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NAS WHITING FIELD
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FEASIBILITY STUDY FOR SITE 15 SOUTHWEST LANDFILL NAS WHITING FIELD FL
3/1/2001
HARDING LAWSON ASSOCIATES

FEASIBILITY STUDY

SITE 15, SOUTHWEST LANDFILL

NAVAL AIR STATION WHITING FIELD
MILTON, FLORIDA

UNIT IDENTIFICATION CODE: N60508
CONTRACT NO.: N62467-89-D-0317/116

MARCH 2001

SOUTHERN DIVISION
NAVAL FACILITIES ENGINEERING COMMAND
NORTH CHARLESTON, SOUTH CAROLINA 29418

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MILTON, FLORIDA

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FEASIBILITY STUDY
FOR
SURFACE AND SUBSURFACE SOILS

SITE 15, SOUTHWEST LANDFILL

NAVAL AIR STATION WHITING FIELD
MILTON, FLORIDA

USEPA ID No.: FL2170023244

Unit Identification Code: N60508

Contract No.: N62467-89-D-0317/116

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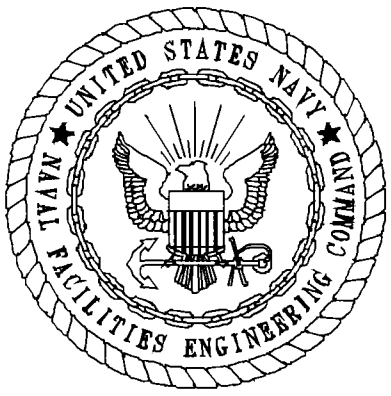
Linda Martin, Code 1859, Engineer-in-Charge

March 2001



CERTIFICATION OF TECHNICAL
DATA CONFORMITY (MAY 1987)

The Contractor, Harding Lawson Associates, hereby certifies that, to the best of its knowledge and belief, the technical data delivered herewith under Contract No. N62467-89-D-0317/116 are complete and accurate and comply with all requirements of this contract.

DATE: March 15, 2001

NAME AND TITLE OF CERTIFYING OFFICIAL: Rao Angara
Task Order Manager

NAME AND TITLE OF CERTIFYING OFFICIAL: Eric Blomberg, P.G.
Project Technical Lead

(DFAR 252.227-7036)

The evaluations and professional opinions rendered in this planning document describing the feasibility study for Site 15, Naval Air Station Whiting Field, Milton, Florida, were conducted or developed in accordance with commonly accepted procedures consistent with applicable standards of practice. This document is not intended to be used for construction of the selected alternative.

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FOREWORD

To meet its mission objectives, the U.S. Navy performs a variety of operations, some requiring the use, handling, storage, and/or disposal of hazardous materials. Through accidental spills or leaks or as a result of and conventional methods of past disposal, hazardous materials may have entered the environment in ways unacceptable by current standards. With growing knowledge of the long-term effects of hazardous materials on the environment, the Department of Defense initiated various programs to investigate and remediate conditions related to suspected past releases of hazardous materials at their facilities.

One of these programs is the Installation Restoration (IR) program. This program complies with the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), as amended by the Superfund Amendments and Reauthorization Act (SARA), the Resource Conservation and Recovery Act, and the Hazardous and Solid Waste Amendments of 1984. These acts establish the means to assess and clean up hazardous waste sites for both private-sector and Federal facilities. The CERCLA and SARA acts form the basis for what is commonly known as the Superfund program.

Originally, the Navy's part of this program was called the Naval Assessment and Control of Installation Pollutants (NACIP) program. Early reports reflect the NACIP process and terminology. The Navy eventually adopted the program structure and terminology of the standard IR program.

The IR program is conducted in several stages as follows:

- preliminary assessment (PA),
- site inspection (SI) (formerly the PA and SI steps were called the initial assessment study under the NACIP program),
- remedial investigation and feasibility study, and
- remedial design and remedial action.

The Southern Division, Naval Facilities Engineering Command manages and the U.S. Environmental Protection Agency and the Florida Department of Environmental Protection oversee the Navy environmental program at Naval Air Station (NAS) Whiting Field. All aspects of the program are conducted in compliance with State and Federal regulations, as ensured by the participation of these regulatory agencies.

Questions regarding the CERCLA program at NAS Whiting Field should be addressed to Ms. Linda Martin, Code 1859, at (843) 820-5574.

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GLOSSARY

ABB-ES	ABB Environmental Services, Inc.
AFFF	aqueous film-forming foam
ARAR	applicable or relevant and appropriate requirement
BEI	Bechtel Environmental Inc.
BRA	Baseline Risk Assessment
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CFR	Code of Federal Regulations
cm/s	centimeters per second
COPC	chemicals of potential concern
CT	central tendency
ELCR	excess lifetime cancer risk
ERA	ecological risk assessment
FDEP	Florida Department of Environmental Protection
FGGC	Florida Groundwater Guidance Concentration
FS	feasibility study
FSCG	Florida Soil Cleanup Goal
GCTL	groundwater cleanup target level
GIR	General Information Report
HHCOPC	human health chemicals of potential concern
HHRA	human health risk assessment
HI	hazard index
HLA	Harding Lawson Associates
IR	Installation Restoration
IRA	interim remedial action
JP-5	jet propellant
LUC	land-use control
LUCIP	Land-Use Control Implementation Plan
MCL	maximum contaminant level
NAS	Naval Air Station
NCP	National Oil and Hazardous Substances Contingency Plan
PCB	polychlorinated biphenyls
RA	remedial action
RAO	remedial action objective
RBC	risk based concentration
RCRA	Resource Conservation and Recovery Act

GLOSSARY (Continued)

RI	remedial investigation
RME	reasonable maximum exposure
ROD	record of decision
SARA	Superfund Amendments and Reauthorization Act
SOUTHNAV-FACENGCOM	Southern Division, Naval Facilities Engineering Command
SCTL	soil cleanup target level
SVOC	semivolatile organic compound
TBC	to be considered
TCL	target compound list
TRPH	total petroleum recoverable hydrocarbon
USDA	U.S. Department of Agriculture
USEPA	U.S. Environmental Protection Agency
VOC	volatile organic compound
yd^3	cubic yard

1.0 INTRODUCTION

Harding Lawson Associates (HLA) has been contracted by the Department of the Navy, Southern Division, Naval Facilities Engineering Command (SOUTHNAVFACENGCOM) to complete a feasibility study (FS) for Site 15, Short-Term Sanitary Landfill, at Naval Air Station (NAS) Whiting Field, Milton, Florida. The FS is being completed under contract number N62467-89-D-0317-116. The FS report for Site 15 is one in a series of site-specific reports being completed in conjunction with the NAS Whiting Field General Information Report (GIR) (HLA, 1998) and Remedial Investigation (RI) report (ABB Environmental Services, Inc. [ABB-ES], 1998) to present the results of the overall RI/FS for the site. This FS report includes the development, screening, and evaluation of potential remedial alternatives that address contaminated media at Site 15.

Investigations at NAS Whiting Field, a facility listed on the National Priorities List, are being conducted in accordance with the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) of 1980, as amended by the Superfund Amendments and Reauthorization Act (SARA) of 1986, and the National Oil and Hazardous Substances Pollution Contingency Plan (NCP) (40 Code of Federal Regulations [CFR], Part 300). The investigations at the facility are being conducted under the Navy's Installation Restoration (IR) program, which is designed to identify and abate or control contaminant migration resulting from past operations at naval installations while working within the aforementioned regulatory framework. SOUTHNAVFACENGCOM is the agency responsible for the Navy's IR program in the southeastern United States. Therefore, SOUTHNAVFACENGCOM has the responsibility to process NAS Whiting Field through preliminary assessment, site inspection, RI/FS, and remedial response selection.

The goals of the RI/FS are (1) to assess the extent, magnitude, and impact of contamination at the site; (2) to qualitatively and quantitatively assess the risk posed to human health and the environment by site-related contamination; and (3) to develop remedial alternatives addressing threats to human health and/or the environment. The first two goals have been discussed in the GIR and RI reports; the remaining goal will be presented and discussed in this FS Report. For brevity, general information presented in the GIR and RI report will not be repeated in the FS report.

The GIR provides information common to all sites at NAS Whiting Field, such as

- facility information and history,
- description of physical characteristics of the facility (climatology, hydrology, soil geology, and hydrogeology),
- summary of previous investigations,
- summary of the field investigations activities conducted during the RI,
- baseline risk assessment (BRA) methodology for both human health and ecological receptors, and
- a summary of the facilitywide background evaluation.

The RI serves as the mechanism for collecting data to identify the source of contamination and migration pathway characteristics for conducting a BRA, and for collecting physical measurements and chemical analytical data necessary for remedial alternative evaluation in the FS. The RI provides the basis for determining whether or not remedial action is necessary. The RI Report of Site 15 as NAS Whiting Field provides the following information:

- a site description and summary of previous investigations for Site 15;
- a summary of the field investigation methods used during the RI at the site;
- a site-specific data quality assessment;

- an assessment of the extent, magnitude, and impact of contamination at the site; and
- a qualitative and quantitative assessment of risks to human health and the environment.

The FS uses the results of the RI and the information presented in the GIR to identify remedial action objectives (RAOs) and to develop, screen, and evaluate potential remedial alternatives. The FS is prepared in accordance with the following regulations and guidance documents: CERCLA, as amended by SARA (references made to CERCLA in this report should be interpreted as "CERCLA, as amended by SARA"); the NCP; 40 CFR, Part 300; and Guidance for Conducting Remedial Investigations and Feasibility Studies Under CERCLA (RI/FS Guidance) (U.S. Environmental Protection Agency [USEPA], 1988).

The remaining sections in this chapter describe the FS process for CERCLA sites (Section 1.1), present how this process is applied to NAS Whiting Field sites (Section 1.2), and provide the conceptual understanding of Site 15 environmental conditions as of the completion of the RI report (Section 1.3).

1.1 THE CERCLA FS PROCESS.

The development of remedial alternatives for CERCLA sites consists of developing RAOs and then identifying applicable technologies and developing those technologies into remedial alternatives to meet RAOs. The NCP requires that a range of alternatives be presented in the FS to the maximum practicable extent.

The first step in the FS process is to develop RAOs that specify the contaminants, media of interest, exposure pathways, and preliminary remedial goals that permit a range of alternatives to be developed. The preliminary remedial goals are developed based on chemical-specific applicable or relevant and appropriate requirements (ARARs) (when available), site-specific risk-based factors, or other available information.

Once RAOs are identified, general response actions for each medium of interest are developed. General response actions typically fall into the following categories: no action, containment, excavation, extraction, treatment, disposal, or other actions, singularly or in combination, taken to satisfy the RAOs for the site.

The next step in the FS process is to identify and screen applicable technologies for each general response action. This step eliminates technologies that cannot be implemented technically. Those technologies passing the screening phase are then assembled into remedial alternatives. Remedial alternatives are then described and analyzed in detail using seven criteria described in the NCP, including

- overall protection of human health and the environment;
- reduction of toxicity, mobility, or volume of contaminants through treatment;
- compliance with ARARs;
- long-term effectiveness and permanence;
- short-term effectiveness;
- implementability; and
- economics (i.e., cost).

Alternatives are evaluated against two additional factors after State participation and the public comment period for the FS. The factors are

- State acceptance, and
- community acceptance.

The results of the detailed analyses (for the first seven criteria) are summarized and compared in a comparative analysis. The alternatives are compared with each other against several criteria, including the following:

Threshold criteria:

- Protection of human health and the environment; and
- Attainment of Federal and State human health and environmental requirements identified for the site.

Primary Balancing criteria:

- cost;
- long-term effectiveness and permanence;
- shot-term effectiveness;
- use of permanent solutions and alternative treatment technologies or resource recovery technologies, to the maximum extent practicable; and
- preference for treatment that reduces toxicity, mobility, or volume of contaminants as a principal element.

These criteria are used because SARA requires them to be considered during remedy selection. **Modifying criteria**, which include State and community acceptance, are also evaluated. State acceptance is evaluated when the State reviews and comments on the draft FS report and a Proposed Plan is then prepared in consideration of the State's comments. Community acceptance is evaluated based on comments received on the FS and Proposed Plan during a public comment period. This evaluation is described in a responsiveness summary in the Record of Decision (ROD).

