N60200.AR.009488
NAS CECIL FIELD
5090.3a

INITIAL ASSESSMENT STUDY NAS CECIL FIELD FL
7/1/1985
ENVIRODYNE ENGINEERS, INC.

NAS CECIL FIELD

32215.000
01.02.00.0002

132

JULY, 1985
INITIAL ASSESSMENT STUDY OF NAVAL AIR STATION CECIL FIELD, JACKSONVILLE, FLORIDA

NEESA 13-073

NAVAL ENERGY AND ENVIRONMENTAL SUPPORT ACTIVITY

Port Hueneme, California 93043

Release of this Document requires prior notification of the Chief Official of the Studied Activity.

INITIAL ASSESSMENT STUDY
NAVAL AIR STATION, CECIL FIELD
CECIL FIELD, FLORIDA

UIC: N60200

Prepared by:

Envirodyne Engineers, Inc.
12161 Lackland Road
St. Louis, Missouri 63146

Contract No. N62474-84-3128

Initial Assessment Study Team Members

Envirodyne Engineers:

Stan Muterspaugh, Project Manager
Daniel Logan, Environmental Engineer
Cindy Dahl, Environmental Engineer

Edward E. Clark Engineers-Scientists:

Kevin Smolenyak, Hydrologist
Steve Carney, Biologist

Naval Energy and Environmental Support Activity

Project Manager

Kent D. Adams

Prepared for:

NAVY ASSESSMENT AND CONTROL
OF INSTALLATION POLLUTANTS DEPARTMENT
Naval Energy and Environmental Support Activity
Port Hueneme, California 93043

July 1985

Distribution:
CNO (OP-45)
CINCLANTFLT (Code N923)
COMNAVAIRLANT (Code 61)
COMNAVFACENGCOM (FAC-112)
CO SOUTHNAVFACENGCOM (Code 114)
CO NAS Cecil Field (Code 18E)

AU724

EXECUTIVE SUMMARY

This report presents the results of an Initial Assessment Study (IAS) conducted at the Naval Air Station (NAS), Cecil Field, Florida. The purpose of an IAS is to identify and assess sites posing a potential threat to human health or the environment due to contamination from past hazardous substance disposal operations.

Based on historical data, aerial photographs, field inspections and personnel interviews, 18 potentially contaminated sites were identified at NAS Cecil Field. Each of the sites was evaluated with regard to contamination characteristics, migration pathways and pollutant receptors.

The major pathways for migration from potentially contaminated sites at NAS Cecil Field include erosion, surface runoff and ground water movement through the surficial aquifer to receiving waters of Rowell Creek, Sal Taylor Creek and Lake Fretwell. Aquatic organisms in these receiving waters and the animals which rely on these areas for feeding and water are potential receptors. These receiving waters are classified by the Florida Department of Environmental Regulations as Class III Water-Recreation, Propogation and Management of Fish and Wildlife. Base Personnel also fish lake Fretwell and are potential receptors.

The study concludes that ten of the sites warrant futher investigation under the Naval Assessment and Control of Installation Pollutants (NACIP) Program, to assess potential long-term impacts. A confirmation study, including actual sampling and monitoring of the sites, is recommended to confirm or deny the existence of the suspected contamination and to quantify the extent of any problems which may exist. The ten sites recommended for confirmation are listed below in order of priority.

1) Site 2, Recent Landfill
2) Site 8, Boresite Range Hazardous Waste/Fire Fighting Training Area
3) Site 16, AIMD Seepage Pit
4) Site 4, Grease Pits
5) Site 1, Old Landfill
6) Site 3, Oil/Sludge Disposal Pit
7) Site 17, Oil/Sludge Disposal Pit Southwest
8) Site 7, Old Fire Fighting Training Area
9) Site 5, Oil Disposal Area Northwest
10) Site 11, Golf Course Pesticide Disposal Area

Confirmation studies at these sites will determine whether a threat to human health or the environment exists, the extent of contamination, and the potential for contaminant migration.

In addition to recommending confirmation studies, mitigating action is recommended at the following site:

Site 18, Ammunition Disposal Area

NEPSS

Naval
Environmental
Protection
Support
Service

FOREWORD

The Department of the Navy developed the Navy Assessment and Control of Installation Pollutants (NACIP) Program to identify and control environmental contamination from past use and disposal of hazardous substances at Navy and Marine Corps installations. The NACIP Program is part of the Department of Defense Installation Restoration Program, and is similar to the Environmental Protection Agency's "Superfund" Program authorized by the Comprehensive Environmental Response, Compensation and Liability Act of 1980.

In the first phase of the NACIP Program, a team of engineers and scientists conducts an Initial Assessment Study (IAS). The IAS team collects and evaluates evidence of contamination that may pose a potential threat to human health or the environment. The IAS includes a review of archival and activity records, interviews with activity personnel, and an on-site survey of the activity. This report documents the findings of an IAS at the Naval Air Station (NAS), Cecil Field, Florida.

A Confirmation Study, Phase II of the NACIP Program, is recommended for ten sites identified during the IAS. Southern Division of the Naval Facilities Engineering Command (SOUTHNAVFACENGCOM) will assist NAS Cecil Field in implementing the recommendations.

Questions regarding this report should be referred to the Naval Energy and Environmental Support Activity, Code 112N at AUTOVON 360-3351, FTS 799-3351, or commercial 805-982-3351. Questions concerning confirmation work or other follow-on efforts should be referred to SOUTHNAVFACENGCOM, 114, at AUTOVON 794-5510, FTS 679-5510, or commercial 803-743-5510.

W. L. Nelson

W. L. Nelson, LCDR, CEC, USN
Environmental Officer
Naval Energy and Environmental Support Activity

ACKNOWLEDGEMENTS

The Initial Assessment Study team expresses its thanks for the support, assistance and cooperation provided by personnel at Southern Division, Naval Facilities Engineering Command (SOUTHNAVFACENGCOM); Naval Energy and Environmental Support Activity (NEESA); and Naval Air Station (NAS), Cecil Field, Florida. Without their support, the Initial Assessment Study at NAS Cecil Field could not have been successfully completed. In particular, the team acknowledges the effort provided by the following people:

Ed Balducci, Environmental Engineer, NAS Cecil Field

James Malone, Southern Division, Naval Facilities Engineering Command

CONTENTS

		Page
Chapter 1.	Introduction	1-1
1.1	Program Background	1-1
1.1.1	Department of Defense Program	1-1
1.1.2	Navy Program	1-1
1.2	Authority	1-1
1.3	Scope	1-1
1.3.1	Past Operations	1-1
1.3.2	Results	1-1
1.4	Initial Assessment Study	1-2
1.4.1	Records Search	1-2
1.4.2	On-Site Survey	1-2
1.4.3	Confirmation Study Ranking System	1-2
1.4.4	Site Ranking	1-2
1.4.5	Confirmation Study Criteria	1-2
1.5	Confirmation Study	1-2
1.6	IAS Report Contents	1-3
Chapter 2.	Significant Findings and Conclusions	2-1
2.1	Introduction	2-1
2.2	Potential for Contaminant Migration	2-1
2.3	Potential Contaminant Receptors	2-2
2.4	Sites Recommended for Confirmation Study	2-2
2.4.1	Site 1, Old Landfill	2-2
2.4.2	Site 2, Recent Landfill	2-5
2.4.3	Site 3, Oil/Sludge Disposal Pit	2-6
2.4.4	Site 4, Grease Pits	2-6
2.4.5	Site 5, Oil Disposal Area Northwest	2-7
2.4.6	Site 7, Old Fire Fighting Training Area	2-7
2.4.7	Site 8, Boresite Range Hazardous Waste Storage/ Fire Fighting Training Area	2-8
2.4.8	Site 11, Golf Course Pesticide Disposal Area	2-8
2.4.9	Site 16, AIMD Seepage Pit	2-9
2.4.10	Site 17, Oil/Sludge Disposal Pit Southwest	2-10
2.5	Sites Not Recommended for Confirmation Study	2-10
2.5.1	Site 6, Lake Fretwell Rubble Disposal Area	2-10
2.5.2	Site 9, Recent Grease Pits	2-11
2.5.3	Site 10, Rubble Disposal Area	2-11
2.5.4	Site 12, Public Works Rubble Disposal Area	2-11
2.5.5	Site 13, Day Tank Fuel Spill	2-11
2.5.6	Site 14, Blue 5 Ordnance Disposal Area	2-11
2.5.7	Site 15, Blue 10 Ordnance Disposal Area	2-12
2.5.8	Site 18, Ammunition Disposal Area	2-13
Chapter 3.	Recommendations	3-1
3.1	Introduction	3-1
3.2	Confirmation Study Recommendations	3-1
3.2.1	Site 1, Old Landfill; Site 2, Recent Landfill	3-1
3.2.2	Site 3, Oil/Sludge Disposal Pit; Site 4 Grease Pits	3-4
3.2.3	Site 5, Oil Disposal Area Northwest	3-4

CONTENTS (CONTD.)

			Page
	3.2.4	Site 7, Old Fire Fighting Training Area	3-6
	3.2.5	Site 8, Boresight Range Hazardous Waste Storage/ Fire Fighting Training Area	3-6
	3.2.6	Site 11, Golf Course Pesticide Disposal Area	3-8
	3.2.7	Site 16, AIMD Seepage Pit	3-11
	3.2.8	Site 17, Oil/Sludge Disposal Pit Southwest	3-11
	3.2.9	General Confirmation Study Recommendations	3-13
	3.3	Other Recommendations	3-13
	3.3.1	Site 18, Ammunition Disposal Area	3-13
Chapter 4.		Background	4-1
	4.1	General	4-1
	4.1.1	Location	4-1
	4.1.2	Tenant/Host Relationships	4-1
	4.1.3	Adjacent Land Use	4-7
	4.2	History	4-8
	4.3	Legal Action	4-9
	4.4	Biological Features	4-9
	4.4.1	Ecosystems	4-9
	4.4.2	Endangered, Threatened and Rare Species	4-11
	4.5	Physical Features	4-19
	4.5.1	Climatology	4-19
	4.5.2	Topography	4-20
	4.5.3	Geology	4-23
	4.5.4	Soils	4-25
	4.5.5	Hydrology	4-38
	4.6	Migration Potential	4-49
Chapter 5.		Waste Generation	5-1
	5.1	General	5-1
	5.2	Industrial Operations	5-1
	5.2.1	Aircraft Intermediate Maintenance Department	5-1
	5.2.2	Air Operations Department	5-6
	5.2.3	Squadron Level Maintenance Operations	5-6
	5.2.4	Public Works Department	5-8
	5.2.5	Fleet Aviation Specialized Operational Group, Atlantic Fleet Detachment	5-13
	5.2.6	Photo Laboratory	5-13
	5.2.7	Naval Regional Medical Center Branch Clinic, Cecil	5-13
	5.2.8	Cecil Field Branch Dental Clinic	5-13
	5.3	Ordnance Operations	5-13
Chapter 6.		Material Handling: Storage and Transportation	6-1
	6.1	General	6-1
	6.2	Storage	6-1
	6.2.1	Petroleum, Oil, Lubricants	6-1
	6.2.2	Pesticides	6-1
	6.2.3	Hazardous Wastes	6-1
	6.2.4	PCB Oil and Transformers	6-5

CONTENTS (CONTD.)

		Page
6.2.5	Fire Fighting Training Area	6-5
6.3	Transportation	6-5
6.3.1	Supply	6-5
6.3.2	Petroleum, Oil and Lubricants	6-5
6.3.3	Solid Waste	6-7
6.3.4	Galley Grease	6-7
6.3.5	Hazardous Waste	6-7
6.4	Ordnance	6-7
Chapter 7.	Waste Processing	7-1
7.1	Sewage Treatment	7-1
Chapter 8.	Disposal Sites and Potentially Contaminated Areas	8-1
8.1	General	8-1
8.2	Site 1, Old Landfill	8-1
8.3	Site 2, Recent Landfill	8-5
8.4	Site 3, Oil/Sludge Disposal Pit	8-6
8.5	Site 4, Grease Pits	8-9
8.6	Site 5, Oil Disposal Area Northwest	8-11
8.7	Site 6, Lake Fretwell Rubble Disposal Area	8-13
8.8	Site 7, Old Fire Fighting Training Area	8-13
8.9	Site 8, Boresight Range Hazardous Waste Storage/ Fire Fighting Training Area	8-14
8.10	Site 9, Recent Grease Pits	8-18
8.11	Site 10, Rubble Disposal Area	8-20
8.12	Site 11, Golf Course Pesticide Disposal Area	8-22
8.13	Site 12, Public Works Rubble Disposal Area	8-22
8.14	Site 13, Day Tank Fuel Spill	8-26
8.15	Site 14, Blue 5 Ordnance Disposal Area	8-28
8.16	Site 15, Blue 10 Ordnance Disposal Area	8-30
8.17	Site 16, AIMD Seepage Pit	8-32
8.18	Site 17, Oil/Sludge Disposal Pit Southwest	8-35
8.19	Site 18, Ammunition Disposal Area	8-36
References		REF-1
Bibliography		BIB-1
Appendix A	Government Agencies Contacted for the Initial Assessment Study	A-1
Appendix B	Geraghty and Miller Quarterly Sampling Results	B-1
Appendix C	Report Concerning Soil and Ground Water Contamination Resulting from Day Tank Fuel Spill	C-1

FIGURES

Figure No.	Title	Page
1-1	Location Map	1-4
2-1	Waste Disposl Sites, Cecil Field and Yellow Water Weapons Area	2-3
3-1	Sites 1, 2, 10 and 17 Recommended Sampling Locations	3-3

CONTENTS (CONTD.)

		Page
3-2	Sites 3, 4, and 5 Recommended Sampling Locations..	3-5
3-3	Site 7, Recommended Sampling Locations.....	3-7
3-4	Site 8, Recommended Sampling Locations.....	3-9
3-5	Site 11, Recommended Sampling Locations.....	3-10
3-6	Site 16, Recommended Sampling Locations.....	3-12
4-1	Vicinity Map.....	4-2
4-2	Cecil Field and Yellow Water Weapons Areas.....	4-3
4-3	OLF Whitehouse.....	4-4
4-4	Organizational Structure.....	4-5
4-5	Temperature Monthly Normals, Means and Extremes....	4-21
4-6	Precipitation Monthly Maximums, Normals and Minimums.....	4-22
4-7	Soils Map of Cecil Field and Yellow Water Weapons Area.....	4-27
4-8	Soils Map of OLF Whitehouse.....	4-29
4-9	Surface Drainage Map Cecil Field and Yellow Water Weapons Area.....	4-39
4-10	Generalized Geologic Column.....	4-41
4-11	Contour Map of Potentiometric Surface, Shallow Rock Aquifer.....	4-44
4-12	Contour Map of Potentiometric Surface for Floridan Aquifer.....	4-46
4-13	Well Location Map.....	4-48
8-1	Sites 1, 2, 10 and 17 Waste Disposal.....	8-3
8-2	Sites 3, 4, 5 and 6 Waste Disposal.....	8-8
8-3	Site 7, Old Fire Fighting Training Area.....	8-15
8-4	Site 8, Boresight Range Hazardous Waste Storage/ Fire Fighting Training Area.....	8-17
8-5	Site 9, Recent Grease Pits.....	8-22
8-6	Site 11, Golf Course Pesticide Disposal Area.....	8-23
8-7	Site 12, Public Works Rubble Disposal Area.....	8-25
8-8	Site 13, Day Tank Fuel Spill.....	8-27
8-9	Site 14, Blue 5 Ordnance Disposal Area.....	8-29
8-10	Site 15, Blue 10 Ordnance Disposal Area.....	8-31
8-11	Site 16, AIMD Seepage Pit.....	8-33
8-12	Site 18, Ammunition Disposal Area.....	8-37

TABLES

Table No.	Title	Page
2-1	Past Disposal Sites at NAS Cecil Field.....	2-4
3-1	Summary of Confirmation Study Recommendations.....	3-2
4-1	Tenant and Supported Activities.....	4-6
4-2	Stratigraphic Units in Duval County.....	4-24
4-3	Well Inventory of NAS Cecil Field.....	4-47
5-1	AIMD Airframes Division Waste Generation Rates.....	5-3
5-2	AIMD Waste Generation Rates.....	5-5
5-3	Air Operations Division Waste Generation Rates.....	5-7
5-4	CLAW-1 Squadrons Waste Generation Rates.....	5-9
5-5	CVSW-1 Squadrons Waste Generation Rates.....	5-10

CONTENTS (CONTD.)

		Page
5-6	Public Works Department Waste Generation Rates.....	5-11
5-7	Hazardous Waste Generation Rates.....	5-14
5-8	Weapons Department Hazardous Waste Generation Rates.....	5-16
6-1	Storage Facilities.....	6-2
6-2	Cecil Field POL Materials.....	6-3
6-3	Pest Control Materials Inventory.....	6-4
6-4	Hazardous Waste Site Inventory.....	6-6
6-5	Ordnance Facilities - Cecil Field.....	6-9
6-6	Ordnance Facilities - Yellow Water.....	6-10
8-1	Past Disposal Sites at NAS Cecil Field.....	8-2
8-2	Wastes Potentially Disposed at the Old Landfill, Site 1.....	8-4
8-3	Wastes Potentially Disposed at the Recent Landfill, Site 2.....	8-7
8-4	Wastes Potentially Disposed at the Oil/Sludge Disposal Pit, Site 3.....	8-10
8-5	Wastes Potentially Disposed at the Grease Pits Site 4.....	8-12
8-6	Wastes Potentially Burned at the Old Fire Fighting Training Area, Site 7.....	8-16
8-7	Wastes Potentially Burned at the Fire Fighting Training Area, Site 8.....	8-19
8-8	Typical Inventories of Pest Control Materials Maintained at the Golf Course Facility.....	8-24
8-9	Liquid Wastes Discharged From Building 313 Into the Seepage Pit, Site 16.....	8-34

CHAPTER 1. INTRODUCTION

1.1 PROGRAM BACKGROUND. Past hazardous waste disposal methods, although acceptable at the time, have often caused unexpected long-term problems through release of hazardous pollutants into the soil and ground water. In response to a growing recognition of these problems, the U.S. Congress directed the U.S. Environmental Protection Agency (EPA) to develop a comprehensive national program to manage past disposal sites. The program is outlined in the Comprehensive Environmental Response, Compensation and Liability Act (CERCLA) of December 1980.

1.1.1 Department of Defense (DOD) Program. DOD efforts in this area preceded the nationwide CERCLA program. In 1975, the U.S. Army developed for DOD a pilot program to investigate past disposal sites at military installations. In 1980, DOD named this program the Installation Restoration Program and instructed the services to comply with program guidelines.

1.1.2 Navy Program. The Navy manages its part of the program, the Navy Assessment and Control of Installation Pollutants (NACIP) Program, in three phases. Phase one, the Initial Assessment Study (IAS), identifies disposal sites and contaminated areas caused by past hazardous substance storage, handling or disposal practices at Naval activities. These sites are then individually evaluated with respect to their potential threat to human health or to the environment. Phase two, the Confirmation Study, verifies or characterizes the extent of contamination present and provides additional information regarding migration pathways. Phase three, Remedial Action, provides the required corrective measure to mitigate or eliminate confirmed problems.

1.2 AUTHORITY. The Chief of Naval Operations (CNO) initiated the NACIP program in OPNAVNOTE 6240 of 11 September 1980, superseded by OPNAVINST 5090.1 of 26 May 1983. Naval Facilities Engineering Command (NAVFACENGCOM), manages the program within the existing structure of the Naval Environmental Protection Support Service (NEPSS), which is administered by the Naval Energy and Environmental Support Activity (NEESA). NEESA conducts the program's first phase, the IAS, in coordination with NAVFACENGCOM Engineering Field Divisions (EFDs). Activities are selected for an IAS by CNO, based on recommendations by NAVFACENGCOM, the EFDs, and NEESA. Approval of the Naval Air Station (NAS) Cecil Field, Jacksonville, Florida, for an IAS is contained in CNO letter ser 451/3U39244 of July 1983.

1.3 SCOPE.

1.3.1 Past Operations. The NACIP program focuses attention on past hazardous substance storage, use and disposal practices on Navy property. Current practices are regularly surveyed for conformity to state and federal regulations and, therefore, are not included in the scope of the NACIP program. The IAS addresses operational non-hazardous disposal and storage areas only if they were hazardous waste disposal or storage areas in the past. Current operations are investigated solely to determine what types and quantities of chemicals or other materials were used and what disposal methods were practiced.

1.3.2 Results. If necessary, an IAS recommends mitigating actions to be performed by the activity or EFD, or recommends Confirmation Studies to be

administered by the EFD under the NACIP program. Based on these recommendations, NAVFACENGCOM schedules Confirmation Studies for those sites which have been determined by scientific and engineering judgment to be potential hazards to human health or to the environment.

1.4 INITIAL ASSESSMENT STUDY.

1.4.1 Records Search. The IAS begins with an investigation of activity records followed by a records search at various government agencies including EFDs, national and regional archives and records centers, and U.S. Geological Survey offices. In this integral step, study team members review records to assimilate information about the activity's past missions, industrial processes, waste disposal records, and known environmental contamination. Examples of records include activity master plans and histories, environmental impact statements, cadastral records, and aerial photographs. Appendix A lists agencies contracted during this study.

1.4.2 On-Site Survey. After the records search, the study team conducts an on-site survey to complete documentation of past operations and disposal practices and to identify potentially-contaminated areas. With the assistance of an activity point-of-contact, the team inspects the activity during ground and aerial tours, and interviews long-term employees and retirees. The on-site survey for NAS Cecil Field was conducted from 29 October to 2 November 1984; information in this report is current as of those dates.

Information obtained from interviews is verified by data from other sources or from corroborating interviews before inclusion in the report. If information for certain sites is conflicting or inadequate, the team may collect samples for clarification.

1.4.3 Confirmation Study Ranking System. With information collected during the study, team members evaluate each site for its potential hazard to human health or to the environment. A two-step Confirmation Study Ranking System (CSRS) developed at NEESA is used to systematically evaluate the relative severity of potential problems. The two steps of the CSRS are a flow- chart and a numerical ranking model. The first step is a flowchart based on type of waste, containment, and hydrogeology. This step eliminates innocuous sites from further consideration. If the flowchart indicates a site poses a potential threat to human health or to the environment, the second step, the model, is applied. This model assigns a numerical score from 0 to 100 to each site. The score reflects the characteristics of the waste, the potential migration pathways from the site, and possible contaminant receptors on and off the activity.

1.4.4 Site Ranking. After scoring a site, engineering judgment is applied to determine the need for a Confirmation Study or for immediate mitigating action. At sites recommended for further work, CSRS scores are used to rank the sites in a prioritized list for scheduling projects. For a more detailed description, refer to NEESA 20.2-042, Confirmation Study Ranking System.

1.4.5 Confirmation Study Criteria. A Confirmation Study is recommended for sites at which: 1) sufficient evidence exists to indicate the presence of contamination, and 2) the contamination poses a potential threat to human health or to the environment.

1.5 CONFIRMATION STUDY. Generally, the EFD conducts the Confirmation Study in two phases - verification and characterization. In the verification

phase, short-term analytical testing and monitoring determines whether specific toxic and hazardous materials, identified in the IAS, are present in concentrations considered to be hazardous. Normally, the IAS recommends verification phase sampling and monitoring. The design of the characterization phase usually depends on results form the verification phase. If required, a characterization phase, using longer-term testing and monitoring, provides more detailed information concerning the horizontal and veritical distribution of contamination migrating from sites, as well as site hydrogeology. If sites require remedial actions or additional monitoring programs, the Confirmation Study recommendations include the necessary planning information for the work, such as design parameters.

1.6 IAS REPORT CONTENTS. In this report, the significant findings and conclusions from the IAS are presented in Chapter 2. Recommendations are presented in Chapter 3. Chapter 4 describes general activity information, history, biology and physical features. Chapters 5 through 8 trace the use of chemicals and hazardous materials from storage and transfer, through manufacturing and operations, to waste processing and disposal. The latter chapters provide detailed documentation to support the findings, conclusions and recommendations in Chapters 2 and 3. Figure 1-1 shows the location of NAS Cecil Field, Outlying Landing Field (OLF) Whitehouse and the Yellow Water Weapons Area. These are the areas included in this study.

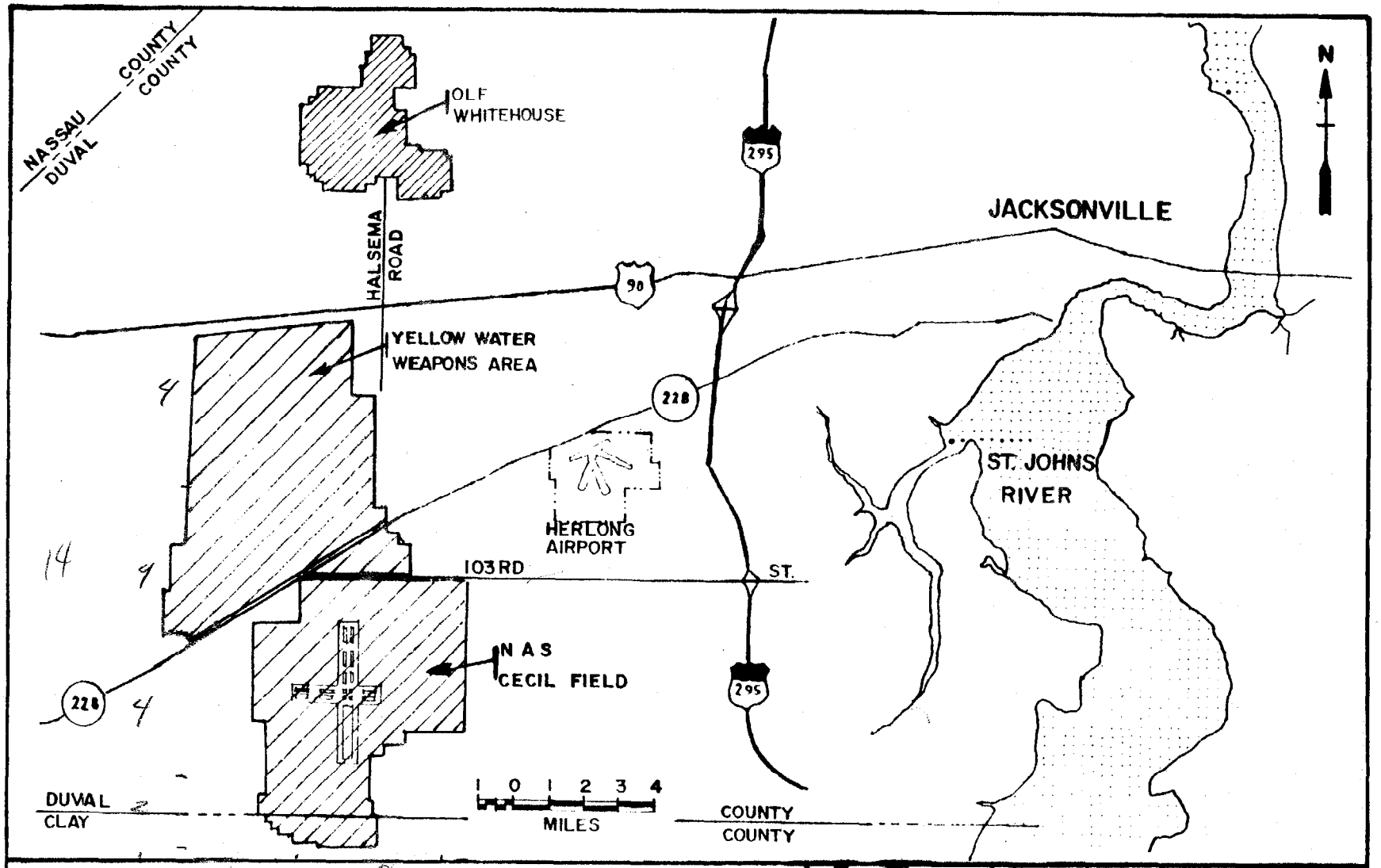


FIGURE 1-1

VICINITY MAP

INITIAL ASSESSMENT STUDY
NAVAL AIR STATION
CECIL FIELD

CHAPTER 2. SIGNIFICANT FINDINGS AND CONCLUSIONS

2.1 INTRODUCTION. This chapter summarizes the significant findings and conclusions developed as a result of the Initial Assessment Study (IAS) for Naval Air Station (NAS) Cecil Field. Information presented in this chapter is based on a review of available information, the results of the on-site survey, and interviews with current and long-term personnel. In the first part of the chapter, the potential for contaminant migration and the potential contaminant receptors for NAS Cecil Field are summarized. The remainder of the chapter summarizes disposal operations at each of the 18 disposal sites and presents conclusions as to whether the sites pose a potential threat to human health or the environment and warrant confirmation studies.

2.2 POTENTIAL FOR CONTAMINANT MIGRATION. There are three aquifers of concern at NAS Cecil Field. These are the surficial, shallow rock and Floridan aquifers. The unconfined surficial aquifer occurs at or near the surface and extends to a depth of 20 to 40 feet. The surficial aquifer is composed of unconsolidated deposits of fine to medium grained sand and clayey sands which overlie clayey confining units. It is recharged primarily from local rainfall.

Contaminants may easily enter the surficial aquifer due to its close proximity to the land surface and the rapid permeability of the sandy soils common throughout the area. Contaminant movement through the surficial aquifer would be primarily lateral because vertical movement is impeded by underlying clayey sediments. The general direction of ground water flow is from topographic highs to areas of natural discharge such as ditches, creeks, and swamps. Ground water velocity in the surficial aquifer, as estimated from the Darcy equation, is on the order of 40 feet per year. Thus, contaminants entering the surficial ground water may readily enter nearby discharge areas such as ditches and creeks where they could migrate off-base into Yellow Water Creek.

Underlying the surficial aquifer, at a depth of 60 to 125 feet below the surface, is the shallow rock aquifer. This aquifer is composed of sand, limestone and dolomite lenses that are interbedded in clayey confining units. The principal water bearing zone is a limestone bed 20 to 25 feet thick. The ground water in this aquifer is under semi-artesian to artesian conditions.

Contaminants from the surficial aquifer could potentially migrate downward into the shallow rock aquifer. However, underlying clayey sediments between the surficial and the shallow rock aquifer impede downward migration and reduce the potential for contamination. The degree of mixing between the surficial and shallow rock aquifer would depend on the continuity and thickness of the clayey sediments, which vary from 20 to 105 feet in thickness. The shallow rock aquifer ground water movement is in an easterly direction.

Most small domestic water supplies in the area are obtained from wells completed in the shallow rock aquifer. There are numerous Navy wells scattered throughout the installation which tap the shallow rock aquifer. These are primarily water supply wells for outlying buildings not served by the main water system. Water from these wells is used occasionally for potable purposes.

Contamination of the Floridan aquifer, from which NAS Cecil Field and the majority of the surrounding population obtain their potable water, is not anticipated due to extensive confining deposits of the Hawthorn Formation which are over 400 feet thick in the NAS Cecil Field area and underlie the shallow rock aquifer.

Contaminant migration by surface waters is also a potential pathway at NAS Cecil Field. Numerous ditches and creeks occur throughout the installation. Contaminants could enter these surface waters by direct surface runoff or through ground water discharge of the surficial aquifer. The major receiving waters of NAS Cecil Field are Lake Fretwell, Rowell Creek, and Sal Taylor Creek. Contaminants entering the creeks could migrate off-base.

2.3 POTENTIAL CONTAMINANT RECEPTORS. Much of NAS Cecil Field is forested or marshy and there are numerous small creeks and drainages along with two lakes. This diverse habitat serves to provide cover, nesting and foraging for numerous species of birds and animals including deer, upland game birds (turkey, quail), waterfowl, a variety of wading birds (great egrets), invertebrates and numerous species of fish, including largemouth bass, redear sunfish and bluegill. The American alligator and eastern indigo snake, both listed as threatened species by the United States Fish and Wildlife Service, and the gopher tortoise, listed as threatened by the Florida Committee on Rare and Endangered Plants and Animals, are known to occur at NAS Cecil Field. Contaminants at NAS Cecil Field could potentially impact these receptors.

Because contaminants would ultimately migrate to receiving waters such as Rowell Creek, Sal Taylor Creek, and Lake Fretwell, the primary impact would be to aquatic wildlife inhabiting these waters and the predators, such as wading birds, and animals that depend on these areas for feeding and water. Lake Fretwell and Rowell Creek are fished by base personnel, and contaminants could impact humans.

Wells at NAS Cecil Field do not tap the surficial aquifer, therefore direct impact to water sources is not anticipated. There is some potential for contamination of the shallow rock aquifer. The shallow rock aquifer is used for potable water. However, the presence of confining clayey sediments impedes the downward migration of contaminants from the surficial aquifer to the shallow rock aquifer.

2.4 SITES RECOMMENDED FOR CONFIRMATION STUDY. Of the 18 disposal and spill sites identified at NAS Cecil Field, 10 are recommended for confirmation studies. Figure 2-1 shows the location of these sites. Table 2-1 summarizes the findings of the disposal and spill sites. Detailed descriptions of each of these sites can be found in Chapter 8.

2.4.1 Site 1, Old Landfill. Site 1 is a nine acre landfill located in the southwestern portion of NAS Cecil Field, adjacent to the perimeter road. Site 1 was operated from the early 1950's until 1965, during which it was the only landfill at NAS Cecil Field. The landfill was a trench and fill operation with daily burning of wastes. Virtually all the solid waste and some liquid and chemical wastes generated at the installation were disposed at the site.

A worst-case estimate indicated that as much as 260,000 gallons of liquid wastes were disposed at the site. These liquid wastes included fuels, oils,

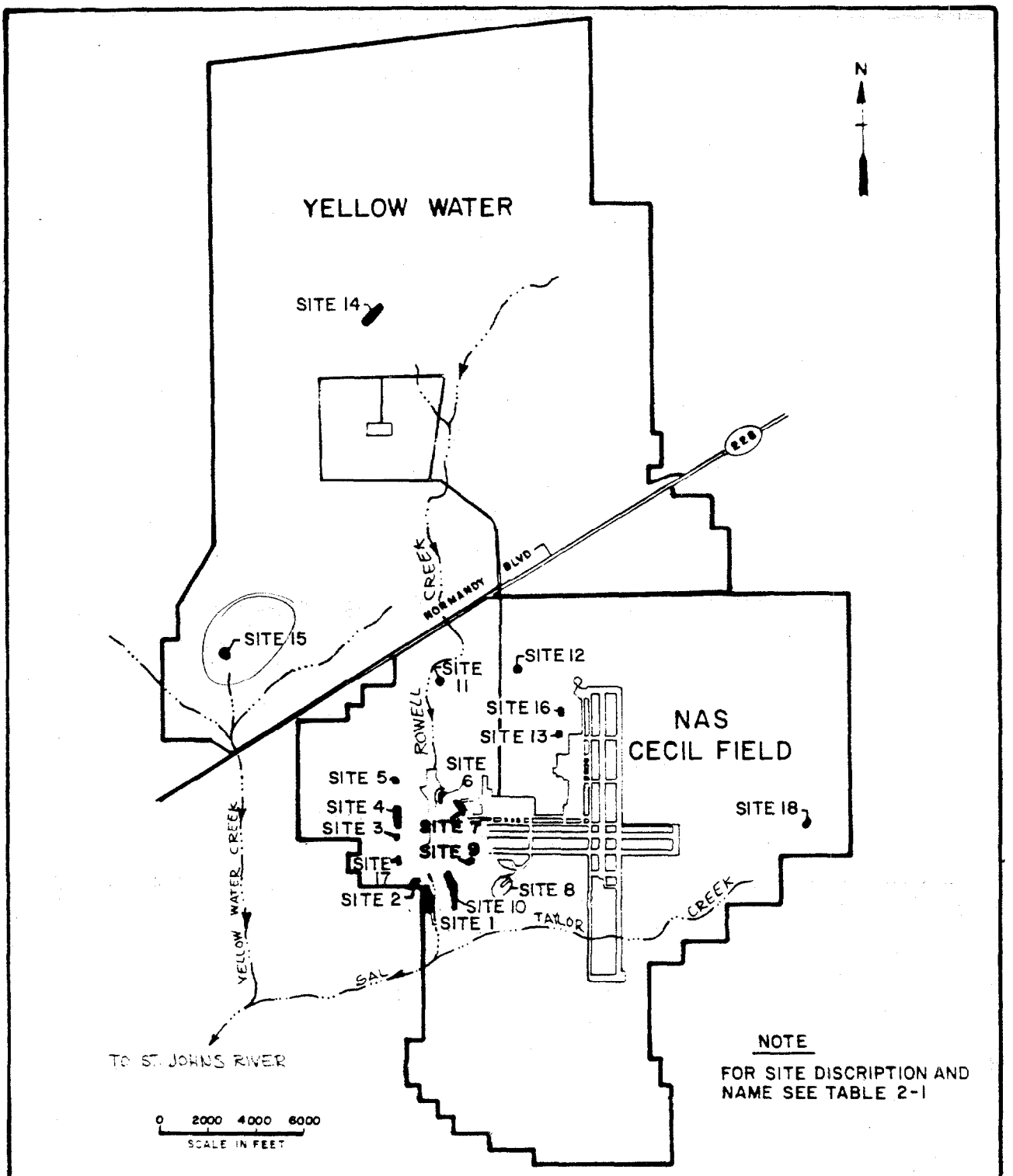


FIGURE 2-1

Waste Disposal Sites, Cecil Field and Yellow Water Weapons Area

INITIAL ASSESSMENT STUDY
NAVAL AIR STATION
CECIL FIELD

Table 2-1

Past Disposal Sites at NAS Cecil Field

Site No.	Site Name	Map Location	Period of Operation	Waste Types	Estimated Total Quantities	Sources
Sites Recommended For Confirmation Studies:						
1	Old Landfill	J-7	1950s-1965	Solid waste, oils, fuels, paints, paint strippers, solvents	275,000 yd^3 of solid waste; unknown quantities of other liquid wastes	All industrial operations and shops
2	Recent Landfill	J-7	1965-1975	Solid waste, oils, fuels, paints, paint strippers, solvents	210,000 yd^3 of solid waste; unknown quantities of other liquid wastes	All industrial operations and shops
3	Oil/Sludge Disposal Pit	I/H-7	1950s-1975	Waste fuels, oils, paints, paint strippers, solvents	210,000 to 310,000 gallons of waste fuel, oil and sludge, unknown quantities of other liquid wastes	Fuel farm, AIMD, squadrons, public works shops
4	Grease Pits	H-7	1950s-1983	Grease, fuels, oils, paints, solvents, paint strippers	625,000 to 800,000 gallons of watered-down grease; unknown quantities of other liquid wastes	Installation messes, AIMD, fuel farms, squadrons, public work shops
5	Oil Disposal Area Northwest	G-7	1950s	Oil and fuel (potentially paint, paint strippers, solvents)	unknown	Fuel farm (potentially other industrial shops)
7	Old Fire Fighting Training Area	H-8	1950s-1975	Waste fuels, oil, solvents, paint, paint strippers	200,000 gallons	Fuel farm, AIMD, squadrons, public work shops
8	Boresite Range Hazardous Waste Storage/Fire Fighting Training	I-9	1975-1984	Waste fuels, oil, solvents, paint, paint strippers	145,000 gallons; unknown quantities of hazardous waste stored and spilled at the site	Fuel farm, AIMD, squadrons, public work shops
11	Golf Course Pesticide Disposal Area	E-8	1970s-1978	Pesticides, fungicide, herbicide containers	200-450 empty 5-gallon cans; 2-3 full 30 gallon drums; 10-15 full 5-gallon cans	Golf course pesticide shop
16	AIMD Seepage Pit	F-10	1960-1980	Solvents, heavy metals, acids, blasting grit, paint residue, photo wastes	26 million gallons	Building 313, jet engine maintenance shop
17	Oil/Sludge Disposal Pit Southwest	I-7	late 1960s-early 1970s	Waste fuels/oils (potentially paint, paint strippers, solvents)	unknown	Fuel farm (potentially other industrial shops)
Sites Not Recommended For Confirmation Studies:						
6	Lake Fretwell Rubble Disposal Area	H-8	1950s-1984	Inert rubble	unknown	Building construction, demolition debris
9	Recent Grease Pits	I-8	1983-1984	Grease mixed with water	24,000 to 30,000 gallons	Installation messes
10	Rubble Disposal Area	I/J-8	1950s-1960s	Inert rubble	unknown	Building construction, demolition and runway debris
12	Public Works Rubble Disposal Area	E-9	1970s-1984	Inert rubble	unknown	Public works
13	Day Tank 2 Fuel Spill	F-10	1981	JP-5 fuel spill	497,000 gallons	Day tank fuel spill
14	Blue 5 Ordnance Disposal Area	-	1967-1977	Fuses, 100 pound bombs, large munitions, lulu fuses, other explosive materials	30,000-45,000 pounds	Yellow water ordnance operations
15	Blue 10 Ordnance Disposal Area	-	1960s-1977	Small arms, parachute/distress flares, Mark IV signal cartridges, rocket ignitors, CADS, 5 and 2.75 inch rockets	350 tons	Yellow water ordnance operations
18	Ammunition Disposal Area	H-15	1950s	Ammunition crates, misc. ordnance items, general rubble	unknown	Magazine area

Site 19 Rowell Creek Rubble Disposal Area

solvents [methyl ethyl ketone (MEK), Stoddard, trichloroethylene, PD-680, methyl isobutyl ketone (MIBK), toluene, naphtha and xylene], paints and paint thinners. Waste paints disposed at the site could contain cadmium, chromium and lead. Fuels disposed at the site could also contain lead. An estimated 275,000 cubic yards of solid waste was also disposed at the landfill, including empty pesticide containers. Since much of the waste was burned at the site, flammable liquids and materials disposed at the site were probably incinerated. Products of incomplete combustion may exist at the site.

The primary pathway for contaminant migration at the site is ground water movement through the surficial aquifer. Portions of the waste are in direct contact with the surficial ground water. Thus, there is a high potential for contaminant migration from the site. Ground water movement within the surficial aquifer is primarily in an easterly direction at the site, with Rowell Creek along the eastern border of the site serving as the probable ground water discharge area. Areas of Rowell Creek may provide suitable habitat for the alligator. Rowell Creek is also fished by installation personnel and serves as a foraging area for a number of predators including wading birds and raccoons. Contaminants entering the creek could also migrate off-base.

Based on the types of wastes disposed at Site 1, the high potential for contaminant migration and the presence of receptors, a confirmation study is recommended.

2.4.2 Site 2, Recent Landfill. Site 2 is a five acre landfill located in the southwestern portion of NAS Cecil Field, adjacent to the perimeter road. Site 2 was operated from 1965 to 1975, during which it was the only landfill at the installation. The landfill was a trench and fill operation. Virtually all the solid waste and some liquid and chemical wastes generated at the installation were disposed at the site.

A worst-case estimate indicated that as much as 265,000 gallons of liquid wastes were disposed at the site. Liquid wastes disposed at the site reportedly included fuels, oils, solvents (MEK, Stoddard, trichloroethylene, PD-680, MIBK, toluene, naphtha and xylene), paints and paint thinners. Waste paints disposed at the site could contain cadmium, chromium and lead. Fuels disposed at the site could also have contained lead. An estimated 160,000 cubic yards of solid waste was also disposed at the landfill, including empty pesticide containers. Burning was not done intentionally at the site, although fires did periodically occur.

The primary pathway for contaminant migration at the site is ground water movement through the surficial aquifer. Portions of the waste are in direct contact with the surficial ground water. Thus, there is a high potential for contaminant migration from the site. Ground water movement within the surficial aquifer is primarily in an easterly direction at the site, with Rowell Creek being the probable discharge area. Areas of Rowell Creek may provide suitable habitat for the alligator. Rowell Creek is also fished by installation personnel and serves as a foraging area for a number of predators including wading birds and raccoons. Contaminants entering the creek could migrate off-base.

Based on the types of waste disposed at Site 2, the high potential for contaminant migration and the presence of receptors a confirmation study is recommended.

2.4.3 Site 3, Oil/Sludge Disposal Pit. Site 3 is located immediately northeast of the intersection of the western perimeter road and the service road leading from the south end of Lake Fretwell. A pit at the site, which was 50 to 100 feet in diameter and three to five feet deep, was used to dispose of liquid wastes and sludge from the mid 1950's until 1975. Liquid wastes from the fuel farm and shops were taken to the site in 55-gallon drums or bowsers, drained into the pit and allowed to seep into the soil or evaporate. Approximately once every three months the pit was set afire.

It is estimated that 210,000 to 310,000 gallons of oil, fuel and tank sludges waste from the fuel farm were disposed at the site. Much of this volume included water. Other liquid wastes from the Aircraft Intermediate Maintenance Department (AIMD), the squadrons and public works disposed at the site reportedly included solvents (MEK, Stoddard, trichoroethylene, PD-680, MIBK, toluene, naphtha, xylene), paints, paint thinners, and additional fuels and oils. A worst-case estimate indicated that as much as an additional 500,000 gallons of liquid wastes from the shops were disposed at the site. Waste paints disposed at the site could contain cadmium, chromium and lead. In addition, some of the fuel disposed at the site most likely contained lead.

The primary pathway for contaminant migration from the site is ground water movement through the surficial aquifer. Ground water movement through the surficial aquifer is primarily in an easterly direction at the site with Lake Fretwell and Rowell Creek, approximately 1,200 feet to the east, serving as probable ground water discharge areas. Waterfowl and wading birds (great egret) are known to utilize the shallow water shoreline of Lake Fretwell as a foraging area. Lake Fretwell is also fished by base personnel for largemouth bass, redear sunfish, and bluegill. Rowell Creek is also fished by installation personnel and serves as a foraging area for a number of predators including wading birds and raccoons. Contaminants entering the creek could migrate off-base.

Based on the wastes disposed at Site 3, the potential for contaminant migration and presence of receptors, a confirmation study is recommended.

2.4.4 Site 4, Grease Pits. Site 4 encompasses an area of approximately nine acres and is located to the west of Lake Fretwell along the perimeter road. Site 4 was used to dispose of grease from the installation messes and other liquid wastes from the shops from the 1950s until 1983. Typical disposal operations at the site consisted of placing wastes into excavated pits where they were allowed to seep into the soil or evaporate. Once a pit became full it was covered with soil and a new pit excavated. Numerous pits of varying sizes exist throughout the area of the site.

A worst-case estimate indicated that as much as 700,000 gallons of liquid waste from the fuel farm, AIMD, the squadrons and public works were disposed at the site. Based on interviews with long-term personnel, liquid waste disposed at the site reportedly included solvents (MEK, Stoddard, trichloroethylene, PD-680, MIBK, toluene, naphtha, xylene), paint, paint thinners, oils, and fuels. Waste paints disposed at the site could contain cadmium, chromium and lead. The fuels disposed at the site could also have contained lead. An estimated 650,000 to 800,000 gallons of grease and water from installation messes were also disposed at the site.

The primary pathway for contaminant migration at the site is ground water movement through the surficial aquifer. Ground water movement is primarily

in an easterly direction with Lake Fretwell, approximately 1,200 feet to the east, serving as the probable ground water discharge area. Waterfowl and wading birds are known to utilize the shallow water shoreline of Lake Fretwell as a foraging area. Lake Fretwell is also fished by base personnel.

Based on the types of liquid wastes disposed at Site 4, the potential for contaminant migration and the presence of receptors, a confirmation study is recommended.

2.4.5 Site 5, Oil Disposal Area Northwest. Site 5 covers an area of approximately 0.5 acres and is located to the west of Lake Fretwell, along the perimeter road. Site 5 was reportedly used in the 1950s to dispose of unknown quantities of waste fuel and oil. Portions of the site are oil stained and devoid of vegetation. There is a definite petroleum odor at the site. From the appearance and odor at the site, it seems likely that waste liquids have been disposed at the site more recently than the 1950s.

Visual evidence indicated that petroleum wastes were disposed at the site. A common practice was to mix other liquid wastes such as solvents, paints and thinners in with petroleum wastes. Therefore, it is likely that these wastes were disposed at the site as well. Waste paints disposed at the site could contain cadmium, chromium and lead. In addition, waste fuels disposed at the site could contain lead.

Both surface runoff and ground water movement through the surficial aquifer are pathways for contaminant migration at the site. Surface runoff from the site is intercepted by a ditch along the southern boundry of the site. This ditch empties into Lake Fretwell 900 feet east of the site. The surficial ground water also likely discharges into the ditch and could thus end up in Lake Fretwell. Waterfowl and wading birds are known to utilize the shallow water shoreline of Lake Fretwell as a foraging area. Lake Fretwell is also fished by base personnel.

Due to the types of wastes potentially disposed at this site, the potential for migration and the presence of receptors, a confirmation study is recommended.

2.4.6 Site 7, Old Fire Fighting Training Area. Site 7 is located approximately 400 to 500 feet southeast of Building 865, along an asphalt apron. The site consisted of two burning pads on the asphalt apron and one unlined burning pit in the grassed area north of the apron. Each of the burning areas were approximately 30 feet in diameter. The site was used from the mid 1950s to 1975 as a fire fighting training area. Waste liquids from the fuel farm or shops were taken to the site in bowsers or 55-gallon drums. Flammable liquids were then drained onto the burning area and set afire. The fires were suppressed with water and a biodegradable and nontoxic protein foaming agent. The protein foam was composed of naturally occurring proteinaceous materials such as fish meal, feather meal, and horn and hoof meal.

It is estimated that 200,000 gallons of a mixed liquid waste were burned at the site. Waste liquids disposed at the site included fuels, oils, solvents (MEK, Stoddard, trichloroethylene, PD-680, MIBK, toluene, naphtha and xylene), paints, and paint thinners. Waste paint disposed at the site could contain cadmium, chromium and lead. Fuels disposed at the site could also have contained lead.

Most of the materials burned during drills were consumed by fire or volatilization. However, some residual flammable liquids remained following burns and some compounds such as trichloroethylene are non-flammable. It is possible that soils surrounding the asphalt apron may be contaminated. There is also a possibility that the surficial aquifer could be contaminated. Ground water movement of the surficial aquifer is primarily in a westerly direction at the site with Lake Fretwell, approximately 1,200 feet to the west, serving as the probable discharge area. Lake Fretwell is a foraging area for waterfowl and a number of wading birds. The lake is also fished by base personnel.

Based on the types of liquid wastes disposed at the site, the potential for contaminant migration and the presence of potential receptors, a confirmation study is recommended.

2.4.7 Site 8, Boresite Range Hazardous Waste Storage/Fire Fighting Training Area. Site 8 is located at the boresite range. The boresite range has been used as a fire fighting training area from 1975 to the present. There are three unlined bermed pits at the site. Typically, waste liquids from the fuel farm and shops were transported to the site in bowsers. During a practice burn the waste liquids were drained into one or more of the burning pits and set afire. The fires were suppressed with a biodegradable and nontoxic protein foaming agent and water. In addition, the area adjacent to and in front of the boresite range back-stop was used to store 50 to 100 drums of unmarked hazardous waste. Many of the drums were reportedly in a deteriorated and leaking condition. In additon, many of the drums were riddled with bullets, as the area was being used for small arms/machine gun target practice, resulting in additional leakage at the site.

It is estimated that 145,000 gallons of waste liquids were burned during fire fighting training exercises at the site. Waste liquids burned at the site included waste fuels, oils, solvents (MEK, Stoddard, trichloroethylene, PD-680, MIBK, toluene naphtha and xylene), paints and paint thinners. Based on the time period, the hazardous waste stored in the drums likely contained solvents, paints and paint strippers. Paints taken to the site could contain cadmium, chromium and lead. Fuels disposed at the site could also have contained lead.

There is a potential for soil and surficial ground water contamination at the site. Both surface water runoff and ground water movement through the surficial aquifer are contaminant migration pathways. Runoff is to a ditch which forms the northwest border of the site. This ditch drains in a southerly direction to Sal Taylor Creek and has a noticable fuel odor. Breaks in the berms of the three burning pits allow essentially direct runoff into the ditch. The surficial ground water in the area generally flows in a southerly direction with likely discharge to Sal Taylor Creek. There may be some ground water discharge to the ditch. Contaminants entering surface waters could impact foraging animals such as wading birds and raccoons, and could migrate off-base.

Based on the types of liquid wastes used for fire fighting training and the hazardous wastes spilled at the site, the potential for migration and the presence of receptors, a confirmation study is recommended.

2.4.8 Site 11, Golf Course Pesticide Disposal Area. Site 11 is located in a 40 by 40 foot clearing in a wooded area between fairways 11 and 17 of the

golf course. Site 11 was used as a disposal area for pesticide, fungicide and herbicide containers from the early 1970s until approximately 1978. Waste containers (mainly five-gallon cans) were collected from the golf course maintenance building and taken to the site. Periodically the cans were crushed by a front-end loader and buried approximately three feet deep. The cans were not rinsed prior to disposal.

An estimated 200 to 450 empty cans were disposed at the site. In addition, two to three 30-gallon drums of unused pesticide, of which at least one was reportedly nemagon (1,2-dibromo-3-chloropropane), and 10 to 15 full five-gallon containers of pesticides, herbicides, and fungicides were discarded and buried at the site in 1978. Many of the full containers were beginning to rust or lacked identification labels.

The primary pathway for contaminant migration at the site is ground water movement through the surficial aquifer. The surficial ground water probably flows in a westerly or northwesterly direction at the site with Rowell Creek serving as the probable ground water discharge area. Rowell Creek and the receiving waters, Lake Fretwell, provide suitable habitat for a number of wading birds and waterfowl. Lake Fretwell is also fished by base personnel.

Based on the types of wastes disposed at the site, the potential for migration and the presence of receptors, this site is recommended for a confirmation study.

2.4.9 Site 16, AIMD Seepage Pit. Site 16 is located 60 feet north of Building 313, the jet engine maintenance shop and Non-destructive Inspection Lab (NDI Lab). A seepage pit at the site, which was 40 feet long by 2.7 feet wide by 9.5 feet deep, was used to dispose of liquid wastes from 1960 until 1980. The seepage pit was constructed with concrete blocks. Half-inch gaps were left between the vertical intersections and no mortar was used on these vertical gaps. Waste liquids placed in the pit were therefore able to seep out of the pit into the surrounding soils. In the late 1960s wastes began backing up in the seepage pit and a storm drainage discharge pipe was added to the pit. The discharge pipe was three feet four inches from the bottom of the pit. Once the liquid level in the seepage pit reached the discharge pipe, there was essentially direct discharge to an open ditch which then drained to Sal Taylor Creek. Throughout the 1970s and until the seepage pit was closed in 1980, direct discharge from the seepage pit through the storm drainage line reportedly occurred. In 1980, the line leading into the seepage pit was disconnected, as was the storm drainage discharge line. The seepage pit was filled with sand.

Over 26 million gallons of rinse water was disposed into the seepage pit. Some of the more significant wastes contained in the rinse water included sodium cyanide, trichloroethylene, creosol, phenol, methylene chloride and oil. In addition, greases, rust, scale and paint removed during the parts clearing process conducted in Building 313 would also have been disposed into the seepage pit.

The primary pathway for contaminant migration at the site is ground water movement through the surficial aquifer. Ground water movement in the area of the site is primarily easterly, with Sal Taylor Creek approximately one mile east of the site being the probable ground water discharge area. Contamination of the drainage ditch which received overflow from the seepage pit is also possible. The ditch also discharges to Sal Taylor Creek. Contaminants

migrating to the ditch and Sal Taylor Creek could adversely impact the aquatic wildlife. Some areas of Sal Taylor Creek afford suitable habitat for the alligator.

Based on the types of wastes disposed at Site 16, the high potential for contaminant migration and the presence of receptors, a confirmation study is recommended.

2.4.10 Site 17, Oil/Sludge Disposal Pit Southwest. Site 17 is located in the southwestern portion of NAS Cecil Field, along the east side of the perimeter road. A pit at the site, which was approximately 50 feet in diameter and three to five feet deep, was used to dispose of liquid wastes for a two to three year period in the late 1960's or early 1970's. Liquid wastes from the fuel farm, AIMD, the squadrons and public works were typically taken to the site in bowsers or 55-gallon drums, drained into the pit and allowed to seep into the soil or evaporate.

Waste oil and fuel were reportedly disposed at the site. A common practice was to mix other liquid wastes such as solvents, paints and paint thinners in with the oil. Therefore, it is likely that these wastes were disposed at the site as well. Waste paints disposed at the site could contain cadmium, chromium and lead. In addition, waste fuels disposed at the site could contain lead. During the time period this site was operated, hundreds of gallons of these types of wastes could have been disposed at the site.

The primary pathway for contaminant migration at the site is ground water movement through the surficial aquifer. Ground water movement is primarily in an easterly direction at the site with Rowell Creek serving as the probable ground water discharge area. Areas of Rowell Creek may provide suitable habitat for the alligator. Rowell Creek is also fished by installation personnel and serves as a foraging area for a number of predators including wading birds and raccoons. Contaminants entering the creek could migrate off-base.

Based on the types of liquid wastes potentially disposed at Site 17, the potential for contaminant migration and the presence of receptors, a confirmation study is recommended.

2.5 SITES NOT RECOMMENDED FOR CONFIRMATION STUDY. Eight of the 18 potentially contaminated sites are not recommended for confirmation studies. Significant findings for these sites are summarized in Table 2-1 and the site locations are shown in Figure 2-1. Detailed descriptions of each of these sites can be found in Chapter 8.

2.5.1 Site 6, Lake Fretwell Rubble Disposal Area. Site 6 is a 3.5 acre rubble disposal area located along the eastern bank of Lake Fretwell. Site 6 was operated from the mid 1950's until 1984. The site was originally a low-lying marshy area, and rubble was used to fill in the area. Wastes disposed at the site include concrete, lumber, tree clippings, scrap metal and similar inert type materials. The source of the majority of the wastes was construction and building demolition debris.

Due to the inert materials disposed at the site, the site is not a significant source of potential surface or ground water contamination. No confirmation study is recommended.

2.5.2 Site 9, Recent Grease Pits. Site 9 encompasses an area of approximately 0.5 acres and is located approximately 1,400 feet west of the south power check facility. Site 9 was used to dispose of grease from the installation messes during 1983 and beginning of 1984. There were three pits at the site into which the grease was disposed. A total of 24,000 to 30,000 gallons of grease and water was disposed at the site. The pits are currently covered with soil.

Due to the fact that only mess grease was disposed at the site, the site is not a significant source of potential surface or ground water contamination. No confirmation study is recommended.

2.5.3 Site 10, Rubble Disposal Area. Site 10 is a 6.5 acre rubble disposal area located in the southwestern portion of NAS Cecil Field. The site was operated from the early 1950's through the 1960's. Wastes disposed at the site consist of building demolition debris and concrete along with other inert type wastes such as tires, asphalt and furniture.

Due to the inert materials disposed at the site, the site is not a significant source of potential surface or ground water contamination. No confirmation study is recommended.

2.5.4 Site 12, Public Works Rubble Disposal Area. Site 12 is 0.5 acre rubble disposal area located approximately 75 feet north of Building 105. The site was operated from the mid 1970's to 1984. Wastes disposed at the site include mainly concrete, wood, wire, cable, scrap metal and similar inert debris. Most of the rubble is buried approximately three feet below the surface. However, there is some rubble above ground.

Due to the inert materials disposed at the site, the site is not a significant source of potential surface or ground water contamination. No confirmation study is recommended.

2.5.5 Site 13, Day Tank Fuel Spill. Site 13 is located at the Day Tank Facility, which is 160 feet north of Building 824. On February 19, 1981, a 497,000 gallon spill of JP-5 fuel occurred at the site. Subsequent cleanup actions resulted in the recovery of 257,000 gallons of the JP-5 fuel. A portion of the remaining 240,000 gallons of JP-5 volatilized. However, some of the fuel soaked into the ground in the areas surrounding the day tank. Numerous soil borings and wells were installed at the site after the spill to determine the extent of soil and ground water contamination (Geraghty and Miller, 1981). From this sampling effort, it was determined that the JP-5 was present only in the unsaturated zone and had not penetrated to the water table. It was concluded that the JP-5 fuel would naturally degrade over time due to bacterial action. To promote the breakdown of the JP-5, fertilizer was added to the soil throughout the spill area.

The JP-5 fuel did not reach the migration pathway, and in the four years since the spill, natural degradation of the fuel has occurred. This site is therefore not judged to present a threat to human health or the environment. No confirmation study is recommended.

2.5.6 Site 14, Blue 5 Ordnance Disposal Area. Site 14 is a 4.5 acre ordnance disposal area located in the north central portion of the Yellow Water Ordnance Area. Site 14 was operated from 1967 until 1977. The disposal operation consisted of detonation. Typical ordnance detonated at the site

included fuses, 100 pounds bombs, large munitions and explosive materials that normally do not burn. Based on interviews with EOD personnel, typical explosives detonated included trinitrotoluene (TNT), trinitrophenylmethylnitramine (tetryl) and cyclotrimethylenetrinitramine (RDX). The site was used to detonate ordnance approximately once every six weeks. On the average, 300 to 450 pounds of explosive materials were detonated each time. Over the time period that the site was utilized, it is estimated that 30,000 to 45,000 pounds of explosive material were detonated at the site.

Detonation operations at the site likely resulted in the formation of some residual metal oxides, primarily aluminum and lead based. However, a study by the Naval Ordnance and Environmental Support Office (OESO) concluded the quantities of residuals left from typical ordnance disposal operations were insignificant in terms of environmental contamination (Fauth, 1984). Aluminum oxides in the presence of water also rapidly decay, while lead in the soil does not appear to be rapidly taken into the food chain (Fauth, 1984).

Based on the information presented in the preceeding paragraph and the relatively low volumes of ordnance disposed at the site, this site is not judged to represent a significant threat to human health or the environment. No confirmation study is recommended.

2.5.7 Site 15, Blue 10 Ordnance Disposal Area. Site 15 is a 10 acre ordnance disposal area located in the southwestern portion of the Yellow Water ordnance area. The site was operated as an ordnance disposal area from the mid 1960's until 1977. The disposal operation consisted of burning of ordnance materials and static firing of rockets. Much of the ordnance disposed at the site was burned in a heavy metal tank. This included small arms up to 20 mm, parachute and distress flares, Mark IV signal cartridges, rocket ignitors, and Cartridge Activated Devices (CADS). Burns were conducted in the tank approximately once every four to six weeks. Typically 6,000 to 8,000 rounds of ammunition plus any other materials which had accumulated were burned per episode. Also burned at the site were 2.75 and 5 inch rockets. Solid propellant from the rockets was laid out on the ground and ignited. In addition, rockets were also static fired at the site. Static firing was primarily limited to five inch rockets, although on occasions 2.75 inch rockets were also static fired.

While the amount of ordnance disposed at the site was variable, it was estimated by EOD personnel that approximately 2.5 tons per month was disposed at the site. Throughout the time period that the site was operational, it is estimated that 350 tons of ordnance mateial was burned at the site.

Ordnance items burned in the tank were subjected to elevated temperatures sufficient to destroy organic compounds. The residual ash left in the tank may have contained metal oxides. Likewise, burning of the double-based rocket propellants likely resulted in the formation of some metal oxides, primarily aluminum and lead. However, a study by OESO concluded that the quantities of residuals left from typical ordnance burning operations were insignificant in terms of environmental contamination (Fauth, 1984). Aluminum oxides in the presence of water also rapidly decay, while lead in the soil does not appear to be rapidly taken into the food chain.

Based on the information presented in the preceeding paragraph and the relatively low volumes of ordnance disposed at the site, this site is nc

judged to represent a significant threat to human health or the environment. No confirmation study is recommended.

2.5.8 Site 18, Ammunition Disposal Area. Site 18 is located in the southeastern corner of NAS Cecil Field, at the intersection of a former service road and a tributary to Sal Taylor Creek. The site covers an area approximately 30 feet by 100 feet and was used in the late 1940's through the 1950s as a disposal area for ordnance materials and rubbish. The disposal operation consisted of dumping the material off a small wooden bridge into the creek and along the roadway to the south of the bridge. Observed at the site were ammunition crates, a projectile nose cone, unidentified canisters, and general rubbish which included furniture and paint cans. Two or three unidentified crates were observed in a pool of water approximately five feet deep to the east of the wooden bridge.

Subsequent to the on-site survey, this site was inspected by EOD personnel and found to contain no harmfull ordnance items. The ammunition crates were all empty and the projectile had been spent. Attempts by EOD personnel to recover the submerged crates were unsuccessful, but they are scheduled to return to the site and determine the contents of the crates.

Because this site is being inspected for possible remaining ordnance and no other types of hazardous materials are present, a confirmation study is not recommended.

- 25 projectile nose cones observed on 13 May 87 when water was very low
- 6 round ~~ob~~ metal objects ~1' diameter
- 3 ammo boxes
- steel grate
- HLA rain magnetics on site

CHAPTER 3. RECOMMENDATIONS

3.1 INTRODUCTION. This chapter presents the recommended actions for the potentially contaminated sites at Naval Air Station (NAS) Cecil Field. Based on the significant findings and conclusions developed in Chapter 2, ten sites are recommended for confirmation studies under phase two of the Naval Assessment and Control of Installation Pollutants (NACIP) program. The two-step Confirmation Study Ranking System (CSRS), developed by Naval Energy and Environmental Support Activity (NEESA), was used to systematically evaluate the relative severity of potential problems. The results of the CSRS and a summary of actions for the sites recommended for confirmation studies are listed in Table 3-1. The confirmation study recommendations are designed to first verify the presence of contamination. The verification phase is for one year. However, if contamination is detected at a site after the first quarterly sampling effort, further characterization to determine the extent of contamination can proceed immediately.

3.2 CONFIRMATION STUDY RECOMMENDATIONS. This section contains the detailed recommendations for the ten sites recommended for confirmation studies.

3.2.1 Site 1, Old Landfill; Site 2, Recent Landfill. These sites were studied together because of their close proximity. It is recommended that three surficial monitoring wells be installed at the sites to detect contaminant migration toward Rowell Creek. An existing surficial monitoring well and shallow rock monitoring well at the sites should also be used in the sampling program. These two wells were recently installed and are constructed of two inch diameter Schedule 40 PVC. One upgradient surficial monitoring well is also recommended. Two sediment samples and one surface water sample from Rowell Creek are also recommended to determine if contaminants have migrated to the Creek. Proposed sampling locations are shown in Figure 3-1.

Type of Samples:	Ground water, sediment and surface water
Ground Water Monitoring Wells:	Six
Sampling Frequency:	Ground water: Quarterly for one year Surface water: Quarterly for one year Sediment: One time only
Number of Samples:	Ground water: 24 Sediment: Two Surface water: Four
Testing Parameters:	Scan gas chromatograph (GC)/flame ionization detector (FID) with capillary column for methyl ethyl ketone (MEK), trichloroethylene, toluene and xylene; scan GC/electron capture device (ECD) for pesticides; chemical oxygen demand (COD); total organic carbon (TOC); total organic halogens (TOX); cadmium, chromium, lead; oil and grease; specific conductance; pH

Remarks: The monitoring wells should be completed a minimum of 15 feet into the surficial aquifer, if possible, and screened from two feet above the

Table 3-1

Summary of Confirmation Study Recommendations
Study Number 073

Site No.	Site Identification	CSRS Score	No. of Wells	No. and Type of Samples	Frequency	Testing Parameters
73-1	Old Landfill/	21	6	24 Ground water	Quarterly for first year*	See Note 1
73-2	New Landfill	24		2 Sediment	One time only	See Note 1
				4 Surface water	Quarterly for first year	See Note 1
73-3	Oil/Sludge Disposal Pit	19	7	28 Ground water	Quarterly for first year*	See Note 2
73-4	Grease Pits	22		8 Surface water	Quarterly for first year	See Note 2
				3 Sediment	One time only	See Note 2
73-5	Oil Disposal Area Northwest	15	2	8 Ground water	Quarterly for first year*	See Note 2
				4 Surface water	Quarterly for first year	See Note 2
				1 Sediment	One time only	See Note 2
				2 Soil	One time only	See Note 2
73-7	Old Fire Fighting Training Area	18	3	12 Ground water	Quarterly for first year*	See Note 2
				2 Soil	One time only	See Note 2
73-8	Hazardous Waste/Fire Fighting Training Area	24	5	20 Ground water	Quarterly for first year*	See Note 2
				7 Soil	One time only	See Note 2
				2 Sediment	One time only	See Note 2
				4 Surface water	Quarterly for first year	See Note 2
73-11	Golf Course Pesticide Disposal Area	12	3	12 Ground water	Quarterly for first year*	See Note 3
				2 Soil	One time only	See Note 3
73-16	AIMD Seepage Pit	23	3	12 Ground water	Quarterly for first year*	See Note 2
				1 Sediment	One time only	See Note 2
73-17	Oil/Sludge Disposal Pit Southwest	19	2	8 Ground water	Quarterly for first year*	See Note 2

*If contamination is detected at a site after the first quarterly sampling effort, further characterization to determine the extent of contamination can proceed immediately.

Note 1: Scan GC/FID with capillary column for MEK, trichloroethylene, toluene and xylene; scan GC/ECD for pesticides; COD; TOC; TOX; cadmium, chromium, lead; oil and grease; specific conductance; pH.

Note 2: Scan GC/FID with capillary column for MEK, trichloroethylene, toluene and xylene; COD; TOC; TOX; cadmium, chromium, lead; oil and grease; specific conductance; pH (For Site 16 add phenol, methylene chloride, cresol, silver and cyanide).

Note 3: Scan GC/FID with capillary column; scan GC/ECD for pesticides; COD; TOC; TOX; specific conductance; pH.

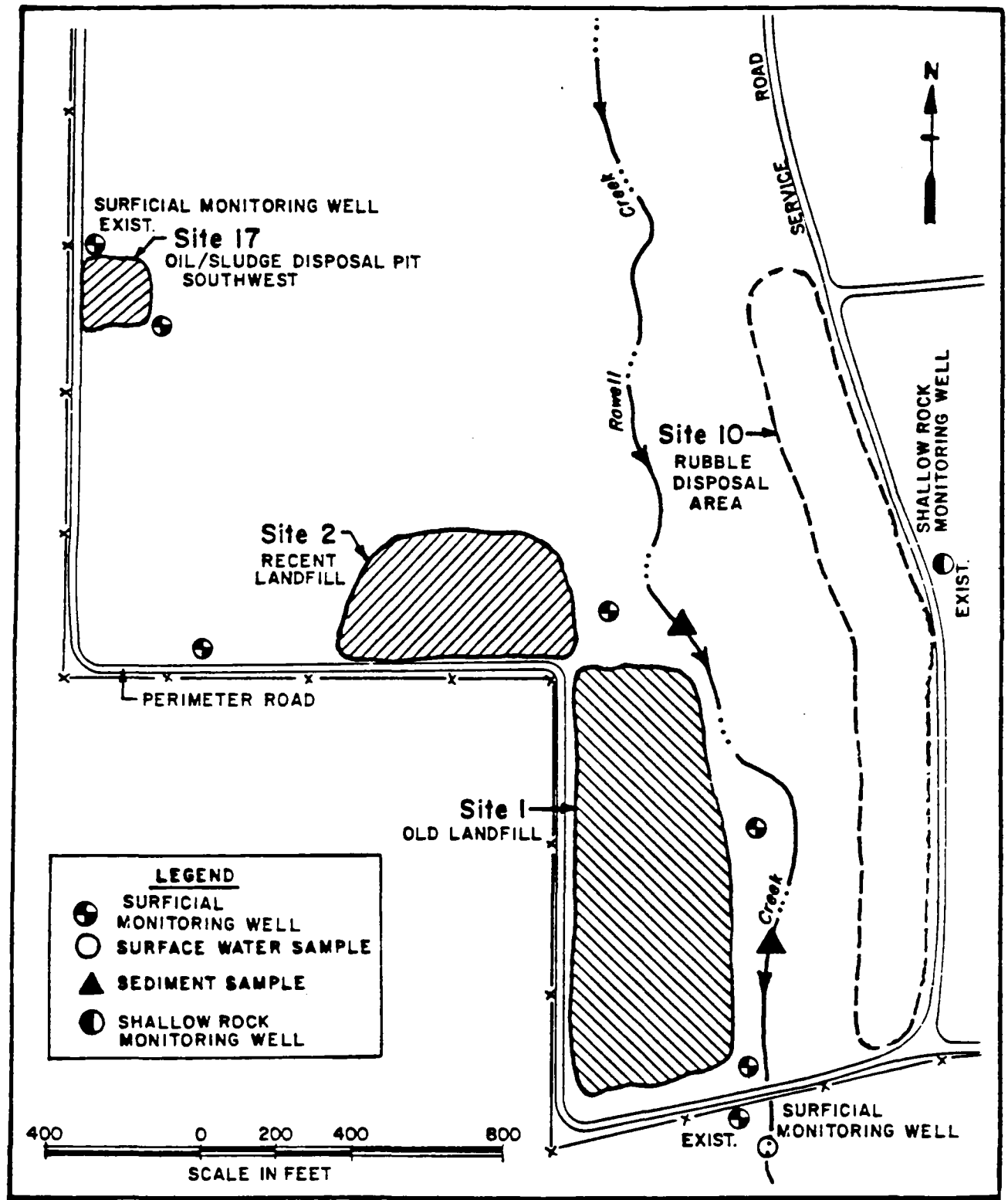


FIGURE 3-1

Sites 1,2 & 17
Recommended
Sampling Locations

INITIAL ASSESSMENT STUDY
NAVAL AIR STATION
CECIL FIELD

water level to the bottom of the wells. Well locations and elevations should be surveyed, and water levels taken prior to sampling. Two 18-inch sediment cores should be taken from Rowell Creek. At each sediment sampling location, the entire 18 inch core should be composited for analysis purposes.

3.2.2 Site 3, Oil/Sludge Disposal Pit; Site 4, Grease Pits. These sites were studied together because of their close proximity. It is recommended that three surficial monitoring wells be installed at the sites. In addition, two existing surficial monitoring wells and one shallow rock monitoring well at the sites should be used in the sampling program. The existing wells are constructed of two inch diameter Schedule 40 PVC. The recommended and existing wells are positioned to detect contaminant migration toward Lake Fretwell and Rowell Creek. One upgradient surficial monitoring well is also recommended. Two sediment and one surface water samples from Lake Fretwell and one sediment and surface water sample from Rowell Creek are also recommended to determine if contaminants have migrated to these receiving waters. The proposed sampling locations are shown in Figure 3-2.

Type of Samples:	Ground water, sediment and surface water
Ground Water Monitoring Wells:	Seven
Sampling Frequency:	Ground water: Quarterly for one year Surface water: Quarterly for one year Sediment: One time only
Number of Samples:	Ground water: 28 Surface water: Eight Sediment: Three
Testing Parameters:	Scan GC/FID with capillary column for MEK, trichloroethylene, toluene and xylene; COD; TOC; TOX; cadmium, chromium, lead; oil and grease; specific conductance; pH

Remarks: The monitoring wells should be completed a minimum of 15 feet into the surficial aquifer, if possible, and screened from two feet above the water level to the bottom of the wells. Well locations and elevations should be surveyed, and water levels taken prior to sampling. Eighteen inch sediment cores should be taken from Lake Fretwell and Rowell Creek. At each sediment sampling location, the entire 18 inch core should be composited for analysis purposes.

3.2.3 Site 5, Oil Disposal Area Northwest. It is recommended that two surficial monitoring wells be installed to the south and east of the site to detect contaminant migration toward the drainage ditch and Lake Fretwell. In addition, one surface water and one sediment sample from the drainage ditch are recommended to determine if contaminants have migrated to the ditch. Two soil samples from oil saturated areas are also recommended. The proposed sampling locations are shown in Figure 3-2.

Type of Samples:	Ground water, surface water, sediment, soil
Ground Water Monitoring Wells:	Two

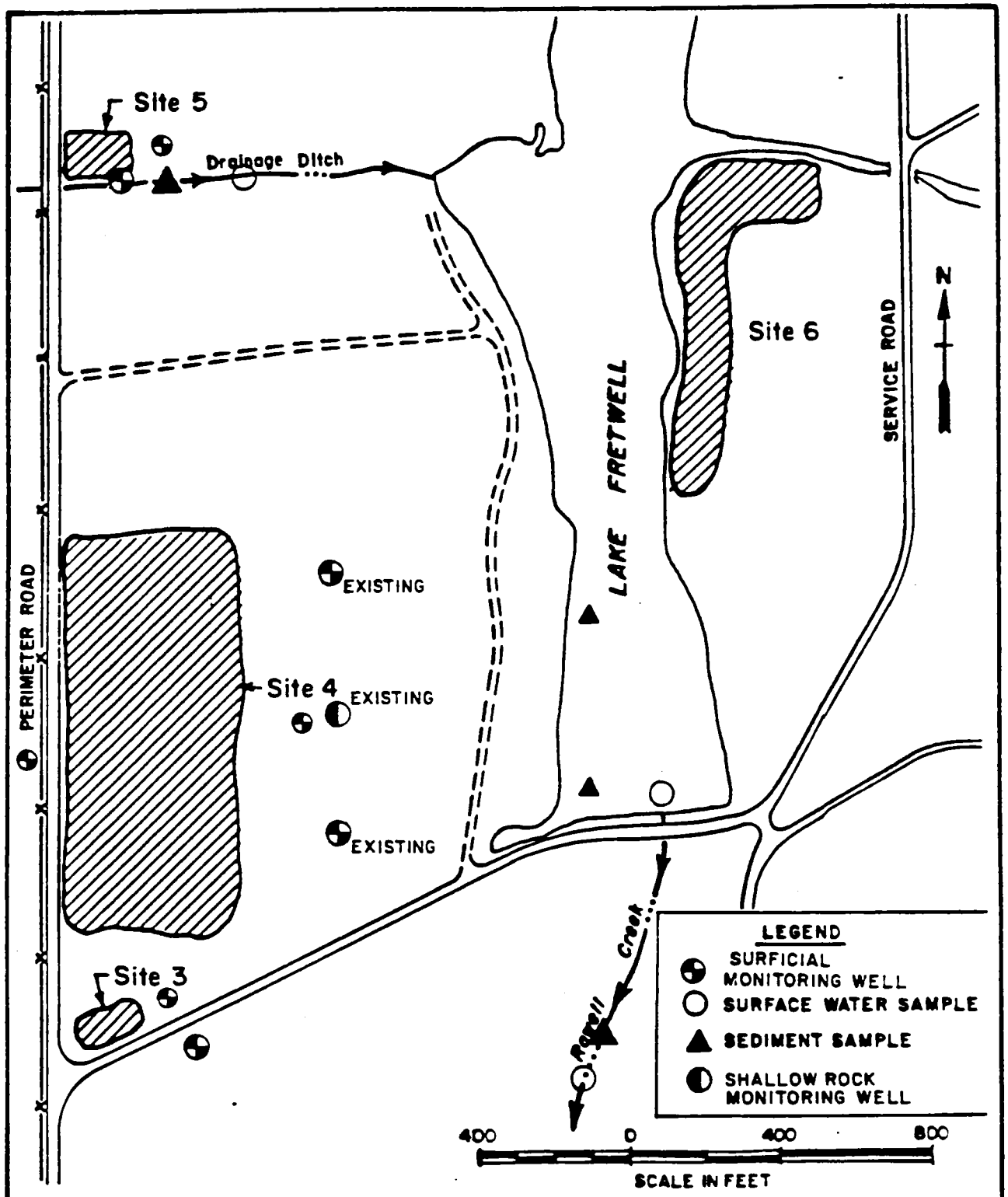


FIGURE 3-2
Sites 3,4 & 5
Recommended
Sampling Locations

INITIAL ASSESSMENT STUDY
NAVAL AIR STATION
CECIL FIELD

Sampling Frequency:	Ground water: Quarterly for one year Surface water: Quarterly for one year Sediment and soil: One time only
Number of Samples:	Ground water: Eight Surface water: Four Soil: Two Sediment: One
Testing Parameters:	Scan GC/FID with capillary column for MEK, trichloroethylene, toluene and xylene; COD; TOC; TOX; cadmium, chromium, lead; oil and grease; specific conductance; pH

Remarks: The monitoring wells should be completed a minimum of 15 feet into the surficial aquifer, if possible, and screened from two feet above the water level to the bottom of the wells. Well locations and elevations should be surveyed and water levels taken prior to sampling. An 18-inch sediment core should be taken from the drainage ditch and composited into one sample. Each of the soil samples should be taken to a depth of 12 inches. At each soil sampling location, the entire 12 inch core should be composited for analysis purposes.

3.2.4 Site 7, Old Fire Fighting Training Area. Runoff from the asphalt apron and overflow from the pit could have contaminated the soils in the area of the site. Therefore, soil samples are recommended at the site. Three surficial monitoring wells are also recommended to detect the migration of contaminants which may have infiltrated the ground water. The proposed sampling locations are shown in Figure 3-3.

Type of Samples:	Ground water and soil
Ground Water Monitoring Wells:	Three
Sampling Frequency:	Ground water: Quarterly for one year Soil: One time only
Number of Samples:	Ground water: 12 Soil: Two
Testing Parameters:	Scan GC/FID with capillary column for MEK, trichloroethylene, toluene and xylene; COD; TOC; TOX; cadmium, chromium, lead; oil and grease; specific conductance; pH

Remarks: Soil samples should be taken to a depth of one foot. The soil samples to the northeast of the asphalt apron should be composited into one sample, and those to the southwest should be composited into another sample. The monitoring wells should be completed a minimum of 15 feet into the surficial aquifer, if possible, and screened from two feet above the water level to the bottom of the wells. Well locations and elevations should be surveyed and water levels taken prior to sampling.

