N60508.AR.000150
NAS WHITING FIELD
5090.3a

FINAL FEASIBILITY STUDY FOR SITE 5A NAS WHITING FIELD FL

9/27/2005

TETRA TECH NUS

Comprehensive Long-term Environmental Action Navy

CONTRACT NUMBER N62467-94-D-0888

Rev. 1
09/27/05

Feasibility Study
for
Operable Unit 5, Site 5A, Battery Acid Seepage Pit Surface and Subsurface Soil

Naval Air Station Whiting Field
Milton, Florida
USEPA ID No. FL2170023244

Contract Task Order 0079

September 2005

Southern Division
Naval Facilities Engineering Command
2155 Eagle Drive
North Charleston, South Carolina 29406

TETRA TECH NUS, Inc.

FEASIBILITY STUDY
FOR
OPERABLE UNIT 5, SITE 5A,
BATTERY ACID SEEPAGE PIT
SURFACE AND SUBSURFACE SOIL

NAVAL AIR STATION WHITING FIELD
MILTON, FLORIDA

COMPREHENSIVE LONG-TERM
ENVIRONMENTAL ACTION NAVY (CLEAN) CONTRACT

Submitted to:
Southern Division
Naval Facilities Engineering Command
2155 Eagle Drive
North Charleston, South Carolina 29406

Submitted by:
Tetra Tech NUS, Inc.
661 Andersen Drive
Foster Plaza 7
Pittsburgh, Pennsylvania 15220

CONTRACT NUMBER N62467-94-D-0888
CONTRACT TASK ORDER 0079

SEPTEMBER 2005

PREPARED UNDER THE SUPERVISION OF:

_____
TERRY J. HANSEN, P.G.
TASK ORDER MANAGER
TETRA TECH NUS, INC.
TALLAHASSEE, FLORIDA

APPROVED FOR SUBMITTAL BY:

_____
DEBRA M. HUMBERT
PROGRAM MANAGER
TETRA TECH NUS, INC.
PITTSBURGH, PENNSYLVANIA

This document, *Feasibility Study for Operable Unit 5, Site 5A, Battery Acid Seepage Pit, Surface and Subsurface Soil, Naval Air Station Whiting Field, Milton, Florida*, has been prepared under the direction of a Florida Registered Professional Engineer. The work and professional opinions rendered in this report were conducted or developed in accordance with commonly accepted procedures consistent with applicable standards of practice. This document was prepared for Naval Air Station Whiting Field, Milton, Florida and should not be construed to apply to any other site.

Tetra Tech NUS, Inc.
3360 Capital Circle N.E., Suite B
Tallahassee, Florida 32308
Certificate of Authorization Number 7988

_____
Michael O. Jaynes
Professional Engineer
State of Florida License Number 55441
Expires: February 28, 2007

TABLE OF CONTENTS

SECTION **PAGE**

ACRONYMS ..... **vi**
FOREWORD ..... **viii**

EXECUTIVE SUMMARY **ES-1**

1.0 INTRODUCTION **1-1**
1.1 THE CERCLA FS PROCESS 1-2
1.2 PURPOSE 1-5
1.3 ENVIRONMENTAL CONDITIONS 1-6
1.4 REGULATORY SETTING 1-6
1.5 REPORT ORGANIZATION 1-8

2.0 SITE 5A – THE BATTERY ACID SEEPAGE PIT **2-1**
2.1 ENVIRONMENTAL CONDITIONS 2-1
2.1.1 Nature and Extent of Contamination 2-1
2.1.2 Risk Assessment Results 2-2
2.2 REMEDIAL ACTION OBJECTIVES 2-3
2.2.1 Applicable or Relevant and Appropriate Requirements 2-3
2.2.2 Identification of Remedial Action Objectives 2-7
2.2.3 Preliminary Remediation Goals 2-7
2.2.4 Human Health COCs 2-9
2.2.5 Areas and Volumes of Soil Requiring Remedial Action 2-9
2.3 DEVELOPMENT OF REMEDIAL ACTION ALTERNATIVES 2-9
2.3.1 General Response Actions 2-10
2.3.2 Identification and Screening of Remedial Technologies 2-10
2.3.3 Alternative Range Development 2-12
2.3.4 Assembly of Soil Alternatives 2-13
2.4 DETAILED ANALYSES OF SOIL ALTERNATIVES 2-15
2.4.1 Site 5A Soil Alternatives 2-15
2.4.2 Summary Of Site 5A Soil Alternatives 2-21
2.5 COMPARATIVE ANALYSIS FOR SOIL ALTERNATIVES 2-21
2.5.1 Overall Protection of Human Health and the Environment 2-22
2.5.2 Compliance with ARARs 2-27
2.5.3 Long-Term Effectiveness and Permanence 2-27
2.5.4 Reduction of Mobility, Toxicity, or Volume through Treatment 2-28
2.5.5 Short-Term Effectiveness 2-28
2.5.6 Implementability 2-29
2.5.7 Cost 2-29
2.5.8 State Acceptance 2-30
2.5.9 Community Acceptance 2-30

REFERENCES **R-1**

TABLE OF CONTENTS (Continued)

APPENDICES

A GENERAL RESPONSE ACTIONS
B CERCLA EVALUATION CRITERIA

TABLES

NUMBER		PAGE
1-1	Criteria for Detailed Analysis of Alternatives	1-3
2-1	Synopsis of Federal and State ARARs and Guidance for Site 5A	2-6
2-2	Determination of PRGs at Site 5A	2-8
2-3	COC Evaluation for Site 5A Surface Soil	2-9
2-4	Identification and Screening of Remedial Technologies and Process Options	2-11
2-5	Soil Technologies and Process Options Passing Preliminary Screening	2-11
2-6	Range of Alternatives for Site 5A	2-12
2-7	Site 5A Soil Remedial Alternatives	2-14
2-8	Summary of Comparative Analysis of Soil Alternatives for Site 5A	2-23

FIGURES

NUMBER		PAGE
1-1	Site Location Map	1-7

ACRONYMS

ABB-ES	ABB Environmental Services, Inc.
ARARs	Applicable or Relevant and Appropriate Requirements
bls	Below Land Surface
BRA	Baseline Risk Assessment
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CFR	Code of Federal Regulations
CLEAN	Comprehensive Long-term Environmental Action Navy
COCs	Constituents of Concern
COPCs	Constituents of Potential Concern
DoD	Department of Defense
EE	Envirodyne Engineers, Inc.
F.A.C.	Florida Administrative Code
FDEP	Florida Department of Environmental Protection
FR	Federal Register
FS	Feasibility Study
ft	Feet (or Foot)
GIR	General Information Report
GRAs	General Response Actions
HHRA	Human Health Risk Assessment
HI	Hazard Index
HRS	Hazard Ranking System
ILCR	Incremental Lifetime Cancer Risk
LDRs	Land Disposal Restrictions
IR	Installation Restoration
LUCs	Land Use Controls
mg/kg	Milligrams per kilogram
NACIP	Naval Assessment and Control of Installation Pollutants
NAS	Naval Air Station
NAVFAC EFD SOUTH	Southern Division, Naval Facilities Engineering Command
Navy	United States Navy
NCP	National Oil and Hazardous Substances Pollution Contingency Plan
NEPA	National Environmental Policy Act

ACRONYMS (Continued)

NPL	National Priorities List
PA	Preliminary Assessment
PCBs	Polychlorinated Biphenyls
PRGs	Preliminary Remediation Goals
RAOs	Remedial Action Objectives
RCRA	Resource Conservation and Recovery Act
RD	Remedial Design
RI	Remedial Investigation
RI/FS	Remedial Investigation/Feasibility Study
ROD	Record of Decision
RPO	Representative Process Option
SARA	Superfund Amendments and Reauthorization Act
SCTLs	Soil Cleanup Target Levels
SERA	Screening-level Ecological Risk Assessment
SIs	Site Inspections
TBC	To Be Considered
TSDF	Treatment, Storage, and Disposal Facility
TtNUS	Tetra Tech NUS, Inc.
USEPA	United States Environmental Protection Agency

FOREWORD

To meet its mission objectives, the United States Navy (Navy) performs a variety of operations, some requiring the use, handling, storage, or disposal of hazardous materials. Through accidental spills and leaks and conventional methods of past disposal, hazardous materials may have entered the environment. With growing knowledge of the long-term effects of hazardous materials on the environment, the United States Department of Defense (DoD) initiated various programs to investigate and remediate conditions related to suspected past releases of hazardous materials at its 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 (RCRA), 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. CERCLA and SARA 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 consists of Preliminary Assessment (PA) and Site Inspections (SIs), Remedial Investigation and Feasibility Study (RI/FS), and remedial design (RD) and remedial action at sites with suspected releases of hazardous substances. The PA provides historical information for the site and the SI identifies and confirms the presence of hazardous substances. The nature and extent of contamination as well as potential remedial solutions are determined during the RI/FS. The RD and remedial action are performed to complete implementation of the solution.

The Southern Division, Naval Facilities Engineering Command (NAVFAC EFD SOUTH) manages and the United States Environmental Protection Agency (USEPA) and the Florida Department of Environmental Protection (FDEP) 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.

EXECUTIVE SUMMARY

A Feasibility Study (FS) has been conducted for Site 5A at NAS Whiting Field in Milton, Florida, by NAVFAC EFD SOUTH, as part of the DoD IR program. The Remedial Investigation (RI) Report [Tetra Tech NUS, Inc. (TtNUS), 2005] was completed for Sites 05/5A, 07, 29, 35, and 38 in March 2005.

This FS report develops and evaluates potential remedies for surface and subsurface soil contamination for Site 5A. In this FS, Remedial Action Objectives (RAOs) have been identified, Preliminary Remediation Goals (PRGs) have been developed, and remedial action alternatives to achieve those objectives have been identified and evaluated. The FS identifies and discusses the applicable or relevant and appropriate requirements (ARARs), and presents a brief overview of the findings of the RI and the baseline risk assessment (BRA) in order to identify RAOs. For this FS, RAOs have been formulated based on the following criteria: (1) Unacceptable human health risks, (2) FDEP Soil Cleanup Target Levels (SCTLs), and (3) USEPA Region IX PRGs. Remedial technologies addressing site-specific considerations were identified and screened. Those technologies passing the screening phase were then developed into remedial alternatives. A limited number of technologies were identified based on guidance established under CERCLA, as amended by SARA, and the National Oil and Hazardous Substances Pollution Contingency Plan (NCP) 40 Code of Federal Regulations (CFR) 300. Assessment of groundwater and the leaching of soil at these sites will be performed as part of the ongoing Site 40 Basewide Groundwater Investigation.

SITE 5A – THE BATTERY ACID SEEPAGE PIT

The Battery Shop, Building 1478, was the site of battery waste acid and electrolyte solution disposal from 1967 until 1984. Waste solutions with sodium bicarbonate and tap water were poured down the drain of a sink in the building and discharged to a dry well west of the building. The dry well consisted of a section of 60-inch diameter concrete culvert set vertically in the ground and filled with gravel. The sink drain was disconnected from the dry well in 1984 and connected to the sanitary sewer. An estimated 180 gallons of battery waste electrolyte solution was discharged to the dry well annually during the period of operation [Envirodyne Engineers, Inc. (EE), 1985].

Originally, Building 1478 was called the Old Transformer Repair Shop and, from the 1940's until 1964, the building was used for electrical transformer repair. Transformers were reportedly drained of dielectric fluid possibly containing polychlorinated biphenyls (PCBs) and discharged into the grassed ditch located approximately 500 feet (ft) southeast of the Old Transformer Repair Shop. Based on this disposal method, the ditch was designated Site 06 and investigated as part of the IR Program (EE, 1985).