The entire FS process provides the technical information and analyses that form the basis for a proposed remedial action plan (Proposed Plan) and the subsequent ROD that documents the identification and selection of the remedy.

1.2 PURPOSE.

The purpose of the FS report is to document the results of the study that including developing RAOs to address contaminated media at the site and developing, screening, and evaluating potential remedial alternatives to meet these objectives.

The FS report was developed in accordance with the NCP and with USEPA's *Streamlining the RI/FS for CERCLA Municipal Landfill Sites* (USEPA, 1991a); both of these documents provide guidance for identifying technologies for municipal landfills. Because municipal landfill sites typically have similar characteristics, the USEPA recognizes that similar waste management approaches will be required for remediation. The NCP states that the USEPA expects containment technologies will generally be appropriate for waste (e.g., landfills) that pose a relatively low long-term threat or where treatment is impractical (Section 300.430[a][1][iii][B]). Additionally, the USEPA expects physical and/or thermal treatment to be considered for identifiable areas of highly toxic and/or mobile material that constitute the principal threat(s) posed by the site (Section 300.430[a][1][iii][A]).

The purpose of the FS report is not to present all the possible variations and combinations of remedial actions that could be taken at the site, but to present distinctly different alternatives representing a range of opportunities for meeting RAOs. It is expected that these different alternatives can be adjusted during the proposed plan and decision process, and to a lesser extent during detailed design, to accomplish RAOs in a manner similar to the initially proposed alternative. The FS report also does not present information on al-

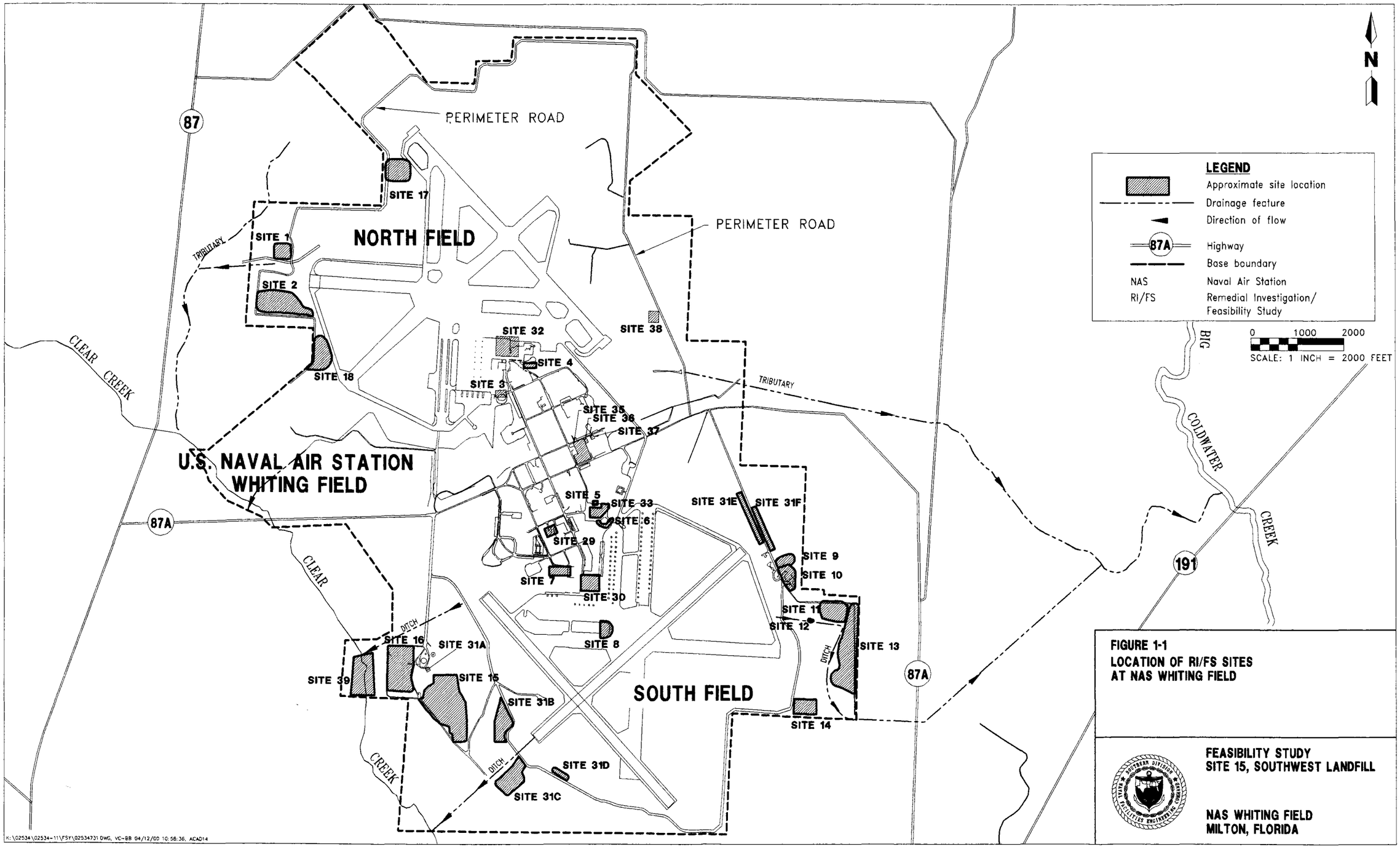

FIGURE 1-1
LOCATION OF RI/FS SITES
AT NAS WHITING FIELD

FEASIBILITY STUDY
SITE 15, SOUTHWEST LANDFILL

NAS WHITING FIELD
MILTON, FLORIDA

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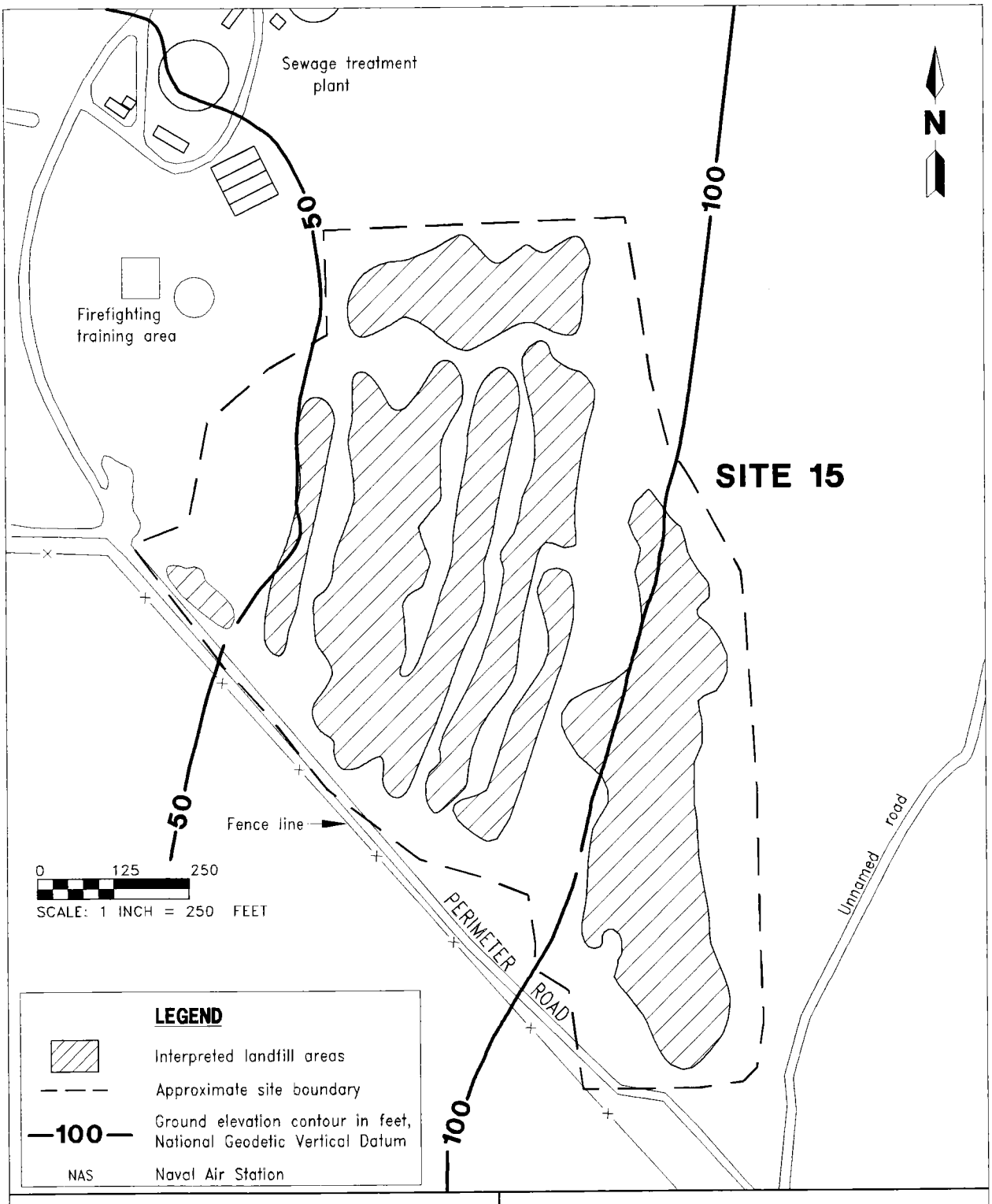

FIGURE 1-2
GENERAL FEATURES

FEASIBILITY STUDY
SITE 15, SOUTHWEST LANDFILL

NAS WHITING FIELD
MILTON, FLORIDA

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2.0 REMEDIAL ACTION OBJECTIVES

This section presents the goals and objectives for remedial action at Site 15 that provide the basis for selecting appropriate RAOs and, subsequently, identifying remedial technologies and developing alternatives to address contamination at the site. To establish these objectives, ARARs are first identified (Section 2.1). Next, RAOs are defined based on consideration of ARARs, the results and conclusions of the RI, the BRA, and other criteria (Section 2.2). Finally, general response actions appropriate for technology identification are discussed (Section 2.3). The information presented in this chapter will be used to identify appropriate remedial technologies for the site (presented in Chapter 3.0).

2.1 APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS.

ARARs are Federal and State human health and environmental requirements used to define the appropriate extent of site cleanup, identify sensitive land areas or land uses, develop remedial alternatives, and direct site remediation. CERCLA and the NCP require that remedial actions comply with State ARARs that are more stringent than Federal ARARs, are legally enforceable, and are consistently enforced statewide.

The NCP defines two ARAR components: (1) applicable requirements, and (2) relevant and appropriate requirements.

> Applicable requirements are those cleanup standards, standards of control, and other substantive requirements, criteria, or limitations promulgated under Federal or State environmental or facility siting laws that specifically address a hazardous substance, pollutant, contaminant, remedial action, or other circumstance found at a CERCLA site. State standards that may be applicable are only those which (1) have been identified by the State in a timely manner, (2) are consistently enforced, and (3) are more stringent than Federal requirements.
>
> Relevant and appropriate requirements are those cleanup standards, standards of control, and other substantive requirements under Federal and State environmental and facility siting laws that, while not "applicable" to a hazardous substance, pollutant, contaminant, or remedial action, address situations sufficiently similar to those encountered at the CERCLA site so that their use is well suited to the particular site. Only those State standards that are identified in a timely manner and are more stringent than Federal requirements may be relevant and appropriate.

"Applicability" is a legal determination of jurisdiction of existing statutes and regulations, whereas "relevant and appropriate" is a site-specific determination of the appropriateness of existing statutes and regulations. Therefore, relevant and appropriate requirements allow flexibility not provided by applicable requirements in the final determination of cleanup levels. Once a requirement is identified as an ARAR, the selected remedy must comply with ARARs, even if the ARAR is not required to assure protectiveness. The general relevant and appropriate requirements apply only to actions at the site. Applicable requirements apply to both on- and off-site remedial actions.

Under the description of ARARs set forth in the NCP and SARA, State and Federal ARARs are categorized as

- Chemical-specific (i.e., governing the extent of site remediation with regard to specific contaminants and pollutants);
- Location-specific (i.e., governing site features such as wetland, floodplains, and sensitive ecosystems and pertaining to existing natural and man-made site features such as historical or archaeological sites); and

- Action-specific (i.e., pertaining to the proposed site remedies and governing the implementation of the selected site remedy).

