INSTALLATION RESTORATION PROGRAM

PHASE I – RECORDS SEARCH

McGUIRE AFB, NEW JERSEY

PREPARED FOR

UNITED STATES AIR FORCE
AFESC/DEV
Tyndall AFB, Florida
and
HQ MAC/DEEV
Scott AFB, Illinois

ENGINEERING-SCIENCE

NOVEMBER, 1982

INSTALLATION RESTORATION PROGRAM
PHASE I: RECORDS SEARCH
McGUIRE AFB, NEW JERSEY

Prepared For
United States Air Force
AFESC/DEV
Tyndall AFB, Florida
and
HQ MAC/DEEV
Scott AFB, Illinois

November, 1982

By
ENGINEERING-SCIENCE, INC.
57 Executive Park South, N.E.
Suite 590
Atlanta, Georgia 30329

ENGINEERING-SCIENCE

57 EXECUTIVE PARK SOUTH, N.E., SUITE 590 • ATLANTA, GEORGIA 30329 • 404/325-0770

CABLE ADDRESS: ENGINSCI
TELEX: 54-2882

26123

November 24, 1982

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

Dear Mr. Lindenberg:

Enclosed is the Engineering-Science, Inc. (ES) final report entitled "Installation Restoration Program, Phase I - Records Search, McGuire AFB, New Jersey." This report has been prepared in accordance with the ES proposal dated April 6, 1982 and Air Force Contract Number F08637-80-G0009 Call #0017.

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

We appreciate the opportunity to work with you and the other Air Force personnel who contributed information to us for the completion of this assessment. Any questions regarding this report should be directed to the Office of Public Affairs, McGuire Air Force Base, New Jersey, 609/724-2465.

Very truly yours,

ENGINEERING-SCIENCE, INC.

E J Schroeder

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

EJS/lmr

Enclosure

TABLE OF CONTENTS

LIST OF FIGURES

LIST OF TABLES

EXECUTIVE SUMMARY

EXECUTIVE SUMMARY

The Department of Defense (DOD) has developed a program to identify and evaluate past hazardous material disposal sites on DOD property, to control the migration of hazardous contaminants, and to control hazards to health or welfare that may result from these past disposal operations. This program is called the Installation Restoration Program (IRP). The IRP has four phases consisting of Phase I, Initial Assessment/Records Search; Phase II, Confirmation; Phase III, Technology Base Development; and Phase IV, Operations. Engineering-Science (ES) was retained by the Air Force Engineering and Services Center to conduct the Phase I, Initial Assessment/Records Search for McGuire AFB under Contract No. F08637-80-G0009, Call No. 0017, using funding provided by the Military Airlift Command.

INSTALLATION DESCRIPTION

McGuire Air Force Base is located in south central New Jersey, 18 miles southeast of Trenton. The base borders the community of Wrightstown and the Fort Dix Army Installation in Burlington County. McGuire AFB is in a semi-rural area located in the northeast section of the New Jersey Pine Barrens. The study area for this project included the main base comprising 3,536 acres, and five off-base areas which are under the jurisdiction of McGuire AFB. These areas are as follows:

McGuire Middle Marker	0.52 acres
McGuire Missile Site (BOMARC)	219.0 acres
Gibbsboro Radar Station	23.0 acres
Burlington POL Off-Loading Facility	2.13 acres
McGuire Approach Lights	2.18 acres

McGuire AFB site was used as an Army Air Base between 1937 and 1948. In 1948, the Fort Dix Airfield was officially transferred to the Air Force and designated McGuire Air Force Base. The first command at the base was the Strategic Air Command (SAC), followed by the Continental Air Command (CAC) and in 1952 the Military Air Transport Service (MATS), a predecessor command of the Military Airlift Command (MAC). The primary mission of the base since 1952 has been to provide a port of aerial embarkation for the Atlantic Division. In 1954, the New Jersey Air National Guard (NJANG) became a major tenant on the base. In 1966, MATS was renamed MAC and the 1611th Air Transport Wing became the 438th Military Airlift Wing which is presently the host organization on McGuire AFB.

ENVIRONMENTAL SETTING

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

- Surface soils of the McGuire Air Force Base area are typically sandy, permeable and possess shallow water levels (six feet or less).
- The Cohansey Sand, Kirkwood Formation and the Vincentown Formation are present at McGuire AFB, either exposed or very near ground surface. These formations are considered to be aquifers of limited significance in the study area. The base is located within the recharge zone of these aquifers.
- The mean annual precipitation is 43.5 inches and the net precipitation is calculated to be 9.3 inches.
- As much as 85% of the precipitation infiltrating into these shallow aquifers will be lost as baseflow to area streams, usually within a period of a few days from the time of infiltration.

- The major regional aquifer exists at great depth in the study area (about 500 feet below ground surface). The regional aquifer is recharged at some distance from the base, but may receive some local recharge as leakage through semipervious zones from overlying shallow aquifers.
- Evidence of limited contamination identified in wells constructed in the Potomac-Raritan-Magothy outcrop area has been published. This is not expected to impact base water quality in the near term.
- Flooding is not a problem typical of the McGuire Air Force Base Area.
- The streams entering and exiting the base boundaries are considered to have good water quality.
- No threatened or endangered species have been observed within the McGuire AFB boundaries.

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 aerial inspections were conducted at past hazardous waste activity sites. Twenty-two sites located within the McGuire AFB boundaries or on the McGuire Missile Site were identified as potentially containing hazardous contaminants resulting from past activities (Figure 1 and Figure 2). 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.

TABLE 1
PRIORITY RANKING OF POTENTIAL CONTAMINATION SOURCES
MCGUIRE AFB

Rank	Site Name	Date of Operation or Occurrence	Overall Total Score
1	Landfill No. 4	1958-1973	73
2	Landfill No. 2	1950-1956	66
3	Landfill No. 3	1956-1957	65
4	McGuire Missile Site JP-X Discharge Pit	1958-1972	59
5	Pesticide Wash Area	1974-present	58
6	DPDO Storage Facility	1960-1979	56
7	Fire Protection Training Area No. 1	Late 1940's - 1958	54
8	Bulk Fuel Storage Tank	1963-1970	53
9	Landfill No. 5	1970-1973	52
10	Fire Protection Training Area No. 2	1958-1968	51
11	Landfill No. 6	1973-1976	50
11	WWTP Sludge Disposal Areas	1953-present	50
11	McGuire Missile Site - Transformer Locations	1958-present	50
14	Buried Oil Drums	Early 1950's	49
15	Fire Protection Training Area No. 3	1973-1976, 1982	48
16	NDI Shop - Drain Field	1960's-1972	47
17	McGuire Missile Site Accident Area	1960	46
19	McGuire Missile Site Mogas Storage Tanks	1958-present	45
19	McGuire Missile Site BOMARC Launcher Hydraulic Systems	1958-present	39
20	McGuire Missile Site Neutralized Acid Pit	1958-1972	37
21	PCB Spill Site	1982	6

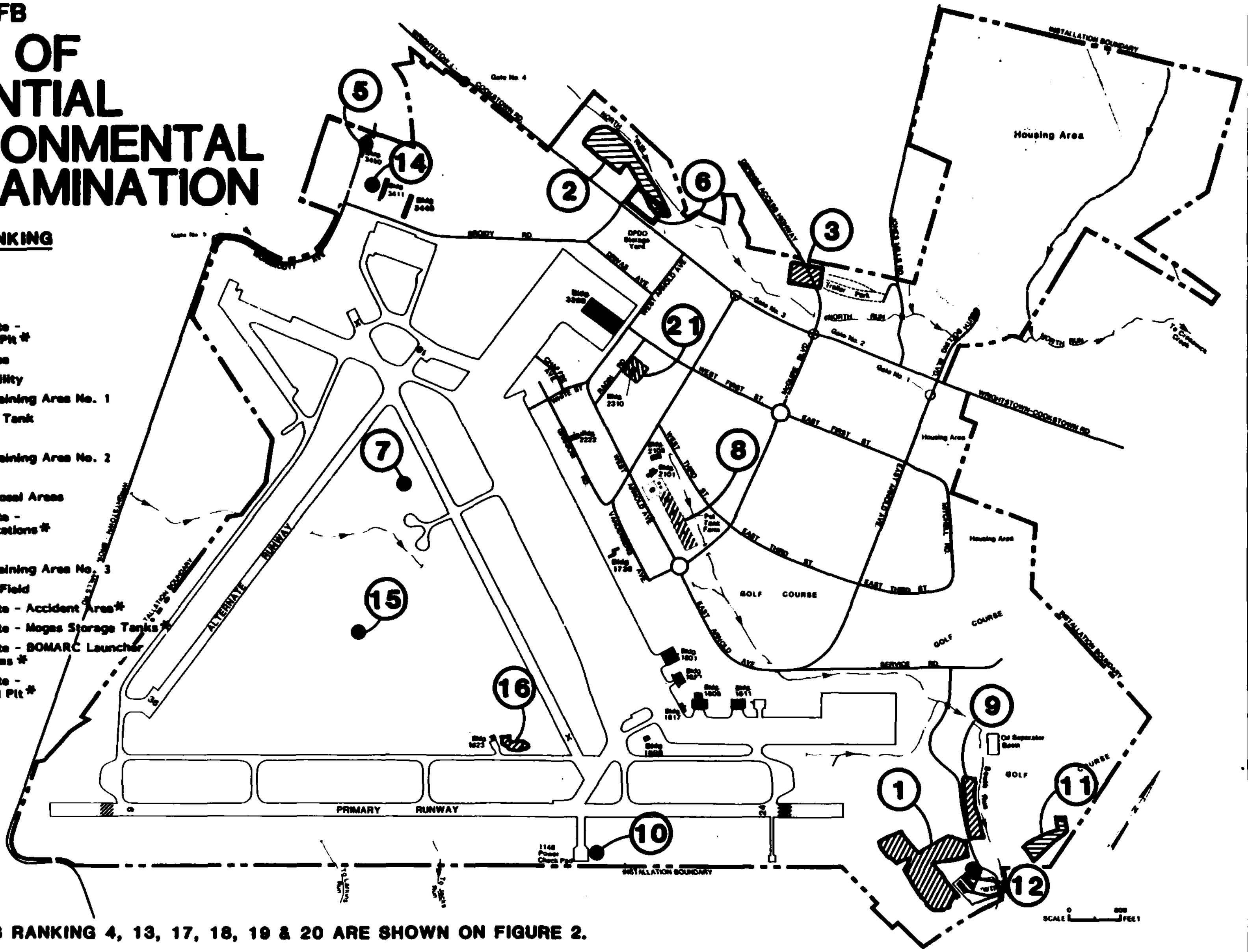
NOTE: This ranking was performed according to the Hazard Assessment Rating Methodology (HARM) described in Appendix G. Individual site rating forms are in Appendix H.

FIGURE 1

McGUIRE AFB
SITES OF POTENTIAL ENVIRONMENTAL CONTAMINATION

LEGEND & RANKING

1. Landfill No. 4
2. Landfill No. 2
3. Landfill No. 3
4. McGuire Missile Site - JP-X Discharge Pit *
5. Pesticide Wash Area
6. DPDO Storage Facility
7. Fire Protection Training Area No. 1
8. Bulk Fuel Storage Tank
9. Landfill No. 5
10. Fire Protection Training Area No. 2
11. Landfill No. 6
12. WWTP Sludge Disposal Areas
13. McGuire Missile Site - Transformer Locations *
14. Buried Oil Drums
15. Fire Protection Training Area No. 3
16. NDI Shop - Drain Field
17. McGuire Missile Site - Accident Area *
18. McGuire Missile Site - Mogas Storage Tanks *
19. McGuire Missile Site - BOMARC Launcher Hydraulic Systems *
20. McGuire Missile Site - Neutralized Acid Pit *
21. PCB Spill Site



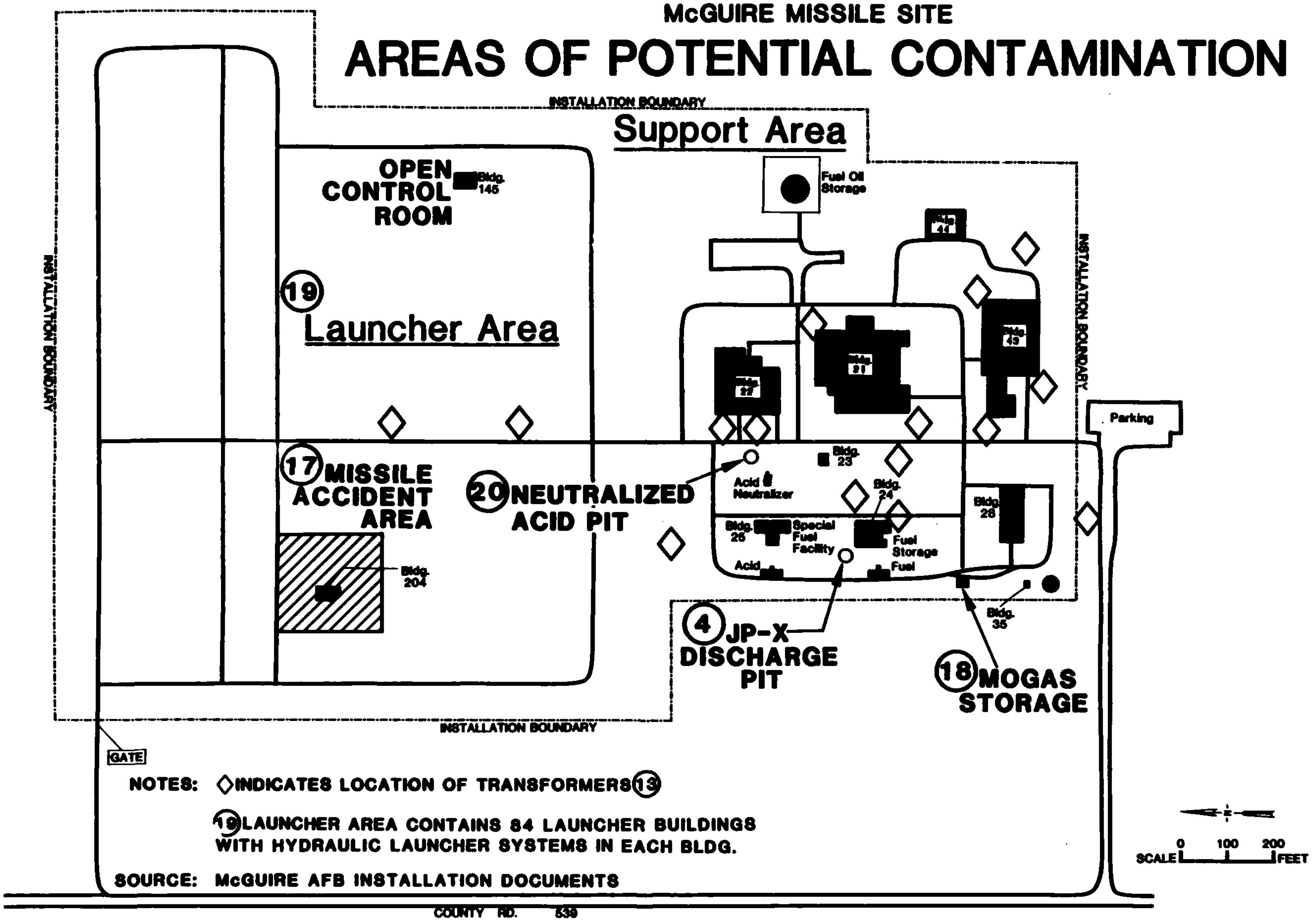
NOTE: *SITES RANKING 4, 13, 17, 18, 19 & 20 ARE SHOWN ON FIGURE 2.

SOURCE: McGUIRE AFB INSTALLATION DOCUMENTS

FIGURE 2

McGUIRE MISSILE SITE

AREAS OF POTENTIAL CONTAMINATION



NOTES: ◇ INDICATES LOCATION OF TRANSFORMERS (13)

(19) LAUNCHER AREA CONTAINS 84 LAUNCHER BUILDINGS WITH HYDRAULIC LAUNCHER SYSTEMS IN EACH BLDG.

SOURCE: McGUIRE AFB INSTALLATION DOCUMENTS

FINDINGS AND CONCLUSIONS

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

The areas determined to have a high potential for environmental contamination are as follows:

- Landfill No. 4
- Landfill No. 2
- Landfill No. 3

The areas determined to have a moderate potential for environmental contamination are as follows:

- JP-X Discharge Pit (located at the McGuire Missile Site)
- Pesticide Wash Area
- DPDO Storage Facility
- Fire Protection Training Area No. 1
- Bulk Fuel Storage Tank Sludge Disposal Area

The areas determined to have a low potential for environmental contamination are as follows:

- Landfill No. 5
- Fire Protection Training Area No. 2
- Landfill No. 6
- WWTP Sludge Disposal Areas
- Transformer Sites (located at the McGuire Missile Site)
- Buried Oil Drums
- Fire Protection Training Area No. 3
- NDI Shop - Drain Field
- McGuire Missile Site Accident Area
- Mogas Storage Tanks (located at the McGuire Missile Site)
- McGuire Missile Site BOMARC Launcher Hydraulic Systems
- Neutralized Acid Pit (located at the McGuire Missile Site)
- PCB Spill Site

RECOMMENDATIONS

The detailed recommendations developed for further assessment of environmental concern areas at McGuire AFB and the McGuire Missile Site are presented in Chapter 6. The recommendations are summarized as follows:

o Landfill No. 4	Ground-water monitoring Surface water monitoring
o Landfill No. 2	Ground-water monitoring Surface water monitoring
o Landfill No. 3	Ground-water monitoring Surface water monitoring
o JP-X Discharge Pit - McGuire Missile Site	Ground-water monitoring
o Pesticide Wash Area	Core sampling and analyses Surface water and sediment monitoring
o DPDO Storage Facility	Soil sampling and analyses
o Fire Protection Training Area No. 1	Ground-water monitoring
o POL Bulk Fuel Storage Area	Ground-water monitoring Surface water monitoring
o Buried Oil Drums	Metal detection survey of the area
o McGuire Missile Site Accident Area	Continuation of radiation monitoring program

CHAPTER 1

INTRODUCTION

CHAPTER 1

INTRODUCTION

BACKGROUND AND AUTHORITY

The United States Air Force 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 of hazardous wastes identify the locations and contents of disposal sites and take action to eliminate the hazards in an environmentally responsible manner. The Department of Defense (DOD) has issued Defense Environmental Quality Program Policy Memorandum (DEQPPM) 81-5 requiring the identification and evaluation of past hazardous material disposal sites on DOD property, the control of migration of hazardous contaminants, and the control of hazards to health or welfare that could result from these past operations. This program is called the Installation Restoration Program (IRP). The IRP will be a basis for response actions on Air Force installations under the provisions of the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) of 1980. DEQPPM 81-5 implemented by Air Force message dated 21 January 1982 reissued and amplified all previous directives and memoranda on IRP.

PURPOSE AND SCOPE OF THE ASSESSMENT

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

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

Engineering-Science (ES) was retained by the Air Force Engineering and Services Center to conduct the Phase I Records Search at McGuire Air Force Base under Contract No. F08637-80-G0009, Call No. 0017, using funding provided by the Military Airlift Command. This report contains a summary and an evaluation of the information collected during Phase I of the IRP. The land areas included as part of the McGuire AFB study are as follows:

McGuire AFB	3,536 acres
McGuire Middle Marker	0.52 acres
McGuire Missile Site (BOMARC)	219 acres
Gibbsboro Radar Station	23 acres
Burlington POL Off-Loading Facility	2.13 acres
McGuire Approach Lights	2.18 acres

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

- Reviewed site records
- Interviewed personnel familiar with past generation and disposal activities
- Inventoried wastes
- Determined quantities and locations of current and past hazardous waste storage, treatment and disposal
- Defined the environmental setting at the base
- Reviewed past disposal practices and methods
- Conducted field and aerial inspection
- Gathered pertinent information from federal, state and local agencies
- Assessed potential for contaminant migration.

ES performed the on-site portion of the records search during August 1982. The following core team of professionals were involved:

- J. R. Absalon, Hydrogeologist, BS Geology, 8 years of professional experience
- J. W. Braswell, Environmental Engineer, MS Environmental Health Engineering, 7 years professional experience
- R. M. Reynolds, Chemical Engineer, BSChE, 8 years of professional experience
- E. J. Schroeder, Environmental Engineer and Project Manager, MSCE, 15 years of professional experience

- M. I. Spiegel, Environmental Scientist, BS Environmental Science, 5 years of professional experience

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

METHODOLOGY

The methodology utilized in the McGuire AFB Records Search began with a review of past and present industrial operations conducted at the base. Information was obtained from available records such as shop files and real property files, as well as interviews with past and present base employees from the various operating areas. Those interviewed included current and past personnel associated with the Civil Engineering Squadron, Bioenvironmental Engineering Services, Aircraft Ground Services, Field Maintenance Services, and Fuels Management. Experienced personnel from present and past tenant organizations were also interviewed. Interviews were conducted with 52 individuals from the base to obtain the needed past activity information. A listing of Air Force interviewees by position and approximate period 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 eleven agencies contacted and interviewed are listed below as well as in Appendix B.

- U.S. Army Toxic and Hazardous Materials Agency, Aberdeen Proving Grounds, MD
- U.S. Army Corps of Engineers, Philadelphia and New York Districts
- U.S. Army Corps of Engineers Resident Engineer, Fort Dix, NJ
- U.S. Environmental Protection Agency, Region II
- New Jersey Dept. of Environmental Protection - Bureau of Pesticide Control
- New Jersey Dept. of Environmental Protection - Div. of Fish, Game, and Wildlife
- New Jersey Dept. of Environmental Protection - Div. of Water Resources

- New Jersey Dept. of Environmental Protection - Div. of Waste Management
- New Jersey Pinelands Commission, New Lisbon, New Jersey
- Rutgers University, Department of Geology, Staff
- U.S. Geological Survey, Water Resources Division

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

A general ground tour and an aerial 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.

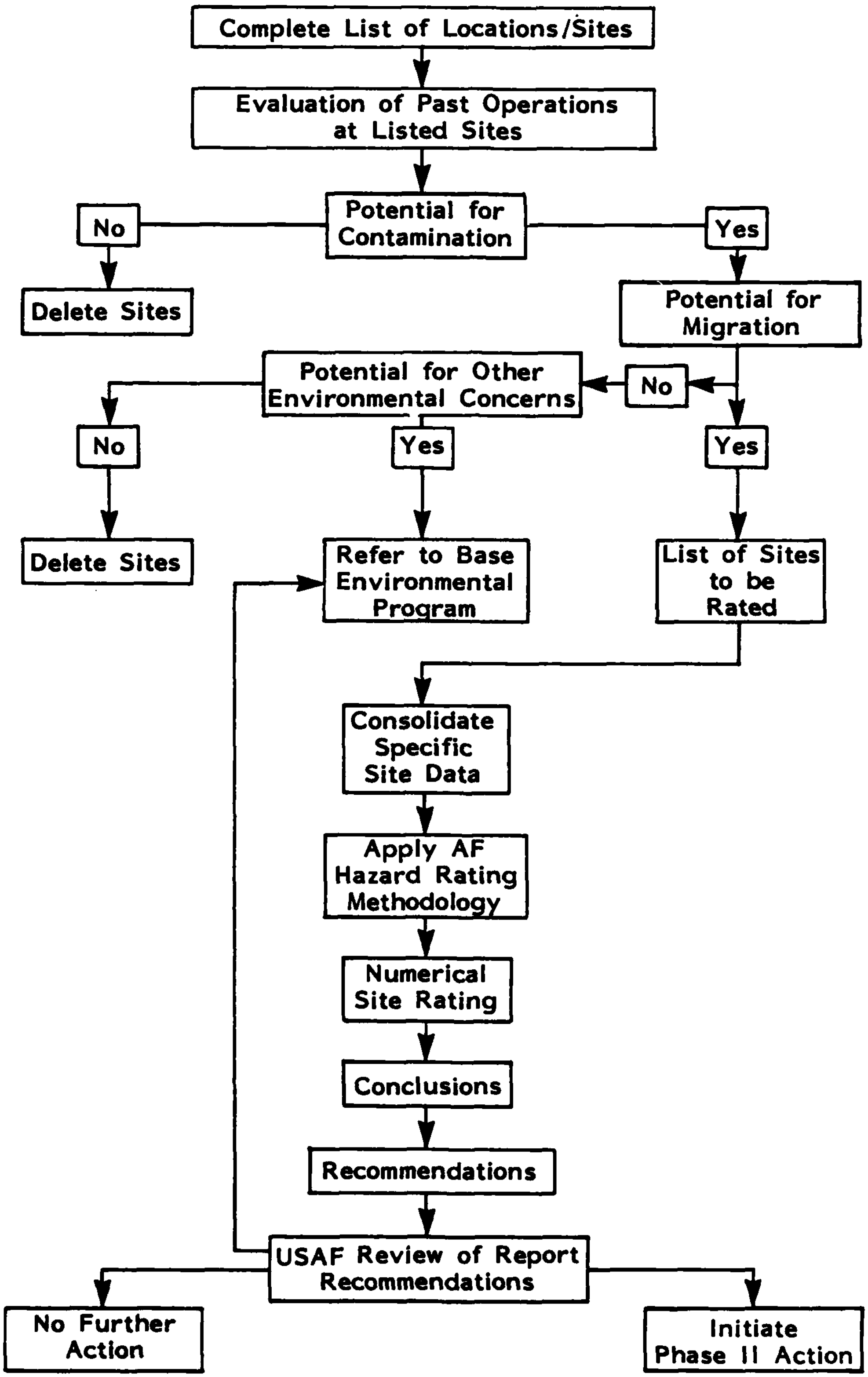
A decision was then made, based on all of the above information, whether a potential exists for hazardous material contamination at any of the identified sites using the Decision Tree shown in Figure 1.1. If no potential exists, the site was deleted from further consideration. For those sites where a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

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

FIGURE 1.1

PHASE I INSTALLATION RESTORATION PROGRAM

DECISION TREE



CHAPTER 2

INSTALLATION DESCRIPTION

CHAPTER 2

INSTALLATION DESCRIPTION

LOCATION, SIZE AND BOUNDARIES

McGuire Air Force Base is located in south central New Jersey, 18 miles southeast of Trenton and borders the community of Wrightstown in Burlington County (Figures 2.1 and 2.2). East, south and west boundaries of McGuire AFB border on the U.S. Army Fort Dix installation. The base is located in a semi-rural area with most adjacent lands either vacant, wooded or used for agricultural or military purposes. McGuire AFB is geographically positioned in the northeast corner of a region designated as the New Jersey Pine Barrens, an expanse of relatively level wooded land covering one and one-third million acres on the coastal plain between the piedmont and the tidal strip. The area is under the management of the New Jersey Pinelands Commissions. Figure 2.3 depicts the configuration of the 3,536 acres comprising McGuire AFB. Several installation annexes under the jurisdiction of McGuire AFB were also included in this study. These areas are identified below and depicted in Figure 2.2.

McGuire Middle Marker	- 0.52 acres located approximately 900 feet outside of the base boundaries within the approach of Runway 06. The site is used to provide navigational markings. The land is owned by the U.S. Army but under custody of McGuire AFB.
McGuire Missile Site (BOMARC)	- 219 acres located approximately 11 miles east of McGuire AFB within the Fort Dix Military reservation and directly west of the Lakehurst Naval Air Station.

FIGURE 2.1

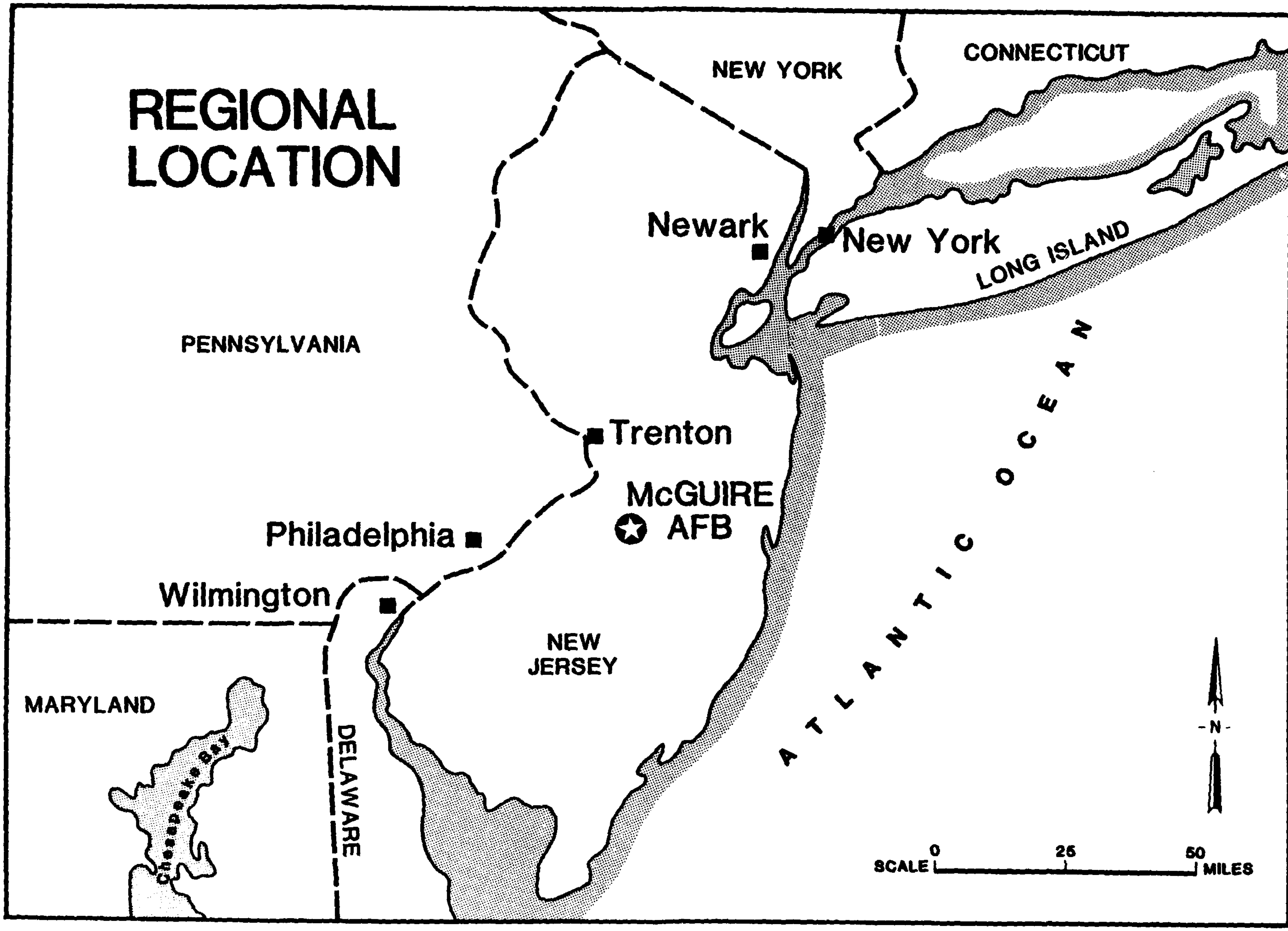
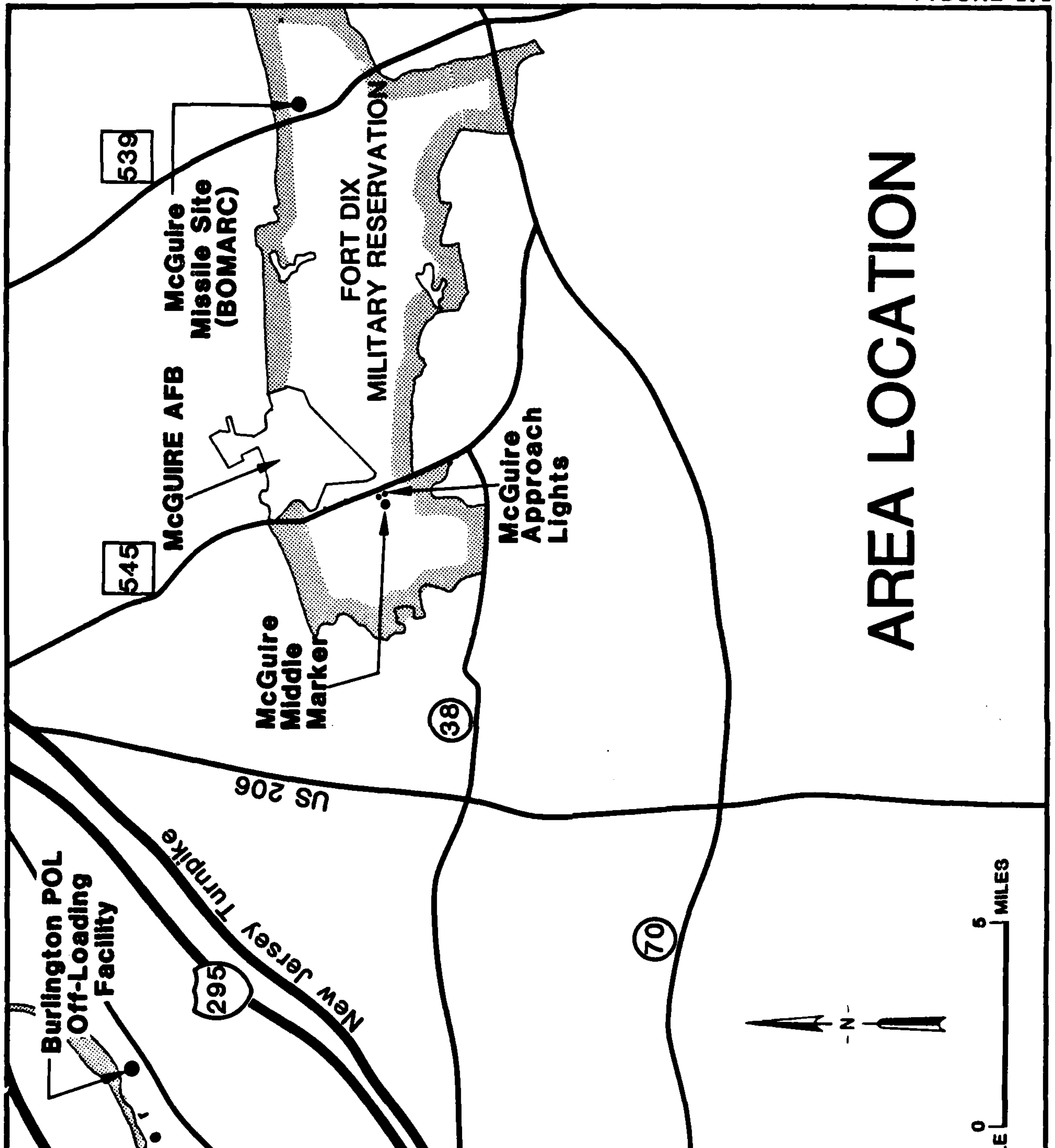
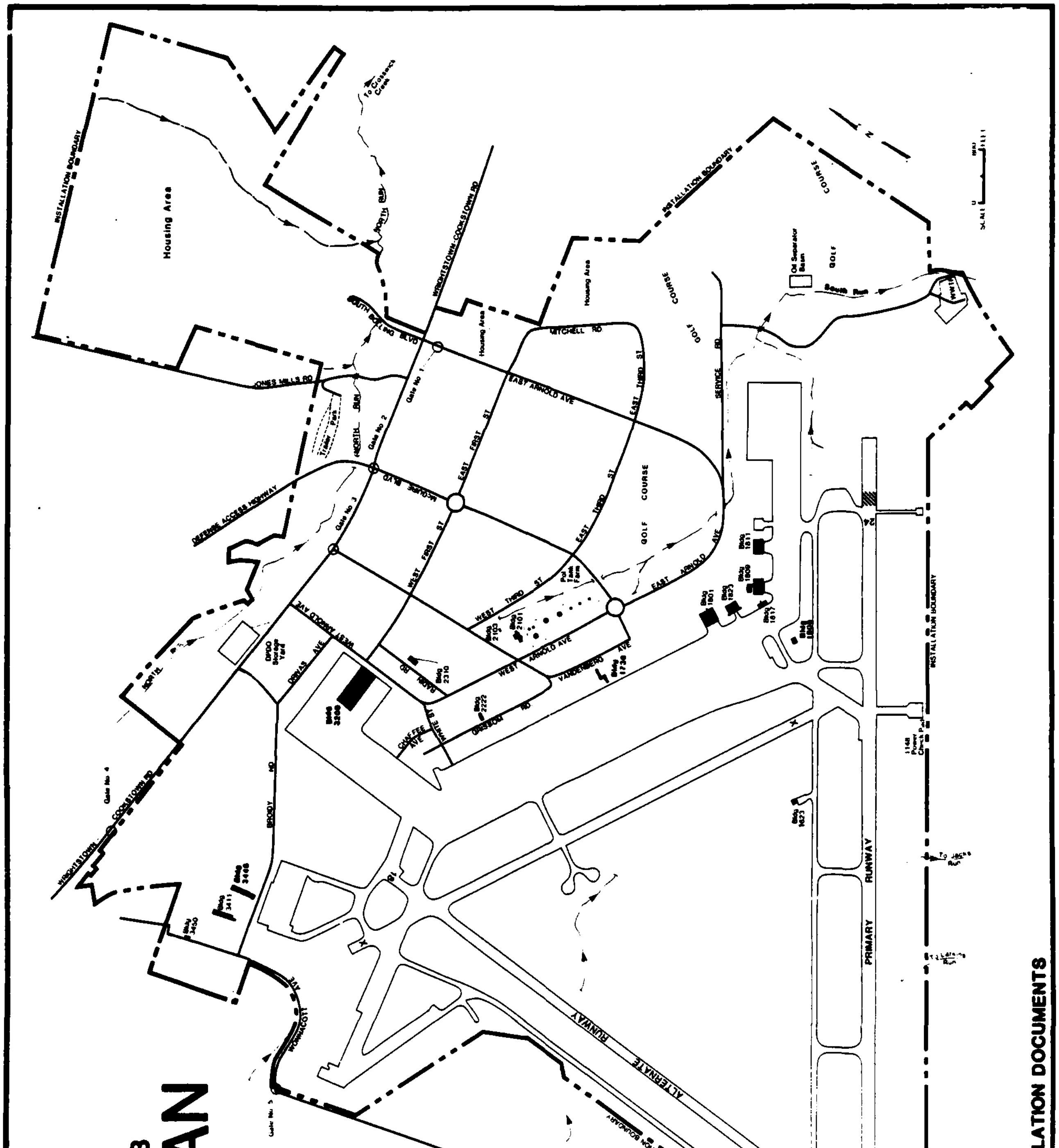

REGIONAL
LOCATION
NEW YORK
CONNECTICUT
Newark
New York
LONG ISLAND
PENNSYLVANIA
Trenton
McGUIRE
AFB
Philadelphia
Wilmington
NEW
JERSEY
ATLANTIC OCEAN
MARYLAND
Chesapeake Bay
DELAWARE
N
SCALE
0
25
50
MILES

FIGURE 2.2



AREA LOCATION
McGUIRE AFB
McGuire Missile Site (BOMARC)
FORT DIX MILITARY RESERVATION
McGuire Approach Lights
McGuire Middle Marker
539
545
38
US 206
70
73
New Jersey Turnpike
295
US 130
95
Delaware River
Burlington POL Off-Loading Facility
N.E. Philadelphia
Gibbsboro Radar Station
N
SCALE 0 5 MILES



ES ENGINEERING-SCIENCE

		The area was utilized by the Air Force as a launch site for the BOMARC missiles between the mid 1950's and 1972. The land is owned by the U.S. Army but is under custody of McGuire AFB.
Gibbsboro Radar Station	-	23 acres located 25 air miles southwest of McGuire AFB along Hwy 561 near the town of Gibbsboro, New Jersey. The site is used as a Tactical Air Command radar tracking station.
Burlington POL Off-Loading Facility	-	2.13 acres located on the south-east side of the Burlington Bridge along the eastern shore of the Delaware River. The site is 15 miles northwest of McGuire AFB. It is used as an off-loading terminal for the JP-4 pipeline that supplies McGuire AFB.
McGuire Approach Lights	-	2.18 acres located approximately 900 feet outside of the base boundaries within the approach of Runway 06. The land is owned by the U.S. Army by is under custory of McGuire AFB.

BASE HISTORY

In 1937, McGuire AFB began as a single dirt-strip runway with a few maintenance and administrative buildings. The airfield called Rudd Field at the time, was developed as an adjunct to the U.S. Army Training Center, Fort Dix, and was operated by the Army Air Corps.

During the period 1940 thru 1942, the U.S. Army Air Corps, under Command Headquarters located at New Castle Air Base, Delaware, made extensive improvements, including expanded aircraft pavements and landing strips to meet World War II transitional training activities. The airfield remained under Army control until 1948.

In 1948, the Fort Dix Airfield and all existing facilities were transferred to the U.S. Air Force, and the installation was officially designated McGuire Air Force Base. The installation was assigned to the Strategic Air Command (SAC) until September 1949, when it was transferred to the Continental Air Command (CAC). In 1952 a major program of development was initiated to provide a port of aerial embarkation for Atlantic Division, Military Air Transport Service (MATS).

In July 1954, the base was officially assigned to the Military Air Transport Service with Air Defense Command (ADC) and the New Jersey Air National Guard (NJANG) as major tenant organizations. The NJANG consolidated their activities on the west side of the base supported by a major construction program. Subsequently, SAC and CAC tenant units were assigned to McGuire AFB. In January 1966, the Military Air Transport Service became the Military Airlift Command (MAC) with headquarters at Scott AFB, IL. Eastern Transport Air Force became the 21st Air Force with headquarters at McGuire AFB, and the 1611th Air Transport Wing became the 438th Military Airlift Wing. The SAC Tanker Squadron left McGuire in 1965 and its facilities were occupied by the 170th Air Transport Group NJANG.

ORGANIZATION AND MISSION

The present host organization at McGuire AFB is the 438th Military Airlift Wing whose primary mission is to provide quick reacting, concentrated, massive airlift to place Department of Defense forces into combat situations in a fighting posture and then furnish them with the material they need to stay in that posture. The Wing is also responsible for operating McGuire AFB and for providing adequate support to a large number of tenant units.

Tenant organizations at McGuire AFB are listed below. Descriptions of the major base tenant organizations and their missions are presented in Appendix C.

Headquarters Twenty First Air Force

Air Force Office of Special Investigation, Detachment 413

Air Force Audit Agency

Air Force ROTC, Northeast Area Office

Defense Fuel Region - Northeastern

Defense Property Disposal Office

Detachment 1, 1600th Management Engineering Squadron

Field Training, Detachment 203

OL-A Detachment 1, 375th Aeromedical Airlift Wing

OL-K, Headquarters Military Airlift Command

Detachment 10, 7th Weather Wing

Headquarters New Jersey Air National Guard

Headquarters 108th Tactical Fighter Wing

141st Tactical Fighter Squadron

Headquarters 170th Air Refueling Group

514th Military Airlift Wing and Associated Units

772nd Radar Squadron, Gibbsboro AFS, NJ

Military Airlift Command Non-Commissioned Officers Academy East

1998th Communication Squadron

3515th USAF Recruiting Squadron

590th Air Force Band

CHAPTER 3

ENVIRONMENTAL SETTING

CHAPTER 3

ENVIRONMENTAL SETTING

The environmental setting of McGuire Air Force Base is described in this chapter with the primary emphasis directed toward identifying features which may facilitate the movement of hazardous waste contaminants. A summary of the environmental setting pertinent to the study is presented at the conclusion of this section.

METEOROLOGY

Temperature, precipitation and snowfall data furnished by Detachment 10, 15th Weather Squadron, McGuire AFB, are presented in Table 3.1. The period of record is 33 years. The summarized data indicate that the mean annual precipitation is 43.5 inches. This corresponds with the value obtained from the National Oceanic and Atmospheric Administration Climatic Atlas of the United States (NOAA, 1977). The NOAA has determined that the mean annual Class A pan evaporation for the area is 45 inches with a 76 percent coefficient. These values result in a net precipitation of 9.3 inches.

GEOGRAPHY

The McGuire AFB area is located along the southern boundary of the inner coastal plain section of the Atlantic Coastal Plain Physiographic Province. This physiographic division is characterized by low dissected hills and broad sandy plains occurring in a narrow belt some ten to twenty miles wide that extends northeast along the Delaware Valley across New Jersey to Raritan Bay (Wolfe, 1977 and Minnard and Owens, 1962). Major features of the inner coastal plain include nearly level plains, gently rolling uplands, extensive surficial dissection, mature streams and swampy areas. Upland stream valleys possess "V-type" channels when viewed in cross section, indicative of rapidly eroding sandy soils. Lowland stream channels exhibit a "sag and swale" appearance,

TABLE 3.1
MCGUIRE AFB CLIMATIC CONDITIONS

	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	ANN
TEMPERATURE													
Average Max	40	42	49	62	71	80	84	83	76	66	54	43	63
Average Min	24	26	32	41	51	60	66	64	57	47	37	28	44
Days ≥ 80°	0	0	--	2	6	17	25	22	11	2	--	0	85
Days ≤ 32°	25	22	16	4	--	0	0	0	0	1	10	22	100
Record Max	74	74	85	93	94	97	102	100	100	88	82	75	102
Record Min	-4	-4	8	19	31	42	50	42	35	25	15	0	-4
PRECIPITATION (All Forms)													
Average Inches	3.0	3.0	3.9	3.5	3.2	3.3	4.2	5.0	3.6	3.3	3.4	4.1	43.5
Greatest Inches	9.19	5.73	6.02	6.54	6.50	8.34	10.2	15.0	8.58	7.22	8.83	12.4	62.8
Least Inches	.31	.72	1.14	1.17	.23	.05	.71	.78	.82	.08	.24	.16	27.2
24-Hr Max	2.23	2.41	2.29	2.59	2.91	4.06	4.15	9.61	3.76	3.32	3.40	6.74	9.61
PRECIPITATION (As Snow)													
No. Days Precip.	11	10	11	11	11	10	9	9	8	7	10	10	117
No. Days Snow	3	4	3	--	0	0	0	0	0	--	--	2	12
Average Inches	6.2	5.2	4.7	.5	T	0	0	0	0	T	.75	3.8	21.7
24-Hr Max	14.5	18.1	20.1	5.8	7	0	0	0	0	7	8.6	7.1	20.1

T = Trace
Source: Detachment 10, 15th Weather Squadron, McGuire AFB
Period of Record: 1948-1981

indicating the presence of somewhat cohesive, fine-grained soils that tend to be more resistant to erosional effects. Figure 3.1 depicts the physiographic regions of New Jersey.

