Comprehensive Long-term Environmental Action Navy

CONTRACT NUMBER N62467-04-D-0055

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NAS PENSACOLA
5090.3b

Rev. 4
08/06/08

Five-Year Review

Operable Units 1, 4, 11, and 13

Naval Air Station Pensacola
Pensacola, Florida

Contract Task Order 0067

August 2008

NAVFAC
Naval Facilities Engineering Command
NAVFAC SOUTHEAST

NAS Jacksonville
Jacksonville, Florida 32212-0030

TETRA TECH NUS, Inc.

FIVE-YEAR REVIEW

OPERABLE UNITS 1, 4, 11, AND 13

NAVAL AIR STATION PENSACOLA
PENSACOLA, FLORIDA

COMPREHENSIVE LONG-TERM
ENVIRONMENTAL ACTION NAVY (CLEAN) CONTRACT

Submitted to:
Naval Facilities Engineering Command
Southeast
Box 30
Naval Air Station Jacksonville
Jacksonville, Florida 32212-0030

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

CONTRACT NUMBER N62467-04-D-0055
CONTRACT TASK ORDER 0067

August 2008

PREPARED UNDER THE SUPERVISION OF:

GERALD WALKER, P.G.
TASK ORDER MANAGER
TETRA TECH NUS, INC.
TALLAHASSEE, FLORIDA

APPROVED FOR SUBMITTAL BY:

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

Key Review Information

Site Identification			
Site Name: Naval Air Station Pensacola			EPA ID: FL9 170 024 567
Region: 4	State: FL	City/County: Pensacola/Escambia	
Site Status			
NPL Status: Final			
Remediation Status (under construction, operating, complete): OU1 – operating; OU4 – operating, OU10 – operating, OU11 – operating; OU13 - operating			
Multiple OUs* (highlight): Y N		Number of OUs: 4 (for this review)	
Construction Completion Date: OU1 – March 1, 2000, OU4 – September 28, 2003, OU-11 – March 30, 2008 (Projected), OU-13 – August 30, 2007 (Projected).			
Fund/PRP/Federal Facility Lead: Federal Facility		Lead Agency: Department of the Navy, Naval Facilities Engineering Command Southeast	
Has site been put into reuse? (highlight): Y N			
Review Status			
Who conducted the review (EPA Region, State, Federal Agency):		USEPA Region 4, FDEP, NAVFAC Southeast, TtNUS , & CH2M Hill	
Author Name: Patty Marajh-Whittemore; Greg Campbell		Author Title: NAVFACSE Remedial Project Manager; Facility Environmental Coordinator	
Author Affiliation: Department of the Navy, Naval Facilities Engineering Command Southeast			
Review Period: November 2002 to January 2008		Inspection: Date(s): November 14th and 15th, 2007	
Type of Review: Statutory	Policy Type (MNAe): 1. Post-SARA		Review Number (1, 2, etc.) 2
Triggering Action Event: OU 10 Remedial Action. OU 10 was later transferred to the RCRA Program (03/6/02) and OU 1 was the next ROD completed.			
Trigger Action Date: OU 10 - 11/03/97; OU 1 – 3/12/99			
Due Date: 1st five year review was signed February 3, 2003			

* OU refers to Operable Unit

Issues: Issues discovered during the five-year review were as follows:

Operable Unit 1

- Down-gradient monitoring wells have been destroyed by Hurricane Ivan. The Optimization Study proposes replacement of destroyed wells.

Operable Unit 11

- A source removal action was completed in 2007 using Hurricane Ivan funds; however, the extent of excavated site area was not documented
- Natural attenuation monitoring will begin in December 2008.

Recommendation and Follow-up Actions:

Operable Unit 1

- Implement treatment system optimization and additional remedial options (ongoing).
- Continue assessment of the feasibility of alternate engineering controls at Wetland 3 (ongoing).
- Replace monitoring wells and implement recommended optimization strategy.

Operable Unit 11

- Conduct confirmatory soil sampling and analysis to verify successful abatement of impacted soil.
- Implement natural attenuation monitoring.

Protectiveness Statement(s):

Operable Unit 1

This remedy is considered protective in the short-term because LUCs are in place, and therefore, there is no current or potential exposure. Follow-up actions are necessary to address long-term protectiveness.

Operable Unit 4

The remedy is protective.

Operable Unit 11

This remedy is considered protective in the short-term because LUCs are in place, and therefore, there is no current or potential exposure. Follow-up actions are necessary to address long-term protectiveness

Operable Unit 13

The remedy is protective.

Signature of U.S. Department of the Navy and Date

_____ _____

Date

Captain, U. S. Navy
Commanding Officer
NAS Pensacola

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ACRONYMS

ADVENT	ADVENT Environmental, Inc.
ARAR	applicable or relevant and appropriate requirement
BEI	Bechtel Environmental, Inc.
BEQ	benzo(a)pyrene equivalent
bls	below land surface
BNA	base neutral acid
CAP	Corrective Action Plan
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CFR	Code of Federal Regulations
CLEAN	Comprehensive Long-term Environmental Action Navy
COC	contaminants of concern
CNET	Chief of Naval Education and Training
CTO	Contract Task Order
CTL	cleanup target level
DDE	dichlorodiphenyldichloroethene
DDT	dichlorodiphenyltrichloroethane
DoD	Department of Defense
ERA	ecological risk assessment
FAC	Florida Administrative Code
FDEP	Florida Department of Environmental Protection
FDER	Florida Department of Environmental Regulation
FFA	Federal Facilities Agreement
FOTW	federally owned treatment works
FS	Focused Feasibility Study
G&M	Geraghty and Miller, Inc.
GCTL	Groundwater Cleanup Target Level
gpm	gallons per minute
HHRA	human health risk assessment
HI	hazard index
IAS	Initial Assessment Study
ILCR	incremental lifetime cancer risk
IR	Installation Restoration
ISDB	Industrial Sludge Drying Bed
ITRC	Interstate Technology and Regulatory Council
ITS	interceptor trench system

ACRONYMS (CONTINUED)

IWTP	Industrial Waste Treatment Plant
LTGMP	Long-term Groundwater Monitoring Plan
LUC	land use control
LUCAP	Land Use Control Assurance Plan
LUCIP	Land Use Control Implementation Program
LUCRD	land use control remedial design
LURA	Land Use Restriction Agreement
MCL	Maximum Contaminant Levels
MCLG	Maximum Contaminant Level Goals
mg/kg	milligrams per kilogram
MOA	Memorandum of Agreement
msl	mean sea level
MWR	Morale, Welfare, and Recreation
NADEP	Naval Aviation Depot
NAS	Naval Air Station
NAVFAC SE	Naval Facilities Engineering Command Southeast
NCP	National Oil and Hazardous Substances Pollution Contingency Plan
NEESA	Naval Energy and Environmental Support Activity
NFA	No Further Action
NPDES	National Pollutant Discharge Elimination System
NPL	National Priorities List
O&M	Operation and Maintenance
ORC	Oxygen Release Compound
OU	Operable Unit
PAH	polynuclear aromatic hydrocarbon
PCB	polychlorinated biphenyl
PSC	Potential Source of Contamination
PVC	polyvinyl chloride
PWC	Public Works Center
RAB	Remedial Advisory Board
RAO	remedial action objective
RCRA	Resource Conservation and Recovery Act
RI	remedial investigation
ROD	Record of Decision
SVOCs	semivolatile organic compounds

ACRONYMS (CONTINUED)

SPLP	synthetic precipitation leaching procedure
SWMU	Solid Waste Management Unit
TCLP	toxicity characteristic leaching procedure
TRPH	total recoverable petroleum hydrocarbons
TtNUS	Tetra Tech NUS, Inc.
UCL	upper confidence limit
µg/L	micrograms per liter
USEPA	United States Environmental Protection Agency
UST	underground storage tank
VA	Veterans Administration
VOC	volatile organic compound
WWTP	wastewater treatment plant
yd^3	cubic yards

1.0 INTRODUCTION

This Five-Year Review Report has been prepared under Contract Task Order (CTO) 0067 as part of the Comprehensive Long-term Environmental Action Navy (CLEAN) IV Contract Number N62467-04-D-0055 for the Naval Facilities Engineering Command Southeast (NAVFAC SE). Tetra Tech NUS, Inc. (TtNUS) conducted the five-year review of the following sites:

- Operable Unit (OU) 1 - Site 1, Sanitary Landfill
- OU4 – Site 15, Area Pesticide Rinsate Disposal
- OU11 – Site 38, Facility Hazardous Waste Storage
- OU13 – Site 24, Public Works Center, DDT Mixing Area.

Each OU is located at Naval Air Station (NAS) Pensacola, in Northwest Florida on the west edge of Pensacola Bay, two miles south of Pensacola, Escambia County Florida, on Navy Boulevard (Figure 1-1). The locations of the OUs are shown on Figure 1-2.

Five additional OUs have signed Records of Decision (RODs):

- OU3, Site 2, Waterfront Sediments (ROD dated 9/30/05)
- OU6, Site 29, Soil South of Building 34 (ROD dated 9/23/99)
- OU12, Site 39, Oak Grove Compound (ROD dated 3/6/98)
- OU14, Site 17, Transformer Storage Yard (ROD dated 8/19/98)
- OU15, Site 40, Bayou Grande (ROD dated 9/30/05)
- OU17, Site 42, Pensacola Bay Area (ROD dated 9/25/98).

Each of these RODs concluded No Further Action (NFA) was appropriate. The NFA determination was based on no hazardous substances, pollutants, or contaminants from past storage, handling, and disposal practices remaining at the sites. Because of the NFA, the five-year review process does not apply.

The purpose of the five-year review is to determine whether the selected remedies at the OUs are protective of human health and the environment. The methods, findings, and conclusions of the reviews are documented in this Five-Year Review Report. In addition, this report identifies issues found during the review, if any, and identifies recommendations to address them.

The United States Environmental Protection Agency (USEPA) is responsible for implementing statutory five-year reviews consistent with the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) and the National Oil and Hazardous Substances Pollution Contingency

Plan (NCP). However, by Executive Order 12580, federal facilities under the jurisdiction, custody, or control of the Department of Defense (DoD) relieves the USEPA of this responsibility and delegates the responsibility to the DoD. The United States Navy is the lead agency responsible for this five-year review at NAS Pensacola, working with the USEPA and the Florida Department of Environmental Protection (FDEP) through the Federal Facilities Agreement (FFA).

The first five-year review for NAS Pensacola was completed on February 2, 2003 and addressed only OU1 and OU10. OU10 was not included in this five-year review because the site was transferred to the RCRA Program. OU4 was not included in the first five-year review because active remediation efforts were ongoing when the initial review was being conducted. As of February 2, 2003, OU11 and OU13 did not have signed RODs and therefore were not included in the first five-year review. The final RODs for both OU11 and OU13 were signed on October 5, 2006. This five-year review is being conducted because hazardous substances, pollutants, and contaminants from past storage, handling, and disposal practices at OU1, OU4, OU11, and OU13 remain at concentrations above levels that allow for unlimited use and unrestricted exposure at NAS Pensacola.

This report consists of the sections listed below:

- Section 1.0 discusses the purpose of the report, provides a summary of the history and site chronology of NAS Pensacola, and evaluates the changes that have occurred in the applicable or relevant and appropriate requirements (ARARs).

- Sections 2.0 through 5.0 are the five-year reviews for OU1, OU4, OU11 and OU13, respectively, at NAS Pensacola. Each section includes the OU chronology, background, summary of the remedial actions performed and the five-year review process, technical assessment, issues, recommendations and follow-up actions, and protectiveness statements.

- Section 6.0 provides a general summary, conclusions, and protectiveness statement for the NAS Pensacola facility. This section also identifies when the next five-year review is required and the other tasks that should be performed as part of that five-year review.

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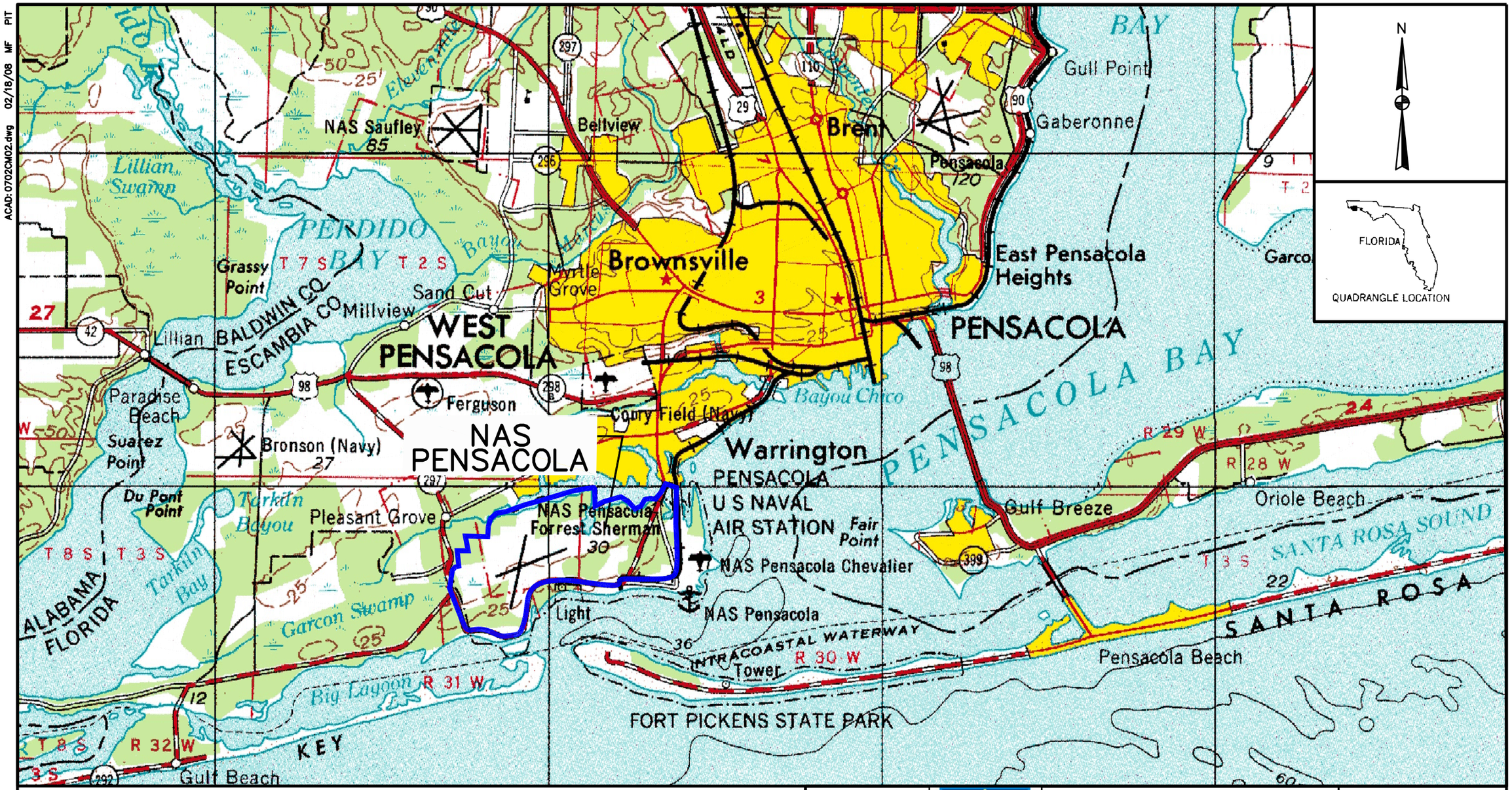

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BASE LOCATION MAP
FIVE YEAR REVIEW REPORT
NAVAL AIR STATION PENSACOLA
PENSACOLA, FLORIDA

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0067	
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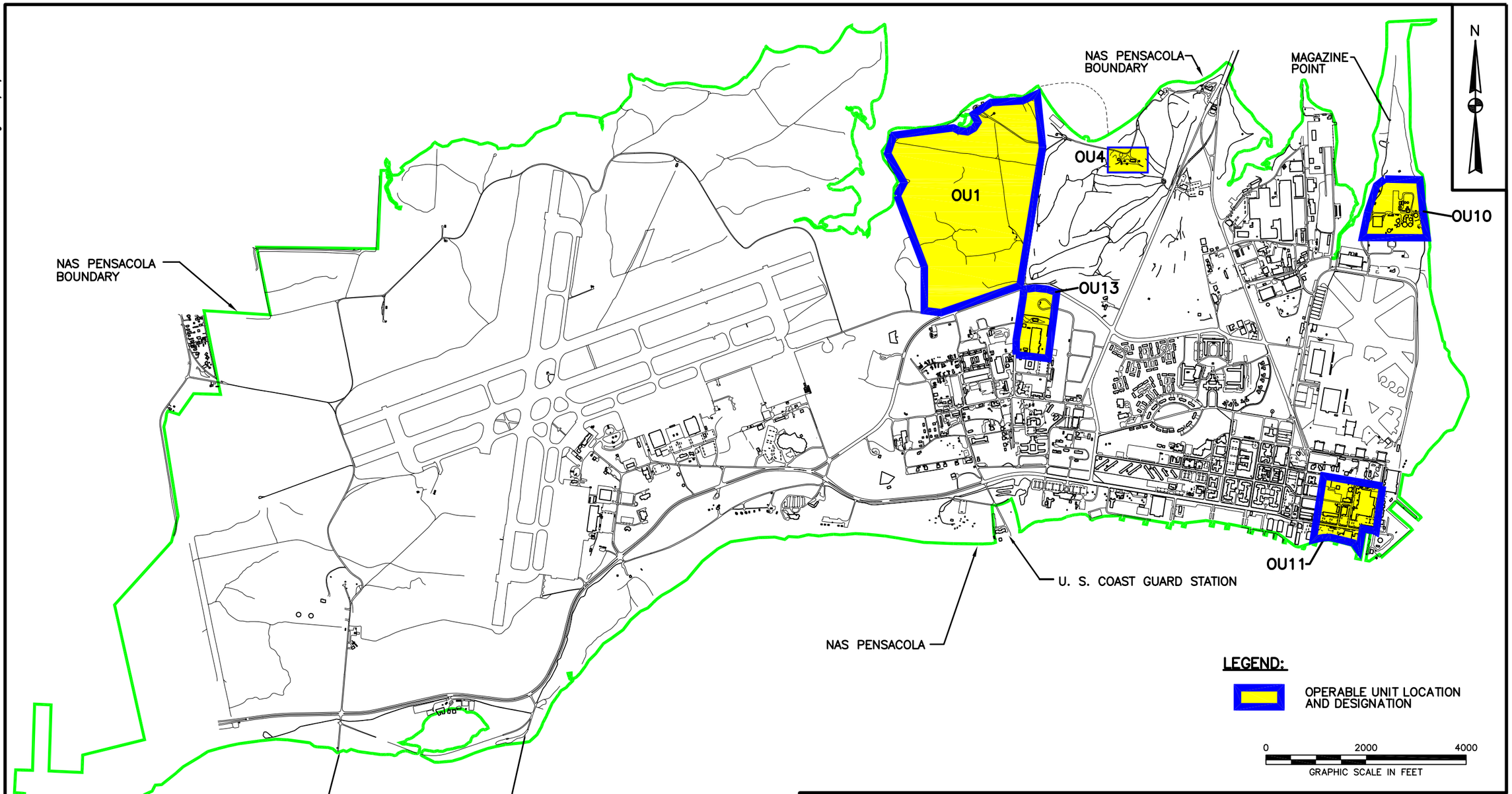

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TtNUS conducted the five-year review in conjunction with the NAS Pensacola Partnering Team, which includes:

- Patty Marajh-Whittemore, NAVFAC SE
- Greg Campbell, NAS Pensacola Public Works Department
- Greg Fraley, USEPA
- Tracie Bolanos, FDEP
- Brian Caldwell, TtNUS
- Gerald Walker, TtNUS
- Greg Wilfley, CH2M HILL

This five-year review consisted of a review of relevant documents, interviews, and a site inspection. In addition, a presentation will be made to the NAS Pensacola Remedial Advisory Board (RAB) and an announcement (included as Appendix A) of the review will be provided to the public prior to the completion of the review. Site inspection forms are included as Appendix B. The completed report is available in the information repository at the John C. Pace Library, located at the University of West Florida, Pensacola, Florida.

1.1 OVERVIEW OF NAS PENSACOLA

The official mission of NAS Pensacola is to provide facilities, service, and support for the operation and maintenance of naval weapons and aircraft to operating forces of the Navy as designated by the Chief of Naval Operations. Some of the tasks required to accomplish this mission include operation of fuel storage facilities, performance of aircraft maintenance, maintenance and operation of engine repair facilities and test cells for aircraft engines, and support of weapon systems. The following sections provide a history and chronology, as well as a brief description of the physical and geological conditions at NAS Pensacola.

1.2 HISTORY

The U.S. Navy has maintained a presence in the Pensacola area since 1825, when a Navy Yard was established on Pensacola Bay. Between 1828 and 1835, the Navy acquired approximately 2,300 acres as operations expanded. Several natural disasters in the early 1900s destroyed the yard and forced it into maintenance status in 1911. Three years later the Navy's first permanent air station was established on the site of the old Navy yard. The air station has been the primary training base for naval aviators since that time and continues to expand (EnSafe, 1996).

Today, NAS Pensacola occupies 5,800 acres on a peninsula in southern Escambia County, five miles southwest of the city of Pensacola. The peninsula is bounded on the north by Bayou Grande and on the east and south by Pensacola Bay. Various housing, training, and support facilities are on the base. A large naval aviation depot that repairs and refurbishes aircraft engines and frames was in the area surrounding Chevalier Field. Most industrial operations were conducted in the older portion of the base on the eastern end of the peninsula. The naval aviation depot was decommissioned in September 1995. The western end is taken up by the main airfield (Forrest Sherman Field) and undeveloped forest land (EnSafe, 1996).

The Navy initiated an environmental investigation of NAS Pensacola in 1983. Because of environmental investigation activities, 29 potential sources of contamination (PSCs) were identified as needing additional investigation. In December 1989, the base was placed on the National Priorities List (NPL). The FFA, signed in October 1990, outlined the regulatory path to be followed at NAS Pensacola. NAS Pensacola must complete not only the regulatory obligations associated with its NPL listing, but it also must satisfy the ongoing requirement of an environmental Resource Conservation and Recovery Act (RCRA) permit issued in 1988.

A permit is an authorizing document issued by an approved Florida agency or USEPA to implement the requirements of an environmental regulation. That permit addresses the treatment, storage, and disposal of hazardous waste, and the investigation and remediation of any releases of hazardous waste and/or constituents from SWMUs at NAS Pensacola.

The RCRA govern ongoing use of hazardous wastes and the operating permit rules. RCRA and CERCLA investigations and actions are coordinated through the FFA, streamlining the cleanup process. Currently, the cleanup program is being conducted under the Navy's Installation Restoration (IR) program.

In 1992, regulatory focus of environmental investigation at OU10 shifted from RCRA to CERCLA and a Remedial Investigation/Feasibility Study (RI/FS) Work Plan was submitted to meet CERCLA requirements (EnSafe, 1997a). On March 6, 2002, OU10 was again transferred, this time from the CERCLA program back to the RCRA oversight program (permit number 0154498-005-HP).

A Post Closure RCRA Permit Renewal application for NAS Pensacola was submitted to the FDEP in March 2006. Amendments to the original RCRA permit application were submitted in January 2007 and the RCRA permit renewal is currently pending.

2.0 OPERABLE UNIT 1, SITE 1 – SANITARY LANDFILL

Implementation of the remedial actions at OU1 began in 1999. The initial five-year review was completed in 2003. This five-year review consists of an approximate five-year period of data and provides a status update for OU1. This statutory review is required by regulation because landfill wastes are still contained on site and do not allow for unlimited use and unrestricted exposure.

2.1 SITE CHRONOLOGY

A list of important OU1 historical events and relevant dates in the site chronology is shown in Table 2-1.

TABLE 2-1
OU1 SITE CHRONOLOGY
FIVE-YEAR REVIEW
NAVAL AIR STATION PENSACOLA
PENSACOLA, FLORIDA

Event	Date
Domestic and industrial wastes from NAS Pensacola and other outlying Navy facilities were disposed of at OU1.	Prior to 1974
Discovery of landfill leachate discharge.	1974
Monitoring wells installed to investigate the leachate discharge.	1975
Landfill officially closed.	1976
Initial Assessment Study (IAS) – OU1 was recommended for further investigation due to the presence of metals in the leachate.	1983
Verification Study – monitoring wells were installed to collect groundwater samples to confirm the IAS results.	1984
Characterization Study – monitoring wells were installed to collect groundwater samples to determine the nature and extent of the contamination.	1986
NAS Pensacola placed on NPL.	1989
Contamination Assessment / Remedial Activities Investigation.	1991
Final RI Report issued.	January 5, 1996
Focused FS issued.	November 1997
Proposed Plan issued for public comment issued.	December 1997
Final ROD issued.	September 25,1998
Conceptual Remedial Design issued.	1998
Final Remedial Design issued.	1999
Removal Action – 73 tons of material was removed.	1998
Start of on-site construction of treatment system (Phase 1) (date that triggers the five-year review).	March 12, 1999

TABLE 2-1 (cont.) OU1 Site Chronology	
Event	**Date**
Navy issues Memorandum of Agreement (MOA) for land use controls (LUCs).	March 31, 1999
Completion of on-site construction of treatment system.	May 7, 1999
Treatment system testing, startup, and performance monitoring.	June 1999
Long-term Groundwater Monitoring Plan issued.	July 1999
Final Declaration of the Explanation of Significant Differences to send groundwater remedial system water to WWTP instead of wetland recharge.	August 23, 1999
Memorandum of Agreement signed by responsible parties	September 24 1999
Completion Report issued.	March 2000
Operation and Maintenance (O&M) Manual for Groundwater Treatment and Recovery System issued.	March 2000
O&M begins.	March 2000
1st Annual Groundwater Monitoring Report issued.	January 2001
2nd Annual Groundwater Monitoring Report issued.	September 4, 2002
Initial Five-Year Review Report issued.	February 2, 2003
49.83 Acre tract of land associated with OU1 transferred to the Veterans Administration (VA).	May, 23, 2002
Initial Final Optimization Study issued.	August 3, 2004
3rd Annual Groundwater Monitoring Report issued.	April 30, 2003
FDEP "Optimization Study" comments issued.	November 3, 2004
Revised Optimization Study and Implementation Plan issued.	September 2005
5th Annual Groundwater Monitoring Report issued.	December 2006
Final Revised Optimization Study issued.	November 29, 2007

2.2 BACKGROUND

2.2.1 Site Description

Figure 1-2 is a generalized map of NAS Pensacola that shows the location of OU1 in the north-central portion of the facility. A detailed figure of OU1 is provided as Figure 2-1. OU1, also referred to as Site 1, is an inactive sanitary landfill encompassing approximately 85-acres. The landfill surface varies from 8 to 20 feet above mean sea level and is densely vegetated with 15 to 40-foot tall planted pines and natural scrub vegetation. The landfill is bordered by an inland water body (Bayou Grande) to the north, by the A.C. Read Golf Course to the east, and by areas of natural scrub vegetation and Barrancas National Cemetery to the west and south. Bayou Grande has been classified by the FDEP as a Class III water body, indicating its use for recreation and maintaining a well-balanced fish and wildlife population. Beyond the scrub vegetation, Taylor Road lies approximately 200 feet south of the site.