Other requirements "to be considered" (TBC) are Federal and State nonpromulgated authorities or guidance that are not legally binding and do not have the status of potential ARARs (i.e., they have not been promulgated by statute or regulation). However, if there are no specific ARARs for a chemical or site condition, or if ARARs are not deemed sufficiently protective, then guidance or advisory criteria should be identified and used to ensure the protection of human health and the environment.

During the detailed analysis of remedial alternatives, each alternative will be analyzed to determine its compliance with ARARs. Chemical-, location-, and action-specific ARARs are discussed in the following subsections and presented in Table 2-1.

2.1.1 Chemical-Specific ARARs

Chemical-specific requirements are standards that limit the concentration of a chemical found in or discharged to the environment. They govern the extent of site remediation by providing either actual cleanup levels or the basis for calculating such levels. The State of Florida has developed chemical-specific risk based SCTLs for soil. These target levels are listed in Chapter 62-777, Florida Administrative Code (FAC) (FDEP, 1999). The USEPA Region III has developed a risk-based concentration table which specifies residential and industrial RBCs in soils (USEPA, 1998).

2.1.2 Location-Specific ARARs

Location-specific ARARs govern site features (e.g., wetlands, floodplains, wilderness areas, and endangered species) and manmade features (e.g., places of historical or archaeological significance). These ARARs place restrictions on concentrations of hazardous substances or the conduct of activities based solely on the site's particular characteristics or location.

As stated in the RI (HLA, 1999), no State or federally listed rare, threatened, or endangered species or species of concern are known to inhabit Site 15 (Nature Conservancy, 1997). Furthermore, Site 15 is not located in the 100-year floodplain or known to contain areas of historical or archeological significance. Therefore location-specific ARARs do not apply to Site 15.

2.1.3 Action-Specific ARARs

Action-specific ARARs are technology- or activity- based limitations controlling activities for remedial actions. Action-specific ARARs generally set performance or design standards, controls, or restrictions on particular types of activities. To develop technically feasible alternatives, applicable performance or design standards must be considered during the detailed analysis of remedial alternatives. During the detailed analysis of alternatives, each alternative will be analyzed to determine compliance with action-specific ARARs.

Certain action-specific ARARs include permit requirements. Under CERCLA Section 121(e), permits are not required for remedial actions conducted entirely on site at Superfund sites. This permit exemption applies to all administrative requirements, including approval of or consultation with administrative bodies, documentation, record keeping, and enforcement. However, the substantive requirements of these ARARs must be attained.

2.1.4 TBC Criteria

As previously stated, TBCs are Federal and State non-promulgated advisories or guidance not legally binding and do not have the status of being a potential ARAR (i.e., have not been promulgated by statute or regulation). However, if there are no specific regulatory requirements for a chemical or site condition, or if

Table 2-1
Synopsis of Federal and State ARARs and Guidance

Feasibility Study For Surface And Subsurface Soils
Site 15, Southwest Landfill
Naval Air Station Whiting Field
Milton, Florida

Name and Regulatory Citation	Description	Consideration in the Remedial Action Process	Type
Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), and the National Hazardous Substance and Contingency Plan Regulations (40 Code of Federal Regulations [CFR], Section 300.430)	Discusses the types of institutional controls to be established at CERCLA sites.	**Applicable.** These regulations may be used as guidance in establishing appropriate institutional controls at Site 15.	Action-specific
Occupational Safety and Health Act (29 CFR Part 1910)	Requires establishment of programs to ensure worker health and safety at hazardous waste sites.	**Applicable.** These requirements apply to response activities conducted in accordance with the National Contingency Plan. During the implementation of any remedial alternative for Site 15, these regulations must be attained.	Action-specific
Resource Conservation and Recovery Act (RCRA) Regulations, Identification and Listing of Hazardous Waste [40 CFR Part 261]	Defines those solid wastes that are subject to regulation as hazardous waste.	**Applicable.** Any excavated materials would be sampled and analyzed for hazardous characteristics as defined by 40 CFR Part 261.	Chemical-Specific
Hazardous Materials Transportation Act Regulations, [49 CFR Parts 171-179]	Provides requirements for packaging, labeling, manifesting, and transporting of hazardous materials. Similar requirements are found in 40 CFR Part 263.	**Applicable.** If surface soil, wetland sediments, or shoreline sediments are determined to be hazardous material and off-site disposal arranged, the hazardous material would need to be handled, manifested, and transported to a licensed off-site disposal facility in compliance with these regulations.	Action-specific
RCRA Regulations, Standards Applicable to Transporters of Hazardous Wastes [40 CFR Part 263]	Establish the responsibilities of generators and transporters of hazardous waste in the handling, transportation and management of that waste. To avoid duplicative regulation, USEPA has expressly adopted certain DOT regulations (see next entry) governing the transportation of hazardous materials.	**Relevant and Appropriate.** If surface soil is determined to be hazardous material and off-site disposal is arranged, the hazardous material would need to be handled, manifested, and transported to a licensed off-site disposal facility in compliance with these regulations.	Action-specific
RCRA Regulations, Landfills (40 CFR, Part 264, Subpart N)	Provides monitoring, inspection, closure, and post-closure care requirements for landfills that contain hazardous waste.	**Relevant and Appropriate.** These regulations are not applicable to Site 15 because they apply only to landfills that received waste after 1980; however, the requirements may be used as guidance for developing a landfill inspection program.	Action-specific

See notes at end of table.

Table 2-1 (Continued)
Synopsis of Federal and State ARARs and Guidance

Feasibility Study For Surface And Subsurface Soils
Site 15, Southwest Landfill
Naval Air Station Whiting Field
Milton, Florida

Name and Regulatory Citation	Description	Consideration in the Remedial Action Process	Type
Solid Waste Disposal Act Regulations, Criteria for Municipal Solid Waste Landfills (40 CFR, Part 258)	This rule establishes minimum standards for design and operation of municipal solid waste landfills.	**Relevant and Appropriate.** Although this regulation applies to RCRA municipal landfills, not CERCLA landfills, some applications may apply.	Action-specific
Region III Risk-Based Concentrations (USEPA, 1998)	Provides RBCs from ingestion or exposure to chemicals in soil, tap water, ambient air, and fish consumption.	**Applicable.** The chemicals detected at Site 15 were screened against these standards for selection of chemicals of concern and developing remedial action alternatives.	Chemical-specific
Florida Contaminant Cleanup Target Levels Rule (Chapter 62-777, FAC)	Provides soil and groundwater cleanup levels.	**Applicable.** These values should be used and considered when evaluating cleanup levels.	Chemical-specific
Florida Rules on Hazardous Waste Warning Signs (Chapter 62-736, FAC)	Requires warning signs at National Priorities List (NPL) sites to inform the public of the presence of potentially harmful conditions.	**Applicable.** This requirement is applicable for sites that are on the NPL.	Action-specific
Florida Solid Waste Disposal Facility Regulations (Chapter 62-701, FAC)	Provides the minimum landfill final closure standards for inactive landfills. Chapter 62-701.600 provides information on closure procedures, permits, closure report, design plan, final cover design, and post closure monitoring.	**Relevant and Appropriate.** Although these regulations are not directly applicable because Site 15 did not receive wastes after the effective date of regulation (1985); Chapter 62-701.600, FAC, provides guidance for closure procedures.	Action-specific
Florida Hazardous Waste Rules (Chapter 62-730, FAC)	Adopts specific sections of the federal hazardous waste regulations, including the section regulating hazardous waste landfills (40 CFR, Part 264, Subpart N) and makes additions to these regulations.	**Relevant and Appropriate.** These regulations are not applicable to Site 15 because they apply only to landfills that received waste after 1983; however, the requirements may be used as guidance for developing a landfill inspection program.	Chemical-specific; Action-specific

Notes: ARAR = applicable or relevant and appropriate requirement.
USEPA = U.S. Environmental Protection Agency.
DOT = Department of Transportation.
TBC = "to be considered" guidance materials.

ARARs are not deemed sufficiently protective, then guidance or advisory criteria should be identified and used to ensure the protection of human health and the environment.

2.2 IDENTIFICATION OF RAOs.

RAOs are defined in the CERCLA RI/FS guidance manual as media-specific goals established to protect human health and the environment, and are typically based on chemicals of concern, exposure routes, and receptors present at the site. RAOs are developed to ensure compliance with ARARs. RAOs for surface and subsurface soils will be identified based on consideration of ARARs, the RI, and the BRA. RAOs addressing groundwater and leaching to groundwater will not addressed in this FS. However, they will be addressed in the FS for Site 40, Basewide Groundwater.

Surface Soil. Chemical-specific ARARs and TBCs for surface soil were considered when identifying RAOs based on ARARs. All detections of VOCs, SVOCs, and pesticides and PCBs were below the USEPA Region III residential and industrial RBCs and Florida residential and industrial SCTLs.

Two inorganic analytes, arsenic and vanadium, were detected in surface soil above their respective residential and/or industrial Florida SCTLs and/or USEPA Region III RBCs. Arsenic concentration was below the FDEP approved site specific cleanup goal of 4.62 mg/kg at all locations except location 15S01501. Vanadium exceeded the FDEP residential SCTL of 15 mg/kg at three locations. Table 2-2 provides a summary of the detected concentrations of arsenic and vanadium and their respective cleanup target levels.

The HHRA completed for Site 15 evaluated risks to current and future users of the site due to HHCOPCs aluminum, arsenic, iron, manganese, and vanadium. The risks posed to site maintenance workers, occupational workers, and excavation workers based on exposure to surface soil at Site 15 via direct contact, ingestion, or inhalation of particulates are less than the USEPA target risk range and the FDEP risk threshold.

The human health assessment for Site 15 also considered adult and child residents and trespassers exposed to surface soil at the site using central tendency, or average exposure assumptions. This assessment indicated an ELCR of 4×10^{-6} and 2×10^{-6} respectively. These are within the acceptable USEPA risk range, but exceed Florida's target risk level of concern of 1×10^{-6}. Non-cancer risks for the adult and child resident were within the acceptable USEPA and FDEP risk thresholds.

> **RAO 1:** Reduce risks associated with exposure to surface soil containing contaminant concentrations greater than action levels.

The ERA completed for Site 15 identified no risks to ecological receptor populations.

Because Site 15 and several other sites at NAS Whiting Field are disposal sites, the Navy requested that the FDEP consider a site-specific soil cleanup goal for arsenic because the fill and cover material obtained at NAS Whiting Field included subsurface soil which contained elevated arsenic levels. The Navy recommended a soil cleanup goal for arsenic at NAS Whiting Field covered landfill sites (Sites 1, 2, 9, 10, 11, 12, 13, 14, 15, and 16) of 4.62 mg/kg. This request is included as Appendix A of this report.

The FDEP responded to this request in a letter dated April 27, 1998 (FDEP 1998a). The FDEP response, included in Appendix B, concurred with the recommendation for the site-specific soil cleanup goal for arsenic at NAS Whiting Field disposal sites given the following conditions:

- In the future, the disposal sites will be used for activities that involve less than full-time contact with surface soil at the site. These activities could include parks, recreation areas, or agricultural sites.

Table 2-2
Summary of Chemicals Exceeding Chemical-Specific ARARs and TBCs in Surface Soil

Feasibility Study For Surface And Subsurface Soils
Site 15, Southwest Landfill
Naval Air Station Whiting Field
Milton, Florida

Analyte	Frequency of Detection[1]	Range of Detected Analyte Concentration	Background Screening Value[2]	Soil Cleanup Target Level[3] Residential/ Industrial/Leachability	USEPA Region III RBCs Residential/ Industrial[4]	Site-Specific Soil Cleanup Goal[5]
Inorganic Analytes (ug/L)						
Arsenic	30/30	0.75 to 6.8	4.6	0.8/3.7/29	0.43/3.8	4.62
Vanadium	30/30	4.1 to 33.8	21.2	15**/7,400/980	55/1,400	NA

[1] Frequency of detection is the fraction of total samples analyzed in which the analyte was detected.
[2] Background screening values are two times the arithmetic mean of detected background concentrations.
[3] Source: Contaminant Cleanup Target Levels, Chapter 62-777, FAC (June 1999).
[4] USEPA Region III RBCs for soil ingestion based on an excess lifetime cancer risk of 1×10^{-6} or an adjusted hazard quotient of 0.1. (October 1998).
[5] Site-specific cleanup goal for arsenic based on information provided in Appendices A and B.

