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FINAL RECORD OF DECISION FOR OPERABLE UNIT 10 (OU 10) SITE 21 GOLF COURSE MAINTENANCE AREA NAS CECIL FIELD FL

9/1/2005

TETRA TECH NUS INC

Comprehensive **L**ong-term **E**nvironmental **A**ction **N**avy

CONTRACT NUMBER N62467-94-D-0888

Record Of Decision
Operable Unit 10, Site 21
Golf Course Maintenance Area

Naval Air Station Cecil Field
Jacksonville, Florida

Contract Task Order 0078

September 2005

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

TETRA TECH NUS, Inc.

RECORD OF DECISION
OPERABLE UNIT 10, SITE 21
GOLF COURSE MAINTENANCE AREA

NAVAL AIR STATION CECIL FIELD
JACKSONVILLE, FLORIDA

COMPREHENSIVE LONG-TERM
ENVIRONMENTAL ACTION NAVY (CLEAN) CONTRACT

Submitted to:
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Naval Facilities Engineering Command
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This document that describes the Record of Decision for Operable Unit 10, Site 21, Golf Course Maintenance Area at Naval Air Station Cecil Field, Jacksonville, 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.

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TABLE OF CONTENTS

SECTION **PAGE NO.**

ACRONYMS v

1.0 DECLARATION OF THE RECORD OF DECISION 1-1
1.1 SITE NAME AND LOCATION 1-1
1.2 STATEMENT OF BASIS AND PURPOSE 1-1
1.3 ASSESSMENT OF THE SITE 1-1
1.4 DESCRIPTION OF THE SELECTED REMEDY 1-1
1.5 STATUTORY DETERMINATIONS 1-2
1.6 DATA CERTIFICATION CHECKLIST 1-3
1.7 SIGNATURE AND SUPPORT AGENCY ACCEPTANCE OF REMEDY 1-3

2.0 DECISION SUMMARY 2-1
2.1 SITE NAME, LOCATION, AND DESCRIPTION 2-1
2.2 SITE HISTORY AND ENFORCEMENT ACTIVITIES 2-2
2.2.1 Site 21 History 2-2
2.2.2 Site Investigations 2-3
2.3 HIGHLIGHTS OF COMMUNITY PARTICIPATION 2-4
2.4 SCOPE AND ROLE OF OPERABLE UNIT 2-4
2.5 SUMMARY OF SITE CHARACTERISTICS 2-5
2.5.1 Geology and Hydrogeology 2-5
2.5.2 Nature and Extent of Contamination 2-6
2.5.3 Current and Potential Future Site Uses 2-8
2.6 SUMMARY OF SITE RISKS 2-8
2.6.1 Human Health Risk Assessment 2-8
2.6.2 Ecological Risk Assessment 2-9
2.7 PRELIMINARY REMEDIAL GOALS 2-10
2.7.1 Soil PRG 2-10
2.7.2 Groundwater PRG 2-10
2.8 DESCRIPTION OF REMEDIAL ALTERNATIVES 2-10
2.8.1 Soil Remedial Alternatives 2-10
2.8.2 Groundwater Remedial Alternatives 2-12
2.9 SUMMARY OF COMPARATIVE ANALYSIS OF ALTERNATIVES 2-14
2.10 SELECTED REMEDY 2-14
2.10.1 Summary of Rationale For Remedy Selection 2-14
2.10.2 Remedy Description 2-15
2.10.3 Summary of Estimated Remedy Costs 2-17
2.10.4 Expected Outcomes of the Selected Remedy 2-17
2.11 STATUTORY DETERMINATIONS 2-18
2.11.1 Protection of Human Health and the Environment 2-18
2.11.2 Compliance with Applicable or Relevant and Appropriate Requirements 2-18
2.11.3 Other Criteria, Advisories, or Guidance To Be Considered for This Remedial Action 2-19
2.11.4 Cost-Effectiveness 2-20
2.11.5 Utilization of Permanent Solutions and Alternative Treatment Technologies 2-20
2.11.6 Preference for Treatment as a Principal Element 2-21
2.11.7 Five-Year Review Requirement 2-21
2.12 DOCUMENTATION OF SIGNIFICANT CHANGES 2-21

TABLE OF CONTENTS (Continued)

SECTION **PAGE NO.**

REFERENCES R-1

APPENDICES

A RESPONSIVENESS SUMMARY
B ESTIMATED COSTS OF SELECTED REMEDY

TABLES

NUMBER

1-1 Data Certification Checklist
2-1 Summary of Soil Analytical Data and UCL Calculations
2-2 Summary of Positive Detection in Existing Groundwater Data
2-3 Summary of Comparative Analysis of Soil Remedial Alternatives
2-4 Summary of Comparative Analysis of Groundwater Remedial Alternatives
2-5 Explanation of Detailed Analysis Criteria
2-6 Federal Chemical-Specific ARARs for Selected Remedy
2-7 State Chemical-Specific ARARs for Selected Remedy
2-8 Federal Location-Specific ARARs for Selected Remedy
2-9 State Location-Specific ARARs for Selected Remedy
2-10 Federal Action-Specific ARARs for Selected Remedy
2-11 State Action-Specific ARARs for Selected Remedy

FIGURES

NUMBER

2-1 General Location Map
2-2 Site Vicinity Map
2-3 General Site Arrangement
2-4 Soil Concentrations Greater than IBDS and Three Times SCTLs
2-5 Groundwater Results Greater Than Criteria - Existing and RI Data
2-6 Block Flow Diagram, Selected Remedy
2-7 Land Use Control Parcel

ACRONYMS

µg/L	microgram(s) per liter
ABB-ES	ABB Environmental Services, Inc.
AOI	Area of Interest
ARAR	Applicable or relevant and appropriate requirement
BCT	BRAC Cleanup Team
bgs	Below ground surface
BHC	Benzene hexachloride
BRA	Baseline Risk Assessment
BRAC	Base Realignment and Closure
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CFR	Code of Federal Regulations
COC	Chemical of concern
EBS	Environmental Baseline Survey
EE	Envirodyne Engineers
EE/CA	Engineering Evaluation/Cost Analysis
FAC	Florida Administrative Code
FDEP	Florida Department of Environmental Protection
FFA	Federal Facility Agreement
FS	Feasibility Study
G&M	Geraghty & Miller
GAC	Granular activated carbon
GCTL	Groundwater Cleanup Target Level
gpm	Gallon(s) per minute
HLA	Harding Lawson Associates
HSWA	Hazardous and Solid Waste Amendments
IAS	Initial Assessment Study
IBDS	Inorganic Background Data Set
IR	Installation Restoration
IRA	Interim Removal Action
LUC	Land use control
MCL	Maximum Contaminant Level
mg/kg	Milligram(s) per kilogram
NAS	Naval Air Station

NCP	National Oil and Hazardous Substances Pollution Contingency Plan
NPL	National Priorities List
NPW	Net present worth
O&M	Operation and maintenance
OSHA	Occupational Safety and Health Administration
OU	Operable Unit
PCB	Polychlorinated biphenyl
PPE	Personal protection equipment
PRE	Preliminary Risk Evaluation
PRG	Preliminary Remedial Goal
PSC	Potential Source of Contamination
RAO	Remedial Action Objective
RCRA	Resource Conservation and Recovery Act
RD	Remedial Design
RFI	RCRA Facility Investigation
RI	Remedial Investigation
ROD	Record of Decision
SARA	Superfund Amendments and Reauthorization Act
SCTL	Soil Cleanup Target Level
SDWA	Safe Drinking Water Act
SMCL	Secondary MCL
SPECAP	Specific capacity
SPLP	Synthetic Precipitation Leaching Procedure
SVOC	Semivolatile organic compound
TAL	Target Analyte List
TBC	To be considered
TCL	Target Compound List
TRPH	Total recoverable petroleum hydrocarbons
TtNUS	Tetra Tech NUS, Inc.
U.S. EPA	United States Environmental Protection Agency
UCL	Upper confidence level
USCS	United Soil Classification System
VOC	Volatile organic compound

1.0 DECLARATION OF THE RECORD OF DECISION

1.1 SITE NAME AND LOCATION

Operable Unit (OU) 10, Site 21 consists of the contaminated soil and groundwater identified at the Golf Course Maintenance Area at the former Naval Air Station (NAS) Cecil Field, Jacksonville, Florida [United States Environmental Protection Agency (U.S. EPA) ID FL5 170 022 474]. Site 21 is located within the Golf Course in the northwestern corner of the former Main Base.

1.2 STATEMENT OF BASIS AND PURPOSE

This Record of Decision (ROD) presents the selected remedy for contaminated soil and groundwater at OU 10, Site 21 at the former NAS Cecil Field. The selected remedial actions were chosen in accordance with the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) of 1980, as amended by the Superfund Amendments and Reauthorization Act (SARA) of 1986, and to the extent practicable, the National Oil and Hazardous Substances Pollution Contingency Plan (NCP) [40 Code of Federal Regulations (CFR) 300]. This decision document was prepared in accordance with U.S. EPA decision document guidance (1999). This decision is based on the Administrative Record for the site. The United States Department of the Navy (Navy) and U.S. EPA Region 4 issue this ROD (jointly). The Florida Department of Environmental Protection (FDEP) concurs with the selected remedy.

1.3 ASSESSMENT OF THE SITE

The response actions selected in this ROD are necessary to protect the public health, welfare, or the environment from actual or threatened releases of hazardous substances into the environment or of pollutants or contaminants from this site that may present an imminent and substantial endangerment to public health or welfare.

1.4 DESCRIPTION OF THE SELECTED REMEDY

OU 10, Site 21 is part of a comprehensive environmental investigation and cleanup currently being performed at the former NAS Cecil Field under the CERCLA program. This ROD addresses only OU 10, Site 21. The selected remedy eliminates unacceptable exposures to arsenic in soil and chlordane in groundwater. The selected remedy for OU 10, Site 21 includes monitored natural attenuation for groundwater and land use controls (LUCs) that will limit exposure to soil, prevent any residential reuse activities, and restrict extraction and prohibit consumption of groundwater from taking place at this location. The selected remedy was chosen based upon evaluation of site conditions, site-related risks,

future land use, applicable or relevant and appropriate requirements (ARARs), and Remedial Action Objectives (RAOs).

The major components of the selected remedy for Site 21 are as follows:

- LUCs in the form of deed restrictions will be implemented to prevent residential development of Site 21 and to restrict future uses of the surficial aquifer until the levels of contamination in the groundwater meet the State of Florida's Groundwater Cleanup Target Level (GCTL).

- Long-term groundwater monitoring will be performed by collecting and analyzing groundwater samples to verify that no unacceptable contaminant migration is occurring and to evaluate reductions in contaminant concentrations through dilution and naturally occurring processes such as biodegradation, dispersion, advection, and adsorption.

The Navy shall prepare in accordance with U.S. EPA guidance and submit to the U.S. EPA and FDEP, a LUC Remedial Design (RD) as well as all other post-ROD documents as specified in the Federal Facility Agreement (FFA) for the former NAS Cecil Field dated October 23, 1990 and further described in the 2003 Navy Principles.

1.5 STATUTORY DETERMINATIONS

The selected remedy is protective of human health and the environment, is cost effective, and complies with federal and State requirements that are legally applicable or relevant and appropriate to remedial action. The nature of the selected remedy for OU 10, Site 21 is such that ARARs will eventually be met through monitored natural attenuation for groundwater. The selected remedy represents the maximum extent to which permanent solutions and treatment technologies can be used in a practicable manner at this site. Of those alternatives that are protective of human health and the environment and that comply with ARARs, the selected remedy provides the best balance of trade-offs in terms of the five balancing criteria, while also considering the statutory preference for treatment. The selected remedy does not provide for treatment as a principal element; however, no source materials constituting principal threats are present at the site, and reductions in soil and groundwater contaminant concentrations are expected over time due to dilution and biological, dispersion, advection, and adsorption processes. Because this remedy would result in soil and groundwater with contaminant concentrations greater than health-based levels remaining on site, CERCLA Five-Year Reviews will be conducted to verify that the cleanup goals and RAOs are being achieved.

1.6 DATA CERTIFICATION CHECKLIST

The information required to be included in the ROD is summarized on Table 1-1. These data are presented in Section 2.0: Decision Summary of this ROD. Additional information, if required, can be found in the Administrative Record for OU 10, Site 21.

1.7 SIGNATURE AND SUPPORT AGENCY ACCEPTANCE OF REMEDY

J.L. MCCAULEY, P.E.
Director
Environmental Services
NAVFAC EFD SOUTH

Date 9/4/05

for WINSTON A. SMITH
Director
Waste Management Division
U.S. EPA Region 4

Date 9/14/05

TABLE 1-1

DATA CERTIFICATION CHECKLIST
OPERABLE UNIT 10, SITE 21 RECORD OF DECISION
NAVAL AIR STATION CECIL FIELD
JACKSONVILLE, FLORIDA

Information	ROD Reference
Chemicals of Concern (COCs) and their concentrations	Section 2.5.2; Tables 2-1 and 2-2 Figures 2-4 and 2-5 Pages 2-6 through 2-8
Baseline risk represented by the COCs	Section 2.6 Pages 2-8 and 2-9
Preliminary Remedial Goals (PRGs) established for the COCs	Section 2.7 Page 2-10
Disposition of source materials constituting principal threat	Section 2.2.2, 2nd and 3rd bullets Page 2-3
Current and reasonably anticipated future land and groundwater use scenarios used for risk assessment and ROD	Section 2.5.3 Page 2-8
Potential land and groundwater uses available at the site as a result of the selected remedy	Section 2.10.4 Page 2-17
Estimated capital, operation and maintenance (O&M), and total present worth costs of selected remedy. Discount rate used and timeframe over which these costs are projected	Section 2.10.3 Page 2-17 Appendix B
Key factors that lead to the selection of the remedy	Section 2.10.1 Pages 2-14 and 2-15

2.0 DECISION SUMMARY

2.1 SITE NAME, LOCATION, AND DESCRIPTION

OU 10 Site 21 is situated within the boundaries of the former NAS Cecil Field (U.S. EPA ID FL5 170 022 474), which is located 14 miles southwest of Jacksonville, Florida. The majority of Cecil Field is located within Duval County, but the southernmost part of the Facility is located in Clay County. NAS Cecil Field was established in 1941 and provided facilities, services, and material support for the operation and maintenance of naval weapons, aircraft, and other units of the operation forces as designated by the Chief of Naval Operations. Since the closure of NAS Cecil Field in September 1999, most of the Facility has been transferred to the Jacksonville Port Authority (now Jacksonville Airport Authority) and the City of Jacksonville. According to the City's reuse plan, Cecil Field will have multiple uses but will be used primarily for industrial and/or commercial activities.

OU 10, Site 21 consists of the contaminated soil and groundwater identified at the Golf Course Maintenance Area of NAS Cecil Field (see Figure 2-1). As shown on Figure 2-2, Site 21 is located at the northern end of an access road (formerly I Avenue) in the center of the golf course at NAS Cecil Field. As shown on Figure 2-3, the site includes Buildings 238, 370, 371, 397, 398, and 874 and the adjacent area [Harding Lawson Associates (HLA), 1999a].