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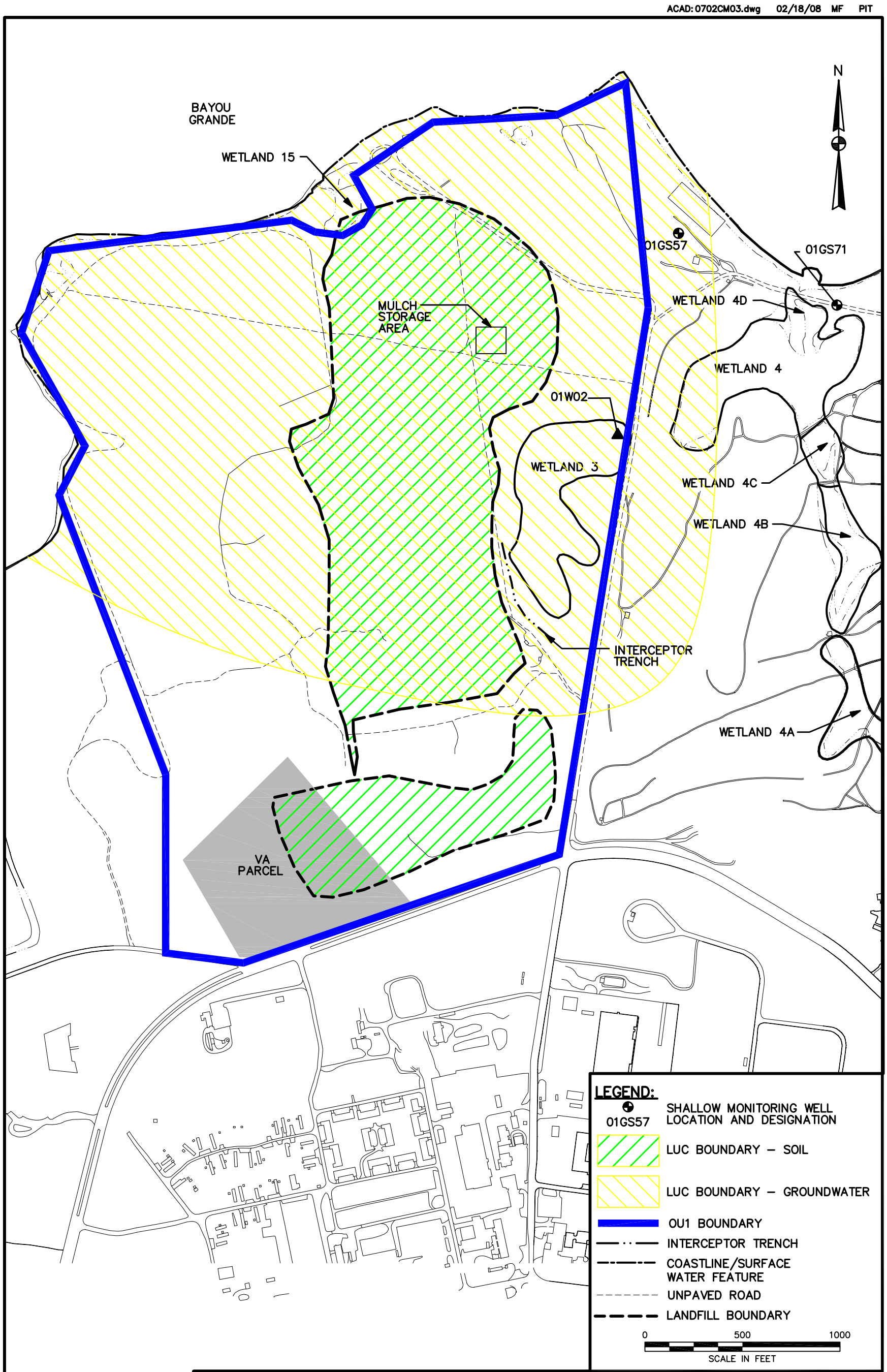

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SCALE AS NOTED			DRAWING NO. FIGURE 2-1 / REV. 0

NAVFAC

FORM CADD NO. SDIV-BV.DWG - REV 1 - 9/10/98

2.2.2 Land and Resource Use

From the early 1950s until 1976, domestic and industrial wastes from NAS Pensacola and other outlying Navy facilities were disposed of at OU1. Wastes consisted of ketone-, poly-chlorinated biphenyl (PCB)-, and transformer oil-soaked rags; paint chips; paint sludge; compressed air cylinders; asbestos; and garbage. The facility was officially closed on October 1, 1976. (EnSafe, 1998a)

The land use for the areas immediately north of the landfill include a Boy Scout camp, a nature trail, a picnic area, and recreational Buildings 3553 and 3487. Also in this generally developed area are two tidal-inlet ponds with associated wetlands. Other wetland areas are west and east of the landfill; most are associated with marshy intermittent creeks.

On May 23, 2002, 49.83 acres of land located immediately adjacent to the south and southwest portion of OU1 was transferred to the VA. This purpose of this transfer was to provide for expansion of the Barrancas Military Cemetery and construction of an administration building, and a facility maintenance building.

The nearest residential area (base housing) is approximately 1,000 feet south of OU1. Potable water for this residential area and all of NAS Pensacola is supplied from Corry Station, approximately three miles north of NAS Pensacola. Groundwater flow is generally northward, toward Bayou Grande and adjacent surface water features, with components to the northwest and northeast (EnSafe, 1998a).

2.2.3 History of Contamination

Landfill leachate discharging from an abandoned drainage field into a nearby golf course pond was discovered in 1974. Groundwater sample analysis detected phenol and several metals. Further investigations (Verification and Confirmation Studies) detected volatile organic compounds (VOCs) and trace concentrations of semivolatile organic compounds (SVOCs) in the groundwater. It was determined that contamination (VOCs, SVOCs, and metals) was limited to the areas within and around the landfill's perimeter. However, several metals were leaching to the shallow groundwater and migrating to the Wetland 3. Also, a tar pit was identified during the RI, which posed a physical hazard to site trespassers (EnSafe, 1998a).

2.2.4 Initial Response

The physical hazard presented by the tar pit was initially addressed. Toxicity Characteristic Leaching Procedure (TCLP) samples collected from the tar pit in 1993 indicated that the tar was not a hazardous

waste. Therefore, a total of 73 tons of tar material was excavated in January 1998 and disposed of at a Subtitle D landfill to remove the physical hazard.

2.2.5 Basis for Taking Action

Contaminants

Hazardous substances that have been released at the site in each media include:

All Depth Soil	**Shallow and Intermediate Groundwater**	
4-Chloro-3-methylphenol	1,1,2,2-Tetrachloroethane	Chromium
Aluminum	1,1,2-Trichloroethane	Copper
Barium	1,2-Dichloroethene (total)	Dieldrin
Cadmium	1,4-Dichlorobenzene	Manganese
Copper	Aluminum	2-Methylnaphthalene
Dieldrin	Arsenic	Naphthalene
Manganese	Barium	Nickel
2-Methylnaphthalene	Benzene	Trichloroethene
Naphthalene	Bis(2-ethylhexyl)phthalate	Vinyl chloride
Nickel	Bromoform	Xylene
Tetrachloroethene	Cadmium	Zinc
Toluene	Chlorobenzene	Chloroform
Xylene	Chloroform	
Surface Soil	**Deep Groundwater**	
Aluminum	Manganese	
Aroclor-1248		
Aroclor-1254		
Aroclor-1260		
Beryllium		
Cadmium		
Lead		
Manganese		

Exposure to all environmental media was within USEPA's generally acceptable ranges for the trespassing child and the potential future site worker. Exposure to the shallow/intermediate groundwater medium presented an unacceptable risk via the ingestion and inhalation exposure pathways for the hypothetical future site resident. Unacceptable risk was not projected for exposure to the surface soil or surface and subsurface soil (EnSafe, 1998a).

The primary non-carcinogenic COCs for groundwater ingestion were arsenic, barium, cadmium, iron, manganese, nickel, and chlorobenzene. The primary carcinogenic COCs identified for ingestion of groundwater included arsenic, vinyl chloride, and benzene (EnSafe, 1998a).

The primary non-carcinogenic COCs for inhalation of groundwater were benzene and chlorobenzene. No carcinogenic COCs were identified for the inhalation of groundwater exposure pathway (EnSafe, 1998a).

Surface water samples collected from Wetland 3 indicated iron was present in exceedance of the Florida contaminant cleanup target levels (CTLs). It was determined that iron was leaching into the shallow groundwater at OU1 and migrating to Wetland 3 (EnSafe, 1998a).

2.3 REMEDIAL ACTIONS

2.3.1 Remedy Selection

The ROD for NAS Pensacola OU1 was signed on September 25, 1998. Remedial Action Objectives (RAOs) were developed as a result of data collected during the RI to aid in the development and screening of remedial alternatives to be considered for the ROD.

The purpose of the remedial action at OU1 was to reduce the risks to human health and environment associated with exposure to contaminated groundwater and soil. To meet these goals, three RAOs were identified. Table 2-2 lists the RAOs for OU1.

TABLE 2-2
REMEDIAL ACTION OBJECTIVES FOR OU1
FIVE-YEAR REVIEW
NAVAL AIR STATION PENSACOLA
PENSACOLA, FLORIDA

Medium	Contaminants Causing Unacceptable Risk	Remedial Action Objectives
Groundwater	Arsenic, barium, cadmium, iron, manganese, nickel, vinyl chloride, benzene, and chlorobenzene	Prevent current or future unacceptable exposure to contaminated groundwater
Surface Water	Iron	Prevent further contamination of surface water
Waste		Protect groundwater from leaching compounds

In the FS for OU1, four remedial alternatives were evaluated to address the three RAOs. Of the four alternatives evaluated, the selected remedial action for OU1 was Alternative 2C as listed in the ROD for OU1. The major components involved with Alternative 2C are listed below:

- Institutional controls imposed to restrict groundwater use of the surficial zone of the sand and gravel aquifer within 300 feet of the site.

- Institutional controls imposed to limit intrusive activities within the landfill boundary without prior approval from the NAS Pensacola Environmental Office.

- Annual review of the institutional controls and certification that the controls should remain in place or be modified to reflect changing site conditions.

- Groundwater monitoring to ensure that the natural attenuation processes are effective.

- A review during which the Navy would determine whether groundwater performance standards continue to be appropriate and if natural attenuation processes are effective.

- Continued groundwater monitoring at regular sampling intervals after performance standards are attained. The groundwater monitoring program would continue until a five-year review concludes that the alternative has achieved continued attainment of the performance standards and remains protective of human health and the environment.

- A groundwater interception system to capture the contaminated groundwater upgradient of Wetland 3. The intercepted groundwater will be treated to reduce iron levels before being reintroduced into Wetland 3.

- Concentrations of the organic compounds present in the groundwater and surface water will be reduced through natural attenuation resulting from naturally occurring biotic and abiotic processes, which take place in the groundwater and surface water systems.

2.3.2 Remedy Implementation

The remedial action was organized into two phases. The first phase included the design and construction of the treatment system. The second phase included the long-term groundwater monitoring plan. The remedial action selected for implementation at OU1 is consistent with CERCLA and the NCP.

The selected remedy satisfies the statutory preference for treatment to the extent practicable, which permanently and significantly reduces the volume, mobility, and toxicity of hazardous substances as a principle element. The conceptual remedial design was completed by EnSafe for the Navy in 1998. The final remedial design was prepared by Bechtel Environmental, Inc. (BEI) and was included as a component of the *Remediation Work Plan/Remedial Design for Phase I Groundwater Treatment and Recovery System at Operable Unit 1.*

The remedial design included the specifications necessary to construct the Interceptor Trench System (ITS) which completed Phase 1 of the remedial actions listed in the ROD (EnSafe, 1998b). BEI initiated remedial activities on April 12, 1999 and completed the installation of the ITS, on May 7, 1999. The installation of electrical utilities, system startup, and performance monitoring were performed during the period of June 8 through June 17, 1999.

A modification to the remedy presented in the ROD was incorporated during the installation of the ITS. This modification consisted of redirecting treated effluent into the Navy's wastewater system, in lieu of discharging into the adjacent wetland. The USEPA and FDEP subsequently concurred with the modification to the remedy for OU1 since it did not affect the protectiveness of human health and the environment, it was cost effective and it complied with all the ARARs identified in the ROD.

The *Long-Term Groundwater Monitoring Plan for Phase II Remedial Action* was issued by BEI in July 1999. This plan presented the technical approach for executing the natural attenuation monitoring required by the ROD. The long-term monitoring program included groundwater monitoring, monitored natural attenuation, and surface water sampling two times a year for years one through three, then annually until the contaminants of concern (COCs) are below performance standards. The first semi-annual sampling event was initiated in March 2000.

As specified in the final ROD for OU1, the institutional controls for OU1 are imposed using a Land Use Restriction Agreement (LURA). The LURA was actually completed in the form of a MOA as agreed by the USEPA, FDEP, and the Navy.

Attached as an appendix to the MOA is a Land Use Control Implementation Plan (LUCIP) for OU1, which provides the site description, site location, LUC objectives, LUC implementation to achieve objectives, and the reference decision document.

The LUCIP specified:

- The NAS Pensacola IR Manager shall be responsible and coordinate inspections of this site. Any discrepancies will be forwarded to NAS Pensacola Facilities Officer for correction to maintain the objectives.

- Institutional controls shall be imposed to restrict groundwater use of the surficial zone of the sand and gravel aquifer within 300 feet of the site boundaries.

- No intrusive activities shall be permitted within the site boundaries without prior approval from the NAS Pensacola Environmental Office.

- The NAS Pensacola IR Manager will submit an annual review of the institutional controls and certification that the controls should remain in place or be modified to reflect changing site conditions.

- Groundwater shall be monitored down gradient of the site to ensure natural attenuation processes are effective and contaminants above state and federal levels are not being discharged into adjacent surface waters.

- The groundwater interception system installed to capture contaminated groundwater upgradient of Wetland 3 will continue operation with the effluent being treated prior to being discharged and shall be maintained until performance standards that are acceptable to both FDEP and USEPA are achieved.

- The groundwater monitoring program will continue until a five-year review concludes that the alternative has achieved continued attainment of the performance standards and remains protective of human health and the environment.

2.3.3 System Operations/O&M

The Navy has operated the groundwater interception system since June 1999. The O&M Manual for the Groundwater Treatment and Recovery System was issued by BEI in March 2000. The primary activities associated with the O&M include the following:

- Routine weekly system checks and readings to confirm operations are within normal parameters.
- Extended system maintenance to inspect and clean all above grade and in-well system components and check calibration of the flow transmitter.
- Semi-annual groundwater and surface water sampling and natural attenuation monitoring.

Beginning in December 1999, the Navy contracted TtNUS to perform the long-term groundwater monitoring for OU1. In August 2001, the contract was modified to add the O&M for the groundwater remediation system. Semi-annual sampling events have been conducted on March 2000, August 2000, May 2001, November 2001, May 2002, October 2002, June 2003, November 2003, June 2005, and December 2005. The work is being conducted as directed by the OU1 ROD, Long-Term Groundwater Monitoring Plan (LTGMP), and the O&M manual. The completed activities for long-term monitoring include the following:

- The first year of groundwater and surface water sampling (semi-annually), natural attenuation monitoring (semi-annually), and annual reporting of results (report dated January 2001).
- The second year of groundwater and surface water sampling (semi-annually), natural attenuation monitoring (semi-annually), and annual reporting of results (report dated September 2002).
- The third year of groundwater and surface water sampling (semi-annually), natural attenuation monitoring (semi-annually), and annual reporting of results (report dated April 2003).
- The fifth year of groundwater and surface water sampling (semi-annually), natural attenuation monitoring (semi-annually), and annual reporting of results (report dated December 2006).

As stated in the ROD for OU1 (EnSafe, 1998a), the Navy's original 1996 cost estimate for implementation of remedial action and closure of OU1 and 30 years of long-term monitoring program (risk-reduction) was $4,542,600. The approximate cost to date for remedial actions including O&M and monitoring at OU1 is $942,144.

2.4 FIVE-YEAR REVIEW

This is the second five-year review for this site.

2.4.1 Administrative Components

Members of the NAS Pensacola Partnering Team were notified of the initiation of the five-year review on September 18, 2007. The five-year review was led by Gerald Walker, P.G. of TtNUS, the NAVFAC SE Navy Clean III Contractor, and included other TtNUS staff. Patty Marajh-Whittemore of NAVFAC SE,

Greg Campbell of NAS Pensacola Public Works Department, Greg Fraley of USEPA, Tracie Bolanos of FDEP, assisted in the review.

The review included the following components:

- Community Involvement
- Document Review
- Data Review
- Site Inspection
- Five-Year Review Report development and review

2.4.2 Community Involvement

On December 19, 2007, a notice was published in the Pensacola News Journal that a five-year review was to be conducted and that comments could be sent to Mr. Greg Campbell, Remedial Project Manager, NAS Pensacola 310 John Tower Road, Pensacola, Florida 32508-5000. In addition to these activities, the Community Relations Plan will be updated following the five-year review and a public information "Fact Sheet" will be published and distributed.

2.4.3 Document Review

This five-year review consisted of a review of relevant documents including the RI Report, the FS, the Proposed Plan, the ROD, the Construction Completion Report, the O&M Manual for Groundwater Treatment and Recovery System, the LTGMP, subsequent Annual Monitoring Reports, and the Optimization Study. Additionally, FDEP Groundwater Cleanup Target Levels (GCTLs) from Chapter 62-777, Florida Administrative Code (FAC) and applicable federal statutes were reviewed.

2.4.4 Data Review

Groundwater Monitoring

Groundwater monitoring is documented in annual reports prepared by TtNUS in March 2000, January 2001, September 2002, April 2003, and December 2006. Since the initial ROD was signed, four years of semi-annual monitoring and sampling have occurred. Monitoring was not conducted in year four due to extensive hurricane damage throughout the facility. Semi-annual sampling and reporting was resumed the following year. The ROD and Long-Term Monitoring Plan (BEI, 1999) established the groundwater COCs as benzene, chlorobenzene, vinyl chloride, nickel, naphthalene, xylene, 1,1,2,2-tetrachloroethane, aluminum, cadmium, chromium, iron and manganese.

During the first year of monitoring xylenes, cadmium, iron, manganese, benzene, vinyl chloride, and chlorobenzene were detected above FDEP CTLs. During the second year of monitoring benzene, vinyl chloride, xylene, aluminum, cadmium, iron, and manganese were detected above FDEP CTLs. During the third year of monitoring, benzene, chlorobenzene, vinyl chloride, aluminum, iron and manganese were detected above FDEP CTLs. During the fifth year of monitoring, down gradient groundwater quality monitoring wells 01GS57 and 01GS71 were found to be destroyed and could not be sampled. The analysis of groundwater samples collected in June and December 2005 revealed the presence of seven COCs at concentrations above their respective GCTLs. Manganese, aluminum, and iron were the only metals from the COC list with exceedances. Iron and manganese exceedances were distributed evenly across the study area, and four VOCs (benzene, chlorobenzene, xylene, and vinyl chloride) were detected at concentrations exceeding current FDEP criteria. VOC exceedances were limited to monitoring wells located on the perimeter or adjacent to the main body of the old landfill.

The overall behavior of the groundwater contaminant plumes was evaluated in light of the changes in the number of monitoring wells with exceedances, the contaminant concentration trends in wells with exceedances, and the changes in contaminant concentrations in individual monitoring wells with time. The trend analysis for the COCs for groundwater at NAS Pensacola was performed using the Mann-Kendall test and groundwater sample data collected from 1993 to 2005. The Mann-Kendall test is used because it does not assume any particular distributional form and accommodates values below the detection limit by assigning them a common value.

The trend analysis results are provided in Appendix C. In general, the test results indicated that for all of the COCs, most monitoring wells samples are stable or have a statistically significant downward trend identified, especially for benzene and vinyl chloride. A statistically significant upward trend is identified at a limited number of monitoring wells, especially for iron. Detailed information is provided in the Appendix C tables.

Natural Attenuation Monitoring

Natural attenuation monitoring also began in March 2000. . A recent trend analysis was conducted for contaminants of concern for groundwater. For all of the COCs, most monitoring wells are stable or a statistically significant downward trend is identified, especially for benzene and vinyl chloride. Statistically significant upward trend is identified at the limited number of monitoring wells especially for iron (See Appendix C). The trend analysis and the evaluation of geochemical processes indicate MNA is effective at reducing COC concentrations before reaching the Bayou. Current site conditions do not preclude the possibility that reductive dechlorination of source materials from the landfill has already occurred, producing the vinyl chloride seen at the site as a breakdown product. Some of the COCs at the site,

including vinyl chloride and benzene, are more rapidly decomposed under aerobic conditions, so the absence of reducing conditions may not be significant.

Surface Water Monitoring

In addition to groundwater and natural attenuation monitoring, surface water monitoring of iron concentrations has also been conducted in Wetland 3 since March 2000. During the monitoring period, surface water samples collected from Wetland 3 continued to present iron concentrations above FDEP surface water standards and NAS Pensacola site specific wetland criteria. The iron concentrations remain lower than the 700,000 to 1,800,000 micrograms per liter (µg/L) concentrations reported in August 2000.

Total iron concentrations reported for surface water location 01W01 during these sampling events were lower than results reported for the previous two years of monitoring. Iron concentrations reported for down-gradient surface water location 01W02 have been variable, fluctuating by an order of magnitude between sampling events with no apparent trend. The fluctuation may be a result of a number of factors including differential rates of flow and solubility changes brought on by temperature variations (TtNUS, 2006d).

Treatment System Monitoring

The remedial system includes an anoxic limestone trench for interception of groundwater originating from the landfill area with effluent discharge into Wetland 3. Historically, the concentrations of iron in groundwater samples collected down gradient of the treatment system ranged from 3 to 33 times less than the iron concentrations in the upgradient well samples (TtNUS, 2003). The detected concentrations of iron in groundwater samples collected from monitoring wells located down gradient from the treatment system continue to exceed both the FDEP Surface Water Criteria of 1,000 µg/L and the GCTL for iron of 300 µg/L as specified in 62-777, FAC, as well as the site-specific reference concentration for freshwater wetlands of 2,360 µg/L. High concentrations of iron are found throughout the site in shallow and intermediate zones. Both groundwater and surface water standards are used in comparison because surface water of Wetland 3 is derived from groundwater flowing from beneath the former landfill.

The treatment system did not function from September 2004 to October 2005 due to pump failure. Comparative analysis of data collected during “functional” and “non-functional” sampling events presents evidence that the treatment system effectively removes iron from shallow groundwater in some parts of the study area. However, the system does not appear to be removing enough iron to meet RAOs for surface water in Wetland 3. Several design flaws and unfavorable site conditions, as well as possible upgrades to the system, are mentioned in the optimization study (TtNUS, 2006a). The optimization study suggests that certain physical, chemical, and biological processes naturally occurring in the wetland are

more effective at removing iron from surface waters. Secondly, the elevated levels of iron appear to have little or no negative effects on vegetation.

Review of the Site 41 RI Report (EnSafe, 2005b) indicates that NFA recommendations have been issued for other sites located on NAS Pensacola with wetlands that have elevated iron concentrations. As a result, it is recommended in the optimization study (TtNUS, 2006a) that operation of the interceptor trench system (ITS) be discontinued, and monitoring of natural attenuation processes should be implemented. However, currently the remedial system remains in operation. It is expected that the remedial system will be shut down in the near future.

2.4.5 Five-Year Review Site Inspection

Inspections at the site were conducted on November 14th and 15th, 2007 by TtNUS and NAS Pensacola personnel. The purpose of the inspections was to assess the protectiveness of the remedy, including the presence of fencing to restrict access, the condition and operation of the treatment and recovery system, the condition of the monitoring wells, and the condition of the wetlands.

The institutional controls that are in place include the restriction of groundwater use of the surficial zone of the sand and gravel aquifer within 300 feet of the site, and the limiting of intrusive activities within the landfill boundary without prior approval from the NAS Pensacola Environmental Office. No new uses of groundwater were observed.

During the site inspection, it was noted that construction of the Barrancas National Cemetery expansion, and associated infrastructure, was still in progress immediately adjacent to the southern portion of OU1. According to the NAS Pensacola Environmental Office, 49.83 acres of land was transferred to the VA on May 23, 2002, to provide additional burial plots and space for construction of administrative and maintenance building structures. A portion of the land transferred from the Navy to the VA was inadvertently located in OU1. The Navy has coordinated with the VA to ensure expansion of cemetery plots and new facilities are outside the OU1 boundaries. The Navy and VA are currently drafting a MOA which requires the VA to follow the OU1 LUCs for that portion of the transferred land that is located in OU1 that was inadvertently transferred to the VA. The location of the VA transferred land that is located inside the OU1 boundary is depicted on Figure 2-1. As evidenced by this figure, the VA out parcel encompasses a portion of the southern soil LUC boundary for OU1.

2.4.6 ARAR Level Changes

The following standards were identified as chemical-specific ARARs in the ROD. They were reviewed for changes that could affect protectiveness:

- RCRA Maximum Contaminant Levels (MCLs) [40 Code of Federal Regulations (CFR) 264 Subpart F]
- Safe Drinking Water Act MCLs (40 CFR 141.11 – 141.16)
- Safe Drinking Water Act Maximum Contaminant Level Goals (MCLGs) (40 CFR 141.50 – 141.51)
- Florida Water Quality Standards, FAC, Chapter 62-3
- Florida Surface Water Standards, FAC, Chapter 62-301 and 302
- Florida Drinking Water Standards, FAC, Chapter 62-550
- Development of Cleanup Target Levels, FAC, Chapter 62-777 (Amended 4/17/05)
- Contaminated Site Cleanup Criteria, FAC, Chapter 62-780

It should be noted that Florida Water Quality Standards, FAC, Chapter 62-3 and Chapter 62-550 were repealed in January 2000 and December 2006, respectively. The trigger action levels for contingent action at OU1 are the Florida surface water standards for Class III freshwater and the Florida drinking water standards.

The addition of FAC, Chapter 62-780 to the list of ARAR standards does not affect the protectiveness for groundwater because Chapter 62-777, FAC, provides default groundwater, surface water, and soil CTLs, which defaults to the MCLs listed in Chapter 62-550, and are the same as the established MCLs for OU1.

Surface water criteria are also presented in FAC, 62-777 including many constituents without quantitative values in FAC, 62-302. The following compounds have surface water criteria listed in FAC, 62-777:

- trans-1,2-Dichloroethene: 11,000 µg/L (Toxicity Criteria)
- 1,2-Dichloroethane: 5 µg/L (Human Health)
- 1,4-dichlorobenzene: 100 µg/L (Toxicity Criteria)
- Chlorobenzene: 17 µg/L (Toxicity Criteria)

Where:

The toxicity criteria are 1/20 of the applicable LC50 data.

None of these compounds were detected in the Wetland 3 surface water.

The Wetlands Protection Policy, authorized under Executive Order 11990, remains unchanged and is the only location-specific ARAR for OU1. The following standards were identified as action-specific ARARs for OU1, governing actions such as the construction of landfills:

- RCRA Groundwater Monitoring Requirements (40 CFR 264 Subpart F)
- Clean Water Act Discharge Limitations National Pollutant Discharge Elimination System (NPDES) Permit (40 CFR 122, 125, 129, 136)
- Pretreatment Standards (40 CFR 403.5)
- Safe Drinking Water Act Underground Injection Control Program (40 CFR 144)
- Florida Rules on Permits, FAC, Chapter 62-4 (Amended 10/1/07)
- Florida Underground Injection Control Regulations, FAC, Chapter 62-528
- RCRA Solid Waste Groundwater Monitoring Requirements

The Florida rules on permits (FAC Chapter 62-4) were amended on October 1, 2007. The amendments to this rule do not affect the protectiveness of the remedy. The remaining standards remain unchanged and are RCRA requirements.

2.5 TECHNICAL ASSESSMENT

The following conclusions support the determination that the remedy at OU1 is expected to be protective of human health and the environment.

Question A: Is the remedy functioning as intended by the decision documents?
No as explained below.

- ***Remedial Action Performance:*** The ITS remedy is functioning, on a mechanical basis, as designed [i.e., extracting groundwater at the specified rate of 20 gallons per minute (gpm)] and buffering the pH for treatment at the federally owned treatment works (FOTW). However, the existing ITS is not effectively treating iron contaminated groundwater migrating from the OU1 landfill and discharging into Wetland 3, as is evidenced by the elevated iron concentrations present in Wetland 3 surface water. It is possible that the capture area of the wall is not sufficient to prevent further iron migration. A compounding factor to this is that iron concentrations are elevated across OU1, both upgradient and down gradient of the ITS. Groundwater and surface water concentrations of iron are elevated and exceed several regulatory criteria in many background locations, in the interior of the landfill, and along the down-gradient perimeter of OU1. The design and subsequent performance of the trench does not appear to be sufficient to capture and extract the iron contamination migrating to the wetland.

  Furthermore, even if the ITS was effectively capturing and treating the local groundwater (which it does not appear to do based upon the elevated iron concentrations in groundwater immediately down gradient of the ITS) the prevalence of iron within the shallow groundwater upgradient, side-

gradient, and down gradient to the ITS would make achievement of the RAOs for surface water in Wetland 3 impractical with the existing system. In summary, the system is not currently meeting, or expected to meet, the reductions necessary for cleanup.

Prior to initiating the optimization study, groundwater monitoring was being conducted at the site as specified in the ROD and Groundwater Monitoring Plan. The historical analytical and geochemistry data indicates the organic contaminants (e.g., vinyl chloride) in groundwater are stable or decreasing. The sampling interval was scheduled to decrease in year six (2005), from semi-annual sampling to annual sampling. However, contaminant concentrations remained stable and the reduction in sampling frequency was not justified at the time.

- ***System Operations/O&M:*** The groundwater recovery and treatment system has mechanically functioned in accordance with designed specifications. Current O&M activities have been reduced from weekly on-site system visits and monthly sampling events to weekly telephone monitoring and semi-annual sampling events. O&M of the system has occurred at regular intervals and the treatment system has been maintained to meet design specifications.

- ***Cost of System Operations/O&M:*** System operations and O&M cost-to-date from 1999 to the present for the groundwater recovery and treatment system are approximately $942,144.

- ***Opportunities for Optimization:*** An optimization study for OU1 was initially submitted to the FDEP in July 2004. A Revised Final Optimization Study, incorporating the FDEP requested implementation plan, was submitted in May 2006. The FDEP issued additional comments on the Revised Final Optimization Study in a correspondence dated February 19, 2007. The Optimization Study was approved by the USEPA on March 29, 2007. All FDEP comments were addressed in a correspondence dated November 27, 2007.

Because the ITS is not meeting the RAOs, modification of the existing remedy is necessary. Two alternative modifications were developed and considered:

Alternative 1 -

Increase the influence and capacity of the capture and treatment system to address the magnitude of the iron contamination discharging into Wetland 3.

Other remedial options and modifications to the treatment system were considered. However, as presented in previous sections, remedial actions have not been prescribed or required for similar conditions both at OU1 and across NAS Pensacola because the existing iron concentrations do not

present risk to human health and the environment. Therefore, the recommendations presented below do not include modification or enhancement of the active remedial system.

Physical modifications or enhancements to the ITS does not appear to be a viable option based on the evaluation of the overall suitability of the ITS for the site conceptual model. Modification of the ITS would require significant changes to the system to achieve better capture and treatment of the iron contaminated water. These modifications could include increasing the pumping rate of the existing trench or extending the length of the trench combined with an increase in the pumping rate. While increasing the pumping rate may seem like a straightforward and logical modification, this may potentially cause alternative problems in the performance of the ITS.

