results, lead concentrations in eight soil samples pose potential risks to insectivorous small mammals and birds that forage exclusively at Site 43 (HQs ranged from 3.3 to 39). These eight samples were collected from primarily three isolated areas: the vicinity of location PEN-43-SS21 (located within the former tennis court boundaries), Anomaly Area 11, and Anomaly Area 23. The extent to which birds and mammals forage at Site 43 is uncertain but is not expected to be significant based on the poor habitat at the site.

Results of Step 3A refinement for initial COPCs that do not bioaccumulate or biomagnify indicated unacceptable risks to soil invertebrates and plants from barium, copper, and lead. However, the locations where elevated concentrations for the final COPCs exist are primarily limited to three small isolated areas: within the vicinity of location PEN-43-SS21 (located within the former tennis court boundaries), Anomaly Area 11, and Anomaly Area 23. No impacts to plants and invertebrates at Site 43 are expected at other locations. The Navy, in consultation with USEPA and FDEP, determined that based on the lack of significant habitat, ecological risks at the site were negligible and therefore action to address the risks was not warranted.

2.5.3 Basis for Response Action

Unacceptable risks were estimated for residential and non-residential exposure to lead in soil and groundwater at Site 43. Arsenic, barium, copper, vanadium, and cPAHs were detected in surface and subsurface soil at concentrations exceeding FDEP residential risk-based criteria, and cPAHs and lead were detected at concentrations exceeding FDEP industrial risk-based screening criteria and site-specific recreational criteria (see Table 2-5). Because risks were identified under the current and reasonably anticipated future land use scenario (non-residential), a response action is necessary to protect the public health or welfare or the environment from actual or threatened releases of hazardous substances, pollutants, or contaminants into the environment that may present an imminent and substantial endangerment to public health or welfare.

TABLE 2-5. SOIL COCS REQUIRING A RESPONSE ACTION

COC	FDEP SCTL		SURFACE SOIL			SUBSURFACE SOIL		
	RESIDENTIAL	INDUSTRIAL	MAX. CONC.	FREQUENCY OF EXCEEDANCE		MAX. CONC.	FREQUENCY OF EXCEEDANCE	
				RESID	IND.		RESID.	IND.
Arsenic	2.1	12	8	6 / 10	0 / 10	14.6	4 / 6	1 / 6
Barium	120	130,000	726	5 / 10	0 / 10	939	6 / 6	0 / 6
Copper	150	89,000	889	4 / 10	0 / 10	3,380	6 / 6	0 / 6
Lead	400	1,400	7,360	7 / 10	5 / 10	5,500	6 / 6	2 / 6
Vanadium	67	10,000	73	1 / 10	0 / 10	156	1 / 6	0 / 6
cPAHs	0.10	0.70	288	5 / 10	0 / 10	14,766	3 / 6	1 / 6

Concentrations in mg/kg.

2.6 PRINCIPAL THREAT WASTES

Principal threat wastes are those source materials considered to be highly toxic or highly mobile that generally cannot be reliably contained or that would present a significant risk to human health or the environment should exposure occur. A source material is a material that includes or contains hazardous substances, pollutants, or contaminants that act as a reservoir for migration of contamination to groundwater, surface water, or air, or acts as a source for direct exposure. The NCP under 40 Code of Federal Regulations (CFR) 300.430(a)(1)(iii)(A) establishes an expectation that treatment will be used to address the principal threats posed by a site wherever practicable. There are no source materials constituting principal threat wastes at Site 43 because source material was removed during the 2001 IRA.

2.7 REMEDIAL ACTION OBJECTIVES

RAOs are media-specific goals that define the objective of conducting remedial actions to protect human health and the environment. RAOs specify the COCs, potential exposure routes and receptors, and acceptable concentrations (i.e., cleanup goals) for a site and provide a general description of what the cleanup will accomplish. RAOs typically serve as the design basis for the remedial alternatives that were evaluated as described in Section 2.8. The RAOs for Site 43 are as follows:

- Prevent unacceptable human health risk associated with exposure to soil containing arsenic, barium, copper, lead, vanadium, and PAHs at concentrations greater than FDEP SCTLs.
- Prevent unacceptable human health risk associated with exposure to groundwater containing lead concentrations greater than the FDEP GCTL and USEPA Action Level.

Table 2-6 presents the soil cleanup goals established in the FS.

The groundwater cleanup goal is the FDEP GCTL and USEPA Action Level of 15 µg/L for lead.

TABLE 2-6. SOIL CLEANUP GOALS		
COC	RESIDENTIAL	INDUSTRIAL
cPAHs	100 µg/kg	700 µg/kg
Arsenic	2.1 mg/kg	12 mg/kg
Barium	120 mg/kg	NA
Copper	150 mg/kg	NA
Lead	400 mg/kg	1,400 mg/kg
Vanadium	67 mg/kg	NA

NA – Not applicable, no industrial exceedances.

2.8 Description and Comparative Analysis of Remedial Alternatives

To address estimated unacceptable human health risks associated with soil and groundwater at Site 43, a **preliminary screening** of General Response Actions (GRAs) and remedial approaches was completed as detailed in the FS. Remedial approaches under five soil and three groundwater GRAs were retained after preliminary screening and were then evaluated with respect to implementability, effectiveness, and relative cost (high/medium/low).

Soil remedial technologies and process options excluded from further analysis included:

- Infiltration barriers under the containment GRA because reduction of infiltration is not required to meet RAOs.
- In-situ treatment including thermal, physical/chemical, and biological technologies because they were not applicable to all site contaminants or conditions or because they would interfere with future site uses.

Groundwater remedial technologies and process options excluded from further analysis included in-situ biological treatment processes because they are not suitable for site contaminants and/or conditions.

Consistent with the NCP, no action alternatives were evaluated for soil and groundwater as baselines for comparison with other alternatives during the comparative analyses. Four **remedial alternatives** for soil (no action, excavation to meet industrial SCTLs, excavation to meet residential SCTLs, and limited excavation and pavement maintenance to meet industrial SCTLs) and three groundwater alternatives (no action, LUCs and long-term monitoring, and in-situ treatment) were retained for a detailed comparative analysis in accordance with the NCP (see Tables 2-8 and 2-9, respectively).

2.8.1 Description of Remedial Alternatives

Table 2-7 describes the major components and provides estimated costs for the soil remedial alternatives identified for Site 43, and Table 2-8 provides this information for groundwater alternatives.

