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INSTALLATION RESTORATION PROGRAM

PHASE I - RECORDS SEARCH

MAXWELL AFB, ALABAMA

AD-A227 041

ES ENGINEERING - SCIENCE

PREPARED FOR

UNITED STATES AIR FORCE
AFESC/DEV
Tyndall AFB, Florida

and

HQ AIR UNIVERSITY/DEEV
Maxwell AFB, Alabama

JANUARY 1984

NOTICE

This report has been prepared for the United States Air Force by Engineering-Science for the purpose of aiding in the Air Force Installation Restoration Program. It is not an endorsement of any product. The views expressed herein are those of the contractor and do not necessarily reflect the official views of the publishing agency, the United States Air Force, nor the Department of Defense.

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INSTALLATION RESTORATION PROGRAM
PHASE I: RECORDS SEARCH
MAXWELL AFB, ALABAMA

Prepared For
United States Air Force
AFESC/DEV
Tyndall AFB, Florida
and
HQ AIR UNIVERSITY/DEEV
Maxwell AFB, Alabama

January 1984

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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, Confirmation/Quantification; Phase III, Technology Base Development; and Phase IV, Operations/Remedial Actions. Engineering-Science (ES) was retained by the United States Air Force to conduct the Phase I, Initial Assessment/Records Search for Maxwell AFB under Contract No. F08637-80-G0009-5008.

INSTALLATION DESCRIPTION

Maxwell Air Force Base is located in Montgomery County, Alabama. The City of Montgomery, Alabama borders the base on the east and south. The north portion of the base is situated on the Alabama River in a floodplain area. The study area for this project included the main base comprised of 2,524 acres of which 2,487 acres are owned by the Air Force and 37 acres are leased and several off-base facilities which are under the jurisdiction of Maxwell AFB. These facilities are as follows:

Gunter Air Force Station	368 acres
Maxwell Family Housing Annex	30 acres
Lake Martin Recreation Area	55 acres
Lake Pippin Recreation Area	50 acres

Maxwell Air Force base had its beginning in 1910 when Orville Wright came to Montgomery with five student fliers and one mechanic to start a flying school. Wright's venture lasted less than a year and the area which is now Maxwell AFB had little use until the outbreak of World War I. In 1918, during the height of the first World War, the Army leased some 300 acres and established the Montgomery Air Intermediate Depot primarily to provide engine and aircraft repair and maintenance support for six other airfields in the southeast. The leased acreage for the base was then purchased in 1920. In November 1922, the Montgomery Air Intermediate Depot was renamed "Maxwell Field". Construction of the first permanent buildings on the base was completed in May 1928.

In June 1931, the first troops from the Air Corps Tactical School arrived at Maxwell Field as part of the transfer of that facility from Langley Field, Virginia. Then in 1940, because of events leading to World War II, the facilities were utilized by the Southeast Air Corps Training Center to train officers and pilots. Both the Air Corps Tactical School and the Southeast Air Corps Training Center served as flight training operations rather than maintenance and repair organizations.

In 1946, Air University (AU) was established and Maxwell became the home of the Air Force's center for the professional military education. Presently, Air University provides instruction for more than 500,000 students annually. Active flying on Maxwell is currently limited to a tenant reserve unit.

ENVIRONMENTAL SETTING

The environmental setting data reviewed for this investigation indicate the following major points that are relevant to the evaluation of past hazardous waste management practices at Maxwell AFB:

- o Study area mean annual precipitation is reported to be 52.1 inches and net precipitation was calculated to be approximately eight inches which represents the meteoric water available for infiltration. The 24-hour maximum rainfall event is 6.3 inches.
- o Much of Maxwell AFB is located in the zone flooded by a 100-year event. Gunter AFS is located above the 100-year flood zone.

- Surface soils at both Maxwell AFB and Gunter AFS tend to be moderately to poorly permeable, but are underlain by highly permeable soils at shallow depths.
- The terrace deposit aquifer is presently at ground surface at both Maxwell AFB and Gunter AFS. Water levels in this unit are shallow (3.5 to 7 feet below ground).
- The terrace deposits form the shallow aquifer in the study area and directly overlie and provide recharge to the Eutaw, which is present at shallow depth (40 feet) below ground surface. The Eutaw is a major regional aquifer. No separation exists between the terrace materials and the Eutaw. The water level in the Eutaw was measured at 10 feet below ground surface in a well at Maxwell AFB.
- Two major regional aquifers, the Gordo and Coker exist below the Eutaw and communicate with it. The city obtains most of its ground-water supplies from these two aquifers.
- Contaminants including arsenic and lead are entering the base through the surface drainage influent from a portion of the City of Montgomery on the east side of Maxwell AFB.
- No known endangered or threatened species of plants or animals exist on either Maxwell AFB or Gunter AFS.

From these major points it may be noted that potential pathways for the migration of hazardous waste-related contamination exist. Hazardous materials present at ground surface could be mobilized to the area's shallow aquifer (terrace deposits) and subsequently discharged to local surface streams or transferred to the underlying Eutaw or Gordo Formations as recharge.

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 past hazardous waste activities; interviews were held with local, state and Federal agencies; and field and helicopter reconnaissance inspections were conducted at past hazardous waste activity sites. Eleven sites were identified as containing potentially hazardous contaminants resulting from past activities (Figure 1). These sites have been assessed using a Hazard 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 sufficient potential to create environmental contamination are as follows:

Electroplating Waste Disposal Site
Surface Drainage System
Landfill No. 4
C. E. Drum Storage Area
Fire Protection Training Area No. 2
Landfill No. 5
Landfill No. 6
Fire Protection Training Area No. 1
Landfill No. 2
Landfill No. 3

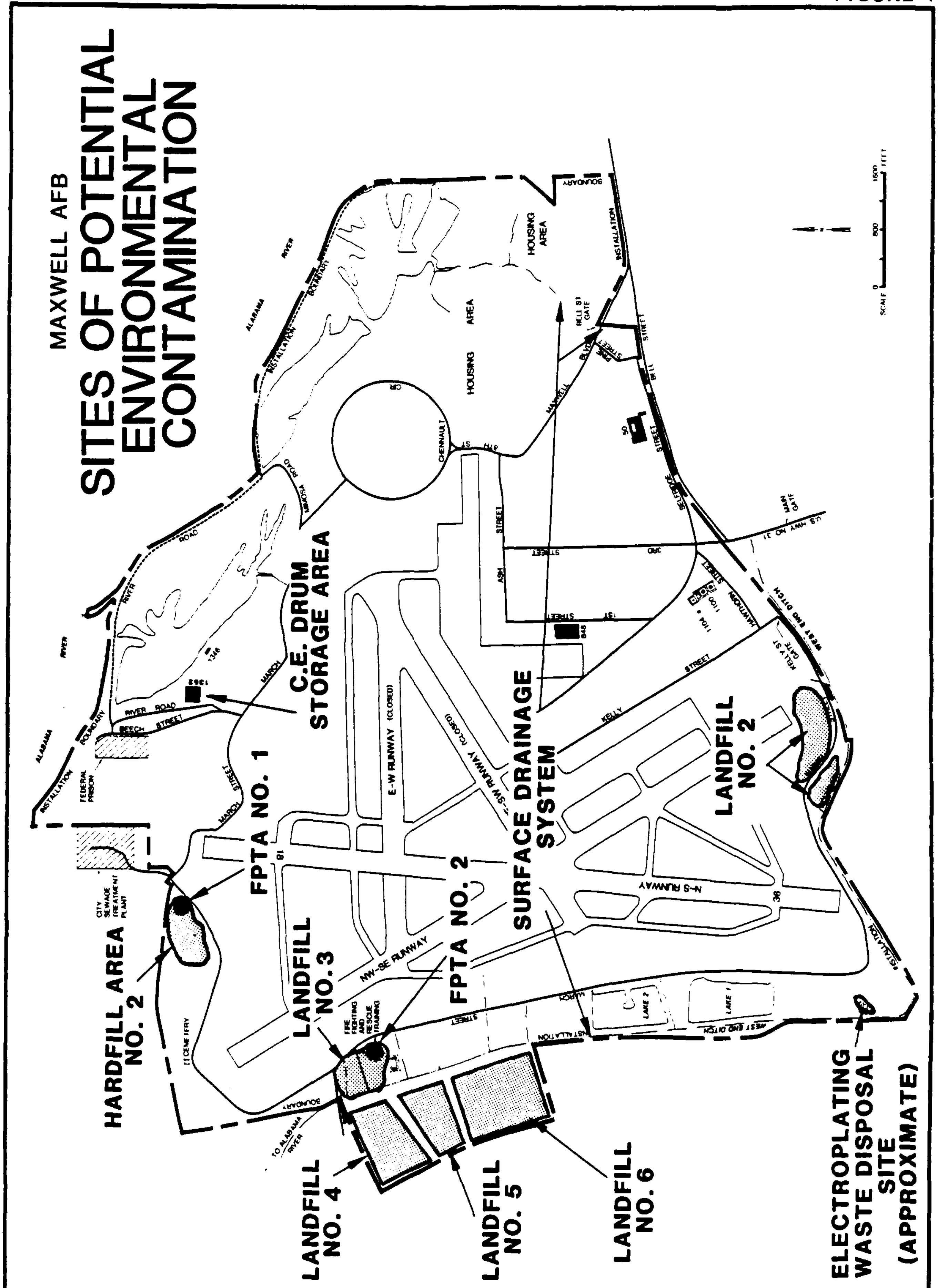
Follow-on investigations for these areas is warranted.

The area determined to have an insufficient potential to create environmental contamination is as follows:

Hardfill Area No. 2

Follow-on investigation for this area is not warranted.

FIGURE 1



MAXWELL AFB
SITES OF POTENTIAL ENVIRONMENTAL CONTAMINATION
HARDFILL AREA NO. 2
FPTA NO. 1
C.E. DRUM STORAGE AREA
LANDFILL NO. 3
FPTA NO. 2
SURFACE DRAINAGE SYSTEM
LANDFILL NO. 2
LANDFILL NO. 4
LANDFILL NO. 5
LANDFILL NO. 6
ELECTROPLATING WASTE DISPOSAL SITE (APPROXIMATE)
ALABAMA RIVER
INSTALLATION BOUNDARY
FEDERAL PRISON
CITY SEWAGE TREATMENT PLANT
CEMETERY
RIVER ROAD
BEECH STREET
MARCH STREET
MIMOSA ROAD
CHENNAULT CIR
HOUSING AREA
E-W RUNWAY (CLOSED)
NE-SW RUNWAY (CLOSED)
NW-SE RUNWAY
N-S RUNWAY
KELLY STREET
ASH STREET
SELFRIDGE STREET
BELL STREET
MAXWELL BLVD
HAWTHORN STREET
WEST END DITCH
U.S. HWY NO. 31
MAIN GATE
BELL ST GATE
KELLY ST GATE
LAKE 1
LAKE 2
FIRE FIGHTING AND RESCUE TRAINING
TO ALABAMA RIVER
SCALE 0 800 1600 FEET

TABLE 1
SITES ASSESSED USING THE HAZARD
ASSESSMENT RATING METHODOLOGY

MAXWELL AFB

Rank	Site Name and Number	Time Period	Final Score
1	Electroplating Waste Disposal Site	Late 1940's to Mid 1960's	72
2	Surface Drainage System	1940's to Early 1970's	72
3	Fire Protection Training Area No. 2	1962 to Present	59
4	Fire Protection Training Area No. 1	1940's to 1962	58
5	Landfill No. 4	1956 to Early 1970's	54
6	C. E. Drum Storage Area	Mid-1970's to Present	53
7	Landfill No. 5	Early 1970's to 1974	52
8	Landfill No. 6	1974 to Present	52
9	Landfill No. 2	Early 1940's to 1951	51
10	Landfill No. 3	1951-1956	51
11	Hardfill Area No. 2	1951-Present	44

RECOMMENDATIONS

Recommended guidelines for future land use restrictions at the disposal sites identified are presented in Chapter 6. The detailed recommendations developed for further assessment of areas of environmental concern at Maxwell AFB are also presented in Chapter 6. These recommendations are summarized as follows:

- Electroplating Waste Disposal Site — Conduct an electromagnetic and/or magnetometer survey to confirm the locations of buried drums. Install three monitoring wells and implement ground-water monitoring program.
- Surface Drainage System — Collect and analyze thirteen stream sediment samples. Expand the number of surface water sampling points by four in West End Ditch. Implement expanded list of parameters for existing surface monitoring points on Maxwell AFB.
- Fire Protection Training Area No. 2 and Landfill No. 3 — Conduct a geophysical survey to delineate the extent of the site. Install three monitoring wells and implement ground-water monitoring program.
- Fire Protection Training Area No. 1 — Install three monitoring wells and implement ground-water monitoring program.
- Landfill No. 4, No. 5 and No. 6 — Conduct a geophysical survey to delineate the extent of the site. Install four monitoring wells and implement ground-water monitoring program.
- C. E. Drum Storage Area — Install three monitoring wells and implement ground-water monitoring program.
- Landfill No. 2 — Conduct a geophysical survey to delineate the extent of the site. Install three monitoring wells and implement ground-water monitoring program.

SECTION 1

INTRODUCTION

BACKGROUND AND AUTHORITY

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 past disposal sites and take action to eliminate hazards in an environmentally responsible manner. The primary Federal legislation governing disposal of hazardous waste is the Resource Conservation and Recovery Act (RCRA) of 1976, as amended. Under Section 3012 and 6003 of the Act, Federal agencies are directed to assist the Environmental Protection Agency (EPA) and state agencies to inventory past disposal sites and make the information available to the requesting agencies. To assure compliance with these hazardous waste regulations, the Department of Defense (DOD) developed the Installation Restoration Program (IRP). The current DOD IRP policy is contained in Defense Environmental Quality Program Policy Memorandum (DEQPPM) 81-5, dated 11 December 1981 and implemented by Air Force message dated 21 January 1982. DEQPPM 81-5 reissued and amplified all previous directives and memoranda on the Installation Restoration Program. DOD policy is to identify and fully evaluate suspected problems associated with past hazardous contamination, and to control hazards to health and welfare that resulted from these past operations. The IRP will be the basis for response actions on Air Force installations under the provisions of the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) of 1980, and clarified by Executive Order 12316. CERCLA is the primary legislation governing remedial action at past hazardous waste disposal sites.

PURPOSE AND SCOPE

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

Phase I	- Initial Assessment/Records Search
Phase II	- Confirmation/Quantification
Phase III	- Technology Base Development
Phase IV	- Operations/Remedial Actions

Engineering-Science (ES) was retained by the United States Air Force to conduct the Phase I Records Search at Maxwell Air Force Base (AFB) under Contract No. F08637-80-G0009-5008. This report contains a summary and an evaluation of the information collected during Phase I of the IRP and recommendations for follow-on actions. The land areas included as part of the Maxwell AFB study are as follows:

Main Base Site	2,524 acres
Gunter Air Force Station	368 acres
Maxwell Family Housing Annex	30 acres
Lake Martin Recreational Area	55 acres
Lake Pippin Recreational Area	50 acres

The objective of the first phase of the program was to identify the potential for environmental contamination from past waste disposal practices at Maxwell AFB, and to assess the potential for contaminant migration. The activities that were performed in the Phase I study included the following:

- Review site records
- Interview personnel familiar with past generation and disposal activities
- Inventory generation of wastes in the past
- Estimate quantities and locations of current and past hazardous waste treatment, storage, and disposal
- Definition of the environmental setting at the base
- Review past disposal practices and methods

- Field and aerial reconnaissance
- Gathering pertinent information from Federal, state and local agencies
- Assessment of potential for contaminant migration.
- Develop recommendations for follow-on actions.

ES performed the on-site portion of the records search during August 1983. The following team of professionals were involved:

- R. M. Reynolds, Chemical Engineer and Project Manager, BChE, 10 years of professional experience
- J. R. Absalon, Hydrogeologist, BS Geology, 10 years of professional experience
- R. L. Thoem, Environmental Engineer, MS Sanitary Engineering, 20 years of professional experience

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

METHODOLOGY

The methodology utilized in the Maxwell 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 41 past and present base employees from the various operating areas. Those interviewed included current and past personnel associated with the Civil Engineering Squadron, Bioenvironmental Engineering Services, Reserve Units, and Fuels Management Branch. A listing of interviewee positions with approximate years of service is presented in Appendix B.

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 below as well as in Appendix B.

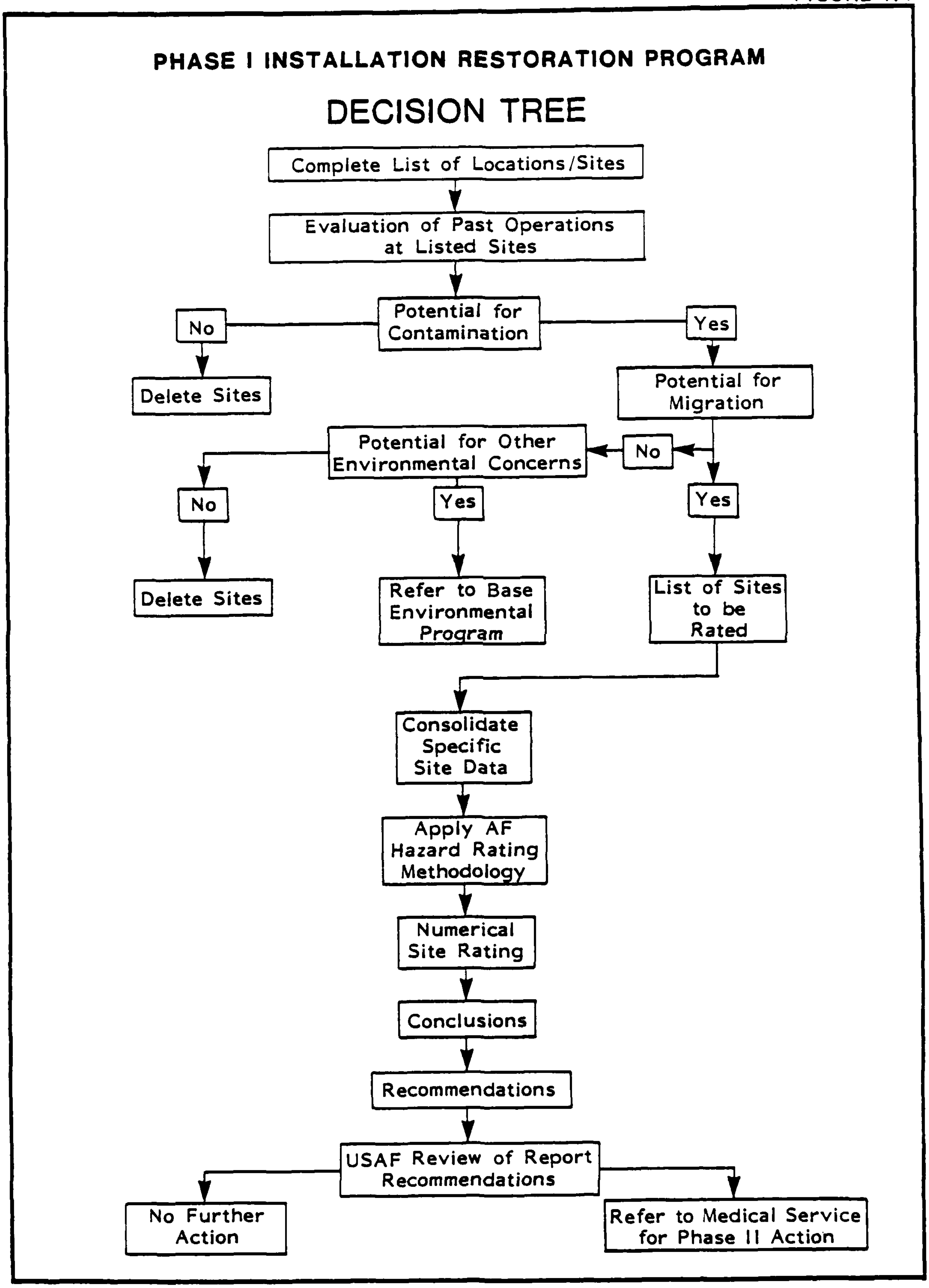
- o U.S. Geological Survey (USGS), Water Resources Division
- o Alabama Department of Environmental Management

- U.S. Department of Agriculture, Soil Conservation Service
- Montgomery Municipal Water Works, City Water Supply Division
- Mobile District, U.S. Army Corps of Engineers
- U.S. Environmental Protection Agency, Region IV
- Geological Survey of Alabama

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 known past disposal sites and other possible sources of contamination such as spill areas.

A general ground tour and a helicopter overflight of the 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 existed, 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 there were no further environmental concerns, then the site was deleted. If there are other environmental concerns then these are referred to the base environmental program. If the potential for contaminant migration was considered significant, then the site was evaluated and prioritized using the Hazard Assessment Rating Methodology (HARM). A discussion of the HARM system is presented in Appendix G. The sites that were evaluated using the HARM procedures were also reviewed with regard to future land use restrictions.


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
Refer to Medical Service for Phase II Action

SECTION 2

INSTALLATION DESCRIPTION

LOCATION, SIZE AND BOUNDARIES

Maxwell AFB is located in Montgomery County, Alabama. The City of Montgomery, Alabama borders the eastern and southern portion of Maxwell AFB with the Alabama River bounding the base on the north (Figure 2.1 and 2.2). To the south and west of Maxwell AFB, the land uses are mixed residential and industrial. A public housing project and the central business district of Montgomery are located east of the base. An extensive undeveloped floodplain is located north of the base along the river. Figure 2.3 depicts the configuration of the 2,524 acres comprising Maxwell AFB of which 37 acres is leased land. Several other facilities are under the jurisdiction of Maxwell AFB. These facilities are described below and are shown in Figure 2.4.

Gunter Air Force Station (AFS): 368 acres (349 acres are owned by the Air Force and 19 acres are leased) located five miles from Maxwell AFB on the east side of Montgomery. The leased area is a narrow strip of land located on the east corner of the facility and includes Building 900. Gunter AFS hosts the Air Force Senior NCO Academy and the Air Force Data System Design Center.

Maxwell Family Housing Annex: 30 acres located one mile south of Maxwell AFB.

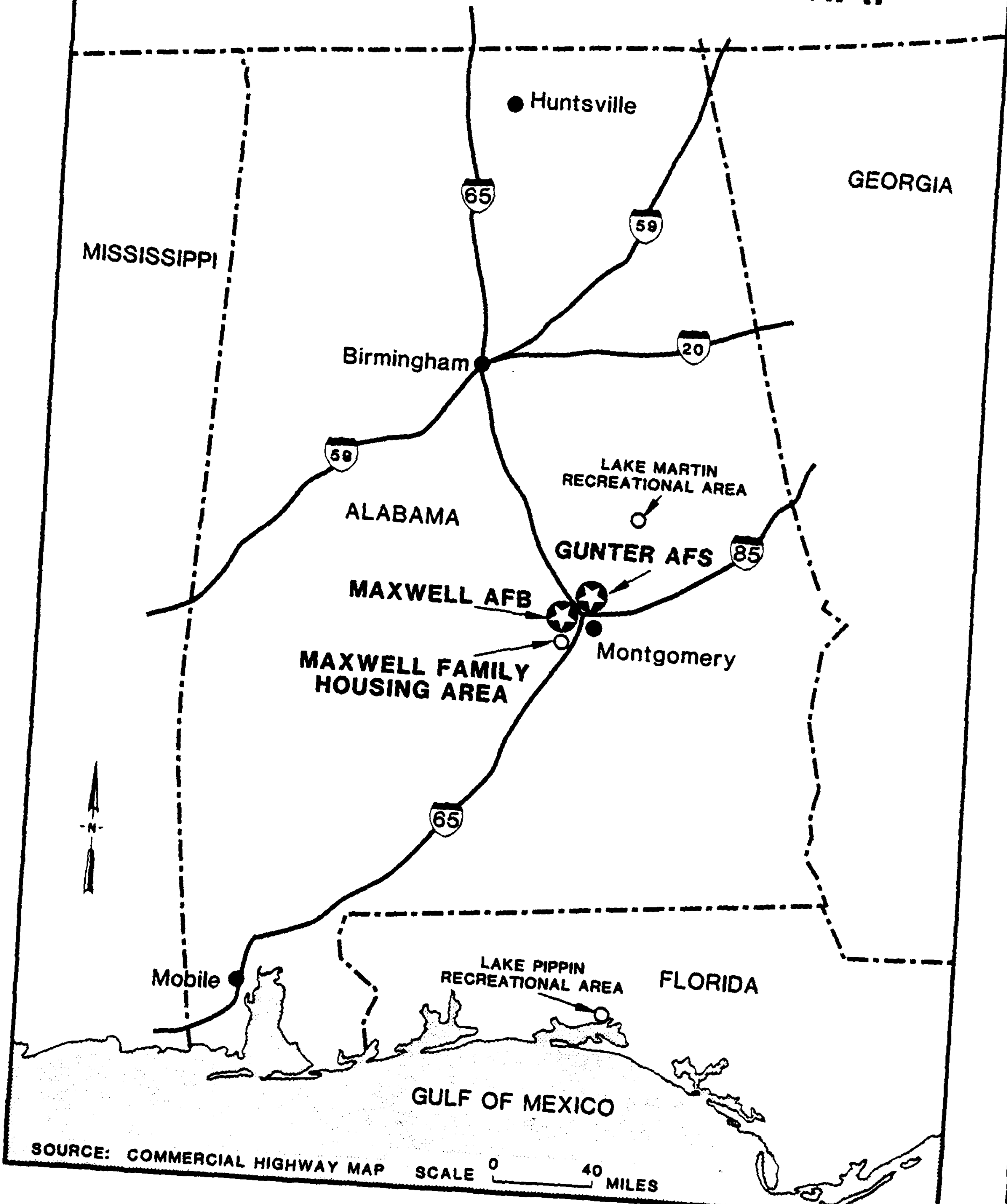
Lake Martin Recreational Area: 55 acres located 65 miles northeast of Maxwell AFB near Dadeville, Alabama.

Lake Pippin Recreational Area: 50 acres located 165 miles south of Maxwell AFB on Eglin AFB reservation. Lake Pippin area is leased to Maxwell AFB by Eglin AFB.

FIGURE 2.1

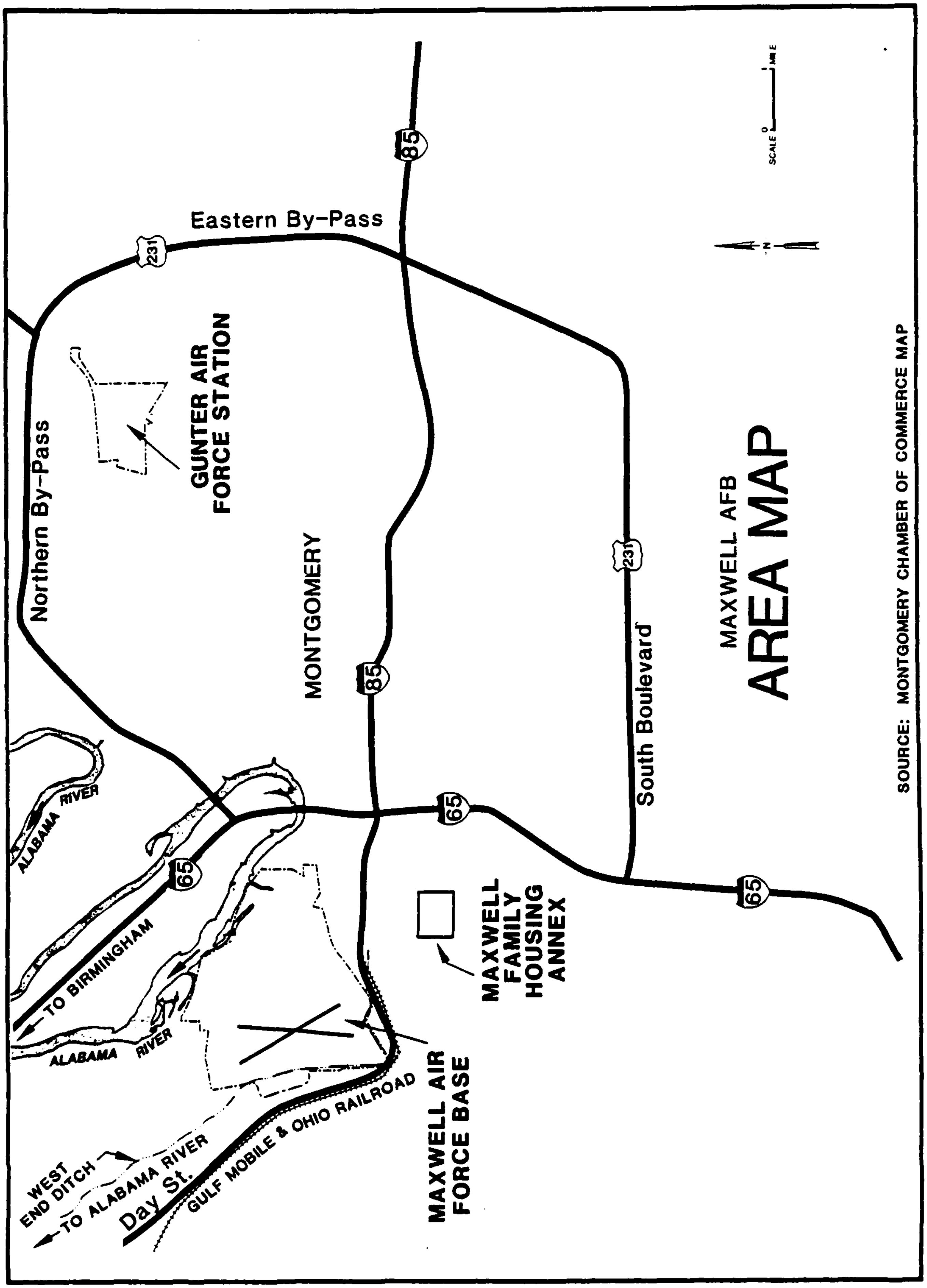
MAXWELL AFB

REGIONAL LOCATION MAP



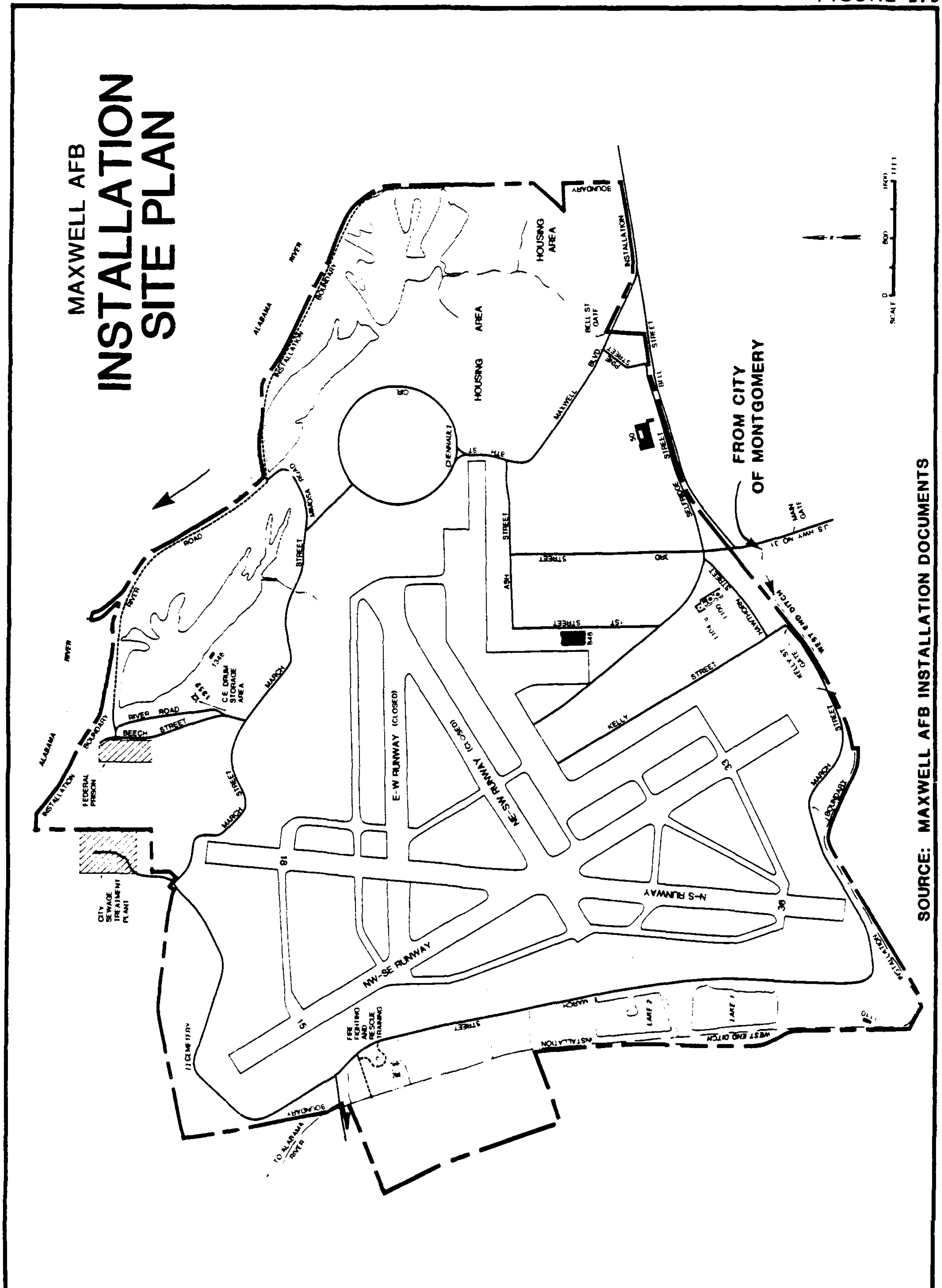
SOURCE: COMMERCIAL HIGHWAY MAP SCALE 0 40 MILES

ES ENGINEERING-SCIENCE



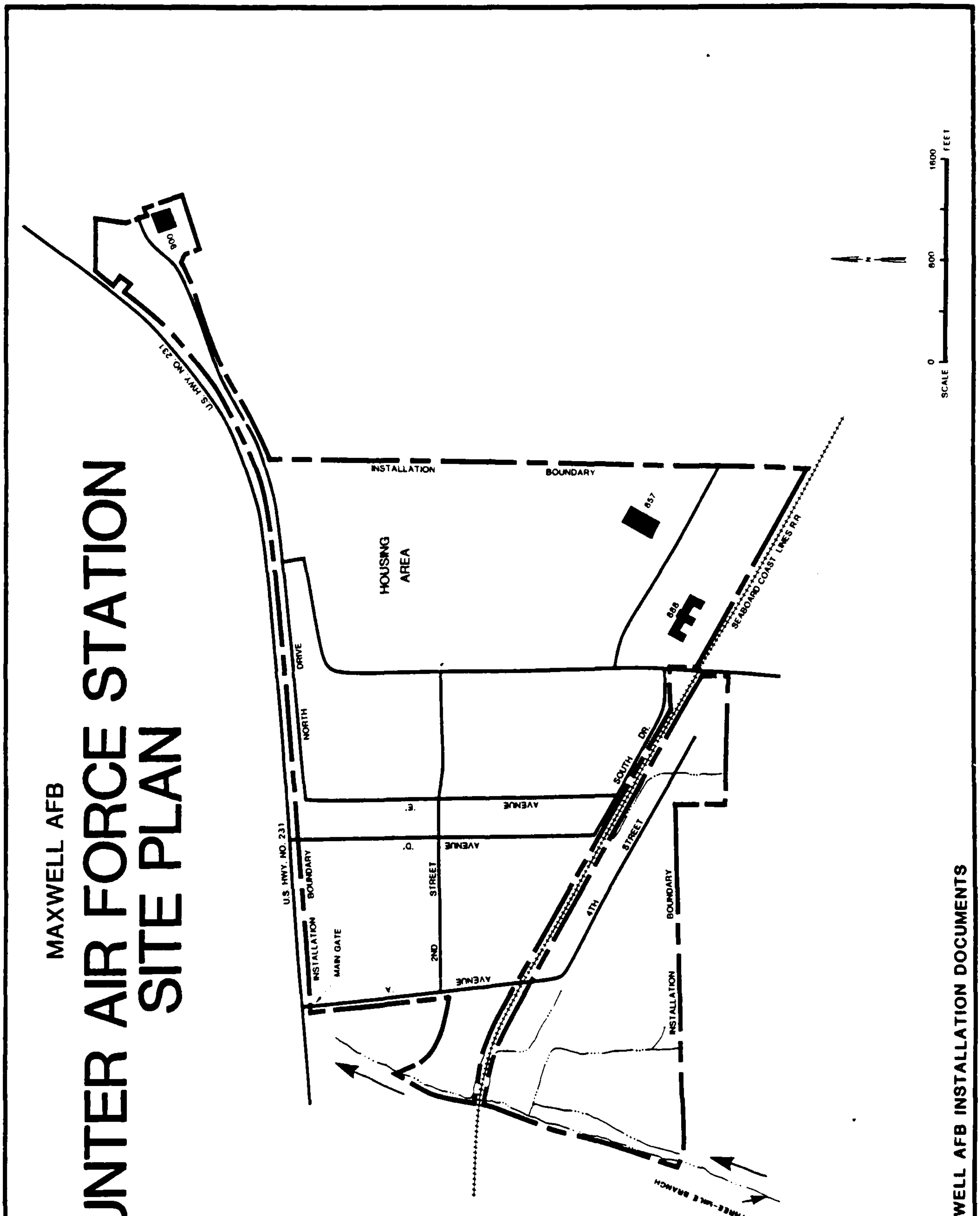
ES ENGINEERING-SCIENCE

FIGURE 2.3



ES ENGINEERING-SCIENCE

FIGURE 2.4



SOURCE: MAXWELL AFB INSTALLATION DOCUMENTS

Lake Pippin and Lake Martin recreational areas and the Maxwell Family Housing Annex have had no hazardous waste disposal activities and are not considered further in this study.

BASE HISTORY

Maxwell AFB

Maxwell Air Force Base had its beginning in 1910 when Orville Wright came to Montgomery with five student fliers and one mechanic to start a flying school. Wright's venture lasted less than a year and the area which is now Maxwell AFB had little use until the outbreak of World War I. In 1918, during the height of the first World War, the Army leased some 300 acres and established the Montgomery Air Intermediate Depot primarily to provide engine and aircraft repair and maintenance support for six other airfields in the southeast. The leased acreage for the base was then purchased in 1920. In November 1922, the Montgomery Air Intermediate Depot was renamed "Maxwell Field". Construction of the first permanent buildings on the base was completed in May 1928.

In June 1931, the first troops from the Air Corps Tactical School arrived at Maxwell Field as part of the transfer of that facility from Langley Field, Virginia. Then in 1940, because of events leading to World War II, the facilities were utilized by the Southeast Air Corps Training Center to train officers and pilots. Both the Air Corps Tactical School and the Southeast Air Corps Training Center served as flight training operations rather than maintenance and repair organizations.

In 1946, Air University (AU) was established and Maxwell became the home of the Air Force's center for the professional military education. Presently, Air University provides instruction for more than 500,000 students annually. Active flying on Maxwell is currently limited to a tenant reserve unit.

Gunter AFS

Activated on August 27, 1940, as a basic flying school, American, British, French and Chinese pilots were trained at Gunter AFS during World War II. In 1946, training of U. S. Armed Forces students received major emphasis at Gunter AFS.

In the past there have been several tenants occupying the installation. In the 1950s, the Medical Service School was housed at Gunter AFS. In 1957, the Montgomery Air Defense Sector was activated at Gunter AFS and then during the 1960s, the headquarters for the 14 Air Force, was located at the base, along with the 32 Air Division. These organizations provided mainly administrative support and have since been relocated or deactivated and no active flying is presently conducted at Gunter AFS.

In July, 1971, the Air Force Data Systems Design Center (AFDSDC) was transferred to Gunter AFS. AFDSDC is responsible for designing standard automated data systems assigned by Headquarters USAF. In June 1978, the AFDSDC became a direct reporting unit of the Air Force Communication Command.

During the 1940's, the size of Gunter AFS grew to about 1,200 acres most of which was leased from the City of Montgomery. In 1946, all aircraft stationed at Gunter AFS were transferred to Maxwell AFB and in 1949 all flying at Gunter AFS stopped. In 1971, approximately 800 acres of leased land on Gunter AFS was returned to the City of Montgomery. The remaining property is owned by the Department of Defense.

PRIMARY ORGANIZATION AND MISSION

The primary mission of Maxwell AFB is to support the Air University. The 3800 Air Base Wing and the 3800 Air Base Squadron operate and maintain Maxwell AFB and Gunter AFS, respectively, and provide logistic support and base services for Air University organizations located on these installations. The components of the Air University assigned to Maxwell AFB and Gunter AFS are listed below. Descriptions of these organizations and their individual missions are presented in Appendix C.

Maxwell AFB

- Headquarters, Air University
- Air War College
- Squadron Officer School
- Air Command and Staff College
- Education and Development Center
- Leadership and Management Development Center
- Air University Library

Maxwell AFB (continued)

USAF Regional Hospital - Maxwell

Headquarters, Civil Air Patrol

Air University Manpower and Organization Directorate

Center for Aerospace Doctrine, Research and Education

Gunter AFS

AF Senior NCO Academy

AF Logistics Management Center

Extension Course Institute

Air University Field Printing Plant

TENANT ORGANIZATIONS AND MISSIONS

Maxwell AFB and Gunter AFS also host several tenant organizations. The tenant organizations are listed below and descriptions of their missions are also presented in Appendix C.

Maxwell AFB

Headquarters, Air Force ROTC

USAF Auditor General Representative Office

USAF Trial Judiciary

Federal Prison

908 Tactical Airlift Group (Reserves)

1973 Communications Squadron

Det. 9, 24 Weather Squadron

Det. 3, 1402 Military Airlift Squadron

District 8, OSI (IG), HQ USAF

Corps of Engineers

USAF Postal and Courier Flights

Air Force Medical Management Team

Albert F. Simpson Historical Research Center

Community College of the Air Force

Defense Investigative Service

Federal Aviation Administration

United States Post Office

Gunter AFS

AF Data Systems Design Center

AF Data Systems Evaluation Center

Gunter AFS (continued)

AF Automated Systems Project Office

Defense Property Disposal Office

3531 Recruiting Squadron

SECTION 3

ENVIRONMENTAL SETTING

The environmental setting of Maxwell Air Force Base is described in this section with the primary emphasis directed toward identifying features which may facilitate the movement of hazardous waste contamination off base. A summary of key environmental conditions pertinent to the study is presented at the conclusion of this section.

METEOROLOGY

Temperature, precipitation and snowfall data furnished by Detachment 9, 24 Weather Squadron, Maxwell Air Force Base are presented in Table 3.1. The summarized data indicate that the mean annual precipitation (all forms) is 52.1 inches and the maximum 24-hour rainfall event is 6.3 inches. This corresponds with the value obtained from the National Oceanic and Atmospheric Adminstration Climatic Atlas of the United States (NOAA, 1977). The NOAA has determined that the mean annual Class A pan evaporation for the study area is 58 inches with a 76 percent coefficient of evaporation. These values result in a calculated net precipitation of approximately eight inches which represents the amount of meteoric water available for infiltration.

GEOGRAPHY

Maxwell Air Force Base is located within the Fall Line Hills subdivision of the Gulf Coastal Plain Physiographic Province. This physiographic division occurs as a narrow band of hilly uplands that have formed along the inner margin of the coastal plain, just south of the Fall Line (the Fall Line is the arbitrary boundary separating the Piedmont from the coastal plain). It is characterized by frequent rolling hills, extensive surficial dissection, nearly level plains and mature streams. Figure 3.1 depicts major study area physio-geographic features.