3.2.5 Site 8, Boresite Range Hazardous Waste Storage/Fire Fighting Training Area. Soil samples are recommended in the area where the drums of hazardou waste were stored and from the area surrounding the burning pits. Four

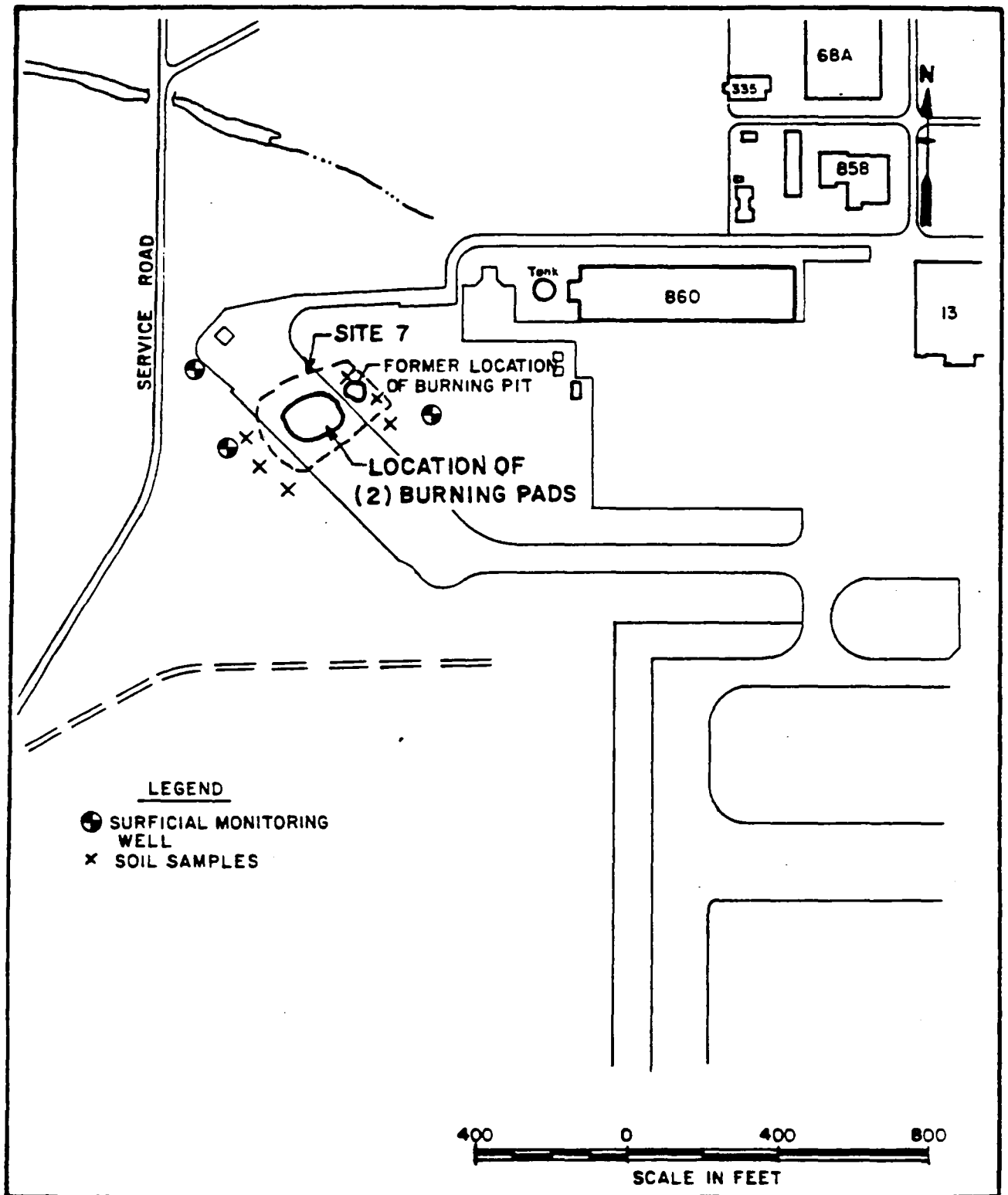


FIGURE 3-3

Site 7
Recommended
Sampling Locations

INITIAL ASSESSMENT STUDY
NAVAL AIR STATION
CECIL FIELD

surficial ground water monitoring wells are also recommended to detect contaminant migration at the site. One upgradient surficial monitoring well is also recommended. Two sediment and one surface water samples from the drainage ditch are also recommended to determine if contaminants have migrated to the drainage ditch. The proposed sampling locations are shown in Figure 3-4.

Type of Samples:	Ground water, soil, sediment, surface water
Ground Water Monitoring Wells:	Five
Sampling Frequency:	Ground water: Quarterly for one year Surface water: Quarterly for one year Sediment and soil: One time only
Number of Samples:	Ground water: 20 Surface water: Four Sediment: Two Soil: Seven
Testing Parameters:	Scan GC/FID with capillary column for MEK, trichloroethylene, toluene and xylene; COD; TOC; TOX; cadmium, chromium, lead; oil and grease; specific conductance; pH

Remarks: All soil samples should be taken to a depth of one foot. A pattern similar to the one shown in Figure 3-4 is recommended. The three soil samples to the west of the two northern-most burning pits can be composited into one sample. Similarly, the three soil samples to the west of the southern-most burning pit can be composited into one sample. Five composite soil samples, marked A through E on Figure 3-4, should be obtained from the hazardous waste storage area. Two 18-inch sediment cores should be taken from the drainage ditch. At each sediment sampling location, the entire 18 inch core should be composited for analysis purposes. The monitoring wells should be completed a minimum of 15 feet into the surficial aquifer, if possible, and screened from two feet above the water level to the bottom of the wells. Well locations and elevations should be surveyed and water levels taken prior to sampling.

3.2.6 Site 11, Golf Course Pesticide Disposal Area. Three surficial monitoring wells are recommended to detect containment migration at the site. Soil samples from the northern and southern portion of the site are also recommended. The proposed sampling locations are shown in Figure 3-5.

Type of Samples:	Ground water and soil
Ground Water Monitoring Wells:	Three
Sampling Frequency:	Ground water: Quarterly for one year Soil: One time only
Number of Samples:	Ground water: 12 Soil: Two
Testing Parameters:	Scan GC/FID with capillary column for organic compounds; scan GC/ECD fo pesticides; COD; TOC; TOX; specific conductance; pH

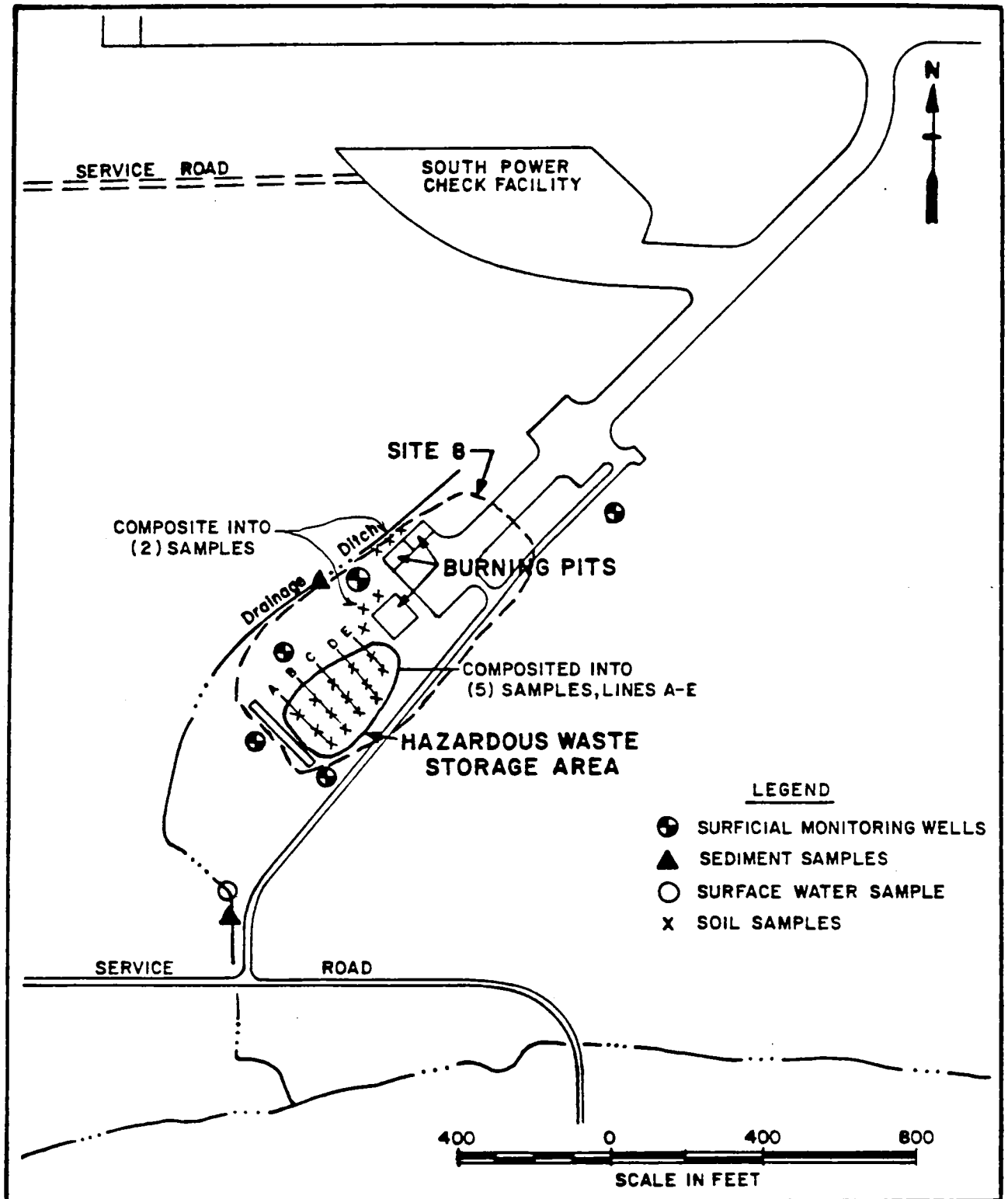


FIGURE 3-4

Site 8
Recommended
Sampling Locations

INITIAL ASSESSMENT STUDY
NAVAL AIR STATION
CECIL FIELD

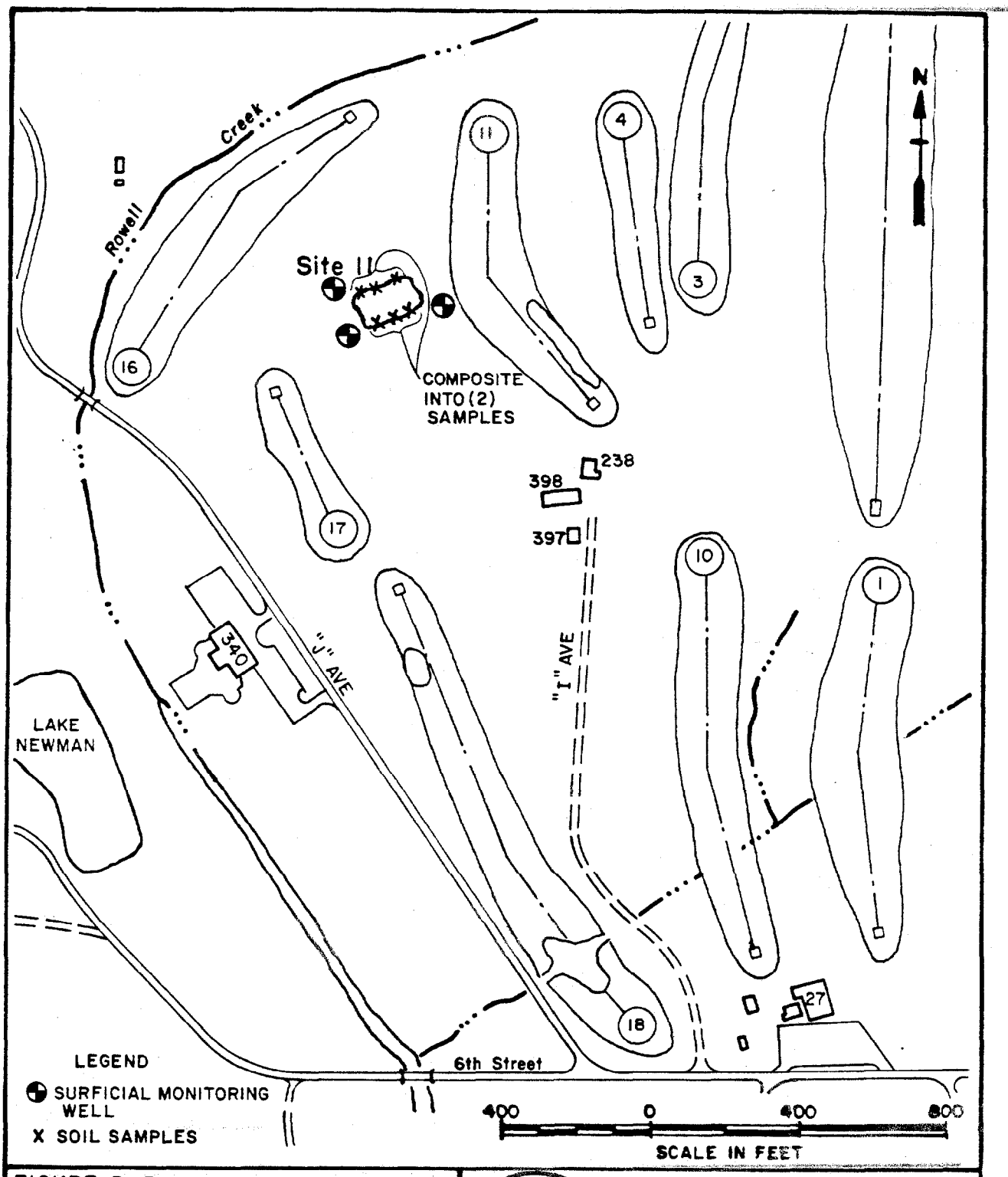


FIGURE 3-5

Site 11
Recommended
Sampling Locations

INITIAL ASSESSMENT STUDY
NAVAL AIR STATION
CECIL FIELD

Remarks: The monitoring wells should be completed a minimum of 15 feet into the surficial aquifer, if possible, and screened from two feet above the water level to the bottom of the well. Well locations should be surveyed and water levels taken prior to sampling. The soil samples should be taken to a depth of one foot. The three northern-most soil samples should be composited into one sample, and the three southern-most soil samples should be composited into one sample. A general organics scan is recommended because of the wide variety of compounds potentially present at the site.

3.2.7 Site 16, AIMD Seepage Pit. It is recommended that three surficial monitoring wells be installed at the site to detect contaminant migration from the seepage pit. In addition, it is recommended that a sediment sample be taken from the drainageway which received discharge from the seepage pit. The proposed sampling locations are shown in Figure 3-6.

Type of Samples:	Ground water and sediment
Ground Water Monitoring Wells:	Three
Sampling Frequency:	Ground water: Quarterly for one year Sediment: One time only
Number of Samples:	Ground water: 12 Sediment: One
Testing Parameters:	Scan GC/FID with capillary column for MEK, trichloroethylene, toluene, phenol, methylene chloride and cresol; COD; TOC; TOX; cadmium, chromium, silver, lead, cyanide; oil and grease; specific conductance; pH

Remarks: The monitoring wells should be completed a minimum of 15 feet into the aquifer and screened from two feet above the water level to the bottom of the wells. The well locations and elevations should be surveyed and water levels taken prior to sampling. The drainage ditch which received discharge from the seepage pit should be identified through a dye study and sampled. The sediment core should be taken to a depth of 18 inches and composited.

3.2.8 Site 17, Oil/Sludge Disposal Pit Southwest. It is recommended that one surficial monitoring well be installed at the site to detect contaminant migration toward Rowell Creek. An existing surficial well in the immediate vicinity of the site can also be used in the sampling program. The existing well is constructed of two inch diameter Schedule 40 PVC. The proposed sampling locations are shown in Figure 3-1.

Type of Samples:	Ground water
Ground Water Monitoring Wells:	Two
Sampling Frequency:	Quarterly for one year
Number of Samples:	Eight
Testing Parameters:	Scan GC/FID with capillary column for MEK, trichloroethylene, toluene and xylene; COD; TOC; TOX; cadmium, chromium, lead; oil and grease; specific conductance; pH

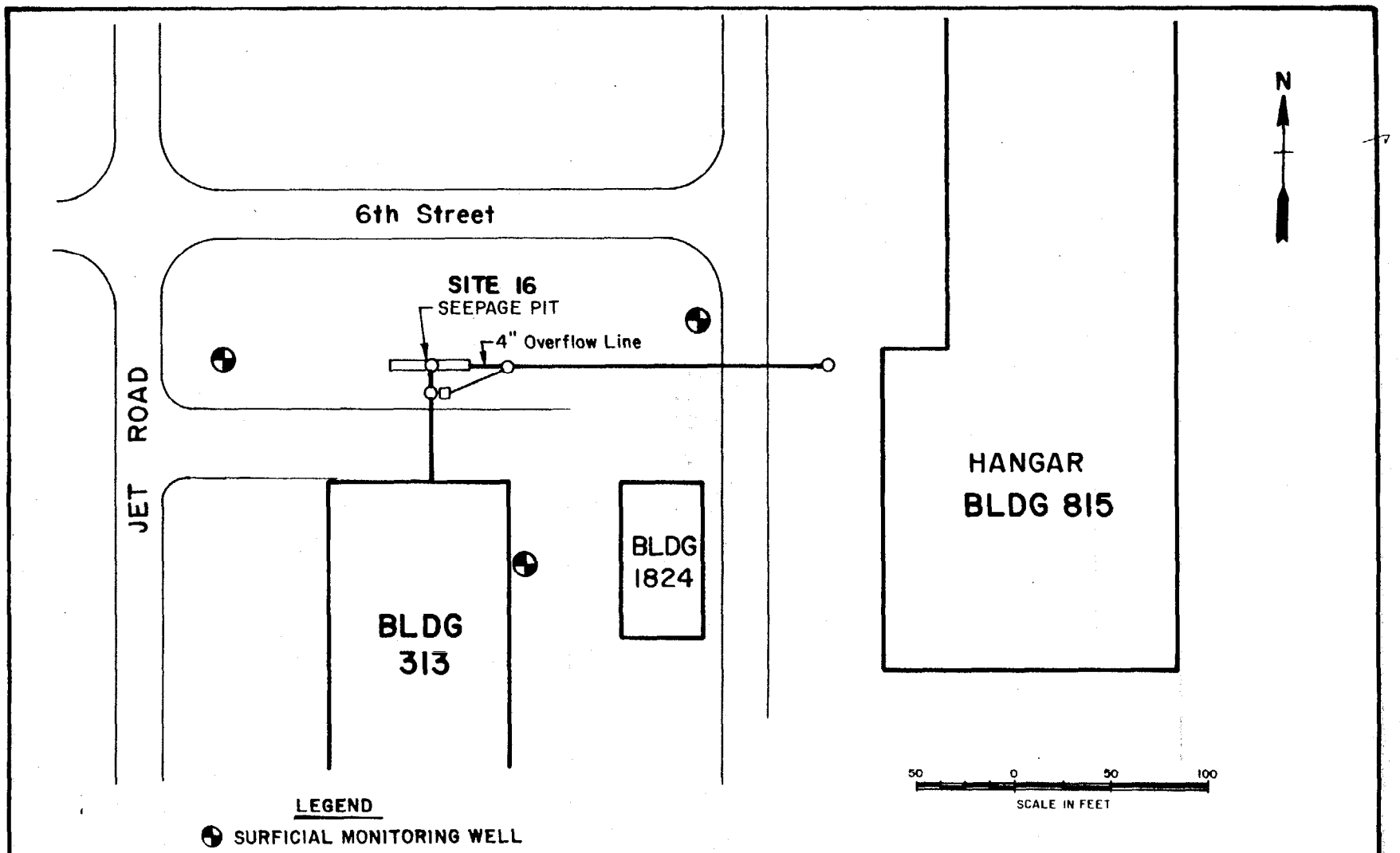


FIGURE 3-6

Site 16

Recommended Sampling Locations

INITIAL ASSESSMENT STUDY
NAVAL AIR STATION
CECIL FIELD

Remarks: The monitoring wells should be completed a minimum of 15 feet into the aquifer, if possible, and screened from two feet above the water level to the bottom of the well. The well locations and elevations should be surveyed and water levels taken prior to sampling.

3.2.9 General Confirmation Study Recommendations. A background sediment and surface water sample from Rowell Creek are recommended. The background samples should be obtained from Rowell Creek where it enters Cecil Field. This is upgradient of all the disposal sites.

Type of Samples:	Sediment and surface water
Sampling Frequency:	Sediment: One time only; Surface water: Quarterly for one year
Number of Samples:	Sediment: One Surface Water: Four
Testing Parameters:	Scan GC/FID with capillary column for MEK, trichloroethylene, toluene and xylene; scan GC/ECD for pesticides; COD; TOC; TOX; pH; cadmium, chromium, lead; oil and grease; specific conductance

3.3 OTHER RECOMMENDATIONS. All eighteen sites identified in this study should be documented and labeled on future installation maps.

3.3.1 Site 18, Ammunition Disposal Area. It is recommended that any further investigation of this site should be at the discretion of the NAS Weapons Department and EOD.

CHAPTER 4. BACKGROUND

4.1 GENERAL. This chapter presents an overview of Naval Air Station (NAS) Cecil Field. General background information about NAS Cecil Field is included in this chapter with other pertinent information including its history, adjacent land use, climatology, topography, geology, soils, hydrology, biological features, and contaminant migration potential.

4.1.1 Location. NAS Cecil Field is located in the northeastern portion of Florida, mainly within Duval County with only the southern most portion dipping into Clay County. Downtown Jacksonville is approximately 14 miles northeast of the installations main entrance. The Georgia State line is located approximately 15 miles to the north. A general location map is shown in Figure 4-1.

NAS Cecil Field has grown since its beginning in 1941 to where it now occupies over 20,000 acres. NAS Cecil Field can be divided into three distinct areas: Cecil Field which occupies 9,516 acres, the Yellow Water Weapons Department which occupies 8,091 acres, and Outlying Landing Field (OLF) Whitehouse which occupies 2,492 acres. The Naval air station and the weapons department are bisected by state road 228, effectively separating the two areas (Figure 4-2). OLF Whitehouse, which is approximately seven miles north of the main entrance, is shown in Figure 4-3.

4.1.2 Tenant/Host Relationship. The official mission of NAS Cecil Field is to provide facilities, services, and material support for the operation and maintenance of naval weapons and aircraft to activities and units of the operating forces as designated by the Chief of Naval Operations. Some of the tasks required to accomplish this mission include 1) operation of fuel storage facilities, 2) provision of facilities and performance of organizational level aircraft maintenance, 3) provision of facilities and performance of intermediate level aircraft maintenance, 4) maintenance and operation of an engine repair facility and test cells for designated turbo-jet engines, and 5) provide special weapons support.

NAS Cecil Field is under the command of Commander, Sea Based Anti-Submarine Warfare Wings, Atlantic. The line of command continues up to the Commander, Naval Air Force, United States Atlantic Fleet to the Chief of Naval Operations. The station is comprised of 11 Departments, the Navy Exchange, and 7 special assistants and staff offices. The station is also host activity to 24 tenant activities, 20 supported activites, and five non-governmental activities. Station organizational structure is outlined in Figure 4-4. The tenant and supported activities are listed in Table 4-1. The host activities are presented below, with a brief description of their operations or responsibilities.

The Administration Department provides general administrative services for the command; operates the centralized portion of the activity mail, files, correspondence, directives, duplicating, and messenger systems, and exercises technical coordination of such systems and services throughout the activity; administers the military personnel program; operates station and fleet policy, and procedures for safeguarding classified materials, and monitors compliance therewith.

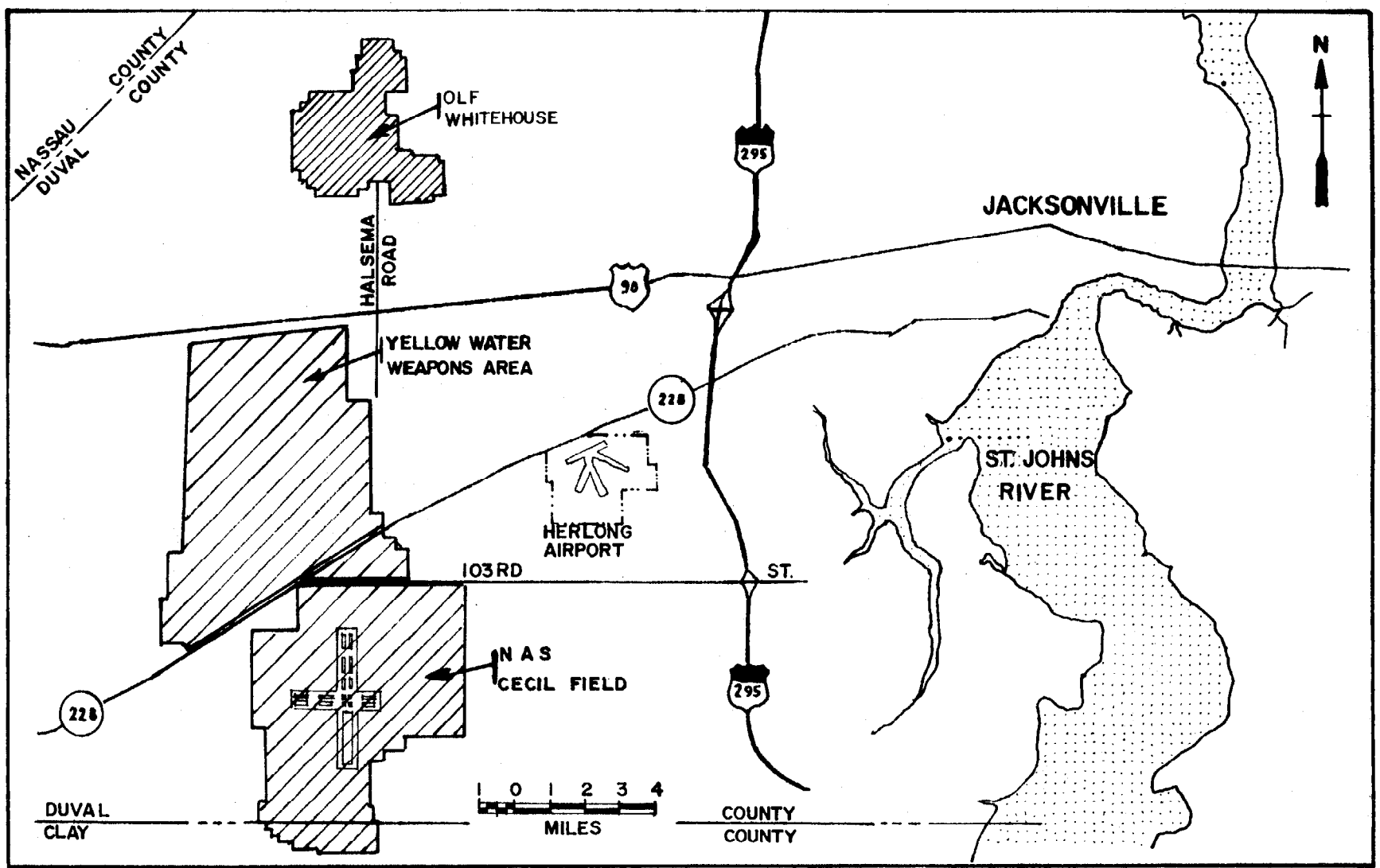


FIGURE 4-1

VICINITY MAP

INITIAL ASSESSMENT STUDY
NAVAL AIR STATION
CECIL FIELD

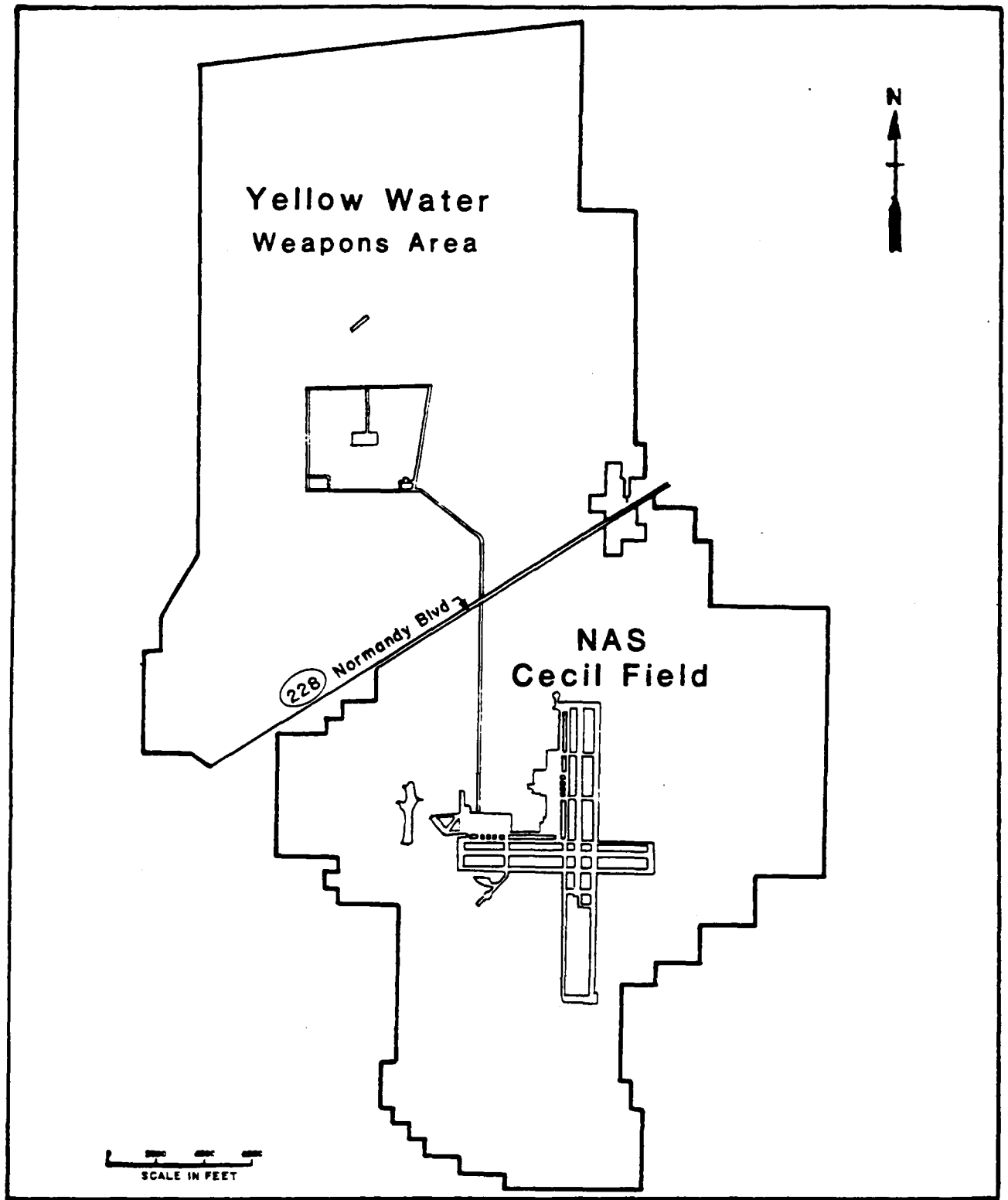


FIGURE 4-2

Cecil Field and
Yellow Water Weapons Area

INITIAL ASSESSMENT STUDY
NAVAL AIR STATION
CECIL FIELD

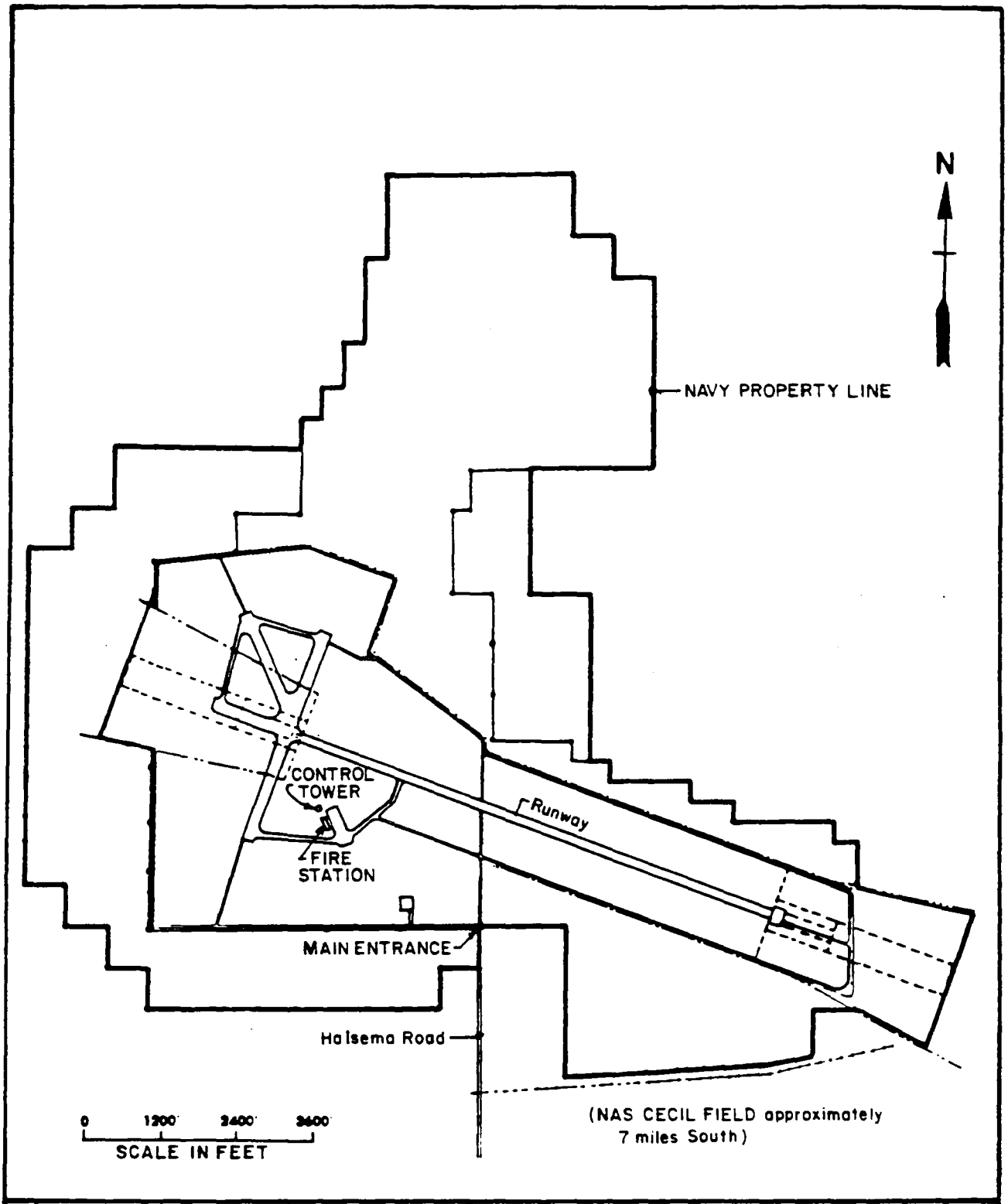


FIGURE 4-3

Outlying Landing Field

WHITEHOUSE

INITIAL ASSESSMENT STUDY
NAVAL AIR STATION
CECIL FIELD

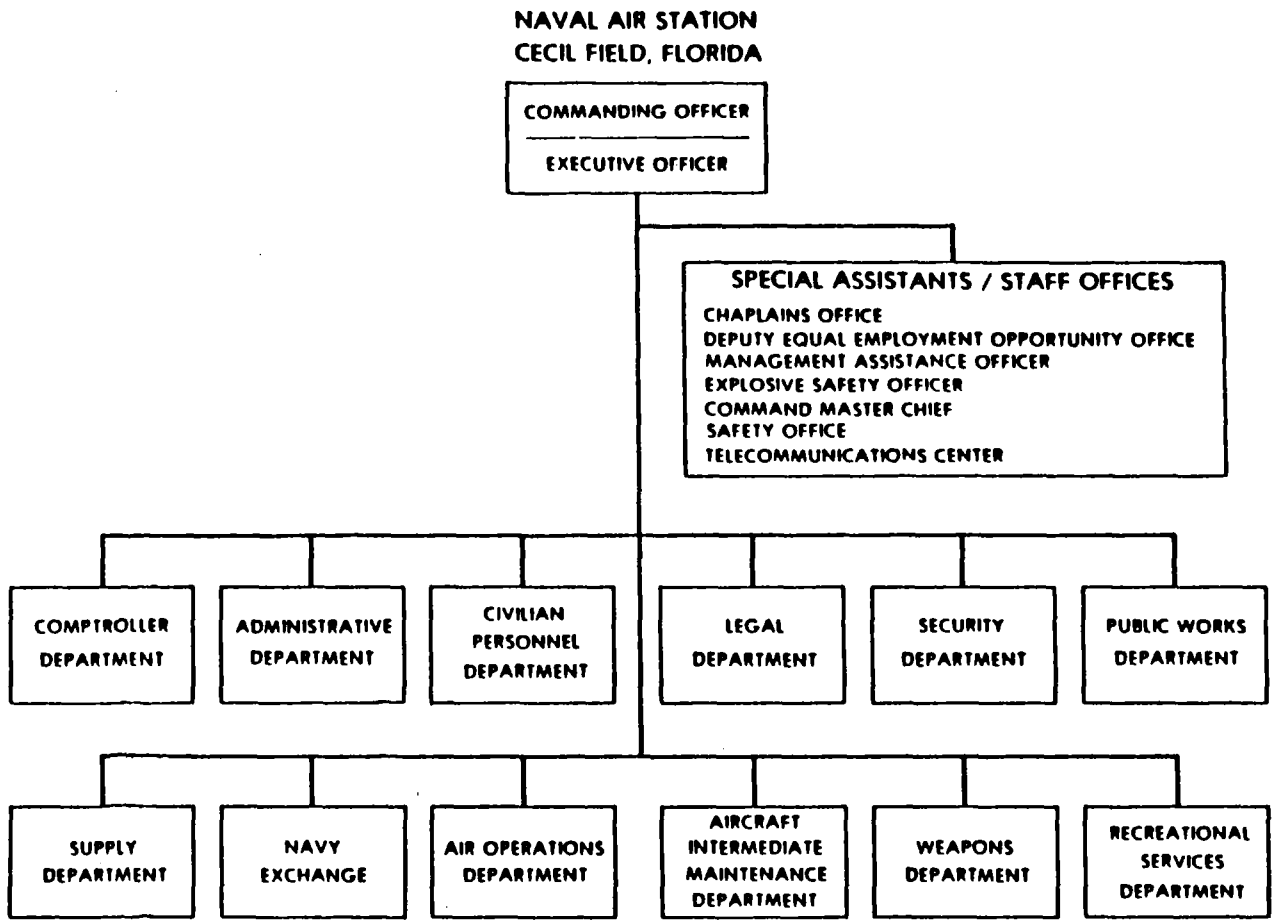


FIGURE 4-4

ORGANIZATIONAL STRUCTURE

INITIAL ASSESSMENT STUDY
NAVAL AIR STATION
CECIL FIELD

Table 4-1

Tenant and Supported Activities

Tenant Activities:

1) Naval Oceanography Command Detachment.
2) Naval Air Maintenance Training Group Detachment.
3) Explosive Ordnance Disposal Detachment.
4) Detachment Cecil Field, Fleet Aviation Specialized Operational Training Group.
5) Naval Aviation Engineering Service Unit Detachment.
6) Resident Officer in Charge of Construction.
7) Personnel Support Detachment.
8) Navy Commissary Store Branch, NAS Jacksonville.
9) Defense Property Disposal Office Branch.
10) Dispensary, NAS Cecil Field Branch, Navy Regional Medical Center, Jacksonville.
11) Marine Barracks, NAS Cecil Field.
12) Fleet Air Intelligence Support Center, Cecil Field.
13) COMLATWING 1.
14) COMAIRASWING 1.
15) United States Post Office.
16) Naval Regional Dental Center, Jacksonville, Cecil Field Branch.
17) Homeported and transient commands and units of the operating Forces.
18) Atlantic Fleet Audio Visual Center Detachment, Cecil Field.
19) Area Transportation Branch Office.
20) Marine Air Reserve Training Detachment.
21) Naval Air Reserve Unit Attack Squadron 203.
22) Naval Air Reserve Unit Attack Squadron 1074.
23) Navy Campus for Achievement.
24) Naval Investigative Service.

Supported Activities:

1) Defense Property Disposal Office, Jacksonville Site.
2) Navy Finanace Office.
3) Navy Commissary Store.
4) Navy Regional Medical Center.
5) Defense Contract Administration Services Plant Representative Office.
6) FAA Airways Facilities.
7) Naval Oceanography Command Detachment.
8) Naval Aviation Engineering Service Unit.
9) ROICC.
10) Naval Investigative Service.
11) Navy Campus for Achievement.
12) Naval Education Training Program Development Center.
13) Naval Regional Dental Center.
14) Naval Air Reserve Unit.
15) Explosive Ordnance Disposal Detachment.
16) Fleet Aviation Specialized Operational Training Group.
17) Atlantic Fleet Audio-Visual Center.
18) Counseling and Assistance Center.
19) Naval Air Maintenance Training Group Detachment.
20) Air Anti-Submarine Support Unit.

The Recreational Services Department develops, conducts, and provides varied leisure time programs, and provides efficient management of lands, facilities, and personnel necessary to administer these programs.

The Comptroller Department develops, coordinates, and maintains an integrated system of staff services in the financial management area that will provide to the commanding officer the factual data essential for effective management control. The department also exercises internal review of financial operations and systems, and encourages, advises, and assists station managers in improving financial management techniques.

The Civilian Personnel Department adminsters and develops the activity civilian personnel program, a labor relations program, employment policies and procedures, and wage and classification policies and procedures.

The Security Department is responsible for protection of life and property within the confines of the station by providing police, investigative, and visitor control services. The department coordinates activities of the Alert Security Force, Anit-Sabotage Force, and Civil Disturbance Force. The department also maintains liaison with other Military Security Departments, Military Investigative Services, city, county, state and federal law enforcement agencies.

The Aircraft Intermediate Maintenance Department (AIMD) performs intermediate level maintenance on all station aircraft, tenant squadron and units aircraft, and provide material and associated support equipment and training. AIMD activities are described in detail in Chapter 5.

The Branch Dental Clinic provides dental care to active duty, military, and other eligible beneficiaries in the Jacksonville, Florida area.

The Supply Department provides material support and data processing support to station departments, Fleet Squadrons, and other tenant commands. The department also operates bulk petroleum, liquid gases, and high speed refueling facilities.

The Air Operations Department operates airfield facilities and provides services to support operations of station, tenant, and transient aircraft. The department also operates and maintains OLF Whitehouse, and maintains limited air terminal facilities.

The Public Works Department is responsible for station construction and development, and for maintenance, operation, and repair of all public works and utilities, and transportation equipment and facilities. The department administers the housing program and operates and maintains public quarters.

The Weapons Department procures, receives, stores, tests, and maintains air launched ordnance items; operates small arms firing ranges, and is responsible for explosive ordnance and special weapons disposal.

The Navy Exchange provides a convenient source from which authorized patrons may obtain articles and services required for their well-being.

4.1.3 Adjacent Land Use. The area surrounding the station is rural in character and sparsely populated. The only appreciably sized city within the area is Jacksonville, which lies approximately 14 miles to the northeast

(SOUTHNAVFACENGCOM, 1981). Primarily, the surrounding land is used for forestry with some light agriculture and ranching occurring. Small communities and scattered dwellings associated with these activities are found in the vicinity. A small residential area on Nathan Hale Road, which abuts the Cecil Field property to the west, typifies these rural communities.

The nearest incorporated municipality is the town of Baldwin, whose center lies approximately 6.4 miles to the northwest of the NAS main gate.

Eastward, the rural surroundings intergrade into a suburban fringe which borders the major east-west roadways. Low intensity commercial use, such as convenience stores, and low density residential areas characterize the land use (Jacksonville Area Planning Board, 1979).

Herlong Airport lies approximately 4.5 miles to the northeast of Cecil Field along State Road 228. Beyond this point, the region becomes more urbanized approaching Jacksonville (Jacksonville Area Planning Board, 1979).

A development, Villages of Argyle, is planned for future construction. It will consist of seven separate villages or communities which will ultimately abut Cecil Field to the south and southeast (SOUTHNAVFACENGCOM, 1981).

OLF Whitehouse is approximately seven miles to the north of Cecil Field. The land north and west of the property is characterized as rural, but is predominantly forested. Cary State Forest is five miles to the northwest. To the east is a small industrialized area, part of a future industrial/residential development called Westlake (SOUTHNAVFACENGCOM, 1981). The rural community of Whitehouse is nearly adjacent to OLF Whitehouse (SOUTHNAVFACENGCOM, 1981), while the rural community of Helsema is approximately 1.8 miles to the south.

Due to the current rural nature of the adjacent lands, the surrounding off base areas are not anticipated to be major sources of potential contamination to on-base areas. There are no known sources of contamination reported for these areas which can be expected to impact on-base areas, although septic tanks in these areas may contaminate the surficial aquifer.

As discussed in detail in Section 4.6, off-base impacts from potential on-base sources of contamination would be primarily associated with drainage ditches or creeks which could carry contaminants off Navy property.

4.2 HISTORY. The history of NAS Cecil Field began in 1941, just prior to United States involvement in World War II. Operations at NAS Jacksonville had increased tremendously in order to handle the influx of student pilots, but more facilities were needed. The Navy purchased 2,600 acres of forest and farm land in Southwestern Duval County in June of 1941. In December of the same year, flight operations began, and the new air field was commissioned Naval Auxiliary Air Station (NAAS) Cecil Field, in honor of Commander Henry Barton Cecil, USN, who died in the crash of the dirigible Akron in 1933. At this time, Cecil Field had a 2,000 foot circular landing mat, two maintenance hangers (Buildings 13 and 14), and a small number of buildings for administration, maintenance, and living quarters. As the United States became more heavily involved in the war, the naval flight training program expanded. Four 5,000 foot runways were constructed, tangential to the landing mat to meet the needs of training pilots for combat flight operations. Cecil Field continued to operate at full capacity for the remainder of the war, but was reduced to caretaker status at the end of the war.

In November of 1948, NAAS Cecil Field was selected as homeport for two carrier air groups consisting of approximately 200 aircraft. Carrier Air Group 17 arrived in January of 1949, with the first jet squadron to be based in Northern Florida. Carrier Air Group One and Fleet Aircraft Service Squadron Nine reported in February. At this time, NAAS Cecil Field was again fully operational. Training operations escalated in 1950 due to the outbreak of hostilities in Korea.

Cecil Field was one of four bases selected in 1950 for development under a plan proposed by Captain R.W.D. Woods for the establishment of a small number of master jet bases. In 1951, an additional 2,000 acres of forest land was purchased, and four 8,000 foot runways were constructed. On June 30, 1952, NAAS Cecil Field was re-designated as NAS Cecil Field. A program of expansion, begun in 1952, has continued with over 20,000 acres now occupied by the station. In 1960, Naval Magazine Yellow Water was commissioned as a separate command. In 1961, it was incorporated with Cecil Field as the Weapons Department, Yellow Water. In 1967, the construction of Hangar 824 brought a great increase in the station's capabilities with AIMD and a multi-million dollar jet engine repair facility. The station now employs over 9,000 military and civilian personnel, and handles approximately 300,000 take-offs and landings per year.

4.3 LEGAL ACTION. The only environmental-related legal action taken against NAS Cecil Field was in relation to a 497,000 gallon fuel spill in 1981. As a result of this spill, the Florida Department of Health, Welfare, and Bio-Environmental Services cited the Commanding Officer of NAS Cecil Field for water quality violations. The Navy was assessed the cost of an environmental survey to assess the damage done by the spill and fined.

4.4 BIOLOGICAL FEATURES.

4.4.1 Ecosystems. Two major terrestrial habitat types predominate in Duval County west of the St. Johns River. The pine flatwoods association constitutes the largest percentage of land area with the sandhill community comprising the majority of the remaining area (Davis, 1980). Accordingly, these habitat types comprise the majority of the NAS property. Two other habitat types are represented at the NAS. These are the swamp forest association found along the natural drainages, and the freshwater habitats of the creeks and lakes. Each of these is discussed below.

4.4.1.1 Pine Flatwoods. The pine flatwoods are the most extensive forest in Duval County (Jacksonville Area Planning Board, 1980). The soils are sandy with a moderate amount of organic matter in the top few centimeters and an acid, organic hardpan 0.3 to 1.0m (1-3 feet) beneath the surface. This hardpan reduces rainfall percolation, reduces the upward movement of water, and impedes root penetration during droughts (Ward, 1979). Thus, standing surface water is common during the rainy season (Jacksonville Area Planning Board, 1980).

Three major types of flatwoods occur in Florida: Longleaf pine (*Pinus palustris*) flatwoods found in well-drained sites and characterized by having longleaf pine as the dominant overstory tree, slash pine (*P. elliottii*) flatwoods with slash pine as the dominant overstory species and usually in areas of intermediate wetness, and pond pine (*P. serotina*) flatwoods with the pond pine as the dominant tree species and typical in poorly drained areas (Ward, 1979).

Considerable overlap in understory plants exists among the three major types of flatwoods, with many species found in all three communities. Generally, however, gallberry (Ilex glabra) and saw palmetto (Serenoa repens) dominate the understory in slash pine flatwoods; wiregrasses (Aristida spp.) and runner oaks (Quercus pumila) are especially prevalent in longleaf pine flatwoods; and rusty lyonia (Lyonia ferruginea) and several of the bay trees are characteristic of pond pine areas. Flatwoods also often include intermingled cypress domes, bayheads, and small titi swamps (Ward, 1979).

Vast acreages of pine flatwoods have been planted and managed for timbering (Jacksonville Area Planning Board, 1980) in Duval County. The NAS began a forestry program in 1963 and have reforested 97 percent of the area with slash pine (SOUTHNAVFACENGCOM, 1981), now making the slash pine flatwoods the predominant community type for the NAS vicinity. Vegetation chracteristic of disturbed locations now inhabits many of the cleared areas, formerly slash pine flatwoods: fennel (Eupatorium sp.), beggar's tick (Bidens sp.), greenbriar (Smilax sp.), sandbur (Cenchrus sp.), and rattlebox (Sesbania sp.).

4.4.1.2 Sandhill Community. Sandhill communities occur on well-drained, white to yellowish sands. Formerly longleaf pines (P. palustris) formed the overstory while a variety of oaks (Quercus spp.) formed the understory in mature natural stands (Ward, 1979). However, due to forestry and prevention of fires, the oaks in many cases became predominant and prevented the reestablishment of the pine. When this situation is perpetuated, the sandhill community becomes similar to a xeric or mesic hammock, with a dense stand of oaks and changes in the growth and development of the underbush (Jacksonville Area Planning Board, 1980). This situation occurs infrequently at the NAS. Many of the former sandhill areas, due to recent activities, are presently predominated by species characteristic of disturbed areas: fennel, beggar's tick, greenbriar, sandbur, and rattlebox.

4.4.1.3 Swamp Forest Association. This association is predominated by deciduous hardwoods bordering rivers and creeks where the forest floor is saturated or submerged during part of the year (Ward, 1979). The southern portion of Rowell Creek, Sal Taylor Creek, and some of its lesser tributaries to the east, and Yellow Water Creek typified this association at the NAS. Red maple (Acer rubrum), water oak (Quercus nigra), swamp bay (Persea palustris) and sweet gum (Liguidamber styraciflua) were common along these drainages. Occasional bayheads scattered about in the pine flatwoods harbored many of the same species stated above as well as an occasional bald cypress (Taxodium distichum).

4.4.1.4 Aquatic Habitat. A number of small creeks, totaling about eight miles, meander throughout the NAS property (SOUTHNAVFACENGCOM, 1981). These include Yellow Water Creek, Sal Taylor Creek and Rowell Creek, as well as a number of lesser drainages. Two man-made lakes are located on the property, Newman Lake and Lake Fretwell, a part of the Rowell Creek drainage. OLF Whitehouse also has some drainages and ponds which feed into McGirts Creek, a principal drainage for the Whitehouse area (SOUTHNAVFACENGCOM, 1981). The vegetation associated with natural drainages is the swamp forest type discussed above. Cattails (Typha sp.) fringe much of the lake shoreline. These waters are classified as Class III Waters (Recreation, Propagation and Management of Fish and Wildlife) by the State of Florida Department of Environmental Regulation.

4.4.1.5 Fauna. The 15,503 acres of forested land at the NAS provides ample food and cover for a number of species. A variety of mammals are present in the forest and mixed habitats surrounding the NAS, and include: whitetail deer (Odocoileus virginianus), nine-banded armadillo (Dasypus novemcinctus), squirrels (Sciurus spp.), raccoon (Procyon lotor), oppossum (Didelphis virginiana), spotted skunk (Spilogale putorius), striped skunk (Mephitis mephitis), rabbits (Sylvilagus spp.), gray fox (Urocyon cinereoargenteus), wild hog (Sus scrofa), and bobcat (Lynx rufus). Among the larger predators, the Florida black bear (Ursus americanus floridanus) is known to utilize the outlying portions of the NAS property, while the Florida panther (Felis concolor coryi), though not recorded at the NAS, has been observed in Duval County (Roy G. Weston, Inc., 1978).

Important upland game birds known to be present at the NAS are the wild turkey (Meleagris gallopavo), which was observed on two occasions during the on-site survey, and the bobwhite or quail (Colinus virginianus). Both are hunted by local sportsmen. The ample forested areas provide roosting, nesting, and feeding areas for a variety of avifauna including hawks, owls, woodpeckers, and common songbirds (Jacksonville Area Planning Board, 1980). The drainages and lakes provide foraging areas for a variety of wading birds and water fowl. A number of great egrets (Casmerodius albus) were observed foraging along the mud flats of Lake Fretwell during the initial assessment visit. Ospreys (Pandion haliaetus) could be expected to prey on fish in Lake Fretwell on occasion. Scavenging birds such as the black vulture (Coragyps atratus) and the American crow (Corvus brachyrhynchos) are opportunistic feeders at the NAS.

Among the important herpatofauna, the gopher tortoise (Gopherus ployphemus) was found to be common at the NAS. The burrows of this tortoise provide domicile for other species of concern: the eastern indigo snake (Drymarchon corais) and the Florida gopher frog (Rana areolata); eastern diamondback rattlesnakes (Crotalus adamateus) are known to frequent these burrows as well. A variety of other snakes, lizards, and turtles frequent the terrestrial habitats afforded by the NAS. Among these, an eastern glass lizard (Ophisaurus ventralis), a southern racer (Coluber constrictor priapus), fence lizards (Sceloporus undulatus), and an eastern box turtle (Terrapene carolina) were observed during the site visit.

Associated with the drainage is the protected American alligator (Alligator mississippiensis), reported to occur in the waters on the NAS, and a variety of turtles. A number of unidentified frogs (Rana spp.) were observed along Lake Fretwell.

The numerous species of fish and invertebrates indigenous to the Yellow Water and Black Creek drainages are presumed to inhabit the creeks and lakes at the NAS. Largemouth bass (Micropterus salmoides), redear sunfish (Lepomis microlophus), bluegill (Lepomis macrochirus), and the mosquito fish (Gambusia affinis) are known to occur at the NAS. Among the invertebrates, crayfish, (Procambarus spp.) are expected to be common.

4.4.2 Endangered, Threatened and Rare Species. The U.S. Endangered Species Act of 1973 (16 USC 1531), the Florida Endangered and Threatened Species Act of 1977 (Section 372.072, Florida Statutes), and the Preservation of Native Flora of Florida Act (Section 581.185-187, Florida Statutes) have each promulgated a list of animal and plant species which are protected in the State of Florida and addressed on the following lists: List of Endangered and

Threatened Wildlife and Plants (50 CFR 17.12-12), Official Lists of Endangered and Potentially Endangered Fauna and Flora in Florida (Section 39-27.03-05, Florida Administrative Code and Section 581.185-187, Florida Statutes). Under Florida Law, endangered and threatened species are defined as follows:

> "Endangered species" means any species of fish and wildlife naturally occurring in Florida whose prospects of survival is in jeopardy due to modification or loss of habitat; over-utilization for commercial, sporting, scientific or educational purposes; disease; predation; inadequacy of regulatory mechanisms; or other natural or man-made factors affecting its continued existence.
>
> "Threatened species" means any species of fish and wildlife naturally occurring in Florida which may not be in immediate danger of extinction, but exists in such small populations as to become endangered if it is subjected to increased stress as a result of further modification of its environment.

The category of "species of concern" is addressed in the Florida Administrative Codes (Section 39-27.02-05) and is best defined by the Florida Committee on Rare and Endangered Plants and Animals (FCREPA) as those species relatively abundant and widespread, but vulnerable to certain types of exploitation or environmental changes, and thus, have experienced a slow decline in numbers." This category may also be defined as a species with a potential effect on other species considered endangered or threatened.

FCREPA also applies a category of rare to a number of species having a limited geographic distribution, special habitat requirements, or occurring at the periphery of their range.

These status designations are applied to the species in the sections which follow on fauna and flora.

4.4.2.1 Fauna. There are 37 species of animals in Florida that are presently on the U.S. Fish and Wildlife Service (USFWS) list of endangered or threatened species. Eleven of these have the potential to be in the region of NAS Cecil Field. Florida Game and Fresh Water Fish Commission's (FGFWFC) list of endangered or threatened species contains an additional 29 species. Four of these have ranges which may include the study area. FCREPA's inventory of important fauna includes 55 endangered, 146 threatened and 73 rare species (274 total). From the FCREPA list, 19 additional species, not included on the federal or state listings, have ranges that may encompass the area of concern. Interviews and site investigations revealed that at least three of these species presently occur at the NAS. Each of the species habitat requirements, etc., is addressed below. The parenthetical references after USFWS in the text which follows identifies the most recent date the notice or rule-making action concerning each species appeared in the Federal Register.

The shortnose sturgeon (*Acipenser brevirostrum*) has been recorded only on one occasion in the upper reaches of the St. Johns River, Florida. It generally ranges from southern New Burnswick, Canada, southwards along the eastern seaboard, rarely occurring south of South Carolina. This species prefers estuarine conditions and can be found along the coastline and near the low reaches of coastal rivers. Spawning takes place in the fresh water of t

upper portions of the major coastal rivers. There is no evidence of spawning in the St. Johns River (Gilbert, 1978). This species is considered endangered by the FGFWFC (Wood, 1984), USFSW (32 FR 4001; March 11, 1978) and FCREPA. While this species would not be present at the NAS, the creeks exiting from the property ultimately drain to the St. Johns via the Yellow Water and Black Creeks.

The Atlantic sturgeon (Acipenser oxyrhynchus) ranges from the coast of Labrador in Canada along the eastern seaboard to northeast Florida. The western subspecies continues along the coastline from west-central Florida to Louisiana. The eastern subspecies of can be found on rare occasions in the St. Johns River. This species spawns in freshwater, however, the available literature does not mention whether this activity occurs in the St. Johns (Gilbert, 1978). This species is considered threatened by FCREPA. FGFWFC (Wood, 1984) lists this fish as a species of special concern. The USFWS still has the Atlantic sturgeon under review. While this species would not be present at the NAS, the creeks exiting from the property ultimately drain to the St. Johns via the Yellow Water and Black Creeks.

The sea lamprey (Petromyzon marinus) is considered a pest farther to the north, causing the collapse of some fish populations. Northeast Florida represents the southern limit of its range. This parasitic species has been recorded along the St. Johns River as far south as Seminole County, however, its presence is only occasional (Gilbert, 1978) and thus it is considered rare by FCREPA. While this species is not expected to occur at the NAS, the creeks exiting from the property ultimately drain to the St. Johns via the Yellow Water and Black Creeks.

An isolated population of the snail bullhead (Ictalurus brunneus) occurs in the middle reaches of the St. Johns River system. The major population of the snail bullhead ranges northeasterly in a band from the Apalachicola system of the Florida panhandle to the central portion of North Carolina. This species' preferred habitat is characterized by hard, rocky bottom streams with moderate to swift currents. Here, the bullhead specifically utilized the holes and flowing pools (Gilbert, 1978). FCREPA categorizes this bullhead as rare. While this species probably does not occur at the NAS, the creeks exiting the property ultimately drain to the St. Johns via the Yellow Water and Black Creeks.

While the mountain mullet (Agonostomus monticola) can be commonly found in Central and northern South America, it has a limited distribution throughout the southeastern United States. In Florida, it is occasionally found in the St. Johns River. A catadromous species, juvenile mountain mullet are found offshore, while the sub-adult and adult fish migrate to the upper reaches of tropical and subtropical streams (Gilbert, 1978). FCREPA considers this species rare, due to its scattered distribution in Florida waters. While not expected to be found on the NAS property, the creeks exiting the property ultimately drain to the St. Johns via the Yellow Water and Black Creeks.

The river goby (Awaous tajasica) is the only United States species of the family Gobiidae to spend most of its life in freshwater. It ranges throughout much of the Caribbean and Central America. Present records of its distribution are limited in Florida to three scattered localities - the area of St. Lucie/Indian River counties, Garnier's Creek in Okaloosa County, and the headwaters of the St. Johns River in Putnam County. This goby is found in streams with clear water, some current, sandy or hard mixed bottoms, and

scant vegetation (Gilbert, 1978). This species is listed as rare by FCREPA. Based upon present records in the literature, it is not known if this species would occur in waters affected by the NAS and the Black Creek drainage.

A species of special concern (FCREPA), dusky shiner (Notropis cummingsae), is included here because a disjunct population of this species occurs in the St. Johns River drainage (most recently Orange Creek). Elsewhere in its range, the dusky shiner inhabits a variety of river environments, and thus may be present at a number of localities along the St. Johns (Gilbert, 1978). Based upon present records in the literature, it is not known if this species would occur in waters affected by the NAS and the Black Creek drainage.

The gopher tortoise (Gopherus polyphemus) constructs its burrows in the dry, sandy soils afforded by sand pine, long leaf pine and live oak hammock communities. The tortoise is omnivorous, although the adults usually graze on grasses and herbs. The gopher tortoise is particularly important in that its burrow provides refuge to a number of other species, such as the gopher frog and indigo snake (McDiarmid, 1978). The gopher tortoise is considered threatened by FCREPA. FGFWFC (Wood, 1984) lists this as a species of special concern, while USFWS has it under review. A number of gopher tortoise burrows were observed at the NAS property, some in association with Sites 2 and 4. Bioaccumulation of potentially present toxic materials in the vegetation at these sites may be transmitted to this herbivore.

The spotted turtle (Clemmys guttata) is known from Ontario, Canada southwards along the eastern seaboard to northern Florida. It inhabits shallow woodland ponds, seasonal wetlands, and sloughs with abundant aquatic vegetation. They sometimes can be found in brackish water (McDiarmid, 1978). The spotted turtle is listed as rare by FCREPA. It is not known if this turtle occurs on the NAS, though suitable habitat is present.

The American alligator (Alligator mississippiensis) inhabits a wide variety of brackish and fresh water habitats throughout Florida. It is able to tolerate man-altered habitats, often occurring in lakes or canals in the middle of most urbanized settings. The alligator is an opportunistic feeder, but typically consumes fish, birds, and reptiles. Nesting begins in the late spring with the female constructing a mound nest of vegetation near to a body of water. The numbers of alligators have been increasing since it has become legally protected (McDiarmid, 1978). The USFWS (48 FR 46336; October 12, 1983) has reclassified the alligator from an endangered to a threatened status within the State of Florida. Both FGFWFC (Wood, 1984) and FCREPA consider the American alligator a species of special concern. It was reported by interviewees during the site visit that this reptile occurs on Navy property though specific locations were not given.

The eastern indigo snake (Drymarchon corais couperi) is found throughout the majority of peninsular Florida. This species is apparently tolerant of a wide variety of habitats-pine flatwood, moist tropical hammocks and, more typically, sandhill habitats. The indigo snake is one of many species known to utilize the burrow of the gopher tortoise for shelter. It feeds on a variety of prey species including venomous snakes (McDiarmid, 1978). This species is listed as threatened by both the USFWS (43 FR 4028; January 31, 1978) and FGFWFC (Wood, 1984). The FCREPA categorizes it as a species of special concern. Suitable habitat, including gopher tortoise burrows, is present at Cecil Field.

The Florida gopher frog (Rana areolata aesopus) is considered threatened by FCREPA and a species of special concern by FGFWFC (Wood, 1984); it is currently under review by USFWS. This species is found in the dry, well drained soils of sandhill communities, pine flatwoods and sand pine scrub. Although this frog can be found in a number of opportunistic living quarters (mouse burrows, post holes, etc), it more commonly utilizes the burrow of another protected species, the gopher tortoise. The gopher frog spends the majority of its life in terrestrial environs. During the breeding season, it will migrate to shallow grassy ponds to reproduce (McDiarmid, 1978). Suitable habitat, including gopher tortoise burrows, is present at Cecil Field.

The striped newt (Notophthalmus perstriatus) has a small geographic distribution ranging from southeast Georgia south to the area near Orlando, Florida. The preferred habitat is flatwood ponds, but other aquatic environs may furnish suitable habitat (McDiarmid, 1978). Due to its spotty distribution, as well as its limited range, it is presently listed as rare by FCREPA. Based upon habitat requirements and range, it is probable that this species occurs at or near the NAS property.

The wood stork (Mycteria americana) ranges from the southeastern states south and west to Central and South America. At present, breeding sites in the United States are restricted to Florida and southeastern Georgia. Able to soar up to 80 miles from nesting sites in search of food, adults seek shallow fresh water marshes, flooded pasture or ditches that may have sufficient concentrations of fish. Their inefficient method of feeding (groping) requires that the wood stork have access to this specific feeding habitat. Drainage or alteration of these areas have led to this birds decline in population (Kale, 1978). The wood stork is considered endangered by USFWS (49 FR 7335; February 28, 1984), FGFWFC (Wood, 1984) and FCREPA. Suitable habitat for feeding may be present in shallow water areas of the NAS property.

The cosmopolitan peregrine falcon (Falco peregrinus) is not known to breed in Florida; however, Florida is an important wintering area for this migratory species. Peregrines can be found in a variety of areas, particularly coastal habitats, that harbor other birds which it utilizes for prey. They tend to stay in the same area for the winter period before migrating north (Kale, 1978). The USFWS (49 FR 10526; March 20, 1984) considers the Artic subspecies (Falco peregrinus tundrius) to be threatened, while the American subspecies (Falco peregrinus anatum) is listed as endangered. FGFWFC (Wood, 1984) addresses only the Artic subspecies, which it lists as endangered. Due to the apparent difficulty in distinguishing the subspecies, FCREPA has, for reasons of practicality, considered all subspecies of the peregrine as endangered.

The ivory-billed woodpecker (Campephilus principalis) is considered endangered by USFWS (35 FR 8495; June 2, 1970), FGFWFC (Wood, 1984) and FCREPA. It was once known to occur throughout the State of Florida. Due to the diminution of mature stands of lowland hardwood forests, this species may be very near extinction both in Florida and elsewhere in its historic range. Verifiable sightings of this bird have not been reported in recent years (Kale, 1978). The NAS does not appear to provide the extensive mature hardwood swamp forest habitat required for this species.

The red-cockaded woodpecker (Picoides borealis) is considered endangered by both USFWS (35 FR 16047; October 13, 1970) and FCREPA; FGFWFC (Wood, 1984) categorizes this species as threatened. Coastal plain pinewoods provide

habitat for this species; it is associated with mature to overmature southern pines (longleaf, loblolly, shortleaf, slash and pond pines). The red-cockaded woodpecker resides (and nests) in cavities that it excavates in living trees. It feeds on insects, seeds and fruits (Kale, 1978). Though within the historic range of this species, the pine forests at the NAS probably do not harbor the mature stands of trees required by the red-cockaded woodpecker.

The eastern brown pelican (Pelecanus occidentalis carolinesis) can be found along the eastern seaboard from North Carolina through the Gulf states into Central and South America. In Florida, nesting colonies occur along the coast, usually on mangrove islands or undisturbed fringe areas. The Brown pelican preys exclusively on fish, usually feeding in shallow estuarine waters. Though seemingly common along the shore, they are sensitive to some forms of water pollution such as pesticides (Kale, 1978). USFWS (35 FR 8495; June 2, 1970) categorizes this species as endangered, but it is anticipated that the brown pelican will soon be removed from the federal listing. FGFWFC (Wood, 1984) and FCREPA each consider it a threatened species. This species is found along coastal habitats and would not be found at the NAS.

The southern bald eagle (Haliaeetus leucocephalus) was once considered widespread in Florida; its numbers have diminished considerably since the 1940s. The bald eagle is generally associated with lakes, rivers and shallow coastal areas, particularly during their nesting season. They depend extensively upon fish as their food source, but will feed on any suitably sized vertebrates, either dead or alive (Kale, 1978). The southern bald eagle is listed as endangered by USFWS (43 FR 6233; February 14, 1978). It is listed as threatened by FGFWFC (Wood, 1984) and FCREPA. Since nesting occurs near the St. Johns River, the bald eagle may occasionally stray over the NAS.

The osprey (Pandion haliaetus) can be found throughout North America. It nests throughout Florida particularly near its favored habitats - shallow coastal waters, rivers and lakes. Also known as the fish hawk, this raptor preys almost exclusively on fish. The osprey seems tolerant to man and most of his activities, however, being a top predator, it is sensitive to pesticide pollution (Kale, 1978). FCREPA categorizes this species as threatened. The osprey may occasionally utilize the lakes at the NAS, however, this event would have to be considered episodic.

A subspecies of the American kestrel, the southeastern American kestrel (Falco sparverius paulus) is found from South Carolina southward to Florida and southern Alabama. Though this falcon is able to utilize a variety of habitats, it seems to prefer open pine forests or clearings with available perches. Its prey include insects, small rodents and reptiles (Kale, 1978). Both FCREPA and FGFWFC (Wood, 1984) consider this species threatened. USFWS currently has it under review. This species probably occurs at the NAS.

The least tern (Sterna albiforns) is listed as threatened by FGFWFC (Wood, 1984) and FCREPA. The subspecies least tern is known from coastal Louisiana to Florida and northwards in coastal habitats as far north as Maine. Although the preferred natural habitat is coastal beaches and sand dunes, this tern is opportunistic and will readily utilize man-made habitats often nesting on gravel roof tops and spoil banks. These shorebirds prey on small bait fish (Kale, 1978). It is not likely this species uses habitat at the NAS for nesting.

The Florida panther (Felis concolor coryi) has a broad habitat preference and at one time could be found throughout Florida. At the present time, due to the perturbation of large tracts of panther habitat and past hunting pressures, the population has dwindled to dangerously low levels. Although the panther will prey on a number of species, it depends primarily on the population of deer within its hunting range. A limited number of sightings have taken place in central and southern Florida in recent years. Northern portions of the state may still harbor a few individuals of this carnivore (Layne, 1978). The panther is presently listed at endangered by USFWS (32 FR 4001; March 11, 1967), FGFWFC (Wood, 1984) and FCREPA. Portions of the property appear to offer suitable habitat, however there have been no verifiable sightings of this species at the NAS.

Sherman's fox squirrel (Sciurus niger shermani) has been found throughout most of peninsular Florida north of Lake Okeechobee. The preferred habitats of this species are those communities offered by the sandhill association (longleaf pine-turkey oak) and ectonal situations in flatwoods. Typically, this squirrel depends upon pine seeds and acorns for its food (Layne, 1978). The diminishing habitat of this species is the primary reason FCREPA considers it threatened. FGFWFC (Wood, 1984) lists this as a species of special concern, while USFWS still has it under review. It is possible that this species occurs in the pine woods at the NAS.

The Florida black bear (Ursus americanus floridanus) was at one time found throughout much of Florida. Today, it is found only in large tracts of property which offer heavy vegetation as refuge. Bears are omnivorous, taking meat if the opportunity arises; typically they will feed on berries, insects and honey (Layne, 1978). While still under review by USFWS, the Florida black bear is considered threatened by both FGFWFC (Wood, 1984) and FCREPA. Evidence of black bears was reported in 1982 from the outlying portions of the property according to the NAS forester.

The West Indian manatee (Trichechus manatus latirostris) can be found throughout the coastal waters of eastern Florida, while it appears nearly as far north as the panhandle on the west coast. It is known to occur along the St. Johns River and its tributaries. This aquatic mammal is strictly herbivorous feeding on plants in the water and along the shoreline (Layne 1978). FCREPA views this mammal as threatened; USFWS (35 FR 8495; June 2, 1970) and FGFWFC (Wood, 1984) consider it to be endangered. Though not found on the NAS, its local habitat, the St. Johns, ultimately receives water from the drainages leaving Navy property.

The literature states that the southeastern shrew (Sorex longirostris longirostris) is known from approximately eight scattered locations in northern Florida. However, in that it is found throughout many of the other states in the southeast, it is probably present in larger numbers and more localities than the records indicate. Florida's smallest mammal has been captured only in swamp forests and forests of river flood plains. Until more is known about this animal, FCREPA considers it rare (Layne, 1978). This species could occur in the swamp forest present at the NAS.

Common throughout much of the United States and southern Canada, the big brown bat (Eptesicus fuscus) is present in low numbers in northern Florida. It is not known to occur south of Lake Okeechobee. Individuals might be

found to inhabit buildings, bridges and hollow trees (Layne, 1978). FCREPA lists the big brown bat as rare. Provided with the appropriate habitat, this species could occur at the NAS property.

The hoary bat (Lasiurus cinereus) is rare to absent in the southeast United States, though it can be found throughout most of North America. The occurence of this species is limited to the northern half of Florida. These tree-dwelling bats take insect prey while in flight (Layne, 1978). This species is classified as rare by FCREPA. Though few in number, this species could occur at the NAS property.

The southeastern big-eared bat (Plecotus rafinesquii) is found in the northern half of Florida. It seeks refuge in abandoned buildings and hollow trees in heavily forested regions of Florida. This species feeds on insects late in the evening. This very secretive and scarce bat is classified as rare by FCREPA (Layne, 1978). This species could occur at the NAS property.

The southeastern weasel (Mustela frenata olivacea) can be found in the southeastern states from North Carolina to eastern Mississippi. It has only a limited occurrence in the northern third of Florida. The weasel is very adaptive and can be found in a wide range of habitat types including urbanized settings. They aggressively prey on a variety of small mammals and birds. FCREPA considers the weasel as one of Florida's rarest carnivores (Layne, 1978). This species could potentially inhabit the NAS property.

The Florida mouse (Peromyscus floridanus) has its range limited to a patchy distribution in peninsular Florida. It is considered to have a very narrow habitat range within sand pine scrub and longleaf pine-turkey oak communities. The Florida mouse forages for seeds and plant material, and occasionally it will feed on insects, etc. (Layne, 1978). The Florida mouse is considered a threatened species by FGFWFC (Wood, 1984) and FCREPA. USFWS still has this species under review. Known from Clay County, this species may potentially range into appropriate habitats at the NAS.

The scarab beetle (Bolbocerosoma hamatum) is considered rare by FCREPA. It has only been found in 16 localities scattered around Florida. A range map indicates that it has been found in Duval County. Little is known about its habitat preferences (Franz, 1982).

The scarab beetle (Mycotrupes cartwrighti) is common near Tallahassee and some nearby regions of Georgia. This species is considered rare (FCREPA) elsewhere in northern Florida. A range map indicates this species occurs in Duval County, however, no specific information was given on locality. Its habitat requirements are not known (Franz, 1982).

Presently the Black Creek crayfish (Procambarus pictus) is considered to be a species of special concern by FCREPA. However, this species is included here because it is unique to the Black Creek drainage system of northern Clay and southern Duval counties. It requires the cool, flowing water in the larger tributaries (Franz, 1982). Black Creek ultimately receives surface water from the NAS.

4.4.2.2 Flora. The USFWS lists four plants in Florida as endangered. None of these are known to occur in Duval County (Martin, 1984). There are 325 plants listed as either endangered or threatened by the Florida Department of Agriculture (FDA); among these, two have ranges and habitat requirements

which potentially include the NAS (see below). The inventory of plants prepared by FCREPA includes a total of 168 endangered, threatened, or rare species. From this list, two additional species, with the potential to occur at the NAS and not included in the FDA listing above, will be considered. These four species are briefly discussed below.

The rare (FCREPA) spoon-flower (Peltandra sagittifolia) grows in a variety of wet habitats - bogs, ditches, cypress swamps, and margins of lakes and streams. It is possible to find this plant in suitable habitats from North Carolina's coastal plain to the central portions of Florida's peninsula (Ward, 1979). This plant has the potential to occur at the NAS.

The dwarf or blue stem palmetto (Sabal minor) is presently on the FDA list of threatened plant species. The dwarf or blue stem palmetto is found in hammocks and along river banks from central Florida north to North Carolina and west to Texas (Long and Lakela, 1971). Though common, this plant has been commercially exploited, thus its present status. It is thought that this species and other palms may be reevaluated and reduced in status (Martin, 1984). Based upon range and habitat requirements, the dwarf palm has the potential to be present at the NAS.

Jackson-vine (Smilax smallii) ranges from coastal Virginia south to Northern Florida and westward to eastern Texas. This woody vine prefers habitats provided by rich woods and hammocks, ravines and stream banks. This species is considered threatened by FCREPA. Based upon range and habitat requirements, this species has the potential to occur at the NAS.

Bartram's ixia (Sphenostigma coelestinum) is unique in that it is exclusive to a small area in northeastern Florida. Its habitat is wet, grassy, flatwoods associated with slash or longleaf pines and wiregrass. Fire, which tends to burn away competing vegetation, ensures the continuation of this flower. Due to its very limited range, Bartram's ixia is listed as threatened by both FDA (Wood, 1984) and FCREPA. USFWS presently has this species under review. This species may occur in the vicinity of Cecil Field, though there have been no recent records of Bartram's ixia in Duval County (Martin, 1984).

4.5 PHYSICAL FEATURES.

4.5.1 Climatology. Duval County is located in the temperate zone only seven degrees of latitude north of the torrid zone, resulting in a climate that tends to be more tropical than temperate (Frederic R. Harris, Inc., 1973). The area is located near the northern boundary of the trade winds which dominate summer season climate patterns. During winter months, the southerly penetration of the North American Polar-Front jet stream dictates the number and intensity of polar air mass penetrations into Florida (City of Jacksonville, 1980b).

The atmosphere is moist, with an average relative humidity of about 75 percent, ranging from about 90 percent in the early morning hours to about 55 percent during the afternoon. The average daily sunshine runs from 5.5 hours in December to 9.0 hours in May (NOAA, 1983).

Jacksonville's temperatures are more varied than in the more subtropical portions of peninsular Florida (City of Jacksonville, 1980b). The annual mean temperature for Jacksonville is between 68 and 69°F. June, July, and August are the hottest months, with temperatures averaging near 80°F; December,

January and February are the coolest months, with mean temperatures near the middle fifties (NOAA, 1983). Extreme high temperatures are normally associated with low rainfall and drought period conditions. Temperatures in excess of 100°F are not common but have occurred in every month from May through September. The highest temperature recorded in Jacksonville, 105°F, occurred in July, 1942 (City of Jacksonville, 1980b). Evening temperatures fall to freezing or below about 12 times during a typical winter season, while temperatures normally rise above freezing during the day; there have been only five occasions where the daylight temperature failed to rise above freezing (NOAA, 1983). An all time low temperature of 10°F was recorded in 1899, but for the 1941-1976 period summarized in Figure 4-5, a low of 12°F was recorded in December 1942 (City of Jacksonville, 1980b).

Mean annual precipitation for the area is 51.49 inches (NOAA, 1983). From November to February, monthly rainfall normally ranges between 1.96 and 3.11 inches; however, monthly accumulations of 7 inches to over 11 inches have occurred during this period (City of Jacksonville, 1980b). Jacksonville's rainy season is from June to September with monthly rainfall accumulations typically between 6 and 8 inches; extreme accumulations of 13 to more than 19 inches per month have occurred. However, these extremes are generally associated with the passage of tropical storms (City of Jacksonville, 1980b). Rainfall of an inch or more in 24 hours normally occurs 14 times a year (NOAA, 1980). See Figure 4-6 for a summary of precipitation.

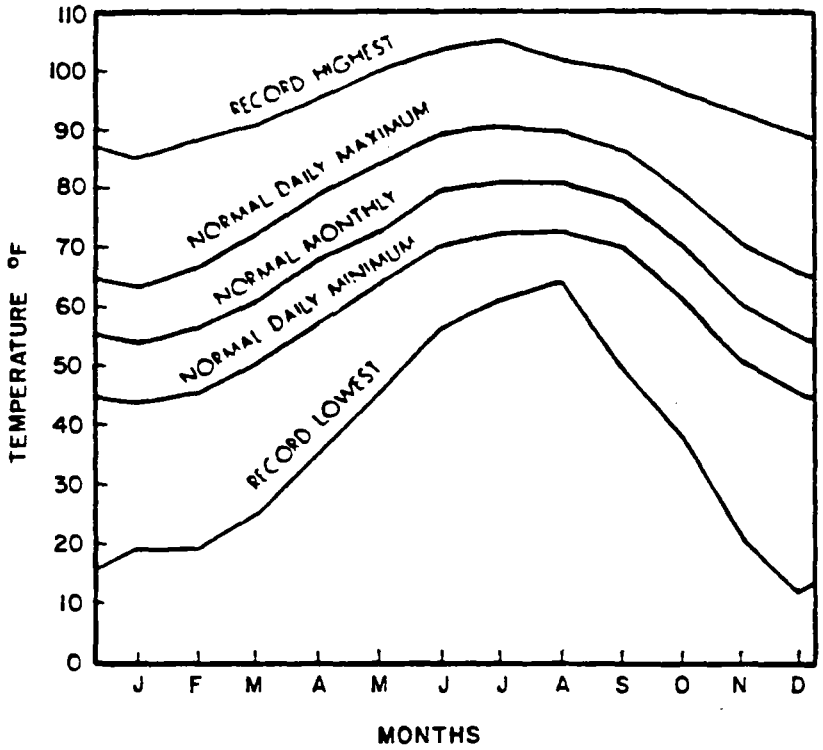
Prevailing winds are northeasterly in the fall and winter months, and southwesterly in spring and summer (NOAA, 1983). The annual mean wind speed is 8.9 mph. Wind speeds of less than 12 mph can be expected over 75 percent of the time and winds of less than 24 mph can be expected 99 percent of the time (City of Jacksonville, 1980b).

Although Jacksonville lies within the Hurricane Belt, it has been fortunate in escaping hurricane-force winds; an exception was Hurricane Dora in 1964 which produced winds of 82 mph (NOAA, 1983).

Snow has fallen in measurable amounts twice since 1871: 1.9 inches in 1899 and 1.5 inches in 1958. Sleet and freezing rain storms, likewise, have only been recorded twice: once in 1879 and a 16 hour storm in 1962 (NOAA, 1983).

4.5.2 Topography. The topography of Duval County's 840 square miles is controlled by a series of ancient marine terraces that have been dissected and modified by stream erosion. These terraces were formed during Pleistocene times when the ocean stood at higher levels. As the sea dropped to a lower level the sea floor emerged as a terrace marked by a low scarp. A gently undulating topography is formed by these north to south paralleling terraces. Generally, these terraces are interspaced with poorly drained areas and sizable swamps (Jacksonville Area Planning Board, 1980).

