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U.S. DEPARTMENT OF THE NAVY
NAVAL COASTAL SYSTEMS CENTER
PANAMA CITY, FLORIDA

FINAL REPORT

RCRA FACILITY ASSESSMENT
CONTRACT NO. N62467-87-D-0025

E.C. JORDAN PROJECT NO. 5330-01

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TABLE OF CONTENTS

SECTION	TITLE	PAGE NO.
	EXECUTIVE SUMMARY	1
1.0	INTRODUCTION	6
	1.1 THE NIRP PROGRAM AND PANAMA CITY NAVAL COASTAL SYSTEMS CENTER	8
2.0	DESCRIPTION OF FACILITY OPERATIONS AND WASTE GENERATION	10
	2.1 FACILITY OPERATIONS	10
	2.2 WASTE GENERATION	10
	2.2.1 Public Works Division	10
	2.2.2 Battery Shop	12
	2.2.3 Machine Shop	12
	2.2.4 Paint Shop	13
	2.2.5 Metal Plating Shop	13
	2.2.6 Electrical Shop	14
	2.2.7 Plastic Shop	15
	2.2.8 Woodworking Shop	16
	2.2.9 Rigging Shop	16
	2.2.10 Photo Shop	16
	2.2.11 Motor Vehicle Maintenance Shop	17
	2.2.12 Pest Control Shop	17
	2.2.13 Boilers and Cooling Condensers	18
	2.2.14 Power House	18
	2.2.15 Fire Fighting Training	19
	2.2.16 Pier Operations	19
	2.2.17 Marina	20
	2.2.18 Hobby Shop	20
	2.3 TENANT OPERATIONS	21
	2.3.1 Assault Craft Unit Five (ACU5)	21
	2.3.2 Explosive Ordnance Disposal Group Two Detachment	21
	2.3.3 Naval Diving and Salvage Training Center (NDSTC)	22
	2.3.4 Navy Experimental Diving Unit (NEDU)	23
	2.3.5 U.S.S. Fidelity	23
	2.3.6 Dispensary	23
	2.3.7 Naval Regional Dental Center Branch Dental Clinic	24
	2.3.8 Navy Publications and Printing Service Office Reprographic Facility	24

TABLE OF CONTENTS (Cont'd)

SECTION	TITLE	PAGE NO.
3.0	ENVIRONMENTAL SETTING AND TARGET POPULATIONS	26
	3.1 GEOLOGICAL AND HYDROLOGICAL SETTING	26
	3.1.1 Physiography	26
	3.1.2 Stratigraphy and Structure	26
	3.1.3 Hydrology	30
	3.2 TARGET POPULATIONS	34
4.0	SWMU DESCRIPTIONS	36
	4.1 SWMU #1 - LANDFILL A (NIRP Site 1)	36
	4.1.1 Unit Characteristics	36
	4.1.2 Waste Characteristics	38
	4.1.3 Groundwater	38
	4.1.4 Surface Water	40
	4.1.5 Air	40
	4.1.6 Soils	40
	4.1.7 Subsurface Gas	40
	4.1.8 Data Gaps and Recommendations	41
	4.2 SWMU #2 - LANDFILL B (NIRP Site 2)	41
	4.2.1 Unit Characteristics	41
	4.2.2 Waste Characteristics	41
	4.2.3 Groundwater	42
	4.2.4 Surface Water	44
	4.2.5 Air	44
	4.2.6 Soils	45
	4.2.7 Subsurface Gas	45
	4.2.8 Data Gaps and Recommendations	45
	4.3 SWMU #3 - LANDFILL C (NIRP Site 6)	45
	4.3.1 Unit Characteristics	45
	4.3.2 Waste Characteristics	46
	4.3.3 Groundwater	46
	4.3.4 Surface Water	48
	4.3.5 Air	48
	4.3.6 Soils	48
	4.3.7 Subsurface Gas	49
	4.3.8 Data Gaps and Recommendations	49

TABLE OF CONTENTS (Cont'd)

SECTION	TITLE	PAGE NO.
4.4	SWMU #4 - LANDFILL D (NIRP Site 7)	49
4.4.1	Unit Characteristics	49
4.4.2	Waste Characteristics	50
4.4.3	Groundwater	50
4.4.4	Surface Water	50
4.4.5	Air	50
4.4.6	Soils	51
4.4.7	Subsurface Gas	51
4.4.8	Data Gaps and Recommendations	51
4.5	SWMU #5 - PAINT SHOP CLEANING AREA (NIRP Site 5)	51
4.5.1	Unit Characteristics	51
4.5.2	Waste Characteristics	52
4.5.3	Groundwater	52
4.5.4	Surface Water	52
4.5.5	Air	52
4.5.6	Soils	52
4.5.7	Subsurface Gas	54
4.5.8	Data Gaps and Recommendations	54
4.6	SWMU #6 - HAZARDOUS WASTE STORAGE AREA (HWSA)	54
4.6.1	Unit Characteristics	54
4.6.2	Waste Characteristics	55
4.6.3	Groundwater	55
4.6.4	Surface Water	61
4.6.5	Air	61
4.6.6	Soils	61
4.6.7	Subsurface Gas	62
4.6.8	Data Gaps and Recommendations	62
4.7	SWMU #7 - WASTEWATER TREATMENT PLANT	62
4.7.1	Unit Characteristics	62
4.7.2	Waste Characteristics	63
4.7.3	Groundwater	63
4.7.4	Surface Water	64
4.7.5	Air	64
4.7.6	Soils	64
4.7.7	Subsurface Gas	64
4.7.8	Data Gaps and Recommendations	65

TABLE OF CONTENTS (Cont'd)

SECTION	TITLE	PAGE NO.
4.8	SWMU #8 - CLASSIFIED DOCUMENTS INCINERATOR	65
4.8.1	Unit Characteristics	65
4.8.2	Waste Characteristics	65
4.8.3	Groundwater	65
4.8.4	Surface Water	66
4.8.5	Air	66
4.8.6	Soils	66
4.8.7	Subsurface Gas	66
4.8.8	Data Gaps and Recommendations	67
4.9	SWMU #9 - CURRENT FIRE TRAINING AREA	67
4.9.1	Unit Characteristics	67
4.9.2	Waste Characteristics	67
4.9.3	Groundwater	68
4.9.4	Surface Water	68
4.9.5	Air	68
4.9.6	Soils	68
4.9.7	Subsurface Gas	69
4.9.8	Data Gaps and Recommendations	69
4.10	SWMU #10 - OIL/WATER SEPARATOR	69
4.10.1	Unit Characteristics	70
4.10.2	Waste Characteristics	70
4.10.3	Groundwater	70
4.10.4	Surface Water	70
4.10.5	Air	70
4.10.6	Soils	71
4.10.7	Subsurface Gas	71
4.10.8	Data Gaps and Recommendations	71
4.11	SWMU #11 - TEMPORARY HAZARDOUS WASTE STORAGE AREA (PAINT SHOP)	71
4.11.1	Unit Characteristics	71
4.11.2	Waste Characteristics	72
4.11.3	Groundwater	72
4.11.4	Surface Water	72
4.11.5	Air	72
4.11.6	Soils	72
4.11.7	Subsurface Gas	73
4.11.8	Data Gaps and Recommendations	73

TABLE OF CONTENTS (Cont'd)

SECTION	TITLE	PAGE NO.
	4.12 SWMU #12 - TEMPORARY HAZARDOUS WASTE STORAGE AREA (BLDG. 40)	73
	4.12.1 Unit Characteristics	73
	4.12.2 Waste Characteristics	73
	4.12.3 Groundwater	73
	4.12.4 Surface Water	75
	4.12.5 Air	75
	4.12.6 Soils	75
	4.12.7 Subsurface Gas	75
	4.12.8 Data Gaps and Recommendations	75
5.0	AREAS OF CONCERN	76
	5.1 AREA OF CONCERN #1 - OLD FIRE TRAINING AREA (NIRP Site 3)	76
	5.1.1 Unit Characteristics	76
	5.1.2 Waste Characteristics	76
	5.1.3 Groundwater	76
	5.1.4 Surface Water	77
	5.1.5 Air	77
	5.1.6 Soils	77
	5.1.7 Subsurface Gas	77
	5.1.8 Data Gaps and Recommendations	78
	5.2 AREA OF CONCERN #2 - UNDERGROUND OIL CONTAMINATED AREA (NIRP Site 4)	78
	5.2.1 Unit Characteristics	78
	5.2.2 Waste Characteristics	80
	5.2.3 Groundwater	80
	5.2.4 Surface Water	80
	5.2.5 Air	80
	5.2.6 Soils	81
	5.2.7 Subsurface Gas	81
	5.2.8 Data Gaps and Recommendations	81

TABLE OF CONTENTS (Cont'd)

SECTION	TITLE	PAGE NO.
	5.3 AREA OF CONCERN #3 - SOLVENT DISPOSAL AREA AT BUILDING 40 (NIRP Site 8) . . .	81
	5.3.1 Unit Characteristics.	81
	5.3.2 Waste Characteristics	82
	5.3.3 Groundwater	82
	5.3.4 Surface Water	82
	5.3.5 Air	82
	5.3.6 Soils	82
	5.3.7 Subsurface Gas.	83
	5.3.8 Data Gaps and Recommendations .	83
6.0	CONCLUSIONS AND RECOMMENDATIONS.	84
	6.1 SWMUs AND ACs REQUIRING NO FURTHER ACTION.	84
	6.2 SWMUs RECOMMENDED FOR PREVENTATIVE MEASURES.	84
	6.3 SWMUs AND ACs RECOMMENDED FOR FURTHER ACTION.	84
	6.3.1 SWMU #1 (NIRP Site 1) - Landfill A.	86
	6.3.2 SWMU #2 (NIRP Site 2) - Landfill B.	86
	6.3.3 SWMU #3 (NIRP Site 6) - Landfill C.	86
	6.3.4 SWMU #5 (NIRP Site 5) - Paint Shop Cleaning Area . . .	86
	6.3.5 SWMU #9 - Current Fire Training Area.	86
	6.3.6 Area of Concern #1 - Old Fire Training Area (NIRP Site 3). .	86
	6.3.7 Area of Concern #2 - Underground Oil Contamination Area (NIRP Site 4).	87

REFERENCES

APPENDIX A - Site Photographs
APPENDIX B - Waste Generation and Disposal
APPENDIX C - Water Level Data and Contour Map

LIST OF TABLES

TABLE NO.	TITLE	PAGE NO.
ES-1	OPERATIONS AT NCSC PANAMA CITY	2
ES-2	SUMMARY OF WASTES GENERATED NCSC PANAMA CITY, FLORIDA	3
ES-3	SUMMARY OF RELEASE INFORMATION	5
3-1	MEAN MONTHLY WIND DIRECTION AND WIND SPEED AT NCSC.	31
4-1	ESTIMATED WASTE QUANTITIES DISPOSED OF AT LANDFILL A, NCSC PANAMA CITY, FLORIDA.	39
4-2	ESTIMATED WASTE QUANTITIES DISPOSED OF AT LANDFILL B, NCSC PANAMA CITY, FLORIDA.	43
4-3	ESTIMATED WASTE QUANTITIES DISPOSED OF AT LANDFILL C, NCSC PANAMA CITY, FLORIDA	47
4-4	ESTIMATED WASTE QUANTITIES DISPOSED OF AT SWMU #5, NCSC PANAMA CITY, FLORIDA	53
4-5	BAY CHARACTERISTICS, HAZARDOUS WASTE STORAGE FACILITY, NCSC PANAMA CITY, FLORIDA	56
4-6	STORAGE AND CONTAINMENT CAPACITIES.	57
4-7	CHEMICAL AND PHYSICAL ANALYSIS OF WASTES AT NCSC	58
4-8	ESTIMATED METAL PLATING SHOP WASTE GENERATION NCSC PANAMA CITY, FLORIDA	74
6-1	SUMMARY OF RELEASE INFORMATION.	85

LIST OF FIGURES

FIGURE NO.	TITLE	PAGE NO.
1-1	NCSC SITE VICINITY	7
2-1	LOCATION OF WASTE GENERATING OPERATIONS.	11
3-1	EAST - WEST GEOLOGIC CROSS SECTION OF NCSC	27
3-2	STRATIGRAPHIC NOMENCLATURE FOR THE GEOLOGIC FORMATIONS IN BAY COUNTY, FLORIDA.	28
4-1	LOCATION OF SOLID WASTE MANAGEMENT UNITS AND AREAS OF CONCERN	37

EXECUTIVE SUMMARY

The Resource Conservation and Recovery Act (RCRA) corrective action program is designed to evaluate the potential for release of hazardous waste from Solid Waste Management Units (SWMU) and to implement corrective actions as necessary. The program applies to all operating, closed, or closing RCRA facilities and consists of the RCRA Facility Assessment (RFA), the RCRA Facility Investigation, and corrective measures. E.C. Jordan (Jordan), under contract No. N62467-87-D-0025 is providing services to the Department of the Navy, Naval Facilities Engineering Command, Southern Division (SDIV) in support of their compliance with HSWA Permit requirements . Jordan conducted an RFA at Naval Coastal Systems Center, Panama City, Florida (NCSC) (RCRA Permit No. FL8 170 002 792) on June 23-24, 1987 to identify the SWMUs and evaluate the potential for release of hazardous waste from these SWMUs to the environment.

NCSC is located in Bay County, Florida and consists of two operational areas, the laboratory area and the ordnance area. NCSC has been a major research, development, testing and evaluation laboratory since the mid-1940s. Planning, maintenance and industrial shops support NSCS activities, and several tenant activities are located at the facility. NCSC and tenant activities are listed on Table ES-1. Wastes generated from these activities include those listed on Table ES-2.

The physiography of NCSC is that of the flat-wood Forest Subdivision of the Gulf Coastal Lowlands Physiographic Division. The area is well drained except for some low-lying swampy areas near bays. The land surface at NCSC varies from 0 to 17 feet above MSL. Surface soils are highly permeable quartz sand. NCSC is underlain by Pleistocene to recent sediments overlying the Intracoastal Formation. The Intracoastal is underlain by the Bruce Creek, Suwannee Limestone and limestones of the Ocala Group, respectively.

Surface water at NCSC drains directly to St. Andrew Bay and Alligator Bayou. Groundwater occurs in the unconfined surficial aquifer, the secondary artesian aquifer, and the Floridan aquifer. The surficial aquifer occurs approximately 4 to 8.5 feet below land surface and may be hydraulically connected to the Floridan aquifer in the NCSC area.

Land uses immediately adjacent to NCSC are primarily commercial and coastal residential with a substantial amount of undeveloped open space. Water is supplied almost entirely by the Bay County Water System which obtains water from Deer Point Lake.

TABLE ES-1
OPERATIONS AT NCSC PANAMA CITY

NCSC Operations

Public Works Division
Battery Shop
Machine Shop
Paint Shop
Metal Plating Shop
Electrical Shop
Plastic Shop
Woodworking Shop
Rigging Shop
Photo Shop
Motor Vehicle Maintenance Shop
Pest Control Shop
Boilers and Cooling Condensers
Power House
Fire Fighting Training
Pier Operations
Marina
Hobby Shop

Tenant Operations

Assault Craft Unit Five (ACU5)
Explosive Ordnance Disposal Group Two, Detachment
Naval Diving and Salvage Training Center (NDSTC)
Navy Experimental Diving Unit (NEDU)
U.S.S. Fidelity
Dispensary
Naval Regional Dental Center Branch Dental Clinic
Navy Publications and Printing Service Office Reprographic Facility

TABLE ES-2
SUMMARY OF WASTES GENERATED
NCSC PANAMA CITY, FLORIDA

- batteries
- waste oils
- paint
- solvents
  - mineral spirits
  - methyl ethyl ketone
  - paint thinner
  - acetone
- plating wastes
  - dyes
  - hydrochloric acid
  - nitric acid
  - fluoboric acid
  - sodium persulfate acid
  - chromic acid
  - nickel solution
  - alkaline stripper
  - cyanide
- trichloroethylene
- transformer oil (possibly containing PCBs)
- styrene
- photographic wastes
  - developer (color and black & white)
  - fixer
  - bleach
  - stabilizer
  - reversal bath
  - conditioner
- perchloroethylene
- bilge water
- phosphoric acid
- trisoduim phosphate
- butylethanol
- amalgam solution (contains mercury)
- x-ray developing solution
- solid wastes
  - scrap wood
  - garbage, trash

The RFA identified 12 SWMUs and 3 Areas of Concern (AC) at NCSC. The Areas of Concern did not fall under the EPA Guidance definition of SWMU, but were included to make the RFA a complete assessment of possible sources of release at NCSC. Each SWMU and AC was evaluated with respect to its age, condition, size, location and potential for release. This information was used to make recommendations for each SWMU and AC. The recommendations included no further action, preventative measures, and further action. This information is summarized on Table ES-3. Further action recommendations ranged from closure using existing wells to further characterization using soil borings and the installation of monitoring wells. Most of the sites recommended for further action are currently being acted upon under the Navy Installation Restoration Program (NIRP). The sites being studied under NIRP are designated with a NIRP Site number on Table ES-3.

TABLE ES-3
SUMMARY OF RELEASE INFORMATION
RCRA FACILITY ASSESSMENT
NAVAL COASTAL SYSTEMS CENTER
PANAMA CITY, FLORIDA

SWMU #	NIRP SITE #	DESCRIPTION	GROUNDWATER	SURFACE WATER	AIR	SOIL	SUBSURFACE GAS	RECOMMENDATION
1)	1	LANDFILL A	P	P	NE	P	NE	RFI
2)	2	LANDFILL B	D	NE	NE	D	NE	RFI
3)	6	LANDFILL C	NE	NE	NE	NE	NE	RFI
4)	7	LANDFILL D	NE	NE	NE	NE	NE	RFI
5)	5	PAINT EQUIPMENT CLEANING AREA	P	NE	NE	E	NE	RFI
6)		RCRA HAZ. WASTE STORAGE AREA	NE	NE	NE	NE	NE	NO ACTION
7)		WASTEWATER TREATMENT FACILITY	NE	P	NE	NE	NE	NO ACTION
8)		CLASSIFIED DOCUMENTS INCINERATOR	NE	NE	NE	NE	NE	RFI
9)		CURRENT FIRE TRAINING AREA	E	NE	NE	E	NE	RFI
10)		OIL/WATER SEPARATOR	P	P	NE	P	NE	NO ACTION
11)		TEMPORARY HAZ. WASTE STORAGE (BLDG. 84)	NE	NE	NE	P	NE	PREVENTATIVE MEASURES
12)		TEMPORARY HAZ. WASTE STORAGE (BLDG. 40)	NE	P	NE	NE	NE	*
AREAS OF CONCERN								
1)	3	OLD FIRE TRAINING AREA	D	NE	NE	D	NE	RFI
2)	4	UNDERGROUND OIL CONTAMINATED AREA	D	D	NE	D	NE	RFI
3)	8	SOLVENT DISPOSAL (BLDG. 40)	NE	NE	NE	NE	NE	NO ACTION

NE - NOT EXPECTED
P - POTENTIAL
E - EXPECTED
D - DOCUMENTED

* - PLATING SHOP SCHEDULED FOR DEMOLITION NOVEMBER/DECEMBER 1987

1.0 INTRODUCTION

The Resource Conservation and Recovery Act (RCRA) corrective action program is designed to evaluate the potential for releases of hazardous wastes or hazardous constituents and to implement corrective actions, as necessary, under the broad authority of the 1984 Hazardous and Solid Waste Amendments (HSWA). The program applies to all operating, closed or closing RCRA facilities and consists of three phases:

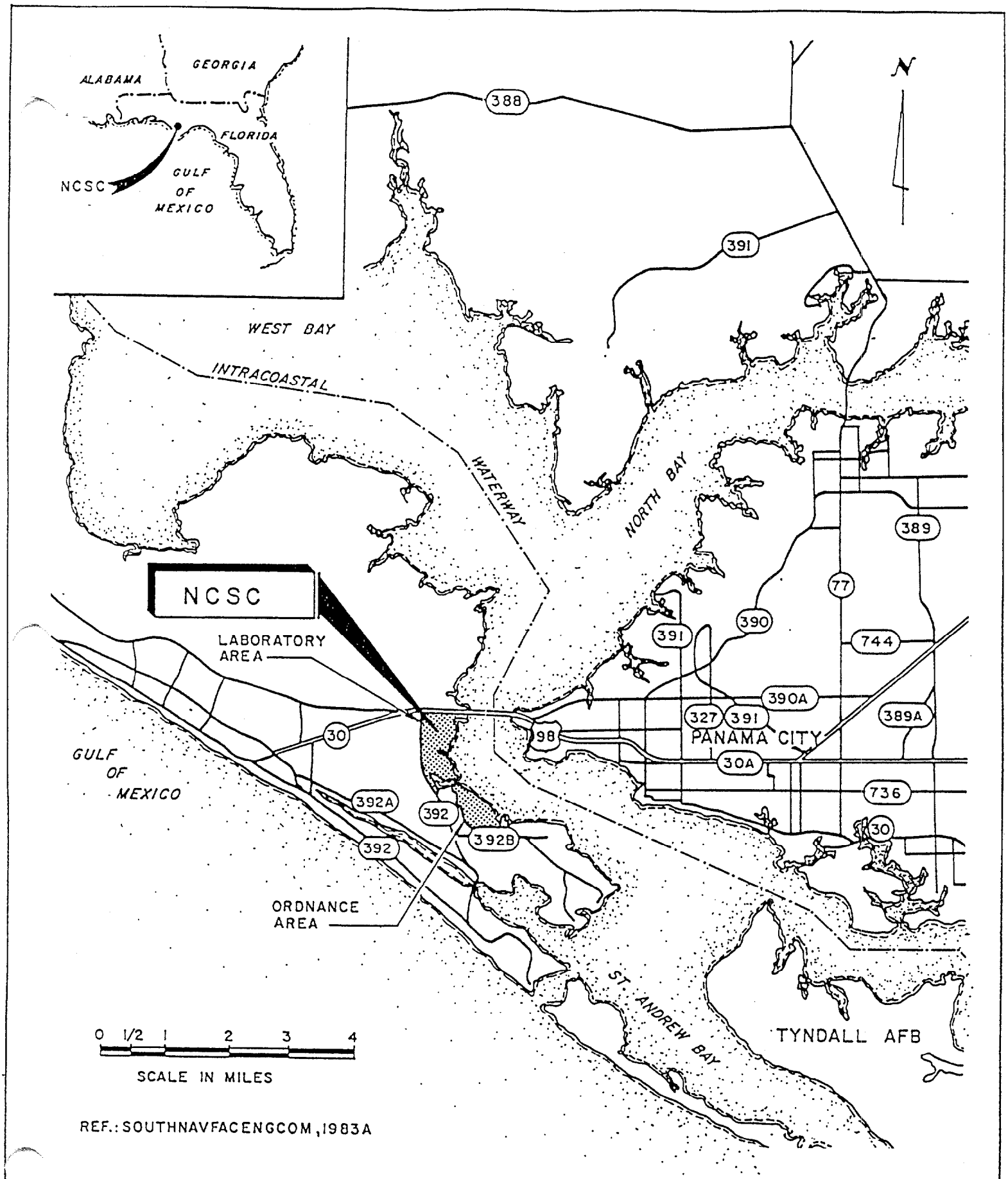
- the RCRA Facility Assessment (RFA) to identify releases or potential releases that require additional investigation;
- the RCRA Facility Investigation (RFI) to characterize the nature and extent of releases; and
- corrective measures (CM) to define the need and type of remedial measures.

E.C. Jordan (Jordan) is providing services to the Department of the Navy, Naval Facilities Engineering Command, Southern Division (SDIV) in support of their compliance with HSWA Permit requirements for the Naval Coastal Systems Center (NCSC) facility. As part of this service, Jordan was authorized in June 1987 to conduct an RFA at the NCSC, Panama City, Florida, under Contract No. N62467-87-D-0025. A site location of the NCSC facility is presented in Figure 1-1.

The RFA identifies information on solid waste management units (SWMUs) at RCRA facilities, evaluates the potential for releases to the environment, and determines the need for future investigations. The RFA consists of a preliminary review (PR) and a visual site inspection (VSI). The PR consists of the review of available file information from state environmental agency files as well as local and facility files, if necessary, to fill specific data gaps.

The RFA for NCSC consisted of a preliminary review of available information supplied by NCSC, SDIV, and FDER file reviews. In addition to the PR, a VSI was conducted on June 23-24, 1987 by Jordan and NCSC personnel. A photographic log of the VSI is included in Appendix A. Detailed information on waste generation, handling and processing and on inactive (past) solid waste management units (SWMUs) and Areas of Concern (AC) already has been compiled and reported under the Navy Installation Restoration Program (NIRP). The NIRP program at NCSC is discussed in detail in the following section.

In compliance with the Superfund Amendment and Reauthorization Act (SARA) and the Comprehensive Environmental Response Compensation and Liability Act (CERCLA) Section 120, all future



REF.: SOUTHNAVFACENGCOM, 1983A

E.C. JORDAN CO. ENGINEERS & SCIENTISTS	NCSC SITE VICINITY	
U.S. DEPT. OF NAVY NAVAL COASTAL SYSTEMS CENTER PANAMA CITY, FLORIDA	5330-01	FIGURE 1-1

Navy restoration program work methodology and terminology will conform to that used by the United States Environmental Protection Agency (USEPA) as stated in the Naval Facilities Engineering Command Interim Policy dated 23 April 1987. In addition, to insure consistency among the activities within the Department of Defense (DOD), the Navy has renamed NACIP the Naval Installation Restoration Program (NIRP).

1.1 THE NIRP PROGRAM AND PANAMA CITY NAVAL COASTAL SYSTEMS CENTER (NCSC)

The NCSC is included in the Navy Installation Restoration Program (NIRP). NIRP was established to identify the presence of any suspected contamination at Navy and Marine Corps lands resulting from past operations, and, if needed, to institute corrective remedial measures. The NIRP is implemented in three parts.

1. Initial Assessment Study (IAS). The study consists of records searches and personnel interviews to collect and evaluate evidence supporting the existence of any potential contamination problems at NCSC.

2. Confirmation Study. The study consists of on-site investigations including physical and chemical analyses to confirm or deny the existence of contamination, to quantify the extent of the problem, and to recommend necessary corrective measures if contamination is present.

3. Remedial Measures. The study identifies corrective actions to control and mitigate contamination.

The IAS was completed for NCSC by C.C. Johnson and Associates Inc. (Johnson) and a report submitted to the Navy in September 1985. The IAS contains background information on the chemicals which were used at the Navy facility and on specific sites where chemical wastes were known to have been stored or disposed or where such activities are suspected to have occurred. Eight sites were identified in the IAS report. The IAS provides a ranking of these sites based on the available information and any potential hazard to human health and the environment. On the basis of this ranking and a review of the IAS by the Florida Department of Environmental Regulation (FDER) and the U.S. Environmental Protection Agency (EPA),

seven sites were selected by the Navy for the Confirmation Study (Figure 1). The Confirmation Study is divided into two phases of study. The phases are described below:

CONFIRMATION STUDY PHASE

Phase	Description
1	**Verification** of existence and concentration of chemicals in the environment.
2	**Characterization** of extent and rate of migration of contaminants, hydrogeology and other factors.

The Confirmation Study-Verification Phase was completed for NCSC Panama City by Environmental Science and Engineering (ESE) and a report submitted to the Navy in May 1987. Seven sites were investigated at NCSC as a part of this study and as a result of these investigations three sites were recommended for study under the Characterization Phase of the Confirmation Study. The Navy is awaiting comments from EPA on the ESE report prior to initiating the Characterization Phase at NCSC.

Of the seven sites delineated in the NIRP, three are listed in this document as "areas of concern" and not as specific SWMUs. These sites do not qualify as SWMUs according to the EPA RFA guidance. However, they are areas of concern in the Navy's view and are being studied under NIRP. Therefore, they are included in this RFA report. These sites include: an area of a suspected, one-time solvent release; an area associated with a former petroleum storage tank and its associated distribution system; and an old fire training area.

Jordan is currently preparing the RCRA Facility Investigation (RFI) Work Plan for the Navy's submittal to EPA Region IV. Further sampling to confirm or deny the presence of releases from certain SWMUs is included in this work plan. The Navy has also implemented an Underground Storage Tank (UST) Management Program, which will assess and monitor all USTs at NCSC, as well as correct any leaks and clean up any contamination of groundwater and soils resulting from leaking tanks.

2.0 DESCRIPTION OF FACILITY OPERATIONS AND WASTE GENERATION

2.1 FACILITY OPERATIONS

The Naval Coastal Systems Center (NCSC) Panama City, Florida is a major Navy research and development facility. NCSC is located on St. Andrew Bay in Bay County, Florida. It is situated approximately 103 miles east of Pensacola, 98 miles west of Tallahassee, and 7 miles west of Panama City, Florida. NCSC is bounded by U.S. Highway 98 to the north, St. Andrew Bay to the east, State Road 392B (Magnolia Beach Road) to the south, and State Road 392 (Thomas Drive) to the west.