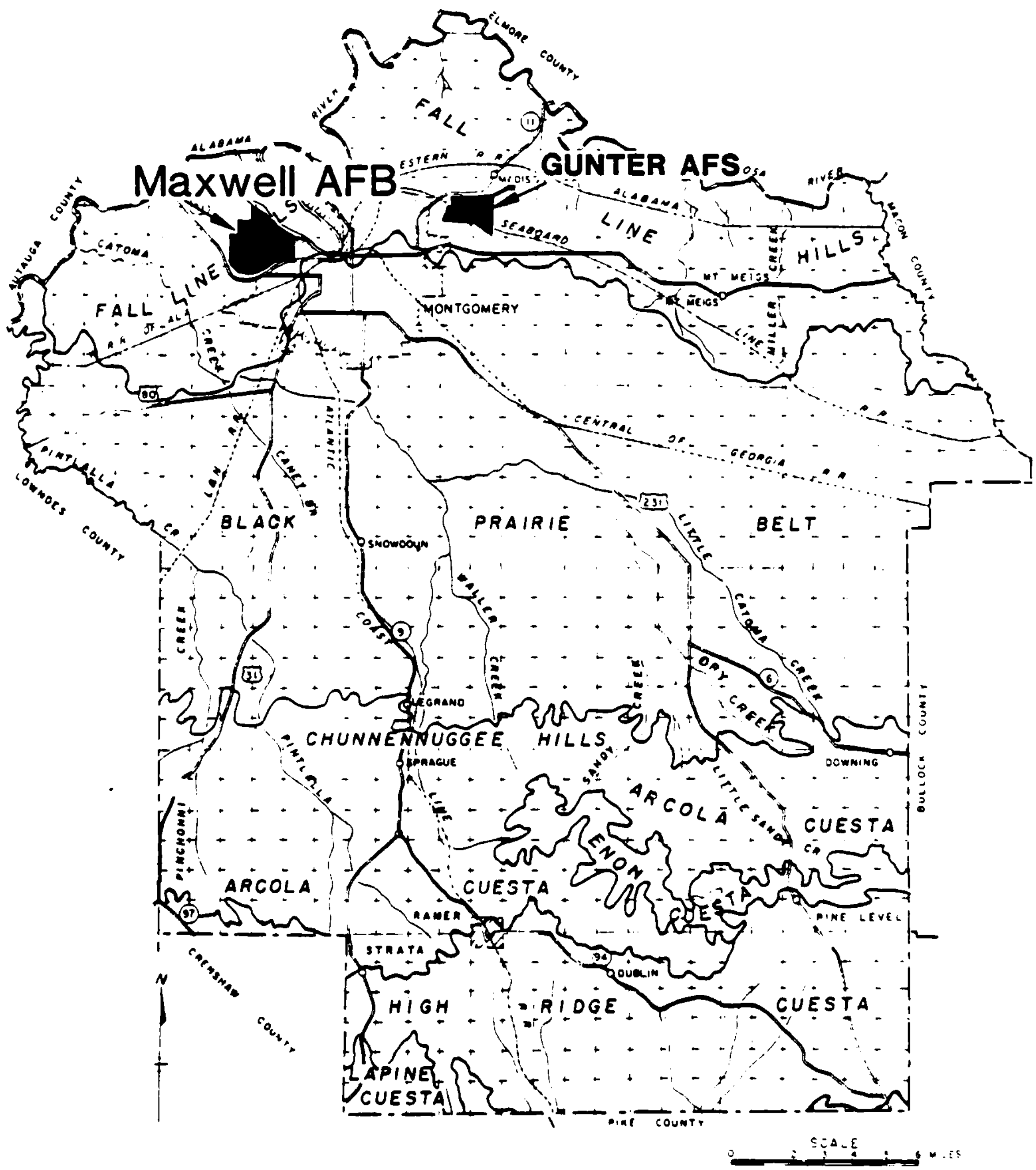
TABLE 3.1
MAXWELL AFB CLIMATIC CONDITIONS

MONTH	Temperature (°F)					Precipitation (In)				Snowfall (In)		
	Mean											
	Daily		Monthly	Extreme		Monthly			Max	Monthly		Max
	Max	Min		Max	Min	Mean	Max	Min	24 Hrs	Mean	Max	24 Hrs
Jan	57	39	48	82	5	4.2	10.6	0.9	3.3	#	6	3
Feb	61	41	51	84	12	4.5	8.5	1.6	5.1	#	2	2
Mar	69	48	58	88	20	6.3	14.0	2.3	3.8	#	#	#
Apr	77	56	67	93	30	4.5	11.2	1.1	4.3	#	#	#
May	84	63	74	98	43	4.0	12.9	0.5	4.0	0	0	0
Jun	90	70	80	104	52	4.3	11.8	0.5	6.3	0	0	0
Jul	91	73	82	105	61	5.6	10.7	2.5	4.7	0	0	0
Aug	91	72	82	103	60	4.1	15.4	1.0	5.6	0	0	0
Sep	86	67	77	101	42	3.8	8.4	0.1	5.4	0	0	0
Oct	78	55°	67	96	32	1.8	8.3	#	3.3	0	0	0
Nov	66	45	56	87	14	3.5	19.3	0.1	5.9	#	#	#
Dec	59	40	49	84	15	5.5	10.1	#	3.6	#	#	#
Annual	76	56	66	105	5	52.1	19.3	#	6.3	#	6	3

#: Trace
Source: Detachment 9, 24 Weather Squadron, Maxwell AFB. (1983)
Period of Record: 1937-1981

MAXWELL AFB

PHYSIOGRAPHIC DIVISIONS OF MONTGOMERY COUNTY, ALABAMA



SOURCE: POWELL, et al., 1957

Topography

The topography of the main sections of Maxwell Air Force Base and Gunter Air Force Station is generally level. Maxwell AFB elevations average 168 feet, National Geodetic Vertical Datum of 1929 (NGVD) and Gunter AFS elevations average 215 feet, NGVD. The only major variation is created by the alluvial terraces of the Alabama River which form the northwest boundary of Maxwell AFB. At Maxwell AFB, maximum local relief is approximately thirty-five feet along the banks of the Alabama River. At Gunter AFS, maximum relief is about five feet along the small stream channel which drains the western section of the installation.

Drainage

The drainage of Maxwell AFB and Gunter AFS land areas are accomplished by overland flow to diversion structures and then to area streams, all of which terminate in the Alabama River. At Maxwell AFB, the western section of the base drains to West End Ditch, which flows around the southwest installation boundary and joins the Alabama River about two miles northwest of the base. The north, east and south sections of Maxwell drain to local streams and ponds which have outlets to the Alabama River.

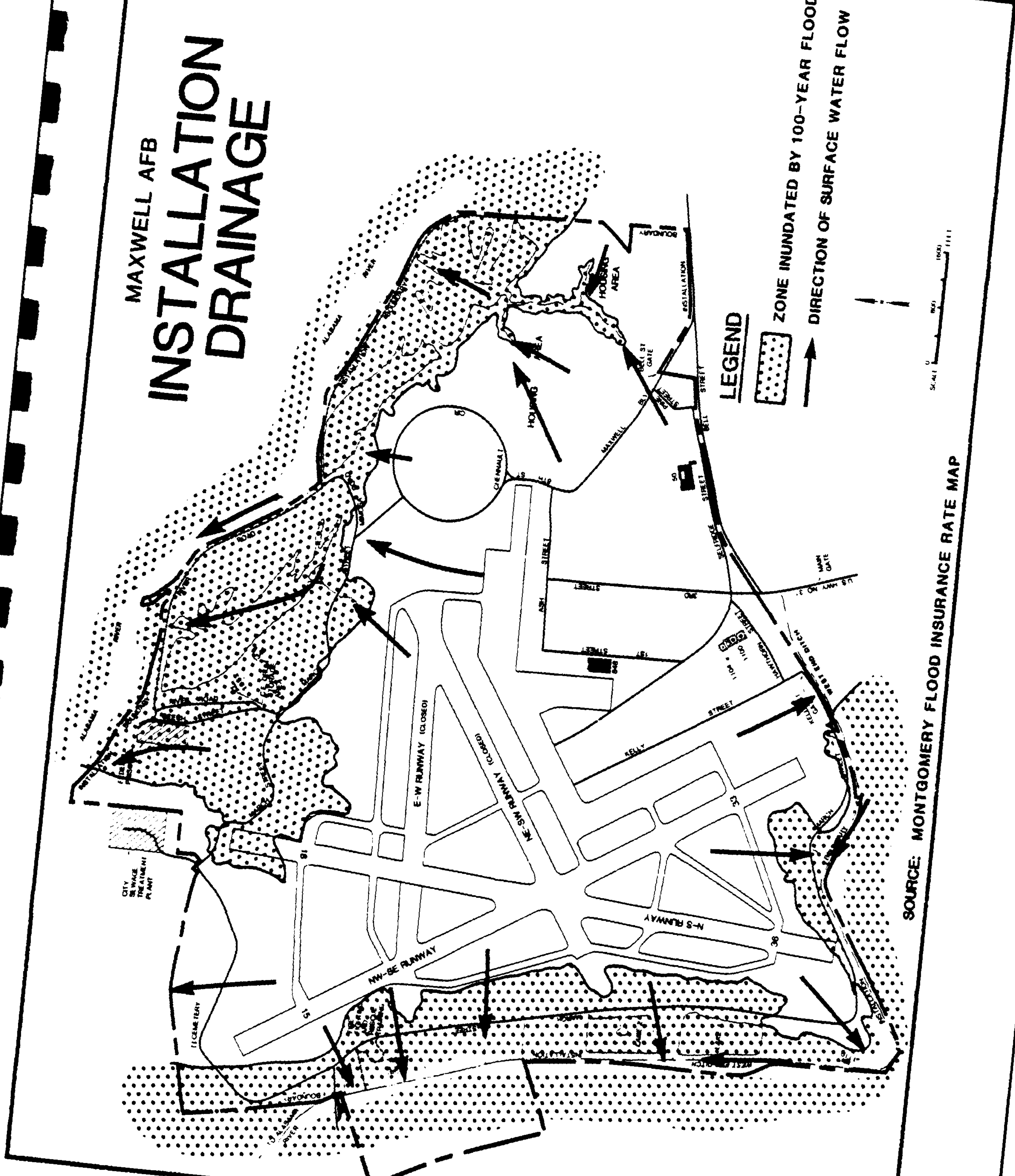
Flooding is known to be a serious problem at Maxwell Air Force Base and may occur on the north, west and south portions of the base. The 100-year flood limits portrayed on Figure 3.2, Maxwell AFB Installation Drainage, are based on the City of Montgomery Flood Insurance Rate Map, published by the Federal Emergency Management Agency, 1974, and roughly correspond to the record flood limits (1962) depicted on installation documents.

Gunter Air Force Station drains westward to Galbraith Mill Creek, which terminates at its confluence with the Alabama River, approximately five miles northwest of the station (Willmon, 1972). Gunter AFS is not known to experience flooding problems, although locally, some wetness could occur briefly due to runoff restriction during sustained precipitation. Figure 3.3 depicts Gunter AFS surface drainage features.

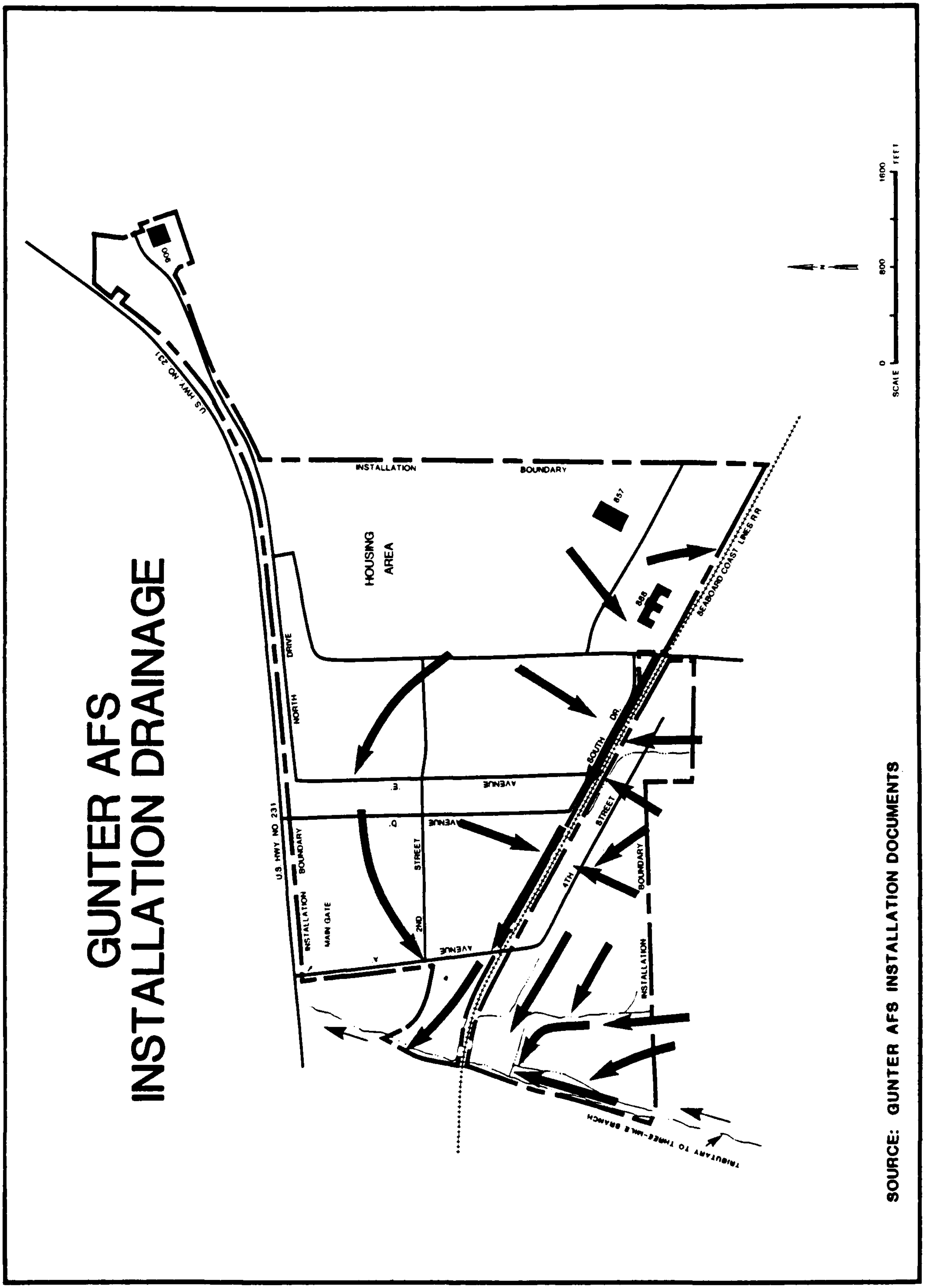
Surface Soils

Surface soils of Montgomery County, Alabama have been identified in a report issued by the U.S. Department of Agriculture, Soil Conservation

FIGURE 3.2



MAXWELL AFB
INSTALLATION DRAINAGE
LEGEND
ZONE INUNDATED BY 100-YEAR FLOOD
DIRECTION OF SURFACE WATER FLOW
SOURCE: MONTGOMERY FLOOD INSURANCE RATE MAP
NW-SE RUNWAY
N-S RUNWAY
E-W RUNWAY (CLOSED)
NE-SW RUNWAY (CLOSED)
KELLY STREET
SELFRIDGE STREET
BELL STREET
ASH STREET
1ST STREET
3RD STREET
CHENNAULT
HOUSING AREA
CITY SEWAGE TREATMENT PLANT
CEMETERY
ALABAMA RIVER
MAIN GATE


GUNTER AFS
INSTALLATION DRAINAGE
HOUSING AREA
INSTALLATION BOUNDARY
U.S. HWY NO 231
NORTH DRIVE
SOUTH DR.
4TH STREET
2ND STREET
MAIN GATE
SEABOARD COAST LINES RR
TRIBUTARY TO THREE-MILE BRANCH
SCALE
0
800
1600
FEET
SOURCE: GUNTER AFS INSTALLATION DOCUMENTS

Service (1960). Although a detailed survey was not performed within Maxwell Air Force Base boundaries, a generalized soil association map of the study area was published and is presented as Figure 3.4. A soil association is defined by the Soil Conservation Service as a group of individual soils that collectively form a landscape possessing a distinctive proportional pattern of soils. Two soils associations have been mapped in the study area and are described as follows:

- Cahaba-Wickham-Roanoke Association (unit 2 on Figure 3.2). This unit occurs along the north and west boundaries of Maxwell AFB. The major soils types are sandy loams and silt loams. The soils of this association usually form level to gently sloping lowlands on floodplains and low stream terraces. They are well to poorly drained. Parts of the association include flat, broad, well-drained areas cut by poorly drained sloughs. Much of the association is underlain by thick gravel beds and possesses a high seasonal water table.
- Amite-Cahaba Association (unit 4 on Figure 3.2). This unit underlies most of Maxwell AFB and all of Gunter AFS. The soils of this association form level to sloping uplands on high stream terraces. The Amite-Cahaba Association is composed principally of sandy loam, sandy clay loam and sandy clay. Most of the unit is well drained, except those soils occurring along drainage paths, which are poorly drained. Most of the association is underlain by a fine-grained, moderate to poorly permeable subsoil and has a seasonally high water table of ten or more feet below ground surface.

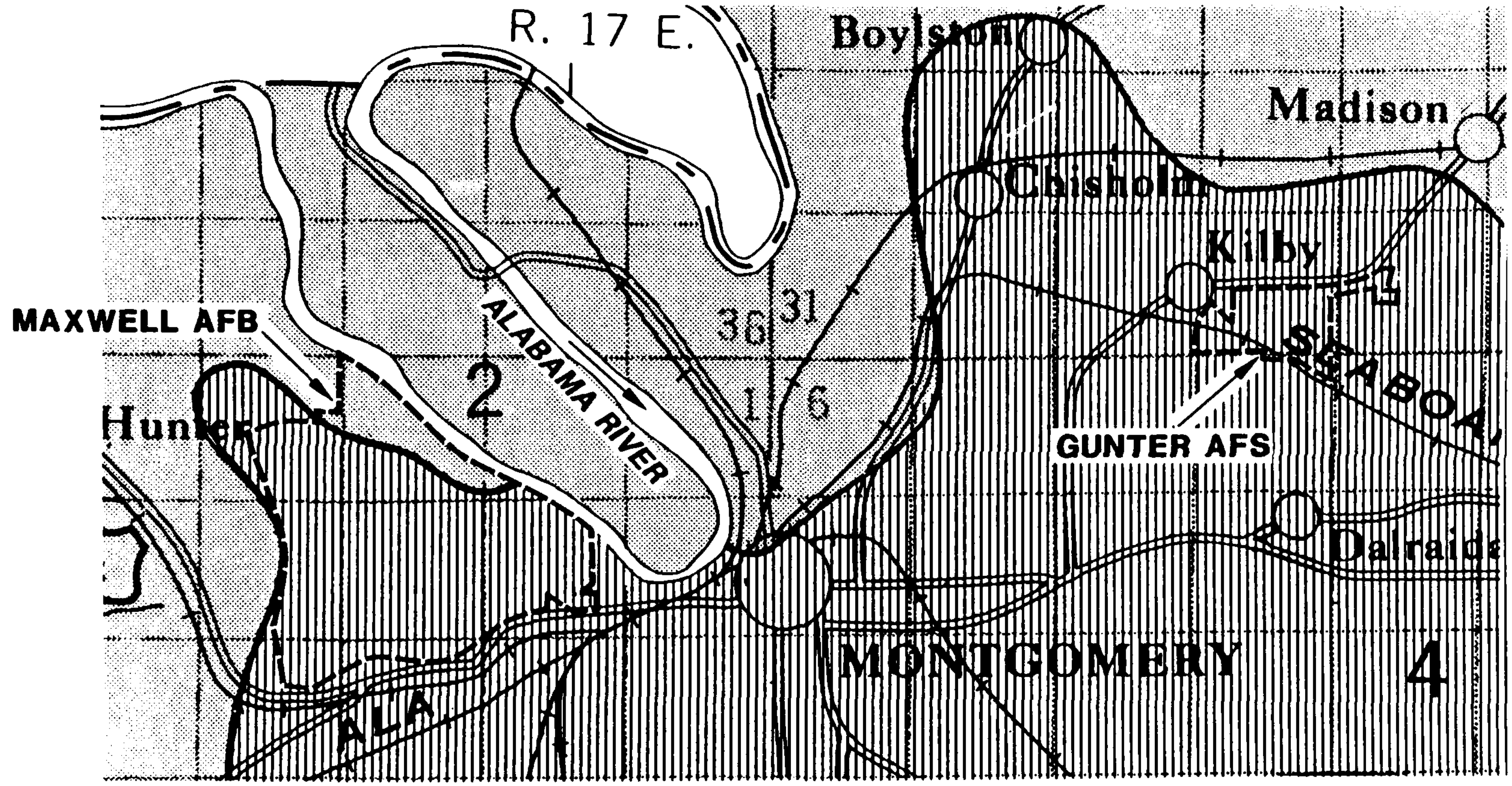
GEOLOGY

Information describing the geologic setting of the Montgomery area has been obtained from Adams, et al. (1926); Carlston (1944); Knowles, et al. (1960 and 1963); Powell et al. (1957) and Moser (1981). Additional information has been obtained from an interview with a U.S. Geological Survey-Water Resources Division (USGS-WRD) hydrologist. A brief review of their work and pertinent comments follow.

FIGURE 3.4

MAXWELL AFB

SOILS MAP



LEGEND

LEVEL AND VERY GENTLY SLOPING, WELL-DRAINED TO POORLY DRAINED SOILS ON STREAM TERRACES: CAHABA-WICKHAM-ROANOKE.

LEVEL TO SLOPING, WELL-DRAINED SOILS ON HIGH STREAM TERRACES: AMITE-CAHABA.

SOURCE: U.S. DEPARTMENT OF AGRICULTURE, SOIL CONSERVATION SERVICE, 1960

SCALE 0 — 1 MILES

Stratigraphy and Structure

Geologic units ranging in age from Upper Cretaceous to recent have been identified in the Coastal Plain deposits of Montgomery County. These units are typically unconsolidated materials consisting of gravel, sand, silt, clay, chalk, glauconite and lignite, reposing on a Precambrian crystalline basement complex.

The Coastal Plain sediments form a southerly dipping wedge, with a point of origin at the Fall Line. The Fall Line, which extends along most of the Atlantic coast is an arbitrary demarcation separating the Piedmont uplands from the Coastal Plain. In Alabama, it extends through Elmore County, north of Montgomery. At the Fall Line, sediment thickness is no more than a few feet, however at the Gulf of Mexico these same strata attain a thickness measured in the thousands of feet. The thickness of all unconsolidated deposits at Maxwell AFB is 1,008 feet, as measured in USGS test well G-33, located one thousand feet west of the installation near U.S. Route 31 (Powell, et al., 1957). Well G-33 was identified as "K-24" by Knowles, et al. (1960 and 1963). Individual geologic units within the Coastal Plain sediments tend to dip seaward at a shallow rate and thickens substantially. They are not known to be faulted or otherwise disrupted in the Montgomery area; however past cycles of erosion/deposition may have created significant local variations in unit characters or lithology. Table 3.2 summarizes the geologic units identified in Montgomery County.

Distribution

The surficial geology of Maxwell Air Force Base is dominated by Quaternary Terrace deposits which occur at ground surface and are approximately forty feet thick at USGS test well K-24 (G-33) (Knowles, et al., 1963). The terrace materials consist principally of sands, silts and clays in their upper extent and coarsen with depth (i.e., coarse sands and gravel are prevalent). The terrace deposits at Maxwell AFB were examined in detail by Moser (1981), who reported the lithology as medium to coarse grained, poorly sorted sand, sandy clay and clay (upper extent of the formation).

Several Maxwell AFB test boring locations and all well locations are shown on Figure 3.5. A cross section based upon the test borings is

TABLE 3.2

GENERALIZED SECTION OF THE GEOLOGIC FORMATIONS IN MONTGOMERY COUNTY

System	Series	Stratigraphic Unit			Thickness	Lithology
Quaternary	Recent	Alluvium			0-40±	Sand, white to light-gray, silty, poorly sorted, lensing; some yellowish-orange to bluish-gray sandy clay.
	Pleistocene	Terrace Deposits			10-100±	Sand, pale-yellowish orange, cross-bedded, medium to very coarse grained, poorly sorted, ferruginous, quartzitic; dark-reddish-brown sandy clay; and lenses of well rounded gravel ranging in diameter from 4 to 256 mm.
Tertiary	Paleocene	Midway Group	Clayton Formation		--	Chalk, gray, sandy; grayish-white fossiliferous limestone; and gray sandy clay. Present only as outlier on high hill on Montgomery-Crenshaw County boundary.
Cretaceous	Upper Cretaceous	Selma Group	Providence Sand	Upper Member	85	Sand, pale-yellowish-orange, cross-bedded, fine- to coarse grained, poorly sorted; interbedded with white, pale-red-purple, and moderate-reddish-brown massive clay. Present as outliners capping high hills in southern Montgomery County.
				Perote Member	60	Sand, dark-gray to yellowish-orange very fine to fine-grained, micaceous, carbonaceous, ferruginous, calcareous-cemented, fossiliferous, thinly laminated with clayey silt; some thin beds of hard limonitic sandstone.
			Prairie Bluff Chalk		50-90	Chalk, light-olive-gray to yellowish-gray, massive, silty to finely sandy, micaceous, glauconitic, fossiliferous; becomes increasingly sandy toward top. Thins eastward and merges with Providence sand in Bullock County.
			Ripley Formation	Upper Member	180-315	Sand, greenish-gray to yellowish-gray, cross-laminated, fine- to very coarse-grained, poorly to well sorted, micaceous, ferruginous, limonitic, glaucontic, calcareous, fossiliferous; greenish-gray to pale-olive silty to sandy fissile micaceous, calcareous fossiliferous clay; and thin beds of hard-gray to yellowish-gray fine- to medium-grained argillaceous micaceous ferruginous glauconitic calcareous-cemented fossiliferous sandstone.
				Cusseta Sand Member	0-120	Sand, light-gray to pale-yellowish-orange, fine- to medium-grained, micaceous, glauconitic, fossiliferous; light-gray to white calcareous-cemented fossiliferous sandstone; and greenish-gray to white sandy chalk. Thins westward and merges into upper part of Demopolis chalk in central Montgomery County.

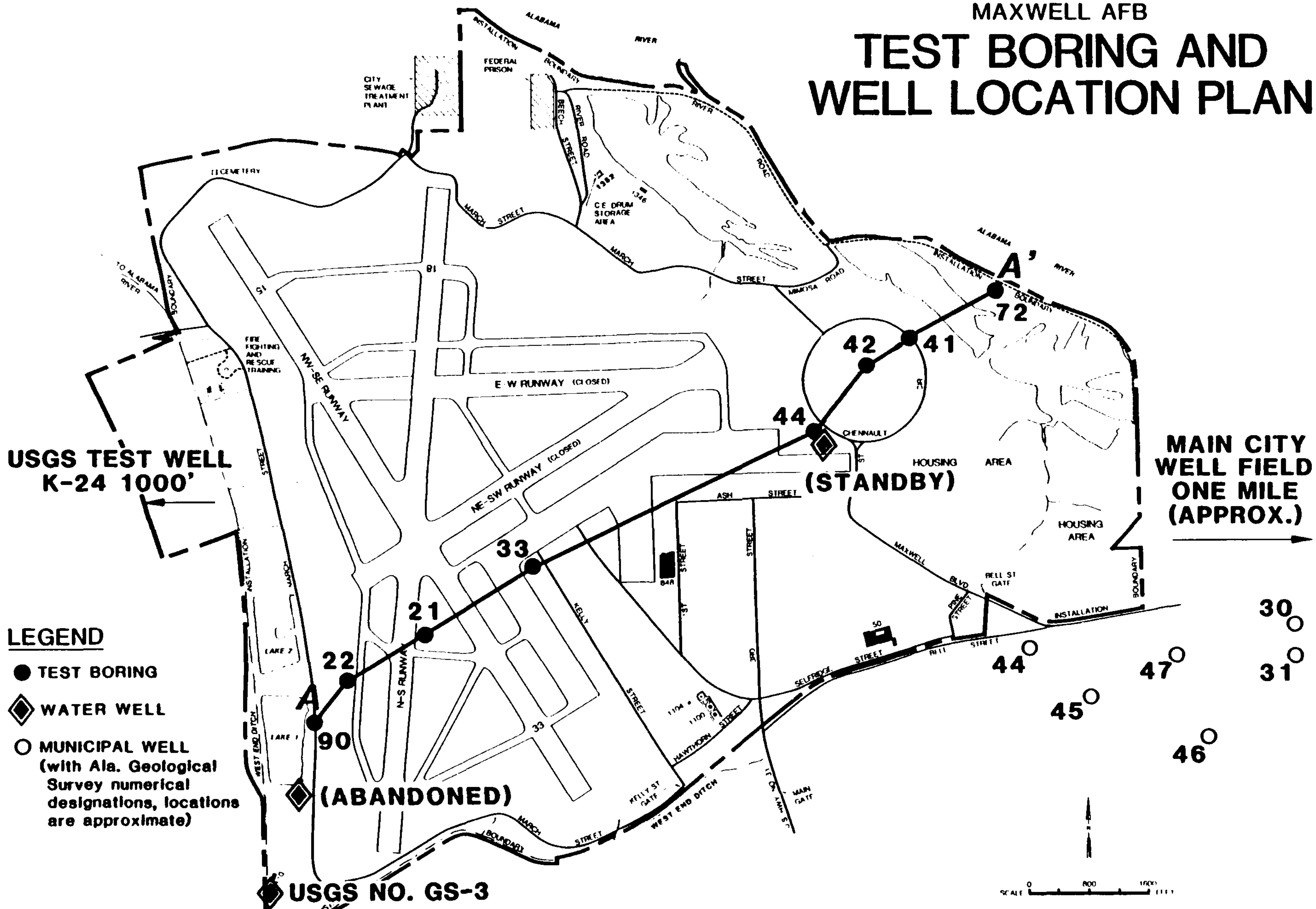
TABLE 3.2
(Continued)
GENERALIZED SECTION OF THE GEOLOGIC FORMATIONS IN MONTGOMERY COUNTY

System	Series	Stratigraphic Unit			Thickness	Lithology
Cretaceous (cont'd)	Upper Cretaceous (cont'd)	Selma Group (cont'd)	Demopolis Chalk		250-420	Upper and lower parts are chalk, light-greenish-gray to yellowish-gray, silty to finely sandy, clayey, micaceous, fossiliferous, separated by a bed of relatively pure fossiliferous; separated by a bed of relatively pure, fossiliferous chalk; contains bentonitic clay in southwestern part of county.
			Mooreville Chalk	Arcola Limestone Member	5-10	Limestone, impure, light-gray, thin-bedded, hard, dense, fossiliferous: two to four beds, 6 inches to 1 foot thick, separated by a bed of gray to pale-olive calcareous clay 3 to 6 feet thick.
				Lower Member	600	Chalk, light-greenish-gray to yellowish-gray, silty to finely sandy, argillaceous, ferruginous, fossiliferous; in eastern part of county grades laterally into gray to yellowish-orange sandy calcareous clay.
		Eutaw Formation			3-400	Sand, light-greenish-gray, cross-laminated, fine to medium-grained, well-sorted, micaceous, glauconitic, fossiliferous, interbedded with greenish-gray micaceous glauconitic fossiliferous clay and sandy clay. Upper part contains several hard beds, 6 inches to 1 foot thick, of light-gray to white fossiliferous medium-grained quartzitic glauconitic calcareous cemented sandstone.
		Tuscaloosa Group	Gordo Formation		195-340	Sand, pale-yellowish-orange, medium to coarse grained, poorly sorted, quartzitic, ferruginous-cemented; interbedded with moderate-reddish brown to pale-red-purple clay. Generally contains a thin bed of gravel at the base and elsewhere in the formation.
			Coker Formation		360-600±	Sand in upper 300 to 400 feet, light greenish-gray, medium to coarse-grained, well-sorted, micaceous, quartzitic, glauconitic, fossiliferous; thinly laminated with greenish-gray lignitic fossiliferous clay. Lower 150 to 200 feet is chiefly pale-yellowish-orange medium to coarse-grained arkosic sand interbedded with reddish-brown, pale-red-purple, and pale-green sandy clay. Contains thin beds of hard calcareous sandstone throughout.
Pre-Cretaceous Crystalline Rocks					Unknown	Biotite mica schist.

Source: Knowles, et al., 1963.

MAXWELL AFB

TEST BORING AND WELL LOCATION PLAN



ES ENGINEERING-SCIENCE

presented as Figure 3.6. This section depicts the highly variable nature of terrace deposits as they occur across the upper extent of Maxwell Air Force Base. Similar geologic conditions exist at Gunter Air Force Station. Alluvial materials, chiefly poorly graded fine sands and silts, characterize the surficial geology of lowland areas, floodplains and stream channels. These are recently deposited materials, associated with the development of area streams. Carlston (1944) reported the alluvium to be up to 90 feet thick in the Alabama River Valley.

Several Gunter AFS test boring locations and all well locations are shown on Figure 3.7. Figure 3.8 is a cross section that depicts the nature of terrace deposits as they are encountered at Gunter Air Force Station. The terrace materials are principally poorly graded sands which are occasionally underlain by gravels or gravel-bearing sands. Test boring water levels ranged from 12 to 20 feet below ground.

HYDROLOGY

Ground-water hydrology of the project area has been reported by Carlston (1944); Carter (1949); Powell, et al., (1957); Knowles, et al., (1960 and 1963) and Moser, (1981). Additional information has been obtained from an interview with a U.S. Geological Survey - Water Resources Division hydrologist.

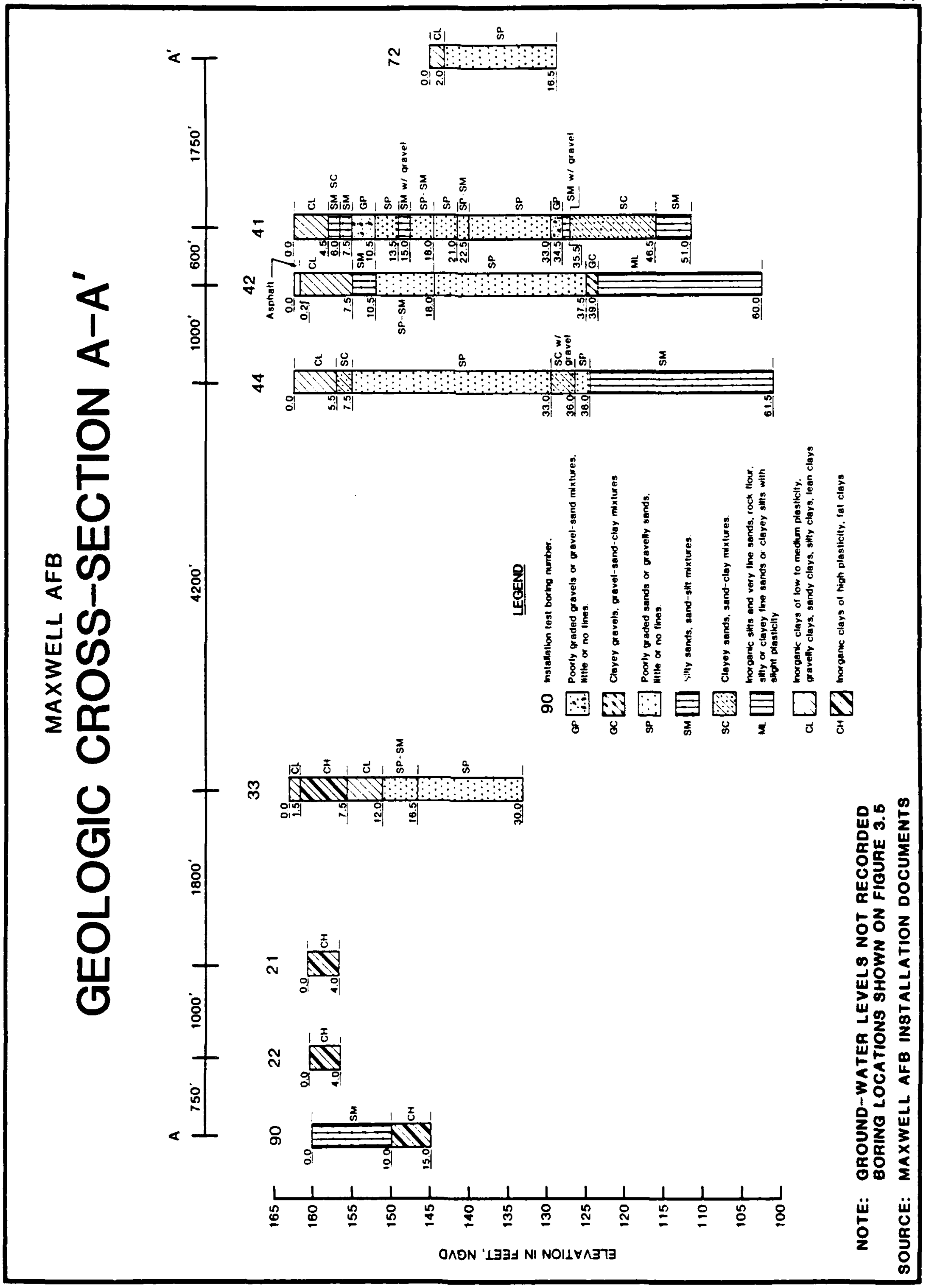
Hydrogeologic Units

Maxwell Air Force Base and Gunter Air Force Station both lie within the uplands section of the Gulf Coastal Plain. In this area several major hydrogeologic units have been identified, which are listed on Table 3.2. The units of particular interest to this investigation include the following:

- o Recent Alluvium
- o Pleistocene Terrace Deposits
- o Eutaw Formation
- o Gordo Formation
- o Coker Formation

These units are summarized in the following overview which has been divided according to the typical depths (shallow or deep) at which they

FIGURE 3.6



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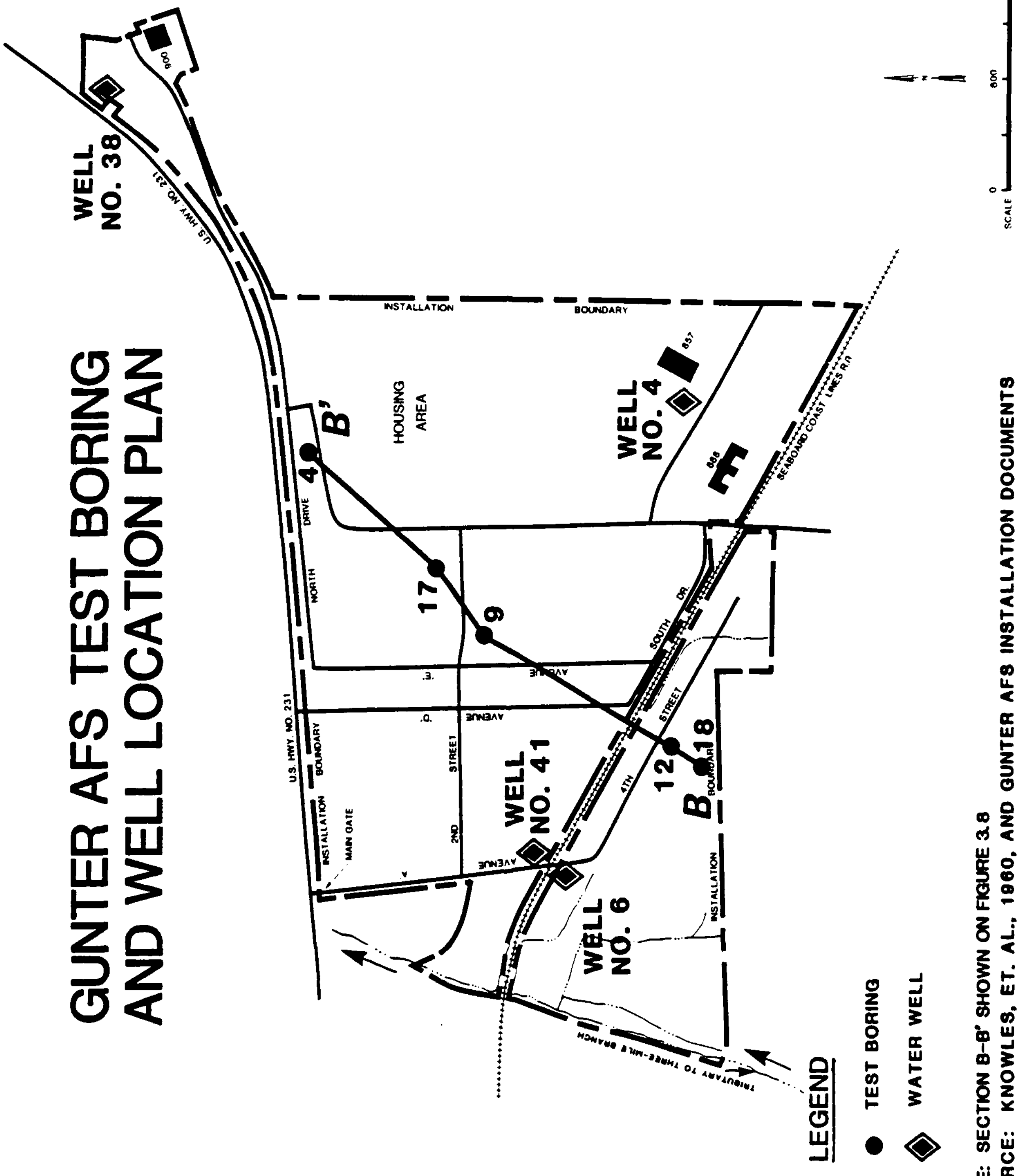
GUNTER AFS TEST BORING AND WELL LOCATION PLAN



LEGEND

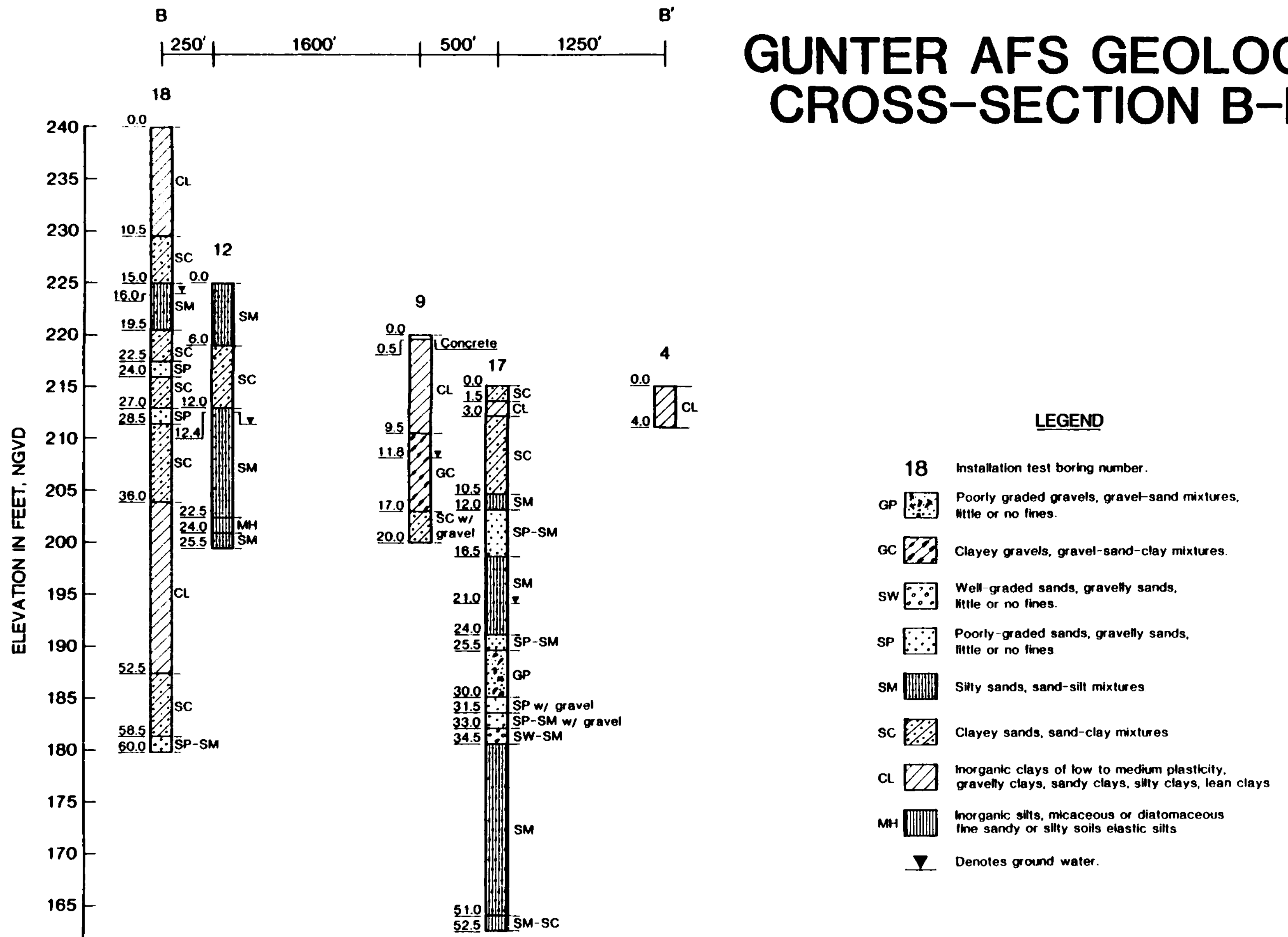
- ● TEST BORING
- ◆ WATER WELL

NOTE: SECTION B-B' SHOWN ON FIGURE 3.8

SOURCE: KNOWLES, ET. AL., 1960, AND GUNTER AFS INSTALLATION DOCUMENTS

FIGURE 3.8

GUNTER AFS GEOLOGIC CROSS-SECTION B–B'



SOURCE: GUNTER AFS INSTALLATION DOCUMENTS

NOTE: BORING LOCATIONS SHOWN ON FIGURE 3.7

may be encountered. They may be seen in stratigraphic sequence on Figure 3.9, a hydrogeologic cross section drawn through the project area.

