INSTALLATION RESTORATION PROGRAM

PHASE I – RECORDS SEARCH

ROBINS AFB, GEORGIA

PREPARED FOR

UNITED STATES AIR FORCE
AFESC/DEV
Tyndall AFB, Florida

APRIL, 1982

ES ENGINEERING-SCIENCE

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By

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9654

April 13, 1982

Mr. Bernard Lindenberg
AFESC/DEVP
Tyndall AFB, Florida 32403

Dear Mr. Lindenberg:

Enclosed is the Engineering-Science, Inc. (ES) final report entitled "Installation Restoration Program, Phase I ~~- Records Search~~, Robins AFB, Georgia." This report has been prepared in accordance with the ES proposal dated July 15, 1981 and Air Force Contract Number F08637-80-G-0009 Call #0009.

Presented in this report are introductory background information on the Installation Restoration Program, a description of the Robins AFB installation including past activities, mission and environmental setting, a review of industrial activities at Robins AFB, an inventory of major solid and hazardous waste from past activities, a review of past and present waste handling, treatment and disposal facilities, an evaluation of the pollution potential of waste disposal sites, and recommendations for the Installation Restoration Program, Phase II, Problem Confirmation and Quantification.

Any questions concerning this report should be directed to the Office of Public Affairs, Robins Air Force Base, 912/926-5202.

We appreciate the opportunity to work with you and the other Air Force personnel who contributed information to us for the completion of this assessment.

Very truly yours,

ENGINEERING-SCIENCE, INC.

E J Schroeder

E. J. Schroeder, P.E.
Manager, Solid & Hazardous Waste

EJS/lmr

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EXECUTIVE SUMMARY

EXECUTIVE SUMMARY

The Department of Defense (DOD) has developed a program to identify and evaluate past hazardous material disposal sites on DOD property, to control the migration of hazardous contaminants, and to control hazards to health or welfare that may result from these past disposal operations. This program is called the Installation Restoration Program (IRP). The IRP has four phases consisting of Phase I, Initial Assessment/Records Search, Phase II, Problem Confirmation, Phase III, Technology Base Development, and Phase IV, Operations. Engineering-Science (ES) was retained by the Air Force Engineering and Services Center to conduct the Phase I, Initial Assessment/Records Search at Robins AFB under Contract No. F08637-80-G009, Call No. 0009, using funding provided by the Air Force Logistics Command.

INSTALLATION DESCRIPTION

Robins AFB is located in middle Georgia approximately 90 miles southeast of Atlanta and 18 miles south of Macon. The base was activated in 1942 and presently comprises 8,855 acres. The primary mission of the base is serving as the parts and equipment logistics manager for a variety of aircraft. This mission has not changed significantly since the mid 1940's.

ENVIRONMENTAL SETTING

The environmental setting data reviewed for this study indicate the following key items concerning the impact of past waste disposal practices on the base:

- Alluvial deposits cover the upper 20 to 40 feet of the base. The eastern part of the base is swampy with peat deposits covering the upper 10 to 15 feet and underlain by a thin layer of clay. The western part of the site consists of more sandy alluvial deposits which extend eastward below the swamp deposits.

- The water table beneath the site is shallow, particularly to the east where a surface discharge contributes toward the creation of a swampy area. In the western part of the base, the surface soils are sandy and infiltration of precipitation is expected to be high. This infiltration would directly recharge the shallow aquifer.
- The primary regional aquifer, the Cretaceous aquifer, underlies Robins AFB at a depth of about 40 to 50 feet and extends to a depth of approximately 650 feet below the surface. It consists of sand with a few clay lenses interspersed throughout its thickness.
- Robins AFB obtains its water supply from twelve wells distributed over the installation. The City of Warner Robins has a separate system consisting of 11 wells, located throughout the city. All wells are drilled into the Tuscaloosa Formation of the Cretaceous aquifer.
- Recharge for the Cretaceous aquifer occurs west of Robins AFB where the Providence sand outcrops at the surface. Some recharge may also occur beneath the base as some interconnection between alluvial and underlying deposits may occur.
- Area precipitation rates (44.1 inches per year) are higher than potential evapotranspiration rates (42 inches per year).
- Approximately 1200 acres of wetlands in the form of an unimproved river swamp system are located on the east side of the base. The wetlands are known to harbor two species of animals listed by the Federal government as threatened or endangered; American alligator and the red-cockaded woodpecker.

METHODOLOGY

During the course of this project, interviews were conducted with base personnel (past and present) familiar with past waste disposal practices, file searches were performed for facilities which have generated, handled, transported, and disposed of waste materials, interviews were held with local, state and federal agencies, and site inspections were conducted at facilities that have generated, treated, stored, and disposed of hazardous waste. Thirteen disposal sites located on the Robins AFB property were identified as containing hazardous waste resulting from past waste disposal activities, (Figure 1). These sites have been assessed using a hazardous assessment rating methodology (HARM) which takes into account factors such as site characteristics, waste characteristics, potential for contaminant migration and waste management practices. The details of the rating procedure are presented in Appendix G and the results of the assessment are given in Table 1. The rating system is designed to indicate the relative need for follow-on action.

FINDINGS AND CONCLUSIONS

The following conclusions have been developed based on the results of the project team's field inspection, review of base records and files and interviews with base personnel.

The areas determined to have a high potential for contaminant migration are as follows:

- Sludge Lagoon
- Landfill No. 4
- DDT Spill (1979)

The areas determined to have a moderate potential for contaminant migration are as follows:

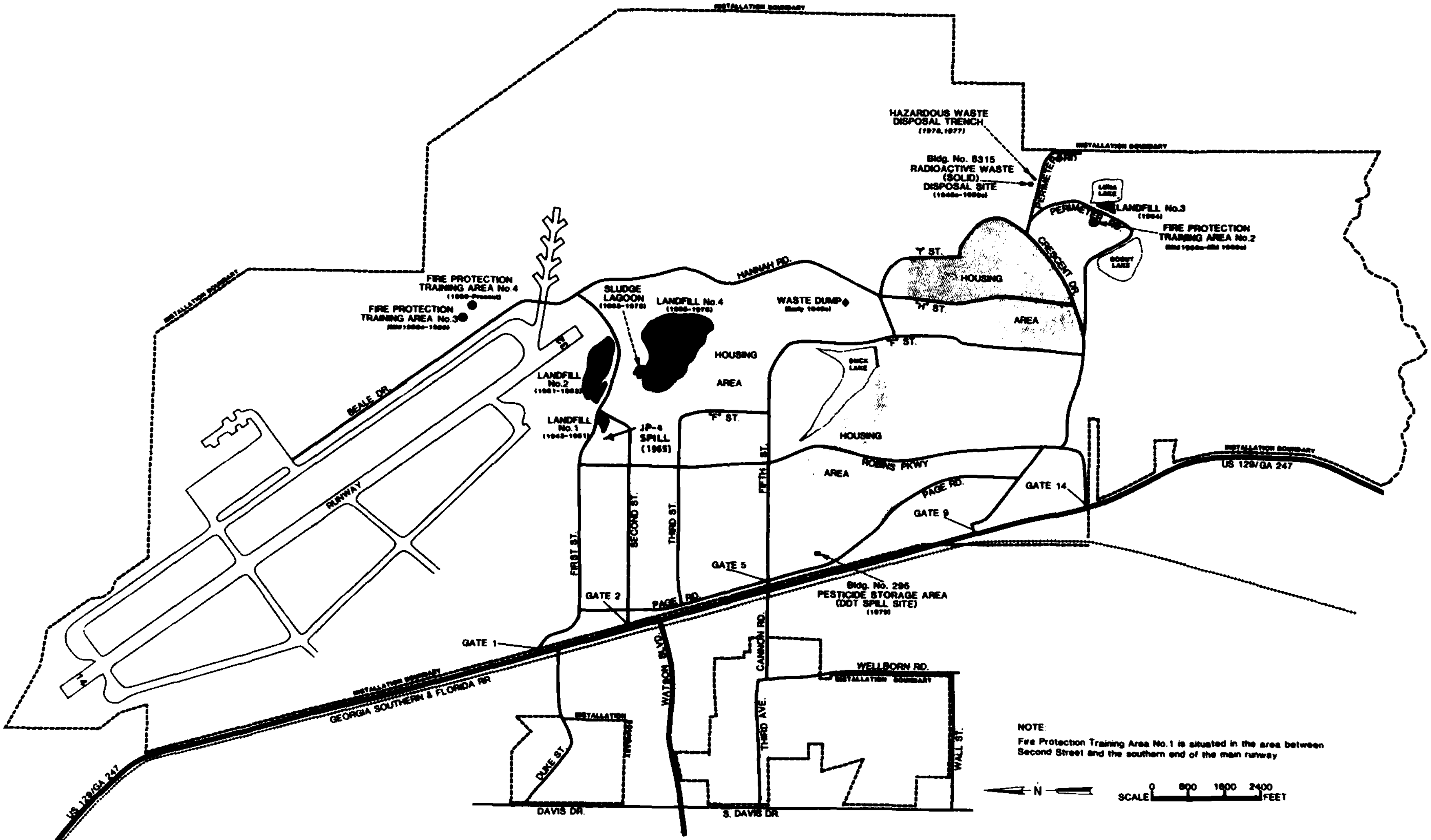
- Fire Protection Training Area No. 2
- Landfill No. 1
- Landfill No. 2
- JP-4 Spill (1965)
- Hazardous Waste Burial Site
- Fire Protection Training Area No. 1
- Laboratory Chemical Disposal Site

The areas determined to have a low potential for contaminant migration are as follows:

- Landfill No. 3
- Fire Protection Training Area No. 3
- Low Level Radioactive Waste (Solid) Burial Site

FIGURE

ROBINS AFB
SITES WITH POTENTIAL FOR CONTAMINANT MIGRATION



SOURCE: ROBINS AFB INSTALLATION DOCUMENTS

TABLE 1

PRIORITY RANKING OF POTENTIAL CONTAMINATION SOURCES
ROBINS AFB

Rank	Site Name	Date of Operation or Occurrence	Overall Total Score
1	Sludge Lagoon	1963-1978	77
2	Landfill No. 4	1965-1978	73
3	DDT Spill (1979)	1979	70
4	Fire Protection Training Area No. 2	mid 1950's to mid 1960's	64
5	Landfill No. 1	1943-1951	59
6	Landfill No. 2	1951-1953	58
7	JP-4 Spill (1965)	1965	57
8	Hazardous Waste Burial Site	1976, 1977	54
9	Fire Protection Training Area No. 1	1943-mid 1950's	52
10	Laboratory Chemical Disposal Site	early 1960's	51
11	Landfill No. 3	1964	47
12	Fire Protection Training Area No. 3	mid 1960's to 1969	45
13	Low Level Radioactive Waste (Solid) Burial Site	1940's to 1950's	31

Note: This ranking was performed according to the Hazardous Assessment Rating Methodology (HARM) described in Appendix G. Individual site rating forms are in Appendix H.

RECOMMENDATIONS

The detailed recommendations developed for further assessment of potential contaminant migration are presented in Chapter 6. These recommendations are summarized as follows:

- Sludge Lagoon and Landfill No. 4 - Conduct geophysical surveys and additional ground-water monitoring.
- DDT Spill Site - Remove contaminated soils and sample soils to verify clean up.
- Fire Protection Training Area No. 2 - Collect and analyze soil borings in and around the site.
- Landfill No. 1 and JP-4 Spill Site - Conduct geophysical surveys or sample the top of the water table. Also sample landfill leachate stream.
- Landfill No. 2 and Fire Protection Training Area No. 1 - Conduct ground-water monitoring program.
- Hazardous Waste Burial Site - Conduct ground-water monitoring program.
- Laboratory Chemical Disposal Site - Conduct geophysical survey and collect and analyze soil borings.
- Water Supply Wells - Sample and analyze well water.
- Surface Water - Conduct additional surface water monitoring on the base.

CHAPTER 1

INTRODUCTION

CHAPTER 1
INTRODUCTION

BACKGROUND

The United States Air Force, due to its primary mission, has long been engaged in a wide variety of operations dealing with toxic and hazardous materials. Federal, state and local governments have developed strict regulations to require that disposers identify the locations and contents of disposal sites and take action to eliminate the hazards in an environmentally responsible manner. The Department of Defense (DOD) has issued Defense Environmental Quality Program Policy Memorandums 80-6 and 81-5 which require the identification and evaluation of past hazardous material disposal sites on DOD property, the control of migration of hazardous contaminants, and the control of hazards to health or welfare that resulted from these past operations. This program is called the Installation Restoration Program (IRP). The IRP will be a basis for response actions on Air Force Installations under the provisions of the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) of 1980.

PURPOSE AND SCOPE OF THE ASSESSMENT

The Installation Restoration Program has been developed as a four-phased program as follows:

- Phase I - Initial Assessment/Records Search
- Phase II - Problem Confirmation
- Phase III - Technology Base Development
- Phase IV - Operations (Control Measures)

Engineering-Science (ES) was retained by the Air Force Engineering and Services Center to conduct the Phase I Records Search at Robins AF Base under Contract No. F08637-80-G0009, Call No. 0009, using funding provided by the Air Force Logistics Command. This report contains a summary and an evaluation of the information collected during Phase I of the IRP.

The goal of the first phase of the program was to identify the potential for environmental contamination from past waste disposal practices at Robins AFB, and to assess the potential for contaminant migration. The activities undertaken in Phase I included the following:

- Review site records
- Interview personnel familiar with past generation and disposal activities
- Inventory wastes
- Determine quantities and locations of current and past hazardous waste storage, treatment and disposal
- Define the environmental setting at the base
- Review past disposal practices and methods
- Conduct field inspection
- Gather pertinent information from federal, state and local agencies
- Assess potential for contaminant migration

To perform the on-site portion of the records search phase, ES assembled the following core team of professionals:

- E. J. Schroeder, Environmental Engineer and Project Manager, MSCE, 14 years of professional experience
- R. E. Zimmermann, Hydrogeologist, BS Geology, 4 years of professional experience
- G. M. Gibbons, Environmental Engineer, MSCE, 3 years of professional experience
- M. I. Spiegel, Environmental Scientist, BS Environmental Science, 5 years of professional experience
- R. M. Reynolds, Chemical Engineer, BSChE, 8 years of professional experience

More detailed information on these individuals is presented in Appendix A.

METHODOLOGY

The methodology utilized in the Robins AFB Records Search began with a review of past and present industrial operations conducted at the base. Information was obtained from available records such as shop files and real property files, as well as interviews with past and present base employees from the various operating areas of the base. Those interviewed included current and past environmental personnel associated with the Civil Engineering Squadron, the Bioenvironmental Engineering Services Division Office, and the Directorate of Maintenance. Several current or past personnel associated with the fire protection, wastewater treatment plant, pesticide program, fuels management and solid waste collection and disposal were interviewed extensively. Experienced personnel from the tenant organizations were also interviewed. Formal interviews were conducted with 62 personnel to obtain the needed past activity information.

Concurrent with the base interviews the applicable federal, state and local agencies were contacted for pertinent base related environmental data. The agencies contacted and interviewed are listed as follows:

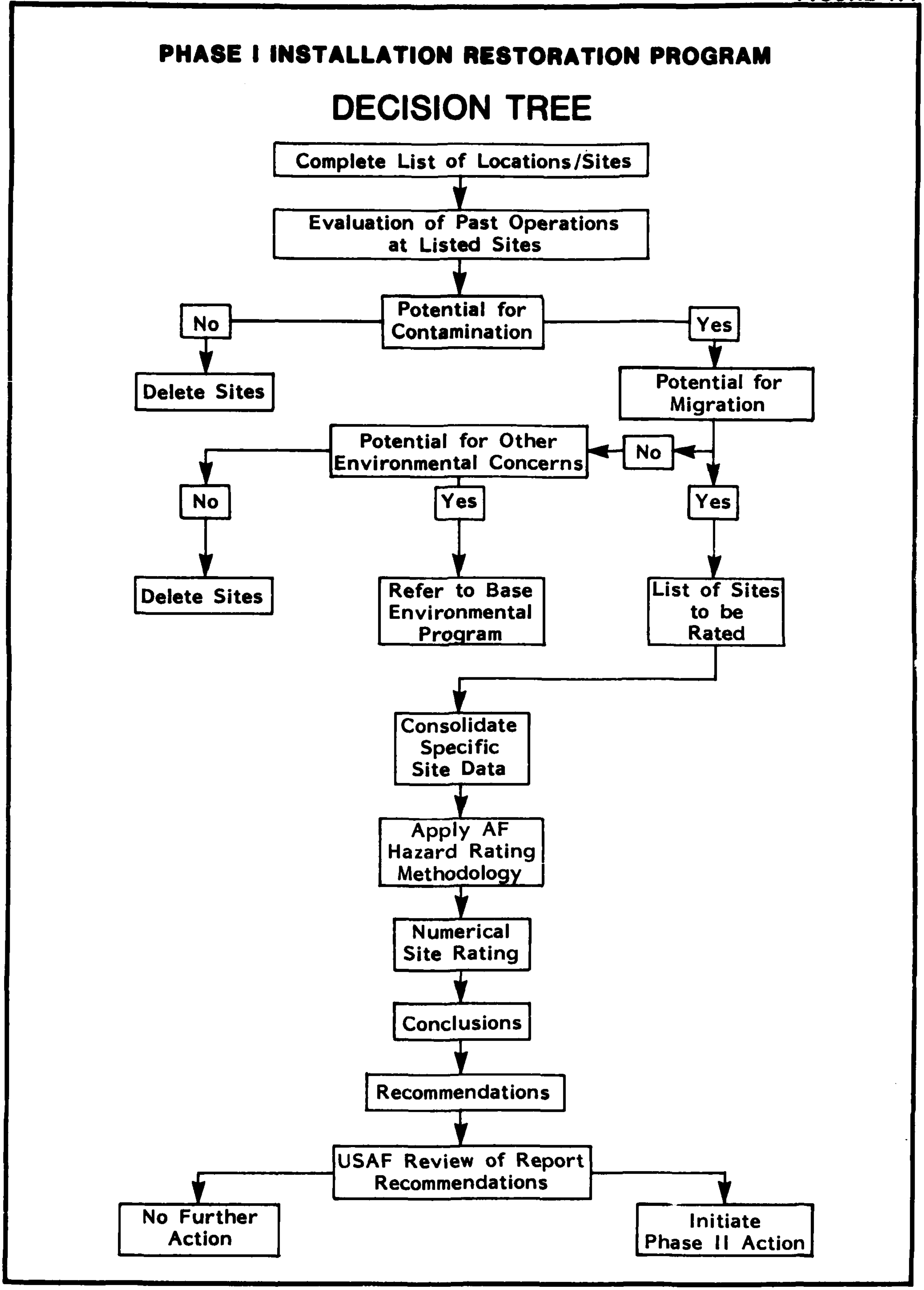
- o U.S. Environmental Protection Agency, Region IV, Atlanta, Georgia
- o U.S. Soil Conservation Service, Atlanta, Georgia
- o U.S. Geological Survey, Atlanta, Georgia
- o Georgia Geological Survey, Atlanta, Georgia
- o Georgia Environmental Protection Division, Atlanta, Georgia
- o City of Warner Robins Water Department, Warner Robins, Georgia
- o Georgia Game and Fish Division of the Department of Natural Resources, Fort Valley, Georgia.

The next step in the activity review was to determine the past management practices regarding the use, storage, treatment, and disposal of hazardous materials from the various operations on the base. Included in this part of the activities review was the identification of all known past disposal sites and other possible sources of contamination such as fuel-saturated areas resulting from spills.

An aerial overflight and a general ground tour of identified sites were then made by the ES Project Team to gather site specific information including (1) visual evidence of environmental stress, (2) the presence of nearby drainage ditches or surface-water bodies, and (3) visual inspection of these water bodies for any obvious signs of contamination or leachate migration.

A decision was then made, based on all of the above information, whether a potential exists for hazardous material contamination at any of the identified sites using the decision tree shown in Figure 1.1. If no potential exists, the site was deleted from further consideration. For those sites where a potential for contamination was identified, a determination of the potential for migration of the contamination was made by considering site-specific conditions. If the potential for contaminant migration was considered significant, then the site was evaluated and prioritized using the hazardous assessment rating methodology (HARM).

The HARM score indicates the relative potential for contaminant migration at each site. For those sites showing a high potential, recommendations are made to quantify the potential contaminant migration problem under Phase II of the Installation Restoration Program. For those sites showing a moderate potential, a limited Phase II program may be recommended to confirm that a contaminant migration problem does or does not exist. For those sites showing a low potential, no further follow-up Phase II work would be recommended.


PHASE I INSTALLATION RESTORATION PROGRAM
DECISION TREE
Complete List of Locations/Sites
Evaluation of Past Operations at Listed Sites
Potential for Contamination
No
Yes
Delete Sites
Potential for Migration
Potential for Other Environmental Concerns
No
No
Yes
Yes
Delete Sites
Refer to Base Environmental Program
List of Sites to be Rated
Consolidate Specific Site Data
Apply AF Hazard Rating Methodology
Numerical Site Rating
Conclusions
Recommendations
USAF Review of Report Recommendations
No Further Action
Initiate Phase II Action

CHAPTER 2
INSTALLATION DESCRIPTION

CHAPTER 2

INSTALLATION DESCRIPTION

LOCATION, SIZE AND BOUNDARIES

Robins AFB is located in middle Georgia approximately 90 miles southeast of Atlanta and 18 miles south of Macon as shown in Figures 2.1, 2.2 and 2.3. The base lies within the lower Ocmulgee River Basin and drains primarily to Horse Creek. The boundaries of the base cover 8,855 acres with facilites for operation, industrial, administrative and supply functions. Present land areas adjacent to the base are primarily as follows:

North - commercial, residential
East - dense forest, swamp
South - commercial, residential
West - commercial, residential

The most prominent physiographic features of the area are the Ocmulgee River and the swamp surrounding the east portion of the base.

BASE HISTORY

The initial construction of Robins AFB began in 1941 on a 3,000 acre tract of land donated by the City of Macon and Bibb County. The base was officially activated in March 1942. Subsequent acquisitions by the Federal government increased the size of the installation to its present 8,855 acres. The original intent was to establish Robins AFB as a maintenance and supply depot, but the installation also was used as a training center. Original facilities included both temporary and permanent structures. After World War II, the base ceased its training functions while continuing its supply and maintenance role.

A second growth surge began in 1949 when the Fourteenth Air Force Headquarters moved to Robins AFB, where it remained until deactivated in 1960. The largest construction program commenced in 1958 to prepare facilities for the 19th Bombardment wing as a tenant organization. Runway enlargement and family housing areas were included in this

FIGURE 2.1

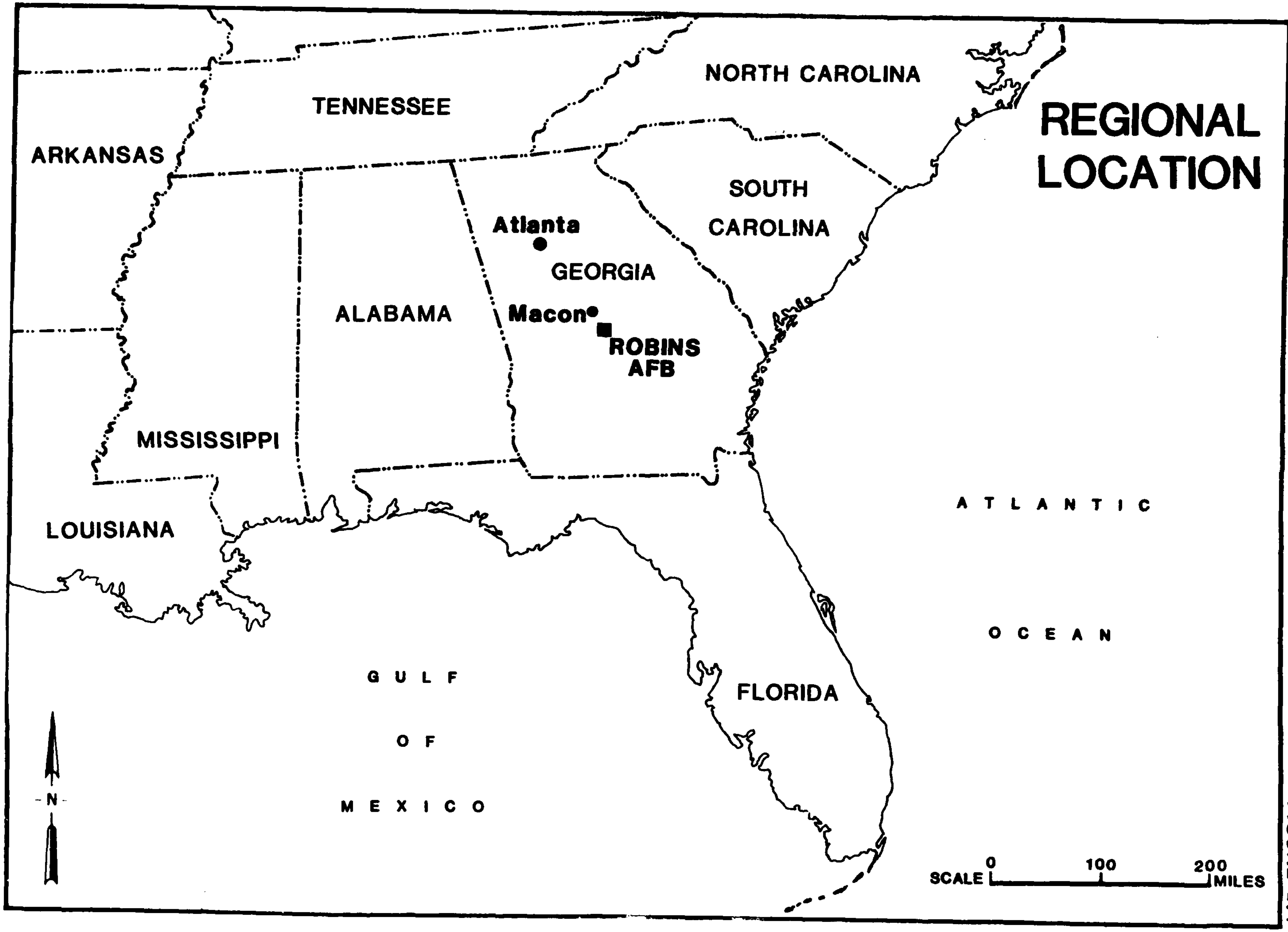


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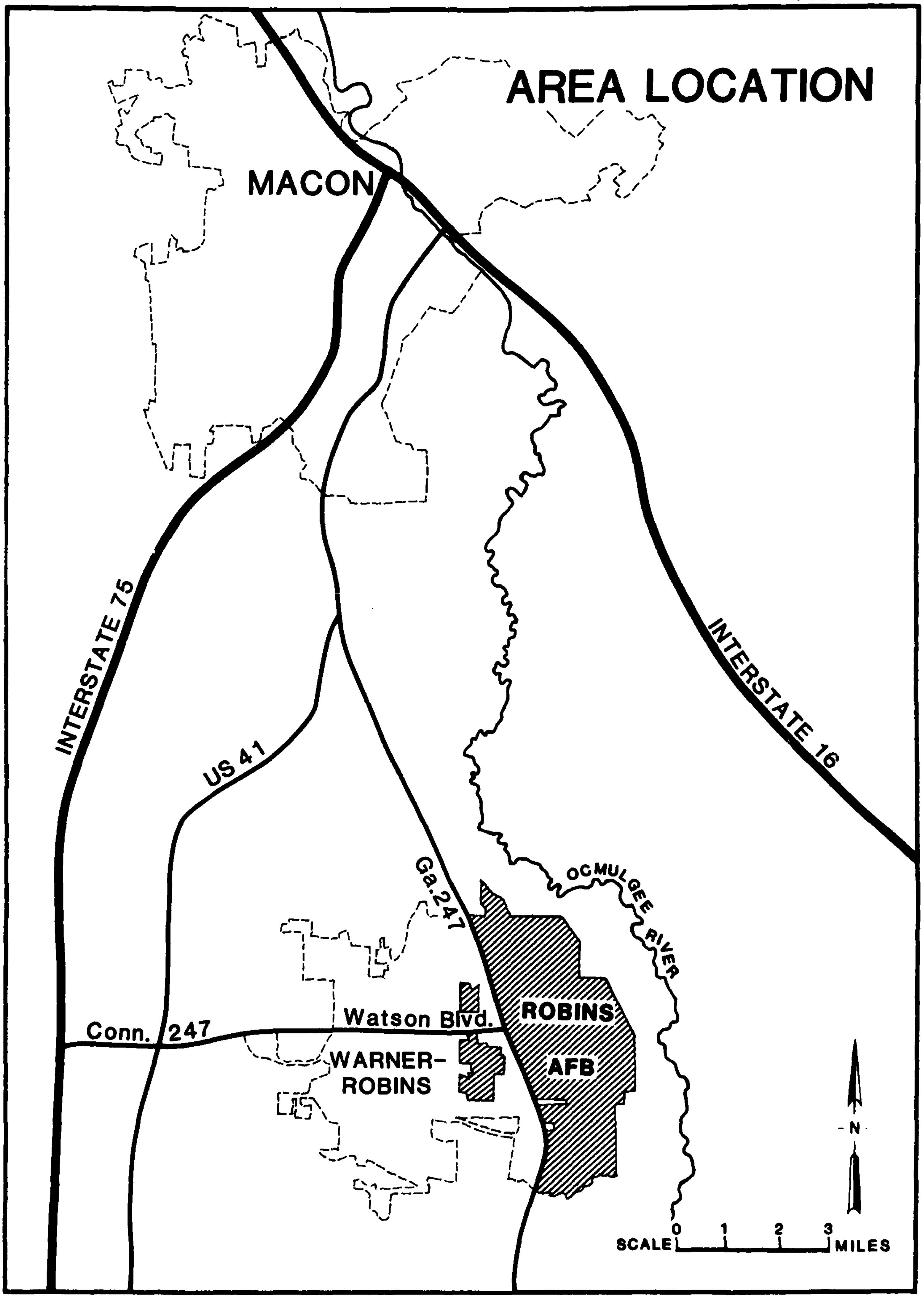
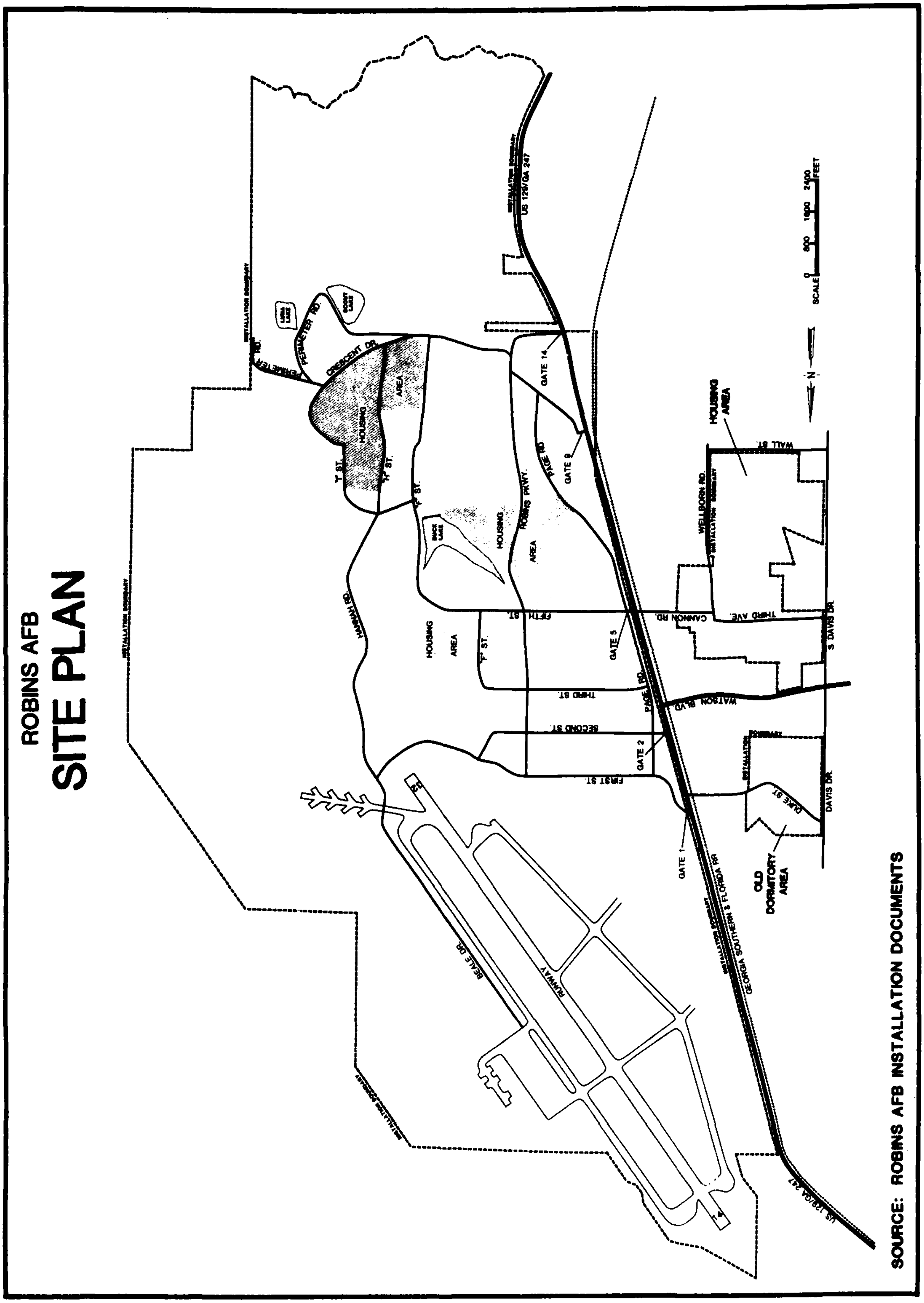
FIGURE 2.2



ES ENGINEERING-SCIENCE

FIGURE 2.3



ROBINS AFB
SITE PLAN

SOURCE: ROBINS AFB INSTALLATION DOCUMENTS

program. In 1962, the runways were further rehabilitated to better accomodate the B-52 and KC-135 aircraft. In 1974, the Technology Repair Center (TRC) was created as a function of the Warner Robins Air Logistics Center (WR-ALC). In addition to depot maintenance responsibility for assigned aircraft, the WR-ALC, TRC, performed repair services on aircraft component systems.

A complete description of Robins Air Force Base history is presented in Appendix B.

ORGANIZATION AND MISSION

The primary mission of Robins AFB are the responsibilities assigned to the Warner Robins Air Logistics Center (WR-ALC). The WR-ALC has a threefold mission as follows:

a. It is the worldwide logistics manager for assigned aircraft and commodities;
b. It is the repair center for aircraft and five distinct technologies;
c. It serves as a storage center at wholesale and retail levels for Air Force spare parts and systems.

The WR-ALC is logistics manager for five Air Force transport aircraft (C-141, C-130, C-7, C-140, C-123), the F-15 fighter, a bomber used in reconnaissance (B-57), eight missiles, five helicopters, seven utility aircraft and seven drones and remotely piloted vehicles. In addition, electronics equipment managed at WR-ALC ties its support to every element of the aerospace combat forces.

WR-ALC is the exclusive technology repair center for airborne electronics for the Air Force. In addition, aircraft repair and maintenance responsibilities for the F-15, C-141 and C-130 are assigned to the WR-ALC. The WR-ALC has various shops (plating, machining, metal bonding, etc.) which support the major workload activities.

The third major mission involves receiving, storing, issuing and transporting material. These functions are carried out in automated warehouses on base. In conjunction with its worldwide missions, WR-ALC has a geographical area of responsibility for logistics support of Air Force installations which include Eastern United States, Newfoundland, Greenland, Iceland, Bermuda, The Azores and activities in Europe, Africa and the Mid-East.

The 2853rd Air Base Group provides the services and support to carry out the mission of the WR-ALC and other tenant organizations on Robins AFB. Descriptions of the tenant organizations and their missions are presented in Appendix B.

CHAPTER 3

ENVIRONMENTAL SETTING

CHAPTER 3

ENVIRONMENTAL SETTING

The environmental setting of Robins AFB is described in this chapter with the primary emphasis directed toward identifying features which may affect the movement of hazardous waste contaminants. A summary of the environmental setting pertinent to the study are highlighted at the end of the section.

METEOROLOGY

Temperature and precipitation data furnished by the Global Climatology Branch, Robins AFB, are presented in Table 3.1. The period of record is 33 years. The summarized data indicate that the mean annual precipitation is 44.1 inches. Using Thornthwaites Equation (Chow, 1964, p.11.27-28) potential evapotranspiration for the Warner Robins Area is 42.0 inches.

GEOGRAPHY

Robins Air Force Base lies along the upper margin of the Coastal Plain province. The Coastal Plain is part of a large coastal province extending from Long Island, N.Y., to the Mexican border (LeGrand, 1962). Just north of the study area, lies the Piedmont Province (Figure 3.1). The line separating the Piedmont from the Coastal Plain is generally known as the Fall Line. This line separates the more resistant crystalline rocks of the Piedmont from the less resistant deposits of the Coastal Plain.

Locally, Robins AFB lies within the Coastal Plain province but is situated on alluvial deposits along the Ocmulgee River. These deposits form a low terrace about 3 miles wide extending westward from the river to the City of Warner Robins.

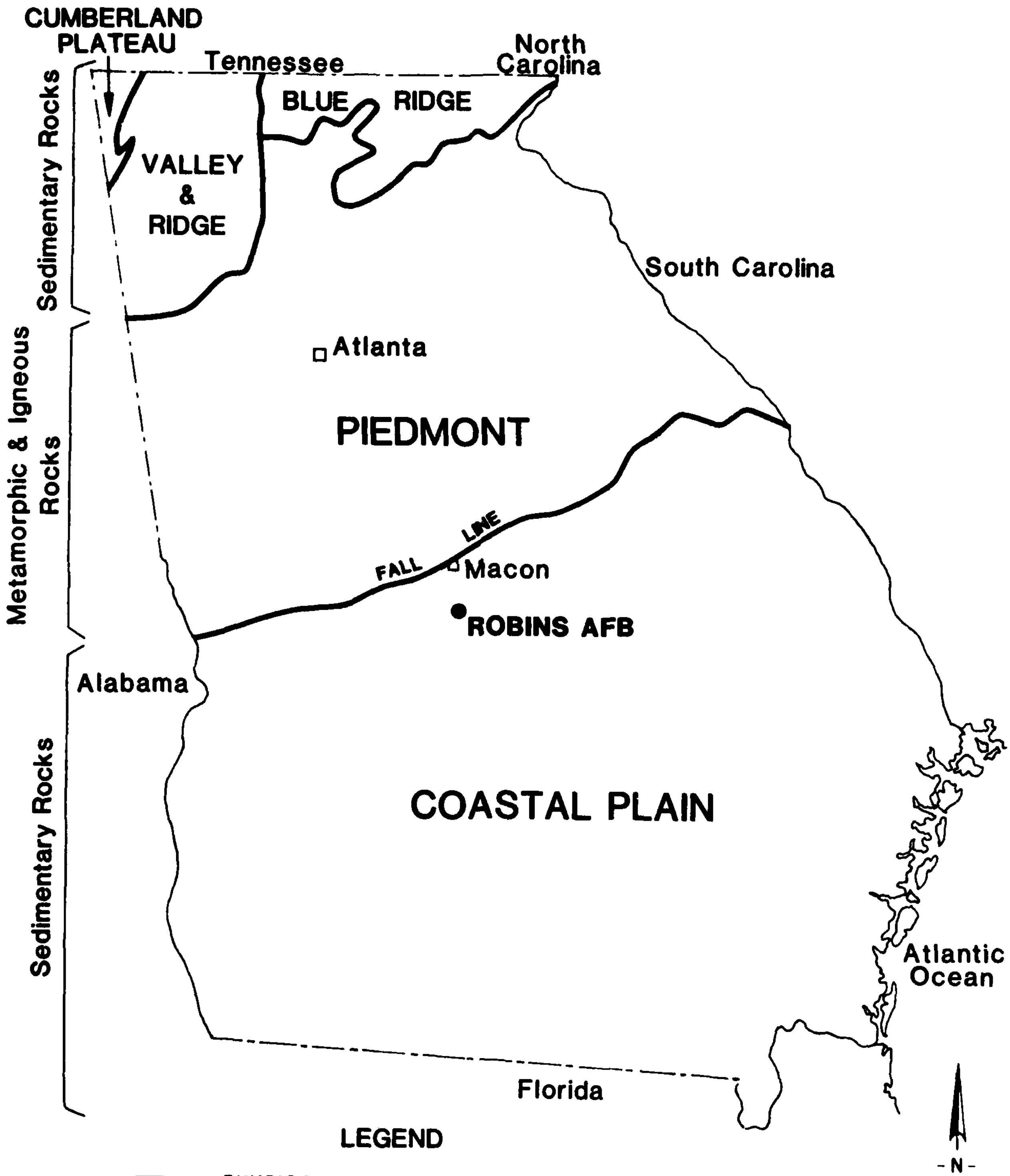
TABLE 3.1

ROBINS AFB CLIMATIC DATA

Month	Precipitation Mean (in.)	Precipitation Max (in.)	Temperature Mean max (°F)	Temperature Mean (°F)	Temperature Mean min (°F)
January	4.0	8.4	57.5	47.5	37.2
February	4.5	9.0	60.7	50.2	39.2
March	4.8	10.6	67.7	56.9	45.7
April	3.2	8.4	76.9	65.4	53.6
May	3.5	7.2	84.0	73.1	61.7
June	3.7	7.0	88.9	78.9	68.5
July	5.1	9.3	90.3	81.1	71.6
August	3.8	6.7	90.2	80.7	70.9
September	2.9	7.9	85.3	75.8	65.9
October	2.2	7.4	77.1	65.8	54.0
November	2.2	5.4	67.3	55.6	43.5
December	4.4	11.5	59.5	49.2	38.5
Annual	44.3	--	75.5	65.0	54.2

Source: Global Climatology Branch, Robins AFB

PHYSIOGRAPHIC PROVINCES OF GEORGIA



LEGEND

PHYSIOGRAPHIC REGIONAL BOUNDARY

SOURCE: SONDEREGGER, POLLARD & CRESSLER (1978)

Topography

The Coastal Plain is basically level with an eastward slope of approximately 2-3 feet per mile from the Fall Line to the Georgia coast (Thomson et el, 1956). Robins AFB is located on a low alluvial terrace of the Ocmulgee River. The slope of the base east of Highway 247 is towards the east with elevations of 300 feet MSL on the western edge of the site and 240 feet MSL on the east along the Ocmulgee River. Much of the area bordering the base is low lying swamp land and parts of the base have been constructed over reclaimed swamp land.

Drainage

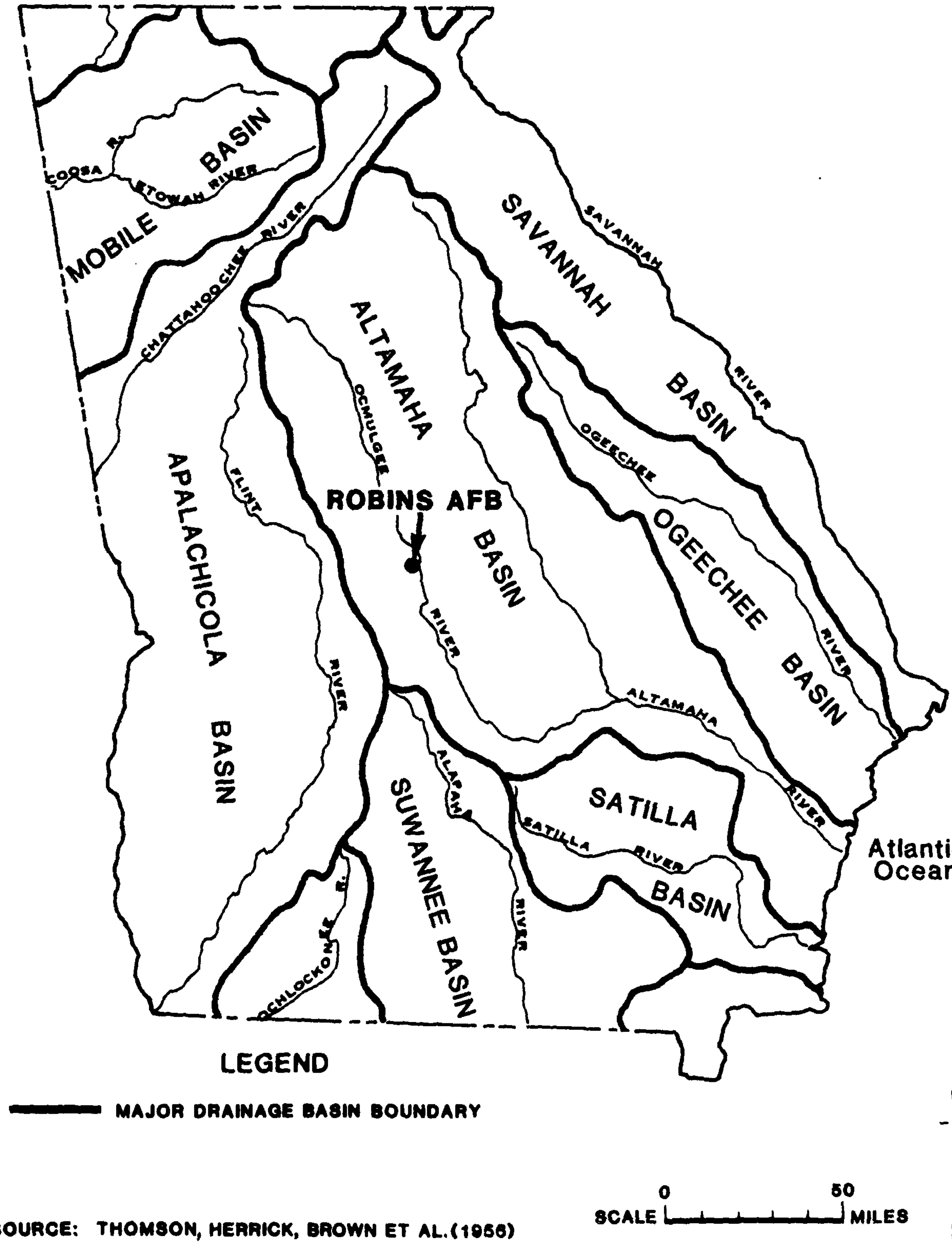
Robins AFB lies within the drainage basin of the Ocmulgee River, known as the Altamaha basin (Figure 3.2). The installation is drained by several unnamed intermittent streams as well as overland flow. Direction of surface flow is to the east, through the swamp (Figure 3.3).

A large portion of precipitation on the site may not become surface flow but rather infiltrate through the sandy soil. Based on the intensity of precipitation and on the amount of moisture in the soil, this water most likely will recharge the shallow aquifer. Approximately 4.2 inches of total annual percipitation will become recharge to the shallow aquifer. Flooding is a problem on the eastern boundary of the base where the water table intersects the surface and results in swamp development. During flooding periods, Hannah Road would become innundated, as would several other areas at the base including parts of some past waste disposal sites.

Surface Soils

Surface soils of the Robins Air Force Base area have been reported by the USDA, Soil Conservation Service (1967). Twenty soil types have been mapped within installation boundaries and are depicted on Figure 3.4. The individual soil types are discussed on Table 3.2. Base soils fall within two distinct groups: sandy upland soils, and wet, organic lowland types. All the soil types present on the installation exhibit moderate to severe constraints on the development of waste disposal facilities, due either to permeability or flooding potential.

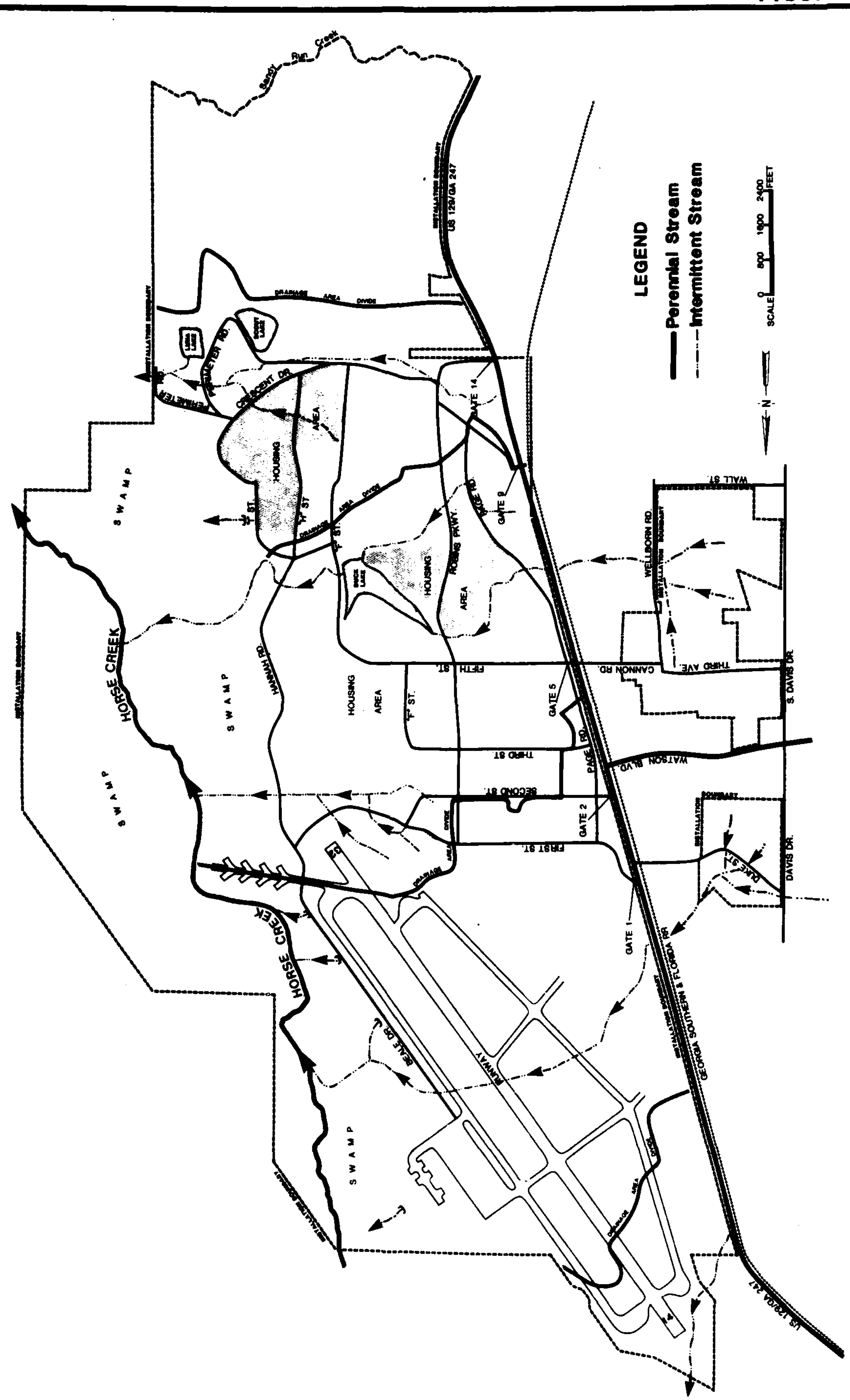
MAJOR DRAINAGE BASINS OF GEORGIA



SOURCE: THOMSON, HERRICK, BROWN ET AL.(1956)

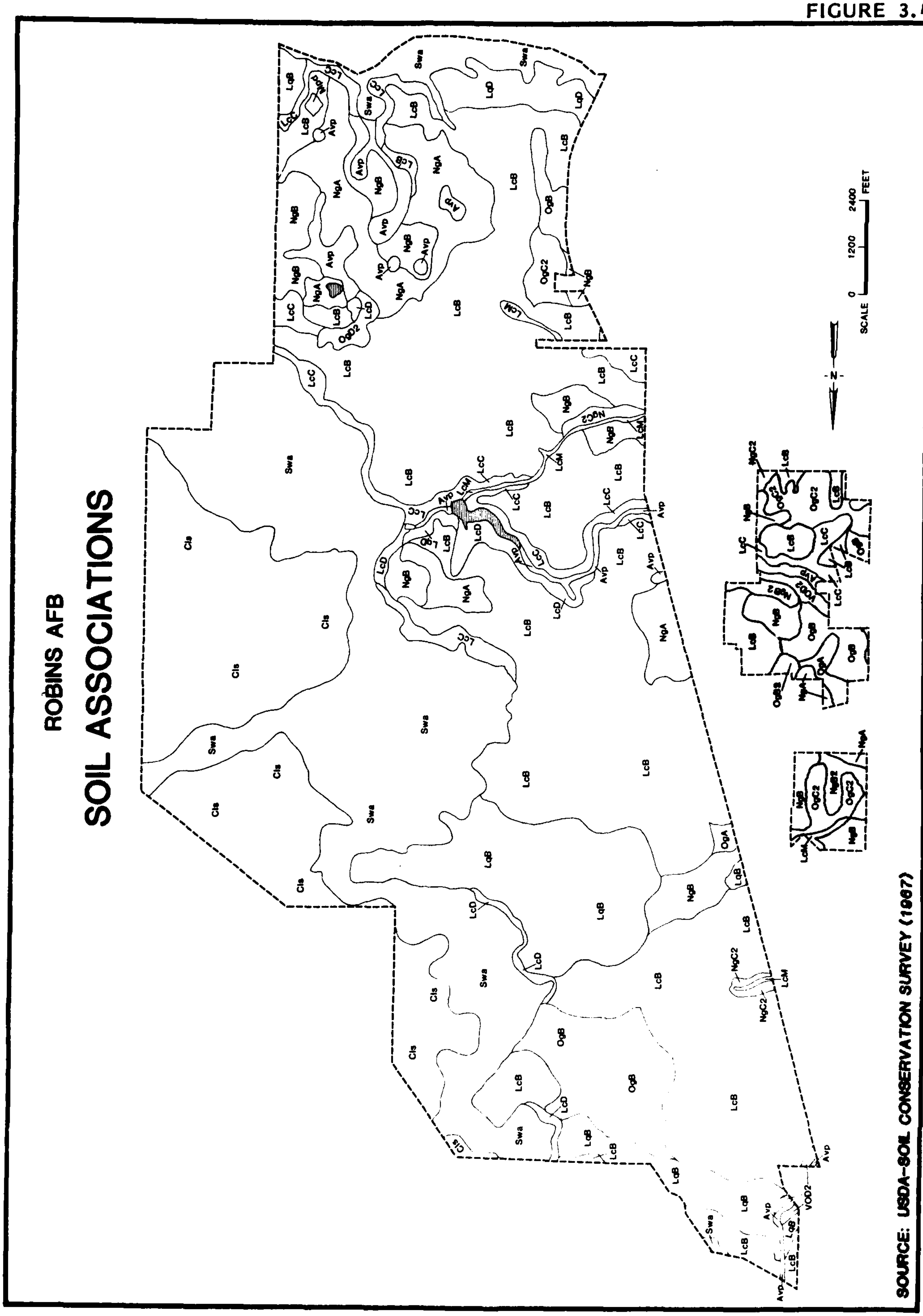
FIGURE 3.3

ROBINS AFB
SURFACE DRAINAGE



SOURCE: ROBINS AFB INSTALLATION DOCUMENTS

FIGURE 3.4



ROBINS AFB
SOIL ASSOCIATIONS
SCALE
0 1200 2400 FEET
N
SOURCE: USDA-SOIL CONSERVATION SURVEY (1967)

TABLE 3.2

ROBINS AIR FORCE BASE SOILS

Symbol	Description	USDA Texture	Thickness (in.)	Unified Classification	Permeability (in/hr)	HWD Facility Use Constraints
Avp	Alluvial land, wet, 0-2 percent slopes	Organic clay loam, clay	36+	SC,CL,CH,OH	Not estimated	Severe - floods
Cls	Chastain leaf soils, 0-2 percent slopes	Silt loam, silty clay loam, silty clay; clay	50	Ml,CL	<0.2 - 0.63	Severe - floods
LcB	Lucy sand, 0-5 percent slopes	Sand, loamy sand, sandy	60	SP,SM,SC,CL	0.63 - >6.3	Severe - High permeability
LcC	Lucy sand, 5-8 percent slopes	Sand, loamy sand, sandy	60	SP,SM,SC,CL	0.63 - >6.3	Severe - High permeability
LcD	Lucy sand, 8-12 percent slopes	Sand, loamy sand, sandy	60	SP,SM,SC,CL	0.63 - >6.3	Severe - High permeability
LcM	Local alluvial land, 0-2 percent slopes	This unit is highly variable.	24-36	Properties not estimated		Severe - floods
LqB	Lakeland fine sand, 0-5 percent slopes	Fine sand, sand	60	SP,SM	>6.3	Severe - High permeability
LqD	Lakeland fine sand, 5-12 percent slopes	Fine sand, sand	60	SP,SM	>6.3	Severe - High permeability
NgA	Norfolk loamy fine sand, 0-2 percent slopes	Loamy fine sand, sandy clay loam	58	SM,SC,CL	0.63 - >6.3	Moderate permeability
NgB	Norfolk loamy fine sand, 2-5 percent slopes	Loamy fine sand, sandy clay loam	58	SM,SC,CL	0.63 - >6.3	Moderate permeability
NgB_2	Norfolk loamy fine sand, 2-5 percent slopes, eroded	Loamy fine sand, sandy clay loam	58	SM,SC,CL	0.63 - >6.3	Moderate permeability
NgC_2	Norfolk loamy fine sand, 5-8 percent slopes, eroded	Loamy fine sand, sandy clay loam	58	SM,SC,CL	0.63 - >6.3	Moderate permeability
OgA	Orangeburg loamy fine sand, 0-2 percent slopes	Loamy fine sand, sandy clay loam	64	SM,SC	0.63 - >6.3	Moderate permeability
OgB	Orangeburg loamy fine sand, 2-5 percent slopes	Loamy fine sand, sandy clay loam	64	SM,SC	0.63 - >6.3	Moderate permeability
OgB_2	Orangeburg loamy fine sand, 2-5 percent slopes, eroded	Loamy fine sand, sandy clay loam	64	SM,SC	0.63 - >6.3	Moderate permeability
OgC_2	Orangeburg loamy fine sand, 5-8 percent slopes, eroded	Loamy fine sand, sandy clay loam	64	SM,SC	0.63 - >6.3	Moderate permeability
OgD_2	Orangeburg loamy fine sand, 8-12 percent slopes, eroded	Loamy fine sand, sandy clay loam	64	SM,SC	0.63 - >6.3	Moderate permeability
RhA	Red Bay fine sandy loam, 0-2 percent slopes	Fine sandy loam, sandy clay loam	70	SM,SC,CL	0.63 - 6.3	Moderate permeability
Swa	Swamp	Perennial wetland	Properties not estimated			Severe - floods
VOD_2	Vaucluse-*Hoffman* complex, 8-12 percent slopes, eroded	Loamy sand, sandy clay loam	60	SM,SC,CL	0.63 - >6.3	Moderate permeability

Source: USDA, Soil Conservation Service, 1967

GEOLOGY

The geology of the Warner Robins AFB has been reported by LeGrand (1962), Herrick (1961, 1963, and 1965), Thomson et al. (1956), Herrick and Vorhis (1963), Sonderegger (1978), Pollard (1980), and Mitchell (1979) among others. A brief review of their work has been summarized in support of this investigation.

Stratigraphy

Stratigraphy of the area was studied in order to understand the occurrence and movement of ground water beneath the site. Geologic units ranging from Cretaceous to Quatenary have been described in the Warner Robins area and are presented in Table 3.3. The lithologies of these units are typically unconsolidated material. Older Cretaceous units are encountered at depths of approximately 1700 feet. Crystalline basement rocks are typically encountered at depths greater than 1750 feet below ground surface (LeGrand, 1962).

Regionally, the site is located within the upper Coastal Plain province, but locally, lies on an alluvial terrace of the Ocmulgee River. Sections of the base constructed in swamps have been built up over fill material and do not represent original stratigraphic sequences. The uppermost native unit consists of alluvial deposits of two types depending upon exact location on the base (refer to Geologic Map and legend, Figure 3.5). In the lowland or swampy areas typical of the eastern portion of the base, as well as beneath many of the artificially filled areas, a 5 to 15 foot thick layer of peat and fine silts are encountered, generally underlain by a thin (3 to 5 feet) layer of clay. In upland areas typical of the western half of the base, however, fine alluvial sands and silts are present at the surface and grade into sands and fine gravels with increasing depth. A clay layer not known to exist below these deposits. These sand and fine gravel ivial deposits also underlie the organic deposits in the lowlands. These are recent deposits and may be 20 to 25 feet thick.

Directly below the surficial alluvial deposits are the most significant geologic units, comprised primarily of several hundred feet of permeable sands. The uppermost major unit is the Providence Sand. It is the youngest and uppermost Cretaceous formation in Georgia.

It consists of light colored sands, interbedded with numerous layers of clay. Thickness of the Providence Sand ranges from 60 to 120 feet and is approximately 60 feet at Robins AFB (LeGrand, 1962).