As noted in the remedial design, the 20 gpm pumping rate was optimally selected to minimize drawdown and increase groundwater retention time in the ITS (BEI, 2000). Increasing the pumping rate would decrease the retention time, reduce the buffering effect of the limestone, and may also result in drawing oxygenated water into the trench, causing iron precipitation and coating of the limestone. This would result in a decrease its buffering capacity and longevity of the ITS. Increasing the length of the trench to better capture the iron contaminated water flowing around the trench is an option. However, this modification would not address elevated iron currently present in Wetland 3. Elevated iron levels in the groundwater appears to be an area wide condition, thus enhancing the localized collection and treatment is not likely to effectively address the iron concentrations associated with Wetland 3. Additionally, as stated above, these activities are not necessary to protect human health and the environment.

Alternative 2.

Discontinue active pumping in the ITS coupled with monitoring and the modification of the remedial goals for the existing remedy.

The second alternative involves discontinuing active pumping of the ITS and continuing surface water monitoring within the wetland. The primary remedial process under this option would be natural oxidation and precipitation of iron in Wetland 3. Implementing this option would require several modifications to the existing system, the RAOs and the surface and groundwater monitoring network. The necessary modifications are presented as follows:

- The ROD would have to be modified to establish ecological-based risk criteria to determine the overall protectiveness of the remedy related to the OU1 seep at Wetland 3.

- The RAO for protection of Wetland 3 would need to be modified.

- Additional surface monitoring would also be required and a contingency plan consisting of additional ecological risk evaluation may be required to further monitor the conditions and effects of iron within Wetland 3.

Existing limited data presents that Wetland 3 is naturally treating the effluent iron concentrations. The mechanisms by which this is occurring are believed to be physical, chemical, and biological. Field observations indicate that physical processes including natural sedimentation appear to be occurring where the iron flocculants drop out of suspension. The field observations also indicate healthy vegetative growth in Wetland 3. This is a good indication that, as identified in the ROD and documented by Interstate Technology and Regulatory Council (ITRC) (2003), the native vegetation is likely contributing to the reduction of the iron via several mechanisms including sedimentation, adsorption, oxidation, biological, and phytodegradation of the iron. The vegetation also provides an unspecified amount of evapotranspiration in the wetland which aids in treatment.

Considering that Wetland 3 is already an integral part of the treatment process for iron, it is expected that iron concentrations in Wetland 3 will remain stable and may decrease over time. The results from the surface water samples should be monitored to confirm that the iron concentrations do not exceed 19,600 µg/L.

Early Indicators of Potential Remedy Failure: Although the iron concentrations down-gradient of the groundwater recovery and treatment system are lower than the concentrations upgradient of the treatment system, the down-gradient concentrations are still above the CTLs. It is evident that the system will not be able to reduce iron concentrations to an acceptable level. It is also possible that differences in seasonal precipitation may be influencing the iron concentrations.

Implementation of Institutional Controls and Other Measures: The MOA was completed on August 31, 1999, and was approved and authorized by the responsible parties including USEPA, FDEP, and the Navy. The LUCIP was included as an appendix. OU1 is reported to have been inspected quarterly to insure the controls remain in place and an Annual Review Report has been completed. No water supply wells are within the restricted area.

It should be noted that a portion of the site was converted to an access road for the Barrancas National Cemetery addition and 49.83 acres of land were transferred to the VA for additional burial plots and construction of an administrative and facility maintenance building. A portion of the land transferred from the Navy to the VA was inadvertently located in OU1. The Navy has coordinated with the VA to ensure expansion of cemetery plots and new facilities are outside the OU1 boundaries. The Navy and VA are currently drafting a MOA which requires the VA to follow the OU1 LUCs for that portion of the transferred

land that is located in OU1 that was inadvertently transferred to the VA. Figure 2-1 shows the encroachment of the VA transferred land that is located inside the OU1 boundary. .

Question B: Are the assumptions used at the time of remedy selection still valid?

There have been no changes in the physical conditions of site that would affect the protectiveness of the remedy.

- ***Changes to Standards to Be Considered:*** This five-year review identified state CTLs that had been promulgated since the ROD was signed. The new CTLs do not affect the protectiveness of the remedy because the new CTLs defer to the MCLs listed in FAC, 62-550.

- ***Changes in Exposure Pathways:*** No changes in exposure pathways.

- ***Changes in Toxicity and Other Contaminant Characteristics:*** Toxicity and other factors for COCs have not changed.

- ***Changes in Risk Assessment Methodologies:*** Changes in risk assessment methodologies since the time of the ROD do not call into question the protectiveness of the remedy.

Question C: Has any other information come to light that could call into question the protectiveness of the remedy?

No other information that could call into question the protectiveness of the remedy has been discovered.

2.6 ISSUES

Issues were discovered during the five-year review and are noted in Table 2-3. These issues may affect the protectiveness of the remedy if corrective actions are not taken.

TABLE 2-3
OU1 ISSUES
FIVE-YEAR REVIEW
NAVAL AIR STATION PENSACOLA
PENSACOLA, FLORIDA

Issues	Affects Protectiveness (Y/N)	
	Current	Future
Down-gradient monitoring wells have been destroyed by Hurricane Ivan. The Optimization Study proposes replacement of the destroyed wells.		Y

2.7 RECOMMENDATIONS AND FOLLOW-UP ACTIONS

The recommendations and follow-up actions are outlined in Table 2-4.

TABLE 2-4
OU1 RECOMMENDATIONS AND REQUIRED ACTIONS
FIVE-YEAR REVIEW
NAVAL AIR STATION PENSACOLA
PENSACOLA, FLORIDA

Recommendations/ Follow-up Actions	Party Responsible	Oversight Agency	Milestone Date	Follow-up Actions: Affects Protectiveness (Yes or No)	
				Current	Future
Implement Treatment System optimization and additional remedial options (ongoing)	Navy	EPA	N/A		Yes
Continue the assessment of the feasibility of alternative engineering controls at Wetland 3 (ongoing)	Navy	EPA	N/A		Yes
Replace monitoring wells and implement optimization strategy	Navy	EPA	N/A		Yes

2.8 PROTECTIVENESS STATEMENT

The remedy is expected to be protective of human health and the environment upon attainment of groundwater cleanup goals, through natural attenuation. In the interim, exposure pathways that could result in unacceptable risks are being controlled and institutional controls are preventing exposure to, or the ingestion of, contaminated groundwater.

3.0 OPERABLE UNIT 4, SITE 15 – AREA PESTICIDE RINSATE DISPOSAL

This five-year review consists of an approximate five-year period of data and provides a status update for OU4. This statutory review is required by regulation because wastes are still contained on site and do not allow for unlimited use and unrestricted exposure.

3.1 SITE CHRONOLOGY

A list of important OU4 historical events and relevant dates in the site chronology is shown in Table 3-1.

TABLE 3-1
OU4 SITE CHRONOLOGY
FIVE-YEAR REVIEW
NAVAL AIR STATION PENSACOLA
PENSACOLA, FLORIDA

Event	Date
Fertilizer, Herbicides and Pesticides Stored and Mixed at Golf Course Maintenance Facility	1963 - Present
Verification Study conducted	1984
Characterization Study conducted	1986
Contamination Assessment/ Remedial Investigation – Phase I conducted	1991
Under Ground Storage Tank Removed from Facility	1993
Contamination Assessment/ Remedial Investigation – Phase II conducted	1995
Contamination Assessment/ Remedial Investigation – Phase III conducted	1996
Baseline Risk Assessment conducted	1997
ROD issued	September 27, 2000
Baseline Sampling Event	November – December 2001
Initial Remedial Action Conducted – 754 cubic yards of soil removed/disposed.	April 26, 2002 – May 6, 2002
1st Semi Annual Monitoring Event	June 2002
2nd Semi Annual Monitoring Event	January 2003
Groundwater Monitoring Plan	June 25, 2003
Annual Monitoring Report	January 18, 2005
Semi Annual Monitoring Report	August 2005
Semi Annual Monitoring Report	November 11, 2005
Annual Monitoring Report	December 22, 2005
Semi Annual Monitoring Report	March 15, 2006
Annual Monitoring Report	November 6, 2006
Semi-Annual Monitoring Report – Year 2007	January 2008

3.2 BACKGROUND

3.2.1 Site Description

OU4, Site 15, is located in the northern portion of NAS Pensacola, as shown on Figure 1-2. Site 15 is accessible from the west by an unpaved road and includes portions of the golf course, the golf course maintenance facilities, three concrete wash-down pads, two asphalt wash-down pads, a former pesticide/drum storage building, a removed UST, equipment storage buildings, and several in-use buildings. The site is surrounded by the golf course on its southern and western sides and Bayou Grande approximately 665 feet to the north.

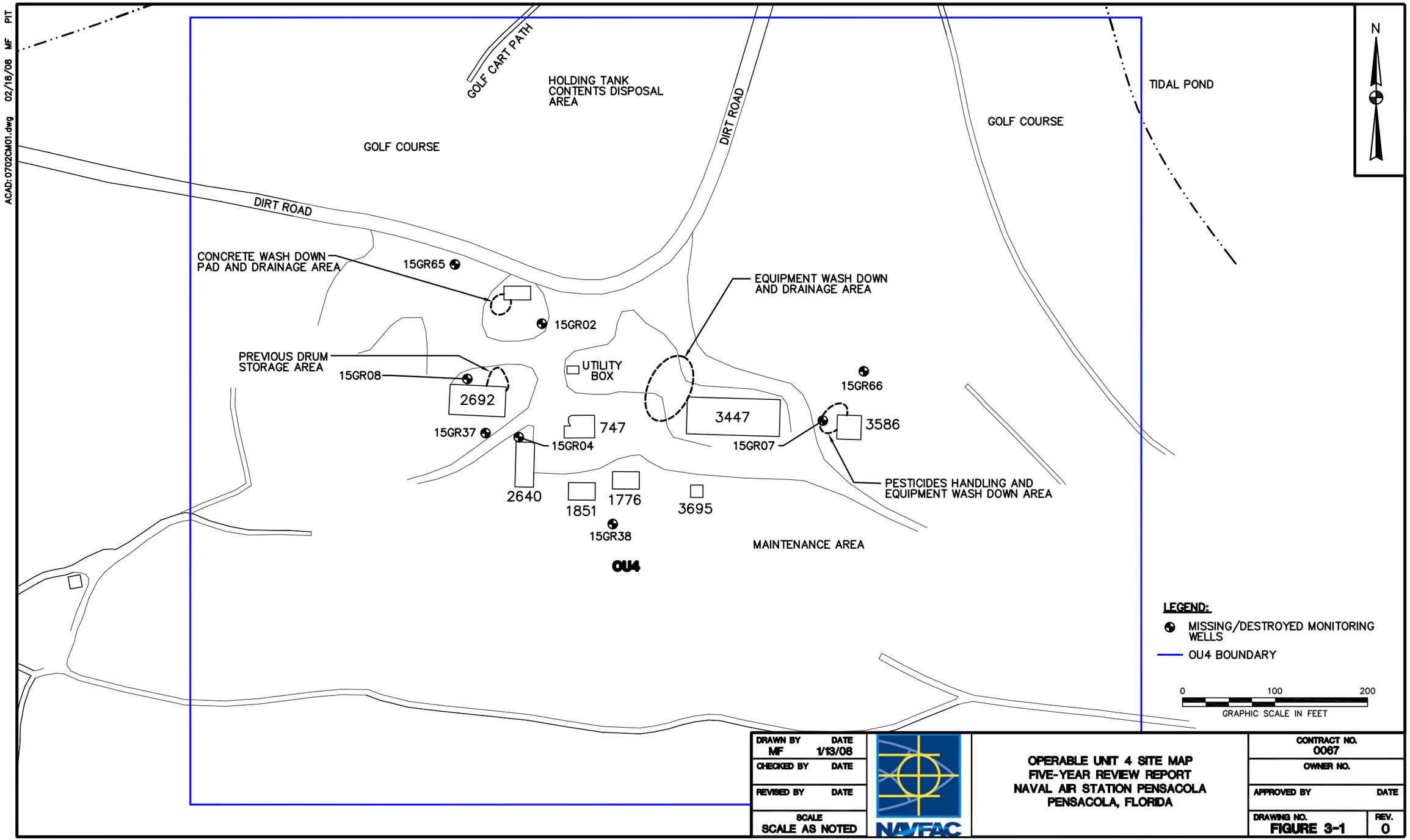
From 1963 to the present, fertilizer, pesticide, and herbicide materials for application at the golf course have been stored and mixed at the golf course maintenance facility. Application equipment such as tractors, sprayer tanks, and spreaders are also rinsed at the facility's wash-down pads, which are located northeast of Building 2692 and northwest of Building 3447. Prior to the construction of the wash racks, cleaning the equipment at the asphalt wash-down pad released dilute rinsate solutions directly onto the surrounding ground surface, where the materials infiltrated the soil. [Geraghty and Miller (G&M), 1984].

In the past, a sink located outside of Building 3586 and a floor drain in a concrete pad north of the building collected pesticide and herbicide residue waste and discharged them into a UST. The contents were periodically pumped out by a contracted agent before its removal in 1993. Reportedly, the UST was removed in 1993 and the contents of the tank were spread across the ground surface, approximately 200 feet north-northwest of Building 3447 (EnSafe, 1999).

3.2.2 Land and Resource Use

Site 15 is located within the confines of the NAS Pensacola Golf Course. Surface cover in the vicinity of the site is dirt and/or grass (See Figure 3-1). The site is separated from the golf course by a perimeter border of oak and palm trees. Water hazards associated with the golf course are located 765 feet to the northeast and 425 west. Bayou Grande is located approximately 665 feet north of the study area. Depth to groundwater ranges from 10 to 15 feet bls, depending on precipitation, tidal influence, and ground surface elevation. Stormwater management on the site is addressed through direct infiltration into the subsurface through the sandy surficial soil (EnSafe, 1997b).

Groundwater flow generally mimics the peninsular topography (with flow to the northwest, north, and northeast towards Bayou Grande). Groundwater is not currently used as a potable water source at OU4 (CH2MHill, 2006).



DRAWN BY	DATE		OPERABLE UNIT 4 SITE MAP FIVE-YEAR REVIEW REPORT NAVAL AIR STATION PENSACOLA PENSACOLA, FLORIDA	CONTRACT NO. 0067	
MF	1/13/08			OWNER NO.	
CHECKED BY	DATE			APPROVED BY	DATE
REVISED BY	DATE				
SCALE SCALE AS NOTED		NAVFAC		DRAWING NO. FIGURE 3-1	REV. 0

FORM CADD NO. SDIV-BH.DWG - REV 1 - 9/10/98

History of Contamination

Site 15

Contaminant types identified in soil samples collected at Site 15 consisted of metals (particularly arsenic), total recoverable petroleum hydrocarbons (TRPH), VOCs, polynuclear aromatic hydrocarbons (PAHs), and pesticides. Groundwater samples detected low concentrations of metals (particularly arsenic) and dieldrin/4,4-DDE (EnSafe, 1999).

Several inorganic and organic parameters exceeded preliminary remedial goals in soil samples. Based on the magnitude and frequency of the detection, arsenic and dieldrin remained the primary parameters of concern in soil. Arsenic was detected across the extent of the site due to handling of various arsenic-based herbicides and pesticides, such as the common herbicide monosodium methanarsonate. The two areas of greatest surface soil arsenic concentrations were identified as the asphalt pad northwest of Building 2640 and the concrete pad west-northwest of Building 3586. Contaminated soil was also noted at isolated locations throughout Site 15 and north of the road in the old disposal area (EnSafe, 1999).

3.2.3 Initial Response

The IAS report prepared by Naval Energy and Environmental Support Activity (NEESA) identified OU4, Site 15 as potentially posing a threat to human health or the environment due to contamination from past hazardous materials operations. According to the IAS report, pesticide rinsate was not sufficiently concentrated to threaten human health or the environment and further study was not recommended (NEESA, 1983). However, environmental sampling and laboratory analyses were not performed, and the potential impact was not properly assessed.

In 1984, Geraghty and Miller, Inc. (G&M) conducted a verification study of the asphalt wash-down pad and pesticide storage area at OU4, Site 15. The results of the verification study confirmed the presence of arsenic and organic pesticide contaminants in the soil. The presence of arsenic impacted groundwater at the site was documented by G&M during performance of a 1986 Characterization Study.

Phase I of a Contamination Assessment/RI was conducted in 1991 by Ecology and Environment, Inc. to identify principal areas and primary COCs, and to recommend any subsequent investigations. Investigation results indicated the potential presence of metals (particularly arsenic), TRPH, VOCs, PAHs, and pesticides were potentially present in the soil. Groundwater samples detected low metals (particularly arsenic) and dieldrin/4,4-DDE concentrations (EnSafe, 1999).

No initial remedial action activities were conducted at OU4, Site 15.

3.2.4 Basis for Taking Action

The hazard presented by potential exposure to the identified contaminants at Site 15 resulted in the performance of a baseline risk assessment. The baseline risk assessment used the Florida risk threshold goals, which is more conservative than USEPA's acceptable risk range and associated Risk Assessment Guidance for Superfund (RAGS) information (EnSafe, 1997b).

The Incremental Lifetime Cancer Risk (ILCR) associated with the incidental ingestion of surface soil by a hypothetical future resident (7E- 5) and site worker (8E-6) exceeded FDEP's target level (1.0E-6). The ILCR associated with dermal contact with surface soil by a hypothetical future resident (2E-5) and site worker (7E-6) also exceeded FDEP's target level. Both exceedances were primarily due to the presence of arsenic at all 24 sample locations, dieldrin in two of the locations, and alpha-chlordane and benzo(a)pyrene equivalents (BEQs) in one location each. In addition, the ILCR associated with the incidental ingestion of groundwater by a hypothetical future resident in Areas 1 and 2 (5E-3 and 2E-3, respectively) and site workers (1E-3 and 5E-4, respectively) exceeded FDEP's target level. This was primarily due to the presence of arsenic (CH2MHill, 2006).

The Human Health Risk Assessment (HHRA) identified arsenic, BEQs, dieldrin, alpha-chlordane, and gamma-chlordane as COCs for surface soil, and arsenic and dieldrin as COCs for groundwater. The HHRA determined all 15 soil samples had a cumulative non-cancer hazard index (HI) from potential exposures to alpha-chlordane, arsenic, BEQs, dieldrin, and gamma-chlordane in soil of less than 1. This is within the USEPA and FDEP target HI of 1 for current workers, trespassers, and future residents for industrial scenarios. Moreover, the HHRA determined 6 of 28 well locations had reported dieldrin or arsenic concentrations, which resulted in a cumulative HI of greater than 1, primarily due to the presence of arsenic. This is not within the USEPA and FDEP acceptable risk range for current workers, trespassers, and future residents. The HHRA determined all 15 soil samples had a cumulative non-cancer HI from potential exposures to alpha-chlordane, arsenic, BEQs, dieldrin, and gamma-chlordane in soil of less than 1. This is below the USEPA and FDEP target HI of 1 for current workers, trespassers, and future residents for industrial scenarios.

The ecological risk assessment (ERA) selected the eastern cottontail rabbit and the American robin as endpoint wildlife species for the baseline risk assessments ecological component, as no endangered species were identified on site. Based on conservative assumptions, the risk evaluation indicates potential sub-lethal effects to these species from maximum detected arsenic, mercury, and possibly surface soil pesticide concentrations (EnSafe, 1999).

Down-gradient surface water, sediment, and biota (within Bayou Grande and Wetland 65) were not at risk from the site, given their distance, the shallow groundwater quality adjacent to the water bodies, and the nature and limited extent of site-impacted groundwater. (EnSafe, 1999).

Contaminants

Hazardous substances that have been released at the site in each media include:

Site 15 – Soil	Site 15 – Shallow Groundwater
Arsenic	Arsenic
Benzo(a)pyrene (BEQs)	Dieldrin
Dieldrin	
Alpha-chlordane	
Gamma-chlordane	
TRPH	

3.3 REMEDIAL ACTIONS

3.3.1 Remedy Selection

The ROD for NAS Pensacola OU4 was signed on September 27, 2000. RAOs were developed based on data collected during the RI to aid in the development and screening of remedial alternatives to be considered for the ROD. The purpose of the remedial action at OU4 was to reduce the risks to human health and environment associated with exposure to soil and groundwater. To meet these goals, two RAOs were identified. Table 3-2 lists the RAOs for OU4.

TABLE 3-2
REMEDIAL ACTION OBJECTIVES FOR OU4
FIVE-YEAR REVIEW
NAVAL AIR STATION PENSACOLA
PENSACOLA, FLORIDA

Medium	Contaminants Causing Unacceptable Risk	Remedial Action Objectives
Soil	Arsenic, benzo(a)pyrene, and dieldrin	Eliminate human health risk above HI=1.
Groundwater	Arsenic and dieldrin	Monitor groundwater to insure COCs are not migrating off-site, and institutional controls

The remedial alternative for soil was selected to prevent future unacceptable exposure to arsenic, BEQ, and dieldrin contaminated soil. The major components of the soil remedy include:

- Removing excess risk from the dermal and ingestion pathways for contaminated soil by removing contaminated soil above industrial goals through a removal action.

- Implementing institutional controls through the Land Use Control Assurance Plan (LUCAP), restricting site use to industrial.

- Reviewing the institutional controls and certification in order to determine if they should remain in place or be modified to reflect changing site conditions.

The following components constitute the remedial action for OU4 to address the groundwater RAOs:

- Performing groundwater monitoring to ensure the COCs are not moving off-site. Monitoring slated to cease after two consecutive sampling events demonstrate attainment of remedial goals, and concurrence with USEPA and FDEP is received.

- Conducting a review to determine whether groundwater performance standards continue to be appropriate.

- Implementing institutional controls through the LUCAP to restrict use of groundwater from the surficial zone of the sand and gravel aquifer within 300 feet of the site.

- Annual review/certification of institutional controls to determine if they should remain in place or be modified to reflect changing site conditions.

3.3.2 Remedy Implementation

In accordance with the selected remedy, source removal activities were initiated on April 26, 2002 and concluded on May 6, 2002. Five individual contaminated areas were consolidated into one large and two smaller excavation areas. A subcontracted registered Florida land surveyor demarked the areas requiring excavation to a depth of 2 feet bls and two specific areas requiring excavation to the soil water table interface. Demarked excavation areas were based on assessment data provided by CH2MHill.

Approximately 754 cubic yards of arsenic impacted soil was excavated and transported to the BFI Timberlands Landfill, located in Brewton, Alabama, for disposal. Prior to completing the excavation

activities at the site, representative soil samples were collected from the selected off-site backfill source at the Sand & Dirt, Inc. facility. The soil was analyzed to ensure its suitability for use at the project site. One sample was collected from the proposed backfill barrow pit and analyzed for VOCs, SVOCs, pesticides, herbicides, metals, PCBs, TRPH, and pH. The analytical results indicated the soil was non-detect for all tested constituents except metals. Arsenic was detected above the residential direct exposure MCL, but below the site-specific cleanup goal of 21.93 milligrams per kilogram (mg/kg). Therefore the backfill was accepted as clean fill (CH2MHill, 2006).

As previously stated, the ROD for Site 15 requires monitoring of groundwater to ensure that COCs are not moving off-site. The remedial goal for arsenic, established in the Site 15 ROD, is 50 µg/L. Baseline groundwater sampling was conducted in November and December 2001 and two semi-annual sampling events were completed in June 2002 and January 2003, respectively (EnSafe, 1999). In preparation of long-term monitoring, the monitoring wells at Site 15 were evaluated to document construction deficiencies. As a result, 14 monitoring wells that were damaged or improperly constructed were abandoned. Five were replaced (15GR03R, 15GR04R, 15GR65R, 15GR66R, and 15GS69R), and one new monitoring well (15GR07R) was installed adjacent to a previously abandoned monitoring well (CH2MHill, 2003).

The ROD specifies collection of groundwater samples from monitoring wells 15GR03R,15GR04R, 15GR07R, 15GR065R, 15GR66R, 15GS68, 15GS69R, 15GS70, 15GS71, 15MW72, 15MW73, 15MW74, 15MW75, and 15MW76 on a semi-annual basis. The results of the baseline groundwater monitoring event conducted in November through December 2001 indicated the presence of arsenic at concentrations ranging from 70 µg/L to 510 µg/L. The arsenic concentrations detected during the June 2002 and January 2003 semi-annual sampling events ranged from 66 µg/L to 650 µg/L, and 53 µg/L to 630 µg/L, respectively. Arsenic concentrations detected in groundwater samples collected semi-annually from January 2004 to October 2007 ranged from non-detect to 160 µg/L. However the monitoring well with the highest previous concentrations (15GR03R) has not been sampled since March 2006 because the well could not be located (Aerostar, 2008). All other groundwater samples collected during this period reported arsenic concentrations less than the remedial goal of 50 µg/L.

It should be noted that the wells exceeding the remedial goal for arsenic in the baseline survey also exceeded the remedial goal for arsenic during each semi-annual monitoring event. In addition, although the ROD specified a remedial goal of 50 µg/L, the USEPA Region IV preliminary remediation goal and FDEP's GCTL for arsenic is 10 µg/L (CH2MHill, 2003).

A Groundwater Monitoring Plan was prepared by CH2MHill in June 2003; and seven semi-annual monitoring events have been completed through January 2008. The cost expended to date for capital costs, O&M costs, and remedial action is $1,270,457.

3.4 FIVE-YEAR REVIEW

This is the first five-year review for this site.

3.4.1 Administrative Components

Members of the NAS Pensacola Partnering Team were notified of the initiation of the five-year review on September 18, 2007. The five-year review was led by Gerald Walker, P.G. of TtNUS, and included other TtNUS staff. Patty Marajh-Whittemore of NAVFAC SE and Greg Campbell, P.E., of NAS Pensacola Public Works, assisted in the review.

The review included the following components:

- Community Involvement
- Document Review
- Data Review
- Site Inspection
- Local Interviews
- Five-year Review report development and review

3.4.2 Community Involvement

On December 19, 2007, a notice was published in the Pensacola News Journal that a five-year review was to be conducted and that comments could be sent to Mr. Greg Campbell, Remedial Project Manager, NAS Pensacola 310 John Tower Road, Pensacola, Florida 32508-5000. In addition to these activities, the Community Relations Plan will be updated following the five-year review and a public information "Fact Sheet" will be published and distributed.

3.4.3 Document Review

This five-year review consisted of a review of relevant documents including the ROD, Interim Remedial Action Report, Groundwater Monitoring Plan, semi-annual monitoring reports, FDEP CTLs from Chapter 62-777, FAC, and applicable federal statutes.

3.4.4 Data Review

The results presented in the Interim Remedial Action Report indicate that all arsenic impacted soil at concentrations above the remedial goal were removed and replaced with clean backfill. Semi-annual and annual reports summarizing the analytical results of monitored natural attenuation of groundwater indicated that groundwater concentrations have continued to decrease. The most recent sampling event reviewed (September 2006) indicated that groundwater arsenic concentrations had decrease below the remedial goal of 50 µg/L, but at two locations were still above the regulatory standard of 10 µg/L.

3.4.5 Five-Year Review Site Inspection

Inspections at the site were conducted on November 14th and 15th, 2007 by TtNUS and NAS Pensacola personnel. The purpose of the inspection was to assess the protectiveness of the remedy and condition of the monitoring wells. Because surficial soil with arsenic concentrations above the remedial goal were removed, fencing the site was not warranted. Monitoring wells were accessible and in good condition. Therefore, no deficiencies were noted during the site inspection.

3.4.6 Interviews

Discussions with the Navy, including the Base and NAVFAC SE personnel, were conducted in preparation of this report. Based on these discussions, it was determined that groundwater sampling events were being conducted in accordance with ROD criteria, and that the soil removal was conducted efficiently and quickly. According to the personnel's understanding, the remedies were effective in keeping the contamination from migrating off-site.

3.4.7 ARAR Level Changes

The following standards were identified as action, chemical and/or location-specific ARARs in the ROD. They were reviewed for changes that could affect protectiveness:

Federal

- National Primary and Secondary Ambient Air Quality Standards (40 CFR 50)
- Clean Water Act Discharge Limits NPDES Permit (40 CFR 122, 125, 129, 136)
- Ambient Water Quality Criteria (40 CFR 131)
- National Primary Drinking Water Standards (40 CFR 141)
- Identification and Listing of Hazardous Wastes (40 CFR 261)
- Standards Applicable to Generators of Hazardous Waste (40 CFR 262)
- Standards Applicable to Transporters of Hazardous Waste (40 CFR 263)

- Standards for Owners and Operators of Hazardous Waste Treatment, Storage, and Disposal Facilities (40 CFR 264)
- RCRA Land Disposal Restrictions (40 CFR 268)
- MCLGs (PL No. 99-339 100 Stat. 462) (1986)
- Department of Transportation Rules for the Transport of Hazardous Substances (49 CFR 107, 171-179)
- Executive Order 11990 Wetlands Protection Policy

State

- Florida Water Quality Standards, FAC, Chapter 62-3
- Florida Rules on Permits, FAC, Chapter 62-4
- Florida Surface Water Standards, FAC, Chapter 62-301 and 302
- Florida Drinking Water Standards, Monitoring and Reporting, FAC, Chapter 62-550
- Florida Ambient Air Quality Standards
- Florida Hazardous Waste Rules, FAC, Chapter 62-730
- Florida Soil Cleanup Target Levels, FAC Chapter 62-777 (Amended 4/17/05)
- Florida Hazardous Substances Release Notification
- Contaminated Site Cleanup Criteria, FAC, Chapter 62-780

It should be noted that Florida Water Quality Standards, FAC, Chapter 62-3 and Chapter 62-550 were repealed in January 2000 and December 2006, respectively. The addition of FAC, Chapter 62-780 to the list of ARAR standards does not affect the protectiveness for groundwater because Chapter 62-777, FAC, provides default groundwater, surface water, and soil CTLs, which defaults to the MCLs listed in Chapter 62-550. However, although the ROD specified a remedial goal of 50 µg/L for arsenic in groundwater, currently the USEPA Region IV preliminary remediation goal and FDEP's GCTL for arsenic is 10 µg/L.