Topography

The topography of McGuire AFB ranges from generally level to gently rolling in appearance. Local relief is primarily the result of dissection by erosional activity or stream channel development. Base surface elevations range from a low of 80 feet mean sea level (MSL) along the South Run stream channel east of Building 1503 to 144 feet MSL at the cemetery located along the southwest base boundary.

Drainage

Drainage of McGuire AFB land areas is accomplished by overland flow to diversion structures and then to area surface streams, all of which are tributaries of the Delaware River. Typically, the north portion of the base drains to the North and South Runs of Crosswicks Creek. The south and east sections of the base drain to Bowker's Run, Jack's Run and Larkin's Run, all of which are tributaries of Rancocas Creek. Generally, the base is well drained and has not experienced any disruptions to service because of flooding. According to Schaefer (1982) the McGuire AFB - Fort Dix area is not subject to flooding. No wetland areas have been identified on base. Figure 3.2 depicts McGuire AFB drainage.

Surface Soils

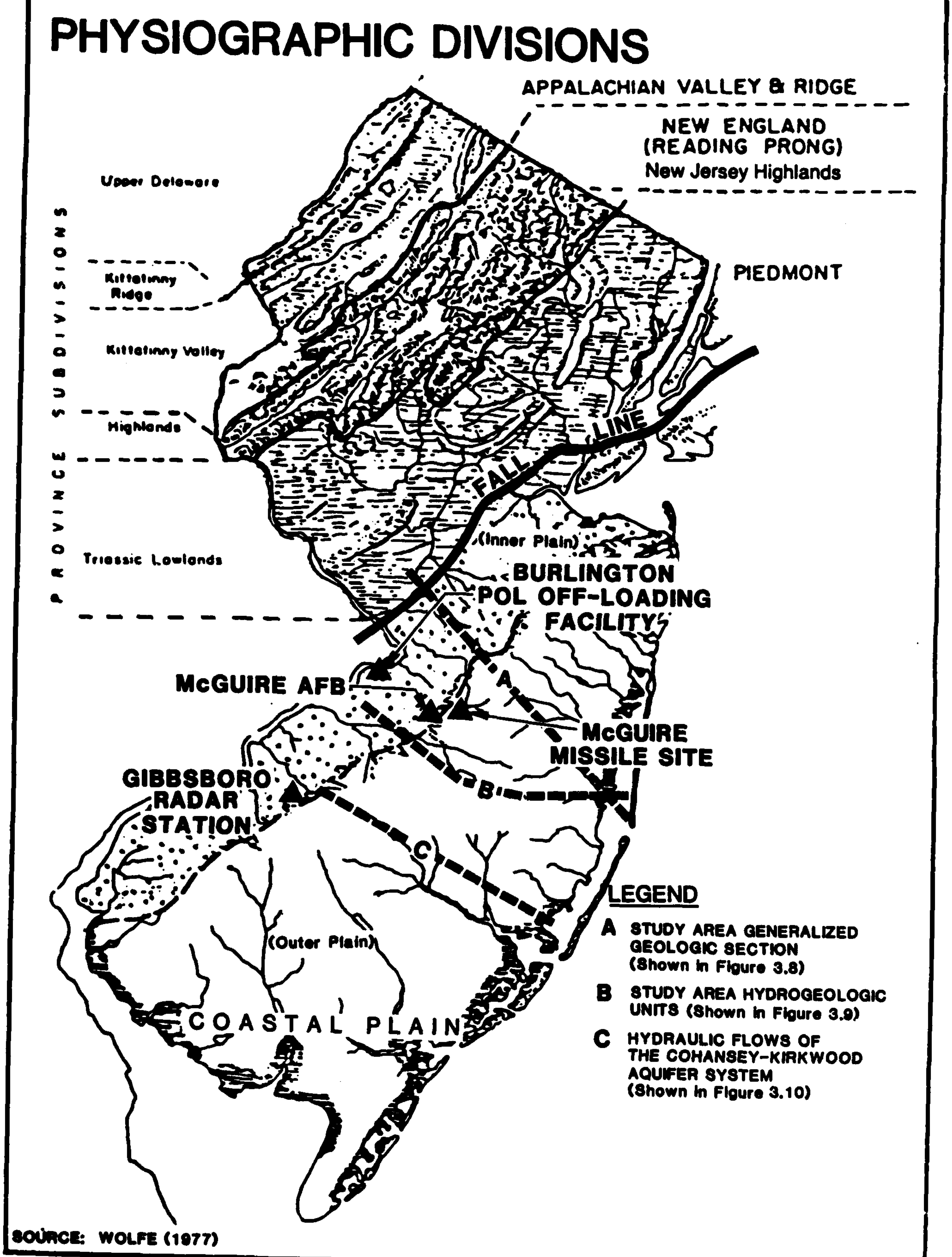
Surface soils of the McGuire AFB, the Burlington POL off-loading Facility and the McGuire Missile Site have been reported by the U.S. Department of Agriculture, Soil Conservation Service (1971 and 1980). Twenty-three soil types have been identified within the installation boundaries of these three sites. The individual soil units are described in Table 3.2 and are mapped in Figure 3.3. Most of the base soil units impose moderate to severe constraints on the development of waste disposal facilities. These soil units are typically sandy, well drained and possess a normally high water table.

GEOLOGY

Information describing the geologic setting of the McGuire AFB area has been obtained from Lewis and Kummel (1912, rev. 1950), Minard and

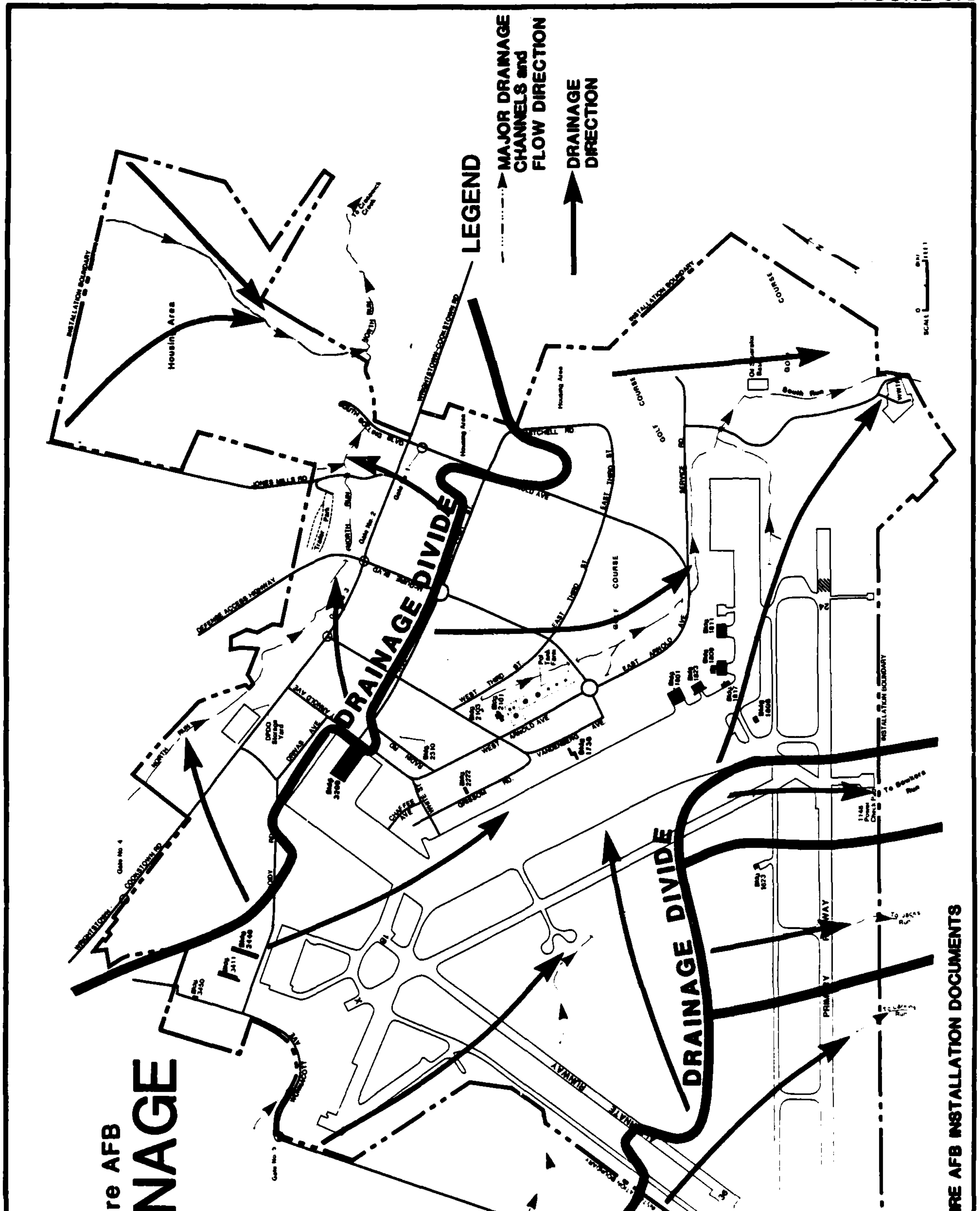
FIGURE 3.1

PHYSIOGRAPHIC DIVISIONS



SOURCE: WOLFE (1977)

FIGURE 3.2



SOURCE: McGUIRE AFB INSTALLATION DOCUMENTS

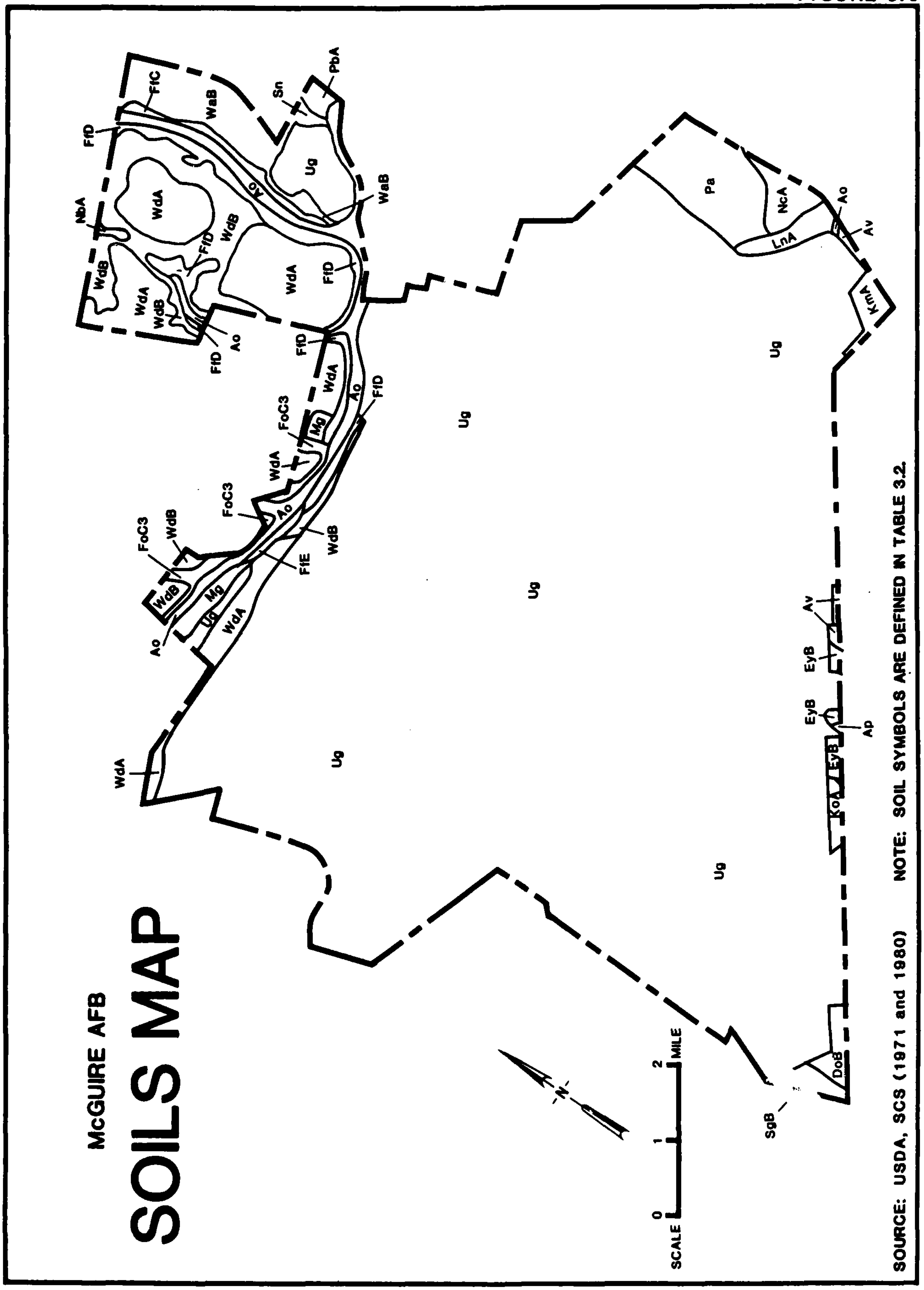
TABLE 3.2
McGUIRE AIR FORCE BASE SOILS

Map Symbol	Unit Description	USDA Texture (Major Fraction)	Thickness (inches)	Unified Classification (Major Fraction)	Permeability (Inches/Hour)	Disposal Site Facility Use Constraints
Ao	Alluvial land	Loam, sandy loam, clay loam	60	SM, SC, ML, CL	Variable	Severe-high water table; floods
Ap	Alluvial land	Sand	60	SM, SP, SP-SM	>6.3	Severe-high water table; floods
Av	Atsion fine sand	Sand, fine sand,loamy fine sand	60	SP, SP-SM	2.0 - >6.3	Severe-high water table
DoB	Downer loamy sand	Loamy sand	60	SM, SP-SM	2.0 - 6.3+	Severe-limited unsaturated zone
EyB	Evesboro fine sand	Sand or fine sand	60	SP, SP-SM	0.2 - 6.3+	Moderate-slopes
FfC	Freehold fine sandy loam, 5-10% slopes	Fine sandy loam, clay loam, sandy clay loam	60	SC, SM, SM-SC	0.2 - 6.3+	Severe-slopes
FfD	Freehold fine sandy loam, 10-15% slopes	Fine sandy loam, clay loam, sandy clay loam	60	SC, SM, SM-SC	0.2 - 6.3 +	Severe-slopes
FfE	Freehold fine sandy loam, 15-25% slopes	Fine sandy loam, clay loam, sandy clay loam	60	SC, SM, SM-SC	0.2 - 6.3+	Severe-slopes
FoC3	Freehold sandy loam, 5-10% slopes	Fine sandy loam, clay loam, sandy clay loam	60	SC, SM, SM-SC	0.63 - 6.3+	Slight
KmA	Klej sand	Sand, fine sand	60	SM, SP, SP-SM	>6.3	Severe-high water table
KoA	Klej fine sand	Sand, fine sand	60	SM, SP, SP-SM	>6.3	Severe-high water table
LnA	Lakehurst fine sand	Sand, fine sand	60	SP, SP-SM	>6.3	Severe-high water table
Mg	Made land(or sanitary fill)	Highly Variable - Properties not estimated				Probably severe-water table
NbA	Nixonton fine sandy loam	Fine sandy loam, loamy fine sand	60	SM	0.2 - 2.0	Severe-high water table
NcA	Nixonton loamy fine sand	Loamy fine sand, sandy loam	60	SM, SP-SM	0.2 - 6.3+	Severe-high water table
Pa	Pasquotank fine sandy loam	Fine sandy loam, loamy sand, sand	60	SM, SP	0.63 - 2.0	Severe-high water table
SgB	Sassafras fine sandy loam	Fine sandy loam	60	SM, SC, ML	0.2 - 6.3+	Slight
Sn	Shrewsbury fine sandy loam	Loam, fine sandy loam, sandy clay loam	60	SM, SC, ML	0.63 - 2.0	Severe-high water table
Ug*	Urban land (sandy)	Loamy sand or sandy loam	60	SM, SP-SM	2.0 - 6.3	Variable-probably moderate to severe
Ul**	Urban land	Highly Variable - Properties not estimated				Probably Severe-permeability
WaB	Westphalia loamy fine sand	Loamy fine sand, fine sandy loam	60	SM, SP-SM	0.2 - 6.3	Slight-Unsat. zone may be limited
WdA	Westphalia fine sandy loam	Fine sandy loam	60	SM, SP-SM	0.2 - 6.3	Slight-Unsat. zone may be limited
WdB	Westphalia fine sandy loam	Fine sandy loam	60	SM, SP-SM	0.2 - 6.3	Slight-Unsat. zone may be limited

* Present at McGuire AFB and Burlington POL Station

** Present at BOMARC Site

Source: USDA, Soil Conservation Service, 1971 and 1980



McGUIRE AFB

SOILS MAP

SOURCE: USDA, SCS (1971 and 1980)

NOTE: SOIL SYMBOLS ARE DEFINED IN TABLE 3.2

Owens (1962), Isphording and Lodding (1969), Markewicz (1969), Wolfe (1977) and N. J. Pinelands Commission (1980). Additional information has been obtained from an interview with U.S. Geological Survey (USGS) personnel. A brief review of their work and pertinent comments has been summarized to support this investigation.

Stratigraphy

Geologic units ranging in age from Cretaceous to Quaternary have been identified in the Coastal Plain. These units are typically unconsolidated materials consisting of gravel, sand, silt, clay, glauconite, marl and organic materials, reposing on a Pre-Cambrian/Lower Paleozoic crystalline (consolidated) basement complex. Although the units may be somewhat similar in character, they can usually be differentiated by variations in mineralogy, macro and microstructure, color (related to depositional environment) and fossils. Table 3.3 summarizes coastal plain geologic formations and describes their significant characteristics, in chronoloigcal sequence.

Distribution

The surface distribution of geologic units relevant to this study is presented as Figure 3.4, which has been modified from the work of Minard and Owens (1962). Generally, the geology of McGuire AFB is dominated by moderately thick sections of interbedded continental and marine sands and clays of the Cohansey (Tch), Kirkwood (Tkw) and Vincentown (Tvt) Formations. According to Minard and Owens (1962), each unit reaches a maximum thickness of some 50 feet in the general area of McGuire AFB. The degree of interbedding is variable and it has been reported that individual layers within major formations cannot be correlated over long distances without some difficulty. This may be due to internal lithologic variations or past erosional effects following depositional cycles. The highly variable nature of upper geologic units present at McGuire AFB may be observed on the logs of two test borings, drilled approximately one mile apart (Figures 3.5 and 3.6). Their locations are shown on Figure 3.4.

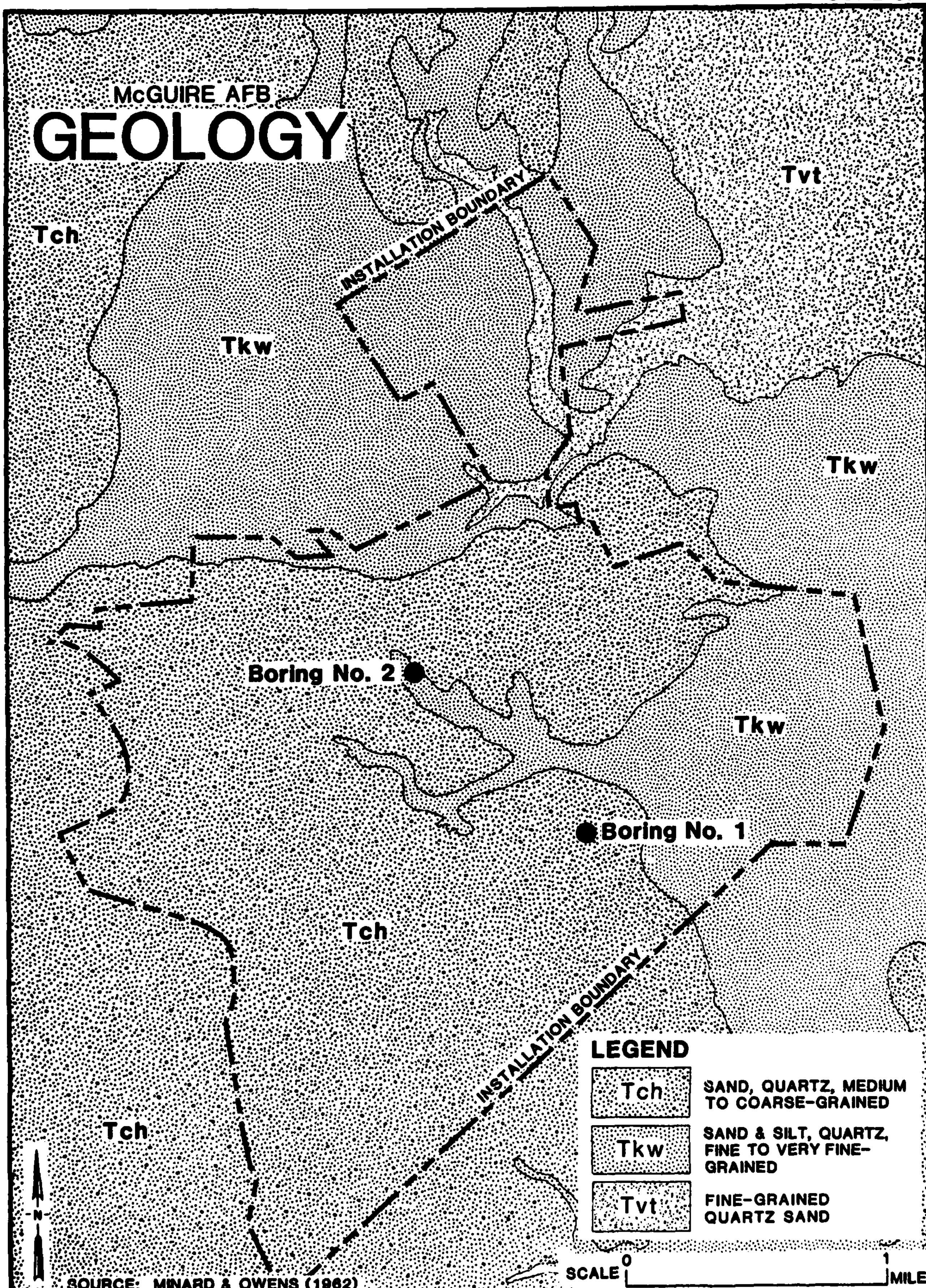
The distribution, lithology, etc. of significant geologic units present at the McGuire Missile Site is similar to that of the main installation. In this area, it is believed that a relatively thin (40 feet or less) expression of the Cohansey Sand is present at ground sur-

TABLE 3.3

COASTAL PLAIN GEOLOGIC FORMATIONS

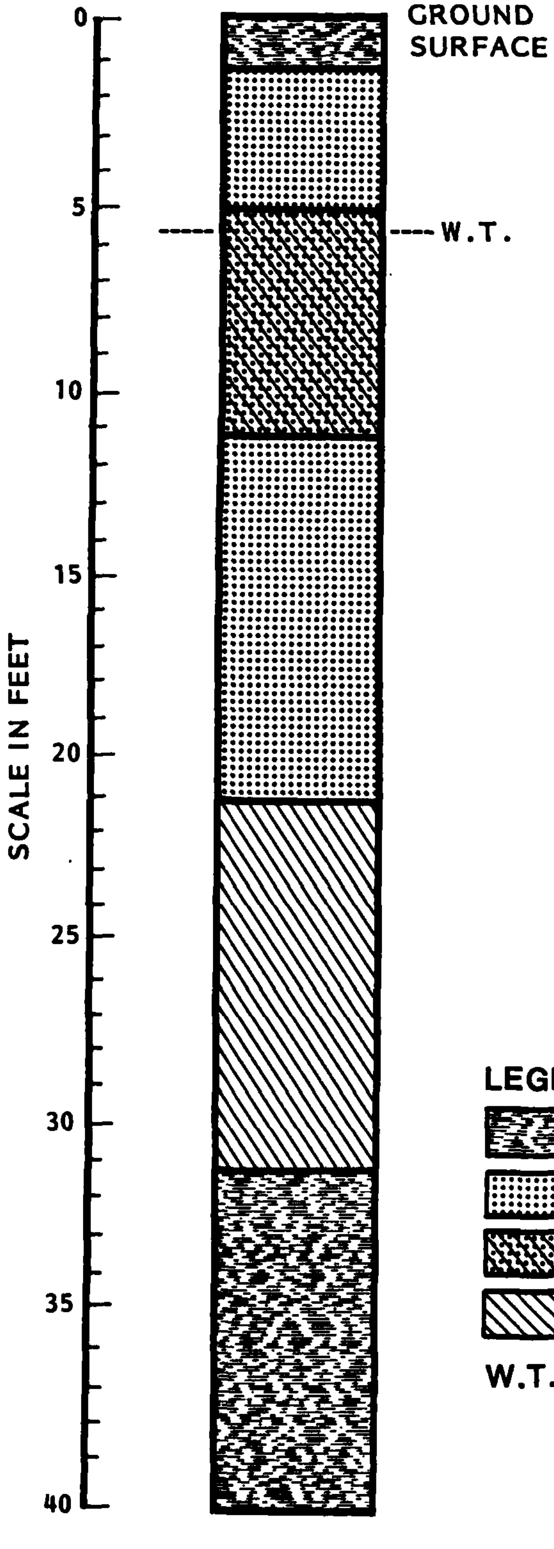
SYSTEM	FORMATION	MAXIMUM REPORTED THICKNESS	LITHOLOGY
Quaternary	Alluvial deposits	80	Sand, silt, and black mud.
Quaternary	Beach sand and gravel	80	Sand, quartz, light-colored, medium grained, pebbly.
Quaternary	Cape May Formation	200	Sand, quartz, light-colored, heterogenous, clayey, pebbly, glauconitic.
Tertiary	Pensauken Formation	200	Sand, quartz, light-colored, heterogenous, clayey, pebbly, glauconitic.
Tertiary	Bridgeton Formation	200	Sand, quartz, light-colored, heterogenous, clayey, pebbly, glauconitic.
Tertiary	Beacon Hill Formation	40	Gravel, quartz, light-colored, sandy.
Tertiary	Cohansey Sand	250	Sand, quartz, light-colored, medium to coarse-grained, pebbly; local clay beds.
Tertiary	Kirkwood Formation	780	Sand, quartz, gray to tan, very fine- to medium-grained, micaceous, and dark-colored diatomaceous clay.
Tertiary	Piney Point Formation	220	Sand, quartz and glauconitic, fine- to coarse-grained.
Tertiary	Shark River Marl	140?	Sand, quartz and glauconite, gray, brown, and green, fine- to coarse-grained, clayey, and green silty and sandy clay.
Tertiary	Manasquan Formation	180	Sand, quartz and glauconite, gray, brown, and green, fine- to coarse-grained, clayey, and green silty and sandy clay.
Tertiary	Vincentown Formation	100	Sand, quartz, gray and green, fine- to coarse-grained, glauconitic, and brown clayey, very fossiliferous, glauconite and quartz calcarenite.
Tertiary	Hornerstown Sand	35	Sand, glauconite, green, medium- to coarse-grained, clayey.
Cretaceous	Tinton Sand	25	Sand, quartz, and glauconite, brown and gray, fine- to coarse-grained, clayey, micaceous.
Cretaceous	Red Bank Sand	150	Sand, quartz, and glauconite, brown and gray, fine- to coarse-grained, clayey, micaceous.
Cretaceous	Navesink Formation	50	Sand, glauconite, and quartz, green, black, and brown, medium- to coarse-grained, clayey.
Cretaceous	Mount Laurel Sand	220	Sand, quartz, brown and gray, fine- to coarse-grained, glauconitic.
Cretaceous	Wenonah Formation	220	Sand, quartz, gray and brown, very fine- to fine-grained, glauconitic, micaceous.
Cretaceous	Marshalltown Formation	30	Sand, quartz and glauconite, gray and black, very fine to medium-grained, very clayey.
Cretaceous	Englishtown Formation	220	Sand, quartz, tan and gray, fine- to medium-grained; local clay beds.
Cretaceous	Woodbury Clay	325	Clay, gray and black, micaceous.
Cretaceous	Merchantville Formation	325	Clay, gray and black, micaceous, glauconitic, silty; locally very fine-grained quartz and glauconitic sand.
Cretaceous	Magothy Formation	4100	Sand, quartz, light-gray, fine-grained, and dark-gray lignitic clay.
Cretaceous	Raritan Formation	4100	Sand, quartz, light-gray, fine- to coarse-grained, pebbly, arkosic, red, white, and variegated clay.
Cretaceous	Potomac Group	4100	Alternating clay, silt, sand, and gravel.
Pre-Cretaceous	Pre-Cretaceous Unconsolidated rocks and Wissahickon Formation	?	Precambrian and lower Paleozoic crystalline rocks, metamorphic schist and gneiss; locally Triassic basalt, sandstone, and shale.

Source: Vowinkel and Foster (1981)


McGUIRE AFB
GEOLOGY
Tch
Tkw
Tvt
INSTALLATION BOUNDARY
Tkw
Boring No. 2
Tkw
Boring No. 1
Tch
INSTALLATION BOUNDARY
Tch
LEGEND
Tch SAND, QUARTZ, MEDIUM TO COARSE-GRAINED
Tkw SAND & SILT, QUARTZ, FINE TO VERY FINE-GRAINED
Tvt FINE-GRAINED QUARTZ SAND
N
SCALE 0 1 MILE
SOURCE: MINARD & OWENS (1962)

McGUIRE AFB

LOG OF TEST BORING NO. 1



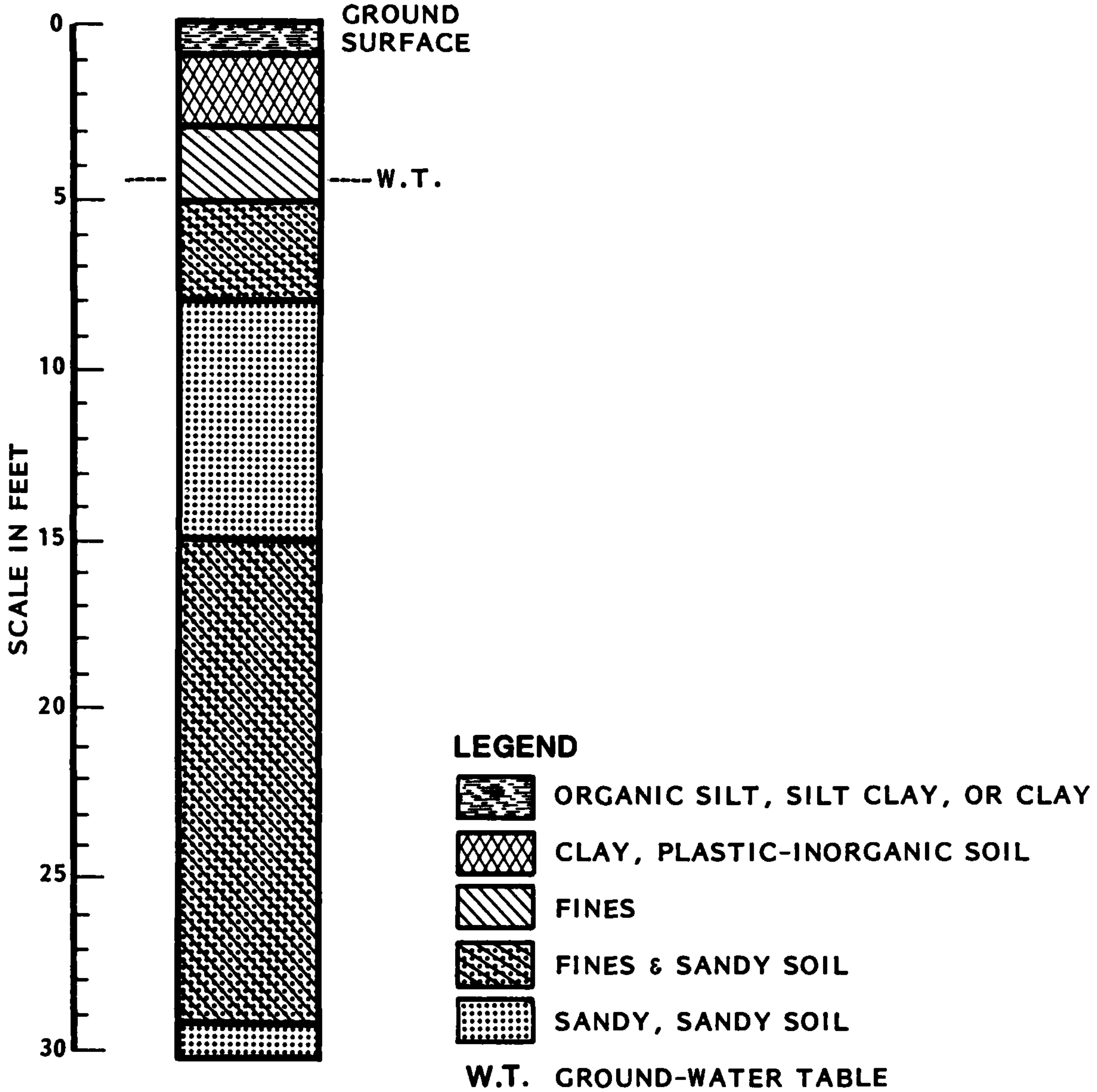
LEGEND

- ORGANIC SILT, SILT CLAY, OR CLAY
- SAND, SANDY SOIL
- FINES & SANDY SOIL
- FINES
- W.T. GROUND-WATER TABLE

SOURCE: McGUIRE AFB INSTALLATION DOCUMENTS

NOTE: BORING LOCATED IN BUILDING 1809

McGUIRE AFB
LOG OF TEST BORING NO. 2



NOTE: BORING LOCATED BETWEEN BUILDING 2402 & 2405

SOURCE: McGUIRE AFB, INSTALLATION DOCUMENTS

face and is underlain by an unknown thickness of the Kirkwood Formation. The log of a test boring drilled at the McGuire Missile Site is included as Figure 3.7.

Structure

The Coastal Plain sediments form a southeast dipping wedge, with a point of origin the Fall Line north of Trenton (refer to Figure 3.1) and thicken to the southeast (seaward). At the Fall Line, sediment thickness is no more than a few feet; however, at Cape May, New Jersey, the accumulation exceeds 6,000 feet (Vowinkel and Foster, 1981). Individual geologic units within the Coastal Plain sediments also tend to thicken downdip and possess an average unit dip ranging from 10 feet per mile (Cohansey) to 45 feet per mile (Hornerstown) (Minard and Owens, 1962). These units are not known to be disrupted by faulting or other geologic discontinuities; however, depositional or past erosional events may cause some isolated beds to occur at steeply dipping angles or be replaced abruptly on a local scale. Figure 3.8, a generalized subsurface section of the New Jersey Coastal Plain, depicts the significant structural conditions of major geologic units.

HYDROLOGY

Introduction

Ground-water hydrology of the project area has been reported by Gill and Farlekas (1976), N. J. Pinelands Commission (1980), Means et al (1981), Vowinkel and Foster (1981) and Fusillo and Voronin (1981). Additional information has been obtained from interviews with U.S. Geological Survey Water Resources Division and New Jersey Department of Environmental Protection Personnel.

Hydrogeologic Units

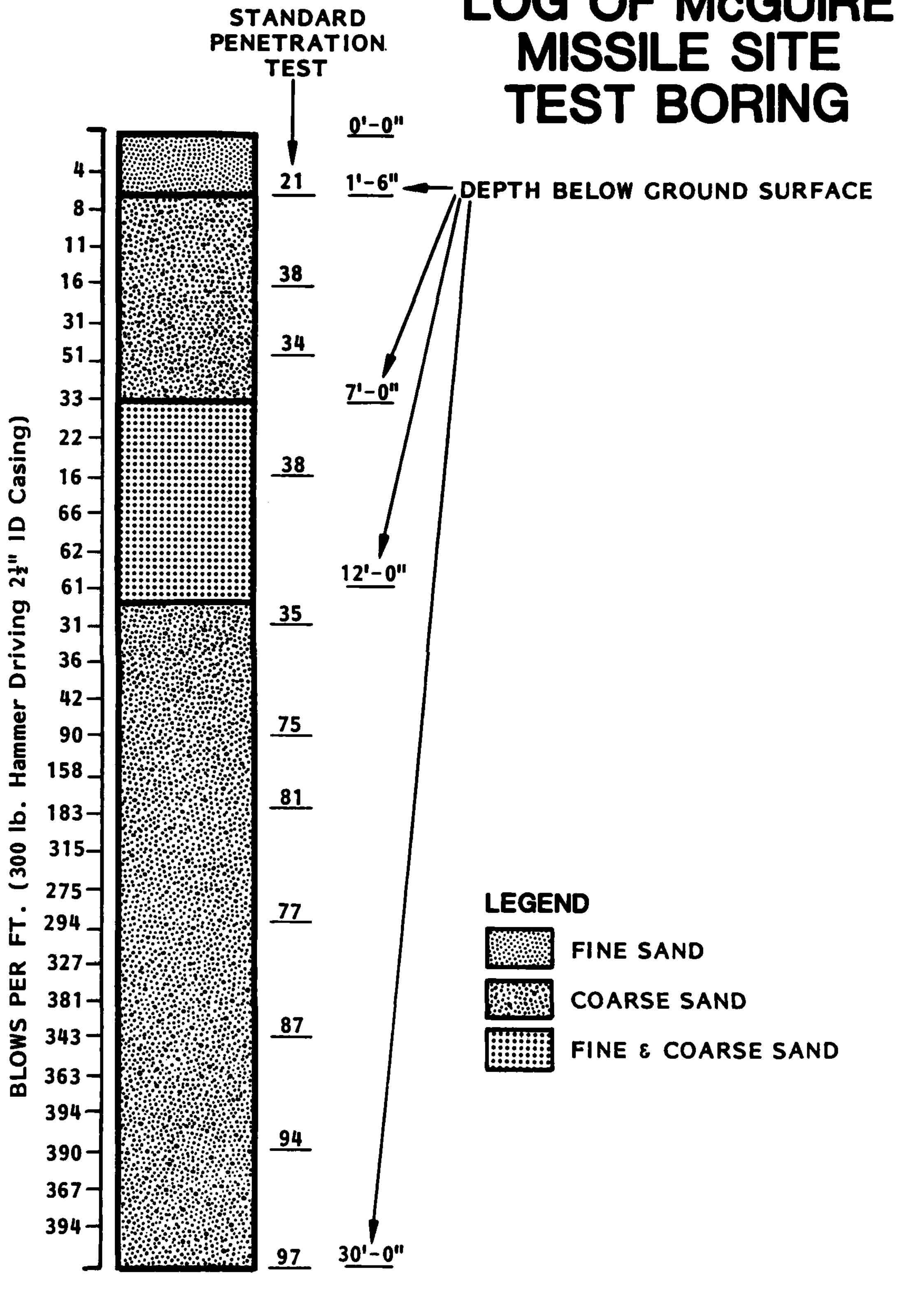
McGuire AFB lies within the northern pinelands section of the New Jersey Coastal Plain. In this area several major hydrogeologic units have been identified, which are listed in Table 3.3 and shown in cross-section on Figure 3.9. The units of particular interest to this investigation are as follows:

- Cohansey Sand
- Kirkwood Formation
- Vincentown Formation
- Potamac-Raritan-Magothy System (PRM)

FIGURE 3.7

McGUIRE AFB

LOG OF McGUIRE MISSILE SITE TEST BORING



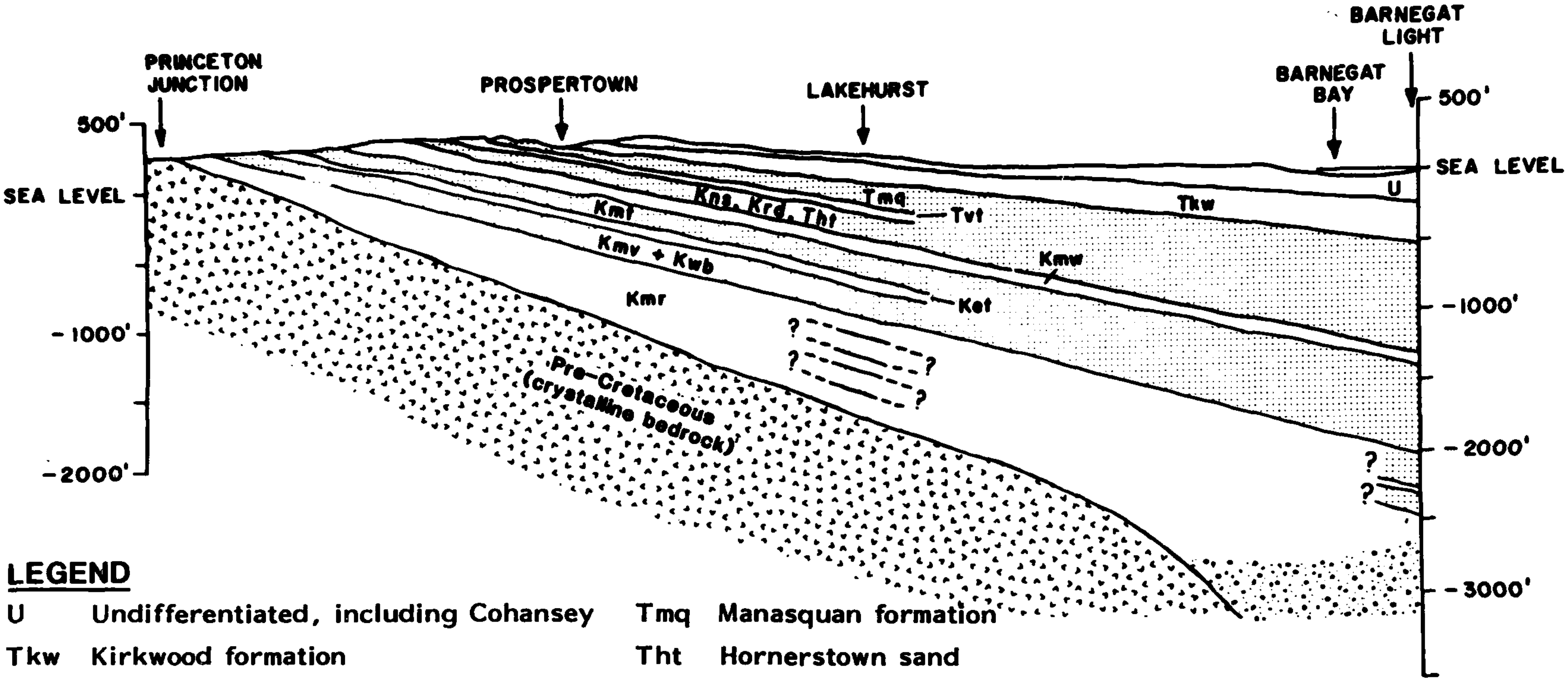
NOTES: WATER READING ON 8/19/57 AT 16'-3"
SURFACE ELEVATION - 165'-5"

SOURCE: McGUIRE AFB INSTALLATION DOCUMENTS

FIGURE 3.8

GENERALIZED GEOLOGIC SECTION OF THE NEW JERSEY COASTAL PLAIN

(Section A, Figure 3.1)



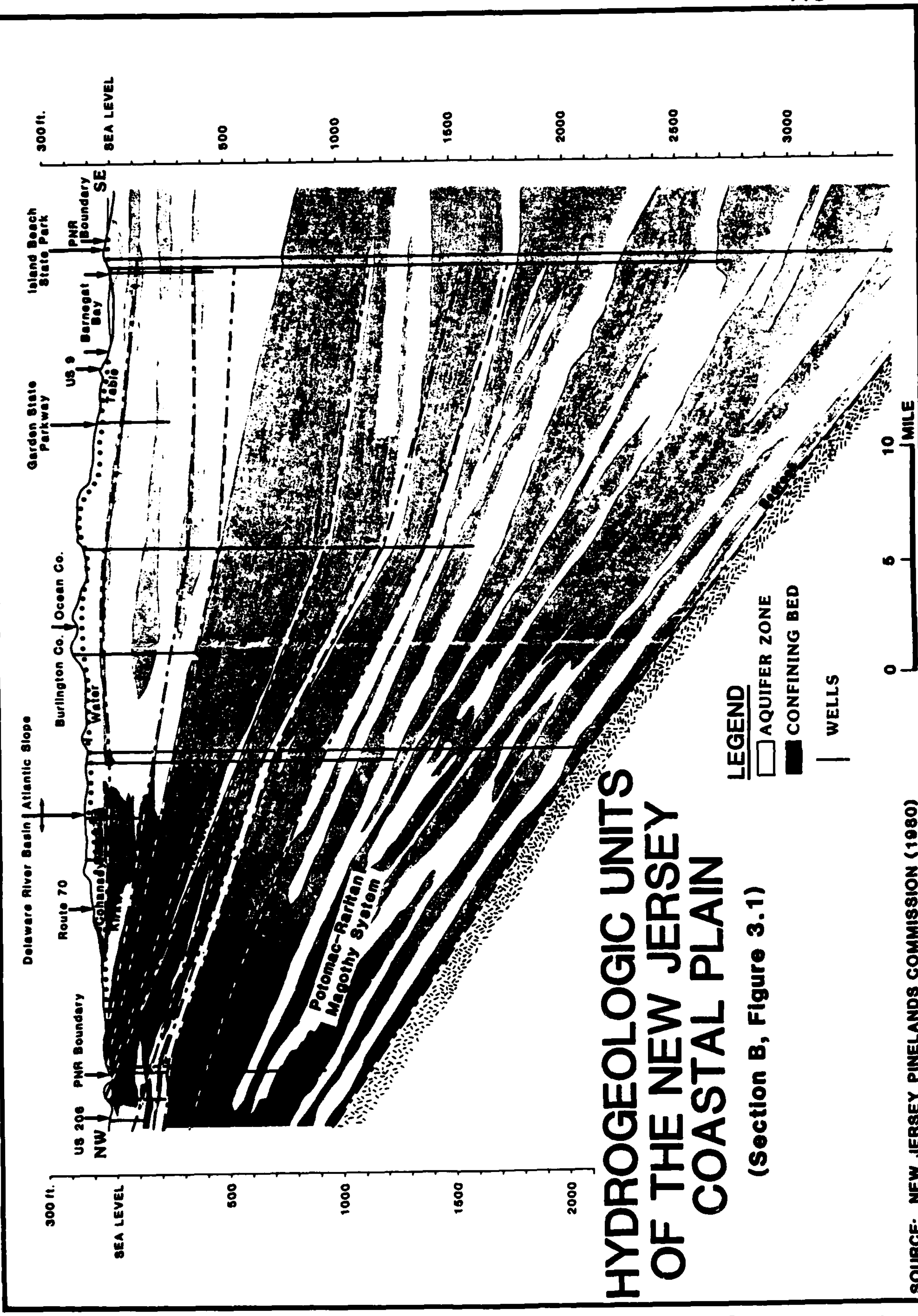
LEGEND

U	Undifferentiated, including Cohansey	Tmq	Manasquan formation
Tkw	Kirkwood formation	Tht	Hornerstown sand
Tvt	Vincentown formation	Krb	Red Bank sand
Kmw	Mount Laurel sand and Wenonah formation	Kmt	Marshalltown formation
		Kwb	Woodbury clay
Ket	Englishtown formation	Kmv	Merchantville formation
Kmr	Raritan and Magothy formation	Kns	Navesink formation

SOURCE: MEANS (1981)

NOTE: Vertical scale greatly exaggerated

FIGURE 3.9



ES ENGINEERING-SCIENCE

Shallow Units

The Cohansey, Kirkwood and Vincentown Formations are of interest because they occur at or near ground surface within the study area. All of these hydrogeologic units are highly permeable and relatively thin in section (50 feet or less) where they crop out. In the vicinity of McGuire AFB, ground water occurs at shallow depths in these units under water table (unconfined) conditions, although artesian or semi-artesian conditions may occur locally. According to Vowinkel and Foster (1981), the Cohansey and Kirkwood are hydraulically connected locally. The Vincentown contains water in localized water-bearing beds that may yield small to moderate quantities of water to wells screened within them. Further down dip, the Vincentown is a confining bed (refer to Figure 3.9).

