AD-A133 933 INSTALLATION RESTORATION PROGRAM RECORDS SEARCH FOR CANNON AIR FORCE BASE NEW MEXICO(U) CH2M HILL GAINESVILLE FL AUG 83 F08637-80-G-0010

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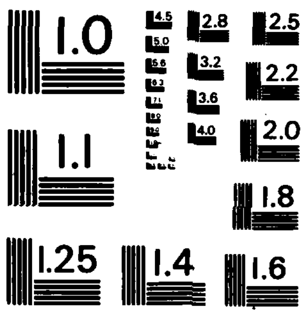

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NATIONAL BUREAU OF STANDARDS-1963-A

INSTALLATION RESTORATION
PROGRAM RECORDS SEARCH

FOR

CANNON AIR FORCE BASE, NEW MEXICO

Prepared for

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August 1983

Contract No. F08637-80-G0010-0018

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EXECUTIVE SUMMARY

A. INTRODUCTION

1. CH2M HILL was retained on December 20, 1982, to conduct the Cannon Air Force Base (AFB) records search under Contract No. F08637-80-G0010-0018, with funds provided by Tactical Air Command (TAC).

2. Department of Defense (DoD) policy, directed by Defense Environmental Quality Program Policy Memorandum (DEQPPM) 81-5, is to identify and fully evaluate suspected problems associated with past hazardous material disposal sites on DoD facilities, control the migration of hazardous contamination from such facilities, and control hazards to health and welfare that may have resulted from these past operations.

3. To implement the DoD policy, a four-phase Installation Restoration Program has been directed. Phase I, the records search, is the identification of potential problems. Phase II (not part of this contract) consists of follow-on field work to determine the extent and magnitude of contaminant migration. Phase III (not part of this contract) consists of technology base development (evaluation of alternatives for remedial actions) to support the development of project plans for controlling migration or restoring the installation. Phase IV (not part of this contract) includes those efforts which are required to control identified hazardous conditions.

4. The Cannon AFB records search included a detailed review of pertinent installation records, 23 agency contacts for documents relevant to the records search effort, and an onsite base visit conducted by CH2M HILL during the week of May 9 through May 13, 1983. Activities conducted during the

on-site base visit included interviews with 37 base employees, a ground tour of the installation, a detailed search of installation records, and a helicopter overflight to identify past disposal areas. Attempts were also made to contact and interview former base employees for information relevant to the records search effort. (Prior to the base visit, the Public Affairs Office provided a press release announcing the study and requesting persons knowledgeable of past disposal practices at the installation to contact Cannon AFB.) The installations addressed in the records search include Cannon AFB, Melrosé Bombing Range, and Conchas Lake Recreation Annex.

B. MAJOR FINDINGS

1. The majority of industrial operations at Cannon AFB have been in existence since 1952. In 1942, the Army Air Corps took control of the existing civilian airfield and began construction of the base. The base was in operation until May 1947, at which time it was deactivated. The base was reactivated in November 1951, and industrial activities have been continuous since then. The major industrial operations include jet engine, pneudraulics, aerospace ground equipment (AGE) maintenance, corrosion control, vehicle maintenance shops, and the non-destructive inspection (NDI) lab. These industrial operations generate varying quantities of waste oils, contaminated fuels, and spent solvents and cleaners. The total quantity of waste oils, contaminated fuels, and spent solvents and cleaners generated ranges from 35,000 to 55,000 gallons per year. The above range of total waste quantities is believed to be representative for the period from the mid-1960s, when the mission changed to that of a replacement training unit, to present.

2. Standard procedures for past and present industrial waste disposal practices have been as follows: (1) fire

department training exercises and landfills (1943-1947, 1952-1965), (2) fire department training exercises, landfill and contractor removal (1965-1975), (3) landfills and contractor removal (1975-1982), and (4) fire department training exercises and contractor removal (1982-present).

3. Interviews with base employees resulted in the identification of 19 past disposal or spill sites at Cannon AFB and the approximate dates that these sites were active. The location map of the identified disposal and spill sites is shown on Figure 1.

C. CONCLUSIONS

1. No direct evidence was found to indicate that migration of hazardous contaminants exists within or beyond Cannon AFB boundaries. Indirect evidence of contamination was found at three sites:

- Site No. 9 (Fire Department Training Area No. 4)

  Small pools of fuel were observed in tire ruts around the simulated aircraft.

- Site No. 11 (Engine Test Cell Overflow Pit and Leaching Field)

  The unlined overflow pit was observed to contain a black liquid with a hydrocarbon odor.

- Site No. 15 (AGE Drainage Ditch)

  The bottom of the ditch was observed to have a black color and a characteristic POL odor.

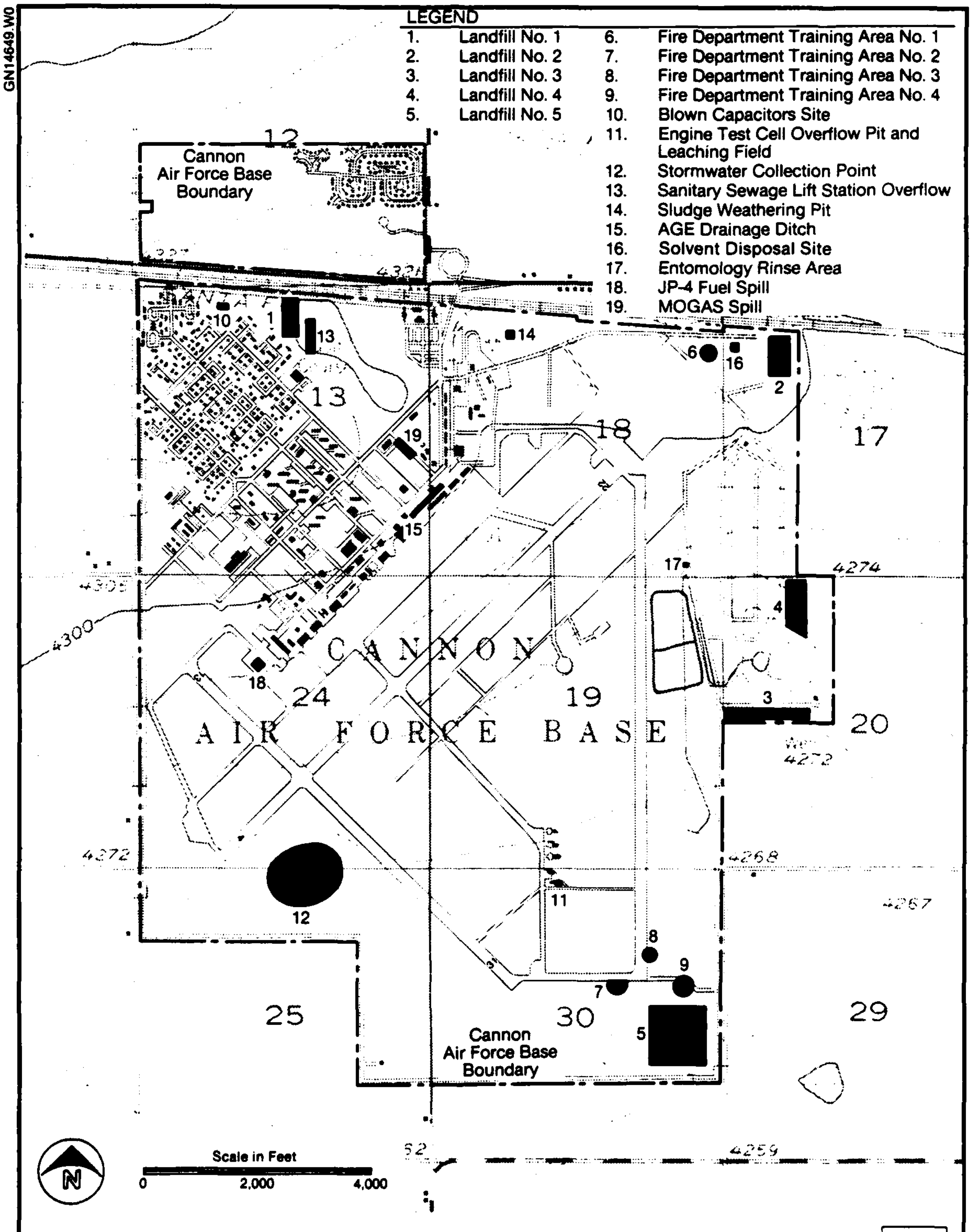

FIGURE 1. Location Map of Identified Disposal and Spill Sites at Cannon AFB.

2. No evidence of environmental stress due to past disposal of hazardous wastes was observed at Cannon AFB.

3. Information obtained through interviews with 37 base personnel, base records, shop folders, and field observations indicates that hazardous wastes have been disposed of on Cannon AFB property in the past.

4. A low potential for contaminant migration exists at Cannon AFB, due primarily to: (1) depth to ground-water, (2) low precipitation, (3) high evapotranspiration rate, and (4) the occurrence of a very low-permeability caliche layer under most of the base. Although low, the potential for migration exists at those sites where a constant, or nearly constant, hydraulic driving force is present (i.e., Site No. 9 [drainage pit adjacent to site] and Site No. 11).

5. *Table 1 presents a priority listing of the rated* sites and their overall scores. The following sites were designated as areas showing the most significant potential (relative to other Cannon AFB sites) for environmental concerns.

- Site No. 9 (Fire Department Training Area No. 4 [Active])
- Site No. 5 (Landfill No. 5 [Active])
- Site No. 15 (AGE Drainage Ditch)
- Site No. 6 (Fire Department Training Area No. 1)
- Site No. 11 (Engine Test Cell Overflow Pit and Leaching Field)

Table 1
PRIORITY LISTING OF DISPOSAL AND SPILL SITES

Site No.	Site Description	Overall Score
9	Fire Department Training Area No. 4	66
5	Landfill No. 5	60
15	AGE Drainage Ditch	59
6	Fire Department Training Area No. 1	57
11	Engine Test Cell Overflow Pit and Leaching Field	57
4	Landfill No. 4	56
1	Landfill No. 1	55
3	Landfill No. 3	54
14	Sludge Weathering Pit	52
2	Landfill No. 2	50
16	Solvent Disposal Site	50
12	Stormwater Collection Point	49
18	JP-4 Fuel Spill	48
13	Sanitary Sewage Lift Station Overflow Site	47
19	MOGAS Spill	47
17	Entomology Rinse Area	47
7	Fire Department Training Area No. 2	42
8	Fire Department Training Area No. 3	42

6. The remaining rated sites (Sites No. 1-4, 7-8, 12-14, 16-19) as well as the site that was not rated (Site No. 10--Blown Capacitors Site), are not considered to present significant concern for adverse effects on health or the environment.

7. The records search did not indicate any significant environmental concerns for the Melrose Bombing Range or the Conchas Lake Recreation Annex. Therefore, no Phase II work is recommended for these off-base facilities.

D. RECOMMENDATIONS

1. A limited Phase II monitoring program is recommended for the zone consisting of the two sites, No. 9 and No. 5, and Sites No. 15 and 6, to confirm or rule out the presence and/or migration of hazardous contaminants. The location map of sites recommended for limited Phase II monitoring is shown on Figure 2. This program includes installation of upgradient and downgradient monitoring wells for sampling ground water at the zone consisting of Sites No. 9 and 5. Soil sampling is recommended at the Fire Department Training Area No. 4 (Site No. 9), the AGE Drainage Ditch (Site No. 15) and the Fire Department Training Area No. 1 (Site No. 6). The priority for monitoring at Cannon AFB is considered low to moderate. Details of the limited Phase II monitoring program are provided in Section VI and in Appendix J of this report.

2. The specific details of the monitoring program, including the exact locations of sampling points, should be finalized as part of the Phase II program. In the event that contaminants are detected at significant levels, a more extensive field survey program should be implemented to determine the extent of contaminant migration.

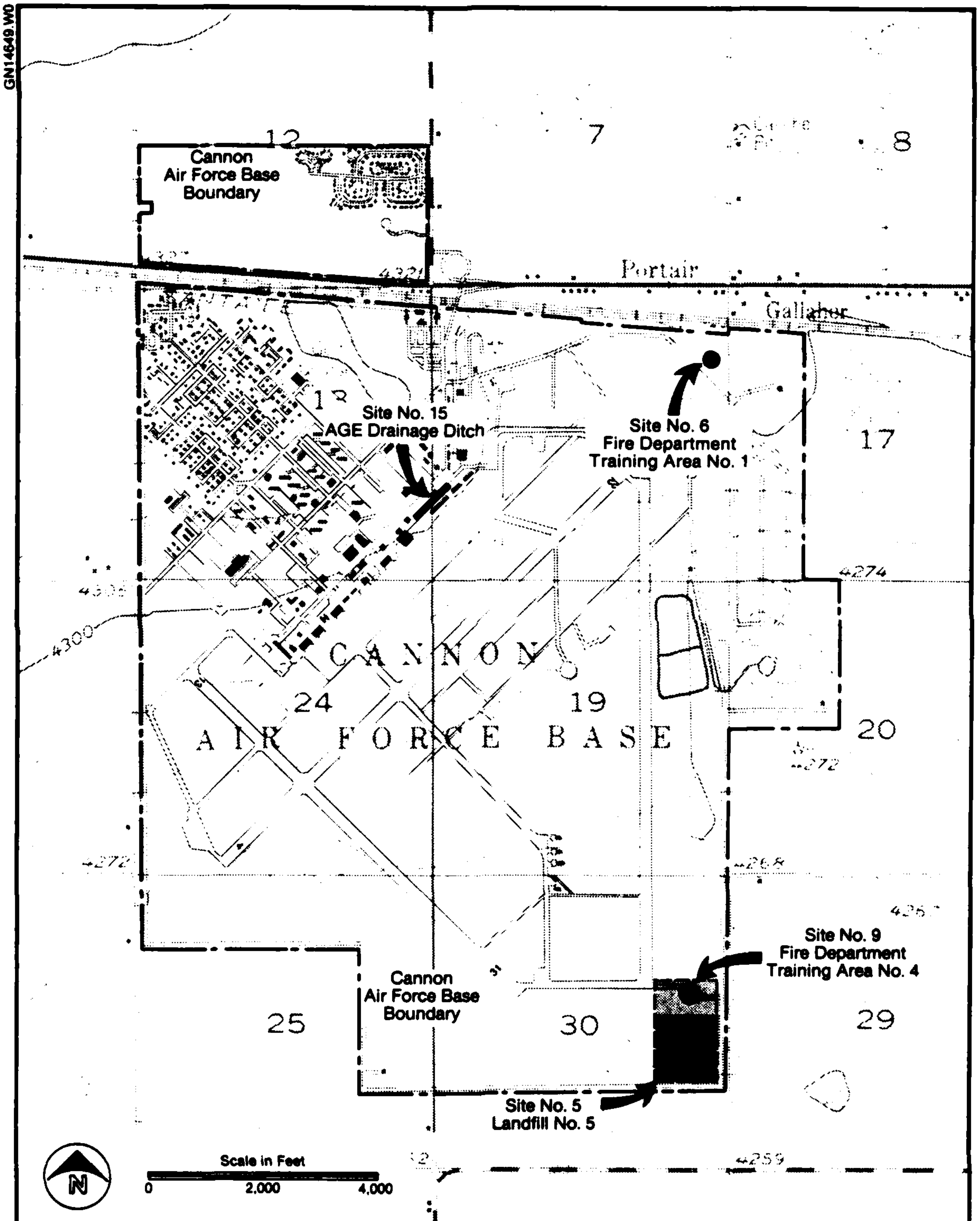

FIGURE 2.
Location Map of Sites Recommended for Limited Phase II Monitoring.

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3. Other environmental recommendations include: (1) sampling and analyzing potable water Well No. 9 for priority pollutants to determine if potential contaminant migration exists from the Engine Test Cell Overflow Pit and Leaching Field (Site No. 11), (2) monitor the sewage lagoon influent and effluent for priority pollutants, and (3) determine if POL substances are being discharged into the sanitary sewers leading to Lift Station No. 1402.

4. Phase II monitoring is not recommended for the Melrose Bombing Range or the Conchas Lake Recreation Annex.

5. Appropriate land use restrictions should be applied to the Melrose Bombing Range should its future use be considered for modification. No land use restrictions are recommended for the Conchas Lake Recreation Annex.

I. INTRODUCTION

A. BACKGROUND

The United States Air Force (USAF), due to its primary mission, has long been engaged in a wide variety of operations dealing with toxic and hazardous materials. Federal, state, and local governments have developed strict regulations to require that disposers identify the locations and contents of disposal sites and take action to eliminate the hazards in an environmentally responsible manner. The primary Federal legislation governing disposal of hazardous waste is the Resource Conservation and Recovery Act (RCRA) of 1976, as amended. Under Sections 6003 and 3012 of the Act, Federal agencies are directed to assist the Environmental Protection Agency (EPA) and state agencies to inventory past disposal sites and make the information available to the requesting agencies.

The Department of Defense (DoD) developed the current Installation Restoration Program (IRP) to assure compliance with these hazardous waste regulations. The DoD IRP policy is contained in Defense Environmental Quality Program Policy Memorandum (DEQPPM) 81-5, dated 11 December 1981 and implemented by Air Force message dated 21 January 1982. DEQPPM 81-5 reissued and amplified all previous directives and memoranda on the IRP. DoD policy is to identify and fully evaluate suspected problems associated with past hazardous contamination, and to control hazards to health and welfare that resulted from these past operations. The IRP will be the basis for remedial actions on Air Force installations under the provisions of the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) of 1980, as clarified by Executive Order 12316.

To conduct the IRP Hazardous Materials Disposal Sites Records Search for Cannon AFB, New Mexico, CH2M HILL was retained on December 20, 1982 under Contract No. F08637-80-G0010-0018 with funds provided by Tactical Air Command (TAC). The installations included in the records search include: (1) Cannon AFB; (2) Melrose Bombing Range; and (3) Conchas Lake Recreation Annex. A location map of these sites is shown on Figure 3.

The records search is Phase I of the DoD IRP and is intended to review installation records to identify possible hazardous waste-contaminated sites and to assess the potential for contaminant migration. Phase II (not part of this contract) consists of follow-on field work as determined from Phase I. Phase II consists of a preliminary survey to confirm or rule out the presence and/or migration of contaminants and if necessary, additional field work to determine the extent and magnitude of the contaminant migration. Phase III (not part of this contract) consists of technology base development (evaluation of alternatives for remedial actions) to support the development of project plans for controlling migration or restoring the installation. Phase IV (not part of this contract) includes those efforts which are required to control identified hazardous environmental conditions.

B. AUTHORITY

The identification of hazardous waste disposal sites at Air Force installations was directed by Defense Environmental Quality Program Policy Memorandum 81-5 (DEQPPM 81-5) dated 11 December 1981, and implemented by Air Force message dated 21 January 1982, as a positive action to ensure compliance of Air Force installations with existing environmental regulations.

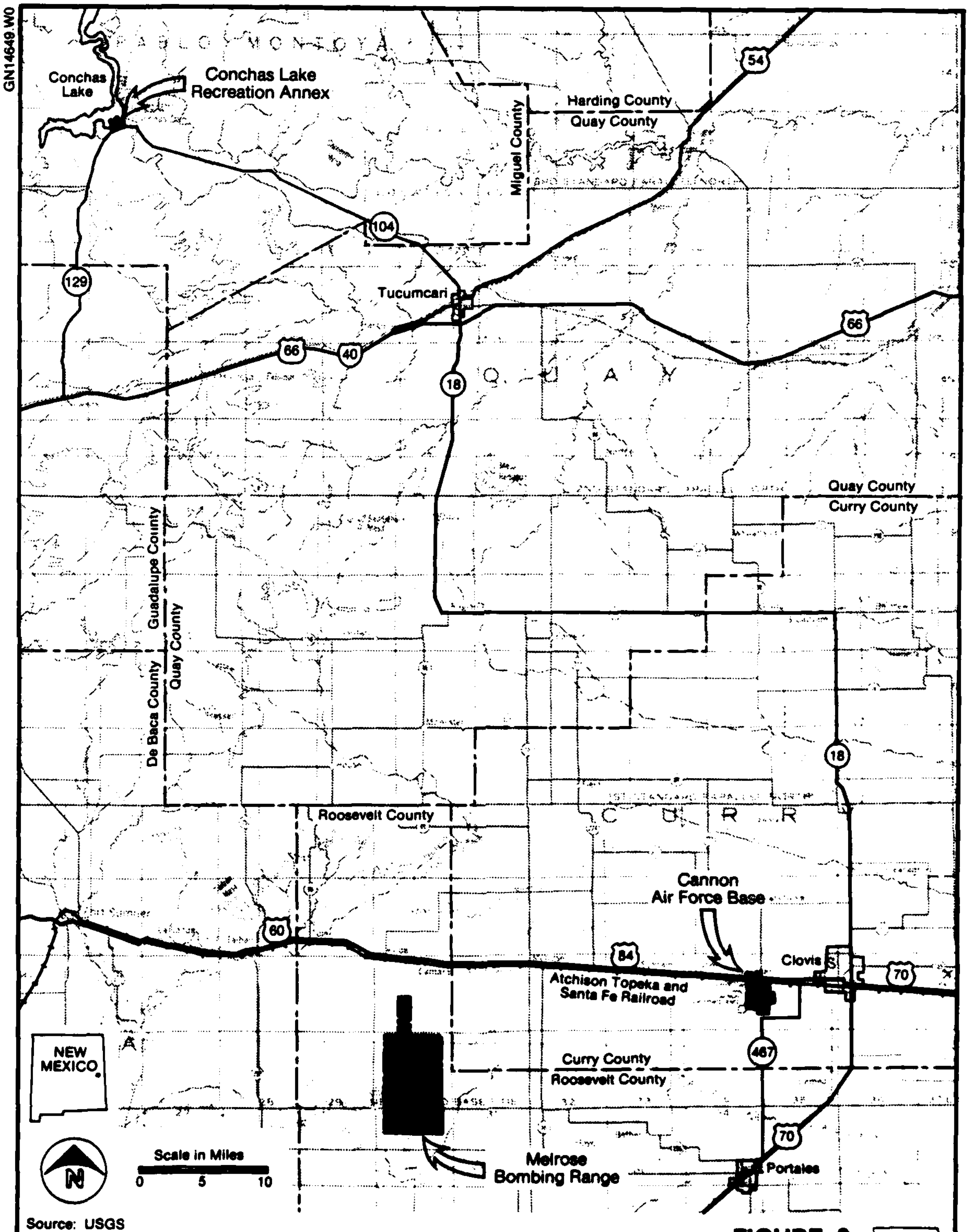

FIGURE 3.
Location Map of Cannon AFB, Melrose Bombing Range, and Conchas Lake Recreation Annex.

C. PURPOSE OF THE RECORDS SEARCH

The purpose of the Phase I records search is to identify and fully evaluate suspected problems associated with past hazardous material disposal sites and spill sites on DoD facilities. The existence and potential for migration of hazardous material contaminants were evaluated at Cannon AFB by reviewing the existing information and conducting an analysis of installation records. Pertinent information included the history of operations, the geological and hydrogeological conditions which may have contributed to the migration of contaminants, and the ecological settings which indicated environmentally sensitive habitats or evidence of environmental stress.

D. SCOPE

The records search program included a pre-performance meeting, an onsite base visit, a review and analysis of the information obtained, and preparation of this report.

The pre-performance meeting was held at Cannon AFB, New Mexico, on February 17, 1983. Attendees at this meeting included representatives of the Air Force Engineering and Services Center (AFESC), Tactical Air Command (TAC), Cannon AFB, and CH2M HILL. The purpose of the pre-performance meeting was to provide detailed project instructions, to provide clarification and technical guidance by AFESC, and to define the responsibilities of all parties participating in the Cannon AFB records search.