Notes: ARAR = applicable or relevant and appropriate requirement.
TBC = "to be considered" guidance material.
mg/kg = milligrams per kilogram.
NA = not applicable.
* = average of sample and duplicate.
** = value based on acute toxicity considerations.

- The Navy will incorporate these land-use considerations into a Land-Use Control (LUC) Agreement.
- The soil cleanup goals for arsenic will not be used at any other site without prior FDEP approval.

Based on establishment of this site-specific cleanup goal for arsenic at Site 15, NAS Whiting Field, and as shown in Table 2-2, the establishment of a chemical-specific RAO for arsenic is not necessary if the above conditions are met. However, pending the future land use of Site 15 and a cost sensitivity analysis, varying levels of site cleanup may be required. The various action levels for Site 15 surface soils are listed in Table 2.2.

Subsurface Soil. Chemical-specific ARARs and TBCs for subsurface soil were considered when identifying RAOs based on ARARs. The chemicals detected in subsurface soil at Site 15 were compared to the State SCTLs and to the USEPA RBCs for industrial sites. Two chemicals, arsenic and aroclor 1242 exceeded the Florida residential SCTL. However, arsenic concentrations were below the background screening value of 6.2 mg/kg and concentration of aroclor-1242 was above the Florida industrial SCTL of 2,100 ug/kg (depth of 10 to 11 feet below land surface). Table 2-3 provides a summary of the detected concentrations of arsenic and Aroclor-1242 and their respective cleanup target levels.

An RAO will be established to address exceedance of Aroclor-1242 in Site 15 subsurface soils.

> **RAO 2:** Reduce risks associated with exposure to subsurface soils containing Arclor-1242 concentrations greater than action levels.

Waste Disposal. Action-specific ARARs related to landfill closure were considered for identifying RAOs. In order to complete this review, it was noted that the disposal site at Site 15 did not receive wastes after 1979. Based on this review, Federal and State landfill closure regulations were deemed not applicable to Site 15 for the following reasons:

- Federal regulations for closure of Resource Conservation and Recovery Act (RCRA) hazardous waste landfills (40 CFR, Part 264, Subpart N) are not applicable because the disposal sites did not receive waste after the effective date of RCRA, November 19, 1980;
- Federal regulations for the closure of solid waste landfills (40 CFR, Part 258) are not applicable because the disposal site did not receive waste after the effective date of the regulation, October 9, 1993; and
- Florida Solid Waste Disposal Facilities Regulations (Florida Administrative Code, Chapter 62-701) are not applicable because the disposal site did not receive waste after the effective date of the regulation, July 1, 1983.

> The closure requirements described in these regulations do not apply to disposal areas that received their final covers before 1983.

Other Considerations. Although the above-referenced regulations are not directly applicable to remedial action at Site 15, portions of the regulations may be relevant for developing remedial alternatives for the sites. For example, the *Technical Manual for Solid Waste Disposal Criteria* (USEPA, 1992) provides information regarding statistical evaluation of groundwater monitoring data. In addition, guidance published for CERCLA sites provides information regarding closure of CERCLA landfills.

As stated in *Design and Construction of RCRA/CERCLA Final Covers* (USEPA, 1991b), closure of CERCLA landfills that are not subject to specific closure regulations can be achieved by "hybrid-landfill closure." A "hybrid-landfill closure" may be used when residual contamination poses a direct contact threat,

Table 2-3
Summary of Chemicals Exceeding Chemical-Specific ARARs and TBCs in Subsurface Soil

Feasibility Study For Surface And Subsurface Soils
Site 15, Southwest Landfill
Naval Air Station Whiting Field
Milton, Florida

Analyte	Frequency of Detection[1]	Range of Detected Analyte Concentration	Background Screening Value[2]	Soil Cleanup Target Level Residential/ Industrial[3]/Leachability	USEPA Region III RBCs Industrial[4]	Site-Specific Soil Cleanup Goal[5]
Inorganic Analytes (ug/L)						
Arsenic	5/5	0.63 to 2.6	6.2	0.8/3.7/29	3.8	4.62
Aroclor-1242	1/5	2,200	ND	500/2,100/17,000	2,900	NA

[1] Frequency of detection is the fraction of total samples analyzed in which the analyte was detected.
[2] Background screening values are two times the arithmetic mean of detected background concentrations.
[3] Source: Contaminant Cleanup Target Levels, Chapter 62-777, FAC (June 1999).
[4] USEPA Region III RBCs for soil ingestion based on an excess lifetime cancer risk of 1×10^{-6} or an adjusted hazard quotient of 0.1. (October 1998).
[5] Site-specific cleanup goal for arsenic based on information provided in Appendices A and B.

Notes: ARAR = applicable or relevant and appropriate requirement.
TBC = "to be considered" guidance material.
mg/kg = milligrams per kilogram.
NA = not applicable.
* = average of sample and duplicate.
** = value based on acute toxicity considerations.

but does not pose a groundwater threat. USEPA guidance (USEPA, 1991b) suggests the following items be considered for hybrid-landfill closures:

- covers, which may be permeable, to prevent a direct contact threat;
- limited long-term cover maintenance;
- minimal groundwater monitoring; and
- institutional controls (e.g., land use controls), as necessary.

Based on consideration of these items and the recommendations of the RI (including the RA), some or several of these components will be considered in developing remedial alternatives for Site 15.

Summary of RAOs. Two RAOs have been established for Site 15. Table 2-4 lists the RAOs.

Table 2-4
Summary of Remedial Action Objectives

Feasibility Study For Surface And Subsurface Soils
Site 15, Southwest Landfill
Naval Air Station Whiting Field
Milton, Florida

Remedial Action Objectives	Description
1	Reduce risks associated with exposure to surface soil containing contaminant concentrations greater than action levels.
2	Reduce risks associated with exposure to subsurface soils containing Aroclor-1242 concentrations greater than action levels.

2.3 IDENTIFICATION OF GENERAL RESPONSE ACTIONS.

General response actions describe potential medium-specific measures that may be employed to address RAOs. Potential response actions for CERCLA sites include the following general response categories:

- no action
- limited action
- containment
- treatment (either *in situ* or *ex situ*)
- disposal

To develop appropriate response actions for former disposal sites, the NCP and USEPA provide guidance for developing general response actions for such sites. The USEPA has produced a document entitled *Streamlining the RI/FS for CERCLA Municipal Landfill Sites* (USEPA, 1991a). Because municipal landfill sites typically have similar characteristics as land disposal sites, the USEPA recognizes that similar waste management approaches will be required for remediation. The NCP states that the USEPA expects containment technologies will generally be appropriate for landfills that pose a relatively low long-term threat or where treatment is impractical (Section 300.430[a][1][iii][B]). Therefore, the number of general response actions identified for Sites 9 and 10 are limited based on these guidance documents.

The USEPA states in *Streamlining the RI/FS for CERCLA Municipal Landfill Sites* (USEPA, 1991a) that physical and/or thermal treatment technologies should be considered for identifiable areas of highly toxic and/or mobile material that constitute the principal threat(s) posed by the site (Section 300.430[a][1][iii]-[A]). However, the RI for Site 15 did not identify highly toxic areas or materials that pose a principal threat; therefore, the general response actions identified for Site 15 do not include physical or thermal treatment

technologies. As a result, the presumptive remedy for Site 15 are focused on containment (i.e., capping) rather than physical or chemical treatment technologies.

In summary, the general response actions identified for Site 15 include:

- no action,
- limited action (i.e., landfill closure and post-closure activities),
- containment (i.e., soil cover), and
- disposal (i.e., limited soil removal).

3.0 REMEDIAL ACTION ALTERNATIVES

The approach and rationale leading to the development of remedial alternatives for Site 15 are presented in this chapter. The development of remedial alternatives for CERCLA sites consists of identifying applicable technologies, screening those technologies, and using the selected technologies to develop remedial alternatives that accomplish the RAOs identified in Chapter 2.0.

The NCP requires that a range of remedial alternatives be considered. SARA emphasizes the use of treatment technologies. Treatment alternatives range from those that eliminate the need for long-term management to those that reduce toxicity, mobility, or volume of contaminants. The range of alternatives considered in this FS include technologies from the following categories:

- no action
- limited action (LUCs)
- containment (capping)
- disposal (soil excavation and disposal)

The NCP and USEPA provide guidance for developing remedial alternatives (USEPA 1991). Because municipal landfill sites typically have similar characteristics, the USEPA recognizes that similar waste management approaches will be required for remediation. Section 300.430[a][1][iii][B] of the NCP states that the USEPA expects containment technologies will generally be appropriate for waste (e.g., landfills) that poses a relatively low long-term threat or where treatment is impractical. In this FS, the number of technologies and alternatives evaluated for Site 15 were limited in scope based on these guidance documents.

The remaining sections of this chapter identify the types of technologies that contribute to achieving the RAOs, evaluate and select representative technologies for each technology type, and develop remedial alternatives using the selected technologies. A detailed evaluation of remedial alternatives is presented in Chapter 4.0.

3.1 IDENTIFICATION AND SCREENING OF REMEDIAL TECHNOLOGIES.

The purpose of this section is to identify and screen appropriate technologies for assembly into remedial alternatives that address the RAO identified for Site 15. Each technology is then screened based on site- and waste-limiting characteristics.

Site characteristics considered during this process included the following:

- site geology, hydrogeology, and terrain;
- availability of space and resources necessary to implement the technology; and
- presence of special site features (e.g., wetlands, floodplains, or endangered species).

The following waste characteristics were also considered:

- contaminated media;
- types and concentrations of waste constituents; and
- physical and chemical properties of the waste (e.g. volatility, solubility, and mobility).

Table 3-1 presents the remedial technologies applicable for addressing the RAOs for Site 15. This table also presents the screening of those technologies. The technology screening process reduces the number of potentially applicable technologies by evaluating the applicability of each technology to site- and waste-limiting factors. Technologies deemed ineffective or not implementable were eliminated from further consideration. The remaining technologies are assembled into remedial alternatives in Section 3.2.

Table 3-1
Identification and Screening of Remedial Technologies

Feasibility Study For Surface And Subsurface Soils
Site 15, Southwest Landfill
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General Response Action and Technology	Description of Technology	Applicability to:		Screening Status
		Site Characteristics	Waste Characteristics	
No Action				
No action	No remedial actions are taken at Site 15. Five-year site reviews would be required.	Applicable.	Applicable.	Retained. This alternative is retained for a baseline for comparison with other alternatives as required by CERCLA.
Five-year site reviews	Under CERCLA, if wastes are left on a site after closure, the site should be reviewed every 5 years.	Applicable.	Applicable.	Retained. This alternative is retained based on the CERCLA requirement that if wastes remain on site after closure, a review of the site must be completed every 5 years.
Limited Action				
Land-use controls (LUC)	Use of LUC documents to maintain the site for non-residential purposes.	Applicable.	Applicable.	Retained. This alternative is retained because it would achieve RAO 1.
Containment				
Soil covering and related activities	A cover material (i.e. clay, soil, asphalt, gravel, or synthetic membrane) is placed over the site. Provides a barrier preventing receptor contact with Site 15 soil.	Applicable.	Applicable.	Retained. This alternative would achieve RAOs 1, 2, and 3.

See notes at end of table.