Shallow Units

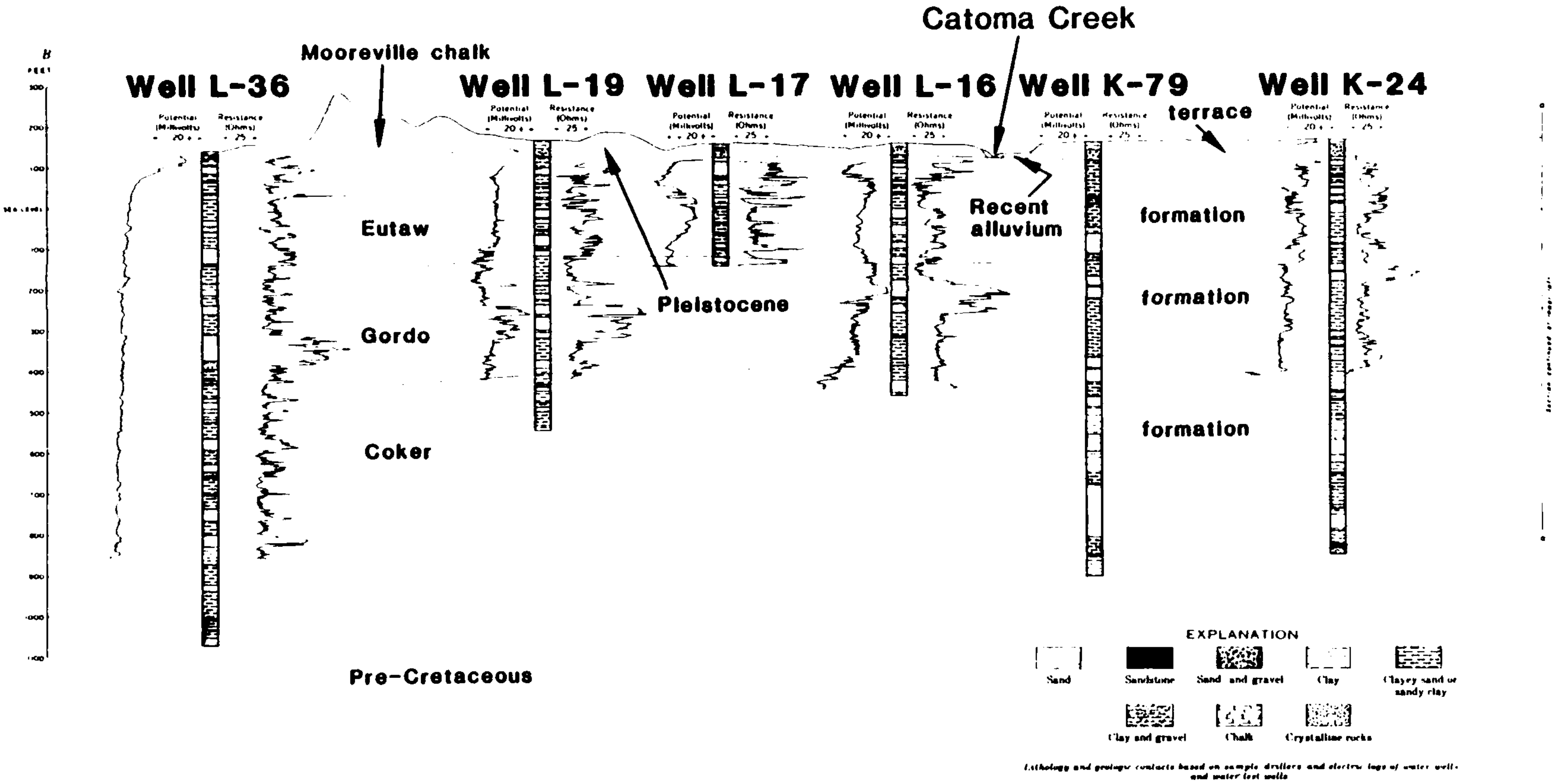
Two shallow hydrogeologic units are present within the study area: recent alluvium and the Pleistocene Terrace deposits. The alluvium consists principally of sand, silt and clay deposited by the meandering streams (especially the Alabama River) of the area. The alluvial deposits reach a maximum thickness of 40 feet in the study area, adjacent to the Alabama River. Ground water occurs in the alluvium under water table (unconfined) conditions. Recharge occurs by precipitation falling on any exposed portions of the unit and from the terrace deposits at higher elevations. Flow proceeds down slope with discharge directed to the Alabama River and the underlying Eutaw, with which the alluvium is in close hydraulic communication. The alluvium is also in contact with the underlying Eutaw. Much of the unit is presently at or below the level of the Alabama because of recent increases in the normal pool elevation of the Alabama. The alluvial aquifer is present along the northeast boundary of Maxwell Air Force Base, usually at elevations below 140 feet, NGVD, within the river channel. Water levels within the unit are usually close to ground surface. The alluvial aquifer does not occur at Gunter Air Force Station.

The ubiquitous terrace deposits form a significant shallow aquifer which is present beneath both Maxwell AFB and Gunter AFS (Knowles, et al., 1963). The unit consists of gravel, sand, silt and clay deposited by meandering streams (ancestral Alabama River) during Pleistocene time. The unit occurs at ground surface at both installations and is probably about 40 to 50 feet thick across the study area. Ground water usually occurs in the unit under water table (unconfined) conditions. Recharge enters the unit primarily as infiltrating precipitation. Both Maxwell AFB and Gunter AFS are located in the recharge area of this aquifer. Terrace deposit ground-water levels at Maxwell range from two feet below ground surface (Moser, 1981) to 10 feet below ground (Knowles, et al., 1960). Ground water depths at Gunter AFS range from 10 to 21 feet below ground surface (test boring data recorded on installation documents).

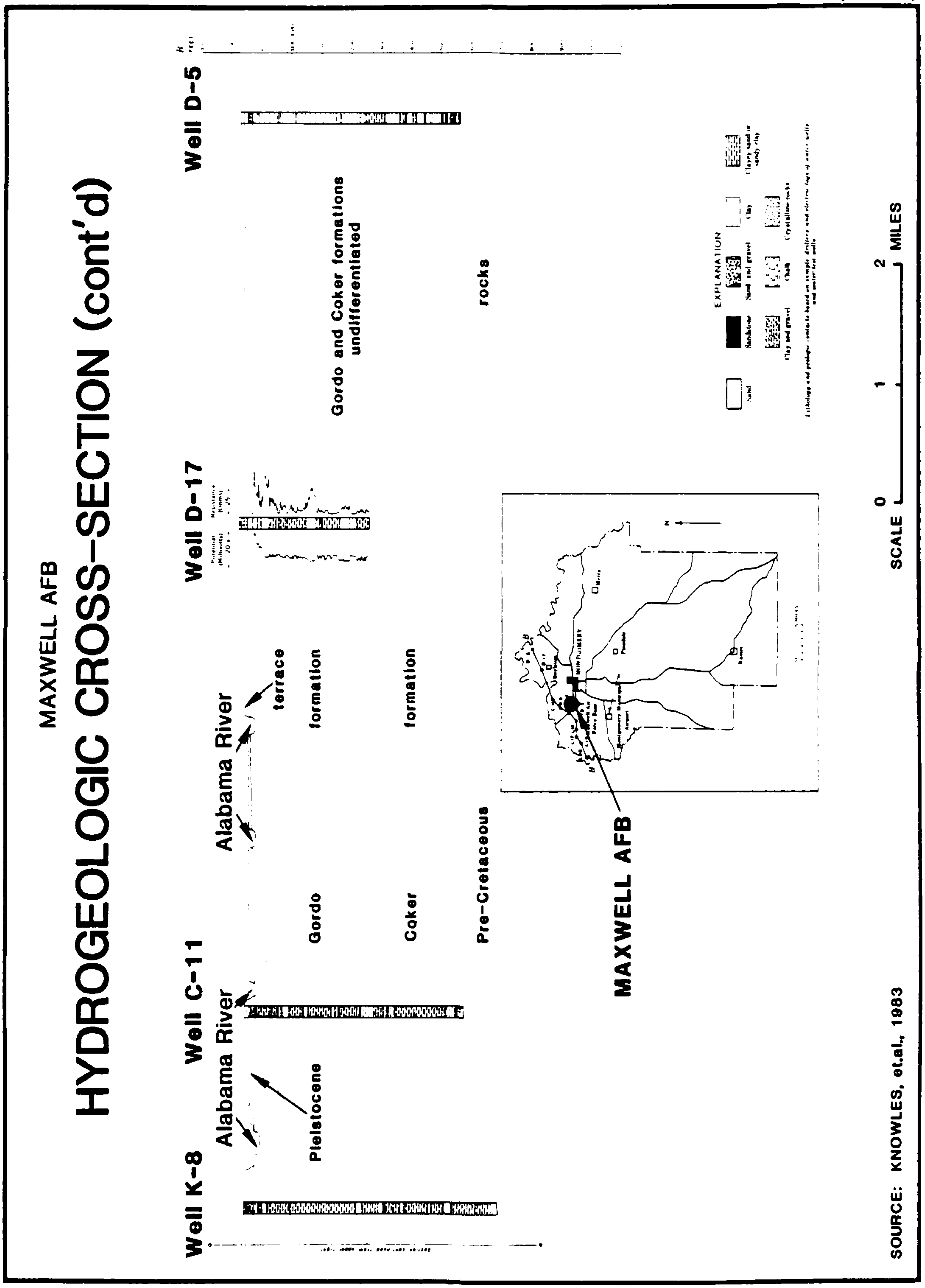
FIGURE 3.9

MAXWELL AFB

HYDROGEOLOGIC CROSS-SECTION



SOURCE: KNOWLES, et.al., 1983


MAXWELL AFB
HYDROGEOLOGIC CROSS-SECTION (cont'd)
Well K-8
Well C-11
Well D-17
Well D-5
Alabama River
Alabama River
Pleistocene
terrace
Gordo
formation
Coker
formation
Pre-Cretaceous
rocks
Gordo and Coker formations
undifferentiated
MAXWELL AFB
EXPLANATION
Sand
Sandstone
Clay and gravel
Sand and gravel
Chalk
Clay
Crystalline rocks
Clayey sand or sandy clay
SCALE
0
1
2
MILES
SOURCE: KNOWLES, et.al., 1983

Ground water flow within the terrace materials is probably a subdued replica of the topographic surface; water flow proceeds from higher elevations to low elevations. Discharge is directed to area surface streams and the underlying Eutaw Formation, as little or no effective separation is known to exist between the shallow and deeper aquifers.

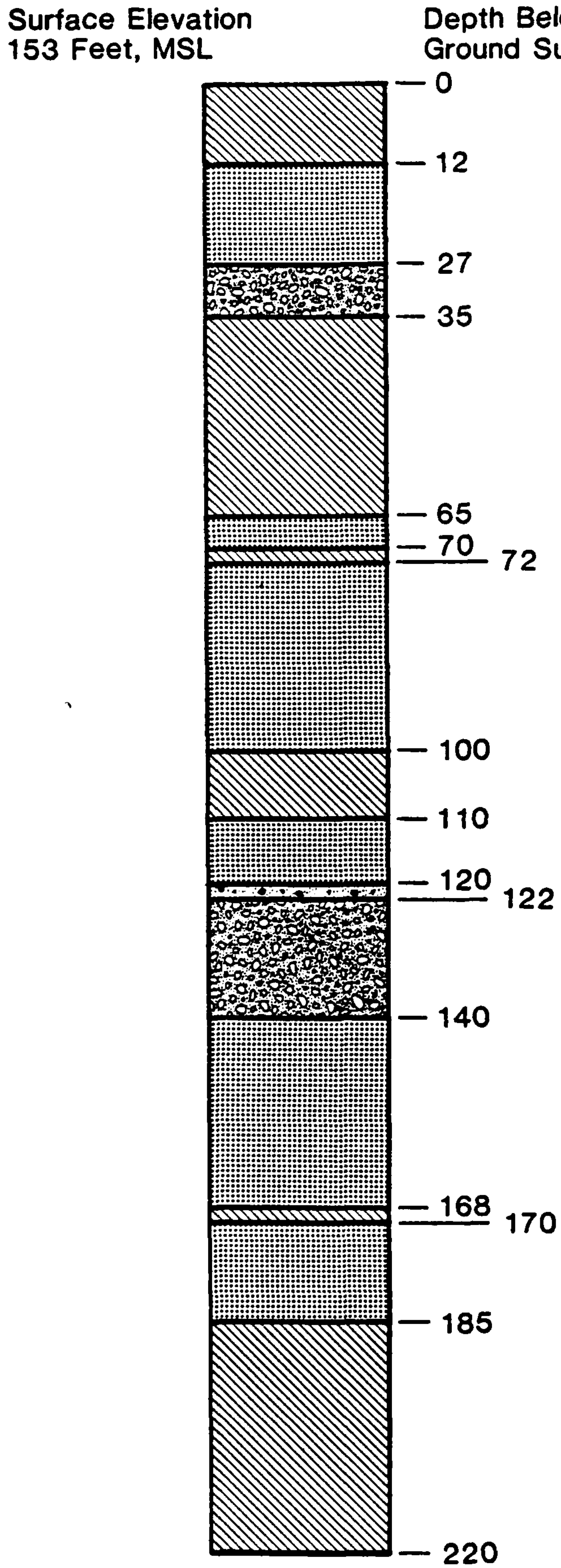
Deep Units

The deep hydrogeologic units present in the study area are, in order of occurrence, the Eutaw, Gordo and Coker Formations of Upper Cretaceous age. Figure 3.9 depicts the deep units in their stratigraphic relationships in a generalized hydrogeologic cross-section which has been modified from Knowles, et al., (1963).

Eutaw Formation

This unit is a regional aquifer which has been extensively developed in the study area. The Eutaw crops out as an arcuate belt two miles wide and 11 miles long in northern Montgomery County, just east of Maxwell AFB and approximately one mile south of Gunter AFS. It extends beneath both installations where it is unconformably overlain by some 40 feet of Pleistocene Terrace deposits. It is estimated to be 150 feet thick at Maxwell AFB and some 50 feet thick at Gunter AFS (extrapolated from Knowles, et al., 1963, Figure 7). Ground water occurs in the Eutaw under water table conditions in the outcrop area and under artesian conditions elsewhere. The Eutaw is recharged by infiltration of precipitation in its outcrop zones and by downward leakage from alluvial and Pleistocene Terrace deposits. The magnitude of leakage from overlying strata is not known. Natural (pre-pumping) ground-water flow in the Eutaw was most likely down-dip to the south from the principal recharge zones. Extensive water resource development has altered this scenario locally; large-scale drawdowns in the potentiometric surface of the unit probably direct flow towards major pumping centers such as municipal wells. Eutaw Formation artesian water levels were reported to be on the order of 150 feet, MSL at both Maxwell AFB and Gunter AFS (Powell, et al., 1960). Knowles, et al., (1960) reported the depth to water in the Eutaw as 10 feet below land in the well at Maxwell AFB, Building 1109. Figure 3.10 is the log of the well located at Building 1109. At Maxwell AFB, ground-water flow in the Eutaw was postulated to be east toward municipal wells located north of Montgomery, while flow in the same unit

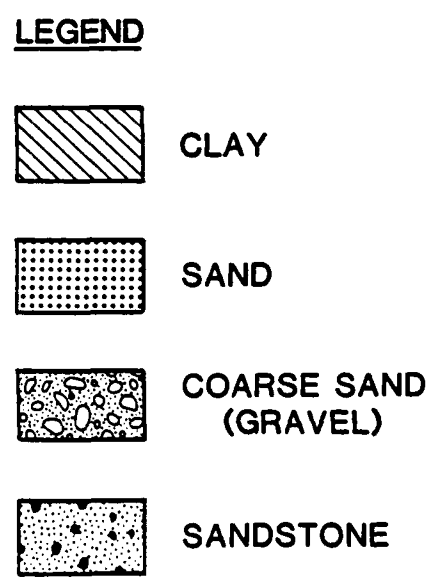
FIGURE 3.10



MAXWELL AFB

LOG OF USGS TEST WELL NO. GS-3

(ALABAMA GEOLOGICAL SURVEY WELL K-65, LOCATED AT BUILDING NO. 1109)



SOURCE: KNOWLES, et. al., 1960

was believed to be southwest with respect to Gunter AFS, toward the same well field. The Eutaw is capable of producing large supplies (1,500 gpm) of water to wells.

Gordo Formation

The Gordo is also considered to be a regional source of water, but is not as prolific as the Eutaw or underlying Coker. It is exposed in Autauga and Elmore Counties, north of Montgomery. In the study area, it is unconformably overlain by the Eutaw Formation. It generally occurs at a depth of 200 to 400 feet below surface at Montgomery west well field, located two miles southwest of Maxwell AFB. In Montgomery, the Gordo ranges in thickness from 250 to 300 feet and contains water under artesian conditions. Recharge occurs by infiltration of precipitation in the outcrop area (Autauga and Elmore Counties) and by leakage from overlying units. Formerly (1885), some Gordo wells installed just north of Montgomery flowed naturally under artesian pressures. By 1953 such flow had ceased and water levels declined to about 100 feet below land surface, due to the extensive use of the Gordo as a water supply. No reliable, current data is available to describe ground-water flow in the Gordo with respect to Maxwell AFB and Gunter AFS. The Gordo is capable of furnishing modest (200 gpm) supplies of water.

Coker Formation

The Coker is considered to be a prolific aquifer of regional importance. The unit crops out north of Montgomery in Autauga and Elmore Counties and dips gently south. It unconformably overlies crystalline basement rocks and is, in turn, unconformably overlain by the Gordo Formation. At Maxwell Air Force Base, the Coker occurs at an approximate depth of 500 feet below land surface and is estimated to be 600 feet thick at a test well just west of the installation (interpolated from Powell, et al., 1960, Plate 3). The unit is recharged primarily by infiltrating precipitation in its outcrop area. Reliable current data describing ground-water levels and flow directions is not available. Powell, et al., (1960) reported that as of 1953, ground-water levels in the Gordo and Coker Formations ("Tuscaloosa" aquifers) were similar. It is known that past extensive development of the aquifer and more recently the use of surface water to offset ground-water overdevelopment had at first created large-scale lowering of Coker water levels and then had permitted some recovery. The Coker is known to be an excellent water source, capable of producing large (1,000 gpm) supplies of water.

Base and Area Water Supplies

Formerly, Maxwell AFB and Gunter AFS obtained water resources from wells located on the installations. Three inactive wells are located on Maxwell AFB and four inactive wells are located on Gunter AFS and are shown on Figures 3.5 and 3.7, respectively. At present, both installations obtain water resources from the municipal system of Montgomery. The City of Montgomery obtains its water supplies by conjunctive use of both ground and surface waters. The surface water intake is located on the Tallapoosa River, near the confluence of the Coosa and Alabama Rivers. The municipal well system consists of forty-five wells located west and north of the urban area. Six of the wells are located near the southeast corner of Maxwell Air Force Base. Typically, city wells located west of the urban area are screened into both the Gordo and Coker Formations. Some wells located north of the city were reported to be screened into the Eutaw (Powell, et al., 1960). It is unlikely that the terrace and alluvial deposits are used as water sources in the study area.

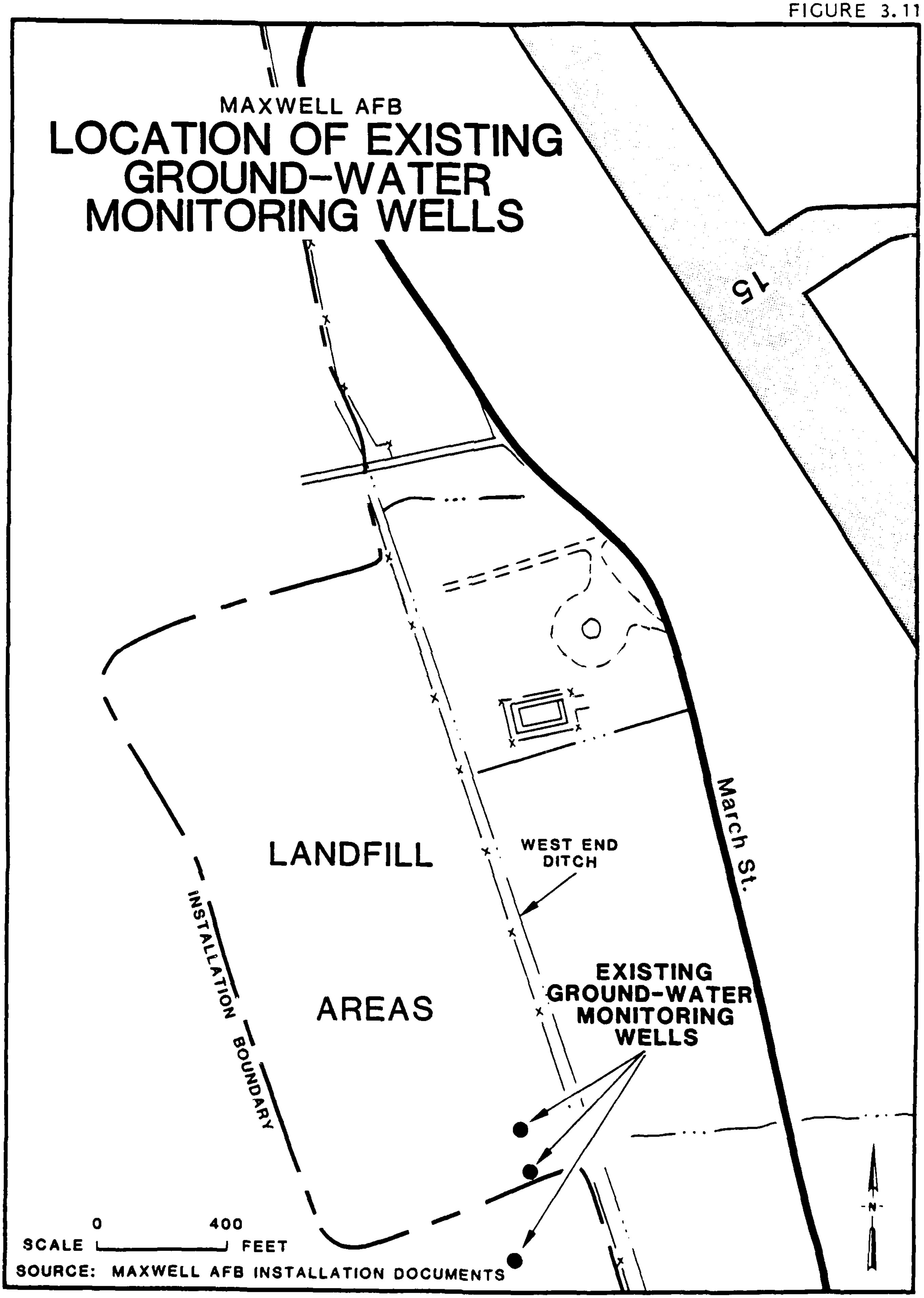
Ground-Water Quality

Powell, et al., (1960), Knowles, et al., (1963) and Scott (1983) report that water resources obtained from the Eutaw, Gordo and Coker Formations are generally very good. Wells screened into the upper extent of the Eutaw may encounter excessive amounts of iron locally. Bryant (1983) reports that the quality of water obtained from city wells is good, however, specific water quality analyses results for these wells were not available.

Installation Ground-Water Monitoring

At present, a ground-water monitoring system consisting of three shallow wells is being utilized to observe terrace deposit water quality near the active landfill (Figure 3.11). According to installation information (furnished August 1983) and Moser (1981), water levels adjacent to the landfill ranged from seven feet below land surface to 35 feet below ground, respectively. During an inspection of the facility's open trench, seepage into the pit which may be ground water, was observed. A comparison of trench depth and indicated water levels suggests that disposed wastes and terrace deposit ground water are in

FIGURE 3.11



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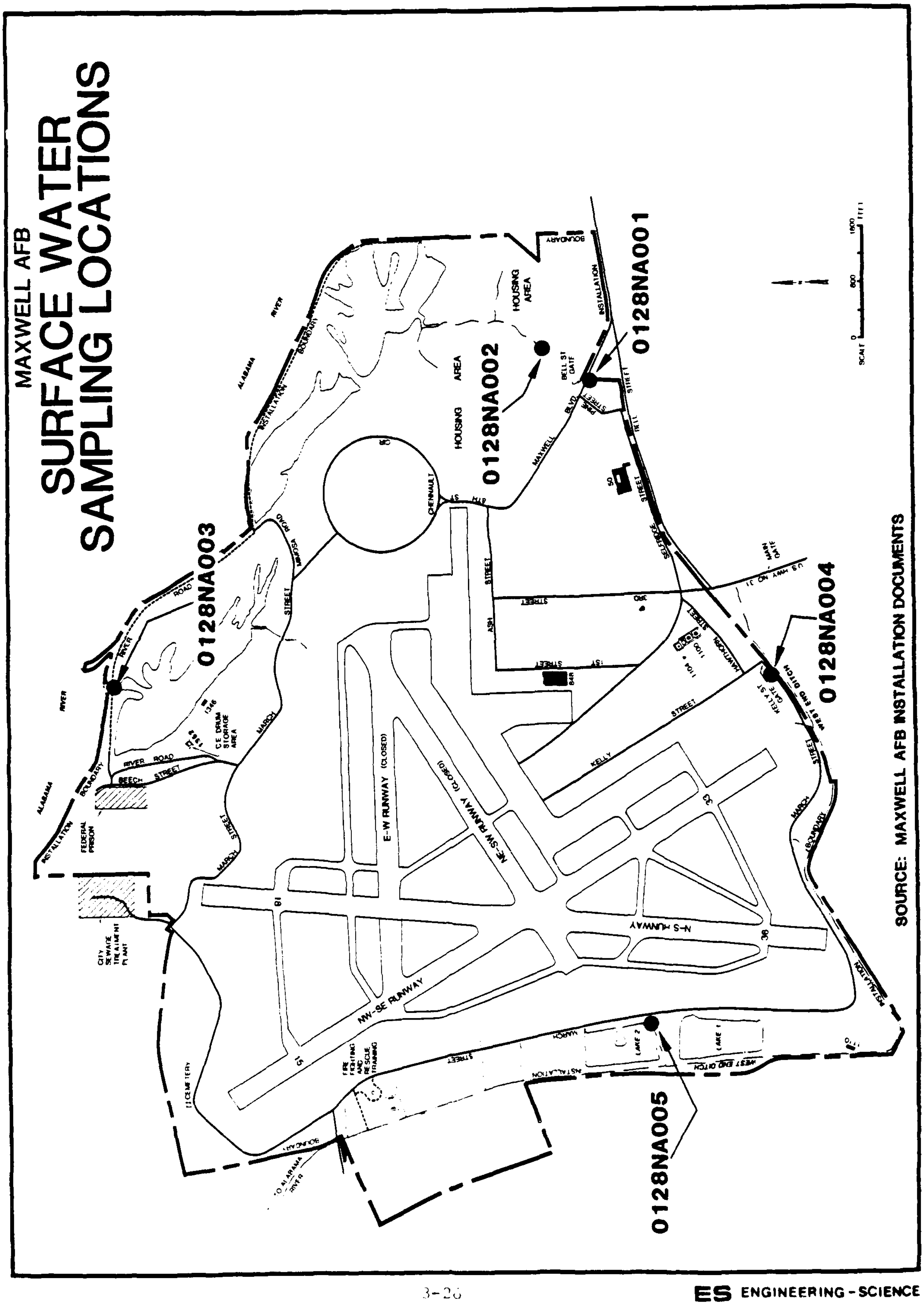
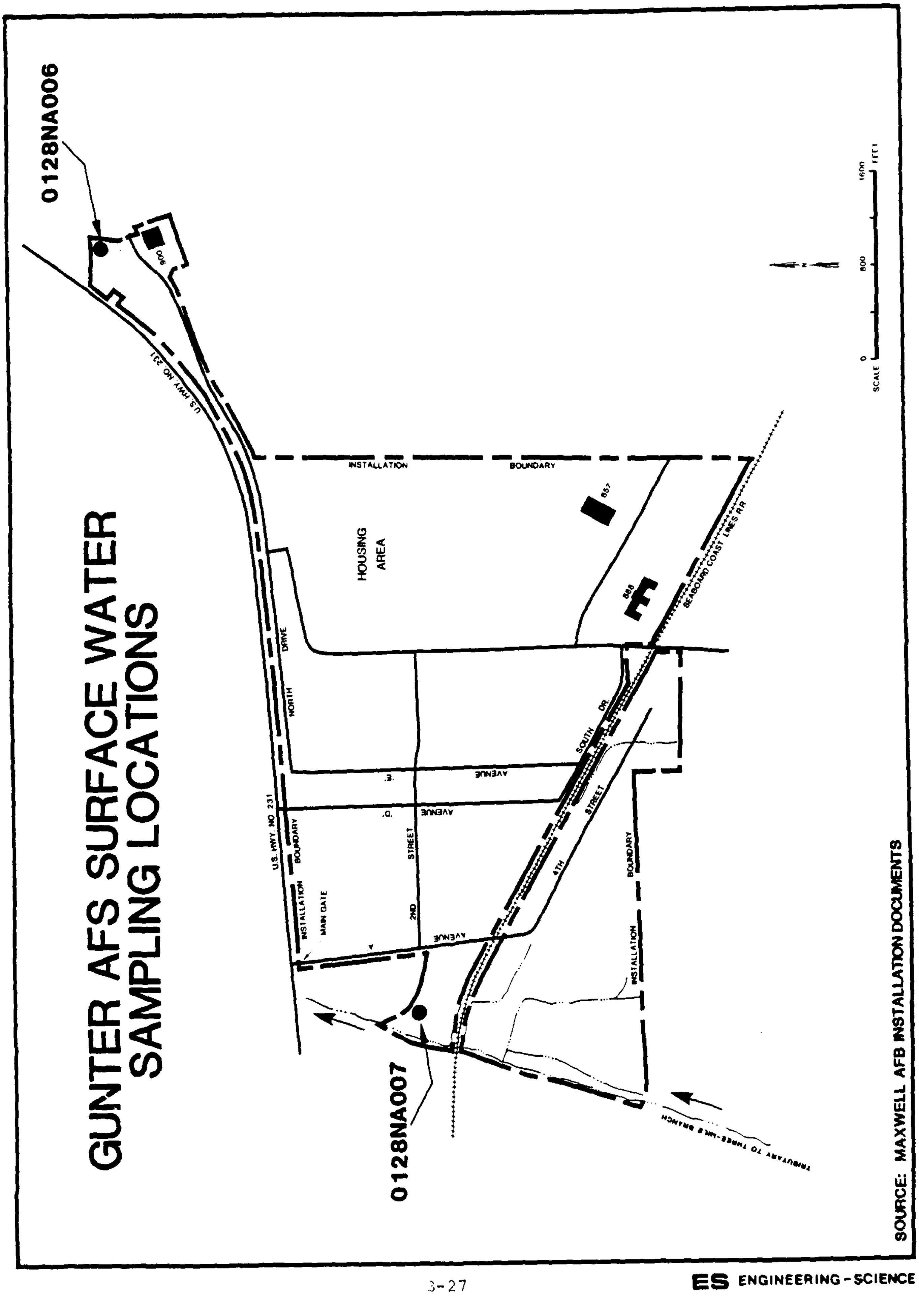
contact, at least seasonally. It is not possible to assess the appropriateness of the monitoring data as it is uncertain that monitoring wells have been installed in the proper locations with respect to buried waste materials and that the wells have been sampled correctly. No accurate ground-water elevations were available to evaluate the ground-water flow direction relative to the buried wastes.

Assuming that terrace deposit ground-water flow follows topographic influences, then discharge to the West End Ditch would be expected. Because the downgradient wells are apparently installed on a line parallel to the active trench, but south of same, it would seem that these wells are not situated properly to intercept migrating contamination, should it exist. Also, because driller's logs and monitoring well installation details were not available, it is not known how the wells were constructed or if they tap a zone from which representative ground-water quality samples may be obtained. Also, the method of sample collection utilized by the outside contractor involved obtaining grab samples of ground water from each well without first pumping out the stagnant water then letting the well recharge with representative effluent.

Surface Water Quality

Base personnel routinely collect and analyze water samples from various surface drainage locations on Maxwell AFB and Gunter AFS in accordance with NPDES Permit No. AL0003727 and AL0003719, respectively. The locations of the five monitoring points for Maxwell AFB are shown in Figure 3.12 and the two locations for Gunter AFS are shown in Figure 3.13. The parameters for each sampling point have included flow, pH, oil and grease, suspended solids, temperature and fecal coliform. Sampling point 0128NA001 is the influent of the surface drainage from a portion of the City of Montgomery to the east side of Maxwell AFB. Sampling point 0128NA003 on Maxwell AFB and sampling points 0128NA006 and 0128NA007 on Gunter AFS monitor surface drainage effluents exiting the installations. Sampling point 0128NA002 on Maxwell AFB monitors a drainage stream prior to discharge into an on-base lake while sampling points 0128NA004 and 0128NA005 monitor surface drainage streams prior to discharge into the West End Ditch. None of the sampling points monitor


MAXWELL AFB
SURFACE WATER SAMPLING LOCATIONS
0128NA001
0128NA002
0128NA003
0128NA004
0128NA005
HOUSING AREA
FEDERAL PRISON
CITY SEWAGE TREATMENT PLANT
CEMETERY
E-W RUNWAY (CLOSED)
NE-SW RUNWAY (CLOSED)
N-S RUNWAY
NW-SE RUNWAY
INSTALLATION BOUNDARY
ALABAMA RIVER
RIVER ROAD
BEECH STREET
MARCH STREET
KELLY STREET
SELFRIDGE STREET
ASH STREET
CHENNAULT CIR
WEST END DITCH
C.E. DRUM STORAGE AREA
FIRE FIGHTING AND RESCUE TRAINING
LAKE 1
LAKE 2
BELL ST GATE
KELLY ST GATE
MAIN GATE
U.S. HWY NO. 31
SOURCE: MAXWELL AFB INSTALLATION DOCUMENTS


GUNTER AFS SURFACE WATER
SAMPLING LOCATIONS
0128NA006
0128NA007
U.S. HWY. NO. 231
INSTALLATION BOUNDARY
HOUSING AREA
NORTH DRIVE
SOUTH DR.
4TH STREET
2ND STREET
AVENUE 'A'
AVENUE 'D'
AVENUE 'E'
MAIN GATE
SEABOARD COAST LINES RR
TRIBUTARY TO THREE-MILE BRANCH
857
858
900
SCALE
0
800
1600
FEET
SOURCE: MAXWELL AFB INSTALLATION DOCUMENTS

West End Ditch directly. A review of the NPDES monitoring data for the period May 16, 1979 through March 31, 1983, indicated no water quality problems at the required sampling points.

Beginning in May 1982, the number of parameters analyzed at 0128NA001 (influent to the base) was expanded to include cyanide, phenols, arsenic, cadmium, lead and mercury. A summary of the sample analysis data is shown in Appendix E, Table E.1. The data indicates that elevated levels of arsenic (1.5 mg/l maximum) and lead (1.3 mg/l maximum) are present in the surface drainage entering the base. Levels of phenols and oil and grease are also indicated. Levels of cyanide, cadmium and mercury were negligible or less than detectable limits. The surface drainage flows through 0128NA002 on the east side of the base and enters a series of on-base lakes which drain to the Alabama River. The source or sources of the off-base contaminants have not been identified.

Endangered Species

There are no known endangered or threatened species of plants or animals on either Maxwell AFB or Gunter AFS.

SUMMARY OF ENVIRONMENTAL SETTING

The environmental setting data reviewed for this investigation indicated that the following major items are relevant to the assessment of past hazardous waste management practices at Maxwell Air Force Base and Gunter Air Force Station:

- Study area mean annual precipitation is reported to be 52.1 inches and net precipitation was calculated to be approximately eight inches which represents the meteoric water available for infiltration. The 24-hour maximum rainfall event is 6.3 inches.
- Much of Maxwell AFB is located in the zone flooded by a 100-year event. Gunter AFS is located above the 100-year flood zone.
- Surface soils at both Maxwell AFB and Gunter AFS tend to be moderately to poorly permeable, but are underlain by highly permeable soils at shallow depths.

- The terrace deposit aquifer is present at ground surface at both Maxwell AFB and Gunter AFS. Water levels in this unit are shallow (3.5 to 7 feet below ground).
- The terrace deposits form the shallow aquifer in the study area and directly overlie and provide recharge to the Futaw, which is present at shallow depth (40 feet) below ground surface. The Eutaw is a major regional aquifer. No separation exists between the terrace materials and the Eutaw. The water level in the Eutaw was measured at 10 feet below ground surface in a well at Maxwell AFB.
- Two major regional aquifers, the Gordo and Coker exist below the Eutaw and communicate with it. The city obtains most of its ground-water supplies from these two aquifers.
- Contaminants including arsenic and lead are entering the base through the surface drainage influent from a portion of the City of Montgomery on the east side of Maxwell AFB.
- No known endangered or threatened species of plants or animals exist on either Maxwell AFB or Gunter AFS.

From these major points it may be noted that potential pathways for the migration of hazardous waste-related contamination exist. Hazardous materials present at ground surface could be mobilized to the area's shallow aquifer (terrace deposits) and subsequently discharged to local surface streams or transferred to the underlying Futaw or Gordo Formations as recharge.

SECTION 4

FINDINGS

To assess hazardous waste management at Maxwell AFB and Gunter AFS, past waste generation and disposal methods were reviewed. This section summarizes the hazardous waste generated by activity; describes past waste disposal methods; identifies the disposal sites located on the base; and evaluates the potential for environmental contamination.

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 activity consisted of a review of files and records, interviews with current and former base employees, and site inspections.

The source of most hazardous wastes on Maxwell AFB and Gunter AFS can be associated with one of the following activities:

- o Industrial Operations (Shops)
- o Pesticide Utilization
- o Fuels Management
- o Fire Protection Training
- o Waste Storage Areas

The following discussion addresses only those wastes generated on Maxwell AFB and Gunter AFS 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 material.

Industrial Operations (Shops)

A large number of the shops and related operations at Maxwell and Gunter utilize hazardous materials. Many are consumed in the process and do not result in a waste material for disposal. Appendix D lists the shop activities which handle hazardous materials and generate hazardous waste. The present shop locations and treatment, storage and disposal methods are also indicated in Appendix D. These data were developed from the Bioenvironmental Engineer's files and interviews with shop employees.

Interviews were conducted with several long-time shop employees at Maxwell and Gunter. These interviews were supplemented by a careful review of the bioenvironmental engineer files and an internal Air Force report (AF OEHL, 1969) which dealt with industrial waste discharges at Maxwell. A summary of the shop activity review is presented in Table 4.1. The shop name (past and present), waste materials, approximate quantities of waste, and the disposal procedures are included. Shops which generate small quantities of wastes are not indicated in Table 4.1.

The information in Table 4.1 shows estimated timelines for hazardous waste management practices by shop and by waste material. The solid lines indicate those practices which were confirmed while the dashed line indicates the practices which were assumed to have been in effect. Waste quantities listed in Table 4.1 are based on present or most recent data available. If no quantity data were available, best estimates were made from discussions with interviewees.

As previously discussed in Section 2, the flying activities at Maxwell have steadily declined. The primary flying missions occurred at Maxwell AFB from 1941 to 1946 and from the 1950's to early 1960's. Aircraft shops at Gunter AFS were active from 1942 until 1949. Shop interviewees estimated that the current shop quantities would represent approximately one-half to one-third the waste disposal quantities of past years at Maxwell AFB. A comparison of past shop quantities with present quantities at Gunter AFS could not be made.