TABLE 2-7. SOIL REMEDIAL ALTERNATIVES EVALUATED

ALTERNATIVE	COMPONENTS	DETAILS	COST
S-0: No Action *No action to address contaminated soil and no restrictions on activities.*	None	No action	No cost
S-1: Excavation to Meet Industrial SCTLs and Off-Site Disposal and LUCs *Excavation and off-site disposal of soil such that remaining COC concentrations meet industrial SCTLs and LUCs*	Excavation and off-site treatment (if required) and disposal of soil	Excavation of approximately 136 cubic yards of soil in four areas; off-site treatment (if required) and off-site disposal; confirmation sampling; backfilling with clean soil and reseeding or repaving	**Capital**: $358,000 **O&M (NPW 30-Year)**: $77,000 **Total Cost (30-Year NPW)**: $435,000 **Discount rate**: 7% **Time frame**: 6 months
	LUCs	LUCs to prohibit residential activities and uncontrolled soil excavation	
S-2: Excavation to Meet Residential SCTLs and Off-Site Disposal *Excavation and off-site disposal of soil such that remaining COC concentrations meet residential SCTLs*	Excavation and off-site disposal of soil (soil pre-treatment if required)	Excavation of approximately 1,800 cubic yards of soil in four areas; off-site treatment (if required) and disposal; confirmation sampling; backfilling with clean soil (including 600 cubic yards of uncontaminated surface soil from 2001 IRA excavation areas) and reseeding or repaving	**Capital**: $706,000 **O&M (NPW 30-Year)**: $0 **Total Cost (30-Year NPW)**: $706,000 **Discount rate**: 7% **Time frame**: 6 months
S-3: Limited Excavation to Meet Industrial SCTLs, Off-Site Disposal, Maintenance of Pavement, and LUCs *Limited excavation and off-site disposal of soil and maintenance of existing pavement such that exposure to soil with COC concentrations exceeding industrial SCTLs does not*	Excavation and off-site disposal of soil (soil pre-treatment if required)	Excavation of approximately 120 cubic yards of soil; off-site treatment (if required) and disposal; confirmation sampling; backfilling with clean soil, covering with topsoil, and reseeding	**Capital**: $300,000 **O&M (NPW 30-Year)**: $90,000 **Total Cost (30-Year NPW)**: $390,000 **Discount rate**: 7% **Time frame**: 6 months
	LUCs	LUCs to prohibit residential uses and uncontrolled soil excavation and to ensure inspection and maintenance of pavement	

TABLE 2-8. GROUNDWATER REMEDIAL ALTERNATIVES EVALUATED

ALTERNATIVE	COMPONENTS	DETAILS	COST
G-0: No Action *No action to address contaminated groundwater and no restrictions on activities.*	None	No action	No cost
G-1: LUCs and Long-Term Monitoring *LUCs to prevent use of groundwater and long-term monitoring to verify lack of plume migration*	LUCs	Implementation of groundwater use restrictions to prevent exposure to contaminated groundwater	**Capital**: $114,000 **O&M (NPW 30-Year)**: $92,000 **Total Cost (30-Year NPW)**: $206,000 **Discount rate**: 7% **Time frame**: Immediately
	Long-term monitoring	Collection of groundwater samples from four wells (one existing and three new downgradient wells) and analyzing them for total lead for a period of 1 year or until concentrations decrease to less than the CG	

TABLE 2-8. GROUNDWATER REMEDIAL ALTERNATIVES EVALUATED			
ALTERNATIVE	COMPONENTS	DETAILS	COST
G-2: In-Situ Treatment, Short-Term LUCs, and Monitoring *In-situ precipitation of lead using diammonium phosphate, LUCs to prevent use of groundwater until treatment is complete, and monitoring to evaluate treatment progress*	In-situ precipitation	DPT injection of diammonium phosphate (two rounds) to decrease lead solubility such that filtered lead concentrations would be less than the CG	**Capital**: $286,000 **O&M (NPW 30-Year)**: $41,000 **Total Cost (30-Year NPW)**: $372,000 **Discount rate**: 7% **Time frame**: 2 years
	Short-term LUCs	Implementation of short-term groundwater use restrictions until lead concentrations meet the CG	
	Monitoring	Collection of groundwater samples from four wells (one existing and three new downgradient wells) and analyzing them for total and dissolved lead to evaluate treatment effectiveness	

2.8.2 Comparative Analysis of Remedial Alternatives

Tables 2-9 and 2-10 and the following text summarize the comparative analysis of soil and groundwater alternatives with respect to the nine CERCLA evaluation criteria.

Threshold Criteria

Overall Protection of Human Health and the Environment. The no action alternative for both soil and groundwater would not achieve the RAOs and therefore would not protect human health and the environment. They will not be considered further in this ROD.

For soil, although Alternative S-2 would be the most protective of human health because it would permanently remove all unacceptable risks from exposure to soil COCs through excavation and off-site disposal, this alternative is not consistent with current and reasonably anticipated future land use (non-residential). Alternatives S-1 and S-3 are consistent with current and reasonably anticipated land use scenario and are protective of human health and the environment. LUCs would be required under these two alternatives to restrict future site use to non-residential use and prohibit pavement disturbance. For groundwater, the treatment alternative, G-2, would be more protective of human health than LUCs and monitoring, G-1, because it employs treatment and does not depend on groundwater use prohibitions to provide protection.

Compliance with ARARs. ARARs include any federal or state standards, requirements, criteria, or limitations determined to be legally applicable or relevant and appropriate to the site or remedial action. No location-specific ARARs were identified for Site 43. All active alternatives evaluated for soil and groundwater would meet all chemical- and action-specific ARARs to the same general degree.

Primary Balancing Criteria

Long-Term Effectiveness and Permanence. Alternative S-2 would have the most long-term effectiveness and permanence because all contaminated soil with COC concentrations greater than residential SCTLs would be removed from the site. Alternative S-1 would have less long-term effectiveness and permanence than S-2 (because contamination would remain on site and LUCs would be required) but more than S-3. Alternative S-3 would have the least long-term effectiveness and permanence because contaminated soil would remain at the site under pavement that would have to be maintained and the pavement might require significant repairs or total replacement in the future to provide continued protectiveness. For groundwater, Alternative G-2 (in-situ precipitation) would have a higher degree of long-term effectiveness and permanence because it has the potential to permanently attain the CG; however, Alternative G-1 would depend on groundwater use controls for its long-term effectiveness.

Reduction in Toxicity, Mobility, or Volume Through Treatment. It was assumed that off-site treatment by chemical fixation/solidification would be conducted for all of the soil alternatives. Although the exact amount of soil requiring off-site treatment prior to land disposal would be determined based on the results of TCLP testing, it was assumed that 100 percent of the soil would be treated to reduce the toxicity, mobility, or volume of hazardous substances (1,800 cubic yards for S-2, 136 cubic yards for S-1, and 120 cubic yards for S-3). Because of the type of contamination at Site 43 and its relatively low long-term risk based on the current and reasonably anticipated future site use, the limited amount of soil treatment was deemed impracticable. For groundwater, Alternative G-2 would reduce the mobility and bioavailability (toxicity) of lead in groundwater.

Short-Term Effectiveness. Because of the removal and off-base transportation of a larger quantity of soil, which would involve a greater opportunity for exposure of remediation workers to contaminated soil and a slightly greater potential to impact the surrounding community during transport of excavated soil, Alternative G-2 would pose greater short-term risk than the other alternatives. Alternative G-3 would pose the least short-term risks because of the lesser amount of soil to be excavated. Under all alternatives, exposure to impacted soil during excavation and restoration activities would pose additional short-term risks to site workers. The use of proper personal protective equipment (PPE), monitoring equipment, and observance of Occupational Safety and Health Administration (OSHA) guidelines would address the worker exposure concerns for all alternatives, and potential environmental effects such as dust, stormwater and erosion, and noise abatement could be managed through control measures implemented during excavation activities. Alternatives S-1 and S-3, which include LUCs, would have additional short-term risks associated with periodic inspections of the site.

For groundwater, Alternative G-2 would initially pose the most short-term concerns to workers involved in the active treatment process; however, after verification of successful treatment, no further worker exposure would occur. Alternative G-2 would not adversely impact the surrounding community or the environment. Worker exposure to groundwater during sampling would continue under Alternative G-1 until the CG is achieved. Risks to the surrounding community and the environment from off-site transportation of investigation-derived waste (e.g., water from well purging) would be minimal. These risks would be adequately mitigated through adherence to OSHA regulations and site-specific health and safety procedures. The LUCs and monitoring included under G-2 would achieve the groundwater RAO immediately upon implementation of groundwater use controls. Eventual compliance of Alternative G-1 with the groundwater CG would be determined through monitoring. In-situ precipitation would also achieve the groundwater RAO immediately upon implementation of groundwater use controls, but the CG would not be attained for approximately 2 years.

