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DRAFT RECORD OF DECISION FOR OPERABLE UNIT 2 (OU 2) WITH TRANSMITTAL NTC ORLANDO FL

2/1/2002

TETRA TECH

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0202-E054

February 22, 2002

Commander, Southern Division
Naval Facilities Engineering Command
ATTN: Ms. Barbara Nwokike, Code ES33
P.O. Box 190010
2155 Eagle Drive
North Charleston, SC 29419-9010

Reference: CLEAN Contract No. N62467-94-D-0888
Contract Task Order No. 0024

Subject: Draft Record of Decision for Operable Unit 2
Former Naval Training Center, Orlando, Florida

Dear Ms. Nwokike:

Enclosed is the draft Record of Decision for Operable Unit 2 for your review and comment. A second copy has been mailed to your attention at Southern Division's Orlando office. As described in the draft Proposed Plan, the selected remedy for Operable Unit 2 is a combination of additional soil cover, implementation of LUCs, and natural attenuation monitoring.

Please contact me at (865) 220-4730 if you have any questions regarding the draft ROD.

Sincerely,

Steven B. McCoy, P.E.
Task Order Manager

SBM:tko

Enclosure

c: Ms. Barbara Nwokike, Southern Division (Orlando Office)
Mr. David Grabka, FDEP
Mr. Gregory Fraley, USEPA Region 4
Mr. Jean-Luc Glorieux, Tetra Tech NUS
Ms. Debbie Wroblewski, Tetra Tech NUS (cover letter only)
Mr. Mark Perry, Tetra Tech NUS (unbound)
Ms. Teresa Grayson, Tetra Tech NUS
Mr. Steve Tsangaris, CH2M Hill (2)
Mr. Mark Salvetti, Harding ESE
File/db

DRAFT
RECORD OF DECISION
for
OPERABLE UNIT 2

Naval Training Center
Orlando, Florida

Southern Division
Naval Facilities Engineering Command
Contract Number N62467-94-D-0888
Contract Task Order 0024

February 2002

DRAFT
RECORD OF DECISION
FOR
OPERABLE UNIT 2

NAVAL TRAINING CENTER
ORLANDO, FLORIDA

COMPREHENSIVE LONG-TERM
ENVIRONMENTAL ACTION NAVY (CLEAN) CONTRACT

Submitted to:

Department of the Navy, Southern Division
Naval Facilities Engineering Command
2155 Eagle Drive
North Charleston, South Carolina 29406

Submitted by:

Tetra Tech NUS
661 Andersen Drive
Foster Plaza 7
Pittsburgh, Pennsylvania 15220

CONTRACT NO. N62467-94-D-0888
CONTRACT TASK ORDER 0024

FEBRUARY 2002

PREPARED UNDER THE SUPERVISION OF:

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DEBBIE WROBLEWSKI
PROGRAM MANAGER
TETRA TECH NUS
PITTSBURGH, PENNSYLVANIA

PROFESSIONAL ENGINEER CERTIFICATION

I hereby certify that this document, *Record of Decision for Operable Unit 2, Naval Training Center, Orlando, Florida,* was prepared under my direct supervision in accordance with acceptable standards of engineering practice.

Steven B. McCoy, P.E. / Date
License No. PE-0041511
Tetra Tech NUS, Inc.
Certificate of Authorization No. 7988

TABLE OF CONTENTS

TABLE OF CONTENTS (Continued)

APPENDICES

TABLES

FIGURES

ACRONYMS

ARAR	applicable or relevant and appropriate requirement
AWQC	Ambient Water Quality Criteria
BCT	BRAC Cleanup Team
bgs	below ground surface
BRAC	Base Realignment and Closure
CERCLA	Comprehensive Environmental Response, Compensation; and Liability Act
CFR	*Code of Federal Regulations*
COC	chemical of concern
COPC	chemical of potential concern
CSM	Conceptual Site Model
CTL	Cleanup Target Level
DON	Department of the Navy
DOT	U.S. Department of Transportation
DPT	direct push technology
ECOPC	ecological chemical of potential concern
ERA	Ecological Risk Assessment
F.A.C.	*Florida Administrative Code*
FDEP	Florida Department of Environmental Protection
FS	Feasibility Study
ft^2	square feet
GCTL	groundwater cleanup target level
GOAA	Greater Orlando Aviation Authority
gpm	gallons per minute
HHRA	Human Health Risk Assessment
HI	Hazard Index
HRC®	Hydrogen Release Compound®
ICR	incremental cancer risk
IR	installation restoration
IRA	Interim Remedial Action
LUC	Land Use Control
MCLG	Maximum Contaminant Level Goal
MCL	Maximum Contaminant Level
µg/L	micrograms per liter
MNA	monitored natural attenuation
msl	mean sea level
NCP	National Oil and Hazardous Substances Pollution Contingency Plan
NEPA	National Environmental Policy Act
NPL	National Priorities List
NTC	Naval Training Center

O&M	operation and maintenance
OPT	Orlando Partnering Team
ORC®	Oxygen Release Compound®
OSHA	Occupational Safety and Health Act
OU	operable unit
PAH	polynuclear aromatic hydrocarbon
POTW	publicly owned treatment work
PPE	personal protective equipment
PRB	permeable reactive barrier
PRG	Preliminary Remediation Goal
RA	Remedial Action
RAB	Restoration Advisory Board
RAO	Remedial Action Objective
RBC	risk-based concentration
RCRA	Resource Conservation and Recovery Act
RfD	reference dose
RI	Remedial Investigation
ROD	Record of Decision
SACM	Superfund Accelerated Cleanup Model
SARA	Superfund Amendments and Reauthorization Act
SCTL	Soil Cleanup Target Level
SDWA	Safe Drinking Water Act
SVOC	semivolatile organic compound
SWCTL	Surface Water Cleanup Target Level
TBC	to be considered
TCE	trichloroethene
TtNUS	Tetra Tech NUS, Inc.
UCL	upper confidence limit
U.S.C.	*United States Code*
USEPA	U.S. Environmental Protection Agency
VOC	volatile organic compound
yd^3	cubic yard
ZVI	zero valent iron

1.0 INTRODUCTION

1.1 SITE NAME AND LOCATION

Operable Unit (OU) 2 is located at McCoy Annex of the former Naval Training Center (NTC), Orlando, Florida (Figure 1-1). The McCoy Annex Landfill (OU 2) is an inactive landfill located in the southern part of the McCoy Annex (Figure 1-2).

1.2 STATEMENT OF BASIS AND PURPOSE

This decision document presents the selected remedy for OU 2 which was chosen in accordance with the requirements of the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), as amended by the Superfund Amendments and Reauthorization Act of 1986 (SARA) and, to the extent practicable, the National Oil and Hazardous Substances Pollution Contingency Plan (NCP). Information supporting the selection of this remedy is contained in the Administrative Record for the NTC. The NTC Orlando Information Repository, including the Administrative Record, is located at the Orlando Public Library, Social Sciences Department, 2nd Floor, 101 East Central Boulevard, Orlando, Florida 32801.

The purpose of the selected remedy at OU 2 is to implement a combination of actions to:

- Prevent potential direct human contact with the landfill contents through implementation and Enforcement of Land Use Controls (LUCs) that prohibit intrusive activities within the landfill boundary, restrict access to areas, and ban the use of the Surficial Aquifer groundwater as a drinking water supply.
- Monitor groundwater and surface water to assess the progress of natural attenuation.

These actions must be taken to protect the public and the environment. The U.S. Environmental Protection Agency (USEPA) and the State of Florida concur with the selected remedy.

1.3 ASSESSMENT OF THE SITE

The nature and extent of contamination of OU 2 are described in the Remedial Investigation (RI) (TtNUS, 2001). The Feasibility Study (FS) (TtNUS, 2002a) evaluated the chemicals of potential concern (COPCs) and their exposure routes and receptors for soil, groundwater, surface water, and sediment. The chemicals of concern (COCs) were identified as benzene, trichloroethene (TCE), vinyl chloride, iron, and manganese in groundwater. There were no COCs identified for soil, surface water, or sediment.

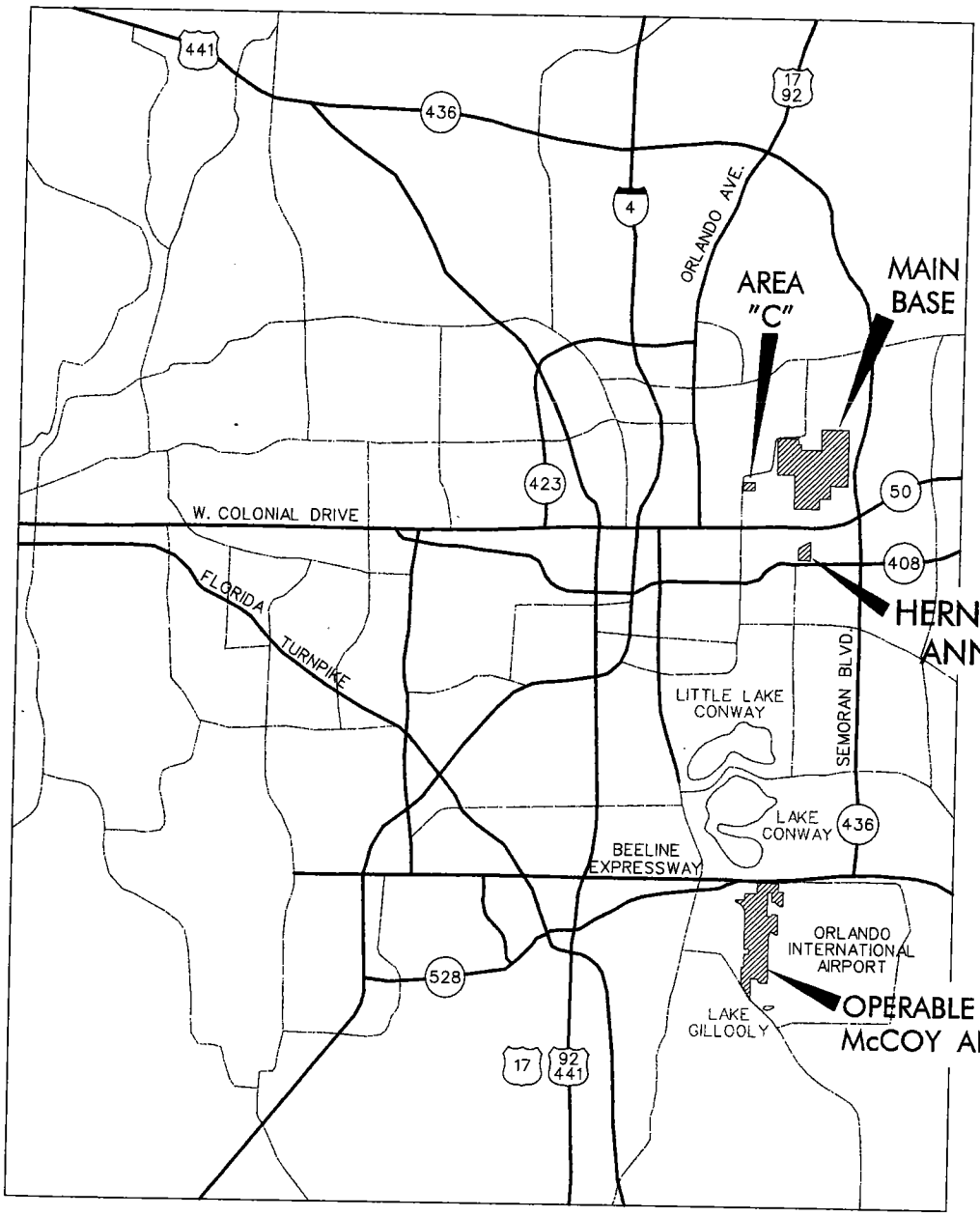
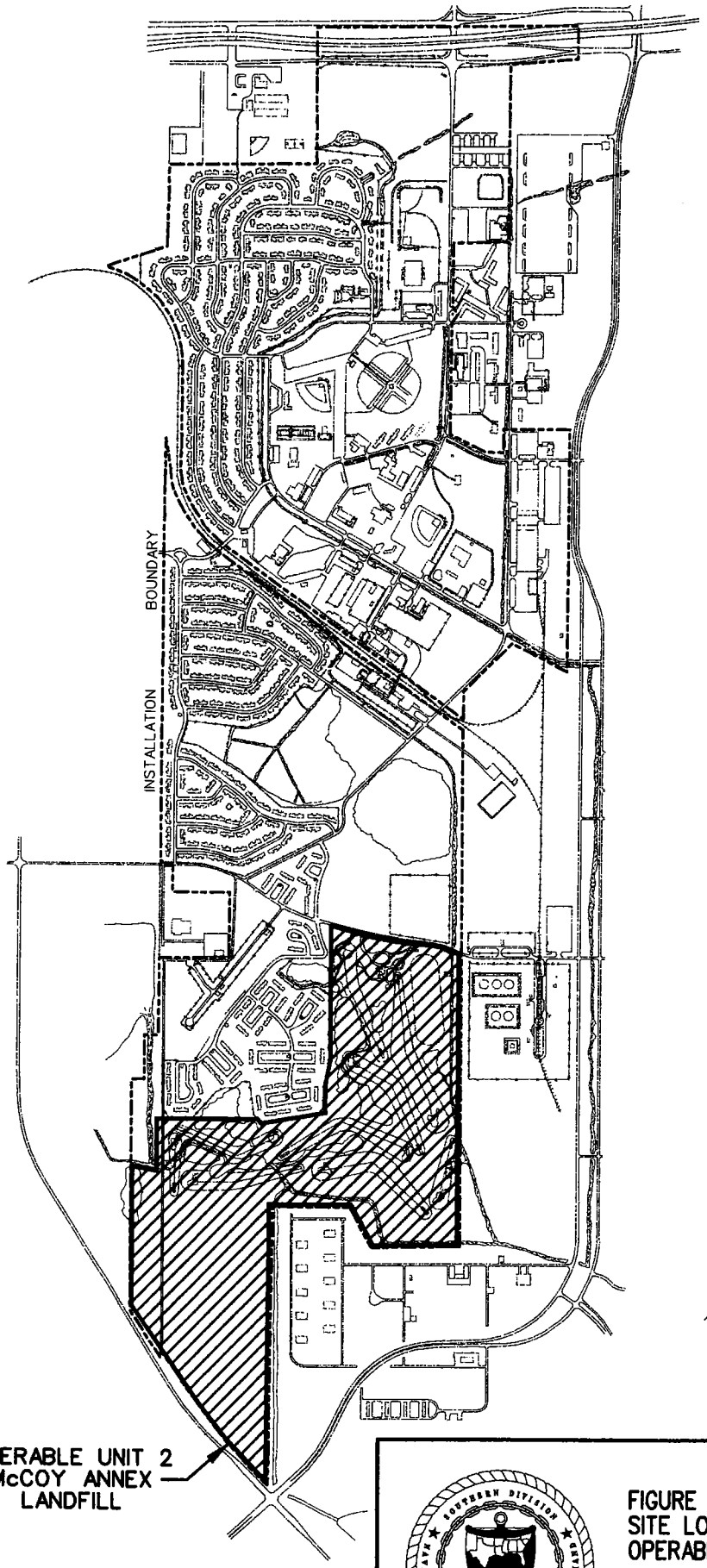


FIGURE 1-1
FACILITY LOCATIONS
OPERABLE UNIT 2

NAVAL TRAINING CENTER
ORLANDO, FLORIDA



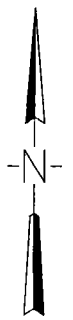


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FIGURE 1-2
SITE LOCATION MAP
OPERABLE UNIT 2

NAVAL TRAINING CENTER
ORLANDO, FLORIDA

Remedial Action Objectives (RAOs) were developed to establish media-specific goals to protect human health and the environment. The RAOs for this site are as follows:

- Minimize the potential for human ingestion, inhalation, or dermal contact of soil, sediment, and groundwater containing chemicals that exceed regulatory requirements or risk-based acceptable exposure levels.
- Prevent leaching of chemicals from soil, sediment, or landfill material that would result in groundwater concentrations in excess of either the Florida Department of Environmental Protection (FDEP) groundwater cleanup target levels (GCTLs) for organic compounds or site-specific background screening levels for inorganic compounds.
- Restore the surface water and Surficial Aquifer groundwater aquifers to the FDEP GCTLs for organic compounds and site-specific background screening levels for inorganic compounds.

Because OU 2 is expected to be transferred to the City of Orlando under Base Realignment and Closure (BRAC) for reuse, the potential exists for residences to be constructed and for potential exposure to groundwater through drinking and showering. For the risk assessment, OU 2 was divided into two exposure units: Area 1 (the northeast portion) and Area 2/3 (the central and southern portions). The incremental cancer risk (ICR) associated with hypothetical future residential exposure to soil, groundwater, surface water, and sediment is 1.9E-05 for Area 1 and 1.6E-03 for Area 2/3. For both areas, this risk exceeds the FDEP level of concern (1.0E-06). For Area 2/3, this risk exceeds the allowable risk range (1.0E-04 to 1.0E-06) specified by the USEPA. The FS (TtNUS, 2002a) established that the risk drivers are the COPCs in groundwater [benzene, 1,4-Dichlorobenzene, tetrachloroethene (PCE), TCE, vinyl chloride, arsenic, iron, and manganese].

The ICRs to the maintenance worker (1.8E-06) and the visitor/trespasser (2.0E-06) exceed the target ICR of 1.0E-06 set by the FDEP. Risk to the maintenance worker is driven by polynuclear aromatic hydrocarbons (PAHs) in surface soil; however, Interim Remedial Action (IRA) activities (Bechtel, 2000; EEG, 2000) have reduced this risk. Risk to the trespasser is driven by bis(2-ethylhexyl)phthalate in surface water; however, the RI discusses uncertainties regarding this chemical.

Actual or threatened releases of hazardous substances from this site, if not addressed by implementing the selected remedy in this Record of Decision (ROD), present a current and future potential threat to public health and welfare and the environment.

1.4 DESCRIPTION OF THE SELECTED REMEDY

The selected remedy described in this ROD is the final action for OU 2 and is based on the results of the RI [Tetra Tech NUS, Inc. (TtNUS), 2001] and the FS (TtNUS, 2002a). Two IRAs (Bechtel, 2000; EEG, 2000) were conducted in 1999. One action involved soil excavation to remove a total of 2,000 cubic yards (yd^3) of surface soil contaminated with PAHs exceeding FDEP Soil Cleanup Target Levels (SCTLs). The other action involved placement of additional soil cover for an approximately 25-acre portion of another area due to exceedances of FDEP SCTLs and thin landfill cover.

The FS was conducted in accordance with the USEPA's interim guidance, *Application of the CERCLA Municipal Landfill Presumptive Remedy to Military Landfills* (USEPA, 1996). The interim guidance states that containment is an appropriate presumptive remedy if the military landfill contains primarily "Municipal-type wastes." Presumptive remedies are preferred technologies for common categories of sites based on historical RI/FS investigations within the Superfund program.

After careful consideration of the conditions at OU 2, comparison of cleanup alternatives, and consideration of the proposed reuse of the area, a remedy has been selected to address the potential risk from groundwater contamination. This selected remedy is a combination of two remedial alternatives as defined in the FS (TtNUS, 2002a) and the Proposed Plan (TtNUS, 2002b). For the northern groundwater plume, Alternative N-2, Native Soil Cover, LUCs, and Monitoring, will be implemented. For the southern groundwater plume, Alternative S-2, LUCs and Monitoring, will be implemented.

The major components of the selected remedy are as follows:

- Restrictions to site access and usage.
- Placing 1.5 feet of clean cover at locations without adequate landfill cover.
- Monitoring for cover maintenance and groundwater contamination.
- Long-term monitoring of groundwater for natural attenuation parameters.
- Long-term monitoring of maintenance of the landfill cover.
- Five-year reviews.