From the 1940's to 1974, most of the combustible liquid wastes such as oils, fuels, thinners and solvents were drummed and taken to the fire protection training areas at Maxwell AFB for burning. In 1974, this

TABLE 4.1

INDUSTRIAL OPERATIONS (Shops)

Waste Management

SHOP NAME	LOCATION (BLDG. NO.)	WASTE MATERIAL	WASTE QUANTITY	METHOD(S) OF TREATMENT, STORAGE & DISPOSAL (1950 1960 1970 1980)
3800 AIR BASE WING (ABW)/ 908 AIR RESERVE GROUP (CONSOLIDATED MAINTENANCE)				
AEROSPACE GROUND EQUIPMENT (AGE)	1023/1025	DIESEL FUEL	55 GALS./YR.	1940 FPTA → DPDO
		PD-680/PS-661	55 GALS./YR.	FPTA → DPDO
		OILS	330 GALS./YR.	FPTA → DPDO
		HYDRAULIC FLUID	120 GALS./YR.	FPTA → DPDO
		ALKALINE DESCALER, PAINT STRIPPER & PD-680	450 GALS./YR.	FPTA → OBC
ELECTRIC/BATTERY	848	PD-680/PS-661	220 GALS./YR.	1955 FPTA OR SURFACE DRAINAGE SYSTEM → OBC
		ACID & ALKALI	156 GALS./YR.	SANITARY SEWER → NEUTRALIZED SANITARY SEWER
NON-DESTRUCTIVE INSPECTION	848	PENETRANTS	110 GALS./YR.	SURFACE DRAINAGE SYSTEM → DPDO
		EMULSIFIERS	110 GALS./YR.	SURFACE DRAINAGE SYSTEM → DPDO
		DEVELOPERS	15 GALS./YR.	SURFACE DRAINAGE SYSTEM → SILVER RECOVERY, SANITARY SEWER
		FIXER SOLUTION	3 GALS./YR.	SURFACE DRAINAGE SYSTEM → DPDO

KEY

——— CONFIRMED TIME-FRAME DATA BY SHOP PERSONNEL

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

FPTA - FIRE PROTECTION TRAINING AREA

OBC - OFF-BASE CONTRACTOR

TABLE 4.1 (cont'd)

INDUSTRIAL OPERATIONS (Shops)

Waste Management

SHOP NAME	LOCATION (BLDG. NO.)	WASTE MATERIAL	WASTE QUANTITY	METHOD(S) OF TREATMENT, STORAGE & DISPOSAL (1950 1960 1970 1980)
CORROSION CONTROL/PAINT	848	PAINTS & THINNERS	600 GALS./YR.	1940 FPTA → OBC
		WATERFALL EFFLUENT AND SLUDGE	4000 GALS./YR.	SURFACE DRAINAGE SYSTEM → OBC
PNEUDRAULICS SHOP	848	PD-680/PS-661	110 GALS./YR.	FPTA → DPDO
		HYDRAULIC FLUID	3 GALS./YR.	FPTA → DPDO
MACHINE SHOP	848	MACHINE OIL & PD-680/PD-661	1 GAL./YR.	FPTA → DPDO
AIRCRAFT WASHING & PAINT STRIPPING	W OF 689	CALLA 301 & PD-680/PS-661	NOT AVAILABLE	SURFACE DRAINAGE SYSTEM → 74 CLOSED
	E OF 847	PAINT STRIPPER & CLEANING SOLVENT	NOT AVAILABLE	SURFACE DRAINAGE SYSTEM → CLOSED
	S OF 645	PD-680/PS-661	NOT AVAILABLE	SURFACE DRAINAGE SYSTEM → CLOSED
	N OF 1025	RINSEWATER WITH CLEANING COMPOUND	100-200 GALS./WK.	SURFACE DRAINAGE SYSTEM → OIL WATER SEPARATOR TO SURFACE DRAINAGE SYSTEM
908 AIR RESERVE GROUP (MAINTENANCE)				
FLIGHTLINE MAINTENANCE	689	HYDRAULIC FLUID	INCLUDED WITH BLDG. 848	(COMBINED WITH 3800 ABW) 1969 FPTA → DPDO

KEY

——— CONFIRMED TIME-FRAME DATA BY SHOP PERSONNEL

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

FPTA - FIRE PROTECTION TRAINING AREA

OBC OFF-BASE CONTRACTOR

TABLE 4.1 (cont'd)

INDUSTRIAL OPERATIONS (Shops)

Waste Management

SHOP NAME	LOCATION (BLDG. NO.)	WASTE MATERIAL	WASTE QUANTITY	METHOD(S) OF TREATMENT, STORAGE & DISPOSAL (1950 – 1960 – 1970 – 1980)
ENGINE/PROPELLOR	848	PD-680/KEROSENE	60 GALS./YR.	1969 FPTA → DPDO
		OIL	420 GALS./YR.	FPTA → DPDO
TIRE SHOP	848	PD-680	500 GALS./YR.	FPTA → DPDO
3800 ABW/MAINTENANCE				
FLIGHTLINE MAINTENANCE (INCL. TRANSIENT AIRCRAFT AND 908 FLIGHTLINE MAINTENANCE)	848	PD-680/PS-661	110 GALS./YR.	1940 FPTA → DPDO
		JP-4	110 GALS./YR.	FPTA
		OIL & HYDRAULIC FLUIDS	110 GALS./YR.	FPTA → DPDO
ELECTROPLATING SHOP	848	PLATING BATHS(Cu, Ni, Cr & Cd)	240 GALS./YR. (WHEN DUMPED)	ELECTROPLATING WASTE DISPOSAL SITE → NO WASTES → 1971 CLOSED
		RINSEWATER	100,000 GALS./YR.	SURFACE DRAINAGE SYSTEM → CLOSED
		ACIDS	50 GALS./YR.	SURFACE DRAINAGE SYSTEM → CLOSED
		TRICHLOROETHYLENE SLUDGE	50 GALS./YR.	NOT AVAILABLE → LANDFILL → CLOSED

KEY

——— CONFIRMED TIME-FRAME DATA BY SHOP PERSONNEL

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

FPTA - FIRE PROTECTION TRAINING AREA

OBC - OFF-BASE CONTRACTOR

TABLE 4.1 (cont'd)

INDUSTRIAL OPERATIONS (Shops)

Waste Management

SHOP NAME	LOCATION (BLDG. NO.)	WASTE MATERIAL	WASTE QUANTITY	METHOD(S) OF TREATMENT, STORAGE & DISPOSAL (1950 / 1960 / 1970 / 1980)
AIRCRAFT CLEANING, REPAIR & PAINTING (LOCKHEED)	1023	ALKALINE DERUSTER	1200 GALS./YR.	1967 FPTA 1973 → CLOSED
	342	PD-680 & ALKALINE CLEANING COMPOUNDS	1320 GALS./YR.	SANITARY SEWER → CLOSED
		SKIN BRIGHTENER	1320 GALS./YR.	SANITARY SEWER → CLOSED
		ALODINE 1200	660 GALS./YR.	SANITARY SEWER → CLOSED
	843	PAINT WASTES (MEK)	UNKNOWN	FPTA → CLOSED
ABW/SUPPLY				
FUELS STORAGE/INSPECTION	1101/1104	AVGAS	50 GALS./YR.	1940 FPTA OR DPDO → DPDO → WASTE RECLAIMED
		JP-4	50 GALS./YR.	FPTA OR DPDO → DPDO → WASTE RECLAIMED
		TANK SLUDGES	275 GALS./4 YRS.	WEATHERED TO LANDFILL
VEHICLE MAINTENANCE (GENERAL & HEAVY EQUIPMENT)	936	OILS	1980 GALS./YR.	FPTA → DPDO
		PAINT WATERFALL EFFLUENT	6000 GALS./YR.	SURFACE DRAINAGE SURFACE → OIL-WATER SEPARATOR TO SURFACE DRAINAGE SYSTEM
		RADIATOR CLEANER	1 GAL./YR.	SURFACE DRAINAGE SYSTEM → OIL-WATER SEPARATOR TO SURFACE DRAINAGE SYSTEM
REFUELING VEHICLE MAINTENANCE	1063	OILS	250 GALS./YR.	FPTA → DPDO

KEY

——— CONFIRMED TIME-FRAME DATA BY SHOP PERSONNEL

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

FPTA - FIRE PROTECTION TRAINING AREA

OBC - OFF-BASE CONTRACTOR

TABLE 4.1 (cont'd)

INDUSTRIAL OPERATIONS (Shops)

Waste Management

SHOP NAME	LOCATION (BLDG. NO.)	WASTE MATERIAL	WASTE QUANTITY	METHOD(S) OF TREATMENT, STORAGE & DISPOSAL (1950 – 1960 – 1970 – 1980)
LAWN MOWER MAINTENANCE	924	OILS	2670 GALS./YR.	1940 FPTA → DPDO
ABW/MORALE, WELFARE & RECREATION				
AUTO/WOOD HOBBY SHOP	1067	OIL, SOLVENT, KEROSENE	1820 GALS./YR.	FPTA → DPDO
ABW/BASE CIVIL ENGINEERING				
PROTECTIVE COATING/PAINT	78	PAINTS, THINNER & STRIPPER	350 GALS./YR.	FPTA → OBC
		WATERFALL SLUDGE	20 GALS./YR.	LANDFILL
HEATING SYSTEMS MAINTENANCE	78	CLEANING SOLVENT	290 GALS./YR.	FPTA → DPDO
		CUTTING FLUID	2 GALS./YR.	FPTA → OBC
POWER PRODUCTION	82	OIL & FUEL	110 GALS./YR.	FPTA → OBC
REFRIGERATION/AIR CONDITIONING	82	PD-680/PS-661	110 GALS./YR.	FPTA → USE OF SOLVENT DISCONTINUED
FIRE PREVENTION	1043	CHLOROBROMOMETHANE	10 GALS./YR.	DISCHARGED TO GROUND → OBC

KEY

——— CONFIRMED TIME-FRAME DATA BY SHOP PERSONNEL

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

FPTA - FIRE PROTECTION TRAINING AREA

OBC - OFF-BASE CONTRACTOR

TABLE 4.1 (cont'd)

INDUSTRIAL OPERATIONS (Shops)

Waste Management

SHOP NAME	LOCATION (BLDG. NO.)	WASTE MATERIAL	WASTE QUANTITY	METHOD(S) OF TREATMENT, STORAGE & DISPOSAL (1950 – 1960 – 1970 – 1980)
PAVEMENTS/GROUNDS AND ENTOMOLOGY	1338 (ALSO 1013)	PESTICIDE RINSEWATER	5 - 10 GALS./WK.	1940 DISCHARGED TO GROUND → SANITARY SEWER
		EMPTY CONTAINERS	5 - 10/MO.	UNRINSED TO LANDFILL → RINSED TO LANDFILL
GOLF COURSE MAINTENANCE	1441	PESTICIDE RINSEWATER	10 - 15 GALS./WK.	DISCHARGED TO GROUND
		EMPTY CONTAINERS	5 - 10/MO.	UNRINSED TO LANDFILL
3800 AIR BASE SQUADRON (ABS)/ CIVIL ENGINEERING (GUNTER AFS)				
PAVEMENTS AND GROUNDS	560	PESTICIDE RINSEWATER	5 - 10 GALS./MO.	DISCHARGED TO SURFACE DRAINAGE SYSTEM
		EMPTY CONTAINERS	2 - 5/MO.	RINSED TO HARDFILL AREA → RINSED TO SANITARY LANDFILL
ENTOMOLOGY	503	PESTICIDE RINSEWATER	5 - 10 GALS./MO.	SANITARY SEWER
		EMPTY CONTAINERS	2 - 5/MO.	RINSED TO HARDFILL AREA → RINSED TO SANITARY LANDFILL
PROTECTIVE COATING/PAINT	512	PAINT RESIDUALS	15 GALS./YR.	LEASED LANDFILL → MAXWELL LANDFILL
		THINNERS	55 GALS./YR.	MAXWELL FPTA → OBC

KEY

——— CONFIRMED TIME-FRAME DATA BY SHOP PERSONNEL

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

FPTA FIRE PROTECTION TRAINING AREA

OBC OFF BASE CONTRACTOR

TABLE 4.1 (cont'd)

INDUSTRIAL OPERATIONS (Shops)

Waste Management

SHOP NAME	LOCATION (BLDG. NO.)	WASTE MATERIAL	WASTE QUANTITY	METHOD(S) OF TREATMENT, STORAGE & DISPOSAL (1950 1960 1970 1980)
ABS/MORALE, WELFARE & RECREATION (GUNTER AFS)				
AUTO HOBBY SHOP	715	OILS	1980 GALS./YR.	1940 - - - - MAXWELL FPTA ——→ DPDO ——→
ABS/TRANSPORTATION (GUNTER AFS)				
VEHICLE MAINTENANCE	715	OILS	110 GALS./YR.	- - - - MAXWELL FPTA ——→ DPDO ——→
ABS/MAINTENANCE (GUNTER AFS)				
ENGINE OVERHAUL	857	OILS	NOT AVAILABLE	1951 - - - DPDO OR FPTA - - -→ 1971 CLOSED

KEY

——— CONFIRMED TIME-FRAME DATA BY SHOP PERSONNEL

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

FPTA - FIRE PROTECTION TRAINING AREA

OBC OFF BASE CONTRACTOR

practice was discontinued and these wastes were either stored at the point of generation at Maxwell AFB or Gunter AFS or taken to a drum storage area at Facility 1352. Arrangements were made through Base Civil Engineering and/or Defense Property Disposal Offices (DPDO) to sell the material to a waste oil contractor.

From the 1940's to the early 1970's, aqueous industrial waste solutions from the Maxwell AFB shops were discharged to the surface drainage system which discharges to West End Ditch and the Alabama River. The solutions included washrack wastewater, paint stripper, dilute acids and dilute caustics. Since the early 1970's oil/water separators have been installed and neutralization of acid and caustic wastes is practiced.

From the 1940's to the mid-1970's, some industrial wastes were disposed of in landfills around Maxwell. Electroplating wastes generated during the late 1940's through the mid-1960's were drummed and disposed of in landfill areas around Hopper Lodge (Bldg. 1110). During the peak plating years (mid-1950's to early 1960's), it is estimated between four and five drums of spent plating solutions were disposed of on at least five to ten occasions. Beginning in the mid-1960's, the plating solutions were regenerated which eliminated the need for on-site disposal. The plating operations were closed in the early 1970's and the remaining solutions were transported to Kelly Air Force Base for final disposal in the mid-1970's. Also, a small quantity of trichloroethylene sludge from the plating shop was occasionally disposed of in the active sanitary landfills during the 1950's and 1960's. Waste paints, paint cans, paint spray booth sludges and rinsed pesticide containers were also disposed of in the active sanitary landfills from the 1940's to the present.

Pesticide Utilization

A variety of pesticides (insecticides, herbicides, fungicides, and rodenticides) are used at Maxwell AFB and Gunter AFS installations. Use of the pesticides is under the direction of the Entomology Shop, Pavement and Grounds and golf course maintenance personnel. Appendix E (Table E.2) summarizes the pesticides currently in use.

Since 1977, precautions have been taken in handling and disposing of pesticide materials. At Maxwell AFB, all unused solutions in sprayers from Pavement and Grounds have been transferred to storage containers for later use. Pesticide containers have been rinsed and taken to the sanitary landfill. Container and sprayer rinsewater is drained to the sanitary sewer. Prior to about 1977, unrinsed empty containers were taken to the active sanitary landfill. Rinsewater from equipment cleaning was poured on the grounds near Building 1334. In the years preceding approximately 1972, this practice took place near Building 1013.

At the golf course maintenance shop, most pesticide chemicals used were delivered in bags. The empty bags and a small number of empty containers are taken to the active sanitary landfill. Unused pesticide solutions and rinsewaters were discharged on the grounds at various locations throughout the golf course.

At Gunter AFS, unused pesticide solutions at the Entomology Shop have been stored in a 55 gallon drum for pickup by a contractor. Pesticide container rinsewater is discharged to the sanitary sewer. The Pavement and Grounds Shop pesticide containers at Gunter AFS are rinsed in the yard outside Building 560 and drained onto the ground. All rinsed containers and bags from Gunter AFS are currently sent to the Maxwell AFB sanitary landfill. However, some may have been buried in the past at the existing hardfill area at Gunter AFS which is presently used for disposal of landscape and construction debris.

Fuels Management

A listing of the fuel storage tanks at Maxwell AFB and Gunter AFS is presented in Table 4.2. These tanks are used to store JP-4, AVGAS, MOGAS, Diesel Fuel No. 2, and Fuel Oil No. 5.

The tanks at the main fuel storage area (Facility No. 1100) at Maxwell AFB are above ground and have earthen containment dikes. All other tanks in use at Maxwell AFB and Gunter AFS are underground except 30 small above ground MOGAS and diesel fuel tanks.

The bulk fuel storage area at Maxwell AFB can be and has been supplied by a 4-inch diameter pipeline in past years but is currently supplied by trucks. Rail service can also be used as needed. The inactive pipeline enters the base from the southwest corner and ends at Facility No. 1100 storage yard which is paved. Drainage from the truck unloading area and the storage containment area flows to two oil/water separators.

TABLE 4.2

SUMMARY OF MAJOR FUEL STORAGE TANKS
MAXWELL AFB AND GUNTER AFS

Item	Facility Number	No. of Tanks	Total Storage Capacity	Storage Above or Below Ground
MAXWELL AFB				
JP-4	1100	2	934,000	Above
AVGAS	1100	2(1)	49,000	Above
MOGAS	1100	1	11,000	Above
Fuel Oil No. 2	1100	1	227,000	Above
Diesel Fuel No. 2	913	1	10,000	Below
MOGAS	913	2	21,000	Below
MOGAS	1112	3	30,000	Below
AVGAS	843	1	2,000	Below
AVGAS	1037	6(2)	150,000	Below
Kerosene	1037	1(2)	1,000	Below
Fuel Oil No. 2	1037	3(3)	33,000	Above
Fuel Oil No. 5	1410	5	100,000	Below
Fuel Oil No. 2	(4)	26(4)	98,000	Below
MOGAS	(5)	12(5)	4,000	Above/Below(6)
Diesel Fuel No. 2	(7)	18(7)	16,000	Above/Below(6)
GUNTER AFS				
MOGAS	408	2	25,000	Below
MOGAS	813	5	15,000	Below
Diesel Fuel No. 2	857	4	92,000	Below
Diesel Fuel No. 2	(8)	16(8)	39,000	Below
MOGAS	(9)	4(9)	1,000	Above/Below(6)

(1) One tank normally not used.
(2) Abandoned - filled with water.
(3) Not used.
(4) Numerous locations at base; sizes range from 1,000 - 12,000 gal.
(5) Numerous locations at base; sizes range from 2 - 1,000 gal.
(6) Large tanks below ground and small ones usually above.
(7) Numerous locations at base; sizes range from 30 - 2,500 gal.
(8) Numerous locations at station; sizes range from 350 - 3,500 gal.
(9) Several locations at station; sizes range from 5 - 600 gal.

The main fuel storage tanks and appurtenances are inspected daily for leaks. The underground tanks are checked for water each time they are filled. When water is found further testing is performed to determine possible leakage. No major leaks have been reported.

The six main tanks receiving fuel at Facility 1100 are periodically cleaned. AVGAS and JP-4 fuel tanks have been cleaned about every four years. Sludge quantity withdrawn from each tank during cleaning is estimated to be approximately 55 gallons. The sludge has been weathered in isolated areas usually near the on-base landfill active at the time the tanks are cleaned. The sludge is normally weathered for a period of four weeks prior to disposal in the landfill.

There have been several instances of minor spillage of fuels at storage tanks (during filling) and on the flightline. Flightline spills are usually washed to the surface drainage system. There have been several spills/leaks reported by fuels management personnel. Table 4.3 summarizes the information available concerning the spills and leaks.

Due to the relatively small amounts of the spills/leaks and the clean-up efforts made on the larger spills/leaks, these incidents are not believed to pose a potential for waste contamination or migration.

Fire Protection Training

Limited fire protection training activities were conducted on Gunter AFS through the late 1940's. One or more areas were believed to have been used to conduct the exercises on an as-needed basis. All fire protection training activities ceased at Gunter AFS in the late 1940's and Gunter AFS fire protection personnel participated in training exercises at Maxwell AFB from that time to the present. Fire protection training activities have been conducted on Maxwell AFB in two areas on base. A description of each area is given below.

Fire Protection Training Area No. 1

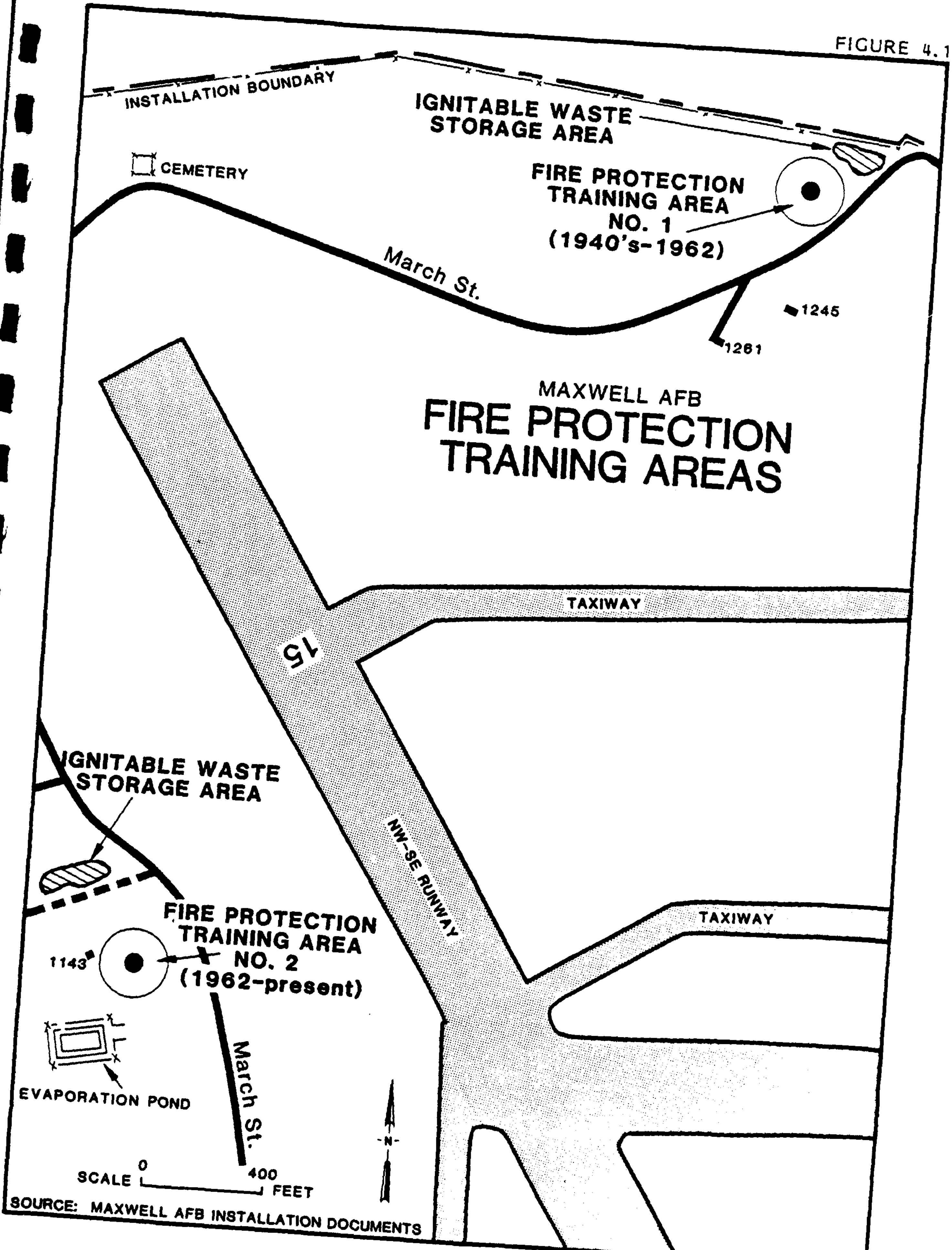
Fire protection training exercises were conducted in the area presently used for disposal of landscape debris and construction rubble as shown in Figure 4.1. This location was utilized from the early 1940's to about 1962. The training area consisted of a shallow unlined depressed area no more than 12 inches deep in the center. Training exercises were conducted primarily on weekends and usually two to three

TABLE 4.3

SPILLS AND LEAKS OCCURRING ON MAXWELL AFB AND GUNTER AFS

Approximate Date	Description	Location	Material Spilled/ Leaked	Approximate Quantity Spilled/ Leaked (gallons)	Approximate Quantity Recovered (gallons)	Remarks
MAXWELL AFB						
1978	Pipeline leak	Near south end of the NW-SE runway.	JP-4	1,000±	500	No visual evidence of contamination.
1972	Pipeline leak	Near south perimeter road and the skeet range.	JP-4	300±	0	No visual evidence of contamination.
1968	Truck overflow during filling.	POL tank farm.	JP-4	(unknown)	0	Contaminants flushed to surface drainage system.
1961	Hose failure during truck filling.	POL tank farm.	JP-4	(unknown)	0	Contaminants flushed to surface drainage system.
GUNTER AFS						
1981	Pipeline leak	Base service station.	MOGAS	300±	0	No visual evidence of contamination.

FIGURE 4.1



MAXWELL AFB
FIRE PROTECTION TRAINING AREAS

SOURCE: MAXWELL AFB INSTALLATION DOCUMENTS

exercises would be conducted per day. High pressure water was used for extinguishing fires.

Prior to each exercise the pit area would be soaked with water. Waste oils, waste fuels, waste shop solvents and other ignitable wastes were stored on an embankment near the area of the fire pit (Figure 4.1). Between 10 and 20 full or partially full drums were stored at the site. Occasionally, the waste fuels and solvent would be washed out of the pit area during an exercise into a small pond located nearby. The training pit area and pond have been filled in and covered over with several feet of soil, landscape debris and construction rubble.

Fire Protection Training Area No. 2

In 1962, fire protection training activities were moved to the present location as shown in Figure 4.1. Initially the training area was constructed as a shallow unlined pit about 12 inches deep in the center and 35 feet in diameter. Protein foam, AFFF and Halon were used as an extinguishing agents at this site.

For the period 1962 through 1973, the practice of using waste oils, waste fuels, waste solvents and other ignitable wastes for the training exercises continued. Drums of these waste materials were delivered to a holding area just north of the fire pit (Figure 4.1). Between 25 and 35 drums were frequently stored at this location. Some leakage from these drums was believed to have occurred. A list of these wastes is shown in Table 4.4. Prior to each exercise the pit area was soaked with water then the ignitable materials were poured in the pit to conduct the training exercise. At the conclusion of the exercise residue materials and water soaked into the pit area. Occasionally throughout the period 1962 through 1978, water and residual waste ignitable materials would overflow from the pit area to West End Ditch.

In 1978 a concrete liner, sump, oil/water separator and evaporation pond system was constructed over the unlined fire pit area. This system is operating at present. Any residual fuel is separated and collected while any water is discharged to the evaporation pond and allowed to evaporate. The evaporation pond is unlined and has no discharge to surface waters.

TABLE 4.4

INDUSTRIAL WASTES CONSUMED FOR EXERCISES AT
FIRE PROTECTION TRAINING AREA NO. 2
(1962 through 1974)

Item	Disposal Quantity (gallons)	Disposal Interval
Paint Stripper	50-70	Yearly
Dope, Enamel and Lacquer Thinners	20	Weekly
PS-661/PD-680	2	Weekly
Motor Oil, Brake Fluid and Hydraulic Fluid	55	Weekly
Methyl Ethyl Ketone (MEK)	(unknown)	(unknown)
Alkaline Deruster	300	1 per 3 mos.
Kerosene	9	weekly
Aircraft Engine Oil	10	weekly
Carbon Remover	165	1 per 2 yrs.

Source: AF OEHL, 1969, and installation documents.

For the period 1973 to the present, the practice of burning waste fuels, oils and solvents has been discontinued and only JP-4 with 10 percent or less contamination has been used.

Waste Storage Areas

From the mid-1970's to the present, several facilities have been used for the storage of waste petroleum products and waste shop chemicals. Many petroleum wastes are stored in drums at or near the point of generation. Civil Engineering arranges for a contractor to pump out the wastes on an as-needed basis. The Auto Hobby Shop (Bldg. 1067) maintains an underground waste oil tank which is also pumped out by a contractor on an as-needed basis.

Shop chemical wastes are stored either near the aircraft washrack (Bldg. 1025) or at the C.E. drum storage area (Figure 4.2). An off-base contractor was used to collect and dispose of these wastes on an as-needed basis. From the mid to the late 1970's, drums were stored on an unlined ground area. Since the late 1970's, drums at the C.E. storage area have been stored on a concrete pad which drains to an oil/water separator. A visual inspection of the concrete pad and surrounding area indicated minor spillage may have occurred.

DESCRIPTION OF PAST DISPOSAL METHODS

The facilities at Maxwell AFB and Gunter AFS which have been used for the management and disposal of wastes can be categorized as follows:

- Landfills
- Hardfill Areas
- Electroplating Waste Disposal Site
- Sanitary Sewer System
- Surface Drainage System
- Incinerators

Landfills

Six past and present landfills have been identified on Maxwell AFB. The landfills on Maxwell AFB are located around the north, west and south installation boundaries as shown in Figure 4.3. The data for each landfill is summarized in Table 4.5. Descriptions of the individual sites are given below.

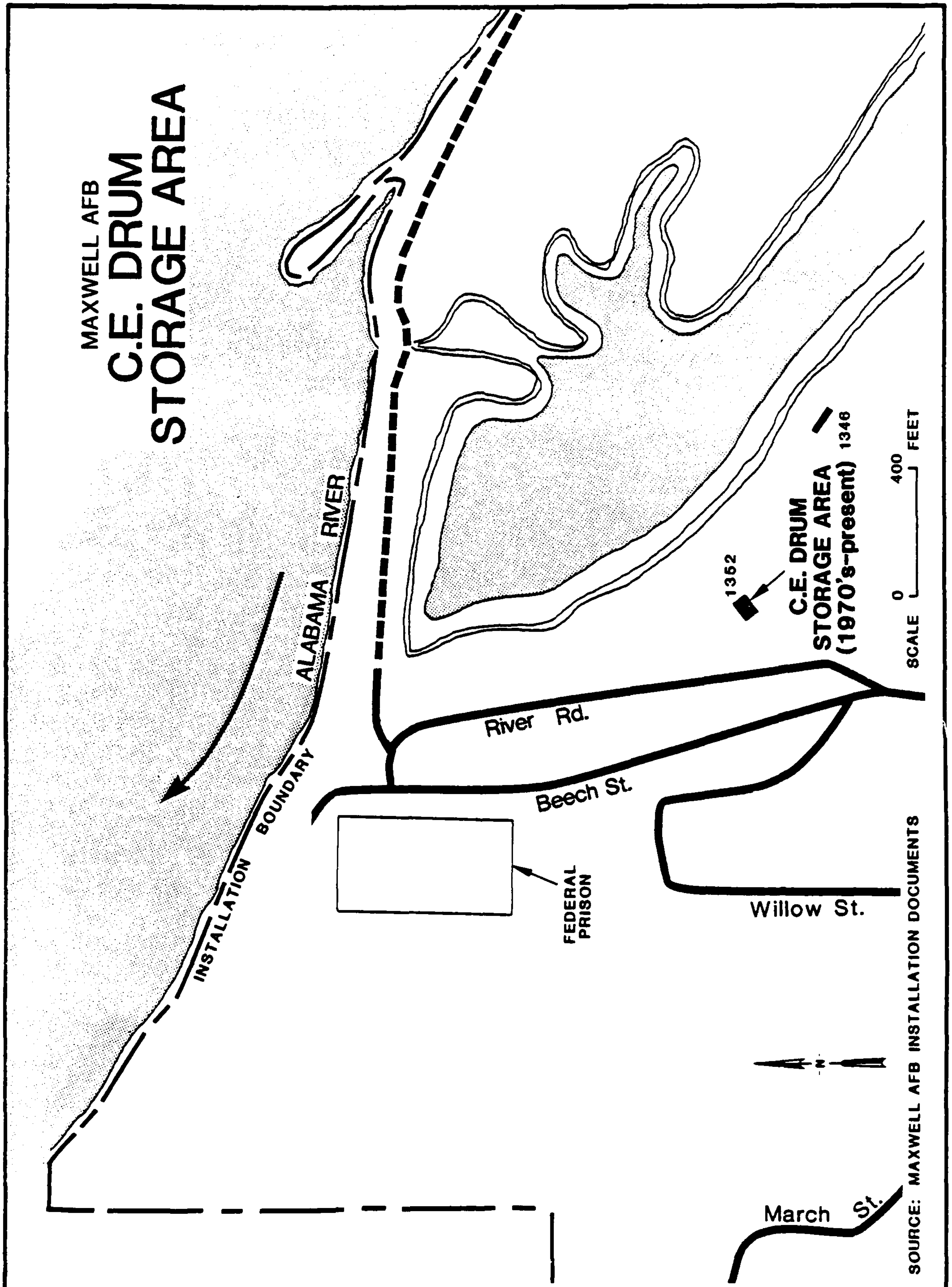
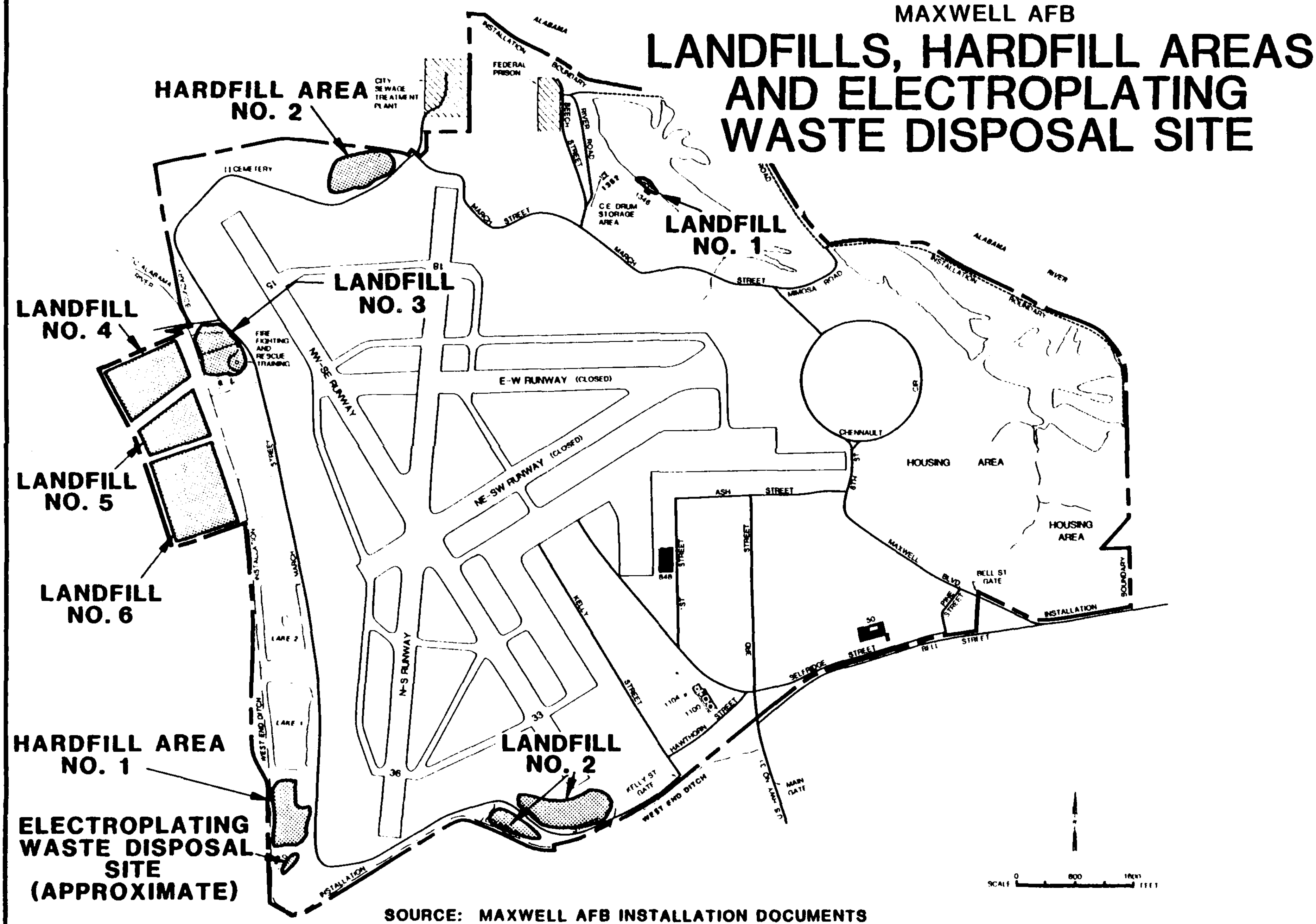

MAXWELL AFB
C.E. DRUM
STORAGE AREA
ALABAMA RIVER
INSTALLATION BOUNDARY
River Rd.
Beech St.
Willow St.
March St.
FEDERAL PRISON
1352
1346
C.E. DRUM
STORAGE AREA
(1970's-present)
SCALE
0
400
FEET
N
SOURCE: MAXWELL AFB INSTALLATION DOCUMENTS

FIGURE 4.3

MAXWELL AFB
LANDFILLS, HARDFILL AREAS AND ELECTROPLATING WASTE DISPOSAL SITE



SOURCE: MAXWELL AFB INSTALLATION DOCUMENTS

TABLE 4.5
SUMMARY OF LANDFILLS, HARDFILL AREAS AND ELECTROPLATING WASTE DISPOSAL SITE

Site Name	Figure No.	Period of Operation	Approximate Size (acres)	Types of Wastes	Method of Operation	Closure Status	Surface Drainage	Site Visit Comments
LANDFILLS								
Landfill No. 1	4.2	1930's	5 to 10	Some garbage, base trash, construction rubble.	Area fill with burning.	Covered embankment.	To golf course lakes.	No evidence of contamination.
Landfill No. 2	4.5	Early 1940's-1951	20	Garbage, base trash, industrial sludges, paints.	Trench & fill Depth: 10 feet.	Closed and covered.	To West End Ditch.	No evidence of contamination.
Landfill No. 3	4.6	1951-1956	10	Garbage, base trash, industrial sludges, paints.	Trench & fill Depth: 10 ft.	Closed and covered.	To West End Ditch.	No surficial evidence of contamination.
Landfill No. 4	4.6	1956-Early 1970's	12	Garbage, base trash, industrial sludges, paints.	Trench & fill with burning. Depth: 8-10 ft.	Closed and covered.	To West End Ditch.	No surficial evidence of contamination.
Landfill No. 5	4.6	Early 1970's-1974	10	Garbage, base trash, industrial sludges, paints.	Trench & fill Depth: 8 ft.	Closed and covered.	To West End Ditch.	No surficial evidence of contamination.
Landfill No. 6	4.6	1974-Present	15	Garbage, base trash, industrial sludges, paints.	Trench & fill Depth: 5 ft.	Active site.	To West End Ditch.	No surficial evidence of contamination.
HARDFILL AREAS								
Hardfill Area No. 1	4.7	Early 1940's-1951	8	Hardfill, construction rubble, landscape debris.	Area fill.	Closed and covered.	To West End Ditch.	No evidence of contamination.
Hardfill Area No. 2	4.8	1951-Present	5	Hardfill, construction rubble, landscape debris.	Area fill.	Active site.	To Alabama River.	No surficial evidence of contamination.
Hardfill Area No. 3	NA	1950-Present	10	Hardfill, landscape debris.	Area fill.	Active site.	Drainage ditches to Alabama River.	No surficial evidence of contamination.
ELECTROPLATING WASTE DISPOSAL SITE								
Electroplating Waste Disposal Site	4.7	Late 1940's-mid-1960's	3 to 5	Spent electroplating solutions.	Trench & fill Depth: 8-10 ft.	Closed and covered.	To West End Ditch.	No surficial evidence of contamination.

From the mid-1970's to the present, household garbage and base trash from Gunter AFS has been collected and hauled to the active landfills at Maxwell AFB. Prior to the mid-1970's, garbage and trash were collected and taken to a nearby landfill for disposal. In the past, this landfill was located on leased land which was part of Gunter AFS, however, the leased property has been returned to the owner (City of Montgomery).

Landfill No. 1

During the 1930's, base sanitary refuse was disposed of on an embankment behind the present horse stables and Building 1346 as shown in Figure 4.4. Landfill No. 1 was operated as an area fill whereby household garbage and base refuse (paper, scrap wood, scrap metal) were routinely pushed over the embankment, occasionally burned and then covered. Aerial photographs and ground observations made during the on-site visit indicate that dense vegetation has been established and that no visible evidence of contamination exists at this site. Due to the inert nature of the materials disposed of in this landfill, there is no reason to suspect that contamination problems exist at this site.

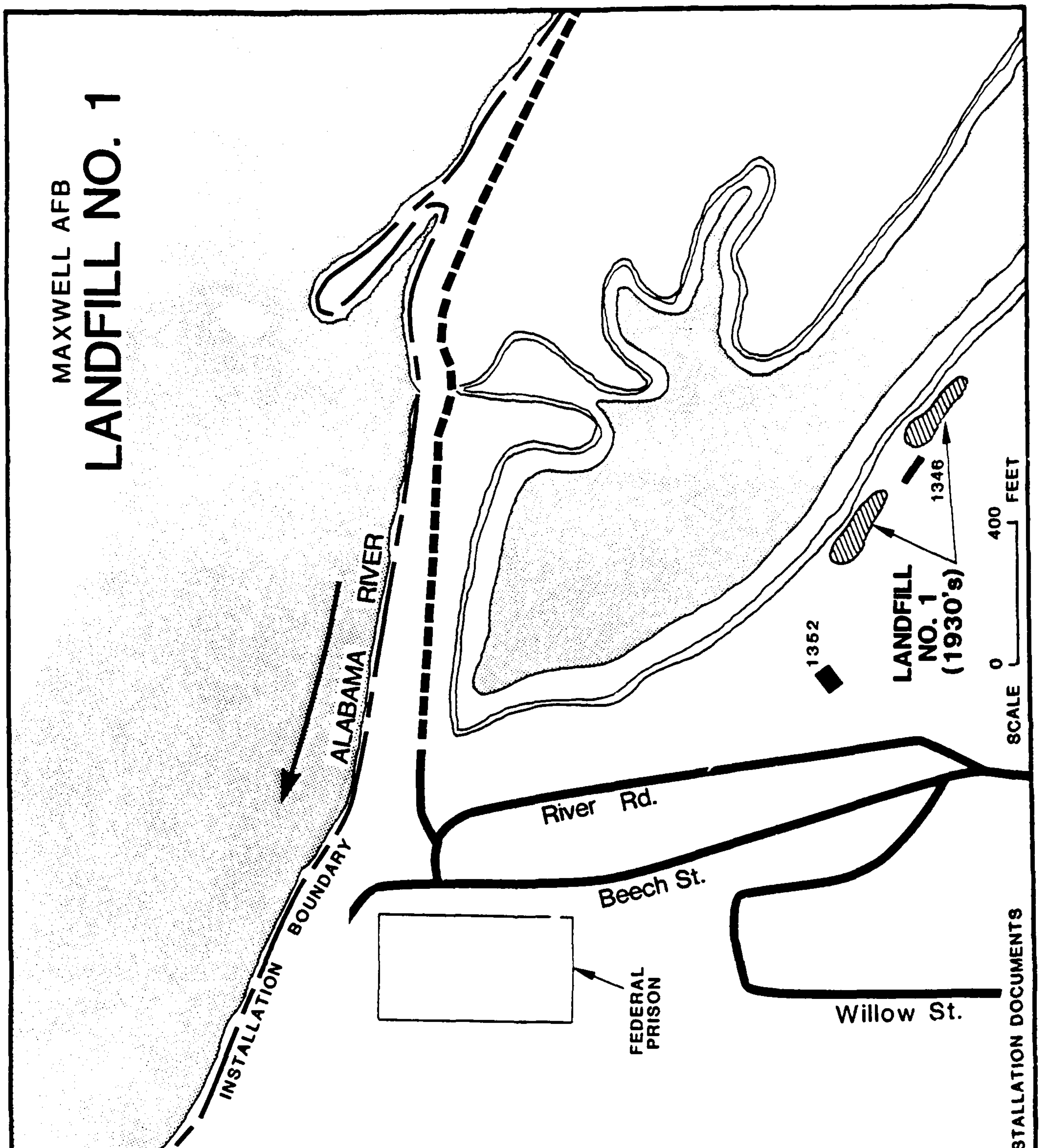
Landfill No. 2

During the early 1940's through approximately 1951, the base operated Landfill No. 2 for the disposal of household garbage, base trash (paper, wood, scrap metal) and some industrial non-liquid wastes such as waste paints, paint cans, paint booth sludges and unrinsed pesticide containers (Figure 4.5). This landfill was a trench and fill operation with daily cover. The trenches were approximately 10 feet deep by 15 feet wide. The landfill encompasses about 20 acres and is presently closed and covered. The landfill is located in a floodplain near West End Ditch and the water table in the area is near the surface.