Site 5A was previously investigated and closed; however, Site 5 was not investigated for possible pesticide/PCB contamination. As a result, the pesticide/PCB contamination investigation at Site 5A was initially conducted as Site 5. After further review, the NAS Whiting Field Partnering Team determined Site 5A should be reopened and the pesticide/PCB contamination investigated as part of Site 5A. Four surface soil borings and four subsurface soil borings were advanced at Site 5A for the purpose of investigating the possible pesticide/PCB contamination. The samples collected from the borings were analyzed for pesticides, PCBs, and inorganics. Vanadium was detected above the FDEP Direct Exposure Limit for Residential Use (DE1) SCTL. Pesticides/PCBs and several inorganics were detected above the USEPA Risk Assessment Guidance for Superfund. After comparison to site specific screening levels, conducting a human health risk assessment (HHRA), and conducting a screening-level ecological risk assessment (SERA), it was determined no risks are present at Site 5A.

The three alternatives for Site 5A represent a range of actions including no action, containment/limited action addressing principal threats, and an aggressive action minimizing the need for long-term management. The three alternatives providing a range of treatment options for Site 5A are listed below.

- Alternative S5A-1: No Action
- Alternative S5A-2: Surface Soil (exceeding PRGs) Land Use Controls (LUCs)
- Alternative S5A-3: Surface Soil (exceeding PRGs) Removal

1.0 INTRODUCTION

TtNUS, under Comprehensive Long-term Environmental Action Navy (CLEAN) III Contract Number N62467-94-D-0888 to NAVFAC EFD SOUTH is submitting this FS to address surface and subsurface soil at Site 5A NAS Whiting Field, Milton, Florida. The impact of these soils on groundwater will be evaluated in the FS for Site 40, Basewide Groundwater. This FS is one in a series of site-specific reports being completed in conjunction with the NAS Whiting Field General Information Report (GIR) [ABB Environmental Services, Inc. (ABB-ES), 1998] and the RI report for Sites 05/5A, 07, 29, 35, and 38 (TtNUS, 2005) 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 addressing impacted soil at Site 5A.

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 reports will not be repeated in this 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.
- BRA methodology for both human health and ecological receptors.
- A summary of the facility-wide background evaluation.

The RI serves as the mechanism for collecting data to identify the nature and extent of contamination and migration pathway characteristics for conducting a BRA and for collecting physical measurements and chemical analytical data necessary for the remedial alternative evaluation in the FS. The RI provides the basis for determining whether remedial action is necessary. The RI report for Sites 05/5A, 07, 29, 35, and 38 at NAS Whiting Field provides the following information:

- Site descriptions and a summary of previous investigations for Sites 5A, 07, 29, 35, and 38.
- A summary of the field investigation methods used during the RI.
- A site-specific data quality assessment.

- The identification of Constituents of Potential Concern (COPCs) for the sites.
- An assessment of the extent, magnitude, and impact of contamination at each site.
- A qualitative and quantitative assessment of risks to human health and the environment which leads to the identification of site specific contaminants of concern.

The FS uses the results of the RI and the information presented in the GIR to identify RAOs and PRGs and to develop, screen, and evaluate potential remedial alternatives. The FS has been 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"); NCP (40 CFR Part 300); and RI/FS Guidance (USEPA, 1988).

1.1 THE CERCLA FS PROCESS

The development of remedial alternatives for CERCLA sites consists of developing PRGs and areas and volumes of contamination and then identifying applicable technologies and developing those technologies into remedial alternatives to meet the PRGs. Table 1-1 presents the criteria used for detailed analysis of alternatives.

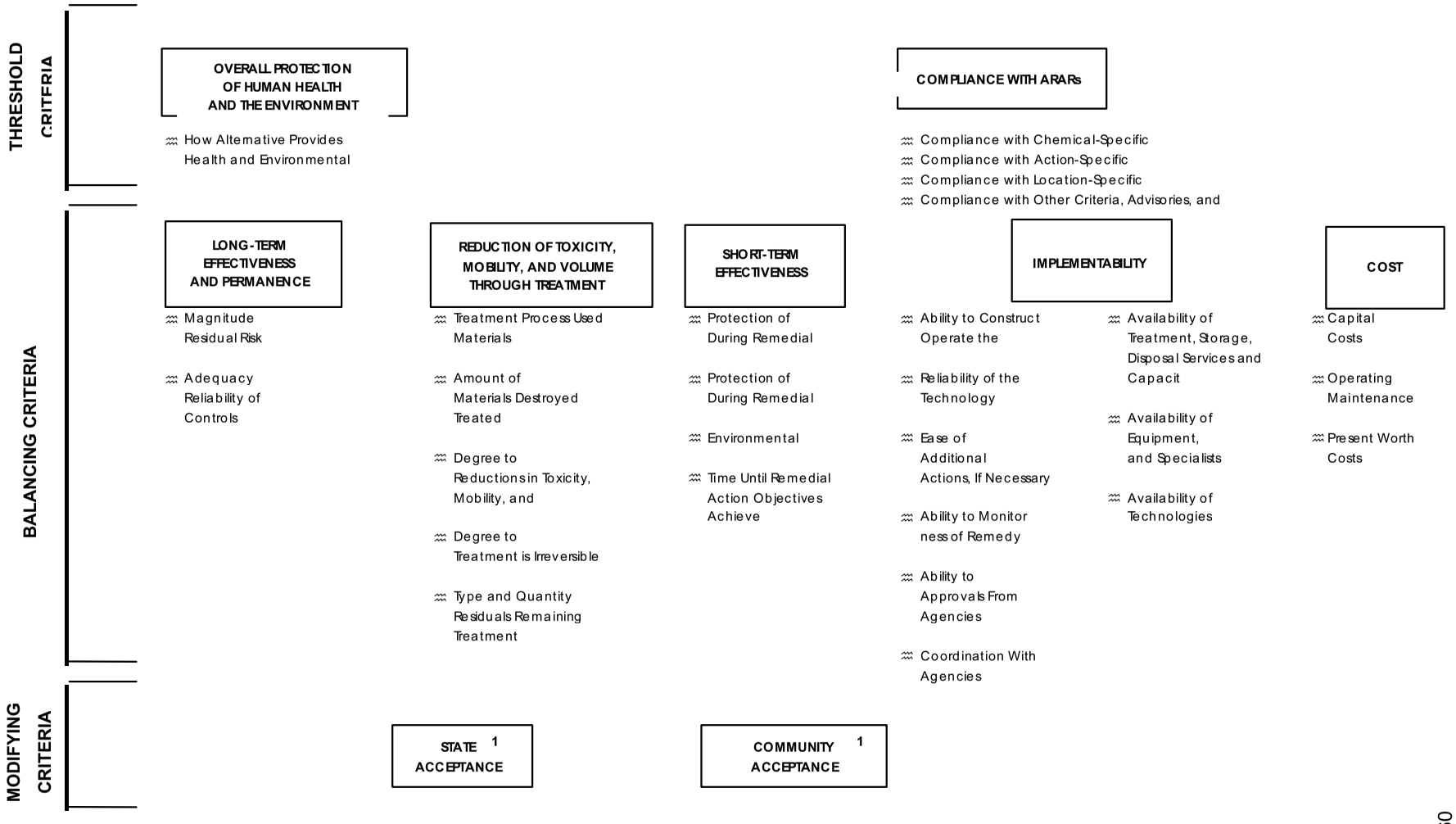
The first step in the FS process is to develop RAOs specifying the contaminants, media of interest, and exposure pathways leading to development of the PRGs. The PRGs are developed based on chemical-specific ARARs, when available; site-specific risk-based factors; or other available information. Constituents of Concern (COCs), as identified in the RI, are those chemicals with average concentrations exceeding the PRGs and background. Once the PRGs and COCs have been determined, the areas and volumes of contamination requiring remedial action are determined.

Once RAOs/PRGs are identified, general response actions (GRAs) for each medium of interest are developed. GRAs typically fall into the following categories: No Action, containment, excavation, extraction, treatment, disposal, or other actions, singular or in combination, taken to satisfy the RAOs for the site.

The next step in the FS process is to identify and screen alternatives. This step considers applicable technologies for each GRA. This step eliminates technologies not technically feasible. Those technologies passing the screening phase are then assembled into remedial alternatives. The NCP requires a range of alternatives be presented in the FS to the maximum practicable extent. Remedial

TABLE 1-1

CRITERIA FOR DETAILED ANALYSIS OF ALTERNATIVES
NAS WHITING FIELD, MILTON, FLORIDA



1 These criteria are assessed following regulatory and public comment on the RI/FS report and the

Source: Guidance for Conducting Remedial Investigations and Feasibility Studies under CERCLA (USEPA,

alternatives are then described and analyzed in detail using the CERCLA evaluation criteria (see Table 1-1) described in the NCP, including:

Threshold Criteria

- Overall protection of human health and the environment
- Compliance with ARARs

Balancing Criteria

- Long-term effectiveness and permanence
- Reduction of toxicity, mobility, or volume of contaminants through treatment
- Short-term effectiveness
- Implementability
- Cost

Alternatives are evaluated against two additional factors (Modifying Criteria) after state participation:

Modifying Criteria

- State acceptance
- Community acceptance

The results of the detailed analyses are summarized and compared in a comparative analysis. The alternatives are compared against each other using the CERCLA evaluation criteria.

These criteria are used because SARA requires them to be considered during remedy selection. Modifying criteria, including 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 Proposed Plan during a public comment period. This evaluation is described in a responsiveness summary and will be included in the Record of Decision (ROD).

Upon completion of the FS report, the Proposed Plan will be developed. The Proposed Plan will identify the preferred remedial alternative for Site 5A. This document will be written in community-friendly language and will be made available for public comment. Upon receipt of public comments, responses to these comments will be developed in a responsiveness summary, and the ROD will be prepared. The ROD will document the chosen alternative for the site and will include the responsiveness summary as an appendix. Once the ROD is signed, the chosen remedial alternative will be implemented.

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

1.2 PURPOSE

The purpose of the FS report for Site 5A at NAS Whiting Field is to develop remedial alternatives to address threats to human health and the environment at Site 5A. RAOs are used to develop, screen, and evaluate potential remedial alternatives to meet the objectives. In the case of Site 5A, it has been determined that the soil is not contaminated, therefore, all the alternatives meet the objectives.

The FS report was developed in accordance with the NCP, providing guidance for identifying applicable remedial action technologies. The FS report does not present all the possible variations and combinations of remedial actions possible, but presents distinctly different alternatives representing a range of opportunities for meeting the RAOs. It is expected these different alternatives can be adjusted during the proposed plan and decision process, and to a lesser extent during detailed design, to accomplish the RAOs in a manner similar to the initially proposed alternative. Also, the FS report does not present information on alternatives failing to meet the RAOs, except for a No Action alternative, providing a baseline for comparison of all alternatives.

The following criteria are considered in identifying appropriate remedial action for Site 5A.

- RAOs. RAOs are developed to specify the contaminants, media of interest, exposure pathways, and remedial action goals.
- Applicable Technologies. Technologies applicable for addressing contaminated media are identified and screened. Technologies are eliminated if they cannot be implemented.
- Remedial Alternatives. Technologies passing the screening phase are assembled into remedial alternatives.
- Detailed Analysis. Selected remedial alternatives are described and evaluated using seven of the nine criteria outlined in the NCP.
- Comparative Analysis. Remedial alternatives are compared against each other using threshold and primary balancing criteria.

