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NAS WHITING FIELD
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FINAL FEASIBILITY STUDY FOR OPERABLE UNIT 27 SITE 41 FORMER PESTICIDE STORAGE BUILDING 1485C SURFACE AND SUBSURFACE SOILS NAS WHITING FIELD FL

03/01/2011

TETRA TECH NUS

Comprehensive Long-term Environmental Action Navy

CONTRACT NUMBER N62467-94-D-0888

Rev. 3
March 2011

Feasibility Study
for
Operable Unit 27 - Site 41
Former Pesticide Storage Building 1485C
Surface and Subsurface Soil

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

Contract Task Order 0079

March 2011

NAVFAC
Naval Facilities Engineering Command
NAVFAC SOUTHEAST

NAS Jacksonville
Jacksonville, Florida 32212-0030

TETRA TECH NUS, Inc.

Rev. 3
03/30/11

FEASIBILITY STUDY
FOR
SITE 41, FORMER PESTICIDE STORAGE
BUILDING 1485C
SURFACE AND SUBSURFACE SOIL

NAVAL AIR STATION WHITING FIELD
MILTON, FLORIDA
USEPA ID No. FL2170023244

COMPREHENSIVE LONG-TERM
ENVIRONMENTAL ACTION NAVY (CLEAN) CONTRACT

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This document, *Feasibility Study for Site 41, Former Pesticide Storage Building 1485C, Surface and Subsurface Soils, 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.

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TABLE OF CONTENTS

SECTION **PAGE**

CERTIFICATION PAGE ..... **iii**
ACRONYMS ..... **vi**
EXECUTIVE SUMMARY **ES-1**

1.0 INTRODUCTION **1-1**
1.1 THE CERCLA FS PROCESS 1-2
1.2 PURPOSE 1-8
1.3 ENVIRONMENTAL CONDITIONS 1-9
1.4 REGULATORY SETTING 1-11
1.5 SITE DESCRIPTION AND HISTORY 1-11
1.6 SITE CONDITIONS 1-16
1.6.1 Nature and Extent of Contamination 1-16
1.6.2 Risk Assessment Results 1-19
1.6.3 Risk Assessment Summary 1-20
1.6.4 Conclusion 1-22

2.0 REMEDIAL ACTION OBJECTIVES AND CLEANUP GOALS **2-1**
2.1 REMEDIAL ACTION OBJECTIVES 2-1
2.1.1 Applicable or Relevant and Appropriate Requirements 2-1
2.2 CLEANUP GOALS 2-7
2.3 ESTIMATED VOLUME OF CONTAMINATED SOIL 2-8

3.0 SCREENING OF TECHNOLOGIES AND PROCESS OPTIONS **3-1**
3.1 DEVELOPMENT OF REMEDIAL ACTION ALTERNATIVES 3-1

4.0 DETAILED ANALYSIS OF REMEDIAL ALTERNATIVES **1**
4.1 INTRODUCTION 1
4.2 ASSEMBLY AND DETAILED ANALYSIS OF REMEDIAL ALTERNATIVES FOR SOIL ... 3

5.0 COMPARATIVE ANALYSIS OF ALTERNATIVES **5-1**
5.1 COMPARATIVE ANALYSIS FOR SOIL ALTERNATIVES 5-1
5.1.1 Overall Protection of Human Health and the Environment 5-1
5.1.2 Compliance with ARARs 5-2
5.1.3 Long-Term Effectiveness and Permanence 5-2
5.1.4 Reduction of Mobility, Toxicity, or Volume through Treatment 5-3
5.1.5 Short-Term Effectiveness 5-3
5.1.6 Implementability 5-4
5.1.7 Cost 5-5
5.1.8 State Acceptance 5-5
5.1.9 Community Acceptance 5-5

REFERENCES **R-1**

APPENDICES

A REMEDIAL ALTERNATIVE COST ESTIMATES
B SOIL VOLUME CALCULATIONS
C RESPONSE TO COMMENTS ON DRAFT FS

TABLES

NUMBER		PAGE
1-1	Criteria for Detailed Analysis of Alternatives	1-4
2-1	Summary of Federal and State ARARs	2-3
3-1	Identification and Screening of Remedial Technologies and Process Options	3-3
3-2	Soil Technologies and Process Options Passing Preliminary Screening	3-6
3-3	Soil Remedial Alternatives	3-10
5-1	Summary of Comparative Analysis of Soil Alternatives for Site 41	5-6

FIGURES

NUMBER		PAGE
1-1	Site Location Map	1-10
1-2	Site 41 (Former Pesticide Storage Building 1485C) Site Map	1-12
1-3	Soil Sample Location Map	1-15
1-4	Soil Sample Exceedances	1-18
2-1	Analytical Results in Surface Soil (0-1 Feet)	2-9
2-2	Analytical Results in Surface soil (1-2 Feet)	2-10
2-3	Analytical Results in Subsurface Soil (2-6 Feet)	2-11
4-1	Alt. S41-2 – Soil Excavation Exceeding Industrial SCTLs and LUCs	4-6
4-2	Alt. S41-3 – Soil Excavation Exceeding Residential SCTLs	4-11

ACRONYMS

ABB-ES	ABB Environmental Services, Inc.
ARARs	Applicable or Relevant and Appropriate Requirements
B(a)A	Benzo(a)anthracene
B(a)P	Benzo(a)pyrene
B(b)F	Benzo(a)flourene
bls	Below Land Surface
BOS	Base Operating Services
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	Contaminants of Concern
COPCs	Contaminants of Potential Concern
cPAH	Carcinogenic Polynuclear Aromatic Hydrocarbon
CTO	Contract Task Order
D(a,h)A	Dibenzo(a,h)anthracene
DDT	Dichlorodiphenyltrichloroethane
DoD	Department of Defense
DPT	Direct Push Technology
EC	Engineering Controls
ESV	Environmental Screening Values
F.A.C.	Florida Administrative Code
FDEP	Florida Department of Environmental Protection
FID	Flame Ionization Detector
FR	Federal Register
FS	Feasibility Study
ft	Feet (or Foot)
ft^2	Square Feet
GIR	General Information Report
GRAs	General Response Actions
HHRA	Human Health Risk Assessment
HI	Hazard Index
HRS	Hazard Ranking System
IC	Institutional Controls
ILCR	Incremental Lifetime Cancer Risk

ACRONYMS (Continued)

IR	Installation Restoration
LDRs	Land Disposal Restrictions
LUCs	Land Use Controls
mg/kg	Milligrams per kilogram
NAS	Naval Air Station
NAVFAC SE	Naval Facilities Engineering Command Southeast
Navy	United States Navy
NCP	National Oil and Hazardous Substances Pollution Contingency Plan
NEPA	National Environmental Policy Act
NFA	No Further Action
NPL	National Priorities List
O&M	Operations and Maintenance
OVA	Organic Vapor Analyzer
PA	Preliminary Assessment
PAH	Polynuclear Aromatic Hydrocarbon
PCBs	Polychlorinated Biphenyls
PRGs	Preliminary Remediation Goals
PSC	Potential Source of Contamination
RAGS	Risk Assessment Guidance for Superfund
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
SI	Site Investigation
SPLP	Synthetic Precipitate Leaching Procedure
SVOCs	Semivolatile Organic Compounds
TAL	Target Analyte List
TBC	To Be Considered

ACRONYMS (Continued)

TCL	Target Compound List
TRPH	Total Recoverable Petroleum Hydrocarbons
TSDF	Treatment, Storage, and Disposal Facility
TtNUS	Tetra Tech NUS, Inc.
UCL	Upper Confidence Level of the Mean
USEPA	United States Environmental Protection Agency
VOC	Volatile Organic Compound
yd^3	Cubic Yards

EXECUTIVE SUMMARY

This Feasibility Study (FS) Report for Site 41, Former Pesticide Storage Building 1485C at Naval Air Station (NAS) Whiting Field in Milton, Florida, has been prepared by Tetra Tech NUS, Inc. (Tetra Tech) for Naval Facilities Engineering Command Southeast (NAVFAC SE) under the Comprehensive Long-Term Environmental Action Navy (CLEAN) Program, Contract Number N62467-94-D-0888, Contract Task Order (CTO) 0079. This FS describes the development and evaluation of remedial alternatives for contaminated surface and subsurface soil at Site 41. The Remedial Investigation (RI) Report (Tetra Tech, 2009) for Site 41 soils was completed in February 2009. Assessment of groundwater and the leaching of soil at this site will be performed as part of the ongoing Site 40 Base-wide Groundwater Investigation.

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 risk assessment in order to identify RAOs.

RAOs have been formulated based on the following criteria: unacceptable human health risks, Florida Department of Environmental Protection (FDEP) Soil Cleanup Target Levels (SCTLs), and United States Environmental Protection Agency (USEPA) Region 4 Soil Screening Levels (SSLs). Remedial technologies addressing site-specific considerations have been identified and screened; technologies that passed the screening phase have been developed into remedial alternatives. A limited number of technologies have been identified based on guidance established under the Comprehensive Environmental Response, Compensation and Liability Act (CERCLA) of 1980, as amended by the Superfund Amendments and Reauthorization Act (SARA) of 1986, and the National Oil and Hazardous Substances Pollution Contingency Plan (NCP) [40 *Code of Federal Regulations (CFR)* 300].

The development of remedial alternatives for CERCLA sites consists of developing PRGs, determining areas and volumes of contamination, and then identifying applicable technologies and developing those technologies into remedial alternatives to meet the PRGs. Remedial alternatives are then described and analyzed in detail using the CERCLA evaluation criteria 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 evaluated in a comparative analysis. The alternatives are compared against each other using the CERCLA evaluation criteria.

The entire FS process provides the technical information and analyses forming the basis for a proposed remedy, and the subsequent Record of Decision (ROD) documents the identification and selection of the remedy.

SITE DESCRIPTION AND HISTORY

Current land use at NAS Whiting Field consists of aviation-related activities, residential housing, training, and support activities. Site 41, approximately 23,000 square feet (ft^2) in size, is the site of the former Pesticide Storage Building 1485C. The building was located within the Base Operating Services (BOS) Compound northwest of the eastern termination of Yorktown Street, and was used during an undetermined period of time for storage of ground maintenance equipment and limited amounts of pesticide compounds.

In the late 1980s, the building caught fire and was completely destroyed. Following the fire, cleanup activities at the site included the removal of all building materials and the concrete slab. The depth of the removal excavation and the disposal history of the excavated materials are unknown.

Site 41 was initially designated Potential Source of Contamination (PSC) 1485C; because of this, many of the initial sample numbers and earlier references reflect the original site nomenclature.

In March 1996, Brown & Root Environmental Services, Inc. collected a single surface soil sample from 0 to 1 ft below land surface (bls) at the site. The sample was collected to support the United States Navy's relative risk ranking for the site. The soil sample was analyzed for Target Compound List (TCL) volatile organic compounds (VOCs), TCL semivolatile organic compounds (SVOCs), TCL pesticides and polychlorinated biphenyls (PCBs), and Target Analyte List (TAL) metals. No organic compounds or inorganic analytes were detected above regulatory limits in the soil sample. No other investigations were conducted at this site prior to the RI.

Based on the estimated building location, sampling locations were selected for the RI and the investigation progressed with one round of sampling. Subsequent to this initial sampling effort, Tetra Tech became aware of aerial photographs from the early 1960s, which showed the building relative to surrounding features. Based on this information, the footprint of the former building was more accurately located (east of the initial location), and additional samples were collected.

During the various sampling events conducted from May 24, 2000 to August 31, 2004, a total of 53 surface soil samples were collected from 0 to 1 ft bls, and a total of 67 subsurface soil samples were collected from 53 locations from depths of up to 10 feet (ft) bls, and analyzed for the various parameters described above. Laboratory analytical results were compared to FDEP SCTLs, NAS Whiting Field background screening values for inorganics only, and USEPA Region 4 SSLs, both Residential and Industrial, to determine if contaminants in the surface and subsurface soil samples exceeded regulatory criteria.

Concentrations of carcinogenic polynuclear aromatic hydrocarbons (cPAHs) [as benzo(a)pyrene equivalents] reported for several surface soil samples collected at the site exceeded the industrial SCTLs and/or SSLs. One subsurface soil sample location where samples were collected from 2 to 6 ft bls, soil boring location SB43, had cPAHs and dieldrin concentrations that exceeded the industrial SCTLs and SSLs.

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 that risks are present at Site 41 and an FS should be conducted.

The data demonstrate that the soil at Site 41 is characterized by both lateral and vertical contamination by cPAHs, dieldrin, 4-4'-DDT, and TRPH. Of these contaminants, cPAHs and dieldrin exceed Florida's industrial SCTLs in Chapter 62-777, F.A.C., Table II, and all four contaminants exceed the residential SCTLs up to two orders of magnitude. Given the locations, types, and levels of contaminants discovered,

and other general circumstances found at Site 41, it is the Navy's considered, discretionary judgment that some form of remedial action is warranted at this site.

Implementing a soil removal action in conjunction with LUCs prohibiting residential land use at Site 41, following additional soil delineation, will allow the Navy to properly and effectively manage future land use at the site and minimize threats to human health or the environment.

REMEDIAL ACTION OBJECTIVES AND CLEANUP GOALS

Site-specific RAOs specify contaminants of concern (COCs), media of interest, exposure pathways, and cleanup goals or acceptable contaminant concentrations. A cleanup goal is the target concentration to which a COC must be reduced within a particular medium of concern to achieve RAOs. According to the NCP, the cleanup goals are developed based on readily available information such as chemical-specific ARARs. To protect the public from potential current and future health risks, as well as to protect the environment, the following site-specific RAO has been developed:

RAO: To protect human health from carcinogenic risks associated with incidental ingestion of, inhalation of, and dermal contact with soils containing cPAHs [as benzo(a)pyrene equivalents] and dieldrin, at concentrations exceeding industrial SCTLs.

The current and future land use scenario at Site 41 is industrial use. Cleanup goals were developed for those constituents exceeding screening levels at Site 41. The cleanup goals for soil meet the FDEP direct exposure SCTLs for each COC. Based on USEPA risk assessment guidelines it was determined that there is no unacceptable risk at Site 41, therefore; the USEPA Regional SSLs were not used when determining cleanup goals for Site 41. The cleanup goals for Site 41 are:

SOIL CLEANUP GOALS		
COC	RESIDENTIAL CG	INDUSTRIAL CG
cPAHs	0.100	0.700
Dieldrin	0.06	0.30

*Concentrations in milligrams per kilogram (mg/kg)

ESTIMATED VOLUME OF CONTAMINATED SOIL

Tetra Tech estimated the chemical-specific volume of soil requiring remediation using the following decision criteria and assumptions:

- The surface soil area of concern exceeding the cleanup goals encompasses approximately 1,028 ft^2 to a depth of 2 ft bls.

- The subsurface soil area of concern exceeding the cleanup goals encompasses a 20-ft diameter circular area around sampling location SB43 at a depth of 2 to 3 ft bls.

Based on the above criteria, the total estimated volume of soil exceeding the cleanup goals is approximately 88 cubic yards (yd^3) of soil.

Following screening and development, three alternatives were evaluated for Site 41 that represent a range of actions: no action, limited removal action addressing principal threats, and an aggressive action eliminating the need for long-term management.

The three soil alternatives for Site 41 are listed below:

- **Alternative S41-1: No Action.**

- **Alternative S41-2: Surface and Subsurface Soil Removal (exceeding industrial SCTLs), Off-site Disposal and Land Use Controls (LUCs).**

- **Alternative S41-3: Surface and Subsurface Soil Removal (exceeding residential SCTLs), and Off-site Disposal.**

1.0 INTRODUCTION

Tetra Tech NUS, Inc. (Tetra Tech), under Comprehensive Long-Term Environmental Action Navy (CLEAN) III Contract Number N62467-94-D-0888 to Naval Facilities Engineering Command Southeast (NAVFAC SE) is submitting this Feasibility Study (FS) to address surface and subsurface soil at Site 41 Naval Air Station (NAS) Whiting Field, Milton, Florida. The impact of these soils on groundwater will be evaluated in the FS for Site 40, Base-wide 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 Remedial Investigation (RI) report (Tetra Tech, 2009) to present the results of the overall Remedial Investigation/Feasibility Study (RI/FS) for the site. This FS report includes the development, screening, and evaluation of potential remedial alternatives addressing impacted soil at Site 41.

The goals of the RI and FS are to assess the extent, magnitude, and impact of contamination at the site; to qualitatively and quantitatively assess the risk posed to human health and the environment by site-related contamination; and 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 third 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.
- Risk Assessment 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 baseline risk assessment (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 an FS is warranted. The RI report for Site 41 at NAS Whiting Field provides the following information:

- Site description and a summary of previous investigations at Site 41.
- 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 site.
- An assessment of the extent, magnitude, and impact of contamination at the 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 (COCs).

The FS utilizes the RI results and the information presented in the GIR to identify Remedial Action Objectives (RAOs) and Preliminary Remediation Goals (PRGs), and to develop, screen, and evaluate potential remedial alternatives. The FS has been prepared in accordance with the following regulations and guidance documents: Comprehensive Environmental Response, Compensation and Liability Act (CERCLA), as amended by the Superfund Amendments and Reauthorization Act (SARA) (references made to CERCLA in this report should be interpreted as "CERCLA, as amended by SARA"); National Oil and Hazardous Substances Pollution Contingency Plan (NCP) [40 Code of Federal Regulations (CFR) Part 300]; and RI/FS Guidance [United States Environmental Protection Agency (USEPA), 1988].

This FS Report is organized into five chapters. Chapter 1.0 presents the purpose, regulatory setting, site description and history, and results of the RI for Site 41 at NAS Whiting Field. Chapter 2.0 presents the development of the RAOs, PRGs, and estimated areas and volumes of contamination. Chapter 3.0 identifies and screens the remedial action alternatives. Chapter 4.0 presents the detailed analysis of the alternatives. Chapter 5.0 presents the comparative analysis of the alternatives.

Remedial Alternative cost estimates are provided in Appendix A.

1.1 THE CERCLA FS PROCESS

The development of remedial alternatives for CERCLA sites consists of developing PRGs, determining areas and volumes of contamination, and then identifying applicable technologies and developing those technologies into remedial alternatives to meet the PRGs.

The first step in the FS process is to develop RAOs specifying the COCs, media of interest, and exposure pathways leading to development of the PRGs. The PRGs are developed based on chemical-specific Applicable or Relevant and Appropriate Requirements (ARARs), when available; site-specific risk-based

factors; or other available information. COCs, as identified in the RI, are those chemicals with average concentrations exceeding the screening criteria and/or background levels. Once the PRGs and COCs have been determined, the areas and volumes of contamination requiring remedial action are determined.

Once RAOs and 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 alternatives are then described and analyzed in detail using the CERCLA evaluation criteria (see Table 1-1).

In accordance with the NCP (40 CFR Part 300.430), the following nine criteria are used for the evaluation of remedial alternatives:

Threshold Criteria

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

Balancing Criteria

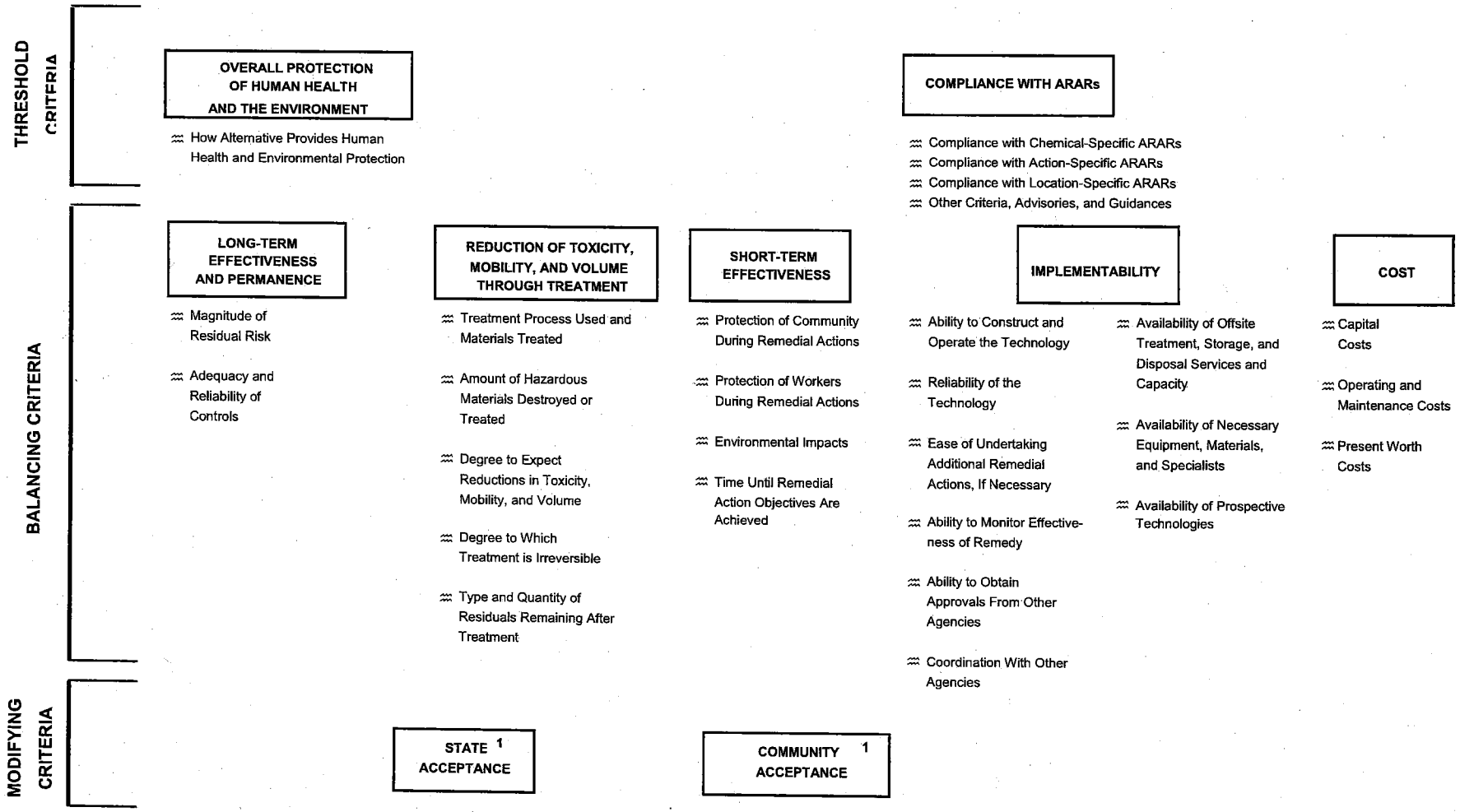
- Long-term effectiveness and permanence.
- Reduction of toxicity, mobility, or volume of contaminants through treatment.
- Short-term effectiveness.
- Implementability.
- Cost.

Modifying Criteria

- State acceptance.
- Community acceptance.

TABLE 1-1

CRITERIA FOR DETAILED ANALYSIS OF ALTERNATIVES
SITE 41
NAS WHITING FIELD
MILTON, FLORIDA



[1] These criteria are assessed following regulatory and public comment on the RI/FS report and the proposed plan.

Source: Guidance for Conducting Remedial Investigations and Feasibility Studies under CERCLA (USEPA, 1988).

Overall Protection of Human Health and the Environment

Alternatives must be assessed for adequate protection of human health and the environment, in both the short- and long-term, from unacceptable risks posed by hazardous substances or contaminants present at the site by eliminating, reducing, or controlling exposure to levels exceeding cleanup goals. Overall protection draws on the assessments of other evaluation criteria, especially long-term effectiveness and permanence, short-term effectiveness, and compliance with ARARs.

Compliance with ARARs

Alternatives must be assessed to determine whether they attain ARARs under federal environmental laws and state environmental or facility siting laws. CERCLA Section 121(d) specifies in part that remedial actions for cleanup of hazardous substances must comply with requirements and standards under federal or more stringent state environmental laws and regulations that are applicable or relevant and appropriate (i.e., ARARs) to the hazardous substances or particular circumstances at a site, or a waiver must be obtained [see also 40 CFR 300.430(f)(1)(ii)(B)]. ARARs include only federal and state environmental or facility siting laws/regulations, and do not include occupational safety or worker protection requirements. In addition, per 40 CFR 300.405(g)(3), other advisories, criteria, or guidance may be considered in determining remedies [to be considered (TBC) guidance category].