The original remedial goal for arsenic in soil was based on the FAC Chapter 62-777 industrial direct exposure SCTL of 3.7 mg/kg. In April 2005, FAC Chapter 62-777 was amended and the commercial/industrial SCTL for arsenic was changed to 12 mg/kg. This change was incorporated into the 95 percent upper confidence limit (UCL) methodology calculations prior to initiation of source removal activities, and therefore, did not affect the protectiveness of the remedy for OU4. The remaining standards remain unchanged.

3.5 TECHNICAL ASSESSMENT

Question A: Is the remedy functioning as intended by the decision documents?
The review of documents, ARARs, risk assumptions, and the results of the site inspection indicates that the remedy is functioning as intended by the ROD.

- ***Remedial Action Performance:*** Contaminated soil was removed from Site 15 and replaced with clean backfill. Monitored natural attenuation of groundwater contaminants is being conducted .

- ***Early Indicators of Potential Remedy Failure:*** None, the source of the contaminants has been removed and natural attenuation monitoring is being conducted

- ***Implementation of Institutional Controls and Other Measures:*** The reporting and certification requirements for the LUCs are incorporated into the LUCAP between the Navy, USEPA, and FDEP. Site 15 will be available for industrial use. Residential use of the site would be prohibited, and the Navy would perform periodic site inspections and ensure the LUCs are being properly maintained and administered. Groundwater use of the surficial zone of the sand and gravel aquifer is prohibited within 300 feet of the site. The Navy will conduct an annual review of the institutional controls and certify that the controls should either remain in place or be modified to reflect changing site conditions.

Question B: Are the assumptions used at the time of remedy selection still valid?
There have been no changes in the physical conditions of the site that would affect the protectiveness of the remedy.

- ***Changes to Standards and To Be Considered:*** Changes to standards FAC Chapter 62-3, 62-550 and 62-777 were identified during performance of this five-year review. However, the changes are not believed to affect the protectiveness of the remedy for this site.

- ***Changes in Exposure Pathways:*** No changes in the site conditions or land use that affect exposure pathways were identified as part of the five-year review. Exposure to the site groundwater is still restricted by the LUC.

- ***Changes in Toxicity and Other Contaminant Characteristics:*** Toxicity and other factors for COCs have not changed.
- ***Changes in Risk Assessment Methodologies:*** Changes in risk assessment methodologies since the time of the ROD do not call into question the protectiveness of the remedy.

Question C: Has any other information come to light that could call into question the protectiveness of the remedy?

No additional information has come to light that calls into question the protectiveness of the remedy.

3.6 ISSUES

No issues were discovered during the five-year review.

3.7 RECOMMENDATIONS AND FOLLOW-UP ACTIONS

No recommendations or follow up actions were identified for this five-year review.

3.8 PROTECTIVENESS STATEMENT

This remedy is protective. Current sampling data indicates the COCs are below GCTLs. After two consecutive sampling events that indicate similar data then NFA is anticipated.

4.0 OPERABLE UNIT 11, SITE 38 – HAZARDOUS MATERIAL STORAGE

This five-year review consists of an approximate five-year period of data and provides a status update for OU11, Site 38. This statutory review is required by regulation because wastes are still contained on site and do not allow for unlimited use and unrestricted exposure.

4.1 SITE CHRONOLOGY

A list of important OU11 historical events and relevant dates in the site chronology is shown in Table 4-1.

TABLE 4-1
OU11 SITE CHRONOLOGY
FIVE-YEAR REVIEW
NAVAL AIR STATION PENSACOLA
PENSACOLA, FLORIDA

Event	Date
Aircraft painting and stripping conducted at Building 71	1935 – Late 1970's
Metal plating operations at Building 604	1960 – 1996
Hazardous materials stored on second floor of Building 604	1970's - 1996
Hazardous waste stored at Building 71	1980 - 1989
IAS on-site survey	1982
IAS Final Report	June 1983
Confirmation and Verification Study conducted	1984
Characterization Study conducted	1986
RCRA Facility Assessment	1988
RCRA/HSWA Permit issued	1988
RCRA Closure of hazardous waste storage facility	1989
Contamination assessment/RI – Phase I conducted	1991
UST removed from facility	1992
Contamination Assessment/RI – Phase II conducted	1993
RCRA/Hazardous and Solid Waste Amendments of 1984 (HSWA) Permit renewed	January 2002
Limited source removal activities conducted	2004
Final ROD	October 5, 2006

4.2 BACKGROUND

4.2.1 Site Description

OU11, Site 38 is within the boundaries of NAS Pensacola , in Pensacola, Florida (Figure 1-2). OU11, Site 38 consists of the contaminated soil and groundwater identified at Buildings 71 and 604 and associated IWTP sewer line area of NAS Pensacola.

Building 71, shown on Figure 4-1, was used from 1935 to the late 1970s for aircraft paint stripping and painting operations, and consisted of a steel-framed structure with metal siding on a 10- to 14-inch-thick concrete slab. The building was approximately 100 feet wide by 160 feet long and approximately 35 feet high. An interior concrete block wall divided it into a northern half, curbed with concrete in several places, and a southern half enclosing 10 dip tanks. The building was demolished in 1993. Building 71 was used from 1935 to the late 1970s for aircraft paint stripping and painting operations.

From 1980 to 1989, hazardous waste was stored on the north side of Building 71, which was permitted for hazardous waste storage in January 1985 by the FDEP (formerly the FDER) (NEESA, 1985). Waste stored during this period reportedly consisted of solvents, acids, caustics, oxidizers, and liquid and non-liquid toxic materials (E&E, 1992). The building structure has subsequently been demolished and the area is used by Morale, Welfare, and Recreation (MWR) for parking large trucks.

Wastes from various operations at Site 38 (including paint stripping) were discharged to Pensacola Bay until the IWTP was built in 1973. Wastes previously entered the IWTP sewer line by gravity feed and force main without any pretreatment or segregation. Except for one 18-foot section constructed of 8-inch diameter polyvinyl chloride (PVC) pipe, the lines in this area are constructed of 8- to 12-inch diameter vitrified clay with hub and spigot joints. Building 3435, north of the Building 71 area, housed the lift station for the force main. The interconnected gravity lines, which previously served operations at Building 604 and Building 71, flow to the lift station at Building 3435. The force main extends northeast from the lift station where it eventually discharged to the IWTP (EnSafe, 2005a).

Building 604, shown on Figure 4-1, was an irregularly shaped, brick/masonry structure built in 1937. Naval Aviation Depot (NADEP) metal plating operations were located in Building 604 until it was closed in May 1996 (EnSafe, 2005a).

Initial plating operations were conducted in the western portion of Building 604 from approximately 1960 until the shop was demolished around 1970 (NEESA, 1983). Plating operations were subsequently transferred to a larger plating shop, constructed in 1970, in the southwest portion of Building 604.

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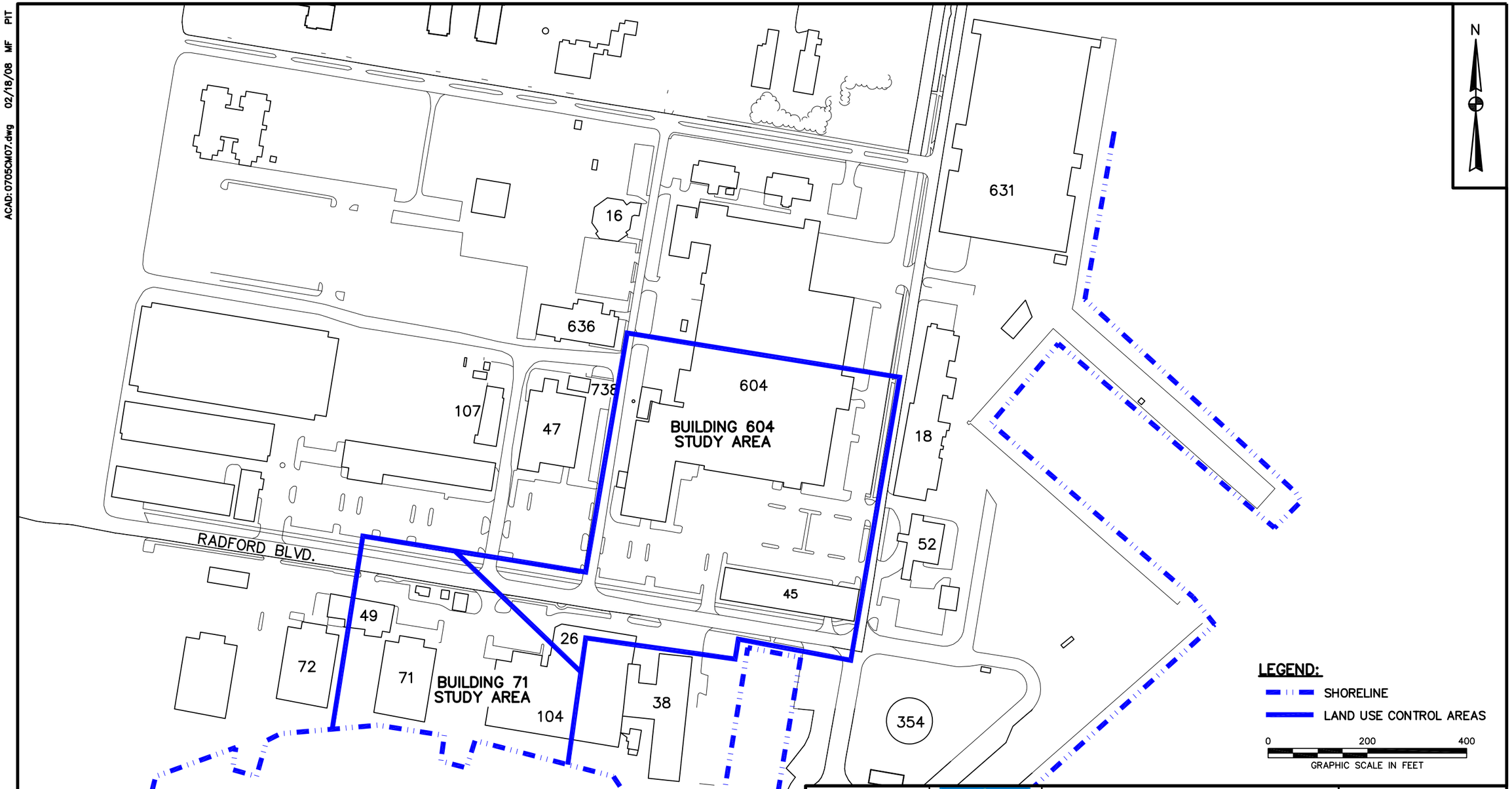

DRAWN BY MF	DATE 1/13/08	OPERABLE UNIT 11 SITE MAP FIVE-YEAR REVIEW REPORT NAVAL AIR STATION PENSACOLA PENSACOLA, FLORIDA	CONTRACT NO. 0067
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SCALE SCALE AS NOTED			DRAWING NO. FIGURE 4-1 / REV. 0

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Three cadmium plating lines and a magnesium treatment line were located in the plating shop. Chromium was used in the magnesium treatment process. NEESA (1983) reports that 50-gallon tanks containing chromium solutions were drained approximately once a month; larger tanks were present but were drained less frequently. Reportedly, these tanks were emptied into sewer lines that discharged into Pensacola Bay (NEESA, 1983). Cyanide solutions were also used in the plating process, and prior 1962, cyanide waste was disposed in the sanitary sewer. Cyanide and chromium wastes that were dumped into the sewer system were routed to bypass the treatment plant and flowed untreated into Pensacola Bay. Hazardous materials have been stored on the second floor of Building 604 since early 1970s.

4.2.2 Land and Resource Use

As shown on Figure 4-2, OU11, Site 38 is located north of Pensacola Bay along Radford Boulevard, in the southeastern portion of the NAS Pensacola facility. The site is primarily paved or covered by buildings and encompasses approximately 12 acres. The area is generally flat with land surface elevations approximately 3 to 8 feet above mean sea level (msl).

Site 38 is located immediately north of Pensacola Bay and depth to groundwater ranges from 2.5 to 8 feet bls, depending on precipitation, tidal influence and ground surface elevation. Rainfall is addressed via an existing storm water management system (EnSafe, 2005a).

Groundwater flow generally mimics the peninsular topography and flows to the south towards Pensacola Bay. Groundwater is not currently used as a potable water source at OU11 (EnSafe, 2005a).

4.2.3 History of Contamination

Soil data generated by various investigations at OU11, Site 38 identified constituents above applicable Chapter 62-777 FAC residential and industrial soil CTLs, as well as Leachability Criteria in surface and subsurface soil.

Contaminants identified in the Building 71 study area included heavy metals, chlorinated solvents, and petroleum solvents potentially related to past paint stripping and metal refinishing activities. Specifically, inorganics, SVOCs, pesticides, and PCBs exceeded applicable criteria for the Building 71 study area. SVOC contaminant exceedances were primarily associated with the IWTP line, except for one location beneath the southern part of Building 604. Parts cleaning took place in the general vicinity of this sample. Pesticides and PCBs exceeded their criteria in samples from grassy areas on site. Pesticide detections in these areas are likely the result of residuals remaining from routine spraying.

Contaminants identified in the Building 604 study area included inorganics, SVOCs, pesticides, and VOCs. Heavy metals, including chromium and cadmium, were also detected above reference concentrations and applicable criteria near the former plating facility.

4.2.4 Initial Response

The hazard presented by potential exposure to the identified contaminants at Site 38 initiated a baseline risk assessment. The results of the baseline risk assessment prompted the performance of a preliminary risk evaluation of potential risks from site constituents to human receptors at the site. The risks calculated in a preliminary risk evaluation are derived by a comparison of exposure concentrations to CTLs. These CTLs are derived using default exposure assumptions established by FDEP. There are no deviations between the Navy and the regulatory agencies regarding those exposure assumptions or pathways defined by the regulatory agencies for residential and industrial exposures. Florida's acceptable risk is 1.0E-6 (1 in 1,000,000) and it is that risk level on which CTLs are based. The USEPA's acceptable target risk range is 1.0E-4 to 1.0E-6 (1 in 10,000 to 1 in 1,000,000). Preliminary risk evaluation is the risk evaluation tool on which remedial decisions are based, and was conducted to refine the list of potential contaminants to actual COCs using tools recommended by FDEP. No initial remedial action activities were conducted at OU11, Site 38.

4.2.5 Basis for Taking Action

Chemicals of Concern identified for Site 38 include:

Site 38, Building 71 - Soil	Site 38, Building 74 – Shallow Groundwater
Arsenic	Acenaphthalene
Chromium	Dibenzofuran
Copper	Fluorene
Lead	Naphthalene
Aroclor 1254	Ethyl benzene
Benzo(a)pyrene	Tetrachloroethene
Phenol	Trichloroethene
1,2-Dichloroethane	Vinyl Chloride
2-Methylphenol	Barium
4-Methylphenol	Cadmium
Tetrachloroethene	Copper
Trichloroethene	Iron
	Manganese
	Zinc

Site 38, Building 604 - Soil	Site 38, Building 604 – Shallow Groundwater
Antimony	Acenaphthalene
Arsenic	Anthracene
Cadmium	Dibenzofuran
Chromium	Fluoranthene
Copper	Naphthalene
Lead	Phenanthrene
Beta-BHC	Pyrene
Delta-BHC	1,2,-Dibro-3-Chloropropar
Dieldrin	Ethyl benzene
Benzo(a)anthracene	Tetrachloroethene
Benzo(a)pyrene	Trichloroethene
Benzo(b)fluoranthene	Vinyl Chloride
Dibenzo(a,h)anthracene	Barium
Methylene Chloride	Cadmium, Copper
Tetrachloroethene	Iron, Manganese
Perchloroethene	Mercury, Zinc

The concentrations of detected contaminants in the soil samples collected at Site 38 are not within the USEPA and FDEP acceptable risk range for current workers, trespassers, and future residents (TtNUS, 2006b). Groundwater contaminant concentrations were compared against natural attenuation default source concentrations in Chapter 62-777 FAC to evaluate natural attenuation. Contaminants exceeding any of these criteria were listed as COCs.

4.3 REMEDIAL ACTIONS

4.3.1 Remedy Selection

The ROD for NAS Pensacola OU11 was signed on October 5, 2006. RAOs were developed as a result of data collected during the RI to aid in the development and screening of remedial alternatives to be considered for the ROD. The goals of the selected soil and groundwater remedies at OU11 are to protect human health and the environment by eliminating, reducing, or controlling hazards posed by the site and to meet ARARs. Based on consideration of the requirements of CERCLA, the NCP, the detailed analysis of alternatives, and any comments received from USEPA, FDEP, and the public, excavation of industrial hot spots and leachability Criteria exceedances with off-site disposal and natural attenuation monitoring of groundwater contaminants with LUCs, were selected to address contamination at OU11, Site 38.

Table 4-2 lists the RAOs for OU4.

TABLE 4-2
REMEDIAL ACTION OBJECTIVES FOR OU11
FIVE-YEAR REVIEW
NAVAL AIR STATION PENSACOLA
PENSACOLA, FLORIDA

Medium	Contaminants Causing Unacceptable Risk	Remedial Action Objectives
Soil	Antimony, Arsenic, Cadmium, Chromium, Copper, Lead, Beta-BHC, Delta-BHC, Dieldrin, Benzo(a)anthracene, Benzo(a)pyrene, Benzo(b)fluoranthene, Dibenzo(a,h)anthracene, Methylene Chloride, Tetrachloroethene, Perchloroethene	Eliminate human health risk above HI =1.
Groundwater	Arsenic	Monitor groundwater to insure COCs are not migrating off-site and institutional controls

The remedy was selected for the following reasons:

- Except for the areas identified for removal, detected concentrations remaining in soil do not present an unacceptable threat to human health or the environment assuming that only industrial and/or commercial uses are permitted at Site 38 and the existing caps are maintained. Because of Hurricane Ivan damage, the Navy has elected to remove the buildings and associated parking lots. Surface soil areas identified as exceeding Soil Cleanup Target Levels were to be removed and replaced with clean fill to prevent unacceptable exposure.

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

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

The following components constitute the remedial action for OU11 to address the groundwater RAO:

- Performing groundwater monitoring to ensure the COCs are not moving off-site.
- Conducting review to determine whether groundwater performance standards continue to be appropriate.
- Implementing institutional controls through the LUCAP to restrict use of groundwater from the surficial zone of the sand and gravel aquifer within 300 feet of the site.
- Reviewing the institutional controls and certification in order to determine if they should remain in place or be modified to reflect changing site conditions.

4.3.2 Remedy Implementation

According to NAS Pensacola personnel, the building structures, parking lot surface and surficial soil were removed in conjunction with cleanup of hurricane related debris in 2004. However, the contractor that performed the work did not document the source removal activity. Completed waste manifests documenting the volume of soil removed is available; however, a surveyed map of the area of excavation has not been completed. Natural attenuation monitoring has not been initiated because the documentation of the source removal activities has not been provided to the Navy. To date no cost associated with site remediation have been expended.

4.4 FIVE-YEAR REVIEW

This is the first five-year review for this site.

4.4.1 Administrative Components

Members of the NAS Pensacola Partnering Team were notified of the initiation of the five-year review on September 18, 2007. The five-year review was led by Gerald Walker, P.G. of TtNUS, and included other TtNUS staff. Patty Marajh-Whittemore of NAVFAC SE and Greg Campbell of NAS Pensacola Public Works, assisted in the review.

- Community Involvement
- Document Review
- Data Review
- Report development and review
- Site Inspection
- Local Interviews
- Five-year reviews

4.4.2 Community Involvement

On December 19, 2007, a notice was published in the Pensacola News Journal that a five-year review was to be conducted and that comments could be sent to Mr. Greg Campbell, Remedial Project Manager, NAS Pensacola 310 John Tower Road, Pensacola, Florida 32508-5000. In addition to these activities, the Community Relations Plan will be updated following the five-year review and public information "Fact Sheet" will be published and distributed.

4.4.3 Document Review

This five-year review consisted of a review of relevant documents including the ROD and FDEP CTLs from Chapter 62-777, FAC.

4.4.4 Data Review

Source removal activities were reportedly conducted at Site 38 in conjunction with cleanup of hurricane related debris, and clean fill was placed in the excavated areas to limit direct exposure to impacted soil. However, no report documenting associated activities was available for review. Monitoring of natural attenuation of groundwater quality has not been initiated because documentation of the source removal activity has to first be documented prior to initiation.

4.4.5 Five-Year Review Site Inspection

Inspections at the site were conducted on November 14th and 15th, 2007 by TtNUS and NAS Pensacola personnel. The purpose of the inspection was to assess the protectiveness of the remedy, including the presence of fencing to restrict access, the condition of the remedial caps, and the condition of the monitoring wells.

Since surficial soil with contaminant concentrations above the remedial goal were reportedly removed, fencing the site was not warranted. Existing monitoring wells were accessible and in good condition. Therefore, no deficiencies were noted during the site inspection.

4.4.6 Interviews

Discussions with the Navy, including the Base and NAVFAC SE personnel were conducted in preparation of this report. Based on these discussions, it was determined that confirmatory soil sampling needs to be conducted to evaluate the effectiveness of the 2004 source removal activity and monitored natural attenuation monitoring of groundwater quality needs to be initiated.

4.4.7 ARAR Level Changes

The following standards were identified as chemical and action specific ARARs in the ROD. They were reviewed for changes that could affect protectiveness:

Federal

- DOT Rules for Transport of Hazardous Substances (9 CFR Parts 107 and 171-179)
- National Environmental Policy Act (40 CFR Part 6, Appendix A)
- Fish and Wildlife Coordination Act (40CFR 6.302)
- National Primary and Secondary Ambient Air Quality Standards (40 CFR 50)
- Ambient Water Quality Criteria (40 CFR 131)
- National Primary Drinking Water Standards (40 CFR 141)
- Safe Drinking Water Act MCLs (40 CFR 141.11–141.16)
- Safe Drinking Water Act MCLs (40 CFR 141.50–141.51)
- RCRA Identification and Listing of Hazardous Wastes (40 CFR 261)
- RCRA Generator Standards (40 CFR 262)
- Standards Applicable to Transporters of Hazardous Waste (40 CFR 263)
- RCRA Location Requirements (40 CFR 264.18)
- RCRA Facility Standards (40 CFR 265, Subparts C, D, I, J and L)
- RCRA Land Disposal Restrictions, 40 CFR 268
- Executive Order 11988 Wetlands Protection Policy

State

- Florida Water Quality Standards, FAC, Chapter 62-3
- Florida Rules on Permits, FAC, Chapter 62-4
- Florida Stormwater Discharge Regulations (FAC, Chapter 62-25)
- Florida Hazardous Substance Release Notification Rules (FAC Chapter 62-150)
- Florida Surface Water Standards, FAC, Chapter 62-301 and –302
- Florida Drinking Water Standards, Monitoring and Reporting, FAC, Chapter 62-550
- Florida Hazardous Waste Rules, FAC, Chapter 62-730
- Florida Soil Cleanup Target Levels, FAC Chapter 62-777
- Contaminated Site Cleanup Criteria, (FAC 62-780)

It should be noted that Florida Water Quality Standards, FAC, Chapter 62-550 were repealed in December 2006. The remaining standards remain unchanged.

4.5 TECHNICAL ASSESSMENT

Question A: Is the remedy functioning as intended by the decision documents? No because monitoring for MNA has yet to be evaluated.

- ***Remedial Action Performance:*** Contaminated soil was removed from Site 38 and replaced with clean backfill. Monitored natural attenuation of residual concentrations of regulated compounds has not been initiated.

- ***Early Indicators of Potential Remedy Failure:*** None.

- ***Implementation of Institutional Controls and Other Measures:*** LUC have been implemented as evidenced by the NAS Pensacola Master Plan dated December 2007.

Question B: Are the assumptions used at the time of remedy selection still valid?
There have been no changes in the physical conditions of the site that would affect the protectiveness of the remedy.

- ***Changes to Standards and To Be Considered:*** No changes to standards were identified during performance of this five-year review.

- ***Changes in Exposure Pathways:*** No changes in the site conditions or land use that affect exposure pathways were identified as part of the five-year review. Exposure to the site groundwater is still restricted by the institutional control.

- ***Changes in Toxicity and Other Contaminant Characteristics:*** Toxicity and other factors for COCs have not changed.

- ***Changes in Risk Assessment Methodologies:*** Changes in risk assessment methodologies since the time of the ROD do not call into question the protectiveness of the remedy.

Question C: Has any other information come to light that could call into question the protectiveness of the remedy?

No additional information has come to light that calls into question the protectiveness of the remedy.

4.6 ISSUES

Issues were discovered during the five-year review and are noted in Table 4-3. These issues may affect the long term protectiveness of the remedy if corrective actions are not taken.

TABLE 4-3
OU11 ISSUES
FIVE-YEAR REVIEW
NAVAL AIR STATION PENSACOLA
PENSACOLA, FLORIDA

Issues	Affects Protectiveness (Yes or /No)	
	Current	Future
A source removal action was completed in 2007 using Hurricane Ivan funds, however the extent of the excavated site area was not documented.		Yes
Groundwater Natural Attenuation monitoring will begin in December 2008		Yes

4.7 RECOMMENDATIONS AND FOLLOW-UP ACTIONS

The recommendations and follow-up actions are outlined in Table 4-4.

TABLE 4-4
OU11 RECOMMENDATIONS AND REQUIRED ACTIONS
FIVE-YEAR REVIEW
NAVAL AIR STATION PENSACOLA
PENSACOLA, FLORIDA

Recommendations/ Follow-up Actions	Party Responsible	Oversight Agency	Milestone Date	Follow-up Actions: Affects Protectiveness (Yes or No)	
				Current	Future
Conduct confirmatory soil sampling and analysis to verify successful abatement of impacted soil	Navy	EPA	December 2008		Yes
Implement Natural Attenuation Monitoring	Navy	EPA	December 2008		Yes

4.8 PROTECTIVENESS STATEMENT

The remedy is expected to be protective of human health and the environment upon attainment of groundwater cleanup goals, through natural attenuation. In the interim, exposure pathways that could result in unacceptable risks are being controlled and institutional controls are preventing exposure to, or the ingestion of, contaminated groundwater.

5.0 OPERABLE UNIT 13, SITES 8 AND 24 – RIFLE RANGE DISPOSAL SITE AND DDT MIXING AREA

This five-year review consists of an approximate five-year period of data and provides a status update for OU13, Sites 8 and 24. This statutory review is required by regulation because wastes are still contained on site and do not allow for unlimited use and unrestricted exposure.

5.1 SITE CHRONOLOGY

A list of important OU13 historical events and relevant dates in the site chronology is shown in Table 5-1.

TABLE 5-1
OU13 SITE CHRONOLOGY
FIVE-YEAR REVIEW
NAVAL AIR STATION PENSACOLA
PENSACOLA, FLORIDA

Event	Date
Waste disposal activities initiated at Site 8	Late 1950s – Early 1960's
DDT mixing conducted at Site 24	Early 1950 – Early 1960's
Building No. 3561 constructed at Site 8 location	1976
IAS on-site survey	1983
Phase I screening investigation conducted	1991
RI/Focused FS completed	1996
RI Report filed	1997
RI Report Addendum issued	September 1999
MOA issued	November 1999
Focused FS issued	May 2000
Focused FS Addendum issued	September 2001
Interim Removal Action conducted at Site 8	2002 – 2004
Interim Removal Action Report issued for Site 8	2004
Final ROD issued	October 5, 2006
Groundwater Monitoring Plan issued	2007
Remedial Design approved	September 19, 2007

5.2 BACKGROUND

5.2.1 Site Description

OU13 is comprised of Site 8 (Rifle Range Disposal Area) and Site 24 (DDT Mixing Area), which border the eastern side of John H. Tower Road and are located southeast of the intersection of John H. Tower and Taylor Roads at NAS Pensacola (Figure 1-2). The site is located in an industrialized portion of NAS Pensacola.

Site 8

Site 8, shown in Figure 5-1, is an approximately 450- by 600-foot area currently occupied by Building 3561, which houses the NAS Pensacola PWC Maintenance/Material Department. An extensive asphalt-paved area surrounds Building 3561 to the north, east, and west, covering nearly all land surface. The PWC stores building materials on the paved area west of the building.

Various solid wastes and dry refuse were reportedly placed in trenches and burned at Site 8 during the late 1950s and early 1960s. Aerial photographs and maps from the 1950s and 1960s show a rifle range at Building 3561's current location. Earlier aerial photographs show an excavation at the northern end of the rifle range, while later photographs show the excavated area as overgrown with vegetation. Most of the excavation noted in the earlier photographs is currently covered by Building 3561 and surrounding paved area, which were constructed during the mid 1970s. Facility personnel reported no waste or residue identified during the building's construction (NEESA, 1983). However, cemetery personnel have reported finding buried metal, rubber, and plastic aircraft parts during excavation along Site 24's eastern boundary (TtNUS, 2006c). Building 3561 was constructed in the mid 1970s and is first visible in aerial photographs from April 1976. During most of the 1980s, a limited portion of Building 3561 was used as a pesticide storage and equipment rinsing area. A tank wash rack rinsing area was constructed in March 1981 midway along Building 3561's eastern side to contain and collect pesticide equipment wash water and rinsate. Wastewater from the wash rack was discharged to the sanitary sewer system. Base pest control operations were moved from Building 3561 to their current location at Building 1538 in the early 1990s (NEESA, 1983; TtNUS, 2006c).