Immediately underlying the Providence Sand is the Tuscaloosa Formation. Although it does not crop out at the base, it is the oldest outcropping formation of Georgia's Coastal Plain Region (LeGrand 1962). Lithologically, the Tuscaloosa is almost identical to the Providence Sand. It also consists of a light-colored sand with numerous lenticular masses of clay interbedded throughout the formation. These clay beds are generally lenses which can not be traced far. Thickness of this formation ranges from 500 to 600 feet. A generalized geologic section depicting the relationships of major geologic units is presented as Figure 3.6. The Tuscaloosa Formation is a superb aquifer capable of producing tremendous quantities of excellent quality water. Both Robins AFB and the City of Warner Robins use this formation as a source of their water supplies.

Immediately below the Tuscaloosa formation are crystalline rocks of Paleozoic, or possibly older, age. No records were found of wells reaching bedrock, therefore, the exact depth to these units is uncertain. Due to the depth and nature of these formations, they would not be a significant source of water in this area.

Distribution

The areal distribution of geologic units significant to this study is mapped on Figure 3.5, which is modified from the work published by H. E. LeGrand (1962). Most of the site is immediately underlain by alluvial deposits of the Ocmulgee River. The depth to consolidated deposits is not confirmed, but presumed to be at least 1700 feet below the surface, based upon regional geologic data. The western half of the base is dominated by sandy alluvial deposits while the eastern part of the base is underlain by peat and fine grained organic silt deposits.

HYDROGEOLOGY

Ground-water hydrology of the Warner Robins Area has been reported by LeGrand (1962), Mitchell (1979), Pollard and Vorhis (1980), Thomson (1956), Herrick (1961) and Sonderegger (1978). Supporting information

TABLE 3.3

GEOLOGIC FORMATIONS IN ROBINS AFB AREA

System	Series	Formation		Thickness (feet)
Quaternary	Pliocene to Recent	Swamp Deposits:	Peat, organic silty clays deposited in Ocmulgee River generally over alluvian.	5-20
		Alluvial Deposits:	Silts, sands and gravels deposited along major stream borders and in interstream areas.	
Tertiary	NONE PRESENT UNDERLYING ROBINS AFB			
Cretaceous	Upper	Providence Sand:	Light colored sand interbedded with lenticular layers of clay.	60-120
		Tuscaloosa Formation:	Light colored sand interbedded with several lenticular layers of clay.	500-600

Source: LeGrand, 1962

FIGURE 3.5

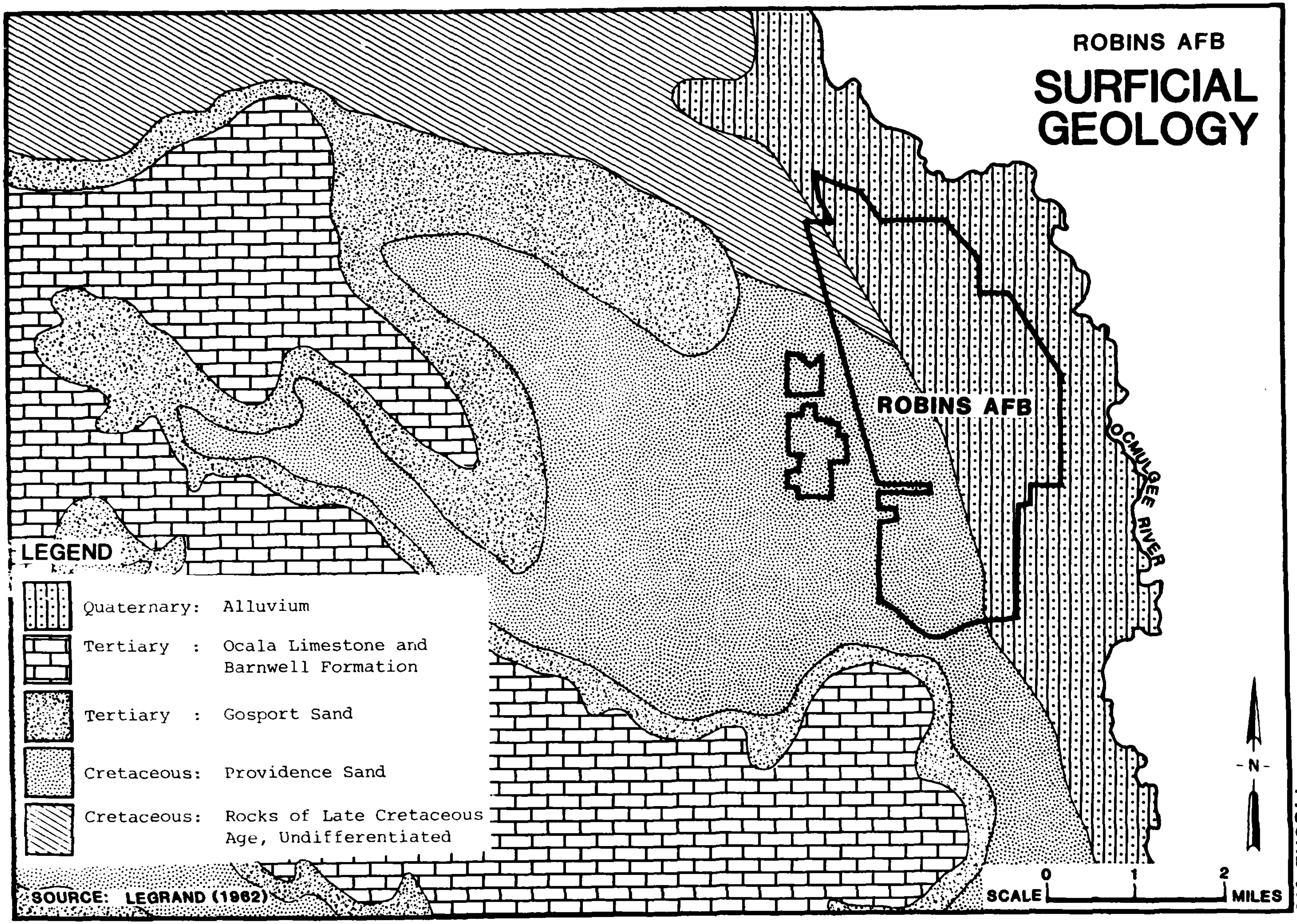
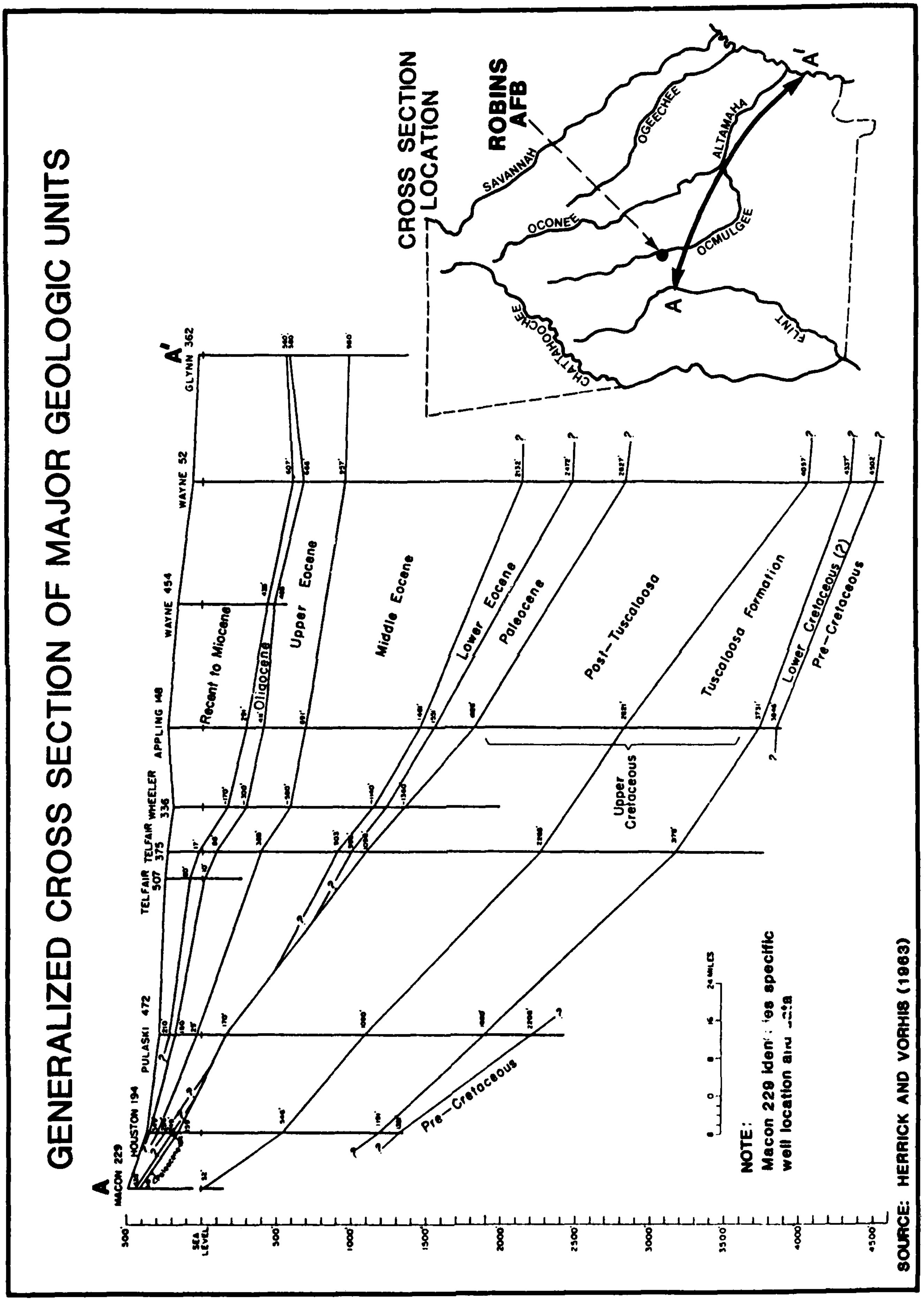

ROBINS AFB
SURFICIAL GEOLOGY
ROBINS AFB
OCMULGEE RIVER
- N -
SCALE
0
1
2
MILES
LEGEND
Quaternary: Alluvium
Tertiary : Ocala Limestone and Barnwell Formation
Tertiary : Gosport Sand
Cretaceous: Providence Sand
Cretaceous: Rocks of Late Cretaceous Age, Undifferentiated
SOURCE: LEGRAND (1962)

FIGURE 3.6



GENERALIZED CROSS SECTION OF MAJOR GEOLOGIC UNITS
CROSS SECTION LOCATION
ROBINS AFB
SAVANNAH
OGEECHEE
ALTAMAHA
OCONEE
OCMULGEE
CHATTAHOOCHEE
FLINT
A
A'
MACON 229
HOUSTON 194
PULASKI 472
TELFAIR 507
TELFAIR 375
WHEELER 336
APPLING 148
WAYNE 454
WAYNE 52
GLYNN 362
Recent to Miocene
Oligocene
Upper Eocene
Middle Eocene
Lower Eocene
Paleocene
Post-Tuscaloosa
Tuscaloosa Formation
Lower Cretaceous (?)
Pre-Cretaceous
Upper Cretaceous
SEA LEVEL
NOTE:
Macon 229 identifies specific well location and data
SOURCE: HERRICK AND VORHIS (1963)

has been obtained from Robins AFB water department files and files from the City of Warner Robins water plant. Additional information on permeabilities and shallow ground-water quality were obtained from a report by Law Engineering Testing Company (LETCO, 1980).

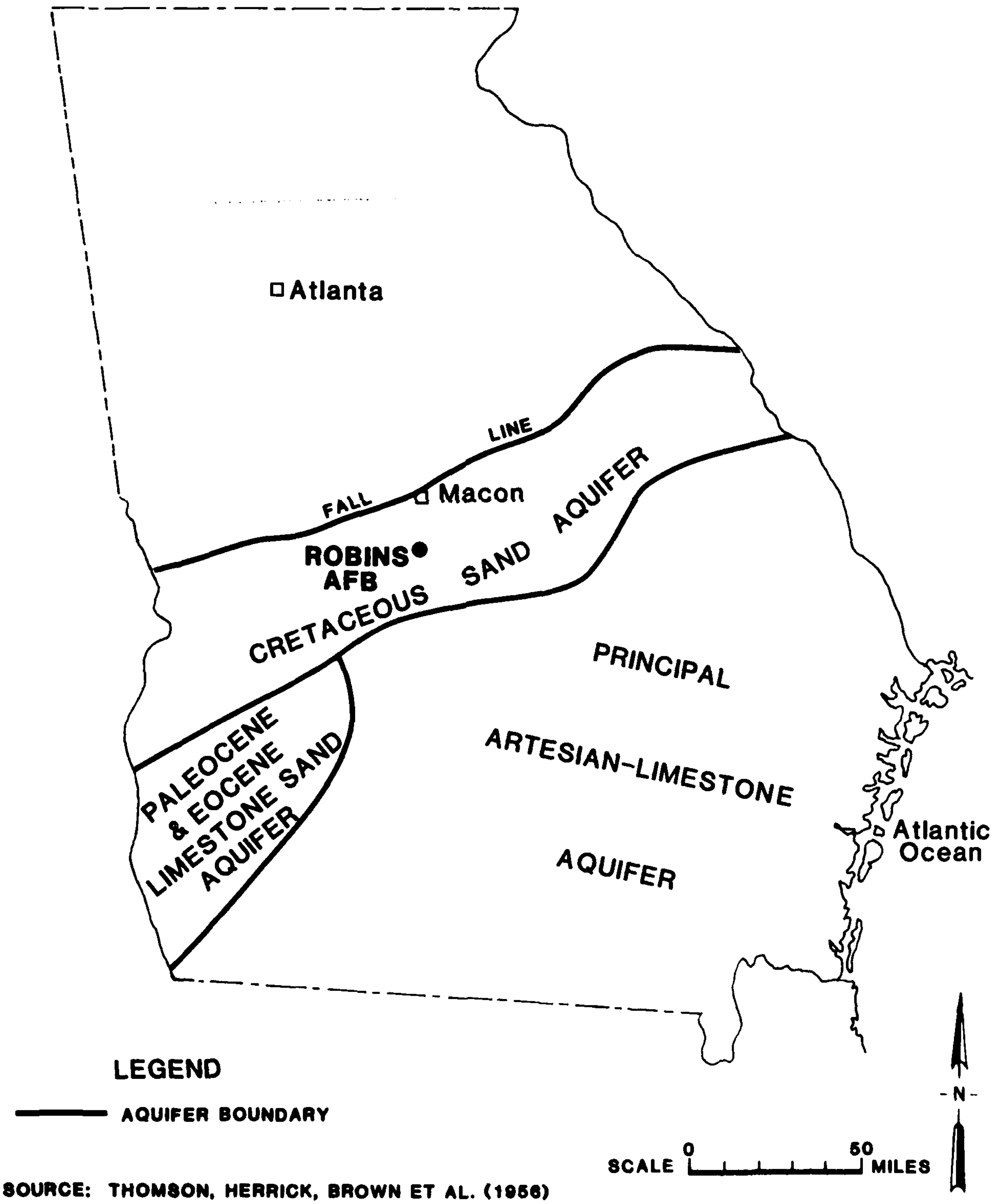
The Coastal Plain province in Georgia extends from the Fall Line on the north to Florida in the south and from the Savannah River and the Atlantic Ocean on the east to the Chattahoochee River on the west.

The Coastal Plain may be divided into three areas (Figure 3.7) according to aquifer availability and utilization (Thomson, Herrick, Brown et al, 1956). Along the Fall Line, and for a distance of 30 to 60 miles south of it, sand and gravel of Cretaceous age constitute the principle aquifer. Sands and gravels of both the Providence Sand and Tuscaloosa Formation comprise the Cretaceous aquifer which extend to a depth of 600 to 700 feet below the surface at Robins AFB.

An important consideration in assessing ground-water contamination is the water present in the upper alluvial deposits. These deposits are not used locally as a source of water supply, although some degree of interconnection may occur between this and the underlying formations.

Ground water exists beneath Robins AFB under both water table and artesian conditions. The water table is present throughout the base in the upper sandy alluvial deposits. The water table discharges to the east and contributes to the development of a swampy area extending to the Ocmulgee River, LeGrand, (1962). There appears to be a confining bed just below the swamp deposits which would create weak artesian conditions immediately below this upper layer. Both the land surface and the beds are inclined towards the southeast, but the inclination of the beds is steeper. The numerous interbedded clay layers in both the Providence Sand and the Tuscaloosa Formation create artesian conditions within them. Surface water recharge, particularly precipitation, enters the ground, percolates to the water table and flows downgradiant to a point where the zone of saturation is interrupted by an impermeable bed. Part of the water may pass above the bed and continue to flow under water table conditions and the other part of it flows beneath the confirming bed. This is confined or artesian water; it will rise in a tightly cased well to a height above the bottom of the confining bed. The interlayering of clay and sand results in a composite artesian

PRINCIPAL AQUIFERS OF THE COASTAL PLAIN OF GEORGIA



SOURCE: THOMSON, HERRICK, BROWN ET AL. (1956)

system consisting of several artesian sand aquifers, and intervening clay confining beds.

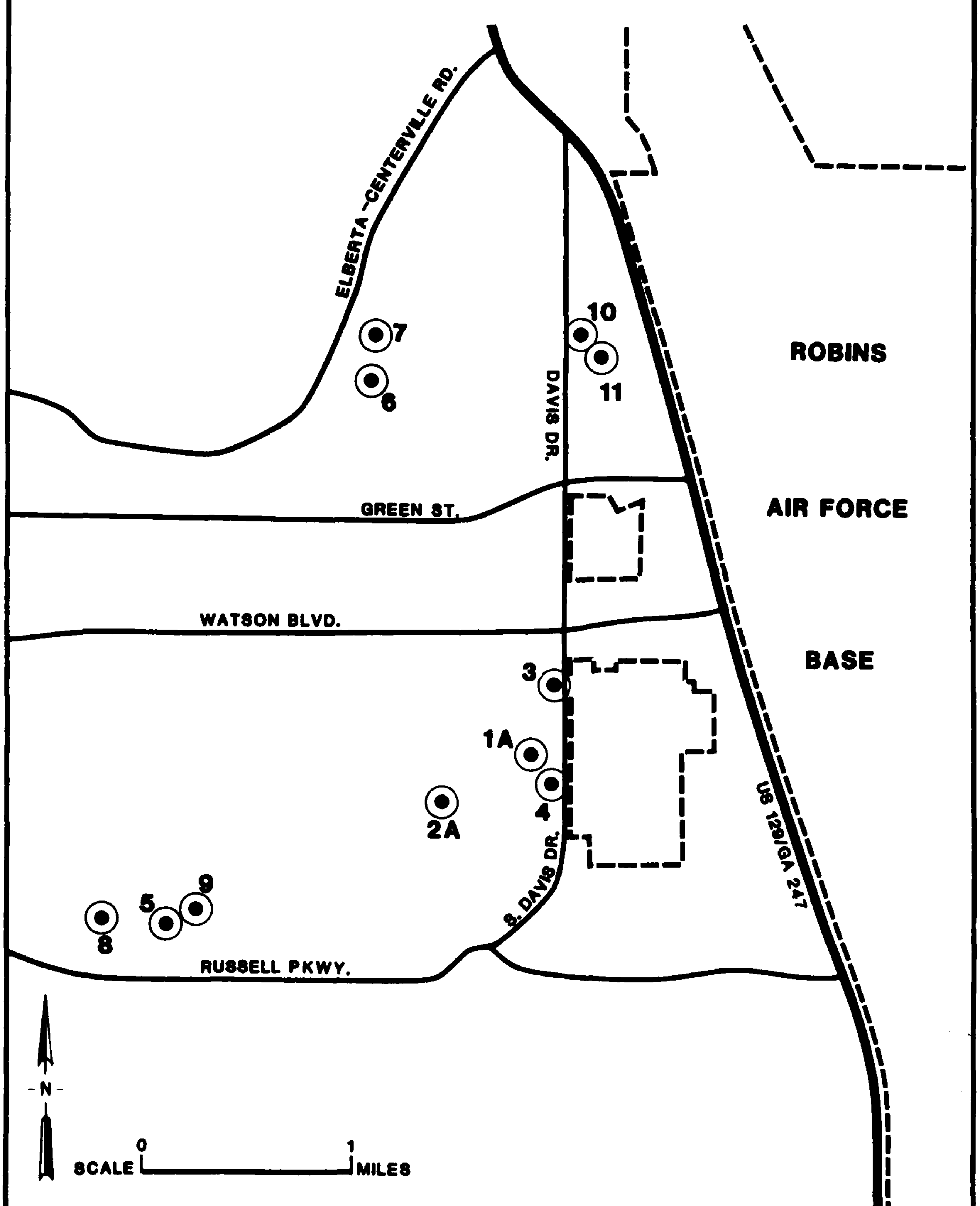
In the study area, deposits of Cretaceous age furnish adequate water supplies to present users and are capable of yielding large supplies to future developers. The City of Warner Robins obtains its water from wells screened in various sand layers of the Tuscaloosa Formation (See Well Logs - Appendix F). Figure 3.8 shows the location of these wells and Table 3.4 gives a brief summary of the wells. The city wells have capacities which range from 1000 to 1600 gpm indicating the large quantity of water available from this aquifer. Robins AFB has 12 wells. The logs of these wells are shown also in Appendix F. Of these 12 wells, numbers 1 through 8 are used as a drinking water source. Locations and a summary of these wells are given in Figure 3.9 and Table 3.5. Well No. 9 furnishes water supplies to the Federal Avi:tion Administration (FAA) building. Well No. 10 is not connected to the public system but is an independent two-inch diameter well used for drinking water supply at the skeet range. Wells No. 11 and No. 12 are used for water level maintenance at Luna and Scout Lakes.

Ground-Water Quality

Ground-water flow direction in the Cretaceous aquifer is in an easterly-southeasterly direction (LeGrand, 1962), discharging to the Ocmulgee River locally. Natural ground-water quality in the Cretaceous aquifer has been reported to be excellent (LeGrand, 1962). Results from samples collected from these wells in January of 1978 indicated the quality to be excellent with very little mineral content present. Results did not indicate any contamination of these wells for the parameters tested; an organic scan was not run.

Shallow ground water in the vicinity of Landfill No. 4 was reported by Law Engineering Testing Company (LETCO, 1980) to be contaminated. Several shallow monitoring wells installed by LETCO (Figure 3.10) indicate the presence of various concentrations of chloride, dissolved solids, nitrate, cyanide, arsenic, calcium, chromium, lead, manganese and zinc. An organic scan was run on monitoring wells nos. 4, 5, 15, and 18. The results of this analyses indicated the presence of methylene chloride, phenol, diethylphthalate, bis(2-ethylhexyl)phthalate, benzene, chlorobenzene, trans-1,2,dichloroethylene,

City of Warner Robins
WELL LOCATIONS



SOURCE: CITY OF WARNER ROBINS, WATER DEPARTMENT DOCUMENTS (1981)

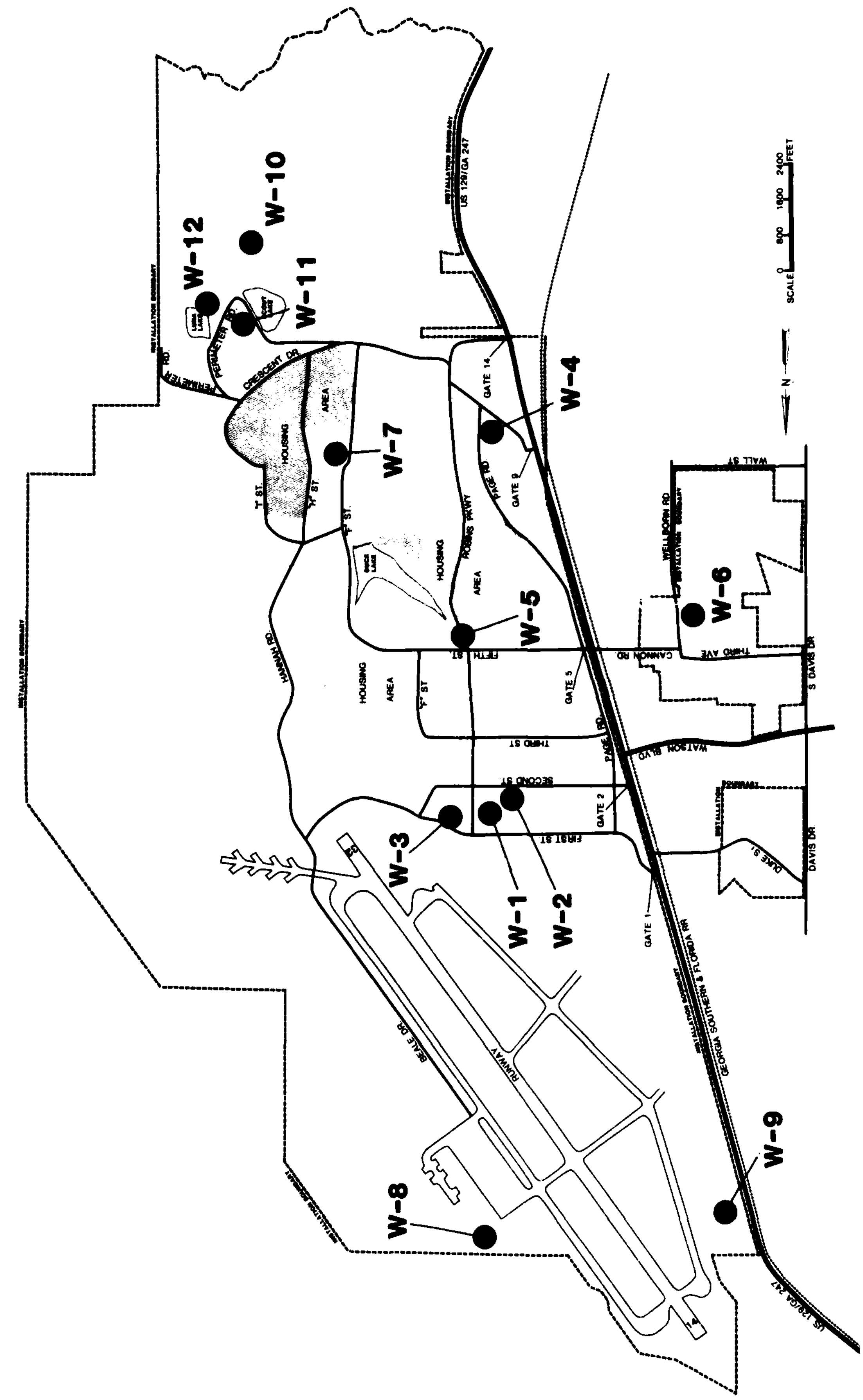
TABLE 3.4
CITY OF WARNER ROBINS MUNICIPAL WELLS

Well No.	Casing Diam. (in.)	Total Depth (feet)	Capacity (GPM)	Static Depth Below Ground Surface (Feet)	Motor H.P.	Date Drilled	Remarks
1A	12	540	1557	129	150	1981	10' screens at 340', 370' and 420' 20' screens at 440', 470' & 510'
2A	25	580	1613	132	150	1979	10' screens at 174', 300', 478' and 495' 40' screen at 400'
3	10	415	1000	105	75	1961	10' screen at 360' 20' screen at 275' 15 ' screen at 390'
4	12	390	1559	122	100	1960	10' screen at 240' and 320' 20' screen at 360'
5	12	422	1100	132	75	1962	10' screens at 235' & 270' 20' screen at 392' 5' screen at 349'
6	12	435	1050	116	100	1968	10' screens at 250', 390' and 415' 20' screen at 290'
7	12	440	1641	105	150	1972	10' screen at 240', 20' screen at 345', 30' screen at 400'
8	12	430	1641	101	150	1970	20' screens at 240', 360' and 400' 15' screen at 305'
9	12	490	1613	101	150	1971	10' screens at 330' and 405' 20' screens at 360' and 460'
10	12	480	1613	56		1976	
11	12	440	1600	47	100	1976	

Source: City of Warner Robins Water Plant Files

FIGURE 3.9

ROBINS AFB
WATER SUPPLY WELL LOCATIONS



SOURCE: ROBINS AFB INSTALLATION DOCUMENTS

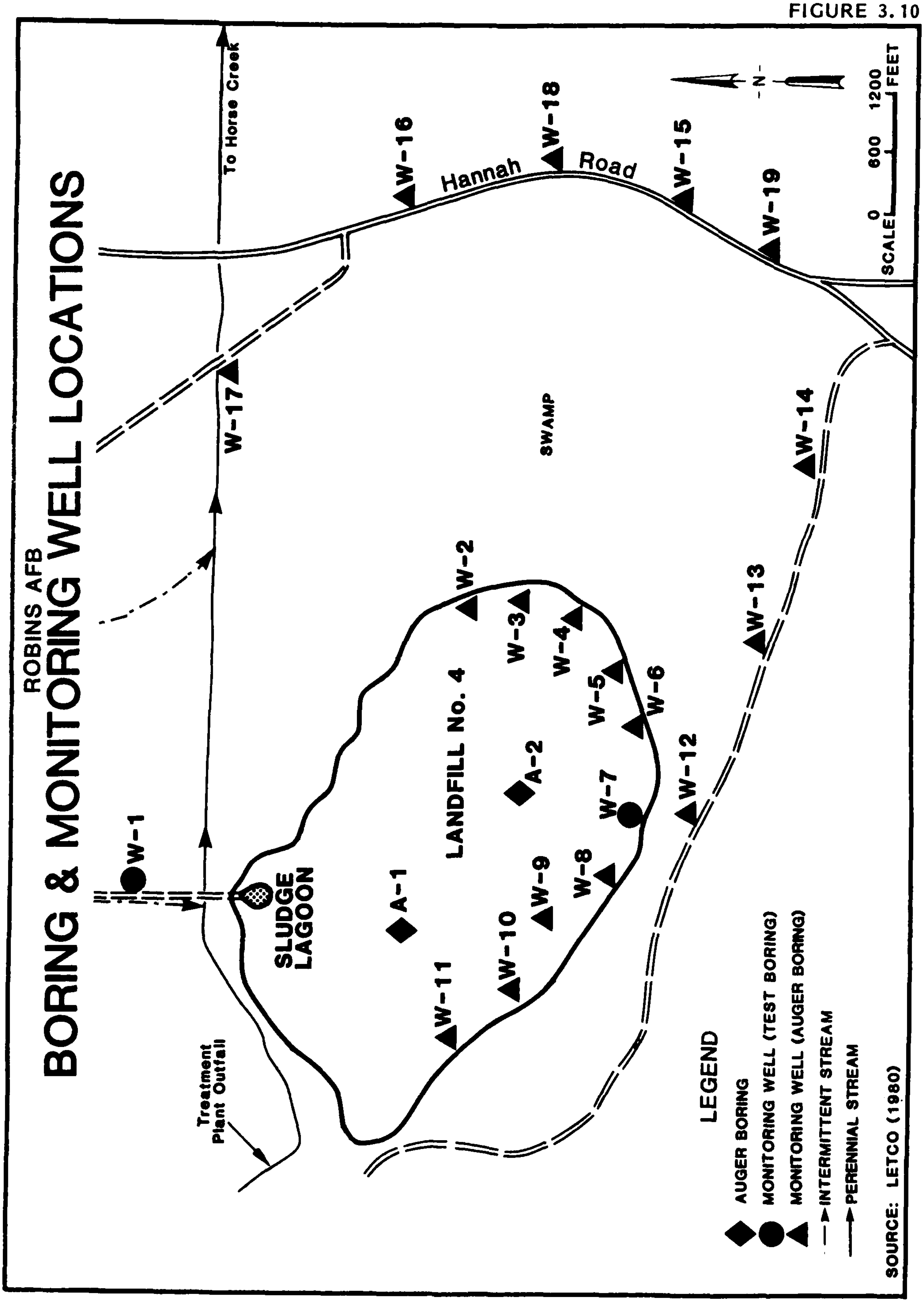
TABLE 3.5
SUMMARY OF ROBINS AFB WELLS

Bldg No.	Well No.	Casing Diam.	Feet Depth	Capacity (GPM)	Orig. Static Level	Motor H.P.	Pump Type	Date Drilled	Remarks
186	1	12"	362	835		100	Vertical turbine	1941	Redrilled
	1A	12"	389	950				1975	
164	2	12"	255	900		100		1941	Redrilled
	2A	12"	386	900				1974	
	3	12"	298	1300			Vertical turbine	1942	
648	4	12"	430	775		60		1943	
	4A	12"	385	992		60		1956	
511	5	12"	355	700				1942	Redrilled
	5A	12"	430	1230	45'	100		1963	
	6	12"	367	1500	45'	150		1943	Redrilled
	6A	12"	495	1500	63'			1976	
	7							1944	Redrilled
	7A	12"	490	992	38'	100		1958	
61	8	8"	522	900	9'	75		1958	
	9	6"	140	30	60'	3	Submersible	1958	
	9A	-	135	300		7 1/2	Submers-	1970	6"Outlet
	10	(Small well - data unavailable)							
	11		180	10	45'	1	Jet pump	1968	2"Outlet
	12			20		1	Submersible	1966	4"Outlet

Source: Robins AFB Files

Note: The A notation after the Well No. indicates that the well was redrilled.

FIGURE 3.10



ROBINS AFB
BORING & MONITORING WELL LOCATIONS
To Horse Creek
Hannah Road
W-16
W-18
W-15
W-19
W-17
SWAMP
W-14
W-13
W-12
W-2
W-3
W-4
W-5
W-6
W-7
W-8
W-9
W-10
W-11
W-1
A-1
A-2
LANDFILL No. 4
SLUDGE LAGOON
Treatment Plant Outfall
N
SCALE 0 600 1200 FEET
LEGEND
AUGER BORING
MONITORING WELL (TEST BORING)
MONITORING WELL (AUGER BORING)
INTERMITTENT STREAM
PERENNIAL STREAM
SOURCE: LETCO (1980)

trichloroethylene, and 1,1,2,2 tetrachloroethylene in the shallow ground water downgradient of Landfill No. 4 and the sludge lagoon. A summary of the LETCO ground-water quality data is included in the appendix. This study was conducted at Landfill No. 4 and shallow ground-water quality elsewhere on the base has not been investigated.

In the area of Landfill No. 4, weak artesian conditions may exist below the thin clay layer which underlies the swamp deposits (LeGrand, 1962, Figures 6). Both of these factors (clay layer and artesian conditions) may affect the concentrations of contaminants entering the lower aquifer. The upper clay layer, which is probably restricted to the zone underlying the swamp deposits, may act as a confining bed preventing any further infiltration. It is important to note however, that organic compounds such as methylene chloride and other chlorinated hydrocarbons have the ability to move through clay more rapidly than water would move through clay (Roberts et al, 1980, and Giger and Molnar-Kubica, 1978). The mechanisms through which this occurs are extremely complex but have been shown through experimentation. Under normal circumstances, weak artesian conditions appear to exist in the deposits immediately below the clay. This may cause the "upwelling" of water from below the fill rather than infiltration from the fill into the aquifer. The fate of organics in the subsurface is extremely difficult to predict because of the uncertainty involved in describing precise attentuation mechanisms occurring under unsaturated and saturated conditions.

SURFACE WATER QUALITY

Robins AFB has several streams and surface drainage systems which originate on or flow through the base property. All of these streams drain in a general west-to-east course and ultimately flow to the Ocmulgee River either via defined creek beds such as Horse Creek or by dissipated overland drainage through the adjacent swamp areas. The streams have been monitored routinely at several locations by the base Bioenvironmental Engineering Services Division (BESD) in compliance with State permit requirements. In addition to the required monthly sampling program, the BESD conducted a baseline chemical characterization survey of the non-potable surface waters within the base between 1978 and 1979

(Talley, et al., 1979). Figure 3.11 depicts the surface water monitoring stations presently sampled for NPDES permit compliance as well as the additional stations sampled during the 1978-1979 baseline survey. Summaries of the data compiled during the 1978-1979 study and the 1981 NPDES data are included in Appendix C.

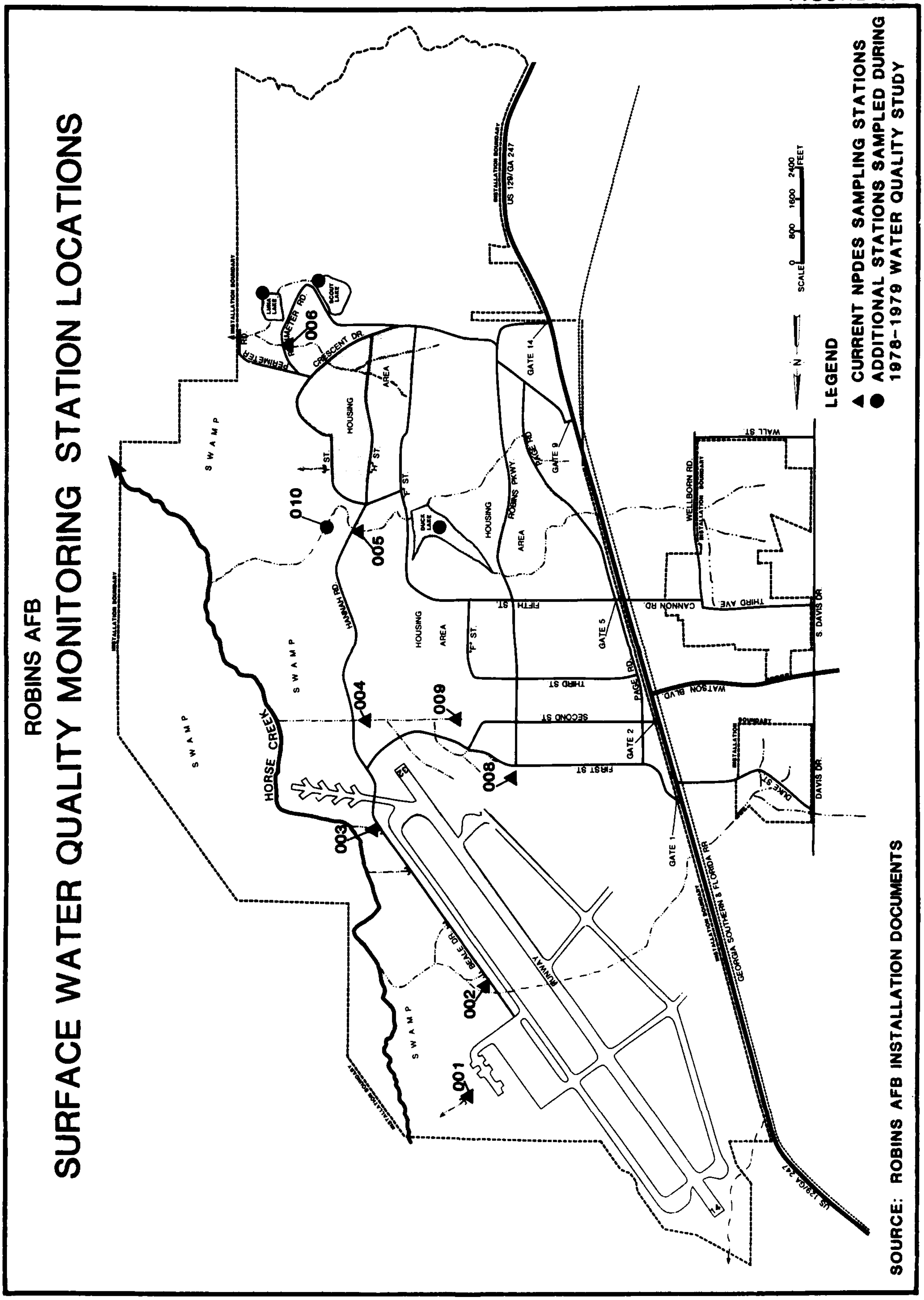
The 1978-1979 water quality survey detected levels of phenol from 0.05 to 1.5 mg/l in the Hannah Road runoff ditch, Station 004. Ammonia-nitrogen concentrations at Station 004 ranged between 4.0 and 8.6 mg/l and manganese concentrations ranged from 0.057 to 0.18 mg/l. The phenol and ammonia values may be attributable to the sanitary sewage treatment plant No. 1 discharge or to seepage from past landfills adjacent to the creek. The 1981 NPDES data revealed only one sample which exceeded the 2.0 mg/l ammonia nitrogen limitation at a concentration of 2.4 mg/l. Phenols were not sampled at this location; however, the phenol data collected directly from the sanitary treatment plant No. 1 effluent (Station 009) were at or below the NPDES limits. Oil and grease concentrations ranged from 0.3 to 6.2 mg/l at Station 004 and from 0.2 to 4.7 mg/l at Station 009. The oil and grease concentrations at Station 004 was frequently higher than those detected upstream at Station 009, signifying that oil and grease may be entering the ditch at some point downstream of the industrial wastewater treatment plant.

All remaining monitoring stations were found to have good water quality values. The only noticeably high constituent detected was total iron in samples collected from Stations 001 and 005 during the 1978-1979 survey. These concentrations ranged from 0.28 to 3.4 mg/l for Station 001 and 0.57 to 1.8 mg/l for Station 005.

WETLAND AREAS

Robins AFB has 1,178 acres of wetlands in the form of an unimproved river swamp system. The swamp area provides important functions for the sustenance of aquatic life and water quality in the river and streams receiving its drainage. These functions include providing breeding

FIGURE 3.11


ROBINS AFB
SURFACE WATER QUALITY MONITORING STATION LOCATIONS
LEGEND
▲ CURRENT NPDES SAMPLING STATIONS
● ADDITIONAL STATIONS SAMPLED DURING 1978-1979 WATER QUALITY STUDY
SCALE 0 800 1600 2400 FEET
N
SOURCE: ROBINS AFB INSTALLATION DOCUMENTS
001
002
003
004
005
006
008
009
010
HORSE CREEK
SWAMP
HOUSING AREA
RUNWAY
GATE 1
GATE 2
GATE 5
GATE 9
GATE 14
FIRST ST
SECOND ST
THIRD ST
FIFTH ST.
"F" ST.
HANNAH RD.
CRESCENT DR.
PERIMETER RD.
PAGE RD.
ROBINS PKWY.
WATSON BLVD.
CANNON RD.
THIRD AVE.
WELLBORN RD.
WALL ST.
S. DAVIS DR.
DAVIS DR.
DUKE ST.
GEORGIA SOUTHERN & FLORIDA RR
US 129/GA 247
INSTALLATION BOUNDARY
DUCK LAKE
SCOUT LAKE

grounds for various aquatic organisms as well as providing the streams with vital organic matter which serves as a food source for the many organisms inhabiting these areas. In addition, the swamp is known to harbor two species of animals listed by the Federal government as threatened or endangered. These species are the American alligator and the red-cockaded woodpecker. Ten alligators have been sighted on Robins AFB and it is estimated that approximately 15-20 alligators actually exist on base. Approximately ten red-cockaded woodpeckers have been sighted on the base. A list of the threatened or endangered vertebrate species potentially present is included in Appendix C. There are also several species of threatened or endangered plants which potentially occur within the swamp area.

Summary of Environmental Settings

The environmental setting data reviewed for this study indicate the following key items concerning the impact of past waste disposal practices on the base:

- Alluvial deposits cover the upper 20 to 40 feet of the base. The eastern part of the base is swampy with peat deposits covering the upper 10 to 15 feet and underlain by a thin layer of clay. The western part of the site consists of more sandy alluvial deposits which extend eastward below the swamp deposits.
- The water table beneath the base is shallow, particularly to the east where a surface discharge contributes toward the creation of a swampy area. In the western part of the base, the surface soils are sandy and infiltration of precipitation is expected to be high. This infiltration may directly recharge the shallow aquifer.
- The primary regional aquifer, the Cretaceous aquifer, underlies Robins AFB at a depth of about 40 to 50 feet and extends to a depth of approximately 650 feet below the surface. It consists of sand with a few clay lenses interspersed throughout its thickness.
- Robins AFB obtains its water supply from twelve wells distributed over the installation. The City of Warner Robins has a separate system consisting of 11 wells, located throughout the

city. All wells are drilled into the Tuscaloosa Formation of the Cretaceous aquifer.

- Recharge for the Cretaceous aquifer occurs west of Robins AFB where the Providence sand outcrops at the surface. Some recharge may also occur beneath the base as some interconnection between alluvial and underlying deposits may occur.
- Area precipitation rates (44.1 inches per year) are higher than potential evapotranspiration rates (42 inches per year).
- Approximately 1200 acres of wetlands in the form of an unimproved river swamp system are located on the east side of the base. The wetlands are known to harbor two species of animals listed by the Federal government as threatened or endangered; American alligator and the red-cockaded woodpecker.

From these major points, it may be seen that the potential for the generation and migration of contamination caused by past waste disposal practices is high. The presence of shallow ground-water contaminants has been documented near landfill No. 4 (LETCO, 1980). Although the production wells located on the base are several hundred feet deep, some degree of interconnection between upper and lower aquifers potentially could occur. Information obtained from base production wells and from ground-water monitoring data (LETCO, 1980) indicate that the base is located in a ground-water discharge area; i.e. the hydraulic gradient is upward. However, the production wells will alter this gradient within their particular zone of influence and may induce the downward movement of leachate. On the eastern edge of the base, some migrating contaminants may be transported in shallow ground-water flow and discharged at the surface into the swamp.

CHAPTER 4

FINDINGS

CHAPTER 4

FINDINGS

To assess hazardous waste management at Robins Air Force Base, waste generation and disposal methods were reviewed. This chapter summarizes the hazardous waste generated by activity, describes waste disposal methods, identifies the disposal sites located on the base, and evaluates the potential for contaminant migration.

PAST SHOP AND BASE ACTIVITY REVIEW

To identify past base activities that resulted in generation and disposal of hazardous waste, a review was conducted of current and past waste generation and disposal methods. This review consisted of interviews with base employees, a search of files and records, and site inspections.

The source of most hazardous wastes on Robins AFB can be associated with one of the following activities:

- o Industrial shops
- o Fire protection training
- o Pesticide utilization
- o Fuels management

The following discussion addresses only those wastes generated on base which are either hazardous or potentially hazardous. In this discussion a hazardous waste is defined as hazardous by the Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA). A potentially hazardous waste is one which is suspected of being hazardous although insufficient data are available to fully characterize the waste material.

Industrial Shops

The industrial operations at Robins AFB can be divided into two major groups as follows: The Directorate of Maintenance and other base facilities or tenant organizations. Five major divisions embody the majority of the shop activities for the Directorate of Maintenance. The divisions include the Aircraft Division, Plant Management Division, Airborne Electronics Division, Quality Division and Industrial Products Division. A principal source of waste materials generated at Robins AFB has been the Directorate of Maintenance areas.

Other base maintenance support activities include the industrial shops from the Directorate of Distribution, the 2853rd Air Base Group, the 2853rd Civil Engineering Squadron, the 5th Combat Communications Group, the 19th Bombardment Wing, and the 1926th Communication Installation Group. These industrial operations include primarily vehicle, electrical and aircraft maintenance and repair.

In order to identify those shops which handle hazardous materials and/or generate hazardous waste, a review was made of the Bioenvironmental Engineering Services Division shop files. The results of this file review are shown in Appendix D, Master List of Industrial Shops.

For those shops identified that handled hazardous materials or generated hazardous waste, key personnel within the Directorate of Maintenance and other base maintenance support functions were interviewed. A timeline of disposal methods was established for major wastes generated. The information from the interviews with base personnel and base records is summarized in Table 4.1. This table shows the building locations as well as the waste material names, waste quantities, and disposal method timeline.

TABLE 4.1

INDUSTRIAL OPERATIONS (Shops)

HAZARDOUS WASTE MANAGEMENT

SHOP NAME	LOCATION (BLDG. NO.)	WASTE MATERIAL	WASTE QUANTITY[1]	METHOD(S) OF TREATMENT, STORAGE & DISPOSAL (1950 – 1960 – 1970 – 1980)
DIRECTORATE of DISTRIBUTION				
HAZARDOUS CHEMICAL STORAGE	327	NON-SALABLE PAINT STRIPPERS	10 to 15 GALS./YR.	SANITARY SEWER → IWTP[2]
		NON-SALABLE, EXPIRED SHELF-LIFE CHEMICALS	15 to 30 LBS./YR.	DPDO[4] ON-BASE LANDFILLS → DPDO OFF-BASE CONTRACTORS
		DDT	20 to 40 LBS./2 to 5 YRS.	DPDO ON-BASE LANDFILLS → DPDO OFF-BASE CONTRACTORS
PAINT SHOP	354	PAINT SHOP WASTES, MISCELLANEOUS	25 GALS./MO.	1950 DRUMMED TO BASE LANDFILLS → DPDO
GUN ROOM (Cleaning)	368	SOLVENTS	25 GALS./18 MOS.	1980 DPDO
DIRECTORATE of MAINTENANCE				
AIRCRAFT DIVISION				
CORROSION CONTROL	54 (1979 to Present) 110 (to 1979)	PHENOLIC/NON-PHENOLIC PAINT STRIPPERS	1,500 to 2,000 GALS./WK.	NEGLIGIBLE STRIPPING → 1957 STORM SEWER → IWTP
		PHOSPHORIC ACID CLEANER	800 GALS./MO.	NEUTRALIZED TO SANITARY SEWER → IWTP
		CHROMIC ACID CLEANER	800 GALS./MO.	CHEMICAL REDUCTION TO STORM SEWER → IWTP
		PD-680	55 GALS./WK.	BURNED IN FPT[3] AREAS → DPDO
PAINT SHOP	?/89 (Bldg. 89 - 1964 to Present)	PAINT RESIDUE, THINNERS & SOLVENTS	800 GALS./MO.	STORM SEWER OR BURNED IN FPT AREAS → SLUDGE LAGOON OR ON-BASE LANDFILL → DPDO
NOSE DOCKS	44, 47, 48 & 49	PD-680 HYDRAULIC FLUID	100 GALS./MO.	BURNED IN FPT AREAS → DPDO
ENGINE REPAIR SHOP	125	PD-680 WASTE OILS	50 GALS./MO.	BURNED IN FPT AREAS → DPDO
LANDING GEAR SHOP	125	PD-680	50 GALS./2 MOS.	BURNED IN FPT AREAS → DPDO

KEY

?/ ACTIVITY ASSUMED TO OCCUR IN A SHOP LOCATED ELSEWHERE

——— CONFIRMED TIME-FRAME DATA BY SHOP PERSONNEL

------- ESTIMATED TIME-FRAME DATA BY SHOP PERSONNEL

(1) BASED ON CURRENT RATES AND BEST ESTIMATES OF PAST RATES

(2) IWTP = INDUSTRIAL WASTE TREATMENT PLANT

(3) FPT = FIRE PROTECTION TRAINING

(4) DPDO = DEFENSE PROPERTY DISPOSAL OFFICE

TABLE 4.1 (continued)

INDUSTRIAL OPERATIONS (Shops)

HAZARDOUS WASTE MANAGEMENT

SHOP NAME	LOCATION (BLDG. NO.)	WASTE MATERIAL	WASTE QUANTITY	METHOD(S) OF TREATMENT, STORAGE & DISPOSAL (1950 – 1960 – 1970 – 1980)
AIRBORNE ELECTRONICS DIVISION				
COMPOSITE - ALL SHOPS	640 & 645	ACETONE PD-680 METHLYENE CHLORIDE METHYL ETHYL KETONE PAINT THINNERS POLYSULFIDE SEALANT TRICHLOROETHYLENE (to '79) TRICHLOROETHANE (from '79)	600 to 800 GALS./MO. (1950s to 1972) 100 GALS./WK. (1972 to Present)	BURNED IN FPT AREAS → SLUDGE LAGOON OR ON-BASE LANDFILLS → DPDO
		PAINT WASTE	100 GALS./WK.	STORM SEWER OR BURNED IN FPT AREAS → SLUDGE LAGOON OR ON-BASE LANDFILLS → DPDO
INDUSTRIAL PRODUCTS DIVISION				
PAINT SHOP	125	PAINT RESIDUE, THINNERS & SOLVENTS	50 to 100 GALS./2 WKS.	STORM SEWER OR BURNED IN FPT AREAS → SLUDGE LAGOON OR ON-BASE LANDFILLS → DPDO
TURRET SHOP	?/140 (Bldg. 140 - 1971 to Present)	PD-680	110 GALS./MO.	BURNED IN FPT AREAS → DPDO
		TRICHLOROETHYLENE	50 GALS./WK.	BURNED IN FPT AREAS → DPDO
		WASTE OILS	100 GALS./MO.	BURNED IN FPT AREAS → DPDO
		METHYL ETHYL KETONE	110 GALS./MO.	BURNED IN FPT AREAS → SLUDGE LAGOON OR ON-BASE LANDFILLS → DPDO
PROPELLER & PROP CLEANING	?/140 (Bldg. 140 - 1971 to Present)	HYDRAULIC FLUID	50 GALS./MO.	BURNED IN FPT AREAS → DPDO
		TRICHLOROETHYLENE	50 GALS./MO.	BURNED IN FPT AREAS → DPDO
		CARBON REMOVER, PHENOLIC	100 GALS./MO.	BURNED IN FPT AREAS → SLUDGE LAGOON
ELECTROPLATING SHOP	142 (1969 to Present) 130 (1955 to 1969) 125 (1940s to 1955)	CHROME BATHS	200 to 400 GALS./YR.	CHEMICAL REDUCTION TO STORM SEWER → IWTP
		WASTE ACID CLEANERS SLUDGE	200 LBS./YR.	STORM SEWER → IWTP
		CYANIDE BATHS	500 GALS./YR.	SANITARY SEWER → IWTP

TABLE 4.1 (continued)

INDUSTRIAL OPERATIONS (Shops)

HAZARDOUS WASTE MANAGEMENT

SHOP NAME	LOCATION (BLDG. NO.)	WASTE MATERIAL	WASTE QUANTITY	METHOD(S) OF TREATMENT, STORAGE & DISPOSAL (1950 – 1960 – 1970 – 1980)
INDUSTRIAL PRODUCTS DIVISION (continued)				
ELECTROPLATING SHOP (continued)	142 (1969 to Present); 130 (1955 to 1969); 125 (1940s to 1955)	WASTE ALKALINE CLEANERS	400 GALS./3 MOS.	STORM SEWER → IWTP
		TRICHLOROETHYLENE	150 GALS./WK.	BURNED IN FPT AREAS → DPDO
		TRICHLOROETHANE	150 GALS./WK.	BURNED IN FPT AREAS → DPDO
		PERCHLORETHYLENE	150 GALS./WK.	BURNED IN FPT AREAS → DPDO
HYDROSTATIC TESTING	150	PAINT WASTES & RESIDUE	30 GALS./MO.	STORM SEWER OR BURNED IN FPT AREAS → SLUDGE LAGOON OR ON-BASE LANDFILLS → DPDO
BATTERY SHOP	150	WASTE ACIDS	25 GALS./MO.	STORM SEWER → IWTP
PARTS CLEANING & METAL BOND	169	PAINT STRIPPER, PHENOLIC	110 GALS./DAY	SANITARY SEWER → IWTP
		TRICHLOROETHANE	55 GALS./WK.	BURNED IN FPT AREAS → DPDO
PLASTICS SHOP & RADOME SHOP	670 & 680	METHYL ETHYL KETONE, TOLUENE	150 GALS./MO.	BURNED IN FPT AREAS → SLUDGE LAGOON OR ON-BASE LANDFILLS → DPDO
		PAINT RESIDUE	50 GALS./3 WKS.	STORM SEWER OR BURNED IN FPT AREAS → SLUDGE LAGOON OR ON-BASE LANDFILLS → DPDO
5 COMBAT COMMUNICATIONS GROUP (CCG)				
GROUND POWER SHOP	614	WASTE GENERATOR OIL	110 GALS./MO.	1964 DPDO
VEHICLE MAINTENANCE	655	SKIMMED OIL SLUDGE	100 GALS./4 MOS.	SLUDGE LAGOON OR ON-BASE LANDFILLS → 1974 → DPDO
19 BOMBARDMENT WING (BW)				
FIELD MAINTENANCE SQUADRON (FMS)				
FUEL SYSTEM SHOP	52	SKIMMED OIL/FUEL SLUDGE	200 GALS./4 MOS.	1965 SLUDGE LAGOON OR ON-BASE LANDFILLS → DPDO

TABLE 4.1 (continued)

INDUSTRIAL OPERATIONS (Shops)

HAZARDOUS WASTE MANAGEMENT

SHOP NAME	LOCATION (BLDG. NO.)	WASTE MATERIAL	WASTE QUANTITY	METHOD(S) OF TREATMENT, STORAGE & DISPOSAL (1950 1960 1970 1980)
19 BOMBARDMENT WING (BW) (continued)				
FIELD MAINTENANCE SQUADRON (FMS) (continued)				
PNEUDRAULICS SHOP	79	PD-680	160 GALS./6 MOS.	1965 DPDO →
		HYDRAULIC FLUID	1 QT./MO.	1965 DISPOSED OF AT BLDG. 79 →
ELECTRIC SYSTEMS SHOP	79	WASTE BATTERY ACID	10 GALS./6 MOS.	1965 IWTP VIA BLDG. 150 →
CORROSION CONTROL	80	PAINT RESIDUE, THINNERS, PAINT STRIPPERS, ACID CLEANERS, METAL BRIGHTENERS	55 GALS./MO.	1965 SLUDGE LAGOON OR ON-BASE LANDFILLS → DPDO →
AEROSPACE GROUND EQUIPMENT (AGE) REPAIR SHOP & AGE SERVICEING SHOP	82 & 85	JP-4	100 GALS./MO.	1965 DPDO →
		MOGAS	100 GALS./MO.	1965 DPDO →
		HYDRAULIC FLUID, PAINT THINNER, PAINT STRIPPER, LUBRICATION OIL	200 GALS/MO.	1965 SLUDGE LAGOON OR ON-BASE LANDFILLS → DPDO →
PROPULSION BRANCH	76	JP-4	100 GALS./MO.	1965 DPDO →
		ENGINE OIL	10 GALS./MO.	1965 DPDO →
MUNITION MAINTENANCE SQUADRON				
EQUIPMENT MAINTENANCE BRANCH	86	HYDRAULIC FLUID	Also included in AGE Shop waste total	SLUDGE LAGOON OR ON-BASE LANDFILLS → DPDO →
		PD-680	36 GALS./MO.	1965 DPDO →

TABLE 4.1 (continued)

INDUSTRIAL OPERATIONS (Shops)

HAZARDOUS WASTE MANAGEMENT

SHOP NAME	LOCATION (BLDG. NO.)	WASTE MATERIAL	WASTE QUANTITY	METHOD(S) OF TREATMENT, STORAGE & DISPOSAL (1950 – 1960 – 1970 – 1980)
19 BOMBARDMENT WING (BW) (continued)				
ORGANIZATION MAINT. SQUADRON				
BOMBER-PHASE MAINTENANCE	67	ENGINE OIL	100 GALS./MO.	1965 DPDO →
TANKER-PHASE MAINTENANCE	81	HYDRAULIC FLUID	100 GALS./MO.	1965 DPDO →
1926 COMMUNICATIONS & INSTALLATION GROUP				
MINOR VEHICLE MAINTENANCE	978	SKIMMED OIL SLUDGE	20 to 30 GALS./YR.	1965 SLUDGE LAGOON OR ON-BASE LANDFILLS → DPDO
WEATHER EQUIPMENT REPAIR	1684	WASTE OILS, FLUIDS	5 GALS./YR.	1955 DPDO →
2853 AIR BASE GROUP (ABG)				
VEHICLE TRANSPORTATION DIVISION				
FUEL VEHICLE REPAIR	190	MOTOR OIL	800 GALS./MO.	BURNED IN FPT AREAS → DPDO
VEHICLE MAINTENANCE SHOP	302	AUTOMATIC TRANS. FLUID		
AUTO MAINTENANCE SHOP	307	HYDRAULIC FLUID		
PAINT & BODY SHOP	304	THINNERS & PAINT REMOVER	55 GALS./YR.	STORM SEWER OR BURNED IN FPT AREAS → SLUDGE LAGOON OR ON-BASE LANDFILLS → DPDO
		PAINT BOOTH SLUDGE	55 GALS./3 YRS.	STORM SEWER → SLUDGE LAGOON OR ON-BASE LANDFILLS → DPDO
		PAINT RESIDUE	55 GALS./2 YRS.	STORM SEWER → SLUDGE LAGOON OR ON-BASE LANDFILLS → DPDO
2853 CIVIL ENGINEERING SQUADRON (CES)				
INDUSTRIAL WASTE TREATMENT PLTS.	141, 147 & 314	IWTP SLUDGES	900 CU. YDS./YR.	SANITARY SEWER, STORM SEWER OR ON-BASE LANDFILLS → SLUDGE LAGOON → SLUDGE DEWATERING FACILITY
TRANSFORMER STORAGE	1190	PCB TRANSFORMERS	1 to 2 EA./2 to 5 YRS.	ELECTRIC REHABILITATION CONTRACTORS (CES) → DPDO

TABLE 4.1 (continued)

INDUSTRIAL OPERATIONS (Shops)

HAZARDOUS WASTE MANAGEMENT

SHOP NAME	LOCATION (BLDG. NO.)	WASTE MATERIAL	WASTE QUANTITY	METHOD(S) OF TREATMENT, STORAGE & DISPOSAL (1950 – 1960 – 1970 – 1980)
2853 CIVIL ENGINEERING SQUADRON (CES)				
PAINT SHOP	275	PAINT RESIDUE	100 GALS./3 MOS.	STORM SEWER OR BURNED IN FPT AREAS → SLUDGE LAGOON OR ON-BASE LANDFILLS → DPDO
		THINNERS	50 GALS./3 MOS.	STORM SEWER OR BURNED IN FPT AREAS → SLUDGE LAGOON OR ON-BASE LANDFILLS → DPDO
ENTOMOLOGY UNIT	295 & 296	RINSED CONTAINERS	10 to 20 EA./YR.	ON-BASE LANDFILLS → COUNTY LANDFILL
		OFF-SPEC GRANULAR MALATHION	40 TONS (One-Time Occurrence)	ON-BASE LANDFILL (to 1964)
		AEROSOL CANS OF DDT	240 CANS (One-Time Occurrence)	HAZARDOUS WASTE BURIAL SITE (1976)
GROUNDS SHOP	591 & 593	RINSED CONTAINERS	10 to 12 EA./YR.	ON-BASE LANDFILLS (to 1967)

From the early 1940's to approximately 1965, many ignitable waste chemicals and petroleum compounds were burned in fire protection training pits during training exercises. Waste solvents were burned in the fire protection training pits through approximately 1955, then the base began disposal of the material through resale or reuse. Rinse water from the plating and painting operations were previously discharged to the storm sewer. Cyanide solutions from the plating facility were discharged to the sanitary sewer system.