1.3 ENVIRONMENTAL CONDITIONS

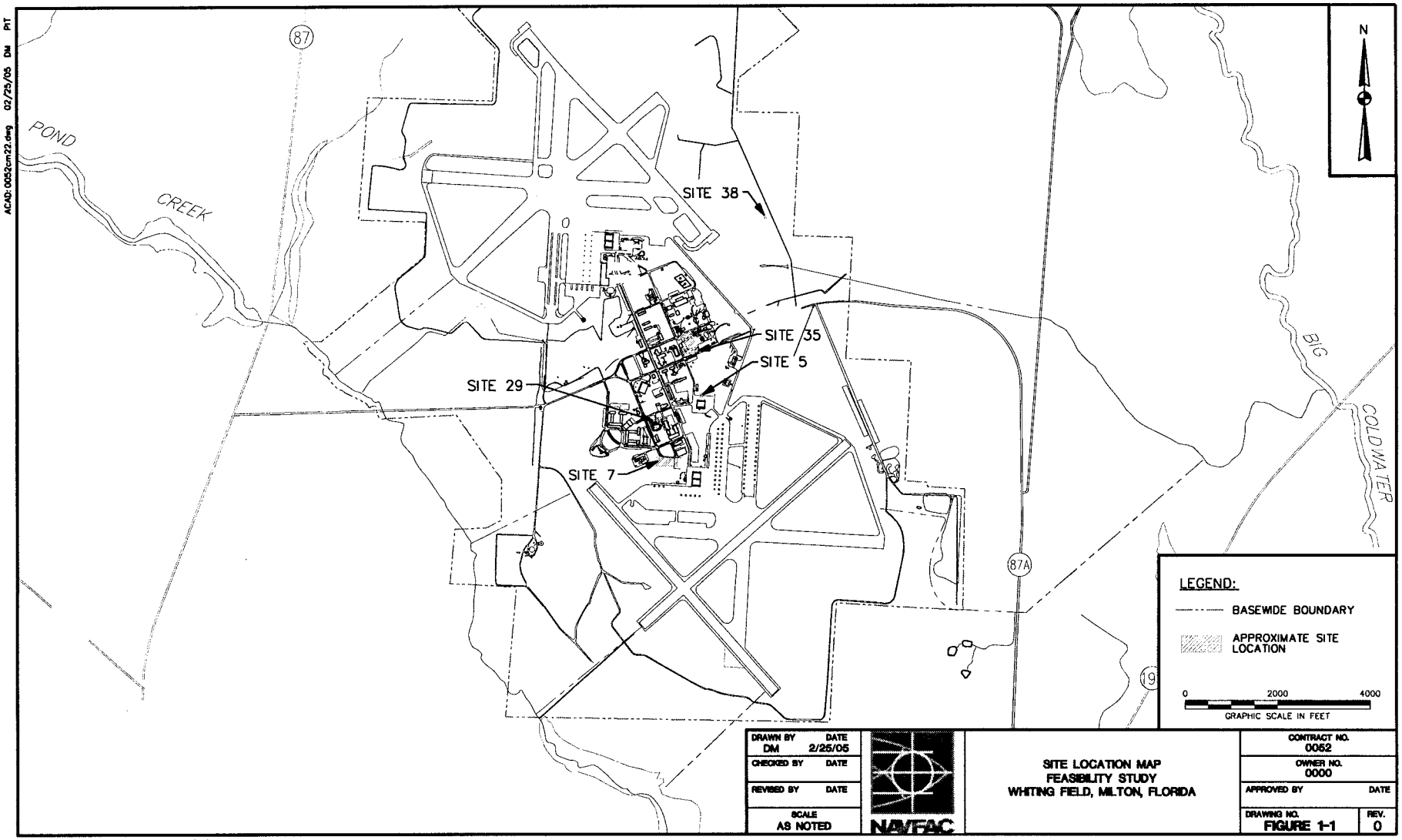
NAS Whiting Field is located in Santa Rosa County, in Florida's northwestern coastal area, approximately 5.5 miles north of Milton and 25 miles northeast of Pensacola. Mobile, Alabama is approximately 70 miles west of the air station, and Tallahassee, the capital of Florida, is 174 miles to the east. The installation was constructed in the early 1940s and since has served as a naval aviation training facility. NAS Whiting Field presently consists of two airfields (North and South Fields) separated by an industrial area. The installation is approximately 3,842 acres in size. NAS Whiting Field provides the support facilities for flight and academic training. Figure 1-1 presents the installation layout and locations of RI/FS sites at NAS Whiting Field.

Land surrounding NAS Whiting Field consists primarily of agricultural land to the northwest, residential and forested areas to the south and southwest, and forests along the remaining boundaries. Located on an upland area, elevations at NAS Whiting Field range from 50 to 190 ft above sea level. The facility is bounded by the following low-lying receiving waters: Clear Creek to the west and south and Big Coldwater Creek to the east. These two streams are tributaries of the Blackwater River. The Blackwater River discharges to the estuarine waters of the East Bay of the Escambia Bay coastal system. Both Clear Creek and Big Coldwater Creek are classified by the FDEP as Class II Waters Recreation-Propagation and Management of Fish and Wildlife. Blackwater River is classified as an Outstanding Florida Water. Outstanding Waters are considered to be of exceptional recreational and ecological significance.

1.4 REGULATORY SETTING

The Navy IR program was designed to identify and abate or control contaminant migration resulting from past operations at naval installations, with the goal of expediting and improving environmental response actions while protecting human health and the environment. The IR program is conducted in accordance with Section 120 of CERCLA as amended by SARA and Executive Order 12580. CERCLA requires federal facilities to comply with the act, both procedurally and substantively. NAVFAC EFD SOUTH is the agency responsible for the Navy IR program in the southeastern United States; therefore, NAVFAC EFD SOUTH has the responsibility of processing NAS Whiting Field through the PA, SI, RI/FS, and remedial response in compliance with the guidelines of NCP (40 CFR 300).

Section 105(a)(8)(A) of SARA required the USEPA to develop criteria to set priorities for remedial action based on relative risk to human health and the environment. To meet this requirement, USEPA has established the Hazard Ranking System (HRS) as Appendix A to the NCP. First promulgated in 1982, the HRS was amended in December 1990, effective March 14, 1991 [55 *Federal Register* (FR) No. 241:51532-51667], to


ACAD: 0052cm22.dwg 02/25/05 DM PIT
N
POND
CREEK
87
SITE 38
SITE 35
SITE 5
SITE 29
SITE 7
BIG
COLDWATER
87A
19
LEGEND:
BASEWIDE BOUNDARY
APPROXIMATE SITE LOCATION
0
2000
4000
GRAPHIC SCALE IN FEET
DRAWN BY DM
DATE 2/25/05
CHECKED BY
DATE
REVISED BY
DATE
SCALE AS NOTED
NAVFAC
SITE LOCATION MAP
FEASIBILITY STUDY
WHITING FIELD, MILTON, FLORIDA
CONTRACT NO. 0052
OWNER NO. 0000
APPROVED BY
DATE
DRAWING NO. FIGURE 1-1
REV. 0
FORM CADD NO. SDIV-BH.DWG - REV 1 - 9/10/98

comply with requirements of Section 105(c)(1) of SARA to increase the accuracy of the assessment of relative risk.

The HRS score for NAS Whiting Field was generated in 1993. The score was sufficient to place NAS Whiting Field on the National Priorities List (NPL); therefore, in January 1994, USEPA placed NAS Whiting Field on a list of sites proposed for inclusion on the NPL (40 CFR 300; FR 18 January 1994), and on May 31, 1994, NAS Whiting Field was placed on the NPL effective June 30, 1994 (40 CFR Part 300; FR 31 May 1994). Consequently, the RI/FS for NAS Whiting Field must follow the requirements of the NCP, as amended by SARA, and guidance for conducting an RI/FS under CERCLA (USEPA, 1988).

Per CERCLA Section 121(d), the Navy will follow ARARs of the State of Florida for all IR program activities at NAS Whiting Field.

1.5 REPORT ORGANIZATION

The FS report is organized into two chapters. Chapter 1.0 presents the purpose, site description, and regulatory setting for the FS at NAS Whiting Field. Chapter 2.0 presents the development of the RAOs, PRGs, and areas and volumes of contamination; identifies and screens the alternatives; presents the detailed analysis of the alternatives; and presents the comparative analysis for Site 5A.

The FS report also includes Appendices A and B. GRAs are described in Appendix A, and CERCLA evaluation criteria are discussed in Appendix B.

2.0 SITE 5A – THE BATTERY ACID SEEPAGE PIT

The Battery Shop, Building 1478, was the site of battery waste acid and electrolyte solution disposal from 1967 until 1984. Waste solutions with sodium bicarbonate and tap water were poured down the drain of a sink in the building and discharged to a dry well west of the building. The dry well consisted of a section of 60-inch diameter concrete culvert set vertically in the ground and filled with gravel. The sink drain was disconnected from the dry well in 1984 and connected to the sanitary sewer. An estimated 180 gallons of battery waste electrolyte solution was discharged to the dry well annually during the period of operation (EE, 1985).

Originally, Building 1478 was called the Old Transformer Repair Shop, and from the 1940's until 1964, the building was used for electrical transformer repair. Transformers were reportedly drained of dielectric fluid possibly containing PCBs and discharged into the grassed ditch located approximately 500 ft southeast of the Old Transformer Repair Shop. Based on this disposal method, the ditch was designated Site 06 and investigated as part of the IR Program (EE, 1985).

Site 5A was previously investigated and closed; however, Site 5A was not investigated for possible pesticide/PCB contamination. As a result, the investigation of Site 5A was reopened. Four surface soil borings and four subsurface soil borings were advanced at Site 5A for the purpose of investigating the possible pesticide/PCB contamination.

The RI for Site 5A was concluded in 2001, and the Final RI report was issued in April 2005 (TtNUS, 2005).

2.1 ENVIRONMENTAL CONDITIONS

2.1.1 Nature and Extent of Contamination

Constituents detected in the surface soils at Site 5A include pesticides/PCBs and inorganics. Three pesticides, one PCB, and 19 inorganic analytes were detected in the surface soil on the northeastern side of Building 1478.

The individual inorganic constituents, aluminum, iron, and vanadium have no direct evidence of site-related use at Site 5A, and the process and procedures at this site did not likely contribute to the presence of these inorganics in surface soil. Additionally, the site-specific concentrations for these inorganics are within the range of levels found at NAS Whiting Field. Considering the information presented above, aluminum, iron, and vanadium were dropped from consideration as COCs for Site 5A surface soils.

2.1.2 Risk Assessment Results

2.1.2.1 Surface Soil

Three constituents (aroclor-1260, dieldrin, and chromium) were selected as COPCs for surface soil at Site 5A. The COPCs and their associated cancer risk estimates and hazard index (HI) calculations are presented in Final RI report (TtNUS, 2005) and are summarized below.

2.1.2.1.1 Carcinogenic Risks

The incremental lifetime cancer risk (ILCR) calculated for the hypothetical future resident and the typical occupational worker (based on FDEP SCTLs) are 5.2E-07 and 1.5E-07, respectively. These risk estimates are below the USEPA target risk range and the State of Florida benchmark of 1E-06. The ILCRs for aroclor-1260, dieldrin, and chromium do not exceed 1E-06 for either receptor. There is no primary risk driver. The ILCR is at the lower end of the target risk range and the FDEP benchmark of 1E-06 is not exceeded, based on the presence of aroclor-1260, dieldrin, or chromium.

2.1.2.1.2 Noncarcinogenic Risks

The noncancer risks associated with surface soil ingestion and dermal contact for the child and/or adult trespasser, occupational worker, site maintenance worker, construction worker, and the adult resident are below USEPA's and FDEP's target HI of 1. The HI calculated on a target organ specific basis for any of the receptors also does not exceed 1.

2.1.2.2 Subsurface Soil

The subsurface soil below the 0 to 1 ft below land surface (bls) interval at Site 5A was not analyzed by a laboratory. Subsurface soil borings were advanced and soil samples were collected from 1-2 ft bls and visually inspected for discoloration (indicating possible pesticide/PCB contamination). No discoloration was observed. And because the surface soil did not indicate the presence of pesticides/PCBs above FDEP SCTLs, it is not likely pesticides/PCBs exist in the subsurface soil at Site 5A above FDEP SCTLs (FDEP, 2005).

2.1.2.3 Ecological

A SERA was performed for Site 5A. Several inorganics and organic compounds were detected in surface soil at maximum concentrations exceeding conservative screening levels and, thus, were selected as

COPCs. These COPCs were assessed in a less conservative Step 3A evaluation. The results of the Step 3A analysis indicate the chemicals detected in the surface soil at Site 5A do not pose unacceptable risks to ecological receptors and will not be evaluated further.

2.2 REMEDIAL ACTION OBJECTIVES

The objectives and goals for remedial actions at Site 5A provide the basis for selecting RAOs and identifying remedial technologies to address unacceptable human health risks associated with direct exposure to surface soil contamination at the site. RAOs addressing groundwater and leaching to groundwater will be addressed in the FS for Site 40, Basewide Groundwater.