NCSC consists of two operational areas which encompass 657 acres. The laboratory area, situated north of Alligator Bayou (an inlet to St. Andrew Bay), covers approximately 350 acres and houses research facilities and various support activities and tenants. The ordnance area, south of Alligator Bayou, is approximately 300 acres in extent and is used primarily for ordnance storage and limited research.

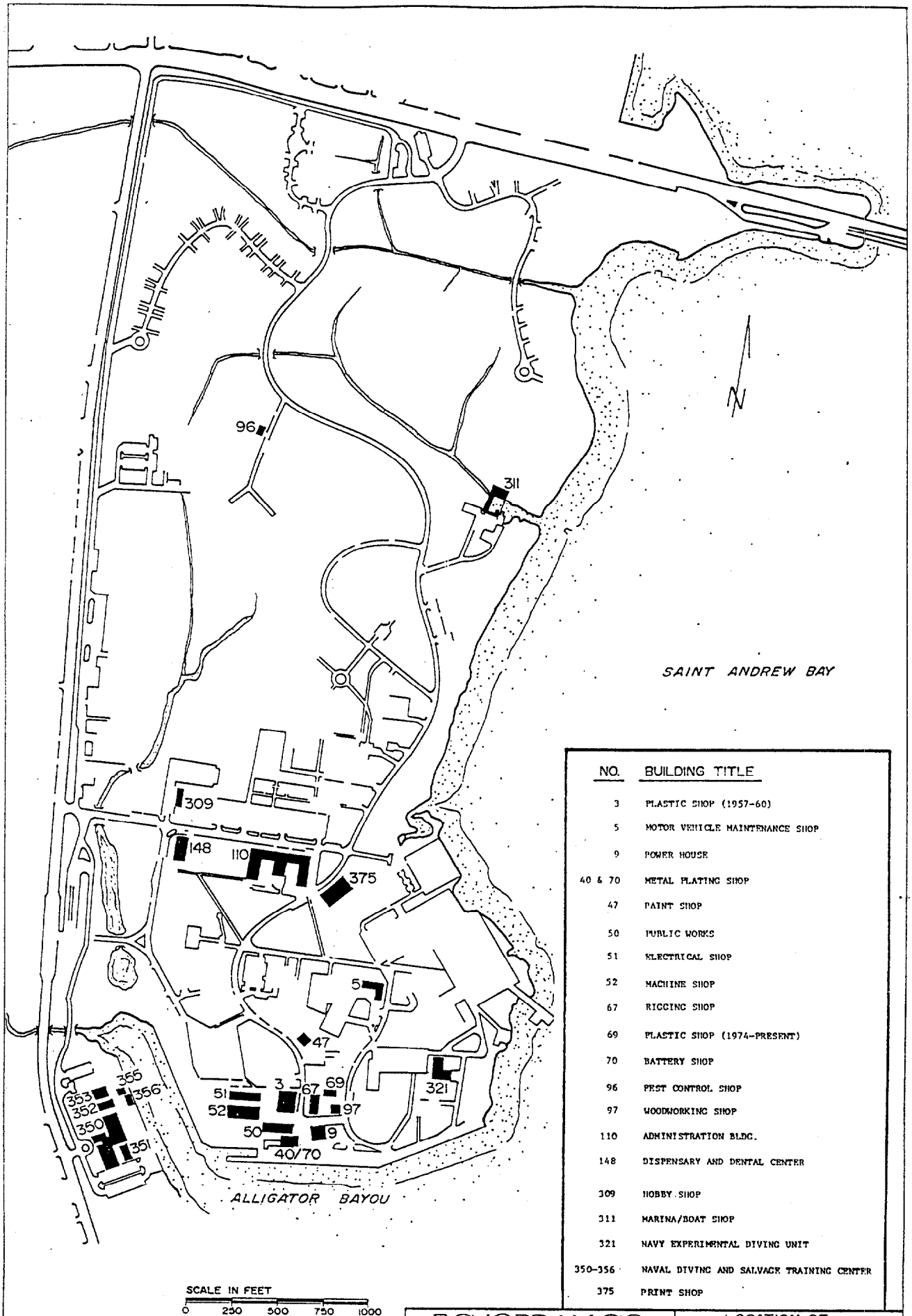
2.2 WASTE GENERATION

The Naval Coastal Systems Center has been a major research, development, testing and evaluation laboratory since the mid-1940s. Various support activities including planning, maintenance and industrial shops are present at NCSC. The following sections contain descriptions of the various shops at NCSC and the types and volumes of waste generated.

2.2.1 Public Works Division

The Public Works (PW) Division at NCSC was established in 1976 and is headquartered in Building T2026, the location of which is presented on Figure 2-1. PW Division is responsible for maintenance and repair of all facilities at NCSC and is separate from the scientific shops which support the various research and development programs at NCSC. Prior to 1976, public works activities were performed by the individual scientific shops. The PW Division consists of the following shops: carpentry, painting, heating and air conditioning, electrical, plumbing, pipe fitting and gardening. On occasion, the PW Division staff may utilize the scientific shop facilities (Johnson, 1985).

Wastes generated by shops at NCSC include scrap lumber and sheet rock, empty paint cans, empty trichloroethane spray cans, metal shavings, packing material, and small quantities of paint thinner and mineral spirits. Since the PW Division's establishment in 1976, all of the above materials except the paint thinner and mineral spirits have been disposed of off



NO.	BUILDING TITLE
3	PLASTIC SHOP (1957-60)
5	MOTOR VEHICLE MAINTENANCE SHOP
9	POWER HOUSE
40 & 70	METAL PLATING SHOP
47	PAINT SHOP
50	PUBLIC WORKS
51	ELECTRICAL SHOP
52	MACHINE SHOP
67	RIGGING SHOP
69	PLASTIC SHOP (1974-PRESENT)
70	BATTERY SHOP
96	PEST CONTROL SHOP
97	WOODWORKING SHOP
110	ADMINISTRATION BLDG.
148	DISPENSARY AND DENTAL CENTER
309	HOBBY SHOP
311	MARINA/BOAT SHOP
321	NAVY EXPERIMENTAL DIVING UNIT
350-356	NAVAL DIVING AND SALVAGE TRAINING CENTER
375	PRINT SHOP

E.C.JORDAN CO. ENGINEERS & SCIENTISTS		LOCATION OF WASTE GENERATING OPERATIONS
U.S. DEPT. OF NAVY NAVAL COASTAL SYSTEMS CENTER PANAMA CITY, FLORIDA	5330-01	FIGURE 2-1

station (county landfill) by a solid waste disposal contractor. From 1976 to 1981, the paint thinner and mineral spirits (approximately 100 gallons per year) were removed from their point of usage by a waste hauling contractor. Since 1981 these materials have been transferred to the NCSC's hazardous waste storage area to await removal by a waste hauling contractor. These wastes are generated by the PW Division and are independent of the wastes generated by the paint shop and other scientific shops (Johnson, 1985).

2.2.2 Battery Shop

The NCSC battery shop has been located in Building 70 in the southern portion of the facilities laboratory area since about 1965. From the mid-1940s to about 1965, the shop was located in Building 107. This building is located along the west dock near SWMU #1. The shop services batteries for automobiles, boats, generators and a variety of projects under development at NCSC. Since the early 1970s, lead/acid batteries have been disposed of at a rate of approximately five per month. Reportedly, from the mid-1940s through the early 1970s, use and disposal of lead/acid batteries was about twice the current rate. The battery shop has infrequently serviced nickel/cadmium batteries used in the power house.

From 1958 through 1981, the off-shore platforms formerly associated with NCSC used alkaline/mercury batteries until use of the platforms was discontinued. Each year during the operation of these platforms, approximately 40 alkaline/mercury batteries were disposed of through the battery shop. Estimated quantities of all waste generated by the battery shop and the location of disposal of the waste are listed on Table B-1 in Appendix B. There are no records of on-site battery disposal (Johnson, 1985).

2.2.3 Machine Shop

From 1945 to about 1955 the machine shop was located in Building 67. The shop was then moved to its present location in Building 52. The location of both Building 52 and 67 are presented on Figure 2-1. The size and function of the shop have changed little since 1945. The function of the shop is to fabricate metal parts according to specifications provided by the research and development programs at NCSC. Chemicals used at the machine shop have included cutting oil, dry cleaning solvent, acetone, water, trichloroethane, petroleum distillates, and isopropanol. Wastes produced by the shop primarily include water, soluble machine coolant and water along with small quantities of cutting oil. The dry cleaning solvent, used for cleaning metal parts, is contained in a 5-gallon dip tank that requires periodic replenishment due to

evaporation. The tank is never drained and does not generate any waste.

Hydraulic fluid has been used and wastes have either evaporated or have been wiped up with rags. Empty chemical containers and rags used to absorb excess chemicals have been placed in a dumpster and disposed of with the NCSC general solid waste (Johnson, 1985).

2.2.4 Paint Shop

The Paint Shop has been located in Building 47 since at least 1950. The location of Building 47 is presented on Figure 2-1. The function of the shop is to provide support to NCSC's various research and development programs. The types of paints used have included enamels, epoxy paints and zinc chromate and red lead primers. Chemicals used for cleanup have included methyl ethyl ketone, mineral spirits, acetone and paint thinner.

Prior to 1978, waste chemicals from equipment cleaning were allowed to drain into the sandy soil at the wash area located behind the shop (SWMU #5). Estimated chemical quantities generated and locations of disposal are listed in Table B-2 in Appendix B. Empty chemical containers and rags used to absorb excess chemicals are placed in a dumpster and disposed of with the facility's general solid waste.

Since 1978, all cleanup has been conducted on a curbed concrete pad and chemicals used for equipment cleanup have been collected in buckets and poured into 55-gallon drums. The 55-gallon drums are stored on the pad and then taken to the hazardous waste storage area (SWMU #6) to await disposal by a contract waste hauler (Johnson, 1985).

2.2.5 Metal Plating Shop

The plating shop is located in Buildings 40 and 70. The location of both plating shops is presented on Figure 2-1. The shop provides support to the research and development programs at NCSC. Shop operations began in Building 70 and in part of Building 40 around 1970. Building 40 was enlarged in 1972 and again in 1982 to accommodate NCSC's expanding plating operation. The main processing area of the shop includes an anodizing area (Building 70), a nickel plating area (Building 40), a plating area (Building 40), a small darkroom (Building 40), a vapor degreasing unit (Building 40) and an etching machine (Building 40) (Johnson, 1985).

When established in 1970, the plating shop was much smaller than the present facility and consisted of 50-gallon, aboveground dip tanks containing phosphoric acid, a dichromate seal solution, and nickel acetate. Associated back-up tanks

were also present. Chemicals for these processes are purchased and stored indoors in metal and plastic containers ranging in size from 1 gallon to 55 gallons. From 1970 until 1978, waste chemicals were disposed of through a floor drain in Building 40 to the wastewater treatment facility via the sewer system. In 1978, the shop staff began storing the waste chemicals in containers in an area behind Building 40 (SWMU #12) for recycling or off-station treatment by a private contractor. During the early 1970s, a small dark room, a vapor degreasing unit and an etching machine were added to the operation in Building 70. This building also houses the present nickel plating line which was brought into operation in about 1983 (Johnson, 1985). Table B-3 in Appendix B lists estimates of waste generated by the plating operations and the locations of disposal of these wastes.

The plating shop will be demolished and plating operations discontinued on the NCSC property in late 1987. During this demolition, the old septic tank will be located and removed if it is still in place.

2.2.6 Electrical Shop

The electrical shop has been located in Building 50 since about 1981. From the mid-1960s to 1981, the shop was located in Building 52 and from 1951 to the mid-1960s it was housed in Building 3. The location of the buildings which have housed these operations is presented on Figure 2-1. The size and scope of operations at the shop have changed very little since 1951. Generally, the shop is involved in assembling heavy electrical cables and performing custom wiring from specifications prepared by research and development personnel. Small quantities (5-gallon containers and smaller) of chemicals used in the electrical shop are stored in a cable shed near Building 50. These chemicals include methyl ethyl ketone, acetone, trichloroethane, polyurethane, resin, hardener and mold release compound. The only chemical to accumulate as waste is methyl ethyl ketone. Estimated quantities of waste methyl ethyl ketone generated and the locations of disposal are listed on Table B-4 in Appendix B. Empty chemical containers are deposited in dumpsters and disposed of along with the rest of the facility's general solid waste.

Transformer maintenance was the responsibility of the electrical shop from 1951 until 1976 when electricians assigned to the Public Works Division took over this task. Spare transformers in good condition and those in need of repair have been stored in a fenced, paved yard behind Building 5 since 1976. Prior to 1976, such transformers were stored in open storage area 1 at the end of Pirate Place. No leaks or spills have been reported from transformers stored in either of these areas (Johnson, 1985).

Waste transformers were stored behind Building 5 from 1976 to 1984 and in the hazardous waste storage area behind Building 290 since about 1981. When a waste transformer arrives at the storage area, a sample of the transformer oil is collected and analyzed. If the oil does not contain PCBs or PCB concentrations are below background level, the oil is left in the transformer and it is shipped intact to the Defense Property Disposal Office (DPDO) at Eglin AFB. If the transformer oil has a PCB concentration above background, the transformer is placed in the hazardous waste storage area (SWMU #6) for removal by a waste hauling contractor. The waste hauling contractor may or may not drain the transformers before removing them from NCSC. Smaller transformers can usually be packed in drums with absorbant material while larger units are generally drained prior to transport. It was reported that transformers with high PCBs (about 110 gallons of oil) were removed from the hazardous waste storage area in July 1984; three transformers (about 110 gallons of oil) were removed from behind Building 5 in October 1984; and one transformer (about 300 gallons of oil) was removed from Building 5 in December 1982. From the mid-1940s to 1975, spare transformers were stored in open storage area 1. About five transformers were stored on the steel matting at any given time. It cannot be confirmed whether these transformers contained PCB-laden oil or not. Unknown quantities of transformer oil were reportedly burned at Landfill B (SWMU #2 see Section 4.2). Once removed from service, it was reported that these transformers were probably transferred to DPDO as usable equipment or scrap metal. The number of transformers disposed of from the mid-1940s to 1975 is not known. However, they are currently replaced at a rate of about three per year (Johnson, 1985).

2.2.7 Plastic Shop

The plastic shop at NCSC fabricates custom fiberglass and plastic parts and component coverings for research and development projects. The shop, established in about 1957, was originally located in Building 3. Around 1960 the shop was moved to Building 52 where it remained until about 1974. In 1974, the shop was moved to its present location on the east side of Building 69. These locations are presented on Figure 2-1. Principal chemicals used at the shop have included methyl ethyl ketone, acetone, alcohol, urethane, epoxy resin and spray cans of trichloroethane. Form 1957 to 1979, waste methyl ethyl ketone, acetone and alcohol were disposed of by pouring them onto the ground at any convenient outdoor location. Shop personnel could not identify specific disposal locations. Since 1979 waste methyl ethyl ketone, acetone and alcohol has been stored in 55-gallon drums and removed by a waste hauler. Urethane, epoxy and resin are completely used and become part of the final products. Most of the trichloroethane is consumed, with the remainder either being evaporated or wiped up with Kim-wipes. Used Kim-wipes and empty chemical

containers are deposited in a dumpster for disposal with the NCSC general solid waste (Johnson, 1985).

Styrene with a mixture of waste styrene and alcohol was used at the shop from 1957 to 1967. The mixture was disposed of onto the ground at any convenient outdoor location. Shop personnel could not identify specific disposal locations (Johnson, 1985). A summary of waste chemicals generated and locations of disposal is presented on Table B-5 in Appendix B.

2.2.8 Woodworking Shop

A woodworking shop at NCSC performs varied tasks in support of the Center's active research and development programs. The shop has been located in Building 97 since at least 1970. The location of the woodworking shop is presented on Figure 2-1. Chemicals used by the shop include lacquer thinner and contact cement for gluing counter tops. Use of these chemicals has been infrequent and involves very small quantities. No waste chemicals have been generated at the Woodworking Shop. Lacquer thinner and contact cement are used up during work and the remainder is wiped up with rags. These rags, containing residual quantities of chemical, have been place in a dumpster and disposed of with the Activity's general solid waste by a contact waste hauler. Scrap wood is the main waste product and is disposed of into the dumpster (Johnson, 1985).

2.2.9 Rigging Shop

The rigging shop has been in Building 67 since before 1970. The location of Building 67 is presented on Figure 2-1. The shop makes rope and cable rigs for mines and ships in support of the NCSC research and development programs. The only hazardous material used at the shop has been small quantities of paint used for the color coding of cables (Johnson, 1987).

2.2.10 Photo Shop

The Photo Shop has been located in Building 51 since its inception in the mid-1950s. The location of the Photo Shop is presented on Figure 2-1. Approximate annual shop workload has consisted of 13,000 to 14,000 black and white prints, 600 rolls of color negative film and 600 rolls of color slide film. Very little chemical mixing is required at the shop and virtually no chemical spillage has occurred. Since the mid-1950s, most waste chemicals have been diluted with water and poured down the shop's drain for disposal. However, since 1979, those waste chemicals containing silver are stored indoors until they are sold to a private contractor for recycling. Prior to a sewer reconstruction in the late 1970s, chemicals poured down the drain flowed to Alligator Bayou by way of the storm drain.

Since the sewer reconstruction, drainage from the shop flows to the NCSC wastewater treatment plant (Johnson, 1987).

Chemicals used in the black and white film developing process include developer and fixer. Developer is diluted with water and poured down the drain. From the mid-1950s to 1979, fixer was also diluted with water and poured down the drain. Since 1979, fixer has been collected and turned over to the Supply Department for silver reclamation. Estimated waste quantities generated and the locations of disposal are presented on Table B-6 in Appendix B. The same black and white process has been used for about 6 years. The previous process used more chemical per photograph; however, because more photographs are currently developed at the shop than in the past, the amount of chemical used has remained about the same (Johnson, 1985).

Two new color processors have been in operation at the photo shop since the latter part of 1984. Chemicals used for color processing include bleach, conditioner, two developers, reversal bath, stabilizer and fixer. From the mid-1950s to 1979, color fixer was diluted with water and poured down the drain. Since 1979, the fixer from both color processors has been turned over to the Supply Department for silver reclamation. The other color processing chemicals are diluted with water and poured down the drain when the machine is clean. The previously used color process generated chemical quantities four to five times greater than the currently used processes (Johnson, 1985).

2.2.11 Motor Vehicle Maintenance Shop

The motor vehicle maintenance shop at NCSC has been located in Building 5 since 1945. The location of Building 5 is presented on Figure 2-1. Waste oil and small quantities of perchloroethylene are the main wastes generated. The shop generates approximately 50 gallons of these wastes each month. Since 1969, these wastes have been stored in 55-gallon drums until removed by a contract waste hauler. From 1945 to 1969, a mixture of waste oil and perchloroethylene was spread on dirt roads or burned at Landfill B (SWMU #2 see Section 4.2). Estimated waste quantities generated and the locations of disposal are summarized on Table B-7 in Appendix B. Empty chemical containers and rags used during vehicle maintenance are placed in a dumpster for disposal with the NCSC general solid waste (Johnson, 1985).

2.2.12 Pest Control Shop

Pesticide management has been a contract operation at NCSC since 1976. From 1968 to 1976 in-house pesticide management operated out of Building 96, the location of which is presented

on Figure 2-1. Empty pesticide containers were washed and rinsed in a gravel filled pit outside the building during this period. Prior to 1968 pesticide operations were housed in Building 60. Empty pesticide containers were washed and rinsed on a concrete area outside Building 60. Large quantities of water were used to dilute the residual quantities of pesticides draining from the containers (Johnson, 1985).

Pesticides are used to treat storage warehouses, residential quarters, shop areas, and swamp and grass areas, among others. No pesticide handling spills or accidents have been reported. A listing of pesticide types, usages and average quantities on hand is presented on Table B-8 in Appendix B. From the mid-1940s to 1975, pesticides were ordered in small quantities and all of the chemicals obtained were used. As a result, no unused pesticides were disposed of except for the residual in empty containers (Johnson, 1985).

2.2.13 Boilers and Cooling Condensers

Most buildings at NCSC are heated individually by oil fired boilers or furnaces. There are approximately fifteen major boilers at NCSC with capacities ranging from 450,000 BTU per hour to 2,700,000 BTU per hour. These boilers are fueled by oil or natural gas. Boiler and cooling condenser maintenance is performed by the Public Works Division staff and does not generate waste material (Johnson, 1985).

2.2.14 Power House

Electrical power at NCSC has been supplied by Gulf Power since 1945. Back-up power is supplied by generators housed in Building 9, the Power House. The location of the Power House is presented on Figure 2-1. Since these generators are back-up units and seldom used, their maintenance is infrequent and results in very small quantities of waste oil. Waste oil is transferred to the dock area oil separator and waste oil storage tank. Since 1969, this tank has been periodically emptied by a waste hauling contractor. From 1945 to 1968, waste oil was spread on dirt roads and burned at Landfill B (SWMU #2 see Section 4.2.). Starting power for the stand-by power generating equipment is provided by four nickel/cadmium batteries which require replacement at the end of their useful life. Waste battery acid is stored in carboys and removed by a contract waste hauler. Estimated Power House waste generation and locations of disposal are summarized on Table B-9 in Appendix B.

2.2.15 Fire Fighting Training

Fire fighting training has been conducted at NCSC since 1946. From 1946 through the early 1970s, an area of about 11 acres surrounding Pirate Place (see Section 4.2, SWMU #2, Landfill B) was used occasionally for fire fighting training. Reportedly, waste oil, contaminated fuel, solvents (including methyl ethyl ketone, perchloroethylene, trichloroethylene, and acetone), as well as other flammable liquids were disposed of at Landfill B (SWMU #2). These liquids were used to ignite the wastes landfilled at SWMU #2. Fire fighting training was coordinated with these waste burning activities. When landfilling activities at Landfill B were terminated, fire training activities were shifted to an unlined pit located about 140 feet west of Building 100 (Johnson. 1985) (See Section 5.1, Area of Concern 3, Old Fire Training Area).

Training was conducted at Landfill B (SWMU #2) from the early 1970s until the late 1970s. Combustible liquids from 55-gallon drums were poured, allowed to soak into the ground, ignited and then extinguished. The types of waste disposed of included diesel fuel, oily bilge water, paint thinner, paint, and gasoline contaminated with water. Eight or nine drums of flammable liquids were used during each training session and a total of 45 to 50 drums were used during a year (Johnson, 1985).

Since about 1980, fire fighting training activities have been conducted at an area located off Gull Circle near Building 61 (SWMU #9). This area contains two mobile homes used in conjunction with smoke training. Contaminated fuel (i.e., fuel not meeting specification), stored in a 4,500 gallon, aboveground tank, was poured onto combustible material contained in a large dumpster. This fuel was then ignited and extinguished with either water or chemical extinguishers. Eighteen to twenty training fires were conducted per year and approximately 100 to 150 gallons of contaminated fuel were used per training fire (ESE, 1987). The area is currently being used for smoke training only, until a new fire training facility is complete (Jordan, Personal Communication, 1987).

2.2.16 Pier Operations

Docking facilities at NCSC have been located along the north bank of Alligator Bayou since the early 1940s (Figure 2-1). A 22-foot depth is maintained in the entrance channel, the turning basin and Alligator Bayou. Periodic dredging is required to maintain this depth. Berthing space for larger vessels is provided along the NCSC's East and South Docks while space for smaller craft is available along the West Dock and in the small craft basin. Marine diesel fuel, fresh water, compressed air, electricity and wastewater collection service are available along the East and South Docks. Fresh water, air

and electricity are available in the small craft basin while gasoline is available on the West Dock. JP-5 is available by truck at any location along the dock (Johnson, 1985).

Prior to 1968, oily bilge water and waste oil collected from ships berthed at NCSC reportedly were used for fire fighting training or burned at Landfill B (SWMU #2). Since 1968, bilge water and waste oil are passed through an oil-water separator (SWMU #10) and reclaimed oil is hauled off-station by a waste hauling contractor. Estimated quantities of wastes generated by pier operations and the locations of disposal are presented on Table B-10 in Appendix B (Johnson, 1985).

2.2.17 Marina

The NCSC Marina and Boat Shop are located in Building 311 on St. Andrew Bay. Since 1970, the marina has rented small boats (15 power boats, 4 sail boats, and 2 canoes) to active duty personnel, retirees and civilians in the area. A few private boats are docked here as well (Johnson, 1985).

The marina operates a 2,000 gallon, aboveground gasoline storage tank on the dock. The tank is filled about once per month during the summer and once during the winter. Outboard motor oil is sold to patrons in 1 quart cans and is also mixed with gasoline in a ratio of 1 pint to 6 gallons of gasoline. There were no reports of gasoline or oil spillage (ESE, 1987).

2.2.18 Hobby Shop

A Hobby Shop was established for NCSC personnel in 1972. The shop is located in Building 309 and provides tools and equipment for automotive maintenance. The location of Building 309 is presented on Figure 2-1. Three indoor stalls and three outdoor stalls are in use at the Hobby Shop for automotive maintenance. Each stall has two floor drains used to collect spilled waste oil. The small amounts of oil that spill onto the concrete floor of the stalls are washed with water into the floor drains and collect in one of two oil/water separators. It is not known whether the oil/water separators have ever required cleaning or whether the separators have actually been cleaned (Johnson, 1985).

Waste engine oil is drained from vehicles into buckets which are then emptied outside the shop into 55-gallon drums. Since 1972, one to four gallons of waste engine oil have been generated per week by the Hobby Shop. The drummed waste oil is collected and disposed of off-station by a waste oil disposal contractor.

Only one spill incident has been reported at the Hobby Shop when rainwater caused two nearly-full waste oil drums to overflow onto the surrounding soil. In January 1975, the oily, stained soil in the area was excavated, placed in 55-gallon drums and disposed of off-station by a waste disposal contractor. The excavation of oily soil continued until Public Works hit clean sand with no visual indication of oil. An area of about 10 feet by 10 feet by 3 feet deep was excavated. Reportedly, automobile batteries have never been drained and waste batteries have never been stored at the Hobby Shop (Johnson 1985).

2.3 TENANT OPERATIONS

The Naval Coastal Systems Center provides space and service for a number of tenant activities. These tenants include groups involved in research and development, personnel training and various tenant activities that exist at the Center. The types and quantities of waste generated are noted.

2.3.1 Assault Craft Unit Five (ACU-5)

Assault Craft Unit Five has been a tenant at NCSC since 1977 and provides services in support of engineering tests and trials of prototype cargo-carrying amphibious land craft. The unit is located on St. Andrew Bay north of the Administration Building (Building 110) in NCSC's Laboratory Area. ACU-5 operations generate waste oil and fuel as well as contaminated water. These liquid wastes are stored in a tank which is periodically emptied by a contractor for off-station disposal. This has been the practice since the establishment of ACU-5 at NCSC. Very little solid waste has been generated by ACU-5. Scrap metal is stored in bins for removal to the NCSC open storage area. General solid waste from ACU-5 has always been collected and disposed of off-station by a private contractor. Hazardous materials requiring special disposal have been properly packaged and turned over to NCSC for ultimate disposal. There have been no changes in solid or hazardous waste disposal practices at ACU-5 since the unit has been a tenant at NCSC (ESE, 1987). Two large hovercraft were docked on the ramp during the Jordan site visit (Jordan, Personal Communication 1987).

2.3.2 Explosive Ordnance Disposal Group Two, Detachment

The Explosive Ordnance Disposal Group Two Detachment (EOD Detachment) has been assigned to the NCSC since at least the early 1970s. The EOD Detachment's principal activities at NCSC include explosives testing and ordnance storage. Ordnance has been tested in a man-made pond located in the Ordnance Area of the activity. The explosives test pond has a diameter of about 150 feet and a depth of 13 feet. The types of plastic

explosives tested in the pond are varied and depend upon the type of research being conducted. A limit of 10 pounds per test has been set for all underwater explosive testing in the pond. Types of ordnance tested have included C4 plastic charges and 50 caliber charges (Johnson, 1985).

Ordnance requiring disposal has been stored in a retrograde magazine at NCSC's Ordnance Area until subsequent transportation to Tyndall Air Force Base for disposal. Ordnance requiring immediate disposal has been transferred directly to Tyndall Air Force Base (Johnson, 1985).

The EOD Detachment maintains its own motor boats and automobiles. Since the detachment began at NCSC, less than 20 gallons of waste oil per year have been generated by the maintenance of motor boats and automobiles. The waste oil has been stored in 1-gallon containers and hauled off-base by a private contractor for recycling. Waste automobile and boat batteries have been turned over to the NCSC Supply Department. About three undrained batteries per year have been generated and turned in to the Supply Department since the early 1970s (Johnson, 1985).