Implementability. The excavation alternatives would all be easy to implement because resources, equipment, and materials for soil excavation (basic earth-moving equipment) are readily available. Except for procurement of the appropriate disposal facility and arrangement for transportation, these alternatives would not require an extended planning phase or design. Delineation to determine the limits of excavation area and site restoration would need to be verified through sampling under each scenario. In addition, the administrative implementability of the excavation alternatives (e.g., manifesting for off-site transportation) would be relatively easy. Alternatives S-1 and S-3, which include LUCs, would involve additional administrative aspects (inspection and maintenance) but would still be readily implementable. For groundwater, Alternative G-1 would involve more administrative implementability requirements (because of the need to indefinitely maintain groundwater use controls), whereas, Alternative G-2 would involve more technical implementability requirements associated with in-situ treatment.

Cost. For soil, the estimated present-worth cost is greatest for Alternative S-2, $706,000. The estimated present-worth for S-1 is $435,000, and the estimated present-worth for S-3 is $390,000. For groundwater, the estimated present-worth cost is greatest for Alternative G-2, $372,000. The estimated present-worth for Alternative G-2 is $206,000.

Modifying Criteria

State Acceptance. State involvement has been solicited throughout the CERCLA process for Site 43. FDEP, as the designated state support agency in Florida, concurs with the Selected Remedy.

Community Acceptance. No written questions were received during the formal public comment period for the Proposed Plan, and a public meeting was not requested.

TABLE 2-9. SUMMARY OF COMPARATIVE ANALYSIS OF SOIL ALTERNATIVES

CERCLA CRITERION	S-0: NO ACTION	S-1: EXCAVATION AND OFF-SITE DISPOSAL TO MEET INDUSTRIAL SCTLS AND LUCS	S-2: EXCAVATION AND OFF-SITE DISPOSAL TO MEET RESIDENTIAL SCTLS	S-3: LIMITED EXCAVATION, OFF-SITE DISPOSAL, AND MAINTENANCE OF PAVEMENT TO MEET INDUSTRIAL SCTLS AND LUCS
Overall Protection of Human Health and the Environment	○	◎	●	●
Compliance With ARARs	○	●	●	●
Long-Term Effectiveness and Permanence	○	◎	●	◎
Reduction of Toxicity, Mobility, and Volume		◎	◎	◎
Short-Term Effectiveness	○	◎	○	●
Implementability	●	●	●	◎
Capital Cost NPW of O&M NPW	$0	$358,000 $77,000 $435,000	$706,000 -- --	$300,000 $90,000 $390,000
State Acceptance	○	●	●	●
Community Acceptance	○	●	●	●

● - High. ◎ - Medium. ○ - Low.

TABLE 2-10. SUMMARY OF COMPARATIVE ANALYSIS OF GROUNDWATER ALTERNATIVES

CERCLA CRITERION	G-0: NO ACTION	G-1: LUCS AND LONG-TERM MONITORING	G-2: IN-SITU GROUNDWATER TREATMENT AND SHORT-TERM LUCS WITH MONITORING
Overall Protection of Human Health and the Environment	○	◎	●
Compliance With ARARs	○	●	●
Long-Term Effectiveness and Permanence	○	◎	●
Reduction of Toxicity, Mobility, and Volume	NA	○	◎
Short-Term Effectiveness	○	●	◎
Implementability	●	●	◎
Capital Cost NPW of O&M NPW	$0	$114,000 $92,000 $206,000	$286,000 $21,000 $327,000
State Acceptance	○	●	●
Community Acceptance	○	●	●

● - High. ◎ - Medium. ○ - Low.

2.9 SELECTED REMEDY

2.9.1 Rationale for Selected Remedy

The Selected Remedy for Site 43 at NAS Pensacola includes limited soil excavation and off-site disposal, to meet industrial SCTLs, LUCs, and long-term groundwater monitoring. As reflected in Tables 2-9 and 2-10, these soil and groundwater alternatives were selected because they provide the best balance of tradeoffs with respect to the nine CERCLA remedy selection evaluation criteria and will allow for continued non-residential use of the property. The remedy will meet the RAOs by excavating contaminated soil to the extent that soil concentrations are less than industrial SCTLs, by monitoring groundwater to evaluate decreases in concentrations and to verify lack of off-site migration, and by implementing LUCs to prohibit future residential activities, to ensure maintenance of paved areas, and to prohibit uncontrolled soil excavation and groundwater use at the site.

The key factors in the selection of this remedy were as follows:

- The remedy is consistent with the reasonably anticipated future non-residential use of the site and will allow continued use of the parking area without disturbance of the pavement.
- The remedy achieves similar protection at a significantly lower cost less than full-scale removal to achieve unrestricted use and unlimited exposure ($390,000 compared to $706,000).

- Because it is expected that, with the removal of the soil source, lead concentrations in groundwater may rapidly decrease to less than the CG, and because long-term LUCs will be required to prevent residential development and ensure maintenance of pavement, the inclusion of a groundwater use restriction was not additionally burdensome.

2.9.2 Description of Selected Remedy

The Selected Remedy includes three major components: (1) excavation and off-site disposal of the most contaminated soil (in unpaved areas) to meet industrial SCTLs; (2) groundwater monitoring; and (3) LUCs to prohibit future residential use, to ensure maintenance of paved areas, and prohibit groundwater use.

Soil will be excavated from an area of approximately 1,031 square feet to an estimated depth of 4 feet, for a total of approximately 120 (in-situ) cubic yards of soil (see Figure 2-6). The final excavation limits will be determined based on sampling conducted prior to or during preparation of the soil Remedial Design (RD). During the 2001 IRA, ornamental ordnance and inert munitions were encountered and removed from the site, but as a precaution, an unexploded ordnance (UXO) specialist will be present to verify that any excavated debris does not contain UXO.

Confirmatory samples will be collected from the sidewalls and bottoms of the excavated areas to verify that industrial SCTLs are met. TCLP sampling will be conducted to verify disposal requirements. For costing purposes, it was assumed that all of the soil would exceed TCLP limits and require treatment, possibly using chemical fixation/solidification, to meet land disposal requirements at a RCRA Subtitle C facility. Approximately 120 cubic yards of excavated void will be filled with clean backfill, covered with top soil, and seeded with grass.

Figure 2-6. Selected Remedy – Limited Soil Excavation, LUCs, and Long-Term Monitoring

LUCs will be implemented within the Site 43 boundaries (see Figure 2-6) to limit use of the property, to control access to the remaining contaminated soil (exceeding residential SCTLs), and to prohibit groundwater use. Consistent with the RAOs developed for the site, the specific performance objectives for the LUCs to be implemented at Site 43 are as follows:

- To prohibit residential uses of the site. Prohibited residential uses shall include, but not be limited to, any form of housing, child-care facilities, pre-schools, elementary schools, secondary schools, playgrounds, convalescent, or nursing care facilities.
- To prohibit the unauthorized excavation and/or removal of soil with contaminant concentrations exceeding FDEP residential SCTLs.
- To prohibit all uses of groundwater from the surficial aquifer underlying the site including, but not limited to, human consumption, dewatering, irrigation, heating/cooling purposes, and industrial processes.
- To maintain the integrity of the current 40,000-square-foot parking lot on the site.
- To maintain the integrity of existing or any future monitoring or remediation system(s).