Long-Term Effectiveness and Permanence

Alternatives must be assessed for the long-term effectiveness and permanence they offer, along with the degree of certainty that the alternative will prove successful. Factors that will be considered as appropriate include the following:

- Magnitude of Residual Risk - Risk posed by untreated waste or treatment residuals at the conclusion of remedial activities. The characteristics of residuals should be considered to the degree that they remain hazardous, taking into account their volume, toxicity, mobility, and propensity to bioaccumulate.

- Adequacy and Reliability of Controls - Controls such as containment systems and Land Use Controls (LUCs) that are necessary to manage treatment residuals and untreated waste must be shown to be reliable. In particular, the following must be addressed: the uncertainties associated with land disposal for providing long-term protection from residuals; the assessment of the potential need to replace technical components of the alternative such as a cap, slurry wall, or

treatment system; and the potential exposure pathways and risks posed if the remedial action needs replacement.

Reduction of Toxicity, Mobility, or Volume through Treatment

The degree to which the alternative employs treatment that reduces the toxicity, mobility, or volume will be assessed, including how treatment is used to address the principal threats posed by the site. Factors that will be considered, as appropriate, include the following:

- The treatment the alternative employs and the materials that they will treat.
- The amount of hazardous substances, pollutants, or contaminants that will be destroyed or treated.
- The degree of expected reduction in toxicity, mobility, or volume of waste as a result of treatment and the specification of which reduction(s) is occurring.
- The degree to which the treatment is irreversible.
- The type and quantity of residuals that will remain following treatment, considering the persistence, toxicity, mobility, and propensity to bioaccumulate of such hazardous substances and their constituents.
- The degree to which treatment reduces the inherent hazards posed by principal threats at the site.

Short-Term Effectiveness

The short-term impacts of the alternative will be assessed considering the following:

- Short-term risks that might be posed to the community during implementation.
- Potential impacts on workers during remedial action, and the effectiveness and reliability of protective measures.
- Potential environmental impacts of the remedial action, and the effectiveness and reliability of mitigative measures during implementation.

- Time until protection is achieved.

Implementability

The ease or difficulty of implementing the alternatives will be assessed by considering the following types of factors, as appropriate:

- Technical feasibility, including technical difficulties and unknowns associated with the construction and operation of a technology, the reliability of the technology, ease of undertaking additional remedial actions, and the ability to monitor the effectiveness of the remedy.

- Administrative feasibility, including activities needed to coordinate with other offices and agencies, and the ability and time required to obtain any necessary approvals and permits from other agencies (for off-site actions).

- Availability of services and materials, including the availability of adequate off-site treatment capacity, storage capacity, and disposal capacity and services; the availability of necessary equipment and specialists, and provisions to ensure necessary additional resources; the availability of services and materials; and the availability of prospective technologies.

Cost

Capital costs will include both direct and indirect costs. Annual operations and maintenance (O&M) costs will be provided, and a net present value of the capital and O&M costs will also be provided. Typically, the cost estimate accuracy range is plus 50 percent to minus 30 percent.

State Acceptance

The state's concerns that must be assessed include the following:

- The state's position and key concerns related to the preferred alternative and other alternatives.
- State comments on ARARs or the proposed use of waivers.

These concerns cannot be evaluated until the State has reviewed and commented on the FS. These concerns will be discussed, to the extent possible, in the Proposed Plan to be issued for public comment.

Community Acceptance

This assessment consists of responses of the community to the Proposed Plan, and includes determining which components of the alternatives interested persons in the community support, have reservations about, or oppose. This assessment can be conducted after comments on the Proposed Plan are received from the public.

Following the detailed analyses of alternatives, the results are summarized and compared. 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 is included in the Record of Decision (ROD).

Upon completion of this FS report, the Proposed Plan will be developed. The Proposed Plan will identify the preferred remedial alternative for Site 41, and 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); the subsequent ROD serves to select the remedy for the site.

1.2 PURPOSE

The purpose of this FS report for Site 41 at NAS Whiting Field is to develop remedial alternatives to address threats to human health and the environment resulting from contaminated soil. RAOs are used to develop, screen, and evaluate potential remedial alternatives that meet the objectives.

This FS report was developed in accordance with the NCP, to provide guidance for identifying applicable remedial action technologies. This 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 possible 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. This FS report does not present information on alternatives failing to meet the RAOs.

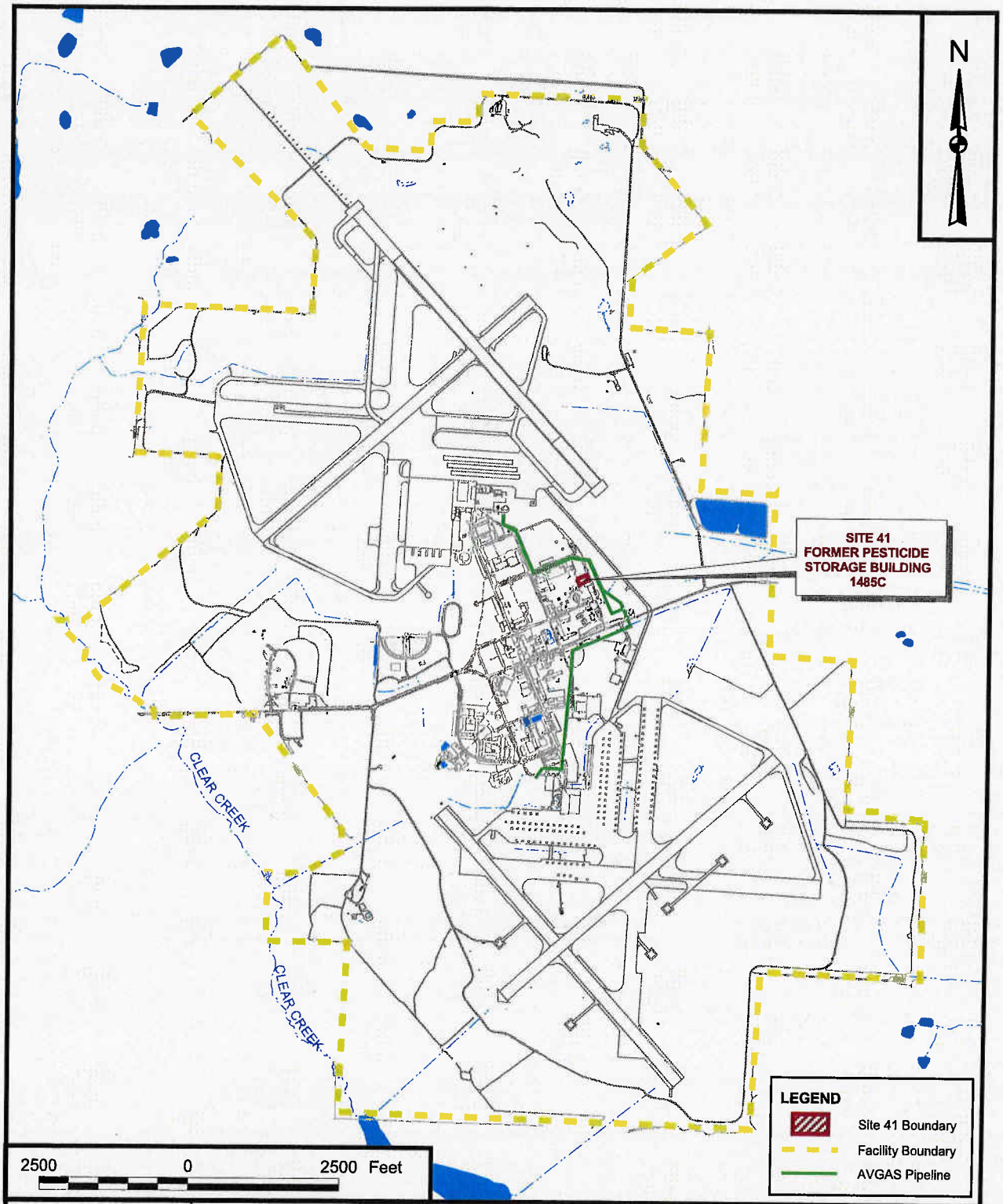
The following have been considered in identifying appropriate remedial action for Site 41:

- RAOs: RAOs have been developed to specify the contaminants, media of interest, exposure pathways, and remedial action goals.
- Applicable Technologies: Technologies applicable for addressing contaminated media have been identified and screened. Technologies have been eliminated if they cannot be implemented.
- Remedial Alternatives: Technologies passing the screening phase have been assembled into remedial alternatives.
- Detailed Analysis: Selected remedial alternatives are described and evaluated in this FS using seven of the nine criteria (the threshold and balancing criteria) outlined in the NCP.
- Comparative Analysis: Remedial alternatives have been compared in this FS using the 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 has since 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 (including Site 41) 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 forested areas along the remaining boundaries. Located on an upland area, elevations at NAS Whiting Field range from 50 to 190 feet (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 Florida Department of Environmental Protection (FDEP) as Class III Waters for Recreation, Propagation and Maintenance of Fish and Wildlife.



DRAWN BY: S. PAXTON	DATE: 3/06/08	SITE LOCATION MAP FEASIBILITY STUDY SITE 41 NAS WHITING FIELD MILTON, FLORIDA	CONTRACT NUMBER: 0052
CHECKED BY: M. JAYNES	DATE: 4/20/09		APPROVED BY: — DATE: —
COST/SCHEDULE-AREA			APPROVED BY: — DATE: —
SCALE: AS NOTED			DRAWING NO.: FIGURE 1 - 1 REV: 0

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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 United States Navy (Navy) Installation Restoration (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. Naval Facilities Engineering Command Southeast (NAVFAC SE) is the agency responsible for the Navy IR program in the southeastern United States; therefore, NAVFAC SE has the responsibility of processing NAS Whiting Field through the Preliminary Assessment (PA), Site Investigation (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 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). On May 31, 1994, NAS Whiting Field was placed on the NPL effective June 30, 1994 (40 CFR Part 300; FR 31 May 1994). 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).

1.5 SITE DESCRIPTION AND HISTORY

Site 41, approximately 23,000 square feet (ft^2) in size, is the site of the former Pesticide Storage Building 1485C. The building was located within the Base Operating Services (BOS) Compound northwest of the eastern termination of Yorktown Street. The site layout is presented on Figure 1-2.

The former Building 1485C was used during an undetermined period for storage of ground maintenance equipment and limited amounts of pesticide compounds. The building caught fire in the late 1980's and

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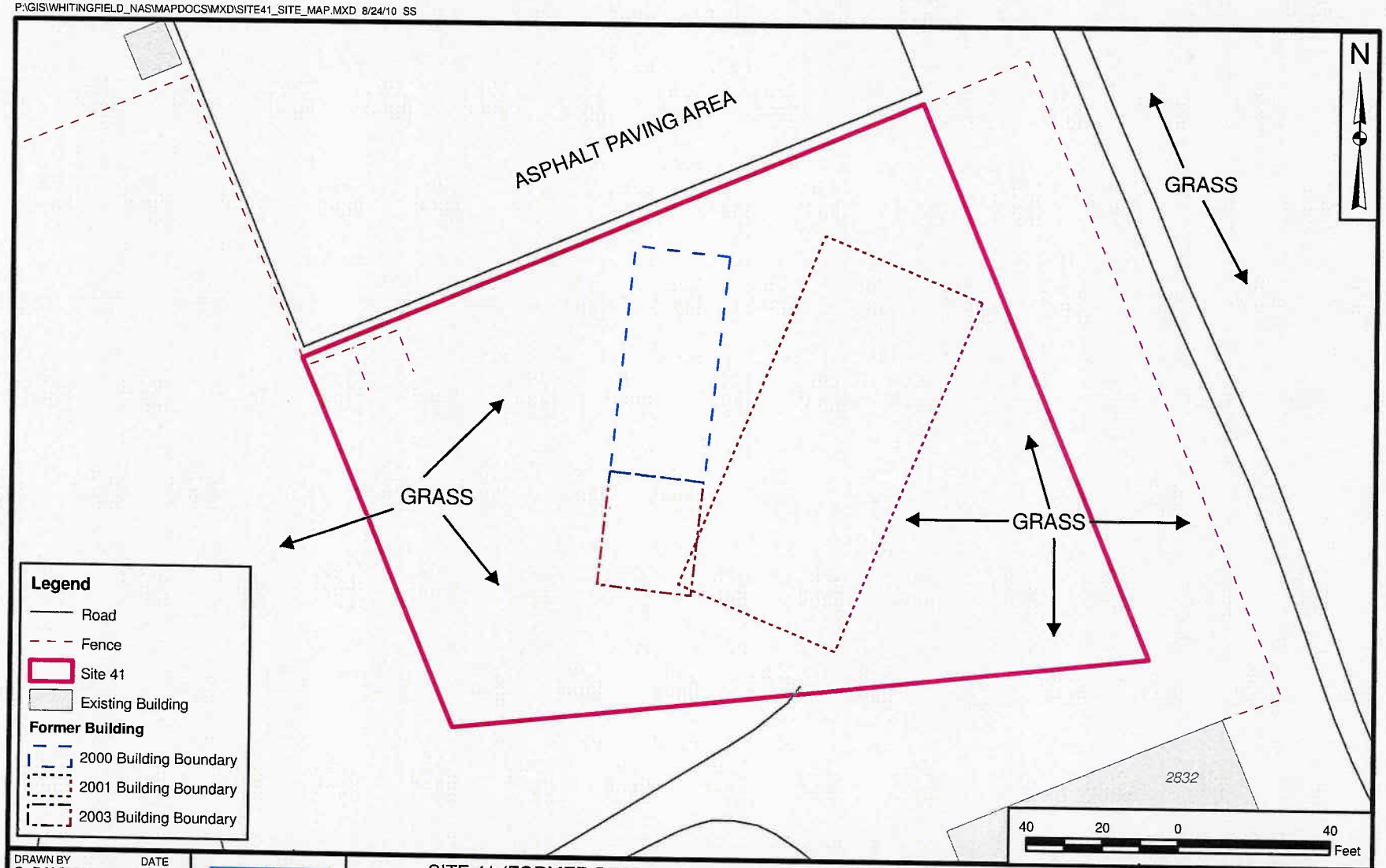

DRAWN BY S. PAXTON	DATE 1/22/09	SITE 41 (FORMER PESTICIDE STORAGE BUILDING 1485C) SITE MAP	CONTRACT NUMBER CTO 0079
CHECKED BY M. JAYNES	DATE 8/24/10	FEASIBILITY STUDY	APPROVED BY — DATE —
REVISED BY S. STROZ	DATE 8/19/10	SITE 41	APPROVED BY — DATE —
SCALE AS NOTED	NAVFAC	NAS WHITING FIELD MILTON, FLORIDA	FIGURE NO. 1-2 REV 0

was completely destroyed. Following the fire, cleanup activities at the site included the removal of all building materials and the concrete slab flooring. The depth of the removal excavation and the disposal history of the excavated materials are unknown.

Site 41 was initially designated Potential Source of Contamination (PSC) 1485C; therefore, many of the initial sample numbers and references reflect the original site nomenclature.

In March 1996, Brown & Root Environmental Services, Inc. collected a single surface soil sample [0 to 1 ft below land surface (bls) sample depth] at the site. The sample was collected to support the Navy's relative risk ranking for the site. The soil sample was analyzed for Target Compound List (TCL) Volatile Organic Compounds (VOCs), TCL Semivolatile Organic Compounds (SVOCs), TCLPesticides/Polychlorinated Biphenyls (PCBs), and Target Analyte List (TAL) metals. No organic compounds or inorganic analytes were detected above regulatory limits in the soil sample.

Records located at the Public Works Department at NAS Whiting Field were searched to determine if historical documents were available for Site 41; no historical documents were found. An interview was conducted with a representative of the on-base facilities maintenance contractor. This interview coupled with a site walk was used to develop the initial estimated location of the Former Pesticide Storage Building 1485C. Based on the estimated building location, sampling locations were selected and the investigation progressed with one round of sampling. Subsequent to this initial sampling effort, Tetra Tech became aware of aerial photographs from the early 1960s showing the building relative to surrounding features. Based on this information, the footprint of the former building was more accurately located (east of the initial location) and additional samples were collected.

Based on the information presented above, four direct-push technology (DPT) borings (SB01 through SB04) were advanced to a depth of 20 ft bls on April 13, 2000, at locations projected to be near the boundaries of the former structure. Subsurface samples were collected from each boring at 5-ft intervals and screened on-site with a Flame Ionization Detector (FID). These subsurface soil samples did not exhibit a significantly elevated Organic Vapor Analyzer (OVA) response, staining, or other indications that would warrant laboratory analysis.

Subsequent soil sampling activities (both surface and subsurface) were conducted using an iterative process of evaluating the analytical data and collecting additional data either laterally or vertically where previous results exceeded FDEP criteria. This approach was used to evaluate the lateral and vertical extent of soil contamination at the site rather than collecting a large number of samples (many of which may have been outside the limits of contamination) during one event.

On May 24, 2000, six surface soil samples (0 to 1 ft bls) were collected near the originally indicated boundaries of the former structure. Sample locations 1 through 4 were co-located with the DPT sample locations of April 13, 2000 as SB01 through SB04. These samples were processed for Synthetic Precipitate Leaching Procedure (SPLP) analysis of metals, pesticides, SVOCs (samples SS02, SS03, and SS06 only), and Total Recoverable Petroleum Hydrocarbons (TRPH). These and all subsequent sample locations are presented on Figure 1-3.

On June 5, 2000, four additional subsurface soil samples were collected via DPT from the four originally indicated corners of the former structure. Samples were collected from the 3 to 5 ft bls interval in borings SB06 and SB07, and the 8 to 10 ft bls interval in borings SB05 and SB08.

Initial soil analytical results were positive only for benzo(a)pyrene [B(a)P] and pesticides; therefore, analysis was limited to B(a)P and pesticides for the next group of samples (collected in 2001). These analytes were used as indicators of soil contamination at the site. Eight surface soil samples (0 to 1 ft bls) were collected on May 17, 2001 (SS07 through SS14) near points where SVOCs or pesticides were detected previously.

During the initial sampling round in 2000, an on-site worker with historic knowledge of the location of Building 1485C indicated to the sampling team the estimated location and orientation of the former building was reasonably accurate. Conversely, during the summer of 2001, a second on-site worker, again claiming personal knowledge of the location of former Building 1485C, indicated that the building was larger than the initially estimated footprint and was of open frame construction with no walls. Based on this information, the sampling area was extended approximately 20 ft to the south-southwest. On August 15, 2001, surface soil samples (0 to 1 ft bls) were collected from locations SS18, SS19, and SS20 to evaluate this additional area (Figure 1-3). Three surface soil samples were also collected on this date near SS02 to further evaluate SVOC and pesticide contamination found at this location during the May 2000 sampling event.

Aerial photographs (circa 1961) obtained by Tetra Tech in October 2003 showed that the actual location of Building 1485C was east of the originally suspected locations. Based on the aerial photographs, Tetra Tech concluded that previous sampling was incorrect and biased to the west side of the now accurately located former Building 1485C. Therefore, additional data were needed to identify the area of potential soil contamination. As described below, several iterative field investigations were conducted to delineate concentrations of contaminants in the soil exceeding regulatory or risk-based screening criteria. These sample locations are shown along with all other samples on Figure 1-3.

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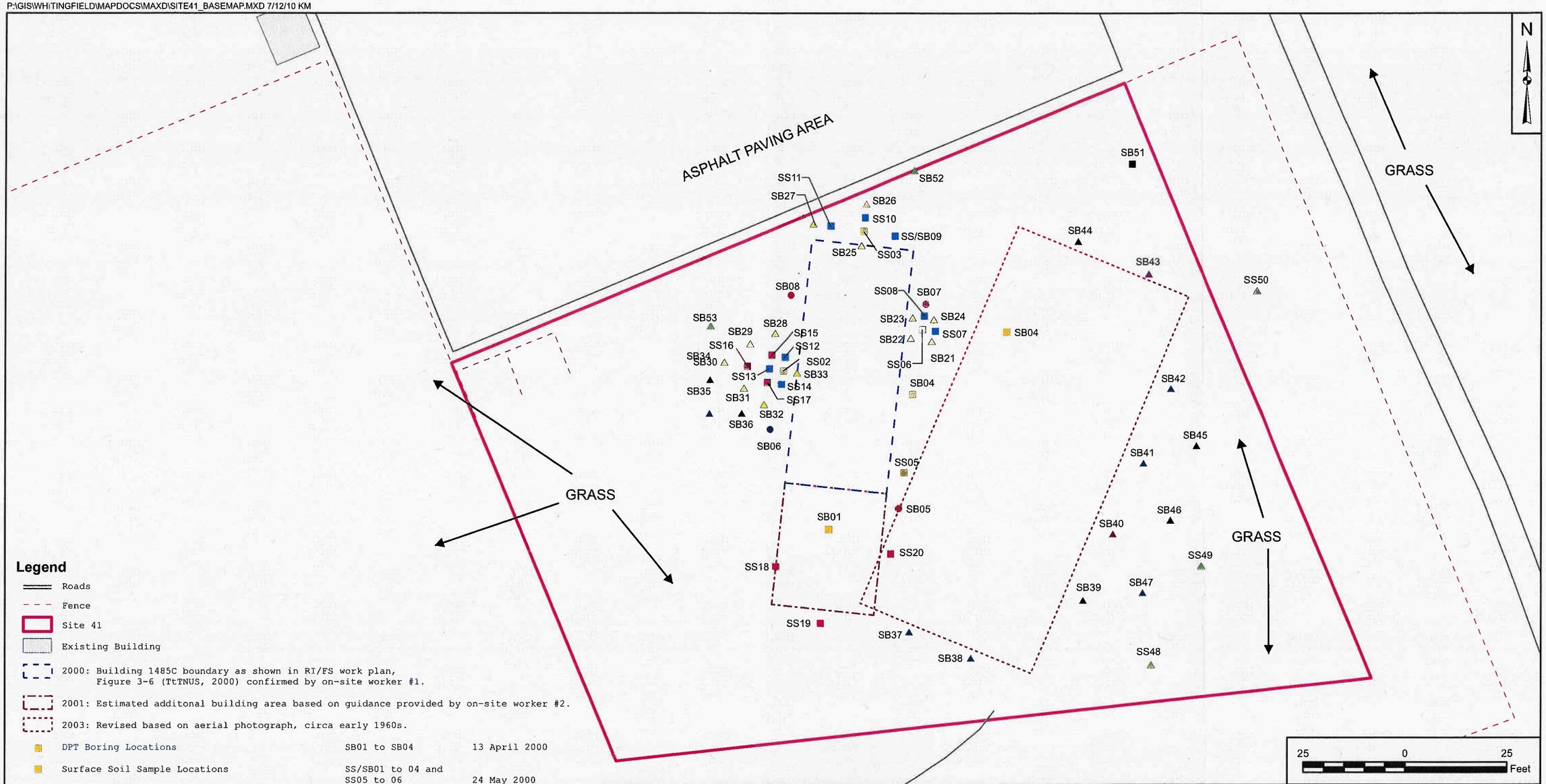

Legend

- Roads
- Fence
- Site 41
- Existing Building
- 2000: Building 1485C boundary as shown in RI/FS work plan, Figure 3-6 (TtNUS, 2000) confirmed by on-site worker #1.
- 2001: Estimated additonal building area based on guidance provided by on-site worker #2.
- 2003: Revised based on aerial photograph, circa early 1960s.

■	DPT Boring Locations	SB01 to SB04	13 April 2000
■	Surface Soil Sample Locations	SS/SB01 to 04 and SS05 to 06	24 May 2000
●	DPT Boring Locations	SB05 to SB08	5 June 2000
■	Surface Soil Sample Locations	SS07 to SS14	17 May 2001
■	Surface Soil Sample Locations	SS15 to SS20	15 August 2001
△	Surface and Subsurface Soil Sample Locations	SB21 to SB33	16 October 2003
▲	Surface and Subsurface Soil Sample Locations	SB34 to SB47	10-11 November 2003
▲	Surface and Subsurface Soil Sample Locations	SB48 to SB53	31 August 2004

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M. JAYNES	7/12/10
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SCALE	
AS NOTED	

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SOIL SAMPLE LOCATION MAP
FEASIBILITY STUDY
SITE 41
NAS WHITING FIELD
MILTON, FLORIDA

CONTRACT NO.	
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Additional surface and subsurface soil samples were collected on October 16, 2003. B(a)P was used as an indicator chemical, and samples were analyzed for this compound only. Twenty-seven surface soil samples (from 0 to 1 ft bls at locations SB21 through SB33 and from 1 to 2 ft bls at locations SB09 and SB21 through SB33) were collected during this sampling event. In addition, subsurface soil samples were collected from the 2 to 3 ft bls interval at locations SB31 and SB33.