For the northern plume, this remedy prevents the direct contact pathway and meets minimum landfill cover requirements (for presumptive remedy). Additionally, monitored natural attenuation (MNA) will be implemented for addressing organic contamination in groundwater. For the southern plume, this remedy relies on MNA of groundwater and does not actively address existing and potential future contamination. The Navy estimates the present worth cost of Alternatives N-2 ($824,000) and S-2 ($671,000) to be $1,495,000 over a 30-year period.

1.5 STATUTORY DETERMINATIONS

1.5.1 Statutory Requirements

The selected remedy for groundwater at OU 2 is protective of human health and the environment, complies with Federal and state requirements legally applicable and appropriate to the remedial action (RA), is cost effective, and utilizes permanent solutions and alternative treatment technologies to the maximum practicable extent.

1.5.2 Statutory Preference for Treatment

This remedy does not satisfy the statutory preference for treatment as a principal element of the remedy. Because this remedy will result in hazardous substances, pollutants, or contaminants remaining on-site above residential health-based standards, a statutory review will be conducted every 5 years after initiation of the remedial action to ensure the remedy continues to be protective of human health and the environment.

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 can be found in the Administrative Record.

TABLE 1-1

DATA CERTIFICATION CHECKLIST

OPERABLE UNIT 2
NTC, ORLANDO

Information	ROD Reference
COPCs and their concentrations	Section 2.7.1, Table 2-3
Baseline risk represented by the COPCs	Section 2.7.1, Table 2-4
Cleanup levels established for the COCs	Section 2.8
Disposition of source material constituting principal threats	Section 2.11
Current and reasonably anticipated future land and groundwater use scenarios used for risk assessment and ROD	Section 2.6
Potential land and groundwater uses available at the site as a result of the selected remedy	Section 2.12.4
Estimated capital, operation and maintenance (O&M), and total present worth costs of selected remedy. Discount rate used and time frame over which these costs are projected.	Appendix B
Key factors that lead to the selection of the remedy	Section 2.12

1.7 AUTHORIZING SIGNATURES

The undersigned members of the OPT concur with the findings and recommendations presented in this Record of Decision.

OPERABLE UNIT 2

Gregory D. Fraley Senior Remedial Project Manager U.S. Environmental Protection Agency, Region 4	Date
David P. Grabka, P.G. Remedial Project Manager Florida Department of Environmental Protection	Date
Barbara Nwokike BRAC Environmental Coordinator U.S. Department of the Navy	Date

2.0 DECISION SUMMARY

2.1 SITE NAME, LOCATION, AND DESCRIPTION

NTC Orlando (see Figure 1-1) consists of 2,072 acres in Orange County, Florida, and includes four discrete areas: Main Base, Area C, Herndon Annex, and McCoy Annex. The McCoy Annex, which includes OU 2, encompasses approximately 877 acres and is located approximately 8 miles south of the Main Base, west of Orlando International Airport. The McCoy Annex Landfill (OU 2) is an inactive landfill located in the southern part of the McCoy Annex (see Figure 1-2).

The landfill covers approximately 114 acres, and its relatively flat topography slopes from north to south. A nine-hole golf course now occupies much of the site. The golf course is bounded on the east and south by manmade canals that drain to Lake Gillooly to the south and eventually to Boggy Creek and Boggy Creek Swamp to the southeast.

2.2 SITE HISTORY AND ENFORCEMENT ACTIVITIES

2.2.1 Operational and Waste Disposal History

The western portion of the site was used as a landfill by the Air Force from about 1960 to 1972, while the eastern portion was used as a landfill by the Air Force and Navy from 1972 until about 1978. Landfill operations consisted of excavating ditches (100 to 200 feet long by 20 to 25 feet wide by 10 to 15 feet deep) into which trucks disposed wastes. Occasional burning of the waste took place in ditches. Trenches were filled with waste to within 3 or 4 feet of the ground surface and then backfilled with soil and seeded. The estimated volume of waste is approximately 1,000,000 yd^3. Landfill wastes reportedly included hospital wastes, paint and paint thinner, automobile batteries, airplane parts, and asbestos.

2.2.2 History of Site Investigations and Interim Remedial Actions

NTC Orlando is not listed on the National Priorities List (NPL); therefore, remedial action is not directed by CERCLA. Remedial action at NTC Orlando is directed by the Navy's Installation Restoration (IR) program. The IR program is conducted using CERCLA for guidance. The IR program structure and terminology are discussed in detail in Section 1.1 of the RI report (TtNUS, 2001).

An RI/FS was conducted at OU 2 from May 1997 through December 2001. The RI report was submitted as a final document in March 2001 (TtNUS) and the final FS was submitted in ----------2002 (TtNUS).

The Proposed Plan (TtNUS, ------) was issued for public comment in ---------2002. Table 2-1 summarizes the investigative history for OU 2.

Two IRAs were conducted at OU 2 during final RI report preparation. One of these IRAs consisted of removing 2,000 yd^3 of contaminated surface soil in the southern portion of the golf course (Bechtel, 2000), and the other involved placement of additional soil cover for an approximately 25-acre area in the southern portion (wooded area) of OU 2 (EEG, 2000).

The removal action consisted of soil excavation to remove surface soil contaminated with PAHs at surface soil sample location S91, north of the fairway for hole No. 3, and location S103, north of the fairway for hole No. 7 (Figure 2-1). The excavation was then backfilled with 2 feet of certified clean fill from a borrow source. The backfill material was placed in lifts and compacted. The cover was graded, to provide a smooth uniform surface that promotes gravity drainage, and seeded.

The soil cover action provided additional soil cover for an approximately 25-acre portion of the area south of the golf course (see Figure 2-1). The site was cleared prior to spreading the new soil cover. Twenty-eight surface soil locations were covered with 2 feet of additional soil. The cover was composed of an initial 6 inches of soil from the Main Base golf course that contained levels of arsenic below the State of Florida industrial SCTL. The initial cover was followed by 18 inches of soil from a clean borrow source. After all the soil was spread, the site was graded to allow for proper drainage and minimize ponding. Seed, fertilizer, and mulch were then applied for final site restoration.

There is no history of CERCLA Enforcement Activities for this site.

2.3 COMMUNITY PARTICIPATION

The RI report (TtNUS, 2001), the FS report (TtNUS, 2002a), and the Proposed Plan (TtNUS, 2002b) for OU 2 were made available to the public for review in ----------2002. These documents and other RI program information are contained within the Administrative Record in the Information Repository at the Orlando Public Library, Orlando, Florida.

The technical approach to the RI and the FS was developed in conjunction with the Orlando Partnering Team (OPT). The OPT includes representatives from the FDEP, the USEPA Region 4, Southern Division, Naval Facilities Engineering Command, and their contractors, and the Public Works Department at NTC, Orlando.

TABLE 2-1

INVESTIGATIVE HISTORY

OPERABLE UNIT 2
NTC, ORLANDO

Date	Investigation Title	Activities	Findings
1998	*Remedial Investigation Technical Memorandum for Operable Unit 2, McCoy Annex Landfill, NTC, Orlando, FL* (Brown & Root Environmental, 1998)	• Geophysical surveys and hand auger borings • Ground penetrating radar survey • Surface water and sediment sampling • Soil organic vapor survey • DPT groundwater sampling survey • Cone penetrometer testing	• Boundaries of landfill identified • Determined thickness of existing landfill cover • Identified surface soil, surface water, and groundwater contaminants • Collected geotechnical and hydrogeological properties
1998	*Focused Risk Assessment for Operable Unit 2, McCoy Annex Landfill, NTC, Orlando, FL* (TtNUS, 1998)	• Evaluated risk associated with the contamination of the surficial soil covering the landfill	• Excess Lifetime Cancer Risk values were found to be within the acceptable risk range as defined by the USEPA.
1999	*Remedial Investigation Report, Operable Unit 2, McCoy Annex Landfill, NTC, Orlando, FL* (TtNUS, 2001)	• Geophysical surveys and hand auger borings • Surface soil sampling • Surface water and sediment sampling • DPT groundwater sampling survey • Monitoring well, piezometer, and staff gauge installation	• Western limits of landfill identified • Determined thickness of existing landfill cover in western and southern margins of landfill • Identified 8 VOCs exceeding FDEP GCTLs, SVOCs, metals, and radiological parameters exceeded FSWCs • Found no exceedances in sediments • Determined groundwater flow direction • Identified 8 VOCs exceeding FDEP GCTLs, SVOCs, metals, and radiological parameters exceeded FSWCs
2000	*Completion Report for Site OU 2, McCoy Annex, NTC, Orlando, FL* (Bechtel, 2000)	• Removed PAH contaminated soil from sample locations S91 and S103 • Activities began April 15, 1999.	• 2,000 yd^3 soil was excavated from location areas S91 and S103.
2000	*Completion Report, Operable Unit-2, McCoy Annex Landfill, NTC, Orlando, FL* (EEG, 2000)	• Placed additional 2 foot soil cover over approximately 25 acres of the former landfill where existing cover is insufficient.	• 66,367 yd^3 of soil from a local source was spread approximately 18 inches in depth over entire site. • 20,157 yd^3 soil from the main base golf course with arsenic levels below the industrial standard was spread at approximately 6 inches in depth over the site.
2002	*Feasibility Study for Operable Unit 2, McCoy Annex Landfill, NTC, Orlando, FL* (TtNUS, 2002a)	• Performed additional groundwater sampling. • Identified RAOs. • Developed PRGs. • Determined COCs. • Identified and evaluated several remedial action alternatives and estimated their costs.	• Groundwater was the only medium determined to have unacceptable contaminant concentrations. • Benzene, TCE, vinyl chloride, iron, and manganese were selected as groundwater COCs
2002	*Proposed Plan, Operable Unit 2, NTC, Orlando, FL* (TtNUS, 2002b)	• Preferred remedy for OU 2 was issued for public comment.	• Alternative N-2, Native Soil Cover, LUCs, and Monitoring is proposed to address the northern plume. • Alternative S-2, LUCs and Monitoring is proposed to address the southern plume.

COC	chemical of concern	PAH	Polynuclear aromatic hydrocarbon
DPT	direct push technology	PRG	Preliminary Remediation Goal
FDEP	Florida Department of Environmental Protection	RAO	Remedial Action Objective
FSWC	(Florida) Freshwater Surface Criteria	SVOC	semivolatile organic compound
GCTL	groundwater cleanup target level	TCE	trichloroethene
LUC	Land Use Control	USEPA	U.S. Environmental Protection Agency
NTC	Naval Training Center	VOC	volatile organic compound
OU	Operable unit		

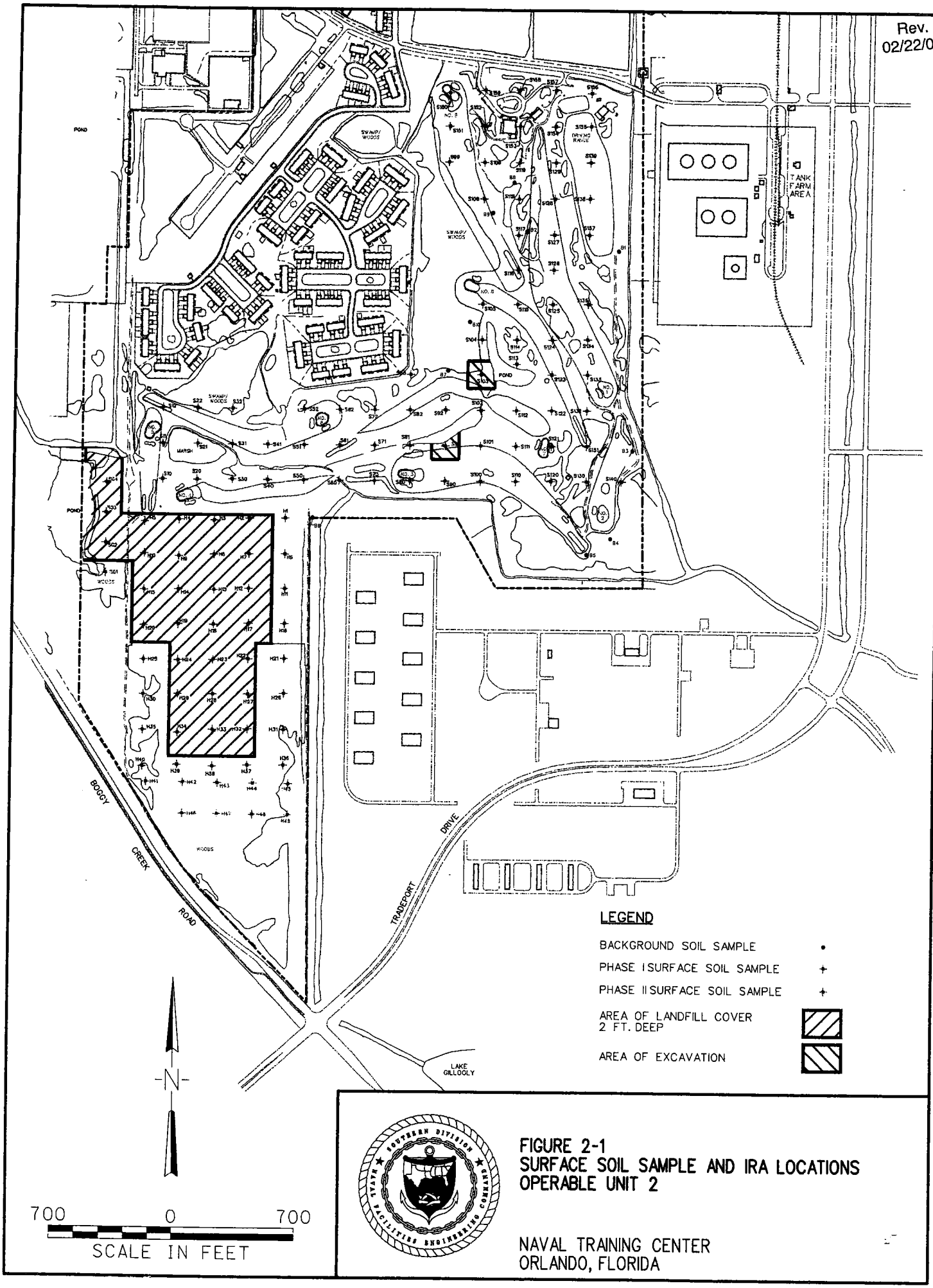

FIGURE 2-1
SURFACE SOIL SAMPLE AND IRA LOCATIONS
OPERABLE UNIT 2

NAVAL TRAINING CENTER
ORLANDO, FLORIDA

The notice of the availability of the RI report, FS report, and Proposed Plan was published in *The Orlando Sentinel* on ---------- and focused on the communities closest to NTC Orlando. The notice of availability presented information on OU 2 and invited community members to submit written comments on the Proposed Plan.

A public comment period was held from ---------2002 through --------2002 to solicit comments on the Proposed Plan. The comment period included an opportunity for the public to request a public meeting; however, a public meeting was not held because one was not requested. The RI report, FS report, and Proposed Plan were presented to the NTC, Orlando Restoration Advisory Board (RAB), and the public at advertised meetings. Representatives from NTC Orlando, Southern Division Naval Facilities Engineering Command, USEPA, FDEP, and the Navy's environmental consultants participated in these meetings. No comments were received during the public comment period (See Section 3.0, Responsiveness Summary, and Appendix A).

The RAB is a group consisting of community members and representatives from various governmental agencies (NTC, USEPA, FDEP, Orlando NTC Reuse Commission). The RAB works as a partner in an advisory role with the BRAC Cleanup Team (BCT) on cleanup issues that involve the affected community. The RAB makes information available for public participation and provides a forum to discuss concerns and issues relating to the IR program. RAB meetings are open to the public and their quarterly meeting minutes are publicized in *The Orlando Sentinel.*

2.4 SCOPE AND ROLE OF REMEDY SELECTED FOR OU 2

OU 2, the subject of this ROD, is the only operable unit at the McCoy Annex of the former NTC, Orlando facility. The selected remedy for OU 2 will be the final action for the site.

Investigations at OU 2 have indicated that groundwater contamination poses unacceptable risks to human receptors. To protect the public and environment, the remedy selected for OU 2 will be implemented to:

- Prevent potential direct human contact with the landfill contents through implementation and enforcement of LUCs that prohibit intrusive activities within the landfill boundary, restrict access to areas, and ban the use of the Surficial Aquifer groundwater as a drinking water supply.
- Monitor groundwater and surface water to assess the progress of natural attenuation.

2.5 SITE CHARACTERISTICS

2.5.1 Site Overview

The McCoy Annex Landfill (OU 2) is an inactive landfill located in the southern part of the McCoy Annex (see Figure 1-2). The landfill occupies approximately 114 acres, and its relatively flat topography slopes from north to south. The surface elevation across the site is approximately 90 feet above mean sea level (msl). A nine-hole golf course now occupies much of the site. Surface water drainage is controlled by a series of drainage canals, ditches, and ponds located in and around the site vicinity. Some localized drainage within the golf course is directed to ponds, interconnecting bodies of water, and low-lying marshy areas where water tends to pond after a rainfall event. The golf course is bounded on the east and south by manmade canals that drain to Lake Gillooly to the south and eventually to Boggy Creek and Boggy Creek Swamp to the southeast.

2.5.2 Geology and Hydrogeology

Data collected during the RI indicate that sand, silty sand, and sandy silt are the major units from the surface to approximately 30 feet below ground surface (bgs). Investigations at the middle of the landfill indicate a strata of sand or silty sand to sandy silt from the ground surface to approximately 30 feet bgs. A clay or silty clay unit approximately 17 to 25 feet thick was also identified underlying the sand unit. A second minor sandy silt to clayey silt layer (9 to 11 thick) is located in the 65- to 80-foot substratum.

The Surficial Aquifer at the site is unconfined and has a saturated thickness of approximately 25 feet consisting predominantly of fine- to medium-grained quartz sand. The bottom of the Surficial Aquifer is delineated by the presence of a laterally extensive, dense, greenish clay at a depth typically 30 feet bgs. The thickness of the clay unit ranges from 10 to 20 feet.

RI data suggest that some ponds onsite act as local recharge to the unconfined aquifer. The drainage canal data show that the Surficial Aquifer is prone to discharge to the canal during baseline conditions.

Results from an aquifer pump test conducted in the Surficial Aquifer provided an average estimate of transmissivity of about 602 ft^2/day and an average storativity of 0.04. The estimate for the hydraulic conductivity is 25 ft/day. Slug tests suggest that the lower portion of the Surficial Aquifer is slightly more conductive than the upper portion, and the underlying confined aquifer is significantly less conductive than the Surficial Aquifer.