The following generally describes those LUCs that will be implemented at Site 43 to achieve the aforementioned LUC performance objectives:

Institutional Controls:

- Incorporation of the LUC boundaries and all prohibited land and groundwater uses into the Base Master Plan (and any other documents governing land use at the installation).
- Utilization of the installation Dig Permitting process to require review/approval and implementation of appropriate worker protection practices before any intrusive activities are performed at the site.
- Placement of appropriate notices and restrictions in any deed of conveyance or lease affecting the site in the event the property is conveyed or leased to a third party.

Engineering Controls:

- Posting of signs at the site advising that any excavation activity must be authorized in advance by the base environmental department. The size, location, and content of the signs will be specified in the LUC RD.
- Maintenance of the existing parking lot to preclude access to underlying contaminated soil.

These LUCs will be implemented and maintained by the Navy until concentrations of hazardous substances in soil are at levels that allow for unrestricted use and unlimited exposure. The Navy or any subsequent owners shall not modify, delete, or terminate any LUC without USEPA and FDEP concurrence. The Navy is responsible for implementing, maintaining, reporting on, and enforcing the LUCs described in this ROD. Although the Navy may later transfer these procedural responsibilities to another party by contract, property transfer agreement, or through other means, the Navy shall retain ultimate responsibility for the remedy integrity. Should any LUC remedy fail, the Navy will ensure that appropriate actions are taken to reestablish the remedy's protectiveness and may initiate legal action to either compel action by a third party(ies) and/or to recover the Navy's costs for remedying any discovered LUC violation(s).

All LUC implementation actions including monitoring and enforcement requirements will be set forth in the Site 43 LUC RD that will be prepared by the Navy as the LUC component of the overall RD. Within

90 days of ROD signature, the Navy shall prepare and submit to USEPA and FDEP for review and comment (pursuant to those Primary Document review procedures stipulated in the FFA) the LUC RD for Site 43 that shall contain implementation and maintenance actions, including periodic inspections. The Navy will maintain, monitor, and enforce the LUCs according to the LUC RD. LUCs have been developed in accordance with the Principles and Procedures for Specifying, Monitoring, and Enforcement of Land Use Controls and Other Post-ROD Actions, per letter dated October 2, 2003, from Raymond F. DuBois, Deputy Under Secretary of Defense (Installations and Environment), to Hon. Marianne Lamont Horinko, Acting Administrator, USEPA.

Monitoring will consist of collecting and analyzing groundwater samples from four monitoring wells, one existing well and three new downgradient wells, quarterly for 1 year for analysis of lead. After 1 year, data will be evaluated to determine future monitoring requirements. Additional groundwater samples will be collected in the area around the existing well with the lead GCTL exceedance to confirm the extent of the groundwater contamination and to provide direction for installation of the new downgradient wells. Other existing permanent monitoring wells may periodically substitute for the downgradient monitoring wells to verify that contamination has not appeared elsewhere in groundwater at the site.

2.9.3 Expected Outcomes of Selected Remedy

It is expected that the Selected Remedy will be protective of human health and the environment while allowing for continued non-residential uses of the land and facilities within the boundaries of Site 43. The RAOs for Site 43 should be achieved within approximately 6 months of implementation of the remedy. The soil excavation effort will result in short-term disruptions to ongoing site operations, but the longer-term soil LUC component should have only minimal impact on future property usage. The shallow groundwater use prohibition component of the Selected Remedy should not negatively impact future site usage because past operations at the site have not historically relied upon the use of that resource. Table 2-11 describes how the Selected Remedy mitigates risk and achieves the RAOs for Site 43.

TABLE 2-11. HOW SELECTED REMEDY MITIGATES RISK AND ACHIEVES RAOS

RISK	RAO	COMMENTS
Direct exposure to, ingestion of, and inhalation of contaminated soil and groundwater	Prevent unacceptable human health risk from exposure to soil containing arsenic, barium, copper, lead, vanadium, and cPAHs	Excavation of soil in unpaved areas to meet risk-based industrial SCTLs use will remove contaminated soil from unpaved areas of the site. Paved areas will provide a barrier to contaminated soil left on site. LUCs will limit exposures via ingestion, dermal contact, and inhalation that result in unacceptable risks by preventing residential use, by preventing exposure by ensuring maintenance of pavement areas, and by preventing uncontrolled excavation of soil with residential SCTL exceedances from the site.
	Prevent unacceptable human health risk from exposure to groundwater containing lead	LUCs to prevent unacceptable risks from exposure to contaminated groundwater by preventing use/exposure. Monitoring will be implemented to verify that lead contamination is not migrating off site.

With regard to soil, because metals contamination does not readily attenuate through natural processes, LUCs to preclude residential use of the site will need to remain in effect for the foreseeable future unless more active remedial measures are undertaken to allow for future unrestricted site use. For groundwater, it is expected that the planned removal of lead-contaminated soil will result in decreases of current lead concentrations over time. The Selected Remedy includes 1 year of groundwater monitoring followed by a re-evaluation of conditions. Any modifications to the LUCs to be implemented for groundwater based on such a re-evaluation(s) will be made in accordance with the provisions of the LUC RD for Site 43.

2.9.4 Statutory Determinations

In accordance with Section 121(b) of CERCLA, the Selected Remedy meets the following statutory criteria:

- **Protection of Human Health and the Environment** – The Selected Remedy will prevent future risks associated with maintenance and industrial worker exposure to contaminated surface and subsurface soil and groundwater. Excavation of soil to achieve industrial SCTLs will be conducted and LUCs will be implemented to ensure current protectiveness.

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

- **Cost-Effectiveness** – The Selected Remedy is the most cost-effective alternative that allows for continued non-residential of the property and represents the most reasonable value for the money. The costs are proportional to overall effectiveness by achieving a reasonable degree of long-term effectiveness and permanence within a reasonable time frame. Detailed costs for the Selected Remedy are presented in Appendix B.

- **Utilization of Permanent Solutions and Alternative Treatment Technologies or Resource Recovery Technologies to the Maximum Extent Practicable** – The Selected Remedy represents the most practical utilization of permanent solutions and treatment and recovery technologies taking into account site-specific conditions and current and anticipated future land uses. It requires the removal and off-site treatment as needed of soil with contaminant concentrations exceeding industrial use criteria, which in turn should lead to the relatively rapid restoration of shallow groundwater, which is the best permanent solution to the lead contamination currently affecting that resource. By removing soil not acceptable for exposures normally associated with industrial activities, it will also serve to ensure that anticipated future industrial and recreational uses of the property may be safely undertaken.

- **Preference for Treatment as a Principal Element** – Only limited off-site soil treatment, if required, is included in the Selected Remedy at Site 43 because there are no principal threat wastes at the site and because limited excavation and LUCs provides the best balance of tradeoffs with respect to long-term effectiveness and permanence at a reasonable cost.

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

2.10 Community Participation

The Navy performs public participation activities in accordance with CERCLA and the NCP throughout the site cleanup process at NAS Pensacola. The Navy has a comprehensive community relations program for NAS Pensacola, and community relations activities are conducted in accordance with NAS Pensacola Community Involvement Plan. These activities include regular technical and Restoration Advisory Board (RAB) meetings with local officials and the establishment of an Information Repository at the local library for dissemination of information to the community.