On November 10 and 11, 2003, Tetra Tech conducted sampling at 14 soil borings at locations south, east, and north of the former structure (Figure 1-3). Soil boring locations sampled during this event included SB34 through SB47. Three soil samples (from 0 to 1 ft bls, 1 to 2 ft bls, and 2 to 3 ft bls) were collected from each of these locations. All samples were sent to a laboratory and analyzed for TCL VOCs, SVOCs, pesticides/PCBs, TRPH, and TAL inorganics plus cyanide.

On August 31, 2004, additional samples were collected from 19 soil borings to the east, west, and north of the former structure (Figure 1-3). Sampling locations were selected to further delineate the horizontal and vertical extent of SVOC and/or pesticide soil contamination detected during previous sampling events. All samples collected during this event were analyzed for the SVOCs B(a)P and dibenzo(a,h)anthracene [D(a,h)A], and the pesticides aldrin, dieldrin, and heptachlor. Three subsurface soil samples were collected from each soil boring at locations SB31 and SB43 (3 to 4, 4 to 5, and 5 to 6 ft bls). Also during this sampling event, soil samples were collected from each soil boring at locations SS48 through SS50 and SB51 through SB53. Two surface soil (from 0 to 1 ft and 1 to 2 ft bls) samples and one subsurface soil (2 to 3 ft bls) sample were collected at each location and analyzed for the five compounds indicated above.

1.6 SITE CONDITIONS

1.6.1 Nature and Extent of Contamination

During the various sampling events conducted from May 24, 2000 to August 31, 2004, a total of 53 surface soil samples were collected from 0 to 2 ft bls and analyzed for the various parameters discussed previously. Laboratory analytical results were compared to FDEP SCTLs, USEPA Region 4 SSLs, and NAS Whiting Field background screening values for inorganics only, to determine if contaminants in the surface soil samples exceeded regulatory criteria.

During the various sampling events conducted from June 5, 2000 to August 31, 2004, a total of 67 subsurface soil samples were collected from 53 locations from depths of up to 10 ft bls, and analyzed for the various parameters discussed previously. Laboratory analytical results were compared to FDEP SCTLs, USEPA Region 4 SSLs, and NAS Whiting Field background screening values for inorganics only, to determine if contaminants in the surface soil samples exceeded regulatory criteria.

Constituents detected in the surface and subsurface soil samples at Site 41 include SVOCs, pesticides, inorganics, cyanide, and TRPH. The following conclusions were made in the Site 41 RI:

- SVOCs [benzo(a)anthracene [B(a)A], benzo(a)pyrene [B(a)P], benzo(b)fluoranthene [B(b)F], dibenzo(a,h)anthracene [D(a,h)A], fluoranthene, indeno(1,2,3-cd)pyrene (IP), phenanthrene, and pyrene] were found in surface soil at several locations, including SB47, SS07, and SB41.

- Large areas of pesticide [4,4-dichlorodiphenyldichlorethane (DDD), 4,4-dichlorodiphenyldichloroethylene (DDE), 4,4-dichlorodiphenyltrichloroethane (DDT), and dieldrin] exceedances are present in surface soil in the southeast and northwest portions of Site 41.

- Two areas of inorganic (chromium, lead, and zinc) exceedances have been defined: south and southwest of SB37; and also northwest, north, and northeast of SB43 and SB44.

- Lead was also found in surface soil samples SS01, SS04, SS05, and SS06 at concentrations exceeding primary criteria in the SPLP leachate.

- SVOC exceedances at SB43 have been delineated in all directions except to the south where the former building was located. A second area associated with locations SB31 and SB35 is well defined in all directions except to the southwest of SB35.

- Pesticide (4,4-DDD, 4,4-DDE, 4,4-DDT, and dieldrin) exceedances at SB37 have not been delineated to the south or southwest. Exceedances associated with SB41 and SB43 have been laterally delineated.

Surface and subsurface soil exceedances of both residential and industrial criteria are presented on Figure 1-4.

In summary, although some areas of Site 41 were not fully delineated during the RI, it was determined that enough information was available for evaluation of human health and ecological risks at the site. The Site 41 investigation was an iterative process. Initially the site was designated for an interim removal action (IRA) during which additional sampling would take place to define the boundaries of contamination. However, during partnering activities it was determined that the IRA would not take place and an RI with both HHRA and ERA assessments should be performed and that sufficient samples had been collected even though contamination maps presented at the time indicated exceedances at site boundaries. Therefore; further investigation will be required to complete implementation of a remedy and the additional delineation will take place during remedial design development.

Rev. 3
March 2011

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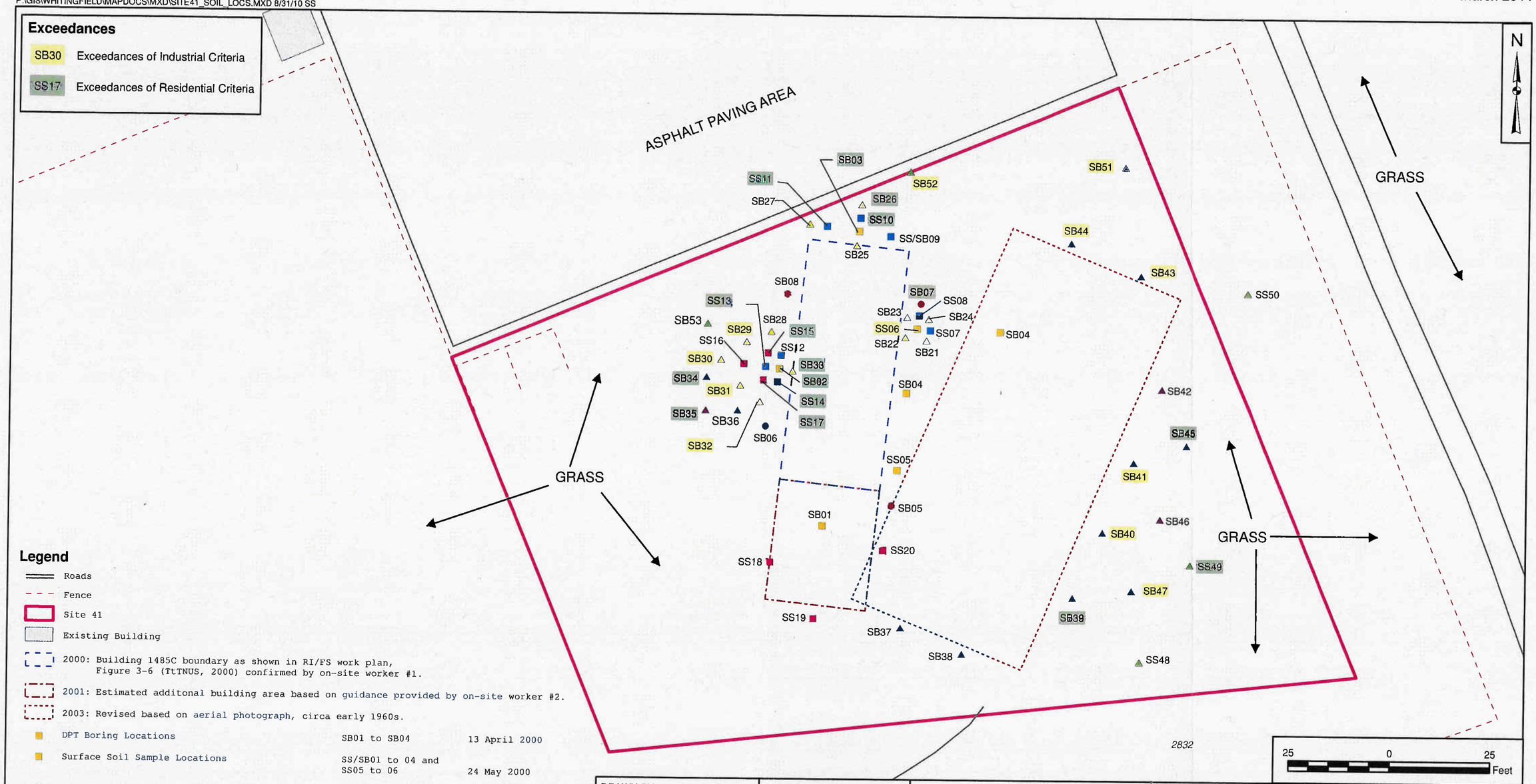
Exceedances

SB30 Exceedances of Industrial Criteria

SS17 Exceedances of Residential Criteria



Legend

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■	Surface Soil Sample Locations	SS07 to SS14	17 May 2001
■	Surface Soil Sample Locations	SS15 to SS20	15 August 2001
△	Surface and Subsurface Soil Sample Locations	SB21 to SB33	16 October 2003
▲	Surface and Subsurface Soil Sample Locations	SB34 to SB47	10-11 November 2003
▲	Surface and Subsurface Soil Sample Locations	SB48 to SB53	31 August 2004

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CHECKED BY M. JAYNES	DATE 8/31/10
COST/SCHED-AREA	
SCALE AS NOTED	

NAVFAC

SOIL SAMPLE EXCEEDANCES
FEASIBILITY STUDY
SITE 41
NAS WHITING FIELD
MILTON, FLORIDA

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1.6.2 Risk Assessment Results

A human health risk assessment (HHRA) was conducted for the chemical constituents detected in surface soil and subsurface soil samples collected at Site 41. The evaluation was conducted using both USEPA and State of Florida regulations and guidelines for HHRA. The results of the USEPA and FDEP risk assessments are summarized in the following sections.

During the HHRA, a review of the surface and subsurface soil data indicated that the 95 percent Upper Confidence Level of the Mean (UCL) of COC concentrations exceeded their respective FDEP commercial/industrial SCTLs identified in Chapter 62-777, Florida Administrative Code (F.A.C.), Table II.

Surface Soil

A comparison of the maximum detected surface soil concentrations to screening levels was conducted based on FDEP SCTLs and USEPA Region 4 SSLs. The following chemicals were detected in surface soils at maximum concentrations exceeding the direct contact, risk-based screening levels and background, and were retained as COPCs for surface soil:

-
- SVOCs - B(a)P and D(a,h)A.
- Pesticides – dieldrin.
- Inorganics – chromium.

The following chemicals were identified as exceeding the Level 1 SCTLs and were retained as potential COCs for residential exposures to surface soil at Site 41:

- Carcinogenic Polynuclear Aromatic Hydrocarbons (cPAHs) [as B(a)P equivalents]
- Dieldrin

The following chemicals were identified as exceeding the Level 2 SCTLs and were retained as potential COCs for industrial exposures to surface soil at Site 41:

- cPAHs [as B(a)P equivalents]

Subsurface Soil

A comparison of the maximum detected subsurface soil concentrations to screening levels was conducted based on FDEP SCTLs and USEPA Region 4 SSLs. The following chemicals were detected

in subsurface soils at maximum concentrations exceeding the direct contact, risk-based screening levels and background, and were retained as COPCs for subsurface soil:

- SVOCs - benzo(a)anthracene [B(a)A], B(a)P, Benzo(a)flourene [B(a)F], D(a,h)A, and indeno(1,2,3,cd)pyrene.
- Pesticides - 4,4'- Dichlorodiphenyltrichloroethane (DDT), aldrin, and dieldrin.

The following chemicals were identified as exceeding the Level 1 SCTLs and were retained as potential COCs for residential exposures to subsurface soil at Site 41:

- cPAHs [as B(a)P equivalents].
- 4,4'-DDT and dieldrin.
- TRPH.

The following chemicals were identified as exceeding the Level 2 SCTLs and were retained as potential COCs for industrial exposures to subsurface soil at Site 41:

- cPAHs [as B(a)P equivalents]
- dieldrin

1.6.3 Risk Assessment Summary

The USEPA risk assessment assumed exposure via the ingestion, dermal contact, and inhalation routes of exposure, and considered five receptors: the hypothetical future resident, the typical industrial worker, the construction worker, the maintenance worker, and the trespasser/recreational user. Quantitative estimates of non-carcinogenic and carcinogenic risks [Hazard Indices (HIs) and Incremental Lifetime Cancer Risks (ILCRs), respectively] were developed for potential human receptors. Results of these evaluations are summarized below.

Non-carcinogenic risks are below the target HI of 1.0, and satisfy USEPA requirements for exposure to surface soil and subsurface soil. Carcinogenic risks for exposure to surface and subsurface soil are within the USEPA's target risk range of 10^{-4} to 10^{-6} for all receptors.

The risk assessment conducted per the State of Florida regulations and guidelines evaluated risks using the published SCTLs to a hypothetical future resident for the residential land use scenario, and to a typical industrial worker and a typical construction worker for the industrial land use scenario. Risks to a hypothetical future recreational user were evaluated using SCTLs specifically developed for this risk

assessment as stipulated in the State of Florida regulations and guidelines. Risks associated with exposure to surface soil exceed FDEP's target risk level of 10^{-6} for the industrial workers, construction workers, lifelong recreational users, and hypothetical future residents. Carcinogenic risks associated with exposure to subsurface soil exceed FDEP's target risk level for the industrial workers and hypothetical future residents.

The following table presents a breakdown of the COCs for surface and subsurface soils based on a comparison of maximum concentrations to SCTLs:

COCs FOLLOWING RISK ASSESSMENT			
COC	Maximum Concentration	Residential SCTL	Industrial SCTL
Surface Soil			
cPAHs	9.0	0.10	0.70
Dieldrin	0.34	0.06	0.30
Subsurface Soil			
cPAHs	2.98	0.10	0.70
4,4'-DDT	5.70	2.90	15
Dieldrin	0.94	0.06	0.30
TRPH	920	460	2,700

Note: Concentrations and SCTLs in milligram per kilogram (mg/kg)

Ecological

A Screening Level Ecological Risk Assessment (SERA) was performed for Site 41, Former Pesticide Storage Building 1485C. The site area is small (approximately 23,000 ft^2) with little ecological habitat present. In surface soil, five SVOCs/PAHs, nine pesticides, and six metals were retained as COPCs because their maximum concentrations exceeded Environmental Screening Values (ESVs). ESVs were not available for one VOC and seven SVOCs/PAHs, which were also retained as COPCs. COPC concentrations were compared to facility background concentrations (for inorganics), appropriate alternate toxicity information (based on soil invertebrates and plants), spatial distribution, and frequency of exceedances.

No constituents were retained as COPCs for risk to plants, soil invertebrates, or wildlife at Site 41. Therefore, ecological risks are not expected from site-related constituents at Site 41.

1.6.4 Conclusion

The data demonstrate that the soil at Site 41 is characterized by both lateral and vertical contamination by cPAHs, dieldrin, 4-4'-DDT, and TRPH. Of these contaminants, cPAHs and dieldrin exceed Florida's industrial SCTLs in Chapter 62-777, F.A.C., Table II, and all four contaminants exceed the residential SCTLs up to two orders of magnitude. Given the locations, types, and levels of contaminants discovered, and other general circumstances found at Site 41, it is the Navy's considered, discretionary judgment that some form of remedial action is warranted at this site.

Implementing a soil removal action in conjunction with LUCs prohibiting residential land use at Site 41, following additional soil delineation, will allow the Navy to properly and effectively manage future land use at the site and minimize threats to human health or the environment.

2.0 REMEDIAL ACTION OBJECTIVES AND CLEANUP GOALS

The regulatory requirements (e.g., ARARs) and guidance that may potentially govern remedial activities are presented in this section. In addition, this section presents the COCs identified in Section 1.0 and the conceptual pathways through which these chemicals may affect human health and the environment. The cleanup goals for contaminated media are developed in this section, and GRAs that may be suitable to achieve the cleanup goals are presented. Finally, this section presents an estimated volume of contaminated media.

2.1 REMEDIAL ACTION OBJECTIVES

The objectives and goals for response actions at Site 41 provide the basis for selecting RAOs and identifying remedial technologies to address unacceptable human health risks associated with direct exposure to surface and subsurface soil contamination at the site. RAOs addressing groundwater and leaching to groundwater will be addressed in the FS for Site 40 Base-wide Groundwater.

To establish RAOs, potential ARARs were first identified. RAOs were then defined primarily on consideration of ARARs and the results and conclusions of the RI. Next, action levels (PRGs) for the medium of concern were defined. Volumes of affected soil above action levels were then calculated for Site 41.

2.1.1 Applicable or Relevant and Appropriate Requirements

ARARs are federal and state environmental and state facility siting 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 they are more stringent than federal ARARs, unless waived.

The NCP defines two ARAR types: "applicable requirements" and "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 those identified by the state in a timely manner, consistently enforced, and 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, address situations sufficiently similar to

those encountered at a CERCLA site so their use is well suited to the particular site. Only those state standards identified in a timely manner that are more stringent than federal requirements may be relevant and appropriate.

"Applicability" is a legal determination of jurisdiction of existing statutes and regulations, whereas "relevant and appropriate" is a site-specific determination of the appropriateness of existing statutes and regulations. Therefore, relevant and appropriate requirements allow flexibility not provided by applicable requirements in the final determination of cleanup levels. Once a requirement is identified as an ARAR, the selected remedy must meet, or waive, the ARAR, utilizing one of the waivers defined in Section 121 of CERCLA, 42 U.S.C. § 9621(d)(4). 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 factors to be considered in the selection and implementation of a remedial action may be contained in advisories, criteria or other non-promulgated guidance. This guidance is termed "To Be Considered" under the NCP, *see* 40 CFR Section 300.515(h)(2). Such guidance may, either in the presence or absence of ARARs, be found to be useful in ensuring 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- and action-specific ARARs are discussed in the following sections and summarized in Table 2-1.

TABLE 2-1
FEDERAL AND STATE ARARs
SITE 41

NAS WHITING FIELD
MILTON, FLORIDA
PAGE 1 OF 2

Requirement	Citation	ARAR Type	Description	Comments
FEDERAL				
Resource Conservation & Recovery Act (RCRA) Regulations – Identification and Listing of Hazardous Wastes	40 Code of Federal Regulations (CFR) Part 262.11 and 264.13(a)(1)	Applicable	Requires characterization of solid waste and additional characterization of waste determined to be hazardous. Part 261.11 requires determination of whether solid waste is hazardous. Part 263.13(a)(1) requires a detailed chemical and physical analysis of a representative sample of the waste to determine treatment, storage, and disposal requirements.	Response action is expected to generate non-hazardous solid waste (contaminated soil determined not to be hazardous).
RCRA – Land Disposal Restrictions (LDRs) Treatment Standards for Contaminated Soil	40 CFR Part 268.7 and 268.49	Applicable	40 CFR Part 268.7 requires determination of whether waste is restricted from land disposal under 40 CFR 268 et. seq. by testing in accordance with prescribed methods or by use of generator knowledge of the waste. 40 CFR 268.49 prohibits land disposal of untreated hazardous wastes and provides treatment standards for contaminated soil considered hazardous waste.	Excavated soil determined to be hazardous waste will be sent off-site fro treatment and disposal at an appropriate facility.
RCRA Regulations – Use and Management of Containers	40 CFR Part 265.171 to 173	Applicable	Establish requirements for use and management of hazardous waste in containers.	Containers that may be used for temporary storage of hazardous waste (i.e., contaminated soil) on site prior to off-site treatment and disposal will comply with these requirements.
RCRA Regulations – Storage of Hazardous Waste in Staging Pile	40 CFR Part 264.554(a)(1)(i)-(iii) and 40 CFR 264.554(i)(1)	Relevant and Appropriate	Provides requirements for temporary storage and closure of non-flowing hazardous remediation waste in a staging pile to prevent or minimizes releases of hazardous substances or constituents into the environment.	Storage area for contaminated soil temporarily staged on-site will consider these requirements.
RCRA Regulations – Transportation of Hazardous Waste	40 CFR Part 262.10(h)	Applicable	An owner or operator who initiates a shipment of hazardous waste from a treatment, storage, or disposal facility must comply with the generator standards established in this part, including the requirements of 40 CFR 262.20-23 for manifesting; Section 262.30 for packaging; Section 262.31 for labeling; Section 262.32 for marking; Section 262.33 for placarding; Section 262.41(a) for record-keeping; and Section 262.12 to obtain EPA ID number.	Hazardous waste requiring off-site disposal will meet transportation requirements.

TABLE 2-1
SUMMARY OF FEDERAL AND STATE ARARs
SITE 41

NAS WHITING FIELD
MILTON, FLORIDA
PAGE 2 OF 2

Requirement	Citation	ARAR Type	Description	Comments
STATE				
Florida Solid Waste Management Facilities Regulations	Chapter 62-701.300, Florida Administrative Code (FAC)	Relevant and Appropriate	Prohibits storage, processing, or disposal except at a permitted solid waste management facility.	Waste generated on site and deemed nonhazardous solid waste will be stored, transported, or disposed of properly.
Florida General Pollutant Emission Limitation Standards	Chapter 62-296.320(4)(c), FAC	Applicable	Requires reasonable precautions, such as application of water or other dust suppressants, to control emission of particulate matter from any activity including but not limited to, vehicular movement and construction..	Precautions will be undertaken to prevent fugitive dust emissions from any land disturbing activities.
Florida Regulation of Stormwater Discharge – Facility Performance Standards	Chapter 62-25.025(7), FAC	Relevant and Appropriate	Establishes requirements for discharges from stormwater discharge facility to ensure protection of the surface waters of the state.	Erosion and stormwater control best management practices will be implemented during construction to retain sediment on site.
Florida Generic Permit For Stormwater Discharge from Construction Activities	Chapter 62-621.300(4)(a), FAC	Applicable	Requires development and implementation of best management practices (BMPs) and erosion and sedimentation controls for stormwater discharges to ensure protection of the surface waters of the state.	Erosion and stormwater control BMPs will be implemented during construction activity such as well installation to retain sediment on site.
Florida Contaminant Cleanup Target Levels Rule	Chapter 62-777.170, FAC Table II	Relevant and Appropriate	This rule provides default cleanup criteria, namely cleanup target levels (CTLs) in Table II and an explanation for deriving CTLs for soilr and surface water that can be used for site rehabilitation (i.e., cleanup).	Soil CTLs in Table II for Direct Exposure and Leachability Based on Groundwater Criteria were used to establish cleanup goals for some of the soil COCs.

Notes:

CERCLA = Comprehensive Environmental Response, Compensation, and Liability Act
CFR = Code of Federal Regulations
F.A.C. = Florida Administrative Code
FDEP = Florida Department of Environmental Protection
PRG = Preliminary Remediation Goals
RCRA = Resource Conservation and Recovery Act
SCTLs = Soil Cleanup Target Levels
TBC = To be Considered
TSDF = Treatment, storage, and disposal facilities
UCL = Upper Confidence Limit
USEPA = United States Environmental Protection Agency

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 4 SSL (USEPA, 2008) requested by the USEPA to be used at NAS Whiting Field as a "Relevant and Appropriate" requirement.

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 41 indicate no state or federally listed rare, threatened, or endangered species of concern are known to exist on this site (Tetra Tech, 2010). Site 41 does not contain wetland areas, and no part of the site is located within a 100-year floodplain; therefore, there are no location-specific ARARs at Site 41.

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 requirements must be attained.

TBC Criteria

As previously stated, other factors to be considered in the selection and implementation of a remedial action may be contained in advisories, criteria or other non-promulgated guidance. This "To Be

Considered" (TBC) guidance may, either in the presence or absence of ARARs, be found to be useful in ensuring protection of human health and the environment.

2.1.2 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 soil and will consider the results of the RI, particularly the HHRAs, as well as the ARARs identified in Table 2-1.

The potential for the leaching of contaminants to groundwater from soils will be evaluated as part of Site 40 Base-wide 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, one RAO has been developed for Site 41.

RAO: To protect human health from carcinogenic risks associated with incidental ingestion of, inhalation of, and dermal contact with soils containing cPAHs [as B(a)P equivalents] and dieldrin, at concentrations exceeding industrial SCTLs.

2.1.3 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 Section 2.2).

PRGs are determined based on ARARs, COCs, media of interest, and actual or potential exposure pathways taking into account TBCs and current and future anticipated land use. The current as well as the anticipated land use at Site 41 is industrial.

The PRG selection process is summarized below:

- The FDEP SCTLs (Chapter 62-777, F.A.C.) and/or the USEPA Region 4 SSLs for Industrial Direct Exposure will be used as PRGs.