The onsite base visit was conducted by CH2M HILL from May 9 through 13, 1983. Activities performed during the onsite visit included a detailed search of installation records, a ground tour, a helicopter overflight of the installation, and interviews with base personnel. Attempts were also made to contact and interview past base personnel for information relevant to the records search effort. (Prior to the base visit, the Public Affairs Office provided a press release announcing the study and requesting any persons knowledgeable of past disposal activities at the installation to contact Cannon AFB.) At the conclusion of the onsite base visit, the Cannon AFB Environmental Protection Committee was briefed on the preliminary findings. The following individuals comprised the CH2M HILL records search team:

1. Mr. David Moccia, Project Manager (B.S. Chemical Engineering, 1971)

2. Mr. Greg McIntyre, Assistant Project Manager/ Environmental Engineer (M.S. Environmental and Water Resources Engineering, 1981)

3. Mr. Gary Eichler, Hydrogeologist (M.S. Engineering Geology, 1974)

4. Mr. Brian Winchester, Ecologist (B.S. Wildlife Ecology, 1973)

Resumes of these team members are included in Appendix A.

Government agencies were contacted for information and relevant documents. Appendix B lists the organizations contacted.

Individuals from the Air Force who assisted in the Cannon AFB records search include the following:

1. Mr. Bernard Lindenberg, AFESC, Air Force Engineering Coordinator for IRP

2. Mr. Gil Burnet, TAC, Command Program Manager, Phase I

3. 2LT. Taylor F. Stem, Cannon AFB, Chief of Environmental and Contract Planning

4. Mr. Jim Richards, Cannon AFB, Environmental Coordinator

5. 2LT. Eric J. Scott, Cannon AFB, Chief of Bioenvironmental Engineering Services

E. METHODOLOGY

The methodology utilized in the Cannon AFB records search is shown graphically on Figure 4. First, a review of past and present industrial operations was conducted at the base. Information was obtained from available records such as shop files and real property files, as well as interviews with base employees from the various operating areas of the base. The information obtained from interviewees on past activities was based on their best recollection. A list of 37 interviewees from Cannon AFB, with areas of knowledge and years at the installation, is given in Appendix C.

The next step in the activity review process was to determine the past management practices regarding the use, storage, treatment, and disposal of hazardous materials from all the industrial operations on the base. Included in this part of the activity review was the identification of landfill and burial sites; as well as other possible sources of contamination such as major PCB or solvent spills, or fuel-saturated areas resulting from significant fuel spills or leaks.

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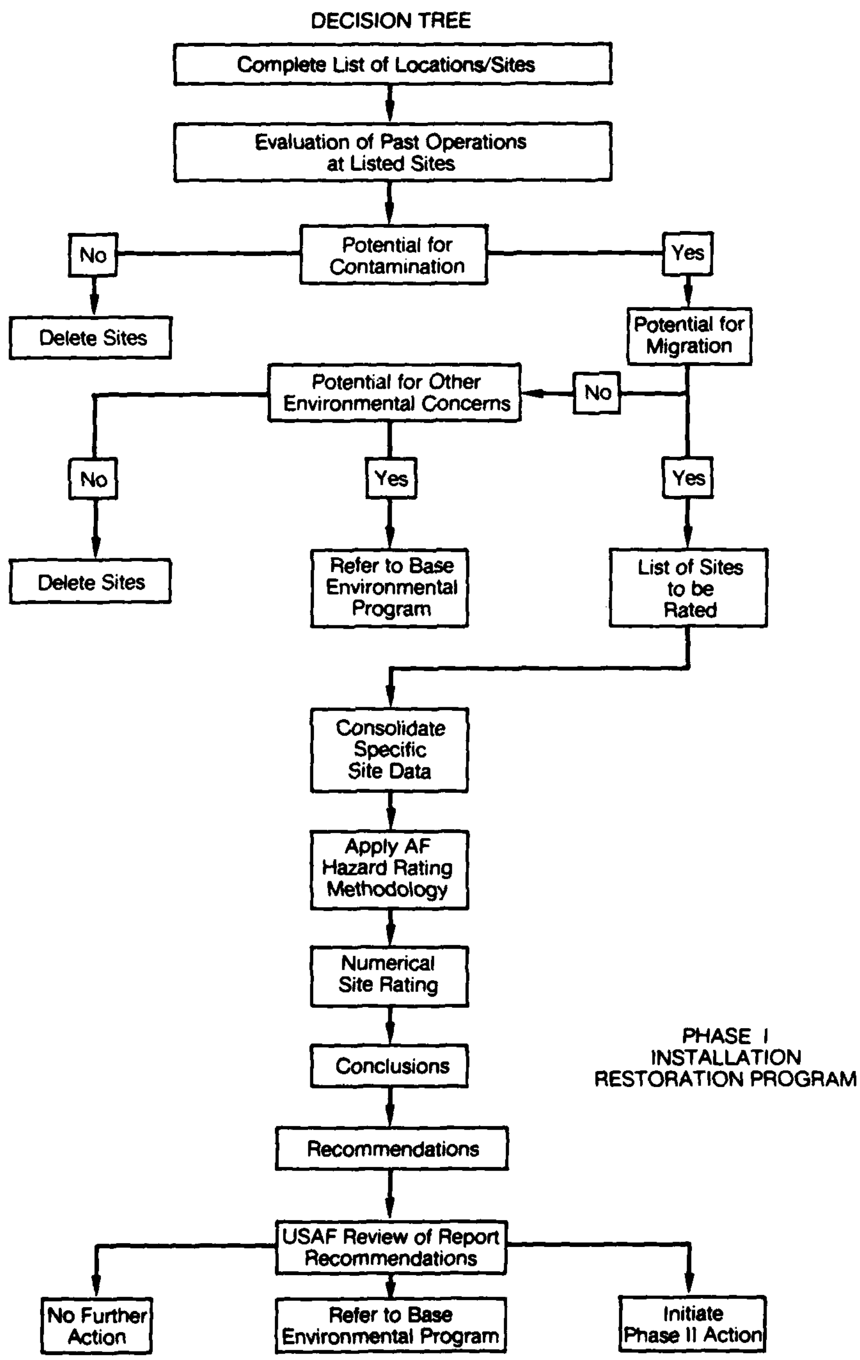

FIGURE 4.
Records Search Methodology.

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A helicopter overflight and a general ground tour of identified sites were then taken by the records search team to gather site-specific information including evidence of environmental stress and the presence of nearby drainage ditches or surface-water bodies. These water bodies were inspected for evidence of contamination or leachate migration.

A decision was then made, based on all of the above information, as to whether a potential existed for hazardous material contamination from any of the identified sites. If not, the site was deleted from further consideration. Minor operations and maintenance deficiencies (not of an IRP nature) were noted during the investigations and were made known and discussed at the outbriefing.

For those sites at which a potential for contamination was identified, the potential for migration of this contamination was evaluated by considering site-specific soil and ground-water conditions. If there was no potential for contaminant migration, but other environmental concerns were identified, the site was referred to the base environmental monitoring program. If no further environmental concerns were identified, the site was deleted from consideration. If the potential for contaminant migration was identified, then the site was rated and prioritized using the site rating methodology described in Appendix H, "Hazard Assessment Rating Methodology."

The site rating indicates the relative potential for adverse environmental impact at each site. For those sites showing a significant potential, recommendations were made to quantify the potential contaminant migration problem under Phase II of the IRP. For those sites showing a low potential, no Phase II work was recommended.

II. INSTALLATION DESCRIPTION

A. LOCATION

Cannon AFB is located in Curry County, New Mexico, approximately 7 miles west of the City of Clovis. The base is situated on approximately 4,320 acres of land. The vicinity map of Cannon AFB is shown on Figure 5 and the site map of Cannon AFB is shown on Figure 6. Off-base facilities include the Melrose Bombing Range and the Conchas Lake Recreation Annex. Locations and descriptions of these facilities are given in Section VII, Off-Base Facilities.

B. ORGANIZATION AND MISSION

The history of Cannon AFB dates back to 1929, when Portair Field was established on the site. Portair Field was a civilian passenger terminal for early commercial transcontinental flights. In 1942, the Army Air Corps took control of the civilian airfield and it became known as the Clovis Army Air Base. In early 1945, the base was renamed Clovis Army Air Field. Flying, bombing, and gunnery classes continued through the end of World War II. By mid-1946, however, the airfield was placed on a reduced operational status and flying activities decreased. The installation was deactivated in May 1947. The types of aircraft stationed at Cannon AFB from 1942 to 1947 included B-17, B-24, and B-29 heavy bombers.

The base was reassigned to the Tactical Air Command in July 1951. The first unit, the 140th Fighter-Bomber Wing, arrived in October of that year. The airfield was formally reactivated in November 1951 as Clovis Air Force Base. Between 1952 and 1957, the 50th and 388th Fighter-Bomber Wings were activated and upon their transfer, were replaced by the 312th and 474th Fighter-Bomber Groups. Predominant

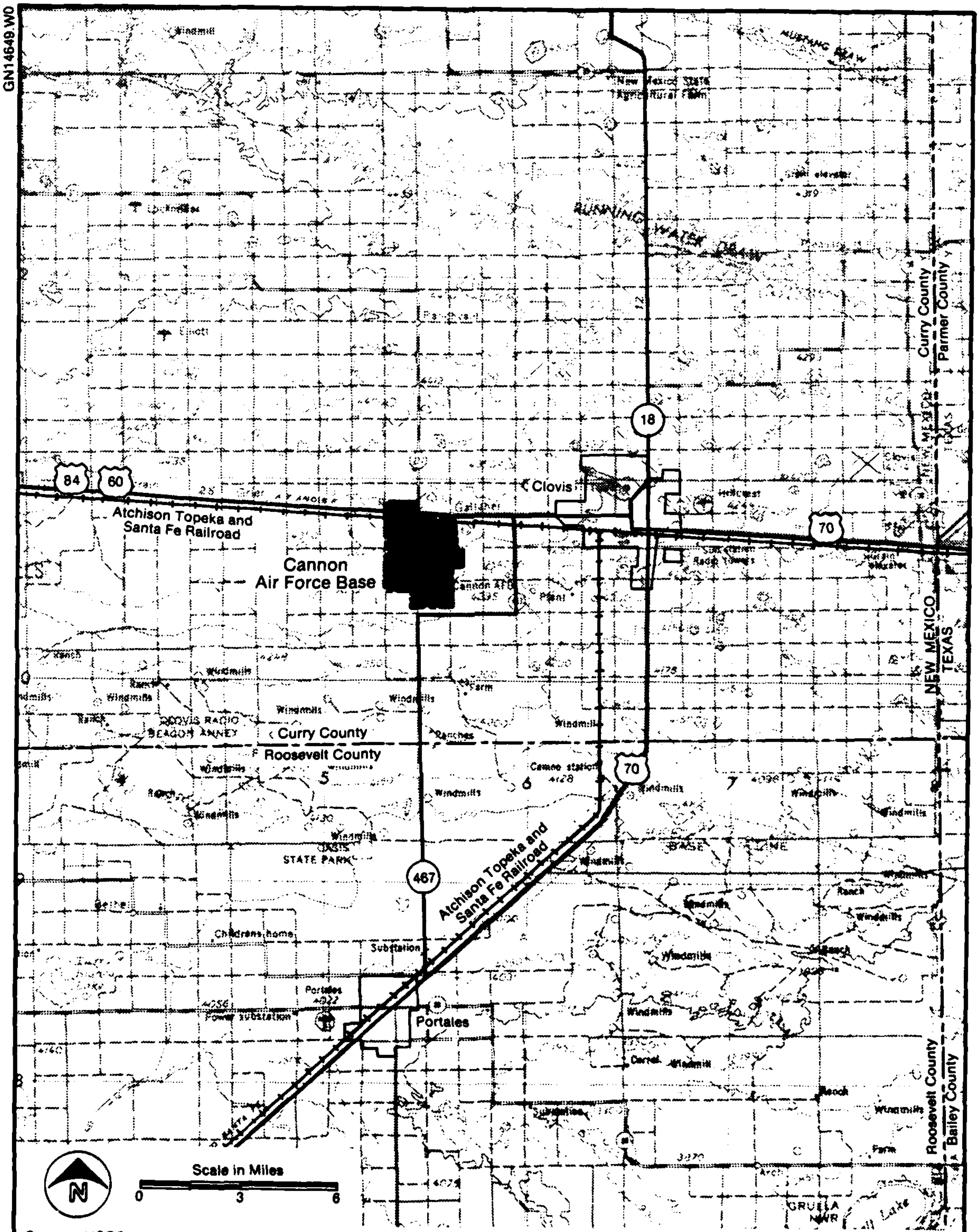


FIGURE 5.
Vicinity Map of Cannon AFB.

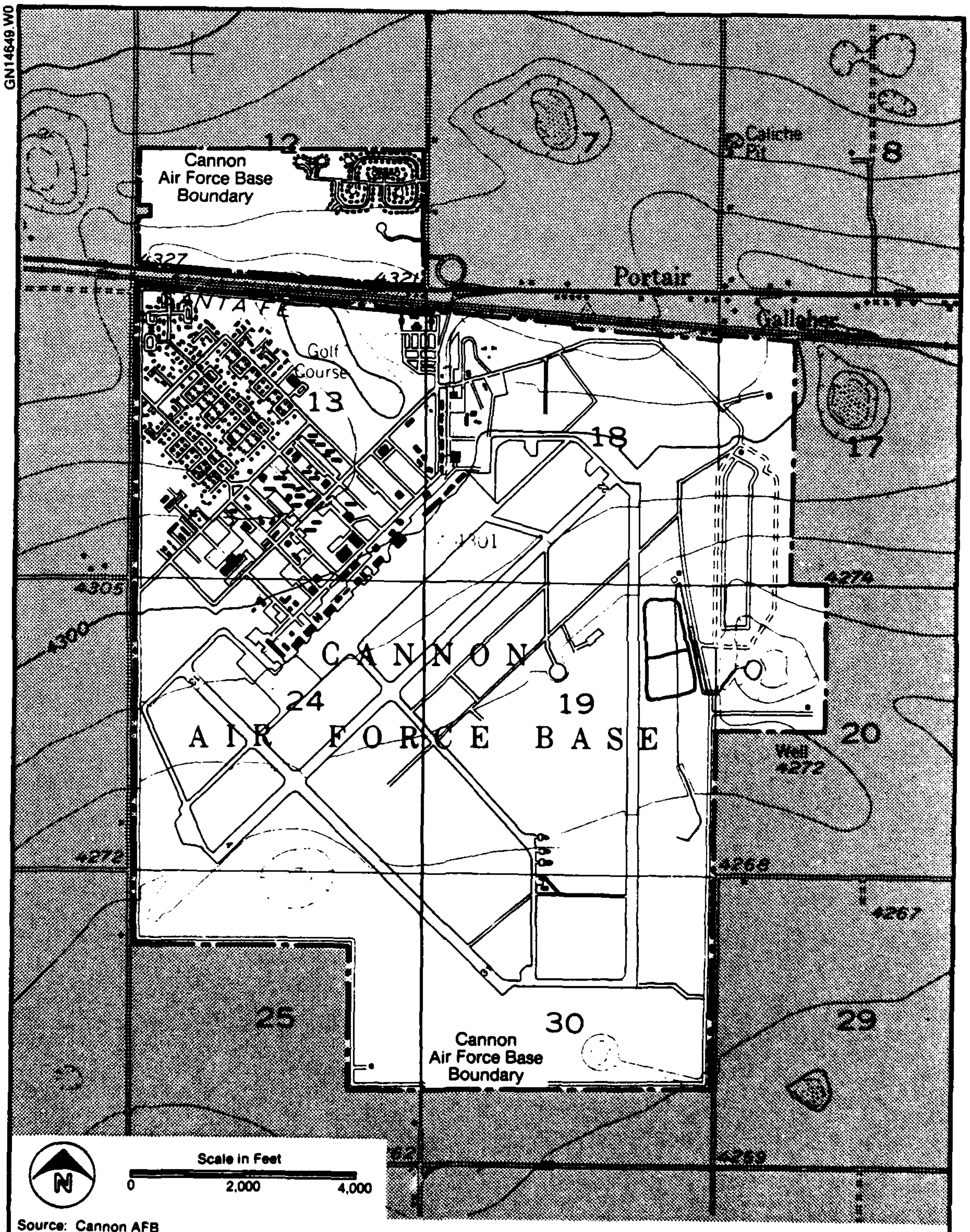


FIGURE 6.
Site Map of Cannon AFB.

aircraft stationed at Cannon AFB from 1951 to 1957 included the P-51 "Mustang" fighter and the F-86 "Sabre" fighter jet.

In June 1957, the base became a permanent installation and was renamed Cannon Air Force Base in honor of the late General John K. Cannon, a former commander of the Tactical Air Command. In October 1957, the 312th and 474th Fighter-Bomber Groups were redesignated tactical fighter wings and the 832nd Air Division was activated to oversee their activities.

In 1959, the 312th Tactical Fighter Wing (TFW) was deactivated and replaced at Cannon AFB by the 27th TFW. In December 1965, the base's mission changed to that of a replacement training unit, and the 27th TFW became the largest such unit in the Tactical Air Command. The predominant aircraft stationed at Cannon AFB from 1957 to 1965 was the F-100 "Super Sabre" fighter jet.

The 832nd Air Division was deactivated in July 1975, leaving the 27th TFW the principal Air Force unit at Cannon AFB. In early 1981, the 27th TFW was designated a Rapid Deployment Joint Task Force member.

The primary mission of Cannon AFB has remained relatively unchanged since 1965, i.e., to develop and maintain an F-111 tactical fighter wing capable of day, night, and all-weather combat operations and to provide replacement training of combat aircrews for tactical organizations worldwide. Aircraft stationed at Cannon AFB since 1965 include the F-100 "Super Sabre" fighter jet (1957-1969), the F-111A (1969), the F-111E (1969-1971) and the F-111D (1971-present).

There are approximately 70 F-111D aircraft assigned to Cannon AFB. The total work force on Cannon AFB numbers approximately 4,780, which includes 4,090 military, 425 civil service, and 265 non-appropriated fund employees.

The major organizations at Cannon AFB are as follows:

HOST

- 27th Combat Support Group
- 27th Tactical Fighter Wing
- USAF Hospital, Cannon

TENANT

- Army and Air Force Exchange Service
- Detachment 2, 4400 Management Engineering Squadron
- Defense Property Disposal Office
- Detachment 2, AF Commissary Service
- Detachment 11, 25th Weather Squadron
- Detachment 408, AFAA Area Audit Office
- Detachment 526, 3751 Field Training Squadron
- Detachment 1702, AF Office of Special Investigations
- USAF Trial Judiciary Office
- 2040th Communications Squadron

A more detailed description of the base history and its mission is included in Appendix D.

III. ENVIRONMENTAL SETTING

A. METEOROLOGY

The area around Cannon AFB is semiarid with a pronounced moisture gradient. The mean annual precipitation at Cannon AFB is about 14 inches while Clovis, approximately 7 miles east, receives nearly twice as much precipitation. Mean annual lake evaporation, commonly used to estimate the mean annual evapotranspiration rate, in the vicinity of Cannon AFB is estimated to be 69 inches per year. Therefore, the annual net precipitation (mean annual precipitation minus mean annual evapotranspiration) for the Cannon AFB area is approximately -55 inches per year. The wettest months are during the summer, with virtually all of the precipitation due to thunderstorms. Winters in the Cannon AFB area are relatively dry, with about 12 inches of snow occurring. Due to the relatively warm temperatures (average daily maximum at least 51°F), snow usually melts within 24 hours of occurrence.

Temperatures are cooler during the summer than in the lower elevations to the east. Additionally, the air is drier than in the lower elevations (maximum relative humidity is less than 40 percent during the summer). This summer dryness is due to the "Marfa" or "dewpoint" front which usually lies to the east. Whenever this "front" moves to the west of Cannon AFB, the relative humidity rises dramatically.

Frontal passages throughout the year are generally dry and contribute only gusty winds. The wind usually blows from the west during the winter and gradually shifts to the south as the temperatures rise in the spring and summer. In the spring, the wind is generally very gusty with an average daily peak wind of about 25 knots from the west-southwest.

Meteorological data are summarized in Table 2.

Table 2
METEOROLOGICAL DATA SUMMARY FOR CANNON AFB, NEW MEXICO

	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sep.	Oct.	Nov.	Dec.	Ann.
Temperature (°F)													
Record High	76	80	89	94	97	106	105	105	100	90	84	77	106
Record Low	-11	2	8	14	32	43	55	53	29	28	4	-11	-11
Normal Maximum	51	55	61	71	80	89	90	89	82	72	60	51	71
Normal Minimum	25	28	32	42	52	61	65	64	57	46	33	27	45
Precipitation (inches)													
Record Maximum (in 24 hours)	0.9	0.6	0.7	1.6	2.0	2.5	3.7	2.5	2.9	2.8	0.5	0.6	3.7
Normal Mean	0.5	0.4	0.4	0.6	1.3	2.0	2.8	1.9	1.4	1.5	0.4	0.5	13.7
Mean Snowfall	3	3	1	Trace	Trace	0	0	0	0	Trace	2	3	12
Wind													
Mean Velocity (mph)	10	10	12	12	11	11	9	8	8	8	9	10	10
Prevailing Direction	W	W	W	W	S	S	S	S	S	W	W	W	W

Period: 1943-1967, extremes updated 12/75

Source: Brotzman and Hughes, 1976

B. PHYSICAL GEOGRAPHY

Cannon AFB is located in the Southern High Plains section of the Great Plains physiographic province. The region is known locally as the South Plains and was named Llano Estacado by the early Spanish explorer, Coronada. The Southern High Plains includes parts of eastern New Mexico and western Texas and covers a total area of approximately 32,000 square miles. The section is a plateau, bounded on the north by the Canadian River, 60 miles north of Cannon AFB, and on the east and west by escarpments which rise as much as 300 feet above the surrounding area. The southern boundary is less well defined, merging without a sharp physiographic break into the Edwards Plateau in west Texas.

Cannon AFB is situated near the center of this plateau and is typified by flat, featureless terrain with almost no relief. Elevations at the base range from 4,327 feet above mean sea level (ft-msl) at the northwest corner to approximately 4,260 ft-msl at the southeast corner. Like the plateau, the base slopes gently downward to the southeast.

The only features of relief occurring on the otherwise flat plateau are numerous shallow depressions called "playas," sand dunes, and small stream valleys. Only playas, depressions caused by wind erosion, are evident on the base. The largest of these playas, known as Playa Lake, receives treated effluent from the base sewage treatment lagoons. Another playa, located near the intersection of the primary and NW-SE runways, is used as a stormwater retention pond and receives most of the base runoff.

Surface-water streams are non-existent in the Cannon AFB vicinity. Running Water Draw, located approximately 10 miles north of the base, is the nearest drainage feature and it is dry most of the time. Stream drainage of the plateau is very poorly developed because of the low annual rainfall and lack of relief. Drainage patterns generally consist of long, shallow valleys with almost no tributaries. (Running Water Draw is typical.) These valleys, sloping downward to the east and southeast, eventually enter the valley of one of three major rivers: the Red, the Brazos, and the Colorado. However, the Southern High Plains area generally does not contribute to streamflow except during rare periods of excessive rainfall. Water is lost to evapotranspiration and shallow infiltration before it has a chance to run off.

The playas further reduce the possibility of runoff leaving the plateau. These depressions, hollowed out by the action of the wind, can be up to 50 feet deep and a mile or more in diameter. Drainage areas for these "lakes" range from 1 square mile to as much as 50 square miles. The playas, the low point of a particular drainage area, collect stormwater runoff from rainfall or snow melt. The playa has no surface discharge and water is lost by evapotranspiration and infiltration. Some of the larger and deeper playas become saline lakes, with salts being concentrated by evaporation.