The Navy organized a RAB in 1995 to review and discuss NAS Pensacola environmental issues with local community officials and concerned citizens. The RAB consists of representatives of the Navy, USEPA, FDEP, and members of the community. The RAB has met frequently since its inception. Site 43 investigation activities, results, and associated remedial decisions have been discussed at RAB meetings and formally presented to the RAB on September 1, 2009. The NAS Pensacola Information Repository is located at the John C. Pace Library, University of West Florida, 11000 University Parkway, Pensacola,

Florida. Documents and other relevant information relied upon in the remedy selection process are available for public review in the Information Repository, which includes a copy of the Administrative Record. For access to the Administrative Record or additional information on the Installation Restoration Program at NAS Pensacola, contact: Greg Campbell, Remedial Project Manager, NAS Pensacola, Navy Public Works Department, Building 3560, 310 John Tower Road, Pensacola, Florida, 32508-5000, 850-452-3146, e-mail Gregory.Campbell@navy.mil.

In accordance with Sections 113 and 117 of CERCLA, the Navy provided a public comment period from July 20 to August 18, 2009, for the proposed remedial action described in the Proposed Plan for Site 43. Public notice of the availability of documents and opportunity for a public meeting was published in the Pensacola News Journal on July 19, 2009.

3.0 Responsiveness Summary

Although the opportunity for a public hearing was provided as stated in the Navy's public notice, none was requested, and no written comments, concerns, or questions were received by the Navy, USEPA, or FDEP during the public comment period.

ACRONYMS

ARAR	Applicable or Relevant and Appropriate Requirement
BaPEq	Benzo(a)pyrene equivalents
bls	Below land surface
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
COC	Chemical of concern
COPC	Chemical of potential concern
cPAH	Carcinogenic polynuclear aromatic hydrocarbon
CSF	Cancer slope factor
CSM	Conceptual Site Model
Eco-SSL	Ecological Soil Screening Level
EPC	Exposure point concentration
ERA	Ecological risk assessment
ER, N	Environmental Restoration, Navy
ESV	Ecological Screening Value
F.A.C.	Florida Administrative Code
FDEP	Florida Department of Environmental Protection
FFA	Federal Facility Agreement
FS	Feasibility Study
GCTL	Groundwater Cleanup Target Level
GRA	General Response Action
HHRA	Human health risk assessment
HI	Hazard index
HQ	Hazard quotient
IEUBK	Integrated Exposure Uptake Biokinetic
ILCR	Incremental lifetime cancer risk
IRA	Interim Remedial Action
LUC	Land use control
MCL	Maximum Contaminant Level
mg/kg	Milligram per kilogram
NCP	National Oil and Hazardous Substances Pollution Contingency Plan
NFA	No Further Action
NPW	Net present worth
NAS	Naval Air Station
NEESA	Naval Energy and Environmental Support Activity
NTTC	Naval Technical Training Center
O&M	Operation and maintenance

OSHA	Occupational Safety and Health Administration
PAH	Polynuclear aromatic hydrocarbon
PPE	Personal protective equipment
PRG	Preliminary Remediation Goal
RAB	Restoration Advisory Board
RAO	Remedial Action Objective
RCRA	Resource Conservation and Recovery Act
RD	Remedial Design
RfD	Reference dose
RG	Remedial Goal
RI	Remedial Investigation
RME	Reasonable maximum exposure
ROD	Record of Decision
SARA	Superfund Amendments and Reauthorization Act
SMP	Site Management Plan
SSL	Soil Screening Level
SVOC	Semivolatile organic compound
TAL	Target Analyte List
TCL	Target Compound List
TCLP	Toxicity Characteristic Leaching Procedure
TRW	Technical Review Workgroup
TtNUS	Tetra Tech NUS, Inc.
UCL	Upper Confidence Limit
USEPA	United States Environmental Protection Agency
UXO	Unexploded ordnance
VOC	Volatile organic compound
µg/dL	Microgram per deciliter
µg/L	Microgram per liter

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Administrative Record Reference Table

DETAILED ADMINISTRATIVE RECORD REFERENCE TABLE

Item	Reference Phrase in ROD	Location in ROD	Location of Information in Administrative Record
1	initial identification	Section 2.2, Table 2-1	Remedial Investigation Report for the Demolition Debris Disposal Area Site 43, Naval Air Station Pensacola, Pensacola, Florida. Section 1.2.1, page 1-3. TtNUS, 2006.
2	geophysical anomalies	Section 2.2, Table 2-1	Geophysical Investigation of Buried Drum Area Site 10 (West), Naval Air Station Pensacola. Sections 3 and 4, pages 4 to 16. Ensafe/Allen & Hoshall, 1994.
3	sampling	Section 2.2, Table 2-1	Site Characterization Report, (Site 43), Naval Air Station Pensacola, Pensacola, Florida. Section 3.2, pages 3-1 to 3-5, and Figures 3-1 to 3-3. TtNUS, 2004.
4	removal	Section 2.2, Table 2-1	Project Completion Report, Excavation of Contaminated Soil and Groundwater Monitoring at Site 43, Naval Air Station Pensacola, Pensacola, Florida. Section 4.0, pages 4-1 to 4-11. CH2MHILL Constructors, Inc., 2002.
5	soil samples	Section 2.2, Table 2-1	Remedial Investigation Report for the Demolition Debris Disposal Area Site 43, Naval Air Station Pensacola, Pensacola, Florida. Section 2.1, pages 2-1 to 2-4. TtNUS, 2006.
6	groundwater samples	Section 2.2, Table 2-1	Remedial Investigation Report for the Demolition Debris Disposal Area Site 43, Naval Air Station Pensacola, Pensacola, Florida. Section 2.4, pages 2-7 and Figure 2-3. TtNUS, 2006.
7	remedial alternatives	Section 2.2, Table 2-1	Feasibility Study Report for Site 43, Demolition Debris Disposal Area, Naval Air Station Pensacola, Pensacola, Florida. Section 4.1, pages 4-1 to 4-3. TtNUS, 2008.
8	overburden materials	Section 2.3	Remedial Investigation Report for the Demolition Debris Disposal Area Site 43, Naval Air Station Pensacola, Pensacola, Florida. Sections 3.4 and 3.5, page 3-3. TtNUS, 2006.
9	inorganics	Section 2.3	Remedial Investigation Report for the Demolition Debris Disposal Area Site 43, Naval Air Station Pensacola, Pensacola, Florida. Sections 5.2.2 and 5.3.2, pages 5-8 and 5-9. TtNUS, 2006.
10	PAHs	Section 2.3	Remedial Investigation Report for the Demolition Debris Disposal Area Site 43, Naval Air Station Pensacola, Pensacola, Florida. Sections 5.2.1 and 5.3.1, pages 5-8 and 5-9. TtNUS, 2006.
11	chemicals of potential concern	Section 2.5.1	Remedial Investigation Report for the Demolition Debris Disposal Area Site 43, Naval Air Station Pensacola, Pensacola, Florida. Tables 6-1 to 6-3. TtNUS, 2006.
12	exposure assessment	Section 2.5.1	Remedial Investigation Report for the Demolition Debris Disposal Area Site 43, Naval Air Station Pensacola, Pensacola, Florida. Section 6.1.3, pages 6-13 to 6-17. TtNUS, 2006.
13	Toxicity assessment	Section 2.5.1	Remedial Investigation Report for the Demolition Debris Disposal Area Site 43, Naval Air Station Pensacola, Pensacola, Florida. Section 6.1.4, pages 6-27 to 6-29. TtNUS, 2006.