NAS Cecil Field, the Yellow Water Weapons Area and OLF Whitehouse are located in the western part of Duval County. The terraces in the western part of the county range in elevation from 30 to 199 feet. The land surface there is irregular, consisting of hills, high plateaus, and some relatively steep scarps. Elevations at NAS Cecil Field range from 40 to 92 feet above mean sea level (MSL). The Yellow Water Weapons Area ranges in elevation from 60 to 87 feet MSL while elevations at OLF Whitehouse range from 70 to 102 feet MSL. Portions of all three of these sites are within the 100 year flood plain. Lower terraces occur in the central and eastern parts of the coun

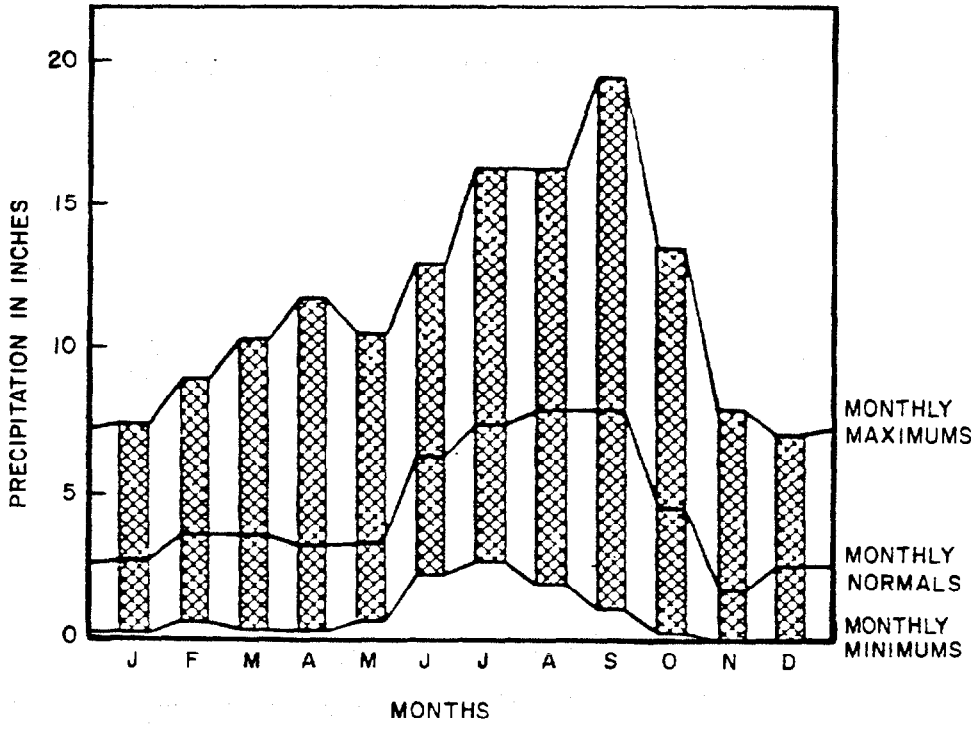


SOURCE: CITY OF JACKSONVILLE, 1980b

FIGURE 4-5

Temperature Monthly Normals, Means and Extremes

INITIAL ASSESSMENT STUDY
NAVAL AIR STATION
CECIL FIELD



SOURCE: CITY OF JACKSONVILLE, 1980 b

FIGURE 4-6

Precipitation Monthly Maximums Normals and Minimums

INITIAL ASSESSMENT STUDY
NAVAL AIR STATION
CECIL FIELD

and range from sea level to around 30 feet in elevation, although some scattered sand hills and dunes may reach 50 feet. The average elevation in the central part of the City of Jacksonville is 20 feet with a range of 15 feet to 40 feet in isolated areas (SOUTHNAVFACENGCOM, 1981).

From the highest elevation of 199 feet above sea level near the western extremity of Duval County, the land surface slopes gently eastward toward the ocean. A majority of the land area in the county has a slope of less than one percent (Jacksonville Area Planning Board, 1980).

The present drainage in Duval County consists of many short streams tributary to four major streams; the St. Johns River, the St. Marys River, the Nassau River, and the Intracoastal Waterway. Along the divides between the major drainage divisions, erosion has not been pronounced and, as a result, relatively wide and flat swampy areas remain. The swampy areas are so flat that delineation of some drainage areas is difficult if not impossible (Frederick R. Harris, Inc., 1973).

All of NAS Cecil Field and major portions of the Yellow Water Weapons Area and OLF Whitehouse drain to streams which are tributary to the St. Johns River. Specifically, all of NAS Cecil Field is located within the 67.4 square mile Yellow Water Creek drainage basin, which is tributary to the St. Johns River. The Yellow Water Weapons Area is located within three drainage basins. The majority of the area is located within the Yellow Water Creek drainage basin. Generally, the northwest and northeast portions of the site are located within Brandy Creek (33.9 square miles) and McGirts Creek (62.9 square miles) drainage basins, respectively. McGirts Creek is tributary to the St. Johns River, while Brandy Creek is tributary to the St. Marys River. OLF Whitehouse is located within the McGirts Creek, Brandy Creek and Ribault River (31.4 square miles, tributary to St. Johns River) drainage basins (City of Jacksonville, 1980b). For a detailed description of the drainage patterns at NAS Cecil Field see Section 4.5.5.1.1.

4.5.3 Geology. Traditionally, the geology of the Duval County area has been divided into two distinct assemblages: rocks that form the Floridan Aquifer and younger rocks which are found above the Floridan Aquifer (see Section 4.5.5.2 for a detailed description of the Floridan Aquifer). The two assemblages differ in their general character. The younger rocks are very sandy with layers of shell, limestone, and clay. Most of the material is unconsolidated. Rocks of the older assemblage are consolidated limestone with some dolomite (Roy F. Weston, Inc., 1978).

4.5.3.1 Stratigraphy. A detailed description of the various geologic strata in Duval County (Roy F. Weston, Inc., 1978) and the Cecil Field area follows. Table 4-2 provides a listing of the stratigraphic units in Duval County.

4.5.3.1.1 The youngest rocks in Duval County are Holocene and Pleistocene age sediments. Because they were deposited on an irregular surface and because their tops have been eroded since deposition, the thickness of this material is extremely variable. The greatest thicknesses are found below topographic highs and over depressions in the underlying surface. These unconsolidated deposits are approximately 20 to 40 feet thick at NAS Cecil Field and consist of sands and clayey sands (Geraghty and Miller, 1983).

Table 4-2

Stratigraphic Units in Duval County

Geologic Age	Stratigraphic Unit	Approximate Thickness (feet)	Lithologic Character
Recent Holocene, and Pleistocene	Recent Holocene, Pleistocene deposits	0-150	Soil, muck, coarse to fine sand, shell, and some clayey sand
Pliocene	Pliocene or Upper Miocene deposits	20-110	Gray-green calcareous, silty clay and clayey sand; contains shell beds and white soft, firable limestone beds
Miocene	Hawthorn Formation	260-490	Gray to blue-green clacareous phosphatic, sandy clays and clayey sands; contains fine to medium phosphatic sand lenses and limestone and dolomite beds, particularly near the base of the formation
Eocene	Ocala Group:		
	Crystal River Formation	50-300	White to cream chalk, massive fossiliferous marine limestone
	Williston Formation	20-100	Tan to buff granular, marine limestone
	Inglis Formation	40-120	Tan to buff granular, calcitic, marine limestone; contains thin dolomite lenses and zones of Millioldae foraminiferal coquina
	Avon Park Limestone	50-250	Alternating beds of brown to tan hard, massive dolomite, brown finely crystalline dolomite, and granular calcitic limestone
	Lake City Limestone	425-500+	White to brown, purple-tinted lignitic, granular limestone and gray hard, massive dolomite; contains lignite beds and zones of Valvulinidae foraminiferal coquina

Source: (Roy F. Weston, Inc., 1978)

4.5.3.1.2 Below the Holocene and Pleistocene sediments are Upper Miocene or Pliocene sediments. The thickness of these varies in the same way as does the thickness of the younger sediments. They are made up of sand, shell, sandy clay and limestone.

4.5.3.1.3 The Miocene Age Hawthorn formation ranges in thickness from 250 feet (in southern Duval County) to about 500 feet (in north-central Duval and central Nassau Counties). The formation consists of calcereous, phosphatic sandy clays and clay sands, interbedded with thin, discontinuous lenses of sand, sandy limestone, and hard dolomite. The limestone and dolomite lenses are thicker, and are more prevalent near the base of the formation. In Duval County, the upper surface of the Hawthorn Formation occurs at 50 to 200 feet below land surface. In the NAS Cecil Field area, the deposits are located approximately 75 feet below the land surface and are approximately 400 feet thick (Geraghty and Miller, 1983).

4.5.3.1.4 The Eocene Age Crystal River Formation is the youngest unit in the Floridan Aquifer and the youngest member of the Ocala Group. It is a white to cream, chalky marine limestone with abundant fossils. Thickness of the formation is variable, but in general it is approximately 100 feet thick in western and central Duval County, and 300 feet thick in the northeastern portion of the county. The top of the formation (and therefore the top of the Ocala Group) occurs at less than 300 feet below MSL in southern Duval County, to more than 550 feet below MSL in the north central part of the county.

The middle member of the Ocala Group is the Williston Formation; of granular limestone, it ranges in thickness from 20 to 100 feet. The formation is distinguised by its characteristic fossil assemblage. The Inglis Formation underlies the Williston and is the lowest unit of the Ocala Group. Its thickness is also variable, ranging from 40 to 120 feet. It is also a granular marine limestone but can be easily differentiated from the Williston Formation by the presence of coquina beds formed by foraminifers. It is not always possible to distinguish between the three members of the Ocala Group. In the NAS Cecil Field area, the Ocala Group is about 200 feet thick (Geraghty and Miller, 1983) and underlain by the Avon Park Limestone.

4.5.3.1.5 The Avon Park Limestone includes rocks that vary from limestone (calcium carbonate) to dolomite (magnesium carbonate). Dolomite beds are harder than granular limestone beds. It is found at a depth of approximately 600 feet below land surface and is roughly 200 feet thick. At NAS Cecil Field, the Avon Park Limestone is found at a depth of approximately 700 feet below land surface and is about 50 feet thick (Geraghty and Miller, 1983).

4.5.3.1.6 The Lake City Limestone underlies the Avon Park Limestone. It consists of alternating limestone and dolomite and contains bed that consist entirely of foraminifers and locally has thin lignite beds. In Duval County, depths to the top of the formation range from 580 to 1,260 feet thick. The formation occurs from 1,300 feet to 1,700 feet below land surface and consists of massive to granular limestone and chesty, glauconitic dolomite. At NAS Cecil Field, the top of the formation is approximately 780 feet below land surface (Geraghty and Miller, 1983).

4.5.4 Soils. The general solis at the NAS belong to the Leon-Ridgeland-Wesconnett and Pelham-Mascotte-Sapelo map units. These generalized soil types are considered soils of the flatwoods and make up the majority of Duval County (70%). Leon-Ridgeland-Wesconnett, is found along the eastern portion

of Cecil Field and Yellow Water while Pelham-Mascotte-Sapelo constitutes the western portions of both these properties. OLF Whitehouse is predominated by the former. These flatwood soils are poorly drained to very poorly drained with a colored weakly cemented sandy layer underlain by sandy or loamy material.

A series of detailed maps depicting specific soil types are provided for Cecil Field, Yellow Water and OLF Whitehouse (See Figures 4-7 and 4-8). A description of the various soil types indicated on the maps is given below (SCS, 1980). The descriptions used below for permeability are equivalent to the following rates:

Moderately slow = 0.2 to 0.6 inches/hour
Moderate = 0.6 to 2.0 inches/hour
Moderately rapid = 2.0 to 6.0 inches/hour
Rapid = 6.0 to 20 inches/hour

4.5.4.1 Albany Fine Sand, Zero To Five Percent Slopes. This is a nearly level to gently sloping, somewhat poorly drained soil on narrow to broad ridges and isolated knolls. Individual areas range in size from 3 to 200 acres. Slopes are smooth and convex.

Typically, the surface layer is very dark gray fine sand about three inches thick. The sub-surface layer is fine sand about 47 inches thick. The upper 26 inches is light yellowish brown, and the lower 21 inches is light gray and finely mottled. The upper 13 inches of the subsoil is strong brown sandy loam coarsely mottled with light gray and red. The lower part is light gray sandy clay loam coarsely mottled with reddish yellow. It extends below a depth of 80 inches.

Included with this soil in mapping are small areas of Blanton, Mascotte, Pelham and Sapelo soils. Also included are small areas of similar soils that have loamy layers at a depth of 20 to 40 inches. Included areas make up about 10 percent of any mapped area.

Under natural conditions, this soil has a water table at a depth of 10 to 30 inches for one to three months, and at a depth of 30 to 60 inches for four to eight months or more during most years. Permeability is rapid above a depth of 50 inches and moderate below. Natural fertility is low, and organic matter content is low. Available water capacity is low.

4.5.4.2 Aquic Quartzipsamments. These are nearly level to gently sloping, sandy soils that have been reworked by manmade dredging and earthmoving operations, or they have formed by natural deposition on islands along the Atlantic Coast. Individual areas range in size from 5 to 200 acres. Slopes range from zero to five percent and are smooth to convex.

Some areas of these soils were originally ridges that have been excavated to a depth below natural ground level and then reworked. Others are deep areas of dredge spoil. Other areas are natural depositions which occur as swales between the high dunes; soils in these areas have no diagnostic horizons. The material has been deposited in the last 150 years.

Where the soil has been reworked or mixed, it does not have orderly sequence of horizons. The texture of the mixed material is fine sand. Colors ar variable and range from white to brownish yellow. The most common colors are

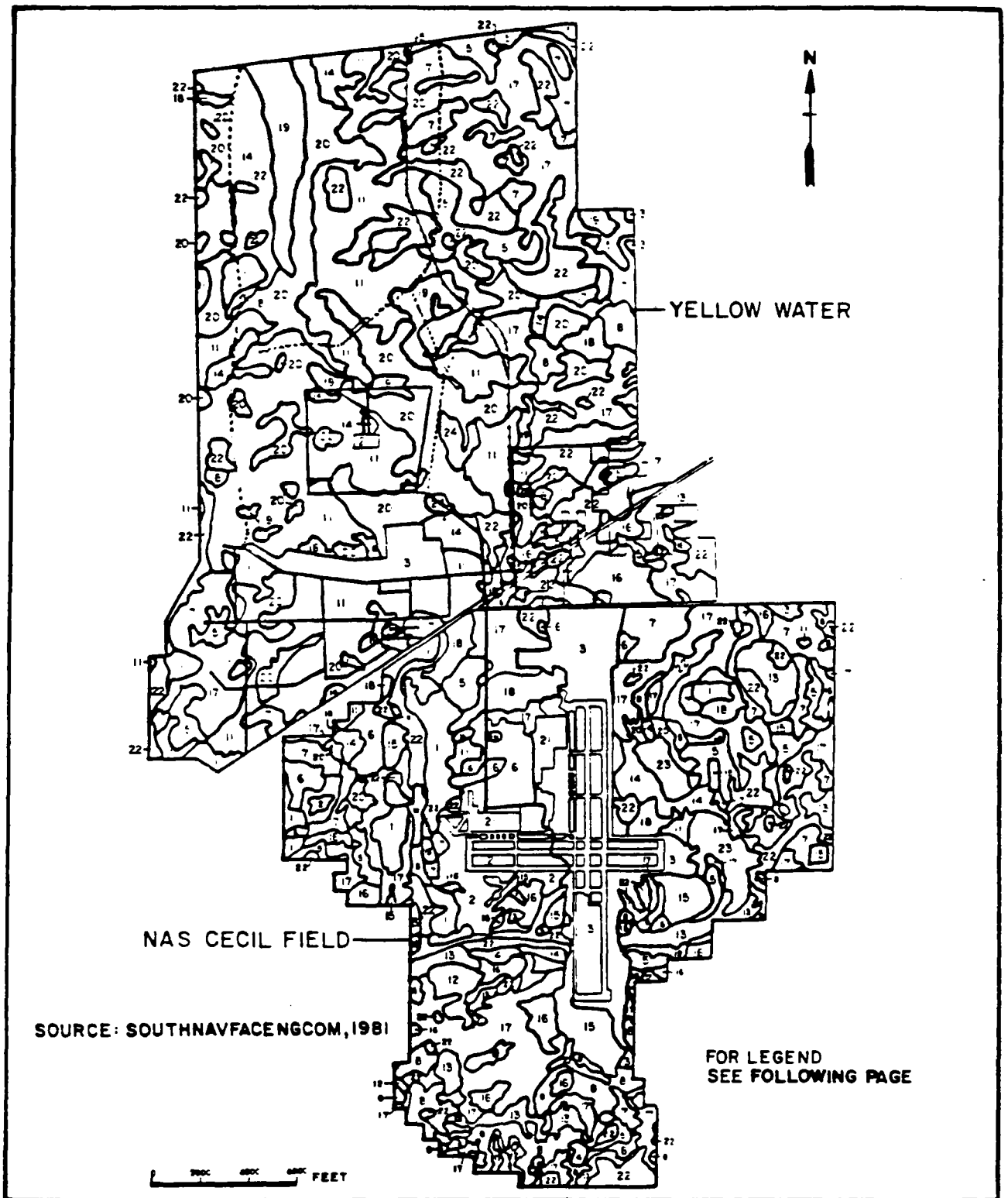


FIGURE 4-7

Soils Map of CECIL FIELD and Yellow Water Weapons Area

INITIAL ASSESSMENT STUDY
NAVAL AIR STATION
CECIL FIELD

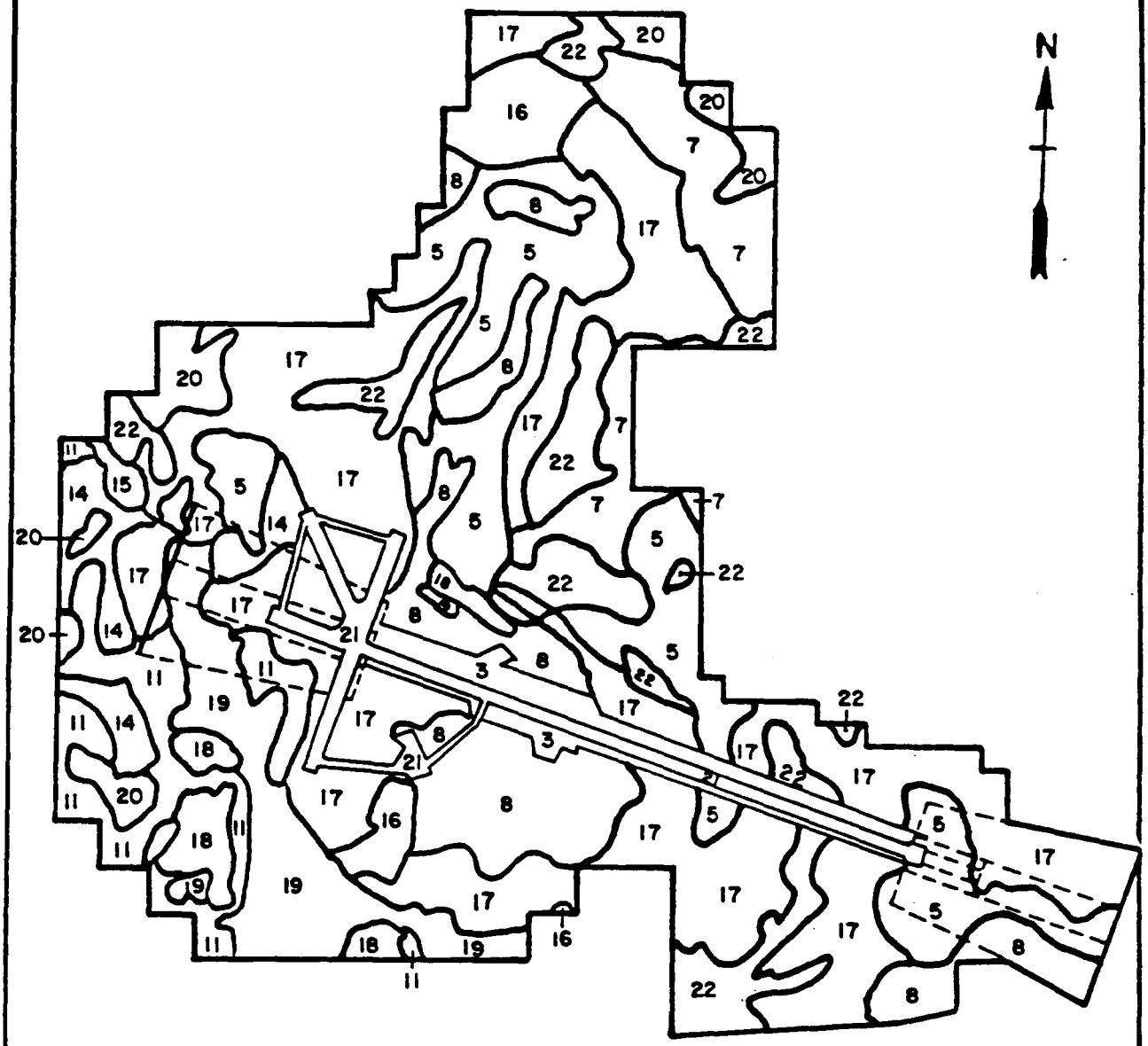
1	Albany Fine Sand
2	Aquic Quartzipsamments
3	Arents
4	Blanton Fine Sand
5	Leon Fine Sand
6	Leon-Urban Land Complex
7	Lynn Haven Fine Sand
8	Mandarin Fine Sand
9	Mascotte Fine Sand
10	Maurepas Muck
11	Olustee Fine Sand
12	Ortega Fine Sand
13	Pamlico Muck
14	Pelham Fine Sand
15	Pits
16	Pottsburg Fine Sand
17	Ridgeland Fine Sand
18	Sapelo Fine Sand
19	Stockade Fine Sand Loam
20	Surrency Fine Sand
21	Urban Land
22	Wesconnett Fine Sand
23	Yulee Clay
24	Yonges Fine Sandy Loam

SOURCE: SOUTHNAVFACENGCOM, 1981

FIGURE 4-7 (CONT'D)

LEGEND, SOILS MAPS

INITIAL ASSESSMENT STUDY
NAVAL AIR STATION
CECIL FIELD



FOR LEGEND SEE FIGURE 4-7

SOURCE: SOUTHNAVFACENGCOM, 1981

0 1200 2400 3600

SCALE IN FEET

FIGURE 4-8

Soils Map of OLF Whitehouse

INITIAL ASSESSMENT STUDY
NAVAL AIR STATION
CECIL FIELD

white, light gray, gray, pale brown, very pale brown, light yellowish brown, yellowish brown, and brownish yellow. Thicknesses of the mixed material ranges from 2 to 12 feet.

Soils that have been deposited naturally are fine sand to a depth of 80 inches or more. They are commonly light brownish gray, light gray, pale brown, very pale brown and light yellowish brown. Few to many horizontal bands of black heavy minerals, mostly rutile and ilmenite, occur throughout the pedon.

Included with these soils in mapping are a few areas in which shell fragments or rock fragments occur in the sandy materials. Included areas make up about 20 percent of any mapped area. Under natural conditions, these soils have a water table at a depth of less than 40 inches during most years. Permeability is very rapid throughout. Natural fertility is low. Organic matter content and available water capacity are low.

4.5.4.3.1 Arents. These are nearly level, poorly drained soils that have been reworked by manmade earthmoving operations. Individual areas range in size from 5 to 500 acres. Slopes range from zero to two percent and are smooth to convex.

Typically, the soils consist of mixed soil material. This material is light gray, grayish brown, very pale brown, yellow, black, dark reddish brown, strong brown, and a red fine sand, sandy loam, and sandy clay loam. Sandy textures are dominant in most areas. The sandy loam and sandy clay loam part is fragments or pieces of subsoil material. Pieces of weakly cemented subsoil material are also present in most of these soils. Thickness of the material ranges from 2 to 20 feet. This soil does not have an orderly sequence of horizons.

Included with these soils in mapping are a few areas in which shell fragments or rack fragments occur in the sandy materials. Included areas make up about 15 percent of any mapped area.

These soils are moderately suited to improved pastures. Water control measures are needed to remove excess water during wet periods. Low fertility is also a limiting factor.

4.5.4.3.2 Arents, Sanitary Landfill. These are nearly level to gently sloping soils that have been reworked by manmade earthmoving operations. Individual areas range from 20 to 200 acres in size. Slopes range from zero to five percent and are smooth to convex.

Typically, the upper two to three feet of these soils is a mixture of sandy materials interbedded with fragments or pieces of loamy subsoil material or weakly cemented, sandy subsoil material, or both. This material overlies large cells of garbage and refuse which range in thickness from 2 to 20 feet. In some areas, the mixture of sandy materials is used as a daily cover, and the garbage is in stratified layers within the sandy material. Some areas of this map unit are in former pits and others were constructed on the surface of undisturbed soils. These soils have a variable water table that is dependent upon the water table of the nearby soils. Permeability is variable but generally ranges from very rapid to moderately rapid. Nautral fetrility is low. Organic matter content and available water capacity i variable.

4.5.4.4 Blanton Fine Sand, Zero to Five Percent Slopes. This is a nearly level to gently sloping, moderately well drained soil on narrow to broad ridges and isolated knolls. Individual areas range from 10 to 500 acres in size. Slopes are smooth to convex.

Typically, the surface layer is dark gray fine sand about three inches thick. The subsurface layer is fine sand about 51 inches thick. The upper 33 inches is pale brown and very pale brown, and the lower 18 inches is white. The upper 11 inches of the subsoil is yellowish brown fine sandy loam that has very pale brown, yellowish red, and strong brown mottles. The lower part of the subsoil, to a depth of 83 inches or more, is strong brown fine sandy loam that has many dark yellowish brown and light gray mottles and few yellowish red mottles.

Under natural conditions, this soil has a perched water table at a depth of 40 to 60 inches for two to five months during most years. Permeability is rapid above a depth of 54 inches and moderate below. Natural fertility is low, and organic matter content is low. Available water capacity is low.

4.5.4.5 Leon Fine Sand. This is a nearly level, poorly drained soil in broad flatwood areas. Individual areas range from 5 to 2000 acres in size. Slopes range from zero to two percent and are smooth to convex.

Typically, the surface layer is fine sand about eight inches thick. In the upper five inches it is very dark gray, and in the lower three inches it is dark gray. The subsurface layer is gray fine sand about 10 inches thick. The subsoil is fine sand that extends to a depth of more than 80 inches. The upper eight inches of subsoil is black and weakly cemented, the next 11 inches is very dark gray and weakly cemented, the next eight inches is dark brown, and the lower 35 inches is dark reddish brown and weakly cemented.

Included with this soil in mapping are small areas of Leon, Pottsburg, Ridgeland, and Wesconnett soils. Included areas make up about 10 percent of any mapped area.

Under natural conditions, this soil has a water table at a depth of less than 10 inches from two to four months and at a depth of 10 to 30 inches for two to eight months during most years. Permeability is moderate to moderately rapid in the weakly cemented layers and rapid in all other layers. Natural fertility is low, and organic matter content is high. Available water capacity is moderate.

4.5.4.8 Mandarin Fine Sand. This is a nearly level, somewhat poorly drained soil on narrow to broad ridges slightly higher than the adjacent flatwoods. Individual areas range in size from 5 to 600 acres. Slopes range from zero to two percent and are smooth to convex.

Typically, the surface layer is dark gray fine sand about four inches thick. The subsurface layer is fine sand about 22 inches thick. The upper four inches is light brownish gray, and the lower 18 inches is light gray. The subsoil is fine sand that extends to a depth of 46 inches. Except for the lower six inches, it is weakly cemented and well coated with organic matter. The upper four inches is very dark grayish brown, the next five inches is very dark brown, the next five inches is black, and the lower six inches is brown. Below this, to a depth of 56 inches, is light gray fine sand. The

next six inches is white fine sand, and the next 11 inches is grayish brown fine sand. Between depths of 73 to 80 inches is weakly cemented, black fine sand, and the sand grains are coated with organic matter.

Included with this soil in mapping are small areas of Leon, Mascotte, Ortega, and Pottsburg soils. Also included are small areas of similar soils in which the subsoil is at a depth of more than 30 inches. Included areas make up about 10 percent of any mapped area.

Under natural conditions, this soil has a water table at a depth of 20 to 40 inches for four to six months during most years. The water table is at a depth of 10 to 20 inches for periods of as much as two weeks in some years. Permeability is moderate to moderately rapid in the weakly cemented layers and rapid in all other layers. Natural fertility is low and organic matter content is low to medium. Available water capacity is low.

4.5.4.9 Mascotte Fine Sand. This is a nearly level, poorly drained soil in borad flatwood areas. Individual areas range from 5 to 2000 acres in size. Slopes range from zero to two percent and are smooth to convex.

Typically, the surface layer is black fine sand about five inches thick. The subsurface layer is fine sand about 10 inches thick. The upper three inches is gray, and the lower seven inches is light brownish gray. The upper part of the subsoil, between depths of 15 and 25 inches, is loamy fine sand. It is weakly cemented, and the sand grains are coated with organic matter. The upper six inches is black, the next two inches is very dusky red, and the lower two inches is dark reddish brown. Below this is a layer of light gray and dark brown loamy fine sand about three inches thick. The lower part of the subsoil, between depths of 28 and 58 inches is coarsely mottled light gray, strong brown, and red fine sandy loam. Below this to a depth of 80 inches, is gray fine sand.

Included with this soil in mapping are small areas of Albany, Sapelo, Leon, and Pelham soils. Included areas make up about 15 percent of any mapped area.

Under natural conditions, this soil has a water table at a depth of less than 10 inches for two to four months and at a depth of 10 to 30 inches for two to eight months during most years. Permeability is rapid to a depth of 15 inches and moderate between depths of 15 and 58 inches and rapid below. Natural fertility is moderate, and organic matter content is high. Available water capacity is moderate.

4.5.4.10 Maurepas Muck. This is a level to nearly level, very poorly drained soil on the tributaries of major streams, in large drainageways, and in depressions. Individual areas range in size from 5 to 1000 acres. Slopes are less than one percent and are smooth to concave.

Typically, the surface layer is a dark reddish brown muck about 55 inches thick. Below is a layer of black muck that extends to a depth of 80 inches or more.

Included with this soil in mapping are small areas of Leon, Pamlico, Ridgeland, Surrency, Tisonia and Wesconnett soils. Included areas make up about 10 percent of any mapped area.

Under natural conditions, this soil has a water table at a depth of less than 10 inches, or the soil is covered by water for one to six months during most years. Permeability is moderately rapid throughout. Natural fertility is moderate, and organic matter content is very high. Available water capacity is high.

4.5.4.11 Olustee Fine Sand. This is a nearly level, poorly drained soil in broad flatwood areas. Individual areas range in size from 5 to 2000 acres. Slopes range from zero to two percent and are smooth to convex.

Typically, the surface layer is black fine sand about six inches thick. The upper part of the subsoil, between depths of 6 and 21 inches, is fine sand. It is weakly cemented, and the sand grains are well coated with organic matter. The upper five inches is very dark gray, and the lower 10 inches is black. Below this is a 15 inch layer of gray fine sand. The lower part of the subsoil, between depths of 36 and 54 inches, is gray sandy clay loam. Below this is a layer of dark gray fine sand about 10 inches thick. Below this, to a depth of 80 inches or more, is mixed light gray and gray fine sand.

Included with this soil mapping are small areas of Leon, Pelham, Pottsburg, Ridgeland and Sapelo soils. Included areas make up about 10 percent of any mapped area.

Under natural conditions, this soil has a water table at a depth of less than 10 inches for two to four months and at a depth of 10 to 30 inches for two to eight months during most years. Permeability is rapid in the upper six inches and between depths of 21 and 36 inches and it is moderate in the subsoil. Natural fertility is moderate, and organic matter content is high. Available water capacity is moderate.

4.5.4.12 Ortega Fine Sand, Zero To Five Percent Slopes. This is a nearly level to gently sloping, moderately well drained soil on narrow to broad ridges and isolated knolls. Individual areas range from 2 to 2000 acres in size. Slopes are smooth to convex.

Typically, the surface layer is grayish brown fine sand about five inches thick. Below this to a depth of 48 inches is very pale brown fine sand. The next layer is white fine sand that extends to a depth of 82 inches or more.

Included with this soil in mapping are small areas of Kershaw, Mandarin, Leon and Pottsburg soils. Also included are small areas of similar soils that show evidence of wetness within a depth of 30 inches, similar soils that have a light gray subsurface layer, and similar soils that have a dark colored subsoil within a depth of 70 to 80 inches. Included areas make up about 15 percent of any mapped area.

Under natural conditions, this soil has a water table at a depth of 40 to 60 inches for more than six months during most years. Permeability is very rapid to a depth of 80 inches. Natural fertility and orgnaic matter content are low. Available water capacity is low.

4.5.4.13 Pamlico Muck. This is a nearly level, very poorly drained soil on tributaries of major streams, in depressions and in drainageways. Individual areas range in size from 20 to 1000 acres. Slopes range from zero to two percent and are smooth to concave.

Typically, the surface layer is black, well decomposed muck about eight inches thick over 24 inches of very dusky red muck. A layer of dark brown muck extends to a depth of 37 inches. The next layers are very dark grayish brown fine sand about 25 inches thick and dark brown fine sand that extends to a depth of 80 inches or more.

Included with this soil in mapping are small areas of Leon, Lynn Haven, Maurepas and Wesconnett soils. Also included are small areas of similar soils in which reaction is higher than extremely acid and small areas of soils that have loamy horizons below a depth of 40 inches. Included areas make up about 15 percent of any mapped area.

Under natural conditions, this soil has a water table at a depth of less than 10 inches, and the soil is covered with water for more than six months during most years. Permeability is moderately rapid in the upper 38 inches and rapid below that depth. Natural fertility is moderate, and organic matter content is very high. Available water capacity is high.

4.5.4.14 Pelham Fine Sand. This is a nearly level, poorly drained soil in broad flatwood areas. Individuals areas range in size from 2 to 2,000 acres. Slopes range from zero to two percent and are smooth to convex.

Typically, the surface layer is very dark gray loamy fine sand about six inches thick. The subsurface layer is fine sand about 15 inches thick. It is grayish brown in the upper eight inches and light gray in the lower seven inches. The subsoil is between depths of 21 and 69 inches. It is light brownish gray fine sandy loam in the upper five inches, light brownish gray sandy clay loam in the middle 34 inches, and light brownish gray fine sandy loam in the lower nine inches.

Included with this soil in mapping are small areas of Albany, Mascotte, Olustee, Sapelo, and Yonges soils. Also included are similar soils in which the combined thickness of the surface layer and subsoil is less than 60 inches and soils in which the depth of the subsoil is less than 20 inches. Included areas make up about 15 percent of any mapped area.

Under natural conditions this soil has a water table at a depth of less than 10 inches for two to four months and at a depth of 10 to 30 inches for 4 to 12 months during most years. Permeability is rapid to a depth of 21 inches and moderate below. Natural fertility is moderate, and organic matter content is high. Available water capacity is moderate.

4.5.4.15 Pits. Pits consist of excavations from which soil and geologic material have been removed for use in road construction or for foundation purposes. Pits, locally called borrow pits, range from small to large. Many pits have been excavated to a depth below the normal water table and are ponded for nine months or more each year. Most are abandoned, though excavation is continuing in a few places. Some of the older pits are used for fishing, and they are also used by wading birds and waterfowl as feeding areas. Most of these pits that contain water can be improved by stocking with fish.

4.5.4.16 Pottsburg Fine Sand. This is a nearly level, somewhat poorly drained soil on the flatwoods at slightly higher elevations than the surrounding soils. Individual areas range from 5 to 800 acres in size. Slopes range from zero to two percent and are smooth to convex.

Typically, the surface layer is gray fine sand about three inches thick. The subsurface layer extends to a depth of 57 inches. It is brown fine sand seven inches thick, grayish brown fine sand 24 inches thick, and light gray fine sand 23 inches thick. The subsoil, between depths of 57 and 80 inches, is dark reddish brown fine sand that is weakly cemented and well coated with organic matter.

Included with this soil in mapping are small areas of Kershaw, Mandarin, Leon, Ortega, Ridgeland and Wesconnett soils. Included areas make up about 15 percent of any mapped area.

Under natural conditions, this soil has a water table at a depth of 6 to 12 inches for two to four months and at a depth of 12 to 40 inches for six to nine months or longer during most years. Permeability is rapid to a depth of 57 inches and moderate below that depth. Natural fertility and organic matter content are low. Available water capacity is low.

4.5.4.17 Ridgeland Fine Sand. This is a nearly level, poorly drained soil in broad flatwood areas. Individual areas range in size from 5 to 800 acres. Slopes range from zero to two percent and are smooth to convex.

Typically, the surface layer is very dark gray fine sand about six inches thick. The upper part of the subsoil, between depths of 6 and 16 inches, is fine sand. It is dark brown and weakly cemented, and the sand grains are well coated with organic matter. The upper eight inches is dark reddish brown, and the rest is black.

Included with this soil in mapping are small areas of Leon, Lynn Haven, Ortega, Pottsburg and Wesconnett soils. Included areas make up about 10 percent of any mapped area.

Under natural conditions, this soil has a water table at a depth of less than 10 inches for brief periods of two to four weeks, at a depth of 10 to 20 inches for two to four months, and at a depth of 20 to 40 inches most of the remainder of the year during most years. A few small areas of this soil are covered with water for periods of one to two weeks. Permeability is rapid in the upper six inches and between depths of 16 and 31 inches and moderate to moderately rapid between depths of 6 and 16 inches and below a depth of 31 inches. Natural fertility is moderate and organic matter content is high. Available water capacity is low.

4.5.4.18 Sapelo Fine Sand. This a nearly level, poorly drained soil in broad flatwood areas. Individual areas range in size from 2 to 2000 acres. Slopes range from zero to two percent and are smooth to convex.

Typically, the surface layer is black and dark gray fine sand about six inches thick. The subsurface layer extends to a depth of 23 inches. It is light brownish gray fine sand. The upper part of the subsoil, between depths of 23 and 38 inches, is fine sand. It is weakly cemented, and the sand grains are coated with organic matter. The upper seven inches is black and dark reddish brown; the next two inches is black reddish brown, and a very rusky red; and the lower six inches is dark brown. Below this is a layer of very pale brown fine sand that extends to a depth of 56 inches. The lower part of the subsoil, to a depth of 80 inches or more is gray. The upper six inches is sandy clay loam and the lower 18 inches is fine sandy loam.

Included with this soil in mapping are small areas of Mascotte, Olustee, Pelham, and Yonges soils. Included areas make up about 15 percent of any area.

Under natural conditions, this soil has a water table at a depth of less than 10 inches for two to four months or more and at a depth of 10 to 30 inches for two to six months during most years. Permeability is very rapid to a depth of 23 inches, moderate to a depth of 38 inches, very rapid to a depth of 56 inches, and moderate below that depth. Natural fertility is moderate, and organic matter content is medium. Available water capacity is low.

4.5.4.19 Stockage Fine Sandy Loam. This is a nearly level, very poorly drained soil in shallow depressions and large drainageways. Individual areas range from 5 to 1500 acres in size. Slopes range from zero to two percent and are concave.

Typically, the surface layer is black fine sandy loam about 12 inches thick. The subsoil, between depth of 12 and 46 inches, is sandy clay loam. The upper 14 inches is very dark gray, and the lower 20 inches is dark gray. Below this is dark grayish brown and light brownish gray fine sand extending to a depth of 65 inches or more.

Included with this soil in mapping are small areas of Leon, Ortega, Pottsburg and Ridgeland soils. Also, included are small areas of similar soils in which reaction in the subsoil is very strongly acid and strongly acid and a few areas of soils that have a loamy fine sand surface layer. Included areas make up about 15 percent of any mapped area.

Under natural conditions, this soil has a water table at a depth of less than 10 inches, or the soil is covered with water for more than six months during most years. Permeability is moderately rapid in the surface layer, moderate to moderately rapid in the subsoil, and rapid below. Natural fertility and organic matter content are high. Available water capacity is moderate.

4.5.4.20 Surrency Fine Sand. This is a very level, very poorly drained soil in shallow depressions and broad drainageways. Individual areas range in size from 5 to 900 acres. Slopes are less than one percent and are smooth to concave.

Typically, the surface layer is about 18 inches thick. The upper 14 inches is black loamy fine sand, and the lower four inches is dark brown fine sand. The subsurface layer is light brownish gray fine sand about eight inches thick. The subsoil, between depths of 26 and 70 inches, is fine sandy loam. the upper 12 inches is dark grayish brown and has light gray and dark brown mottles, the next 11 inches is dark gray and has light brownish gray mottles, and the lower 21 inches is greenish gray. Below this, to a depth of 80 inches or more, is greenish gray sandy clay loam.

Included with this soil in mapping are small areas of Pottsburg, Leon, Mascotte, Olustee, Pelham and Wesconnett soils. Also included are small areas of similar soils in which reaction ranges from medium acid to mildly alkaline and small areas of soils in which the surface layer is fine sand. Included areas make up about 15 percent of any mapped area.

Under natural conditions, this soils has a water table at a depth of less than 10 inches or the soil is covered with water from 6 to 12 months durin

most years. Permeability is rapid in the surface and subsurface layers and moderate in the subsoil. Natural fertility is moderate, and organic matter content is high. Available water capacity is moderate.

4.5.4.21 Wesconnett Fine Sand. This is a nearly level, very poorly drained soil in shallow depressions and large drainageways. Individual areas range in size from 4 to 1,200 acres. Slopes range from zero to two percent and are smooth to concave.

Typically, the surface layer is black fine sand about two inches thick. The upper part of the subsoil, between depths of 2 and 32 inches, is weakly cemented fine sand. The upper eight inches is black, the next 16 inches is dark reddish brown, and the lower six inches is dark brown. Below this is a layer of pale brown fine sand about 12 inches thick. The lower part of the subsoil, between depths of 44 and 80 inches, is fine sand. It is weakly cemented, and the sand grains are well coated with organic matter. The upper 28 inches is reddish black and the lower eight inches is very dusky red.

Included with this soil in mapping are small areas of Leon, Lynn Haven, Maurepas, Pamlico, Pottsburg and Ridgeland soils. Also included are small areas of similar soils that are slightly acid to moderately alkaline. Areas of this soil along Yellow Water and McGirt's Creeks have natural depositions of sandy materials two to four inches thick overlying the natural soil. Included areas make up about 20 percent of any mapped area.

Under natural conditions, this soil has a water table at a depth of 0 to 10 inches, or the soil is covered by water for 6 to 12 months during most years. Permeability is rapid in the surface layer and between depths of 32 and 44 inches and moderate to moderately rapid between depths of 2 and 32 inches and below a depth of 44 inches. Natural fertility is moderate and organic matter content is high. Available water capacity is moderate.

4.5.4.22 Yonges Fine Sandy Loam. This is a nearly level, poorly drained soil in low-lying parts of the Coastal Plain. Individual areas range in size from 5 to 300 acres. Slopes range from zero to two percent and are smooth to concave.

Typically, the surface layer is very dark gray fine sandy loam about three inches thick. The subsurface layer is gray loamy fine sand about three inches thick. The subsoil extends between depths of 6 to 80 inches. The upper layer of subsoil extends between depths of 6 to 80 inches. The upper layer of subsoil is gray and yellow, mottled sandy clay loam about 19 inches thick. The next layer is gray and dark gray sandy clay loam that contains coarse, brownish yellow mottles and that extends to a depth of 31 inches. The next 24 inches is mixed gray, yellowish brown, and yellow sandy clay loam. Below this is greenish gray sandy clay loam that contains coarse yellowish brown mottles and that is about 10 inches thick. The next layer extends to a depth of 80 inches; it is mixed dark greenish gray, greenish gray, and light olive brown sandy clay loam.

Included with this soil in mapping are small areas of Mascotte, Pelham, Sapelo and Stockage soils. Also included are small areas of similar soils in which reaction ranges from medium acid to very strngly acid. Also included are a few areas of soils that have a loamy fine sandy surface layer. Included areas make up about 10 percent of any mapped area.

Under natural conditions, this soil has a water table at a depth of less than 10 inches for two to six months during most years. Permeability is moderate to moderately rapid in the surface layer, moderately slow in the subsoil, and moderate below. Natural fertility is moderate, and organic matter content is low. Available water capacity is high.

4.5.4.23 Yulee Clay. This is a nearly level, very poorly drained soil in shallow depressions and large drainageways. Individual areas range in size from 5 to 1500 acres. Slopes range from zero to two percent and are concave.

Typically, the surface layer is black clay about 14 inches thick. The subsoil, between depths of 14 and 66 inches, is sandy clay. The upper layer, 14 inches thick, is very dark gray and has strong brown mottles; they extend to a depth of 48 inches. The layer below this, about 18 inches thick, is dark gray and has coarse strong brown and dark red mottles. Below this is a layer of pale yellow sandy clay loam that has dark reddish brown and dark yellowish brown mottles and this is about nine inches thick. Below this, and extending to a depth of 80 inches or more, is a layer of coarsely mottled greenish gray, greenish gray, and olive clay loam.

Included with this soil mapping are small areas of Mascotte, Olustee, Pelham, Sapelo and Yonges soils. Also included are small areas of similar soils that are very strongly acid and have a clay loam surface layer. Included areas make up about 15 percent of any mapped area.

Under natural conditions, this soils has a water table at a depth of less than 10 inches, or the soil is covered with water for more than six months during most years. Permeability is moderately slow to a depth of 14 inches and moderate below. Natural fertility and organic matter content are high. Available water capacity is medium to high.

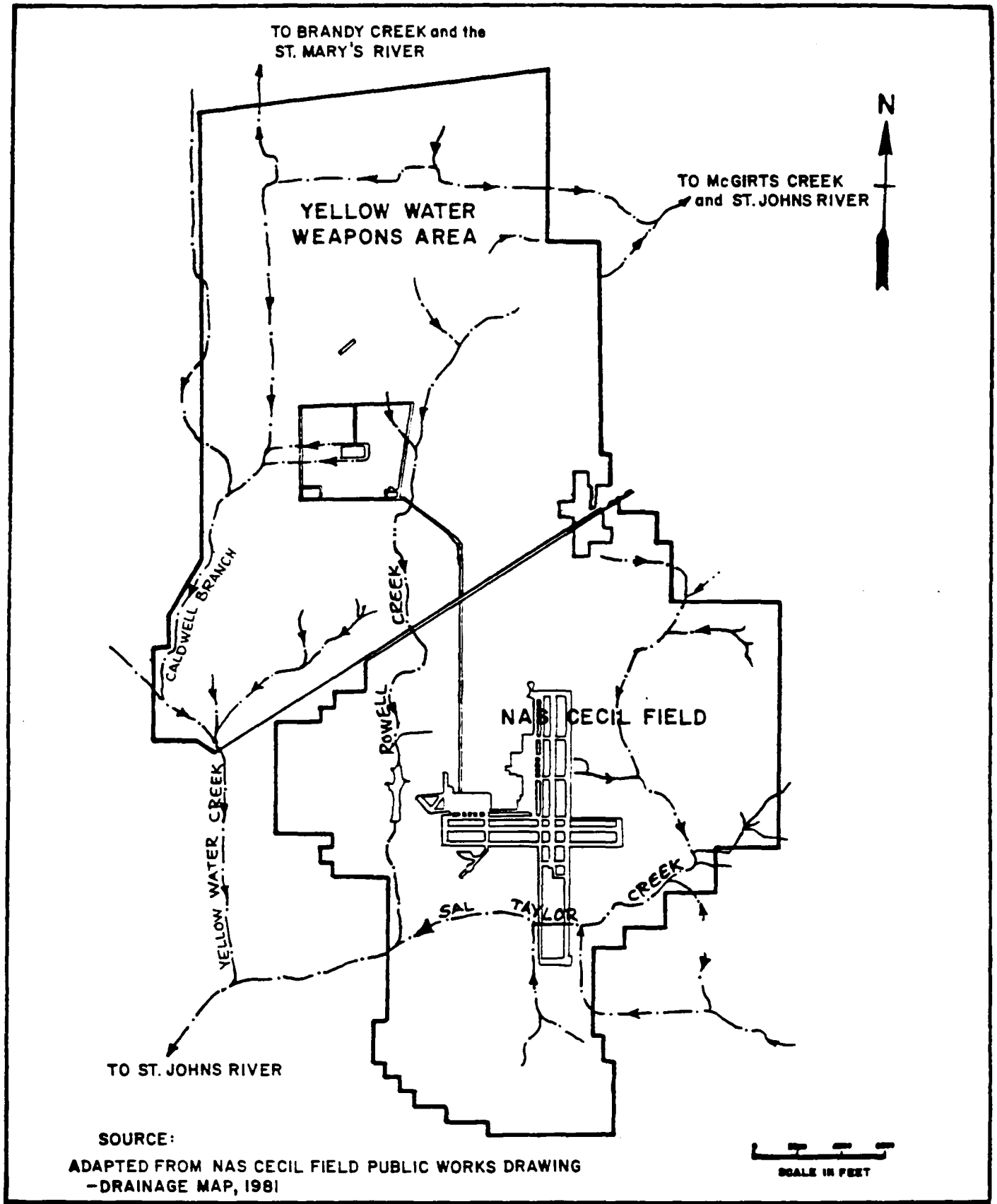
4.5.5 Hydrology.

4.5.5.1 Surface Water.

4.5.5.1.1 Surface runoff from NAS Cecil Field is conveyed by a system of storm sewers and vegetated ditches to receiving streams which border the station, as indicated in Figure 4-9. Generally the eastern and southern portions of Cecil Field drain to Sal Taylor Creek while the western portion drains to Lake Fretwell or to Rowell Creek, which discharges south to Sal Taylor Creek. Sal Taylor Creek drains in a westerly direction, discharging into Yellow Water Creek, which drains south to the St. Johns River. The St. Johns River drains to the Atlantic Ocean and is tidally influenced.

Sal Taylor Creek, Rowell Creek, Yellow Water Creek and the St. Johns River are all classified by the Florida Department of Environmental Regulation (FDER) as Class III Waters: Recreation, Propagation and Management of Fish and Wildlife (Jacksonville Area Planning Board, 1980). Lake Fretwell, which is approximately eight acres in area, is stocked with bass for sportfishing and a recreational complex has been developed along its northeastern shoreline (SOUTHNAVFACENGCOM, 1981).

Up until 1975, the Cecil Field sewage treatment plant discharged treatment effluent through a ditch and into Lake Fretwell. In 1975, a pipe outfall which discharges to Rowell Creek just south of Lake Fretwell, was installed, thus eliminating discharges to the Lake.



SOURCE:
ADAPTED FROM NAS CECIL FIELD PUBLIC WORKS DRAWING
-DRAINAGE MAP, 1981

FIGURE 4-9
Surface Drainage Map Cecil Field and Yellow Water Weapons Area

INITIAL ASSESSMENT STUDY
NAVAL AIR STATION
CECIL FIELD

Major water quality problems in the St. Johns River, which have been identified, include depressed dissolved oxygen concentrations, bacteriological contamination, and organic deposits along the rive bottom (Stanley Consultants, Inc., 1978). Bio-Environmental Services Division of the City of Jacksonville has detected DDT in Yellow Water Creek (Roy F. Weston, Inc., 1978).

4.5.5.1.2 Surface runoff from the Yellow Water Weapons Area is conveyed by a system of vegetated ditches to nearby receiving streams as indicated in Figure 4-9.

In general, the southwest portion of the Yellow Water Weapons Area drains south via Caldwell Branch or other drainage systems to Yellow Water Creek. The southeast portion drains south to Rowell Creek and Sal Taylor Creek, which eventually drain to Yellow Water Creek. The northwest portion of the Yellow Water Weapons Area drains north to Brandy Creek, which discharges to the St. Marys River. The northeast portion drains eastward to McGirts Creek, which drains out to the St. Johns River.

All of the aforementioned creeks and rivers are classified by the Florida FDER as Class III Waters - Recreation, Propagation and Management of Fish and Wildlife (Jacksonville Area Planning Board, 1980).

Water quality information for Yellow Water Creek and St. Johns River is provided in Section 4.5.5.1. Water quality problems in McGirts Creek include high coliform levels and low dissolved oxygen levels (Stanley Consultants, Inc., 1978).

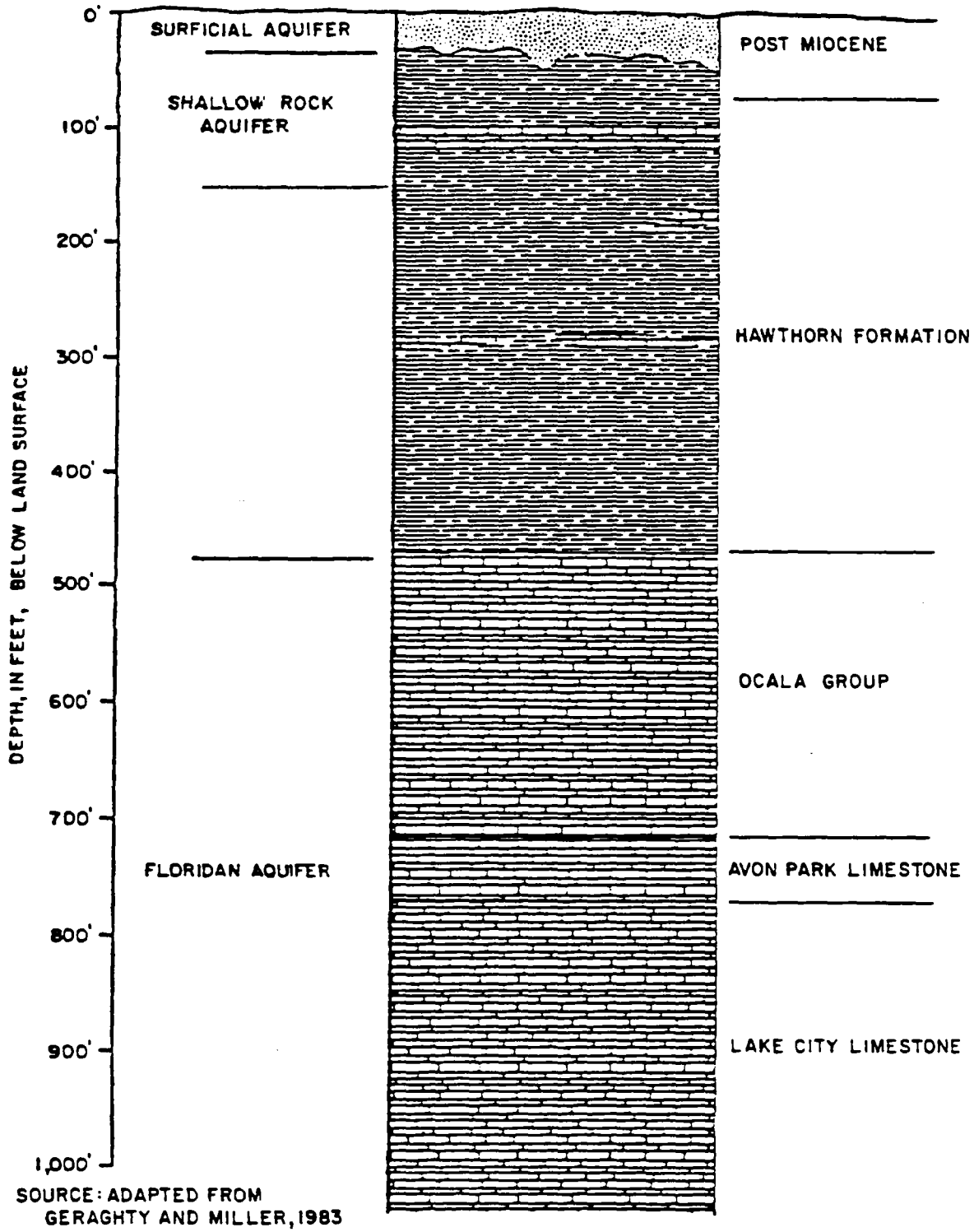
4.5.5.1.3 Small drainageways and swampy areas drain OLF Whitehouse to McGirts Creek, which originates at OLF Whitehouse. This creek is the principal drainage for the area (SOUTHNAVFACENGCOM, 1981). Eastern portions of the OLF Whitehouse drain east to Sixmile Creek which is a tributary to the St. Johns River. Northern portions of Whitehouse drain to Brandy Creek, which drains north and is a tributary of the St. Marys River (City of Jacksonville, 1980b).

All of the aforementioned creeks and rivers are classified by the Florida FDER as Class III Waters - Recreation, Propagation and Management of Fish and Wildlife (Jacksonville Area Planning Board, 1980).

4.5.5.2 Ground Water. Ground water supplies in the Duval County area are obtained from three aquifers; the surficial sand aquifer, the shallow rock aquifer and the Floridan aquifer. Figure 4-10 provides a geologic profile of the three aquifers in the NAS Cecil Field Area. A detailed description of the aquifers follows.

4.5.5.2.1 The surficial aquifer is comprised of the uppermost fine to medium-grained quartz sands and clayey sands that overlie clayey confining units (Geraghty and Miller, 1983). In Duval County, the surficial aquifer extends from the surface to a depth of 25 to 50 feet (Stanley Consultants, Inc., 1978). At the NAS Cecil Field, the surficial aquifer ranges in thickness from 20 to 40 feet (Geraghty and Miller, 1983).

The surficial aquifer is recharged by local rainfall or from water from nearby streams. The aquifer discharges into surface streams and is the primary source of base flow for many streams in Duval County (Frederic R. Harris Inc., 1973). In the Cecil Field area, the ground water movement is primarily



SOURCE: ADAPTED FROM GERAGHTY AND MILLER, 1983

FIGURE 4-10

Generalized Geologic Column

INITIAL ASSESSMENT STUDY
NAVAL AIR STATION
CECIL FIELD

lateral through the surficial aquifer because vertical movement is impeded by underlying clayey sediments. In these areas, the general direction of ground water flow is from topographic highs to areas of natural discharge such as creeks, swamps and ditches in the area (Geraghty and Miller, 1983). Based on a limited information of ground water levels in the Cecil Field area (SOUTHNAVFACENGCOM, 1981; and Geraghty and Miller, 1983), it is estimated that ground water elevations may vary from at or near the surface in low lying swampy areas up to 10 feet below the ground in higher areas.

Information regarding ground water gradients and flow rates in the Cecil Field area is sparse. A detailed study (Geraghty and Miller, 19[illegible]) of a fuel spill at NAS Cecil Field (details to be discussed later in this section) estimated that the ground water flow rate in the immediate vicinity of the spill site was about 40 feet per year. The spill site is topographically located on a ridge and fairly remote from the nearest area of natural discharge. Since ground water gradients near areas of discharge are typically steeper than those in broad interstream areas, ground velocities are probably somewhat higher than 40 feet per year closer to areas of discharge at NAS Cecil Field.

An on going ground water monitoring study in the NAS Cecil Field area (see Appendix B) should provide further information on ground water gradients and flow rates in the area.

Contaminants may easily enter the surficial aquifer due to its close proximity to the land surface and the rapid permeability of the sandy soils that are common to the area. In Duval County, this aquifer is subject to contamination from septic tanks and polluted surface drainage (Frederic R. Harris, Inc., 1973). One case of ground water contamination in the surficial aquifer on Navy property has been reported. This contamination resulted from a half-million gallon spill of JP-5 at a Day Tank (Site 13) at Cecil Field in 1981. A study (Geraghty and Miller, 1981) of the spill (see Section 8.3 and Appendix C for further details) concluded: only a small amount of fuel has migrated into the shallow ground water system and the amount of fuel is small enough so that no significant oil plume has or will be formed.

The previously mentioned on-going ground water monitoring study at NAS Cecil Field is being conducted, in part, to determine if there is any ground water contamination (surficial aquifer and shallow rock aquifer) at Cecil Field from the landfills (Sites 1 and 2) and grease pits (Site 4), which were identified during a preliminary study of the area. Preliminary results of the ground water sampling efforts are provided in Appendix B.

The water from the surficial aquifer is generally low in dissolved solid content, but may be corrosive due to its slightly acidic character and high carbon dioxide content (Frederic R. Harris, Inc., 1973).

The surficial aquifer in Duval County is generally not used as a potable water source, but is suitable for low-yield, non-potable uses such as lawn watering (City of Jacksonville, 1980a). There are no offically recorded wells in the surficial aquifer at Cecil Field, Yellow Water or OLF Whitehouse.

4.5.5.2.2 In Duval County, the shallow rock aquifer which is composed of shell, limestone and sand deposits, extends below the water table up to a depth of about 150 feet. The water in this aquifer is generally confined by

low permeable beds overlying the aquifer and is under semi-artesian to artesian conditions. In the Cecil Field area, the deposits separating the shallow rock aquifer from the overlying surficial aquifer consist of calcareous silty clays, clays and clayey sands (Figure 4-10). These deposits range from approximately 20 to 105 feet in thickness in the Cecil Field area, based on the range in depth to the principle, water bearing limestone layer (Geraghty and Miller, 1983). In Duval County, the principle water bearing zone in this aquifer is a bed of limestone 40 to 100 feet below the surface (Stanley Consultants, Inc., 1978). In the Cecil Field area, the limestone layer is approximately 20 to 25 feet thick, occurring at a depth of 60 to 125 feet (Geraghty and Miller, 1983).

Ground water flow in the shallow rock aquifer in the vicinity of NAS Cecil Field is toward the east as indicated in the potentiometric surface contour map in Figure 4-11. Based on the map, it has been suggested that in the upland areas at Cecil Field there is a downward movement of water from the surficial aquifer into the shallow rock aquifer, while in stream valleys, the movement is upward from the shallow rock aquifer into the surficial aquifer (Geraghty and Miller, 1983).

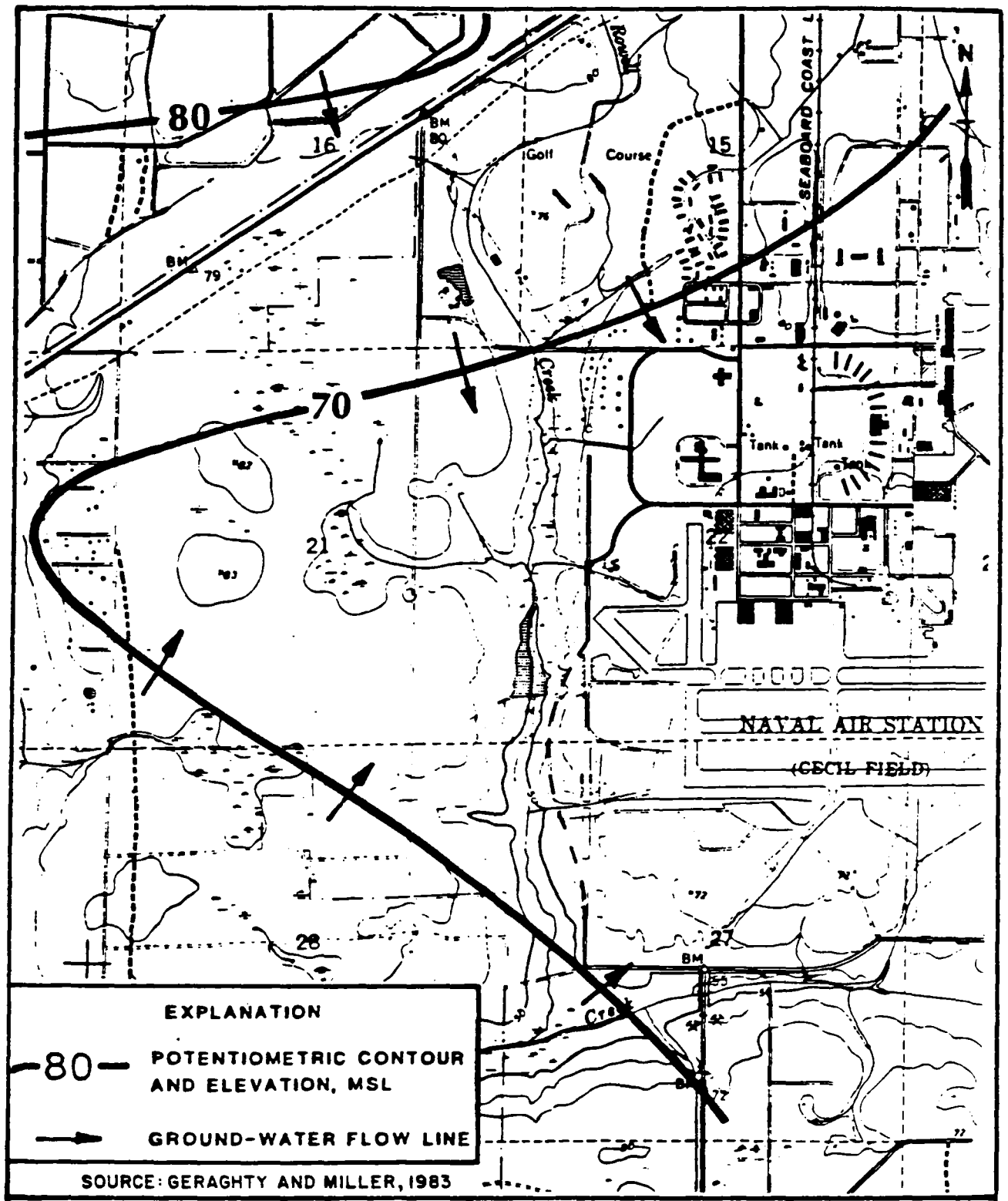
Potential contaminant migration to this aquifer from landfills and oil pits located at Cecil Field is currently under study by Geraghty and Miller, Inc. as previously discussed in Section 4.5.5.2.1.

Water from this aquifer, in the Duval County area, contains 150 to 400 mg/l of dissolved solids and is slightly alkaline. The iron content is highly variable, ranging from a few hundredths to more than 2.5 mg/l.

Most small domestic water supplies are obtained from wells completed in this aquifer in areas not serviced by municipal or private water utilities. It also supplies water to wells for lawn sprinkling and for some industrial purposes such as cooling condensors in water exchange units and for boiler make-up water (Frederic R. Harris, Inc., 1973). The shallow rock aquifer is considered a low-to-moderate yield source (City of Jacksonville, 1980a). There are some wells tapping this aquifer at NAS Cecil Field. See Section 4.5.5.3 for details concerning these wells.

4.5.5.2.3 The Floridan aquifer extends throughout all of peninsular Florida and parts of Georgia, Alabama and South Carolina. It consists of limestone and dolostones of the Ocala Group, Avon Park Limestone, and the Lake City Limestone. In Duval County, the top of the aquifer is between 300 to 600 feet below sea level and is more than 1,000 feet thick. The aquifer was found to be about 1,600 feet thick in one deep test well drilled in the area (Stanley Consultants, Inc., 1978). At NAS Cecil Field the top of the Floridan aquifer occurs at a depth of about 500 feet. The overlying Hawthorn Formation acts as a confining unit separating the surficial and the shallow rock aquifer from the underlying artesian Floridan aquifer.

A ground water study of the NAS Cecil Field area (Geraghty and Miller, 1983) places the shallow rock aquifer in the upper part of the Hawthorn Formation, while others (City of Jacksonville, 1980a-1980b) place the shallow rock aquifer above the Hawthorn Formation. Confining deposits of the Hawthorn Formation underlying the shallow rock aquifer separate the shallow rock aquifer from the Floridan Aquifer. The Hawthorn Formation, as described in Section 4.5.3.1.3, consists primarily of calcerous, phosphatic sandy clays and clay sands, interbedded with thin, discontinuous lenses of sands, sandy



SOURCE: GERAGHTY AND MILLER, 1983

FIGURE 4-11
Contour Map of Potentiometric Surface
Shallow Rock Aquifer

INITIAL ASSESSMENT STUDY
NAVAL AIR STATION
CECIL FIELD

limestone and hard dolomite. It is approximately 400 feet thick in the NAS Cecil Field area (Geraghty and Miller, 1983). Because it is essentially well compacted clays and sandy clays, the thick Hawthorn Formation is considered by the U.S. Geological Survey as an aquiclude in the Duval County area (City of Jacksonville, 1980a). Others (City of Jacksonville, 1980a-1980b) suggest that further investigations be conducted to determine potential leakage from and recharge to the Florida aquifer through the Hawthorn.

Much of the recharge to the aquifer occurs 30 to 60 miles southwest of Jacksonville where the overlying beds are thin or absent. In this area the aquifer is recharged by rainfall and downward infiltration from surface lakes and streams. Water moves laterally away from the recharge area through the aquifer toward Jacksonville and other areas in northeastern Florida (Frederic R. Harris, Inc., 1973). Figure 4-12 shows that ground water flow directions in the Floridan aquifer for September 1982, were toward the east-northeast. This figure indicates that the potentiometric surface of the Floridan aquifer in the area at Cecil Field, Yellow Water and OLF Whitehouse ranged from approximately 45 to 50 feet MSL. Assuming a potentiometric surface elevation of 70 feet MSL for the shallow rock aquifer at Cecil Field (Figure 4-10), this indicates that there is a downward hydraulic gradient between the two aquifers in the area (Geraghty and Miller 1983).

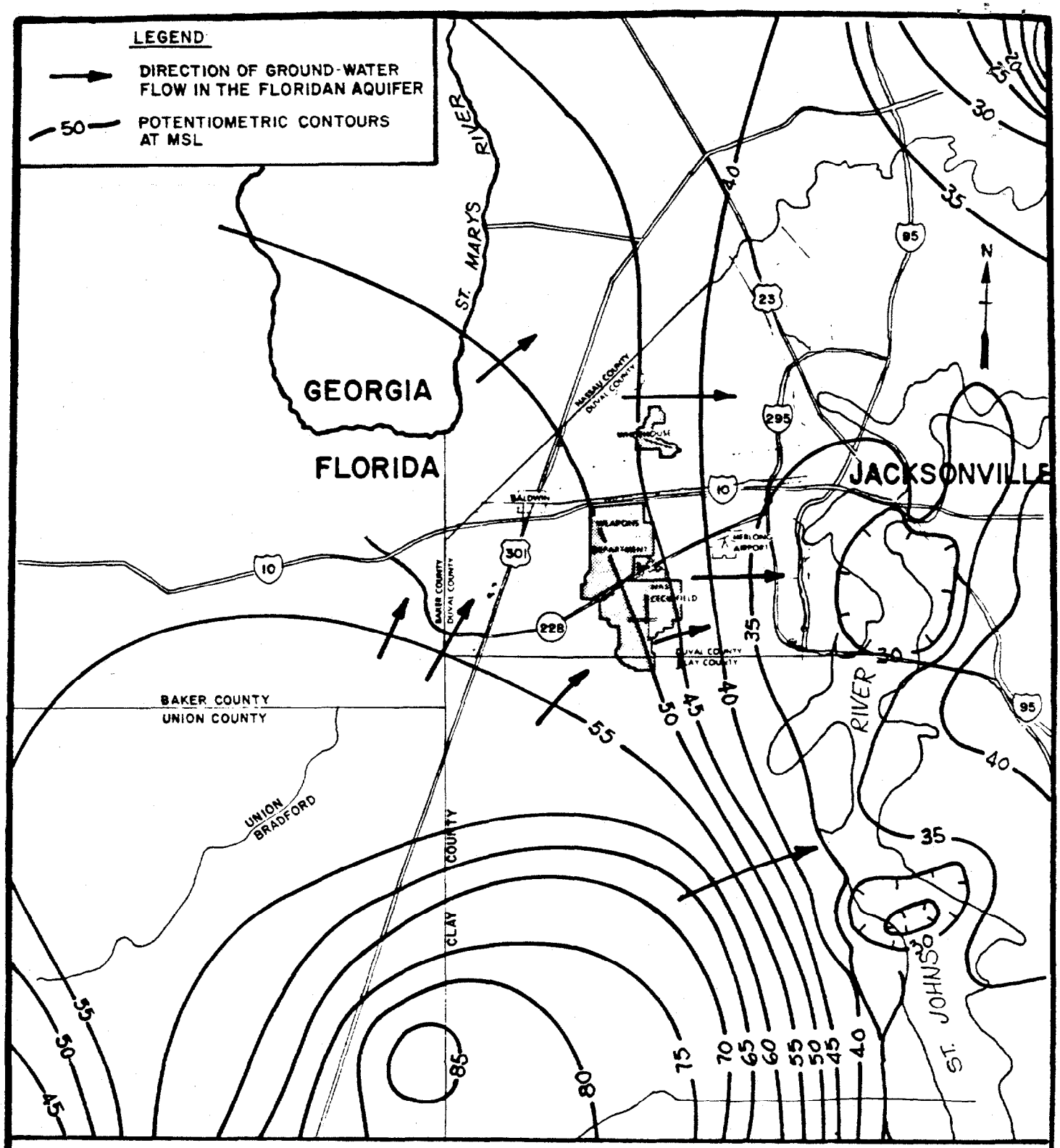
A transmissivity of 190,000 gpd/ft was determined for the Floridan aquifer a few miles east of Cecil Field (Geraghty and Miller, 1983). Assuming an aquifer thickness of 1,000 feet, a hydraulic conductivity of about 0.009 centimeters per second is determined. Using a hydraulic gradient of 0.0022 ft/ft based on Figure 4-12 and applying Darcy's law, the rate of ground water flow is about 200 feet per year.

The quality of water in the Floridan aquifer is variable depending upon the location and depth in the aquifer. The dissolved solid content ranges from about 250 mg/l to more than 600 mg/l and the total hardness ranges from about 90 mg/l to more than 400 mg/l. The dissolved iron content is less than 0.3 mg/l (Frederic R. Harris, Inc., 1973).

The Floridan aquifer is recognized as one of the most productive aquifers in the world (Jacksonville Area Planning Board, 1980). It is the principal source of potable water supplies in the Duval County area. All municipal and private water utility supply systems and most commercial and industrial supplies are obtained from wells completed in this aquifer. The potable water supply systems for NAS Cecil Field, the Yellow Water Weapons Area and OLF White house all tap the Floridan aquifer. See section 4.5.5.3 for details concerning the wells.

4.5.5.3 Water Supply. All of the water utilized at NAS Cecil Field, the Yellow Water Weapons Area and OLF Whitehouse is obtained from on-site wells. Table 4-3 provides an inventory of the Navy wells and of nearby wells off Navy property. Figure 4-13 indicates the locations of the various wells.

4.5.5.3.1 NAS Cecil Field's potable water supply system consists of five deep wells (Wells PS-1 through PS-5) which tap the Floridan aquifer. The water is pumped from the deep wells and stored in reservoirs and elevated water tanks. There is one 500,000 gallon reservoir, one 200,000 gallon reservoir and two 250,000 gallon elevated water tanks at Cecil Field (SOUTHNAVFACENGCOM, 1981). The five wells have a combined capacity of approximately 4.8 million gallons per day (MGD).



SOURCE: GERAGHTY AND MILLER, 1983

FIGURE 4-12
Contour Map of Potentiometric Surface for Floridan Aquifer

INITIAL ASSESSMENT STUDY
NAVAL AIR STATION
CECIL FIELD

Table 4-3

Well Inventory of NAS Cecil Field and Nearby Areas

Well Designation	Owner	Date Installed	Depth (ft)	Interval Open to Formation[a] (ft depth)	Status[b]
PS-1	U.S. Navy	1941	887	? -887(F)	Potable water - CF
PS-2	U.S. Navy	1945	970	? -907(F)	Potable water - CF
PS-3	U.S. Navy	1950	950	? -950(F)	Potable water - CF
PS-4	U.S. Navy	1956	1303	485-1303(F)	Potable water - CF
PS-5	U.S. Navy	1956	1350	? -1350(F)	Potable water - CF
PS-6	U.S. Navy	1976	770	486-770(F)	Potable water - YWWA (Family Housing)
PS-7	U.S. Navy	1976	780	490-780(F)	Potable water - YWWA (Family Housing)
PS-8	U.S. Navy	1941	610	? -610(F)	Potable water - YWWA
PS-9	U.S. Navy	1941	610	? -610(F)	Potable water - YWWA
PS-10	U.S. Navy	?	?	? (F)	Potable water - OLF
J391	U.S. Navy	1941	887	400-887(F)	Unknown
J2876	U.S. Navy	1956	964	396-964(F)	Unknown
A	U.S. Navy	?	?	? (F)	Golf Course Irrigation
B	U.S. Navy	?	?	? (R)	Water supply - FFTA
C	U.S. Navy	?	120±	? (R)	Water supply - FFTA
D	U.S. Navy	?	800±	? (F)	Abandoned
DS-143	U.S. Navy	1941	990	? (F)	No longer in use. Formly used for water cooling of air conditioning system at movie theater.
DS-94	Private	?	64	? (R)	Unknown
DS-142	Private	?	125	? (R)	Unknown
Y-1 & Y-2	U.S. Navy	1940s	?	? (F)	Former potable water supply wells for old Navy training base. Wells last used in 1950s.

Notes: [a](R) Well taps shallow rock aquifer; (F) Well taps Florida aquifer.
[b]CF - NAS Cecil Field; YWWA - Yellow Water Weapons Area; OLF - OLF Whitehouse; FFTA - Fire Fighting Training Area.

Source: Adopted from Geraghty and Miller, 1983 and NAS Cecil Field Well Location Map, 1981.

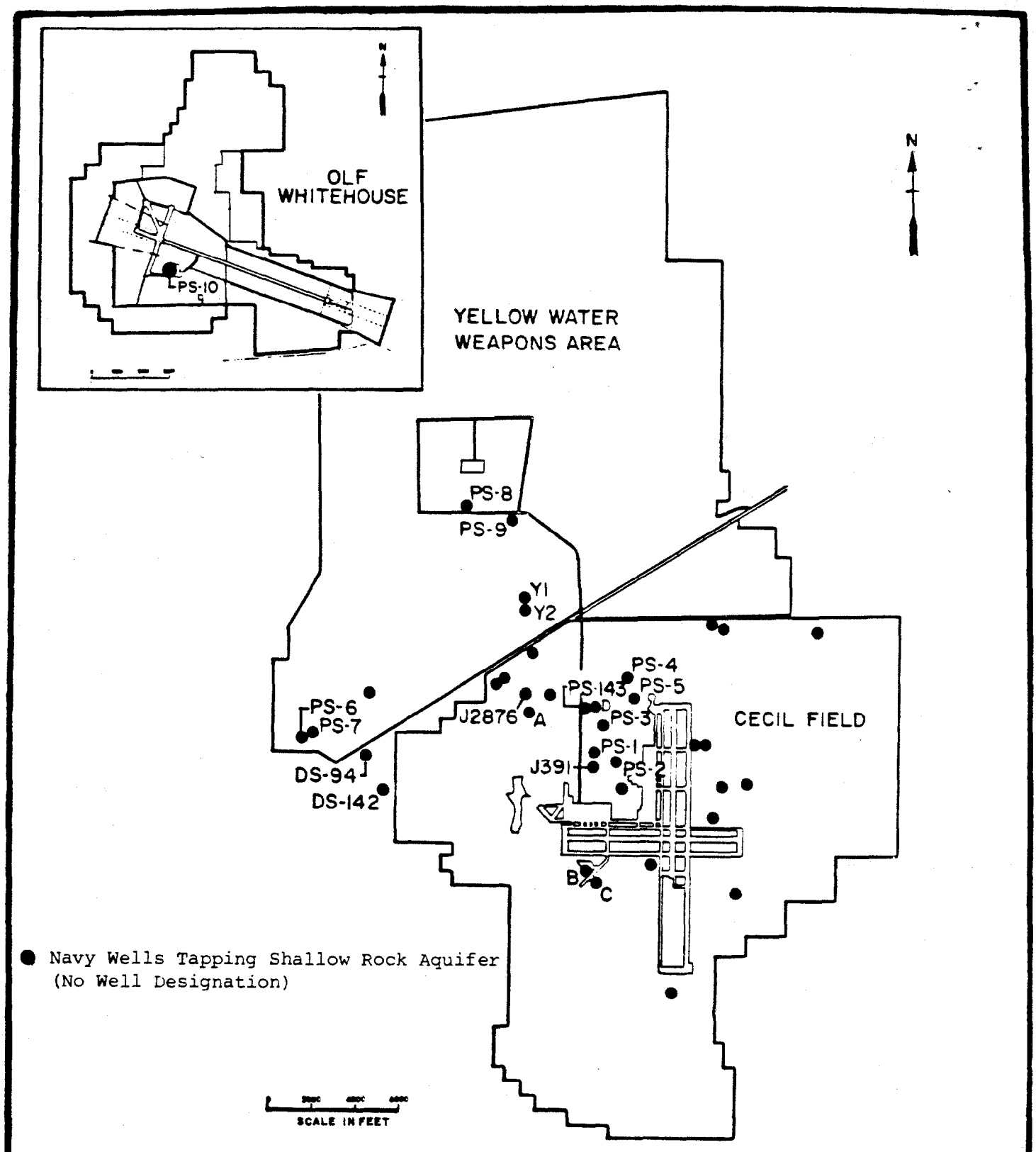


FIGURE 4-13

Well Location Map

INITIAL ASSESSMENT STUDY
NAVAL AIR STATION
CECIL FIELD

Water from the wells is used for potable, industrial and heating purposes. Treatment consists of chlorination and aeration. In addition, phosphate is added to boiler plant water. There are no back up supplies of potable water at NAS Cecil Field.

At the golf course, Well A, which taps the Floridan aquifer, is used for irrigation purposes only.

There are numerous Navy wells scattered throughout NAS Cecil Field which tap the shallow rock aquifer. The wells are typically two inches in diameter and made of steel and are approximately 100 to 200 feet deep. The status of all these wells is unknown. These wells are not a part of the Cecil Field water supply system, but are used as individual water supplies along outlying areas of the base which are not served by the main water system. These wells have not been monitored or maintained since they provide service to so few people. Water from these wells are used for flushing of toilets, irrigation, and potable purposes at outlying facilities. Wells B and C are used to provide water for practice burns at the fire fighting training area. It has also been reported that Boy Scouts camping at NAS Cecil Field have used these wells.

There were no reported incidences of water contamination in any of the wells at Cecil Field which tap the Floridan aquifer. However, a shallow rock aquifer well at the golf course was closed due to coliform contamination from a nearby septic tank, and another well was installed nearby.

4.5.5.3.2 Two wells (PS-6 and PS-7) tapping the Floridan aquifer provide water to the Yellow Water Housing Area. This water supply is independent of the Cecil Field water supply system. The housing area is served by a 10,000 gallon pressure tank (SOUTHNAVFACENGCOM, 1981). This water supply system is independent of other water supply systems.

Treatment consists of chlorination and aeration at the housing and weapons areas. There are no back up supplies of potable water for these areas.

4.5.5.3.3 Water is provided to OLF Whitehouse by one well tapping the Floridan aquifer. This is essentially a household water system with a capacity of about 15 gallons per minute (gpm). Treatment consists of chlorination and aeration. There are no back up water supplies for this area.

A small unincorporated community on Nathan Hale Road, immediately west of NAS Cecil Field and south of Normandy Boulevard (State Route 228), uses wells. Records of only two wells (DS-94 and DS-142) in the community are available. These private wells, not part of a water utility system, are 64 and 125 feet deep, respectively. It is probable that most if not all drinking water wells there tap the shallow rock aquifer (Geraghty and Miller, 1983).

4.6 MIGRATION POTENTIAL. The major migration pathways from sites of potential contamination at NAS Cecil Field and the Yellow Water Weapons Area include surface runoff, and ground water movement in the surficial aquifer to nearby receiving waters such as ditches and creeks.

Contaminant migration by the surface runoff pathway could occur in areas where the source of contamination is at or near the surface or where erosion problems expose previously buried materials, thereby allowing direct contact with surface runoff.

Many of the potential contamination sites drain to nearby receiving ditches. This allows relatively direct access of potential contaminants from the ditches to receiving waters such as Lake Fretwell, Rowell Creek and Sal Taylor Creek.

Gamefish (bass, Micropterus salmoides), as well as a number of other aquatic organisms inhabiting Lake Fretwell, may be receptors for contaminants potentially present in the water and bottom substrates. Predators, such as wading birds utilizing this area for foraging, may be impacted through further bio-accumulation. Since a number of recreation activities occur at the lake, including fishing and canoeing, the potential for direct human contact exists.

Impacts to the creeks on the base would primarily be limited to the aquatic wildlife inhabiting the waters and the predators, such as wading birds, that depend on these areas for feeding. There is little human contact with these areas as they are relatively isolated from normal base activities.

Contaminants from potential sites may easily enter the surficial aquifer due to its close proximity to the land surface and the rapid permeability of the sandy soils that are common to the area. In certain instances, buried materials were reported to be in direct contact with the surficial ground water.

Ground water movement in the surficial aquifer is primarily lateral because vertical movement is impeded by underlying clayey sediments. The general direction of this lateral ground water movement in the surficial aquifer is from topographic highs to areas of natural discharge such as ditches and creeks. It is estimated that the ground water velocity in the Cecil Field area is on the order of 40 feet per year. Thus, potentially contaminated ground water may readily enter or recharge nearby ditches and creeks. As previously discussed for surface runoff migration patterns, potential impacts in this area would be primarily limited to the aquatic wildlife, with the greatest potential for human impact on Navy property being associated with recreational activities at Lake Fretwell.