The most common soil association in Curry County, as well as on Cannon AFB, is Amarillo soils (Figure 7). This soil type, derived from the action of stream erosion and reworked by the wind, generally consists of a loamy sand overlying a hard, calcareous caliche layer. The U.S. Department of Agriculture, Soil Conservation Service (SCS) has described Amarillo soils as follows:

> The Amarillo soils are the most extensive in Curry County and are among the best for agriculture. They have formed on medium textured to moderately coarse textured calcareous materials, probably alluvium

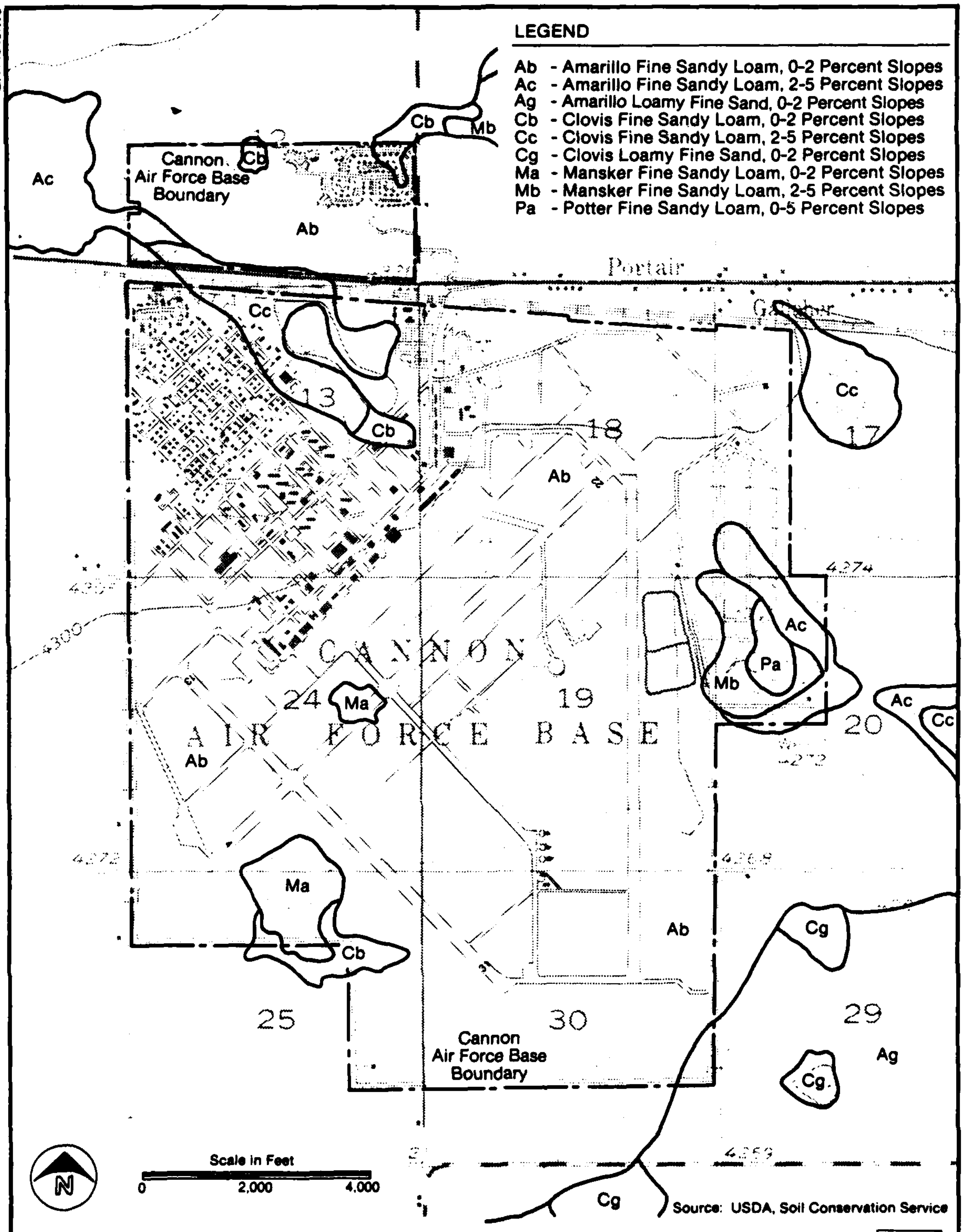


FIGURE 7.
Soils Map.

reworked by wind. These soils have well-developed profiles. They resemble the Clovis soils but are deeper over lime, and in many places their B horizon has a slightly stronger structure.

The Amarillo series is represented in Curry County by three soil types--Amarillo loam, Amarillo fine sandy loam, and Amarillo loamy fine sand. The Amarillo loams resemble the Pullman loams with which they merge, but the structure of their B horizon is not so strongly developed, and their profile is sandier throughout. Except that they are less sandy and their surface layers are thinner, the Amarillo loamy fine sands are like the Brownfield fine sands with which they merge. The Amarillo loamy fine sands are less sandy and are better developed structurally than the Springer loamy fine sands.

Range in characteristics--The Amarillo soils overlie a white chalky zone that begins at depths of 3 to 6 or more feet but that generally is at a depth of about 4 feet. From 40 to 70 percent of this zone is lime. The amount of lime in the profile above the chalky zone varies. The Amarillo fine sandy loams and loamy fine sands are deeper over calcareous material than the Amarillo loams. In places the Amarillo loamy fine sands are noncalcareous to within 1 or 2 inches of the chalky zone. Some areas of the Amarillo loams are calcareous at a depth of about 18 inches.

The color of the surface soil ranges from brown to reddish brown in the Amarillo loams, through yellowish red in the loamy fine sands. The color of the subsoil ranges from dark reddish brown in some areas of Amarillo loam to yellowish red in the loamy fine sands.

Amarillo soils cover over 90 percent of Cannon AFB. Permeabilities typical of Amarillo soils are moderate and range from 1 x 10^{-3} to 4 x 10^{-4} cm/sec.

Other soil associations occurring at Cannon AFB, primarily in the vicinity of playa "lakes" include: Clovis soils, Mansker soils, and Potter soils. These soil types together account for less than 10 percent of the area at Cannon AFB. The SCS describes these soils as follows:

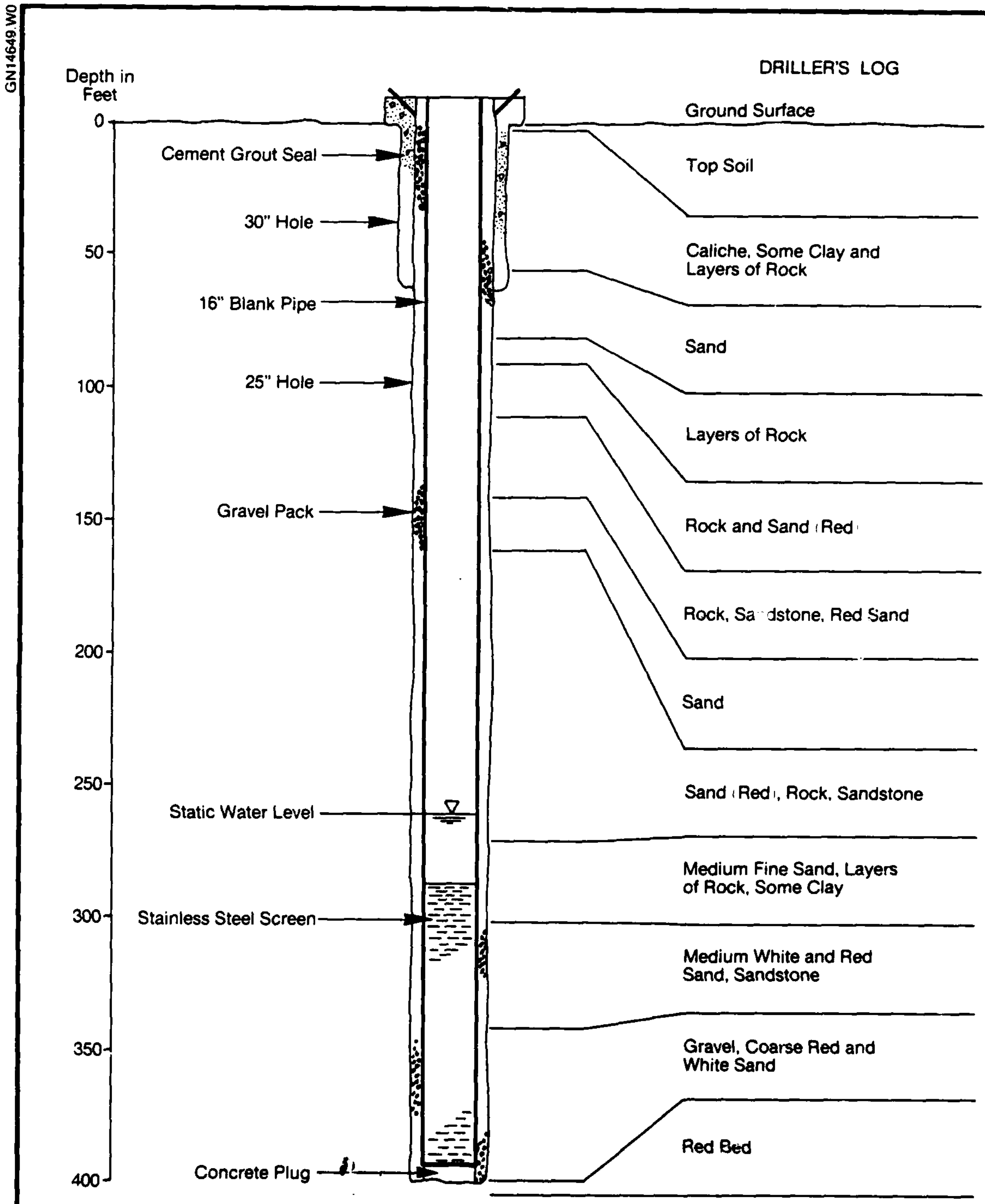
> Clovis soils--These soils generally occur in small areas within broader areas of Amarillo soils. They occupy the upper margins of many of the draws and playas. The Clovis soils are similar to the Amarillo, but the chalky zone occurs at shallower depths (16 to 36 inches), and in many places the profile is not so well developed.
>
> In Curry County the Clovis series is represented by three soil types--Clovis loam, Clovis fine sandy loam, and Clovis loamy fine sand. The Clovis loams resemble the thin solum phases of the Pullman loams, except for weaker structural development in the B horizon.
>
> Mansker soils--Mansker soils are strongly calcareous. They normally occupy the slopes of draws and playas. Small, nearly level to gently sloping areas, however, occur within larger areas of Pullman, Amarillo, and Clovis soils. The Mansker soils are extensive throughout Curry County. They have formed where the upper part of some other soil has been lost through erosion and the strongly calcareous substratum has been exposed. These soils show very little profile development.

Potter soils--The Potter soils are shallow and strongly calcareous. They overlie hard, consolidated caliche. The degree of cementation in the caliche varies. In some places the caliche resembles limestone; in others it consists of lime-cemented pebbles and nodules. The material from which these soils developed was mainly weathered caliche, but it was intermixed with wind-deposited materials. The Potter soils occur throughout the county, normally in areas of less than 100 acres. In many places they are closely associated with the Mansker soils.

Permeabilities of all three soil types would be more towards the lower end of the range typical for the Amarillo soils.

Cannon AFB is underlain by unconsolidated gravel, sand, silts, clay, and caliche to a depth of approximately 390 feet below land surface (bls). These materials, where saturated with water, constitute a part of the High Plains Aquifer. The base of the aquifer is considered to be the varicolored (primarily red) fine- to medium-grained sandstone of the Dockum Group. These strata, referred to as Triassic red beds due to their color and geologic age, represent the greatest depth penetrated by wells in the Cannon AFB vicinity. Figure 8 presents details of a typical well construction and driller's log at Cannon AFB. Figure 9 presents a geologic cross section in the vicinity of Cannon AFB. The Triassic beds, deposited between 138 and 240 million years ago, were subjected to erosion prior to deposition of the overlying unconsolidated sediments which are late Miocene, early Pliocene age (10 million years ago). As a result, the surface of the Triassic formation, which is the base of the aquifer, is highly irregular.

In the vicinity of Cannon AFB, the geologic materials younger than Triassic but older than late Miocene were



Source: Cannon AFB Driller's Log

FIGURE 8.
Typical Geologic Log and Well Construction Detail.

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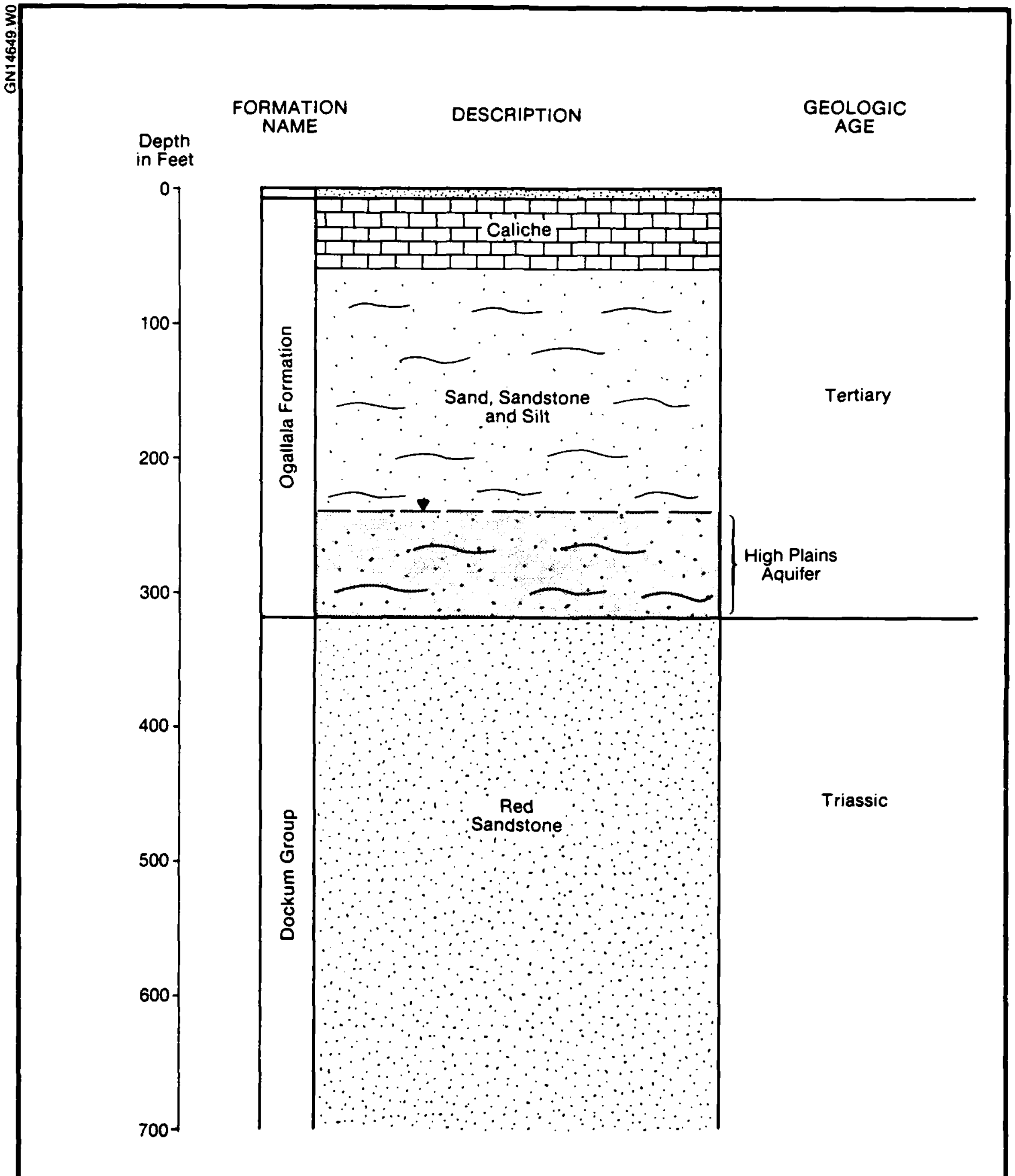

Source: USGS

FIGURE 9.
Geologic Column at Cannon AFB.

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removed by erosion prior to the deposition of the younger, unconsolidated materials which make up the Ogallala Formation. The Ogallala, where saturated with water, is the principal formation of the High Plains Aquifer in the Cannon AFB vicinity.

In some places, the Ogallala Formation is overlain by unconsolidated alluvial deposits of Pleistocene age (1 million years ago). These deposits occur primarily as valley fill and consist of gravel, sand, silt, and clay. In some areas, these deposits are saturated, hydraulically connected to the Ogallala Formation, and therefore considered part of the High Plains Aquifer.

Elsewhere, sand dunes consisting of fine to medium sand or loess deposits consisting of silt and fine sand overlie the Ogallala Formation. These deposits are Pleistocene to Recent in age.

At Cannon AFB, the soil layer is underlain by a fairly thick (approximately 25-foot) caliche layer which is part of the Ogallala Formation. This caliche varies in depth and thickness across the base. Geologic logs taken at the base indicate that caliche occurs as shallow as 2 feet bls and is up to 54 feet in thickness. Observations made at the current landfill operation indicate that the top of the caliche layer is approximately 5 feet bls and becomes harder with depth. In fact, at a depth of approximately 15 feet bls, heavy-duty earthmoving equipment could not penetrate the caliche.

C. HYDROLOGY

Low precipitation (13.7 inches/year), high evapotranspiration, and low relief typical of the Southern High Plains have resulted in a poorly developed surface drainage system. Cannon AFB lies in the headwaters of the Brazos River; however, little if any water which falls as rain or snow at Cannon AFB ever reaches the Brazos River; most is lost to evapotranspiration and shallow infiltration.

Playa lakes, as discussed above, also reduce the possibility of precipitation leaving the area as runoff.

Most of the surface drainage from Cannon AFB is directed through a series of ditches to a large playa located near the intersection of the primary runway and the NW-SE runway. Except under the most severe conditions, no surface drainage leaves the base.

Ground water occurs under unconfined (water table) conditions at Cannon AFB. The base is underlain by a portion of the regionally important High Plains Aquifer developed in the unconsolidated sediments of the Ogallala Formation. The High Plains Aquifer is the major and in some places (e.g., eastern New Mexico) the only source of potable water. The aquifer occurs in eastern New Mexico, western Texas, parts of eastern Colorado and Wyoming, parts of western Kansas and Oklahoma, and most of Nebraska, extending into southern South Dakota. The Ogallala Formation, which is Pliocene in age (approximately 10 million years old), consists of clay, silt, fine to coarse-grained sand, gravel, and caliche. Lithology within the formation varies considerably within short distances both vertically and horizontally, with individual beds tending to be lenticular in shape and therefore discontinuous over wide areas. For the most part, the Ogallala Formation is unconsolidated; however, in many places such as Cannon AFB the formation is capped, just below the soil horizon, by a stratum of caliche. This caliche consists of sediments which have been cemented together by calcium carbonate. This caliche layer plays a significant role in not only the erosional/

weathering processes of the High Plains but also in the process of aquifer recharge. Because it is highly resistant to erosion, it forms a caprock across the High Plains preventing significant erosion from wind and water. This caliche layer outcrops around the margin of some of the playas or along stream valleys. On base, the top of this stratum can be seen in the open cuts at the landfill.

The Ogallala Formation overlies an eroded surface of much older rocks, which are Triassic in age (138-240 million years old). These beds, known as Triassic red beds, form the base of the High Plains Aquifer. The aquifer consists of the saturated sediments above the top of the Triassic red beds. The aquifer thickness ranges from zero, where the Ogallala Formation wedges out against older rocks, to as much as 560 feet in some parts of Curry County.

Figure 10 illustrates structural contours drawn on the base of the aquifer in the vicinity of Cannon AFB (top of the Triassic red beds). This map depicts the elevation, in feet above mean sea level, of the base of the Ogallala Formation. The base of the aquifer is at elevation 4,000 ft-msl. From Figure 11, elevations at the base range from 4,260 to 4,327 ft-msl. Also based on this figure, the unconsolidated materials above the Triassic red beds are approximately 260 to 327 feet in thickness. This compares reasonably well with actual driller's logs from on-base wells where unconsolidated materials are reported to be approximately 390 feet thick (ranging from 360 to 390 feet). This figure and the associated calculations represent thickness of unconsolidated materials at Cannon AFB rather than aquifer thickness, since a portion of this material is unsaturated.

Figure 12 illustrates the configuration of the top of the water table as it was in 1978. Again, contours in feet

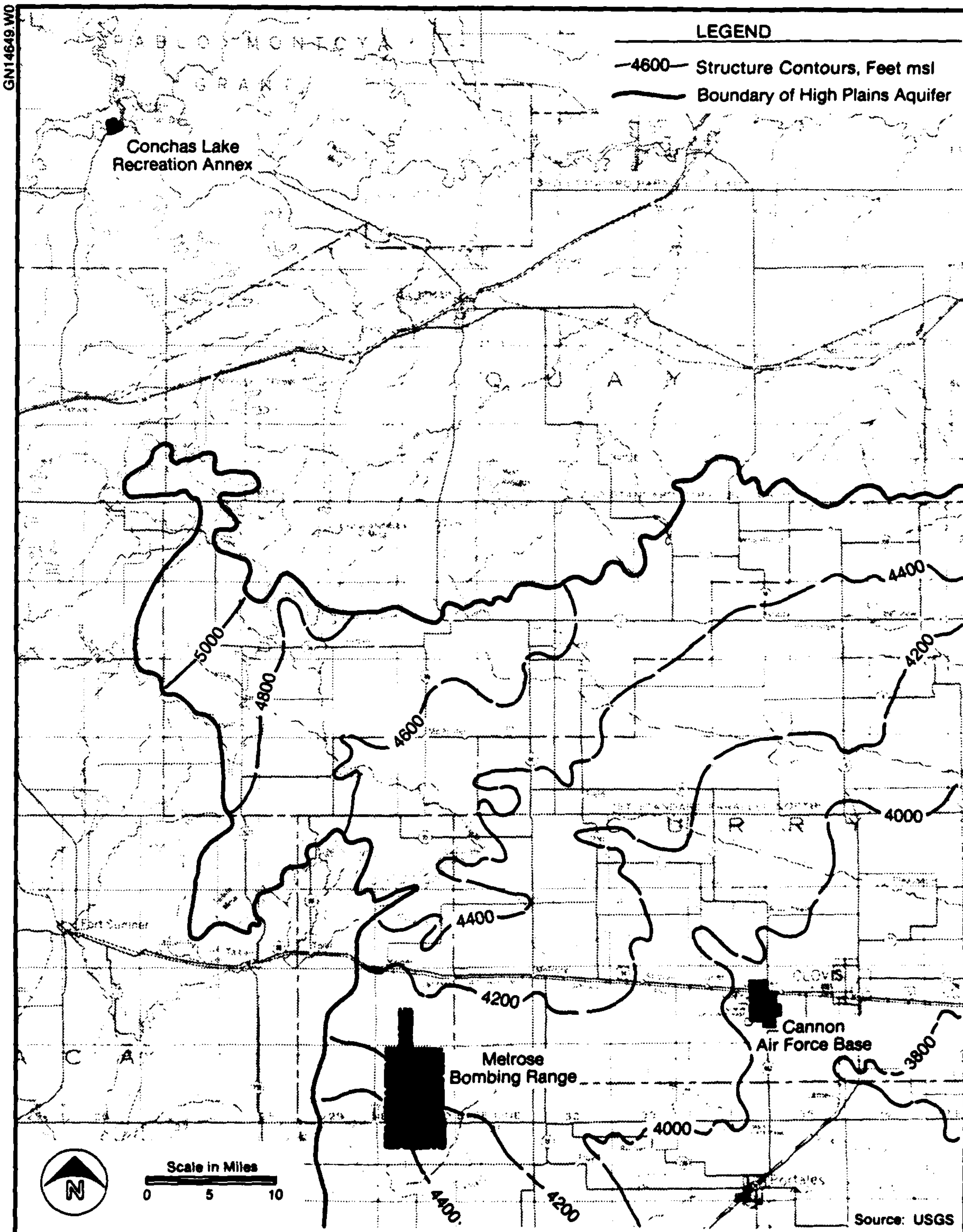

FIGURE 10.
Altitude of High Plains Aquifer Base.