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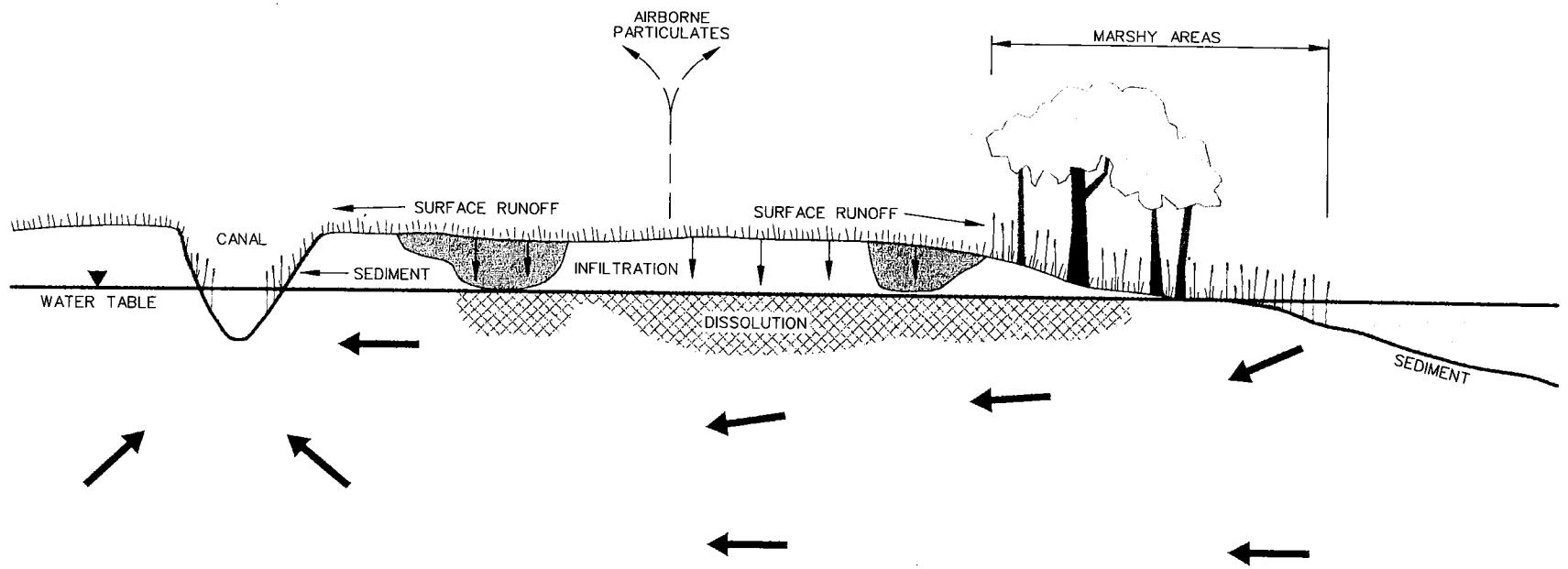

LEGEND

GROUNDWATER FLOW

CONTAMINATED SOIL OR LANDFILL

NOTES:

1) VERTICAL EXAGGERATION EXCEEDS HORIZONTAL.

2) NOT TO SCALE

FIGURE 2-2
CONCEPTUAL SITE MODEL
OPERABLE UNIT 2

NAVAL TRAINING CENTER
ORLANDO, FLORIDA

Rev. 0
02/22/02

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The potentiometric data from the confined aquifer that lies in the Hawthorn Group below the Surficial Aquifer indicate that there is a downward gradient across the clay interval generally toward the south and southwest. Groundwater in the Surficial Aquifer flowing beneath the landfill areas transports dissolved contaminants, and flow is predominantly toward the canals that border the entire eastern perimeter of OU 2. This direction is consistent with discharge of this aquifer into surface water bodies, streams, and rivers that are part of the Kissimmee River Basin that lies to the south of the site. Downward migration of contaminants from the Surficial Aquifer to the underlying confined aquifer zone in the Hawthorn formation is not indicated by the site data.

2.5.3 Conceptual Site Model

The Conceptual Site Model (CSM) provides the basis for the risk assessment and response action. The CSM provides the framework within which the source and release mechanism, transport of contaminants, and environmental pathways of concern are identified.

The routes of contaminant migration depend on the past, current, and future physical conditions of the site. Some site features are known to have been different. Man-made canals border the entire eastern perimeter of the landfill area; however, the southern portion of the canal adjacent to the wooded area appears to have been constructed post-1986, after closure of the landfill. The depth of the canals intercepts the Surficial Aquifer water table. Interpretation of contaminant migration that has occurred to date is based on current conditions and the observed patterns of contaminants in environmental media. Future land use is assumed to be consistent with current use.

A CSM depicting the potential routes of contaminant migration was presented in Section 2 of the FS (TtNUS, 2002a) and is shown as Figure 2-2 in this ROD.

2.5.4 Sampling Strategy

An RI/FS was conducted at the site from May 1997 through December 2001. The RI field activities were performed in a phased approach as listed below.

- Phase I, May – December 1997
- Phase II, March – October 1998
- Phase III, February 1999 – February 2001

Table 2-2 summarizes the activities and sampling strategy taken during the three phases of the RI.

TABLE 2-2

SUMMARY OF REMEDIAL INVESTIGATION FIELD ACTIVITIES

OPERABLE UNIT 2
NTC, ORLANDO

REMEDIAL INVESTIGATION PHASE	ACTIVITIES CONDUCTED
Phase I - 1997	• Geophysical surveys. • Hand auger borings to determine boundaries of the landfill and thickness of the existing cover material. • Surface water and sediment sampling from nine locations within the landfill boundaries, and one downgradient on adjacent property. • Surface soil sampling from 116 locations. • Soil organic vapor survey to identify to identify the presence of volatile organic compounds (VOCs) and semivolatile organic compounds. • Soil organic vapor survey to identify the presence of methane gas in surface soil. • Direct push technology (DPT) groundwater sampling survey at 182 locations to evaluate groundwater quality possibly contaminated by the landfill. • Cone penetrometer testing at 14 locations to interpret geotechnical and hydrogeological properties.
Phase II - 1998	• Geophysical surveys to define the western limits of the landfill. • Hand auger borings and surface soil sampling to evaluate the thickness and potential contamination of the landfill cover near the western and southern margins of the landfill. • Surface water and sediment sampling to evaluate the perimeter areas. • DPT groundwater sampling to help further define locations for the groundwater monitoring wells. • Piezometer and staff gauge installation to determine groundwater flow and interaction between groundwater and surface water at the site. • Monitor well installation and groundwater sampling of Surficial Aquifer and Hawthorne Group aquifer. • Aquifer testing to characterize site hydrogeology.
Phase III – 1999-2001	• Additional hand auger borings to validate and supplement geophysical data for interpretation of the soil cover thickness over landfilled areas. • 46 monitor wells sampled. • Sediment and surface water samples collected in the dredged sections of the canals. • DPT groundwater sampling at 28 locations in the southern portion of the landfill.
Post-RI Investigations 1999-2001	• Additional sampling in the southern area performed to better define extent of contamination, and sampling to evaluate natural attenuation. • DPT groundwater sampling. • Installation of 2-inch monitor wells, DPT microwells. • Samples analyzed for VOCs in mobile and fixed-base laboratory. • Measured groundwater indicators of the oxidation-reduction conditions and corresponding concentrations of organic contaminants and their degradation products.

Additional studies have been performed since the completion of the RI report. The studies included additional sampling to better define the extent of contamination, and sampling to evaluate natural attenuation. The results of this post-RI investigation are reported in the FS (Section 2.2.3 and Appendix A of the FS).

2.5.5 Contaminants and the Affected Media

A complete list of all constituents sampled and their detected concentrations in surface soil, groundwater, sediment, and surface water is available in the RI report. The affected media at OU 2 include surface soil, surface water, sediment, and groundwater. Because landfill materials were buried in trenches or pits that intercept the water table, the most significant source of contaminants lies beneath the ground surface.

The chemicals of interest and the COPCs were reevaluated in the FS (see Section 3.4 of the FS). Groundwater was the only medium for which COCs were identified. To facilitate presentation of groundwater data and evaluation of remedial alternatives, the contamination in groundwater at OU 2 was divided into northern and southern plume areas. Figures 4-2 and 4-3 in the FS identify the location of these areas. The COCs for the northern area are benzene, iron, and manganese. The COCs for the southern area are benzene, TCE, and vinyl chloride. Both VOC (benzene, TCE, and vinyl chloride) and inorganic compound concentrations (iron) exceeded the Preliminary Remediation Goals (PRGs) in the southern plume area. The FS (Section 3.5.2) documented the rationale for not retaining iron as a COC for the southern area. In summary, the exceedances of the PRG for iron are attributed to local background conditions, with the exception of the area of one well, MW28. Analysis of post RI-sampling data in this area indicated the anaerobic conditions, which promote reductive dechlorination processes, are occurring (natural attenuation). Specific measures to capture and/or remediate iron in the southern plume are not recommended.

2.5.6 Sources of Contamination

Evaluation of the data collected in the RI suggests that the former landfill is the primary source of:

- Organic and inorganic contaminants detected in groundwater.
- PAHs in surface soil.
- Inorganic contaminants detected in sediment and surface water.

The landfill is also possibly a secondary source for inorganic contaminants in surface soil.

Because burning was reported to have occurred during landfill operations, it is likely that the occurrence of PAHs in surface soil is related to the distribution of impacted soil during covering and closure of the landfill. The soil may also have been disturbed and/or redistributed during construction of the golf course.

Subsequent urban development of the area and the construction and maintenance of a golf course over a large portion of the site are also considered to be potential contributors for some contaminants. Surface application (possibly including spillage and disposal) of pesticides at the golf course was the primary source for pesticides (and possible related inorganic compounds such as arsenic) in surface soil.

2.5.7 Location of Contamination and Migration Pathways

Figures 2-3, 2-4, and 2-5 show the northern, southern shallow, and southern Intermediate groundwater plumes, respectively. These plumes were determined to be flowing toward the drainage canals located on the eastern side of the site. The northern plume was estimated to be 278,400 square feet (ft^2) (6.4 acres in size). The total estimated volume is 7.8 million gallons. The total combined areas of the shallow and intermediate southern plumes was estimated to be 1,007,500 ft^2 (23.1 acres in size). The total estimated volume of the southern plume is 36 million gallons.

Primary recharge to the Surficial Aquifer occurs by infiltration and percolation of rainfall through the surface soils and through the buried landfill material. The surface runoff and infiltration of rainwater are the primary mechanisms for the migration of contaminants in surface soil. VOCs, if present in surface soil, may also migrate via volatilization and wind dispersion. Contaminants in surface soil may be eroded by surface runoff and may be carried while adsorbed to soil particles. This process facilitates lateral migration of soil contaminants primarily to low-lying areas, swales, ditches, and ultimately to ponds and canals where they may be incorporated into sediment. Dissolution of contaminants in surface soil into surface water runoff may also occur. This water is likely to flow into the canals. Flow in the canals is generally to the south and southeast as it leaves the OU 2 area.

If runoff does not occur, the primary migration mechanism for contaminants in surface soil is dissolution or leaching of contaminants with infiltration into the underlying soils or landfill material. If sufficient infiltration occurs to overcome the effects of evapotranspiration, then the contaminants may percolate to the shallow water table and be dispersed into the Surficial Aquifer.

The water table in the Surficial Aquifer is typically near the ground surface (within 5 to 7 feet bgs) at OU 2. Because landfill materials were buried in trenches or pits that intercept the water table, the most significant contaminant migration pathway appears to be groundwater flow in the Surficial Aquifer.

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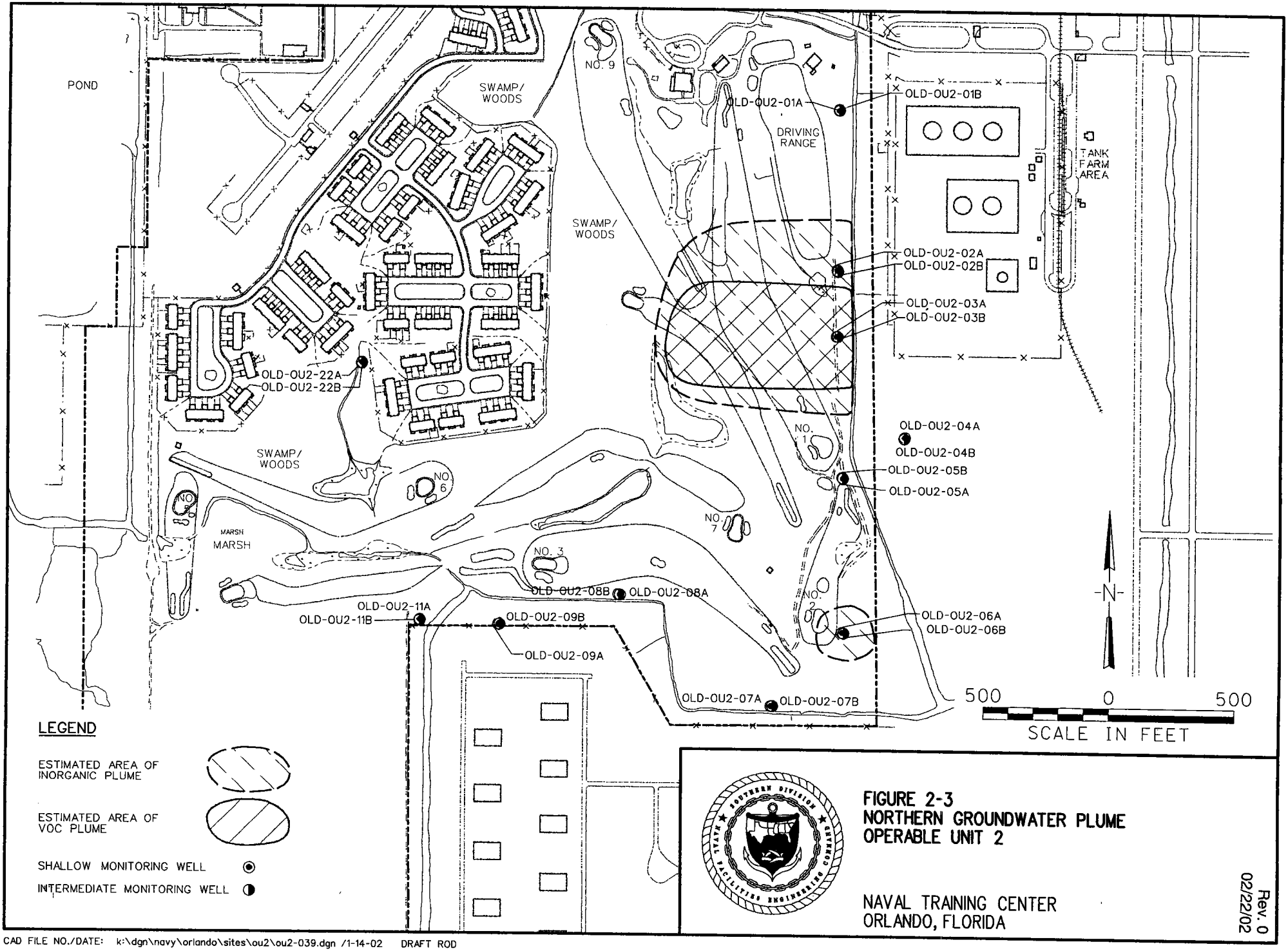

FIGURE 2-3
NORTHERN GROUNDWATER PLUME
OPERABLE UNIT 2

NAVAL TRAINING CENTER
ORLANDO, FLORIDA

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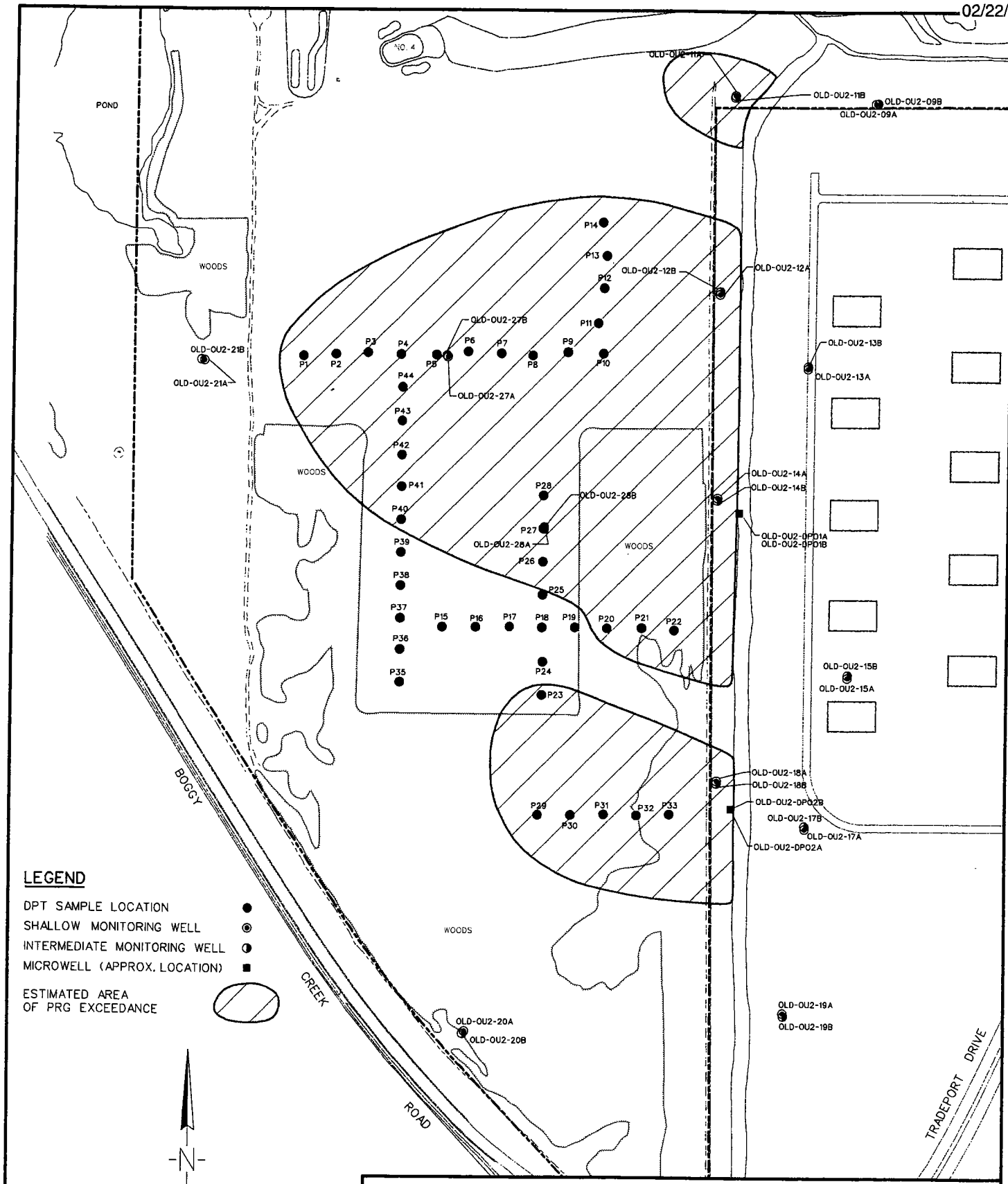

FIGURE 2-5
SOUTHERN INTERMEDIATE GROUNDWATER PLUME
OPERABLE UNIT 2

NAVAL TRAINING CENTER
ORLANDO, FLORIDA

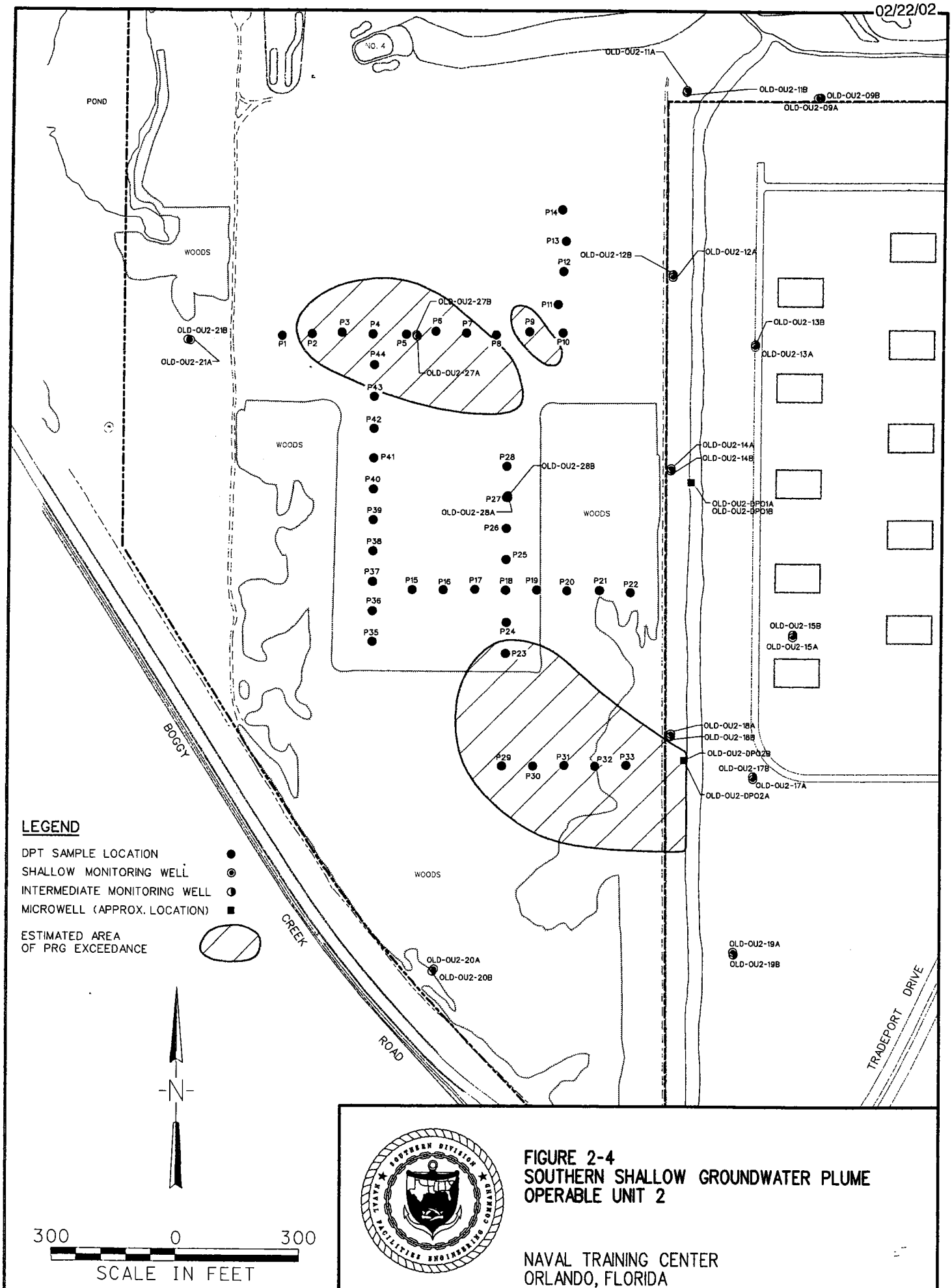

FIGURE 2-4
SOUTHERN SHALLOW GROUNDWATER PLUME
OPERABLE UNIT 2

NAVAL TRAINING CENTER
ORLANDO, FLORIDA

The leaching of contaminants from surface soil and landfill materials and their transport via groundwater to the canals are considered prime contaminant pathways.