2.3.3 Naval Diving and Salvage Training Center (NDSTC)

The Naval Diving and Salvage Training Center is located in Buildings 350-356, and has been a tenant activity at NCSC since 1979. The location of NDSTC is presented on Figure 2-1. The NDSTC is involved in the training of divers for all branches of the military, as well as local fire and police departments. The NDSTC's Medical Department provides treatment for decompression and diving related diseases. The school operates six 1000-gallon diving tanks (3 open and 3 pressurized) and a 50 foot by 90 foot by 15 foot deep training pool. Average monthly wastewater discharge from these tanks as well as from showers and toilets has been approximately 2 million gallons. Since the quantity of water discharged from the tanks and training pool exceeds the capacity of the NCSC wastewater treatment plant, about 75 percent of the diving tank and training pool water is discharged into St. Andrew Bay. All other wastewater drains to the wastewater treatment plant (Johnson, 1985).

Various shops, including carpentry, machine, small boat repair, welding, dive system maintenance and electronics, as well as three sea-going craft are part of the school's facilities. Waste materials from the shops and ships have always been handled in accordance with procedures followed by the NCSC Public Works Division. Since 1979, oil wastes have been stored in three underground tanks (two are 100 gallons in size and one is 55 gallons in size) and an aboveground 30 gallon drum

located near Building 350. These storage containers have been inspected or emptied about once a week by a waste oil contractor and transported to the separator system (structure 363). Estimated quantities of waste generated and locations of disposal are presented on Table B-11 in Appendix B (Johnson, 1985).

2.3.4 Navy Experimental Diving Unit (NEDU)

The NEDU is a technical specialties branch of the Naval Sea Systems Command (NAVSEASYSCOM) and has been located in Building 321 since 1975; the location is presented on Figure 2-1. The unit supports diving and hyperbaric operations at the Ocean Simulation Unit of NCSC, the Naval Diving and Salvage Training Center of NCSC and the Pensacola Diving Locker (Johnson, 1985).

The NEDU operates a van under NEDU Engineering for the purpose of cleaning diving system components, including oxygen system valves and piping. If the components are obviously dirty they are first cleaned with Cee Bee 101 (phosphoric acid) mixed with water. About one gallon of Cee Bee 101 is used each week for scrubbing small components. Larger components have been cleaned by flushing the solution, stored in a 55-gallon drum, through the component and back into the drum. The used solution is then spilled onto the concrete and eventually discharges into St. Andrew Bay. About three 55-gallon drums of CEE Bee 101 are used per year. Granular trisodium phosphate (TSP) is also used for equipment cleaning. About 100 pounds of TSP are used per month. Other cleaning agents include: methyl ethyl ketone, trichlorotrifluoroethylene (liquid freon) and Formula 999 (butoxyethanol). Estimated quantities of waste generated and the locations of disposal are presented on Table B-12 in Appendix B (Johnson,1985).

2.3.5 USS Fidelity

USS Fidelity is an active duty minesweeper, as well as a platform for mine and countermeasures research and development. The ship has been homeported at the NCSC since 1974. Any wastes generated on the USS Fidelity are handled by the Public Works Division (Johnson, 1985).

2.3.6 Dispensary

The Dispensary has been located in Building 148 since 1958. The location of Building 148 is presented on Figure 2-1. The dispensary provides medical services to active duty members and their dependents and retired military personnel. In addition, occupational health services and emergency care are provided for civil service personnel working at NCSC. The dispensary employs a doctor and a nurse, and operates a laboratory,

pharmacy, X-ray facility and preventive medicine facilities (Johnson, 1985).

From 1958 to 1985, blood samples and culture plates were burned about twice a week in a trash can behind the building after being disinfected in an autoclave. The ashes from this burning were disposed of, along with the general solid waste, off-station by a waste disposal contractor.

X-ray development solutions containing silver are retained at a rate of about 20 gallons per month. This also includes waste X-ray solution from the dental clinic (located in the same building). The solution has been collected in five gallon containers by the X-ray technician and retained by the NCSC Supply Department prior to being sent to NAS Pensacola for reclamation. Estimated dispensary waste generation and locations of disposal are presented on Table B-13 in Appendix B (Johnson, 1985).

2.3.7 Naval Regional Dental Center Branch Dental Clinic

The Dental Clinic has been a tenant activity at NCSC since 1981 and is located in Building 148. The location of Building 148 is presented on Figure 2-1. The clinic provides dental services for active duty personnel and is served by a dentist, a peridontist and an endodontist. Wastes from the clinic include amalgam (containing mercury) and silver from X-ray developing solutions. Excess amalgam is stored in a plastic container (along with liquid) and is collected on a yearly basis. Silver containing solutions from X-ray developing is combined with X-ray developing solution from the hospital. Estimated Waste quantities and location of waste disposal by the Dental Clinic are presented on Table B-14 in Appendix B (Johnson, 1985).

2.3.8 Navy Publications and Printing Service Office Reprographic Facility

The print shop, presently located in Building 375, has been at NCSC since the late 1940s and has been a tenant activity since 1981. The location of the print shop is presented on Figure 2-1. The shop was located in Building 110 until July 1986. The shop, which produces approximately 4.5 million off-set and quickprint impressions per year, supports the production of all local technical documentation. Color processing is not done at the print shop. Chemicals used at the shop include small quantities of electro-static solution, multilith blanker roller (perchloroethylene and petroleum naptha), xerox film remover (isopropanol), deglazing solvent (methylene chloride), deglazer (1,1,1 trichloroethane), silicone fuser oil, WD-40 lubricant,

and ink. The chemicals listed above have either been consumed during the printing process, evaporated or absorbed on rags. Used rags are sent to NAS Pensacola for disposal (Johnson, 1985).

Photochemicals used at the shop have included Foto Plate Developer (96 gallons per year; approximately 3500 total gallons) and SQD Lith Developer (24 gallons per year; approximately 900 total gallons). These chemicals are diluted with water and poured down the drain discharging to the NCSC wastewater treatment plant (Johnson, 1985)

A silver-containing fixer solution is used at the print shop at a rate of 40 gallons per year. Since 1979, waste fixer solution has been collected in plastic containers and periodically collected by a private contractor for off-station silver recovery. From the late-1940s to 1978, waste fixer solution was diluted with water and washed down the drain to the NCSC wastewater treatment plant (Johnson, 1985).

3.0 ENVIRONMENTAL SETTING AND TARGET POPULATIONS

3.1 GEOLOGICAL AND HYDROLOGICAL SETTING

3.1.1 Physiography

The NCSC is located in the Flat-wood Forest Physiographic Subdivision of the Gulf Coastal Lowlands Physiographic Division. The Flat-wood Forest is covered with pines in areas where it has not been cleared. It is well drained except for some low-lying swampy areas near bays, which become inundated during periods of extended rainfall.

The land surface varies from slightly rolling to flat and has an elevation of less than 70 feet above mean sea level (MSL). This topography is the result of the build-up of ancient marine terraces due to isostatic sea level changes.

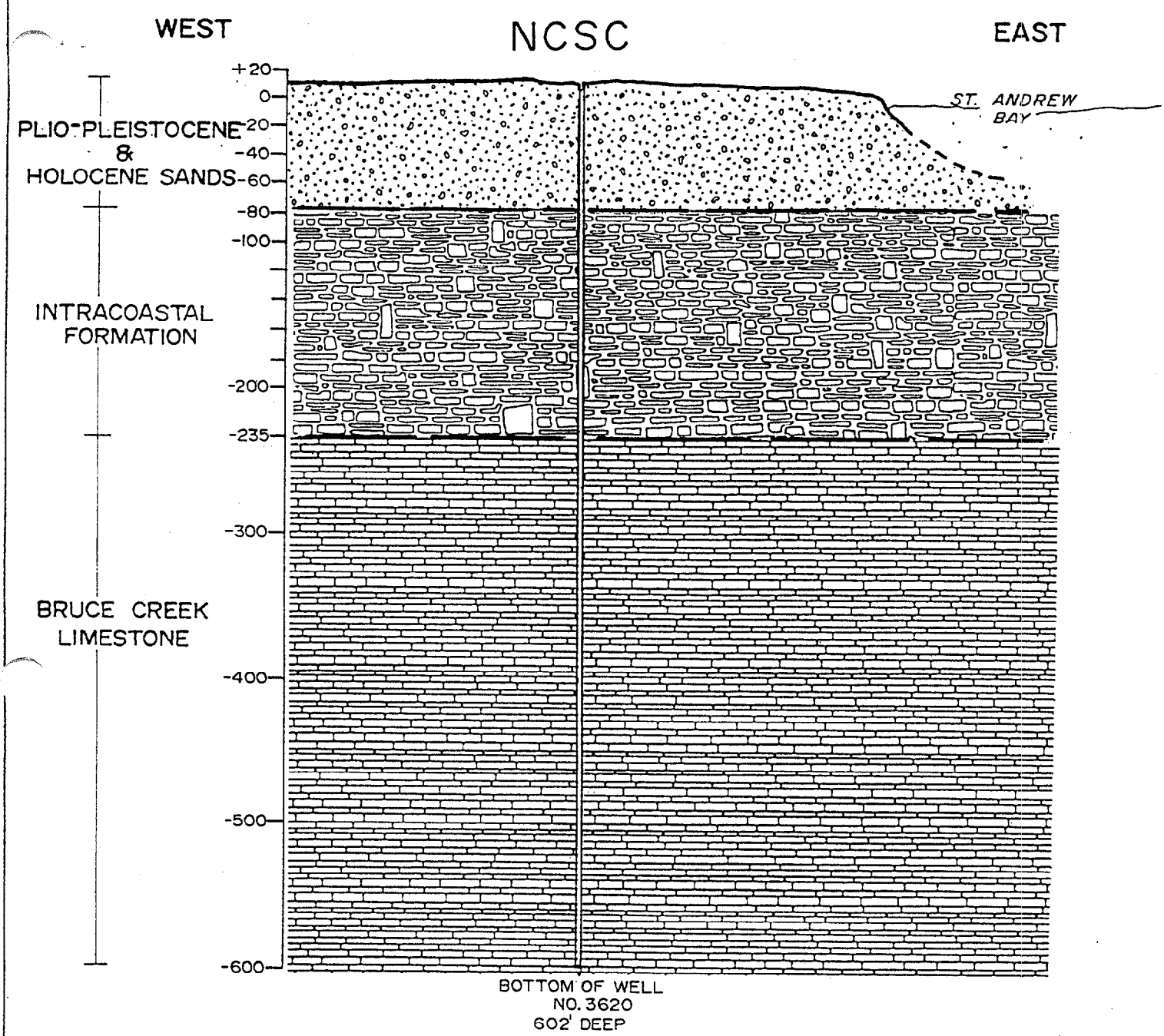
Elevations at NCSC range from 0 to 17 feet above MSL, indicative of the Silver Bluff Terrace (0 to 10 feet above MSL) and the Pamlico Terrace (0 to 25 feet above MSL). Terrace breaks are difficult to discern in this area, so these two terrace systems are often paired for purposes of identification.

3.1.2 Stratigraphy and Structure

Surficial deposits at the site are Pleistocene to Recent coastal plain sediments of marine and estuarine origin. They are predominantly comprised of quartz sands. They vary in thickness from 70 to 100 feet in Bay County and are approximately 100 feet in thickness at NCSC (Figure 3-1). An interpretative geologic cross section of the geology beneath NCSC is presented on Figure 3-1. A stratigraphic nomenclature for the geologic formations in Bay County, Florida, is presented on Figure 3-2.

The upper 50 feet of sediments at NCSC consist of fine sands. Dominant surface soils which have developed from these surficial deposits include the Mandarin, Rutledge, Osier, Arents, and Leon soil series (Naval Facilities Engineering Command, 1983). These soil series range from very poorly drained sands, sandy clay loams and organic soils in the low lying areas to well-drained sands on high ridges of the Coastal Plain.

The Intracoastal Formation underlies the Pleistocene to Recent sediments at NCSC (Figure 3-1). This formation is late Middle Miocene to Late Pliocene in Bay County. It is olive green, consists of sand and poorly consolidated limestone, is highly fossiliferous, and contains phosphorite. This formation is approximately 150 feet thick at NCSC.



SOURCE: SCHMIDT & CLARK, 1980; BARR & WAGNER, 1981; ESE, 1986

NOTE: AREAL EXTENT OF SPECIFIC STRATIGRAPHY INFERRED FROM GEOLOGIC LOG OF WELL NO. 3620

LEGEND

- UNDIFFERENTIATED GRAVELS, QUARTZ SANDS, AND CLAYEY SANDS.
- SANDY, CLAYEY LIMESTONE
- LIMESTONE OF THE FLORIDAN AQUIFER

E.C. JORDAN CO. ENGINEERS & SCIENTISTS	EAST-WEST GEOLOGIC CROSS SECTION OF NCSC	
U.S. DEPT. OF NAVY NAVAL COASTAL SYSTEMS CENTER PANAMA CITY, FLORIDA	5330-01	FIGURE 3-1

ERA	PERIOD	EPOCH	ROCK UNITS OR FORMATIONS, AND DESCRIPTIONS		APPROXIMATE DEPTH (FEET BELOW GROUND SURACE)
CENOZOIC	QUATERNARY	RECENT	UNDIFFERENTIATED QUARTZ SANDS		
		PLEISTOCENE			100
			UNDIFFERENTIATED CLAYEY SANDS AND GRAVELS		
	NEOGENE	PLIOCENE	INTRACOASTAL FORMATION	GRAY-OLIVE GREEN, SANDY, ARGILLACIOUS, POORLY CONSOLIDATED VERY MICRO-FOSSILIFEROUS CALCARENITE	
		UPPER			250
		MIDDLE MIOCENE LOWER	BRUCE CREEK LIMESTONE	WHITE TO LIGHT YELLOW, MODERATELY INDURATED, GRANULAR LIMESTONE	
	PALEOGENE	OLIGOCENE	SUWANNEE LIMESTONE	LIGHT GRAY TO YELLOW GRAY, DOLOMITIC LIMESTONE, OFTEN HIGHLY ALTERED, SUCROSIC, ALTERED FOSSIL TYPES	550
		EOCENE	OCALA LIMESTONE	LIGHT ORANGE TO WHITE, HIGH POROSITY LIMESTONES; SMALL AMOUNTS OF SAND AND CHERT; GLAUCONITE IN LOWER FACIES ABUNDANT MICRO-FOSSILS	650
			VARIOUS LIMESTONE FORMATIONS		
		PALEOCENE			1050
MESOZOIC		UPPER CRETACEOUS LOWER	VARIOUS SEDIMENTARY ROCK UNITS		
		JURASSIC			
		TRIASSIC			
PALEOZOIC		CAMBRIAN	QUARTZITE/META-ARKOS		>11,000
PRE-CAMBRIAN			GRANITE	"BASEMENT"?	

E.C.JORDAN CO.
ENGINEERS & SCIENTISTS

STRATIGRAPHIC NOMENCLATURE FOR THE GEOLOGIC FORMATIONS IN BAY COUNTY, FL

U.S. DEPT. OF NAVY
NAVAL COASTAL SYSTEMS CENTER
PANAMA CITY, FLORIDA

5330-01

FIGURE 3-2

The Bruce Creek Formation underlies the Intracoastal Formation in Bay County. It consists of white to light yellow-gray, moderately indurated granular to calcarentic limestone. It may possess up to 20 percent quartz sands, is fossiliferous, and contains minor phosphorite, glauconite, and pyrite. This formation is absent from the northeastern corner of Bay County and increases in thickness, up to about 300 feet, near the coast. It is Miocene or younger in age and is approximately 300 feet thick under NCSC.

The Suwannee Limestone and limestones of the Ocala Group probably underlie the Bruce Creek Formation. Wells have not been drilled to sufficient depths at NCSC to confirm their presence. However, it is inferred from deep wells from surrounding areas that they are present (Schmidt and Clark, 1980). The Suwannee Limestone consists of light gray to yellow-gray limestone, is fossiliferous, and is locally dolomitized. It is Oligocene in age and has a thickness of 70 to 100 feet under NCSC.

Limestones of the Ocala Group underlie the Suwannee Limestone (Figure 3-2). The limestone is divided into an upper and a lower facies. The lower facies is a light orange to white limestone with high porosity, calcite cement, some glauconite and sand, and is highly fossiliferous. The upper facies is similar but glauconite is rare and chert is more common. The Ocala Limestone is of Eocene age. It thickens toward the coast and lies about 650 to 700 feet below the surface. It is approximately 400 feet thick below NCSC.

Older Cenozoic (i.e., Paleocene) and Mesozoic sedimentary rocks probably underlie the site but an exact description is not possible because they have not been encountered during previous drilling episodes in the NCSC area. While such rocks are known to exist at depth throughout the Florida Panhandle, the formations vary in composition and lateral extent.

Cambrian quartzite/meta-arkose and Precambrian granite (basement) underlie the younger sedimentary deposits. These occur at depths greater than 11,000 feet below the surface.

Bay County is located on the western flank of the Apalachicola Embayment, which is the main structural feature influencing the deposition of sediments found in the subsurface. The axis of this shallow basin is generally northeast-southwest; it is narrowest in the northeast and widens to the south and southwest. The magnitude of the basin increases with depth and the Paleogene and Neogene rocks are downwarped to a greater extent and are thicker than the Quaternary and Neogene deposits. This indicates long, continued development.

3.1.3 Hydrology

3.1.3.1 Surface Water. NCSC is located in a humid, subtropical climate, characterized by mild winters and hot, humid summers. The average yearly temperature is 66.9 degrees Fahrenheit, varying from an average of 53 degrees Fahrenheit in January to an average of 82 degrees Fahrenheit in July. This is a low-lying area near to the Gulf of Mexico so the diurnal effects of land-sea breezes obviate temperature extremes. It is particularly breezy in the summer because of the temperature differential between the land and sea. The relative humidity is 55 to 67 percent in the early afternoon and 82 to 88 percent in the evening. Heavy fog is present 20 to 30 percent of the year, generally forming late at night and dissipating after sunrise. Thunderstorms are frequent in the spring and summer. Hurricanes are also encountered in this area. The hurricane season extends from June 1 to November 30, with the greatest frequency of storms occurring in August and September. The estimated chance of hurricane force winds occurring during the season is approximately one in twelve. Tornadoes and windstorms (5.8 mph or more) also occur periodically. The prevailing wind direction varies monthly; the mean wind speed ranges from 5 to 9 knots. Table 3-1 provides mean wind speed and direction of the Panama City/NCSC area. The average yearly rainfall is 55.2 inches, with a seasonal peak occurring in July (9.82 inches average). The driest month occurs in October (2.90 inches average).

NCSC is located between the Gulf of Mexico, which lies 1 mile to the south, and St. Andrew Bay, which borders the facility to the north and east. There are several small streams on-site. Those in the northern portion of the site flow to the east and northeast through channelized tributaries. Those in the southern portion of the site flow through a tributary system towards four freshwater ponds located in the west central portion of NCSC. The two largest ponds, adjacent to Alligator Bayou, are 1.2 and 0.5 acres in extent. Their water levels are maintained by control structures leading to Alligator Bayou. The bayou is tidally influenced and flows in an easterly northeasterly direction. There is a small tidal inlet north of the Hovercraft Landing Pad which drains into St. Andrew Bay. Low-lying areas tend to be swampy.

St. Andrew Bay, to the north and east of NCSC, is a marine body which discharges southward into the Gulf of Mexico. Wave action within the bay is generally limited to short period wind waves with heights less than 1 foot. Wave heights of 2 to 4 feet may be attained during severe storms. The mean tidal range at NCSC is 1.3 feet, and the tides are generally diurnal. The local tidal amplitudes are small and very susceptible to wind and weather modification.

TABLE 3-1
MEAN MONTHLY WIND DIRECTION
AND WIND SPEED
RCRA FACILITY ASSESSMENT
NAVAL COASTAL SYSTEMS CENTER
PANAMA CITY, FLORIDA

1972-1980 MONTH	WIND DIRECTION	MEAN WIND SPEED (Knots)
January	N	7
February	SSE	8
March	SSE	9
April	S	8
May	WSW	7
June	WSW	6
July	WSW	6
August	WSW	5
September	ENE	6
October	NE	6
November	NNE	7
December	NNE	7

3.1.3.2 Groundwater. Groundwater occurs in three aquifers at NCSC: the unconfined surficial aquifer; the secondary artesian aquifer; and the Floridan aquifer.

The surficial aquifer is composed of highly permeable quartz sands with scattered lenses of clayey sand and sandy clay. It ranges in thickness from 65 to 140 feet. The depth to the water table ranges from 0 to 65 feet below land surface, and varies 3 to 5 feet periodically due to changes in rainfall. Groundwater flow direction within this aquifer at NCSC generally follows local topography. On-site flow is primarily towards the discharge areas of St. Andrew Bay and Alligator Bayou, to the east and south. Appendix C contains water level data from two rounds of measurements and a groundwater contour map of NCSC.

The secondary artesian aquifer underlies the surficial aquifer and is composed of isolated sand and shell beds and discontinuous limestone lenses that range from 10 to 25 feet in thickness within the Intracoastal Formation (Figure 3-1). Clay and low permeability limestone bound these more permeable lenses, confining the water in them and producing artesian conditions.

The Floridan aquifer is separated from the aquifers above it by semi-confining beds within the Intracoastal Formation. It is hydraulically connected with overlying strata in this area. At NCSC the aquifer consists of the lower permeable beds of the Intracoastal Formation, the Bruce Creek Formation, the Suwannee Limestone, and the limestones of the Ocala Group. It is composed of limestones and dolomites, its upper units lie about 250 feet below sea level at NCSC, and it is approximately 1,100 feet thick. Groundwater flow within the aquifer is southwesterly toward the Gulf of Mexico.

Recharge is predominantly a result of local rainwater infiltration. Some recharge to the Floridan aquifer occurs from north of Bay County. Water entering near surface limestones in Washington, Holmes, and Jackson counties and in southern Alabama travels down-dip, providing regional recharge. However, the majority of recharge to the Floridan in this area is probably a result of seepage from overlying formations.

The two major water producing aquifer systems at NCSC are the surficial aquifer and the Floridan aquifer. The secondary artesian aquifer does not produce sufficient water locally to make it an economically worthwhile water source. The Floridan aquifer yields up to 500 gallons per minute in wells. However, the water is generally hard and has a high pH. Groundwater hardness, pH, calcium, magnesium, sulfate, chloride, nitrate, and dissolved solids increase in the down-dip direction toward the coast.

Analysis of water quality in the Floridan aquifer at NCSC shows dissolved solids greater than 500 ppm, hardness greater than 180 ppm, chloride greater than 100 ppm, and a fluoride concentration ranging from 0.5 to 1.5 ppm (Johnson, 1985). Deer Point Lake is the main water supply source in Bay County.

The groundwater quality in the surficial aquifer exhibits a high iron content (unsuitable for domestic use) and is acidic and corrosive (pH of 5.5 to 6.5). Laboratory analysis of the groundwater at NCSC shows dissolved solids ranging from 200 to 300 mg/l, hardness ranging from 150 to 200 mg/l, a chloride concentration less than 50 mg/l and fluoride ranging from 0.5 to 1.5 mg/l (Johnson, 1985).

NCSC changed its primary source of water from on-site groundwater wells to municipal surface water in October 1970 in order to avoid possible saltwater intrusion into the aquifer due to excessive pumping. Water is now supplied by the Bay County Water System which obtains water from Deer Point Lake (located 9 miles northeast of NCSC).

There are wells on-site which are utilized for water supply in the Ordnance Area south of Alligator Bayou. Two low-capacity surficial aquifer wells, approximately 100 feet deep, are located 150 to 250 feet south of the southern shore of Alligator Bayou, and are used for drinking water supply. There are four operative Floridan aquifer wells located at Buildings 10, 101, 281 and 394. The well at Bldg. 10 has not been used for 13 years. The well at Bldg. 101 is actively maintained for emergencies. It can be used, if required, to maintain water pressure in the water tower, for fire fighting, and as a potable water supply (with the use of a temporary chlorinator at the discharge point). The well is flushed every 2 months and periodically sampled for coliform bacteria. The well at Bldg. 281 is capable of delivering emergency water, but is not flushed or sampled. The well near the housing area at Bldg. 394 is used to provide water for air conditioning/heating pumps and discharges in the residential area through heat pump sprinkler systems.

There are other Floridan aquifer wells located in the vicinity of NCSC. There are two large capacity wells for public use located at Long Beach Resort (3 miles west of NCSC), three at West Panama Beach (10 miles northwest of NCSC), and two at Lynn Haven (7.5 miles northeast of NCSC). There are two smaller wells located in a campground/trailer park 2 miles north of NCSC which are used for potable water and a swimming pool.

3.2 TARGET POPULATIONS

NCSC is bounded to the east and north by St. Andrew Bay, on the south by the Gulf of Mexico, and on the west by vacant and residential areas.

Land uses immediately adjacent to the installation are primarily commercial and coastal residential with a substantial amount of undeveloped, open space. Commercial development in Panama City is of the strip type, following the main streets and thoroughfares. Small spots of commercial development are located in the area near the base along Thomas Drive. The coastal residential area of Bay Point, located approximately 1.5 miles southeast of the activity, is a condominium development.

Industry in the area is decentralized, with a large complex located at the eastern end of Hathaway Bridge. Most industrial areas are related to either rail or air transportation facilities. The closest off-base residential area is the small community of Woodlawn, located just north of the Activity Center near the main gate.

The Bay County Future Land Use Plan, adopted as a part of the Bay County Comprehensive Plan, designates the Bay Point-Magnolia Beach area as very high density residential; the areas west of and adjacent to NCSC as transitional/residential/ commercial; and the area north of NCSC as residential/medium density (Naval Facilities Engineering Command, 1983).

Potable water is supplied almost entirely by the Bay County Water System, which obtains water from Deer Point Lake. The high iron and chloride content of the surficial aquifer makes it unsuitable for domestic use. The Floridan aquifer was abandoned as a source in 1967 because of fears of over pumping. There are only two local Floridan wells known to be operating adjacent to NCSC. These wells are located in the campground/trailer park about 2 miles north of NCSC and are used for potable water and for swimming pools. Both are about 450 feet in depth.

Although the Floridan aquifer is hydraulically connected to the surface and may be influenced by surficial contamination, given the depth of the wells and the probable direction of groundwater movement, it is highly unlikely that these two wells have been or will be affected.

Although NCSC utilizes the Bay County Water System as its predominant water supplier, there are still some wells in use on the facility, as described in Section 3.1.3.2. The only wells used to deliver a public water supply (the others are for emergency use and for heating/air conditioning systems pumps)

are shallow wells, about 100 feet in depth, located 150 to 250 feet south of Alligator Bayou, or about 3650 to 5200 feet from Site 1. The potential exists for human exposure to contaminated groundwater from these two wells.

Several small creeks transport surface water to Alligator Bayou and to St. Andrew Bay and, thence, to the Gulf of Mexico. Both the bayou and the bay are designated by the state of Florida as Class III waters, suitable for fish and wildlife propagation and water sports. They are also suitable for shellfish harvesting. Lateral groundwater flow in the surficial aquifer might also provide water to the bay and bayou and is a potential pathway for pollutant contamination of these water bodies. Although Alligator Bayou and St. Andrew Bay are large water bodies, thereby diluting any contaminants introduced via surface water or groundwater, there is a slight risk of contamination of fish and shellfish as well as of humans via contact recreational use.