Burning of ignitable and other chemical waste in the fire protection training pits was decreased about 1965 due to air quality considerations. An industrial waste treatment system became operational in 1964 and expanded in 1969. Treatment began of waste streams from facilities such as the Electroplating Shop and the Corrosion Control Shop which had previously discharged to the storm sewer or sanitary sewer. A sludge lagoon was also constructed in the mid-1960's to dispose of industrial waste treatment plant sludge. Many types of waste chemicals and chemical sludges were also disposed of in the sludge lagoon. Paint residue, thinners and paint skimmings were typically disposed of in the on-base landfills. Petroleum products were sold by DPDO beginning in approximately 1965.

In 1978, the on-base disposal of all hazardous solid wastes and most non-hazardous solid waste was discontinued. Solid wastes were disposed of off-base by contract disposal. New industrial waste treatment plant sludge disposal facilities were also completed and started up about this time.

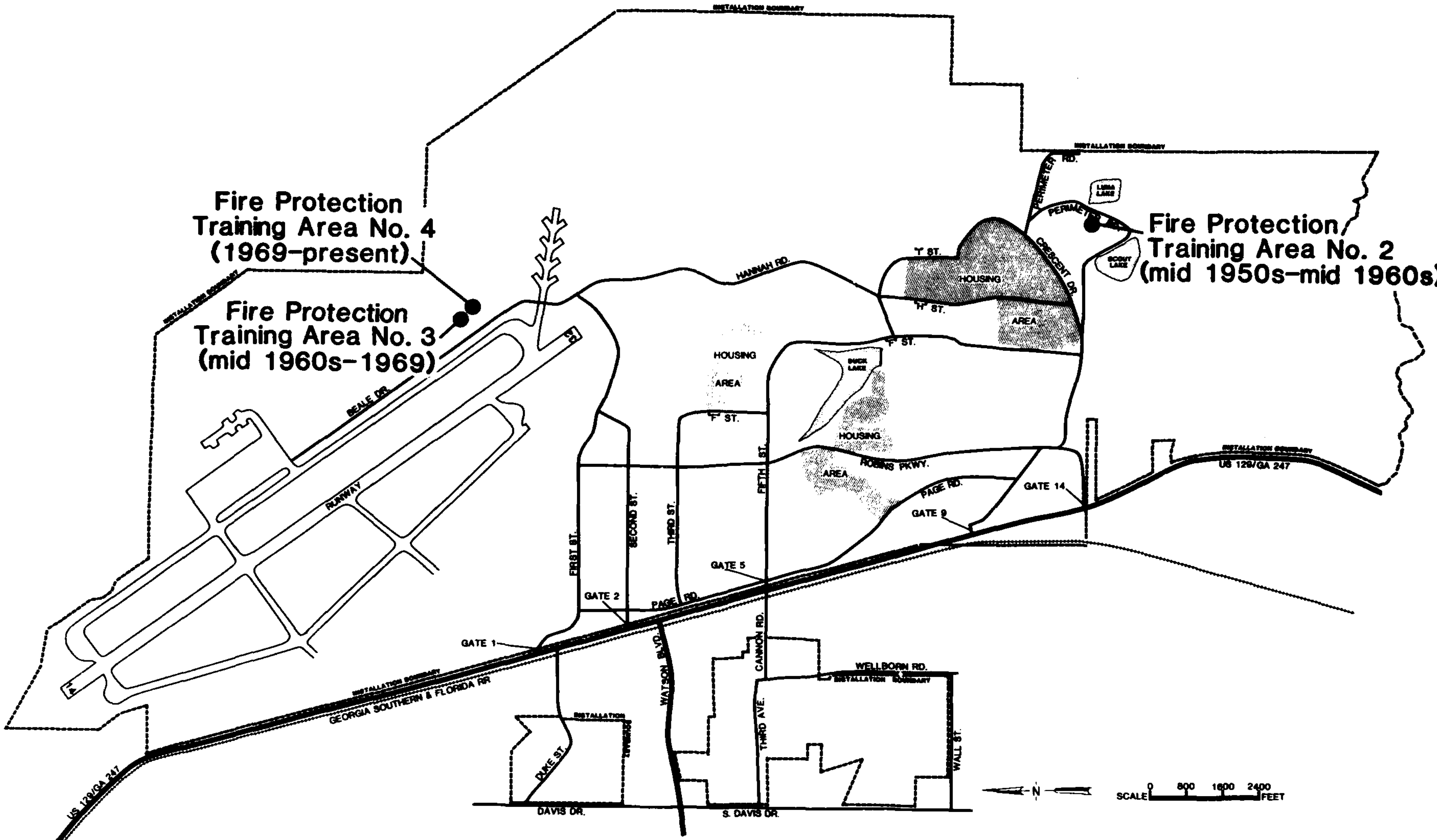
Fire Protection Training

The Fire Department has operated four fire protection training areas since 1943. These areas were used for practice exercises where petroleum based fires are set and then extinguished. The following list gives specific designation for the areas and their approximate period of use (See Figure 4.1).

Fire Protection Training Area	Period of Operation
No. 1	1943-mid 1950's
No. 2	Mid 1950's-mid 1960's
No. 3	Mid 1960's-1969
No. 4	1969-present

ROBINS AFB

FIRE PROTECTION TRAINING AREAS



NOTE: FIRE PROTECTION TRAINING AREA No. 1 IS SITUATED IN THE AREA BETWEEN SECOND STREET AND THE SOUTHERN END OF THE MAIN RUNWAY

SOURCE: ROBINS AFB INSTALLATION DOCUMENTS

In the past, the common mode of operation was for the Fire Department to dump drums of contaminated fuel, oil, solvents, and ignitable chemicals on previously water saturated ground. The area was repeatedly ignited and extinguished during each exercise until it would no longer burn. This was the standard procedure until air pollution control regulations became more stringent in the mid 60's. These regulations curtailed the number of exercises and required the use of only uncontaminated JP-4 (less than 10 percent contaminants).

High pressure water was used to extinguish fires at Robins AFB until the introduction of protein foam in 1950. The protein foam was replaced in 1972 by the AFFF as an extinguishing agent for fire fighting training exercises.

Fire Protection Training Area No. 1

Fire protection training area No. 1 was located in the general vicinity of landfills No. 1 & No. 2, near the POL bulk storage area, however, the exact location of fire protection training area No. 1 could not be determined. This area was an unlined pit surrounded with earthen dikes and was used twice a week from 1943 until the mid 1950's.

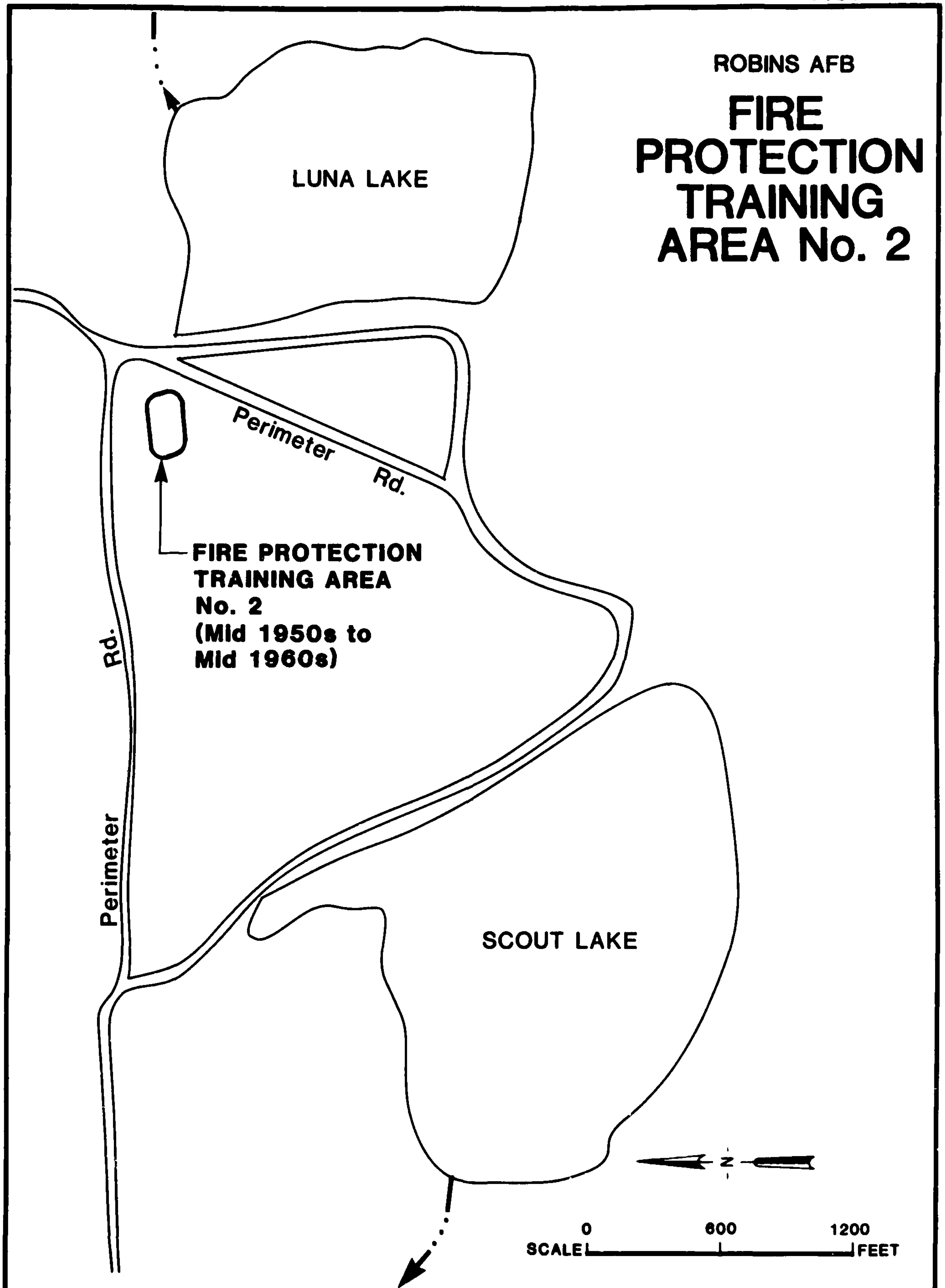
Fire Protection Training Area No. 2

Fire protection training area No. 2 was actually a number of sites in the general area of Lake Luna as shown in Figure 4.2. These sites were used from the mid 1950's until the early to mid 1960's. During this period the Fire Department did not use a pit but conducted training exercises on open sites. Operating procedures included saturating the ground with water and then burning various flammable materials or chemical wastes.

Fire Protection Training Area No. 3

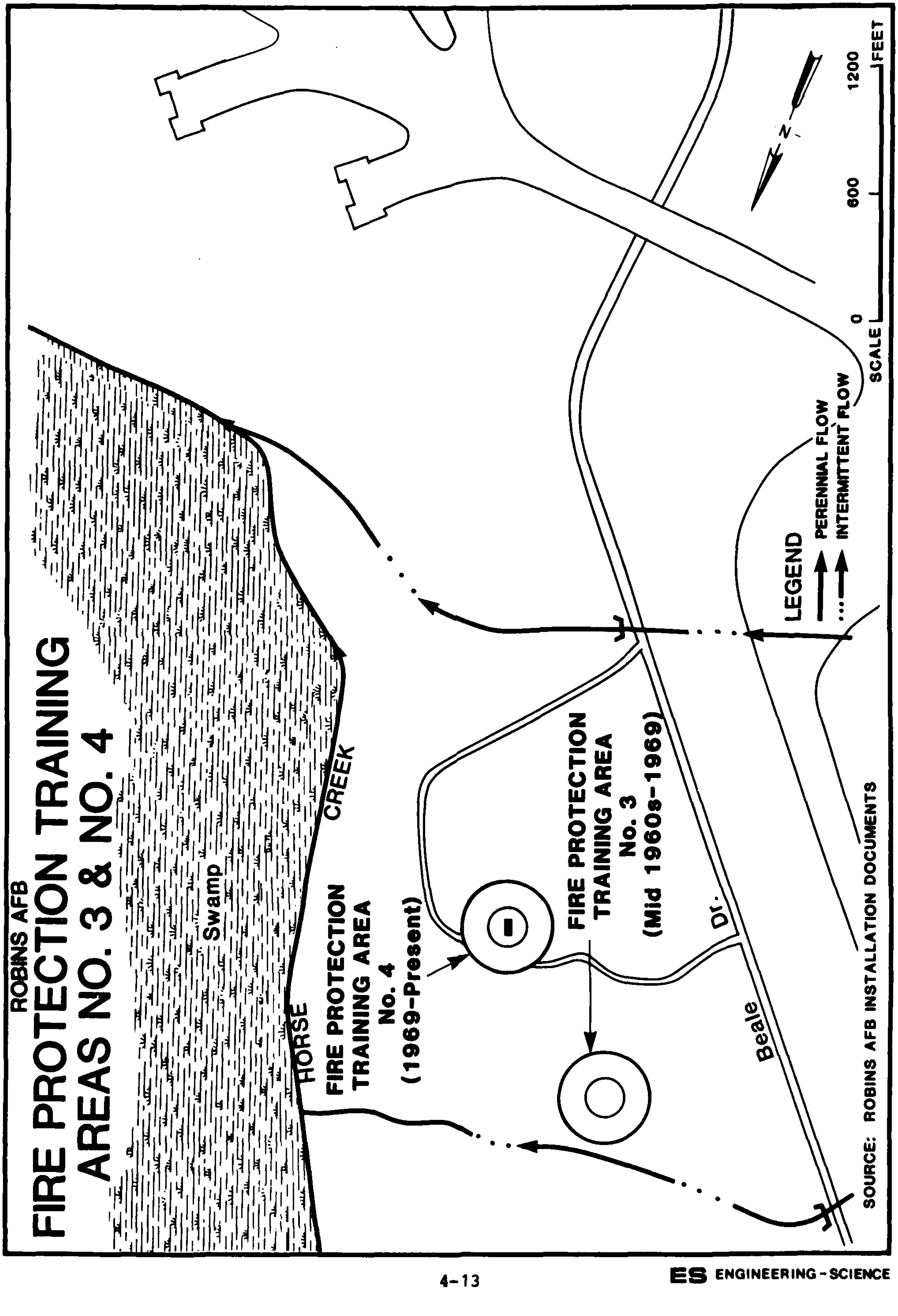
Fire protection training area No. 3, was another diked, unlined pit. This area was located close to the present site (No. 4), as shown in Figure 4.3. The site was operated from the early 1960's until the construction of the present training area in 1969. As previously mentioned, air pollution regulations curtailing the number of exercises and requiring the use of only uncontaminated fuel became effective during this period.

FIGURE 4.2



SOURCE: ROBINS AFB INSTALLATION DOCUMENTS

FIGURE 4.3


ROBINS AFB
FIRE PROTECTION TRAINING
AREAS NO. 3 & NO. 4
Swamp
HORSE
CREEK
FIRE PROTECTION
TRAINING AREA
No. 4
(1969-Present)
FIRE PROTECTION
TRAINING AREA
No. 3
(Mid 1960s-1969)
Dr.
Beale
LEGEND
PERENNIAL FLOW
INTERMITTENT FLOW
N
0
600
1200
FEET
SCALE
SOURCE: ROBINS AFB INSTALLATION DOCUMENTS

Fire Protection Training Area No. 4

The current site, fire protection training area No. 4, is a concrete lined, diked pit located in the SAC area as shown in Figure 4.3. Permanent fuel tanks with gravity feed were also installed during construction. Training exercises are limited to twice per quarter using uncontaminated JP-4.

Pesticide Utilization

Pest control has been an on-going program since the inception of Robins AFB. The Entomology Shop initially administered the pest control program while the grounds and pavements shop was responsible for weed control. In 1967, the two programs were combined and the Entomology Shop became responsible for both programs. The Entomology Shop has always been located in building 295 and the chemical storage areas have been situated in the facilities neighboring the shop. Grounds and pavements has been located in the same compound as Entomology occupying facilities 294 and 286.

The pesticide program entails routine and specific job order spraying. Both truck-mounted and hand-held sprayers are utilized. A listing of the pest and weed control chemicals presently on hand is included in Appendix C. Standard procedures include mixing and using all pesticides immediately or storing any residual mixtures for use within 15 to 30 days. In 1966, a wash rack was constructed in an area adjacent to the Entomology Shop to rinse empty containers and spray equipment. Water collected in the wash rack is stored in an underground tank. The water is routinely pumped and used as make-up water for chemical mixing. Prior to the wash rack installation, Entomology Shop personnel interviewed stated that excess herbicides were usually sprayed on the adjacent lot. Empty pesticide containers are presently triple rinsed, punctured or crushed and disposed along with the base refuse.

It was indicated by several base personnel that a one time quantity of pesticide, approximately 40 tons, had been disposed in Landfill No. 2. It is suspected that the material was a mixture of clay or aggregate with 1.5 to 10 percent granular malathion used for aerial spraying to control mosquitoes and gnats. Further investigation revealed that the disposal operation would likely have occurred prior to 1964.

In October 1979, 55 gallons of DDT solution leaked from a drum stored in a gravel section of the chemical storage area adjacent to building 295, (Figure 4.4). The Bioenvironmental Engineering Services Division collected soil samples from the site and the drainage paths from the storage area to determine the extent and degree of migration of the DDT (SGB, 1980). Soil under the gravel was found to be primarily a sandy loam. The chemical analyses were conducted by USAF OEHL, Brooks AFB, TX and are summarized below:

Location	Concentration DDT in ppm
Surface of soil under pallet	2144
Crystalline material from pallet	55
Soil sample 6"-10" under surface	7600
Soil sample 18" under surface	6760
10' west of pallet	1124
Surface - east runoff ditch	135
Drainage ditch at entrance to storm sewer	3

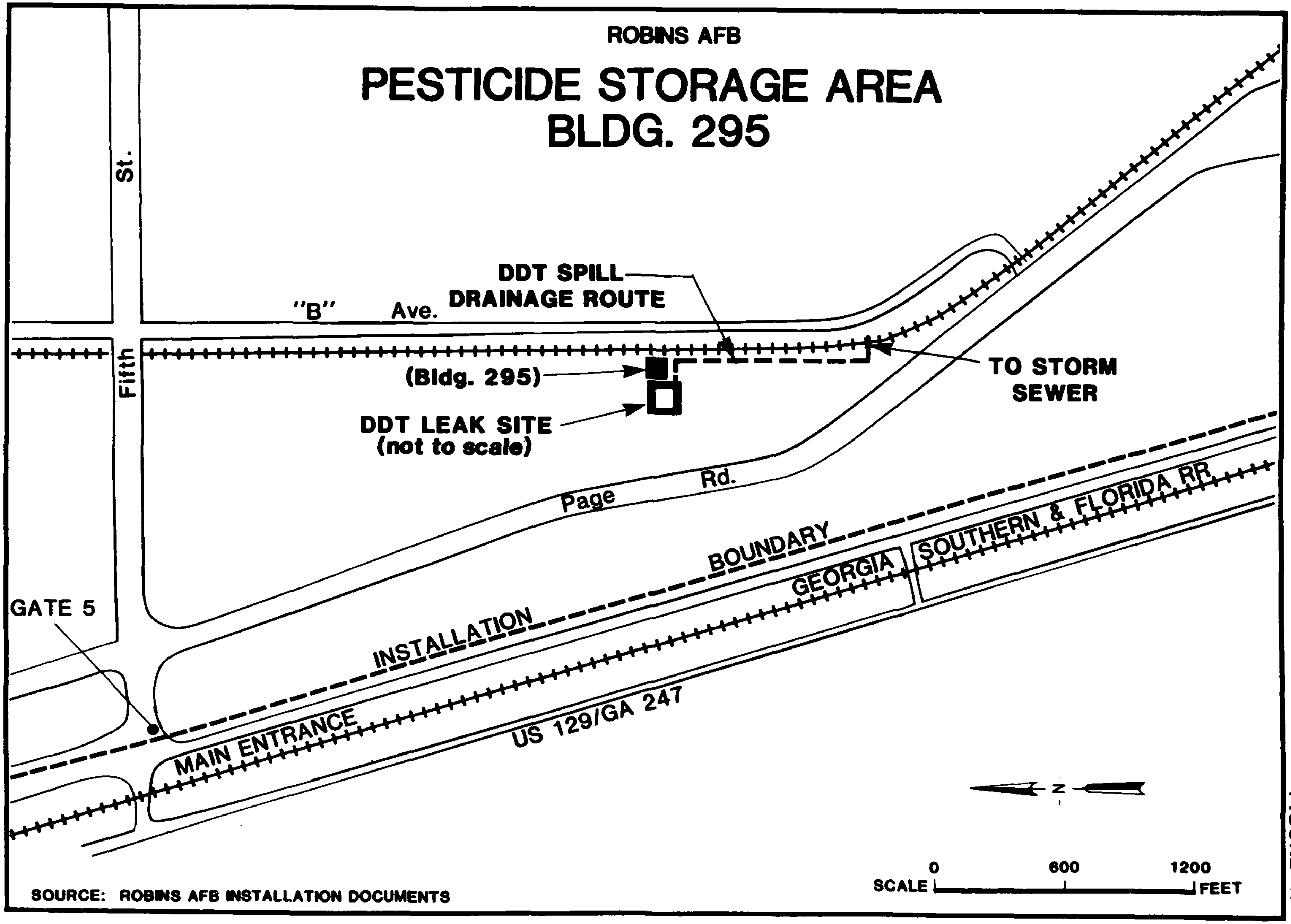
The area at the leak site has since been covered with an asphalt pad incorporating a four inch high curb along the perimeter. This area continues to serve as the drummed chemical storage area for the entomology shop.

Fuel Management

The Robins AFB Fuels Management storage system consists of numerous under-ground and above-ground storage tanks in various locations throughout the base. A description of major fuel, oil and chemical bulk storage capacities is summarized in Table 4.2. These include JP-4, DF-2 (distillate fuel), MOGAS, AVGAS, solvents, oil and other chemicals. Bulk storage of fuels is located in the fenced POL tank area. The JP-4 tanks in the bulk storage area are supplied by a four inch diameter steel pipe running from the Standard Transmission Corporation tank farm located north of the base on Georgia Highway 247. An eight inch diameter steel line supplies JP-4 to the SAC area from the POL storage area. The POL storage area was paved with concrete some time between 1978 and 1979. Prior to this time the containment dikes were tarred and the rest of the ground surface was covered with gravel.

Fuel storage tanks have been cleaned every three years and 1 to 50 gallons of sludge per tank was removed during cleaning. Until 1975, the

FIGURE 4.4



SOURCE: ROBINS AFB INSTALLATION DOCUMENTS

TABLE 4.2

SUMMARY OF MAJOR FUEL, OIL AND CHEMICAL STORAGE CAPACITIES

Robins Air Force Base

Item	No. of Tanks	Maximum Tank Volume (gals.)	Minimum Tank Volume (gals.)	Total Storage Volume (gals.)
JP-4	20	788,739	48,770	2,909,369
MOGAS	4	17,387	9,988	58,771
Fuel Oil	4	1,063,223	2,018	1,115,189
AVGAS	1	24,493	24,493	24,493
JPTS	1	24,963	24,963	24,963
Aluminum Sulfate	1	5,250	5,250	5,250
Sodium Hydroxide	1	16,000	16,000	16,000
Sulfuric Acid	1	16,000	16,000	16,000
Oil, Phillips 220	1	30,000	30,000	30,000
Solvents	1	1,400	1,400	1,400
Calibration Fluid	1	5,000	5,000	5,000

Note: Information obtained from Robins AFB Oil and Hazardous Substances - Pollution Contingency Plan, 30 September 1981.

sludge was dumped next to the cleaned tank, the area was roped off and the sludge allowed to weather. Sludges removed from the tanks are now disposed of off-base by contractor service through DPDO.

Spent fuel filters were placed in buckets to allow the fuel to evaporate. After the fuel filter has sufficiently weathered it was discarded into a dumpster to be disposed of with the general refuse.

Interviews with base personnel indicated there have been three major fuel spills on the base. A leak of an undetermined amount of JP-4 occurred from the four inch diameter supply line about the mid 1960's. The leak was located north of the POL bulk storage area by landfill No. 1. After the pipeline was repaired the pipe trench was closed and no attempt was made to recover the JP-4 that was spilled. JP-4 has been found in pipe trenches and other excavations in this general area on a regular basis since the leak occurred.

A second major spill of JP-4 occurred in the early 1970's. An estimated 60,000 gallon of fuel overflowed a tank in the POL storage area. The containment dike valve was left open and the fuel flowed into the drainage ditches leading to Horse Creek. Only a small portion of the spilled JP-4 was recovered. Contaminated soil in the affected area of the sump was excavated and removed.

A third JP-4 spill occurred in May of 1978 when approximately 1,000 gallons of fuel overflowed a tank in the storage area. This spill was contained and recovered.

Numerous small leaks were mentioned in the interviews along the four inch diameter JP-4 supply line and the eight inch diameter SAC JP-4 supply line. These pipelines were originally installed without cathodic protection and were susceptible to corrosion. Most of the pipe has been replaced and protection has been installed during the replacement effort.

DESCRIPTION OF PAST ON-BASE DISPOSAL METHODS

Prior to 1977, many waste materials generated at Robins AFB were disposed of or treated on the base by landfilling, burning in the fire protection training pits, or discharged to the sludge lagoon or industrial wastewater treatment plant. The collection and on-base transportation of liquid waste solvents from a portion of the various base organizations has been a contract service from 1974 to 1982. The contractor has been responsible for emptying and cleaning various degreasing vats, solution tanks and paint booths and containerizing the waste material. He was also responsible for transporting the waste from the on-base industrial facility to the on-base waste holding area. The waste holding area was located in the vicinity of industrial waste treatment plant No. 1 and Landfill No. 4 from approximately 1965 through 1979. From 1965 to 1974, base employees performed these services.

Since 1980, the Defense Property Disposal Office (DPDO) has been responsible for disposal of hazardous wastes. DPDO has awarded one year contracts that require the contractor to load and transport the materials for off-base reprocessing or disposal.

The on-site facilities which have been used for management and disposal of waste can be categorized as follows:

- Landfills
- Waste Dumps
- Sludge Lagoon
- Hazardous Waste Burial Sites
- Low Level Radioactive Waste Sites
- Industrial Wastewater Treatment Plant
- Sanitary Wastewater Treatment Plant
- Storm Sewers (Oil/Water Separators)
- Refuse Incineration

The types of waste management facilities are discussed individually in the following subsections.

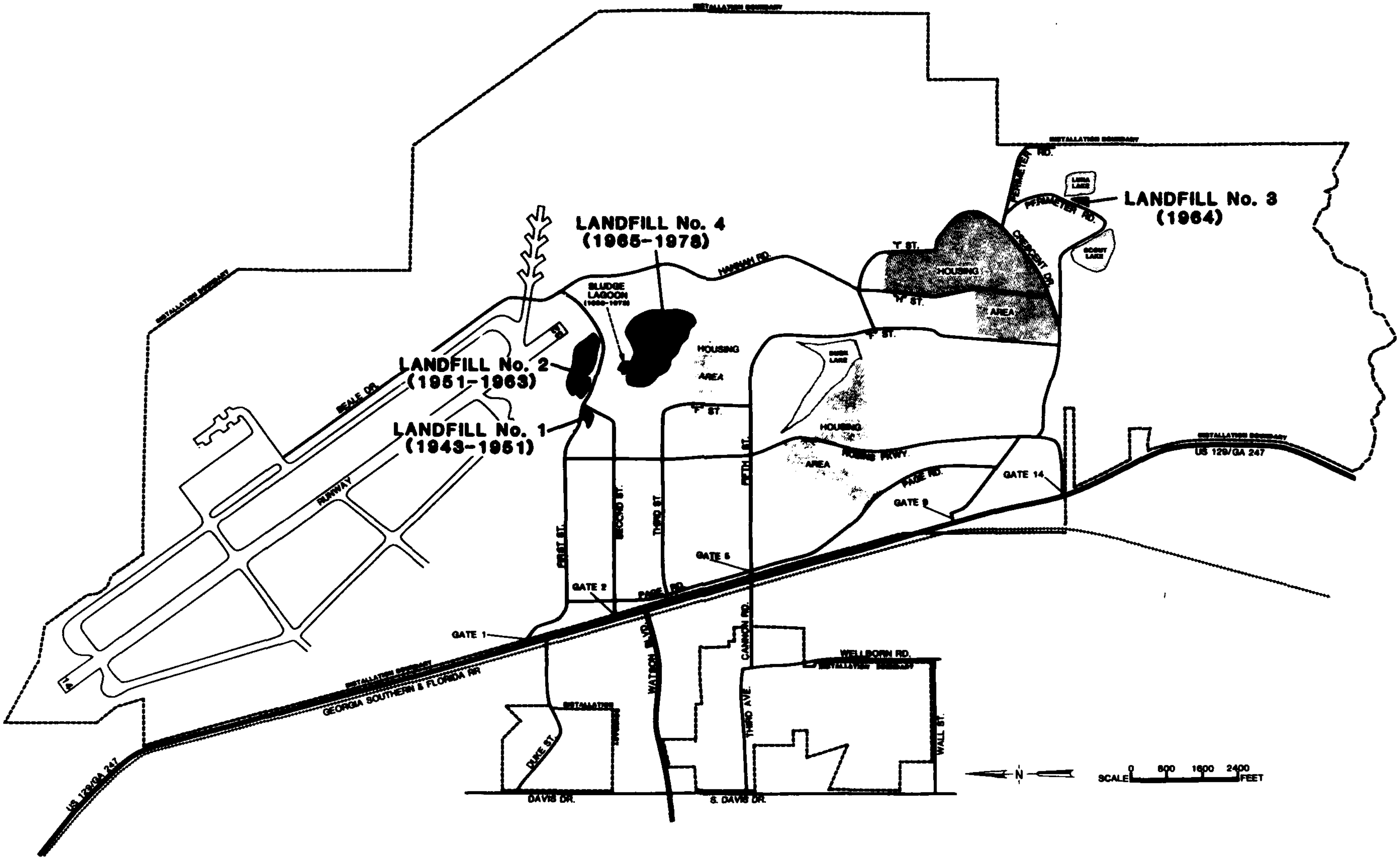
Landfills

On-base landfills have been used for disposal of non-hazardous and hazardous solid wastes at Robins Air Force Base. Landfills were operated at four locations on the base as shown in Figure 4.5. Table 4.3 contains a summary of pertinent information concerning each landfill disposal site. Since 1978, solid wastes have been hauled off-base and no landfills were operated on the base.

Landfill No. 1

Landfill No. 1 is located, as shown in Figure 4.6, near the south end of the runway, between the fuels management (POL) tank farm and Second Street. The site was operated from 1946 to 1951, encompassing an

ROBINS AFB
LANDFILL LOCATIONS



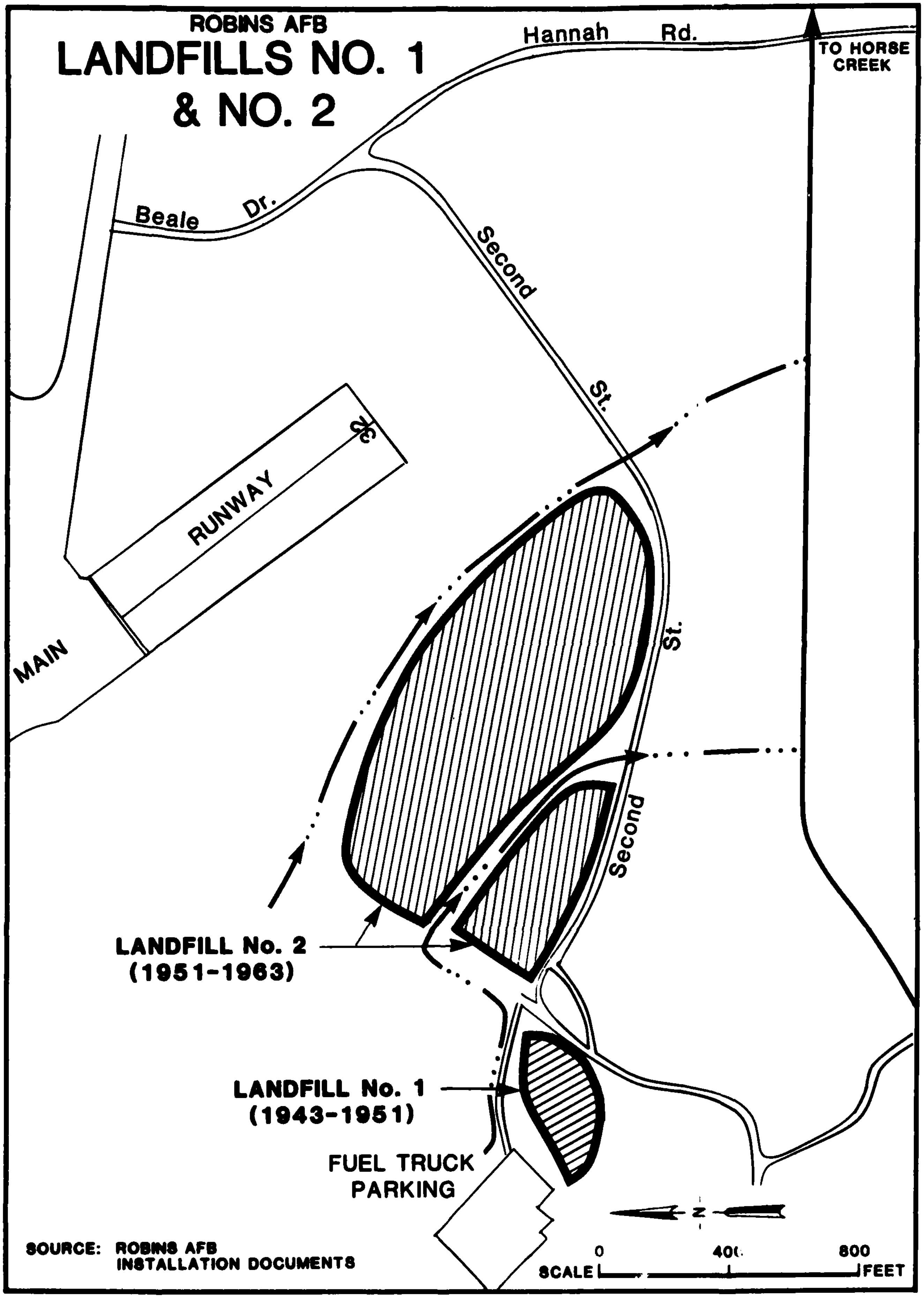
SOURCE: ROBINS AFB INSTALLATION DOCUMENTS

TABLE 4.3

SUMMARY OF LANDFILL DISPOSAL SITES

Landfill	Operation Period	Approximate Size (Acres)	Types of Wastes	Estimated Waste Quantity (cu.yd.)	Method of Operation	Closure Status	Surface Drainage	Comments
Number 1	1946-1951	2	•General Refuse •Probably some industrial wastes •Boiler bottom ash (daily cover) •Ash from refuse incinerator	65,500	Trench and daily bottom ash cover Filled in water table	Closed: cover of sandy-loam and local grasses. Impact sled located in area.	To Horse Creek and swamp	•Surface erosion on slope -landfilled material exposed •Leachate entering ditch -bright green color
Number 2	1951-1963	22	•General Refuse •Probably some industrial wastes •Boiler bottom ash (daily cover •Approx. 40 tons of granular malathion and aggregate	580,000	Trench and daily bottom ash cover Filled in water table. A wood burning face located on west	Closed: cover of sandy loam and local grasses, runway buffer area. Ponding on the surface.	To Horse Creek and swamp	•Water on surface of trench areas •Drainage stream traverses the site
Number 3	1964	2	•General Refuse	65,500	Surface dump in water table	Closed: cover of sandy loam. Used for a baseball field.	To Horse Creek and swamp	•Permeable soil •Close Proximity to Lake Luna
Number 4	1965-1978	45	•General Refuse •Probably some industrial wastes	484,000	Surface dump and daily cover with west end-trench and daily cover. Filled in water table of swamp	Closed: cover of sandy loam.	To Horse Creek and surrounding swamp	•Reported G.W. contamination (from monitoring wells installed 1980) •Permeable soil cover •Erosion on edges of fill •Waste chemical drums once stored on top of fill

FIGURE 4.6


ROBINS AFB
LANDFILLS NO. 1 & NO. 2
Hannah Rd.
TO HORSE CREEK
Beale Dr.
Second St.
RUNWAY
32
MAIN
Second St.
LANDFILL No. 2 (1951-1963)
LANDFILL No. 1 (1943-1951)
FUEL TRUCK PARKING
N
0
400
800
SCALE
FEET
SOURCE: ROBINS AFB INSTALLATION DOCUMENTS

area of approximately two acres. The landfill was a trench and fill operation with daily cover of bottom ash from the boiler. The area had been previously filled with a sandy loam. Trench depths of 20 feet penetrated the fill material and sometimes extended below the water table requiring pumping when equipment had to operate near the trench bottom. General refuse from the base and housing areas was the primary material landfilled. Disposal of chemicals in the landfill was not standard procedure, however, some industrial wastes may have been placed in this landfill. An impact test facility sled was constructed on the site after landfill was closed. During construction of the sled, JP-4 seeped into the excavation that had been dug in the landfill. The source of the fuel may have resulted from a previous leak in the 4-inch diameter fuel supply line. Apparently, portions of the landfill contained JP-4 from the leaking supply line. The landfill is closed and the area is covered with soil and has established grass. During visual inspection of the site a green colored leachate was noted flowing from an eroded section on the northwest slope of the landfill. The site is 800 feet from a drinking water well and 4500 feet from the base boundary.

Landfill No. 2

Landfill No. 2 is located, as shown in Figure 4.6, east of the first site, across Second Street. This fill encompasses approximately 22 acres and was in operation from 1951 to 1963. Operation of landfill No. 2 was similar to No. 1, and included trenching into a previously filled area with daily cover of boiler bottom ash. The trench depths of 20 feet also penetrated the water table. Landfill No. 2 had a burning face on the west side of the site for disposing of scrap lumber from the base. Disposal material in landfill No. 2 included general refuse and moderate quantities of industrial wastes. Information obtained from interviews with base personnel revealed that in the early 1960's, forty tons of off-specification pesticide was buried at this site ('clay or aggregate and 1.5 t 0 percent granular malathion). The site is closed and is covered with soil and vegetation has been established. An inspection of landfill No. 2 revealed some ponding of rain water on the top of the site. A drainage stream is located in the southwest corner of the site. Landfilling occurred on both sides of the drainage stream. This site is approximately 2200 feet from a drinking water well.

Landfill No. 3

Landfill No. 3 is located, as shown in Figure 4.7, in the southeastern part of the Robins AFB property near Lake Luna. The site was operated in 1964, primarily to fill a swampy area. Total area of the fill is approximately 2 acres. General refuse was deposited followed by a daily cover of sandy loam. Fire protection training exercises were conducted around the landfill site. The landfill is closed and the area has an established vegetation cover and a baseball field is built over it.

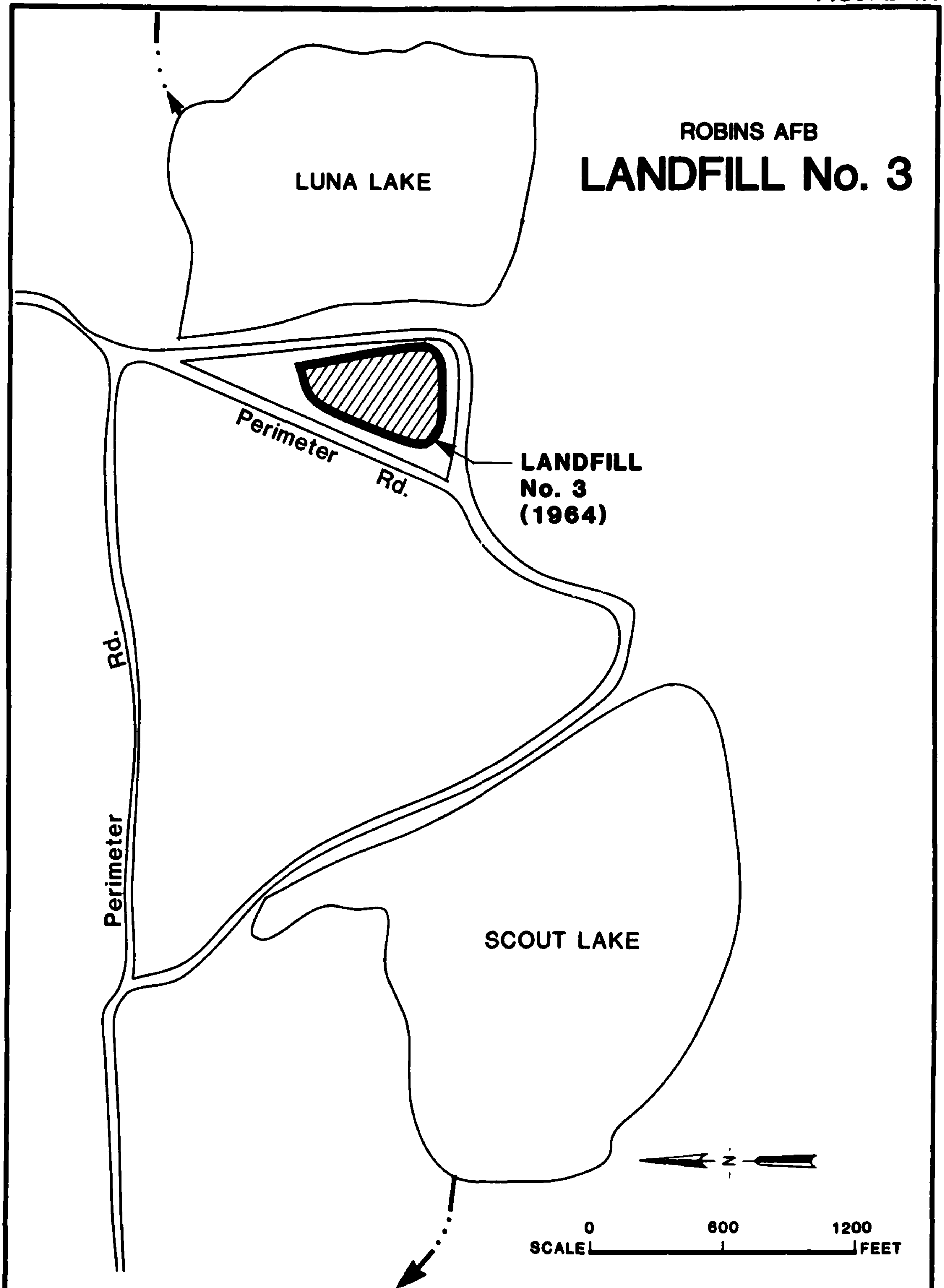
Landfill No. 4

Landfill No. 4 is located, as shown in Figure 4.8, near landfill No. 2, southeast of the industrial waste treatment plant addition. The fill was operated from 1965 to 1978, encompassing approximately 45 acres. Landfill No. 4 was the last on-base disposal site for solid waste. General refuse was deposited into the swamp and covered daily with a sandy soil. Little or no boiler bottom ash was used as cover due to the conversion of the boiler system to natural gas in 1966. There was occasional dumping of industrial wastes in this landfill throughout its life. The site is now covered with a sandy soil loam and partially established vegetation. This site is approximately 2200 feet from a drinking water well and is located adjacent to drainage ditches which flow to Horse Creek. From 1976 to 1979, approximately 1500 drums of waste material were stored at the west end of the landfill. A groundwater monitoring study was conducted around Landfill No. 4 and the sludge lagoon (LETCO, 1980). The results of this monitoring program indicate the presence of contaminants in the shallow aquifer has occurred downgradient of the site.

Waste Dumps

Four sites on-base were used for general refuse and landscape trash. The general locations of the waste dumps are indicated on Figure 4.9. Waste dump No. 1 and 2 were operated from early 1942 through 1946. The exact method of operation of the waste dumps was not determined. It is speculated that refuse was surface dumped at these sites and burned when it began to accumulate. No daily cover was probably applied,

FIGURE 4.7

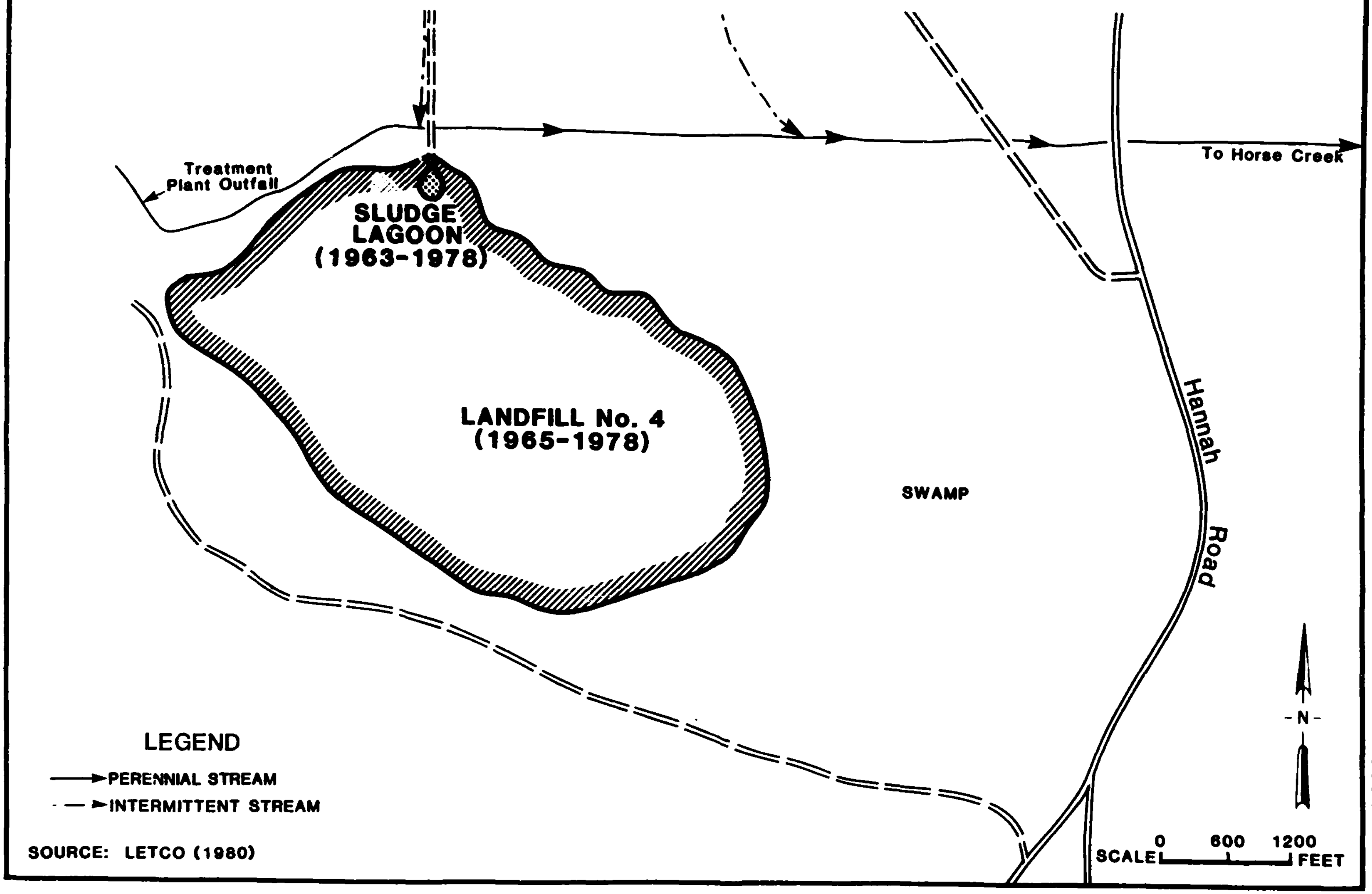


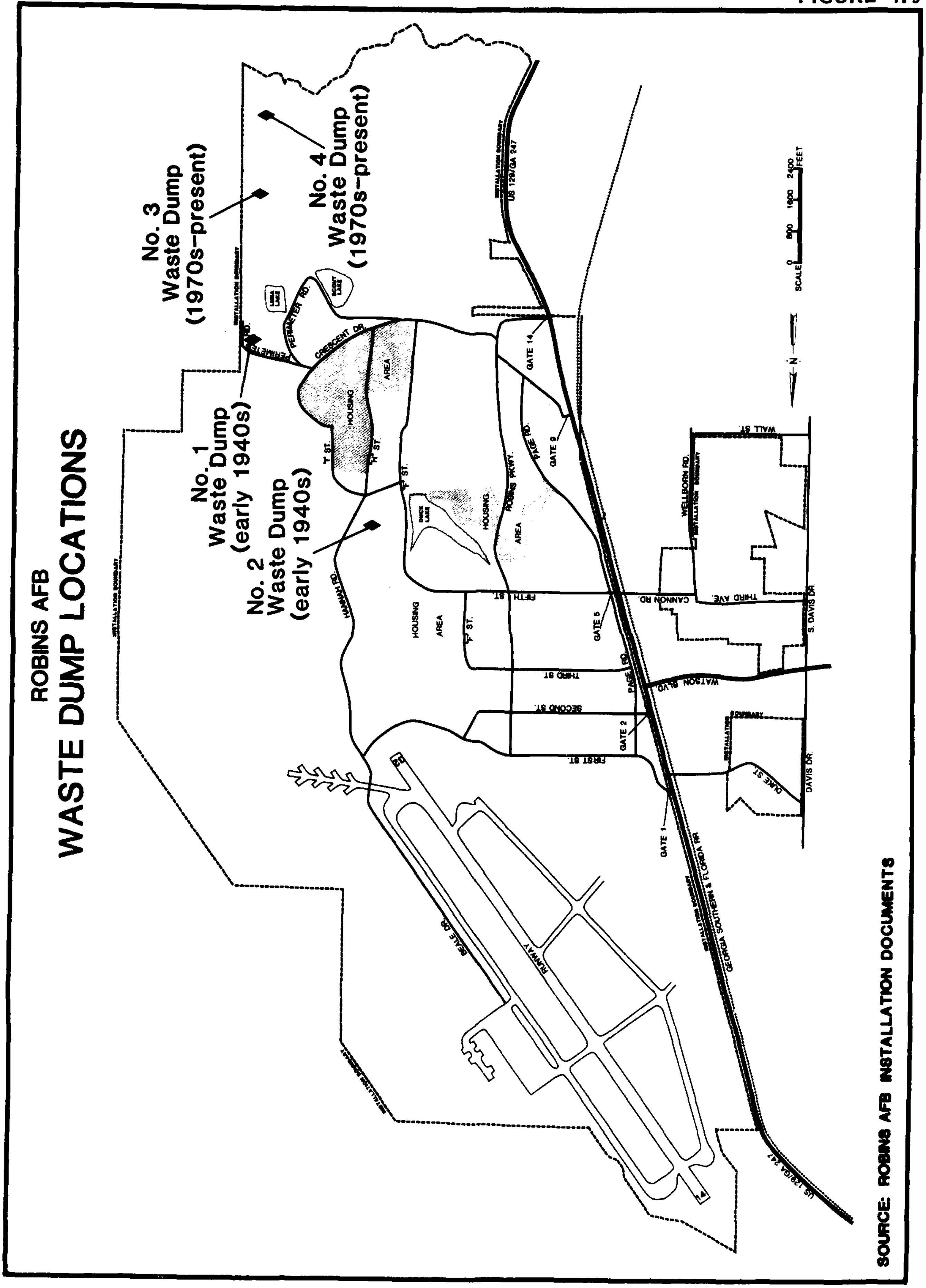
SOURCE: ROBINS AFB INSTALLATION DOCUMENTS

FIGURE 4.8

ROBINS AFB

LANDFILL NO. 4 & SLUDGE LAGOON





ROBINS AFB
WASTE DUMP LOCATIONS

SOURCE: ROBINS AFB INSTALLATION DOCUMENTS

however, both waste dump No. 1 and No. 2 have been given a final cover.

Waste dump No. 3 and No. 4 are currently active sites where primarily landscape refuse has been disposed. Portions of these areas are covered with soil. Small quantities of paint cans, construction material wastes, automotive filters and oil cans, tires, and empty fire extinguisher agent containers were observed during a visual inspection. No hazardous wastes were found at these sites.

Sludge Lagoon

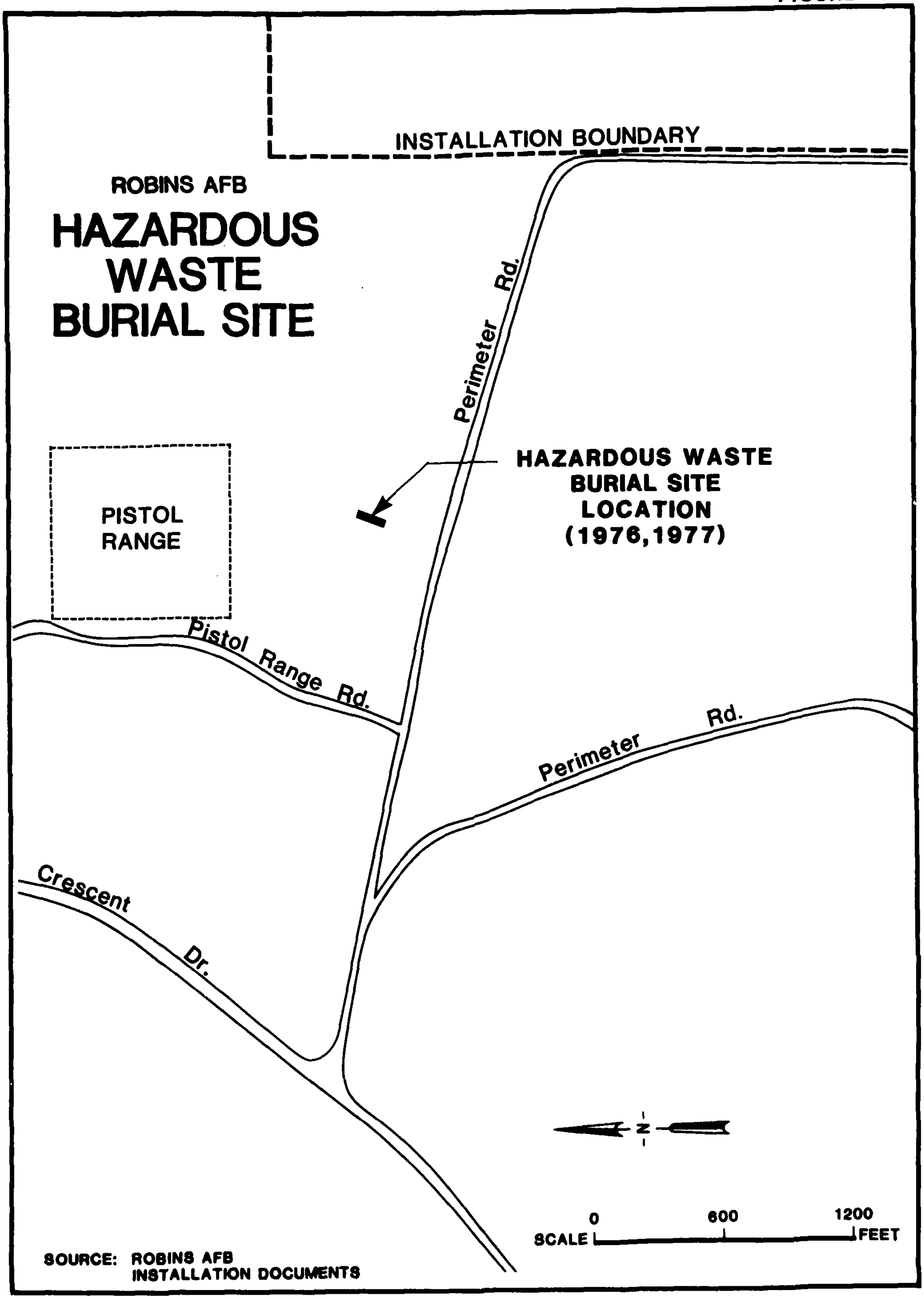
A sludge lagoon was used for disposal of industrial wastewater treatment plant sludges from approximately 1962 until its closure in 1978. The lagoon emcompassed approximately 1.5 acres located on the north end of Landfill No. 4 (Figure 4.8). The lagoon was an unlined, diked pit with the bottom excavated below the water table level. Sludges (2-5 percent solids) from both industrial waste treatment plants were dumped into the lagoon. Sludge from industrial waste treatment plant No. 1 contained some phenols and oils. Industrial waste treatment plant No. 2 treated waste water from metal plating operations and the sludges contained cyanide, chrome, and other heavy metals. Other industrial wastes such as paint removers, solvents, hydraulic fluids, and oils were occasionally disposed of in the sludge lagoon.

The sludge lagoon was closed in 1978 when the sludge dewatering and disposal building was started up. The lagoon is now covered with sandy loam soil which also covers Landfill No. 4. The lagoon is approximately 2200 feet from a drinking water well and 5200 feet from the nearest base boundary. The ground-water monitoring program recently conducted indicated the presence of contaminants in the shallow aquifer downgradient of the sludge lagoon.

Hazardous Waste Burial Sites

In January 1976, approximately 240 aerosol cans of DDT with pyrethrin were disposed by burial on the south portion of the base (Figure 4.10). Several sections of 30 inch diameter reinforced concrete pipe 48 inch in length were used as containers. These sections were placed vertically in a trench then capped at the bottom end with concrete. The aerosol cans were placed in the pipe sections. Each pipe section was capped at the top end with concrete for a secure closure. The trench was filled and 24 inches of natural earth cover was placed over the pipe

FIGURE 4.10


INSTALLATION BOUNDARY
ROBINS AFB
HAZARDOUS WASTE BURIAL SITE
Perimeter Rd.
HAZARDOUS WASTE
BURIAL SITE
LOCATION
(1976,1977)
PISTOL
RANGE
Pistol Range Rd.
Perimeter Rd.
Crescent Dr.
N
0
600
1200
SCALE
FEET
SOURCE: ROBINS AFB
INSTALLATION DOCUMENTS

sections. Similar procedures were used at this same location for disposal of two containers of mercury contaminated material and one container of a small amount of PCB material in April 1976. Approximately 15 gallons of wastes contaminated with mercury were disposed at this location in April 1977. The waste material was placed in plastic bags, then placed in metal containers. The containers were placed in additional plastic bags, then were encapsulated with six inches of concrete prior to final burial. No indication of further waste disposal at this site was determined from the base records and personnel interviews.

Laboratory chemicals which had exceeded their recommended shelf life were buried in two unlined pits in the southeastern end of the base sometime between 1962 and 1964. This was a one time disposal of old bottles, canisters and jars of a variety of laboratory chemicals from the base storage. The disposal site is believed to be in the vicinity of Luna Lake by the dog kennel, however, an exact location could not be determined.

Low Level Radioactive Waste Sites

Low level radioactive wastes have been generated on-base from instrument repair work and washdown of radioactive aircraft. The disposal sites for these wastes occurred in the locations shown in Figure 4.11 and are described below.