The site is primarily unpaved and covers an area of about 1.5 acres. A drainage ditch forms part of the eastern border of the site. A fence and trees isolate the site from the golf course on the east, northeast and south. A large wooded area isolates the site from the golf course on the northwestern and western sides.

Building 238 is the golf course maintenance building and includes office space, a repair shop, and a fenced, sheltered storage area. Buildings 370 and 371 are metal storage sheds. Building 397, the pesticide storage building, is secured by a fence and includes secondary containment around a paved mixing area. A septic system south of Building 397 serves that building. A valve system is in place to prevent discharge of contaminated water into the septic field adjacent to Building 397. Building 398, the golf course storage building, is a Quonset hut with an earthen floor that is used to store maintenance equipment and vehicles. Building 874 is a public restroom that was served by a small adjacent septic field. All the buildings date to the 1950s, except Building 397, which was built in 1981 (HLA, 1999a).

North of Building 238 and adjacent to the ditch is a small concrete washdown pad. Prior to the construction of this pad, equipment was washed on the eastern side of Building 238, and the rinse water

followed a swale to the ditch (HLA, 1999a). An empty drum/can disposal pile was once located northwest of Building 371. Most of these drums and cans were removed prior to 1992 (HLA, 1999b).

Soil contaminated with arsenic and pesticides was delineated during pre-Remedial Investigation (RI) sampling activities. The contaminated soil was excavated and disposed off site [Tetra Tech NUS, Inc. (TtNUS), 2000 and 2002b]. Groundwater contaminated by DDD and chlordane was also identified in earlier studies and was further investigated during the RI. In addition, manganese was detected in two wells at concentrations greater than the background levels (TtNUS, 2001).

2.2 SITE HISTORY AND ENFORCEMENT ACTIVITIES

The first environmental studies for the investigation of waste handling and/or disposal sites at NAS Cecil Field were conducted between 1983 [Geraghty and Miller (G&M), 1983] and 1985 (G&M, 1985). These studies were followed in 1985 by an Initial Assessment Study (IAS) [Envirodyne Engineers (EE), 1985]. A Resource Conservation and Recovery Act (RCRA) Facility Investigation (RFI) was completed in 1988 (HLA, 1988).

NAS Cecil Field was placed on the National Priorities List (NPL) by the U.S. EPA in December 1989. An FFA for NAS Cecil Field was signed by FDEP, U.S. EPA, and the Navy in 1990. Following the listing of NAS Cecil Field on the NPL and the signing of the FFA, remedial response activities at the Facility have been completed under CERCLA authority. OU 10 is 1 of 12 OUs that have been identified. A Hazardous and Solid Waste Amendments (HSWA) permit was issued on October 13, 1996. The HSWA permit was last renewed on February 18, 2004 and is still in effect.

2.2.1 Site 21 History

Since its construction, the site has been used as a maintenance area for the golf course. Prior to construction, the area was undeveloped. The buildings were constructed in the 1950s, with the exception of Building 397, which was built in 1981. Site activities involved the storage and maintenance of golf course maintenance equipment and included cleaning and rinsing chemical-dispensing equipment and preparation of chemical solutions. The chemicals used included fungicides, nematocides, insecticides, and herbicides. Rinsing occurred at one of two places, on the eastern side of Building 238 or on a concrete pad on the northern side of the site. At both locations, rinse water discharged into a ditch along the eastern side of the site (HLA, 1999b).

In a 1992 screening study, Site 21 was referred to as Site A in the Golf Course Maintenance Area. For the Environmental Baseline Survey (EBS) [ABB Environmental Services (ABB-ES), 1994], the site was designated as Area of Interest (AOI) 21. In March 1999, when it was determined that soil contamination

was present over a large area, the site was redesignated as Potential Source of Contamination (PSC) 21. In February 2000, when the presence of groundwater contamination was confirmed, the area was again redesignated as Installation Restoration (IR) Site 21 within OU 10.

2.2.2 Site Investigations

The following investigations and studies have been conducted in and around Site 21:

- November 1991 - A Site Screening Study was performed by ABB-ES. Six surface soil samples and three sediment samples were collected and analyzed for Target Compound List (TCL) volatile organic compounds (VOCs), semivolatile organic compounds (SVOCs), pesticides and polychlorinated biphenyls (PCBs) and Target Analyte List (TAL) inorganic analytes (HLA, 1999a).

- January 1997 through December 1998 - Phase II Investigation of AOI 21. Twenty-nine surface soil samples and eight subsurface soil samples were collected and analyzed for TCL VOCs, SVOCs, pesticides, and PCBs, organophosphate pesticides and herbicides, and TAL inorganic analytes. One shallow monitoring well was installed in each of the two septic fields at the site. The groundwater samples were analyzed for TCL VOCs, SVOCs, pesticides, and PCBs and TAL inorganic analytes (HLA, 1999a).

- June 1999 through March 2000 - Investigation of PSC 21. Samples were collected to delineate soil and groundwater contamination. Seventy-two surface soil samples and 15 subsurface soil samples were collected. Six wells were installed and sampled, and two existing wells were sampled. Analyses were limited to the contaminants that had been detected in previous investigations. Typically, samples were analyzed for pesticides, herbicides, and arsenic. The results were used to delineate soil contamination for excavation and disposal. Three additional surface soil samples were collected and analyzed using the Synthetic Precipitation Leaching Procedure (SPLP) to evaluate the impact of soil contamination on groundwater. The groundwater investigation identified one well with DDD and chlordane concentrations greater than FDEP criteria.

- April 2000 through February 2001 - Site 21 RI. Samples were collected to provide data required for the Preliminary Risk Evaluation (PRE) and for evaluation remedial alternatives in the Feasibility Study (FS). One permanent monitoring well was installed and sampled at a location outside the area of DDD and chlordane exceedances where a previous soil sample SPLP result suggested that dieldrin could potentially leach into the groundwater. The groundwater sample was analyzed for pesticides using a modified method to ensure that the low detection limit required for dieldrin could be obtained. In addition, geotechnical soil samples were collected and specific capacity (SPECAP) tests were

performed on two existing monitoring wells to determine site-specific hydrogeological conditions (TtNUS, 2001).

- February through October 2001 - Site 21 FS. Based upon the results of previous investigations, groundwater chemicals of concern (COCs) were identified and Preliminary Remedial Goals (PRGs) established. Groundwater remedial technologies were screened, and remedial alternatives were assembled, analyzed, and compared.

- May through June 2001 - First Interim Removal Action (IRA). Approximately 2,999 tons of soil with concentrations of pesticides (chlordane, DDT, toxaphene, and dieldrin), arsenic, and TRPH greater than FDEP Soil Cleanup Target Levels (SCTLs) for industrial exposure were excavated and disposed off site (CH2M Hill, 2001).

- August 2002 - Second IRA. A total of 78.87 tons of non-hazardous arsenic-contaminated soil wereremoved. All soil as delineated by a registered surveyor was removed in accordance with the Final Dig and Haul Design (TtNUS, 2002a) and was disposed off site (CH2M Hill, 2003).

- October 2003 - A revised FS was submitted that took into account the second IRA.

2.3 HIGHLIGHTS OF COMMUNITY PARTICIPATION

Public notices of the availability of the Proposed Plan (TtNUS, 2005) were placed in the Metro section of the *Florida Times-Union* on July 8, 2005. A 30-day comment period was held from July 7 to August 8, 2005. Public comments and the responses to these comments are presented in the Responsiveness Summary provided in Appendix A.

Documents pertaining to OU 10, Site 21 are available to the public at the Information Repository located at the former Memorial Chapel, 6112 New World Avenue, Cecil Commerce Center, Jacksonville, Florida 32221 [Telephone (904) 777-1900]. This ROD will become part of the Administrative Record File [NCP §300.825(a)(2)].

2.4 SCOPE AND ROLE OF OPERABLE UNIT

The environmental concerns at the former NAS Cecil Field are complex. As a result, work at the 24 sites in the IR Program has been organized into 12 OUs. More than 200 other areas have undergone or are undergoing evaluation in the Base Realignment and Closure (BRAC) and Petroleum Programs.

This ROD is the final action for OU 10, Site 21. Final RODs have been approved for OU 1 through OU 4; OU 5, Site 14; OU 6 through OU 8; and OU 9, Sites 36/37; OU 10, Site 25; OU 11, Site 45; and OU 12, Sites 32, 42, and 44 and Old Golf Course. An RI, Baseline Risk Assessment (BRA), and a draft FS have also been prepared for OU 5, Site 15. An Engineering Evaluation/Cost Analysis (EE/CA) report for OU 9, Site 49 was finalized in February 2002. RI and FS reports were finalized for OU 9, Sites 57 and 58 in August and October 2002, respectively. An RI is in progress at OU 9, Site 59. Decision documents are forthcoming for Sites 49, 57 and 58, and 59.

Investigations at OU 10, Site 21 indicated the presence of soil and groundwater contamination from past operating practices. This contamination could pose an unacceptable human health risk if residential development occurred at the site or if the groundwater was used as a potable water source.

The following RAOs were established for soil and groundwater at OU 10, Site 21:

- Prevent unacceptable risk from exposure to soil with concentrations of arsenic greater than the background value.

- Prevent unacceptable risk from ingestion of groundwater with concentrations of chlordane greater than the FDEP GCTL and the federal Maximum Contaminant Level (MCL).

- Reduce concentrations of chlordane in groundwater to less than the FDEP GCTL and federal MCL.

It is expected that the remedy documented in this ROD will achieve these RAOs.

2.5 SUMMARY OF SITE CHARACTERISTICS

Contaminant sources, detected concentrations, fate and transport, contaminated media, and geologic and hydrogeologic conditions of OU 10, Site 21 are discussed in Sections 4.0, 5.0, and 6.0 of the OU 10, Site 21 RI Report (TtNUS, 2001). These site characteristics are summarized in the following paragraphs.

2.5.1 Geology and Hydrogeology

Shallow soil to a depth of 8 feet below ground surface (bgs) at Site 21 was composed of 74 to 85 percent fine sand and 15 to 26 percent silt and clay, with a United Soil Classification System (USCS) classification of SM. Specific gravity of the soil ranged from 2.64 to 2.73, and porosity ranged from 37.9 to 42.3 percent.

Three main hydrogeologic units underlie the site. These units, in ascending order, are the Floridan aquifer system, the intermediate aquifer system or confining unit, and the surficial aquifer.

Depth to groundwater at Site 21, as measured in April 2000, ranged from approximately 4.5 to 9.5 feet bgs. The surficial aquifer system in which the wells are installed is approximately 90 to 100 feet thick at NAS Cecil Field, although wells at Site 21 monitor only the shallow zone to depths of 15 feet bgs.

Based on the water level measurements taken during the RI, groundwater flows to the south across the site. This direction of flow is consistent with nearby Site 11. The groundwater gradient at the site is approximately 0.017.

The velocity of groundwater flow can be calculated from a modified form of Darcy's equation:

$$V_h = K_h \times i/n_e$$

Where,

V_h is horizontal velocity, feet/day
K_h is horizontal hydraulic conductivity, feet/day
i is hydraulic gradient, dimensionless
n_e is effective porosity, dimensionless (assumed at 0.15 for fine sands)

Because the contamination is limited to the shallow zone of the surficial aquifer, groundwater velocity was evaluated only in that zone. The K_h value used was the average of the values derived from the SPECAP test data for wells CEF-P21-1S and CEF-P21-5S.

K_h = 3.3 feet/day
i = 0.017
n_e = 0.15.

The resulting V_h is 0.37 feet/day or 136 feet/year.

2.5.2 Nature and Extent of Contamination

2.5.2.1 Soil

During the RI, several pesticides (4,4'-DDT, chlordane, dieldrin, toxaphene), arsenic, and TRPH were detected in soil at concentrations in excess of FDEP SCTLs for industrial exposure. Methylene chloride, 4-nitrophenol, and alpha-, beta-, and gamma-hexachlorocyclohexane(BHC) were also detected in soil but

at concentrations less than their SCTLs for industrial exposure. The presence of these chemicals in the soil is probably due to golf course maintenance activities at the site, including the handling and application of pesticides. A statistical evaluation was conducted to determine the areas of soil requiring removal so that the site-wide 95-percent upper confidence limit (UCL) of the remaining concentrations of each contaminant was equal to or less than the SCTL for direct industrial exposure. The results of this statistical evaluation are presented in the Action Memorandum for PSC 21 (TtNUS, 2000).

A removal action was conducted in May and June 2001 (CH2M Hill, 2001) during which approximately 2,999 tons of contaminated material were excavated and disposed off site so that the 95-percent UCLs of the residual concentrations of pesticides, arsenic, and TRPH in soil were equal to or less than FDEP industrial SCTLs. A second removal action was conducted in August 2002 during which a total of 78.87 tons of non-hazardous, arsenic-contaminated soil were removed and disposed off site (CH2M Hill, 2003).

Table 2-1 presents a summary of post-removal action soil analytical data, including minimum and maximum detected concentrations and 95-percent UCLs of remaining concentrations of arsenic, pesticides (4,4'-DDT, chlordane, dieldrin, toxaphene), and TRPH computed for each of five 0.5-acre parcels used to evaluate a potential future residential land use scenario at the site. Table 2-1 also compares these data to FDEP residential and leachability SCTLs and, for arsenic only, to the site-specific IBDS value (HLA, 1998). As can be seen from Table 2-1, the 95-percent UCLs of the remaining concentrations of pesticides and TRPH no longer exceed the FDEP residential or leachability SCTLs in any of the Site 21 parcels. However, the 95-percent UCL of remaining concentrations of arsenic still exceeds the IBDS value in Parcel Nos. 2, 3, and 5. In addition, soil with arsenic concentrations greater than three times the residential SCTL remains on site. Accordingly, the site is not acceptable for unrestricted reuse, and arsenic was retained as a soil COC for Site 21. Post-removal action exceedances of the IBDS value in soil, including locations where arsenic concentrations are greater than three times the residential SCTL, are illustrated on Figure 2-4.

2.5.2.2 Groundwater

During pre-RI investigations, DDD and chlordane were detected in the groundwater at well P21-01S at concentrations greater than their respective FDEP GCTLs of 0.10 and 2.0 micrograms per liter (µg/L) (FDEP, 1999a). Also during pre-RI investigations, manganese was detected in groundwater at two locations at concentrations slightly in excess of twice the NAS Cecil Field site-specific IBDS value but, because manganese was not a component of the chemicals used at Site 21, these detections were considered not to be site related. During the RI, neither dieldrin nor any other pesticide was detected in the groundwater sample (CEF-P21-07S) collected from the newly installed monitoring well at the location where a soil sample SPLP result suggested that dieldrin could potentially leach into the groundwater.

Table 2-2 presents a summary of DDD and chlordane detections in groundwater during the pre-RI and RI sampling events.

As shown in Table 2-2, DDD was detected slightly in excess of its FDEP GCTL at location P21-01S during the January 1997 sampling event. During a subsequent sampling event at that same location in May 1999, the DDD concentration was reported to be undetected; however, the detection limit (0.4 µg/L) for this sample was greater than the GCTL. The sum of alpha- and gamma-chlordane was also in excess of the total chlordane GCTL (2.0 µg/L) at P21-01S during both the January 1997 sampling event (3.4 µg/L) and the June 1999 sampling event (2.9 µg/L). Because the DDD exceedance concentration in 1997 was so close to the GCTL, and because chlordane is present at a higher concentration at the same location, no further analysis of DDD was performed.