2.6 CURRENT AND POTENTIAL FUTURE LAND AND WATER USES

2.6.1 Land Uses

The OU 2 property is currently zoned public use district. The current and potential future use of the property at OU 2 is public use. The area was converted into a golf course in 1981. The northern portion of the property is currently being used as a golf course and is expected to remain a golf course for the foreseeable future.

The proposed reuse of the southern wooded portion of the landfill area will be recreational. The recreational facilities may include soccer fields, softball/baseball diamonds, a picnic area, and recreational trails.

2.6.2 Groundwater and Surface Water Uses

Groundwater

There are no known current uses of groundwater at OU 2. Groundwater use restrictions will be implemented through LUCs prohibiting the use of the Surficial Aquifer groundwater at OU 2 as a potable drinking water source.

Surface water

Surface water at OU 2 exists as drainage canals and ditches for stormwater runoff, small ponds, interconnecting bodies of water that flow to the canals, and low-lying marshy areas. Current and future use of surface water will remain the same.

2.7 SUMMARY OF SITE RISKS

The RI for OU 2 included a risk assessment to predict whether the site would pose current or future threats to human health or the environment. Both a Human Health Risk Assessment (HHRA) and an Ecological Risk Assessment (ERA) were performed. The baseline risk assessment estimates the risks the site poses if no action were taken. It provides the basis for taking action and identifies the contaminants and exposure pathways that need to be addressed by the remedial action. The HHRA and

the ERA evaluated the contaminants detected in site media during the RI and provided the basis for selecting the RA.

2.7.1 Human Health Risk Assessment

An HHRA was conducted for OU 2 to characterize the risks associated with potential exposures to site-related contaminants for human receptors. The HHRA is provided in Chapter 6 of the RI report (TtNUS, 2001). The methodology for the HHRA consisted of the following five steps: (1) data evaluation, (2) selection of COPCs, (3) exposure assessment, (4) toxicity assessment, and (5) risk characterization.

For the HHRA, OU 2 was divided into two exposure units referred to as Area 1 and Area 2/3. The rationale for this distinction and the description of these areas are discussed in Section 6.1 of the RI and Section 2.4 of the FS. Soil and groundwater data were grouped appropriately to correspond to whether the sampling location was in Area 1 or Area 2/3. The entire surface water and sediment data sets were used for both exposure areas.

Data Evaluation. The data evaluation involves numerous activities, including sorting of the data by medium, evaluating the quality of data with respect to qualifiers and codes, and developing a data set for use in risk assessment. Data consisted of analytical results for surface soil, surface water, sediment and groundwater samples collected during Phases I, II, and III of the RI.

Identification of Chemicals of Potential Concern. USEPA Region 4 guidelines and criteria were used to select COPCs (USEPA, 1999). For soil and groundwater, COPCs were selected for each medium and exposure unit. For surface water and sediment, COPCs were selected for each medium and evaluated as COPCs for both exposure units. The COPCs were defined as chemicals that were positively detected in at least one sample in each medium/exposure unit at a maximum concentration exceeding background and screening values.

The list of chemicals identified as COPCs may not represent a true picture of the media-specific chemical concentrations or realistic risk exposure at a site. In order to represent overall chemical concentration levels and exposure, COCs were developed from the list of COPCs. COPCs that passed the screening processes described above were also further evaluated by statistically calculating a representative concentration, where appropriate, and comparing these concentrations to the PRGs.

Table 2-3 summarizes the human health COCs and their exposure point concentrations for groundwater.

TABLE 2-3

SUMMARY OF HUMAN HEALTH CHEMICALS OF CONCERN AND EXPOSURE POINT CONCENTRATIONS FOR GROUNDWATER

OPERABLE UNIT 2
NTC, ORLANDO

Exposure Point (Ingestion: tap water/vapors)	Chemical of Concern	Units	Arithmetic Mean	95% UCL of Normal Data	Maximum Detected Concentration	Exposure Point Concentration[1]
Area 1	Benzene	µg/L	1.48	2.8	3.4	3.4
	Iron	µg/L	9670	18,800	23,700	23,700
	Manganese	µg/L	136	392	616	616
Area 2/3	Benzene	µg/L	3.31	8.36	1.3	1.3
	Trichloroethene	µg/L	134	382	1,200	1,200
	Vinyl chloride	µg/L	2.68	6.71	20	20

(1) Exposure point concentration is the lower of either the arithmetic mean or maximum detected concentration.
UCL upper confidence limit
µg/L micrograms per liter

Exposure Assessment. The pathways by which humans are potentially exposed to COPCs, the magnitude of actual or potential exposure, and frequency and duration of exposure are presented in Section 6.3 of the RI.

For both current and future time frames, three potential receptors were evaluated for Area 1 and Area 2/3:

- Recreational user (adult and adolescent golfer for Area 1, adult and child using ball fields and trails in Area 2/3).
- Site maintenance worker.
- Off-site resident (trespasser or visitor).

Hypothetical future adult, adolescent, and child on-site residents were quantified for information purposes only. Deed restrictions are planned to prevent on-site residents; therefore, on-site residential land use is not expected in the foreseeable future.

Toxicity Assessment. The toxicity assessment is a two-step process whereby potential hazards associated with the route-specific exposure to a given chemical are (1) identified by reviewing relevant human and animal studies and (2) quantified through analysis of dose-response relationships. USEPA has calculated numerous toxicity values having undergone extensive review within the scientific community. These values (published in the Integrated Risk Information System and other journals) are used in the baseline evaluation to calculate both carcinogenic and noncarcinogenic risks associated with each COPC and rate of exposure.

TABLE 2-3

SUMMARY OF HUMAN HEALTH CHEMICALS OF CONCERN AND EXPOSURE POINT CONCENTRATIONS FOR GROUNDWATER

OPERABLE UNIT 2
NTC, ORLANDO

Exposure Point (Ingestion: tap water/vapors)	Chemical of Concern	Units	Arithmetic Mean	95% UCL of Normal Data	Maximum Detected Concentration	Exposure Point Concentration[1]
Area 1	Benzene	µg/L	1.48	2.8	3.4	3.4
	Iron	µg/L	9670	18,800	23,700	23,700
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	Trichloroethene	µg/L	134	382	1,200	1,200
	Vinyl chloride	µg/L	2.68	6.71	20	20

(1) Exposure point concentration is the lower of either the arithmetic mean or maximum detected concentration.
UCL upper confidence limit
µg/L micrograms per liter

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For both current and future time frames, three potential receptors were evaluated for Area 1 and Area 2/3:

- Recreational user (adult and adolescent golfer for Area 1, adult and child using ball fields and trails in Area 2/3).
- Site maintenance worker.
- Off-site resident (trespasser or visitor).

Hypothetical future adult, adolescent, and child on-site residents were quantified for information purposes only. Deed restrictions are planned to prevent on-site residents; therefore, on-site residential land use is not expected in the foreseeable future.

Toxicity Assessment. The toxicity assessment is a two-step process whereby potential hazards associated with the route-specific exposure to a given chemical are (1) identified by reviewing relevant human and animal studies and (2) quantified through analysis of dose-response relationships. USEPA has calculated numerous toxicity values having undergone extensive review within the scientific community. These values (published in the Integrated Risk Information System and other journals) are used in the baseline evaluation to calculate both carcinogenic and noncarcinogenic risks associated with each COPC and rate of exposure.

Risk Characterization. In the final step of the risk assessment, results of the exposure and toxicity assessments are combined to estimate the overall risk from reasonable maximum exposure to site contamination. For cancer-causing chemicals, risk is estimated to be a probability. For example, a particular exposure to chemicals at a site may present a 1 in 1 million (or 1.0E-06) chance of development of cancer over an estimated lifetime of 70 years. The USEPA allowable carcinogen risk range is 1.0E-04 to 1.0E-06 and the FDEP acceptable target ICR is 1.0E-06. Therefore, carcinogenic risks greater than 1.0E-06 are unacceptable.

For noncancer-causing chemicals, the chemical dose to which a receptor may be exposed is estimated and compared to the reference dose (RfD). The RfD is developed by USEPA scientists and represents an estimate of the amount of chemical a person (including the most sensitive persons) could be exposed to over a lifetime without developing adverse effects. The measure of the likelihood of adverse effects other than cancer occurring in humans is called the Hazard Index (HI). An HI greater than 1 suggests adverse effects are possible.

Table 2-4 summarizes the human health risks associated with potential future land use for groundwater exposure scenarios for OU 2. The chemicals listed as risk drivers were the focus of the baseline risk assessment.

TABLE 2-4

RISK SUMMARY FUTURE POTENTIAL LAND USE
GROUNDWATER EXPOSURE SCENARIOS

OPERABLE UNIT 2
NTC, ORLANDO

Receptor	Exposure Route	Cancer Risk	Hazard Index	Risk Driver
Adult Resident (Area 1)	Ingestion	**3.2E-06**	**2.2E+00**	Benzene, iron, 1,4-dichlorobenzene
	Inhalation	**1.8E-06**	--	
	Dermal	9.2E-07	2.9E-02	
	Total	**5.9E-06**	**2.2E+00**	
Child Resident (Area 1)	Ingestion	**1.9E-06**	**7.0E+00**	Benzene, iron, manganese, 1,4-dichlorobenzene
	Inhalation	**1.0E-06**	--	
	Dermal	4.9E-07	1.5E-01	
	Total	**3.4E-06**	**7.2E+00**	
Adult resident (Area 2/3)	Ingestion	**4.8E-04**	**5.5E+00**	Benzene, PCE, TCE, vinyl chloride, arsenic
	Inhalation	**4.0E-04**	**5.5E+00**	
	Dermal	**1.1E-04**	**4.2E+00**	
	Total	**9.9E-04**	**1.5E+01**	
Child Resident (Area 2/3)	Ingestion	**2.8E-04**	**1.4E+01**	PCE, TCE, vinyl chloride, arsenic
	Inhalation	**2.4E-04**	**1.3E+01**	
	Dermal	**5.9E-05**	**8.9E+00**	
	Total	**5.7E-04**	**3.6E+01**	

Bold values exceed the FDEP ICR target of 1.0E-06 or the target HI of 1.0.
Data presented in this table are summarized from the following tables in Appendix E of the RI: E10.9B, E10.13B, E10.14B, and E10.10B.

2.7.1.1 Risks for Area 1

The estimated ICRs and HIs for the groundwater scenarios for Area 1 (the northeast portion of OU 2) calculated in the HHRA are summarized in Table 2-4. The following items summarize the results of the risk characterization for Area 1 using updated RI Phase III sample data:

- Noncancer risk estimates (HIs) indicate potential adverse effects for the hypothetical future resident only.
- ICRs exceed 1.0E-06 for the maintenance worker (1.8E-06) and the hypothetical future resident (1.9E-05). ICRs for individual COPCs in the maintenance worker scenario do not exceed 1.0E-06.
- No ICRs exceeded 1.0E-04.

2.7.1.2 Risks for Area 2/3

The estimated ICRs and HIs for the groundwater scenarios for Area 2/3 (the central and southern portions of OU 2) calculated in the HHRA are summarized in Table 2-4. The following items summarize the results of the risk characterization for Area 2/3 using updated RI Phase III sample data:

- Noncancer risk estimates (HIs) indicate potential adverse effects for hypothetical future residents only. The HIs for Area 2/3 groundwater are an order of magnitude greater than those calculated for Area 1.
- ICRs exceed 1.0E-06 for the maintenance worker (1.8E-06) and the hypothetical future resident (1.6E-03).
- ICRs exceeded 1.0E-04 for the hypothetical future resident only.

2.7.1.3 Risk Characterization for Trespassers exposed to Local Surface Waters/Sediment

A summary of the HHRA conducted for off-site residents, visitors, or trespassers occasionally exposed to surface water/sediment local to OU 2 was presented in the RI. Adverse noncarcinogenic health effects are not anticipated under the conditions established in the exposure assessment. The ICR estimate for the trespasser (3.1E-06) is within the USEPA target risk range. ICR estimates for COPCs in sediment do not exceed 1.0E-08.

2.7.2 Ecological Risk Assessment

The ERA for this site evaluated actual and potential adverse effects to ecological receptors associated with exposure to contamination from OU 2. The ERA was completed in accordance with the current guidance materials (USEPA, 1997) for ERAs at Superfund sites.

This ERA can be considered a screening level assessment since it is based on comparing chemical concentrations against conservative screening values and an evaluation of historical ecological data. This assessment generally followed a two-step process: Step 1 – Preliminary Problem Formulation and Preliminary Ecological Effects Evaluation; Step 2 – Preliminary Exposure Estimate and Preliminary Risk Calculation. In addition, Step 3A (Refinement of COPCs) was also performed in accordance with Navy Guidance (DON, 1999).

The northern, central, and southern sections of OU 2 are somewhat disparate ecologically. As a result, receptors prevalent on each portion of OU 2 vary and difficulties arise when determining overall risks. The northern section is mostly golf course grounds, the canal along the eastern border of OU 2, and some ponded water. The central section is comprised of the golf course and the canal as well but contains a system of ponds and forested wetlands. The southern section is almost entirely wooded, mainly upland, with some forested wetland areas interspersed among the upland areas.

The ERA showed that some potential risks were present from inorganic and organic compounds in surface soil. Most of the risks to terrestrial receptors were driven by hot spots of contamination. The IRA activities have reduced or eliminated the risk due to surface soil contamination.

Some food chain risks were present from inorganic compounds, PAHs, and pesticides. Most of these risks were driven by localized, elevated concentrations of chemicals. Localized, elevated metals in surface soil do not appear to pose potential food chain risks at the population or community level, and the IRA activities have reduced or eliminated these potential risks.

The only pervasive risks appear to be in the canal along the southeastern side of OU 2. Although elevated concentrations of inorganics (mainly mercury) were present in canal surface water during all three RI sampling phases (TtNUS, 2001), the canal contains limited habitat in both quantity and quality. Additionally, the canal is dredged periodically, significantly disturbing the available habitat. The canal discharges into Lake Gillooly south of OU 2, and sampling suggests that inorganics have not migrated to the lake in any appreciable degree. Although potential risks may be associated with canal surface water, no remedial activity or additional ecological study is recommended.

A complete list of all constituents sampled and their detected concentrations is available in the RI report. Table 2-5 provides a summary of the ecological chemicals of potential concern (ECOPCs) selected for OU 2.

TABLE 2-5

SUMMARY OF ECOLOGICAL CHEMICALS OF POTENTIAL CONCERN

OPERABLE UNIT 2
NTC, ORLANDO

Environmental Medium	ECOPCs[1]
Surface Soil	**VOCs:** Acetone **SVOCs:** Anthrancene, benzo(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, benzo(g,h,i)perylene, benzo(k)fluoranthene, chrysene, dibenzo(a,h)anthracene, fluoranthene, indeno(1,2,3-cd)pyrene, phenanthrene, pyrene **Pesticides/PCBs:** 4,4'-DDE, 4,4'-DDT, dieldrin, endrin ketone, gamma-chlordane, heptachlor **Inorganic Compounds:** Aluminum, chromium, iron, mercury, silver, vanadium
Surface Water	**Inorganic Compounds:** Aluminum, barium, chromium, cobalt, copper, iron, lead, manganese, mercury, vanadium, zinc
Sediment	**Pesticides/PCBs:** Alpha-chlordane, gamma-chlordane **Inorganic Compounds:** Aluminum, barium, cobalt, iron, manganese, selenium, vanadium
Groundwater	**VOCs:** cis-1,2-dichloroethene, methane, vinyl chloride, xylenes **SVOCs:** 1,4-dichlorobenzene, naphthalene **Inorganic Compounds:** Aluminum, chromium, copper, iron, lead, manganese, mercury, vanadium, zinc

(1) Most chemicals were selected based on the maximum detected concentrations exceeding USEPA ecological screening values.

2.7.3 Basis for Action

Actual or threatened releases of hazardous substances from this site, if not addressed by implementing the selected remedy in this ROD, present a current and future potential threat to public health and welfare.

Surface soil, groundwater, surface water, and sediment all show exceedances of the State of Florida Cleanup Target Levels (CTLs). The risk assessments indicate unacceptable risks for hypothetical future residents exposed to environmental media and sporadic terrestrial and food chain risks for ecological receptors. The ICR estimate for the current/future maintenance worker (1.8E-06) exceeds the FDEP

target ICR, and was within the USEPA target risk range, primarily due to benzo(a)pyrene and arsenic in surface soil.

2.8 REMEDIAL ACTION OBJECTIVES

The ERA presented in the RI concluded that although there may be some potential risks associated with surface water, no remedial activity or additional ecological study is warranted. Therefore, no RAOs are identified for ecological receptors.