Other buildings within the Site 8 area include:

- Building 3680, Hazardous Material Storage Building
- Building 3817, Gas Bottle Storage Shed
- Building 3834, Material Storage
- Building 3816, Lumber Storage Shed

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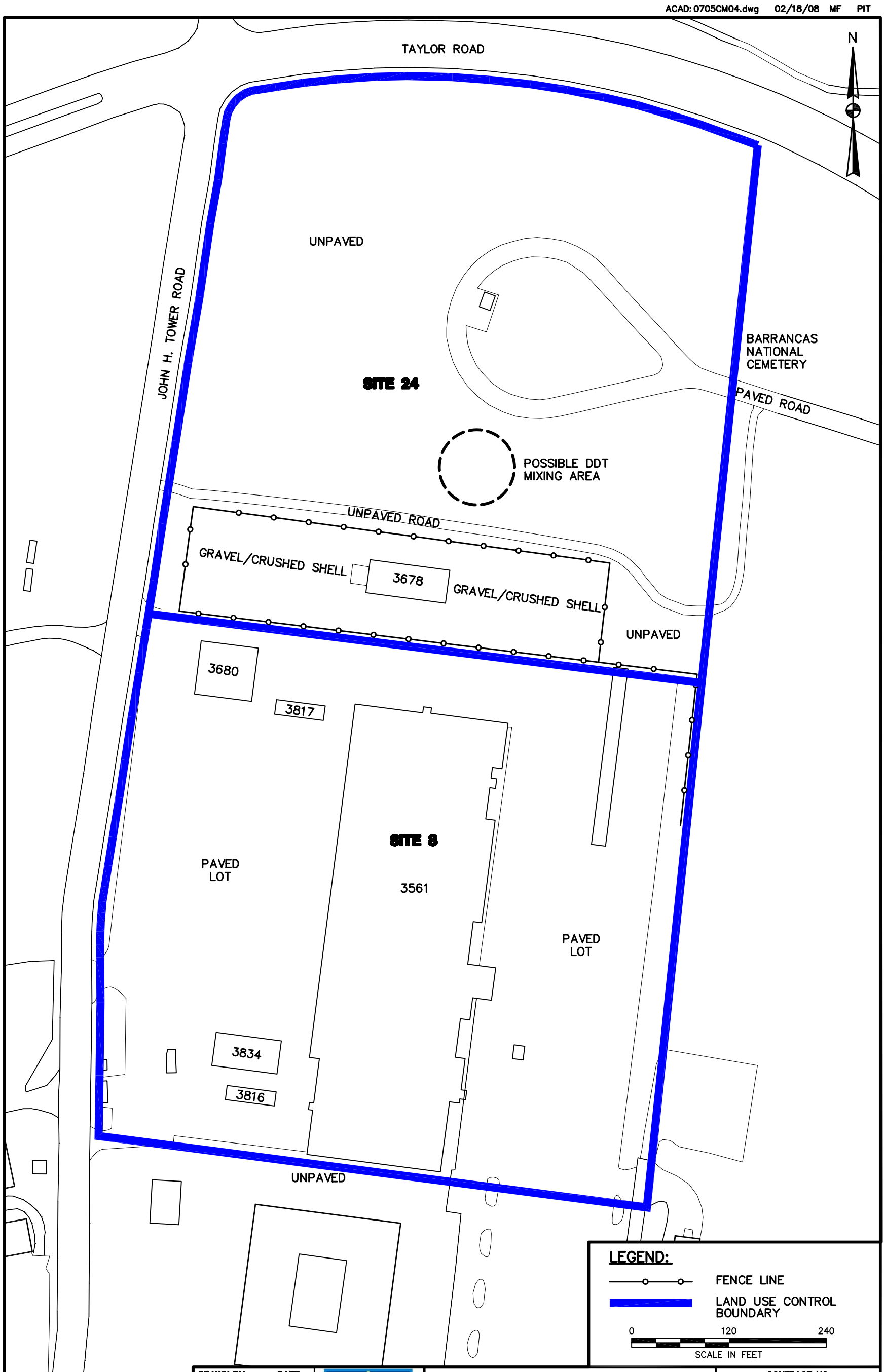

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SCALE AS NOTED			DRAWING NO. FIGURE 5-1 / REV. 0

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Site 24

Site 24, shown in Figure 5-1, is immediately north of Building 3561, near the northwest corner of the Barrancas National Cemetery. The central and northern portions of Site 24 are primarily unpaved and sparsely covered with native grasses and trees. However, the fenced storage area around Building 3678, in Site 24's southern portion, has a gravel/crushed shell land surface. An unimproved dirt road runs west to east across the site's center.

From the early 1950s until the early 1960s, Site 24 was used to mix DDT with diesel fuel for mosquito control. Reportedly, DDT was spilled in the mixing area during transfer from drums to spray tanks, and may have contaminated local soil and groundwater. DDT was aerially applied for at least 10 years to control mosquito outbreaks. In later years, DDT was applied by a fogger machine. It is estimated that up to 20 gallons of diesel/DDT solution may have been spilled during the years of operation at the site (NEESA, 1983).

The fenced storage area north of Building 3561 was developed during the mid 1980s and the PWC storage building was constructed inside the fenced area prior to November 1989. A water supply well (NAS Pensacola Well No. 1) is located upgradient of the combined site area, approximately 0.3 miles to the southeast. However, potable water is obtained from Corry Station. The NAS Pensacola Well No. 1 is screened in the main producing zone beneath the low permeability zone, which separates it from the surficial aquifer.

There are several other IR Program sites nearby. Site 22 (the Refueler Repair Shop) is directly west, across John Tower Road and is now part of the petroleum program. Site 17 (the Transformer Storage Yard) is approximately 1,300 feet southwest and the southern boundary of OU1 (the Sanitary Landfill) is located approximately 200 feet northwest of the John Tower/ Taylor Road intersection (TtNUS, 2006c).

5.2.2 Land and Resource Use

Site 8 is generally flat with a land surface elevation averaging 29 feet above msl. Miscellaneous office trailers and fenced storage, including Building 3678, are north of the building. The paved area east of the building is used for PWC storage and employee parking. Sidewalks and a grassy median are to the south, between Buildings 3560 and 3561. Although it is not completely shown on the figure, most of Site 8 is surrounded by chain-link fencing. Site use is projected to remain consistent with current use. At Site 8, the depth-to-water measurements ranged from approximately 8 feet bls across most of the site to approximately 11 feet bls in the northeastern portion of the site.

Depth-to-water measurements at Site 24 ranged from approximately 5.5 feet bls in the western portion to approximately 8.5 feet bls in the southern portion. Overall, this flow regime generally mimics the local

topography, sloping slightly north-northeast across the area. Groundwater is not currently used as a potable water source at OU13, (TtNUS, 2007).

Site 24's soil is primarily sand and near the surface in some locations, silty clayey sandy fill. The entire site area is generally flat, with land surface elevations approximately 24 to 26 feet above msl. Surface drainage across the site is precluded by the high permeability of the surficial soil which allows direct, rapid infiltration of precipitation. The northern portion of Site 24 is currently part of the Barrancas National Cemetery. The projected future site use continues to be a cemetery (TtNUS, 2006c).

5.2.3 History of Contamination

Site 8

Analytical data generated by soil quality investigations revealed the presence of cadmium, lead, TRPH, PAH, the carbamate pesticide fluometuron, and dieldrin in the soil at OU13 Site 8. The detected contaminant concentrations of cadmium and dieldrin exceeded their applicable preliminary remediation goal.

Only cadmium, manganese, and an isolated lead detection exceeded both cleanup criteria and reference concentrations in Site 8 groundwater. Antimony exceeded its cleanup criteria in two samples; however, there is no RC for antimony. Except for one antimony detection, all exceedances occurred in samples collected from the site's north and northeastern portion (toward the cemetery). This distribution is consistent with past disposal of metallic-alloy aircraft refuse or other metallic material that may lie beneath Building 3561's current location and the site's northern shallow groundwater flow. The extent of shallow groundwater impact does not extend to Site 8's farthest down-gradient well as confirmed by no inorganic exceedances found in the Phase II sample from that location. No organic cleanup criteria exceedances were detected in Site 8 groundwater samples. No PCBs, SVOCs or VOCs were detected above cleanup criteria in Site 8 groundwater (TtNUS, 2007).

Site 24

Inorganic soil contaminants identified in samples collected at Site 24 are attributed to application of fertilizer in the immediate area of sample collection. Therefore, no further investigation or remediation was deemed necessary.

Cleanup criteria and remedial goal exceedances of iron and manganese detected in shallow groundwater at Site 24 can be attributed to fertilizer application, which commonly contains water-soluble forms of these inorganics as essential nutrients.

Metal fragments were found in the subsurface soil north of Building 3678, indicating that Site 8 fill activities extended to, or have been reworked onto Site 24. Based on this evidence, sporadic antimony, cadmium, nickel, and thallium exceedances in shallow groundwater are attributed to metal-alloy debris disposal at Site 8 and/or Site 24. In the RI Addendum investigation, aluminum, calcium, iron, magnesium, and sodium concentrations exceeded cleanup criteria or reference concentrations. Relatively low concentrations of methylene chloride, trichloroethene and vinyl chloride slightly exceeded their cleanup criteria, and are also suspected to be the result of past disposal activities at Site 8 and/or Site 24. No other exceedances were detected. No pesticides were detected in the six down-gradient wells installed and sampled in the RI Addendum investigation. No SVOCs or PCBs were detected above cleanup criteria in Site 24 groundwater.

5.2.4 Initial Response

As a result of the hazard presented by potential exposure to the identified contaminants, CH2M Hill conducted interim removal actions at OU13 from June 28, 2004 to August 25, 2005. The objective of the interim removal action was to remove contaminated soil from Site 8. Delineation samples were collected and the remedial volume was calculated for the protection of human health and protection of groundwater from leachable contaminants. Approximately 634 cubic yards of cadmium impacted soil and approximately 429 cubic yards of dieldrin contaminated soil was removed from Site 8. The removal action is detailed in the Interim Removal Action Report, Excavation of Contaminated Soil at Operable Unit 13 Site 8 (CH2M Hill, 2004). The backfill material was analyzed and determined to be clean fill.

A baseline risk assessment was also conducted for OU13. The baseline risk assessment, which was based on contaminated environmental site media as identified in the RI, was conducted to assess the resulting impact to human health and environment. The response action selected in the ROD was necessary to protect the public health or welfare or the environment from actual or threatened releases of hazardous substances into the environment.

Several inorganic and organic parameters were identified as COCs in the human health component of the baseline risk assessment, with regard to specific land use scenarios. Although the baseline risk assessment presented risks for both soil and groundwater, the interim removal action completed in October 2004 has eliminated the human health and leachability risk from Site 8 soil. Therefore, the potential exposure to the soil at Site 24 and the groundwater at Sites 8 and 24 were considered in the risk analysis.

The extent of impacted media driving excess risk at Sites 8 and 24 is limited. The magnitude of this contamination is also low relative to most applicable ARARs. This human heath risk analysis should be qualified based on factors that affect the exposure potential of humans to impacted media at these sites.

The shallow groundwater of the surficial zone at both sites is not currently used as a groundwater source due to its poor ambient quality. Because higher quality water sources are available for the base system, shallow groundwater is unlikely to be used in the future. These two factors greatly reduce the actual exposure potential to groundwater at Sites 8 and 24.

5.2.5 Basis for Taking Action

Because the State of Florida considers all groundwater to be potable, the basis for taking action at OU13 is the presence of contaminants in groundwater exceeding drinking water standards. The COCs identified for Sites 8 and 24 include:

Site 8 - Soil	Site 8 – Shallow Groundwater
Arsenic	Antimony
Benzo(a)pyrene	Cadmium
Dieldrin	Lead
	Manganese
	Thallium

Site 24 - Soil	Site 24 – Shallow Groundwater
Aldrin	Antimony
Arsenic	Cadmium
Benzo(b)fluoranthene	Dieldrin
Benzo(a)pyrene	Iron
Dibenzo(a,h)anthracene	Lead
Dieldrin	Manganese
	Methylene Chloride
	Nickel
	Thallium
	Trichloroethene
	Vinyl Chloride

The concentrations of detected contaminants in the soil samples collected at Site 24 are not within the USEPA and FDEP acceptable risk range for current workers, trespassers, and future residents (TtNUS, 2007).

Groundwater contaminant concentrations were compared against natural attenuation default source concentrations in Chapter 62-777 FAC to evaluate natural attenuation. Contaminants exceeding any of these criteria were listed as COCs.

5.3 REMEDIAL ACTIONS

5.3.1 Remedy Selection

The ROD for NAS Pensacola OU13 was signed on October 5, 2006. RAOs were developed as a result of data collected during the RI to aid in the development and screening of remedial alternatives to be considered for the ROD. The goals of the selected soil and groundwater remedies at OU13 are to protect human health and the environment by eliminating, reducing, or controlling hazards posed by the site and to meet ARARs.

Based upon consideration of the requirements of CERCLA, the NCP, the detailed analysis of alternatives and public and state comments, the Navy selected No Action for soil at OU13 and LUCs with groundwater monitoring to address groundwater contamination at OU13. Both alternatives, once implemented, will be protective of human health and the environment, are cost-effective, and result in permanent solutions to the maximum extent practicable. With the implementation of these alternatives, the site will be protective of human health and the environment. Table 5-2 lists the RAOs for OU13.

TABLE 5-2
REMEDIAL ACTION OBJECTIVES FOR OU13
FIVE-YEAR REVIEW
NAVAL AIR STATION PENSACOLA
PEANSACOLA, FLORIDA

Medium	Contaminants Causing Unacceptable Risk	Remedial Action Objectives
Soil	Aldrin, Arsenic, Benzo(b)fluoranthene, Benzo(a)pyrene, Dibenzo(a,h)anthracene Dieldrin	Eliminate human health risk above HI=1.
Groundwater	Antimony Cadmium Dieldrin Heptachlor epoxide Iron Lead Manganese Methylene Chloride Nickel Thallium Trichloroethene Vinyl Chloride	Monitor groundwater to ensure COCs are not migrating off-site and institutional controls are maintained.

The remedy was selected for the following reasons:

- Because the removal action was performed, site soil poses no risk.
- The OU13 area is currently used for industrial uses including a paved area for PWC storage and employee parking (Site 8) and buffer zone and cemetery burials in Barrancas National Cemetery (Site 24).
- The projected future site use is consistent with the current uses. Groundwater on site currently exceeds remedial goals. However, natural degradation appears to be occurring and there is no evidence of contaminant migration off-site. Furthermore, the surficial aquifer is not likely to be used for potable water due to its low quality. Source control remediation will address restricting exposure to contaminated groundwater.

Source control shall include LUCs which will be used to restrict groundwater use of the surficial zone of the sand and gravel aquifer on site. A Land Use Control Remedial Design Work Plan will be prepared as the land use component of the remedial design. In accordance with the Site Management Plan and the NAS Pensacola FFA, the Navy shall prepare and submit a LUCRD that shall contain LUC implementation and maintenance actions, including periodic inspections to USEPA and FDEP. The Navy is responsible for implementing, maintaining, reporting on, and enforcing the LUCs. Although the Navy may later transfer these procedural responsibilities to another party by contract, property transfer agreement, or through other means, the Navy shall retain ultimate responsibility for the remedial integrity.

The following components constitute the remedial action for OU13 to address the groundwater RAO:

- Performing groundwater monitoring to ensure the COCs are not moving off-site.
- Conducting reviews to determine whether groundwater performance standards continue to be appropriate.
- Implementing institutional controls to restrict use of groundwater from the surficial zone of the sand and gravel aquifer within 300 feet of the site.
- Reviewing the institutional controls and certification in order to determine if they should remain in place or be modified to reflect changing site conditions.

5.3.2 Remedy Implementation

The OU13 ROD specified removal of isolated hot spot areas of impacted soil to reduce the direct exposure potential at the site. Approximately 634 cubic yards of dieldrin-impacted soil were removed from the eastern side of Building 3561 and approximately 429 cubic yards of cadmium-impacted soil were also removed from the western side of Building 3561. All dieldrin and cadmium impacted soil with contaminant concentrations exceeding the remedial goal of 0.004 mg/kg, and 0.005 µg/L, respectively

were removed. The Groundwater Monitoring Plan has been approved and monitoring of natural attenuation has been initiated. Total remediation cost expended to date for this project is $24,150.00.

5.4 FIVE-YEAR REVIEW

This is the first five-year review for this site.

5.4.1 Administrative Components

Members of the NAS Pensacola Partnering Team were notified of the initiation of the five-year review on September 18, 2007. The five-year review was led by Gerald Walker, P.G. of TtNUS, and included other TtNUS staff. Patty Marajh-Whittemore of NAVFAC SE and Greg Campbell of NAS Pensacola Public Works, assisted in the review.

- Community Involvement
- Document Review
- Data Review
- Site Inspection
- Local Interviews
- Five-year reviews report development and review

5.4.2 Community Involvement

On December 19, 2007, a notice was published in the Pensacola News Journal that a five-year review was to be conducted and that comments could be sent to Mr. Greg Campbell, Remedial Project Manager, NAS Pensacola 310 John Tower Road, Pensacola, Florida 32508-5000. In addition to these activities, the Community Relations Plan will be updated following the five-year review and a public information "Fact Sheet" will be published and distributed.

5.4.3 Document Review

This five-year review consisted of a review of relevant documents including the ROD, Interim Removal Action Report, Draft LUCRD, and FDEP CTLs from Chapter 62-777, FAC.

5.4.4 Data Review

The specified remedial goals associated with impacted soil removal were more stringent than the residential and industrial direct exposure soil cleanup target levels presented in Chapter 62-777 FAC.

Natural attenuation monitoring of groundwater contaminants has been initiated, but analytical results were not available for review while preparing this report.

5.4.5 Five-Year Review Site Inspection

Inspections at the site were conducted on November 14th and 15th, 2007 by TtNUS and NAS Pensacola personnel. The purpose of the inspection was to assess the protectiveness of the remedy, including the presence of fencing to restrict access and condition of monitoring wells. Since surficial soil with contaminant concentrations above the remedial goal were reportedly removed, fencing the site was not warranted. Monitoring wells were accessible and in good condition. Therefore, no deficiencies were noted during the site inspection.

5.4.6 Interviews

Discussions with the Navy, including the Base and NAVFAC SE personnel were conducted in preparation of this report. Based on these discussions, it was determined that natural attenuation monitoring of groundwater had been initiated at OU 13; however, the initial summary reports were not available at the time of this review. .

5.4.7 ARAR Level Changes

The following standards were identified as chemical and action specific ARARs in the ROD. They were reviewed for changes that could affect protectiveness:

Federal

- National Environmental Policy Act (40 CFR Part 6, Appendix A)
- Ambient Water Quality Criteria (40 CFR 131)
- National Primary Drinking Water Standards (40 CFR 141)
- Safe Drinking Water Act MCLs (40 CFR 141.11–141.16)
- Safe Drinking Water Act MCLs (40 CFR 141.50–141.51)
- Executive Order 11988 Wetlands Protection Policy

State

- Florida Surface Water Standards, FAC, Chapter 62-301 and –302
- Florida Drinking Water Standards, Monitoring and Reporting, FAC, Chapter 62-550
- Florida Soil Cleanup Target Levels, FAC Chapter 62-777
- Contaminated Site Cleanup Criteria, (FAC 62-780)

It should be noted that Florida Drinking Water Standards, Monitoring and Reporting (FAC, Chapter 62-550) was repealed in December 2006. These standards remain unchanged.

5.5 TECHNICAL ASSESSMENT

Question A: Is the remedy functioning as intended by the decision documents?

The review of documents, ARARs, risk assumptions, and results of site inspections indicates that the remedy is functioning as intended by the ROD.

- ***Remedial Action Performance:*** Contaminated soil was removed from Site 8 and replaced with clean backfill. The Groundwater Monitoring Plan for OU13 has been approved and natural attenuation monitoring has been initiated.

- ***Early Indicators of Potential Remedy Failure:*** No indicators of potential remedy failure have been identified.

- ***Implementation of Institutional Controls and Other Measures:*** The remedial design outlining the site specific LUCIP has been completed and complies with the LUCAP agreement between the Navy, USEPA, and FDEP. Accordingly, OU13, Sites 8 and 24 will be available for industrial use, but residential use of the site would be prohibited. The Navy will be required to conduct periodic site inspections and ensure that the proposed LUCs are being properly maintained and administered. Groundwater use of the surficial zone of the sand and gravel aquifer in the immediate vicinity of OU13 is prohibited. The Navy will conduct an annual review of the institutional controls and certify that the controls should either remain in place or be modified to reflect changing site conditions.

Question B: Are the assumptions used at the time of remedy selection still valid?

There are no physical changes to the site that would affect the protectiveness of the ROD.

- ***Changes to Standards and To Be Considered:*** Noted changes to standards were identified during performance of this five-year review.

- ***Changes in Exposure Pathways:*** No changes in the site conditions or land use that affect exposure pathways were identified as part of the five-year review. Exposure to the site groundwater is still restricted by institutional controls.

- ***Changes in Toxicity and Other Contaminant Characteristics:*** Toxicity and other factors for COCs have not changed.

- ***Changes in Risk Assessment Methodologies:*** Changes in risk assessment methodologies since the time of the ROD do not call into question the protectiveness of the remedy.

Question C: Has any other information come to light that could call into question the protectiveness of the remedy?

No additional information has come to light that calls into question the protectiveness of the remedy.

5.6 ISSUES

No issues.

5.7 RECOMMENDATIONS AND FOLLOW-UP ACTIONS

The recommendations for OU 13 are to continue natural attenuation monitoring of groundwater.

5.8 PROTECTIVENESS STATEMENT

The remedy is protective.

6.0 BASE WIDE CONCLUSIONS AND RECOMMENDATIONS

The base-wide conclusions and recommendations are presented below. These conclusions and recommendations are provided in the form of a base-wide protectiveness statement and a summary of the requirements of the next five-year review.

6.1 PROTECTIVENESS STATEMENT

A ROD with a selected remedial strategy has been established for OU1, OU4, OU11, and OU13.

The remedies for OU4 and OU13 are protective of human health and the environment.

The remedies for OU1 and OU11 are being evaluated to determine the long-term protectiveness. These evaluations involve obtaining additional groundwater data and confirmatory soil sampling data. This additional sampling and analysis will be completed in the next six months. In regards to the short-term protectiveness of the remedies for OU1 and OU11, the LUCs that NAS Pensacola has put in place are effective in eliminating exposure pathways.

6.2 NEXT REVIEW

NAS Pensacola has OUs that require statutory five-year reviews. This report represents the second five-year review conducted at NAS Pensacola. The next five-year review will be required within five years of the signature date of this review. A summary of the anticipated requirements for the next five-year review is provided below.

The five-year review should include a detailed review of the status of OU1, OU4, OU11, and OU13. All monitoring reports and LUCIP review reports should be included in the review. The next review should also include any additional sites that have received a signed ROD. The review should include all remedial action documents, including any monitoring reports. Additionally, the MOA for NAS Pensacola should be reviewed to determine its applicability to the sites.

6.2.1 Statutory Review

This five-year review meets the CERCLA § 121(c) statutory requirement for facilities that have hazardous substances, pollutants, or contaminants remaining on site at concentrations that prevent unlimited use and unrestricted exposure.

OUs 1, 4, 11, and 13 will require a statutory review within five-years of the date of this document.

6.2.2 Reviews for Sites with RODs Published Since This Five-Year Review

No other sites have had RODs published since the inception of this five-year review.

REFERENCES

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E&E (Ecology & Environment, Inc.), 1992. Phase I Remedial Investigation Report *for* Operable Unit 11, NAS Pensacola, Florida.

EnSafe/Allen & Hoshall (EnSafe), 1996, Final Remedial Investigation, Site 1, NAS Pensacola, Florida, January.

EnSafe, 1997a. Final Record of Decision Operable Unit 10, NAS Pensacola, Florida.

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EnSafe, 1998b. Conceptual Remedial Design at Operable Unit 1, Naval Air Station Pensacola, Florida, Rev. 1.

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EnSafe, 2005b. Final Remedial Investigation Report [Revised Report], Site 41 Wetlands, NAS Pensacola, Pensacola, Florida, August.

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ITRC (Interstate Technology and Regulatory Council) Wetlands Team, 2003. Technical and Regulatory Guidance Document for Constructed Treatment Wetlands, http://www.itrcweb.org/WTLND-1.pdf

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NEESA Records, 1985. Operable Unit 11, NAS Pensacola, Florida.

TtNUS (Tetra Tech NUS, Inc.), 2003. Annual Groundwater Monitoring Report for Operable Unit 1, NAS Pensacola, Florida. Prepared for Naval Facilities Engineering Command, Southeast, North Charleston, South Carolina.

TtNUS, 2006a. Optimization Study Report for Operable Unit 1 NAS Pensacola Draft – Final, Pensacola, Florida. Prepared for Naval Facilities Engineering Command, Southeast, North Charleston, South Carolina. May.

TtNUS, 2006b. Record of Decision (Revision 3), Operable Unit 11, NAS Pensacola, Florida. Prepared for Naval Facilities Engineering Command, Southeast, North Charleston, South Carolina. August.

TtNUS, 2006c. Record of Decision (Revision 3), Operable Unit 13, NAS Pensacola, Florida. Prepared for Naval Facilities Engineering Command, Southeast, North Charleston, South Carolina. August.

TtNUS, 2006d. 5th Annual Monitoring Report for Long-Term Monitoring Operable Unit 1, Prepared for Naval Facilities Engineering Command, Southeast, North Charleston, South Carolina. November.

TtNUS, 2007. Remedial Design, Operable Unit 13, NAS Pensacola, Florida.

APPENDIX A

PUBLIC NOTICE

PENSACOLA
News Journal
Informed. In Tune. In Touch.

Published Daily-Pensacola, Escambia County, FL

PROOF OF PUBLICATION

State of Florida

County of Escambia:

Before the undersigned authority personally appeared **Claudia C. Wysocki-Ables** who on oath, says that he is a personal representative of the Pensacola News Journal, a daily newspaper published in Escambia County, Florida; that the attached copy of advertisement, being a Legal in the matter of:

Notice of Review

Was published in said newspaper in the issue(s) of:

December 19, 2007

Affiant further says that the said Pensacola News Journal is a newspaper published in said Escambia County, Florida, and that the said newspaper has heretofore been published in said Escambia County, Florida, and has been entered as second class matter at the Post Office in said Escambia County, Florida, for a period of one year next preceding the first publication of the attached copy of advertisement; and affiant further says that she has neither paid nor promised any person, firm or corporation any discount, rebate, commission or refund for the purpose of securing this advertisement for publication in the said newspaper.

Sworn to and subscribed before me this 19th Day of December, 2007, by **Claudia C. Wysocki-Ables** who Is personally known to me.

Claudia C Wysocki Ables Affiant

Nikki E Nichols Notary Public

NIKKI E. NICHOLS
Notary Public-State of FL
Comm. Exp. Aug. 01, 2008
Comm. No. DD 427341

Notice of the U.S. Navy's Five-Year CERCLA Review for Naval Air Station (NAS) Pensacola

As part of the Installation Restoration Program (IRP) at Naval Air Station Pensacola and in accordance with the Super Fund Amendments and Reauthorization Act of 1988, the Navy is conducting the second statutory, five-year review for the station. The review will include the following five Operable Units at sites at NAS Pensacola:

- Operable Unit 1 - Site 1, Sanitary Landfill
- Operable Unit 4 - Site 15, Pesticide Rinsate Disposal Area
- Operable Unit 10 - Site 32, 33, 34, Industrial Waste Water Treatment Plant Sludge Drying Beds and Waste Water Treatment Plant Ponds
- Operable Unit 11 - Site 38 Facility Hazardous Waste Storage
- Operable Unit 13 - Site 8 Rifle Range Disposal Area and Site 24 DDT Mixing Area.

The purpose of the five-year review process is to "determine whether the remedy selected at the site is protective of human health and the environment." During the process the above listed sites are reviewed to determine whether the remedy selected is effective. If it is determined to require modifications, such issues will be brought forth in the report that is created following the review.

This document will be maintained in the NAS Pensacola repository located in the University of West Florida Library.

Any person wishing to provide comments regarding this notice may respond in writing to:

Mr. Greg Campbell
Remedial Project Manager
Naval Air Station Pensacola
310 John Tower Road
Pensacola, Florida 32508-5000

For information about the five-year review, or any environmental cleanup activities at NAS Pensacola, please contact Mr. Campbell at (850) 452-3131 extension 3007.

Legal No. 71770 1T December 19, 2007

APPENDIX B

SITE INSPECTION FORMS

Please note that "O&M" is referred to throughout this checklist. At sites where Long-Term Response Actions are in progress, O&M activities may be referred to as "system operations" since these sites are not considered to be in the O&M phase while being remediated under the Superfund program.

Five-Year Review Site Inspection Checklist (Template)

(Working document for site inspection. Information may be completed by hand and attached to the Five-Year Review report as supporting documentation of site status. "N/A" refers to "not applicable.")