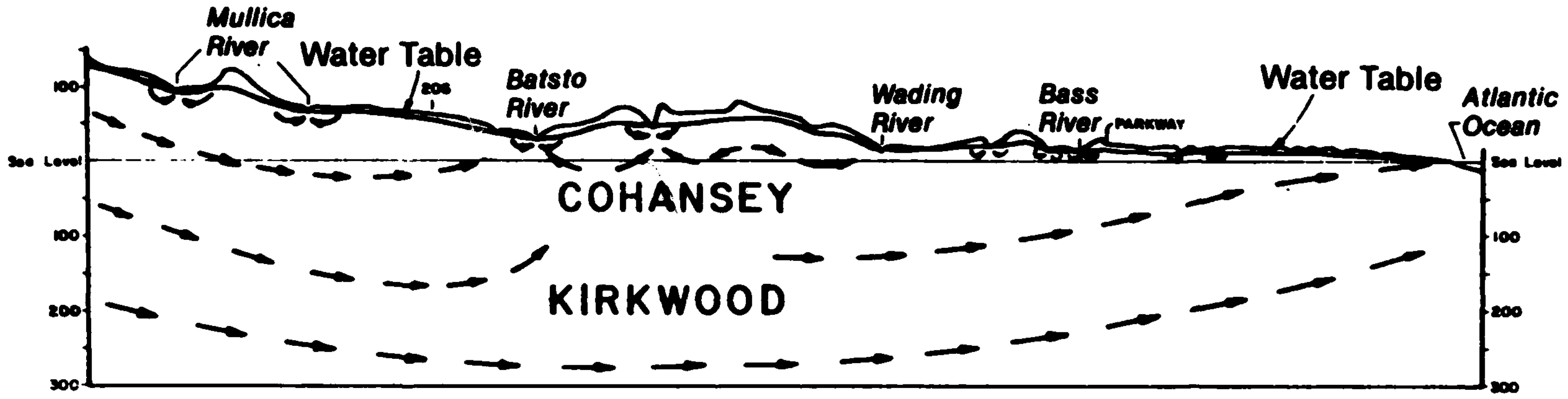
Recharge of the Cohansey and Kirkwood Formations occurs primarily by precipitation falling on exposed portions of the units. In this case, most of the land area of McGuire AFB is situated in the Cohansey-Kirkwood recharge zone. Once water enters the hydraulic regime, it flows under the influence of gravity to zones of decreasing hydraulic head. It is significant to note here that two major flow systems have been identified in the Cohansey-Kirkwood. These include a surficial or local system and an intermediate system. Figure 3.10 presents a conceptual view of these two systems.

The shallow system possesses fairly short flow paths, as "no point in the Pinelands is more than 1.5 miles from a surface water body," (N.J. Pinelands Commission, 1980). Using normal climatic conditions and typical hydraulic gradients, the water flow rate is estimated to be on the order of four (4) feet per day. Assuming a maximum travel distance of 1.5 miles, water detention time for the Cohansey-Kirkwood would not be expected to exceed five years. It is estimated that 85 percent of the infiltrated precipitation follows the shallow flow path (N.J. Pinelands Commission, 1980) and is therefore discharged to a surface water body only a short distance from the point of entry into the surficial aquifer system. Approximately ten percent of the infiltrating precipitation reaches the intermediate flow system (N.J. Pinelands Commission, 1980), which typically occurs at depths of 50 to 300 feet below sea

FIGURE 3.10

HYDRAULIC FLOWS OF THE COHANSEY–KIRKWOOD AQUIFER SYSTEM

(Section C, Figure 3.1)



SCALE 0 5 MILES

SOURCE: NEW JERSEY PINELANDS COMMISSION (1980) level. According to N.J. Pinelands Commission (1980) estimates, intermediate system flow travel times from a point in the central Pinelands southeast (down dip) to the Atlantic Ocean would be on the order of 2000 years.

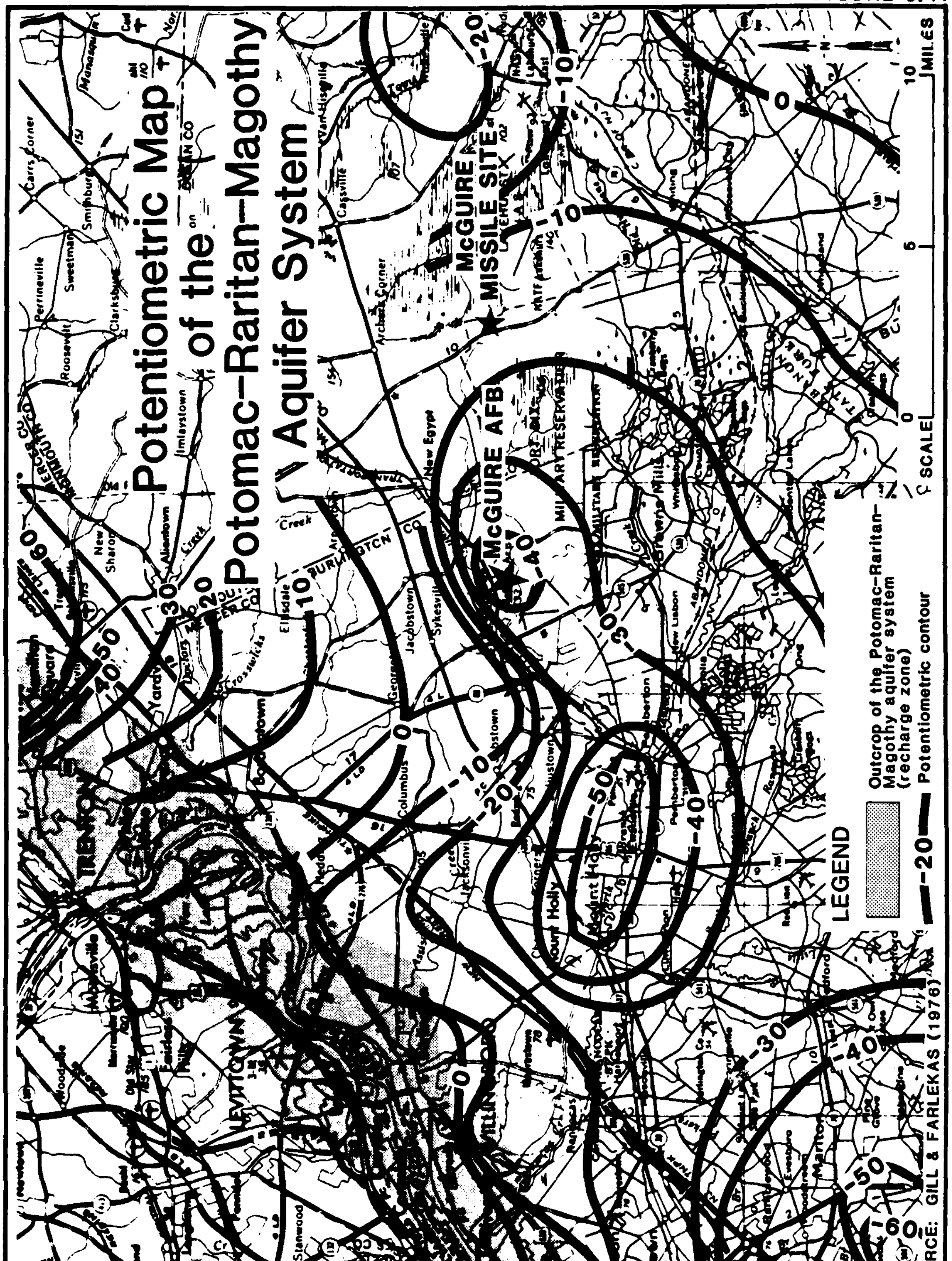
Because the Cohansey-Kirkwood system is not normally utilized for water supply within the Fort Dix-McGuire AFB area, little base-specific information is available for review. Further down dip, especially in the Atlantic City area, the units substantially thicken and are utilized extensively as a source of potable water supplies.

Limited information describing the Cohansey-Kirkwood unit has been obtained by review of McGuire Missile Site test boring and water well data. Nineteen test borings, two water wells and one test pit excavation were advanced during site work performed in 1957 (from drawing entitled, "McGuire Special Facility - Core Boring Data and Test Pit," drawing number AW 16-14-01, contract 1917C, dated 20 January 1958). At the McGuire Missile Site, the unit appears to be present at or near ground surface, is permeable to the ground-water level and has uniformly shallow water levels (about 18 feet below ground surface). Prior to construction, the highest water elevations were shown to be occurring in the northwest quadrant of the McGuire Missile Site facility area. Assuming that the highest water elevations were indicative of active recharge to the aquifer, it is believed that ground-water flow moved across the site to the east and south. The subsequent construction and site-use modifications (leveling, filling and paving large areas) performed during the erection of the McGuire Missile Site complex have undoubtedly altered the original shallow aquifer ground-water conditions. The actual extent of this alternation is unknown.

Deep Unit

The deep hydrogeologic unit present at McGuire AFB consists of the Potomac-Raritan-Magothy (PRM) aquifer system, shown in section on Figure 3.9. The PRM is regional in extent and is the primary source for potable water supplies in the study area. This hydrogeologic unit consists of three communicating geologic formations, the Potomac Group, the Raritan Formation and the Magothy Formation. By interpolation of published isopach data, it appears that this unit occurs within the study area at an approximate elevation of -450 feet (MSL) and is some 550 feet thick. The PRM is defined by the crystalline basement rock on which it reposes and its upper limit is accepted to be the Late Cretaceous Merchantville Formation and Woodbury Clay (Gill and Farlekas, 1976). As in the case of all other Coastal Plain hydrogeologic units, it thickens substantially in a down dip (seaward) direction. Typically, the PRM includes many interconnected sand layers, isolated for short distances by interbedded clays, marl, etc. For this reason, wells drilled into the PRM are usually constructed with multiple screens to allow water intake from several productive zones.

The primary source of recharge to the PRM system consists of rainfall or surface water flow contacting the area of topographically high outcrop, such as that northeast of Trenton and represented on Figure 3.11 as a crown in the PRM potentiometric surface. The outcrop area forms a narrow band beginning in Delaware and trending northeast along the Delaware Valley, eventually crossing New Jersey and reaching Perth Amboy. Located within the outcrop area of the major regional aquifer are the highly industrialized centers of Wilmington, DE; Chester and Philadelphia, PA; Camden, Willingboro, Burlington and Trenton, NJ; etc. Lesser amounts of recharge are thought to occur as leakage from overlying units, down dip of the outcrop zone (Gill and Farlekas, 1976). Once water enters the outcrop area, it follows down dip into the system or towards local pumping centers. Water typically occurs in the PRM system under artesian (confined) conditions. Prior to massive pumping (1963) that is now commonplace in the region, ground-water flow was primarily down dip (south or southeast). Large pumping centers such as Fort Dix and McGuire AFB have caused large-scale reversal of the historical flow path, which may be seen on Figure 3.11, a potentiometric surface map of the PRM system, modified from Gill and Farlekas (1976). A large drawdown feature (cone of depression) may be seen in the surface of the potentiometric level at the base. During the period 1900-1968, ground-water levels in the PRM system declined some 80 feet in the Fort Dix-McGuire AFB area (Gill and Farlekas, 1976). At present it is estimated that the potentiometric surface for the primary regional aquifer is approximately 200 feet below ground level at McGuire. This estimate is based on a 1969 water level of 183 feet for Well D and an average decline rate of one foot per year.


Potentiometric Map
of the
Potomac–Raritan–Magothy
Aquifer System
McGUIRE AFB
McGUIRE
MISSILE SITE
LEGEND
Outcrop of the Potomac–Raritan–Magothy aquifer system (recharge zone)
-20 Potentiometric contour
SCALE
0 5 10 MILES
SOURCE: GILL & FARLEKAS (1976)

In the early 1900's a ground-water mound which followed surface topography was identified in the vicinity of McGuire AFB. This may indicate the location of a past recharge area where leakage through overlying semi-pervious strata could have occurred (Gill and Farlekas, 1976).

Base Wells

McGuire AFB derives its water resources from a supply system based on four deep wells, all presumably screened into the Potomac-Raritan-Magothy Aquifer System described above. Figure 3.12 is the log of a typical base water supply Well D, which penetrates the PRM system and terminates in the crystalline basement rock. An inspection of this well log indicates the presence of a substantial thickness of clay and marl confining materials encountered from 363 feet to 520 feet below ground surface, at the well location. Construction information summarizing available well data is presented in Table 3.4.

Two shallow inactive wells are present at the McGuire Missile Site. These wells are reported to be small diameter (six inch) and are apparently screened into the Kirkwood Formation. Water levels for these wells were determined to be elevation 125.5 feet MSL (1957 data). Figure 3.13 is the log of McGuire Missile Site Well Number 1 which depicts permeable soils encountered throughout the depth of drilling. The locations of installation water wells are shown on Figure 3.14.

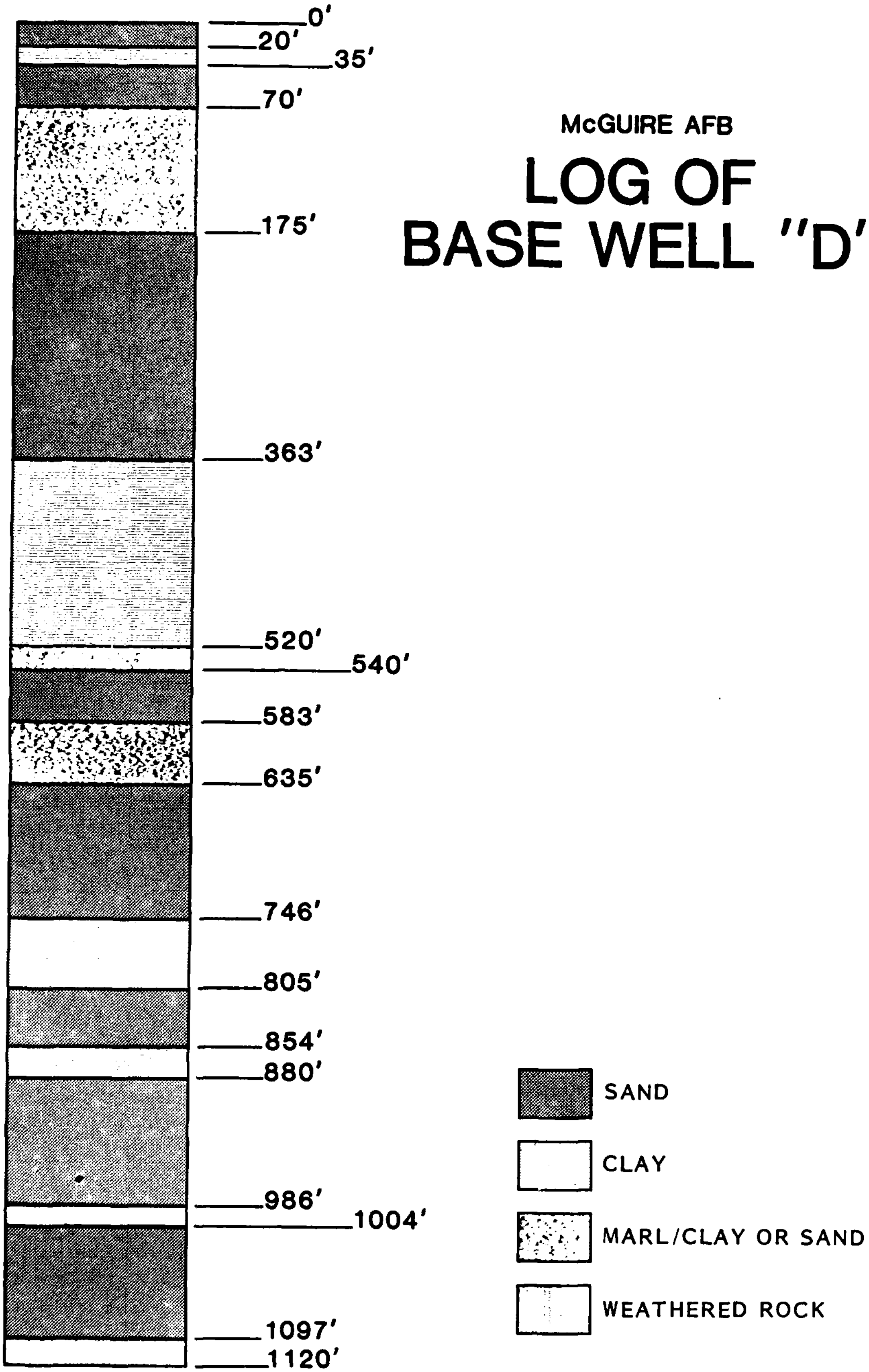
Area Wells

The adjacent borough of Wrightstown obtains water supplies from a municipal distribution system based upon deep wells screened into the previously discussed Potomac-Raritan-Magothy Aquifer System (Lawson, 1982). Water quality was described as adequate. Water levels and well construction information were not available for review.

The nearby community of Cookstown and rural areas typically derive water supplies from individual wells. Generally, such wells are screened into the deeper and more dependable PRM system, although local exceptions probably occur. Consumptive use permitting of ground-water withdrawals is not required for those installations pumping less than 100,000 gallons per day. In addition, individuals possessing "grandfather rights" (users diverting ground-water resources prior to adoption of legislation and now, by virtue of chronology, exempt from permitting

FIGURE 3.12

McGUIRE AFB
LOG OF BASE WELL "D"

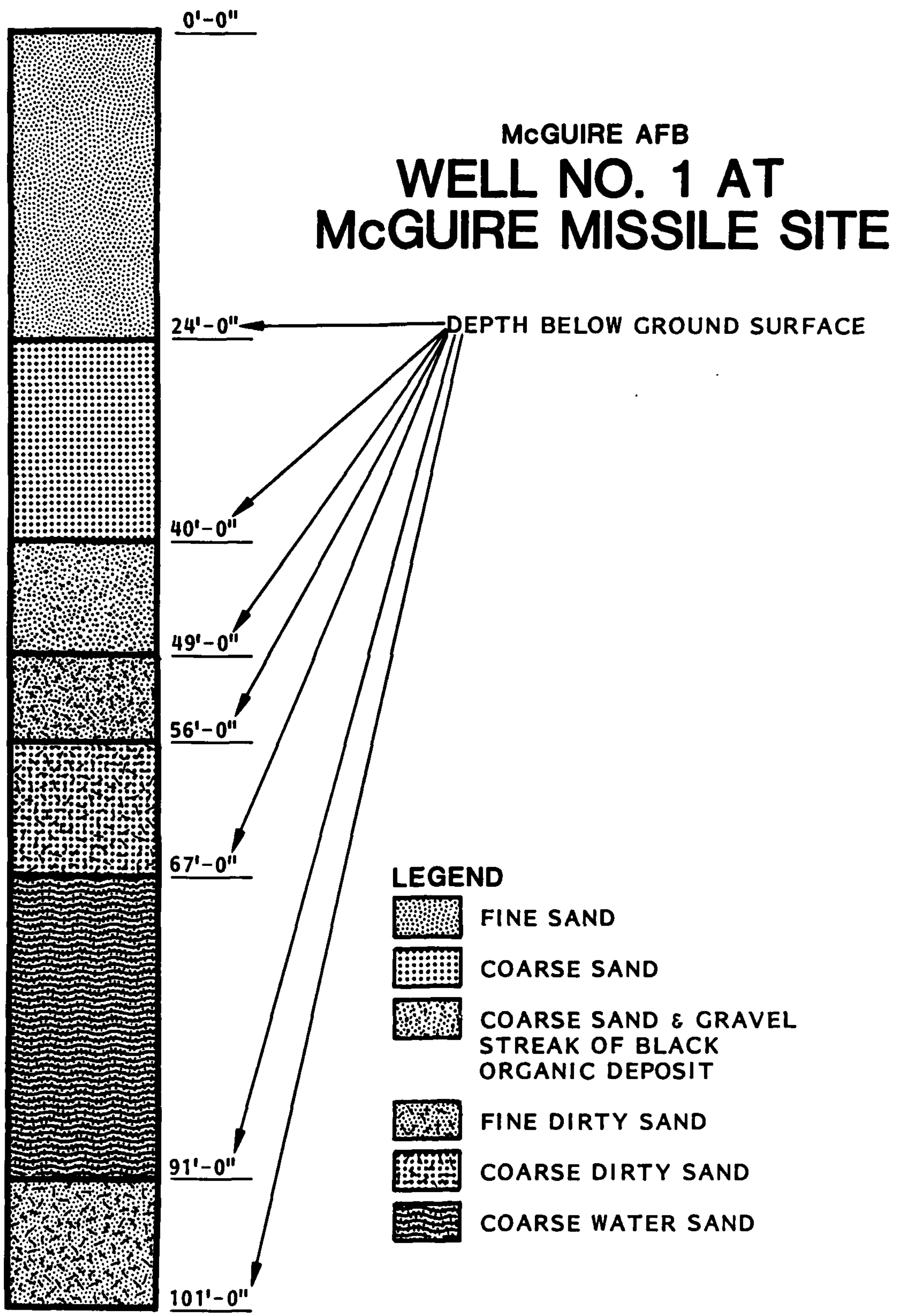


SOURCE: McGUIRE AFB INSTALLATION DOCUMENTS

TABLE 3.4
WELL DATA FOR McGUIRE AIR FORCE BASE, NJ

Well No.	Date Drilled	Casing (inches)	Total Depth (Feet)	Land Surface Elevation (Feet, MSL)	Static Water Level Feet Below Ground (Year)	Capacity (gal/min)
A	1953	16	1055	122	140 (1962)	925
B	1960	16	1008	130	123 (1960); 152 (1969)	785
C	1966	16	1096	105	110 (1962); 133 (1966)	710
D	1953	24	1020	110	110 (1953); 183 (1969)	925
*1	1957	6	101	148.5	23 (1957)	---
*2	1957	6	100	147.5	22 (1957)	---

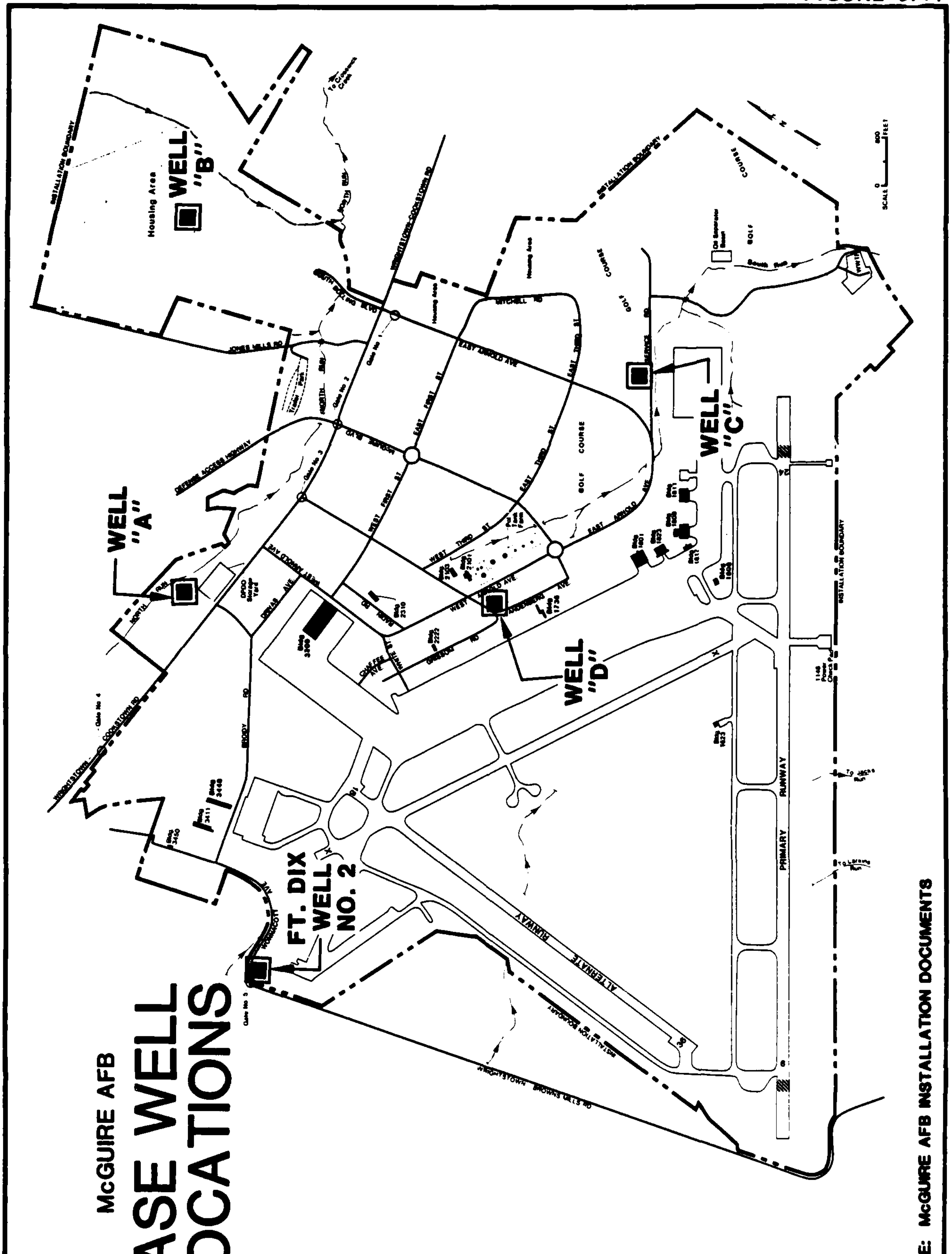
*McGuire Missile Site Well (Inactive)
Source: Installation Documents



NOTES: WATER READING ON 12/19/57 AT 23'-0"
SURFACE ELEVATION – 148'-5"

SOURCE: McGUIRE AFB INSTALLATION DOCUMENTS

FIGURE 3.14


McGUIRE AFB
BASE WELL LOCATIONS
WELL "A"
WELL "B"
WELL "C"
WELL "D"
FT. DIX WELL NO. 2
Housing Area
GOLF COURSE
INSTALLATION BOUNDARY
PRIMARY RUNWAY
ALTERNATE RUNWAY
WRIGHTSTOWN - COOKSTOWN RD
WRIGHTSTOWN - BROWNS MILLS RD
DEFENSE ACCESS HIGHWAY
EAST ARNOLD AVE
WEST ARNOLD AVE
MITCHELL RD
SOURCE: McGUIRE AFB INSTALLATION DOCUMENTS

requirements) are not subject to ground-water use regulations (NJ Pinelands Commission, 1980). Because of these two situations, it was not possible to determine the number, depth and location of individually owned domestic and irrigation wells installed near McGuire Air Force Base.

Ground-Water Quality

Ground-water quality information has been obtained from Fusillo and Voronin (1981), installation documents and from interviews conducted with New Jersey Department of Environmental Protection officials.

Ground water obtained from base wells penetrating the regional (PRM) aquifer produce water of generally good quality. A number of municipal, industrial and privately owned water wells producing water from the outcrop zone of the PRM system (15 miles west of McGuire AFB) do show evidence of contamination. A water quality study by Fusillo and Voronin (1981) analyzed samples obtained from 262 water wells located in the Delaware Valley between Trenton and Pennsville, primarily along the PRM outcrop. Approximately 19 percent (46 wells) of the 246 wells analyzed for organic materials showed evidence of contamination by organic chemicals including benzene, trichloroethylene, toluene, tetrachloroethylene and 1,1-dichloroethylene. It is believed that well contamination has been caused by industrial waste disposal activities practiced near the point where contamination was detected. Despite the obvious water degradation revealed in the PRM outcrop zone, it is assumed that such contamination will not migrate to the McGuire AFB area in detectable concentrations in the near future.

SURFACE WATER QUALITY

McGuire AFB routinely collects surface water samples at eight locations within the base. The sampling stations are identified in Figure 3.15. A review of recent water quality data collected within McGuire AFB and from streams in close proximity to the base indicated no significant water quality problems in the streams entering and exiting the base boundaries. The single large point source discharge on base is the wastewater treatment plant which discharges into South Run. The Fort Dix sanitary treatment plant also discharges into South Run about three miles upstream.

During the 1950's and 1960's several industrial shops and wash areas were known to have discharged or occasionally spilled wash water, dilute cleaning solutions, oils and fuels into the various drainage systems on the base. Shop wastes are no longer discharged to the storm drainage system. The base has installed several oil/water separator systems at key washracks and in 1977, constructed a skimming system and retention basin along South Run to divert and retain any floating substances accidentally discharged or spilled into the drainage system.

BIOTIC ENVIRONMENT

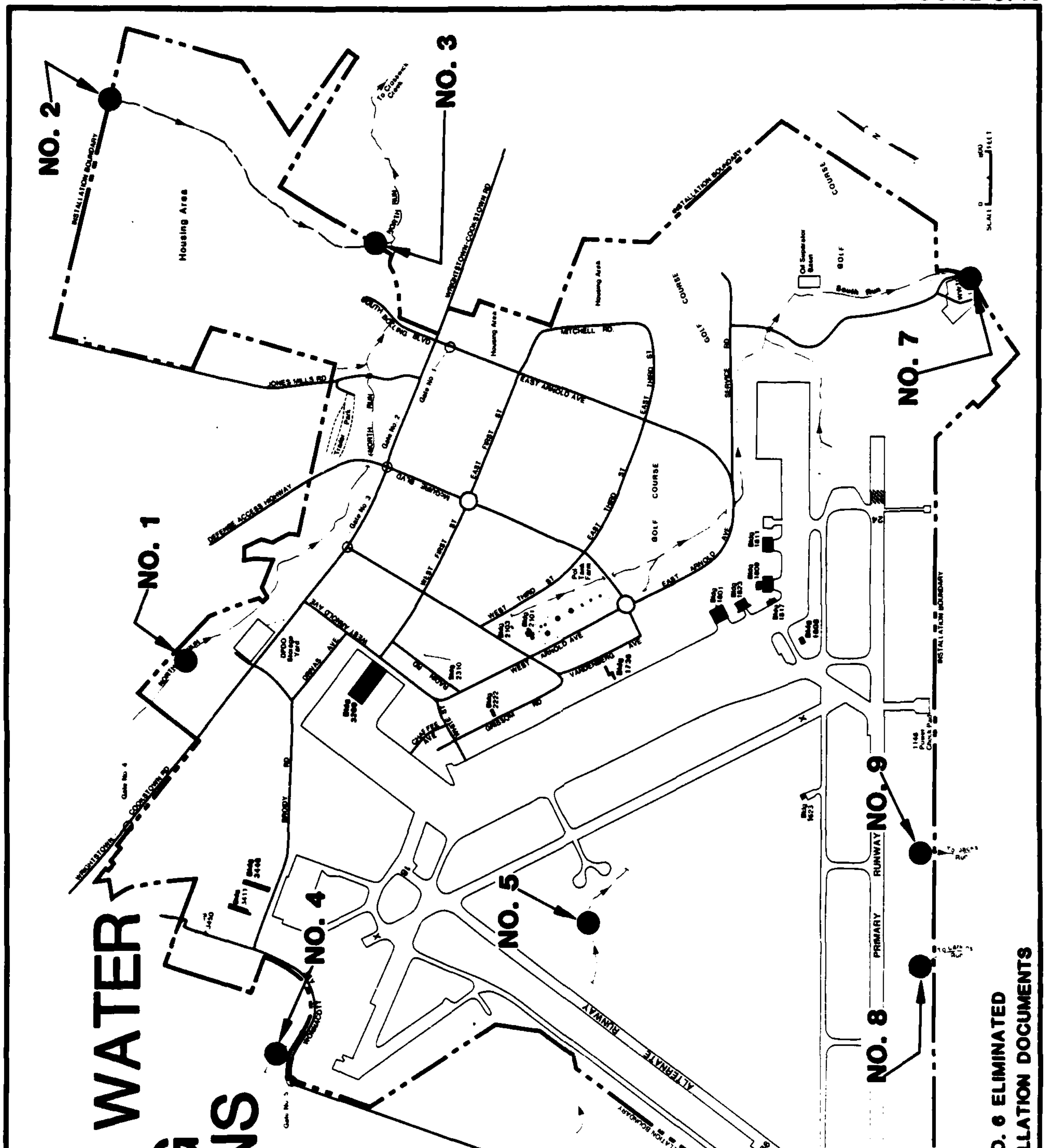
McGuire AFB is located in the northeast corner of a large tract of land classified as the New Jersey Pinelands Area, designated as such by the New Jersey Pinelands Protection Act. The Pinelands Area was designated as the country's first Natural Reserve. The Reserve concept has as its primary goal the management of the lands by innovative means, combining the capabilities and resources of the local, state and federal governments and the private sector. The main emphasis in the New Jersey Pinelands Comprehensive Management Plan has been the development of programs to safeguard the Pinelands' resources while the land remains in the care of the local people and governmental agencies.

The vast majority of McGuire AFB is developed area that supports a variety of trees, shrubs and grasses. A few small woodland areas exist within the base and the major types of trees found in these areas are sweetgum, maple, pine, sycamore and red cedar. No crops are grown on the base. No rare or endangered plant or animal species have been reported on McGuire AFB; however, the Pinelands Commission has developed records of reported sightings of rare and endangered plant and animal species in close proximity to McGuire AFB (Pinelands Comm., 1982). These species have been listed in Appendix D, Table D.1.

SUMMARY OF 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 McGuire Air Force Base:

- Surface soils of the McGuire Air Force Base area are typically sandy, permeable and possess shallow water levels (six feet or less).



McGUIRE AFB
SURFACE WATER SAMPLING LOCATIONS

NOTE: SAMPLING STATION NO. 6 ELIMINATED
SOURCE: McGUIRE AFB INSTALLATION DOCUMENTS

- The Cohansey Sand, Kirkwood Formation and the Vincentown Formation are present at McGuire AFB, either exposed or very near ground surface. These formations are considered to be aquifers of limited significance in the study area. The base is located within the recharge zone of these aquifers.
- The mean annual precipitation is 43.5 inches and the net precipitation is calculated to be 9.3 inches.
- As much as 85% of the precipitation infiltrating into these shallow aquifers will be lost as baseflow to area streams, usually within a period of a few days from the time of infiltration.
- The major regional aquifer exists at great depth in the study area (about 500 feet below ground surface). The regional aquifer is recharged at some distance from the base, but may receive some local recharge as leakage through semi-pervious zones from overlying shallow aquifers.
- Evidence of limited contamination identified in wells constructed in the Potomac-Raritan-Magothy outcrop area has been published. This is not expected to impact base water quality in the near future.
- Flooding is not a problem typical of the McGuire Air Force Base area.
- The streams entering and existing the base are considered to have good water quality.
- No threatened or endangered species have been observed within McGuire Air Force Base boundaries.

From these major points, it may be seen that potential pathways for the migration of hazardous waste-related contamination exist. If hazardous materials are present in or on the ground, they may encounter a shallow aquifer and subsequently be discharged as baseflow to area surface waters. A lesser potential for contamination of intermediate aquifer zones exists, due to the recharge relationships of shallow/intermediate ground-water systems. The potential for the migration of contamination to the major regional aquifer is considered to be remote.

CHAPTER 4

FINDINGS

CHAPTER 4

FINDINGS

To assess hazardous waste management at McGuire Air Force Base, past activities of waste generation and disposal methods were reviewed. This chapter summarizes the hazardous waste generated by activity; describes waste disposal methods; identifies the disposal sites located on the base; and evaluates the potential for environmental contamination. An additional section has been included in this chapter which describes the McGuire Missile Site (BOMARC) operations and discusses the areas of potential contamination found within the site.

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 base employees, and site inspections.

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

- Industrial shops
- Fire protection training
- Pesticide/herbicide utilization
- Heat and power production
- Fuels management
- Defense Property Disposal Office (DPDO) storage

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

Industrial Operations (Shops)

Since the late 1930's, industrial operations (shops) at McGuire AFB have included maintenance activities to support aircraft flying missions. These shops maintained, fabricated and repaired components and parts of aircraft and ground equipment. A list of past and present industrial shops was obtained from the Bioenvironmental Engineering Services (BES) files. Information contained in the files indicated those shops which generate hazardous waste and/or handle hazardous materials. A summary review of the shop files is shown in Appendix E, Master List of Industrial Shops.

For those shops that generated hazardous waste, key personnel within the base maintenance support functions were interviewed. A timeline of disposal methods was established for major wastes generated. The information from interviews with base personnel and base records has been summarized in Table 4.1. This table presents a list of building locations as well as the waste material names, waste quantities, and disposal method timeline. Many of the disposal methods are based on speculative information derived from personnel currently at the base. The waste quantities shown in Table 4.1 are based on verbal estimates given by shop personnel at the time of the interviews. The shops that have generated insignificant quantitites or no hazardous waste are not listed in Table 4.1.

Little information concerning past waste practices for the period 1937 through 1947, when the base was an Army Airfield, was available during the records search. Some maintenance activities likely occurred in support of the Army Air Corps training mission during this period. These activities typically generated waste fuels and oils which were likely disposed of either by burning or landfilling. All other wastes were believed to have been generated in small quantities. Some solid wastes were reported to have been disposed of in Landfill No. 1 located in the vicinity of Hanger 1801 in the area which now serves as the flightline.

From 1947 to 1958, waste aircraft fuels, oils, hydraulic fluid and some spent solvents (PD-680) were collected and burned during fire protection training (FPT) exercises. There were reports that some of these wastes were buried in landfills and other locations throughout the

Table 4.1

INDUSTRIAL OPERATIONS (Shops)

WASTE GENERATION

SHOP NAME	LOCATION (BLDG. NO.)	WASTE MATERIAL	WASTE QUANTITY (1)	METHOD(S) OF TREATMENT, STORAGE & DISPOSAL (1950 – 1960 – 1970 – 1980)
438 AIR BASE GROUP				
AUTO HOBBY SHOP	2415	OIL/WATER SEPARATOR SLUDGE	4-5 FT.^{3}/MO.	1947 FPT(2) NO. 1 → CONTRACTOR
		WASTE MOTOR OILS & FLUIDS	400 GALS./MO.	FPT NO. 1 → CONTRACTOR
438 AVIONICS MAINTENANCE SQUADRON (AMS)				
ELECTRICAL SYSTEMS AND HARNESS SHOP	2220/1801	BATTERY ACID	20 GALS./WK.	DILUTED TO ROCK PIT TO SANITARY SEWER
		PD-680	20 GALS./3 to 6 MOS.	FPT NO. 1 → DPDO(4)
		WASTE OILS	10 GALS./6 MOS.	FPT NO. 1 → DPDO
PRECISION MEASUREMENT EQUIPMENT LAB (PMEL)	1809	MERCURY	10 LBS./YR.	DPDO
438 FIELD MAINTENANCE SQUADRON (FMS)				
AEROSPACE GROUND EQUIPMENT (AGE)	2253	WASTE OILS	200 GALS./MO.	FPT NO. 1 → DPDO
		HYDRAULIC FLUID	110 GALS./6 MOS.	FPT NO. 1 → DPDO
		PD-680	55 GALS./6 MOS.	FPT NO. 1 → DPDO
CORROSION CONTROL	1803	COMBINED WASTES (Spent MEK(3), Toluene, Paints & Thinners)	55 GALS./4 WKS.	ON-BASE LANDFILLS → FORT DIX LANDFILL → DPDO

KEY

——— CONFIRMED TIME-FRAME DATA BY SHOP PERSONNEL

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

(1) BASED ON CURRENT RATES AND BEST ESTIMATES OF PAST RATES
(2) FIRE PROTECTION TRAINING
(3) METHYL ETHYL KETONE
(4) DPDO WASTE MATERIAL IS SOLD OR CONTRACTED FOR DISPOSAL AT AN OFF-BASE LOCATION.

Table 4.1 (Cont'd.)

INDUSTRIAL OPERATIONS (Shops)

WASTE GENERATION

SHOP NAME	LOCATION (BLDG. NO.)	WASTE MATERIAL	WASTE QUANTITY	METHOD(S) OF TREATMENT, STORAGE & DISPOSAL (1950–1980)
438 FIELD MAINTENANCE SQUADRON (FMS) (Cont'd.)				
CORROSION CONTROL WASHRACK	2240	PAINT STRIPPER (Hot Tank)	165 GALS./6 MOS.	1947 IWPP[5] TO STORM DRAIN → OIL WATER SEPARATOR TO SANITARY SEWER → DPDO
		PAINT STRIPPER (Cold Tank)	15 GALS./MO.	IWPP TO STORM DRAIN → OIL WATER SEPARATOR TO SANITARY SEWER → DPDO
		PD-680	150 GALS./MO.	IWPP TO STORM DRAIN → OIL WATER SEPARATOR TO SANITARY SEWER → DPDO
		CORROSION REMOVING COMPOUND[6]	5 GALS./2 to 4 MOS.	IWPP TO STORM DRAIN → OIL WATER SEPARATOR TO SANITARY SEWER → DPDO
NON-DESTRUCTIVE INSPECTION (NDI)	1623	PENETRANT	55 GALS./18 MOS.	DRAINAGE BASIN → SANITARY SEWER
		EMULSIFIER	55 GALS./18 MOS.	DRAINAGE BASIN → SANITARY SEWER
		DEVELOPER	55 GALS./18 MOS.	DRAINAGE BASIN → SANITARY SEWER
		PD-680	50 GALS./YR.	FPT NO. 1 → DPDO
		FIXER	5 GALS./MO.	DRAINAGE BASIN → SILVER RECOVERY TO SANITARY SEWER
PNEUDRAULICS SHOP	2305	WASTE OILS	1 GAL./MO.	FPT NO. 1 → DPDO
		HYDRAULIC FLUID	4 GALS./DAY	FPT NO. 1 → DPDO
JET ENGINE SHOP	1801	WASHRACK EFFLUENT	10-50 GALS./MO.	STORM DRAIN → OIL/WATER SEPARATOR TO SANITARY SEWER
		WASHRACK SLUDGE	1-3 FT.^{3}/MO.	FPT NO. 1 OR ON-BASE LANDFILL → FORT DIX LANDFILL OR CONTRACTOR
		WASTE OILS	300-400 GALS./MO.	FPT NO. 1 → DPDO
		PD-680	100 GALS./YR.	FPT NO. 1 → DPDO

KEY

——— CONFIRMED TIME-FRAME DATA BY SHOP PERSONNEL

- - - - ESTIMATED TIME FRAME DATA BY SHOP PERSONNEL

(5) INDUSTRIAL WASTE PRETREATMENT PLANT

(6) COMBINATION OF DILUTE ACIDS USED FOR RUST REMOVAL

Table 4.1 (Cont'd.)

INDUSTRIAL OPERATIONS (Shops)

WASTE GENERATION

SHOP NAME	LOCATION (BLDG. NO.)	WASTE MATERIAL	WASTE QUANTITY	METHOD(S) OF TREATMENT, STORAGE & DISPOSAL (1950 1960 1970 1980)
438 FIELD MAINTENANCE SQUADRON (FMS) (Cont'd.)				
WHEEL AND TIRE SHOP	3209	PD-680	275 GALS./6 WKS.	1947 FPT NO. 1 → DPDO
438 ORGANIZATIONAL MAINTENANCE SQUADRON (OMS)				
ALL OMS SHOPS	2250, 2251	WASTE FUELS	NO ESTIMATE AVAILABLE	ON-BASE FPT AREAS → DPDO → OFF BASE FPT AREAS → DPDO
438 TRANSPORTATION SQUADRON				
ALLIED TRADES	3001	WASTE PAINTS AND THINNERS	55 GALS./5 to 6 MOS.	ON-BASE LANDFILL OR STORM DRAIN → CONTRACTOR OR FORT DIX LANDFILL → DPDO
BATTERY SHOP	3001	BATTERY ACIDS	10 GALS./WK	NEUTRALIZED TO SANITARY SEWER
VARIOUS VEHICLE MAINTENANCE SHOPS	3001	WASTE OILS	525 GALS./6 MOS.	FPT NO. 1 → DPDO
		WASTE FUELS	100-200 GALS./MO.	FPT NO. 1 → DPDO
438 CIVIL ENGINEERING SQUADRON (CES)				
EXTERIOR ELECTRIC	3411	PCB TRANSFORMERS	2-5/YR.	DPDO OR ON-BASE STORAGE AWAITING CONTRACTOR DISPOSAL
ENTOMOLOGY SHOP	3450[7]	PESTICIDE RINSE WATER	NO ESTIMATE AVAILABLE	SANITARY SEWER & STORM DRAINAGE → REUSED AS MAKE UP WATER SANITARY SEWER & STORM DRAINAGE
		EMPTY CANS & DRUMS	130/YR.	RINSED TO BASE LANDFILLS → RINSED TO OFF-BASE LANDFILLS
PAVEMENT AND GROUNDS	3401	EMPTY CONTAINERS	10-15/YR.	ON-BASE OR OFF-BASE LANDFILLS
		OFF SPECIFICATION PESTICIDES	0-5 GALS./YR.	ON-BASE LANDFILLS, ON-BASE STORAGE OR OFF-BASE CONTRACTOR

KEY

——— CONFIRMED TIME-FRAME DATA BY SHOP PERSONNEL

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

(7) PRIOR TO 1974, THE ENTOMOLOGY SHOP WAS LOCATED IN THREE ADJACENT FACILITIES ALONG DRIVAS AVENUE.