4.0 SWMU DESCRIPTIONS

The RFA identified 12 SWMUs at NCSC Panama City. These include:

SWMU #	NIRP Site #	DESCRIPTION
1	1	Landfill A
2	2	Landfill B
3	6	Landfill C
4	7	Landfill D
5	5	Paint Equipment Cleaning Area
6		Hazardous Waste Storage Area
7		Wastewater Treatment Plant
8		Classified Documents Incinerator
9		Current Fire Training Area
10		Oil/Water Separator Facility
11		Temporary Hazardous Waste Storage Area at Bldg. 87
12		Temporary Hazardous Waste Storage Area at Bldg. 40

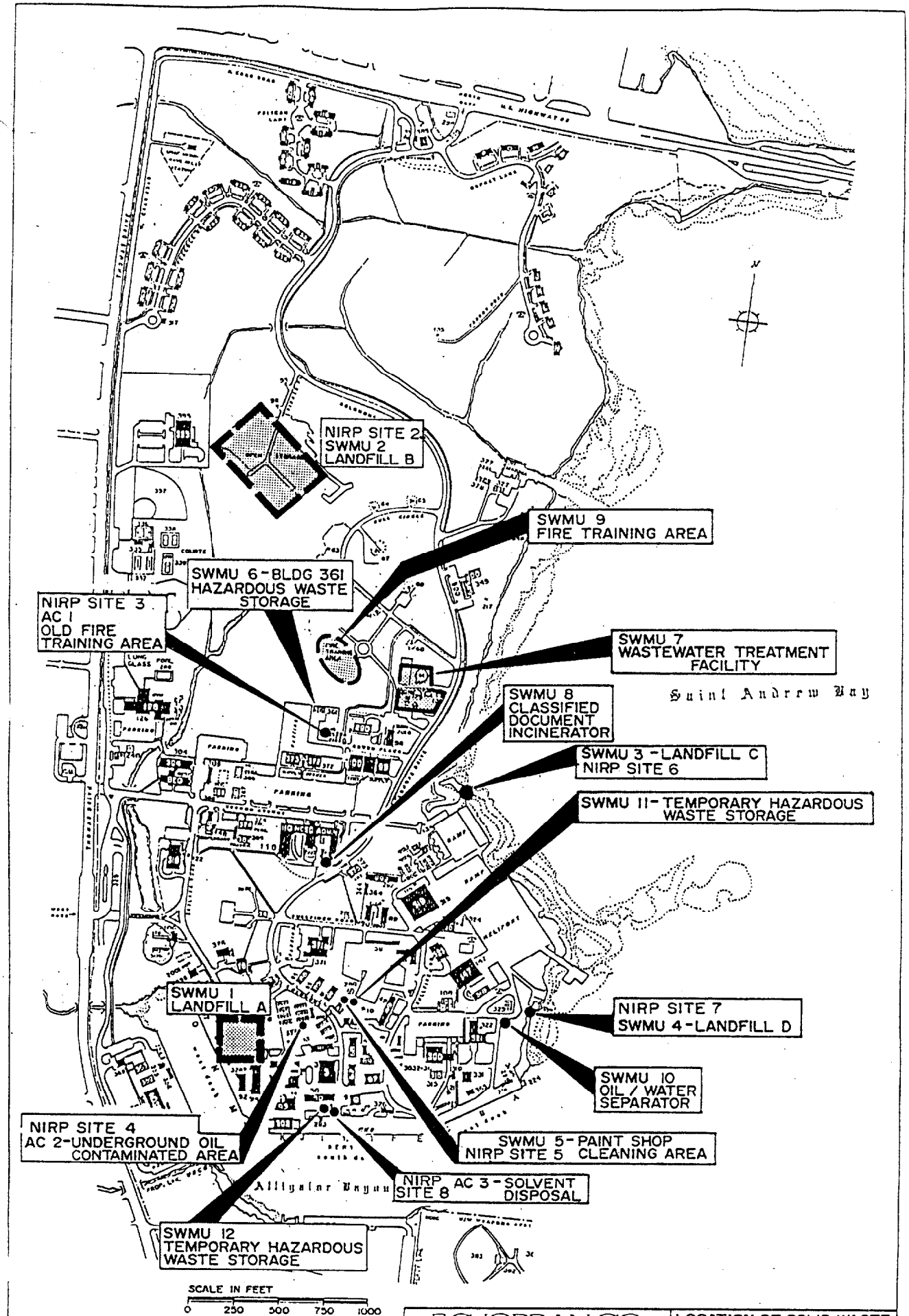
Unit and waste characteristics are discussed for each SWMU in this section. In addition, pollutant migration pathways and evidence of release to groundwater, surface water, air, soil, or subsurface gas are considered. Section 5.0 presents similar information on the three Areas of Concern delineated at NCSC. Recommendations for further action at each SWMU are presented in Section 6.0.

4.1 SWMU #1 (NIRP SITE 1) - LANDFILL A

4.1.1 Unit Characteristics

Landfill A encompasses about one acre along the edge of Alligator Bayou near the present location of Buildings 77, 293 and 333. The location of SWMU #1 is presented in Figure 4-1 and site photographs taken during the VSI are included in Appendix A. That portion of the site nearest the Bayou is currently underneath the concrete deck of the facility's West Dock. It is unknown whether wastes in this portion of the area were moved during dock construction in the early 1950s or during reconstruction in the late 1970s. Following site closure, the construction of the dock and other structures has resulted in the paving of much of the disposal area. No indications of past waste disposal were evident during Jordan's on-site visit.

Several product storage tanks (USTs), such as the one pictured in photograph No. 1 of Appendix A, are located over SWMU #1. The Navy has recently implemented an UST Management Program



LEGEND

SWMU - SOLID WASTE MANAGEMENT UNIT
AC - AREAS OF CONCERN

E.C. JORDAN CO. ENGINEERS & SCIENTISTS	LOCATION OF SOLID WASTE MANAGEMENT UNITS AND AREAS OF CONCERN
U.S. DEPT. OF NAVY NAVAL COASTAL SYSTEMS CENTER PANAMA CITY, FLORIDA	5330-01 FIGURE 4-1

which will assess all USTs at NCSC. The program will also address contamination, if any, and remediation as necessary for each UST.

NCSC used SWMU #1 from about 1945 to 1953 for general waste disposal and the burning of combustible waste. Details of the burning operation are unknown. During its period of operation, the site was the principal disposal area for the entire facility and received nearly all wastes generated by NCSC.

The disposal area was originally a marshy depression along the shore of Alligator Bayou. The geology beneath SWMU #1 is anticipated to be similar to the cross section presented on Figure 3-1. The RFI Work Plan calls for further study of SWMU #1. This will include a specific geological description of this SWMU.

Groundwater elevations measured in monitoring wells within the vicinity of Landfill A indicate that the groundwater flow direction is southwest towards Alligator Bayou. The water table lies within two to three feet of ground surface over most of the site (ESE, 1987).

4.1.2 Waste Characteristics

In addition to general household waste, food waste, scrap metal and scrap lumber, wastes received included small quantities of paint, paint thinner, solvents (acetone, methyl ethyl ketone, dry cleaning solvent, trichloroethylene and CRC-336) in cans ranging in sizes from four ounces to five gallons, and lead battery acid. Bilge water and waste oil were poured on the ground and burned. Based on waste quantities generated at the facility over the past 20 years and the number of buildings at the activity during 1945 through 1953, it is estimated that about 3000 cubic yards (before burning) were disposed at SMWU #1 annually. Estimated quantities of hazardous materials disposed of at Landfill A are shown on Table 4-1.

4.1.3 Groundwater

4.1.3.1 Pollutant Migration Pathways. The potential for the release of contaminants from Landfill A to the unconfined aquifer exists. It is expected that fill material is in direct contact with the unconfined aquifer in some areas of the site. However, due to the time elapsed since the disposal operations and the age of the material landfilled, it is unlikely that a significant release will occur in the future.

4.1.3.2 Evidence of Release. No evidence of release was noted in the available records or during the VSI. Samples collected from two downgradient monitoring wells indicate that levels of

TABLE 4-1
ESTIMATED WASTE QUA[illegible]ES DISPOSED OF AT LANDFILL A
RCRA F[illegible]ITY ASSESSMENT
NAVAL COASTAL SYSTEMS CENTER
PANAMA CITY, FLORIDA

PERIOD OF DISPOSAL	WASTE TYPE	ESTIMATED TOTAL QUANTITY (Before Burning)	COMMENTS
Late 1940s - 1953	Methyl ethyl ketone	200 gallons	Assume 35 percent of 550 gallons from the Electrical Shop were disposed here.
1945 - 1953	Dry cleaning solvent	300 gallons	Assume 35 percent of 950 gallons from the Motor Vehicle Maintenance Shop were disposed here.
1945 - 1953	Waste oil	23,000 gallons	Assume 35 percent of 14,500 gallons from the Motor Vehicle Maintenance Shop plus 35 percent of 350 gallons from Power House plus 18,000 gallons from Pier Operations were disposed here.
1946 - 1952	Lead-acid battery acid	1,900 gallons	Assume 35 percent of 5,500 gallons from the Battery Shop were disposed here.
Mid 1940s - 1953	Bilge water	55,000 gallons	From Pier Operations.
1946 - 1952	Trichloroethylene	Unknown	

NOTES

1. Source: Johnson (1985)
2. Rationale for the percentage of material disposed of is not known.
3. Estimates of waste quantities are based primarily on interviews with NCSC employees. While types of waste are believed to be accurate, quantities are approximate (Stinger, 1987).

16 trace metals, total petroleum hydrocarbons and 31 volatile organic compounds are below detection levels (ESE, 1987). Due to the downgradient position of SWMU #1 from Area of Concern No. 2 (Underground Oil Contamination Area) and the lack of analyses for specific petroleum product compounds, SWMU No. 1 is scheduled for additional study under the RFI in conjunction with AC No. 2.

4.1.4 Surface Water

4.1.4.1 Pollutant Migration Pathways. Because this landfill is inactive and covered with concrete, asphalt and grass, migration of contaminants off-site by storm water runoff is unlikely. Landfill A does border on Alligator Bayou, however, current releases of contaminants to the Bayou are expected to be small due to the age of the fill material and type of operation (i.e., burning of combustibles) during its active life.

4.1.4.2 Evidence of Release. No evidence of release was noted in the available records or during the VSI. Two surface water samples collected from Alligator Bayou had levels of trace metals and purgeable organic compounds below detection levels (ESE, 1987).

4.1.5 Air

4.1.5.1 Pollutant Migration Pathways. Since most of the site is paved, release to the atmosphere is not anticipated.

4.1.5.2 Evidence of Release. No evidence of release was noted in the available records or during the VSI.

4.1.6 Soils

4.1.6.1 Pollutant Migration Pathways. The potential for vertical and horizontal migration of contaminants exists at this SWMU.

4.1.6.2 Evidence of Release. Evidence of a release to soils was noted by ESE (1987) as a "petroleum-like odor" during the installation of monitoring wells. However, it cannot be said with certainty as to whether this release is from SWMU #1 or from other activities currently occupying the site (i.e., petroleum product storage) and upgradient of the site (i.e., area of concern #2).

4.1.7 Subsurface Gas

4.1.7.1 Pollutant Migration Pathways. Due to the nature of disposal operations at this SWMU (i.e. burning), the generation and release of subsurface gas is not expected.

4.1.7.2 Evidence of Release. A distinct petroleum-like odor was noted during drilling of three monitoring wells (ESE, 1987). The origin of this odor, however, is not clear. Further investigation of gas buildup under the asphalt will be addressed in the RFI Work Plan.

4.1.8 Data Gaps and Recommendations

Based upon evidence presented by ESE (1987), SWMU #1 has adequately been characterized and releases have not been detected.

The confirmation study (ESE, 1987) recommended RCRA closure of this unit. Jordan concurs with this recommendation.

The petroleum hydrocarbon problem within the immediate vicinity of SWMU #1 is addressed in Section 5.2. Area of Concern #2 and Jordan's recommendations are presented in this section.

4.2 SWMU #2 - LANDFILL B

4.2.1 Unit Characteristics

The location of SWMU #2 is presented on Figure 4-1 and site photographs taken during the VSI are included in Appendix A. This site occupies an area of approximately 11 acres surrounding Pirate Place. Landfill B is the largest and longest operating disposal area on the facility. Presently, much of the area surrounding Pirate Place is used for open storage.

One area of the site, south of Pirate Place, was once used as a burial area for several tons (two or more trailer truck loads) of red lead paint in 1946 to 1947. A trench, approximately 100 feet long and 8 feet deep was bulldozed and paint cans (5-gallon cans) were deposited, compacted and covered with earth. Several more feet of fill were then placed over the trench (Johnson, 1985).

Major landfilling operations at the site began around 1957 when the site was used as a general disposal and burning area. These operations continued until the early 1970s. Refuse from the entire base was collected in a small compactor truck (probably 12 to 16 cubic yards), on a daily basis, and piled at SWMU #2 to be burned. Burning took place about once every six months by pouring about 10 gallons of gasoline around the edge of the pile and igniting it. In addition, any 55-gallon drum brought to the site had its contents poured on the ground prior to burning. Non-combustible materials were buried along with the ash in trenches excavated by bulldozers. The excavated material was then used as cover. It was reported

that some scrap metal salvage occurred prior to burial. Wet garbage (from the living quarters) was buried separately in the area south and west of Pirate Place (Johnson, 1985).

Waste burning operations were discontinued in two steps. Burning of garbage ceased around the mid-1960s when contract hauling of waste began. Burning of trees, lumber and untreated demolition materials was continued probably into the late 1960s. The "burn pile" was then inactive for about 5 years due to a Bay County prohibition of open burning. However, during phasing out of the site in the early 1970s, a special permit was obtained and burning resumed under the supervision of the fire department (Johnson, 1985).

The geology beneath SWMU #2 is anticipated to be similar to the cross section presented on Figure 3-1.

The water table beneath the site ranges from three to nine feet BLS. Groundwater flow direction is northeast, towards an intermittent drainage ditch, and east towards St. Andrew Bay (ESE, 1987).

4.2.2 Waste Characteristics

Wastes disposed of in Landfill B reportedly included: household garbage, tires, wooden crates and pallets, scrap lumber, tree limbs, metal shavings, conduit, rope, paint cans and drums (mostly empty or with residues), paint thinners, wastes oils (possibly transformer oil contained polychlorinated biphenyls), solvents (trichloroethylene, dry cleaning solvent, methyl ethyl ketone, and acetone), mineral spirits, alcohol, hydraulic fluids and bilge water. An estimate of the waste quantity disposed at the site (before burning) is 6,240 cubic yards per year (Johnson, 1985). This figure is based on reported amounts of approximately 80 cubic yards per week of compacted wastes (household garbage and trash, mess hall wastes) and 40 cubic yards per week of non-compacted materials (wood crates, pallets, paint cans). Estimated quantities of hazardous wastes disposed of at SWMU #2 are shown in Table 4-2. It was also reported that, beginning around 1955, between 900 and 1150 gallons per week of bilge water were hauled to the site in a tank trailer and discharged on the ground (Johnson, 1985).

In an area to the east of the present open storage area, wastes from a one-day "base cleanup" operation were disposed sometime between 1970 and 1975. Trenches approximately 100 feet long by 10 feet wide by 8 feet deep were used to bury materials. The wastes reportedly included general trash, drums and cans which possibly contained paints, oils and solvents (possibly trichloroethylene, methyl ethyl ketone, and acetone), scrap lumber and construction rubble. Based on the size of the

ESTIMATED WASTE QUANTITIES DISPOSED OF AT LANDFILL B
RCRA FACIL[illegible]SSESSMENT
NAVAL COASTAL [illegible]STEMS CENTER
PANAMA CITY, FLORIDA

PERIOD OF DISPOSAL	WASTE TYPE	ESTIMATED TOTAL QUANTITY	COMMENTS
1946 or 1947	Red lead paint	3 to 4 tons	Paint was buried in 5 gallon cans and compacted.
1955 - 1968	Bilge water	750,000 gallons	
Late 1940s - 1969	Waste Oil	42,500	Assume 45 percent of 14,500 gallons from the Vehicle Maintenance Shop plus 45 percent of 350 gallons from the Power House, plus 36,000 gallons from Pier Operations were disposed here.
1955 - 1972	Styrene and Acetone	Less than 3,000 gallons	Assume 61 percent of 4,600 gallons from the Paint Shop were disposed here.
Mid 1940s - 1968	Methyl ethyl ketone	200 gallons	Assume 45 percent of 550 gallons from the Electrical Shop were disposed here.
1955 - 1968	Dry cleaning solvent	400 gallons	Assume 45 percent of 950 gallons from the Vehicle Maintenance Shop were disposed here.
1957 - 1979	Alcohol	200 gallons	Originating from the Plastic Shop.
Late 1940s - 1969	Hydraulic Fluid	Unknown	
1951 - 1971	Trichloroethylene	Unknown	
1953 - 1959	Transformer oil possibly containing polychlorinated biphenyls (PCB)	Unknown	

NOTES

1. Source: Johnson (1985)
2. Rationale for the percent of material disposed of is not known.

trenches, approximately 800 cubic yards of material were disposed of during this operation (Johnson, 1985)

4.2.3 Groundwater

4.2.3.1 Pollutant Migration Pathways. The potential for groundwater contamination exists at SWMU #2. Elevated levels of petroleum hydrocarbons (33 to 65,800 ug/g) and trace metals (barium, cadmium, chromium and lead) exist in the surface soils (ESE, 1987) throughout most of the site. Hence a release to the surficial aquifer is probable.

4.2.3.2 Evidence of Release

Low levels of groundwater contamination by various compounds were detected in several samples collected from monitoring wells in October 1986 (ESE, 1987). However, no discernible pattern of contaminant release or movement is noticeable.

4.2.4 Surface water

4.2.4.1 Pollutant Migration Pathway. An ephemeral drainage system exists within the vicinity of SWMU #2. Surface water drainage from the northern portion of SWMU #2 flows overland to the north, then east to St. Andrew Bay (less than 1100 feet away). Surface drainage from the southern portion of the site is southerly to a series of unnamed ponds which drain into Alligator Bayou. The eastern boundary of the site is approximately 1100 feet from St. Andrew Bay, while the southern boundary is about 600 feet from an unnamed stream.

At present, significant ground cover, high infiltration rates, and a lack of a discrete channel system within the site boundaries indicate that surface runoff is not significant.

4.2.4.2 Evidence of Release. ESE (1987) established two surface water/sediment sampling stations downgradient of SWMU #2. The exact location of these stations is unknown. However, it is indicated in the report that they are several hundred yards downgradient to the site.

Data from surface water samples indicate no significant contamination or contaminant migration. Sediment samples, however, contained detectable levels of barium (1.72 to 5.49 mg/kg), copper (1.87 to 2.68 mg/kg), zinc (171 to 328 mg/kg) and petroleum hydrocarbons (78 to 123 mg/kg). Results of the samples may be indicative of a release at the SWMU. No other sampling data of surface water within the immediate vicinity SWMU were available and no indication of a release was evident during the VSI.

4.2.5 Air

4.2.5.1 Pollutant Migration Pathways. The release of contaminants to air is not expected at this SWMU. At present, the material that was landfilled and burned is capped with soil.

4.2.5.2 Evidence of Release. No evidence of an air release was found during the PR or the VSI and it is not expected.

4.2.6 Soils

4.2.6.1 Pollutant Migration Pathways. Soil contamination by trace metals and total petroleum hydrocarbons are known to exist at this site. Vertical migration of these contaminants, in conjunction with percolating rainfall, is probable.

4.2.6.2 Evidence of Release. Data presented by ESE (1987) indicate significant soil contamination from trace metals (barium, chromium, copper, lead and zinc) and petroleum hydrocarbons (up to 65,800 mg/kg) throughout most of the site. In addition, it is apparent a release of benzene has taken place in the area of the one-day base cleanup operation disposal site (ESE, 1987).

4.2.7 Subsurface Gas

4.2.7.1 Pollutant Migration Pathways. Since most wastes were burned before covering, the generation of subsurface gas is expected to be minimal. The RFI Work Plan will address the possibility that subsurface gas exists in the wet garbage disposal area in SWMU #2.

4.2.7.2 Evidence of Release. No evidence of subsurface gas release was found in the available records or observed during the VSI and no release is anticipated.

4.2.8 Data Gaps and Recommendations

Previous studies (ESE, 1987) of this area indicate a soil and groundwater contamination problem. Jordan recommends surface and subsurface soil sampling with monitoring well placement based on the analytical results of the soil samples. Soil gas analysis may be a viable alternative to soil sampling at this SWMU for placement of monitoring wells. The RFI Work Plan includes monitoring wells and sampling to further characterize SWMU #2.

4.3 SWMU #3 (NIRP SITE 6) - LANDFILL C

4.3.1 Unit Characteristics

The location of SWMW #3 is presented on Figure 4-1 and site photographs taken during the VSI are included in Appendix A.

This landfill is located northeast of the Amphibious Assault Landing Craft area (Building 319) on the beach of St. Andrew Bay. It was the second landfill area used on the activity. The site was approximately 150 feet by 50 feet by 12 feet deep.

The landfill was operational from about 1953 to 1959. Two to three truck loads (12 to 16 cubic yards per truck) of wastes were brought to the site daily. Burning took place about once a month. Bulldozers were used to push the piles together to a height of about 25 feet. The piles were doused with gasoline and ignited. The ash piles were then covered with sand (Johnson, 1985).

The geology beneath SWMU #3 is anticipated to be similar to the cross section presented on Figure 3-1. Groundwater in the vicinity of SWMU #3 probably exists above a saltwater interface. The direction of contaminant transport within the unconfined aquifer should then be southward along the shoreline of St. Andrew Bay.

4.3.2 Waste Characteristics

The types of wastes included general household garbage, scrap lumber and metal, tree limbs, paint thinner and solvent cans (containing methyl ethyl ketone, acetone, trichloroethylene, xylene), waste oil (possibly transformer oil containing polychlorinated biphenyls) and bilge water. Most of the cans were empty or contained residues (Johnson, 1985). Jordan personnel observed several cans and other debris during the VSI.

An estimate of the fill volume in this landfill prior to burning is about 3300 cubic yards. Estimated quantities of hazardous materials disposed in the site are shown on Table 4-3.

4.3.3 Groundwater

4.3.3.1 Pollutant Migration Pathways. Due to the time elapsed since disposal, further release of contaminants is not expected.

4.3.3.2 Evidence of Release. No evidence of a release to groundwater was noted in the records or during the VSI. Data presented by ESE (1987) from a monitoring well adjacent to the upgradient edge of the unit indicate no release of contaminants to groundwater. No other monitoring well data is known for this SWMU. ESE (1987) sampled surface water and sediment

TABLE 4-5

ESTIMATED WASTE QUANTITIES DISPOSED OF AT LANDFILL C
RCRA FACILITY ASSESSMENT
NAVAL COASTAL SYSTEMS CENTER
PANAMA CITY, FLORIDA

PERIOD OF DISPOSAL	WASTE TYPE	ESTIMATED TOTAL QUANTITY	COMMENTS
Early 1950s - 1959	Paint	1,700 gallons	Assume 18 percent of 9,250 gallons from the Paint Shop were disposed here.
Early 1950s - 1959	Paint thinner	800 gallons	Assume 18 percent of 4,600 gallons from the Paint Shop plus 26 percent of 550 gallons from the Electrical Shop were disposed here.
Early 1950s - 1959	Methyl ethyl ketone	200 gallons	Assume 18 percent of 300 gallons from the Paint Shop plus 26 percent of 550 gallons from the Plastic Shop were disposed here.
Early 1950s - 1959	Acetone	1,400 gallons	Assume 26 percent of 4,600 gallons from the Paint Shop plus 20 percent of 3,000 gallons from the Plastic Shop were disposed here.
Early 1950s - 1959	Waste oil	9,800 gallons	Assume 26 percent of 14,500 gallons from the Motor Vehicle Maintenance plus 6,000 gallons from the Pier Operations were disposed here.
Early 1950s - 1959	Bilge Water	75,000 gallons	Originating from Pier Operations.
1953 - 1959	Transformer oil possibly containing polychlorinated biphenyls.	Unknown	Resulting from transformer maintenance.

NOTES
1. Source: Johnson (1985)
2. Rationale for the percent or material disposed of is not known.
3. Estimates of waste quantities are based primarily on interviews with NCSC employees. While types of waste are believed to be accurate, quantities are approximate (Stinger, 1987).

downgradient of SWMU #3. Analytical data is discussed in Section 4.3.4.2.

4.3.4 Surface Water

4.3.4.1 Pollutant Migration Pathways. SWMU #3 borders directly on St. Andrew Bay. Transport of possible contaminants is expected to be by both erosional processes and in the surface water. Direction of transport is southward along the shoreline of St. Andrew Bay.

4.3.4.2 Evidence of Release. Data presented by ESE (1987) showed no significant levels of contamination in either surface waters or sediments. No other evidence of a release to St. Andrew Bay was noted in the records or during the VSI. Resampling of sediments and seeps, if any, is called for in the RFI Work Plan.

4.3.5 Air

4.3.5.1 Pollutant Migration Pathways. No release to the atmosphere is expected from this SWMU.

4.3.5.2 Evidence of Release. No evidence of release was noted in the records or during the VSI and such a release is not expected.

4.3.6 Soils

4.3.6.1 Pollutant of Migration Pathways. Elevated concentrations of trace metals and total petroleum hydrocarbons have been found in composite samples of the surface to 3 feet of soil (ESE, 1987). A potential exists for migration to St. Andrew Bay through wave and tidal action.

4.3.6.1 Evidence of Release. Data presented by ESE (1987) indicate elevated levels of total petroleum hydrocarbons (128-214 mg/kg) and certain trace metals (218-728 mg/kg copper, 64.6-431 mg/kg lead and 279-1180 mg/kg zinc) in the soil throughout SWMU #3. Data for a sediment sample collected just offshore of the SWMU show considerably reduced levels of trace metals. In addition, the concentration of total petroleum hydrocarbons was below detection limit.

Results of the investigation conducted by ESE (1987) indicate that there is an insignificant release of trace metals from the soil to other environmental media either through dissolution or sediment transport. Results for total petroleum hydrocarbons are inconclusive. There exists the potential that the elevated levels found in the soil are the result, at least in part, of petroleum products that have washed ashore. There is no

evidence that petroleum hydrocarbons are being released from the soil to other media.

4.3.7 Subsurface Gas

Since the wastes were burned before covering, the generation of subsurface gas is not expected to be significant at this site, however, the RFI Work Plan will include testing for subsurface gas in the former landfill areas.

4.3.8 Data Gaps and Recommendations

Residual concentrations of petroleum hydrocarbons and trace metals exist in the soil at SWMU #3.

ESE (1987) recommends closure using the existing monitoring well at this SWMU. Due to the nature of the wastes and the time elapsed since disposal, further releases from this SWMU should be minimal and pose no environmental problems. Therefore, Jordan concurs with this recommendation.

4.4 SWMU #4 (NIRP Site 7) - LANDFILL D

4.4.1 Unit Characteristics

The location of SWMU #4 is presented on Figure 4-1 and site photographs taken during the VSI are presented in Appendix A. The site is located along the banks of St. Andrew Bay in the southeast portion of the activity, near the present location of Building 295. The area, encompassing less than one-fourth of an acre, was originally a ravine carrying surface water runoff to St. Andrew Bay and was later filled with construction rubble. Presently, rubble can be seen at the site and there was no ongoing fill operation noted during the IAS site visit conducted by Johnson or during the VSI conducted by Jordan in June 1987. Based on aerial photographs, the site appears to have been only sporadically active through the mid 1960s and apparently received little or no additional fill material after 1970 (ESE, 1987).

The geology beneath SWMU #4 is anticipated to be similar to the cross section presented in Figure 3-1. Although groundwater data at SWMU #4 are lacking, it is believed that the surficial aquifer exists above the saltwater interface. The depth to groundwater is expected to be within 3 feet of the land surface. Flow direction is anticipated to be towards the south along St. Andrew Bay.

4.4.2 Waste Characteristics

Between 1954 and 1958, concrete blocks, pieces of broken concrete and hardened asphalt, tires and other inert materials were deposited in the ravine. Reportedly, this area was not a general waste disposal area and received only construction rubble fill materials, mostly from the demolition of buildings, roads and other structures. It is unknown whether any materials disposed of at SWMU #4 contained asbestos (Johnson, 1985).

4.4.3 Groundwater

4.4.3.1 Pollution Migration Pathways. Groundwater is estimated to occur between 1 and 3 feet below land surface beneath SWMU #4 and is anticipated to flow southeast towards St. Andrew Bay.

4.4.3.2 Evidence of Release. No evidence of a release to groundwater was found as a result of the record search conducted during the IAS or during Jordan's review of FDER files. Based on the type of wastes disposed of at this site no release to groundwater is expected.

4.4.4 Surface Water

4.4.4.1 Pollution Migration Pathways. SWMU #4 was originally a surface water drainage ravine discharging to St. Andrew Bay. Based on the type of waste disposed of at this site and the lack of fill materials it is expected that SWMU #4 still receives surface water runoff from the surrounding area. The runoff is anticipated to flow beneath the waste and either infiltrate through the soils to groundwater or discharge to St. Andrew Bay.

4.4.4.2 Evidence of Release. No evidence of a release to surface water was found as a result of the record search conducted during the IAS or as a result of a review of FDER files. Based on the type of waste disposed of at this site no release to surface water is expected.

4.4.5 Air

4.4.5.1 Pollution Migration Pathways. Due to the lack of fill cover materials at this site the potential exists for a release to the atmosphere.

4.4.5.2 Evidence of Release. No evidence of a release to the atmosphere was found during the IAS or RFA file searches. Based on the types of wastes disposed of at SWMU #4 (i.e., lack of volatile organic compounds) an atmospheric release is not expected.

4.4.6 Soils

4.4.6.1 Pollution Migration Pathways. Due to the lack of fill materials covering the wastes disposed of at SWMU #4 and the coarse texture of the waste materials, a release to the surface soils beneath the wastes by leaching is possible.

4.4.6.2 Evidence of Release. No evidence of a release to soils was found in either the IAS or RFA file searches and based on the types of wastes disposed, none is expected.

4.4.7 Subsurface Gas

4.4.7.1 Pollution Migration Pathways. The waste materials disposed of at SWMU #4 (construction rubble) are not conducive to the generation of subsurface gas commonly found in municipal landfills.

4.4.7.2 Evidence of Release. No evidence of the generation or release of subsurface gas was found during either the IAS or RFA file searches. Based on the types of wastes disposed of at SWMU #4 the generation or release of subsurface gases are not expected.

4.4.8 Data Gaps and Recommendations

No evidence of a release from SWMU #4 was found during either the IAS or RFA file searches and, based on the type of wastes disposed of at this site, none are expected. Sampling of sediment and seeps, if any, will be addressed in the RFI Work Plan.