I. SITE INFORMATION	
Site name: OU1 SANITARY LANDFILL	**Date of inspection:** 11/14-15/07
Location and Region: NAS Pensacola	**EPA ID:**
Agency, office, or company leading the five-year review: NAVY, SOUTHERN DIVISION	**Weather/temperature:** 68° /CLEAR

Remedy Includes: (Check all that apply)

- G Landfill cover/containment
- G Access controls
- ● Institutional controls
- ● Groundwater pump and treatment
- G Surface water collection and treatment
- G Other _____
- ● Monitored natural attenuation
- G Groundwater containment
- G Vertical barrier walls

Attachments: G Inspection team roster attached G Site map attached

II. INTERVIEWS (Check all that apply)

1. **O&M site manager** _____ _____ _____
   Name Title Date
   Interviewed G at site G at office G by phone Phone no. _____
   Problems, suggestions; G Report attached _____

2. **O&M staff** _____ _____ _____
   Name Title Date
   Interviewed G at site G at office G by phone Phone no. _____
   Problems, suggestions; G Report attached _____

3. **Local regulatory authorities and response agencies** (i.e., State and Tribal offices, emergency response office, police department, office of public health or environmental health, zoning office, recorder of deeds, or other city and county offices, etc.) Fill in all that apply.

Agency _____
Contact _____ _____ _____ _____
Name Title Date Phone no.
Problems; suggestions; G Report attached _____

Agency _____
Contact _____ _____ _____ _____
Name Title Date Phone no.
Problems; suggestions; G Report attached _____

Agency _____
Contact _____ _____ _____ _____
Name Title Date Phone no.
Problems; suggestions; G Report attached _____

Agency _____
Contact _____ _____ _____ _____
Name Title Date Phone no.
Problems; suggestions; G Report attached _____

4. **Other interviews** (optional) G Report attached.

III. ON-SITE DOCUMENTS & RECORDS VERIFIED (Check all that apply)

1.	**O&M Documents**			
	G O&M manual	● Readily available	● Up to date	G N/A
	G As-built drawings	● Readily available	● Up to date	G N/A
	G Maintenance logs	G Readily available	G Up to date	G N/A
	Remarks			
2.	**Site-Specific Health and Safety Plan**	● Readily available	● Up to date	G N/A
	G Contingency plan/emergency response plan	● Readily available	● Up to date	G N/A
	Remarks			
3.	**O&M and OSHA Training Records**	● Readily available	● Up to date	G N/A
	Remarks			
4.	**Permits and Service Agreements**			
	G Air discharge permit	G Readily available	G Up to date	● N/A
	G Effluent discharge	G Readily available	G Up to date	G N/A
	G Waste disposal, POTW	G Readily available	G Up to date	G N/A
	G Other permits	G Readily available	G Up to date	G N/A
	Remarks			
5.	**Gas Generation Records**	G Readily available	G Up to date	● N/A
	Remarks			
6.	**Settlement Monument Records**	G Readily available	G Up to date	● N/A
	Remarks			
7.	**Groundwater Monitoring Records**	● Readily available	● Up to date	G N/A
	Remarks			
8.	**Leachate Extraction Records**	G Readily available	G Up to date	● N/A
	Remarks			
9.	**Discharge Compliance Records**			
	G Air	G Readily available	G Up to date	● N/A
	G Water (effluent)	G Readily available	G Up to date	● N/A
	Remarks			
10.	**Daily Access/Security Logs**	G Readily available	G Up to date	● N/A
	Remarks			

IV. O&M COSTS

1. **O&M Organization**

G State in-house
G PRP in-house
G Federal Facility in-house
G Other_____

G Contractor for State
G Contractor for PRP
✓ Contractor for Federal Facility

2. **O&M Cost Records**

G Readily available G Up to date
G Funding mechanism/agreement in place
Original O&M cost estimate_____ G Breakdown attached

Total annual cost by year for review period if available

From_____ To_____ _____ G Breakdown attached
Date Date Total cost
From_____ To_____ _____ G Breakdown attached
Date Date Total cost
From_____ To_____ _____ G Breakdown attached
Date Date Total cost
From_____ To_____ _____ G Breakdown attached
Date Date Total cost
From_____ To_____ _____ G Breakdown attached
Date Date Total cost

3. **Unanticipated or Unusually High O&M Costs During Review Period**

Describe costs and reasons: _____

V. ACCESS AND INSTITUTIONAL CONTROLS ✓ Applicable G N/A

A. Fencing

1. **Fencing damaged** G Location shown on site map G Gates secured G N/A

Remarks NO FENCE, GATED ACCESS ROAD present

B. Other Access Restrictions

1. **Signs and other security measures** G Location shown on site map G N/A

Remarks "AUTHORIZED PERSONNEL ONLY" Signs POSTED

C. Institutional Controls (ICs)

1. **Implementation and enforcement**

Site conditions imply ICs not properly implemented G Yes ✓ No G N/A
Site conditions imply ICs not being fully enforced G Yes ✓ No G N/A

Type of monitoring (*e.g.*, self-reporting, drive by) DRIVE BY
Frequency DAILY
Responsible party/agency NAS PENSACOLA
Contact _____ _____ _____ _____
Name Title Date Phone no.

Reporting is up-to-date G Yes G No G N/A
Reports are verified by the lead agency G Yes G No G N/A

Specific requirements in deed or decision documents have been met G Yes G No G N/A
Violations have been reported G Yes G No G N/A
Other problems or suggestions: G Report attached

2. **Adequacy** ✓ ICs are adequate G ICs are inadequate G N/A
Remarks

D. General

1. **Vandalism/trespassing** G Location shown on site map ✓ No vandalism evident
Remarks

2. **Land use changes on site** G N/A
Remarks NEW CEMETERY & U.A. MEDICAL CENTER under construction, U.A. - OUTPARCEL of OU1

3. **Land use changes off site** G N/A
Remarks

VI. GENERAL SITE CONDITIONS

A. Roads ✓ Applicable G N/A

1. **Roads damaged** ✓ Location shown on site map G Roads adequate G N/A
Remarks Roads generally cleared of obstructions

B. Other Site Conditions

Remarks_____

VII. LANDFILL COVERS ✓ Applicable G N/A

A. Landfill Surface

1. **Settlement** (Low spots) G Location shown on site map ✓ Settlement not evident
   Areal extent_____ Depth_____
   Remarks_____

2. **Cracks** G Location shown on site map ✓ Cracking not evident
   Lengths_____ Widths_____ Depths_____
   Remarks_____

3. **Erosion** G Location shown on site map ✓ Erosion not evident
   Areal extent_____ Depth_____
   Remarks_____

4. **Holes** G Location shown on site map ✓ Holes not evident
   Areal extent_____ Depth_____
   Remarks_____

5. **Vegetative Cover** G Grass G Cover properly established G No signs of stress
   G Trees/Shrubs (indicate size and locations on a diagram)
   Remarks_____

6. **Alternative Cover (armored rock, concrete, etc.)** G N/A
   Remarks_____

7. **Bulges** G Location shown on site map G Bulges not evident
   Areal extent_____ Height_____
   Remarks_____

8. **Wet Areas/Water Damage** G Wet areas/water damage not evident
G Wet areas G Location shown on site map Areal extent_____
G Ponding G Location shown on site map Areal extent_____
G Seeps G Location shown on site map Areal extent_____
G Soft subgrade G Location shown on site map Areal extent_____
Remarks_____

9. **Slope Instability** G Slides G Location shown on site map G No evidence of slope instability
Areal extent_____
Remarks_____

B. Benches G Applicable ✓ N/A
(Horizontally constructed mounds of earth placed across a steep landfill side slope to interrupt the slope in order to slow down the velocity of surface runoff and intercept and convey the runoff to a lined channel.)

1. **Flows Bypass Bench** G Location shown on site map G N/A or okay
Remarks_____

2. **Bench Breached** G Location shown on site map G N/A or okay
Remarks_____

3. **Bench Overtopped** G Location shown on site map G N/A or okay
Remarks_____

C. Letdown Channels G Applicable ✓ N/A
(Channel lined with erosion control mats, riprap, grout bags, or gabions that descend down the steep side slope of the cover and will allow the runoff water collected by the benches to move off of the landfill cover without creating erosion gullies.)

1. **Settlement** G Location shown on site map G No evidence of settlement
Areal extent_____ Depth_____
Remarks_____

2. **Material Degradation** G Location shown on site map G No evidence of degradation
Material type_____ Areal extent_____
Remarks_____

3. **Erosion** G Location shown on site map G No evidence of erosion
Areal extent_____ Depth_____
Remarks_____

4. **Undercutting** G Location shown on site map G No evidence of undercutting
Areal extent_____ Depth_____
Remarks_____

5. **Obstructions** Type_____ G No obstructions
G Location shown on site map Areal extent_____
Size_____
Remarks_____

6. **Excessive Vegetative Growth** Type_____
G No evidence of excessive growth
G Vegetation in channels does not obstruct flow
G Location shown on site map Areal extent_____
Remarks_____

D. Cover Penetrations G Applicable ✓ N/A

1. **Gas Vents** G Active G Passive
G Properly secured/locked G Functioning G Routinely sampled G Good condition
G Evidence of leakage at penetration G Needs Maintenance
G N/A
Remarks_____

2. **Gas Monitoring Probes**
G Properly secured/locked G Functioning G Routinely sampled G Good condition
G Evidence of leakage at penetration G Needs Maintenance G N/A
Remarks_____

3. **Monitoring Wells** (within surface area of landfill)
G Properly secured/locked G Functioning G Routinely sampled G Good condition
G Evidence of leakage at penetration G Needs Maintenance G N/A
Remarks_____

4. **Leachate Extraction Wells**
G Properly secured/locked G Functioning G Routinely sampled G Good condition
G Evidence of leakage at penetration G Needs Maintenance G N/A
Remarks_____

5. **Settlement Monuments** G Located G Routinely surveyed G N/A
Remarks_____

E. Gas Collection and Treatment G Applicable ✓ N/A

1. **Gas Treatment Facilities**
   G Flaring G Thermal destruction G Collection for reuse
   G Good condition G Needs Maintenance
   Remarks_____

2. **Gas Collection Wells, Manifolds and Piping**
   G Good condition G Needs Maintenance
   Remarks_____

3. **Gas Monitoring Facilities** (*e.g.*, gas monitoring of adjacent homes or buildings)
   G Good condition G Needs Maintenance G N/A
   Remarks_____

F. Cover Drainage Layer G Applicable ✓ N/A

1. **Outlet Pipes Inspected** G Functioning G N/A
   Remarks_____

2. **Outlet Rock Inspected** G Functioning G N/A
   Remarks_____

G. Detention/Sedimentation Ponds G Applicable ✓ N/A

1. **Siltation** Areal extent_____ Depth_____ G N/A
   G Siltation not evident
   Remarks_____

2. **Erosion** Areal extent_____ Depth_____
   G Erosion not evident
   Remarks_____

3. **Outlet Works** G Functioning G N/A
   Remarks_____

4. **Dam** G Functioning G N/A
   Remarks_____

H. Retaining Walls G Applicable ● N/A

1. **Deformations** G Location shown on site map G Deformation not evident
Horizontal displacement_____ Vertical displacement_____
Rotational displacement_____
Remarks_____

2. **Degradation** G Location shown on site map G Degradation not evident
Remarks_____

I. Perimeter Ditches/Off-Site Discharge G Applicable ● N/A

1. **Siltation** G Location shown on site map G Siltation not evident
Areal extent_____ Depth_____
Remarks_____

2. **Vegetative Growth** G Location shown on site map G N/A
G Vegetation does not impede flow
Areal extent_____ Type_____
Remarks_____

3. **Erosion** G Location shown on site map G Erosion not evident
Areal extent_____ Depth_____
Remarks_____

4. **Discharge Structure** G Functioning G N/A
Remarks_____

VIII. VERTICAL BARRIER WALLS G Applicable ● N/A

1. **Settlement** G Location shown on site map G Settlement not evident
Areal extent_____ Depth_____
Remarks_____

2. **Performance Monitoring** Type of monitoring_____
G Performance not monitored
Frequency_____ G Evidence of breaching
Head differential_____
Remarks_____

IX. GROUNDWATER/SURFACE WATER REMEDIES ☑ Applicable G N/A

A. Groundwater Extraction Wells, Pumps, and Pipelines ☑ Applicable G N/A

1. **Pumps, Wellhead Plumbing, and Electrical**
   ☑ Good condition G All required wells properly operating G Needs Maintenance G N/A
   Remarks

2. **Extraction System Pipelines, Valves, Valve Boxes, and Other Appurtenances**
   ☑ Good condition G Needs Maintenance
   Remarks

3. **Spare Parts and Equipment**
   ☑ Readily available G Good condition G Requires upgrade G Needs to be provided
   Remarks ORDERED AS NEEDED

B. Surface Water Collection Structures, Pumps, and Pipelines G Applicable ☑ N/A

1. **Collection Structures, Pumps, and Electrical**
   G Good condition G Needs Maintenance
   Remarks

2. **Surface Water Collection System Pipelines, Valves, Valve Boxes, and Other Appurtenances**
   G Good condition G Needs Maintenance
   Remarks

3. **Spare Parts and Equipment**
   G Readily available G Good condition G Requires upgrade G Needs to be provided
   Remarks

C. Treatment System G Applicable ● N/A

1. **Treatment Train** (Check components that apply)
   G Metals removal G Oil/water separation G Bioremediation
   G Air stripping G Carbon adsorbers
   G Filters_____
   G Additive (*e.g.*, chelation agent, flocculent)_____
   G Others_____
   G Good condition G Needs Maintenance
   G Sampling ports properly marked and functional
   G Sampling/maintenance log displayed and up to date
   G Equipment properly identified
   G Quantity of groundwater treated annually 10 million gALLONS
   G Quantity of surface water treated annually_____
   Remarks_____

2. **Electrical Enclosures and Panels** (properly rated and functional)
   G N/A ● Good condition G Needs Maintenance
   Remarks_____

3. **Tanks, Vaults, Storage Vessels**
   ● N/A G Good condition G Proper secondary containment G Needs Maintenance
   Remarks_____

4. **Discharge Structure and Appurtenances**
   G N/A ● Good condition G Needs Maintenance
   Remarks_____

5. **Treatment Building(s)**
   ● N/A G Good condition (esp. roof and doorways) G Needs repair
   G Chemicals and equipment properly stored
   Remarks_____

6. **Monitoring Wells** (pump and treatment remedy)
   ● Properly secured/locked G Functioning ● Routinely sampled ● Good condition
   G All required wells located G Needs Maintenance G N/A
   Remarks Two (2) downgradient wells are destroyed and need to be replaced

D. Monitoring Data

1. Monitoring Data
   ● Is routinely submitted on time ● Is of acceptable quality

2. Monitoring data suggests:
   ● Groundwater plume is effectively contained G Contaminant concentrations are declining

D. Monitored Natural Attenuation

1. **Monitoring Wells** (natural attenuation remedy)
☑ Properly secured/locked ☑ Functioning ☑ Routinely sampled ☑ Good condition
☐ All required wells located ☑ Needs Maintenance ☐ N/A
Remarks Down-gradient wells destroyed, need to be replaced

X. OTHER REMEDIES

If there are remedies applied at the site which are not covered above, attach an inspection sheet describing the physical nature and condition of any facility associated with the remedy. An example would be soil vapor extraction.

XI. OVERALL OBSERVATIONS

A. Implementation of the Remedy

Describe issues and observations relating to whether the remedy is effective and functioning as designed. Begin with a brief statement of what the remedy is to accomplish (i.e., to contain contaminant plume, minimize infiltration and gas emission, etc.).

Groundwater is recovered at a flow rate of 20 gpm from a 12-inch diameter horizontal recovery well located within the anoxic limestone interceptor trench. The extracted groundwater is discharged into the NAS Pensacola sanitary sewer system.

B. Adequacy of O&M

Describe issues and observations related to the implementation and scope of O&M procedures. In particular, discuss their relationship to the current and long-term protectiveness of the remedy.

The system is operating at its designed specification but it is not effectively reducing the COC's (iron) to acceptable levels. Therefore the protectiveness of the remedy is in question. It is apparent that the system cannot achieve the desired goal and modifications will be required.

C. Early Indicators of Potential Remedy Problems

Describe issues and observations such as unexpected changes in the cost or scope of O&M or a high frequency of unscheduled repairs, that suggest that the protectiveness of the remedy may be compromised in the future.

Iron concentrations are not decreasing in down gradient wells with samples. The organic contaminants are not decreasing as anticipated. It is evident that the current efforts are not sufficient to insure the protectiveness of the remedy.

D. Opportunities for Optimization

Describe possible opportunities for optimization in monitoring tasks or the operation of the remedy.

Termination of system pumping efforts and allow for natural attenuation of COCs. Long term monitoring should continue.

Please note that "O&M" is referred to throughout this checklist. At sites where Long-Term Response Actions are in progress, O&M activities may be referred to as "system operations" since these sites are not considered to be in the O&M phase while being remediated under the Superfund program.

Five-Year Review Site Inspection Checklist (Template)

(Working document for site inspection. Information may be completed by hand and attached to the Five-Year Review report as supporting documentation of site status. "N/A" refers to "not applicable.")

I. SITE INFORMATION	
Site name: OU4, Site 15 Pesticide Disposal	**Date of inspection:** 11/14-15/07
Location and Region: NAS Pensacola	**EPA ID:**
Agency, office, or company leading the five-year review: Navy, Southern Division	**Weather/temperature:** 68° Clear

Remedy Includes: (Check all that apply)

- G Landfill cover/containment
- G Access controls
- ✓ Institutional controls
- G Groundwater pump and treatment
- G Surface water collection and treatment
- G Other _____
- ✓ Monitored natural attenuation
- G Groundwater containment
- G Vertical barrier walls

Attachments: G Inspection team roster attached G Site map attached

II. INTERVIEWS (Check all that apply)

1. **O&M site manager** _____ _____ _____
   Name Title Date
   Interviewed G at site G at office G by phone Phone no. _____
   Problems, suggestions; G Report attached _____

2. **O&M staff** _____ _____ _____
   Name Title Date
   Interviewed G at site G at office G by phone Phone no. _____
   Problems, suggestions; G Report attached _____

3. **Local regulatory authorities and response agencies** (i.e., State and Tribal offices, emergency response office, police department, office of public health or environmental health, zoning office, recorder of deeds, or other city and county offices, etc.) Fill in all that apply.

Agency _____
Contact _____ _____ _____ _____
Name Title Date Phone no.
Problems; suggestions; G Report attached _____
_____

Agency _____
Contact _____ _____ _____ _____
Name Title Date Phone no.
Problems; suggestions; G Report attached _____
_____

Agency _____
Contact _____ _____ _____ _____
Name Title Date Phone no.
Problems; suggestions; G Report attached _____
_____

Agency _____
Contact _____ _____ _____ _____
Name Title Date Phone no.
Problems; suggestions; G Report attached _____
_____

4. **Other interviews** (optional) G Report attached.

III. ON-SITE DOCUMENTS & RECORDS VERIFIED (Check all that apply)

1. **O&M Documents**

G O&M manual	G Readily available	G Up to date	● N/A
G As-built drawings	G Readily available	G Up to date	● N/A
G Maintenance logs	G Readily available	G Up to date	● N/A

Remarks

2. **Site-Specific Health and Safety Plan** ● Readily available ● Up to date G N/A
   G Contingency plan/emergency response plan ● Readily available ● Up to date G N/A
   Remarks

3. **O&M and OSHA Training Records** ● Readily available ● Up to date G N/A
   Remarks

4. **Permits and Service Agreements**

G Air discharge permit	G Readily available	G Up to date	● N/A
G Effluent discharge	G Readily available	G Up to date	G N/A
G Waste disposal, POTW	G Readily available	G Up to date	G N/A
G Other permits	G Readily available	G Up to date	G N/A

Remarks

5. **Gas Generation Records** G Readily available G Up to date ● N/A
   Remarks

6. **Settlement Monument Records** G Readily available G Up to date ● N/A
   Remarks

7. **Groundwater Monitoring Records** ● Readily available ● Up to date G N/A
   Remarks

8. **Leachate Extraction Records** G Readily available G Up to date ● N/A
   Remarks

9. **Discharge Compliance Records**

G Air	G Readily available	G Up to date	● N/A
G Water (effluent)	G Readily available	G Up to date	● N/A

Remarks

10. **Daily Access/Security Logs** G Readily available G Up to date ● N/A
    Remarks

IV. O&M COSTS

1. **O&M Organization**

G State in-house
G PRP in-house
G Federal Facility in-house
G Other_____

G Contractor for State
G Contractor for PRP
✓ Contractor for Federal Facility

2. **O&M Cost Records**

G Readily available G Up to date
G Funding mechanism/agreement in place
Original O&M cost estimate_____ G Breakdown attached

Total annual cost by year for review period if available

From_____ To_____ _____ G Breakdown attached
Date Date Total cost
From_____ To_____ _____ G Breakdown attached
Date Date Total cost
From_____ To_____ _____ G Breakdown attached
Date Date Total cost
From_____ To_____ _____ G Breakdown attached
Date Date Total cost
From_____ To_____ _____ G Breakdown attached
Date Date Total cost

3. **Unanticipated or Unusually High O&M Costs During Review Period**

Describe costs and reasons: _____

V. ACCESS AND INSTITUTIONAL CONTROLS ✓ Applicable G N/A

A. Fencing

1. **Fencing damaged** G Location shown on site map G Gates secured G N/A

Remarks NO Fencing exists, not Warranted

B. Other Access Restrictions

1. **Signs and other security measures** G Location shown on site map G N/A

Remarks NO signage was noted

C. Institutional Controls (ICs)

1. **Implementation and enforcement**

Site conditions imply ICs not properly implemented — G Yes ● No G N/A
Site conditions imply ICs not being fully enforced — G Yes ● No G N/A

Type of monitoring (*e.g.*, self-reporting, drive by) DRIVE BY
Frequency Daily
Responsible party/agency NAS Pensacola
Contact _____ _____ _____ _____
Name Title Date Phone no.

Reporting is up-to-date — G Yes G No G N/A
Reports are verified by the lead agency — G Yes G No G N/A

Specific requirements in deed or decision documents have been met — G Yes G No G N/A
Violations have been reported — G Yes G No G N/A
Other problems or suggestions: G Report attached

2. **Adequacy** ● ICs are adequate G ICs are inadequate G N/A
Remarks

D. General

1. **Vandalism/trespassing** G Location shown on site map ● No vandalism evident
Remarks

2. **Land use changes on site** ● N/A
Remarks

3. **Land use changes off site** ● N/A
Remarks

VI. GENERAL SITE CONDITIONS

A. Roads ● Applicable G N/A

1. **Roads damaged** ● Location shown on site map ● Roads adequate G N/A
Remarks

B. Other Site Conditions

Remarks_____

VII. LANDFILL COVERS G Applicable ✓ N/A

A. Landfill Surface

1. **Settlement** (Low spots) G Location shown on site map G Settlement not evident
Areal extent_____ Depth_____
Remarks_____

2. **Cracks** G Location shown on site map G Cracking not evident
Lengths_____ Widths_____ Depths_____
Remarks_____

3. **Erosion** G Location shown on site map G Erosion not evident
Areal extent_____ Depth_____
Remarks_____

4. **Holes** G Location shown on site map G Holes not evident
Areal extent_____ Depth_____
Remarks_____

5. **Vegetative Cover** G Grass G Cover properly established G No signs of stress
G Trees/Shrubs (indicate size and locations on a diagram)
Remarks_____

6. **Alternative Cover (armored rock, concrete, etc.)** G N/A
Remarks_____

7. **Bulges** G Location shown on site map G Bulges not evident
Areal extent_____ Height_____
Remarks_____

8. **Wet Areas/Water Damage** G Wet areas/water damage not evident
G Wet areas G Location shown on site map Areal extent_____
G Ponding G Location shown on site map Areal extent_____
G Seeps G Location shown on site map Areal extent_____
G Soft subgrade G Location shown on site map Areal extent_____
Remarks_____

9. **Slope Instability** G Slides G Location shown on site map G No evidence of slope instability
Areal extent_____
Remarks_____

B. Benches G Applicable ● N/A
(Horizontally constructed mounds of earth placed across a steep landfill side slope to interrupt the slope in order to slow down the velocity of surface runoff and intercept and convey the runoff to a lined channel.)

1. **Flows Bypass Bench** G Location shown on site map G N/A or okay
Remarks_____

2. **Bench Breached** G Location shown on site map G N/A or okay
Remarks_____

3. **Bench Overtopped** G Location shown on site map G N/A or okay
Remarks_____

C. Letdown Channels G Applicable ● N/A
(Channel lined with erosion control mats, riprap, grout bags, or gabions that descend down the steep side slope of the cover and will allow the runoff water collected by the benches to move off of the landfill cover without creating erosion gullies.)

1. **Settlement** G Location shown on site map G No evidence of settlement
Areal extent_____ Depth_____
Remarks_____

2. **Material Degradation** G Location shown on site map G No evidence of degradation
Material type_____ Areal extent_____
Remarks_____

3. **Erosion** G Location shown on site map G No evidence of erosion
Areal extent_____ Depth_____
Remarks_____

4. **Undercutting** G Location shown on site map G No evidence of undercutting
Areal extent_____ Depth_____
Remarks_____

5. **Obstructions** Type_____ G No obstructions
G Location shown on site map Areal extent_____
Size_____
Remarks_____

6. **Excessive Vegetative Growth** Type_____
G No evidence of excessive growth
G Vegetation in channels does not obstruct flow
G Location shown on site map Areal extent_____
Remarks_____

D. Cover Penetrations G Applicable ✓ N/A

1. **Gas Vents** G Active G Passive
G Properly secured/locked G Functioning G Routinely sampled G Good condition
G Evidence of leakage at penetration G Needs Maintenance
G N/A
Remarks_____

2. **Gas Monitoring Probes**
G Properly secured/locked G Functioning G Routinely sampled G Good condition
G Evidence of leakage at penetration G Needs Maintenance G N/A
Remarks_____

3. **Monitoring Wells** (within surface area of landfill)
G Properly secured/locked G Functioning G Routinely sampled G Good condition
G Evidence of leakage at penetration G Needs Maintenance G N/A
Remarks_____

4. **Leachate Extraction Wells**
G Properly secured/locked G Functioning G Routinely sampled G Good condition
G Evidence of leakage at penetration G Needs Maintenance G N/A
Remarks_____

5. **Settlement Monuments** G Located G Routinely surveyed G N/A
Remarks_____

E. Gas Collection and Treatment G Applicable ● N/A

1. **Gas Treatment Facilities**
   G Flaring G Thermal destruction G Collection for reuse
   G Good condition G Needs Maintenance
   Remarks_____

2. **Gas Collection Wells, Manifolds and Piping**
   G Good condition G Needs Maintenance
   Remarks_____

3. **Gas Monitoring Facilities** (*e.g.*, gas monitoring of adjacent homes or buildings)
   G Good condition G Needs Maintenance G N/A
   Remarks_____

F. Cover Drainage Layer G Applicable ● N/A

1. **Outlet Pipes Inspected** G Functioning G N/A
   Remarks_____

2. **Outlet Rock Inspected** G Functioning G N/A
   Remarks_____

G. Detention/Sedimentation Ponds G Applicable ● N/A

1. **Siltation** Areal extent_____ Depth_____ G N/A
   G Siltation not evident
   Remarks_____

2. **Erosion** Areal extent_____ Depth_____
   G Erosion not evident
   Remarks_____

3. **Outlet Works** G Functioning G N/A
   Remarks_____

4. **Dam** G Functioning G N/A
   Remarks_____

H. Retaining Walls G Applicable ✓ N/A

1. **Deformations** G Location shown on site map G Deformation not evident
Horizontal displacement_____ Vertical displacement_____
Rotational displacement_____
Remarks_____

2. **Degradation** G Location shown on site map G Degradation not evident
Remarks_____

I. Perimeter Ditches/Off-Site Discharge G Applicable ✓ N/A

1. **Siltation** G Location shown on site map G Siltation not evident
Areal extent_____ Depth_____
Remarks_____

2. **Vegetative Growth** G Location shown on site map G N/A
G Vegetation does not impede flow
Areal extent_____ Type_____
Remarks_____

3. **Erosion** G Location shown on site map G Erosion not evident
Areal extent_____ Depth_____
Remarks_____

4. **Discharge Structure** G Functioning G N/A
Remarks_____

VIII. VERTICAL BARRIER WALLS G Applicable ✓ N/A

1. **Settlement** G Location shown on site map G Settlement not evident
Areal extent_____ Depth_____
Remarks_____

2. **Performance Monitoring** Type of monitoring_____
G Performance not monitored
Frequency_____ G Evidence of breaching
Head differential_____
Remarks_____

IX. GROUNDWATER/SURFACE WATER REMEDIES ● Applicable G N/A

A. Groundwater Extraction Wells, Pumps, and Pipelines G Applicable ● N/A

1. **Pumps, Wellhead Plumbing, and Electrical**
   G Good condition G All required wells properly operating G Needs Maintenance G N/A
   Remarks_____

2. **Extraction System Pipelines, Valves, Valve Boxes, and Other Appurtenances**
   G Good condition G Needs Maintenance
   Remarks_____

3. **Spare Parts and Equipment**
   G Readily available G Good condition G Requires upgrade G Needs to be provided
   Remarks_____

B. Surface Water Collection Structures, Pumps, and Pipelines G Applicable ● N/A

1. **Collection Structures, Pumps, and Electrical**
   G Good condition G Needs Maintenance
   Remarks_____

2. **Surface Water Collection System Pipelines, Valves, Valve Boxes, and Other Appurtenances**
   G Good condition G Needs Maintenance
   Remarks_____

3. **Spare Parts and Equipment**
   G Readily available G Good condition G Requires upgrade G Needs to be provided
   Remarks_____

C. Treatment System G Applicable ● N/A

1. **Treatment Train** (Check components that apply)
   G Metals removal G Oil/water separation G Bioremediation
   G Air stripping G Carbon adsorbers
   G Filters_____
   G Additive (*e.g.*, chelation agent, flocculent)_____
   G Others_____
   G Good condition G Needs Maintenance
   G Sampling ports properly marked and functional
   G Sampling/maintenance log displayed and up to date
   G Equipment properly identified
   G Quantity of groundwater treated annually_____
   G Quantity of surface water treated annually_____
   Remarks_____

2. **Electrical Enclosures and Panels** (properly rated and functional)
   ● N/A G Good condition G Needs Maintenance
   Remarks_____

3. **Tanks, Vaults, Storage Vessels**
   G N/A G Good condition G Proper secondary containment G Needs Maintenance
   Remarks_____

4. **Discharge Structure and Appurtenances**
   G N/A G Good condition G Needs Maintenance
   Remarks_____

5. **Treatment Building(s)**
   G N/A G Good condition (esp. roof and doorways) G Needs repair
   G Chemicals and equipment properly stored
   Remarks_____

6. **Monitoring Wells** (pump and treatment remedy)
   G Properly secured/locked G Functioning G Routinely sampled G Good condition
   G All required wells located G Needs Maintenance G N/A
   Remarks_____

D. Monitoring Data

1. Monitoring Data
   ● Is routinely submitted on time ● Is of acceptable quality

2. Monitoring data suggests:
   ● Groundwater plume is effectively contained ● Contaminant concentrations are declining

D. Monitored Natural Attenuation

1. **Monitoring Wells** (natural attenuation remedy)
   ✓ Properly secured/locked G Functioning ✓ Routinely sampled ✓ Good condition
   ✓ All required wells located G Needs Maintenance G N/A
   Remarks

X. OTHER REMEDIES

If there are remedies applied at the site which are not covered above, attach an inspection sheet describing the physical nature and condition of any facility associated with the remedy. An example would be soil vapor extraction.