Accordingly, only chlordane was retained as a COC for the Site 21 surficial aquifer groundwater. Chlordane contamination is limited to the shallow zone of the surficial aquifer and does not extend beyond approximately 15 feet bgs. Figure 2-5 presents the DDD and chlordane results from previous investigations and the RI. This figure also shows the plume outline as defined by the FDEP groundwater criterion for total chlordane (2.0 µg/L). The size of the chlordane plume is estimated to be less than 30 feet in diameter and centered on well CEF-P21-01S.

The source of chlordane as detected in the groundwater at Site 21 appears to be a former septic field. Chlordane was detected in soil samples but only at concentrations less than the FDEP SCTL for leachability to groundwater. In addition, chlordane was not detected in soil samples near the plume. The origin of the chlordane is assumed to be related to routine golf course maintenance activities.

2.5.3 Current and Potential Future Site Uses

Site 21 is currently used as the Golf Course Maintenance Area. The future use for this site is continued use as the Golf Course Maintenance Area. Site RAOs support industrial risk exposure; therefore, potential future uses for Site 21 are limited to industrial and/or commercial land use.

2.6 SUMMARY OF SITE RISKS

2.6.1 Human Health Risk Assessment

The concentrations of chlordane detected in groundwater were greater than the FDEP GCTL. The PRE performed as part of the RI indicated that the carcinogenic risk level associated with groundwater exposure is 1.5 x 10^{-5}, which is within the U.S. EPA's carcinogenic target risk range but is greater than

FDEP's carcinogenic target risk of 10^{-6}. Concentrations of arsenic remain in soil at concentrations greater than the background value following the soil excavations.

The 95-percent UCLs of all soil COCs remaining at the site following the removal actions are less than their respective industrial FDEP SCTLs and have concentrations less than their respective leachability criteria. Overall, for industrial exposure, the cumulative post-removal hazard index is significantly less than 1.0 and cumulative cancer risk is less than 1×10^{-6}, with arsenic at a UCL concentration slightly less than its Cecil Field IBDS value.

The post-removal UCLs of all soil COCs except arsenic are less than their respective residential PRGs. The site was subdivided into ½-acre parcels, and a post-removal arsenic UCL was calculated for each parcel. The arsenic UCLs of three parcels exceed the Cecil Field IBDS value. Overall, for residential exposure, the cumulative post-removal hazard index for arsenic in soil in any parcel is less than 1.0. The cumulative cancer risk in the parcels ranges from 2.4×10^{-6} to 3.8×10^{-6}, within U.S. EPA's target risk range but greater than FDEP's target risk of 10^{-6}.

The PRE is a screening-level evaluation of potential risks from site constituents to human receptors at the site. The risks calculated in a PRE are derived by a comparison of exposure concentrations to SCTLs or PRGs. These SCTLs and PRGs are derived using default exposure assumptions established by the FDEP and U.S. EPA, respectively. Because there are no deviations between the Navy and the regulatory agencies regarding those exposure assumptions or pathways defined by the regulatory agencies for residential and industrial exposures, this approach was used to streamline the evaluation of risk.

2.6.2 Ecological Risk Assessment

Exposure to post-excavation surface soil contaminants poses minimal risks to ecological receptors at the site. Concentrations of pesticides in some surface soil samples were elevated relative to U.S. EPA Region 4 ecological screening values. Potential pesticide-related risks in most of these samples are minor based on comparisons to other soil guidelines. The greatest pesticide concentrations were in samples collected from the central portion of the site, where ecological habitat is essentially absent. Thus, pesticide-related risks in the central portion of the site are negligible.

Concentrations of pesticides (primarily DDD, DDE, and DDT) were elevated in a soil sample collected from the western portion of the site. However, pesticide concentrations were relatively low in nearby samples, indicating that potential risk at this location is minimal due to the extremely small area represented by this sample. Similarly, mercury was slightly elevated in one sample location; however, mercury was not detected in samples collected to the west and was less than its IBDS value in samples

collected to the east of this location. Thus, potential risk from mercury is negligible due to the extremely small area represented by this one sample.

2.7 PRELIMINARY REMEDIAL GOALS

A PRG is the target concentration to which a COC must be reduced within a particular medium of concern to achieve one or more of the established RAOs. PRGs are developed to ensure that contaminant concentration levels left on site are protective of human and ecological receptors. For Site 21, PRGs were established based on the following criteria:

- Protection of human health from direct exposure to contaminated soil and groundwater
- Compliance with ARARs, and to the extent practicable, To Be Considered (TBC) criteria

2.7.1 Soil PRG

The arsenic soil PRG was established as 2.04 milligrams per kilogram (mg/kg), which is the NAS Cecil Field site-specific IBDS value (HLA, 1998).

2.7.2 Groundwater PRG

The total chlordane PRG for Site 21 groundwater was established as 2.0 µg/L, which is the FDEP GCTL and the federal MCL.

2.8 DESCRIPTION OF REMEDIAL ALTERNATIVES

This section provides a narrative of each alternative evaluated for the remediation of soil and groundwater at OU 10, Site 21. For further information on the remedial alternatives, refer to the FS (TtNUS, 2003) and the Proposed Plan (TtNUS, 2003b). The remedy selected for this ROD is presented in Section 2.10. As part of the FS, each of the following alternatives was evaluated for compliance with related ARARs; Section 2.0 of the FS presents a complete list of these ARARs. It should be noted that the ARARs presented in Section 2.11 of this ROD are specific to the selected remedy.

2.8.1 Soil Remedial Alternatives

Three remedial alternatives were analyzed for OU 10, Site 21 soil. This ROD has selected Soil Alternative 2 LUCs to address contaminants remaining in soil following excavation activities. These alternatives are summarized in Table 2-3 and in this section.

2.8.1.1 Soil Alternative 1: No Action

Evaluation of the No Action alternative is required by law to provide a baseline for comparison with other alternatives. Under this alternative, no remedial activities would occur to remove soil contamination, and no controls would be implemented to reduce exposure by human receptors. No periodic monitoring would be performed to evaluate contamination reduction or to verify that no contaminant migration is occurring.

This alternative would not protect human health because risks from exposure to contaminated soil would continue to exist. Table 2-1 presents contaminant concentrations compared to applicable residential, industrial, and leachability criteria. This alternative would not achieve the soil RAO or comply with ARARs. There would be no reduction of contaminant mobility, and reduction in toxicity and volume would occur only through long-term natural attenuation and would not be monitored. Because no remedial action would take place, this alternative would not result in any short-term risks and would be very easy to implement. There would be no cost associated with this alternative.

2.8.1.2 Soil Alternative 2: LUCs

A LUC in the form of an enforceable deed restriction that would run with the land would restrict future land use to industrial/commercial purposes so as to prevent future residential development. Prohibited residential uses include but shall not be limited to residential or residential-like uses such as any form of housing, child preschool, day care, or nurseries, and adult convalescent or nursing home facilities. How that LUC would be maintained would be addressed in a LUC RD to be submitted to U.S. EPA and FDEP for review and comment.

This alternative would protect human health because it would prevent the potential for unacceptable carcinogenic risk from direct exposure to contaminated soil by preventing residential development. Exposure to soil would result in residential risk that exceeds Florida's carcinogenic target risk level of 10^{-6}. This alternative would achieve the soil RAO but would not comply with chemical-specific TBCs because the arsenic UCL exceeds the IBDS value. However, for the intended future land use (industrial), the site would be protective as long as LUCs are maintained. There would be no reduction of contaminant toxicity, mobility, or volume through active treatment. There would be minimal short-term risks associated with the performance of inspection activities that could easily be addressed through appropriate on-site worker health and safety procedures. The activities for this alternative would be easy to implement. The capital cost, operation and maintenance (O&M) cost, and 30-year net present worth (NPW) of this alternative are estimated at $11,000, $28,000, and $39,000, respectively.

2.8.1.3 Soil Alternative 3: Excavation and Off-Base Disposal

This alternative would consist of excavating approximately 624 cubic yards of contaminated soil to reduce the 95-percent UCLs of remaining concentrations of arsenic in all 0.5-acre residential reuse parcels to less than the IBDS value and to remove arsenic concentrations that are greater than three times the residential SCTL. Additional sampling would be required to confirm the extent of excavation. Excavated areas would be backfilled with clean soil. The excavated soil would be transported off base to a permitted facility for disposal. Prior to landfilling, the excavated material might be treated, if required, by such technologies as chemical fixation/solidification. However, based on experience from previous soil removal actions at Site 21, it is not anticipated that such treatment would be required.

This alternative would protect human health because it would permanently remove contaminated soil from the site and thus prevent unacceptable risk from exposure under any current or future land use scenario. This alternative would achieve the soil RAO and comply with ARARs through removal, treatment, and disposal. There would be a significant reduction of contaminant toxicity, mobility, or volume through treatment, and an estimated 1.8 pounds of arsenic would be irreversibly and permanently removed from the site. There could be significant short-term risks associated with excavation of the contaminated soil and the off-base transportation of the excavated soil. However, these risks could be addressed through appropriate engineering controls and on-site worker health and safety procedures. This alternative would achieve the soil PRG within an estimated 2 months. The activities for this alternative would be easy to implement. The capital cost and NPW of this alternative are estimated at $289,000. There are no O&M costs associated with this alternative.

2.8.2 <u>Groundwater Remedial Alternatives</u>

Three remedial alternatives were analyzed for OU 10, Site 21 groundwater. This ROD has selected Groundwater Alternative 2: Natural Attenuation, LUCs, and Groundwater Monitoring to address contaminants in groundwater. The alternatives evaluated are described in the FS and summarized in Table 2-4 and in this section.

2.8.2.1 Groundwater Alternative 1: No Action

Under this alternative, no remedial activities would occur to remove groundwater contamination, and no controls would be implemented to reduce exposure by human receptors. Although chlordane would attenuate naturally, no periodic monitoring would be performed to evaluate the effectiveness of the No Action alternative in meeting the chlordane PRG or in preventing the potential downgradient migration of chlordane.

This alternative would not protect human health because risks from direct exposure to contaminated groundwater would continue to exist. This alternative would not achieve the groundwater RAO or comply with ARARs. There would be no reduction of contaminant mobility, and reduction in toxicity and volume would occur only through long-term natural attenuation and would not be monitored. Because no remedial action would take place, this alternative would not result in any short-term risks and would be very easy to implement. There would be no cost associated with this alternative.

2.8.2.2 Groundwater Alternative 2: Natural Attenuation, LUCs, and Groundwater Monitoring

Natural processes such as dispersion, advection, adsorption, dilution, and biological degradation would eventually reduce the groundwater concentrations of chlordane to its PRG. A long-term groundwater monitoring program would be implemented to evaluate the decrease of chlordane concentrations in groundwater. Groundwater monitoring would also be used to detect the potential downgradient migration of chlordane. A LUC in the form of an enforceable deed restriction that would run with the land would prevent the use of groundwater until the chlordane PRG has been met.

This alternative would protect human health because it would reduce the risk from direct exposure to contaminated groundwater. This alternative would achieve the groundwater RAO, and monitoring would establish eventual compliance with ARARs through natural attenuation. There would be no reduction of contaminant toxicity, mobility, or volume through active treatment, but contaminant toxicity and volume would be reduced through long-term natural attenuation. There would be minimal short-term risks associated with the performance of groundwater monitoring activities that could easily be addressed through appropriate on-site worker health and safety procedures. Based on modeling results, it is anticipated that the chlordane PRG would be attained within approximately 49 months. The activities for this alternative would be easy to implement. The capital cost, O&M cost, and 5-year NPW of this alternative are estimated at $26,000, $62,000, and $88,000, respectively.

2.8.2.3 Groundwater Alternative 3: Extraction, On-Site Treatment, Surface Water Discharge, LUCs, and Groundwater Monitoring

This alternative would consist of extracting the contaminated groundwater through three new extraction wells pumping at a combined rate of 10 gallons per minute (gpm). The extracted groundwater would be treated by liquid-phase granular activated carbon (GAC) adsorption to remove dissolved chlordane prior to discharge to surface water. LUCs and monitoring would be the same as for Groundwater Alternative 2.

This alternative would protect human health because it would actively remove chlordane-contaminated groundwater from the surficial aquifer and thus reduce the risk from direct exposure to contaminated groundwater. This alternative would achieve the groundwater RAO and comply with ARARs through treatment. There would be a significant reduction of contaminant toxicity, mobility, or volume through treatment, and an estimated 1.6 pounds of chlordane would be irreversibly and permanently removed

from the groundwater. There would be minimal short-term risks associated with operation of the groundwater extraction and treatment system and performance of groundwater monitoring activities. These risks could easily be addressed through appropriate on-site worker health and safety procedures. Based on modeling results, the chlordane PRG would be attained within approximately 38 months. The activities for this alternative would be easy to implement. The capital cost, O&M cost, and 5-year NPW of this alternative are estimated at $453,000, $331,000, and $784,000, respectively.

2.9 SUMMARY OF COMPARATIVE ANALYSIS OF ALTERNATIVES

This section evaluates and compares each of the soil and groundwater remedial alternatives with respect to the nine criteria outlined in Section 300.430(e) of the NCP. These criteria are categorized as threshold, primary balancing, and modifying and are further explained in Table 2-5. A detailed analysis was performed for each alternative using the nine criteria to select a site remedy. Tables 2-3 and 2-4 present a summary comparison of these analyses for soil and groundwater, respectively.

2.10 SELECTED REMEDY

2.10.1 Summary of Rationale For Remedy Selection

The goals of the selected soil and groundwater remedies are to protect human health and the environment by eliminating, reducing, or controlling hazards posed by the site and to meet ARARs. Based on consideration of the requirements of CERCLA, the NCP, the detailed analysis of alternatives, and any comments received from U.S. EPA, FDEP, and the public, Soil Alternative 2 and Groundwater Alternative 2 were selected to address contamination at OU 10, Site 21.

This remedy was selected for the following reasons:

- Although concentrations of arsenic remaining in soil exceed the background value, they do not present an unacceptable threat to human health or the environment assuming that only industrial and/or commercial uses are permitted at Site 21.

- Although chlordane is present in groundwater at concentrations greater than the FDEP GCTL, detected concentrations are relatively low and do not present an unacceptable threat to human health or the environment under the groundwater use restrictions to be implemented as part of the selected remedy.

- The chlordane contaminant plume is small and stable and confined to the shallow aquifer, and there is no evidence of ongoing contaminant migration.

Therefore, as long as exposure to contaminated soil and groundwater is prohibited, the selected remedy is considered to be adequately protective at a much more reasonable cost than active treatment.

2.10.2 Remedy Description

The remedy is illustrated on Figure 2-6 and consists of three major components: (1) natural attenuation of contaminated groundwater, (2) LUCs, and (3) long-term groundwater monitoring.