The radioactive waste (solid) disposal site, facility number 8315, is located, as shown in Figure 4.12, on the southeast corner of the base along Perimeter Road south of the firing range. It is comprised of a concrete vault buried approximately six feet below the ground surface. A locked chain-linked fence with two barbed wire strands surrounds the disposal area. Two signs are posted on the fence designating the area as a "Radiation Hazard Area". The site was used in the early 1950's for disposal of low-level solid radioactive wastes such as old radium dials, contaminated radioactive brushes, election tubes and spark gaps. Soil samples collected within and adjacent to the burial area have been analyzed annually. The 1980 soil analyses are presented in Table C.13 (Appendix C). The area was last surveyed with a beta/gamma radioactivity detector in September of 1981. Radiation levels did not exceed 0.03 mr/hr above a background of 0.01 mr/hr; indicating radioactive

FIGURE 4.11

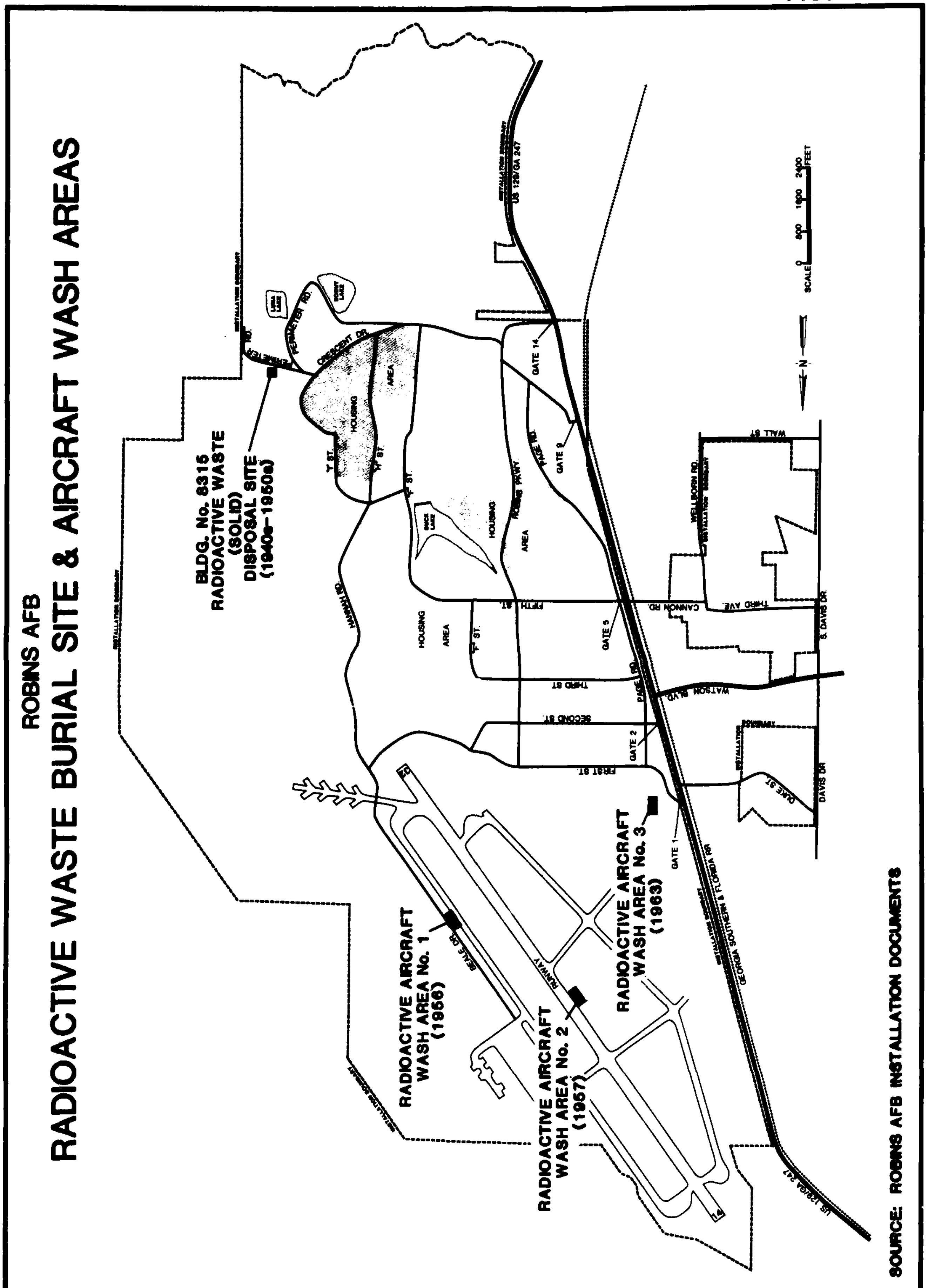
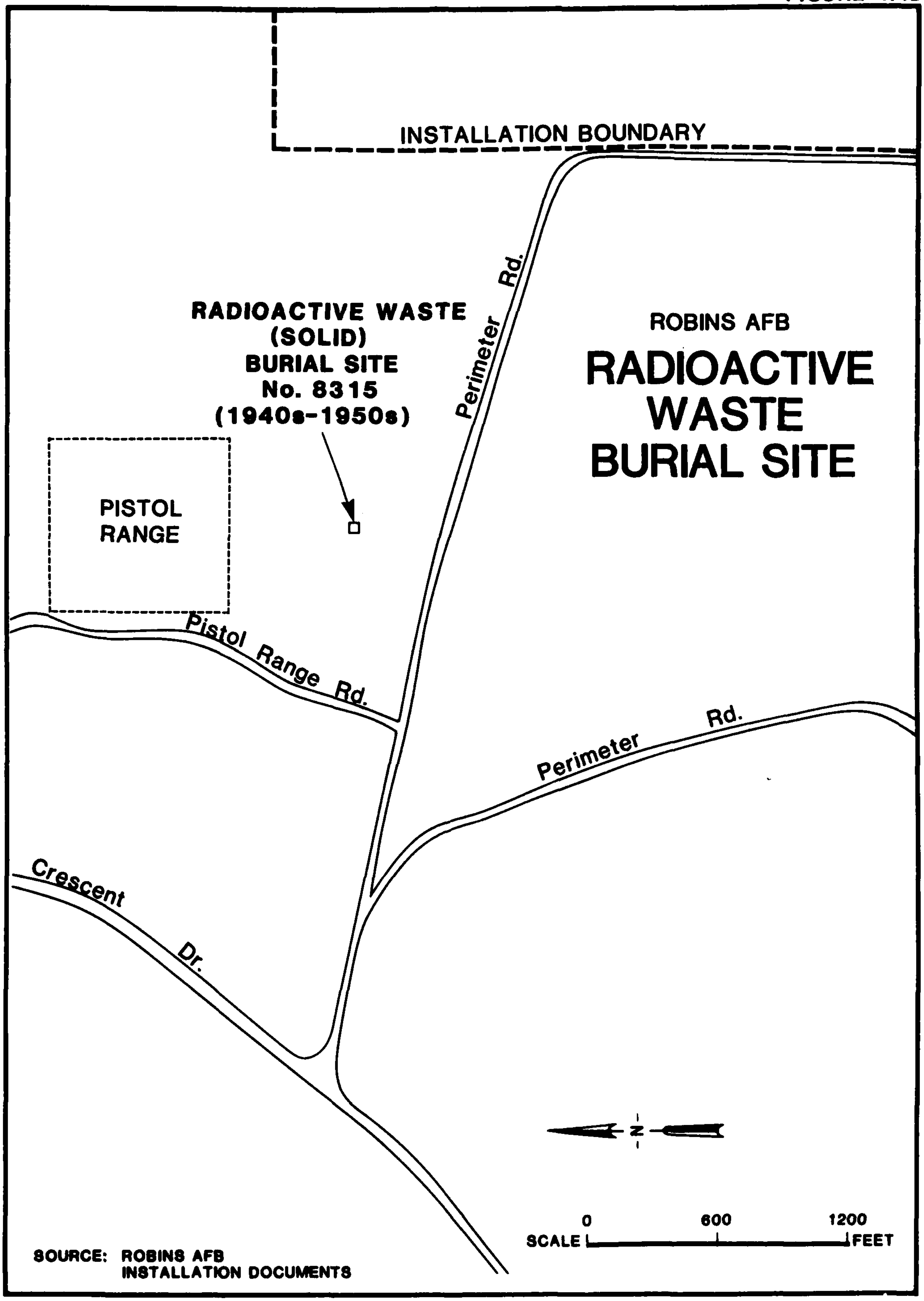

ROBINS AFB
RADIOACTIVE WASTE BURIAL SITE & AIRCRAFT WASH AREAS
BLDG. No. 6316
RADIOACTIVE WASTE
(SOLID)
DISPOSAL SITE
(1940s–1950s)
RADIOACTIVE AIRCRAFT
WASH AREA No. 1
(1956)
RADIOACTIVE AIRCRAFT
WASH AREA No. 2
(1957)
RADIOACTIVE AIRCRAFT
WASH AREA No. 3
(1963)
HOUSING AREA
RUNWAY
GATE 1
GATE 2
GATE 5
GATE 9
GATE 14
WATSON BLVD.
US 129/GA 247
GEORGIA SOUTHERN & FLORIDA RR
SCALE 0 800 1600 2400 FEET
N
SOURCE: ROBINS AFB INSTALLATION DOCUMENTS

FIGURE 4.12



SOURCE: ROBINS AFB INSTALLATION DOCUMENTS

materials are present, but do not result in radioactivity levels hazardous to human health.

Two open radioactive aircraft wash areas were utilized at Robins AFB for decontamination caused by airborne fission products. Wash area No. 1 was located east of the SAC ordinance area. This area was used in 1956 to decontaminate one aircraft. The aircraft was positioned off of the taxiway onto a grass area for washdown. The area was restricted after washing until monitoring for levels of radioactivity indicated only background amounts.

Similar washdown operations occurred in area No. 2. Approximately four aircraft were decontaminated at this location during 1957. Similar area restrictions and monitoring were initiated until only background levels of radioactivity were detectable.

Two underground storage tanks (wash area No. 3) located adjacent to the east side of building 58, were designed to collect washdown from aircraft that also may have been contaminated by airborne fission products. The contents of these tanks were sampled in 1978 and found to contain water contaminated with zinc, iron, low level radiation and a surfactant. The east tank also contained a stratified upper layer mixture of a petroleum base solvent and a compound similar to methyl ethyl ketone. The solutions were probably generated around 1963 during a washdown operation. During interviews with the Bioenvironmental Engineering Services Division personnel, it was learned that these tanks were pumped out in 1978 and the water was discharged to the wastewater treatment plant at a predetermined, dilution ratio.

Industrial Waste Treatment Plants

The first industrial waste treatment at Robins AFB began in 1960 with batch treatment of cyanide wastes. The treated wastes were combined with treated sanitary sewer wastes and discharge to Horse Creek. Prior to this many aqueous industrial wastes may have been neutralized, diluted and discharged to the storm sewer system.

The first industrial waste treatment plant was built in 1964 primarily as an air flotation system for removal of oils and phenols. In 1971, the plant was upgraded to provide treatment for reduction of hexavalent chromium, neutralization, and coagulation/precipitation of heavy metals. Industrial waste treatment plant No. 1 treats all the industrial waste from the base except the plating shops, and includes wastes from aircraft stripping operations and washdown. The wastewater contains oils, phenols, chrome, paint residues, solvents and alkaline based stripping materials. Sludge from the treatment plant was discharged into the sludge lagoon until its closure in 1978. Sludge has been dewatered and placed in the sludge disposal building since 1978. Effluent from industrial waste treatment plant No. 1 flows through a sanitary waste treatment facility for biological oxidation of residual phenols.

Industrial waste treatment plant No. 2 was built in 1969 to treat the base plating shops wastes. Influent is typical plating waste and includes high levels of chrome, cyanide and heavy metals. Sludge from the clarifier underflow of this facility was also disposed in the sludge lagoon until its closure in 1978. Since then the sludge has been dewatered and placed in the sludge disposal building.

The sludge dewatering and disposal facility was built in 1978 as part of the closure of the sludge lagoon. The disposal building is completely enclosed with a concrete floor. Decant from sludge dewatering (plate and frame pressure filter) is returned to industrial waste treatment plant No. 1. The sludge disposal building was designed for a total dry sludge storage volume of 9,323 cubic yards and an estimated life of 10 years at current sludge generation rates. The locations of the waste treatment facilities are shown in Figure 4.13.

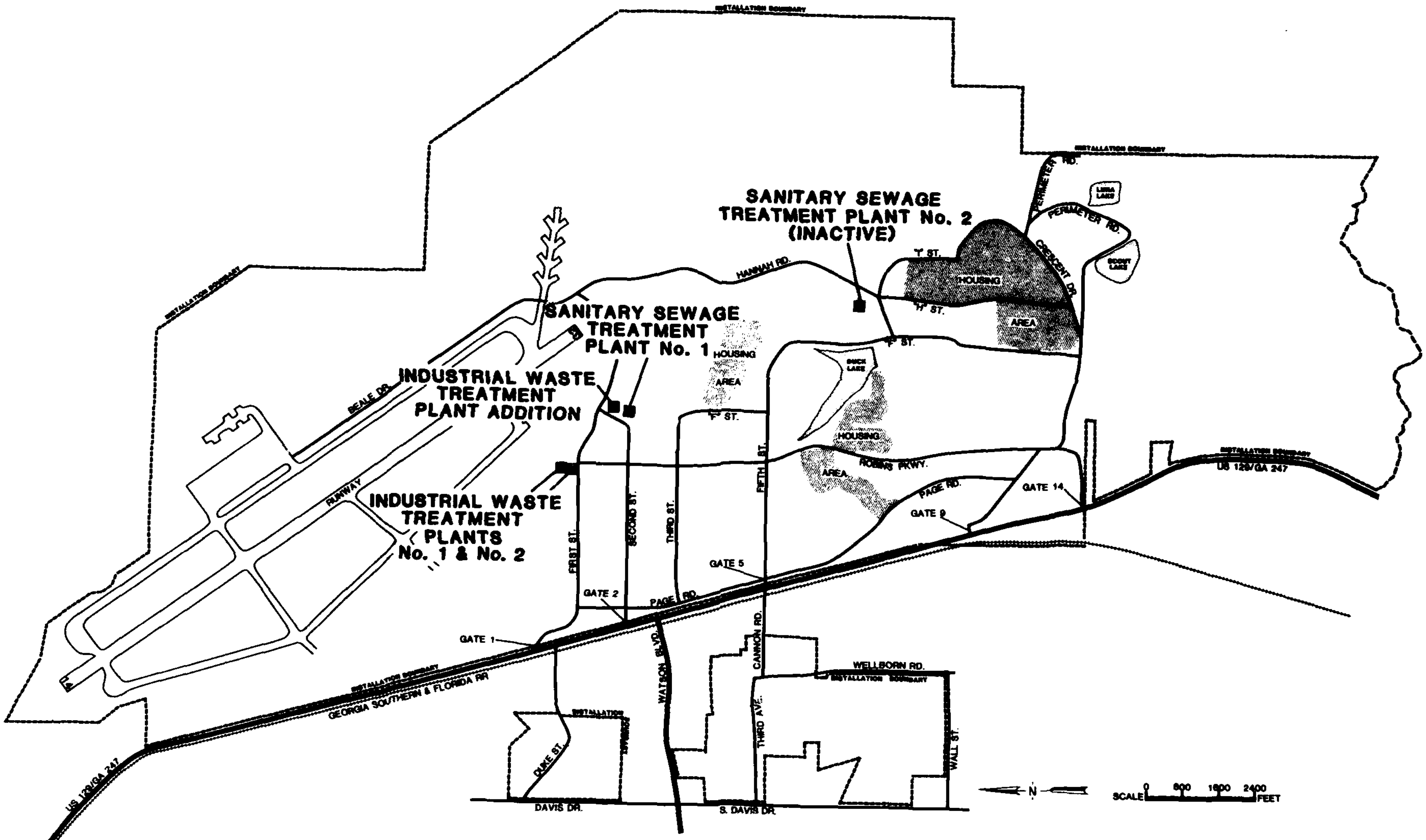
Sanitary Wastewater Treatment Facilities

Domestic sewage has been treated on-base since 1942 by a single stage trickling filter system located in the area of industrial waste treatment plant No. 1. This sanitary treatment facility discharges treated effluent to a tributary of Horse Creek. The sludge generated from this treatment facility was applied to various land areas on-base. This system may have received wastewater streams containing phenolic and non-phenolic paint strippers from the mid 1940's to 1965. Also this system may have received batches of partially or completely treated cyanide baths from the electroplating operations on-base during the same period.

FIGURE 4.13

ROBINS AFB

WASTEWATER TREATMENT FACILITIES



SOURCE: ROBINS AFB INSTALLATION DOCUMENTS

An additional sanitary wastewater treatment plant was operational from 1943 through approximately 1979. In 1973 this facility was upgraded from a primary to a secondary treatment facility. This facility is located off Hannah Road near Seventh Street. It is believed that this plant received little or no industrial waste streams. This facility is now used only as a pumping station. The locations of the waste treatment facilities are shown in Figure 4.13.

Storm Sewer Systems

The storm sewer systems on-base consist primarily of concrete conduits or open-channels which direct drainage towards tributaries of Horse Creek. The systems in the areas of aircraft maintenance functions received some discharges of wastes from maintenance activities from the mid 1940's through the early 1970's. In the mid 1970's, oil/water separators were installed in many of the systems. A list of these units is shown in Table 4.4.

Refuse Incineration

General refuse from the base was disposed of by incineration in the late 1940's. The incinerator was located west of landfill No. 4. Ash from the incinerator was buried in landfill No. 1. The operation was discontinued in the early 1950's and the refuse went directly to the landfill for disposal.

EVALUATION OF PAST DISPOSAL ACTIVITIES AND FACILITIES

The review of past operation and maintenance functions and past waste management practices at Robins AFB has resulted in the identification of 13 sites containing hazardous waste materials and having the potential for migration of contaminants. Other sites were reviewed and eliminated from further evaluation based on the logic presented in the decision tree shown in Figure 1.1.

The 13 sites have been assessed using a hazardous assessment rating methodology (HARM) which takes into account characteristics of potential receptors, waste characteristics, pathways for migration and specific characteristics of the site related to waste management practices. The details of the HARM procedures are presented in Appendix G and the results of the assessment are summarized in Table 4.5. The rating system is designed to indicate the relative need for follow-on action. The

TABLE 4.4

SUMMARY OF ON-BASE OIL/WATER SEPARATORS

Separator Number	Date Installed	Building Location	Description
0-01	1972	23	North Side
0-02	1978	30	Noise Suppressor N.E. Corner
0-03	1969	33	East of Pad
0-04	1970	47	West Side
0-05	1967	48	East Side
0-06	1967	49	East Entrance
0-07	1954	628	West Side ALC
0-08	1976	656	N.W. Side
0-09	1975	959	(Gray Eagle Unit)
0-10	1979	979	S.W. Side
0-11	1977	377	East Side (Fire Dept.)
0-12	1952	318	East Side (Land Fill)
0-13	1956	194	S.E. of Bldg. 153 on Parking Ramp
0-14	1964	302	East End of Washrack
0-15	1960	67	N.W. Side
0-16	1960	67	North Side
0-17	1975	85	North Side
0-18	1960	76	N.E. Corner
0-19	1960	82	North Side
0-20	1962	52	South Side
0-21	1962	52	North Side
0-22	1963	190	North Side
0-23	1963	190	N.E. Holding Tank
0-24	1963	196	North of Bldg. 192 (POL)
0-25	1963	196	Area near Bldg. 73 (POL)
0-26	1960	79	Adjacent to Washrack
0-27	1979	PB64	Outside Flight Line Area along 1st St.
0-28	1974	922	BX Service Station
0-29	1979	979	Washrack
0-30	1980	184	Aero Club/Aircraft Parking Lot
0-31	1967	985	Base Hobby Shop
0-32	1963	109	Fire Department
0-33	1951	93	Paint Storage (inactive)

SOURCE: Bioenvironmental Engineering Services Division Files, verified and updated by CES

TABLE 4.5

SUMMARY OF HARM SCORES FOR POTENTIAL CONTAMINATION SOURCES

Rank	Site Name	Receptor Subscore	Pathways Subscore	Waste Characteristics Subscore	Waste Management Factor	Overall Total Score
1	Sludge Lagoon	57	100	75	1.0	77
2	Landfill No. 4	59	100	60	1.0	73
3	DDT Spill (1979)	51	100	60	1.0	70
4	Fire Protection Training Area No. 2	46	55	90	1.0	64
5	Landfill No. 1	46	80	50	1.0	59
6	Landfill No. 2	42	80	53	1.0	58
7	JP-4 Spill (1965)	4[illegible]	80	45	1.0	57
8	Hazardous Waste Burial Site	44	48	80	0.95	54
9	Fire Protection Training Area No. 1	44	62	50	1.0	52
10	Laboratory Chemical Burial Site	42	80	30	1.0	51
11	Landfill No. 3	46	56	40	1.0	47
12	Fire Protection Training Area No. 3	40	56	40	1.0	45
13	Radioactive Waste (Solid) Disposal Site	44	41	14	0.95	31

information presented in Table 4.5 is intended as a guide for assigning priorities for further evaluation of the Robins AFB disposal areas (Chapter 5, Conclusions and Chapter 6, Recommendations). The rating forms for the individual waste disposal sites on Robins AFB are presented in Appendix H. Photographs of some of the key disposal sites are contained in Appendix E.

CHAPTER 5

CONCLUSIONS

CHAPTER 5
CONCLUSIONS

The goal of Phase I of the IRP is to identify the potential for environmental contamination from past waste disposal practices at Robins AFB and to assess the probability of contaminant migration. The conclusions given below are based on the assessment of the information collected from the project team's field inspection, review of records and files, interviews with base personnel, past employees and state and local government employees and review of the environmental setting. Table 5.1 contains a summary of HARM scores for sites at Robins AFB.

1) The sludge lagoon has a high potential for migration of contaminants. This lagoon was used from approximately 1962 through 1978 to dispose of sludges from the industrial waste treatment plants. Sludges and industrial wastes from other industrial operations on-base were also disposed of in this lagoon. The results of a recently conducted ground-water monitoring program (LETCO, 1980), indicated contamination of the shallow aquifer down-gradient of the site. The lagoon is approximately 2,200 feet from a drinking water well and 5,200 feet from the base boundary. The lagoon was constructed in a former swamp area and the bottom extends below the water table. A stream flows adjacent to the lagoon site and standing water conditions commonly occur near the lagoon site. This site received a rating score of 77.

2) Landfill No. 4 has a high potential for migration of contaminants. This landfill was utilized from 1965 through 1978 for disposal of general refuse and significant quantities of industrial wastes. The results of a ground-water monitoring study (LETCO, 1980) indicate contamination of the shallow aquifer downgradient of the site. Landfill No. 4 is located approximately 2,000 feet from a drinking water well and 4,800 feet from the nearest base boundary. The bottom of the landfill is in the ground-water

TABLE 5.1

PRIORITY RANKING OF POTENTIAL CONTAMINATION SOURCES
ROBINS AFB

Rank	Site Name	Date of Operation or Occurrence	Overall Total Score
1	Sludge Lagoon	1963-1978	77
2	Landfill No. 4	1965-1978	73
3	DDT Spill (1979)	1979	70
4	Fire Protection Training Area No. 2	mid 1950's to mid 1960's	64
5	Landfill No. 1	1943-1951	59
6	Landfill No. 2	1951-1953	58
7	JP-4 Spill (1965)	1965	57
8	Hazardous Waste Burial Site	1976, 1977	54
9	Fire Protection Training Area No. 1	1943-mid 1950's	52
10	Laboratory Chemical Disposal Site	early 1960's	51
11	Landfill No. 3	1964	47
12	Fire Protection Training Area No. 3	mid 1960's to 1969	45
13	Low Level Radioactive Waste (Solid) Burial Site	1940's to 1950's	31

table. This site is presently closed and covered with sandy loam and has some vegetation established. Landfill No. 4 was given a HARM score of 73.

3) The DDT spill (1979) poses a high potential for contaminant migration. The spill involved a 55-gallon drum which leaked concentrated pesticide prior to discovery by base personnel. The immediate area around the spill received significant quantities of DDT as determined by soil samples taken by the Bioenvironmental Engineering Services Division office. The surface drainage pathway of the spilled material leading to Horse Creek was also sampled and contained lower levels of DDT. The remedial action taken consisted of covering the contaminated spill site with asphalt material. No removal of contaminated soil from the spill area or drainage pathway was reported. This site received a HARM score 70.

4) Fire Protection Training Area No. 2 poses a moderate potential for migration of contaminants. This area actually consists of several grade level open burning sites used from the mid 1950's through the mid 1960's. Significant amounts of chemical wastes, solvents, and paint wastes may have been routinely burned at this site in addition to the petroleum based materials used in each exercise. The estimated locations of the burn areas are within 1,200 feet to 600 feet of a drinking water well and are within 1,200 feet to 2,000 feet from the base boundary. The depth to ground water is estimated to be between 20 feet and 25 feet. This area received a HARM score of 64.

5) Landfill No. 1 poses a moderate potential for contaminant migration. Landfill No. 1 was operated from 1946 to 1957 and may have received small quantities of industrial wastes as well as general refuse. During a visual inspection of the site, a green colored leachate was noted flowing from an eroded section on the northwest slope of the landfill. The landfill may contain JP-4 as a result of a pipeline leak that occurred in the 1960's. This site is 800 feet from a drinking water well and 4,500 feet from the base boundary. Landfill No. 1 is now covered with soil and established vegetation. This landfill received a HARM score of 59.

6) Landfill No. 2 poses a moderate potential for migration of contaminants. Landfill No. 2 was used for disposal of general refuse and may have received moderate quantities of industrial wastes from 1951 to 1963. This site is approximately 2200 feet from a drinking water well and is located adjacent to drainage ditches which lead to Horse Creek. The distance from the bottom of the landfill to ground water is estimated to be 5 feet or less. This site is closed and covered with soil and vegetation is established. This landfill received a HARM score of 58.

7) The JP-4 leak (1965) poses a moderate potential for migration of contaminants. Several incidents of finding JP-4 seepage during excavations have been reported in the area of the old pipeline leak specifically around Landfill No. 1. It is believed that a moderate to large quantity of JP-4 may be floating on the ground water table down-gradient of the leak site. The quantity of fuel spilled and the quantity remaining on the ground-water table has not been determined. The JP-4 spill received a HARM score of 57.

8) The hazardous waste burial site poses a moderate potential for migration of contaminants. This site contains moderate amounts of hazardous wastes. Encapsulation of the wastes in concrete pipes was completed at the hazardous waste disposal site prior to burial of the material. The hazardous waste disposal site received a HARM score of 54.

9) Fire Protection Training Area No. 1 poses a moderate potential for contaminant migration. Hazardous materials have been burned in this area along with petroleum materials. The area was operated from 1943 through 1950. The precise location of Fire Protection Training Area No. 1 could not be determined, but it is believed to be located in or by Landfill No. 2. This site received a HARM score of 52.

10) The laboratory chemical disposal site is believed to pose a moderate potential for migration of contaminants. This site is located somewhere in the vicinity of Luna Lake and the dog kennel but the exact location could not be determined. Bottles, canisters and jars of outdated laboratory chemicals from the base storage

facility were buried at this site. The disposal site received a HARM score of 51.

11) Landfill No. 3 poses low potential for migration of contaminants. This site was operated in 1964 and is believed to have received primarily general refuse and little or no waste chemicals for disposal. The site is covered with vegetation and soil. Landfill No. 3 received a HARM score of 47.

12) Fire Protection Training Area No. 3 poses a low potential for contaminant migration. Fire training was conducted in this area from 1960 through 1969, only petroleum substances were known to be used in the training exercises. The site received a HARM score of 45.

13) The low level radioactive waste (solid) burial site poses a low potential for migration of contaminants. A concrete vault was used to dispose small quantities of low-level radiation materials in the late 1940's and early 1950's. The site is fenced securely and marked with warning signs. This site received the lowest HARM score, 31.

CHAPTER 6

RECOMMENDATIONS

CHAPTER 6

RECOMMENDATIONS

To aid in the comparison of the 13 sites on Robins AFB with those sites identified in the IRP at other Air Force Bases, a hazardous assessment rating methodology (HARM) was developed. Of primary concern at Robins AFB are those sites with a high potential for contaminant migration and with HARM scores greater than 65. These sites require further investigation in Phase II. Sites of secondary concern are those with moderate potential for contaminant migration and have HARM scores from 50 to 64. Further investigation at these sites is recommended. No further monitoring is recommended for those sites with low potential for migration of contaminants (scores from 0 to 49) unless data collected from other locations indicate a potential problem could exist at one of these sites.

The following recommendations are made to further assess the potential for contaminant migration from waste disposal areas at Robins AFB. The recommended monitoring program for Phase II is summarized in Table 6.1.

1) Landfill No. 4 is considered to have a high potential for migration of contaminants as demonstrated by the contamination of the shallow ground water down-gradient of the site. The recommended monitoring at this site is intended to define the extent of contamination and help determine remedial measures.

Geophysical survey techniques are recommended to help map the contaminant plume and further define site geology. The swamp area may restrict the performance of geophysical survey techniques.

A revised ground water monitoring program is recommended to determine plume configuration, depth of contamination, and concentration of contaminants. The monitoring program should consist of the following:

- Evaluate the existing down-gradient monitoring wells along Hannah Road to determine their condition. The wells are constructed of polyvinyl chloride (PVC) pipe and some of the organic contaminants such as methylene chloride will react with the PVC. Use these wells if no distortion or sofening of the PVC is noted. If PVC deterioration is observed, then construct new monitoring wells with Teflon®, stainless steel, or other inert material.

- Establish three wells in deeper zones above Hannah Road, to depths of 50, 75 and 100 feet, respectively. These wells can be used to evaluate vertical migration of contaminants. Monitor for the parameters in List A, Table 6.2. If contamination is found at 100 feet, then deeper wells should be constructed to define the depth of the plume. The material for well construction should be determined from the previous evaluation.
- Establish an up-gradient well nest west of Landfill No. 4 and other sources of contamination. The ground-water should be sampled at 25, 50, 75 and 100 feet. Monitor for the parameters in List A, Table 6.2. The existing up-gradient well is in an area down-gradient of another potential source of contamination (Landfill No. 2). Therefore this well is not representative of background conditions.
- Establish eight monitoring wells down-gradient at the landfill perimeter, capable of sampling to depths of 25, 50, 75 and 100 feet. These wells should be constructed of stainless steel or Teflon® since deterioration of the existing perimeter wells constructed of PVC has already been observed. Monitor for the parameters in List A, Table 6.2.
- Abandon and seal the existing up-gradient and perimeter monitoring wells in accordance with Section 391-3-2.13 of the Georgia Ground Water Use Act of 1974.
- Monitoring wells should be established to determine the furthest edge of the ground-water contaminant plume. This may be difficult to achieve in the swamp area. Samples should be anlayzed for the parameters in List A, Table 6.2.

2) The sludge lagoon is also considered to have a high potential for migration of contaminants as demonstrated by the contamination of the shallow ground water down-gradient of the site. Landfill No. 4 and the

sludge lagoon are too close to each other to monitor separately, therefore, the program described for monitoring Landfill No. 4 will include the sludge lagoon.

3) The DDT spill (1979) site has a high potential for contaminant migration. Sampling has shown that the soil around the site is contaminated with DDT. The contaminated soil should be removed and replaced with fill material then the area paved to prevent infiltration. Sampling and analyses for DDT should be performed to verify clean up of the site.

4) The Fire Protection Training Area No. 2 is considered to have a moderate potential for migration of contaminants. The exact location of this site was not clearly defined by the records search project therefore part of the monitoring will be aimed at identifying the pit location. Collect soil borings in and around the suspected area of the old pits (100 ft. by 200 ft., 15 in the general pit area and 1 outside the area). The borings should be on a 50 foot grid, ten feet deep with soil samples taken at regular intervals and at any interface. Analyses should be performed on water extractions and then analyzed for the parameters in List B (Table 6.2).

5) Landfill No. 1 is considered to have a moderate potential for contaminant migration and monitoring is recommended. Geophysical survey techniques are recommended to identify any JP-4 in or around the site. If the geophysical survey is not affective, then install six monitoring wells (PVC) into the top of the water table down-gradient of the landfill and sample for floating oil. Samples of any leachate stream(s) should be collected and analyzed for the parameters in List A, Table 6.2.

6) Landfill No. 2 is considered to have a moderate potential for migration of contaminants and monitoring of this site is recommended. One upgradient and three downgradient monitoring wells (Schedule 40 PVC) should be constructed in the uppermost aquifer and the shallow ground water should be monitored for the parameters in List A, Table 6.2.

7) The area around the JP-4 leak (1965) is considered to have a moderate potential for migration of JP-4 and monitoring down-gradient of the site is recommended. Geophysical survey techniques may be effective

for defining JP-4 floating on top of the water table. If the geophysical survey is not effective then install six monitoring wells (PVC) into the top of the water table down-gradient of the leak and sample for floating material. This monitoring should be done jointly with monitoring for Landfill No. 1.

8) The hazardous waste burial site has a moderate potential for contaminant migration. One up-gradient and two down-gradient monitoring wells are recommended at this site. The wells should be constructed of Schedule 40 PVC and the ground water should be sampled and analyzed for the parameters in List B, Table 6.2.

9) The Fire Protection Training Area No. 1 has a moderate potential for contaminant migration. Since this site is believed to be located in or around Landfill No. 2, it will be included as part of the monitoring of Landfill No. 2.

10) The laboratory chemical disposal site is considered to have a moderate potential for contaminant migration. The exact location of this site could not be determined by the records search project. Since some of the materials were disposed of in metal containers, geophysical surveys techniques may be effective in identifying the location. The waste were reported buried on the south side of Luna Lake near the dog kennels. If the site is identified, collect soil borings as described for fire protection area No. 2.

11) Conduct a one-time water sampling program for water supply wells Nos. 3, 6, 8 and 12. Analyze each sample for he parameters shown in List A of Table 6.2.

12) Sample water and sediments of the drainage courses around landfill No. 4 to determine if leachate from the landfill and sludge lagoon are entering the drainage ditch. Set up eight sample stations and analyze for the parameters in List B, Table 6.2.

TABLE 6.1

RECOMMENDED MONITORING PROGRAM FOR PHASE II - ROBINS AIR FORCE BASE

Site	HARM Score	Recommended Monitoring	Comments
Landfill No. 4	73	a. Utilize geophysical survey techniques to map contaminant plume, if site geology permits.	Geophysical survey performance may be degraded by site geology and wetland environment.
		b. Establish a revised ground-water monitoring program to determine configuration, depth of contamination, and concentrations of contaminants. Monitoring program should consist of:	Contamination of the shallow aquifer downgradient of this site has been documented by previous ground-water monitoring (LETCO, 1980).
		- Evaluate existing down-gradient monitoring wells along Hannah Road to determine condition. Continue use if well condition is adequate. - Abandon and seal (per Section 391-3-2.13 of the Ground Water Use Act of 1974) upgradient well and landfill perimeter wells. - Establish new upgradient well, west of Landfill No. 4, at depths of 25, 50, 75 and 100 feet. Monitor for parameters in List A, Table 6.2. - Establish eight monitoring wells downgradient at landfill perimeter capable of sampling to depths of 25, 50, 75 and 100 feet. Construct wells of stainless or Teflon®. Monitor for parameters in List A (Table 6.2). - If condition permits, use LETCO Hannah Road wells to monitor shallow ground-water quality. If well condition is poor, replace wells with stainless steel or Teflon®. Monitor for parameters in List A, Table 6.2. - Establish wells in deeper zones along Hannah Road, to depths of 50, 75 and 100 feet. Analyze for parameters in List A, Table 6.2. - If possible, establish a line of monitoring wells along edge of farthest plume extent. Construct and monitor for parameters in List A, Table 6.2. - If contamination is determined to exist at depths of 100 feet, increase monitoring depth in order to determine maximum depth of contamination. Monitor for parameters specified in List A, Table 6.2.	This recommended monitoring program is more extensive than confirming if contamination exists. It is intended to define the extent of contamination and help determine remedial action.
Sludge Lagoon	77	Monitoring program described under Landfill No. 4 will include the sludge lagoon.	Landfill No. 4 and the sludge lagoon are too close to monitor separately.

TABLE 6.1 (Continued)

Site	HARM Score	Recommended Monitoring	Comments
DDT Spill (1979)	70	Monitor soil samples for DDT to verify clean up of the site.	Preliminary monitoring has indicated DDT contamination. The soil in the spill area should be removed and replaced with fill material then pave over the site.
Fire Protection Area No. 2	64	Collect soil borings in and around the suspected area of the old pits (100 ft. by 200 ft., 15 in the pit area and 1 outside the area). The borings should be on 50 foot grid, ten feet deep and soil samples taken at regular intervals and at any interface. Analyses should be performed on water extractions and then analyzed for the parameters in List B (Table 6.2).	
Landfill No. 1	59	a. Conduct geophysical survey in the area in and around the landfill (approximately 15 to 20 acres). If geophysical survey techniques do not work then install six monitoring wells into the top of the water table down-gradient of the site (about 10 to 20 feet deep). Sample for floating material. b. Collect surface water samples of leachate stream(s). Analyze for parameters in List A (Table 6.2).	JP-4 spill (1965) occurred around Landfill No. 1. Therefore monitoring of these sites should be performed jointly.
Landfill No. 2	58	Establish shallow ground-water quality monitoring system in uppermost aquifer, consisting of one upgradient and three downgradient wells. Construct wells of PVC (Schedule 40) and monitor for parameters in List A (Table 6.2).	
JP-4 Spill (1965)	57	Conduct monitoring as described under Landfill No. 1.	Should monitor with Landfill No. 1 since they are in the same area.
Hazardous Waste Burial Site	54	Establish shallow ground-water quality monitoring system in uppermost aquifer consisting of one upgradient and two down-gradient wells. Construct wells of PVC (Schedule 40) pipe and monitor for parameters in List B (Table 6.2).	
Fire Protection Training Area No. 1	52	Monitoring will be included as part of monitoring program at Landfill No. 2.	
Laboratory Chemical Disposal Site	51	Utilize geophysical survey techniques to locate site. If site is identified, collect soil boring as described for Fire Protection Area No. 2.	Unable to determine location of this site. Geophysical survey may be able to detect metal containers.

TABLE 6.1 (Continued)

Site	HARM Score	Recommended Monitoring	Comments
Water Supply Wells	-	Conduct a water sample collection and analyses program for water supply wells Nos. 3, 6, 8 and 12. The parameters shown in List A of Table 6.2 should be used for analyses of each sample.	
Surface Water Monitoring	-	Sample water and sediments of the drainage courses from Landfill No. 4 to the base boundary. Set up approximately 8 sampling stations and analyze for the parameters in List A (Table 6.2).	

TABLE 6.2

RECOMMENDED LIST OF ANALYTICAL PARAMETERS

List A

Samples from:

- Ground-water monitoring wells
- Leachate
- Base water supply wells
- Stream sediment samples
- Stream water samples

Analyses to include:

- GC/MS scan
- Total organic carbon
- pH
- Nickel
- Phenol
- Cyanide
- Copper
- Zinc
- Manganese
- Total dissolved solids
- Interim Primary Drinking Water Standards (selected list)

Arsenic	Lead	Endrin	2,4,5-TP Silvex
Barium	Mercury	Lindane	Radium
Cadmium	Nitrate	Methoxychlor	Gross alpha
Chromium	Selenium	Toxaphene	Gross Beta
Fluoride	Silver	2,4-D	

List B

Samples from:

- Ground-water monitoring wells
- Water extract of soil borings

Analyses to include:

- Interim Primary Drinking Water Standards (see above list)
- pH
- Total organic carbon
- Nickel
- Phenol
- Cyanide
- Copper
- Zinc
- Manganese
- Total Dissolved Solids

APPENDICES

APPENDIX A

BIOGRAPHICAL DATA

G. M. Gibbons
R. M. Reynolds, P.E.
E. J. Schroeder, P.E.
M. I. Spiegel
R. E. Zimmermann, C.P.G.

Biographical Data
GREGORY M. GIBBONS
Sanitary Engineer

PII Redacted

[redacted]

Education

B.S. in Civil Engineering, 1978, University of Notre Dame
M.S. in Sanitary Engineering, 1980, University of Michigan, Ann Arbor.

Professional Affiliations

Engineering-in-Training (Indiana)
American Society of Civil Engineers
Water Pollution Control Federation

Experience Record

1977-Date — Engineering-Science. Technical Specialist (1977). Responsible for reviewing shop drawings and performing general office duties.

Assistant Engineer (1978). Prepared designs, wrote specifications, and reviewed shop drawings.

Engineer (1979). Responsible for design preparation, pilot plant operation, and data analysis. Also involved in contract administration.

Sanitary Engineer (1980-Date). Responsible for industrial waste survey, characterization and treatability studies, including field surveys, analyses, interviewing and report preparation. Responsible for field investigation and report preparation for sludge land application EIS at Des Moines, Iowa. Assisted in air pollution source tests and compliance determinations at various industrial facilities. Assisted in EIS preparation for wastewater treatment plant in Hanover County, Virginia. Responsible for design of components of 100-mgd Division Avenue Water Treatment Plant (Cleveland, Ohio). Lead responsibility in process design for electroplating waste treatment system. Project Manager for resource recovery assessment of newsprint for the Commonwealth of Virginia.

1978-1979 — University of Michigan, Ann Arbor, Michigan. Laboratory Aide (1978). Teaching Assistant (1979). Responsible for instructing laboratory classes in water quality analysis.

Biographical Data

Randal M. Reynolds

Senior Engineer

PII Redacted

[redacted]

Education

BChE (Chemical Engineering), 1973, Georgia Institute of Technology, Atlanta, Georgia

Professional Affiliations

Registered Professional Engineer, Georgia #13023
Air Pollution Control Association
American Institute of Chemical Engineers (Chapter Secretary)

Experience Record

1973-1975 U.S. Environmental Protection Agency, Water Enforcement Branch, Atlanta, Georgia. Chemical Engineer. Responsible for developing draft NPDES limitations for industrial discharges, issuing public notices and final NPDES permits and participating in public hearings concerning NPDES permits.

1975-1981 Gold Kist Inc., Corporate Engineering, Atlanta, Georgia. Environmental Process Engineer. Responsible for reviewing and implementing new air quality, NPDES, RCRA and TSCA regulations. Supervised preparation and submittal of air quality, water quality and hazardous waste permit applications. Kept management informed of impact of regulations on existing and future projects.

Served as staff engineer responsible for preparing preliminary designs for air pollution control systems and detailed cost estimates for air system capital projects. Major projects included the preliminary selection of alternatives for a particulate emission control system for a 60,000 lbs/hr industrial steam boiler (peanut hull/wood fired).

1981-Date Engineering-Science, Inc., Atlanta, Georgia. Senior Engineer. Responsibility for developing environmental studies and alternative evaluations for clients.

Randal M. Reynolds, Continued

Project Engineer for Phase I Installation Restoration Program projects for the Department of Defense. Developed hazardous chemical usage, waste generation and waste disposal practice timelines for industrial operations at several Air Force bases. Identified industrial operation disposal practices which could result in migration of contaminants and recommended priority disposal practices requiring further investigation.

Project Engineer assisting in a comprehensive study of the solid waste management program for the City of Roswell, Georgia. Developed conceptual cost estimates for a city operated sanitary landfill and incinerator disposal alternatives.

Project Manager for development of a Spill Prevention Control and Countermeasures (SPCC) Plan for an industrial facility. Coordinated the design of spill containment structures and recommended structure modifications. Recommended essential spill control and clean-up equipment.

Publications and Presentations

R. M. Reynolds, "Practical Tips - Bagging Sludge?", Pollution Engineering, Vol. 12, No. 7, July 1980, pg. 28.

R. M. Reynolds, "Pulse-Type Fabric Filters in a Soybean Processing Facility," Operation and Maintenance of Air Particulate Control Equipment, R. A. Young, F. L. Cross, Jr., editors, Ann Arbor Science Publishers, Inc., Ann Arbor, Michigan, July 1980, pp. 121-123.

"Operation, Maintenance and Design of Fabric Filters for a Soybean Processing Facility," a slide presentation for the EPA technology transfer serminar, "Operation and Maintenance of Air Pollution Equipment for Particulate Control," April 12, 1979, Atlanta, Georgia.

Biographical Data

ERNEST J. SCHROEDER

Environmental Engineer
Manager, Solid and Hazardous Waste

[redacted]

Education

B.S. in Civil Engineering, 1966, University of Arkansas, Fayetteville, Arkansas
M.S. in Sanitary Engineering, 1967, University of Arkansas, Fayetteville, Arkansas

Professional Affiliations

Registered Professional Engineer (Arkansas No. 3259, Georgia No. 10618, Texas No. 33556 and Florida No. 0029175)
Water Pollution Control Federation

Honorary Affiliations

Chi Epsilon

Experience Record

1967-1976 Union Carbide Technical Center, Engineering Department, South Charleston, West Virginia (1967-1968). Project Engineer. Responsible for environmental protection engineering projects for various organic chemicals and plastics plants. Conducted industrial waste surveys, landfill design, and planning for plant environmental protection programs; evaluated air pollution discharges from new sources; reviewed a wastewater treatment plant design; and participated on a project team to design a new chemical unit.

Union Carbide Corporation, Environmental Protection Department, Texas City, Texas (1969-1975). Project Engineer and Engineering Supervisor. Responsible for various aspects of plant pollution abatement programs, including preparation of state and federal permits for wastewater treatment activities.

Operations Representative on $8 million regional wastewater treatment project and member of design team which made the initial site selection and process evaluation

ERNEST J. SCHROEDER (Continued)

and recommendation. Participated in contract negotiations, process and detailed engineering design, construction of the facilities, preparation of start-up manuals, operator training, and the start-up activities. Designated as Project Engineer after start-up on expansion to original waste treatment unit.

Engineering Supervisor responsible for operation of wastewater treatment facilities including collection system, sampling and monitoring programs, spill control and clean-up, primary waste treatment, wastewater transfer system, biological waste treatment, and waste treatment pilot plants. Developed odor control program which successfully reduced odor emissions and represented Union Carbide at a public hearing on community odor problems.

Led special projects such as an excess loss control program to reduce water pollution losses; sewer segregation program involving coordination and reporting of 38 projects for the separation of contaminated and non-contaminated water; and sludge disposal program to develop long-term sludge disposal alternatives and recover land in present sludge landfill area. Developed improved methods of sampling and continuous monitoring of wastewater.

Union Carbide Corporation, Environmental Protection Project Engineer, Toronto, Ontario, Canada (1975-1976). Responsible for the overall environmental permitting, engineering design, construction and start-up of waste treatment systems associated with a new refinery.

1976-Date Engineering-Science, Inc., Project Manager (1976-1978). Responsible for several industrial wastewater projects including the following: wastewater investigation to characterize sources of waste streams in a chemical plant and to develop methods to reduce the wastes, sludge settling studies to evaluate settling characteristics of activated sludge at a chemical plant, development of a process document for the design and operation of a wastewater treatment facility at a petrochemical complex, wastewater treatment evaluation which included characterization of wastewater, unit process evaluation, inhibition studies, design review, operations review, preparation of operations manual, operator training and providing operating assistance for waste treatment facilities, various biological treatability studies and bench-scale and pilot-scale evaluation of advanced waste treatment technologies such as granular carbon adsorption, multimedia filtration, powdered activated carbon treatment, ion exchange and ozonation.

ERNEST J. SCHROEDER (Continued)

Project Manager for hazardous waste disposal projects involving waste characterization, development of criteria for disposal of hazardous waste, site investigation, preparation of permits, detailed design, construction of facilities and spill clean-up activities.

Deputy Project Manager for industry-wide pilot plant study of advanced waste treatment in the textile industry. Technologies evaluated included coagulation/clarification, multi-media filtration, granular carbon adsorption, powdered activated carbon treatment, ozonation and dissolved air flotation.

Engineering-Science, Inc., Manager of the Industrial Waste Group in the Atlanta, Georgia office (1978-1980). Responsible for the supervision of industrial waste project managers and project engineers and the management of industrial waste studies conducted in the office. Also directly involved in project management consulting with clients on environmental studies and environment assessment projects, e.g., project manager for several spill control and wastewater treatability projects and for a third-party EIS for a new phosphate mine in Florida.

Engineering-Science, Inc., Manager of Solid and Hazardous Waste Group in the Atlanta, Georgia office (1980-date). Responsible for the supervision of solid and hazardous waste project managers and project engineers and the management of solid and hazardous waste projects in the office. Project activities have included permit and regulatory assistance, environmental audits, waste management program development, ground water monitoring, landfill evaluations, landfill closure design, hazardous waste management, waste inventory, waste recovery/recycle evaluation, waste disposal alternative evaluation, transportation evaluation, and spill control and countermeasure planning.

Project Manager for several Phase I Installation Restoration Program projects for the U.S. Air Force. The objective of this program is to audit past hazardous waste disposal practices that could result in migration of contaminants and recommend priority sites requiring further investigation. Also conducted environmental audits (air, water and solid waste) at several Gulf Oil Company facilities.

ERNEST J. SCHROEDER (Continued)

Publications and Presentations

Schroeder, E. J., "Filamentous Activated Sludge Treatment of Nitrogen Deficient Waste," research paper submitted in partial fulfillment of the requirements for MSCE degree, 1967.

Schroeder, E. J., and Loven, A.W., "Activated Carbon Adsorption for Textile Wastewater Pollution Control," Symposium Proceedings: Textile Industry Technology, December 1978, Williamsburg, VA.

Schroeder, E. J., "Summary Report of the BATEA Guidelines (1974) Study for the Textile Industry," North Carolina Section of AWWA/ WPCA, Pinehurst, North Carolina, November 1979.

Mayfield, R. E., Sargent, T. N. and Schroeder, E. J., "Evaluation of BATEA Guidelines (1974) Textiles," U.S. EPA Report, Grant No. R-804329, February 1980.

Storey, W. A., and Schroeder, E. J., "Pilot Plant Evaluation of the 1974 BATEA Guidelines for the Textile Industry," Proceedings of the 35th Industrial Waste Conference, Purdue University, May 1980.

Pope, R. L., and Schroeder, E. J., 'Treatment of Textile Wastewaters Using Activated Sludge With Powdered Activated Carbon," U.S. EPA Report, Grant No. R-804329, December 1980.

Schroeder, E. J., "Industrial Solid Waste Management Program to Comply with RCRA," Engineering Short Course Instructor, Auburn University, October 1980.

Schroeder, E. J., "Technical and Economic Impact of RCRA on Industrial Solid Waste Management, Florida Section, American Chemical Society, May 1981.

Biographical Data

MARK I. SPIEGEL

PII Redacted

Environmental Scientist

[redacted]

Education

B.S. in Environmental Health Science (Magna cum laude), 1976, University of Georgia, Athens, Georgia
Limnology and Environmental Biology, University of Florida, Gainesville, Florida
Business Administration, Georgia State University

Professional Affiliations

American Water Resources Association
Technical Association of the Pulp and Paper Industry

Experience Record

1974-1976 U.S. Environmental Protection Agency, Surveillance and Analysis Division. Cooperative Student. On assignment to Air Surveillance Branch, participated in ambient air study in Natchez, Mississippi, and operated unleaded fuel sampling program for Southeast National Air Surveillance Network. For Engineering Branch, participated in NPDES compliance monitoring of industrial facilties throughout the southeast; operation and maintenance studies of municipal waste treatment facilities; and post-impoundment study of West Point Reservoir, West Point, Georgia. Participated in industrial bioassay studies for the Ecological Branch.

1977-Date Engineering-Science. Environmental Scientist. Responsible for the conduct of water and wastewater sampling programs and analyses, quality control, laboratory process evaluations, and evaluation of other environmental assessment data. Conducted leachate extraction studies of sludges produced at a large organic chemicals plant to define nature of sludges according to the Resource Recovery and Conservation Act guidelines. Involved in laboratory quality assurance program for the analysis of water samples used in a stream modeling project. Conducted water quality modeling study for Amerada Hess Corporation to determine the assimilative capacity of a stream receiving effluent from a southern Mississippi refinery.

Mark I. Spiegel (Continued)

Participated in bench-scale industrial treatability studies conducted for the American Textile Manufacturers Institute and Eli Lilly Pharmaceuticals in Mayaguez, Puerto Rico, and in carbon adsorption studies for an American Cyanamid chemical plant and Union Carbide Agricultural Products Division.

Involved in various aspects of several industrial environmental impact assessments including preliminary planning for a comprehensive study for St. Regis Paper Company on a major pulp and paper mill expansion project. Assisted in preparation of third-party EIS for EPA and Mobil Chemical Company concerning a proposed 16,000-acre phosphate mining and beneficiation facility. Developed an EIA prior to construction of a pulp and paper complex by the Weyerhaeuser Company in Columbus, Mississippi, which included preparation of a separate document for the Interstate Commerce Commission concerning the construction of a railroad spur to serve the complex. Also involved in formulating the water quality, water resource and socio-economic aspects of an environmental impact assessment for International Paper Company. Participated in large scale site evaluation to determine the suitability and environmental permitting requirements of a site for an east coast brewery for the Adolph Coors Company. Assisted in development of a peat mining and restoration plan for a private concern in coastal North Carolina.

Project Manager. Conducted comprehensive process evaluation of an 80 mgd wastewater treatment system for Weyerhaeuser Company. Responsible for a study to determine the leaching characteristics of sludges for a paint manufacturing facility for RCRA compliance. Also managed study for development of a solid waste management plan for a ceramic pottery manufacturer in northern Alabama which included evaluating surface and groundwater contamination potential from the existing disposal site and assisting manufacturer in developing a disposal program acceptable to state agencies.

Participated as project team member for Phase I Installation Restoration Program projects for the Department of Defense. Studies were conducted at five Air Force bases to identify past hazardous waste disposal practices that could result in migration of contaminants and recommend priority sites requiring further investigation.

Biographical Data

ROBERT E. ZIMMERMANN

Geologist

PII Redacted

[redacted]

Education

B.S. in Geology, 1978, University of Akron, Akron, Ohio
Post baccalaureate Studies - University of Akron - Geology, 1979
M.S. - Envionrmental Geology, University of Akron - Presently working towards degree
Cartographic Certification - 1981 - University of Akron

Professional Affiliations

American Institute of Professional Geologists
National Water Well Association
Geological Society of America
American Society of Photogrammetry

Experience Record

1978 - 1981 Ohio Environmental Protection Agency, Twinsburg, Ohio
Geologist

...Performed RCRA Site inspections of Hazardous Waste Facilities as part of permit process
...Performed site investigations and evaluations for the disposal of hazardous and solid waste materials.
...Hydrogeologic studies of ambient groundwater quality in various aquifers in Northeast Ohio.
...Performed groundwater contamination studies due to various pollution sources (landfills, chemical disposal sites, salt storage, road salting, brine disposal, etc.)
...Hydrogeologic evaluation for injection well sites.
...Conducted Surface Impoundment Assessment in Northeast Ohio as required by the Safe Drinking Water Act and completed groundwater pollution potential reports on selected impoundments.
...Responsible for the compiling and drafting of final copies of groundwater aquifer maps for State of Ohio.
...Worked with general public on water quality and well problems.

Robert E. Zimmermann (Continued)

Additional Responsibilities

...Worked very closely with various consultants on groundwater contamination problems and approval of new or expanding landfill sites;
...Compiled and drafted soil capability maps, groundwater quality maps, aquifer maps, etc.;
...Collected and interpreted geochemical analyses of groundwater samples;
...Provided input for Ohio's proposed Groundwater Protection Strategy;
...Provided geologic information as needed by Ohio EPA staff and general public

1981 - Date — Engineering-Science, Inc., Cleveland, Ohio. Geologist. Responsible for setting up groundwater monitoring programs for industry; supervising drilling and well construction of monitoring wells; assessing impact of contaminants on groundwater quality; determining flow rates, directions, etc., of groundwater at industrial disposal sites; locate and determine new sites suitable for solid and hazardous waste disposal, monitoring groundwater at solid waste facilities; determination of subsurface geology at various locations; hydrogeologic studies at various solid and hazardous waste disposal facilities.

Special Skills

Certified Cartographer, drafting abilities, calligrapher

APPENDIX B

INSTALLATION HISTORY, ORGANIZATION AND MISSIONS

APPENDIX B

INSTALLATION HISTORY, ORGANIZATION AND MISSIONS

HISTORY

This information was obtained from Robins AFB records.

Robins Air Force Base began in 1941 with the announcement by Congressman Carl Vinson of plans to establish a maintenance and supply depot in the southeast. The original tract of 3,000 acres of land was donated by the City of Macon and Bibb County. Subsequent acquisitions by the Federal Government increased the size of the installation to its present 8,855 acres.

The names "Robins" for the Base and "Warner Robins" for the ALC and the City honor the memory of Brigadier General Augustine Warner Robins, Chief of the Air Corps, Material Division, Army Air Corps, 1935-1939, and Commandant of Randolph Field at the time of his death in 1940.

Officially activated on 1 March 1942 and declared a permanent military installation in 1952, the base today is a multi-mission facility. The original intent was to establish a maintenance and supply depot but the installation also became a training center. Original facilities were both temporary and permanent. After World War II, Robins ceased to be a training center but continued as an Air Material Area of AMC (now AFLC).

A second growth spurt began in 1949 when the Fourteenth Air Force Headquarters moved to Robins where it remained until deactivated in 1960. Headquarters Continental Air Command moved to Robins in 1961. Other factors contributing to the expansion were the Korean Conflict in 1950 and the decentralization of prime responsibility by the Air Material Command to its Air Material Areas.

The largest construction program commenced in 1958 with contracts exceeding 26 million dollars to prepare facilities for the 19th Bombardment Wing as a tenant organization. Runway enlargement and Capehart Family Housing were two of the numerous items of this program. In 1962, the runways were further rehabilitated to better accommodate the heavy B-52 and KC-135 aircraft.

Today, Robins AFB, an Air Force Logistics Command installation, is a huge, sprawling military complex of closely related units with diversified missions. The Warner Robins Air Logistic Center is one of five similar organizations in the Air Force. These Centers provide logistics support to the entire Air Force, and it is their mission to keep the United States Air Force Weapons Systems at constant state of readiness.

The Warner Robins ALC determines the parts, supplies, and equipment needed to support the weapon systems for which it is responsible.

The ALC budgets for these items, buys them, stores them, distributes them, repairs and maintains them, and finally disposes of them when they have outlived their usefulness.

In short, the Warner Robins ALC is system manager for 41 aircraft, missile and support systems. In addition, the ALC has 10 program management assignments. The ALC's support mission includes management of 167,000 items in virtually all commodity areas.

The commodity range is from simple hardware items to the free world's most sophisticated aerospace communications and electronic equipment.

The entire Air Force fleet of bombers, fighter-interceptors, reconnaissance, cargo aircraft, and helicopters depends on Warner Robins logistics expertise to fulfill vital logistical needs.

In 1973, the ALC was designed as the Technology Repair Center for airborne electronics, gyros and life support systems. Airborne electronics is one of the largest and most sophisticated repair loads of the new assignments.

The Warner Robins Air Logistics Center has command jurisdiction over the installation with the 2853rd Air Base Group providing the housekeeping functions vital to operation of the installation.

Throughout its 41 years, the relationship of Robins AFB with its neighboring communities has been outstanding. The Base depends upon the local area for many community services and its most important resource people. In turn, Robins AFB is an integral part of the Middle Georgia economy. There is recognition of this dependence as the base and the communities work together for a solution of mutual problems and the further strengthening of the ties that bind the two.

ORGANIZATIONS AND MISSIONS

This information was obtained from the Robins Air Force Base Tab A-1 Environmental Narrative and the Warner Robins-Air Logistics Center Information Handbook, Fiscal Year 1981, prepared by Management and Cost Analysis, Comptroller.

Warner Robins-Air Logistics Center

The Warner Robins Air Logistics Center (WR-ALC) is one of five organizations that provide logistics support to the entire U. S. Air Force. As a worldwide logistics manager, it is one of the vital parts of the Air Force Logistics Command (AFLC) which supports the aerospace forces.

The Center determines the spare parts, supplies and equipment needed to support the weapon systems for which it is responsible. It budgets for these, buys them, stores them, distributes them, and finally disposes of them when they have outlived their usefulness.

Warner Robins ALC currently serves as System Manager - that is, the overall Air Force focal point - for five transport aircraft, seven utility aircraft, five helicopters, eight air-to-air and air-to-ground missiles, seven drones, the F-15 Fighter and B-57 reconnaisance bomber. The latest system management responsibility assignment is the H-60 Helicopter.

Warner Robins ALC's support mission includes management of nearly 200,000 items ranging from single hardware items to the most sophisticated communications and electronic equipment. The entire fleets of Air Force bombers, fighter-interceptors, reconnaissance, cargo aircraft, and helicopters depend on the Warner Robins ALC to fulfill their logistics needs. Other item management responsibilities include bombing-navigation systems, fire control systems, target acquisition systems, airborne radar, airborne electronic warfare systems, propellers, bearings, general purpose automatic data processing equipment, satellite communication equipment, guns and vehicles.

The largest group of people in the ALC are engaged in repairing, modifying, and overhauling aircraft and equipment. In the aircraft area, this involves depot level repair of the C-141, C-130 and the F-15.

The WR-ALC is also the technology repair center for aircraft propellers, life support equipment, instruments, gyros, and airborne electronics. As Avionics Center of the Air Force, we use some of the most sophisticated equipment and skills anywhere in the world.

The Center has the geographic area logistics support responsibility for most Air Force bases along the eastern coast as well as the Atlantic Missile Test Range, Newfoundland, Labrador, Greenland, Iceland, Bermuda and the Azores.