4.5 SWMU #5 (NIRP Site 5) - PAINT SHOP CLEANING AREA

4.5.1 Unit Characteristics

SWMU #5 (Figure 4-1) is located behind the Paint Shop (Building 47) and is estimated to have been approximately 100 square feet in size. Site photographs taken during the VSI are included in Appendix A. The site was a sand pit where painting equipment was cleaned. This operation took place from at least the early 1950s to 1979. Brushes and other painting equipment were rinsed using mineral spirits, methyl ethyl ketone, acetone and paint thinner. Paint and cleaning wastes were poured directly onto the ground. A project undertaken in 1979 to prevent further use of the sand pit provided a concrete brush cleaning pad with spill containment adjacent to Building 87. The original sand pit used for disposal has since been paved with asphalt.

The geology beneath SWMU #5 is anticipated to be similar to the cross section presented in Figure 3-1. Groundwater flow direction in the vicinity of the SWMU is south to southwest towards Alligator Bayou. The water table occurs approximately 3 to 4 feet BLS.

4.5.2 Waste Characteristics

The size of past operations at the Paint Shop exceeded the size of the current operations. Estimated quantities and types of wastes disposed of at SWMU #5 are shown on Table 4-4.

4.5.3 Groundwater

4.5.3.1 Pollutant Migration Pathways. Since solvents and paints were discharged into an unlined equipment cleaning area, a pathway for migration to the unconfined aquifer exists.

4.5.3.2 Evidence of Release. No evidence of release to groundwater was found in the records. ESE (1987) installed and sampled two monitoring wells at the site. Laboratory analytical results obtained from the downgradient well did not differ from those obtained from the upgradient well. Results of both analyses were below detection limits for the substances of concern.

4.5.4 Surface Water

4.5.4.1 Pollutant Migration Pathways. Surface runoff from storm events in the vicinity of the site is collected in a storm water drainage system which discharges into Alligator Bayou.

4.5.4.2 Evidence of Release. No evidence of a surface water release was found in the available records or observed during the VSI. Since the SWMU is capped with asphalt, release to surface water is not expected.

4.5.5 Air

4.5.5.1 Pollutant and Migration Pathways. Since the area is covered with asphalt, a release to the atmosphere is not expected at this site.

4.5.5.2 Evidence of Release. No evidence of a release to the atmosphere was found in the available records or noted during the VSI.

4.5.6 Soils

4.5.6.1 Pollutant Migration Pathways. Based on the waste quantities, types of wastes disposed of and the coarse grained porous soils present beneath the site, soil contamination is expected at this site.

TABLE 4-4
ESTIMATED WASTE QUANTITIES DISPOSED OF AT SWMU #5 (NIRP SITE #5)
RCRA FACILITY ASSESSMENT
NAVAL COASTAL SYSTEMS CENTER
PANAMA CITY, FL

PERIOD OF DISPOSAL	WASTE TYPE	ESTIMATED TOTAL QUANTITY	COMMENTS
Before 1950 - 1978	Waste Paint	7,000 gallons	Assume 76 percent of 9,250 gallons from the Paint Shop were disposed here.
Before 1950 - 1978	Paint Thinner	3,500 gallons	Assume 76 percent of 4,600 gallons from the Paint Shop were disposed here.
Before 1950 - 1978	Acetone	3,500 gallons	Assume 76 percent of 4,600 gallons from the Paint Shop were disposed here.
Before 1950 - 1978	Mineral Spirits	3,500 gallons	Assume 76 percent of 4,600 gallons from the Paint Shop were disposed here.
Before 1950 - 1978	Methyl Ethyl Ketone	2,000 gallons	Assume 76 percent of 3,100 gallons from the Paint Shop were disposed here.

NOTES:
1. Source: Johnson (1985)
2. Rationale for the percent of material disposed of is not known.

4.5.6.2 Evidence of Release. No analytical data on the degree and extent of soil contamination was found in the available records.

4.5.7 Subsurface Gas

A release of subsurface gas is not expected at this SWMU.

4.5.8 Data Gaps and Recommendations

Due to the nature of waste reportedly disposed of at this SWMU, Jordan recommends surface and subsurface soil sampling. Soil gas analysis may be appropriate in this area as an alternative to soil sampling. Installation of additional groundwater monitoring wells may be warranted, based on the analytical results of soil sampling. Additional sampling of this SWMU will be addressed in the RFI Work Plan.

4.6 SWMU #6 - HAZARDOUS WASTE STORAGE FACILITY

4.6.1 Unit Characteristics

NCSC Panama City stores hazardous waste in containers at a permitted hazardous waste storage facility. The permits include a FDER Operating Permit (issued 12/2/85, expires 9/1/90) and an EPA RCRA permit (issued 12/6/85, expires 12/6/95). The location of SWMU #6 is presented on Figure 4-1 and photographs of the site taken during the VSI are included in Appendix A.

The container storage facility is located within a fenced open storage compound at the western end of Raven Place. The site is isolated and secured with a 6-foot fence and locked gate. There are six equally sized bays measuring 8' x 11'4" each and a seventh bay that is 8' x 23'4". The bays are separated by a 5 feet high concrete wall and wastes are stored in separate bays by waste type, thereby segregating potentially incompatible wastes.

A corrugated metal roof overhangs the bays at a height of about 11 feet above the base to prevent rain from entering the bays. Exterior walls are 9'4" high. Bases are constructed of concrete 6 inches thick and sloped toward collection trenches located at the rear of each bay. Floors are sloped at one-half inch per foot. Cast iron grates cover the collection trenches.

The six equal sized bays have collection trenches that are 9.5 feet long, 2 feet deep and 1.5 feet wide. Trenches are isolated from one another and bays are separated by cinder block walls 5 feet in height. An apron is provided in front of the bays and is approximately 10 feet wide, 6 inches thick and slopes away from the bays. Surrounding the apron is an asphalt paved surface used for loading/unloading and repackaging of wastes.

Maximum storage capacity of the facility is a function of sizes of containers used; 15-, 30- and 55-gallon containers are typically used. Maximum storage is sixty 55-gallon drums or 3,300 gallons. The large bay (8′ x 23′4") is able to accommodate 12 drums (660 gallons) of ignitable waste. The other six bays (8′ x 11′4") are used for non-ignitable waste and each can accommodate 8 drums (440 gallons).

Table 4-5 presents the storage characteristics of each bay (type of waste, size, and capacity). Table 4-6 shows calculated storage and spill containment capacities of each bay and its respective collection trench. Trench containment is 110 percent of the total capacity of wastes stored. The geology beneath SWMU #5 is anticipated to be similar to that presented on Figure 3-1. The unconfined aquifer lies between 6 to 8 feet BLS and flows northeast towards St. Andrew Bay.

4.6.2 Waste Characteristics

Chemical and physical information for hazardous wastes stored at the facility is shown on Table 4-7. For each waste, the table includes:

1. General description;

2. Hazardous characteristics, i.e., toxic, ignitable, corrosive, reactive (c.f. 40 CFR 261, Subpart C); and

3. Basis for hazard designation, e.g., flashpoint (c.f. 40 CFR 261, Subpart C) or waste lists (c.f. 40 CFR 261, Subpart D).

4.6.3 Groundwater

4.6.3.1 Pollutant Migration Pathways. Groundwater beneath SWMU #6 occurs between 6 and 8 feet beneath land surface. Flow in the surficial aquifer beneath the site is easterly, towards St. Andrew Bay, based on water level observations from monitoring wells in the area. Flow in the deeper Floridan aquifer beneath the storage facility is to the south. A migration pathway to either groundwater body is not apparent.

TABLE 4-5
BAY CHARACTERISTICS, HAZARDOUS WASTE STORAGE FACILITY
RCRA FACILITY ASSESSMENT
NAVAL COASTAL SYSTEMS CENTER
PANAMA CITY, FL

BAY NO.	WASTES STORED	CAPACITY NO. OF 55-GALLON DRUMS
1	Caustics and cyanides (D007, F007, F008, F009)	8
2	Halogenated organics (F001, F002)	8
3	Toxics (D006, D007, D009)	8
4	Non-hazardous industrial wastes	8
5	Acids (including oxidizer/ corrosive wastes)	8
6	PCB Items *	--
7	Ignitables (F003, F005, D007, maybe D008)	12

* Not covered under RCRA

SOURCE: Hazardous Waste Facility, Operating Permit Application (FL8170023792), NCSC Panama City, FL

TABLE 4-6
STORAGE AND CONTAINMENT CAPACITIES
RCRA FACILITY ASSESSMENT
NAVAL COASTAL SYSTEMS CENTER
PANAMA CITY, FLORIDA

Bay Dimensions	Number of Bays	Number Drums/Bay	Stored Gallons/Day	Dimensions	Capacity Gallons/Bay
8' x 11'4"	6	8	440	9'6" x 1'6" x 2'	213
8' x 23'4"	1	12	660	21'6" x 1'6" x 2'	482

SOURCE: Hazardous waste facility operating permit application (FL8170023792), NCSC Panama City, FL

TABLE 4-7
CHEMICAL AND PHYSICAL ANALYSIS OF WASTES
RCRA FACILITY ASSESSMENT
NAVAL COASTAL SYSTEMS CENTER
PANAMA CITY, FLORIDA

General Description	Hazardous Charac-teristic*	Basis for Designation	Analytical Information/ Reports+
Acetic acid, glacial	C	Waste has a pH <2.0	P-HMIS**
Acetone	I	This is a listed waste due to its flash point (0°F)	P-HMIS
Alkaline rust remover	C	Waste has a pH>12.5	P-HMIS
Alkaline wastes	C	Waste has a pH>12.5	pH run on-site using portable pH meter
Alcohol	I	Waste has a flash point <140°	P-HMIS
Alodine	C,T	Material contains chromic acid (pH<2.0); waste contains toxic levels of chromium	P-HMIS
Ammonia	C	Solution has a pH >12.5	P-HMIS
Ammonium persulfate	C	Dilute solutions may corrode steel	P-HMIS
Arcal "Weld-O"	C	Material contains hydrochloric acid and may have a pH <2.0	P-HMIS
Az-Cu Guard	C,T	Waste has a pH >12.5 and may contain soluble RCRA metals	P-HMIS
Battery acid	C	Solution has a pH <2.0	pH
Black dye	C	Waste has pH <2.0	P-HMIS
Chloroform	T	Waste is listed	P-HMIS
Chrome caustic	C,T	Waste has a pH<2.0 and contains soluble chromium	P-HMIS
Cleaning solvents	I,T	These paint cleaners have flash points between 0° and 110°F; they may contain listed wastes (F003) xylene, toluene, or methyl ethyl ketone	P-HMIS

TABLE 4-7 (Cont.)
CHEMICAL AND PHYSICAL ANALYSIS OF WASTES
RCRA FACILITY ASSESSMENT
NAVAL COASTAL SYSTEMS CENTER
PANAMA CITY, FLORIDA

General Description	Hazardous Charac-teristic*	Basis for Designation	Analytical Information/ Reports+
Cleaning/degreasing compounds	T	Degreasing and metal cleaning compounds contain either trichloroethane or Freon and are listed hazardous wastes (F001)	P-HMIS
Corrosion removing compound	C	Material has a pH <2.0	P-HMIS
Cyanide plating solution	T	Wastes are listed	Pending-cyanide
Developers (film) and fixers	T	Film developing and fixing chemicals contain silver	P-HMIS
Ethanol (see alcohol)			
Heat bath solutions	C	Waste may have a pH>12.5	P-HMIS
Hydrochloric acid	C	Waste has a pH<2.0	
Hydrofluoric acid	C	Waste has a pH<2.0	P-HMIS
Methyl ethyl ketone (MEK)	I,T	Material is a listed waste and has a flash point of 22°F	P-HMIS
MEK peroxide mixtures	I	Waste is a strong oxidizer (DOT designation) and is an ignitable hazardous waste by definition	P-HMIS
Mineral spirits	I	Waste has a flash point <140°F	P-HMIS
Mixed paint wastes	I,T	Paint wastes may contain lead and chromium and have flash points <140°F	Pending-flash point, EP Toxicity
Nickel chloride plating solution and nickel stripping solution	C,T	Nickel plating solutions have pH<2.0; they may contain soluble metals	P-HMIS
Paint remover	C	Paint removing (stripping) compounds have pH <2.0	P-HMIS

TABLE 4-7 (Cont.)
CHEMICAL AND PHYSICAL ANALYSIS OF WASTES
RCRA FACILITY ASSESSMENT
NAVAL COASTAL SYSTEMS CENTER
PANAMA CITY, FLORIDA

General Description	Hazardous Charac-teristic*	Basis for Designation	Analytical Information/ Reports+
Paints (off-specification products)	I	Most paint materials are solvent-based with flash points varying from 40°F to 140°F	P-HMIS
Phosphoric acid	C	Phosphoric acid waste has a pH<2.0	P-HMIS
Sodium hydroxide solution	C	Material has a pH >12.5	P-HMIS
Sodium persulfate	C	Waste has a pH <2.0	P-HMIS
Sulfuric acid	C	Material has a pH<2.0	P-HMIS
Toluene	I	Material is a listed waste (F003); it has a flash point of 40°F	P-HMIS
Trichloroethane	T	Material is a listed waste (U228, F002) (U226, F001)	P-HMIS
Trichloroethylene	T	Material is a listed waste (U228, F002)	P-HMIS
Xylene	I	Xylene has a flash point of 84°F; it is also a listed waste (F003, U239)	P-HMIS
Zinc (zincate) plating solution	C	Zinc plating solutions have pH<2	P-HMIS

* T = toxic; I = Ignitable; C = Corrosive; and R = Reactive.

\+ L = Laboratory analysis (report attached); P = Published data, source shown; and Pending = Laboratory analysis pending.

** HMIS = Hazardous Material information System used with specific National Stock Number (NSN).

++ HMIS and 40 CFR 261 waste lists used to characterize specific component wastes identified by generator records.

SOURCES: Ensafe, Inc.
Water and Air Research, Inc.
Moore, Gardner and Assoc.

The construction of the storage facility precludes a release to groundwater.

4.6.3.2 Evidence of Release. No evidence of a release to groundwater was found during the PR or observed during the VSI.

There is no expected potential for contamination of groundwater at the storage facility itself because of the construction characteristics of the facility.

4.6.4 Surface Water

4.6.4.1 Pollutant Migration Pathways. There are no streams or ponds immediately adjacent to the storage facility. Surface water runoff at this site flows in a southeasterly direction towards St. Andrew Bay.

Because of the containment structure at this facility none of the hazardous materials should come in contact with surface waters, either by spilling to surface waters or by runoff passing into and through the storage area. Therefore, surface water contamination is not expected.

4.6.4.2 Evidence of Release. No evidence of release to surface water from this SWMU was found in the available file information or observed during the VSI. Based on the construction details and spill containment precautions no release to surface water is expected.

4.6.5 Air

4.6.5.1 Pollutant Migration Pathways. Because of the construction of the storage facility, its operation poses no expected threat of contamination to the air. There is a potential for airborne contamination during a fire or as the result of a spill during transport. However, the Emergency Contingency Plan provides for both of these situations so that the danger of substantial airborne pollution is minimal.

4.6.5.2 Evidence of Release. No evidence of release to air from this SWMU was found during the PR or observed during the VSI.

4.6.6 Soils

4.6.6.1 Pollutant Migration Pathways. Because of the containment features at the facility, there is no expected threat of soil contamination.

4.6.6.2 Evidence of Release. No evidence of release to soil from this SWMU was found during the PR or observed during the VSI.

4.6.7 Subsurface Gas

Since this is an aboveground containerized facility there is no potential for the release of subsurface gas.

4.6.8 Data Gaps and Recommendations

Data collected previously by ESE (1987) are sufficient to characterize this site. There are no recommendations for further action.

4.7 SWMU #7 - WASTEWATER TREATMENT FACILITY

4.7.1 Unit Characteristics

Prior to 1956, individual septic tanks were used for each building at NCSC. The septic tank systems frequently failed, resulting in unpleasant odor and unsightly conditions (Department of the Navy, 1956). In order to comply with local ordinances and regulations, construction of a central sanitary collection system and wastewater treatment facility (WWTF) was recommended in 1953. The WWTF was constructed in about 1956 to provide primary and secondary treatment of 250,000 gallons per day (gpd) maximum daily flow. The location of the WWTF is presented on Figure 4-1 and photographs taken during the VSI are included in Appendix A.

Wastewater generated at NCSC is collected in sewers and conveyed to one of the center's five lift stations. Wastewater is pumped from the stations to the secondary treatment facility employing a trickling filter process. The treated effluent is discharged through a conduit to St. Andrew Bay, located 100 feet east of the treatment facility.

Collection sewers are predominantly 8 inches in diameter. Due to the flat topography at NCSC pumping stations are required at critical locations throughout the facility. Pump station No. 134 services the laboratory area and those facilities near Building 126, while pump station No. 135 serves the married personnel housing area.

The treatment facility consists of a comminutor, an aerated grit chamber, a primary clarifier, a trickling filter, a secondary clarifier, a chlorine disinfection facility, an anaerobic digester, and three sludge drying beds. Dried sludge produced by the sewage treatment plant has been removed from the station about once every 3 to 6 months by individuals for

use as a humus or has been spread on undeveloped station grounds.

Discharges from the treatment facility are regulated by the National Pollutant Discharge Elimination System (NPDES) Permit Number FL0002551 and the FDER Operating Permit Number DO 03-11762. Based on plant operating data for 1978 to 1982, flows averaged 0.173 MGD. Also, a 1982 evaluation of the treatment plant shows a design capacity of 0.155 MGD with the secondary clarifier as the rate limiting process (Naval Facilities Engineering Command, 1982). The average annual daily flow in 1985 was 0.157 MGD. Plans have been completed for expansion of the facility to 0.300 MGD. These plans include the addition of a trickling filter, secondary clarifier, and sludge drying beds. The expansion is scheduled to begin in the Fall of 1987. Provisions are included to modify the trickling filters with higher surface area media in the event of increased capacity requirements. The provisional plan increases the capacity to 0.50 MGD (William M. Bishop Consulting Engineers, Inc., 1987).

The plant has experienced periodic overloads due to normal base flow, rain induced inflow, and short-term infiltration. During overload periods, adequate treatment is not possible and inadequately treated water is discharged to St. Andrew Bay. Information on these releases is provided to FDER under the plant's NPDES Permit requirements. The geology present beneath the WWTF is anticipated to be similar to that presented on Figure 3-1.

Monitor wells installed near the old fire training area immediately to the southwest of the WWTF indicated that the water table occurs at 6 to 8 feet BLS and flows in a southeasterly direction to St. Andrew Bay at an estimated rate of 0.15 feet/day (ESE, 1987).

4.7.2 Waste Characteristics

Waste entering the WWTF consists of general sanitary waste, water from the oil/water separators, runoff from the hazardous waste accumulation area behind the paint shop, and small amounts of assorted wastes from various shops on NCSC.

4.7.3 Groundwater

4.7.3.1 Pollutant Migration Pathways. The various systems in which waste are treated at the WWTF are all constructed of concrete. Release through seepage into groundwater is not expected from this SWMU.

4.7.3.2 Evidence of Release. No evidence of release to groundwater was found in available file information or during the VSI and based on the construction of the WWTF none is expected.

4.7.4 Surface Water

4.7.4.1 Pollutant Migration Pathways. The potential for release at the WWTF exists as overflow out of container boundaries. Within the sludge drying beds, supernatant may flow through the undiked driveway where the sludge is loaded for transportation. The potential for overflow also exists at the influent structure of the WWTF during times of high influent rate (William M. Bishop Consulting Engineers, Inc., 1987). The potential for release also exists through the effluent which is released to St. Andrew Bay. Treated effluent is monitored for metals, BOD, temperature and pH in compliance with the NPDES Permit.

4.7.4.2 Evidence of Release. No evidence of release was noted around the sludge drying beds or around the influent structure. Available file information indicated no waste effluent permit violations into St. Andrew Bay.

4.7.5 Air

4.7.5.1 Pollutant Migration Pathways. The potential for volatilization from the sludge drying beds, trickling filter system and clarifiers exists. The small amounts of various wastes that volatilize from these areas is not expected to present a potential threat to human health or the environment, as hazardous constituents are not released into the WWTF.

4.7.5.2 Evidence of Release. No evidence of release to air from the WWTF was found in the available file information or during the VSI.

4.7.6 Soils

4.7.6.1 Pollutant Migration Pathways. Soil contamination could occur by releases from overflow of waste as discussed in the Section 4.7.4.

4.7.6.2 Evidence of Release. No evidence of an overflow or release to soils was found in the available file information or during the VSI.

4.7.7 Subsurface Gas

4.7.7.1 Pollutant Migration Pathways. Migration of subsurface gas from the WWTF is not expected as the operation is aboveground.

4.7.7.2 Evidence of Release. No evidence of a subsurface gas release was found in the available file information or during the VSI.

4.7.8 Data Gaps and Recommendations

Sufficient information was available to fully characterize the WWTF, therefore, no future action is recommended for this SWMU. No evidence of releases to the environment were found and none are expected.

4.8 SWMU #8 - CLASSIFIED DOCUMENTS INCINERATOR

4.8.1 Unit Characteristics

NCSC operates a natural gas-fired solid waste incinerator used exclusively for the destruction of classified material. The date of installation of the incinerator is not known. The incinerator has a capacity of 300 pounds and is operated twice weekly for approximately 8 hours per burn. The location of SWMU #8 is presented on Figure 4-1 and photographs taken during the VSI are included in Appendix A.

The incinerator is scheduled for replacement in July 1987 with a 1,000 pound capacity unit. The new unit is also gas-fired and will be operated once per week. Specific unit characteristics were not available during the PR or VSI. The incinerator is located on a concrete slab and the proposed new incinerator will replace the old unit on the existing slab. Exhaust from the current solid waste incinerator is released via a permitted stack approximately 40 feet high.

The geology in this area is expected to be similar to the other areas of NCSC and is depicted on Figure 3-1. Groundwater in the area is expected to occur at 5 to 8.5 feet BLS and flows to the southeast at approximately 0.36 feet per day (ESE, 1987).

4.8.2 Waste Characteristics

The classified material disposed of in the solid waste incinerator consists primarily of paper documents, although some photographs and negatives are also destroyed. The incinerator is not used for any other wastes. Ash from the incinerator is disposed of off-station by the NCSC solid waste contractor.

4.8.3 Groundwater

4.8.3.1 Pollutant Migration Pathways. This SWMU is used for burning non-hazardous solid wastes and is mounted on a concrete slab. Groundwater contamination is not expected from this unit.

4.8.3.1 Pollutant Migration Pathways. This SWMU is used for burning non-hazardous solid wastes and is mounted on a concrete slab. Groundwater contamination is not expected from this unit.

4.8.3.2 Evidence of Release. No evidence of release to groundwater from the incinerator was found in available file material or during the VSI.

4.8.4 Surface Water

4.8.4.1 Pollutant Migration Pathways. The possibility exists that ash could enter surface water via stormwater runoff from the incinerator area. Since hazardous materials are not disposed of in the incinerator, contamination is not expected.

4.8.4.2 Evidence of Release. No evidence of release to surface water from the incinerator was found in the available file information and no ash was observed in the area around the incinerator during the VSI.

4.8.5 Air

4.8.5.1 Pollutant Migration Pathways. The classified documents incinerator releases exhaust to air via a stack. This exhaust is released under FDER Permit No. A003-34959. Release of hazardous constituents is not expected as only paper and small amounts of photographic material are incinerated in this unit.

4.8.5.2 Evidence of Release. No evidence of release of hazardous wastes to air was found in the available file information or during the VSI. The exhaust stack is permitted by FDER.

4.8.6 Soils

4.8.6.1 Pollutant Migration Pathways. The release of ash is possible from the incinerator in stormwater runoff during ash removal. This ash should not contain hazardous materials due to the nature of the wastes incinerated.

4.8.6.2 Evidence of Release. No evidence of release to soils from the incinerator was found in the available file information and no ash was observed in the area around the incinerator during the VSI.

4.8.7 Subsurface Gas

4.8.7.1 Pollutant Migration Pathways. The entire classified documents incinerator is located on a concrete slab above the

ground surface, therefore, a subsurface gas release is not expected from this SWMU.

4.8.7.1 Evidence of Release. No evidence of a subsurface gas release was found in available file information or during the VSI.

4.8.8 Data Gaps and Recommendations

Sufficient information was available to characterize the classified documents incinerator. Based on the wastes types (paper and small amounts of photographic material), no release to the environment is expected and no further action is recommended at this SWMU. An ash sample will be analyzed for EP Tox constituents during the RFI to confirm this assessment.

4.9 SWMU #9 - CURRENT FIRE TRAINING AREA

4.9.1 Unit Characteristics

The current fire training area is located southwest of Gull Circle near Building 61. Fire training commenced at this location in approximately 1980. The location of SWMU #9 is presented on Figure 4-1 and photographs taken during the VSI are included in Appendix A. The area consists of two mobile homes that are used for smoke training, two dumpsters and a trash pile that were used for live fire training. Live fire training has been suspended until an environmentally sound containment structure is completed. This structure is included in the NCSC Fiscal Year 1988 budget. Specific design elements are not currently available. A 4,500-gallon aboveground tank located northeast of the training area is used to accumulate fuel for fire training. This tank will be studied as a component of SWMU #9 under the RFI. During live-fire training approximately 18 to 20 fires were conducted per year with 100 to 150 gallons of fuel used per fire (Johnson, 1985).

The geology in this area is expected to be similar to the other areas of NCSC and is depicted on Figure 3-1. Groundwater was encountered at 6 to 8 feet BLS during drilling operations at the old fire training area directly south of this SWMU. The groundwater flow is expected to trend to the southeast at approximately 0.15 feet per day (ESE, 1987).

4.9.2 Waste Characteristics

The primary wastes used for fuel in the fire training area are contaminated fuels including JP-5 helicopter fuel, diesel fuel, and gasoline. According to NCSC personnel, it is possible that flammable waste solvents have also been used as fuels (Jordan Personal Communication, 1987). Approximately 100 to 500 gallons were used for each of the 18 to 20 training fires

conducted per year. From this information it is estimated that between 1980 and 1985 approximately 14,000 gallons of fuel were ignited for training exercises. The percentage of unburned fuel remaining is not known.

4.9.3 Groundwater

4.9.3.1 Pollutant Migration Pathways. Highly permeable soils underlie the fire training area, prossibly allowing the migration of unburned fuel and solvents into the surficial aquifer. As stated in Section 3.1, the possibility exists that the surficial and the Floridan aquifers are hydraulically connected, therefore contamination of the Floridan aquifer is possible from this SWMU.

4.9.3.2 Evidence of Release. No sampling data indicating a release to groundwater from this SWMU was found in the available file information. Groundwater sampling has never been conducted near this SWMU.

4.9.4 Surface Water

4.9.4.1 Pollutant Migration Pathways. Surface drainage in the area flows to the east. Fuels and solvents used for practice fires could migrate to St. Andrew Bay during rain events. Live fire training has been discontinued, so the possibility of surface water contamination from this SWMU is reduced.

4.9.4.2 Evidence of Release. No evidence of a surface water release from this SWMU was found in available file material or during the VSI.

4.9.5 Air

4.9.5.1 Pollutant Migration Pathways. Volatilization of fuels and solvents used in fire training is possible during practice sessions. Particulate material is also released during these practices. The release of hazardous materials depends on the waste products used as fuels for the practice fires.

4.9.5.2 Evidence of Release. No evidence of release to air was found in available file information or during the VSI. Fire training is currently suspended until completion of new facilities. Smoke training is still conducted in two mobile homes at this SWMU.

4.9.6 Soils

4.9.6.1 Pollutant of Migration Pathways. Fuels were placed in dumpsters and directly onto the soil in the fire training area, therefore soil contamination is expected from this SWMU.

4.9.6.2 Evidence of Release. Jordan personnel observed small areas of stained soils around the trash pile in the center of the fire training area during the VSI. Soil samples have been collected in the fire training area and analyzed for oil and grease (free and dissolved). Elevated levels of free oil and grease were noted in all (five) samples collected (NAVFAC, 1985). Further study of the area will be addressed in the RFI Work Plan.

4.9.7 Subsurface Gas

4.9.7.1 Pollutant Migration Pathways. A subsurface gas release is not expected from this SWMU. The waste disposal practices do not cause the formation of subsurface gas.

4.9.7.2 Evidence of Release. No evidence of a subsurface gas release from this SWMU was found in the available file information or observed during the VSI.

4.9.8 Data Gaps and Recommendations

According to available file information, sampling conducted around this SWMU indicates soil contamination by petroleum products. Since substantial quantities of contaminated fuels and possibly waste solvents were used in this area, Jordan recommends that soil and groundwater sampling be conducted to characterize the nature and extent of the contamination in the fire training area. Further sampling of this area will be addressed in the RFI Work Plan.

4.10 SWMU #10 - OIL/WATER SEPARATOR

4.10.1 Unit Characteristics

Prior to 1968, oily bilge water and waste oil collected from ships berthed at NCSC were reportedly used for fire fighting training and burned at SWMU #2. Since 1968, all bilge water and waste oil have been passed through an oil/water separator and the accumulated waste oil hauled off-station by a waste hauling contractor. The separated waste oils are stored in a 10,000 gallon concrete underground storage tank. The storage tank accumulates waste oils from all containers, bowsers, pumps and nonstorage facilities at NCSC and is emptied approximately once every 6 months for off-station disposal. The separated water is pumped to the wastewater treatment facility. The concrete slab is designed to direct spills incurred during transfer operations into the oil/water separator.