2.10.2.1 Component 1: Natural Attenuation of Contaminated Groundwater

Natural attenuation will rely on naturally occurring processes within the surficial aquifer to reduce the concentration of chlordane. Dispersion and dilution through aquifer movement, adsorption on soil particles, and biodegradation will be the main attenuation processes. Surficial aquifer conditions will be periodically monitored to make sure that chlordane concentrations are being adequately reduced through natural processes.

2.10.2.2 Component 2: Land Use Controls

Soil and groundwater contamination remains at Site 21 at concentrations that preclude unrestricted reuse; therefore, the remedy includes LUCs to prevent unacceptable risk. These LUCs will be implemented to prohibit both residential development at Site 21 and usage of the surficial aquifer beneath the site and thereby preclude unacceptable risks from exposure to contaminated soil and groundwater. The boundaries of OU 10, Site 21 and the area to be covered by the LUCs are shown in Figure 2-7. The LUCs cover both soil and groundwater. The following are the LUC performance objectives for OU 10, Site 21:

- Prohibit reuse of the site for residential or residential-like (e.g., elementary or secondary schools, child care facilities, and playgrounds) uses.

- Prohibit the excavation and removal of soil unless prior written approval is obtained from the Navy, U.S. EPA, and FDEP.

- Prohibit all uses of groundwater from the surficial aquifer underlying the site (including, but not limited to, human consumption, dewatering, irrigation, heating/cooling purposes, and industrial processes) without prior written approval from the Navy, U.S. EPA, and FDEP.

- Maintain the integrity of any existing or future monitoring or remediation system(s).

The LUCs shall be implemented and maintained for as long as they are required to prevent unacceptable exposures to contaminated soil and groundwater or to preserve the integrity of the remedy. The Navy or any subsequent owners shall not modify, delete, or terminate any LUC without U.S. EPA and FDEP concurrence. The LUCs shall be maintained until the concentrations of hazardous substances in the soils and groundwater beneath have been reduced to levels that allow for unlimited exposure and unrestricted reuse.

The Navy is responsible for implementing, inspecting, reporting, and enforcing the LUCs described in this ROD in accordance with the LUC RD. Although the Navy will retain ultimate responsibility for the performance of these actions and for remedy integrity, the Navy may arrange, by contract or otherwise, for another party(ies) to carry them out. Should any LUC remedy fail, the Navy will ensure that appropriate actions are taken to reestablish the remedy's protectiveness and may initiate legal action to either compel action by a third party(ies) and/or to recover the Navy's costs for remedying any discovered LUC violation(s).

Within 90 days of ROD signature, the Navy shall prepare and submit the LUC RD to U.S. EPA and FDEP for review and comment.

2.10.2.3 Component 3: Long-Term Monitoring

Long-term monitoring will consist of the periodic collection and analysis of groundwater samples to verify that no contaminant migration is occurring within the surficial aquifer, as determined by sentinel well sample results. Long-term monitoring will also be used to assess natural attenuation of groundwater contamination.

Groundwater samples will be collected from two existing monitoring wells and analyzed for chlordane. Sampling frequency will be semi-annually for the first 3 years and annually thereafter. The number of wells to be sampled, the parameters to be analyzed, and the sampling frequency may change over time depending on sample results and with approval by the Navy, U.S. EPA, and FDEP.

As agreed by the BRAC Cleanup Team (BCT), if the results of two consecutive groundwater sampling events indicate that the chlordane PRG has been met, the site will be considered as remediated for chlordane in groundwater.

2.10.2.4 Contingency Remedy

If results show that (1) the implemented LUCs have failed to prevent unacceptable risks from exposure to on-site soil and/or groundwater contamination; (2) contaminated groundwater has migrated to an unacceptable degree as determined by sentinel well sampling results; or (3) the chlordane contamination in groundwater is not attenuating as expected, then additional active remedial measures would need to be evaluated and possibly implemented. Potential contingency remedial measures could include additional excavation and off-base disposal of contaminated soil and the extraction, on-site treatment, and surface discharge of contaminated groundwater.

2.10.3 Summary of Estimated Remedy Costs

The estimated capital cost and 30-year NPW of the capital, LUC, and O&M costs of the selected remedy are as follows:

- Capital cost: $28,000
- 30-year NPW of capital, LUC, and O&M costs: $109,000

The above cost figures have been rounded to the nearest $1,000 to reflect the preliminary nature of the estimates. The NPW is based upon an annual discount rate of 7 percent. A detailed breakdown of the above estimates is provided in Appendix B. The above estimates exclude duplicated cost items (such as LUC preparation) included in both the soil and groundwater alternatives estimates.

2.10.4 Expected Outcomes of the Selected Remedy

The expected outcomes of the selected remedy may be summarized as follows:

- Immediately upon implementation of the remedy, Site 21 will be environmentally safe for its intended reuse as an industrial and/or commercial facility as long as the soil and groundwater LUCs are in place and observed.

- Eventually the groundwater chlordane PRG will be attained, and the surficial aquifer will become available for unrestricted use. It is expected that the cleanup goals will be attained within 5 years.

- Site 21 is currently used for pesticide storage and mixing and equipment maintenance for golf course operations. The surrounding area is expected to continue to be used as a golf course. It is anticipated that the reuse of the former NAS Cecil Field, including Site 21, will be beneficial to the Jacksonville area and expand the tax base of Duval County.

2.11 STATUTORY DETERMINATIONS

Under CERCLA Section 121 and the NCP, the selected remedy must be protective of human health and the environment, comply with ARARs (unless a statutory waiver is justified), be cost effective, and utilize permanent solutions and alternative treatment technologies or resource recovery technologies to the maximum extent practicable. In addition, CERCLA includes a preference for remedies that employ treatment that permanently and significantly reduces volume, toxicity, or mobility of hazardous substances, pollutants, or contaminants as a principal element and a bias against off-site disposal of untreated hazardous substances, pollutants, or contaminants. The following sections discuss how the selected remedy meets these statutory requirements.

2.11.1 Protection of Human Health and the Environment

The selected remedy, Soil Alternative 2 and Groundwater Alternative 2, will protect human health and the environment. LUCs will prevent the future residential development of the site. The reduced frequency of exposure and potential pathways associated with industrial land use results in a reduced potential intake of soil COCs and consequently, reduced risks to human health. LUCs will also prohibit use of groundwater from the surficial aquifer beneath the site. Consequently, there will continue to be no exposure to contaminated groundwater.

The PRE indicated that future residential exposure to soil and groundwater associated with Site 21 would result in incremental cancer risks that fall within U.S. EPA's target risk range of 10^{-4} to 10^{-6} and hazard indices less than the target value of 1.0 for both industrial and residential exposures. Moreover, concentrations of all soil COCs are less than FDEP SCTLs for leachability to groundwater. Therefore, soil is unlikely to pose any significant impact to groundwater. However, the incremental cancer risk for residential soil exposure to arsenic exceeds FDEP's target risk level of 10^{-6}. Additionally, the concentrations of chlordane in groundwater exceed the FDEP GCTL and the US. EPA MCL, which triggers the need for monitoring.

2.11.2 Compliance with Applicable or Relevant and Appropriate Requirements

The selected remedy, Soil Alternative 2 and Groundwater Alternative 2, will comply with all ARARs as presented below and in more detail in Tables 2-6 through 2-11. There are no Location-Specific ARARs.

The Chemical- and Action-Specific ARARs include the following:

- Safe Drinking Water Act (SDWA) MCLs (40 CFR Part 141), This is a Chemical-Specific ARAR that specifies acceptable concentration levels in groundwater that serves as a potential drinking water aquifer.

- Groundwater Classes, Standards, and Exemptions [Florida Administrative Code (FAC) Chapter 62-520]. This is a Chemical-Specific ARAR that designates the groundwater of the State into five classes and establishes minimum "free from" criteria (i.e., what contaminants are prohibited from being present in a particular class of aquifer).

- Occupational Safety and Health Act (OSHA), General Industry Standards (29 CFR Part 1910). This is an Action-Specific ARAR that requires the establishment of programs to assure worker health and safety at hazardous waste sites.

- OSHA Occupational Safety and Health Regulations (29 CFR Part 1910, Subpart Z). This is an Action-Specific ARAR that establishes permissible exposure limits for workplace exposure to specific chemicals.

- OSHA Recordkeeping, Reporting, and Related Regulations (29 CFR Part 1904). This is an Action-Specific ARAR that dictates recordkeeping and reporting requirement for remedial activities.

- OSHA, Health and Safety Standards (29 CFR Part 1926). This is an Action-Specific ARAR that specifies the type of safety training, equipment, and procedures to be used during remediation.

- Florida Water Well Permitting and Construction Requirement - March 1992. This is an Action-Specific ARAR that establishes minimum standard for location, construction, repair, and abandonment of water wells.

- Florida Rules on Hazardous Waste Warning Signs - July 1991. This is an Action-Specific ARAR that requires appropriate warning signs for public protection at NPL and FDEP hazardous waste sites.

- Drinking Water Criteria (FAC Chapter 62-550). This Chemical-Specific ARAR provides primary and secondary drinking water quality criteria.

2.11.3 Other Criteria, Advisories, or Guidance To Be Considered for This Remedial Action

In implementing the selected remedy, the Navy, U.S. EPA and the State have agreed to consider a number of non-binding criteria that are TBCs. These include:

- SDWA Regulations, National Secondary Drinking Water Standards [Secondary MCLs (SMCLs)], (40 CFR 143). This Chemical-Specific TBC establishes welfare-based standards for public water systems.

- Cancer Slope Factors (Integrated Risk Information System). This Chemical-Specific TBC provides guidance values used to evaluate the potential carcinogenic hazard caused by exposure to contaminants.

- Reference Dose Factors (Integrated Risk Information System). This Chemical-Specific TBC provides guidance values used to evaluate the potential noncarcinogenic hazard caused by exposure to contaminants.

- Contaminant Cleanup Target Levels Rule (FAC Chapter 62-777). This Chemical-Specific TBC provides values for soil, groundwater, and surface water cleanup.

- U.S. EPA Monitored Natural Attenuation Guidance. This provides guidance on evaluation of monitored natural attenuation.

2.11.4 Cost-Effectiveness

The selected remedy is deemed to be cost-effective and represents a reasonable value for the money to be spent. In making this determination, the following definition was used: "A remedy shall be cost-effective if it costs are proportional to its overall effectiveness." [NCP §300.430(f)(1)(ii)(D)]. This was accomplished by evaluating the "overall effectiveness" of those alternatives that satisfied the threshold criteria (i.e., both were protective of human health and the environment and ARAR-compliant). Overall effectiveness was evaluated by assessing three of the five balancing criteria in combination (long-term effectiveness and permanence; reduction in toxicity, mobility, and volume through treatment; and short-term effectiveness). The relationship of the overall effectiveness of this remedial alternative was determined to be proportional to its costs, and hence this alternative represents a reasonable value for the money spent.

The estimated 30-year NPW of the selected remedy is $109,000.

2.11.5 Utilization of Permanent Solutions and Alternative Treatment Technologies

The Navy and U.S. EPA, in conjunction with FDEP, have determined that the selected remedy represents the maximum extent to which permanent solutions and treatment technologies can be utilized in a

practicable manner at Site 21. Of those alternatives that are protective of human health and the environment and comply with ARARs, the Navy and U.S. EPA, in conjunction with FDEP, have determined that the selected remedy provides the best balance of trade-offs in terms of the five balancing criteria while also considering the statutory preference for treatment as a principal element and bias against off-site treatment and disposal and considering State and community acceptance.

2.11.6 Preference for Treatment as a Principal Element

The selected remedy does not provide for treatment as a principal element; however, no source materials constituting principal threats are present at the site, and reductions in soil and groundwater contaminant concentrations are expected over time due to dilution and biological, dispersion, advection, and adsorption processes.

2.11.7 Five-Year Review Requirement

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

2.12 DOCUMENTATION OF SIGNIFICANT CHANGES

The Navy, U.S. EPA and FDEP provided an opportunity for the public to review and comment on the Site 21 Proposed Plan. A Public Notice was publishing in the Florida Times-Union Newspaper on July 8, 2005 informing the public that the Proposed Plan was available for review at the Cecil Field Information Repository and requested that all comments be submitted to the Navy by August 8, 2005. However, no comments were received from the public during the comment period; therefore no significant changes to the remedy, as originally identified in the Proposed Plan, were necessary or appropriate.

TABLE 2-1

SUMMARY OF SOIL ANALYTICAL DATA AND UCL CALCULATIONS
OPERABLE UNIT 10, SITE 21
RECORD OF DECISION
NAVAL AIR STATION CECIL FIELD
JACKSONVILLE, FLORIDA

Analyte	Unit	Minimum Detected Concentration	Maximum Detected Concentration	Site-Wide UCL[1]	Residential UCL by Parcel[2]					SCTL Direct Exposure Residential[3]	SCTL Direct Exposure Industrial[3]	SCTL Leachability to Groundwater[3]	IBDS Value
					No. 1	No. 2	No. 3	No. 4	No. 5				
Arsenic	mg/kg	0.36	7.3	1.6	1.9	2.1	2.1	1.7	2.2	0.8	3.7	29	2.04
4,4'-DDT	µg/kg	4.2	5,740	205	NA	114	ND	13*	626	3,300	13,000	11,000	NA
alpha-Chlordane	µg/kg	1.1	1890	129	NA	344	4*	113	88	3,100	12,000	9,600	NA
gamma-Chlordane	µg/kg	1.4	1,970	124	NA	366	ND	107	51	3,100	12,000	11,000	NA
Dieldrin	µg/kg	0.85	1.8	1.8*	NA	0.9	ND	ND	1.8*	70	300	4	NA
Toxaphene	µg/kg	410	3,620	887	NA	ND	ND	650	741	1,000	3,700	31,000	NA
TRPH	mg/kg	12	152	43.2	NA	ND	37	35	124	340	2,500	340	NA

NOTES:

1. 95-percent upper confidence limit (UCL) of residual concentrations computed over the entire site.
2. 95-percent UCL of residual concentrations computed over each of five half-acre parcels.
3. Florida Department of Environmental Protection (FDEP) Soil Cleanup Target Levels (SCTLs) (FDEP, 1999a).

IBDS NAS Cecil Field site-specific Inorganic Background Data Set (HLA, 1998c).
µg/kg micrograms per kilogram.
mg/kg milligrams per kilogram.
NA Not available.
ND Not detected.
TRPH Total recoverable petroleum hydrocarbons.
* Indicates that maximum concentration was used because UCL was greater than maximum.