Table 4.1 (Cont'd.)

INDUSTRIAL OPERATIONS (Shops)

WASTE GENERATION

SHOP NAME	LOCATION (BLDG. NO.)	WASTE MATERIAL	WASTE QUANTITY	METHOD(S) OF TREATMENT, STORAGE & DISPOSAL (1950 – 1960 – 1970 – 1980)
438 CIVIL ENGINEERING SQUADRON (CES) (Cont'd.)				
POWER PRODUCTION	3412	BATTERY ACID	2 GALS./MO.	1947 NEUTRALIZED TO STORM DRAIN; DPDO
		COMBINED OILS & SOLVENTS	10 GALS./MO.	FPT NO. 1; DPDO
108 TACTICAL FIGHTER WING (ANG)				
AEROSPACE GROUND EQUIPMENT (AGE)	3343	PD-680	50-60 GALS./YR.	1954 FPT NO. 1; DPDO
		ENGINE OIL	220 GALS./YR.	FPT NO. 1; DPDO
		HYDRAULIC FLUID	55 GALS./YR.	FPT NO. 1; DPDO
		TURBINE OIL	110 GALS./YR.	FPT NO. 1; DPDO
WEAPONS SHOP	3320	PD-680	55 GALS./6 MOS.	FPT NO. 1; DPDO
ENGINE SHOP	3321	PD-680	10 GALS./6 MOS.	FPT NO. 1; DPDO
		OILS	10-15 GALS./MO.	FPT NO. 1; DPDO
		FUELS	5 GALS./MO.	FPT NO. 1; DPDO
TIRE SHOP	3322	PD-680	110 GALS./4 MOS.	FPT NO. 1; DPDO
CORROSION CONTROL	3322	COMBINED WASTES (Spent MEK, Toluene & Paint Thinners)	3-4 GALS./MO.	STORM DRAIN; OIL WATER SEPARATOR TO SANITARY SEWER; DPDO

KEY

———— CONFIRMED TIME-FRAME DATA BY SHOP PERSONNEL

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

Table 4.1 (Cont'd.)

INDUSTRIAL OPERATIONS (Shops)

WASTE GENERATION

SHOP NAME	LOCATION (BLDG. NO.)	WASTE MATERIAL	WASTE QUANTITY	METHOD(S) OF TREATMENT, STORAGE & DISPOSAL (1950–1980)
108 TACTICAL FIGHTER WING (ANG) (Cont'd.)				
NON-DESTRUCTIVE INSPECTION (NDI)	3322	PENETRANT	55 GALS./YR.	1958 FPT NO. 1; DPDO →
		EMULSIFIER	55 GALS./YR.	DPDO →
		FIXER (X-ray)	2 GALS./MO.	SILVER RECOVERY TO SANITARY SEWER →
		DEVELOPER (X-ray)	2 GALS./MO.	SANITARY SEWER →
PNEUDRAULICS SHOP	3322	PD-680	55 GALS./2 MOS.	FPT. NO. 1; DPDO →
		TRICHLOROETHANE	55 GALS./3 MOS.	- - - DPDO →
		CARBON REMOVER	10 GALS./4 MOS.	- - - DPDO →
VEHICLE MAINTENANCE	3325	BATTERY ACID	60 GALS./YR.	NEUTRALIZED TO SANITARY SEWER →
		ENGINE OIL	400 GALS./YR.	FPT NO. 1; DPDO →
		VARSOL	165 GALS./YR.	FPT NO. 1; DPDO →
		WASTE JET FUELS	400 GALS./YR.	- - - DPDO →
170 AIR REFUELING GROUP (ANG)				
CORROSION CONTROL	1811	WASTE PAINTS & TOLUENE	55 GALS./6-12 MOS.	1965 DPDO →
		PAINT STRIPPER	55 GALS./YR.	DPDO →
		WASHRACK EFFLUENT	50 200 GALS./6 WKS.	OIL/WATER SEPARATOR TO SANITARY SEWER →

KEY

——— CONFIRMED TIME FRAME DATA BY SHOP PERSONNEL

- - - - ESTIMATED TIME FRAME DATA BY SHOP PERSONNEL

Table 4.1 (Cont'd.)

INDUSTRIAL OPERATIONS (Shops)

WASTE GENERATION

SHOP NAME	LOCATION (BLDG. NO.)	WASTE MATERIAL	WASTE QUANTITY	METHOD(S) OF TREATMENT, STORAGE & DISPOSAL (1950 – 1960 – 1970 – 1980)
170 AIR REFUELING GROUP (ANG) (Cont'd.)				
OTHER 170 ANG SHOPS	1811, 1939	PD-680	110 GALS./YR.	1965 → DPDO (confirmed)
		JET FUELS	330 GALS./YR.	1965 → DPDO (confirmed)
		OILS & HYDRAULIC	100 GALS./MO.	1965 → DPDO (confirmed)
		CARBON REMOVER	100 GALS./3 MOS.	1965 → DPDO (confirmed)

KEY

——— CONFIRMED TIME-FRAME DATA BY SHOP PERSONNEL

- - - - - ESTIMATED TIME FRAME DATA BY SHOP PERSONNEL base. From 1958 through 1976, waste fuels were segregated from used oils, hydraulic fluids and solvents and temporaily stored in an underground tank (Tank B-7 adjacent to Bldg. 1736) until sold to off-base contractors. From 1977 to 1980, DPDO transferred the waste fuels to an off-base location for fire protection training exercises. Beginning in 1980 through the present, DPDO has resold waste fuels to contractors.

Most of the waste oils, hydraulic fluid and solvents were disposed of through DPDO, beginning about 1958 and continuing through the present. However, some waste oils, hydraulic fluids and spent solvents were also disposed of in Landfill No. 2 and Landfill No. 3 between 1950 and 1957. The major waste chemicals which have been disposed of in the past include paints, paint strippers, paint thinners, chemical solvents (toluene, methyl ethyl ketone), carbon remover, battery acids, and pesticide equipment rinse water. During the period 1947 through the late 1960's paints, paint thinners, paint strippers (mostly phenolic), chemical solvents and carbon remover were disposed of as part of washrack operations throughout the base. During this period, the washrack locations discharged to the storm drainage system with little or no treatment. By the late 1960's oil/water separators were installed at all washrack facilities and the discharge from each system was connected to the sanitary sewer system.

Landfills No. 2, No. 3 and No. 4, were reported to have received an unquantifiable number of drums containing miscellaneous waste chemicals. The practice of landfill disposal of waste chemicals occurred from the early 1950's to the early 1970's. From the early 1970's until approximately 1980, many of the chemical wastes generated at McGuire AFB, in particular those generated at the Corrosion Control Shops, were disposed of in the Fort Dix landfill along with the general refuse generated at the Air Force Base. Since 1980, chemical wastes have been temporarily stored at a hazardous waste storage area (Facility 2310) and eventually disposed of by an off-base hazardous waste disposal contractor.

Other site-specific disposal practices have occurred at several shops in the past. Waste battery acid generated at the Battery Shop (Bldg 2220) has been disposed of by diluting the acid with water and discharging it to an underground pit located adjacent to the building. This disposal practice was implemented prior to 1964. Shop personnel have indicated that the pit is believed to contain limestone for the neutralization of the dilute acid. The pit is also believed to be constructed of concrete and connected to the sanitary sewer system. Approximately 20 gallons per week of partially diluted battery acid have been disposed of in the pit. No recent inspections have been performed on the pit to ascertain whether any limestone is still present.

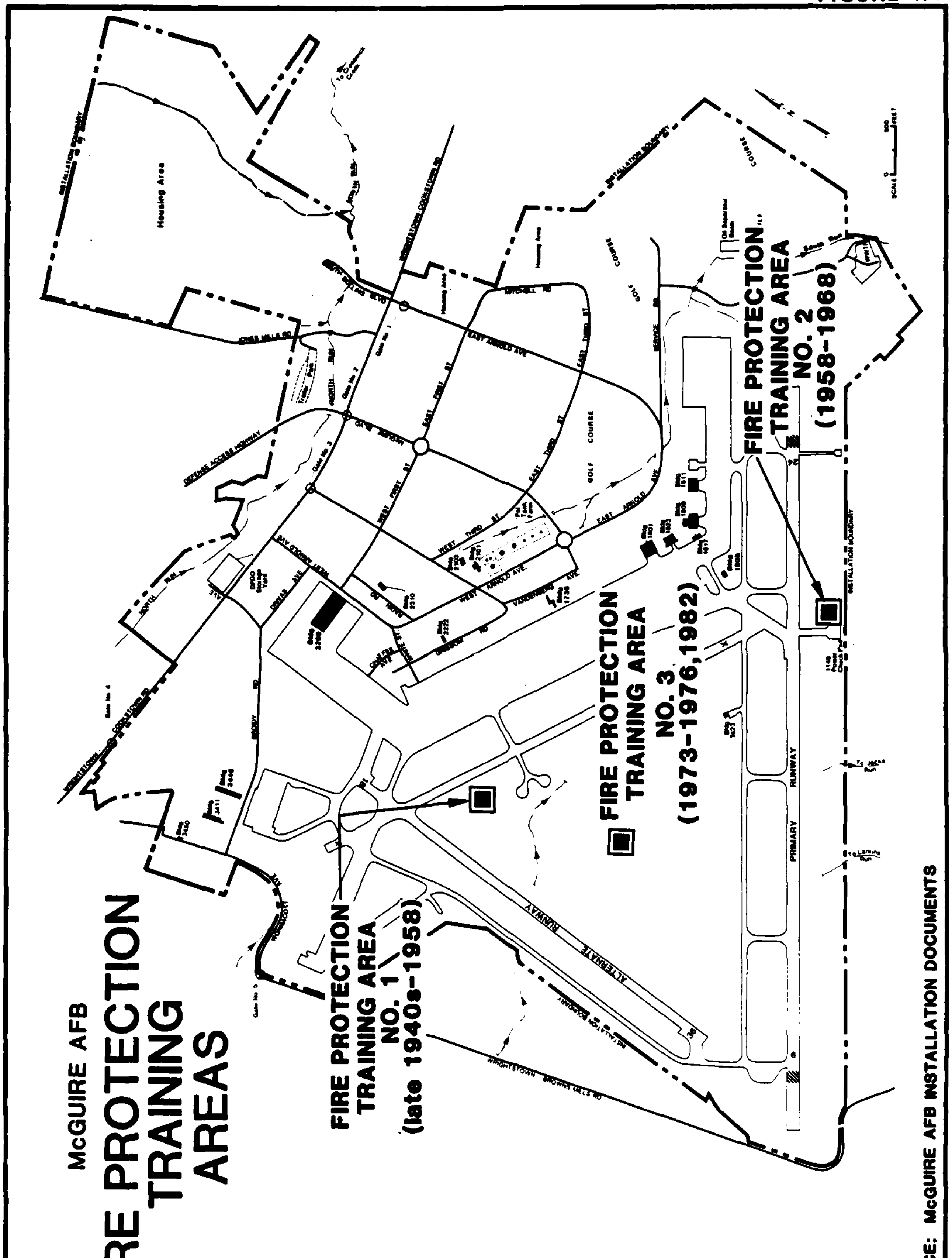
The Non-Destructive Inspection (NDI) Lab (Bldg. 1623), located inside the runway triangle, has discharged waste penetrant, emulsifier and developer into a depressed grassy area east of the building. The practice occurred from 1966 to 1972. Approximately 55 gallons of each of these materials were drained to this area every 18 to 20 months. Since 1972, these materials have been collected in underground storage tanks for disposal in the base sanitary waste treatment plant.

The Entomology Shop has been located in several areas since the early 1950's. Until the early 1970's, rinse water generated from cleaning small spray equipment was typically drained to the sanitary sewer. The larger truck-mounted spray equipment was rinsed in areas adjacent to the early shop facilities which were located along Drivas Avenue and have since been demolished. About 1974, the shop was relocated to Building 3450. Since 1974, rinse waters from small spray equipment and empty containers were either reused as make-up water or drained to the sanitary sewer. The larger truck-mounted sprayers have been rinsed on a driveway located adjacent to the shop. The rinsate flows into a drainage ditch located along the side of the driveway.

<u>Fire Protection Training</u>

The Fire Department has operated three fire protection training areas (FPTA) since the activation of McGuire AFB (Figure 4.1). From the late 1940's until 1958, the Fire Department conducted fire protection training exercises within the runway triangle at a location northwest of the hazardous cargo parking pads (Fire Protection Training No. 1). The site has a slightly depressed topographic contour. Close examination of the area detected discolored charred soils with small molten residues scattered on the surface. Grasses now cover the entire site. During the period the site was in use, various types of combustible waste chemicals generated at the base were burned during training exercises. The combustible materials included waste oils, waste Avgas and jet fuel,

FIGURE 4.1



ES ENGINEERING-SCIENCE

hydraulic fluid, spent solvents and alcohol. The combustible waste materials were brought to the area in 55 gallon drums and stacked temporarily until the contents of the drums could be burned. The burn area did not have a liner system nor was there any pre-application of water to prevent the percolation of the waste chemicals into the soil. The extinguishing agents used during that period included CO_2, protein foam and water.

In 1958, the fire protection training area was relocated to the eastern side of a power check pad (Facility No. 1148) located along the southern boundary of the base (Fire Protection Training Area No. 2). The area was utilized for training exercises between 1958 and 1973. A visit to the area detected charred discolored soils as evidence of the existence of this training site. Only JP-4 had been burned for training exercises at this location. All fuel was trucked to the area at the time of each exercise. The burn area was wetted prior to application of the fuel to prevent excess percolation. A drainage swale adjacent to the burn site was blocked prior to each exercise to prevent runoff of any of the applied fluids (i.e., water, fuel and extinguishing agents) and allow the residual fluids to eventually percolate into the soil. Extinguishing agents used during this period also included CO_2, protein foam and water.

In 1973, a new training area was established directly in the center of the runway triangle (FPTA No. 3). Between 1973 and 1976 the area was utilized without a liner system or any collection system for residual fluids. Training exercises were performed in the same manner as they had been for FPTA No. 2. Approximately 24 to 30 burns occurred annually. Each burn would require 650 to 800 gallons of JP-4. Between 1977 and 1982, the fire protection training pit was not used. In 1982, a clay liner, fuel storage tanks, a fuel distribution system and an oil/water separator system were constructed at FPTA No. 3. Since training exercises resumed, JP-4 has been used as a fuel source and AFFF was added to the list of extinguishing agents. Approximately 300 gallons of fuel have been utilized during each training exercise.

Pesticide/Herbicide Utilization

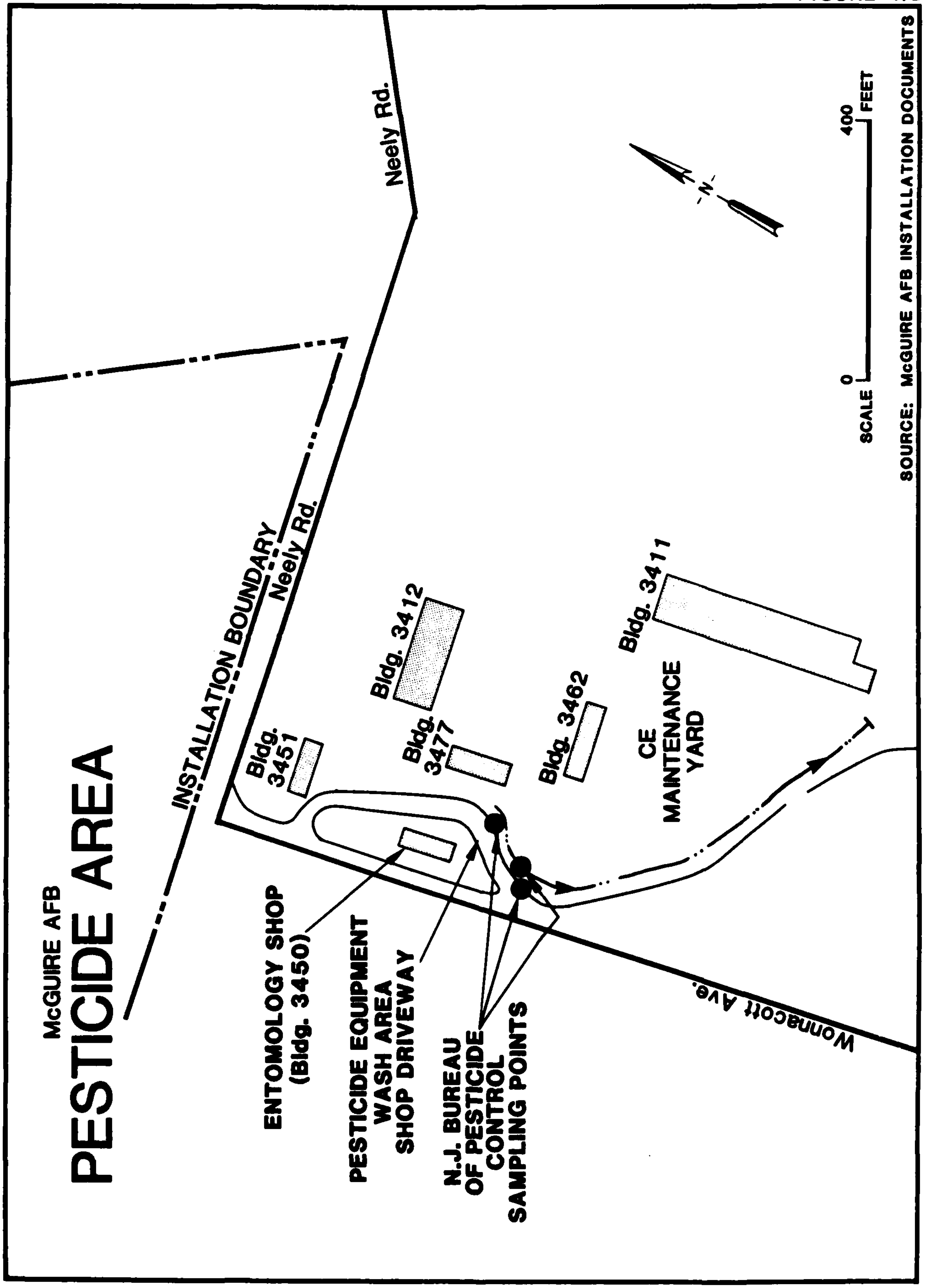
The pesticide and herbicide programs have been conducted by two separate organizations at McGuire AFB. Pesticide applications have been performed by the Entomology Shop and most herbicide applications have been performed by the Pavements and Grounds Shop. Both organizations are part of the CE Squadron.

The Entomology Shop has been conducting routine pest control on McGuire AFB since the early 1950's. From that time until 1974, the Entomology Shop had been located in three facilities which were situated a few hundred yards from each other in an area located north of Hangar 3209, along Drivas Avenue. These facilities have since been demolished. During this period, most rinse water generated from cleaning small spray equipment was flushed down the sanitary sewer. The larger equipment was rinsed in an area adjacent to the buildings and allowed to run off. No streams or ditches were located in close proximity to these facilities. Empty containers were disposed of with general refuse in the base landfills.

Since 1974, the Entomology Shop has been located in Building 3450 (Figure 4.2). About that time, new procedures were implemented for rinsing spray equipment and empty pesticide containers. Some rinse waters were saved for reuse as make-up water and some were allowed to drain into the sanitary sewer system. Triple rinsing procedures for empty pesticide containers began in the late 1970's. The containers were then punctured and disposed of with general refuse. It has been estimated that approximately 30 to 35 drums and 100 cans per year have been disposed of by the shop. The larger truck-mounted spray equipment has been rinsed on the driveway adjacent to Building 3450. The driveway is situated on a rise which drains toward a small surface drainage ditch.

In March of 1982, the New Jersey Bureau of Pesticide Control conducted an inspection to evaluate the pesticide program at McGuire AFB. During the site visit, three soil samples were collected from areas that received runoff from the equipment cleaning operation. The samples were collected from a grassy area located at the bottom of the driveway, the bank of the drainage ditch adjacent to Building 3450 and the sediments within the drainage ditch. The analytical results of the soils samples are presented in Appendix D, Table D.3. These samples showed the presence of low to moderate levels of pesticides with long residual periods. The data indicated moderate levels of DDT-related

FIGURE 4.2


McGUIRE AFB
PESTICIDE AREA
INSTALLATION BOUNDARY
Neely Rd.
Neely Rd.
Bldg. 3451
Bldg. 3412
Bldg. 3477
Bldg. 3462
Bldg. 3411
CE MAINTENANCE YARD
ENTOMOLOGY SHOP (Bldg. 3450)
PESTICIDE EQUIPMENT WASH AREA SHOP DRIVEWAY
N.J. BUREAU OF PESTICIDE CONTROL SAMPLING POINTS
Wonnacott Ave.
N
SCALE
0
400
FEET
SOURCE: McGUIRE AFB INSTALLATION DOCUMENTS

products in the sediment samples collected from within the ditch. All of the samples showed the presence of chlordane. The samples collected from the bottom of the driveway and the bank of the drainage ditch also contained low levels of dieldrin.

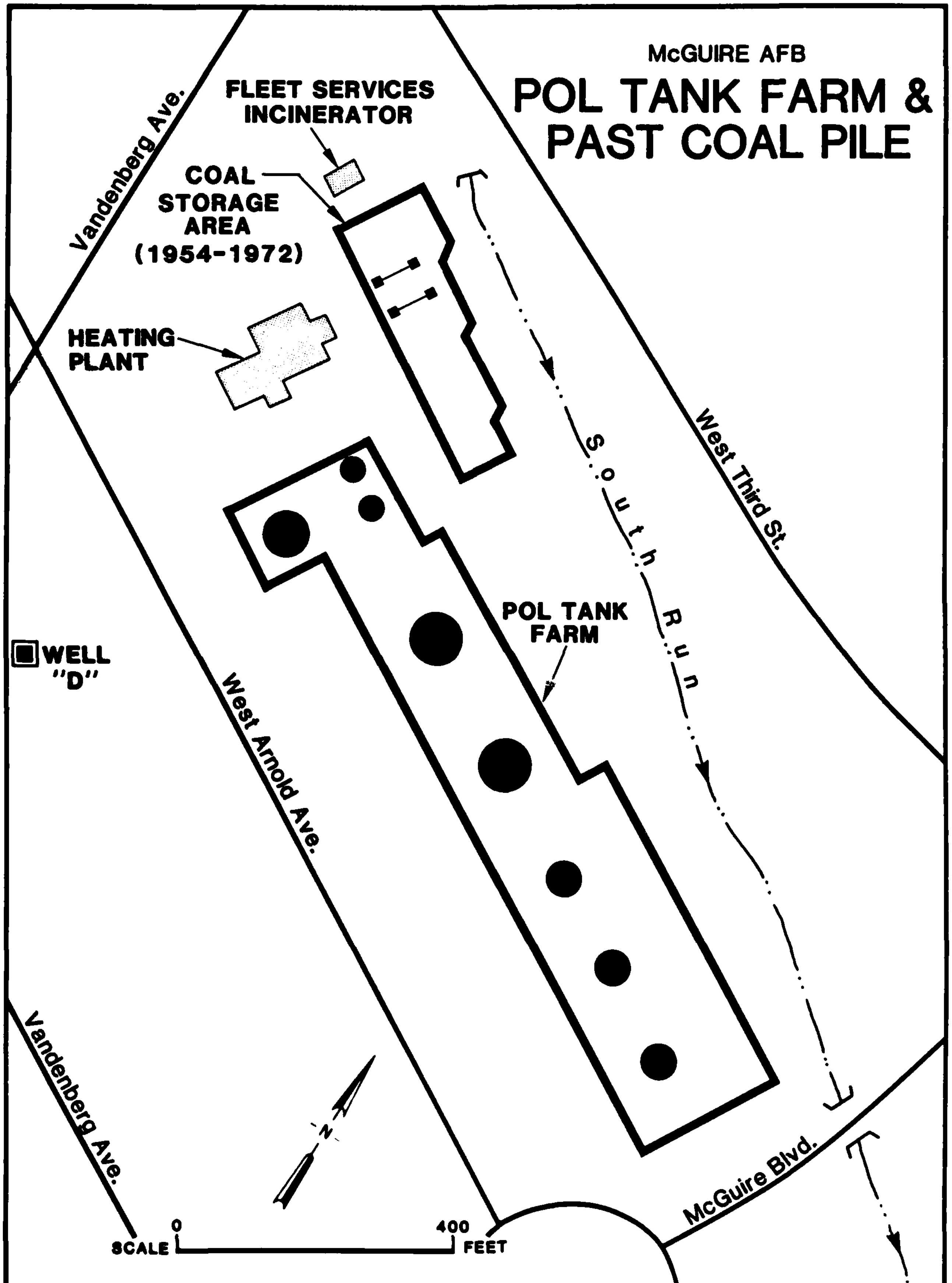
Since 1974, most pesticides used on the base have been stored in a separate room within Building 3450. A list of typical chemicals which have been utilized on an "as required" basis can be found in Appendix D, Table D.2. The more frequently used chemicals have also been denoted on the list. Entomology Shop personnel interviewed indicated no knowledge of any significant pesticide spills occurring on McGuire AFB.

The weed control program is primarily conducted by the Pavement and Grounds Shop, although the Entomology Shop has administered some herbicides. Equipment and empty herbicide containers have been rinsed near Building 3440. All chemicals mixed are eventually applied around the base. Herbicides have been stored in several locations around the base which include Buildings 3450, 3440, 3415, 3401 and 1906 (ammo bunker). No significant herbicide spills have occurred at McGuire AFB.

Heat and Power Production

McGuire AFB has been equipped with a central heating and power plant since 1954. The plant was fueled by coal from 1954 until 1972. Since 1972, the boilers have been fired by oil and gas. During the period when the plant was fired with coal, a large area directly behind the facility was utilized as the coal storage area (Figure 4.3). The coal piles were located on a concrete pad which was sloped toward South Run Creek directly behind the coal storage area. A portion of the coal was stored under a shelter; however, the majority was uncovered. The coal storage area was thorougly cleaned in 1974. Coal pile runoff may have caused some contamination to the South Run during the period of use; however, it is concluded that no significant residual contaminants are left on the base. Since the coal piles were situated on a concrete base no soil contamination would have occurred.

Bottom and fly ash generated during the coal burning period had been disposed of in several locations on the base. Coal ash was generated at an average rate of 75 cubic yards per week. The ash was used as fill and cover material in Landfills No. 2, 3 and 4. Traces of coal slag can still be found on the surface of these landfills. There has



SOURCE: McGUIRE AFB INSTALLATION DOCUMENTS

been some indication that coal ash may have also been disposed of in landfills located within Fort Dix.

Fuels Management

The McGuire AFB fuels management system includes a number of above-ground and underground storage tanks and pipelines located throughout the base. A summary of the major fuel and oil storage facilities has been provided in Appendix D, Table D.4. Fuels stored at McGuire AFB include: JP-4, Avgas, Mogas, diesel oil, heating fuel oil, contaminated fuels and used oils. Fuels arrive on base by pipeline, rail and tanker truck.

During the early period of base operations through 1963, fuel storage occurred on the west side of the base near Building 3446. Four 25,000-gallon underground tanks were utilized to store Avgas. Avgas was delivered to the base by truck during this period. In 1963, the use of these tanks was discontinued and the tanks were filled with sand. During the same year, the base began use of the existing POL tank farm (Figure 4.3). Tanks in this area are surrounded by asphalt covered earthen dikes. Initially these above-ground tanks were used to store Avgas, JP-4 and heating fuel oil; however, the storage of Avgas at the tank farm was phased out and these tanks were converted to store additional JP-4. Avgas is now stored in four 25,000-gallon underground tanks located adjacent to Building 1808.

Fuel has been delivered to the aircraft either by an underground hydrant system or by refueling trucks. All fuel storage and distribution systems have been routinely inspected and leak tested by the liquid fuels maintenance personnel. Discussions with base personnel indicated that a leak had occurred in the underground distribution system around 1967. The line was repaired and the spilled material was cleaned up. Cathodic protection was added to the system to reduce corrosion of the underground piping and tankage and no leakage has occurred since 1967.

Fuel storage tanks have been cleaned about every three years. In past years, fuel sludges accumulating on the bottoms of the storage tanks were buried within the fuel tank dikes. Holes were dug in the floor of the diked areas and up to 2,000 gallons of fuel sludge were disposed of within these pits. No preliminary weathering occurred prior to disposal. Since 1970, the sludge has been weathered and temporarily stored in the waste fuels storage tank prior to contract removal, arranged by DPDO.

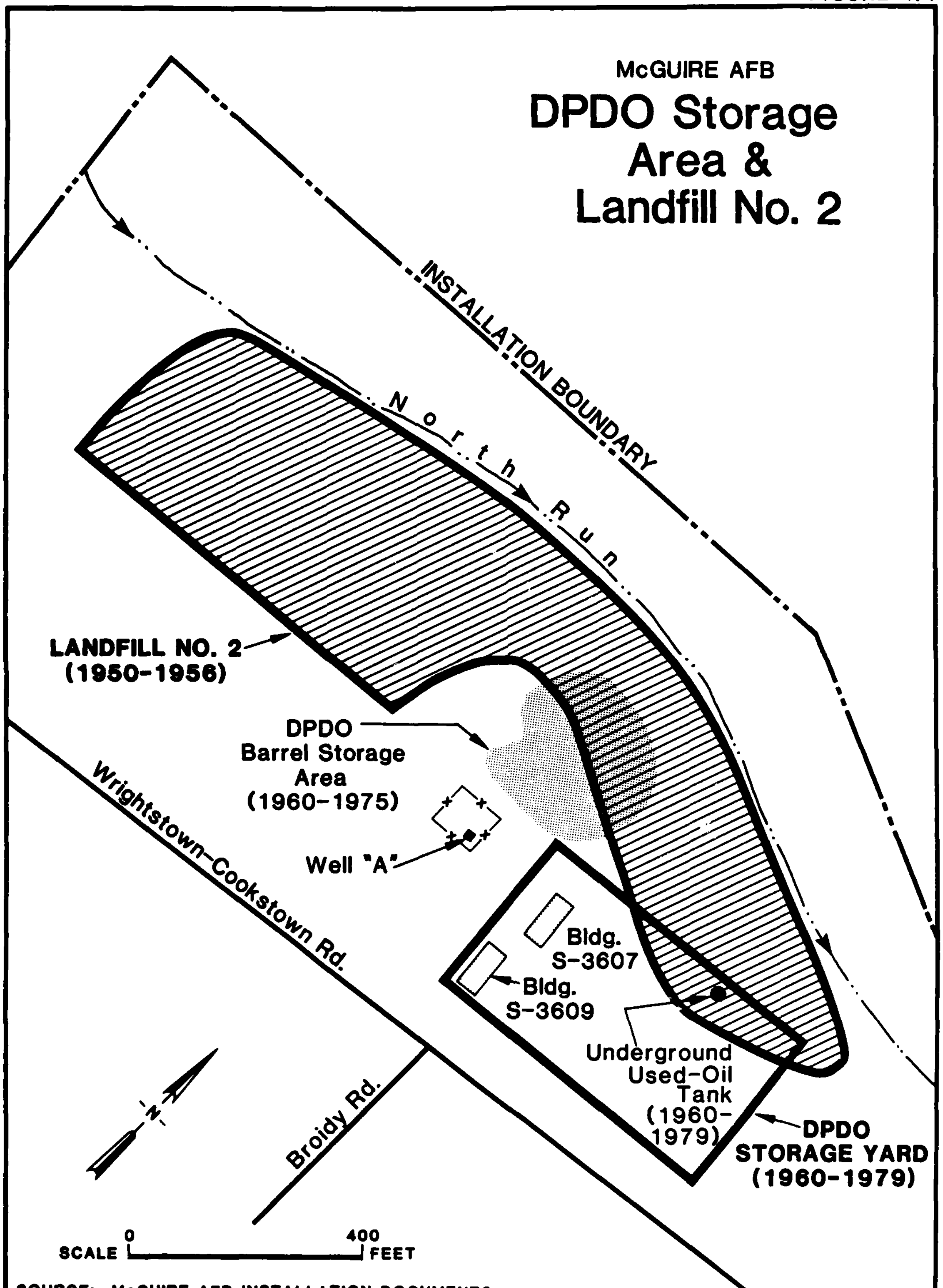
Defense Property Disposal Office (DPDO)

The Defense Property Disposal Office (Facility 3609) is located on the north side of Wrightstown-Cookstown Rd. approximately one quarter mile west of Gate No. 2, as shown in Figure 2.3. DPDO has arranged for the disposal of used petroleum products, out-of-service transformers, and most hazardous wastes for both McGuire AFB and Fort Dix. Prior to disposal, waste materials have been held at or adjacent to the DPDO area. The used petroleum products disposed of through DPDO have included used oils, fuels, hydraulic fluid and spent solvents. Until 1979 these products were collected and held at DPDO prior to contractor disposal. Storage was either in a 10,000-gallon underground holding tank within the DPDO area or in barrels in a separate storage area to the northwest of the DPDO yard above the closed Landfill No. 2 (Figure 4.4). In 1975 the barrel storage area was relocated inside the DPDO storage yard (fenced area). Use of the holding tank was terminated in 1979, and since that time used oils generated at McGuire AFB have been primarily stored in a 25,000-gallon underground tank near Building 1736 (Tank B-7). Several smaller used oil storage tanks located throughout the base have also been utilized.

Out-of-service transformers were temporarily held prior to disposal in the DPDO area until 1978. Approximately 30 to 40 transformers were stored at DPDO and reportedly there was leakage from these transformers. In 1978, out-of-storage transformer storage was relocated to the CE service yard located behind Building 3411. Since 1981, the PCB transformers have been stored in the hazardous waste storage area, Facility 2310.

Spills

The majority of spills which have occurred at McGuire AFB have involved small quantities of fuels, oils and hydraulic fluids. The spills have primarily occurred along the flightline and in the associated maintenance shops. Recent records indicate that the response to reported spills entailed either direct recovery of spilled materials or dilution of the spilled substance with rinse water and eventual capture of the materials in the downstream oil separation basin. Most spill incidences have not posed any long-term deterimental environmental concern.

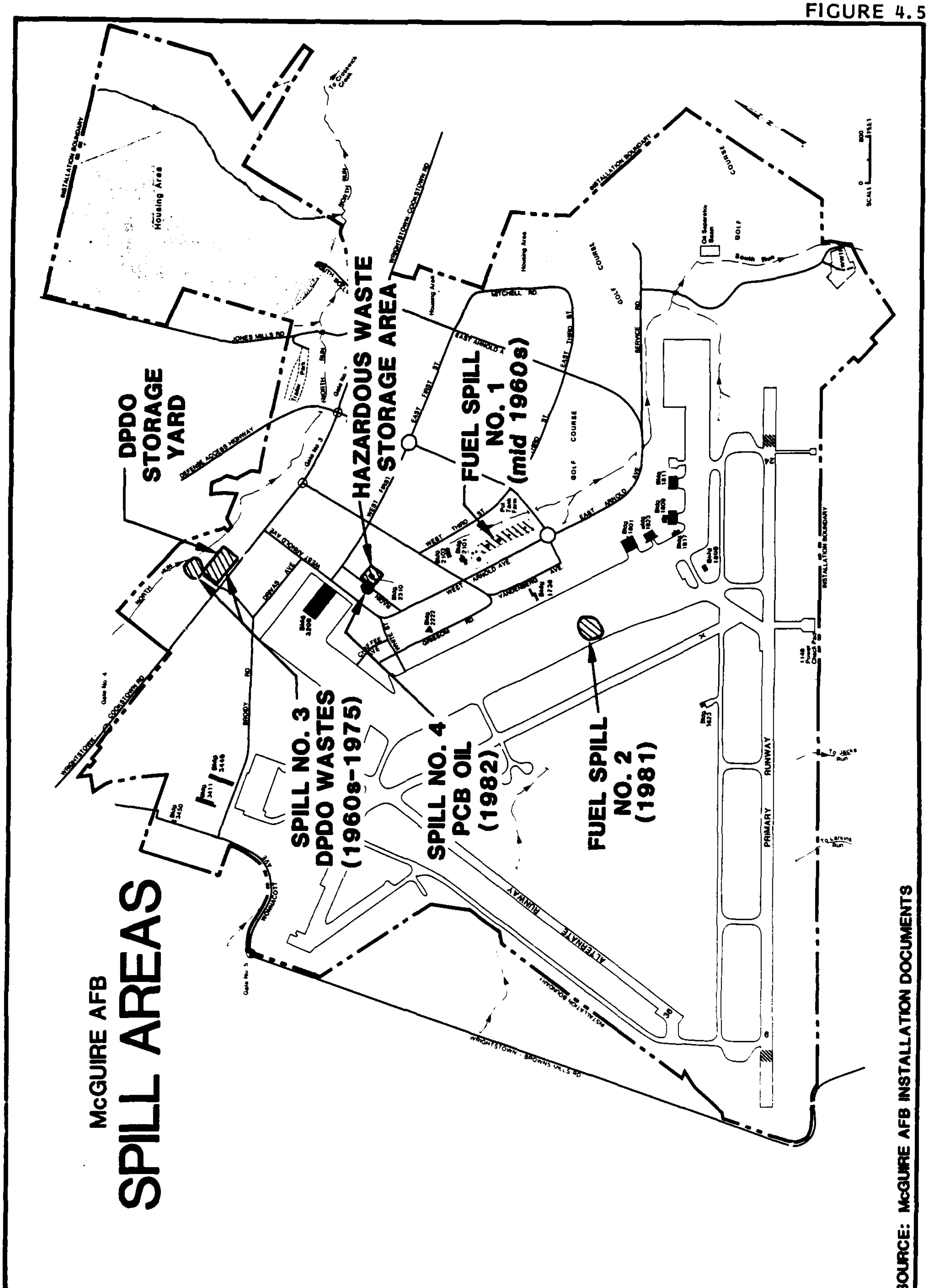


SOURCE: McGUIRE AFB INSTALLATION DOCUMENTS

Four sites have been identified at McGuire AFB where either very large spills once occurred or smaller spills of materials which still may pose a potential for contamination have occurred. These areas are identified on Figure 4.5. Two significant fuel spills were reported to have occurred at McGuire AFB. The first fuel spill incident (Spill No. 1) occurred in the mid 1960's when 500,000 gallons of JP-4 was spilled from a fuel storage tank and discharged from the base property via the surface drainage system. The cause of the spill was attributed to an above-ground storage tank valve which was accidentally left open. It is presumed, since the fuel was spilled into the surface drainage system approximately 20 years ago, no environmental contamination would still be present on the base.

Another fuel spill occurred in 1981 along the flightline (Spill No. 2). The spill involved an aircraft which lost 3,000 gallons of JP-4. The Fire Department responded by diluting the fuel with water and washing the fuel into the adjacent grassy area within the runway triangle. It is expected that the majority of the fuel evaporated and therefore, the area is not considered to be contaminated.

The third spill site (Spill No. 3) was located in and around the DPDO storage yard (Figure 4.4). Several specific areas within this location have been identified where leakage and/or spillage had occurred. A storage area used for storing drums of waste oils, hydraulic fluid and spent solvents was located outside of the fenced storage area, over Landfill No. 2. Several reports indicated that a considerable amount of leakage occurred from these drums and saturated the soils in the area. In 1975, all drums were removed, additional cover was placed on the surface, and the area was graded and reseeded. A second area where spillage occurred within the DPDO storage yard was in a location where transformers were once stored. At one period prior to 1978, approximately 40 to 50 transformers were stored in the DPDO yard and reportedly there were numerous leaks. Some of these leaking transformers may have contained dielectric oil with PCB's (Polychlorinated Biphenyls). In addition, the DPDO yard was the site of an underground bulk waste petroleum storage tank. The tank was leak tested in 1970 and


McGUIRE AFB
SPILL AREAS
DPDO STORAGE YARD
HAZARDOUS WASTE STORAGE AREA
FUEL SPILL NO. 1 (mid 1960s)
SPILL NO. 3 DPDO WASTES (1960s-1975)
SPILL NO. 4 PCB OIL (1982)
FUEL SPILL NO. 2 (1981)
PRIMARY RUNWAY
ALTERNATE RUNWAY
SOURCE: McGUIRE AFB INSTALLATION DOCUMENTS

found to have no leaks. No berm or impervious surface was provided around the tank inlet and evidence of past spillage around the inlet was apparent during the recent site visit.

The most recent spill having a potential for environmental concern involved the loss of 75 to 200 gallons of PCB transformer oil (Spill No. 4). This spill, which occurred in January of 1982, was caused by the accidental rupture of an electrical transformer when it was being loaded on a truck during a salvage/removal operation. The spill occurred approximately 30 feet northwest of Facility 2310 (Hazardous Material Storage Area). Spill response measures involved immediately covering the affected area and containing the spill with sorbent pads and sand. Soon after, the contaminated materials and soil were excavated and disposed of off-base as hazardous waste. Ten soil samples were collected at the lower extent of the excavation. All of the samples had less than 7.5 ppm of PCB's. The affected area was recovered with fresh gravel.

There are several in-service and out-of-service PCB transformers still located throughout McGuire AFB. These transformers have been inspected quarterly and no leakage has been discovered during any of the routine inspections.

DESCRIPTION OF PAST ON-BASE TREATAMENT AND DISPOSAL METHODS

The facilities on McGuire AFB which have been used for the management of waste can be categorized as follows:

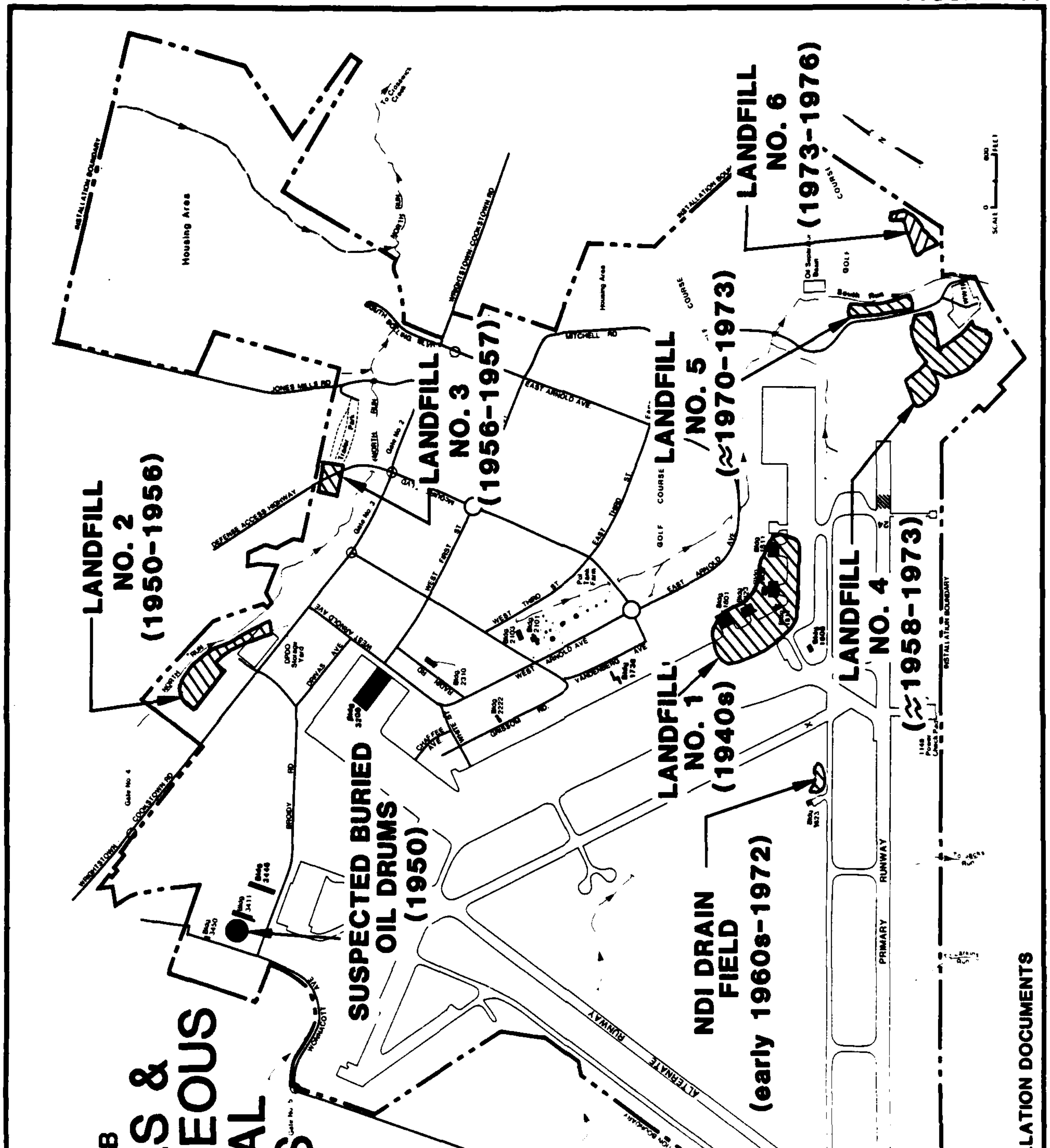
- Landfills
- Refuse Incineration
- Wastewater Treatment System and Sludge Disposal Areas
- Storm Drainage
- Miscellaneous Disposal Sites

The waste management facilities are discussed individually in the following sub-sections.

Landfills

Six landfills used for the disposal of refuse were identified at McGuire AFB. Landfill locations have been shown on Figure 4.6 and a summary of pertinent information concerning each landfill has been presented in Table 4.2.