The oil/water separator and the underground waste oil storage tank are located between Building 321 and St. Andrew Bay (Figure 4-1). Photographs of this SWMU are included in Appendix A. The separator and storage tank facility is approximately 450 feet north of the east dock on Alligator Bayou and is connected to the dock area by an underground pipeline system. The geology in this area is expected to be similar to the rest of the NCSC and is shown on Figure 3-1. Groundwater is expected to occur at 4 to 6 feet BLS in this area and flow eastward towards St. Andrew Bay.

4.10.2 Waste Characteristics

The oil/water separator receives bilge water and waste oil from ships berthed at NCSC and waste oil from facility operations and shops. The underground storage tank for waste oil accumulates waste oils from all containers, bowsers, pumps and non-storage facilities at NCSC.

4.10.3 Groundwater

4.10.3.1 Pollutant Migration Pathways. A 10,000 gallon concrete underground waste oil storage tank and underground transfer piping system exist in association with the oil/water separator. The potential for leakage from the tank or pipeline into the shallow aquifer exists. Accumulated waste oil is removed from the storage tank by a contract waste hauler approximately every 6 months.

4.10.3.2 Evidence of Release. No evidence of release to groundwater was found in the available file information or during the VSI.

4.10.4 Surface Water

4.10.4.1 Pollutant Migration Pathways. Potential for release to surface water exists in areas where bilge water or waste oil enters the oil/water separator system such as aboveground transfer connectors. This potential is reduced by the design of the concrete slab that directs spills back into the separator.

4.10.4.2 Evidence of Release. No evidence of release to surface water was found in the available file information or during the VSI.

4.10.5 Air

4.10.5.1 Pollutant Migration Pathways. The oil/water separator system is essentially enclosed, therefore, no pollutant migration pathways to air exist.

4.10.5.1 Evidence of Release. No evidence of release to air was found in the available file information or during the VSI.

4.10.6 Soils

4.10.6.1 Pollutant Migration Pathways. As discussed in the section on groundwater and surface water, little potential for release to soils exists within the oil/water separator system. Leakage from the pipeline, tanks, or during transfer of waste could potentially contaminate soils in the area. This potential is reduced by the design of the concrete slab that directs spills back into the separator.

4.10.6.2 Evidence of Release. No evidence of release to soils was found in the available file review or during the VSI.

4.10.7 Subsurface Gas

4.10.7.1 Pollutant Migration Pathways. Pathways for the accumulation and release of subsurface gas are not expected to exist at this site.

4.10.7.2 Evidence of Release. No evidence of release to subsurface gas was found in available file information of during the VSI.

4.10.8 Data Gaps and Recommendations

The storage tank and piping for this SWMU are subject to FDER underground storage tank regulations. NCSC is presently working with FDER to bring their storage tanks into compliance. Since the oil/water separator does not exhibit a high potential for release, no further action is recommended at this SWMU.

4.11 SWMU #11 - TEMPORARY HAZARDOUS WASTE STORAGE AREA (PAINT SHOP)

4.11.1 Unit Characteristics

The temporary storage facility is located on the southeast side of Building 84. The storage area consists of a sloping concreted pad with spill containment curbing and a collection sump. The sump discharges directly to the sanitary sewer. The location of this SWMU is provided in Figure 4-1 and photographs are included in Appendix A.

Since 1978, cleanup of painting equipment has been conducted here. Chemicals used for cleaning are collected in buckets and waste solvents are poured into 55-gallon drums. The drums are stored on the pad until a sufficient volume has accumulated. They are then transferred to the hazardous waste storage

facility to await disposal off-station by a contract waste hauler.

Geology beneath this SWMU is expected to be similar to the cross section presented on Figure 3-1. Installation of monitor wells in 1986, southwest of this SWMU, indicated groundwater levels of 5 to 8.5 feet BLS. Groundwater flows to the southwest, south, and southeast towards Alligator Bayou and St. Andrew Bay in these wells. The groundwater flow rate was estimated to be 0.36 feet per day.

4.11.2 Waste Characteristics

Waste materials generated and stored at this site consist of mineral spirits, paint, methyl ethyl ketone, paint thinner and acetone. Volumes vary with paint shop activity but are expected to average 78 gallons per month.

4.11.3 Groundwater

4.11.3.1 Pollutant Migration Pathways. The temporary storage area is underlain by a concrete slab and surrounded by a concrete dike. It is unlikely that a release to groundwater will occur within this bermed pad. However, a potential for a release is possible in the sanitary sewer system that is connected to the sump. This potential is lessened somewhat in that most sewer lines within the facility lie below the water table and act as groundwater drains.

4.11.3.2 Evidence of Release. There is no visible evidence or available sampling data indicating a release to groundwater from this SWMU.

4.11.4 Surface Water

Release to surface water is not expected from this SWMU.

4.11.5 Air

4.11.5.1 Pollutant Migration Pathways. In the event of a spill or leak from a container, volatilization of liquids is probable.

4.11.5.2 Evidence of Release. No available file information is available to indicate a release to air.

4.11.6 Soils

4.11.6.1 Pollutant Migration Pathways. Release to soil within the confines of the storage area is not expected. The

potential does exist in the surrounding ground surface due to improper handling during waste transfer.

4.11.6.2 Evidence of Release. Data presented by ESE (1987) indicate surface soil contamination by trace metals in soils immediately around the storage area. During the VSI it was observed that soils in the vicinity contained paint residues.

4.11.7 Subsurface Gas

The generation of subsurface gas is not expected.

4.11.8 Data Gaps and Recommendations

No further sampling is recommended at this SWMU, however, the direct release of the containment basin contents to the sewerage system may allow hazardous constituents to enter the WWTF.

4.12 SWMU #12 - TEMPORARY HAZARDOUS WASTE HOLDING AREA (BLDG 40)

4.12.1 Unit Characteristics

SWMU #12 is an area approximately 5 ft x 5 ft, in the parking lot behind Building 40 where plastic 55-gallon barrels containing plating wastes are temporarily stored before being transported to the Hazardous Waste Storage Facility (SWMU #6). This practice began in 1978. The drums sit on the pavement next to the building and are not otherwise contained. When the holding barrels become full, or at least monthly, they are removed.

The surficial deposits at the site are fine to medium quartz sands. The geology beneath SWMU #12 is expected to be similar to the cross-section presented in Figure 3-1. Groundwater in this area occurs at 5 to 8.5 feet BLS and flow tO the southeast towards Alligator Bayou. The groundwater flow rate was estimated at 0.36 feet per day (ESE, 1987).

4.12.2 Waste Characteristics

Building 40 is a metal plating shop. It contains a nickel plating area, another area for plating with a variety of metals, a small darkroom, a vapor degreasing unit, and an etching machine. Table 4-8 lists wastes generated by the plating shop and the estimated total quantity of those wastes.

4.12.3 Groundwater

4.12.3.1 Pollutant Migration Pathways. The surficial aquifer flows southeasterly toward Alligator Bayou. The regional flow of the deeper Florida aquifer is southwesterly.

TABLE 4-8
ESTIMATED METAL PLATING SHOP WASTE GENERATION
RCRA FACILITY ASSESSMENT
NAVAL COASTAL SYSTEMS CENTER
PANAMA CITY, FL

YEARS OF GENERATION	WASTE TYPES	ESTIMATED TOTAL QUANTITY
1976 - 1985	Hydrochloric acid	450 gal.
1976 - 1985	Sulfuric acid	450 gal.
1976 - 1985	Nitric acid	450 gal.
1976 - 1985	Actane	100 gal.
1976 - 1985	Fluoboric acid	100 gal.
1982 - 1985	Electro-less nickel solution	100 gal.
1976 - 1985	Alkaline stripper	200 gal.
1970 - 1979	Various chemicals including chromic acid and cyanide	500 to 1,000 gal.

NOTES:

SOURCE: Johnson (1985)

There is a potential for contamination of the surficial aquifer due to a lack of a containment area, however, spills from this area would probably stay on the concrete and flow into Alligator Bayou (See Section 4.12.4).

4.12.3.2 Evidence of Release. No evidence of a release to groundwater was found in the available files or during the VSI.

4.12.4 Surface Water

4.12.4.1 Pollutant Migration Pathways. This site is about 200 feet north of the south dock. Since there is no containment structure, spills in the parking lot could potentially enter Alligator Bayou through the storm drainage system.

4.12.4.2 Evidence of Release. No evidence of a release to surface water was found in the available files or during the VSI.

4.12.5 Air

4.12.5.1 Pollutant Migration Pathways. The potential for a significant release to the air exists in the case of a spill or during a fire. During normal operation a release is not expected.

4.12.5.2 Evidence of Release. No evidence of a release to the atmosphere was found in the available files and no odors were observed during the VSI.

4.12.6 Soils

4.12.6.1 Pollutant Migration Pathways. In that the area around SWMU #12 is paved, a release to the soil is not anticipated.

4.12.6.2 Evidence of Release. No evidence of a release to the soil was found in the available files or observed during the VSI.

4.12.7 Subsurface Gas

This is an aboveground facility. The generation of subsurface gas is not expected.

4.12.8 Data Gaps and Recommendations

No data gaps have been detected. It was recommended that concrete curbing be considered for installation around this area to provide containment in the case of leakage or spillage from the containers. However, the building has been scheduled for demolition in late 1987 and plating will be discontinued at NCSC.

5.0 AREAS OF CONCERN

5.1 AREA OF CONCERN #1 (NIRP Site 3) - OLD FIRE TRAINING AREA

5.1.1 Unit Characteristics

Fire fighting training occurred approximately once a month in an unlined pit of approximately 500 square feet, located about 140 feet west of Building 100 and approximately 700 feet from St. Andrew Bay (Figure 4-1). The site was paved in 1978 with asphalt and is presently used as an open storage area. The site was used for fire fighting training from the mid-1950s to late 1970 when the new facility on Gull Circle was constructed. Materials burned at the site were spilled onto the ground and ignited.

Site specific geology is generally similar to the cross-section provided in Figure 3-1. All borings except PCY3-3 reported fine to medium grained sand to the total depth of the borings in the vicinity of AC #1. Monitoring well PCY3-3 well log reported fill sand and orange to red clay in the upper 3 feet of the well.

Groundwater at this SWMU was encountered at 6 to 8 feet BLS during ESE drilling operations. The flow was southeasterly toward Alligator Bayou and St. Andrew Bay at an estimated rate of 0.15 feet per day (ESE, 1987).

5.1.2 Waste Characteristics

During the period of operation, waste oils (possibly oil containing PCBs), contaminated fuels (diesel, gasoline, JP-5), paint, and paint thinners were spilled onto the ground and ignited. Waste originated from sources such as the paint shop, motor pool and boat house. Reportedly eight to nine 55-gallon drums of wastes were burned during each training exercise, and about 45 to 50 drums of material were burned annually. Assuming the drums were three-quarters full, an estimated 2,000 to 6,000 gallons per year were spilled onto the ground and ignited (Johnson, 1985).

5.1.3 Groundwater

5.1.3.1 Pollutant Migration Pathways. Since the pit in which dumping and burning took place was unlined, a direct pathway existed for contaminant migration to the shallow aquifer and subsequently the Floridan aquifer.

5.1.3.2 Evidence of Release. Monitoring wells installed around the site during the confirmation study indicate evidence of a release to groundwater. A strong petroleum odor was

noticed in two of three wells and subsequent groundwater analysis for volatile organic compounds and metals indicates elevated levels of benzene (3.6 ug/l), ethylbenzene (29 ug/l), toluene (68 ug/l), trichlorofluoromethane (21 ug/l), and methyl isobutyl ketone (16 ug/l) in well PCY3-3 (ESE, 1987). Of the three wells sampled, the downgradient well (PCY3-3) generally contained higher contaminant levels for most of the parameters identified. Based on these results, former operations at the fire training area have resulted in groundwater contamination by petroleum products.

5.1.4 Surface Water

5.1.4.1 Pollutant Migration Pathways. Because the old fire training area has been paved, stormwater runoff from the site should not result in the contamination of surface water. Since groundwater is known to be contaminated and is moving towards St. Andrew Bay and Alligator Bayou, discharge into surface water is possible.

5.1.4.2 Evidence of Release. No evidence of release to surface water was found in available file information and was not noticed during the VSI.

5.1.5 Air

5.1.5.1 Pollutant Migration Pathways. Because this site is paved, contaminant migration pathways do not exist for release to air.

5.1.5.2 Evidence of Release. No evidence of release to air was found in the available file information or during the VSI.

5.1.6 Soils

5.1.6.1 Pollutant Migration Pathways. Because waste oils were poured on the ground for fire fighting training, soil contamination is expected.

5.1.6.2 Evidence of Release. Soil borings were analyzed for seven PCB compounds and eighteen organochlorine pesticides (ESE, 1987). No PCBs were detected but residual levels of the pesticide DDT and its degradation products were detected. ESE (1987) reported visible contamination of soils with petroleum materials and odor within the borings.

5.1.7 Subsurface Gas

5.1.7.1 Pollutant Migration Pathways. Because of the presence of known contamination of both groundwater and soils, the possibility exists for volatilization of petroleum products

within the subsurface, however, there is little possibility of this gas collecting in subsurface pockets and reaching explosive levels. Therefore, subsurface gas is not expected to present problems at this SWMU.

5.1.7.2 Evidence of Release. No evidence of release of a subsurface gas was found in the available file information or during the VSI.

5.1.8 Data Gaps and Recommendations

Additional data are needed to characterize the migration of contaminants from this SWMU. The Confirmation Study Verification Phase (ESE, 1987), recommends two additional groundwater monitoring wells and ten soil borings. Based on the available information, Jordan concurs with this recommendation and further recommends the nesting of at least two additional wells at location PCY3-3 to determine the vertical extent of contamination.

5.2 AREA OF CONCERN #2 (NIRP SITE 4) - UNDERGROUND OIL CONTAMINATED AREA

5.2.1 Unit Characteristics

This site (Figure 4-1) is the former location of an aboveground 10,000 barrel petroleum storage tank (No. 11), associated distribution and supply lines and an area under the South Dock where leaked oil collected and seeped into Alligator Bayou. Construction of the tank, which was 24 feet tall and 55 feet in diameter, was completed in 1943. The tank received diesel fuel from barges at the South Dock fuel off-loading station and distributed it, by pipeline, to other vessels moored at fueling stations along the dock. Numerous small leaks from the tank reportedly occurred before and after its rehabilitation in 1957. According to an Environmental Pollutant Control Proposed Project Report (Naval Facilities Engineering Command, 1977), 50,000 gallons of diesel oil were lost from the tank in 1953. The location of the spilled 50,000 gallons of diesel oil and whether the underground pipeline leaked fuel are unknown.

In 1957, the tank was rehabilitated, which consisted of dismantling, cleaning and reassembling the tank using new bolts and gaskets. The replaced gaskets allowed the tank to be used for storage of gasoline and aviation fuel as well as fuel oil. The periods of time the tank stored gasoline, aviation fuel or fuel oil are unknown. Reportedly, about 1,000 gallons of contaminated fuel were stored in the tank before its removal in 1979. During rehabilitation, the tank bottom was found to be

badly deteriorated and replacement of twenty-eight bottom plates was required. Reportedly, the tank continued to leak following rehabilitation and its associated piping was in poor condition.

During the mid 1960s, the oil supply line between the dock and the storage tank ruptured and an estimated 10,000 gallons of oil collected under the South Dock. Following the leak, seepage of diesel oil through the South Dock's steel bulkhead to Alligator Bayou was noted. The tank was dismantled and removed in late 1975. Underground piping and fill material to the berm (60 feet from the outer edge of the tank) may also have been removed at this time.

In 1976, following repeated containments and clean up of oil slicks formed under the South Dock, a program was undertaken to solve the problem of oil sheens in Alligator Bayou. Reportedly, the dock's steel bulkhead had numerous small pits and holes. During periods of low tide, the elevation of the floating oil layer beneath the dock was low enough to allow oil to escape to Alligator Bayou through the holes in the bulkhead. The bulkhead was cleaned and all holes and pits were repaired. In addition, fourteen boreholes were drilled through the dock's concrete deck and into the soil below. Based on these borings the groundwater level was found to range from 8 to 10 feet below the paved deck of the dock. Soils with an oily odor were identified at depths of 5 to 8 feet below the deck. Following review of the borehole data, an oil recovery well was installed at the South Dock. An oil and groundwater mixture was initially pumped about once a month from this well, although it currently requires less frequent pumping. The recovered oil and groundwater mixture has been taken off-base by a waste oil hauler. Since implementation of these measures, oil slicks have occurred infrequently. However, oil continues to collect behind the South Dock's bulkhead since the recovery well continues to require pumping.

The partial asphalt paving of the former location of the tank and its associated piping as well as South Dock prevents most surface water from coming into contact with spilled oil or oil contaminated soil. Groundwater flowing through the site may come into contact with spilled oil and contaminated soil. Since soil in the area, based on borings through the dock, is sandy and fairly permeable, oil-contaminated groundwater collects under South Dock where its release to Alligator Bayou is restricted by the dock's bulkhead. Most of the oil collects in a floating layer above the groundwater with some leaking into the bay through holes in the bulkhead.

The geology beneath this area is expected to be similar to the cross-section in Figure 3-1. Groundwater was encountered at 5

to 8.5 feet BLS during ESE drilling operations at this site in October 1986. The flow of the groundwater in wells installed in this area (PCY4-2,3,4) was to the southeast, south, and southwest at an estimated rate of 0.36 feet per day (ESE, 1987).

5.2.2 Waste Characteristics

Approximately 50,000 gallons of diesel oil were reported to have leaked from the storage tank or its associated piping system in 1953. An additional 10,000 gallons were reported lost in the South Dock area during the mid-1960s. It is known that the storage tank and associated piping system leaked throughout most of its functional life.

5.2.3 Groundwater

5.2.3.1 Pollutant Migration Pathways. The groundwater flow direction is southwest to south towards Alligator Bayou. The water table is from 5 to 8 feet BLS in the vicinity of Tank 11. No impermeable layer is known to exist beneath the area to prevent migration of contaminants into the unconfined surficial aquifer.

5.2.3.2 Evidence of Release. The ESE Phase II Confirmation Study Verification Phase Report (1987) presents results of chemical analysis of groundwater samples collected in the vicinity of AC #2. Elevated levels of polynuclear aromatic compounds were found in all samples. Other compounds detected in various wells included ethylbenzene, toluene, lead and mercury.

5.2.4 Surface Water

5.2.4.1 Pollutant Migration Pathways. As noted, Alligator Bayou abuts area of concern #2 and seepage of diesel fuel through the South Dock's bulkhead has been noted.

5.2.4.2 Evidence of Release. Results of samples of both surface water and sediments were reported by ESE (1987). Elevated levels of total petroleum hydrocarbons (840-7580 ug/l) were found in the five sediment samples collected. In addition, elevated levels of several trace metals were also found. Results of the surface water samples showed no significant levels of trace metals or of the five purgeable organic compounds analyzed.

5.2.5 Air

5.2.5.1 Pollutant Migration Pathways. Due to the nature of waste disposal in this area, no release to the atmosphere is expected.

5.2.5.2 Evidence of Release. No evidence of a release to air from this area was found during the PR or VSI.

5.2.6 Soil

5.2.6.1 Pollutant Migration Pathways. Soil contamination by petroleum hydrocarbons and lead exists in this area. Migration of the petroleum products that leaked from the storage tank and pipeline is in a south-southeasterly direction towards Alligator Bayou.

5.2.6.2 Evidence of Release. ESE (1987) reported elevated levels of total petroleum hydrocarbons (38.6 to 19,500 mg/kg) and lead (<1 to 23.7 mg/g) in soil samples collected in this area.

5.2.7 Subsurface Gas

No release of subsurface gas is expected from this area.

5.2.8 Data Gaps and Recommendations

ESE (1987) recommended geophysics to delineate the contamination plume and two additional wells to be nested with the existing contaminated shallow well. In addition to these recommendations, Jordan recommends surface and subsurface soil sampling to delineate the plume (soil gas analysis may be considered) and possibly installation of additional wells based on the soil analytical results.

5.3 AREA OF CONCERN #3 (NIRP SITE 8)- SOLVENT DISPOSAL AREA AT BUILDING 40

5.3.1 Unit Characteristics

This site (Figure 4-1) is located behind Building 40, the Plating Shop. Approximately 55-gallons of trichloroethylene (TCE) were disposed of in an area of about 20 square feet. The disposal occurred in 1973 and was a one time operation in which the solvent was poured onto the ground.

The surficial deposits underlying this site are highly permeable fine to medium quartz sands. The geology beneath this area is expected to be similar to the cross-section presented in Figure 3-1.

The groundwater in the surficial aquifer occurs at 5 to 8.5 feet BLS in this area and is flowing southeasterly towards Alligator Bayou. The regional flow of the deeper Floridan aquifer beneath this site is southwesterly.

5.3.2 Waste Characteristics

The sole waste was 55 gallons of trichloroethylene (TCE).

5.3.3 Groundwater

5.3.3.1 Pollutant Migration Pathways. The dumping occurred into highly permeable soils and therefore probably migrated into the surficial aquifer. As stated in Section 3.1, the surficial aquifer is hydraulically connected to the deeper Floridan aquifer. Therefore, there was potential for contamination of the Floridan aquifer.

The time elapsed since the reported spill is approximately 15 years. It is not expected that a significant release of TCE to groundwater will occur in the future.

5.3.3.2 Evidence of Release. Evidence for the release of TCE to groundwater is based upon personal interviews conducted by C.C. Johnson and Associates, Inc., 1985. No analytical data exists to support or deny the release.

5.3.4 Surface Water

5.3.4.1 Pollutant Migration Pathways. Surface water runoff drains toward the South Dock located on Alligator Bayou. The Bayou is the nearest surficial water body; it is only about 200 feet south of the site.

5.3.4.2 Evidence of Release. No evidence of release to surface water was found in the available file information or observed during the VSI.

5.3.5 Air

5.3.5.1 Pollutant Migration Pathways. In that this is a supposed one-time release in 1973, the potential for an air release, at this time, is not expected.

5.3.5.2 Evidence of Release. No evidence of a release to air was found in the available files or during the VSI.

5.3.6 Soils

5.3.6.1 Pollutant Migration Pathways. Residual soil contamination by TCE and its degradation products is expected to be minimal.

5.3.6.2 Evidence of Release. No documented evidence of a release of TCE to soil was found in the available files. No evidence of a spill was observed during the VSI. ESE (1987)

reported that several soil samples were taken in the area of the reported spill. No evidence of the TCE spill was found.

5.3.7 Subsurface Gas

5.3.7.1 Pollutant Migration Pathways. The generation and release of subsurface gas is not expected.

5.3.8 Data Gaps and Recommendations

Detection of a slug of contamination such as this that occurred approximately 15 years ago would be difficult. Therefore, no further action is recommended.

6.0 CONCLUSIONS AND RECOMMENDATIONS

Table 6-1 provides a summary of release information on the 12 SWMUs and 3 areas of concern (AC) that were discussed in the previous sections. The SWMUs and ACs have been classified as those requiring no further action, those recommended for preventative measures, and those recommended for further action. Many of the SWMUs/ACs that are recommended for further action will be acted upon under the NIRP program.

6.1 SWMUs AND ACs REQUIRING NO FURTHER ACTION

The following SWMUs and ACs present little or no potential for release to the environment and are therefore not recommended for further action:

SWMU #4 (NIRP Site 7) - Landfill D
SWMU #6 - RCRA Hazardous Waste Storage Area
SWMU #7 - Wastewater Treatment Facility
SWMU #8 - Classified Documents Incinerator
SWMU #10 - Oil/Water Separator
AC #3 (NIRP Site 8) - Solvent Disposal (Building 40) Area

6.2 SWMUs RECOMMENDED FOR PREVENTATIVE MEASURES

While further investigative action was not recommended for the sites discussed below, the following preventative measures should be noted. SWMU #11, the temporary hazardous waste storage area behind the paint shop, employs a sump that drains directly to the sewer system. If a spill occurs in this area, hazardous chemicals could be introduced to the WWTF. Jordan recommends installation of a valve or other type of preventative action to avoid shocking the biological treatment system of the WWTF.

Jordan also recommended installation of curbing around the temporary hazardous waste storage area behind Building 40 (SWMU #12). This curbing would prevent migration of contaminants to Alligator Bayou in the event of a spill. However, the plating shop is scheduled for removal in late 1987 and plating operations will be discontinued at NCSC.

6.3 SWMUs AND ACs RECOMMENDED FOR FURTHER ACTION

SWMUs and ACs recommended for further action were classified in Table 6-1 as having a potential for release, a release expected, or a documented release. A potential for release indicates that although the probability is low, a possibility exists for a release to a specific media. An expected release classification indicates that the probability is high that a release has occurred or will occur. Areas that have been sampled, analyzed and found to contain elevated levels of hazardous constituents (i.e., priority pollutants) are

TABLE 6-1
SUMMARY OF RELEASE INFORMATION
RCRA FACILITY ASSESSMENT
NAVAL COASTAL SYSTEMS CENTER
PANAMA CITY, FLORIDA

SWMU #	NIRP SITE #	DESCRIPTION	GROUNDWATER	SURFACE WATER	AIR	SOIL	SUBSURFACE GAS	RECOMMENDATION
1)	1	LANDFILL A	P	P	NE	P	NE	RFI
2)	2	LANDFILL B	D	NE	NE	D	NE	RFI
3)	6	LANDFILL C	NE	NE	NE	NE	NE	RFI
4)	7	LANDFILL D	NE	NE	NE	NE	NE	RFI
5)	5	PAINT EQUIPMENT CLEANING AREA	P	NE	NE	E	NE	RFI
6)		RCRA HAZ. WASTE STORAGE AREA	NE	NE	NE	NE	NE	NO ACTION
7)		WASTEWATER TREATMENT FACILITY	NE	P	NE	NE	NE	NO ACTION
8)		CLASSIFIED DOCUMENTS INCINERATOR	NE	NE	NE	NE	NE	RFI
9)		CURRENT FIRE TRAINING AREA	E	NE	NE	E	NE	RFI
10)		OIL/WATER SEPARATOR	P	P	NE	P	NE	NO ACTION
11)		TEMPORARY HAZ. WASTE STORAGE (BLDG. 84)	NE	NE	NE	P	NE	PREVENTATIVE MEASURES
12)		TEMPORARY HAZ. WASTE STORAGE (BLDG. 40)	NE	P	NE	NE	NE	*
AREAS OF CONCERN								
1)	3	OLD FIRE TRAINING AREA	D	NE	NE	D	NE	RFI
2)	4	UNDERGROUND OIL CONTAMINATED AREA	D	D	NE	D	NE	RFI
3)	8	SOLVENT DISPOSAL (BLDG. 40)	NE	NE	NE	NE	NE	NO ACTION

NE - NOT EXPECTED
P - POTENTIAL
E - EXPECTED
D - DOCUMENTED

* - PLATING SHOP SCHEDULED FOR DEMOLITION NOVEMBER/DECEMBER 1987

considered to have documented releases. SWMUs recommended for further action are discussed in the following sections.

6.3.1 SWMU #1 (NIRP Site 1) - Landfill A

The Confirmation Study Verification Phase (ESE, 1987) recommended RCRA closure of this unit. Jordan concurs with this recommendation.

6.3.2 SWMU #2 (NIRP Site 2) - Landfill B

Previous studies of this area indicated a soil and groundwater contamination problem. Jordan recommends surface and subsurface soil sampling with monitoring well placement based on the analytical results of the soil samples. Soil gas analysis may be a viable alternative to soil sampling at this SWMU for the placement of monitoring wells.

6.3.3 SWMU #3 (NIRP Site 6) - Landfill C

ESE (1987) recommended closure using the existing monitoring well at this SWMU. Due to the nature of the wastes and the time elapsed since disposal, further release from this SWMU is unlikely. Therefore, Jordan concurs with this recommendation.

6.3.4 SWMU #5 (NIRP Site 5) - Paint Shop Cleaning Area

Due to the nature of waste reportedly disposed of at this SWMU Jordan recommends surface and subsurface soil sampling at this site. Soil gas analysis may be appropriate in this area as an alternative to soil sampling. Installation of additional groundwater monitoring wells may be warranted, based on the analytical results of soil sampling.

6.3.5 SWMU #9 - Current Fire Training Area

According to available field information, sampling has been conducted around this SWMU and results indicate surface contamination by petroleum products. Since contaminated fuels and possibly waste solvents were used in this area, Jordan recommends that soil and groundwater sampling be conducted. This sampling will characterize the nature and extent of the contamination in the fire training area.

6.3.6 Area of Concern #1 (NIRP Site 3) - Old Fire Training Area

Additional data is needed to characterize the migration of contaminants from this SWMU. The Confirmation Study-Verification Phase (ESE, 1987) recommends two additional groundwater monitoring wells and ten soil borings. Based on

the available information, Jordan concurs with this recommendation and recommends the nesting of at least two additional wells, downgradient of well PCY3-3, to determine the vertical and horizontal extent of contamination.