Since there are no wells at NAS Cecil Field or the Yellow Water Weapons Area which tap the surficial aquifer, no direct impacts to water sources is anticipated. However, there is some potential for downward percolation of water from the surficial aquifer, to the artesian shallow rock aquifer. A potentiometric surface map of the shallow rock aquifer indicates that recharge to this aquifer from the surficial aquifer would be primarily limited to upland areas. In low lying areas, the hydraulic gradient would be upward from the shallow rock aquifer to the surficial aquifer. There are scattered wells at NAS Cecil Field and the Yellow Water Weapons Area which tap the shallow rock aquifer. These only provide limited service to outlying Navy areas which are not tied into the main water supply system. However, some are used as a source of potable water.

The potential for contaminant migration to these wells from the surficial aquifer would depend on the cone of influence of the wells, the ground water gradient at the site and the continuity and thickness of the underlying clay lenses in the area. However, due to the occasional isolated use of these wells for potable water, their small capacity (i.e. two inch diameter and low-to-moderate yield of the shallow rock aquifer) and the impeded percolation from the surficial aquifer to the shallow rock aquifer, the potential impact to humans is limited.

Contaminant migration from the surficial aquifer to the underlying Florida aquifer is not anticipated since the two aquifers are separated by the extensive confining deposits of the Hawthorn Formation, which are over 400 feet thick in the NAS Cecil Field area.

Impacts to nearby private ground water supplies (community on Nathan Hale Road) due to potential ground water contamination on Navy property, are not anticipated since any potential ground water contamination would be primarily limited to the surficial aquifer. In addition, the topography of the area infers that the wells at Nathan Hale Road are either upgradient of potential contamination sites at NAS Cecil Field, or are separated from the sites by a ground water divide. However, information on actual ground water gradients in the area, which will be obtained during the confirmation phase of the study, will be required to confirm this assumption.

The potential off-base impacts from sources of contamination on Navy property would be primarily associated with drainage ditches or creeks which may carry contaminants off Navy property. Although these surface waters are not a source of potable water for the area, they are classified as recreational waters and thus are subject to human contact. Aquatic wildlife inhabiting these waters, and the predators (wading birds) that depend on these waters for feeding, may be impacted.

The area surrounding the station is rural in character and sparsely populated (SOUTHNAVFACENGCOM, 1981). Thus, surrounding off-base areas are not anticipated to be major sources of potential contamination to on-base area. There are no known sources of contamination reported for these areas which can be expected to impact on-base areas, although septic tanks in these areas may contaminate the surficial aquifer.

CHAPTER 5. WASTE GENERATION

5.1 GENERAL. Naval Air Station (NAS) Cecil Field is homeport to all A-7 light attack aircraft and S-3 anti-submarine warfare aircraft assigned to the Atlantic Fleet. The station was commissioned as a Naval Auxiliary Air Station (NAAS) in 1941. During World War II, Cecil Field was used for flight training. There were two hangars (Buildings 13 and 14) and a 2,000 foot circular landing mat. No Carrier Air Groups were homeported at Cecil Field, and no Aircraft Intermediate Maintenance Department (AIMD) facilities were on-base, so waste generation was limited to a minor amount of squadron maintenance operations in the hangars. As the United States' involvement in World War II escalated, four 5,000 foot runways were added to expand flight training capabilities. At the end of World War II, Cecil Field was reduced to caretaker status, during which period essentially no waste generation took place. In 1949, two Carrier Air Groups, consisting of approximately 200 planes, were assigned to be homeported at Cecil Field, resulting in a requirement for increased housing, administration, and aircraft maintenance and support activities.

The United States' involvement in the Korean conflict put Cecil Field back on full operational status in 1950. The construction of new maintenance hangars in 1955, 1966, 1970 and 1976, along with the construction of AIMD facilities in 1960 and 1967, have significantly increased the number of aircraft and squadrons that can be accommodated as well as the level of maintenance and repair work that can be accomplished. The types and quantities of hazardous wastes generated at Cecil Field are directly related to these operations, and corresponding support activities.

The operations generating hazardous wastes at Cecil Field are outlined in this chapter. Dates of operation, quantities and types of waste generated, and disposal practices are identified where known.

5.2 INDUSTRIAL OPERATIONS. The mission of NAS Cecil Field is to provide facilities and perform organizational level aircraft maintenance as well as aircraft intermediate level maintenance, and to maintain and operate test cells and an engine repair facility for turbo jet engines. The Air Station is not involved in any heavy industrial or production-type operations. Principle industrial activities are performed by AIMD, the Air Operations Department, the Squadrons and the Public Works Department (PWD). The types and quantities of hazardous wastes generated by each shop are tabulated for clarity.

5.2.1 Aircraft Intermediate Maintenance Department. AIMD performs intermediate level maintenance on all aircraft and ground support equipment belonging to the squadrons homeported at Cecil Field. AIMD consists of 12 divisions. Most of the industrial-type operations occur in the Airframes, Ground Support Equipment (GSE), and Power Plant divisions. Prior to 1967 when the main AIMD facility was constructed (Building 824), very little AIMD activity took place at Cecil Field. Intermediate maintenance was performed at NAS Jacksonville or other stations as necessary. Since 1967, AIMD operations have steadily increased as new hangars have been built and additional squadrons have been stationed at Cecil Field.

5.2.1.1 Airframes Division. The Airframes Division consists of six work centers: structural, machine, hydraulic, tire, weld and the non-destructive

inspection (NDI) laboratory. The Airframes Division is responsible for repair and fabrication of structural components for aircraft. This includes the hydraulic systems and maintenance of the tires and brakes. Hazardous waste generation for the Airframes Division is summarized in Table 5-1.

The main waste generating operation of the structural shop in Building 825 is painting aircraft components. The shop uses methyl ethyl ketone (MEK) and toluene to strip paints. The shop has used polyurethane and isocyanate paints since about 1977. Previous to that time, other types of paints were used including epoxy and enamel.

Another operation of the structural shop is the removal of paint from aircraft components by vapor blasting. This takes place in Building 313. Wastes from this process include water and glass beads or shot. This waste was discharged to a seepage pit at Building 313 (Site 16) from 1960 until 1980. The seepage pit was abandoned in 1980 and a separate, three-chamber, underground settling tank was constructed on the west side of Building 313. Vapor blasting wastewater is discharged to this settling tank, where the beads settle-out of the wastewater and the water passes over the tank baffles and into the sanitary sewer system. The glass beads are periodically cleaned out of the settling tank and removed by a contractor. No records of the quantity of waste generated was available.

Waste paints and solvents from the Airframes shops have been handled in different manners through the years. Prior to 1972, there was no specified waste collection and disposal procedure for industrial wastes. It is reasonable to assume the waste paints and solvents would have been collected in empty cans or drums. Disposal of these containers was the responsibility of AIMD personnel. These wastes may have been taken to the old fire fighter training area (Site 7) for use in training exercises, taken to the landfill, (Site 1 or 2), or, if the waste was liquid, it may have been poured into one of the waste oil pits along the perimeter road (Site 3, 4, 5 or 17). Small containers of waste paint and solvents may have been placed in the trash dumpsters. This would result in the waste being put in one of the Cecil Field landfills (Site 1 or 2) until the mid to late 1960s, and in an off-station landfill after that time.

Around 1972, waste oil bowsers began to be used on-base. Waste paints and solvents were often disposed in the bowsers. Some wastes from the structural shop may have been placed in bowsers during this time. The remaining waste was probably handled as it was before the bowsers were incorporated. In 1979, hazardous waste barrels were instituted for collection of non-petroleum, oil or lubricant (POL) wastes. These barrels are still in use.

The tire shop operations include the inspection and maintenance of aircraft tires and wheels. This shop is located in Building 825. Hazardous waste generation from this operation is limited to industrial degreasing solvent used in parts cleaning tanks, and a small quantity of dry cleaning solvent. Wastes from this process have been placed in hazardous waste drums since their implementation in 1979. Information on disposal practices previous to 1979 was not available. It is reasonable to assume the waste solvents were disposed in much the same manner as those from the structural shop.

The hydraulic shop has been located in Building 824A, the main AIMD building, since 1967. The shop is responsible for inspection, maintenance and repai of aircraft hydraulic systems. Wastes produced during operations include

Table 5-1

AIMD Airframes Division Waste Generation Rates

Waste Source	Waste Type	Estimated Waste Generation Rate (gallons per year)	Period of Generation	Treatment/Disposal Location
Structural	Paints (enamel, epoxy, other)	insufficient data	1966-1972	Drums or cans placed in dumpsters or taken to landfill (2)*
	MEK			
	Toluene		1972-1977	Some placed in waste oil bowsers[a]
	Paints (polyurethane, isocyanate, other)	insufficient data	1977-1979	Some waste paint in waste oil bowsers[b] rest in cans or drums in dumpsters taken off base
	MEK			
	Toluene			
			1979-present	Wastes in hazardous waste barrels, pick-up by PWD, RBC**
Hydraulic	Dry Cleaning Solvent	25	1966-1970	Empty drums or cans, placed in dumpster or taken to landfill (1,2)
	Hydraulic Fluid	75		
	Freon	negligible		
	PD-680 Type I	32	1970-1979	Most waste placed in waste oil bowser[b]; rest in cans or drums taken to landfill (2)
	Hydraulic Fluid	95		
	Freon	negligible		
	PD-680 Type II	40	1979-present	Hazardous waste drums; RBC
	Hydraulic Fluid	120	1979-present	Waste oil bowsers; RBC
	Freon	negligible	1979-present	-
Tire Shop	Solvent 3	1,100	1966-1970	Drums or cans placed in dumpsters or hauled to landfill (2)
	Dry Cleaning Solvent	200		
	Solvent 3	1,400	1970-1979	Waste oil bowser[b] or drums in dumpsters[c]
	PD-680 Type I	235		
	Solvent 3	1,800	1979-present	Hazardous waste drums RBC
	PD-680 Type II	300		
NDI Lab	Cold Carbon Cleaner	800	1959-1980	All wastewater entered seepage pit from settling tank (16)
	Alkaline Permanganate	1,100		
	Phosphoric Acid	440		
	Trichloroethylene	250		
	MEK	insufficient data		
	Toluene	insufficient data		
	Alkaline-sodium hydroxide	440		
	Photo Film Developer	520		
	Sulfuric Acid	250		
	Penetrant	500		
	Magnasolve	360		
	Cold Carbon Cleaner	800	1980-present	All wastewater held in 2,000 gallon underground tank for removal by contractor
	Alkaline Permanganate	1,100		
	Alkaline-sodium hydroxide	440		
	Trichloroethylene	440		
	Photo Film Developer	520		
	Penetrant	500		
	Magnasolve	360		
	PD-680 Type II	insufficient data	1980-present	Hazardous waste drums RBC
	MEK	insufficient data		
	Toluene	insufficient data		

Note: *Number in parenthesis is Site No.
**RBC = Removed by Contractor; FFTA = Fire Fighting Training Area; PWD = Public Works Department.
[a]Taken to oil pits (Sites 3 and 4), or FFTA (Sites 7 and 8).
[b]Taken to oil pits (Sites 3, 4 and 17), or FFTA (Site 8).
[c]Taken to base landfill (Site 2), or off-base landfill.

PD-680 Type II and hydraulic fluid. The shop also uses small quantities of Surjex (a trichloroethylene-based solvent) and Freon, but the only wastes generated tend to either evaporate or be contained on rags used for wiping parts. Two hydraulic testing machines, containing 20 gallons of hydraulic fluid each, are emptied and re-filled approximately three times per year. Waste solvent from the hydraulic shop has been disposed in hazardous waste drums since 1979. Waste hydraulic fluid has been disposed in waste oil bowsers since about 1972. Waste disposal previous to 1972 is assumed to have been handled in the same manner as the other Airframes Shops.

The NDI laboratory (Building 313) performs intensive inspections of aircraft components to locate fractures, breaks or unsatisfactory welds. This is accomplished by thoroughly cleaning the components in cold carbon cleaner, acid baths and alkaline baths to remove paint, grease and dirt. The component is then soaked in a penetrant which will enter any cracked surfaces. Excess penetrant is washed off before the component is subjected to X-ray examination. The NDI laboratory also uses PD-680, trichloroethylene, MEK and toluene as cleaners.

From 1959 (when Building 313 was constructed) until 1969, wastewater from the NDI laboratory was discharged to an underground settling tank followed by a seepage pit (Site 16) on the north side of the building. The seepage pit was constructed of concrete blocks with one-half inch vertical gaps between the blocks. Glass beads from a blasting operation in Building 313 which also discharged into the seepage pit began to plug the gaps and prevent seepage. By 1969, the seepage pit was filling and wastewater backing-up into the building. To remedy this problem, a drain line was constructed in 1969, which began at the wall of the seepage pit and led to the storm drainage ditches east of the runways. Seepage continued, but some flow exited through the drain pipe. In 1980, the seepage pit was entirely sealed off. The 2,000 gallon underground holding tank, previously used as a settling tank, was used to store the NDI laboratory wastewater for removal by contractor. This practice has continued to the present time.

5.2.1.2 Ground Support Equipment Division. The GSE shop is located in Building 824A. GSE is responsible for scheduled and unscheduled maintenance on all ground support equipment (JG-75 tow tractor, aircraft jacks and maintenance stands). Maintenance operations generating hazardous wastes include oil changes, replacement of asbestos brake shoes, vacuum blasting to remove paint from exterior surfaces, and touch-up painting. Waste fuels, oils and transmission fluids are disposed in waste oil bowsers. Waste paint, paint thinners, naphtha, MEK, blasting material and tricresyl phosphate are disposed in hazardous waste drums. No information on past disposal practices or quantities generated was available. Estimates were made based on current practices. Waste generation is summarized in Table 5-2.

5.2.1.3 Power Plant Division. The Power Plant Division performs jet engine tear-down, repair, testing and rebuilding. The Power Plant shop is located in Building 313. The jet engine test cells are located nearby in Building 328. In performing maintenance and repair of the engines, a small quantity of waste oil, fuel and hydraulic fluid is generated. This is disposed in a waste oil bowser. Waste generated at the test cells is collected in an oil/water separator which is pumped out by a private contractor. Waste production is summarized in Table 5-2.

Table 5-2

AIMD Waste Generation Rates

Waste Source	Waste Type	Estimated Waste Generation Rate (gallons per year*)	Period of Generation	Treatment/Disposal Location
GSE Division	Fuel, Lubricants, Hydraulic Fluid, Motor Oil	8,000	1966-1979 1979-present	Waste oil bowser or drum[a] Waste oil bowser, RBC*
	Paint (polyurethane, isocyanate) Thinners Naphtha MEK	-	1966-1979 1979-present	Waste oil bowser, drum, cans or dumpster[a] Hazardous waste drums, RBC
	Tricresyl Phosphate Blasting Material Beryllium from Brake Shoes	-		
Power Plants	Engine oil, Hydraulic Fluid	240	1966-1979 1979-present	Waste oil bowser or drum[a] Waste oil bowser, RBC
	Fuel	120		
	Fuel, Hydraulic Fluid	15,000-21,000	1975-present	Oil/water separator holding tank at Building 328; pumped out by contractor

Note: *RBC = Removed by Contractor; FFTA = Fire Fighting Training Area
[a]Taken to oil pits (Sites 3, 4 or 17), landfill (Site 2), or FFTA (Site 7 or 8).

5.2.2 Air Operations Department. The Air Operations Department, located in Building 82, maintains ground electronics equipment, and provides radar air traffic control and structural and aircraft fire protection. Hazardous waste generation is limited to the Operations Maintenance and Fire divisions.

5.2.2.1 Operations Maintenance Division. This division provides minor maintenance to transient aircraft and operates a lineshack (Building 565). Only a small quantity of waste material was reported, generated during touch-up painting activities. These are summarized in Table 5-3.

5.2.2.2 Fire Division. This division's headquarters has been located in Building 9 since 1942. There is a crash and rescue squad housed in Building 77, and a fire division branch at Outlying Landing Field (OLF) Whitehouse in Building 15. Regular operations of the fire division include holding fire fighter training for division and squadron personnel as necessary. From the mid-1950s until the mid-1960s, fire fighting training was held on the end of an asphalt strip southwest of the runways (Site 7). At the start of the United States involvement in the Vietnam War, an additional fire fighting pit was added in the grass alongside the asphalt. This area was used until 1975. Fire fighting training was conducted by staging aircraft fires and having the trainees extinguish them. Scrap aircraft were doused with flammable material and ignited.

The fire division conducted training sessions once per week between the mid-1950s and 1965. Each training session utilized about 100 gallons of flammable materials. When the fire pit was added to accommodate increasing numbers of personnel to be trained, 200 to 300 gallons of flammable material were used once per week.

In 1975, the fire fighting training area was moved to its present location south of the airfield in front of the boresite range (Site 8). There are three rectangular pits and one cross pit at the site. Training sessions are held twice per month with fires started in two or three pits simultaneously, using 500 to 600 gallons of flammable material per session.

Until hazardous waste segregation began in 1979, the fire division collected waste oil bowsers from the squadrons and AIMD shops to burn during the training sessions. These bowsers contained waste oils, hydraulic fluid, fuels, solvents, alcohol, paint wastes and paint thinners. In addition, drums of mixed waste materials from the shops were often brought to the fire fighting training area by shop personnel.

In 1977, with the introduction of polyurethane and isocyanate paints, waste paint had to be removed from the list of materials collected for burning during the training sessions. These paints produce toxic and noxious gases when burned. Since 1979, only waste jet fuel has been used for the training sessions. This fuel is collected in bowsers at the fuel farm and at the fuel test facilities on the flight line.

The fires are extinguished using water and aqueous film forming foam (AFFF). Protein foam was used occasionally until 1979. Waste generation is summarized in Table 5-3.

5.2.3 Squadron Level Maintenance Operations. The squadron maintenance activities are located in the aircraft hangars. Each hangar houses fou squadrons which usually have 12 to 14 aircraft each. The Carrier-Based Light

Table 5-3

Air Operations Division Waste Generation Rates

Waste Source	Waste Type	Estimated Waste Generation Rate (gallons per year)	Period of Generation	Treatment/Disposal Location
Operations Maintenance Division	Nitrocellulose Lacquer Thinner	2	1942-1979	Waste oil drum or can, placed in dumpster[a]
	Paint Remover	5	1979-present	Hazardous waste barrel
Fire Division FFTA*	Oil, Jet Fuel, AVGAS, Hydraulic Fluid, Solvents, Thinners, Alcohol, Waste Paint	5,000	1950s-1965	Old FFTA (Site 7)
	Oil, Jet Fuel, AVGAS, Hydraulic Fluid, Solvents, Thinners, Alcohol, Waste Paint	15,000	1965-1975	Old FFTA (Site 7)
	AFFF	1,200		
	Oil, Jet Fuel, AVGAS, Hydraulic Fluid, Solvents, Thinners, Alcohol, Waste Paint	15,000	1975-1977	New FFTA (Site 8)
	AFFF	1,200		
	Oil, Jet Fuel, AVGAS, Hydraulic Fluid, Solvents, Thinners, Alcohol, Waste Paint	15,000	1977-1979	New FFTA (Site 8)
	AFFF	1,200		
	Jet Fuel	15,000	1980-present	New FFTA (Site 8)
	Gasoline	120		
	AFFF	1,200		

Note: *FFTA = Fire Fighting Training Area.
[a]Taken to oil pits (Sites 3, 4 or 17), or FFTA (Site 7 or 8).

Attack Wing One (CLAW-1) has had A-7 aircraft since 1967. Before that, A-4s were used. The Carrier-Based Fixed Wing Anti-Submarine Wing One (CVSW-1) has had S-3 and F-3 aircraft since the mid-1970s. Previously, S-2 and F-3 aircraft were used. The Marine Squadrons on-station have A-4 aircraft. The squadrons are rotated from carrier duty to the Air Station on a regular basis. On the average, a squadron spends 6 to 8 weeks on-station for training exercises and aircraft maintenance every three to six months.

5.2.3.1 CLAW-1 Squadrons. The CLAW-1 squadrons occupy the hangars on the east side of the station. The number of squadrons has grown along with the construction of new hangars over the years. The first hangar to be built on the east flight line was Hangar 67 in 1955. Hangar 825 was constructed in 1966 and Hangar 815 in 1970. The two newest hangars are numbers 1820 and 1845. Hangar 1820 was completed in 1982. Hangar 1845 is still under construction. The squadrons in each of the hangars perform basically the same operations. Squadron shops include a corrosion control, airframe, avionics, aircraft division, power plant and hydraulics. All wastes generated by the squadron's shops were disposed in the same bowsers, drums and dumpsters, so it is not possible to break down these wastes by shop. The quantity of wastes generated by the CLAW-1 squadrons was directly related to the number of squadrons and aircraft, which increased as the hangars were constructed. Waste generation for the CLAW-1 squadrons is summarized in Table 5-4.

5.2.3.2 CVSW-1 Squadrons. The CVSW-1 squadrons occupy the hangars on the south side of the station. There are three hangars, two of which were the original hangars constructed in 1941 when NAAS Cecil Field opened (Hangars 13 and 14). Hangar 860 was built in 1976. There are four squadrons housed in each hangar. All 12 squadrons perform the same basic maintenance and minor repair operations in support of their training activities. Squadron shops include a corrosion control, airframe, avionics, aircraft division, power plant and hydraulics shop. Wastes generated by all the squadron's shops are disposed in the same bowser, drum or dumpster for a particular squadron. Therefore, it is impossible to distinguish waste generation and disposal procedures between shops. Total CVSW-1 waste generation rates were related to the number of squadrons present on-station. A summary of the wastes generated by the CVSW-1 squadrons is found in Table 5-5.

5.2.4 Public Works Department. The PWD is responsible for general maintenance of grounds, roads and buildings at NAS Cecil Field, Yellow Water Weapons Department, and OLF Whitehouse. In addition, all potable water consumed on-station is produced from wells located on Cecil Field and Yellow Water. The Environmental Control Program and the Hazardous Materials Program are also managed by PWD. The Environmental Control Officer and administrative personnel are located in Building 1. Waste generation for PWD is summarized in Table 5-6.

5.2.4.1 Maintenance Division. The Maintenance Division Shops have been located in Building 81 since 1953 and include the Machine, Electric and Paint shops. The Machine Shop utilizes a degreasing dip tank for cleaning small parts. This tank is refilled as the cleaning solution evaporates, but has never been emptied or cleaned out. Therefore, it is not a waste generator. The Electric Shop is responsible for maintenance and minor repair of electrical equipment and systems on the station. Small quantities of solvents and cleaning solutions are utilized in the shop. Empty spray cans and rags are the only wastes generated. These are disposed as trash, which is hauled of base.

Table 5-4
CLAW-1 Squadrons Waste Generation Rates

Waste Type	Estimated Waste Generation Rate (gallons per year)	Period of Generation	Treatment/Disposal Location
Motor Oil	750	1955-1966	Waste oil bowsers, drums or cans, taken to oil pits (3,4,5*), landfill (1), or FFTA** (7)
Fuel	2,340		
Hydraulic Fluid	375		
Enamel Paint	38		
Thinner	225		
Naphtha	25		
Ethyl Acetate	14		
Xylene	30		
Toluene	45		
MEK	90		
Toluene-MIK	40		
Trichloroethylene	150		
Dry Cleaning Solvent	675		
Motor Oil	1,500	1966-1970	Waste oil bowsers, drums or cans, taken to oil pits (3,4,17), landfill (2), or FFTA (7)
Fuel	4,680		
Hydraulic Fluid	750		
Enamel Paint	76		
Epoxy Paint	74		
Acrylic Lacquer	40		
Lacquer Thinner	450		
Acrylic Thinner	12		
Epoxy Paint Remover	50		
Naphtha	50		
Ethyl Acetate	25		
Xylene	60		
Toluene	90		
MEK	180		
Toluene-MIK	78		
Trichloroethylene	300		
PD-680 Type I	1,300		
Motor Oil	2,250	1970-1979	Waste oil bowsers, drums or cans, taken to oil pits (3,4,17), landfill (2), or FFTA (7,8)
Fuel	7,020		
Hydraulic Fluid	1,125		
Enamel Paint	9		
Epoxy Paint	108		
Acrylic Lacquer	60		
Lacquer Thinner	675		
Acrylic Thinner	18		
Epoxy Paint Remover	75		
Naphtha	75		
Ethyl Acetate	40		
Xylene	90		
Toluene	135		
MEK	270		
Toluene-MIK	117		
Trichloroethylene	450		
PD-680 Type I	2,025		
Motor Oil	2,250	1979-1982	Waste oil bowser; removed by contractor
Fuel	7,020		
Hydraulic Fluid	1,125		
Polyurethane Paint	108	1979-1982	Hazardous waste drum; removed by contractor
Enamel Paint	9		
Epoxy Paint	108		
Acrylic Lacquer	60		
Lacquer Thinner	675		
Acrylic Thinner	18		
Epoxy Paint Remover	75		
Naphtha	75		
Ethyl Acetate	40		
Xylene	90		
Toluene	135		
MEK	270		
Toluene-MIK	117		
Trichloroethylene	450		
PD-680 Type I	2,025		
Motor Oil	3,000	1982-present	Waste oil bowsers; removed by contractor
Fuel	9,360		
Hydraulic Fluid	1,500		
Polyurethane Paint	144	1982-present	Hazardous waste drums; removed by contractor
Enamel Paint	12		
Epoxy Paint	144		
Acrylic Lacquer	80		
Lacquer Thinner	900		
Epoxy Paint Remover	100		
Naphtha	100		
Ethyl Acetate	55		
Xylene	120		
Toluene	180		
MEK	360		
Toluene-MIK	156		
1,1,1-Trichloroethane	600		
PD-680 Type II	2,700		

Note: *Numbers in parenthesis are Site Numbers.
**FFTA = Fire Fighting Training Area.

Table 5-5

CVSW-1 Squadrons Waste Generation Rates

Waste Type	Estimated Waste Generation Rate (gallons per year)	Period of Generation	Treatment/Disposal Location
Motor Oil	2,000	1941-1945	Waste oil bowsers, drums or cans[a]
Fuel	6,240	1950-1976	
Hydraulic Fluid	1,000		
Enamel Paint	108		
Thinner	600		
Naphtha	66		
Ethyl Acetate	37		
Xylene	80		
Toluene	120		
MEK	240		
Toluene-MIBK	104		
Trichloroethylene	400		
Dry Cleaning Solvent	1,800		
Motor Oil	3,000	1976-present	Waste oil bowsers, RBC*
Fuel	9,200		
Hydraulic Fluid	1,300		
Enamel Paint	12	1976-1979	Waste oil bowsers[b]
Epoxy Paint	140	1979-present	Hazardous waste drums, RBC
Polyurethane Paint	140		
Acrylic Lacquer	80		
Lacquer Thinner	900		
Acrylic Thinner	24		
Epoxy Paint Remover	100		
Naphtha	100		
Ethyl Acetate	55		
Xylene	120		
Toluene	180		
MEK	360		
Toluene-MIBK	156		
1,1,1-Trichloroethane	600		
PD-680 Type II	2,500		

Note: *RBC = Removed by Contractor; FFTA = Fire Fighting Training Area
[a]Taken to oil pits (Sites 3, 4, 5 or 17), landfill (Sites 1 or 2), or FFTA (Site 7 or 8).
[b]Taken to oil pits (Site 4), or FFTA (Site 8)

Table 5-6

Public Works Department Waste Generation Rates

Waste Source	Waste Type	Estimated Waste Generation Rate (gallons per year)	Period of Generation	Treatment/Disposal Location
Maintenance Division:				
Paint Shop	Paints (enamels, latex, etc.)	negligible	1942-1979	Cans disposed in dumpsters and taken to landfills (1,2)*
	Thinners (enamels, lacquers, etc.)		1979-present	All paint wastes in hazardous waste drums, RBC**
Pest Control	Nemagon (1,2-dibromo-3-chloropropane)	60-90	1978	Buried on golf course (Site 11)
Transportation Division	Motor Oil, Grease, Hydraulic Fluid	1,200	1942-1945 1945-1979	Waste oil bowser or drums; disposed in oil pits (Sites 3,4,5,17) or burned at FFTA (Sites 7,8)
			1979-present	Waste oil bowser; pumped out by contractor

Note: *Numbers in parenthesis are Site Numbers.
**RBC = Removed by Contractor; FFTA = Fire Fighting Training Area.

Transformer maintenance is accomplished by testing transformer oil at the transformer site. If necessary, the oil is filtered and replaced. No transformer repairs have ever been done on-base. This work is contracted off-base. Disposal of transformers has been through Defense Property Disposal Office (DPDO). It has not been a practice to remove oil from transformers prior to disposal. Any polychlorinated biphenyl (PCB) wastes, such as oil drained from leaking transformers, out-of-service transformers or contaminated soil, are stored in a designated PCB bunker at Yellow Water until DPDO arranges for off-station disposal.

The paint shop utilizes small quantities of paint and paint thinner. Until about 1979, waste paint and thinners were diposed in the waste oil bowser located at the PWD area. Since 1979, the paint and thinner wastes have been put into the 55-gallon hazardous waste drums at the shops.

The Pest Control Shop is also part of the Public Works Maintenance Division. There were pesticide storage and mixing facilities in Buildings 238 and 371 on the golf course until 1978 when a new storage building was constructed (Building 559). Building 101 near the PWD is also used for pesticide storage. Pest control operations normally do not result in waste production since the pesticides are completely used. The only wastes currently generated are empty containers, which are rinsed, rendered unusable, and disposed as trash. The rinsate is used as make-up water. In 1978, when the pesticide operations at the golf course were moved into the new building, two or three 30-gallon drums and ten to fifteen 5-gallon drums of pesticide were buried on the golf course at Site 11. At least one of the drums is believed to have contained Nemagon, a pesticide containing 1,2-dibromo-3-chloropropane. A number of empty five gallon cans from the golf course pesticide shop were also buried at Site 11 from 1970 to 1978. Prior to 1979, it may be assumed the pesticide containers were not rinsed before disposal. Empty cans at Site 11 are probably contaminated with pesticides. Empty cans from the PWD pesticide shop went to on-base landfills for disposal (Sites 1 and 2).

The Public Works Maintenance Division has been responsible for picking-up the hazardous waste disposal drums located throughout the station since 1979 when the program began. The drums are picked-up on a weekly or as-needed basis. They are transported to the hazardous waste storage slab at Yellow Water to await disposal off-station by a DPDO contractor.

5.2.4.2 Public Works Transportation Division. The transportation division maintains about 500 vehicles which are used throughout the station. These vehicles range from pick-up trucks to bulldozers and road graders. The transportation division is responsible for maintaining roads, performing any ground clearing or tree removal, and digging pits for galley grease disposal as required. Until 1969, the transportation division was also responsible for on-base trash collection and disposal at the station's landfills (Sites 1 and 2). Since that time, trash removal and off-base disposal has been privately contracted.

The transportation shops are located in Buildings 49, 80, 394 and 928 built in 1942, 1952, 1961 and 1974, respectively. Waste oil and hydraulic fluid generated during vehicle maintenance operations are collected in oil pans and poured into a waste oil bowser located in the shop yard. This bowser is pumped out by a private contractor and hauled off-base. There is also an oil/water separator connected to the drain in the Quonset hut used for oi

changes. This contains any oil not caught in the oil drip pans. The wastewater from the hangar deck scrubbing machine is emptied into the oil/water separator. This wastewater may contain a small quantity of oil and detergent. The oil/separator is pumped-out by the waste oil hauler on a monthly basis.

5.2.4.3 Public Works Utilities. The main responsibilities of the Utilities Division are the operation, maintenance and repair of the potable water supply, the sewage treatment plant, and the steam production facilities. All drinking water for Cecil Field, Yellow Water and Whitehouse is produced and treated on-station. Five deep wells tapping the Floridian Aquifer provide potable water for Cecil Field. Water for OLF Whitehouse is provided by one well tapping the Floridian Aquifer. Two deep wells at Yellow Water supply potable water for the Weapons Department. All drinking water is aerated and chlorinated. No hazardous wastes are produced from this process. Operation of the sewage treatment plant is discussed in Chapter 7. Steam production for comfort control and industrial use takes place in Building 11. The steam distribution system is limited in extent by the capacity of the boilers. Other buildings requiring steam have been equipped with individual boilers. Boiler blowdown water is the only waste produced by this operation. The blowdown is discharged to the sanitary sewer system.

5.2.5 Fleet Aviation Specialized Operational Group, Atlantic Fleet Detachment. Fleet Aviation Specialized Operational Group (FASO) is responsible for familiarizing, indoctrinating, training and refreshing designated fleet aviation personnel in the operational and tactical employment of equipment and weapon systems. FASO operates and maintains ground training and flight simulators. FASO facilities are located in Hangar 67 and Buildings 832, 858 and 338. Waste generation is related to maintenance of the training equipment and includes parts cleaning and degreasing agents as summarized in Table 5-7.

5.2.6 Photo Laboratory. The Photo Lab provides official photographic services to Cecil Field and tenant activities. It has been located in Building 82 since 1954. Wastes generated from the developing process include developer solutions, fixative baths and waste film. The fixative bath from color film processing and shredded waste film are sent to NAS Jacksonville for silver recovery. Developer solutions are disposed in the sanitary sewer system. Waste generation is summarized in Table 5-7.

5.2.7 Naval Regional Medical Center Branch Clinic - Cecil. The Naval Regional Medical Center-Cecil (NRMC-Cecil) provides emergency and outpatient care for personnel and dependents of Cecil Field. Hospital care is provided by NAS Jacksonville. NRMC-Cecil was first located in Building 198 from 1960 until 1976. At that time, the new clinic (Building 808) was constructed and NRMC-Cecil moved to its present location. Chemical wastes, syringes and waste drugs are sent to NAS Jacksonville for incineration. X-ray film is also sent to NAS Jacksonville for silver recovery.

5.2.8 Cecil Field Branch Dental Clinic. The Dental Clinic provides full dental services to Cecil Field military personnel and dependents. The Clinic was opened in 1967 in Building 808. The only hazardous waste generated by the Dental Clinic is X-ray fixative solution, sent to NAS Jacksonville for silver recovery.

5.3 ORDNANCF OPERATIONS. Ordnance operations for Cecil Field are conducted by the Weapons Department, Yellow Water. Yellow Water was incorporated as

Table 5-7

Hazardous Waste Generation Rates

Waste Source	Waste Type	Estimated Waste Generation Rate (gallons per year)	Period of Generation	Treatment/Disposal Location
FASO	Isopropyl Alcohol	20	1942-1945	Waste oil bowser, drum or can in dumpster[a]
	Trichloroethane	4	1950-1979	
	PD-680	3		
	Freon	10		
			1979-present	Hazardous waste drum, RBC*
Photo Lab	Developer Solution	500	1954-present	Sanitary sewer
	Fixative Bath	500	1954-present	NAS Jacksonville for silver recovery
	Waste Film	-		

Note: *RBC = Removed by Contractor; FFTA = Fire Fighting Training Area.
[a]Taken to landfill (Sites 1 or 2), oil pits (Sites 3, 4, 5 or 17) or burned at FFTA (Sites 7 or 8).

part of Cecil Field in 1961. Between 1967 and 1977, ordnance disposal was conducted at two sites on Yellow Water: the Blue 5 detonation area (Site 14), and the Blue 10 burning area (Site 15). The Blue 5 area was used to detonate large bombs, 20 inch rockets and classified fusing devices. The Blue 10 area was used to burn small caliber ammunition in a burn tank. The Blue 5 and 10 areas were closed in 1977 when housing was constructed at Yellow Water.

The detonation operation occurred approximately every six weeks, with 300 to 450 pounds of explosives detonated each time. The disposal of ordnance by detonation results in the formation of a small amount of residual material. The residual material is composed of a variety of organic compounds and metal oxides, primarily aluminum and lead. A study by the Naval Ordnance Environmental Support Office (OESO) found that contamination of the ground surface from ordnance detonation and open burning was insignificant (Fauth 1984).

The ordnance materials destroyed by burning at the Blue 10 area consisted of solid, double-based propellants (burned on the ground), and flares, rocket ignitors and small caliber ammunition (burned in the burn tank). The double-base propellants were nitroglycerine-based, and would have resulted in an insignificant quantity of lead oxide residual from the burning. The materials in the burn tank were subjected to elevated temperatures sufficient to completely destroy organic components. The resulting molten metal slag was allowed to cool in the burn tank, and buried on-site.

Ordnance destruction has been conducted off-station since 1977, except for a small number of emergency detonations. In 1974, the Bomb Dummy Unit (BDU) rework operation began in Building 602 at Yellow Water. BDU was moved to Building 617 in 1981. This operation includes sandblasting and painting of dummy bombs. Table 5-8 summarizes hazardous waste generation from the Weapons Department.

Table 5-8

Weapons Department Hazardous Waste Generation Rates

Waste Type	Estimated Disposal Rate	Period of Generation	Treatment/Disposal Location
100-150 pound Bombs Classified Fusing Devices 20 inch Rockets	3,000-4,500 pounds/yr	1967-1977	Blue 5 detonation area (Site 14)
20 mm Ammunition 2.75 inch Rockets	48,000 rounds/yr	1967-1977	Blue 10 burn tank (Site 15)
5 inch Rockets Mark IV Cartridges Parachute and Distress Flares	30 tons/yr		

CHAPTER 6. MATERIAL HANDLING: STORAGE AND TRANSPORTATION

6.1 GENERAL. Material handling at Naval Air Station (NAS) Cecil Field primarily involves fuels and lubricants used in aircraft operations. Procurement, inventory control and distribution of materials are handled by the Supply Department. In addition to a number of general warehouses, operational storage facilities near the flightlines are maintained for aviation support materials. Identification of storage facilities on Cecil Field and a description of handling and transportation operations are contained in this chapter.

6.2 STORAGE. Storage facilities on NAS Cecil Field are related to the aviation training and maintenance operations of the station and to the support of station personnel. Cecil Field does not serve as a depot or storage facility for other Naval installations. Table 6-1 lists the storage facilities and capacities for Cecil Field, Yellow Water and Outlying Landing Field (OLF) Whitehouse.

6.2.1 Petroleum, Oil and Lubricants (POL). The jet fuel piped-in from NAS Jacksonville (see Section 6.3.2) is stored at the Underground Aviation Fuel Storage Facility in six 567,000 gallon tanks. This is the current fuel farm and was constructed in 1952 along with the fuel pipeline. Previous to that time, jet fuel and other (POL) materials were stored at the old fuel farm, built in 1944 and located at the south end of "A" Avenue.

From 1944 until 1952, the main aircraft fuels utilized were Aviation Gas (AVGAS) and Jet Propellant (JP)-3. In 1953, JP-3 was replaced by JP-4, and less AVGAS was used. In 1959, JP-5 became the major jet fuel. JP-5 is stored primarily at the fuel farm in the six underground concrete tanks. JP-5 is also stored in two 20,000 gallon underground tanks (Tanks 320 and 321) and in Day Tanks 1 and 2, each of which hold 210,000 gallons. AVGAS, JP-4, motor vehicle gasoline (MOGAS), kerosene, and Naval distillate fuel (NDF) are all trucked onto Cecil Field and stored in tanks located at the old fuel farm. Table 6-2 lists tank numbers, capacities and contents for Cecil Field POL materials.

On February 19, 1981, Day Tank 1 was ruptured, spilling 500,000 gallons of JP-5 into the waterways. Most of the fuel was contained on Navy property through the use of booms and dikes on the streams. This spill (Site 13) is discussed in Chapter 8. In the 1960s, a 200 to 300 gallon spill of JP-5 occurred at the Day Tanks. The fuel entered the storm drains since there was no containment structure at that time.

6.2.2 Pesticides. Pesticides have been stored in several locations on Cecil Field. The pesticides are handled by the Public Works Maintenance Division and only used on-station. Pesticide storage and mixing was done in Buildings 238 and 371 from 1955 until 1978. In 1978, a new storage building was constructed (Building 559) which is still in use. Building 101 was constructed in 1975 and has been used to store pesticides since that time. Table 6-3 lists pesticides used on-station and the quantities typically kept in storage.

6.2.3 Hazardous Wastes. Hazardous wastes generated and collected at Cecil Field are stored temporarily at Yellow Water before disposal off-station by a Defense Property Disposal Office (DPDO) contractor. The hazardous waste

Table 6-1

Storage Facilities

Building No.	Description	Area (square feet)
NAS Cecil Field:		
78	Public Works Maintenance Storage	1,540
99	Public Works Maintenance Storage	5,100
326	Public Works Maintenance Storage, Communication Storage	1,600
328	Aircraft Spares Storage	1,950
365	Ready Magazine	1,332
366	Community Storage	456
241	Aircraft Spares Storage, Miscellaneous Utility Plant Building	4,000
824	Avionics Shop, Aircraft Spares Storage, Aircraft Ground Support Equipment	101,348
68	General Warehouse, SERVMART	62,489
68A	General Warehouse	72,480
179	General Warehouse	7,200
332	Cold Storage Warehouse	5,476
335	Hazard/Flammable Storehouse	6,500
177	Operational Storage	4,468
393	Operational Storage	8,080
Yellow Water:		
601	Ordnance Operating Building, Inert Storehouse, UEPH	9,050
603	Hazard/Flammable Storehouse	120
618	Public Works Maintenance Storage	545
624	General Warehouse	1,500
629	Inert Storehouse	375
650-670	Ordnance Storage Magazine	2,255
701	Inert Storehouse	2,480
705	Public Works Maintenance Storage	48
760-777	Ordnance Storage Magazine	2,255
778-799	Ordnance Storage Magazine	2,255
OLF Whitehouse:		
15	Operational Storage	480

Table 6-2

Cecil Field POL Materials

Tank No.	Capacity (gallons)	Year Built	Fuel Type*	Building Form*	Fail-Safe Equipment*	Containment
76	594,545	1952	JP-5	CCS	LLIG	Pond
76A	594,545	1952	JP-5	CCS	LLIG	Pond
76B	594,545	1952	JP-5	CCS	LLIG	Pond
76C	594,545	1952	JP-5	CCS	LLIG	Pond
76D	594,545	1953	JP-5	CCS	LLIG	Pond
76E	594,545	1953	JP-5	CCS	LLIG	Pond
320	20,000	1959	JP-5	UGS	LLIS	None
321	20,000	1959	JP-5	UGS	LLIS	None
DT 1	210,000	1956	JP-5	CCS	LLA & LLIG	Pond
DT 2	210,000	1956	JP-5	CCS	LLA & LLIG	Pond
43-D-5	250,000	1944	NDF	CCC	LLIT	Pond
43-C-6	100,000	1944	MOGAS	CCC	LLIT	Pond
43-B-7	50,000	1944	MT	CCC	LLIT	Pond
43-1(E)**	25,000	1944	SALV	UGS	LLIT	None
43-2(F)**	25,000	1944	SALV	UGS	LLIT	None
43-3(G)**	25,000	1944	SALV	UGS	LLIT	None
43-4(H)**	25,000	1944	SALV	UGS	LLIT	None
43-J	15,000	1941	K	AGS	LLIT	Pond
43-K	15,000	1941	JP-4	AGS	LLIT	Pond
43-L	15,000	1941	AVGAS	AGS	LLIT	Pond
11-B	15,000	-	NDF	AGS	LLIT	Pond
11-C	15,000	-	NDF	AGS	LLIT	Pond
11-D	15,000	-	NDF	AGS	LLIT	Pond
81-A	3,000	1945	K	AGS	LLIT	Pond
81-B	2,000	1945	K	AGS	LLIT	Pond
81-C	3,000	1945	K	AGS	LLIT	Pond

*AGS - Aboveground Steel; UGS - Underground Steel; CCS - Cut and Covered Steel; CCC - Cut and Covered Concrete; LLIG - Liquid Level Indicator-Gage; LLA - Liquid Level Alarm; LLIS - Liquid Level Indicator-Stick; LLIT - Liquid Level Indicator-Tape; AVGAS - Aviation Gasoline; NDF - Navy Distillate Fuel; SALV - Salvaged Fuel; MT - Empty; K - Kerosene

**No longer in use except occasionally for salvagable fuel resale.

Source: (Oil and Hazardous Material Spill Prevention Control and Countermeasure Plan, 5 November 1981)

Table 6-3

Pest Control Materials Inventory

Type	Quantity
PEST CONTROL SHOP (BUILDING 101)	
Insecticides:	
Carbaryl, 23.4% Emulsifiable Concentrate (EC)	5 gallons
Carbaryl, 80% Wettable Powder (WP)	320 pounds
Chlordane, 5% Dust	25 pounds
Chlordane, 72% EC	80 gallons
Diazinon, 2% Dust	50 pounds
Diazinon, 47.5% EC	10 gallons
Dibrom (Naled), 85% Conc	100 gallons
Dursban, 23.5% EC	5 gallons
Lindane, 20% EC	5 gallons
Malathion, 5% Dust	775 pounds
Malathion, 57% EC	6 gallons
Malathion, 95% Conc	50 gallons
Propoxur (Baygon), 13.9% EC	10 gallons
Pyrethin, 0.25% Aero (14 ounce cans)	48 cans
Pyrethin, 0.25% OS	5 gallons
Repellent (Deet), 71.2% Aero (2 ounce cans)	75 cans
Vapona (Dichlorvos) Strips	12 each
Herbicides:	
Bromacil (Hyvar XL), 21.9% EC	50 gallons
Cardi-X (Bromacil, 4%; Diuron, 2.5%), 6.5% WP	200 pounds
Copper Sulfate, 25.2% (Metallic)	150 pounds
Diquat, 35.3% EC	25 gallons
Diuron, 80% WP	100 pounds
2,4-D, 4 lb/gal	20 gallons
Rodenticides:	
Diphacinon (Para-Blox), 0.005% Bait	40 pounds
Diphacinon (Pellets), 0.05% Bait	48 pounds
Warfarin, 0.3% Bait	50 pounds
Miscellaneous:	
Algaecide (Copper), 8% Liquid	20 gallons
Kromad, 27.5% EC	30 pounds
Spreader/Sticker, Conc	25 gallons
Thiosperse	30 gallons
GOLF COURSE PESTICIDE STORAGE AND MIXING FACILITY (BUILDING 559)	
Insecticides:	
Carbaryl, 80% WP	150 pounds
Dursban, 23.5% EC	20 gallons
Malathion, 57% EC	10 gallons
Propoxur (Baygon), 70% WP	47 pounds
Herbicides:	
Buctril (Bromoxynil), 33.8% EC	4 gallons
Monosodium acid methanearsonate, 48% EC	90 gallons
Round-Up (Glyphosate), 41% EC	5 gallons
Trimec, 30% EC	10 gallons
Trimec, 43% EC	5 gallons
2,4-D, 47.4% Amine	40 gallons
Fungicides:	
Dithane (Manzate), 80% WP	200 pounds
Maneb (Tersan LSR), 80% WP	30 pounds
Maneb (Tersan), 75% WP	70 pounds
Form-A-Turf (Formaldehyde), 31% EC	10 gallons

Source: (NAS Cecil Field Pest Management Plant, March 1983)

storage or staging site is located in the former Naval Air Gunnery Range and consists of a concrete slab with a berm surrounding 95 percent of the perimeter. The waste drums are inspected by Public Works personnel on a regular basis. Any leaks or spills are cleaned-up immediately, properly contained, and stored temporarily on the slab before disposal off-base. The concrete slab has been in use since 1980. Previous to that time, flammable and toxic chemical wastes were stored at the boresite range (Site 8). This area was also used to conduct aircraft fire drills, small arms/machine gun target practice, fire fighter training, and the entry and departure of special weapons.

In 1979, stray rounds of ammunition pierced several of the drums, causing the chemicals to spill onto the ground adjacent to and in front of the boresight range back-stop. At this time, the wastes were relocated to the current hazardous waste storage area. Table 6-4 lists a typical waste inventory for the Yellow Water storage site.

6.2.4 Polychlorinated Biphenyl (PCB) Oil and Transformers. PCB transformers found to be leaking or in need of service are being replaced by non-PCB transformers at Cecil Field. PCB transformers removed from service and any PCB oil removed from the transformers are held in an ammunition bunker at Yellow Water until DPDO can arrange for off-station disposal by a contractor. The ammunition bunker was designated as the PCB waste storage facility in order to segregate the wastes. The bunker has been in use since approximately 1979. Previous to that time, PCB wastes were not handled separately.

6.2.5 Fire Fighting Training Area. Temporary storage of flammable material for the fire fighting training sessions is accomplished at the Fire Fighting Training Area. The area has been used since 1975. One large, stationary tank (approximately 3,000 gallons) and one or more 250 gallon bowsers are used to hold flammable material between training sessions. Whenever possible, the material is held in the bowsers until needed. If a bowser is needed back on the flight line, it is emptied into the holding tank. Since 1979, only JP-5 has been used at the sessions. Previous to that time, oil, hydraulic fluid, fuel and other materials were used. The material is only stored between training sessions which take place twice per month.

6.3 TRANSPORTATION.

6.3.1 Supply. Flammable and hazardous materails, POL products (with the exception of JP-5) and pesticides are transported onto Cecil Field by truck or tank car. Tank trucks and tank cars are only used for a small number of POL products stored at the old fuel farm. Other raw materials or supplies are received in 55-gallon drums or smaller containers. The Supply Department is responsible for transporting materials in trucks from the receiving department to the supply warehouses or directly to the shops.

6.3.2 Petroleum, Oil and Lubricants. Jet fuel is barged from the Navy Fuel Depot on the north banks of the St. Johns River to NAS Jacksonville. The JP-5 fuel is delivered to NAS Cecil Field by pipeline from NAS Jacksonville. The fuel line is eight inches in diameter, 14.7 miles long, and contains 287,000 gallons of fuel. There are 18 isolation valves along the pipeline for the purpose of securing the pipeline for maintenance or in case of an emergency. The pipeline enters Cecil Field near the "A" Avenue gate and proceeds parallel to the road to the Underground Aviation Fuel Storage

Table 6-4

Typical Hazardous Wastes Storage Area Inventory
Yellow Water Weapons Department

Number	Contents
55-Gallon Drums:	
42	Paint wastes, gross mixture
33	Empty, essentially empty, empty with rain water
11	PCB contaminated sand, material (clothing, etc.)
8	Waste oil/paint mixture
6	Alkaline permanganate
5	Dry cleaning solvent
4	Lacquer thinner
3	Hydraulic fluid
3	Paint stripping waste
2	Aliphatic naphtha
2	Consolidated paint thinner supernatant
2	Trichloroethylene
2	Beryllium contaminated water
2	Mercury contaminated material (clothing, etc.)
1	Consolidated waste paint solids
1	Alodine
20-Gallon Drums:	
15	Paint wastes
9	Empty
1	Freon
5-Gallon Cans:	
198	Empty, essentially empty, empty with rain water
21	Toluene
5	Methyl ethyl ketone
1	Triaryl phosphate
Plastic Bags:	
6	Beryllium contaminated materials
10	Asbestos contaminated materials
250-Gallon Waste Oil Bowsers:	
3	Each one-third full of solidified paint waste

Facility (the fuel farm). The JP-5 is stored in six 567,000 gallon tanks and distributed from the tanks via trucks or pipeline to the two high speed refueling facilities located near the east and south aircraft parking aprons.

6.3.3 Solid Waste. The collection and transportation of solid wastes generated on-station was the responsibility of the Public Works Transportation Department until approximately 1965. From 1942 until 1965, trash was collected in about 200 ten cubic yard dumpsters. The dumpsters were transported using two "hoist and haul" type garbage trucks which carried the dumpsters, one at a time, to the Cecil Field landfills (Sites 1 and 2) to be emptied. The trucks operated five days per week, making 10 to 12 trips per day.

In 1965, trash collection was contracted to a private firm which disposed of the trash at an off-station landfill. From 1965 until about 1975, the Transportation Department continued to perform trash collection and disposal for approximately eight dumpsters located at OLF Whitehouse and in the housing area. This was also contracted in 1975.

6.3.4 Galley Grease. Restaurant/Mess Hall operations at Cecil Field are equipped with a total of six, inground, concrete grease traps. From 1942 until about 1980, the Public Works Maintenance Division was responsible for pumping out the grease traps on a monthly basis and disposing of the grease and water. A series of grease disposal pits (Sites 4 and 9) have been operated through the years. The grease is transported in a tank truck equipped with pumping apparatus. In 1980, the task of pumping out the grease traps was awarded to a private contractor. Disposal is still on-station at the grease pit (Site 4) located along the western perimeter road.

6.3.5 Hazardous Waste. Collection of the hazardous waste drums located at the squadron, Aircraft Intermediate Maintenance Department (AIMD) and Public Works shops has been the responsibility of the Public Works Maintenance Division since the hazardous waste control program begin in 1979. The Public Works Environmental Coordinator maintains a logbook containing the location, number and contents of drums or other wastes to be picked-up. The Maintenance Division personnel use a truck to transport the hazardous wastes to the storage area at Yellow Water. The Environmental Coordinator then notifies DPDO of material that needs to be disposed by the contractor.

Transportation of flammable materials to the fire fighting training area (Sites 7 and 8) has always been the responsibililty of the Fire Division. From the mid-1950s until 1979, Fire Division personnel hauled bowsers from the shop areas or the fuel farms to the fire fighting training area. Occasionally, shop personnel would bring the materials to the fire fighting training area either in drums or bowsers. When the Fire Division stopped burning waste oil and other hazardous material in 1979, the primary source of JP-5 for the training sessions became the fuel farm. The Fire Division picks up a bowser containing waste fuel from the fuel farm when a training session is scheduled, or when they receive notice a bowser is full. Contaminated JP-5 is also received from the flightline fuel testing facilities and the high speed refuelers on occasion.

6.4 ORDNANCE. The Cecil Field Weapons Department is located at Yellow Water. Although most ordnance storage and handling operations take place at Yellow Water, ordnance storage and receiving facilities are maintained at Cecil Field. The Weapons Department procures, receives, stores, tests, repairs and issues all ordnance materials to station and fleet units and

other tenant activities. Tables 6-5 and 6-6 list the storage facilities, authorized ordnance type, and capacity for Cecil Field and Yellow Water.

The majority of conventional ordnance received by the Weapons Department arrives by truck, with only a small amount arriving by railcar. Classified ordnance normally arrives by plane and is off-loaded at the hot cargo area south of Runway 9R. The classified ordnance material is then transported by Weapons Department vehicles to storage bunkers at Yellow Water or Cecil Field.

Table 6-5

Ordnance Facilities - Cecil Field

Building Number	Type Magazine/Facility	Recommended Limit/Class*
33	Pyrotechnic	PC**/(04)1.2
60	High Explosives	250,000 pounds/1.1
61	Fuse and Detonator	PC/1.1
63	High Explosives	250,000 pounds/1.1
64	Fuse and Detonator	PC/1.1
65	Operating Building	5,000 pounds/1.2
66	Small Arms	125,000 pounds/1.1
104	Pyrotechnic	PC/(04)1.2
225	High Explosives	35,000 pounds/1.1
226	High Explosives	225,000 pounds/1.1
227	High Explosives	125,000 pounds/1.1
228	High Explosives	175,000 pounds/1.1
229	High Explosives	250,000 pounds/1.1
230	High Explosives	250,000 pounds/1.1
352	Hot Cargo Area	175,000 pounds/1.1
365	Pyrotechnic	PC/(04)1.2
504	Inert Storage	Not applicable
505	High Explosives	30,000 pounds/1.1
506	High Explosives	45,000 pounds/1.1
512	Pyrotechnic	PC/1.1
515-518	Fuse and Detonator	15,000 pounds/1.1
521-523	High Explosives	250,000 pounds/1.1
524-528	High Explosives	175,000 pounds/1.1
531-534	High Explosives	250,000 pounds/1.1
595	Operating Building	700 pounds/1.1
596	High Explosives	700 pounds/1.1

*Refer to NAVSEA OP-5, Volume 1, Chapter 5, for hazard class and appropriate tables for ESQD arcs.

**PC = Physical Capacity

Table 6-6

Ordnance Facilities - Yellow Water

Building Number	Type Magazine/Facility	Recommended Limit/Class*
601-602	Inert Storage	Not applicable
617	Operating Building	1,000 pounds/1.4
626	Operating Building	4,000 pounds/1.1
635	Railhead	500,000 pounds/1.1
645	Small Arms	8,000 pounds/1.1
646-647	Small Arms	6,000 pounds/1.1
650-657	High Explosives	375,000 pounds/1.1
658-659	High Explosives	400,000 pounds/1.1
660	High Explosives	425,000 pounds/1.1
661	High Explosives	450,000 pounds/1.1
662	High Explosives	400,000 pounds/1.1
663-664	High Explosives	375,000 pounds/1.1
665-666	High Explosives	350,000 pounds/1.1
667-670	High Explosives	325,000 pounds/1.1
711	Heli Pad	75,000 pounds/1.1
760	High Explosives	400 pounds/1.1
761	High Explosives	500 pounds/1.1
762	High Explosives	600 pounds/1.1
763	High Explosives	900 pounds/1.1
764-799	High Explosives	1,000 pounds/1.1
865	Pyrotechnic	PC**/(04)1.2

*Refer to NAVSEA OP-5, Volume 1, Chapter 5, for hazard class and appropriate tables for ESQD arcs.

**PC = Physical Capacity

CHAPTER 7. WASTE PROCESSING

7.1 SEWAGE TREATMENT. There have been two sewage treatment plants at Naval Air Station (NAS) Cecil Field. The main treatment plant is located near Lake Fretwell on Cecil Field. A second treatment plant was formerly in operation on Yellow Water, but was closed in 1978. The Cecil Field treatment plant was constructed in 1941 and consisted of a trickling filter operation with sludge drying beds. In 1974, the operation was expanded to 0.82 million gallons per day capacity with an activated sludge process replacing the trickling filter. Three sludge digesters (one 68,000 gallon and two 32,000 gallon) were also installed to reduce sludge volume.

The outfall from the treatment plant originally entered a drainage ditch or creek which fed the northern end of Lake Fretwell. In 1975, the treatment plant outfall was moved to a point downstream of Lake Fretwell to avoid eutrophying the lake. Dried sewage sludge has been used to supplement and fertilize soil throughout the station. The sludge was analyzed in 1980 for heavy metal content and found to have acceptable levels.

Until the early 1980s, when hazardous waste control programs began to take effect, the sewage treatment plant regularly experienced upsets to the biological system due to large quantities of oils, fuel and industrial chemicals entering the sanitary sewer system. In the mid-1970s, it was not uncommon for the sludge digesters to contain as much as 30,000 gallons of oil. Installation of oil/water separators in 1973, 1975 and 1977 cut the quantity of oil in the digestors to the current rate of approximately 2,000 gallons per month. There are currently six oil/water separators on Cecil Field: three at the Jet Engine Test Cells, two at the Public Works Shops, and one at Hangar 860. In addition, two containment ponds with baffle separators are in place in tributaries to Sal Taylor Creek to contain oil entering storm drains.

From the early 1960s until 1978, a separate sewage treatment plant was operated at Yellow Water to provide secondary sewage treatment for Yellow Water housing and operations areas. The plant consisted of two Imhoff tanks and two lagoons. The facility was closed in 1978 to avoid the costs of upgrading the system. Sewage from Yellow Water was then pumped to the Cecil Field treatment plant. The Cecil Field treatment plant continues to handle all sewage from Yellow Water and Cecil Field.

CHAPTER 8. DISPOSAL SITES AND POTENTIALLY CONTAMINATED AREAS

8.1 GENERAL. Eighteen potentially contaminated areas were identified at Naval Air Station (NAS) Cecil Field during this study. This chapter contains a detailed discussion on each of the identified disposal sites. Information presented was obtained during the on-site survey, interviews with current and long-term personnel, and a review of available records. Table 8-1 summarizes the information collected on these sites.

8.2 SITE 1, OLD LANDFILL. Site 1 is located in the southwestern portion of NAS Cecil Field, immediately northwest of where Rowell Creek crosses the perimeter road (base coordinate system location: J-7). The site covers an area approximately 1,000 feet by 400 feet, encompassing 9 acres. The location and aerial extent of the site are shown in Figure 8-1.

The site was used as a landfill from the early 1950s, when the base was reactivated, until 1965. During this time period, this was the only operating landfill at the installation. Virtually all the solid waste and some liquid and chemical waste generated at the base was disposed at the site. Dumpsters stationed throughout the installation were picked up by public works and disposed at the landfill. In addition, individual shops took some of their own wastes directly to the landfill.

The landfill was a trench and fill operation. Trenches ran east to west and were 18 to 20 feet wide, 10 to 12 feet deep, and approximately 300 feet long. The trenches extended to within approximately 50 feet of Rowell Creek. Typically, there was standing water in the trenches. There was daily burning at the landfill. At the end of each week, used portions of a trench were backfilled with soil. The site was worked from the south to the north.

Approximately 21,000 cubic yards of solid waste was disposed at the landfill annually. Over the period of time the landfill was operated, this amounted to an estimated 275,000 cubic yards of solid waste disposed at the site.

Also disposed at the site were liquid wastes generated by the Aircraft Intermediate Maintenance Department (AIMD) and the squadrons during the maintenance and repair of aircraft. These wastes included fuels, oils, solvents [methyl ethyl ketone (MEK), trichloroethylene, Stoddard, PD-680, methyl isobutyl ketone (MIBK), toluene, naphtha and xylene], paint and paint strippers. Table 8-2 summarizes the estimated waste liquid quantities generated during the operational period of the site. The wastes listed in Table 8-2 were disposed on Navy property; some at this site. Because no records were kept on disposal activities, access to the site was not controlled, and other disposal options were available at the installation, a more exact quantification of the liquid wastes disposed at the site is not possible.

Since much of the waste was burned at the site, flammable liquids and materials that were disposed at this site were probably incinerated. Products of incomplete combustion may exist at the site. Waste paints disposed at the site could contain cadmium, chromium and lead. Some of the fuels disposed at the site likely contained lead.

Most of the surface drainage from the site is directly into Rowell Creek. Drainage ditches also border the site on the north and south, discharging into Rowell Creek. Rowell Creek flows south, beneath the perimeter road,

Table B-1

Past Disposal Sites at NAS Cecil Field

Site No.	Site Name	Map Location	Period of Operation	Waste Types	Estimated Total Quantities	Sources
1	Old Landfill	J-7	1950s-1965	Solid waste, oils, fuels, paints, paint strippers, solvents	275,000 yd^3 of solid waste; unknown quantities of other liquid wastes	All industrial operations and shops
2	Recent Landfill	J-7	1965-1975	Solid waste, oils, fuels, paints, paint strippers, solvents	160,000 yd^3 of solid waste; unknown quantities of other liquid wastes	All industrial operations and shops
3	Oil/Sludge Disposal Pit	I/H-7	1950s-1975	Waste fuels, oils, paints, paint strippers, solvents	210,000 to 310,000 gallons of waste fuel, oil and sludge, unknown quantities of other liquid wastes	Fuel farm, AIMD, squadrons, public works shops
4	Grease Pits	H-7	1950s-1983	Grease, fuels, oils, paints, solvents, paint strippers	625,000 to 800,000 gallons of watered-down grease; unknown quantities of other liquid wastes	Installation messes, AIMD, fuel farms, squadrons, public work shops
5	Oil Disposal Area Northwest	G-7	1950s	Oil and fuel (potentially paint, paint strippers, solvents)	unknown	Fuel farm (potentially other industrial shops)
6	Lake Fretwell Rubble Disposal Area	H-8	1950s-1984	Inert rubble	unknown	Building construction, demolition debris
7	Old Fire Fighting Training Area	H-8	1950s-1975	Waste fuels, oil, solvents, paint, paint strippers	200,000 gallons	Fuel farm, AIMD, squadrons, public work shops
8	Boresite Range Hazardous Waste Storage/Fire Fighting Training	I-9	1975-1984	Waste fuels, oil, solvents, paint, paint strippers	145,000 gallons; unknown quantities of hazardous waste stored and spilled at the site	Fuel farm, AIMD, squadrons, public work shops
9	Recent Grease Pits	I-8	1983-1984	Grease mixed with water	24,000 to 30,000 gallons	Installation messes
10	Rubble Disposal Area	I/J-8	1950s-1960s	Inert rubble	unknown	Building construction, demolition and runway debris
11	Golf Course Pesticide Disposal Area	E-8	1970s-1978	Pesticides, fungicide, herbicide containers	200-450 empty 5-gallon cans; 2-3 full 30 gallon drums; 10-15 full 5-gallon cans	Golf course pesticide shop
12	Public Works Rubble Disposal Area	E-9	1970s-1984	Inert rubble	unknown	Public works
13	Day Tank 2 Fuel Spill	F-10	1981	JP-5 fuel spill	497,000 gallons	Day tank fuel spill
14	Blue 5 Ordnance Disposal Area	-	1967-1977	Fuses, 100 pound bombs, large munitions, lulu fuses, other explosive materials	30,000-45,000 pounds	Yellow water ordnance operations
15	Blue 10 Ordnance Disposal Area	-	1960s-1977	Small arms, parachute/distress flares, Mark IV signal cartridges, rocket ignitors, CADS, 5 and 2.75 inch rockets	350 tons	Yellow water ordnance operations
16	AIMD Seepage Pit	F-10	1960-1980	Solvents, heavy metals, acids, blasting grit, paint residue, photo wastes	26 million gallons	Building 313, jet engine maintenance shop
17	Oil/Sludge Disposal Pit Southwest	I-7	Late 1960s-Early 1970s	Waste fuels/oils (potentially paint, paint strippers, solvents)	unknown	Fuel farm (potentially other industrial shops)
18	Ammunition Disposal Area	H-15	1950s	Ammunition crates, misc. ordnance items, general rubble	unknown	Magazine area

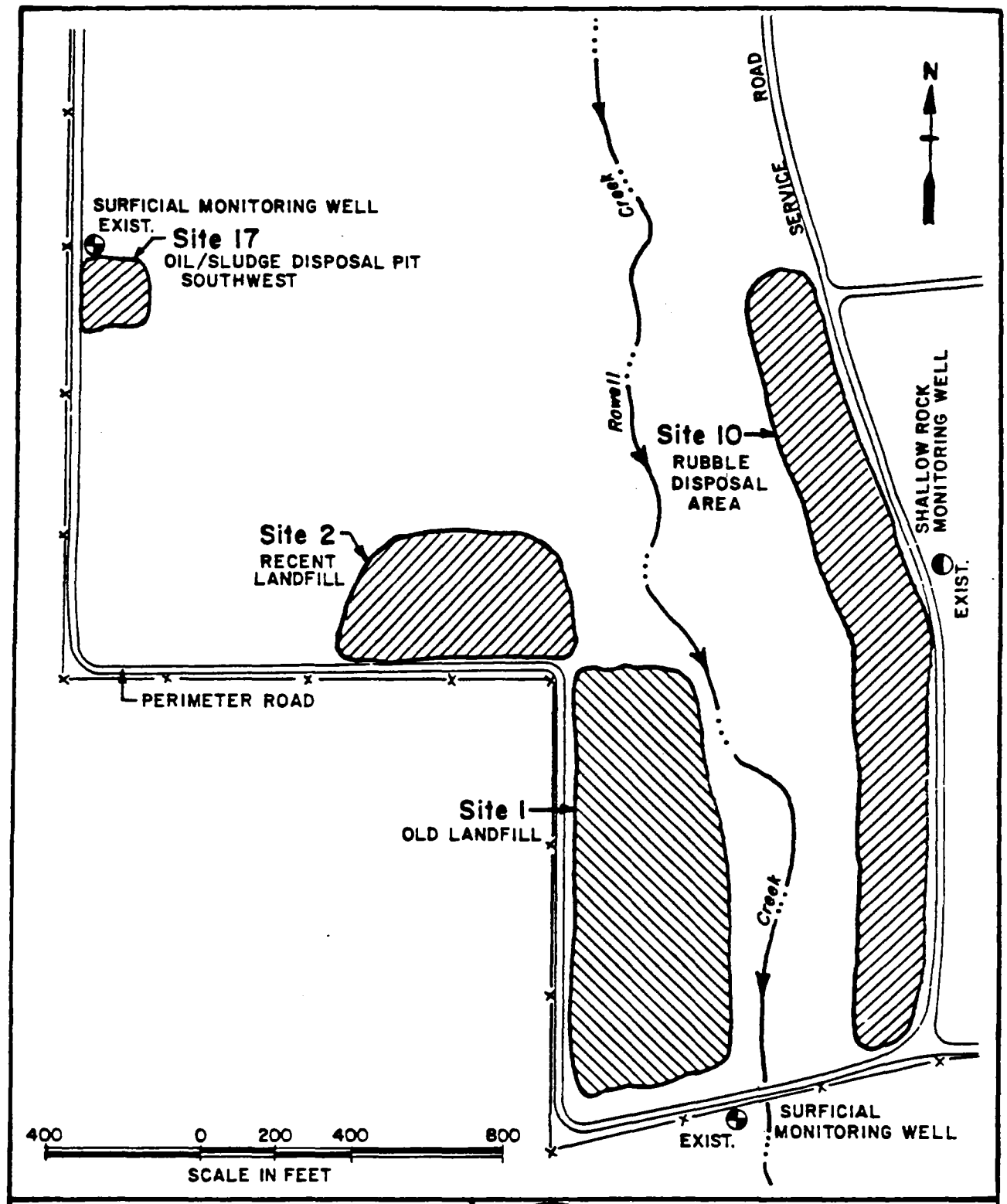


FIGURE 8-1

Waste Disposal Sites 1, 2, 10 and 17

INITIAL ASSESSMENT STUDY
NAVAL AIR STATION
CECIL FIELD

Table 8-2

Wastes Potentially Disposed at the Old Landfill, Site 1

Waste Type	Total Estimated Quantity Disposed	Source	Comments
Solid Waste	275,000 yd^3	All NAS Cecil Field operations	Wastes from dumpsters throughout installation
Waste Paint (enamel, epoxy, polyurethane, lacquer, acrylic)	1,800 gallons*	Squadrons, AIMD, Public works	-
Spent Solvents (Stoddard, MEK, trichloroethylene, PD-680, MIBK, toluene, naphtha, xylene)	49,000 gallons*	AIMD, squadrons, Public works	-
POL Wastes	200,000 gallons*	Fuel farm, AIMD, squadrons	-
Pesticides	insufficient data	Public works and golf course pesticide shops	Empty 5-gallon containers and bags
Paint Thinners	10,000 gallons*	Squadrons, AIMD, Public works shops	-

*This represents the total quantity generated during the operational period of the site. Some unknown portion of this total quantity was disposed at the site. This number provides a worst-case assumption.

into Sal Taylor Creek which flows west into Yellow Water Creek. The site is generally depressed several feet below the perimeter road which borders the site on the west and south. A planted pine forest with moderate undergrowth covers the site. The site gradually slopes towards Rowell Creek along its eastern border where it intergrades into a swamp forest association. There were no detectable signs of biological stress indicated for the vegetation occurring at the site or along Rowell Creek.

As part of a ground water monitoring plan at NAS Cecil Field, two wells were installed near the site (Geraghty and Miller, 1983). A surficial monitoring well was installed approximately 300 feet south of the site and a shallow rock aquifer well was installed approximately 600 feet northeast of the site. In addition, a surface water sampling station was placed in Rowell Creek approximately 800 feet downstream from the site.

These sampling locations were analyzed for a complete list of primary and secondary drinking water parameters. The first two quarterly sampling rounds have been completed. The surficial aquifer monitoring well was within the drinking water standards. The heavy metals were, for the most part, below the laboratory detection limit and, in all cases, were below the drinking water standards. In addition, the volatile organic compounds (VOC) were below laboratory detection limits. In the shallow rock aquifer monitoring well, the drinking water standards were also met, with the exception of trichloroethene which showed up at concentrations of 0.1 and 1.6 parts per billion (ppb) during the quarterly sampling. At the surface water sampling station, four organic compounds were detected in low concentrations in the VOC analysis during the first quarterly sampling. During the second quarterly sampling period only one organic compound, 1,1-dichloroethane, was detected in the VOC scan. The complete results from the first two quarterly sampling efforts are included in Appendix B.

8.3 SITE 2, RECENT LANDFILL. Site 2 is located in the northwestern corner of NAS Cecil Field, just north of the perimeter road (base coordinate system location: J-7). The site covers an area approximately 600 feet by 350 feet, encompassing 5 acres. The location and aerial extent of the site are shown in Figure 8-1.

The site was used as a landfill from 1965 to 1975. During this period, it was the only operating landfill at the installation. Solid waste and some liquid and chemical waste generated at the installation were disposed at this site. Dumpsters stationed throughout the installation were picked up by public works and disposed at the landfill until 1969, when trash collection for the major portion of the base was contracted to a private firm. From 1969 until the site closed, the Public Works Transportation Division continued to pick-up approximately eight dumpsters located at Outlying Landing Field (OLF) Whitehouse and the housing area, and dispose of them in the landfill. In addition, AIMD, the squadrons and public work shops took some of their own wastes directly to the landfill.

The landfill was a trench and fill operation. Trenches ran east to west and were 10 to 12 feet wide and deep, and approximately 600 feet long. Typically, there was standing water in the trenches. The trenches sloped toward Rowell Creek, with one end open for drainage purposes. Burning was not done intentionally at the site, although fires did periodically occur.

Approximately 21,000 cubic yards of solid waste was disposed at the landfill annually from 1965 to 1969. From 1969 to 1975, solid waste disposed at the site decreased by about one-half, to 10,500 cubic yards annually. Over the period of time the landfill was operated, this amounts to an estimated 160,000 cubic yards of solid waste disposed at the site.

The site also received liquid wastes generated by AIMD and the squadrons during the maintenance and repair of aircraft. These wastes included fuels, oils, solvents (MEK, trichloroethylene, Stoddard, PD-680, MIBK, toluene, naphtha and xylene), paint and paint strippers. Table 8-3 summarizes the estimated waste liquid quantities generated during the operational period of the site. These wastes were disposed on Navy property; some at this site. Because no records were kept on disposal activities, access to the site was not controlled, and other disposal options were available at the installation, a more exact quantification of the liquid wastes disposed at the site is not possible. Waste paints disposed at the site could contain cadmium, chromium and lead. Some of the fuels disposed at the site likely contained lead.

The general slope of the site is from west to east. A roadside drainage ditch on the southern boundary of the site intercepts portions of the surface drainage from the site and conveys it easterly into Rowell Creek, which is located approximately 300 feet east of the site. The remaining area of the site typically drains east by overland flow to Rowell Creek.

The site is sparsely covered with grasses and weeds. Pine trees border the site on the north and east, and a mature stand of oak trees occurs along the western edge. The vegetation growing on the site displayed no apparent biological stress, however, the total vegetation of the area seemed unusually sparse. Neither the pine nor oak communities surrounding the site exhibited visible signs of biological stress.

There are no major signs of surface erosion at the site. However, some exposed wastes were evident on the surface, including pieces of metal, brick and plastic.

The two monitoring wells and one surface water sampling location discussed in Section 8.2 are situated where they could also pick-up contaminants originating from Site 2. The results from the first two quarterly sampling rounds at these sites are included in Appendix B.

8.4 SITE 3, OIL/SLUDGE DISPOSAL PIT. Site 3 is located immediately northeast of the intersection of the western perimeter road and the service roadway leading from the south end of Lake Fretwell (base coordinate system location: I/H-7). The pit was approximately 50 to 100 feet in diameter and three to five feet deep. The location of the site is shown in Figure 8-2.

The site was used to dispose liquid wastes and sludge from the mid-1950s until approximately 1975. Liquid wastes were typically taken to the site by the individual shops (fuel division, AIMD and the squadrons) in bowsers or 55-gallon drums, drained into the pit and allowed to seep into the soil or evaporate. The pit was burned when the liquid level approached the top, which was approximately once every three months. The burning was done by the fire department.

Table 8-3

Wastes Potentially Disposed at the Recent Landfill, Site 2

Waste Type	Total Estimated Quantity Disposed	Source	Comments
Solid Waste	160,000 yd^3	All NAS Cecil Field operations	Wastes from dumpsters throughout installation
Waste Paint (enamel, epoxy, polyurethane, lacquer, acrylic)	2,500 gallons*	Squadrons, AIMD, Public works	-
Spent Solvents (Stoddard, MEK, trichloroethylene, PD-680, MIBK, toluene, naphtha, xylene)	70,000 gallons*	AIMD, squadrons, Public works	-
POL Wastes	180,000 gallons*	Fuel farm, AIMD, squadrons	-
Pesticides	insufficient data	Public works and golf course pesticide shops	Empty 5-gallon containers and bags
Paint Thinners	12,000 gallons*	Squadrons, AIMD, Public works	-

*This represents the total quantity generated during the operational period of the site. Some unknown portion of this total quantity was disposed at the site. This number provides a worst-case assumption.

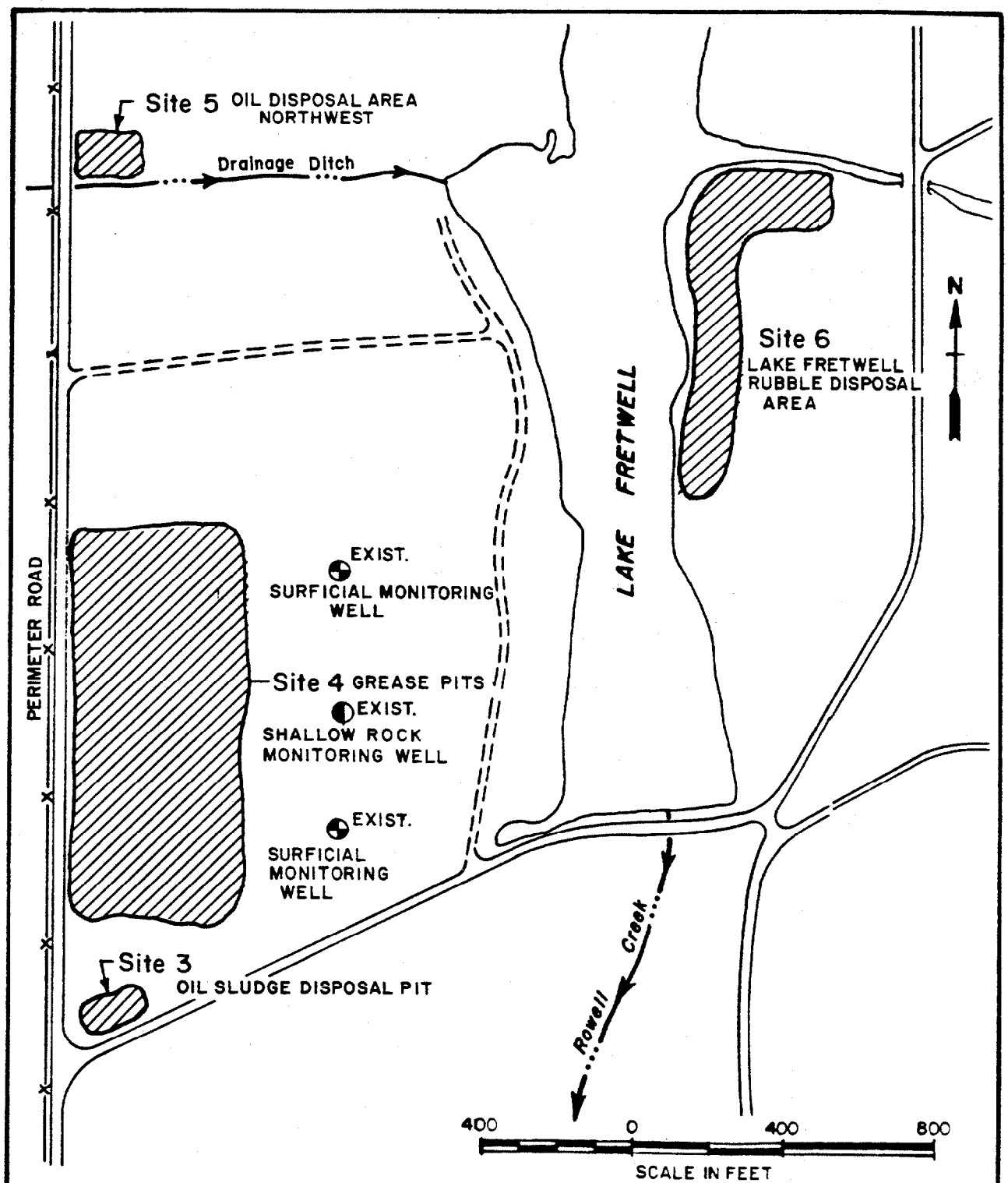


FIGURE 8-2

Waste Disposal Sites 3, 4, 5 and 6

INITIAL ASSESSMENT STUDY
NAVAL AIR STATION
CECIL FIELD

Typically, 200 to 300 gallons of waste oil, fuel and tank sludges from the fuel farm were disposed weekly at the site. Much of this volume included water. Over the period of time the disposal pit was operated, it is estimated that 210,000 to 310,000 gallons of these wastes from the fuel farm were disposed at the site.

Also disposed at the site were liquid wastes generated by the shops during the maintenance and repair of aircraft. These wastes included fuels, oils, solvents (MEK, trichloroethylene, Stoddard, PD-680, MIBK, toluene, naphtha and xylene), paint and paint strippers. Table 8-4 summarizes the estimated waste liquid quantities generated during the operational period of the site. These wastes were disposed on Navy property; some at this site. Because no records were kept on waste disposal activities, access to the site was uncontrolled, and other disposal options were available at the installation, a more exact quantification of the liquid wastes disposed at the site is not possible. Waste paints disposed at the site could contain cadmium, chromium and lead. Some of the fuels disposed at the site likely contained lead.

Following closure of the site in 1975, the pit was filled and covered with soil. There is no evidence of the pit at the site now.

The site is bounded on the west by the perimeter road and on the south by a dirt road. The periphery of the site is depressed approximately one to two feet below the roads with a mounded area near the center of the site which is approximately two to four feet above the roads.

Surface runoff would typically pond in the low areas between the site and the surrounding roads. Any overland flow would eventually discharge to Lake Fretwell which lies approximately 1,200 feet northeast of the site. There were no signs of surface erosion at the site.

The site is primarily dominated by ground flora typical of disturbed areas (grasses and weeds). The vegetation grades into the marshy habitat of Lake Fretwell, 1,200 feet to the northeast. There was no indication of biological stress at Site 3.

As part of a ground water monitoring program at NAS Cecil Field, two surficial aquifer monitoring wells and one shallow rock aquifer monitoring well were installed to the northeast of the site to monitor another known disposal site (Geraghty and Miller, 1983). The results from the first two quarterly sampling rounds are included in Appendix B. A discussion of the sampling results is contained in Section 8.5.

8.5 SITE 4, GREASE PITS. Site 4 is located to the west of Lake Fretwell along the perimeter road (base coordinate system location: H-7). The site covers an area approximately 1,000 feet by 400 feet, encompassing 9 acres. The location and aerial extent of the site are shown in Figure 8-2.

The site was used to dispose of grease from the various installation messes from the 1950s until 1983. In addition, other liquid wastes from the fuel farm, AIMD, the squadrons and public works shops were also disposed at Site 4. Typical disposal operations at the site consisted of placing wastes into excavated pits. These pits varied in size, but were approximately three feet deep with a one to two foot earthen berm. Each of the pits is estimated to have had a capacity of a few thousand gallons (Geraghty and Miller, 1983).