XI. OVERALL OBSERVATIONS

A. Implementation of the Remedy

Describe issues and observations relating to whether the remedy is effective and functioning as designed. Begin with a brief statement of what the remedy is to accomplish (i.e., to contain contaminant plume, minimize infiltration and gas emission, etc.).

Source removal activities were conducted to remove contaminated soil above the remedial goal (RG). Natural attenuation monitoring was conducted/implemented to document contaminant concentrations in groundwater over time. The remedy is moderately effective. Groundwater contaminants are not attenuating at the anticipated rate.

B. Adequacy of O&M

Describe issues and observations related to the implementation and scope of O&M procedures. In particular, discuss their relationship to the current and long-term protectiveness of the remedy.

none noted

C. Early Indicators of Potential Remedy Problems

Describe issues and observations such as unexpected changes in the cost or scope of O&M or a high frequency of unscheduled repairs, that suggest that the protectiveness of the remedy may be compromised in the future.

The slow rate of contaminant attenuation will require additional years of monitoring as such, the cost will increase accordingly

D. Opportunities for Optimization

Describe possible opportunities for optimization in monitoring tasks or the operation of the remedy.

In the event that attenuation rates fail to meet the RG within the next 7 years of monitoring, optimization should be considered.

Please note that "O&M" is referred to throughout this checklist. At sites where Long-Term Response Actions are in progress, O&M activities may be referred to as "system operations" since these sites are not considered to be in the O&M phase while being remediated under the Superfund program.

Five-Year Review Site Inspection Checklist (Template)

(Working document for site inspection. Information may be completed by hand and attached to the Five-Year Review report as supporting documentation of site status. "N/A" refers to "not applicable.")

I. SITE INFORMATION	
Site name: OU 10 IWTP + WWTP	**Date of inspection:** 11/14-15-/07
Location and Region: NAS Pensacola	**EPA ID:**
Agency, office, or company leading the five-year review: NAVY, Southern Division	**Weather/temperature:** 68° / CLEAR

Remedy Includes: (Check all that apply)

- G Landfill cover/containment
- G Access controls
- G Institutional controls
- ✓ Groundwater pump and treatment
- G Surface water collection and treatment
- ✓ Other Excavation + Leachability Study
- G Monitored natural attenuation
- G Groundwater containment
- G Vertical barrier walls

Attachments: G Inspection team roster attached G Site map attached

II. INTERVIEWS (Check all that apply)

1. **O&M site manager** _____ _____ _____
   Name Title Date
   Interviewed G at site G at office G by phone Phone no. _____
   Problems, suggestions; G Report attached _____

2. **O&M staff** _____ _____ _____
   Name Title Date
   Interviewed G at site G at office G by phone Phone no. _____
   Problems, suggestions; G Report attached _____

3. **Local regulatory authorities and response agencies** (i.e., State and Tribal offices, emergency response office, police department, office of public health or environmental health, zoning office, recorder of deeds, or other city and county offices, etc.) Fill in all that apply.

Agency _____
Contact _____ _____ _____ _____
Name Title Date Phone no.
Problems; suggestions; G Report attached _____
_____

Agency _____
Contact _____ _____ _____ _____
Name Title Date Phone no.
Problems; suggestions; G Report attached _____
_____

Agency _____
Contact _____ _____ _____ _____
Name Title Date Phone no.
Problems; suggestions; G Report attached _____
_____

Agency _____
Contact _____ _____ _____ _____
Name Title Date Phone no.
Problems; suggestions; G Report attached _____
_____

4. **Other interviews** (optional) G Report attached.

III. ON-SITE DOCUMENTS & RECORDS VERIFIED (Check all that apply)

1. **O&M Documents**
   - G O&M manual — G Readily available — G Up to date — G N/A
   - G As-built drawings — G Readily available — G Up to date — G N/A
   - G Maintenance logs — G Readily available — G Up to date — G N/A

   Remarks

2. **Site-Specific Health and Safety Plan** — ● Readily available — ● Up to date — G N/A
   - G Contingency plan/emergency response plan — ● Readily available — ● Up to date — G N/A

   Remarks

3. **O&M and OSHA Training Records** — ● Readily available — ● Up to date — G N/A

   Remarks

4. **Permits and Service Agreements**
   - G Air discharge permit — G Readily available — G Up to date — G N/A
   - G Effluent discharge — G Readily available — G Up to date — G N/A
   - G Waste disposal, POTW — G Readily available — G Up to date — G N/A
   - G Other permits RCRA PERMIT — ● Readily available — ● Up to date — G N/A

   Remarks # 015 4498 - 004 - HF

5. **Gas Generation Records** — G Readily available — G Up to date — G N/A

   Remarks

6. **Settlement Monument Records** — G Readily available — G Up to date — G N/A

   Remarks

7. **Groundwater Monitoring Records** — G Readily available — G Up to date — G N/A

   Remarks

8. **Leachate Extraction Records** — G Readily available — G Up to date — G N/A

   Remarks

9. **Discharge Compliance Records**
   - G Air — G Readily available — G Up to date — G N/A
   - G Water (effluent) — G Readily available — G Up to date — G N/A

   Remarks

10. **Daily Access/Security Logs** — ● Readily available — ● Up to date — G N/A

    Remarks

IV. O&M COSTS

1. **O&M Organization**

G State in-house
G PRP in-house
G Federal Facility in-house
G Other_____

G Contractor for State
G Contractor for PRP
● Contractor for Federal Facility

2. **O&M Cost Records**

G Readily available G Up to date
G Funding mechanism/agreement in place
Original O&M cost estimate_____ G Breakdown attached

Total annual cost by year for review period if available

From_____ To_____ _____ G Breakdown attached
Date Date Total cost

From_____ To_____ _____ G Breakdown attached
Date Date Total cost

From_____ To_____ _____ G Breakdown attached
Date Date Total cost

From_____ To_____ _____ G Breakdown attached
Date Date Total cost

From_____ To_____ _____ G Breakdown attached
Date Date Total cost

3. **Unanticipated or Unusually High O&M Costs During Review Period**

Describe costs and reasons: _____

V. ACCESS AND INSTITUTIONAL CONTROLS G Applicable G N/A

A. Fencing

1. **Fencing damaged** ● Location shown on site map ● Gates secured G N/A

Remarks Fencing intact, gated access.

B. Other Access Restrictions

1. **Signs and other security measures** ● Location shown on site map G N/A

Remarks_____

C. Institutional Controls (ICs)

1. **Implementation and enforcement**

Site conditions imply ICs not properly implemented G Yes G No ● N/A
Site conditions imply ICs not being fully enforced G Yes G No ● N/A

Type of monitoring (*e.g.*, self-reporting, drive by) _____
Frequency _____
Responsible party/agency _____
Contact _____ _____ _____ _____
Name Title Date Phone no.

Reporting is up-to-date G Yes G No ● N/A
Reports are verified by the lead agency G Yes G No ● N/A

Specific requirements in deed or decision documents have been met G Yes G No ● N/A
Violations have been reported G Yes G No ● N/A
Other problems or suggestions: G Report attached

2. **Adequacy** G ICs are adequate G ICs are inadequate ● N/A
Remarks _____

D. General

1. **Vandalism/trespassing** G Location shown on site map ● No vandalism evident
Remarks _____

2. **Land use changes on site** ● N/A
Remarks _____

3. **Land use changes off site** ● N/A
Remarks _____

VI. GENERAL SITE CONDITIONS

A. Roads ● Applicable G N/A

1. **Roads damaged** G Location shown on site map ● Roads adequate G N/A
Remarks _____

B. Other Site Conditions

Remarks_____

VII. LANDFILL COVERS G Applicable ● N/A

A. Landfill Surface

1. **Settlement** (Low spots) G Location shown on site map G Settlement not evident
Areal extent_____ Depth_____
Remarks_____

2. **Cracks** G Location shown on site map G Cracking not evident
Lengths_____ Widths_____ Depths_____
Remarks_____

3. **Erosion** G Location shown on site map G Erosion not evident
Areal extent_____ Depth_____
Remarks_____

4. **Holes** G Location shown on site map G Holes not evident
Areal extent_____ Depth_____
Remarks_____

5. **Vegetative Cover** G Grass G Cover properly established G No signs of stress
G Trees/Shrubs (indicate size and locations on a diagram)
Remarks_____

6. **Alternative Cover (armored rock, concrete, etc.)** G N/A
Remarks_____

7. **Bulges** G Location shown on site map G Bulges not evident
Areal extent_____ Height_____
Remarks_____

8. **Wet Areas/Water Damage** G Wet areas/water damage not evident
G Wet areas G Location shown on site map Areal extent_____
G Ponding G Location shown on site map Areal extent_____
G Seeps G Location shown on site map Areal extent_____
G Soft subgrade G Location shown on site map Areal extent_____
Remarks_____

9. **Slope Instability** G Slides G Location shown on site map G No evidence of slope instability
Areal extent_____
Remarks_____

B. Benches G Applicable ● N/A
(Horizontally constructed mounds of earth placed across a steep landfill side slope to interrupt the slope in order to slow down the velocity of surface runoff and intercept and convey the runoff to a lined channel.)

1. **Flows Bypass Bench** G Location shown on site map G N/A or okay
Remarks_____

2. **Bench Breached** G Location shown on site map G N/A or okay
Remarks_____

3. **Bench Overtopped** G Location shown on site map G N/A or okay
Remarks_____

C. Letdown Channels G Applicable ● N/A
(Channel lined with erosion control mats, riprap, grout bags, or gabions that descend down the steep side slope of the cover and will allow the runoff water collected by the benches to move off of the landfill cover without creating erosion gullies.)

1. **Settlement** G Location shown on site map G No evidence of settlement
Areal extent_____ Depth_____
Remarks_____

2. **Material Degradation** G Location shown on site map G No evidence of degradation
Material type_____ Areal extent_____
Remarks_____

3. **Erosion** G Location shown on site map G No evidence of erosion
Areal extent_____ Depth_____
Remarks_____

4. **Undercutting** G Location shown on site map G No evidence of undercutting
Areal extent_____ Depth_____
Remarks_____

5. **Obstructions** Type_____ G No obstructions
G Location shown on site map Areal extent_____
Size_____
Remarks_____

6. **Excessive Vegetative Growth** Type_____
G No evidence of excessive growth
G Vegetation in channels does not obstruct flow
G Location shown on site map Areal extent_____
Remarks_____

D. Cover Penetrations G Applicable ✓ N/A

1. **Gas Vents** G Active G Passive
G Properly secured/locked G Functioning G Routinely sampled G Good condition
G Evidence of leakage at penetration G Needs Maintenance
G N/A
Remarks_____

2. **Gas Monitoring Probes**
G Properly secured/locked G Functioning G Routinely sampled G Good condition
G Evidence of leakage at penetration G Needs Maintenance G N/A
Remarks_____

3. **Monitoring Wells** (within surface area of landfill)
G Properly secured/locked G Functioning G Routinely sampled G Good condition
G Evidence of leakage at penetration G Needs Maintenance G N/A
Remarks_____

4. **Leachate Extraction Wells**
G Properly secured/locked G Functioning G Routinely sampled G Good condition
G Evidence of leakage at penetration G Needs Maintenance G N/A
Remarks_____

5. **Settlement Monuments** G Located G Routinely surveyed G N/A
Remarks_____

E. Gas Collection and Treatment G Applicable ● N/A

1. **Gas Treatment Facilities**
   G Flaring G Thermal destruction G Collection for reuse
   G Good condition G Needs Maintenance
   Remarks_____

2. **Gas Collection Wells, Manifolds and Piping**
   G Good condition G Needs Maintenance
   Remarks_____

3. **Gas Monitoring Facilities** (*e.g.*, gas monitoring of adjacent homes or buildings)
   G Good condition G Needs Maintenance G N/A
   Remarks_____

F. Cover Drainage Layer G Applicable ● N/A

1. **Outlet Pipes Inspected** G Functioning G N/A
   Remarks_____

2. **Outlet Rock Inspected** G Functioning G N/A
   Remarks_____

G. Detention/Sedimentation Ponds G Applicable ● N/A

1. **Siltation** Areal extent_____ Depth_____ G N/A
   G Siltation not evident
   Remarks_____

2. **Erosion** Areal extent_____ Depth_____
   G Erosion not evident
   Remarks_____

3. **Outlet Works** G Functioning G N/A
   Remarks_____

4. **Dam** G Functioning G N/A
   Remarks_____

H. Retaining Walls G Applicable ● N/A

1. **Deformations** G Location shown on site map G Deformation not evident
Horizontal displacement_____ Vertical displacement_____
Rotational displacement_____
Remarks_____

2. **Degradation** G Location shown on site map G Degradation not evident
Remarks_____

I. Perimeter Ditches/Off-Site Discharge G Applicable ● N/A

1. **Siltation** G Location shown on site map G Siltation not evident
Areal extent_____ Depth_____
Remarks_____

2. **Vegetative Growth** G Location shown on site map G N/A
G Vegetation does not impede flow
Areal extent_____ Type_____
Remarks_____

3. **Erosion** G Location shown on site map G Erosion not evident
Areal extent_____ Depth_____
Remarks_____

4. **Discharge Structure** G Functioning G N/A
Remarks_____

VIII. VERTICAL BARRIER WALLS G Applicable ● N/A

1. **Settlement** G Location shown on site map G Settlement not evident
Areal extent_____ Depth_____
Remarks_____

2. **Performance Monitoring** Type of monitoring_____
G Performance not monitored
Frequency_____ G Evidence of breaching
Head differential_____
Remarks_____

IX. GROUNDWATER/SURFACE WATER REMEDIES ● Applicable G N/A

A. Groundwater Extraction Wells, Pumps, and Pipelines G Applicable ● N/A

1. **Pumps, Wellhead Plumbing, and Electrical**
   G Good condition G All required wells properly operating G Needs Maintenance G N/A
   Remarks_____

2. **Extraction System Pipelines, Valves, Valve Boxes, and Other Appurtenances**
   G Good condition G Needs Maintenance
   Remarks_____

3. **Spare Parts and Equipment**
   G Readily available G Good condition G Requires upgrade G Needs to be provided
   Remarks_____

B. Surface Water Collection Structures, Pumps, and Pipelines G Applicable ● N/A

1. **Collection Structures, Pumps, and Electrical**
   G Good condition G Needs Maintenance
   Remarks_____

2. **Surface Water Collection System Pipelines, Valves, Valve Boxes, and Other Appurtenances**
   G Good condition G Needs Maintenance
   Remarks_____

3. **Spare Parts and Equipment**
   G Readily available G Good condition G Requires upgrade G Needs to be provided
   Remarks_____

C. Treatment System G Applicable ● N/A

1. **Treatment Train** (Check components that apply)
   G Metals removal G Oil/water separation G Bioremediation
   G Air stripping G Carbon adsorbers
   G Filters_____
   G Additive (*e.g.*, chelation agent, flocculent)_____
   G Others_____
   G Good condition G Needs Maintenance
   G Sampling ports properly marked and functional
   G Sampling/maintenance log displayed and up to date
   G Equipment properly identified
   G Quantity of groundwater treated annually_____
   G Quantity of surface water treated annually_____
   Remarks_____

2. **Electrical Enclosures and Panels** (properly rated and functional)
   ● N/A G Good condition G Needs Maintenance
   Remarks_____

3. **Tanks, Vaults, Storage Vessels**
   ● N/A G Good condition G Proper secondary containment G Needs Maintenance
   Remarks_____

4. **Discharge Structure and Appurtenances**
   ● N/A G Good condition G Needs Maintenance
   Remarks_____

5. **Treatment Building(s)**
   ● N/A G Good condition (esp. roof and doorways) G Needs repair
   G Chemicals and equipment properly stored
   Remarks_____

6. **Monitoring Wells** (pump and treatment remedy)
   ● Properly secured/locked G Functioning ● Routinely sampled ● Good condition
   ● All required wells located G Needs Maintenance G N/A
   Remarks_____

D. Monitoring Data

1. Monitoring Data
   ● Is routinely submitted on time ● Is of acceptable quality

2. Monitoring data suggests:
   G Groundwater plume is effectively contained G Contaminant concentrations are declining

D. Monitored Natural Attenuation

1. **Monitoring Wells** (natural attenuation remedy)
   ✓ Properly secured/locked ✓ Functioning ✓ Routinely sampled ✓ Good condition
   G All required wells located G Needs Maintenance G N/A
   Remarks

X. OTHER REMEDIES

If there are remedies applied at the site which are not covered above, attach an inspection sheet describing the physical nature and condition of any facility associated with the remedy. An example would be soil vapor extraction.

XI. OVERALL OBSERVATIONS

A. Implementation of the Remedy

Describe issues and observations relating to whether the remedy is effective and functioning as designed. Begin with a brief statement of what the remedy is to accomplish (i.e., to contain contaminant plume, minimize infiltration and gas emission, etc.).

The remedy for this site consists of LTM to document natural attenuation of COC's. Review of analytical data generated by the last 5 years of monitoring indicates that contaminant concentrations in perimeter wells exceed allowable limitations. As a result the protectiveness of the remedy is in question.

B. Adequacy of O&M

Describe issues and observations related to the implementation and scope of O&M procedures. In particular, discuss their relationship to the current and long-term protectiveness of the remedy.

~~The monitoring well network needs to be reevaluated for detection efficiency~~

C. Early Indicators of Potential Remedy Problems

Describe issues and observations such as unexpected changes in the cost or scope of O&M or a high frequency of unscheduled repairs, that suggest that the protectiveness of the remedy may be compromised in the future.

D. Opportunities for Optimization

Describe possible opportunities for optimization in monitoring tasks or the operation of the remedy.

The monitoring well network needs to be evaluated for deficiency. additional wells should be installed as necessary to recreate the protectiveness of the remedy.

Please note that "O&M" is referred to throughout this checklist. At sites where Long-Term Response Actions are in progress, O&M activities may be referred to as "system operations" since these sites are not considered to be in the O&M phase while being remediated under the Superfund program.

Five-Year Review Site Inspection Checklist (Template)

(Working document for site inspection. Information may be completed by hand and attached to the Five-Year Review report as supporting documentation of site status. "N/A" refers to "not applicable.")

OU 13 I. SITE INFORMATION	
Site name: OU 13, Site 8; 24 RR Disposal; DDT Mixing Area	Date of inspection: 11/14 - 11/15/07
Location and Region: NAS Pensacola	EPA ID:
Agency, office, or company leading the five-year review: Navy, Southe Division	Weather/temperature: 68° Clear

Remedy Includes: (Check all that apply)

- G Landfill cover/containment
- G Access controls
- ✓ Institutional controls
- G Groundwater pump and treatment
- G Surface water collection and treatment
- G Other _____
- ✓ Monitored natural attenuation
- G Groundwater containment
- G Vertical barrier walls

Attachments: G Inspection team roster attached G Site map attached

II. INTERVIEWS (Check all that apply)

1. **O&M site manager** _____ _____ _____
   Name Title Date
   Interviewed G at site G at office G by phone Phone no. _____
   Problems, suggestions; G Report attached _____

2. **O&M staff** _____ _____ _____
   Name Title Date
   Interviewed G at site G at office G by phone Phone no. _____
   Problems, suggestions; G Report attached _____

3. **Local regulatory authorities and response agencies** (i.e., State and Tribal offices, emergency response office, police department, office of public health or environmental health, zoning office, recorder of deeds, or other city and county offices, etc.) Fill in all that apply.

Agency _____
Contact _____ _____ _____ _____
Name Title Date Phone no.
Problems; suggestions; G Report attached _____
_____

Agency _____
Contact _____ _____ _____ _____
Name Title Date Phone no.
Problems; suggestions; G Report attached _____
_____

Agency _____
Contact _____ _____ _____ _____
Name Title Date Phone no.
Problems; suggestions; G Report attached _____
_____

Agency _____
Contact _____ _____ _____ _____
Name Title Date Phone no.
Problems; suggestions; G Report attached _____
_____

4. **Other interviews** (optional) G Report attached.

III. ON-SITE DOCUMENTS & RECORDS VERIFIED (Check all that apply)

1. **O&M Documents**

G O&M manual	G Readily available	G Up to date	● N/A
G As-built drawings	G Readily available	G Up to date	● N/A
G Maintenance logs	G Readily available	G Up to date	● N/A

Remarks

2. **Site-Specific Health and Safety Plan** ● Readily available ● Up to date G N/A
   G Contingency plan/emergency response plan ● Readily available G Up to date G N/A
   Remarks

3. **O&M and OSHA Training Records** ● Readily available ● Up to date G N/A
   Remarks

4. **Permits and Service Agreements**

G Air discharge permit	G Readily available	G Up to date	● N/A
G Effluent discharge	G Readily available	G Up to date	● N/A
G Waste disposal, POTW	G Readily available	G Up to date	● N/A
G Other permits	G Readily available	G Up to date	● N/A

Remarks

5. **Gas Generation Records** G Readily available G Up to date ● N/A
   Remarks

6. **Settlement Monument Records** G Readily available G Up to date ● N/A
   Remarks

7. **Groundwater Monitoring Records** G Readily available G Up to date G N/A
   Remarks NAM not implemented as of the date of the review

8. **Leachate Extraction Records** G Readily available G Up to date ● N/A
   Remarks

9. **Discharge Compliance Records**

G Air	G Readily available	G Up to date	● N/A
G Water (effluent)	G Readily available	G Up to date	● N/A

Remarks

10. **Daily Access/Security Logs** G Readily available G Up to date ● N/A
    Remarks

IV. O&M COSTS

1. **O&M Organization**

G State in-house
G PRP in-house
G Federal Facility in-house
G Other _____

G Contractor for State
G Contractor for PRP
● Contractor for Federal Facility

2. **O&M Cost Records**

G Readily available G Up to date
G Funding mechanism/agreement in place
Original O&M cost estimate _____ G Breakdown attached

Total annual cost by year for review period if available

From _____ To _____ _____ G Breakdown attached
Date Date Total cost

From _____ To _____ _____ G Breakdown attached
Date Date Total cost

From _____ To _____ _____ G Breakdown attached
Date Date Total cost

From _____ To _____ _____ G Breakdown attached
Date Date Total cost

From _____ To _____ _____ G Breakdown attached
Date Date Total cost

3. **Unanticipated or Unusually High O&M Costs During Review Period**

Describe costs and reasons: _____

V. ACCESS AND INSTITUTIONAL CONTROLS ● Applicable G N/A

A. Fencing

1. **Fencing damaged** G Location shown on site map G Gates secured G N/A

Remarks Fencing present but not warranted

B. Other Access Restrictions

1. **Signs and other security measures** G Location shown on site map G N/A

Remarks _____

C. Institutional Controls (ICs)

1. **Implementation and enforcement**

Site conditions imply ICs not properly implemented — G Yes ● No G N/A
Site conditions imply ICs not being fully enforced — G Yes ● No G N/A

Type of monitoring (*e.g.*, self-reporting, drive by) _____
Frequency _____
Responsible party/agency _____
Contact _____ _____ _____ _____
Name Title Date Phone no.

Reporting is up-to-date — G Yes G No G N/A
Reports are verified by the lead agency — G Yes G No G N/A

Specific requirements in deed or decision documents have been met — G Yes G No G N/A
Violations have been reported — G Yes G No G N/A
Other problems or suggestions: G Report attached

2. **Adequacy** ● ICs are adequate G ICs are inadequate G N/A
Remarks _____

D. General

1. **Vandalism/trespassing** G Location shown on site map ● No vandalism evident
Remarks _____

2. **Land use changes on site** G N/A
Remarks _____

3. **Land use changes off site** G N/A
Remarks _____

VI. GENERAL SITE CONDITIONS

A. Roads ● Applicable G N/A

1. **Roads damaged** G Location shown on site map ● Roads adequate G N/A
Remarks _____

B. Other Site Conditions

Remarks_____

VII. LANDFILL COVERS G Applicable ● N/A

A. Landfill Surface

1. **Settlement** (Low spots) G Location shown on site map G Settlement not evident
Areal extent_____ Depth_____
Remarks_____

2. **Cracks** G Location shown on site map G Cracking not evident
Lengths_____ Widths_____ Depths_____
Remarks_____

3. **Erosion** G Location shown on site map G Erosion not evident
Areal extent_____ Depth_____
Remarks_____

4. **Holes** G Location shown on site map G Holes not evident
Areal extent_____ Depth_____
Remarks_____

5. **Vegetative Cover** G Grass G Cover properly established G No signs of stress
G Trees/Shrubs (indicate size and locations on a diagram)
Remarks_____

6. **Alternative Cover (armored rock, concrete, etc.)** G N/A
Remarks_____

7. **Bulges** G Location shown on site map G Bulges not evident
Areal extent_____ Height_____
Remarks_____

8. **Wet Areas/Water Damage** G Wet areas/water damage not evident
G Wet areas G Location shown on site map Areal extent_____
G Ponding G Location shown on site map Areal extent_____
G Seeps G Location shown on site map Areal extent_____
G Soft subgrade G Location shown on site map Areal extent_____
Remarks_____

9. **Slope Instability** G Slides G Location shown on site map G No evidence of slope instability
Areal extent_____
Remarks_____

B. Benches G Applicable ● N/A
(Horizontally constructed mounds of earth placed across a steep landfill side slope to interrupt the slope in order to slow down the velocity of surface runoff and intercept and convey the runoff to a lined channel.)

1. **Flows Bypass Bench** G Location shown on site map G N/A or okay
Remarks_____

2. **Bench Breached** G Location shown on site map G N/A or okay
Remarks_____

3. **Bench Overtopped** G Location shown on site map G N/A or okay
Remarks_____

C. Letdown Channels G Applicable ● N/A
(Channel lined with erosion control mats, riprap, grout bags, or gabions that descend down the steep side slope of the cover and will allow the runoff water collected by the benches to move off of the landfill cover without creating erosion gullies.)