Tenant Organizations

Robins AFB is the host to many tenants and provides services, facilities, and other support to these organizations. The following list shows the tenant units located on Robins Air Force Base. In addition, Robins AFB supports some 63 off base organizations ranging from high school ROTC detachments to American units in 11 foreign countries.

Robins Air Force Base Exchange (AAFES)

The mission of the Army & Air Force Exchange Service is to: (1) provide merchandise and services of necessity and convenience which are not furnished from appropriated funds to authorized patrons at uniformly low prices.

Robins Air Force Base Commissary (AFCOMS)

The Air Force Commissary Service (AFCOMS) is a centralized commissary system which manages and operates the worldwide Air Force Commissary function.

1926th Communications Squadron (AFCC)

The mission of the 1926 Communications Squadron is to manage, operate, and maintain communications-electronics-meteorological (C-E-M) services and the air traffic control (ATC) services/facilities in support of Robins AFB.

Detachment 5, Air Force Communications Command (AFCC)

The mission of DET 5, AFCC, is to provide communications-electronics (C-E) and air traffic control (ATC) staff support to Headquarters Air Force Reserve (AFRES).

5th Combat Communications Group (AFCC)

The mission of 5th Combat Communications Group is to provide mobile and transportable communications, aids to navigation, and air traffic control services for use in any area of the world, but primarily in support of the Tactical Air Command.

1839th Engineering Installation Group, Operating Location C (AFCC)

The mission of the 1839th Engineering Installation Group, Operating Location C, Robins Air Force Base, Georgia, is to fabricate AN/TSC-107 (Quick Reaction Package), test, furnish emergency and depot level maintenance of these systems in the field.

Headquarters Air Force Reserve (AFRES)

The United States Air Force Reserve develops, maintains, and provides operationally ready units and trained individuals needed to augment the Air Force in time of war, national emergency or when required to maintain national security.

94th Aerial Port Squadron (AFRES)

The primary peacetime mission of the 94th Aerial Port Squadron is to attain and maintain through training a state of operational readiness that will permit the 94th Aerial Port Squadron to fulfill its mobilization and/or contingency responsibilities.

402d Combat Logistics Support Squadron (AFRES)

The primary mission of the 402d Combat Logistics Support Squadron is to provide highly trained worldwide deployable military teams to accomplish rapid aircraft battle damaged repair and combat packaging and supply operations.

Detachment 6, 3025th Management Engineering Team (AFLC)

The Management Engineering Team (MET) provides manpower, organization, management engineering and management advisory services to all ALC activities.

Detachment 8, 2762d Logistics Squadron (Special) (AFLC)

Det 8 insures equipment, skills, and techniques capable of performing and supporting the system's operational role are compositely programmed, managed, and furnished in keeping with overall program objectives.

NCO Academy/Leadership School (AFLC)

The mission of the NCO Academy and NCO Leadership School is to insure that selected NCOs are prepared to assume supervisory positions, more advanced leadership and management responsibilities, and are able to fulfill their role in the Air Force.

321st Field Training Detachment (ATC)

FTD 321 is an off-campus unit of the U.S. Air Force School of Applied Aerospace Sciences, Sheppard AFB, Texas.

3503d USAF Recruiting Group (ATC)

The Group is responsible for all active duty Air Force recruiting programs in 12 states and Puerto Rico.

14th Flying Training Wing (ATC)

The detachment trains the co-pilots of the 19th Bomb wing.

Office of the Placement Coordinator Zone 2 and Atlantic Theatre (DOD)

The DOD Placement Coordinator, Zone 2/Atlantic Theatre, acts for the Assistance Secretary of Defense (Manpower, Reserve Affairs and Logistics) in implementing and administering various DOD-wide personnel programs in the geographic area of the Southeast and Southwest Civil Service Regions and the Atlantic Theatre.

DCAS Quality Assurance Section (DLA)

DCAS Quality Assurance Section is a management area of Defense Contracts Administration Region Atlanta located in Marietta, Georgia.

Defense Property Disposal Office (DLA)

The Defense Property Disposal Office mission is to receive, segregate, inspect, classify, and store excess surplus and scrap property turned in by all host installation organizations and other generators in the geographical area. Dispose of property through reutilization, transfer, donation, sale and destruction.

Federal Aviation Administration Radar Approach Control (FAA)

The mission of the FAA Radar Approach Control is to provide for the management of civil and military air traffic operating within the geographical boundaries of the facility's allocated navigable airspace.

Air Force Audit Agency Area Office

Detachment 960 (AFAA)

The mission of Det 960, Air Force Audit Agency (AFAA) Area Audit Office is to provide all levels of Air Force management with independent, objective, and constructive evaluations of the economy, effectiveness, and efficiency with which managerial responsibilities (including financial, operational, and support activities) are carried out.

Detachment 712, Air Force Office of

Special Investigations (AFOSI)

AFOSI Detachment 712 is a field extension of AFOSI District 7, Patrick AFB, FL. AFOSI investigates fraudulent activities, major administrative irregularities and violations of public trust involving Air Force procurement, disposal, pay and allowance matters, and nonappropriated fund activities.

Area Defense Counsel (USAF)

The Area Defense Counsel's mission is to perform legal defense functions.

Detachment 13, 15th Weather Squadron (MAC)

The mission of Det 13, 15 Weather Squadron is to provide or arrange for the environmental services needed to support the exercise, contingency, and wartime requirements of the Warner Robins Logistics Center and the 19th Bombardment Wing.

Headquarters 19th Bombardment Wing (SAC)

The mission of the 19th Bombardment Wing, Heavy, (BMW) is to develop and maintain operational capability to permit the conduct of strategic warfare according to the emergency war order (EWO) plans as directed by proper command authority.

Procurement Center Representative (SBA)

The Procurement Center Representatives (PCRs) represent the Small Business Administration to the commanding officer of the installation on any procurement or technical matter pertaining to policy or operation SBAs programs or the small business community.

4400th Mobility Support Flight (TAC)

The mission is to acquire, store, and maintain the Harvest Eagle Air Transportable Housekeeping Package in a serviceable condition for deployments in support of wartime commitments, contingencies, and exercises.

Detachment 3, 2d Aircraft Delivery Group (TAC)

Responsible for the movement of aircraft from the Southern United States and Central and South America.

RAF - Royal Air Force C-130 Liaison Team

This team serves as liaison for the C-130 program between the Royal Air Force and Robins AFB.

RCAF - Canadian Forces Logistics Unit

The first Canadian Forces Logistics Liaison Detachment is to serve as liaison agency between logistics functions at Robins AFB and the Royal Canadian Air Force.

RAAF - Royal Australian AF Liaison Office

The Royal Australian AF Liaison Office is to serve as liaison agency between logistics functions at Robins AFB and the Royal Australian Air Force.

U. S. Army Corps of Engineers

This U. S. Army unit is known as the U. S. Army Corps of Engineers, Savannah District. It administers and supervises Air Force and Army construction contracts at Robins and the surrounding areas. It coordinates contract sales of government real estate properties and facilities.

General Accounting Office (USGAO)

The U. S. General Accounting Office is an independent, nonpolitical agency in the legislative branch of the government. It provides the Congress, its committees and members with information, analyses and recommendations concerning operations of the government, primarily the executive branch.

GAO is concerned that the federal departments and agencies through their programs and activities, carry out the mandate or intent of legislation enacted by the Congress.

APPENDIX C

SUPPLEMENTAL ENVIRONMENTAL SETTING INFORMATION

APPENDIX C

SUPPLEMENTAL ENVIRONMENTAL SETTING
INFORMATION

BIOLOGICAL RESOURCES

The following information regarding the Robins AFB biological resources was obtained from the Tab A-1, Environmental Narrative, 1976. The information pertaining to threatened and endangered vertebrate species was verified and updated by the Georgia Game and Fish Division (GA Game and Fish Div., 1982).

Robins AFB encompasses natural forests totaling 1,964 acres (60% wetlands) and grasslands with low bush totaling 4,197 acres. The wet ecosystem of the wetlands promotes the growth of hardwoods such as oak and hinders the growth of softwoods such as pine. Floating, submerged and emergent types of aquatic plants are present in the wetlands.

The natural forests and grasslands on-base provide habitat areas for a wide variety of animal life. Large and small game animals and a variety of predatory bird exist on-base. Numerous species of fish and waterfowl inhabit the lakes and wetlands on-base. Several of the animal species are included as threatened or endangered as shown in Table C.1.

SUMMARY OF SURFACE WATER QUALITY DATA

A summary of NPDES water quality sampling data is shown in Table C.2. A summary surface water quality sampling data conducted by the Base Bioenvironmental Engineering Office is shown in Tables C.3 through C.10. The EPA interim primary and proposed secondary drinking water standards are shown in Table C.11.

INVENTORY OF PESTICIDES

A summary of the current inventory of pesticides on-base is shown in Table C.12.

GROUND-WATER MONITORING - LANDFILL NO. 4

In October 1979 Law Engineering Testing Company (LETCO) was subcontracted to perform a hydrogeologic and ground-water quality study at Landfill No. 4. The objectives of the study were to determine if any ground or surface water contamination was occurring from Landfill No. 4 or the sludge lagoon, determine the magnitude of contamination if demonstrated to exist, and provide other relevant landfill closure information.

The study consisted of an exploratory drilling program, the installation of a monitoring well system and ground and surface water sampling, summarized in a formal report. The study confirmed the presence of several metals and numerous priority pollutants hydraulically down stream and down-gradient of Landfill No. 4 (LETCO, 1980). Recommendations for further studies were included in the formal report. The Phase I IRP report is a follow-on project to the earlier study and supplements the information collected in the previous work.

TABLE C.1

THREATENED OR ENDANGERED VERTEBRATE SPECIES
POTENTIALLY FOUND WITHIN
ROBINS AIR FORCE BASE

Common Name	Status	Habitat
Fish		
Suwannee Bass	Threatened	Unpolluted springs & rivers
Trispot Darter	Threatened	Unpolluted streams
Reptiles and Amphibians		
American Alligator	Endangered	Coastal plain swamps & bayous
Pine Barrens Tree Frog	Threatened	Pine barren swamps
Birds		
Southern Bald Eagle	Endangered	Estuarine shores, rivers
Florida Sandhill Crane	Threatened	Wet prairies and fields
Ivory-Billed Woodpecker	Endangered	Bottom land hardwood stands
Red-Cockaded Woodpecker	Endangered	Old-age pine woodlands
Bachman's Warbler	Endangered	River swamp forest
Mammals		
Florida Panther	Endangered	Large, unmolested swamp, deer available

Source: Robins AFB TAB A-2, Updated 1976
Verified and updated by Georgia Game and Fish Division, 1982

TABLE C.2

1981 NPDES DATA SUMMARY

Station/Parameter	Unit	Permit Requirement	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV
Station 001 (Runoff Ditch by Missile Storage)													
BOD	mg/l	10.0	5.8	4.7	2.5	2.4	1.6	1.5	2.6	5.1	4.3	2.3	2.5
Oil/Grease	mg/l	15.0	3.1	0.6	1.5	1.0	1.3	5.4	2.3	10.3	3.1	2.7	4.8
Suspended Solids	mg/l	50.0	--	6.0	4.5	1.3	1.2	--	1.6	3.2	2.4	1.0	2.7
pH	unit	6.0-8.5	6.7	6.9	6.2	6.8	7.3	7.7	7.1	6.9	7.2	6.7	6.7
Station 002 (Runoff Ditch by Ammo Storage Area)													
BOD	mg/l	15.0	8.0	6.3	6.9	3.8	3.0	1.9	1.4	4.1	3.5	2.7	2.2
Oil/Grease	mg/l	15.0	4.6	0.6	1.2	1.9	2.9	3.9	4.1	9.1	5.4	3.8	4.2
pH	unit	6.0-8.5	6.6	6.9	8.5	7.3	7.2	7.4	7.4	7.0	6.8	7.4	6.6
Station 003 (Runoff Ditch North SAC Alert)													
BOD	mg/l	15.0	7.0	4.3	3.2	2.5	3.0	1.3	2.0	4.1	2.5	2.6	1.8
Oil/Grease	mg/l	15.0	3.0	0.8	2.1	1.3	1.7	2.1	1.7	11.0	2.6	3.1	8.4
pH	unit	6.0-8.5	6.7	10.3	7.2	6.5	7.3	7.2	7.6	7.3	8.0	6.9	6.7
Station 004 (Hannah Rand Runoff Ditch)													
BOD	mg/l	15.0	5.1	2.4	3.7	2.3	1.8	2.0	1.6	1.6	2.5	1.3	2.0
Oil/Grease	mg/l	15.0	1.8	0.3	1.3	1.5	3.4	1.2	2.9	2.9	6.2	4.7	4.6
pH	unit	6.0-8.5	6.5	7.1	7.1	6.9	7.1	7.1	7.1	6.9	6.7	6.9	6.5
NH_3-N	mg/l	2.0	0.56	0.28	0.8	0.3	0.5	1.4	0.56	1.8	0.001	2.4	0.3

TABLE C.2

(Continued)
1981 NPDES DATA SUMMARY

Station/Parameter	Unit	Permit Requirement	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV
Station 005 (Ditch at End of San. Treat. Plant No. 2 Pipe)													
BOD	mg/l	15.0	3.5	3.5	3.7	3.4	2.7	2.4	2.4	4.9	3.0	2.9	2.5
Oil/Grease	mg/l	15.0	1.8	0.1	1.6	2.5	2.1	1.6	4.8	3.7	4.1	4.4	3.2
pH	unit	6.0-8.5	6.9	6.7	6.7	6.7	7.1	7.2	7.2	6.9	7.0	7.1	6.6
NH_3-N	mg/l	2.0	0.42	1.12	0.56	0.2	0.92	0.56	0.56	0.84	0.001	0.28	0.2
Station 006 (Ditch by Dependent Pool)													
BOD	mg/l	15.0	4.7	3.9	3.6	2.9	2.4	1.8	1.4	4.6	1.4	2.8	1.7
Oil/Grease	mg/l	15.0	2.3	0.4	1.4	1.0	4.3	1.5	1.3	2.7	5.2	6.8	3.1
pH	unit	6.0-8.5	7.3	6.4	6.8	6.9	7.4	7.2	7.9	7.4	7.3	6.9	7.0
Station 008 (Industrial Waste Treatment Plant #2)													
BOD	mg/l	30.0	2.1	2.3	3.2	1.3	3.3	1.7	6.8	3.7	3.1	3.1	2.9
Suspended Solids	mg/l	30.0	13.0	18.0	7.9	6.0	5.8	9.9	5.8	8.4	10.0	7.6	6.8
COD	mg/l	150.0	40.0	50.0	38.0	20.0	48.0	60.0	61.0	60.2	55.0	60.0	40.0
Oil/Grease	mg/l	15.0	1.1	1.8	9.4	4.1	6.3	9.0	4.4	6.4	3.1	8.0	6.1
Phenol	mg/l	0.2	0.02	0.2	0.19	0.2	0.1	0.2	0.1	0.1	0.001	0.01	0.01
Cyanide	mg/l	0.35	0.04	0.04	0.05	0.06	0.05	0.1	0.04	0.05	0.03	0.04	0.05
Cadmium	mg/l	0.15	0.02	0.02	0.03	0.02	0.08	0.05	0.02	0.13	0.02	0.02	0.01
Chromium (total)	mg/l	0.45	0.08	0.01	0.01	0.01	0.13	0.07	0.13	0.20	0.10	0.01	0.08
Zinc	mg/l	0.45	0.08	0.05	0.06	0.01	0.10	0.11	0.07	0.10	0.18	0.12	0.1
Nickel	mg/l	0.75	0.01	0.01	0.01	0.12	0.12	0.07	0.1	0.17	0.34	0.06	0.04
Lead	mg/l	0.15	0.01	0.01	0.01	0.01	0.02	0.05	0.01	0.01	0.10	0.08	0.1
Copper	mg/l	0.30	0.02	0.04	0.2	0.02	0.18	0.10	0.07	0.3	0.04	0.07	0.08
pH	unit	6.0-9.0	8.8	8.8	8.3	8.9	8.6	8.8	9.0	9.0	9.0	9.0	8.1

TABLE C.2

(Continued)
1981 NPDES DATA SUMMARY

Station/Parameter	Unit	Permit Requirement	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV
Station 009 (Industrial Waste Treatment Plant #1)													
BOD	mg/l	Not Listed	16.0	20.0	23.0	27.0	21.0	25.0	19.0	18.0	15.0	8.0	8.0
COD	mg/l	"	39.0	50.0	44.0	10.0	32.0	20.0	50.0	31.0	31.4	20.0	20.0
Suspended Solids	mg/l	"	15.0	13.0	25.0	11.0	17.0	18.0	14.0	13.0	15.0	4.0	4.0
Phenol	mg/l	0.20	0.10	0.02	0.02	0.2	0.2	0.2	0.2	0.1	0.1	0.02	0.01
Oil/Grease	mg/l	15.0	0.90	0.2	1.1	2.0	1.6	1.5	4.7	2.3	2.1	2.1	3.0
NH_3-N	mg/l	2.0	0.28	0.56	0.77	1.1	0.6	1.6	0.28	1.8	0.001	0.56	0.2
Fecal Coliform	N/100 ml	400.0	1.0	200.0	131.00	1000	TNTC	219.0	1000	3500	5000	4.0	1.0
pH	Unit	6.0-9.0	7.5	7.9	7.3	7.3	7.0	7.4	7.4	7.3	7.2	7.3	7.2

TNTC = too numerous to count

TABLE C.3

SUMMARY OF WATER SAMPLE RESULTS
FROM MONITORING STATION NO. 001
(Missile Storage Area)
March 1979

Day	COD (mg/l)	TOC (mg/l)	Oil & Grease (mg/l)	Fe (µg/l)	K (mg/l)	Na (mg/l)	CN (mg/l)
13	20	7	0.6	2,300	1.3	5.9	0.2
14	20	8	0.3	1,600	1.1	4.5	0.1
15	20	5	(a)	1,000	1.1	4.5	(b)
16	15	7	(a)	280	1.1	4.5	(b)
17	15	9	(a)	2,900	1.0	6.0	(b)
18	14	7	(a)	3,400	0.7	6.0	2.1

(a) Less than detectable limits of 0.3 mg/l.

(b) Less than detectable limits of 0.1 mg/l.

(c) Results for the following parameters were less than the detectable limits shown:

NH_3(0.2 mg/l), PO_4(0.2 mg/l), Cd(10 µg/l), Cr^{+3}(50 µg/l),

Cr^{+6}(50 µg/l), Cu(20 µg/l), Pb(50 µg/l), Hg(5 µg/l), Ni(50 µg/l) and Zn(50 g/l).

TABLE C.4

SUMMARY OF WATER SAMPLE RESULTS FROM
MONITORING STATION NO. 002 (SAC DITCH), NOVEMBER 1978

Day	COD mg/l	TOC mg/l	Oil & Grease mg/l	Cd μg/l	Cr^{+3} μg/l	Cu μg/l	Ag mg/l	Na mg/l	K mg/l	Zn μg/l	Temp. °F	pH S.U.	D.O. mg/l	NH_3 mg/l	Cl^- mg/l
15	11	1	(b)	31	100	38	28	28	1.6	100	68.9	7.2	8.0	0	0
16	6	(a)	(b)	15	(c)	30	(d)	54.3	1.3	140	68.9	6.8	7.0	0	0
17	5	(a)	(b)	19	58	27	(d)	16	0.4	84	68.9	7.2	6.5	0	0
18	11	(a)	(b)	25	(c)	29	(d)	.31	2.0	100	68	7.2	7.5	0	0
19	6	(a)	0.4	11	(c)	29	(d)	14.1	0.8	70	59	7.2	7.0	0	0
20	6	(a)	0.4	<10	(c)	40	(d)	2.2	0.5	70	62.6	7.0	7.5	0	0
21	6	1	(b)	41	(c)	35	(a)	65.5	1.3	95	66.2	7.0	7.0	0	0

(a) Less than detectable limits of 1.0 mg/l
(b) Less than detectable limits of 0.3 mg/l
(c) Less than detectable limits of 50 g/l
(d) Less than detectable limits of 10 g/l
(e) Results for the following parameters were less than the detectable limits shown:

CN (0.1 mg/l), Phenol (0.1 mg/l), Cr^{+6} (50 μg/l), Pb (50 μg/l)), Ni (50 μg/l), Surfactants (0.1 mg/l).

TABLE C.5

SUMMARY OF WATER SAMPLE RESULTS FROM MONITORING STATION NO. 004 (Hannah Rd.,) February 1979

Day	COD (mg/l)	TOC (mg/l)	Oil & Grease (mg/l)	NH_3 (mg/l)	NO_3 (mg/l)	PO_4 (mg/l)	Cd (μg/l)	Cr^{+3} (μg/l)	Cr^{+6} (μg/l)	Cu (μg/l)	Fe^{+3} (μg/l)	Mn (μg/l)	Hg (μg/l)	Ni (μg/l)	Ag (μg/l)	Zn (μg/l)	Ca (mg/l)	Mg (mg/l)	K (mg/l)	Na (mg/l)	Cl^{-} (mg/l)	SO^{-4} (mg/l)	Surf-act-ants (mg/l)	Phenol (mg/l)	CN (mg/l)
7	130	35	(a)	6.8(b)	0.5	0.5	(d)	(e)	(e)	81	2.3	170	(a)	(e)	(d)	91	23	3	4	36	16	100	0.3	0.55(c)	0
8	95	23	(a)	8.6(b)	0.5	0.5	(d)	52	(e)	36	2.0	150	(a)	(e)	(d)	69	22.5	3	5	37	20	95	0.4	1.1(c)	0
9	20	5	0.4	4.7(b)	0.5	0.4	(d)	(e)	(e)	30	2.2	140	(a)	(e)	(d)	140	17	2	3	19	16	48	0.1	0.45(c)	0
10	35	11	0.8	7.5(b)	0.4	0.4	(d)	(e)	(e)	32	2.2	150	(a)	50	(d)	89	20	2	4	32	24	63	0.2	0.05	0
11	13	5	(a)	4.0(b)	0.6	0.4	(d)	(e)	(e)	32	1.6	130	(a)	(e)	(d)	(a)	14	2	2	15	28	33	0.1	0.02	0
12	35	10	1.4	7.5(b)	0.5	0.5	13	(e)	57	39	1.8	57	(a)	(e)	(d)	(a)	18	<1	4	32	16	78	0.2	0.17	0
13	50	12	1.0	8.0(b)	0.4	0.5	(d)	57	57	110	2.4	180	(a)	(e)	(d)	130	17	2	4	37	16	85	0.4	1.5(c)	0

(a) Less than detectable limits of 0.3 mg/l

(b) Exceeds NPDES permit limits of 2.0 mg/l

(c) Exceeds NPDES permit limits of 0.2 mg/l

(d) Less than detectable limits of 10 μg/l

(e) Less than detectable limits of 50 μg/l.

TABLE C.6

SUMMARY OF WATER SAMLE RESULTS FROM MONITORING STATION NO. 005 (Golf Course Lake), March 1979

Day	COD mg/l	TOC mg/l	Oil & Grease mg/l	PO_4 mg/l	Cu µg/l	Fe µg/l	Hg µg/l	Zn µg/i	K mg/l	Na mg/l	Ca mg/l	CN mg/l
20	10	(a)	(b)	0.3	-	1,400	20	-	0.5	1.4	12.2	-
21	10	(a)	(b)	0.2	36	1,800	(d)	(e)	0.5	2.7	-	2.3
22	6	1	(b)	0.4	65	1,600	(d)	50	0.5	2.3	-	-
23	6	(a)	(b)	(c)	40	1,400	(d)	(e)	0.5	2.3	-	-
24	6	(a)	(b)	(c)	35	570	(d)	(e)	1.5	0.8	-	-
25	6	1	(b)	(c)	30	800	(d)	(e)	1.2	1.1	-	-
26	<5	(a)	5	(c)	<20	1,200	(d)	170	1.5	1.9	-	-

(a) Less than detectable limits of 1.0 mg/l

(b) Less than detectable limits of 0.3 mg/l)

(c) Less than detectable limits of 0.2 mg/l

(d) Less than detectable limits of 5 µg/l

(e) Less than detectable limits of 50 µg/l

(f) Results for the following parameters were less than the detectable limits shown: NH_3 (0.2 mg/l), Cd (10 µg/l), Cr^{+3} (50 µg/l), Cr^{+6} (50 µg/l), Pb (50 µg/l), and Ni (50 µg/l).

TABLE C.7

SUMMARY OF WATER SAMPLE RESULTS FROM
HORSE CREEK (HC) AND THE STABLE AREA (006)
APRIL 1979

Day	COD (mg/l)	TOC (mg/l)	Oil & Grease (mg/l)
Stable Area			
2	15	5	(a)
3	(a)	4	(a)
4	(a)	4	(a)
5	10	4	(a)
6	6	3	(a)
7	6	(a)	(a)
8	6	3	(a)
Horse Creek			
9	15	0.7	(a)
10	10	3	(a)
11	15	4	(a)
12	5	4	(a)
13	5	5	(a)
14	10	5	(a)
15	5	3	(a)

(a) Less than detectable limits of 0.3 mg/l.
(b) Results for the following parameters were less than the detectable limits shown:
NH_3(0.2 mg/l), PO_4(0.2 mg/l) and surfactants (0.1 mg/l).

TABLE C.8

SUMMARY OF WATER SAMPLE RESULTS FROM INDUSTRIAL WASTE TREATMENT PLANT ADDITION

Day	COD (mg/l)	TOC (mg/l)	NH_3 (mg/l)	NO_3 (mg/l)	PO_4 (mg/l)	Surfac-tants (mg/l)	Phenol (mg/l)	CN (mg/l)	pH -
1	30	13	7.2	0.5	3.1	0.2	0	0	7.2
2	10	2	3.2	1.9	3.5	0.1	0	0	7.4
3	30	13	8.0	0.3	4.1	0.1	0	0	7.2
4	28	13	4.0	0.8	3.5	0.1	0	0	7.4
5	28	11	3.5	1.0	2.8	0.2	0	0	7.2
6	15	10	2.5	1.2	2.5	0.1	0	0	7.4
7	30	13	4.0	0.9	2.0	0.2	0	0	7.2

(a) Results for oil and greese were less than the detectable limit of 0.3 mg/l.

(b) No sample results were given for the following parameters: Cd, Cr^{+3}, Cr^{+6}, Cu, Fe, Mn, Hg, Ni, Ag, Zn, Ca, Mg, K, Na, Cl^-, SO_4

TABLE C.9

SUMMARY OF WATER SAMPLE RESULTS FROM MAJOR BASE LAKES, August 8 to October 13, 1978

	DUCK LAKE				LUNA LAKE				SCOUT LAKE			
	No. of Samples	Min.	Max.	Mean	No. of Samples	Min.	Max.	Mean	No. of Samples	Min.	Max.	Mean
Cu, μg/l	11	0	0	-	4	0	0	-	4	0	0	-
Cr^{+6}, μg/l	11	0	0	-	4	0	0	-	4	0	0	-
Cr^{+3}, μg/l	11	0	0	-	4	0	0	-	4	0	0	-
NH_3, mg/l	11	0	0	-	4	0	0	-	4	0	0	-
NO_3, mg/l	11	0	0	-	4	0	0	-	4	0	0	-
NO_2, mg/l	11	0	0	-	4	0	0	-	4	0	0	-
PO_4, mg/l	11	0	0.4	0.12	4	0	0.18	0.05	4	0	0	-
Fe, μg/l	10	100	300	160	4	0	100	40	4	0	100	30
SO_4, mg/l	10	0	0	-	4	0	0	-	4	0	0	-
Ca, mg/l	1	10	10	10	1	5	5	5	1	5	5	5
Cl^-, mg/l	1	2.5	2.5	2.5	1	2.5	2.5	2.5	1	2.5	-	-
Pb, μg/l	10	6.8	8.0	7.1	1	5.5	5.5	5.5	1	-	-	-

TABLE C.10

SUMMARY OF WATER SAMPLE RESULTS FROM THE WASTE TREATMENT PLANTS

August 8 - December 13, 1978

	Station 009 (Ind. Waste Treat. Plt #1)				Station 005 (End of San. Treat. Plt. No. 2 Pipe)				Station 004 (Hannah Road Ditch)			
	No. of Samples	Min.	Max.	Mean	No. of Samples	Min.	Max.	Mean	No. of Samples	Min.	Max.	Mean
Cu, µg/l	13	0	0	-	13	0	0	-	13	0	0	-
Cr^{+6}, µg/l	13	0	0	-	13	0	0	-	13	0	0	-
Cr^{+3}, µg/l	13	0	0	-	13	0	0	-	13	0	0	-
NH_3, mg/l	13	3	12.7	7.4	13	1.2	10.5	5.2	14	1.6	8.3	4.2
NO_3, mg/l	9	0.1	5.1	2.5	6	1	3	1.9	6	0.1	1.0	0.96
NO_2, mg/l	9	0.01	1.0	0.5	7	0.03	2.4	0.12	6	0	0.9	0.4
PO_4, mg/l	10	1.8	4.0	2.8	10	5	18	10.3	9	0.7	5.1	1.7
Fe, µg/l	12	200	500	370	13	50	210	130	9	0.6	1.2	1.0
SO_4, mg/l	6	40	80	65	7	15	18	15.4	6	20	50	37
Ca, mg/l	6	50	60	52.5	7	40	50	47.8	5	30	35	34
Cl, mg/l	7	18	30	22.3	7	20	25	22.8	5	25	30	28
Pb, µg/l	7	6.8	7.4	7.2	7	7.2	7.4	7.3	6	5.5	6.8	6.4

TABLE C.11

EPA INTERIM PRIMARY AND PROPOSED SECONDARY DRINKING WATER STANDARDS

PARAMETER	MAXIMUM LEVEL	
A. Interim Primary		
Arsenic	0.05	mg/l
Barium	1.0	mg/l
Cadmium	0.01	mg/l
Chromium (VI)	0.05	mg/l
Fluoride	1.4 to 2.4	mg/l
Lead	0.05	mg/l
Mercury	0.002	mg/l
Nitrate (as N)	10	mg/l
Selenium	0.01	mg/l
Silver	0.05	mg/l
Endrin	0.002	mg/l
Lindane	0.004	mg/l
Methoxychlor	0.1	mg/l
Toxyphene	0.005	mg/l
2,4-D	0.01	mg/l
2,4,5-TP Silvex	0.01	mg/l
Radium	5 pCi/l	
Gross Alpha	15 pCi/l	
Gross Beta	4 millirem/yr	
Turbidity	1 TU	
Coliform Bacteria	1/100 ml	
B. Secondary		
Chloride	250	mg/l
Copper	1	mg/l
Foaming Agents	0.5	mg/l
Hydrogen Sulfide	0.05	mg/l
Iron	0.3	mg/l
Manganese	0.05	mg/l
Sulfate	250	mg/l
Total Dissolved Solids	500	mg/l
Zinc	5	mg/l
Color	15 Color Units	
Corrosivity	Non-corrosive	
Odor	3 threshold Odor Number	
pH	6.5 to 8.5	

TABLE C.12

ROBINS AIR FORCE BASE
CURRENT PESTICIDES USED

Insecticides	Herbicides	Rodenticides
Avitral	Ansar	Zinc Phosphide Bait
Amdro	Borocil	Pinalyl Bait
Baygon	Diquat	Diphacinone Bait
Chlordane	Maintain	Strychnine Bait
Cyanogas	Retard	
Cygon	Round-Up	
Dursban	Spike	
Dibrom (Naled)	Velpar	
Diazinon	2,4-D	
Ficam		
Lindane		
Malathion		
Naptha		
DDVP		
Sevin		
D-Phenothrin		

Source: Robins AFB Bioenvironmental Engineering Files

TABLE C.13

ANALYSIS OF SOIL SAMPLES COLLECTED FROM THE RADIOACTIVE WASTE DISPOSAL AREA

Parameters	Units	Approximate Sample Location			
		100' from Site (Bottom of Hill)	Center of Site	20' from Site (Up Hill)	50' from Site (Down Grade)
Gross Alpha	pCi/g	20	26	20	20
Gross Beta	pCi/g	17	27	20	24
Potassium 40	pCi/g	.17	1.82	.97	1.24
Cesium 137	pCi/g	.084	1.59	.77	.30
Uranium 238	pCi/g	1.07	1.03	1.88	1.87
Radium 226	pCi/g	.91	1.26	1.35	1.66
Thorium 232	pCi/g	1.45	1.34	2.00	2.40
Cobalt 60	pCi/g		.070		

SOURCE: Base reports

APPENDIX D

MASTER LIST

INDUSTRIAL SHOPS

APPENDIX D

MASTER LIST

INDUSTRIAL SHOPS

Name	Present Location (Bldg. No.)	Handles Hazardous Materials	Generates Hazardous Wastes
DIRECTORATE OF DISTRIBUTION (DS*)			
Supply & Equip. Shed	28		
Supply & Equip. Shed	29		
LOX Storage	32		
Hydrogen Fluoride Bldg.	38		
Liq. Fluoride Pump Station	39		
LOX Storage	50		
Supply & Equipment Warehouse	59		
Liq. Fuel Pump Station	70		
Liq. Fuel Pump Station	72		
Liq. Fuel Pump Station	73		
Terminal Air Freight	127		
Supply & Issue Shipping	153		
(Name not listed)**	193		
POL Operations/Qual. Control	194	X	
Liq. Fuel Pump Station	195		
POL Operations/Qual. Control	196	X	
(Name not listed)	209		

* Office symbols used by the Air Force.
** Indicates no name for the facility was listed in the BEE records.
X Indicates presence of hazardous materials or generation of hazardous waste.

APPENDIX D (CONTINUED)

Name	Present Location (Bldg. No.)	Handles Hazardous Materials	Generates Hazardous Wastes
Directorate of Distribution (Continued)			
(Name not listed)	211		
Supply & Equipment Warehouse	232		
Shop Shelter	(241-closed)		
Depot MAT Process	247		
Shop Shelter	248		
Logistics Facility Depot	300		
Warehouse Supply & Equip. Depot	301		
Vehicle Fueling Station	303		
Mag Storage	306		
Supply & Equipment Warehouse	309		
Supply & Equipment Warehouse	310		
Storage Igloo	311		
Storage Igloo	312		
Segregated Mag Storage	313		
Supply & Equip. Shed	320		
Supply & Equip. Shed	322		
Chemical Storage	327	X	X
Chemical Storage	328	X	
Bottled Gas Storage	329		
Bottled Gas Storage	330		
Bottled Gas Storage	331		
Supply & Equip Shed	334		

APPENDIX D (CONTINUED)

Name	Present Location (Bldg. No.)	Handles Hazardous Materials	Generates Hazardous Wastes
Directorate of Distribution (Continued)			
Supply & Equip Shed	334		
Supply & Equip Shed	335		
Supply & Equip. Shed	336		
Supply & Equip. Shed	337		
Supply & Equip. Shed	338		
Supply & Equip. Shed	339		
Supply & Equip. Shed	350		
Material Process. Depot	351		
Material Process. Depot	354	X	X
(Name not listed)	357		
Material Process Depot	364		
Material Process Depot	365		
Supply & Equipment Warehouse	366		
Supply & Equipment Warehouse	367		
Lumber Shed	372		
Material Process Depot	376		
Supply & Equipment Warehouse	380		
Supply & Equipment Warehouse	385		
Supply & Equipment Warehouse	602		
Material Process Depot	606		
Supply & Equipment Warehouse	641		

APPENDIX D (CONTINUED)

Name	Present Location (Bldg. No.)	Handles Hazardous Materials	Generates Hazardous Wastes
Directorate of Distribution (Continued)			
Supply & Equipment Warehouse	660		
(Name not listed)	10091		
(Name not listed)	10094		
(Name not listed)	10187		
(Name not listed)	10188		
DIRECTORATE OF MAINTENANCE (MA)			
Aircraft Division (MAB)			
Hydrogen Fluoride Bldg.	23	X	
Functional Testing	40	X	X
Nose Dock	44	X	X
Nose Dock	47	X	
Nose Dock	48	X	
Nose Dock	49	X	
Compress Air Bldg.	53		
Corrosion Control	54	X	X
Nose Dock	55	X	X
Paint Shop	89	X	X
Hazardous Storage	93	X	
(Old Corrosion Control)	(110)	(X)	(X)
Hazardous Storage	112	X	

APPENDIX D (CONTINUED)

Name	Present Location (Bldg. No.)	Handles Hazardous Materials	Generates Hazardous Wastes
Aircraft Division (Continued)			
(Name not listed)	115		
Aircraft Training Facility	120		
Non-Destructive Inspect.	125	X	
Welding	125		
C-141	125		
C-130	125		
F-15	125		
Radio Repair	125		
Engine Repair	125	X	X
Landing Gear	125	X	X
Tire Shop	125		
Sealant Shop	125	X	
(Name not listed)	145		
F-15 Maintenance	149	X	X
Hazardous Storage	151		
AIRBORNE ELECTRONICS DIVISION (MAI)			
Surveillance & Inst. Shop	635		
Bomb Navigation	640	X	X
Radar Navigation	640	X	X
Weapons	640	X	X
Communications Shop	645	X	X
Fire Control Shop	645	X	X

APPENDIX D (CONTINUED)

Name	Present Location (Bldg. No.)	Handles Hazardous Materials	Generates Hazardous Wastes
Airborne Electronics Division (Continued)			
Electronic Warfare	645	X	
Air Cond. & Engr. Shop	647		
Boresight Shop	675		
INDUSTRIAL PRODUCTS DIVISION (MAN)			
Paint Shop	125	X	X
Life Support	128		
Hazardous Storage	132	X	
Pylon Shop	140		
Tubing & Cable	140		
F-15 Shop	140		
Parachute Shop	140		
Turret Shop	140	X	X
Electric Shop	140		
F-15 Pylon	140		
Pneudraulics	140	X	
Propeller Cleaning	140	X	X
Propeller Shop	140	X	X
Machine Shop	140		
Heat Treat Shop	140		
Electroplating Shop	142	[illegible]	X

APPENDIX D (CONTINUED)

Name	Present Location (Bldg. No.)	Handles Hazardous Materials	Generates Hazardous Wastes
Industrial Products Division (Continued)			
Hydrostatic Testing	150	X	X
Battery Shop	150	X	X
(Name not listed)	154		
Physical Lab	165	X	
Chemical Lab	165	X	
Tubing & Cable	169		
Small Motor Repair	169		
Cleaning Shop	169	X	X
Metal Bond	169	X	
Forms and Patterns	169		
Small Motor Mfg.	169		
Plant Services	173	X	
Industrial X-ray	181	X	X
Fabric Shop	181		
Parachute Shop	181		
Paint Shop	605	X	X
Plastics Shop	670	X	X
Radome Strip	680	X	X
DIRECTORATE OF CONTRACTING AND MANUFACTURING (PM)			
Maintenance Dock	67		
Aircraft Engine Shipping	148	X	
Precision Measurement Equip. Lab	162	X	X

APPENDIX D (CONTINUED)

Name	Present Location (Bldg. No.)	Handles Hazardous Materials	Generates Hazardous Wastes
USAF HOSPITAL			
X-ray Lab	700	X	
Dental Lab	700	X	
5 COMBAT COMMUNICATIONS GROUP (CCG)			
(Name not listed)	600		
(Name not listed)	611		
Generator Shop	615		
Supply & Equipment Warehouse	651		
Vehicle Maintenance	655		
Chemical Storage	656		
Supply & Equipment Warehouse	658		
Supply & Equipment Warehouse	659		
Maintenance Facility	925		
(Name not listed)	948		
(Name not listed)	949		
(Name not listed)	950		
(Name not listed)	951		
Communications Shipping	962		
(Name not listed)	10000		
(Name not listed)	10023		
(Name not listed)	10070		

APPENDIX D (CONTINUED)

Name	Present Location (Bldg. No.)	Handles Hazardous Materials	Generates Hazardous Wastes
5 Combat Communications Group (Continued)			
(Name not listed)	10085		
(Name not listed)	10098		
(Name not listed)	10205		
(Name not listed)	10207		
(Name not listed)	10212-10218		
19 BOMBARDMENT WING (BW)			
(Name not listed)	1		
Traffic Check House	6		
Ordnance Control Point	8		
(Name not listed)	9		
(Name not listed)	10		
Readiness Crew	12		
Traffic Check House	16		
Aircraft Maintenance Shipping	22		
Engine Test Cell	31	X	X
Fuel Cell Repair	59	[illegible]	X
Nose Dock	66		
Nose Dock	67		
(Name not listed)	69		
(Name not listed)	74		

Name	Present Location (Bldg. No.)	Handles Hazardous Materials	Generates Hazardous Wastes
19 Bombardment Wing (Continued)			
Weapons Shop	75	X	
Propulsion Shop	76	X	
Environmental Systems	76		
Munitions Shop	76		
Multi-Maintenance Shops	79	X	
Corrosion Control	80	X	X
Tire Shop	81	X	
Aerospace Ground Equipment (AGE)	82	X	X
(Name not listed)	85	X	
Equipment Maintenance	86	X	
Munitions Shop	94		
SRAM Missile Shop	100		
(Name not listed)	10001		
(Name not listed)	10004		
(Name not listed)	10006		
(Name not listed)	10007		
(Name not listed)	10079		
(Name not listed)	10080		
(Name not listed)	10082		
(Name not listed)	10102		
(Name not listed)	10120		

APPENDIX D (CONTINUED)

Name	Present Location (Bldg. No.)	Handles Hazardous Materials	Generates Hazardous Wastes
1926 COMMUNICATIONS INSTALLATION GROUP (CIG)			
(Name not listed)	10148-10154		
(Name not listed)	3		
(Name not listed)	19		
(Name not listed)	26	X	
Aircraft Maintenance	46		
Facility Depot	56		
Communications Center	161		
Base Communications	225		
(Name not Listed)	608		
Vehicle Maintenance	978		
Instrument Repair	1684	X	
2853 AIR BASE GROUP (ABG)			
Graphics Services	321	X	
Photo Lab	321	X	X
BX Gas Station	922	X	X
Auto Hobby Shop	985	X	X
Fuel Vehicle Repair	190	X	X
Vehicle Maintenance	302	X	X
Paint & Body Shop	304	X	X
Auto Maintenance Shop	307	X	X

APPENDIX D (CONTINUED)

Name	Present Location (Bldg. No.)	Handles Hazardous Materials	Generates Hazardous Wastes
2853 CIVIL ENGINEERING SQUADRON (CES)			
Tire Shop	308	X	
Fire Training	5	X	
Fire Training	7	X	
Fuel Tank Repair	63	X	
Steam Facility	83		
Fire Station	109	X	
Indus. Waste Treat. Plant (IWTP)	141	X	X
IWTP	147		
Steam Plant	177		
Metal Maintenance Shop	270		
Paint Shop	272	X	X
Plumbing Shop	272		
Refrig. Shop	272		
Structural Shop	272		
Electric Shop	273		
Paint Shop	275	X	X
Generator Shop	286		
Entomology Unit	295, 296	X	
Sludge Dewatering	352	X	X
Grounds Shop	591, 593	X	X

APPENDIX E

PHOTOGRAPHS

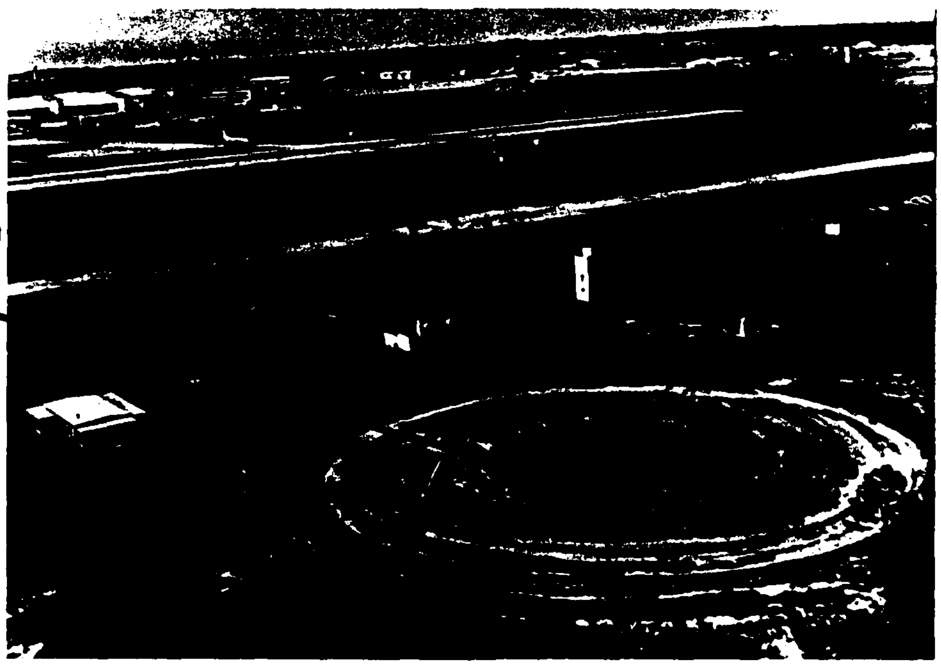
LANDFILL No. 1

LANDFILLS No. 2 & No. 4
and SLUDGE LAGOON

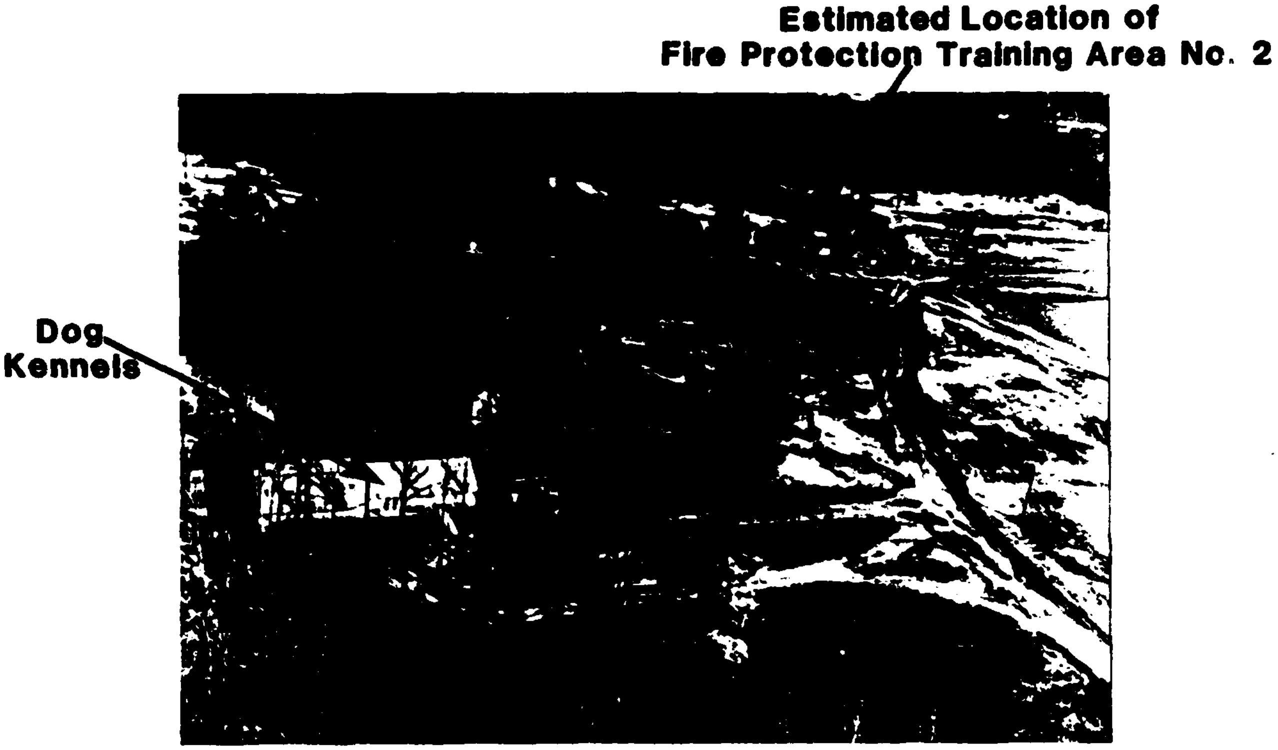
SLUDGE LAGOON

HAZARDOUS WASTE BURIAL SITE

HAZARDOUS WASTE BURIAL SITE



FIRE PROTECTION TRAINING AREA NO. 4



FIRE PROTECTION TRAINING AREA No. 2

LANDFILL No. 3

APPENDIX F
WATER SUPPLY WELL LOGS

- City of Warner Robins
- Robins AFB

FILED   I P

ENVIRONMENTAL PROTECTION DIVISION
WATER SUPPLY SECTION
270 WASHINGTON STREET, S.W.
ATLANTA, GEORGIA 30334

WELL DATA SHEET FOR PUBLIC WATER SYSTEM (TO BE COMPLETED BY WATER WELL CONTRACTOR)

_ OF WATER SYSTEM: Warner Robins, Ga - Well No. 1-A   COUNTY: Houston

LOCATED AT: No. 1 Water Plant   TYPE WATER SYSTEM: COMMUNITY ____ NON-COMMUNITY ____

OWNER: City of Warner Robins, GA   DRILLER: Rowe Drilling Co., Inc.

ADDRESS: P.O. Box 1468, Warner Robins, Ga 31093   ADDRESS: P.O.Box 1363, Tallahassee, Fl 3230?

PHONE: ______   PHONE: (904)576-1271   LIC. NO.: 72

WELL DESCRIPTION

DATE DRILLED: 6/8/81

TOTAL DEPTH: 540 FT.

A

TYPE DRILLING (INDICATE):

ROTARY X PERCUSSION __ OTHER __

HOLE DIAMETER

SIZE 32 IN. FROM 0 FT. TO 120 FT.

SIZE 25 IN. FROM 120 FT. TO 540 FT.

SIZE __ IN. FROM __ FT. TO __ FT.

(USE ADDITIONAL SHEETS IF NECESSARY)

CASING RECORD

TYPE MATERIAL: Black Steel

WALL THICKNESS: .375

WEIGHT/FOOT: ______

SIZE 26 IN. FROM 0 FT. TO 120 FT.

SIZE 16 IN. FROM 0 FT. TO 255 FT.

SIZE 12 IN. FROM 255 FT. TO 540 FT.

(USE ADDITIONAL SHEETS IF NECESSARY)

WELL SCREEN

TYPE MATERIAL: 304 Stainless Steel

SIZE 12 IN. FROM 340 FT. TO 350 FT.

SIZE 12 IN. FROM 320 FT. TO 380 FT.

SIZE 12 IN. FROM 420 FT. TO 430 FT.

SIZE 12 IN. FROM 440 FT. TO 460 FT.

12 ... 470 ... 490

SIZE 12 IN. FROM 510 FT. TO 530 FT.

WAS SLOT SIZE DETERMINED BY SIEVE ANALYSIS: YES X NO __

GROUTING

TYPE GROUT: Neat Portland

APPLIED BY PRESSURE: YES X NO __

FROM 120 FT TO 0 FT

FROM __ FT. TO __ FT.

STATIC WATER LEVEL: 129 FT.

PUMPING WATER LEVEL: 149 FT. AT 1557 GPM

TEST PUMP DATA

DATE TESTED: June 8 & 9, 1981

PUMPED X BAILED __ ESTIMATED __

PUMP RATED: 4000 GPM 217 HP

TOTAL CONTINUOUS HRS. TESTED: 24

DID WATER LEVEL STABILIZE: YES X NO __

HRS. RUN BEFORE STABILIZATION: 1

YIELD 1557 GPM AFTER 24 HRS. OF CONTINUOUS PUMPING

DISCHARGE PRESSURE: 0 PSI

WATER LEVEL BEFORE TEST: 129 FT.

TOTAL DRAWDOWN: 16 FT (ATTACH COPY OF DRAWDOWN MEASUREMENTS)

SPECIFIC CAPACITY: 62.5 GPM/FT.

NO. MINUTES FOR WELL TO RECOVER: ______

WAS WELL DEVELOPED AND DISINFECTED: YES X NO __

WERE UNTREATED WATER SAMPLES COLLECTED

FOR BACTI: YES X NO __

FOR CHEMICAL: YES X NO __

PERMANENT PUMP DATA (BY CONTRACTOR OR OWNER)

PUMP TYPE: Peerless Pump   OUTLET SIZE: 10 IN.

POWERED BY: 150 HP

RATE: 1500 GPM

TOTAL DYNAMIC HEAD: 216 FT.

PUMP SET AT: 200 FT. w/30 Ft. Tail Pipe

PUMP DISINFECTED: YES X NO __

DEEP WELL AIR LINE, TYPE MATERIAL: Gal" LENGTH 200 FT.

ACCESS PORT, DIA.: 2 IN.

EP WS 31

COMPLETE WELL LOG ON REVERSE SIDE

WELL LOG

1-A

FROM FEET	TO FEET	TYPE MATERIAL ENCOUNTERED	REMARKS	INDICATE WATER BEARING ZONES
0	20	red clay		
20	33	coarse sand, red		
33	45	brown course sand		
45	62	clay		
62	89	coarse sand		
89	110	fine & coarse sand		
110	122	clay		
122	164	coarse sand		
164	190	red coarse sand		
190.	205	brown coarse sand & clay		
205	208	clay		
208	286	coarse sand		
286	294	clay		
294	307	coarse sand, little red clay		
307	317	clay		
317	372	coarse sand		
372	437	sand		
437	470	coarse sand		
470	480	coarse sand, little clay		
480	523	sand		
523	538	coarse sand, little clay		
538	540	clay		
540	566	coarse sand, little clay		
566	588	coarse sand, very little clay		
588	605	coarse sand, very little clay		

(If More Space is Required, Use Additional Sheet)

THIS WELL WAS DRILLED ACCORDING TO THE RULES FOR SAFE DRINKING WATER (CHAPTER 391-3-5) OF THE GEORGIA DEPARTMENT OF NATURAL RESOURCES AND THE INFORMATION ON THIS FORM IS TRUE AND CORRECT TO THE BEST OF MY KNOWLEDGE

SIGNED ______________________ LIC. NO.: 72

WATER WELL CONTRACTOR'S SIGNATURE

DATE 6/9/81

ETURN COMPLETED
ORM TO:

2A

GEORGIA DEPARTMENT OF NATURAL RESOURCES
ENVIRONMENTAL PROTECTION DIVISION
WATER SUPPLY SECTION
270 WASHINGTON STREET, S.W.
ATLANTA, GEORGIA 30334

WELL DATA SHEET FOR PUBLIC WATER SYSTEM
(TO BE COMPLETED BY WATER WELL CONTRACTOR)

EPD Project No.
79-E-WS-14

NAME OF WATER SYSTEM: City of Warner Robins, Georgia   COUNTY: Houston

LOCATED AT: Warner Robins   TYPE WATER SYSTEM: COMMUNITY XX NON-COMMUNITY ____

OWNER: City of Warner Robins   DRILLER: Layne Atlantic Company

ADDRESS: ____   ADDRESS: Post Office Box 669, Albany, Georgia

PHONE ____   PHONE: 912/435-8338   LIC. NO.: 14

"City Well No. 2-A - South Pleasant at City Maintenance Yard"

WELL DESCRIPTION

DATE DRILLED: May 7, 1979

TOTAL DEPTH: 580 FT.

TYPE DRILLING (INDICATE):

ROTARY X PERCUSSION ___ OTHER ___

HOLE DIAMETER

SIZE: 32 IN., FROM 0 FT. TO 125 FT.

SIZE: 25 IN., FROM 125 FT. TO 510 FT.

SIZE: ___ IN., FROM ___ FT. TO ___ FT.

(USE ADDITIONAL SHEETS IF NECESSARY)

CASING RECORD

TYPE MATERIAL: Black Steel pipe

WALL THICKNESS: 0.375 Sch. 40

WEIGHT/FOOT: Schedule 40 P.E.

SIZE: 26 IN., FROM 0 FT. TO 125 FT.

SIZE: 16 IN., FROM 0 FT. TO 250 FT.

SIZE: 12 IN., FROM 250 FT. TO 510 FT.

(USE ADDITIONAL SHEETS IF NECESSARY)

WELL SCREEN

TYPE MATERIAL: Stainless Steel Type 304

SIZE: 12 IN., FROM 274 FT. TO 284 FT.

SIZE: 12 IN., FROM 300 FT. TO 310 FT.

SIZE: 12 IN., FROM 400 FT. TO 440 FT.

SIZE: 12 IN., FROM 478 FT. TO 488 FT.

SIZE: 12 IN., FROM 495 FT. TO 500 FT.

WAS SLOT SIZE DETERMINED BY SIEVE ANALYSIS:
YES XX NO ___

GROUTING

TYPE GROUT: Cement

APPLIED BY PRESSURE YES XX NO ___

FROM 0 FT TO 125 FT.

FROM ___ FT TO ___ FT.

STATIC WATER LEVEL: 132 FT.

PUMPING WATER LEVEL: 235 FT. AT 1,613 GPM

TEST PUMP DATA

DATE TESTED: June 13, 1979

PUMPED XX BAILED ___ ESTIMATED ___

PUMP RATED: 1613 GPM 150 HP

TOTAL CONTINUOUS HRS. TESTED: 24

DID WATER LEVEL STABILIZE: YES XX NO ___

HRS. RUN BEFORE STABILIZATION 10

YIELD 1,613 GPM AFTER 24 HRS. OF CONTINUOUS PUMPING

DISCHARGE PRESSURE: 0 PSI

WATER LEVEL BEFORE TEST: 132 FT.

TOTAL DRAWDOWN: 103 FT
(ATTACH COPY OF DRAWDOWN MEASUREMENTS)

SPECIFIC CAPACITY: 15.66 GPM/FT.

NO. MINUTES FOR WELL TO RECOVER: 2-hrs

WAS WELL DEVELOPED AND DISINFECTED: YES XX NO ___

WERE UNTREATED WATER SAMPLES COLLECTED

FOR BACTI: YES XX NO ___

FOR CHEMICAL: YES XX NO ___

PERMANENT PUMP DATA (BY CONTRACTOR OR OWNER)

PUMP TYPE: Layne OUTLET SIZE 8 IN.

POWERED BY: 40 HP

RATE: 600+ GPM

TOTAL DYNAMIC HEAD: 202 FT.

PUMP SET AT: 160 FT.

PUMP DISINFECTED: YES XX NO ___

DEEP WELL AIR LINE, TYPE MATERIAL: ¼" Galv.
LENGTH: 160 FT

ACCESS PORT, DIA.: 1 IN

WS 31

COMPLETE WELL LOG ON REVERSE SIDE

WELL LOG

2A

FROM FEET	TO FEET	TYPE MATERIAL ENCOUNTERED	REMARKS	INDICATE WATER BEARING ZONES
0	15	Red Clay		
15	45	Red Clay & White Clay		
45	60	White Clay & fine sand		
60	75	Coarse white sand & clay		
75	94	Coarse white sand & little clay		
94	109	Coarse sand		
109	123	White & red clay - slow		
123	168	Coarse white sand		
168	228	White coarse sand		
228	241	Coarse sand with little clay streaks		
241	256	Coarse sand and little white clay		
256	270	Fine pepper sand - slow		
270	285	Fine sand and red clay		
285	300	Fine sand & little clay streaks		
300	315	Coarse sand with little clay streaks		
315	328	Sand with little clay streaks		
328	343	Coarse sand & clay streaks		
343	359	Sand - little clay streaks - slow		
359	372	Sand with little clay streaks		
372	386	Coarse sand with little clay streaks		
386	400	White sand little clay streaks		
400	415	Sand little white clay		

(If More Space is Required, Use Additional Sheet)

THIS WELL WAS DRILLED ACCORDING TO THE RULES FOR SAFE DRINKING WATER (CHAPTER 391-3-5) OF THE GEORGIA DEPARTMENT OF NATURAL RESOURCES AND THE INFORMATION ON THIS FORM IS TRUE AND CORRECT TO THE BEST OF MY KNOWLEDGE

SIGNED [signature] Dist. Mgr. LIC. NO. 14
WATER WELL CONTRACTOR'S SIGNATURE

DATE 3/20/80

LAYNE ATLANTIC COMPANY
P. O. BOX 669
ALBANY, GEORGIA 31702

WELL LOG

2A

FROM FEET	TO FEET	TYPE MATERIAL ENCOUNTERED	REMARKS	INDICATE WATER BEARING ZONES
415	430	Coarse sand and little white clay - med.		
430	444	White sand with little clay streaks		
444	460	Coarse white sand		
460	473	Yellow fine sand and clay		
473	488	Sand & red clay - slow		
488	502	Coarse sand little clay - med.		
502	532	Fine white sand - tight		
532	548	Fine white sand & clay streaks		
548	561	Fine white sand & clay - med.		
561	580	Fine sand & clay - slow		

(If More Space is Required, Use Additional Sheet)

THIS WELL WAS DRILLED ACCORDING TO THE RULES FOR SAFE DRINKING WATER (CHAPTER 391-3-5) OF THE GEORGIA DEPARTMENT OF NATURAL RESOURCES AND THE INFORMATION ON THIS FORM IS TRUE AND CORRECT TO THE BEST OF MY KNOWLEDGE.