DETAILED ADMINISTRATIVE RECORD REFERENCE TABLE

Item	Reference Phrase in ROD	Location in ROD	Location of Information in Administrative Record
14	cancer risks and non-cancer hazards	Section 2.5.1	Remedial Investigation Report for the Demolition Debris Disposal Area Site 43, Naval Air Station Pensacola, Pensacola, Florida. Section 6.1.5, pages 6-29 to 6-33. TtNUS, 2006.
15	exposure to lead in soil	Section 2.5.1	Remedial Investigation Report for the Demolition Debris Disposal Area Site 43, Naval Air Station Pensacola, Pensacola, Florida. Section 6.1.5, pages 6-33 to 6-35. TtNUS, 2006.
16	Results	Section 2.5.1	Remedial Investigation Report for the Demolition Debris Disposal Area Site 43, Naval Air Station Pensacola, Pensacola, Florida. Section 6.1.5, pages 6-35 and 6-36. TtNUS, 2006.
17	risk characterization	Section 2.5.1	Remedial Investigation Report for the Demolition Debris Disposal Area Site 43, Naval Air Station Pensacola, Pensacola, Florida. Section 6.1.6, pages 6-36 to 6-51. TtNUS, 2006.
18	unacceptable risks were identified for soil	Section 2.5.1	Remedial Investigation Report for the Demolition Debris Disposal Area Site 43, Naval Air Station Pensacola, Pensacola, Florida. Sections 6.1.6.3.1 and 6.1.6.3.2, pages 6-51 to 6-54. TtNUS, 2006.
19	iron, lead, and manganese	Section 2.5.1	Remedial Investigation Report for the Demolition Debris Disposal Area Site 43, Naval Air Station Pensacola, Pensacola, Florida. Section 6.1.6.3.3, pages 6-54 TtNUS, 2006.
20	State of Florida regulations	Section 2.5.1	Remedial Investigation Report for the Demolition Debris Disposal Area Site 43, Naval Air Station Pensacola, Pensacola, Florida. Appendix D. TtNUS, 2006.
21	screening-level ERA	Section 2.5.2	Remedial Investigation Report for the Demolition Debris Disposal Area Site 43, Naval Air Station Pensacola, Pensacola, Florida. Section 6.2, pages 6-67 to 6-85. TtNUS, 2006.
22	preliminary technology screening evaluation	Section 2.8	Feasibility Study Report for Site 43, Demolition Debris Disposal Area, Naval Air Station Pensacola, Pensacola, Florida. Tables 3-1, 3-2, and 3-3. TtNUS, 2008.
23	four soil alternatives and three groundwater alternatives	Section 2.8	Feasibility Study Report for Site 43, Demolition Debris Disposal Area, Naval Air Station Pensacola, Pensacola, Florida. Sections 4-3 and 4-4, pages 4-8 to 4-28. TtNUS, 2008.
24	approximately 136 cubic yards	Section 2.8.1, Table 2-7	Feasibility Study Report for Site 43, Demolition Debris Disposal Area, Naval Air Station Pensacola, Pensacola, Florida. Figure 4-1. TtNUS, 2008.
25	Cost	Section 2.8.1, Table 2-7	Feasibility Study Report for Site 43, Demolition Debris Disposal Area, Naval Air Station Pensacola, Pensacola, Florida. Appendix C. TtNUS, 2008.
26	approximately 1,800 cubic yards	Section 2.8.1, Table 2-7	Feasibility Study Report for Site 43, Demolition Debris Disposal Area, Naval Air Station Pensacola, Pensacola, Florida. Figure 4-2. TtNUS, 2008.
27	Cost	Section 2.8.1, Table 2-7	Feasibility Study Report for Site 43, Demolition Debris Disposal Area, Naval Air Station Pensacola, Pensacola, Florida. Appendix C. TtNUS, 2008.

DETAILED ADMINISTRATIVE RECORD REFERENCE TABLE

Item	Reference Phrase in ROD	Location in ROD	Location of Information in Administrative Record
28	approximately 120 cubic yards	Section 2.8.1, Table 2-7	Feasibility Study Report for Site 43, Demolition Debris Disposal Area, Naval Air Station Pensacola, Pensacola, Florida. Figure 4-3. TtNUS, 2008.
29	Cost	Section 2.8.1, Table 2-7	Feasibility Study Report for Site 43, Demolition Debris Disposal Area, Naval Air Station Pensacola, Pensacola, Florida. Appendix C. TtNUS, 2008.
30	Cost	Section 2.8.1, Table 2-8	Feasibility Study Report for Site 43, Demolition Debris Disposal Area, Naval Air Station Pensacola, Pensacola, Florida. Appendix C. TtNUS, 2008.
31	groundwater samples	Section 2.8.1, Table 2-8	Feasibility Study Report for Site 43, Demolition Debris Disposal Area, Naval Air Station Pensacola, Pensacola, Florida. Figure 4-4. TtNUS, 2008.
32	diammonium phosphate	Section 2.8.1, Table 2-8	Feasibility Study Report for Site 43, Demolition Debris Disposal Area, Naval Air Station Pensacola, Pensacola, Florida. Figure 4-5. TtNUS, 2008.
33	Cost	Section 2.8.1, Table 2-8	Feasibility Study Report for Site 43, Demolition Debris Disposal Area, Naval Air Station Pensacola, Pensacola, Florida. Appendix C. TtNUS, 2008.
34	groundwater samples	Section 2.8.1, Table 2-8	Feasibility Study Report for Site 43, Demolition Debris Disposal Area, Naval Air Station Pensacola, Pensacola, Florida. Figure 4-4. TtNUS, 2008.
35	chemical- and action-specific ARARs	Section 2.8.2	Feasibility Study Report for Site 43, Demolition Debris Disposal Area, Naval Air Station Pensacola, Pensacola, Florida. TtNUS, 2008.
36	public notice	Section 3.0	Public Notice for the Proposed Plan for Site 43 published in the Pensacola News Journal on July 19, 2009.

Appendix A
ARARs

ARARs to be Met by the Selected Remedy				
Requirement	**Citation**	**Status**	**Synopsis**	**Evaluation/Action to be Taken**
Chemical-Specific				
Lead and Copper Rule (LCR)	Federal Regulation (FR) 26564	Relevant and Appropriate	Establishes Action Level of 15 µg/L for lead to protect public health by minimizing lead in drinking water.	Protective levels for groundwater that is a potential drinking water source. The federal Action Level, which is equal to the Florida GCTL, was used to determine the groundwater cleanup goal for lead at Site 43.
Florida Contaminant Cleanup Target Levels Rule	Chapter 62-777.170, Florida Administrative Code (F.A.C.)	Applicable	Provides guidance for soil, groundwater, and surface water cleanup levels that can be developed on a site-by-site basis.	Was used to determine soil cleanup goals (Florida SCTLs – Table II), and as stated above, the Florida GCTL for lead (Table I) is equal to the federal Action Level, the Site 43 groundwater cleanup goal.
Action-Specific				
Resource Conservation and Recovery Act (RCRA) Regulations, Identification and Listing of Hazardous Wastes	40 CFR Part 262.11 and 264.13(a)(1)	Applicable	Requires characterization of solid waste and additional characterization of waste determined to be hazardous. Part 261.11 requires determination of whether solid waste is hazardous. Part 264.13(a)(1) requires a detailed chemical and physical analysis of a representative sample of the waste to determine treatment, storage, and disposal requirements.	Will be applied to determine whether or not a solid waste (excavated soil) is hazardous, either by being listed or by exhibiting a hazardous characteristic.
RCRA Regulations, Land Disposal Restrictions (LDRs) for Contaminated Soil	40 CFR Part 268.49	Applicable	Prohibits the land disposal of untreated hazardous wastes and provides treatment standards for contaminated soil that is considered hazardous waste.	Excavated soil determined to be hazardous waste will be treated transported for off-site treatment and disposal.