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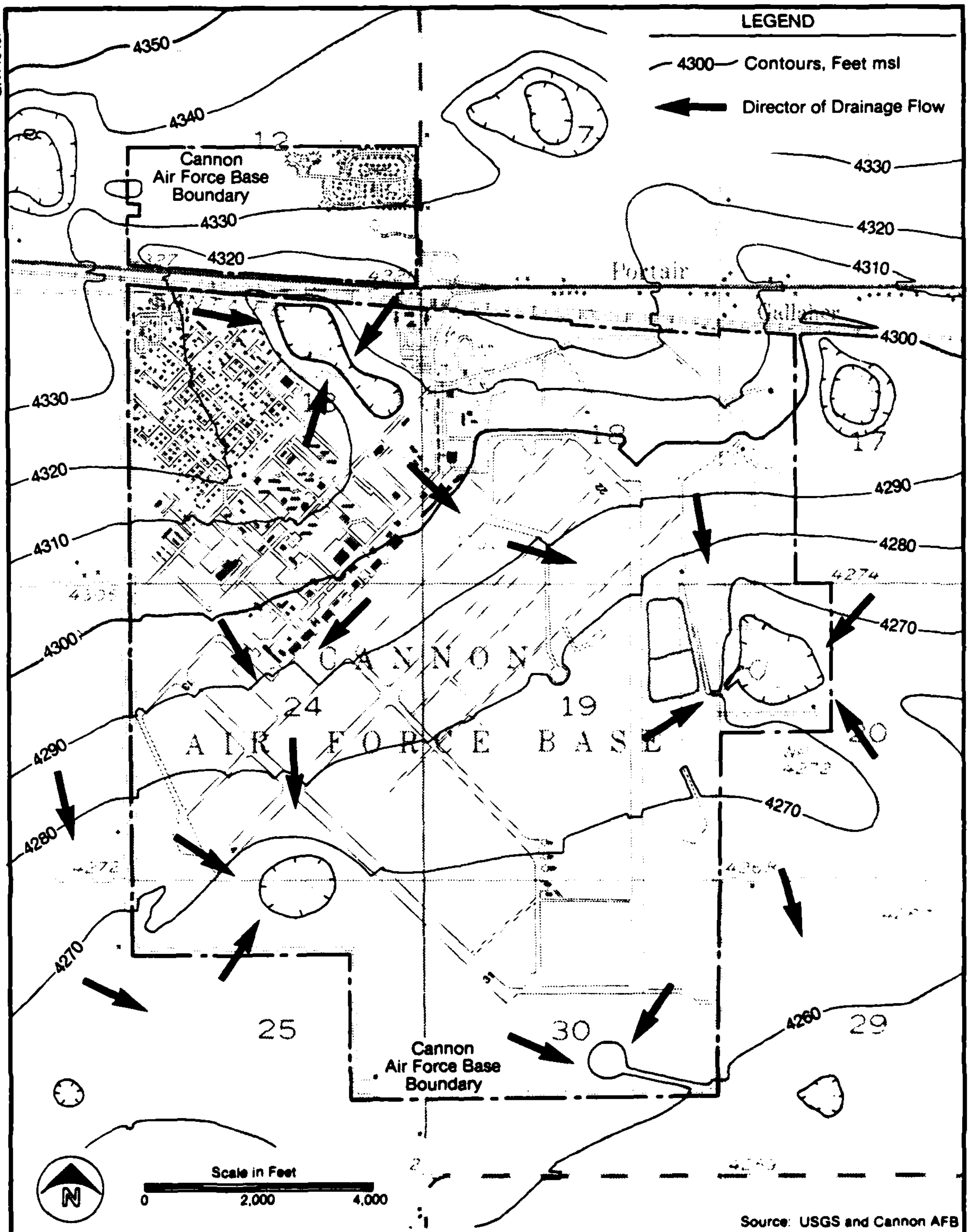

FIGURE 11.
Topography and Surface Drainage Map.

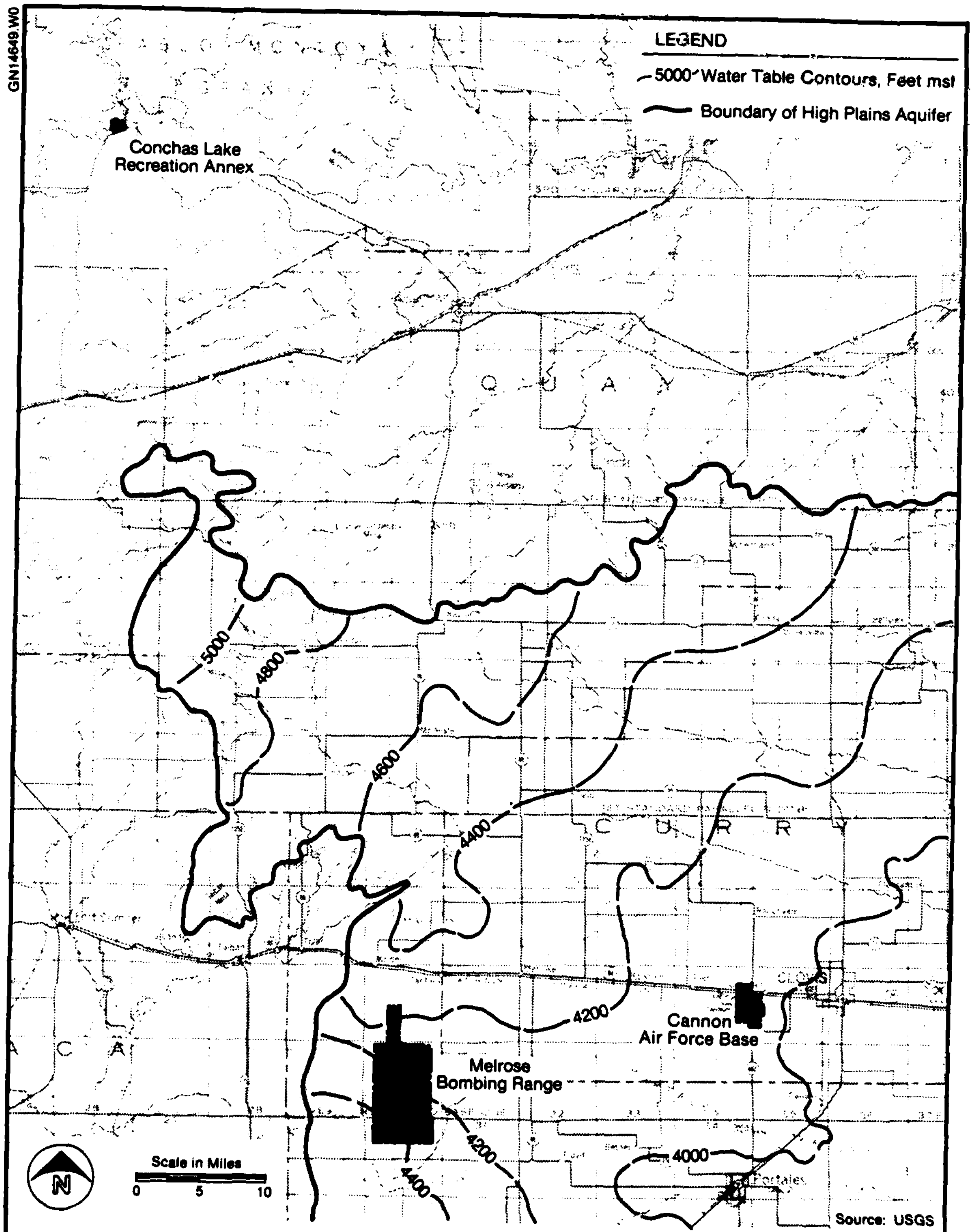

FIGURE 12.
Altitude and Configuration of the Water Table—1978.

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above mean sea level are used to depict the water surface. From this figure, the 1978 water table at Cannon AFB is approximately 4,000 ft-msl. Given the scale of both Figures 10 and 12, these contours would seem to indicate that both the base and the top of the aquifer (water table) are at elevation 4,000 ft-msl. In fact, at Cannon AFB, the base of the aquifer is at elevation 3,900 ft-msl and therefore aquifer thickness at Cannon AFB is approximately 100 feet.

The principal source of recharge to the Ogallala Formation is precipitation falling on the high plains. The escarpments which bound the high plains on the east, west, and southwest and the valley of the Canadian River on the north isolate the Ogallala Formation and restrict ground-water movement from those directions. The water table, as depicted in Figure 12, slopes downward to the southeast, preventing movement upgradient from this direction. Some small but unknown amount of aquifer recharge occurs from irrigation return flow and from areas where water is continuously ponded.

The amount of water which actually reaches the aquifer as recharge is dependent on the amount, distribution, and intensity of the precipitation, the amount of moisture in the soil, the temperature, vegetative cover, and permeability of the sediments at the site of the precipitation event.

The caliche layer, described above, impedes the recharge process considerably in many places. Estimates of recharge rate to the aquifer range from less than 0.5 inch to 0.8 inch per year, which is extremely low.

Discharge from the aquifer occurs naturally through seeps and springs along the southeast, downgradient bounding escarpment and locally around the margins of some of the larger playas. Natural discharge also occurs by evapotranspiration. The most significant discharge from the aquifer is from wells withdrawing water for irrigation. Agricultural irrigation began to develop on a significant scale in Curry County in 1947. As a result of irrigation withdrawals, the aquifer is currently being depleted faster than it can be replenished by recharge. During the period from 1937 to 1967 water levels in the vicinity of Cannon AFB declined 20 feet. From 1967 to 1978 water levels declined another 3 to 4 feet. If irrigation increases, the rate of decline will also increase since recharge is limited due to low rainfall and the occurrence of the low-permeability caliche layer.

Ground-water quality within the Ogallala is acceptable for most uses. Water is typically hard and high in silica and fluoride. The Ogallala Formation is the only reliable source of water in the vicinity. Table 3 lists the results of water quality analyses from Cannon AFB Well No. 1. Figure 13 shows the locations of the base water supply wells including the USGS observation well.

Potential for contamination of the High Plains Aquifer at Cannon AFB is low, primarily due to low rainfall, depth to water table, and the occurrence of a caliche layer of low permeability. Three cases in which the potential would be greatly increased would be (1) where there is a constant driving force such as an impoundment, pond, or disposal pit; (2) where the caliche layer has been breached, since sediments which directly underlie this stratum are quite permeable; and (3) where wells have not been properly sealed, thereby creating a direct pathway to the aquifer.

Table 3
WATER QUALITY ANALYSES FOR CANNON AFB
WELL NO. 1[a]

	Sampling Date							
	3/66	3/70	5/71	4/75	5/76	11/78	10/81	12/81
Silica	36	34	39	37	37	--	--	--
Iron in solution	0.00	0.00	--	--	--	--	--	--
Iron total	0.06	0.04	30	0.44	0.30	--	--	--
Manganese	--	--	--	0.00	0.00	--	--	--
Calcium	42	44	42	43	45	--	--	--
Magnesium	38	37	39	41	39	--	--	--
Sodium	--	--	55	53	54	--	--	--
Potassium	--	--	6.7	7.1	7.1	--	--	--
Sodium + Potassium (Calc.)	58	61	--	--	--	--	--	--
Bicarbonate	218	222	222	225	217	--	--	--
Carbonate	0	0	--	0	0	--	--	--
Sulfate	132	129	130	120	130	--	--	--
Chloride	45	46	46	42	52	--	--	--
Fluoride	2.3	2.4	1.8	2.3	2.4	2.1	--	--
Nitrate	4.6	6.6	1.2	--	--	--	1.4	--
Nitrite + Nitrate as N	--	--	--	1.60	1.30	--	--	--
Dissolved Solids (ton/acre-ft)	--	--	0.64	--	--	--	--	--
Dissolved Solids								
Calculated	465	469	474	463	479	--	--	--
Residue on Evap. at 180°C	471	465	462	441	478	--	--	--
Hardness as $CaCO_3$	262	261	270	280	270	--	--	--
Noncarbonate Hardness as $CaCO_3$	84	79	83	92	95	--	--	--
Alkalinity as $CaCO_3$	179	182	182	185	178	--	--	--
Percent Sodium	--	--	30	--	--	--	--	--
Carbon Dioxide as CO_2 (Calc.)	5.4	5.6	11	9.0	--	--	--	--
Specific Conductance (micromhos at 25°C)	740	708	735	725	--	--	--	--
Sodium Adsorption Ratio	--	--	1.5	1.4	1.4	--	--	--
pH (standard units)	7.8	7.8	7.5	7.6	--	--	--	--
Color (APHA units)	0	5	5	5	2	--	--	--
Langelier Index - 25°C	--	--	--	-0.1	--	--	--	--
Arsenic	--	--	--	--	--	<0.01	<0.01	--
Barium	--	--	--	--	--	<1.0	<1.0	--
Cadmium	--	--	--	--	--	<0.01	<0.01	--
Chromium	--	--	--	--	--	<0.05	<0.05	--
Lead	--	--	--	--	--	<0.05	<0.02	--
Mercury	--	--	--	--	--	<0.002	0.003	<0.002
Selenium	--	--	--	--	--	<0.01	<0.01	--
Silver	--	--	--	--	--	<0.01	<0.01	--
Pesticides:								
Aldrin	--	--	--	--	--	--	ND[b]	--
DDD	--	--	--	--	--	--	ND	--
DDE	--	--	--	--	--	--	ND	--
Dieldrin	--	--	--	--	--	--	ND	--
Endrin	--	--	--	--	--	--	ND	--
Heptachlor	--	--	--	--	--	--	ND	--
Heptachlorepoxide	--	--	--	--	--	--	ND	--
Lindane	--	--	--	--	--	--	ND	--
p, pl-DDT	--	--	--	--	--	--	ND	--
Methoxychlor	--	--	--	--	--	--	ND	--
o, p-DDT	--	--	--	--	--	--	ND	--
Chlordane	--	--	--	--	--	--	ND	--
alpha-BHC	--	--	--	--	--	--	ND	--
beta-BHC	--	--	--	--	--	--	ND	--
delta-BHC	--	--	--	--	--	--	ND	--
Toxaphene	--	--	--	--	--	--	ND	--
2,4-D	--	--	--	--	--	--	ND	--
Silvex	--	--	--	--	--	--	ND	--

[a]All values expressed as mg/l except as noted otherwise.

[b]None detected.

Source: Cannon AFB.

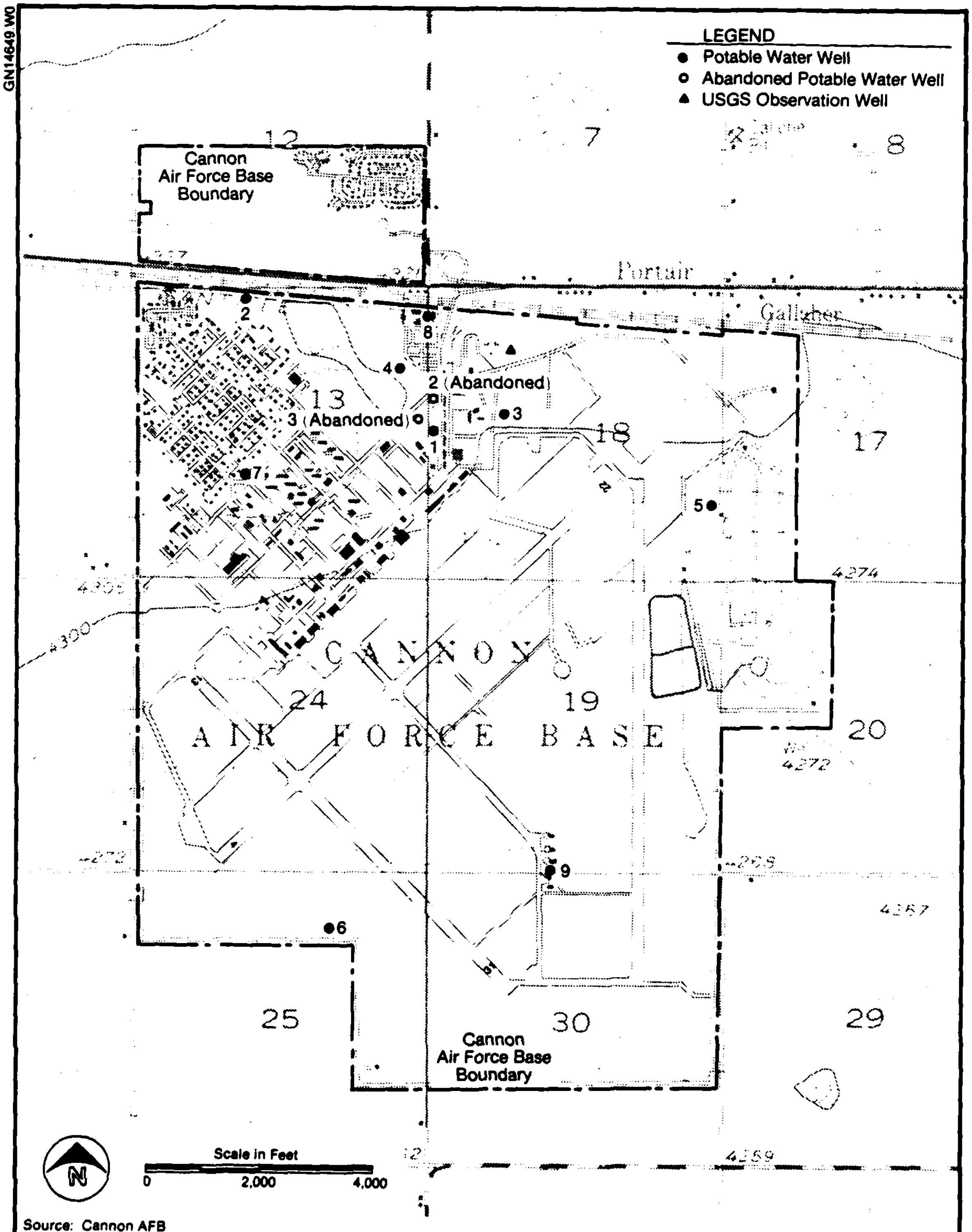

FIGURE 13.
Location Map of Water Wells at Cannon AFB.

D. ECOLOGY

1. Habitat

The natural flora of Cannon AFB consists of plant species typical of semiarid short grass prairies, with water availability being the major factor limiting vegetative development. Grasses and forbs comprise most of the vegetative cover, with heights ranging from 0.5 to 2.0 meters. With the exception of disturbed areas (e.g., landfills), Playa Lake, and the stormwater collection playa, the natural vegetation is essentially the same throughout the airfield, with ground coverage exceeding 50 percent. The dominant grass and forb species include blue grama (Boutelova gracilis), buffalo grass (Buchloe bactyloides), side-oats grama (Boutelova cartipendula), silver bluestem (Andropogen saccharoides), sand dropseed (Sporobolus cryptandrus), kochia weed (Kochia scoparia), tansy-leaved aster (Aster tanacetifolius), broom snakeweed (Gutierrezia saprothrae), horseweed (Conyza canadensis), soapweed yucca (Yucca elata), and wild buckwheat (Eriogonum lachnogynum). Woody plants include salt cedar (Tamarix glauca), plains cottonwood (Populus sargentii), Chinese elm (Ulmus pamila), and catclaw acacia (Acacia greggii).

The prairie grasslands of Cannon AFB are utilized primarily by a variety of passerine birds, raptors, and herbivorous mammals. Common passerine species include horned larks (Eremophila alpestris), meadowlarks (Stumella spp.), and various sparrows. Common raptors include marsh hawk (Circus cyaneus), red-tailed hawks (Buteo jamaicensis), and burrowing owls (Spectyto cunicularia). A variety of waterfowl and black-crowned night herons (Nycticorax nycticorax) were observed to be using the Playa Lake. Two major communities of black-tailed prairie dog (Cynomys ludovicianus) exist on Cannon AFB, one in the munitions storage area and one in the final approach to Runway 21. Other common mammals include black-tailed jackrabbits (Lepus californicus), desert cottontails (Sylvilagus audobonii), and several species of ground squirrels and mice.

2. Threatened and Endangered Species

No Federally endangered plant or animal species are known to occur on Cannon AFB. Federally listed species which have been recorded in southern Curry County or northern Roosevelt County include the black-footed ferret (Mustela nigripes--endangered) and southern bald eagle (Haliaeetus leucocephalus leucocephalus--endangered). The last sighting of a black-footed ferret in the area occurred in the mid-70s in an area 15 to 20 miles south of Cannon AFB (Morrison, 1983). Bald eagles have been observed in flight over the Melrose Bombing Range, but none nest in the area (Harrison et al., 1976; Hubbard et al., 1979). The state-threatened Mississippi kite (Ictinia mississippiensis) nests in the Clovis area (Morrison, 1983), and one specimen was observed in flight over Cannon AFB during the site visit. Other state-threatened species possibly occurring in southern Curry County and northern Roosevelt County include the red-headed woodpecker (Melanerpes erythrocephalus) and the Pecos western ribbon snake (Thamnophis proximus diabolicus). No Federally or state-listed plant species are known to occur in the two-county area (Isaacs, 1983).

IV. FINDINGS

A. ACTIVITY REVIEW

1. Summary of Industrial Waste Disposal Practices

The majority of industrial operations at Cannon AFB have been in existence since 1952. In 1942, the Army Air Corps took control of the existing civilian airfield and began construction of the base. The base was in operation until May 1947, at which time it was deactivated. The base was later reactivated in November 1951, and industrial activities have since been continuous. The major industrial operations include jet engine, pneudraulics, aerospace ground equipment (AGE) maintenance, corrosion control, vehicle maintenance shops, and the non-destructive inspection (NDI) lab. These industrial operations generate varying quantities of waste oils, recoverable fuels, and spent solvents and cleaners.

The total quantity of waste oils, recovered fuels, and spent solvents and cleaners generated ranges from 35,000 to 55,000 gallons per year. The above range of total waste quantities is believed to be representative for the period from the mid-1960s, when the mission changed to that of a replacement training unit, to present.

Practices for past (based on information obtained from shop files and on the best recollection of interviewees) and present industrial waste disposal practices are as follows:

- 1943 to 1947 and 1952 to 1965: The majority of waste oils, spent solvents, and recovered fuels were burned during fire department training exercises or burned/buried at one of the base landfills. Since no program of waste segregation existed, most spent solvents and paint thinners were commingled with waste engine oils, lube oils, and hydraulic fluids. The waste oils, spent solvents, and recovered fuels were collected in 55-gallon drums and bowsers and transported by shop personnel to either the fire department training area (Site No. 6) or landfill (Sites No. 1, 2, and 3) in use at the time. Waste materials brought to the fire department training area in 55-gallon drums were stored at the area until needed to ignite a practice burn during training exercises. Waste materials brought to the landfills were burned prior to burial in trenches.

- 1965 to 1975: The majority of waste oils, spent solvents, and recovered fuels were burned during fire department training exercises; brought to the underground waste oil tank (Facility No. 4028) and removed by a contractor; or disposed of in one of the base landfills. Since no program of waste segregation existed, most spent solvents and paint thinners were commingled with waste oils. Waste materials were collected in 55-gallon drums and bowsers and transported to either a fire department training area (Sites No. 6 and 9), a landfill (Sites No. 3, 4, and 5), or the underground waste oil tank (Facility No. 4028). From approximately 1968 to 1974, waste materials were not burned at the fire department training areas. However, burning of waste materials at the fire department training areas was practiced between 1974 and 1975. Burning operations at the landfill ceased in 1972, after which materials were placed directly into landfill trenches. Waste materials brought to the 20,000-gallon underground waste oil tank (Facility No. 4028) were removed by a contractor. Some waste oils collected in the underground waste oil tank were transported by base personnel to the Melrose Bombing Range and used for road oiling to control dust on unimproved roads. Some recovered fuels generated during the cleaning of refueling trucks were drained onto the ground at Site No. 9.

- <u>1975 to 1982</u>: The practice of burning waste oils and spent solvents during fire department training exercises was stopped in 1975. The majority of waste oils were collected in 55-gallon drums and bowsers and transported to the underground waste oil tank (Facility No. 4028). Waste oils were removed by a contractor. The Defense Property Disposal Office (DPDO) assumed accountability and contracting responsibility for the contractor removal of waste oils in 1978. Some waste oils were disposed of in the base landfill (Site No. 5) during this period.