SIGNED: [signature] Dist. Mgr. LIC NO.: 14

WATER WELL CONTRACTOR'S SIGNATURE

DATE: 3/26/80

LAYNE ATLANTIC COMPANY
P. O. BOX 669
ALBANY, GEORGIA 31702

DEPARTMENT OF NATURAL RESOURCES
STATE OF GEORGIA
APPLICATION FOR A PERMIT TO USE GROUNDWATER
PART B - WELL DATA

Submit one (1) Form for Each Well (Print or Type all Information)

APPLICANT CITY OF WARNER ROBINS

WELL NO. 3 (Key to Attached Location Map) Ground Elevation ______ ft.
Latitude 32°36'43" N Longitude 83°36'46"W (if available)

WELL CONSTRUCTION DESCRIPTION [XX] EXISTING [ ] PROPOSED

Name of Aquifer(s) being or to be Utilized Tuscaloosa Group

TYPE DRILLING (Indicate)
XX Rotary
___ Percussion Total Depth 415 ft.
___ Bored Static Water Level 105 Ft.

DRILL HOLE DIAMETER
From 0 ft., to 97 ft., 26 in.
From 0 ft., to 415 ft., 25 in.
From ___ ft., to ___ ft., ___ in.
From ___ ft., to ___ ft., ___ in.
From ___ ft., to ___ ft., ___ in.

CASING RECORD
Type Material Steel
Wall Thickness 0.312, 0.375, 0.365 in.
Weight/Foot 65.71, 49.56, 40.48 Lb.
Size 20 in. from 0 ft., to 97 ft.
Size 12 in. from 0 ft., to 200 ft.
Size 10 in. from 200 ft., to 415 ft.
Size ___ in. from ___ ft., to ___ ft.
Size ___ in. from ___ ft., to ___ ft.

WELL SCREEN
Type Material Stainless Steel
Size 10 in. from 275 ft., to 295 ft.
Size 10 in. from 360 ft., to 370 ft.
Size 10 in. from 390 ft., to 405 ft.
Size ___ in. from ___ ft., to ___ ft.
Size ___ in. from ___ ft., to ___ ft.

Date Drilled March 1961
Date to be Drilled ______
Driller Layne-Atlantic Co.

GROUTING: [XX] Yes [ ] No
Type Pressure (cement)
From 97 ft., to 0 ft.
From ___ ft., to ___ ft.
From ___ ft., to ___ ft.

TEST PUMP DATA
Pumped Test Bailed
Estimated Actual Test
Date Tested Feb. 24, 1961
Pump Rated 1000/1500 GPM 75 HP
Test Yield ______ GPM After 5 & 5 hrs. of pumping
Water Level before Test 105 ft.
Drawdown 33/53 ft.
Specific Capacity 30.3 / 28.3 GPM/ft.

PERMANENT PUMP DATA (if available)
Pump Type Deep Well Turbine
Outlet Size 8"
Powered by Electric Motor
Horsepower 75
Rate 1000 GPM
Pumping Level 138/158 Ft.
Average Hours Pumped Per Day ______

NOTE: Detailed well construction specifications of a proposed well may be required by the Division upon review of the submitted application.

Complete WELL LOG on reverse side, if available.

WELL LOG

3

TO FEET	TYPE MATERIAL ENCOUNTERED	REMARKS	INDICATE WATER BEARING ZONES
1	Top Soil		
5	Yellow Sandy Clay		
14	Red Clay		
22	Med. Coarse Sand		
32	White Clay W/Sand - Slow		
49	White Clay - Slow		
58	Coarse Sand - Thin Stks White Clay		
72	Coarse Sand		
96	Clay W/Stks Sand		
102	Clay - Slow		
108	Clay W/ Stks Sand		
114	Clay - Slow		
146	Coarse White Sand - Soft		
149	Clay		
158	Coarse White Sand - Soft		
161	Yellow Clay		
194	Coarse Sand W/Thin Stks of Clay		
198	Yellow Clay - Slow Drilling		
218	Med. Coarse Sand - Soft		
220	Streaks of Clay		
238	Med. Coarse Sand - Soft		
240	Streaks of Clay		

(If More Space is Required, Use Additional Sheet)

The above information is true and correct to the best of my knowledge.

Signed ______________________ Title ______________________

Date ______________________

No. 3

	TO FEET	TYPE MATERIAL ENCOUNTERED	REMARKS	INDICATE WATER BEARING ZONES
	257	Med. Coarse Sand - Soft		
	265	Lavender Clay - Slow		
	337	Med. Coarse Sand - Soft		
	399	Med. Coarse Sand W/ Thin Stks of Clay		
	400	Streaks of Clay		
	412	Med. Coarse Sand - Soft		
	425	White Clay - Slow Drilling		
	433	Med. Coarse Sand - Soft		
	440	White Clay - Slow Drilling		
	465	Med. Coarse Sand W/ Stks of Clay		
	478	White Clay - Slow Drilling		

(If More Space is Required, Use Additional Sheet)

The above information is true and correct to the best of my knowledge.

Signed ______________________ Title ______________________

Date ______________________

DEPARTMENT OF NATURAL RESOURCES
STATE OF GEORGIA
APPLICATION FOR A PERMIT TO USE GROUNDWATER
PART B - WELL DATA

Submit one (1) Form for Each Well (Print or Type all Information)

APPLICANT CITY OF WARNER ROBINS

WELL NO. 4 (Key to Attached Location Map) Ground Elevation ____ ft.
Latitude 32°36'29"N Longitude 83°36'55"W (if available)

WELL CONSTRUCTION DESCRIPTION [XX] EXISTING [ ] PROPOSED

Name of Aquifer(s) being or to be Utilized Tuscaloosa Group

TYPE DRILLING (Indicate)
XX Rotary
___ Percussion Total Depth 390 ft.
___ Bored Static Water Level 122 Ft.

DRILL HOLE DIAMETER
From 0 ft., to 60 ft., 26 in.
From 0 ft., to 390 ft., 25 in.
From ___ ft., to ___ ft., ___ in.
From ___ ft., to ___ ft., ___ in.
From ___ ft., to ___ ft., ___ in.

CASING RECORD
Type Material Steel
Wall Thickness 0.312, 0.375 In.
Weight/Foot 65.71, 49.56 Lb.
Size 20 in. from 0 ft., to 60 ft.
Size 12 in. from 0 ft., to 390 ft.
Size ___ in. from ___ ft., to ___ ft.
Size ___ in. from ___ ft., to ___ ft.
Size ___ in. from ___ ft., to ___ ft.

WELL SCREEN
Type Material Stainless Steel
Size 12 in. from 240 ft., to 250 ft.
Size 12 in. from 320 ft., to 330 ft.
Size 12 in. from 360 ft., to 380 ft.
Size ___ in. from ___ ft., to ___ ft.
Size ___ in. from ___ ft., to ___ ft.

Date Drilled February 1960
Date to be Drilled ___
Driller Layne-Atlantic Co.

GROUTING: [XX] Yes [ ] No
Type Pressure (Cement)
From 60 ft., to 0 ft.
From ___ ft., to ___ ft.
From ___ ft., to ___ ft.

TEST PUMP DATA
Pumped Test Bailed ___
Estimated · Actual Test
Date Tested Feb. 20, 1960
Pump Rated 1500 GPM 100 HP
Test Yield 1559 GPM After 12 hrs. of pumping
Water Level before Test 122 ft.
Drawdown 60 ft.
Specific Capacity 25 GPM/ft.

PERMANENT PUMP DATA (if available)
Pump Type Deep Well Turbine
Outlet Size 10 In.
Powered by Electric Motor
Horsepower 100
Rate 1500 GPM
Pumping Level 182 Ft.
Averag. Hours Pumped Per Day ___

NOTE: Detailed well construction specifications of a proposed well may be required by the Division upon review of the submitted application.

Complete WELL LOG on reverse side, if available.

WELL LOG
4

OM ET	TO FEET	TYPE MATERIAL ENCOUNTERED	REMARKS	INDICATE WATER BEARING ZONES
0	3	Fill Dirt		
3	23	Sandy Red Clay		
23	42	Sand w/stks of Clay		
42	47	Clay - Slow		
47	56	Sand - Soft		
56	73	Clay - Slow		
73	97	Coarse Sand - Soft		
97	106	Clay - Medium		
06	124	Clay w/stks of Sand - Soft		
24	154	Coarse White Sand - Soft		
54	178	Coarse White Sand w/thin stks of Clay - Soft		
78	201	Coarse Reddish Sand - Soft		
01	211	Clay - Medium Drilling		
11	232	Coarse Reddish Sand - Soft		
32	236	Clay - Soft		
36	261	Medium Coarse Reddish Sand - Soft		
61	264	Clay - Medium		
64	275	Med. Coarse Sand - Soft - Cut Rough		
75	292	Med. Coarse Sand - Soft		
92	301	Clay - Slow Drilling		
301	316	Med. Coarse Sand - Soft		
316	318	Clay - Med. Drilling		

(If More Space is Required, Use Additional Sheet)

The above information is true and correct to the best of my knowledge.

Signed ____________________ Title ________________

Date ____________________

No. 4

TO FEET	TYPE MATERIAL ENCOUNTERED	REMARKS	INDICATE WATER BEARING ZONES
343	Coarse Sand - Soft- Cut Rough		
346	Clay - Med. Drilling		
360	Coarse Sand W/Stks of Clay- Soft		
380	CoarseWhite Sand - Soft		
384	Sandy Clay - Soft		
403	Coarse White Sand - Soft		
405	Clay - Med. Drilling		
432	Coarse White Sand - Soft - Cut Rough		
438	Clay Med. Drilling		
485	Med. Coarse White Sand w/stks of Clay - Soft		
491	White Clay - Med. Drilling		

(If More Space is Required, Use Additional Sheet)

The above information is true and correct to the best of my knowledge.

Signed ______________________ Title ______________________

Date ______________________

ENVIRONMENTAL PROTECTION DIVISION
DEPARTMENT OF NATURAL RESOURCES
STATE OF GEORGIA
APPLICATION FOR A PERMIT TO USE GROUNDWATER
PART B - WELL DATA

Submit one (1) Form for Each Well (Print or Type all Information)

APPLICANT CITY OF WARNER ROBINS

WELL NO. 5 (Key to Attached Location Map) Ground Elevation 431 ± ft.
Latitude 32°35'44"N Longitude 83°38'42"W (if available)

WELL CONSTRUCTION DESCRIPTION [XX] EXISTING [ ] PROPOSED

Name of Aquifer(s) being or to be Utilized Tuscaloosa Group

TYPE DRILLING (Indicate)
XX Rotary
___ Percussion
___ Bored

Total Depth 422 ft.
Static Water Level 132 Ft.

DRILL HOLE DIAMETER
From 0 ft., to 94 ft., 26 in.
From 0 ft., to 422 ft., 25 in.
From ___ ft., to ___ ft., ___ in.
From ___ ft., to ___ ft., ___ in.
From ___ ft., to ___ ft., ___ in.

CASING RECORD
Type Material Steel
Wall Thickness 0.312, 0.375 In.
Weight/Foot 65.71, 49.56 Lb.
Size 20 in. from 0 ft., to 94 ft.
Size 12 in. from 0 ft., to 422 ft.
Size ___ in. from ___ ft., to ___ ft.
Size ___ in. from ___ ft., to ___ ft.
Size ___ in. from ___ ft., to ___ ft.

WELL SCREEN
Type Material Stainless Steel
Size 12 in. from 235 ft., to 245 ft.
Size 12 in. from 270 ft., to 280 ft.
Size 12 in. from 349 ft., to 354 ft.
Size 12 in. from 366 ft., to 371 ft.
Size 12 in. from 392 ft., to 412 ft.

Date Drilled November 1962
Date to be Drilled ___
Driller Layne-Atlantic Co.

GROUTING: [XX] Yes [ ] No
Type Pressure (Cement)
From 94 ft., to 0 ft.
From ___ ft., to ___ ft.
From ___ ft., to ___ ft.

TEST PUMP DATA
Pumped Test Bailed
Estimated Actual Test
Date Tested November 27, 1962
Pump Rated 1100 GPM 75 HP
Test Yield ___ GPM After 24 hrs. of pumping
Water Level before Test 132 ft.
Drawdown 24 ft.
Specific Capacity 45.8 GPM/ft.

PERMANENT PUMP DATA (if available)
Pump Type Deep Well Turbine
Outlet Size 8"
Powered by Electric Motor
Horsepower 75
Rate 1000 GPM
Pumping Level 156 Ft.
Average Hours Pumped Per Day ___

NOTE: Detailed well construction specifications of a proposed well may be required by the Division upon review of the submitted application.

Complete WELL LOG on reverse side, if available.

WELL LOG
5

FROM FEET	TO FEET	TYPE MATERIAL ENCOUNTERED	REMARKS	INDICATE WATER BEARING ZONES
0	1	Top Soil		
1	10	Red Clay		
10	20	Red Sandy Clay		
20	30	Dark Red Clay		
30	35	Coarse Red Sandy Clay		
35	44	Red Clay		
44	51	Fine Red Sandy Clay		
51	59	Fine Sand w/Stks of White Clay		
59	74	Fine Sand w/Heavy Stks of Clay		
74	84	Med Coarse Sand		
84	94	Pink & White Clay (Med. - Slow)		
9	105	Red Clay (Med.-Slow)		
105	139	White Clay		
139	148	Sand		
148	155	Coarse Sand w/White Clay		
155	185	Coarse Sand w/Stks of Clay		
185	216	Coarse Sand w/Stks of White Clay		
216	258	Med. Coarse Sand w/Very Little Clay		
258	298	Coarse Sand w/Iron Granules		
298	308	White Clay - Slow		
308	321	Red & White Clay - Slow		
321	332	White Clay - Slow		

(If More Space is Required, Use Additional Sheet)

The above information is true and correct to the best of my knowledge.

Signed ______________________ Title ______________________

Date ______________________

ntinued

WELL LOG

5

FROM FEET	TO FEET	TYPE MATERIAL ENCOUNTERED	REMARKS	INDICATE WATER BEARING ZONES
32	339	Pink & White Clay w/Stks of Soft Sand		
39	370	Coarse White Sand w/Stks of Clay		
70	390	Coarse White Sand w/Possible Clay Stks		
90	400	Med. Coarse White Sand w/Stks of White Clay		
00	430	Coarse Sand w/ Stks of Clay		
30	460	Clay w/Stks of Coarse Sand		

(If More Space is Required, Use Additional Sheet)

The above information is true and correct to the best of my knowledge.

Signed ______________________ Title ______________________

Date ______________________

ENVIRONMENTAL PROTECTION DIVISION
DEPARTMENT OF NATURAL RESOURCES
STATE OF GEORGIA
APPLICATION FOR A PERMIT TO USE GROUNDWATER
PART B - WELL DATA

No. 6

Submit one (1) Form for Each Well (Print or Type all Information)

APPLICANT CITY OF WARNER ROBINS

WELL NO. 6 (Key to Attached Location Map) Ground Elevation 393 ± ft.
Latitude 32°37'58"N Longitude 83°37'42"W (if available)

WELL CONSTRUCTION DESCRIPTION [XX] EXISTING [ ] PROPOSED

Name of Aquifer(s) being or to be Utilized Tuscaloosa Group

TYPE DRILLING (Indicate)
XX Rotary
___ Percussion
___ Bored

Total Depth 435 ft.
Static Water Level 116 Ft.

DRILL HOLE DIAMETER
From 0 ft., to 70 ft., 32 in.
From 0 ft., to 435 ft., 25 in.
From ___ ft., to ___ ft., ___ in.
From ___ ft., to ___ ft., ___ in.
From ___ ft., to ___ ft., ___ in.

CASING RECORD
Type Material Steel
Wall Thickness 0.312, 0.375, 0.375 in.
Weight/Foot 85.73, 62.58, 49.56 Lb.
Size 26 in. from 0 ft., to 70 ft.
Size 16 in. from 0 ft., to 230 ft.
Size 12 in. from 230 ft., to 435 ft.
Size ___ in. from ___ ft., to ___ ft.
Size ___ in. from ___ ft., to ___ ft.

WELL SCREEN
Type Material Stainless Steel
Size 12 in. from 250 ft., to 260 ft.
Size 12 in. from 290 ft., to 310 ft.
Size 12 in. from 390 ft., to 400 ft.
Size 12 in. from 415 ft., to 425 ft.
Size ___ in. from ___ ft., to ___ ft.

Date Drilled July 1968
Date to be Drilled ___
Driller Layne-Atlantic

GROUTING: [XX] Yes [ ] No
Type Pressure (Cement)
From 70 ft., to 0 ft.
From ___ ft., to ___ ft.
From ___ ft., to ___ ft.

TEST PUMP DATA
Pumped Test Bailed ___
Estimated 1050 GPM
Date Tested July 16, 1968
Pump Rated 1040 GPM 100 HP
Test Yield ___ GPM After 24 hrs. of pumping
Water Level before Test 116 ft.
Drawdown 15 ft.
Specific Capacity 69.3 GPM/ft.

PERMANENT PUMP DATA (if available)
Pump Type Deep Well Turbine
Outlet Size 8"
Powered by Electric Motor
Horsepower 100
Rate 1100 GPM
Pumping Level 131 Ft.
Average Hours Pumped Per Day ___

NOTE: Detailed well construction specifications of a proposed well may be required by the Division upon review of the submitted application.

Complete WELL LOG on reverse side, if available.

WELL LOG

6

FROM FEET	TO FEET	TYPE MATERIAL ENCOUNTERED	REMARKS	INDICATE WATER BEARING ZONES
0	1	Top Soil		
1	18	Sand Clay		
18	32	White Clay		
32	47	White Clay & Sand		
47	64	Red Clay W/Little Sand		
64	74	Clay		
74	122	Coarse Sand		
122	130	Clay - White		
130	155	Coarse Sand W/ Stks Clay		
155	180	Med. Coarse Sand		
180	185	White Clay		
185	215	Med. Coarse Sand		
21[illegible]	224	Clay		
224	281	Med. Coarse Sand		
281	296	Sand & Clay		
296	341	Med. Coarse Sand W/Little Stks of White Clay		
341	357	Med. Coarse Sand W/Some White Clay		
357	369	Coarse Sand		
369	385	Med. Coarse Sand		
385	393	Sand W/Lots of Clay - Clay Washes Out		
393	435	Coarse Sand - Little Clay		
435	464	Coarse Sand W/Stks of White Clay		

(If More Space is Required, Use Additional Sheet)

The above information is true and correct to the best of my knowledge.

Signed ______________________ Title ______________________

Date ______________________

Georgia Department of Public Health
Water Supply Service
47 Trinity Avenue, S. W.
Atlanta, Georgia 30334

DO NOT WRITE	
CLASS II	
CLASS III	
INDIVIDUAL	

WELL DATA SHEET
For
PUBLIC OR COMMUNITY WATER SUPPLY SYSTEMS OR INDIVIDUAL WATER SUPPLY

Well No. 7 (Water Plant No. 3)

INSTRUCTIONS:

Name of Water System: Warner Robins, Georgia Location: Arizona Street County: Houston

Type: Municipal X ; Subdivision ____ No of Lots ____ ; Mobile Homes ____ or Trailer Parks ____

No of Lots ____ ; Industrial ____ ; Commercial ____ ; Individual ____ ; Other ____

Owner: City of Warner Robins Driller: Singer-Layne Atlantic Company

Address: ____ Address: Albany, Georgia

Date Drilling Started: January 1972 Date Completed: February 1972

WELL DESCRIPTION

TYPE DRILLING (Check)

Rotary: X
Percussion: ____
Bored: ____
Total depth of Well: 440 Ft.
Depth to water (SWL): 105 Ft.

HOLE DIAMETER:

From	Ft. To	Ft.	in.
0	140		32
0	440		25

CASING RECORD:

Type Material: Steel

Size (in.)	From (Ft.)	To (Ft.)
26	0	140
16	0	200
12	200	440

*12"x16" steel swage

WELL SCREEN:

Type Material: Layne Stainless Steel Shutter

Size (in.)	From (Ft.)	To (Ft.)
12	220	250
12	345	365
12	420	430

GROUTING

Type Grout: Cement
Applied by pressure: X Other ____
From 0 Ft. To 140 Ft.
From ____ Ft. To ____ Ft.
From ____ Ft. To ____ Ft.

TEST PUMP DATA:

Pumped: Test Bailed: ____
Estimated: Actual Test
Date Tested: February 8, 1972
Pump rated: 1641 GPM ____ HP Test Engine
Yield: 1641 GPM after 24 hrs. of stabilization
Water Level before Test: 105 Ft.
Drawdown: 42 Ft.
Specific Capacity: 39.0 GPM per ft.

Well developed and Disinfected:

X Yes ____ No

PERMANENT PUMP DATA (If Available)

Pump Type: Singer-Layne & Bowler
Outlet Size: 8"
Powered by: 150 Electric Motor
Horse power: 150
Rate: 1500 GPM
Pumping Level: 146
Pump Disinfected: X Yes ____ No

FOR WELL LOG, USE REVERSE SIDE

WELL LOG

7

Total Thickness each stratum FROM FEET	TO FEET	TYPE MATERIAL ENCOUNTERED	REMARKS	INDICATE WATER BEARING ZONES
1	1	Top Soil		
18	17	Sand Clay		
32	14	White Clay		
47	15	White Clay & Sand		
64	17	Red Clay W/Little Sand		
74	10	Clay		
122	48	Coarse Sand		
130	8	Clay-White		
155	25	Coarse Sand W/Stks. Clay		
180	30	Med. Coarse Sand		
185	5	White Clay		
215	30	Med. Coarse Sand		
224	9	Clay		
281	57	Med. Coarse Sand		
296	15	Sand & Clay		
341	45	Med. Coarse Sand W/Little stks. of white clay		
357	16	Med. Coarse Sand W/Some White Clay		
3[illegible]	39	Coarse Sand		
385	16	Med. Coarse Sand		
393	8	Sand W/lots of Clay. Clay washes out		
435	42	Coarse Sand Little Clay		
464	29	Coarse Sand W/Stks of White		
		Clay		
488	24	Med. Sand W/Little Clay		
495	7	Med. Red Sand W/Little Clay		
503	8	Red Clay W/Little Sand		

(If More Space is Required, Use Additional Sheet)

This well was drilled according to the Rules and Regulations of the Georgia Department of Public Health and the above information is true and correct to the best of my knowledge.

Signed ______ John W. Platt Title District Manager

Date June 15, 1972

ENVIRONMENTAL PROTECTION DIVISION
DEPARTMENT OF NATURAL RESOURCES
STATE OF GEORGIA
APPLICATION FOR A PERMIT TO USE GROUNDWATER
PART B - WELL DATA

NO 8

Submit one (1) Form for Each Well (Print or Type all Information)

APPLICANT CITY OF WARNER ROBINS

WELL NO. 8 (Key to Attached Location Map) Ground Elevation 396 ± ft.
Latitude 32°35'44" N Longitude 83°38'57"W (if available)

WELL CONSTRUCTION DESCRIPTION [XX] EXISTING [ ] PROPOSED

Name of Aquifer(s) being or to be Utilized Tuscaloosa Group

TYPE DRILLING (Indicate)
XX Rotary
___ Percussion Total Depth 430 ft.
___ Bored Static Water Level 101 Ft.

DRILL HOLE DIAMETER
From 0 ft., to 100 ft., 32 in.
From 0 ft., to 430 ft., 25 in.
From ___ ft., to ___ ft., ___ in.
From ___ ft., to ___ ft., ___ in.
From ___ ft., to ___ ft., ___ in.

CASING RECORD
Type Material Steel
Wall Thickness 0.312, 0.375, 0.375 in.
Weight/Foot 85.73, 62.58, 49.56 lb.
Size 26 in. from 0 ft., to 100 ft.
Size 16 in. from 0 ft., to 225 ft.
Size 12 in. from 225 ft., to 430 ft.
Size ___ in. from ___ ft., to ___ ft.
Size ___ in. from ___ ft., to ___ ft.

WELL SCREEN
Type Material Stainless Steel
Size 12 in. from 240 ft., to 260 ft.
Size 12 in. from 305 ft., to 320 ft.
Size 12 in. from 360 ft., to 380 ft.
Size 12 in. from 400 ft., to 420 ft.
Size ___ in. from ___ ft., to ___ ft.

Date Drilled August 1970
Date to be Drilled ___
Driller Singer-Layne-Atlantic Co.

GROUTING: [XX] Yes [ ] No
Type Pressure (Cement)
From 100 ft., to 0 ft.
From ___ ft., to ___ ft.
From ___ ft., to ___ ft.

TEST PUMP DATA
Pumped Test Bailed ___
Estimated 1500 GPM
Date Tested August 13, 1970
Pump Rated 1641 GPM 150 HP
Test Yield 1641 GPM After 24 hrs. of pumping
Water Level before Test 101 ft.
Drawdown 27 ft.
Specific Capacity 60.8 GPM/ft.

PERMANENT PUMP DATA (if available)
Pump Type Deep Well Turbine
Outlet Size 8 in.
Powered by Electric Motor
Horsepower 150
Rate 1500 GPM
Pumping Level 128 Ft.
Average Hours Pumped Per Day ___

NOTE: Detailed well construction specifications of a proposed well may be required by the Division upon review of the submitted application.

Complete WELL LOG on reverse side, if available.

WELL LOG

8

(FR)OM (F)EET	TO FEET	TYPE MATERIAL ENCOUNTERED	REMARKS	INDICATE WATER BEARING ZONES
0	15	Red Sandy Clay w/Hard Stks of Rock		
5	35	Yellow Sandy Clay		
35	42	Sandy Clay		
42	50	Red Clay - Slow		
50	65	Red Clay - Very Slow		
65	80	Red Sandy Clay - Slow		
80	87	Med. Coarse Sand & Little Clay - Soft		
87	100	Cla y		
00	126	Coarse Sand w/Small Stks of Clay		
26	187	Coarse Sand		
87	274	Med. Coarse Sand		
74	294	Med. Coarse Sand w/Stks of Clay		
9[illegible]	443	Med. Coarse Sand - Soft		
43	463	Med. Coarse Sand - W/Stks of Clay		
63	480	Med. Coarse Sand - Soft		
80	494	Red Sandy Clay - Very Slow		

(If More Space is Required, Use Additional Sheet)

The above information is true and correct to the best of my knowledge.

Signed ______________________ Title ______________________

Date ______________________

Georgia Department of Public Health
Water Supply Service
47 Trinity Avenue, S. W.
Atlanta, Georgia 30334

DO NOT WRITE	
CLASS II	
CLASS III	
INDIVIDUAL	

WELL DATA SHEET
For
PUBLIC OR COMMUNITY WATER SUPPLY SYSTEMS OR INDIVIDUAL WATER SUPPLY
Well No. 9 (Water Plant No. 2)

INSTRUCTIONS:

Name of Water System: Warner Robins Location: Arrowhead Trail County: Houston

Type: Municipal X ; Subdivision ____ No of Lots ____ ; Mobile Homes ____ or Trailer Parks ____

No of Lots ____ ; Industrial ____ ; Commercial ____ ; Individual ____ ; Other ____

Owner: City of Warner Robins Driller: Singer-Layne Atlantic Company

Address: ____ Address: Albany, Georgia

Date Drilling Started: September 1971 Date Completed: October 1971

WELL DESCRIPTION

TYPE DRILLING (Check)

Rotary: X
Percussion: ____
Bored: ____
Total depth of Well: 490 Ft.
Depth to water (SWL): 101 Ft

HOLE DIAMETER:

From	Ft. To	Ft.	in.
0	110	32	
0	490	25	

CASING RECORD:

Type Material: Steel

Size (in.)	From (Ft.)	To (Ft.)
26	0	110
16	0	250
* 12	250	490

*Steel Swage 12"x16"

WELL SCREEN:

Type Material: Layne Stainless Steel Shutter

Size (in.)	From (Ft.)	To (Ft.)
12	330	340
12	360	380
12	405	415
12	460	480

GROUTING

Type Grout: Cement
Applied by pressure: X Other: ____
From 0 Ft. To 110 Ft.
From ____ Ft. To ____ Ft.
From ____ Ft. To ____ Ft.

TEST PUMP DATA:

Pumped: Test Bailed: ____
Estimated: Actual Test
Date Tested: October 5, 1971
Pump rated: 1613 GPM ____ HP Test Engir
Yield: 1613 GPM after ____ hrs. of stabilization
Water Level before Test: 101 Ft.
Drawdown: ~~31~~ 31 Ft.
Specify Capacity: 52 GPM per ft.

Well developed and Disinfected:

X Yes ____ No

PERMANENT PUMP DATA (If Available)

Pump Type: Singer-Layne & Bowler
Outlet Size: 8"
Powered by: Electric Motor
Horse power: 150
Rate: 1500 GPM
Pumping Level: 130'
Pump Disinfected: X Yes ____ No

FOR WELL LOG, USE REVERSE SIDE

EH 4.8-0

WELL LOG

9

Total Depth	Thickness each Stratum	TYPE MATERIAL ENCOUNTERED	REMARKS	INDICATE WATER BEARING ZONES
7	7	Sand		
20	13	Sand & White Clay		
36	16	Sand W/Little Stks. of White Clay		
50	14	Coarse Sand & White Clay-Slow		
80	30	Coarse Sand		
127	47	Coarse Sand W/Stks. of White Clay		
189	62	Med. Coarse Sand		
221	32	Med. Coarse Sand W/Stks of Clay		
231	10	Med. Coarse Sand-Soft		
253	22	Med. Coarse Sand & Stks. of Clay-Soft		
270	23	Med. Cand & Red Clay-Slow		
295	25	Sand & Red Clay-Very Slow		
314	19	Coarse Sand-Very Slow		
344	30	Med. Coarse Sand-Soft		
366	42	Med. Coarse Sand W/Little Clay-Soft		
396	10	Red Sand Clay-Slow		
[illegible]	21	Med. Coarse Sand-Soft		
437	20	Coarse Sand Wome Clay-Slow		
450	13	Sand Clay-Slow		
467	17	Med. Coarse Sand-Soft		
497	30	Med. Coarse Sand W/Little Clay-Soft		
528	31	Sand W/Little Clay-Soft.		

(If More Space is Required, Use Additional Sheet)

This well was drilled according to the Rules and Regulations of the Georgia Department of Public Health and the above information is true and correct to the best of my knowledge.

Signed ______________________ Title District Manager

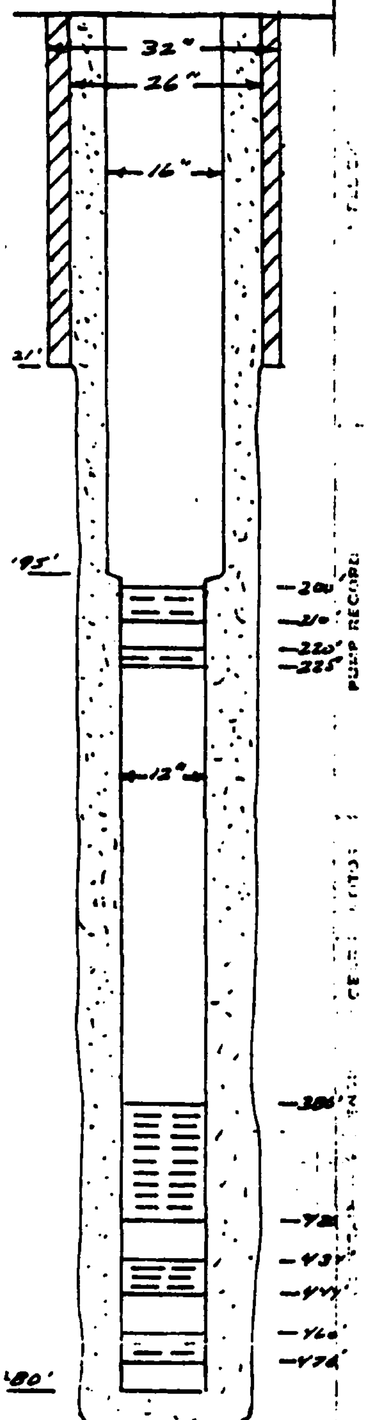
John W. Flatt

Date June 15, 1972

No. 10

ALL MEASUREMENTS TAKEN FROM (GROUND) (TOP OF FOUNDATION) (TOP OF CASING) (TOP BASE PLATE)

DRAWING OF THE WELL



STARTED WELL ______ 19 ____ AND COMPLETED ______ 19 ____
TOTAL DEPTH 480 ELEVATION ______ STATIC WATER LEVEL ______
LENGTH SURFACE CASING ______ SIZE ______ THICKNESS ______
CEMENTED WITH ______ SACKS CEMENT TYPE PACKER ______
LENGTH WELL CASING 121 SIZE 26 WEIGHT SCH 40
CEMENTED WITH ______
INNER CASING 16x12 195'x285' WEIGHT STD SCH 40
WITH AS SHOWN ______ TYPE BACKOFF ______
END SEAL ______ GUIDE ______
WELL STRAINER MAKE Layne SIZE 12 LENGTH 75 OPENING 7½"
TYPE MATERIAL S.S. Welded CONNECTIONS
SIZE HOLE DRILLED FOR SURFACE CASING 32 WITH Tri-Cone
SIZE HOLE DRILLED FOR WELL CASING 26 WITH Tri-Cone
26 WITH Tri-Cone
YARDS OF GRAVEL USED ______ HOW PLACED ______
HOW ______
NOTES ______

RIG USED Gardner Denver DRILLER Sylvester Yaun

SERIAL NUMBER ______ MAKE ______ FOUNDATION ______
LENGTH COLUMN ______ SIZE ______ TYPE ______ @ 10 20 LENGTHS
BOWL SIZE ______ TYPE ______ STAGES ______ MATERIAL IMPELLER ______
MATERIAL BOWL ______ WITH ______ PORTS AND ______ SHAFT
SUCTION SIZE ______ LENGTH ______ SUCTION STRAINER ______
IS PUMP SEALED HOW ______ WHERE ______ WITH WHAT ______
LUBRICATOR TYPE ______ SIZE ______ VOLTAGE ______
LENGTH OF AIRLINE ______ SIZE ______ TYPE MATERIAL ______
AIR RELEASE VALVE TYPE ______ SIZE ______
SIZE SURFACE DISCHARGE ______ TYPE ______ DAYTON COUPLING ______
PRESSURE GUAGE ______ SPEED ______
NOTES ______

PUMP RECORD

RIG USED TO SET PUMP ______ INSTALLER ______
DATE PUMP INSTALLED ______ 19 ____ DATE IN OPERATION ______ 19 ____

MAKE ______ HP ______ PHASE ______ CYCLE ______ VOLT. 220/440
SPEED ______ MODEL ______ SERIAL NUMBER ______
TOP BEARING ______ BOTTOM BEARING ______ RATCHET ______
STARTER ______ PRESSURE SWITCH ______ FLOAT ______

MAKE ______ MODEL ______ SIZE ______ RATIO ______ NO. ______
SIZE PULLEY ______ TYPE MOTOR FRAME ______

MAKE ______ MODEL ______ HP ______ SERIAL NUMBER ______
SPEED ______ SIZE PULLEY ______ FOUNDATION ______
TYPE FUEL TANK ______ MAKE MAG ______ NO. ______
MAKE STARTER ______ HP ______ TYPE FUEL ______
MAKE FLEXIBLE SHAFT ______ SIZE ______ LENGTH ______ BELT LENGTH ______

PURPOSE FOR WHICH THIS WATER IS USED ______
TEMPERATURE ______ IS WATER CLEAR ______ CAPACITY ______
SAND ______ HARDNESS ______ PH ______ IRON ______ NaCL ______
TYPE TREATMENT USED ______
IS THERE A DERRICK OVER THE WELL ______ HEIGHT ______ TYPE ______
CAN TRUCK OR ______ EASILY ______ TO WELL ______
PUMP HOUSE ______ SIZE HATCH ______

CONTRACT NO. AL-015B

OUR WELL NO. 10 ______ IN WELL NO. 10 ______ IN TEST HOLE NO. ______

LOCATION OF THE WELL Tabor Drive

INSTALLED FOR City of Warner Robins

ADDRESS CITY Warner Robins COUNTY Houston STATE Georgia

Prime Contractor: Arthur Pew Construction Co. YEAR 1976
Engineer : Flood & Associates

ENGINEERS PROJECT NO: 7106:4

WELL NO. 10
CITY OF WARNER ROBINS
CONTRACT NO. AL-0150

FORMATION LOG OF THE WELL OR TEST HOLE

STARTED TEST HOLE Dec. 13 1976 FINISHED Dec. 14 1976 TEST HOLE NUMBER ____
LOCATION City of Warner Robins SEC. ____ TS. ____ RANGE ____ ELEVATION ____
Taber Drive

TOTAL DEPTH	THICKNESS EACH STRATUM	FORMATION
36	36	Red Sandy Clay- Slow.
66	30	Red & White Sandy Clay
96	30	Coarse Sand & Clay
116	20	Med. Coarse Sand & Clay. Soft.
125	9	White Sandy Clay. Very Slow.
135	10	White Clay & Sand. Slow.
155	20	Sand & Stks. of White Clay. Soft.
183	28	Coarse Sand & Little White Clay. Soft.
213	30	Coarse Sand. Soft.
270	57	Coarse Sand & Little White Clay. Soft.
305	35	Med. Coarse Sand. Soft.
325	20	Sand & Red Clay. Very Slow.
500	175	Coarse Sand & Little Stks. of White Clay. Soft & Slow.
561	61	Coarse Sand & Stks. of Red Clay

TOTAL DEPTH	THICKNESS EACH STRATUM	FORMATION

MUD PIT SIZE ____ FT. X ____ FT. ____ X ____ FT. DEEP
TYPE BIT USED TO CUT SAND ____
SIZE OF TEST HOLE THROUGH SAND ____
TYPE OF BIT USED TO CUT UPPER FORMATIONS ____
SIZE ____
TYPE MUD PUMP USED ____
DRILLING PRESSURE IN SAND ____
TYPE OF MUD USED ____
NOTES: ____

TEST DATA

	PRELIMINARY TEST	FINAL TEST
STATIC WATER LEVEL	56'	
PUMPED G. P. M.	1613	
PRESSURE, POUNDS		
DRAWDOWN	48'	
G. P. F. D.		
GUARANTEED G. P. M.	1500	
GUARANTEED PRESSURE		
DATE OF TEST	MAR. 8, 1977	

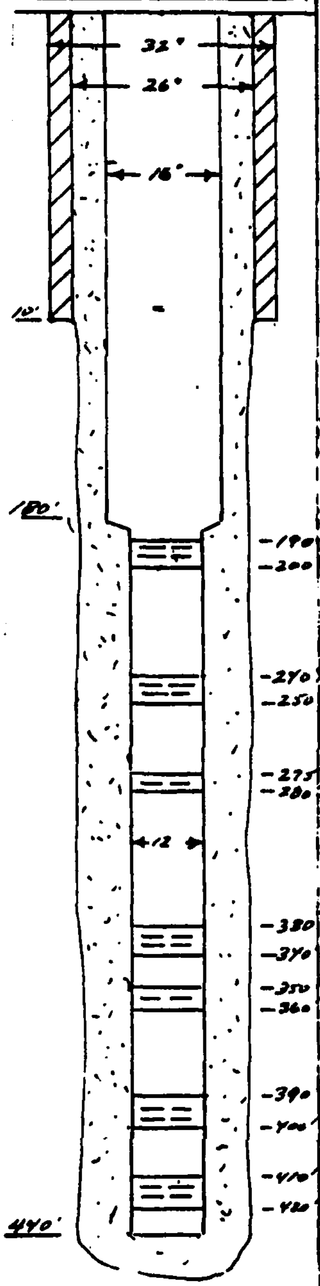
REMARKS

DRILLER Sylvester Yaun
FIELD SUP'T Jess Mendenhall

No. 11

ALL MEASUREMENTS TAKEN FROM (GROUND) (TOP OF FOUNDATION) (TOP OF CASING) (TOP BASE PLATE)

DRAWING OF THE WELL



WELL DATA

STARTED WELL Oct. 25 1976 AND COMPLETED Dec. 7 1976
TOTAL DEPTH 440 ELEVATION ____ STATIC WATER LEVEL ____
LENGTH SURFACE CASING ____ SIZE ____ THICKNESS ____
CEMENTED WITH ____ SACKS CEMENT TYPE PACKER ____
LENGTH WELL CASING 180' SIZE 26 WEIGHT SCH 40
CEMENTED WITH ____ SACKS CEMENT TYPE PACKER ____
INNER CASING LENGTH 16x12 SIZE 180'x260' WEIGHT SCH 40
WITH ____ X ____ GUIDES LOCATED Shown TYPE BACKOFF ____
LEAD SEAL ____ BACKPRESSURE VALVE ____ GUIDE ____
WELL STRAINER MAKE Layne SIZE 12 LENGTH 75 OPENING 71
TYPE MATERIAL S.S. WITH Welded CONNECTIONS
SIZE HOLE DRILLED FOR SURFACE CASING 32 WITH Tri-Cone
SIZE HOLE DRILLED FOR WELL CASING 26 WITH Tri-Cone
SIZE HOLE DRILLED FOR STRAINER 26 WITH Tri-Cone
YARDS OF GRAVEL USED ____ HOW PLACED ____
HOW WAS WELL DEVELOPED ____
NOTES: ____

RIG USED Gardner Denver DRILLER Sylvester Yawn

PUMP RECORD

SERIAL NUMBER 82863 MAKE Layne FOUNDATION Concrete
LENGTH COLUMN 100 SIZE 10x1½x2½ TYPE Oil @ 20 LENGTHS
BOWL SIZE 12 TYPE TLC STAGES 6 MATERIAL IMPELLER ____
MATERIAL BOWL C.I. WITH Open PORTS AND S.S. SHAFT
SUCTION SIZE 10 LENGTH 30 SUCTION STRAINER Galv Cone
IS PUMP SEALED HOW Yes WHERE Foundation WITH WHAT Concrete
LUBRICATOR TYPE Oil SIZE 4 Qts. VOLTAGE 460
LENGTH OF AIRLINE 100 SIZE 1/4 TYPE MATERIAL Galv
AIR RELEASE VALVE TYPE Crispen SIZE 2"
SIZE SURFACE DISCHARGE 10 TYPE ____ DAYTON COUPLING ____
PRESSURE GUAGE 0-100 SPEED 1800
NOTES ____

RIG USED TO SET PUMP Crane INSTALLER B. Castleberry
DATE PUMP INSTALLED 3-2 1977 DATE IN OPERATION 11-1 1977

MOTOR

MAKE GE HP 100 FRAME B444TP PHASE 3 CYCLE 60 VOLT. 230/440
SPEED 1800 MODEL 5K6277 X H2A SERIAL NUMBER KMJ1013153
TOP BEARING ____ BOTTOM BEARING ____ RATCHET NRR
STARTER ____ PRESSURE SWITCH ____ FLOAT ____

GEAR

MAKE Johnson MODEL CH200 SIZE 200 HP RATIO 1:1 NO. ____
SIZE PULLEY ____ TYPE MOTOR FRAME Combination

ENGINE

MAKE Waukesha MODEL F-1197GU HP 253 SERIAL NUMBER 365649
SPEED 1800 SIZE PULLEY ____ FOUNDATION Concrete
TYPE FUEL TANK ____ MAKE MAG ____ NO. ____
MAKE STARTER ____ NO. ____ TYPE FUEL Natural Gas
MAKE FLEXIBLE SHAFT ____ SIZE ____ LENGTH ____ BELT LENGTH ____
Hillard Twiflex 1246-1-D4100

GENERAL

PURPOSE FOR WHICH THIS WATER IS USED Municipal
TEMPERATURE ____ IS WATER CLEAR Yes CAPACITY 1500
SAND No HARDNESS 4 PH 5.6 IRON 0.01 NaCl ____
TYPE TREATMENT USED ____
IS THERE A DERRICK OVER THE WELL No HEIGHT ____ TYPE ____
CAN TRUCK OR RIG EASILY GET TO WELL No-In House
PUMP HOUSE Yes SIZE HATCH 4'x4'

CONTRACT NO. AI-0150 - ____

OUR WELL NO. 11 THEIR WELL NO. 11 IN TEST HOLE NO. ____

LOCATION OF THE WELL Taber Street

INSTALLED FOR City of Warner Robins

ADDRESS CITY Warner Robins COUNTY Houston STATE Georgia

Prime Contractor: Arthur Pew Construction Co.
Engineer : Flood & Associates

YEAR 1976

No. 11

WELL NO. 11
CONTRACT NO. AL-0150

FORMATION LOG OF THE WELL OR TEST HOLE

STARTED TEST HOLE ________ 19 76 FINISHED November 3 19 76 TEST HOLE NUMBER ________
LOCATION [illegible] Street, [illegible] SEC. ____ TS. ____ RANGE ____ ELEVATION ____

TOTAL DEPTH	THICKNESS EACH STRATUM	FORMATION
8	8	Red Sand Clay
[illegible]	4	Red Clay
[illegible]	8	Red Sand Clay
[illegible]	5	Red & White Sandy Clay
[illegible]	5	Yellow Sand & Clay
[illegible]	9	Coarse Gravel. Circulation Problems.
[illegible]	[illegible]	Coarse Sand & Little White Clay
85	27	Coarse Sand & Stks of White Clay. Soft.
[illegible]	41	Sand & White Clay. Soft.
155	29	Med. Coarse Sand & White Clay Soft.
18[illegible]	28	Coarse Sand with Stks. of White Clay. Soft.
[illegible]98	15	Med. Coarse Sand with Little White Clay. Soft.
[illegible]	22	Coarse Sand with Stks. of White Clay. Soft.
[illegible]	5	White Clay (No Sample) Slow.
[illegible]	45	Coarse Sand & Little White Clay. Soft.
[illegible]	45	Med. Coarse Sand. Little Clay Medium Drilling.
[illegible]	[illegible]	Red & White Clay. Very Slow.
[illegible]	[illegible]	Coarse Sand & Little Clay. Soft.
[illegible]	58	Coarse Sand with Stks. of White Clay. Soft.
443	29	Coarse Sand & Little Clay. Soft.
[illegible]	[illegible]	Sand & Little Stks. of Red Clay
[illegible]	[illegible]	Sand & Red Clay. Slow.
[illegible]	[illegible]	Brown Sand with Little Clay. Slow.
[illegible]	[illegible]	Sand & Stks of Red Clay
559	50	Red Sand & Clay. Very Slow.

MUD PIT SIZE ____ FT. X ____ FT. ____ X ____ FT. DEEP
TYPE BIT USED TO CUT SAND ____
SIZE OF TEST HOLE THROUGH SAND ____
TYPE OF BIT USED TO CUT UPPER FORMATIONS ____
____ SIZE ____
TYPE MUD PUMP USED ____
DRILLING PRESSURE IN SAND ____
TYPE OF MUD USED ____
NOTES ____

TEST DATA

	PRELIMINARY TEST	FINAL TEST
STATIC WATER LEVEL	47	
PUMPED G. P. M.	1613	
PRESSURE. POUNDS		
DRAWDOWN	25	
G. P. F. D.	64.52	
GUARANTEED G. P. M.	1600	
GUARANTEED PRESSURE		
DATE OF TEST	December 2, 1976	

REMARKS

DRILLER Sylvester Yawn

FIELD SUPT. Jess Mendenhall

No. 1

LAYNE ATLANTIC COMPANY

NORFOLK, VA.

E. H. Smith

LOG OF WELL For Robins Field (Georgia Air Depot)

Located at Wellston in Georgia (near Macon, Ga.) County, State

Date Drilling Started September 2, 1941 Date Started August 21, 1941

Finished Drilling September 15, 1941 Finished October 28, 1941

FORMATIONS AND DEPTH OF WELL

TOTAL DEPTH OF ALL STRATA FT.	IN.	DEPTH OF EACH STRATUM FT.	IN.	FORMATION FOUND AT EACH STRATUM
				Well #1
20		20		Brown sand
40		20		Yellow sand
48		8		Yellowish white sand
70		22		Coarse white sand
76		6		Very coarse sand
86		10		Coarse white sand
95		9		Coarse sand, some chalk
122		27		Coarse white sand and fine gravel
				Signs of chalk 95 to 100
				1 ft. very hard streak at 109
132		10		Soft coarse white sand
136		4		Hard chalk and gravel
152		16		Chalk and gravel
157		5		Soft coarse white sand
162		5		Soft chalk and coarse gravel
167		5		Medium hard coarse gravel - used 1/2 pit of water
172		5		Coarse white sand
177		5		Chalk and gravel
[illegible]		25		Soft coarse sand
207		15		Hard clay and gravel
23[illegible]		28		Coarse white sand
2[illegible]		[illegible]		Hard streak (?). No sample
263		16		Fine white sand
270		17		Coarse sand - used water
274		4		Very hard gravel
290		16		Very hard chalk
315		25		Coarse sand
318		3		Coarse sand and little clay
328		10		Coarse sand
332		4		Coarse and fine white sand with white clay
337		5		Fine sand
344		7		Coarse sand, soft
357		13		Coarse and fine sand - little chalk
362		5		Very coarse sand - soft
				? - used pit of water 301 to 308

DIMENSIONS OF CASING AND SCREEN

TOTAL LENGTH OF ALL SCREENS and CASINGS FT.	IN.	LENGTH OF EACH SEC. OF SCREEN OR CASING FT.	IN.	SPECIFY SCREEN OR CASING	SIZE OF SCREEN OR CASING IN.	GAUGE OF SCREEN	
75		75		Casing	20	5/16	(cemented) [illegible]
12" casing commences at 60'							
50		50		Casing	12	50#	Steel [illegible] opening
70		20		Screen	12	6	[illegible]
190		120		Casing	12	50#	Steel [illegible] opening
210		20		Screen	12	6	[illegible]

WELL DATA:

Preliminary Test

Date Tested 9-20 1941 Static Level

Production 1400 GPM Pumping Level

73' drawdown

Permanent Test

Date Tested 9-22 1941 Static Level 40'

Production 835 GPM Active St. Level

Drawdown 35' Pumping Level

Remarks: 36 hour test

PUMP DATA:

Shop No. Type Lubr.

Type Head Size Suction

Depth Setting (BP to MB)

Size Column Length Suction

Type Bowl Length Air Line

No. Stages Discharge-

Cap'y and Head Pressure

MOTOR DATA:

Horsepower Voltage

RPM Phase

Type Cycles

Make Frame No.

No. 1

WELL DATA	INSTALLATION	WELL NO.
	Robins AFB, Georgia	#1

ELEVATION (Ft)	LOCATION	DATE CONSTR ENDED
	Bldg # 186	28 October 1941

WELL

TYPE		
Drilled Well (Underreamed Gravel - Packed Well)		
DEPTH: 265 ft.	DIAMETER: 8 in.	PUMPSETTING DEPTH: 100 ft.
ORIG STATIC WATER LEVEL: No Record	DRAWDOWN: 35'	RECOVERY TIME:

TEST DATA		AIR LINES AND GAGES			SPECIFIC CAPACITY (Gal per ft)
Well capacity	Pumping level	Yes	No	Length	GPM / DRAWDOWN =
850 GPM		X			

WELL PUMPING EQUIPMENT

PUMP

TYPE AND MAKE					CAPACITY
Vertical Turbine Layne Pump No. 17097					850 GPM
SUCTION (Ft): 20 Ft. 6 in.	SIZE AND LENGTH:	COLUMN: 8 in.			
HEAD: Above grnd	Below grnd	Total	NUMBER BOWLS	SIZE AND TYPE	NO. STAGES
	X		4 Stage	12" RKMC	4

MOTOR

SERIAL NO.	TYPE	MAKE	HP	RPM	FRAME	PHASE	CYCLES	VOLTAGE
286857	CFU	U. S. Motor	75	1800	952	3	60	220/440

STANDBY POWER	MAKE	SIZE
Yes	General Motors diesel	
HP: 90 / RPM: 1800	DESCRIPTION: Ser. No. 4A-90389; Model 4030C	

CASING AND WELL SCREENING MATERIAL USED	SETTING DEPTH	LENGTH EACH
75 ft. of 20" pit casing cemented in place.		
Top of original 12" screen line at 60'		
Top of 8" screen line at 108'		
8" stainless steel screen at 110' - 130' and 245' - 265'		
NOTE: Above well was relined in March 1953 to data shown above.		
PUMP: Layne No. 17097		
100' of 8" X $2\frac{1}{2}$" X $1\frac{1}{2}$" Column		
4 Stage 12" RKMC Bowls		
20' of 6" Suction		
Gear Drive: Johnson 1 1/3 - 1		

1A

MEASUREMENTS TAKEN FROM (GROUND) (TOP OF FOUNDATION) (TOP OF CASING) (TOP BASE PLATE)

DRAWING OF THE WELL

WELL DATA

STARTED WELL August 13 19 75 AND COMPLETED Sept. 17 19 75
TOTAL DEPTH 360 ELEVATION STATIC WATER LEVEL 37'
LENGTH SURFACE CASING 154 SIZE 26 THICKNESS 0.375
CEMENTED WITH 400 SACKS CEMENT TYPE PACKER
LENGTH WELL CASING SIZE WEIGHT
CEMENTED WITH SACKS CEMENT TYPE PACKER
INNER CASING LENGTH 360 SIZE 12" WEIGHT 0.375 wall
WITH as shown GUIDES LOCATED TYPE BACKOFF
LEAD SEAL BACKPRESSURE VALVE GUIDE
WELL STRAINER MAKE Cook SIZE 12 LENGTH 50 OPENING .055
TYPE MATERIAL SS (304) WITH CONNECTIONS
SIZE HOLE DRILLED FOR SURFACE CASING 32 WITH Tri Cone
SIZE HOLE DRILLED FOR WELL CASING 26 WITH " "
SIZE HOLE DRILLED FOR STRAINER 26 WITH " "
YARDS OF GRAVEL USED 70 HOW PLACED Gravity & Back Flow
HOW WAS WELL DEVELOPED Test Pump & Air
NOTES:

RIG USED Gardner-Denver DRILLER S. Yawn

PUMP RECORD

SERIAL NUMBER 17097 MAKE Layne FOUNDATION
LENGTH COLUMN 100 SIZE 8 x 1½ x 2½ TYPE oil @ 10/20 LENGTHS
BOWL SIZE 12 TYPE RKAM STAGES 4 MATERIAL IMPELLER bronze
MATERIAL BOWL C.I. WITH open PORTS AND SHAFT
SUCTION SIZE 8" LENGTH 10' SUCTION STRAINER cone
IS PUMP SEALED HOW WHERE WITH WHAT
LUBRICATOR TYPE SIZE VOLTAGE
LENGTH OF AIRLINE 100' SIZE ½" TYPE MATERIAL galvanized
AIR RELEASE VALVE TYPE SIZE
SIZE SURFACE DISCHARGE TYPE DAYTON COUPLING
PRESSURE GUAGE SPEED
NOTES

RIG USED TO SET PUMP INSTALLER
DATE PUMP INSTALLED 19 DATE IN OPERATION 19

MOTOR

MAKE U.S. HP 100 FRAME 404TP PHASE 3 CYCLE 60 VOLT. 220/440
SPEED 1800 MODEL SERIAL NUMBER
TOP BEARING BOTTOM BEARING RATCHET
STARTER PRESSURE SWITCH FLOAT

GEAR

MAKE MODEL SIZE RATIO NO.
SIZE PULLEY TYPE MOTOR FRAME

ENGINE

MAKE MODEL HP SERIAL NUMBER
SPEED SIZE PULLEY FOUNDATION
TYPE FUEL TANK MAKE MAG NO.
MAKE STARTER NO. TYPE FUEL
MAKE FLEXIBLE SHAFT SIZE LENGTH BELT LENGTH

GENERAL

PURPOSE FOR WHICH THIS WATER IS USED
TEMPERATURE IS WATER CLEAR CAPACITY
SAND HARDNESS PH IRON NaCL
TYPE TREATMENT USED
IS THERE A DERRICK OVER THE WELL HEIGHT TYPE
CAN TRUCK OR RIG EASILY GET TO WELL
PUMP HOUSE SIZE HATCH

CONTRACT NO. 13264 - 171

OUR WELL NO. 1(a) THEIR WELL NO. 1(a) IN TEST HOLE NO.

LOCATION OF THE WELL Robins Air Force Base

INSTALLED FOR Mid-South Construction Company

ADDRESS CITY Warner Robins COUNTY Houston STATE Georgia

RAFP Contract No. F09650-75-C-0083
Redrill Well No. 1
Project No. WR 134-5

YEAR 1975

No. 1A

Contract No. 13264

FORMATION LOG OF THE WELL OR TEST HOLE

STARTED TEST HOLE Aug. 20 19 75 FINISHED Aug. 26 19 75 TEST HOLE NUMBER 1

LOCATION Well No. 1 (A) SEC. TS. RANGE ELEVATION

North of old Well No. 1, Bldg. No. 186 approximately 300'

TOTAL DEPTH	THICKNESS EACH STRATUM	FORMATION
10	10	Filled Sand & Clay
20	10	Sandy Clay - Slow
37	17	Sand & Little Clay-Soft
70	33	Sandy Clay - 50'
126	56	Sand & Stks. of White Clay-
		Soft
155	29	Sandy W/Hard Stks. of Clay
177	22	Sand & Little Clay - Soft.
192	15	White Clay & Sand - Slow
216	24	Sand - Little White Clay-
		Soft
244	28	Coarse Sand - Soft
260	16	Coarse Sand Little Clay -
		Soft
277	17	Red Sand Clay - Slow
364	87	Coarse Sand & Little Clay
		Soft.
389	25	Coarse Sand & Stks. of Clay=
		Soft

MUD PIT SIZE FT. X FT. X FT. DEEP

TYPE BIT USED TO CUT SAND

SIZE OF TEST HOLE THROUGH SAND

TYPE OF BIT USED TO CUT UPPER FORMATIONS

SIZE

TYPE MUD PUMP USED

DRILLING PRESSURE IN SAND

TYPE OF MUD USED

NOTES: Set 154' of 26" casing and grouted in place. Before completing test hole. This well was located on side of hill in back fill soil conditions on surface.

TEST DATA

	PRELIMINARY TEST	FINAL TEST
STATIC WATER LEVEL	37'	
PUMPED G. P. M.	1613	
PRESSURE, POUNDS		
DRAWDOWN	43'	
G. P. F. D.	37.51	
GUARANTEED G. P. M.	950	
GUARANTEED PRESSURE		
DATE OF TEST	9-11-75	

REMARKS

DRILLER S. Yawn

FIELD SUP'T. J. Flatt

LAYNE ATLANTIC COMPANY

NORFOLK, VA.

LOG OF WELL For Robins Field (Georgia Air impor)

Located at Weliston in (Near Macon, Ga.) County, State Georgia #2

Date Drilling Started September 19, 1941 Date Started August 21, 1941

Finished Drilling September 27, 1941 Finished October 28, 1941

FORMATIONS AND DEPTH OF WELL

TOTAL DEPTH OF ALL STRATA FT.	IN.	DEPTH OF EACH STRATUM FT.	IN.	FORMATION FOUND AT EACH STRATUM
				Well #2
45		45		Fine brown sand
67		22		Medium white and yellow sand
72		5		Fine white sand
78		6		Coarse sand and gravel - very hard
80		2		Clay
95		15		Coarse dark sand
108		13		Medium white sand - soft
122		14		Clay and chalk - soft
140		18		Coarse sand and gravel - soft, used 2 pits of water
173		33		Very soft white sand - used water
195		22		Coarse white sand - cut medium
199		4		Clay
205		6		Fine sand and chalk
210		5		Fine white sand
215		5		Fine white sand and chalk
220		5		Clay and gravel
225		5		Coarse gravel - hard
230		5		Coarse white sand, Cut medium. Used 1/4 pit of water
[illegible]		[illegible]		Coarse white sand - hard
250		10		Fine white sand - medium
260		10		" " " - soft
265		5		Coarse " " - hard
270		5		Coarse gravel - hard
290		20		Chalk and gravel

bottom of well 255'

Under-reamed from 125 to 170

and from 225 to 255

DIMENSIONS OF CASING AND SCREEN

TOTAL LENGTH OF ALL SCREENS and CASINGS FT.	IN.	LENGTH OF EACH SEC. OF SCREEN OR CASING FT.	IN.	SPECIFY SCREEN OR CASING	SIZE OF SCREEN OR CASING IN.	GAUGE OF SCREEN
75		75		Casing	20	5/16

Cemented ...

12" casing commences 56'-6".

Cased 76'

WELL DATA:

Preliminary Test

Date Tested 10-3 1941 Static Level 32'

Production 900 to 925 GPM Pumping Level

Permanent Test

Date Tested 19 Static Level

Production GPM Active St. Level

Drawdown Pumping Level

Remarks:

PUMP DATA:

Shop No. Type Lubr.

Type Head Size Suction

Depth Setting (BP to MB)

Size Column Length Suction

Type Bowl Length Air Line

No. Stages Discharge-

Cap'y and Head Pressure

MOTOR DATA:

Horsepower Voltage

RPM Phase

Type Cycles

Make Frame No.