ARARs to be Met by the Selected Remedy				
Requirement	**Citation**	**Status**	**Synopsis**	**Evaluation/Action to be Taken**
Action-Specific (continued)				
Florida Contaminated Site Cleanup Criteria - Risk Management Option (RMO) Level II	Chapter 62-780.680(2), F.A.C.	Applicable	Chapter 62-780.680(2) is the RMO applicable to a site with soil excavation to meet industrial SCTLs and subsequent land use controls (LUCs).	The requirements associated with RMO Level II will be met[1].
Florida Natural Attenuation with Monitoring Regulation	Chapter 62-780.690 (8)(a) thru (c), F.A.C	Relevant and Appropriate	Specifies minimum number of wells and sampling frequency for conducting groundwater monitoring as part of a natural attenuation remedy.	The requirements associated with implementation of groundwater monitoring will be met.[1]
Florida Water Well Permitting and Construction Requirements	Chapter 62-532.500, F.A.C.	Applicable	Establishes minimum standards for the location, construction, repair, and abandonment of water wells.	The selected remedy involves installation of new groundwater monitoring wells; therefore, the substantive requirements for permitting will be met.
Florida Hazardous Waste - Requirements for Remedial Action	Chapter 62-730.225(3)	Applicable	Requires warning signs at sites suspected or confirmed to be contaminated with hazardous waste.	This requirement will be met.

ARARs = Applicable or Relevant and Appropriate Requirements. No location-specific ARARs were identified.

1 For groundwater monitoring, the designated number of wells, sampling time frames/frequency, and specific parameters for analyses will be provided in a Monitoring Plan that is included in a post-ROD document (e.g., Remedial Design or Remedial Action Work Plan) to be approved by USEPA and FDEP. Soil and groundwater LUC implementation actions will be provided in a post-ROD document (LUC Remedial Design) to be approved by USEPA and FDEP.

Appendix B
Cost Estimates

DETAILED COSTING INFORMATION FOR THE SELECTED REMEDY
SOIL

Item	Quantity	Unit	Unit Cost				Extended Cost				Subtotal
			Subcontract	Material	Labor	Equipment	Subcontract	Material	Labor	Equipment	
PROJECT PLANNING											
Prepare LUC RD and Work Plans	140	hr			$35.00		$0	$0	$4,900	$0	$4,900
Contractor Completion Report	40	hr			$35.00		$0	$0	$1,400	$0	$1,400
INITIAL EXCAVATION AREA CHARACTERIZATION											
Utility Clearances	1	ls	$3,500.00				$3,500	$0	$0	$0	$3,500
DPT Mobilization/Demobilization	1	ea	$2,000.00				$2,000	$0	$0	$0	$2,000
DPT Rig Rental	5	day	$3,000.00				$15,000	$0	$0	$0	$15,000
DPT Materials	60	lf	$4.00				$240	$0	$0	$0	$240
Field Construction Mgt. (1 person)	5	day		$190.00	$300.00		$0	$950	$1,500	$0	$2,450
Sample Collection (2 persons for 5 days)	10	day		$190.00	$300.00		$0	$1,900	$3,000	$0	$4,900
Soil Sampling w/ 72-hr TAT	15	ea	$480.00	$10.00			$7,200	$150	$0	$0	$7,350
XRF Scientist	5	day		$190.00	$300.00		$0	$950	$1,500	$0	$2,450
XRF Rental	1	week				$2,000.00	$0	$0	$0	$2,000	$2,000
MOBILIZATION AND DEMOBILIZATION											
Preconstruction Meeting	30	hr			$55.00		$0	$0	$1,650	$0	$1,650
Site Support Facilities (trailers, phone, electric, etc.)	1	ls		$1,000.00		$3,500.00	$0	$1,000	$0	$3,500	$4,500
Equipment Mobilization/Demobilization	4	ea			$158.00	$384.00	$0	$0	$632	$1,536	$2,168
FIELD SUPPORT											
Construction Survey Support	2	day	$935.00				$1,870	$0	$0	$0	$1,870
Site Superintendent	3	week			$1,234.20		$0	$0	$3,703	$0	$3,703
Site Health & Safety and QA/QC	3	week			$701.20		$0	$0	$2,104	$0	$2,104
Decontamination Services	1	ls		$210.00		$315.00	$0	$210	$0	$315	$525
EXCAVATION AND DISPOSAL											
Backhoe/Loader, 1.25 cy	3	day			$307.20	$285.40	$0	$0	$922	$856	$1,778
Screening Plant	3	day				$539.00	$0	$0	$0	$1,617	$1,617
UXO Technician	3	day			$273.00		0	$0	$819	$0	$819
Site Labor, (2 laborers)	3	day			$460.00		$0	$0	$1,380	$0	$1,380
Rolloff Box, rental & delivery	2	ea	$755.00				$1,510	$0	$0	$0	$1,510
Off Site Disposal, Hazardous for Lead	182	ton	$235.00				$42,770	$0	$0	$0	$42,770
Characterization/Offsite Disposal Soil Testing	4	ea	$1,000.00	$20.00			$4,000	$80	$0	$0	$4,080
Confirmatory Sampling, (72 hr TAT)	20	ea	$480.00	$10.00			$9,600	$200	$0	$0	$9,800

Item	Quantity	Unit	Unit Cost				Extended Cost				Subtotal
			Subcontract	Material	Labor	Equipment	Subcontract	Material	Labor	Equipment	
SITE RESTORATION											
Select Fill	125	cy		$12.00			$0	$1,500	$0	$0	$1,500
Topsoil (loam)	10	cy		$24.93			$0	$249	$0	$0	$249
Seeding Disturbed Areas	2	msf	$71.00				$142	$0	$0	$0	$142
Site Labor, (2 laborers)	3	day			$460.00		$0	$0	$1,380	$0	$1,380
Backhoe/Loader, 1.25 cy	3	day			$307.20	$285.40	$0	$0	$922	$856	$1,778
POST-CONSTRUCTION COST											
Remedial Action Closeout Report	160	hr			$35.00		$0	$0	$5,600	$0	$5,600
Prepare LUC Document	120	hr			$35.00		$0	$0	$4,200	$0	$4,200
LUC Survey Support	1	day	$935.00				$935	$0	$0	$0	$935
Permanent Sign (24" by 24"), w/ posts	4	ea	$154.00				$616	$0	$0	$0	$616
Subtotal							$89,383	$7,189	$35,610	$10,680	$142,863
Overhead on Labor Cost @	30%								$10,683		$10,683
G & A on Labor Cost @	10%								$3,561		$3,561
G & A on Material Cost @	10%							$719			$719
G & A on Equipment Cost @	10%									$1,068	$1,068
G & A on Subcontract Cost @	10%						$8,938				$8,938
Tax on Materials and Equipment Cost @	6%							$431		$641	$1,072
Total Direct Cost							$98,321	$8,340	$49,855	$12,389	$168,905
Indirects on Total Direct Cost @	25%	(excluding transportation and disposal cost)									$31,534
Profit on Total Direct Cost @	10%										$16,890
Subtotal											$217,329
Health & Safety Monitoring @	2%										$4,347
Total Field Cost											$221,675
Contingency on Total Field Costs @	20%										$44,335
Engineering on Total Field Cost @	15%										$33,251
TOTAL CAPITAL COST											**$299,262**

tem	Item Cost Years 1 to 30	Item Cost Years 5, 10, 20, 25	Item Cost Years 15, 30	Item Cost Every 5 Years	Notes
Site Visit	$3,500				Labor and supplies to visit site once a year to inspect LUCs
Report	$1.400				Document site
Parking Lot Repair		$4,500			Repair (patch) parking lot years 5, 10, 20, & 25. Assume 2,000 sf (5% of lot) will require repair
Parking Lot Repaving			$13,500		Repave parking lot years 15 & 30. Size of parking lot is 40,000 sf
Site Review				$7,500	Site reviews
TOTALS	**$4,900**	**$4,500**	**$13,500**	**$7,500**	