Table 8-4

Wastes Potentially Disposed at the Oil/Sludge Disposal Pit, Site 3

Waste Type	Total Estimated Quantity Disposed	Source	Comments
Waste Fuel, Oil and Sludge	210,000-310,000 gallons	Fuel farm	Fuel, oil and sludge mixed with water
Waste Paint (enamel, epoxy, polyurethane, lacquer, acrylic)	4,200 gallons*	Squadrons, AIMD, Public works	-
Spent Solvents (Stoddard, MEK, trichloroethylene, PD-680, MIBK, toluene, naphtha, xylene)	110,000 gallons*	AIMD, squadrons, Public works	-
POL Wastes	440,000 gallons*	AIMD, squadrons	-
Paint Thinners	20,000 gallons*	Squadrons, AIMD, Public works	-

*This represents the total quantity generated during the operational period of the site. Some unknown portion of this total quantity was disposed at the site. This number provides a worst-case assumption.

A particular pit continued to be used until it became full. At that time the pit was covered with soil and a new pit excavated. Typically, a pit would last for more than six months. Numerous pits exist throughout the area of the site. The number and locations of the pits were not recorded although the locations of the most recent pits are apparent from disturbance of the land surface.

A truck with a 500-gallon capacity tank was used to dispose of mess grease at the site. This was done approximately weekly. Based on installation records, 400 to 500 gallons of grease were disposed weekly at the site. Therefore, it is estimated that over the period of time the site was used, a total of 650,000 to 800,000 gallons of grease were disposed at the site. The grease contained a significant quantity of water.

Also reportedly disposed at the site were liquid wastes generated by the shops during the maintenance and repair of aircraft. These wastes included fuels, oils, solvents (MEK, trichloroethylene, Stoddard, PD-680, MIBK, toluene, naphtha and xylene), paint and paint strippers. Table 8-5 summarizes the estimated waste liquid quantities generated during the operational period of the site. These liquid wastes were disposed on Navy property; some at this site. Because no records were kept on disposal activities, access to the site was not controlled, and other disposal operations were available at the installation, a more exact quantification of the liquid wastes disposed at the site is not possible. The waste paints disposed at the site could contain cadmium, chromium and lead. Some of the fuels disposed at the site likely contained lead.

Surface drainage at the site can be characterized as ponding with any overland flow eventually draining in an easterly direction toward lower ground, with eventual discharge to Lake Fretwell.

The perimeter road borders the site on the west with a small berm approximately two feet high located along the eastern edge. A small pine forest borders the site to the north and also to the west of the perimeter road. The ground gradually slopes to the east where it becomes marshy at the border of Lake Fretwell, approximately 1,200 feet east of the site.

The site has scattered slash pines with a few small oaks and staggerbush. The predominant vegetation at the site is grasses and weeds characteristic of disturbed areas. The vegetation present at the site showed no visible indication of biological stress.

As part of a ground water monitoring program at NAS Cecil Field, two surficial aquifer monitoring wells and one shallow rock aquifer well were installed just east of the site (Geraghty and Miller, 1983). The first two quarterly sampling rounds did not find any violations of the primary and secondary drinking water parameters. The concentration of the organic compounds (VOCs and acid extractables) were all below laboratory detection limits. The complete results are contained in Appendix B.

8.6 SITE 5, OIL DISPOSAL AREA NORTHWEST. Site 5 is located approximately 2,000 feet north of the intersection of the perimeter road and the roadway leading from the south end of Lake Fretwell (base coordinate system location: G-7). The site covers an area approximately 100 feet by 200 feet, encompassing 0.5 acre. The location and aerial extent of the site are shown in Figure 8-2.

Table 8-5

Wastes Potentially Disposed at the Grease Pits, Site 4

Waste Type	Total Estimated Quantity Disposed	Source	Comments
Grease	625,000-800,000 gallons	Installation messes	Grease mixed with water
Waste Paint (enamel, epoxy, polyurethane, lacquer, acrylic)	8,000 gallons*	Squadrons, AIMD, Public works	-
Spent Solvents (Stoddard, MEK, trichloroethylene, PD-680, MIBK, toluene, naphtha, xylene)	180,000 gallons*	AIMD, squadrons, Public works	-
POL Wastes	550,000 gallons*	AIMD, squadrons, fuel farm	-
Paint Thinners	35,000 gallons*	Squadrons, AIMD, Public works	-

*This represents the total quantity generated during the operational period of the site. Some unknown portion of this total quantity was disposed at the site. This number provides a worst-case assumption.

The site was reportedly used in the 1950s to dispose of waste oil. Portions of the area are oil stained and devoid of vegetation. From appearances at the site, it seems likely that disposal operations occurred at the site since the 1950s.

Visual evidence indicated that petroleum wastes were disposed at the site. A common practice was to mix other liquid wastes such as solvents, paints and thinners in with petroleum wastes. Therefore, it is likely that these wastes were disposed at the site as well. Waste paints disposed at the site could contain cadmium, chromium and lead. In addition, waste fuels disposed at the site could contain lead.

The general slope of the site is toward the south. Runoff from the site is intercepted by the ditch along the southern border of the site. This ditch flows in an easterly direction to Lake Fretwell which is located approximately 900 feet east of the site.

The site is bounded on the west by the perimeter road and on the south by a drainage ditch. The site is covered with patches of grass and weeds. A small stand of slash pine borders the site to the east while younger pines are beginning to establish themselves along the north. The lack of vegetation on the oil-saturated areas of the site indicates an adverse impact. There is a definite oil odor at the site.

8.7 SITE 6, LAKE FRETWELL RUBBLE DISPOSAL AREA. Site 6 is located along the eastern bank of Lake Fretwell, just south of the old sewage treatment plant discharge ditch (base coordinate system location: H-8). The site covers an area approximately 1,000 feet by 150 feet, encompassing 3.5 acres. The location and aerial extent of the site are shown in Figure 8-2.

The site was used as a rubble disposal area from the mid-1950s to 1984. The site was originally a low-lying marshy area, and rubble was used to fill in the area. Rubble was hauled to and disposed at the site by public works. The rubble in the northern half of the site has been covered with soil and a three to five foot berm placed along the northern and western-most perimeters of this area. The rubble in the southern half of the site is above ground and uncovered.

Wastes disposed at the site include concrete, lumber, tree clippings, scrap metal and similar inert type materials. The source of the majority of the wastes disposed at the site was construction and building demolition debris. There were no reports or evidence of hazardous wastes being disposed at the site.

The site is bordered on the west by Lake Fretwell and on the north by an east-west drainage ditch going into the lake. The general slope of the site is from east to west. However, due to a berm along the north and northwest perimeter of the site, the predominant drainage pattern for the site is toward a marshy area to the southwest. Any overflow from this area would enter Lake Fretwell.

8.8 SITE 7, OLD FIRE FIGHTING TRAINING AREA. Site 7 is located approximately 400 to 500 feet southwest of Building 865 along an asphalt apron (base coordinate system location: H-8). The site consisted of two burning pads on

the asphalt apron and one burning pit in the grassed area north of the apron. Each of these burning areas was approximately 30 feet in diameter. The location of the site is shown in Figure 8-3.

The site was used from the mid-1950s to 1975 as a training area for fire fighting. Typically, waste liquids were taken from the fuel farm, AIMD, the squadrons, and public works, and transported to the site in bowsers or 55-gallon drums. The flammable liquids were then drained onto the burning area, typically around a scrap aircraft carcass, and set afire. The fires were surpressed with a protein foaming agent and water. A practice burn was conducted approximately once per week.

Until about the mid-1960s, all burning was conducted at the two burning pads on the asphalt apron. Beginning in the mid-1960s during the Vietnam War, a burning pit was constructed in the grassed area north of the apron. Following the mid-1960s, burning was conducted on the asphalt apron and at the pit.

Approximately 100 gallons of waste fuels, oils, solvents (MEK, trichloroethylene, Stoddard, PD-680, MIBK, toluene, naphtha and xylene), paints, and paint strippers were burned weekly at this site until the mid-1960s. Following the mid-1960s and until the site was closed in 1975, the quantity of waste liquids burned at the site increased to approximately 200 to 300 gallons per week. This was due to increased training activities associated with the Vietnam War.

Over the time period the site was operational, it is estimated that 200,000 gallons of waste liquids were burned at the site. Table 8-6 summarizes the estimated waste liquid quantities generated during the operational period of the site which could have been burned at the site. It is not possible to accurately estimate what portion of the flammable liquid was consumed b burning or volatilization and what portion percolated into the surrounding ground. However, based on accounts of fire station personnel, it is assumed that waste liquids did remain following practice burns. Waste paints disposed at the site could contain cadmium, chromium and lead. The fuels disposed at the site could also contain lead.

Following closure of the site in 1975, the burning pit was filled with soil. The location of the pit is no longer distinguishable at the site and grass covers the entire area. There were no indications of biological stress at the site. Runoff from the site typically ponds in the areas immediately surrounding the site.

8.9 SITE 8, BORESITE RANGE HAZARDOUS WASTE STORAGE/FIRE FIGHTING TRAINING AREA. Site 8 is located at the boresite range (base coordinate system location: I-9). The fire fighting training area consists of two bermed pits, each with approximate dimensions of 60 feet by 60 feet, and a third bermed pit with approximate dimensions of 90 feet by 100 feet. Each of the pits is approximately three feet deep. The former hazardous waste storage area is adjacent to and in front of the boresite range back-stop. The location of Site 8 is shown in Figure 8-4.

Although the fire fighting training area is still in use, the nature of the operation has changed significantly. Currently, waste fuels are primarily used in the practice burns. However in the past, other wastes liquids, such as solvents, paints, paint strippers and oils were used at the site. There fore, this area is included as a site in this report.

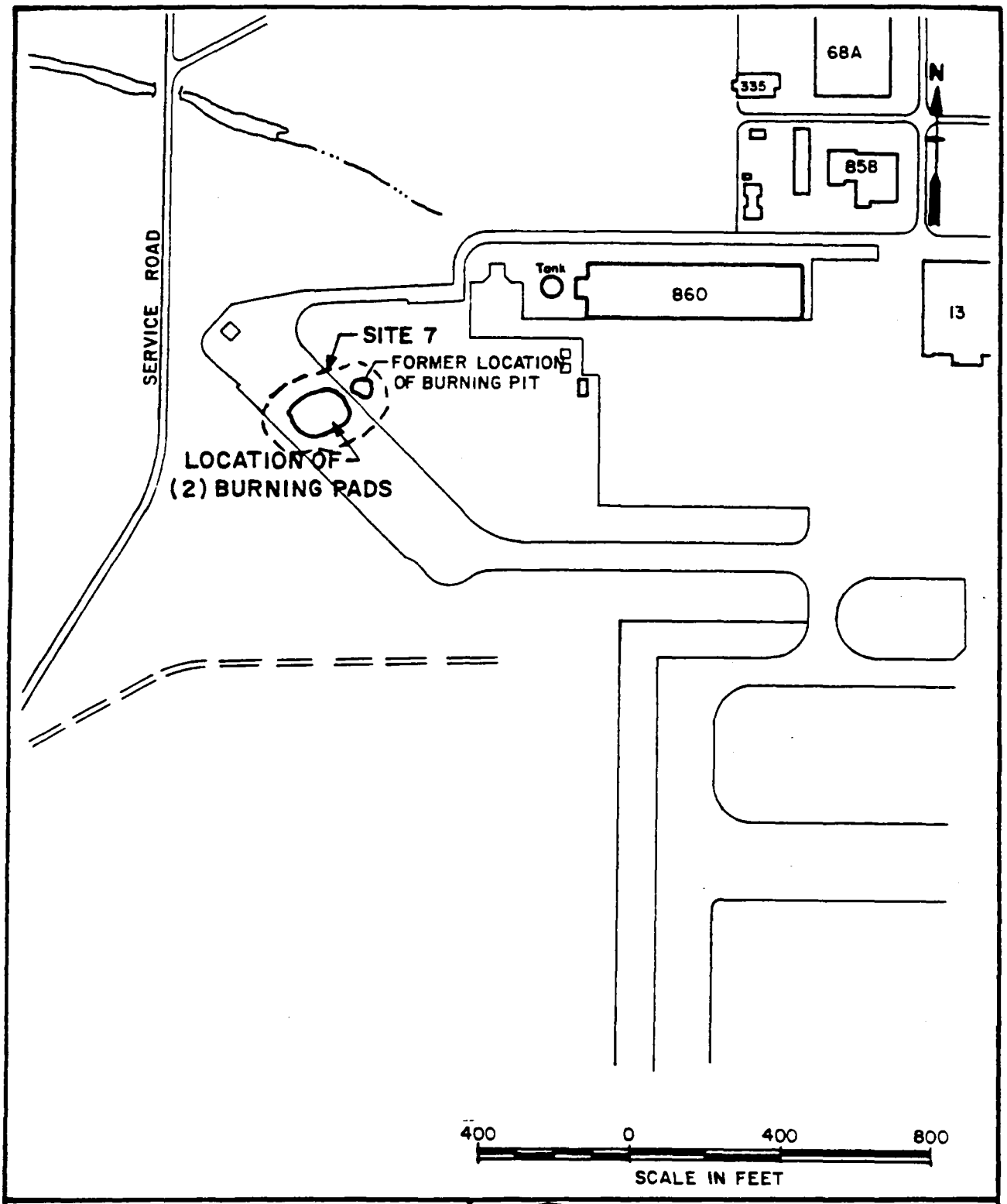


FIGURE 8-3

Site 7, Old Fire Fighting Training Area

INITIAL ASSESSMENT STUDY
NAVAL AIR STATION
CECIL FIELD

Table 8-6

Wastes Potentially Burned at the
Old Fire Fighting Training Area, Site 7

Waste Type	Total Estimated Quantity Disposed	Source
Waste Paint (enamel, epoxy, polyurethane, lacquer, acrylic)	4,200 gallons*	Squadrons (Claw-1 and CVSW-1), AIMD, Public works
Spent Solvents (Stoddard, MEK, trichloroethylene, PD-680, MIBK, toluene, naphtha, xylene)	110,000 gallons*	Squadrons (Claw-1 and CVSW-1), AIMD, Public works
POL Wastes	440,000 gallons*	Squadrons (Claw-1 and CVSW-1), AIMD, Public works
Paint Thinners	20,000 gallons*	Squadrons (Claw-1 and CVSW-1), AIMD, Public works

*This represents the total quantity generated during the operational period of the site. Some unknown portion of this total quantity was disposed at the site. This number provides a worst-case assumption.

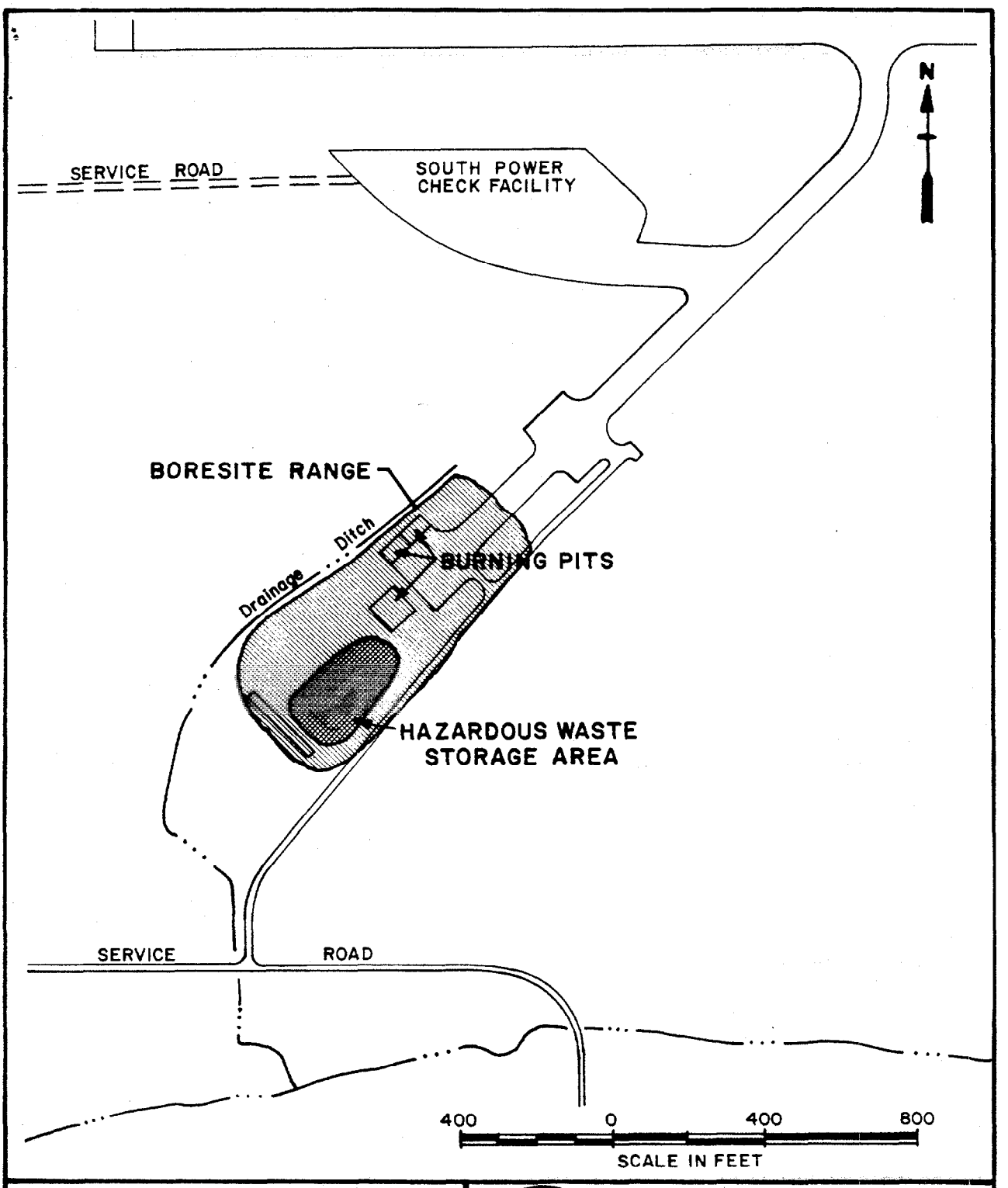


FIGURE 8-4

Site 8, Boresite Range Hazardous Waste Storage / Fire Fighting Training Area

INITIAL ASSESSMENT STUDY
NAVAL AIR STATION
CECIL FIELD

Channel 26
1-4 pm
EPA
mtg on Fed
Fac site
Around 3 pm

The fire fighting training area has been used from 1975 to 1984. Typically, waste liquids were taken from the fuel farm, AIMD, the squadrons, and public works, and transported to the site in bowsers. These waste liquids were either stored at the site in bowsers or transferred to a 5,000-gallon tank at the site. Practice burns were conducted approximately twice per month at the site. The waste liquids were drained into one of the burning pits, typically around a scrap aircraft carcass and set afire. The fires were surpressed with a protein foaming agent and water.

Approximately 1,200 gallons of waste fuels, oils, solvents, paints and paint thinners were burned at the site monthly. Over the time period the fire fighting training area was operational, it is estimated that 145,000 gallons of flammable liquids were burned at the site. Table 8-7 summarizes the estimated waste liquid quantities generated during the operational period of the site which could have been burned at the site. It is not possible to accurately estimate what portion of the flammable liquid was consumed by burning or volatilization and what portion percolated into the ground. However, based on accounts of fire station personnel and an inspection of the site, it is assumed that flammable liquids did remain following practice burns. Waste paints disposed at the site could contain cadmium, chromium and lead. The fuels disposed at the site could also contain lead.

The area adjacent to and in front of the boresite range back-stop was also used to store unmarked 55-gallon drums of hazardous wastes in the late 1970s to 1980. It is estimated that 50 to 100 drums were stored at this site. Many of the drums were in a deteriorated and leaking condition. Some of the drums reportedly lacked tops and many were overturned with their contents spilled on the ground.

Many of the hazardous waste drums were also riddled with bullets, as they were being stored against the boresight range back-stop where small arms/ machine gun target practice was conducted. The contents of the bullet riddled drums also leaked onto the ground.

The drummed wastes were unlabeled, but likely contained waste solvents (MEK, trichloroethylene, Stoddard, PD-680, MIBK, toluene, naphtha and xylene), paint, and paint strippers. Use of the site was discontinued in 1980 and the drums were transferred from the site.

Site 8 is bordered on the northwest by a small ditch approximately 10 to 15 feet wide. Runoff from the site would enter the ditch and drain in a southerly direction to Sal Taylor Creek, which is located approximately 1,400 feet south of the site.

The three burn pits at the site had evidence of residual fuel. The earthen berms around the pits, which are typically one to two feet high, have breaks in them, thereby allowing direct runoff from the site into the ditch to the northwest. The ditch had a noticeable fuel odor.

The site is covered with a mixture of grasses and weeds. The area surrounding the burning pits exhibited signs of stress, probably a combination of fire as well as fuel contamination. No noticeable areas of stress were observed in the area where the hazardous waste drums were stored.

8.10 SITE 9, RECENT GREASE PITS. Site 9 is located approximately 1,4 feet west of the south power check facility (base coordinate system location:

Table 8-7

Wastes Potentially Burned at the
Fire Fighting Training Area, Site 8

Waste Type	Total Estimated Quantity Disposed	Source
Waste Paint (enamel, epoxy, polyurethane, lacquer, acrylic)	2,100 gallons*	Squadrons (Claw-1 and CVSW-1), AIMD, Public works
Spent Solvents (Stoddard, MEK, trichloroethylene, PD-680, MIBK, toluene, naphtha, xylene)	55,000 gallons*	Squadrons (Claw-1 and CVSW-1), AIMD, Public works
POL Wastes	295,000 gallons*	Squadrons (Claw-1 and CVSW-1), AIMD, Public works
Paint Thinners	8,600 gallons*	Squadrons (Claw-1 and CVSW-1), AIMD, Public works

*This represents the total quantity generated during the operational period of the site. Some unknown portion of this total quantity was disposed at the site. This number provides a worst-case assumption.

I-8). The site covers an area approximately 100 feet by 200 feet, encompassing 0.5 acre. The location and aerial extent of the site are shown in Figure 8-5.

The site was used to dispose of grease from the various installation messes during 1983 and the first part of 1984. There were three pits at the site. The pits varied in size, but were approximately three feet deep with a one to two foot earthen berm. Each of the pits is estimated to have had a capacity of a few thousand gallons. A truck with a 500-gallon capacity was used to dispose of the grease at the site.

A particular pit continued to be used until it became full. At that time, the pit was covered with soil and a new pit excavated. Typically, a pit would last four to six months. The use of this site was abandoned after approximately 15 months due to a high clay content in the soil which prevented the grease from seeping into the ground. Grease was disposed at the site approximately weekly. Based on installation records, 400 to 500 gallons of grease were disposed weekly at the site. It is estimated that during the 15 months the site was operational, a total of 24,000 to 30,000 gallons of grease were disposed at the site. There were no reports or evidence of hazardous wastes being disposed at the site.

The site is depressed approximately three feet below a dirt road which borders the site on the south. A berm approximately five feet high borders the site on the north. The site is sandy with a scattered weed growth. There is a definite grease odor at the site.

The general slope of the site is from east to west. Runoff from the site typically ponds in low areas with overflows entering a small ditch which runs along the northern shoulder of the dirt road located to the south of the site. The ditch drains in a westerly direction to Rowell Creek which is approximately 1,000 feet west of the site.

8.11 SITE 10. RUBBLE DISPOSAL AREA. Site 10 is located in the southwestern portion of NAS Cecil Field, along the western edge of the road which parallels Rowell Creek (base coordinate system location: I/J-8). The site covers an area approximately 140 feet by 2,000 feet, encompassing 6.5 acres. The location and aerial extent of the site are shown in Figure 8-1.

The site was used as a rubble disposal area from the early 1950s through the 1960s. Wastes were typically hauled to and disposed at the site by public works. A dirt road runs the entire length of the site and represents the eastern boundary. Rubble was disposed immediately to the west of this road. In places, the rubble is buried just below the surface, while in other places, the rubble is above-ground.

Wastes disposed at the site consist of building demolition debris and concrete. Many of the World War II buildings demolished in the 1950s were disposed at this site. The six inch concrete slabs from the old runways were also disposed at this site when the thicker runways required by jets were installed in the 1950s. Other inert type wastes such as tires, asphalt and furniture were also disposed at the site during the latter years. There were no reports or evidence of hazardous wastes being disposed at the site.

The general slope of the site is from east to west. Runoff from the ar typically drains to Rowell Creek which is located approximately 400 to 500

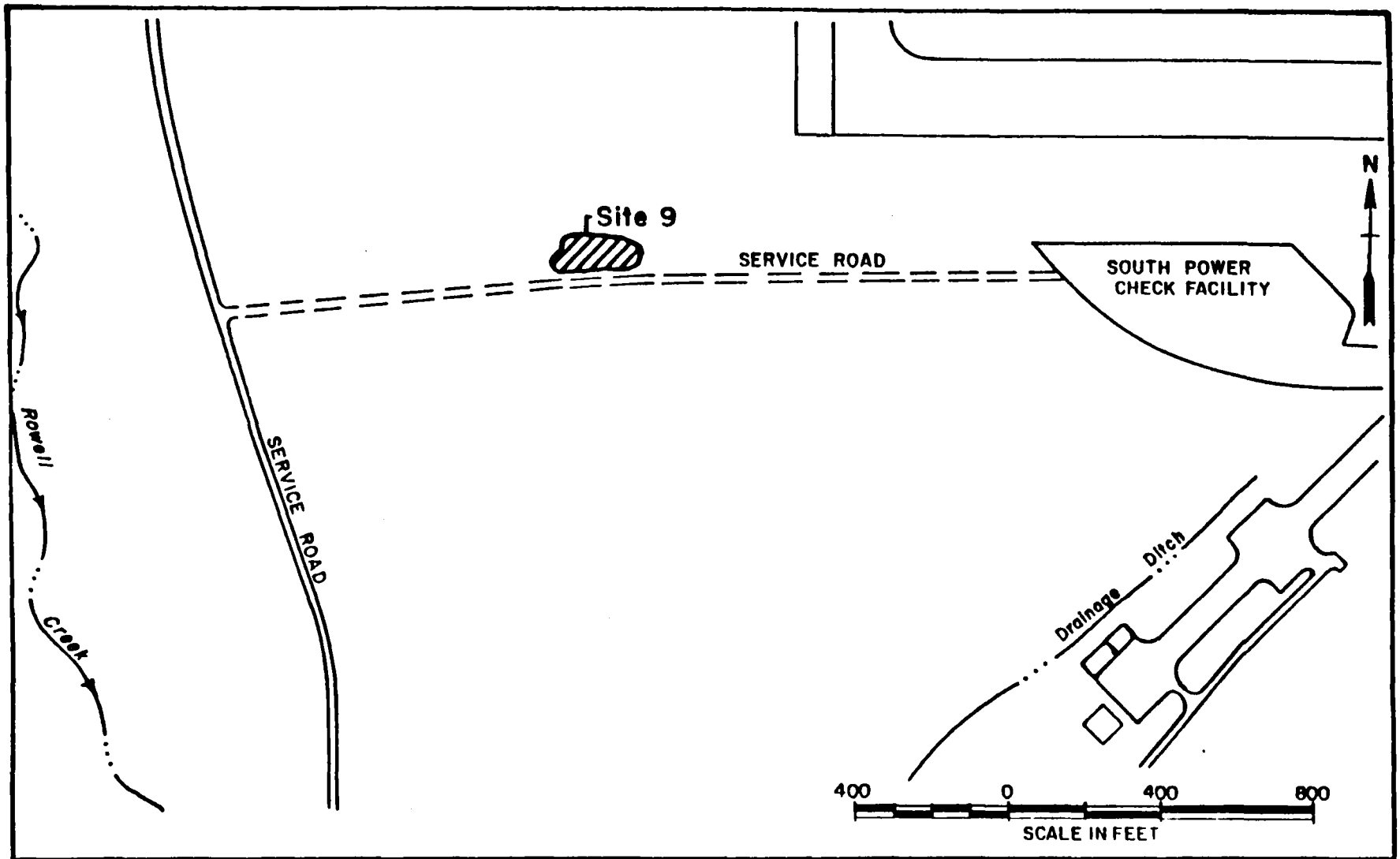


FIGURE 8-5

Site 9, Recent Grease Pits

INITIAL ASSESSMENT STUDY
NAVAL AIR STATION
CECIL FIELD

feet west of the site. The site is covered primarily with slash pines, intermixed with hardwoods (primarily red maple) along the eastern side. The area gradually intergrades into a swamp forest association westward toward Rowell Creek.

8.12 SITE 11, GOLF COURSE PESTICIDE DISPOSAL AREA. Site 11 is located approximately 450 feet northwest of Building 238, between fairways 11 and 17 (base coordinate system location: E-8). The site covers an area approximately 40 feet by 40 feet, encompassing 0.1 acre. The location and aerial extent of the site are shown in Figure 8-6.

The site was used as a disposal area for pesticide, fungicide and herbicide containers from the early 1970s to 1978. Typically, waste containers were collected from the golf course maintenance building and transported to the site by hand or truck for disposal.

Approximately two to four empty five gallon cans were disposed per month at the site. The cans were not rinsed prior to being taken to the site. The cans were allowed to accumulate for a number of months before they were crushed by a front-end loader and buried approximately three feet deep. Over the time period that the site was utilized, it is estimated that between 200 and 450 empty five gallon cans were disposed at the site.

After the completion of a new pesticide facility (Building 397) in 1978, two to three 30 gallon drums of unused pesticide, of which at least one was Nemagon (1,2-dibromo-3-chloropropane), and approximately 10 to 15 full five gallon containers of pesticides, herbicides and fungicides were discarded and buried at the site. Many of these containers were beginning to rust, or lacked identification labels and were considered unusable for the new facility. Once the move was made to the new maintenance facility, use of Site 11 for disposal purposes was discontinued. Potential wastes disposed at the site are listed in Table 8-8.

The disposal area is located in a clearing within a small pine woods. There is an east-west path through the woods which separates the site into two parts. The northern portion is where the full containers were buried along with empty five gallon cans. The area to the south of the path contains buried, empty five gallon cans.

There are no well defined surface drainage patterns for the area and it is anticipated that there is little runoff from the area of the site. In the event there is runoff from the area of the site, it would most likely drain to the west or northwest to Rowell Creek.

The northern area of the site has a mound approximately five feet high and ten feet in diameter made up of dirt and decaying vegetation. The remaining portion of the site is covered sparsely with grasses and weeds. There were no obvious signs of biological stress exhibited by the plants at the site.

8.13 SITE 12, PUBLIC WORKS RUBBLE DISPOSAL AREA. The site is located approximately 75 feet north of Building 105 (base coordinate system location: E-9). The site covers an area approximately 75 feet by 200 feet, encompassing 0.5 acre. The location and aerial extent of the site are shown in Figure 8-7.

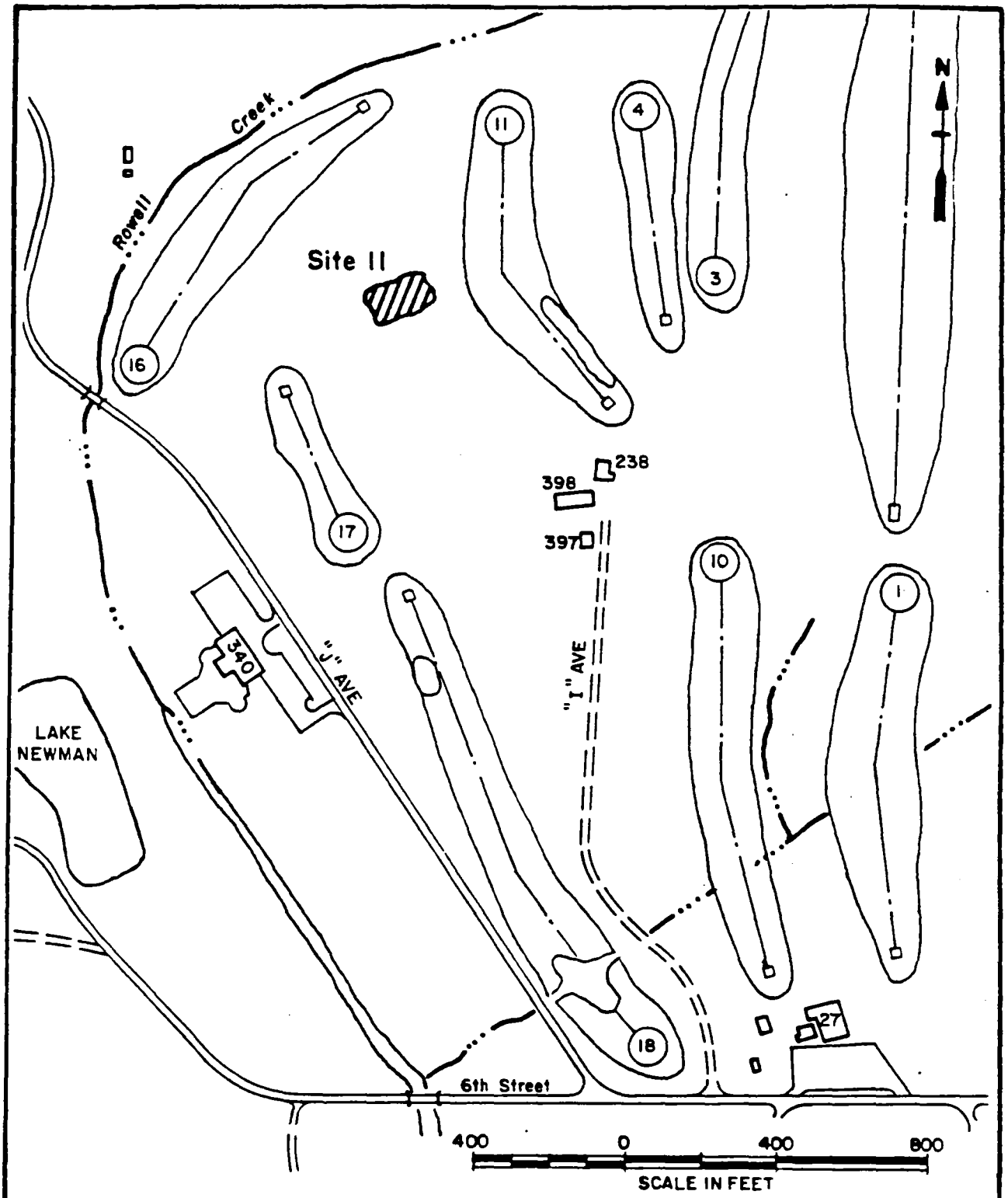


FIGURE 8-6

Site 11, Golf Course Pesticide Disposal Area

INITIAL ASSESSMENT STUDY
NAVAL AIR STATION
CECIL FIELD

Table 8-8

Typical Inventories of Pest Control Materials
Maintained at the Golf Course Facility*

Insecticide	Normal Inventory Level
Carbaryl, 80% wettable powder (WP)	150 pounds
Dursban, 23.5% emulsifiable concentrate (EC)	20 gallons
Malathion, 57% EC	10 gallons
Propoxur (Baygon), 70% WP	50 pounds
Nemagon	300 pounds
Herbicide	
Buctril (Bromoxyril), 33.8% EC	4 gallons
Monosodium acid methanearsonate, 48% EC	90 gallons
Round-up (glyphosate), 41% EC	5 gallons
Trimec, 30% EC	10 gallons
Trimec, 43% EC	5 gallons
2,4-D, 47.4% Amine	40 gallons
Fungicide	
Dithane (Manzate), 80% WP	200 pounds
Maneb (Tersan LSR), 80% WP	30 pounds
Maneb (Tersan), 75% WP	70 pounds
Form-A-Turf (formaldehyde), 31% EC	10 gallons
Daconil	10 gallons

*Based on interviews with pest control personnel and the 1979 Pest Management Plan.

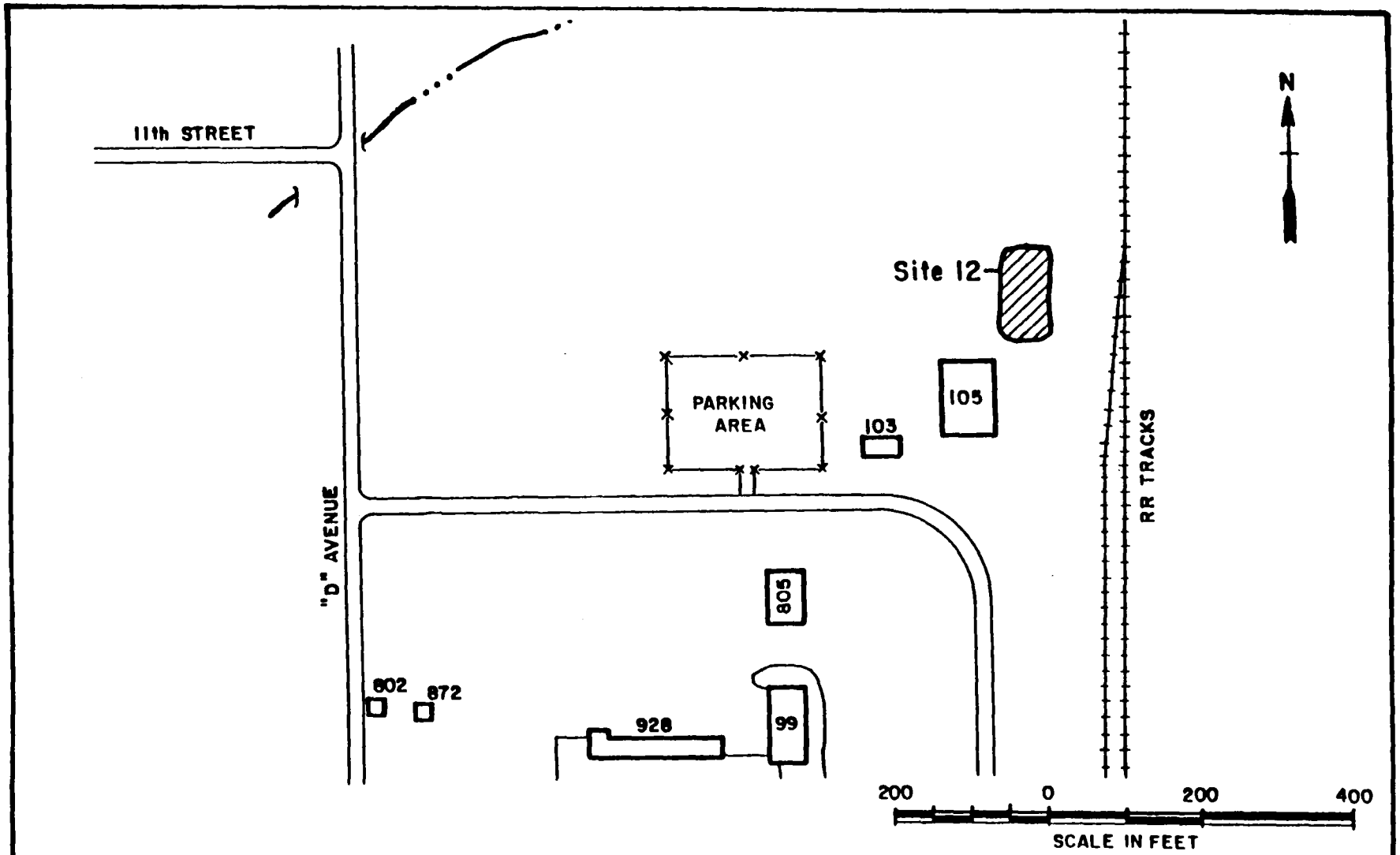


FIGURE 8-7
Site 12, Public Works Rubble Disposal Area

INITIAL ASSESSMENT STUDY
NAVAL AIR STATION
CECIL FIELD

The site was used by public works personnel as a rubble disposal area from the mid-1970s to 1984. Most of the rubble has been buried approximately three feet below the surface. However, there is some rubble above ground. Wastes disposed at the site include mainly concrete, wood, wire, cable, scrap metal (including empty 55-gallon drums), and similar inert debris. There were no reports or evidence of hazardous wastes being disposed at the site.

There is no well-defined surface drainage pattern for the area. The "B" drainage ditch is located approximately 500 feet northwest of the site. The ditch drains southwestward to Rowell Creek. Any surface runoff from the site would probably enter the "B" ditch. There were no signs of surface erosion at the site.

The site is an open area covered with a sparse and patchy cover of grasses. The surrounding vegetation primarily consisted of slash pine, oak and grasses. No biological stress was exhibited by the vegetation at the site.

8.14 SITE 13, DAY TANK FUEL SPILL. Site 13 is located at the Day Tank facility which is 160 feet north of Building 824 and 100 feet east of Jet Road (base coordinate system location: F-10). The site covers an area approximately 300 feet by 240 feet, encompassing 1.5 acres. The location and aerial extent of the site are shown in Figure 8-8.

This site is the location of a fuel spill which occurred during the early morning hours of February 19, 1981. The spill resulted from the unauthorized activation of the fuel pumps which caused the overfilling of the 220,000 gallon, above grade, earth mounded day tank. The overfilling of the tank resulted in a pressure buildup which allowed fuel to be released through the tank vent. The pressure build-up eventually led to rupturing of the tank and fuel lines. It was estimated that 497,000 gallons of JP-5 fuel was spilled at the site.

Once the spill was identified, immediate steps were taken to recover as much of the fuel as possible and to prevent the migration of the fuel off Navy property. Actions taken included blocking off the storm drainage system at two locations, setting oil spill booms at various downstream locations, and using vacuum trucks to recover the spilled fuel which was as much as a foot thick on the creek. These actions eventually led to the recovery of 257,000 gallons of JP-5 fuel.

Much of the unrecovered 240,000 gallons of JP-5 would have rapidly volatilized in the warm and windy days immediately following the spill. In addition, due to the vast amounts of fuel spilled at the site, there was significant pooling of the JP-5 in the area to the north and south of the day tank. Some of the JP-5 soaked into the ground in this area.

The soaking of the JP-5 into the ground represented a potential for ground water contamination. An investigation was conducted to determine the extent of soil and ground water contamination resulting from the spill (Geraghty and Miller, 1981). Numerous soil borings and wells were installed at the site, and it was determined that JP-5 was present only in the unsaturated zone and had not penetrated to the water table. This report concluded that the fuel would naturally degrade over time due to naturally-occurring bacteria. A copy of this report is included as Appendix C.

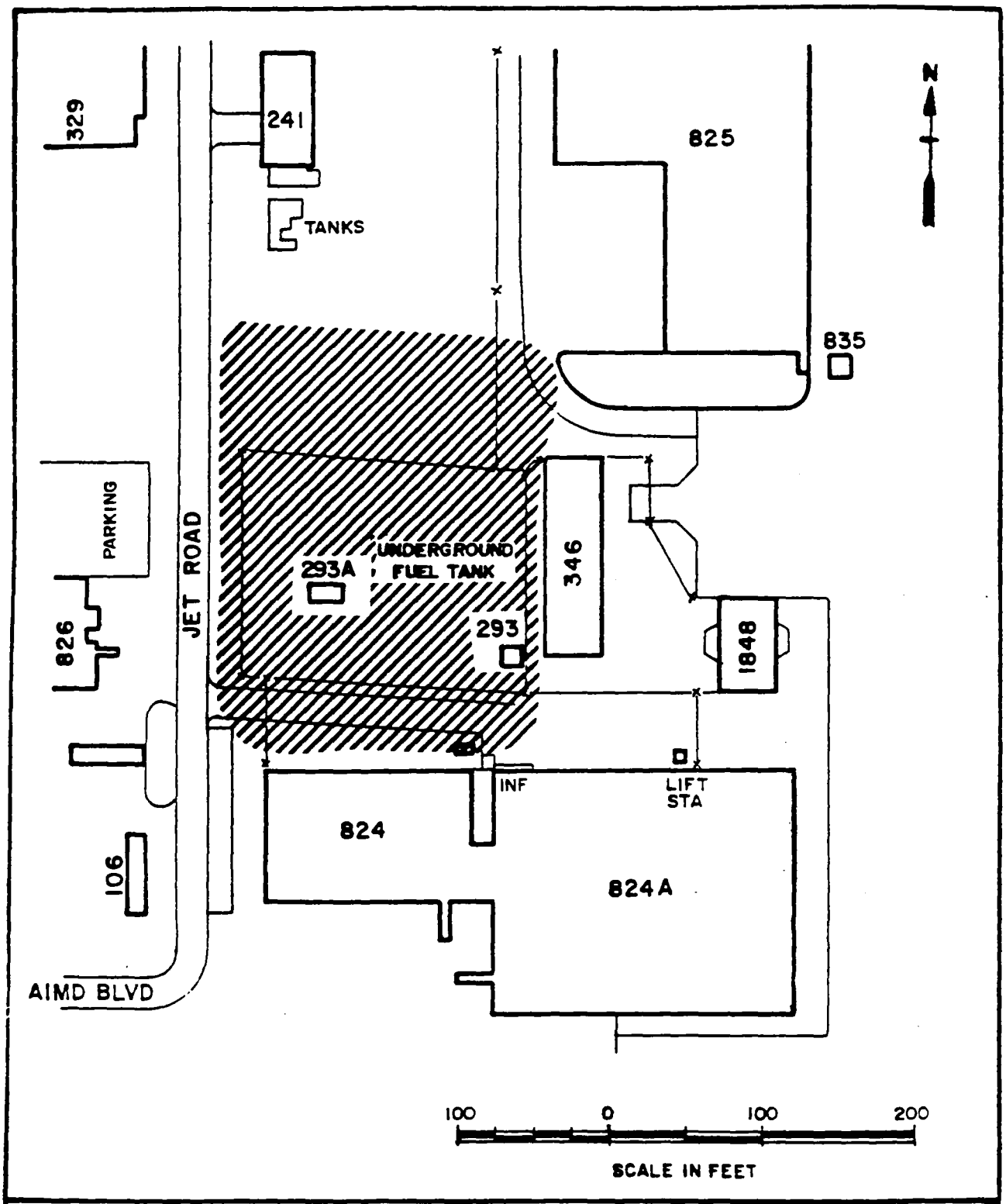


FIGURE 8-8

Site 13
Day Tank Fuel Spill

INITIAL ASSESSMENT STUDY
NAVAL AIR STATION
CECIL FIELD

Based on the findings of the Geraghty and Miller report, fertilizer was added throughout the area where the JP-5 ponded in order to promote the natural breakdown of the fuel into carbon dioxide and water. The site is a maintained area dominated by Bahia grass. Much of the area surrounding the day tank is enclosed by a fence. The area where the fuel was ponded is currently covered with grass with no signs of biological stress.

8.15 SITE 14, BLUE 5 ORDNANCE DISPOSAL AREA. Site 14 is located in the north central portion of the Yellow Water Ordnance area (30° 16.9' north latitude and 81° 54.3' west longitude). The site covers an area approximately 200 feet by 1,000 feet, encompassing 4.5 acres. The location and aerial extent of the site are shown in Figure 8-9.

The site was used as an ordnance disposal area from 1967 until 1977. Ordnance to be disposed was transported to the site by Explosive Ordnance Disposal (EOD) personnel. Disposal operations at this site consisted of detonation and was used to detonate ordnance approximately once every six weeks.

Ordnance items detonated at this site included fuses, 100 pound bombs, large munitions and explosive materials that normally do not burn. Based on interviews with EOD personnel, typical explosives detonated included trinitrotoluene (TNT), trinitrophenylmethylnitramine (tetryl) and cyclotrimethylenetrinitramine (RDX).

On the average, 300 to 450 pounds of explosive material were detonated each time. There was a 100 pound explosive limit at the site due to an adverse impact to area chickens and cows if larger amounts were detonated. Thus, three to four detonations were required to dispose of the ordnance. Over the time period that the site was utilized, it is estimated that 30,000 to 45,000 pounds of explosive material were detonated at the site.

The detonation operations likely resulted in the formation of some residual material at the site. This residual material would be composed mostly of metal oxides, primarily aluminum and lead based. However, a study by the Naval Ordnance and Environmental Support Office (OESO) concluded that the quantities of residues left were insignificant in terms of environmental contamination (Fauth, 1984). Aluminum oxides in the presence of water also rapidly decay, while residual lead in the soil does not appear to be readily taken into the food chain (Fauth, 1984).

The only material noticeable during an on-site survey was some scrap metal pieces. A few detonation crators were evident at the site. These craters were approximately four to five feet across and three feet deep.

There are no well-defined surface drainage patterns for the site. A small ditch which contained standing water during the on-site survey, borders portions of the site on the southwest and northeast. Drainage probably ponds in the ditches on-site, with any off-site drainage entering scattered swampy areas near the site.

The site is predominantly a moist, open, grassy area which is gradually growing back naturally with pines. A dirt road borders the site on the southwest. Planted pined occur along the eastern and northwestern periphery of the site. The remainder of the surrounding area is a pine forest with pockets of swamp forest in the low areas. There were no indications of biological stress observed at the site.

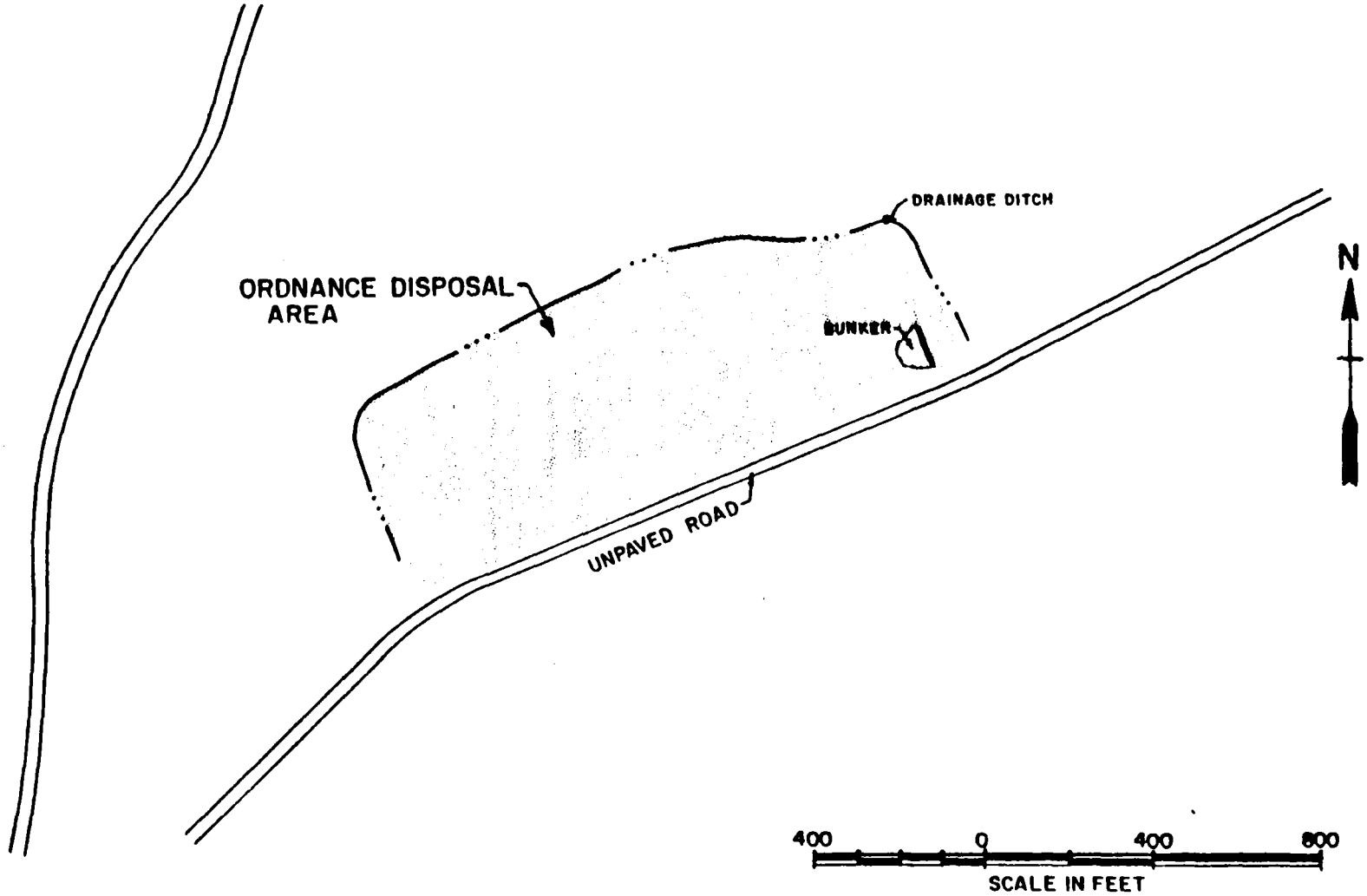


FIGURE 8-9
Site 14, Blue 5 Ordnance Disposal Area

INITIAL ASSESSMENT STUDY
NAVAL AIR STATION
CECIL FIELD

8.16 SITE 15, BLUE 10 ORDNANCE DISPOSAL AREA. Site 15 is located in the southwestern portion of the Yellow Water ordnance area (30° 14.5' north latitude and 81° 55.5' west longitude). The site covers an area approximately 600 feet by 700 feet, encompassing 10 acres. The location and aerial extent of the site are shown in Figure 8-10.

The site was used as an ordnance disposal area from the mid-1960s until 1977. Ordnance materials to be disposed were transported to the site by EOD personnel. The disposal operation at this site consisted of burning of ordnance materials and static firing of rockets.

Much of the ordnance disposed at this site was burned in a heavy metal burning tank. Burned in the tank were small arms up to 20 mm, parachute and distress flares, Mark IV signal cartridges, rocket ignitors, and Cartridge Activated Devices (CADS). Approximately 110 gallons of diesel fuel were used to ignite the burn tank.

Burns were conducted in the tank approximately once every four to six weeks. Typically, 6,000 to 8,000 rounds of ammunition were disposed in the burn tank per episode, plus any flares, Mark IVs, CADS, and rocket ignitors which had accumulated since the last burn.

The materials burned in the tank were subjected to elevated temperatures sufficient to destroy organic compounds. The heat from a burn was so intense within the tank that the metal components of the ordance items became molten. This metal, along with some ash, were about the only materials left after a burn. Following a burn, it took the tank approximately 24 hours to cool down. The metal and ash left in the tank was periodically cleaned out and buried in the area of the site.

Also burned at the site were 2.75 and 5 inch solid double-base propellant (nitroglycerin-based) rockets. The rockets were taken apart at the site and the solid propellant laid out on the ground surface in a crow-footed pattern (branched out with each touching the other). Thus, when the first rocket propellant was ignited, the fire spread throughout all the rockets layed out on the ground.

The 2.75 and 5 inch rockets were also static fired at the site. There was a static firing stand at the site into which the rockets could be loaded and the propellant ignited and allowed to burn. Static firing was primarily limited to 5 inch rockets, as it was easier to tear apart the 2.75 inch rockets and burn them layed out on the ground.

Over the time period that the site was operational, hundreds of 2.75 and 5 inch rockets were disposed at the site. For the three year period from 1969 to 1971, EOD personnel estimated 500 to 600 of the 2.75-inch rocket and 40 of the 5-inch rockets were disposed at the site. The rocket tubes were turned-in to the Defense Property Disposal Office (DPDO) for steel scrap.

While the amount of ordnance disposed at the site was variable, it was estimated by EOD personnel that approximately 2.5 tons per month was disposed at the site. Throughout the time period the site was operational, it is estimated that 350 tons of ordnance material was burned at the site.

The nitroglycerin-based propellants burned at the site have a positive oxygen balance and yield primarily gaseous products (N_2, NO_x, CO_x and H_2O) during

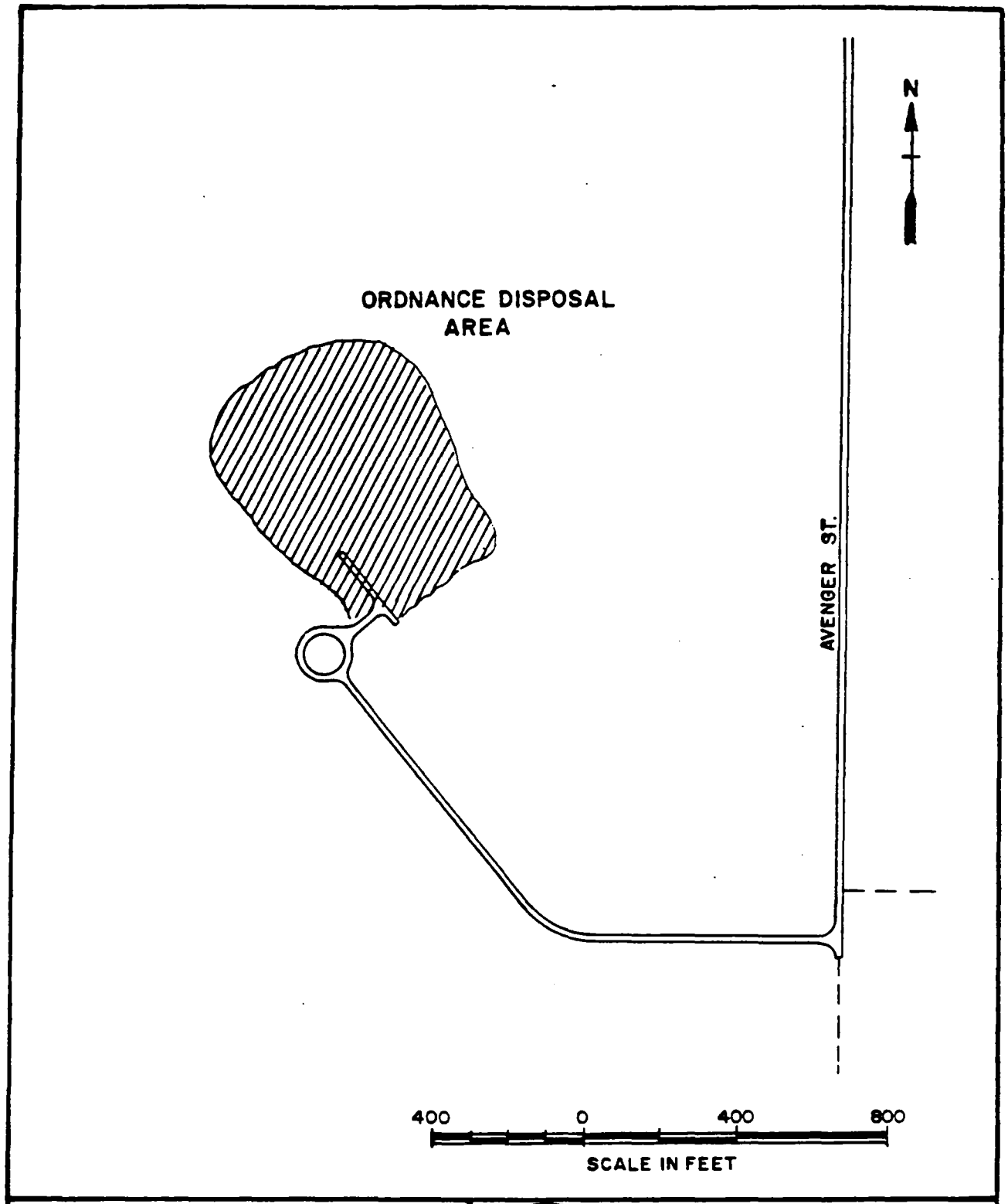


FIGURE 8-10

Site 15
Blue 10 Ordnance Disposal Area

INITIAL ASSESSMENT STUDY
NAVAL AIR STATION
CECIL FIELD

burning. These rocket propellants also contain powdered aluminum and lead which likely resulted in the formation of some residual metal oxides at the site. However, a study by OESO concluded that the quantities of residues left were insignificant in terms of environmental contamination (Fauth, 1984). Aluminum oxides in the presence of water also rapidly decay, while residual lead in the soil does not appear to be readily taken into the food chain (Fauth, 1984).

The site was closed in 1977 when construction began on the Yellow Water housing complex just south of the site. There were some residual metal fragments observed during an on-site inspection. The area was utilized as a skeet range back in World War II and the remains of clay pigeons are evident throughout the site.

The area is relatively flat with no well-defined drainage patterns. Any runoff leaving the site would most likely drain in a westerly direction toward Caldwell Branch which is located approximately 1,400 feet west of the site. The site is still an open area, although slash pines have recently been planted throughout the site. With the exception of a service road entering from the southwest, the entire area is surrounded by pine forest. Some scattered hardwoods are present at the southern edge of the site. There was no evidence of biological stress at the site.

8.17 SITE 16, AIMD SEEPAGE PIT. The site is located 60 feet north of Building 313, the jet engine maintenance shop and Non-Destructive Lab (NDI Lab) (base coordinate system location: F-10). The dimensions of the seepage pit (obtained from installation drawings) were 40 feet long by 2.7 feet wide by 9.5 feet deep. The location of the seepage pit is shown in Figure 8-11.

The seepage pit was used from 1959 until 1980 to dispose of waste liquids generated by the NDI Lab and power plant maintenance operations in Building 313. The seepage pit was constructed with concrete blocks on an eight inch concrete slab. Half-inch gaps were left between the vertical intersections. No mortar was used on these vertical gaps. Waste liquids placed in the pit were therefore able to seep out of these gaps into the surrounding soils.

Liquid wastes from Building 313 were first discharged into a 2,000 gallon holding tank located adjacent to the seepage pit. From the holding tank wastes were then discharged into the seepage pit. A list of the liquid wastes and approximate quantities disposed into the seepage pit are contained in Table 8-9. Also conducted in Building 313 and disposed in the seepage pit were the greases, rust, scale and paint removed during the parts cleaning process and the glass beads and blasting grit from the airframes blasting shop.

In the late 1960s, glass beads from the sandblasting operations had effectively clogged-up the pit, preventing seepage of the waste liquids out of the pit. At this time, a four inch vitrified clay storm drainage line was added to the east end of the seepage pit. The discharge pipe was three feet four inches from the bottom of the pit. Thus, the effective holding capacity of the pit before discharge to the storm drain would occur was approximately 2,700 gallons. The ultimate outfall point for any discharge from the seepage pit was an open ditch which drained to Sal Taylor Creek.

On those occasions when the liquid level in the seepage pit reached the outfall pipe, there would have been essentially direct discharge via the storm

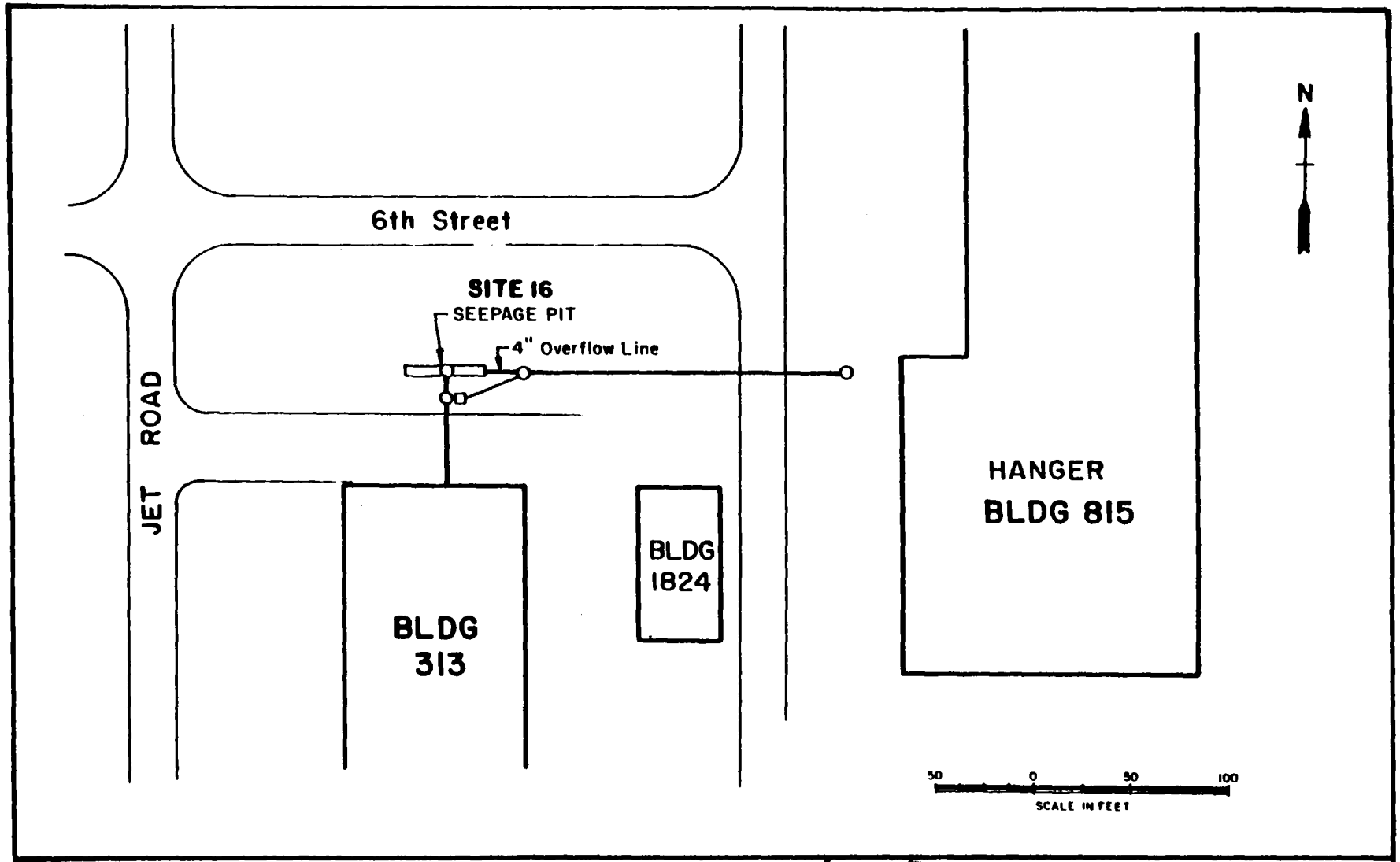


FIGURE 8-11

Site 16, AIMD Seepage Pit

INITIAL ASSESSMENT STUDY
NAVAL AIR STATION
CECIL FIELD

Table 8-9

Liquid Wastes Discharged from Building 313 Into the Seepage Pit, Site 16

Source	Compounds Discharged into Seepage Pit	Annual Quantity Disposed into Seepage Pit* (gallons)**	Total Estimated Quantity Disposed at Seepage Pit (gallons)
Tank A - Cold Carbon Remover	Cresol	264	5,280
	Phenol	8	160
	Oleic Acid	56	1,120
	Potassium Hydroxide	32	640
	Methylene Chloride	440	8,800
	Ethylene Diamine tetraacetic acid	16	320
Tank B - Rust Removing Compounds	Sodium Hydroxide	176	3,520
	Chelate	132	2,640
	Sodium Cyanide	132	2,640
Tank C - Alkaline Permanganate	Potassium Permanganate	275 pounds	5,500 pounds
	Sodium Hydroxide	413 pounds	8,260 pounds
	Sodium Carbonate	413 pounds	8,260 pounds
Tank D - Acid Rinse	Phosphoric Acid	440	8,800
Tank F - Vapor Degreasers	Trichloroethylene	250	5,000
Tank G - Acid Bath	Sulfuric Acid	250	5,000
Photo Processing	Misc. Chemicals including Silver	520	10,400
Penetrant Tank	Low viscosity oil	500	10,000
Emulsifier Tank	Detergent	500	10,000
Magnetic Solvent	Oil	360	7,200
Rinse Water	Containing trace amounts of compounds listed above	1,300,000	26,000,000
		1,304,270	26,090,320

*Source: Engineering Service Request 8143-118, NAS Cecil Field
**Quantities disposed are in gallons unless otherwise noted.

drainage outflow. During the 1970s, this reportedly occurred. For example, in 1975 some unidentified "pink material" was discovered in the outfall drainage ditch which was traced to the seepage pit. On this occasion, the pit was found filled with glass beads, allowing direct discharge to the storm drainage outfall.

In 1980, use of the seepage pit was discontinued. At this time, the line leading into the seepage pit was disconnected, as was the storm drainage discharge line. The bottom six feet of the seepage pit was left in place and filled with clean sand. The remaining upper portion of the seepage pit was removed and replaced with clean sand.

NAS Cecil Field's five potable supply wells, which tap the Floridan aquifer, are all located within 1,700 to 2,700 feet of the site. However, the Floridan aquifer is not likely to be effected by contaminants originating from the seepage pit.

8.18 SITE 17, OIL/SLUDGE DISPOSAL PIT SOUTHWEST. Site 17 is located along the east side of the perimeter road about 900 feet south of its intersection with the service road leading from the south end of Lake Fretwell (base coordinate system location: I-7). The site covers an area approximately 270 feet by 300 feet, encompassing 2 acres. The location and aerial extent of the site are shown in Figure 8-1.

The site was used to dispose of liquid wastes for a two to three year period in the late 1960s or early 1970s. Liquid wastes were typically taken to the site in bowsers or 55-gallon drums, drained into a pit and allowed to seep into the soil or evaporate. The pit was approximately 50 feet in diameter and three to five feet deep. The precise location of the pit is unknown.

Waste fuel and oil was reportedly disposed at the site. A common practice was to mix other liquid wastes such as solvents, paints and paint thinners in with waste oil and fuel. Therefore, it is likely that these wastes were disposed at the site as well. During the time period this site was operated, hundreds of gallons of these types of wastes could have been disposed at the site. Waste paints disposed at the site could contain cadmium, chromium and lead. Fuels disposed at the site could also have contained lead.

Following closure of the site, the disposal pit was filled-in and covered with soil. There is no evidence of the disposal pit at the site now. The area is currently being used for the disposal of brush and tree clippings. No obvious signs of biological stress were observed at the site.

The general slope of the site is from west to east toward Rowell Creek which is located approximately 1,200 feet east of the site. Any runoff from the site would enter Rowell Creek. There were no signs of surface erosion or of exposed wastes at the site.

As part of a ground water monitoring program at NAS Cecil Field, a surficial aquifer monitoring well was installed just upgradient from the site. This was intended as a background well for monitoring in association with other identified disposal sites. The well was placed not knowing this area was a disposal site. The well was analyzed for a complete list of primary and secondary drinking water parameters. Results of the first two quarterly sampling efforts found the concentrations of the organic compounds (VOCs and acid extractables) below laboratory detection limits. In addition, all the

heavy metals were found to be below the detection limit with the exception of barium, which was 0.022 and 0.03 milligrams per liter (mg/l). The complete results from the first two quarterly sampling efforts are included in Appendix B.

8.19 SITE 18, AMMUNITION DISPOSAL AREA. Site 18 is located in the southeastern corner of NAS Cecil Field at the intersection of a former service road and a tributary to Sal Taylor Creek (base coordinate system location: H-15). The site covers an area approximately 30 feet by 100 feet, encompassing less than 0.1 acre. The location and aerial extent of the site are shown in Figure 8-12.

The site was used from the late 1940s through the 1950s as a disposal area for ordnance materials and rubbish. Materials were collected from the nearby magazine area and transported to the site by truck for disposal. The disposal operation consisted of dumping the material off a small wooden bridge into the creek and along the roadway to the south of the bridge.

Observed at the site were ammunition crates, a projectile nose cone, unidentified canisters, and general rubbish which included furniture and two to three paint cans. Also at the site to the east of the wooden bridge, were two to three unidentified crates in a pool of water approximately five feet deep.

Subsequent to the on-site survey, this site was inspected by EOD personnel to determine if there were ordnance items which presented a danger. An inspection of all the wastes along the banks of the creek did not uncover any ordnance item which presented a danger. The ammunition crates were all empty and the projectile had already been spent.

The only ordnance items potentially remaining at the site are the two to three underwater crates. Attempts by EOD personnel to recover these crates were unsuccessful due to high water conditions in the creek. EOD personnel are scheduled to return to the site and determine the contents of the crates once the water in the creek subsides.

The wastes at the site are either in direct contact with water of the creek or scattered along its banks. The creek drains southeasterly toward Sal Taylor Creek which is located approximately 3,000 feet southwest of the site. The site is characterized by a swamp forest association in the area immediately adjacent to the creek. Bordering this association to the north and south are pine flatwoods. A number of unidentified fish were observed in the creek. No visible biological stress could be observed either in the creek or the surrounding forest vegetation.

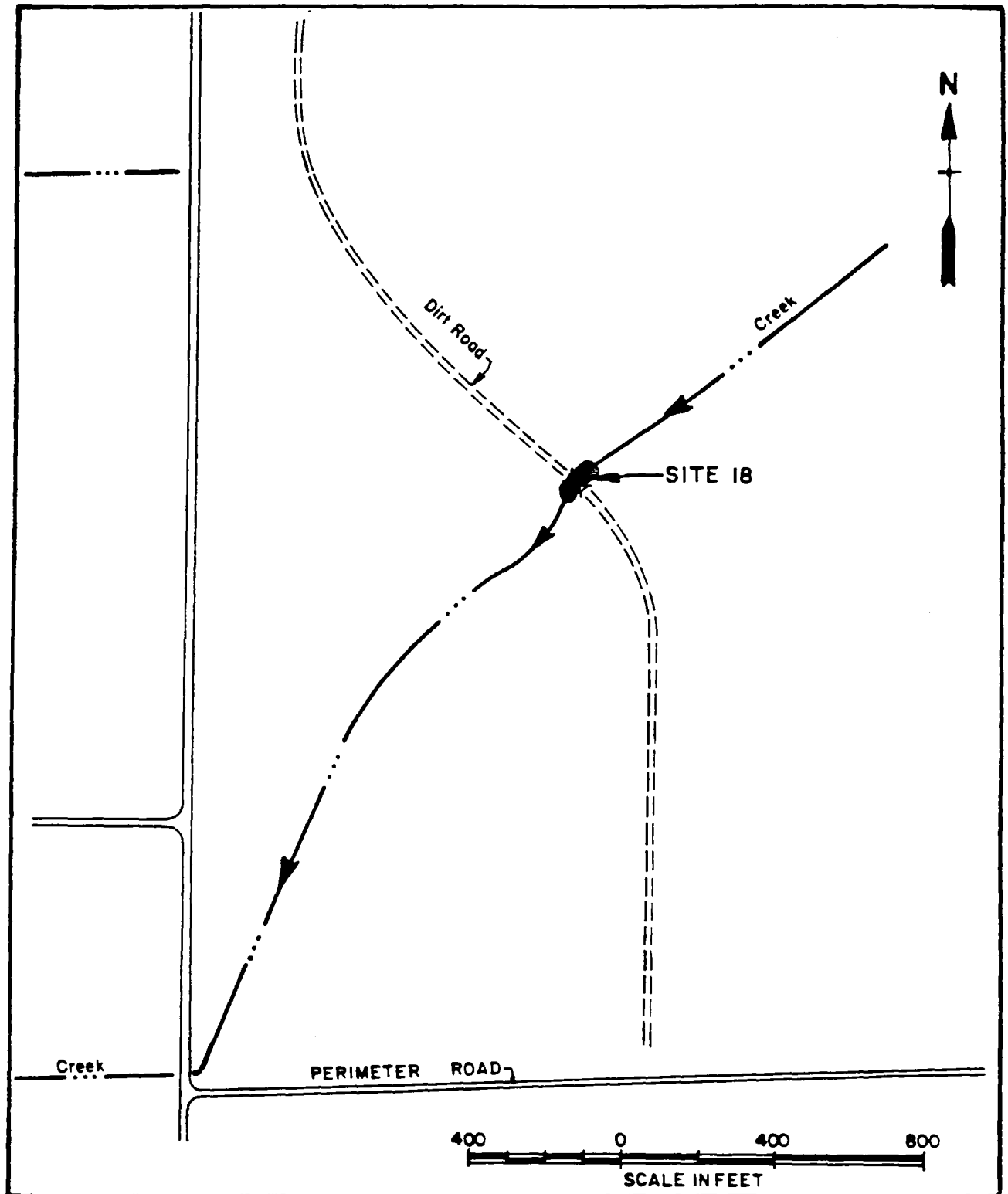


FIGURE 8-12

Site 18 Ammunition Disposal Area

INITIAL ASSESSMENT STUDY
NAVAL AIR STATION
CECIL FIELD

REFERENCES

City of Jacksonville, 1980a. Metropolitan Jacksonville, Florida, Water Resources Study, Plan Formulation Appendix.

City of Jacksonville, 1980b. Metropolitan Jacksonville, Florida, Water Resources Study, Plan Formulation Appendix, Annex III, Flood Plain Management.

Davis, John H. 1980. General Map of Vegetation of Florida, Circular 5-178. Institute of Food and Agricultural Sciences, University of Florida, Gainesville.

Fauth, Mae I., 1984. A Study to Determine Residues from Open Burning of Ordnance-Related Material, OESO.

Franz, R. 1982. Invertebrates. Volume Six, Rare and Endangered Biota of Florida. University Presses of Florida, Gainesville, Florida.

Frederic R. Harris, 1973. Water Quality Management Plan for Duval County, Florida. Technical Supplement.

Geraghty and Miller, 1981. Final Submission Contamination of Soil and Ground Water Resulting from the Rupture of the Day Tank Facility, Naval Air Station, Cecil Field, Florida.

Geraghty and Miller, 1983, Hydrogeologic Assessment and Ground-Water Monitoring Plan, NAS Cecil Field, Jacksonville, Florida.

Gilbert, C.R. 1978, Fishes. Volume Four, Rare and Endangered Biota of Florida. University Presses of Florida, Gainesville, Florida.

Kale II, H.W. 1978. Birds. Volume Two, Rare and Endangered Biota of Florida. University Presses of Florida, Gainesville, Florida.

Jacksonville Area Planning Board, 1979. 2005 Comprehensive Plan, Jacksonville, Florida, Map 15.

Jacksonville Area Planning Board, 1980. 2005 Comprehensive Plan, Jacksonville, Florida. Comprehensive Plan Supplement.

Layne, J.N. 1978. Mammals. Volume One, Rare and Endangered Biota of Florida. University Presses of Florida, Gainesville, Florida.

Long, Robert W. and Olga Lakela, 1971. A Flora of Tropical Florida. University of Miami Press, Coral Gables, Florida.

Martin, David, 1984. Personal Communication. United States Fish and Wildlife Service Endangered Species Field Station, Jacksonville, Florida.

McDiarmid, R., 1978. Amphibians and Reptiles. Volume Three, Rare and Endangered Biota of Florida. University Presses of Florida, Gainesville, Florida.

NAS Cecil Field, Drainage and Well Location Maps, 1981. Obtained from Public Works Department Files.

NOAA, 1983. National Oceanic and Atmospheric Administration, Local Climatological Data, Annual Summary with Comparative Data, Jacksonville, Florida.

Naval Facilities Engineering Command, Southern Division, 1979. NAS Ceci' Field Pest Management Plan.

Naval Facilities Engineering Command, Southern Division, 1980. Environmental Engineering Service Request 8143-118.

Naval Facilities Engineering Command, Southern Division, 1981. NAS Cecil Field, Master Plan.

Naval Facilities Engineering Command, Southern Division, 1983. NAS Cecil Field Pest Management Plan.

Roy F. Weston, Inc., 1978. Metropolitan Jacksonville, Florida, Water Resources Study, Background Information Appendix, Annex I, Base Condition Analyses Report.

Ward, D.B. 1979. Plants. Volume Five, Rare and Endangered Biota of Florida. University Presses of Florida, Gainesville, Florida.

Wood, D.A. (ed.) 1984. Endangered and Potentially Endangered Fauna and Flora in Florida. Florida Game and Fresh Water Fish Commission.

Hawley, Gessner G., 1977. Van Nostrand Reinhold Company. The Condensed Chemical Dictionary, Ninth Edition.

National Fire Protection Association, 1975. Hazardous Chemicals Data NFPA 49-1975.

Sax, N. Irving, 1968. Van Nostrand Reinhold Company. Dangerous Properties of Industrial Materials, Third Edition.

Sax, N. Irving, 1984. Van Nostrand Reinhold Company. Dangerous Properties of Industrial Materials, Sixth Edition.

BIBLIOGRAPHY

DOD Explosives Safety Office, 1983. Explosives Safety Survey of NAS Cecil Field.

Marcon Publishers Inc., 1983. Cecil Field Naval Air Station Information Brochure.

NAS Cecil Field, 1983. Navy Hazardous Waste Report, NAS Cecil Field.

NAS Cecil Field, 1981. Synopsis of JP-5 Fuel Spill of February 19, 1981.

NAS Cecil Field, 1981. Notification of Facilities Which Now or In The Past Stored, Treated or Disposed of Hazardous Substances.

Naval Facilities Engineering Command, Southern Division, 1982. Navy Hazardous Waste Report, NAS Cecil Field.

Naval Facilities Engineering Command, Southern Division, 1982. Long Range Natural Resources Management Plants, NAS Cecil Field.

Naval Facilities Engineering Command, Southern Division, 1981. Oil and Hazardous Material Spill Prevention Control and Countermeasure Plan, NAS Cecil Field.

Naval Facilities Engineering Command, Southern Division, 1981. Environmental Engineering Survey, NAS Cecil Field.

Naval Facilities Engineering Command, Southern Division, 1980. Environmental Engineering Survey, NAS Cecil Field.

Naval Facilities Engineering Command, Southern Division, 1977. Final Environmental Impact Statement, Air Installation Compatible Use Zone, NAS Cecil Field.

Naval Facilities Engineering Command, Southern Division, 1972. Navy Environmental Protection Data Base, NAS Cecil Field.

Water and Air Research Inc., 1983. Hazardous Waste Management Plan, NAS Cecil Field.

APPENDIX A

GOVERNMENT AGENCIES CONTACTED FOR THE INITIAL ASSESSMENT STUDY AT NAS CECIL FIELD

Naval Energy and Environmental Support Activity (NEESA), Port Hueneme, CA.

NAVFAC Command Historian, Naval Construction Battalion Center, Port Hueneme, CA.

Ordnance Environmental Support Office (OESO), Indian Head, MD.

Navy Historical Center, Navy Yard, Washington, DC.

Naval Aviation History Office, Washington Navy Yard, Washington, DC.

National Archives, Navy and Old Army Branch, Washington, DC.

National Records Center, General Archives, Suitland, MD.

Naval Facilities Engineering Command Headquarters, Alexandria, VA.

Naval Air Systems Command, Alexandria, VA.

DOD Explosives Safety Board, Alexandria, VA.

U.S. Geological Survey, Reston, VA.

Naval Sea Systems Command, Alexandria, VA.

Naval Facilities Engineering Command, Southern Division, South Carolina, Environmental Branch, Applied Biology Branch, Facilities Planning Branch, Natural Resources Branch, Real Estate Branch, Utilities Branch.

Soil Conservation Service, Jacksonville, FL.

Jacksonville Area Planning Board, Jacksonville, FL.