FIGURE 4.6



SOURCE: McGUIRE AFB INSTALLATION DOCUMENTS

TABLE 4.2
SUMMARY OF LANDFILL DISPOSAL SITES

LANDFILL	OPERATION PERIOD	APPROXIMATE SIZE (ACRES)	TYPE OF WASTE	ESTIMATED WASTE QUANITY (CU. YD.)	METHOD OF OPERATION	CLOSURE STATUS	SURFACE DRAINAGE
No. 1	1940's	Unknown	Misc. refuse	Unknown	Burial	Closed, wastes removed, covered with asphalt and flightline structures.	To South Run
No. 2	1950 - 1956	11	General refuse, chemical wastes, scrap materials, coal ash	400,000	Trench and fill, daily burning	Closed, recovered 1975, vegetative cover	To North Run
No. 3	1956 - 1957	4	General refuse, chemical wastes scrap materials coal ash	Unknown	Burial in large pit. no burning	Closed, bisected by highway, vegetation or surface	To North Run
No. 4	1958 - 1973	18	General refuse, chemical wastes scrap materials coal ash	2,730,000	Trench and fill	Closed, vegetative cover	To South Run
No. 5	1970 - 1973	3	Coal ash wood and metal wastes, some misc. chemicals suspected	320,000	Trench and fill, some burning	Closed, vegetative cover	To South Run
No. 6	1973 - 1976	4.5	General refuse	450,000	Trench and fill	Closed, addition cover materials are being applied	To South Run

Landfill No. 1

Landfill No. 1 was used to dispose of wastes generated during the 1940's when the base was still under the jurisdiction of the U.S. Army Fort Dix Installation. The landfill was located in a swampy area in the general vicinity of Facility 1801 (Figure 4.6). It is presumed that the landfill received predominantly general refuse generated at the air base as well as scrap materials which required disposal. Since only minor industrial operations occurred during this period, the landfill would not have received any substantial quantities of waste oils or chemicals.

Base personnel who were at McGuire AFB during the early expansion efforts have indicated that the wastes which had been disposed in this area were removed prior to construction of the existing facilities. It is not known where the wastes were relocated, but it was probably not on McGuire AFB. Since the wastes were removed, the area is not considered to be contaminated.

Landfill No. 2

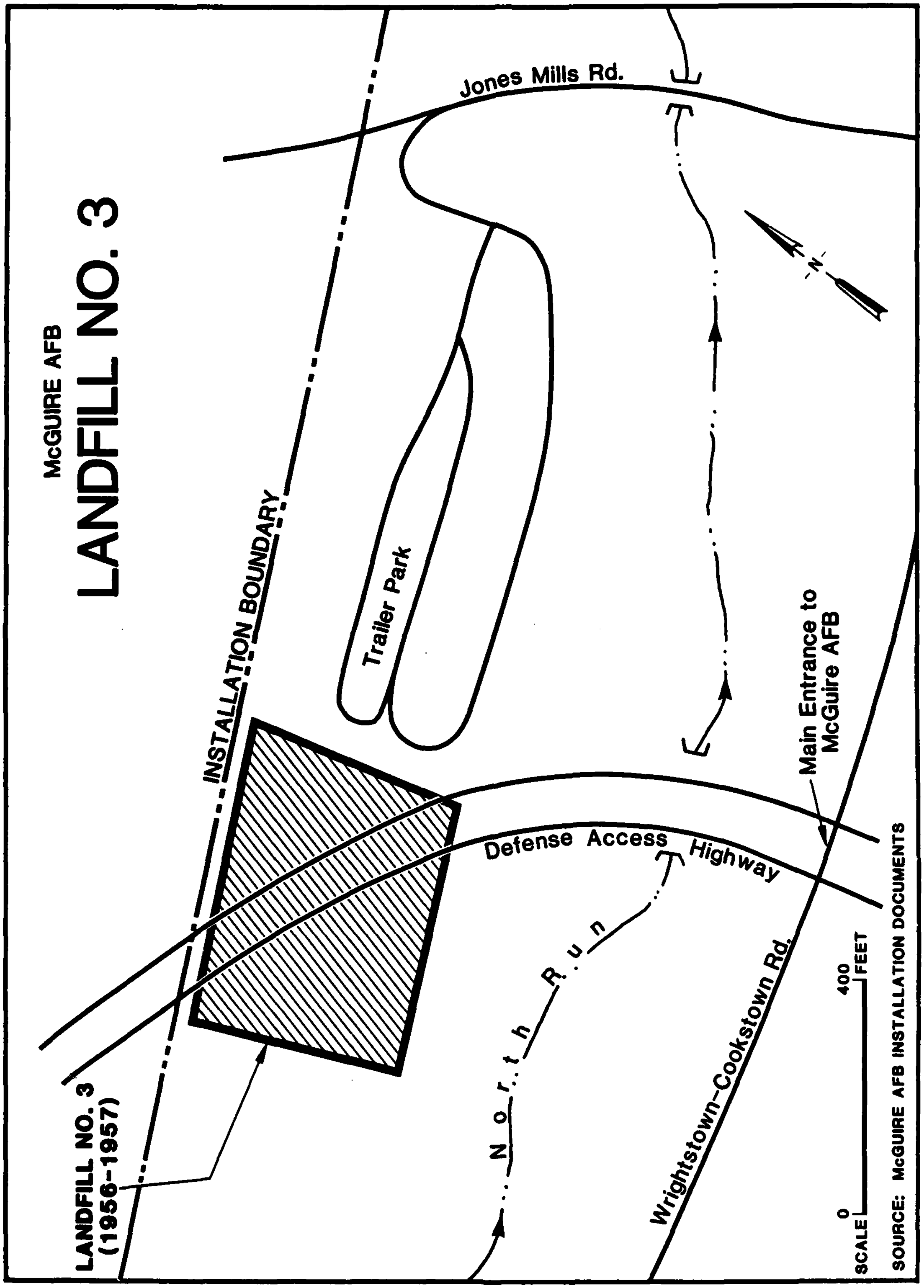
Landfill No. 2 is located in the northwest section of the base property. The landfill is situated on an 11 acre parcel between the Wrightstown-Cookstown Road and a small stream known as the North Run (refer to Figure 4.4). A portion of the landfill is situated in an area which now serves as the DPDO storage yard. The landfill was active from about 1950 to 1956. During this period base personnel collected all wastes generated on the base and operated the landfill to dispose of these wastes. Landfill operations entailed both trench and fill as well as daily burning to reduce the waste volume. Two trenches situated side by side would be utilized simultaneously. Each evening the trench which was in use during the day would be burned. The following day the other open trench would be used for receiving wastes. The trenches were an average of 10 feet deep, 20 feet wide and 300 feet long with north/south orientations. All of the trenches were dug below the water table. Any wastes materials generated on the base may have been disposed of in the landfill. These waste would have included drums of waste oil, and miscellaneous industrial chemicals.

In November 1974, the U.S. Environmental Protection Agency (EPA) Region II, inspected the closed landfill site. The inspection report described the portion of the landfill fronting on the Wrightstown-Cookstown Road as having been graded with a final cover and vegetative growth found on the surface of the fill. However, the back section of the landfill and the adjacent creek bed contained several deteriorated storage tanks and 55 gallon drums, some which were empty and some containing unknown materials. A section of the landfill was being used as an oil storage area by the DPDO, and evidence of oil spillage was apparent. In addition, miscellaneous refuse was found on and along the edge of the landfill near the stream bed. The EPA requested that the site be cleaned and all of the exposed waste materials removed or covered. In April of 1975, the site was inspected again. The final inspection report stated that the area had been cleared and leveled with sufficient final cover. No evidence existed of any former refuse protrusion. Much of the scrap metal was recovered from the surface of the landfill and sold to salvage dealers. Other waste may have been buried at this site or relocated to another landfill; probably Landfill No. 6. The barrel storage area was relocated inside the DPDO storage yard (fenced area). Soil cover was applied and the area was reseeded with grass. The face of the landfill which approaches the stream bed was covered, graded and the stream bed was cleared of debris. During a recent inspection of the landfill, the area was found to be well vegetated and no evidence of surface refuse could be seen. A section of the DPDO storage yard, located within fenced confines, now extends over a portion of the closed landfill.

Landfill No. 3

Landfill No. 3 is located in an area adjacent to and under the Defense Access Highway, outside the main entrance to the base. The landfill comprised approximately a four acre rectangular area west of the McGuire AFB trailer park (Figure 4.7). The landfill was operated between 1956 and 1957. Wastes were buried in a large hole, 18 to 20 feet deep, extending into the water table. No burning occurred at the landfill. Previous landfill operators stated that general base refuse as well as drums of miscellaneous industrial chemicals were buried within the landfill. It is suspected that the wastes which were buried

FIGURE 4.7



McGUIRE AFB
LANDFILL NO. 3

SOURCE: McGUIRE AFB INSTALLATION DOCUMENTS

in the area were partially removed to prepare a suitable roadbed for the highway. When the site was recently inspected, the areas adjacent to the highway were found to be heavily vegetated with underbrush and small trees.

Landfill No. 4

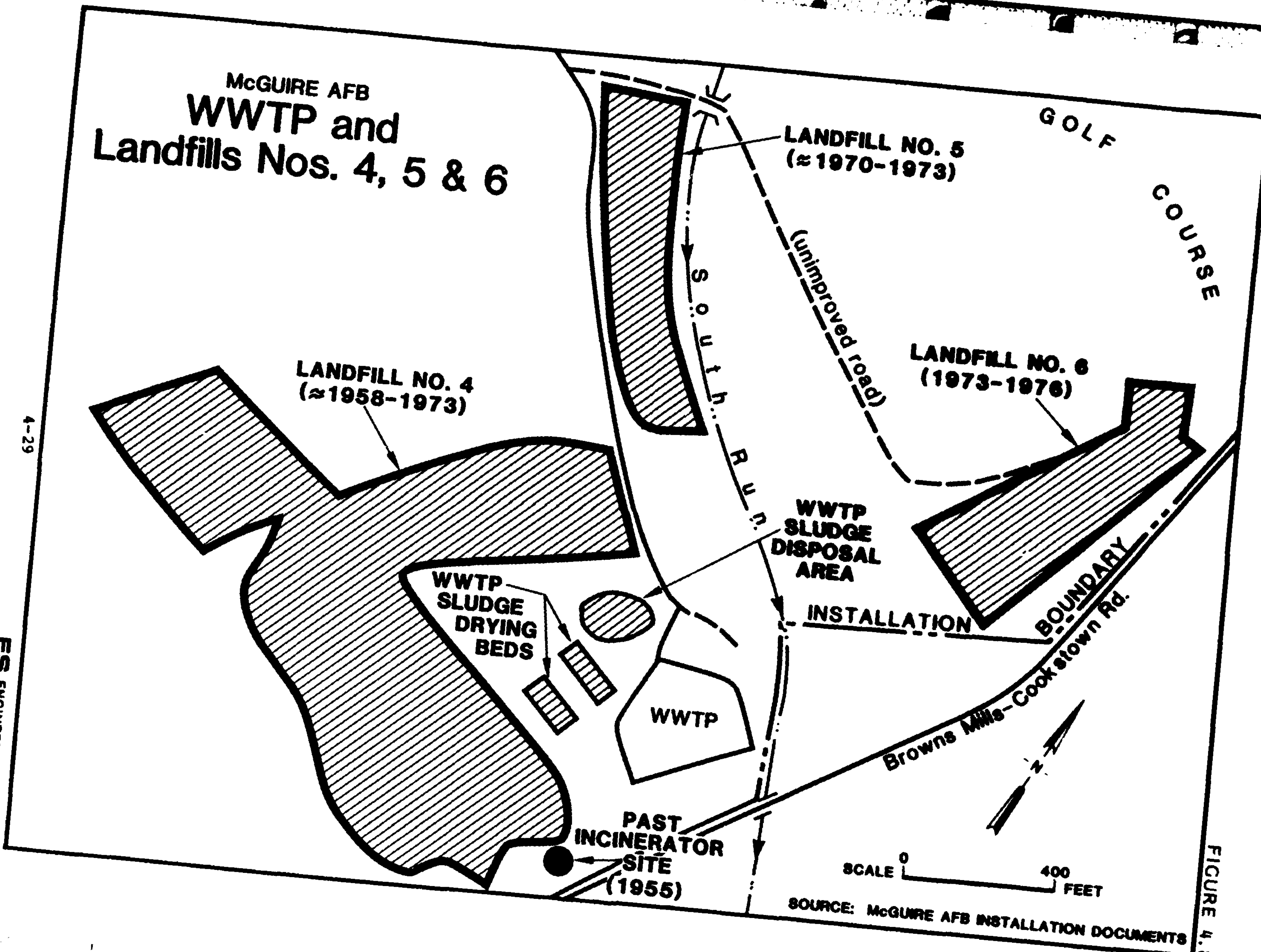
Landfill No. 4 is a long irregularly shaped 18 acre site located near the northeast end of the main runway (Figure 4.8). Disposal operations began in this area about 1958 and continued to the early 1970's. Fill operations began in the southernmost section of the landfill (now a portion of the EOD training area). Operations expanded to the west toward the main runway. By 1968, the section west of the wastewater treatment plant was actively used for landfilling. The landfill was operated primarily in a trench and fill manner. Trenches were approximately 15 feet deep and extended into the water table. No burning occurred in this landfill. Wastes which were cited as being disposed of within this area included general refuse, coal ash and miscellaneous industrial chemicals, some in 55 gallon drums. A few empty 55 gallon drums were observed in a drainage swale which bisected a portion of the landfill. The site has been closed; however, furrows in the land are still evident indicating the location and orientation of the trenches (see photographs Appendix F). The site has been covered with a sandy soil supporting local grasses.

Landfill No. 5

Landfill No. 5 was operated from about 1970 to 1973, simultaneous to the latter phase of Landfill No. 4 activity. The landfill comprised a long narrow parcel of land approximately three acres, located between a road leading up to the wastewater treatment plant and the bank of South Run Creek (Figure 4.8). This landfill was primarily used for the disposal of coal ash, wood and metal wastes; however, it was indicated by landfill personnel that waste chemical compounds may have been occasionally disposed of in this landfill. Waste materials were routinely burned to reduce volume. The site has been covered and presently supports grass, and shrub vegetation.

Landfill No. 6

Landfill No. 6 was the last landfill operated on McGuire AFB. Operation of the landfill occurred between 1973 and 1976. The landfill


McGUIRE AFB
WWTP and
Landfills Nos. 4, 5 & 6
GOLF COURSE
LANDFILL NO. 5
(≈1970-1973)
(unimproved road)
South Run
LANDFILL NO. 6
(1973-1976)
LANDFILL NO. 4
(≈1958-1973)
WWTP
SLUDGE
DISPOSAL
AREA
WWTP
SLUDGE
DRYING
BEDS
WWTP
INSTALLATION BOUNDARY
Browns Mills-Cookstown Rd.
N
PAST
INCINERATOR
SITE
(1955)
SCALE 0 400 FEET
SOURCE: McGUIRE AFB INSTALLATION DOCUMENTS
FIGURE 4.8

covers approximately 4.5 acres situated on the north side of the wastewater treatment plant along the eastern boundary of the base (Figure 4.8). The South Run Creek skirts the southern side of the landfill. Landfill operations involved trench and fill techniques. The depth of the trenches was estimated at fifteen feet and was described to have extended into the water table. The landfill was primarily used to dispose of general refuse generated on the base. During the period when landfill No. 6 was active, there were several programs established to collect and dispose of hazardous industrial chemicals. Therefore, there is little likelihood that significant quantities of industrial chemicals were disposed of in this landfill. No burning occurred at Landfill No. 6. The landfill was used from 1976 to 1981 as a Civil Engineering storage area for various types of equipment and materials. At the time of the site visit, a project was underway to add additional cover to the landfill. The site was level with a significant amount of exposed soil and only sparse vegetation along its fringes. No protruding wastes were observed.

Refuse Incineration

During 1955, the base burned some of its refuse in an incinerator constructed southeast of the wastewater treatment plant (Figure 4.8). The incinerator received general refuse for a period of approximately six months, after which its use was discontinued and later reinstated for a few additional months. The incinerator was eventually dismantled, leaving only the slab foundation.

Another incinerator system was installed in January of 1980 to burn trash from incoming overseas flights which included paper, plastic bags, food and other miscellaneous items. The incinerator is operated by Fleet Services and is located at Facility 2103 northwest of the power plant (refer to Figure 4.3).

Wastewater Treatment Plant

Wastewater has been treated on base since 1953 by a single stage trickling filter system. The treated effluent from this system is discharged into South Run Creek. The treatment plant (Bldg 1512) is located along the eastern corner of the base between Landfills No. 4 and No. 6 (refer to Figure 4.6).

Sludge from the wastewater treatment plant is anaerobically digested then dewatered in sludge drying beds. After dewatering, the sludge has been hauled to the Fort Dix landfill for disposal. Between 197C and 1980 a sludge disposal area located to the northwest of the sludge drying beds was used to dispose of excess sludge (Figure 4.8). In 1981, a portion of the sludge disposal area was closed and the sludge was hauled to the Fort Dix landfill. A large mound of sludge still remains in the area, and is presently covered with dense vegetation. The drying beds have underdrains to collect and recycle most water. There were no liners constructed under the drying beds or in the sludge disposal area. In 1981, detailed analyses of the sludge and of the leachate from the sludge (EP leachate procedure) were performed. Based on these sludge analyses, heavy metals concentrations in the sludge were found to be minimal. Limited concentrations of PCB's (2 ppm), cyanide (0.8 ppm), phenol (2.95 ppm), and TCE (0.987 ppm) were measured in the sludge; however, the concentrations of these contaminants in the leachate was minimal (PCB - 0.032 ppm, cyanide - 0.0045 ppm, phenol - 0.032 ppm, and TCE - 0.00065 ppm). In subsequent analyses for PCB's, one analysis indicated concentrations between 2 and 5 ppm, while the second analysis indicated concentrations below 1 ppm.

Storm Drainage System

The storm drainage system on McGuire AFB consists primarily of concrete conduits and open drainage channels which flow into North Run or South Run Creeks, with a few small drainage systems leading to tributaries of Rancocas Creek. During the period 1947 through the late 1960's, several washrack operations on base discharged mixtures of waste chemicals, detergents, metal brighteners and washwater into the storm drainage system without treatment. During the late 1960's, oil/water separators were installed at each washrack facility and the effluent from each separator was discharged into the sanitary sewer system.

Several areas on base were cited in a 1964 report by the New Jersey Division of Fisheries, Game and Wildlife for discharging wastes into the storm drainage system. These areas included the main aircraft washrack, Building 2240, the Engine Buildup Shop steam cleaning facility near Building 1801, and the main heating plant coal storage area washdown.

The discharges into the storm drainage system have been connected to either an oil/water separator system, the sanitary sewer system or the operation has since been discontinued.

In 1977, the base constructed a large oil separator basin to treat surface drainage before discharging to South Run Creek. The system has been designed to prevent the release of spills or accidental discharges of fuels and oils.

Miscellaneous Disposal Areas

Drummed Waste Oil Burial Area

A drummed waste burial area is suspected to exist under the paved lot of the CE compound (refer to Figure 4.6). Around 1950, approximately fifty 55-gallon drums containing waste oils (heavy) were reported by an equipment operator to have been buried about six feet below the surface. It is not known if these drums were later removed or if they are still present.

Non-Destructive Inspection (NDI) Shop

During the 1960's, waste chemicals from the NDI Shop (Bldg 1623) were discharged into a depressed grassy area located adjacent to the building (refer to Figure 4.6). The waste chemicals were comprised of emulsifiers, penetrants and developer solutions used in the NDI tests. Approximately 55 gallons of waste chemicals were drained into the area every 18 to 20 months and either percolated into the soil, evaporated or entered the runoff into the nearby storm drainage system as runoff.

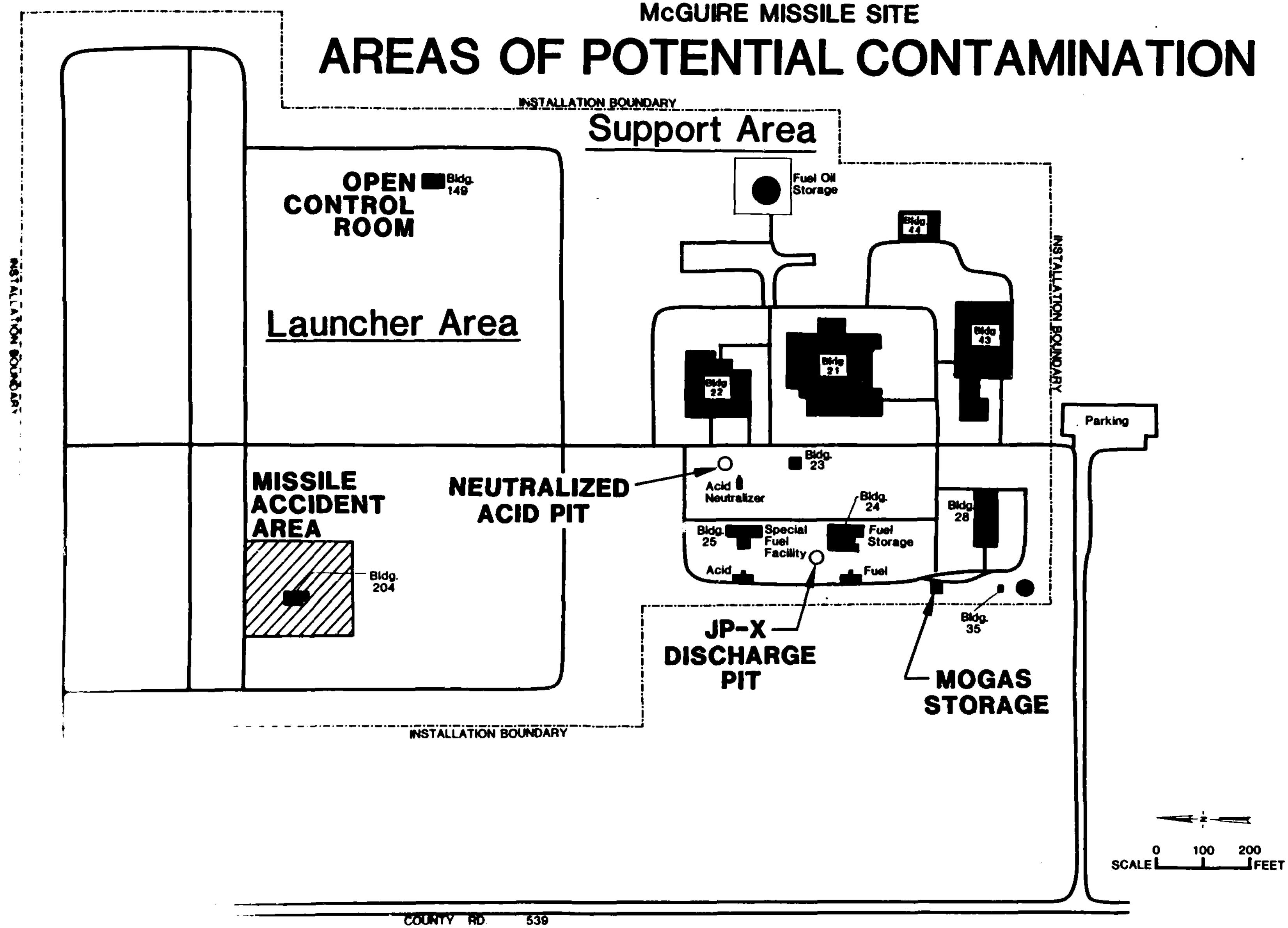
McGUIRE MISSILE SITE (BOMARC)

The McGuire Missile Site (BOMARC) is located on the Fort Dix Military Reservation approximately 11 miles to the east of McGuire AFB (refer to Figure 2.2) on the east side of N.J. Route 539. The site is comprised of 219 acres, divided into two separate areas; a launcher area on the northern side of the site housing the individual launch shelters and related facilities, and a support area on the southern portion of the site which contains the missile fueling, maintenance, power generation and administrative facilities (Figure 4.9). The missile site, which was constructed in the mid 1950's, is on Fort Dix property that has been leased to McGuire AFB. It was the operational site of the 46th Air Defense Missile Squadron (ADMS) and initially housed 56 liquid

FIGURE 4.9

McGUIRE MISSILE SITE

AREAS OF POTENTIAL CONTAMINATION



ATION DOCUMENTS

NOTE: LAUNCHER AREA CONTAINS 84 LAUNCHER BUILDINGS.

fueled BOMARC missiles. In the early 1960's the launch area was expanded and launchers for 28 solid fuel BOMARC missiles were added at the northern end of the launch area. In the early 1970's the missiles became obsolete and the site was deactivated in 1972. Although the missiles and warheads were removed in 1972, other facilities were left in place and McGuire AFB continues to provide security and maintenance for the facility.

The McGuire Missile site has two deep wells located in the southwest corner near Building 35. The wells were used to supply water for the installations. Water treatment consisted of chlorination provided in Building 35, after which the water was stored in a tank adjacent to the water treatment building. Sanitary wastewater was directed to a leach field located to the southeast of Building 43.

Several industrial operations occurred in the support area of the missile site. These activities included missile fueling and defueling, missile maintenance, power production and general maintenance support functions.

Facilities associated with the missile fueling and defueling activities included fuel storage, spill control and decontamination facilities for the two fuel components used for the liquid fueled missiles. These fuel components were nitric acid and JP-X (60% JP-4 and 40% hydrazine). Nitric acid was stored in four tanks located in a below ground sump adjacent to Building 25. JP-X was stored in six below ground tanks adjacent to Building 24. Sumps to collect spilled fuels were provided at the fuel transfer stations adjacent to each building. Acid fuel spills were directed to the acid neutralizer, a concrete basin containing limerock. The effluent from the acid was pumped to the neutralized acid pit, a brick lined, three foot diameter well which extended at least 20 feet below grade (Figure 4.9). The base of the well was exposed to the earth and allowed for the percolation of liquid wastes entering the pit. The JP-X fuel spills were directed to a similarly constructed pit located adjacent to Building 24 and also allowed to percolate into the ground.

Fueling and defueling of the missiles normally occurred in conjunction with most missile maintenance activities. Prior to servicing, a missile would be defueled in the launch area using a fueling vehicle.

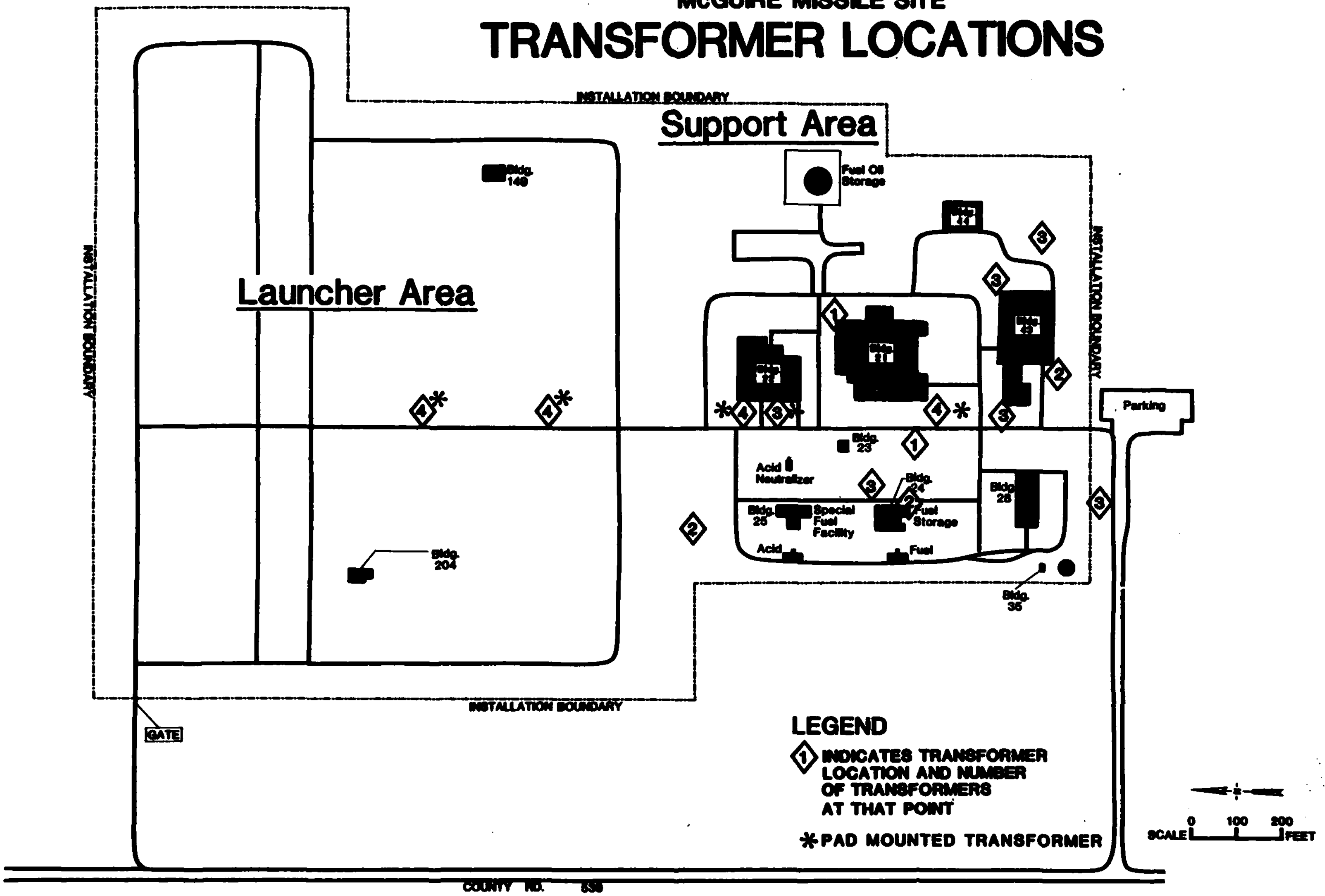
The fuel was then hauled to the fueling facilities and unloaded into the storage tanks. The missile was then hooked to the fueling facilities and the fuel residues were rinsed out of the missile using hot water for the acid tanks and a soap solution for the JP-X tanks. These rinse solutions were flushed to the respective waste sumps. Minor spills (1-2 gallons) were reportedly common when the missiles were being fueled or defueled in the launcher area and when fuel was transferred to and from the storage tanks. At least one large spill occurred (50 gallons) when an acid fuel line broke. Normal clean-up procedure was to wash the spill area down with a large quantity of water.

Power generation for the McGuire Missile Site was provided by diesel generators located in Building 22. The fuel supply was stored in three below-ground fuel storage tanks located adjacent to Building 22 and a 840,000 gallon above-ground bulk fuel storage tank located on the east side of the support area. The above-ground tank was diked to contain any potential spills. During a previous site inspection conducted by the Air Force, it was found that approximately 24,000 gallons of diesel fuel had been left in the three below-ground tanks adjacent to the power plant and approximately 40,000 gallons of fuel oil had been left in the above-ground bulk tank. In addition, approximately 200 gallons of Mogas had been left in two underground 500 gallon storage tanks located adjacent to Building 35. The diesel fuel and 10,000 gallons of fuel oil were removed from the site in August 1982 and taken to McGuire AFB to be burned in the steam plant. To date the Mogas and the remaining 30,000 gallons of fuel oil have not been removed from the McGuire Missile Site.

Power was distributed through transformer banks located throughout the installation (Figure 4.10). Two transformer banks containing a total of seven transformers were located adjacent to Building 22. One bank of four transformers was located adjacent to Building 21 and two banks of four transformers each were located in the launcher area. Additionally, there were eight large pole mounted transformers and 17 small pole mounted transformers located in the support area. At the time the site was decommissioned, none of the transformers were removed. One pad of four transformers located in the launcher area was found empty and the soil around the pad was stained with oil. Based on the

FIGURE 4.10

McGUIRE MISSILE SITE
TRANSFORMER LOCATIONS



SOURCE: McGUIRE AFB INSTALLATION DOCUMENTS

density of the oil listed on the transformer nameplates, the fluid was not a PCB oil. Six of the seven transformers by the power plant, Building 22, were also empty. The oil from the one transformer which still contained fluid had been previously tested by the Air Force and found to contain 23 ppm of PCB's. A pole mounted transformer at the northwest corner of Building 43 was found lying empty on the ground during a recent site inspection. There was no indication of the type of oil in this transformer. It is not known whether any of the additional transformers located throughout the site still contain oil and, if so, whether any of these oils might contain PCB's.

At the time the site was decommissioned all of the missiles were removed from the launch shelters; however, the launchers were left inside each shelter. The hydraulic system associated with each of the launchers had a 200 gallon reservoir. Most of the launcher buildings were sealed closed to prevent entry, however, one launcher shelter (Building 149) was found having an open door to the room containing the launcher hydraulics. An examination of the system revealed that the hydraulic fluid had not been removed from the launcher system and had since leaked into the concrete sump below the floor of the room. It is presumed that other launcher systems may be in the same condition. Most hydraulic fluids used for these types of systems do not contain PCB's; however, no analysis of the fluid has been conducted to confirm the presence of PCB's.

An accident occurred in the launcher area in 1960 which involved a fire in one of the missile launcher shelters (Building 204). The missile and its warhead burned. During the fire fighting effort, plutonium residue was swept out of the launcher building with the water used for extinguishing the fire. As a result, the area around the launcher was contaminated with plutonium. In 1961, the contaminated area was covered with a concrete pad or asphalt to contain the released radioactive materials.

Since the missile accident, twelve radiation surveys have been conducted in the launcher area, in the vicinity of the launcher area and downwind of the site. Based on these surveys, the majority of the plutonium residue was contained in the areas where the concrete and asphalt covers were placed after the accident. Radiation levels measured in other areas were well below those considered to be hazardous to personnel and warranting decontamination.

The concrete pad in front of the launcher has weathered and, at the time of the site inspection, vegetation was observed in the expansion joints. A restoration project is underway to remove the vegetation and seal the joints.

EVALUATION OF PAST DISPOSAL ACTIVITIES AND FACILITIES

The review of past operation and maintenance functions and past waste management practices at McGuire AFB and the McGuire Missile Site has resulted in the identification of 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 not having a potential for contamination were deleted from further consideration. Those sites which were considered as having a potential for the occurance of contamination and migration of contaminants were further evaluated using the Hazard Assessment Rating Methodology (HARM). Table 4.3 identifies the decision tree logic used for each of the areas of initial concern.

Through the decision tree logic eight of the 29 sites originally reviewed were not considered to warrant evaluation using the Hazard Assessment Rating Methodology. The rationale for omitting these eight sites from HARM evaluation is described below. Landfill No. 1 was not considered to be contaminated because the wastes buried in the landfill were reported to have been removed and only minor quantities of chemical wastes would have been disposed at this site. The JP-4 Spill Site No. 1 occurred more than twenty years ago and the fuel was displaced over such a vast area that it is highly unlikely any significant residuals would still be detectable from this spill. The JP-4 Spill Site No. 2 involved

TABLE 4.3
SUMMARY OF DECISION TREE LOGIC FOR AREAS OF INITIAL ENVIRONMENTAL CONCERN AT MCGUIRE AFB

Site Description	Potential For Contamination	Potential For Contaminant Migration	Potential For Other Environmental Concern	Refer to Base Environmental Programs	HARM Rating
Landfill No. 1	Yes	No	No	N/A	No
Landfill No. 2	Yes	Yes	N/A	N/A	Yes
Landfill No. 3	Yes	Yes	N/A	N/A	Yes
Landfill No. 4	Yes	Yes	N/A	N/A	Yes
Landfill No. 5	Yes	Yes	N/A	N/A	Yes
Landfill No. 6	Yes	Yes	N/A	N/A	Yes
Fire Protection Training Area No. 1	Yes	Yes	N/A	N/A	Yes
Fire Protection Training Area No. 2	Yes	Yes	N/A	N/A	Yes
Fire Protection Training Area No. 3	Yes	Yes	Yes	Yes	Yes
DPDO Storage Facility - Spill Site	Yes	Yes	N/A	N/A	Yes
Hazardous Waste Storage Facility - PCB Spill Site	Yes	Yes	Yes	Yes	Yes
JP-4 Spill Site No. 1	Yes	No	No	N/A	No
JP-4 Spill Site No. 2	Yes	No	No	N/A	No
Entomology Shop Equipment Wash Area, Building 3450	Yes	Yes	Yes	Yes	Yes
Past Entomology Shop Equipment Wash Areas	Yes	No	No	No	No
NDI Shop Drain Field	Yes	Yes	No	N/A	Yes
Battery Shop Neutralization Pit	Yes	No	Yes	Yes	No
Wastewater Treatment Plant Sludge Disposal Areas	Yes	Yes	No	N/A	Yes
Bulk Fuel Storage Tank Disposal Areas	Yes	Yes	No	N/A	Yes
Coal Storage Area	Yes	No	No	N/A	No
Buried Drums Containing Waste Oil	Yes	Yes	No	N/A	Yes
Old Refuse Incinerator	No	No	No	N/A	No
Fleet Services Incinerator	No	No	Yes	No	No
McGuire Missile Site Accident Area	Yes	Yes	No	N/A	Yes
McGuire Missile Site Transformer Locations	Yes	Yes	No	N/A	Yes
McGuire Missile Site BOMARC Launcher Hydraulic Systems	Yes	Yes	No	N/A	Yes
McGuire Missile Site Mogas Tanks	Yes	Yes	No	N/A	Yes
McGuire Missile Site JP-X Discharge Pit	Yes	Yes	No	N/A	Yes
McGuire Missile Site Neutralized Acid Pit	Yes	Yes	No	N/A	Yes

3,000 gallons of fuel which were diluted and allowed to evaporate in a grassy area. Only traces of contaminants are expected to remain. The Battery Shop Neutralization Pit is believed to be constructed of concrete and connected to the sanitary sewer. Therefore, no environmental contamination is expected. However, the base should inspect the pit to determine whether replenishment of the limestone is required and to insure that the pit is in good conditions. Areas adjacent to the past Entomology Shops were used for rinsing truck-mounted spray equipment between the early 1950's and the early 1970's. Three areas located within a few hundred yards of each other were used for this purpose. The areas are flat with well drained soils and are not located near streams or drainage ditches. Some trace contaminants may still be present in these soils; however, it is unlikely that migration of these contaminants would still occur from the past practices. The coal storage area was situated on a concrete pad which eliminated the potential for soil contamination. Only slightly detectable levels of contamination are expected to exist as a result of the coal pile runoff which occurred during the period the base used coal to fuel the heating plant (1954-1972). The old refuse incinerator as well as the Fleet Services incinerator now in use have not been used for the disposal of toxic or hazardous waste; therefore, no contamination to the surface or ground- water systems would have occurred.

The remaining 21 sites identified on Table 4.3 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 4.4. The HARM system is designed to indicate the relative need for follow-on action. The information presented in Table 4.4 is intended for assigning priorities for further evaluation of the McGuire AFB disposal areas (Chapter 5, Conclusions and Chapter 6, Recommendations). The rating forms for the individual waste disposal sites at McGuire AFB are presented in Appendix H. Photographs of some of the key disposal sites are included in Appendix F.

TABLE 4.4
SUMMARY OF HARM SCORES FOR POTENTIAL CONTAMINATION SOURCES

Rank	Site Name	Receptor Subscore	Waste Characteristics Subscore	Pathways Subscore	Waste Management Factor	Overall Total Score
1	Landfill No. 4	56	90	74	1.0	73
2	Landfill No. 2	50	60	81	1.0	66
3	Landfill No. 3	67	48	80	1.0	65
4	McGuire Missile Site JP-X Discharge Pit	35	90	53	1.0	59
5	Pesticide Wash Area	55	40	80	1.0	58
6	DPDO Storage Facility	58	54	56	1.0	56
7	Fire Protection Training Area No. 1	36	72	53	1.0	54
8	Bulk Fuel Storage Tank Sludge Disposal Area	52	48	60	1.0	53
9	Landfill No. 5	56	32	67	1.0	52
10	Fire Protection Training Area No. 2	51	48	53	1.0	51
11	Landfill No. 6	51	32	67	1.0	50
11	WWTP Sludge Disposal Areas	51	38	60	1.0	50
11	McGuire Missile Site Transformer Locations	35	60	56	1.0	50
14	Buried Oil Drums	55	32	67	0.95	49
15	Fire Protection Training Area No. 3	36	48	65	0.95	48
16	NDI Shop - Drain Field	47	40	53	1.0	47
17	McGuire Missile Site Accident Area	35	30	80	0.95	46
18	McGuire Missile Site Mogas Storage Tanks	35	48	60	0.95	45
19	McGuire Missile Site BOMARC Laucher Hydraulic Systems	35	40	48	0.95	39
20	McGuire Missile Site Neutralized Acid Pit	35	24	53	1.0	37
21	Hazardous Waste Storage Area - PCB Spill Site	52	60	60	0.10	6

CHAPTER 5

CONCLUSIONS

CHAPTER 5
CONCLUSIONS

The goal of the IRP Phase I study is to identify sites where there is the 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 the assessment of the information collected from the project team's field inspection, 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 McGuire AFB and a summary of HARM scores for those sites.

Landfill No. 4

Landfill No. 4 has a high potential for environmental contamination. The landfill was utilized to dispose of the general refuse generated at the base as well as coal ash, miscellaneous chemicals and other scrap during the late 1950's until the early 1970's. Trench and fill procedures were used and no burning occurred within this landfill. The trenches were reported to have extended into the water table. Landfill No. 4 is located in an area whose geology is dominated by the Kirkwood Formation, a fine grained sand and silt of moderate permeability. Ground water is usually present at shallow depth (6 to 10 feet) and may flow in multiple directions beneath the site (east and south flows are suggested by site topography). The site has been closed and covered with sandy soil. Shallow furrows and the uneven distribution of vegetation highlight the location and orientation of the old trenches. Landfill No. 4 received a HARM score of 73.

Landfill No. 2

Landfill No. 2 has a high potential for environmental contamination. The landfill was active between 1950 and 1956 and received general refuse generated on the base, as well as waste chemicals, coal

TABLE 5.1
PRIORITY RANKING OF POTENTIAL CONTAMINATION SOURCES
McGUIRE AFB

Rank	Site Name	Date of Operation or Occurence	Overall Total Score
1	Landfill No. 4	1958-1973	73
2	Landfill No. 2	1950-1956	66
3	Landfill No. 3	1956-1957	65
4	McGuire Missile Site JP-X Discharge Pit	1958-1972	59
5	Pesticide Wash Area	1974-present	58
6	DPDO Storage Facility	1960-1979	56
7	Fire Protection Training Area No. 1	Late 1940's - 1958	54
8	Bulk Fuel Storage Tank	1963-1970	53
9	Landfill No. 5	1970-1973	52
10	Fire Protection Training Area No. 2	1958-1968	51
11	Landfill No. 6	1973-1976	50
11	WWTP Sludge Disposal Areas	1953-present	50
11	McGuire Missile Site - Transformer Locations	1958-present	50
14	Buried Oil Drums	Early 1950's	49
15	Fire Protection Training Area No. 3	1973-1976, 1982	48
16	NDI Shop - Drain Field	1960's-1972	47
17	McGuire Missile Site Accident Area	1960	46
18	McGuire Missile Site Mogas Storage Tanks	1958-present	45
19	McGuire Missile Site BOMARC Launcher Hydraulic Systems	1958-present	39
20	McGuire Missile Site Neutralized Acid Pit	1958-1972	37
21	PCB Spill Site	1982	6

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

ash and other miscellaneous scrap materials. Operation of the landfill included trench and fill procedures with daily burning to reduce the waste volume. The bottom of the trenches extended into the water table. In 1975, the U.S. EPA inspected the site and requested that the base clean up the landfill and surrounding areas. The clean-up activities included the removal of a DPDO waste drum storage area; removal of all protruding waste materials including drums, tanks and other scrap metal items; grading, recovering and reseeding the landfill. Landfill No. 2 is bisected by the mapped unit contact dividing the Kirkwood Formation and the Cohansey Sand. The Kirkwood, underlying the north half of the site is composed of moderately permeable fine-grained sand and silt. The Cohansey Sand is a highly permeable medium to coarse grained sand underlying the south half of the landfill. Ground-water flow beneath the site is probably north toward South Run, at shallow depths (10 to 15 feet); however, this is unconfirmed. A deep well used for potable water supply at McGuire AFB is situated within fifty feet of the landfill. Landfill No. 2 received a HARM score of 66.

Landfill No. 3

Landfill No. 3 has a high potential for environmental contamination. The landfill, utilized between 1956 and 1957, is located on the northeast portion of the base directly west of the trailer park. The landfill was described as a large pit filled with wastes. These wastes were comprised of general refuse, waste chemicals, coal ash and other scrap materials. The pit extended into the water table. North Run Creek is located less than 100 feet south of the fill area. Since the closure of the landfill, a highway was constructed which bisected the old fill area. It is suspected that some of the wastes buried in the area were removed to prepare a suitable roadbed. Site geology is dominated by the Kirkwood Formation, a moderately permeable fine sand and silt. Ground-water flow beneath the facility probably moves toward the east, south and southwest, toward North Run at shallow depth (10 to 15 feet). Landfill No. 3 received a HARM score of 65.

JP-X Discharge Pit - McGuire Missile Site

The JP-X discharge pit at the McGuire Missile Site has a moderate potential for environmental contamination. The pit was used to collect spilled JP-X from the fueling and defueling operations conducted in the support area of the missile site. The dilute fuels which were washed into the pit were allowed to percolate into the ground. Area geology is characterized by the highly permeable Cohansey Sand, composed of medium to coarse grained sand. Ground water occurs at approximately twenty feet below ground surface; existing flow directions are unconfirmed. This site received a HARM score of 59.

Pesticide Equipment Wash Area

The pesticide equipment wash area located along the driveway adjacent to the Entomology Shop (Building 3450) has a high potential for contributing to the migration of low level pesticide contaminants into the surface drainage system of the base. Since 1974, pesticide application equipment has been washed and rinsed along the Building 3450 driveway situated adjacent to one of the surface drainage ditches which flow through the base. In March 1982, soil and sediment samples collected from the ditch and adjacent areas contained long residual pesticides at low to moderate levels. The site geology is characterized by the Cohansey Sand, a highly permeable medium to coarse-grained sand. Ground water is usually present at shallow depth (10 to 15 feet). Ground-water flow directions beneath this site are uncertain. The pesticide wash area received HARM score of 72.