1. **Settlement** G Location shown on site map G No evidence of settlement
Areal extent_____ Depth_____
Remarks_____

2. **Material Degradation** G Location shown on site map G No evidence of degradation
Material type_____ Areal extent_____
Remarks_____

3. **Erosion** G Location shown on site map G No evidence of erosion
Areal extent_____ Depth_____
Remarks_____

4. **Undercutting** G Location shown on site map G No evidence of undercutting
Areal extent_____ Depth_____
Remarks_____

5. **Obstructions** Type_____ G No obstructions
G Location shown on site map Areal extent_____
Size_____
Remarks_____

6. **Excessive Vegetative Growth** Type_____
G No evidence of excessive growth
G Vegetation in channels does not obstruct flow
G Location shown on site map Areal extent_____
Remarks_____

D. Cover Penetrations G Applicable ✓ N/A

1. **Gas Vents** G Active G Passive
G Properly secured/locked G Functioning G Routinely sampled G Good condition
G Evidence of leakage at penetration G Needs Maintenance
G N/A
Remarks_____

2. **Gas Monitoring Probes**
G Properly secured/locked G Functioning G Routinely sampled G Good condition
G Evidence of leakage at penetration G Needs Maintenance G N/A
Remarks_____

3. **Monitoring Wells** (within surface area of landfill)
G Properly secured/locked G Functioning G Routinely sampled G Good condition
G Evidence of leakage at penetration G Needs Maintenance G N/A
Remarks_____

4. **Leachate Extraction Wells**
G Properly secured/locked G Functioning G Routinely sampled G Good condition
G Evidence of leakage at penetration G Needs Maintenance G N/A
Remarks_____

5. **Settlement Monuments** G Located G Routinely surveyed G N/A
Remarks_____

E. Gas Collection and Treatment G Applicable ● N/A

1. **Gas Treatment Facilities**
G Flaring G Thermal destruction G Collection for reuse
G Good condition G Needs Maintenance
Remarks_____

2. **Gas Collection Wells, Manifolds and Piping**
G Good condition G Needs Maintenance
Remarks_____

3. **Gas Monitoring Facilities** (*e.g.*, gas monitoring of adjacent homes or buildings)
G Good condition G Needs Maintenance G N/A
Remarks_____

F. Cover Drainage Layer G Applicable ● N/A

1. **Outlet Pipes Inspected** G Functioning G N/A
Remarks_____

2. **Outlet Rock Inspected** G Functioning G N/A
Remarks_____

G. Detention/Sedimentation Ponds G Applicable ● N/A

1. **Siltation** Areal extent_____ Depth_____ G N/A
G Siltation not evident
Remarks_____

2. **Erosion** Areal extent_____ Depth_____
G Erosion not evident
Remarks_____

3. **Outlet Works** G Functioning G N/A
Remarks_____

4. **Dam** G Functioning G N/A
Remarks_____

H. Retaining Walls G Applicable ● N/A

1. **Deformations** G Location shown on site map G Deformation not evident
Horizontal displacement_____ Vertical displacement_____
Rotational displacement_____
Remarks_____

2. **Degradation** G Location shown on site map G Degradation not evident
Remarks_____

I. Perimeter Ditches/Off-Site Discharge G Applicable ● N/A

1. **Siltation** G Location shown on site map G Siltation not evident
Areal extent_____ Depth_____
Remarks_____

2. **Vegetative Growth** G Location shown on site map G N/A
G Vegetation does not impede flow
Areal extent_____ Type_____
Remarks_____

3. **Erosion** G Location shown on site map G Erosion not evident
Areal extent_____ Depth_____
Remarks_____

4. **Discharge Structure** G Functioning G N/A
Remarks_____

VIII. VERTICAL BARRIER WALLS G Applicable ● N/A

1. **Settlement** G Location shown on site map G Settlement not evident
Areal extent_____ Depth_____
Remarks_____

2. **Performance Monitoring** Type of monitoring_____
G Performance not monitored
Frequency_____ G Evidence of breaching
Head differential_____
Remarks_____

IX. GROUNDWATER/SURFACE WATER REMEDIES ● Applicable G N/A

A. Groundwater Extraction Wells, Pumps, and Pipelines G Applicable ● N/A

1. **Pumps, Wellhead Plumbing, and Electrical**
   G Good condition G All required wells properly operating G Needs Maintenance G N/A
   Remarks_____

2. **Extraction System Pipelines, Valves, Valve Boxes, and Other Appurtenances**
   G Good condition G Needs Maintenance
   Remarks_____

3. **Spare Parts and Equipment**
   G Readily available G Good condition G Requires upgrade G Needs to be provided
   Remarks_____

B. Surface Water Collection Structures, Pumps, and Pipelines G Applicable ● N/A

1. **Collection Structures, Pumps, and Electrical**
   G Good condition G Needs Maintenance
   Remarks_____

2. **Surface Water Collection System Pipelines, Valves, Valve Boxes, and Other Appurtenances**
   G Good condition G Needs Maintenance
   Remarks_____

3. **Spare Parts and Equipment**
   G Readily available G Good condition G Requires upgrade G Needs to be provided
   Remarks_____

C. Treatment System G Applicable ● N/A

1. **Treatment Train** (Check components that apply)
   G Metals removal G Oil/water separation G Bioremediation
   G Air stripping G Carbon adsorbers
   G Filters _____
   G Additive (*e.g.*, chelation agent, flocculent) _____
   G Others _____
   G Good condition G Needs Maintenance
   G Sampling ports properly marked and functional
   G Sampling/maintenance log displayed and up to date
   G Equipment properly identified
   G Quantity of groundwater treated annually _____
   G Quantity of surface water treated annually _____
   Remarks _____

2. **Electrical Enclosures and Panels** (properly rated and functional)
   ● N/A G Good condition G Needs Maintenance
   Remarks _____

3. **Tanks, Vaults, Storage Vessels**
   ● N/A G Good condition G Proper secondary containment G Needs Maintenance
   Remarks _____

4. **Discharge Structure and Appurtenances**
   ● N/A G Good condition G Needs Maintenance
   Remarks _____

5. **Treatment Building(s)**
   ● N/A G Good condition (esp. roof and doorways) G Needs repair
   G Chemicals and equipment properly stored
   Remarks _____

6. **Monitoring Wells** (pump and treatment remedy)
   ● Properly secured/locked G Functioning G Routinely sampled G Good condition
   G All required wells located G Needs Maintenance G N/A
   Remarks _____

D. Monitoring Data – NAM not yet implemented.

1. Monitoring Data
   G Is routinely submitted on time G Is of acceptable quality

2. Monitoring data suggests:
   G Groundwater plume is effectively contained G Contaminant concentrations are declining

D. Monitored Natural Attenuation

1. **Monitoring Wells** (natural attenuation remedy)
   ● Properly secured/locked G Functioning G Routinely sampled ● Good condition
   ● All required wells located G Needs Maintenance G N/A
   Remarks NAM not yet implemented

X. OTHER REMEDIES

If there are remedies applied at the site which are not covered above, attach an inspection sheet describing the physical nature and condition of any facility associated with the remedy. An example would be soil vapor extraction.

XI. OVERALL OBSERVATIONS

A. Implementation of the Remedy

Describe issues and observations relating to whether the remedy is effective and functioning as designed. Begin with a brief statement of what the remedy is to accomplish (i.e., to contain contaminant plume, minimize infiltration and gas emission, etc.).

Remedy for OU 13 consists of NFA for soils and LUC w/ NAM for groundwater.

The LUC have been approved and the GWMP is under review. NAM groundwater monitoring has not yet been initiated

B. Adequacy of O&M

Describe issues and observations related to the implementation and scope of O&M procedures. In particular, discuss their relationship to the current and long-term protectiveness of the remedy.

C.	Early Indicators of Potential Remedy Problems
	Describe issues and observations such as unexpected changes in the cost or scope of O&M or a high frequency of unscheduled repairs, that suggest that the protectiveness of the remedy may be compromised in the future. NO Remedy failure indicators noted.
D.	Opportunities for Optimization
	Describe possible opportunities for optimization in monitoring tasks or the operation of the remedy.

Please note that "O&M" is referred to throughout this checklist. At sites where Long-Term Response Actions are in progress, O&M activities may be referred to as "system operations" since these sites are not considered to be in the O&M phase while being remediated under the Superfund program.

Five-Year Review Site Inspection Checklist (Template)

(Working document for site inspection. Information may be completed by hand and attached to the Five-Year Review report as supporting documentation of site status. "N/A" refers to "not applicable.")

I. SITE INFORMATION	
Site name: OU11, SITE 38 HAZARDOUS MAT. STORAGE	**Date of inspection:** 11/14 - 11/15/07
Location and Region: NAS Pensacola	**EPA ID:**
Agency, office, or company leading the five-year review: Navy, Southern Division	**Weather/temperature:** 68° Clear

Remedy Includes: (Check all that apply)

- G Landfill cover/containment
- G Access controls
- ✓ Institutional controls
- G Groundwater pump and treatment
- G Surface water collection and treatment
- G Other _____
- ✓ Monitored natural attenuation
- G Groundwater containment
- G Vertical barrier walls

Attachments: G Inspection team roster attached G Site map attached

II. INTERVIEWS (Check all that apply)

1. **O&M site manager** _____ _____ _____
   Name Title Date
   Interviewed G at site G at office G by phone Phone no. _____
   Problems, suggestions; G Report attached _____

2. **O&M staff** _____ _____ _____
   Name Title Date
   Interviewed G at site G at office G by phone Phone no. _____
   Problems, suggestions; G Report attached _____

3. **Local regulatory authorities and response agencies** (i.e., State and Tribal offices, emergency response office, police department, office of public health or environmental health, zoning office, recorder of deeds, or other city and county offices, etc.) Fill in all that apply.

Agency _____
Contact _____ _____ _____ _____
Name Title Date Phone no.
Problems; suggestions; G Report attached _____
_____

Agency _____
Contact _____ _____ _____ _____
Name Title Date Phone no.
Problems; suggestions; G Report attached _____
_____

Agency _____
Contact _____ _____ _____ _____
Name Title Date Phone no.
Problems; suggestions; G Report attached _____
_____

Agency _____
Contact _____ _____ _____ _____
Name Title Date Phone no.
Problems; suggestions; G Report attached _____
_____

4. **Other interviews** (optional) G Report attached.

III. ON-SITE DOCUMENTS & RECORDS VERIFIED (Check all that apply)

1. **O&M Documents**

G O&M manual	G Readily available	G Up to date	● N/A
G As-built drawings	G Readily available	G Up to date	● N/A
G Maintenance logs	G Readily available	G Up to date	● N/A

Remarks

2. **Site-Specific Health and Safety Plan** ● Readily available ● Up to date G N/A

G Contingency plan/emergency response plan G Readily available G Up to date G N/A

Remarks

3. **O&M and OSHA Training Records** ● Readily available ● Up to date G N/A

Remarks

4. **Permits and Service Agreements**

G Air discharge permit	G Readily available	G Up to date	● N/A
G Effluent discharge	G Readily available	G Up to date	● N/A
G Waste disposal, POTW	G Readily available	G Up to date	● N/A
G Other permits	G Readily available	G Up to date	● N/A

Remarks

5. **Gas Generation Records** G Readily available G Up to date ● N/A

Remarks

6. **Settlement Monument Records** G Readily available G Up to date ● N/A

Remarks

7. **Groundwater Monitoring Records** ● Readily available ● Up to date G N/A

Remarks

8. **Leachate Extraction Records** G Readily available G Up to date ● N/A

Remarks

9. **Discharge Compliance Records**

G Air	G Readily available	G Up to date	● N/A
G Water (effluent)	G Readily available	G Up to date	● N/A

Remarks

10. **Daily Access/Security Logs** G Readily available G Up to date ● N/A

Remarks

IV. O&M COSTS

1. **O&M Organization**

G State in-house
G PRP in-house
G Federal Facility in-house
G Other_____

G Contractor for State
G Contractor for PRP
● Contractor for Federal Facility

2. **O&M Cost Records**

G Readily available G Up to date
G Funding mechanism/agreement in place
Original O&M cost estimate_____ G Breakdown attached

Total annual cost by year for review period if available

From_____ Date	To_____ Date	_____ Total cost	G Breakdown attached
From_____ Date	To_____ Date	_____ Total cost	G Breakdown attached
From_____ Date	To_____ Date	_____ Total cost	G Breakdown attached
From_____ Date	To_____ Date	_____ Total cost	G Breakdown attached
From_____ Date	To_____ Date	_____ Total cost	G Breakdown attached

3. **Unanticipated or Unusually High O&M Costs During Review Period**

Describe costs and reasons: _____

V. ACCESS AND INSTITUTIONAL CONTROLS ● Applicable G N/A

A. Fencing

1. **Fencing damaged** G Location shown on site map G Gates secured G N/A

Remarks NO Fencing at on 11

B. Other Access Restrictions

1. **Signs and other security measures** G Location shown on site map G N/A

Remarks NO signage noted

C. Institutional Controls (ICs)

1. **Implementation and enforcement**

Site conditions imply ICs not properly implemented — G Yes ● No G N/A
Site conditions imply ICs not being fully enforced — G Yes ● No G N/A

Type of monitoring (*e.g.*, self-reporting, drive by) _____
Frequency _____
Responsible party/agency _____
Contact _____ _____ _____ _____
Name Title Date Phone no.

Reporting is up-to-date — G Yes ● No G N/A
Reports are verified by the lead agency — G Yes ● No G N/A

Specific requirements in deed or decision documents have been met — ● Yes G No G N/A
Violations have been reported — G Yes ● No G N/A
Other problems or suggestions: G Report attached
No lab confirmation data exist to validate successful removal of impacted soil above RG's. Direct exposure component not eliminated

2. **Adequacy** G ICs are adequate ● ICs are inadequate G N/A
Remarks IC's will remain inadequate until lab confirmation verifies that the direct exposure component has been removed.

D. General

1. **Vandalism/trespassing** G Location shown on site map ● No vandalism evident
Remarks _____

2. **Land use changes on site** ● N/A
Remarks _____

3. **Land use changes off site** ● N/A
Remarks _____

VI. GENERAL SITE CONDITIONS

A. Roads ● Applicable G N/A

1. **Roads damaged** G Location shown on site map ● Roads adequate G N/A
Remarks _____

B. Other Site Conditions

Remarks_____

VII. LANDFILL COVERS G Applicable ✓ N/A

A. Landfill Surface

1. **Settlement** (Low spots) G Location shown on site map G Settlement not evident
Areal extent_____ Depth_____
Remarks_____

2. **Cracks** G Location shown on site map G Cracking not evident
Lengths_____ Widths_____ Depths_____
Remarks_____

3. **Erosion** G Location shown on site map G Erosion not evident
Areal extent_____ Depth_____
Remarks_____

4. **Holes** G Location shown on site map G Holes not evident
Areal extent_____ Depth_____
Remarks_____

5. **Vegetative Cover** G Grass G Cover properly established G No signs of stress
G Trees/Shrubs (indicate size and locations on a diagram)
Remarks_____

6. **Alternative Cover (armored rock, concrete, etc.)** G N/A
Remarks_____

7. **Bulges** G Location shown on site map G Bulges not evident
Areal extent_____ Height_____
Remarks_____

8. **Wet Areas/Water Damage** G Wet areas/water damage not evident
G Wet areas G Location shown on site map Areal extent_____
G Ponding G Location shown on site map Areal extent_____
G Seeps G Location shown on site map Areal extent_____
G Soft subgrade G Location shown on site map Areal extent_____
Remarks_____

9. **Slope Instability** G Slides G Location shown on site map G No evidence of slope instability
Areal extent_____
Remarks_____

B. Benches G Applicable ● N/A
(Horizontally constructed mounds of earth placed across a steep landfill side slope to interrupt the slope in order to slow down the velocity of surface runoff and intercept and convey the runoff to a lined channel.)

1. **Flows Bypass Bench** G Location shown on site map G N/A or okay
Remarks_____

2. **Bench Breached** G Location shown on site map G N/A or okay
Remarks_____

3. **Bench Overtopped** G Location shown on site map G N/A or okay
Remarks_____

C. Letdown Channels G Applicable ● N/A
(Channel lined with erosion control mats, riprap, grout bags, or gabions that descend down the steep side slope of the cover and will allow the runoff water collected by the benches to move off of the landfill cover without creating erosion gullies.)

1. **Settlement** G Location shown on site map G No evidence of settlement
Areal extent_____ Depth_____
Remarks_____

2. **Material Degradation** G Location shown on site map G No evidence of degradation
Material type_____ Areal extent_____
Remarks_____

3. **Erosion** G Location shown on site map G No evidence of erosion
Areal extent_____ Depth_____
Remarks_____

4. **Undercutting** G Location shown on site map G No evidence of undercutting
Areal extent_____ Depth_____
Remarks_____

5. **Obstructions** Type_____ G No obstructions
G Location shown on site map Areal extent_____
Size_____
Remarks_____

6. **Excessive Vegetative Growth** Type_____
G No evidence of excessive growth
G Vegetation in channels does not obstruct flow
G Location shown on site map Areal extent_____
Remarks_____

D. Cover Penetrations G Applicable ● N/A

1. **Gas Vents** G Active G Passive
G Properly secured/locked G Functioning G Routinely sampled G Good condition
G Evidence of leakage at penetration G Needs Maintenance
G N/A
Remarks_____

2. **Gas Monitoring Probes**
G Properly secured/locked G Functioning G Routinely sampled G Good condition
G Evidence of leakage at penetration G Needs Maintenance G N/A
Remarks_____

3. **Monitoring Wells** (within surface area of landfill)
G Properly secured/locked G Functioning G Routinely sampled G Good condition
G Evidence of leakage at penetration G Needs Maintenance G N/A
Remarks_____

4. **Leachate Extraction Wells**
G Properly secured/locked G Functioning G Routinely sampled G Good condition
G Evidence of leakage at penetration G Needs Maintenance G N/A
Remarks_____

5. **Settlement Monuments** G Located G Routinely surveyed G N/A
Remarks_____

E. Gas Collection and Treatment G Applicable ✓ N/A

1. **Gas Treatment Facilities**
   G Flaring G Thermal destruction G Collection for reuse
   G Good condition G Needs Maintenance
   Remarks_____

2. **Gas Collection Wells, Manifolds and Piping**
   G Good condition G Needs Maintenance
   Remarks_____

3. **Gas Monitoring Facilities** (*e.g.*, gas monitoring of adjacent homes or buildings)
   G Good condition G Needs Maintenance G N/A
   Remarks_____

F. Cover Drainage Layer G Applicable ✓ N/A

1. **Outlet Pipes Inspected** G Functioning G N/A
   Remarks_____

2. **Outlet Rock Inspected** G Functioning G N/A
   Remarks_____

G. Detention/Sedimentation Ponds G Applicable ✓ N/A

1. **Siltation** Areal extent_____ Depth_____ G N/A
   G Siltation not evident
   Remarks_____

2. **Erosion** Areal extent_____ Depth_____
   G Erosion not evident
   Remarks_____

3. **Outlet Works** G Functioning G N/A
   Remarks_____

4. **Dam** G Functioning G N/A
   Remarks_____

H. Retaining Walls G Applicable ☒ N/A

1. **Deformations** G Location shown on site map G Deformation not evident
   Horizontal displacement_____ Vertical displacement_____
   Rotational displacement_____
   Remarks_____

2. **Degradation** G Location shown on site map G Degradation not evident
   Remarks_____

I. Perimeter Ditches/Off-Site Discharge G Applicable ☒ N/A

1. **Siltation** G Location shown on site map G Siltation not evident
   Areal extent_____ Depth_____
   Remarks_____

2. **Vegetative Growth** G Location shown on site map G N/A
   G Vegetation does not impede flow
   Areal extent_____ Type_____
   Remarks_____

3. **Erosion** G Location shown on site map G Erosion not evident
   Areal extent_____ Depth_____
   Remarks_____

4. **Discharge Structure** G Functioning G N/A
   Remarks_____

VIII. VERTICAL BARRIER WALLS G Applicable ☒ N/A

1. **Settlement** G Location shown on site map G Settlement not evident
   Areal extent_____ Depth_____
   Remarks_____

2. **Performance Monitoring** Type of monitoring_____
   G Performance not monitored
   Frequency_____ G Evidence of breaching
   Head differential_____
   Remarks_____

IX. GROUNDWATER/SURFACE WATER REMEDIES ● Applicable G N/A

A. Groundwater Extraction Wells, Pumps, and Pipelines G Applicable ● N/A

1. **Pumps, Wellhead Plumbing, and Electrical**
   G Good condition G All required wells properly operating G Needs Maintenance G N/A
   Remarks_____

2. **Extraction System Pipelines, Valves, Valve Boxes, and Other Appurtenances**
   G Good condition G Needs Maintenance
   Remarks_____

3. **Spare Parts and Equipment**
   G Readily available G Good condition G Requires upgrade G Needs to be provided
   Remarks_____

B. Surface Water Collection Structures, Pumps, and Pipelines G Applicable ● N/A

1. **Collection Structures, Pumps, and Electrical**
   G Good condition G Needs Maintenance
   Remarks_____

2. **Surface Water Collection System Pipelines, Valves, Valve Boxes, and Other Appurtenances**
   G Good condition G Needs Maintenance
   Remarks_____

3. **Spare Parts and Equipment**
   G Readily available G Good condition G Requires upgrade G Needs to be provided
   Remarks_____

C. Treatment System G Applicable ● N/A

1. **Treatment Train** (Check components that apply)
   G Metals removal G Oil/water separation G Bioremediation
   G Air stripping G Carbon adsorbers
   G Filters_____
   G Additive (*e.g.*, chelation agent, flocculent)_____
   G Others_____
   G Good condition G Needs Maintenance
   G Sampling ports properly marked and functional
   G Sampling/maintenance log displayed and up to date
   G Equipment properly identified
   G Quantity of groundwater treated annually_____
   G Quantity of surface water treated annually_____
   Remarks_____

2. **Electrical Enclosures and Panels** (properly rated and functional)
   G N/A G Good condition G Needs Maintenance
   Remarks_____

3. **Tanks, Vaults, Storage Vessels**
   G N/A G Good condition G Proper secondary containment G Needs Maintenance
   Remarks_____

4. **Discharge Structure and Appurtenances**
   G N/A G Good condition G Needs Maintenance
   Remarks_____

5. **Treatment Building(s)**
   G N/A G Good condition (esp. roof and doorways) G Needs repair
   G Chemicals and equipment properly stored
   Remarks_____

6. **Monitoring Wells** (pump and treatment remedy)
   G Properly secured/locked G Functioning G Routinely sampled G Good condition
   G All required wells located G Needs Maintenance G N/A
   Remarks_____

D. Monitoring Data – NO monitoring data generated to date

1. Monitoring Data
   G Is routinely submitted on time G Is of acceptable quality

2. Monitoring data suggests:
   G Groundwater plume is effectively contained G Contaminant concentrations are declining

D. Monitored Natural Attenuation

1. **Monitoring Wells** (natural attenuation remedy)
   ✓ Properly secured/locked G Functioning G Routinely sampled ✓ Good condition
   ✓ All required wells located G Needs Maintenance G N/A
   Remarks NAM NOT INIATED AS of this Review date.

X. OTHER REMEDIES

If there are remedies applied at the site which are not covered above, attach an inspection sheet describing the physical nature and condition of any facility associated with the remedy. An example would be soil vapor extraction.

XI. OVERALL OBSERVATIONS

A. Implementation of the Remedy

Describe issues and observations relating to whether the remedy is effective and functioning as designed. Begin with a brief statement of what the remedy is to accomplish (i.e., to contain contaminant plume, minimize infiltration and gas emission, etc.).

The remedy for OU 11 consisted of source removal of "hot spot" soils and NAM of groundwater quality. This remedy was selected to eliminate the direct exposure component and to contain the groundwater contaminant plume. No documentation exists that verifies the removal of "hot spot" soils. NAM has not been initiated as of the date of this review, and the LUC RD has not been completed.

B. Adequacy of O&M

Describe issues and observations related to the implementation and scope of O&M procedures. In particular, discuss their relationship to the current and long-term protectiveness of the remedy.

C. Early Indicators of Potential Remedy Problems

Describe issues and observations such as unexpected changes in the cost or scope of O&M or a high frequency of unscheduled repairs, that suggest that the protectiveness of the remedy may be compromised in the future.

① No lab data exists that verifies the soils above RG's were removed.

② The NAM has not been initiated

③ The LUCRD has not been completed.

D. Opportunities for Optimization

Describe possible opportunities for optimization in monitoring tasks or the operation of the remedy.

① Conduct confirmatory soil sampling/analysis to document/verify the direct exposure component has been addressed.

② Complete the GWM and initiate the NAM

③ Complete the LUCRD.

APPENDIX C

TREND ANALYSIS FOR CONTAMINANTES OF CONCERN IN OU1 GROUNDWATER

Trend Analysis for the Contaminant of Concerns of Groundwater at Operable Unit 1 NAS Pensacola, Pensacola, Florida

1. Data Preparation

The trend analysis for the contaminant of concerns (COCs) of groundwater at NAS Pensacola was performed using the Mann-Kendall test. The Mann-Kendall test is used because it does not assume any particular distributional form and accommodates values below the detection limit by assigning them a common value.

The Mann-Kendall test was performed using the groundwater monitoring data from 1993 – 2005, and focused on the COCs identified in the long-term monitoring plan at the site (TtNUS, 2003). The COCs and the corresponding Florida Groundwater Cleanup Target Level (GCTL) are summarized in Table 1. The Florida GCTL is used to evaluate the remedy performance at NAS Pensacola.

Because of the long history of groundwater monitoring, the analytical data were provided by several different labs. Several Method Detection Limits (MDLs) were thus reported. In order to avoid artifacts that may be introduced in the analysis due to the inconsistency of MDLs, all of the nondetects (data with qualifier "U") were assigned ½ of the lowest MDLs. The lowest MDLs for each COC are summarized in Table 2. The reported values with a qualifier "J" were treated as valid measurements for statistical purposes (EPA, 1992).

Table 1 Performance Standards for Groundwater at NAS Pensacola OU1

Contaminant of Concern	**Florida Groundwater Cleanup Target Level (µg/l)**
Benzene	1
Total Xylenes	20
Vinyl Chloride	1
Aluminum	200
Cadmium	5
Iron	300
Manganese	50

Table 2 The Lowest MDLs for the Analysis

COC	The Lowest MDL	Unit
Benzene	0.0057	µg/l
Total Xylenes	0.02	µg/l
Vinyl Chloride	0.007	µg/l
Aluminum	2.73	µg/l
Cadmium	0.00028	µg/l
Iron	0.001	µg/l
Manganese	0.0009	µg/l

2. Procedure of the Mann-Kendall Test

The Mann-Kendall test involves computing a statistic S, which is the difference between the number of pairwise differences that are positive minus the number that are negative. If S is a

large positive value, then there is evidence of an increasing trend in the data. If S is a large negative value, then there is evidence of a decreasing trend in the data. The null hypothesis or baseline condition for this test is that there is no temporal trend in the data values. The alternative hypothesis is that of either an upward trend or a downward trend.

The Mann-Kendall test followed the procedure below (EPA, 2006)

- For sample sizes less than 10:

STEP 1. Null Hypothesis: H0: There is no trend.
STEP 2. Null Hypothesis: i) HA: There is a downward trend.
ii) HA: There is an upward trend.
STEP 3. Test Statistic: S = Total #(plusses) – Total #(minuses)
STEP 4. a) Critical Value: Find the critical value using a provided table (Table A-12a, EPA, 2006)
STEP 4. b) p-value: Find the p-value using a provided table (Table A-12b, EPA, 2006).
STEP 5. a) Conclusion: If |S| ≥ the critical value, then reject the null hypothesis of no trend.
STEP 5. b) Conclusion: If p-value < α, then reject the null hypothesis of no trend.

- For sample sizes no less than 10 (using normal approximation):

STEP 1. Null Hypothesis: H0: There is no trend.
STEP 2. Null Hypothesis: i) HA: There is a downward trend.
ii) HA: There is an upward trend.
STEP 3. Test Statistic:

$$z_g = \frac{S - sign(S)}{\sqrt{V(S)}}, where \quad V(S) = \frac{1}{18}[n(n-1)(2n+5) - \sum_{j=1}^{g} t_j(t_j - 1)(2t_j + 5)]$$

where g is the number of tied groups, and tj is the number of points in the jth group, $sign(S)$ = 1 if S > 0, 0 if S = 0 and –1 if S < 0.
STEP 4. a) Critical Value: Find $z_{1-\alpha}$ using a provided table (Table A-1, EPA, 2006)
STEP 4. b) p-value: Find $P(Z>|z_0|)$ using a provided table (Table A-1, EPA, 2006) .
STEP 5. a) Conclusion: If $z_0 > z_{1-\alpha}$, then reject the null hypothesis of no trend.
STEP 5. b) Conclusion: If p-value < α, then reject the null hypothesis of no trend.

The Mann-Kendall test result for the time series data for a particular COC at a specific well is either “Significant Downward Trend”, “Significant Upward Trend”, or “No Trend”. The “No Trend” situation is further evaluated to identify whether or not the concentration measurements are stable in time.

The measure of data dispersion, the coefficient of variation (CV) is used for this identification. The CV is defined as the sample standard deviation divided by the sample mean. This measure of dispersion is often used in environmental applications because environmental variables often have variability (when expressed as a standard deviation) proportional to the mean, while this unitless measure allows the comparison of dispersion across several sets of data because it normalizes the standard deviation by the mean. For the “No Trend” cases identified in the Mann-Kendall test, if the CV of the time series data is less than 1, the trend analysis result is marked as “Stable”.

For some monitoring wells, a significant number of NDs were reported for recent sampling events, while few high concentrations used to be detected historically. It was found that this type of feature of time series data may lead to a CV value larger than 1; however, this phenomenon is caused by the artifact contributed by the large amount of extreme values (NDs). To correct this artifact, a “No Trend” result is also marked as “Stable” if all of the measurements are below Florida GCTLs for the most recent 3 years. The GCTLs are used instead of detection limits because multiple MDLs were reported, and the GCTLs are stringent (low values) and are used as performance standards at the site.

3. Results

The trend analysis results are provided for three confidence levels: 80%, 90%, and 95%. The summary tables for all COCs, and the detailed result tables for individual COC are attached with this document. After a thorough evaluation of the results at all confidence levels, the 95% confidence levels are deemed the most representative. The reason for this is that most of the monitoring data for a given well and for a given COC are not characterized by large variations over time – in many of these cases using an 80% confidence level may statistically determine that a trend is present, but the coefficient of variation is less than 1, indicating stability. The 95% confidence level is less sensitive to identifying a significant trend, and can still take into account the stability of the coefficient of variation. For all of the COCs, most monitoring wells are stable or a statistically significant downward trend is identified, especially for benzene and vinyl chloride. Statistically significant upward trend is identified at a limited number of monitoring wells, particularly for iron and manganese. Detailed information is provided in the attached tables.

References

Tetra Tech NUS, Inc. (TtNUS) (2003), 3rd Annual Monitoring Report for Long-Term Monitoring for Operable Unit 1, Naval Air Station, Pensacola, Florida, April.

U.S. EPA (2006), Data Quality Assessment: Statistical Methods for Practitioners, EPA QA/G-9S, EPA/240/B-06/003, Office of Environmental Information, United States Environmental Protection Agency, Washington, DC 20460

U.S. EPA (1992), Statistical Analysis of Ground-Water Monitoring Data at RCRA Facilities, Addendum to Interim Final Guidance, Office of Solid Waste, United States Environmental Protection Agency, Washington, DC 20460