Table 3-1 (Continued)
Identification and Screening of Remedial Technologies

Feasibility Study For Surface And Subsurface Soils
Site 15, Southwest Landfill
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Milton, Florida

General Response Action and Technology	Description of Technology	Applicability to:		Screening Status
		Site Characteristics	Waste Characteristics	
Containment (Continued)				
Soil stabilization	Soils are mixed with an additive, such as a reactive chemical or concrete, to bind specific analytes chemically or physically with soil particles. This technology eliminates migration of contaminants from soil. The process can be performed *in situ* or *ex situ*.	Applicable.	Applicable.	Eliminated. This alternative would not achieve the RAO, and significant arsenic migration from Site 15 is not expected.
Disposal				
Off-Site Soil Disposal:				
RCRA Subtitle D Solid Waste Landfill	Removed soil is sampled and analyzed for waste classification. Soil is transported to a nonhazardous, solid waste landfill based on analytical results from excavated soil.	Applicable. Soil is most likely not characteristically ignitable, corrosive, reactive, or toxic.	Applicable. Analytical results from the RI indicate that the soil would most likely not be classified as hazardous for toxicity.	Retained.
RCRA Subtitle C Hazardous Waste Landfill	Excavated soil is sampled and analyzed for waste classification. Soil is transported to a hazardous, solid waste landfill based on analytical results from excavated soil.	Not Applicable. Soil is most likely not characteristically ignitable, corrosive, reactive, or toxic.	Not Applicable. Analytical results from the RI indicate that the soil would most likely not be classified as hazardous for toxicity.	Eliminated. It was assumed that soil at Site 15 would be classified as nonhazardous.

Notes: CERCLA = Comprehensive Environmental Response, Compensation, and Liability Act.
RAO = remedial action objective.
RCRA = Resource Conservation and Recovery Act.
RI = remedial investigation

3.2 REMEDIAL ALTERNATIVES.

Remedial technologies that passed the technology screening are assembled into alternatives that will meet the RAOs. Table 3-2 presents the alternative development for Site 15. The alternatives for Site 15 were developed to address closure of the disposal area in accordance with ARARs.

Table 3-2
Development of Remedial Alternatives

Feasibility Study For Surface And Subsurface Soils
Site 15, Southwest Landfill
Naval Air Station Whiting Field
Milton, Florida

Alternative	Description of Key Components
Alternative 1: No Action	Five-year site review.
Alternative 2: Land-Use Controls (LUCs)	LUCs including LUC assurance and implementation plans. Five-year site review.
Alternative 3: Soil Cover and LUCs	LUCs including LUC assurance and implementation plans. Posting of warning signs. Clearing and grubbing of disposal area. Placement of soil cover. Site restoration. Five-year site review.

Based on applicable technologies identified in the preceding section, four remedial alternatives were developed for Site 15. These alternatives are options under the no action, limited action, and disposal general response categories. The no action alternative was developed to provide a baseline for comparison with other alternatives (USEPA, 1988). The alternatives developed for Site 15 are discussed in the following subsections.

3.2.1 Alternative 1: No Action

The NCP requires the development of the no action alternative to provide a baseline for comparison against other remedial alternatives. This alternative (i.e. Alternative 1) does not involve the implementation of any remedial technologies to treat wastes at Site 15. Under CERCLA Section 121(c), any remedial action that results in hazardous substances, pollutants, or contaminants remaining on site must be reviewed at least every 5 years. The 5-year site review typically involves an administrative review of site records. For cost estimating purposes, Alternative 1 would include 5-year reviews for a period of 30 years.

3.2.2 Alternative 2: Land-Use Controls

Alternative 2 consists of activities necessary to maintain LUCs at the Site 15 landfill. These activities are

- LUCs (i.e. LUC documents), and
- 5-year site reviews.

LUCs, such as documents that restrict the use of the land in the vicinity of a disposal area and place regulatory controls on excavation of soil, would be drafted, implemented, and enforced in compliance with local regulations as a part of this alternative. The LUCs would be placed on the parcel of land encompassing the disposal site, including a typical buffer zone, as is currently used at other sites in the state.

Under CERCLA Section 121(c), any remedial action that results in hazardous substances, pollutants, or contaminants remaining on site must be reviewed at least every 5 years.

3.2.3 Alternative 3: Soil Cover and LUCs

One containment alternative was developed for Site 15 and consists of all components of Alternative 2 with the addition of a soil cover component. Containment alternatives require no treatment of contaminated materials.

Under this alternative, a cover system would be constructed over the former disposal sites to reduce the infiltration of precipitation, control surface water runoff, and minimize potential direct contact risks. Minimizing infiltration from precipitation and surface water reduces contaminant leaching from soil and landfill wastes to groundwater. The cover design would be in accordance with USEPA guidance for hybrid-landfill closure provided in *Design and Construction of RCRA/CERCLA Final Covers* (USEPA, 1991b).

Prior to cover placement, the site would be cleared, grubbed, and graded. To minimize storm water infiltration and cap erosion, the soil cover would be graded. The soil cover would consist of clean fill placed and compacted in 6-inch lifts to a minimum thickness of 18 inches. Six inches of topsoil would then be placed on top of the clean fill for a total cover thickness of 24 inches. Once in place, the soil layer would be fertilized and seeded to promote vegetative cover.

Post-closure monitoring and maintenance of the installed soil cover system would be required until the cover system stabilized. This monitoring program would include visual inspections and maintenance of the vegetative cover. For cost estimating purposes, inspection and monitoring is estimated for a period of 30 years after closure. Finally, LUCs and 5-year reviews would be implemented as previously discussed. The 5-year site reviews will assess the need for continued landfill monitoring.

4.0 DETAILED ANALYSIS OF ALTERNATIVES

This chapter presents detailed analyses of alternatives for Site 15 at NAS Whiting Field. A detailed analysis is performed to provide decision makers with sufficient information to select the appropriate remedial alternative for a site. The detailed analysis has been conducted in accordance with CERCLA Section 121, the NCP, and USEPA RI/FS guidance (USEPA, 1988). The detailed evaluation of each remedial alternative includes the following:

- a detailed description of the alternative, emphasizing the applications of the technology or actions proposed for each alternative; and

- a detailed analysis of the alternative against seven of the nine criteria.

The remedial alternatives are examined with respect to the requirements stipulated by CERCLA and factors described in the USEPA's *Guidance for Conducting RI/FS Under CERCLA* (USEPA, 1988). The nine criteria from the RI/FS guidance document are

- overall protection of human health and the environment;
- compliance with ARARs
- long-term effectiveness and permanence;
- reduction of toxicity, mobility, and volume of contaminants through treatment;
- short-term effectiveness;
- implementability;
- cost;
- State acceptance; and
- community acceptance.

This FS presents evaluation of the first seven criteria in the alternative evaluation process. Table 4-1 outlines the specific elements considered for these seven criteria. Typically, State acceptance (i.e., the eighth factor) is addressed when comments on the draft FS report have been received from the State. Therefore, State comments will be addressed in the final FS, and a summary of State acceptance of this FS will be included in the final FS report.

Community acceptance (i.e., the ninth factor) is addressed upon receipt of public comments on the Proposed Plan (USEPA, 1988). The responsiveness summary, included as an appendix to the ROD for the site, is intended to provide the overview of achievement of this ninth criterion.

4.1 DETAILED ANALYSIS FOR ALTERNATIVE 1: NO ACTION.

Alternative 1 is a no action alternative. Under this alternative, no actions would be taken to address contamination at the site. A description of this alternative is presented in Subsection 4.1.1, and a technical assessment of this alternative is presented in Subsection 4.1.2.

4.1.1 Detailed Description of Alternative 1

In accordance with the NCP, the no-action alternative is used as a baseline for comparison against other alternatives. Because hazardous substances, pollutants, or contaminants would be left in place at Site 15 as part of this alternative, this alternative would include 5-year site reviews. There would be no restrictions on land-use types; therefore, the site could be used for residential use or other high-exposure uses.

Five-Year Site Reviews. Under CERCLA Section 121(c), any remedial action that results in hazardous substances, pollutants, or contaminants remaining on site must be reviewed at least every 5 years. It is assumed, for this FS, that these reviews would occur over a 30-year period. These reviews would consist of

evaluating changes to site conditions at the site (e.g. construction, demolition, change in potential receptors, migration pathways, qualitative risks, etc.) to assess whether or not human health and the environment continue to be protected by the alternative. The appropriateness of this alternative would then be compared to other remedial alternatives to confirm that it is still the most appropriate selection.

Table 4-1
Criteria for Evaluation of Remedial Action Alternatives

Feasibility Study For Surface And Subsurface Soils
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Factors	Criteria to Consider
Overall protection of human health and the environment	How risks are eliminated, reduced, or controlled. Short-term or cross-media effects.
Compliance with ARARs	Compliance with chemical-specific ARARs. Compliance with location-specific ARARs. Compliance with action-specific ARARs.
Long-term effectiveness and permanence	Magnitude of residual risk. Adequacy of controls. Reliability of controls.
Reduction of mobility, toxicity, and volume of contaminants through treatment	Treatment process and remedy. Amount of hazardous materials destroyed or treated. Reduction of mobility, toxicity, or volume through treatment. Irreversibility of treatment. Type and quantity of treatment residual.
Short-term effectiveness	Protection of community during remedial action. Protection of workers during remedial action. Environmental effects. Time until RAOs are achieved.
Implementability	Ability to construct technology. Reliability of technology. Ease of undertaking additional remedial action, if necessary. Coordination with other agencies.
Cost	Capital cost. Operation and maintenance cost. Total present worth of alternative.

Notes: ARAR = applicable or relevant and appropriate requirement.
RAO = Remedial Action Objective.

4.1.2 Technical Criteria Assessment of Alternative 1

This subsection provides the technical criteria assessment of Alternative 1 against the seven criteria.

Overall Protection of Human Health and the Environment. This alternative would provide no protection to human receptors who may be exposed to soils at Site 15. If this alternative were selected, 5-year site reviews would be instituted.

No adverse short-term or cross media effects are anticipated with this no-action alternative.

Compliance with ARARs. This alternative would not comply with chemical-specific ARARs or TBCs (e.g., MCLs, Florida GCTLs, or Florida SCTLs) in the short term. Eventually, this alternative may comply with ARARs if natural processes including physical, chemical, and biological changes in the soil and groundwater reduce contaminant concentrations.

Long-Term Effectiveness and Permanence. LUCs are not part of the alternative; therefore, human and ecological risks due to exposure to site soils would not be addressed via this alternative. Therefore, these risks would remain over a period of time until natural processes reduce the contaminant concentrations and reduce the mobility of the contaminants, or other LUCs are implemented.

Administrative actions proposed in this alternative (e.g., 5-year site reviews) would provide a means of evaluating the effectiveness of the alternative, but would not provide a permanent remedy for the site. Administrative actions are considered to be reliable controls.

Reduction of Toxicity, Mobility, and Volume of Contaminants through Treatment. This alternative would not provide a reduction in contaminant toxicity, mobility, or volume because no active mitigation of contaminant concentrations is proposed. No treatment residuals would be produced if this alternative were implemented.

Short-Term Effectiveness. This alternative would not reduce human or ecological health risks in the short term because no land-use restrictions would be implemented.

This alternative does not pose a threat to workers through exposure to contaminated soils because remedial construction activities are not proposed under this alternative.

Implementability. This alternative does not require remedial construction for implementation. Other activities, such as 5-year site reviews, are easily implemented.

Cost. The present worth cost of Alternative 1 is presented in Table 4-2. The 5-year site reviews were estimated over a 30-year monitoring period. A 30-year period was chosen only because the RI/FS guidance recommends using this time frame. The total present worth cost of Alternative 1 is $19,000. Cost estimates are presented in Appendix D.

Table 4-2
Cost Summary Table, Alternative 1: No Action

Feasibility Study For Surface And Subsurface Soils
Site 15, Southwest Landfill
Naval Air Station Whiting Field
Milton, Florida

Operation and Maintenance Cost (O&M) (per event)		
5-year site review		$5,000
	Total O&M cost (per event)	$5,000
	Total O&M cost (present worth of semi-annual O&M for 30 years)	$17,000
	Contingency (10 percent)	$2,000
	Total cost Alternative 1: no action	$19,000

Note: Cost are rounded to the nearest $1,000. See Appendix D for cost details.
Total costs are based on present worth costs.

4.2 DETAILED ANALYSIS FOR ALTERNATIVE 2: LAND-USE CONTROLS.

Alternative 2 consists of administrative actions to limit the exposure to soils at Site 15. A description of this alternative is presented in Subsection 4.2.1, and a technical assessment of this alternative is presented in Subsection 4.2.2.

4.2.1 Detailed Description of Alternative 2

Under this alternative, LUCs would be implemented that would provide protection of human receptors. These LUCs would involve the use of institutional controls that would restrict the use of the land in the vicinity of Site 15. The agreement would mandate an ongoing inspection program to ensure compliance while the LUCs are in effect. Additionally, LUCs would place regulatory controls on the excavation of soils or similar activities that have the potential to disturb the site soils or increase the likelihood of exposure to the site soils. The LUCs would be placed on a parcel of land slightly larger than the boundaries of the current disposal area. This would ensure that an appropriate buffer zone is created and maintained between the disposal area and other areas of NAS Whiting Field.