Landfill No. 3

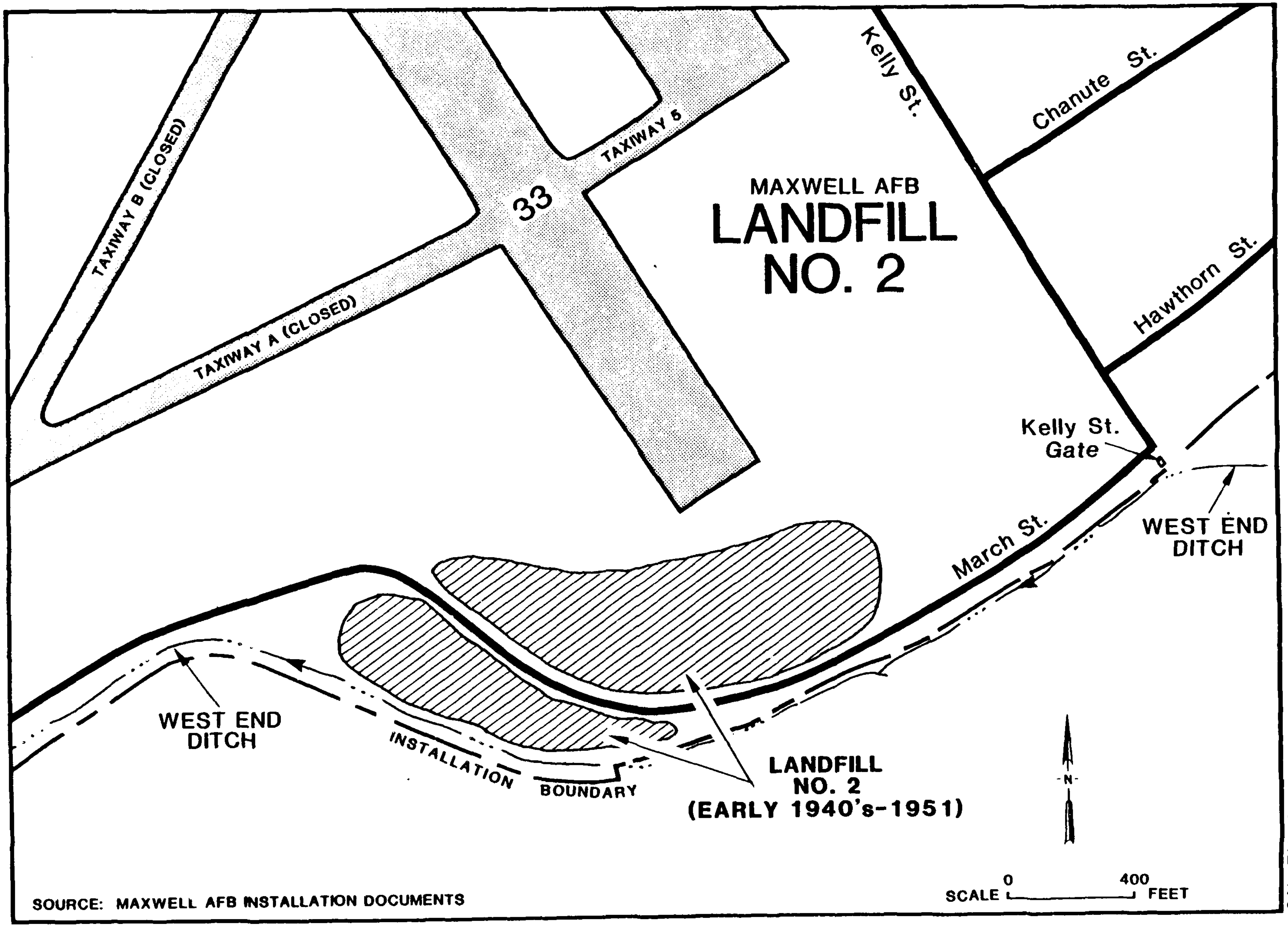
Landfill No. 3 was located in the vicinity of the present fire protection training area as shown in Figure 4.6. Household garbage, base trash (paper, wood, scrap metal) and industrial non-liquids wastes such as waste paints, paint cans, paint booth sludges and unrinsed pesticide containers from the shops were disposed of in this landfill from 1951 to 1956. Trench and fill methods of operation were used over approximately 10 acres and trench dimensions averaged 10 feet deep by 15 feet wide. Daily cover was normally applied. The landfill area is

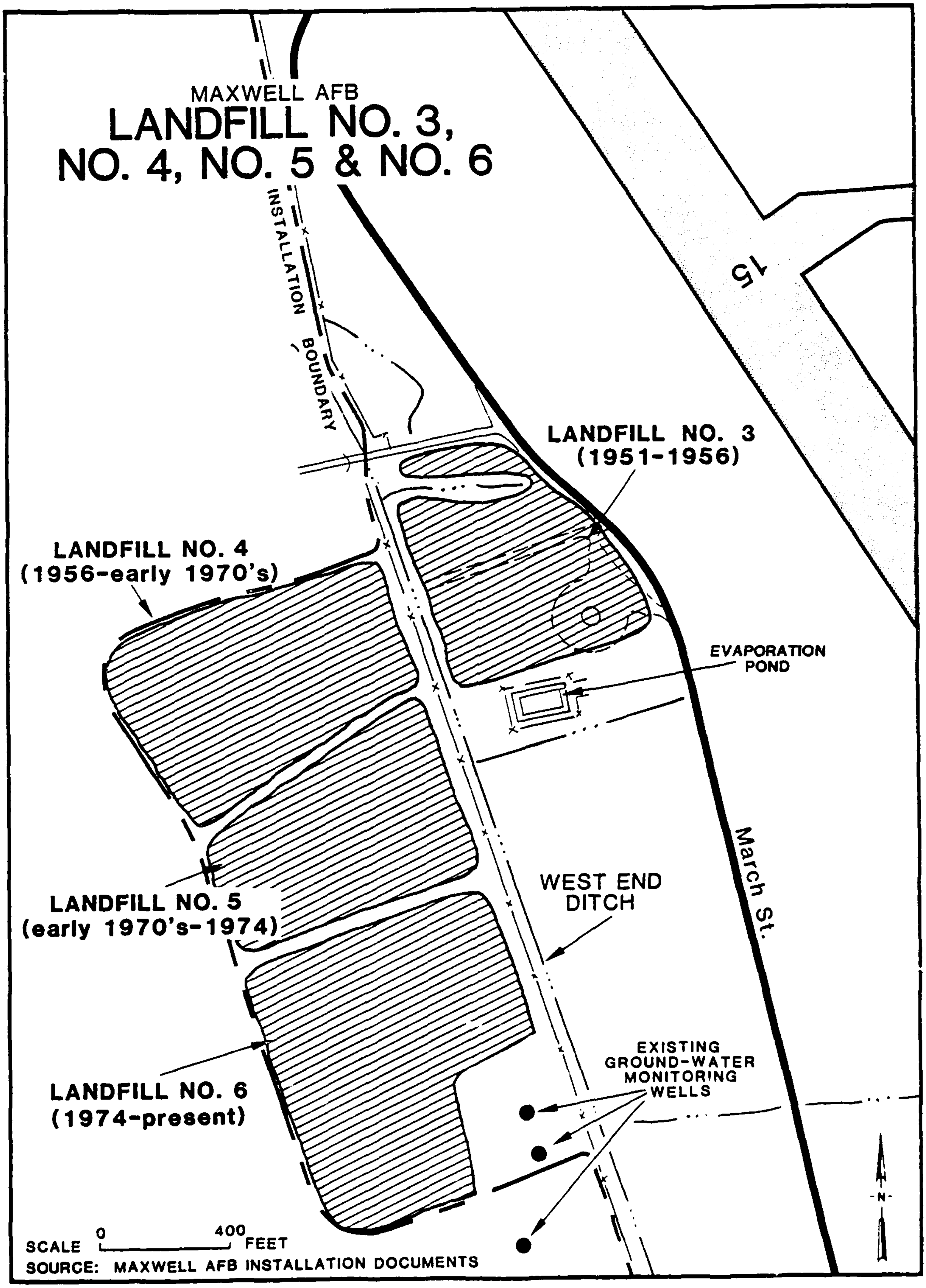
FIGURE 4.4



ES ENGINEERING-SCIENCE

FIGURE 4.5


MAXWELL AFB
LANDFILL
NO. 2
TAXIWAY B (CLOSED)
TAXIWAY A (CLOSED)
TAXIWAY 5
33
Kelly St.
Chanute St.
Hawthorn St.
Kelly St. Gate
March St.
WEST END DITCH
WEST END DITCH
INSTALLATION BOUNDARY
LANDFILL NO. 2 (EARLY 1940's-1951)
N
SCALE 0 400 FEET
SOURCE: MAXWELL AFB INSTALLATION DOCUMENTS


MAXWELL AFB
LANDFILL NO. 3, NO. 4, NO. 5 & NO. 6
INSTALLATION BOUNDARY
15
LANDFILL NO. 3 (1951-1956)
LANDFILL NO. 4 (1956-early 1970's)
EVAPORATION POND
LANDFILL NO. 5 (early 1970's-1974)
WEST END DITCH
March St.
EXISTING GROUND-WATER MONITORING WELLS
LANDFILL NO. 6 (1974-present)
N
SCALE 0 400 FEET
SOURCE: MAXWELL AFB INSTALLATION DOCUMENTS

closed and has been covered. Landfill No. 3 is located in a floodplain near West End Ditch and the water table in the area is near the surface.

Landfill No. 4

Landfill No. 4 was located on land formerly leased to the Air Force adjacent to the base as shown in Figure 4.6. This landfill was operated from 1956 to the early 1970's using trench and fill techniques. Household garbage, base trash (paper, wood, scrap metal) and shop non-liquid wastes such as waste paints, paint cans, paint booth sludges, small quantities of solvent sludge and pesticide containers were disposed of in Landfill No. 4 and burning of the refuse was commonly used in the trenches prior to a daily soil covering. The landfill covered approximately 12 acres and the trench dimensions averaged 10 feet deep by 20 feet wide. Landfill No. 4 is closed and covered and vegetation has been established. This landfill is located in a floodplain near West End Ditch and the water table in the area is near the surface.

Landfill No. 5

Landfill No. 5 is a 10 acre area located on leased land south of Landfill No. 4 as shown on Figure 4.6. This landfill was operated from the early 1970's to 1974 for the disposal of household garbage, base trash (paper, wood, scrap metal) and some industrial non-liquid wastes such as waste paints, paint cans, paint booth sludges and pesticide containers. Landfill No. 5 was operated using trench and fill techniques with trench dimensions averaging eight feet deep by 20 feet wide. Burning of refuse was not a practice at this location and the site is presently closed and covered. This landfill is located in a floodplain near West End Ditch and the water table in the area is near the surface.

Landfill No. 6

Landfill No. 6 is a 15 acre leased site where disposal operations have been conducted from 1974 to the present as shown in Figure 4.6. Trench and fill methods are used to dispose of household garbage, base trash and some industrial non-liquid wastes such as waste paints, paint cans, paint booth sludges and pesticide containers. Trench dimension average approximately five feet deep by 20 feet wide. Daily soil cover is applied to the active disposal cell except during periods of wet weather. Approximately 10 acres of Landfill No. 6 are closed and covered while about five acres are currently active. This landfill is located in a floodplain near West End Ditch and the water table in the area is near the surface.

In 1981, three ground-water monitoring wells were installed at Landfill No. 6 and located as shown in Figure 4.6. The wells are between 21 and 23 feet deep and the depth to water in each well is between six and seven feet below grade. Each well is monitored annually for pH, specific conductance, chlorides and iron.

The locations of the ground-water monitoring wells were established and specified by State of Alabama personnel. No observation wells were installed to determine ground-water flow directions and apparently no consideration was given to near-by past landfill areas in locating the monitoring wells. Also, the method of collecting the annual monitoring well samples does not include purging each well then allowing the well to recover prior to collecting a representative quantity of water. Therefore, the ground-water monitoring data available for this study may not be representative of the impact of Landfill No. 6 on the surrounding ground water and this data is not included in this report.

Hardfill Areas

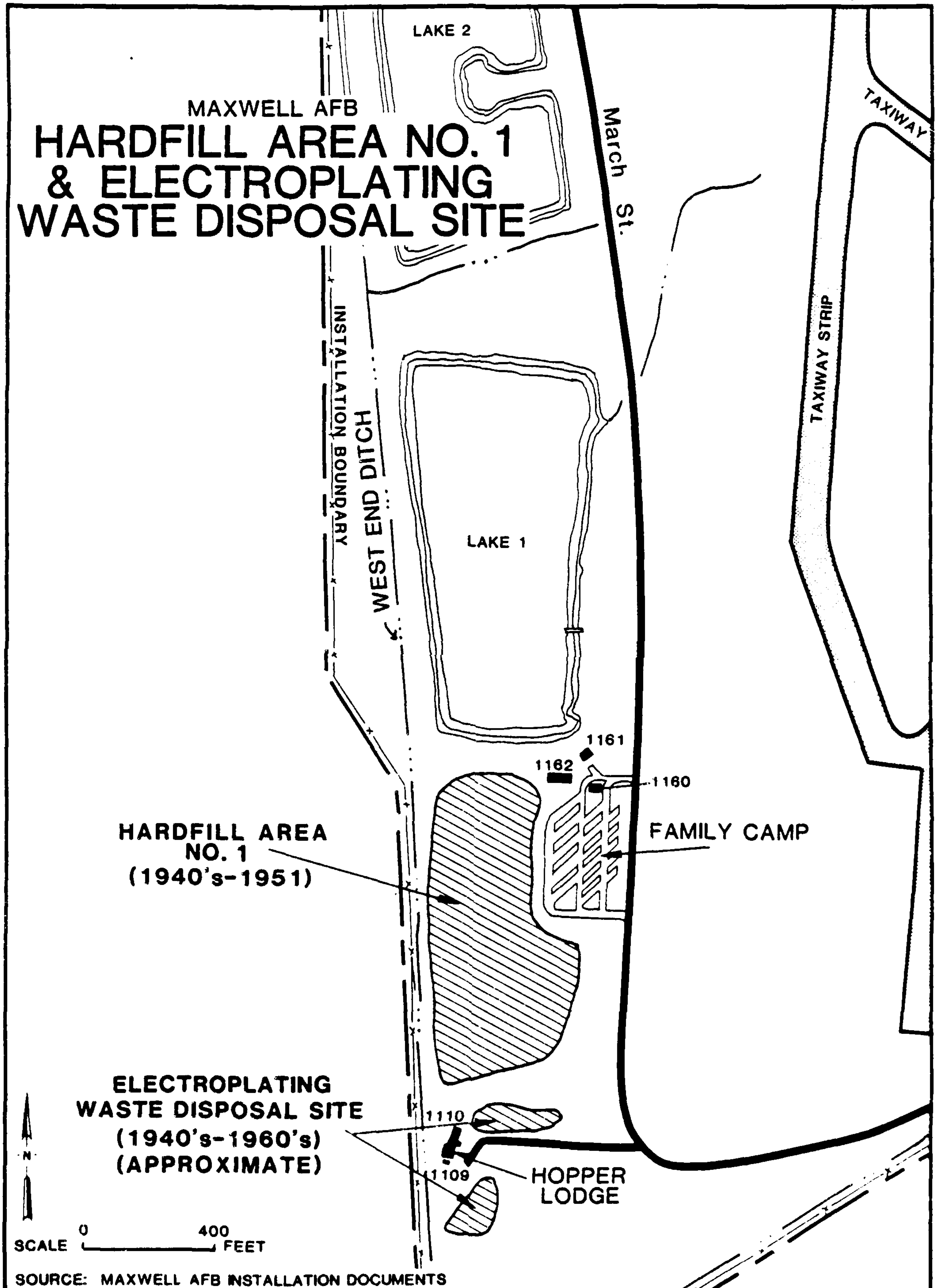
Two hardfill areas on Maxwell AFB and one area on Gunter AFS have been identified. Descriptions of each area are listed below. The data for each hardfill area is summarized in Table 4.5.

Hardfill Area No. 1

Hardfill Area No. 1 was operated from the early 1940's through 1951. Area fill methods of disposal were used for construction rubble, landscape debris and hardfill. Figure 4.7 illustrates the location of the eight acre area. A small northern portion of the landfill is still active for hardfill disposal; however, the remainder of the area is closed and covered. Due to the inert nature of the materials disposed of in this landfill, there is no reason to suspect that contamination problems exist at this location.

Hardfill Area No. 2

From 1951 to the present, Hardfill Area No. 2 receives landscape debris, construction rubble and, in the past, a small amount of household garbage. Fire Protection Training Area No. 1 was located within this hardfill area from the early 1940's to 1962. Hardfill Area No. 2 is an area fill type operation whereby low spots are filled, graded,



SOURCE: MAXWELL AFB INSTALLATION DOCUMENTS

then covered. Hardfill Area No. 2 encompasses approximately five acres as shown in Figure 4.8. A pond existed for many years in the center of this area. The pond has been filled in with construction debris. The landfill is presently active for disposal of landscape debris and construction rubble.

Hardfill Area No. 3

Hardfill Area No. 3 is utilized at Gunter AFS and has been in operation since the 1950's. The hardfill area is located in the east central portion of the facility and receives landscape debris, fill dirt and construction rubble. Occasionally, this hardfill area receives empty paint cans and rinsed pesticide containers. Due to the inert nature of the majority of materials disposed of in this landfill, there is insufficient reason to suspect that waste contamination or migration exists at this location.

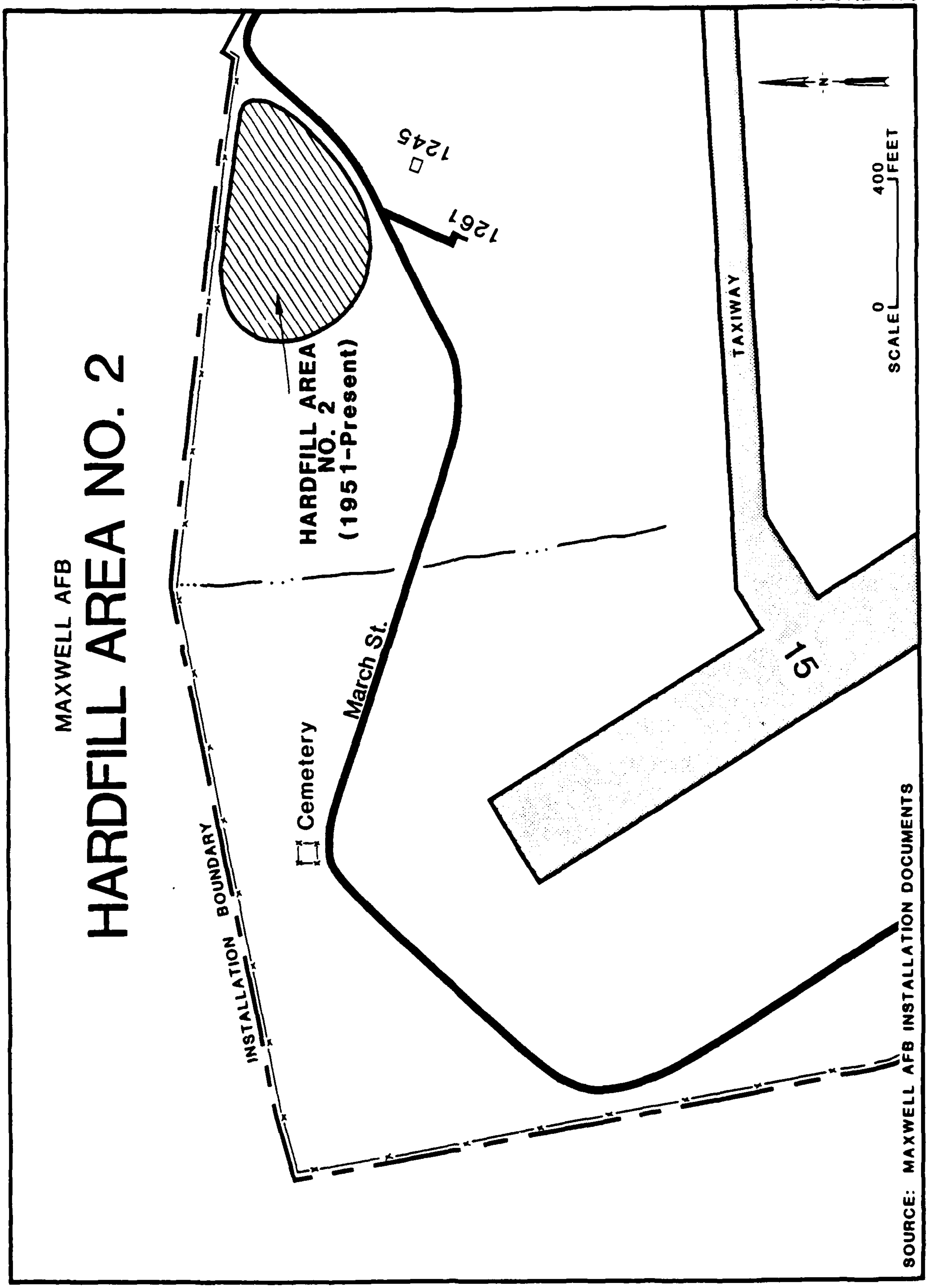
Electroplating Waste Disposal Site

Electroplating operations were conducted at Maxwell AFB from the late 1940's through the early 1970's. From at least the late 1940's through the mid-1960's, spent electroplating solutions were drummed then disposed in an area near Hopper Lodge (Bldg. 1110) as shown in Figure 4.7. These solutions included copper, chromium, nickel, cadmium and cyanide compounds and approximately four to five drums of solutions were disposed per year during peak plating operation years from the mid-1950's to the early 1960's. It is estimated that approximately 20 to 40 drums of solutions have been disposed in this area. The data for this site is summarized in Table 4.5.

The method of disposal for this waste was trench and fill. The trenches were estimated to be eight to ten feet deep and approximately 14 feet wide. The area of disposal was reported to have clay soil and all of the area is covered and closed at the present. A parking lot covers at least a portion of the disposal area.

From the mid-1960's through the early 1970's, the electroplating solutions were regenerated which eliminated the need for on-site land disposal. The electroplating operations ceased in the early 1970's and the spent solutions were transported to Kelly AFB for disposal in the mid-1970's.

FIGURE 4.8


MAXWELL AFB
HARDFILL AREA NO. 2
HARDFILL AREA NO. 2 (1951-Present)
1245
1261
March St.
Cemetery
INSTALLATION BOUNDARY
TAXIWAY
15
N
SCALE 0 400 FEET
SOURCE: MAXWELL AFB INSTALLATION DOCUMENTS

Sanitary Sewer System

Prior to 1967, sanitary wastes at Maxwell AFB were discharged at four outfalls to the Alabama River. In 1967, a wastewater treatment plant and collection system was completed to serve Maxwell AFB and a portion of the City of Montgomery. The treatment plant is located just outside the northern perimeter fence, about 400 feet from Facility 1250. Sanitary wastes from Gunter AFS have always been collected and sent to the City of Montgomery sewerage system.

As shown in Table 4.1, dilute industrial wastes have been discharged to the sanitary sewer system. These include NDI developers, electric shop battery acids and alcohol, aircraft cleaning solutions, aircraft surface preparation materials and pesticide container rinsewaters. No difficulties have been reported by wastewater treatment plant personnel in operating the sanitary treatment plant.

The plant provides secondary treatment (trickling filters) to the sewage and presently has an influent flowrate of 2.2 MGD. The flowrate when operations commenced in 1967 was 1.85 MGD. The total plant design capacity is 3.0 MGD.

Surface Drainage System

The surface drainage system at Maxwell AFB includes open drainage ditches which discharge to West End Ditch or to the Alabama River. The general drainage patterns on the base are shown in Figure 3.2. The West End Ditch empties into the Alabama River northwest of the base.

The surface drainage system on the north and west portions of Maxwell AFB received untreated industrial waste solutions from the 1940's through the early 1970's as noted in Table 4.6. These wastes included effluent from several washracks, rinse water from electroplating operations, unneutralized acids and quantities of paint stripper. An internal Air Force waste disposal survey (AF OEHL, 1969) was conducted in March 1969 to assess industrial waste disposal practices at Maxwell AFB. Oil/water separators were installed in the early 1970's for the separation of oily wastes. Also, the practice of neutralizing acid wastes prior to discharge to the surface drainage system began. Table 4.7 contains a listing and descriptions of the oil/water separators. The separators are cleaned by an off-base contractor on an as-needed basis.

TABLE 4.6

INDUSTRIAL WASTES DISCHARGED TO THE SURFACE DRAINAGE SYSTEM
MAXWELL AFB
(1940's to Early 1970's)

Item	Disposal Quantity (gallons)	Disposal Interval
C.E. Paint Booth Wastewater	800	1 per 3 wks.
Washrack Wastewater	(1)	(1)
Calla 301 (Cleaning) Compound	(1)	(1)
PS-661/PD-680 Solvent	(1)	(1)
Washrack Paint Stripper	(1)	(1)
Electroplating Rinsewater	160	(1)
Dilute Hydrochloric Acid	20	2 per year
Dilute Nitric Acid	10	Yearly
Aircraft Paint Booth Wastewater and Sludges	4,000	Yearly
NDI Penetrant Oil	100	Yearly
NDI Emulsifier	55	Yearly
Radiator Shop Paint Stripper/Water	115	1 per 3 mos.
Streamrack Corrosion Removal Compound	500	1 per 3 mos.

Source: AF OEHL, 1969.

(1) Not specified in source.

TABLE 4.7
SUMMARY OF
OIL/WATER SEPARATORS
MAXWELL AFB AND GUNTER AFS

Bldg./Facility Number	Description	Size of Separator Skimmings Tank (gallons)
MAXWELL AFB		
936	General Vehicle Maintenance	1,000
1001	908 Flightline Maintenance	250
1025	Aircraft Washrack	700
1063	POL Vehicle Maintenance	1,000
1076	Auto Hobby Shop (1067)	1,000
1100	POL Tank Area	1,000
1104	POL Unloading Area	1,000
1352	C.E. Drum Storage Area	2,000
1143	Fire Protection Training Area No. 2	500
GUNTER AFS		
554	Motor Pool	280
715	Vehicle Maintenance	250

The surface drainage system on the east portion of Maxwell AFB receives surface drainage influent from portions of the City of Montgomery. This influent water and surface drainage from the base flow through the housing area then through a series of on-base lakes then to the Alabama River. As discussed in Section 3, a recently expanded monitoring program for the surface drainage influent has indicated elevated levels of arsenic and lead. Also, levels of phenols and oil and grease were detected in the influent stream. The source or sources of the off-base contaminants have not been identified.

The surface drainage patterns for Gunter AFS are shown in Figure 3.3. Open ditches which drain to Galbraith Mill Creek are utilized to transport the surface drainage off-base. In the past, limited amounts of pesticide rinsewater have been discharged to the surface drainage system at Gunter AFS. There are two oil/water separators presently at Gunter AFS also noted in Table 4.7.

Incinerators

Three incinerators are operated at Maxwell AFB, two of which are used infrequently for the destruction of documents and one for the disposal of medical wastes. The two document incinerators are located in Buildings 929 and 1344, respectively, and have been installed since the 1960's. The base hospital (Bldg. 50) operates an incinerator for the disposal of pathological wastes.

EVALUATION OF PAST DISPOSAL ACTIVITIES AND FACILITIES

The review of past operation and maintenance functions and past waste management practices at Maxwell AFB and Gunter AFS has resulted in the identification of 14 sites which were initially considered as areas of concern with regard to the potential for contamination, as well as the potential for the migration of contaminants. These sites were evaluated using the Decision Tree Methodology referred to in Figure 1.1. Those sites which were considered as not having a potential for contamination were deleted from further consideration. Those sites which were considered as having a potential for the occurrence of contamination and migration of contaminants were further evaluated using the Hazard Assessment Rating Methodology (HARM). Table 4.8 identifies the decision tree logic used for each of the areas of initial concern.

TABLE 4.8

SUMMARY OF DECISION TREE LOGIC FOR AREAS OF INITIAL ENVIRONMENTAL CONCERN AT MAXWELL AFB AND GUNTER AFS

Site Description	Potential for Contamination	Potential for Contaminant Migration	Potential for Other Environmental Concern	HARM Rating
Fire Protection Training Area No. 1	Yes	Yes	NA	Yes
Fire Protection Training Area No. 2	Yes	Yes	NA	Yes
C.E. Drum Storage Area	Yes	Yes	NA	Yes
Landfill No. 1	No	No	No	No
Landfill No. 2	Yes	Yes	NA	Yes
Landfill No. 3	Yes	Yes	NA	Yes
Landfill No. 4	Yes	Yes	NA	Yes
Landfill No. 5	Yes	Yes	NA	Yes
Landfill No. 6	Yes	Yes	NA	Yes
Hardfill Area No. 1	No	No	No	No
Hardfill Area No. 2	Yes	Yes	NA	Yes
Hardfill Area No. 3	No	No	No	No
Electroplating Waste Disposal Site	Yes	Yes	NA	Yes
Surface Drainage System	Yes	Yes	NA	Yes

Based on the decision tree logic, three of the 14 sites originally reviewed did not warrant evaluation using the Hazard Assessment Rating Methodology. The rationale for omitting these three sites from HARM evaluation is discussed below.

Landfill No. 1 received household garbage and base refuse during the 1930's prior to the periods of major industrial shop activity on Maxwell AFB. Visual inspection of the site indicated that dense vegetation was established and that the site does not appear to have a potential for contamination.

Hardfill Area No. 1 and the Hardfill Area No. 3 received construction rubble, landscape debris and fill dirt. These materials are typically inert and are considered unlikely to cause any contamination of surface or ground water.

The remaining 11 sites identified on Table 4.9 were evaluated using the Hazard Assessment Rating Methodology. The HARM process 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 rating procedures are presented in Appendix G. Results of the assessment for the sites are summarized in Table 4.9. The HARM system is designed to indicate the relative need for follow-on action. The information presented in Table 4.9 is intended to assigning priorities for further evaluation of the Maxwell AFB disposal areas (Chapter 5, Conclusions and Chapter 6, Recommendations). The rating forms for the individual waste disposal sites at Maxwell AFB are presented in Appendix H. Photographs of some of the disposal sites are included in Appendix F.

TABLE 4.9

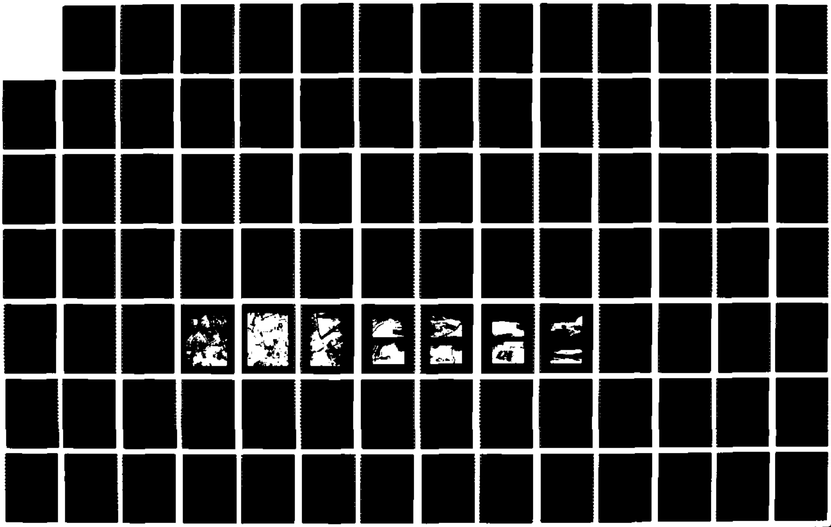
SUMMARY OF HARM SCORES FOR POTENTIAL CONTAMINATION SOURCES

MAXWELL AFB

Rank	Site Name and No.	Receptor Subscore	Waste Characteristics Subscore	Pathways Subscore	Waste Management Factor	Overall Total Score
1.	Electroplating Waste Disposal Site	50	80	86	1.00	72
2.	Surface Drainage System	52	90	84	0.95	72
3.	Fire Protection Training Area No. 2	46	64	76	0.95	59
4.	Fire Protection Training Area No. 1	44	64	67	1.00	58
5.	Landfill No. 4	51	24	88	1.00	54
6.	C.E. Dru Storage Area	45	54	69	0.95	53
7.	Landfill No. 5	51	24	81	1.00	52
8.	Landfill No. 6	51	24	81	1.00	52
9.	Landfill No. 2	41	24	88	1.00	51
10.	Landfill No. 3	48	24	81	1.00	51
11.	Hardfill Area No. 2	46	20	67	1.00	44

AD-A227 041 INSTALLATION RESTORATION PROGRAM PHASE 1: RECORDS SEARCH MAXWELL AIR FORCE BASE ALABAMA(U) ENGINEERING-SCIENCE INC ATLANTA GA JAN 84 2/3

UNCLASSIFIED F/G 24/7 NL



SECTION 5

CONCLUSIONS

The objective of the IRP Phase I study is to identify sites where there is potential for environmental contamination resulting from past waste disposal practices and to assess the probability of contaminant migration from these sites. The conclusions given below are based on field inspections, review of records and files, review of the environmental setting, and interviews with base personnel, past employees, and state and local government employees. Table 5.1 contains a list of the potential contamination sources identified at Maxwell AFB and a summary of the HARM scores for those sites.

ELECTROPLATING WASTE DISPOSAL SITE

The electroplating waste disposal site has a sufficient potential to create environmental contamination and follow-on investigation is warranted. From the late 1940's through the mid-1960's, spent electroplating solutions were drummed then disposed of on Maxwell AFB near Hopper Lodge (Bldg. 1110). These solutions contained copper, chromium, nickel, cadmium and cyanide components commonly used in electroplating processes. It is estimated that a total of 20 to 40 drums of plating solutions have been disposed of by trench and fill methods at this site. Due to the nature of the wastes (persistent metals), the depth of the trenches (eight to 10 feet) in relation to the depth to ground water (five to eight feet) and the probable direct connection between the shallow and deeper aquifers, this site received a HARM score of 72.

SURFACE DRAINAGE SYSTEM

The surface drainage system has a sufficient potential to create environmental contamination and follow-on investigation is warranted. From the 1940's through the early 1970's, the surface drainage system on the west and north portion of Maxwell AFB received considerable

TABLE 5.1
SITES ASSESSED USING THE HAZARD
ASSESSMENT RATING METHODOLOGY

MAXWELL AFB

Rank	Site Name and Number	Occurrence	Final Score
1	Electroplating Waste Disposal Site	Late 1940's to Mid 1960's	72
2	Surface Drainage System	1940's to Early 1970's	72
3	Fire Protection Training Area No. 2	1962 to Present	59
4	Fire Protection Training Area No. 1	1940's to 1962	58
5	Landfill No. 4	1956 to Early 1970's	54
6	C. E. Drum Storage Area	Mid-1970's to Present	53
7	Landfill No. 5	Early 1970's to 1974	52
8	Landfill No. 6	1974 to Present	52
9	Landfill No. 2	Early 1940's to 1951	51
10	Landfill No. 3	1951-1956	51
11	Hardfill Area No. 2	1951-Present	44

quantities of industrial waste solutions including paint booth wastewater, paint strippers, electroplating rinse water, penetrant oil, dilute acids, dilute caustics and steamrack corrosion removal compound. Since the early 1970's most hazardous waste solutions have been drummed for disposal by an off-base contractor. Oil/water separators have been installed throughout the base for the separation of oily wastes. The surface drainage system on the east portion of Maxwell AFB receives contaminants including arsenic and lead from an unidentified off-base source(s). Due to the nature of the wastes described above and listed in Table 4.6, the soil permeability in the shallow aquifer and the probable direct connection between the shallow and deeper aquifers, the surface drainage system received a HARM score of 72.

FIRE PROTECTION TRAINING AREA NO. 2

Fire Protection Training Area No. 2 has a sufficient potential to create environmental contamination and follow-on investigation is warranted. Fire Protection Training Area No. 2 has been operated from 1962 to the present. For the period 1962 through approximately 1973, waste oils, waste fuels, waste solvents and other ignitable wastes from the shop areas were used for the training exercises. Drums of these materials were delivered to a holding area just north of the fire pit then consumed as needed. Between 25 and 35 drums would accumulate at one time at this location. Moderate leakage from these drums was believed to have occurred. Occasionally during the period 1962 through 1978, water and residual waste ignitable materials would overflow from the pit area to West End Ditch. In 1978, a concrete liner, collection sump, oil/water separator and an evaporation pond were constructed in the fire pit area. Due to the nature of the wastes consumed (straight chain hydrocarbons), the soil permeability and the probable direct connection between the shallow and deeper aquifers, this site received a HARM score of 59.

FIRE PROTECTION TRAINING AREA NO. 1

Fire Protection Training Area No. 1 has a sufficient potential to create environmental contamination and follow-on investigation is warranted. Fire Protection Training Area No. 1 was operated from the early 1940's to approximately 1962. Waste oils, waste fuels, waste solvents and other ignitable wastes from the shop area were stored on an embankment near the area of the fire pit for use in each exercise. Between 10 and 20 drums would be stored at one time. Occasionally, the waste fuels and solvent would overflow out of the pit area during an exercise into a small pond which existed nearby. The pit area and pond have been filled in and covered over with several feet of soil, landscape debris and construction rubble. Due to the nature of the wastes (straight chain hydrocarbons) and the probable direct connection between the shallow and deeper aquifers, this site received a HARM score of 58.

LANDFILL NO. 4

Landfill No. 4 has a sufficient potential to create environmental contamination and follow-on investigation is warranted. Landfill No. 4 received household garbage, base trash and industrial non-liquid wastes (waste paints, paint booth sludges, pesticide containers and small quantities of solvent sludge) during its period of operation, 1956 to the early 1970's. Trench and fill methods were used with frequent burning of the trash prior to the application of daily soil cover. Landfill No. 4 is presently closed and a vegetative cover has been established. Due to its location in a floodplain near West End Ditch, the depth of the trenches (10 feet) in relation to the depth to ground water (five to eight feet) and the probable direct connection between the shallow and deeper aquifers, this site received a HARM score of 54.

C.E. DRUM STORAGE AREA

The C.E. drum storage area has a sufficient potential to create environmental contamination and follow-on investigation is warranted. Between 80 and 90 drums of waste paints and non-ignitable oil/water mixtures have been stored at this site. Since the late 1970's, drums at the C.E. storage area have been placed on a concrete pad which drains to an oil/water separator. Prior to the late 1970's, drums were stored on the ground. There was indications that some leakage had occurred. Due to the nature of the wastes stored (substituted and other ring compounds), the soil permeability and the probable direct connection between the shallow and deeper aquifers, this site received a HARM score of 53.

LANDFILL NO. 5

Landfill No. 5 has a sufficient potential to create environmental contamination and follow-on investigation is warranted. Landfill No. 5 received household garbage, base trash and industrial non-liquid wastes (waste paints, paint booth sludges, pesticide containers) during its period of operation, early 1970's to 1974. Trench and fill methods were used, however, the trash was not burned prior to the application of daily soil cover. Landfill No. 5 is presently closed and covered. Due to its location in a floodplain near West End Ditch, the depth of the trenches (eight feet) in relation to the depth to ground water (five to eight feet) and the probable direct connection between the shallow and deeper aquifers, this site received a HARM score of 52.

LANDFILL NO. 6

Landfill No. 6 has a sufficient potential to create environmental contamination and follow-on investigation is warranted. Landfill No. 6 received household garbage, base trash and industrial non-liquid wastes (waste paints, paint booth sludges, pesticide containers) during its period of operation, 1974 to the present. Trench and fill methods were used. Burning of the trash prior to the application of daily soil cover has not been practiced. Landfill No. 6 is presently an active landfill operation. Due to its location in a floodplain near West End Ditch, the depth of the trenches (five feet) in relation to the depth to ground water (five to eight feet) and the probable direct connection between the shallow and deeper aquifers this site received a HARM score of 52.

LANDFILL NO. 2

Landfill No. 2 has a sufficient potential to create environmental contamination and follow-on investigation is warranted. Landfill No. 2 received household garbage, base trash and industrial non-liquid wastes (waste paints, paint booth sludges, pesticide containers) during its period of operation, early 1940's to 1951. Trench and fill methods were used and there was no burning of the trash prior to the application of daily soil cover. Landfill No. 2 is presently closed and covered. Due to its location in a floodplain near West End Ditch, the depth of the trenches (10 feet) in relation to the depth to ground water (five to eight feet) and the probable direct connection between the shallow and deeper aquifers, this site received a HARM score of 51.

LANDFILL NO. 3

Landfill No. 3 has a sufficient potential to create environmental contamination and follow-on investigation is warranted. Landfill No. 3 received household garbage, base trash and industrial non-liquid wastes (waste paints, paint booth sludges, pesticide containers) during its period of operation, 1951 to 1956. Trench and fill methods were used and there was no burning of the trash prior to the application of the soil cover. Landfill No. 3 is presently closed and covered. Due to its location in a floodplain near West End Ditch, the depth of the trenches (10 feet) in relation to the depth to ground water (five to eight feet) and the probable direct connection between the shallow and deeper aquifers, this site received a HARM score of 51.

HARDFILL AREA NO. 2

Hardfill area No. 2 has an insufficient potential for environmental contamination and follow-on investigation is not warranted. This site was considered due to its proximity to Fire Protection Training Area No. 1. This site received a HARM Score of 44.

SECTION 6

RECOMMENDATIONS

Eleven sites were identified as having the potential for environmental contamination. These sites have been evaluated using the HARM system which assesses their relative potential for contamination. Ten of the sites were determined to have sufficient evidence to indicate potential for environmental contamination. Additional data concerning these sites will be required in order to clearly ascertain whether or not these sites have contributed environmental contamination. Therefore, the following recommendations have been developed for each of the sites. There was insufficient evidence at one site to warrant further investigation.

PHASE II MONITORING RECOMMENDATIONS

The following recommendations are made to further assess the potential for environmental contamination from waste disposal areas at Maxwell AFB. The recommended actions are a one-time sampling programs to determine if contamination does exist at the site. If contamination is confirmed, the sampling program may need to be expanded to further quantify the extent of contamination. The recommended monitoring program for Phase II is summarized in Table 6.1.