To establish RAOs, ARARs are first identified. RAOs are then defined primarily on consideration of ARARs and the results and conclusions of the RI. Next, action levels (PRGs) for each media of concern are defined. Volumes of affected media above action levels are then calculated. Finally, general response actions satisfying the RAOs are identified. The information presented in this section is used to identify and evaluate appropriate remedial technologies for Site 5A (see Section 2.3).

2.2.1 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 remedial actions to comply with state ARARs when more stringent than federal ARARs.

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 specifically addressing a hazardous substance, pollutant, contaminant, remedial action, or other circumstance found at a CERCLA site. Applicable state standards are only those (1) identified by the state in a timely manner, (2) consistently enforced, and (3) 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, while not “applicable” to a hazardous substance, pollutant, contaminant, or remedial action, addressing situations sufficiently similar to those encountered at the CERCLA site so their use is well suited to the particular site. Only those state standards identified (1) in a timely manner and (2) 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 or be waived from the ARAR, 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.

Other requirements "to be considered guidance criteria" (TBCs) are federal and state nonpromulgated advisories or guidance not legally binding and not having 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.

Under the description of ARARs set forth in the NCP and SARA, state and federal ARARs are categorized as the following:

- 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 manmade site features such as historical or archaeological sites).

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

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 sections and presented in Table 2-1.

2.2.1.1 Chemical-Specific ARARs

Chemical-specific requirements are standards limiting 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 FDEP has developed chemical-specific,

risk-based SCTLs for soil in Florida (FDEP, 2005). The USEPA Region IX has developed PRGs (USEPA, 2002) requested by the USEPA to be used at NAS Whiting Field as a "Relevant and Appropriate" ARAR.

2.2.1.2 Location-Specific ARARs

Location-specific ARARs govern site features (e.g., wetland, 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.

Observations made during the ecological assessment for Site 5A indicate no state or federally listed rare, threatened, or endangered species of concern are known to exist on this site (TtNUS, 2005). Site 5A does not contain wetland areas, and no part of the site is located within a 100-year floodplain.

2.2.1.3 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.

TABLE 2-1
SYNOPSIS OF FEDERAL AND STATE ARARs AND GUIDANCE FOR SITE 5A
NAS WHITING FIELD, MILTON, FLORIDA

Name and Regulatory Citation	Description	Consideration in the Remedial Action Process	Type
FEDERAL			
USEPA Region IX PRGs	Provides risk-based concentrations for screening of soil.	Relevant and Appropriate. These guidelines aid in the screening of chemicals in soil and have been requested by the USEPA to be used at NAS Whiting Field as an ARAR.	Chemical-specific
CERCLA and the NCP Regulations (40 CFR, Section 300.430)	Discusses the types of LUCs to be established at CERCLA sites.	Applicable. These regulations may be used as guidance in establishing appropriate LUCs at Site 5A.	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 NCP. During the implementation of any remedial alternative for Site 5A, these regulations must be followed.	Action-specific
Hazardous Materials Transportation Act Regulations (49 CFR 171-179)	Provides requirements for packaging, labeling, manifesting, and transporting hazardous materials.	Applicable: If soil is excavated and transported and is found to be hazardous, the soil would need to be handled, manifested, and transported as a hazardous waste.	Action-specific
National Emissions Standards for Hazardous Air Pollutants (40 CFR Part 61)	Standards promulgated under the Clean Air Act for significant sources of hazardous air pollutants.	Relevant and Appropriate: Remedial Action (e.g., soil excavation) may result in release of hazardous air pollutants.	Action-specific
Resource Conservation and Recovery Act (RCRA) Treatment, Storage, and Disposal of Hazardous Waste (40 CFR 262-266)	Regulates the treatment, storage, and disposal of hazardous waste	Relevant and Appropriate: Hazardous waste generated by site remediation activities must meet RCRA generator and treatment, storage, or disposal requirements.	Action-specific
Land Disposal Restrictions (40 CFR 268)	Restricts certain listed or characteristic hazardous waste from placement or disposal on land without treatment.	Excavated soils or treatment residuals (such as spent activated carbon) may require disposal in a land fill.	Action-specific
STATE			
Florida SCTLs (Chapter 62-777, F.A.C.)	Default SCTLs. Human health risk-based cleanup goals for soil.	Applicable. These regulations apply to all remedial actions in the State of Florida.	Chemical-specific
Florida SCTLs (Chapter 62-785, F.A.C.)	Default SCTLs. Human health risk-based cleanup goals for Brownfield soils.	TBC: These regulations apply to all Brownfield remedial actions in the State of Florida.	Guidance
Florida Hazardous Waste Rules (Chapter 62-730, F.A.C.)	Adopts by reference, specific sections of the Federal hazardous waste regulations.	Relevant and Appropriate. These regulations are not applicable to Site 5A because they apply the handling of hazardous waste. These regulations may apply if material is removed from a site.	Action-specific

2.2.1.4 TBC Criteria

As previously stated, TBCs are federal and state nonpromulgated 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 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.

2.2.2 Identification of Remedial Action Objectives

RAOs are defined in USEPA RI/FS guidance as media-specific goals established to protect human health and the environment (USEPA, 1988). RAOs are based on the COCs, the exposure pathway, and the receptors present at the site. RAOs are identified in this section for surface soil and will consider the results of the RI discussed in Section 2.1, particularly the HHRAs and ERAs, as well as the ARARs and TBCs identified in Table 2-1.

For this FS, RAOs have been formulated based on the following criteria:

- FDEP SCTL
- USEPA Region IX PRGs

The potential for the leaching of chemicals by rainwater from soils will be evaluated as part of Site 40, Basewide Groundwater. The current and future anticipated use of the property at this site is industrial. The current and future receptors are occupational and construction workers in direct contact with the soil. Based on the current and future use receptors, two RAOs have been developed for Site 5A. They are as follows:

RAO 1: To protect human health from carcinogenic and noncarcinogenic risks associated with incidental ingestion of, inhalation of, and dermal contact with contaminated soils.

RAO 2: To comply with federal and state ARARs and TBCs in accordance with accepted USEPA and FDEP guidelines.

2.2.3 Preliminary Remediation Goals

PRGs establish acceptable exposure levels protective of human health and the environment. PRGs are based on regulatory requirements, USEPA-acceptable risk levels, and assumptions regarding ultimate

land uses, as well as contaminant pathways. As part of the CERCLA process, PRGs are periodically revised because of new guidance requirements and promulgated or updated ARARs. Final Remediation Goals are not formally set until the approval of the ROD and are often refined during the FS process. Specifically PRGs are used to estimate areas and volumes of impacted media and to set performance standards for potential remedial alternatives. The steps leading to the development of the PRGs include the development of RAOs and the identification of the ARARs (see Sections 2.2.1 and 2.2.2).

PRGs are determined based on ARARs, chemicals and media of interest, and exposure pathways. Two ARARs will be used for PRG development: the FDEP SCTLs (Chapter 62-777, F.A.C.) and the USEPA Region IX PRGs (see Table 2-2). The FS evaluation for groundwater beneath Site 5A and the leaching of chemicals from soil to groundwater will be performed in the FS for Site 40, Basewide Groundwater. The current and future anticipated use of Site 5A is for industrial purposes; therefore, the exposure pathways are to occupational and construction workers.

Cleanup of inorganic chemicals below their established background concentrations will not be performed; therefore, background concentrations will be used as the lower limit for PRGs. The PRG selection process is summarized below.

1. The FDEP SCTLs (Chapter 62-777, F.A.C.) and the USEPA Region IX PRGs for Commercial/Industrial Direct Exposure will be used as PRGs.

2. Background concentration will be used as the lower limit for the PRG of inorganic COCs.

Table 2-2 provides a list of the surface soil, direct-contact PRGs for Site 5A.

TABLE 2-2

DETERMINATION OF PRGs AT SITE 5A
NAS WHITING FIELD, MILTON, FLORIDA

COPC[1]	Units	62-777, F.A.C. Commercial/ Industrial SCTL[2]	USEPA Region IX Industrial PRGs[3]	Lower Value	Risk Driver[4]	Surface Soil Background[5]	Surface Soil PRG
Aroclor-1260	mg/kg	2.1	22	2.1	C	NA	2.1
Dieldrin	mg/kg	0.3	0.03	0.03	C	NA	0.03
Chromium	mg/kg	420	210	210	C	11	210

[1]Combined list of all COPCs for Site 5A.
[2]Table 2, SCTLs, Technical Report: Development of SCTLs for Chapter 62-777, F.A.C..
[3]USEPA Region IX PRG Table, 2002 (Note: 1/10th of the value is used for noncarcinogens).
[4]Soil Basis Codes: N = Noncarcinogen, C = Carcinogen
[5]Table 3-18, GIR, RI/FS, ABB-ES, 1998. Background screening value for inorganics is two times the mean detected concentration.
NA – Not Applicable
mg/kg – milligrams per kilogram

2.2.4 Human Health COCs

COCs were determined in the RI by comparing the soil PRG values against the COPC's site-specific representative concentration. A summary of the COC evaluation (from the Final RI report) for Site 5A is presented in Table 2-3.

As previously discussed in the RI, it has been determined there are no COCs for surface or subsurface soils at Site 5A.

TABLE 2-3

COC EVALUATION FOR SITE 5A SURFACE SOIL
NAS WHITING FIELD, MILTON, FLORIDA

COPC	Units	Maximum Detected Concentration	Maximum Qualifier	Representative Concentration[1]			PRG	COC	Rationale[3]
				Value	Statistic[2]	Rationale			
Aroclor-1260	mg/kg	0.0799	--	0.0799	Maximum	n<10	2.1	No	BSL
Dieldrin	mg/kg	0.0179	--	0.0179	Maximum	n<10	0.03	No	BSL
Chromium	mg/kg	21.5	--	21.5	Maximum	n<10	210	No	BSL

[1]For non-detects, 1/2 sample quantitation limit was used as a proxy concentration; for duplicate sample results, the average value was used in the calculation.
[2]Statistics: Maximum value used since the sample size was <10 samples.
95% UCL of log-transformed data (95% UCL-T).
[3]Rationale Codes: (Selection or Deletion) Below Screening Level (BSL)
mg/kg – milligrams per kilogram

2.2.5 Areas and Volumes of Soil Requiring Remedial Action

Because it has been determined there are no COCs at Site 5A, areas and volumes of soil with COCs exceeding PRGs do not exist and will not be estimated or calculated.

2.3 DEVELOPMENT OF REMEDIAL ACTION ALTERNATIVES

The development of remedial action alternatives for CERCLA sites consists of identifying GRAs, identifying applicable technologies, screening those technologies, and using the selected technologies to develop remedial action alternatives accomplishing the RAOs identified in Section 2.2.

The NCP requires a range of remedial alternatives be considered, and SARA emphasizes the use of treatment technologies. Treatment alternatives range from those minimizing the need for long-term management to those reducing toxicity, mobility, or volume of contaminants.

2.3.1 General Response Actions

General Response Actions (GRAs) describe those actions meeting the requirements of the remedial objectives. GRAs may include no action, limited action, treatment, containment, removal, disposal, or a combination of these. Like RAOs, GRAs are media specific.

The following GRAs were considered for the surface soils at Site 5A.

- No action
- Limited action
- Removal

Soil GRAs are discussed in Appendix A.

The remaining sections of this chapter identify the types of technologies, 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 Section 2.4.

2.3.2 Identification and Screening of Remedial Technologies

The purpose of this section is to identify and screen appropriate technologies for remedial alternatives addressing the RAOs identified for Site 5A. Each technology is then screened based on site- and waste-limiting characteristics.

Site-limiting characteristics considered during this process include the following:

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

The following waste-limiting characteristics were also considered:

- Types and concentrations of waste constituents
- Physical and chemical properties of the waste (e.g., volatility, solubility, and mobility)

Table 2-4 presents the remedial technologies/process options applicable for addressing the RAOs for Site 5A. This table also presents the results of 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.