APPENDIX B

GERAGHTY AND MILLER
QUARTERLY SAMPLING RESULTS

AS-BUILT GROUND-WATER MONITORING NETWORK, NAS-CECIL FIELD JACKSONVILLE, FLORIDA

Prepared for

SOUTHERN DIVISION, NAVAL FACILITIES ENGINEERING COMMAND
Charleston, South Carolina

June 1984

GERAGHTY & MILLER, INC.
Ground-Water Consultants
13902 North Dale Mabry Highway, Suite 150
Post Office Box 271173
Tampa, Florida 33688

INTRODUCTION

The Naval Air Station - Cecil Field near Jacksonville, Florida has complied with Chapter 17-3 and 17-4, FAC (Florida Administrative Code), Section 17-4.245(6)(d), by installing a ground-water monitoring network (Figure 1) around the grease-disposal pits and the inactive landfill. The monitoring network consists of six ground-water monitoring wells: one upgradient well serving both areas, three wells downgradient of the grease pits (2 shallow, 1 deep), and two wells downgradient of the landfill (1 shallow, 1 deep). Additionally, a surface-water monitoring station was installed in Rowell Creek downstream of the landfill. The wells and surface-water station, installed in March 1984, will be sampled quarterly for one year, to detect possible discharges of waste constituents into the ground-water and surface-water systems. Water-level measurements also will be made to determine the ground-water flow direction and potential for vertical movement of the ground water. Upon completion of one year of monitoring, an assessment of the local ground-water quality will be made and a future course of action will be recommended for compliance with the aforementioned chapters. This report discusses the field work performed to date, which includes the installation of the monitor wells, and first quarter ground-water sampling. Also, recommendations for monitoring during the second through fourth quarters of the first year are contained herein.

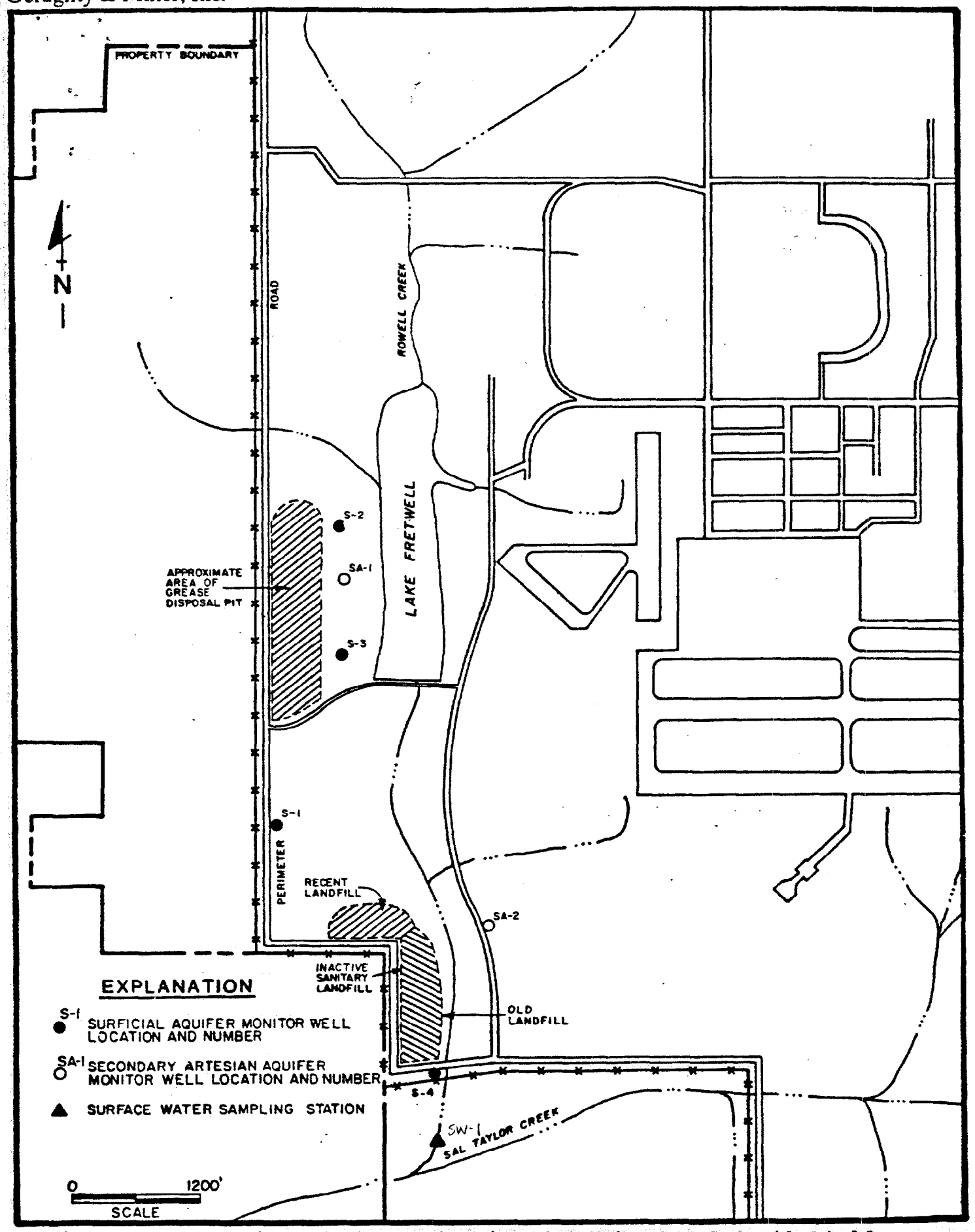


Figure 1. Location of the Monitoring Network at NAS-Cecil Field

Ground-Water and Surface-Water Quality

The laboratory results for the first quarter sampling round are contained in Appendix C. Basically, these samples were analyzed for a complete list of primary and secondary drinking-water parameters in addition to selected constituents that might be present in the waste material. Based on these laboratory results, a preliminary indication of the water-quality at the two sites is provided below. Also, recommendations for monitoring during the second through fourth quarter sampling rounds of the first year have been prepared.

Grease-Disposal Pits

The water-quality samples collected from the monitor wells (SA-1, S-2 and S-3) downgradient of the grease-pit area were analyzed for selected primary and secondary drinking-water parameters, VOCs (volatile organic compounds), and acid extractable compounds. The laboratory results (Appendix C) indicate that the ground water in this area has not been degraded beyond background conditions (S-1). The concentrations of iron, chloride, sulfate, TDS (total dissolved solids) and TOH (total organic halogens) are higher in S-1 than the two shallow monitor wells S-2 and S-3. Also, the pH (4.5 units) in S-1 is lower than that found in S-2 (5.7 units) and S-3 (5.8 units). In general, the concentrations of the drinking-water parameters are below the standards set forth in Chapter 17.22.104. The concentrations

of the organic compounds (VOC's and acid extractables) were all below laboratory detection limits.

Based on these first-quarter laboratory results, recommendations for future ground-water monitoring during the second through fourth-quarter sampling rounds of the first year are shown in Table 1 of Appendix D.

Inactive Landfill Area

Based on the first-quarter laboratory results, the shallow ground water (S-4) near the landfill area also does not appear to be degraded below background conditions. The TDS (196 mg/l), pH (7.5 units) manganese (0.045 mg/l), zinc (0.124 mg/l) and fluoride (0.407 mg/l) are higher than the backround conditions, but are below the drinking-water standards. Although the iron concentration (0.524 mg/l) was above the drinking-water standards, it is still less than that in S-1 (1.751 mg/l). Additionally, the organic compounds (VOC's) were below laboratory detection limits.

In the deeper monitor well SA-2, the primary and secondary drinking-water parameters are all below the standards set forth in Chapter 17-22.104. With the exception of trichloroethene (0.1 ppb - parts per billion) which was at the laboratory detection limit, all of the organic compounds in the VOC analysis were below the detection limit.

Based on these first-quarter water-quality results, recommendations for future ground-water monitoring during the

second through fourth quarter sampling rounds during the first year are listed in Table 1 of Appendix D.

Surface-Water Quality

The water-quality samples collected from the surface-water station downstream of the landfill area indicate that, except for iron (0.925 mg/l), all of the primary and secondary drinking-water parameters are below the numerical standards. The TOH value (120 ug/l - micrograms per liter) was the highest found at the NAS-Cecil Field. Also, four organic compounds were detected in low concentrations in the VOC analysis.

Based on these first-quarter laboratory results, it is proposed that the parameters listed in Table 1 of Appendix D be monitored during the second through fourth-quarter sampling rounds of the first year.

ENVIRONMENTAL CONSULTANTS — INDUSTRIAL CHEMISTS
OFFICE 2471 SWAN ST. — P.O. BOX 52329
LABORATORIES 103-107 STOCKTON STREET
JACKSONVILLE, FLORIDA 32201
(904) 353-5761

oratory No. 58412 May 23, 1984

ample of WATER

ate Received April 13, 1984

r GERAGHTY & MILLER, INC., Post Office Box 271173, Tampa, Florida 33688 ATTN: Mr. Fred Seguiti

larks: S-1, Cecil Field

CERTIFICATE OF ANALYSIS OR TESTS

Arsenic, mg/l	<0.002
Barium, mg/l	0.030
Cadmium, mg/l	<0.005
Chromium, mg/l	<0.010
Lead, mg/l	<0.030
Mercury, mg/l	0.0003
Selenium, mg/l	<0.003
Silver, mg/l	<0.006
Copper, mg/l	<0.003
Iron, mg/l	1.751
Manganese, mg/l	0.003
Zinc, mg/l	0.043
Nitrate, mg/l N	0.010
Hydrogen Sulfide, mg/l	0.6
Chloride, mg/l	18.4
Fluoride, mg/l	0.062
pH	4.5
Sulfate, mg/l	9.1
Total Dissolved Solids, mg/l	42
Endrin, ppm	<0.00002
Lindane, ppm	<0.00001
Methoxychlor, ppm	<0.0001
Toxaphene, ppm	<0.0002
2,4-D, ppm	<0.001
2,4,5TP (Silvex) ppm	<0.0005
Gross Alpha, pCi/liter	3±2
Gross Beta, pCi/liter	<3
*Total Organic Halide	73 ug/l

Supplemental report

Respectfully submitted,

TECHNICAL SERVICES, INC.

By Harvey C. Gray, Jr.

TECHNICAL SERVICES, INC.

ENVIRONMENTAL CONSULTANTS — INDUSTRIAL CHEMISTS
OFFICE 2471 SWAN ST. — P.O. BOX 52329
LABORATORIES 103-107 STOCKTON STREET
JACKSONVILLE, FLORIDA 32201
(904) 353-5761

Laboratory No. 58414 May 23, 1984

Sample of WATER

Date Received April 13, 1984

For GERAGHTY & MILLER, INC., Post Office Box 271173, Tampa, Florida 33688 ATTN: Mr. Fred Seguiti

Marks: S-3, Cecil Field

CERTIFICATE OF ANALYSIS OR TESTS

Arsenic, mg/l	<0.002
Barium, mg/l	0.019
Cadmium, mg/l	<0.005
Chromium, mg/l	<0.010
Lead, mg/l	0.040
Mercury, mg/l	<0.0002
Selenium, mg/l	<0.003
Silver, mg/l	<0.006
Copper, mg/l	<0.003
Iron, mg/l	0.210
Manganese, mg/l	<0.002
Zinc, mg/l	<0.010
Nitrate, mg/l N	0.403
Hydrogen Sulfide, mg/l	<0.1
Chloride, mg/l	5.2
Fluoride, mg/l	0.054
pH	5.8
Sulfate, mg/l	6.3
Total Dissolved Solids, mg/l	23
Endrin, ppm	<0.00002
Lindane, ppm	<0.00001
Methoxychlor, ppm	<0.0001
Toxaphene, ppm	<0.0002
2,4-D, ppm	<0.001
2,4,5TP (Silvex) ppm	<0.0005
Gross Alpha, pCi/liter	<2
Gross Beta, pCi/liter	<3
*Total Organic Halide	52 ug/l

*Supplemental report

Respectfully submitted,

TECHNICAL SERVICES, INC.

By Henry C. Gray, Jr.

Table 2 (cont'd.). Concentrations of Volatile Organic Compounds (Method 601[1])

Client: Geraghty and Miller - Tampa Report No.: 84-439

		Concentration ug/l (ppb)[2]		
Compound	Sample ID: CAA ID:	S-1 8401955	S-2 8401956	S-3 8401957
chloromethane				
dichlorodifluoromethane				
vinyl chloride				
chloroethane				
methylene chloride				
trichlorofluoromethane				
1,1-dichloroethene				
1,1-dichloroethane				
trans-1,2-dichloroethene				
chloroform				
1,2-dichloroethane				
1,1,1-trichloroethane				
carbon tetrachloride				
bromodichloromethane				
1,2-dichloropropane				
trans-1,3-dichloropropane				
trichloroethene				
dibromochloromethane				
1,1,2-trichloroethane				
cis-1,3 dichloropropene				
2-chloroethylvinyl ether				
bromoform				
1,1,2,2-tetrachloroethane				
tetrachloroethene				
chlorobenzene				
Detection Limit		0.1	0.1	0.1

[1]U.S. EPA. 1982. Methods for Organic Chemical Analysis of Municipal and Industrial Wastewater. EPA 600/4-82-057. EPA/EMSL, Cincinnati, Ohio.

[2]Concentrations less than the detection limit are left blank.

TECHNICAL SERVICES, INC.

ENVIRONMENTAL CONSULTANTS — INDUSTRIAL CHEMISTS
OFFICE 2471 SWAN ST. — P.O. BOX 52329
LABORATORIES 103-107 STOCKTON STREET
JACKSONVILLE, FLORIDA 32201
(904) 353-5761

Laboratory No. 58410 May 23, 1984

Sample of WATER

Date Received April 13, 1984

For GERAGHTY & MILLER, INC., Post Office Box 271173, Tampa, Florida 33688 ATTN: Mr. Fred Seguiti

Marks: SA-1, Cecil Field

CERTIFICATE OF ANALYSIS OR TESTS

Arsenic, mg/l	<0.002
Barium, mg/l	0.063
Cadmium, mg/l	<0.005
Chromium, mg/l	<0.010
Lead, mg/l	<0.030
Mercury, mg/l	0.0002
Selenium, mg/l	<0.003
Silver, mg/l	<0.006
Copper, mg/l	<0.003
Iron, mg/l	0.042
Manganese, mg/l	0.003
Zinc, mg/l	<0.010
Nitrate, mg/l N	0.003
Hydrogen Sulfide, mg/l	0.1
Chloride, mg/l	8.3
Fluoride, mg/l	0.268
pH	7.5
Sulfate, mg/l	4.2
Total Dissolved Solids, mg/l	251
Endrin, ppm	<0.00002
Lindane, ppm	<0.00001
Methoxychlor, ppm	<0.0001
Toxaphene, ppm	<0.0002
2,4-D, ppm	<0.001
2,4,5TP (Silvex) ppm	<0.0005
Gross Alpha, pCi/Liter	<2
Gross Beta, pCi/Liter	<3
*Total Organic Halide	50 ug/l

*Supplemental report

Respectfully submitted,

TECHNICAL SERVICES, INC.

By Harvey C. Gray, Jr.

Table 2. Concentrations of Volatile Organic Compounds (Method 601[1])

Client: Geraghty and Miller - Tampa

Report No.: B4-439

Compound	Sample ID: CAA ID:	Concentration ug/l (ppb)[2] SA-1 B401952
chloromethane		
dichlorodifluoromethane		
vinyl chloride		
chloroethane		
methylene chloride		
trichlorofluoromethane		
1,1-dichloroethene		
1,1-dichloroethane		
trans-1,2-dichloroethene		
chloroform		
1,2-dichloroethane		
1,1,1-trichloroethane		
carbon tetrachloride		
bromodichloromethane		
1,2-dichloropropane		
trans-1,3-dichloropropane		
trichloroethene		
dibromochloromethane		
1,1,2-trichloroethane		
cis-1,3 dichloropropene		
2-chloroethylvinyl ether		
bromoform		
1,1,2,2-tetrachloroethane		
tetrachloroethene		
chlorobenzene		
Detection Limit		0.1

[1]U.S. EPA. 1982. Methods for Organic Chemical Analysis of Municipal and Industrial Wastewater. EPA 600/4-82-057. EPA/EMSL, Cincinnati, Ohio.

[2]Concentrations less than the detection limit are left blank.

CAMBRIDGE ANALYTICAL ASSOCIATES, INC.

Table 3. Concentration of Acid Extractables (Method 625[1])

Client: Geraghty and Miller - Tampa

Report No.: 84-

Compound	Sample ID: CAA ID:	Concentration - ug/l (ppb)[2] SA-1 8401952	S-2 8401956	S-3 8401957
ACID COMPOUNDS				
(21A) 2,4,6-trichlorophenol				
(22A) p-chloro-m-cresol				
(24A) 2-chlorophenol				
(31A) 2,4-dichlorophenol				
(34A) 2,4-dimethylphenol				
(57A) 2-nitrophenol				
(58A) 4-nitrophenol				
(59A) 2,4-dinitrophenol				
(60A) 4,6-dinitro-2-methylphenol				
(64A) pentachlorophenol				
(65A) phenol				
Detection Limit		2	2	2

Water-Quality Results at The Landfill Area

TECHNICAL SERVICES, INC.

ENVIRONMENTAL CONSULTANTS — INDUSTRIAL CHEMISTS
OFFICE 2471 SWAN ST. — P.O. BOX 52329
LABORATORIES 103-107 STOCKTON STREET
JACKSONVILLE, FLORIDA 32201
(904) 353-5761

Laboratory No. 58415 May 23, 1984

Sample of WATER

Date Received April 13, 1984

For GERAGHTY & MILLER, INC., Post Office Box 271173, Tampa, Florida 33688 ATTN: Mr. Fred Seguiti

Marks: S-4 Cecil Field

CERTIFICATE OF ANALYSIS OR TESTS

Arsenic, mg/l	<0.002
Barium, mg/l	0.049
Cadmium, mg/l	<0.005
Chromium, mg/l	<0.010
Lead, mg/l	<0.030
Mercury, mg/l	<0.0002
Selenium, mg/l	<0.003
Silver, mg/l	<0.006
Copper, mg/l	<0.003
Iron, mg/l	0.524
Manganese, mg/l	0.045
Zinc, mg/l	0.124
Nitrate, mg/l N	0.012
Hydrogen Sulfide, mg/l	0.1
Chloride, mg/l	9.5
Fluoride, mg/l	0.407
pH	7.5
Sulfate, mg/l	3.5
Total Dissolved Solids, mg/l	196
Endrin, ppm	<0.00002
Lindane, ppm	<0.00001
Methoxychlor, ppm	<0.0001
Toxaphene, ppm	<0.0002
2,4-D, ppm	<0.001
2,4,5TP (Silvex) ppm	<0.0005
Gross Alpha, pCi/liter	<2
Gross Beta, pCi/liter	<3
*Total Organic Halide	51 ug/l

*Supplemental Report

Respectfully submitted,

TECHNICAL SERVICES, INC.

By Harvey C. Gray, Jr.

Table 2 (cont'd.). Concentrations of Volatile Organic Compounds (Method 601[1])

Client: Geraghty and Miller - Tampa Report No.: 84-439

Compound	Sample ID: CAA ID:	Concentration ug/l (ppb)[2] S-4 8401958
chloromethane		
dichlorodifluoromethane		
vinyl chloride		
chloroethane		
methylene chloride		
trichlorofluoromethane		
1,1-dichloroethene		
1,1-dichloroethane		
trans-1,2-dichloroethene		
chloroform		
1,2-dichloroethane		
1,1,1-trichloroethane		
carbon tetrachloride		
bromodichloromethane		
1,2-dichloropropane		
trans-1,3-dichloropropane		
trichloroethene		
dibromochloromethane		
1,1,2-trichloroethane		
cis-1,3 dichloropropene		
2-chloroethylvinyl ether		
bromoform		
1,1,2,2-tetrachloroethane		
tetrachloroethene		
chlorobenzene		
1,2 dibromoethane (EDB)		N/A
Detection Limit		0.1

[1]U.S. EPA. 1982. Methods for Organic Chemical Analysis of Municipal and Industrial Wastewater. EPA 600/4-82-057. EPA/EMSL, Cincinnati, Ohio.

[2]Concentrations less than the detection limit are left blank.

N/A - Not analyzed

TECHNICAL SERVICES, INC.

ENVIRONMENTAL CONSULTANTS — INDUSTRIAL CHEMISTS
OFFICE 2471 SWAN ST. — P.O. BOX 52329
LABORATORIES 103-107 STOCKTON STREET
JACKSONVILLE, FLORIDA 32201
(904) 353-5761

Laboratory No. 58411 May 23, 1984

Sample of WATER

Date Received April 13, 1984

For GERAGHTY & MILLER, INC., Post Office Box 271173, Tampa, Florida 33688 ATTN: Mr. Fred Seguiti

Marks: SA-2, Cecil Field

CERTIFICATE OF ANALYSIS OR TESTS

Arsenic, mg/l	<0.002
Barium, mg/l	0.015
Cadmium, mg/l	<0.005
Chromium, mg/l	<0.010
Lead, mg/l	<0.030
Mercury, mg/l	0.0008
Selenium, mg/l	<0.003
Silver, mg/l	<0.006
Copper, mg/l	<0.003
Iron, mg/l	0.032
Manganese, mg/l	0.011
Zinc, mg/l	0.023
Nitrate, mg/l N	0.006
Hydrogen Sulfide, mg/l	0.6
Chloride, mg/l	7.8
Fluoride, mg/l	0.754
pH	7.6
Sulfate, mg/l	6.3
Total Dissolved Solids, mg/l	211
Endrin, ppm	<0.00002
Lindane, ppm	<0.00001
Methoxychlor, ppm	<0.0001
Toxaphene, ppm	<0.0002
2,4-D, ppm	<0.001
2,4,5TP (Silvex) ppm	<0.0005
Gross Alpha, pCi/liter	4±3
Gross Beta, pCi/liter	3±2
*Total Organic Halide	52 ug/l

*Supplemental Report

Respectfully submitted,

TECHNICAL SERVICES, INC.

By Harvey C. Gray, Jr.

ENVIRONMENTAL CONSULTANTS — INDUSTRIAL CHEMISTS
OFFICE 2471 SWAN ST. — P O. BOX 52329
LABORATORIES 103-107 STOCKTON STREET
JACKSONVILLE, FLORIDA 32201
(904) 353-5761

Laboratory No. 58416 May 23, 1984

Sample of WATER

Date Received April 13, 1984

For GERAGHTY & MILLER, INC., Post Office Box 271173, Tampa, Florida 33688 ATTN: Mr. Fred Seguiti

Marks: SW-1, Cecil Field

CERTIFICATE OF ANALYSIS OR TESTS

Arsenic, mg/l	<0.002
Barium, mg/l	0.017
Cadmium, mg/l	<0.005
Chromium, mg/l	<0.010
Lead, mg/l	<0.030
Mercury, mg/l	<0.0002
Selenium, mg/l	<0.003
Silver, mg/l	<0.006
Copper, mg/l	<0.003
Iron, mg/l	0.925
Manganese, mg/l	0.007
Zinc, mg/l	0.026
Nitrate, mg/l N	0.949
Hydrogen Sulfide, mg/l	<0.1
Chloride, mg/l	19.4
Fluoride, mg/l	0.090
pH	6.5
Sulfate, mg/l	31.1
Total Dissolved Solids, mg/l	80
Endrin, ppm	<0.00002
Lindane, ppm	<0.00001
Methoxychlor, ppm	<0.0001
Toxaphene, ppm	<0.0002
2,4-D, ppm	<0.001
2,4,5TP (Silvex) ppm	<0.0005
Gross Alpha, pCi/liter	<2
Gross Beta, pCi/liter	<3
*Total Organic Halide	120 ug/l

*Supplemental report

Respectfully submitted,

TECHNICAL SERVICES, INC.

By Harvey C. Gray, Jr.

TABLE 1. Recommended Ground-Water Monitoring Parameters in the Second through Fourth Quarters of the First Year

Ground-Water Monitoring Parameters	Upgradient Monitor Well S-1	Grease Pit Area Monitor Wells S-2, S-3, SA-1	Landfill Area Monitor Wells S-4, SA-2	Surface-Water Rowell Creek SW-1
Temperature (field)	X	X	X	X
pH (field & lab)	X	X	X	X
Specific Conductance (field & lab)	X	X	X	X
Total Dissolved Solids	X	X	X	X
Chloride	X		X	X
Sulfate	X		X	X
Nitrate	X		X	X
Arsenic	X		X	X
Barium	X		X	X
Cadmium	X		X	X
Chromium	X		X	X
Fluoride	X		X	X
Lead	X		X	X
Mercury	X		X	X
Selenium	X		X	X
Silver	X		X	X
Volatile Organic Compounds	X	X	X	X

Geraghty & Miller, Inc.

DEPARTMENT OF THE NAVY
Naval Air Station
Cecil Field, Florida 32215

Code 18E/amn

15 OCT 1984

Mrs. Cathy Krespalude
Florida Department of Environmental Regulation
Northeast District
3426 Bills Road
Jacksonville, Florida 32207

Dear Mrs. Krespalude:

Subj: Ground Water Monitoring Network, NAS Cecil Field, FL

Enclosed please find a copy of the laboratory water quality analyses for the second quarter samples collected from monitor wells installed at the Naval Air Station, Cecil Field, Florida, as per Chapter 17-4.245(6)(k)2 of the Florida Administrative Code. This report should be reviewed along with an earlier report entitled, "As-Built Ground-Water Monitoring Network, NAS Cecil Field, Jacksonville, Florida," which was submitted in June 1984. This earlier report contains the monitor well locations, well construction details, location of the surface water sampling station (SW-1), and the laboratory results of the first quarter sampling round.

The water level measurements (referenced to mean sea level) collected from the monitor wells and the water quality parameters measured in the field during the second quarter sampling round are provided in Attachment A. There does not appear to be a change in the ground water flow direction in either the surficial aquifer or the secondary artesian aquifer.

The laboratory water quality results from the second quarter sampling round are presented in Attachment B. When comparing the laboratory results of the two sampling rounds, there does not appear to be a significant change in the quality of the ground water or surface water at the Naval Air Station. Based on these findings, it is recommended that the third and fourth quarter sampling rounds proceed in accordance with the table presented in Attachment C. The third quarter water quality samples are scheduled to be collected during the week of October 15, 1984, therefore, your immediate attention to this matter will be greatly appreciated.

Subj: Ground Water Monitoring Network, NAS Cecil Field, FL

Please review the information contained herein and call Mr. Ed Balducci, at 904-778-5620 if you have further questions.

Sincerely,

F. B. BANKERT
CDR, CEC, USN
Public Works Officer

Enclosures:
A. Water Level Evaluations and Water Quality Parameters Measured in the Field
B. Laboratory Analyses
C. Ground Water Monitoring Parameters for the Third and Fourth Quarters Sampling Rounds

ATTACHMENT A

Water-Level Elevations and Water-Quality Parameters Measured in the Field

ATTACHMENT A. WATER-LEVEL MEASUREMENTS AND WATER-QUALITY PARAMETERS MEASURED IN THE FIELD

WELL NUMBER	MEASURING POINT ELEVATION (ft msl)	WATER-LEVEL ELEVATION (ft msl)	TEMPERATURE (°C)	SPECIFIC CONDUCTANCE (umhos/cm)	DATE SAMPLED Mo.Day.Y
S-1	74.11	70.06	24	140	7-10-84
S-2	73.94	67.69	22	<50	7-11-84
S-3	72.71	67.89	23	<50	7-11-84
S-4	54.83	46.31	23	400	7-11-84
SA-1	73.40	68.62	23	500	7-11-84
SA-2	70.05	61.78	24	460	7-10-84

ATTACHMENT B

Laboratory Analyses

TECHNICAL SERVICES, INC.

ENVIRONMENTAL CONSULTANTS — INDUSTRIAL CHEMISTS
OFFICE 2471 SWAN ST. — P.O. BOX 52329
LABORATORIES 103-107 STOCKTON STREET
JACKSONVILLE, FLORIDA 32201
(904) 353-5761

Laboratory No. 60202 August 15, 1984

Sample of Water

Date Received July 11, 1984

For Geraghty & Miller, Inc., P. O. Box 271173, Tampa, Fl. 33688

Marks: Cecil Field - 7/10/84

CERTIFICATE OF ANALYSIS OR TESTS

	SW1-CF	S-1-CF	SA-2-CF	S-4-CF
Arsenic, mg/l:	<.002	<.002	<.002	<.002
Barium, mg/l:	0.022	0.039	0.014	0.045
Cadmium, mg/l:	<0.005	<0.005	<0.005	<0.005
Chromium, mg/l:	<0.010	<0.010	<0.010	<0.010
Lead, mg/l:	<0.03	<0.03	0.039	<0.03
Mercury, mg/l:	<.0002	<.0002	<.0001	<.0001
Selenium, mg/l:	<0.002	<0.002	<0.002	<0.002
Silver, mg/l:	<0.005	<0.005	<0.005	<0.005
pH	7.05	4.75	7.70	7.65
Total Dissolved Solds, mg/l:	170	102	253	245
Chloride, mg/l:	30.0	22.5	12.1	8.41
Sulfate, mg/l:	19.5	3.45	4.60	6.90
Nitrate, mg/lN:	0.350	0.023	0.005	0.009
Fluroide, mg/l:	0.145	0.062	0.855	0.317
Iron, mg/l:	0.962	2.71	0.158	0.753

Respectfully submitted,

TECHNICAL SERVICES, INC.

BY Henry C. Gray, J

LABORATORY I.D. NO. 82145

TECHNICAL SERVICES, INC.

ENVIRONMENTAL CONSULTANTS — INDUSTRIAL CHEMISTS
OFFICE 2471 SWAN ST. — P.O. BOX 52329
LABORATORIES 103-107 STOCKTON STREET
JACKSONVILLE, FLORIDA 32201
(904) 353-5761

Laboratory No. 60202 August 15, 1984

Sample of Water

Date Received July 11, 1984

For Geraghty & Miller, Inc., P. O. Box 271173, Tampa, Fl. 33688

Marks: Cecil Field

CERTIFICATE OF ANALYSIS OR TESTS

	SA-1-CF	S-2-CF	S-3-CF
pH	7.50	5.30	5.00
Total Dissolved Solids, mg/l:	292	48	33
Iron, mg/l:	0.036	0.187	0.157

Respectfully submitted,

TECHNICAL SERVICES, INC.

BY Henry C. Gray, Jr.

LABORATORY I.D. NO. 82145

TECHNICAL SERVICES, INC.

ENVIRONMENTAL CONSULTANTS — INDUSTRIAL CHEMISTS
OFFICE 2471 SWAN ST. — P.O. BOX 52329
LABORATORIES 103-107 STOCKTON STREET
JACKSONVILLE, FLORIDA 32201
(904) 353-5761

Laboratory No. 60202 August 15, 1984

Sample of Water

Date Received July 11, 1984

For Geraghty & Miller, Inc., P. O. Box 271173, Tampa, Fl. 33688

Marks: SW1-CF Cecil Field

CERTIFICATE OF ANALYSIS OR TESTS

METHOD 601-All Units ppb	CONCENTRATION	DETECTION LIMIT
Bromodichloromethane	BDL	1.0
Bromoform	BDL	1.0
Bromomethane	BDL	1.0
Carbon Tetrachloride	BDL	1.0
Chlorobenzene	BDL	1.0
Chloroethane	BDL	1.0
2-Chloroethylvinyl Ether	BDL	1.0
Chloroform	BDL	1.0
Chloromethane	BDL	1.0
Dibromochloromethane	BDL	1.0
1,2-Dichlorobenzene	BDL	1.0
1,3-Dichlorobenzene	BDL	1.0
1,4-Dichlorobenzene	BDL	1.0
Dichlorodifluoromethane	BDL	1.0
1,1-Dichloroethane	4.2	1.0
1,2-Dichloroethane	BDL	1.0
1,1-Dichloroethene	BDL	1.0
Trans-1,2-Dichloroethene	BDL	1.0
1,2-Dichloropropane	BDL	1.0
Cis-1,3-Dichloropropene	BDL	1.0
Trans-1,3-Dichloropropene	BDL	1.0
Methylene Chloride	BDL	1.0
1,1,2,2,-Tetrachloroethane	BDL	1.0
Tetrachloroethene	BDL	1.0
1,1,1-Trichloroethane	BDL	1.0
1,1,2-Trichloroethane	BDL	1.0
Trichloroethene	BDL	1.0
Trichlorofluoromethane	BDL	1.0
Vinyl Chloride	BDL	1.0

BDL=BELOW DETECTION LIMIT

Respectfully submitted,

TECHNICAL SERVICES, INC.

BY Harvey C. Gray, Jr.

LABORATORY I.D. NO. 82145

TECHNICAL SERVICES, INC.

ENVIRONMENTAL CONSULTANTS — INDUSTRIAL CHEMISTS
OFFICE 2471 SWAN ST. — P.O. BOX 52329
LABORATORIES 103-107 STOCKTON STREET
JACKSONVILLE, FLORIDA 32201
(904) 353-5761

Laboratory No. 60202

August 15, 1984

Sample of Water

Date Received July 11, 1984

For Geraghty & Miller Inc., P. O. BOX 271173, Tampa, Fl. 33688

Marks: SA-1-CF Cecil Field

CERTIFICATE OF ANALYSIS OR TESTS

METHOD 601-All Units ppb	CONCENTRATION	DETECTION LIMIT
Bromodichloromethane	BDL	1.0
Bromoform	BDL	1.0
Bromomethane	BDL	1.0
Carbon Tetrachloride	BDL	1.0
Chlorobenzene	BDL	1.0
Chloroethane	BDL	1.0
2-Chloroethylvinyl Ether	BDL	1.0
Chloroform	BDL	1.0
Chloromethane	BDL	1.0
Dibromochloromethane	BDL	1.0
1,2-Dichlorobenzene	BDL	1.0
1,3-Dichlorobenzene	BDL	1.0
1,4-Dichlorobenzene	BDL	1.0
Dichlorodifluoromethane	BDL	1.0
1,1-Dichloroethane	BDL	1.0
1,2-Dichloroethane	BDL	1.0
1,1-Dichloroethene	BDL	1.0
Trans-1,2-Dichloroethene	BDL	1.0
1,2-Dichloropropane	BDL	1.0
Cis-1,3-Dichloropropene	BDL	1.0
Trans-1,3-Dichloropropene	BDL	1.0
Methylene Chloride	BDL	1.0
1,1,2,2,-Tetrachloroethane	BDL	1.0
Tetrachloroethene	BDL	1.0
1,1,1-Trichloroethane	BDL	1.0
1,1,2-Trichloroethane	BDL	1.0
Trichloroethene	BDL	1.0
Trichlorofluoromethane	BDL	1.0
Vinyl Chloride	BDL	1.0

BDL=BELOW DETECTION LIMIT

Respectfully submitted,

TECHNICAL SERVICES, INC.

BY Harvey C. Gray, Jr.

LABORATORY I.D. NO. 82145

TECHNICAL SERVICES, INC.

ENVIRONMENTAL CONSULTANTS — INDUSTRIAL CHEMISTS
OFFICE 2471 SWAN ST. — P.O. BOX 52329
LABORATORIES 103-107 STOCKTON STREET
JACKSONVILLE, FLORIDA 32201
(904) 353-5761

August 15, 1984

Laboratory No. 60202

Sample of Water

Date Received July 11, 1984

For Geraghty & Miller, Inc., P. O. Box 271173, Tampa, Fl. 33685

Marks: SA-2-CF Cecil Field

CERTIFICATE OF ANALYSIS OR TESTS

METHOD 601-All Units ppb	CONCENTRATION	DETECTION LIMIT
Bromodichloromethane	BDL	1.0
Bromoform	BDL	1.0
Bromomethane	BDL	1.0
Carbon Tetrachloride	BDL	1.0
Chlorobenzene	BDL	1.0
Chloroethane	BDL	1.0
2-Chloroethylvinyl Ether	BDL	1.0
Chloroform	BDL	1.0
Chloromethane	BDL	1.0
Dibromochloromethane	BDL	1.0
1,2-Dichlorobenzene	BDL	1.0
1,3-Dichlorobenzene	BDL	1.0
1,4-Dichlorobenzene	BDL	1.0
Dichlorodifluoromethane	BDL	1.0
1,1-Dichloroethane	BDL	1.0
1,2-Dichloroethane	BDL	1.0
1,1-Dichloroethene	BDL	1.0
Trans-1,2-Dichloroethene	BDL	1.0
1,2-Dichloropropane	BDL	1.0
Cis-1,3-Dichloropropene	BDL	1.0
Trans-1,3-Dichloropropene	BDL	1.0
Methylene Chloride	BDL	1.0
1,1,2,2,-Tetrachloroethane	BDL	1.0
Tetrachloroethene	BDL	1.0
1,1,1-Trichloroethane	BDL	1.0
1,1,2-Trichloroethane	BDL	1.0
Trichloroethene	1.6	1.0
Trichlorofluoromethane	BDL	1.0
Vinyl Chloride	BDL	1.0

BDL=BELOW DETECTION LIMIT

Respectfully submitted,

TECHNICAL SERVICES, INC.

BY Harvey C. Gray, Jr.

LABORATORY I.D. NO. 82145

TECHNICAL SERVICES, INC.

ENVIRONMENTAL CONSULTANTS — INDUSTRIAL CHEMISTS
OFFICE 2471 SWAN ST. — P.O. BOX 52329
LABORATORIES 103-107 STOCKTON STREET
JACKSONVILLE, FLORIDA 32201
(904) 353-5761

Laboratory No. 60202 August 15, 1984

Sample of Water

Date Received July 11, 1984

For Geraghty & Miller, Inc. P. O. Box 271173, Tampa, Fl. 33688

Marks: S-1-CF Cecil Field

CERTIFICATE OF ANALYSIS OR TESTS

METHOD 601-All Units ppb	CONCENTRATION	DETECTION LIMIT
Bromodichloromethane	BDL	1.0
Bromoform	BDL	1.0
Bromomethane	BDL	1.0
Carbon Tetrachloride	BDL	1.0
Chlorobenzene	BDL	1.0
Chloroethane	BDL	1.0
2-Chloroethylvinyl Ether	BDL	1.0
Chloroform	BDL	1.0
Chloromethane	BDL	1.0
Dibromochloromethane	BDL	1.0
1,2-Dichlorobenzene	BDL	1.0
1,3-Dichlorobenzene	BDL	1.0
1,4-Dichlorobenzene	BDL	1.0
Dichlorodifluoromethane	BDL	1.0
1,1-Dichloroethane	BDL	1.0
1,2-Dichloroethane	BDL	1.0
1,1-Dichloroethene	BDL	1.0
Trans-1,2-Dichloroethene	BDL	1.0
1,2-Dichloropropane	BDL	1.0
Cis-1,3-Dichloropropene	BDL	1.0
Trans-1,3-Dichloropropene	BDL	1.0
Methylene Chloride	BDL	1.0
1,1,2,2,-Tetrachloroethane	BDL	1.0
Tetrachloroethene	BDL	1.0
1,1,1-Trichloroethane	BDL	1.0
1,1,2-Trichloroethane	BDL	1.0
Trichloroethene	BDL	1.0
Trichlorofluoromethane	BDL	1.0
Vinyl Chloride	BDL	1.0

BDL=BELOW DETECTION LIMIT

Respectfully submitted,

TECHNICAL SERVICES, INC.

BY Harvey C. Gray, Jr.

LABORATORY I.D. NO. 82145

TECHNICAL SERVICES, INC.

ENVIRONMENTAL CONSULTANTS — INDUSTRIAL CHEMISTS
OFFICE 2471 SWAN ST. — P.O. BOX 52329
LABORATORIES 103-107 STOCKTON STREET
JACKSONVILLE, FLORIDA 32201
(904) 353-5761

Laboratory No. 60202 August 15, 19 8-

Sample of Water

Date Received July 11, 1984

For Geraghty & Miller, Inc., P. O. Box 271173, Tampa, Fl. 33688

Marks: S-2-CF Cecil Field

CERTIFICATE OF ANALYSIS OR TESTS

METHOD 601-All Units ppb	CONCENTRATION	DETECTION LIMIT
Bromodichloromethane	BDL	1.0
Bromoform	BDL	1.0
Bromomethane	BDL	1.0
Carbon Tetrachloride	BDL	1.0
Chlorobenzene	BDL	1.0
Chloroethane	BDL	1.0
2-Chloroethylvinyl Ether	BDL	1.0
Chloroform	BDL	1.0
Chloromethane	BDL	1.0
Dibromochloromethane	BDL	1.0
1,2-Dichlorobenzene	BDL	1.0
1,3-Dichlorobenzene	BDL	1.0
1,4-Dichlorobenzene	BDL	1.0
Dichlorodifluoromethane	BDL	1.0
1,1-Dichloroethane	BDL	1.0
1,2-Dichloroethane	BDL	1.0
1,1-Dichloroethene	BDL	1.0
Trans-1,2-Dichloroethene	BDL	1.0
1,2-Dichloropropane	BDL	1.0
Cis-1,3-Dichloropropene	BDL	1.0
Trans-1,3-Dichloropropene	BDL	1.0
Methylene Chloride	BDL	1.0
1,1,2,2,-Tetrachloroethane	BDL	1.0
Tetrachloroethene	BDL	1.0
1,1,1-Trichloroethane	BDL	1.0
1,1,2-Trichloroethane	BDL	1.0
Trichloroethene	BDL	1.0
Trichlorofluoromethane	BDL	1.0
Vinyl Chloride	BDL	1.0

BDL=BELOW DETECTION LIMIT

Respectfully submitted,

TECHNICAL SERVICES, INC.

BY Harvey C. Gray, J

LABORATORY I.D. NO. 82145

TECHNICAL SERVICES, INC.

ENVIRONMENTAL CONSULTANTS — INDUSTRIAL CHEMISTS
OFFICE 2471 SWAN ST. — P.O. BOX 52329
LABORATORIES 103-107 STOCKTON STREET
JACKSONVILLE, FLORIDA 32201
(904) 353-5761

Laboratory No. 60202

August 15, 19 84

Sample of Water

Date Received July 11, 1984

For Geraghty & Miller, Inc., P. O. Box 271173, Tampa, Fl. 33688

Marks: S-3-CF Cecil Field

CERTIFICATE OF ANALYSIS OR TESTS

METHOD 601-All Units ppb	CONCENTRATION	DETECTION LIMIT
Bromodichloromethane	BDL	1.0
Bromoform	BDL	1.0
Bromomethane	BDL	1.0
Carbon Tetrachloride	BDL	1.0
Chlorobenzene	BDL	1.0
Chloroethane	BDL	1.0
2-Chloroethylvinyl Ether	BDL	1.0
Chloroform	BDL	1.0
Chloromethane	BDL	1.0
Dibromochloromethane	BDL	1.0
1,2-Dichlorobenzene	BDL	1.0
1,3-Dichlorobenzene	BDL	1.0
1,4-Dichlorobenzene	BDL	1.0
Dichlorodifluoromethane	BDL	1.0
1,1-Dichloroethane	BDL	1.0
1,2-Dichloroethane	BDL	1.0
1,1-Dichloroethene	BDL	1.0
Trans-1,2-Dichloroethene	BDL	1.0
1,2-Dichloropropane	BDL	1.0
Cis-1,3-Dichloropropene	BDL	1.0
Trans-1,3-Dichloropropene	BDL	1.0
Methylene Chloride	BDL	1.0
1,1,2,2,-Tetrachloroethane	BDL	1.0
Tetrachloroethene	BDL	1.0
1,1,1-Trichloroethane	BDL	1.0
1,1,2-Trichloroethane	BDL	1.0
Trichloroethene	BDL	1.0
Trichlorofluoromethane	BDL	1.0
Vinyl Chloride	BDL	1.0

BDL=BELOW DETECTION LIMIT

Respectfully submitted,

TECHNICAL SERVICES, INC.

BY Harvey C. Gray, Jr.

LABORATORY I.D. NO. 82145

TECHNICAL SERVICES, INC.

ENVIRONMENTAL CONSULTANTS — INDUSTRIAL CHEMISTS
OFFICE 2471 SWAN ST. — P.O. BOX 52329
LABORATORIES 103-107 STOCKTON STREET
JACKSONVILLE, FLORIDA 32201
(904) 353-5761

Laboratory No. 60202 August 15, 19 8

Sample of Water

Date Received July 11, 1984

For Geraghty & Miller, Inc., P. O. Box 271173, Tampa, Fl. 33688

Marks: S-4-CF Cecil Field

CERTIFICATE OF ANALYSIS OR TESTS

METHOD 601-All Units ppb	CONCENTRATION	DETECTION LIMIT
Bromodichloromethane	BDL	1.0
Bromoform	BDL	1.0
Bromomethane	BDL	1.0
Carbon Tetrachloride	BDL	1.0
Chlorobenzene	BDL	1.0
Chloroethane	BDL	1.0
2-Chloroethylvinyl Ether	BDL	1.0
Chloroform	BDL	1.0
Chloromethane	BDL	1.0
Dibromochloromethane	BDL	1.0
1,2-Dichlorobenzene	BDL	1.0
1,3-Dichlorobenzene	BDL	1.0
1,4-Dichlorobenzene	BDL	1.0
Dichlorodifluoromethane	BDL	1.0
1,1-Dichloroethane	BDL	1.0
1,2-Dichloroethane	BDL	1.0
1,1-Dichloroethene	BDL	1.0
Trans-1,2-Dichloroethene	BDL	1.0
1,2-Dichloropropane	BDL	1.0
Cis-1,3-Dichloropropene	BDL	1.0
Trans-1,3-Dichloropropene	BDL	1.0
Methylene Chloride	BDL	1.0
1,1,2,2,-Tetrachloroethane	BDL	1.0
Tetrachloroethene	BDL	1.0
1,1,1-Trichloroethane	BDL	1.0
1,1,2-Trichloroethane	BDL	1.0
Trichloroethene	BDL	1.0
Trichlorofluoromethane	BDL	1.0
Vinyl Chloride	BDL	1.0

BDL=BELOW DETECTION LIMIT

Respectfully submitted,

TECHNICAL SERVICES, INC.

BY Harvey C. Gray, J

LABORATORY I.D. NO. 82145

ATTACHMENT C

Ground-Water Monitoring Parameters For the Third and Fourth Quarter Sampling Rounds

TABLE 1. Recommended Ground-Water Monitoring Parameters in the Third and Fourth Quarters of the First Year

Ground-Water Monitoring Parameters	Upgradient Monitor Well S-1	Grease Pit Area Monitor Wells S-2, S-3, SA-1	Landfill Area Monitor Wells S-4, SA-2	Surface-Water Rowell Creek SW-1
Temperature (field)	X	X	X	X
pH (field & lab)	X	X	X	X
Specific Conductance (field & lab)	X	X	X	X
Total Dissolved Solids	X	X	X	X
Chloride	X		X	X
Sulfate	X		X	X
Nitrate	X		X	X
Arsenic	X		X	X
Barium	X		X	X
Cadmium	X		X	X
Chromium	X		X	X
Fluoride	X		X	X
Lead	X		X	X
Mercury	X		X	X
Selenium	X		X	X
Silver	X		X	X
Iron	X	X	X	X
Volatile Organic Compounds	X	X	X	X

APPENDIX C

REPORT CONCERNING SOIL AND GROUNDWATER CONTAMINATION RESULTING FROM DAY TANK FUEL SPILL

FINAL SUBMISSION
CONTAMINATION OF SOIL AND GROUND WATER RESULTING FROM THE RUPTURE OF THE DAY TANK FACILITY, NAVAL AIR STATION, CECIL FIELD, FLORIDA

Prepared for

FORREST A. JUNCK AND CHARLES R. WALKER
ARCHITECTS

November 13, 1981

GERAGHTY & MILLER, INC.
Consulting Ground-Water Hydrologists and Geologists
13902 North Dale Mabry Highway
Tampa, Florida 33618

TABLE OF CONTENTS

	Page
INTRODUCTION	1
Objective of the Investigation	1
Basic Considerations	5
Work Performed in the Field	6
HYDROGEOLOGIC FRAMEWORK	11
Topography, Drainage, and Surficial Geology	11
LOCATION OF THE FUEL OIL IN THE GROUND-WATER SYSTEM	14
RECOMMENDATIONS	17

LIST OF FIGURES

Figure		Page
1	Regional Map Showing the Location of NAS Cecil Field	2
2	Location Map of Day Tank Facility and Drainage Outfall	3
3	Surface Areas Affected by Fuel Oil Spill	4
4	Locations of Borings Drilled and Monitor Wells Installed During the Field Program	7
5	Typical Well-Construction Details	9
6	Ground-Water Elevations at Site Based on Measurements Taken on July 23, 1981	12
7	Surface Areas Affected by Fuel Oil Spill and Borings Found to Contain Contaminated Soil Samples	15

LIST OF TABLES

Table		Page
1	Details of Monitor Wells Installed During the Field Program	10

INTRODUCTION

Objective of the Investigation

In March 1981, Geraghty & Miller, Inc., was retained by Forrest A. Junck and Charles R. Walker, Architects, to determine the extent of ground-water contamination resulting from the rupture of the Day Tank facility located at the Naval Air Station, Cecil Field, Florida. Cecil Field is bisected by State Road 228 as shown in Figure 1. The Day Tank facility ruptured on the night of February 19, 1981, spilling a large quantity of JP-5 fuel oil, of which 280,000 gallons were recovered the following day by Jacksonville Spillage Control, Inc., and personnel from the Navy Department of Public Works.

The Day Tank is underlain by a subsurface drainage system connected to a storm sewer which discharges water into Sal Taylor Creek. Much of the fuel was recovered near the location of this outfall (Figure 2); however, some fuel flowed across the land-surface and ponded in two shallow land surface depressions which are depicted in Figure 3. Fuel was recovered from these depressions with a sump pump. Based on the hydrogeologic conditions at the site, the only potential location where fuel oil

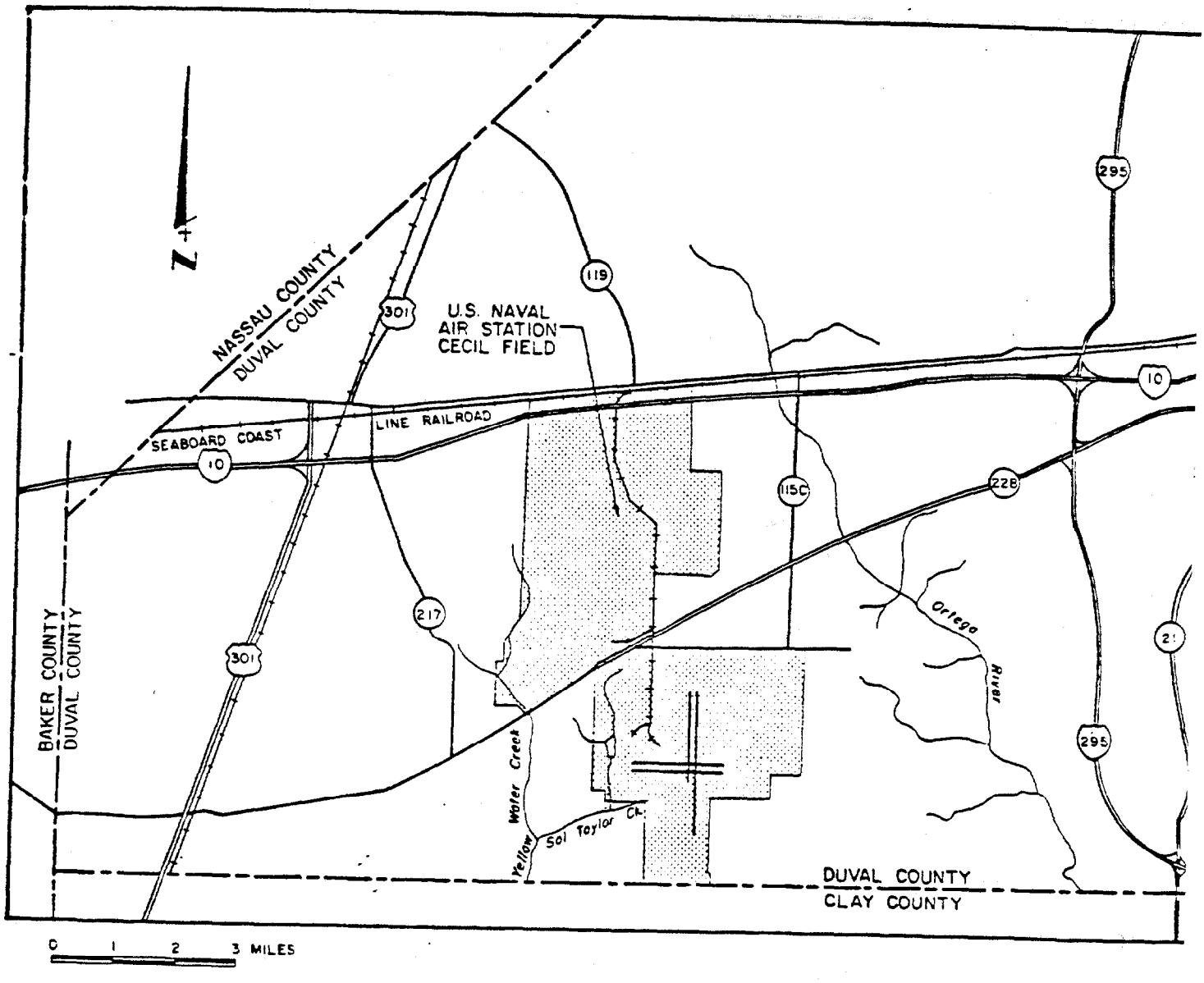


Figure 1. Regional Map Showing the Location of NAS Cecil Field.

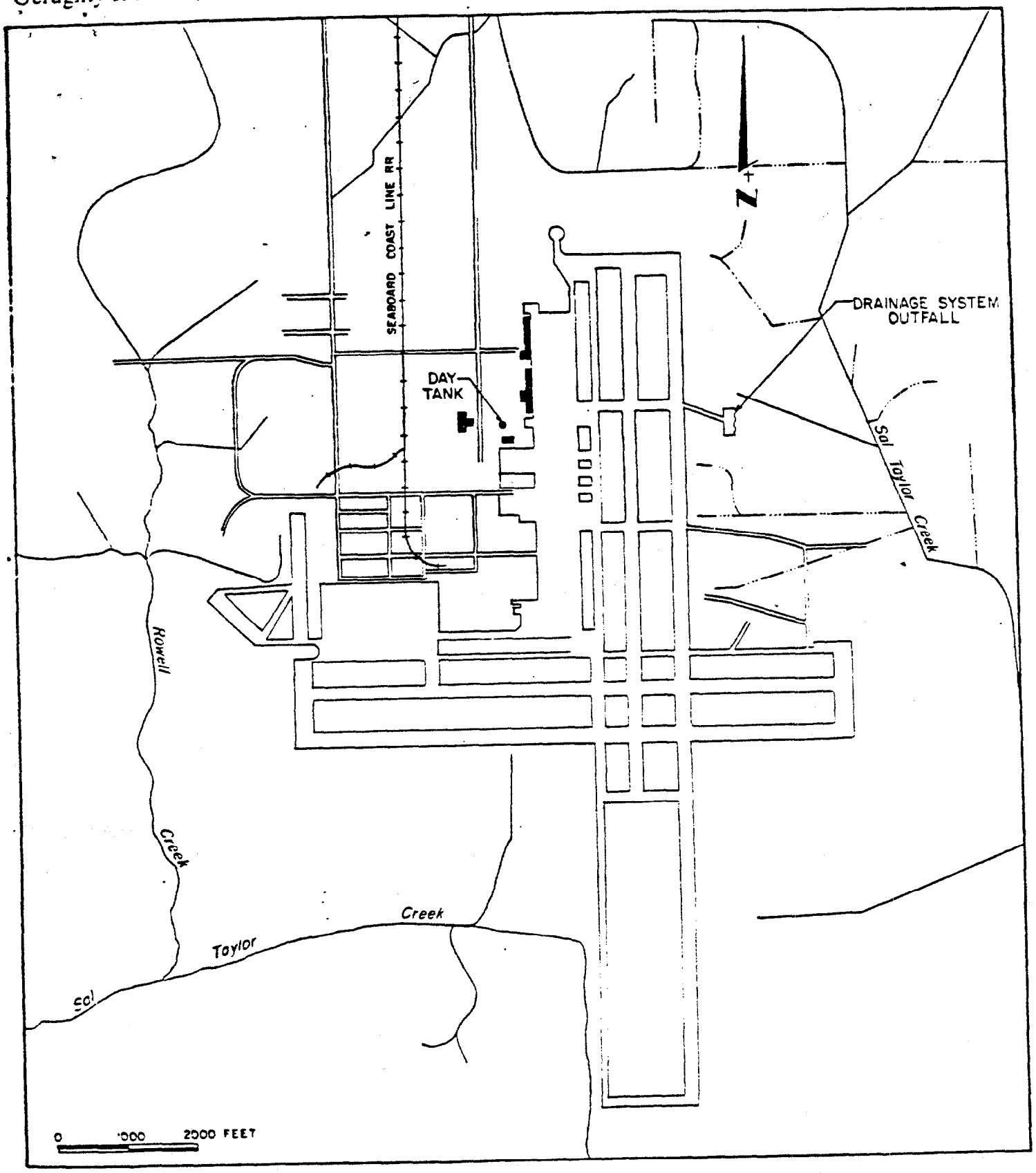


Figure 2. Location Map of Day Tank Facility and Drainage Outfall.

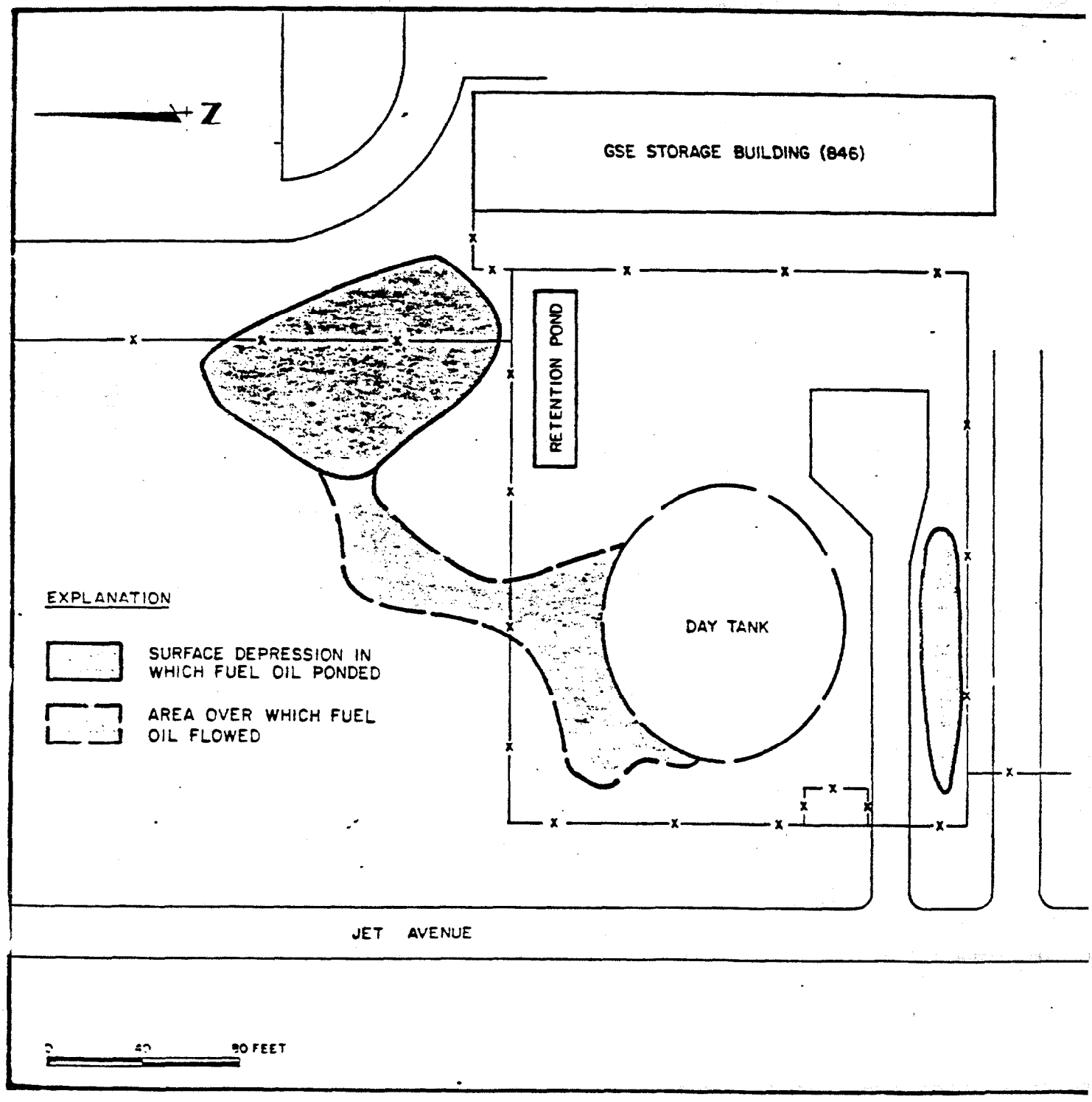


Figure 3. Surface Areas Affected by Fuel Oil Spill.

have entered the shallow ground-water system would be at the Day Tank facility. Therefore, the investigation was focused on determining the extent of ground-water contamination in this area.

Basic Considerations

Movement of a fuel-oil body within the ground-water system is generally restricted to the unsaturated zone above the water table as fuel oil and ground water are immiscible. Once a fuel-oil body reaches the water table, downward seepage ceases and lateral migration begins within the capillary fringe. If, as in the case of this investigation, the influx of fuel oil ceases, capillary spreading becomes very slow and eventually a relatively stable condition is reached which is referred to as residual oil saturation or immobile saturation. Oil contained within the capillary fringe moves up or down concurrently with fluctuations of the water table, and is subject to biodegradation due to decomposition of the fuel oil by naturally-occurring bacteria. In order for the decomposition to occur, the bacteria must have access to adequate supplies of oxygen, moisture, nutrients, and carbon. Under these conditions, and if sufficient supplies of hydrocarbons and nutrients are available, the bacteria will consume the carbon, and release water and carbon dioxide as by-products.

Work Performed in the Field

On March 10 and 11, 1981, a preliminary field investigation was performed consisting of seven auger borings which were drilled to the water table. Based on the analysis of the data collected from these holes, a more detailed field program was designed to define the extent and direction of migration of fuel oil in the surficial sediments.

During the week of June 15, 1981, the detailed field program was conducted consisting of 16 borings drilled at the locations shown in Figure 4. Although an attempt was made to drill within the fenced area of the Day Tank, it was not possible due to the presence of piping, underground utilities, and the cathodic protection system in the subsurface around the tank. During the drilling, the physical and mineral characteristics of the soil samples were described by a hydrogeologist from Geraghty & Miller, Inc., who also determined the presence or absence of fuel oil in the soil samples by smell and by visual inspection.

Five of the soil borings were converted to monitor wells (Figure 4), each of which consisted of a 2-inch-diameter PVC pipe with a 3-foot-long screened section attached to the bottom. A graded sand was placed around the screen, and the remainder of the borehole was backfilled to land surface. A schematic

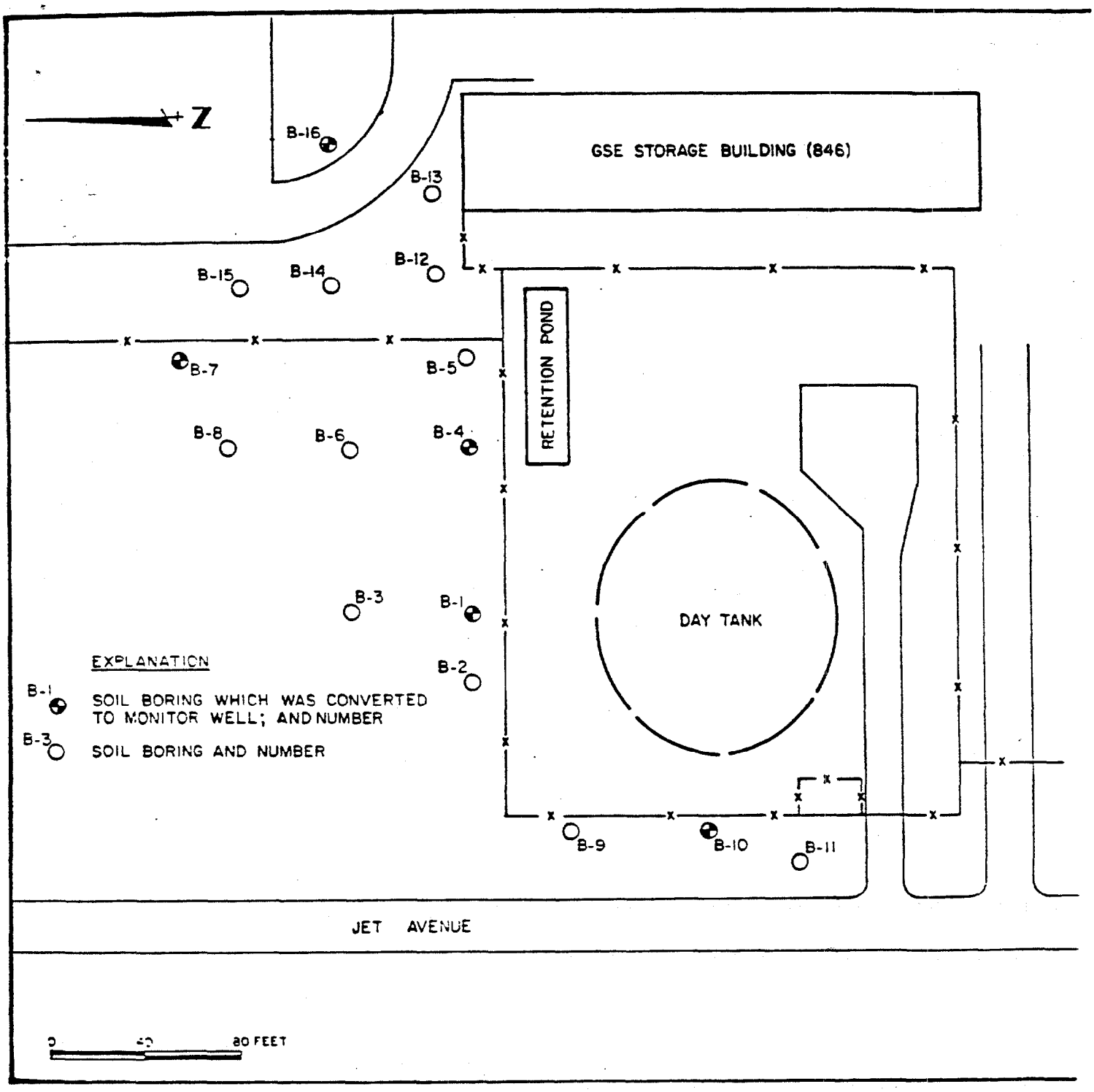


Figure 4. Locations of Borings Drilled and Monitor Wells Installed During the Field Program.

diagram depicting the typical construction details of the monitor wells is shown in Figure 5; Table 1 indicates the construction details for each of the five wells. An attempt was made at each site to set the well at a depth which would allow the screened section to intersect the water table. This was done in order to enable the measurement of the thickness of the fuel oil floating on the water table.

After each well was installed, water-level measurements were taken daily until completion of the field program. The top of the casings, which were the measuring points, were then surveyed so that the water-level measurements could be referenced to mean sea level and the direction of ground-water flow could b determined.

On July 16, 1981, water samples were collected from each of the monitor wells to obtain additional data on the movement of the oil body from the unsaturated zone into the saturated zone after several inches of rain had fallen throughout the area.

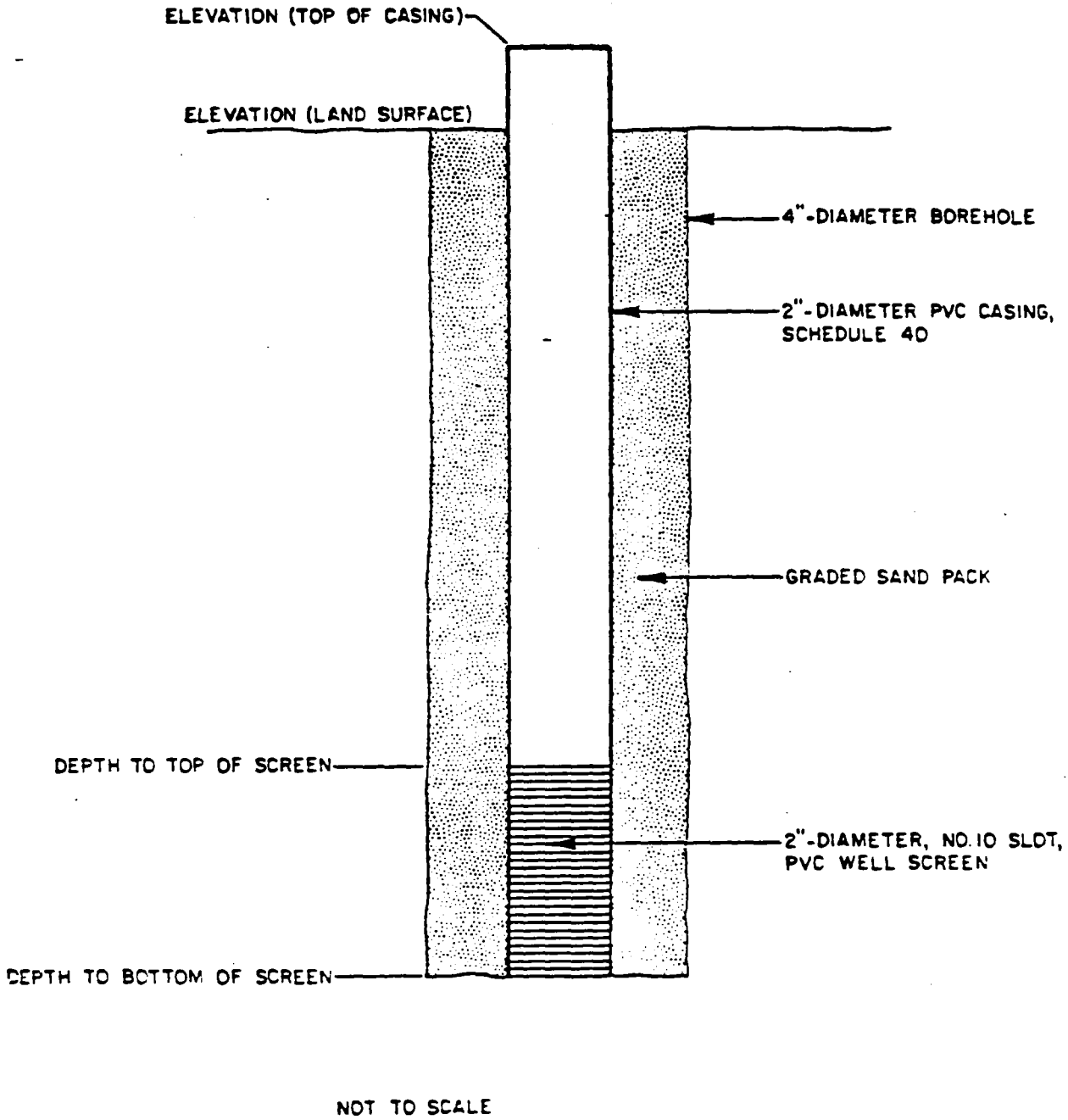


Figure 5. Typical Well-Construction Details.

Table 1. Details of Monitor Wells Installed During the Field Program

Well No.	Depth to Top of Screen (feet)	Depth to Bottom of Screen (feet)	Top of Casing Elevation (feet, msl)[1]	Land Surface Elevation (feet, msl)[1]
B- 1	8	11	81.89	80.0
B- 4	7	10	81.45	79.28
B- 7	7	10	81.51	79.17
B-10	8	11	82.39	80.26
B-16	9	12	81.49	79.36

[1] Elevation of benchmark was approximated.

HYDROGEOLOGIC FRAMEWORK

Topography, Drainage, and Surficial Geology

The topography at the study site is basically flat with numerous shallow land-surface depressions. Land-surface elevations at the site average about 80 ft msl (feet mean sea level). Surface-water drainage is conveyed primarily through storm-sewer systems to canals and low areas which drain to Sal Taylor Creek.

The geology of the upper 10 ft (feet) of earth materials consists of an upper 6 in (inches) of top soil which is underlain with very fine to fine-grained sand with varying amounts of silt. A layer of very dense reddish-brown hard pan was encountered in each of the borings at a depth of approximately 6 ft. Geologic logs of the soil borings are presented in Appendix A.

Water-level measurements taken on July 23, 1981, indicate that the water table slopes slightly to the east or southeast (Figure 6); thus ground-water flow in the surficial sediments is in an east or southeast direction, eventually discharging into Taylor Creek (Figure 2).

Using an estimated hydraulic conductivity of 28 ft per day (which is typical for the fine-grained silty sands encountered at the site), a porosity of 35

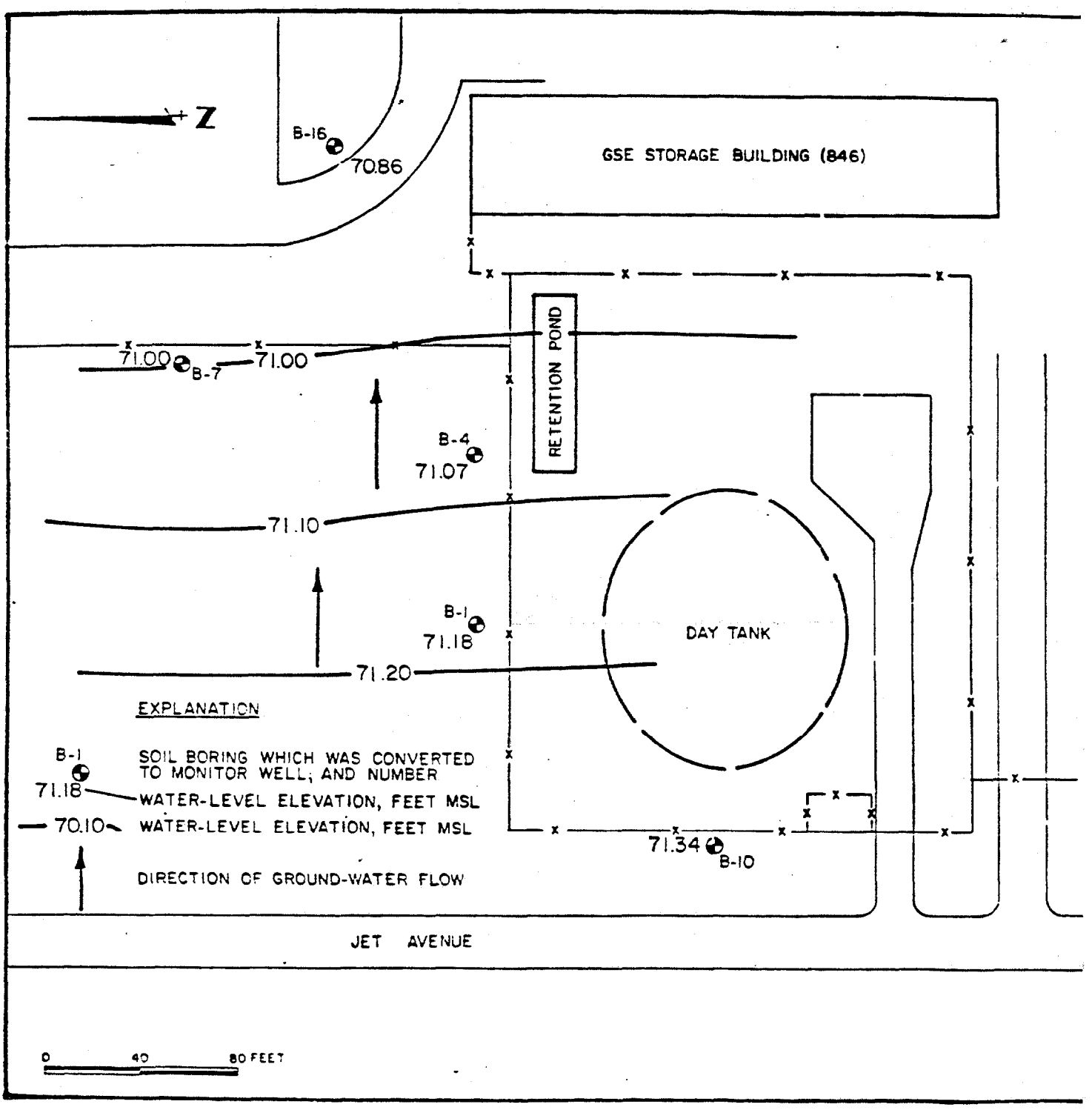


Figure 6. Ground-Water Elevations at Site Based on Measurements Taken on July 23, 1981.

percent, and the prevailing hydraulic gradient, the ground-water flow rate is estimated to be 40 ft per year.

LOCATION OF THE FUEL OIL IN THE GROUND-WATER SYSTEM

Fuel oil which spilled from the ruptured Day Tank flowed across the land surface and either ponded at the locations shown in Figure 3, or it flowed into the storm sewer and discharged into Sal Taylor Creek. Therefore, the only potential areas where the ground water could be contaminated by the fuel oil are those areas shown in Figure 3.

In order to delineate both horizontally and vertically the location of the fuel oil in the shallow ground-water system, soil borings were installed at the locations shown in Figure 7. As indicated in this figure, the only soil borings which were found to contain fuel oil were those drilled in areas where the fuel oil flowed across land surface or where it ponded. All other borings, including those immediately adjacent to the locations where the fuel oil ponded, did not detect the presence of fuel oil.

Borings B-1, B-4, B-7, B-10 and B-16 were converted to monitor wells, and analyses of water samples collected from these wells did not show the presence of fuel oil. Based on these results and on observations in the field, it was concluded that the fuel oil was present only in the unsaturated zone above the water table in the areas identified in Figure 3. In this

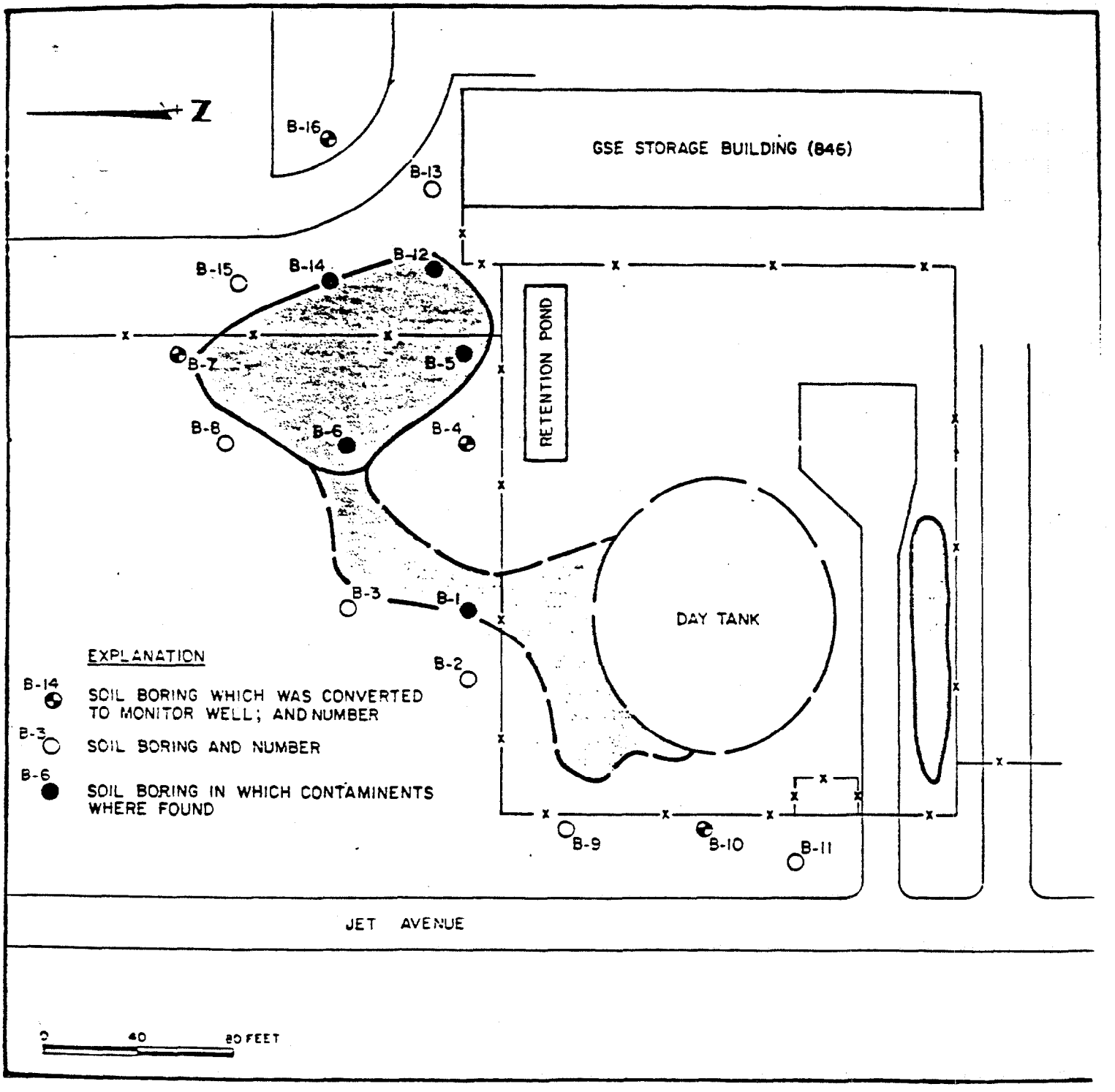


Figure 7. Surface Areas Affected by Fuel Oil Spill and Borings Found to Contain Contaminated Soil Samples.

regard, it should be noted that although no borings could be installed within the fenced area, it is believed that the conditions within the fenced area are similar to those found outside the fenced area.

A second field trip was made to the site five weeks after the drilling program had ended. The purpose of the visit was to resample the monitor wells to determine whether or not the fuel oil in the unsaturated zone had migrated downward and, due to the downward percolation of rainwater, had formed a plume on top of the water table. No plume could be detected; therefore, it is concluded that only a small amount of fuel oil has migrated into the shallow ground-water system and that the amount of fuel oil is small enough so that no significant oil plume has or will be formed. The fuel oil is simply present in the unsaturated zone between the water table and land surface in the areas depicted in Figure 3 and will biodegrade into carbon dioxide and water over a period of time due to naturally-occurring bacteria.

RECOMMENDATIONS

Abatement Program

There is no cost-effective way of recovering fuel oil from the unsaturated zone because the fuel oil has a physical affinity to the soil particles and thus has a tendency to "cling" to these particles. Although the fuel oil in the ground water near the Day Tank could be floated out by flooding the area, the recovery rate would be minimal unless a surfactant, such as a detergent, were used to overcome the physical affinity between the fuel oil and soil particles. If the fuel oil were floated out using a surfactant, the liquid waste product would have to be conveyed to a wastewater-treatment facility.

Therefore, based on the findings, it is recommended that no attempt be made to recover the limited amount of fuel oil tied up in the unsaturated zone. Over a period of time, the fuel oil will decompose naturally due to bacteria in the unsaturated zone. As stated earlier, in order for decomposition to occur, the naturally-occurring bacteria requires adequate supplies of oxygen, moisture, nutrients, and carbon. Because the fuel oil provides the source of carbon, and moisture is provided naturally by rainfall, the amounts of oxygen and nutrients available in the unsaturated zone are the limiting factors on the rate of decomposition of the

fuel oil. Although there are in situ biological treatment systems available for the treatment of hydrocarbons in the ground water, such as the system developed by Suntech, Inc., these systems are not effective in destroying hydrocarbons in the unsaturated zone.