Due to the lack of ground-water flow direction information available for the Phase I Records Search, individual determinations of ground-water flow should be made to aid in the proper placement of ground-water monitoring wells for each identified site. These determinations should be made by installing observation wells in and around

TABLE 6.1

RECOMMENDED MONITORING PROGRAM FOR PHASE II

MAXWELL AFB

Site Name	Rating Score	Recommended Monitoring	Comments
1. Electroplating Waste Disposal Site	72	a. Conduct a geophysical survey using electromagnetic and/or magnetometer techniques to confirm the location of the drums of plating solution wastes and to aid in the proper locations for monitoring wells.	
		b. Install one upgradient and two downgradient ground-water monitoring wells. Wells should be constructed of corrosion and screened below the top of the water table between 10 and 20 feet deep. Wells should be sampled and analyzed for the parameters in List A, Table 6.2.	Continue monitoring if sampling confirms metals or cyanide contamination. Additional monitoring wells may be necessary to assess extent of contamination.
2. Surface Drainage System	72	a. Collect series of stream sediment samples at locations in West End Ditch, the drainage ditch in the north central portion of the base and the drainage ditch in the housing area. Analysis should be performed on the samples for the parameters in List B, Table 6.2.	Establish additional sampling stations if contamination is found to quantify the extent of contamination.
		b. Expand the surface water quality monitoring program to include four additional sampling points in West End Ditch. Water samples should be analyzed for the be analyzed for the parameters in List B, Table 6.2.	Establish additional sampling stations if contamination is found to quantify the extent of contamination.
		c. Expand the surface water quality monitoring program for all existing sampling points on Maxwell AFB to include analyses for the parameters in List B, Table 6.2.	Establish additional sampling stations if contamination is found to quantify the extent of contamination.

TABLE 6.1
RECOMMENDED MONITORING PROGRM FOR PHASE II
MAXWELL AFB
(Continued)

Site Name	Rating Score	Recommended Monitoring	Comments
3. Fire Protection Training Area No. 2 and Landfill No. 3	59 and 51, respectively	a. Conduct a geophysical survey consisting of electrical resistivity, electromagnetic and/or magnetometer techniques to delineate the extent of the site. b. Install one upgradient and two downgradient ground-water monitoring wells. Wells should be constructed of Schedule 40 PVC and screened below the top of the water table between 10 and 20 feet. Wells should be analyzed for parameters in List C, Table 6.2.	Continue monitoring if sampling confirms contamination. GC/MS Scan may be run to identify organic contaminants found. Additional wells may be necessary to quantify extent of the contamination.
4. Fire Protection Training Area No. 1	58	Install one upgradient and two downgradient ground-water monitoring wells. Wells should be constructed of Schedule 40 PVC and screened into the water table (five to 20 feet). Wells should be analyzed for the parameters in List C, Table 6.2.	Continue monitoring if sampling confirms contamination. Additional wells may be necessary to quantify extent of contamination.
5. Landfill No. 4, No. 5 and No. 6	54, 52 and 52, respectively	a. Conduct a geophysical survey consisting of electrical resistivity, electromagnetic and/or magnetometer techniques to delineate the extent of the site. b. Install one upgradient and three downgradient ground-water monitoring wells. Wells should be constructed of Schedule 40 PVC and screened below the top of the water table between 10 and 20 feet. Wells should be analyzed for the parameters in List C, Table 6.2.	Continue monitoring if sampling confirms contamination. GC/MS Scan may be run to identify organic contaminants found. Additional wells may be necessary to quantify extent of contamination.
6. C. E. Drum Storage Area	53	Install one upgradient and two downgradient ground-water monitoring wells. Wells should be constructed of Schedule 40 PVC and screened into the water table (5 to 30 feet). Wells should be analyzed for parameters in List C, Table 6.2.	Continue monitoring if sampling confirms contamination. GC/MS Scan may be run to identify organic contaminants found. Additional wells may be necessary to quantify extent of the contamination.

TABLE 6.1
RECOMMENDED MONITORING PROGRM FOR PHASE II
MAXWELL AFB
(Continued)

Site Name	Rating Score	Recommended Monitoring	Comments
7. Landfill No. 2	51	a. Conduct a geophysical survey consisting of electrical resistivity, electromagnetic and/or magnetometer techniques to delineate the extent of of the site. b. Install one upgradient and two downgradient ground-water monitoring wells. Wells should be constructed of Schedule 40 PVC and screened into the water table between five and 20 feet. Wells should be analyzed for the parameters in List C, Table 6.2.	Continue monitoring if sampling confirms contamination. Additional wells may be necessary to quantify extent of contamination.

each identified site in order to determine ground-water elevations and elevation changes. The Phase II contractor may choose to install the observation wells in accordance with specifications for ground-water monitoring wells for future use in the ground-water monitoring program recommended below.

Electroplating Waste Disposal Site

The locations of the drums containing the plating solution wastes should be confirmed by conducting a geophysical survey using electromagnetic and/or magnetometer techniques. Following completion of this survey, a ground-water monitoring system should be established to characterize the ground-water quality and identify any migration of contaminants. One upgradient and two downgradient ground-water monitoring wells should be installed. The wells should be constructed of corrosion resistant materials able to withstand low pH and cyanide wastes and screened below the water table between 10 and 20 feet. Samples collected from these wells should be analyzed for the parameters in List A, Table 6.2.

Surface Drainage System

Stream sediment samples should be collected at nine locations in West End Ditch, at three locations in the drainage ditch in the north central portion of the base and at one location in the drainage ditch in the housing area as shown in Figure 6.1. Each sediment sample should be taken at a depth of between six and twelve inches. Analyses should be performed for the parameters in List B, Table 6.2.

The surface water quality monitoring program should be expanded for a period of six months to include four additional sampling points in West End Ditch as shown in Figure 6.2. Sampling point A is recommended in order to assess the total contaminant levels entering the base, if any. Sampling points B, C and D are recommended in order to monitor potential migration of contaminants to West End Ditch from Landfill No. 2, the electroplating waste disposal site and Landfill No. 3, No. 4, No. 5 and No. 6. Water samples should be analyzed for the parameters in

TABLE 6.2
RECOMMENDED LIST OF ANALYTICAL PARAMETERS
MAXWELL AFB

List A

Copper	Cyanide
Nickel	pH
Cadium	Total dissolved solids
Chromium	Zinc
Total organic carbon	Phenols

List B

Copper	Cyanide
Nickel	pH
Cadium	Total dissolved solids
Chromium	Zinc
Total organic carbon	Phenols
Lead	Oil and grease
	Arsenic
	Total organic halogens
	Mercury

List C

Total organic halogens	Oil and grease
Total organic carbon	Nickel
Phenols	Cyanide
pH	Sulfate
Copper	Total dissolved solids
Iron	Zinc

Interim Primary Drinking Water Standards (selected list)

Arsenic	Lead	Endrin	2,4,5-TP
Barium	Mercury	Lindane	
Cadium	Nitrate	Methoxychlor	
Chromium	Selenium	Toxaphene	
Fluoride	Silver	2,4-D	

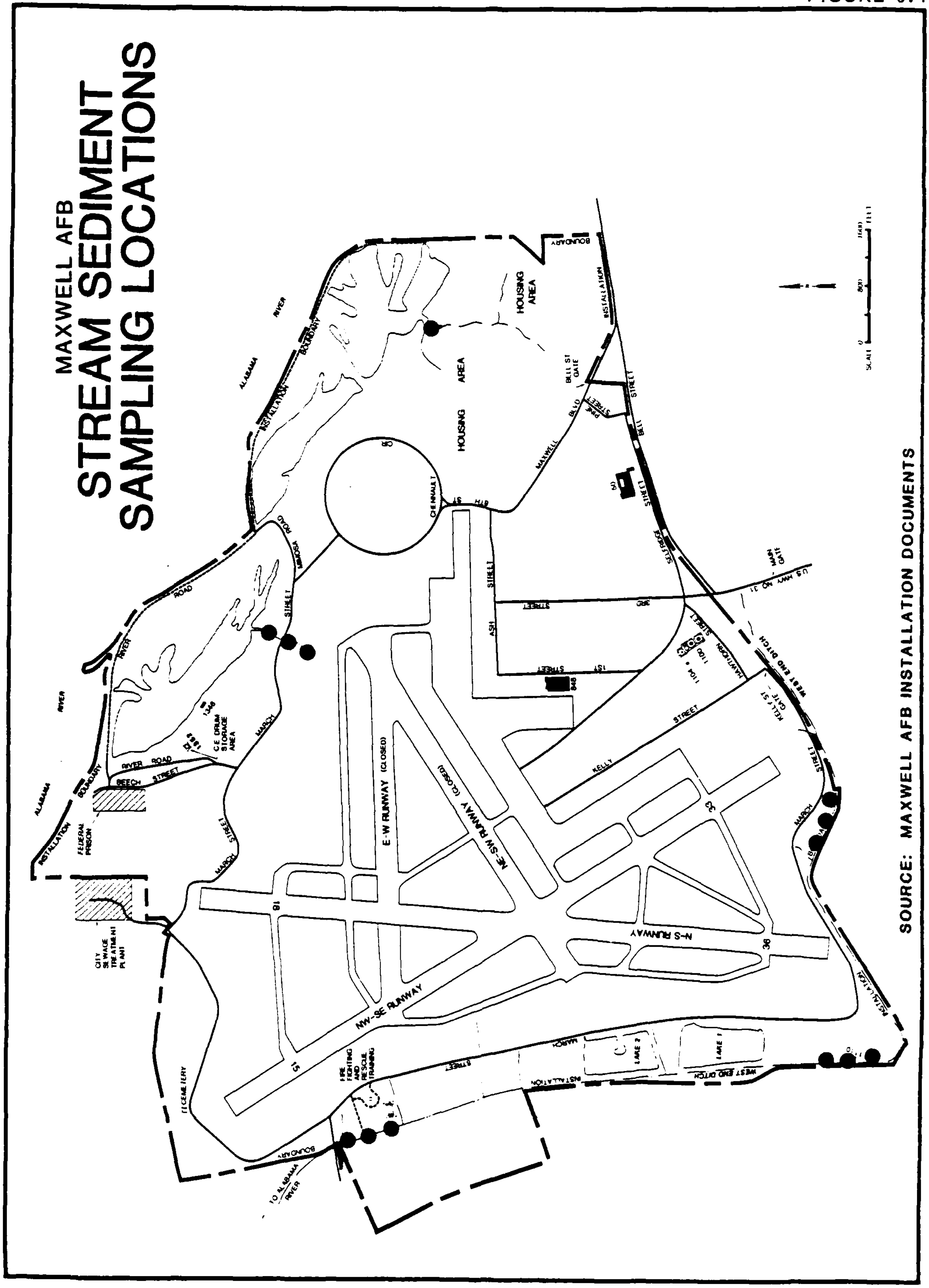
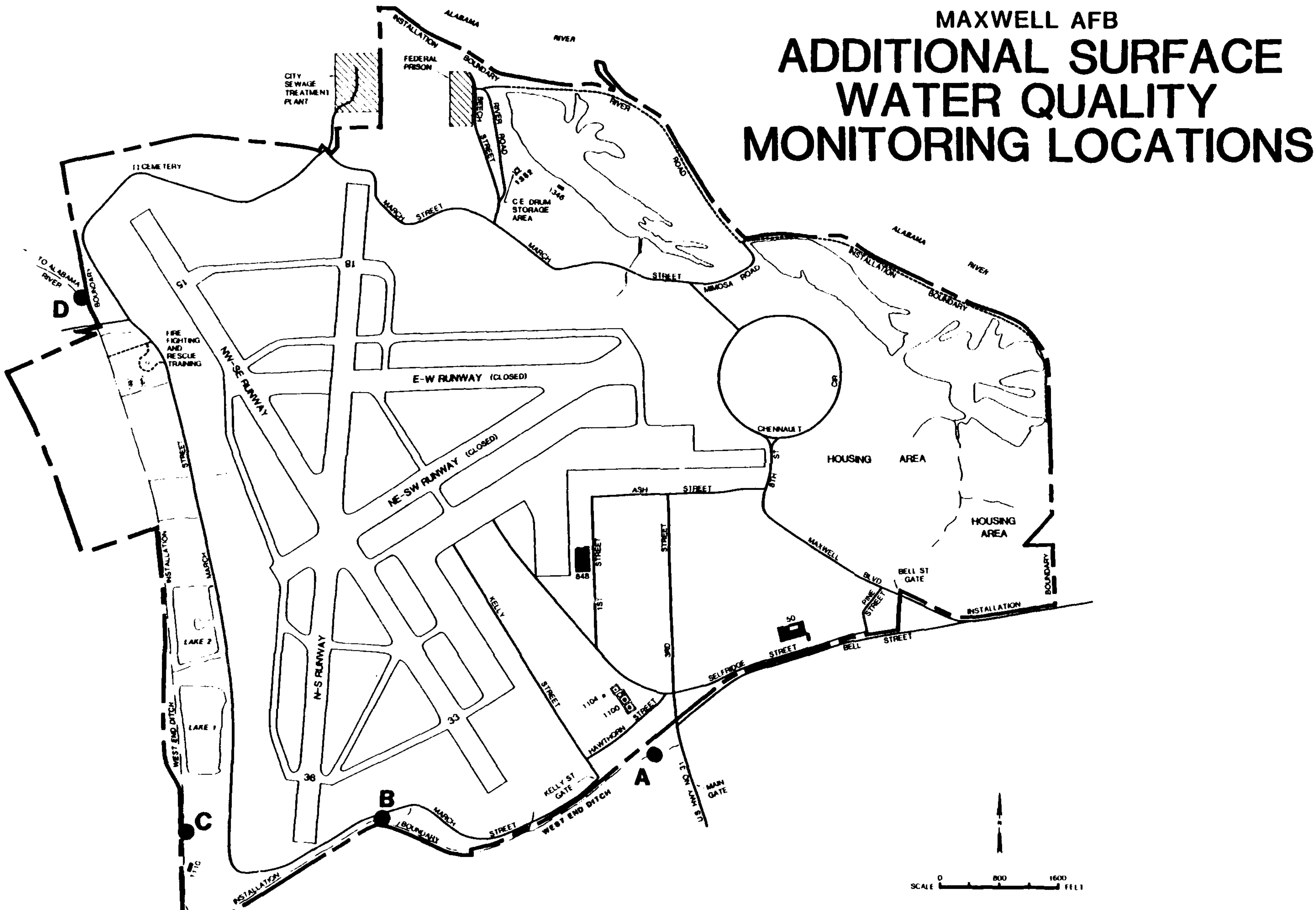

MAXWELL AFB
STREAM SEDIMENT
SAMPLING LOCATIONS
ALABAMA RIVER
INSTALLATION BOUNDARY
HOUSING AREA
BELL ST GATE
MAXWELL BLVD
PINE STREET
BELL STREET
CHENNAULT CIR
6TH ST
MIMOSA ROAD
RIVER ROAD
ASH STREET
3RD STREET
1ST STREET
SELFRIDGE STREET
U.S. HWY NO. 31
MAIN GATE
HAWTHORN STREET
WEST END DITCH
KELLY ST GATE
KELLY STREET
MARCH STREET
C.E. DRUM STORAGE AREA
BEECH STREET
FEDERAL PRISON
CITY SEWAGE TREATMENT PLANT
E-W RUNWAY (CLOSED)
NE-SW RUNWAY (CLOSED)
NW-SE RUNWAY
N-S RUNWAY
CEMETERY
FIRE FIGHTING AND RESCUE TRAINING
LAKE 1
LAKE 2
TO ALABAMA RIVER
SOURCE: MAXWELL AFB INSTALLATION DOCUMENTS

FIGURE 6.2

MAXWELL AFB
ADDITIONAL SURFACE WATER QUALITY MONITORING LOCATIONS



SOURCE: MAXWELL AFB INSTALLATION DOCUMENTS

List B, Table 6.2. Also, the parameters for all existing surface water quality sampling locations should be expanded to include analyses for the items in List B, Table 6.2.

Fire Protection Training Area No. 2 and Landfill No. 3

A geophysical survey, consisting of electrical resistivity, electromagnetic and/or magnetometer techniques, is recommended prior to the well installations to attempt to delineate the horizontal and vertical extent of the site as well as any subsurface leachate plumes migrating from the site. After completion of this study, one upgradient and two downgradient ground-water monitoring wells should be installed. The wells should be constructed of Schedule 40 PVC and screened below the top of the water table between 10 and 20 feet. Samples from each well should be analyzed for the parameters in List C, Table 6.2.

Fire Protection Training Area No. 1

One upgradient and two downgradient ground-water monitoring wells should be installed. The wells should be screened into the top of the water table (five to 20 feet). The wells should be constructed of Schedule 40 PVC pipe. Samples from each well should be analyzed for the parameters in List C, Table 6.2.

Landfill No. 4, No. 5 and No. 6

A geophysical survey, consisting of electrical resistivity, electromagnetic and/or magnetometer techniques, is recommended prior to the well installations to attempt to delineate the horizontal and vertical extent of the site as well as any subsurface leachate plumes migrating from the site. After completion of this study, one upgradient and three downgradient groundwater monitoring wells should be installed. Wells should be constructed of Schedule 40 PVC and screened below the top of the water table between 10 and 20 feet. Samples should be collected from the three existing wells and the four new wells and analyzed for the parameters in List C, Table 6.2.

C. E. Drum Storage Area

One upgradient and two downgradient ground-water monitoring wells should be installed. Wells should be constructed of Schedule 40 PVC and screened into the water table (five to 30 feet). Samples from each well should be analyzed for the parameters in List C, Table 6.2.

Landfill No. 2

A geophysical survey, consisting of electrical resistivity, electromagnetic and/or magnetometer techniques, is recommended prior to the well installations to attempt to delineate the horizontal and vertical extent of the site as well as any subsurface leachate plumes migrating from the site. After completion of this study, one upgradient and two downgradient ground-water monitoring wells should be installed. The wells should be constructed of Schedule 40 PVC and screened below the water table 10 to 20 feet. Samples from each well should be analyzed for the parameters in List C, Table 6.2.

RECOMMENDED GUIDELINES FOR LAND USE RESTRICTIONS

It is desirable to have land use restrictions for the identified disposal sites for the following reasons: (1) to provide the continued protection of human health, welfare, and the environment; (2) to insure that the migration of potential contaminants is not promoted through improper land uses; (3) to facilitate the compatible development of future USAF facilities; and (4) to allow for identification of property which may be proposed for excess or outlease.

The recommended guidelines for land use restrictions at each of the identified disposal sites at Maxwell AFB are presented in Table 6.3. A description of the land use restriction guidelines is presented in Table 6.4. Land use restrictions at sites recommended for Phase II monitoring should be reevaluated upon the completion of the Phase II monitoring program and changes made where appropriate.

TABLE 6.3

RECOMMENDED GUIDELINES FOR FUTURE LAND USE RESTRICTIONS AT POTENTIAL CONTAMINATION SITES

	Recommended Guidelines for Future Land Use Restrictions											
Site Name	Construction on the site	Excavation	Well construction on or near the site	Agricultural use	Silvicultural use	Water infiltration (Run-on, ponding, irrigation)	Recreational use	Burning or ignition source	Disposal operations	Vehicular traffic	Material storage	Housing on or near the site
Electroplating Waste Disposal Site	R	R	R	NR	NR	R	NR	NA	R	NR	NA	R
Storm Sewer System	NA	NA	R	R	R	NA	R	NA	R	NR	NA	NA
Fire Protection Training Area No. 2 and Landfill No. 3	NR	R	R	R	R	NR	R	R	R	NR	NA	NA
Fire Protection Training Area No. 1	NA	R	R	R	R	NA	R	R	R	NR	R	NA
Landfill No. 4, 5, & 6	R	R	R	NR	NR	R	NA	NA	R	NR	NA	NA
C. E. Drum Storage Area	NA	NA	R	NA	NA	R	NA	R	R	NR	R	NA
Landfill No. 2	R	R	R	NR	NR	R	NR	NA	R	NR	NA	NA

R = Restriction

NA = Not Applicable

PU = Present Use

NR = No Restriction

See Table 6.4 for definition of land use restrictions.

TABLE 6.4
DESCRIPTION OF GUIDELINES FOR LAND-USE RESTRICTIONS

Guideline	Description
Construction on the site	Restrict the construction of structures which make permanent (or semi-permanent) and exclusive use of a portion of the site's surface.
Excavation	Restrict the disturbance of the cover or subsurface materials.
Well construction on or near the site	Restrict the placement of any wells (except for monitoring purposes) on or within a reasonably safe distance of the site. This distance will vary from site to site, based on prevailing soil conditions and ground-water flow.
Agricultural use	Restrict the use of the site for agricultural purposes to prevent food chain contamination.
Silvicultural use	Restrict the use of the site for silvicultural uses (root structures could disturb cover or subsurface materials).
Water infiltration	Restrict water run-on, ponding and/or irrigation of the site. Water infiltration could produce contaminated leachate.
Recreational use	Restrict the use of the site for recreational purposes.
Burning or ignition sources	Restrict any and all unnecessary sources of ignition, due to the possible presence of flammable compounds.
Disposal operations	Restrict the use of the site for waste disposal operations, whether above or below ground.
Vehicular traffic	Restrict the passage of unnecessary vehicular traffic on the site due to the presence of explosive material(s) and/or of an unstable surface.
Material storage	Restrict the storage of any and all liquid or solid materials on the site.
Housing on or near the site	Restrict the use of housing structures on or within a reasonably safe distance of the site.

TABLE OF CONTENTS

APPENDIX A

PROJECT TEAM BIOGRAPHICAL DATA

Biographical Data

RANDAL M. REYNOLDS

Senior Engineer

[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 (Local Section Chairman, 1982-1983

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. Responsible for developing environmental studies and alternative evaluations for clients in the areas of solid/hazardous waste management, spill control and containment and process/energy system design.

Randal M. Reynolds (Continued)

Lead Project Engineer for a U.S. Department of Energy project concerning the disposal of coal wastes from industrial facilities using RCRA nonhazardous and hazardous design conditions. Performed 19 industrial plant site visits to obtain specific coal ash handling and disposal costs. Coordinated the preparation of 20 plant reports describing the individual cost estimates to comply with RCRA regulations.

Project Manager for an evaluation of laboratory waste solvent generation from an industrial facility. Worked with client's lab personnel to accurately determine waste types and quantities. Established lab procedures to segregate waste solvents for contractor disposal.

Project Manager for a Phase I Installation Restoration Program (IRP) project for the Department of Defense. Conducted interviews of past and present employees, examined records, and performed site investigations to determine hazardous chemical usage, waste generation and waste disposal practices for industrial operations at this Air Force base.

Through environmental audit procedures, identified industrial operation disposal practices which could result in waste migration and recommended priority disposal practices requiring further investigation. Project Engineer for Phase I IRP projects for 10 other Air Force bases.

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 essential spill control and clean-up equipment.

Publications and Presentations

R. M. Reynolds, C. M. Mangan and B. D. Moreth, "Projected RCRA Disposal Costs for Ash and Related Wastes from Coal-Fired Industrial Facilities," presented at the 76th Annual Meeting of the Air Pollution Control Association, Atlanta, Georgia, June 20, 1983.

Randal M. Reynolds (Continued)

R. M. Reynolds, "Practical Tips - Bagging Sludge?", Pollution Engineering, Vol. 12, No. 17, 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 an EPA technology transfer seminar, "Operation and Maintenance of Air Pollution Equipment for Particulate Control," April 12, 1979, Atlanta, Georgia.

Biographical Data

JOHN R. ABSALON
Hydrogeologist

[redacted]

Education

B.S. in Geology, 1973, Upsala College, East Orange, New Jersey

Professional Affiliations

Certified Professional Geologist (Indiana No. 46)
Association of Engineering Geologists
Geological Society of America
National Water Well Association

Experience Record

1973-1974 Soil Testing Incorporated-Drilling Contractors, Seymour, Connecticut. Geologist. Responsible for the planning and supervision of subsurface investigations supporting geotechnical, ground-water contamination, and mineral exploitation studies in the New England area. Also managed the office staff, drillers, and the maintenance shop.

1974-1975 William F. Loftus and Associates, Englewood Cliffs, New Jersey. Engineering Geologist. Responsible for planning and management of geotechnical investigations in the northeastern U.S. and Illinois. Other duties included formal report preparation.

1975-1978 U.S. Army Environmental Hygiene Agency, Fort McPherson, Georgia. Geologist. Responsible for performance of solid waste disposal facility siting studies, non-complying waste disposal site assessments, and ground-water monitoring programs at military installations in the southeastern U.S., Texas, and Oklahoma. Also responsible for operation and management of the soil mechanics laboratory.

1978-1980 Law Engineering Testing Company, Atlanta, Georgia. Engineering Geologist/Hydrogeologist. Responsible for the project supervision of waste management, water quality assessment, geotechnical, and hydrogeologic studies at commercial, industrial, and government

10.22
John R. Absalon (Continued)

facilities. General experience included planning and management of several ground-water monitoring programs, development of remedial action programs, and formulation of waste disposal facility liner system design recommendations. Performed detailed ground-water quality investigations at an Air Force installation in Georgia, a paper mill in southwestern Georgia, and industrial facilities in Tennessee.

1980-Date Engineering-Science. Hydrogeologist. Responsible for supervising efforts in waste management, solid waste disposal, ground-water contamination assessment, leachate generation, and geotechnical and hydrogeologic investigations for clients in the industrial and governmental sectors. Performed geologic investigations at twelve Air Force bases and other industrial sites to evaluate the potential for migration of hazardous materials from past waste disposal practices. Conducted RCRA ground-water monitoring studies for industrial clients and evaluated remedial action alternatives for a county landfill in Florida. Conducted quality management, hydrogeologic and ground-water quality programs for the pulp and paper industry at several mills located in the Southeast United States.

Publications and Presentations

"An Investigation of the Brunswick Formation at Roseland, NJ," 1973, with others, The Bulletin, Vol 18, No. 1, NJ Academy of Science, Trenton, NJ.

"Engineering Geology of Fort Bliss, Texas," 1978, coauthor: R. Barksdale, in Terrain Analysis of Fort Bliss, Texas, US Army Topographic Laboratory, Fort Belvoir, VA.

"Geologic Aspects of Waste Disposal Site Evaluations," 1980, with others, Program and Abstracts AEG-ASCE Symposium on Hazardous Waste Disposal, April 26, Raleigh, NC.

"Practical Aspects of Ground-Water Monitoring at Existing Disposal Sites," 1980, coauthor: R.C. Starr, Proceedings of the EPA National Conference on Management of Uncontrolled Hazardous Sites, HMCRI, Silver Spring, MD.

"Improving the Reliability of Ground-Water Monitoring Systems," 1981, Proceedings of the Madison Conference of Applied Research and Practice on Municipal and Industrial Waste, University of Wisconsin-Extension, Madison, WI.

10.22
John R. Absalon (Continued)

Ground-Water Monitoring Workshop, 1982. Presented to Mississippi Bureau of Pollution Control, Jackson, 15-17 February.

Ground-Water Monitoring Workshop, 1982. Presented to Alabama Division of Solid and Hazardous Waste, Huntsville, 20-21 July.

Ground-Water Monitoring Workshop, 1982. Presented to Kentucky Waste Management Division, Bowling Green, 27-28 July.

"Identification and Treatment Alternatives Evaluation for Contaminated Ground Water," 1982, coauthor: M. R. Hockenbury. Presented to Association of Engineering Geologists Symposium on Hazardous Waste Disposal, Atlanta, 17 September.

"Preliminary Assessment of Past Waste Storage and Disposal Sites," 1982, coauthor: W. G. Christopher. Presented to Association of Engineering Geologists Symposium on Hazardous Waste Disposal, Atlanta, 17 September.

"Treatment Alternatives Evaluation for Aquifer Restoration," 1983, coauthor: M. R. Hockenbury, Proceedings of the Third National Symposium on Aquifer Restoration and Ground Water Monitoring, NWWA, Worthington, OH.

Biographical Data

ROBERT L. THOEM
Civil/Environmental Engineer

[redacted]

Education

B.S. Civil Engineering, 1962, Iowa State University, Ames, IA
M.S. Sanitary Engineering, 1967, Rutgers University, New Brunswick, NJ

Professional Affiliations

Registered Professional Engineer (Alabama No. 10580, Georgia No. 10391, Iowa No. 5802, Illinois No. 62-32684, South Carolina No. 9178 and Virginia No. 13461)
American Academy of Environmental Engineering (Diplomate)
American Society of Civil Engineers (Fellow)
National Society of Professional Engineers (Member)
Water Pollution Control Federation (Member)

Honorary Affiliations

Who's Who in Engineering
Who's Who in the Midwest
USPHS Traineeship

Experience Record

1962-1965 U.S. Public Health Service, New York, NY. Staff Engineer, Construction Grants Section (1962-1964). Technical and administrative management of grants for municipal wastewater facilities in New York, Pennsylvania, New Jersey and Delaware.

Water Resources Section Chief (1964-1965). Supervised preparation of regional water supply and pollution control reports.

1966-1983 Stanley Consultants, Muscatine, IA and Atlanta, GA. Project Manager and Project Engineer (1966-1973). Responsible for managing studies and preparing reports for a variety of industrial and governmental environmental projects.

Environmental Engineering Department Head (1973-1976). Supervised staff involved in auditing environmental practices, conducting studies and preparing reports concerning water and wastewater systems, solid waste

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and resource recovery and water resources projects (industrial and governmental).

Resource Management Department Head (1976-1982). Responsible for multidiscipline staff engaged in planning and design of water and wastewater systems, solid waste and resource recovery, water resources, bridge, site development and recreational projects (industrial, domestic and foreign governments).

Associate Chief Environmental Engineer (1980-1983). Corporate-wide quality assurance responsibilities on environmental engineering planning projects.

Operations Group Head and Branch Office Manager (1982-1983). Directed multidiscipline staff responsible for planning and design of steam generation, utilities, bridge, water and wastewater systems, solid waste and resource recovery, water resources, site development and recreational projects (industrial, domestic and foreign governments). Administered branch office support activities.

Project Manager/Engineer for over 25 industrial projects including iron and steel, industrial coke, distillery, tannery, poultry, meat, automotive, forging, plating, paper, plastic and aluminum operations. Responsibilities included studies, environmental audits, reports and preliminary designs for service water systems, wastewater treatment and pretreatment, oil removal, recirculation and cooling (water/wastewater/recirculation flows to 47,000 gpm at one plant), boiler feedwater treatment, storm drainage, residual waste disposal (to 1,000 tons per day) and/or solid waste disposal with energy recovery (to 45 tons per day).

Project Manager for over 25 city and county projects ranging in present study area population from 1,400 to 1,700,000. Investigations included water supply and treatment; water storage, pumping and distribution using computer modeling; wastewater collection and treatment (201 studies for plants to 120 mgd); sludge processing and disposal; storm drainage; and/or solid waste collection, disposal and resource recovery systems (to 4500 tons per day for one county).

Project Manager for over 10 regional (multi-county) planning or operating agency projects. Projects included comprehensive evaluation of sludge thickening, conditioning, stabilization, dewatering, incineration, thermal treatment, drying, fertilizer production, landspreading and landfill (at a 290 mgd metro plant with 460 tons dry solids per day); solid waste collection, resource recovery, and disposal; water and sewer master plans; and 208 areawide plans for major metropolitan regions covering point source wastewater management, nonpoint source controls, water quality management, and institutional/financial arrangements.

Project Manager for five state agency projects concerning water quality management, waste load allocations (303e and 208 programs), statewide sewage sludge disposal guidelines, and/or statewide solid waste resource recovery options. Also served three state universities on water distribution system, refuse incineration with energy recovery and steam plant planning projects.

Project Manager/Engineer on over 10 projects for federal agencies. Studies included wastewater management for several major urban areas; leather tanning and finishing industry wastewater effluent guidelines; wastewater and water planning, design and operation manuals; solid waste collection and disposal; flood control and statewide river navigability.

Project Manager on several projects for Middle East governments including design of a 48-inch diameter high-pressure water transmission line and an environmental assessment of a $1.7 billion wastewater system improvement program serving a metropolitan area of over nine million people.

1983-Date Engineering-Science. Senior Project Manager. Responsible for managing a variety of environmental projects. Conducted two hazardous waste audits at U.S. Air Force bases to identify the potential migration of contaminants resulting from past disposal practices under the Phase I Installation Restoration Program. Evaluated solid waste collection, disposal and potential for resource recovery at a U. S. Army post. Performed cost allocation study for purposes of determining financial responsibilities among major users of a wastewater treatment plant.

Publications and Presentations

"Analysis of Dissolved Oxygen and the Application of Artificial Aeration in the Upper Passaic River," M.S. Thesis, Rutgers University, January 1967.

"Solid Waste System Cost Evaluation and Financing," presented at the Eleventh Annual Water Resources and Design Conference, Iowa State University, February 1973 (Coauthor L. J. Larson).

"Financing Sanitary Landfills," Iowa Municipalities, September 1973.

Discussion of "Basic Data for Solid Waste Pilot Study," ASCE Journal of the Environmental Engineering Division, October 1973.

"Sludge Handling and Disposal Comparisons in the Minneapolis-St. Paul Area," presented at the ASCE Environmental Engineering Division National Specialty Conference, July 1974.

"Project Cost Evaluation Using Probability Concepts," Consulting Engineer, November 1974 (Coauthor K. A. Smith).

"Planning Solid Waste Management for an Urban County," Public Works, November 1974 (Coauthor L. J. Larson).

"Using Probability Concepts for Project Cost Evaluation," Modern Government/National Development, January-February 1978 (Coauthor K. A. Smith).

"New Potable Water Supply for Jordan," presented at the Fiftieth Annual Georgia Water and Pollution Control Association Conference, August 1981.

"New Potable Water Supply for Jordan," presented at the ASCE Water Resources Planning and Management Division National Speciality Conference, March 1983 (Coauthors L. L. Pruitt and R. F. Haskins).

"Jordan Meets Water Supply Challenges," presented at the AWWA Annual National Conference, June 1983 (Coauthor L. L. Pruitt).

"Steel Pipeline Provides New Water Supply for Jordan," presented at the ASCE Speciality Conference on Pipelines in Adverse Environments II, November 1983 (Coauthors C. L. Meyer and M. C. Boner).

APPENDIX B

LIST OF INTERVIEWEES

TABLE B.1

LIST OF INTERVIEWEES

	Position	Years of Service
1.	Chief, Engineering and Environmental Branch, 3800 ABW, Maxwell	4 (Gunter) 18 (Maxwell)
2.	Environmental Coordinator, 3800 ABW, Maxwell	1
3.	Plumber/Pipe Fitter, 3800 ABW, Maxwell	30
4.	Chief, Engineering Design, 3800 ABW, Maxwell	12 (Maxwell) 14 (Gunter)
5.	Asst. Chief, Training, Fire Dept., Maxwell	4
6.	Chief, Fire Dept., Maxwell	9
7.	Driver/Operator, Fire Dept., Maxwell	27
8.	Equipment Operator Foreman, 3800 ABW, Maxwell	30
9.	Vehicle Operator, 3800 ABW, Maxwell	36
10.	Supervisor, Roads & Grounds, 3800 ABW, Maxwell	31
11.	Equipment Operator Foreman, 3800 ABW, Maxwell	9 (Gunter) 22 (Maxwell)
12.	Pavements Supervisor, 3800 ABW, Maxwell	31
13.	Chief, Operations, Gunter AFS	1
14.	Mechanical Superintendent, Civil Eng., Gunter	20 (Gunter) 2 (Maxwell)
15.	Equipment Mechanic, Civil Eng., Gunter	10 (Gunter) 21 (Maxwell)
16.	Structural Superintendent, Civil Eng., Gunter	5 (Maxwell) 1 (Gunter)
17.	Foreman, Pavements & Grounds, Gunter	13 (Maxwell) 23 (Gunter)

TABLE B.1
(Continued)
LIST OF INTERVIEWEES

Position		Years of Service
18.	Power Production Specialist, CE Shop, Maxwell	1
19.	NCOIC, Heating Shop, Maxwell	1
20.	Painter, Paint Shop, Maxwell	23
21.	Chief, Fire Inspector, Fire Dept., Maxwell	1
22.	Asst. Dock Chief, 908 Reserves, Maxwell	3
23.	Fabrication Branch Chief, 3800 ABW, Maxwell	29
24.	Paint Shop, 3800 ABW, Maxwell	14
25.	Prop. Shop Supervisor, 908 Reserves, Maxwell	14
26.	3800 ABW, Maxwell	11
27.	Ground Power Repair & Support (AGE), Maxwell	27
28.	Warehouse Classified Consultant, DPDO, Gunter/Maxwell	28
29.	Paint Foreman, Civil Eng., Gunter	29
30.	Water & Waste, Civil Eng., Gunter	10
31.	NCOIC Heavy Equip., Civil Eng., Gunter	1
32.	Property Disposal Specialist, DPDO, Gunter	27
33.	Quality Control Supr., Fuels Mgmt., Maxwell	17
34.	Fuel Storage Foreman, Fuels Mgmt., Maxwell	26
35.	Plant Supervisor, Towassa Water Pollution Control Plant, Mongtomery Water Works & Sanitary Sewer Board	15
36.	Asst. Supt., Golf Course, 3800 ABW, Maxwell	1
37.	Sanitary Supt., 3800 ABW, Maxwell	28
38.	Elect. Syst. Shop Chief, 3800 ABW, Maxwell	27

TABLE B.1
(Continued)
LIST OF INTERVIEWEES

Position	Years of Service
39. Field Maintenance Section, 3800 ABW, Maxwell	28
40. Aircraft Welding Shop Foreman, Maxwell	29
41. Welder/Metal Processor, Maxwell	28

TABLE B.2

OUTSIDE AGENCY CONTACTS

Name		Position
1.	John C. Scott	Hydrologist, 30 years, USGS - Water Resources Division, Montgomery, AL; 205/832-7510
2.	Joe Power	Engineer, 10 years, Drinking Water Supply Section, Alabama Dept. of Environmental Management, Montgomery, AL; 205/832-3170
3.	George Bryant	Superintendent, 20 years, City Water Supply Division, Montgomery Municipal Water Works, Montgomery, AL; 205/272-1246
4.	James P. Martin	Public Health Engineer, 5 years, Water Quality Section, Alabama Department of Environmental Management, Montgomery, AL; 205/277-3630
5.	Joe Hutton	Chief, Flood Plain Management/Special Studies Branch, Mobile District, U.S. Army Corps of Engineers, Mobile, AL; 205/694-3801
6.	Art Linton	Federal Facilities, U.S. Environmental Protection Agency, Region IV, Atlanta, GA; 404/881-3776
7.	C. Stubbs	Soil Conservation Service, U.S. Department of Agriculture, Auburn, AL; 205/821-8070
8.	Paul H. Moser	Environmental Geologist, Geological Survey of Alabama, University, AL; 205/349-2852

APPENDIX C
PRIMARY AND TENANT ORGANIZATIONS AND MISSIONS

APPENDIX C

PRIMARY AND TENANT ORGANIZATIONS AND MISSIONS

PRIMARY ORGANIZATION AND MISSION

The primary mission of Maxwell and Gunter is to support the Air University (AU). The 3800 Air Base Wing operates and maintains Maxwell and Gunter and provides logistic support and base services for AU organizations located on these installations. It also provides services and support for other Department of Defense agencies in accordance with current DOD and United States Air Force directives.

MAXWELL AFB

Headquarters, Air University

Air University's mission is to provide continuing professional military education for the Air Force and functions as the Air Force education, doctrinal and research center. As such it provides education to meet Air Force needs in scientific, technological, managerial and other specified professional areas.

Air War College

The mission of the Air War College is to prepare senior officers for high command and staff duty by developing a sound understanding of military strategy in support of national security policy to insure an intelligent contribution toward the most effective development and employment of aerospace power.

Squadron Officer School

The mission of the Squadron Officer School is to prepare selected captains and lieutenants for those command and staff tasks required of junior officers; to strengthen those professional values necessary for a full career of dedication and service; and to provide these officers with a foundation for further professional development.

Air Command and Staff College

The Air Command and Staff College provides an intermediate level of professional education. Its mission is to improve and broaden the professional competence of selected field grade officers; to prepare them for command and staff positions of greater responsibility.

Education and Development Center

Its mission is threefold: (a) it conducts the Academic Instructor School which is the prime preparatory training for future AU faculty members, AFROTC instructors and other teaching personnel throughout the Air Force; (b) through its International Officer School, international officers are prepared for advanced training in other AU schools and the USAF School of Aerospace Medicine; and (c) provides specialized instruction in communication skills for students currently attending other Air University courses.

Leadership and Management Development Center

Its mission is to conduct special professional development courses and to perform research, writing, lecturing and consultant services in the areas of leadership and management development.

Air University Library

Its mission is to provide research library services to the staff of the headquarters, schools, colleges and tenant units of Air Univesity at Maxwell and Gunter.

Center for Aerospace Doctrine, Research and Education

The mission of CADRE is to conduct basic and applied aerospace power research; to assist in the development, analysis and testing of concepts, doctrine, and strategy; to conduct computerized wargaming for the Air Force; and to provide specialized educational assistance and publication support for AU academic programs.

Air University Manpower and Organization Directorate

AU/MO establishes manpower policies, determines manpower requirements and directs the development of command manpower programs.

USAF Regional Hospital-Maxwell

Its mission is to provide support in all medical and surgical specialties and to provide support to practically all military bases in the southeastern United States with medical consultations and specialized treatment for referred patients from other military facilities.

Headquarters, Civil Air Patrol

Its mission is to serve in a guidance and advisory capacity to the Civil Air patrol, helping oversee its nationwide activities.

GUNTER AFS

AF Senior NCO Academy

The mission of the AFSNCOA is to provide the education necessary for senior noncommissioned officers to become more effective leaders and managers during peace time. This is accomplished by providing a highly practical eduction to the top NCOs who supervise over 85 percent of the USAF enlisted force.

AF Logistics Management Center

The Air Force Logistics Management Center improves the capability of USAF logistics forces. To perform this mission, the Center develops, analyzes, evaluates and aids in the implementation of new or improved concepts and systems that increase the Air Force's readiness to react to and sustain combat. The AFLMC focuses on management science and operations research which will produce beneficial impacts on the Air Force logistics system.

Extension Course Institute

The Extension Course Institute supports the formal training and educational programs and provides career courses to military and civilian personnel throughout the DOD. The Institute also provides self-study material for the Air Force upgrade training program.

Air University Field Printing Plant

The Field Printing Plant provides editing and publication support AU organizations. It develops and produces textbooks and other instructional material.

TENANT ORGANIZATIONS AND MISSIONS

Maxwell AFB and Gunter AFS also host several tenant organizations. These organizations are listed below with brief descriptions of their missions.

MAXWELL AFB

Headquarters, Air Force ROTC

Its mission is to direct and give administrative assistance in the commissioning of officers to meet Air Force requirements through educational programs on college campuses.

USAF Trial Judiciary

Its mission is to provide military judges for general and special court-martials for the southeastern United States and trial counsels and defense counsels for the same area plus the Canal Zone.

Federal Prison

Its mission is a confinement facility for the housing and care of convicted federal prisoners. The camp is a minimum custody facility and inmates committed are generally from the southeastern region of the country and not considered serious offenders.

908 Tactical Airlift Group (Reserves)

Its mission is to provide air transportation for airborne forces, their equipment, and supplies with delivery by airdrop or airland; to provide intratheater airlift of personnel, equipment and supplies including tactical aeromedical evacuation within the theater of operations; and to provide intratheater airlift of personnel and cargo when required.

1973 Communications Squadron

Its mission is to provide communications and electronics support to Maxwell AFB and Gunter AFS.

Det. 9, 24 Weather Squadron

Its mission is to provide routine and specialized weather services to the Headquarters, Air University, Maxwell AFB, and other DOD units in support of the Air Weather Service worldwide mission.

Det. 3, 1402 Military Airlift Squadron

Its mission is to provide operational airlift support to Department of Defense personnel under the direction of Military Airlift Command. The unit provides air transport to and from destinations throughout the continental United States utilizing CT-39A aircraft in support of centrally scheduled and directed missions.

District 8, OSI(IG), HQ USAF

Its mission is to provide criminal, counter intelligence, internal security, and special investigative services for all Air Force activities and to perform distinguished visitor protective services and operations as authorized.