Year	Capital Cost	Annual Cost	Total Year Cost	Annual Discount Rate at 7%	Present Worth
0	$299,262		$299,262	1.000	$299,262
1		$4,900	$4,900	0.935	$4,582
2		$4,900	$4,900	0.873	$4,278
3		$4,900	$4,900	0.816	$3,998
4		$4,900	$4,900	0.763	$3,739
5		$16,900	$16,900	0.713	$12,050
6		$4,900	$4,900	0.666	$3,263
7		$4,900	$4,900	0.623	$3,053
8		$4,900	$4,900	0.582	$2,852
9		$4,900	$4,900	0.544	$2,666
10		$16,900	$16,900	0.508	$8,585
11		$4,900	$4,900	0.475	$2,328
12		$4,900	$4,900	0.444	$2,176
13		$4,900	$4,900	0.415	$2,034
14		$4,900	$4,900	0.388	$1,901
15		$25,900	$25,900	0.362	$9,376
16		$4,900	$4,900	0.339	$1,661
17		$4,900	$4,900	0.317	$1,553
18		$4,900	$4,900	0.296	$1,450
19		$4,900	$4,900	0.277	$1,357
20		$16,900	$16,900	0.258	$4,360
21		$4,900	$4,900	0.242	$1,186
22		$4,900	$4,900	0.226	$1,107
23		$4,900	$4,900	0.211	$1,034
24		$4,900	$4,900	0.197	$965
25		$16,900	$16,900	0.184	$3,110
26		$4,900	$4,900	0.172	$843
27		$4,900	$4,900	0.161	$789
28		$4,900	$4,900	0.15	$735
29		$4,900	$4,900	0.141	$691
30		$25,900	$25,900	0.131	$3,393
			TOTAL PRESENT WORTH		**$390,375**

DETAILED COSTING INFORMATION FOR THE SELECTED REMEDY
GROUNDWATER

Item	Quantity	Unit	Unit Cost				Extended Cost				Subtotal
			Subcontract	Material	Labor	Equipment	Subcontract	Material	Labor	Equipment	
PROJECT PLANNING & DOCUMENTS											
Prepare Documents & Plans including Permits	100	hr			$35.00		$0	$0	$3,500	$0	$3,500
Prepare Groundwater Use control	100	hr			$35.00		$0	$0	$3,500	$0	$3,500
Completion Report	50	hr			$35.00		$0	$0	$1,750	$0	$1,750
INSTALL TEMPORARY WELLS AND SAMPLE											
Utility Clearances	1	ls	$3,500.00				$3,500	$0	$0	$0	$3,500
Construction Survey	1	day	$2,000.00				$2,000	$0	$0	$0	$2,000
DPT Mobilization/Demobilization	1	ea	$2,000.00				$2,000	$0	$0	$0	$2,000
DPT Rig Rental	3	day	$3,000.00				$9,000	$0	$0	$0	$9,000
Temporary Wells	300	lf	$4.00				$1,200	$0	$0	$0	$1,200
Field Construction Mgt. (1 person)	5	day		$190.00	$300.00		$0	$950	$1,500	$0	$2,450
Sample Collection (2 persons for 5 days)	10	day		$190.00	$300.00		$0	$1,900	$3,000	$0	$4,900
Sampling (Lead, 72-hr TAT)	34	ea	$50.00	$10.00			$1,700	$340	$0	$0	$2,040
INSTALL MONITORING WELLS											
Construction Survey	1	day	$2,000.00				$2,000	$0	$0	$0	$2,000
Drill Rig Mobilization/Demobilization	1	ea	$2,000.00				$2,000	$0	$0	$0	$2,000
Monitoring Well Installation, 3" diameter (3 wells)	75	lf	$78.00				$5,850	$0	$0	$0	$5,850
Vault & Cover	3	ea	$750.00				$2,250	$0	$0	$0	$2,250
Field Construction Mgt. (1 person)	5	day		$190.00	$300.00		$0	$950	$1,500	$0	$2,450

Item	Quantity	Unit	Unit Cost				Extended Cost				Subtotal
			Subcontract	Material	Labor	Equipment	Subcontract	Material	Labor	Equipment	
Subtotal							$31,500	$4,140	$14,750	$0	$50,390
Overhead on Labor Cost @	30%								$4,425		$4,425
G & A on Labor Cost @	10%								$1,475		$1,475
G & A on Material Cost @	10%							$414			$414
G & A on Equipment Cost @	10%									$0	$0
G & A on Subcontract Cost @	10%						$3,150				$3,150
Tax on Materials and Equipment Cost @	6%							$248		$0	$248
Total Direct Cost							$34,650	$4,802	$20,650	$0	$60,102
Indirects on Total Direct Cost @	25%										$15,026
Profit on Total Direct Cost @	10%										$6,010
Subtotal											$81,138
Health & Safety Monitoring @	4%										$3,246
Total Field Cost											$84,384
Contingency on Total Field Costs @	20%										$16,877
Engineering on Total Field Cost @	15%										$12,658
TOTAL CAPITAL COST											**$113,918**

Item	Item Cost Years 1 to 30	Item Cost Every 5 Years	Notes
Sampling	$3,100		Labor and supplies to collect samples from four wells using a crew of two, once a year for 30 years
Analysis/Water	$150		Analyze groundwater samples for lead
Report	$2,900		Document sampling events and results
Site Review		$7,500	Site Report
TOTAL	**$6,150**	**$7,500**	

Year	Capital Cost	Annual Cost	Total Year Cost	Annual Discount Rate at 7%	Present Worth
0	$113,918		$113,918	1.000	$113,918
1		$6,150	$6,150	0 935	$5,750
2		$6,150	$6,150	0.873	$5,369
3		$6,150	$6,150	0.816	$5,018
4		$6,150	$6,150	0.763	$4,692
5		$13,650	$13,650	0.713	$9,732
6		$6,150	$6,150	0.666	$4,096
7		$6,150	$6,150	0.623	$3,831
8		$6,150	$6,150	0.582	$3,579
9		$6,150	$6,150	0.544	$3,346
10		$13,650	$13,650	0.508	$6,934
11		$6,150	$6,150	0.475	$2,921
12		$6,150	$6,150	0.444	$2,731
13		$6,150	$6,150	0.415	$2,552
14		$6,150	$6,150	0.388	$2,386
15		$13,650	$13,650	0.362	$4,941
16		$6,150	$6,150	0.339	$2,085
17		$6,150	$6,150	0.317	$1,950
18		$6,150	$6,150	0.296	$1,820
19		$6,150	$6,150	0.277	$1,704
20		$13,650	$13,650	0.258	$3,522
21		$6,150	$6,150	0.242	$1,488
22		$6,150	$6,150	0.226	$1,390
23		$6,150	$6,150	0.211	$1,298
24		$6,150	$6,150	0.197	$1,212
25		$13,650	$13,650	0.184	$2,512
26		$6,150	$6,150	0.172	$1,058
27		$6,150	$6,150	0.161	$990
28		$6,150	$6,150	0.15	$923
29		$6,150	$6,150	0.141	$867
30		$13,650	$13,650	0.131	$1,788
			TOTAL PRESENT WORTH		**$206,403**