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

2.1.4 Selection of COCs

COCs are determined by comparing soil PRG values against the COPC's site-specific representative concentration (or maximum value if less than 10 samples). Any COPC with a site-specific representative concentration exceeding the PRG becomes a COC. The following discussion summarizes the selection of COCs at Site 41:

Surface Soil COCs

One VOC, 12 SVOCs, 10 pesticides, 19 inorganics, TRPH, and cyanide were detected in surface soil samples (0-2 ft bls) collected at Site 41. A comparison of the maximum detected surface soil concentrations to screening levels (FDEP SCTLs and USEPA Region 4 SSLs) is presented in the RI. The following chemicals were detected in surface soils at maximum concentrations exceeding the direct contact, risk-based screening levels and, as discussed in Chapter 1.0, and were retained as COCs for surface soil under an industrial land use scenario:

- SVOCs - cPAHs [as B(a)P equivalents]

Subsurface Soil COCs

Two VOCs, 15 SVOCs, 11 pesticides/PCBs, 20 inorganics, TRPH, and cyanide were detected in subsurface soil samples collected at Site 41. A comparison of the maximum detected subsurface soil concentrations to screening levels (FDEP SCTLs and USEPA Region 4 SSLs) is presented in the RI. The following chemicals were detected in subsurface soils at maximum concentrations exceeding the direct contact, risk-based screening levels and, as discussed in Chapter 1.0, and were retained as COCs for subsurface soil under an industrial land use scenario:

- SVOCs - cPAHs [as B(a)P equivalents]
- Pesticides - Dieldrin

2.2 CLEANUP GOALS

A cleanup goal is the target concentration to which a COC must be reduced within a particular medium of concern to achieve RAOs. According to the NCP, cleanup goals are developed based on readily available information such as chemical-specific ARARs.

The current industrial land use scenario at Site 41 will remain for the foreseeable future. Under this scenario, cleanup goals were developed for constituents exceeding screening levels at Site 41. The cleanup goals for soil shall meet the FDEP direct exposure SCTLs for each COC. Based on USEPA risk assessment guidelines it was determined that there is no unacceptable human health risk at Site 41, therefore; the USEPA Region 4 SSLs were not used when determining cleanup goals for Site 41.
The cleanup goals for Site 41 are:

SOIL CLEANUP GOALS		
COC	RESIDENTIAL CG	INDUSTRIAL CG
cPAHs	0.100	0.700
Dieldrin	0.06	0.30

Note: Concentrations in milligrams per kilogram (mg/kg)

2.3 ESTIMATED VOLUME OF CONTAMINATED SOIL

The chemical-specific volume of soil requiring remediation was estimated using the following decision criteria and assumptions:

- The volume of contaminated surface and subsurface soil was determined based on industrial direct exposure SCTLs as the soil cleanup goal.
- The surface soil area of concern exceeding the cleanup goals encompasses approximately 1,028 ft^2 to a depth of 2 ft bls (Figures 2-1 and 2-2).
- The subsurface soil area of concern exceeding the cleanup goals encompasses a 20-ft radial area (314 ft^2) around sampling location SB43 to a depth of 2 to 3 ft bls (Figure 2-3).

Concentrations of cPAHs [as B(a)P equivalents] and dieldrin reported for four surface soil (0 to 2 feet bls) samples collected at the site exceeded the industrial SCTLs. One subsurface soil sample collected from 2 to 3 ft bls, at soil boring SB43, had cPAHs and dieldrin concentrations that exceeded the industrial SCTLs. Based on the proximity of surrounding soil borings, the impacted surface and subsurface soil areas are presented on Figures 2-1, 2-2, and 2-3. An estimated 88 cubic yards (yd^3) of soil exceeds industrial direct exposure SCTLs for B(a)P equivalents and dieldrin. Soil volume calculations are provided in Appendix B.

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Tag Notes:
1) Bold text indicates the result exceeds criteria.
2) J indicates the presence of a chemical at an estimated concentration.
3) (0-1) indicates the depth of the sample.

N

SS03 (5/24/2000)
(0-1)
Semivolatile (mg/kg)
Benzo(a)pyrene eq **0.24886**
Benzo(a)pyrene **0.185 J**/0.185

SB26 (10/16/2003)
(0-1)
Semivolatile (mg/kg)
Benzo(a)pyrene **0.11 J**

SS52 (8/31/2004)
(0-1)
Semivolatile (mg/kg)
Benzo(a)pyrene **0.30**
Pesticides/PCBs (mg/kg)
Dieldrin **0.0135 J**

SS06 (5/24/2000)
(0-1)
Semivolatile (mg/kg)
Benzo(a)pyrene eq 0.40508
Benzo(a)pyrene **0.3 J**/0.3
Pesticides/PCBs (mg/kg)
Dieldrin **0.0041 J**

SS51 (8/31/2004)
(0-1)
Semivolatile (mg/kg)
Benzo(a)pyrene **0.16 J**
Pesticides/PCBs (mg/kg)
Dieldrin **0.182**

SS10 (5/17/2001)
(0-1)
Semivolatile (mg/kg)
Benzo(a)pyrene **0.122 J**

SS11 (5/17/2001)
(0-1)
Semivolatile (mg/kg)
Benzo(a)pyrene **0.119 J**

SB29 (10/16/2003)
(0-1)
Semivolatile (mg/kg)
Benzo(a)pyrene **0.24 J**

SS15 (8/15/2001)
(0-1)
Semivolatile (mg/kg)
Benzo(a)pyrene **0.196 J**

SB30 (10/16/2003)
(0-1)
Semivolatile (mg/kg)
Benzo(a)pyrene **0.29 J**

SS13 (5/17/2001)
(0-1)
Semivolatile (mg/kg)
Benzo(a)pyrene **0.197 J**

SB31 (10/16/2003)
(0-1)
Semivolatile (mg/kg)
Benzo(a)pyrene **9 J**

SS17 (8/15/2001)
(0-1)
Semivolatile (mg/kg)
Benzo(a)pyrene **0.14 J**

SB32 (10/16/2003)
(0-1)
Semivolatile (mg/kg)
Benzo(a)pyrene **0.88 J**

SS14 (5/17/2001)
(0-1)
Semivolatile (mg/kg)
Benzo(a)pyrene **0.0774 J**

SB44 (11/11/2003)
(0-1)
Semivolatile (mg/kg)
Benzo(a)pyrene eq **0.41803**
Benzo(a)pyrene **0.28**/0.28
Pesticides/PCBs (mg/kg)
Dieldrin **0.06**

SB43 (11/11/2003)
(0-1)
Semivolatile (mg/kg)
Benzo(a)pyrene eq **0.26036**
Benzo(a)pyrene **0.18**/0.18
Pesticides/PCBs (mg/kg)
Dieldrin **0.30**

SB41 (11/10/2003)
(0-1)
Semivolatile (mg/kg)
Benzo(a)pyrene eq **0.57343**
Benzo(a)pyrene **0.38**/0.38
Pesticides/PCBs (mg/kg)
Dieldrin **0.015 J**

SB45 (11/11/2003)
(0-1)
Semivolatile (mg/kg)
Benzo(a)pyrene eq **0.11513**
Benzo(a)pyrene **0.073**/0.073
Pesticides/PCBs (mg/kg)
Dieldrin **0.0048**

SB40 (11/10/2003)
(0-1)
Semivolatile (mg/kg)
Benzo(a)pyrene eq 0.080934
Benzo(a)pyrene 0.053/0.053
Pesticides/PCBs (mg/kg)
Dieldrin **0.34 J**

SS49 (8/31/2004)
(0-1)
Semivolatile (mg/kg)
Benzo(a)pyrene 0.032
Pesticides/PCBs (mg/kg)
Dieldrin **0.0458**

SB02 (5/24/2000)
(0-1)
Semivolatile (mg/kg)
Benzo(a)pyrene eq **0.20772**
Benzo(a)pyrene **0.159 J**/0.159
Pesticides/PCBs (mg/kg)
Dieldrin **0.0031 J**

SB39 (11/10/2003)
(0-1)
Semivolatile (mg/kg)
Benzo(a)pyrene eq 0.06899
Benzo(a)pyrene 0.044/0.044
Pesticides/PCBs (mg/kg)
Dieldrin **0.036**

SB47 (11/11/2003)
(0-1)
Semivolatile (mg/kg)
Benzo(a)pyrene eq **0.46796**
Benzo(a)pyrene **0.33**/0.33
Pesticides/PCBs (mg/kg)
Dieldrin **0.02**

ESTIMATED AREA OF IMPACT

ASPHALT PAVING AREA

GRASS

GRASS

GRASS

SS/SB09 SB25 SB27 SB08 SS53 SB28 SS16 SS12 SB33 SB34 SB35 SB36 SB06 SS08 SB07 SB23 SB24 SB22 SS07 SB21 SB04 SS04 SS05 SB05 SB01 SS20 SS18 SB19 SB37 SB38 SS50 SB42 SB46 SS48

2832

0 35 Feet

Legend

- Roads
- Fence
- Site 41
- Existing Building
- 2000: Building 1485C boundary as shown in RI/FS work plan, Figure 3-6 (TtTNUS, 2000) confirmed by on-site worker #1.
- 2001: Estimated additonal building area based on guidance provided by on-site worker #2.
- 2003: Revised based on aerial photograph, circa early 1960s.

DPT Boring Locations	SB01 to SB04	13 April 2000
Surface Soil Sample Locations	SS/SB01 to 04 and SS05 to 06	24 May 2000
DPT Boring Locations	SB05 to SB08	5 June 2000
Surface Soil Sample Locations	SS07 to SS14	17 May 2001
Surface Soil Sample Locations	SS15 to SS20	15 August 2001
Surface and Subsurface Soil Sample Locations	SB21 to SB33	16 October 2003
Surface and Subsurface Soil Sample Locations	SB34 to SB47	10-11 November 2003
Surface and Subsurface Soil Sample Locations	SB48 to SB53	31 August 2004

DRAWN BY	DATE
K. MOORE	4/9/07
CHECKED BY	DATE
M. JAYNES	9/01/10
COST/SCHED-AREA	
SCALE	
AS NOTED	

NAVFAC

ANALYTICAL RESULTS IN SURFACE SOIL (0-1 FEET)
FEASIBILITY STUDY
SITE 41
NAS WHITING FIELD
MILTON, FLORIDA

CONTRACT NO.	
CTO 0079	
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APPROVED BY	DATE
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Rev. 3
March 2011

Tag Notes:
1) Bold text indicates the result exceeds criteria.
2) J indicates the presence of a chemical at an estimated concentration.
3) (1-2) indicates the depth of the sample.

N

SB31
(1-2) (10/16/2003)
Semivolatile (mg/kg)
Benzo(a)pyrene eq **0.4**
Benzo(a)pyrene **0.4**/0.4

SB34
(1-2) (11/11/2003)
Semivolatile (mg/kg)
Benzo(a)pyrene eq 0.071
Benzo(a)pyrene **0.071**/0.071

SB35
(1-2) (10/11/2003)
Semivolatile (mg/kg)
Benzo(a)pyrene eq **0.19**
Benzo(a)pyrene **0.19**/0.19

SB43
(1-2) (11/11/2003)
Semivolatile (mg/kg)
Benzo(a)pyrene **2**
Pesticides/PCBs (mg/kg)
4,4'-DDT **5.7**
Dieldrin **0.67 J**
Petroleum Hydrocarbons (mg/kg)
Petroleum Hydrocarbons **630**

SB41
(1-2) (10/11/2003)
Semivolatile (mg/kg)
Benzo(a)pyrene eq 0.032937
Benzo(a)pyrene 0.02/0.02
Pesticides/PCBs (mg/kg)
Dieldrin **0.15**
Petroleum Hydrocarbons (mg/kg)
Petroleum Hydrocarbons 7.4 J

SB33
(1-2) (10/16/2003)
Semivolatile (mg/kg)
Benzo(a)pyrene eq 0.092
Benzo(a)pyrene **0.092**/0.092

ASPHALT PAVING AREA

ESTIMATED AREA OF IMPACT

GRASS

GRASS

GRASS

2832

SS11 SB27 SB52 SB26 SS10 SS/SB09 SB25 SS03 SB51 SB44 SS50 SB08 SB31 SB53 SB29 SB28 SS15 SS12 SB30 SB02 SS14 SS13 SS17 SB32 SB36 SB06 SB07 SS08 SB23 SB24 SS07 SB22 SB21 SS06 SB04 SS04 SB42 SB45 SS05 SB05 SB01 SS18 SS20 SB46 SB40 SS49 SB47 SB39 SS19 SB37 SB38 SS48

Legend

- Roads
- Fence
- Site 41
- Existing Building
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■	DPT Boring Locations	SB01 to SB04	13 April 2000
■	Surface Soil Sample Locations	SS/SB01 to 04 and SS05 to 06	24 May 2000
●	DPT Boring Locations	SB05 to SB08	5 June 2000
■	Surface Soil Sample Locations	SS07 to SS14	17 May 2001
■	Surface Soil Sample Locations	SS15 to SS20	15 August 2001
△	Surface and Subsurface Soil Sample Locations	SB21 to SB33	16 October 2003
▲	Surface and Subsurface Soil Sample Locations	SB34 to SB47	10-11 November 2003
▲	Surface and Subsurface Soil Sample Locations	SB48 to SB53	31 August 2004

35 0 35 Feet

DRAWN BY	DATE		
S. STROZ	08/24/10		
CHECKED BY	DATE		
M. JAYNES	09/01/10		
REVISED BY	DATE		
—	—		
SCALE			
AS NOTED			

NAVFAC

ANALYTICAL RESULTS IN SURFACE SOIL (1-2 FEET)
FEASIBILITY STUDY
SITE 41
NAS WHITING FIELD
MILTON, FLORIDA

CONTRACT NUMBER	CTO 0079
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FIGURE NO.	REV
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Rev. 3
March 2011

Tag Notes:
1) Bold text indicates the result exceeds criteria.
2) J indicates the presence of a chemical at an estimated concentration.
3) (2-3) indicates the depth of the sample.

N

SB31
(2-3) (10/16/2003)
Semivolatiles (mg/kg)
Benzo(a)pyrene eq **0.26**
Benzo(a)pyrene **0.26** /0.26

SB35
(2-3) (10/11/2003)
Semivolatiles (mg/kg)
Benzo(a)pyrene eq **0.11**
Benzo(a)pyrene **0.11** /0.11

SB43
(2-3) (11/11/2003)
Semivolatiles (mg/kg)
Benzo(a)pyrene eq **0.51511**
Benzo(a)pyrene **0.36** /0.36
Pesticides/PCBs (mg/kg)
4,4'-DDT **5.5**
Deildrin **0.94** J
Petroleum Hydrocarbons (mg/kg)
Petroleum Hydrocarbons **920**
(5-6) (08/31/2004)
Semivolatiles (mg/kg)
Benzo(a)pyrene eq 0.0064
Benzo(a)pyrene 0.004 J/0.004
Pesticides/PCBs (mg/kg)
Deildrin **0.154**

SB40
(2-3) (10/11/2003)
Semivolatiles (mg/kg)
Benzo(a)pyrene eq **0.073277**
Benzo(a)pyrene 0.049/0.049
Petroleum Hydrocarbons (mg/kg)
Petroleum Hydrocarbons 14

ASPHALT PAVING AREA

ESTIMATED AREA OF IMPACT

GRASS

GRASS

GRASS

SB51 SB52 SB44 SS50 SB42 SB45 SB46 SS49 SB47 SS48 SB39 SB37 SB38 SS19 SS18 SB01 SS20 SB05 SS05 SB04 SS04 SS06 SB07 SS08 SB23 SB24 SS07 SB22 SB21 SB08 SB31 SB28 SS15 SB53 SB29 SS12 SB30 SB02 SS14 SB13 SS17 SB36 SB32 SB06 SS11 SB27 SB26 SS10 SS/SB09 SB25 SS03

2832

35 0 35 Feet

Legend

- Roads
- Fence
- Site 41
- Existing Building
- 2000: Building 1485C boundary as shown in RI/FS work plan, Figure 3-6 (TtTNUS, 2000) confirmed by on-site worker #1.
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Surface Soil Sample Locations	SS15 to SS20	15 August 2001
Surface and Subsurface Soil Sample Locations	SB21 to SB33	16 October 2003
Surface and Subsurface Soil Sample Locations	SB34 to SB47	10-11 November 2003
Surface and Subsurface Soil Sample Locations	SB48 to SB53	31 August 2004

DRAWN BY S. STROZ	DATE 08/24/10
CHECKED BY M. JAYNES	DATE 09/01/10
REVISED BY ___	DATE ___
SCALE AS NOTED	

NAVFAC

ANALYTICAL RESULTS IN SUBSURFACE SOIL (2-6 FEET)
FEASIBILITY STUDY
SITE 41
NAS WHITING FIELD
MILTON, FLORIDA

CONTRACT NUMBER	CTO 0079
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APPROVED BY ___	DATE ___
FIGURE NO. 2-3	REV 0

3.0 SCREENING OF TECHNOLOGIES AND PROCESS OPTIONS

This section identifies, screens, and evaluates the potential technologies and process options that may be applicable to develop remedial alternatives for Site 41 at NAS Whiting Field. The primary objective of this phase of the FS is to develop an appropriate range of remedial technologies and process options that will be used for developing the remedial alternatives.

3.1 DEVELOPMENT OF REMEDIAL ACTION ALTERNATIVES

The development of remedial action alternatives for CERCLA sites consists of identifying General Response Actions (GRAs), identifying applicable technologies, screening those technologies, and using the selected technologies to develop remedial action alternatives that will accomplish the RAO identified in Section 2.1.

The NCP requires a range of remedial alternatives be considered, and the 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.

3.1.1 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 and subsurface soils at Site 41.

- No Action
- Limited action
- Containment
- Removal
- Disposal

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 4.0.

3.1.2 Identification and Screening of Remedial Technologies

The purpose of this section is to identify and screen appropriate technologies for remedial alternatives addressing the RAO identified for Site 41. Each technology is 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 3-1 presents the remedial technologies/process options applicable for addressing the RAO for Site 41. 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 3-2 summarizes the technologies/process options passing the screening criteria. Table 3-2 also shows the Representative Process Option (RPO) selected for alternative evaluations. The RPOs are assembled into remedial alternatives in Section 3.1.4.

3.1.3 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

TABLE 3-1

IDENTIFICATION AND SCREENING OF REMEDIAL TECHNOLOGIES AND PROCESS OPTIONS
SITE 41
NAS WHITING FIELD
MILTON, FLORIDA
PAGE 1 OF 3

General Response Action	Remedial Technology	Process Option	Description	Screening Result
No Action	No Action	None	No remedial actions taken.	Retained. No action is retained as baseline comparison with other technologies.
Limited action	Land Use Controls (i.e., Institutional and Engineering Controls)	LUCs	LUCs in the area of soil contamination would include restrictions on excavation/construction or future land use. LUCs include access controls (e.g., fences, 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. This option could be used to restrict access to the area of concern.
Containment	Surface capping	Soil cover	Application of soil layer(s) or asphalt cap over contaminated areas to reduce exposure of human and animal receptors to site contaminants, and to prevent infiltration and provide a physical barrier.	Eliminated. Not viable under current land use scenario as industrial facility. Industrial level exceedances would remain in the subsurface.
Removal	Excavation	Bulk excavation	Excavation is the removal of soils using common construction equipment such as a high lift and backhoe.	Retained. Based on volume, cost would be moderate and excavation is easy to implement.

TABLE 3-1

IDENTIFICATION AND SCREENING OF REMEDIAL TECHNOLOGIES AND PROCESS OPTIONS
SITE 41
NAS WHITING FIELD
MILTON, FLORIDA
PAGE 2 OF 3

General Response Action	Remedial Technology	Process Option	Description	Screening Result
In-Situ Treatment	Biological	Biodegradation	Nutrients and amendments are added to surface soil to promote biodegradation.	Eliminated. Due to the low solubility of the detected cPAHs, the strong tendency of cPAHs to bind to soil organic matter, and the slow degradation rate for cPAHs present at Site 41.
	Physical/ Chemical	Soil vapor extraction	Use of vacuum and possibly air sparging to volatilize contaminants.	Eliminated. cPAHs and pesticides are not highly volatile and the effectiveness of SVE would be limited.
Ex-Situ Treatment	Thermal	Off-site incineration	Use of high temperature to destroy organic contaminants.	Eliminated. Due to the cost associated with low volumes. This technology is more cost effective for larger contaminant plumes than that which is present at Site 41.
	Physical/ Chemical	Stabilization/ Solidification	Physically binds or encloses contaminants within a stabilized mass and chemically reduces the hazard potential of a waste by converting the contaminants into less soluble, mobile, or toxic forms.	Eliminated. Due to limited effectiveness for the immobilization of cPAHs in soil.

TABLE 3-1

IDENTIFICATION AND SCREENING OF REMEDIAL TECHNOLOGIES AND PROCESS OPTIONS
SITE 41
NAS WHITING FIELD
MILTON, FLORIDA
PAGE 3 OF 3

General Response Action	Remedial Technology	Process Option	Description	Screening Result
Disposal	On-site landfill	Hazardous landfill	Double-lined and capped permanent disposal facility.	Eliminated. It is against DoD/Navy policy to create new landfills on any Navy facility.
		Hybrid landfill	Unlined but capped permanent disposal facility.	Eliminated. It is against DoD/Navy policy to create new landfills on any Navy facility.
		Non-hazardous landfill	Unlined and uncapped permanent disposal facility.	Eliminated. It is against DoD/Navy policy to create new landfills on any Navy facility.
	Off-site landfill	Hazardous waste landfill	Existing RCRA hazardous waste disposal site.	Retained
		Non-hazardous waste landfill	Existing nonhazardous waste disposal site.	Retained

Notes:

LUCs = Land use controls

RCRA = Resource Conservation and Recovery Act

DoD = Department of Defense

TABLE 3-2

SOIL TECHNOLOGIES AND PROCESS OPTIONS PASSING PRELIMINARY SCREENING
SITE 41
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 Non-hazardous waste landfill	Non-hazardous waste landfill

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

LUCs = Land Use Controls

the nine CERCLA evaluation criteria discussed in Section 1.0. The range of alternatives developed for surface soil remediation at Site 41 is discussed below.

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.

The second alternative type is limited action. The limited action alternative usually includes 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 and/or 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.

3.1.4 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.

- LUCs in the form of Institutional controls (ICs) or Engineering controls (ECs) can 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 ECs and treatment would 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 soil cover.
- ICs, such as access restrictions, would be used to supplement ECs, 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 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 CERCLA off-site disposal facility.

Based on the selected COCs for surface and subsurface soil at Site 41, the basic components of alternative analysis were conducted as required. The three soil alternatives for Site 41 represent a range of actions including no action, removal action addressing principal threats and minimizing the need for long-term management, and removal eliminating the need for long-term management.

The three alternatives provide a range of treatment options for Site 41 and are listed below:

Alternative S41-1:	No Action
Alternative S41-2:	Surface and Subsurface Soil (Exceeding Industrial SCTLs) Removal, Off-site Disposal, and LUCs
Alternative S41-3:	Surface and Subsurface Soil (Exceeding Residential SCTLs) Removal and Off-site Disposal

Table 3-3 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, S41-1, is also used as a basis for comparison with other alternatives. 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.

Alternative S41-2 minimizes long-term management through excavation and off-site disposal of surface and subsurface soils exceeding industrial SCTLs (or PRGs). This alternative includes LUCs for surface and subsurface soils at Site 41, thus preventing any potential direct exposure to COCs remaining on site. LUCs in the form of ICs and/or ECs will be implemented to ensure access to the site is restricted and to ensure appropriate future land use (non-residential or residential-like).