The in situ biological treatment systems involve the introduction of nutrients and oxygen into the earth materials to increase the population of carbon-destroying bacteria present in the soil. Because oxygen is already available in the unsaturated zone, decomposition will occur if sufficient nutrients are available. Therefore, Geraghty & Miller, Inc., has modified the in situ biological treatment process so that natural decomposition of hydrocarbons in the unsaturated zone is accelerated.

To achieve this accelerated rate of decomposition, a 12-6-6 type lawn fertilizer should be applied monthly to the area shown in Figure 3 at an application rate that is three to four times the recommended lawn application rate. After the fertilizer has been applied, the area should be watered by the spray irrigation method at a rate equivalent to about three to four inches per application. These procedures should be followed for a period of six months.

If it is required to remove some soil enclosing the Day Tank in order to make repairs to the tank, it is suggested that the soil be spread out in the same areas where the fuel oil is already present in the unsaturated zone. Fertilizer and moisture should be applied in the same manner as discussed above. This will promote the decomposition of fuel oil tied up in the soil. After about six months, the decomposition of most of the fuel oil should be completed and the soil can either be seeded or it can be repacked around the Day Tank.

Monitoring Program

Since the fuel oil has essentially reached immobile saturation, the five monitor wells which were installed during this program will not be needed to determine future migiration of the fuel oil. Therefore, it is recommended that these wells be used to monitor the success of the proposed treatment process. Prior to initiating the treatment process, water samples should be collected from each of the monitor wells and analyzed for the presence of carbon dioxide (CO_2), bicarbonate (HCO_3), and nitrate. This will establish baseline levels and will be used to monitor the success of the treatment program. Since carbon dioxide is a byproduct of the decomposition process, high concentrations of carbon dioxide and bicarbonate in the downgradient wells will be indicative of the success of the the treatment

program. Increased nitrate in the downgradient wells will indicate whether the fertilizer is moving past the root zone and is reaching the water table. Therefore, after the treatment program is initiated, monthly water samples should be collected from each of the wells and analyzed for carbon dioxide, bicarbonate, and nitrate.

Respectfully submitted,

GERAGHTY & MILLER, INC.

Peter L. Palmer, P.E.
Senior Scientist

Daniel W. Rothenberger
Hydrogeologist

32215.000
01.02.00.0003

YEAR-END REPORT OF GROUND-WATER MONITORING AT NAS-CECIL FIELD JACKSONVILLE, FLORIDA

Prepared for

SOUTHERN DIVISION, NAVAL FACILITIES ENGINEERING COMMAND
Charleston, South Carolina

July 1985

GERAGHTY & MILLER, INC.
Ground-Water Consultants
14310 North Dale Mabry Highway, Suite 200
Post Office Box 271173
Tampa, Florida 33688

TABLE OF CONTENTS

	PAGE
INTRODUCTION	1
WORK PERFORMED	1
RESULTS OF THE WATER-LEVEL MEASUREMENTS	3
RESULTS OF THE WATER-QUALITY ANALYSES	8
GREASE-DISPOSAL PITS	8
INACTIVE LANDFILL AREA	9
SAL TAYLOR CREEK	9
CONCLUSIONS AND RECOMMENDATIONS	10
APPENDIX A	A-1

LIST OF FIGURES

		PAGE
FIGURE 1.	LOCATION OF THE MONITORING NETWORK AT NAS-CECIL FIELD.....	2
FIGURE 2.	CONSTRUCTION DETAILS OF INSTALLED SECONDARY ARTESIAN MONITOR WELLS.....	4
FIGURE 3.	CONSTRUCTION DETAILS OF INSTALLED SHALLOW MONITOR WELLS.....	5

LIST OF TABLES

TABLE 1.	WATER-LEVEL ELEVATIONS AND FIELD PARAMETERS MEASURED DURING THE FIRST YEAR OF QUARTERLY SAMPLING.....	6

INTRODUCTION

The Naval Air Station - Cecil Field near Jacksonville, Florida has complied with Chapter 17-3 and 17-4, FAC (Florida Administrative Code), Section 17-4.245(6)(d), by installing a ground-water monitoring network (Figure 1) around the grease-disposal pits and the inactive landfill. The monitoring network consists of six ground-water monitoring wells: one upgradient well serving both areas, three wells downgradient of the grease pits (2 shallow, 1 deep), and two wells downgradient of the landfill (1 shallow, 1 deep). Additionally, a surface-water monitoring station was installed in Rowell Creek downstream of the landfill. The wells and surface-water station, installed in March 1984, have been sampled quarterly for one year, to detect possible discharges of waste constituents into the ground-water and surface-water systems. Water-level measurements also have been made to determine the ground-water flow direction and potential for vertical movement of the ground water. This report discusses the local ground-water quality and recommends a future course of action for compliance with the aforementioned chapters. Also, the water-quality results for each of the quarterly sampling rounds are contained herein.

WORK PERFORMED

During the week of March 19, 1984, two secondary artesian aquifer monitor wells were installed; one downgradient of the grease-disposal pits and one downgradient

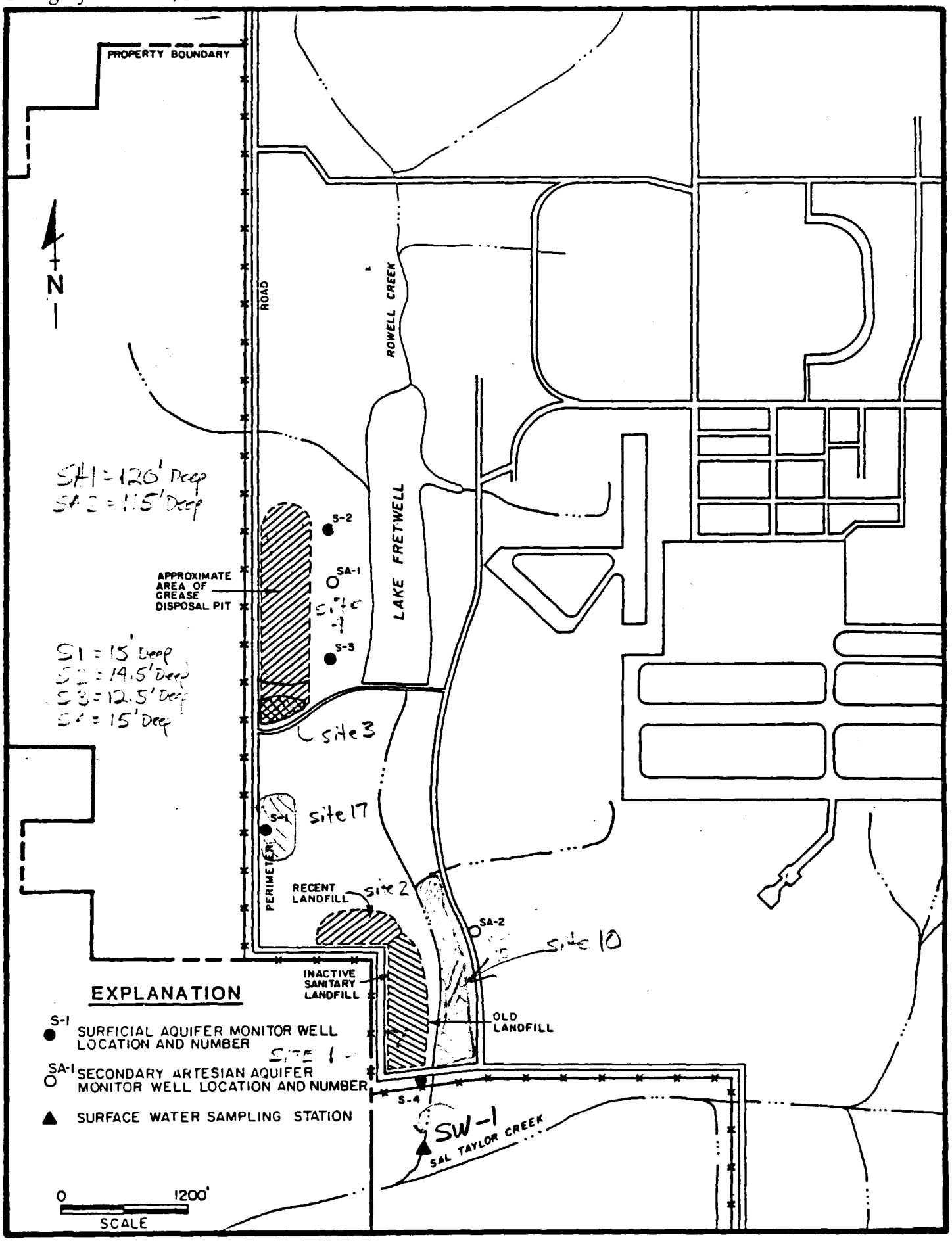


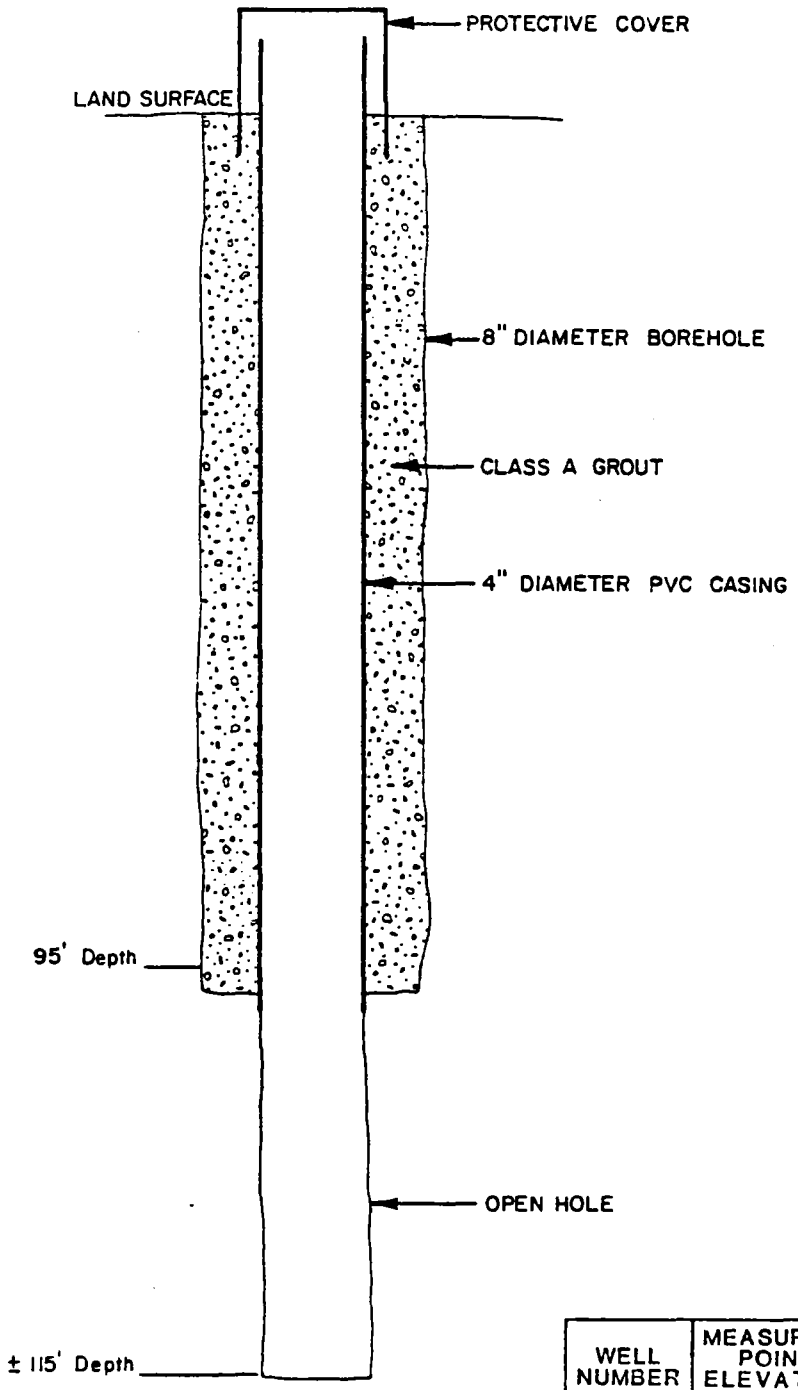
FIGURE 1. Location of the Monitoring Network at NAS-Cecil Field.

of the inactive landfill. Figure 2 shows the construction details of these wells. The following week, four shallow monitor wells were installed; two wells at the grease-disposal pits, one well near the inactive sanitary landfill, and one well between the two sites to represent background conditions. Figure 3 shows the construction details of the shallow monitor wells. These wells were installed as described in an earlier report entitled "As-Built Ground-Water Monitoring Network, NAS-Cecil Field, Jacksonville, Florida".

Quarterly ground-water samples were collected from each well on April 12, 1984, July 10, 1984, October 17, 1984 and February 20, 1985 according to the Sampling and Analysis Plan submitted in an earlier report entitled "Hydrogeologic Assessment and Ground-Water Monitoring Plan, NAS Cecil Field, Jacksonville, Florida". At the time of collection, the samples were measured for temperature, pH, and specific conductance. Table 1 contains the field parameters for each of the quarterly sampling rounds. These samples were delivered to Florida Department of Environmental Regulation (FDER) approved laboratories for analysis.

RESULTS OF THE WATER-LEVEL MEASUREMENTS

The water-level data that was collected were refered to a common datum, mean sea level, so that the direction of ground-water flow could be determined. The data indicated that the highest ground-water levels occurred in the

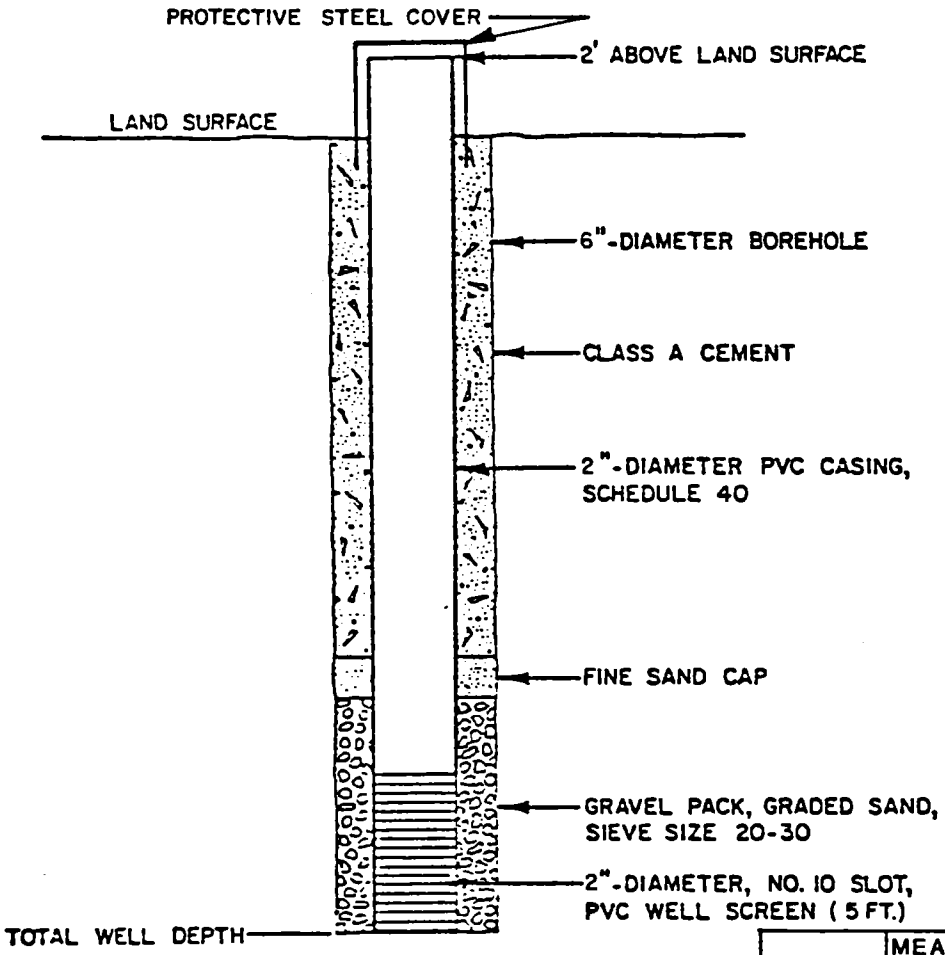


NOT TO SCALE

WELL NUMBER	MEASURING POINT ELEVATION (FT.MSL)	TOTAL DEPTH
SA-1	73.40	120
SA-2	70.05	115

MEASUREMENT FROM TOP OF PVC CASING

FIGURE 2. Construction Details of Installed Secondary Artesian Monitor Wells.



NOT TO SCALE

WELL NUMBER	MEASURING POINT ELEVATION (FT. MSL)	TOTAL DEPTH (FT.)
S-1	74.11	15.0
S-2	73.94	14.5
S-3	72.71	12.5
S-4	54.83	15.0

MEASUREMENT FROM TOP OF PVC CASING

FIGURE 3. Construction Details of Installed Shallow Monitor Wells.

TABLE 1. WATER-LEVEL ELEVATIONS AND FIELD PARAMETERS MEASURED DURING THE FIRST YEAR OF QUARTERLY SAMPLING

Well Number	Parameter	1st Quarter 4/12/84	2nd Quarter 7/10/84	3rd Quarter 10/17/84	4th Quarter 2/20/85
SA-1	Water-level elevation (ft msl)[1/]	70.20	68.62	68.92	67.34
	Temperature, °C	-	23.00	21.00	21.00
	pH	7.26	-	6.97	7.30
	Specific conductance (umhos/cm)	420.00	500.00	500.00	410.00
SA-2	Water-level elevation (ft msl)[1/]	63.23	61.78	62.49	61.64
	Temperature, °C	-	24.00	21.00	20.00
	pH	7.26	-	7.29	9.60
	Specific conductance (umhos/cm)	390.00	460.00	430.00	470.00
S-1	Water-level elevation (ft msl)[1/]	72.04	70.06	70.37	69.67
	Temperature, °C	-	24.00	22.00	19.00
	pH	4.92	-	4.93	5.11
	Specific conductance (umhos/cm)	90.00	140.00	130.00	110.00
S-2	Water-level elevation (ft msl)[1/]	70.48	67.69	68.69	66.59
	Temperature, °C	17.5	22.00	22.00	18.00
	pH	4.97	-	5.70	6.10
	Specific conductance (umhos/cm)	<50.00	<50.00	<50.00	<50.00
S-3	Water-level elevation (ft msl)[1/]	70.27	67.89	68.60	67.68
	Temperature, °C	19.00	23.00	23.00	16.00
	pH	5.31	-	5.44	5.71
	Specific conductance (umhos/cm)	50.00	<50.00	55.00	55.00
S-4	Water-level elevation (ft msl)[1/]	47.59	46.31	46.63	46.60
	Temperature, °C	19.00	23.00	21.00	18.00
	pH	-	-	7.02	7.11
	Specific conductance (umhos/cm)	300.00	400.00	380.00	300.00

? >2 d from other wells

Well Number	Parameter	1st Quarter 4/14/84	2nd Quarter 7/12/84	3rd Quarter 10/16/84	4th Quarter 2/21/85
SW-1	Temperature, °C	20.00	28.00	22.00	16.0
	pH	6.14	-	6.66	-
	Specific conductance (umhos/cm)	75.00	380.00	200.00	295.00

1/ ft msl means feet above mean sea level.

background well S-1, and suggests that flow in the surficial aquifer is east toward Sal Taylor Creek. Futhermore, the vertical hydraulic gradient between the surficial and deeper sediments is very low and on one occasion (October, 1984) the vertical gradient at the grease pit was determined to be upward.

RESULTS OF THE WATER-QUALITY ANALYSES

The laboratory results for each quarterly sampling round are contained in Appendix A. These samples were analyzed for primary and secondary drinking-water parameters, one time for acid-extractable compounds, and quarterly for VOCs (volatile organic compounds). The laboratory results are discussed below.

GREASE-DISPOSAL PITS

The water-quality samples collected from the monitor wells (SA-1, S-2, and S-3) downgradient of the grease-pit area show that concentrations of the primary drinking-water parameters are below the standards set forth in Chapter 17-22.104. The concentrations of the secondary-drinking water parameters were generally below FDER standards except for pH and dissolved iron which were also exceeded in the background monitor well (S-1). The concentrations of the organic compounds (VOCs and acid-extractables) were all below laboratory detection limits.

INACTIVE LANDFILL AREA

At the landfill area (monitor wells S-4 and SA-2), the primary and secondary drinking-water parameters were all below the standards set forth in Chapter 17-22.104, except for the levels of dissolved iron which were also exceeded in the background monitor well, S-1. The VOCs were generally below laboratory detection limits except for TCE (trichloroethene) in monitor well SA-2 which was found at levels of 0.1 and 1.6 ppb (parts per billion) (the FDER drinking-water standard is 3 ppb) during the first and second quarter samples; no TCE was detected in the third and fourth quarter samples.

SAL TAYLOR CREEK

The surface water samples were collected from Sal Taylor Creek downgradient from the landfill at the location shown in Figure 1. The results show that the levels of the primary drinking-water parameters were below drinking-water standards and the concentrations of the secondary drinking-water parameter, except for dissolved iron, were also below drinking-water standards. VOCs were detected in low concentrations during the first and second quarterly samples. The first quarter sample contained four VOCs ranging from a low of 0.5 ppb of TCE to a high of 1.8 ppb of methylene chloride. None of the VOCs detected during the first quarter sampling were found during the second quarter; however, one VOC was present in the sample, 4.2 ppb of 1,1-dichloroethene.

No VOCs were detected in the third and fourth quarter water samples.

CONCLUSIONS AND RECOMMENDATIONS

The data collected from the water-quality monitoring system indicates that the grease pits and landfill have minimal impact on the shallow and deeper ground-water systems. Shallow ground water from these disposal areas is moving east into Sal Taylor Creek at a rate estimated to be between 100 and 200 feet per year. Due to the presence of clayey confining deposits and the low vertical hydraulic gradient, the potential for any significant downward movement of potential contaminants is minimal.

The work performed to date was conducted in accordance with Chapter 17-4 Florida Administrate Code (FAC). Section 17-4.245(6)(f) states that "If the Department determines from the monitoring plan that the discharge will not impair the designated use of the underlying ground water, the Department may exempt the installation owner from implementing a monitoring program". Based on the results of the one year sampling program, G&M recommends that the Department of the Navy request from the FDER an exemption from future monitoring at these sites.

APPENDIX A

LABORATORY WATER-QUALITY RESULTS

WATER-QUALITY RESULTS AT THE GREASE PIT AREA

FIRST QUARTER

TECHNICAL SERVICES, INC.

ENVIRONMENTAL CONSULTANTS — INDUSTRIAL CHEMISTS
OFFICE 2471 SWAN ST. — P.O. BOX 52329
LABORATORIES 103-107 STOCKTON STREET
JACKSONVILLE, FLORIDA 32201
(904) 353-5761

Laboratory No. 58412 May 23, 1984

Sample of WATER

Date Received April 13, 1984

For GERAGHTY & MILLER, INC., Post Office Box 271173, Tampa, Florida 33688 ATTN: Mr. Fred Seguiti

Marks: S-1, Cecil Field

CERTIFICATE OF ANALYSIS OR TESTS

Arsenic, mg/l	<0.002
Barium, mg/l	0.030
Cadmium, mg/l	<0.005
Chromium, mg/l	<0.010
Lead, mg/l	<0.030
Mercury, mg/l	0.0003
Selenium, mg/l	<0.003
Silver, mg/l	<0.006
Copper, mg/l	<0.003
Iron, mg/l	1.751
Manganese, mg/l	0.003
Zinc, mg/l	0.043
Nitrate, mg/l N	0.010
Hydrogen Sulfide, mg/l	0.6
Chloride, mg/l	18.4
Fluoride, mg/l	0.062
pH	4.5
Sulfate, mg/l	9.1
Total Dissolved Solids, mg/l	42
Endrin, ppm	<0.00002
Lindane, ppm	<0.00001
Methoxychlor, ppm	<0.0001
Toxaphene, ppm	<0.0002
2,4-D, ppm	<0.001
2,4,5TP (Silvex) ppm	<0.0005
Gross Alpha, pCi/liter	3±2
Gross Beta, pCi/liter	<3
*Total Organic Halide	73 ug/l

*Supplemental report

Respectfully submitted,

TECHNICAL SERVICES, INC.

By Harvey C. Gray, Jr.

TECHNICAL SERVICES, INC.

ENVIRONMENTAL CONSULTANTS — INDUSTRIAL CHEMISTS
OFFICE 2471 SWAN ST. — P.O. BOX 52329
LABORATORIES 103-107 STOCKTON STREET
JACKSONVILLE, FLORIDA 32201
(904) 353-5761

Laboratory No. 58413 May 23, 1984

Sample of WATER

Date Received April 13, 1984

For GERAGHTY & MILLER, INC., Post Office Box 271173, Tampa, Florida 33688 ATTN: Mr. Fred Seguiti

Marks: S-2, Cecil Field

CERTIFICATE OF ANALYSIS OR TESTS

Arsenic, mg/l	<0.002
Barium, mg/l	0.005
Cadmium, mg/l	<0.005
Chromium, mg/l	<0.010
Lead, mg/l	<0.030
Mercury, mg/l	<0.0002
Selenium, mg/l	<0.003
Silver, mg/l	<0.006
Copper, mg/l	<0.003
Iron, mg/l	0.029
Manganese, mg/l	0.007
Zinc, mg/l	0.030
Nitrate, mg/l N	0.002
Hydrogen Sulfide, mg/l	<0.1
Chloride, mg/l	2.5
Fluoride, mg/l	0.045
pH	5.7
Sulfate, mg/l	2.8
Total Dissolved Solids, mg/l	15
Endrin, ppm	<0.00002
Lindane, ppm	<0.00001
Methoxychlor, ppm	<0.0001
Toxaphene, ppm	<0.0002
2,4-D, ppm	<0.001
2,4,5TP (Silvex) ppm	<0.0005
Gross Alpha, pCi/liter	<2
Gross Beta, pCi/liter	<3
*Total Organic Halide	40 ug/l

*Supplemental report

Respectfully submitted,

TECHNICAL SERVICES, INC.

By Harvey C. Gray, Jr.

TECHNICAL SERVICES, INC.

ENVIRONMENTAL CONSULTANTS — INDUSTRIAL CHEMISTS
OFFICE 2471 SWAN ST. — P.O. BOX 52329
LABORATORIES 103-107 STOCKTON STREET
JACKSONVILLE, FLORIDA 32201
(904) 353-5761

Laboratory No. 58414 May 23, 1984

Sample of WATER

Date Received April 13, 1984

For GERAGHTY & MILLER, INC., Post Office Box 271173, Tampa, Florida 33688 ATTN: Mr. Fred Seguiti

Marks: S-3, Cecil Field

CERTIFICATE OF ANALYSIS OR TESTS

Arsenic, mg/l	<0.002
Barium, mg/l	0.019
Cadmium, mg/l	<0.005
Chromium, mg/l	<0.010
Lead, mg/l	0.040
Mercury, mg/l	<0.0002
Selenium, mg/l	<0.003
Silver, mg/l	<0.006
Copper, mg/l	<0.003
Iron, mg/l	0.210
Manganese, mg/l	<0.002
Zinc, mg/l	<0.010
Nitrate, mg/l N	0.403
Hydrogen Sulfide, mg/l	<0.1
Chloride, mg/l	5.2
Fluoride, mg/l	0.054
pH	5.8
Sulfate, mg/l	6.3
Total Dissolved Solids, mg/l	23
Endrin, ppm	<0.00002
Lindane, ppm	<0.00001
Methoxychlor, ppm	<0.0001
Toxaphene, ppm	<0.0002
2,4-D, ppm	<0.001
2,4,5TP (Silvex) ppm	<0.0005
Gross Alpha, pCi/liter	<2
Gross Beta, pCi/liter	<3
*Total Organic Halide	52 ug/l

*Supplemental report

Respectfully submitted,

TECHNICAL SERVICES, INC.

By Henry C. Gray, Jr.

CAMBRIDGE ANALYTICAL ASSOCIATES, INC.

Table 2 (cont'd.). Concentrations of Volatile Organic Compounds (Method 601[1])

Client: Geraghty and Miller - Tampa Report No.: 84-439

		Concentration ug/l (ppb)[2]		
Compound	Sample ID: CAA ID:	S-1 8401955	S-2 8401956	S-3 8401957
chloromethane				
dichlorodifluoromethane				
vinyl chloride				
chloroethane				
methylene chloride				
trichlorofluoromethane				
1,1-dichloroethene				
1,1-dichloroethane				
trans-1,2-dichloroethene				
chloroform				
1,2-dichloroethane				
1,1,1-trichloroethane				
carbon tetrachloride				
bromodichloromethane				
1,2-dichloropropane				
trans-1,3-dichloropropane				
trichloroethene				
dibromochloromethane				
1,1,2-trichloroethane				
cis-1,3 dichloropropene				
2-chloroethylvinyl ether				
bromoform				
1,1,2,2-tetrachloroethane				
tetrachloroethene				
chlorobenzene				
Detection Limit		0.1	0.1	0.1

[1] U.S. EPA. 1982. Methods for Organic Chemical Analysis of Municipal and Industrial Wastewater. EPA 600/4-82-057. EPA/EMSL, Cincinnati, Ohio.

[2] Concentrations less than the detection limit are left blank.

TECHNICAL SERVICES, INC.

ENVIRONMENTAL CONSULTANTS — INDUSTRIAL CHEMISTS
OFFICE 2471 SWAN ST. — P.O. BOX 52329
LABORATORIES 103-107 STOCKTON STREET
JACKSONVILLE, FLORIDA 32201
(904) 353-5761

Laboratory No. 58410 May 23, 1984

Sample of WATER

Date Received April 13, 1984

For GERAGHTY & MILLER, INC., Post Office Box 271173, Tampa, Florida 33688 ATTN: Mr. Fred Seguiti

Marks: SA-1, Cecil Field

CERTIFICATE OF ANALYSIS OR TESTS

Arsenic, mg/l	<0.002
Barium, mg/l	0.063
Cadmium, mg/l	<0.005
Chromium, mg/l	<0.010
Lead, mg/l	<0.030
Mercury, mg/l	0.0002
Selenium, mg/l	<0.003
Silver, mg/l	<0.006
Copper, mg/l	<0.003
Iron, mg/l	0.042
Manganese, mg/l	0.003
Zinc, mg/l	<0.010
Nitrate, mg/l N	0.003
Hydrogen Sulfide, mg/l	0.1
Chloride, mg/l	8.3
Fluoride, mg/l	0.268
pH	7.5
Sulfate, mg/l	4.2
Total Dissolved Solids, mg/l	251
Endrin, ppm	<0.00002
Lindane, ppm	<0.00001
Methoxychlor, ppm	<0.0001
Toxaphene, ppm	<0.0002
2,4-D, ppm	<0.001
2,4,5TP (Silvex) ppm	<0.0005
Gross Alpha, pCi/Liter	<2
Gross Beta, pCi/Liter	<3
*Total Organic Halide	50 ug/l

*Supplemental report

Respectfully submitted,

TECHNICAL SERVICES, INC.

By Harvey C. Gray, Jr.

CAMBRIDGE ANALYTICAL ASSOCIATES, INC.

Table 2. Concentrations of Volatile Organic Compounds (Method 601[1])

Client: Geraghty and Miller - Tampa

Report No.: 84-439

Compound	Sample ID: CAA ID:	Concentration ug/l (ppb)[2] SA-1 8401952
chloromethane		
dichlorodifluoromethane		
vinyl chloride		
chloroethane		
methylene chloride		
trichlorofluoromethane		
1,1-dichloroethene		
1,1-dichloroethane		
trans-1,2-dichloroethene		
chloroform		
1,2-dichloroethane		
1,1,1-trichloroethane		
carbon tetrachloride		
bromodichloromethane		
1,2-dichloropropane		
trans-1,3-dichloropropane		
trichloroethene		
dibromochloromethane		
1,1,2-trichloroethane		
cis-1,3 dichloropropene		
2-chloroethylvinyl ether		
bromoform		
1,1,2,2-tetrachloroethane		
tetrachloroethene		
chlorobenzene		
Detection Limit		0.1

[1]U.S. EPA. 1982. Methods for Organic Chemical Analysis of Municipal and Industrial Wastewater. EPA 600/4-82-057. EPA/EMSL, Cincinnati, Ohio.

[2]Concentrations less than the detection limit are left blank.

CAMBRIDGE ANALYTICAL ASSOCIATES, INC.

Table 3. Concentration of Acid Extractables (Method 625[1])

Client: Geraghty and Miller - Tampa

Report No.: 84-439

Compound	Sample ID: CAA ID:	Concentration - ug/l (ppb)[2] SA-1 8401952	S-2 8401956	S-3 8401957
ACID COMPOUNDS				
(21A) 2,4,6-trichlorophenol				
(22A) p-chloro-m-cresol				
(24A) 2-chlorophenol				
(31A) 2,4-dichlorophenol				
(34A) 2,4-dimethylphenol				
(57A) 2-nitrophenol				
(58A) 4-nitrophenol				
(59A) 2,4-dinitrophenol				
(60A) 4,6-dinitro-2-methylphenol				
(64A) pentachlorophenol				
(65A) phenol				
Detection Limit		2	2	2

WATER-QUALITY RESULTS AT THE GREASE PIT AREA

SECOND QUARTER

TECHNICAL SERVICES, INC.

ENVIRONMENTAL CONSULTANTS — INDUSTRIAL CHEMISTS
OFFICE 2471 SWAN ST. — P.O. BOX 52329
LABORATORIES 103-107 STOCKTON STREET
JACKSONVILLE, FLORIDA 32201
(904) 353-5761

Laboratory No. 60202

August 15, 1984

Sample of Water

Date Received July 11, 1984

For Geraghty & Miller, Inc., P. O. Box 271173, Tampa, Fl. 33688

Marks: Cecil Field

CERTIFICATE OF ANALYSIS OR TESTS

	SA-1-CF	S-2-CF	S-3-CF
pH	7.50	5.30	5.00
Total Dissolved Solids, mg/l:	292	48	33
Iron, mg/l:	0.036	0.187	0.157

Respectfully submitted,

TECHNICAL SERVICES, INC.

BY Henry C. Gray, Jr.

LABORATORY I.D. NO. 82145

TECHNICAL SERVICES, INC.

ENVIRONMENTAL CONSULTANTS — INDUSTRIAL CHEMISTS
OFFICE 2471 SWAN ST. — P.O. BOX 52329
LABORATORIES 103-107 STOCKTON STREET
JACKSONVILLE, FLORIDA 32201
(904) 353-5761

Laboratory No. 60202 August 15, 1984

Sample of Water

Date Received July 11, 1984

For Geraghty & Miller, Inc., P. O. Box 271173, Tampa, Fl. 33688

Marks: Cecil Field - 7/10/84

CERTIFICATE OF ANALYSIS OR TESTS

	SW1-CF	S-1-CF	SA-2-CF	S-4-CF
Arsenic, mg/l:	<.002	<.002	<.002	<.002
Barium, mg/l:	0.022	0.039	0.014	0.045
Cadmium, mg/l:	<0.005	<0.005	<0.005	<0.005
Chromium, mg/l:	<0.010	<0.010	<0.010	<0.010
Lead, mg/l:	<0.03	<0.03	0.039	<0.03
Mercury, mg/l:	<.0002	<.0002	<.0001	<.0001
Selenium, mg/l:	<0.002	<0.002	<0.002	<0.002
Silver, mg/l:	<0.005	<0.005	<0.005	<0.005
pH	7.05	4.75	7.70	7.65
Total Dissolved Solds, mg/l:	170	102	253	245
Chloride, mg/l:	30.0	22.5	12.1	8.41
Sulfate, mg/l:	19.5	3.45	4.60	6.90
Nitrate, mg/lN:	0.350	0.023	0.005	0.009
Fluroide, mg/l:	0.145	0.062	0.855	0.317
Iron, mg/l:	0.962	2.71	0.158	0.753

Respectfully submitted,

TECHNICAL SERVICES, INC.

BY Harvey C. Gray, Jr.

LABORATORY I.D. NO. 82145

TECHNICAL SERVICES, INC.

ENVIRONMENTAL CONSULTANTS — INDUSTRIAL CHEMISTS
OFFICE 2471 SWAN ST. — P.O. BOX 52329
LABORATORIES 103-107 STOCKTON STREET
JACKSONVILLE, FLORIDA 32201
(904) 353-5761

Laboratory No. 60202 August 15, 1984

Sample of Water

Date Received July 11, 1984

For Geraghty & Miller, Inc. P. O. Box 271173, Tampa, Fl. 33688

Marks: S-1-CF Cecil Field

CERTIFICATE OF ANALYSIS OR TESTS

METHOD 601-All Units ppb	CONCENTRATION	DETECTION LIMIT
Bromodichloromethane	BDL	1.0
Bromoform	BDL	1.0
Bromomethane	BDL	1.0
Carbon Tetrachloride	BDL	1.0
Chlorobenzene	BDL	1.0
Chloroethane	BDL	1.0
2-Chloroethylvinyl Ether	BDL	1.0
Chloroform	BDL	1.0
Chloromethane	BDL	1.0
Dibromochloromethane	BDL	1.0
1,2-Dichlorobenzene	BDL	1.0
1,3-Dichlorobenzene	BDL	1.0
1,4-Dichlorobenzene	BDL	1.0
Dichlorodifluoromethane	BDL	1.0
1,1-Dichloroethane	BDL	1.0
1,2-Dichloroethane	BDL	1.0
1,1-Dichloroethene	BDL	1.0
Trans-1,2-Dichloroethene	BDL	1.0
1,2-Dichloropropane	BDL	1.0
Cis-1,3-Dichloropropene	BDL	1.0
Trans-1,3-Dichloropropene	BDL	1.0
Methylene Chloride	BDL	1.0
1,1,2,2,-Tetrachloroethane	BDL	1.0
Tetrachloroethene	BDL	1.0
1,1,1-Trichloroethane	BDL	1.0
1,1,2-Trichloroethane	BDL	1.0
Trichloroethene	BDL	1.0
Trichlorofluoromethane	BDL	1.0
Vinyl Chloride	BDL	1.0

BDL=BELOW DETECTION LIMIT

Respectfully submitted,

TECHNICAL SERVICES, INC.

BY Harvey C. Gray, Jr.

LABORATORY I.D. NO. 82145

TECHNICAL SERVICES, INC.

ENVIRONMENTAL CONSULTANTS — INDUSTRIAL CHEMISTS
OFFICE 2471 SWAN ST. — P.O. BOX 52329
LABORATORIES 103-107 STOCKTON STREET
JACKSONVILLE, FLORIDA 32201
(904) 353-5761

Laboratory No. 60202 August 15, 1984

Sample of Water

Date Received July 11, 1984

For Geraghty & Miller, Inc., P. O. Box 271173, Tampa, Fl. 33688

Marks: S-2-CF Cecil Field

CERTIFICATE OF ANALYSIS OR TESTS

METHOD 601-All Units ppb	CONCENTRATION	DETECTION LIMIT
Bromodichloromethane	BDL	1.0
Bromoform	BDL	1.0
Bromomethane	BDL	1.0
Carbon Tetrachloride	BDL	1.0
Chlorobenzene	BDL	1.0
Chloroethane	BDL	1.0
2-Chloroethylvinyl Ether	BDL	1.0
Chloroform	BDL	1.0
Chloromethane	BDL	1.0
Dibromochloromethane	BDL	1.0
1,2-Dichlorobenzene	BDL	1.0
1,3-Dichlorobenzene	BDL	1.0
1,4-Dichlorobenzene	BDL	1.0
Dichlorodifluoromethane	BDL	1.0
1,1-Dichloroethane	BDL	1.0
1,2-Dichloroethane	BDL	1.0
1,1-Dichloroethene	BDL	1.0
Trans-1,2-Dichloroethene	BDL	1.0
1,2-Dichloropropane	BDL	1.0
Cis-1,3-Dichloropropene	BDL	1.0
Trans-1,3-Dichloropropene	BDL	1.0
Methylene Chloride	BDL	1.0
1,1,2,2,-Tetrachloroethane	BDL	1.0
Tetrachloroethene	BDL	1.0
1,1,1-Trichloroethane	BDL	1.0
1,1,2-Trichloroethane	BDL	1.0
Trichloroethene	BDL	1.0
Trichlorofluoromethane	BDL	1.0
Vinyl Chloride	BDL	1.0

BDL=BELOW DETECTION LIMIT

Respectfully submitted,

TECHNICAL SERVICES, INC.

BY Harvey C. Gray, Jr.

LABORATORY I.D. NO. 82145

TECHNICAL SERVICES, INC.

ENVIRONMENTAL CONSULTANTS — INDUSTRIAL CHEMISTS
OFFICE 2471 SWAN ST. — P.O. BOX 52329
LABORATORIES 103-107 STOCKTON STREET
JACKSONVILLE, FLORIDA 32201
(904) 353-5761

Laboratory No. 60202 August 15, 19 84

Sample of Water

Date Received July 11, 1984

For Geraghty & Miller, Inc., P. O. Box 271173, Tampa, Fl. 33688

Marks: S-3-CF Cecil Field

CERTIFICATE OF ANALYSIS OR TESTS

METHOD 601-All Units ppb	CONCENTRATION	DETECTION LIMIT
Bromodichloromethane	BDL	1.0
Bromoform	BDL	1.0
Bromomethane	BDL	1.0
Carbon Tetrachloride	BDL	1.0
Chlorobenzene	BDL	1.0
Chloroethane	BDL	1.0
2-Chloroethylvinyl Ether	BDL	1.0
Chloroform	BDL	1.0
Chloromethane	BDL	1.0
Dibromochloromethane	BDL	1.0
1,2-Dichlorobenzene	BDL	1.0
1,3-Dichlorobenzene	BDL	1.0
1,4-Dichlorobenzene	BDL	1.0
Dichlorodifluoromethane	BDL	1.0
1,1-Dichloroethane	BDL	1.0
1,2-Dichloroethane	BDL	1.0
1,1-Dichloroethene	BDL	1.0
Trans-1,2-Dichloroethene	BDL	1.0
1,2-Dichloropropane	BDL	1.0
Cis-1,3-Dichloropropene	BDL	1.0
Trans-1,3-Dichloropropene	BDL	1.0
Methylene Chloride	BDL	1.0
1,1,2,2,-Tetrachloroethane	BDL	1.0
Tetrachloroethene	BDL	1.0
1,1,1-Trichloroethane	BDL	1.0
1,1,2-Trichloroethane	BDL	1.0
Trichloroethene	BDL	1.0
Trichlorofluoromethane	BDL	1.0
Vinyl Chloride	BDL	1.0

BDL=BELOW DETECTION LIMIT

Respectfully submitted,

TECHNICAL SERVICES, INC.

BY Harvey C. Gray, Jr.

LABORATORY I.D. NO. 82145

TECHNICAL SERVICES, INC.

ENVIRONMENTAL CONSULTANTS — INDUSTRIAL CHEMISTS
OFFICE 2471 SWAN ST. — P.O. BOX 52329
LABORATORIES 103-107 STOCKTON STREET
JACKSONVILLE, FLORIDA 32201
(904) 353-5761

Laboratory No. 60202

August 15, 1984

Sample of Water

Date Received July 11, 1984

For Geraghty & Miller Inc., P. O. BOX 271173, Tampa, Fl. 33688

Marks: SA-1-CF Cecil Field

CERTIFICATE OF ANALYSIS OR TESTS

METHOD 601-All Units ppb	CONCENTRATION	DETECTION LIMIT
Bromodichloromethane	BDL	1.0
Bromoform	BDL	1.0
Bromomethane	BDL	1.0
Carbon Tetrachloride	BDL	1.0
Chlorobenzene	BDL	1.0
Chloroethane	BDL	1.0
2-Chloroethylvinyl Ether	BDL	1.0
Chloroform	BDL	1.0
Chloromethane	BDL	1.0
Dibromochloromethane	BDL	1.0
1,2-Dichlorobenzene	BDL	1.0
1,3-Dichlorobenzene	BDL	1.0
1,4-Dichlorobenzene	BDL	1.0
Dichlorodifluoromethane	BDL	1.0
1,1-Dichloroethane	BDL	1.0
1,2-Dichloroethane	BDL	1.0
1,1-Dichloroethene	BDL	1.0
Trans-1,2-Dichloroethene	BDL	1.0
1,2-Dichloropropane	BDL	1.0
Cis-1,3-Dichloropropene	BDL	1.0
Trans-1,3-Dichloropropene	BDL	1.0
Methylene Chloride	BDL	1.0
1,1,2,2,-Tetrachloroethane	BDL	1.0
Tetrachloroethene	BDL	1.0
1,1,1-Trichloroethane	BDL	1.0
1,1,2-Trichloroethane	BDL	1.0
Trichloroethene	BDL	1.0
Trichlorofluoromethane	BDL	1.0
Vinyl Chloride	BDL	1.0

BDL=BELOW DETECTION LIMIT

Respectfully submitted,

TECHNICAL SERVICES, INC.

BY Harvey C. Gray, Jr.

LABORATORY I.D. NO. 82145

WATER-QUALITY RESULTS AT THE GREASE PIT AREA

THIRD QUARTER

TECHNICAL SERVICES, INC.

ENVIRONMENTAL CONSULTANTS — INDUSTRIAL CHEMISTS
OFFICE 2471 SWAN ST. — P.O. BOX 52329
LABORATORIES 103-107 STOCKTON STREET
JACKSONVILLE, FLORIDA 32201
(904) 353-5761

Laboratory No. 63001 November 7, 1984

Sample of WASTEWATER

Date Received October 18, 1984

For GERAGHTY & MILLER, P.O. Box 271173, Tampa, FL 33688
Attn: Mr. Fred Sequiti

Marks: Project No. T290CF1, S-1-CF, 10/17/84, 1515 hrs.

CERTIFICATE OF ANALYSIS OR TESTS

Chloride, mg/l:	32.1
Sulfates, mg/l:	<3
pH:	4.5
Specific Conductance, µmhos/cm:	120
Total Dissolved Solids, mg/l:	85
Nitrate, mg/l N:	<0.02
Iron, mg/l:	1.88
Fluoride, mg/l:	0.076
Arsenic, mg/l:	<0.002
Barium, mg/l:	0.041
Cadmium, mg/l:	0.005
Chromium, mg/l:	<0.01
Lead, mg/l:	<0.04
Mercury, mg/l:	0.0002
Selenium, mg/l:	<0.005
Silver, mg/l:	<0.005

Respectfully submitted,

TECHNICAL SERVICES, INC.

BY Henry C. Gray, Jr.

TECHNICAL SERVICES, INC.

ENVIRONMENTAL CONSULTANTS — INDUSTRIAL CHEMISTS
OFFICE 2471 SWAN ST. — P.O. BOX 52329
LABORATORIES 103-107 STOCKTON STREET
JACKSONVILLE, FLORIDA 32201
(904) 353-5761

Laboratory No. 63001 November 7, 1984

Sample of WATER

Date Received October 18, 1984

For GERAGHTY & MILLER, P.O. Box 271173, Tampa, FL 33688
Attn: Mr. Fred Sequiti

Marks: Project No T290CF1, S-1-CF, 10/17/84, 1515 hrs.

CERTIFICATE OF ANALYSIS OR TESTS

EPA Method 601	CONCENTRATION,ppb	DETECTION LIMIT,ppb
Bromodichloromethane	BDL*	1.0
Bromoform	BDL	1.0
Bromomethane	BDL	1.0
Carbon tetrachloride	BDL	1.0
Chlorobenzene	BDL	1.0
Chloroethane	BDL	1.0
2-Chloroethylvinyl ether	BDL	1.0
Chloroform	BDL	1.0
Chloromethane	BDL	1.0
Dibromochloromethane	BDL	1.0
1,2-Dichlorobenzene	BDL	1.0
1,3-Dichlorobenzene	BDL	1.0
1,4-Dichlorobenzene	BDL	1.0
Dichlorodifluoromethane	BDL	1.0
1,1-Dichloroethane	BDL	1.0
1,2-Dichloroethane	BDL	1.0
1,1-Dichloroethene	BDL	1.0
trans-1,2-Dichloroethene	BDL	1.0
1,2-Dichloropropane	BDL	1.0
cis-1,3-Dichloropropene	BDL	1.0
trans-1,3-Dichloropropene	BDL	1.0
Methylene chloride	BDL	1.0
1,1,2,2-Tetrachloroethane	BDL	1.0
Tetrachloroethene	BDL	1.0
1,1,1-Trichloroethane	BDL	1.0
1,1,2-Trichloroethane	BDL	1.0
Trichloroethene	BDL	1.0
Trichlorofluoromethane	BDL	1.0
Vinyl chloride	BDL	1.0

*BDL = Below Detection Limit

Respectfully submitted,

TECHNICAL SERVICES, INC.

BY Harvey C. Gray, Jr.

LABORATORY I.D. NO. 82145

TECHNICAL SERVICES, INC.

ENVIRONMENTAL CONSULTANTS — INDUSTRIAL CHEMISTS
OFFICE 2471 SWAN ST. — P.O. BOX 52329
LABORATORIES 103-107 STOCKTON STREET
JACKSONVILLE, FLORIDA 32201
(904) 353-5761

Laboratory No. 63001 November 7, 1984

Sample of WASTEWATER

Date Received October 18, 1984

For GERAGHTY & MILLER, P.O. Box 271173, Tampa, FL 33688
Attn: Mr. Fred Sequiti

Marks: Project No. T290CF1, S-1-CF, 10/17/84, 1515 hrs.

CERTIFICATE OF ANALYSIS OR TESTS

EPA Method 602	CONCENTRATION, ppb	DETECTION LIMIT, ppb
Benzene	BDL*	1.0
Ethyl Benzene	BDL	1.0
Toluene	BDL	1.0
Xylenes	BDL	1.0

*BDL=Below Detection Limit

Respectfully submitted,

TECHNICAL SERVICES, INC.

BY Harvey C. Gray, Jr.

LABORATORY I.D. NO. 82145

TECHNICAL SERVICES, INC.

ENVIRONMENTAL CONSULTANTS — INDUSTRIAL CHEMISTS
OFFICE 2471 SWAN ST. — P.O. BOX 52329
LABORATORIES 103-107 STOCKTON STREET
JACKSONVILLE, FLORIDA 32201
(904) 353-5761

Laboratory No. 63004 November 1, 19 84

Sample of Wastewater

Date Received October 18, 1984

For Geraghty & Miller, P. O. Box 271173, Tampa, Fl. 33688

Marks: Attn: Mr. Fred Sequiti
Project #T290CF-1, S-2-CF, 10/17/84, 1605 hrs.

CERTIFICATE OF ANALYSIS OR TESTS

pH	5.1
Specific Conductance, umhos:	30
Total Dissolved Solids, mg/l:	27
Iron, mg/l:	0.15

Respectfully submitted,

TECHNICAL SERVICES, INC.

By Harry C. Gray, Jr.

TECHNICAL SERVICES, INC.

ENVIRONMENTAL CONSULTANTS — INDUSTRIAL CHEMISTS
OFFICE 2471 SWAN ST. — P.O. BOX 52329
LABORATORIES 103-107 STOCKTON STREET
JACKSONVILLE, FLORIDA 32201
(904) 353-5761

Laboratory No. 63004 November 1, 1984

Sample of Wastewater

Date Received October 18, 1984

For Geraghty & Miller, P. O. Box 271173, Tampa, Fl. 33688

Marks: Attn: Mr. Fred Sequiti

Project #T290CF-1, S-2-CF, 10/17/84, 1605 hrs.

CERTIFICATE OF ANALYSIS OR TESTS

EPA Method 602	CONCENTRATION, ppb	DETECTION LIMIT, ppb
Benzene	BDL*	1.0
Ethyl Benzene	BDL	1.0
Toluene	BDL	1.0
Xylenes	BDL	1.0

*BDL=Below Detection Limit

Respectfully submitted,

TECHNICAL SERVICES, INC.

BY Harvey C. Gray, Jr.

LABORATORY I.D. NO. 82145

TECHNICAL SERVICES, INC.

ENVIRONMENTAL CONSULTANTS — INDUSTRIAL CHEMISTS
OFFICE 2471 SWAN ST. — P.O. BOX 52329
LABORATORIES 103-107 STOCKTON STREET
JACKSONVILLE, FLORIDA 32201
(904) 353-5761

Laboratory No. 63004 November 1, 19 84

Sample of Wastewater

Date Received October 18, 1984

For Geraghty & Miller, P. O. Box 271173, Tampa, Fl. 33688

Marks: Attn: Mr. Fred Sequiti
Project #T290CF-1, S-2-CF, 10/17/84, 1605 hrs.

CERTIFICATE OF ANALYSIS OR TESTS

EPA Method 601	CONCENTRATION, ppb	DETECTION LIMIT, ppb
Bromodichloromethane	BDL*	1.0
Bromoform	BDL	1.0
Bromomethane	BDL	1.0
Carbon tetrachloride	BDL	1.0
Chlorobenzene	BDL	1.0
Chloroethane	BDL	1.0
2-Chloroethylvinyl ether	BDL	1.0
Chloroform	BDL	1.0
Chloromethane	BDL	1.0
Dibromochloromethane	BDL	1.0
1,2-Dichlorobenzene	BDL	1.0
1,3-Dichlorobenzene	BDL	1.0
1,4-Dichlorobenzene	BDL	1.0
Dichlorodifluoromethane	BDL	1.0
1,1-Dichloroethane	BDL	1.0
1,2-Dichloroethane	BDL	1.0
1,1-Dichloroethene	BDL	1.0
trans-1,2-Dichloroethene	BDL	1.0
1,2-Dichloropropane	BDL	1.0
cis-1,3-Dichloropropene	BDL	1.0
trans-1,3-Dichloropropene	BDL	1.0
Methylene chloride	BDL	1.0
1,1,2,2-Tetrachloroethane	BDL	1.0
Tetrachloroethene	BDL	1.0
1,1,1-Trichloroethane	BDL	1.0
1,1,2-Trichloroethane	BDL	1.0
Trichloroethene	BDL	1.0
Trichlorofluoromethane	BDL	1.0
Vinyl chloride	BDL	1.0

*BDL = Below Detection Limit

Respectfully submitted,

TECHNICAL SERVICES, INC.

By Harvey C. Gray, Jr.

LABORATORY I.D. NO. 82145

TECHNICAL SERVICES, INC.

ENVIRONMENTAL CONSULTANTS — INDUSTRIAL CHEMISTS
OFFICE 2471 SWAN ST. — P.O. BOX 52329
LABORATORIES 103-107 STOCKTON STREET
JACKSONVILLE, FLORIDA 32201
(904) 353-5761

Laboratory No. 63006 November 1, 1984

Sample of Wastewater

Date Received October 18, 1984

For Geraghty & Miller, P. O. Box 271173, Tampa, Fl. 33688
Attn: Mr. Fred Sequiti

Marks: T290CF1, S-3-CF, 10/17/84, 1640 hrs.

CERTIFICATE OF ANALYSIS OR TESTS

pH	4.2
Specific Conductance, umhos:	55
Total Dissolved Solids, mg/l:	16
Iron, mg/l:	0.18

Respectfully submitted,

TECHNICAL SERVICES, INC.

BY Harvey C. Gray

TECHNICAL SERVICES, INC.

ENVIRONMENTAL CONSULTANTS — INDUSTRIAL CHEMISTS
OFFICE 2471 SWAN ST. — P.O. BOX 52329
LABORATORIES 103-107 STOCKTON STREET
JACKSONVILLE, FLORIDA 32201
(904) 353-5761

Laboratory No. 63006 November 1, 19 84

Sample of Wastewater

Date Received October 18, 1984

For Geraghty & Miller, P. O. Box 271173, Tampa, Fl. 33688

Marks: Attn: Mr. Fred Sequiti
T290CF1, S-3-CF, 10/17/84, 1640 hrs.

CERTIFICATE OF ANALYSIS OR TESTS

EPA Method 601	CONCENTRATION,ppb	DETECTION LIMIT,ppb
Bromodichloromethane	BDL*	1.0
Bromoform	BDL	1.0
Bromomethane	BDL	1.0
Carbon tetrachloride	BDL	1.0
Chlorobenzene	BDL	1.0
Chloroethane	BDL	1.0
2-Chloroethylvinyl ether	BDL	1.0
Chloroform	BDL	1.0
Chloromethane	BDL	1.0
Dibromochloromethane	BDL	1.0
1,2-Dichlorobenzene	BDL	1.0
1,3-Dichlorobenzene	BDL	1.0
1,4-Dichlorobenzene	BDL	1.0
Dichlorodifluoromethane	BDL	1.0
1,1-Dichloroethane	BDL	1.0
1,2-Dichloroethane	BDL	1.0
1,1-Dichloroethene	BDL	1.0
trans-1,2-Dichloroethene	BDL	1.0
1,2-Dichloropropane	BDL	1.0
cis-1,3-Dichloropropene	BDL	1.0
trans-1,3-Dichloropropene	BDL	1.0
Methylene chloride	BDL	1.0
1,1,2,2-Tetrachloroethane	BDL	1.0
Tetrachloroethene	BDL	1.0
1,1,1-Trichloroethane	BDL	1.0
1,1,2-Trichloroethane	BDL	1.0
Trichloroethene	BDL	1.0
Trichlorofluoromethane	BDL	1.0
Vinyl chloride	BDL	1.0

*BDL = Below Detection Limit

Respectfully submitted,

TECHNICAL SERVICES, INC.

BY Henry C. Gray, Jr.

LABORATORY I.D. NO. 82145

TECHNICAL SERVICES, INC.

ENVIRONMENTAL CONSULTANTS — INDUSTRIAL CHEMISTS
OFFICE 2471 SWAN ST. — P.O. BOX 52329
LABORATORIES 103-107 STOCKTON STREET
JACKSONVILLE, FLORIDA 32201
(904) 353-5761

Laboratory No. 63006 November 1, 1984

Sample of Wastewater

Date Received October 18, 1984

For Geraghty & Miller, P. O. Box 271173, Tampa, Fl. 33688

Attn: Mr. Fred Sequiti

Marks:

T290CF1, S-3-CF, 10/17/84, 1640 hrs.

CERTIFICATE OF ANALYSIS OR TESTS

EPA Method 602	CONCENTRATION, ppb	DETECTION LIMIT, ppb
Benzene	BDL*	1.0
Ethyl Benzene	BDL	1.0
Toluene	BDL	1.0
Xylenes	BDL	1.0

*BDL=Below Detection Limit

Respectfully submitted,

TECHNICAL SERVICES, INC.

BY Harvey C. Gray, Jr.

LABORATORY I.D NO. 82145

TECHNICAL SERVICES, INC.

ENVIRONMENTAL CONSULTANTS — INDUSTRIAL CHEMISTS
OFFICE 2471 SWAN ST. — P.O. BOX 52329
LABORATORIES 103-107 STOCKTON STREET
JACKSONVILLE, FLORIDA 32201
(904) 353-5761

Laboratory No. 63000 November 1, 19 84

Sample of Wastewater

Date Received October 18, 1984

For Geraghty & Miller, P. O. Box 271173, Tampa, Fl. 33688

Marks: Project #T290CF1, SA-1-CF, 10/17/84, 1223 hr.

CERTIFICATE OF ANALYSIS OR TESTS

pH	7.4
Specific Conductance, umhos:	550
Total Dissolved Solids, mg/l:	333
Iron, mg/l:	0.04

Respectfully submitted,

TECHNICAL SERVICES, INC.

By Harvey C. Gray, Jr.

TECHNICAL SERVICES, INC.

ENVIRONMENTAL CONSULTANTS — INDUSTRIAL CHEMISTS
OFFICE 2471 SWAN ST. — P.O. BOX 52329
LABORATORIES 103-107 STOCKTON STREET
JACKSONVILLE, FLORIDA 32201
(904) 353-5761

Laboratory No. 63000 November 1, 19 84

Sample of Wastewater

Date Received October 18, 1984

For Geraghty & Miller, P. O. Box 271173, Tampa, Fl. 33688

Attn: Mr. Fred Sequiti

Marks: SA-1-CF, 10/17/84, 1223 hrs.

CERTIFICATE OF ANALYSIS OR TESTS

EPA Method 601	CONCENTRATION,ppb	DETECTION LIMIT,ppb
Bromodichloromethane	BDL*	1.0
Bromoform	BDL	1.0
Bromomethane	BDL	1.0
Carbon tetrachloride	BDL	1.0
Chlorobenzene	BDL	1.0
Chloroethane	BDL	1.0
2-Chloroethylvinyl ether	BDL	1.0
Chloroform	BDL	1.0
Chloromethane	BDL	1.0
Dibromochloromethane	BDL	1.0
1,2-Dichlorobenzene	BDL	1.0
1,3-Dichlorobenzene	BDL	1.0
1,4-Dichlorobenzene	BDL	1.0
Dichlorodifluoromethane	BDL	1.0
1,1-Dichloroethane	BDL	1.0
1,2-Dichloroethane	BDL	1.0
1,1-Dichloroethene	BDL	1.0
trans-1,2-Dichloroethene	BDL	1.0
1,2-Dichloropropane	BDL	1.0
cis-1,3-Dichloropropene	BDL	1.0
trans-1,3-Dichloropropene	BDL	1.0
Methylene chloride	BDL	1.0
1,1,2,2-Tetrachloroethane	BDL	1.0
Tetrachloroethene	BDL	1.0
1,1,1-Trichloroethane	BDL	1.0
1,1,2-Trichloroethane	BDL	1.0
Trichloroethene	BDL	1.0
Trichlorofluoromethane	BDL	1.0
Vinyl chloride	BDL	1.0

*BDL = Below Detection Limit

Respectfully submitted,

TECHNICAL SERVICES, INC.

By Harvey C. Gray, Jr.

LABORATORY I.D. NO. 82145

TECHNICAL SERVICES, INC.

ENVIRONMENTAL CONSULTANTS — INDUSTRIAL CHEMISTS
OFFICE 2471 SWAN ST. — P.O. BOX 52329
LABORATORIES 103-107 STOCKTON STREET
JACKSONVILLE, FLORIDA 32201
(904) 353-5761

Laboratory No. 63000 November 1, 19 84

Sample of Wastewater

Date Received October 18, 1984

For Geraghty & Miller, P. O. Box 271173, Tampa, Fl. 33688

Marks: Attn: Mr. Fred Sequiti
SA-1-CF, 10/17/84, 1223 hr.

CERTIFICATE OF ANALYSIS OR TESTS

EPA Method 602	CONCENTRATION, ppb	DETECTION LIMIT, ppb
Benzene	BDL*	1.0
Ethyl Benzene	BDL	1.0
Toluene	BDL	1.0
Xylenes	BDL	1.0

*BDL=Below Detection Limit

Respectfully submitted,

TECHNICAL SERVICES, INC.

BY Harvey C. Gray, Jr.

LABORATORY I.D. NO. 82145

WATER-QUALITY RESULTS AT THE GREASE PIT AREA

FOURTH QUARTER

TECHNICAL SERVICES, INC.

ENVIRONMENTAL CONSULTANTS — INDUSTRIAL CHEMISTS
OFFICE 2471 SWAN ST. — P.O. BOX 52329
LABORATORIES 103-107 STOCKTON STREET
JACKSONVILLE, FLORIDA 32201
(904) 353-5761

Laboratory No. 65309 March 26, 19 85

Sample of WATER

Date Received February 20, 1985

For GERAGHTY AND MILLER, P O. Box 271173, Tampa, FL 33688
Attn: Mr. Fred Sequiti

Marks:
Cecil Field, 2/20/85

CERTIFICATE OF ANALYSIS OR TESTS

	S-1-CF	S-4-CF	SA-2-CF	SW-1-CF
pH:	5.0	7.0	8.2	6.9
Total Dissolved Solids, mg/l:	89	209	293	186
Arsenic, mg/l:	<0.002	<0.002	<0.002	<0.002
Barium, mg/l:	0.028	0.042	0.063	0.069
Cadmium, mg/l:	<0.005	<0.005	<0.005	<0.005
Chromium, mg/l:	<0.01	<0.01	<0.01	<0.01
Lead, mg/l:	<0.03	<0.03	<0.03	<0.03
Mercury, mg/l:	<0.0002	0.0002	0.0002	<0.0002
Selenium, mg/l:	<0.003	<0.003	<0.003	<0.003
Silver, mg/l:	<0.005	<0.005	<0.005	<0.005
Iron, mg/l:	6.47	1.24	0.31	1.84
Chloride, mg/l:	26.4	8.5	12.4	24.2
Sulfate, mg/l:	4	<1	<1	26
Fluoride, mg/l:	0.061	0.353	0.916	0.232
Nitrate, mg/l N:	<0.02	<0.02	<0.02	0.760

Respectfully submitted,

TECHNICAL SERVICES, INC.

By Henry C. Gray, Jr.

LABORATORY I.D. NO 82145

TECHNICAL SERVICES, INC.

ENVIRONMENTAL CONSULTANTS — INDUSTRIAL CHEMISTS
OFFICE 2471 SWAN ST. — P.O. BOX 52329
LABORATORIES 103-107 STOCKTON STREET
JACKSONVILLE, FLORIDA 32201
(904) 353-5761

Laboratory No. 65310 March 14, 19 85

Sample of WATER

Date Received February 20, 1985

For GERAGHTY AND MILLER, P.O. Box 271173, Tampa, FL 33688
Attn: Mr. Fred Sequiti

Marks:
Cecil Field, 2/20/85

CERTIFICATE OF ANALYSIS OR TESTS

	S-2-CF	S-3-CF	SA-1-CF
Total Dissolved Solids, mg/l:	22	69	350
Iron, mg/l:	1.21	0.25	0.13
pH:	5.0	5.25	7.4

Respectfully submitted,

TECHNICAL SERVICES, INC.

BY Harvey C. Gray, Jr.

LABORATORY I.D. NO. 82145

TECHNICAL SERVICES, INC.

ENVIRONMENTAL CONSULTANTS — INDUSTRIAL CHEMISTS
OFFICE 2471 SWAN ST. — P.O. BOX 52329
LABORATORIES 103-107 STOCKTON STREET
JACKSONVILLE, FLORIDA 32201
(904) 353-5761

Laboratory No. 65309 March 27, 19 85

Sample of WATER

Date Received February 20, 1985

For GERAGHTY & MILLER, P.O. Box 271173, Tampa, FL 33688
Attn: Mr. Fred Sequiti

Marks:
Cecil Field, 2/20/85, S-1-CF

CERTIFICATE OF ANALYSIS OR TESTS

EPA Method 601	CONCENTRATION, ppb	DETECTION LIMIT, ppb
Bromodichloromethane	BDL*	1.0
Bromoform	BDL	1.0
Bromomethane	BDL	1.0
Carbon tetrachloride	BDL	1.0
Chlorobenzene	BDL	1.0
Chloroethane	BDL	1.0
2-Chloroethylvinyl ether	BDL	10.0
Chloroform	BDL	1.0
Chloromethane	BDL	1.0
Dibromochloromethane	BDL	1.0
1,2-Dichlorobenzene	BDL	1.0
1,3-Dichlorobenzene	BDL	1.0
1,4-Dichlorobenzene	BDL	1.0
Dichlorodifluoromethane	BDL	1.0
1,1-Dichloroethane	BDL	1.0
1,2-Dichloroethane	BDL	1.0
1,1-Dichloroethene	BDL	1.0
trans-1,2-Dichloroethene	BDL	1.0
1,2-Dichloropropane	BDL	1.0
cis-1,3-Dichloropropene	BDL	1.0
trans-1,3-Dichloropropene	BDL	1.0
Methylene chloride	BDL	1.0
1,1,2,2-Tetrachloroethane	BDL	1.0
Tetrachloroethene	BDL	1.0
1,1,1-Trichloroethane	BDL	1.0
1,1,2-Trichloroethane	BDL	1.0
Trichloroethene	BDL	1.0
Trichlorofluoromethane	BDL	1.0
Vinyl chloride	BDL	1.0

*BDL = Below Detection Limit

Respectfully submitted,

TECHNICAL SERVICES, INC.

BY Henry C. Gray, Jr.

LABORATORY I.D. NO 82145

TECHNICAL SERVICES, INC.

ENVIRONMENTAL CONSULTANTS — INDUSTRIAL CHEMISTS
OFFICE 2471 SWAN ST. — P.O. BOX 52329
LABORATORIES 103-107 STOCKTON STREET
JACKSONVILLE, FLORIDA 32201
(904) 353-5761

Laboratory No. 65310 March 14, 1985

Sample of WATER

Date Received February 20, 1985

For GERAGHTY AND MILLER, P.O. Box 271173, Tampa, FL 33688
Attn: Mr. Fred Sequiti

Marks: Cecil Field, 2/20/85
S-2-CF

CERTIFICATE OF ANALYSIS OR TESTS

EPA Method 601	CONCENTRATION, ppb	DETECTION LIMIT, ppb
Bromodichloromethane	BDL*	1.0
Bromoform	BDL	1.0
Bromomethane	BDL	1.0
Carbon tetrachloride	BDL	1.0
Chlorobenzene	BDL	1.0
Chloroethane	BDL	1.0
2-Chloroethylvinyl ether	BDL	1.0
Chloroform	BDL	1.0
Chloromethane	BDL	1.0
Dibromochloromethane	BDL	1.0
1,2-Dichlorobenzene	BDL	1.0
1,3-Dichlorobenzene	BDL	1.0
1,4-Dichlorobenzene	BDL	1.0
Dichlorodifluoromethane	BDL	1.0
1,1-Dichloroethane	BDL	1.0
1,2-Dichloroethane	BDL	1.0
1,1-Dichloroethene	BDL	1.0
trans-1,2-Dichloroethene	BDL	1.0
1,2-Dichloropropane	BDL	1.0
cis-1,3-Dichloropropene	BDL	1.0
trans-1,3-Dichloropropene	BDL	1.0
Methylene chloride	BDL	1.0
1,1,2,2-Tetrachloroethane	BDL	1.0
Tetrachloroethene	BDL	1.0
1,1,1-Trichloroethane	BDL	1.0
1,1,2-Trichloroethane	BDL	1.0
Trichloroethene	BDL	1.0
Trichlorofluoromethane	BDL	1.0
Vinyl chloride	BDL	1.0

*BDL = Below Detection Limit

Respectfully submitted,

TECHNICAL SERVICES, INC.

BY Harvey C. Gray, Jr.

LABORATORY I.D. NO. 82145

TECHNICAL SERVICES, INC.

ENVIRONMENTAL CONSULTANTS — INDUSTRIAL CHEMISTS
OFFICE 2471 SWAN ST. — P.O. BOX 52329
LABORATORIES 103-107 STOCKTON STREET
JACKSONVILLE, FLORIDA 32201
(904) 353-5761

Laboratory No. 65310 March 14, 1985

Sample of WATER

Date Received February 20, 1985

For GERAGHTY AND MILLER, P.O. Box 271173, Tampa, FL 33688
Attn: Mr. Fred Sequiti

Marks: Cecil Field, 2/20/85
S-3-CF

CERTIFICATE OF ANALYSIS OR TESTS

EPA Method 601	CONCENTRATION,ppb	DETECTION LIMIT,ppb
Bromodichloromethane	BDL*	1.0
Bromoform	BDL	1.0
Bromomethane	BDL	1.0
Carbon tetrachloride	BDL	1.0
Chlorobenzene	BDL	1.0
Chloroethane	BDL	1.0
2-Chloroethylvinyl ether	BDL	1.0
Chloroform	BDL	1.0
Chloromethane	BDL	1.0
Dibromochloromethane	BDL	1.0
1,2-Dichlorobenzene	BDL	1.0
1,3-Dichlorobenzene	BDL	1.0
1,4-Dichlorobenzene	BDL	1.0
Dichlorodifluoromethane	BDL	1.0
1,1-Dichloroethane	BDL	1.0
1,2-Dichloroethane	BDL	1.0
1,1-Dichloroethene	BDL	1.0
trans-1,2-Dichloroethene	BDL	1.0
1,2-Dichloropropane	BDL	1.0
cis-1,3-Dichloropropene	BDL	1.0
trans-1,3-Dichloropropene	BDL	1.0
Methylene chloride	BDL	1.0
1,1,2,2-Tetrachloroethane	BDL	1.0
Tetrachloroethene	BDL	1.0
1,1,1-Trichloroethane	BDL	1.0
1,1,2-Trichloroethane	BDL	1.0
Trichloroethene	BDL	1.0
Trichlorofluoromethane	BDL	1.0
Vinyl chloride	BDL	1.0

*BDL = Below Detection Limit

Respectfully submitted,

TECHNICAL SERVICES, INC.

By Harvey C. Gray, Jr.

LABORATORY I.D. NO. 82145

TECHNICAL SERVICES, INC.

ENVIRONMENTAL CONSULTANTS — INDUSTRIAL CHEMISTS
OFFICE 2471 SWAN ST. — P.O. BOX 52329
LABORATORIES 103-107 STOCKTON STREET
JACKSONVILLE, FLORIDA 32201
(904) 353-5761

Laboratory No. 65310 March 14, 19 85

Sample of WATER

Date Received February 20, 1985

For GERAGHTY AND MILLER, P.O. Box 271173, Tampa, FL 33688
Attn: Mr. Fred Sequiti

Marks: Cecil Field, 2/20/85
SA-1-CF

CERTIFICATE OF ANALYSIS OR TESTS

EPA Method 601	CONCENTRATION, ppb	DETECTION LIMIT, ppb
Bromodichloromethane	BDL*	1.0
Bromoform	BDL	1.0
Bromomethane	BDL	1.0
Carbon tetrachloride	BDL	1.0
Chlorobenzene	BDL	1.0
Chloroethane	BDL	1.0
2-Chloroethylvinyl ether	BDL	1.0
Chloroform	BDL	1.0
Chloromethane	BDL	1.0
Dibromochloromethane	BDL	1.0
1,2-Dichlorobenzene	BDL	1.0
1,3-Dichlorobenzene	BDL	1.0
1,4-Dichlorobenzene	BDL	1.0
Dichlorodifluoromethane	BDL	1.0
1,1-Dichloroethane	BDL	1.0
1,2-Dichloroethane	BDL	1.0
1,1-Dichloroethene	BDL	1.0
trans-1,2-Dichloroethene	BDL	1.0
1,2-Dichloropropane	BDL	1.0
cis-1,3-Dichloropropene	BDL	1.0
trans-1,3-Dichloropropene	BDL	1.0
Methylene chloride	BDL	1.0
1,1,2,2-Tetrachloroethane	BDL	1.0
Tetrachloroethene	BDL	1.0
1,1,1-Trichloroethane	BDL	1.0
1,1,2-Trichloroethane	BDL	1.0
Trichloroethene	BDL	1.0
Trichlorofluoromethane	BDL	1.0
Vinyl chloride	BDL	1.0

*BDL = Below Detection Limit

Respectfully submitted,

TECHNICAL SERVICES, INC.

BY Harvey C. Gray, Jr.

LABORATORY I.D. NO. 82145

WATER-QUALITY RESULTS AT THE LANDFILL AREA

FIRST QUARTER

TECHNICAL SERVICES, INC.

ENVIRONMENTAL CONSULTANTS — INDUSTRIAL CHEMISTS
OFFICE 2471 SWAN ST. — P.O. BOX 52329
LABORATORIES 103-107 STOCKTON STREET
JACKSONVILLE, FLORIDA 32201
(904) 353-5761

Laboratory No. 58415 May 23, 1984

Sample of WATER

Date Received April 13, 1984

For GERAGHTY & MILLER, INC., Post Office Box 271173, Tampa, Florida 33688 ATTN: Mr. Fred Seguiti

Marks: S-4 Cecil Field

CERTIFICATE OF ANALYSIS OR TESTS

Arsenic, mg/l	<0.002
Barium, mg/l	0.049
Cadmium, mg/l	<0.005
Chromium, mg/l	<0.010
Lead, mg/l	<0.030
Mercury, mg/l	<0.0002
Selenium, mg/l	<0.003
Silver, mg/l	<0.006
Copper, mg/l	<0.003
Iron, mg/l	0.524
Manganese, mg/l	0.045
Zinc, mg/l	0.124
Nitrate, mg/l N	0.012
Hydrogen Sulfide, mg/l	0.1
Chloride, mg/l	9.5
Fluoride, mg/l	0.407
pH	7.5
Sulfate, mg/l	3.5
Total Dissolved Solids, mg/l	196
Endrin, ppm	<0.00002
Lindane, ppm	<0.00001
Methoxychlor, ppm	<0.0001
Toxaphene, ppm	<0.0002
2,4-D, ppm	<0.001
2,4,5TP (Silvex) ppm	<0.0005
Gross Alpha, pCi/liter	<2
Gross Beta, pCi/liter	<3
*Total Organic Halide	51 ug/l

*Supplemental Report

Respectfully submitted,

TECHNICAL SERVICES, INC.

By Harvey C. Gray, Jr.

CAMBRIDGE ANALYTICAL ASSOCIATES, INC.

Table 2 (cont'd.). Concentrations of Volatile Organic Compounds (Method 601[1])

Client: Geraghty and Miller - Tampa Report No.: 84-439

		Concentration ug/l (ppb)[2]
Compound	Sample ID: CAA ID:	S-4 8401958
chloromethane		
dichlorodifluoromethane		
vinyl chloride		
chloroethane		
methylene chloride		
trichlorofluoromethane		
1,1-dichloroethene		
1,1-dichloroethane		
trans-1,2-dichloroethene		
chloroform		
1,2-dichloroethane		
1,1,1-trichloroethane		
carbon tetrachloride		
bromodichloromethane		
1,2-dichloropropane		
trans-1,3-dichloropropane		
trichloroethene		
dibromochloromethane		
1,1,2-trichloroethane		
cis-1,3 dichloropropene		
2-chloroethylvinyl ether		
bromoform		
1,1,2,2-tetrachloroethane		
tetrachloroethene		
chlorobenzene		
1,2 dibromoethane (EDB)		N/A
Detection Limit		0.1

[1] U.S. EPA. 1982. Methods for Organic Chemical Analysis of Municipal and Industrial Wastewater. EPA 600/4-82-057. EPA/EMSL, Cincinnati, Ohio.

[2] Concentrations less than the detection limit are left blank.

N/A - Not analyzed

TECHNICAL SERVICES, INC.

ENVIRONMENTAL CONSULTANTS — INDUSTRIAL CHEMISTS
OFFICE 2471 SWAN ST. — P.O. BOX 52329
LABORATORIES 103-107 STOCKTON STREET
JACKSONVILLE, FLORIDA 32201
(904) 353-5761

Laboratory No. 58411 May 23, 1984

Sample of WATER

Date Received April 13, 1984

For GERAGHTY & MILLER, INC., Post Office Box 271173, Tampa, Florida 33688 ATTN: Mr. Fred Seguiti

Marks: SA-2, Cecil Field

CERTIFICATE OF ANALYSIS OR TESTS

Arsenic, mg/l	<0.002
Barium, mg/l	0.015
Cadmium, mg/l	<0.005
Chromium, mg/l	<0.010
Lead, mg/l	<0.030
Mercury, mg/l	0.0008
Selenium, mg/l	<0.003
Silver, mg/l	<0.006
Copper, mg/l	<0.003
Iron, mg/l	0.032
Manganese, mg/l	0.011
Zinc, mg/l	0.023
Nitrate, mg/l N	0.006
Hydrogen Sulfide, mg/l	0.6
Chloride, mg/l	7.8
Fluoride, mg/l	0.754
pH	7.6
Sulfate, mg/l	6.3
Total Dissolved Solids, mg/l	211
Endrin, ppm	<0.00002
Lindane, ppm	<0.00001
Methoxychlor, ppm	<0.0001
Toxaphene, ppm	<0.0002
2,4-D, ppm	<0.001
2,4,5TP (Silvex) ppm	<0.0005
Gross Alpha, pCi/liter	4±3
Gross Beta , pCi/liter	3±2
*Total Organic Halide	52 ug/l

*Supplemental Report

Respectfully submitted,

TECHNICAL SERVICES, INC.

By Harvey C. Gray, Jr.

CAMBRIDGE ANALYTICAL ASSOCIATES, INC.

Table 2. Concentrations of Volatile Organic Compounds (Method 601[1])

Client: Geraghty and Miller - Tampa

Report No.: 84-439

Compound	Sample ID: CAA ID:	Concentration ug/l (ppb)[2] SA-2 8401953
chloromethane		
dichlorodifluoromethane		
vinyl chloride		
chloroethane		
methylene chloride		
trichlorofluoromethane		
1,1-dichloroethene		
1,1-dichloroethane		
trans-1,2-dichloroethene		
chloroform		
1,2-dichloroethane		
1,1,1-trichloroethane		
carbon tetrachloride		
bromodichloromethane		
1,2-dichloropropane		
trans-1,3-dichloropropane		
trichloroethene		0.1
dibromochloromethane		
1,1,2-trichloroethane		
cis-1,3 dichloropropene		
2-chloroethylvinyl ether		
bromoform		
1,1,2,2-tetrachloroetnane		
tetrachloroethene		
chlorobenzene		
Detection Limit		0.1

[1]U.S. EPA. 1982. Methods for Organic Chemical Analysis of Municipal and Industrial Wastewater. EPA 600/4-82-057. EPA/EMSL, Cincinnati, Ohio.

[2]Concentrations less than the detection limit are left blank.

TECHNICAL SERVICES, INC.

ENVIRONMENTAL CONSULTANTS — INDUSTRIAL CHEMISTS
OFFICE 2471 SWAN ST. — P.O. BOX 52329
LABORATORIES 103-107 STOCKTON STREET
JACKSONVILLE, FLORIDA 32201
(904) 353-5761

Laboratory No. 58416 May 23, 1984

Sample of WATER

Date Received April 13, 1984

For GERAGHTY & MILLER, INC., Post Office Box 271173, Tampa, Florida 33688 ATTN: Mr. Fred Seguiti

Marks: SW-1, Cecil Field

CERTIFICATE OF ANALYSIS OR TESTS

Arsenic, mg/l	<0.002
Barium, mg/l	0.017
Cadmium, mg/l	<0.005
Chromium, mg/l	<0.010
Lead, mg/l	<0.030
Mercury, mg/l	<0.0002
Selenium, mg/l	<0.003
Silver, mg/l	<0.006
Copper, mg/l	<0.003
Iron, mg/l	0.925
Manganese, mg/l	0.007
Zinc, mg/l	0.026
Nitrate, mg/l N	0.949
Hydrogen Sulfide, mg/l	<0.1
Chloride, mg/l	19.4
Fluoride, mg/l	0.090
pH	6.5
Sulfate, mg/l	31.1
Total Dissolved Solids, mg/l	80
Endrin, ppm	<0.00002
Lindane, ppm	<0.00001
Methoxychlor, ppm	<0.0001
Toxaphene, ppm	<0.0002
2,4-D, ppm	<0.001
2,4,5TP (Silvex) ppm	<0.0005
Gross Alpha, pCi/liter	<2
Gross Beta, pCi/liter	<3
*Total Organic Halide	120 ug/l

*Supplemental report

Respectfully submitted,

TECHNICAL SERVICES, INC.

By Harvey C. Gray, Jr.

CAMBRIDGE ANALYTICAL ASSOCIATES, INC.