  The majority of spent solvents and paint thinners were collected in 55-gallon drums and stored at the individual shops until contractor removal. DPDO arranged for contractor removal of spent solvents and paint thinners. Some waste paints and paint thinners were disposed of in the base landfill (Site No. 5).

The majority of recovered JP-4 fuel was burned during fire department training exercises or placed in the underground waste oil tank (Facility No. 4028) and removed by a contractor. Recovered JP-4 was collected in 55-gallon drums and bowsers and transported to the fire department training area (Site No. 9) and placed in a 2,000-gallon underground tank. The fuel was then pumped from the storage tank to the simulated aircraft when needed to ignite a burn. Other recovered JP-4 fuel was placed in the underground waste oil tank (Facility No. 4028) and removed by a contractor. Some recovered fuels were disposed of in the base landfill (Site No. 5).

- <u>1982 to present</u>: Currently, waste materials are segregated and then accumulated and temporarily stored in marked 55-gallon drums and bowsers at designated waste accumulation points. Waste oils collected at the waste accumulation points are transported to the underground waste oil tank (Facility No. 4028) and are then removed by a contractor. Spent solvents and paint thinners collected at the waste accumulation points are turned over to DPDO for contractor removal and are stored at the base hazardous storage area. Recovered JP-4 fuel is transported to the fire department training area (Site No. 6) and placed in the 2,000-gallon underground tank or is collected in marked 55-gallon drums and turned over to DPDO for contractor removal.

2. Industrial Operations

The industrial operations at Cannon AFB have been primarily involved in the routine maintenance of B-17, B-24, B-29, F-51, F-86, F-100, F-111A, F-111E, and F-111D aircraft. Appendix E contains a master list of the industrial operations.

A review of base records and interviews with base employees resulted in the identification of the industrial operations in which the majority of industrial chemicals are handled and hazardous wastes are generated. Table 4 summarizes the major industrial operations and includes the estimated quantities of wastes generated as well as the past and present management practices for these wastes (i.e., treatment, storage, and disposal) since reactivation of the base. It is assumed that activities during the period prior to reactivation (i.e., 1943 to 1947) were similar. Information on estimated waste quantities and past disposal practices is based upon information obtained from shop files and also from interviews with shop personnel, which are in turn based upon their best recollection.

a. 27th Component Repair Squadron

i. Jet Engine Shop

The Jet Engine Shop is located in Building No. 680. Activities include the draining, maintenance, repair, tear down, and modification of aircraft jet engines and afterburners. Wastes generated include 7808 engine oil (2,000 gal/yr), JP-4 (1,000 gal/yr), PD-680 (Type II, 55 gal/yr), and aircraft cleaning compound (480 gal/yr).

Table 4
MAJOR INDUSTRIAL OPERATIONS SUMMARY

Shop Name	Present Location (Bldg. No.)	Waste Material	Current Estimated Waste Quantity	Treatment/Storage/Disposal Methods (1940 – 1950 – 1960 – 1970 – 1980)
27th Component Repair Squadron				
Jet Engine Shop	680	7808 Engine Oil	2,000 gal/yr	FDT, LF; FDT, WOT, LF; WOT
		JP-4	1,000 gal/yr	FDT, LF; FDT
		PD-680 (Type II)	55 gal/yr	FDT, LF; FDT, WOT, LF; DPDO, LF; DPDO
		Aircraft Cleaning Compound	480 gal/yr	Oil/Water Separator to Sanitary Sewer
NDI Lab	185	Penetrant PD-680 (Type II)	220 gal/yr 100 gal/yr	FDT, LF; FDT; DPDO
		Developer Emulsifier	220 gal/yr 220 gal/yr	Sanitary Sewer
		Fixer	480 gal/yr	Silver Recovery to Sanitary Sewer

LEGEND

FDT = Fire department training exercises.
LF = Landfill.
WOT = 20,000-Gallon underground waste oil tank (Facility No. 4028), contractor removal (DPDO accountability since 1978).
DPDO = Defense Property Disposal Office, previously designated Redistribution and Marketing.

Table 4--Continued

Shop Name	Present Location (Bldg. No.)	Waste Material	Current Estimated Waste Quantity	Treatment/Storage/Disposal Methods (1940 – 1950 – 1960 – 1970 – 1980)
Pneudraulics Shop	680	PD-680 (Type II)	400 gal/yr	Sanitary Sewer; DPDO, LF; DPDO
		Hydraulic Fluid	330 gal/yr	FDT, LF; FDT, WOT, LF; WOT, LF; DPDO
27th Equipment Maintenance Squadron				
Corrosion Control Shop	196	Waste Paints Paint Strippers Thinners Solvents	1,600 gal/yr	FDT, LF; DPDO, LF; DPDO
Fuel Systems Repair Shop	196	JP-4	660 gal/yr	FDT, LF; FDT
Lead Acid Battery Shop	185	Battery Acid	300 gal/yr	Neutralization to Sanitary Sewer
AGE Maintenance Shop	186	Waste Engine Oil Hydraulic Fluid	4,000 gal/yr	FDT, LF; FDT, WOT, LF; WOT

LEGEND

FDT = Fire department training exercises.
LF = Landfill.
WOT = 20,000-Gallon underground waste oil tank (Facility No. 4028), contractor removal (DPDO accountability since 1978).
DPDO = Defense Property Disposal Office, previously designated Redistribution and Marketing.

Table 4--Continued

Shop Name	Present Location (Bldg. No)	Waste Material	Current Estimated Waste Quantity	Treatment/Storage/Disposal Methods (1940, 1950, 1960, 1970, 1980)
ACE Maintenance Shop - Continued	186	PD-680 (Type II) Aircraft Cleaning Compound	2,640 gal/yr	Washrack Oil/Water Separator to Sanitary Sewer
Aircraft Washrack	165	PD-680 (Type II) Aircraft Cleaning Compound	3,600 gal/yr 1,700 gal/yr	Oil/Water Separator to Storm Drainage System
Wheel and Tire Shop	194	PD-680 (Type II) Turco Cold Stripper	880 gal/yr 1,320 gal/yr	FDT, LF; FDT, WOT, LF; DPDO, LF; DPDO
27th Transportation Squadron				
Special Purpose Vehicle Maintenance Shop	379	Engine Oil[a]	3,300 gal/yr	FDT, LF; FDT, WOT, LF; WOT, LF; WOT
		PD-680 (Type II)	280 gal/yr	FDT, LF; FDT, WOT, LF; DPDO, LF; DPDO

LEGEND

FDT = Fire department training exercises.
LF = Landfill.
WOT = 20,000-Gallon underground waste oil tank (Facility No. 4028), contractor removal (DPDO accountability since 1978).
DPDO = Defense Property Disposal Office, previously designated Redistribution and Marketing.

[a]Includes waste engine oils generated by the General Purpose Vehicle Maintenance Shop.

Since 1975, the 7808 engine oil has been transported to the underground waste oil tank (Facility No. 4028) and periodically removed by a contractor. Between 1965 and 1975, the final disposition of the engine oil was fire department training exercises, underground waste oil tank and periodic contractor removal, or landfill. Prior to 1965, the final disposition of the engine oil was fire department training exercises or landfill. Since 1975, the recovered JP-4 (less than 10 percent contaminated) has been burned during fire department training exercises. Prior to 1975, the final disposition of recovered JP-4 was fire department training exercises or landfill. The 30-gallon PD-680 dip tank used for cleaning bearings is cleaned approximately once every 6 months. Since late 1981, the PD-680 has been turned over to DPDO for contractor removal. Between 1975 and 1982, the final disposition of the PD-680 was contractor removal through DPDO or landfill. Prior to 1975, the final disposition of the PD-680 was the same as that of the 7808 engine oil described above. The aircraft cleaning compound is used at a recently constructed indoor washrack for engine cleaning. This compound (which contains 5 percent by weight ethylene glycol n-mono butyl ether) is an alkaline water-based compound which is 90 percent biodegradable. The washrack drains to an oil/water separator which discharges to the sanitary sewer.

ii. NDI Lab

The NDI Lab is located in Building No. 185. Non-destructive testing methods, including x-ray, magnaflux, and ultrasound, are performed to determine structural integrity and material defects of aircraft structures, component parts, and related ground equipment. Wastes generated by the developing process include penetrant (220 gal/yr), developer (220 gal/yr), emulsifier (220 gal/yr), and fixer (480 gal/yr). PD-680 (Type II, 100 gal/yr) is also periodically generated at the lab when the 25-gallon dip tank is cleaned out approximately every 3 months. The photographic developing solutions are contained in processing tanks. The developer and emulsifier processing tanks are cleaned approximately every 3 months and these biodegradable materials are discharged to the sanitary sewer. This has also been the common practice in the past. The penetrant processing tank is also cleaned out approximately every 3 months, and the contents are placed in a 55-gallon drum. Since 1975, the penetrant and PD-680 have been reportedly taken to the fire department training area and placed in the 2,000-gallon underground tank located at the site. Prior to 1975, the final disposition of the penetrant and PD-680 was fire department training exercises or landfill. The fixer processing tank is cleaned out on a monthly basis and the fixer solution processed for silver recovery prior to discharging to the sanitary sewer. This has also been the common practice in the past. The recovered silver sludge is sent to DPDO for final disposition.

iii. Pneudraulics Shop

The Pneudraulics Shop is located in Building No. 680. Wastes generated during the maintenance and repair of aircraft pneumatic and hydraulic systems include PD-680 (Type II, 400 gal/yr) and hydraulic fluid (330 gal/yr). The shop has a 100-gallon PD-680 dip tank which is cleaned about every 3 months. Since late 1981, the PD-680 has been turned over to DPDO for contractor removal. Between 1979 and 1982, the final disposition of the PD-680 was contractor removal through DPDO or landfill. Prior to 1979, the PD-680 was discharged to the sanitary sewer. The hydraulic fluid is currently placed in 55-gallon drums and turned over to DPDO for contractor removal. Between 1975 and 1982, the final disposition of the hydraulic fluid was the underground waste oil tank (Facility No. 4028) with periodic contractor removal or landfill. Between 1965 and 1975, the final disposition was fire department training exercises, underground waste oil tank with periodic contractor removal, or landfill. Prior to 1965, the final disposition was fire department training exercises or landfill.

b. 27th Equipment Maintenance Squadron

i. Corrosion Control Shop

The Corrosion Control Shop is located in Building No. 196. Corrosion control activities include cleaning, stripping, sanding, wiping, priming, repainting, and stenciling of aircraft and AGE units. All washing activities are conducted at the aircraft washrack (Facility No. 165), as discussed later in this section. During 1982, 46 aircraft from Cannon AFB and 25 transient aircraft received full paint jobs and 123 aircraft received major touch-up paint jobs. Approximately 1,600 gallons of waste paints, paint strippers, thinners, and solvents are generated annually during corrosion control activities. Methyl ethyl ketone and toluene are the two solvents primarily used by the Corrosion Control Shop. Currently, all the wastes are placed in marked 55-gallon drums and are processed to DPDO for contractor removal. Between 1975 and 1982, the waste drums were either removed by a contractor through DPDO or disposed of in Landfill No. 5 (Site No. 5). Prior to 1975, the final disposition of the wastes was fire department training exercises or landfill. Interviewees reported that the disposal of corrosion control wastes in Landfill No. 5 was most frequent during the early to mid-1970s. The corrosion control spray booth located in Building No. 196 is a waterfall-type spray booth. The collected paint particles form a scum which floats on the water. The paint scum is scraped off the surface of the water and placed in the dumpster. The water holding tank is periodically purged to the sanitary sewer and replenished with fresh water. The spray booth paint filters (31 total) are removed twice per month and placed in the dumpster. Materials in the dumpster are disposed of at the base landfill (Site No. 5). This has also been the common practice in the past.

ii. Fuel Systems Repair Shop

The Fuel Systems Repair Shop is located in Building No. 196. The only waste generated during the maintenance and repair of aircraft fuel tanks is JP-4 (660 gal/yr). The fuel residuals are drained from the fuel tanks by vacuum and placed in a bowser. Since 1975, the recovered JP-4 has been burned during fire department training exercises. Prior to 1975, the final disposition of recovered JP-4 was fire department training exercises or landfill.

iii. Lead Acid Battery Shop

The Lead Acid Battery Shop is located in Building No. 185. The only waste generated during the servicing of lead acid batteries is battery acid (sulfuric acid, 300 gal/yr). The battery acid is neutralized with sodium bicarbonate in a neutralization tank and periodically discharged to the sanitary sewer. This has also been the common practice in the past. Approximately 15 to 20 lead acid batteries are processed each month. Used battery casings are sent to DPDO for final disposition.

iv. AGE Maintenance Shop

The AGE Maintenance Shop is located in Building No. 186. The responsibility of this shop is to repair, maintain, and periodically inspect all aerospace ground equipment. Approximately 4,000 gallons of waste oils and hydraulic fluid are generated annually. Since 1975, the commingled waste oils and hydraulic fluid have been transported to the underground waste oil tank (Facility No. 4028) and periodically removed by a contractor. Between 1965 and 1975, the final disposition of the wastes was fire department training exercises, underground waste oil tank and periodic contractor removal, or landfill. Prior to 1965, the final disposition of the wastes was fire department training exercises or landfill. Approximately 2,640 gal/yr of aircraft cleaning compound and PD-680 (Type II) are used at the AGE washrack. The washrack drains to an oil/water separator which discharges to the sanitary sewer (separator and drain installed in 1971).

v. Aircraft Washrack

The Aircraft Washrack is located at Facility No. 165. All aircraft cleaning operations are conducted at the washrack. Between one and four aircraft are cleaned per day at the washrack during the warmer months. Wastes generated include PD-680 (Type II, 3,600 gal/yr) and aircraft cleaning compound (1,700 gal/yr). The aircraft cleaning compound is mixed with water in a holding tank in a 1 to 8 ratio prior to application. The PD-680 and aircraft cleaning compound are flushed down the washrack drain into an oil/water separator. The effluent from the separator is discharged to the storm drainage system. The material collected by the oil/water separator is removed periodically and processed through DPDO. This has been the common practice since the construction of the washrack in 1966.

vi. Wheel and Tire Shop

The Wheel and Tire Shop is located in Building No. 194. Activities include the inspection, maintenance, and repair of aircraft wheels and bearings. Wastes generated during the cleaning and stripping of aircraft wheels include PD-680 (Type II, 880 gal/yr) and Turco cold stripper (1,320 gal/yr). The shop has two large dip tanks: a 110-gallon PD-680 cleaning dip tank which is cleaned out once every 45 days and a 110-gallon cold stripper dip tank which is cleaned out once a month. Since late 1981, the PD-680 and Turco Cold Stripper have been turned over to DPDO for contractor removal. Between 1975 and 1982, the final disposition of the wastes was contractor removal through DPDO or landfill. Between 1965 and 1975, the final disposition of the wastes was fire department training exercises, underground waste oil tank and periodic contractor removal, or landfill. Prior to 1965, the final disposition of the wastes was fire department training exercises or landfill.

c. 27th Transportation Squadron

i. Special Purpose Vehicle Maintenance Shop

The Special Purpose Vehicle Maintenance Shop is located in Building No. 379. The lube rack in Building No. 379 is used by both the Special and General Purpose Vehicle Maintenance Shops. All engine oil changes are conducted at the lube rack. Wastes generated during the repair and maintenance of special purpose vehicles include engine oil (3,300 gal/yr) and PD-680 (Type II, 280 gal/yr). The 35-gallon PD-680 dip tank located in the shop is cleaned out approximately every 45 days. Since 1975, the PD-680 has been turned over to DPDO for contractor removal and the engine oil has been transported to the underground waste oil

(Facility No. 4028) and periodically removed by a contractor. Some of the PD-680 and engine oil waste were disposed of in the base landfill during the period between 1975 and 1982. Between 1965 and 1975, the final disposition of the wastes was fire department training exercises, underground waste oil tank and periodic contractor removal, or landfill. Prior to 1965, the final disposition of the wastes was fire department training exercises or landfill.

3. <u>Fuels</u>

The major fuel storage area on Cannon AFB is the POL bulk storage area. The POL bulk storage area houses three aboveground, floating-roof, diked tanks for JP-4 storage. Two of the storage tanks have a capacity of 20,000 barrels (Facilities No. 395 and 396), and the other has a capacity of 10,000 barrels (Facility No. 394). Also located at the POL bulk storage area are a 25,000-gallon MOGAS tank (Facility No. 378), a 10,000-gallon MOGAS tank (Facility No. 398), and a 20,000-gallon diesel tank (Facility No. 399). The MOGAS and diesel storage tanks are all aboveground. There are numerous other tanks on-base used for the storage of MOGAS, diesel fuel, and JP-4. A complete inventory of existing POL storage tanks is included in Appendix F. Appendix F provides facility number, type of POL stored, capacity, and type of tank.

JP-4 recovered during the defueling of aircraft is recycled and reused or taken to the fire department training area (Site No. 9) and placed in an underground 2,000-gallon storage tank to be used for training exercises. There is a 2,000-gallon underground tank (Facility No. 390) located at the POL bulk storage area which stores recovered JP-4 and is pumped out by a contractor.

The major JP-4 storage tanks at the POL bulk storage area are inspected on an annual basis and cleaned out approximately every 5 years. The quantities of sludge generated per tank cleaning operation are small, and the sludge consists mainly of water, rust, dirt, and fuel. The most recent tank cleaning operation (Facility No. 395 in 1981) was conducted by a contractor and the sludge was hauled off-base. In the past, fuel tank sludge was weathered at the sludge weathering pit (Site No. 14). The sludge was allowed to weather for several weeks and then brought to the landfill in use at that time and buried. A soil sample collected from the sludge weathering pit in 1981 was analyzed for lead and extractable oil and grease. The results for lead were negative and the results for extractable oil and grease indicated a concentration of 0.012 gm/kg. Potential sources of lead are AVGAS and leaded MOGAS fuel tank sludges.

Two fuel spill sites were identified at Cannon AFB. These sites (Sites No. 18 and 19) will be discussed in further detail in Section IV.B, "Disposal Sites Identification and Evaluation," pages IV-44 and IV-45.

Three inactive underground diesel oil storage tanks have been identified at Cannon AFB. One tank is located adjacent to the 20,000 gallon underground waste oil tank (Facility No. 4028). The size and date the tank was inactivated are not known, however, the tank has reportedly been emptied and filled with sand.

A second inactive underground tank is located adjacent to Building No. 357. This tank, previously inactivated, was discovered in 1975 to be partially full with diesel oil. The oil was removed and the tank filled with sand.

A third inactive underground tank is located adjacent to Building No. 163 (Photo Lab). It is not known whether or not this tank has been filled with sand.

4. Fire Department Training Exercises

Four fire department training areas were identified at Cannon AFB, covering a period from 1959 to present. Fire department training activities are believed to have been common practice since the activation of the base. Although the location(s) of training areas in use prior to 1959 could not be verified, it is assumed that they were in the same area as Fire Department Training Area No. 1. The training exercises have been conducted in a cleared, unlined, circular area using a mock aircraft. Depending on the period of operation, either POL wastes (primarily recovered fuels with commingled waste oils and spent solvents) or recovered JP-4 were used to ignite the practice burn. Prior to 1968, wastes brought to the fire department training areas were poured directly onto the ground prior to a practice burn. Procedures since 1968 have been to presaturate the ground surface with water, apply the starter fuel, ignite, preburn for 30 to 45 seconds, and extinguish with "Aqueous Film-Forming Foam (AFFF)." Most of the starter fuel (POL waste or recovered JP-4) would have been consumed in the fire, but some minor percolation into the ground may have taken place. A brief description of past and present fire department training activities at Cannon AFB is given below. Further discussion of the fire department training areas is given in Section IV.B., page IV-34.

- 1959 to 1968: Fire Department Training Area No. 1 (Site No. 6) was located in the northeast corner of the base. Approximately 300 gallons of POL wastes, primarily recovered fuels with commingled waste oils and spent solvents, were used during training exercises. POL wastes were brought to the site in 55-gallon drums and bowsers. The frequency of exercises was twice per month.

- o <u>1968 to 1974</u>: During this period, Fire Department Training Areas No. 2 and No. 3 (Sites No. 7 and No. 8, respectively) were used concurrently. Both training areas were located in the southeast corner of the base, adjacent to the abandoned runway. It was reported that only new JP-4 was used at these sites. Approximately 300 gallons of new JP-4 was used per exercise. The frequency of exercises was reduced to twice per quarter during this period.

- o <u>1974 to present</u>: Since 1974, exercises have been conducted at Fire Department Training Area No. 4 (Site No. 9) located in the southeast corner of the base. For approximately 1 year, from 1974 to 1975, approximately 300 gallons of POL wastes, primarily recovered fuels with co-mingled waste oils and spent solvents, were used. In 1975, a 2,000-gallon underground tank was installed to store recovered fuel for practice burns. Approximately 300 gallons of the JP-4 is pumped from the storage tank to the mock aircraft to ignite a practice burn. The frequency of exercises during this period has been twice per month. Runoff from the training area is collected in an unlined pit adjacent to the site.

5. <u>Polychlorinated Biphenyls (PCBs)</u>

Typical sources of PCBs at Cannon AFB are electrical transformers and capacitors. Presently, there are approximately 20 out-of-service PCB transformers stored on-base. All out-of-service PCB transformers are stored in Building No. 224. Building No. 224, constructed in 1981, was specifically designed for the storage of PCB items and PCB-contaminated items. Prior to 1981, all out-of-service transformers were stored at the Civil Engineering open storage yard. All out-of-service PCB transformers are turned over to DPDO for proper disposition. In the past (prior to 1978) all out-of-service transformers were turned over to supply for salvage.

A program exists to sample and analyze all in-service transformers for PCB. Of the approximately 550 in-service transformers at Cannon AFB, analytical results are available on 76. The results as of this study indicate 47 transformers with a PCB concentration of less than 50 ppm; 26 transformers with a PCB concentration between 50 ppm and 500 ppm; and three transformers with a concentration greater than 500 ppm.

There is no record or report of any major PCB spills from leaking or blown transformers. The only PCB spill identified during the records search occurred in 1978 when three blown capacitors released about 6 gallons of oil which was believed to contain PCBs. The soil surrounding the power pole was removed, placed in 55-gallon drums, and transported off-base. This site (Site No. 10) is discussed in further detail in Section IV.B., page IV-37.

6. Pesticides

Pesticides have commonly been used at Cannon AFB. The Entomology Shop controls the use and handling of all pesticides used to control mosquitoes, cockroaches, ants, and mice, as well as undesirable weeds, algae, and overgrowth.

The major pesticides used and the annual usage (1981) are Sevin (100 lb/yr), Diazinon E.C. (35 lb/yr), Diazinon granules (220 lb/yr), Dursban E.C. (63 lb/yr), Baygon solution (37 lb/yr), Baygon granules (7 lb/yr), Malathion E.C. (50 gal/yr), Malathion technical (15 gal/yr), zinc phosphide (10 lb/yr), and 2,4-D herbicide (24 gal/yr).

Proper preparation and application procedures are followed. All empty pesticide containers are triple-rinsed and punctured with holes prior to disposal in the landfill. All rinsing of pesticide application equipment and empty containers is conducted in Building No. 2160. The rinse is collected in a sink which drains to a small open pit located outside the building. The entomology rinse area (Site No. 17) is discussed in further detail in Section IV.B., "Disposal Sites Identification and Evaluation," page IV-43.

There were no reports of banned or restricted herbicides or other pesticides currently used on-base.