The following components would be included as part of this alternative:

- LUCs, and
- 5-year site reviews.

LUCs. Under new USEPA Region IV guidance, the use of the LUCs as a remedy for contaminated sites requires the development of an LUC assurance plan as provided in the memorandum of agreement (MOA) dated November 1999, and an LUC implementation plan (LUCIP). These two documents detail the actions required when LUCs are selected as a remedy for a site.

The LUCIP is developed for each site where LUCs are necessary on the facility. The LUCIP would include details regarding additional required activities, such as quarterly and annual inspection, and reporting for the specific area. These activities are required as part of the LUC agreement to ensure compliance while the LUCs for the sites are in effect. Further, because LUCs will remain in effect until the contamination at the sites has been adequately addressed, the activities identified in the LUCIP will also remain in effect until such time that the contamination present at the sites has been adequately addressed.

5-Year Site Reviews. Refer to Subsection 4.1.1 for a detailed description of these reviews.

4.2.2 Technical Criteria Assessment of Alternative 2

This subsection presents the technical criteria assessment of Alternative 2.

Overall Protection of Human Health and the Environment. Human receptors, namely residents, would be protected if this alternative were implemented. Regulatory controls (i.e. LUCs) would prohibit potential future residents and workers from exposure to the site because residential and industrial use of the site would be restricted under the proposed LUCs.

By implementing this alternative, no adverse short-term or cross-media effects are anticipated.

Compliance with ARARs. This alternative would not comply with chemical-specific ARARs or TBCs (e.g., MCLs, Florida GCTLs, or Florida SCTLs). Concentrations of contaminants are not less than their respective industrial SCTLs or site-specific cleanup goals, as discussed in Chapter 2.0.

Long-Term Effectiveness and Permanence. The risks presented to the future resident and ecological receptors based on exposure to surface soil at the site would be addressed via the LUCs. The long-term effectiveness and permanence of these controls will be managed by the facility under the MOA developed for NAS Whiting Field.

Administrative actions proposed in this alternative (e.g., LUCs and 5-year site reviews) would provide a means of evaluating the effectiveness of the alternative. These administrative actions are considered to be reliable controls, as long as the facility maintains its LUCAP and LUCIP.

Reduction of Toxicity, Mobility, and Volume of Contaminants through Treatment. Although no treatment is included in this alternative, natural processes may provide some reduction in contaminant toxicity through natural processes. However, this alternative would not provide a reduction in contaminant mobility or volume because no active mitigation of contaminant mobility or reduction in volume is proposed. No treatment residuals would be produced if this alternative were implemented.

Short-Term Effectiveness. This alternative would reduce human and ecological health risks in the short term by reducing the potential exposure to Site 15 soils by human and ecological receptors.

This alternative does not pose a threat to workers through exposure to contaminated soils because only limited remedial construction activities (e.g., posting signs) are proposed under this alternative.

Implementability. This alternative does not require remedial construction for implementation. Other activities, such as LUCs and 5-year site reviews, are easily implemented.

Cost. The present worth cost of Alternative 2 is presented in Table 4-3. Both the LUCs and 5-year site reviews were costed out over a 30-year monitoring period. A 30-year period was chosen only because that is what the RI/FS guidance recommends. The total present worth cost of Alternative 2 is $135,000. Cost estimates are presented in Appendix D.

Table 4-3
Cost Summary Table, Alternative 2: Land Use Controls

Feasibility Study For Surface And Subsurface Soils
Site 15, Southwest Landfill
Naval Air Station Whiting Field
Milton, Florida

Direct Cost		
Land-use controls		$12,000
	Total direct cost	$12,000
Operation and Maintenance Cost (O&M) (per event)		
5-year site review		$ 7,000
Inspection/Reporting		$5,000
	Total O&M cost (per event)	$ 12,000
	Total O&M cost (present worth of semi-annual O&M for 30 years)	$111,000
	Total Direct and O&M	$123,000
	Contingency (10 percent)	$12,000
	Total cost Alternative 2: LUCs	$135,000

Note: Costs are rounded to the nearest $1,000. See Appendix D for cost details.
Total costs are based on present worth costs.

4.3 DETAILED ANALYSIS FOR ALTERNATIVE 3: SOIL COVER AND LUCs.

Alternative 3 consists of constructing a soil cover in accordance with Chapter 62-701.600, FAC (Florida Landfill Closure regulation) at Site 15. A description of this alternative is presented in Subsection 4.4.1 and a technical criteria assessment of this alternative is presented in Subsection 4.4.2.

The design criteria presented in this section are intended for cost comparison purposes only and are not intended to be final design specifications.

4.3.1 Detailed Description of Alternative 3

Alternative 3 is designed to address closure of the disposal areas and exposure to surface soil at Site 15. The selected landfill cover design for Alternative 3 is primarily based on the Florida landfill closure regulation (Chapter 62-701.600, FAC). This regulation was used to develop appropriate criteria for a soil cover design and to formulate a cost estimate for the detailed evaluation of this alternative. The following components would be included as part of this alternative:

- LUCs
- Site preparation, clearing, and grubbing
- Soil cover design
- Post-closure care
- Five-year site reviews

LUCs. Refer to Alternative 2 for a description of LUCs. The Site LUC Plan would consist of a closure report, closure design plan, and closure operation plan in accordance with Chapter 62-701.600, FAC.

Site Preparation, Clearing, and Grubbing. A stockpile area, with a 12-inch-thick gravel base, would be installed at the site and would be large enough to provide sufficient volume for several days of filling and grading operations associated with this alternative. An area adjacent to the stockpile area would be prepared with a 12-inch-thick gravel base to be used as a parking area for construction- support trailers and heavy equipment. Equipment mobilized to the site would include earth-moving equipment such as backhoes, front-end loaders, bulldozers, and dump trucks.

Approximately 10 percent of the site is assumed to be covered by trees; a sparse layer of groundcover covers the remainder of the site. Pine trees, shrubs, and other vegetation will be cleared with a trackhoe or other type of excavation equipment to provide a cleared surface for placement of the landfill cover. Small brush and vegetation will be chopped and spread over the landfill surface. Large trees will be disposed as yard-waste at an appropriate mulching or tree recycling facility, or chipped and spread over the landfill surface prior to construction of the soil cover.

Soil Cover. The primary intent of the landfill cover is to limit direct contact exposure to site soil. As a result, the soil cover will be approximately 24 inches thick and consist of an 18-inch thick barrier soil layer and 6-inch topsoil layer for vegetative cover per Chapter 62-701.600, FAC. This barrier layer will be placed and compacted in 6-inch lifts to ensure proper compaction and cover stability. A fine-grained, low-permeable soil layer (59,584 yd^3) will be obtained from an off-site borrow source. The borrow soil will be tested to verify that it is "clean" fill and exhibits a pH between 6 and 7.5 standard units (su).

This soil will be compacted with a sheepsfoot or smooth roller to achieve a structurally stable surface. The final compacted soil layer will consist of a minimum of 2 feet soil cover. Only minimal modification of the existing topography will be performed.

A final 6-inch layer of topsoil (19,861 yd^3) will be placed over the compacted soil to support vegetative growth. The soil will be obtained from an off-site borrow source to provide the adequate soil composition required to stimulate and support natural vegetation. The soil will be tested to verify that it is "clean" fill and exhibits a pH between 6 and 7.5 su.

Selected seed and fertilizer will be placed on the vegetative support layer to establish vegetation. Hay will be used to protect the seed and fertilizer during initial development. Post-closure care will include provisions to stimulate growth. The vegetative cover will minimize erosion by developing root systems within the vegetative support layer that overlies the compacted soil cover material. The vegetation will also provide evapotranspiration of moisture contained in the soil cover, which will increase the cover's structural stability.

Post-Closure Care. Post-closure care will consist of the activities listed below, performed on an annual basis for a period of 30 years after cover construction.

- Visually inspecting, seeding, watering, and otherwise maintaining the vegetation on the surface of the closed landfill.

- Visually inspecting the landfill cover for signs of wear or discontinuities, such as seeps, pits, cracks, or other imperfections that may compromise the cover's structural integrity.

Groundwater monitoring is not included in post-closure care as groundwater is being investigated on a facilitywide basis at NAS Whiting Field (designated Site 40). The need for groundwater monitoring will be assessed in the Site 40 RI for groundwater.

Five-Year Site Reviews. Refer to Alternative 1 for a description of this component.

4.3.2 Technical Criteria Assessment of Alternative 3

This subsection presents the technical criteria assessment of Alternative 3.

Overall Protection of Human Health and the Environment. Protection of human receptors would be provided by the implementation of this alternative as a landfill cover and regulatory controls (i.e., LUCs) would prohibit potential human receptors from coming into contact with the soil. This alternative would also provide protection for ecological receptors at the site; however, in doing so, this alternative would alter the native ecological habitat present at the site.

Compliance with ARARs. Landfill closure requirements under RCRA Subtitles C and D, as well as Florida Solid Waste Disposal Facilities Regulations, were referenced as appropriate concerning the soil cover design.

Worker safety standards will be maintained during construction activities to comply with ARARs. Dust control will be used to minimize the spread of wind-blown soil during site grading.

Five-year site reviews will be prepared to assess the effectiveness of the alternative.

Long-Term Effectiveness and Permanence. The construction of a soil cover will prevent human health risks posed by ingestion of surface soil and ecological risks to small mammals exposed to surface soil.

Alternative 3 can be viewed as a permanent method of reducing human health risks posed by ingestion of surface soil if the cover stability shows permanence after completion of the 5-year review. Similar to human health risk reduction, the soil cover will also be designed to prevent risks posed to ecological receptors. A vegetative cover will be placed over the compacted soil to allow growth of native vegetation. The vegetation will increase evapotranspiration and reduce cover erosion. The risk posed to local species by ingesting biota that contain contaminants in their tissue, or by directly ingesting surface soil that contains contaminants, will be eliminated by placement of the compacted soil.

Alternative 3 includes clearing and grubbing vegetation that currently exists on the landfills. Existing vegetation will be removed, and ecological diversity will be reduced at Site 15. This ecological loss is not permanent; new vegetation will be planted on the final cover to induce continued ecological growth. However, this new vegetation will consist of mostly grasses and small brush, which is not quite as diverse as the natural vegetation that currently exists (due to the removal of some trees). The clearing and grubbing of the existing vegetation can be viewed as a permanent long-term ecological impact.

Reduction of Toxicity, Mobility, and Volume of Contaminants through Treatment. Alternative 3 does not include treatment of contaminants, and does not physically or chemically alter contaminants contained in the landfills. Thus, this alternative does not reduce the toxicity and/or volume of contaminants through treatment. However, the cover design will effectively reduce the mobility of contaminants contained in surface soil by preventing the spread of wind-blown particulates. The cover will also prevent the uptake of contaminants contained in surface soil, which will prevent biomagnification of contaminants through the local ecological food chain.

Short-Term Effectiveness. During the clearing, grubbing, and grading of the site, fugitive dust will be generated. This dust may contain hazardous particulates that pose an inhalation risk to site workers. Dust suppression by the use of water trucks and hoses is included in this alternative to minimize these potential short-term risks.

Site workers may be exposed to contaminated surface soil during construction activities. Appropriate PPE can be used to minimize this increased risk.

Alternative 3 will include clearing and grubbing vegetation that currently exists. Ecological species that depend upon the surface of the landfills for food and other natural resources will be impacted by the removal of existing vegetation. This detrimental impact is an adverse short-term impact that will be reversed upon the growth of new vegetation. Construction operations are expected to last for 5 months, and new vegetation will likely require years to mature. Thus, the short-term ecological impacts as a result of clearing and grubbing the site may be significant.

Implementability. Equipment and materials are readily available to construct the cover designed for Alternative 3. Site work will be completed within a 5-month period, and will require standard construction expertise. Because of the difficulty in obtaining borrow soil in the vicinity of the site, compacted soil will be obtained from a non-local borrow source. The lack of local borrow sources would result in additional transportation cost, but does not render the alternative infeasible.