TABLE 2-2

SUMMARY OF POSITIVE DETECTIONS IN EXISTING GROUNDWATER DATA
OPERABLE UNIT 10, SITE 21
RECORD OF DECISION
NAVAL AIR STATION CECIL FIELD
JACKSONVILLE, FLORIDA

Parameter	CEF-P21-01S[1]		CEF-P21-001			CEF-P21-02		CEF-P21-03	CEF-P21-04S		CEF-P21-05S		CEF-P21-06S	FDEP GCTL[2]
	Jan-97	Jun-99	May-99	Sep-99		May-99		May-99	Jul-99		Aug-99		Aug-99	
				Sample	Duplicate	Sample	Duplicate		Sample	Duplicate	Sample	Duplicate		
4,4'-DDD	0.12 J	0.4 U	2.5 U	0.5 U	0.5 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	1 U	1 U	0.2 U	0.1
alpha-Chlordane	**1.9**	**1.4**	2.5 U	0.5 U	0.5 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	1 U	1 U	0.2 U	2[3]
gamma-Chlordane	**1.5**	**1.5**	2.5 U	0.5 U	0.5 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	1 U	1 U	0.2 U	2[3]
Total Chlordane	**3.4**	**2.9**	2.5 U	NA	NA	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	1 U	1 U	0.2 U	2[3]

U = Not detected at indicated detection limit.
J = Estimated concentration.
NA = Not analyzed.
Shaded/bolded results are greater than FDEP criterion.
1 Previously identified as 90G001.
2 Florida Department of Environmental Protection Groundwater Cleanup Target Level, FAC 62-777.
3 FDEP criterion for chlordane is for total chlordane.

TABLE 2-3

SUMMARY OF COMPARATIVE ANALYSIS OF SOIL REMEDIAL ALTERNATIVES
OPERABLE UNIT 10, SITE 21
RECORD OF DECISION
NAVAL AIR STATION CECIL FIELD
JACKSONVILLE, FLORIDA

Evaluation Criteria	Soil Alternative 1: No Action	Soil Alternative 2: LUCs	Soil Alternative 3: Excavation and Off-Base Disposal
Overall Protection of Human Health and Environment	Would not be protective because residential development could occur that would result in unacceptable risks to human and ecological receptors.	Would be protective of human health and the environment by preventing residential development.	Would be most protective by eliminating the risk of exposure to soil with concentrations of arsenic greater than background value.
Compliance with ARARs and TBCs: Chemical-Specific Location-Specific Action-Specific	 Would not comply Would not comply Not applicable	 Would comply Would comply Would comply	 Would comply Would comply Would comply
Long-Term Effectiveness and Permanence	Would have very limited long-term effectiveness and permanence because all contaminants would remain on site. Any long-term effectiveness would not be known because monitoring would not occur.	Would be long-term effective and permanent. The prevention of residential development through LUCs would provide long-term effectiveness and permanence.	Would provide the most long-term effectiveness and permanence. Risks from exposure to contaminated soil under any land use scenario would be effectively and permanently eliminated through removal and disposal.
Reduction of Contaminant Toxicity, Mobility, or Volume through Treatment	Would not achieve reduction of toxicity, mobility, or volume of contaminants through treatment but may achieve some reduction through natural processes.	Would not achieve reduction of toxicity, mobility, or volume of contaminants through treatment but may achieve some reduction through natural processes.	Approximately 624 cubic yards of contaminated soil containing an estimated 1.8 pounds of arsenic would be permanently removed from the site.

TABLE 2-3

SUMMARY OF COMPARATIVE ANALYSIS OF SOIL REMEDIAL ALTERNATIVES
OPERABLE UNIT 10, SITE 21
RECORD OF DECISION
NAVAL AIR STATION CECIL FIELD
JACKSONVILLE, FLORIDA

Evaluation Criteria	Soil Alternative 1: No Action	Soil Alternative 2: LUCs	Soil Alternative 3: Excavation and Off-Base Disposal
Short-Term Effectiveness	Would not result in short-term risks to site workers or adversely impact the surrounding community but would also not achieve the soil RAO and PRG.	Would result in slight risk to site workers during inspections. This risk would be reduced through the wearing of appropriate personal protection equipment (PPE) and the compliance with site-specific health and safety procedures. The soil RAO would be achieved immediately upon implementation.	Would result in a significant risk of exposure to site workers to contaminated soil during the excavation and off-base disposal activities. This risk would be reduced through the wearing of appropriate PPE and the compliance with site-specific health and safety procedures. The soil RAO would be achieved immediately upon implementation. Soil PRG would be attained within 2 months.
Implementability	Would be simple to implement because no action would occur.	Would be easy to implement because the resources, materials, and equipment are readily available. Provisions would be incorporated into the property transfer documents to ensure the continuation of the institutional controls and monitoring when ownership of the site is transferred to the private sector.	Would be the most difficult to implement because contaminated soil would have to be excavated and transported off base for disposal. No LUCs or monitoring would be required. A construction permit and manifesting would also be required.
Costs: Capital NPW of O&M NPW	 $0 $0 $0	 $11,000 $28,000 $39,000	 $289,000 $0 $289,000

TABLE 2-4

SUMMARY OF COMPARATIVE ANALYSIS OF GROUNDWATER REMEDIAL ALTERNATIVES
OPERABLE UNIT 10, SITE 21
RECORD OF DECISION
NAVAL AIR STATION CECIL FIELD
JACKSONVILLE, FLORIDA

Evaluation Criteria	Groundwater Alternative 1: No Action	Groundwater Alternative 2: Natural Attenuation, LUCs, and Monitoring	Groundwater Alternative 3: Extraction, On-Site Treatment, Surface Discharge, LUCs, and Monitoring
Overall Protection of Human Health and Environment	Would not be protective because there would be a continued risk from human exposure to contaminated groundwater. Also, potential contaminant migration would remain unchecked.	Would be protective by preventing risk from exposure to contaminated groundwater through LUCs and monitoring.	Would be more protective than Alternative 2 by providing the same protective components plus elimination of risk from exposure to chlordane in groundwater through extraction and treatment of the contaminant plume.
Compliance with ARARs and TBCs: Chemical-Specific Location-Specific Action-Specific	 Would not comply Would not comply Not applicable	 Would eventually comply Would comply Would comply	 Would eventually comply Would comply Would comply
Long-Term Effectiveness and Permanence	Would not be effective and permanent in the long term because contaminants would remain on site. Any long-term effectiveness would not be known because monitoring would not occur.	Would be effective and permanent in the long term. Groundwater use restrictions and monitoring would effectively prevent unacceptable risk from exposure to contaminated groundwater.	Would be effective and permanent in the long term. Groundwater use restrictions and monitoring would effectively prevent unacceptable risk from exposure to contaminated groundwater.
Reduction of Contaminant Toxicity, Mobility, or Volume through Treatment	Would not achieve reduction of toxicity, mobility, or volume of contaminants through treatment but might achieve some reduction through natural processes.	Would not achieve reduction of toxicity, mobility, or volume of contaminants through treatment but would achieve reduction through natural processes.	Would achieve reduction of contaminant toxicity, mobility, and volume through treatment. An estimated 0.00037 pound of chlordane would be irreversibly and permanently removed from the groundwater.

TABLE 2-4

SUMMARY OF COMPARATIVE ANALYSIS OF GROUNDWATER REMEDIAL ALTERNATIVES
OPERABLE UNIT 10, SITE 21
RECORD OF DECISION
NAVAL AIR STATION CECIL FIELD
JACKSONVILLE, FLORIDA

Evaluation Criteria	Groundwater Alternative 1: No Action	Groundwater Alternative 2: Natural Attenuation, LUCs, and Monitoring	Groundwater Alternative 3: Extraction, On-Site Treatment, Surface Discharge, LUCs, and Monitoring
Short-Term Effectiveness	Would not result in short-term risks to site workers or adversely impact the surrounding community but would also not achieve the groundwater RAO and PRG.	Would result in slight risk of exposure of site workers during sampling of groundwater. This risk would be reduced through the wearing of appropriate PPE and the compliance with site-specific health and safety procedures. The groundwater RAO would be achieved immediately upon implementation. The chlordane PRG would be attained within approximately 49 months.	Would result in slight risk of exposure of site workers during the installation and operation of the groundwater extraction and treatment system and the sampling of groundwater. This risk would be reduced through the wearing of appropriate PPE and the compliance with site-specific health and safety procedures. The groundwater RAO would be achieved immediately upon implementation. The chlordane PRG would be attained within approximately 38 months.
Implementability	Would be simple to implement because no action would occur.	Would be easy to implement. Resources, materials, and equipment are readily available. Provisions would be incorporated into the property transfer documents to ensure the continuation of the LUCs and monitoring.	Would be slightly more difficult to implement than Alternative 2 because, in addition to LUCs and monitoring, a groundwater extraction and treatment system would have to be installed, operated, and maintained. Provisions would be incorporated into the property transfer documents to ensure the continuation of the LUCs and monitoring. A construction permit would be required.
Costs: Capital NPW of O&M NPW	 $0 $0 $0	 $26,000 $62,000 (5-Year) $88,000 (5-Year)	 $453,000 $331,000 (5-Year) $784,000 (5-Year)

TABLE 2-5

EXPLANATION OF DETAILED ANALYSIS CRITERIA
OPERABLE UNIT 10, SITE 21
RECORD OF DECISION
NAVAL AIR STATION CECIL FIELD
JACKSONVILLE, FLORIDA

Criterion	Description
Threshold	**Overall Protection of Human Health and the Environment.** This criterion evaluates the degree to which each alternative eliminates, reduces, or controls threats to human health and the environment through treatment, engineering methods, or institutional controls (e.g., access restrictions). **Compliance with State and federal Regulations.** The alternatives are evaluated for compliance with environmental protection regulations determined to be applicable or relevant and appropriate to the site conditions.
Primary Balancing	**Long-Term Effectiveness and Permanence.** The alternatives are evaluated based on their ability to maintain reliable protection of human health and the environment after implementation. **Reduction of Contaminant Toxicity, Mobility, and Volume Through Treatment**. Each alternative is evaluated based on how it reduces the harmful nature of the contaminants, their ability to move through the environment, and the amount of contamination. **Short-Term Effectiveness.** The risks that implementation of a particular remedy may pose to workers and nearby residents (e.g., whether or not contaminated dust will be produced during excavation), as well as the reduction in risks that results by controlling the contaminants, are assessed. The length of time needed to implement each alternative is also considered. **Implementability**. Both the technical feasibility and administrative ease (e.g., the amount of coordination with other government agencies needed) of a remedy, including availability of necessary goods and services, are assessed. **Cost.** The benefits of implementing a particular alternative are weighted against the cost of implementation.
Modifying	**U.S. EPA and FDEP Acceptance.** The final Feasibility Study and the Proposed Plan, which are placed in the Administrative Record, represent a consensus by the Navy, U.S. EPA, and FDEP. **Community Acceptance.** The Navy assesses community acceptance of the preferred alternative by giving the public an opportunity to comment on the remedy selection process and the preferred alternative and then responds to those comments.

TABLE 2-6

FEDERAL CHEMICAL-SPECIFIC ARARs FOR SELECTED REMEDY
OPERABLE UNIT 10, SITE 21
RECORD OF DECISION
NAVAL AIR STATION CECIL FIELD
JACKSONVILLE, FLORIDA

Authority	Medium	Requirement	Citation	Status	Synopsis of Requirement	Action To Be Taken to Attain Requirement
Federal Regulatory Requirement	Groundwater	Safe Drinking Water Act (SDWA) Regulations, Maximum Contaminant Levels	40 Code of Federal Regulations (CFR) Part 141	Relevant and Appropriate	Establishes enforceable standards for potable water for specific contaminants that have been determined to adversely affect human health.	Were used to establish protective levels for groundwater that are current or potential drinking water sources.
Federal Regulatory Requirement	Groundwater	SDWA Regulations, National Secondary Drinking Water Standards	40 CFR Part 143	To Be Considered	Establishes welfare-based standards for public water systems for specific contaminants or water characteristics that may affect the aesthetic qualities of drinking water.	Were considered to establish protective levels for groundwater that are current or potential drinking water sources.
Federal Advisory	Soil and Water	Cancer Slope Factors		TBC	Guidance values used to evaluate the potential carcinogenic hazard caused by exposure to contaminants.	Were considered for development of human health protection preliminary remedial goals (PRGs) for soil and groundwater at this site.
Federal Advisory	Soil and Water	Reference Doses		TBC	Guidance values used to evaluate the potential noncarcinogenic hazard caused by exposure to contaminants.	Were considered for development of human health protection PRGs for soil and groundwater at this site.
Federal Guidance	Groundwater	U.S. EPA Monitored Natural Attenuation Guidance		TBC	Provides guidance on the evaluation of monitored natural attenuation.	Was considered in site evaluation

TABLE 2-7

STATE CHEMICAL-SPECIFIC ARARs FOR SELECTED REMEDY
OPERABLE UNIT 10, SITE 21
RECORD OF DECISION
NAVAL AIR STATION CECIL FIELD
JACKSONVILLE, FLORIDA

Authority	Medium	Requirement	Citation	Status	Synopsis of Requirement	Action To Be Taken to Attain Requirement
State Regulatory Requirement	Groundwater	Groundwater Classes, Standards, and Exemptions	Florida Administrative Code (FAC) Chapter 62-520	Applicable	This rule designates the groundwater of the State into five classes and establishes minimum "free from" criteria. This rule also specifies that Classes I and II must meet the primary and secondary drinking water standards listed in Chapter 62-550.	This rule was used to establish preliminary remediation goals (PRGs) for groundwater that is a potential source of drinking water.
State Regulatory Requirement	Groundwater	Drinking Water Criteria	FAC Chapter 62-550	To Be Considered	This rule provides primary and secondary drinking water quality criteria.	This rule was considered for the development of groundwater PRGs at this site.
State Regulatory Requirement	Soil and Groundwater	Contaminant Cleanup Target Levels Rule	FAC Chapter 62-777	To Be Considered	This rule provides guidance for soil, groundwater, and surface water cleanup levels that can be developed on a site-by-site basis.	This rule was considered for the development of soil and groundwater PRGs at this site.