Alternative S41-3 eliminates long-term management through excavation and off-site disposal of surface and subsurface soils exceeding residential SCTLs (or PRGs) 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 3-3

SOIL REMEDIAL ALTERNATIVES
SITE 41
NAS WHITING FIELD
MILTON, FLORIDA

Alternative Number	Alternative Type	Representative Process Options	Alternative Description
Alternative S41-1: No action	No Action	None	• No Action
Alternative S41-2: Surface and Subsurface Soil (exceeding industrial PRGs) Removal and LUCs	Removal and Limited Action Minimizes Long-Term Management	Excavation, Disposal, and LUCs	• Delineation/confirmatory sampling of surface and subsurface soil • Excavation/disposal of surface and subsurface soil • Backfill excavation with clean fill • Off-site Disposal • LUCs to prevent future residential land use
Alternative S41-3: Surface and Subsurface Soil (exceeding residential PRGs) Removal	Removal - Eliminates Long-Term Management	Excavation, Disposal	• Delineation/confirmatory sampling of surface and subsurface soil • Excavation/disposal of surface and subsurface soil • Backfill excavation with clean fill • Off-site Disposal

LUCs = Land Use Controls

PRGs = Preliminary Remediation Goals

4.0 DETAILED ANALYSIS OF REMEDIAL ALTERNATIVES

4.1 INTRODUCTION

This section presents an evaluation of each remedial alternative with respect to the criteria of the NCP (40 CFR Part 300). These criteria and the relative importance of these criteria are described in the following subsections. Descriptions of the nine CERCLA evaluation criteria based on USEPA guidance (USEPA, 1988) are provided in Section 1.0.

4.1.1 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) and the NCP. 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.

As discussed in Section 1.0, a three-phase approach is used in the detailed analyses with the evaluation criteria. The "threshold" criteria are considered during the initial evaluation step for an alternative. For an alternative to advance to the next set of criteria, it must be protective of human health and the environment and comply with ARARs.

The "balancing" criteria are considered during the second step in the evaluation stage. In this step, an alternative is assessed as to long-term effectiveness and permanence; reduction of mobility, toxicity, or volume through treatment; short-term effectiveness; implementability; and cost. The third and final stage relates to the "modifying" criteria. In this step state acceptance and community acceptance are evaluated.

4.1.2 Relative Importance of Criteria

Among the nine criteria, the threshold criteria are:

- Overall Protection of Human Health and the Environment
- Compliance with ARARs (excluding those that may be waived)

The threshold criteria must be satisfied for an alternative to be eligible for selection. Among the remaining criteria, the following five criteria are considered to be the primary balancing criteria:

- Long-Term Effectiveness and Permanence
- Reduction of Contaminant Toxicity, Mobility, or Volume through Treatment
- Short-Term Effectiveness
- Implementability
- Cost

The balancing criteria are used to weigh the relative merits of the alternatives.

The remaining two of the nine criteria, State Acceptance and Community Acceptance, are considered to be modifying criteria that must be considered during remedy selection. These last two criteria can be evaluated after the FS has been reviewed by the State of Florida and the Proposed Plan has been made available to the public and opened to public comment. Therefore, this document addresses only the first seven of the nine remedy selection criteria.

4.1.3 Selection of Remedy

The selection of a remedy is a two-step process. The first step consists of identification of a preferred alternative and presentation of the alternative in a Proposed Plan to the community for review and comment. The preferred alternative must meet the following criteria:

- Protection of human health and the environment.
- Compliance with ARARs (unless a waiver is justified).
- Cost effectiveness in protecting human health and environment and in complying with ARARs.
- Utilization of permanent solutions and alternate treatment technologies or resource recovery technologies to the maximum extent practicable.

The second step consists of the review of public comments and determination by the Navy and USEPA, in consultation with FDEP, as to whether the preferred alternative continues to be the most appropriate remedial action for the site.

4.2 ASSEMBLY AND DETAILED ANALYSIS OF REMEDIAL ALTERNATIVES FOR SOIL

Based on the detailed screening of technologies and process options presented in Section 3.0, the following remedial alternatives were developed for soil at Site 41:

Alternative S41-1: No Action

Alternative S41-2: Surface and Subsurface Soil (Exceeding Industrial SCTLs) Removal, Off-site Disposal, and LUCs

Alternative S41-3: Surface and Subsurface Soil (Exceeding Residential SCTLs) Removal and Off-site Disposal

Alternative S41-1: No Action

Description

In an FS, the No Action alternative (S41-1) is typically considered to serve as a baseline consideration or to address sites not requiring any active remediation. The Alternative S41-1 for Site 41 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 Alternative S41-1.

Assessment

Threshold Criteria

Overall Protection of Human Health and the Environment

Alternative S41-1 would not provide protection to human health and the environment because no remedial action would be performed at Site 41.

Compliance with ARARs

On the basis of protecting human health and the environment, Alternative S41-1 would not satisfy ARARs or take into consideration TBCs, including the SCTLs.

Balancing Criteria

Long-Term Effectiveness and Permanence

Alternative S41-1 would not provide long-term effectiveness and permanence for Site 41. Site 41 would pose a continuing risk to human health and the environment. The magnitude of and potential for residual risk within Site 41 would be relatively unchanged by the Alternative S41-1. The adequacy and reliability of the controls component is not applicable for Alternative S41-1 because no construction, installation, or equipment is associated with the alternative. Alternative S41-1 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 41 would not change significantly and there would be no risk posed to human health and the environment because Alternative S41-1 involves no action.

Short-Term Effectiveness

Alternative S41-1 would provide no short-term effectiveness or short-term risks during implementation. 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.

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 Alternative S41-1.

Cost

There would be no costs associated with Alternative S41-1 since no remedial action would occur and 5-year reviews would not be required.

Alternative S41-2: Surface and Subsurface Soil (Exceeding Industrial SCTLs) Removal, Off-site Disposal, and LUCs

Description

Alternative S41-2 addresses principal threats through excavation of soils exceeding the industrial SCTLs (or PRGs) and the implementation of LUCs for surface and subsurface soil with residual contamination exceeding residential standards. This alternative consists of three components:

- Excavation of Surface and Subsurface Soil exceeding industrial SCTLs (or PRGs) (including delineation of excavation area).

- Off-Site Disposal.

- LUCs to restrict use of the site to industrial uses only.

Component 1: Excavation of Surface and Subsurface Soils

Excavation would be used to remove impacted soil exceeding industrial SCTLs. The approximate soil area to be excavated is shown on Figure 4-1. Additional sampling would be required to collect soil samples from in and around the area of impact at Site 41. The purpose of the sampling would be to assess the current extent and concentration of cPAHs and dieldrin exceeding industrial SCTLs in surface and subsurface soil at the site, and to delineate a more definitive boundary prior to implementation of the excavation.

Following additional delineation activities, soil excavation would occur in an approximate 1,028 ft^2 area to a depth of 2 ft bls, and the 314 ft^2 area around soil boring location SB43 from a depth of 2 to 3 ft bls, for a total of approximately 88 yd^3 of soil. Dust control measures and appropriate health and safety measures would be implemented during the excavation and screening. Samples of soil from the side walls and bottoms of the excavated areas would be collected for confirmatory analysis of concentrations of cPAHs and dieldrin.

After the soil within the excavation area is removed, the excavated areas would be backfilled with approximately 88 yds^3 of clean backfill material, and the site would be covered with top soil, seeded with grass, and returned to its original condition

Component 2: Off-Site Disposal

It is assumed that all soil excavated and removed from the site will be characterized as non-hazardous and will be disposed (approximately 123 tons) at a RCRA Subtitle D landfill. Samples of the excavated soil would be collected and analyzed to ensure that the soil will comply with the landfill requirements.

Component 3: LUCs

Following excavation and disposal, LUCs restricting the site to industrial use would be put in place at Site 41. The LUCs would limit exposure pathways by restricting access to the site by implementing the use of warning signs, fencing, or other containment barriers. The LUCs would have the following performance objectives:

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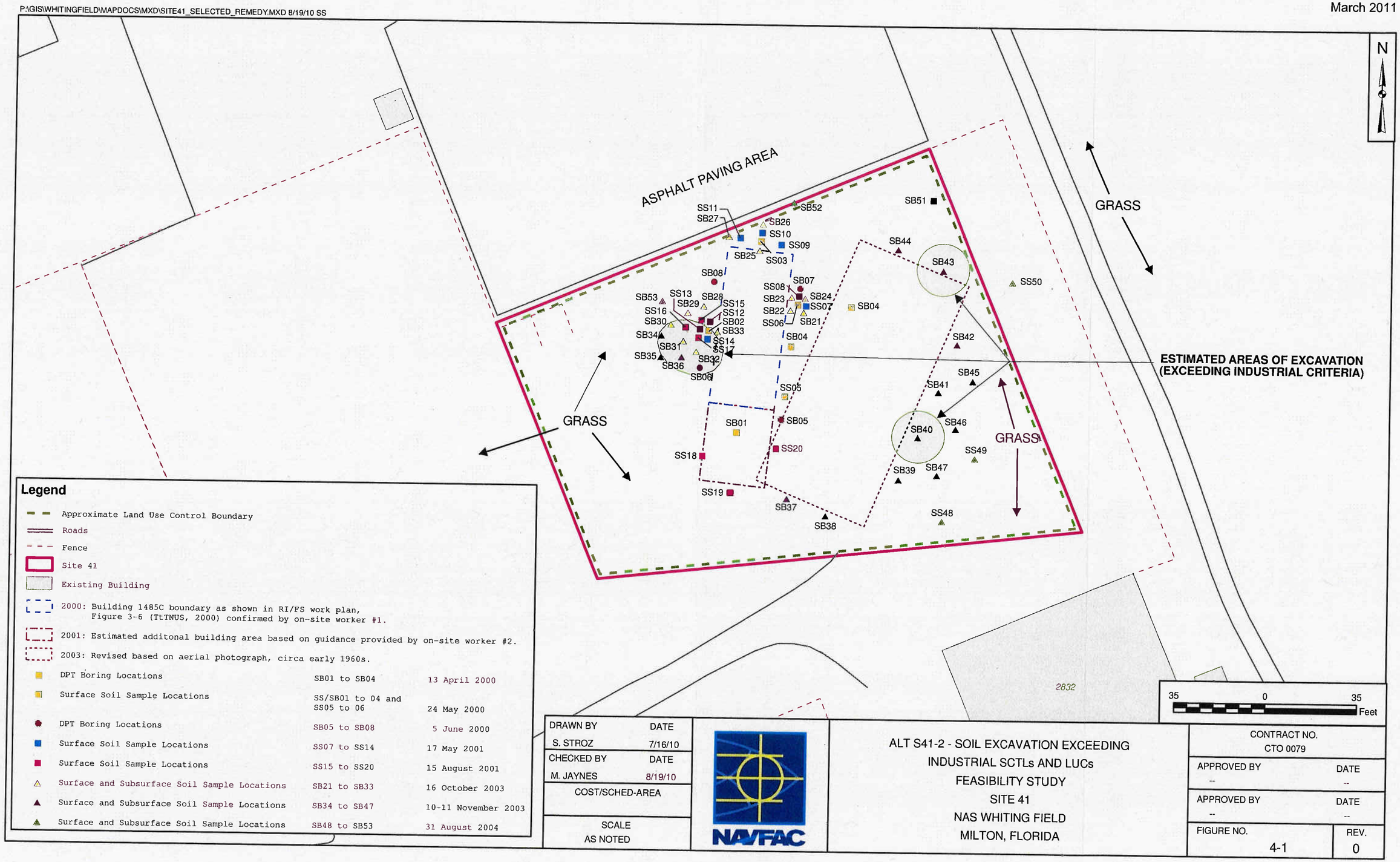

Legend

- Approximate Land Use Control Boundary
- Roads
- Fence
- Site 41
- Existing Building
- 2000: Building 1485C boundary as shown in RI/FS work plan, Figure 3-6 (TtNUS, 2000) confirmed by on-site worker #1.
- 2001: Estimated additonal building area based on guidance provided by on-site worker #2.
- 2003: Revised based on aerial photograph, circa early 1960s.

DPT Boring Locations	SB01 to SB04	13 April 2000
Surface Soil Sample Locations	SS/SB01 to 04 and SS05 to 06	24 May 2000
DPT Boring Locations	SB05 to SB08	5 June 2000
Surface Soil Sample Locations	SS07 to SS14	17 May 2001
Surface Soil Sample Locations	SS15 to SS20	15 August 2001
Surface and Subsurface Soil Sample Locations	SB21 to SB33	16 October 2003
Surface and Subsurface Soil Sample Locations	SB34 to SB47	10-11 November 2003
Surface and Subsurface Soil Sample Locations	SB48 to SB53	31 August 2004

DRAWN BY / DATE	S. STROZ 7/16/10
CHECKED BY / DATE	M. JAYNES 8/19/10
COST/SCHED-AREA	
SCALE	AS NOTED

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ALT S41-2 - SOIL EXCAVATION EXCEEDING INDUSTRIAL SCTLs AND LUCs
FEASIBILITY STUDY
SITE 41
NAS WHITING FIELD
MILTON, FLORIDA

CONTRACT NO.	CTO 0079
APPROVED BY / DATE	-- / --
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FIGURE NO.	4-1
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- Prohibit residential or residential-like use of the site unless prior written approval is obtained from USEPA, and FDEP. Prohibited residential or residential-like uses include, but are not limited to, any form of housing, any kind of school (including pre-schools, elementary schools, and secondary schools), child care facilities, playgrounds, and adult convalescent and nursing care facilities.

- Prohibit the excavation of surface and subsurface soil from the site unless prior written approval is obtained from the USEPA, and FDEP.

- Restrict access to the site to limit exposure of workers to surface and subsurface soil exceeding residential criteria.

- Maintain access restrictions unless prior written approval is obtained from the USEPA, and FDEP.

Site inspections and maintenance would be required. LUCs would be developed in accordance with the Principles and Procedures for Specifying, Monitoring, and Enforcement of Land Use Controls and Other Post-ROD Actions, per a letter dated October 2, 2003, from Raymond F. DuBois, Deputy Under Secretary of Defense (Installations and Environment), to Hon. Marianne Lamont Horinko, Acting Administrator, USEPA. Implementation of this alternative would therefore require a survey of the site, annual visual inspections, reporting, and five-year review report preparation.

Assessment

Threshold Criteria

Overall Protection of Human Health and the Environment

Alternative S41-2 would provide protection to human health and the environment by minimizing risk from exposure to soil through excavation and by restricting access to residual soils by LUCs, fencing, or other containment barriers. LUCs would be effective in the protection of human health. Fencing or other containment barriers would protect human health and the environment. There would be no significant risks to human health or the environment during implementation of Alternative S41-2. Alternative S41-2 would provide a moderate level of protection for human health and environmental resources on the base.

Compliance with ARARs

ARARs applying to source control and reducing risk to humans would be satisfied by Alternative S41-2. Although fencing or other containment barriers are not active remedial processes, exposure to the COCs would be prevented. Constituent exposure and chemical-specific ARARs for workers and the public would define the degree of worker protection and emission control required during implementation of Alternative S41-2.

Balancing Criteria

Long-Term Effectiveness and Permanence

The degree of long-term effectiveness and permanence provided by Alternative S41-2 is moderate. LUCs provide long-term effectiveness and permanence in minimizing exposure pathways. There would be potential for residual risk for on-base receptors, but the exposure pathways would be minimized following excavation as long as LUCs (e.g., fencing, containment barriers) remain in place. A 5-year review would be required to assess the effectiveness of the LUC remedy in protecting human health and the environment.

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

Reduction of Mobility, Toxicity, or Volume through Treatment

The mobility, toxicity, and volume of constituents in Site 41 would not be reduced significantly following the excavation because there would be no treatment.

LUCs would also not provide any reduction or treatment. Fencing and/or barriers would minimize exposure pathways. The implementation and operation of Alternative S41-2 would produce minimal treatment residuals.

Short-Term Effectiveness

The short-term risk to workers, on-base personnel, and the public from implementation of Alternative S41-2 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 S41-2 would be approximately 15 days. Minimal risk to the community would be expected from excavation and transportation of impacted soil during excavation and off-base disposal. Alternative S41-2 would be immediately effective in minimizing all exposure pathways. The estimated time to achieve the RAO is less than one year.

Implementability

The RPOs associated with Alternative S41-2 would be easily implementable, and vendors are available to conduct this work. Soil sampling would be required to confirm the extent of impacted soil and the area of excavation. Excavation and disposal of Site 41 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. The need for future remedial actions would depend on the effectiveness of Alternative S41-2 in minimizing exposure pathways. Future remedial actions would not be hindered by the implementation of Alternative S41-2; however, modification of LUCs may be required. Coordination with regulatory agencies would be manageable.

Cost

Estimated costs for Alternative S41-2 are as follows:

- Capital: $ 80,000
- 30-Year Net-Present Worth (NPW) of O&M: $ 14,000
- 30-Year NPW of Alternative S41-3: $ 94,000

The above figures have been rounded to the nearest $1,000 to reflect the preliminary nature of the estimates. A detailed cost estimate is provided in Appendix A.

Alternative S41-3: Surface and Subsurface Soil (Exceeding Residential SCTLs) Removal and Off-site Disposal

Description

Alternative S41-3 eliminates the need for long-term management because all surface and subsurface soils containing COCs exceeding residential and industrial SCTLs (or PRGs) would be removed from the site. Excavation would be used to remove all impacted soil exceeding PRGs. This alternative consists of two components:

- Excavation of Surface and Subsurface Soil exceeding residential SCTLs (or PRGs) (including delineation of excavation area).
- Off-site Disposal.

Component 1: Excavation of Surface and Subsurface Soils

Excavation would be used to remove all impacted soil exceeding residential SCTLs. The excavation would consist of removing soil from the area of impact as indicated on Figure 4-2. Additional sampling would be required to confirm the extent of soil contamination and define the area of impact at Site 41. The purpose of the sampling would be to assess the current extent and concentration of cPAHs and dieldrin exceeding residential SCTLs in surface and subsurface soil at the site, and to delineate a more definitive boundary prior to implementation of the planned excavation.

Following additional delineation activities, soil excavation would occur in the approximate 10,800 ft^2 area to a depth of 2 ft bls and the 314 ft^2 area around soil boring location SB43 from a depth of 2 to 6 ft bls, for a total of approximately 847 yds^3 of soil. Dust control measures and appropriate health and safety measures would be implemented during the excavation and screening. Samples of soil from the side walls and bottoms of the excavated areas would be collected for confirmatory analysis of concentrations of cPAHs and dieldrin.

After all impacted soil within the excavation area is removed, the excavated areas would be backfilled with approximately 847 yds^3 of clean backfill material, and the site would be covered with top soil, seeded with grass, and returned to its original condition.

Component 2: Off-Site Disposal

It is assumed that all soil excavated and removed from the site will be characterized as non-hazardous and will be disposed (approximately 1,185 tons) at a RCRA Subtitle D landfill. Samples of the excavated soil would be collected and analyzed to ensure that the soil will comply with the landfill requirements.

No long-term monitoring or maintenance (i.e., LUCs) would be required under Alternative S41-3.

Assessment

Threshold Criteria

Overall Protection of Human Health and the Environment

Alternative S41-3 would provide protection of human health and the environment by removal and off-base disposal of all soil exceeding residential PRGs, and eliminating all exposure pathways. Immediate and future risk from any potential land use exposure would be eliminated by the removal of all impacted soil and its subsequent off-base disposal. The reliability of excavation and off-base disposal is certain to

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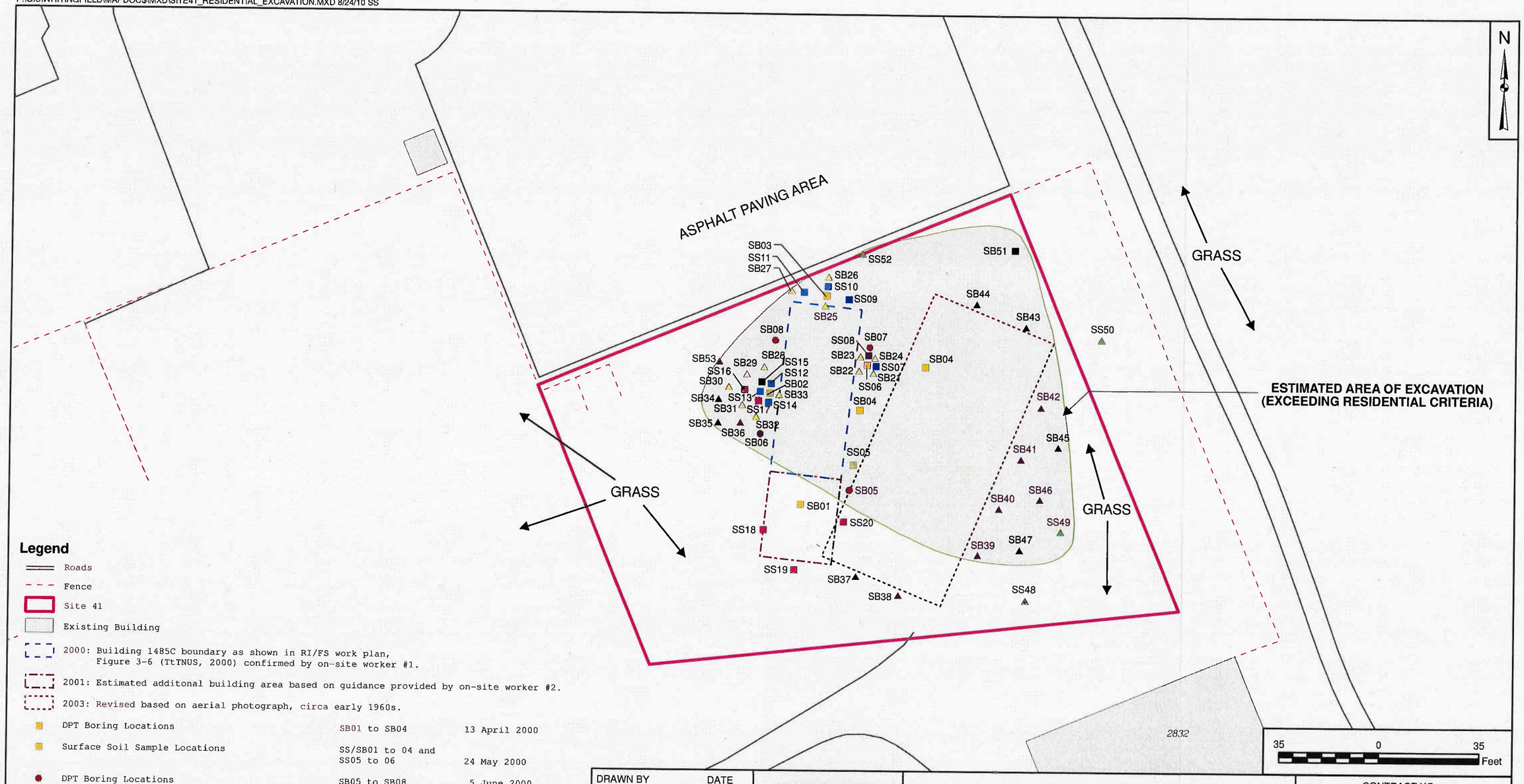

Legend

- Roads
- Fence
- Site 41
- Existing Building
- 2000: Building 1485C boundary as shown in RI/FS work plan, Figure 3-6 (TtTNUS, 2000) confirmed by on-site worker #1.
- 2001: Estimated additonal building area based on guidance provided by on-site worker #2.
- 2003: Revised based on aerial photograph, circa early 1960s.

DPT Boring Locations	SB01 to SB04	13 April 2000
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Surface and Subsurface Soil Sample Locations	SB34 to SB47	10-11 November 2003
Surface and Subsurface Soil Sample Locations	SB48 to SB53	31 August 2004

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K. MOORE	4/9/07
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M. JAYNES	8/24/10
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ALT S41-3 - SOIL EXCAVATION EXCEEDING
RESIDENTIAL SCTLs
FEASIBILITY STUDY
SITE 41
NAS WHITING FIELD
MILTON, FLORIDA

CONTRACT NO.	
CTO 0079	
APPROVED BY	DATE
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FIGURE NO.	REV.
4 - 2	0

protect human health and the environment because the source of risk is permanently removed from the site.

There would be minimal risks to human health and the environment during implementation of this alternative if normal dust control, runoff control, excavation, and transportation procedures are conducted and direct worker contact with impacted soils is minimized. Therefore, Alternative S41-3 would provide a high level of protection for human health and environmental resources both on and off base. Implementation of Alternative S41-3 would allow for unlimited exposure and unrestricted use at Site 41.

Compliance with ARARs

All ARARs applying to source control and reducing risk to human health and the environment would be satisfied by Alternative S41-3. Alternative S41-3 would satisfy chemical- and action-specific ARARs for achieving remedial objectives including the FDEP SCTLs. Constituent exposure and chemical-specific ARARs for workers and the public would define the degree of worker protection and emission control required during implementation of Alternative S41-3.