Corps of Engineers

Its mission is to administer and inspect military construction contracts (MCP) at Maxwell and Gunter. This office also coordinates the needs of the Air Force for a facility under construction with the contractor and the designer.

USAF Postal & Courier Flights

Its mission is to provide personal mail service to all authorized personnel assigned to Maxwell and to forward all undeliverable mail addressed to personnel having departed Maxwell.

Other Maxwell Tenant Units

USAF Auditor General Representative Office

Air Force Medical Management Team

Albert F. Simpson Historical Research Center

Community College of the Air Force

Defense Investigative Service

Federal Aviation Administration

United States Post Office

GUNTER AFS

AF Data Systems Design Center

The mission of the center is to promote accomplishment of the Air Force mission by providing automated data processing capabilities to major commands and field units located around the world. The work of the center permits the effective and efficient achievement and maintenance of readiness, survivability and sustainability.

AF Data Systems Evaluation Center

The Center provides independent quality assurance assessments of automated data processing systems and provides expert consultant program management support to program managers.

AF Automated Systems Project Office

The AFASPO's mission is to acquire new automated data processing systems. Currently four major Air Force acquisition programs are handled by the AFASPO. The program which gave the AFASPO its start and original name (Phase IV Program Management Office) is the Base-Level Data Automation Program which began in 1976. In 1979, the AFASPO was made responsible for the Inter-Service/Agency Automated Message Processing Exchange Program. Two more programs were assigned in 1981 - The Air Force Automated Message Processing Exchange Program and the Telecommunications Center Upgrade Program.

Defense Property Disposal Office

Its primary mission is to provide reutilization of military owned personal property. Utilization specialists work full time to find "new homes" for used material.

3531 Recruiting Squadron

The 3531 Recruiting Squadron has approximately 100 personnel recruiting young men and women in three states. The squadron is responsible for the recruitment of both officers and enlisted personnel in the majority of Alabama, Georgia and the panhandle of Florida.

APPENDIX D

MASTER LIST OF INDUSTRIAL SHOPS

APPENDIX D

MASTER LIST OF INDUSTRIAL SHOPS

Name	Present Location (Bldg. No.)	Handles Hazardous Materials	Generates Hazardous Wastes	Typical Treatment Storage & Disposal Methods
3800 Air Base Wing/908 Air Reserve Group (Consolidated Maintenance)				
Aerospace Ground Equipment (AGE)	848/1025	Yes	Yes	Contractor/ DPDO
Electric/Battery	848	Yes	Yes	Contractor/DPDO
Non-destructive Inspection	848	Yes	Yes	DPDO/Sanitary Sewer
Metal Processing/Welding	848	Yes	No	--
Corrosion Control/Paint	848	Yes	Yes	Contractor
Pneudraulics	848	Yes	Yes	DPDO
Machine Shops	848	Yes	Yes	DPDO
Structural Shop	848	Yes	No	--
908 Air Reserve Group/Maintenance				
Flightline Maintenance	689	Yes	Yes	To Bldg. 848/ DPDO
Survival Equipment	1002	Yes	No	--
Engine/Propeller	848	Yes	Yes	DPDO
Tire	848	Yes	Yes	DPDO
3800 Air Base Wing (ABW)/Maintenance				
Flightline Maintenance	848	Yes	Yes	DPDO/FPTA
Communications, Navigation & Instruments	848	Yes	Yes	--

APPENDIX D
(Continued)
MASTER LIST OF INDUSTRIAL SHOPS

Name	Present Location (Bldg. No.)	Handles Hazardous Materials	Generates Hazardous Wastes	Typical T.S.D. Methods
3800 Air Base Wing (ABW)/Maintenance (Continued)				
Transient Aircraft Maintenance	844	Yes	Yes	To Bldg. 848/ DPDO
Precision Measuring Equipment Laboratory	1017	Yes	Yes	DPDO
ABW/Supply				
Fuels Storage/Inspection	1101/1104	Yes	Yes	DPDO/FPTA/ Landfill
Service Station	913	Yes	Yes	DPDO
Vehicle Maintenance (General and Heavy Equipment)	936	Yes	Yes	O-W Separators/ DPDO
Refueling Vehicle Maintenance	1063	Yes	Yes	DPDO
Lawn Mower Maintenance	924	Yes	Yes	DPDO
ABW/Morale, Welfare & Recreation				
Auto/Wood Hobby Shop	715	Yes	Yes	DPDO
ABW/Services				
Laundry/Dry Cleaning	912	Yes	No	--
ABW/Base Civil Engineering				
Protective Coating Paint	78	Yes	Yes	Contractor/ Landfill

APPENDIX D
(Continued)
MASTER LIST OF INDUSTRIAL SHOPS

Name	Present Location (Bldg. No.)	Handles Hazardous Materials	Generates Hazardous Wastes	Typical T.S.D. Methods
ABW/Base Civil Engineering (Continued)				
Metal Working (Sheet Metal)	78	Yes	No	--
Heating Systems Maintenance	78	Yes	Yes	Contractor/DPDO
Carpenter	78	Yes	No	--
Plumbing	78	Yes	No	--
Interior Electric	78	Yes	No	--
Exterior Electric	78	Yes	Yes	Contractor/DPDO
Power Production	82	Yes	Yes	Contractor
Welding	82	Yes	No	--
Refrigerating/Air Conditioning	82	Yes	No	--
Pavement & Grounds	1334	Yes	Yes	Sanitary Sewer
Entomology	1334	Yes	Yes	Sanitary Sewer
Fire Protection	1043	Yes	Yes	Evaporation Pond
Heating & Air Conditioning Plant	1410	Yes	Yes	Boilers
Golf Course Maintenance	1441	Yes	Yes	Landfill
ABW/Administration				
Maxwell Duplicating	1006	Yes	No	--
Micrographics Production	914	Yes	No	--

APPENDIX D
(Continued)
MASTER LIST OF INDUSTRIAL SHOPS

Name	Present Location (Bldg. No.)	Handles Hazardous Materials	Generates Hazardous Wastes	Typical T.S.D. Methods
1973D Communications Squadron				
Outside Plant	929	Yes	No	--
Inside Plant	929	Yes	No	--
Nav Aids Maintenance	929	Yes	No	--
Cable Maintenance	929	Yes	No	--
Weather Equipment Maintenance	929	Yes	No	--
Crytographic Maintenance	929	Yes	No	--
Ground Radio Maintenance	929	Yes	No	--
Teletype Maintenance	929	Yes	No	--
Television Maintenance	802/1402	Yes	No	--
USAF Hospital Maxwell				
Nuclear Medicine	50	Yes	Yes	Contractor/ Manufacturer
Radiology	50	Yes	Yes	DPDO/Sanitary Sewer
Dental Clinic	50	Yes	Yes	DPDO/Sanitary Sewer
Hospital Laboratory	50	Yes	Yes	Incineration/ Sanitary Sewer
Pathology	50	Yes	Yes	Incineration/ Contractor
Surgery	50	Yes	Yes	Incinerator

APPENDIX D
(Continued)
MASTER LIST OF INDUSTRIAL SHOPS

Name	Present Location (Bldg. No.)	Handles Hazardous Materials	Generates Hazardous Wastes	Typical T.S.D. Methods
Audiovisual Service Center (D-K Associates)				
Photographic Laboratory	1214	Yes	Yes	Contractor
Civil Air Patrol, USAF				
Printing Plant	747	Yes	No	--
3800 Air Base Squadron (ABS)/Civil Engineering (Gunter AFS)				
Pavements/Grounds Maintenance	560	Yes	Yes	Surface Drainage/Contractor
Entomology	503	Yes	Yes	Landfill/ Sanitary Sewer
Structural Maintenance	505	Yes	No	--
Protective Coating (Paint)	512	Yes	Yes	Contractor/ Landfill
Plumbing	326	Yes	No	--
Sheet Metal/Welding	502	Yes	No	--
Refrigeration/Air Conditioning	503	Yes	No	--
Heating Systems Maintenance	326	Yes	No	--
ABS/Morale, Welfare & Recreation				
Auto Hobby Shop	715	Yes	Yes	DPDO

APPENDIX D
(Continued)
MASTER LIST OF INDUSTRIAL SHOPS

Name	Present Location (Bldg. No.)	Handles Hazardous Materials	Generates Hazardous Wastes	Typical T.S.D. Methods
ABS/Transportation				
Vehicle Maintenance	715	Yes	Yes	DPDO
Service Station	408	Yes	Yes	DPDO
ABS/AU Field Printing Plant				
Printing Plant	847	Yes	No	--
ABS/Dental Clinic				
Clinic	209	Yes	Yes	DPDO/Sanitary Sewer

APPENDIX E

SUPPLEMENTAL BASE ENVIRONMENTAL DATA

TABLE E.1
ANALYSIS RESULTS FOR SAMPLING POINT
0128NA001
(Storm Drainage Influent to Base)
Maxwell AFB

	Flow (gpm)	Suspended Solids (mg/l)	Oil to Grease (mg/l)	Cyanide (mg/l)	Phenols (ug/l)	Arsenic (ug/l)	Cadmium (ug/l)	Lead (ug/l)	Mercury (ug/l)	pH (std. units)
5-7-82	4	213	480	<0.01	<10	95.6	<10	<50	<5	8.2
7-8-82	2	336	0.9	<0.01	82	233	<10	348	<5	6.5
8-6-82	-	242	1.8	<0.01	<10	267	<10	<50	<5	-
9-8-82	1	26	23.2	0.03	18	1,158	<10	<50	<5	-
10-21-82	3	632	58.8	<0.01	14	400	<10	345	<5	6.5
11-3-82	5	61	2.5	0.01	20	96	<10	221	<5	6.5
12-8-82	10	35	86.4	0.01	250	34	<10	<50	<5	-
1-5-83	3	170	14.8	<0.01	<10	1,500	<10	1,276	<5	-
2-2-83	7	11	0.5	<0.01	<10	150	<10	258	<5	-
3-1-83	20	196	163.2	<0.01	16	240	<10	60	<5	7.5
4-6-83	5	27	252	<0.01	<10	250	<10	<50	<5	7.7
5-4-83	5	230	55.2	<0.01	<10	400	<10	<50	<5	7.8
6-1-83	5	440	98.4	<0.01	<10	350	<10	374	<5	8.2

Note: The water quality classification for the Alabama River near Maxwell AFB is "Fish and Wildlife". The specific water quality criteria for this classification is shown following Table E.2 in this appendix.

TABLE E.2
LIST OF PESTICIDES CURRENTLY IN USE
MAXWELL AFB AND GUNTER AFS

Maxwell AFB

Kromad
Daconil
Paraquat
Methyl Bromide
Zeptox
Riverside 9-12
Actidione Thiram
Sevin
Round-up
Chipco
Diazinon
Diquat
Proxol
Balan
Ronstar G
Thiram
Kerb
Koban
Fore
Cutrine
Amdro
Propoxhr
Dursban M
Pyrethrin
Malathion
Zinc Phosphide
Sevin
Diphacin
Super Zepticide
Chlordane
Urox "B" Bromocil
Urox 22 Monuron
2,4-D
Perma Dust PT 240
Bolt pyrethrin

Gunter AFS

Round-up
Prometone
2,4-D
Malathion
Warfrain
Diazinon
Baygon
Bolt Pyrethrin
Diphacin
Resmethrin
Vaponite
Amdro
Dipterex
D-tox 4E
d-Phenothrin
Lindane

D. FISH AND WILDLIFE

Best Usage of Waters: Fishing, propagation of fish, aquatic life, and wildlife, and any other usage except for swimming and water-contact sports or as a source of water supply for drinking or food-processing purposes.

Conditions Related to Best Usage: The waters will be suitable for fish, aquatic life and wildlife propagation. The quality of salt and estuarine waters to which this classification is assigned will also be suitable for the propagation of shrimp and crabs.

Items	Specifications
1. Sewage, industrial wastes, or other wastes.	None which are not effectively treated in accordance with Section V of these criteria.
2. pH	Sewage, industrial wastes or other wastes shall not cause the pH to deviate more than one unit from the normal or natural pH, nor be less than 6.0, nor greater than 8.5. For salt waters and estuarine waters to which this classification is assigned, wastes as herein described shall not cause the pH to deviate more than one unit from the normal or natural pH, nor be less than 6.5, nor greater than 8.5.
3. Temperature	a. The maximum temperature in streams, lakes, and reservoirs, other than those in river basins listed in Part b. hereof, shall not exceed 90°F.
	b. The maximum temperature in streams, lakes, and reservoirs in the Tennessee and Cahaba River Basins, and for that portion of the Tallapoosa River Basin from the tailrace of Thurlow Dam at Tallassee downstream to the junction of the Coosa and Tallapoosa Rivers which has been designated by the Alabama Department of Conservation and Natural Resources as supporting smallmouth bass, sauger, or walleye, shall not exceed 86°F.
	c. The maximum in-stream temperature rise above ambient water temperature due to the addition of artificial heat by a discharger shall not exceed 5°F in streams, lakes, and reservoirs in non-coastal and non-estuarine areas.

(3. Temperature - Cont'd)

d. The maximum in-stream temperature rise above ambient water temperature due to the addition of artificial heat by a discharger shall not exceed $4^{o}F$ in coastal or estuarine waters during the period October through May, nor shall the rise exceed $1.5^{o}F$ during the period June through September.

e. In lakes and reservoirs there shall be no withdrawal from, nor discharge of heated waters to, the hypolimnion unless it can be shown that such discharge or withdrawal will be beneficial to water quality.

f. In all waters the normal daily and seasonal temperature variations that were present before the addition of artificial heat shall be maintained, and there shall be no thermal block to the migration of aquatic organisms.

g. Thermal permit limitations in State discharge permits may be less stringent than those required by criteria a. - d. hereof when a showing by the discharger has been made pursuant to Section 316 of the Federal Water Pollution Control Act (FWPCA), 33 U.S.C. 1251 et seq. or pursuant to a study of an equal or more stringent nature required by the State of Alabama authorized by Title 22, Section 22-22-9(c), Code of Alabama, 1975, that such limitations will assure the protection and propagation of a balanced, indigenous population of shellfish, fish and wildlife, in and on the body of water to which the discharge is made. Any such demonstration shall take into account the interaction of the thermal discharge component with other pollutants discharged.

4. **Dissolved Oxygen**

For a diversified warm water biota, including game fish, daily dissolved oxygen concentrations shall not be less than 5 mg/l at all times; except under extreme conditions due to natural causes, it may range between 5 mg/l and 4 mg/l, provided that the water quality is favorable in all other parameters. The normal seasonal and daily fluctuations shall be maintained above these levels. In no event shall the dissolved oxygen level be less than 4 mg/l due to discharges from existing impoundments. All new impoundments shall be designed so that the discharge will

(4. Dissolved Oxygen - Cont'd)	contain at least 5 mg/l dissolved oxygen where practicable and technologically possible. The Environmental Protection Agency in cooperation with the State of Alabama and parties responsible for impoundments, shall develop a program to improve the design of existing facilities. In coastal waters, surface dissolved oxygen concentrations shall not be less than 5 mg/l, except where natural phenomena cause the value to be depressed. In estuaries and tidal tributaries, dissolved oxygen concentrations shall not be less than 5 mg/l, except in dystrophic waters or where natural conditions cause the value to be depressed. In the application of dissolved oxygen criteria referred to above, dissolved oxygen shall be measured at a depth of 5 feet in waters 10 feet or greater in depth; and for those waters less than 10 feet in depth, dissolved oxygen criteria will be applied at mid-depth.
5. Toxic substances attributable to sewage, industrial wastes, or other wastes.	Only such amounts, whether alone or in combination with other substances, as will not be injurious to fish and aquatic life, including shrimp and crabs in estuarine or salt waters or the propagation thereof; not to exceed one-tenth of the 96-hour median tolerance limit for fish and aquatic life, including shrimp and crabs in salt and estuarine waters, except that other limiting concentrations may be used when factually justified and approved by the Commission.
6. Taste, odor, and color-producing substances attributable to sewage, industrial wastes, and other wastes.	Only such amounts, whether alone or in combination with other substances, as will not be injurious to fish and aquatic life, including shrimp and crabs in estuarine and salt waters or adversely affect the propagation thereof; impair the palatability or marketability of fish and wildlife or shrimp and crabs in estuarine and salt waters; unreasonably affect the aesthetic value of waters for any use under this classification.

7. **Bacteria**

Bacteria of the fecal coliform group shall not exceed a geometric mean of 1,000/100 ml on a monthly average value; nor exceed a maximum of 2,000/100 ml in any sample.

8. **Radioactivity**

The concentrations of radioactive materials present shall not exceed the requirements of the State Department of Public Health.

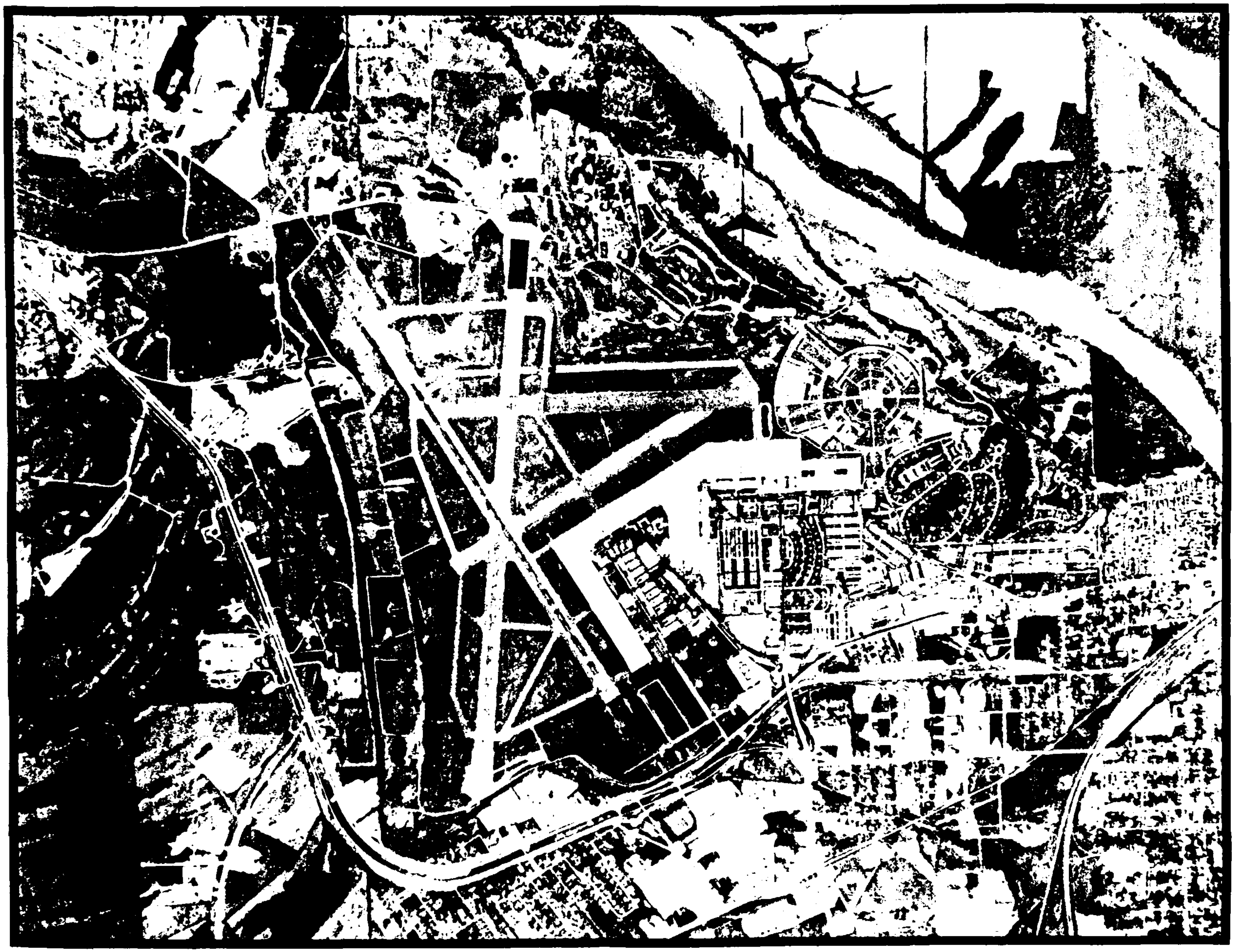
9. **Turbidity**

There shall be no turbidity of other than natural origin that will cause substantial visible contrast with the natural appearance of waters or interfere with any beneficial uses which they serve. Furthermore, in no case shall turbidity exceed 50 Nephelometric units above background. Background will be interpreted as the natural condition of the receiving waters without the influence of man-made or man-induced causes. Turbidity levels caused by natural runoff will be included in establishing background levels.

Source: Alabama Department of Environmental Management, "Regulations, Policies and Procedures", revised September 13, 1983.

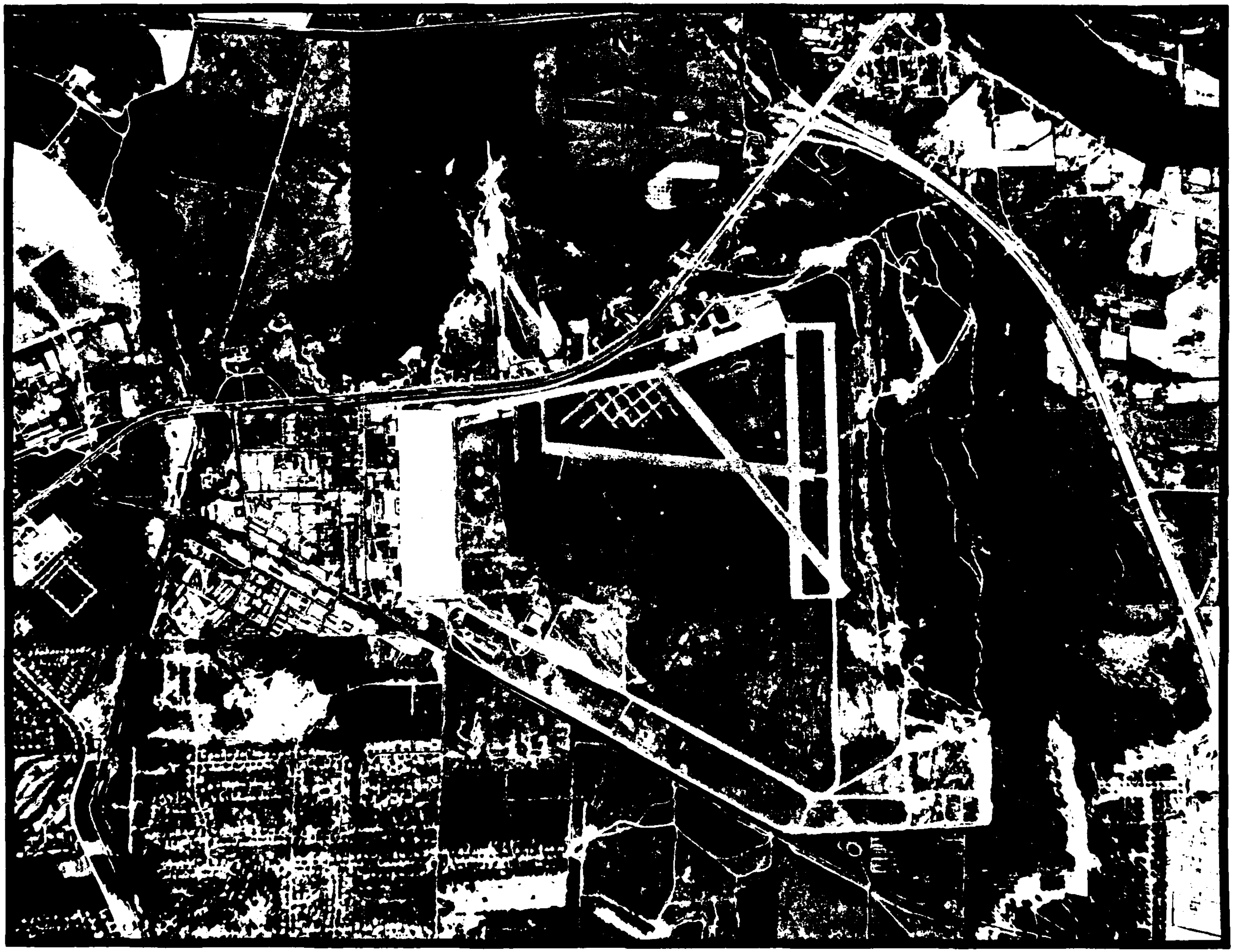
APPENDIX F

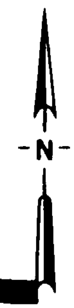
SITE PHOTOGRAPHS



MAXWELL AFB, ALABAMA

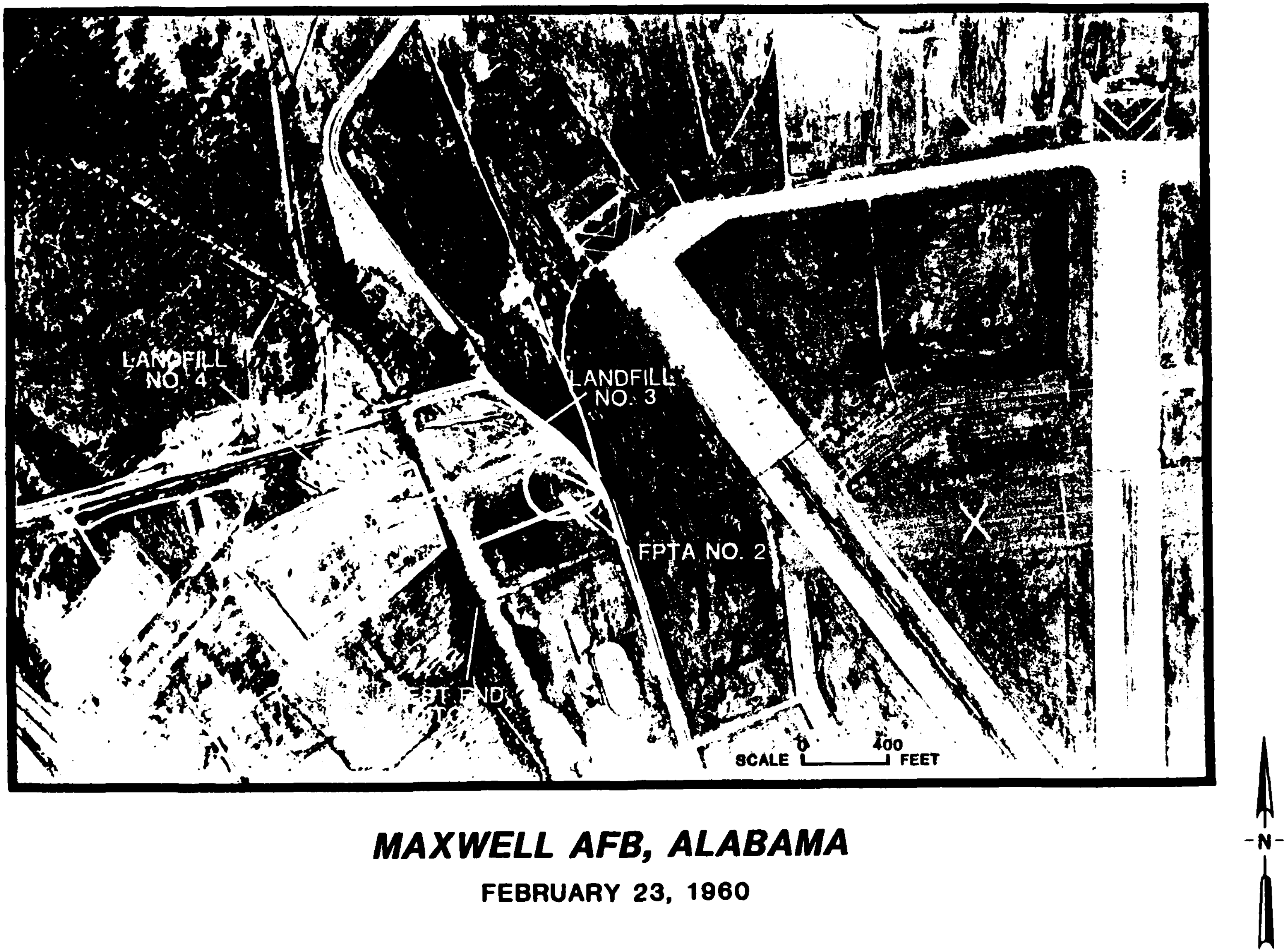
AUGUST, 1969





GUNTER AFS, ALABAMA

AUGUST, 1969

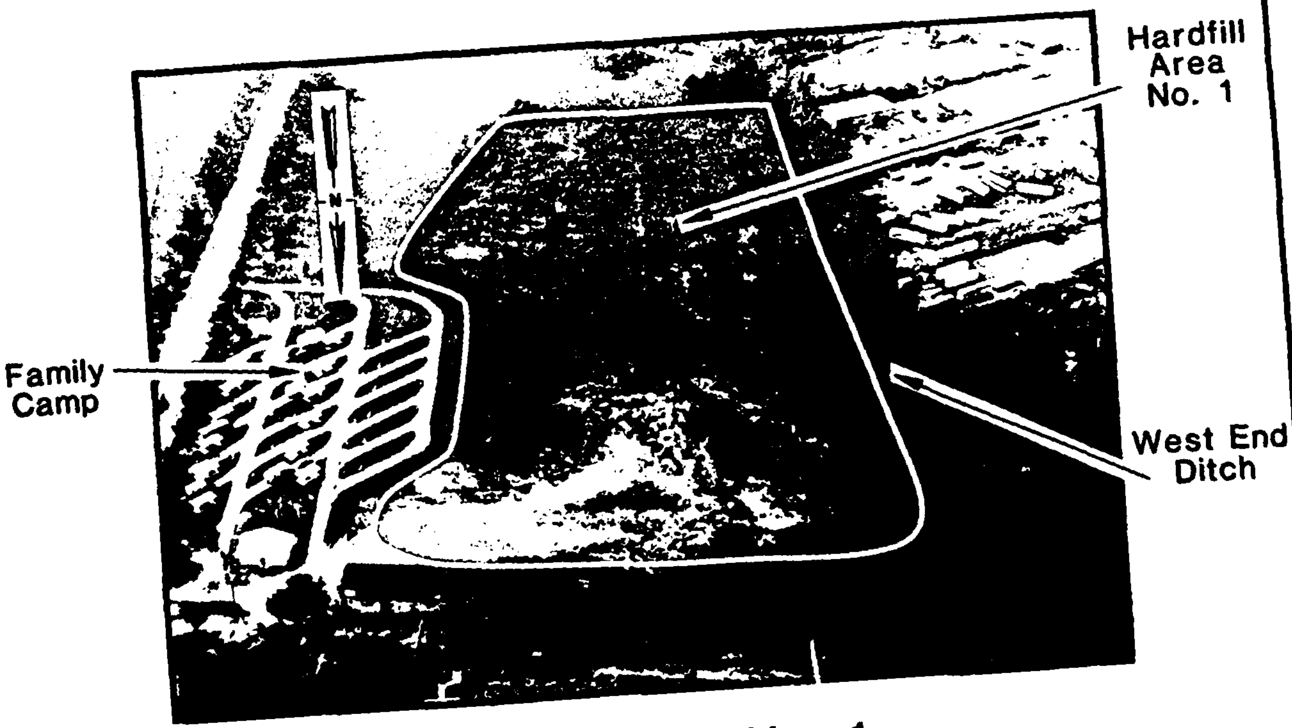


MAXWELL AFB, ALABAMA

FEBRUARY 23, 1960

MAXWELL AFB

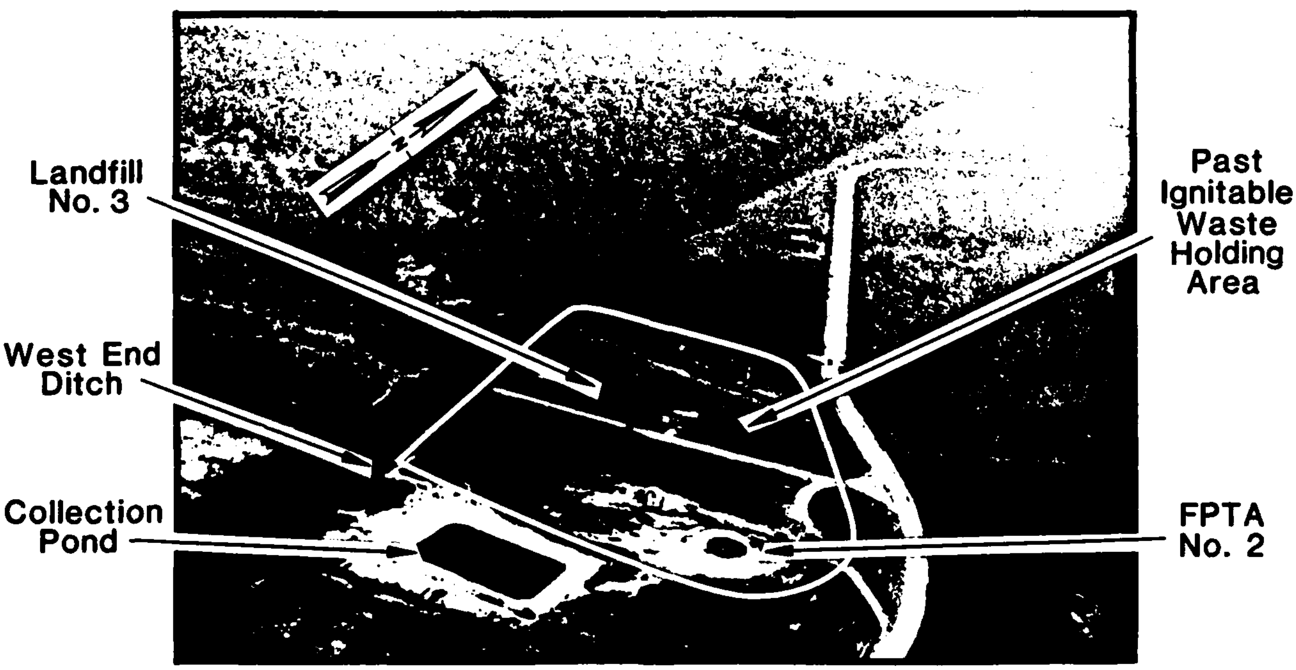
Landfill No. 2



Hardfill Area No. 1

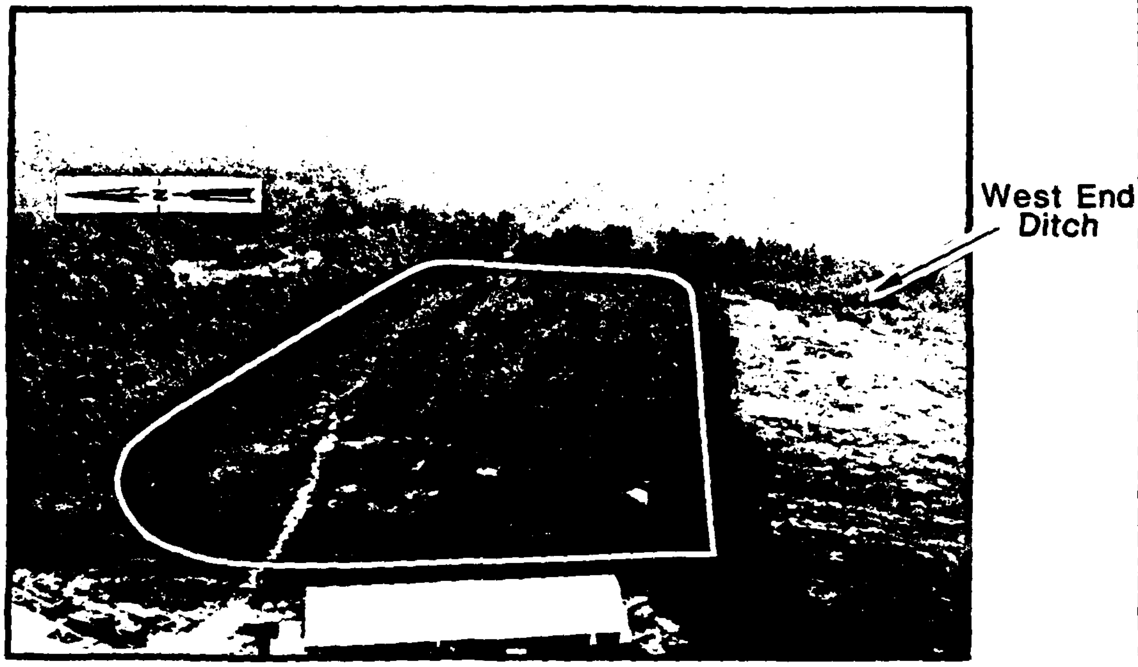
MAXWELL AFB

FPTA No. 1 and Hardfill Area No. 2

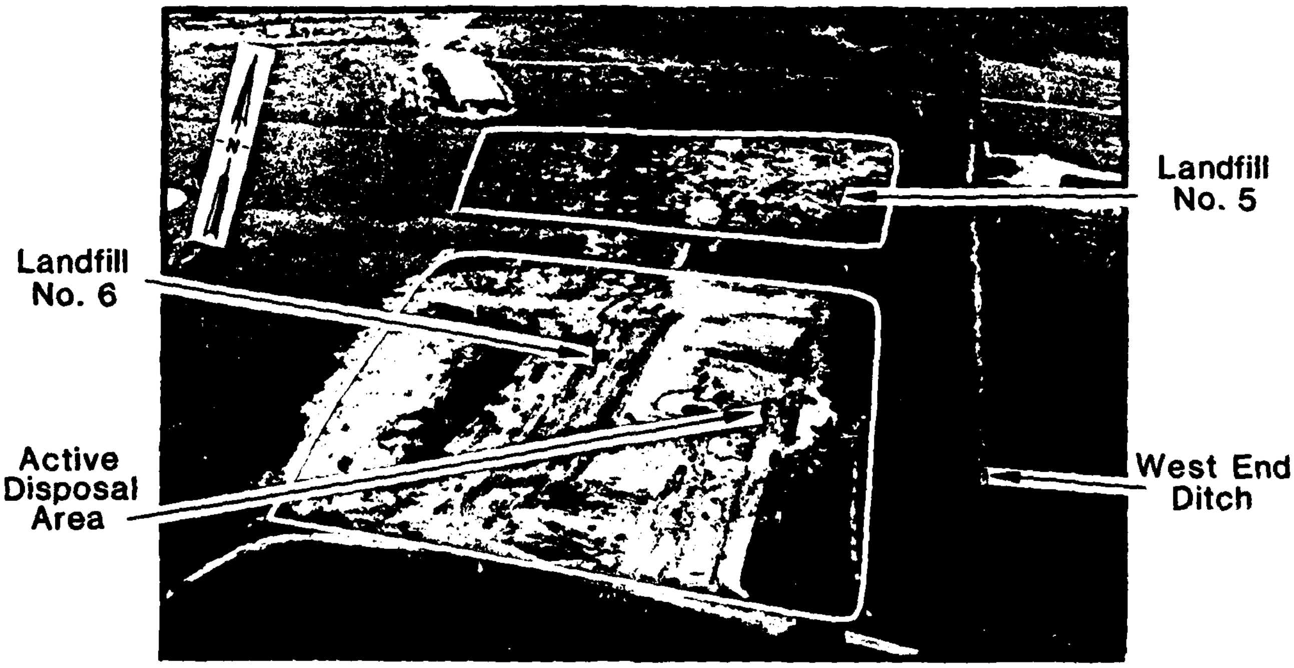


FPTA No. 2 and Landfill No. 3

MAXWELL AFB



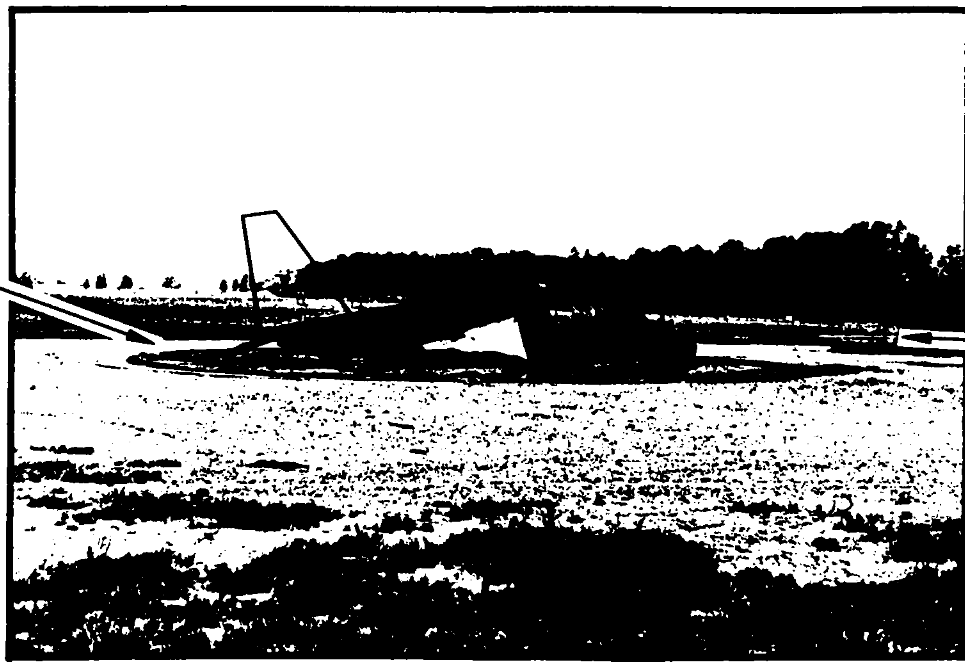
Landfill No. 4



Landfill No. 5 and No. 6

MAXWELL AFB

Landfill No. 6
(Looking North)



Fire Protection Training Area No. 2
(Looking South)

APPENDIX G

USAF INSTALLATION RESTORATION PROGRAM

HAZARD ASSESSMENT RATING 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 percert. The final site score is calculated by applying the waste management practices category factor to the sum of the scores for the other three categories.