The FS developed RAOs based on unacceptable human health risk that exists for direct exposure to groundwater, surface or subsurface soil, sediment and surface water based on the current and anticipated future land use of the sites. The current and future use of the property at OU 2 is for recreational purposes; therefore, public use. Considered receptors are commercial/industrial workers. All exposure scenarios for human health receptors used the State of Florida CTLs criteria [Chapter 62-777, *Florida Administrative Code* (F.A.C.)].

The RAOs for this site are as follows:

- Minimize the potential for human ingestion, inhalation, or dermal contact of soil, sediment, and groundwater containing chemicals that exceed regulatory requirements or risk-based acceptable exposure levels.
- Prevent leaching of chemicals from soil, sediment, or landfill material that would result in groundwater concentrations in excess of either the FDEP GCTLs for organic compounds or site-specific background screening levels for inorganic compounds.
- Restore the surface water and Surficial Aquifer groundwater to the FDEP GCTLs for organic compounds and site-specific background screening levels for inorganic compounds.

PRGs establish acceptable chemical concentrations that are protective of human health and the environment and are estimated for OU 2 using baseline assumptions and inputs. PRGs are used to determine COCs, to estimate areas and volumes of impacted media, and to set performance standards for potential remedial alternatives. The groundwater COCs for OU 2 and their corresponding PRGs are listed below:

COC	PRG (µg/L)
Benzene	1
Trichloroethene	3
Vinyl chloride	1
Iron	1227
Manganese	50

These goals are based on State of Florida CTLs (62-777, F.A.C.), background screening values, and assumptions regarding future land uses. The PRG selection criteria are summarized in the FS, Section 3.3 (TtNUS, 2002a).

2.9 DESCRIPTION OF ALTERNATIVES

Media of concern for OU 2 include landfill material and groundwater. Technologies and remedial alternatives were evaluated in the FS (TtNUS, 2002a). The FS was conducted in accordance with the USEPA's interim guidance, *Application of the CERCLA Municipal Landfill Presumptive Remedy to Military Landfills* (USEPA, 1996).

Alternatives were developed separately for the northern and southern areas of OU 2, based on current data for extent and magnitude of contamination. However, potential exists for the release of contaminants from landfill material.

Northern Area

The alternatives for the northern area are listed below and summarized in Table 2-6.

- Alternative N-1: No action.
- Alternative N-2: Native soil cover, LUCs, and monitoring.
- Alternative N-3: Native soil cover, groundwater extraction and treatment, discharge to infiltration gallery, LUCs, and monitoring.
- Alternative N-4: Native soil cover, groundwater extraction, discharge to Publicly Owned Treatment Work (POTW), LUCs, and monitoring.

Southern Area

The alternatives for the southern area are listed below and summarized in Table 2-7.

- Alternative S-1: No action.
- Alternative S-2: LUCs and monitoring.
- Alternative S-3: Enhanced biodegradation, LUCs, and monitoring.
- Alternative S-4: Groundwater extraction and treatment, discharge to infiltration gallery, LUCs, and monitoring.
- Alternative S-5: Limited containment using sheet piles, Permeable Reactive Barriers (PRBs), LUCs, and monitoring.
- Alternative S-6: Extended containment using sheet piles, PRBs, LUCs, and monitoring.

TABLE 2-6

SUMMARY OF EVALUATED REMEDIAL ALTERNATIVES NORTHERN PLUME

OPERABLE UNIT 2
NTC, ORLANDO

Alternative	Description of Key Components	Cost (Present Worth)	Duration[1]
Alternative N-1: No Action	No remedial actions would be perfomed. Only 5-year site reviews would be performed.	$29,000	Indefinite
Alternative N-2: Native Soil Cover, LUCs, and Monitoring	Implement LUCs for groundwater use restrictions until PRGs achieved. LUCs for restrictions to site access and land development must be enforced indefinitely. Place additional soil cover. Monitoring for cover maintenance. Long-term monitoring of groundwater contamination. Perform natural attenuation monitoring. Perform 5-year site reviews.	$824,000	30 years
Alternative N-3: Native Soil Cover, Groundwater Extraction and Treatment with Discharge to Infiltration Gallery, LUCs, and Monitoring	Implement LUCs for groundwater use restrictions until PRGs achieved. LUCs for restrictions to site access and land development must be enforced indefinitely. Place additional soil cover. Install groundwater extraction system and treatment system to include air stripping and chemical precipitation with discharge to an infiltration gallery. Monitoring for cover maintenance. Long-term monitoring of groundwater contamination. Monitoring for treatment system performance. Perform natural attenuation monitoring. Perform 5-year site reviews.	$1,969,000	30 years[2]
Alternative N-4: Native Soil Cover, Groundwater Extraction with Discharge to POTW, LUCs, and Monitoring	Implement LUCs for groundwater use restrictions until PRGs achieved. LUCs for restrictions to site access and land development must be enforced indefinitely. Place additional soil cover. Install groundwater extraction system and discharge extracted groundwater to POTW. Monitoring for cover maintenance. Long-term monitoring of groundwater contamination. Perform natural attenuation monitoring. Perform 5-year site reviews.	$1,257,000	30 years[2]

[1] A period of 30 years was chosen for present worth costing purposes only. Under CERCLA, remedial actions must continue as long as hazardous substances, pollutants, or contaminants remain at the site.

[2] Estimated time to reach PRGs for known contamination by groundwater extraction and treatment is 9 years.

Notes:

LUC = Land Use Control
POTW = Publicly Owned Treatment Works
RG = Remediation Goal
Estimated Present Worth Cost of 5-year reviews over 30 year period = $29,000.

TABLE 2-7
SUMMARY OF EVALUATED REMEDIAL ALTERNATIVES SOUTHERN PLUME
OPERABLE UNIT 2
NTC, ORLANDO

Alternative	Description of Key Components	Cost (Present Worth)	Duration[1]
Alternative S-1: No Action	No remedial response or long-term monitoring would occur. LUCs for restrictions to site access and land development must be enforced indefinitely. Perform 5-year site reviews.	$29,000	indefinite
Alternative S-2: LUCs and Monitoring	Implement LUCs for groundwater use restrictions until PRGs are achieved. LUCs for restrictions to site access and land development must be enforced indefinitely. Perform 5-year site reviews. Monitor groundwater and surface water to assess progress of natural attenuation.	$671,000	30 years
Alternative S-3: Enhanced Biodegradation, LUCs, and Monitoring	Inject chemicals such as ORC® or HRC® into subsurface to enhance biodegradation. Implement LUCs for groundwater use restrictions until PRGs are achieved. LUCs for restrictions to site access and land development must be enforced indefinitely. Perform 5-year site reviews. Monitor groundwater and surface water to assess progress of natural attenuation.	$1,639,000	30 years
Alternative S-4: Groundwater Extraction and Treatment with Discharge to Infiltration Gallery, LUCs, and Monitoring	Install groundwater extraction system and treatment system to include greensand filtration and air stripping with discharge to infiltration gallery. Implement LUCs for groundwater use restrictions until PRGs are achieved. LUCs for restrictions to site access and land development must be enforced indefinitely. Perform 5-year site reviews. Monitor groundwater and surface water to assess progress of natural attenuation.	$2,660,000	30 years
Alternative S-5: Limited Containment Using Sheet Piles, PRBs, LUCs, and Monitoring	Install sheet pile wall on eastern edge of southern area and two PRB gates using zero valent iron as reactor medium. Implement LUCs for groundwater use restrictions until PRGs are achieved. LUCs for restrictions to site access and land development must be enforced indefinitely. Perform 5-year site reviews. Monitor groundwater and surface water to assess progress of natural attenuation.	$4,140,000	30 years
Alternative S-6: Extended Containment Using Sheet Piles, PRBs, LUCs, and Monitoring	Install sheet pile wall on all sides of southern area and PRB gate using zero valent iron as reactor medium. Implement LUCs for groundwater use restrictions until PRGs are achieved. LUCs for restrictions to site access and land development must be enforced indefinitely. Perform 5-year site reviews. Monitor groundwater and surface water to assess progress of natural attenuation.	$5,953,000	30 years

[1]A period of 30 years was chosen for present worth costing purposes only. Under CERCLA, remedial actions must continue as long as hazardous substances, pollutants, or contaminants remain at the site.

Notes: HRC® – Hydrogen Release Compound®
LUC – Land Use Control
ORC® – Oxygen Release Compound®
PRB – Permeable Reactive Barrier
RG - Remediation Goal
Estimated Present Worth Cost of 5-year reviews over 30-year period = $29,000.

2.9.1 Detailed Description of Remedial Alternatives for the Northern Area

Alternative N-1: No Action

The No Action alternative (estimated present worth cost of $29,000) would maintain the site at current levels of impact and environmental conditions. This alternative was retained to provide a baseline for comparison to the other alternatives (as required by CERCLA) and does not address the wastes that are present or the impacted groundwater. No remedial response or long-term monitoring would occur. Only administrative actions, which include a 5-year review, would be taken. The estimated present worth cost to implement Alternative N-1 includes a periodic cost of $8,080 for conducting the 5-year reviews over a 30-year monitoring period, and a capital cost of $0.

Alternative N-2: Native Soil Cover, LUCs, and Monitoring

This alternative (estimated present worth cost of $824,000) consists of the following components:

- Site access and future usage restrictions.
- Placing 1.5 feet of clean cover at locations without adequate landfill cover.
- Monitoring for cover maintenance and groundwater contamination along with long-term monitoring of groundwater for natural attenuation parameters and maintenance of the landfill cover.
- Five-year site reviews.

LUCs would be implemented to control or eliminate pathways of exposure to COCs. LUCs would include site restrictions to prohibit intrusive activity within the landfill boundary and a ban of using groundwater as a drinking water supply. Land use plans and property deeds for land near the golf course would be annotated to indicate that groundwater extraction for potable use in the area could pose an unacceptable health risk if consumed without treatment. The agency currently responsible for administering well installation permits would be requested not to issue permits for potable wells screened within the Surficial Aquifer. These groundwater use restrictions would be removed only when a 5-year site review indicates that FDEP drinking water standards have been achieved. Other portions of the LUCs that restrict site access and land development would have to be enforced indefinitely.

Additional soil cover would involve the placement of an estimated 7,800 yd^3 of native soil and grading those areas to required contours. The goal for placing additional soil would be a minimum of 1.5 feet of native soil cover over the entire landfill area.

This alternative would prevent the direct contact pathway and meet the minimum landfill cover requirements (for presumptive remedy). It would rely on MNA to address organic contamination in groundwater. Monitoring would include both groundwater and surface water monitoring to assess the progress of natural attenuation.

Five-year site reviews would continue indefinitely to confirm that the LUCs restricting site access and land development are being enforced. The estimated capital costs would be $169,000. Annual O&M costs would be $46,000 for the first 2 years and $24,000 thereafter.

Alternative N-3: Native Soil Cover, Groundwater Extraction and Treatment, Discharge to Infiltration Gallery, LUCs, and Monitoring

This alternative (estimated present worth cost of $1,969,000) consists of the following components:

- Site access and future usage restrictions.
- Placing 1.5 feet of clean cover at locations without adequate landfill cover.
- Extraction of groundwater.
- On-site treatment using air stripping and metals precipitation to remove VOCs and metals.
- Discharge of treated water to an infiltration gallery.
- Monitoring for cover maintenance, treatment system performance, and groundwater conditions.
- Five-year site reviews.

The elements of LUCs and native soil cover would be similar to those described for Alternative N-2. Removal of contaminated groundwater would include installation of four 4-inch extraction wells equipped with submersible pumps for a total flow rate of 18 gallons per minute (gpm). Treatment would include iron and manganese removal via green sand filters, and VOC removal using a low profile air stripping unit. Treated groundwater with contaminant levels below the corresponding PRGs would be discharged through an infiltration gallery located within the golf course area for subsurface discharge. Operation of the treatment system would last for 9 years.

Five-year reviews would evaluate site conditions and treatment plant and monitoring data. Five-year site reviews would continue indefinitely to confirm that the LUCs restricting site access and land development are being enforced. The estimated capital costs would be $169,000. Annual O&M costs would be $112,000 for years 1-2, $94,000 for years 3-9, and $20,000 thereafter.

Alternative N-4: Native Soil Cover, Groundwater Extraction, Discharge to POTW, LUCs, and Monitoring

This alternative (estimated present worth cost of $1,257,000) consists of the following components:

- Site access and future usage restrictions.
- Placing 1.5 feet of clean cover at locations without adequate landfill cover.
- Monitoring for cover maintenance and groundwater contamination.
- Extraction of groundwater using four extraction wells.
- Discharge of water to POTW.
- Five-year site reviews.

The elements of LUCs, native soil cover, and groundwater extraction would be similar to those described for Alternative N-3. Extracted groundwater would be discharged directly to the City of Orlando POTW without prior treatment. Monitoring would involve sampling of the extracted groundwater prior to discharge to the sewer line (POTW) and both groundwater and surface water periodic monitoring to assess the progress of remediation. The period of treatment would be for 9 years, and monitoring wells and surface water would be sampled for a period of 30 years.

Five-year reviews would evaluate site conditions, groundwater extraction system, and monitoring data. Site reviews would continue indefinitely to confirm that the LUCs restricting site access and land development are being enforced. The estimated capital costs would be $427,000. Annual O&M costs would be $72,000 for years 1-2, $54,000 for years 3-9, and $20,000 thereafter.

2.9.2 Detailed Description of Remedial Alternatives for the Southern Area

Alternative S-1: No Action

The No Action alternative (estimated present worth cost of $29,000) would maintain the site at current levels of impact and environmental conditions. Only administrative actions, which include a 5-year review, would be taken. This alternative does not address the wastes that are present or the impacted groundwater. No remedial response or long-term monitoring would occur. This alternative would not be protective of human health and the environment, but was retained to provide a baseline for comparison to the other alternatives (as required by CERCLA). The estimated present worth cost to implement Alternative S-1 includes a periodic cost of $8,080 for conducting the 5-year reviews over a 30-year monitoring period, and a capital cost of $0.

Alternative S-2: LUCs and Monitoring

This alternative (estimated present worth cost of $671,000 over a 30-year period) consists of the following components:

- Site access and future usage restrictions.
- Monitoring for groundwater contamination along with long-term monitoring for natural attenuation parameters.
- Five-year site reviews.

LUCs would be implemented to control or eliminate exposure pathways to COCs at the site. Site restrictions would be enacted to prohibit unauthorized intrusive activity within the landfill boundary, to restrict access to areas, and to ban using groundwater as a drinking water supply. Land use plans and property deeds for land near the golf course would be annotated for land in the vicinity of the southern area of OU 2. The extent of property to be controlled would include land in between the fence and canals, presently owned by the Greater Orlando Aviation Authority (GOAA). The property deeds would be annotated to indicate that groundwater extraction for potable use in the area could pose an unacceptable health risk if consumed without treatment. The agency currently responsible for administering well installation permits would be requested not to issue permits for potable wells screened within the Surficial Aquifer. These groundwater use restrictions would be removed only when a 5-year site review indicates that FDEP drinking water standards have been achieved. Other portions of the LUCs that restrict site access and land development would have to be enforced indefinitely.

This alternative would rely on natural attenuation for addressing the organic contaminants in the groundwater and surface water. Evaluation of data suggests that natural attenuation of groundwater has been in progress at the southern area of OU 2.

Five-year reviews would evaluate site conditions and monitoring data to determine whether this alternative remains appropriate for the southern area of OU 2. Site reviews would continue indefinitely to confirm that the LUCs restricting site access and land development are being enforced. The estimated capital costs would be $32,000. The annual O&M costs would be $45, 000 for the first 2 years, and $23,000 thereafter.

Alternative S-3: Enhanced Biodegradation, LUCs, and Monitoring

This alternative (estimated present worth cost of $1,639,000 over a 30-year period) consists of the following components:

- Site access and future usage restrictions.
- Monitoring for groundwater contamination and natural attenuation parameters.
- Injection of enhancement chemicals such as Hydrogen Release Compound (HRC®) and Oxygen Release Compound (ORC®) into the areas of chlorinated hydrocarbon contamination to accelerate in situ biodegradation.
- Natural attenuation of residual organic contamination.
- Five-year site reviews.

This alternative would utilize biodegradation enhancement chemicals such as HRC® and ORC® to increase the reaction rate of natural attenuation processes already underway. The FS provides a preliminary layout of injection points. The best method to deliver these chemicals into the subsurface is to inject the material using direct push hydraulic equipment. Site-specific pilot studies would be required to determine the suitability of these chemicals for the site and amount of chemicals needed to meet the target levels.

LUCs would be similar to Alternative S-2. Monitoring would involve both groundwater and surface water to assess the progress of enhanced biodegradation and natural attenuation. Five-year reviews would evaluate site conditions and monitoring data to determine whether this alternative remains appropriate for the southern area of OU 2. Site reviews would continue indefinitely to confirm that the LUCs restricting site access and land development are being enforced. The estimated capital costs would be $405,000. The annual O&M costs would be $206, 000 for years 1-2, $184,000 for years 3-4, and $23,000 thereafter.

Alternative S-4: Groundwater Extraction and Treatment, Discharge to Infiltration Gallery, LUCs, and Monitoring

This alternative (estimated present worth cost of $2,660,000 over a 30-year period) consists of the following components:

- Site access and future usage restrictions.
- Extraction of groundwater.
- On-site groundwater treatment using air stripping to remove VOCs.
- Discharge of treated water to an infiltration gallery.
- Monitoring for treatment system performance and groundwater conditions.
- Five-year site reviews.

This alternative involves removal and treatment of contaminated groundwater. A preliminary layout for this system is provided in Section 5.2.4 of the FS (TtNUS, 2002a). The extraction system would consist of five 4-inch wells with a total flow rate of 37 gpm. Extracted groundwater would be treated for the removal of benzene, TCE, and vinyl chloride through air stripping. No off-gas treatment would be required, as determined in the FS. Treated water with contaminant levels below reinjection requirements would be discharged through an infiltration gallery located in the golf course area.

Periodic monitoring would be required for both groundwater and surface water to assess the progress of remediation. The treatment system would be in operation for an estimated 18 years. The elements of LUCs would be similar to Alternative S-2.

Five-year reviews would evaluate site conditions and monitoring data to determine whether this alternative remains appropriate for the southern area of OU 2. Site reviews would continue indefinitely to confirm that the LUCs restricting site access and land development are being enforced. The estimated capital costs would be $1,206,000. The annual O&M costs would be $116,000 for years 1-2, $99,000 for years 3-4, and $19,000 thereafter.

Alternative S-5: Limited Containment using Sheet Piles, PRBs, LUCs, and Monitoring

This alternative (estimated present worth cost of $4,140,000 over a 30-year period) consists of the following components:

- Site access and future usage restrictions.
- Approximately 2,000 feet of sheet piling along the canal to prevent contaminated groundwater flow into the canals.
- Installing zero valent iron (ZVI) PRB as gates in the contained area to provide in situ treatment of chlorinated organic compounds in groundwater.
- Natural attenuation of residual organic contamination (e.g., benzene)
- Monitoring for cover maintenance, PRB performance, and groundwater conditions along with natural attenuation parameters.
- Five-year site reviews.

Alternative S-5 involves partial containment of the southern area of OU 2 and treatment of contaminated groundwater through in situ PRBs. The containment would be provided by installation of a sheet pile wall

on the eastern edge of the southern area of OU2. The PRBs would be installed such that they would address contamination in both the shallow and intermediate zones of the aquifer. ZVI would be used as the reactor media; however, field studies would be required to assure the suitability of the ZVI.

Periodic monitoring would be required for both groundwater and surface water to assess the progress of remediation. The period of in situ treatment system would be an estimated 30 years. The elements of LUCs would be similar to Alternative S-2.