TABLE 2-8

FEDERAL LOCATION-SPECIFIC ARARs FOR SELECTED REMEDY
OPERABLE UNIT 10, SITE 21
RECORD OF DECISION
NAVAL AIR STATION CECIL FIELD
JACKSONVILLE, FLORIDA

Authority	Medium	Requirement	Citation	Status	Synopsis of Requirement	Action To Be Taken to Attain Requirement

There are no Federal Location-Specific ARARs

TABLE 2-9

STATE LOCATION-SPECIFIC ARARs FOR SELECTED REMEDY
OPERABLE UNIT 10, SITE 21
RECORD OF DECISION
NAVAL AIR STATION CECIL FIELD
JACKSONVILLE, FLORIDA

Authority	Medium	Requirement	Citation	Status	Synopsis of Requirement	Action To Be Taken to Attain Requirement

There are no State Location-Specific ARARs

TABLE 2-10

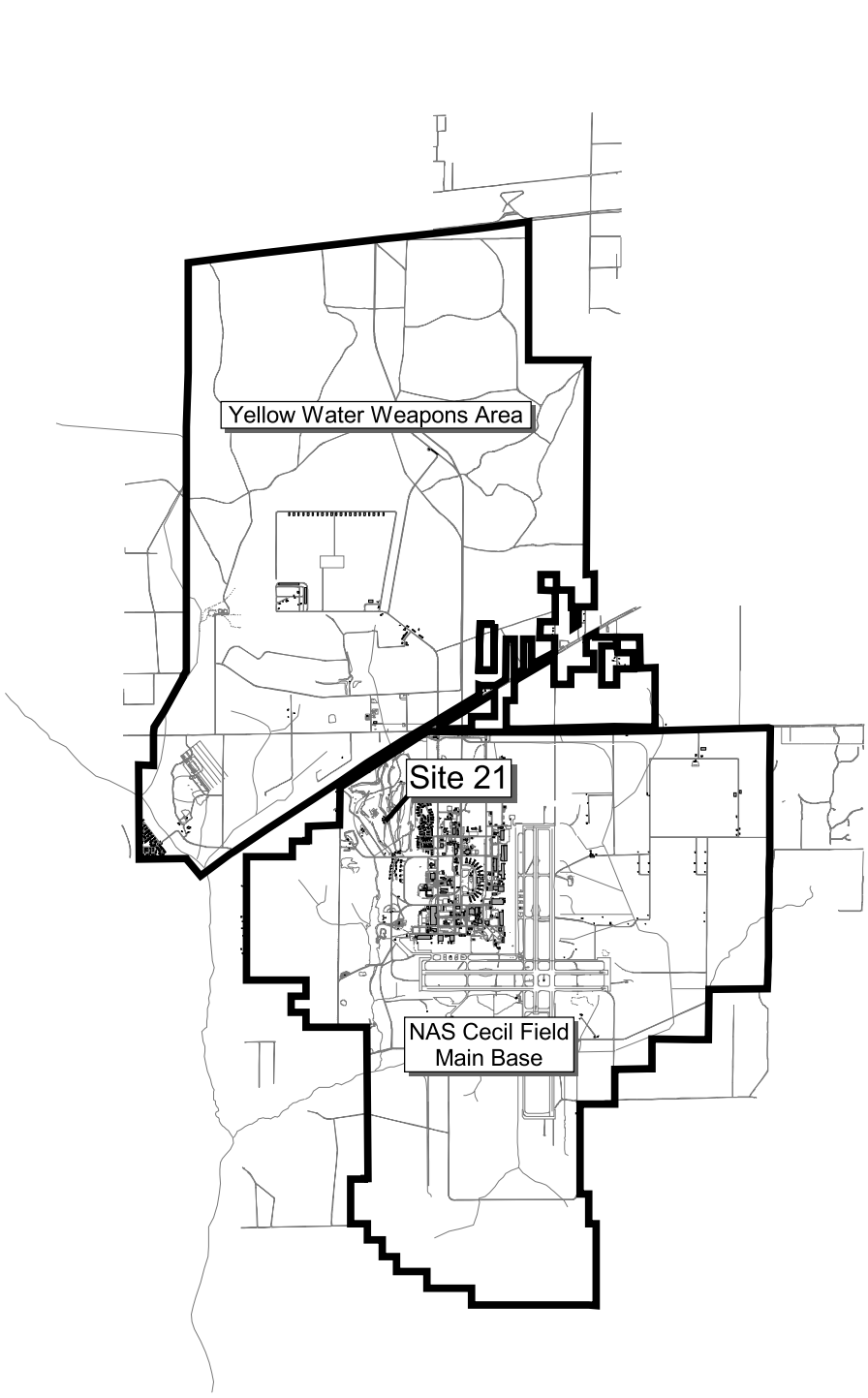
FEDERAL ACTION-SPECIFIC ARARs FOR SELECTED REMEDY
OPERABLE UNIT 10, SITE 21
RECORD OF DECISION
NAVAL AIR STATION CECIL FIELD
JACKSONVILLE, FLORIDA

Authority	Medium	Requirement	Citation	Status	Synopsis of Requirement	Action To Be Taken to Attain Requirement
Federal Regulatory Requirement	All	Occupational Safety and Health Act (OSHA), General Industry Standards	29 Code of Federal Regulations (CFR) Part 1910	Applicable	Requires establishment of programs to assure worker health and safety at hazardous waste sites, including employee-training requirements.	Will apply to all soil and groundwater remedial activities.
Federal Regulatory Requirement	All	OSHA, Occupational Health and Safety Regulations	29 CFR Part 1910, Subpart Z	Applicable	Establishes permissible exposure limits for workplace exposure to a specific listing of chemicals.	Will be applied to control worker exposure to OSHA hazardous chemicals during remedial activities.
Federal Regulatory Requirement	All	OSHA, Recordkeeping, Reporting, and Related Regulations	29 CFR Part 1904	Applicable	Provides recordkeeping and reporting requirements applicable to remedial activities.	Will apply to all site contractors and subcontractors and will be followed during all site work.
Federal Regulatory Requirement	All	OSHA, Health and Safety Standards	29 CFR Part 1926	Applicable	Specifies the type of safety training, equipment, and procedures to be used during the site investigation and remediation.	All phases of the remedial response project will be executed in compliance with these standards.

TABLE 2-11

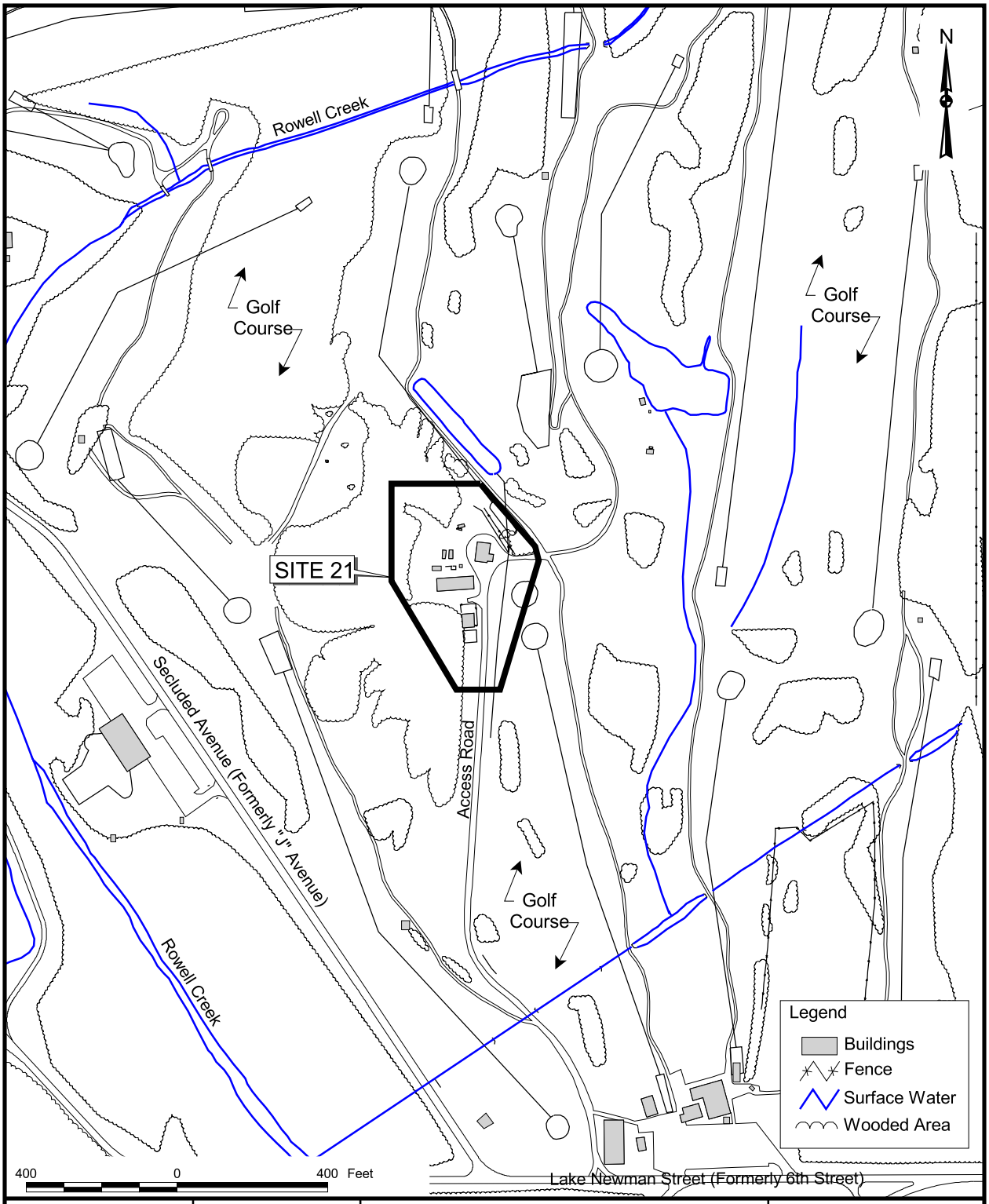
STATE ACTION-SPECIFIC ARARs FOR SELECTED REMEDY
OPERABLE UNIT 10, SITE 21
RECORD OF DECISION
NAVAL AIR STATION CECIL FIELD
JACKSONVILLE, FLORIDA

Authority	Medium	Requirement	Citation	Status	Synopsis of Requirement	Action To Be Taken to Attain Requirement
State Regulatory Requirement	Groundwater	Florida Water Well Permitting and Construction Requirements – March 1992	Florida Administrative Code (FAC) Chapter 62-532	Applicable	Establishes minimum standards for the location, construction, repair, and abandonment of water wells. Permitting requirements and procedures are established.	The substantive requirements for permitting will be met for the construction, repair, and/or abandonment of monitoring wells.
State Regulatory Requirement	All	Florida Rules on Hazardous Waste Warning Signs – July 1991	FAC Chapter 62-736	Applicable	Requires warning signs at NPL and FDEP-identified hazardous waste sites to inform the public of the presence of potentially harmful conditions.	This requirement will be met.



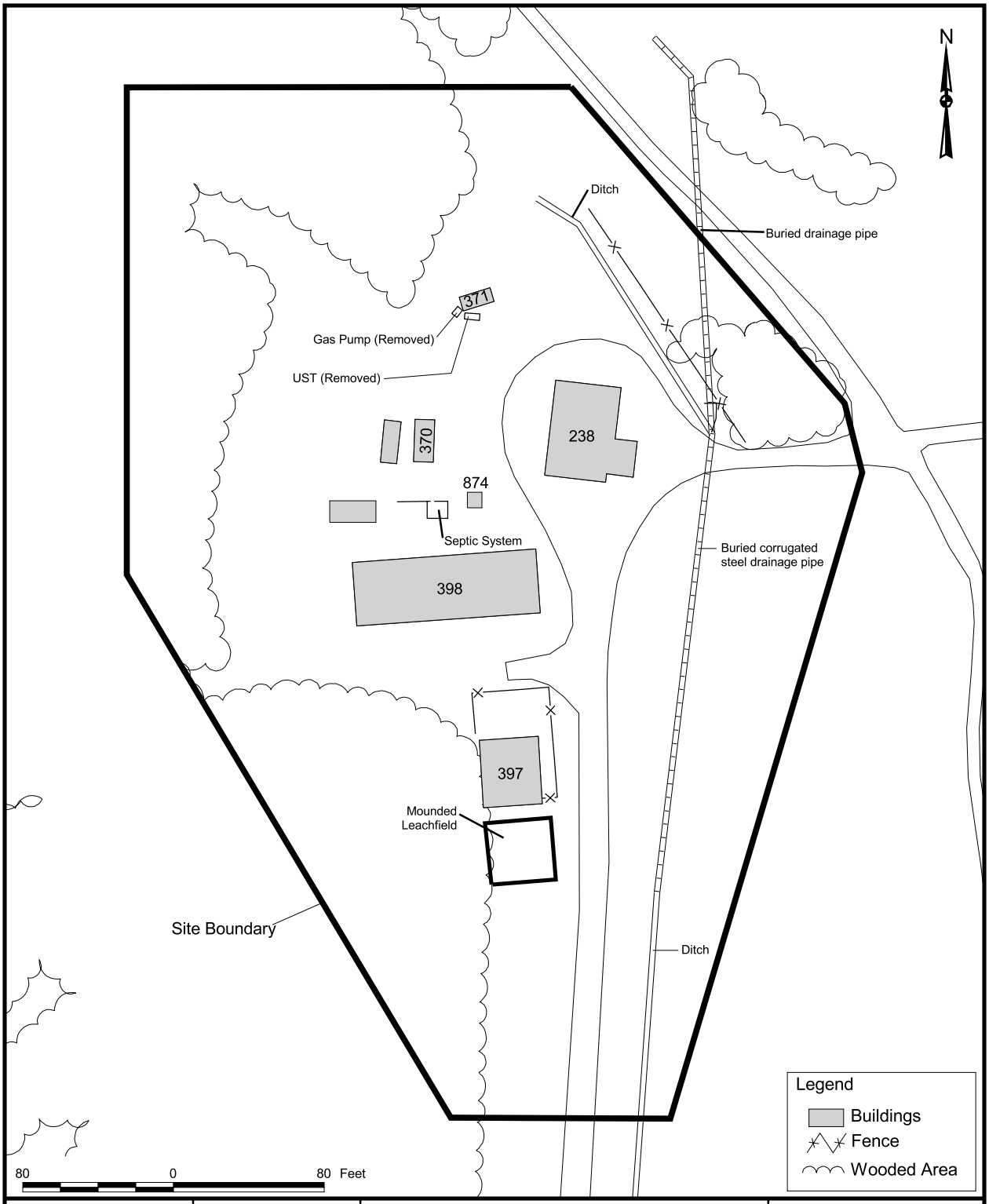
DRAWN BY MJJ	DATE 08May00	GENERAL LOCATION MAP OU 10, SITE 21 RECORD OF DECISION NAVAL AIR STATION CECIL FIELD JACKSONVILLE, FLORIDA	CONTRACT NUMBER 0039
CHECKED BY	DATE		APPROVED BY DATE
COST/SCHEDULE-AREA			APPROVED BY DATE
SCALE AS NOTED			DRAWING NO. FIGURE 2-1 / REV 0

P:\GIS\NAS_CecilField\Site-21_ROD.apr 14Sep01 MJJ Site Location Map Layout



DRAWN BY MJJ	DATE 02Oct00	SITE VICINITY MAP OU 10, SITE 21 RECORD OF DECISION NAVAL AIR STATION CECIL FIELD JACKSONVILLE, FLORIDA	CONTRACT NUMBER 0039
CHECKED BY	DATE		APPROVED BY DATE
COST/SCHEDULE-AREA			APPROVED BY DATE
SCALE AS NOTED	NAVFAC		DRAWING NO. FIGURE 2-2 REV 0