TABLE 2-4

IDENTIFICATION AND SCREENING OF REMEDIAL TECHNOLOGIES AND PROCESS OPTIONS NAS WHITING FIELD, MILTON, FLORIDA

General Response Action	Remedial Technology	Process Option	Description	Screening Result
No Action	No Action	None	No remedial actions taken. Five-year review would be required.	Retained
Limited action	LUCs	LUCs	LUCs for property in the area of soil contamination would include restrictions on excavation/construction or future land use. LUCs include access controls (e.g., fences, security guards, warning signs, etc.), and institutional controls (e.g., public advisories, Base Master Plan notations, etc.), and site monitoring to ensure compliance with the provisions of the LUCs.	Retained
Removal	Excavation	Bulk excavation	Excavation is the removal of soils using common construction equipment such as a high lift and backhoe.	Retained
Disposal	On-site landfill	Hazardous landfill	Double-lined and capped permanent disposal facility.	Eliminated[1]
		Hybrid landfill	Unlined but capped permanent disposal facility.	Eliminated[1]
		Nonhazardous landfill	Unlined and uncapped permanent disposal facility.	Eliminated[1]
	On-site landfill	Hazardous waste landfill	Existing RCRA hazardous waste disposal site.	Retained
		Nonhazardous waste landfill	Existing nonhazardous waste disposal site.	Retained

[1]On-site landfills are not a viable option at Site 5A due to the groundwater beneath the site.

Table 2-5 summarizes the technologies/ process options passing the screening criteria. Table 2-5 also shows the Representative Process Option (RPO) selected for alternative evaluations. The RPOs are assembled into remedial alternatives in Section 2.3.4.

TABLE 2-5

SOIL TECHNOLOGIES AND PROCESS OPTIONS PASSING PRELIMINARY SCREENING NAS WHITING FIELD, MILTON, FLORIDA

General Response Action	Remedial Technology	Process Option[1]	Representative Process Option
No action	No action	None	None
Limited action	LUCs	LUCs	LUCs
Removal	Excavation	Excavation	Excavation
Disposal	Off-site landfill	Hazardous waste landfill Nonhazardous waste landfill	Nonhazardous waste landfill

[1]At least one process option was retained as the representative process option for each acceptable remedial technology.

2.3.3 Alternative Range Development

CERCLA requires the selected RPOs to be assembled into alternatives representing a range of treatment and containment combinations, as appropriate (USEPA, 1988). The purpose of providing a range of alternatives is to ensure all reasonable GRAs are represented and evaluated.

For soil actions, alternatives address PRGs and/or exposure pathways and the time frame the alternative will achieve PRGs. Alternatives are developed by combining different RPOs to address the problems at a site. A range of alternatives is developed encompassing all probable actions from a baseline No Action alternative to a maximum practical response. The range of alternatives is not necessarily ordered by increasing protection of human health and the environment. The alternatives are then compared to the nine CERCLA evaluation criteria. The range of alternatives developed for surface soil remediation is presented in Table 2-6.

TABLE 2-6

RANGE OF ALTERNATIVES FOR SITE 5A
NAS WHITING FIELD, MILTON, FLORIDA

Alternative Type
No Action (Baseline)
Limited Action – No or Minimal Treatment
Removal/Treatment – Minimizes Long-Term Management

The first alternative type is No Action. The No Action alternative is used as the lowest level of remedial action and to provide a baseline for comparing alternatives. Under the No Action alternative, there will not be any costs except for 5-year review costs.

The second alternative type is limited action. The limited action alternative usually provides LUCs restricting the exposure pathways to receptors. This alternative type provides little or no treatment, but protects human health and the environment by preventing potential exposure to and/or reducing the mobility of constituents.

The third alternative type is removal/treatment minimizing long-term management. This alternative type represents the upper bound of the alternative range and relies on an aggressive treatment approach. Harmful constituents may be treated in-situ to irreversible and less harmful forms or removed from the site. For soil remedial responses, the time frame for this alternative type is usually short relative to those

for other alternative types. Often a combination of various aggressive treatment systems is employed to reduce any harmful constituents in a timely manner.

2.3.4 Assembly of Soil Alternatives

Alternatives are developed to provide an appropriate range of options. Sufficient information is included to adequately evaluate and compare alternatives and to determine the most appropriate alternative. Alternatives are developed around USEPA's expectations pertaining to remediation of CERCLA sites. These expectations have been listed in the NCP [40 CFR 300.430(a)(1)(iii) and 55 FR 8846, March 8, 1990] and are summarized below.

- Engineering controls such as in-situ barriers could be used for waste posing a relatively low long-term threat and for sites where treatment is impracticable.
- Principal threats (i.e., highly mobile or highly toxic waste) will be treated, if practicable.
- A combination of engineering controls and treatment will be used, as appropriate, to achieve protection of human health and the environment. An example would include treatment of "hot spots" in combination with a cap.
- LUCs, such as access restrictions, will be used to supplement engineering controls, as appropriate, to prevent exposure to hazardous wastes.
- Innovative technologies will be considered when such technologies offer the potential for superior treatment performance or to lower costs for performance similar to the demonstrated technologies.

In developing soil alternatives, the range of options accounts for various site conditions. Soil alternatives are developed on a site-wide basis because of the type of constituent, constituent characteristics and concentrations, and depth and volume of impacted soil. A combination of RPOs is used to address not only cleanup levels, but also the time frame the remedial objectives will be achieved. Alternatives are developed to achieve ARARs and/or other protective health-based levels using different methodologies. Excavation of soils is considered to provide removal of near surface soil as well as bulk removal for permanent means of removing impacted soils, thereby minimizing worker exposure risks. Separate alternatives are developed to reflect the option of either near surface soil removal or bulk excavation. Soils needing to be removed will be taken to an approved off-site disposal facility.

Although there are no COCs for direct contact of surface soil at Site 5A, the basic components of alternative analysis were conducted as required. Table 2-7 presents the three remedial alternatives assembled into the appropriate alternative types for the soil at this site. The first alternative, No Action, is usually carried forward because CERCLA, SARA, and National Environmental Policy Act (NEPA)

regulations [40 CFR 1501.2(c)] require consideration of this alternative. The No Action alternative, S5A-1, is also used as a basis for comparison with other alternatives. In the case of Site 5A, it also meets all the RAOs.

The second and third alternatives, limited action and removal were carried forward because CERCLA, SARA, and NEPA Regulations [40 CFR 1501.2(c)] require consideration of at least three alternatives. Alternatives S5A-2 and S5A-3 also meet all the RAOs.

Alternative S5A-2 is a limited action alternative addressing the principal threat of direct contact with surface soil. This alternative includes LUCs for surface soil at Site 5A, thus preventing any potential direct exposure. LUCs will be implemented to ensure access to the site is restricted and to ensure appropriate future land use. LUCs are described in Appendix A.

Alternative S5A-3 minimizes long-term management through excavation of surface soils exceeding PRGs (except under buildings) and disposal at an off-site treatment, storage, and disposal facility (TSDF) or landfill. The excavated soil will be characterized as hazardous or nonhazardous before shipment to the appropriate TSDF.

TABLE 2-7

SITE 5A SOIL REMEDIAL ALTERNATIVES
NAS WHITING FIELD, MILTON, FLORIDA

Alternative Number	Alternative Type	Representative Process Options Combined Into Alternatives	Alternative Description
Alternative S5A-1	No Action	None	• Five-year Reviews.
Alternative S5A-2 Surface Soil (exceeding PRGs) LUCs	Limited Action No or Minimal Treatment	LUCs	• LUCs including LUC Assurance Plan (LUCAP) and LUC Implementation Plan (LUCIP). • Posting of warning signs. • Five-year site reviews.
Alternative S5A-3 Surface Soil (exceeding PRGs) Removal	Removal – Minimizes Long-Term Management	Excavation, Disposal	• Delineation/confirmatory sampling of surface soil. • Excavation/disposal of surface soil. • Backfill excavation with clean fill. • Establish vegetative cover. • Five-year site reviews.

2.4 DETAILED ANALYSES OF SOIL ALTERNATIVES

The objective of the individual detailed analyses is to provide adequate information for each alternative to facilitate the selection of soil remedial actions at NAS Whiting Field. During detailed analysis of alternatives, soil remedial alternatives are assessed against the nine evaluation criteria outlined in USEPA's *Guidance for Conducting Remedial Investigations and Feasibility Studies under CERCLA* (USEPA, 1988). The evaluation criteria, widely used in CERCLA investigations, are beneficial in selecting and reducing the number of remedial alternatives. Uncertainties associated with specific alternatives are included in the evaluation when changes in assumptions or unknown conditions could affect the analyses.

A three-phase approach is used in the detailed analyses with the evaluation criteria. Table 1-1 presents a summary of the criteria for detailed analyses of alternatives. The "threshold" criteria represent the initial evaluation step for an alternative. For an alternative to advance to the next set of criteria, it must (1) be protective of human health and the environment and (2) comply with ARARs.

The "balancing" criteria constitute the second step in the evaluation stage. In this step, an alternative is assessed as to (1) long-term effectiveness and permanence; (2) reduction of mobility, toxicity, or volume through treatment; (3) short-term effectiveness; (4) implementability; and (5) cost. The third and final stage relates to the "modifying" criteria. In this step (1) state acceptance and (2) community acceptance are evaluated. Descriptions of the nine CERCLA evaluation criteria based on USEPA guidance (USEPA, 1988) are provided in Appendix B.

2.4.1 Site 5A Soil Alternatives

The three alternatives for Site 5A represent a range of actions including no action, limited action addressing principal threats, and removal minimizing the need for long-term management. The three alternatives providing a range of treatment options for Site 5A are listed below.

Alternative S5A-1: No Action
Alternative S5A-2: Surface Soil (Exceeding PRGs) LUCs
Alternative S5A-3: Surface Soil (Exceeding PRGs) Removal

2.4.1.1 Alternative S5A-1: No Action

2.4.1.1.1 Description

In an FS, the No Action alternative is typically considered to serve as a baseline consideration or to address sites not requiring any active remediation. The No Action alternative assumes no remedial action would occur and establishes a basis for comparison with the other alternatives. No remedial action, treatment, LUCs, or monitoring of conditions would remain or be implemented under the No Action alternative.

2.4.1.1.2 Assessment

Threshold Criteria

Overall Protection of Human Health and the Environment

The No Action alternative would provide protection to human health and the environment because it has been determined through previous analysis there are no COCs and, therefore, no threats to human health and the environment at Site 5A.

Compliance with ARARs

On the basis of protecting human health and the environment, Alternative S5A-1 would satisfy ARARs and TBCs, including the SCTLs.

Balancing Criteria

Long-Term Effectiveness and Permanence

Alternative S5A-1 would provide long-term effectiveness and permanence for Site 5A. Site 5A would not pose a continuing risk to human health and the environment. The magnitude of and potential for residual risk within Site 5A would be relatively unchanged by the No Action alternative. The adequacy and reliability of controls component is not applicable for Alternative S5A-1 because no construction, installation, or equipment is associated with the alternative. The No Action alternative would not include provisions for long-term monitoring.

Reduction of Mobility, Toxicity, or Volume through Treatment

The mobility, toxicity, and volume of constituents in Site 5A would not change significantly and there would be no risk posed to human health and the environment because Alternative S5A-1 involves no action.

Short-Term Effectiveness

The No Action alternative would provide no short-term effectiveness or short-term risks during implementation of the No Action alternative. There would be no short-term risks to workers, the community, or the environment because no construction or implementation would occur. There would be no implementation time associated with the No Action alternative. The time required to achieve remedial objectives under the No Action alternative will be immediate (less than 1 year) upon acceptance and approval.

Implementability

No technical implementability issues exist because no remedial action would occur. There is no need to coordinate with other agencies or acquire permits. Services or materials are not required. Future actions, if needed, would not be hindered by the No Action alternative.

Cost

There would be no costs associated with the No Action alternative since no remedial action will occur.

2.4.1.2 Alternative S5A-2: Surface Soil (Exceeding PRGs) LUCs

2.4.1.2.1 Description

Alternative S5A-2 addresses the principal threats through the implementation of LUCs for surface soil. LUCs are described in Appendix A.

There is no impacted surface soil (up to 1 ft bls) exceeding PRGs at Site 5A. However, site inspections and maintenance would be required. Because the site is entirely grass covered, all areas would require fencing or other materials to serve as a barrier to prevent humans from contacting the soil.