Five-year reviews would evaluate site conditions, PRB treatment, and monitoring data to determine whether this alternative remains appropriate for the southern area of OU 2. Site reviews would continue indefinitely to confirm that the LUCs restricting site access and land development are being enforced. The estimated capital costs would be $3,501,000. The annual O&M costs would be $45,000 for the first 2 years and $23,000 thereafter.

Alternative S-6: Extended containment using Sheet Piles, PRBs, LUCs, and Monitoring

This alternative (estimated present worth cost of $5,953,000 over a 30-year period) consists of the following components:

- Site access and future usage restrictions.
- Approximately 5,000 feet of sheet to isolate the southern area of OU 2.
- Installing ZVI PRB as a gate along the southern edge of the landfill to provide in situ treatment of chlorinated organic compounds in groundwater.
- Natural attenuation of residual organic contamination (e.g., benzene).
- Monitoring for cover maintenance, PRB performance, and groundwater conditions along with natural attenuation parameters.
- Five-year site reviews.

Alternative S-6 is similar to Alternative S-5; however, it provides total containment of the southern area of OU 2. Section 5.2.6.1 of the FS (TtNUS, 2002a) provides a detailed description of this alternative. Periodic monitoring would be required for both groundwater and surface water to assess the progress of remediation. The period of in situ treatment system would be an estimated 30 years. The elements of LUCs would be similar to Alternative S-2.

Five-year reviews would evaluate site conditions, PRB treatment, and monitoring data to determine whether this alternative remains appropriate for the southern area of OU 2. Site reviews would continue indefinitely to confirm that the LUCs restricting site access and land development are being enforced. The estimated capital costs would be $5,314,000. The annual O&M costs would be $45,000 for the first 2 years and $23,000 thereafter.

2.10 SUMMARY OF THE COMPARATIVE ANALYSIS OF ALTERNATIVES

In selecting the preferred alternatives for OU 2 to address the minimum landfill cover requirements and groundwater contamination, the nine CERCLA criteria were used to evaluate the alternatives developed in the FS. The first seven are technical criteria, based on the degree of protection of the environment, cost, and engineering feasibility issues. The alternatives were further evaluated, based on the final two criteria: acceptance by the USEPA and FDEP and acceptance by the community. These nine criteria can be categorized into three groups: threshold criteria, primary balancing criteria, and modifying criteria as shown below.

Threshold Criteria

1. Overall protection of human health and the environment
2. Compliance with applicable or relevant and appropriate requirements (ARARs)

Primary Balancing Criteria

1. Long-term effectiveness and permanence
2. Reduction of toxicity, mobility, or volume through treatment
3. Short-term effectiveness
4. Implementability
5. Cost

Modifying Criteria

1. Federal and state acceptance
2. Community acceptance

Based on evaluation of the alternatives against these criteria, Alternative N-2 (for the northern area) and Alternative S-2 (for the southern area) were selected as the preferred alternatives for OU 2.

Tables 2-8 and 2-9 contain a summary of the comparative evaluation of alternatives for OU 2.

2.11 PRINCIPAL THREAT WASTES

Principal threat wastes are those source materials considered to be highly toxic or highly mobile that generally cannot be reliably contained, or would present a significant risk to human health or the environment should exposure occur. Contaminated groundwater generally is not considered to be a source material. The source materials at OU 2 (buried landfill wastes and contaminated groundwater) are not considered to be principal threat wastes; therefore, this ROD does not address these types of wastes.

2.12 SELECTED REMEDY

2.12.1 Summary of Rationale for Remedy Selection

Based on consideration of the requirements of CERCLA, the NCP, the USEPA, the FDEP, and public comments, a remedy has been selected to address the minimum landfill cover requirements and groundwater contaminants at OU 2. After consideration of the conditions at OU 2, comparison of cleanup alternatives, and consideration of the proposed reuse of the area, the OPT proposed a combination of the following two alternatives:

- Alternative N-2, Native soil cover, LUCs, and monitoring.
- Alternative S-2, LUCs and monitoring.

This remedy was recommended by the OPT for the following reasons:

- The two IRAs conducted at OU 2 reduced the human health risk due to surface soil contamination. The placement of additional soil cover and implementation and enforcement of LUCs will minimize the potential risk due to direct contact with landfill materials.
- Detected concentrations of benzene, TCE, vinyl chloride, iron, and manganese are in excess of the FDEP GCTLs; however, they do not present an unacceptable threat to human health or the environment under the current and foreseeable future site use scenario because groundwater use will be restricted.
- The size of the groundwater contaminant plume is small, and there is no evidence of ongoing contaminant migration.

The preferred remedial action presented in the Proposed Plan (TtNUS, 2002b) was made available for public comment in _____ 2002. No comments were received from the public regarding the plan.

TABLE 2-8

COMPARISON OF CLEANUP ALTERNATIVES – NORTHERN AREA PLUME

OPERABLE UNIT 2
NTC, ORLANDO

Evaluation Criteria	Alternative N-1 No Action	Alternative N-2 Native Soil Cover LUCs Monitoring	Alternative N-3 Native Soil Cover Groundwater Extraction and Treatment, Discharge to Infiltration Gallery, LUCs and Monitoring	Alternative N-4 Native Soil Cover Groundwater Extraction Discharge to POTW LUCs and Monitoring
Protects Human Health and the Environment	Would not be protective because residential development could occur that would result in unacceptable risks to human receptors.	Would be protective by preventing direct human contact with landfill contents, by preventing residential development, and by detecting any potential migration of contaminants through groundwater and surface water monitoring.	Would be protective by preventing direct human contact with landfill contents, by remediating contaminated groundwater, by preventing residential development, and by detecting any potential migration of contaminants through groundwater and surface water monitoring.	Would be protective by preventing direct human contact with landfill contents, by remediating contaminated groundwater, by preventing residential development, and by detecting any potential migration of contaminants through groundwater and surface water monitoring.
Meets Federal and State Requirements	Would not comply	Would comply	Would comply	Would comply
Long-term Effectiveness and Permanence	Would have no long-term effectiveness or permanence because there would be no protection from contaminants remaining on-site.	Would be long-term effective and permanent. Additional soil cover would be permanent and effective on a long-term basis in providing protection against direct contact. The prevention of residential development through deed restrictions and monitoring to evaluate potential migration of contaminants would provide long-term effectiveness and permanence.	Groundwater collection and treatment using air stripping and metal oxidation is a proven and established technology that would provide long-term reliability and effectiveness. Additional soil cover would be permanent and effective on a long-term basis in providing protection against direct contact. The prevention of residential development through deed restrictions and monitoring to evaluate potential migration of contaminants would provide long-term effectiveness and permanence.	Groundwater extraction is a proven technology as is treatment at a POTW. The long-term reliability and effectiveness of the system are proven. Additional soil cover would be permanent and effective on a long-term basis in providing protection against direct contact. The prevention of residential development through deed restrictions and monitoring to evaluate potential migration of contaminants would provide long-term effectiveness and permanence.
Reduces 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.	Groundwater with chemical concentrations above PRGs would remain in the subsurface until natural attenuation processes act on them. Reduction of toxicity may occur only through natural processes. Natural biodegradation would be documented through monitoring.	Treatment using air stripping and metals oxidation would offer reduction in volume. High levels of removal would be achieved through the treatment steps of this alternative.	Extracting contaminated groundwater with treatment at a POTW would offer reduction in toxicity. Groundwater with concentrations of COCs above PRGs would be treated at the POTW. High levels of removal would be achieved through treatment at the POTW.
Short-Term Effectiveness	Would not result in short-term effectiveness because risks to site workers would adversely impact the surrounding community and would also not achieve the RAOs or PRGs.	Would result in slight risk to site workers during placement of native soil cover and during sampling activities. However, common engineering practices would minimize such risks.	Would result in medium risk to site workers during placement of native soil cover, construction of treatment system, and during sampling activities. However, common engineering practices would minimize such risks.	Would result in medium risk to site workers during monitoring well installation, placement of native soil cover and during sampling activities. However, common engineering practices would minimize such risks.
Implementability	Would be simple to implement because no action would occur.	Would be readily implementable. The soil cover and monitoring wells could be readily installed.	Would be readily implementable. Treatment system components, native soil cover, and monitoring wells could be readily installed.	Would be readily implementable. Materials and labor are readily available for installing extraction wells and monitoring wells.
State Acceptance	To be determined after the public comment period.			
Community Acceptance	To be determined after the public comment period.			
Cost: Capital Operation and Maintenance Cost (present worth)	 $0 $8,080 $29,000	 $169,000 $46,000 for years 1-2 $24,000 for years 3-30 $824,000	 $834,000 $112,000 for years 1-2 $94,000 for years 2-9 $20,000 for years 10-30 $1,969,000	 $427,000 $72,000 for years 1-2 $54,000 for years 3-9 $20,000 for years 10-30 $1,257,000
Time to Reach Cleanup Goals	Indefinite	30 years	9 years	9 years

Notes:
The nine evaluation criteria are those required by CERCLA.
Shading indicates the preferred alternative.

TABLE 2-9

COMPARISON OF CLEANUP ALTERNATIVES – SOUTHERN AREA PLUME

OPERABLE UNIT 2
NTC, ORLANDO

Evaluation Criteria	Alternative S-1 No Action	Alternative S-2 LUCs Monitoring	Alternative S-3 Enhanced Biodegradation LUCs, and Monitoring	Alternative S-4 Groundwater Extraction and Treatment, Discharge to Infiltration Gallery, LUCs, Monitoring	Alternative S-5 Limited containment PRBs LUCs, and Monitoring	Alternative S-6 Extended containment PRBs LUCs, and Monitoring
Protects Human Health and the Environment	Would not provide adequate protection of human health and the environment. No action would allow unacceptable risks to human health and the environment.	Would offer adequate human health protection. Monitoring would indicate whether migration of contaminated groundwater was occurring. As long as migration would not occur, adequate protection to the environment would be provided by this alternative.	Would offer adequate human health protection through accelerated biodegradation processes and restricting the usage of groundwater until PRGs are achieved.	This alternative provides a high level of protection of human health and the environment.	This alternative provides a high level of protection of human health and the environment because it contains groundwater and prevents it from flowing off-site.	This alternative provides a high level of protection of human health and the environment because it contains groundwater and prevents it from flowing off-site.
Meets Federal and State Requirements	Would not attain the PRGs	Would comply	Would comply	Would comply	Would comply	Would comply.
Long-term Effectiveness and Permanence	Existing cover would be adequate; however, lack of proper inspection and maintenance would lower the long-term effectiveness. This alternative has no other measures that provide long-term effectiveness or permanence.	Would be long-term effect and permanent. LUCs with groundwater use restrictions would prevent potential human exposure and consumption on a long-term basis.	Would be long-term effect and permanent. LUCs with groundwater use restrictions would prevent potential human exposure and consumption on a long-term basis.	Groundwater extraction and treatment using air stripping is a proven and established technology that provides long-term reliability and effectiveness.	Containment is effective in preventing off-site migration. This technology is long-term reliable and effective.	Containment is effective in preventing off-site migration. This technology is long-term reliable and effective.
Reduces Toxicity, Mobility, or Volume through Treatment	Groundwater with chemical concentrations above PRGs would remain in the subsurface. Reduction of toxicity, mobility, or volume might occur through natural processes, although it would not be documented in the absence of monitoring.	Groundwater with chemical concentrations above PRGs would remain in the subsurface. Reduction of toxicity, mobility, or volume might occur through natural processes, although it would not be documented in the absence of monitoring.	Enhanced biodegradation and natural attenuation would lower chemical concentrations to PRG levels over a period of time. Reduction of toxicity, mobility, or volume would occur through natural processes, and would be documented through monitoring.	Treatment using air stripping would offer reduction in volume. High levels of removal would be achieved through the treatment steps of this alternative.	Treatment using PRBs would offer reduction in toxicity. High levels of removal would be achieved through the treatment steps of this alternative.	Treatment using PRBs would offer reduction in toxicity. High levels of removal would be achieved through the treatment steps of this alternative.
Short-term Effectiveness	Because no remedial activities are associated with the implementation of this alternative, no short-term effects would occur.	A low short-term risk to workers, the community, and the environment would occur during installation of monitoring wells. However, these risks could be controlled by following standard practices.	Short-term risks to workers, the community, and the environment would be low during the injection of HRC® and ORC® into the subsurface.	Short-term risks to workers and the environment would be medium during construction of the air stripping facility and installing extraction wells.	Short-term risks to workers and the environment would be high.	Short-term risks to workers and the environment would be high.
Implementability	No technical implementability issues exist.	Would be readily implementable. Monitoring wells could be readily installed.	Would be readily implementable.	Would be readily implementable.	Would be readily implementable.	Would be readily implementable.
State Acceptance	To be determined after the public comment period.					
Community Acceptance	To be determined after the public comment period.					
Cost: Capital Operation and Maintenance	$0 $8,080	$32,000 $45,000 for years 1-2 $23,000 for years 3-20	$405,000 $206,000 for years 1-2 $184,000 for years 2-4 $23,000 for years 5-30	$1,026,000 $116,000 for years 1-2 $99,000 for years 3-4 $19,000 for years 5-30	$3,501,000 $45,000 for years 1-2 $23,000 for year 3-30	$5,314,000 $45,000 for years 1-2 $23,000 for years 3-30
Cost (present worth)	$29,000	$671,000	$1,639,000	$2,660,000	$4,140,000	$5,953,000
Time to Reach Cleanup Goals	Indefinite	30 years	30 years	30 years	30 years	30 years

Notes:
The nine evaluation criteria are those required by CERCLA.
Shading indicates the preferred alternative.

2.12.2 Remedy Description

The remedy selected to address the potential risk from groundwater is a combination of two remedial alternatives as defined in the FS (TtNUS, 2002a) and the Proposed Plan (TtNUS, 2002b). For the northern groundwater plume, Alternative N-2, Native Soil Cover, LUCs, and Monitoring, will be implemented. For the southern groundwater plume, Alternative S-2, LUCs and Monitoring, will be implemented.

The major components of the selected remedy are as follows:

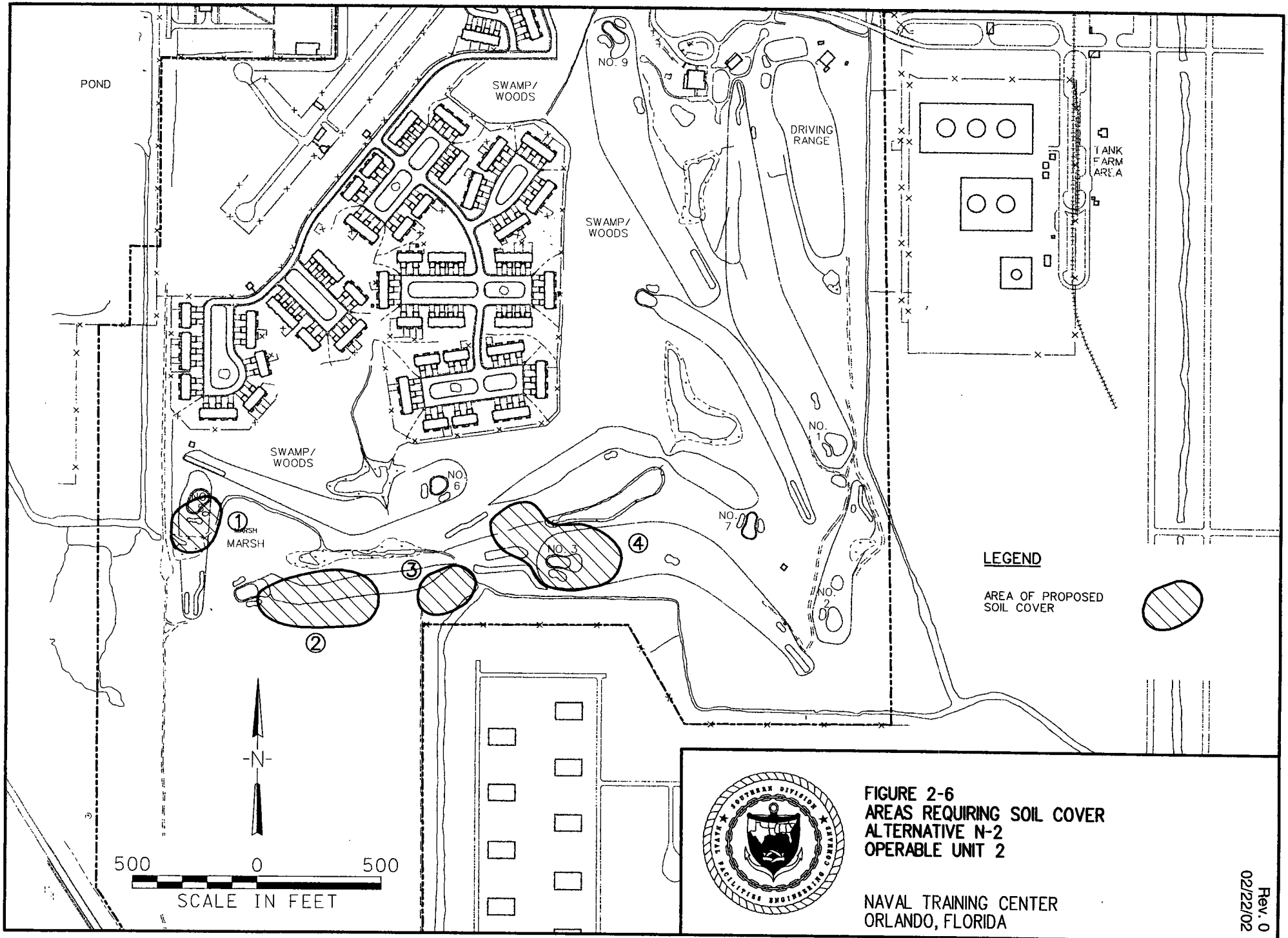
- Restrictions to site access and usage.
- Placing 1.5 feet of clean cover at locations without adequate landfill cover.
- Monitoring for cover maintenance and groundwater contamination.
- Long-term monitoring of groundwater for natural attenuation parameters.
- Long-term monitoring of maintenance of the landfill cover.
- Five-year site reviews.

For the northern plume, this remedy prevents the direct contact pathway and meets minimum landfill cover requirements (for presumptive remedy). Additionally, MNA will be implemented for addressing organic contamination in groundwater. For the southern plume, this remedy relies on MNA of groundwater and does not actively address existing and potential future contamination.

LUCs will be implemented to control or eliminate pathways of exposure to COCs. LUCs will include site restrictions to prohibit unauthorized intrusive activity within the landfill boundary and a ban of using groundwater as a drinking water supply.

For the northern plume area, land use plans and property deeds for land near the golf course will be annotated to indicate that groundwater extraction for potable use in the area could pose an unacceptable health risk if consumed without treatment. Similarly, for the southern plume area, land use plans and property deeds for land near the golf course will be annotated for land in the vicinity of the southern area of OU 2. The extent of property to be controlled includes land in between the fence and canals, presently owned by GOAA. The agency currently responsible for administering well installation permits will be requested not to issue permits for potable wells screened within the Surficial Aquifer. These groundwater use restrictions will be removed only when a 5-year site review indicates that FDEP drinking water standards have been achieved.

In the northern plume area, additional soil cover involves the placement of an estimated 7,800 yd^3 of native soil and grading those areas to required contours (Figure 2-6). The goal for placing additional soil is a minimum of 1.5 feet of native soil cover over the entire landfill area. This would prevent the direct contact pathway and meet the minimum landfill cover requirements (for presumptive remedy).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POND
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SCALE IN FEET
FIGURE 2-6
AREAS REQUIRING SOIL COVER
ALTERNATIVE N-2
OPERABLE UNIT 2
NAVAL TRAINING CENTER
ORLANDO, FLORIDA
Rev. 0
02/22/02
470102001
2-38
CTO 0024
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The selected remedy will rely on MNA to address organic contamination in both the northern and southern groundwater plume areas. Monitoring will include both groundwater and surface water monitoring to assess the progress of natural attenuation.