7. Wastewater Treatment

Combined sanitary and industrial wastewater from Cannon AFB is treated in two on-base stabilization lagoons. The lagoons have a combined surface area of 32 acres and are operated in series. The lagoons, constructed in 1966, have unlined earth bottoms and concrete-lined banks and operate at an average depth of approximately 3 feet, with a maximum depth of 4.5 feet. Based on the most recent year (1982) of operating data, the average daily flow to the lagoons was 566,000 gpd. The influent to the lagoons is monitored on a daily basis for flow and temperature and on at least a monthly basis for pH, settleable solids, and dissolved oxygen (DO). A sample of sludge from the lagoons was collected in July 1982 and analyzed for the characteristics of EP toxicity. The results of the EP toxicity test were negative. Prior to the construction of the two lagoons in 1966, the base sanitary and industrial wastewater was treated by an Imhoff tank treatment system that discharged to Playa Lake.

The treated effluent from the lagoons is channeled to Playa Lake, a natural land depression, which is confined entirely within the base perimeter. Final effluent disposal is by a combination of evaporation, infiltration, and sale to a neighboring farmer for irrigation purposes. Playa Lake has been sampled since 1981 on an annual basis; the samples were analyzed for nitrate, chloride, sulfate, total phosphorus, chemical oxygen demand, oil and grease, and metals. Analytical results have been within acceptable limits.

The wastewater treatment system does not have a National Pollutant Discharge Elimination System (NPDES) permit. Because the lagoons do not discharge into navigable waters, the requirement for an NPDES permit was waived in 1975.

An incident occurred in February 1983 resulting in the discharge of raw sanitary sewage to an overflow pit located on the base golf course. Due to a malfunction in the pumps located in Lift Station No. 1402, an estimated 100,000 to 150,000 gallons of raw sewage were bypassed to an adjacent overflow pit. A water sample was collected and analyzed for the characteristics of EP toxicity. The results for the specified metals and pesticides were negative; however, a hydrocarbon odor was noted and the sample was found to be ignitable at 60°C (140°F). Subsequently, after the liquid was pumped back into the lift station, a soil sample was collected and was negative for ignitability (greater than 60°C). The sanitary sewage lift station overflow pit (Site No. 13) is discussed in further detail in

Section IV.B., "Disposal Sites Identification and Evaluation," page IV-40.

There are 21 oil/water separators located at various industrial shops and washracks to provide pretreatment of the industrial wastewater. The majority of oil/water separators are connected to the sanitary sewer system; however, several discharge to the storm drainage system and those in remote areas discharge to a leaching field. An inventory of all oil/water separators, including location, date of installation, approximate capacity, and discharge receptor is provided in Appendix G. No data was found to substantiate the approximate dates that the oil/water separators were connected to the sanitary sewer system; however, it is assumed they were connected when first installed. The oil/water separators are serviced periodically and waste oils are removed and processed through DPDO.

A sample was collected in October 1981 from the effluent of the oil/water separator, located at the aircraft washrack (Facility No. 165), which discharges to the storm drain. The sample was analyzed and found to be primarily water with a very thin layer of a hydrocarbon floating on the surface. The sample was found to have a flash point of greater than 60°C (140°F) and the only detected parameters were lead (80 μg/l) and chromium (212 μg/l).

8. Available Water Quality Data

All the potable water for Cannon AFB is supplied by nine on-base potable water wells. The locations of each are shown on Figure 13, page III-20. Wells No. 1, 2, 3, 4, and 8 supply raw water to Water Treatment Plant No. 1, which was constructed in 1960 and employs sodium zeolite softening units for hardness removal, followed by chlorination. Plant

No. 1 blends 40 percent treated (soft) and 60 percent untreated (hard) water. Well No. 7 supplies raw water to Water Treatment Plant No. 2, which provides chlorination only. Based on the most recent year (1982) of operating data, the average daily flow from both treatment plants combined is 1.364 mgd. Wells No. 5, 6, and 9 are located in remote areas of the base and receive chlorination by hypochlorinator units. The water quality analyses for Well No. 1 is provided in Table 3, page III-19. The potable water is monitored for pH, hardness, and chlorine residual on a daily basis and for fluoride and DO on at least a monthly basis. Samples collected from Wells No. 1, 2, and 8, and the distribution system in October 1981 were analyzed for metals and pesticides. The results indicated that these wells are below the primary drinking water standards for metals and pesticides. All the base potable wells were sampled in April 1981 for trichloroethylene (TCE). The results indicated that Wells No. 1 and 9 were found to contain less than 1.0 µg/l of TCE and is not considered to be a problem at these low levels. The potential source of TCE in Wells No. 1 and 9 is unknown; however, no TCE was found in any of the other base potable water wells.

The storm drainage system at Cannon AFB is composed of man-made ditches, natural drainageways, and storm sewers. The majority of the base storm drainage flows to a large playa located at the south-southwest corner of the base. Since no storm drainage leaves the base, there is no storm drainage sampling program. The potential exists that minor POL spills along the flightline may be washed into the storm drainage system. In addition, several oil/water separators along the flightline discharge to the storm sewer. The stormwater collection playa (Site No. 12) is discussed in further detail in Section IV.B., "Disposal Sites Identification and Evaluation," page IV-39.

9. Other Activities

The records and information obtained during the interviews produced no evidence of the past or present storage, disposal, or handling of biological or chemical warfare agents at Cannon AFB.

All explosive ordnance disposal (EOD) activities are conducted at the EOD area located on the southeastern portion of the base. This site has always been used for EOD activities and the records search did not identify any other past EOD areas. The EOD area is used for training operations only. The training operations are conducted about once per month and there is a 5-pound explosive limit.

B. DISPOSAL SITES IDENTIFICATION AND EVALUATION

Interviews were conducted with base personnel (Appendix C) to identify disposal and spill sites at Cannon AFB. A preliminary screening was performed on all the identified sites based on the information obtained from the interviews and available records from the base and outside agencies. Using the decision tree process described in the "Methodology" section, a determination was made whether a potential exists for hazardous material contamination at any of the identified sites. For those sites with the potential for hazardous material contamination, a determination was made whether significant potential exists for contaminant migration from these sites. These sites were then rated using the U.S. Air Force Hazard Assessment Rating Methodology (HARM), which was developed jointly by the Air Force, CH2M HILL, and Engineering-Science for specific application to the Air Force IRP. The HARM system considers four aspects of the hazard posed by a specific site: (1) the receptors of the contamination, (2) the waste and its characteristics, (3) potential pathways for waste contaminant migration, and (4) any efforts to contain the contaminants. Each of these categories contains a number of rating factors that are used in the overall hazard rating. A more detailed description of the HARM system is included in Appendix H.

A total of 19 disposal and spill sites were identified at Cannon AFB. Of these, 18 were rated using the HARM rating system. A complete listing of all of the sites, including potential hazards, is given in Table 5. Copies of the completed rating forms are included in Appendix I, and a summary of the hazard ratings for the sites is given in Table 6.

A description of each site, including a brief discussion of the rating results, is presented below. Approximate locations of the sites are shown on Figure 14. Operating dates for the fire department training sites and approximate operating dates for the identified landfills are shown on Figure 15.

1. Landfills

Base solid waste has been disposed of in five base landfills from 1943 to the present. All landfills have received domestic and industrial solid wastes generated on-base. In addition, flightline-generated liquid wastes (oils, solvents, paints, etc.) that were not burned in fire department training exercises or disposed of otherwise were received at the landfills. The five base landfills are discussed below:

a. Site No. 1--Landfill No. 1

Landfill No. 1 (overall score of 55), the original base landfill, was operated from 1943 to 1946.

Table 5
DISPOSAL AND SPILL SITES SUMMARY

Site No.	Site Description	Potential Hazard Contamination	Potential Hazard Migration	Rating
1	Landfill No. 1	Yes	Yes	Yes
2	Landfill No. 2	Yes	Yes	Yes
3	Landfill No. 3	Yes	Yes	Yes
4	Landfill No. 4	Yes	Yes	Yes
5	Landfill No. 5	Yes	Yes	Yes
6	Fire Department Training Area No. 1	Yes	Yes	Yes
7	Fire Department Training Area No. 2	Yes	Yes	Yes
8	Fire Department Training Area No. 3	Yes	Yes	Yes
9	Fire Department Training Area No. 4	Yes	Yes	Yes
10	Blown Capacitors Site	No	N/A	No
11	Engine Test Cell Overflow Pit and Leaching Field	Yes	Yes	Yes
12	Stormwater Collection Point	Yes	Yes	Yes
13	Sanitary Sewage Lift Station Overflow	Yes	Yes	Yes
14	Sludge Weathering Pit	Yes	Yes	Yes
15	AGE Drainage Ditch	Yes	Yes	Yes
16	Solvent Disposal Site	Yes	Yes	Yes
17	Entomology Rinse Area	Yes	Yes	Yes
18	JP-4 Fuel Spill	Yes	Yes	Yes
19	MOGAS Spill	Yes	Yes	Yes

Table 6
SUMMARY OF DISPOSAL AND SPILL SITES RATINGS

Site No.	Site Description	Subscore (% of Maximum Possible Score in Each Category) Receptors	Characteristics	Pathways	Factor for Waste Management Practices	Overall Score	Page Reference of Site Rating Form
1	Landfill No. 1	63	60	43	1.0	55	I-1
2	Landfill No. 2	55	60	35	1.0	50	I-3
3	Landfill No. 3	53	60	50	1.0	54	I-5
4	Landfill No. 4	59	60	50	1.0	56	I-7
5	Landfill No. 5	53	100	28	1.0	60	I-9
6	Fire Department Training Area No. 1	55	80	35	1.0	57	I-11
7	Fire Department Training Area No. 2	50	48	28	1.0	42	I-13
8	Fire Department Training Area No. 3	50	48	28	1.0	42	I-15
9	Fire Department Training Area No. 4	53	64	80	1.0	66	I-17
11	Engine Test Cell Overflow Pit and Leaching Field	52	40	80	1.0	57	I-19
12	Stormwater Collection Point	57	40	50	1.0	49	I-21
13	Sanitary Sewage Lift Station Overflow	63	36	43	1.0	47	I-23
14	Sludge Weathering Pit	59	48	50	1.0	52	I-25
15	AGE Drainage Ditch	56	40	80	1.0	59	I-27
16	Solvent Disposal Site	55	60	35	1.0	50	I-29
17	Entomology Rinse Area	57	40	43	1.0	47	I-31
18	JP-4 Fuel Spill	52	48	43	1.0	48	I-33
19	MOGAS Spill	58	40	43	1.0	47	I-35

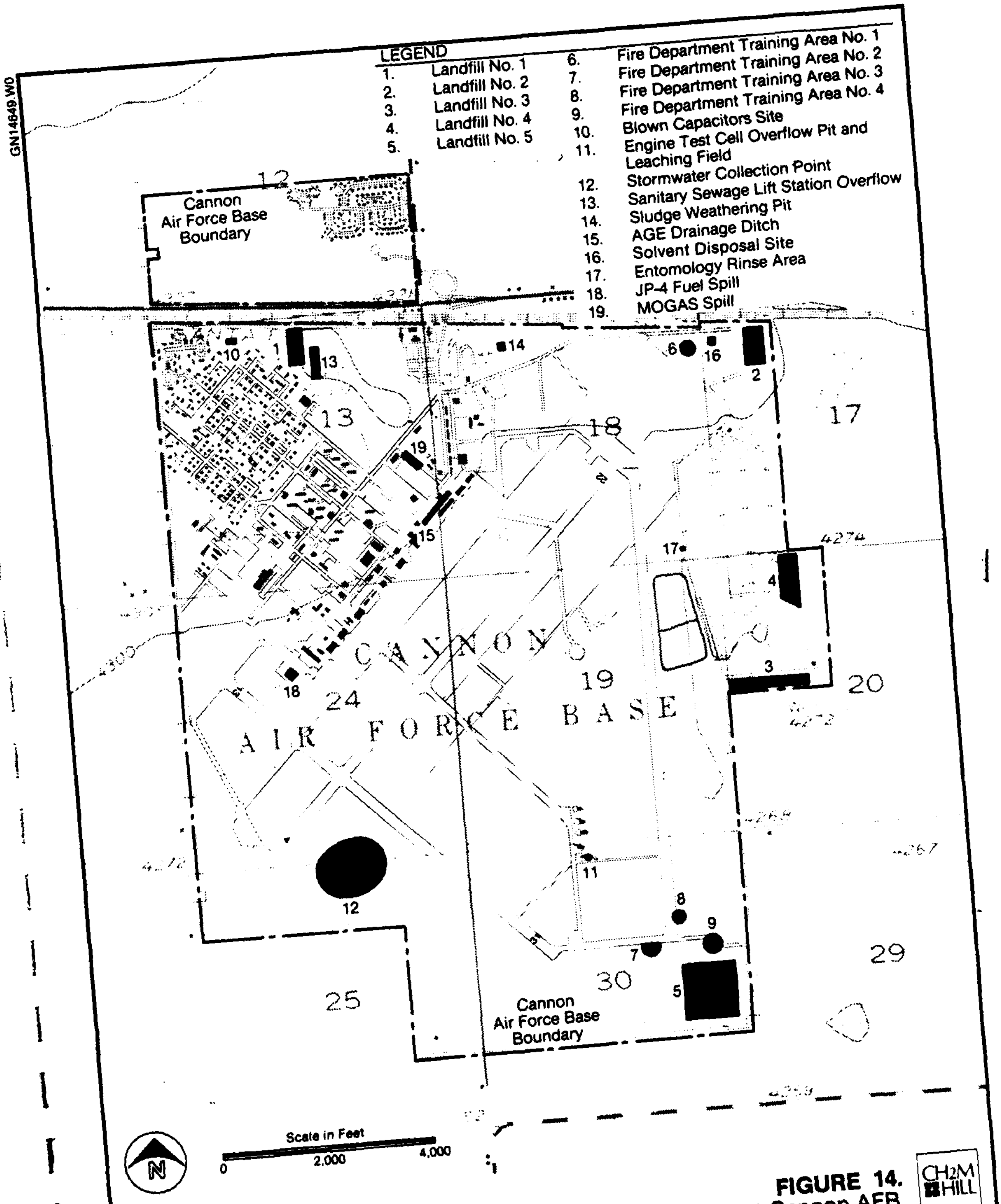

FIGURE 14.
Location Map of Identified Disposal and Spill Sites at Cannon AFB.

GN14649.W0

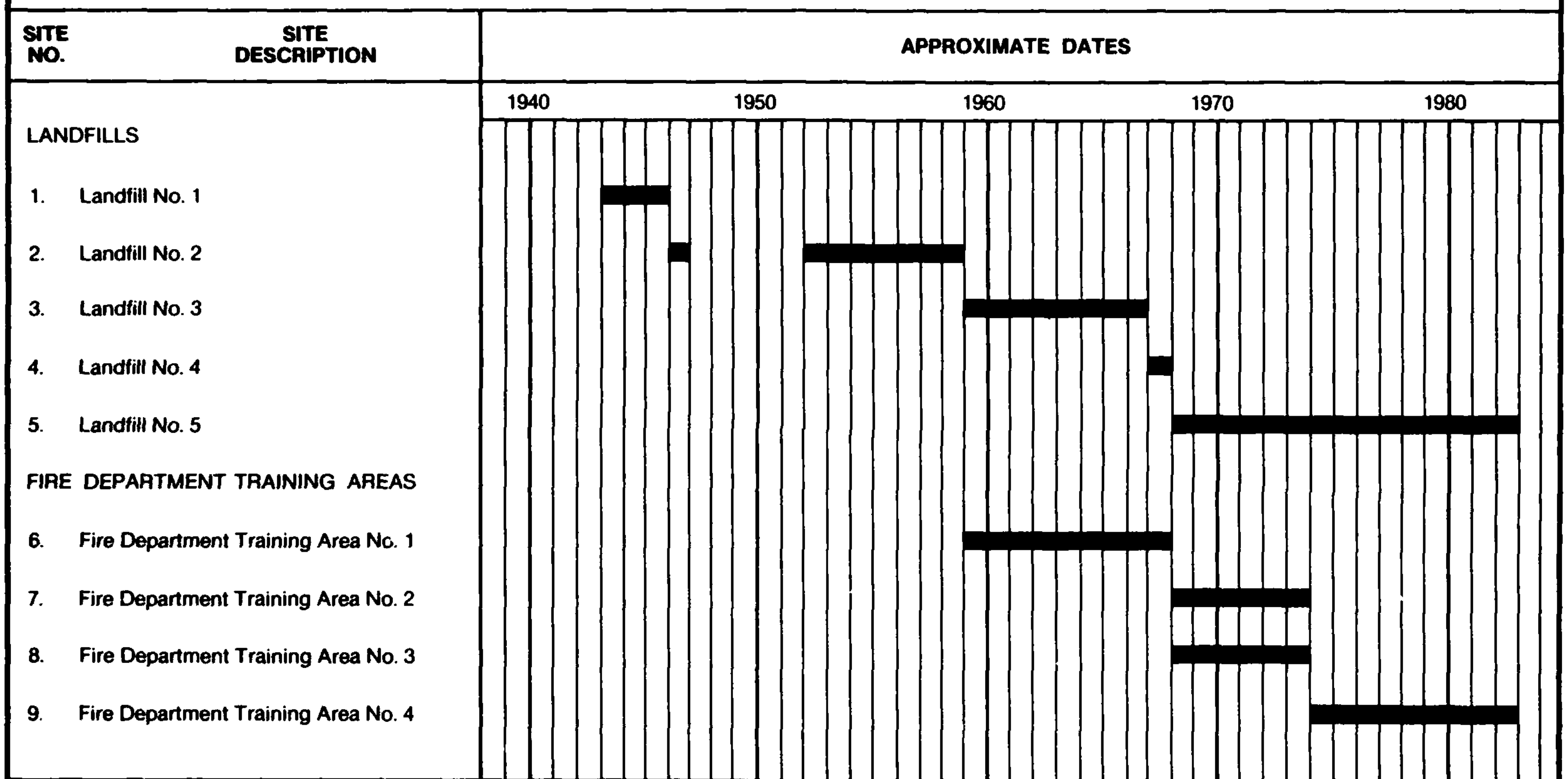

FIGURE 15.
Historical Summary of Activities at Landfills and Fire Department Training Areas.

CH2M HILL

This landfill, estimated to be approximately 4 acres in size, is located on the golf course, approximately 500 feet north of the hospital (Facility No. 1400).

Types of materials received at the landfill included domestic solid waste and shop wastes such as waste oils and solvents; paint strippers and outdated paints; paint thinners; pesticide containers; and various empty cans and drums.

Burning of wastes followed by burying was apparently the mode of operation at this site. There is no indication that buried wastes were encountered or excavated during construction of the golf course.

Landfill No. 1 received an overall HARM rating score of 55, due primarily to: (1) the known disposal of small quantities of hazardous wastes, (2) the proximity of the site to potable water Well No. 2 (approximately 880 feet), and (3) the distance to the reservation boundary (approximately 100 feet).

b. Site No. 2--Landfill No. 2

Landfill No. 2 (overall score of 50) was operated from 1946 to 1947 and from 1952 to 1959. The inactivity of the landfill from 1947 to 1952 coincided with the period that the base was on deactivated status. This site, approximately 4 acres in size, is located in the northeast corner of the base, beyond the end of the primary runway. In its present state, the site appears as an open field, covered with prairie grass species; no evidence of recent use or unauthorized dumping was found.

Materials received at this landfill were similar to those reported for Landfill No. 1, i.e., domestic solid waste; waste oils and solvents; paints, paint strippers and paint thinners; pesticide containers; and various empty cans and drums.

Burning of waste materials, followed by burial in trenches, was apparently the mode of operation at this landfill.

Landfill No. 2 received an overall HARM rating score of 50, due primarily to: (1) the known disposal of small quantities of hazardous wastes, (2) the proximity of the site to potable water Well No. 5 (approximately 2,600 feet) and (3) the distance to the reservation boundary (less than 100 feet).

c. Site No. 3--Landfill No. 3

Landfill No. 3 (overall score of 54) was operated from 1959 to 1967. This site, approximately 9 acres in size, is located on the east side of the base south of the ordnance area. In its present state, the site appears as a rectangular open field covered with prairie grass species; no evidence of recent use or unauthorized dumping was found.

Materials received at this landfill were similar to those reported for Landfills No. 1 and No. 2, i.e., domestic solid waste; waste oils and solvents; paints, paint strippers, and paint thinners; pesticide containers; and various empty cans and drums.

The mode of operation at this site was a burn and bury trench operation. Burned waste materials were covered the following day.

Landfill No. 3 received an overall HARM rating score of 54, due primarily to: (1) the known disposal of small quantities of hazardous wastes, (2) the proximity of the site to potable water Well No. 5 (3,700 feet), (3) the distance to the reservation boundary (less than 100 feet) and (4) the proximity of the site to Playa Lake (400 feet).

d. Site No. 4--Landfill No. 4

Landfill No. 4 (overall score of 56) was operated from 1967 to 1968. This site, approximately 7 acres in size, is located on the east side of the base, between the ordnance area and the base property line. In its present state, this site is an open field covered with prairie grass species; no evidence of recent use or unauthorized dumping was found.

Materials received at this site were similar to those reported for the earlier landfills, i.e., domestic solid waste; waste oils and solvents; paints, paint strippers, and paint thinners; pesticide containers; and various empty cans and drums.

The mode of operation at this site was the same as at previous sites. Wastes were deposited into trenches, burned, and covered the following day.

Landfill No. 4 received an overall HARM rating score of 56, due primarily to: (1) the known disposal of small quantities of hazardous wastes, (2) the proximity of the site to potable water Well No. 5 (2,400 feet), (3) the distance to the reservation boundary (less than 100 feet) and (4) the proximity of the site to Playa Lake (less than 50 feet).

e. Site No. 5--Landfill No. 5

Landfill No. 5 (overall score of 60) began operation in 1968 and is the landfill in current use. The site is located in the southeast corner of the base and covers approximately 30 acres.

Materials received at this landfill are similar to those received at the former base landfills and include domestic solid waste; waste oils and solvents; paints, paint removers, and paint thinners; pesticide containers; and various empty cans and drums. Until late 1981, an estimated 5 to 10 drums per month of waste oils and solvents were received at the site. The drums ranged from partially to completely full. Drummed materials received at this site were generally deposited directly into the trench and crushed by a bulldozer. Only empty drums are currently received at the site.

The mode of operation at this landfill was burn and bury in trenches from 1968 to about 1972. Since 1972, the standard operation has been direct burial of the wastes in trenches. Approximately 11 covered trenches exist at the site. A twelfth trench was opened and in use at the time of the records search site visit. Trenches were generally excavated 18 to 20 feet deep with trench bottoms into the underlying caliche layer.

Landfill No. 5 received an overall HARM rating score of 60, due primarily to: (1) the known disposal of a large quantity of hazardous wastes, (2) the proximity of the site to an off-base private irrigation well (200-300 feet), and (3) the distance to the reservation boundary (200 feet).

2. Fire Department Training Areas

Four fire department training areas, covering a period from 1959 to the present, were identified. It is not known where training exercises may have been conducted prior to 1959. Each identified site is discussed below:

a. Site No. 6--Fire Department Training Area No. 1

Site No. 6 (overall score of 57), located in the northeast corner of the base, was operated from 1959 to 1968. In its present state, it appears as an approximately 100-foot-diameter, previously disturbed area with some vegetative cover. No evidence of recent use was found.

Waste oils, recovered fuels, and spent solvents were burned at this site. On some occasions the ground may have been presaturated with water prior to pouring the wastes onto the ground. Most of the materials would have been consumed in the fires; however, some minor percolation into the ground probably occurred. It is not known what quantities of these waste liquids may have percolated into the ground; however, considering that most of the flammable liquids would have been consumed in the fires, the quantity was probably small.

Site No. 6 received an overall HARM rating score of 57 due primarily to: (1) the known disposal of a moderate quantity of hazardous wastes, (2) the proximity of the site to potable water Well No. 5 (2,800 feet), and (3) the distance to the reservation boundary (400 feet).

b. Sites No. 7 and No. 8--Fire Department Training Areas No. 2 and No. 3

Sites No. 7 and No. 8 (overall scores of 42 each), located in the southeast corner of the base, were operated concurrently from 1968 to 1974. Each site appears as a surface-scarred circular area with some vegetative cover. No evidence of recent use was found at either site. It is not known why the two sites were operated concurrently.