DPDO Storage Facility

The DPDO Storage Facility has a moderate potential for environmental contamination. A portion of the site is situated on the surface of Landfill No. 2 and the remainder of the site is situated on an area adjacent to the landfill. There are three areas associated with the DPDO facility which may have contributed some degree of contamination: leakage from the drum storage area, leakage from the storage of transformers and spillage from the underground waste oil storage tank fill line. The drum storage area has since been cleaned up and the transformers have been removed and are no longer stored at the site. The underground waste oil storage tank has been out of service since 1979. The facility is underlain by the highly permeable Cohansey Sand, a medium to coarse grained material. Ground-water flow below the site is most probably north to North Run at shallow depth (10 to 15 feet). Some ground-water flow may also occur in a southerly direction (assessment based on surface topography and surface water flow). The DPDO facility is located within 50 feet of a deep well used to supply potable water to the base. A HARM score of 56 was determined for the DPDO facility.

Fire Protection Training Area No. 1

Fire Protection Training Area No. 1 has a moderate potential for environmental contamination. Training exercises were conducted in this area from the late 1940's until 1958. Various waste oils and other combustable waste chemicals were stored in 55 gallon drums adjacent to the training area and used for fuel during exercises. The burn area did not have a liner system nor was there any pre-application of water to inhibit the percolation of waste chemicals into the soil. The site is underlain by the highly permeable Cohansey Sand, consisting of medium to coarse-grained sand. Ground-water flow is uncertain and probably occurs in shallow depth (10 to 15 feet). The site received a HARM score of 54.

Bulk Fuel Tank Farm

Sludge generated from the periodic cleaning of the fuel storage tanks was buried in holes dug within the diked areas surrounding the bulk fuel storage tanks. The bulk fuel tank farm is underlain by the highly permeable Cohansey Sand. Ground water is present at shallow depth (10 to 15 feet). Ground-water flows are probably complex, both north and south in the general direction of South Run and its major unnamed tributary. The area is considered to have a moderate potential for environmental contamination and received a HARM score of 53.

Landfill No. 5

Landfill No. 5 has a low potential for environmental contamination. The landfill is situated on a long narrow strip of land between South Run Creek and the road leading to the WWTP. This landfill was primarily used for the disposal of coal ash, and wood and other scrap wastes. Some miscellaneous chemicals may also have entered the landfill. Operation of Landfill No. 5 overlapped with the latter period of operation of Landfill No. 4. Burning was a routine practice for operating Landfill No. 5. The site is underlain by the moderately permeable Kirkwood Formation fine sands and silt. Ground-water flow is probably east toward South Run, occurring at relatively shallow depth (6 to 10 feet). Landfill No. 5 received a HARM score of 52.

Fire Protection Training Area No. 2

Fire Protection Training Area No. 2 has a low potential for environmental contamination. The training area was situated south of the primary runway directly east of Power Check Pad 1148. Only JP-4 had been burned during training excercises. The burn area was soaked with water prior to the application of fuel so as to prevent any excess percolation of the fuel. This site is underlain by the highly permeable Cohansey medium to coarse sands. Ground water occurs at shallow depths; flow directions are uncertain. Fire Protection Training Area No. 2 received a HARM score of 51.

Landfill No. 6

Landfill No. 6 has a low potential for environmental contamination. The landfill is situated along the eastern boundary of the base on the north side of South Run Creek. Wastes were buried in trenches which extended into the water table. Landfill No. 6 was used for the disposal of general refuse generated at McGuire AFB between 1973 and 1976. Only small quantities of chemical wastes are suspected to have been disposed of in this landfill. A program to increase the cover on the landfill is presently underway. This site is underlain by the moderate permeable Kirkwood fine sands and silt. Ground-water flow is probably directed to the southwest to South Run at shallow depth (6 to 10 feet) below grade. The site received a HARM score of 50.

Wastewater Treatment Plant Sludge Disposal Areas

The wastewater treatment plant sludge disposal areas have a low potential for environmental contamination. The wastewater treatment plant receives both domestic and industrial wastewater from the facilities located throughout McGuire AFB. The sludge generated at the WWTP has been dewatered in sludge drying beds and transported by truck to the Fort Dix landfill. On occasion excess sludge beyond the capacity of the drying beds was produced at the WWTP. When this occurred, the sludge was stored in an area adjacent to the WWTP. The sludge disposal areas are underlain by the moderately permeable Kirkwood fine sands and silt. Ground water occurs at relatively shallow depth (6 to 10 feet); flow is probably east to South River. The WWTP sludge disposal areas received a HARM score of 50.

Transformers - McGuire Missile Site

Several transformers were left at the McGuire Missile Site after the site was decommissioned in 1972. Some of the transformers were found empty, others were found to have leaked oil around the pad on which they were situated, and others were intact and still contain fluids. One large transformer which still contained oil was tested and found to contain 23 ppm of PCB's. The transformer sites were considered to be areas having a low potential for environmental contamination. The missile site is underlain by the highly permeable Cohansey Sand. Ground water is estimated to be present at approximately twenty feet below grade; ground-water flow directions are uncertain. These sites received a HARM score of 50.

Buried Oil Drums

The waste burial site located beneath the CE compound storage area is suspected to contain fifty, 55 gallon drums of waste oils. The drums were reported to have been buried at a depth of six feet in the early 1950's. The drum burial site is underlain by the highly permeable medium to coarse Cohansey Sand. Ground water is estimated to be present at shallow depth (10 to 15 feet) below grade. Ground-water flow directions are uncertain. The site received a HARM score of 49 and is considered to have a low potential for environmental contamination.

Fire Protection Training Area No. 3

Fire Protection Training Area No. 3 has a low potential for environmental contamination. The first use of this training area occurred between 1973 and 1976. During this period, fire training excercises were conducted in the area without a liner system or any collection system for residual fluids. The area was not used again until 1982, when the pit had been reconstructed to include a clay liner, fuel distribution system and an oil/water separator. JP-4 has been the only fuel source used at this training area. This site is underlain by the highly permeable Cohansey medium to coarse sands. Ground water occurs at relatively shallow depth (10 to 15 feet); flow directions are unknown. Fire Protection Training Area No. 3 received a HARM score of 48.

NDI Shop - Drain Field

The NDI shop drain field was found to have a low potential for environmental contamination. From the early to mid 1960's until 1972, chemical wastes generated at the shop were drained to a depressed grassy area adjacent to the facility. The NDI Shop is underlain by the highly permeable Cohansey medium to coarse sands. Ground water occurs at relatively shallow depth (10 to 15 feet) below the site. Ground-water flow directions are uncertain. The site received a HARM score of 47.

Accident Area - McGuire Missile Site

An accident occurred in the launcher area of the McGuire Missile Site in 1960 in which a missile caught fire and burned. As a result the area in and around the launcher building was contaminated with plutonium residue which escaped during the fire fighting operations. The missile site is underlain by the highly permeable Cohansey Sands. Ground water is estimated to be present at approximately twenty feet below grade. Flow directions are not known. In 1961, the contaminated area was covered with concrete or asphalt to contain the released radioactive materials. The contaminated areas have been fenced to prevent access and routine monitoring has been conducted to determine the radiation levels. Since the contamination has been contained and the area designated off-limits, the site has a low potential for additional environmental contamination. The accident site received a HARM score of 46.

Mogas Storage Tanks - McGuire Missile Site

Two 500-gallon underground Mogas storage tanks at the McGuire Missile Site were abandoned in 1972 with approximately 200 gallons of fuel left in the tanks. The tanks are situated near the water treatment building. The missile site is underlain by the highly permeable Cohansey sands. Ground water is estimated to be present at approximately twenty feet below grade. Flow directions are not known. These tanks pose a low potential for environmental contamination. A HARM score of 45 was determined for this site.

BOMARC Missile Launchers - McGuire Missile Site

The 84 missile launcher systems in the launcher buildings at the McGuire Missile Site are suspected to contain hydraulic fluids. Each launcher facility had a 200 gallon hydraulic fluid reservoir. Only one of the launcher buildings was accessable during the site visit. An examination of this building revealed that the hydraulic fluid had leaked into the concrete sump below the floor of the room. The missile site is underlain by the highly permeable Cohansey Sands. Ground water is estimated to be present at approximately twenty feet. These sites were found to have a low potential for environmental contamination. A HARM score of 39 was determined for the launcher facilities.

Neutralized Acid Pit - McGuire Missile Site

The neutralized acid pit at the McGuire Missile Site was determined to have a low potential for environmental contamination. The pit was used as the final receptor for acid fuel spills which occurred in the vicinity of the missile fueling facility. Acid spills were first directed to a concrete pit containing limerock to neutralize the acid. The liquid was then pumped to the neutralized acid pit where it was allowed to percolate into the ground. The missile site is underlain by the highly permeable Cohansey Sands. Ground water is estimated to be present at approximately twenty feet. Flow directions are not known. The site received a HARM score of 37.

PCB Spill Site

The PCB Spill Site located adjacent to the Hazardous Waste Storage Facility has a low potential for environmental contamination. In January 1982, 75 to 200 gallons of PCB transformer oil were spilled on the ground during an electrical transformer salvage/removal operation. This site is underlain by the highly permeable medium to coarse-grained Cohansey Sands. Ground water is estimated to be present at relatively shallow depth (10 to 15 feet) below grade. Ground-water flow is suspected to be in an easterly direction, toward the tributary of South Run. Immediate response measures were conducted which included containing and cleaning up the spill area. The contaminated soils were excavated and disposed of as hazardous wastes. Soil samples were collected at the lower extent of the excavation. All of the samples were found to contain less than 7.5 ppm of PCB's. The spill site received a HARM score of 6.

SECTION 6
RECOMMENDATIONS

CHAPTER 6
RECOMMENDATIONS

To aid in the comparison of the 22 sites on McGuire AFB and the McGuire Missile Site with those sites identified in the IRP at other Air Force Bases, a Hazard Assessment Rating Methodology (HARM) was used. Of primary concern are those sites with a high potential for environmental contamination. These sites require further investigation in Phase II. Sites of secondary concern are those with moderate potential for environmental contamination. Further investigation at these sites is also recommended. No further monitoring is recommended for those sites with low potential for environmental contamination, unless other data collected indicate a potential problem could exist at one of these sites.

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

The recommended monitoring effort summarized on the following table focuses on the shallow aquifer zone as the subsurface environment of primary interest. The monitoring of deeper zones is not recommended at this time, as it is unlikely deeper aquifers will show detectable concentrations of contaminants. Also, this approach helps to control monitoring costs and emphasizes study of the zone in which contamination would reasonably be expected to first appear.

A larger-than-normally expected number of wells are specified for utilization at Landfills 4 and 2 and the Bulk Fuel Storage Tank Farm. Additional monitoring wells may be required at these facilities in order to satisfy the following conditions:

TABLE 6.1
RECOMMENDED MONITORING PROGRAM FOR PHASE II
McGUIRE AIR FORCE BASE

Site	Rating Score	Recommended Monitoring
Landfill No. 4	73	Install two upgradient and six down-gradient ground-water monitoring wells around Landfill No. 4. Wells should be constructed of Schedule 40 PVC, screened into the top of the water table (10'to 15' deep.) Sample wells and analyze for the parameters in List A, Table 6.2.
Landfill No. 2	66	Install one upgradient and four down-gradient ground-water monitoring wells around Landfill No. 2. Wells should be constructed of Schedule 40 PVC, screened into the top of the water table (10' to 15' deep). Sample wells and analyze for the parameters in List A, Table 6.2.
Landfill No. 3	65	Install one upgradient and three down-gradient ground-water monitoring wells around Landfill No. 3. Wells should be constructed of Schedule 40 PVC. Screen in the water table to a depth of 30 feet. Sample and analyze for the parameters in List A, Table 6.2.
JP-X Waste Pit - McGuire Missile Site	59	Install one upgradient and three down-gradient ground-water monitoring wells around the JP-X waste pit. Wells should be constructed of Schedule 40 PVC, screened into the uppermost portion of the water table (15' to 20' deep). Sample and analyze for total organic carbon, JP-4, hydrazine and oil and grease.
Pesticide Wash Area	58	a) Collect soil samples from three soil borings in the drainage path from the wash area and one control sample outside the affected area. Borings should be 4' deep or until the water table is reached. Collect soil samples at interfaces or regular intervals. A chlorinated hydrocarbon and organophosphate pesticide scan should be performed on the soil samples.

TABLE 6.1 (Continued)

Site	Rating Score	Recommended Monitoring
		b) Collect sediment and water samples from the drainage ditch at three points; adjacent to the Entomology Shop, at the bottom of the shop driveway, and approximately 30 yards downstream of the shop driveway. A pesticide scan should be performed on these samples.
DPDO Storage Facility	55	Collect ten surface soil samples in the storage areas and one control sample from a nearby unaffected area. Analyze samples for parameters in List B, Table 6.2.
Fire Protection Training Area No. 1	54	Install one upgradient and three downgradient ground-water monitoring wells around Fire Training Area No. 1. Wells should be constructed of Schedule 40 PVC, screened into the top of the water table (10' to 15' deep). Sample and analyze for the parameters in List B, Table 6.2.
Bulk Fuel Storage Tank Farm	53	Install one upgradient and five downgradient ground-water monitoring wells around the Bulk Fuel Storage Tank Farm. Wells should be constructed of Schedule 40 PVC, screened into the uppermost portion of the water table (10' to 15' deep). Sample and analyze for JP-4, lead, total organic carbon and oil and grease.

TABLE 6.1 (Continued)

Site	Rating Score	Recommended Monitoring
Buried Oil Drums	49	Conduct metal detection testing to determine if oil drums are buried around the CE shop area.
McGuire Missile Site Accident Area	46	Continue existing radiation monitoring program.
Surface Water		Establish three additional surface water sampling stations along North Run Creek. The stations should be located upstream and downstream of Landfill No. 2 and on the east side of the Defense Access Highway, downstream of Landfill No. 3. Establish four additional surface water sampling stations along South Run Creek. The stations should be located upstream and downstream of the POL bulk fuel storage area, directly downstream of the oil separation basin and just upstream of the WWTP discharge. All of the samples collected from these stations should be analyzed for the parameter in List B, Table 6.2.

- o All three sites are probably located in areas having multiple ground-water flow directions;
- o A sufficient number of wells are required to provide adequate coverage to sites possessing a large down-gradient frontage;
- o Landfill 4 has an unusual site geometry when inspected in plan views and is also located in a topographically complex zone. Additional wells may be required to provide adequate facility monitoring.

RECOMMENDATIONS

1) Landfill No. 4 has a high potential for environmental contamination and monitoring of this site is recommended. A ground-water monitoring system should be established to characterize the ground-water quality and identify any contaminant migration. Two upgradient and six downgradient ground-water monitoring wells should be constructed of Schedule 40 PVC and screened into the top of the water table (10' to 15' deep). The wells should be sampled for the parameters in List A found on Table 6.2.

2) Landfill No. 2 has a high potential for environmental contamination. A ground-water monitoring system should be established to characterize the ground-water quality and identify any contaminant migration. One upgradient, and four downgradient monitoring wells should be installed in the area adjacent to the landfill. The wells should be constructed of Schedule 40 PVC, screened into the top of the water table (10' to 15'deep). Samples collected from these wells should be analyzed for the parameters in List A, Table 6.2.

3) Landfill No. 3 also has a high potential for environmental contamination. A ground-water monitoring program should be developed involving the installation of one upgradient and three downgradient wells. Since the depth of the burial pit ranged between 18 and 20 feet, the wells should be screened in the water table to a depth of 30 feet. The wells should be constructed of Schedule 40 PVC. Samples collected from the wells should be analyzed for the parameters in List A, Table 6.2.

4) The JP-X Discharge Pit located at the McGuire Missile Site has a moderate potential for environmental contamination. The extent of contamination should be determined by installing four monitoring wells in the vicinity of the discharge pit. One well should be positioned

TABLE 6.2
RECOMMENDED LIST OF ANALYTICAL PARAMETERS

LIST A

GC/MS Scan
Total organic carbon
pH
Copper
Zinc
Manganese
Oil and grease
Nickel
Cyanide
Phenol
PCB
Sulfate
Total dissolved solids
Interim Primary Drinking Water Standards (selected list)

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

LIST B

Total organic carbon
pH
Oil and grease
Phenol
PCB
Total dissolved solids
Interim Primary Drinking Water Standards (selected list)

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

upgradient and three wells downgradient of the discharge pit. The wells should be constructed of Schedule 40 PVC and screened into the uppermost position of the water table (15' to 20' deep). Samples collected from the wells should be analyzed for total organic carbon, JP-4, hydrazine and oil and grease.

5) The pesticide wash area has been identified as a source of low level pesticide contaminants in the soils neighboring the Entomology Shop as well as the surface drainage system of the base. A monitoring program for the site is recommended to determine the extent of the contamination. The program should entail the collection of three soil borings within the drainage path of the wash area and one control sample collected in an adjacent area not within the drainage path. The borings should be four feet deep or drilled until the water table is encountered. Soil samples should be collected at the soil interfaces or at regular intervals. The analyses should include a pesticide scan to identify chlorinated hydrocarbon and organophosphate compounds. Additionally, three sediment and surface water samples should be collected from the ditch located adjacent to the wash area. The sampling points should be located adjacent to the wash area, adjacent to the bottom of the driveway and approximately 30 yards downstream from the bottom of the driveway. A pesticide scan should also be performed on these samples. The soil borings should be backfilled with clay at the completion of the sampling program to avoid any potential introduction of contaminants to the surficial aquifer.

6) The DPDO Storage Facility was identified as an area where leakage and spillage had occurred from the storage of waste petroleum products and transformers. This area has a moderate potential for ground-water contamination. To identify the extent of contamination which may have resulted from these leaks and spills, ten surface soil samples should be collected from the storage areas, including areas inside and outside of the fenced DPDO compound. One additional control sample should be collected from a nearby area not suspected to have been contaminated. A water extract of the soil samples should be analyzed for the parameters in List B, Table 6.2. The ground-water monitoring program established for Landfill No. 2 should also serve to detect any

ground-water contamination which may have resulted from the DPDO storage facility.

7) Fire Protection Training Area No. 1 is considered to have a moderate potential for environmental contamination due to the burning of a variety of fuels and liquid combustible wastes. To identify any contamination which may have resulted from these waste materials, one upgradient and three downgradient monitoring wells should be installed around the Fire Training Area. The wells should be constructed of Schedule 40 PVC, screened into the top of the water table (10' to 15' deep). Samples collected from the wells should be analyzed for the parameters in List B, Table 6.2.

8) The POL fuel storage tank farm has a moderate potential for environmental contamination. Sludge from tank cleaning was disposed of in pits in the tank farm. One upgradient and five downgradient ground-water monitoring wells are recommended to identify the extent of contamination which may have occurred from this disposal practice. Samples collected from wells should be analyzed for JP-4, lead, total organic carbon and oil and grease.

9) Approximately fifty drums containing waste oil may have been buried in the CE storage lot. Even though this is not a high priority site according to its HARM score, it is recommended that a survey of the area be conducted to detect any buried metal objects. Initial testing should be conducted with a metal detector. If the results from the metal detector are inconclusive, a magnetometer survey should be conducted to acquire a greater degree of sensitivity. If the tests indicate that metal objects are buried in the area, a test pit should be dug to better identify the material.

10) The McGuire Missile Site Accident Area has been routinely monitored since the accident occurred in 1960. The data collected from the site indicates that the radioactive contamination has been contained. Routine monitoring of the radioactive levels in and around the area should continue to insure that the contamination does not migrate.

11) Additional surface water sampling should be conducted at McGuire AFB to determine the impact of the landfills and other disposal sites on the surface water quality of the streams in the area. Three additional sampling stations should be established along North Run Creek

and four additional sampling stations should be established along South Run Creek. The sample stations along North Run Creek should consist of one station upstream of Landfill No. 2, one station downstream of Landfill No. 2 and one station on the east side of the Defense Access Highway downstream of Landfill No. 3. The samples should be analyzed for the parameters in List B, Table 6.2. Comparison of the data from these three sampling locations may indicate whether Landfill No. 2, Landfill No. 3 or the DPDO storage facility are contributing any contamination to the creek.

The sampling stations along South Run Creek should be located upstream and downstream of the POL bulk fuel storage area, directly downstream of the oil separation basin and just upstream of the WWTP discharge. Samples collected from these stations should also be analyzed for the parameters in List B, Table 6.2. The data collected from these sampling stations should detect any contamination occurring from the POL bulk fuel storage area or the landfills located in the eastern corner of the base (Landfill Nos. 4, 5 and 6).

APPENDIX A

BIOGRAPHICAL DATA

J. R. Absalon, C.P.G.
J. W. Braswell
R. M. Reynolds, P.E.
E. J. Schroeder, P.E.
M. I. Spiegel

Biographical Data

JOHN R. ABSALON
Hydrogeologist

PII Redacted

[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

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.

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.

Biographical Data

JONATHAN W. BRASWELL

Sanitary Engineer

PII Redacted

[redacted]

Education

B.S. in Civil Engineering, 1975, University of Texas, Austin
M.S. in Environmental Health Engineering, 1978, University of Texas, Austin
U. S. Army Radiological Protection Officer Course, 1972, Fort McClellan, Alabama

Professional Affiliations

Engineer-in-Training, 1975 (Texas)
Water Pollution Control Federation
Texas Water Pollution Control Association
Federal Water Quality Association
Virginia Water Pollution Control Association

Honors and Awards

EPA Traineeship
Tau Beta Pi
Chi Epsilon

Experience Record

1980-Date — Engineering-Science. Project Manager (1981-Date). Responsible for industrial/hazardous waste assessment, management, and treatment projects including: waste surveys; preparation of waste management plans; RCRA groundwater monitoring; coordination with regulatory agencies; and waste treatment system design. Task manager for the evaluation and compatibility testing of available polymeric liners for the containment of explosives and solvents. Task manager for the review of hazardous waste generation and management procedures for industrial facilities and the preparation of RCRA guidance documents and RCRA closure plans. Project manager for the implementation of a RCRA groundwater monitoring plan and subsequent groundwater analyses. Project Manager for the assessment of sludge disposal alternatives for Des Moines EIS. Project Manager for the evaluation of wastewater generation and treatment for an electroplating facility and directed the redesign, O&M Manual preparation, and start-up of the new treatment system at the facility. Project Manager for the preparation of the O&M Manual for the mixing and screening facilities for a sludge composting facility.

Jonathan W. Braswell (Continued)

Project Engineer (1980-1981). Responsible for preliminary studies and process design for wastewater and sludge treatment facilities. Established the design criteria, directed the evaluation and selection of system components and coordinated the design of the mixing and screening systems for a 400 wet ton per day sludge composting facility. Responsible for the evaluation of existing wastewater and sewage sludge treatment facilities, including preparation of final reports detailing findings. Responsible for the determination of the types and amounts of solid waste generated by the manufacturing operations of a large machine tool builder and for the evaluation of existing disposal methods.

1978-1980 PRC Toups, Staff Environmental Engineer. Responsible for process design and field studies. Project experience included feasibility studies and preliminary engineering and industrial wastewater treatment, sludge composting, and solid waste resource recovery facilities and the co-disposal of solid waste and sewage sludge. Responsible for developing the test program and field testing of a prototype stationary sludge/bulking agent receiving and mixing system. Conducted field investigations of a failing sewer line and the operation of a municipal wastewater treatment plant. Assisted in the process design of sludge composting facilities with a combined capacity of 1400 wet tons per day and the critical review of a proposed sludge/solid waste composting facility.

1976-1978 Graduate Student, University of Texas, Austin.

1975-1976 Naval Facilities Command, Naval Environmental Support Office, Civil Engineer. Responsible for the development of surveys and data base formats covering solid waste management and potable water treatment and distribution at Navy shore facilities. Responsible for preparation of economic analysis of planned projects. Involved in the preparation of a report detailing the Navy's post pollution control efforts and results. Responsible for coordination of disposal of radioactive waste materials with other Navy Commands.

Jonathan W. Braswell (Continued)

Publications

"The WSSC Stationary Mixing System for Sludge Composting", in Proceedings of National Conference on Municipal and Industrial Sludge Composting, New Carrollton, Maryland, November 14-16, 1979 (Co-Authors: T. G. Shea, R. Menke, D. R. Vogt and L. A. Haug).

"Bulking Agent Selection in Sludge Compost Facility Design", Compost Science/Land Utilization: 20, November-December 1979 (Co-Authors: T. G. Shea and C. S. Coker).

"Process Dynamics in Aerated Static Pile Composting," presented at the 53rd Annual Water Pollution Control Federation Conference, Las Vegas, Nevada, September 1980. (Co-Authors: T. G. Shea and E. M. Halley).

"An Investigation of the Recycling of Electroplating Wastewaters," presented at the Water Reuse Symposium II, Washington, D.C., August 1981. (Co-Author: J. Jacobs)

BIOGRAPHICAL DATA

Randal M. Reynolds, P.E.

Chemical/Environmental Engineer

PII Redacted

[redacted]

Education

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

Professional Affiliation

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

Experience Record

1973-1975	U.S. Environmental Protection Agency, Water Enforcement Branch, Atlanta, Georgia. Chemical Engineer.
1975-1981	Gold Kist Inc., Corporate Engineering, Atlanta, Georgia. Environmental Process Engineer.
1981-Date	Engineering-Science, Inc., Atlanta, Georgia.

Pertinent Experience

Mr. Reynolds has over nine years regulatory, industrial and consulting experience in ventilation and air contaminant control system design and operation. As an environmental process engineer with Gold Kist, Inc. and as a chemical/environmental engineer with ES, Mr. Reynolds has been involved with the specific projects listed below concerning exhaust hood system design, airborne contaminant collection and control system design and contaminant control equipment selection.

- o Reviewed and evaluated non-compliance fluoride emissions from a scrubber system at a superphosphate fertilizer facility. Recommended a mesh mist elimination curtain and optimum flouride concentrations for each of three scrubbing stages which restored the system to a complaince status.

- Provided complete ductwork sizes and layouts, contaminant control device specifications and system fan specifications for granulator pesticide formulation process. The exhaust system included a fabric filter for dust collection followed by a caustic packed tower scrubber for toxic fume control.

- Provided a complete economic evaluation of alternatives for particulate emission control for a 60,000 lbs/hr industrial stream boiler fired with wood wastes and ground peanut hulls. This evaluation included venturi scrubbers and an electroscrubber filter as well as a high temperature reverse pulse fabric filter which was the final selection.

- Provided thorough ventilation system duct velocity and static pressure tests to optimize exhaust rates from a trichloroethane solution tank to a carbon adsorption system. These test required the use to standard manometers and pitot tube devices to insure accuracy at low air flow rates.

- Provided hood designs, air flow calculations, duct size calculations, fan specifications and contaminant control device selections for over 15 additional exhaust air systems ranging from 2,000 to 30,000 ACFM.

Publication and Presentations

R. M. Reynolds, "Bagging Sludge?", Pollution Engineering, Vol. 12, No. 7, July 1980, pg. 28. A practical tips article describing the design and use of a simple fabric bag to dewater a slurry from a fertilizer scrubber settling pond.

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

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

Biographical Data

ERNEST J. SCHROEDER

Environmental Engineer
Manager, Solid and Hazardous Waste

PII Redacted

[redacted]

Education

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

Professional Affiliations

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

Honorary Affiliations

Chi Epsilon

Experience Record

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

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

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

ERNEST J. SCHROEDER (Continued)

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

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

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

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

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

ERNEST J. SCHROEDER (Continued)

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

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

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

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

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

ERNEST J. SCHROEDER (Continued)

Publications and Presentations

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

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

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

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

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

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

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

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

Biographical Data

MARK I. SPIEGEL

PII Redacted

Environmental Scientist

[redacted]

Education

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

Professional Affiliations

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

Experience Record

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

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

Mark I. Spiegel (Continued)

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

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

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

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

Mark I. Spiegel (Continued)

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

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

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

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

APPENDIX B

LIST OF INTERVIEWEES AND OUTSIDE AGENCY CONTACTS

APPENDIX B

LIST OF INTERVIEWEES AND OUTSIDE AGENCY CONTACTS

LIST OF INTERVIEWEES (Position, Period of Service)

1. Environmental Engineer, 438 CES, 1968-1982
2. Explosives Safety Officer, 438 MAW, 1958-1982
3. Public Affairs Officer, 638 MAW
4. Duty Engineer McGuire Missile Site, 438 CES, 1958-1982 (Worked at Missile Site, 1958-1972)
5. Fire Chief, 438 CES, 1981-1982
6. Assistant Fire Chief, 438 CES, 1956-1982
7. Deputy Fire Chief, 438 CES, 1982
8. Liquid Fuels Maintenance Supervisor, 438 CES, 1958-1982
9. Retired Heavy Equipment Operator, 438 CES, 1948-1972
10. Equipment Foreman, 438 CES 1957-1982
11. Real Properties Supervisor, 438 CES, 1967-1982
12. Supervising Civil Engineer, Gibbsboro Radar Station, 1962-1982
13. Supervisor Mechanical Engineering, 438 CES, 1954-1982
14. Supervisor Entomology, 438 CES, 1960-1982
15. Supervisor Herbicide Program, 438 CES, 1978-1982
16. NCOIC, Fuels Management Branch, 438 SS, 1978-1982
17. Chief, Engineering and Environmental Planning, 438 CES, 1963-1982
18. Assistant Superintendant Fleet Services, 438 MAW, 1973-1982

19. Superintendent, CE Grounds Fuel, 438 CES

20. Historian, 438 MAW

21. Foreman, Wastewater Treatment Plant, 438 CES, 1955-1982

22. Commander, Avionic Maintenance Sq., 438 AMS, 1980-1982

23. Shop Chief, Electrical Systems and Harness Shop, 438 AMS, 1981-1982

24. Shop Supervisor, Electric Shop, 438 AMS, 1962-1982

25. Commander, Field Maintenance Sq., 438 FMS, 1979-1982

26. Chief, Engineering Branch, 438 FMS, 1963-1982

27. Shop Chief, NDI Shop, 438 FMS, 1962-1982

28. Shop Chief, Corrosion Control, 438 FMS, 1978-1982

29. Asst. Shop Chief, Corrosion Control, 438 FMS, 1968-1982

30. Commander, Civil Engineering Flight, 108 ANG, 1979-1982

31. Commander, Consolidated Aircraft Maintenance Sq. 108 ANG, 1955-1982

32. NCOIC, Consolidated Aircraft Maintenance Sq., 108 ANG, 1962-1982

33. Shop Chief, NDI and Corrosion Control, 108 ANG, 1970-1982

34. Shop Chief, Tire Shop, 108 ANG, 1967-1982

35. Shop Chief, Weapons Shop, 108 ANG, 1969-1982

36. Shop Chief, Weapons Shop, 108 ANG, 1975-1982

37. Shop Chief, AGE Branch, 108 ANG, 1966-1982

38. Shop Chief, Pneudraulic Shop, 108 ANG, 1970-1982

39. Commander, Resource Management Squadron, 108 ANG, 1960-1982

40. Shop Chief, Motor Pool, 108 ANG, 1957-1982

41. Asst. Maintenance Commander, 170 ANG, 1965-1982

42. Shop Supervisor, Corrosion Control, 170 ANG, 1980-1982

43. Supervisor, Disaster Preparedness Training Center, Chemical Warfare Defense

44. Base Bioenvironmental Engineer, USAF Clinic, 1981-1982

45. Shop Chief, Power Production, 438 CES, 1980-1982

46. Supervisor, Vehicle Maintenance, 438 Trans, 1962-1982

47. Shop Chief, Battery Shop, 438 Trans, 1967-1982

48. Shop Chief, Allied Trades, 438 Trans, 1980-1982

49. Shop Chief, Exterior Electric, 438 CES, 1981-1982

50. DPDO Property Disposal Agent, DPDO, 1964-1982

51. Retired employee, Fuel Decontamination Operation (BOMARC), 1959-1966

52. Shop Supervisor, Auto Hobby Shop, 438 ABG, 1968-1982

OUTSIDE AGENCY CONTACTS (Agency, Point of Contact)

New Jersey Dept. of Environmental Protection	
Division of Water Resources	
Ground-Water Protection Section	William Althoff
	Tim Stone
Compliance Investigation Section	Alfred Valencia
Bureau of Monitoring and Data Management	Kathy Giordana
	Terry Henry
Division of Waste Management	
Crisis Control Section	George Weiss
Quality Assurance Section	Dave Bute
	Joe Goliszewski
	Steve Borgianini
Division of Fish, Game, and Wildlife	
Endangered Species Section	Jo Ann Frier
Bureau of Freshwater Fisheries	A. Bruce Pyle
Division of Environmental Quality	
Bureau of Pesticide Control	Robert Kozinski
New Jersey Pinelands Commission, New Lisbon, NJ	Robert Zampella
Rutgers University, New Brunswick, NJ	
Dept. of Geography	Robert M. Hardon
U.S. Army Corps of Engineers	
Resident Engineers Office, Ft. Dix, NJ	M. B. Thomas
U.S. Army Corps of Engineers, Philadelphia District	
Flood Plain Management Section	Rick Schaefer

U.S. Geological Survey Water Resources Division	George Farlekas Doug Harriman
U.S. Environmental Protection Agency Region II, New York	Lester Nagel Ron Testa E. Regna Ernest Schmalz
U.S. Army Toxic and Hazardous Material Agency Aberdeen Proving Grounds, MD Chief Assessment Division	Andrew Anderson Capt. Newing
U.S. Army, Ft. Dix Installation Directorate of Facilities Engineering Post Environmental Office	Pat Rayfied Howard Kempton Joe Haug

APPENDIX C

TENANT ORGANIZATIONS AND MISSIONS

APPENDIX C

ORGANIZATIONS AND MISSIONS

PRIMARY ORGANIZATION AND MISSION

The primary mission of the 438th Military Airlift Wing (MAC) consists of three major functions:

a. Execute global airlift as directed to airlift troops and cargo as well as air evacuate patients;

b. Command and operate McGuire AFB;

c. Support designated tenant organizations.

TENANT ORGANIZATIONS AND MISSIONS

McGuire AFB is the host to several tenant organizations and provides services, facilities and other support to these organizations. The following list identifies the major tenant organizations located at McGuire AFB and briefly describes their missions.

514th Military Airlift Wing and Associated Units

The 514th Military Airlift Wing (Assoc.) provides necessary augmentation to the active Wing in the form of C-141 aircrews, maintenance support, aerial port operations and aeromedical evacuation under various conditions of heightened tension including full mobilization. The Reserve Wing uses aircraft, facilities, training equipment, AGE and spares of the 438th MAW.

New Jersey Air National Guard (NJANG)

The mission of the NJANG, headquartered at McGuire AFB, is to advise and assist the State authorities in the administration logistics, training and operation of the military forces of the State. It provides for the operational employment of assigned military forces engaged in providing military support to the civil authorities for civil defense during a post attack period. Its mission is also to train a nucleus of

Air National Guard personnel, enlisted and officers for duties in connection with selective service and internal security.

21st Air Force

The 21st Air Force, with headquarters at McGuire AFB, is one of the two combat ready strategic and tactical arms of the Military Airlift Command (MAC). The 21st Air Force is responsible for an area from the Mississippi River eastward to the border separating Afghanistan and Pakistan. Within this region, over 33,000 MAC people and nearly 300 airlift aircraft operate from more than 50 locations. The 21st Air Force also has the resupply mission for the Eastern Missile Test Range and provides for aeromedical evacuation of patients from the Atlantic Area. It conducts combat training excercises throughout the world to maintain its strategic and tactical mobility posture for worldwide airlift.

1998th Communications Squadron

The 1998th Communications Squadron (Air Force Communications Command) provides on-base services for daily Air Force operations ranging from air traffic control to telephone systems and telecommunications centers. McGuire air traffic controllers handle aircraft within the McGuire Approach Control situated in the center of the New York, Philadelphia and Atlantic City area. The squadron maintenance section maintains the radar, radio and air navigation aids for air traffic control purposes. They also provide communications maintenance in the Digital Subscribe Terminal Equipment, cryptographic and teletype areas as well as all electronic systems assigned to the 1998th.

Detachment 10, 7th Weather Wing

The mission of Detachment 10 is three-fold; provide weather briefings for aircraft, issue weather advisories for protection of base resources, and support the worldwide weather network.

590th U. S. Air Force Band

The 590th U.S. Air Force Band, known as the "Air Force Band of the East," serves ten eastern states by supporting recruiting and community relations activities and promoting military morale.

Air Force Audit Agency (AFAA)

The mission of the Air Force Audit Agency is to provide all levels of Air Force management with an independent, objective, and constructive evaluation of the effectiveness and efficiency with which managerial responsiblities (including financial, operational, and supporting activities) are carried out.

Defense Property Disposal Office (DPDO)

The mission of the DPDO is to provide for control and warehousing of excess and surplus government property for preparation for reutilization, donation, sale or other dispositions.

Air Force Office of Special Investigations (OSE), Detachment 413

The mission of this organization is to provide criminal, counterintelligence, internal security and special investigative services to Air Force activities; to perform distinguished visitor protection services and operations; to collect, analyze and disseminate information of investigative and counterintelligence significance; and to collect and report information which is pertinent to base security.

Additional Units

Air Force ROTC, Northeast Area Office
Defense Fuel Region - Northeastern
Detachment 1, 1600th Management Engineering Squadron
Field Training, Detachment 203
OL-A, Detachment 1, 375th Aeromedical Airlift Wing
OL-K, Headquarters Military Airlift Command
Headquarters, 108th Tactical Fighter Wing
141st Tactical Fighter Squadron
Headquarters, 170th Air Refueling Group

772nd Radar Squadron, Gibbsboro AFS, NJ

Military Airlift Command, Non-Commissioned Officers Academy East

3515th USAF Recruiting Squadron

APPENDIX D

MCGUIRE AIR FORCE BASE SUPPLEMENTAL INFORMATION AND DATA

Threatened and Endangered Species Within
Close Proximity to McGuire AFB
Pesticide Inventory
New Jersey Bureau of Pesticide Control Soil
Sampling Data from Entomology Shop Wash Area
Fuel Storage

TABLE D.1
THREATENED AND ENDANGERED SPECIES WITHIN CLOSE PROXIMITY TO McGUIRE AIR FORCE BASE

THREATENED & ENDANGERED PLANTS

Utricularia gibba - Colliers Mill - Jackson Twp.

Utricularia purpurea - Colliers Mill - Jackson Twp.

Xyris flexuosa - Success Lake - Jackson Twp.

Lygodium palmatum - New Lisbon - Pemberton.

Lygodium palmatum - Pemberton (near Browns Mill Junction)

Schwalbea americana - Whitesbog, Pemberton Twp.

THREATENED & ENDANGERED REPTILES

Bog Turtle - New Egypt, Plumsted Twp., 1932.

Wood Turtle - Browns Mills, 1935, 1948; Upton (Pemberton Twp., 1920); Wrightstown, 1959; New Egypt, 1950.

Timber Rattalesnake - Pemberton Borough, 1906; Upton (Pemberton Twp.), 1931, 1941, 1944.

Corn Snake - Near Upton (Pemberton Twp.), 1945, date unknown.

Pine Snake - Browns Mills, 1923, prior to 1940, 1944, 1947, 1947, 1977; Country Lakes, 1978-79, 1979; Upton, 1928, 1942, 1944, 1944, 1944, 1945, 1945, 1947, 1948; Whitesbog, 1935, 1935, 1936, 1952, 1980; New Egypt, 1949, 1980, Pemberton, June 1981.*

Pine Barrens Treefrog - SW of Browns Mills, 1975; New Lisbon, date unknown; Pemberton, date unknown; Upton, date unknown, Pemberton, 1981 (several sightings)*.

THREATENED & ENDANGERED BIRDS

Upland Sandpiper - Breeds most abundantly in the Juliustown-Sandtown-Jobstown area near Fort Dix (just outside the PNR/PA).

Red-headed Woodpecker - Reported from Fort Dix.

NOTE: Threatened and Endangered Plants: Pinelands Commission Files.
Threatened and Endangered Reptiles: With the exception of sightings noted with an asterisk, records are from N.J. Division of Fish, Game, and Wildlife files.
Threatened and Endangered Birds: Pinelands Commission Files

*Source: New Jersey Pinelands Commission Records

TABLE D.2

PESTICIDES USED AT MCGUIRE AFB

(Compiled from inventory records developed between 1977 and 1982)

Insecticides	Herbicides
Abate	*Diquat
*Acepate	Paraquat
Baytex	*Round-up
Cygon	*Copper Napthenate
Dichlorous	Copper Sulfate
Diazinon	Urea-Bore (1406, 3440, 3415, or 3401)
*Dursban	2,4-D
*Malathion (1906 - Ammo Bunker)	DLK-64 (1906, 3440, 3415, or 3401)
*Baygon	Potassium Salt #2
*Ficam	MCPP (1906, 3440, 3415 or 3401
*Vapam	
Chlorobenzilate	**Rodenticides**
*Chlordane	Strychnine Sulfate
DDT	*Diphacin
Lindane	*Pivalyl
Pentachlorophenol	*Warfarin
Bromacil	*Rozol
Fenac	Calcium Cyanide
Pramitol	Zinc Phosphide
Simazine	*Ethylene Oxide (34102)
Ban vel	Avitrol
Dacthal	
*Dalapon	
Dichloram	
Phenothrin	

NOTE: All chemicals are stored in Building 3450 except where noted in parenthesis.
The more frequently used chemicals are marked with asterisks.

SOURCE: McGuire AFB records

TABLE D.3
NEW JERSEY BUREAU OF PESTICIDE CONTROL
SOIL SAMPLING DATA FROM ENTOMOLOGY SHOP WASH AREA

Parameter	Sampling Point Descriptions		
	Bottom of Driveway Below Bldg. 3450	Bank of Drainage Ditch Adjacent to Bldg. 3450	Sediments Within Drainage Ditch
Chlordane	18.7 ppm	9.34 ppm	10.2 ppm
DDT	----	142.86 ppb	4.45 ppm
Diazinon	N.D.	N.D.	N.D.
Dieldrin	16.22 ppb	29.73 ppb	----
pp DDE	----	----	604.55 ppb
op DDT	----	----	1,556.00 ppb
pp DDD	----	----	990.00 ppb

ppb - parts per billion
ppm - part per million
N.D. - non detected
--- - not analyzed

SOURCE: New Jersey Department of Environmental Protection, Division of Environmental Quality, Bureau of Pesticide Control, March 1982.