For both the northern and southern plume areas, 5-year site reviews will evaluate site conditions and monitoring data to determine whether this selected remedy remains appropriate for OU 2. Site reviews will continue indefinitely to confirm that the LUCs restricting site access and land development are being enforced.

Tables 2-10 and 2-11 summarize the evaluation of the selected remedy for the northern and southern plumes, respectively, against the nine CERCLA criteria.

2.12.3 Cost Summary

The sum of the present worth costs for Alternatives N-2 ($824,000) and S-2 ($671,000) is $1,495,000. This represents the estimated cost to implement the selected remedy to address the landfill cover improvements and groundwater contamination at OU 2. The information in the cost estimate summary tables (Appendix B, Tables B-1 and B-2) is based on the best available information regarding the anticipated scope of the remedial alternative. Changes in cost elements are likely to occur as a result of new information and data collected during the engineering design of the remedial alternative. Major changes may be documented in the form of a memorandum in the Administrative Record file, an explanation of significant differences, or a ROD amendment. The estimate is an order-of-magnitude engineering cost estimate expected to be within the range of +50 to -30 percent of the actual project cost.

2.12.4 Expected Outcome of Selected Remedy

The selected remedy is expected to achieve the RAOs established for the site:

- Minimize the potential for human ingestion, inhalation, or dermal contact of soil, sediment, and groundwater containing chemicals that exceed regulatory requirements or risk-based acceptable exposure levels.
- Prevent leaching of chemicals from soil, sediment, or landfill material that would result in groundwater concentrations in excess of either the FDEP GCTLs for organic compounds or the site-specific background screening levels for inorganic compounds.
- Restore the surface water and the Surficial Aquifer groundwater to the FDEP GCTLs for organic compounds and site-specific background screening levels for inorganic compounds.

TABLE 2-10

**SUMMARY EVALUATION OF SELECTED REMEDY
ALTERNATIVE N-2 FOR NORTHERN PLUME**

**OPERABLE UNIT 2
NTC, ORLANDO**

Evaluation Criteria	Assessment
Overall Protection of Human Health and the Environment	Provides a sufficient level of human health protection. The combination of additional soil cover and implementation of land and groundwater use restrictions will ensure that public health and the environment are properly protected.
Compliance with ARARs	Meets chemical-specific ARARs through LUCs. Meets action-specific ARARs if construction and sampling of monitoring wells meet PPE requirements.
Long-term Effectiveness and Permanence	Additional soil cover provides long-term effective protection against direct contact with landfill contents. The prevention of residential development through deed restrictions coupled with long-term monitoring would effectively prevent exposure from groundwater ingestion. Management is required for estimated 30 years.
Reduction of Toxicity, Mobility, or Volume through Treatment	This alternative would not actively reduce toxicity, mobility, or volume of contaminated groundwater. Reduction of toxicity may occur through natural processes that would be documented through MNA.
Short-term Effectiveness	Drinking water standards would not be achieved in the foreseeable future. Groundwater use restrictions will provide short-term effectiveness in protecting the public from existing contaminants. There would be slight exposure to workers performing groundwater monitoring and placing native soil cover.
Implementability	Placement of additional soil cover, groundwater use restrictions, groundwater monitoring, and 5-year reviews are easily implemented.
Total Cost	Present worth cost estimate is $824,000.
Federal and State Acceptance	The USEPA and FDEP have concurred with the selected remedy.
Community Acceptance	The community has been given the opportunity to review and comment on the selected remedy. No comments were received.

Notes: ARAR = applicable or relevant and appropriate requirement
FDEP = Florida Department of Environmental Protection
LUC = land use control
MNA = monitored natural attenuation
PPE = personal protective equipment
USEPA = U.S. Environmental Protection Agency

TABLE 2-11

**SUMMARY EVALUATION OF SELECTED REMEDY
ALTERNATIVE S-2 FOR SOUTHERN PLUME**

**OPERABLE UNIT 2
NTC, ORLANDO**

Evaluation Criteria	Assessment
Overall Protection of Human Health and the Environment	Protective of future land and groundwater use receptors by implementing land and groundwater-use restrictions. Groundwater monitoring will determine if plume migrates beyond the groundwater use restriction boundary.
Compliance with ARARs	Meets chemical-specific ARARs through LUCs. Meets action-specific ARARs if construction and sampling of monitoring wells meet PPE requirements.
Long-term Effectiveness and Permanence	The prevention of residential development through deed restrictions coupled with long-term monitoring would effectively prevent exposure from groundwater ingestion. Management is required for estimated 30 years.
Reduction of Toxicity, Mobility, or Volume through Treatment	This alternative would not actively reduce toxicity, mobility, or volume of contaminated groundwater. Reduction of toxicity may occur through natural processes that would be documented through MNA.
Short-term Effectiveness	Drinking water standards would not be achieved in the foreseeable future. Groundwater use restrictions will provide short-term effectiveness in protecting the public from existing contaminants. There would be slight exposure to workers during installation of monitoring wells and performing groundwater and surface water monitoring.
Implementability	Land and groundwater use restrictions, groundwater monitoring, and 5-year reviews are easily implemented.
Total Cost	Present worth cost estimate is $671,000.
Federal and State Acceptance	The USEPA and FDEP have concurred with the selected remedy.
Community Acceptance	The community has been given the opportunity to review and comment on the selected remedy. No comments were received.

Notes: ARAR = applicable or relevant and appropriate requirement
FDEP = Florida Department of Environmental Protection
LUC = land use control
MNA = monitored natural attenuation
PPE = personal protective equipment
USEPA = U.S. Environmental Protection Agency

Natural attenuation is expected to ultimately restore the groundwater quality of the shallow zone of the Surficial Aquifer in the northern area of OU 2 to the FDEP GCTLs for organic compounds, and to site-specific background screening values for inorganic compounds. Benzene was the only organic COC present at very low concentrations (maximum of 3.4 µg/L). Iron and manganese were the only inorganic compounds exceeding PRG levels. Natural attenuation (including dilution) might be able to achieve groundwater cleanup goals over a period of time. Based on current groundwater data, the time frame for achieving PRGs is estimated at 5 years. As soon as the LUCs are implemented and the additional soil cover is installed, the first two RAOs will be met. However, to achieve the third RAO may take 30 years or more due to the presence of landfill material. Any potential transport of contaminants to nearby bodies of water would not be halted by this alternative other than through natural processes.

Natural attenuation is expected to ultimately restore the groundwater quality of the shallow and intermediate zones of the Surficial Aquifer in the southern area of OU 2 to the FDEP GCTLs for organic compounds and to site-specific background screening values for inorganic compounds. The organic compounds benzene, TCE, and vinyl chloride currently exceed PRGs in groundwater. Natural attenuation processes (including dilution) will eventually reduce contaminant concentrations in the groundwater to Florida GCTLs. Achieving PRGs and RAOs may take 30 or more years due to the presence of landfill material.

Implementation of LUCs in the form of groundwater use restrictions will prevent exposure and consumption of contaminated groundwater. FDEP landfill cover requirements would be met, and presumptive remedy requirements for landfills would be partially met.

Available land uses upon achieving cleanup levels. Land use at OU 2 will remain public use. The Navy plans to transfer the site to the City of Orlando. Deed restrictions will be placed as part of the reuse plan because of the landfill underlying the golf course.

Final cleanup levels for each medium. The FS selected only groundwater COCs to be evaluated. PRGs were established for the COCs as follows:

COC	PRG (µg/L)
Benzene	1
Trichloroethene	3
Vinyl chloride	1
Iron	1227
Manganese	50

The PRGs for benzene, TCE, and vinyl chloride are the FDEP GCTLs. For iron and manganese, the PRGs are site-specific background screening values.

2.13 STATUTORY DETERMINATIONS

This section provides a brief, site-specific description of how the selected remedy satisfies the statutory requirements of CERCLA 121 [as required by NCP 300.430 (f) (5) (ii)], and explains the 5-year review requirements for the selected remedy.

Protection of Human Health and the Environment

The selected remedy (Alternatives N-2 and S-2) is consistent with the Navy's IR program, CERCLA, and the NCP. The selected remedy is protective of human health and the environment.

The selected remedy eliminates, reduces, or controls risks by placing additional soil cover on portions of the northern area of the landfill, monitoring groundwater and surface water in the northern and southern areas to assess natural attenuation, and implementing LUCs for the northern and southern areas to restrict site access and groundwater use.

No unacceptable short-term risks or cross-media impacts will be caused by implementation of the remedy. Comparison of the selected remedy to the nine USEPA evaluation criteria is summarized in Tables 2-10 and 2-11.

Compliance with ARARs

The selected remedy meets chemical-specific ARARs through LUCs. For the southern area, ARARs will be met if the construction and sampling of monitoring wells meet PPE requirements.

Table 2-12 provides a summary of ARARs and to be considered (TBC) guidance specific to the selected remedy.

Cost-Effectiveness and Utilization of Permanent Solutions

The selected remedy is cost effective and provides a balance between cost and overall effectiveness in the protection of human health and the environment. Permanent solutions and treatment are utilized to the maximum practicable extent. However, the selected remedy does not provide for treatment of the groundwater contamination other than that occurring through natural processes. LUCs (for site access

TABLE 2-12

SUMMARY OF FEDERAL AND STATE ARARs AND GUIDANCE SPECIFIC TO THE SELECTED REMEDY

OPERABLE UNIT 2
NTC, ORLANDO

Name and Regulatory Citation	Description	Consideration in the Remedial Action Process	Type
Federal Guidance Material USEPA Region IX Risk-Based Concentrations (November, 2000)	Risk Based Concentrations (RBCs) are human health-based allowable exposure guidance levels developed for carcinogenic and non-carcinogenic compounds using reference doses and carcinogenic potency slopes for nearly 600 chemicals. These toxicity constants have been combined with standard exposure scenarios to calculate chemical concentrations corresponding to fixed levels of risk in various media.	TBC. Contaminant-cleanup Target Levels from Chapter 62 777, F.A.C. are used in lieu of RBCs as agreed upon by USEPA, Region-4 and FDEP.	Chemical-specific
Federal Regulatory Requirements Resource Conservation and Recovery Act (RCRA) Regulations, Identification and Listing of Hazardous Wastes (40 CFR Part 261)	Defines listed and characteristic hazardous wastes subject to RCRA. Contains the toxicity characteristic leaching procedure.	Applicable when determining whether or not waste on-site is hazardous by being listed or by exhibiting a hazardous characteristic. Monitoring data will be compared to the RCRA requirement or state mandated benchmark.	Chemical-specific Action-specific
RCRA (42 U.S.C. Section 6901 et seq.); Location Standards (40 CFR Section 264.18(b)	A hazardous waste facility located in a 100-year floodplain must be designed, constructed, operated, and maintained to prevent washout or to result in no adverse effects on human health or the environment if washout were to occur.	Potentially Applicable. No waste facility anticipated. Soil piles for the placement of cover would be constructed to meet the requirement.	Location-specific
Executive Order 11990 Re: Protection of Wetlands 40 CFR Part 6, Appendix A National Environmental Policy Act (NEPA) Wetlands, floodplains, important farmland, coastal zones, etc. (40 CFR Section 6.302(a))	This Order requires Federal agencies to take action to avoid adversely impacting wetlands wherever possible, to minimize wetlands destruction and to preserve the values of wetlands, and to prescribe procedures to implement the policies and procedures of this Executive Order.	Potentially Applicable. Actions will be conducted so that any nearby wetlands would not be disturbed.	Location-specific
Endangered Species Act 16 USC 1531 et seq., 50 CFR Parts 17,81, 225, and 402	If a location contains a federal endangered or threatened species or its critical habitat, and an action may impact the species or its habitat, the U.S. Fish & Wildlife Service or the National Marine Fisheries Service and the corresponding state agencies must be consulted.	Potentially Applicable. Endangered or threatened species survey was conducted during the RI and alternative construction is not expected to affect any of the species. Further surveys would be conducted if deemed necessary.	Location-specific

TABLE 2-12

SUMMARY OF FEDERAL AND STATE ARARs AND GUIDANCE SPECIFIC TO THE SELECTED REMEDY

OPERABLE UNIT 2
NTC, ORLANDO

Name and Regulatory Citation	Description	Consideration in the Remedial Action Process	Type
Native American Grave Protection Act of 1979, 25 U.S.C. 3001 et seq.	This act would be applicable if human remains were discovered during remedial activities.	No history exists regarding grave sites in the near vicinity and the alternative would not involve large scale excavation.	Location-specific
Conservation Programs on Military Reservations (Sikes Act) of 1960, as Amended	This act requires that military installations manage natural resources for multipurpose uses and public access appropriate for those uses consistent with the military department's mission.	McCoy Annex at NTC, Orlando is an inactive military installation. The property is slated for transfer to the public. Requirements will be met as appropriate.	Location-specific
RCRA Subtitle D, 40 U.S.C. 6901	Establishes design and operating criteria for solid waste (non-hazardous) landfills.	Relevant and Appropriate. Would meet final cover requirements, monitoring would indicate potential releases	Location-specific Action-specific
Land Disposal Restrictions (40 CFR 268)	Establishes treatment standards (chemical concentration levels or method of treatment) which wastes must meet in order to be eligible for land disposal.	Potentially Applicable. Any waste to be disposed of would meet the requirements of this standard. Native soil cover material will meet the requirements of this standard.	Chemical-specific Action-specific
RCRA Regulations, Standards Applicable to Transporters of Hazardous Waste (40 CFR Part 263)	These regulations specify the requirements for transporting manifested hazardous waste to a licensed facility.	Potentially Applicable. Any waste generated would be disposed of following applicable regulations.	Action-specific
Occupational Safety and Health Act (OSHA) Requirements (20 CFR 1910, 1926, and 1904)	These regulations specify the requirements for safety and health applicable to workers engaged in on-site field activities.	Potentially Applicable. OSHA regulations will be followed for all on-site construction and other remediation related activities.	Action-specific
DOT Hazardous Materials Transportation, 49 CFR 171-173	These regulations specify the requirements for manifesting and transporting hazardous waste.	Potentially Applicable. Any waste to be disposed of would meet the requirements.	Action-specific
Application of the CERCLA Municipal Landfill Presumptive Remedy to Military Landfills, USEPA 540/F-96/020, Dec. 1996	This directive highlights a step-by-step approach to determining when a specific military landfill is an appropriate site for application of the containment presumptive remedy.	TBC. The step-by-step approach determination indicted that containment presumptive remedy is appropriate for OU 2.	Action-specific
Presumptive Remedies: Policy and Procedures, USEPA 540/F-93/047, Sept. 1993	Overall guide to the presumptive remedies initiative and its effect on site cleanup.	TBC. Existing soil cover would partially fulfill the requirements of presumptive remedy.	Action-specific
Presumptive Remedy for CERCLA Municipal Landfill Sites. USEPA 540/F-93/035, September 1993.	This directive establishes the procedures for containment as the remedy for CERCLA municipal landfills under Superfund Accelerated Cleanup Model (SACM)	TBC. Existing soil cover in the southern plume area would partially fulfill the requirements of presumptive remedy.	Action-specific

TABLE 2-12

SUMMARY OF FEDERAL AND STATE ARARs AND GUIDANCE SPECIFIC TO THE SELECTED REMEDY

OPERABLE UNIT 2
NTC, ORLANDO

PAGE 3 OF 4

Name and Regulatory Citation	Description	Consideration in the Remedial Action Process	Type
Safe Drinking Water Act (SDWA) Regulations, Maximum Contaminant Levels (MCLs) (40 CFR Parts 141.11-141.16)	Establishes enforceable standards (MCLs) for potable water for specific contaminants. MCLGs are nonenforceable health goals. These regulations set standards for protection of drinking water sources serving at least 25 persons.	Relevant and Appropriate. MCLs are applicable because they are used for potential drinking water sources. Nonzero MCLGs can be considered potential relevant and appropriate requirements for groundwater used as a current or potential drinking water source. LUCs and monitoring will prevent potential use of groundwater as drinking water until the PRGs are met.	Chemical-specific
National Secondary Drinking Water Regulations (40 CFR 143)	Sets secondary MCLs for contaminants in drinking water that primarily affect the aesthetic qualities relating to public acceptance of drinking water.	TBC. LUCs and monitoring will prevent potential use of groundwater until PRGs are met. Natural processes should eventually reduce contaminant concentrations to levels below PRGs.	Chemical-specific
Groundwater Protection Strategy	Sets USEPA policy to protect groundwater for its highest present or potential future beneficial use.	TBC. LUCs and monitoring will prevent potential use of groundwater until PRGs are met.	Chemical-specific
Groundwater Protection and Monitoring, Resource Conservation and Recovery Act (RCRA) Subpart F (40 CFR 264.90-264.109)	Establishes monitoring requirements for SWMUs by specifying concentration standards and corrective action measures. Includes groundwater protection standards for 14 toxic compounds that are equal to MCLs under the Safe Drinking Water Act.	Relevant and Appropriate. Requirements are considered for developing PRGs and monitoring plans.	Chemical-specific
Ambient Water Quality Criteria (AWQC), Section 304, Clean Water Act	Sets criteria for assessing the need for surface water remedial action.	Relevant and Appropriate. Requirements are considered for developing PRGs. Monitoring would ensure future water quality.	Chemical-specific
State Requirements FDEP, Contaminant Cleanup Target Levels (CTLs) (Chapter 62-777, F.A.C.)	Provides risk-based and/or toxicity-based cleanup target levels for contaminants in groundwater (GCTL), surface water (SWCTL), and soil (SCTL) based on direct human contact.	TBC. Should be considered when determining cleanup levels for groundwater, surface water, and soil. The CTLs are used as PRGs for remedial actions. Monitoring would ensure future compliance.	Chemical-specific
FDEP, Surface Water Quality Standards (Chapter 62-302, F.A.C.)	Sets the chemical concentration standards for discharges to surface water.	Applicable. The standards are used in the development of PRGs. Monitoring would indicate future compliance.	Chemical-specific

TABLE 2-12

SUMMARY OF FEDERAL AND STATE ARARs AND GUIDANCE SPECIFIC TO THE SELECTED REMEDY

OPERABLE UNIT 2
NTC, ORLANDO

Name and Regulatory Citation	Description	Consideration in the Remedial Action Process	Type
FDEP, Groundwater Classes, Standards, and Exemptions (Chapter 62-520, F.A.C.)	Specifies Class I and II waters must meet primary and secondary drinking water standards in Chapter 62-550, F.A.C.	Applicable. Used to determine cleanup standards for groundwater at OU 2.	Chemical-specific
FDEP, Hazardous Waste (Chapter 62-730, F.A.C.)	These rules adopt by reference appropriate sections of 40 CFR Parts 260 through 268 and establish minor additions and exceptions concerning the generation, storage, treatment, transportation, and disposal of hazardous waste. Defines chemical concentration limits that would classify solid waste as hazardous waste, and sets rules for the management of such waste.	Applicable. Based on the history of operations at OU 2, the wastes encountered at the OU would be classified as hazardous wastes. Any waste generated during remediation would be handled following regulations under Hazardous Waste Management.	Action-specific Chemical-specific
Florida Game and Freshwater Fish Commission, Florida Natural Areas Inventory	Regulates activities affecting state-listed endangered or threatened species or their critical habitat.	Relevant and Appropriate. A survey was conducted during the RI. Alternative construction is not expected to affect any of the species. The state agencies will be consulted if deemed necessary.	Location-specific

Notes:

CERCLA = Comprehensive Environmental Response, Compensation, and Liability Act
CFR = *Code of Federal Regulations*
F.A.C. = *Florida Administrative Code*
LUC = Land Use Control
MCLG = Maximum Contaminant Level Goal
PRG = Preliminary Remediation Goal
SWCTL = Surface Water Cleanup Target Level
TBC = to be considered (guidance materials)
USEPA = U.S. Environmental Protection Agency

restrictions and groundwater use restrictions) and monitoring will be used to ensure that the public health and environment are protected. The remedy provides the best trade-off among the alternatives evaluated with respect to the balancing and modifying evaluation criteria listed in Tables 2-8 and 2-9.