2.4.1.2.2 Assessment

Threshold Criteria

Overall Protection of Human Health and the Environment

Alternative S5A-2 would provide protection to human health and the environment by minimizing all exposure pathways by restricting access to soil by LUCs, fencing, or other containment barriers. LUCs would be effective in the protection of human health. Fencing or other containment barriers would protect humans and the environment. There would be no significant risks to human health or the environment during implementation of Alternative S5A-2 because no construction or implementation would occur;

therefore, for overall protection of human health and environmental resources both on and off base, Alternative S5A-2 would provide a high level of protection.

Compliance with ARARs

All ARARs applying to source control and reducing risk to humans would be satisfied by Alternative S5A-2. Although fencing or other containment barriers are not active remedial processes, exposure to the constituents would be prevented. Constituent exposure and chemical-specific ARARs and TBCs for workers and the public would define the degree of worker protection and emission control required during implementation of Alternative S5A-2.

Balancing Criteria

Long-Term Effectiveness and Permanence

The degree of long-term effectiveness and permanence provided by Alternative S5A-2 is high. LUCs provide long-term effectiveness and permanence in minimizing exposure pathways. The magnitude and potential of residual risk would be unchanged for on-base receptors, but the exposure pathways would be minimized as long as LUCs (e.g., fencing, containment barriers) remain in place. A 5-year review would be required to assess the surface soils and remaining inorganic constituents.

The adequacy and reliability of LUCs would be sufficient to restrict access to impacted soils. Long-term management would consist of LUCs and monitoring and would be expected to last 30 years.

Reduction of Mobility, Toxicity, or Volume through Treatment

The mobility, toxicity, and volume of constituents in Site 5A would not change significantly and there would be no risk posed to human health and the environment because Alternative S5A-2 involves no construction or remedial action.

LUCs would also reduce the mobility of inorganic constituents posing a risk through fugitive dust. Fencing and/or barriers would minimize exposure pathways. This alternative would provide a low degree of irreversible treatment. The implementation and operation of Alternative S5A-2 would produce no treatment residuals.

Short-Term Effectiveness

There would be no short-term risk to workers, on-base personnel, and the public from implementation of Alternative S5A-2. Alternative S5A-2 would be effective in minimizing all exposure pathways. The estimated time to achieve the RAOs is less than one year.

Implementability

The RPOs associated with Alternative S5A-2 would be easily implementable. Soil sampling would be required to finalize the extent of impacted soil for the placement of LUCs. All components of Alternative S5A-2 would be reliable in the protection of human health and the environment. The need for future remedial actions would depend on the effectiveness of Alternative S5A-2 in minimizing exposure pathways. Future remedial actions would not be hindered by the implementation of Alternative S5A-2; however, modification of LUCs may be required. Coordination with regulatory agencies would be obtainable.

Cost

The estimated present worth total project cost for Alternative S5A-2 is **$60,572** including $7,375 for 5-year reviews, and $3,092 for monitoring of LUCs over a 30-year period.

2.4.1.3 Alternative S5A-3: Surface Soil (Exceeding PRGs) Removal

2.4.1.3.1 Description

Alternative S5A-3 minimizes the need for long-term management because all surface soil containing COCs exceeding PRGs (hypothetical) would be removed. Excavation would be used to remove all impacted surface soil exceeding PRGs. The excavation would consist of removing the soil from the surface down to approximately 2 feet bls. After all impacted soil within the excavation area exceeding PRGs is removed, the excavated areas would be backfilled with clean native material, compacted, and revegetated with no long-term monitoring or maintenance required. The excavated soil from Site 5A would be disposed in an approved off-base TSDF and/or landfill. Some pretreatment of the excavated soils may be necessary to meet Land Disposal Restrictions (LDRs) and would be provided by the TSDF, if required.

2.4.1.3.2 Assessment

Threshold Criteria

Overall Protection of Human Health and the Environment

Alternative S5A-3 would provide protection of human health and the environment by removal and off-base disposal of all soil exceeding PRGs and minimizing all exposure pathways. Immediate and future risk from any potential industrial land use exposure would be reduced by the removal of all impacted soil and its subsequent off-base disposal. The reliability of excavation and off-base disposal is certain in the protection of human health and the environment because the source of risk is permanently removed from the site. There would be no significant risks to human health and the environment during implementation

of Alternative S5A-3 if normal dust control, runoff control, excavation, and transportation procedures are conducted and direct worker contact with impacted soils is minimized. Therefore, Alternative S5A-3 would provide a high level of protection for human health and environmental resources both on and off base.

Compliance with ARARs

All ARARs applying to source control and reducing risk to human health and the environment would be satisfied by Alternative S5A-3. Alternative S5A-3 would satisfy chemical- and action-specific ARARs and TBCs for achieving remedial objectives including the FDEP SCTLs; however, pretreatment of excavated soil may be necessary to meet LDRs. If required, pretreatment would be provided by the TSDF. Constituent exposure and chemical-specific ARARs and TBCs for workers and the public would define the degree of worker protection and emission control required during implementation of Alternative S5A-3.

Balancing Criteria

Long-Term Effectiveness and Permanence

The degree of long-term effectiveness and permanence provided by Alternative S5A-3 is high since impacted soils will be removed from the site. Excavation and off-base disposal provide long-term effectiveness and permanence by minimizing exposure pathways, assuming all impacted soil exceeding PRGs is identified, excavated, and disposed.

Reduction of Mobility, Toxicity, or Volume through Treatment

Excavation and off-base disposal of all impacted soil would reduce the mobility of constituents by physically moving them from the site to a secure landfill. The toxicity of the excavated constituents may be reduced through treatment in an off-base TSDF before landfill disposal. Minor inorganic constituent residuals would remain below action levels after the implementation of Alternative S5A-3. No treatment residuals would be produced by the implementation of Alternative S5A-3.

Short-Term Effectiveness

The short-term risk to workers, on-base personnel, and the public from implementation of Alternative S5A-3 would be controllable and would result from the excavation, transportation, and off-base disposal of impacted soil. Health and safety issues include dust control, runoff control, and proper decontamination procedures. Construction time to implement Alternative S5A-3 would be approximately 45 days. Minimal risk to the community would be expected from excavation and transportation of impacted soil during excavation and off-base disposal. Alternative S5A-3 would be immediately effective in minimizing all exposure pathways. The estimated time to achieve the RAOs is less than one year.

Implementability

The RPOs associated with Alternative S5A-3 would be implementable, and vendors are available to conduct this work. Soil sampling would be required to finalize the extent of impacted soil for the

placement of the excavation areas. Excavation and disposal of Site 5A soils would require clean, native backfill to replace excavated materials; heavy construction equipment; sufficient area for staging/maneuvering; and accommodation for underground utilities. Excavation may be required around utilities. All components of Alternative S5A-3 would be reliable in the protection of human health and the environment. The need for future remedial actions would depend on the effectiveness of Alternative S5A-3 in minimizing the source areas. Future remedial actions would not be hindered by the implementation of Alternative S5A-3. Coordination with regulatory agencies would be obtainable.

Cost

Because there are no COCs for Site 5A and S5A-3 is only a hypothetical alternative for comparison purposes, the cost to implement the alternative was not estimated.

2.4.2 Summary Of Site 5A Soil Alternatives

As part of the detailed analyses of alternatives for Site 5A, one alternative involving No Action, one alternative involving limited action, and one alternative minimizing long-term management have been evaluated. Alternatives S5A-1, S5A-2, and S5A-3 all satisfy the threshold criteria to the full extent, provide varying degrees of protection and will be viable for the selection as a preferred alternative. The relative merits of all Site 5A alternatives are evaluated in Section 2.5.

2.5 COMPARATIVE ANALYSIS FOR SOIL ALTERNATIVES

In contrast to the preceding evaluation (Section 2.4) where each alternative was analyzed independently without consideration of other alternatives, the comparative analysis (presented in this section) evaluates the relative performance of each alternative in relation to each specific evaluation criterion. The comparative analysis focuses on the key differences between the alternatives and attempts to highlight critical issues of concern to the decision maker in selecting the preferred remedial action. The following sections provide a summary of the key comparative features and performance of each site-specific alternative relative to the other alternatives with respect to the CERCLA criteria (see Table 1-1).

The main objectives for the preferred remedial action are to be protective of human health and the environment and to comply with ARARs. Protection of human health and the environment and compliance with ARARs are considered threshold criteria. For an alternative to be considered as final, these two threshold criteria must be met. The following five criteria are referred to as the balancing criteria: (1) long-term effectiveness and permanence; (2) reduction of toxicity, mobility, or volume through treatment; (3) short-term effectiveness; (4) implementability; and (5) cost. The balancing criteria require the most discussion in this section because the key differences between alternatives frequently relate to

one or more of these five criteria. The modifying criteria include (1) state acceptance and (2) community acceptance. These criteria will be addressed after the public review and comment period has been completed in the form of a response summary to the Proposed Plan.

A summary of the comparative analyses for the Site 5A alternatives is presented in Table 2-8. This comparison between alternatives is based on the CERCLA evaluation criteria.

2.5.1 Overall Protection of Human Health and the Environment

This evaluation criterion is used to assess whether an alternative provides adequate protection of human health and the environment and is described in Appendix B.

The existing exposure pathways to humans for Site 5A are dermal contact, inhalation, and incidental ingestion. There are no unacceptable exposure pathways for ecological receptors in the environment. Potential for the constituents to leach and impact groundwater is not considered in this FS, but will be considered in the Site 40, Basewide Groundwater RI/FS. For an alternative to be protective of human health and the environment, it must protect humans from all potential exposure pathways.

TABLE 2-8
SUMMARY OF COMPARATIVE ANALYSIS OF SOIL ALTERNATIVES FOR SITE 5A
NAS WHITING FIELD, MILTON, FLORIDA
PAGE 1 OF 4

Criteria	Alternative S5A-1 No Action	Alternative S5A-2 Surface Soil (Exceeding PRGs) LUCs	Alternative S5A-3 Surface Soil (Exceeding PRGs) Removal
THRESHOLD CRITERIA			
Overall Protection of Human Health and the Environment			
Human Health Protection	Provides required level of protection.	Provides a high level of protection. LUCs reduce risk from residuals. Fencing and barriers reduce risk of potential exposure.	Provides highest level of protection. Excavation and disposal eliminates risk of potential exposure.
Environmental Protection	There are no COCs. Constituent concentrations do not need to be reduced.	There are no COCs. Constituent concentrations do not need to be reduced.	Excavation and disposal will reduce all concentration levels in a short period of time.
Compliance with Applicable or Relevant and Appropriate Requirements (ARARs)			
Compliance with Chemical-Specific ARARs	Meets ARARs immediately.	Meets ARARs	Meets ARARs within 1 year.
Compliance with Action-Specific ARARs	Not applicable	Not applicable	Meets ARARs if proper PPE used during excavation and disposal.
Compliance with Location-Specific ARARs	Not applicable	Not applicable	Not applicable
Compliance with Other Criteria	Not applicable	Meets NAS Whiting Field requirements	Meets NAS Whiting Field requirements
BALANCING CRITERIA			
Long-Term Effectiveness and Permanence			
Reduction in Residual Risk	No residual risk	No residual risk	Provides highest level of long-term residual risk reduction. Risk eliminated or reduced by excavation and off-site disposal.