Cost. The cost estimate for Alternative 3 is presented in Table 4-4 and detailed cost calculations are provided in Appendix D. This estimate is based on the preliminary design criteria presented in this section. The total present worth cost of Alternative 3 is approximately $2,127,000.

Table 4-4
Cost Summary Table, Alternative 3: Soil Cover and LUCs

Feasibility Study For Surface And Subsurface Soils
Site 15, Southwest Landfill
Naval Air Station Whiting Field
Milton, Florida

Direct Cost		
Land-use controls		$12,000
Mobilization and site preparation		$83,000
Site clearing and grubbing		$60,000
Soil cover		$1,147,000
Dust control		$3,000
Site restoration		$42,000
	Total direct cost	$1,347,000
Indirect Cost		
Health and safety (3 percent)		$40,000
Administration and permitting (3 percent)		$40,000
Engineering and design (10 percent)		$135,000
Construction support services (10 percent)		$135,000
	Total indirect cost	$350,000
	Total capital cost (direct + indirect)	$1,697,000
Operation and Maintenance (O&M) Cost (capitalized)		
Soil cover inspection and maintenance		$75,000
Land-use controls - Quarterly & Annual inspections and reporting		$135,000
5-year site review		$27,000
	Total O&M cost (capitalized)	$237,000
	Total capital and O&M costs	$1,934,000
	Contingency (10 percent)	$193,000
	Total cost Alternative 3	$2,127,000

Note: Line item costs are rounded to the nearest $1,000. See Appendix D for cost details.
Total costs are based on present worth costs.

5.0 COMPARATIVE ANALYSIS OF REMEDIAL ALTERNATIVES

Remedial alternatives for Site 15 were developed in Chapter 3.0 and were individually evaluated in Chapter 4.0 using seven criteria. For comparative purposes, these criteria are grouped into the following categories:

- threshold criteria
- primary balancing criteria
- modifying criteria

The remainder of this chapter presents a comparison of remedial alternatives with respect to these criteria. This comparison is intended to provide technical information required to support the selection of a preferred alternative for Site 15.

5.1 OVERALL APPROACH TO COMPARATIVE ANALYSIS.

As presented in Chapter 4.0, remedial alternatives were developed to accomplish the RAOs identified for the site. The three sets of criteria identified above are used to streamline the comparison between alternatives while ensuring compliance with the RAOs. Components of these criteria are described below.

5.1.1 Threshold Criteria

Because the selected remedy must be protective of human health and the environment, as well as comply with ARARs, the following two threshold criteria are essential:

- overall protection of human health and the environment, and
- compliance with ARARs.

An individual assessment of each alternative with respect to these criteria was presented in Chapter 4.0. An overall comparative analysis of alternatives using threshold criteria is presented in Section 5.2.

5.1.2 Primary Balancing Criteria

Primary balancing criteria consist of the following five components:

- long-term effectiveness and permanence;
- reduction of toxicity, mobility, and volume of contaminants through treatment;
- short-term effectiveness;
- implementability; and
- cost.

These criteria are used to provide an assessment of the permanence of each remedial alternative, while ensuring their implementability and cost-effectiveness. An individual assessment of each alternative with respect to these criteria is presented in Chapter 4.0. An overall comparative analysis of alternatives using primary balancing criteria is presented in Section 5.2.

5.1.3 Modifying Criteria

The final two criteria are as follows:

- State acceptance, and
- community acceptance.

Typically, State acceptance (i.e., the eighth factor) is addressed when comments on the draft FS report have been received from the State. Therefore, State comments will be addressed in the Final FS, and a summary of State acceptance of this FS will be included in the final FS report.

Community acceptance (i.e., the ninth factor) is addressed upon receipt of public comments on the Proposed Plan (USEPA, 1988). The responsiveness summary, included as an appendix to the ROD for the site, is intended to provide the overview of achievement of this ninth criterion.

Based on this information, an evaluation of modifying criteria is not included in this FS.

5.2 COMPARATIVE ANALYSIS OF REMEDIAL ALTERNATIVE.

This section provides a comparative analysis for remedial alternatives for Site 15 with respect to the criteria described in Section 5.1.

5.2.1 Comparison of Threshold Criteria

The remedial alternatives for Site 15 were first compared to the two threshold criteria: overall protection of human health and the environment and compliance with ARARs.

Alternative 1 does not provide a means of restricting future land use of the area. Therefore, this alternative does not protect potential future residents from environmental conditions at the site. Alternative 1 would not achieve the RAOs established for Site 15.

The implementation of Alternative 2 would provide a measure of continued protection of human health and the environment because the alternative includes LUCs (including LUCIP). However, the FDEP site-specific variance applies to non-residential uses only. Thus, Alternative by itself will not achieve the RAOs.

Alternative 3 would also provide a measure of continued protection of human health and the environment because the alternative includes LUCs after the placement of soil cover to eliminate surface soil exposure.

5.2.2 Comparison of Primary Balancing Criteria

A comparison is made between alternatives with respect to five criteria: long-term effectiveness and permanence; reduction in toxicity, mobility, and volume of contaminants through treatment; short-term effectiveness; implementability; and cost.

For long-term effectiveness, Alternatives 1, 2, and 3 will not reduce concentrations of arsenic and vanadium through natural mechanisms.

Alternatives 1, 2, and 3 would not reduce the toxicity or mobility of contaminants at the site because these alternatives do not involve treatment of contaminants in media at the site.

The implementability of Alternatives 1, 2, and 3 would be relatively easy. For Alternatives 2 and 3, a LUCIP would need to be developed.

The relative present-worth costs are shown below for each alternative. In accordance with USEPA guidance the costs for Alternative 1, 2, 3 and are based on a 30-year timeframe.

- Alternative 1: $19,000
- Alternative 2: $135,000
- Alternative 3: $2,127,000

As expected, Alternative 1, the no-action alternative, has the lowest estimated overall cost. Alternative 2 involves LUCs and quarterly/annual inspections and reporting over 30 years and is the next lowest cost. Alternatives 3 incorporates all the components (and costs) of Alternative 2 with soil cover.

5.2.3 Modifying Criteria

As stated in Subsection 5.1.3, an evaluation of modifying criteria will not be included in this FS.

REFERENCES

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USEPA, Region IV. 1998. Memorandum from Jon D. Johnston, Chief of Federal Facilities Branch to the Region IV Federal Facilities Branch. Subject: "Assuring Land Use Controls at Federal Facilities."

APPENDIX A

NAVY'S REQUEST FOR SITE-SPECIFIC SOIL CLEANUP GOAL FOR ARSENIC AT DISPOSAL SITES AT NAS WHITING FIELD

Evaluation of Background Arsenic Concentrations for Covered Landfill Sites

At Naval Air Station (NAS) Whiting Field, nine soil types, as identified by the U. S. Department of Agriculture, Soil Conservation Service (USSCS), are present. The Remedial Investigation (RI) sites at NAS Whiting Field are associated with seven of the nine soil types. The background surface soil data set for each RI site was initially determined to be comprised of background surface soil samples from the same USSCS soil types as occur on the individual sites. However, available information and review of historical aerial photographs indicated that in the construction of landfills at the facility, a borrow pit was dug to an approximate depth of 10 to 15 feet bls and the excavated soil was piled to the side. Following landfill operations, the borrow materials comprised of undifferentiated surface and subsurface soils were used for the landfill cover. Any additional soils required to complete the landfill cover are believed to have been obtained from other borrow pits located at the facility.

If a mix of surface and subsurface soils were used in the cover for landfills, it would be appropriate to use the combined data set of surface and subsurface soil samples as the background screening value. However, in order to be protective of human health and the environment, it is proposed that the background surface and subsurface data set be combined to a single value as the "Industrial Use Soil Cleanup Goal." This modified "Industrial Use Soil Cleanup Goal" is specifically limited to the covered landfill sites including Sites 1, 2, 9, 10, 11, 13, 14, 15, and 16, and to the inorganic analyte arsenic.

Tables 3-8 through 3-18 in the General Information Report present the detected concentrations and summarize the analytical data for the individual background soil samples collected at NAS Whiting Field. A summary of the arsenic background data set and the modified "Industrial Use Soil Cleanup Goal" for arsenic is presented in Table A-1. As indicated on the table, the modified "Industrial Use Soil Cleanup Goal" for arsenic to be used at covered landfill sites is 4.62 milligrams per kilogram.

Table A-2
Comparison of Detected Arsenic Concentrations in Surface and Subsurface Soil Samples to Florida Soil Cleanup Goals

Feasibility Study
Sites 9 and 10, Waste Fuel Disposal Pit, and Southeast Open Disposal Area (A)
Naval Air Station Whiting Field
Milton, Florida

Analyte	Minimum Detected Concentration	Maximum Detected Concentration	Mean of Detected Concentrations	Soil Cleanup Goals for Florida (Residential)[1]	Soil Cleanup Goals for Florida (Industrial)[1]	Modified Industrial Use Cleanup Goal[2]
Inorganic Analyte (mg/kg)						
Arsenic	0.52	6.3	2.31	0.8	3.7	4.62

[1] Source: FDEP Memorandum from John Ruddell, Director Division of Waste Management, to District Directors and Waste Program Administrators. Subject: Applicability of Soil Cleanup Goals for Florida, January 19, 1996.
[2] The modified Industrial Use Cleanup Goal for arsenic is twice the mean of detected concentrations in the surface and subsurface soil samples.

Notes: mg/kg = milligram per kilogram.

APPENDIX B

FDEP'S RESPONSE AND ACCEPTANCE OF THE SITE-SPECIFIC SOIL CLEANUP GOAL FOR ARSENIC FOR DISPOSAL SITES AT NAS WHITING FIELD

Department of Environmental Protection

Lawton Chiles
Governor

Twin Towers Building
2600 Blair Stone Road
Tallahassee, Florida 32399-2400

Virginia B. Wetherell
Secretary

April 27, 1998

Ms. Linda Martin
Department of the Navy, Southern Division
Naval Facilities Engineering Command
2155 Eagle Drive, PO Box 190010
North Charleston, SC 29419-9010

file: arsenic1.doc

RE: Request for Site-Specific Arsenic Soil Cleanup Levels: Covered Landfill Sites, NAS Whiting Field

Dear Ms. Martin:

I have reviewed the request for approval of a site-specific Soil Cleanup Goal for arsenic at the "covered landfill sites" at NAS Whiting Field from Mr. Gerald Walker, ABB Environmental Services, dated April 22, 1998 (received April 22, 1998). Based on the prior presentation to Department Staff and the summary information furnished in the letter and the attached Appendix I, the request is granted to utilize a site-specific Soil Cleanup Goal for arsenic of 4.62 mg/kg at Sites 1, 2, 9, 10, 11, 12, 13, 14, 15 and 16., with the following conditions:

1. The sites may be utilized for activities that involve less than full-time contact with the site. This may include, but is not limited to, a.) parks b.) recreation areas that receive heavy use (such as soccer or baseball fields) or, c.) agricultural sites where farming practices result in moderate site contact (approximately 100 days/year, or less).

2. The Navy must assure adherence to the land use by incorporating the site and conditions in a legally binding Land Use Contol agreement.

3. The above Soil Cleanup Goal shall not be utilized at any other site without specific Department approval.

If you have questions or require further clarification, please contact me at (904) 921-4230.