TABLE D.4
STORAGE TANKS

Storage Area	Type Fuel	Tank Size (Gallons)	No. of Tanks	Above or Below Ground
Fuel Oils				
Bldg. 1907	#4 Oil	10,500	1	Below
Bldg. 2401	#4 Oil	7,500	2	Below
Bldg. 1823	#4 Oil	7,500	1	Below
Bldg. 1623	#4 Oil	3,000	1	Below
Bldg. 3340	#2 Oil	15,000	2	Below
CHP	#2 Oil	150,000	2	Above
CHP	#2 Oil	840,000	1	Above
POL	Av-Lub Oil	15,000	1	Below
Bldg. 18-01	#4 Oil	5,000	1	Below
Bldg. 3402	#2 Oil	5,000	1	Below
Bldg. 3459	#2 Oil	5,000	1	Below
Various	#2 Oil	275/550	60	Above
Jet Fuel (except oils)				
Bldg. 3337	JP-4	2,000	1	Below
Bldg. 1701	JP-4	25,000	6	Below
Meter Pits	JP-4	1,000	3	Below
Bldg. 1747	JP-4	50,000	6	Below
Bldg. 1707	JP-4	25,000	6	Below
POL	JP-4	840,000	3	Above
POL	JP-4	525,000	1	Above
Bldg. 1933	JP-4	50,000	6	Below
POL	JP-4	20,000	2	Below
POL	JP-4	12,500	3	Below
AV (Aeroplane) Gas				
Bldg. 3432	Avgas	10,000	1	Below
Bldg. 3433	Avgas	5,000	1	Below
Bldg. 1808	Avgas	25,000	4	Below

TABLE D.4
STORAGE TANKS
(Continued)

Storage Area	Type Fuel	Tank Size (Gallons)	No. of Tanks	Above or Below Ground
<u>Auto Gasoline</u>				
Bldg. 3438	Mogas	5,000	4	Below
Meter Pits	Mogas	2,000	1	Above
POL	Mogas	15,000	2	Below
Bldg. 3005	Mogas	5,000	4	Below
Bldg. 2913	Mogas	5,000	4	Below
Bldg. 1933	Mogas	1,000	1	Below
Bldg. 3001	Diesel	2,000	1	Above
<u>Hydrant System Sewer Tanks</u>				
Bldg. 1701	Fuels	5,000	2	Below
Bdlg. 1747	Fuels	2,000	1	Below
POL	Fuels	1,000	1	Below
Bldg. 1707	Fuels	5,000	1	Below
Bldg. 1933	Fuels	2,000	1	Below
Bldg. 1808	Oils	5,000	2	Below
<u>Defueling Tanks</u>				
Fuel Pumphouses	----	25,000	4	Below
Bldg. 1808	----	25,000	1	Below
<u>Used Oil Storage Tanks</u>				
Bldg. 1750	Used Oil	500	1	Above
Bldg. 2415	Used Oil	500	1	Below
Bldg. 3001	Used Oil	500	1	Below
Bldg. 1734 (Tank B-7)	Used Oil	25,000	1	Below

Source: McGuire AFB records

APPENDIX E

MASTER LIST OF INDUSTRIAL SHOPS

APPENDIX E

MASTER LIST OF INDUSTRIAL SHOPS

Name	Present Location (Bldg. No.)	Handles Hazardous Materials	Generates Hazardous Wastes	Typical T.S.D. Methods
438 Air Base Group				
Auto Hobby Shop	2415	Yes	Yes	Contractor
Reproduction	3104	Yes	No	—
Base Photo Lab	1809	Yes	yes	Silver Recov.
438 Aerial Port Squadron				
Air Freight	1702	No	No	--
Fleet Services	1734	No	No	--
Packing & Crating	3101	No	No	--
Baggage Section	1706	No	No	--
438 Avionics Maintenance Squadron				
Auto Pilot	2306	Yes	No	--
Electrical Systems and Harness Shop	1801/2220	Yes	Yes	Diluted to acid pit
Flight Simulation	2307	No	No	--
Instrument Shop	2306	Yes	No	--

Name	Present Location (Bldg. No.)	Handles Hazardous Materials	Generates Hazardous Wastes	Typical T.S.D Methods
438 Avionics Maintenance Squadron (Continued)				
Precision Measurement Equipment Lab	1809	Yes	Yes	DPDO
Radio Shop	2306	Yes	No	--
Radar Shop	2306	Yes	No	--
Inertial Navigation	2306	No	No	--
438 Field Maintenance Squadron (FMS)				
Accessory Repair	1801	Yes	Yes	DPDO
Aerospace Ground Equipment (AGE) Shop	2253	Yes	Yes	DPDO
Corrosion Control	1803/2240	Yes	Yes	DPDO contractor
Environmental Systems	2226	Yes	No	--
Flight Dispatch	1801	No	No	--
Fuel Systems Repair	1823	Yes	No	--
Gas Turbine Compressor	1801	Yes	No	--
Jet Engine Test Cell	1832	Yes	Yes	DPDO
Structural Repair	2311	Yes	No	--
Machine Shop	2311	Yes	No	--
Non-Destructive Insp. (NDI)	1623	Yes	Yes	DPDO
Non-Power AGE Shop	1801	Yes	Yes	DPDO
Plastics Shop	2315	Yes	No	--
Pneudralics Shop	2305	Yes	Yes	DPDO

Name	Present Location (Bldg. No.)	Handles Hazardous Materials	Generates Hazardous Wastes	Typical T.S.D. Methods
438 FMS (Continued)				
Repair and Reclamation	3209	Yes	No	--
Scheduled Maintenance	1801	Yes	Yes	DPDO
Survival Equipment & Parachute Shop	1748	Yes	No	--
Jet Engine Shop	1801	Yes	Yes	DPDO
Welding Shop	2311	Yes	No	--
Wheel and Tire Shop	3209	Yes	Yes	DPDO
Comfort Pallets	3209	No	No	--
438 Organizational Maintenance Squadron (OMS)				
Flightline Branch	2221	Yes	Yes	DPDO
Inspection Branch	2250	Yes	Yes	DPDO
Alternate Mission Equipment	1809	Yes	No	--
Refurbishment	3209	Yes	No	--
Rail Shop	1809	Yes	No	--
Configurations	1809	No	No	--
Transient Maintenance	1801	Yes	Yes	DPDO
438 Supply Squadron				
Fuels Management Branch	1807	Yes	No	--
Fuels Quality Lab	1812	Yes	No	--
Explosive Ordance Disposal and Chemical Warfare Training	3434	Yes	No	--

Name	Present Location (Bldg. No.)	Handles Hazardous Materials	Generates Hazardous Wastes	Typical T.S.D. Methods
438 Transportation Squadron				
Material Handling Equipment	1750	Yes	Yes	DPDO
Allied Trades	3001	Yes	Yes	DPDO
Fire Truck Maintenance	1708	Yes	Yes	San. Sewer, Contractor
General Purpose Veh. Maint.	3001	Yes	Yes	DPDO
Minor Maintenance	3001	Yes	Yes	Neutral to San. Sewer
Refueling Maintenance	1836	Yes	Yes	DPDO
Special Purpose Maint.	3001	Yes	Yes	DPDO
USAF Clinic				
Medical Equipment Repair	3104	Yes	No	--
Dental Clinic	2409	Yes	Yes	Silver Recov. to San. Sewer
Medical Clinic	2411	Yes	No	--
438 Civil Engineering				
Carpenter Shop	3411	No	No	--
Interior Electric	3411	Yes	No	--
Exterior Electric	3411	Yes	Yes	PCB Storage/ DPDO
Entomology	3450	Yes	Yes	San. Sewer, Surface Drainage

Name	Present Location (Bldg. No.)	Handles Hazardous Materials	Generates Hazardous Wastes	Typical T.S.D. Methods
438 Civil Engineering (Continued)				
Family Housing Maintenance	3701	No	No	--
Fire Extinguisher Maintenance	1709	Yes	No	--
Sheet Metal/Welding	3411	Yes	No	--
Heating Shop/Plant	2101/2102	Yes	No	--
Liquid Fuels Maintenance	1907	Yes	Yes	Contractor
Water/Waste Plant	1512	Yes	No	--
Masonry Shop	3412	No	No	--
Plumbing Shop	3411	No	No	--
Power Production	3412	Yes	Yes	DPDO
Paint/Sign Shop	3411	Yes	No	--
Refrigeration/ Air Conditioning	3412	Yes	No	--
Pavements and Grounds	3401	Yes	No	--
21st AF Utility Plant	1908	Yes	Yes	DPDO
108 Tactical Fighter Wing (ANG)				
AGE Shop	3343	Yes	Yes	DPDO
Welding	3322	Yes	No	--
Weapons	3331	Yes	No	--
Propulsion	2231	Yes	Yes	DPDO
Fuel Cell Repair	3350	Yes	No	--

Name	Present Location (Bldg. No.)	Handles Hazardous Materials	Generates Hazardous Wastes	Typical T.S.D. Methods
108 ANG (Continued)				
Parachute Shop	3322	Yes	No	--
Egress	3322	Yes	No	--
Tire Shop	3322	Yes	Yes	DPDO
Corrosion	3322	Yes	Yes	DPDO
Sheet Metal	3322	Yes	No	--
Electrical/Battery	3322	Yes	No	--
Machine Shop	3322	Yes	No	--
NDI Shop	3322	Yes	Yes	DPDO
Pneudraulics	3322	Yes	Yes	DPDO
Hangar Maintenance	3322	Yes	Yes	DPDO
Photo Shop	3327	Yes	Yes	Silver Recov. San. Sewer
Communications	3331	Yes	No	--
Instrument/Auto Pilot	3331	Yes	No	--
Weapons Control	3322	Yes	Yes	DPDO
Simulator	3327	No	No	--
Civil Engineer	3312	Yes	No	--
Nonpowered AGE	3338	Yes	Yes	DPDO
Munitions	3320	Yes	No	--
Life Support	3327	Yes	No	--
Transportation (Vehicle Maintenance)	3325	Yes	Yes	DPDO

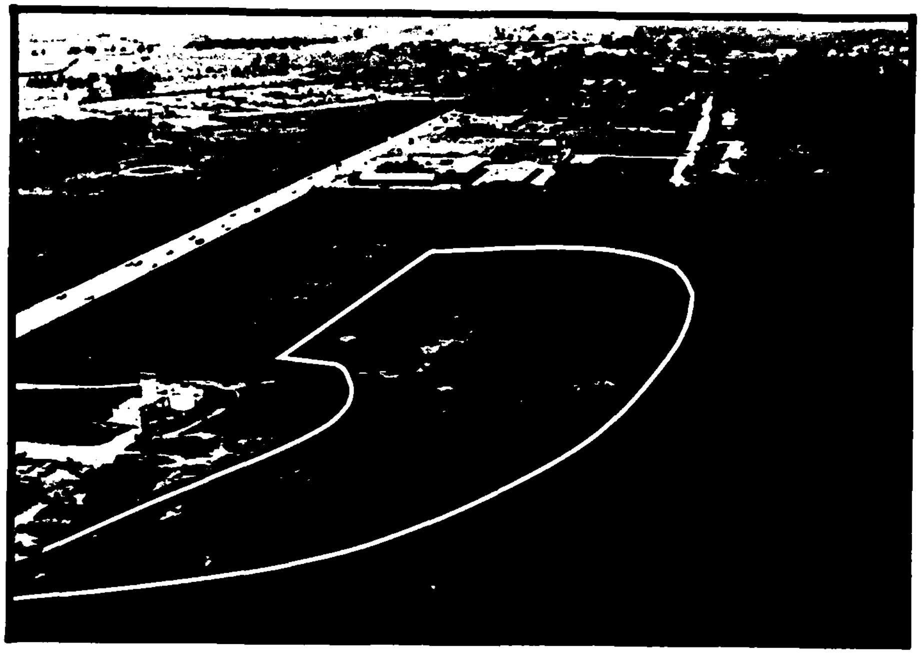
Name	Present Location (Bldg. No.)	Handles Hazardous Materials	Generates Hazardous Wastes	Typical T.S.D. Methods
170 Air Refueling Group (ANG)				
Life Support	1818	Yes	Yes	to DPDO Battery Recov.
Transportation		(Combined with 108 ANG)		
Flightline	1930	Yes	Yes	DPDO
Inspection Section	1811	Yes	Yes	DPDO
Repair and Reclamation	1920	Yes	Yes	DPDO
Machine Shop	1811	No	No	--
Electrical Shop	1811	Yes	Yes	DPDO
Hydraulic Shop	1811	Yes	Yes	DPDO
Photo Section	1818	Yes	No	--
Instrument/Auto Pilot	1929	Yes	No	--
Fuels Management	3330	Yes	Yes	DPDO
NDI Shop		(Combined with 108 ANG)		
Avionics	1929	Yes	No	--
AGE Shop	1939	Yes	Yes	DPDO
Civil Engineering		(Combined with 108 ANG)		
Pneudraulics		(Combined with 170 ANG Hydraulics)		
Corrosion Control	1811	Yes	Yes	DPDO, O/W Sep.
Survival Equipment	1936	Yes	No	--
Engine Shop	1929	Yes	Yes	DPDO

Name	Present Location (Bldg. No.)	Handles Hazardous Materials	Generates Hazardous Wastes	Typical T.S.D. Methods
170 ANG (Continued)				
Non-powered AGE	1937	Yes	Yes	DPDO
Fuel Cell	1931	Yes	Yes	DPDO
Supply Warehouse	1825	Yes	No	--
Clinic		(Combined with 108 ANG)		
Sheet Metal Shop	1811	Yes	No	--

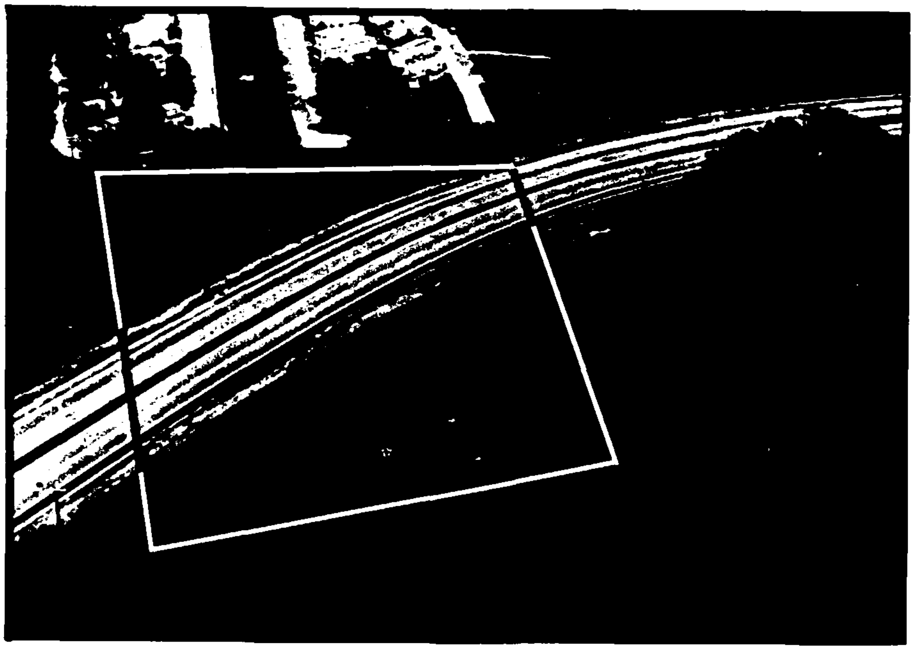
APPENDIX F

PHOTOGRAPHS

McGUIRE AFB

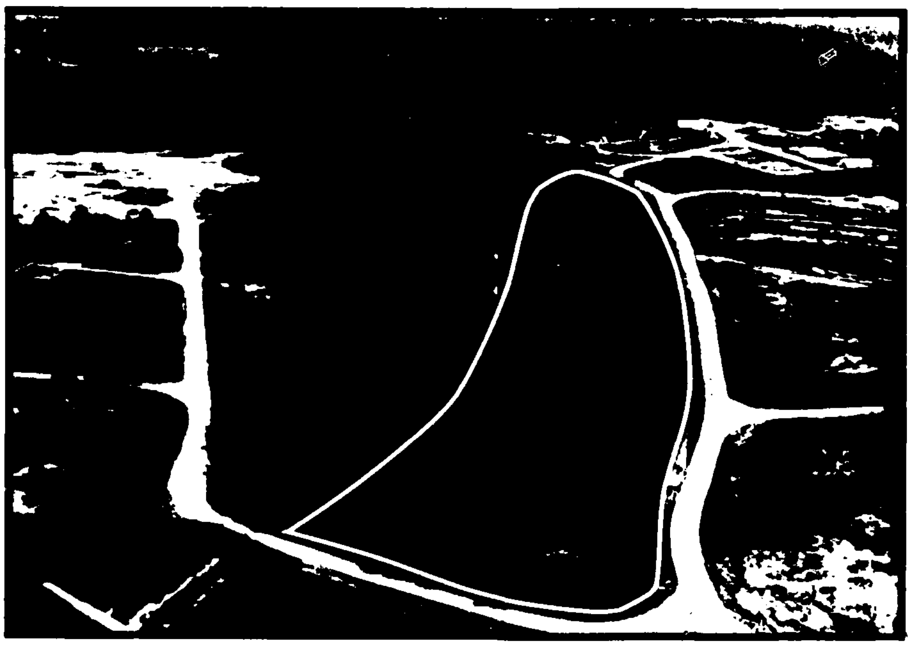


Landfill No. 2

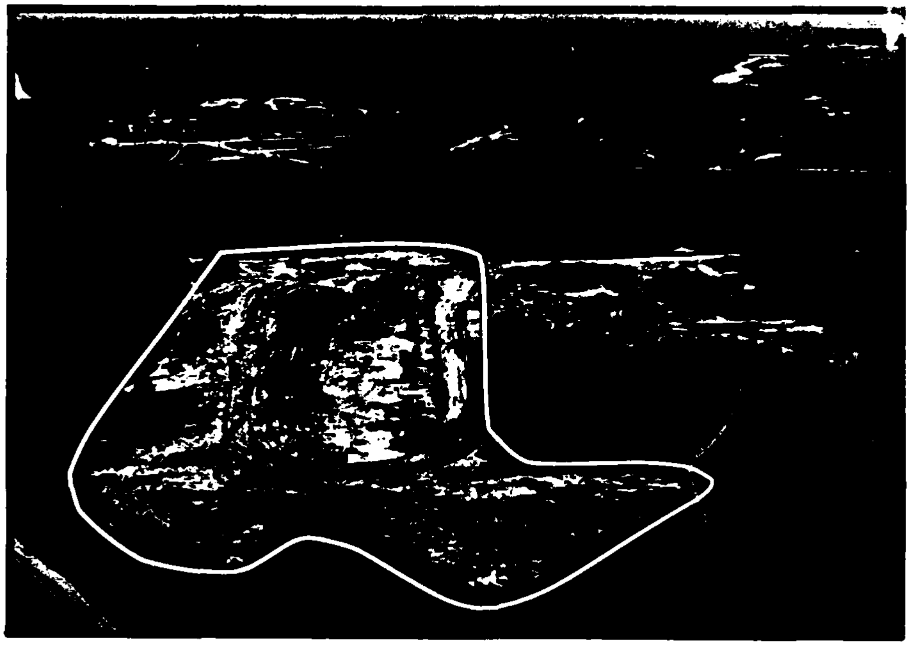


Landfill No. 3

Landfill No. 4 and
WWTP Sludge Disposal Area

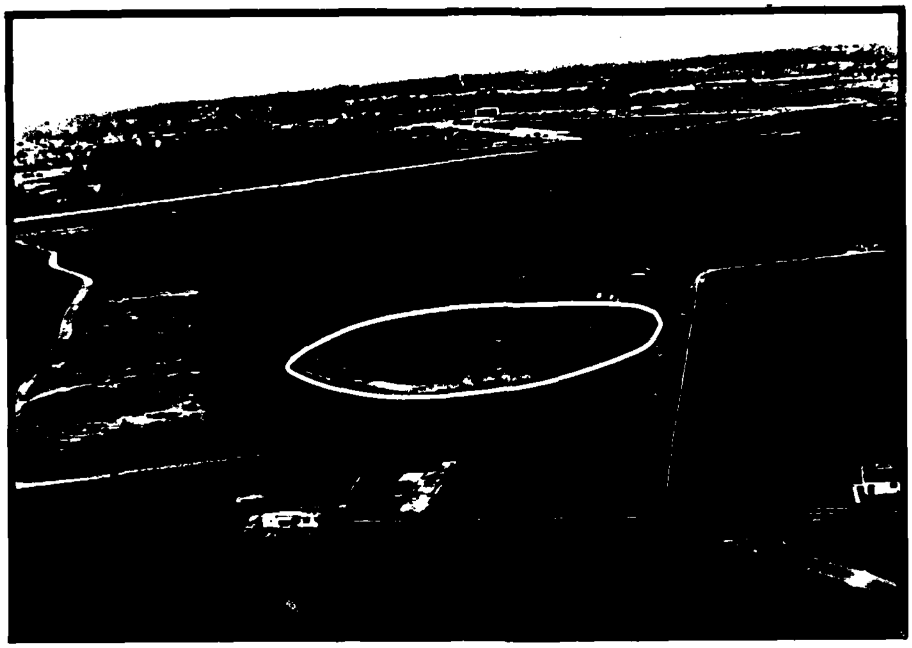


Landfill No. 5



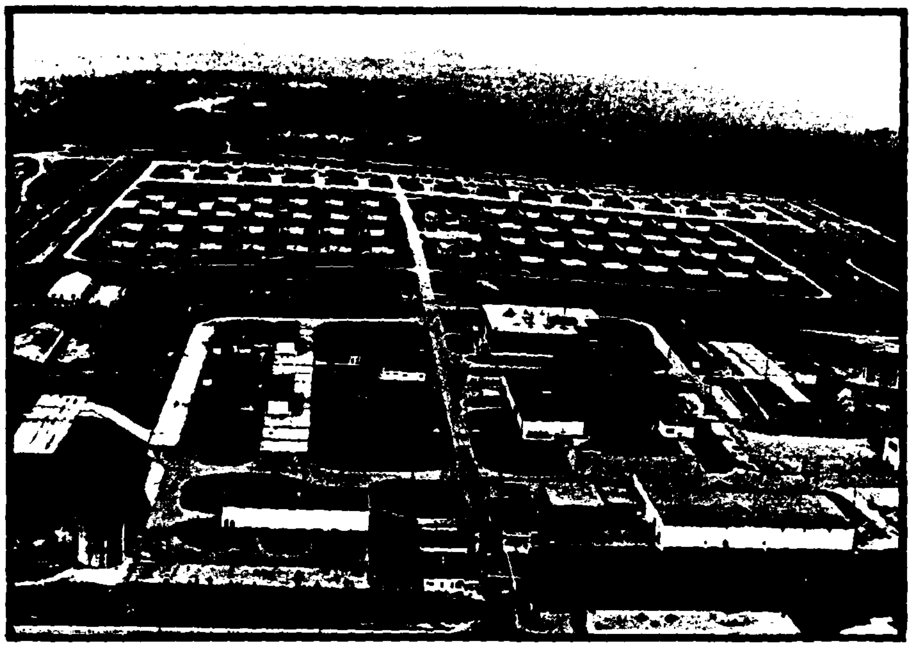
Landfill No. 6

Fire Protection Training Area No. 1

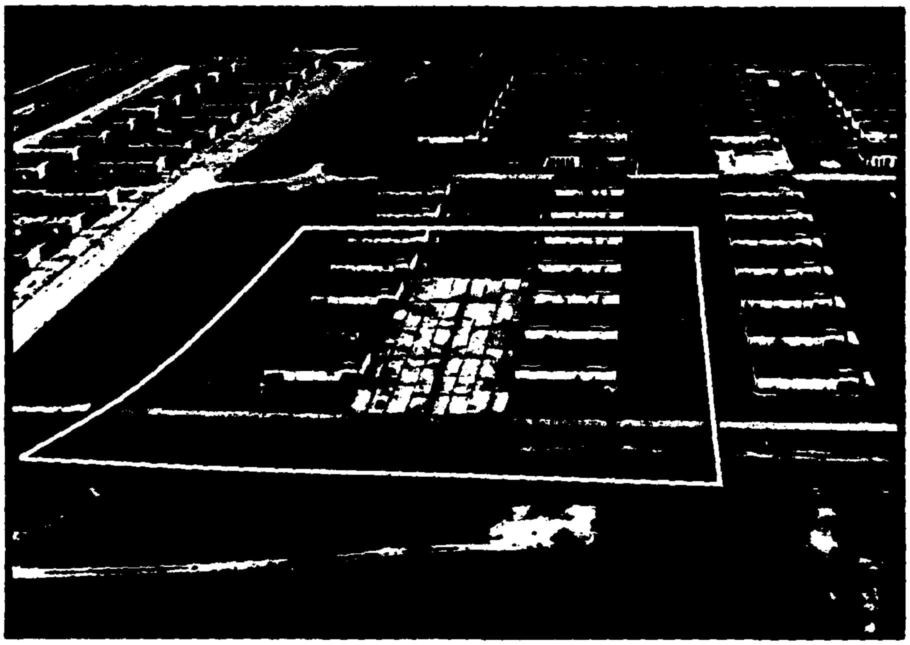


Fire Protection Training Area No. 3

Entomology Shop
Equipment Wash Area



McGuire Missile Site (BOMARC)



Missile Launcher Accident Site
and Launcher Buildings

APPENDIX G

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 Occup. tional Environmental Health Laboratory (OEHL), Air Force Engineering Services Center (AFESC), Engineering-Science (ES) and CH_2M Hill. The basis for this model was a system developed for EPA by JRB Associates of McLean, Virginia. The JRB model was modified to meet Air Force needs.

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

PURPOSE

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

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

DESCRIPTION OF MODEL

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

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

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

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

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

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

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

FIGURE 1

HAZARD ASSESSMENT RATING METHODOLOGY FLOW CHART

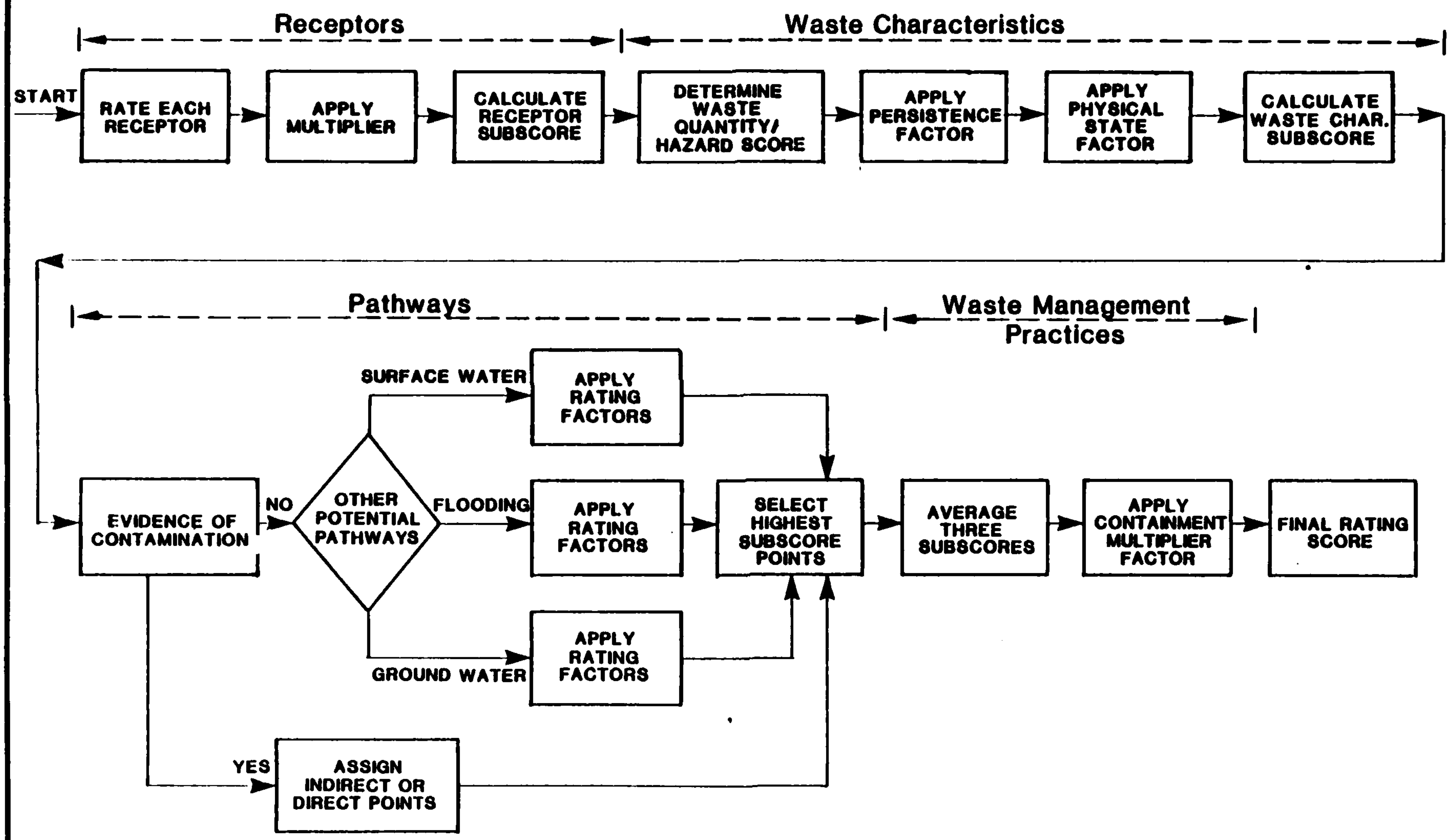


FIGURE 2

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) ______

2. Flooding

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
Flooding		1		

Subscore (100 x factor score/3) ______

3. Ground-water migration

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
Depth to ground water		8		
Net precipitation		6		
Soil permeability		8		
Subsurface flows		8		
Direct access to ground water		8		
Subtotals			______	______

Subscore (100 x factor score subtotal/maximum score subtotal) ______

C. Highest pathway subscore.

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

Pathways Subscore ______

IV. WASTE MANAGEMENT PRACTICES

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

Receptors ______
Waste Characteristics ______
Pathways ______

Total ______ divided by 3 = ______
Gross Total Score

B. Apply factor for waste containment from waste management practices

Gross Total Score X Waste Management Practices Factor = Final Score

______ X ______ = ______

TABLE 1

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	6
D. Distance to installation boundary	Greater than 2 miles	1 to 2 miles	1,001 feet to 1 mile	0 to 1,000 feet	3
E. Critical environments (within 1 mile radius)	Not a critical environment	Natural areas	Pristine natural areas; minor wetlands; preserved areas; presence of economically important natural resources susceptible to contamination.	Major habitat of an endangered or threatened species; presence of recharge area; major wetlands.	10
F. Water quality/use designation of nearest surface water body	Agricultural or industrial use.	Recreation, propagation and management of fish and wildlife.	Shellfish propagation and harvesting.	Potable water supplies	6
G. Ground-Water use of uppermost aquifer	Not used, other sources readily available.	Commercial, industrial, or irrigation, very limited other water sources.	Drinking water, municipal water available.	Drinking water, no municipal water available; commercial, industrial, or irrigation, no other water source available.	9
H. Population served by surface water supplies within 3 miles downstream of site	0	1 - 50	51 - 1,000	Greater than 1,000	6
I. Population served by aquifer supplies within 3 miles of site	0	1 - 50	51 - 1,000	Greater than 1, 000	6

TABLE 1 (Continued)

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 flood-plain	In 10-year flood-plain	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	C.95
Fully contained and in full compliance	0.10

Guidelines for fully contained:

Landfills:

- o Clay cap or other impermeable cover
- o Leachate collection system
- o Liners in good condition
- o Adequate monitoring wells

Spills:

- o Quick spill cleanup action taken
- o Contaminated soil removed
- o Soil and/or water samples confirm total cleanup of the spill

Surface Impoundments:

- o Liners in good condition
- o Sound dikes and adequate freeboard
- o Adequate monitoring wells

Fire Proection Training Areas:

- o Concrete surface and berms
- o Oil/water separator for pretreatment of runoff
- o Effluent from oil/water separator to treatment plant

General Note: If data are not available or known to be complete the factor ratings under items I-A through I, III-B-1 or III-B-3, then leave blank for calculation of factor score and maximum possible score.

APPENDIX H

SITE RATING FORMS

HAZARD ASSESSMENT RATING METHODOLOGY FORMS

McGUIRE AIR FORCE BASE

TABLE OF CONTENTS

HAZARD ASSESSMENT RATING METHODOLOGY FORM

NAME OF SITE Landfill No. 4

LOCATION Northeast corner of base, northeast of primary runway

DATE OF OPERATION OR OCCURRENCE Approximately 1958 to 1973

OWNER/OPERATOR McGuire AFB

COMMENTS/DESCRIPTION Closed, covered, vegetation

SITE RATED BY E J Schroeder

I. RECEPTORS

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
A. Population within 1,000 feet of site	1	4	4	12
B. Distance to nearest well	3	10	30	30
C. Land use/zoning within 1 mile radius	2	3	6	9
D. Distance to reservation boundary	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	1	9	9	27
H. Population served by surface water supply within 3 miles downstream of site	0	6	0	18
I. Population served by ground-water supply within 3 miles of site	3	6	18	18
		Subtotals	101	180

Receptors subscore (100 X factor score subtotal/maximum score subtotal) 56

II. WASTE CHARACTERISTICS

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

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

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

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

100 x 0.9 = 90

C. Apply physical state multiplier

Subscore B X Physical State Multiplier = Waste Characteristics Subscore

90 x 1.0 = 90

III. PATHWAYS

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

A. If there is evidence of migration of hazardous contaminants, assign maximum factor subscore of 100 points for direct evidence or 80 points for indirect evidence. If direct evidence exists then proceed to C. If no evidence or indirect evidence exists, proceed to B.

Subscore N/A

B. Rate the migration potential for 3 potential pathways: surface water migration, flooding, and ground-water migration. Select the highest rating, and proceed to C.

1. Surface water migration

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
Distance to nearest surface water	3	8	24	24
Net precipitation	2	6	12	18
Surface erosion	2	8	16	24
Surface permeability	0	6	0	18
Rainfall intensity	2	8	16	24
Subtotals			68	108

Subscore (100 X factor score subtotal/maximum score subtotal) 63

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
2. Flooding	0	1	0	3

Subscore (100 x factor score/3) 0

3. Ground-water migration

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
Depth to ground water	3	8	24	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			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 74

IV. WASTE MANAGEMENT PRACTICES

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

Receptors	56
Waste Characteristics	90
Pathways	74

Total 220 divided by 3 = 73 Gross Total Score

B. Apply factor for waste containment from waste management practices

Gross Total Score X Waste Management Practices Factor = Final Score

73 x 1.0 = 73

HAZARD ASSESSMENT RATING METHODOLOGY FORM

NAME OF SITE Landfill No. 2

LOCATION North and northwest of DPDO storage facility; north of Wrightstown-Cookstown Rd.

DATE OF OPERATION OR OCCURRENCE 1950 to 1956

OWNER/OPERATOR McGuire AFB

COMMENTS/DESCRIPTION Closed landfill, cover, vegetation, waste burned

SITE RATED BY E/ Schroeder

I. RECEPTORS

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
A. Population within 1,000 feet of site	2	4	8	12
B. Distance to nearest well	3	10	30	30
C. Land use/zoning within 1 mile radius	2	3	6	9
D. Distance to reservation boundary	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	1	9	9	27
H. Population served by surface water supply within 3 miles downstream of site	0	6	0	18
I. Population served by ground-water supply within 3 miles of site	3	6	18	18
		Subtotals	105	180

Receptors subscore (100 X factor score subtotal/maximum score subtotal) 58

II. WASTE CHARACTERISTICS

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

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

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

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

100 x 0.8 = 80

C. Apply physical state multiplier

Subscore B X Physical State Multiplier = Waste Characteristics Subscore

80 x 0.75 = 60

III. PATHWAYS

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

A. If there is evidence of migration of hazardous contaminants, assign maximum factor subscore of 100 points for direct evidence or 80 points for indirect evidence. If direct evidence exists then proceed to C. If no evidence or indirect evidence exists, proceed to B.

Subscore N/A

B. Rate the migration potential for 3 potential pathways: surface water migration, flooding, and ground-water migration. Select the highest rating, and proceed to C.

1. Surface water migration

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
Distance to nearest surface water	3	8	24	24
Net precipitation	2	6	12	18
Surface erosion	1	8	8	24
Surface permeability	0	6	0	18
Rainfall intensity	2	8	16	24
		Subtotals	60	108

Subscore (100 X factor score subtotal/maximum score subtotal) 56

2. Flooding

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
Flooding	1	1	1	3

Subscore (100 x factor score/3) 33

3. Ground-water migration

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
Depth to ground water	3	8	24	24
Net precipitation	2	6	12	18
Soil permeability	3	8	24	24
Subsurface flows	2	8	16	24
Direct access to ground water	2	8	16	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	58
Waste Characteristics	60
Pathways	81
Total 199 divided by 3 =	66 Gross Total Score

B. Apply factor for waste containment from waste management practices

Gross Total Score X Waste Management Practices Factor = Final Score

66 x 1.0 = 66

HAZARD ASSESSMENT RATING METHODOLOGY FORM

NAME OF SITE Landfill No. 3

LOCATION Outside Gate No. 2, bisected by the Defense Access Highway

DATE OF OPERATION OR OCCURRENCE 1956-1957

OWNER/OPERATOR McGuire AFB

COMMENTS/DESCRIPTION Closed landfill, covered, vegetation, road built through site

SITE RATED BY E J Schneider

I. RECEPTORS

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
A. Population within 1,000 feet of site	3	4	12	12
B. Distance to nearest well	3	10	30	30
C. Land use/zoning within 1 mile radius	3	3	9	9
D. Distance to reservation boundary	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	2	9	18	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			121	180

Receptors subscore (100 X factor score subtotal/maximum score subtotal) 67

II. WASTE CHARACTERISTICS

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

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

Factor Subscore A (from 20 to 100 based on factor score matrix) 80

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

80 x 0.8 = 64

C. Apply physical state multiplier

Subscore B X Physical State Multiplier = Waste Characteristics Subscore

64 x 0.75 = 48

III. PATHWAYS

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

A. If there is evidence of migration of hazardous contaminants, assign maximum factor subscore of 100 points for direct evidence or 80 points for indirect evidence. If direct evidence exists then proceed to C. If no evidence or indirect evidence exists, proceed to B.

Subscore N/A

B. Rate the migration potential for 3 potential pathways: surface water migration, flooding, and ground-water migration. Select the highest rating, and proceed to C.

1. Surface water migration

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
Distance to nearest surface water	3	8	24	24
Net precipitation	2	6	12	18
Surface erosion	1	8	8	24
Surface permeability	0	6	0	18
Rainfall intensity	2	8	16	25
		Subtotals	60	108

Subscore (100 X factor score subtotal/maximum score subtotal) 56

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
2. Flooding	0	1	0	3

Subscore (100 x factor score/3) 0

3. Ground-water migration

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
Depth to ground water	3	8	24	24
Net precipitation	2	6	12	18
Soil permeability	3	8	24	24
Subsurface flows	2	8	16	24
Direct access to ground water	2	8	16	24
		Subtotals	92	114

Subscore (100 x factor score subtotal/maximum score subtotal) 80

C. Highest pathway subscore.

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

Pathways Subscore 80

IV. WASTE MANAGEMENT PRACTICES

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

Receptors 67
Waste Characteristics 48
Pathways 80

Total 195 divided by 3 = 65 Gross Total Score

B. Apply factor for waste containment from waste management practices

Gross Total Score X Waste Management Practices Factor = Final Score

65 x 1.0 = 65

HAZARD ASSESSMENT RATING METHODOLOGY FORM

NAME OF SITE JP-X Discharge Pit

LOCATION McGuire Missile Site, adjacent to Bldg. 24

DATE OF OPERATION OR OCCURRENCE 1958-1972

OWNER/OPERATOR McGuire AFB

COMMENTS/DESCRIPTION Infiltration pit for spilled fuel, JP-4 and hydrazine

SITE RATED BY E/ Schroeder

I. RECEPTORS

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
A. Population within 1,000 feet of site	0	4	0	12
B. Distance to nearest well	3	10	30	30
C. Land use/zoning within 1 mile radius	0	3	0	9
D. Distance to reservation boundary	3	6	18	18
E. Critical environments within 1 mile radius of site	0	10	0	30
F. Water quality of nearest surface water body	1	6	6	18
G. Ground water use of uppermost aquifer	1	9	9	27
H. Population served by surface water supply within 3 miles downstream of site	0	6	0	18
I. Population served by ground-water supply within 3 miles of site	0	6	0	18
		Subtotals	63	180

Receptors subscore (100 X factor score subtotal/maximum score subtotal) 35

II. WASTE CHARACTERISTICS

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

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

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

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

100 x 0.9 = 90

C. Apply physical state multiplier

Subscore B X Physical State Multiplier = Waste Characteristics Subscore

90 x 1.0 = 90

III. PATHWAYS

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

A. If there is evidence of migration of hazardous contaminants, assign maximum factor subscore of 100 points for direct evidence or 80 points for indirect evidence. If direct evidence exists then proceed to C. If no evidence or indirect evidence exists, proceed to B.

Subscore N/A

B. Rate the migration potential for 3 potential pathways: surface water migration, flooding, and ground-water migration. Select the highest rating, and proceed to C.

1. Surface water migration

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
Distance to nearest surface water	2	8	16	24
Net precipitation	2	6	12	18
Surface erosion	1	8	8	24
Surface permeability	0	6	0	18
Rainfall intensity	2	8	16	24
		Subtotals	52	108

Subscore (100 X factor score subtotal/maximum score subtotal) 48

2. Flooding

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
Flooding	0	1	0	3

Subscore (100 x factor score/3) 0

3. Ground-water migration

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
Depth to ground water	2	8	16	24
Net precipitation	2	6	12	18
Soil permeability	3	8	24	24
Subsurface flows	0	8	0	24
Direct access to ground water	1	8	8	24
		Subtotals	60	114

Subscore (100 x factor score subtotal/maximum score subtotal) 53

C. Highest pathway subscore.

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

Pathways Subscore 53

IV. WASTE MANAGEMENT PRACTICES

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

Receptors	35
Waste Characteristics	90
Pathways	53
Total 178 divided by 3 =	59 Gross Total Score

B. Apply factor for waste containment from waste management practices

Gross Total Score X Waste Management Practices Factor = Final Score

59 x 1.0 = 59

HAZARD ASSESSMENT RATING METHODOLOGY FORM

NAME OF SITE Pesticide Wash Area

LOCATION Entomology Shop, Bldg. 3450

DATE OF OPERATION OR OCCURRENCE Early 1950's to present

OWNER/OPERATOR McGuire AFB

COMMENTS/DESCRIPTION Rinse water discharged to ground

SITE RATED BY E J Schroeder

I. RECEPTORS

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
A. Population within 1,000 feet of site	3	4	12	12
B. Distance to nearest well	3	10	30	30
C. Land use/zoning within 1 mile radius	2	3	6	9
D. Distance to reservation boundary	3	6	18	18
E. Critical environments within 1 mile radius of site	0	10	0	30
F. Water quality of nearest surface water body	1	6	6	18
G. Ground water use of uppermost aquifer	1	9	9	27
H. Population served by surface water supply within 3 miles downstream of site	0	6	0	18
I. Population served by ground-water supply within 3 miles of site	3	6	18	18
		Subtotals	99	180

Receptors subscore (100 X factor score subtotal/maximum score subtotal) 55

II. WASTE CHARACTERISTICS

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

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

Factor Subscore A (from 20 to 100 based on factor score matrix) 40

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

40 x 1.0 = 40

C. Apply physical state multiplier

Subscore B X Physical State Multiplier = Waste Characteristics Subscore

40 x 1.0 = 40

III. PATHWAYS

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

A. If there is evidence of migration of hazardous contaminants, assign maximum factor subscore of 100 points for direct evidence or 80 points for indirect evidence. If direct evidence exists then proceed to C. If no evidence or indirect evidence exists, proceed to B.

Subscore 80

B. Rate the migration potential for 3 potential pathways: surface water migration, flooding, and ground-water migration. Select the highest rating, and proceed to C.

1. Surface water migration

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
Distance to nearest surface water	3	8	24	24
Net precipitation	2	6	12	18
Surface erosion	1	8	8	24
Surface permeability	0	6	0	18
Rainfall intensity	2	8	16	24
Subtotals			60	108

Subscore (100 X factor score subtotal/maximum score subtotal) 56

2. Flooding

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
Flooding	0	1	0	3

Subscore (100 x factor score/3) 0

3. Ground-water migration

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
Depth to ground water	3	8	24	24
Net precipitation	2	6	12	18
Soil permeability	3	8	24	24
Subsurface flows	-	8	--	--
Direct access to ground water	1	8	8	24
Subtotals			68	90

Subscore (100 x factor score subtotal/maximum score subtotal) 76

C. Highest pathway subscore.

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

Pathways Subscore 80

IV. WASTE MANAGEMENT PRACTICES

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

Receptors	55
Waste Characteristics	40
Pathways	80

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 1.0 = 58

HAZARD ASSESSMENT RATING METHODOLOGY FORM

NAME OF SITE Defense Property Disposal Office (DPDO) Storage Facility

LOCATION North of Wrightstown-Cookstown Rd., on and adjacent to Landfill No. 2

DATE OF OPERATION OR OCCURRENCE 1960 - 1979

OWNER/OPERATOR McGuire AFB

COMMENTS/DESCRIPTION Spills and leakage of waste oils, waste chemicals and transformer oils have occurred in area.

SITE RATED BY E J Edwards

I. RECEPTORS

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
A. Population within 1,000 feet of site	2	4	8	12
B. Distance to nearest well	3	10	30	30
C. Land use/zoning within 1 mile radius	2	3	6	9
D. Distance to reservation boundary	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	1	9	9	27
H. Population served by surface water supply within 3 miles downstream of site	0	6	0	18
I. Population served by ground-water supply within 3 miles of site	3	6	18	18
Subtotals			105	180

Receptors subscore (100 X factor score subtotal/maximum score subtotal) 58

II. WASTE CHARACTERISTICS

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

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

Factor Subscore A (from 20 to 100 based on factor score matrix) 60

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

60 x 0.9 = 54

C. Apply physical state multiplier

Subscore B X Physical State Multiplier = Waste Characteristics Subscore

60 x 1.0 = 54

III. PATHWAYS

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

A. If there is evidence of migration of hazardous contaminants, assign maximum factor subscore of 100 points for direct evidence or 80 points for indirect evidence. If direct evidence exists then proceed to C. If no evidence or indirect evidence exists, proceed to B.

Subscore N/A

B. Rate the migration potential for 3 potential pathways: surface water migration, flooding, and ground-water migration. Select the highest rating, and proceed to C.

1. Surface water migration

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
Distance to nearest surface water	3	8	24	24
Net precipitation	2	6	12	18
Surface erosion	1	8	8	24
Surface permeability	0	6	0	18
Rainfall intensity	2	8	16	24
Subtotals			60	108

Subscore (100 X factor score subtotal/maximum score subtotal) 56

2. Flooding

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
Flooding	0	1	0	3

Subscore (100 x factor score/3) 0

3. Ground-water migration

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
Depth to ground water	3	8	24	24
Net precipitation	2	6	12	18
Soil permeability	3	8	24	24
Subsurface flows	0	8	0	24
Direct access to ground water	0	8	0	24
Subtotals			60	114

Subscore (100 x factor score subtotal/maximum score subtotal) 53

C. Highest pathway subscore.

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

Pathways Subscore 56

IV. WASTE MANAGEMENT PRACTICES

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

Receptors	58
Waste Characteristics	54
Pathways	56

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 1.0 = 56

HAZARD ASSESSMENT RATING METHODOLOGY FORM

NAME OF SITE Fire Protection Training Area No. 1

LOCATION North of Hazardous Cargo Parking Area within Runway Triangle

DATE OF OPERATION OR OCCURRENCE late 1940's to 1958

OWNER/OPERATOR McGuire AFB

COMMENTS/DESCRIPTION Waste chemicals and contaminated fuels burned

SITE RATED BY E J Schnaeder

I. RECEPTORS

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
A. Population within 1,000 feet of site	1	4	4	12
B. Distance to nearest well	1	10	10	30
C. Land use/zoning within 1 mile radius	2	3	6	9
D. Distance to reservation boundary	2	6	12	18
E. Critical environments within 1 mile radius of site	0	10	0	30
F. Water quality of nearest surface water body	1	6	6	18
G. Ground water use of uppermost aquifer	1	9	9	27
H. Population served by surface water supply within 3 miles downstream of site	0	6	0	18
I. Population served by ground-water supply within 3 miles of site	3	6	18	18
		Subtotals	65	180

Receptors subscore (100 X factor score subtotal/maximum score subtotal) 36

II. WASTE CHARACTERISTICS

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

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

Factor Subscore A (from 20 to 100 based on factor score matrix) 80

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

80 x 0.9 = 72

C. Apply physical state multiplier

Subscore B X Physical State Multiplier = Waste Characteristics Subscore

72 x 1.0 = 72

III. PATHWAYS

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

A. If there is evidence of migration of hazardous contaminants, assign maximum factor subscore of 100 points for direct evidence or 80 points for indirect evidence. If direct evidence exists then proceed to C. If no evidence or indirect evidence exists, proceed to B.

Subscore N/A

B. Rate the migration potential for 3 potential pathways: surface water migration, flooding, and ground-water migration. Select the highest rating, and proceed to C.