No: 2

[illegible] Contract No. [illegible]
U.S. Contract No. [illegible]

FORMATION LOG OF THE WELL OR TEST HOLE

STARTED TEST HOLE [illegible] 19[illegible] FINISHED [illegible] 19[illegible] TEST HOLE NUMBER [illegible]
LOCATION [illegible] SEC. ____ TS. ____ RANGE ____ ELEVATION ____

TOTAL DEPTH	THICKNESS EACH STRATUM	FORMATION
[illegible]	8	[illegible] Clay
[illegible]	[illegible]	Coarse Sand & Little Clay
[illegible]	[illegible]	[illegible] Clay washed
		[illegible] no sample
[illegible]	48	[illegible] Sand- Soft
[illegible]	[illegible]1	[illegible] Sand w/Little Stks of
		[illegible]
[illegible]	[illegible]	Coarse Sand w/Little Stks
		[illegible] Clay
[illegible]	[illegible]	Sand w/Little Clay: Soft
[illegible]	[illegible]	[illegible] Clay w/Little Sand-
		[illegible] of Clay washed Out:
		[illegible]
[illegible]	[illegible]1	[illegible] Sand-Soft
[illegible]	[illegible]	Sand-[illegible]
[illegible]	[illegible]	Sand- [illegible] Slow
[illegible]	[illegible]	Sand w/Little Stks of White
		Clay: Soft
[illegible]	[illegible]	Sand- Very Soft
[illegible]	[illegible]	White Clay w/Little Sand-
		[illegible] Slow
[illegible]	44	[illegible]. Coarse Sand w/Little
		Stks. Of White Clay-
		[illegible] Soft
[illegible]	[illegible]	[illegible] Sand [illegible] White Clay
		[illegible]
[illegible]	[illegible]	[illegible]

MUD PIT SIZE ____ FT. X ____ FT. ____ X ____ FT. DEEP
TYPE BIT USED TO CUT SAND [illegible]
SIZE OF TEST HOLE THROUGH SAND [illegible]
TYPE OF BIT USED TO CUT UPPER FORMATIONS [illegible]
____ SIZE ____
TYPE MUD PUMP USED ____
DRILLING PRESSURE IN SAND ____
TYPE OF MUD USED [illegible]
NOTES: ____

TEST DATA

	PRELIMINARY TEST	FINAL TEST
STATIC WATER LEVEL	[illegible]	
PUMPED G. P. M.	1230	
PRESSURE POUNDS		
DRAWDOWN	[illegible]	
G. P. F. D.	[illegible]	
GUARANTEED G. P. M.	[illegible]	
GUARANTEED PRESSURE		
DATE OF TEST	July 31, 19[illegible]	

REMARKS

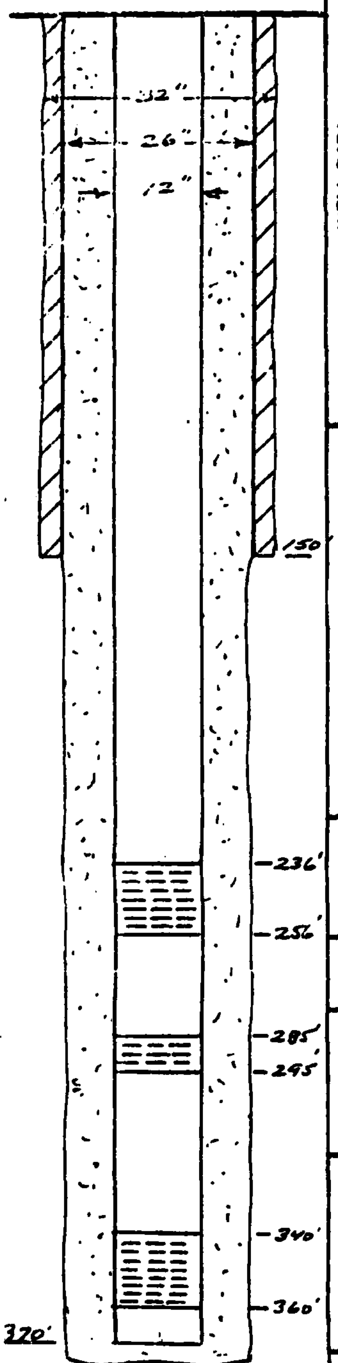
DRILLER [illegible]

FIELD SUPT. [illegible]

No. 2

ALL MEASUREMENTS TAKEN FROM (GROUND) (TOP OF FOUNDATION) (TOP OF CASING) (TOP BASE PLATE)

DRAWING OF THE WELL



5" Guides @ 145'
5" " " 200'
5" " " 255'
5" " " 300'
5" " " 365'

WELL DATA

STARTED WELL July 1 19 74 AND COMPLETED August 2 19 74
TOTAL DEPTH 370 ELEVATION ___ STATIC WATER LEVEL 50'
LENGTH SURFACE CASING 150' SIZE 26" THICKNESS 0.375
CEMENTED WITH 250 SACKS CEMENT TYPE PACKER ___
LENGTH WELL CASING ___ SIZE ___ WEIGHT ___
CEMENTED WITH ___ SACKS CEMENT TYPE PACKER ___
INNER CASING LENGTH 370' SIZE 12" I.D. WEIGHT 0.375
WITH 5 X 5 GUIDES LOCATED SHOWN TYPE BACKOFF Orange Peel
LEAD SEAL ___ BACKPRESSURE VALVE ___ GUIDE ___
WELL STRAINER MAKE COOK SIZE 12" LENGTH 50' OPENING .55
TYPE MATERIAL S.S. Type 30 WITH Welded CONNECTIONS
SIZE HOLE DRILLED FOR SURFACE CASING 32 WITH Tri-Cone
SIZE HOLE DRILLED FOR WELL CASING 26 WITH " "
SIZE HOLE DRILLED FOR STRAINER 25 WITH " "
YARDS OF GRAVEL USED 60 Tons HOW PLACED Pumped Low Pressure
HOW WAS WELL DEVELOPED Test Pump & Surging
NOTES:

RIG USED Cardwell 1946 DRILLER Sylvester Yawn

PUMP RECORD

SERIAL NUMBER ___ MAKE ___ FOUNDATION ___
LENGTH COLUMN ___ SIZE ___ TYPE ___ @ 10/20 — LENGTH
BOWL SIZE ___ TYPE ___ STAGES ___ MATERIAL IMPELLER ___
MATERIAL BOWL ___ WITH ___ PORTS AND ___ SHA
SUCTION SIZE ___ LENGTH ___ SUCTION STRAINER ___
IS PUMP SEALED HOW ___ WHERE ___ WITH WHAT ___
LUBRICATOR TYPE ___ SIZE ___ VOLTAGE ___
LENGTH OF AIRLINE ___ SIZE ___ TYPE MATERIAL ___
AIR RELEASE VALVE TYPE ___ SIZE ___
SIZE SURFACE DISCHARGE ___ TYPE ___ DAYTON COUPLING ___
PRESSURE GUAGE ___ SPEED ___
NOTES ___

RIG USED TO SET PUMP ___ INSTALLER ___
DATE PUMP INSTALLED ___ 19 ___ DATE IN OPERATION ___ 19 ___

MOTOR

MAKE ___ HP ___ FRAME ___ PHASE ___ CYCLE ___ VOLT. 220/440
SPEED ___ MODEL ___ SERIAL NUMBER ___
TOP BEARING ___ BOTTOM BEARING ___ RATCHET ___
STARTER ___ PRESSURE SWITCH ___ FLOAT ___

GEAR

MAKE ___ MODEL ___ SIZE ___ RATIO ___ NO. ___
SIZE PULLEY ___ TYPE MOTOR FRAME ___

ENGINE

MAKE ___ MODEL ___ HP ___ SERIAL NUMBER ___
SPEED ___ SIZE PULLEY ___ FOUNDATION ___
TYPE FUEL TANK ___ MAKE MAG ___ NO. ___
MAKE STARTER ___ NO. ___ TYPE FUEL ___
MAKE FLEXIBLE SHAFT ___ SIZE ___ LENGTH ___ BELT LENGTH ___

GENERAL

PURPOSE FOR WHICH THIS WATER IS USED Municipal for Base
TEMPERATURE ___ IS WATER CLEAR YES CAPACITY 900
SAND NONE HARDNESS 5 PH 5.6 IRON .05 NaCl ___
TYPE TREATMENT USED C/2
IS THERE A DERRICK OVER THE WELL NO HEIGHT ___ TYPE ___
CAN TRUCK OR RIG EASILY GET TO WELL YES
PUMP HOUSE ___ SIZE HATCH ___

CONTRACT NO. 1312 - 100

OUR WELL NO. 2(a) THEIR WELL NO. 2(a) IN TEST HOLE NO. 1

LOCATION OF THE WELL Robins Air Force Base

INSTALLED FOR Robins Air Force Base

ADDRESS CITY Warner Robins COUNTY Houston STATE Georgia

Contract No. [illegible]-74-0326
Mid-South Construction Co.
Warner Robins, Georgia, Prime Contractor

YEAR 1974

WELL DATA	INSTALLATION Robins AFB, Georgia	WELL NO. #2

ELEVATION (Ft)	LOCATION Bldg # 164	DATE CONST ENDED 28 October 1941

WELL			
	TYPE Drilled Well (Underreamed Gravel - Packed Well)		
	DEPTH 247 ft.	DIAMETER 8 in.	PUMPSETTING DEPTH 120 ft.
	ORIG STATIC WATER LEVEL 32 ft.	DRAWDOWN	RECOVERY TIME

TEST DATA		AIR LINES AND GAGES					SPECIFIC CAPACITY (Gal per ft)
Well capacity 950 GPM	Pumping level	X	Yes		No	Length	GPM / DRAWDOWN =

WELL PUMPING EQUIPMENT

PUMP					
TYPE AND MAKE Vertical Turbine Layne Pump No. 14428					CAPACITY 950 GPM
SUCTION (Ft) 30'6"	SIZE AND LENGTH	COLUMN 8 in.			
HEAD: Above grnd	Below grnd	Total	NUMBER BOWLS 4 Stage	SIZE AND TYPE 12" RKHC	NO STAGES 4

MOTOR								
SERIAL NO. 6276089	TYPE KF	MAKE G. E.	HP 100	RPM 1765	FRAME N-6508	PHASE 3	CYCLES 60	VOLTAGE 220/440
STANDBY POWER YES		MAKE Sterling - Model Nr. LC-6						SIZE
HP 135	RPM 1350	DESCRIPTION Gasoline Engine 135 HP						

CASING AND WELL SCREENING MATERIAL USED	SETTING DEPTH	LENGTH EACH
75' of 20" pit casing cemented in place.		
Top of original 12" screen line 56' - 6"		
Top of 8" screen line at 128' - 6"		
8" stainless steel screen at 130 - 150' and 227 - 247'		
<u>NOTE</u>: Above well was relined in May 1954 to data as shown		
above.		
<u>PUMP</u>: Layne No. 14428		
120' of 8" X 2½" X 1½" Column		
4 Stage 12" RKHC Bowls		
30' of 6" Suction		
Gear Drive: Johnson 1 1/3 - 1		

AF FORM 995, AUG 58

No. 3

LAYNE ATLANTIC COMPANY

NORFOLK, VA.

LOG OF WELL For [illegible] Field (Well # 3)

Located at [illegible] in ([illegible], Georgia) County, State Georgia

Date Drilling Started ______ 19 ___ Date Started ______ 19

Finished Drilling ______ 19 ___ Finished Oct. 10, ______ 19[illegible]

FORMATIONS AND DEPTH OF WELL					DIMENSIONS OF CASING AND SCREEN						
TOTAL DEPTH OF ALL STRATA FT.	IN.	DEPTH OF EACH STRATUM FT.	IN.	FORMATION FOUND AT EACH STRATUM	TOTAL LENGTH OF ALL SCREENS and CASINGS FT.	IN.	LENGTH OF EACH SEC. OF SCREEN OR CASING FT.	IN.	SPECIFY SCREEN OR CASING	SIZE OF SCREEN OR CASING IN.	GAUGE OF SCREEN
[illegible]		10		Coarse gravel [illegible]	75		75		Casing	1°	
[illegible]		10		[illegible]	(35' to)						
1[illegible]		20		Gravel	190		120		Casing	1[illegible]	
[illegible]		25		Coarse [illegible] chalk	210		30		Screen	12	
[illegible]		7		[illegible] sand	2[illegible]5		75		Casing	12	
[illegible]		[illegible]		[illegible] sand, chalk, gravel - hard	305		20		Screen	12	
[illegible]		[illegible]		Sand [illegible] chalk							
[illegible]		[illegible]		Clay & chalk, hard							
[illegible]		15		Coarse sand & gravel, [illegible] [illegible], Hard [illegible]							
110		12		[illegible] white sand, soft							
1[illegible]		19		Coarse white sand, very soft							
1[illegible]		5		[illegible], brown [illegible] white sand, soft							
1[illegible]		12		Coarse yellow sand							
1[illegible]		10		Coarse [illegible] fine white sand, soft							
1[illegible]		6		Soft coarse white sand							
1[illegible]		4		Hard							
1[illegible]5		15		Chalk & gravel							
[illegible]		2[illegible]		Soft coarse white sand							
[illegible]		[illegible]		Med. coarse white sand							
24[illegible]		10		Med. & hard white sand							
247		6		Chalk & coarse sand							
262		15		Chalk & sand							
267		5		Med. fine sand & chalk							
272		15		Med. coarse sand							
283		11		Coarse white sand							
[illegible]		10		Med. coarse white sand							
308		15		Coarse sand [illegible] chalk							
318		10		Coarse white sand, soft							
[illegible]		5		Coarse sand & gravel							
338		10		Fine sand							
344		6		Clay & chalk							
352		[illegible]		Coarse sand & gravel							
35[illegible]		7		Chalk							
365		7		Chalk, clay & coarse sand							
375		10		Hard clay - bottom of hole							

WELL DATA:

Preliminary Test

Date Tested 19 Static Level 30

Production GPM Pumping Level

Permanent Test

Date Tested 19 Static Level

Production GPM Active St. Level

Drawdown Pumping Level

Remarks:

PUMP DATA:

Shop No. [illegible] Type Lubr.

Type Head Size Suction

Depth Setting (BP to MB)

Size Column Length Suction

Type Bowl Length Air Line

No. Stages Discharge-

Cap'y and Head Pressure

MOTOR DATA:

Horsepower Voltage

RPM Phase

Type Cycles

Make Frame No.

WELL DATA	INSTALLATION Robins AFB, Georgia	WELL NO. #3

ELEVATION (Ft)	LOCATION Bldg # 191	DATE CONSTR ENDED 10 October 1942

WELL

TYPE Drilled Well (Underreamed Gravel - Packed W[illegible])		
DEPTH 298 ft.	DIAMETER 8 in.	PUMPSETTING DEPTH 80 ft.
ORIG STATIC WATER LEVEL 30 ft.	DRAWDOWN	RECOVERY TIME

TEST DATA		AIR LINES AND GAGES			SPECIFIC CAPACITY (Gal per ft)
Well capacity 1300 GPM	Pumping level	X Yes	No	Length	GPM / DRAWDOWN =

WELL PUMPING EQUIPMENT

PUMP

TYPE AND MAKE Vertical Turbine Layne Pump No. 38749						CAPACITY 1300 GPM
SUCTION (Ft) 10 ft. 8 in.	SIZE AND LENGTH		COLUMN 8 in.			
HEAD: Above grnd	Below grnd	Total	NUMBER BOWLS 5 Stage	SIZE AND TYPE 12" RKHC		NO. STAGES 5

MOTOR

SERIAL NO. 95128	TYPE	MAKE U. S. Motors	HP 100	RPM 1800	FRAME 712R	PHASE 3	CYCLES 60	VOLTAGE 220/440
STANDBY POWER NO		MAKE						SIZE
HP	RPM	DESCRIPTION						

CASING AND WELL SCREENING MATERIAL USED	SETTING DEPTH	LENGTH EACH
75' of 18" pit casing cemented in place.		
Top of original 12" screen line at 60'		
Top of 8" screen line at 101'		
8" stainless steel screen set at 190' - 210' and 276' - 296'		
80' of 8" X 1 11/16" X 2½" column		
5 Stage 12" RKHC Bowls		
10' of 8" Suction		

#4

NORFOLK, VA.

LOG OF WELL For [illegible] (Well [illegible] 4)

Located at [illegible] **in** (near [illegible]) **County, State** [illegible]

Date Drilling Started ______ 19___ **Date Started** ______ 19___

Finished Drilling ______ 19___ **Finished** May ______ 19 [illegible]

FORMATIONS AND DEPTH OF WELL | **DIMENSIONS OF CASING AND SCREEN**

TOTAL DEPTH OF ALL STRATA FT.	IN.	DEPTH OF EACH STRATUM FT.	IN.	FORMATION FOUND AT EACH STRATUM	TOTAL LENGTH OF ALL SCREENS and CASINGS FT.	IN.	LENGTH OF EACH SEC. OF SCREEN OR CASING FT.	IN.	SPECIFY SCREEN OR CASING	SIZE OF SCREEN OR CASING IN.	GAUGE OF SCREEN
10		10		Top soil							
[illegible]		10		[illegible] clay [illegible] gravel							
[illegible]		[illegible]		[illegible]ed clay [illegible] coarse sand, [illegible] hard, little white chalk							
[illegible]		5		[illegible]te chalk, clay, slow drilling							
[illegible]		10		[illegible]nd & clay slow drilling							
[illegible]		10		Coarse sand, fast drilling							
[illegible]		30		Coarse sand & clay, med. drilling							
115		[illegible]		[illegible] sand [illegible] soft drilling							
[illegible]		10		Blue clay, slow drilling							
[illegible]		50		Blue & white chalk, clay, medium drilling							
[illegible]		40		[illegible]nd, fast drilling							
[illegible]		10		[illegible]hite clay, cut hard							
[illegible]		28		Fine white sand, cut fast & rough, good water							
[illegible]		10		Coarse sand, soft drilling							
[illegible]		31		Coarse white sand, soft drilling							

WELL DATA:

Preliminary Test

Date Tested 19 Static Level

Production GPM Pumping Level

Permanent Test

Date Tested [illegible] 19 [illegible] Static Level [illegible]

Production [illegible] GPM Active St. Level

Drawdown Pumping Level

Remarks:

PUMP DATA:

Shop No.

Type Head Type Lubr.

Depth Setting Size Suction (BP to MB)

Size Column

Type Bowl Length Suction

No. Stages Length Air Line

Cap'y and Head Discharge-Pressure

MOTOR DATA:

Horsepower Voltage

RPM Phase

Type Cycles

Make Frame No.

[illegible] of Well For

Located at Robins Field in Houston County, State Georgia

Date Drilling Started April 25 1956 Date Started April 19 1956

Finished Drilling May 9 1956 Finished May 24 1956

(E-4)

FORMATIONS AND DEPTH OF WELL

Total Depth of All Strata FT.	IN.	Depth of Each Stratum FT.	IN.	Formation Found at Each Stratum
1		1		Top Soil
19		18		Red Clay and Sand
33		14		Sand & Gravel
45		12		Fine Sand
56		11		Kaolin
65		9		Fine Sand & Clay
105		40		Coarse Sand Soft
111		6		Cavity-no returns
131		20		Coarse Sand, Soft
140		9		Coarse Sand & Clay
152		12		Find Sand & Clay
165		13		Fine Sand with Clay
186		21		Blue & Chalky Clay, Soft
204		18		Chalky Clay, Med. Drilling
231		27		Med. Coarse Sand
236		5		Chalky Clay. Slow Drilling
248		12		Coarse Sand, Soft
260		12		Coarse Sand, very little clay
340		80		Coarse sand with thin streaks of Kaolin
369		29		Coarse Sand, Soft
375		6		Coarse Sand with a little clay
392		17		Sand & Clay, med. drilling
402		10		Coarse Sand, soft.
460		58		Coarse White Sand with streaks of Kaolin.

DIMENSIONS OF CASING AND SCREEN

Total Length of All Screens and Casings FT.	IN.	Length of Each Sec. of Screen or Casing FT.	IN.	Specify Screen or Casing	Size of Screen or Casing IN.	Gauge of Screen
52		52		Casing	20	Cemented in place
Top of screen line is at surface						
195		195		Casing	12	
220		25		Casing	10	
230		10		Screen	10	
300		70		Casing	10	
310		10		Screen	10	
330		20		Casing	10	
350		20		Screen	10	
360		10		Casing	10	
370		10		Screen	10	
385		10		Casing	10	

Bottom of Finished well is at 385' with steel plate welded across screen line.

WELL DATA:

Preliminary Test

Date Tested 19 Static Level

Production GPM Pumping Level

Permanent Test

Date Tested 19 Static Level

Production 982 GPM Active St. Level 39'

Drawdown 48' Pumping Level 87'

Remarks: Ran pumping test 12 hours, installed pump from old well #4.

PUMP DATA:

Shop No. 11860 Type Lubr. Oil

Type Head TP 825 Size Suction 8"

Depth Setting 100' (BP to MB)

Size Column 8"X2½" X 1½" Length Suction 20'

Type Bowl 12" BMLC Length Air Line 100'

No. Stages 5 Discharge-

Cap'y and Head Pressure

MOTOR DATA:

Horsepower 60 Voltage 220/440

RPM 1800 Phase 3

Type Cycles 60

Make U. S. Electrical Frame No. 950

No. 4

LAYNE ATLANTIC COMPANY

NORFOLK, VA.

LOG OF WELL For Robins Field (well #4)

Located at Wellston (Near Macon, Georgia) County, State Georgia

Date Drilling Started May 26 19 43 Date Started May 19 1943

Finished Drilling June 25 19 [illegible] Finished July 2 19 43

FORMATIONS AND DEPTH OF WELL					DIMENSIONS OF CASING AND SCREEN						
TOTAL DEPTH OF ALL STRATA FT.	IN.	DEPTH OF EACH STRATUM FT.	IN.	FORMATION FOUND AT EACH STRATUM	TOTAL LENGTH OF ALL SCREENS and CASINGS FT.	IN.	LENGTH OF EACH SEC. OF SCREEN OR CASING FT.	IN.	SPECIFY SCREEN OR CASING	SIZE OF SCREEN OR CASING IN.	GAUGE OF SCREEN
10		10		Top Soil	80		80		Casing	18	Cemented in Place
20		10		Red clay & gravel							
25		5		Red clay & coarse sand. Cu hard. Little white chalk	Top of 12" Screen Line at surface (?)						
30		5		White chalk, clay, slow drilling	200		200		Casing	12	
40		10		Sand & clay slow drilling	210		10		Screen	12	
70		30		Coarse sand, fast drilling	260		50		Casing	12	
90		20		Coarse sand & clay, med. drilling	270		10		Screen	12	
115		25		Coarse sand & soft drilling	290		20		Casing	12	
125		10		Blue clay, slow drilling	300		10		Screen	12	
175		50		Blue & white chalk, clay med. drilling	360		60		Casing	12	
214		39		Sand, fast drilling	370		10		Screen 1	12	
234		20		White clay, cut hard							
262		28		Fine white sand, cut fast & rough used water							
272		10		Coarse sand, soft drilling	Bottom of Completed well at [illegible]'						
[illegible]		[illegible]		Coarse white sand, soft drilling							
[illegible]		[illegible]		[illegible]							
355		32		Coarse white sand, soft drilling							
380		25		Coarse white sand, small lumps of white clay. Soft & Rough drilling							
430		50		Coarse white sand with little small lumps white clay.							

Old Well #4, has been discontinued, done away with. And new well drilled

WELL DATA:

Preliminary Test

Date Tested 19 Static Level

Production GPM Pumping Level

Permanent Test

Date Tested 7/23 1943 Static Level 32' (?)

Production 775 GPM Active St. Level 32' (?)

Drawdown 47 Pumping Level 79'

Remarks: Ran test 13 hours, Installed new pump bowl assembly June 6, 1951.

PUMP DATA:

Shop No. 11860 Type Lubr. Oil

Type Head [illegible] Size Suction 8"

Depth Setting 140' (BP to MB)

Size Column 8" x [illegible] Length Suction 10'

Type Bowl 12" [illegible] Length Air Line

No. Stages 5 Discharge-

Cap'y and Head Pressure

MOTOR DATA:

Horsepower 60 Voltage 220/440

RPM 1750 Phase 3

Type [illegible] Cycles 60

Make [illegible] Frame No. [illegible]

WELL DATA	INSTALLATION Robins AFB, Georgia	WELL NO #4

ELEVATION (FT)	LOCATION Bldg # 648	DATE CONSTRUCTED 24 May 1956

WELL

TYPE		
Drilled Well (Underreamed Gravel - Packed well)		
DEPTH 385 ft.	DIAMETER 8 in.	PUMPSETTING DEPTH 100ft.
ORIG STATIC WATER LEVEL 39 ft.	DRAWDOWN	RECOVERY TIME

TEST DATA		AIR LINES AND GAGES					SPECIFIC CAPACITY (Gal per ft)
Well capacity 900 GPM	Pumping level	X	Yes		No	Length	GPM / DRAWDOWN =

WELL PUMPING EQUIPMENT

PUMP

TYPE AND MAKE						CAPACITY
Vertical Turbine Layne Pump No. 11860						900 GPM
SUCTION (FT) 28 ft. 8 in.	SIZE AND LENGTH		COLUMN 8 in.			
HEAD			NUMBER BOWLS	SIZE AND TYPE	NO STAGES	
Above grad	Below grad	Total	5 Stage	12" RKLC	5	

MOTOR

SERIAL NO.	TYPE	MAKE	HP	RPM	FRAME	PHASE	CYCLES	VOLTAGE

STANDBY POWER	MAKE	SIZE
NO		

HP	RPM	DESCRIPTION

CASING AND WELL SCREENING MATERIAL USED	SETTING DEPTH	LENGTH EACH
52' of 20" pit casing cemented in place.		
Top of 12 X 10" screen line at ground surface.		
12" pipe to 195'		
10" pipe from 195' to 220'		
10" stainless steel screen line - 220' to 230'		
300' to 310'		
330' to 350'		
360' to 370'		
NOTE: Attempted to reline old well #4 in February 1956, but		
was unable to do so.		
PUMP: Layne No. 11860		
100' of 8" X 1½" X 2½" Column		
5 Stage 12" RKLC Bowls		
28' of 8" Suction		

AF FORM 996, AUG 58

AFLC RAFB GA AUG 66 - 000

Contract No. ... 09(603)-50148
Building 311

Job No. 10997/ 7A-1
No. 5

LAYNE ATLANTIC COMPANY
Albany, Georgia

LOG OF WELL For Robins Air Force Base - Well No. 5 (Relocated 1963)
Located Robins AFB in Houston County, State Georgia
Date Drilling Started July 25 1963 Date Started 19
Finished Drilling Oct. 25 1963 Finished 19

FORMATIONS AND DEPTH OF WELL					DIMENSIONS OF CASING AND SCREEN							
TOTAL DEPTH OF ALL STRATA		DEPTH OF EACH STRATUM		FORMATION FOUND AT EACH STRATUM	TOTAL LENGTH OF ALL SCREENS and CASINGS		LENGTH OF EACH SEC. OF SCREEN OR CASING		SPECIFY SCREEN OR CASING	SIZE OF SCREEN OR CASING	GAUGE OF SCREEN	
FT.	IN.	FT.	IN.		FT.	IN.	FT.	IN.		In.		
1		1		Top soil	90		90		casing	20	Pit	Casing
12		11		Sand Clay	Cemented in 26" Hole							
25		14		Coarse Sand	Screen line starts at ground							
38		13		Clay and Sand	surface.							
50		12		Sandy Clay	253		253		casing	12		
78		28		Coarse White Sand	263		10		screen	12	#7 gauge SS	
93		15		Clay, little Sand	310		47		Casing	12		
123		30		Coarse Sand	325		5		Screen	12	#7 gauge SS	
129		6		Clay	350		25		casing	12		
160		31		Coarse Sand	365		15		screen	12	#7 gauge SS	
185		25		Coarse Sand with stks. of yellow clay	370		5		Casing	12		
					380		10		screen	12	#7 gauge SS	
216		31		Coarse Sand	390		10		casing	12		
226		10		Coarse Sand, stks. of white clay	Bottom of screen line orange peeled weld.							
236		10		Clay								
338		102		Coarse Sand and little white clay.	Total 40' Layne Stainless Steel Shutter Screen #7 gauge.							
430		92		Coarse Sand and some white clay								

Changed existing Johnson Gear Drive Model 39100 Serial No. 7723 from 1½:1 to 1:1

New Continental Engine Speed 1800 RPM, Type R3572.

WELL DATA:

Preliminary Test

Date Tested [illegible] 19 Static Level [illegible]
Production [illegible] GPM Pumping Level [illegible]

Permanent Test

Date Tested 8/28 1963 Static Level 45'
Production 1220 GPM Active St. Level 45'
Drawdown 20' Pumping Level 65'
Remarks: Test pumped well 12 hrs. Installed existing pump and electric motor with new auxiliary engine.

PUMP DATA:

Shop No. 12868A Type Lubr. Oil
Type Head TF825 Size Suction 10"
Depth Setting 120 (BP to MB)
Size Column 10x1½x2½ Length Suction 30'
Type Bowl 12" BKMC Length Air Line 121'
No. Stages 5 Discharge-
Cap'y and Head Pressure

MOTOR DATA:

Horsepower 100 Voltage 440
RPM 1800 Phase 3
Type CFU Cycles 60
Make US Frame No. 952

Contract No. DA 09(603)-50148
Building 511

Job No. 10997

BA-1

LAYNE ATLANTIC COMPANY

Albany, Georgia

LOG OF WELL For Robins Air Force Base - Well No. 5 (Relocated 1963)

Located Robins AFB in Houston County, State Georgia

Date Drilling Started July 25 19 63 Date Started 19

Finished Drilling Oct. 25 19 63 Finished 19

FORMATIONS AND DEPTH OF WELL					DIMENSIONS OF CASING AND SCREEN						
TOTAL DEPTH OF ALL STRATA		DEPTH OF EACH STRATUM		FORMATION FOUND AT EACH STRATUM	TOTAL LENGTH OF ALL SCREENS and CASINGS		LENGTH OF EACH SEC. OF SCREEN OR CASING		SPECIFY SCREEN OR CASING	SIZE OF SCREEN OR CASING	GAUGE OF SCREEN
FT.	IN.	FT.	IN.		FT.	IN.	FT.	IN.		IN.	
1		1		Top soil	90		90		Casing	20	Pit Casing
12		11		Sand Clay			Cemented in 26" Hole				
25		14		Coarse Sand			Screen line starts at ground				
38		13		Clay and Sand					surface.		
50		12		Sandy Clay	253		253		Casing	12	
78		28		Coarse White Sand	263		10		Screen	12	#7 gauge SS
93		15		Clay, little Sand	310		47		Casing	12	
123		30		Coarse Sand	325		5		Screen	12	#7 gauge SS
129		6		Clay	350		25		Casing	12	
160		31		Coarse Sand	365		15		Screen	12	#7 gauge SS
185		25		Coarse Sand with stks. of yellow clay	370		5		Casing	12	
					380		10		Screen	12	#7 gauge SS
216		31		Coarse Sand	390		10		Casing	12	
226		10		Coarse Sand, stks. of white clay			Bottom of screen line swage				
							peened weld.				
236		10		Clay							
338		102		Coarse Sand and little white clay.			Total 40' Layne Stainless Steel				
							Shutter Screen #7 gauge.				
430		92		Coarse Sand and some white clay							

Changed existing Johnson Gear Drive Model 39100 Serial No. 7723 from 1½1 to 1¼1

New Continental Engine Speed 1800 RPM, Type RD572.

WELL DATA:

Preliminary Test

Date Tested 4/28/63 19 Static Level 45'

Production 1220 GPM Pumping Level 65'

Permanent Test

Date Tested 8/28 19 63 Static Level 45'

Production 1220 GPM Active St. Level 45'

Drawdown 20' Pumping Level 65'

Remarks: Test pumped well 12 hrs. Installed existing pump and electric motor with new auxiliary engine.

PUMP DATA:

Shop No. 12868A Type Lubr. Oil

Type Head TF825 Size Suction 10"

Depth Setting 130 (BP to MB)

Size Column 10x1½x2½ Length Suction 30'

Type Bowl 12" RKMC Length Air Line 121'

No. Stages 5 Discharge-

Cap'y and Head Pressure

MOTOR DATA:

Horsepower 100 Voltage 440

RPM 1800 Phase 3

Type CFU Cycles 60

Make US Frame No. 952

LAYNE ATLANTIC COMPANY
NORFOLK, VA.

15

LOG OF WELL For [illegible] (Well [illegible] 5)

Located at [illegible] **in** ([illegible]) **County, State** Georgia

Date Drilling Started ______ 19___ **Date Started** ______ 19__

Finished Drilling ______ 19___ **Finished** June ______ 19__

FORMATIONS AND DEPTH OF WELL

TOTAL DEPTH OF ALL STRATA FT.	IN.	DEPTH OF EACH STRATUM FT.	IN.	FORMATION FOUND AT EACH STRATUM
25		25		[illegible] sandy clay
[illegible]		5		[illegible]hite clay
[illegible]		10		[illegible]ough sand [illegible] clay
[illegible]		30		Coarse sand
[illegible]		20		Coarse sandy clay
115		2[illegible]		Coarse sand, soft
[illegible]		60		Blue [illegible] white clay
[illegible]		49		Soft sand
[illegible]		10		Hard white clay
[illegible]		28		Fine white sand
[illegible]		93		Coarse white sand

DIMENSIONS OF CASING AND SCREEN

TOTAL LENGTH OF ALL SCREENS and CASINGS FT.	IN.	LENGTH OF EACH SEC. OF SCREEN OR CASING FT.	IN.	SPECIFY SCREEN OR CASING	SIZE OF SCREEN OR CASING IN.	GAUGE OF SCREEN
80		80		Casing	18	
200		140		Casing	12"	
210		10		Screen	12	7
260		50		Casing	12	
270		10		Screen	12	
290		20		Casing	12	
300		10		Screen	12	
360		60		Casing	12	
370		10		Screen	12	

[illegible]

WELL DATA:

Preliminary Test

Date Tested 6/19 1950 **Static Level** 33

Production 700 **GPM** **Pumping Level**

Permanent Test

Date Tested 19 **Static Level**

Production **GPM** **Active St. Level**

Drawdown **Pumping Level**

Remarks:

PUMP DATA:

Shop No. [illegible] **Type Lubr.**

Type Head **Size Suction**

Depth Setting **(BP to MB)**

Size Column **Length Suction**

Type Bowl **Length Air Line**

No. Stages **Discharge-**

Cap'y and Head **Pressure**

WELL DATA	INSTALLATION Robins AFB, Georgia	WELL NO. #5

ELEVATION (Ft)	LOCATION Bldg # 511	DATE CONSTR ENDED 25 October 1963

WELL

TYPE Drilled Well (Underreamed Gravel - Packed Well)		
DEPTH 390 ft.	DIAMETER 10 in.	PUMPSETTING DEPTH 130 ft.
ORIG STATIC WATER LEVEL 45 ft.	DRAWDOWN 20 ft.	RECOVERY TIME

TEST DATA		AIR LINES AND GAGES					SPECIFIC CAPACITY (Gal per ft)
Well capacity 1050	Pumping level 65 ft.	X	Yes		No	Length 121 ft.	GPM / DRAWDOWN =

WELL PUMPING EQUIPMENT

PUMP

TYPE AND MAKE Vertical Turbine Layne Pump No. 12868A				CAPACITY 1050
SUCTION (Ft) 30 ft.	SIZE AND LENGTH	COLUMN 10 in.		
HEAD: Above grad	Below grad	Total	NUMBER BOWLS 5 Stage	SIZE AND TYPE 12" RKMC
NO. STAGES 5				

MOTOR

SERIAL NO.	TYPE	MAKE	HP	RPM	FRAME	PHASE	CYCLES	VOLTAGE
328387	CPU	U.S. Motors	100	1800	982-A	3	60	220/440

STANDBY POWER		MAKE	SIZE
Yes		Continental Red Seal	
HP 154	RPM 1800	DESCRIPTION Model - 39100	

CASING AND WELL SCREENING MATERIAL USED	SETTING DEPTH	LENGTH EACH
90' of 20" pit casing cemented in place.		
Screen line starts at ground surface.		
Total 40' Layne stainless steel shutter.		
Screen #7 gauge		
NOTE: This well was drilled to replace the old #5 well.		
PUMP: 130' of 10 X 1½" X 2½" Column		
5 Stage 12" RKMC Bowls		
30' of 10" Suction		
NOTE: Changed existing Johnson Gear Drive		
Model 39100 Serial No. 7723 from 1½:1 to 1:1		
New Continental Engine installed.		

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WELL DATA	INSTALLATION Robins AFB, Georgia	WELL NO. #6

ELEVATION (Ft)	LOCATION Bldg # 1688	DATE CONSTR ENDED 29 July 1943

WELL

TYPE		
Drilled Well (Underreamed Gravel - Packed Well)		
DEPTH 311 ft.	DIAMETER 8 in.	PUMPSETTING DEPTH 100 ft.
ORIG STATIC WATER LEVEL 45 ft.	DRAWDOWN	RECOVERY TIME

TEST DATA		AIR LINES AND GAGES				SPECIFIC CAPACITY (Gal per ft)
Well capacity 1500 GPM	Pumping level		Yes	X	No	Length	GPM / DRAWDOWN =

WELL PUMPING EQUIPMENT

PUMP

TYPE AND MAKE				CAPACITY
Vertical Turbine Layne Pump No. 49616				1500 GPM
SUCTION (Ft) 30 ft.	SIZE AND LENGTH 8 in.	COLUMN 8 in.		
HEAD: Above grad	Below grad	Total	NUMBER BOWLS	SIZE AND TYPE	NO. STAGES

MOTOR

SERIAL NO.	TYPE	MAKE	HP	RPM	FRAME	PHASE	CYCLES	VOLTAGE
RJJ221005	K	G. E.	150	1775	6542	3	60	220/440

STANDBY POWER	MAKE	SIZE
Yes	Waukesha	

HP	RPM	DESCRIPTION
145	1750	Model Nr. 145-GK

CASING AND WELL SCREENING MATERIAL USED	SETTING DEPTH	LENGTH EACH
80' of 18" pit casing submitted in place.		
Top of 12" screen line at 53'		
12" screen set as follows: 151' - 161'		
221' - 231'		
251' - 261'		
301' - 311'		
PUMP:		
100' of 8" Column		
100' of 2½" tubing		
100' stainless steel shaft		
30' of 8" Suction		
A new concrete foundation for pump under work completed		
8 June 1964.		

LAYNE ATLANTIC COMPANY

NORFOLK, VA.

#6

LOG OF WELL For Robbins Field (Well # 6)

Located at Wellston **in** (near Macon, Ga.) **County, State** Georgia

Date Drilling Started June 21, 1943 **Date Started** 19

Finished Drilling 19 **Finished** July 29, 1943

FORMATIONS AND DEPTH OF WELL					DIMENSIONS OF CASING AND SCREEN						
TOTAL DEPTH OF ALL STRATA FT.	IN.	DEPTH OF EACH STRATUM FT.	IN.	FORMATION FOUND AT EACH STRATUM	TOTAL LENGTH OF ALL SCREENS and CASINGS FT.	IN.	LENGTH OF EACH SEC. OF SCREEN OR CASING FT.	IN.	SPECIFY SCREEN OR CASING	SIZE OF SCREEN OR CASING IN.	GAUGE OF SCREEN
8		8		Red clay, cut slow	80		80		Casing	18	
36		28		Brown sand, fast drilling	151		98		Casing	12	
40		4		White chalk clay	161		10		Screen	12	#7
60		20		Fine white sand, med. drilling	221		60		Casing	12	
					231		10		Screen	12	#7
100		40		Coarse white sand, medium drilling	251		20		Casing	12	
					261		10		Screen	12	#7
157		57		Coarse white sand, medium drilling (lumps of white clay)	301		40		Casing	12	
					311		10		Screen	12	#7
199		42		Coarse white sand, medium drilling							
230		31		Fine white sand, cut soft							
240		10		Sand & chalk clay, medium drilling							
300		60		Coarse white sand, medium drilling							
315		15		Fine white sand, medium drilling							
367		52		Sandy clay, slow drilling							

Preliminary Test

Date Tested 8/21 1943 **Static Level** 45

Production ~~750~~ 1500 **GPM** **Pumping Level** 58.5

Drawdown 12.5

Permanent Test

Date Tested 19 **Static Level**

Production **GPM** **Active St. Level**

Drawdown **Pumping Level**

Remarks:

PUMP DATA:

Shop No. 12869 **Type Lubr.**

Type Head **Size Suction**

Depth Setting 115' (BP to MB)

Size Column **Length Suction**

Type Bowl **Length Air Line**

No. Stages **Discharge-**

Cap'y and Head **Pressure**

MOTOR DATA:

Horsepower **Voltage**

RPM **Phase**

Type **Cycles**

Make **Frame No.**

LAYNE ATLANTIC COMPANY

NORFOLK, VA.

#7

LOG OF WELL For Robins Air Force Base - Capehart Offsite Utilities

Located at Robins Field in Houston County, State Georgia

Date Drilling Started Sept. 17 19 58 Date Started Sept. 8 19 58

Finished Drilling Oct. 9 19 58 Finished Dec. 18 19 58

FORMATIONS AND DEPTH OF WELL

TOTAL DEPTH OF ALL STRATA FT.	IN.	DEPTH OF EACH STRATUM FT.	IN.	FORMATION FOUND AT EACH STRATUM
3		3		Top Soil
15		12		Red Sand
65		50		Sand with thin streaks clay
83		18		Coarse sand
106		20		Coarse sand with clay particles
125		20		Coarse sand
161		36		Yellowish coarse sand.
168		7		Grey clay & some shell rock
19[illegible]		26		White Coarse sand
195		1		Streak of Clay
203		6		Grey Coarse Sand
220		17		Mixture of Clays. Grey & White
230		10		White CoarseSand
24[illegible]		12		Clay with streaks of coarse sand
[illegible]		13		White Coarse sand
258		3		Kaolin
264		6		Soft sand.
266		2		Kaolin
[illegible]		[illegible]		[illegible]
[illegible]		29		Coarse white Sand
325		30		Coarse sand with thin streaks of clay
339		4		Kaolin
355		15		Coarse sand. Soft
385		30		Coarse sand with thin streaks of clay
400		15		Sand with more clay than above.
414		14		Pink clay. Slow Drilling
430		16		Coarse white sand
490		60		Coarse white sand with very thin streaks of kaolin. Soft.

DIMENSIONS OF CASING AND SCREEN

TOTAL LENGTH OF ALL SCREENS and CASINGS FT.	IN.	LENGTH OF EACH SEC. OF SCREEN OR CASING FT.	IN.	SPECIFY SCREEN OR CASING	SIZE OF SCREEN OR CASING IN.	GAUGE OF SCREEN
165		165		Casing	20	Pit [illegible] cemented in place.
Top of screen line is at 140'.						
200		60		casing	12	
266		66		Casing	10	
286		20		Screen	10	#7 S. S.
315		29		Casing	10	
325		10		Screen	10	#7 S. S.
340		15		Casing	10	#
350		10		Screen	10	#7 S. S.
420		70		Casing	10	
430		10		Screen	10	#7 S. S.
440		10		Casing	10	

Bottom of screen line "Orange Peeled".

Bottom of completed well is 440'.

WELL DATA:

Preliminary Test

Date Tested 19 Static Level

Production GPM Pumping Level

Permanent Test

Date Tested Oct.17 1958 Static Level 38

Production 992 GPM Active St. Level 33

Drawdown 24' Pumping Level 62'

Remarks: Ran pumping test 12 hours.

PUMP DATA:

Shop No. 39690 Type Lubr. Oil

Type Head TF318 Size Suction 8"

Depth Setting [illegible]

WELL DATA	INSTALLATION Robins AFB, Georgia	WELL NO #7

ELEVATION (Ft)	LOCATION Bldg # 1004	DATE CONSTR ENDED 18 December 1958

WELL

TYPE		
Drilled Well (Underreamed Gravel - Packed Well)		
DEPTH 440 ft.	DIAMETER 8 in.	PUMPSETTING DEPTH 100 ft.
ORIG STATIC WATER LEVEL 38 ft.	DRAWDOWN 24 ft.	RECOVERY TIME

TEST DATA		AIR LINES AND GAGES			SPECIFIC CAPACITY (Gal per ft)
Well capacity 1100 GPM	Pumping level	X Yes	No	Length	GPM / DRAWDOWN =

WELL PUMPING EQUIPMENT

PUMP

TYPE AND MAKE			CAPACITY
Vertical Turbine Layne Pump No. 39690			1100 GPM
SUCTION (Ft) 10 ft. 8 in.	SIZE AND LENGTH	COLUMN 8 in.	

HEAD			NUMBER BOWLS	SIZE AND TYPE	NO STAGES
Above grnd	Below grnd	Total	5 Stage	12 in. RKMC	5

MOTOR

SERIAL NO.	TYPE	MAKE	HP	RPM	FRAME	PHASE	CYCLES	VOLTAGE
1158727	CFU	U.S. Motors	100	1800	504-P4	3	60	220/440

STANDBY POWER		MAKE	SIZE
No			
HP	RPM	DESCRIPTION	

CASING AND WELL SCREENING MATERIAL USED	SETTING DEPTH	LENGTH EACH
165' of 20" pit casing cemented in place.		
Top of 12" X 10" screen line 140'		
12" pipe 140' to 200'		
10" pipe and screen line below.		
10" stainless steel screen set at: 266'- 286'		
315' - 325'		
340' - 350'		
420' - 430'		
PUMP: Layne No. 39690		
100' of 8" X 1 11/16" X 2½" Column		
5 Stage 12" RKMC Bowls		
10' of 8" Suction		

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LAYNE ATLANTIC COMPANY — #8

NORFOLK, VA.

LOG OF WELL For GAC Paving Y-68

Located at Robins Field in Houston County, State Georgia

Date Drilling Started October 2[illegible] 19[illegible] Date Started Oct. 23 19[illegible]

Finished Drilling November 14 19[illegible] Finished June 18 19[illegible]

FORMATIONS AND DEPTH OF WELL

TOTAL DEPTH OF ALL STRATA FT.	IN.	DEPTH OF EACH STRATUM FT.	IN.	FORMATION FOUND AT EACH STRATUM
7		7		Clay
28		21		Soft sand
36		12		Coarse sand & clay
76		40		Sand. Soft
81		5		Clay. Slow
104		23		Coarse sand with thin streaks of Kaolin
115		11		Clay with sand. Slow
178		63		Coarse sand with very thin streaks of clay. Drilled fast.
186		8		Coarse sand with clay. Soft
207		19		Coarse sand with a little clay.
217		10		Coarse sand & clay. Medium
241		24		Coarse sand. Soft.
252		11		Kaolin. Slow drilling.
265		13		Kaolin with thin streaks sand.
286		21		Kaolin with heavy sand.
[illegible]		[illegible]		[illegible]
[illegible]		[illegible]		Coarse reddish sand with streaks of clay. Medium Soft.
330		4		Kaolin. Slow drilling.
342		12		Kaolin with coarse sand. Soft.
356		9		Yellow sandy clay. Slow.
360		2		Coarse sand. Soft.
367		2		Clay. Slow drilling
377		10		Coarse sand soft.
398		21		Clay. Slow drilling
407		9		Coarse sand with streaks of clay
411		4		Pink clay. Slow
421		10		Mixture of clays with thin streaks of sand. Medium.
431		10		Red clay. Slow drilling
441		10		Red and white clay. Some sand.
474		33		Sandy red and yellow clay.
492		18		Coarse yellow sand. Soft.
495		3		Yellow and white clay.
508		13		Coarse white sand.
511		3		Kaolin - Slow drilling.
522		11		Coarse white sand.

DIMENSIONS OF CASING AND SCREEN

TOTAL LENGTH OF ALL SCREENS and CASINGS FT.	IN.	LENGTH OF EACH SEC. OF SCREEN OR CASING FT.	IN.	SPECIFY SCREEN OR CASING	SIZE OF SCREEN OR CASING IN.	GAUGE OF SCREEN
82		82		Casing	20	Pit Casing cemented in place.
12" Screen line is at ground surface.						
170		170		Casing	12	
180		10		Screen	12	#7
278		98		Casing	12	
288		10		Screen	12	#7
295		7		Casing	12	
315		20		Screen	12	#7
375		60		Casing	12	
385		10		Screen	12	#7
400		15		Casing	12	

Bottom of screen line orange peeled.

Completed well depth 400'.

WELL DATA:

Preliminary Test

Date Tested 19 Static Level

Production GPM Pumping Level

Permanent Test

Date Tested Dec. 2 19[illegible] Static Level 9'

Production 1016-1500 GPM Active St. Level 9'

Drawdown 20'-[illegible]' Pumping Level 39' - 39'

Remarks: Ran test 17 hours. Pumped 1500 gpm last 6 hours. Installed Johnson Combination Gear Drive and Fairbanks Morse Diesel 400-[illegible] Engine as Standby.

PUMP DATA:

Shop No. 39623 Type Lubr. Oil

Type Head [illegible] Size Suction 8"

Depth Setting 80' (BP to MB)

Size Column [illegible] Length Suction 10'

Type Bowl 12" [illegible] Length Air Line 80'

No. Stages 5 Discharge-

Cap'y and Head [illegible] Pressure

MOTOR DATA:

Horsepower 75 Voltage 440

RPM 1800 Phase 3

Type CPU Cycles 60

Make U. S. Electrical Frame No. 4[illegible]

#8

WELL DATA	INSTALLATION	
ELEVATION (FT)	LOCATION Bldg # 61	DATE COMPLETED

	TYPE		
WELL	Drilled Well (Underreamed Gravel - Packed Well)		
	DEPTH 400 ft.	DIAMETER 8 in.	PUMPSETTING DEPTH 80 ft.
	ORIG STATIC WATER LEVEL 9 ft.	DRAWDOWN	RECOVERY TEST

TEST DATA		AIR LINES AND GAGES			SPECIFIC CAPACITY
Well capacity 900 GPM	Pumping level	X Yes	No	Length	GPM / DRAWDOWN =

WELL PUMPING EQUIPMENT

PUMP	TYPE AND MAKE: Vertical Turbine Layne Pump No. 39623			CAPACITY 900 GPM
	SUCTION (Ft) 10 ft. 8"	SIZE AND LENGTH	COLUMN 8 in.	
	HEAD: Above grad / Below grad / Total	NUMBER BOWLS 5 Stage	SIZE AND TYPE 12" RKMC	NO STAGES 5

	SERIAL NO.	TYPE	MAKE	HP	RPM	FRAME	PHASE	CYCLES	VOLTAGE
MOTOR	1089523	CFU	U.S. Motors	75	1800	445P	3	60	220/440

	STANDBY POWER		MAKE	SIZE
MOTOR	Yes		Fairbanks - Morse, Diesel	
	HP 90	RPM 1800	DESCRIPTION Model Nr. 49B-4½-18S	

CASING AND WELL SCREENING MATERIAL USED	SETTING DEPTH	LENGTH EACH
82' of 20" pit casing cemented in place.		
Top of 12" screen line at ground surface.		
12" stainless steel screen set at: 170' - 180'		
278' - 288'		
295' - 315'		
375' - 385'		
PUMP: Layne No. 39623		
80' of 8" X 1½" X 2½" Column		
5 Stage 12" RKMC Bowls		
10' of 8" Suction		

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APPENDIX G

HAZARD EVALUATION METHODOLOGY

APPENDIX G

USAF INSTALLATION RESTORATION PROGRAM
HAZARD ASSESSMENT RATING METHODOLOGY

BACKGROUND

The Department of Defense (DOD) has established a comprehensive program to identify, evaluate, and control problems associated with past disposal practices at DOD facilities. One of the actions required under this program is to:

> "develop and maintain a priority listing of contaminated installations and facilities for remedial action based on potential hazard to public health, welfare, and environmental impacts." (Reference: DEQPPM 81-5, 11 December 1981).

Accordingly, the United States Air Force (USAF) has sought to establish a system to set priorities for taking further actions at sites based upon information gathered during the Records Search phase of its Installation Restoration Program (IRP).

The first site rating model was developed in June 1981 at a meeting with representatives from USAF Occupational Environmental Health Laboratory (OEHL), Air Force Engineering Services Center (AFESC), Engineering-Science (ES) and CH_2M Hill. The basis for this model was a system developed for EPA by JRB Associates of McLean, Virginia. The JRB model was modified to meet Air Force needs.

After using this model for 6 months at over 20 Air Force installations, certain inadequacies became apparent. Therefore, on January 26 and 27, 1982, representatives of USAF OEHL, AFESC, various major commands, Engineering Science, and CH_2M Hill met to address the inadequacies. The result of the meeting was a new site rating model designed to present a better picture of the hazards posed by sites at Air Force installations. The new rating model described in this presentation is referred to as the Hazard Assessment Rating Methodology.

PURPOSE

The purpose of the site rating model is to provide a relative ranking of sites of suspected contamination from hazardous substances. This model will assist the Air Force in setting priorities for follow-on site investigations and confirmation work under Phase II of IRP.

This rating system is used only after it has been determined that (1) potential for contamination exists (hazardous wastes present in sufficient quantity), and (2) potential for migration exists. A site can be deleted from consideration for rating on either basis.

DESCRIPTION OF MODEL

Like the other hazardous waste site ranking models, the U.S. Air Force's site rating model uses a scoring system to rank sites for priority attention. However, in developing this model, the designers incorporated some special features to meet specific DOD program needs.

The model uses data readily obtained during the Record Search portion (Phase I) of the IRP. Scoring judgments and computations are easily made. In assessing the hazards at a given site, the model develops a score based on the most likely routes of contamination and the worst hazards at the site. Sites are given low scores only if there are clearly no hazards at the site. This approach meshes well with the policy for evaluating and setting restrictions on excess DOD properties.

As with the previous model, this model considers four aspects of the hazard posed by a specific site: the possible receptors of the contamination, the waste and its characteristics, potential pathways for waste contaminant migration, and any efforts to contain the contaminants. Each of these categories contains a number of rating factors that are used in the overall hazard rating.

The receptors category rating is calculated by scoring each factor, multiplying by a factor weighting constant and adding the weighted scores to obtain a total category score.

The pathways category rating is based on evidence of contaminant migration or an evaluation of the highest potential (worst case) for contaminant migration along one of three pathways. If evidence of contaminant migration exists, the category is given a subscore of 80 to 100 points. For indirect evidence, 80 points are assigned and for direct evidence 100 points are assigned. If no evidence is found, the highest score among three possible routes is used. These routes are surface water migration, flooding, and ground-water migration. Evaluation of each route involves factors associated with the particular migration route. The three pathways are evaluated and the highest score among all four of the potential scores is used.

The waste characteristics category is scored in three steps. First, a point rating is assigned based on an assessment of the waste quantity and the hazard (worst case) associated with the site. The level of confidence in the information is also factored into the assessment. Next, the score is multiplied by a waste persistence factor, which acts to reduce the score if the waste is not very persistent. Finally, the score is further modified by the physical state of the waste. Liquid wastes receive the maximum score, while scores for sludges and solids are reduced.

The scores for each of the three categories are then added together and normalized to a maximum possible score of 100. Then the waste management practice category is scored. Sites at which there is no containment are not reduced in score. Scores for sites with limited containment can be reduced by 5 percent. If a site is contained and well managed, its score can be reduced by 90 percent. The final site score is calculated by applying the waste managment practices category factor to the sum of the scores for the other three categories.

FIGURE 1

HAZARDOUS ASSESSMENT RATING METHODOLOGY FLOW CHART

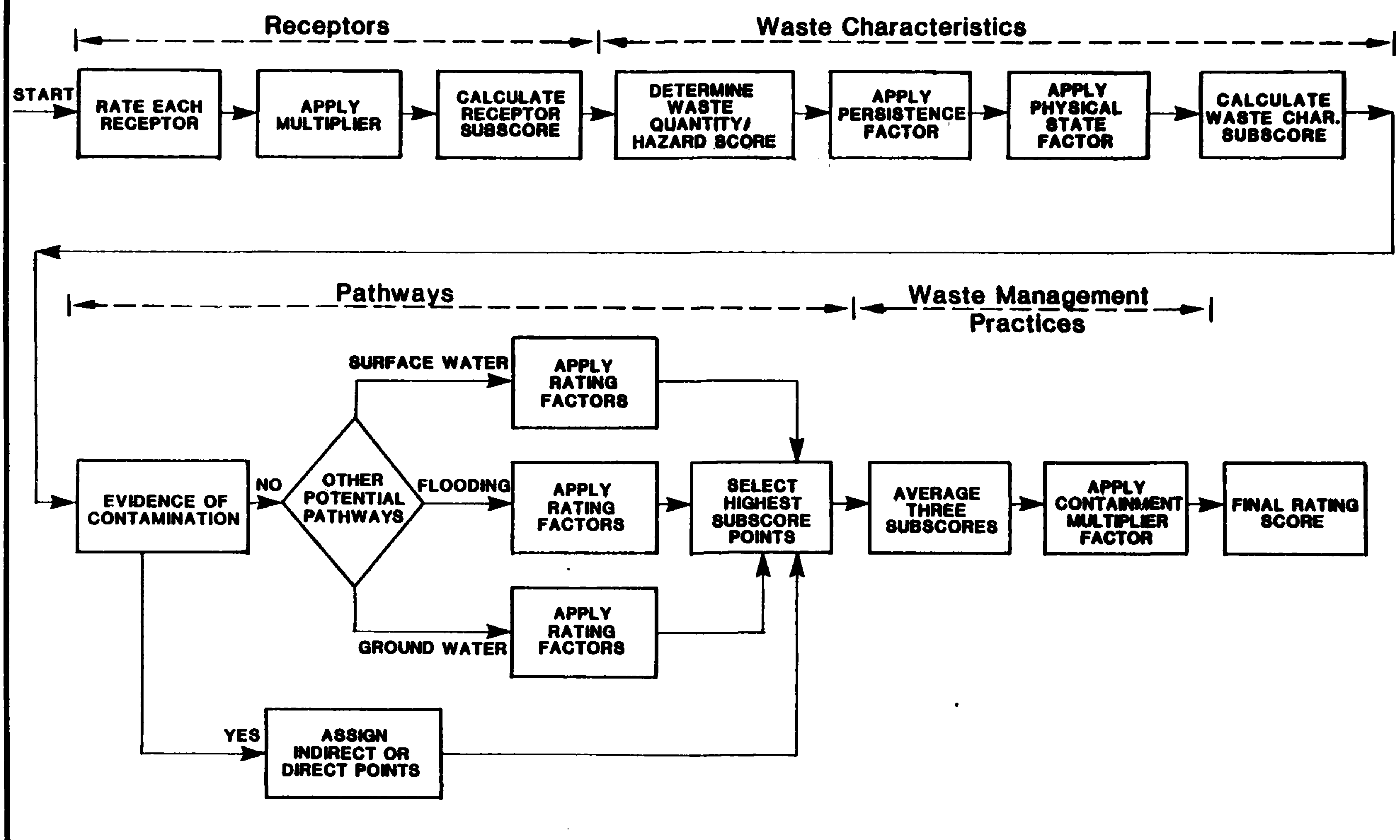

FIGURE 2

HAZARDOUS ASSESSMENT RATING FORM

NAME OF SITE ______________________________

LOCATION ______________________________

DATE OF OPERATION OR OCCURRENCE ______________________________

OWNER/OPERATOR ______________________________

COMMENTS/DESCRIPTION ______________________________

SITE RATED BY ______________________________

I. RECEPTORS

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
A. Population within 1,000 feet of site		4		
B. Distance to nearest well		10		
C. Land use/zoning within 1 mile radius		3		
D. Distance to reservation boundary		6		
E. Critical environments within 1 mile radius of site		10		
F. Water quality of nearest surface water body		6		
G. Ground water use of uppermost aquifer		9		
H. Population served by surface water supply within 3 miles downstream of site		6		
I. Population served by ground-water supply within 3 miles of site		6		
		Subtotals	____	____

Receptors subscore (100 X factor score subtotal/maximum score subtotal) ____

II. WASTE CHARACTERISTICS

A. Select the factor score based on the estimated quantity, the degree of hazard, and the confidence level of the information.

1. Waste quantity (S = small, M = medium, L = large) ____
2. Confidence level (C = confirmed, S = suspected) ____
3. Hazard rating (H = high, M = medium, L = low) ____

Factor Subscore A (from 20 to 100 based on factor score matrix) ____

B. Apply persistence factor
Factor Subscore A X Persistence Factor = Subscore B

____ X ____ = ____

C. Apply physical state multiplier

Subscore B X Physical State Multiplier = Waste Characteristics Subscore

____ X ____ = ____

III. PATHWAYS

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score

A. If there is evidence of migration of hazardous contaminants, assign maximum factor subscore of 100 points for direct evidence or 80 points for indirect evidence. If direct evidence exists then proceed to C. If no evidence or indirect evidence exists, proceed to B.

Subscore ______

B. Rate the migration potential for 3 potential pathways: surface water migration, flooding, and ground-water migration. Select the highest rating, and proceed to C.

1. Surface water migration

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
Distance to nearest surface water		8		
Net precipitation		6		
Surface erosion		8		
Surface permeability		6		
Rainfall intensity		8		
Subtotals			______	______

Subscore (100 X factor score subtotal/maximum score subtotal) ______

2. Flooding

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
Flooding		1		

Subscore (100 x factor score/3) ______

3. Ground-water migration

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
Depth to ground water		8		
Net precipitation		6		
Soil permeability		8		
Subsurface flows		8		
Direct access to ground water		8		
Subtotals			______	______

Subscore (100 x factor score subtotal/maximum score subtotal) ______

C. Highest pathway subscore.

Enter the highest subscore value from A, B-1, B-2 or B-3 above.