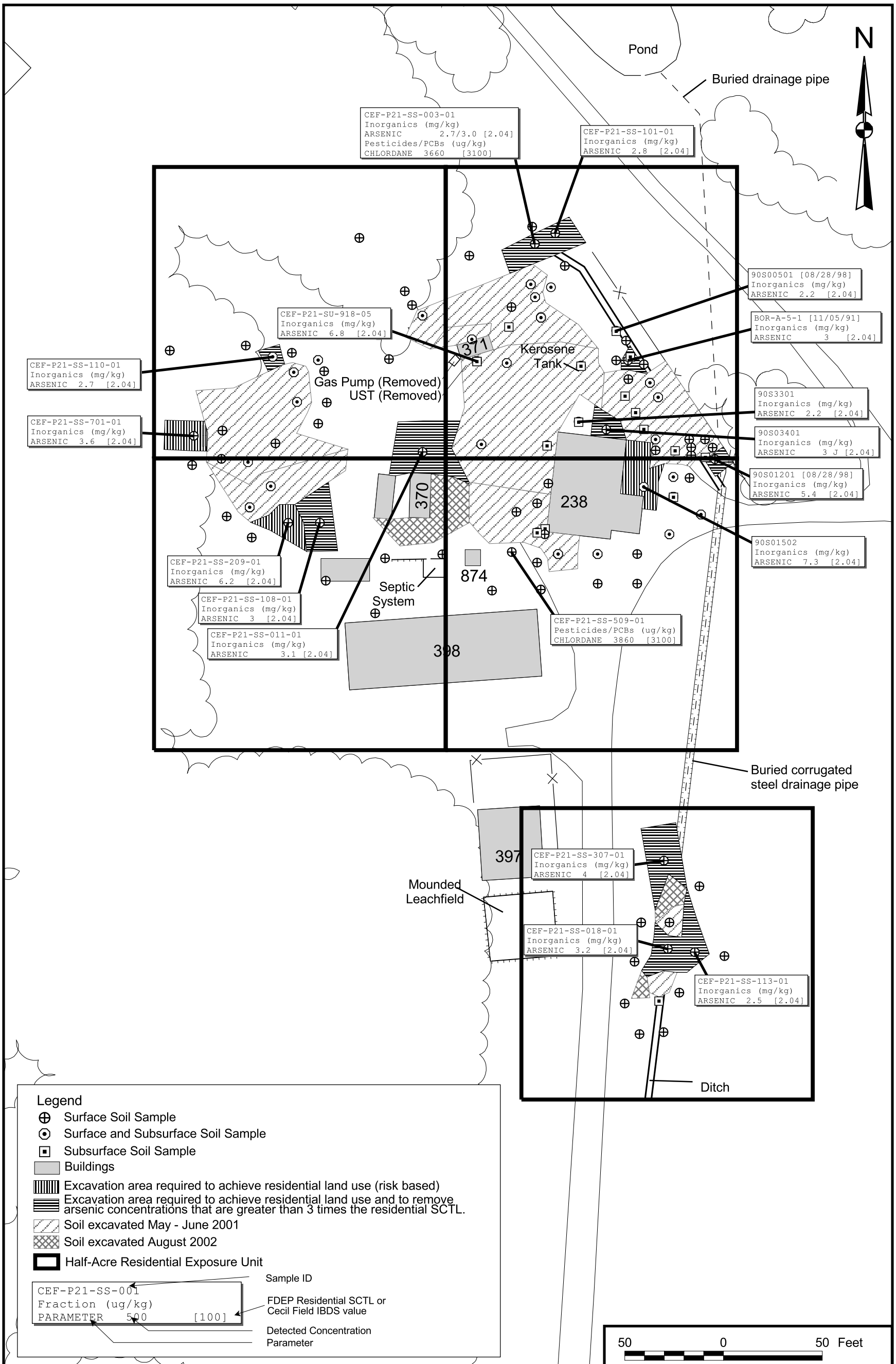
P:\GIS\NAS_CecilField\Site-21_ROD.apr 10May04 MJJ 1-2_Site Vicinity Layout



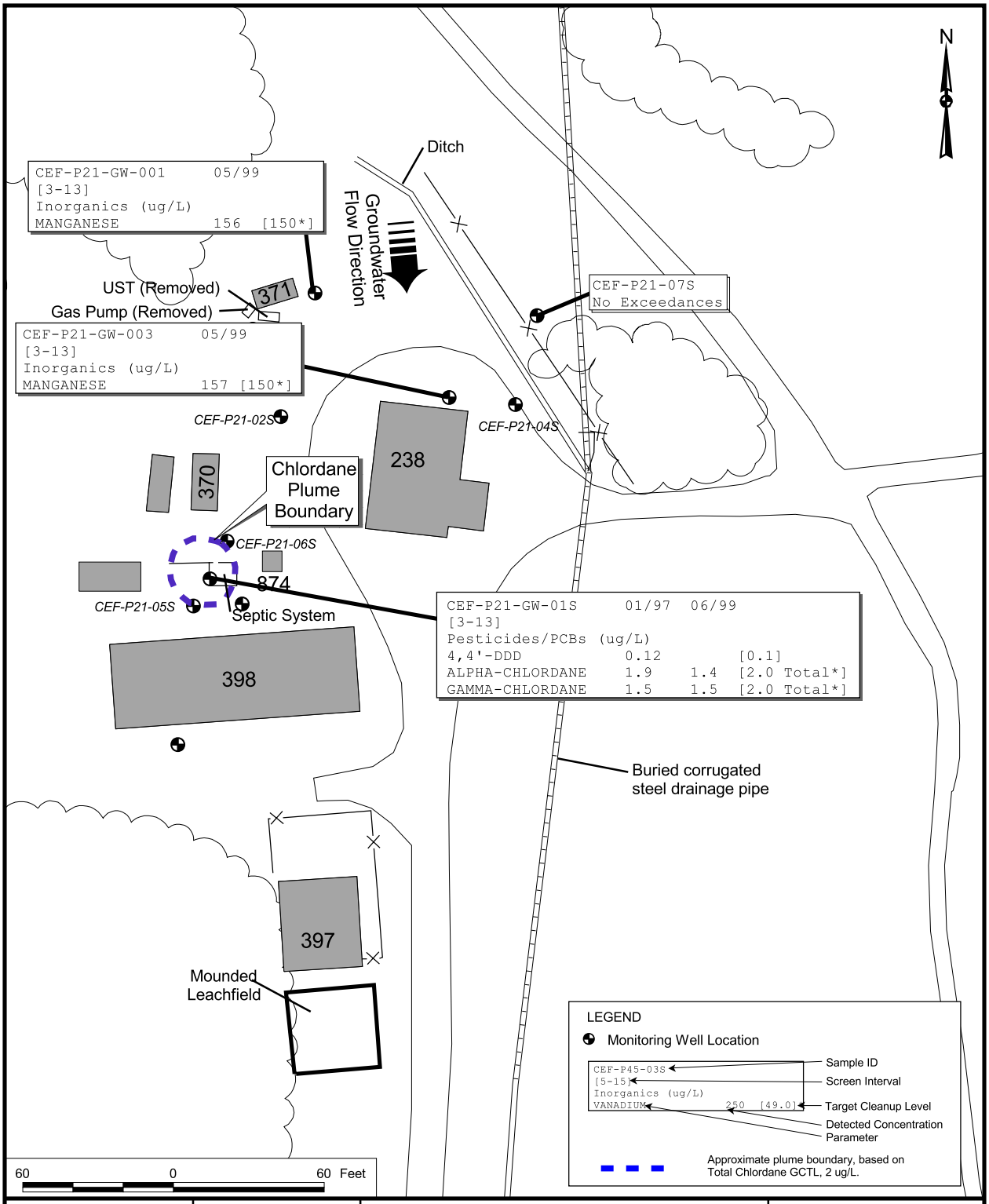
DRAWN BY MJJ — DATE 08May00		GENERAL SITE ARRANGEMENT OU 10, SITE 21 RECORD OF DECISION NAVAL AIR STATION CECIL FIELD JACKSONVILLE, FLORIDA	CONTRACT NUMBER 0039
CHECKED BY — DATE			APPROVED BY — DATE
COST/SCHEDULE-AREA			APPROVED BY — DATE
SCALE AS NOTED	NAVFAC		DRAWING NO. FIGURE 2-3 — REV 0

P:\GIS\NAS_CecilField\Site-21_ROD.apr 29Apr04 MJJ 2_General Arrangement Layout

P:\GIS\NAS_CecilField\Site21_ROD.apr 10May04 MJJ Post Residential Excavation Layout



DRAWN BY MJJ	DATE 29Aug03	SOIL CONCENTRATIONS GREATER THAN IBDS AND THREE TIMES RESIDENTIAL SCTLs	CONTRACT NUMBER 0039
CHECKED BY	DATE	OU 10, SITE 21	APPROVED BY DATE
COST/SCHEDULE-AREA		RECORD OF DECISION	APPROVED BY DATE
SCALE AS NOTED	NAVFAC	NAVAL AIR STATION CECIL FIELD JACKSONVILLE, FLORIDA	DRAWING NO. FIGURE 2-4 / REV 1



DRAWN BY MJJ	DATE 02Oct00	GROUNDWATER RESULTS GREATER THAN CRITERIA - EXISTING AND RI DATA OU 10, SITE 21 RECORD OF DECISION NAVAL AIR STATION CECIL FIELD JACKSONVILLE, FLORIDA	CONTRACT NUMBER 0039
CHECKED BY	DATE		APPROVED BY DATE
COST/SCHEDULE-AREA			APPROVED BY DATE
SCALE AS NOTED			DRAWING NO. FIGURE 2-5 REV 0

P:\GIS\NAS_CecilField\Site-21_ROD.apr 10May04 MJJ 1-4_Groundwater Results Layout

NATURAL ATTENUATION OF CONTAMINATED GROUNDWATER, LONG-TERM GROUNDWATER MONITORING, AND LAND USE CONTROLS

NATURAL ATTENUATION OF CONTAMINATED GROUNDWATER

- REDUCTIONS IN CONCENTRATIONS OF CHLORDANE IN GROUNDWATER THROUGH NATURALLY OCCURRING PROCESSES WITHIN SURFICIAL AQUIFER

→

LONG-TERM GROUNDWATER MONITORING

- PERIODIC COLLECTION AND ANALYSIS OF GROUNDWATER SAMPLES TO VERIFY THAT CONTAMINANT MIGRATION IS NOT OCCURRING AND TO ASSESS NATURAL ATTENUATION OF GROUNDWATER CONTAMINATION

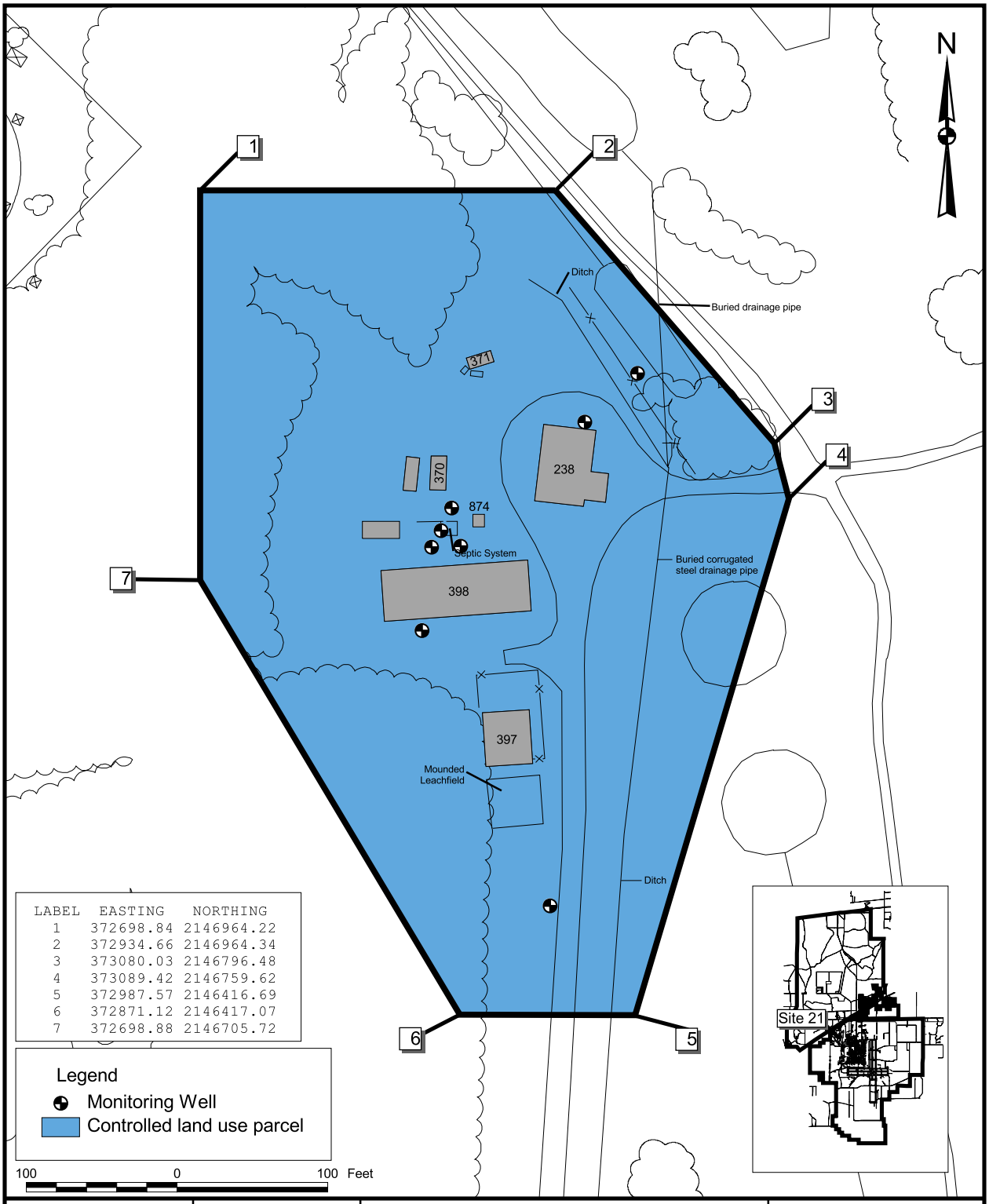
→

LAND USE CONTROLS

- PREVENT RESIDENTIAL AND RESIDENTIAL-LIKE DEVELOPMENT
- PREVENT EXCAVATION AND REMOVAL OF SOIL
- PREVENT CONSUMPTION/USE OF SURFICIAL AQUIFER GROUNDWATER
- MAINTAIN INTEGRITY OF EXISTING AND/OR FUTURE REMEDIATION SYSTEM(S)

DRAWN BY: MJJ	DATE: 29Apr04	BLOCK FLOW DIAGRAM, SELECTED REMEDY OU 10, SITE 21 RECORD OF DECISION NAVAL AIR STATION CECIL FIELD JACKSONVILLE, FLORIDA	CONTRACT NUMBER: 0039
CHECKED BY:	DATE:		APPROVED BY: DATE:
COST/SCHEDULE-AREA			APPROVED BY: DATE:
SCALE: AS NOTED	NAVFAC		DRAWING NO.: FIGURE 2-6 / REV: 0

P:\GIS\NAS_CecilField\Site-21_ROD.apr 10May04 MJJ Block Flow Layout



LABEL	EASTING	NORTHING
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2	372934.66	2146964.34
3	373080.03	2146796.48
4	373089.42	2146759.62
5	372987.57	2146416.69
6	372871.12	2146417.07
7	372698.88	2146705.72

DRAWN BY MJJ	DATE 29Apr04	LAND USE CONTROL PARCEL OU 10, SITE 21 RECORD OF DECISION NAVAL AIR STATION CECIL FIELD JACKSONVILLE, FLORIDA	CONTRACT NUMBER 0039
CHECKED BY	DATE		APPROVED BY DATE
COST/SCHEDULE-AREA			APPROVED BY DATE
SCALE AS NOTED			DRAWING NO. FIGURE 2-7 / REV 0

P:\GIS\NAS_CecilField\Site-21_ROD.apr 14Sep01 MJJ 2-7_LUCs Layout

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APPENDIX A

RESPONSIVENESS SUMMARY

RESPONSIVENESS SUMMARY

Public notice of the availability of the Proposed Plan was placed in the *Florida-Times Union* on July 8, 2005. A 30-day public comment period was held from July 7 to August 8, 2005. Provisions for the public to request a public meeting to discuss the Proposed Plan were also described in the public notice. No comments were received during the 30-day comment period.