FIGURE 1

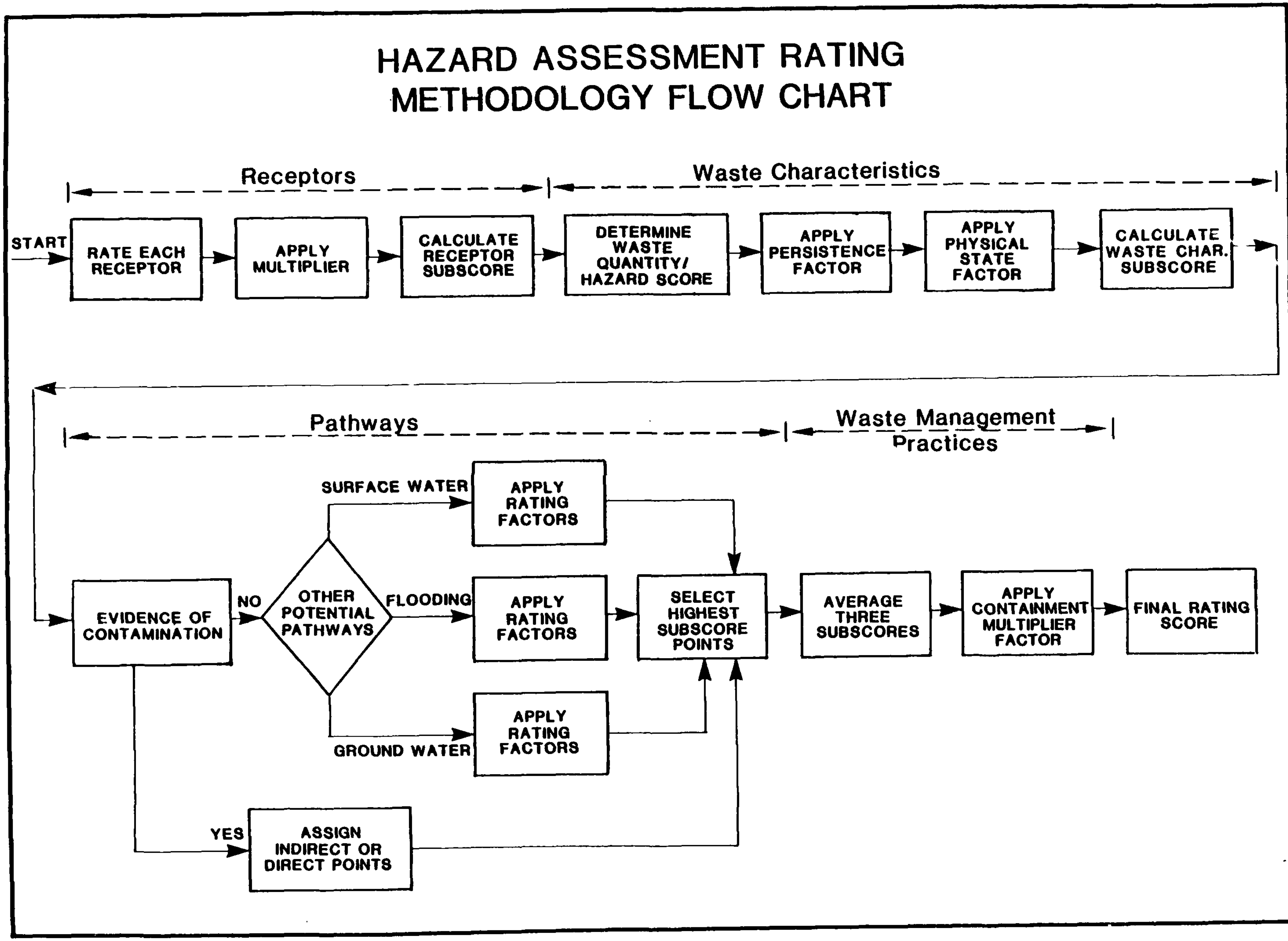

HAZARD ASSESSMENT RATING
METHODOLOGY FLOW CHART
Receptors
Waste Characteristics
START
RATE EACH RECEPTOR
APPLY MULTIPLIER
CALCULATE RECEPTOR SUBSCORE
DETERMINE WASTE QUANTITY/ HAZARD SCORE
APPLY PERSISTENCE FACTOR
APPLY PHYSICAL STATE FACTOR
CALCULATE WASTE CHAR. SUBSCORE
Pathways
Waste Management Practices
EVIDENCE OF CONTAMINATION
NO
YES
OTHER POTENTIAL PATHWAYS
SURFACE WATER
FLOODING
GROUND WATER
APPLY RATING FACTORS
APPLY RATING FACTORS
APPLY RATING FACTORS
ASSIGN INDIRECT OR DIRECT POINTS
SELECT HIGHEST SUBSCORE POINTS
AVERAGE THREE SUBSCORES
APPLY CONTAINMENT MULTIPLIER FACTOR
FINAL RATING SCORE

FIGURE 2

HAZARD ASSESSMENT RATING METHODOLOGY 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) ______

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
2. 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

HAZARD 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	3
D. Distance to installation boundary	Greater than 2 miles	1 to 2 miles	1,001 feet to 1 mile	0 to 1,000 feet	6
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)

HAZARD ASSESSMENT RATING METHODOLOGY GUIDELINES

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)

HAZARD ASSESSMENT RATING METHODOLOGY GUIDELINES

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)

HAZARD ASSESSMENT RATING METHODOLOGY GUIDELINES

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.

Rating Factor	Rating Scale Levels 0	1	2	3	Multiplier
B-1 POTENTIAL FOR SURFACE WATER CONTAMINATION					
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)

HAZARD ASSESSMENT RATING METHODOLOGY GUIDELINES

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

Gen ral 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 ASSESSMENT RATING

FORMS

APPENDIX H

TABLE OF CONTENTS
HAZARD ASSESSMENT RATING METHODOLOGY
MAXWELL AIR FORCE BASE

HAZARD ASSESSMENT RATING METHODOLOGY FORM

Name of Site: ELECTROPLATING WASTE DISPOSAL SITE
Location: EAST OF BUILDING 1110
Date of Operation or Occurence: LATE 1940'S - MID 1960'S
Owner/Operator: MAXWELL AFB
Comments/Description: DRUM DISPOSAL OF PLATING SOLUTIONS (TRENCH & FILL)

Site Rated by: R. M. REYNOLDS

I. RECEPTORS

Rating Factor	Factor Rating (0-3)	Multi-plier	Factor Score	Maximum Possible Score
A. Population within 1,000 feet of site	2	4	8	12
B. Distance to nearest water well	3	10	30	30
C. Land use/zoning within 1 mile radius	2	3	6	9
D. Distance to reservation boundry	3	6	18	18
E. Critical environments within 1 mile radius of site	1	10	10	30
F. Water quality of nearest surface water body	0	6	0	18
G. Ground water use of uppermost aquifer	0	9	0	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			90	180

Receptors subscore (100 x factor score subtotal/maximum score subtotal) 50

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 (1=small, 2=medium, 3=large) 2
2. Confidence level (1=confirmed, 2=suspected) 1
3. Hazard rating (1=low, 2=medium, 3=high) 3

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 1.00 = 80

C. Apply physical state multiplier
Subscore B x Physical State Multiplier = Waste Characteristics Subscore

80 x 1.00 = 80

III. PATHWAYS

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.

Rating Factor	Factor Rating (0-3)	Multi-plier	Factor Score	Maximum Possible Score
1. Surface Water Migration				
Distance to nearest surface water	3	8	24	24
Net precipitation	2	6	12	18
Surface erosion	0	8	0	0
Surface permeability	2	6	12	18
Rainfall intensity	3	8	24	24
Subtotals			72	84
Subscore (100 x factor score subtotal/maximum score subtotal)				86
2. Flooding	2	1	2	3
Subscore (100 x factor score/3)				67
3. Ground-water migration				
Depth to ground water	3	8	24	24
Net precipitation	2	6	12	18
Soil permeability	1	8	8	24
Subsurface flows	3	8	24	24
Direct access to ground water	3	8	24	24
Subtotals			92	114
Subscore (100 x factor score subtotal/maximum score subtotal)				81

C. Highest pathway subscore.

Enter the highest subscore value from A, B-1, B-2 or B-3 above.

Pathways Subscore 86

IV. WASTE MANAGEMENT PRACTICES

A. Average the three subscores for receptors, waste characteristics, and pathways.

Receptors		50
Waste Characteristics		80
Pathways		86
Total	216 divided by 3 =	72 Gross total score

B. Apply factor for waste containment from waste management practices.

Gross total score x waste management practices factor = final score

72 x 1.00 = 72

HAZARD ASSESSMENT RATING METHODOLOGY FORM

Name of Site: SURFACE DRAINAGE SYSTEM
Location: BASE-WIDE
Date of Operation or Occurance: 1940'S - EARLY 1970'S
Owner/Operator: MAXWELL AFB
Comments/Description: RECEIVED NUMEROUS INDUSTRIAL WASTE SOLUTIONS.

Site Rated by: R. M. REYNOLDS

I. RECEPTORS

Rating Factor	Factor Rating (0-3)	Multi-plier	Factor Score	Maximum Possible Score
A. Population within 1,000 feet of site	3	4	12	12
B. Distance to nearest water well	3	10	30	30
C. Land use/zoning within 1 mile radius	2	3	6	9
D. Distance to reservation boundry	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	0
G. Ground water use of uppermost aquifer	0	9	0	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			84	162

Receptors subscore (100 x factor score subtotal/maximum score subtotal) 52

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 (1=small, 2=medium, 3=large) 3
2. Confidence level (1=confirmed, 2=suspected) 1
3. Hazard rating (1=low, 2=medium, 3=high) 3

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 0.90 = 90

C. Apply physical state multiplier
Subscore B x Physical State Multiplier = Waste Characteristics Subscore

90 x 1.00 = 90

III. PATHWAYS

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.

Rating Factor	Factor Rating (0-3)	Multi-plier	Factor Score	Maximum Possible Score
1. Surface Water Migration				
Distance to nearest surface water	0	8	0	0
Net precipitation	2	6	12	18
Surface erosion	0	8	0	0
Surface permeability	1	6	6	18
Rainfall intensity	3	8	24	24
Subtotals			42	60
Subscore (100 x factor score subtotal/maximum score subtotal)				70
2. Flooding	2	1	2	3
Subscore (100 x factor score/3)				67
3. Ground-water migration				
Depth to ground water	3	8	24	24
Net precipitation	2	6	12	18
Soil permeability	2	8	16	24
Subsurface flows	0	8	0	0
Direct access to ground water	3	8	24	24
Subtotals			76	90
Subscore (100 x factor score subtotal/maximum score subtotal)				84

C. Highest pathway subscore.

Enter the highest subscore value from A, B-1, B-2 or B-3 above.

Pathways Subscore 84

IV. WASTE MANAGEMENT PRACTICES

A. Average the three subscores for receptors, waste characteristics, and pathways.

Receptors	52	
Waste Characteristics	90	
Pathways	84	
Total 226 divided by 3 =		75 Gross total score

B. Apply factor for waste containment from waste management practices.

Gross total score x waste management practices factor = final score

75 x 0.95 = \ 72 \

HAZARD ASSESSMENT RATING METHODOLOGY FORM

Name of Site: FIRE PROTECTION TRAINING AREA NO. 2
Location: BUILDING 1143
Date of Operation or Occurance: 1962 - PRESENT
Owner/Operator: MAXWELL AFB
Comments/Description: BURNED WASTE OILS, FUELS, SOLVENTS, THINNERS (1962 - 1974).

Site Rated by: R. M. REYNOLDS

I. RECEPTORS

Rating Factor	Factor Rating (0-3)	Multi-plier	Factor Score	Maximum Possible Score
A. Population within 1,000 feet of site	1	4	4	12
B. Distance to nearest water well	3	10	30	30
C. Land use/zoning within 1 mile radius	1	3	3	9
D. Distance to reservation boundry	3	6	18	18
E. Critical environments within 1 mile radius of site	1	10	10	30
F. Water quality of nearest surface water body	0	6	0	18
G. Ground water use of uppermost aquifer	0	9	0	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 (1=small, 2=medium, 3=large) 3
2. Confidence level (1=confirmed, 2=suspected) 1
3. Hazard rating (1=low, 2=medium, 3=high) 2

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 0.80 = 64

C. Apply physical state multiplier
Subscore B x Physical State Multiplier = Waste Characteristics Subscore

64 x 1.00 = 64

III. PATHWAYS

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.

Rating Factor	Factor Rating (0-3)	Multi-plier	Factor Score	Maximum Possible Score
1. Surface Water Migration				
Distance to nearest surface water	3	8	24	24
Net precipitation	2	6	12	18
Surface erosion	2	8	16	24
Surface permeability	1	6	6	18
Rainfall intensity	3	8	24	24
Subtotals			82	108
Subscore (100 x factor score subtotal/maximum score subtotal)				76
2. Flooding	2	1	2	3
Subscore (100 x factor score/3)				67
3. Ground-water migration				
Depth to ground water	3	8	24	24
Net precipitation	2	6	12	18
Soil permeability	2	8	16	24
Subsurface flows	2	8	16	24
Direct access to ground water	2	8	16	24
Subtotals			84	114
Subscore (100 x factor score subtotal/maximum score subtotal)				74

C. Highest pathway subscore.

Enter the highest subscore value from A, B-1, B-2 or B-3 above.

Pathways Subscore 76

IV. WASTE MANAGEMENT PRACTICES

A. Average the three subscores for receptors, waste characteristics, and pathways.

Receptors	46	
Waste Characteristics	64	
Pathways	76	
Total 186 divided by 3 =		62 Gross total score

B. Apply factor for waste containment from waste management practices.

Gross total score x waste management practices factor = final score

62 x 0.95 = 59

HAZARD ASSESSMENT RATING METHODOLOGY FORM

Name of Site: FIRE PROTECTION TRAINING AREA NO. 1
Location: NORTH OF BUILDING 1245
Date of Operation or Occurance: 1940'S - 1962
Owner/Operator: MAXWELL AFB
Comments/Description: BURNED WASTE FUELS, WASTE OILS, SOLVENTS, PAINT THINNERS.

Site Rated by: R. M. REYNOLDS

I. RECEPTORS

Rating Factor	Factor Rating (0-3)	Multi-plier	Factor Score	Maximum Possible Score
A. Population within 1,000 feet of site	1	4	4	12
B. Distance to nearest water well	2	10	20	30
C. Land use/zoning within 1 mile radius	1	3	3	9
D. Distance to reservation boundry	3	6	18	18
E. Critical environments within 1 mile radius of site	1	10	10	30
F. Water quality of nearest surface water body	1	6	6	18
G. Ground water use of uppermost aquifer	0	9	0	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 (1=small, 2=medium, 3=large) 3
2. Confidence level (1=confirmed, 2=suspected) 1
3. Hazard rating (1=low, 2=medium, 3=high) 2

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 0.80 = 64

C. Apply physical state multiplier
Subscore B x Physical State Multiplier = Waste Characteristics Subscore

64 x 1.00 = 64

III. PATHWAYS

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.

Rating Factor	Factor Rating (0-3)	Multi-plier	Factor Score	Maximum Possible Score
1. Surface Water Migration				
Distance to nearest surface water	1	8	8	24
Net precipitation	2	6	12	18
Surface erosion	0	8	0	0
Surface permeability	0	6	0	18
Rainfall intensity	3	8	24	24
Subtotals			44	84
Subscore (100 x factor score subtotal/maximum score subtotal)				52
2. Flooding	0	1	0	3
Subscore (100 x factor score/3)				0
3. Ground-water migration				
Depth to ground water	2	8	16	24
Net precipitation	2	6	12	18
Soil permeability	3	8	24	24
Subsurface flows	1	8	8	24
Direct access to ground water	2	8	16	24
Subtotals			76	114
Subscore (100 x factor score subtotal/maximum score subtotal)				67

C. Highest pathway subscore.

Enter the highest subscore value from A, B-1, B-2 or B-3 above.

Pathways Subscore 67

IV. WASTE MANAGEMENT PRACTICES

A. Average the three subscores for receptors, waste characteristics, and pathways.

Receptors		44	
Waste Characteristics		64	
Pathways		67	
Total	175 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 1.00 = \ 58 \

HAZARD ASSESSMENT RATING METHODOLOGY FORM

Name of Site: LANDFILL NO. 4
Location: OFF-BASE, WEST OF BUILDING 1143
Date of Operation or Occurance: 1956 - EARLY 1970'S
Owner/Operator: MAXWELL AFB
Comments/Description: SANITARY LANDFILL WITH SOME INDUSTRIAL WASTES.

Site Rated by: R. M. REYNOLDS

I. RECEPTORS

Rating Factor	Factor Rating (0-3)	Multi-plier	Factor Score	Maximum Possible Score
A. Population within 1,000 feet of site	3	4	12	12
B. Distance to nearest water well	3	10	30	30
C. Land use/zoning within 1 mile radius	1	3	3	9
D. Distance to reservation boundry	3	6	18	18
E. Critical environments within 1 mile radius of site	1	10	10	30
F. Water quality of nearest surface water body	0	6	0	18
G. Ground water use of uppermost aquifer	0	9	0	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			91	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 (1=small, 2=medium, 3=large) 2
2. Confidence level (1=confirmed, 2=suspected) 1
3. Hazard rating (1=low, 2=medium, 3=high) 2

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 0.80 = 48

C. Apply physical state multiplier
Subscore B x Physical State Multiplier = Waste Characteristics Subscore

48 x 0.50 = 24

III. PATHWAYS

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.

Rating Factor	Factor Rating (0-3)	Multi-plier	Factor Score	Maximum Possible Score
1. Surface Water Migration				
Distance to nearest surface water	3	8	24	24
Net precipitation	2	6	12	18
Surface erosion	0	8	0	0
Surface permeability	1	6	6	18
Rainfall intensity	3	8	24	24
Subtotals			66	84
Subscore (100 x factor score subtotal/maximum score subtotal)				79
2. Flooding	2	1	2	3
Subscore (100 x factor score/3)				67
3. Ground-water migration				
Depth to ground water	3	8	24	24
Net precipitation	2	6	12	18
Soil permeability	2	8	16	24
Subsurface flows	3	8	24	24
Direct access to ground water	3	8	24	24
Subtotals			100	114
Subscore (100 x factor score subtotal/maximum score subtotal)				88

C. Highest pathway subscore.
Enter the highest subscore value from A, B-1, B-2 or B-3 above.

Pathways Subscore 88

IV. WASTE MANAGEMENT PRACTICES

A. Average the three subscores for receptors, waste characteristics, and pathways.

Receptors		51
Waste Characteristics		24
Pathways		88
Total	163 divided by 3 =	54 Gross total score

B. Apply factor for waste containment from waste management practices.
Gross total score x waste management practices factor = final score

54 x 1.00 = \ 54 \

HAZARD ASSESSMENT RATING METHODOLOGY FORM

Name of Site: C.E. DRUM STORAGE AREA
Location: FACILITY 1352
Date of Operation or Occurance: MID 1970'S - PRESENT
Owner/Operator: MAXWELL AFB
Comments/Description: FORMERLY AN UNLINED AREA (MID TO LATE 1970'S).

Site Rated by: R. M. REYNOLDS

I. RECEPTORS

Rating Factor	Factor Rating (0-3)	Multi-plier	Factor Score	Maximum Possible Score
A. Population within 1,000 feet of site	3	4	12	12
B. Distance to nearest water well	2	10	20	30
C. Land use/zoning within 1 mile radius	1	3	3	9
D. Distance to reservation boundry	2	6	12	18
E. Critical environments within 1 mile radius of site	1	10	10	30
F. Water quality of nearest surface water body	1	6	6	18
G. Ground water use of uppermost aquifer	0	9	0	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			81	180

Receptors subscore (100 x factor score subtotal/maximum score subtotal) 45

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 (1=small, 2=medium, 3=large) 1
2. Confidence level (1=confirmed, 2=suspected) 1
3. Hazard rating (1=low, 2=medium, 3=high) 3

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 0.90 = 54

C. Apply physical state multiplier
Subscore B x Physical State Multiplier = Waste Characteristics Subscore

54 x 1.00 = 54

III. PATHWAYS

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.

Rating Factor	Factor Rating (0-3)	Multi-plier	Factor Score	Maximum Possible Score
1. Surface Water Migration				
Distance to nearest surface water	2	8	16	24
Net precipitation	2	6	12	18
Surface erosion	0	8	0	0
Surface permeability	1	6	6	18
Rainfall intensity	3	8	24	24
Subtotals			58	84
Subscore (100 x factor score subtotal/maximum score subtotal)				69
2. Flooding	2	1	2	3
Subscore (100 x factor score/3)				67
3. Ground-water migration				
Depth to ground water	2	8	16	24
Net precipitation	2	6	12	18
Soil permeability	2	8	16	24
Subsurface flows	0	8	0	0
Direct access to ground water	2	8	16	24
Subtotals			60	90
Subscore (100 x factor score subtotal/maximum score subtotal)				67

C. Highest pathway subscore.

Enter the highest subscore value from A, B-1, B-2 or B-3 above.

Pathways Subscore 69

IV. WASTE MANAGEMENT PRACTICES

A. Average the three subscores for receptors, waste characteristics, and pathways.

Receptors		45
Waste Characteristics		54
Pathways		69
Total	168 divided by 3 =	56 Gross total score

B. Apply factor for waste containment from waste management practices.

Gross total score x waste management practices factor = final score

56 x 0.95 = \ 53 \

HAZARD ASSESSMENT RATING METHODOLOGY FORM

Name of Site: LANDFILL NO. 5
Location: OFF-BASE, SOUTH OF LANDFILL NO. 4.
Date of Operation or Occurance: EARLY 1970'S - 1974
Owner/Operator: MAXWELL AFB
Comments/Description: SANITARY LANDFILL WITH SOME INDUSTRIAL WASTES.

Site Rated by: R. M. REYNOLDS

I. RECEPTORS

Rating Factor	Factor Rating (0-3)	Multi-plier	Factor Score	Maximum Possible Score
A. Population within 1,000 feet of site	3	4	12	12
B. Distance to nearest water well	3	10	30	30
C. Land use/zoning within 1 mile radius	1	3	3	9
D. Distance to reservation boundry	3	6	18	18
E. Critical environments within 1 mile radius of site	1	10	10	30
F. Water quality of nearest surface water body	0	6	0	18
G. Ground water use of uppermost aquifer	0	9	0	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			91	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 (1=small, 2=medium, 3=large) 2
2. Confidence level (1=confirmed, 2=suspected) 1
3. Hazard rating (1=low, 2=medium, 3=high) 2

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 0.80 = 48

C. Apply physical state multiplier
Subscore B x Physical State Multiplier = Waste Characteristics Subscore

48 x 0.50 = 24

III. PATHWAYS

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.

Rating Factor	Factor Rating (0-3)	Multi-plier	Factor Score	Maximum Possible Score
1. Surface Water Migration				
Distance to nearest surface water	3	8	24	24
Net precipitation	2	6	12	18
Surface erosion	0	8	0	0
Surface permeability	1	6	6	18
Rainfall intensity	3	8	24	24
Subtotals			66	84
Subscore (100 x factor score subtotal/maximum score subtotal)				79
2. Flooding	2	1	2	3
Subscore (100 x factor score/3)				67
3. Ground-water migration				
Depth to ground water	3	8	24	24
Net precipitation	2	6	12	18
Soil permeability	2	8	16	24
Subsurface flows	2	8	16	24
Direct access to ground water	3	8	24	24
Subtotals			92	114
Subscore (100 x factor score subtotal/maximum score subtotal)				81

C. Highest pathway subscore.

Enter the highest subscore value from A, B-1, B-2 or B-3 above.

Pathways Subscore 81

IV. WASTE MANAGEMENT PRACTICES

A. Average the three subscores for receptors, waste characteristics, and pathways.

Receptors		51
Waste Characteristics		24
Pathways		81
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 1.00 = 52

HAZARD ASSESSMENT RATING METHODOLOGY FORM

Name of Site: LANDFILL NO. 6
Location: OFF-BASE, SOUTH OF LANDFILL NO.5
Date of Operation or Occurance: 1974 - PRESENT
Owner/Operator: MAXWELL AFB
Comments/Description: SANITARY LANDFILL WITH SOME INDUSTRIAL WASTES.

Site Rated by: R. M. REYNOLDS

I. RECEPTORS

Rating Factor	Factor Rating (0-3)	Multi-plier	Factor Score	Maximum Possible Score
A. Population within 1,000 feet of site	3	4	12	12
B. Distance to nearest water well	3	10	30	30
C. Land use/zoning within 1 mile radius	1	3	3	9
D. Distance to reservation boundry	3	6	18	18
E. Critical environments within 1 mile radius of site	1	10	10	30
F. Water quality of nearest surface water body	0	6	0	18
G. Ground water use of uppermost aquifer	0	9	0	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			91	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 (1=small, 2=medium, 3=large) 2
2. Confidence level (1=confirmed, 2=suspected) 1
3. Hazard rating (1=low, 2=medium, 3=high) 2

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 0.80 = 48

C. Apply physical state multiplier
Subscore B x Physical State Multiplier = Waste Characteristics Subscore

48 x 0.50 = 24

III. PATHWAYS

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.

Rating Factor	Factor Rating (0-3)	Multi-plier	Factor Score	Maximum Possible Score
1. Surface Water Migration				
Distance to nearest surface water	3	8	24	24
Net precipitation	2	6	12	18
Surface erosion	0	8	0	0
Surface permeability	1	6	6	18
Rainfall intensity	3	8	24	24
Subtotals			66	84
Subscore (100 x factor score subtotal/maximum score subtotal)				79
2. Flooding	2	1	2	3
Subscore (100 x factor score/3)				67
3. Ground-water migration				
Depth to ground water	3	8	24	24
Net precipitation	2	6	12	18
Soil permeability	2	8	16	24
Subsurface flows	2	8	16	24
Direct access to ground water	3	8	24	24
Subtotals			92	114
Subscore (100 x factor score subtotal/maximum score subtotal)				81

C. Highest pathway subscore.

Enter the highest subscore value from A, B-1, B-2 or B-3 above.

Pathways Subscore 81

IV. WASTE MANAGEMENT PRACTICES

A. Average the three subscores for receptors, waste characteristics, and pathways.

Receptors	51	
Waste Characteristics	24	
Pathways	81	
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 1.00 = \ 52 \

HAZARD ASSESSMENT RATING METHODOLOGY FORM

Name of Site: LANDFILL NO. 2
Location: NEAR SOUTH END OF NW - SE RUNWAY
Date of Operation or Occurance: EARLY 1940'S - 1951
Owner/Operator: MAXWELL AFB
Comments/Description: SANITARY LANDFILL WITH SOME INDUSTRIAL WASTES.

Site Rated by: R. M. REYNOLDS

I. RECEPTORS

Rating Factor	Factor Rating (0-3)	Multi-plier	Factor Score	Maximum Possible Score
A. Population within 1,000 feet of site	3	4	12	12
B. Distance to nearest water well	2	10	20	30
C. Land use/zoning within 1 mile radius	2	3	6	9
D. Distance to reservation boundry	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	0	9	0	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			74	180

Receptors subscore (100 x factor score subtotal/maximum score subtotal) 41
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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 (1=small, 2=medium, 3=large) 2
2. Confidence level (1=confirmed, 2=suspected) 1
3. Hazard rating (1=low, 2=medium, 3=high) 2

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 0.80 = 48

C. Apply physical state multiplier
Subscore B x Physical State Multiplier = Waste Characteristics Subscore

48 x 0.50 = 24
=========

III. PATHWAYS

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.

Rating Factor	Factor Rating (0-3)	Multi-plier	Factor Score	Maximum Possible Score
1. Surface Water Migration				
Distance to nearest surface water	3	8	24	24
Net precipitation	2	6	12	18
Surface erosion	0	8	0	0
Surface permeability	1	6	6	18
Rainfall intensity	3	8	24	24
Subtotals			66	84
Subscore (100 x factor score subtotal/maximum score subtotal)				79
2. Flooding	2	1	2	3
Subscore (100 x factor score/3)				67
3. Ground-water migration				
Depth to ground water	3	8	24	24
Net precipitation	2	6	12	18
Soil permeability	2	8	16	24
Subsurface flows	3	8	24	24
Direct access to ground water	3	8	24	24
Subtotals			100	114
Subscore (100 x factor score subtotal/maximum score subtotal)				88

C. Highest pathway subscore.

Enter the highest subscore value from A, B-1, B-2 or B-3 above.

Pathways Subscore 88

IV. WASTE MANAGEMENT PRACTICES

A. Average the three subscores for receptors, waste characteristics, and pathways.

Receptors		41	
Waste Characteristics		24	
Pathways		88	
Total	153	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 1.00 = 51

HAZARD ASSESSMENT RATING METHODOLOGY FORM

Name of Site: LANDFILL NO. 3
Location: BUILDING 1143
Date of Operation or Occurance: 1951 - 1956
Owner/Operator: MAXWELL AFB
Comments/Description: SANITARY LANDFILL WITH SOME INDUSTRIAL WASTES.

Site Rated by: R. M. REYNOLDS

I. RECEPTORS

Rating Factor	Factor Rating (0-3)	Multi-plier	Factor Score	Maximum Possible Score
A. Population within 1,000 feet of site	2	4	8	12
B. Distance to nearest water well	3	10	30	30
C. Land use/zoning within 1 mile radius	1	3	3	9
D. Distance to reservation boundry	3	6	18	18
E. Critical environments within 1 mile radius of site	1	10	10	30
F. Water quality of nearest surface water body	0	6	0	18
G. Ground water use of uppermost aquifer	0	9	0	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			87	180

Receptors subscore (100 x factor score subtotal/maximum score subtotal) 48

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 (1=small, 2=medium, 3=large) 2
2. Confidence level (1=confirmed, 2=suspected) 1
3. Hazard rating (1=low, 2=medium, 3=high) 2

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 0.80 = 48

C. Apply physical state multiplier
Subscore B x Physical State Multiplier = Waste Characteristics Subscore

48 x 0.50 = 24

III. PATHWAYS

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.

Rating Factor	Factor Rating (0-3)	Multi-plier	Factor Score	Maximum Possible Score
1. Surface Water Migration				
Distance to nearest surface water	3	8	24	24
Net precipitation	2	6	12	18
Surface erosion	0	8	0	0
Surface permeability	1	6	6	18
Rainfall intensity	3	8	24	24
Subtotals			66	84
Subscore (100 x factor score subtotal/maximum score subtotal)				79
2. Flooding	2	1	2	3
Subscore (100 x factor score/3)				67
3. Ground-water migration				
Depth to ground water	3	8	24	24
Net precipitation	2	6	12	18
Soil permeability	2	8	16	24
Subsurface flows	2	8	16	24
Direct access to ground water	3	8	24	24
Subtotals			92	114
Subscore (100 x factor score subtotal/maximum score subtotal)				81

C. Highest pathway subscore.

Enter the highest subscore value from A, B-1, B-2 or B-3 above.

Pathways Subscore 81

IV. WASTE MANAGEMENT PRACTICES

A. Average the three subscores for receptors, waste characteristics, and pathways.

Receptors	48
Waste Characteristics	24
Pathways	81
Total	153 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 1.00 = \ 51 \

HAZARD ASSESSMENT RATING METHODOLOGY FORM

Name of Site: HARDFILL AREA NO. 2
Location: NORTH OF BUILDING 1245
Date of Operation or Occurance: 1951 - PRESENT
Owner/Operator: MAXWELL AFB
Comments/Description: HARDFILL AREA AND SITE OF FIRE PROTECTION TRAINING AREA NO. 1 (1940'S - 1952).

Site Rated by: R. M. REYNOLDS

I. RECEPTORS

Rating Factor	Factor Rating (0-3)	Multi-plier	Factor Score	Maximum Possible Score
A. Population within 1,000 feet of site	2	4	8	12
B. Distance to nearest water well	2	10	20	30
C. Land use/zoning within 1 mile radius	1	3	3	9
D. Distance to reservation boundry	3	6	18	18
E. Critical environments within 1 mile radius of site	1	10	10	30
F. Water quality of nearest surface water body	1	6	6	18
G. Ground water use of uppermost aquifer	0	9	0	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 (1=small, 2=medium, 3=large) 3
2. Confidence level (1=confirmed, 2=suspected) 1
3. Hazard rating (1=low, 2=medium, 3=high) 1

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 0.80 = 40

C. Apply physical state multiplier
Subscore B x Physical State Multiplier = Waste Characteristics Subscore

40 x 0.50 = 20

III. PATHWAYS

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.

Rating Factor	Factor Rating (0-3)	Multi-plier	Factor Score	Maximum Possible Score
1. Surface Water Migration				
Distance to nearest surface water	1	8	8	24
Net precipitation	2	6	12	18
Surface erosion	2	8	16	24
Surface permeability	0	6	0	18
Rainfall intensity	3	8	24	24
Subtotals			60	108
Subscore (100 x factor score subtotal/maximum score subtotal)				56
2. Flooding	0	1	0	3
Subscore (100 x factor score/3)				0
3. Ground-water migration				
Depth to ground water	2	8	16	24
Net precipitation	2	6	12	18
Soil permeability	3	8	24	24
Subsurface flows	1	8	8	24
Direct access to ground water	2	8	16	24
Subtotals			76	114
Subscore (100 x factor score subtotal/maximum score subtotal)				67

C. Highest pathway subscore.

Enter the highest subscore value from A, B-1, B-2 or B-3 above.

Pathways Subscore 67

IV. WASTE MANAGEMENT PRACTICES

A. Average the three subscores for receptors, waste characteristics, and pathways.

Receptors		46	
Waste Characteristics		20	
Pathways		67	
Total	133	divided by 3 =	44 Gross total score

B. Apply factor for waste containment from waste management practices.

Gross total score x waste management practices factor = final score

44 x 1.00 = \ 44 \

APPENDIX I

REFERENCES

APPENDIX I

REFERENCES

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APPENDIX J

GLOSSARY OF TERMINOLOGY
AND ABBREVIATIONS

APPENDIX J
GLOSSARY OF TERMINOLOGY AND ABBREVIATIONS

ABS: Air Base Squadron.

ABW: Air Base Wing.

ACFT MAINT: Aircraft Maintenance.

AF: Air Force.

AFB: Air Force Base.

AFCS: Air Force Communications Service.

AFESC: Air Force Engineering and Services Center.

AFFF: Aqueous Film Forming Foam, a fire extinquishing agent.

AFR: Air Force Regulation.

AFRES: Air Force Reserve.

AFS: Air Force Station.

AFSC: Air Force Systems Command.

Ag: Chemical symbol for silver.

AGE: Aerospace Ground Equipment.

Al: Chemical symbol for aluminum.

ALLUVIUM: Materials eroded, transported and deposited by streams.

ALLUVIAL FAN: A fan-shaped deposit formed by a stream either where it issues from a narrow mountain valley into a plain or broad valley, or where a tributary stream joins a main stream.

ANG: Air National Guard.

APS: Aerial Port Squadron.

ARTESIAN: Ground water contained under hydrostatic pressure.

AQUICLUDE: Poorly permeable formation that impedes ground-water movement and does not yield 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 geologic unit which impedes ground-water flow.

ASC: Audiovisual Service Center.

ATC: Air Training Command.

AU: Air University

AVGAS: Aviation Gasoline.

Ba: Chemical symbol for barium.

BES: Bioenvironmental Engineering Services.

BIOACCUMULATE: Tendency of elements or compounds to accumulate or build up in the tissues of living organisms when they are exposed to these elements in their environments, e.g., heavy metals.

CALLA 301: A high phosphate cleaning compound.

CAMS: Consolidated Aircraft Maintenance Squadron.

Cd: Chemical symbol for cadmium.

CE: Civil Engineering.

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.

CMS: Component Maintenance Squadron.

CN: Chemical symbol for cyanide.

COASTAL PLAINS: Physiographic province of the Eastern United States characterized by a gently seaward sloping surface formed over exposed, unconsolidated, stratified marine fluvial sediments. Typical coastal plain features include low hills and ridges, organic deposits, floodplains and high water tables.

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.

COMD: Command.

CONFINED AQUIFER: An aquifer bounded above and below by impermeable strata or by geologic units of distinctly lower permeability than that of the aquifer itself.

CONFINING UNIT: An aquitard or other poorly permeable layer which restricts the movement of ground water.

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.

CPM: Counts per minute (alpha radiation measurement).

Cr: Chemical symbol for chromium.

CRS: Component Repair Squadron.

CSG: Combat Support Group.

Cu: Chemical symbol for copper.

DET: Detachment.

DIP: The angle at which a stratum is inclined from the horizontal.

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, previously included Redistribution and Marketing (R&M) and Salvage.

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.

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.

EMS: Equipment Maintenance Squadron.

ENT: Ear, Nose and Throat, an area of medical specialization.

EOD: Explosive Ordnance Disposal.

EP: Extraction Procedure, the EPA's standard laboratory procedure for leachate generation.

EPA: U.S. Environmental Protection Agency.

EPHEMERAL AQUIFER: A water-bearing zone typically located near the surface which normally contains water seasonally.

EROSION: The wearing away of land surface by wind, water, or chemical processes.

FAA: Federal Aviation Administration.

FACILITY: Any land and appurtenances thereon and thereto used for the treatment, storage and/or disposal of hazardous wastes.

FAULT: A fracture in rock along which the adjacent rock surfaces are differentially displaced.

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 as governed principally by the hydraulic gradient.

FMS: Field Maintenance Squadron.

FPTA: Fire Protection Training Area.

GATR: Ground to Air Transmitter Receiver Site.

GC/MS: Gas chromatograph/mass spectrophotometer, a laboratory procedure for identifying unknown compounds.

GLACIAL TILL: Unsorted and unstratified drift consisting of clay, sand, gravel and boulders which is deposited by or underneath a glacier.

GLAUCOMITIC SAND AND GRAVEL: A mixture of sand, gravel and glaucomite, an iron-potassium silicate mineral which imparts a green color to the mixture. Glaucomite is geologically significant because it indicates slow sedimentation.

GLIDE-BLOCK: A large section of a geologic unit that has separated from the main portion of the unit due to earthquake/landslide-induced lateral movement.

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 and landscape debris.

HARM: Hazard Assessment Rating Methodology.

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.

HWMF: Hazardous Waste Management Facility.

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 standards.

INFILTRATION: The movement of water through the soil surface into the ground.

IRP: Installation Restoration Program.

ISOPACH: Graphic presentation of geologic data, including lines of equal unit thickness that may be based on confirmed (drill hole) data or indirect geophysical measurement.

JP-4: Jet Propulsion Fuel Number Four.

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.

LENTICULAR: A bed or rock stratum or body that is lens-shaped.

LINER: A continous layer of natural or man-made materials beneath or on the sides of a surface impoundment, landfill, or landfill cell which restricts the downward or lateral escape of hazardous waste, hazardous waste constituents or leachate.

LOESS: An essentially unconsolidated unstratified calcareous silt; commonly homogeneous, permeable and buff to gray in color.

LOX: Liquid Oxygen.

LYSIMETER: A vacuum operated sampling device used for extracting pore water samples at various depths within the unsaturated zone.

MAC: Military Airlift Command.

MAINT: Recording System Maintenance.

MATS: Military Air Transport Service.

MAW: Military Airlift Wing.

MEK: Methyl Ethyl Ketone.

MGD: Million Gallons per Day.

MOA: Military Operating Area.

MOGAS: Motor gasoline.

Mn: Chemical symbol for manganese.

MODIFIED MERCALLI INTENSITY: A number describing the effects of an earthquake on man, structures and the earth's surface. A Modified Mercalli Intensity of I is not felt. An intensity of VI is felt indoors and outdoors and for an intensity of VII it becomes difficult for a man to remain standing. Intensities of Ix to XII involve increasing levels of destruction with destruction being nearly total at an intensity of XII.

MONITORING WELL: A well used to measure ground-water levels and to obtain samples.

MORAINE: An accumulation of glacial drift deposited cheifly by direct glacial action and possessing initial constructional form independent of the floor beneath it.

Mr/hr: Millirem/hour; a measure of radioactivity.

MSL: Mean Sea Level.

MUNITION ITEMS: Munitions or portions of munitions having an explosive potential.

MUNITIONS RESIDUE: Non-explosive segments of waste munitions (i.e., bomb casings).

MWR: Morale Welfare and Recreation.

NCO: Non-commissioned Officer.

NCOIC: Non-commissioned Officer In-Charge.

NDI: Non-destructive Inspection.

NET PRECIPITATION: The amount of annual precipitation minus annual evaporation.

NGVD: National Geodetic Vertical Datum of 1929.

Ni: Chemical symbol for nickel.

NON-CALCAREOUS: Not bearing calcium carbonate ($CaCO_3$) a characteristic mineral of marine paleoenvironment.

NPDES: National Pollutant Discharge Elimination System.

OEHL: Occupational and Environmental Health Laboratory.

OIC: Officer-In-Charge.

OMS: Organizational Maintenance Squadron.

OPNS: Operations.

ORGANIC: Being, containing or relating to carbon compounds, especially in which hydrogen is attached to carbon.

OSI: Office of Special Investigations.

O&G: Symbols for oil and grease.

Pb: Chemical symbol for lead.

PCB: Polychlorinated Biphenyl; liquids used as a dielectrics in electrical equipment.

PERCOLATION: Movement of moisture by gravity or hydrostatic pressure through interstices of unsaturated rock or soil.

PERMEABILITY: The capacity of a porous rock, soil or sediment for transmitting a fluid without damage to the structure of the medium.

PD-680 (PS-661): Cleaning solvent.

pH: Negative logarithm of hydrogen ion concentration.

PIEDMONT: An upland subdivision of the Appalachian Highlands Physiographic Province, extending from Alabama to New York. The zone is characterized by rolling hills and residual ridges formed by dissection of peneplained irgneous and metamorphic terrain.

PL: Public Law.

PMEL: Precision Measurement Equipment Lab.

POL: Petroleum, Oils and Lubricants.

POLLUTANT: Any introduced gas, liquid or solid that makes a resource unfit for a specific purpose.

POTENTIALLY ACTIVE FAULT: A fault along which movement has occurred within the last 25-million years.

POTENTIOMETRIC SURFACE: The imaginery surface to which water in an artesian aquifer would rise in tightly screened wells penetrating it.

PPB: Parts per billion by weight.

PPM: Parts per million by weight.

PRECIPITATION: Rainfall.

QUATERNARY MATERIALS: The second period of the Cenozoic geologic era, following the Tertiary, and including the last 2-3 million years.

QUICKTRANS: Automated Terminal Service.

RCRA: Resource Conservation and Recovery Act.

RD: Low-level radioactive waste disposal site.

RECHARGE AREA: A surface area in which surface water or precipitation percolates through the unsaturated zone and eventually reaches the zone of saturation. Recharge areas may be natural or manmade.

RECHARGE: The addition of water to the ground-water system by natural or artificial processes.

RECON: Reconnaissance.

RIPARIAN: Living or located on a riverbank.

RWDS: Radioactive Waste Disposal Site.

SAC: Strategic Air Command.

SANITARY LANDFILL: A land disposal site using an engineered method of disposing solid wastes on land in a way that minimizes environmental hazards.

SATURATED ZONE: That part of the earth's crust in which all voids are filled with water.

SCS: U.S. Department of Agriculture Soil Conservation Service.

SEISMICITY: Pertaining to earthquakes or earth vibrations.

SLUDGE: Any garbage, refuse, or slude from a waste treatment plant, water supply 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).

SOLID WASTE: Any garbage, refuse, or sludge from a waste treatment plant, water supply 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.

SS: Supply Squadron.

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.

STP: Sewage Treatment Plant.

TAC: Tactical Air Command.

TACC: Tactical Air Control Center.

TASS: Tactical Air Support Squadron.

TCA: 1,1,2,2-Tetrachloroethane.

TCE: Trichloroethylene.

TDS: Total Dissolved Solid, a water quality parameter.

TFW: Tactical Fighter Wing.

TIDAL STRIP: Physiographic subdivision commonly associated with (ocean) wave activity. Usually includes berms, beach ridges, tidal flats and related landforms typically produced by coastal erosional and depositional processes.

TOC: Total Organic Carbon.

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 of aquifer 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.

TS: Transportation Squadron.

TSD: Treatment, storage or disposal.

TTW: Technical Training Wing.

UNCONFORMABLE: Not succeeding the underlying geologic strata in proper chronological sequence; a bed or stratum having the relation of unconformity to the underlying materials.

UPGRADIENT: In the direction of increasing hydraulic static head; the direction opposite to the prevailing flow of ground-water.

USAF: United States Air Force.

USAFSS: United States Air Force Security Service.

USFWS: United States Fish and Wildlife Service.

USGS: United States Geological Survey.

USMC: United States Marine Corps.

USN: United States Navy.

WATER TABLE: Surface of a body of unconfined ground water at which the pressure is equal to that of the atmosphere.

WWTP: Wastewater Treatment Plant.

Zn: Chemical symbol for zinc.

APPENDIX K

INDEX OF REFERENCES TO POTENTIAL

CONTAMINATION SOURCES FOR MAXWELL AFB

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INDEX OF REFERENCES TO POTENTIAL
CONTAMINATION SOURCES FOR MAXWELL AFB

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