TABLE 2-8
SUMMARY OF COMPARATIVE ANALYSIS OF SOIL ALTERNATIVES FOR SITE 5A
NAS WHITING FIELD, MILTON, FLORIDA
PAGE 2 OF 4

Criteria	Alternative S5A-1 No Action	Alternative S5A-2 Surface Soil (Exceeding PRGs) LUCs	Alternative S5A-3 Surface Soil (Exceeding PRGs) Removal
Long-Term Reliability of Controls	Not applicable	Provides a high level of reliability.	Provides highest level of reliability. Excavation and disposal are adequate and reliable.
Need for 5-Year Review	Not Required	Required	Required
Prevention of Exposure to Residuals	No residual risk	Exposure risk reduced by LUCs.	Exposure to residuals is eliminated or reduced by excavation and disposal.
Potential Need for Replacement of Technical Components after Remedial Objectives Are Achieved	Not applicable	Fencing may require replacement or repair.	No technical components required.
Long-Term Management	Not applicable	Management required for estimated 30 years.	No management required
Reduction of Mobility, Toxicity, or Volume through Treatment			
Amount Destroyed or Treated	None	None	All impacted soil containing COC exceeding PRGs is excavated and disposed. Removal efficiency estimated >95%.
Reduction in Mobility, Toxicity, or Volume	Not applicable	Not applicable	Mobility reduced by excavation and disposal in landfill. Toxicity of excavated soils may be reduced in an off-site TSDF.
Irreversibility of Treatment	Not applicable	Not applicable	Off-site TSDF treatment is an irreversible process.
Type and Quantity of Residuals Remaining after Treatment	None	None	No inorganic residuals remain above action levels.

TABLE 2-8
SUMMARY OF COMPARATIVE ANALYSIS OF SOIL ALTERNATIVES FOR SITE 5A
NAS WHITING FIELD, MILTON, FLORIDA
PAGE 3 OF 4

Criteria	Alternative S5A-1 No Action	Alternative S5A-2 Surface Soil (Exceeding PRGs) LUCs	Alternative S5A-3 Surface Soil (Exceeding PRGs) Removal
Short-Term Effectiveness			
Community Protection During Implementation	Not applicable	Not applicable	Temporary increases in dust emissions through excavation and disposal; controlled by proper construction techniques.
Worker Protection During Implementation	Not applicable	Not applicable	Workers use PPE, as required, to prevent dermal contact as well as dust inhalation and ingestion during construction.
Environmental Impacts	None	None	Excavation of impacted soils can generate runoff and fugitive dust.
Construction Time[a]	Not applicable	Not applicable	Less than 1 year
Time Until Remedial Response Objectives Are Achieved	Immediately	Estimated at 1 year	Estimated at 1 year
Implementability			
Ability to Construct and Operate the Technology	Not applicable	Not applicable	Many contractors available to provide excavation. Fewer contractors accept impacted soil for disposal.
Reliability of Technology	Not applicable	LUCs are reliable for restricting soil access.	. Excavation and disposal are reliable.
Ease of Undertaking Additional Remedial Action, if Required	Easily implementable	Easily Implementable	Implementable

TABLE 2-8
SUMMARY OF COMPARATIVE ANALYSIS OF SOIL ALTERNATIVES FOR SITE 5A
NAS WHITING FIELD, MILTON, FLORIDA
PAGE 4 OF 4

Criteria	Alternative S5A-1 No Action	Alternative S5A-2 Surface Soil (Exceeding PRGs) LUCs	Alternative S5A-3 Surface Soil (Exceeding PRGs) Removal
Ability to Monitor Effectiveness	Not applicable	Monitoring gives notice of potential presence of contaminants in subsurface.	Monitoring indicates excavation and effectiveness of removal.
Permitting Requirements	Not applicable	Not applicable	Transportation and Disposal Permit will be required.
Coordination with Other Agencies	Not applicable	Not applicable	All permits and/or permit modifications are obtainable.
Availability of Services and Capabilities	Not applicable	Not applicable	Readily available
Availability of Equipment, Specialists, and Materials	Not applicable	Not applicable	Readily available
Cost[b]			
Capital Costs	$0	$0	NA[c]
Short-Term O&M	$0	$0	NA[c]
Long-Term O&M			
5-Year Review	$0	$7,375	NA[c]
Land-Use Controls	$0	$3,092	NA[c]
Total Project Present Worth Cost	$0	$60,572	NA[c]

[a] Does not include testing or treatability studies.

[b] Includes, short- and long-term total present worth, and contingency.
[c] Costs not estimated for hypothetical alternative S5A-3 (no COCs)

All three alternatives would provide adequate and required protection of human health and the environment at Site 5A.

Table 2-8 presents a summary for the overall protectiveness of human health and the environment for all Site 5A alternatives.

2.5.2 Compliance with ARARs

This evaluation criterion is used to determine whether an alternative meets all Federal and state ARARs and is described in Appendix B.

Alternative S5A-1 would comply with all ARARs and immediately meet PRGs for Site 5A.

Alternatives S5A-2 and S5A-3 would comply with chemical-specific ARARs and TBCs concerning worker and public safety by providing worker protection and emission control during construction and operation.

PRGs are numerical values representing chemical-specific ARARs. Over time, both alternatives would meet PRGs within Site 5A. Table 2-8 presents a summary of ARARs compliance for each alternative.

2.5.3 Long-Term Effectiveness and Permanence

This criterion addresses (1) the effectiveness of an alternative in terms of residual risk remaining at the site after response objectives have been completed (e.g., after impacted soil management activities are concluded) and (2) the reliability and maintenance of controls used to manage the risk posed by treatment residuals and untreated wastes.

Magnitude of Residual Risks

All three alternatives, when implemented, would not produce or leave any residuals requiring treatment and/or disposal posing any future potential risk to the environment. Alternatives S5A-2 and S5A-3 would require 5-year reviews.

Adequacy and Reliability of Controls

All alternatives, including S5A-1, would be adequate and reliable in controlling exposure to any residuals remaining at the site.

Table 2-8 provides a summary of the comparative evaluation of the long-term effectiveness and permanence, including magnitude of future residual risk, long-term reliability of controls, prevention of

exposure to residuals, potential need for replacement of technical components, and long-term management requirements, of each Site 5A alternative.

2.5.4 Reduction of Mobility, Toxicity, or Volume through Treatment

This criterion addresses the degree each alternative permanently and significantly reduce mobility, toxicity, or volume of hazardous constituents in the soil and is described in Appendix B. All alternatives would permanently and significantly reduce mobility of chemical constituents for Site 5A.

All the alternatives would rely minimally on natural processes to aid in the remediation of the residuals remaining in the soil; however, the types and concentrations of constituent residuals are assumed to be below action levels. None of the alternatives would produce any residuals from treatment (e.g., sludges or soil-washing solutions).

Table 2-8 provides a summary of the comparative evaluation of the constituents destroyed; reduction of toxicity, mobility, or volume; irreversibility of treatment; and residuals remaining after treatment for each Site 5A alternative.

2.5.5 Short-Term Effectiveness

This criterion addresses the effects of each alternative during the implementation and construction phases until remedial response objectives are achieved (e.g., cleanup levels are achieved) and is described in Appendix B.

Alternative S5A-1 would immediately protect human health because there would not be any effects from implementation or construction and these phases are not needed.

More complex and involved alternatives, such as Alternatives S5A-2 and S5A-3, would also protect human health once completed. Alternatives S5A-2 and S5A-3 have an estimated remedial time to reach objectives of less than one year. Alternative S5A-3 would create short-term risks of worker exposure and the potential of fugitive dust during excavation and transportation. These risks appear manageable using appropriate engineering and construction management controls. The environmental impacts (e.g., fugitive dust and runoff) are expected to be minimal during implementation of all alternatives. Engineering controls would minimize any environmental impacts.

Table 2-8 provides a summary of the comparative evaluation of the short-term effectiveness, including construction time, remedial time to completion, community protection during implementation, and worker protection during implementation, of each Site 5A alternative.

2.5.6 Implementability

This criterion addresses whether there are any technical problems or administrative issues associated with an alternative as described in Appendix B.

Alternatives S5A-1 and S5A-2 would be easily implementable. Alternative S5A-3 may require federal, state, or local permits because it includes excavation, transportation, and off-base disposal of impacted soils. In addition, any alternative involving phased construction would require appropriate integrated scheduling of any required permits and construction. Alternatives S5A-2 and S5A-3 would require coordination with other agencies for deed recordation and any required permitting. All remedial technologies are proven and reliable.

Future remedial actions are not necessary or applicable for Alternative S5A-1. Future remedial actions would be easily implementable for Alternative S5A-3 because the site would remain at or be returned to original conditions. Future actions would also be implementable for Alternative S5A-2.

Alternative S5A-1 would not require any inspections or monitoring. Alternative S5A-2 would require inspection for erosion and potential exposure. Alternative S5A-3 would not require any long-term monitoring once the remediation is complete. In addition, monitoring for inhalation of fugitive dust would be performed during construction to protect workers and determine appropriate personal protective equipment. Exposure from dermal contact and ingestion of soil is difficult to monitor.

Alternative S5A-3 would require the use of a TSDF or landfill for excavated soils. TSDFs are available and have sufficient capacity to meet the requirements of this alternative. Equipment, specialists, and materials are readily available.

Table 2-8 provides a summary of the comparative evaluation of implementability, including the ability to construct and operate the technology; reliability of the technology; ease of implementation of future remedial actions; ability to monitor effectiveness; ability to coordinate with other agencies; availability of services and capacities; and availability of equipment, specialists, and materials, for each Site 5A alternative.

2.5.7 Cost

This criterion addresses the estimated cost for each alternative and is described in Appendix B.

The estimated total project present worth values reflect a common degree of complexity and/or remedial time between the alternatives. Alternative S5A-3 would have the highest cost (assumed, not estimated), followed by Alternative S5A-2, with Alternative S5A-1 being the least expensive.

Table 2-8 provides the total project present worth costs for each Site 5A alternative.

2.5.8 State Acceptance

The state regulatory agency, FDEP, will review and comment on the Draft FS for Site 5A prior to final approval and subsequent acceptance. The FDEP comments will be addressed in the Final FS for Site 5A.

2.5.9 Community Acceptance

The information concerning community acceptance will be addressed following the public comment period for the Proposed Plan for Site 5A.

REFERENCES

Envirodyne Engineers, 1985. *Initial Assessment Study, NAS Whiting Field, Milton, Florida.* Final Report. Prepared for Naval Energy and Environmental Support Activity, Port Hueneme, California.

FDEP (Florida Department of Environmental Protection), 2005. Soil Cleanup Target Levels (SCTLs). Chapter 62-777, Florida Administrative Code (F.A.C.). April.

FDEP, 2001. Letter from James Cason, FDEP, to James Holland, NAS Whiting Field. *Analysis of Soil for Arsenic at Outlying Landing Fields.* April 11.

Geraghty & Miller, Inc., 1986. *Verification Study, Assessment of Potential Groundwater Pollution at NAS Whiting Field, Milton, Florida.* Final Report. Prepared for NAVFAC EFD SOUTH, North Charleston, South Carolina.

TtNUS (Tetra Tech NUS, Inc.), 2005. *Remedial Investigation Report for Surface and Subsurface Soil, Sites 05, 07, 29, 35, and 38, Naval Air Station Whiting Field, Milton, Florida.* Prepared for NAVFAC EFD SOUTH, North Charleston, South Carolina. March.

USEPA (United States Environmental Protection Agency) 1988. *Guidance for Conducting Remedial Investigations and Feasibility Studies under CERCLA.*

USEPA, 2001. *Risk Assessment Guidance for Superfund, Volume 1: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment) Interim Guidance*, Office of Emergency and Remedial Response, Washington D.C., September.

USEPA, 2002. Region IX PRGs Table 2002 Update. USEPA Region IX, San Francisco, CA. October 1.

APPENDIX A
GENERAL RESPONSE ACTIONS

GENERAL RESPONSE ACTIONS

General response actions describe those actions that will satisfy the remedial action objectives. General response actions may include treatment, containment, excavation, extraction, disposal, institutional actions, or a combination of these. Like remedial action objectives, general response actions are medium-specific. General response actions that might be used at a site are initially defined during scoping and are refined throughout the RI/FS as a better understanding of site conditions is gained and action-specific ARARs are identified.

No Action

The No Action general response action consists of no additional action. No Action is typically considered in an FS to serve as a baseline consideration or to address sites that do not require any active remediation. The No Action baseline condition for NAS Whiting Field consists of access restrictions. Access to the base is controlled in accordance with existing Navy regulations including controlled entrances on the base and security fencing. The regulations minimize the potential for accidental contact with any portion of the site and are assumed to remain in effect during remediation.