1. Surface water migration

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
Distance to nearest surface water	2	8	16	24
Net precipitation	2	6	12	18
Surface erosion	0	8	0	24
Surface permeability	0	6	0	18
Rainfall intensity	2	8	16	24
Subtotals			44	108

Subscore (100 X factor score subtotal/maximum score subtotal) 41

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
2. Flooding	0	1	0	3

Subscore (100 x factor score/3) 0

3. Ground-water migration

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
Depth to ground water	3	8	24	24
Net precipitation	2	6	12	18
Soil permeability	3	8	24	24
Subsurface flows	0	8	0	24
Direct access to ground water	0	8	0	24
Subtotals			60	114

Subscore (100 x factor score subtotal/maximum score subtotal) 53

C. Highest pathway subscore.

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

Pathways Subscore 53

IV. WASTE MANAGEMENT PRACTICES

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

Receptors 36
Waste Characteristics 72
Pathways 53

Total 161 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 1.0 = 54

HAZARD ASSESSMENT RATING METHODOLOGY FORM

NAME OF SITE Bulk Fuel Storage Tank - Sludge Disposal Areas

LOCATION POL bulk fuel tank farm

DATE OF OPERATION OR OCCURRENCE 1950's to 1970

OWNER/OPERATOR McGuire AFB

COMMENTS/DESCRIPTION Sludge was buried in holes within diked areas around storage tanks

SITE RATED BY E J Schroeder

I. RECEPTORS

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
A. Population within 1,000 feet of site	3	4	12	12
B. Distance to nearest well	3	10	30	30
C. Land use/zoning within 1 mile radius	2	3	6	9
D. Distance to reservation boundary	2	6	12	18
E. Critical environments within 1 mile radius of site	0	10	0	30
F. Water quality of nearest surface water body	1	6	6	18
G. Ground water use of uppermost aquifer	1	9	9	27
H. Population served by surface water supply within 3 miles downstream of site	0	6	0	18
I. Population served by ground-water supply within 3 miles of site	3	6	18	18
		Subtotals	93	180

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

Factor Subscore A (from 20 to 100 based on factor score matrix) 80

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

80 x .80 = 64

C. Apply physical state multiplier

Subscore B X Physical State Multiplier = Waste Characteristics Subscore

64 x .75 = 48

III. PATHWAYS

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

A. If there is evidence of migration of hazardous contaminants, assign maximum factor subscore of 100 points for direct evidence or 80 points for indirect evidence. If direct evidence exists then proceed to C. If no evidence or indirect evidence exists, proceed to B.

Subscore N/A

B. Rate the migration potential for 3 potential pathways: surface water migration, flooding, and ground-water migration. Select the highest rating, and proceed to C.

1. Surface water migration

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
Distance to nearest surface water	3	8	24	24
Net precipitation	2	6	12	18
Surface erosion	0	8	0	24
Surface permeability	0	6	0	18
Rainfall intensity	2	8	16	24
Subtotals			52	108

Subscore (100 X factor score subtotal/maximum score subtotal) 48

2. Flooding

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
Flooding	0	1	0	3

Subscore (100 x factor score/3) 0

3. Ground-water migration

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
Depth to ground water	3	8	24	24
Net precipitation	2	6	12	18
Soil permeability	3	8	24	24
Subsurface flows	0	8	0	24
Direct access to ground water	1	8	8	24
Subtotals			68	114

Subscore (100 x factor score subtotal/maximum score subtotal) 60

C. Highest pathway subscore.

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

Pathways Subscore 60

IV. WASTE MANAGEMENT PRACTICES

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

Receptors	52
Waste Characteristics	48
Pathways	60
Total 160 divided by 3 =	53 Gross Total Score

B. Apply factor for waste containment from waste management practices

Gross Total Score X Waste Management Practices Factor = Final Score

53 x 1.0 = 53

HAZARD ASSESSMENT RATING METHODOLOGY FORM

NAME OF SITE Landfill No. 5

LOCATION Northeast corner of base, northeast of primary runway

DATE OF OPERATION OR OCCURRENCE Approximately 1970 to 1973

OWNER/OPERATOR McGuire AFB

COMMENTS/DESCRIPTION Closed, covered, vegetation, some burning

SITE RATED BY E. J. Schneider

I. RECEPTORS

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
A. Population within 1,000 feet of site	1	4	4	12
B. Distance to nearest well	3	10	30	30
C. Land use/zoning within 1 mile radius	2	3	6	9
D. Distance to reservation boundary	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	1	9	9	27
H. Population served by surface water supply within 3 miles downstream of site	0	6	0	18
I. Population served by ground-water supply within 3 miles of site	3	6	18	18
Subtotals			101	180

Receptors subscore (100 X factor score subtotal/maximum score subtotal) 56

II. WASTE CHARACTERISTICS

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

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

Factor Subscore A (from 20 to 100 based on factor score matrix) 40

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

40 x 0.8 = 32

C. Apply physical state multiplier

Subscore B X Physical State Multiplier = Waste Characteristics Subscore

32 x 1.0 = 32

III. PATHWAYS

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

A. If there is evidence of migration of hazardous contaminants, assign maximum factor subscore of 100 points for direct evidence or 80 points for indirect evidence. If direct evidence exists then proceed to C. If no evidence or indirect evidence exists, proceed to B.

Subscore N/A

B. Rate the migration potential for 3 potential pathways: surface water migration, flooding, and ground-water migration. Select the highest rating, and proceed to C.

1. Surface water migration

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
Distance to nearest surface water	3	8	24	24
Net precipitation	2	6	12	18
Surface erosion	0	8	0	[illegible]
Surface permeability	0	6	0	[illegible]
Rainfall intensity	2	8	16	[illegible]
Subtotals			52	[illegible]

Subscore (100 X factor score subtotal/maximum score subtotal) [illegible]

2. Flooding

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
Flooding	0	1	0	3

Subscore (100 x factor score/3) 0

3. Ground-water migration

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
Depth to ground water	3	8	24	24
Net precipitation	2	6	12	18
Soil permeability	3	8	24	24
Subsurface flows	1	8	8	24
Direct access to ground water	1	8	8	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	56
Waste Characteristics	32
Pathways	67

Total 155 divided by 3 = 52 Gross Total Score

B. Apply factor for waste containment from waste management practices

Gross Total Score X Waste Management Practices Factor = Final Score

52 x 1.0 = 52

HAZARD ASSESSMENT RATING METHODOLOGY FORM

NAME OF SITE Fire Protection Training Area No. 2

LOCATION South of Runway 24, adjacent to Power Check Pad 1148

DATE OF OPERATION OR OCCURRENCE 1958 to 1968

OWNER/OPERATOR McGuire AFB

COMMENTS/DESCRIPTION Only burned JP-4

SITE RATED BY [signature]

I. RECEPTORS

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
A. Population within 1,000 feet of site	1	4	4	12
B. Distance to nearest well	2	10	20	30
C. Land use/zoning within 1 mile radius	2	3	6	9
D. Distance to reservation boundary	3	6	18	18
E. Critical environments within 1 mile radius of site	1	10	10	30
F. Water quality of nearest surface water body	1	6	6	18
G. Ground water use of uppermost aquifer	1	9	9	27
H. Population served by surface water supply within 3 miles downstream of site	0	6	0	18
I. Population served by ground-water supply within 3 miles of site	3	6	18	18
Subtotals			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 (S = small, M = medium, L = large) S
2. Confidence level (C = confirmed, S = suspected) C
3. Hazard rating (H = high, M = medium, L = low) H

Factor Subscore A (from 20 to 100 based on factor score matrix) 60

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

60 x 0.8 = 48

C. Apply physical state multiplier

Subscore B X Physical State Multiplier = Waste Characteristics Subscore

48 x 1.0 = 48

III. PATHWAYS

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

A. If there is evidence of migration of hazardous contaminants, assign maximum factor subscore of 100 points for direct evidence or 80 points for indirect evidence. If direct evidence exists then proceed to C. If no evidence or indirect evidence exists, proceed to B.

Subscore N/A

B. Rate the migration potential for 3 potential pathways: surface water migration, flooding, and ground-water migration. Select the highest rating, and proceed to C.

1. Surface water migration

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
Distance to nearest surface water	2	8	16	24
Net precipitation	2	6	12	18
Surface erosion	1	8	8	24
Surface permeability	0	6	0	18
Rainfall intensity	2	8	16	24
Subtotals			52	108

Subscore (100 X factor score subtotal/maximum score subtotal) 48

2. Flooding

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
Flooding	0	1	0	3

Subscore (100 x factor score/3) 0

3. Ground-water migration

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
Depth to ground water	3	8	24	24
Net precipitation	2	6	12	18
Soil permeability	3	8	24	24
Subsurface flows	0	8	0	24
Direct access to ground water	0	8	0	24
Subtotals			60	114

Subscore (100 x factor score subtotal/maximum score subtotal) 53

C. Highest pathway subscore.

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

Pathways Subscore 53

IV. WASTE MANAGEMENT PRACTICES

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

Receptors 51
Waste Characteristics 48
Pathways 53

Total 152 divided by 3 = 51
Gross Total Score

B. Apply factor for waste containment from waste management practices

Gross Total Score X Waste Management Practices Factor = Final Score

51 x 1.0 = 51

HAZARD ASSESSMENT RATING METHODOLOGY FORM

NAME OF SITE Landfill No. 6

LOCATION Northeast corner of base, northeast of primary runway, noth side of South Run Creek

DATE OF OPERATION OR OCCURRENCE 1973 to 1976

OWNER/OPERATOR McGuire AFB

COMMENTS/DESCRIPTION Closed, covered, sparse vegetation, project underway to provide additional cover

SITE RATED BY E J Schroeder

I. RECEPTORS

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
A. Population within 1,000 feet of site	1	4	4	12
B. Distance to nearest well	2	10	20	30
C. Land use/zoning within 1 mile radius	2	3	6	9
D. Distance to reservation boundary	3	6	18	18
E. Critical environments within 1 mile radius of site	1	10	10	30
F. Water quality of nearest surface water body	1	6	6	18
G. Ground water use of uppermost aquifer	1	9	9	27
H. Population served by surface water supply within 3 miles downstream of site	0	6	0	18
I. Population served by ground-water supply within 3 miles of site	3	6	18	18
		Subtotals	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 (S = small, M = medium, L = large) M
2. Confidence level (C = confirmed, S = suspected) S
3. Hazard rating (H = high, M = medium, L = low) M

Factor Subscore A (from 20 to 100 based on factor score matrix) 40

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

40 x .8 = 32

C. Apply physical state multiplier

Subscore B X Physical State Multiplier = Waste Characteristics Subscore

32 x 1.0 = 32

III. PATHWAYS

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

A. If there is evidence of migration of hazardous contaminants, assign maximum factor subscore of 100 points for direct evidence or 80 points for indirect evidence. If direct evidence exists then proceed to C. If no evidence or indirect evidence exists, proceed to B.

Subscore N/A

B. Rate the migration potential for 3 potential pathways: surface water migration, flooding, and ground-water migration. Select the highest rating, and proceed to C.

1. Surface water migration

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
Distance to nearest surface water	3	8	24	24
Net precipitation	2	6	12	18
Surface erosion	2	8	16	24
Surface permeability	0	6	0	18
Rainfall intensity	2	8	16	24
Subtotals			68	108

Subscore (100 X factor score subtotal/maximum score subtotal) 63

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
2. Flooding	0	1	0	3

Subscore (100 x factor score/3) 0

3. Ground-water migration

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
Depth to ground water	3	8	24	24
Net precipitation	2	6	12	18
Soil permeability	3	8	24	24
Subsurface flows	1	8	8	24
Direct access to ground water	1	8	8	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	51
Waste Characteristics	32
Pathways	67

Total 150 divided by 3 = 50 Gross Total Score

B. Apply factor for waste containment from waste management practices

Gross Total Score X Waste Management Practices Factor = Final Score

50 x 1.0 = 50

HAZARD ASSESSMENT RATING METHODOLOGY FORM

NAME OF SITE Wastewater Treatment Plant Sludge Disposal Areas

LOCATION Northeast corner of base, northeast of primary runway

DATE OF OPERATION OR OCCURRENCE 1953-present

OWNER/OPERATOR McGuire AFB

COMMENTS/DESCRIPTION Sludge dewatered in drying beds, excess sludge accumulated in two adjacent mounds

SITE RATED BY E. J. Schneider

I. RECEPTORS

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
A. Population within 1,000 feet of site	1	4	4	12
B. Distance to nearest well	2	10	20	30
C. Land use/zoning within 1 mile radius	2	3	6	9
D. Distance to reservation boundary	3	6	18	18
E. Critical environments within 1 mile radius of site	1	10	10	30
F. Water quality of nearest surface water body	1	6	6	18
G. Ground water use of uppermost aquifer	1	9	9	27
H. Population served by surface water supply within 3 miles downstream of site	0	6	0	18
I. Population served by ground-water supply within 3 miles of site	3	6	18	18
		Subtotals	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 (S = small, M = medium, L = large) L
2. Confidence level (C = confirmed, S = suspected) C
3. Hazard rating (H = high, M = medium, L = low) L

Factor Subscore A (from 20 to 100 based on factor score matrix) 50

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

50 x 1.0 = 50

C. Apply physical state multiplier

Subscore B X Physical State Multiplier = Waste Characteristics Subscore

50 x 0.75 = 38

III. PATHWAYS

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

A. If there is evidence of migration of hazardous contaminants, assign maximum factor subscore of 100 points for direct evidence or 80 points for indirect evidence. If direct evidence exists then proceed to C. If no evidence or indirect evidence exists, proceed to B.

Subscore N/A

B. Rate the migration potential for 3 potential pathways: surface water migration, flooding, and ground-water migration. Select the highest rating, and proceed to C.

1. Surface water migration

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
Distance to nearest surface water	3	8	24	24
Net precipitation	2	6	12	18
Surface erosion	0	8	0	24
Surface permeability	0	6	0	18
Rainfall intensity	2	8	16	24
Subtotals			52	108

Subscore (100 X factor score subtotal/maximum score subtotal) 48

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
2. Flooding	0	1	0	3

Subscore (100 x factor score/3) 0

3. Ground-water migration

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
Depth to ground water	3	8	24	24
Net precipitation	2	6	12	18
Soil permeability	3	8	24	24
Subsurface flows	0	8	0	24
Direct access to ground water	1	8	8	24
Subtotals			68	114

Subscore (100 x factor score subtotal/maximum score subtotal) 60

C. Highest pathway subscore.

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

Pathways Subscore 60

IV. WASTE MANAGEMENT PRACTICES

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

Receptors	51
Waste Characteristics	38
Pathways	60

Total 149 divided by 3 = 50 Gross Total Score

B. Apply factor for waste containment from waste management practices

Gross Total Score X Waste Management Practices Factor = Final Score

50 x 1.0 = 50

HAZARD ASSESSMENT RATING METHODOLOGY FORM

NAME OF SITE Transformer Sites

LOCATION McGuire Missile Site (throughout site)

DATE OF OPERATION OR OCCURRENCE 1958 to present

OWNER/OPERATOR McGuire AFB

COMMENTS/DESCRIPTION Transformers left on site, some past leakage

SITE RATED BY E J Schroeder

I. RECEPTORS

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
A. Population within 1,000 feet of site	0	4	0	12
B. Distance to nearest well	3	10	30	30
C. Land use/zoning within 1 mile radius	0	3	0	9
D. Distance to reservation boundary	3	6	18	18
E. Critical environments within 1 mile radius of site	0	10	0	30
F. Water quality of nearest surface water body	1	6	6	18
G. Ground water use of uppermost aquifer	1	9	9	27
H. Population served by surface water supply within 3 miles downstream of site	0	6	0	18
I. Population served by ground-water supply within 3 miles of site	0	6	0	18
		Subtotals	63	180

Receptors subscore (100 X factor score subtotal/maximum score subtotal) 35

II. WASTE CHARACTERISTICS

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

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

Factor Subscore A (from 20 to 100 based on factor score matrix) 60

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

60 x 1.0 = 60

C. Apply physical state multiplier

Subscore B X Physical State Multiplier = Waste Characteristics Subscore

60 x 1.0 = 60

III. PATHWAYS

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

A. If there is evidence of migration of hazardous contaminants, assign maximum factor subscore of 100 points for direct evidence or 80 points for indirect evidence. If direct evidence exists then proceed to C. If no evidence or indirect evidence exists, proceed to B.

Subscore N/A

B. Rate the migration potential for 3 potential pathways: surface water migration, flooding, and ground-water migration. Select the highest rating, and proceed to C.

1. Surface water migration

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
Distance to nearest surface water	3	8	24	24
Net precipitation	2	6	12	18
Surface erosion	1	8	8	24
Surface permeability	0	6	0	18
Rainfall intensity	2	8	16	24
Subtotals			60	108

Subscore (100 X factor score subtotal/maximum score subtotal) 56

2. Flooding

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
Flooding	0	1	0	3

Subscore (100 x factor score/3) 0

3. Ground-water migration

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
Depth to ground water	2	8	16	24
Net precipitation	2	6	12	18
Soil permeability	3	8	24	24
Subsurface flows	0	8	0	24
Direct access to ground water	1	8	8	24
Subtotals			60	114

Subscore (100 x factor score subtotal/maximum score subtotal) 53

C. Highest pathway subscore.

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

Pathways Subscore 56

IV. WASTE MANAGEMENT PRACTICES

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

Receptors 35
Waste Characteristics 60
Pathways 56

Total 151 divided by 3 = 50 Gross Total Score

B. Apply factor for waste containment from waste management practices

Gross Total Score X Waste Management Practices Factor = Final Score

50 x 1.0 = 50

HAZARD ASSESSMENT RATING METHODOLOGY FORM

NAME OF SITE Buried Oil Drums

LOCATION West of Bldg. 3469 within CE compound

DATE OF OPERATION OR OCCURRENCE Early 1950's

OWNER/OPERATOR McGuire AFB

COMMENTS/DESCRIPTION Fifty 55-gal. drums of heavy oil buried about 6 feet deep

SITE RATED BY [signature]

I. RECEPTORS

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
A. Population within 1,000 feet of site	3	4	12	12
B. Distance to nearest well	3	10	30	30
C. Land use/zoning within 1 mile radius	2	3	6	9
D. Distance to reservation boundary	3	6	18	18
E. Critical environments within 1 mile radius of site	0	10	0	30
F. Water quality of nearest surface water body	1	6	6	18
G. Ground water use of uppermost aquifer	1	9	9	27
H. Population served by surface water supply within 3 miles downstream of site	0	6	0	18
I. Population served by ground-water supply within 3 miles of site	3	6	18	18
		Subtotals	99	180

Receptors subscore (100 X factor score subtotal/maximum score subtotal) 55

II. WASTE CHARACTERISTICS

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

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

Factor Subscore A (from 20 to 100 based on factor score matrix) 40

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

40 x 0.8 = 32

C. Apply physical state multiplier

Subscore B X Physical State Multiplier = Waste Characteristics Subscore

32 x 1.0 = 32

III. PATHWAYS

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

A. If there is evidence of migration of hazardous contaminants, assign maximum factor subscore of 100 points for direct evidence or 80 points for indirect evidence. If direct evidence exists then proceed to C. If no evidence or indirect evidence exists, proceed to B.

Subscore N/A

B. Rate the migration potential for 3 potential pathways: surface water migration, flooding, and ground-water migration. Select the highest rating, and proceed to C.

1. Surface water migration

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
Distance to nearest surface water	3	8	24	24
Net precipitation	2	6	12	18
Surface erosion	0	8	0	24
Surface permeability	3	6	18	18
Rainfall intensity	2	8	16	24
		Subtotals	70	108

Subscore (100 X factor score subtotal/maximum score subtotal) 65

2. Flooding

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
Flooding	0	1	0	3

Subscore (100 x factor score/3) 0

3. Ground-water migration

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
Depth to ground water	3	8	24	24
Net precipitation	2	6	12	18
Soil permeability	3	8	24	24
Subsurface flows	1	8	8	24
Direct access to ground water	1	8	8	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	55
Waste Characteristics	32
Pathways	67

Total 154 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 .95 = 49

HAZARD ASSESSMENT RATING METHODOLOGY FORM

NAME OF SITE Fire Protection Training Area No. 3

LOCATION Center of Runway Triangle

DATE OF OPERATION OR OCCURRENCE 1973 to 1976, 1982

OWNER/OPERATOR McGuire AFB

COMMENTS/DESCRIPTION Clay base, skimmer, diked tanks, only burned JP-4

SITE RATED BY [signature]

I. RECEPTORS

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
A. Population within 1,000 feet of site	1	4	4	12
B. Distance to nearest well	1	10	10	30
C. Land use/zoning within 1 mile radius	2	3	6	9
D. Distance to reservation boundary	2	6	12	18
E. Critical environments within 1 mile radius of site	0	10	0	30
F. Water quality of nearest surface water body	1	6	6	18
G. Ground water use of uppermost aquifer	1	9	9	27
H. Population served by surface water supply within 3 miles downstream of site	0	6	0	18
I. Population served by ground-water supply within 3 miles of site	3	6	18	18
		Subtotals	65	180

Receptors subscore (100 X factor score subtotal/maximum score subtotal) 36

II. WASTE CHARACTERISTICS

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

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

Factor Subscore A (from 20 to 100 based on factor score matrix) 60

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

60 x 0.8 = 48

C. Apply physical state multiplier

Subscore B X Physical State Multiplier = Waste Characteristics Subscore

48 x 1.0 = 48

III. PATHWAYS

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

A. If there is evidence of migration of hazardous contaminants, assign maximum factor subscore of 100 points for direct evidence or 80 points for indirect evidence. If direct evidence exists then proceed to C. If no evidence or indirect evidence exists, proceed to B.

Subscore N/A

B. Rate the migration potential for 3 potential pathways: surface water migration, flooding, and ground-water migration. Select the highest rating, and proceed to C.

1. Surface water migration

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
Distance to nearest surface water	3	8	24	24
Net precipitation	2	6	12	18
Surface erosion	0	8	0	24
Surface permeability	3	6	18	18
Rainfall intensity	2	8	16	24
Subtotals			70	108

Subscore (100 X factor score subtotal/maximum score subtotal) 65

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
2. Flooding	0	1	0	3

Subscore (100 x factor score/3) 0

3. Ground-water migration

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
Depth to ground water	3	8	24	24
Net precipitation	2	6	12	18
Soil permeability	3	8	24	24
Subsurface flows	0	8	0	24
Direct access to ground water	1	8	8	24
Subtotals			68	114

Subscore (100 x factor score subtotal/maximum score subtotal) 60

C. Highest pathway subscore.

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

Pathways Subscore 65

IV. WASTE MANAGEMENT PRACTICES

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

Receptors	36
Waste Characteristics	48
Pathways	65

Total 149 divided by 3 = 50 Gross Total Score

B. Apply factor for waste containment from waste management practices

Gross Total Score X Waste Management Practices Factor = Final Score

50 x 0.95 = 48

HAZARD ASSESSMENT RATING METHODOLOGY FORM

NAME OF SITE NDI Shop Drain Field

LOCATION Adjacent to Building 1623 within Runway Triangle

DATE OF OPERATION OR OCCURRENCE Early 1960's to 1972

OWNER/OPERATOR McGuire AFB

COMMENTS/DESCRIPTION NDI Shop chemical wastes were drained to a low lying grassy area

SITE RATED BY E. J. Schroeder

I. RECEPTORS

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
A. Population within 1,000 feet of site	1	4	4	12
B. Distance to nearest well	2	10	20	30
C. Land use/zoning within 1 mile radius	2	3	6	9
D. Distance to reservation boundary	2	6	12	18
E. Critical environments within 1 mile radius of site	1	10	10	30
F. Water quality of nearest surface water body	1	6	6	18
G. Ground water use of uppermost aquifer	1	9	9	27
H. Population served by surface water supply within 3 miles downstream of site	0	6	0	18
I. Population served by ground-water supply within 3 miles of site	3	6	18	18
		Subtotals	85	180

Receptors subscore (100 X factor score subtotal/maximum score subtotal) 47

II. WASTE CHARACTERISTICS

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

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

Factor Subscore A (from 20 to 100 based on factor score matrix) 50

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

50 x 0.8 = 40

C. Apply physical state multiplier

Subscore B X Physical State Multiplier = Waste Characteristics Subscore

40 x 1.0 = 40

III. PATHWAYS

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

A. If there is evidence of migration of hazardous contaminants, assign maximum factor subscore of 100 points for direct evidence or 80 points for indirect evidence. If direct evidence exists then proceed to C. If no evidence or indirect evidence exists, proceed to B.

Subscore N/A

B. Rate the migration potential for 3 potential pathways: surface water migration, flooding, and ground-water migration. Select the highest rating, and proceed to C.

1. Surface water migration

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
Distance to nearest surface water	3	8	24	24
Net precipitation	2	6	12	18
Surface erosion	0	8	0	24
Surface permeability	0	6	0	18
Rainfall intensity	2	8	16	24
Subtotals			52	108

Subscore (100 X factor score subtotal/maximum score subtotal) 48

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
2. Flooding	0	1	0	3

Subscore (100 x factor score/3) 0

3. Ground-water migration

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
Depth to ground water	3	8	24	24
Net precipitation	2	6	12	18
Soil permeability	3	8	24	24
Subsurface flows	0	8	0	24
Direct access to ground water	0	8	0	24
Subtotals			60	114

Subscore (100 x factor score subtotal/maximum score subtotal) 53

C. Highest pathway subscore.

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

Pathways Subscore 53

IV. WASTE MANAGEMENT PRACTICES

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

Receptors	47
Waste Characteristics	40
Pathways	53
Total 140 divided by 3 =	47 Gross Total Score

B. Apply factor for waste containment from waste management practices

Gross Total Score X Waste Management Practices Factor = Final Score

47 x 1.0 = 47

HAZARD ASSESSMENT RATING METHODOLOGY FORM

NAME OF SITE McGuire Missile Site Accident Area

LOCATION McGuire Missile site (Launcher 204)

DATE OF OPERATION OR OCCURRENCE 1960

OWNER/OPERATOR McGuire AFB

COMMENTS/DESCRIPTION Fire resulted in radiation contaminated water infiltration into the ground

SITE RATED BY E J Schroeder

I. RECEPTORS

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
A. Population within 1,000 feet of site	0	4	0	12
B. Distance to nearest well	3	10	30	30
C. Land use/zoning within 1 mile radius	0	3	0	9
D. Distance to reservation boundary	3	6	18	18
E. Critical environments within 1 mile radius of site	0	10	0	30
F. Water quality of nearest surface water body	1	6	6	18
G. Ground water use of uppermost aquifer	1	9	9	27
H. Population served by surface water supply within 3 miles downstream of site	0	6	0	18
I. Population served by ground-water supply within 3 miles of site	0	6	0	18
		Subtotals	63	180

Receptors subscore (100 X factor score subtotal/maximum score subtotal) 35

II. WASTE CHARACTERISTICS

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

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

Factor Subscore A (from 20 to 100 based on factor score matrix) 60

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

60 x 1.0 = 60

C. Apply physical state multiplier

Subscore B X Physical State Multiplier = Waste Characteristics Subscore

60 x 0.5 = 30

III. PATHWAYS

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

A. If there is evidence of migration of hazardous contaminants, assign maximum factor subscore of 100 points for direct evidence or 80 points for indirect evidence. If direct evidence exists then proceed to C. If no evidence or indirect evidence exists, proceed to B.

Subscore 80

B. Rate the migration potential for 3 potential pathways: surface water migration, flooding, and ground-water migration. Select the highest rating, and proceed to C.

1. Surface water migration

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
Distance to nearest surface water	3	8	24	24
Net precipitation	2	6	12	18
Surface erosion	0	8	0	24
Surface permeability	0	6	0	18
Rainfall intensity	2	8	16	24
Subtotals			52	108

Subscore (100 X factor score subtotal/maximum score subtotal) 48

2. Flooding

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
Flooding	0	1	0	3

Subscore (100 x factor score/3) 0

3. Ground-water migration

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
Depth to ground water	2	8	16	24
Net precipitation	2	6	12	18
Soil permeability	3	8	24	24
Subsurface flows	0	8	0	24
Direct access to ground water	0	8	0	24
Subtotals			52	114

Subscore (100 x factor score subtotal/maximum score subtotal) 46

C. Highest pathway subscore.

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

Pathways Subscore 80

IV. WASTE MANAGEMENT PRACTICES

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

Receptors	35
Waste Characteristics	30
Pathways	80

Total 145 divided by 3 = 48 Gross Total Score

B. Apply factor for waste containment from waste management practices

Gross Total Score X Waste Management Practices Factor = Final Score

48 x 0.95 = 46

HAZARD ASSESSMENT RATING METHODOLOGY FORM

NAME OF SITE Mogas Storage Tanks

LOCATION McGuire Missile Site - adjacent to Bldg. 35

DATE OF OPERATION OR OCCURRENCE McGuire AFB

OWNER/OPERATOR 200 gallons of Mogas left in two underground tanks

COMMENTS/DESCRIPTION

SITE RATED BY E. J. Schroeder

I. RECEPTORS

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
A. Population within 1,000 feet of site	0	4	0	12
B. Distance to nearest well	3	10	30	30
C. Land use/zoning within 1 mile radius	0	3	0	9
D. Distance to reservation boundary	3	6	18	18
E. Critical environments within 1 mile radius of site	0	10	0	30
F. Water quality of nearest surface water body	1	6	6	18
G. Ground water use of uppermost aquifer	1	9	9	27
H. Population served by surface water supply within 3 miles downstream of site	0	6	0	18
I. Population served by ground-water supply within 3 miles of site	0	6	0	18
		Subtotals	63	180

Receptors subscore (100 X factor score subtotal/maximum score subtotal) 35

II. WASTE CHARACTERISTICS

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

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

Factor Subscore A (from 20 to 100 based on factor score matrix) 60

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

60 x 0.8 = 48

C. Apply physical state multiplier

Subscore B X Physical State Multiplier = Waste Characteristics Subscore

48 x 1.0 = 48

III. PATHWAYS

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

A. If there is evidence of migration of hazardous contaminants, assign maximum factor subscore of 100 points for direct evidence or 80 points for indirect evidence. If direct evidence exists then proceed to C. If no evidence or indirect evidence exists, proceed to B.

Subscore N/A

B. Rate the migration potential for 3 potential pathways: surface water migration, flooding, and ground-water migration. Select the highest rating, and proceed to C.

1. Surface water migration

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
Distance to nearest surface water	3	8	24	24
Net precipitation	2	6	12	18
Surface erosion	1	8	8	24
Surface permeability	0	6	0	18
Rainfall intensity	2	8	16	24
Subtotals			60	108

Subscore (100 X factor score subtotal/maximum score subtotal) 56

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
2. Flooding	0	1	0	3

Subscore (100 x factor score/3) 0

3. Ground-water migration

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
Depth to ground water	3	8	24	24
Net precipitation	2	6	12	18
Soil permeability	3	8	24	24
Subsurface flows	0	8	0	24
Direct access to ground water	1	8	8	24
Subtotals			68	114

Subscore (100 x factor score subtotal/maximum score subtotal) 60

C. Highest pathway subscore.

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

Pathways Subscore 60

IV. WASTE MANAGEMENT PRACTICES

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

Receptors	35
Waste Characteristics	48
Pathways	60

Total 143 divided by 3 = 48 Gross Total Score

B. Apply factor for waste containment from waste management practices

Gross Total Score X Waste Management Practices Factor = Final Score

48 x 0.95 = 45

HAZARD ASSESSMENT RATING METHODOLOGY FORM

NAME OF SITE BOMARC Launcher Hydraulic Systems

LOCATION McGuire Missile Site (Launcher Buildings)

DATE OF OPERATION OR OCCURRENCE 1958 to present

OWNER/OPERATOR McGuire AFB

COMMENTS/DESCRIPTION Hydraulic fluid left in hydraulic system, leakage has occurred

SITE RATED BY E J Schroeder

I. RECEPTORS

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
A. Population within 1,000 feet of site	0	4	0	12
B. Distance to nearest well	3	10	30	30
C. Land use/zoning within 1 mile radius	0	3	0	9
D. Distance to reservation boundary	3	6	18	18
E. Critical environments within 1 mile radius of site	0	10	0	30
F. Water quality of nearest surface water body	1	6	6	18
G. Ground water use of uppermost aquifer	1	9	9	27
H. Population served by surface water supply within 3 miles downstream of site	0	6	0	18
I. Population served by ground-water supply within 3 miles of site	0	6	0	18
		Subtotals	63	180

Receptors subscore (100 X factor score subtotal/maximum score subtotal) 35

II. WASTE CHARACTERISTICS

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

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

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 0.8 = 40

C. Apply physical state multiplier

Subscore B X Physical State Multiplier = Waste Characteristics Subscore

40 x 1.0 = 40

III. PATHWAYS

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

A. If there is evidence of migration of hazardous contaminants, assign maximum factor subscore of 100 points for direct evidence or 80 points for indirect evidence. If direct evidence exists then proceed to C. If no evidence or indirect evidence exists, proceed to B.

Subscore N/A

B. Rate the migration potential for 3 potential pathways: surface water migration, flooding, and ground-water migration. Select the highest rating, and proceed to C.

1. Surface water migration

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
Distance to nearest surface water	3	8	24	24
Net precipitation	2	6	12	18
Surface erosion	0	8	0	24
Surface permeability	0	6	0	18
Rainfall intensity	2	8	16	24
		Subtotals	52	108

Subscore (100 X factor score subtotal/maximum score subtotal) 48

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
2. Flooding	0	1	0	3

Subscore (100 x factor score/3) 0

3. Ground-water migration

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
Depth to ground water	2	8	16	24
Net precipitation	2	6	12	18
Soil permeability	3	8	24	24
Subsurface flows	0	8	0	24
Direct access to ground water	0	8	0	24
		Subtotals	52	114

Subscore (100 x factor score subtotal/maximum score subtotal) 46

C. Highest pathway subscore.

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

Pathways Subscore 48

IV. WASTE MANAGEMENT PRACTICES

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

Receptors 35
Waste Characteristics 40
Pathways 48

Total 123 divided by 3 = 41 Gross Total Score

B. Apply factor for waste containment from waste management practices

Gross Total Score X Waste Management Practices Factor = Final Score

41 x 0.95 = 39

HAZARD ASSESSMENT RATING METHODOLOGY FORM

NAME OF SITE Neutralized Acid Pit

LOCATION McGuire Missile Site, adjacent to Bldg. 25

DATE OF OPERATION OR OCCURRENCE 1958-1972

OWNER/OPERATOR McGuire AFB

COMMENTS/DESCRIPTION Nitric acid neutralized by limestone, percolated into ground

SITE RATED BY E J Schneider

I. RECEPTORS

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
A. Population within 1,000 feet of site	0	4	0	12
B. Distance to nearest well	3	10	30	30
C. Land use/zoning within 1 mile radius	0	3	0	9
D. Distance to reservation boundary	3	6	18	18
E. Critical environments within 1 mile radius of site	0	10	0	30
F. Water quality of nearest surface water body	1	6	6	18
G. Ground water use of uppermost aquifer	1	9	9	27
H. Population served by surface water supply within 3 miles downstream of site	0	6	0	18
I. Population served by ground-water supply within 3 miles of site	0	6	0	18
		Subtotals	63	180

Receptors subscore (100 X factor score subtotal/maximum score subtotal) 35

II. WASTE CHARACTERISTICS

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

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

Factor Subscore A (from 20 to 100 based on factor score matrix) 60

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

60 x 0.4 = 24

C. Apply physical state multiplier

Subscore B X Physical State Multiplier = Waste Characteristics Subscore

24 x 1.0 = 24

III. PATHWAYS

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

A. If there is evidence of migration of hazardous contaminants, assign maximum factor subscore of 100 points for direct evidence or 80 points for indirect evidence. If direct evidence exists then proceed to C. If no evidence or indirect evidence exists, proceed to B.

Subscore N/A

B. Rate the migration potential for 3 potential pathways: surface water migration, flooding, and ground-water migration. Select the highest rating, and proceed to C.

1. Surface water migration

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
Distance to nearest surface water	2	8	16	24
Net precipitation	2	6	12	18
Surface erosion	1	8	8	24
Surface permeability	0	6	0	18
Rainfall intensity	2	8	16	24
Subtotals			52	108

Subscore (100 X factor score subtotal/maximum score subtotal) 48

2. Flooding

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
Flooding	0	1	0	3

Subscore (100 x factor score/3) 0

3. Ground-water migration

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
Depth to ground water	2	8	16	24
Net precipitation	2	6	12	18
Soil permeability	3	8	24	24
Subsurface flows	0	8	0	24
Direct access to ground water	1	8	8	24
Subtotals			60	114

Subscore (100 x factor score subtotal/maximum score subtotal) 53

C. Highest pathway subscore.

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

Pathways Subscore 53

IV. WASTE MANAGEMENT PRACTICES

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

Receptors	35
Waste Characteristics	24
Pathways	53
Total 112 divided by 3 =	37 Gross Total Score

B. Apply factor for waste containment from waste management practices

Gross Total Score X Waste Management Practices Factor = Final Score

37 x 1.0 = 37

HAZARD ASSESSMENT RATING METHODOLOGY FORM

NAME OF SITE Hazardous Waste Storage Area/PCB Spill Site

LOCATION Adjacent to Bldg. 2310 along Radin Rd.

DATE OF OPERATION OR OCCURRENCE 1982

OWNER/OPERATOR McGuire AFB

COMMENTS/DESCRIPTION Spill involved 75-200 gallons of PCB transformer oil

SITE RATED BY E J Schneider

I. RECEPTORS

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
A. Population within 1,000 feet of site	3	4	12	12
B. Distance to nearest well	3	10	30	30
C. Land use/zoning within 1 mile radius	2	3	6	9
D. Distance to reservation boundary	2	6	12	18
E. Critical environments within 1 mile radius of site	0	10	0	30
F. Water quality of nearest surface water body	1	6	6	18
G. Ground water use of uppermost aquifer	1	9	9	27
H. Population served by surface water supply within 3 miles downstream of site	0	6	0	18
I. Population served by ground-water supply within 3 miles of site	3	6	18	18
Subtotals			93	180

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

Factor Subscore A (from 20 to 100 based on factor score matrix) 60

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

60 x 1.0 = 60

C. Apply physical state multiplier

Subscore B X Physical State Multiplier = Waste Characteristics Subscore

60 x 1.0 = 60

III. PATHWAYS

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

A. If there is evidence of migration of hazardous contaminants, assign maximum factor subscore of 100 points for direct evidence or 80 points for indirect evidence. If direct evidence exists then proceed to C. If no evidence or indirect evidence exists, proceed to B.

Subscore N/A

B. Rate the migration potential for 3 potential pathways: surface water migration, flooding, and ground-water migration. Select the highest rating, and proceed to C.

1. Surface water migration

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
Distance to nearest surface water	3	8	24	24
Net precipitation	2	6	12	18
Surface erosion	0	8	0	24
Surface permeability	0	6	0	18
Rainfall intensity	2	8	16	24
Subtotals			52	105

Subscore (100 X factor score subtotal/maximum score subtotal) 48

2. Flooding

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
Flooding	0	1	0	3

Subscore (100 x factor score/3) 0

3. Ground-water migration

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
Depth to ground water	3	8	24	24
Net precipitation	2	6	12	18
Soil permeability	3	8	24	24
Subsurface flows	0	8	0	24
Direct access to ground water	1	8	8	24
Subtotals			68	114

Subscore (100 x factor score subtotal/maximum score subtotal) 60

C. Highest pathway subscore.

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

Pathways Subscore 60

IV. WASTE MANAGEMENT PRACTICES

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

Receptors	52
Waste Characteristics	60
Pathways	60

Total 172 divided by 3 = 57 Gross Total Score

B. Apply factor for waste containment from waste management practices

Gross Total Score X Waste Management Practices Factor = Final Score

57 x .10 = 6

APPENDIX I

REFERENCES

REFERENCES

Farlekas, G.M., 1982, U.S. Geological Survey Water Resources Division, Personal Communication, 3 August.

Fusillo, T. V. and Voronin, T.M., 1981, Water-Quality Data for the Potomac-Raritan-Magothy Aquifer System, Trenton to Pennsville, New Jersey, 1980, U. S. Geological Survey Open-File Report, 80-814.

Gill, H. E., and Falekas, G. M., 1976, Geohydrologic Maps of the Potomac-Raritan-Magothy Aquifer System in the New Jersey Coastal Plain, U. S. Geological Survey Hydrologic Investigations Atlas, HA 557.

Isphording, W. C. and Lodding W., 1969, Focus Changes in Sediments of Miocene Age in New Jersey in Geology of Selected Areas in New Jersey and Eastern Pennsylvania, edited by S. Subitzky, Rutgers University Press, New Brunswick, N.J.

Lewis, J. V. and Kummel, H. B., 1912 (revised 1931 and 1950) Geologic Map of New Jersey, State of New Jersey Department of Conservation and Economic Development, Trenton.

Markewicz, F. J., 1969, Ilmenite Deposits of the New Jersey Coastal Plain in Geology of Selected Areas in New Jersey and Eastern Pennsylvania, edited by s. Subitzky, Rutgers University Press, New Brunswick, NJ.

Means, J. L., Yuretich, R. F., Crerar, D. A., Krunsman, D. J. J. and Boresik, M.P., 1981, Hydrogeochemistry of the New Jersey Pine Barrens, New Jersey Geological Survey, Bulletin 76.

Minard, J. P. and Owens, J. P., 1962, Geologic Map of the New Egypt Quadrangle New Jersey, Pre-Quaternary Geology, U.S. Geological Survey Geologic Quadrangle Map GQ-161.

New Jersey Department of Environmental Protection, Bureau of Pesticide Control, EPA Special Assignment #196, July 20, 1982.

New Jersey Department of Environmental Protection, Div. of Fish, Game and Wildlife, Special Investigation: Inspection of Ft. Dix McGuire AFB and Wrightstown Sewerage Treatment Facilities, August 18, 1964.

New Jersey Pinelands Commission, 1980, Comprehensive Management Plan for the Pinelands National Reserve.

New Jersey Pinelands Commission Records, 1982 New Lisbon, New Jersey.

Schaefer, Richard, 1982, U.S. Army Corps of Engineers Philadelphia District, Personal Communication, 4 August.

Vowinkel, E. F. and Foster, W. K., 1981, Hydrogeologic Conditions in the Coastal Plain of New Jersey, U.S. Geological Survey Open-File Report 81-405.

Wolfe, Peter E., 1977, The Geology and Landscapes of New Jersey, Crane, Russak and Company, New York.

U.S. Department of Agriculture, Soil Conservation Service, 1971, Soil Survey of Burlington County, New Jersey.

U. S. Department of Agriculture Soil Conservation Service, 1980, Soil Survey of Ocean County, New Jersey.

APPENDIX J

GLOSSARY OF TERMINOLOGY AND ABBREVIATIONS

APPENDIX J
GLOSSARY OF TERMINOLOGY AND ABBREVIATIONS

ACFT MAINT: Aircraft Maintenance

AF: Air Force

AFB: Air Force Base

AFFF: Aqueous Film Forming Foam, a fire extinguishing agent

AFR: Air Force Regulation

AFS: Air Force Station

AFSC: Air Force Systems Command

Ag: Chemical symbol for silver

AGE: Aerospace Ground Equipment

Al: Chemical symbol for aluminum

ALC: Air Logistics Center

AMS: Avionics Maintenance Squadron

ANG: Air National Guard

ARTESIAN: Ground water contained under hydrostatic pressure

AQUICLUDE: Poorly permeable formation that impedes ground-water movement and does not yield water to a well or spring

AQUIFER: A geologic formation, group of formations, or part of a formation that is capable of yielding water to a well or spring

AQUITARD: A geologic unit which impedes ground-water flow

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

Cd: Chemical symbol for cadmium

CERCLA: Comprehensive Environmental Response, Compensation and Liability Act

CES: Civil Engineering Squadron

CIRCA: About; used to indicate an approximate date

CLOSURE: The completion of a set of rigidly defined functions for a hazardous waste facility no longer in operation

Cn: chemical symbol for cyanide

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, flood plains and high water tables

CPM: Counts per minute (alpha radiation measurement)

COD: Chemical Oxygen Demand, a measure of the amount of oxygen required to oxidize organic and oxidizable inorganic compounds in water

COE: Corps of Engineers

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

CONTAMINATION: The degradation of natural water quality to the extent that its usefulness is impaired; there is no implication of any specific limits since the degree of permissible contamination depends upon the intended end use or uses of the water

Cr: Chemical symbol for chromium

Cu: Chemical symbol for copper

DET: Detachment

DISPOSAL FACILITY: A facility or part of a facility at which hazardous waste is intentionally placed into or on land or water, and at which waste will remain after closure

DISPOSAL OF HAZARDOUS WASTE: The discharge, deposit, injection, dumping, spilling, or placing of any hazardous waste into or on land or water so that such waste or any constituent thereof may enter the environment or be emitted into the air or discharged into any waters, including ground water

DOD: Department of Defense

DOWNGRADIENT: In the direction of lower hydraulic static head; the direction in which ground water typically flows

DPDO: Defense Property Disposal Office

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.

EOD: Explosive Ordnance Disposal

EPA: 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

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

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

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 Standard

INFILTRATION: The flow of liquid through pores or small openings

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 Fuel

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

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

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

MAC: Military Airlift Command

MAFB: McGuire Air Force Base

MAW: Military Airlift Wing

MEK: Methyl Ethyl Ketone

MGD: Million gallons per day

MOGAS: Motor gasoline

Mn: Chemical symbol for manganese

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

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

MSL: Mean Sea Level

NCOIC: Non-commissioned Officer In-charge

Ni: Chemical symbol for nickel

NJANG: New Jersey Air National Guard

NPDES: National Pollution Discharge Elimination System

OEHL: Occupational and Environmental Health Laboratory

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

O&G: Symbols for oil and grease

Pb: Chemical symbol for lead

PCB: Polychlorinated Biphenyls are highly toxic to aquatic life; they persist in the environment for long periods and are biologically accumulative

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

PERMEABILITY: The rate at which fluids may move through a solid, porous medium

PD-680: 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 a peneplained igneous and metamorprhic terrain

PL: Public Law

POL: Petroleum, Oils and Lubricants

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

PPB: Parts per billion

PPM: Parts per million

RCRA: Resource Conservation and.Recovery Act

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 man-made.

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

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

SLUDGE: The solid residue resulting from a manufacturing or wastewater treatment process which also produces a liquid stream

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

STORAGE OF HAZARDOUS WASTE: Containment, either on a temporary basis or for a period of years, in such a manner as not to constitute disposal of such hazardous waste

STP: Sewage Treatment Plant

TAC: Tactical Air Command

TCE: Trichloroethylene

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

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

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

USAF: United States Air Force

USFWS: United States Fish and Wildlife Service

USGS: United States Geological Survey

V: Chemical symbol for vanadium

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

WWTP: Wastewater Treatment Plant

Zn: Chemical symbol for zinc

APPENDIX K

INDEX OF REFERENCES TO POTENTIAL CONTAMINATION SOURCES

APPENDIX K
INDEX OF REFERENCES TO POTENTIAL CONTAMINATION SOURCES