Unused JP-4 fuel was the only liquid burned at these training sites. The ground was presaturated with water prior to pouring the JP-4 fuel onto the ground. Most of the fuel would have been consumed in the fires; however, some minor percolation into the ground probably occurred. It is not known what quantities may have percolated into the ground; however, because the ground was presaturated with water and considering that most of the fuel would have been consumed in the fires, the quantity was probably small.

Sites No. 7 and No. 8 both received overall HARM rating scores of 42. These ratings are low compared with the score of 57 assigned to the former fire department training area (Site No. 6) and are due primarily to two facts: (1) a smaller quantity of hazardous material entered the soil at Sites No. 7 and No. 8, and (2) Sites No. 7 and No. 8 are further removed from the installation boundary and surface water than Site No. 6.

c. Site No. 9--Fire Department Training Area No. 4

Site No. 9 (overall score of 66), located in the southeast corner of the base near Fire Department Training Areas No. 7 and No. 8, is the current training area and has been in use since 1974.

The training site is an unlined circular area, approximately 400 feet in diameter, which slopes slightly toward the center. A simulated aircraft sits at the center of the site. A 2,000-gallon underground tank installed in 1975 is used to store recovered JP-4 fuel for burning. The fuel is pumped from the storage tank to the simulated aircraft prior to practice burns. Runoff from the area is collected in an unlined pit adjacent to the site.

This site was reportedly used from 1961 to 1974 as a fuel truck cleaning area in which residual fuels were drained onto the ground and the fuel tanks were then cleaned at the site. This practice apparently ended about 1974. For about 1 year, from 1974 to 1975, commingled waste oils, solvents, and recovered JP-4 fuels were burned at the site. Since 1975 only recovered JP-4 fuel has been burned at this site.

Presaturation of the ground with water prior to applying commingled wastes or recovered JP-4 fuel onto the ground was practiced in conjunction with fire department training exercises; however, presaturation was not practiced prior to about 1974, when fuel trucks were cleaned at the site.

Prior to 1974, fuels that did not volatilize would have percolated into the ground. From 1974 to the present, during burn exercises, most of the commingled wastes and recovered JP-4 fuel would have been consumed in the fires; however, some minor percolation into the ground has probably occurred. It is not known what quantities of fuels and commingled wastes have percolated into the ground; however, it is estimated that during the pre-1974 practice, a moderate quantity of fuel (3,000-4,000 gallons) percolated into the ground.

During the records search team's base visit, several small pools of a liquid having a characteristic fuel odor were observed in tire ruts around the mock-up aircraft. There was no evidence or reports indicating that the site had been in recent use and it was speculated that the pools of liquid were liquid in the soil displaced by rain from a storm event of the previous day. In addition, signs of spillage were noted in the area of the underground storage tank. This spillage was assumed to have occurred during transfer of recovered JP-4 fuel into the storage tank.

This site received an overall HARM rating score of 66, due primarily to: (1) the past disposal of a moderate quantity of a hazardous material before and during the site's use as a fire training area and (2) the visual observation of fuel on the ground.

3. Other Sites

a. Site No. 10--Blown Capacitors Site

Site No. 10 (no score determined) is located in the northwest corner of the base, about 300 feet northwest of Housing Facility No. 1437.

The site is the location of a power pole that houses six capacitors. In 1978 lightning struck and caused three of the capacitors to rupture and release about 6 gallons of oil, thought to contain PCB, onto the ground. The contaminated dirt was collected in 55-gallon drums and processed through DPDO.

Site No. 10 was not rated; clean-up activities were considered to have been adequate to eliminate the potential for contamination.

b. Site No. 11--Engine Test Cell Overflow Pit and Leaching Field

Site No. 11 (overall score of 57), located in the southeast area of the base, is the overflow pit and leaching field receiving washdown wastewaters from Engine Test Cell Facility No. 5114.

An oil/water separator (and leaching field) for collection of oils was installed in 1965 along with construction of the engine test cell. Within recent years the leaching field hydraulic capacity has been reduced, possibly due to oils and solids passing through the separator. The effect has been to reduce the hydraulic capacity of the oil/water separator, resulting in hydraulic overloading of the unit. To relieve the overloading, a pit was excavated in 1982 to receive a portion of the engine test cell washwaters. The pit is approximately 6 to 8 feet across and filled with 5 to 6 feet of liquid. At the time of the records search team's base visit, the pit contained a black liquid with a hydrocarbon odor. The standing liquid in the unlined pit poses a concern for potential ground-water contamination. In addition, if the leaching field is partially clogged with oils that have passed through the separator, equal concern exists for potential ground-water contamination in the area of the leaching field.

Site No. 11 received an overall HARM rating score of 57, due primarily to: (1) the known disposal of a hazardous material, (2) the observation of contaminated liquid within the overflow pit, and (3) the proximity of the site to potable water Well No. 9 (300 feet).

c. <u>Site No. 12--Stormwater Collection Point</u>

Site No. 12 (overall score of 49), located near the southwest corner of the base, is a playa that receives stormwater runoff from the flightline areas.

The playa covers approximately 9 acres and has been receiving the stormwater runoff since the base was activated in 1943. The site has also been a disposal point for large pieces of broken concrete, apparently resulting from past apron and runway demolition.

A potential for ground-water contamination is posed by the nature of the materials suspected of having been discharged into the playa along with stormwater runoff. Due to the nature of activities along the flightline, it is likely that fuels from minor spills, oils, and similar POL materials have reached the site. In addition, washwater from the aircraft washrack (Facility No. 165) oil/water separator is discharged through the storm sewers to the playa. It is suspected that small quantities of PD-680 solvent pass through the separator and enter the playa. An analysis of this discharge completed in 1981 described a sample as being primarily water with a very thin layer of a hydrocarbon on the surface. It was noted that the hydrocarbon was similar to PD-680 solvent. The same analysis detected the presence of lead and total chromium in low concentrations (80 μg/l and 212 μg/l, respectively).

Visual observation of the site produced no evidence of contamination. The playa was dry except for a ditch leading from the major influent pipe to the low point of the playa. No sheen or odor was noted in the ditch.

The site received an overall HARM rating score of 49, due primarily to: (1) the suspected disposal of a small quantity of hazardous material and (2) the proximity of the site to potable water Well No. 6 (800 feet).

d. Site No. 13--Sanitary Sewage Lift Station Overflow

Site No. 13 (overall score of 47) is located on the golf course just north of the hospital.

In February 1983, pumps in sanitary sewage Lift Station No. 1402 malfunctioned. An estimated 100,000 to 150,000 gallons of raw sewage were bypassed to an adjacent overflow pit until the pumps were repaired approximately one week later. At that time the bypassed sewage was pumped back into the lift station.

The overflow pit, designed specifically for emergency use, is estimated to be approximately 100 feet wide, 600 feet long, and 2 to 3 feet deep. In its present state it appears as a rectangular depression covered with grass. No evidence of environmental stress was observed at the site.

The site was of concern primarily because of a water analysis completed in February 1983 that showed the sample to be ignitable at 60°C (140°F). In addition, the analyst commented that a hydrocarbon odor was noted. This evidence suggests that a POL material may have been in the sanitary sewage that was diverted into the overflow pit. It is not known what, if any, quantity might have percolated into the ground; however, it is assumed to have been small. A subsequent soil sample, collected after the liquid was pumped back into the lift station, tested negative for ignitability (greater than 60°C).

This site received an overall HARM rating score of 47, due primarily to: (1) the proximity of the site to potable water Well No. 2 (800 feet), (2) the proximity of the site to the reservation boundary (400 feet), and (3) the estimated population within 1,000 feet of the site (>100 people).

e. Site No. 14--Sludge Weathering Pit

Site No. 14 (overall score of 52), located adjacent to the east side of the POL bulk storage area, is a shallow, unlined pit, approximately 25 feet square.

This site was used in the 1960s and 1970s for the weathering of fuel tank sludges. Reportedly, AVGAS and JP-4 sludges were weathered and then taken to the landfills for final disposition. It was not known what quantities of sludge were weathered at the site nor how often; however, the quantities are considered to have been small.

Due to the concern over potential ground-water contamination from the site, a soil sample was analyzed in 1981 for lead and extractable oil and grease. The source of the lead would have been past weathering of AVGAS sludge. The test for lead was negative; however, the test for extractable oil and grease indicated 0.012 gm/kg. The positive oil and grease analysis is considered to represent confirmation that weathering of sludges did occur at this site.

No signs of stress or recent use of the site were observed during the records search team's base visit.

This site received an overall HARM rating score of 52, due primarily to: (1) the known disposal of a small quantity of hazardous material and (2) the proximity of the site to potable water Well No. 3 (1,300 feet) and an observation well located approximately 300 feet south of the weathering pit. This USGS observation well, installed in the early 1960s to monitor water levels in the High Plains Aquifer, is shown on Figure 13, page III-20.

f. Site No. 15--AGE Drainage Ditch

Site No. 15 (overall score of 59) is a ditch that originates on the flightline side of the AGE building (Facility No. 186) and runs parallel to Facilities No. 191, No. 192, and No. 193, terminating near Argentina Avenue. The ditch is reportedly the result of settled earth that followed removal of railroad tracks in the late 1960s.

The ditch receives runoff from the maintenance pad adjacent to the AGE shop. Interviewees reported that fuel or oil spills and leaks that occur on the pad are often washed into the ditch during rainfall events. It is suspected that this has been occurring for several years. Existence of contamination was verified by the records search team during the base visit. For a distance of about 50 to 75 feet, soil in the bottom of the ditch was black and had a characteristic POL odor. A possible source of some of the contamination observed was a synthetic engine oil bowser parked on the edge of the pad on the ditch side. At this precise location, an eroded path, also black and with a POL odor, led from the pad down to the ditch. During the records search team's base visit, personnel were observed pouring waste liquid into the top of the bowser. The dumping procedure appeared awkward and probably results in occasional spillage.

The site received an overall HARM rating score of 59, due primarily to: (1) the known disposal of a small quantity of hazardous wastes, (2) the observed contamination, and (3) the proximity of the site to potable water Well No. 1 (1,600 feet).

g. Site No. 16--Solvent Disposal Site

Site No. 16 (overall score of 50) is located in the northeast corner of the base between Fire Department Training Area No. 1 (Site No. 6) and Landfill No. 2 (Site No. 2).

Two empty 55-gallon drums labeled "Trichloroethylene" (TCE) were found on the ground, opened and positioned such that they would drain into a shallow surrounding pit. Each drum had rust holes in the top side, suggesting that they had been there for several years. A deteriorating black plastic liner was noted at the edge of the shallow pit. Approximately 4 to 6 inches of soil covered the rest of the liner, which had apparently been installed in the pit to prevent the volatile solvent from percolating into the ground. It is not known whether or not the drums were full at the time of disposal. Neither interviews with base personnel nor a review of base files revealed any information on this site.

The Solvent Disposal Site received an overall HARM rating score of 50, due primarily to: (1) the disposal of a small quantity of hazardous waste and (2) the proximity of the site to potable water Well No. 5 (2,900 feet).

h. Site No. 17--Entomology Rinse Area

Site No. 17 (overall score of 47) is located near the wastewater treatment lagoons, behind Building No. 2160. Building No. 2160 is a storage area for pesticides and contains a sink for the rinsing of pesticide spraying equipment and empty containers. The drain from the

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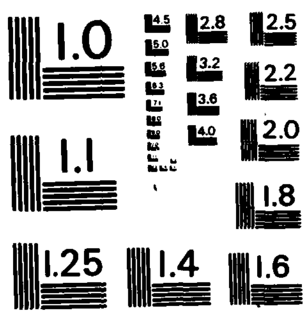

MICROCOPY RESOLUTION TEST CHART
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sink exits the rear of the building and drops into a small open pit which is about 3 feet square and 2 feet deep. The pit structure appears to be an old Parshall flume and was apparently part of the influent structures for the former wastewater treatment system (Imhoff tank). Soil and some gravel in the base of the pit prevented inspection to determine the nature and condition of the bottom. It was not known whether pesticides that drain into the pit are self-contained within the open pit or percolate into the ground, possibly through cracked concrete.

Little was discovered about the use of this site. One interviewee reported that the building and the drain have been in use at least since 1981 and that he suspects the site was used for some time prior to that.

Site No. 17 received an overall HARM rating score of 47, due primarily to: (1) a small quantity of hazardous waste (pesticide) suspected of having percolated into the ground and (2) the proximity of the site to potable water Well No. 5 (1,200 feet).

i. Site No. 18--JP-4 Fuel Spill

Site No. 18 (overall score of 48) is located on the apron southwest of Building No. 120. It is the site of a JP-4 fuel spill from an aircraft fuel tank that occurred in 1980.

The accident resulted from a broken fuel coupling. During attempts to repair the coupling, the leak intensified. Altogether, an estimated 400 gallons of fuel were lost through evaporation and spillage onto the apron. Some of the lost fuel would have entered the ground through construction joints and cracks in the apron; however, it is believed that the quantity would have been small.

The site received an overall HARM rating score of 48, due primarily to: (1) the disposal of a small quantity of hazardous material (JP-4) onto the ground, (2) the proximity of the site to potable water Well No. 7 (3,500 feet) and the reservation boundary (2,200 feet), and (3) the distance to the nearest stormwater inlet structure (550 feet).

j. Site No. 19--MOGAS Spill

Site No. 19 (overall score of 47) is located along the southwest side of Argentina Avenue, opposite the vehicle maintenance shop (Facility No. 379).

On two occasions in the early 1960s fuel trucks leaving the vehicle refueling area adjacent to the vehicle maintenance shop (Facility No. 379) turned over in a ditch on the opposite side of Argentina Avenue. In making the required turn leaving the refueling area, the tractor-trailer fuel trucks had to cross the road. Due to a poor connection between the tractor and the trailer, the trailers turned over on at least two occasions, spilling MOGAS into the ditch. It is not known what quantity of fuel was spilled; however, it is suspected to have been a moderate quantity (2,000 to 3,000 gallons). No attempts were made to recover the fuel or to excavate and replace contaminated soils. Reportedly, the fire department washed down the area in both cases.

In 1977, the construction of the gymnasium and associated pavements along Argentina Avenue changed the physical features of the site. As it currently exists, part of the ditch is apparently below pavement, while a portion exists only as a small depression along the roadside. There is no evidence that contaminated soil was detected or removed during construction of the gym and associated pavements.

The site received an overall HARM rating score of 47, due primarily to: (1) the suspected percolation of a moderate quantity of hazardous material (MOGAS) into the ground, (2) the proximity of the site to potable water Well No. 1 (600 feet), and (3) the distance to the reservation boundary (2,700 feet).

C. ENVIRONMENTAL STRESS

No evidence of significant environmental stress related to hazardous wastes or materials was noted during the site visit to Cannon AFB. Vegetative and animal species observed on the base and in particular, around the identified disposal and spill sites, appeared healthy.

V. CONCLUSIONS

A. No direct evidence was found to indicate that migration of hazardous contaminants exists within or beyond Cannon AFB boundaries. Indirect evidence of contamination was found at three sites:

- Site No. 9 (Fire Department Training Area No. 4)

  Small pools of fuel were observed in tire ruts around the mock-up aircraft.

- Site No. 11 (Engine Test Cell Overflow Pit and Leaching Field)

  The unlined overflow pit was observed to contain a liquid, black in color with a hydrocarbon odor.

- Site No. 15 (AGE Drainage Ditch)

  Bottom of ditch was observed to have a black color and a characteristic POL odor.

B. No evidence of environmental stress due to past disposal of hazardous wastes was observed at Cannon AFB.

C. Information obtained through interviews with 37 base personnel, base records, shop folders, and field observations indicates that hazardous wastes have been disposed of on Cannon AFB property in the past.

D. A low potential for contaminant migration exists at Cannon AFB, due primarily to: (1) depth to ground-water, (2) low precipitation, (3) high evapotranspiration rate, and (4) the occurrence of a very low permeability caliche layer under most of the base. Although low, the potential for migration exists at those sites where a constant, or nearly constant, hydraulic driving force exists (i.e., Site No. 9 [drainage pit adjacent to site] and Site No. 11).

E. Table 7 presents a priority listing of the rated sites and their overall scores. The following sites were designated as areas showing the most significant potential (relative to other Cannon AFB sites) for environmental concerns.

1. <u>Site No. 9--Fire Department Training Area No. 4</u>

This site has been used as a fire department training area since 1974. Prior to 1974 (1961-1974) the site was used as a fuel truck cleaning area. The area is unlined and slopes towards the center where a mock-up aircraft is located. Concern for potential contamination is generated by the nature of materials that have entered the ground during the 23 years of activity at this site--namely, waste oils, waste solvents, and JP-4 fuels.

Site No. 9 received the highest rating (66) of the Cannon AFB sites, due primarily to: (1) the past disposal of a moderate quantity of hazardous materials before and during the site's use as a fire department training area and (2) the visual observation of fuel on the ground at the time of the records search team's base visit.

2. <u>Site No. 5--Landfill No. 5</u>

This landfill has been in use since 1968. Materials received at this landfill are similar to those received at the former base landfills, and include domestic solid waste; waste oils and solvents;

Table 7
PRIORITY LISTING OF DISPOSAL AND SPILL SITES

Site No.	Site Description	Overall Score
9	Fire Department Training Area No. 4	66
5	Landfill No. 5	60
15	AGE Drainage Ditch	59
6	Fire Department Training Area No. 1	57
11	Engine Test Cell Overflow Pit and Leaching Field	57
4	Landfill No. 4	56
1	Landfill No. 1	55
3	Landfill No. 3	54
14	Sludge Weathering Pit	52
2	Landfill No. 2	50
16	Solvent Disposal Site	50
12	Stormwater Collection Point	49
18	JP-4 Fuel Spill	48
13	Sanitary Sewage Lift Station Overflow Site	47
19	MOGAS Spill	47
17	Entomology Rinse Area	47
7	Fire Department Training Area No. 2	42
8	Fire Department Training Area No. 3	42

paints, paint removers, and paint thinners; pesticide containers; and various empty cans and drums. Until late 1981, an estimated 5 to 10 drums per month of waste oils and solvents were received at the site. The drums ranged from partially to completely full. Drummed materials received at this landfill were generally deposited directly into the trench and crushed by a bulldozer. Only empty drums are currently received at the site.

Site No. 5 received a rating of 60 due primarily to: (1) the disposal of a large quantity of hazardous wastes, (2) the proximity of the site to an off-base private irrigation well (200-300 feet), and (3) the distance to the reservation boundary (200 feet).

3. Site No. 15--AGE Drainage Ditch

This site is a ditch that receives runoff from the maintenance pad adjacent to the AGE shop. Fuel or oil spills and leaks that occur on the pad are often washed by rain into the ditch. The ditch bottom has a black color and a characteristic POL odor.

This site also received a rating score of 59 and was due primarily to: (1) the disposal of hazardous wastes in the ditch, (2) the current observation of contamination in the ditch, and (3) the proximity of the site to potable water Well No. 1 (1,600 feet).

4. Site No. 6--Fire Department Training Area No. 1

Site No. 6 was operated as the fire department training area from 1959 to 1968. Waste oils, recovered fuels, and spent solvents were burned at this location. On some occasions the ground may have been presaturated with water prior to pouring the wastes onto the ground. Most of the materials would have been consumed in the fires; however, some minor percolation into the ground probably occurred. It is not known what quantities of these waste liquids may have percolated into the ground; however, considering that most of the flammable liquids would have been consumed in the fires, the quantity was probably small.

Site No. 6 received an overall HARM rating score of 57 due primarily to: (1) the known disposal of a moderate quantity of hazardous wastes, (2) the proximity of the site to potable water Well No. 5 (2,800 feet), and (3) the distance to the reservation boundary (400 feet).

5. <u>Site No. 11--Engine Test Cell Overflow Pit and Leaching Field</u>

Site No. 11 is the overflow pit and leaching field receiving washdown wastewaters from Engine Test Cell Facility No. 5114.

An oil/water separator (and leaching field) for collection of oils was installed in 1965. Within recent years the leaching field hydraulic capacity has been reduced. The effect has been to reduce the hydraulic capacity of the oil/water separator, resulting in hydraulic overloading of the unit. To relieve the overloading, a pit was excavated in 1982 to receive a portion of the engine test cell washwaters. The pit is approximately 6 to 8 feet across and filled with 5 to 6 feet of black liquid with a hydrocarbon odor. The standing liquid in the unlined pit poses a concern for potential ground-water contamination.

Site No. 11 received a rating of 57, due primarily to: (1) the known disposal of a hazardous material, (2) the presence of contaminated liquid within the overflow pit, and (3) the proximity of the site to potable water Well No. 9 (300 feet).

F. The remaining rated sites (Sites No. 1-4, 7-8, 12-14, 16-19) as well as the site that was not rated (Site No. 10--Blown Capacitors Site), are not considered to present significant concern for adverse effects on health or the environment.

VI. RECOMMENDATIONS

A. PHASE II PROGRAM

The priority for monitoring at Cannon AFB is considered low to moderate; no imminent hazard has been identified. Therefore, a limited Phase II monitoring program is suggested to confirm or rule out the presence and/or migration of hazardous contaminants.

Tables 8 and 9 present a summary of recommended monitoring sites, parameters to be measured, and the rationale for the analyses, while Figure 16 shows the sites where monitoring is recommended. Specifically, monitoring is recommended for a zone consisting of Site No. 9 (Fire Department Training Area No. 4) and Site No. 5 (Landfill No. 5). Monitoring is also recomended for Site No. 15 (AGE Drainage Ditch), and Site No. 6 (Fire Department Training Area No. 1). The approximate monitoring locations are shown in Figures 19 through 21 in Appendix J. Recommendations for Site No. 11, Engine Test Cell Overflow Pit and Leaching Field, are presented in Section VI.B., "Other Environmental Recommendations."

1. Zone Monitoring (Site No. 9 and No. 5)

A soil boring is recommended at Site No. 9. The boring should be located as shown on Figure 19 (Appendix J). The boring should be completed to approximately 50 to 60 feet or at least 5 feet below the bottom of the caliche layer. A certified geologist should be present to examine the soil profile and characteristics and to inspect for signs of fuel saturation. Soil samples should be collected and analyzed in accordance with Table 8. The number of samples collected should be at the discretion of the geologist.

Table 8
RECOMMENDED PHASE II ANALYSES

Sample Type	TOX[a] or VOC[b]	Heavy Metals	Phenols	Pesticides	COD, TOC and Oil and Grease
Monitoring Wells					
Zone Consisting of Sites No. 9 and 5--Fire Department Training Area No. 4 and Landfill No. 5, respectively	X	X	X	X	X
Soil Sampling					
Site No. 9--Fire Department Training Area No. 4	X				X
Site No. 15--AGE Drainage Ditch	X				X
Site No. 6--Fire Department Training Area No. 1	X				X

[a]TOX - Total Organic Halogens

[b]VOC - Volatile Organic Compounds

Table 9
RATIONALE FOR RECOMMENDED ANALYSES

Parameter	Rationale
Total Organic Halogens (TOX) or Volatile Organic Compounds (VOC)	Organic solvents used on-base (past and present); persistent components of fuels and other POL products, e.g., benzene and toluene.
Heavy Metals (lead, nickel chromium, cadmium, and silver)	Potential sources identified (leaded fuel, battery acid and other electrolytes, paint wastes, photographic chemicals).
Phenols	Phenolic cleaners and paint strippers used in the past.
Pesticides	Used at Cannon AFB[a].
COD, TOC, and Oil and Grease	Fuel spill indicators and indicators of non-specific contamination.

[a]Pesticide analysis should include Baygon, Chlordane, 2,4-D, Diazinon, Dursban, Endrin, Lindane, Malathion, Methoxychlor, Sevin, and Toxaphene.