Balancing Criteria

Long-Term Effectiveness and Permanence

The degree of long-term effectiveness and permanence provided by Alternative S41-3 is high since all 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

The mobility, toxicity, and volume of constituents in Site 41 would not be reduced significantly following the excavation because there would be no treatment.

Minor inorganic constituent residuals below action levels may remain after the implementation of Alternative S41-3. No treatment residuals would be produced by the implementation of Alternative S41-3.

Short-Term Effectiveness

The short-term risk to workers, on-base personnel, and the public from implementation of Alternative S41-3 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 S41-3 would be approximately 18 days. Minimal risk to the community would be expected from excavation and transportation of impacted soil to an off-base disposal facility. Alternative S41-3 would be immediately effective in minimizing all exposure pathways. The estimated time to achieve the RAO is less than 1 year.

Implementability

The RPOs associated with Alternative S41-3 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 41 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. The need for future remedial actions would depend on the effectiveness of Alternative S41-3. Future remedial actions would not be hindered by the implementation of Alternative S41-3. Coordination with regulatory agencies would be manageable.

Implementation of Alternative S41-3 would allow for unlimited exposure and unrestricted use at Site 41.

Cost

Estimated costs for Alternative S41-3 are as follows:

- Capital: $ 239,000
- 30-Year Net-Present Worth (NPW) of O&M: $ 0
- 30-Year NPW of Alternative S41-3: $ 239,000

The above figures have been rounded to the nearest $1,000 to reflect the preliminary nature of the estimates. A detailed cost estimate is provided in Appendix A.

Implementation of Alternative S41-3 exceeds the cleanup goals of the FS, and would allow for unlimited exposure and unrestricted use at Site 41.

Summary of Site 41 Soil Alternatives

As part of the detailed analyses of alternatives for Site 41, one alternative involving No Action, one alternative involving a limited removal action with LUCs, and one alternative eliminating long-term management have been evaluated. Alternative S41-1 does not satisfy all of the evaluation criteria and will not be selected. Alternatives S41-2 and S41-3 satisfy the evaluation criteria, provide varying degrees of protection, and will be viable for the selection as a preferred alternative. The relative merits of each Site 41 alternative are evaluated in Section 5.0.

5.0 COMPARATIVE ANALYSIS OF ALTERNATIVES

This section compares the analyses for each of the remedial alternatives presented in Section 4.0 of this FS. The criteria for comparison are identical to those used for the detailed analysis of individual alternatives.

5.1 COMPARATIVE ANALYSIS FOR SOIL ALTERNATIVES

In contrast to the preceding evaluation 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.

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: long-term effectiveness and permanence; reduction of toxicity, mobility, or volume through treatment; short-term effectiveness; implementability; and 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 state acceptance and community acceptance. These criteria will be addressed after the public review and comment period has been completed in the form of a responsiveness summary in the ROD.

A summary of the comparative analyses for the Site 41 alternatives is presented in Table 5-1. This comparison between alternatives is based on the CERCLA evaluation criteria.

5.1.1 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.

The existing exposure pathways to humans for Site 41 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 Base-wide Groundwater RI/FS. For an alternative to be protective of human health and the environment, it must protect humans from all potential exposure pathways.

Alternative S41-1 would not be protective of human health and the environment.

Alternatives S41-2 and S41-3 would provide adequate and required protection of human health and the environment at Site 41.

Table 5-1 presents a summary for the overall protectiveness of human health and the environment for all Site 41 alternatives.

5.1.2 Compliance with ARARs

This evaluation criterion is used to determine whether an alternative meets all federal and state ARARs.

Alternative S41-1 would not comply with all ARARs or meet the RAO for Site 41.

Alternatives S41-2 and S41-3 would comply with chemical-specific and action-specific ARARs and take into consideration TBCs.

Table 5-1 presents a summary of ARARs compliance for each alternative.

5.1.3 Long-Term Effectiveness and Permanence

This criterion addresses 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 the reliability and maintenance of controls used to manage the risk posed by treatment residuals and untreated wastes.

Magnitude of Residual Risks

Alternatives S41-1 and S41-2 would leave soils exceeding residential criteria and require LUCs. Although not a component of the remedy, 5-year reviews would be required per CERCLA 121(c). Alternative S-41-3, when implemented, would not produce or leave any residuals requiring treatment and/or disposal posing any future potential risk to the environment.

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).

Adequacy and Reliability of Controls

Alternative S41-1 would not provide any control. Alternatives S41-2 and S41-3 would be adequate and reliable in controlling exposure to any residuals remaining at the site including 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.

Table 5-1 provides a summary of the comparative evaluation of the long-term effectiveness and permanence.

5.1.4 Reduction of Mobility, Toxicity, or Volume through Treatment

This criterion addresses the degree to which each alternative permanently and significantly reduces mobility, toxicity, or volume of hazardous constituents in the soil. Alternative S41-1 would not reduce mobility of chemical constituents at Site 41. Alternatives S41-2 and S41-3 would not permanently and significantly reduce mobility of chemical constituents at Site 41 because there would be no treatment, only off-site disposal.

Table 5-1 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 41 alternative.

5.1.5 Short-Term Effectiveness

This criterion addresses the effects of each alternative during the implementation and construction phases until remedial response objectives are achieved.

Alternative S41-1 would not protect human health in the short term because there would not be any remedy implemented to preclude unacceptable exposure at the site.

Alternatives S41-2 and S41-3, would protect human health once completed. Alternatives S41-2 and S41-3 have an estimated remedial time to reach objectives of less than 1 year. Alternatives S41-2 and S41-3 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.

Table 5-1 provides a summary of the comparative evaluation of the short-term effectiveness of each Site 41 alternative.

5.1.6 Implementability

This criterion addresses whether there are any technical problems or administrative issues associated with an alternative.

Alternatives S41-1 would be easily implementable. Alternatives S41-2 and S41-3 would be more difficult to implement because they include soil excavation, transportation, and off-site disposal. All remedial technologies are proven and reliable.

The ability to undertake future remedial actions is not a consideration under Alternative S41-1. The implementation of Alternatives S41-2 or S41-3 should not adversely affect the Navy's ability to undertake future remedial actions, if necessary, because the site would be returned to original conditions.

Alternative S41-1 would not require any inspections or monitoring. Alternative S41-2 would require inspection for erosion and potential exposure and five-year reviews. Alternative S41-3 would not require any long-term monitoring once the remediation is complete. In addition, monitoring for inhalation of fugitive dust would be performed during the excavation to protect workers and determine appropriate personal protective equipment. Exposure from dermal contact and ingestion of soil is difficult to monitor.

Alternatives S41-2 and S41-3 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 5-1 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 41 alternative.

5.1.7 Cost

This criterion addresses the estimated cost for each alternative.

The estimated total project present worth values reflect a common degree of complexity and/or remedial time between the alternatives. Alternative S41-3 would have the highest cost, followed by Alternative S41-2, with Alternative S41-1 being the least expensive.

The capital and O&M costs and NPW of the soil alternatives are as follows.

Alternative	Capital	NPW of O&M	NPW
S41-1	$0	$0	$0
S41-2	$80,000	$14,000 (30 years)	$94,000 (30 years)
S41-3	$239,000	$0	$239,000

Table 5-1 also provides the total project present worth costs for each Site 41 alternative.

5.1.8 State Acceptance

The state regulatory agency, FDEP, will review and comment on the Draft FS for Site 41 prior to final approval and subsequent acceptance. The FDEP comments will be addressed in the Final FS for Site 41.

5.1.9 Community Acceptance

The information concerning community acceptance will be addressed following public comment on the Proposed Plan for Site 41 in the form of a responsiveness summary to be included in the ROD for Site 41.

TABLE 5-1

SUMMARY OF COMPARATIVE ANALYSIS OF SOIL ALTERNATIVES
SITE 41
NAS WHITING FIELD
MILTON, FLORIDA
PAGE 1 OF 4

Criteria	Alternative S41-1 No Action	Alternative S41-2 Surface and Subsurface Soil Removal and LUCs	Alternative S41-3 Surface and Subsurface Soil Removal
THRESHOLD CRITERIA			
Overall Protection of Human Health and the Environment			
Human Health Protection	Provides no protection.	Provides a high level of protection. Excavation and LUCs reduce risk from residuals. Fencing will reduce risk of potential exposure.	Provides highest level of protection. Excavation and disposal eliminates risk of potential exposure.
Environmental Protection	Constituent concentrations will not be reduced.	Constituent concentrations will 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	Does not meet ARARs	Meets ARARs	Meets ARARs
Compliance with Action-Specific ARARs	Not applicable	Meets ARARs	Meets ARARs
Compliance with Location-Specific ARARs	Not applicable	Not applicable	Not applicable
Compliance with Other Criteria	Not applicable	Not applicable	Not applicable
BALANCING CRITERIA			
Long-Term Effectiveness and Permanence			
Reduction in Residual Risk	Residual risk	Provides high level of long-term residual risk reduction. Risk reduced by excavation and off-site disposal.	Provides highest level of long-term residual risk reduction. Risk eliminated by excavation and off-site disposal.

TABLE 5-1

SUMMARY OF COMPARATIVE ANALYSIS OF SOIL ALTERNATIVES
SITE 41
NAS WHITING FIELD
MILTON, FLORIDA
PAGE 2 OF 4

Criteria	Alternative S41-1: No Action	Alternative S41-2: Surface and Subsurface Soil Removal and LUCs	Alternative S41-3: Surface and Subsurface Soil 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	Not Required
Prevention of Exposure to Residuals	No residual risk	Exposure risk reduced by LUCs.	Exposure to residuals is eliminated 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	Impacted soil exceeding industrial PRGs is excavated and disposed. Removal efficiency estimated >95%.	All impacted soil exceeding PRGs is excavated and disposed. Removal efficiency estimated >95%.
Reduction in Mobility, Toxicity, or Volume	Not applicable	None	None
Irreversibility of Treatment	Not applicable	Not applicable	Not applicable
Type and Quantity of Residuals Remaining after Treatment	Residuals will remain above action levels	Some residuals will remain above action levels.	No residuals remain above action levels.

TABLE 5-1

SUMMARY OF COMPARATIVE ANALYSIS OF SOIL ALTERNATIVES
SITE 41
NAS WHITING FIELD
MILTON, FLORIDA
PAGE 3 OF 4

Criteria	Alternative S41-1 No Action	Alternative S41-2 Surface and Subsurface Soil Removal and LUCs	Alternative S41-3 Surface and Subsurface Soil Removal
Short-Term Effectiveness			
Community Protection During Implementation	Not applicable	Temporary increases in dust emissions through excavation and disposal; controlled by proper construction techniques.	Temporary increases in dust emissions through excavation and disposal; controlled by proper construction techniques.
Worker Protection During Implementation	Not applicable	Workers use PPE, as required, to prevent dermal contact as well as dust inhalation and ingestion during construction.	Workers use PPE, as required, to prevent dermal contact as well as dust inhalation and ingestion during construction.
Environmental Impacts	None	Excavation of impacted soils can generate runoff and fugitive dust.	Excavation of impacted soils can generate runoff and fugitive dust.
Construction Time	Not applicable	Less than 1 year	Less than 1 year
Time Until Remedial Response Objectives Are Achieved	Not achieved	Estimated at 1 year	Estimated at 1 year
Implementability			
Ability to Construct and Operate the Technology	Not applicable	Many contractors available to provide excavation. Fewer contractors accept impacted soil for disposal.	Many contractors available to provide excavation. Fewer contractors accept impacted soil for disposal.
Reliability of Technology	Not applicable	Excavation and disposal are reliable. LUCs are reliable for restricting soil access.	Excavation and disposal are reliable.
Ease of Undertaking Additional Remedial Action, if Required	Easily implementable	Easily Implementable	Easily Implementable

TABLE 5-1

SUMMARY OF COMPARATIVE ANALYSIS OF SOIL ALTERNATIVES
SITE 41
NAS WHITING FIELD
MILTON, FLORIDA
PAGE 4 OF 4

Criteria	Alternative S41-1 No Action	Alternative S41-2 Surface and Subsurface Soil Removal and LUCs	Alternative S41-3 Surface and Subsurface Soil Removal
Ability to Monitor Effectiveness	Not applicable	Monitoring indicates effectiveness of removal.	Monitoring indicates effectiveness of removal.
Permitting Requirements	Not applicable	Transportation and Disposal permit will be required.	Transportation and Disposal permit will be required.
Coordination with Other Agencies	Not applicable	All permits and/or permit modifications are obtainable.	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[1]			
Capital Costs	$0	$80,000	$239,000
Short-Term O&M	$0	$0	$0
Long-Term O&M			
5-Year Review[2]	$0	$0	$0
Land-Use Controls[2]	$0	$1,016	$0
Total Project Present Worth Cost	$0	$94,000	$239,000

[1] Includes, short- and long-term total present worth, and contingency.
[2] Costs are estimated over a 30-year period.

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

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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, 2008. Regional Screening Levels (Soil Screening Levels). USEPA Region 4, Atlanta, GA. April.

APPENDIX A

REMEDIAL ALTERNATIVE COST ESTIMATES

NAVAL AIR STATION WHITING FIELD
MILTON, FLORIDA
SITE 41
SOIL ALTERNATIVE S41-2: SURFACE AND SUBSURFACE SOIL (exceeding FDEP Industrial STCLs) REMOVAL, TRANSPORT, AND OFFSITE DISPOSAL AND LUCs
CAPITAL COSTS

Cost Item	Quantity	Unit	Unit Cost				Extended Cost				
			Subcontract	Material	Labor	Equipment	Subcontract	Material	Labor	Equipment	Subtotal
1 PROJECT PLANNING											
1.1 Prepare Remedial Design	80	hr			$33.79		$0	$0	$2,703	$0	$2,703
1.2 Construction Completion Report	40	hr			$33.79		$0	$0	$1,352	$0	$1,352
1.3 Project Scheduling and Procurement	40	hr			$33.79		$0	$0	$1,352	$0	$1,352
2 MOBILIZATION/DEMOBILIZATION											
2.1 Equipment Mob/Demob (Exc., Loader, & Dozier)	2	ea			$200.00	$500.00	$0	$0	$400	$1,000	$1,400
2.2 Mobilize/Demobilize Personnel (3-persons)	2	ea		$375.00	$300.00		$0	$750	$600	$0	$1,350
2.3 Portable Toilet	1	mo	$74.18				$74	$0	$0	$0	$74
2.4 Storage Trailer (28' x 10')	1	mo	$98.33				$98	$0	$0	$0	$98
2.5 Office Trailer (32' x 8')	0	mo	$221.49				$0	$0	$0	$0	$0
2.6 Site Utilities	0	mo	$1,000.00				$0	$0	$0	$0	$0
3 DECONTAMINATION											
3.1 Temporary Decon Pad	1	ls		$850.00	$500.00	$265.00	$0	$850	$500	$265	$1,615
3.2 Decon Water Disposal	5	drum	$125.00				$625	$0	$0	$0	$625
3.3 Decon Water Storage Drums	5	ea		$45.00			$0	$225	$0	$0	$225
3.4 PPE (3 p * 5 days * 3 Weeks)	12	m-day		$30.00			$0	$360	$0	$0	$360
3.5 Decontaminate Equipment (Pressure Washer)	8	ea			$134.45	$50.00	$0	$0	$1,076	$400	$1,476
4 SITE PREPARATION											
4.1 Erosion Control Fencing	500	lf		$0.23	$1.17		$0	$115	$585	$0	$700
4.2 Collect/Analyze Delineation Samples (cPAHs & others)	5	ea	$250.00	$10.00	$23.52		$1,250	$50	$118	$0	$1,418
4.3 Construction Surveys (2-man crew)	2	day	$850.00				$1,700	$0	$0	$0	$1,700
4.4 Utility Location and Site Delineation/Layout	1	ls	$1,500.00		$33.23		$1,500	$0	$33	$0	$1,533
4.5 Concrete Demolition/Removal (6" reinforced)	0	cy	$45.58				$0	$0	$0	$0	$0
4.6 Site Foreman/FOL	3	day			$300.00		$0	$0	$900	$0	$900
5 EXCAVATION/BACKFILL											
5.1 Excavate/Load Contaminated Soil (2.0 cy Hyd. Exc.)	5	day			$250.00	$1,200.00	$0	$0	$1,250	$6,000	$7,250
5.2 Standby, Crawler Mounted 2.0 CY Hydraulic Excavator	40	hrs				$37.54	$0	$0	$0	$1,502	$1,502
5.3 Wheel Loader, 3 cy	5	day			$250.00	$460.00	$0	$0	$1,250	$2,300	$3,550
5.4 Standby, Wheel Loader, 3 cy	20	hrs				$14.07	$0	$0	$0	$281	$281
5.5 Health & Safety Monitoring during Excavation	5	day			$188.16	$100.00	$0	$0	$941	$500	$1,441
5.6 Collect/Analyze Confirmatory Samples	5	ea	$250.00	$10.00	$23.52		$1,250	$50	$118	$0	$1,418
5.7 Import (Offsite) Place, Compact Clean Fill Material	88	cy		$7.82	$0.85	$1.81	$0	$688	$75	$159	$922
5.8 Backfill with Clean Excavated Material	0	cy		$0.28	$2.02	$0.76	$0	$0	$0	$0	$0
5.9 Site Foreman/FOL	7	day			$300.00		$0	$0	$2,100	$0	$2,100
6 OFF-SITE TRANSPORTATION/DISPOSAL											
6.1 Waste Profile	2	ls	$750.00				$1,500	$0	$0	$0	$1,500
6.2 Transport and Dispose of Soil (Non-haz.) in Landfill	123	ton	$45.00				$5,535	$0	$0	$0	$5,535
6.3 Prepare Shipment Manifests	20	hrs			$33.23		$0	$0	$665	$0	$665
7 SITE RESTORATION											
7.1 Top soil /gravel (haul and spread)	1500	sf	$0.40				$600	$0	$0	$0	$600
8 LAND USE CONTROLS											
8.1 Site Survey (2-man crew)	1	days	$648.36				$648	$0	$0	$0	$648
8.2 Modify Master Plan and Prepare Deed Restrictions	20	hrs			$33.79		$0	$0	$676	$0	$676
Subtotal Direct Capital Costs less Subcontract								$3,088	$16,691	$12,407	$32,187

NAVAL AIR STATION WHITING FIELD
MILTON, FLORIDA
SITE 41
SOIL ALTERNATIVE S41-2: SURFACE AND SUBSURFACE SOIL (exceeding FDEP Industrial STCLs) REMOVAL, TRANSPORT, AND OFFSITE DISPOSAL AND LUCs
CAPITAL COSTS

Cost Item	Quantity	Unit	Unit Cost Subcontract	Unit Cost Material	Unit Cost Labor	Unit Cost Equipment	Extended Cost Subcontract	Extended Cost Material	Extended Cost Labor	Extended Cost Equipment	Subtotal
Local Area Adjustment								84%	84%	84%	
								$2,594	$14,021	$10,422	$27,037
Overhead on Labor Cost @ 30%									$4,206		$4,206
G & A on Labor Cost @ 10%									$1,402		$1,402
G & A on Material Cost @ 10%								$259			$259
Total Direct Capital Cost								$2,853	$19,629	$10,422	$32,905
Indirects on Total Direct Labor Cost @ 75%									$14,722		$14,722
Profit on Total Direct Cost @ 10%											$3,290
Subtotal											$50,917
Health & Safety Monitoring @ 3%		(Includes Subcontractor cost)									$1,971
Total Field Cost											**$52,888**
Subtotal Subcontractor Cost							$14,781				$14,781
G & A on Subcontract Cost @ 10%							$1,478				$1,478
Profit on Subcontractor Cost @ 5%											$739
Subcontractor Cost											**$16,998**
Contingency on Total Field and Subcontractor Costs @ 10%											**$6,989**
Engineering on Total Field and Subcontractor Costs @ 5%											**$3,494**
TOTAL Capital COST											**$80,369**

NAVAL AIR STATION WHITING FIELD
MILTON, FLORIDA
SITE 41
SOIL ALTERNATIVE S41-2: SURFACE AND SUBSURFACE SOIL (exceeding FDEP Industrial STCLs) REMOVAL, TRANSPORT, AND OFFS
ANNUAL COSTS

Cost Item	Quantity	Unit	Unit Cost	Labor Overhead[a]	Total Cost
1 FIVE YEAR SITE REVIEWS (FOR 30 YEAR PERIOD)					
1.1 Site Review Visit/Inspection					
Project Manager	0	hr	$40.12	$40.12	$0
Staff Engineer	0	hr	$26.44	$26.44	$0
ODCs (travel, etc.)	0	ls	$200.00		$0
1.2 Five Year Review Report					
Project Manager	0	hr	$40.12	$40.12	$0
Staff Engineer	0	hr	$26.44	$26.44	$0
ODCs (photocopies, telephone, etc.)	0	ls	$100.00		$0
Subtotal Five Year Review Cost					$0
G&A and Profit @ 15%					$0
Subtotal					$0
Contingency @ 10%					$0.00
Total Five Year Review Cost					**$0**
2 LAND USE CONTROL MONITORING (FOR 30 YEAR PERIOD)					
2.1 Site Inspections					
Project Manager	0	hr	$40.12	$40.12	$0
Staff Engineer	4	hr	$26.44	$26.44	$212
ODCs (travel, etc.)	1	ls	$150.00		$150
2.2 Annual Review and Report w/Checklist)					
Project Manager	1	hr	$40.12	$40.12	$80
Staff Engineer	4	hr	$26.44	$26.44	$212
ODCs (photocopies, telephone, etc.)	1	ls	$50.00	$50.00	$50
2.3 Sign/Fence Maintenance	1	ls	$100.00		$100
Subtotal Land Use Control Monitoring					$803
G&A and Profit @ 15%					$120
Subtotal					$924
Contingency @ 10%					$92.38
Total Land Use Control Monitoring Cost					**$1,016**

[a] Overhead on professional labor @ 100%.