Limited Action

The Limited Action would consist of Land Use Controls (LUCs) and fencing. LUCs are any restriction or control arising from the need to protect human health and the environment or to limit the use of and/or exposure to environmentally contaminated media (e.g., soils, surface water, groundwater) at any site on NAS Whiting Field. LUCs include controls on access (e.g., engineered and nonengineered mechanisms such as fences, caps, and security guards). Additionally, LUCs encompasses both affirmative measures to achieve the desired control (e.g., night lighting of an area) and prohibitive directives (e.g., no drilling of drinking water wells). LUCs include "institutional controls," which are nonengineered mechanisms for ensuring compliance with necessary land use limitations (e.g., public advisories, Base Master Plan notations, and applicable legal restrictions on land or water usage). Monitoring of soil contamination would not be conducted.

Containment

Containment would be used to control access to contaminants in soils. Containment using horizontal barriers, such as soil caps, can be used to minimize dermal contact risks.

In Situ Treatment

In situ treatment is the treatment of organic-contaminated soil "in place." In situ treatment allows the soils to be treated in place with minimal disturbance and typically includes soil venting when remediating organics.

Removal and Disposal

Removal and disposal would consist of excavating the contaminated soils and disposing of them without treatment in a disposal site. Additional excavation would be required to provide access to buried contaminated areas.

CERCLA EVALUATION CRITERIA

The objective of the individual detailed analyses is to provide adequate information for each alternative to facilitate the selection of soil remedial actions at NAS Whiting Field. During detailed analysis of alternatives, soil remedial alternatives are assessed against the nine evaluation criteria outlined in USEPA's *Guidance for Conducting Remedial Investigations and Feasibility Studies under CERCLA* (USEPA, 1988). The evaluation criteria, widely used in CERCLA investigations, are beneficial in selecting and reducing the number of remedial alternatives. Uncertainties associated with specific alternatives are included in the evaluation when changes in assumptions or unknown conditions could affect the analyses.

A three-phase approach is used in the detailed analyses with the evaluation criteria. Table 1-1 presents a summary of the criteria for detailed analyses of alternatives. The "threshold" criteria represent the initial evaluation step for an alternative. For an alternative to advance to the next set of criteria, it must (1) be protective of human health and the environment and (2) comply with ARARs. The "balancing" criteria constitute the second step in the evaluation stage in which an alternative is assessed as to (1) long-term effectiveness and permanence; (2) reduction of mobility, toxicity, or volume through treatment; (3) short-term effectiveness; (4) implementability; and (5) cost. The third and final stage relates to the "modifying" criteria in which (1) state acceptance and (2) community acceptance are evaluated. Descriptions of the nine CERCLA evaluation criteria based on USEPA guidance (USEPA, 1988) are provided below.

Threshold Criteria

Overall Protection of Human Health and the Environment

Evaluation of the overall protectiveness of an alternative focuses on whether a specific alternative provides adequate protection and describes how risks associated with the potential site-specific exposure pathways are eliminated, reduced, or controlled through treatment, engineering, and/or LUCs. This criterion also allows for consideration of whether an alternative poses any unacceptable short-term (during remedial activities) or cross-media impacts. The overall evaluation of protection draws on the assessments conducted under other criteria, especially long-term effectiveness and permanence, short-term effectiveness, and compliance with ARARs. Overall protection from impacted soil is based largely on the certainty that the remedy can achieve and maintain cleanup levels or minimize potential exposure pathways. This criterion must be satisfied for an alternative to be considered in the selection process.

APPENDIX B
CERCLA EVALUATION CRITERIA

Compliance with ARARs

This evaluation criterion is used to determine whether an alternative specific to the site will satisfy all the Federal and state ARARs including compliance with chemical-, action-, and location-specific ARARs. Applicable requirements are those cleanup standards, standards of control (technology- or activity-based), and substantive environmental protection requirements promulgated under Federal or state law that specifically address a situation encountered at NAS Whiting Field. Relevant and appropriate requirements are those Federal and state regulatory requirements that, while not "applicable," address problems or situations sufficiently similar to those encountered in NAS Whiting Field and are appropriate to the circumstances of release or threatened release. Chemical-specific ARARs are numerically represented by the PRGs. Action-specific ARARs are represented by such regulations as RCRA. Location-specific ARARs are represented by regulations regarding actions such as floodplain management. The Navy in consultation with the State of Florida and USEPA makes the final determination of which requirements are relevant and appropriate. This criterion must be satisfied for an alternative to be considered in the selection process.

Balancing Criteria

Long-Term Effectiveness and Permanence

The evaluation of alternatives under this criterion addresses the results of a remedial action in terms of the exposure to risk remaining at the site after RAOs have been satisfied. This evaluation focuses on the extent and effectiveness of controls that may be required to manage risks posed by treatment residuals and/or untreated constituents. The following components of the criterion (USEPA, 1988) described below are addressed for each alternative.

- Magnitude of residual risk. This component provides an assessment of the residual risk (on a pathway basis) remaining from treatment residuals and/or untreated constituents at the conclusion of remedial activities. Issues for evaluation of the residual risk include identifying the remaining sources of risk and the requirement of a 5-year review.

- Adequacy and reliability. This component provides an assessment of the adequacy and reliability of remedial controls, if any, used to manage treatment residuals or untreated constituents remaining at the site. Issues for evaluation are type and degree of long-term management, long-term monitoring, operations and maintenance (O&M) functions, and degree of confidence.

Qualitative terms such as "high," "medium," "low," "certain," and "uncertain" are used to define how well an alternative satisfies the requirements of the evaluation criterion in achieving RAOs. Alternatives must be widely used and proven effective to be considered reliable. An evaluation of the reliability of an alternative is required by CERCLA.

Reduction in Mobility, Toxicity, or Volume through Treatment

This evaluation criterion addresses the preference for selecting remedial actions that employ, as their principal element, treatment technologies that permanently and significantly reduce mobility, toxicity, and/or volume of the constituents in the soil. This preference is satisfied when treatment is used to reduce the principal threats at an area through the destruction of toxic constituents, irreversible reduction in constituent mobility, and/or reduction of the total volume of impacted media.

This evaluation focuses on the following specific factors for each alternative as summarized from CERCLA guidance (USEPA, 1988):

- The treatment process employed.
- The amount of hazardous materials destroyed or treated.
- The degree of expected reduction in mobility, toxicity, or volume.
- The degree to which the treatment is irreversible.
- The type and quantity of treatment residuals that will remain following treatment.
- The degree to which the alternative satisfies the statutory preference for a principal treatment element.

Qualitative terms such as "high," "medium," "low," "certain," and "uncertain" are used to define how an alternative satisfies the requirements of the evaluation criterion in achieving the RAOs.

Short-Term Effectiveness

This evaluation criterion addresses the effects of the alternative during the construction, implementation, and operational phases of remedial action until remedial objectives (e.g., cleanup levels) are achieved. Under this criterion the alternatives are evaluated with respect to their effects on human health and the environment during implementation of the remedial action. The factors below are summarized from CERCLA guidance (USEPA, 1988) and are addressed as appropriate for each of the remedial action alternatives.

- Protection of the community and workers during construction phases. This aspect of short-term effectiveness addresses risk and inconvenience (such as odor) that may result from implementation of the proposed soil remedial action. These considerations include worker and community threats during remedial action and the effectiveness and reliability of available worker-protective measures.

- Environmental impacts. This factor addresses the potential adverse environmental impacts that may result from the construction and implementation of an alternative and evaluates the reliability of available mitigation measures to prevent or reduce potential impacts.

- Time. This factor addresses the time required to complete construction, implementation, and O&M activities, as well as to achieve remedial objectives. Estimated remedial times are based on the time required to remediate sites with similar conditions, computer modeling, pilot test data, and professional judgment.

Qualitative terms such as "high," "medium," "low," "certain," and "uncertain" are used to define how an alternative satisfies the requirements of the evaluation criterion in achieving the RAOs.

Implementability

The implementability criterion addresses the technical and administrative feasibility of implementing an alternative as well as the availability of services and materials required during implementation. This criterion involves analysis of the factors below as summarized from CERCLA guidance (USEPA, 1988).

- Technical feasibility
  - Ability to construct and operate the technology includes an evaluation of difficulties and uncertainties associated with the alternative.
  - Reliability of the technology focuses on the likelihood that technical problems associated with implementation could lead to schedule delays.
  - Ease of undertaking additional remedial action includes a discussion of any future remedial actions that may be required and the difficulty of implementing such additional actions. This criterion addresses the ability of the remedy to accommodate future technologies, capacities, or changing soil-constituent concentrations.
  - Monitoring considerations concern the ability to monitor the effectiveness of the remedy and include the effects of exposure if monitoring is insufficient to detect a system failure.

- Administrative Feasibility
  - Ability to coordinate with other offices and agencies for such requirements as construction permits and necessary access to treatment facilities is assessed.

- Availability of Services and Treatment
  - Availability of TSDF that have the required capacity is evaluated.
  - Availability of equipment, specialists, and provisions required to perform the remediation is evaluated.
  - Availability of sources for competitive services and materials is determined.

Qualitative terms such as "high," "medium," "low," "certain," and "uncertain" are used to define how well an alternative satisfies the requirements of the evaluation criterion in achieving the RAOs.

Cost

The cost criterion addresses the capital costs and annual O&M costs. Costs are estimates for the scope of the remedial action described. A present worth analysis is used to evaluate remedial alternatives occurring over several years. The estimated present worth of each remedial alternative was determined based on a combined interest and inflation rate of 10 percent and a base long-term maintenance/monitoring of not greater than 30 years in accordance with current USEPA guidance (USEPA, 1991). Long-term maintenance/monitoring of alternatives begins upon completion of remedial actions and achievement of PRGs. Costs are presented for comparison and evaluation purposes only.

The cost estimates are prepared based on information from such sources as the *Means Environmental Remediation Cost Data – Assemblies* (Means, 1999a), the *Means Environmental Remediation Cost Data – Unit Price* (Means, 1999b), estimates for similar Tetra Tech NUS projects, telephone quotes provided by vendors, and details provided by treatment facilities personnel. The O&M costs developed are incremental increases over any current system costs. The procedure for preparing the cost estimate was taken from the *Remedial Action Costing Procedures Manual* (USEPA, 1987). A discussion of each component of the cost criterion is given below.

Capital Costs

Total capital costs are defined as those expenditures required to initiate and implement a remedial action. These are short-term costs and are exclusive of costs required to maintain the action throughout the project's lifetime. These direct costs include construction costs or expenditures for equipment, labor, disposal, permits, startup, and materials required during the remedial action installation. A single contingency (10 to 30 percent of present worth project total) is included for each alternative for any bid and scope changes. The bid contingency covers changes during final design and implementation and accounts for factors such as economic/bidding climate, contractor's uncertainty regarding liability and

insurance on hazardous waste sites, adverse weather, strikes by material suppliers, and geotechnical unknowns tending to increase costs associated with constructing a project. Scope contingencies include provisions for inherent uncertainties such as expanding the extent of excavation needed and regulatory or policy changes that may affect the initial assumptions.

The cost for engineering design (between 5-20 percent of the capital cost) is included in the capital cost. Allowances for price inflation and abnormal technical difficulties are not accounted for in the contingencies.

Operations and Maintenance Costs

Short-term costs occur after construction and installation are complete, but before the remedial action is complete. Such costs include labor, monitoring, materials, utilities, energy, disposal, administrative support, services, rehabilitation, and progress reviews required to operate and maintain remedial action activities. Long-term annual O&M costs are costs incurred after remediation is complete and may also include labor, monitoring, materials, administrative support, and site reviews. The O&M costs presented herein are incremental increases from current system costs for each alternative.

Modifying Criteria

Regulatory Agency Acceptance

This assessment evaluates the technical and administrative issues and concerns that regulators may have regarding each alternative. When regulatory review of the FS report has been completed, the response summary to the Proposed Plan and ROD will address this criterion.

Community Acceptance

This assessment evaluates the issues and concerns the public may have regarding each of the alternatives. As with regulatory agency acceptance, this criterion will be addressed in the response summary to the Proposed Plan and the ROD when public comments have been received.