Pathways Subscore ______

IV. WASTE MANAGEMENT PRACTICES

A. Average the three subscores for receptors, waste characteristics, and pathways.

Receptors ______
Waste Characteristics ______
Pathways ______

Total ______ divided by 3 = ______
Gross Total Score

B. Apply factor for waste containment from waste management practices

Gross Total Score X Waste Management Practices Factor = Final Score

______ X ______ = [ ]

TABLE 1

HAZARDOUS ASSESSMENT RATING METHODOLOGY GUIDELINES

I. RECEPTORS CATEGORY

Rating Factors	Rating Scale Levels 0	1	2	3	Multiplier
A. Population within 1,000 feet (includes on-base facilities)	0	1 - 25	26 - 100	Greater than 100	4
B. Distance to nearest water well	Greater than 3 miles	1 to 3 miles	3,001 feet to 1 mile	0 to 3,000 feet	10
C. Land Use/Zoning (within 1 mile radius)	Completely remote (zoning not applicable)	Agricultural	Commercial or industrial	Residential	6
D. Distance to installation boundary	Greater than 2 miles	1 to 2 miles	1,001 feet to 1 mile	0 to 1,000 feet	3
E. Critical environments (within 1 mile radius)	Not a critical environment	Natural areas	Pristine natural areas; minor wetlands; preserved areas; presence of economically important natural resources susceptible to contamination.	Major habitat of an endangered or threatened species; presence of recharge area; major wetlands.	10
F. Water quality/use designation of nearest surface water body	Agricultural or industrial use.	Recreation, propagation and management of fish and wildlife.	Shellfish propagation and harvesting.	Potable water supplies	6
G. Ground-Water use of uppermost aquifer	Not used, other sources readily available.	Commercial, industrial, or irrigation, very limited other water sources.	Drinking water, municipal water available.	Drinking water, no municipal water available; commercial, industrial, or irrigation, no other water source available.	9
H. Population served by surface water supplies within 3 miles downstream of site	0	1 - 50	51 - 1,000	Greater than 1,000	6
I. Population served by aquifer supplies within 3 miles of site	0	1 - 50	51 - 1,000	Greater than 1, 000	6

TABLE 1 (Continued)

HAZARDOUS ASSESSMENT RATING METHODOLOGY GUIDELINES (Cont'd)

II. WASTE CHARACTERISTICS

A-1 Hazardous Waste Quantity

S = Small quantity (<5 tons or 20 drums of liquid)
M = Moderate quantity (5 to 20 tons or 21 to 85 drums of liquid)
L = Large quantity (>20 tons or 85 drums of liquid)

A-2 Confidence Level of Information

C = Confirmed confidence level (minimum criteria below)

- o Verbal reports from interviewer (at least 2) or written information from the records.
- o Knowledge of types and quantities of wastes generated by shops and other areas on base.
- o Based on the above, a determination of the types and quantities of waste disposed of at the site.

S = Suspected confidence level

- o No verbal reports or conflicting verbal reports and no written information from the records.
- o Logic based on a knowledge of the types and quantities of hazardous wastes generated at the base, and a history of past waste disposal practices indicate that these wastes were disposed of at a site.

A-3 Hazard Rating

Hazard Category	Rating Scale Levels 0	1	2	3
Toxicity	Sax's Level 0	Sax's Level 1	Sax's Level 2	Sax's Level 3
Ignitability	Flash point greater than 200°F	Flash point at 140°F to 200°F	Flash point at 80°F to 140°F	Flash point less than 80°F
Radioactivity	At or below background levels	1 to 3 times background levels	3 to 5 times background levels	Over 5 times background levels

Use the highest individual rating based on toxicity, ignitability and radioactivity and determine the hazard rating.

Hazard Rating	Points
High (H)	3
Medium (M)	2
Low (L)	1

TABLE 1 (Continued)

HAZARDOUS ASSESSMENT RATING METHODOLOGY GUIDELINES (Cont'd)

II. WASTE CHARACTERISTICS (Continued)

Waste Characteristics Matrix

Point Rating	Hazardous Waste Quantity	Confidence Level of Information	Hazard Rating
100	L	C	H
80	L	C	M
	M	C	H
70	L	S	H
60	S	C	H
	M	C	M
50	L	S	M
	L	C	L
	M	S	H
	S	C	M
40	S	S	H
	M	S	M
	M	C	L
	L	S	L
30	S	C	L
	M	S	L
	S	S	M
20	S	S	L

Notes:
For a site with more than one hazardous waste, the waste quantities may be added using the following rules:
Confidence Level
- o Confirmed confidence levels (C) can be added
- o Suspected confidence levels (S) can be added
- o Confirmed confidence levels cannot be added with suspected confidence levels

Waste Hazard Rating
- o Wastes with the same hazard rating can be added
- o Wastes with different hazard ratings can only be added in a downgrade mode, e.g., MCM + SCH = LCM if the total quantity is greater than 20 tons.

Example: Several wastes may be present at a site, each having an MCM designation (60 points). By adding the quantities of each waste, the designation may change to LCM (80 points). In this case, the correct point rating for the waste is 80.

B. Persistence Multiplier for Point Rating

Persistence Criteria	Multiply Point Rating From Part A by the Following
Metals, polycyclic compounds, and halogenated hydrocarbons	1.0
Substituted and other ring compounds	0.9
Straight chain hydrocarbons	0.8
Easily biodegradable compounds	0.4

C. Physical State Multiplier

Physical State	Multiply Point Total From Parts A and B by the Following
Liquid	1.0
Sludge	0.75
Solid	0.50

TABLE 1 (Continued)

HAZARDOUS ASSESSMENT RATING METHODOLOGY GUIDELINES (Cont'd)

III. PATHWAYS CATEGORY

A. Evidence of Contamination

Direct evidence is obtained from laboratory analyses of hazardous contaminants present above natural background levels in surface water, ground water, or air. *Evidence should confirm that the source of contamination is the site being evaluated.*

Indirect evidence might be from visual observation (i.e., leachate), vegetation stress, sludge deposits, presence of taste and odors in drinking water, or reported discharges that cannot be directly confirmed as resulting from the site, but the site is greatly suspected of being a source of contamination.

B-1 POTENTIAL FOR SURFACE WATER CONTAMINATION

Rating Factor	Rating Scale Levels 0	1	2	3	Multiplier
Distance to nearest surface water (includes drainage ditches and storm sewers)	Greater than 1 mile	2,001 feet to 1 mile	501 feet to 2,000 feet	0 to 500 feet	8
Net precipitation	Less than -10 in.	-10 to + 5 in.	+5 to +20 in.	Greater than +20 in.	6
Surface erosion	None	Slight	Moderate	Severe	8
Surface permeability	0% to 15% clay ($>10^{-2}$ cm/sec)	15% to 30% clay (10^{-2} to 10^{-4} cm/sec)	30% to 50% clay (10^{-4} to 10^{-6} cm/sec)	Greater than 50% clay ($<10^{-6}$ cm/sec)	6
Rainfall intensity based on 1 year 24-hr rainfall	<1.0 inch	1.0-2.0 inches	2.1-3.0 inches	>3.0 inches	8
B-2 POTENTIAL FOR FLOODING					
Floodplain	Beyond 100-year floodplain	In 25-year floodplain	In 10-year floodplain	Floods annually	1
B-3 POTENTIAL FOR GROUND-WATER CONTAMINATION					
Depth to ground water	Greater than 500 ft	50 to 500 feet	11 to 50 feet	0 to 10 feet	8
Net precipitation	Less than -10 in.	-10 to +5 in.	+5 to +20 in.	Greater than +20 in.	6
Soil permeability	Greater than 50% clay ($>10^{-6}$ cm/sec)	30% to 50% clay (10^{-4} to 10^{-6} cm/sec)	15% to 30% clay (10^{-2} to 10^{-4} cm/sec)	0% to 15% clay ($<10^{-2}$ cm/sec)	8
Subsurface flows	Bottom of site greater than 5 feet above high ground-water level	Bottom of site occasionally submerged	Bottom of site frequently submerged	Bottom of site located below mean ground-water level	8
Direct access to ground water (through faults, fractures, faulty well casings, subsidence fissures, etc.)	No evidence of risk	Low risk	Moderate risk	High risk	8

TABLE 1 (Continued)

HAZARDOUS ASSESSMENT RATING METHODOLOGY GUIDELINES (Cont'd)

IV. WASTE MANAGEMENT PRACTICES CATEGORY

A. *This category adjusts the total risk as determined from the receptors, pathways, and waste characteristics categories for* waste management practices and engineering controls designed to reduce this risk. The total risk is determined by first averaging the receptors, pathways, and waste characteristics subscores.

B. WASTE MANAGEMENT PRACTICES FACTOR

The following multipliers are then applied to the total risk points (from A):

Waste Management Practice	Multiplier
No containment	1.0
Limited containment	0.95
Fully contained and in full compliance	0.10

Guidelines for fully contained:

Landfills:

- o Clay cap or other impermeable cover
- o Leachate collection system
- o Liners in good condition
- o Adequate monitoring wells

Spills:

- o Quick spill cleanup action taken
- o Contaminated soil removed
- o Soil and/or water samples confirm total cleanup of the spill

Surface Impoundments:

- o Liners in good condition
- o Sound dikes and adequate freeboard
- o Adequate monitoring wells

Fire Proection Training Areas:

- o Concrete surface and berms
- o Oil/water separator for pretreatment of runoff
- o Effluent from oil/water separator to treatment plant

General Note: If data are not available or known to be complete the factor ratings under items I-A through I, III-B-1 or III-B-3, then leave blank for calculation of factor score and maximum possible score.

APPENDIX H

SITE RATING FORMS

SITE RATING FORMS

TABLE OF CONTENTS

HAZARDOUS ASSESSMENT RATING FORM

NAME OF SITE Sludge Lagoon

LOCATION North of and Adjacent to Landfill No. 4

DATE OF OPERATION OR OCCURRENCE 1962 to 1978

OWNER/OPERATOR Robins AFB

COMMENTS/DESCRIPTION

SITE RATED BY [signature]

I. RECEPTORS

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
A. Population within 1,000 feet of site	2	4	8	12
B. Distance to nearest well	3	10	30	30
C. Land use/zoning within 1 mile radius	2	3	6	9
D. Distance to reservation boundary	2	6	12	18
E. Critical environments within 1 mile radius of site	2	10	20	30
F. Water quality of nearest surface water body	0	6	0	18
G. Ground water use of uppermost aquifer	1	9	9	27
H. Population served by surface water supply within 3 miles downstream of site	0	6	0	18
I. Population served by ground-water supply within 3 miles of site	3	6	18	18
Subtotals			103	180

Receptors subscore (100 X factor score subtotal/maximum score subtotal) 57

II. WASTE CHARACTERISTICS

A. Select the factor score based on the estimated quantity, the degree of hazard, and the confidence level of the information.

1. Waste quantity (S = small, M = medium, L = large) L
2. Confidence level (C = confirmed, S = suspected) C
3. Hazard rating (H = high, M = medium, L = low) H

Factor Subscore A (from 20 to 100 based on factor score matrix) 100

B. Apply persistence factor
Factor Subscore A X Persistence Factor = Subscore B

100 x 1.0 = 100

C. Apply physical state multiplier

Subscore B X Physical State Multiplier = Waste Characteristics Subscore

100 x 0.75 = 75

III. PATHWAYS

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score

A. If there is evidence of migration of hazardous contaminants, assign maximum factor subscore of 100 points for direct evidence or 80 points for indirect evidence. If direct evidence exists then proceed to C. If no evidence or indirect evidence exists, proceed to B.

Subscore 100

B. Rate the migration potential for 3 potential pathways: surface water migration, flooding, and ground-water migration. Select the highest rating, and proceed to C.

1. Surface water migration

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
Distance to nearest surface water		8		
Net precipitation		6		
Surface erosion		8		
Surface permeability		6		
Rainfall intensity		8		
		Subtotals		

Subscore (100 X factor score subtotal/maximum score subtotal) N/A

2. Flooding

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
Flooding		1		

Subscore (100 x factor score/3) N/A

3. Ground-water migration

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
Depth to ground water		8		
Net precipitation		6		
Soil permeability		8		
Subsurface flows		8		
Direct access to ground water		8		
		Subtotals		N/A

Subscore (100 x factor score subtotal/maximum score subtotal) ______

C. Highest pathway subscore.

Enter the highest subscore value from A, B-1, B-2 or B-3 above.

Pathways Subscore 100

IV. WASTE MANAGEMENT PRACTICES

A. Average the three subscores for receptors, waste characteristics, and pathways.

Receptors	57
Waste Characteristics	75
Pathways	100

Total 232 divided by 3 = 77 Gross Total Score

B. Apply factor for waste containment from waste management practices

Gross Total Score X Waste Management Practices Factor = Final Score

77 x 1.0 = 77

HAZARDOUS ASSESSMENT RATING FORM

NAME OF SITE Landfill No. 4

LOCATION Southeast of Industrial Waste Treatment Plant No. 1

DATE OF OPERATION OR OCCURRENCE 1965 to 1978

OWNER/OPERATOR Robins AFB

COMMENTS/DESCRIPTION

SITE RATED BY [illegible]

I. RECEPTORS

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
A. Population within 1,000 feet of site	3	4	12	12
B. Distance to nearest well	3	10	30	30
C. Land use/zoning within 1 mile radius	2	3	6	9
D. Distance to reservation boundary	2	6	12	18
E. Critical environments within 1 mile radius of site	2	10	20	30
F. Water quality of nearest surface water body	0	6	0	18
G. Ground water use of uppermost aquifer	1	9	9	27
H. Population served by surface water supply within 3 miles downstream of site	0	6	0	18
I. Population served by ground-water supply within 3 miles of site	3	6	18	18
		Subtotals	107	180

Receptors subscore (100 X factor score subtotal/maximum score subtotal) 59

II. WASTE CHARACTERISTICS

A. Select the factor score based on the estimated quantity, the degree of hazard, and the confidence level of the information.

1. Waste quantity (S = small, M = medium, L = large) M
2. Confidence level (C = confirmed, S = suspected) C
3. Hazard rating (H = high, M = medium, L = low) H

Factor Subscore A (from 20 to 100 based on factor score matrix) 80

B. Apply persistence factor
Factor Subscore A X Persistence Factor = Subscore B

80 x 1 = 80

C. Apply physical state multiplier

Subscore B X Physical State Multiplier = Waste Characteristics Subscore

80 x 0.75 = 60

III. PATHWAYS

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score

A. If there is evidence of migration of hazardous contaminants, assign maximum factor subscore of 100 points for direct evidence or 80 points for indirect evidence. If direct evidence exists then proceed to C. If no evidence or indirect evidence exists, proceed to B.

Subscore 100

B. Rate the migration potential for 3 potential pathways: surface water migration, flooding, and ground-water migration. Select the highest rating, and proceed to C.

1. Surface water migration

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
Distance to nearest surface water		8		
Net precipitation		6		
Surface erosion		8		
Surface permeability		6		
Rainfall intensity		8		
		Subtotals		N/A

Subscore (100 X factor score subtotal/maximum score subtotal) ____

2. Flooding

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
Flooding		1		

Subscore (100 x factor score/3) N/A

3. Ground-water migration

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
Depth to ground water		8		
Net precipitation		6		
Soil permeability		8		
Subsurface flows		8		
Direct access to ground water		8		
		Subtotals		

Subscore (100 x factor score subtotal/maximum score subtotal) N/A

C. Highest pathway subscore.

Enter the highest subscore value from A, B-1, B-2 or B-3 above.

Pathways Subscore 100

IV. WASTE MANAGEMENT PRACTICES

A. Average the three subscores for receptors, waste characteristics, and pathways.

Receptors	59
Waste Characteristics	60
Pathways	100

Total 219 divided by 3 = 73 Gross Total Score

B. Apply factor for waste containment from waste management practices

Gross Total Score X Waste Management Practices Factor = Final Score

73 x 1.0 = 73

HAZARDOUS ASSESSMENT RATING FORM

NAME OF SITE DDT Spill at Pesticide Storage Area

LOCATION Asphalt Pad Adjacent to Building 295

DATE OF OPERATION OR OCCURRENCE 1979

OWNER/OPERATOR Robins AFB

COMMENTS/DESCRIPTION DDT solution spilled over a gravel lot

SITE RATED BY E J Schroeder

I. RECEPTORS

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
A. Population within 1,000 feet of site	3	4	12	12
B. Distance to nearest well	3	10	30	30
C. Land use/zoning within 1 mile radius	2	3	6	9
D. Distance to reservation boundary	3	6	18	18
E. Critical environments within 1 mile radius of site	0	10	0	30
F. Water quality of nearest surface water body	0	6	0	18
G. Ground water use of uppermost aquifer	1	9	9	27
H. Population served by surface water supply within 3 miles downstream of site	0	6	0	18
I. Population served by ground-water supply within 3 miles of site	3	6	18	18
		Subtotals	93	180

Receptors subscore (100 X factor score subtotal/maximum score subtotal) 51

II. WASTE CHARACTERISTICS

A. Select the factor score based on the estimated quantity, the degree of hazard, and the confidence level of the information.

1. Waste quantity (S = small, M = medium, L = large) S
2. Confidence level (C = confirmed, S = suspected) C
3. Hazard rating (H = high, M = medium, L = low) H

Factor Subscore A (from 20 to 100 based on factor score matrix) 60

B. Apply persistence factor
Factor Subscore A X Persistence Factor = Subscore B

60 x 1.0 = 60

C. Apply physical state multiplier

Subscore B X Physical State Multiplier = Waste Characteristics Subscore

60 x 1.0 = 60

III. PATHWAYS

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score

A. If there is evidence of migration of hazardous contaminants, assign maximum factor subscore of 100 points for direct evidence or 80 points for indirect evidence. If direct evidence exists then proceed to C. If no evidence or indirect evidence exists, proceed to B.

Subscore 100

B. Rate the migration potential for 3 potential pathways: surface water migration, flooding, and ground-water migration. Select the highest rating, and proceed to C.

1. Surface water migration

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
Distance to nearest surface water		8		
Net precipitation		6		
Surface erosion		8		
Surface permeability		6		
Rainfall intensity		8		
		Subtotals		

Subscore (100 X factor score subtotal/maximum score subtotal) ______

2. Flooding

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
Flooding		1		

Subscore (100 x factor score/3) ______

3. Ground-water migration

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
Depth to ground water		8		
Net precipitation		6		
Soil permeability		8		
Subsurface flows		8		
Direct access to ground water		8		
		Subtotals		

Subscore (100 x factor score subtotal/maximum score subtotal) ______

C. Highest pathway subscore.

Enter the highest subscore value from A, B-1, B-2 or B-3 above.

Pathways Subscore 100

IV. WASTE MANAGEMENT PRACTICES

A. Average the three subscores for receptors, waste characteristics, and pathways.

Receptors	51
Waste Characteristics	60
Pathways	100
Total 211 divided by 3 =	70
	Gross Total Score

B. Apply factor for waste containment from waste management practices

Gross Total Score X Waste Management Practices Factor = Final Score

70 x 1.0 = 70

HAZARDOUS ASSESSMENT RATING FORM

NAME OF SITE Fire Protection Training Area No. 2

LOCATION Near Northwest Corner of Luna Lake

DATE OF OPERATION OR OCCURRENCE Mid-1950's to mid-1960's

OWNER/OPERATOR Robins AFB

COMMENTS/DESCRIPTION May have been several pit areas between Luna & Scout Lakes

SITE RATED BY E. J. Schneider

I. RECEPTORS

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
A. Population within 1,000 feet of site	1	4	4	12
B. Distance to nearest well	3	10	30	30
C. Land use/zoning within 1 mile radius	1	3	3	9
D. Distance to reservation boundary	2	6	12	18
E. Critical environments within 1 mile radius of site	0	10	0	30
F. Water quality of nearest surface water body	1	6	6	18
G. Ground water use of uppermost aquifer	1	9	9	27
H. Population served by surface water supply within 3 miles downstream of site	0	6	0	18
I. Population served by ground-water supply within 3 miles of site	3	6	18	18
		Subtotals	82	180

Receptors subscore (100 X factor score subtotal/maximum score subtotal) 46

II. WASTE CHARACTERISTICS

A. Select the factor score based on the estimated quantity, the degree of hazard, and the confidence level of the information.

1. Waste quantity (S = small, M = medium, L = large) L
2. Confidence level (C = confirmed, S = suspected) C
3. Hazard rating (H = high, M = medium, L = low) H

Factor Subscore A (from 20 to 100 based on factor score matrix) 100

B. Apply persistence factor
Factor Subscore A X Persistence Factor = Subscore B

100 x 0.9 = 90

C. Apply physical state multiplier

Subscore B X Physical State Multiplier = Waste Characteristics Subscore

90 x 1.0 = 90

III. PATHWAYS

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score

A. If there is evidence of migration of hazardous contaminants, assign maximum factor subscore of 100 points for direct evidence or 80 points for indirect evidence. If direct evidence exists then proceed to C. If no evidence or indirect evidence exists, proceed to B.

Subscore N/A

B. Rate the migration potential for 3 potential pathways: surface water migration, flooding, and ground-water migration. Select the highest rating, and proceed to C.

1. Surface water migration

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
Distance to nearest surface water	3	8	24	24
Net precipitation	1	6	6	18
Surface erosion	0	8	0	24
Surface permeability	1	6	6	18
Rainfall intensity	3	8	24	24
		Subtotals	60	108

Subscore (100 X factor score subtotal/maximum score subtotal) 55

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
2. Flooding	0	1	0	3

Subscore (100 x factor score/3) 0

3. Ground-water migration

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
Depth to ground water	2	8	16	24
Net precipitation	1	6	6	18
Soil permeability	2	8	16	24
Subsurface flows	1	8	8	24
Direct access to ground water	0	8	0	24
		Subtotals	46	114

Subscore (100 x factor score subtotal/maximum score subtotal) 40

C. Highest pathway subscore.

Enter the highest subscore value from A, B-1, B-2 or B-3 above.

Pathways Subscore 55

IV. WASTE MANAGEMENT PRACTICES

A. Average the three subscores for receptors, waste characteristics, and pathways.

Receptors	46
Waste Characteristics	90
Pathways	55

Total 191 divided by 3 = 64 Gross Total Score

B. Apply factor for waste containment from waste management practices

Gross Total Score X Waste Management Practices Factor = Final Score

64 x 1.0 = 64

HAZARDOUS ASSESSMENT RATING FORM

NAME OF SITE Landfill No. 1

LOCATION East of Second Street near Fuel Storage Tanks

DATE OF OPERATION OR OCCURRENCE 1946-1951

OWNER/OPERATOR Robins AFB

COMMENTS/DESCRIPTION Site was previously filled with sandy loam

SITE RATED BY E J Schroeder

I. RECEPTORS

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
A. Population within 1,000 feet of site	2	4	8	12
B. Distance to nearest well	3	10	30	30
C. Land use/zoning within 1 mile radius	2	3	6	9
D. Distance to reservation boundary	2	6	12	18
E. Critical environments within 1 mile radius of site	0	10	0	30
F. Water quality of nearest surface water body	0	6	0	18
G. Ground water use of uppermost aquifer	1	9	9	27
H. Population served by surface water supply within 3 miles downstream of site	0	6	0	18
I. Population served by ground-water supply within 3 miles of site	3	6	18	18
		Subtotals	83	180

Receptors subscore (100 X factor score subtotal/maximum score subtotal) 46

II. WASTE CHARACTERISTICS

A. Select the factor score based on the estimated quantity, the degree of hazard, and the confidence level of the information.

1. Waste quantity (S = small, M = medium, L = large) M
2. Confidence level (C = confirmed, S = suspected) S
3. Hazard rating (H = high, M = medium, L = low) H

Factor Subscore A (from 20 to 100 based on factor score matrix) 50

B. Apply persistence factor
Factor Subscore A X Persistence Factor = Subscore B

50 x 1.0 = 50

C. Apply physical state multiplier

Subscore B X Physical State Multiplier = Waste Characteristics Subscore

50 x 1.0 = 50

III. PATHWAYS

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score

A. If there is evidence of migration of hazardous contaminants, assign maximum factor subscore of 100 points for direct evidence or 80 points for indirect evidence. If direct evidence exists then proceed to C. If no evidence or indirect evidence exists, proceed to B.

Subscore 80

B. Rate the migration potential for 3 potential pathways: surface water migration, flooding, and ground-water migration. Select the highest rating, and proceed to C.

1. Surface water migration

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
Distance to nearest surface water	1	8	8	24
Net precipitation	1	6	6	18
Surface erosion	1	8	8	24
Surface permeability	1	6	6	18
Rainfall intensity	3	8	24	24
		Subtotals	52	108

Subscore (100 X factor score subtotal/maximum score subtotal) 48

2. Flooding

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
Flooding	0	1	0	3

Subscore (100 x factor score/3) 0

3. Ground-water migration

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
Depth to ground water	2	8	16	24
Net precipitation	1	6	6	18
Soil permeability	2	8	16	24
Subsurface flows	1	8	8	24
Direct access to ground water	0	8	0	24
		Subtotals	46	114

Subscore (100 x factor score subtotal/maximum score subtotal) 40

C. Highest pathway subscore.

Enter the highest subscore value from A, B-1, B-2 or B-3 above.

Pathways Subscore 80

IV. WASTE MANAGEMENT PRACTICES

A. Average the three subscores for receptors, waste characteristics, and pathways.

Receptors	46
Waste Characteristics	50
Pathways	80

Total 176 divided by 3 = 59 Gross Total Score

B. Apply factor for waste containment from waste management practices

Gross Total Score X Waste Management Practices Factor = Final Score

59 x 1.0 = 59

HAZARDOUS ASSESSMENT RATING FORM

NAME OF SITE Landfill No. 2

LOCATION North of Second Street near Main Runway

DATE OF OPERATION OR OCCURRENCE 1951 to 1963

OWNER/OPERATOR Robins AFB

COMMENTS/DESCRIPTION Site was previously filled with sandy loam.

SITE RATED BY E J Schroeder

I. RECEPTORS

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
A. Population within 1,000 feet of site	0	4	0	12
B. Distance to nearest well	3	10	30	30
C. Land use/zoning within 1 mile radius	2	3	6	9
D. Distance to reservation boundary	2	6	12	18
E. Critical environments within 1 mile radius of site	0	10	0	30
F. Water quality of nearest surface water body	0	6	0	18
G. Ground water use of uppermost aquifer	1	9	9	27
H. Population served by surface water supply within 3 miles downstream of site	0	6	0	18
I. Population served by ground-water supply within 3 miles of site	3	6	18	18
		Subtotals	75	180

Receptors subscore (100 X factor score subtotal/maximum score subtotal) 42

II. WASTE CHARACTERISTICS

A. Select the factor score based on the estimated quantity, the degree of hazard, and the confidence level of the information.

1. Waste quantity (S = small, M = medium, L = large) L
2. Confidence level (C = confirmed, S = suspected) S
3. Hazard rating (H = high, M = medium, L = low) H

Factor Subscore A (from 20 to 100 based on factor score matrix) 70

B. Apply persistence factor
Factor Subscore A X Persistence Factor = Subscore B

70 x 1.0 = 70

C. Apply physical state multiplier

Subscore B X Physical State Multiplier = Waste Characteristics Subscore

70 x 0.75 = 52.5

III. PATHWAYS

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score

A. If there is evidence of migration of hazardous contaminants, assign maximum factor subscore of 100 points for direct evidence or 80 points for indirect evidence. If direct evidence exists then proceed to C. If no evidence or indirect evidence exists, proceed to B.

Subscore 80

B. Rate the migration potential for 3 potential pathways: surface water migration, flooding, and ground-water migration. Select the highest rating, and proceed to C.

1. Surface water migration

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
Distance to nearest surface water	3	8	24	24
Net precipitation	1	6	6	18
Surface erosion	1	8	8	24
Surface permeability	1	6	6	18
Rainfall intensity	3	8	24	24
		Subtotals	68	108

Subscore (100 X factor score subtotal/maximum score subtotal) 63

2. Flooding

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
Flooding	0	1	0	3

Subscore (100 x factor score/3) 0

3. Ground-water migration

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
Depth to ground water	2	8	16	24
Net precipitation	1	6	6	18
Soil permeability	2	8	16	24
Subsurface flows	2	8	16	24
Direct access to ground water	0	8	0	24
		Subtotals	54	114

Subscore (100 x factor score subtotal/maximum score subtotal) 47

C. Highest pathway subscore.

Enter the highest subscore value from A, B-1, B-2 or B-3 above.

Pathways Subscore 80

IV. WASTE MANAGEMENT PRACTICES

A. Average the three subscores for receptors, waste characteristics, and pathways.

Receptors	42
Waste Characteristics	52.5
Pathways	80

Total 174.5 divided by 3 = 58 Gross Total Score

B. Apply factor for waste containment from waste management practices

Gross Total Score X Waste Management Practices Factor = Final Score

58 x 1.0 = 58

HAZARDOUS ASSESSMENT RATING FORM

NAME OF SITE JP-4 Spill

LOCATION POL Bulk Storage Area

DATE OF OPERATION OR OCCURRENCE 1965

OWNER/OPERATOR Robins AFB

COMMENTS/DESCRIPTION Leak in four-inch diameter JP-4 supply line

SITE RATED BY E / Schroeder

I. RECEPTORS

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
A. Population within 1,000 feet of site	2	4	8	12
B. Distance to nearest well	3	10	30	30
C. Land use/zoning within 1 mile radius	2	3	6	9
D. Distance to reservation boundary	2	6	12	18
E. Critical environments within 1 mile radius of site	0	10	0	30
F. Water quality of nearest surface water body	0	6	0	18
G. Ground water use of uppermost aquifer	1	9	9	27
H. Population served by surface water supply within 3 miles downstream of site	0	6	0	18
I. Population served by ground-water supply within 3 miles of site	3	6	18	18
Subtotals			83	180

Receptors subscore (100 X factor score subtotal/maximum score subtotal) 46

II. WASTE CHARACTERISTICS

A. Select the factor score based on the estimated quantity, the degree of hazard, and the confidence level of the information.

1. Waste quantity (S = small, M = medium, L = large) L
2. Confidence level (C = confirmed, S = suspected) S
3. Hazard rating (H = high, M = medium, L = low) M

Factor Subscore A (from 20 to 100 based on factor score matrix) 50

B. Apply persistence factor
Factor Subscore A X Persistence Factor = Subscore B

50 x 0.9 = 45

C. Apply physical state multiplier

Subscore B X Physical State Multiplier = Waste Characteristics Subscore

45 x 1.0 = 45

III. PATHWAYS

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score

A. If there is evidence of migration of hazardous contaminants, assign maximum factor subscore of 100 points for direct evidence or 80 points for indirect evidence. If direct evidence exists then proceed to C. If no evidence or indirect evidence exists, proceed to B.

Subscore 80

B. Rate the migration potential for 3 potential pathways: surface water migration, flooding, and ground-water migration. Select the highest rating, and proceed to C.

1. Surface water migration

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
Distance to nearest surface water	2	8	16	24
Net precipitation	1	6	6	18
Surface erosion	N/A	8	-	-
Surface permeability	1	6	6	18
Rainfall intensity	3	8	24	24
Subtotals			52	84

Subscore (100 X factor score subtotal/maximum score subtotal) 62

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
2. Flooding	0	1	0	3

Subscore (100 x factor score/3) 0

3. Ground-water migration

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
Depth to ground water	2	8	16	24
Net precipitation	1	6	6	18
Soil permeability	2	8	16	24
Subsurface flows	1	8	8	24
Direct access to ground water	0	8	0	24
Subtotals			46	114

Subscore (100 x factor score subtotal/maximum score subtotal) 40

C. Highest pathway subscore.

Enter the highest subscore value from A, B-1, B-2 or B-3 above.

Pathways Subscore 80

IV. WASTE MANAGEMENT PRACTICES

A. Average the three subscores for receptors, waste characteristics, and pathways.

Receptors	46
Waste Characteristics	45
Pathways	80

Total 171 divided by 3 = 57 Gross Total Score

B. Apply factor for waste containment from waste management practices

Gross Total Score X Waste Management Practices Factor = Final Score

57 x 1.0 = 57

HAZARDOUS ASSESSMENT RATING FORM

NAME OF SITE Hazardous Waste Burial Site

LOCATION Near Radioactive (Solid) waste Disposal Site

DATE OF OPERATION OR OCCURRENCE 1976, 1977

OWNER/OPERATOR Robins AFB

COMMENTS/DESCRIPTION

SITE RATED BY [signature]

I. RECEPTORS

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
A. Population within 1,000 feet of site	1	4	4	12
B. Distance to nearest well	3	10	30	30
C. Land use/zoning within 1 mile radius	0	3	0	9
D. Distance to reservation boundary	3	6	18	18
E. Critical environments within 1 mile radius of site	0	10	0	30
F. Water quality of nearest surface water body	0	6	0	18
G. Ground water use of uppermost aquifer	1	9	9	27
H. Population served by surface water supply within 3 miles downstream of site	0	6	0	18
I. Population served by ground-water supply within 3 miles of site	3	6	18	18
Subtotals			79	180

Receptors subscore (100 X factor score subtotal/maximum score subtotal) 44

II. WASTE CHARACTERISTICS

A. Select the factor score based on the estimated quantity, the degree of hazard, and the confidence level of the information.

1. Waste quantity (S = small, M = medium, L = large) M
2. Confidence level (C = confirmed, S = suspected) C
3. Hazard rating (H = high, M = medium, L = low) H

Factor Subscore A (from 20 to 100 based on factor score matrix) 80

B. Apply persistence factor
Factor Subscore A X Persistence Factor = Subscore B

80 x 1.0 = 80

C. Apply physical state multiplier

Subscore B X Physical State Multiplier = Waste Characteristics Subscore

80 x 1.0 = 80

III. PATHWAYS

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score

A. If there is evidence of migration of hazardous contaminants, assign maximum factor subscore of 100 points for direct evidence or 80 points for indirect evidence. If direct evidence exists then proceed to C. If no evidence or indirect evidence exists, proceed to B.

Subscore N/A

B. Rate the migration potential for 3 potential pathways: surface water migration, flooding, and ground-water migration. Select the highest rating, and proceed to C.

1. Surface water migration

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
Distance to nearest surface water	1	8	8	24
Net precipitation	1	6	6	18
Surface erosion	1	8	8	24
Surface permeability	1	6	6	18
Rainfall intensity	3	8	24	24
		Subtotals	52	108

Subscore (100 X factor score subtotal/maximum score subtotal) 48

2. Flooding

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
Flooding	0	1	0	3

Subscore (100 x factor score/3) 0

3. Ground-water migration

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
Depth to ground water	2	8	16	24
Net precipitation	1	6	6	18
Soil permeability	2	8	16	24
Subsurface flows	1	8	8	24
Direct access to ground water	0	8	0	24
		Subtotals	46	114

Subscore (100 x factor score subtotal/maximum score subtotal) 40

C. Highest pathway subscore.

Enter the highest subscore value from A, B-1, B-2 or B-3 above.

Pathways Subscore 48

IV. WASTE MANAGEMENT PRACTICES

A. Average the three subscores for receptors, waste characteristics, and pathways.

Receptors	44
Waste Characteristics	80
Pathways	48

Total 172 divided by 3 = 57 Gross Total Score

B. Apply factor for waste containment from waste management practices

Gross Total Score X Waste Management Practices Factor = Final Score

57 x 0.95 = 54

HAZARDOUS ASSESSMENT RATING FORM

NAME OF SITE Fire Protection Training Area No. 1

LOCATION Second Street near Bulk Fuel Storage Tank

DATE OF OPERATION OR OCCURRENCE 1943 to mid-1950's

OWNER/OPERATOR Robins AFB

COMMENTS/DESCRIPTION Exact location not determined

SITE RATED BY E J Schroeder

I. RECEPTORS

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
A. Population within 1,000 feet of site	1	4	4	12
B. Distance to nearest well	3	10	30	30
C. Land use/zoning within 1 mile radius	2	3	6	9
D. Distance to reservation boundary	2	6	12	18
E. Critical environments within 1 mile radius of site	0	10	0	30
F. Water quality of nearest surface water body	0	6	0	18
G. Ground water use of uppermost aquifer	1	9	9	27
H. Population served by surface water supply within 3 miles downstream of site	0	6	0	18
I. Population served by ground-water supply within 3 miles of site	3	6	18	18
		Subtotals	79	180

Receptors subscore (100 X factor score subtotal/maximum score subtotal) 44

II. WASTE CHARACTERISTICS

A. Select the factor score based on the estimated quantity, the degree of hazard, and the confidence level of the information.

1. Waste quantity (S = small, M = medium, L = large) M
2. Confidence level (C = confirmed, S = suspected) S
3. Hazard rating (H = high, M = medium, L = low) H

Factor Subscore A (from 20 to 100 based on factor score matrix) 50

B. Apply persistence factor
Factor Subscore A X Persistence Factor = Subscore B

50 x 1.0 = 50

C. Apply physical state multiplier

Subscore B X Physical State Multiplier = Waste Characteristics Subscore

50 x 1.0 = 50

III. PATHWAYS

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score

A. If there is evidence of migration of hazardous contaminants, assign maximum factor subscore of 100 points for direct evidence or 80 points for indirect evidence. If direct evidence exists then proceed to C. If no evidence or indirect evidence exists, proceed to B.

Subscore N/A

B. Rate the migration potential for 3 potential pathways: surface water migration, flooding, and ground-water migration. Select the highest rating, and proceed to C.

1. Surface water migration

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
Distance to nearest surface water	2	8	16	24
Net precipitation	1	6	6	18
Surface erosion	N/A	8	-	-
Surface permeability	1	6	6	18
Rainfall intensity	3	8	24	24
Subtotals			52	84

Subscore (100 X factor score subtotal/maximum score subtotal) 62

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
2. Flooding	0	1	0	3

Subscore (100 x factor score/3) 0

3. Ground-water migration

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
Depth to ground water	2	8	16	24
Net precipitation	1	6	6	18
Soil permeability	2	8	16	24
Subsurface flows	1	8	8	24
Direct access to ground water	0	8	0	24
Subtotals			46	114

Subscore (100 x factor score subtotal/maximum score subtotal) 40

C. Highest pathway subscore.

Enter the highest subscore value from A, B-1, B-2 or B-3 above.

Pathways Subscore 62

IV. WASTE MANAGEMENT PRACTICES

A. Average the three subscores for receptors, waste characteristics, and pathways.

Receptors	44
Waste Characteristics	50
Pathways	62

Total 156 divided by 3 = 52 Gross Total Score

B. Apply factor for waste containment from waste management practices

Gross Total Score X Waste Management Practices Factor = Final Score

52 x 1.0 = 52

HAZARDOUS ASSESSMENT RATING FORM

NAME OF SITE Laboratory Chemical Disposal Site

LOCATION Near Luna Lake

DATE OF OPERATION OR OCCURRENCE 1962 to 1964

OWNER/OPERATOR Robins AFB

COMMENTS/DESCRIPTION One time disposal of expired shelf life chemicals

SITE RATED BY [signature]

I. RECEPTORS

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
A. Population within 1,000 feet of site	1	4	4	12
B. Distance to nearest well	3	10	30	30
C. Land use/zoning within 1 mile radius	1	3	3	9
D. Distance to reservation boundary	2	6	12	18
E. Critical environments within 1 mile radius of site	0	10	0	30
F. Water quality of nearest surface water body	0	6	0	18
G. Ground water use of uppermost aquifer	1	9	9	27
H. Population served by surface water supply within 3 miles downstream of site	0	6	0	18
I. Population served by ground-water supply within 3 miles of site	3	6	18	18
Subtotals			76	180

Receptors subscore (100 X factor score subtotal/maximum score subtotal) 42

II. WASTE CHARACTERISTICS

A. Select the factor score based on the estimated quantity, the degree of hazard, and the confidence level of the information.

1. Waste quantity (S = small, M = medium, L = large) M
2. Confidence level (C = confirmed, S = suspected) C
3. Hazard rating (H = high, M = medium, L = low) M

Factor Subscore A (from 20 to 100 based on factor score matrix) 60

B. Apply persistence factor
Factor Subscore A X Persistence Factor = Subscore B

60 x 1.0 = 60

C. Apply physical state multiplier

Subscore B X Physical State Multiplier = Waste Characteristics Subscore

60 x 0.5 = 30

III. PATHWAYS

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score

A. If there is evidence of migration of hazardous contaminants, assign maximum factor subscore of 100 points for direct evidence or 80 points for indirect evidence. If direct evidence exists then proceed to C. If no evidence or indirect evidence exists, proceed to B.

Subscore 80

B. Rate the migration potential for 3 potential pathways: surface water migration, flooding, and ground-water migration. Select the highest rating, and proceed to C.

1. Surface water migration

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
Distance to nearest surface water	2	8	16	24
Net precipitation	1	6	6	18
Surface erosion	0	8	0	24
Surface permeability	1	6	6	18
Rainfall intensity	3	8	24	24
		Subtotals	52	108

Subscore (100 X factor score subtotal/maximum score subtotal) 48

2. Flooding

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
Flooding	0	1	0	3

Subscore (100 x factor score/3) 0

3. Ground-water migration

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
Depth to ground water	2	8	16	24
Net precipitation	1	6	6	18
Soil permeability	2	8	16	24
Subsurface flows	1	8	8	24
Direct access to ground water	3	8	24	24
		Subtotals	70	114

Subscore (100 x factor score subtotal/maximum score subtotal) 61

C. Highest pathway subscore.

Enter the highest subscore value from A, B-1, B-2 or B-3 above.

Pathways Subscore 80

IV. WASTE MANAGEMENT PRACTICES

A. Average the three subscores for receptors, waste characteristics, and pathways.

Receptors	42
Waste Characteristics	30
Pathways	80

Total 152 divided by 3 = 51 Gross Total Score

B. Apply factor for waste containment from waste management practices

Gross Total Score X Waste Management Practices Factor = Final Score

51 x 1.0 = 51

HAZARDOUS ASSESSMENT RATING FORM

NAME OF SITE Landfill No. 3

LOCATION West Side of Luna Lake

DATE OF OPERATION OR OCCURRENCE 1964

OWNER/OPERATOR Robins AFB

COMMENTS/DESCRIPTION

SITE RATED BY E. J. Schroeder

I. RECEPTORS

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
A. Population within 1,000 feet of site	1	4	4	12
B. Distance to nearest well	3	10	30	30
C. Land use/zoning within 1 mile radius	1	3	3	9
D. Distance to reservation boundary	2	6	12	18
E. Critical environments within 1 mile radius of site	0	10	0	30
F. Water quality of nearest surface water body	1	6	6	18
G. Ground water use of uppermost aquifer	1	9	9	27
H. Population served by surface water supply within 3 miles downstream of site	0	6	0	18
I. Population served by ground-water supply within 3 miles of site	3	6	18	18
		Subtotals	82	180

Receptors subscore (100 X factor score subtotal/maximum score subtotal) 46

II. WASTE CHARACTERISTICS

A. Select the factor score based on the estimated quantity, the degree of hazard, and the confidence level of the information.

1. Waste quantity (S = small, M = medium, L = large) S
2. Confidence level (C = confirmed, S = suspected) S
3. Hazard rating (H = high, M = medium, L = low) H

Factor Subscore A (from 20 to 100 based on factor score matrix) 40

B. Apply persistence factor
Factor Subscore A X Persistence Factor = Subscore B

40 x 1.0 = 40

C. Apply physical state multiplier

Subscore B X Physical State Multiplier = Waste Characteristics Subscore

40 x 1.0 = 40

III. PATHWAYS

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score

A. If there is evidence of migration of hazardous contaminants, assign maximum factor subscore of 100 points for direct evidence or 80 points for indirect evidence. If direct evidence exists then proceed to C. If no evidence or indirect evidence exists, proceed to B.

Subscore 0

B. Rate the migration potential for 3 potential pathways: surface water migration, flooding, and ground-water migration. Select the highest rating, and proceed to C.

1. Surface water migration

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
Distance to nearest surface water	3	8	24	24
Net precipitation	1	6	6	18
Surface erosion	0	8	0	24
Surface permeability	1	6	6	18
Rainfall intensity	3	8	24	24
		Subtotals	60	108

Subscore (100 X factor score subtotal/maximum score subtotal) 56

2. Flooding

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
Flooding	0	1	0	3

Subscore (100 x factor score/3) 0

3. Ground-water migration

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
Depth to ground water	2	8	16	24
Net precipitation	1	6	6	18
Soil permeability	2	8	16	24
Subsurface flows	2	8	16	24
Direct access to ground water	0	8	0	24
		Subtotals	54	114

Subscore (100 x factor score subtotal/maximum score subtotal) 47

C. Highest pathway subscore.

Enter the highest subscore value from A, B-1, B-2 or B-3 above.

Pathways Subscore 56

IV. WASTE MANAGEMENT PRACTICES

A. Average the three subscores for receptors, waste characteristics, and pathways.

Receptors	46
Waste Characteristics	40
Pathways	56

Total 142 divided by 3 = 47 Gross Total Score

B. Apply factor for waste containment from waste management practices

Gross Total Score X Waste Management Practices Factor = Final Score

47 x 1.0 = 47

HAZARDOUS ASSESSMENT RATING FORM

NAME OF SITE Fire Training Pit No. 3

LOCATION North of Existing Site in SAC area

DATE OF OPERATION OR OCCURRENCE Mid-1960's to 1969

OWNER/OPERATOR Robins AFB

COMMENTS/DESCRIPTION

SITE RATED BY E J [signature]

I. RECEPTORS

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
A. Population within 1,000 feet of site	0	4	0	12
B. Distance to nearest well	3	10	30	30
C. Land use/zoning within 1 mile radius	1	3	3	9
D. Distance to reservation boundary	2	6	12	18
E. Critical environments within 1 mile radius of site	0	10	0	30
F. Water quality of nearest surface water body	0	6	0	18
G. Ground water use of uppermost aquifer	1	9	9	27
H. Population served by surface water supply within 3 miles downstream of site	0	6	0	18
I. Population served by ground-water supply within 3 miles of site	3	6	18	18
Subtotals			72	180

Receptors subscore (100 X factor score subtotal/maximum score subtotal) 40

II. WASTE CHARACTERISTICS

A. Select the factor score based on the estimated quantity, the degree of hazard, and the confidence level of the information.

1. Waste quantity (S = small, M = medium, L = large) M
2. Confidence level (C = confirmed, S = suspected) S
3. Hazard rating (H = high, M = medium, L = low) M

Factor Subscore A (from 20 to 100 based on factor score matrix) 40

B. Apply persistence factor
Factor Subscore A X Persistence Factor = Subscore B

40 x 1.0 = 40

C. Apply physical state multiplier

Subscore B X Physical State Multiplier = Waste Characteristics Subscore

40 x 1.0 = 40

III. PATHWAYS

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score

A. If there is evidence of migration of hazardous contaminants, assign maximum factor subscore of 100 points for direct evidence or 80 points for indirect evidence. If direct evidence exists then proceed to C. If no evidence or indirect evidence exists, proceed to B.

Subscore N/A

B. Rate the migration potential for 3 potential pathways: surface water migration, flooding, and ground-water migration. Select the highest rating, and proceed to C.

1. Surface water migration

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
Distance to nearest surface water	3	8	24	24
Net precipitation	1	6	6	18
Surface erosion	0	8	0	24
Surface permeability	1	6	6	18
Rainfall intensity	3	8	24	24
		Subtotals	60	108

Subscore (100 X factor score subtotal/maximum score subtotal) 56

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
2. Flooding	0	1	0	3

Subscore (100 x factor score/3) 0

3. Ground-water migration

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
Depth to ground water	2	8	16	24
Net precipitation	1	6	6	18
Soil permeability	2	8	16	24
Subsurface flows	1	8	8	24
Direct access to ground water	0	8	0	24
		Subtotals	46	114

Subscore (100 x factor score subtotal/maximum score subtotal) 40

C. Highest pathway subscore.

Enter the highest subscore value from A, B-1, B-2 or B-3 above.

Pathways Subscore 56

IV. WASTE MANAGEMENT PRACTICES

A. Average the three subscores for receptors, waste characteristics, and pathways.

Receptors 40
Waste Characteristics 40
Pathways 56

Total 136 divided by 3 = 45
Gross Total Score

B. Apply factor for waste containment from waste management practices

Gross Total Score X Waste Management Practices Factor = Final Score

45 x 1.0 = 45

HAZARDOUS ASSESSMENT RATING FORM

NAME OF SITE Radioactive (Solid) Waste Burial Site

LOCATION Facility No. 8315 near Pistol Range

DATE OF OPERATION OR OCCURRENCE 1940's to 1950's

OWNER/OPERATOR Robins AFB

COMMENTS/DESCRIPTION

SITE RATED BY E J Schroeder

I. RECEPTORS

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
A. Population within 1,000 feet of site	1	4	4	12
B. Distance to nearest well	3	10	30	30
C. Land use/zoning within 1 mile radius	0	3	0	9
D. Distance to reservation boundary	3	6	18	18
E. Critical environments within 1 mile radius of site	0	10	0	30
F. Water quality of nearest surface water body	0	6	0	18
G. Ground water use of uppermost aquifer	1	9	9	27
H. Population served by surface water supply within 3 miles downstream of site	0	6	0	18
I. Population served by ground-water supply within 3 miles of site	3	6	18	18
Subtotals			79	180

Receptors subscore (100 X factor score subtotal/maximum score subtotal) 44

II. WASTE CHARACTERISTICS

A. Select the factor score based on the estimated quantity, the degree of hazard, and the confidence level of the information.

1. Waste quantity (S = small, M = medium, L = large) S
2. Confidence level (C = confirmed, S = suspected) C
3. Hazard rating (H = high, M = medium, L = low) L

Factor Subscore A (from 20 to 100 based on factor score matrix) 30

B. Apply persistence factor
Factor Subscore A X Persistence Factor = Subscore B

30 x 0.9 = 27

C. Apply physical state multiplier

Subscore B X Physical State Multiplier = Waste Characteristics Subscore

27 x 0.5 = 13.5

III. PATHWAYS

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score

A. If there is evidence of migration of hazardous contaminants, assign maximum factor subscore of 100 points for direct evidence or 80 points for indirect evidence. If direct evidence exists then proceed to C. If no evidence or indirect evidence exists, proceed to B.

Subscore ND

B. Rate the migration potential for 3 potential pathways: surface water migration, flooding, and ground-water migration. Select the highest rating, and proceed to C.

1. Surface water migration

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
Distance to nearest surface water	1	8	8	24
Net precipitation	1	6	6	18
Surface erosion	0	8	0	24
Surface permeability	1	6	6	18
Rainfall intensity	3	8	24	24
		Subtotals	44	108

Subscore (100 X factor score subtotal/maximum score subtotal) 41

2. Flooding

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
Flooding	0	1	0	3

Subscore (100 x factor score/3) 0

3. Ground-water migration

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
Depth to ground water	2	8	16	24
Net precipitation	1	6	6	18
Soil permeability	2	8	16	24
Subsurface flows	1	8	8	24
Direct access to ground water	0	8	0	24
		Subtotals	46	114

Subscore (100 x factor score subtotal/maximum score subtotal) 40

C. Highest pathway subscore.

Enter the highest subscore value from A, B-1, B-2 or B-3 above.

Pathways Subscore 41

IV. WASTE MANAGEMENT PRACTICES

A. Average the three subscores for receptors, waste characteristics, and pathways.

Receptors	44
Waste Characteristics	14
Pathways	41

Total 99 divided by 3 = 33 Gross Total Score

B. Apply factor for waste containment from waste management practices

Gross Total Score X Waste Management Practices Factor = Final Score

33 x 0.95 = 31

APPENDIX I

REFERENCES

APPENDIX I

REFERENCES

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APPENDIX J

GLOSSARY

APPENDIX J

GLOSSARY OF TERMINOLOGY AND ABBREVIATIONS

AF: Air Force

AFB: Air Force Base

AFFF: Aqueous Film Forming Foam

AFLC: Air Force Logistics Command

AFR: Air Force Regulation

AFSC: Air Force Systems Command

AG: Adjutant General

Ag: Chemical symbol for silver

AGE: Aircraft Ground Equipment

Al: Chemical symbol for aluminum

ALIPHATIC SOLVENTS: Those solvents derived from straight chain hydrocarbon compounds.

AROMATIC SOLVENTS: Those solvents derived from benzene whose molecule contains one or more carbon rings.

ARTESIAN: Ground water contained under hydrostatic pressure

AQUICLUDE: Poorly permeable formation that impeeds ground-water movement and does not yield water to a well or spring

AQUIFER: A geologic formation, group of formations, or part of a formation that is capable of yielding water to a well or spring

AQUITARD: A soils formation which impedes groundwater flow

AVGAS: Aviation Gasoline

Ba: Chemical symbol for barium

BESD: Bioenvironmental Engineering Services Division

Cd: Chemical symbol for cadmium

CERCLA: Comprehensive Environmental Response, Compensation and Liability Act

CES: Civil Engineering Squadron

CIRCA: About; used to indicate an approximate date

CLOSURE: The completion of a set of rigidly defined functions for a hazardous waste facility no longer in operation

CN: Chemical symbol for cyanide

COD: Chemical Oxygen Demand, a measure of the amount of oxygen required to oxidize organic and oxidizable inorganic compounds in water

COE: Corps of Engineers

CONFINED AQUIFER: An aquifer bounded above and below by impermeable beds or by beds of distinctly lower permeability than that of the aquifer itself

CONTAMINATION: The degradation of natural water quality to the extent that its usefulness is impaired; there is no implication of any specific limits since the degree of permissible contamination depends upon the intended end use or uses of the water

Cr: Chemical symbol for chromium

Cu: Chemical symbol for copper

DASC: Direct Air Support Center

DET: Detachment

DISPOSAL FACILITY: A facility or part of a facility at which hazardous waste is intentionally placed into or on land or water, and at which waste will remain after closure

DISPOSAL OF HAZARDOUS WASTE: The discharge, deposit, injection, dumping, spilling, or placing of any hazardous waste into or on land or water so that such waste or any constituent thereof may enter the environment or be emitted into the air or discharged into any waters, including ground water

DOD: Department of Defense

DOWNGRADIENT: In the direction of decreasing hydraulic static head; the direction in which ground water flows

DPDO: Defense Property Disposal Office - previous designation R&M, Redistribution and Marketing

DUMP: An uncovered land disposal site where solid and/or liquid wastes are deposited with little or no regard for pollution control or aesthetics; dumps are susceptible to open burning and are exposed to the elements, disease vectors and scavengers

EOD: Explosive Ordnance Disposal

ECM: Electronic Countermeasures

EFFLUENT: A liquid waste discharge from a manufacturing or treatment process, in its natural state, or partially or completely treated, that discharges into the environment

EPA: U. S. Environmental Protection Agency

EROSION: The wearing away of land surface by wind or water

EPHEMERAL AQUIFER: An aquifer usually near the surface which is only temporary in nature

FAA: Federal Aviation Administration

FACILITY: Any land and appurtenances thereon and thereto used for the treatment, storage and/or disposal of hazardous wastes

Fe: Chemical symbol for iron

FLOOD PLAIN: The lowland and relatively flat areas adjoining inland and coastal areas of the mainland and off-shore islands, including, at a minimum, areas subject to a one percent or greater chance of flooding in any given year

FLOW PATH: The direction or movement of ground water and any contaminants that may be contained therein, as governed principally by the hydraulic gradient

GROUND WATER: Water beneath the land surface in the saturated zone that is under atmospheric or artesian pressure

GROUND WATER RESERVOIR: The earth materials and the intervening open spaces that contain ground water

HALF-LIFE: The time required for half the atoms present in radioactive substance to disintegrate

HARDFILL: Disposal sites receiving construction debris, wood, miscellaneous spoil material

HAZARDOUS WASTE: A solid waste, or combination of solid wastes, which because of its quantity, concentration, or physical, chemical or infectious characteristics may cause or significantly contribute to an increase in mortality or an increase in serious, irreversible, or incapacitating reversible illness; or pose a substantial present or potential hazard to human health or the environment when improperly treated, stored, transported, or disposed of, or otherwise managed

HAZARDOUS WASTE GENERATION: The act or process of producing a hazardous waste

HEAVY METALS: Metallic elements, including the transition series, which include many elements required for plant and animal nutrition in trace concentrations but which become toxic at higher concentrations

Hg: Chemical symbol for mercury

HQ: Headquarters

INCOMPATIBLE WASTE: A waste unsuitable for commingling with another waste or material because the commingling might result in generation of extreme heat or pressure, explosion or violent reaction, fire, formation of substances which are shock sensitive, friction sensitive, or otherwise have the potential for reacting violently, formation of toxic dusts, mists, fumes, and gases, volatilization of ignitable or toxic chemicals due to heat generation in such a manner that the likelihood of contamination of ground water or escape of the substance into the environment is increased, any other reaction which might result in not meeting the Air, Human Health, and Environmental Standard

INFILTRATION: The flow of liquid through pores or small openings

IRP: Installation Restoration Program

KETONE SOLVENTS: Organic solvents containing a ketone functional group

LEACHATE: A solution resulting from the separation or dissolving of soluble or particulate constituents from solid waste or other man-placed medium by percolation of water

LEACHING: The process by which soluble materials in the soil, such as nutrients, pesticide chemicals or contaminants, are washed into a lower layer of soil or are dissolved and carried away by water

LETCO: Law Engineering Testing Company, Marietta, Georgia

LINER: A continous layer of natural or man-made materials beneath or on the sides of a surface impoundmnet, landfill, or landfill cell which restricts the downward or lateral escape of hazardous waste, hazardous waste constituents or leachate

LOX: Liquid Oxygen

LYSIMETERS: A thimble or cup device used for extracting ground water samples at various depths

MAC: Military Airlift Command

MAS: Military Air Service

MGD: million gallons per day

MOA: Military Operating Area

Mn: Chemical symbol for manganese

MONITORING WELL: A well used to measure ground-water levels and to obtain samples

Mr/hr: millirem/hour; a measure of radioactivity

MSL: Mean Sea Level

Ni: Chemical symbol for nickel

OEHL: Occupational and Environmental Health Laboratory

ORGANIC: Being, containing or relating to carbon compounds, especially in which hydrogen is attached to carbon

O&G: Symbols for oil and grease

OT&E: Operations, Training and Evaluation

Pb: Chemical symbol for lead

PCB: Polychlorinated Biphenyls are highly toxic to aquatic life; they persist in the environment for long period and are biologically accumulative

PERCOLATION: Movement of moisture by gravity or hydrostatic pressure through interstices of unsaturated rock or soil

PD-680: Cleaning solvent, safety solvent, Stoddard's solvent

pH: Negative logarithm of hydrogen ion concentration, measurement of acids and bases

PL: Public Law

POL: Petroleum, Oils and Lubricants

POLLUTANT: Any introduced gas, liquid or solid that makes a resource unfit for a specific purpose

RCRA: Resource Conservation and Recovery Act

RECHARGE AREA: An area in which water is absorbed that eventually reaches the zone of saturation in one or more aquifers

RECHARGE: The addition of water to the ground-water system by natural or artificial processes

RECON: Reconnaissance

SANITARY LANDFILL: A land disposal site using an engineered method of disposing solid wastes on land in a way that minimizes enviromental hazards

SATURATED ZONE: That part of the earth's crust in which all voids are filled with water

SLUDGE: The solid residue resulting from a manufacturing or wastewater treatment process which also produces a liquid stream

SOLID WASTE: Any garbage, refuse, or sludge from a waste treatment plant, water suply treatment, or air pollution control facility and other discarded material, including solid, liquid, semi-solid, or contained gaseous material resulting from industrial, commercial, mining, or agricultural operations and from community activities, but does not include solid or dissolved materials in domestic sewage; solid or dissolved materials in irrigation return flows; industrial discharges which are point source subject to permits under Section 402 of the Federal Water Pollution Control Act, as amended (86 USC 880); or source, special nuclear, or by-product material as defined by the Atomic Energy Act of 1954 (68 USC 923)

SPILL: Any unplanned release or discharge of a hazardous waste onto or into the air, land, or water

STORAGE OF HAZARDOUS WASTE: Containment, either on a temporary basis or for a longer period, in such a manner as not to constitute disposal of such hazardous waste

TAC: Tactical Air Command

TOXICITY: The ability of a material to produce injury or disease upon exposure, ingestion, inhalation, or assimilation by a living organism

TRANSMISSIVITY: The rate at which water is transmitted through a unit width under a unit hydraulic gradient

TREATMENT OF HAZARDOUS WASTE: Any method, technique, or process including neutralization designed to change the physical, chemical, or biological character or composition of any hazardous waste so as to neutralize the waste or so as to render the waste nonhazardous

UPGRADIENT: In the direction of increasing hydraulic static head; the direction opposite to the prevailing flow of groundwater

USAF: United States Air Force

V: Chemical symbol for vanadium

WATER TABLE: Surface of a body of unconfined ground water at which the pressure is equal to that of the atmosphere

Zn: Chemical symbol for zinc