6.3.7 Area of Concern #2 (NIRP Site 4) - Underground Oil Contamination Area

ESE (1987) recommended geophysics to delineate the contamination plume and two additional wells to be nested with the existing contaminated shallow well. In addition, Jordan recommends surface and subsurface soil sampling or soil gas analysis to delineate source areas and locations for the installation of additional wells, if necessary.

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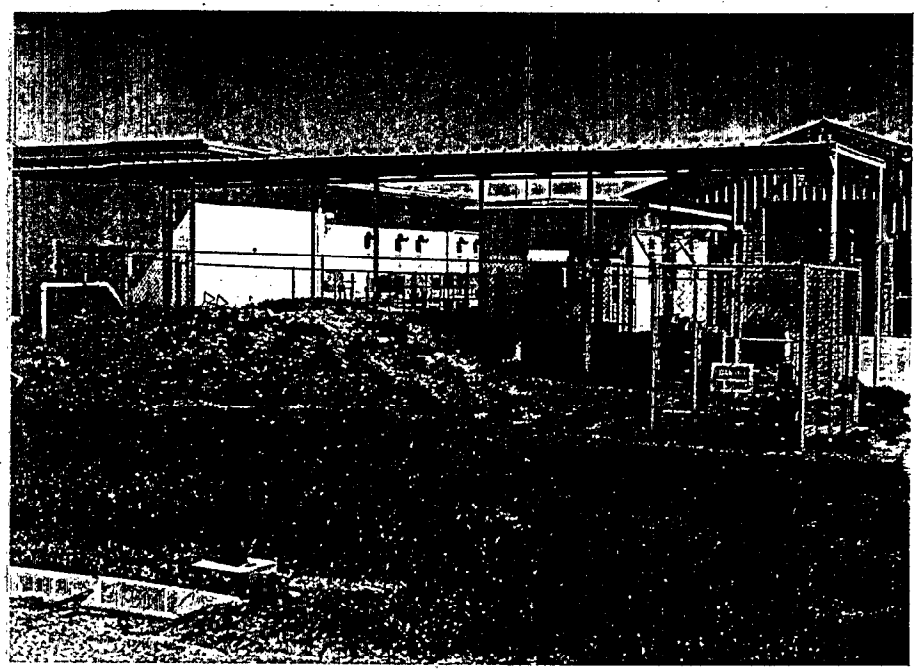
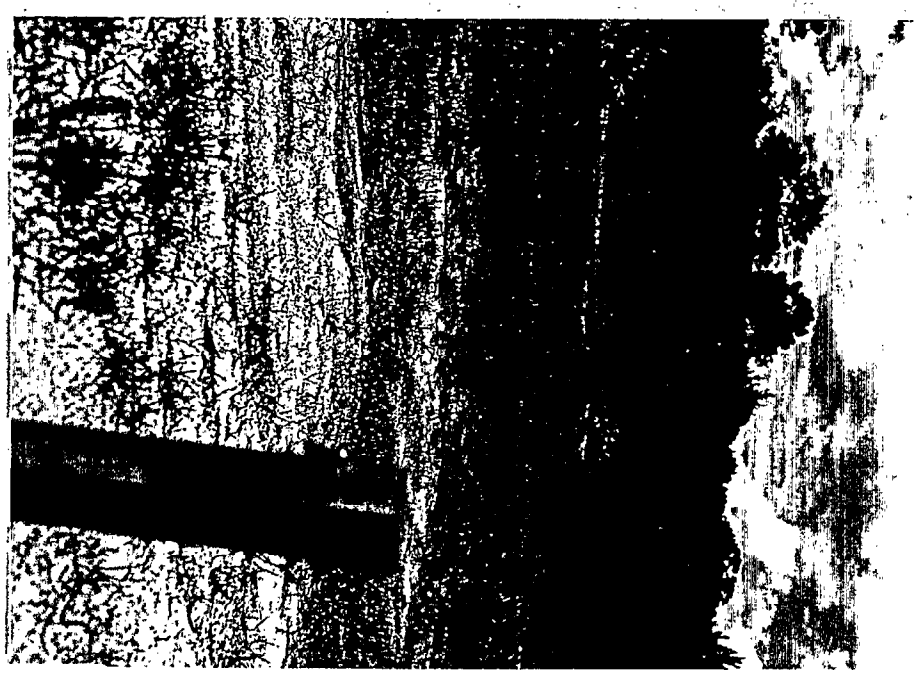
APPENDIX A

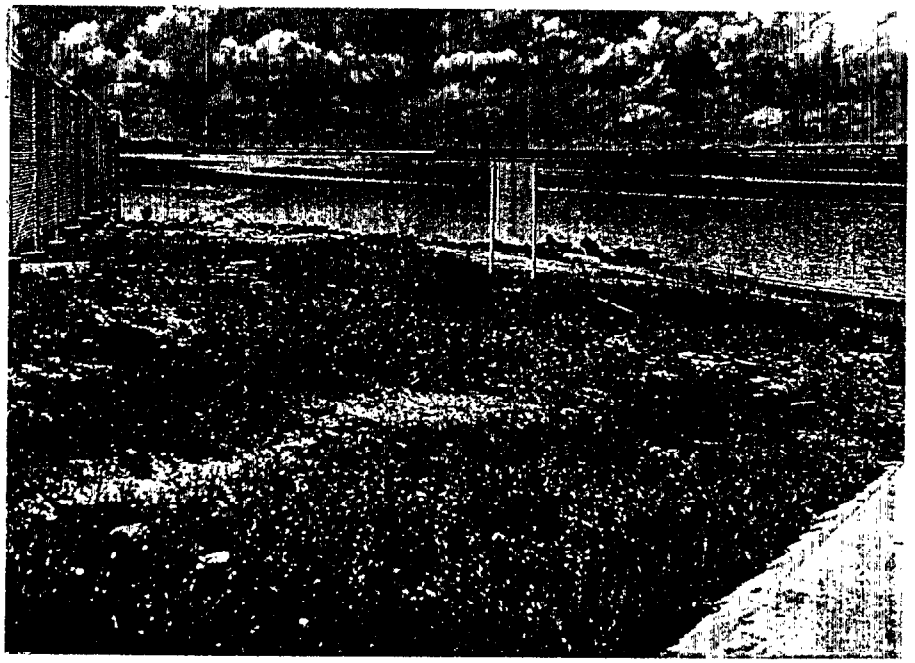
Site Photographs



1. SWMU #1 - Landfill A. Monitor Well PCY1-1 and underground storage tank
3. SWMU #2 - Landfill B. Southern portion, Monitor well PCY2-2.

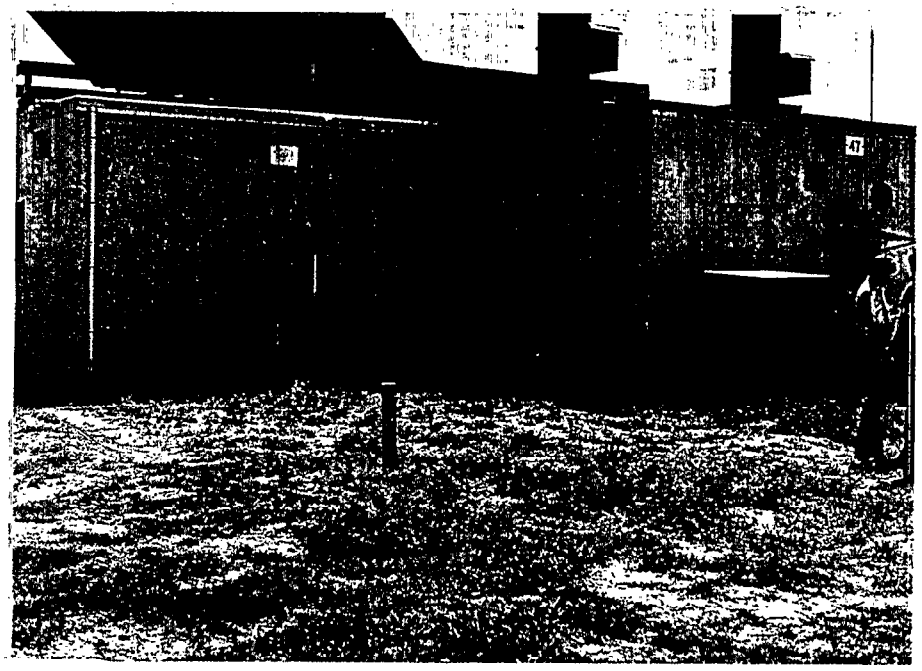
2 SWMU #1 - Landfill A. Spill containment equipment storage.
1. SWMU #2 - Landfill B. Eastern portion.

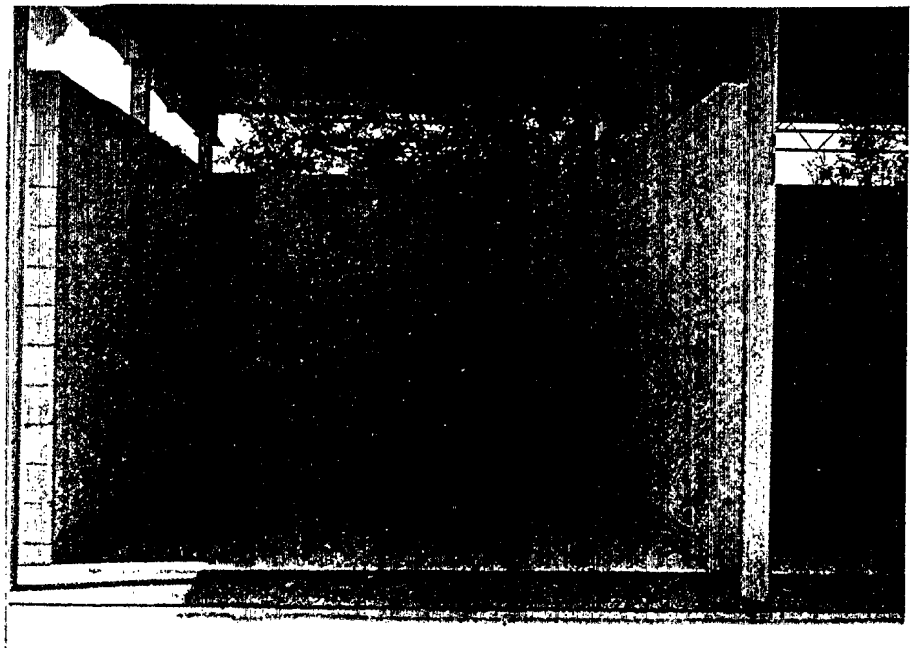


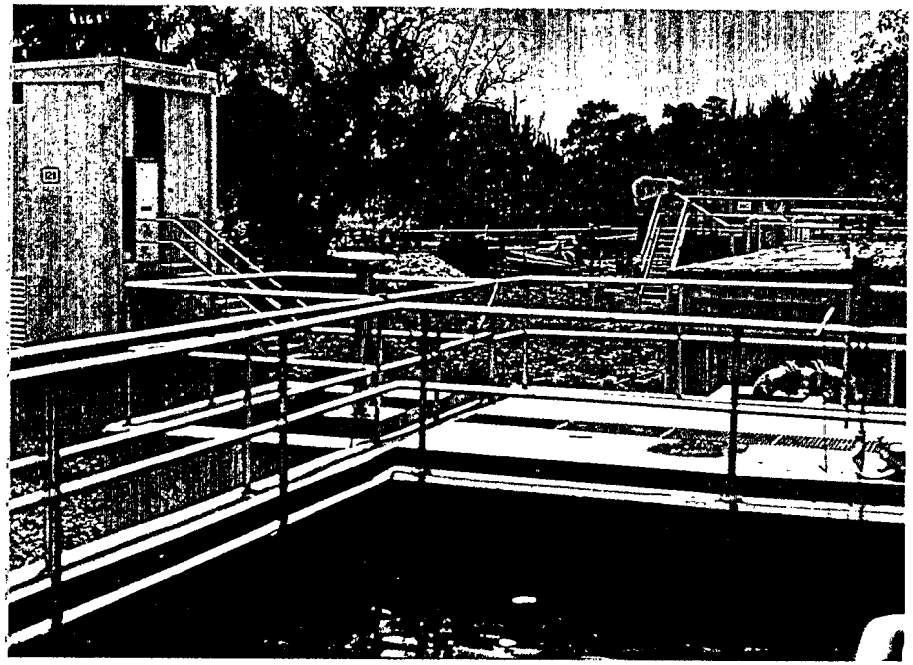


5. SWMU #3 - Landfill C.
7. SWMU #5 - Paint shop cleaning area.

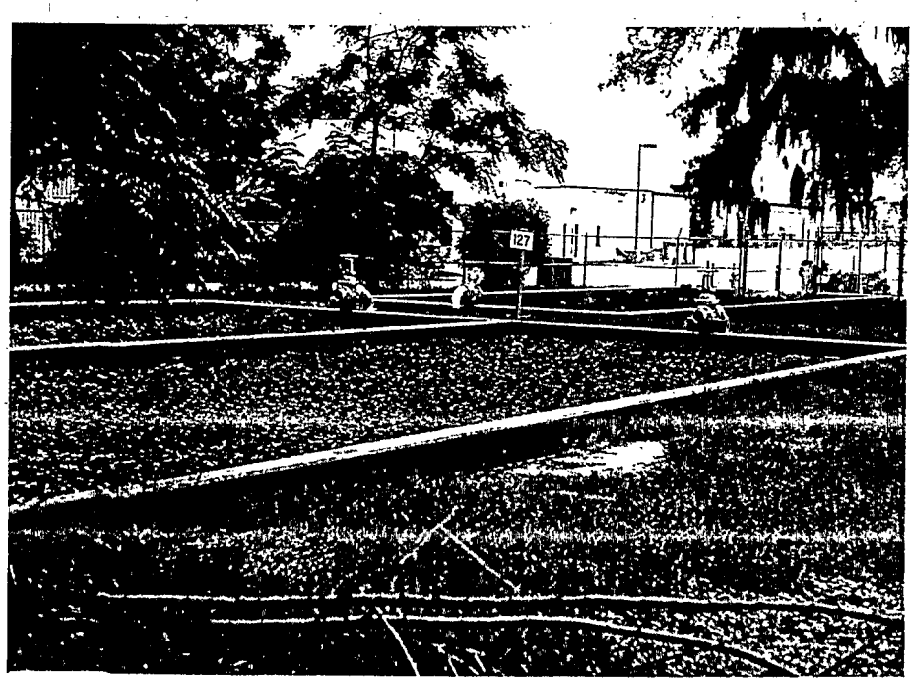
6. SWMU #4 - Landfill D.
8. SWMU #6 - Hazardous Waste Storage Facility.

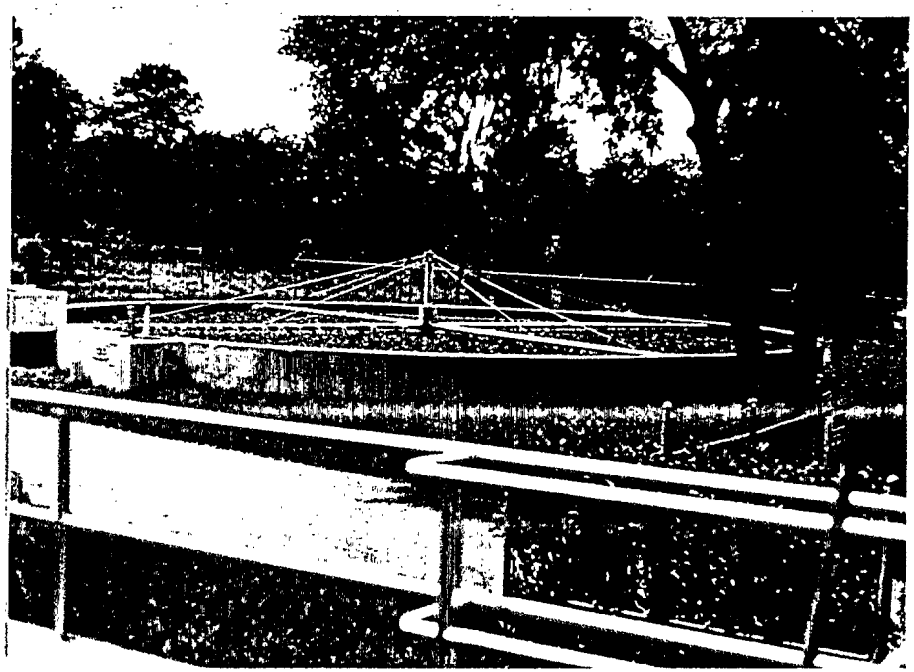


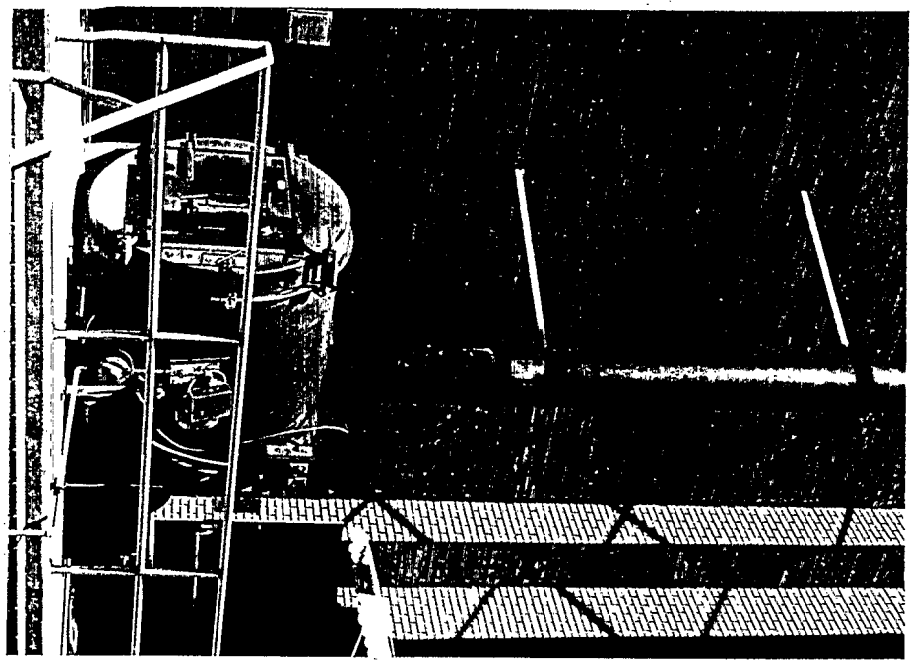




9. SWMU #6 - Hazardous Waste Storage Facility.
10. SWMU #7 - WWTF. Sludge digester(left) and secondary clarifier.
11. SWMU #7 - WWTF. Sludge drying beds.
12. SWMU #7 - WWTF. Trickling filter.

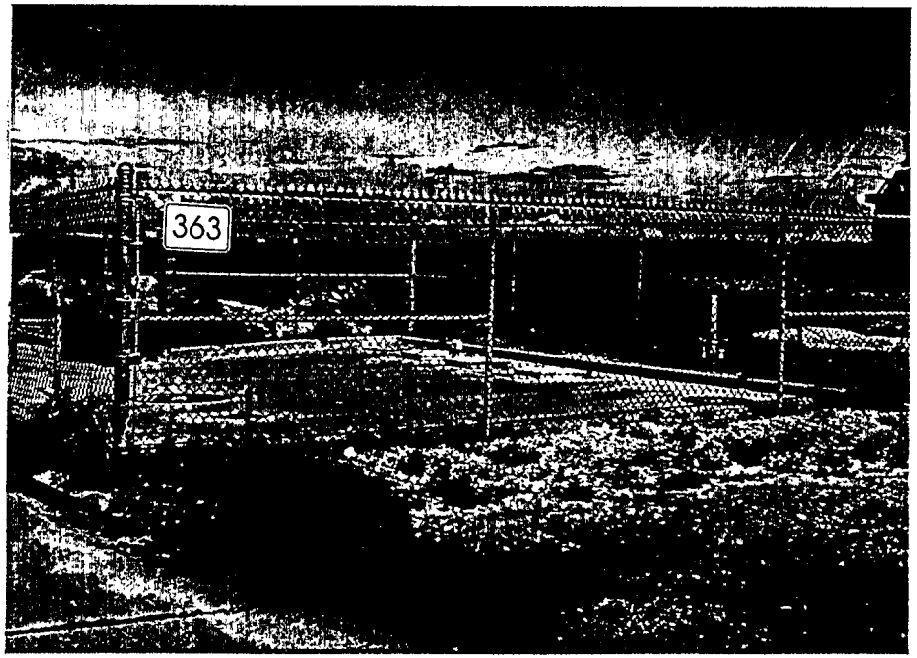


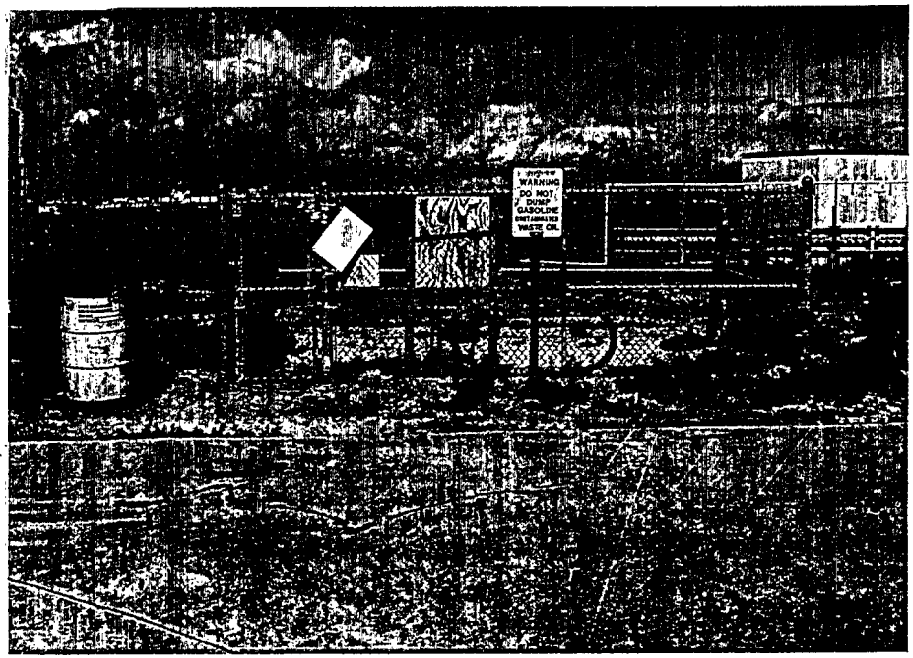


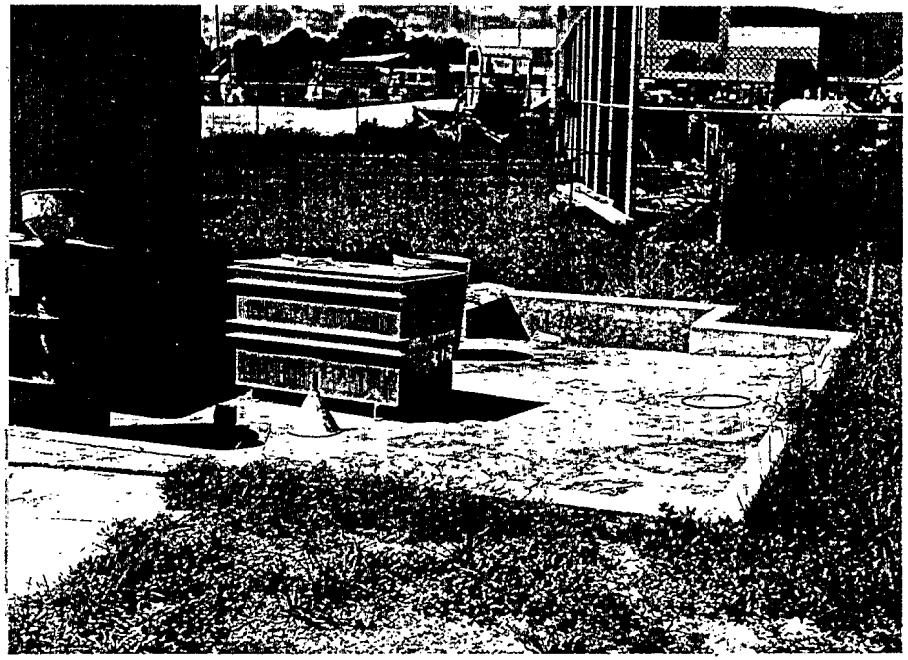


13. SWMU #8 - Classified documents incinerator.
15 SWMU #9 - Current fire training area. Burn pile, Smoke training trailer.

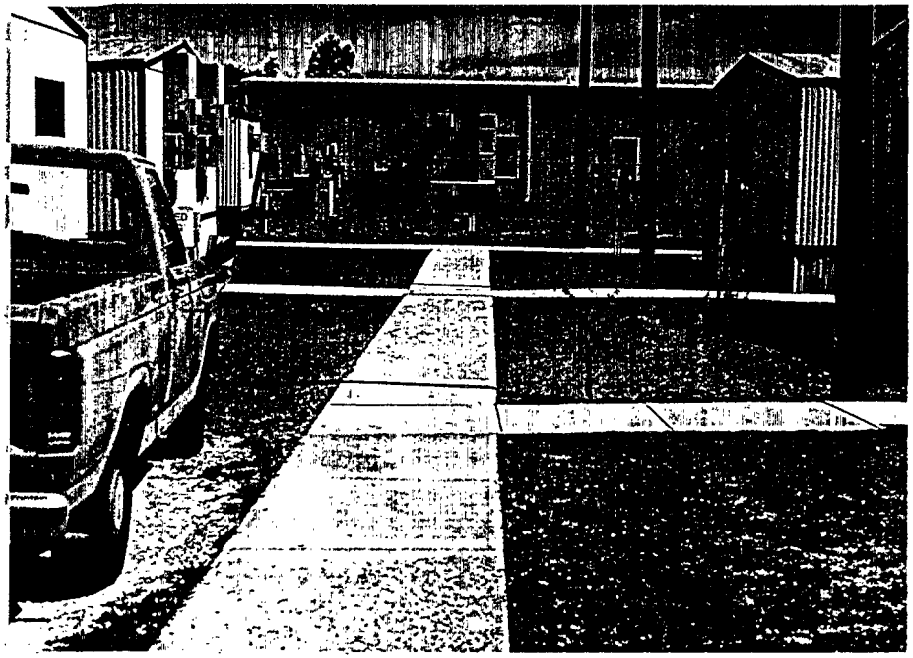
14. SWMU #9 - Current fire training area. 4500 gallon storage tank.
16. SWMU #10 - Oil/Water separator. St. Andrew Bay in background.

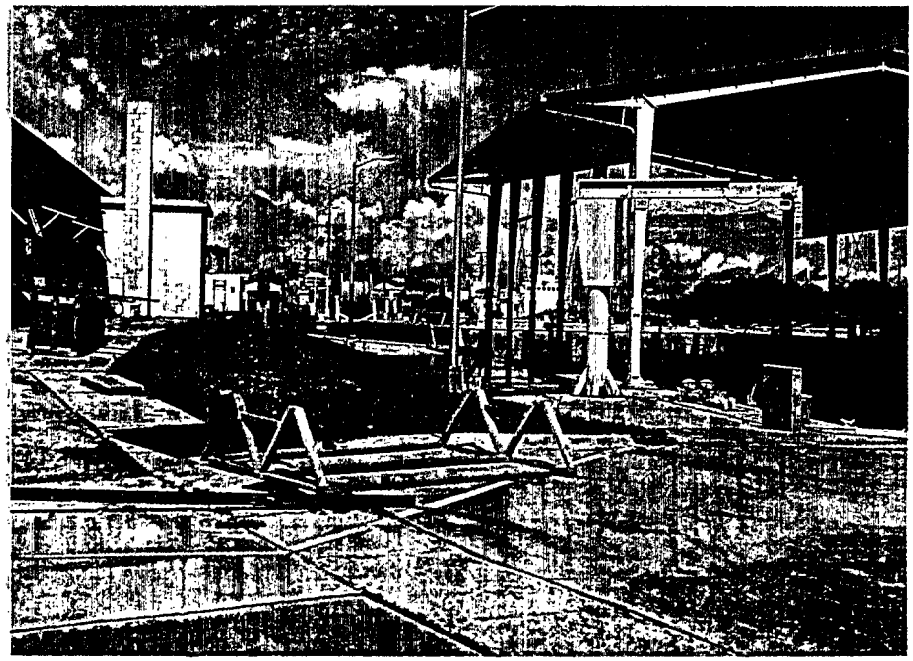






17. SWMU #10 - Oil/Water separator. Underground waste oil storage tank.
18. SWMU #11 - Temparary hazardous waste storage (paint shop).
19. SWMU #12 - Temporary hazardous waste storage (Bldg 40).
20. AC #1 - Old fire training area.





21. AC #2 - Underground oil contamination area.
22. AC #3 - Solvent disposal area. (One time disposal.)
23. Equipment storage area (taken from rear of paint shop, looking to the northeast.
24. South Dock - Old PVC monitor well located three feet to right of red line on concrete.