Table 2. Concentrations of Volatile Organic Compounds (Method 601[1])

Client: Geraghty and Miller - Tampa Report No.: 84-439

Compound	Sample ID: CAA ID:	Concentration ug/l (ppb)[2] SW-1 8401954
chloromethane		
dichlorodifluoromethane		
vinyl chloride		
chloroethane		0.8
methylene chloride		1.8
trichlorofluoromethane		
1,1-dichloroethene		1.0
1,1-dichloroethane		
trans-1,2-dichloroethene		
chloroform		
1,2-dichloroethane		
1,1,1-trichloroethane		
carbon tetrachloride		
bromodichloromethane		
1,2-dichloropropane		
trans-1,3-dichloropropane		
trichloroethene		0.5
dibromochloromethane		
1,1,2-trichloroethane		
cis-1,3 dichloropropene		
2-chloroethylvinyl ether		
bromoform		
1,1,2,2-tetrachloroethane		
tetrachloroethene		
chlorobenzene		
Detection Limit		0.1

[1]U.S. EPA. 1982. Methods for Organic Chemical Analysis of Municipal and Industrial Wastewater. EPA 600/4-82-057. EPA/EMSL, Cincinnati, Ohio.

[2]Concentrations less than the detection limit are left blank.

WATER-QUALITY RESULTS AT THE LANDFILL AREA

SECOND QUARTER

TECHNICAL SERVICES, INC.

ENVIRONMENTAL CONSULTANTS — INDUSTRIAL CHEMISTS
OFFICE 2471 SWAN ST. — P.O. BOX 52329
LABORATORIES 103-107 STOCKTON STREET
JACKSONVILLE, FLORIDA 32201
(904) 353-5761

Laboratory No. 60202 August 15, 1984

Sample of Water

Date Received July 11, 1984

For Geraghty & Miller, Inc., P. O. Box 271173, Tampa, Fl. 33688

Marks: Cecil Field - 7/10/84

CERTIFICATE OF ANALYSIS OR TESTS

	SW1-CF	S-1-CF	SA-2-CF	S-4-CF
Arsenic, mg/l:	<.002	<.002	<.002	<.002
Barium, mg/l:	0.022	0.039	0.014	0.045
Cadmium, mg/l:	<0.005	<0.005	<0.005	<0.005
Chromium, mg/l:	<0.010	<0.010	<0.010	<0.010
Lead, mg/l:	<0.03	<0.03	0.039	<0.03
Mercury, mg/l:	<.0002	<.0002	<.0001	<.0001
Selenium, mg/l:	<0.002	<0.002	<0.002	<0.002
Silver, mg/l:	<0.005	<0.005	<0.005	<0.005
pH	7.05	4.75	7.70	7.65
Total Dissolved Solds, mg/l:	170	102	253	245
Chloride, mg/l:	30.0	22.5	12.1	8.41
Sulfate, mg/l:	19.5	3.45	4.60	6.90
Nitrate, mg/lN:	0.350	0.023	0.005	0.009
Fluroide, mg/l:	0.145	0.062	0.855	0.317
Iron, mg/l:	0.962	2.71	0.158	0.753

Respectfully submitted,

TECHNICAL SERVICES, INC.

BY Henry C. Gray, Jr.

LABORATORY I.D. NO. 82145

TECHNICAL SERVICES, INC.

ENVIRONMENTAL CONSULTANTS — INDUSTRIAL CHEMISTS
OFFICE 2471 SWAN ST. — P.O. BOX 52329
LABORATORIES 103-107 STOCKTON STREET
JACKSONVILLE, FLORIDA 32201
(904) 353-5761

Laboratory No. 60202 August 15, 1984

Sample of Water

Date Received July 11, 1984

For Geraghty & Miller, Inc., P. O. Box 271173, Tampa, Fl. 33688

Marks: S-4-CF Cecil Field

CERTIFICATE OF ANALYSIS OR TESTS

METHOD 601-All Units ppb	CONCENTRATION	DETECTION LIMIT
Bromodichloromethane	BDL	1.0
Bromoform	BDL	1.0
Bromomethane	BDL	1.0
Carbon Tetrachloride	BDL	1.0
Chlorobenzene	BDL	1.0
Chloroethane	BDL	1.0
2-Chloroethylvinyl Ether	BDL	1.0
Chloroform	BDL	1.0
Chloromethane	BDL	1.0
Dibromochloromethane	BDL	1.0
1,2-Dichlorobenzene	BDL	1.0
1,3-Dichlorobenzene	BDL	1.0
1,4-Dichlorobenzene	BDL	1.0
Dichlorodifluoromethane	BDL	1.0
1,1-Dichloroethane	BDL	1.0
1,2-Dichloroethane	BDL	1.0
1,1-Dichloroethene	BDL	1.0
Trans-1,2-Dichloroethene	BDL	1.0
1,2-Dichloropropane	BDL	1.0
Cis-1,3-Dichloropropene	BDL	1.0
Trans-1,3-Dichloropropene	BDL	1.0
Methylene Chloride	BDL	1.0
1,1,2,2,-Tetrachloroethane	BDL	1.0
Tetrachloroethene	BDL	1.0
1,1,1-Trichloroethane	BDL	1.0
1,1,2-Trichloroethane	BDL	1.0
Trichloroethene	BDL	1.0
Trichlorofluoromethane	BDL	1.0
Vinyl Chloride	BDL	1.0

BDL=BELOW DETECTION LIMIT

Respectfully submitted,

TECHNICAL SERVICES, INC.

BY Harvey C. Gray, Jr.

LABORATORY I.D. NO. 82145

TECHNICAL SERVICES, INC.

ENVIRONMENTAL CONSULTANTS — INDUSTRIAL CHEMISTS
OFFICE 2471 SWAN ST. — P.O. BOX 52329
LABORATORIES 103-107 STOCKTON STREET
JACKSONVILLE, FLORIDA 32201
(904) 353-5761

Laboratory No. 60202 August 15, 1984

Sample of Water

Date Received July 11, 1984

For Geraghty & Miller, Inc., P. O. Box 271173, Tampa, Fl. 33688

Marks: SA-2-CF Cecil Field

CERTIFICATE OF ANALYSIS OR TESTS

METHOD 601-All Units ppb	CONCENTRATION	DETECTION LIMIT
Bromodichloromethane	BDL	1.0
Bromoform	BDL	1.0
Bromomethane	BDL	1.0
Carbon Tetrachloride	BDL	1.0
Chlorobenzene	BDL	1.0
Chloroethane	BDL	1.0
2-Chloroethylvinyl Ether	BDL	1.0
Chloroform	BDL	1.0
Chloromethane	BDL	1.0
Dibromochloromethane	BDL	1.0
1,2-Dichlorobenzene	BDL	1.0
1,3-Dichlorobenzene	BDL	1.0
1,4-Dichlorobenzene	BDL	1.0
Dichlorodifluoromethane	BDL	1.0
1,1-Dichloroethane	BDL	1.0
1,2-Dichloroethane	BDL	1.0
1,1-Dichloroethene	BDL	1.0
Trans-1,2-Dichloroethene	BDL	1.0
1,2-Dichloropropane	BDL	1.0
Cis-1,3-Dichloropropene	BDL	1.0
Trans-1,3-Dichloropropene	BDL	1.0
Methylene Chloride	BDL	1.0
1,1,2,2,-Tetrachloroethane	BDL	1.0
Tetrachloroethene	BDL	1.0
1,1,1-Trichloroethane	BDL	1.0
1,1,2-Trichloroethane	BDL	1.0
Trichloroethene	1.6	1.0
Trichlorofluoromethane	BDL	1.0
Vinyl Chloride	BDL	1.0

BDL=BELOW DETECTION LIMIT

Respectfully submitted,

TECHNICAL SERVICES, INC.

BY Harvey C. Gray, Jr.

LABORATORY I.D. NO. 82145

TECHNICAL SERVICES, INC.

ENVIRONMENTAL CONSULTANTS — INDUSTRIAL CHEMISTS
OFFICE 2471 SWAN ST. — P.O. BOX 52329
LABORATORIES 103-107 STOCKTON STREET
JACKSONVILLE, FLORIDA 32201
(904) 353-5761

Laboratory No. 60202 August 15, 1984

Sample of Water

Date Received July 11, 1984

For Geraghty & Miller, Inc., P. O. Box 271173, Tampa, Fl. 33688

Marks: SW1-CF Cecil Field

CERTIFICATE OF ANALYSIS OR TESTS

METHOD 601-All Units ppb	CONCENTRATION	DETECTION LIMIT
Bromodichloromethane	BDL	1.0
Bromoform	BDL	1.0
Bromomethane	BDL	1.0
Carbon Tetrachloride	BDL	1.0
Chlorobenzene	BDL	1.0
Chloroethane	BDL	1.0
2-Chloroethylvinyl Ether	BDL	1.0
Chloroform	BDL	1.0
Chloromethane	BDL	1.0
Dibromochloromethane	BDL	1.0
1,2-Dichlorobenzene	BDL	1.0
1,3-Dichlorobenzene	BDL	1.0
1,4-Dichlorobenzene	BDL	1.0
Dichlorodifluoromethane	BDL	1.0
1,1-Dichloroethane	4.2	1.0
1,2-Dichloroethane	BDL	1.0
1,1-Dichloroethene	BDL	1.0
Trans-1,2-Dichloroethene	BDL	1.0
1,2-Dichloropropane	BDL	1.0
Cis-1,3-Dichloropropene	BDL	1.0
Trans-1,3-Dichloropropene	BDL	1.0
Methylene Chloride	BDL	1.0
1,1,2,2,-Tetrachloroethane	BDL	1.0
Tetrachloroethene	BDL	1.0
1,1,1-Trichloroethane	BDL	1.0
1,1,2-Trichloroethane	BDL	1.0
Trichloroethene	BDL	1.0
Trichlorofluoromethane	BDL	1.0
Vinyl Chloride	BDL	1.0

BDL=BELOW DETECTION LIMIT

Respectfully submitted,

TECHNICAL SERVICES, INC.

BY Harvey C. Gray, Jr.

LABORATORY I.D. NO. 82145

WATER-QUALITY RESULTS AT THE LANDFILL AREA

THIRD QUARTER

TECHNICAL SERVICES, INC.

ENVIRONMENTAL CONSULTANTS — INDUSTRIAL CHEMISTS
OFFICE 2471 SWAN ST. — P.O. BOX 52329
LABORATORIES 103-107 STOCKTON STREET
JACKSONVILLE, FLORIDA 32201
(904) 353-5761

Laboratory No. 63005 November 7, 19 84

Sample of WASTEWATER

Date Received October 18, 1984

For GERAGHTY & MILLER, P.O. Box 271173, Tampa, FL 33688
Attn: Mr. Fred Sequiti

Marks: Project No. T290CF1, S-4-CF, 10/17/84, 1415 hrs.

CERTIFICATE OF ANALYSIS OR TESTS

Chloride, mg/l:	9.8
Sulfates, mg/l:	<3
pH:	7.4
Specific Conductance, µmhos/cm:	325
Total Dissolved Solids, mg/l:	187
Nitrate, mg/l N:	<0.02
Iron, mg/l:	0.36
Fluoride, mg/l:	0.369
Arsenic, mg/l:	<0.002
Barium, mg/l:	0.037
Cadmium, mg/l:	<0.005
Chromium, mg/l:	<0.01
Lead, mg/l:	<0.04
Mercury, mg/l:	0.0003
Selenium, mg/l:	<0.005
Silver, mg/l:	<0.005

Respectfully submitted,

TECHNICAL SERVICES, INC.

BY Harvey C. Gray, Jr.

TECHNICAL SERVICES, INC.

ENVIRONMENTAL CONSULTANTS — INDUSTRIAL CHEMISTS
OFFICE 2471 SWAN ST. — P.O. BOX 52329
LABORATORIES 103-107 STOCKTON STREET
JACKSONVILLE, FLORIDA 32201
(904) 353-5761

Laboratory No. 63005 November 7, 1984

Sample of WASTEWATER

Date Received October 18, 1984

For GERAGHTY & MILLER, P.O. Box 271173, Tampa, FL 33688
Attn: Mr. Fred Sequiti

Marks: Project No. T290CF1, S-4-CF, 10/17/84, 1415 hrs.

CERTIFICATE OF ANALYSIS OR TESTS

EPA Method 601	CONCENTRATION,ppb	DETECTION LIMIT,ppb
Bromodichloromethane	BDL*	1.0
Bromoform	BDL	1.0
Bromomethane	BDL	1.0
Carbon tetrachloride	BDL	1.0
Chlorobenzene	BDL	1.0
Chloroethane	BDL	1.0
2-Chloroethylvinyl ether	BDL	1.0
Chloroform	BDL	1.0
Chloromethane	BDL	1.0
Dibromochloromethane	BDL	1.0
1,2-Dichlorobenzene	BDL	1.0
1,3-Dichlorobenzene	BDL	1.0
1,4-Dichlorobenzene	BDL	1.0
Dichlorodifluoromethane	BDL	1.0
1,1-Dichloroethane	BDL	1.0
1,2-Dichloroethane	BDL	1.0
1,1-Dichloroethene	BDL	1.0
trans-1,2-Dichloroethene	BDL	1.0
1,2-Dichloropropane	BDL	1.0
cis-1,3-Dichloropropene	BDL	1.0
trans-1,3-Dichloropropene	BDL	1.0
Methylene chloride	BDL	1.0
1,1,2,2-Tetrachloroethane	BDL	1.0
Tetrachloroethene	BDL	1.0
1,1,1-Trichloroethane	BDL	1.0
1,1,2-Trichloroethane	BDL	1.0
Trichloroethene	BDL	1.0
Trichlorofluoromethane	BDL	1.0
Vinyl chloride	BDL	1.0

*BDL = Below Detection Limit

Respectfully submitted,

TECHNICAL SERVICES, INC.

BY Harvey C. Gray, Jr.

LABORATORY I.D. NO. 82145

TECHNICAL SERVICES, INC.

ENVIRONMENTAL CONSULTANTS — INDUSTRIAL CHEMISTS
OFFICE 2471 SWAN ST. — P.O. BOX 52329
LABORATORIES 103-107 STOCKTON STREET
JACKSONVILLE, FLORIDA 32201
(904) 353-5761

Laboratory No. 63305 November 7, 1984

Sample of WASTEWATER

Date Received October 18, 1984

For GERAGHTY & MILLER, P.O. Box 271173, Tampa, FL 33688
Attn: Mr. Fred Sequiti

Marks: Project No. T290CF1, S-4-CF, 10/17/84, 1415 hrs.

CERTIFICATE OF ANALYSIS OR TESTS

EPA Method 602	CONCENTRATION, ppb	DETECTION LIMIT, ppb
Benzene	BDL*	1.0
Ethyl Benzene	BDL	1.0
Toluene	BDL	1.0
Xylenes	BDL	1.0

*BDL=Below Detection Limit

Respectfully submitted,

TECHNICAL SERVICES, INC.

BY Harvey C. Gray, Jr.

LABORATORY I.D. NO. 82145

TECHNICAL SERVICES, INC.

ENVIRONMENTAL CONSULTANTS — INDUSTRIAL CHEMISTS
OFFICE 2471 SWAN ST. — P.O. BOX 52329
LABORATORIES 103-107 STOCKTON STREET
JACKSONVILLE, FLORIDA 32201
(904) 353-5761

Laboratory No. 63003 November 7, 1984

Sample of WASTEWATER

Date Received October 18, 1984

For GERAGHTY & MILLER, P.O. Box 271173, Tampa, FL 33688
Attn: Mr. Fred Sequiti

Marks: Project No. T290CF1, SA-2-CF, 10/17/84, 1315 hrs.

CERTIFICATE OF ANALYSIS OR TESTS

Chloride, mg/l:	13.0
Sulfates, mg/l:	<3
pH:	7.8
Specific Conductance, µmhos/cm:	400
Total Dissolved Solids, mg/l:	224
Nitrate, mg/l N:	<0.02
Iron, mg/l:	0.06
Fluoride, mg/l:	0.961
Arsenic, mg/l:	<0.002
Barium, mg/l:	0.021
Cadmium, mg/l:	<0.005
Chromium, mg/l:	<0.01
Lead, mg/l:	<0.03
Mercury, mg/l:	0.0002
Selenium, mg/l:	<0.005
Silver, mg/l:	<0.005

Respectfully submitted,

TECHNICAL SERVICES, INC.

BY Harvey C. Gray, Jr.

TECHNICAL SERVICES, INC.

ENVIRONMENTAL CONSULTANTS — INDUSTRIAL CHEMISTS
OFFICE 2471 SWAN ST. — P.O. BOX 52329
LABORATORIES 103-107 STOCKTON STREET
JACKSONVILLE, FLORIDA 32201
(904) 353-5761

Laboratory No. 63003 November 7, 19 84

Sample of WASTEWATER

Date Received October 18, 1984

For GERAGHTY & MILLER, P.O. Box 271173, Tampa, FL 33688
Attn: Mr. Fred Sequiti

Marks: Project No. T290CF1, SA-2-CF, 10/17/84, 1315 hrs.

CERTIFICATE OF ANALYSIS OR TESTS

EPA Method 601	CONCENTRATION,ppb	DETECTION LIMIT,ppb
Bromodichloromethane	BDL*	1.0
Bromoform	BDL	1.0
Bromomethane	BDL	1.0
Carbon tetrachloride	BDL	1.0
Chlorobenzene	BDL	1.0
Chloroethane	BDL	1.0
2-Chloroethylvinyl ether	BDL	1.0
Chloroform	BDL	1.0
Chloromethane	BDL	1.0
Dibromochloromethane	BDL	1.0
1,2-Dichlorobenzene	BDL	1.0
1,3-Dichlorobenzene	BDL	1.0
1,4-Dichlorobenzene	BDL	1.0
Dichlorodifluoromethane	BDL	1.0
1,1-Dichloroethane	BDL	1.0
1,2-Dichloroethane	BDL	1.0
1,1-Dichloroethene	BDL	1.0
trans-1,2-Dichloroethene	BDL	1.0
1,2-Dichloropropane	BDL	1.0
cis-1,3-Dichloropropene	BDL	1.0
trans-1,3-Dichloropropene	BDL	1.0
Methylene chloride	BDL	1.0
1,1,2,2-Tetrachloroethane	BDL	1.0
Tetrachloroethene	BDL	1.0
1,1,1-Trichloroethane	BDL	1.0
1,1,2-Trichloroethane	BDL	1.0
Trichloroethene	BDL	1.0
Trichlorofluoromethane	BDL	1.0
Vinyl chloride	BDL	1.0

*BDL = Below Detection Limit

Respectfully submitted,

TECHNICAL SERVICES, INC.

By Harvey C. Gray, Jr.

LABORATORY I.D. NO. 82145

TECHNICAL SERVICES, INC.

ENVIRONMENTAL CONSULTANTS — INDUSTRIAL CHEMISTS
OFFICE 2471 SWAN ST. — P.O. BOX 52329
LABORATORIES 103-107 STOCKTON STREET
JACKSONVILLE, FLORIDA 32201
(904) 353-5761

Laboratory No. 63003 November 7, 1984

Sample of WASTEWATER

Date Received October 18, 1984

For GERAGHTY & MILLER, P.O. Box 271173, Tampa, FL 33688
Attn: Mr. Fred Sequiti

Marks: Project No. T290CF1, SA-2-CF, 10/17/84, 1315 hrs.

CERTIFICATE OF ANALYSIS OR TESTS

EPA Method 602	CONCENTRATION, ppb	DETECTION LIMIT, ppb
Benzene	BDL*	1.0
Ethyl Benzene	BDL	1.0
Toluene	BDL	1.0
Xylenes	BDL	1.0

*BDL=Below Detection Limit

Respectfully submitted,

TECHNICAL SERVICES, INC.

Henry C. Gray, Jr.

LABORATORY I.D. NO. 82145

TECHNICAL SERVICES, INC.

ENVIRONMENTAL CONSULTANTS — INDUSTRIAL CHEMISTS
OFFICE 2471 SWAN ST. — P.O. BOX 52329
LABORATORIES 103-107 STOCKTON STREET
JACKSONVILLE, FLORIDA 32201
(904) 353-5761

Laboratory No. 63002 November 7, 1984

Sample of WASTEWATER

Date Received October 18, 1984

For GERAGHTY & MILLER, P.O. Box 271173, Tampa, FL 33688
Attn: Mr. Fred Sequiti

Marks: Project No. T290CF1, SW-1-CF, 10/17/84, 1438 hrs.

CERTIFICATE OF ANALYSIS OR TESTS

Chloride, mg/l:	22.6
Sulfates, mg/l:	8.3
pH:	6.6
Specific Conductance, µmhos/cm:	195
Total Dissolved Solids, mg/l:	153
Nitrate, mg/l N:	<0.02
Iron, mg/l:	1.07
Fluoride, mg/l:	0.126
Arsenic, mg/l:	<0.002
Barium, mg/l:	0.020
Cadmium, mg/l:	<0.005
Chromium, mg/l:	<0.01
Lead, mg/l:	<0.04
Mercury, mg/l:	0.0003
Selenium, mg/l:	<0.005
Silver, mg/l:	<0.005

Respectfully submitted,

TECHNICAL SERVICES, INC.

BY Harvey C. Gray, Jr.

TECHNICAL SERVICES, INC.

ENVIRONMENTAL CONSULTANTS — INDUSTRIAL CHEMISTS
OFFICE 2471 SWAN ST. — P.O. BOX 52329
LABORATORIES 103-107 STOCKTON STREET
JACKSONVILLE, FLORIDA 32201
(904) 353-5761

Laboratory No. 63002 November 7, 19 84

Sample of WASTEWATER

Date Received October 18, 1984

For GERAGHTY & MILLER, P.O. Box 271173, Tampa, FL 33688
Attn: Mr. Fred Sequiti

Marks: Project No. T290CF1, SW-1-CF, 10/17/84, 1438 hrs.

CERTIFICATE OF ANALYSIS OR TESTS

EPA Method 601	CONCENTRATION,ppb	DETECTION LIMIT,ppb
Bromodichloromethane	BDL*	1.0
Bromoform	BDL	1.0
Bromomethane	BDL	1.0
Carbon tetrachloride	BDL	1.0
Chlorobenzene	BDL	1.0
Chloroethane	BDL	1.0
2-Chloroethylvinyl ether	BDL	1.0
Chloroform	BDL	1.0
Chloromethane	BDL	1.0
Dibromochloromethane	BDL	1.0
1,2-Dichlorobenzene	BDL	1.0
1,3-Dichlorobenzene	BDL	1.0
1,4-Dichlorobenzene	BDL	1.0
Dichlorodifluoromethane	BDL	1.0
1,1-Dichloroethane	BDL	1.0
1,2-Dichloroethane	BDL	1.0
1,1-Dichloroethene	BDL	1.0
trans-1,2-Dichloroethene	BDL	1.0
1,2-Dichloropropane	BDL	1.0
cis-1,3-Dichloropropene	BDL	1.0
trans-1,3-Dichloropropene	BDL	1.0
Methylene chloride	BDL	1.0
1,1,2,2-Tetrachloroethane	BDL	1.0
Tetrachloroethene	BDL	1.0
1,1,1-Trichloroethane	BDL	1.0
1,1,2-Trichloroethane	BDL	1.0
Trichloroethene	BDL	1.0
Trichlorofluoromethane	BDL	1.0
Vinyl chloride	BDL	1.0

*BDL = Below Detection Limit

Respectfully submitted,

TECHNICAL SERVICES, INC.

BY Harvey C. Gray, Jr.

LABORATORY I.D. NO. 82145

TECHNICAL SERVICES, INC.

ENVIRONMENTAL CONSULTANTS — INDUSTRIAL CHEMISTS
OFFICE 2471 SWAN ST. — P.O. BOX 52329
LABORATORIES 103-107 STOCKTON STREET
JACKSONVILLE, FLORIDA 32201
(904) 353-5761

Laboratory No. 63002 November 7, 19 84

Sample of WASTEWATER

Date Received October 18, 1984

For GERAGHTY & MILLER, P.O. Box 271173, Tampa, FL 33688
Attn: Mr. Fred Sequiti

Marks: Project No. T290CF1, SW-1-CF, 10/17/84, 1438 hrs.

CERTIFICATE OF ANALYSIS OR TESTS

EPA Method 602	CONCENTRATION, ppb	DETECTION LIMIT, ppb
Benzene	BDL*	1.0
Ethyl Benzene	BDL	1.0
Toluene	BDL	1.0
Xylenes	BDL	1.0

*BDL=Below Detection Limit

Respectfully submitted,

TECHNICAL SERVICES, INC.

By Harvey C. Gray, Jr.

LABORATORY I.D. NO. 82145

WATER-QUALITY RESULTS AT THE LANDFILL AREA

FOURTH QUARTER

TECHNICAL SERVICES, INC.

ENVIRONMENTAL CONSULTANTS — INDUSTRIAL CHEMISTS
OFFICE 2471 SWAN ST. — P.O. BOX 52329
LABORATORIES 103-107 STOCKTON STREET
JACKSONVILLE, FLORIDA 32201
(904) 353-5761

Laboratory No. 65309 March 26, 19 85

Sample of WATER

Date Received February 20, 1985

For GERAGHTY AND MILLER, P.O. Box 271173, Tampa, FL 33688
Attn: Mr. Fred Sequiti

Marks:
Cecil Field, 2/20/85

CERTIFICATE OF ANALYSIS OR TESTS

	S-1-CF	S-4-CF	SA-2-CF	SW-1-CF
pH:	5.0	7.0	8.2	6.9
Total Dissolved Solids, mg/l:	89	209	293	186
Arsenic, mg/l:	<0.002	<0.002	<0.002	<0.002
Barium, mg/l:	0.028	0.042	0.063	0.069
Cadmium, mg/l:	<0.005	<0.005	<0.005	<0.005
Chromium, mg/l:	<0.01	<0.01	<0.01	<0.01
Lead, mg/l:	<0.03	<0.03	<0.03	<0.03
Mercury, mg/l:	<0.0002	0.0002	0.0002	<0.0002
Selenium, mg/l:	<0.003	<0.003	<0.003	<0.003
Silver, mg/l:	<0.005	<0.005	<0.005	<0.005
Iron, mg/l:	6.47	1.24	0.31	1.84
Chloride, mg/l:	26.4	8.5	12.4	24.2
Sulfate, mg/l:	4	<1	<1	26
Fluoride, mg/l:	0.061	0.353	0.916	0.232
Nitrate, mg/l N:	<0.02	<0.02	<0.02	0.760

Respectfully submitted,

TECHNICAL SERVICES, INC.

By Henry C. Gray, Jr.

LABORATORY ID NO 32145

TECHNICAL SERVICES, INC.

ENVIRONMENTAL CONSULTANTS — INDUSTRIAL CHEMISTS
OFFICE 2471 SWAN ST. — P.O. BOX 52329
LABORATORIES 103-107 STOCKTON STREET
JACKSONVILLE, FLORIDA 32201
(904) 353-5761

Laboratory No. 65309 March 27, 1985

Sample of WATER

Date Received February 20, 1985

For GERAGHTY & MILLER, P.O. Box 271173, Tampa, FL 33688
Attn: Mr. Fred Sequiti

Marks:
Cecil Field, 2/20/85, S-4-CF

CERTIFICATE OF ANALYSIS OR TESTS

EPA Method 601	CONCENTRATION, ppb	DETECTION LIMIT, ppb
Bromodichloromethane	BDL*	1.0
Bromoform	BDL	1.0
Bromomethane	BDL	1.0
Carbon tetrachloride	BDL	1.0
Chlorobenzene	BDL	1.0
Chloroethane	BDL	1.0
2-Chloroethylvinyl ether	BDL	10.0
Chloroform	BDL	1.0
Chloromethane	BDL	1.0
Dibromochloromethane	BDL	1.0
1,2-Dichlorobenzene	BDL	1.0
1,3-Dichlorobenzene	BDL	1.0
1,4-Dichlorobenzene	BDL	1.0
Dichlorodifluoromethane	BDL	1.0
1,1-Dichloroethane	BDL	1.0
1,2-Dichloroethane	BDL	1.0
1,1-Dichloroethene	BDL	1.0
trans-1,2-Dichloroethene	BDL	1.0
1,2-Dichloropropane	BDL	1.0
cis-1,3-Dichloropropene	BDL	1.0
trans-1,3-Dichloropropene	BDL	1.0
Methylene chloride	BDL	1.0
1,1,2,2-Tetrachloroethane	BDL	1.0
Tetrachloroethene	BDL	1.0
1,1,1-Trichloroethane	BDL	1.0
1,1,2-Trichloroethane	BDL	1.0
Trichloroethene	BDL	1.0
Trichlorofluoromethane	BDL	1.0
Vinyl chloride	BDL	1.0

*BDL = Below Detection Limit

Respectfully submitted,

TECHNICAL SERVICES, INC.

BY Harry C. Gray, Jr.

LABORATORY I.D. NO. 82145

TECHNICAL SERVICES, INC.

ENVIRONMENTAL CONSULTANTS — INDUSTRIAL CHEMISTS
OFFICE 2471 SWAN ST. — P.O. BOX 52329
LABORATORIES 103-107 STOCKTON STREET
JACKSONVILLE, FLORIDA 32201
(904) 353-5761

Laboratory No. 65309 March 27, 1985

Sample of WATER

Date Received February 20, 1985

For GERAGHTY AND MILLER, P.O. Box 271173, Tampa, FL 33688
Attn: Mr. Fred Sequiti

Marks:
Cecil Field, 2/20/85, SA-2-CF

CERTIFICATE OF ANALYSIS OR TESTS

EPA Method 601	CONCENTRATION, ppb	DETECTION LIMIT, ppb
Bromodichloromethane	BDL*	1.0
Bromoform	BDL	1.0
Bromomethane	BDL	1.0
Carbon tetrachloride	BDL	1.0
Chlorobenzene	BDL	1.0
Chloroethane	BDL	1.0
2-Chloroethylvinyl ether	BDL	10.0
Chloroform	BDL	1.0
Chloromethane	BDL	1.0
Dibromochloromethane	BDL	1.0
1,2-Dichlorobenzene	BDL	1.0
1,3-Dichlorobenzene	BDL	1.0
1,4-Dichlorobenzene	BDL	1.0
Dichlorodifluoromethane	BDL	1.0
1,1-Dichloroethane	BDL	1.0
1,2-Dichloroethane	BDL	1.0
1,1-Dichloroethene	BDL	1.0
trans-1,2-Dichloroethene	BDL	1.0
1,2-Dichloropropane	BDL	1.0
cis-1,3-Dichloropropene	BDL	1.0
trans-1,3-Dichloropropene	BDL	1.0
Methylene chloride	BDL	1.0
1,1,2,2-Tetrachloroethane	BDL	1.0
Tetrachloroethene	BDL	1.0
1,1,1-Trichloroethane	BDL	1.0
1,1,2-Trichloroethane	BDL	1.0
Trichloroethene	BDL	1.0
Trichlorofluoromethane	BDL	1.0
Vinyl chloride	BDL	1.0

*BDL = Below Detection Limit

Respectfully submitted,

TECHNICAL SERVICES, INC.

BY Harvey C. Gray, Jr.

LABORATORY I.D. NO. 82145

TECHNICAL SERVICES, INC.

ENVIRONMENTAL CONSULTANTS — INDUSTRIAL CHEMISTS
OFFICE 2471 SWAN ST. — P.O. BOX 52329
LABORATORIES 103-107 STOCKTON STREET
JACKSONVILLE, FLORIDA 32201
(904) 353-5761

Laboratory No. 65309 March 27, 19 85

Sample of WATER

Date Received February 20, 1985

For GERAGHTY & MILLER, P.O. Box 271173, Tampa, FL 33688
Attn: Mr. Fred Sequiti

Marks:
Cecil Field, 2/20/85, SW-1-CF

CERTIFICATE OF ANALYSIS OR TESTS

EPA Method 601	CONCENTRATION, ppb	DETECTION LIMIT, ppb
Bromodichloromethane	BDL*	1.0
Bromoform	BDL	1.0
Bromomethane	BDL	1.0
Carbon tetrachloride	BDL	1.0
Chlorobenzene	BDL	1.0
Chloroethane	BDL	1.0
2-Chloroethylvinyl ether	BDL	10.0
Chloroform	BDL	1.0
Chloromethane	BDL	1.0
Dibromochloromethane	BDL	1.0
1,2-Dichlorobenzene	BDL	1.0
1,3-Dichlorobenzene	BDL	1.0
1,4-Dichlorobenzene	BDL	1.0
Dichlorodifluoromethane	BDL	1.0
1,1-Dichloroethane	BDL	1.0
1,2-Dichloroethane	BDL	1.0
1,1-Dichloroethene	BDL	1.0
trans-1,2-Dichloroethene	BDL	1.0
1,2-Dichloropropane	BDL	1.0
cis-1,3-Dichloropropene	BDL	1.0
trans-1,3-Dichloropropene	BDL	1.0
Methylene chloride	BDL	1.0
1,1,2,2-Tetrachloroethane	BDL	1.0
Tetrachloroethene	BDL	1.0
1,1,1-Trichloroethane	BDL	1.0
1,1,2-Trichloroethane	BDL	1.0
Trichloroethene	BDL	1.0
Trichlorofluoromethane	BDL	1.0
Vinyl chloride	BDL	1.0

*BDL = Below Detection Limit

Respectfully submitted,

TECHNICAL SERVICES, INC.

BY Harvey C. Gray, Jr.

LABORATORY I.D. NO. 82145

RESULTS OF SAMPLING OF POTABLE WATER WELLS
CECIL FIELD NAVAL AIR STATION
JACKSONVILLE, FLORIDA
MARCH 5, 1986

Prepared by

Geraghty & Miller, Inc.
Ground-Water Consultants
14310 North Dale Mabry Highway, Suite 200
Tampa, Florida 33618

GERAGHTY
& MILLER, INC.
Ground-Water Consultants

May 30, 1986

Mr. John Dingwall
Public Works Engineering
NAS-Cecil Field
Jacksonville, Florida

Dear John:

Enclosed please find 2 copies of the analytical results for water samples collected from the potable water wells at Cecil Field Naval Air Station on March 5, 1986 (Attachment A). The sampling was performed in accordance with Chapter 17-22.104(1)(g), FAC (Florida Administrative Code; copies of regulations germane to the sampling are contained in Attachment B.) Included with each copy is a map detailing well designations and location of the wells sampled (Attachment A). The following is a brief summary of work performed to date.

WORK PERFORMED IN THE FIELD: Sampling was conducted on March 5, 1986, by Geraghty & Miller, Inc. (G&M), personnel. Ground water from wells PS-1, PS-2, PS-3, PS-4, and PS-5 was sampled. Additionally, composite samples consisting of finished ground water from wells PS-1, PS-2, PS-3 (PS-1, PS-2, PS-3: Composite) and PS-4 and PS-5 (PS-4, PS-5: Composite) were collected. Unfinished ground water from wells PS-1, PS-2, PS-3, PS-4 and PS-5 was sampled for ethylene dibromide (EDB). Finished, or chlorinated, ground water was sampled for synthetic organic compounds (SOC). Wells PS-1, PS-2, and PS-3 share a common clorination system, as do wells PS-4 and PS-5 and, therefore, representative composite samples for SOC analysis were collected down line from the respective chlorination points, as specified in Chapter 17-22.105(1) (h), FAC. The samples were then forwarded to a FDER (Florida Department of Environmental Regulation) approved laboratory for analysis.

RESULTS: The results show that only chloroform was detected in the composite sample, the total of which is below EPA primary drinking water standards (proposed) of 100 ug/l total trihalomethanes (THMs) in finished drinking water (Attachment A).

Landmark Office Center • 14310 N. Dale Mabry Hwy. • Suite 200 • Post Office Box 271173 • Tampa, FL 33688-1173 • (813) 961-1921

GERAGHTY & MILLER, INC.

CLOSING: Please review the enclosed information. If you have any questions concerning sampling procedures or analytical results, please do not hesitate to contact us.

Sincerely,

GERAGHTY & MILLER, INC.

Michael O'Hagan
Scientist

Fred A. Seguiti
Staff Scientist

Enclosures
405/1.9

ATTACHMENT A

Compounds Detected During Analysis

Location Map

Lab Results

ATTACHMENT A

Compounds Detected During Analysis

Sample	Chloroform
PS-1	ND[1/]
PS-2	ND
PS-3	ND
PS-4	ND
PS-5	ND
PS-1, PS-2, PS-3 Composite	2.3 ug/l
PS-4, PS-5 Composite	1.9 ug/l

1/ Not detected

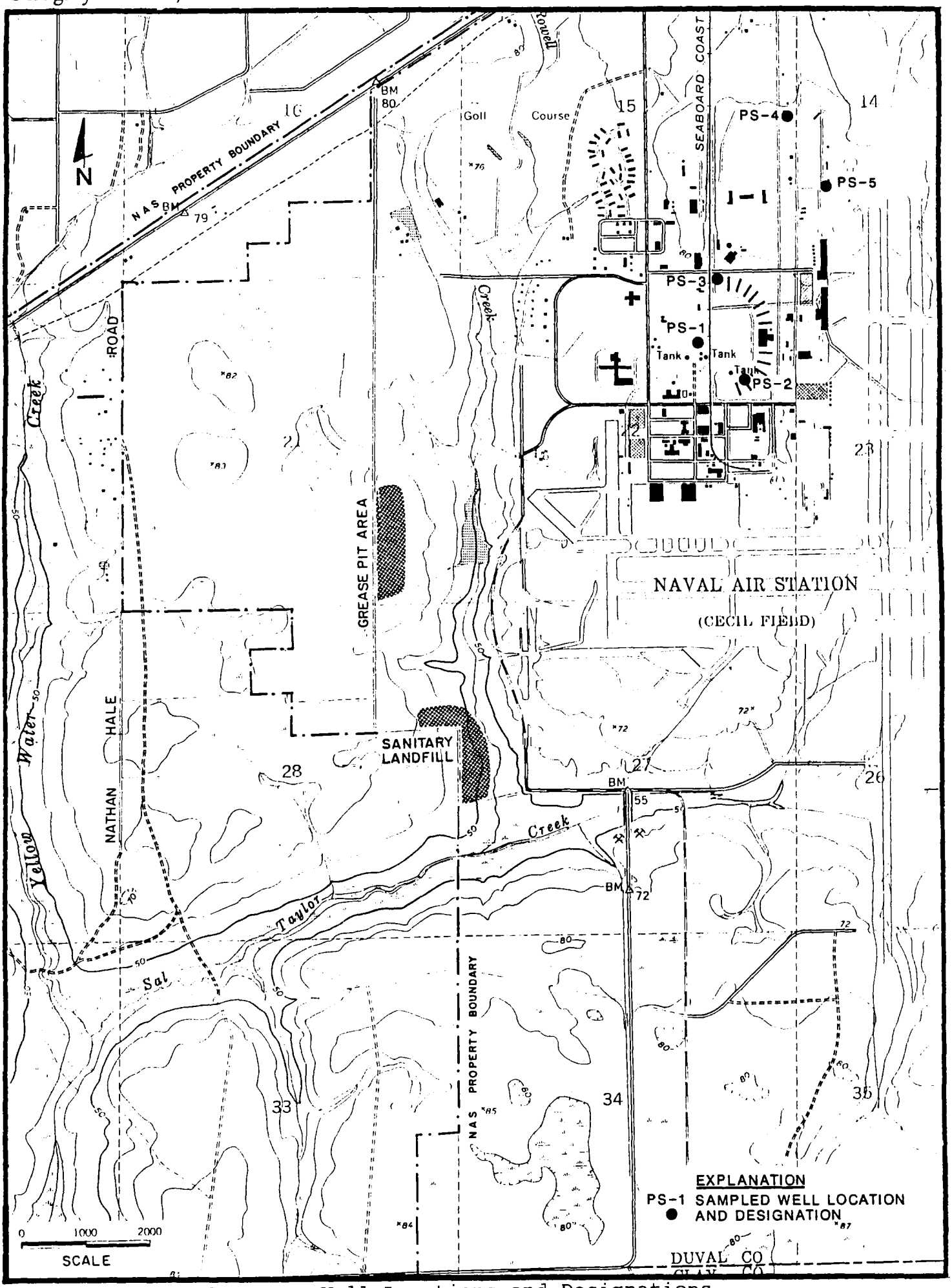


Figure 1. Potable Water Well Locations and Designations

GEI. HTY & MILLER, INC.
Ground-Water Consultants

CHAIN-OF-CUSTODY RECORD

Page ___ of 1

Location: Jacksonville

Laboratory: TSI

Project/Number NS - Cecil Field

Shipping Container ID: _____

Sampler(s) B. Switzer

SAMPLE CONTAINER DESCRIPTION

SAMPLE IDENTITY	Date Sampled	gallon glass SOC	40 ml vials 625	40 ml vials EDB										Total	Remarks
PS - 4	3-5-86			2										2	
PS - 5	3-5-86			2										2	
PS-4, PS-5 COMPOSITE	3-5-86	1	2											3	
PS-2	3-5-86			2										2	
PS-1	3-5-86			2										2	
PS-3	3-5-86			2										2	
PS-1, PS-2, PS-3 COMPOSITE	3-5-86	1	2											3	

Total No. of Containers 16

Relinquished by: B. Switzer Organization: Geraghty & Miller
Date: 3-5-86 Time: 1700 hrs
Received by: Debbie Kinderdine Organization: TSI
Date: _____ Time: _____

Relinquished by: _____ Organization: _____
Date: _____ Time: _____
Received by: _____ Organization: _____
Date: _____ Time: _____

Relinquished by: _____ Organization: _____
Date: _____ Time: _____
Received by: _____ Organization: _____
Date: _____ Time: _____

TECHNICAL SERVICES, INC.

ENVIRONMENTAL CONSULTANTS — INDUSTRIAL CHEMISTS
OFFICE 2471 SWAN ST. — P.O. BOX 52329
LABORATORIES 103-107 STOCKTON STREET
JACKSONVILLE, FLORIDA 32201
(904) 353-5761

Laboratory No. 71672-1 May 14, 19 86

Sample of Water

Date Received 3/5/86

For Geraghty & Miller, Inc., P.O. Box 271173, Tampa, Fl. 33688

Marks: Attn: Mr. Barry Switzer
NS-Cecil Field, Sampled by B. Switzer 3/5/86
PS-4, PS-5: Composite

CERTIFICATE OF ANALYSIS

	VOC		
	CONCENTRATION ppb	DETECTION LIMIT ppb	MAXIMUM CONCENTRATION LEVEL ppb
Finished Water:			
Trichloroethylene	BDL	1	3
Tetrachloroethylene	BDL	1	3
Carbon Tetrachloride	BDL	1	3
Vinyl Chloride	BDL	1	1
1,1,1-Trichloroethane	BDL	1	200
1,2-Dichloroethane	BDL	1	3
Benzene	BDL	0.5	1
Raw Water			
Ethylene Dibromide (EDB)	Not Determined	0.02	0.02

	SOC	
I. PURGEABLES	CONCENTRATION ppb	DETECTION LIMIT ppb
Acrolein	BDL	50
Acrylonitrile	BDL	50
Bromodichloromethane	BDL	1
Bromoform	BDL	1
Bromomethane	BDL	1
Chlorobenzene	BDL	1
Chloroethane	BDL	1
2-Chloroethylvinyl ether	BDL	1

*BDL = Below Detection Limit

CERTIFICATE OF ANALYSIS

#71672-1

	SOC (cont.)	
	CONCENTRATION ppb	DETECTION LIMIT ppb
Chloroform	1.9	1
Chloromethane	BDL	1
Dibromochloromethane	BDL	1
Dichlorodifluoromethane	BDL	1
1,1-Dichloroethane	BDL	1
1,1-Dichloroethene	BDL	1
trans-1,3-Dichloropropene	BDL	1
1,2-Dichloroethene	BDL	1
1,2-Dichloropropane	BDL	1
cis-1,3-Dichloropene	BDL	1
Ethylbenzene	BDL	1
Methylene chloride	BDL	1
1,1,2-Trichloroethane	BDL	1
Trichlorofluoromethane	BDL	1
Toluene	BDL	1
Xylene	BDL	1
Styrene	BDL	1
Dichlorobenzene	BDL	1
1,2-Dibromo-3-Chloropropane	BDL	1
1,1,2,2-Tetrachloroethane	BDL	1
II. PESTICIDES AND PCB's		
Aldrin	BDL	0.004
a-BHC	BDL	0.004
b-BHC	BDL	0.004
g-BHC	BDL	0.004
d-BHC	BDL	0.004
Chlordane	BDL	0.05
4,4'-DDD	BDL	0.01
4,4'-DDE	BDL	0.01
4,4'-DDT	BDL	0.01
Dieldrin	BDL	0.005

*BDL = Below Detection Limit

CERTIFICATE OF ANALYSIS

	SOC (cont.)	
	CONCENTRATION ppb	DETECTION LIMIT ppb
Endosulfan I	BDL	0.004
Endosulfan II	BDL	.02
Endosulfan Sulfate	BDL	0.05
Ethion	BDL	0.02
Trithion	BDL	0.02
o,p-DDT, DDE, DDD	BDL	0.01
Tedion	BDL	0.05
Endrin	BDL	0.005
Endrin Aldehyde	BDL	0.01
Heptachlor	BDL	0.004
Heptachlor Expoxide	BDL	0.004
Toxaphene	BDL	0.1
PCB-1016	BDL	0.50
PCB-1221	BDL	0.50
PCB 1232	BDL	0.50
PCB-1243	BDL	0.50
PCB-1248	BDL	0.50
PCB-1254	BDL	0.50
PCB-1260	BDL	0.50
Aldicarb	BDL	1.0
Diazinon	BDL	0.1
Malathion	BDL	0.050
Parathion	BDL	0.20
Guthion	BDL	0.2
Kelthane (Dicofal)	BDL	0.05
III. BASE NEUTRAL EXTRACTABLES		
Acenaphthene	BDL	10
Acenaphthylene	BDL	10
Anthracene	BDL	10
Benzo(a)anthracene	BDL	10

* BDL = Below Detection Limit

#71672-1

CERTIFICATE OF ANALYSIS

	SOC (cont.)	
	CONCENTRATION ppb	DETECTION LIMIT ppb
Benzo(b)fluoranthene	BDL	10
Benzo(k)fluoranthene	BDL	10
Benzo(a)pyrene	BDL	10
Benzo(g,h,i)perylene	BDL	25
Benzidine	BDL	10
Bis(2-chloroethyl)ether	BDL	10
Bis(2-chloroethoxy)methane	BDL	10
Bis(2-ethylhexyl)phthalate	BDL	10
Bis(2-chloroisopropyl)ether	BDL	10
4-Bromophenyl phenyl ether	BDL	10
Butyl benzyl phthalate	BDL	10
2-Chloronaphthalene	BDL	10
4-Chlorophenyl phenyl ether	BDL	10
Chrysene	BDL	10
Dibenzo(a,h)anthracene	BDL	25
Di-n-butylphthalate	BDL	10
1,3-Dichlorobenzene	BDL	10
1,4-Dichlorobenzene	BDL	10
1,2-Dichlorobenzene	BDL	10
3,3-Dichlorobenzidine	BDL	10
Diethylphthalate	BDL	10
Dimethylphthalate	BDL	10
2,4-Dinitrotoluene	BDL	10
2,6-Dinitrotoluene	BDL	10
Dioctylphthalate	BDL	10
1,2-Diphenylhydrazine	BDL	10
Fluoranthene	BDL	10
Fluorene	BDL	10
Hexachlorobenzene	BDL	10
Hexachlorobutadiene	BDL	10

* BDL = Below Detection Limit

#71672-1

CERTIFICATE OF ANALYSIS

	SOC (cont.)	
	CONCENTRATION ppb	DETECTION LIMIT ppb
Hexachloroethane	BDL	
Hexachlorocyclopentadiene	BDL	10
Indeno(1,2,3-cd)pyrene	BDL	25
Isophorone	BDL	10
Naphthalene	BDL	10
Nitrobenzene	BDL	10
N-Nitrosodimethylamine	BDL	10
N-Nitrosodi-n-propylamine	BDL	10
N-Nitrosodiphenylamine	BDL	10
Phenanthrene	BDL	10
Pyrene	BDL	10
2,3,7,8-Tetrachlorodibenzo-p-dioxin (Dioxin)	BDL	10
1,2,4-Trichlorobenzene	BDL	10
IV. ACID EXTRACTABLES		
2-Chlorophenol	BDL	10
2,4-Dichlorophenol	BDL	10
2,4-Dimethylphenol	BDL	10
2,4-Dinitrophenol	BDL	100
2-Methyl-4,6-Dinitrophenol	BDL	25
4,-Nitrophenol	BDL	100
Pentachlorophenol	BDL	10
Phenol	BDL	10
2,4,6-Trichlorophenol	BDL	10

*BDL = Below Detection Limit

Respectfully submitted,

TECHNICAL SERVICES, INC.

Harvey C. Gray, Jr.

LABORATORY I.D. NO. 82145

TECHNICAL SERVICES, INC.

ENVIRONMENTAL CONSULTANTS — INDUSTRIAL CHEMISTS
OFFICE 2471 SWAN ST. — P.O. BOX 52329
LABORATORIES 103-107 STOCKTON STREET
JACKSONVILLE, FLORIDA 32201
(904) 353-5761

Laboratory No. 71672- 2 May 15, 19 86

Sample of Water

Date Received 3/5/86

For Geraghty & Miller, Inc., P.O. Box 271173, Tampa, Fl. 33688
Attn: Mr. Barry Switzer

Marks: NS-Cecil Field, Sampled by B. Switzer 3/5/86
PS-1, PS-2, PS-3: composite

CERTIFICATE OF ANALYSIS

	VOC		
	CONCENTRATION ppb	DETECTION LIMIT ppb	MAXIMUM CONCENTRATION LEVEL ppb
Finished Water:			
Trichloroethylene	BDL	1	3
Tetrachloroethylene	BDL	1	3
Carbon Tetrachloride	BDL	1	3
Vinyl Chloride	BDL	1	1
1,1,1-Trichloroethane	BDL	1	200
1,2-Dichloroethane	BDL	1	3
Benzene	BDL	0.5	1
Raw Water			
Ethylene Dibromide (EDB)	Not Determined	0.02	0.02

	SOC	
I. PURGEABLES	CONCENTRATION ppb	DETECTION LIMIT ppb
Acrolein	BDL	50
Acrylonitrile	BDL	50
Bromodichloromethane	BDL	1
Bromoform	BDL	1
Bromomethane	BDL	1
Chlorobenzene	BDL	1
Chloroethane	BDL	1
2-Chloroethylvinyl ether	BDL	1

*BDL = Below Detection Limit

#71672-2

CERTIFICATE OF ANALYSIS

	SOC (cont.)	
	CONCENTRATION ppb	DETECTION LIMIT ppb
Chloroform	2.3	1
Chloromethane	BDL	1
Dibromochloromethane	BDL	1
Dichlorodifluoromethane	BDL	1
1,1-Dichloroethane	BDL	1
1,1-Dichloroethene	BDL	1
trans-1,3-Dichloropropene	BDL	1
1,2-Dichloroethene	BDL	1
1,2-Dichloropropane	BDL	1
cis-1,3-Dichloropene	BDL	1
Ethylbenzene	BDL	1
Methylene chloride	BDL	1
1,1,2-Trichloroethane	BDL	1
Trichlorofluoromethane	BDL	1
Toluene	BDL	1
Xylene	BDL	1
Styrene	BDL	1
Dichlorobenzene	BDL	1
1,2-Dibromo-3-Chloropropane	BDL	1
1,1,2,2-Tetrachloroethane	BDL	1
II. PESTICIDES AND PCB's		
Aldrin	BDL	0.01
a-BHC	BDL	0.004
b-BHC	BDL	0.004
g-BHC	BDL	0.004
d-BHC	BDL	0.004
Chlordane	BDL	0.05
4,4'-DDD	BDL	0.01
4,4'-DDE	BDL	0.01
4,4'-DDT	BDL	0.01
Dieldrin	BDL	0.005

*BDL = Below Detection Limit

#71672-2

CERTIFICATE OF ANALYSIS

	SOC (cont.)	
	CONCENTRATION ppb	DETECTION LIMIT ppb
Endosulfan I	BDL	0.004
Endosulfan II	BDL	.02
Endosulfan Sulfate	BDL	0.05
Ethion	BDL	0.02
Trithion	BDL	0.02
o,p-DDT, DDE, DDD	BDL	0.01
Tedion	BDL	0.05
Endrin	BDL	0.005
Endrin Aldehyde	BDL	0.01
Heptachlor	BDL	0.004
Heptachlor Expoxide	BDL	0.004
Toxaphene	BDL	0.1
PCB-1016	BDL	0.50
PCB-1221	BDL	0.50
PCB 1232	BDL	0.50
PCB-1243	BDL	0.50
PCB-1248	BDL	0.50
PCB-1254	BDL	0.50
PCB-1260	BDL	0.50
Aldicarb	BDL	1.0
Diazinon	BDL	0.1
Malathion	BDL	0.050
Parathion	BDL	0.20
Guthion	BDL	0.2
Kelthane (Dicofal)	BDL	0.05
III. BASE NEUTRAL EXTRACTABLES		
Acenaphthene	BDL	10
Acenaphthylene	BDL	10
Anthracene	BDL	10
Benzo(a)anthracene	BDL	10

* BDL = Below Detection Limit

#71672-2

CERTIFICATE OF ANALYSIS

	SOC (cont.)	
	CONCENTRATION ppb	DETECTION LIMIT ppb
Benzo(b)fluoranthene	BDL	10
Benzo(k)fluoranthene	BDL	10
Benzo(a)pyrene	BDL	10
Benzo(g,h,i)perylene	BDL	25
Benzidine	BDL	10
Bis(2-chloroethyl)ether	BDL	10
Bis(2-chloroethoxy)methane	BDL	10
Bis(2-ethylhexyl)phthalate	BDL	10
Bis(2-chloroisopropyl)ether	BDL	10
4-Bromophenyl phenyl ether	BDL	10
Butyl benzyl phthalate	BDL	10
2-Chloronaphthalene	BDL	10
4-Chlorophenyl phenyl ether	BDL	10
Chrysene	BDL	10
Dibenzo(a,h)anthracene	BDL	25
Di-n-butylphthalate	BDL	10
1,3-Dichlorobenzene	BDL	10
1,4-Dichlorobenzene	BDL	10
1,2-Dichlorobenzene	BDL	10
3,3-Dichlorobenzidine	BDL	10
Diethylphthalate	BDL	10
Dimethylphthalate	BDL	10
2,4-Dinitrotoluene	BDL	10
2,6-Dinitrotoluene	BDL	10
Dioctylphthalate	BDL	10
1,2-Diphenylhydrazine	BDL	10
Fluoranthene	BDL	10
Fluorene	BDL	10
Hexachlorobenzene	BDL	10
Hexachlorobutadiene	BDL	10

* BDL = Below Detection Limit

#71672-2

CERTIFICATE OF ANALYSIS

	SOC (cont.)	
	CONCENTRATION ppb	DETECTION LIMIT ppb
Hexachloroethane	BDL	
Hexachlorocyclopentadiene	BDL	10
Indeno(1,2,3-cd)pyrene	BDL	25
Isophorone	BDL	10
Naphthalene	BDL	10
Nitrobenzene	BDL	10
N-Nitrosodimethylamine	BDL	10
N-Nitrosodi-n-propylamine	BDL	10
N-Nitrosodiphenylamine	BDL	10
Phenanthrene	BDL	10
Pyrene	BDL	10
2,3,7;8-Tetrachlorodibenzo-p-dioxin (Dioxin)	BDL	10
1,2,4-Trichlorobenzene	BDL	10
IV. ACID EXTRACTABLES		
2-Chlorophenol	BDL	10
2,4-Dichlorophenol	BDL	10
2,4-Dimethylphenol	BDL	10
2,4-Dinitrophenol	BDL	100
2-Methyl-4,6-Dinitrophenol	BDL	25
4,-Nitrophenol	BDL	100
Pentachlorophenol	BDL	10
Phenol	BDL	10
2,4,6-Trichlorophenol	BDL	10

*BDL = Below Detection Limit

Respectfully submitted,

TECHNICAL SERVICES, INC.

Henry C. Gray, Jr.

LABORATORY I.D. NO. 82145

TECHNICAL SERVICES, INC.

ENVIRONMENTAL CONSULTANTS — INDUSTRIAL CHEMISTS
OFFICE 2471 SWAN ST. — P.O BOX 52329
LABORATORIES 103-107 STOCKTON STREET
JACKSONVILLE, FLORIDA 32201
(904) 353-5761

Laboratory No. 71672- 5 May 14, 19 86

Sample of Water

Date Received 3/5/86

For Geraghty & Miller, Inc., P.O. Box 271173, Tampa, Fl. 33688
Attn: Mr. Barry Switzer

Marks: NS-Cecil Field, Sampled by B. Switzer 3/5/86
PS-1

CERTIFICATE OF ANALYSIS OR TESTS

	CONCENTRATION, ppb	DETECTION LIMIT, ppb	MAXIMUM CONC. LEV
Ethylene Dibromide (EDB)	BDL*	0.01	0.02

*Below Detection Limit

Respectfully submitted,

TECHNICAL SERVICES, INC.

Harvey C. Gray, Jr.

LABORATORY I.D NO 82145

TECHNICAL SERVICES, INC.

ENVIRONMENTAL CONSULTANTS — INDUSTRIAL CHEMISTS
OFFICE 2471 SWAN ST. — P.O. BOX 52329
LABORATORIES 103-107 STOCKTON STREET
JACKSONVILLE, FLORIDA 32201
(904) 353-5761

Laboratory No. 71672-6 May 14, 19 86

Sample of Water

Date Received 3/5/86

For Geraghty & Miller, Inc., P.O. Box 271173, Tampa, Fl. 33688
Attn: Mr. Barry Switzer

Marks: NS-Cecil Field, Sampled by B. Switzer 3/5/86
PS-2

CERTIFICATE OF ANALYSIS OR TESTS

	CONCENTRATION, ppb	DETECTION LIMIT, ppb	MAXIMUM CONC. LEV
Ethylene Dibromide (EDB)	BDL*	0.01	0.02

*Below Detection Limit

Respectfully submitted,

TECHNICAL SERVICES, INC.

Harvey C. Gray, Jr.

LABORATORY I.D. NO 82145

TECHNICAL SERVICES, INC.

ENVIRONMENTAL CONSULTANTS — INDUSTRIAL CHEMISTS
OFFICE 2471 SWAN ST. — P.O. BOX 52329
LABORATORIES 103-107 STOCKTON STREET
JACKSONVILLE, FLORIDA 32201
(904) 353-5761

Laboratory No. 71672- 7 May 14, 19 86

Sample of Water

Date Received 3/5/86

For Geraghty & Miller, Inc., P.O. Box 271173, Tampa, Fl. 33688
Attn: Mr. Barry Switzer

Marks: NS-Cecil Field, Sampled by B. Switzer 3/5/86
PS-3

CERTIFICATE OF ANALYSIS OR TESTS

	CONCENTRATION, ppb	DETECTION LIMIT, ppb	MAXIMUM CONC. LE
Ethylene Dibromide (EDB)	BDL*	0.01	0.02

*Below Detection Limit

Respectfully submitted,

TECHNICAL SERVICES, INC.

Harvey C. Gray, Jr.

LABORATORY I.D. NO 82145

TECHNICAL SERVICES, INC.

ENVIRONMENTAL CONSULTANTS — INDUSTRIAL CHEMISTS
OFFICE 2471 SWAN ST. — P.O. BOX 52329
LABORATORIES 103-107 STOCKTON STREET
JACKSONVILLE, FLORIDA 32201
(904) 353-5761

Laboratory No. 71672-8 May 14, 19 86

Sample of Water

Date Received 3/5/86

For Geraghty & Miller, Inc., P.O. Box 271173, Tampa, Fl. 33688
Attn: Mr. Barry Switzer

Marks: NS-Cecil Field, Sampled by B. Switzer 3/5/86
PS-4

CERTIFICATE OF ANALYSIS OR TESTS

	CONCENTRATION, ppb	DETECTION LIMIT, ppb	MAXIMUM CONC. LEV
Ethylene Dibromide (EDB)	BDL*	0.01	0.02

*Below Detection Limit

Respectfully submitted,

TECHNICAL SERVICES, INC.

Harvey C. Gray, Jr.

LABORATORY I.D. NO. 82145

TECHNICAL SERVICES, INC.

ENVIRONMENTAL CONSULTANTS — INDUSTRIAL CHEMISTS
OFFICE 2471 SWAN ST. — P.O. BOX 52329
LABORATORIES 103-107 STOCKTON STREET
JACKSONVILLE, FLORIDA 32201
(904) 353-5761

Laboratory No. 71672- 9 May 14, 19 86

Sample of Water

Date Received 3/5/86

For Geraghty & Miller, Inc., P.O. Box 271173, Tampa, Fl. 33688
Attn: Mr. Barry Switzer

Marks: NS-Cecil Field, Sampled by B. Switzer 3/5/86
PS-5

CERTIFICATE OF ANALYSIS OR TESTS

	CONCENTRATION, ppb	DETECTION LIMIT, ppb	MAXIMUM CONC. LEVI
Ethylene Dibromide (EDB)	BDL*	0.01	0.02

*Below Detection Limit

Respectfully submitted,

TECHNICAL SERVICES, INC.

Harvey C. Gray, Jr.

LABORATORY I.D. NO 82145

ATTACHMENT B

Florida Administrative Code (FAC) 17-22.104(1)(e)2.a.

through 17-22.105(1)(h)

water shall not produce an annual dose equivalent to the total body or any internal organ greater than 4 millirem/year.

b. Except for the radionuclide listed in Table A [See end of Part II], the concentration of man-made radionuclides causing 4 mrem total body or organ dose equivalents shall be calculated on the basis of a 2 liter per day drinking water intake using the 168-hour data listed in "Maximum Permissible Body Burdens and Maximum Permissible Concentration of Radionuclides in Air or Water for Occupational Exposure," NBS Handbook 69 as amended August 1963, U.S. Department of Commerce. If two or more radionuclides are present, the sum of their annual dose equivalent to the total body or to any organ shall not exceed 4 millirem/year.

(f) Trihalomethane. The following maximum contaminant levels are for trihalomethanes (THM's) and are applicable to all community water supply systems serving a population of 10,000 or more individuals and which add a disinfectant (oxidant) to the water in any part of the drinking water treatment process:

1. Total Trihalomethanes (TTHM) shall include the sum of the concentrations bromodichloromethane, dibromochloromethane, tribromomethane (bromoform) and trichloromethane (chloroform) -0.10 mg/l (MCL).

(g) Volatile Organics. The following maximum contaminant levels (MCLs) for volatile organics are applicable to all community water systems. These concentrations are based on present "state of the art" analytical detection limits as applied to routine sampling, risk analysis, carcinogenicity and chronic toxicity, and may be altered in the future, commensurate with increasing laboratory capability or further data indicating adverse effects on human health.

Contaminant	Level, Micrograms Per Liter
Trichloroethylene	3
Tetrachloroethylene	3
Carbon Tetrachloride	3
Vinyl Chloride	1
1,1,1-Trichloroethane	200
1,2-Dichloroethane	3
Benzene	1-
Ethylene Dibromide	0.02

(2) Secondary Drinking Water Regulations - maximum contaminant levels. These levels shall not be exceeded in community water systems. If an MCL is exceeded, appropriate action, acceptable to the Department, including water treatment plan additions and modifications, shall be taken to provide water in which the MCL is

Copyright 1985 REGfiles, inc., Tallahassee, Florida

(a) Inorganic chemical sampling and analytical requirements.

1. Analyses for the purpose of determining compliance with 17-22.104(1)(a) are required as follows:

a. Analyses for all community water systems utilizing surface water sources shall be completed by June 24, 1978. These analyses shall be repeated at yearly intervals.

b. Analyses for all community water systems utilizing only ground water sources, shall be completed by June 24, 1979. These analyses shall be repeated at three-year intervals.

c. For non-community water systems, whether supplied by surface or ground water sources, analyses for nitrate shall be completed by June 24, 1979. These analyses shall be repeated at five-year intervals.

2. If the result of an analysis made pursuant to paragraph 17-22.105(1)(a)1. indicates that the level of any contaminant listed in 17-22.104(1)(a) exceeds the maximum contaminant level, the supplier of water shall report said fact to the Department within 7 days and initiate and complete three additional analyses for the suspect contaminant at the same sampling point within one month.

3. When the average of four analyses made pursuant to paragraph 17-22.105(1)(a)1. and 2. of this Section, rounded to the same number of significant figures as the maximum contaminant level for the substance in question, exceeds the maximum contaminant level, the supplier of water shall notify the Department pursuant to 17-22.111(2). Monitoring after public notification shall be at a frequency designated by the Department and shall continue until the maximum contaminant level has not been exceeded in two successive samples or until a monitoring schedule as a condition to a variance, exemption or enforcement action shall become effective.

4. The provisions of paragraphs (1)(a)2. and 3. of this section notwithstanding, compliance with the maximum contaminant level for nitrate shall be determined on the basis of the mean of two analyses. When a level exceeding the maximum contaminant level for nitrate is found, a second analysis shall be initiated within 24 hours, and if the mean of the two analyses exceeds the maximum contaminant level, the supplier of water shall report his findings to the Department pursuant to 17-22.111(2) and shall notify the public pursuant to 17-22.112.

5. For the initial analyses required by paragraph 17-22.105(1)(a)-1.a., b., or c. of this section, data for surface waters acquired

Copyright 1985 REGfiles, inc., Tallahassee, Florida

tometry.

i. Silver. Method[1] 272.1, or Method[2] 301-A II, pp. 148-151, Atomic Absorption-Direct Aspiration; or Method[1] 272.2, Atomic Absorption Furnace Techniques.

j. Fluoride. Electrode Method, or SPADNS Method, Method[2] 414-A and C, pp. 391-394, or Method[1] 340.1 or ASTM Method[4] D1179-72A (1978), "Colorimetric SPADNS with Bellack Distillation", or Method[1] 340.2, "Potentiometric Ion Selective Electrode," or ASTM Method[4] D1179-72B (1978); or Colorimetric Method with Preliminary Distillation, Method[2] 603, Automated Complexone Method (Alizarin Fluoride Blue) pp. 614-616; or Automated Electrode Method, "Fluoride in Water and Wastewater," Industrial Method No. 380-75WE, Technicon Industrial Systems, Tarrytown, New York 10591, February 1976, or "Fluoride in Water and Wastewater Industrial Method No. 129-71WE," Technicon Industrial Systems, Tarryton, New York 10591, December 1972; or Fluoride, Total Colorimetric, Zirconium-Eriochrome Cyanine R Method[3] 1-3325-78, pp. 365-367.

k. Sodium. Method[2] pp 250-253, Flame Photometric Method; or Method[1] 273.1, Atomic Absorption-Direct Aspiration or Method[1] 273.2 Atomic Absorption-Graphite Furnace; or Method[4] D1428-64(a).

REGfile-system Editor's Note: The references for the analytical methods in 17-22.105(1)(a)6.a. - k. are included following section (b), below.

(b) Organic chemical sampling and analytical requirements.

1. An analysis of substances for the purpose of determining compliance with 17-22.104(1)(b) shall be made as follows:

a. For all community water systems utilizing surface water sources, analyses shall be completed by June 24, 1978. Samples analyzed shall be collected during the period of the year designated by the Department as the period when contamination by pesticides is most likely to occur. These analyses shall be repeated at one year intervals thereafter.

b. For community water systems utilizing only groundwater sources, analyses shall be completed by June 24, 1979 and repeated at intervals as deemed necessary by the Department based upon evaluation of initial analysis or as conditions warrant.

2. If the result of an analysis made pursuant to paragraph (b)1.

Copyright 1985 REGfiles, inc., Tallahassee, Florida

[1] "Methods of Chemical Analysis of Water and Wastes," EPA Environmental Monitoring and Support Laboratory, Cincinnati, Ohio 45268 (EPA-600/4-79-020), March 1979. Available from ORD Publications, CERI, EPA, Cincinnati, Ohio 45268. For approved Analytical procedures for metals, the technique applicable to total metals must be used.

[2] "Standard Methods for the Examination of Water and Wastewater," 14th Edition, American Public Health Association, American Water Works Association, Water Pollution Control Federation, 1976.

[3] Techniques of Water-Resources Investigation of the United States Geological Survey, Chapter A-1, "Methods for Determination of Inorganic Substances in Water and Fluvial Sediments," Book 5, 1979, Stock No. 024-001-03177-9. Available from Superintendent of Documents, U.S. Government Printing Office, Washington, D.C. 20402.

[4] Annual Book of ASTM Standards, part 31, Water, American Society for Testing and Materials, 1916 Race Street, Philadelphia, Pennsylvania 19103.

[5] Techniques of Water-Resources Investigation of the United States Geological Survey, Chapter A-3, "Methods for Analysis of Organic Substances in Water," Book 5, 1972, Stock No. 2401-1227. Available from Superintendent of Documents, U.S. Government Printing Office, Washington, D.C. 20402.

REGfile-system Editor's Note: End of references.

(c) Turbidity sampling and analytical requirements.

1. Samples shall be taken by suppliers of water for both community water systems and non-community water systems that obtain raw water from a surface source at a representative entry point(s) to the water distribution system at least once per day, for the purpose of making turbidity measurements to determine compliance with Section 17-22.104(1)(c). Community water systems utilizing ground water sources shall analyze for turbidity at the same frequency as required for inorganic contaminants, or at such other frequency and location as deemed appropriate by the Department. If the Department determines that a reduced sampling frequency in a non-community system will not pose a risk to public health, it can reduce the required sampling frequency. The option of reducing the turbidity frequency shall be permitted only in those public water systems that practice disinfection and which maintain an active residual disinfectant in the distribution system, and in those cases where the Department has indicated in writing that no unreasonable risk to health existed under the circumstances of this option. The measurement shall be made by the Nephelometric Method in accordance with the recommendations set forth in "Standard Methods for the Examination of Water and Wastewater," American Public Health Association, 14th Edition, pp. 132-134 or "Methods for Chemical

Copyright 1985 REGfiles, inc., Tallahassee, Florida

Population Served	Minimum Number of Samples Per Month
25 to 2,500	2
2,501 to 3,300	3
3,301 to 4,100	4
4,101 to 4,900	5
4,901 to 5,800	6
5,801 to 6,700	7
6,701 to 7,600	8
7,601 to 8,500	9
8,501 to 9,400	10
9,401 to 10,300	11
10,301 to 11,100	12
11,101 to 12,000	13
12,001 to 12,900	14
12,901 to 13,700	15
13,701 to 14,600	16
14,601 to 15,500	17
15,501 to 16,300	18
16,301 to 17,200	19
17,201 to 18,100	20
18,101 to 18,900	21
18,901 to 19,800	22
19,801 to 20,700	23
20,701 to 21,500	24
21,501 to 22,300	25
22,301 to 23,200	26
23,201 to 24,000	27
24,001 to 24,900	28
24,901 to 25,000	29
25,001 to 28,000	30
28,001 to 33,000	35
33,001 to 37,000	40
37,001 to 41,000	45
41,001 to 46,000	50
46,001 to 50,000	55
50,001 to 54,000	60
54,001 to 59,000	65
59,001 to 64,000	70
64,001 to 70,000	75
70,001 to 76,000	80
76,001 to 83,000	85
83,001 to 90,000	90
90,001 to 96,000	95
96,001 to 111,000	100
111,001 to 130,000	110
130,001 to 160,000	120
160,001 to 190,000	130

Copyright 1985 REGfiles, inc., Tallahassee, Florida

in accordance with the preceding bacteriological sampling table. Such sampling shall begin within two years after June 24, 1977. If the State, on the basis of a sanitary survey, determines that some other frequency is more appropriate, that frequency shall be the frequency required under these regulations. Such frequency shall be confirmed or changed on the basis of subsequent surveys. The frequency shall not be reduced until the non-community water system has performed at least one coliform analysis of its drinking water and is shown to be in compliance with 17-22.104(1)(d).

4. a. A supplier of water of a community water system or a non-community water system may, with the approval of the Department and based upon a sanitary survey, substitute the use of chlorine residual monitoring for not more than 75 percent of the samples required to be taken by paragraph (1)(d)2. of this section, PROVIDED, that the supplier of water takes chlorine residual samples at points which are representative of the conditions within the distribution system at the frequency of at least four for each substituted microbiological sample. There shall be at least daily determinations of chlorine residual.

b. When the supplier of water exercises the option provided for in Section 4.a. above, he shall maintain no less than 0.2 mg/l free chlorine residual throughout the water distribution system. When a particular sampling point has been shown to have a free chlorine residual less than 0.2 mg/l, the water at that location shall be retested as soon as practicable and in any event within one hour. If the original analysis is confirmed, this fact shall be reported to the Department within 48 hours. Also, if the analysis is confirmed, another sample for coliform bacterial analysis must be collected from that sampling point as soon as practicable and preferably within one hour, and the results of such analysis reported to the State within 48 hours after the results are known to the supplier of water.

c. Chlorine residual analysis shall be made in accordance with the 13th Edition, pp. 129-132, of "Standard Methods for the Examination of Water and Wastewater." Compliance with the maximum contaminant levels for coliform bacteria shall be determined on the monthly mean basis specified in Section 17-22.104(1)(d) including those samples taken as a result of failure to maintain the required chlorine residual level. The Department may withdraw its overall approval of the use of chlorine residual substitution by written public notice in the Florida Administrative Weekly, or to a given public water system by actual notice.

Copyright 1985 REGfiles, inc., Tallahassee, Florida

whether disinfection practices following pipe placement, replacement, or repair have been sufficient, shall not be used to determine compliance with Section 17-22.104(1)(d)4. or Section 17-22.105(1)(d)2.

(e) Radionuclides.

1. Monitoring Frequency for Radioactivity in Community Water Systems.

a. Monitoring requirements for gross alpha particle activity, radium-226 and radium-228.

(i) Initial sampling to determine compliance with Section 17-22.104(1)(e) shall begin by June 24, 1979, and the analysis shall be completed by June 24, 1980. Compliance shall be based on the analysis of an annual composite of four consecutive quarterly samples or the average of the analyses of four samples obtained at quarterly intervals.

[1](A) A gross alpha particle activity measurement may be substituted for the required radium-226 and radium-228 analysis, PROVIDED, that the measured gross alpha particle activity does not exceed 5 pCi/l at a confidence level of 95 percent [1.65 (sigma) where (sigma) is the standard deviation of the net counting rate of the sample]. In localities where radium-228 is known to be present or may reasonably be expected to be present in drinking water, radium-226 and/or radium-228 analyses shall be provided when the gross alpha particle activity exceeds 2 pCi/l.

[2](B) When the gross alpha particle activity exceeds 5 pCi/l, the same or an equivalent sample shall be analyzed for radium-226. If the concentration of radium-226 exceeds 3 pCi/l the same or an equivalent sample shall be analyzed for radium-228.

(ii) For the initial analysis required by paragraph 1.a.(i), data acquired within one year prior to June 24, 1977, may be substituted.

(iii) Suppliers of water shall monitor at least once every four years following the procedure required by paragraph 1.a.(i). When an annual record taken in conformance with paragraph 1.a.(i) has established that the average annual concentration is less than half the maximum contaminant levels established by 17-22.104(1)(e), analysis of a single sample may be substituted for the quarterly sampling

Copyright 1985 REGfiles, inc., Tallahassee, Florida

(i) By June 24, 1979, systems using surface water sources and serving more than 100,000 persons, and such other community water systems as are designated by the Department, shall be monitored for compliance with Section 17-22.104(1)(e)2. by analysis of a composite of four consecutive quarterly samples or analysis of four quarterly samples. Compliance with Section 17-22.104(1)(e)2. may be assumed without further analysis if the average annual concentration of gross beta particle activity is less than 50 pCi/l and if the average annual concentrations of tritium and strontium-90 are less than those listed on Table A, PROVIDED, that if both radionuclides are present the sum of their annual dose equivalents to bone marrow shall not exceed 4 millirem/year.

[1](A) If the gross beta particle activity exceeds 50 pCi/l, an analysis of the sample must be performed to identify the major radioactive constituents present and the appropriate organ and total body doses shall be calculated to determine compliance with Section 17-22.104(1)(e)2.

[1](B) Suppliers of water shall conduct additional monitoring, as ordered by the Department, to determine the concentration of man-made radioactivity in principal watersheds designated by the Department.

[1](C) At the discretion of the Department suppliers of water utilizing only groundwaters may be required to monitor for man-made radioactivity.

(ii) For the initial analysis required by paragraph 1.b.(i), data acquired within one year prior to June 14, 1977, may be substituted.

(iii) After the initial analysis required by paragraph 1.b.(i), suppliers of water shall monitor at least every four years following the procedure given in paragraph 1.b.(i).

(iv) By June 24, 1979, the supplier of any community water system designated by the Department as utilizing waters contaminated by effluents from nuclear facilities shall initiate quarterly monitoring for gross beta particle and iodine-131 radioactivity and annual monitoring for strontium-90 and tritium.

[1](A) Quarterly monitoring for gross beta particle activity shall be based on the analysis of monthly samples or the analysis of a composite of three

Copyright 1985 REGfiles, inc., Tallahassee, Florida

(i) Gross Alpha and Beta - Method 302 "Gross Alpha and Beta Radioactivity in Water" Standard Methods for the Examination of Water and Wastewater, 13th Edition, 1971, American Public Health Association, New York, N.Y.

(ii) Total Radium - Method 304 "Radium in Water by Precipitation" Ibid.

(iii) Radium-226 - Method 305 "Radium-226 by Radon in Water" Ibid.

(iv) Strontium-89, 90 - Method 303 "Total Strontium and Strontium-90 in Water" Ibid.

(v) Tritium - Method 306 "Tritium in Water" Ibid.

(vi) Cesium-134 - ASTM D-2459 "Gamma Spectrometry in Water", 1975 Annual Book of ASTM Standards, Water and Atmospheric Analysis, Part 31, American Society for Testing and Materials, Philadelphia, PA (1975).

(vii) Uranium - ASTM D-2907 "Micro-quantities of Uranium in Water by Fluorometry", Ibid.

b. When the identification and measurement of radionuclides other than those listed in paragraph 17-22.105(1)(e)2.a. is required, the following reference are to be used, except in cases where alternative methods have been approved in accordance with 17-22.105(3).

(i) Procedures for Radiochemical Analysis of Nuclear Reactor Aqueous Solutions, H.L. Krieger and S. Gold, EPA-R4-73-014, USEPA, Cincinnati, Ohio, May 1973.

(ii) HASL Procedure Manual, Edited by John H. Harley. HASL 300, ERDA Health and Safety Laboratory, New York N.Y. 1973.

c. For the purpose of monitoring radioactivity concentrations in drinking water, the required sensitivity of the radioanalysis is defined in terms of a detection limit. The detection limit shall be that concentration which can be counted with a precision of plus or minus 100 percent at the 95 percent confidence level [1.96 (sigma) where (sigma) is the standard deviation of the net counting rate of the sample].

(i) To determine compliance with Section 17-22.104(1)(e)-1.a., the detection limit shall not exceed 1 pCi/l. To determine compliance with Section 17-22.104(1)(e)1.b., the detection limit shall not exceed 3 pCi/l.

Copyright 1985 REGfiles, inc., Tallahassee, Florida

methods listed in subparagraph 5. of this subsection.

b. Total Trihalomethane content as a basis to lessen monitoring requirements. Upon the written request of a community water system, the monitoring frequency required by subparagraph 2.a. of this subsection may be reduced by the Department to a minimum of one sample analyzed for TTHM's per quarter taken at a point in the distribution system reflecting the maximum residence time of the water in the system, upon written determination by the Department that the data from at least 1 year of monitoring in accordance with subparagraph 2.a. of this subsection and local conditions demonstrate that trihalomethane concentrations will be consistently below the maximum contaminant level.

c. If at any time during which the reduced monitoring frequency prescribed under this paragraph applies, the results from any analysis exceed 0.10 mg/l of TTHM's and such results are confirmed by at least one check sample taken promptly after such results are received, or if the system makes any significant change to its source of water or treatment program, the system shall immediately begin monitoring in accordance with the requirements of subparagraph 2.a. of this subsection, which monitoring shall continue for at least 1 year before the frequency may be reduced again. The Department may require an increase in monitoring frequency above the minimum established by these rules where necessary to detect variations of TTHM levels within the distribution system.

3. a. Total Trihalomethane Potential as a basis to lessen monitoring requirements. Upon written request to the Department, a community water system utilizing only groundwater sources may seek to have the monitoring frequency required by subparagraph 2.a. of this subsection reduced to a minimum of one sample for maximum TTHM potential per year for each treatment plant used by the system taken at a point in the distribution system reflecting maximum residence time of the water in the system. The system shall submit to the Department the result of at least one sample analyzed for maximum TTHM potential for each treatment plant used by the system taken at a point in the distribution system reflecting the maximum residence time of the water in the system. The system's monitoring frequency may only be reduced upon a written determination by the Department that the system has a maximum TTHM potential of less than 0.10 mg/l and that, based upon an assessment of the system and local conditions affecting it the system is not likely to approach or exceed the maximum contaminant level for TTHM's. The results of all analyses shall be reported to the Department within 30

Copyright 1985 REGfiles, inc., Tallahassee, Florida

Samples for TTHM shall be dechlorinated upon collection to prevent further production of Trihalomethanes, according to the procedures described in the above two methods. Samples for maximum TTHM potential should not be dechlorinated, and should be held for seven days at 25°C prior to analysis, according to the procedure described in the above two methods. Since lack of a disinfectant residual in the TTHM potential samples at the end of seven days invalidates the sample results, 1 drop of a 1% to 5% chlorine solution must be added to the initial 40 milliliter sample.

(g) Volatile Organics – Sampling and Analytical Requirements:

1. Regulations for volatile organic MCLs as set forth in 17-22.104(1)(g) shall take effect June 1, 1985 for systems serving more than 1,000 persons, and January 1, 1987 for systems serving less than 1,000 persons. Analyses for contaminants shall be performed at three-year intervals. Sampling shall be performed on finished water leaving the water treatment plant except for ethylene dibromide which shall be sampled before chlorination. When a system is provided water from multiple treatment plants a sample(s) representative of the distribution system's water will be sufficient. If a sample analysis exceeding the MCL occurs, two additional samples shall be collected and confirmed by GC/MS within one month. If the average value of the three sample results exceeds the MCL, quarterly sampling will be required until two consecutive sample results do not exceed the MCL value.

2. Analyses conducted to determine compliance with 17-22.104(1)(g) shall be made in accordance with the following methods further identified at the end of 17-22.105(1)(h)4.

Trichloroethylene, Tetrachloroethylene, Carbon Tetrachloride, Vinyl Chloride, 1,1,1-Trichloroethane, and 1,2-Dichloroethane – Methods 501.1, 501.2, 501.3, 502.1, 503.1, 601, 602, and 624.

Benzene – Methods 501.1, 501.2, 501.3, 502.1, 503.1, 601, 602, and 624.

Ethylene Dibromide – "Analysis of 1,2-Dibromoethane in Drinking Water", Florida Department of Health and Rehabilitative Services, Jacksonville Central Laboratory, 1217 Pearl Street, Post Office Box 210, Jacksonville, Florida 32231-0042.

(h) Synthetic Organic Contaminants Monitoring. Analyses for synthetic organic contaminants (SOCs) shall be submitted to the department by January 1, 1985 for all community systems serving 1,000

Copyright 1985 REGfiles, inc., Tallahassee, Florida