NAVAL AIR STATION WHITING FIELD
MILTON, FLORIDA
SITE 41
SOIL ALTERNATIVE S41-2: SURFACE AND SUBSURFACE SOIL (exceeding FDEP Industrial STCLs) REMOVAL, TRANSPORT, AND OFFSITE DISPOSAL
PRESENT WORTH ANALYSIS

Year	Capital Cost	Operation and Maintenance Cost	Annual Cost	Total Yearly Cost	Present-Worth Factor (i = 6%)	Present Worth
0	$80,369			$80,369	1.000	$80,369
1		$0	$1,016	$1,016	0.943	$959
2		$0	$1,016	$1,016	0.890	$904
3		$0	$1,016	$1,016	0.840	$853
4		$0	$1,016	$1,016	0.792	$805
5		$0	$1,016	$1,016	0.747	$759
6		$0	$1,016	$1,016	0.705	$716
7		$0	$1,016	$1,016	0.665	$676
8		$0	$1,016	$1,016	0.627	$638
9		$0	$1,016	$1,016	0.592	$601
10		$0	$1,016	$1,016	0.558	$567
11		$0	$1,016	$1,016	0.527	$535
12		$0	$1,016	$1,016	0.497	$505
13		$0	$1,016	$1,016	0.469	$476
14		$0	$1,016	$1,016	0.442	$449
15		$0	$1,016	$1,016	0.417	$424
16		$0	$1,016	$1,016	0.394	$400
17		$0	$1,016	$1,016	0.371	$377
18		$0	$1,016	$1,016	0.350	$356
19		$0	$1,016	$1,016	0.331	$336
20		$0	$1,016	$1,016	0.312	$317
21		$0	$1,016	$1,016	0.294	$299
22		$0	$1,016	$1,016	0.278	$282
23		$0	$1,016	$1,016	0.262	$266
24		$0	$1,016	$1,016	0.247	$251
25		$0	$1,016	$1,016	0.233	$237
26		$0	$1,016	$1,016	0.220	$223
27		$0	$1,016	$1,016	0.207	$211
28		$0	$1,016	$1,016	0.196	$199
29		$0	$1,016	$1,016	0.185	$188
30		$0	$1,016	$1,016	0.174	$177
					TOTAL PRESENT WORTH	**$94,356**

NAVAL AIR STATION WHITING FIELD
MILTON, FLORIDA
SITE 41
SOIL ALTERNATIVE S41-3: SURFACE AND SUBSURFACE SOIL (exceeding Residential) REMOVAL, TRANSPORT, AND OFFSITE DISPOSAL
CAPITAL COSTS

Cost Item	Quantity	Unit	Unit Cost Subcontract	Unit Cost Material	Unit Cost Labor	Unit Cost Equipment	Extended Cost Subcontract	Extended Cost Material	Extended Cost Labor	Extended Cost Equipment	Subtotal
1 PROJECT PLANNING											
1.1 Prepare Remedial Design	160	hr			$33.79		$0	$0	$5,406	$0	$5,406
1.2 Construction Completion Report	60	hr			$33.79		$0	$0	$2,027	$0	$2,027
1.3 Project Scheduling and Procurement	40	hr			$33.79		$0	$0	$1,352	$0	$1,352
2 MOBILIZATION/DEMOBILIZATION											
2.1 Equipment Mob/Demob (Exc., Loader, & Dozier)	2	ea			$200.00	$500.00	$0	$0	$400	$1,000	$1,400
2.2 Mobilize/Demobilize Personnel (3-persons)	2	ea		$375.00	$300.00		$0	$750	$600	$0	$1,350
2.3 Portable Toilet	1	mo	$74.18				$74	$0	$0	$0	$74
2.4 Storage Trailer (28' x 10')	1	mo	$98.33				$98	$0	$0	$0	$98
2.5 Office Trailer (32' x 8')	0	mo	$221.49				$0	$0	$0	$0	$0
2.6 Site Utilities	0	mo	$1,000.00				$0	$0	$0	$0	$0
3 DECONTAMINATION											
3.1 Temporary Decon Pad	1	ls		$850.00	$500.00	$265.00	$0	$850	$500	$265	$1,615
3.2 Decon Water Disposal	14	drum	$125.00				$1,750	$0	$0	$0	$1,750
3.3 Decon Water Storage Drums	14	ea		$45.00			$0	$630	$0	$0	$630
3.4 PPE (3 p * 6 days * 3 Weeks)	48	m-day		$30.00			$0	$1,440	$0	$0	$1,440
3.5 Decontaminate Equipment (Pressure Washer)	10	ea			$134.45	$50.00	$0	$0	$1,345	$500	$1,845
4 SITE PREPARATION											
4.1 Erosion Control Fencing	600	lf		$0.23	$1.17		$0	$138	$702	$0	$840
4.2 Collect/Analyze Delineation Samples (cPAHs & others)	20	ea	$250.00	$10.00	$23.52		$5,000	$200	$470	$0	$5,670
4.3 Construction Surveys (2-man crew)	2	day	$850.00				$1,700	$0	$0	$0	$1,700
4.4 Utility Location and Site Delineation/Layout	1	ls	$2,500.00		$33.23		$2,500	$0	$33	$0	$2,533
4.5 Concrete Demolition/Removal (6" reinforced)	0	cy	$45.58				$0	$0	$0	$0	$0
4.6 Site Foreman/FOL	3	day			$300.00		$0	$0	$900	$0	$900
5 EXCAVATION/BACKFILL											
5.1 Excavate/Load Contaminated Soil (2.0 cy Hyd. Exc.)	18	day			$250.00	$1,200.00	$0	$0	$4,500	$21,600	$26,100
5.2 Standby, Crawler Mounted 2.0 CY Hydraulic Excavator	100	hrs				$37.54	$0	$0	$0	$3,754	$3,754
5.3 Wheel Loader, 3 cy	18	day			$250.00	$460.00	$0	$0	$4,500	$8,280	$12,780
5.4 Standby, Wheel Loader, 3 cy	50	hrs				$14.07	$0	$0	$0	$704	$704
5.5 Health & Safety Monitoring during Excavation	22	day			$188.16	$100.00	$0	$0	$4,140	$2,200	$6,340
5.6 Collect/Analyze Confirmatory Samples	5	ea	$250.00	$10.00	$23.52		$1,250	$50	$118	$0	$1,418
5.7 Import (Offsite) Place, Compact Clean Fill Material	847	cy		$7.82	$0.85	$1.81	$0	$6,624	$720	$1,533	$8,877
5.8 Backfill with Clean Excavated Material	0	cy		$0.28	$2.02	$0.76	$0	$0	$0	$0	$0
5.9 Site Foreman/FOL	15	day			$300.00		$0	$0	$4,500	$0	$4,500
6 OFF-SITE TRANSPORTATION/DISPOSAL											
6.1 Waste Profile	2	ls	$750.00				$1,500	$0	$0	$0	$1,500
6.2 Transport and Dispose of Soil (Non-haz.) in Landfill	1185	ton	$45.00				$53,325	$0	$0	$0	$53,325
6.3 Prepare Shipment Manifests	24	hrs			$33.23		$0	$0	$798	$0	$798
7 SITE RESTORATION											
7.1 Top soil /gravel (haul and spread)	11250	sf	$0.40				$4,500	$0	$0	$0	$4,500
Subtotal Direct Capital Costs less Subcontract								$10,682	$33,010	$39,836	$83,527

NAVAL AIR STATION WHITING FIELD
MILTON, FLORIDA
SITE 41
SOIL ALTERNATIVE S41-3: SURFACE AND SUBSURFACE SOIL (exceeding Residential) REMOVAL, TRANSPORT, AND OFFSITE DISPOSAL
CAPITAL COSTS

Cost Item	Quantity	Unit	Unit Cost Subcontract	Unit Cost Material	Unit Cost Labor	Unit Cost Equipment	Extended Cost Subcontract	Extended Cost Material	Extended Cost Labor	Extended Cost Equipment	Subtotal
Local Area Adjustment								84%	84%	84%	
								$8,972	$27,729	$33,462	$70,163
Overhead on Labor Cost @ 30%									$8,319		$8,319
G & A on Labor Cost @ 10%									$2,773		$2,773
G & A on Material Cost @ 10%								$897			$897
Total Direct Capital Cost								$9,870	$38,820	$33,462	$82,152
Indirects on Total Direct Labor Cost @ 75%									$29,115		$29,115
Profit on Total Direct Cost @ 10%											$8,215
Subtotal											$119,482
Health & Safety Monitoring @ 3%		(Includes Subcontractor cost)									$5,735
Total Field Cost											**$125,217**
Subtotal Subcontractor Cost							$71,698				$71,698
G & A on Subcontract Cost @ 10%							$7,170				$7,170
Profit on Subcontractor Cost @ 5%											$3,585
Subcontractor Cost											**$82,452**
Contingency on Total Field and Subcontractor Costs @ 10%											**$20,767**
Engineering on Total Field and Subcontractor Costs @ 5%											**$10,383**
TOTAL Capital COST											**$238,819**

NAVAL AIR STATION WHITING FIELD
MILTON, FLORIDA
SITE 41
SOIL ALTERNATIVE S41-3: SURFACE AND SUBSURFACE SOIL (exceeding Residential) REMOVAL, TRANSPORT, AND OFFSITE DISPOS-
ANNUAL COSTS

Cost Item	Quantity	Unit	Unit Cost	Labor Overhead[a]	Total Cost
1 FIVE YEAR SITE REVIEWS (FOR 30 YEAR PERIOD)					
1.1 Site Review Meeting (2-persons for 2-days)					
Project Manager	0	hr	$40.12	$40.12	$0
Staff Engineer	0	hr	$26.44	$26.44	$0
ODCs (travel, etc.)	0	ls	$400.00		$0
1.2 Five Year Review Report					
Project Manager	0	hr	$40.12	$40.12	$0
Staff Engineer	0	hr	$26.44	$26.44	$0
ODCs (photocopies, telephone, etc.)	0	ls	$250.00		$0
Subtotal Five Year Review Cost					$0
G&A and Profit @ 15%					$0
Subtotal					$0
Contingency @ 10%					$0.00
Total Five Year Review Cost					**$0**
2 LAND USE CONTROL MONITORING (FOR 30 YEAR PERIOD)					
2.1 Quarterly Site Inspections					
Project Manager (2 hrs for each Inspection)	0	hr	$40.12	$40.12	$0
Staff Engineer	0	hr	$26.44	$26.44	$0
2.2 Annual Review and Report					
Project Manager	0	hr	$40.12	$40.12	$0
Staff Engineer	0	hr	$26.44	$26.44	$0
ODCs (photocopies, telephone, etc.)	0	ls	$250.00		$0
2.3 Sign/Fence Maintenance	0	ls	$50.00		$0
Subtotal Land Use Control Monitoring					$0
G&A and Profit @ 15%					$0
Subtotal					$0
Contingency @ 10%					$0.00
Total Land Use Control Monitoring Cost					**$0**

[a] Overhead on professional labor @ 100%.

NAVAL AIR STATION WHITING FIELD
MILTON, FLORIDA
SITE 41
SOIL ALTERNATIVE S41-3: SURFACE AND SUBSURFACE SOIL (exceeding Residential) REMOVAL, TRANSPORT, AND OFFSITE DISPOS/
PRESENT WORTH ANALYSIS

Year	Capital Cost	Operation and Maintenance Cost	Annual Cost	Total Yearly Cost	Present-Worth Factor (i = 6%)	Present Worth
0	$238,819			$238,819	1.000	$238,819
1		$0	$0	$0	0.943	$0
2		$0	$0	$0	0.890	$0
3		$0	$0	$0	0.840	$0
4		$0	$0	$0	0.792	$0
5		$0	$0	$0	0.747	$0
6		$0	$0	$0	0.705	$0
7		$0	$0	$0	0.665	$0
8		$0	$0	$0	0.627	$0
9		$0	$0	$0	0.592	$0
10		$0	$0	$0	0.558	$0
11		$0	$0	$0	0.527	$0
12		$0	$0	$0	0.497	$0
13		$0	$0	$0	0.469	$0
14		$0	$0	$0	0.442	$0
15		$0	$0	$0	0.417	$0
16		$0	$0	$0	0.394	$0
17		$0	$0	$0	0.371	$0
18		$0	$0	$0	0.350	$0
19		$0	$0	$0	0.331	$0
20		$0	$0	$0	0.312	$0
21		$0	$0	$0	0.294	$0
22		$0	$0	$0	0.278	$0
23		$0	$0	$0	0.262	$0
24		$0	$0	$0	0.247	$0
25		$0	$0	$0	0.233	$0
26		$0	$0	$0	0.220	$0
27		$0	$0	$0	0.207	$0
28		$0	$0	$0	0.196	$0
29		$0	$0	$0	0.185	$0
30		$0	$0	$0	0.174	$0
					TOTAL PRESENT WORTH	**$238,819**

APPENDIX B
SOIL VOLUME CALCULATIONS

Tetra Tech NUS

SOIL VOLUME CALCUATION SHEET

CLIENT: NAS WHITING FIELD	FILE No: 112GN0052	BY: TJS	PAGE: 1 0F 1
SUBJECT: SITE 41 FS	CHECKED BY: MJ	DATE: 08/16/10	

Objective: Estimate excavation volumes for areas exceeding **Industrial SCTLs** at Site 41.

Approach: Calculate volume using current excavation extent and depth information.

SITE 41:

LOCATION(S)	AREA (ft^2)	x DEPTH (ft)	= VOLUME (ft^3)	(yd^3)
SB40	314	2	628	23.26
SB43	314	3	942	34.89
SB31 and SB32	400	2	800	29.63

TOTAL (ft^3) = 2370

TOTAL (yd^3) = 88

Conclusion: The total volume estimated for excavation is 88 yds3 or 123 tons

Tetra Tech NUS

SOIL VOLUME CALCUATION SHEET

CLIENT: NAS WHITING FIELD	FILE No: 112GN0052	BY: TJS	PAGE: 1 0F 1
SUBJECT: SITE 41 FS	CHECKED BY: MJ	DATE: 08/16/10	

Objective: Estimate excavation volumes for areas exceeding **Residential SCTLs** at Site 41.

Approach: Calculate volume using current excavation extent and depth information.

SITE 41:

LOCATION(S)	AREA (ft^2)	x DEPTH (ft)	= VOLUME (ft^3)	(yd^3)
Surface Res	10800	2	21600	800.00
SB43	314	4	1256	46.52
				0.00

TOTAL (ft^3) = 22856

TOTAL (yd^3) = 847

Conclusion: The total volume estimated for excavation is 847 yds3 or 1185 tons

APPENDIX C

RESPONSE TO COMMENTS ON DRAFT FS

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION 4
ATLANTA FEDERAL CENTER
61 FORSYTH STREET
ATLANTA, GEORGIA 30303-8960

June 7, 2010

4SF-FFB

Mr. Benjamin T. Kissam
NAVFAC SE
P.O. Box 30, Bldg. 103
NAS Jacksonville, Fl 32212-0030

SUBJECT: NAS Whiting Field, Florida
EPA ID# FL2170023244

Dear Mr. Kissam:

The United States Environmental Protection Agency (EPA) has received and reviewed the following document:

- **Feasibility Study for Site 41, Former Pesticide Storage Building 1485C, Surface and Subsurface Soil, Rev. 1, Naval Air Station Whiting Field, Milton, Florida, April 2010** (Prepared by Tetra Tech NUS, Inc.)

Enclosed are EPA's review comments. If you should have any questions, please contact me at (404) 562-8555 or by email at Benedikt.Craig@epa.gov .

Sincerely,

Craig A. Benedikt
Senior Remedial Project Manager
Federal Facilities Branch

cc: John Winters, FDEP

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION 4
ATLANTA FEDERAL CENTER
61 FORSYTH STREET
ATLANTA, GEORGIA 30303-8960

June 7, 2010

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Sincerely,

Craig A. Benedikt
Senior Remedial Project Manager
Federal Facilities Branch

cc: John Winters, FDEP

EPA Review Comments
Feasibility Study for Site 41
Surface and Subsurface Soil
Rev. 1
Dated, April 2010

1. **Cover Page:** Please add the EPA ID number for NAS Whiting Field to the cover page.
2. **Acronyms, Page vi:** The definitions for "COCs" and "COPCs" should be "Contaminants of Concern" and "Contaminants of Potential Concern", respectively.
3. **Executive Summary, Page ES-3:** The third sentence of the third paragraph states that laboratory results were compared to USEPA Region 9 Residential PRGs and Industrial PRGs and USEPA Region 4 Risk Assessment Guidance for Superfund (RAGS). USEPA Region 9 PRGs were replaced with USEPA Region 4 Soil Screening Levels in June 2008. The Region 4 Soil Screening Levels should have been used to screen data for the feasibility study. In addition, RAGS only contains guidance criteria for conducting risk assessments not screening values. Please apply this comment to the remainder of the document where screening values are discussed.
4. **Section 1.0, Page 1-1:** In the second sentence of the last paragraph on this page, please change "remedial action is necessary" to "an FS is warranted".
5. **Section 1.1, Page 1-2:** In the second paragraph, the text states that the first step in the FS process is to develop RAOs, leading to development of PRGs. This wording appears to conflict with a later statement that COCs are identified in the RI as those chemicals exceeding PRGs and background. Please clarify.
6. **Section 1.1, Page 1-8:** In the last paragraph of this section, please revise the sentence as follows: "...the subsequent ROD serves to select the remedy for the site."
7. **Section 1.2, Page 1-8:** In the second paragraph, the text states that "It is expected these different alternatives can be adjusted during the proposed plan and decision process . . ." Please be careful not to overstate this notion. The Proposed Plan should present the Preferred Alternative and the other alternatives described in the FS, and the ROD should generally memorialize the Preferred Alternative as the Selected Remedy. Any recombining or adjusting of alternatives should be a rare exception to the rule, and not "expected."

8. **Figure 1-3, Page 1-14:** Please increase the scale of this figure to make it more readable.
9. **Section 1.6.1, Page 1-16 and 1-17:** Please list the detected chemical constituents in each of the bulleted items on these pages. The last two sentences of the last paragraph state that further investigation is need and that additional data will be gathered during the design phase. Please clarify why that information was not gathered during the RI or FS.
10. **Section 1.6.2, Page 1-17:** In the first sentence of this section, please change the word "concentrations" to "constituents". In the Surface Soil subsection, the text states that screening levels were based on USEPA PRGs; however, there is no mention of the FDEP Soil Cleanup Target Levels (SCTLs). Please see Comment No. 3 above as it relates to this section.
11. **Figure 1-4, Page 1-18:** Please increase the scale of this figure to make it more readable.
12. **Section 1.6.2, Page 1-19:** In the "Subsurface Soil" subsection, the text states that screening levels were based on USEPA PRGs; however, there is no mention of the FDEP SCTLs being applied to the screening process. Please also see Comment No. 3 above as it relates to this section. In addition, the text states that SCTLs were exceeded; however, as mentioned above, a discussion of SCTLs is not included in this section.
13. **Section 1.6.3, Page 1-20:** Please delete the subsection titled as "State of Florida Risk Assessment" since only one baseline risk assessment was prepared for the site. In addition, two tables should be presented which identifies each COC, the maximum concentration of the COC detected, and the corresponding SCTL for both surface and subsurface soils, respectively.
14. **Section 1.6.4, Page 1-21:** Please change the first paragraph as follows: "The data demonstrate that the soil at Site 41 is characterized by both lateral and vertical contamination by cPAHs, dieldrin, 4-4'-DDT and TRPH. Of these contaminants, cPAHs and dieldrin exceed the industrial Florida Soil Cleanup Target Levels, at Chapter 62-770 Table II, and all four exceed the residential SCTLs, up to two orders of magnitude." Please change the last sentence in the second paragraph as follows: "The Navy concludes from the data and technical evaluation presented in this document that the site conditions support taking an active remedial action on the soils at Site 41."

15. **Section 1.7, Page 1-22:** This section of the document should be moved to the beginning of the feasibility study since it describes how the feasibility study is organized.
16. **Section 2.0, Page 2-1:** In the first paragraph, first sentence, please move "(e.g., ARARs) to the space after "regulatory requirements." ARARs are not an appropriate example for guidance, where the parenthetical is currently located. In the second sentence of this section, please delete "and thus derives the environmental medium of concern (soil)".
17. **Section 2.1, Page 2-1:** In the first sentence of the second paragraph, please add "potential" before "ARARs."
18. **Section 2.1.1, Page 2-1:** In the last sentence of the first paragraph, please add, "unless waived" at the end of the sentence. Please revise the second sentence of the first paragraph as follows: "CERCLA and the NCP require that remedial actions comply with state ARARs when they are more stringent than federal ARARs." In the first sentence of the second paragraph, please replace "components" with "types." In the third sentence of the second paragraph, please delete "only."
19. **Section 2.1.1, Page 2-2:** In the second paragraph, please rephrase the third sentence to read, "Once a requirement is identified as an ARAR, the selected remedy must meet, or waive, the ARAR, utilizing one of the waivers defined in Section 121 of CERCLA, 42 U.S.C. § 9621(d)(4)." Please delete, at the end of the existing sentence, "even if the ARAR is not required to assure protectiveness." It is not clear that this clause is helpful or even accurate. Please revise the third paragraph to read, "Other factors to be considered in the selection and implementation of a remedial action may be contained in advisories, criteria or other non-promulgated guidance. This guidance is termed "To Be Considered" under the NCP, *see* 40 CFR Section 300.515(h)(2). Such guidance may, either in the presence or absence of ARARs, be found to be useful in ensuring protection of human health and the environment." In the last sentence before the "Chemical-Specific ARARs" subsection, please delete "location-," since there are no location-specific requirements identified in Table 2-1.

20. **Table 2-1, Pages 2-3 and 2-4:** The ARARs listed in this table are too general. Please provide the specific section of each ARAR as they relate to each of the alternatives evaluated.
21. **Section 2.1.1, Page 2-5:** In the "Chemical Specific ARARs" subsection, the USEPA Region 4 Soil Screening Levels should be used in lieu of the USEPA Region 9 PRGs. In the last sentence of the "Action-Specific ARARs" subsection, please delete the last occurrence of "ARAR" and insert "requirement." For the "TBC Criteria" subsection, please see comment 19 above as it relates to TBCs and replace some of this text with text from the suggested language.
22. **Section 2.1.2, Page 2-6:** Please change the word "chemicals" to "contaminants" in the first sentence of the second paragraph. Perhaps "1" could be deleted in "RAO1", since it implies that there is more than one RAO, and it does not appear that there is more than one.
23. **Section 3.1, Page 3-1:** Please spell out "GRA" as this is the first occurrence in the document. Even though "GRA" is the abbreviation of the subsection title, it appears to merit spelling out here for ease of reading.
24. **Section 3.1.2, Page 3-2:** Please reformat the paragraph at the top of the page.
25. **Section 3.1.3, Page 3-7:** In the second sentence of the second paragraph, please change the word "provides" to "includes".
26. **Section 3.1.4, Page 3-8:** Please add "CERCLA" in between "approved" and "off-site" in the last sentence of the first full paragraph on this page. In addition, this section should include a paragraph to introduce the three alternatives being evaluated such as the information presented in Section 4.2. The text of this section discusses aspects of Alternatives S41-1, S41-2, and S41-3 before the alternatives are introduced to the reader.
27. **Section 4.1.1, Page 4-1:** Please add "and the NCP" to the end of the second sentence of the first paragraph.
28. **Section 4.1.2, Page 4-1:** Please delete "considered to be" in the first paragraph.
29. **Section 4.1.2, Page 4-2:** In the last paragraph of this section, please change "discussed at a public meeting, if required and requested" to "made available to the public".
30. **Section 4.2, Page 4-4:** In the "Description" subsection at the bottom of the page, please add "with residual contamination exceeding residential standards."

31. **Section 4.2, Page 4-5:** In the third bulleted item, please add "to restrict use of the site to industrial uses only." The "Component 2: Off-Site Disposal" subsection states that it is anticipated that soil could be disposed in a Subtitle D landfill, but in Alternative S41-3, it mentions the possibility of treatment to meet LDRs. Please clarify how LDRs may be triggered under Alternative S41-3, where more soil is likely to have an average lower concentration of contaminants, but would not be triggered under this alternative, where it is intended to remove only the more contaminated soil under a hotspot removal type scenario.
32. **Section 4.2, Page 4-7:** Please add "reporting" in between "annual visual inspections" and "and five-year review" in the last sentence of the first full paragraph on this page. In the third sentence of the Threshold Criteria subsection, please change "humans" to "human health". In addition, the last sentence on this page states that Alternative S41-2 would provide a moderate level of protection for human health and environmental resources both on and off base. Please clarify how this alternative would provide protection for resources off base.
33. **Section 4.2, Page 4-8:** Long-term management and the estimated time to achieve the RAO should be stated as lasting *at least* 30 years.
34. **Section 4.2, Page 4-10:** Component 2: Offsite Disposal and Compliance with ARARs. See Comment 31.
35. **Section 5.1.2, Page 5-2:** Worker safety regulations are not ARARs, although they may be required and need to be taken into account during the implementation of any remedial action. Please delete the text referring to worker and public safety. Please add text discussing as appropriate a comparison of meeting any of the current ARARs.
36. **Section 5.1.3, Page 5-2:** In the Magnitude of Residual Risks subsection, the text states that all three alternatives, when implemented, would not produce or leave any residual requiring treatment and/or disposal posing any future potential risk to the environment. This statement is not entirely true. Since the site has not been fully characterized, there is the potential that Alternatives S41-1 and S41-2 could potential result in a future potential risk to the environment.

37. **Section 5.1.4, Page 5-3:** Please note that this section should address the degree to which the alternatives reduce the mobility, toxicity or volume of contaminants through treatment. Except for the possibility of treating the excavated soil onsite prior to transporting offsite for disposal, the two active remedial alternatives do not utilize treatment to reduce the mobility, toxicity or volume through treatment. This section should explain why neither of the two active alternatives utilizes treatment. Discussion of natural processes in a paragraph concerning treatment is potentially confusing to the public, as the public may assume that such natural processes are considered treatment. They are not. Please move this text to another section.
38. **Section 5.1.5, Page 5-3:** Please clarify why Alternative S41-2 requires 30 years to reach its RGO. Just because the alternative utilizes LUCs as a component of the remedy does not imply that it does not reach its RGO for 30 years. Will it not reach its RGO upon implementation of the active portion of the remedy and LUCs? Please clarify.
39. **Table 5-1, Page 5-6:** In the "Compliance with Applicable or Relevant and Appropriate Requirements" section of the table, the text states that the "Compliance with Other Criteria" meets NAS Whiting Field requirements. It is not clear what the NAS Whiting Field requirements are. Please clarify.
40. **Table 5-1, Page 5-8:** In the row titled "Time Until Remedial Response Objectives Are Achieved", the response for Alternative S41-1 should be "RAOs not achieved" since the no action alternative will not result in RAOs being met.
41. **Table 5-1, Page 5-9:** In the "Cost" column for Alternative S41-2, the costs for the 5-Year Review and Land Use Controls should reflect the costs over a 30-year period and a footnote should be included to indicate that these costs are estimated over a 30-year period.