APPENDIX B

Waste Generation and Disposal

TABLE B-1

ESTIMATED BATTERY SHOP WASTE GENERATION AND DISPOSAL
NCSC PANAMA CITY, FL

YEARS OF GENERATION	WASTE TYPES	ESTIMATED TOTAL QUANTITY	LOCATION OF DISPOSAL	COMMENTS
1984 - Present	Acid from lead/acid batteries	30 gal.	Left in battery and turned in for off-base recycling.	
1979 - 1984	Acid from lead/acid batteries	700 gal.	Stored in carboys and removed by waste hauler.	
1972 - 1978	Acid from lead/acid batteries	1200 gal.	Drain to waste water treatment plant (STP) on Activity.	
1969 - 1971	Acid from lead/acid batteries	700 gal.	Stored in carboys and removed by waste hauler.	
mid 1940s - 1968	Acid from lead/acid batteries	5500 gal.	Poured onto the ground (no specific location could be identified)	
mid 1940s - 1985	Lead/acid batteries	4100 batteries	Turned in for off-base recycling.	
1958 - 1975	Fluid from alkaline/ mercury batteries	700 gal.	Stored in carboys and sent to NAS Pensacola.	
1976 - 1981	Fluid from alkaline/ mercury batteries	250 gal.	Stored in carboys and removed by private waste hauler.	
1958 - 1981	Alkaline/mercury batteries	900 batteries	Turned in for off-base recycling.	Batteries from off-shore platform.

TABLE B-1 (Continued)

ESTIMATED BATTERY SHOP WASTE GENERATION AND DISPOSAL

YEARS OF GENERATION	WASTE TYPES	ESTIMATED TOTAL QUANTITY	LOCATION OF DISPOSAL	COMMENTS
1960 - 1985	Water soluable machine coolant, water and cutting oil.	5500 gal.	Stored in drums and removed by a waste hauler.	
1945 - Present	Water soluable machine coolant, water and cutting oil.	2200 gal.	Nearest convenient outdoor drain.	Possibly washed out to Alligator Bayou with storm water.
1945 - Present	Empty spray cans and rags contaminated with: trichloroethane, petroleum distillates and isopropanol	Unknown	Disposed of with general solid waste.	Possibly disposed of at Sites 1, 2, and 6 before 1968, Since 1968 the activity's hauled off-base by a private contractor

(SOURCE: C.C. JOHNSON AND ASSOCITES, INC., 1985)

TABLE B-2
ESTIMATED PAINT SHOP WASTE GENERATION AND DISPOSAL
NCSC PANAMA CITY, FL

YEARS OF GENERATION	WASTE TYPES	ESTIMATED TOTAL QUANTITY	LOCATION OF DISPOSAL
1979 - 1985	Mineral spirits	1150 gal.	Stored in drums and removed by waste hauler.
Before 1950 - 1978	Mineral spirits	4600 gal.	Poured onto sandy soil behind shop (Site 5).
1979 - 1985	Paint	2300 gal.	Stored in drums and removed by waste hauler.
Before 1950 - 1978	Paint	9250 gal.	Poured onto sandy soil behind shop (Site 5).
1979 - 1985	Methyl ethyl ketone	750 gal.	Stored in drums and removed by waste hauler.
Before 1950 - 1978	Methyl ethyl ketone	3100 gal.	Poured onto sandy soil behind shop (Site 5).
1979 - 1985	Paint thinner	1150 gal.	Stored in drums and removed by waste hauler.
Before 1950 - 1978	Paint thinner	4600 gal.	Poured onto sandy soil behind shop (Site 5).
1979 - 1985	Acetone	1150 gal.	Stored in drums and removed by waste hauler.
Before 1950 -1978	Acetone	4600 gal.	Poured onto sandy soil behind shop (Site 5).

(SOURCE: C.C. JOHNSON AND ASSOCIATES, INC., 1985)

TABLE B-3

ESTIMATED METAL PLATING SHOP WASTE GENERATION AND DISPOSAL
NCSC PANAMA CITY, FL

YEARS OF GENERATION	WASTE TYPES	ESTIMATED TOTAL QUANTITY	LOCATION OF DISPOSAL	COMMENTS
1970 - 1985	Black dye	80 gal.	Drain to wastewater treatment plant (STP) on activity.	Tank was drained once before 1976.
1970 - 1985	Red dye	20 gal.	Drain to wastewater treatment plant (STP) on activity	Tank was drained once before 1976.
1970 - 1985	Surface Prep Solution (Phosphoric Acid)	10 gal.	Drain to wastewater treatment plant (STP) on activity.	Tank was drained once before 1976.
1976 - 1985	Hydrochloric acid	450 gal.	Off-site disposal by waste hauling contractor.	
1970 - 1976	Hydrochloric acid	200 gal.	Drain to wastewater treatment plant on activity.	
1976 - 1985	Sulfuric acid	450 gal.	Off-site disposal by waste hauling contactor.	
1970 1975	Sulfuric acid	200 gal.	Drain to wastewater treatment plant (STP) on activity.	
1976 - 1985	Nitric acid	450 gal.	Off-site disposal by waste hauling contactor.	
1970 - 1975	Nitric acid	200 gal.	Drain to wastewater treatment plant (STP) on activity.	
1976 - 1985	Actane	100 gal.	Off-site disposal by waste hauling contractor.	
1974 - 1975	Actane	5 gal.	Drain to wastewater treatment plant (STP) on activity.	
1976 - 1985	Fluoboric acid	100 gal.	Off-site disposal by waste hauling contactor.	
1974- 1975	Fluoboric acid	5 gal.	Drain to wastewater treatment plant (STP) on activity.	

TABLE B-3 (Continued)

ESTIMATED METAL PLATING SHOP WASTE GENERATION AND DISPOSAL
NCSC PANAMA CITY, FL

YEARS OF GENERATION	WASTE TYPES	ESTIMATED TOTAL QUANTITY	LOCATION OF DISPOSAL	COMMENTS
1982 - 1985	Electro-less nickel solution	100 gal.	Stored in drums near plating shop.	Shop and Public Works personnel are currently developing an appropriate disposal plan.
1976 - 1985	Sodium persulfate acid	1850 gal.	Off-site disposal by waste hauling contractor.	
1974 - 1975	Sodium persulfate acid	200 gal.	Drain to waste water treatment plant on activity.	
1976 - 1985	Alkaline stripper	200 gal.	Off-site disposal by waste hauling contractor.	
1970 - 1975	Alkaline stripper	80 gal.	Drain to waste water treatment plant on activity.	
1970 - 1975	Kodak KPR developer	4 gal.	Drain to waste water treatment plant on activity.	
1970 - 1979	Various chemicals including chromic acid and cyanide	500 to 1000 gal.	Off-site disposal by waste hauling contractor.	Shop operator accummulated chemicals he thought were too hazardous for drain disposal. Chemicals were stored in a large tank and removed one time in about 1980.
1970 - 1974	Trichloroethylene	55 gal.	Poured on ground behind Building 70.	No evidence of disposal remains. Area has since been paved. Shops operator believes much of this may have evaporated shortly after application to the ground.

(SOURCE: C.C. JOHNSON AND ASSOCIATES, INC., 1985)

TABLE B-4
ESTIMATED ELECTRICAL SHOP WASTE GENERATION AND DISPOSAL
NCSC PANAMA CITY, FL

YEARS OF GENERATION	WASTE TYPES	ESTIMATED TOTAL QUANTITY	LOCATION OF DISPOSAL
1969 - 1985	Methyl ethyl ketone	500 gal.	Removed off activity by contract waste hauler.
Before 1950 - 1968	Methyl ethyl ketone	550 gal.	Small quantities were poured on the ground at various locations. Most was burned for firefighting training at Site 2.
1951 - 1968	Transformer oil possibly containing polychlorinated byphenols	Unknown	Site 2.

(SOURCE: C.C. JOHNSON AND ASSOCIATES, INC., 1985)

TABLE B-5
ESTIMATED PLASTIC SHOP WASTE GENERATION AND DISPOSAL
NCSC PANAMA CITY, FL

YEARS OF GENERATION	WASTE TYPES	ESTIMATED TOTAL QUANTITY	LOCATION OF DISPOSAL	COMMENTS
1979 - 1985	Methyl ethyl ketone, alcohol and acetone	400 gal.	Off-site disposal by waste hauling contractor.	
1957 - 1978	Methyl ethyl ketone, alcohol and acetone	1200 gal.	Directly onto ground or down indoor or outdoor drains.	No specific disposal location identified. Disposal was at any convenient area.
1957 - 1967	Styrene and acetone	3000 gal.	Directly onto ground or down indoor or outdoor drains. A portion of this waste may have been placed in Site 2.	No specific disposal location identified. Disposal was at any convenient area.

(SOURCE: C.C. JOHNSON AND ASSOCIATES, INC., 1985)

TABLE B-6
ESTIMATED PHOTO SHOP WASTE GENERATION AND DISPOSAL
NCSC PANAMA CITY, FL

YEARS OF GENERATION	WASTE TYPE	ESTIMATED TOTAL QUANTITY	LOCATION OF DISPOSAL
1955 - 1978	Black & White developer	1800 gal.	Drain to Alligator Bayou.
1955 - 1978	Black & White fixer	2100 gal.	Drain to Alligator Bayou.
1979 - 1985	Black & White developer	500 gal.	Drain to waste water treatment plant on activity.
1979 - 1985	Black & White fixer	500 gal.	Turned in for off-base reclamation.
1955 - 1978	Color developer	800 gal.	Drain to Alligator Bayou.
1979 - 1985	Color developer	200 gal.	Drain to waste water treatment plant on activity.
1955 - 1978	Color bleach	550 gal.	Drain to Alligator Bayou.
1979 - 1985	Color bleach	140 gal.	Drain to waste water treatment plant on activity.
1955 - 1978	Color stabilizer	550 gal.	Drain to Alligator Bayou.
1979 - 1985	Color stabilizer	140 gal.	Drain to waste water treatment plant on Activity.
1955 - 1978	Color reversal bath	280 gal.	Drain to Alligator Bayou.
1979 - 1985	Color reversal bath	70 gal.	Drain to waste water treatment plant on Activity.

TABLE B-6 (Continued)
ESTIMATED PHOTO SHOP WASTE GENERATION AND DISPOSAL
NCSC PANAMA CITY, FL

YEARS OF GENERATION	WASTE TYPE	ESTIMATED TOTAL QUANTITY	LOCATION OF DISPOSAL
1955 - 1978	Color conditioner	280 gal.	Down drain to Alligator Bayou.
1979 - 1985	Color conditioner	70 gal.	Down drain to waste water treatment plant on Activity.
1955 - 1978	Color fixer	550 gal.	Down drain to Alligator Bayou.
1979 - 1985	Color fixer	140 gal.	Turned in for off-base reclamation.

(SOURCE: C.C. JOHNSON AND ASSOCIATES, INC., 1985)

TABLE B-7
ESTIMATED MOTOR VEHICLE MAINTENANCE SHOP WASTE GENERATION AND DISPOSAL
NCSC PANAMA CITY, FL

YEARS OF GENERATION	WASTE TYPES	ESTIMATED TOTAL QUANTITY	LOCATION OF DISPOSAL	COMMENTS
1969 - 1985	Waste oil	10,200 gal.	Off-site disposal by waste hauling contractor.	
1945 - 1968	Waste oil	14,500 gal.	Waste oil was spread on dirt road or spilled and burned at site 2.	
1969 - 1985	Perchloroethylene	700 gal.	Off-site disposal by waste hauling contractor.	Waste solvent from the shop was combined and disposed with waste oil.
1945 - 1968	Perchloroethylene	950 gal.	Perchloroethylene was spread on dirt roads or spilled and burned at Site 2.	Waste solvent from the shop was combined and disposed with waste oil.

(SOURCE: C.C. JOHNSON AND ASSOCIATES, INC., 1985)

TABLE B-8
TYPES OF PESTICIDES USED TYPICALLY AT
NCSC PANAMA CITY PRIOR TO 1976

Pesticide	Use	Average Quantities On Hand (1966-82)
Anticoagulant	Roaches	27 lbs.
Chlordane	Mosquitoes, termites	15 gal.
Diazinon	Termites, cochroaches, ants, fleas	4 gal.
Dursban	Ants	1200 lbs.
Heptachlor	Wasps, bees, hornets	4800 lbs.
Malthion	Mosquitoes	160 gal.
Pyrethrum	Roaches	16 gal.
Dibrom and Ortho Additive		15 gal.
DDT	Mosquitoes, filter flies	2550 lbs. (1966)
PMP Anticoagulant	Rats	3 lbs.
Karmex	Weeds and grass	23 lbs.
Cygon ZE	Tea scale	4 gal.
Cygon	Leaf miners	4 gal.
2,4-D	Dollar weeds	5 gal.
Amitrole 90+ Dowpon	Torpedo grass	1 lb.
Pyrethrum	Spiders	20 lbs.
Butoxide	Spiders	1 bomb
Dimethoate	Leaf Spot Scale	5 gal.
Ficam	Roaches, ants	24 gal.
Diuron	Vegetation	40 lbs.
Dalapon	Grassy weeds	330 lbs.
Diaquat	Grassy weeds	5 gal.
Mirex		75 lbs.
Dieldren	Insecticide	75 lbs.

(SOURCE: C.C. JOHNSON AND ASSOCIATES, INC., 1985)

TABLE B-9

ESTIMATED POWER HOUSE WASTE GENERATION AND DISPOSAL
NCSC PANAMA CITY, FL

YEARS OF GENERATION	WASTE TYPES	ESTIMATED TOTAL QUANTITY	LOCATION OF DISPOSAL	COMMENTS
1945 - 1985	Nickel/cadmium batteries	40	Turned in for off-base recycling.	
1945 - 1985	Nickel/cadmium battery acid	80 gal.	Poured into carboys and removed from NCSC by waste hauler.	
1969 - 1985	Waste oil	250 gal.	Off-site disposal by waste hauling contractor	
1945 - 1968	Waste oil	350 gal.	Waste oil was spread on dirt roads and spilled and burned at Site 2.	

(SOURCE: C.C. JOHNSON AND ASSOCIATES, INC., 1985)

TABLE B-10
ESTIMATED PIER OPERATIONS WASTE GENERATION AND DISPOSAL
NCSC PANAMA CITY, FL

YEARS OF GENERATION	WASTE TYPES	ESTIMATED TOTAL QUANTITY	LOCATION OF DISPOSAL	COMMENTS
1969 - 1985	Bilge water*	270,000 gal.	Removed off-site by private waste hauler.	
1957 - 1968	Bilge water	750,000 gal.	Burned or dumped at Site 2.	
1954 - 1956	Bilge water	75,000 gal.	Burned or dumped at Site 3.	Some bilge water was disposed of at sea during this period.
1945 - 1953	Bilge water	55,000 gal.	Burned or dumped at Site 1.	Some bilge water was disposed of at sea during this period.
1969 - 1985	Waste oil	36,000 gal.	Removed off-site by private waste hauler.	
1957 - 1968	Waste oil	24,000 gal.	Burned or dumped at Site 2.	
1954 - 1956	Waste oil	6,000 gal.	Burned or dumped at Site 3.	
1945 - 1953	Waste oil	18,000 gal.	Burned or dumped at Site 1.	

*Bilge water consists of stagnant sea water, wash water, waste oil and grease, and other unknown ship generated wastes.

(SOURCE: C.C. JOHNSON AND ASSOCIATES, INC., 1985)

TABLE B-11
ESTIMATED NDSTC WASTE GENERATION AND DISPOSAL
NCSC PANAMA CITY, FL

YEARS OF GENERATION	WASTE TYPES	ESTIMATED TOTAL QUANTITY	LOCATION OF DISPOSAL	COMMENTS
1979 - 1985	Oily waste	15,500 gal.	Removed off-site by private waste hauler.	
1979 - 1985	Waste oil	8,400 gal.	Removed off-site by private waste hauler.	

(SOURCE: C.C. JOHNSON AND ASSOCIATES, INC., 1985)

TABLE B-12
ESTIMATED NEDU WASTE GENERATION AND DISPOSAL
NCSC PANAMA CITY, FL

YEARS OF GENERATION	WASTE TYPES	ESTIMATED TOTAL QUANTITY	LOCATION OF DISPOSAL
1975 - 1985	Cee Bee 101 (Phosphoric acid) mixed with water	1,000 gal.	Poured onto concrete near clean van. Drained to Alligator Bayou.
1975 - 1985	Trisodium Phosphate	12,000 lbs.	Poured onto concrete near clean van. Drained to Alligator Bayou.
1975 - 1985	Nethyl ethyl ketone	500 gal.	Off-station disposal by waste hauling contractor.
1975 - 1985	Formula 999 (Butoxyethanol)	1,100 gal.	Off-station disposal by waste hauling contractor.

(SOURCE: C.C. JOHNSON AND ASSOCIATES, INC., 1985)

TABLE B-13
ESTIMATED HOSPITAL WASTE GENERATION AND DISPOSAL
NCSC PANAMA CITY, FL

YEARS OF GENERATION	WASTE TYPES	ESTIMATED TOTAL QUANTITY	LOCATION OF DISPOSAL	COMMENTS
1958 - Present	Blood samples, culture plates	67,000 gal.	Burned in trash can behind building No. 148	
1958 - Present	X-ray developing solution	6,700 gal.	NAS Pensacola for silver reclamation	From hospital and dental clinic combined.

(SOURCE: C.C. JOHNSON AND ASSOCIATES, INC., 1985)

TABLE B-14
ESTIMATED DENTAL CLINIC WASTE GENERATION AND DISPOSAL
NCSC PANAMA CITY, FL.

YEARS OF GENERATION	WASTE TYPES	ESTIMATED TOTAL QUANTITY	LOCATION OF DISPOSAL	COMMENTS
1980 - 1985	Amalgam solution (Contains mercury)	6 lbs.	NAS Pensacola	Collected in plastic bottle at clinic.
1980 - 1985	X-ray developing solution	Combined with hospital x-ray developing solution	NAS Pensacola for silver reclamation	Combined with hospital waste (see Table 5-14)

(SOURCE: C.C. JOHNSON AND ASSOCIATES, INC., 1985)

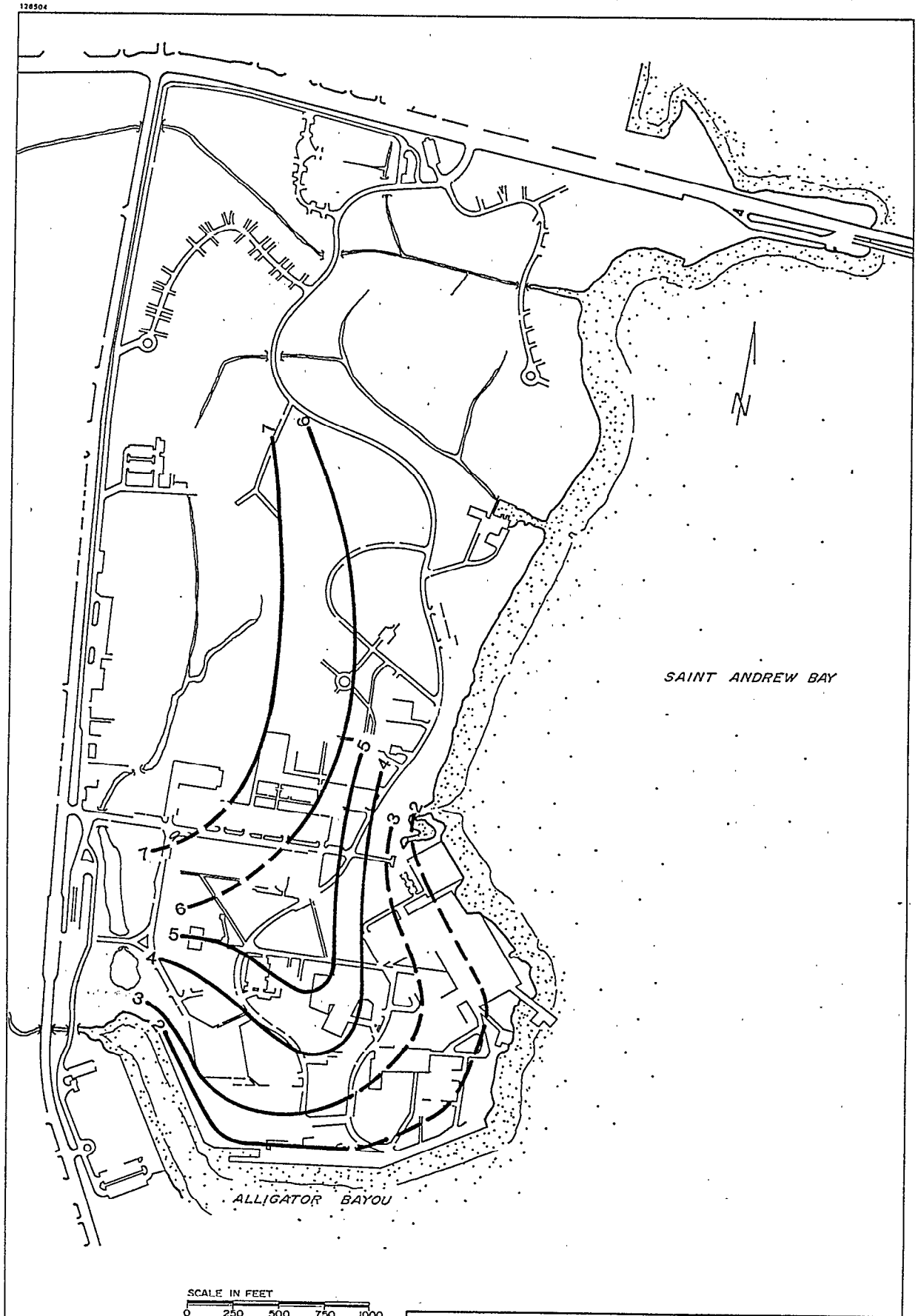
APPENDIX C

Water Level Table and Contour Maps

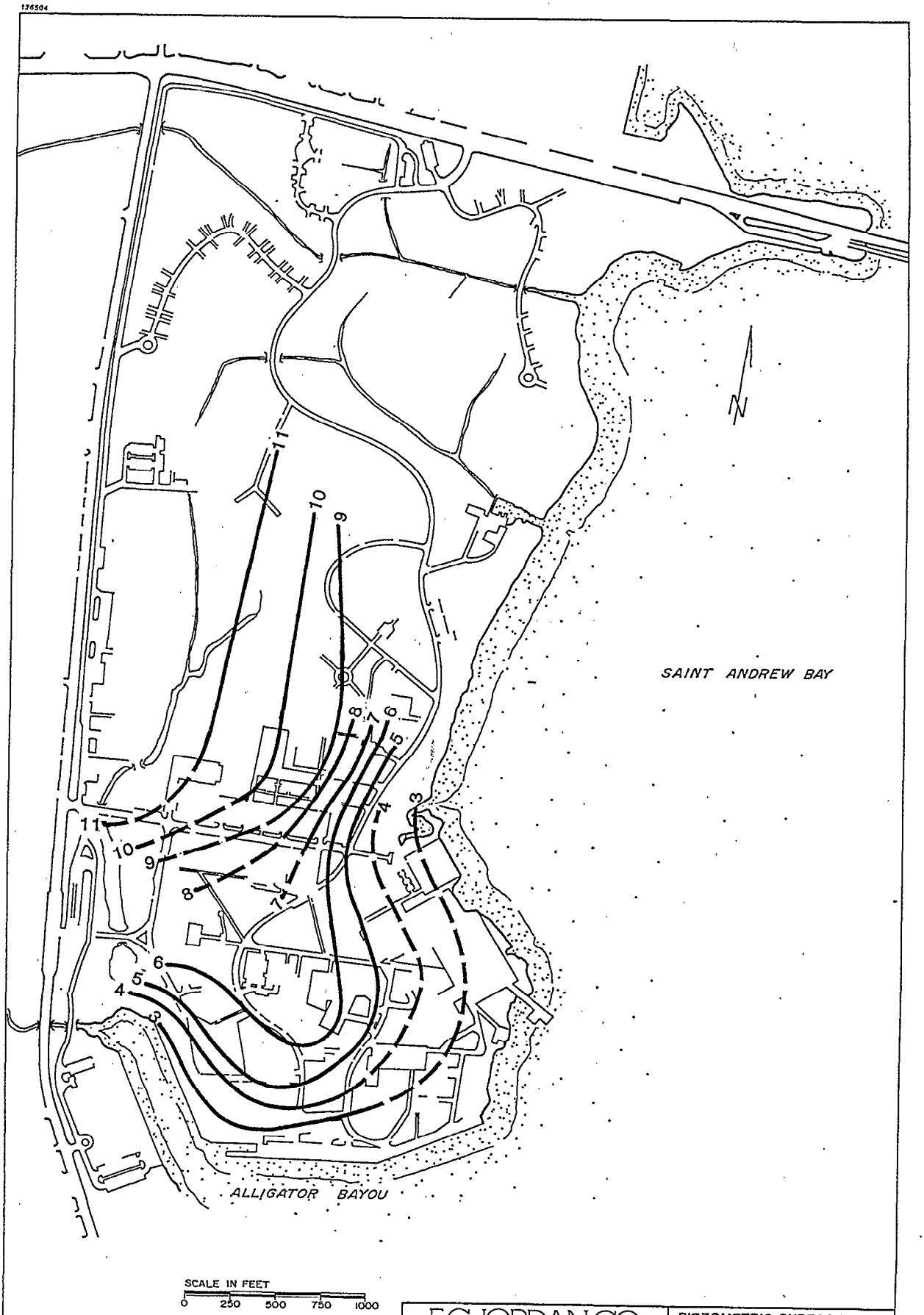
TABLE C-1
GROUNDWATER LEVEL DATA
RCRA FACILITY ASSESSMENT
NAVAL COASTAL SYSTEMS CENTER
PANAMA CITY, FLORIDA

RCRA SITE DESIGNATION	WELL NUMBER	DATE MEASURED	WATER TABLE ELEVATION (FT)	DEPTH TO WATER (FT BLS)	DATE MEASURED	WATER TABLE ELEVATION (FT)	DEPTH TO WATER (FT BLS)
SWMU # 1							
	PCY-1-1	31 OCT 1986	3.01	5.64	19 AUG 1987	3.91	5.93
	PCY-1-2	31 OCT 1986	2.21	5.35	19 AUG 1987	3.15	5.58
	PCY-1-3	31 OCT 1986	3.09	8.15	19 AUG 1987	4.10	8.15
SWMU # 2							
	PCY-2-1	30 OCT 1986	11.94	3.35	19 AUG 1987	13.84	2.76
	PCY-2-2	30 OCT 1986	10.07	4.91	---	---	---
	PCY-2-3	30 OCT 1986	6.15	9.23	19 AUG 1987	8.97	7.33
	PCY-2-4	30 OCT 1986	7.03	6.42	19 AUG 1987	10.96	3.66
SWMU #3							
	PCY-6-1	30 OCT 1986	2.66	4.30	19 AUG 1987	3.57	4.55
	PCY-6-2	30 OCT 1986	1.21	2.65	19 AUG 1987	1.14	4.82
SWMU #5							
	PCY-5-1	31 OCT 1986	4.17	7.93	19 AUG 1987	6.84	6.31
	PCY-5-2	31 OCT 1986	4.31	6.80	19 AUG 1987	6.62	5.71
AC #1							
	PCY-13-1	30 OCT 1986	7.11	8.11	19 AUG 1987	10.46	5.82
	PCY-13-2	30 OCT 1986	6.51	6.14	19 AUG 1987	9.42	4.24
	PCY-13-3	30 OCT 1986	6.30	7.81	19 AUG 1987	9.72	5.33
AC # 2							
	PCY-14-1	31 OCT 1986	4.21	8.63	19 AUG 1987	6.71	7.40
	PCY-14-2	31 OCT 1986	3.48	6.01	19 AUG 1987	5.67	4.92
	PCY-14-3	31 OCT 1986	3.61	7.08	19 AUG 1987	5.12	6.72
	PCY-14-4	31 OCT 1986	3.54	6.81	19 AUG 1987	5.21	6.79
	PCY-14-5	31 OCT 1986	1.73	4.93	19 AUG 1987	2.70	4.90
AC # 3							
	PCY-8-1	31 OCT 1986	2.40	6.80	19 AUG 1987	2.77	7.78

128504



E.C.JORDAN CO. ENGINEERS & SCIENTISTS	PIEZOMETRIC SURFACE MAP UNCONFINED AQUIFER 30,31 OCTOBER, 1986	
U.S. DEPT. OF NAVY NAVAL COASTAL SYSTEMS CENTER PANAMA CITY, FLORIDA		FIGURE C-1



E.C.JORDAN CO. ENGINEERS & SCIENTISTS	PIEZOMETRIC SURFACE MAP *UNCONFINED AQUIFER* 19 AUGUST, 1987	
U.S. DEPT. OF NAVY NAVAL COASTAL SYSTEMS CENTER PANAMA CITY, FLORIDA		FIGURE C-2