Preference for Treatment

The statutory preference for treatment is not met for the groundwater contamination. However, data collected during the post-RI investigation of the southern plume area demonstrate that natural attenuation of the VOC plume is occurring beneath the landfill.

Five-year Review Requirements

Site reviews will occur every 5 years to evaluate the site conditions and monitoring data to determine when PRGs are attained in the both the northern and southern plumes. Although groundwater PRGs may be attained, the 5-year reviews must continue indefinitely to insure the continued implementation and enforcement of the land site access and development restrictions components of the LUCs. The site conditions evaluation will include an assessment of the groundwater conditions and progress of natural attenuation processes. This review process would ensure that Florida surface water standards are not exceeded.

2.14 DOCUMENTATION OF SIGNIFICANT CHANGES

The Proposed Plan (TtNUS, 2002a) for OU 2 was released for public comment in _____ 2002. The Proposed Plan identified Alternative N-2, Native Soil Cover, LUCs, and Monitoring as the preferred alternative for the northern area. Alternative S-2, LUCs and Monitoring, was selected as the preferred alternative to address the southern area. It was determined that no significant changes to the remedy, as originally identified in the Proposed Plan, were necessary or appropriate.

3.0 RESPONSIVENESS SUMMARY

There have been no issues raised by stakeholders, nor are there any technical or legal issues to discuss concerning this ROD.

REFERENCES

Bechtel (Bechtel Environmental, Inc.), 2000. *Completion Report for Site OU 2 McCoy Annex, Naval Training Center, Orlando, Florida.*

Brown & Root Environmental, 1998. *Remedial Investigation Technical Memorandum for Operable Unit 2, McCoy Annex Landfill, NTC, Orlando, FL.*

DON (Department of the Navy), 1999. *Navy Policy for Conducting Ecological Risk Assessment.* Office of the Chief of Naval Operations, Washington, D.C., April 6.

EEG (Environmental Enterprise Group), 2000. *Completion Report, Operable Unit – 2, McCoy Annex Landfill, Naval Training Center, Orlando, Florida.* Prepared for Department of the Navy, Southern Division, Naval Facilities Engineering Command, Charleston, South Carolina.

TtNUS, Inc. (Tetra Tech NUS, Inc.), 1998. *Focused Risk Assessment for Operable Unit 2, McCoy Annex Landfill, NTC, Orlando, FL.*

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TtNUS, Inc., 2002a. *Feasibility Study, Operable Unit 2, McCoy Annex Landfill, Naval Training Center, Orlando, Florida.* Prepared for SOUTHNAVFACENGCOM, North Charleston, South Carolina (***August 2001, Draft***).

TtNUS, Inc., 2002b. *Proposed Plan, Operable Unit 2, McCoy Annex Landfill, Naval Training Center, Orlando, Florida.* Prepared for SOUTHNAVFACENGCOM, North Charleston, South Carolina (***December 2001, Draft***).

USEPA (U.S. Environmental Protection Agency), 1996. *Application of the CERCLA Municipal Landfill Presumptive Remedy to Military Landfills.*

USEPA, 1997. *Ecological Risk Assessment Guidance for Superfund: Process for Designing and Conducting Ecological Risk Assessments,* Edison, New Jersey, June 5.

USEPA, 1999. "Region III Risk-Based Concentration Table."

APPENDIX A

COMMUNITY RELATIONS RESPONSIVENESS SUMMARY

Responsiveness Summary
Operable Unit 2

Naval Training Center
Orlando, Florida

A public comment period on the OU 2 Proposed Plan was held from _____ through _____ 2002. No public comments were received, and because a public meeting was not requested one was not held.

APPENDIX B

COST ESTIMATE SUMMARY TABLES

TABLE B-1

SELECTED ALTERNATIVE FOR NORTHERN PLUME COST ESTIMATE SUMMARY

OPERABLE UNIT 2
NTC, ORLANDO

Capital Costs for Remedy Alternative N-2

	COST ITEM	QUANTITY	UNIT	UNIT COST	COST
1.	Project Planning	240	hrs	$ 41.52	$ 9,965
2.	Mobilization/Demobilization				
	Equipment Mob/Demob	2	ea	$ 5,200.00	$ 10,400
	Mobilize/Demobilize personnel (2 people)	2	ea	$ 675.00	$ 1,350
	Portable Toilet	1	mo	$ 76.03	$ 76[(1)]
	Storage Trailer	1	mo	$ 100.78	$ 101[(1)]
3.	Decontamination				
	Temporary Decon Pad	1	ls	$ 1,005.00	$ 1,005
	Decon Water Disposal	50	drums	$ 125.00	$ 6,250[(1)]
	Decon Water Storage Drums	50	ea	$ 45.00	$ 2,250
	PPE (2 people – *5 days *2 weeks)	20	m-day	$ 30.00	$ 600
	Decon Equipment (pressure washer)	1	ea	$ 184.00	$ 184
4.	Site Preparation				
	Erosion Control Fencing	500	lf	$ 1.40	$ 700
	Construction Surveys	2	day	$ 665.28	$ 1,331[(1)]
	Utility Location and Site	24	hrs	$ 34.05	$ 817
5.	Soil Cover				
	Place Soil Cover	7,800	cu. yd.	$ 22.82	$ 19,714[(1)]
	Health & Safety Monitoring	10	day	$ 288.16	$ 2,882
6.	Site Restoration				
	Cleanup Areas Surrounding Wells	1	day	$ 662.20	$ 662
	Sod Disturbed Area	0.2	acre	$ 20,859.00	$ 4,172[(1)]
7.	Land Use Controls				
	Site Survey (2-man crew)	2	day	$ 665.28	$ 1,331[(1)]
	Construction (2-man crew)	2	day	$ 408.80	$ 818[(1)]
	Prepare Land Use Plan	100	hr	$ 34.05	$ 3,405
	Modify Master Plan and Prepare Deed Restrictions	80	hr	$ 34.05	$ 2,724
8.	Professional Services				
	Drawings Preparation and Engineering Oversight	500	hr	$ 34.05	$ 17,025
	Subtotal - Direct Capital Costs Less Subcontract Costs				**53,970**
9.	**Local Area Adjustment (@86%) of Direct Capital Costs Less Subcontract Costs**				**46,414**
	Overhead on Labor Cost (@30%)				9,846
	G&A on Labor & Material cost (@ 10%)				3,640
	Total Direct Capital Cost				**59,901**
	Indirects on Total Direct Labor Cost (@75%)				34,463
	Profit on Total Direct Cost (@ 10%)				5,990
	Subtotal – Direct Capital plus Indirects and Profit				**100,353**
10.	Health & Safety Monitoring (@ 3%)				4,024
	Health & Safety Site-specific Training				4,024
	Total Field Costs				**108,402**
11.	Subcontractor Cost (including G&A and Profit)				38,860
12.	Contingency on Total Field and Subcontractor Costs (@ 10%)				14,726
13.	Engineering on Total Field and Subcontractor Costs (@5%)				7,363
	Total Capital Cost				**$ 169,352**

Note:
(1) Subcontract Cost

TABLE B-1

SELECTED ALTERNATIVE FOR NORTHERN PLUME COST ESTIMATE SUMMARY

OPERABLE UNIT 2
NTC, ORLANDO

Annual Operation and Maintenance Costs for Remedy Alternative N-2

COST ITEM	QUANTITY	UNIT	UNIT COST	COST
1. Maintenance of Existing Cover	1	ls	1,000.00	1,000
2. Maintenance/Repair of Monitoring Wells	1	ls	1,000.00	1,000
3. Sampling of Wells and Surface Water	4	Qtr	1,950.00	7,800
4. Analysis of GW samples – 5 wells + 1 QA/QC	24	ea	608.33	14,600
5. Analysis of SW samples – 5 locations + 1 QA/QC	24	ea	243.33	5,840
6. Quarterly Reports	4	ea	4,000.00	16,000

Total Cost for One Year Operation (for years 1-2, quarterly sampling)	**46,240**
Total Cost for One Year Operation (for years 3-30, semi-annual sampling)	**24,120**

Costs for Annual LUC Monitoring (for 30 year period)

COST ITEM	QUANTITY	UNIT	UNIT COST	COST
Quarterly Site Inspections				
Project Manager (8 hrs for each Inspection)	32	hr	83.04	2,657
ODCs (travel, etc.)	1	ls	1,000.00	1,000
Annual Review and Report				
Project Manager	12	hr	83.04	996
Senior Staff Engineer	12	hr	68.10	817
ODCs (photocopies, telephone, etc.)	1	ls	100.00	100
Subtotal Review Cost				5,571
G&A and Profit @ 15%				836
Subtotal				6,407
Total for Review Cost				**6,407**

Cost for 5-Year Site Review

COST ITEM	QUANTITY	UNIT	UNIT COST	COST
Five Year Site Review				
1.1 Site Review Meeting (2-person for 2-days)				
Project Manager	16	hr	83.04	1,329
Senior Staff Engineer	16	hr	68.10	1,090
ODCs (travel, etc.)	1	ls	1,000.00	1,000
1.2 Review Report				
Project Manager	16	hr	83.04	1,329
Senior Staff Engineer	32	hr	68.10	2,179
ODCs (photocopies, telephone, etc.)	1	ls	100.00	100
Subtotal Review Cost				7,026
G&A and Profit @ 15%				1,054
Subtotal				8,080
Total for Review Cost				**8,080**

TABLE B-1

SELECTED ALTERNATIVE FOR NORTHERN PLUME COST ESTIMATE SUMMARY

OPERABLE UNIT 2
NTC, ORLANDO
PAGE 3 OF 3

Year	Capital Cost	Operation and Maintenance Cost	Annual LUC Monitoring	5-Year Review Cost	Total Yearly Cost	Present-Worth Factor (I=7%)	Present Worth
	$ 169,352				$ 169,352	10	$ 169,352
1		$ 46,240	$ 6,407		$52,646	0.969	$ 51,014
2		$ 46,240	$ 6,407		$52,646	0.939	$ 49,432
3		$ 24,120	$ 6,407		$30,527	0.910	$ 27,774
4		$ 24,120	$ 6,407		$30,527	0.882	$ 26,913
5		$ 24,120	$ 6,407	$ 8,080	$38,607	0.854	$ 32,981
6		$ 24,120	$ 6,407		$30,527	0.828	$ 25,270
7		$ 24,120	$ 6,407		$30,527	0.802	$ 24,486
8		$ 24,120	$ 6,407		$30,527	0.777	$ 23,727
9		$ 24,120	$ 6,407		$30,527	0.753	$ 22,991
10		$ 24,120	$ 6,407	$ 8,080	$38,607	0.730	$ 28,175
11		$ 24,120	$ 6,407		$30,527	0.707	$ 21,587
12		$ 24,120	$ 6,407		$30,527	0.685	$ 20,918
13		$ 24,120	$ 6,407		$30,527	0.664	$ 20,269
14		$ 24,120	$ 6,407		$30,527	0.643	$ 19,641
15		$ 24,120	$ 6,407	$ 8,080	$38,607	0.623	$ 24,069
16		$ 24,120	$ 6,407		$30,527	0.604	$ 18,442
17		$ 24,120	$ 6,407		$30,527	0.585	$ 17,870
18		$ 24,120	$ 6,407		$30,527	0.567	$ 17,316
19		$ 24,120	$ 6,407		$30,527	0.550	$ 16,779
20		$ 24,120	$ 6,407	$ 8,080	$38,607	0.533	$ 20,562
21		$ 24,120	$ 6,407		$30,527	0.516	$ 15,754
22		$ 24,120	$ 6,407		$30,527	0.500	$ 15,266
23		$ 24,120	$ 6,407		$30,527	0.485	$ 14,793
24		$ 24,120	$ 6,407		$30,527	0.470	$ 14,334
25		$ 24,120	$ 6,407	$ 8,080	$38,607	0.455	$ 17,566
26		$ 24,120	$ 6,407		$30,527	0.441	$ 13,459
27		$ 24,120	$ 6,407		$30,527	0.427	$ 13,041
28		$ 24,120	$ 6,407		$30,527	0.414	$ 12,637
29		$ 24,120	$ 6,407		$30,527	0.401	$ 12,245
30		$ 24,120	$ 6,407	$ 8,080	$38,607	0.389	$ 15,006
						TOTAL PRESENT WORTH	**$ 823,669**

TABLE B-2

SELECTED ALTERNATIVE FOR SOUTHERN PLUME COST ESTIMATE SUMMARY

OPERABLE UNIT 2
NTC, ORLANDO
PAGE 1 OF 3

Capital Costs for Remedy Alternative S-2

COST ITEM	QUANTITY	UNIT	UNIT COST	COST
Project Planning	60	hrs	$ 41.52	$ 3,155
Land Use Controls				
Site Survey (2-man crew)	2	day	$ 665.28	$ 1,331
Construction (2-man crew)	2	day	$ 408.80	$ 818
Prepare Land Use Plan	100	hr	$ 34.05	$ 3,405
Modify Master Plan and Prepare Deed Restrictions	80	hr	$ 34.05	$ 2,724
Professional Services				
Drawings Preparation and Engineering Oversight	40	hr	$ 34.05	$ 1,362
Subtotal - Direct Capital Costs Less Subcontract				**10,647**
Local Area Adjustment (@86%) of Direct Capital Costs				**9,156**
Overhead on Labor Cost (@30%)				2,747
G&A on Labor & Material cost (@ 10%)				916
Total Direct Capital Cost				**12,818**
Indirects on Total Direct Labor Cost (@75%)				9,614
Profit on Total Direct Cost (@ 10%)				1,282
Subtotal – Direct Capital Costs plus Indirects and Profit				**23,714**
Health & Safety Monitoring (@ 3%)				776
Health & Safety Site-specific Training				4,024
Total Field Costs				**25,266**
Subcontractor Cost				2,470
Contingency on Total Field and Subcontractor Costs (@ 10%)				2,774
Engineering on Total Field and Subcontractor Costs (@5%)				1,387
Total Capital Cost				**$ 31,897**

TABLE B-2

SELECTED ALTERNATIVE FOR SOUTHERN PLUME COST ESTIMATE SUMMARY

OPERABLE UNIT 2
NTC, ORLANDO
PAGE 2 OF 3

Annual Operation and Maintenance Costs for Remedy Alternative S-2

COST ITEM	QUANTITY	UNIT	UNIT COST	COST
1. Maintenance of Existing Cover	1	ls	1,000.00	1,000
2. Maintenance/Repair of Monitoring Wells	1	ls	1,000.00	1,000
3. Sampling of Wells and Surface Water	4	Qtr.	1,950.00	7,800
4. Analysis of GW samples – 5 wells + 1 QA/QC	24	ea	578.33	13,880
5. Analysis of SW samples – 5 locations + 1 QA/QC	24	ea	213.33	5,120
6. Quarterly Reports	4	ea	4,000.00	16,000

Total Cost for One Year Operation (for years 1-2, quarterly sampling)	**44,800**
Total Cost for One Year Operation (for years 3-30, semi-annual sampling)	**23,400**

Costs for Annual LUC Monitoring (for 30 Year Period)

COST ITEM	QUANTITY	UNIT	UNIT COST	COST
1.0 Quarterly Site Inspections				
Project Manager (8 hrs for each Inspection)	32	hr	83.04	2,657
ODCs (travel, etc.)	1	ls	1,000.00	1,000
2.0 Annual Review and Report				
Project Manager	12	hr	83.04	996
Senior Staff Engineer	12	hr	68.10	817
ODCs (photocopies, telephone, etc.)	1	ls	100.00	100
Subtotal Review Cost				5,571
G&A and Profit @ 15%				836
Subtotal				6,407
Total Land Use Control Monitoring Cost				**6,407**

Cost for 5-Year Site Review

COST ITEM	QUANTITY	UNIT	UNIT COST	COST
Five Year Site Review				
1.0 Site Review Meeting (2-person for 2-days)				
Project Manager	16	hr	83.04	1,329
Senior Staff Engineer	16	hr	68.10	1,090
ODCs (travel, etc.)	1	ls	1,000.00	1,000
2.0 Review Report				
Project Manager	16	hr	83.04	1,329
Senior Staff Engineer	32	hr	68.10	2,179
ODCs (photocopies, telephone, etc.)	1	ls	100.00	100
Subtotal Review Cost				7,026
G&A and Profit @ 15%				1,054
Subtotal				8,080
Total for Review Cost				**8,080**

TABLE B-2

SELECTED ALTERNATIVE FOR SOUTHERN PLUME COST ESTIMATE SUMMARY

OPERABLE UNIT 2
NTC, ORLANDO
PAGE 3 OF 3

Year	Capital Cost	Operation and Maintenance Cost	Annual LUC Monitoring	5-Year Review Cost	Total Yearly Cost	Present-Worth Factor (I=7%)	Present Worth
	$ 31,897				$ 31,897	10	$ 31,897
1		$ 44,800	$ 6,407		$51,206	0.969	$ 49,619
2		$ 44,800	$ 6,407		$51,206	0.939	$ 48,080
3		$ 23,400	$ 6,407		$29,807	0.910	$ 27,119
4		$ 23,400	$ 6,407		$29,807	0.882	$ 26,278
5		$ 23,400	$ 6,407	$ 8,080	$37,887	0.854	$ 32,366
6		$ 23,400	$ 6,407		$29,807	0.828	$ 24,674
7		$ 23,400	$ 6,407		$29,807	0.802	$ 23,909
8		$ 23,400	$ 6,407		$29,807	0.777	$ 23,167
9		$ 23,400	$ 6,407		$29,807	0.753	$ 22,449
10		$ 23,400	$ 6,407	$ 8,080	$37,887	0.730	$ 27,650
11		$ 23,400	$ 6,407		$29,807	0.707	$ 21,078
12		$ 23,400	$ 6,407		$29,807	0.685	$ 20,425
13		$ 23,400	$ 6,407		$29,807	0.664	$ 19,791
14		$ 23,400	$ 6,407		$29,807	0.643	$ 19,178
15		$ 23,400	$ 6,407	$ 8,080	$37,887	0.623	$ 23,621
16		$ 23,400	$ 6,407		$29,807	0.604	$ 18,007
17		$ 23,400	$ 6,407		$29,807	0.585	$ 17,448
18		$ 23,400	$ 6,407		$29,807	0.567	$ 16,907
19		$ 23,400	$ 6,407		$29,807	0.550	$ 16,383
20		$ 23,400	$ 6,407	$ 8,080	$37,887	0.533	$ 20,179
21		$ 23,400	$ 6,407		$29,807	0.516	$ 15,383
22		$ 23,400	$ 6,407		$29,807	0.500	$ 14,906
23		$ 23,400	$ 6,407		$29,807	0.485	$ 14,444
24		$ 23,400	$ 6,407		$29,807	0.470	$ 13,996
25		$ 23,400	$ 6,407	$ 8,080	$37,887	0.455	$ 17,238
26		$ 23,400	$ 6,407		$29,807	0.441	$ 13,141
27		$ 23,400	$ 6,407		$29,807	0.427	$ 12,734
28		$ 23,400	$ 6,407		$29,807	0.414	$ 12,339
29		$ 23,400	$ 6,407		$29,807	0.401	$ 11,956
30		$ 23,400	$ 6,407	$ 8,080	$37,887	0.389	$ 14,726
						TOTAL PRESENT WORTH	**$ 671,086**