RESPONSE TO USEPA COMMENTS
ON DRAFT FEASIBILITY STUDY FOR
OPERABLE UNIT 27 - SITE 41
FORMER PESTICIDE STORAGE BUILDING 1485C
NAS WHITING FIELD
(Rev. 1 – April 5, 2010)

USEPA Comments issued June 9, 2010, from Mr. Craig Benedict, USEPA, to Mr. Tread Kissam, RPM NAVFAC SE.

1. **Cover Page:** Please add the EPA ID number for NAS Whiting Field to the cover page.

***Response**: This change has been made.*

2. **Acronyms, Page vi:** The definitions for "COCs" and "COPCs" should be "Contaminants of Concern" and "Contaminants of Potential Concern", respectively.

***Response**: This change has been made.*

3. **Executive Summary, Page ES-3:** The third sentence of the third paragraph states that laboratory results were compared to USEPA Region 9 Residential PRGs and Industrial PRGs and USEPA Region 4 Risk Assessment Guidance for Superfund (RAGS). USEPA Region 9 PRGs were replaced with USEPA Region 4 Soil Screening Levels in June 2008. The Region 4 Soil Screening Levels should have been used to screen data for the feasibility study. In addition, RAGS only contains guidance criteria for conducting risk assessments not screening values. Please apply this comment to the remainder of the document where screening values are discussed.

***Response**: These changes have been made throughout the document where appropriate.*

4. **Section 1.0, Page 1-1:** In the second sentence of the last paragraph on this page, please change "remedial action is necessary" to "an FS is warranted".

***Response**: This change has been made.*

5. **Section 1.1, Page 1-2:** In the second paragraph, the text states that the first step in the FS process is to develop RAOs, leading to development of PRGs. This wording appears to conflict with a later statement that COCs are identified in the RI as those chemicals exceeding PRGs and background. Please clarify.

Response: *Agreed. The text has been edited as follows:* "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 Applicable or Relevant and Appropriate Requirements (ARARs), when available; site-specific risk-based factors; or other available information. COCs, as identified in the RI, are those chemicals with average concentrations exceeding the screening criteria and/or background levels."

6. **Section 1.1, Page 1-8:** In the last paragraph of this section, please revise the sentence as follows: "...the subsequent ROD serves to select the remedy for the site."

Response: *This change has been made.*

7. **Section 1.2, Page 1-8:** In the second paragraph, the text states that "It is expected these different alternatives can be adjusted during the proposed plan and decision process . . ." Please be careful not to overstate this notion. The Proposed Plan should present the Preferred Alternative and the other alternatives described in the FS, and the ROD should generally memorialize the Preferred Alternative as the Selected Remedy. Any recombining or adjusting of alternatives should be a rare exception to the rule, and not "expected."

Response: *Agreed. The text has been edited as follows:* "It is possible these different alternatives can be adjusted during the proposed plan and decision process..."

8. **Figure 1-3, Page 1-14:** Please increase the scale of this figure to make it more readable.

***Response**: The scale on Figure 1-3 has been increased.*

9. **Section 1.6.1, Page 1-16 and 1-17:** Please list the detected chemical constituents in each of the bulleted items on these pages. The last two sentences of the last paragraph state that further investigation is need and that additional data will be gathered during the design phase. Please clarify why that information was not gathered during the RI or FS.

***Response:** The chemical constituents have been listed in the text. As for the clarification on further investigation and why that information was not gathered during the RI, the following text has been added (Section 1.6.1, page 1-18):*

"The Site 41 investigation was an iterative process. Initially the site was designated for an interim removal action (IRA) during which additional sampling would take place to define the boundaries of contamination. However, during partnering activities it was determined that the IRA would not take place and an RI with both HHRA and ERA assessments should be performed and that sufficient samples had been collected even though contamination maps presented at the time indicated exceedances at site boundaries. Therefore; further investigation will be required to complete implementation of a remedy and the additional delineation will take place during remedial design development."

10. **Section 1.6.2, Page 1-17:** In the first sentence of this section, please change the word "concentrations" to "constituents". In the Surface Soil subsection, the text states that screening levels were based on USEPA PRGs; however, there is no mention of the FDEP Soil Cleanup Target Levels (SCTLs). Please see Comment No. 3 above as it relates to this section.

***Response:** The text has been edited as follows:* "A human health risk assessment (HHRA) was conducted for the chemical constituents...." and "A comparison of the maximum detected surface soil concentrations to screening levels was conducted based on FDEP SCTLs and USEPA Region 4 SSLs."

11. **Figure 1-4, Page 1-18:** Please increase the scale of this figure to make it more readable.

***Response**: The scale on Figure 1-3 has been increased.*

12. **Section 1.6.2, Page 1-19:** In the "Subsurface Soil" subsection, the text states that screening levels were based on USEPA PRGs; however, there is no mention of the FDEP SCTLs being applied to the screening process. Please also see Comment No. 3 above as it relates to this section. In addition, the text states that SCTLs were exceeded; however, as mentioned above, a discussion of SCTLs is not included in this section.

***Response:** The text has been edited as follows:* "A comparison of the maximum detected surface soil concentrations to screening levels was conducted based on FDEP SCTLs and USEPA Region 4 SSLs."

13. **Section 1.6.3, Page 1-20:** Please delete the subsection titled as "State of Florida Risk Assessment" since only one baseline risk assessment was prepared for the site. In addition, two tables should be presented which identifies each COC, the maximum concentration of the COC detected, and the corresponding SCTL for both surface and subsurface soils, respectively.

***Response:** For Site 41, a risk assessment was prepared using both the USEPA and State of Florida guidelines and presented in the RI. The section has been changed to "Risk Assessment" without subsections.*

As requested, a table identifying the COCs and their corresponding concentrations and SCTLs has been added to the FS (page 1-21).

14. **Section 1.6.4, Page 1-21:** Please change the first paragraph as follows: "The data demonstrate that the soil at Site 41 is characterized by both lateral and vertical contamination by cPAHs, dieldrin, 4-4'-DDT and TRPH. Of these

contaminants, cPAHs and dieldrin exceed the industrial Florida Soil Cleanup Target Levels, at Chapter 62-770 Table II, and all four exceed the residential SCTLs, up to two orders of magnitude." Please change the last sentence in the second paragraph as follows: "The Navy concludes from the data and technical evaluation presented in this document that the site conditions support taking an active remedial action on the soils at Site 41."

***Response**: The text has been edited as follows:* "The data demonstrate that the soil at Site 41 is characterized by both lateral and vertical contamination by cPAHs, dieldrin, 4-4'-DDT and TRPH. Of these contaminants, cPAHS and dieldrin exceed the industrial Florida Soil Cleanup Target Levels (SCTLs), at F.A.C. Chapter 62-777 Table II, and all four contaminants exceed the residential SCTLs, up to two orders of magnitude. Given the location, types and levels of contaminants discovered, and other general circumstances found at Site 41, it is the Navy's considered judgment that some form of remedial action is warranted at this site.

Implementing a soil removal action allowing industrial land use at Site 41 will allow the Navy to properly and effectively manage future land use at the site and minimize threats to human health or the environment."

15. **Section 1.7, Page 1-22:** This section of the document should be moved to the beginning of the feasibility study since it describes how the feasibility study is organized.

***Response**: This change has been made. The text in Section 1.7 has been moved to the end of Section 1.0, Introduction (page 1-2).*

16. **Section 2.0, Page 2-1:** In the first paragraph, first sentence, please move "(e.g., ARARs) to the space after "regulatory requirements." ARARs are not an appropriate example for guidance, where the parenthetical is currently located. In the second sentence of this section, please delete "and thus derives the environmental medium of concern (soil)".

Response: *These changes have been made.*

17. **Section 2.1, Page 2-1:** In the first sentence of the second paragraph, please add "potential" before "ARARs."

Response: *This change has been made.*

18. **Section 2.1.1, Page 2-1:** In the last sentence of the first paragraph, please add, "unless waived" at the end of the sentence. Please revise the second sentence of the first paragraph as follows: "CERCLA and the NCP require that remedial actions comply with state ARARs when they are more stringent than federal ARARs." In the first sentence of the second paragraph, please replace "components" with "types." In the third sentence of the second paragraph, please delete "only."

Response: *These changes have been made.*

19. **Section 2.1.1, Page 2-2:** In the second paragraph, please rephrase the third sentence to read, "Once a requirement is identified as an ARAR, the selected remedy must meet, or waive, the ARAR, utilizing one of the waivers defined in Section 121 of CERCLA, 42 U.S.C. § 9621(d)(4)." Please delete, at the end of the existing sentence, "even if the ARAR is not required to assure protectiveness." It is not clear that this clause is helpful or even accurate. Please revise the third paragraph to read, "Other factors to be considered in the selection and implementation of a remedial action may be contained in advisories, criteria or other non-promulgated guidance. This guidance is termed "To Be Considered" under the NCP, *see* 40 CFR Section 300.515(h)(2). Such guidance may, either in the presence or absence of ARARs, be found to be useful in ensuring protection of human health and the environment." In the last sentence before the "Chemical-Specific ARARs" subsection, please delete

"location-," since there are no location-specific requirements identified in Table 2-1.

Response: *These changes have been made.*

20. **Table 2-1, Pages 2-3 and 2-4:** The ARARs listed in this table are too general. Please provide the specific section of each ARAR as they relate to each of the alternatives evaluated.

Response: *The ARARs table provided by the USEPA has been inserted in place of the previous version of Table 2-1.*

21. **Section 2.1.1, Page 2-5:** In the "Chemical Specific ARARs" subsection, the USEPA Region 4 Soil Screening Levels should be used in lieu of the USEPA Region 9 PRGs. In the last sentence of the "Action-Specific ARARs" subsection, please delete the last occurrence of "ARAR" and insert "requirement." For the "TBC Criteria" subsection, please see comment 19 above as it relates to TBCs and replace some of this text with text from the suggested language.

Response: *These changes have been made.*

22. **Section 2.1.2, Page 2-6:** Please change the word "chemicals" to contaminants" in the first sentence of the second paragraph. Perhaps "1" could be deleted in "RAO1", since it implies that there is more than one RAO, and it does not appear that there is more than one.

Response: *These changes have been made.*

23. **Section 3.1, Page 3-1:** Please spell out "GRA" as this is the first occurrence in the document. Even though "GRA" is the abbreviation of the subsection title, it appears to merit spelling out here for ease of reading.

Response: *This change has been made. The first occurrence of "GRAs" in the first paragraph of Section 3.1 has been spelled out as well as "GRAs" at the beginning of the third paragraph.*

24. **Section 3.1.2, Page 3-2:** Please reformat the paragraph at the top of the page.

Response: *This change has been made.*

25. **Section 3.1.3, Page 3-7:** In the second sentence of the second paragraph, please change the word "provides" to "includes".

Response: *This change has been made.*

26. **Section 3.1.4, Page 3-8:** Please add "CERCLA" in between "approved" and "off-site" in the last sentence of the first full paragraph on this page. In addition, this section should include a paragraph to introduce the three alternatives being evaluated such as the information presented in Section 4.2. The text of this section discusses aspects of Alternatives S41-1, S41-2, and S41-3 before the alternatives are introduced to the reader.

Response: *The text has been edited as follows:*

"Based on the selected COCs for surface and subsurface soil at Site 41, the basic components of alternative analysis were conducted as required. The three soil alternatives for Site 41 represent a range of actions including no action, removal action addressing principal threats and minimizing the need for long-term management, and removal eliminating the need for long-term management.

The three alternatives provide a range of treatment options for Site 41 and are listed below:

Alternative S41-1: No Action

Alternative S41-2: Surface and Subsurface Soil (Exceeding Industrial PRGs) Removal, Off-site Disposal, and LUCs

Alternative S41-3: Surface and Subsurface Soil (Exceeding Residential PRGs) Removal and Off-site Disposal"

27. **Section 4.1.1, Page 4-1:** Please add "and the NCP" to the end of the second sentence of the first paragraph.

Response: *This change has been made.*

28. **Section 4.1.2, Page 4-1:** Please delete "considered to be" in the first paragraph.

Response: *This change has been made.*

29. **Section 4.1.2, Page 4-2:** In the last paragraph of this section, please change "discussed at a public meeting, if required and requested" to "made available to the public".

Response: *This change has been made.*

30. **Section 4.2, Page 4-4:** In the "Description" subsection at the bottom of the page, please add "with residual contamination exceeding residential standards."

Response: *This change has been made.*

31. **Section 4.2, Page 4-5:** In the third bulleted item, please add "to restrict use of the site to industrial uses only." The "Component 2: Off-Site Disposal" subsection states that it is anticipated that soil could be disposed in a Subtitle D landfill, but in Alternative S41-3, it mentions the possibility of treatment to meet LDRs. Please clarify how LDRs may be triggered under Alternative S41-3, where more soil is likely to have an average lower concentration of contaminants, but would not be triggered under this alternative, where it is

intended to remove only the more contaminated soil under a hotspot removal type scenario.

Response: *LDRs would not be triggered under S41-3. The text under Component 3 of S41-3 (pg. 4-10) has been edited as follows:* "It is assumed that all soil excavated and removed from the site will be characterized as non-hazardous and will be disposed of at a RCRA Subtitle D landfill. Samples of the excavated soil would be collected and analyzed to ensure that the soil will comply with the landfill requirements.

No long-term monitoring or maintenance (i.e., LUCs) would be required under Alternative S41-3."

32. **Section 4.2, Page 4-7:** Please add "reporting" in between "annual visual inspections" and "and five-year review" in the last sentence of the first full paragraph on this page. In the third sentence of the Threshold Criteria subsection, please change "humans" to "human health". In addition, the last sentence on this page states that Alternative S41-2 would provide a moderate level of protection for human health and environmental resources both on and off base. Please clarify how this alternative would provide protection for resources off base.

Response: *Alternative S41-2 would not provide protection off base. The text has been edited as follows:* "Alternative S41-2 would provide a moderate level of protection for human health and environmental resources on the base."

33. **Section 4.2, Page 4-8:** Long-term management and the estimated time to achieve the RAO should be stated as lasting *at least* 30 years.

Response: *This change has been made.*

34. **Section 4.2, Page 4-10:** Component 2: Offsite Disposal and Compliance with ARARs. See Comment 31.

Response: *This change has been made. The text under Component 3 of S41-3 (pg. 4-10) has been edited as follows:* "It is assumed that all soil excavated and removed from the site will be characterized as non-hazardous and will be disposed of at a RCRA Subtitle D landfill. Samples of the excavated soil would be collected and analyzed to ensure that the soil will comply with the landfill requirements.

No long-term monitoring or maintenance (i.e., LUCs) would be required under Alternative S41-3."

35. **Section 5.1.2, Page 5-2:** Worker safety regulations are not ARARs, although they may be required and need to be taken into account during the implementation of any remedial action. Please delete the text referring to worker and public safety. Please add text discussing as appropriate a comparison of meeting any of the current ARARs.

Response: *This change has been made. The text has been edited as follows:* "Alternatives S41-2 and S41-3 would comply with chemical-specific and action-specific ARARs and take into consideration TBCs."

36. **Section 5.1.3, Page 5-2:** In the Magnitude of Residual Risks subsection, the text states that all three alternatives, when implemented, would not produce or leave any residual requiring treatment and/or disposal posing any future potential risk to the environment. This statement is not entirely true. Since the site has not been fully characterized, there is the potential that Alternatives S41-1 and S41-2 could potential result in a future potential risk to the environment.

Response: *Agreed. The text has been edited as follows:* "Alternatives S41-1 and S41-2 would leave soils exceeding residential criteria and require LUCs. Although not a component of the remedy, 5-year reviews would be required per CERCLA 121(c).

Alternative S-41-3, when implemented, would not produce or leave any residuals requiring treatment and/or disposal posing any future potential risk to the environment."

37. **Section 5.1.4, Page 5-3:** Please note that this section should address the degree to which the alternatives reduce the mobility, toxicity or volume of contaminants through treatment. Except for the possibility of treating the excavated soil onsite prior to transporting offsite for disposal, the two active remedial alternatives do not utilize treatment to reduce the mobility, toxicity or volume through treatment. This section should explain why neither of the two active alternatives utilizes treatment. Discussion of natural processes in a paragraph concerning treatment is potentially confusing to the public, as the public may assume that such natural processes are considered treatment. They are not. Please move this text to another section.

Response: *Agreed. The text has been edited as follows:* "This criterion addresses the degree to which each alternative permanently and significantly reduces mobility, toxicity, or volume of hazardous constituents in the soil. Alternative S41-1 would not reduce mobility of chemical constituents at Site 41. Alternatives S41-2 and S41-3 would not permanently and significantly reduce mobility of chemical constituents at Site 41 because there would be no treatment, only off-site disposal."

38. **Section 5.1.5, Page 5-3:** Please clarify why Alternative S41-2 requires 30 years to reach its RGO. Just because the alternative utilizes LUCs as a component of the remedy does not imply that it does not reach its RGO for 30 years. Will it not reach its RGO upon implementation of the active portion of the remedy and LUCs? Please clarify.

Response: *The text has been edited as follows:* "Alternatives S41-2 and S41-3, would protect human health once completed. Alternatives S41-2 and S41-3 have an estimated remedial time to reach objectives of less than 1 year."

39. **Table 5-1, Page 5-6:** In the "Compliance with Applicable or Relevant and Appropriate Requirements" section of the table, the text states that the "Compliance with Other Criteria" meets NAS Whiting Field requirements. It is not clear what the NAS Whiting Field requirements are. Please clarify.

Response: *The table has been edited as follows:*

"Compliance with Other Criteria" - "Not applicable" – "Not applicable"

40. **Table 5-1, Page 5-8:** In the row titled "Time Until Remedial Response Objectives Are Achieved", the response for Alternative S41-1 should be "RAOs not achieved" since the no action alternative will not result in RAOs being met.

Response: *Agreed. This change has been made.*

41. **Table 5-1, Page 5-9:** In the "Cost" column for Alternative S41-2, the costs for the 5-Year Review and Land Use Controls should reflect the costs over a 30-year period and a footnote should be included to indicate that these costs are estimated over a 30-year period.

Response: *Agreed. This change has been made.*

Florida Department of Environmental Protection
Bob Martinez Center
2600 Blair Stone Road
Tallahassee, Florida 32399-2400

Charlie Crist
Governor

Jeff Kottkamp
Lt. Governor

Michael W. Sole
Secretary

May 14, 2010

Mr. Benjamin T. "Tread" Kissam, P.G.
Department of the Navy
Naval Facilities Engineering Command Southeast
Naval Air Station Jacksonville
Building 903
Post Office Box 30
Jacksonville, Florida 32212-0030

RE: Feasibility Study for Site 41, Revision 1, Former Pesticide Storage Building 1485C, Naval Air Station Whiting Field, USEPA ID #FL2 170 023 244, Milton, Florida (Tetra Tech NUS, Inc., April 2, 2010)

Dear Mr. Kissam:

I have reviewed the above document dated April 2, 2010 which was received on April 5, 2010 by email. The purpose of the Feasibility Study (FS) report for Site 41 is to develop remedial alternatives to address threats to human health and the environment resulting from contaminated soil. Remedial Action Objectives (RAOs) are used to develop, screen, and evaluate potential remedial alternatives to meet the objectives. The document states "The data collected at Site 41 confirm the presence of carcinogenic polynuclear aromatic hydrocarbons (cPAHs), dieldrin, 4-4-dichlorodiphenyltrichloroethane (DDT), and total recoverable petroleum hydrocarbons (TRPH) contamination in both surface and subsurface soils. Although the cumulative human health risk presented by these contaminants is within USEPA's 10^{-4} to 10^{-6} risk range, the levels of cPAHs and dieldrin found at the site exceed Florida's Industrial soil cleanup target levels (SCTLs) as established under Chapter 62-777, Florida Administrative Code (FAC), and all four contaminants exceed Florida Residential (i.e., unrestricted use) SCTLs by up to two orders of magnitude." The document goes on to state "The National Oil and Hazardous Substances Pollution Contingency Plan (NCP) outlines the process to be followed when determining whether remedial actions must be undertaken in order to comply with CERCLA's requirements. While the NCP generally requires the establishment of unacceptable risk before proceeding to an evaluation of Applicable or Relevant and Appropriate Requirements (ARARs) during the Feasibility Study (FS), USEPA risk assessment guidance also recognizes that chemical-specific standards (such as Florida's SCTLs) may be considered in determining whether current or future exposures present an unacceptable risk to human health or the environment warranting remedy implementation. Given the location, types and levels of contaminants discovered, and other general circumstances found at Site 41, it is the Navy's considered judgment that some form of remedial action is warranted at this site." The Florida Department of Environmental Protection (FDEP) concurs with this language and assessment of the data by the Navy. Based on the detailed screening of technologies and process options presented in the report, the following three remedial alternatives were developed by the Navy for soil at Site 41. The first is Alternative S41-1 which is No Action. The second alternative is Alternative S41-2 which is Surface and Subsurface Soil (exceeding Industrial Preliminary

Remediation Goals which were established to be the FDEP's Industrial SCTLs) Removal, Off-site Disposal, and Land Use Controls (LUCs). The final remedial alternative is Alternative S41-3 which is Surface and Subsurface Soil (Exceeding Residential Preliminary Remediation Goals which were established to be the FDEP's Residential SCTLs) Removal, and Off-site Disposal. FDEP understands Alternative S41-1 will not be chosen as the final remedy since it does not satisfy all of the evaluation criteria. Of the remaining two remedial alternatives, Alternative S41-2 and Alternative S41-3, FDEP will concur with whichever alternative is chosen by the Navy as the final surface and subsurface soil remedy for Site 41. However, following my review of the Comparative Analysis of Alternatives section in this report, it is my opinion the only key difference in these two alternatives according to the CERCLA evaluation criteria is cost. Since the differential in funding required between cleaning up to residential (unrestricted) and industrial (which requires LUCs) appears to be relatively minimal (the difference in capital cost for these two Alternatives is $26,000.00 and the overall difference in cost after 30 years is $5,000.00), I suggest that the Navy may want to consider this in the remedy selection process. Please notify this office upon your selection.

Thank you for the opportunity to review this document. If you require additional clarification, or other assistance, please feel free to contact me at 850/245-8999.

Sincerely,

John Winters, P.G.
Remedial Project Manager

JJC JJC ESN ESN

RESPONSE TO FDEP COMMENTS ON DRAFT FEASIBILITY STUDY FOR OPERABLE UNIT 27 - SITE 41 FORMER PESTICIDE STORAGE BUILDING 1485C NAS WHITING FIELD (Rev. 1 – April 5, 2010)

FDEP Comments issued May 14, 2010, from Mr. John Winters, FDEP, to Mr. Tread Kissam, RPM NAVFAC SE.

1. FDEP narrative summarizing and explaining their understanding of and agreement with the Draft FS (Rev. 1) for Site 41.

***Response**: Narrative noted and agreed to. Due to various issues and discussions, as well as other regulatory comments (see USEPA) since the submittal of the Draft FS for Site 41 (April 5, 2010), some changes have been made to the document that will require additional review.*

Of most concern during previous reviews of the Draft FS for Site 41 was/is the "Conclusion or Basis for Action" language.

The current conclusion language in Section 1.6.4 has been edited as follows:

"The data demonstrate that the soil at Site 41 is characterized by both lateral and vertical contamination by cPAHs, dieldrin, 4-4'-DDT and TRPH. Of these contaminants, cPAHS and dieldrin exceed the industrial Florida Soil Cleanup Target Levels (SCTLs), at F.A.C. Chapter 62-777 Table II, and all four contaminants exceed the residential SCTLs, up to two orders of magnitude. Given the location, types and levels of contaminants discovered, and other general circumstances found at Site 41, it is the Navy's considered judgment that some form of remedial action is warranted at this site.

Implementing a soil removal action allowing industrial land use at Site 41 will allow the Navy to properly and effectively manage future land use at the site and minimize threats to human health or the environment."

Please see the revised Draft FS for Site 41 (Rev. 2) reflecting these and other changes.

With regard to the issue of the remedial alternative cost estimates and the FDEP's recommendation to consider the slight cost difference between Alt S41-2 and Alt S41-3, these have also been changed (some significantly) and are reflected in the revised document.

Again, please see the revised Draft FS for Site 41 (Rev. 2) reflecting these changes.