APPENDIX B

ESTIMATED COSTS OF SELECTED REMEDY

NAVAL AIR STATION CECIL FIELD
JACKSONVILLE, FLORIDA
SITE 21
SOIL REMEDIAL ALTERNATIVE 2: LUCS

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 Health and Safety Plan and Inspection Plan	100	hr			$35.00		$0	$0	$3,500	$0	$3,500
2 INSTITUTIONAL CONTROLS											
5.1 Prepare LUCs	100	hr			$35.00		$0	$0	$3,500	$0	$3,500
Subtotal							$0	$0	$7,000	$0	$7,000
Local Area Adjustments							100.0%	120.5%	88.0%	88.0%	
							$0	$0	$6,160	$0	$6,160
Overhead on Labor Cost @ 30%									$1,848		$1,848
G & A on Labor Cost @ 10%									$616		$616
G & A on Material Cost @ 10%								$0			$0
G & A on Subcontract Cost @ 10%							$0				$0
Total Direct Cost							$0	$0	$8,624	$0	$8,624
Indirects on Total Direct Cost @ 10%											$862
Profit on Total Direct Cost @ 10%											$862
Subtotal											$10,349
Health & Safety Monitoring @ 0%											$0
Total Field Cost											$10,349
Contingency on Total Field Costs @ 10%											$1,035
Engineering on Total Field Cost @ 0%											$0
TOTAL COST											**$11,384**

NAVAL AIR STATION CECIL FIELD
JACKSONVILLE, FLORIDA
SITE 21
SOIL REMEDIAL ALTERNATIVE 2: LUCS
Annual Cost

Item	Item Cost Years 1 thru 30	Item Cost Every 5 Years	Notes
Site Inspection	$1,000		One day annual inspection to verify continued implementation of LUCs
Site Review		$7,000	
TOTALS	$1,000	$7,000	

NAVAL AIR STATION CECIL FIELD
JACKSONVILLE, FLORIDA
SITE 21
SOIL REMEDIAL ALTERNATIVE 2: LUCS
Present Worth Analysis

Year	Capital Cost	Annual Cost	Total Year Cost	Annual Discount Rate at 7%	Present Worth
0	$11;384		$11,384	1.000	$11,384
1		$1,000	$1,000	0.935	$935
2		$1,000	$1,000	0.873	$873
3		$1,000	$1,000	0.816	$816
4		$1,000	$1,000	0.763	$763
5		$8,000	$8,000	0.713	$5,704
6		$1,000	$1,000	0.666	$666
7		$1,000	$1,000	0.623	$623
8		$1,000	$1,000	0.582	$582
9		$1,000	$1,000	0.544	$544
10		$8,000	$8,000	0.508	$4,064
11		$1,000	$1,000	0.475	$475
12		$1,000	$1,000	0.444	$444
13		$1,000	$1,000	0.415	$415
14		$1,000	$1,000	0.388	$388
15		$8,000	$8,000	0.362	$2,896
16		$1,000	$1,000	0.339	$339
17		$1,000	$1,000	0.317	$317
18		$1,000	$1,000	0.296	$296
19		$1,000	$1,000	0.277	$277
20		$8,000	$8,000	0.258	$2,064
21		$1,000	$1,000	0.242	$242
22		$1,000	$1,000	0.226	$226
23		$1,000	$1,000	0.211	$211
24		$1,000	$1,000	0.197	$197
25		$8,000	$8,000	0.184	$1,472
26		$1,000	$1,000	0.172	$172
27		$1,000	$1,000	0.161	$161
28		$1,000	$1,000	0.150	$150
29		$1,000	$1,000	0.141	$141
30		$8,000	$8,000	0.131	$1,048
				TOTAL PRESENT WORTH	$38,885

NAVAL AIR STATION CECIL FIELD
JACKSONVILLE, FLORIDA
SITE 21
GROUNDWATER ALTERNATIVE 2: NATURAL ATTENUATION, INSTITUTIONAL CONTROLS, AND MONITORING
CAPITAL 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 INSTITUTIONAL CONTROLS											
1.1 Prepare Deed Restrictions	100	hours			$35.00		$0	$0	$3,500	$0	$3,500
2 MOBILIZATION/DEMOBILIZATION AND FIELD SUPPORT											
2.1 Equipment Mobilization/Demobilization	1	ea			$45.50	$229.00	$0	$0	$46	$229	$275
2.3 Professional Oversight (1p*1wk)	1	mwk			$1,200.00		$0	$0	$1,200	$0	$1,200
3 DECONTAMINATION											
3.1 Temporary Decon Pad	1	ls		$500.00	$450.00	$155.00	$0	$500	$450	$155	$1,105
3.2 PPE (3 p * 2 days)	6	day		$30.00			$0	$180	$0	$0	$180
3.3 Disposal of Decon Waste (liquid & solid)	1	mo	$4,500.00				$4,500	$0	$0	$0	$4,500
4 MONITORING WELLS											
4.1 Monitoring Well, 2" dia	15	lf	$30.00				$450	$0	$0	$0	$450
4.2 Well Development	2	hour	$35.00				$70	$0	$0	$0	$70
4.3 Collect/Containerize IDW	1	drum	$50.00				$50	$0	$0	$0	$50
4.4 Transport/Dispose IDW Off Site	1	drum	$150.00				$150	$0	$0	$0	$150
4.5 Survey Well Location	1	ls	$300.00				$300	$0	$0	$0	$300
Subtotal							5520	680	5195.5	384	$11,780
Local Area Adjustments							100.0%	123.0%	88.0%	88.0%	
Subtotal							$5,520	$836	$4,572	$338	$11,266
Overhead on Labor Cost @ 30%									$1,372		$1,372
G & A on Labor Cost @ 10%									$457		$457
G & A on Material Cost @ 10%								$84			$84
G & A on Subcontract Cost @ 10%							$552				$552
Total Direct Cost							$6,072	$920	$6,401	$338	$13,731
Indirects on Total Direct Cost @ 30%											$4,119
Profit on Total Direct Cost @ 10%											$1,373
Subtotal											$19,223
Health & Safety Monitoring @ 2%											$384
Total Field Cost											$19,608
Contingency on Total Field Cost @ 20%											$3,922
Engineering on Total Field Cost @ 15%											$2,941
TOTAL COST											**$26,470**

NAVAL AIR STATION CECIL FIELD
JACKSONVILLE, FLORIDA
SITE 21
GROUNDWATER ALTERNATIVE 2: NATURAL ATTENUATION, INSTITUTIONAL CONTROLS, AND MONITORING
Annual Cost

Item	Item Cost Semi-Annually (1)	Item Cost Semi-Annually (2)	Item Cost Annually (3)	Item Cost Annually	Item Cost Year 5	Notes
Sampling	$6,000	$6,000	$3,000			Labor, Mobilization/Demobilization, Field Supplies
Analysis/Water	$1,760	$1,760	$880			Analyze samples from 4 wells for pesticides including QA samples. semi-annually years1 - 2 - 3, and annually years 4 - 5.
Report	$8,000	$8,000	$4,000			Document sampling events and results
Site Inspection				$1,000		Annual one-day site inspection to verify continued prevention of groundwater use.
Site Review					$5,500	
TOTALS	$15,760	$15,760	$7,880	$1,000	$5,500	

(1) Sampling would occur emi-annually for the first year.
(2) Sampling would occur semi-annually for the years 2 - 3.
(3) Sampling would occur annually for years 4 - 5.

NAVAL AIR STATION CECIL FIELD
JACKSONVILLE, FLORIDA
SITE 21
GROUNDWATER ALTERNATIVE 2: NATURAL ATTENUATION, INSTITUTIONAL CONTROLS, AND MONITORING
Present Worth Analysis

Year	Capital Cost	Annual Cost	Total Year Cost	Annual Discount Rate at 7%	Present Worth
0	$26,470		$26,470	1.000	$26,470
1		$16,760	$16,760	0.935	$15,671
2		$16,760	$16,760	0.873	$14,631
3		$16,760	$16,760	0.816	$13,676
4		$8,880	$8,880	0.763	$6,775
5		$14,380	$14,380	0.713	$10,253
				TOTAL PRESENT WORTH	$87,477

NAVAL AIR STATION CECIL FIELD
JACKSONVILLE, FLORIDA
SITE 21
SELECTED REMEDY: NATURAL ATTENUATION, LUCS, AND MONITORING
CAPITAL 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 INSTITUTIONAL CONTROLS											
1.1 Prepare LUCs	150	hours			$35.00		$0	$0	$5,250	$0	$5,250
1.1 Prepare Sampling, H&S, and Inspection Plans	120	hours			$35.00		$0	$0	$4,200	$0	$4,200
2 MOBILIZATION/DEMOBILIZATION AND FIELD SUPPORT											
2.1 Equipment Mobilization/Demobilization	1	ea			$45.50	$229.00	$0	$0	$46	$229	$275
2.3 Professional Oversight (1p*1wk)	1	mwk			$1,200.00		$0	$0	$1,200	$0	$1,200
3 DECONTAMINATION											
3.1 Temporary Decon Pad	1	ls		$500.00	$450.00	$155.00	$0	$500	$450	$155	$1,105
3.2 PPE (3 p * 2 days)	6	day		$30.00			$0	$180	$0	$0	$180
3.3 Disposal of Decon Waste (liquid & solid)	1	mo	$4,500.00				$4,500	$0	$0	$0	$4,500
4 MONITORING WELLS											
4.1 Monitoring Well, 2" dia	15	lf	$30.00				$450	$0	$0	$0	$450
4.2 Well Development	2	hour	$35.00				$70	$0	$0	$0	$70
4.3 Collect/Containerize IDW	1	drum	$50.00				$50	$0	$0	$0	$50
4.4 Transport/Dispose IDW Off Site	1	drum	$150.00				$150	$0	$0	$0	$150
4.5 Survey Well Location	1	ls	$300.00				$300	$0	$0	$0	$300
Subtotal							5520	680	11145.5	384	$17,730
Local Area Adjustments							100.0%	123.0%	88.0%	88.0%	
Subtotal							$5,520	$836	$9,808	$338	$16,502
Overhead on Labor Cost @ 30%									$2,942		$2,942
G & A on Labor Cost @ 10%									$981		$981
G & A on Material Cost @ 10%								$84			$84
G & A on Subcontract Cost @ 10%							$552				$552
Total Direct Cost							$6,072	$920	$13,731	$338	$21,061
Indirects on Total Direct Cost @ 10%											$2,106
Profit on Total Direct Cost @ 10%											$2,106
Subtotal											$25,273
Health & Safety Monitoring @ 2%											$505
Total Field Cost											$25,779
Contingency on Total Field Cost @ 10%											$2,578
Engineering on Total Field Cost @ 0%											$0
TOTAL COST											**$28,357**

Note: Duplictated costs in the Groundwater Alternative estimate and Soil Alternative estimate have been eliminated in this combined estimate.

NAVAL AIR STATION CECIL FIELD
JACKSONVILLE, FLORIDA
SITE 21
SELECTED REMEDY: NATURAL ATTENUATION, LUCS, AND MONITORING
Annual Cost

Item	Item Cost Semi-Annually (1) Year 1	Item Cost Semi-Annually (2) Years 2 and 3	Item Cost Annually (3) Years 4 and 5	Item Cost Annually (4) Years 6 to 30	Item Cost Annually Years 1 to 30	Item Cost Every 5 years, Years 5 to 30	Notes
Sampling - GW	$6,000	$6,000	$3,000				Labor, Mobilization/Demobilization, Field Supplies
Analysis - GW	$1,760	$1,760	$880				Analyze samples from 4 wells for pesticides including QA samples. semi-annually years 1 - 3, and annually years 4 - 5.
Report - GW	$8,000	$8,000	$4,000				Document sampling events and results
Site Inspection					$1,000		Annual one-day site inspection to verify continued prevention of groundwater use.
Site Review						$7,000	5 year review
TOTALS	$15,760	$15,760	$7,880	$0	$1,000	$7,000	

(1) GW Sampling would occur semi-annually for the first year.
(2) GW Sampling would occur semi-annually for the years 2 - 3.
(3) GW Sampling would occur annually for years 4 - 5.
(4) Sampling would occur annually for years 6 - 30.
Note: Duplictated costs in the Groundwater Alternative estimate and Soil Alternative estimate have been eliminated in this combined estimate.

NAVAL AIR STATION CECIL FIELD
JACKSONVILLE, FLORIDA
SITE 21
SELECTED REMEDY: NATURAL ATTENUATION, LUCS, AND MONITORING
Present Worth Analysis

Year	Capital Cost	Annual Cost, sampling/ analysis	Annual Cost, inspection	Annual Cost, 5 year review	Total Year Cost	Annual Discount Rate at 7%	Present Worth
0	$28,357				$28,357	1.000	$28,357
1		$15,760	$1,000		$16,760	0.935	$15,671
2		$15,760	$1,000		$16,760	0.873	$14,631
3		$15,760	$1,000		$16,760	0.816	$13,676
4		$7,880	$1,000		$8,880	0.763	$6,775
5		$7,880	$1,000	$7,000	$15,880	0.713	$11,322
6		$0	$1,000		$1,000	0.666	$666
7		$0	$1,000		$1,000	0.623	$623
8		$0	$1,000		$1,000	0.582	$582
9		$0	$1,000		$1,000	0.544	$544
10		$0	$1,000	$7,000	$8,000	0.508	$4,064
11		$0	$1,000		$1,000	0.475	$475
12		$0	$1,000		$1,000	0.444	$444
13		$0	$1,000		$1,000	0.415	$415
14		$0	$1,000		$1,000	0.388	$388
15		$0	$1,000	$7,000	$8,000	0.362	$2,896
16		$0	$1,000		$1,000	0.339	$339
17		$0	$1,000		$1,000	0.317	$317
18		$0	$1,000		$1,000	0.296	$296
19		$0	$1,000		$1,000	0.277	$277
20		$0	$1,000	$7,000	$8,000	0.258	$2,064
21		$0	$1,000		$1,000	0.242	$242
22		$0	$1,000		$1,000	0.226	$226
23		$0	$1,000		$1,000	0.211	$211
24		$0	$1,000		$1,000	0.197	$197
25		$0	$1,000	$7,000	$8,000	0.184	$1,472
26		$0	$1,000		$1,000	0.172	$172
27		$0	$1,000		$1,000	0.161	$161
28		$0	$1,000		$1,000	0.150	$150
29		$0	$1,000		$1,000	0.141	$141
30		$0	$1,000	$7,000	$8,000	0.131	$1,048
					TOTAL PRESENT WORTH		$108,843

Note: Duplictated costs in the Groundwater Alternative estimate and Soil Alternative estimate have been eliminated in this combined estimate.