Sincerely,

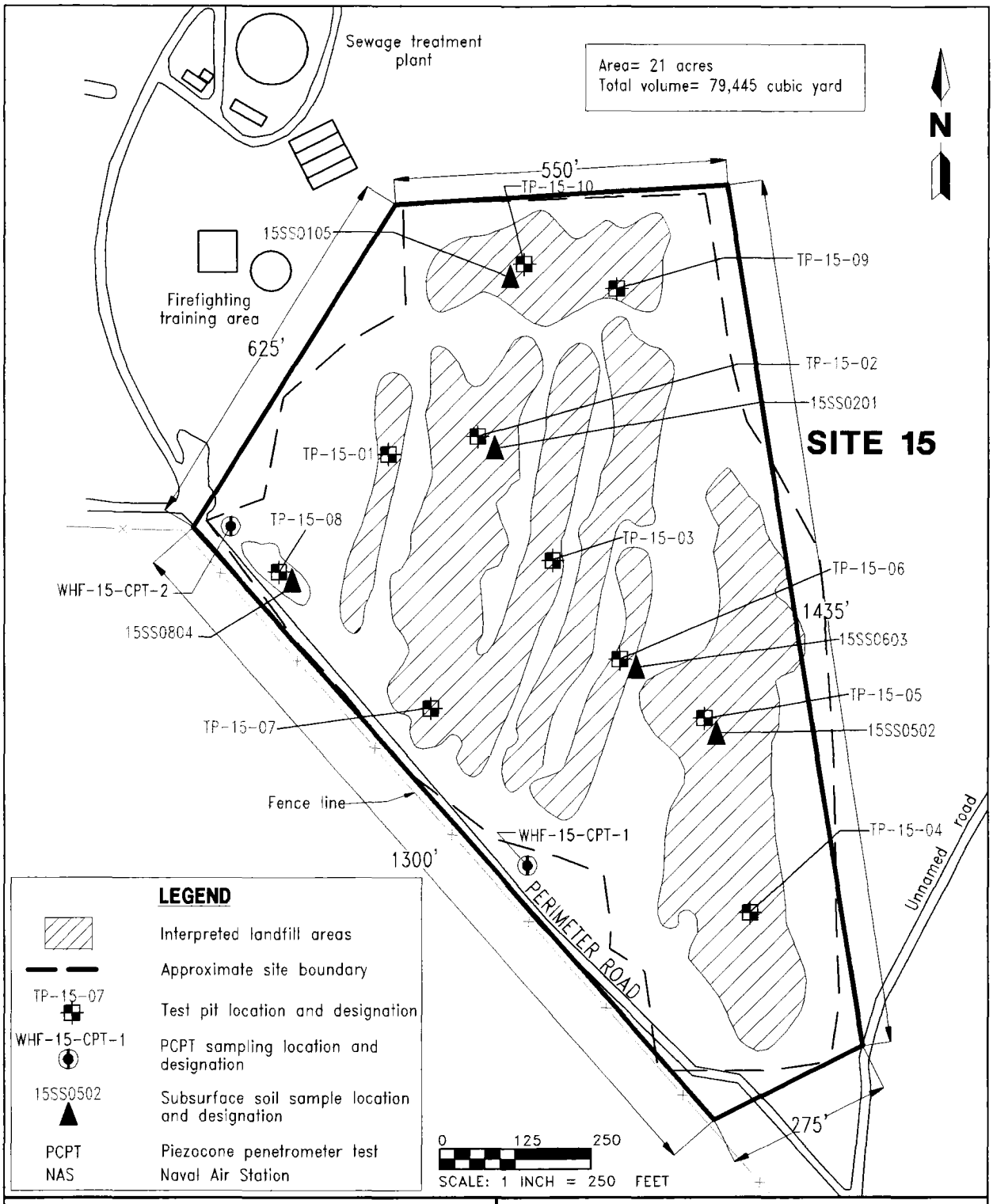
James H. Cason, P.G.
Remedial Project Manager

APPENDIX C

VOLUME ESTIMATE FOR CONTAMINATED MEDIA

FEASIBILITY STUDY - NAS WHITING FIELD SITE, 15
ALTERNATIVE 3: SOIL COVER AND LUCS
BACKFILL VOLUME REQUIRED FOR EXCAVATED AREAS

MATERIAL	AREA (Acres)	THICKNESS (ft.)	VOLUME (cu. yd)	VOLUME (w/20% COMPACTION) (cyd)	TOTAL VOLUME ($)
Common Fill	21	1.5	49,653	9,931	59,584
Topsoil	21	0.5	16,551	3,310	19,861
	TOTAL				**79,445**



SOIL COVER AREA, ALTERNATIVE 3

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FEASIBILITY STUDY
SITE 15, SOUTHWEST LANDFILL

NAS WHITING FIELD
MILTON, FLORIDA

APPENDIX D

COST CALCULATIONS FOR REMEDIAL ALTERNATIVES

ALTERNATIVE #1: No Action, Site 15

	Quantity	Unit	Unit Cost	Total Cost
FIVE YEAR SITE REVIEW COSTS				
Five-year Site Reviews (every 5 years for 30 years)				
Meetings (includes travel time)				
Senior Scientist	16	hrs	$90.00	$1,440
Mid-level Engineer	16	hrs	$60.00	$960
ODCs (includes per diem and rental car)	1	lump sum	$110.00	$110
Five-year Report				
Report				
Senior Scientist	15	hrs	$90.00	$1,350
Mid-level Engineer	20	hrs	$60.00	$1,200
ODCs (includes photocopying, etc.)	1	lump sum	$250.00	$250
Total 5-year costs				*$5,310*
Present Worth of 5-year costs at i=6%				*$17,352*
TOTAL FIVE YEAR SITE REVIEW COSTS				**$17,352**
CONTINGENCY @ 10 PERCENT				**$1,735**
TOTAL COST OF ALTERNATIVE #1				**$19,087**

ALTERNATIVE #2: Land Use Controls, Site 15

	Quantity	Unit	Unit Cost	Total Cost
DIRECT COSTS				
Land Use Controls (LUCs)				
Survey Plat	1	lump sum	$2,500.00	$2,500
Land Use Restriction Fees (Filling, Legal, etc.	1	lump sum	$5,000.00	$5,000
Land Use Implementation Plan:				
Senior Scientist	20	hrs	$90.00	$1,800
Mid-level Engineer	40	hrs	$60.00	$2,400
ODCs (includes photocopying, etc.)	1	lump sum	$250.00	$250
TOTAL DIRECT COSTS				**$11,950**
Operation and Maintenance (O&M) Costs				
Quarterly Inspection				
Senior Scientist	0	hrs	$90.00	$0
Mid-level Engineer	32	hrs	$60.00	$1,920
ODCs (per diem, rental vehicle, etc.)	1	lump sum	$320.00	$320
Quarterly Reporting				
Senior Scientist	8	hrs	$90.00	$720
Mid-level Engineer	32	hrs	$60.00	$1,920
ODCs (per diem, rental vehicle, etc.)	1	lump sum	$1,000.00	$1,000
Annual Reporting				
Senior Scientist	2	hrs	$90.00	$180
Mid-level Engineer	8	hrs	$60.00	$480
ODCs (per diem, rental vehicle, etc.)	1	lump sum	$250.00	$250
Subtotal				$6,790
Present Worth of Land Use Control costs at i=6%				***$93,464***
Five-year Site Reviews (every 5 years for 30 years)				
Meetings (includes travel time)				
Senior Scientist	16	hrs	$90.00	$1,440
Mid-level Engineer	16	hrs	$60.00	$960
ODCs (includes per diem and rental car)	1	lump sum	$110.00	$110
Five-year Report				
Report				
Senior Scientist	15	hrs	$90.00	$1,350
Mid-level Engineer	20	hrs	$60.00	$1,200
ODCs (includes photocopying, etc.)	1	lump sum	$250.00	$250
Subtotal				$5,310
Present Worth of 5-year costs at i=6%				***$17,352***

TOTAL O&M COSTS	**$110,816**
COST OF ALTERNATIVE #2	**$122,766**
CONTINGENCY @10 PERCENT	**$12,277**
TOTAL COST OF ALTERNATIVE #2	**$135,043**

ALTERNATIVE # 3: SOIL COVER AND LUCS, SITE 15

	Quantity	Unit	Unit Cost	Total Cost
DIRECT COSTS				
Land Use Controls (LUCs - See Alternative # 2				**$12,000**
Equipment Delivery (Mobilization)				
Front End Loader	4	LS	$1,000.00	$4,000
Dozer	4	LS	$1,000.00	$4,000
Grad-all	4	LS	$1,000.00	$4,000
Dump Truck (15 cyd)	10	LS	$250.00	$2,500
Water Truck	2	LS	$250.00	$500
Backhoe	4	LS	$500.00	$2,000
Pressure Washer	2	LS	$250.00	$500
Equipment	1	LS	$2,500.00	$2,500
Site Preparation				
Office Trailer	5	mon	$150.00	$750
Storage Trailer	5	mon	$150.00	$750
Trailer Delivery, Setup, Removal	1	each	$300.00	$300
Telephone Service	5	mon	$50.00	$250
Electrical Hookup/Power	5	mon	$50.00	$250
Toilet/Water Cooler Service	5	mon	$50.00	$250
Miscellaneous Equipment	1	LS	$2,500.00	$2,500
Labor (Site Preparation)				
Electrician (2 men @ 7 days @ 10 hrs/day)	140	hrs	$42.00	$5,880
Carpenter (2 men @ 7 days @ 10 hrs/day)	140	hrs	$42.00	$5,880
Foreman (1 man @ 7 days @10 hrs/day)	70	hrs	$60.00	$4,200
Laborers (2 men @ 5 days @ 10 hrs/day)	100	hrs	$36.00	$3,600
Equipment and Disposal Costs (Site Preparation)				
Backhoe and Operator	7	days	$1,200.00	$8,400
Front End Loader and Operator	7	days	$700.00	$4,900
Micellaneous Tools	1	LS	$2,500.00	$2,500
Trans and Disposal - Concrete Debris	0	tons	$30.00	$0
Silt fencing	4200	lf	$5.00	$21,000
Signs	25	ea	$50.00	$1,250
Mobilization and Site Preparation				**$82,660**

Clearing and Grubbing

Foreman (2 wk @ 50 hrs/wk)	100	hrs	$60.00	$6,000
Grubbing, Removal and Stockpile (Labor Included)	12	acres	$3,500.00	$42,000
Transport and Disposal (Grub and Stumps)	400	tons	$30.00	$12,000
Clearing and Grubbing				**$60,000**
Soil Cover - 21 Acres				
Grade Site (4 Dozers and Operators)	40	dy	$1,650.00	$66,000
Common Fill - minimum 1.5' layer, Purchase & Hau	59584	cy	$10.00	$595,840
Common Fill - min. 1.5' layer, Spread & Compact	59584	cy	$2.00	$119,168
Site Superintendant (16.0 wks @ 50 hrs/wk)	800	hr	$60.00	$48,000
Topsoil - 6" layer, Purchase & Haul	19861	cy	$10.00	$198,610
Topsoil - 6" layer, Spread	19861	cy	$6.00	$119,166
Soil Cover				**$1,146,784**
Dust Control				
Water Truck and Driver	6	wk	$550.00	$3,300
Dust Control				**$3,300**
Site Restoration				
Fertilize, Seed, Mulch	21	acres	$2,000.00	$42,000
Site restoration				**$42,000**
TOTAL DIRECT COSTS				$1,346,744
INDIRECT COSTS				
Health and Safety (@3% of Direct Costs)				$40,402
Administrative Fees (@3% of Direct Costs)				$40,402
Engineering and Design (@10% of Direct Costs)				$134,674
Construction Support Services (@10% of Direct Costs)				$134,674
TOTAL INDIRECT COSTS				$350,153
TOTAL CAPITAL COSTS = Direct Costs + Indirect Costs				**$1,696,897**
OPERATION AND MAINTENANCE COSTS (annual)				
Soil Cover Inspection and Maintenance (Annual)				
Replacement of Soil	30	ton	$20.00	$600

Dump Truck and Driver	1	dy	$1,250.00	$1,250
Laborers (2 @ 5dy @ 10 hrs/day)	100	hr	$36.00	$3,600
Subtotal Cost				$5,450
Present Worth (capitalized @ 6%, 30 years)				**$75,018**

5-Year Site Review (see Alternative #1)	
Total LOE	$7,800
Total ODCs	$360
Subtotal Cost	$8,160
Present Worth (capitalized @ 6%, 30 years)	**$26,665**

Land Use Controls - Quarterly and Annual Inspection and Reporting (see Alt. #2)	
Total LOE	$12,100
Other Costs	$11,950
Present Worth (capitalized @ 6%, 30 years)	**$135,043**

TOTAL O&M COSTS (5-Year Reviews and LUCs)	**$236,726**
TOTAL CAPITAL COSTS AND O&M COSTS	**$1,933,624**
CONTINGENCY (@ 10%)	**$193,362**
TOTAL COST OF ALTERNATIVE #3	**$2,126,986**

APPENDIX E

INTERIM REMEDIAL ACTION INFORMATION