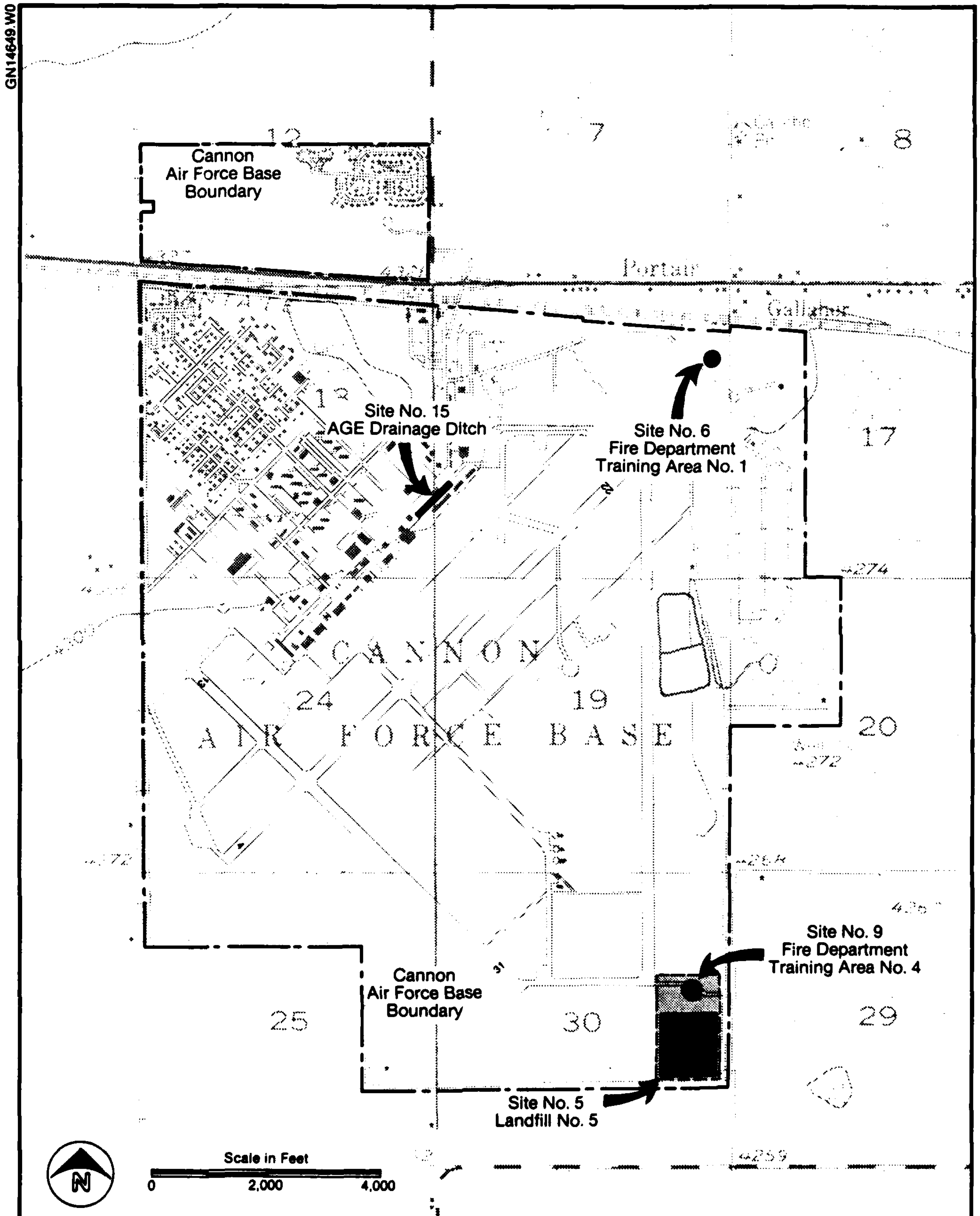

FIGURE 16.
Location Map of Sites Recommended for Limited Phase II Monitoring.

It is recommended that three monitoring wells, two downgradient and one upgradient of the monitoring zone, be installed to determine if hazardous contaminants are present in the ground water. The wells should be located as shown on Figure 19 (Appendix J). Each well should be drilled to the bottom of the High Plains Aquifer (approximately 400 feet) and screened in the ground-water zone (approximately 330 to 400 feet). Each well should be analyzed for the parameters given in Table 8 and should be sampled on two occasions, at least 30 days apart.

An alternative to installation of the downgradient wells may be to sample local private downgradient irrigation wells. A survey would be required to identify applicable wells.

2. Site No. 15 (AGE Drainage Ditch) and Site No. 6 (Fire Department Training Area No. 1)

It is recommended that one soil boring be completed at each site. The borings should be located as shown on Figure 20 and 21 (Appendix J). Each boring should be completed to a depth of approximately 50 to 60 feet or at least 5 feet below the bottom of the caliche layer. A certified geologist should be present to examine the soil profile and characteristics and to inspect for signs of fuel or oil saturation. Soil samples should be collected and analyzed in accordance with Table 8. The number of samples collected should be at the discretion of the geologist.

B. OTHER ENVIRONMENTAL RECOMMENDATIONS

Other recommendations that have resulted from the base visit and records search include the following:

1. Analyze potable water Well No. 9 for the complete

list of priority pollutants. Due to the hydraulic driving force created by standing liquid in the overflow pit at Site No. 11 (Engine Test Cell Overflow Pit and Leaching Field), the potential exists for ground-water contamination and contaminant migration. Potable water Well No. 9, located about 300 feet from the site, has a cone of influence that could possibly include the area beneath Site No. 11. To determine if potential contaminant migration exists from Site No. 11, it is recommended that Well No. 9 be analyzed for priority pollutants.

2. Monitor sewage lagoon influent and effluent at least once to determine if priority pollutants are present. Because wastewaters from industrial shops discharging to the lagoons could contain priority pollutants and because of the hydraulic driving force created by standing liquid in the unlined lagoons, a potential exists for contamination of the ground water beneath the lagoons.

3. Determine if POL materials are being discharged into the sanitary sewers leading to Lift Station No. 1402. Analyses completed at Site No. 13 (Sanitary Sewage Lift Station Overflow) suggested that a POL substance was contained in the sanitary sewage. Due to the potential explosion and fire dangers caused by POL materials in sewers, it is recommended that an investigation be made to determine if POL materials are being discharged into the sewers.

C. LAND USE RESTRICTIONS FOR IDENTIFIED SITES

It is recommended that land use restrictions at the identified disposal and spill sites at Cannon AFB be considered. The purpose of such land use restrictions would be (1) to provide for the continued protection of human health, welfare, and the environment; (2) to ensure that the migration of potential contaminants is not promoted through improper land uses; (3) to facilitate the compatible development of future USAF facilities; and (4) to allow for identification of property which may be proposed for excess or outlease.

The recommended guidelines for land use restrictions at each of the identified disposal and spill sites at Cannon AFB are presented in Table 10. A description of the land use restriction guidelines is presented in Table 11. Land use restrictions at sites recommended for Phase II monitoring should be re-evaluated upon the completion of the Phase II monitoring program and changes made where appropriate.

Table 10
RECOMMENDED GUIDELINES FOR LAND USE RESTRICTIONS

Site No.	Site Description	Recreational Use	Well Construction On or Near the Site	Housing On or Near the Site	Agricultural Use	Surface-Water Impoundments (Lagoons, Irrigation)	Disposal Operations	Construction	Excavation	Burning Operations or Ignition Sources	Material Storage	Silvicultural Use	Vehicular Traffic	Site Access
1	Landfill No. 1	X	X	X	X	X	X	X	X	--	--	--	--	--
2	Landfill No. 2	X	X	X	X	X	X	X	X	--	--	--	--	--
3	Landfill No. 3	X	X	X	X	X	X	X	X	--	--	--	--	--
4	Landfill No. 4	X	X	X	X	X	X	X	X	--	--	--	--	--
5	Landfill No. 5	X	X	X	X	X	X	X	X	--	--	--	--	--
6	Fire Dept. Training Area No. 1	X	X	X	X	X	X	X	X	X	--	--	--	--
7	Fire Dept. Training Area No. 2	X	X	X	X	X	X	X	X	X	--	--	--	--
8	Fire Dept. Training Area No. 3	X	X	X	X	X	X	X	X	X	--	--	--	--
9	Fire Dept. Training Area No. 4	X	X	X	X	X	X	X	X	X	X	--	--	--
10	Blown Capacitors Site	X	X	X	X	X	X	X	X	--	--	--	--	--
11	Engine Test Cell Overflow Pit and Leaching Field	X	X	X	X	X	X	--	--	X	--	--	--	--
12	Stormwater Collection Point	X	X	X	X	NA	X	--	--	--	X	--	--	--
13	Sanitary Sewage Lift Station Overflow	X	X	X	X	NA	X	--	--	X	X	--	--	--
14	Sludge Weathering Pit	X	X	X	X	X	X	--	--	--	--	--	--	--
15	AGE Drainage Ditch	X	X	X	X	NA	X	--	--	X	X	--	--	--
16	Solvent Disposal Site	X	X	X	X	X	X	--	--	--	--	--	--	--
17	Entomology Rinse Area	X	X	X	X	X	X	--	--	--	--	--	--	--
18	JP-4 Fuel Spill	X	X	X	X	X	X	--	--	X	--	--	--	--
19	MOGAS Spill	X	X	X	X	X	X	--	--	X	--	--	--	--

Note: NA = Not Applicable.

Table 11
DESCRIPTION OF LAND USE RESTRICTION GUIDELINES

Guideline	Description
Recreational use	Restrict the use of the site for recreational purposes.
Well construction on or near the site	Restrict the placement of any wells (except for monitoring purposes) on or within a reasonably safe distance of the site. This distance will be site-specific based on hydrogeologic conditions.
Housing on or near the site	Restrict the use of housing structures on or within a reasonably safe distance of the site.
Agricultural use	Restrict the use of the site for agricultural purposes to prevent food chain contamination.
Surface-water impoundments (lagoons, irrigation)	Restrict the use of the site for surface-water impoundments, lagoons, or irrigation. Water infiltration could provide a driving force and promote contaminant migration.
Disposal operations	Restrict the use of the site for waste disposal operations, whether above or below ground.
Construction	Restrict the construction of structures which make permanent (or semi-permanent) and exclusive use of a portion of the site's surface.
Excavation	Restrict the disturbance of the cover or subsurface materials.
Burning operations or ignition sources	Restrict unnecessary sources of ignition, due to the possible presence of flammable compounds.
Material storage	Restrict the storage of any and all liquid or solid materials on the site.
Silvicultural use	Restrict the use of the site for silvicultural uses (root structures could disturb cover or subsurface materials)
Vehicular Traffic	Restrict the passage of unnecessary vehicular traffic on the site due to the presence of explosive material(s) and/or of an unstable surface.
Site Access	Restrict access to the site to prevent unknowing or accidental direct contact with potentially hazardous substances.

VII. OFF-BASE FACILITIES

A. MELROSE BOMBING RANGE

1. Description

Melrose Bombing Range is located in Roosevelt County, New Mexico, approximately 8 miles southwest of the Village of Melrose, New Mexico, and 25 miles west of Cannon AFB. The location of Melrose Bombing Range is shown on Figure 3, page I-3. The range is 4.25 miles wide by 7.25 miles long with a run-in corridor 1 mile wide by 3 miles long on the north end of the range. The range comprises 22,140 acres of land, of which approximately 5,120 acres are contained in the impact area and are maintained for exclusive Air Force use. The remaining 17,020 acres serve as a safety zone and are out-leased to local ranchers for grazing.

The Air Force originally leased 7,771 acres of grassland in early 1952 for use as a bombing and air-to-ground gunnery range. As faster aircraft with more complex weapons systems were introduced, the requirement for larger and more sophisticated range facilities grew accordingly. From 1968 to 1972, the Melrose Bombing Range was expanded when the Air Force purchased 22,043 acres of land, including the 7,771 acres held under lease. The range consists of a composite day and night simulated special and conventional weapon delivery range and a day-only tactical range. Live ordnance have not been used at the range since approximately 1969. Ordnance currently used at the range is limited to practice bombs, inert full-scale bombs, and target practice gun ammunition. The range is used primarily by F-111D aircraft from the 27th TFW at Cannon AFB and A-7D aircraft from the 105th Tactical Fighter Group, an Air National Guard unit at Kirtland AFB, New Mexico. The range is also used occasionally by 14 other Air Force, Air Force Reserve, Air National Guard, Navy, and Marine units.

2. Environmental Setting

a. Geology and Hydrology

The Melrose Bombing Range is located within the South High Plains section of the High Plains physiographic province. The area is characterized by flat, featureless terrain with little or no relief with the exception of the escarpment and mesa occurring in the southwest corner of the range. Elevations range from approximately 4,200 ft-msl to approximately 4,600 ft-msl. Surface drainage at the range is poorly developed, which is typical of the South High Plains.

Soils at the range consist primarily of sandy loam overlying a hard, low-permeability caliche layer occurring at various depths. Soil permeabilities range from 1×10^{-4} to 3.5×10^{-3} cm/sec (moderately permeable).

Geologically, the range is underlain by approximately 200 to 400 feet of unconsolidated sediments deposited over a sandstone known as the Triassic red beds. This stratum forms the base of the aquifer, which is developed within the overlying sediments.

The range lies at the western boundary of the High Plains Aquifer developed within the Ogallala Formation. This regionally significant aquifer wedges out against the escarpment of the mesa occurring in the southwest corner of the range. The saturated thickness of the aquifer is less than 100 feet where it occurs below the range. Ground-water movement is from the southwest to the northeast across the range.

Water quality within the Ogallala at Melrose Bombing Range is typical of the High Plains Aquifer, the water being hard and somewhat high in fluoride and silica.

b. Ecology

The flora of Melrose Bombing Range are essentially the same as those found on natural lands on Cannon AFB. Dominant grasses are buffalo grass, blue grama, and side-oats grama. After burning, forbs such as horseweed, kochia weed, and soapweed yucca predominate, and are replaced later by prairie grasses. Fauna on Melrose Bombing Range are also similar to those on Cannon AFB, except that the range supports a greater variety of species due to its undeveloped nature.

The only Federally listed species which has been observed on Melrose Bombing Range is the southern bald eagle (Harrison et al., 1976). Other endangered species potentially occurring on the range are the same as those listed for Cannon AFB.

3. Findings

Facilities at the Melrose Bombing Range include a main support building, two spotting towers, a motor pool area, an EOD range, a potable water well, an emergency power plant, portable spectator stands, and a variety of simulated target areas. Investigations conducted include a helicopter overflight on May 12, 1983, a search of available pertinent records, and interviews with personnel knowledgeable about the facilities.

Potable water is supplied by an onsite water well and receives chlorination by a hypochlorinator. A septic tank/drainfield system is used for the disposal of domestic sewage. Domestic garbage and solid waste from range support activities are disposed of in an onsite landfill.

A review of available records and interviews with EOD personnel resulted in the identification of one recently activated, one recently deactivated, and six closed expended ordnance burial pits, all of which are located in one area known as the Expended Ordnance Burial Site. The locations of the EOD detonation and burning range and the Expended Ordnance Burial Site are shown on Figure 17. The Expended Ordnance Burial Site receives primarily scrap metal from practice bombs and munitions picked up during range clean-ups and residue from EOD detonation and burning operations. Range clean-ups are performed monthly, yearly, and every 5 years. Approximately 12,000 to 15,000 pounds of scrap metal is collected and disposed of at the burial site on a monthly basis. EOD activities, which include detonation and burning of any unexploded practice munitions, are conducted on a monthly basis. Twenty to thirty pounds are detonated on a routine basis. The residue from the EOD activities is collected and disposed of at the Expended Ordnance Burial Site. Each pit at the burial site is approximately 15 to 20 feet deep, 20 feet wide, and 150 feet long. With the exception of small spotting charges, it has been about 14 years since live ordnance were last used at the range; continuing disposal of actual explosive materials does not occur. However, the USAF conducted a historical survey of range records and identified two areas as potential explosives-contaminated burial areas. These areas are identified on Figure 17. One of the areas is where the closed expended ordnance burial pit (previously discussed) is located. The other area may also be an old expended ordnance burial pit which has been closed for a long period. Although the burial sites, especially the closed sites, may contain hazardous unexploded ordnance, no potential for

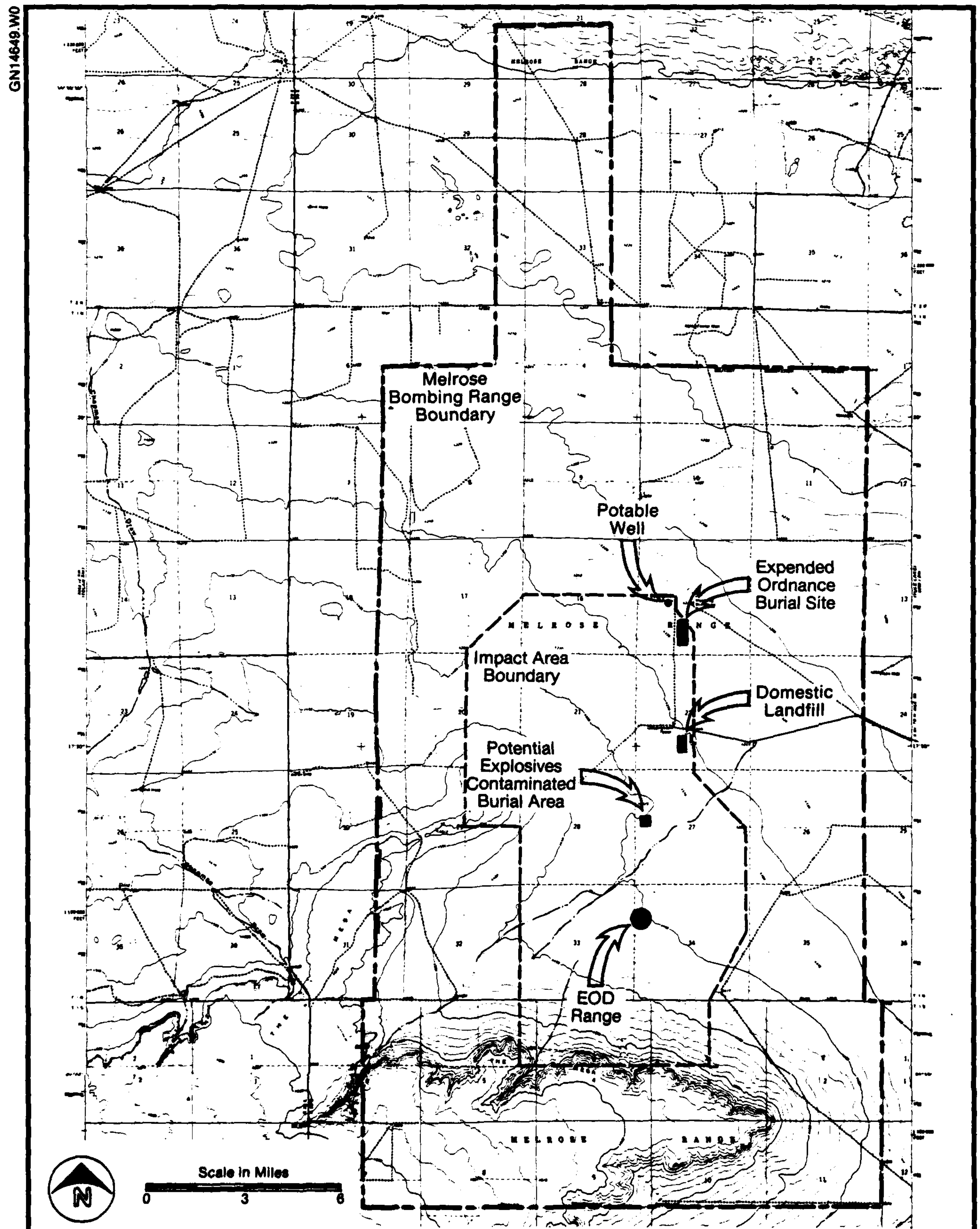

FIGURE 17.
Site Map of Melrose Bombing Range.

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contaminant migration exists; therefore, these sites were not rated.

Interviewees reported that waste oils collected in the underground waste oil tank (Facility No. 4028) at Cannon AFB were transported to Melrose Bombing Range "at least once" and used for road oiling to control dust on unimproved roads. Information regarding the quantities of waste oils used and the location of the road oiling operation could not be determined from interviews and available records. There are approximately 120 miles of unimproved roads at the range, many of which were constructed to serve as fire-breaks. Road oiling for dust control on unimproved roads at the Melrose Bombing Range was not a common disposal method for waste oils generated by Cannon AFB. Due to the insufficient quantities of waste oils which were disposed of at any one particular area at the range, the road oiling site (exact location unknown) was not rated.

No evidence of significant biological stress related to hazardous wastes or materials was noted during the helicopter overflight of Melrose Bombing Range.

4. Conclusions

The potential for hazardous contaminant migration from the identified sites at Melrose Bombing Range is extremely low because of the following factors: (1) the characteristics of the wastes (not conducive to transport), (2) the presence of a low-permeability caliche layer below the surface, (3) the great depth to groundwater, and (4) the very low net precipitation.

5. Recommendations

Phase II monitoring is not recommended at the Melrose Bombing Range.

Due to the nature of activities that have been practiced at the Melrose Bombing Range, appropriate land use restrictions should be applied in the future if use of the range is considered for modification.

B. CONCHAS LAKE RECREATION ANNEX

1. Description

Another off-base installation included in the records search was the Conchas Lake Recreation Annex. The location of the Conchas Lake Recreation Annex is shown on Figure 3, page I-3. Investigations conducted include a search of available pertinent records and interviews with personnel knowledgeable about the annex.

The Conchas Lake Recreation Annex, leased by the Air Force from the Army Corps of Engineers, is located about 80 air miles northwest of Cannon AFB on the Conchas Lake Reservoir, an impoundment of the Canadian and Conchas Rivers. The recreational facilities are located on approximately 27 acres of land and include 18 trailers, picnic shelters, and a bath house. Potable water is obtained by water main from the Conchas Lake State Park. Domestic sewage is pumped to a sewage lagoon located in and operated by the Conchas Lake State Park. All domestic garbage is collected and transported offsite to a private landfill located in the vicinity. The recreation annex has been in operation since the 1960s; however, a major expansion of the facilities occurred in 1980. Other facilities of interest include a 1,000-gallon aboveground propane storage tank and a 300-gallon aboveground MOGAS storage tank. The records search revealed no evidence of the use or disposal of any hazardous materials at the recreation annex.

2. Conclusions

The records search did not identify any past disposal or spill sites at the Conchas Lake Recreation Annex.

3. Recommendations

Since there were no past disposal or spill sites identified, Phase II monitoring is not recommended at the Conchas Lake Recreation Annex.

GLOSSARY OF TERMS

ALLUVIUM - A general term for clay, silt, sand, gravel, or similar unconsolidated detrital material deposited during comparatively recent geologic time by a stream or other body of running water as a sorted or semisorted sediment in the bed of the stream or on its flood plain or delta.

AQUIFER - A geologic formation, or group of formations, that contains sufficient saturated permeable material to conduct ground water to yield economically significant quantities of ground water to wells and springs.

BOWSER - A small mobile tank used to recover and transport POL products.

CALICHE - A term applied broadly in the Southwest U.S. (especially Arizona) to an opaque, reddish-brown to buff or white calcareous material of secondary accumulation (in place), commonly found in layers on, near, or within the surface of stony soils of arid and subhumid climates. It is composed largely of crusts or succession of scrust of soluble calcium salts in addition to impurities such as gravel, sand, silt, and clay.

CONFINING STRATA - A strata of impermeable or distinctly less permeable material stratigraphically adjacent to one or more aquifers.

CONTAMINANT - As defined by section 104(a)(2) of CERCLA, shall include, but not be limited to, any element, substance, compound, or mixture, including disease causing agents, which after release into the environment and upon exposure, ingestion, inhalation, or assimilation into any organism, either directly from the environment or indirectly by ingestion through food chains, will or may reasonably be anticipated to cause death, disease, behavioral abnormalities, cancer, genetic mutation, physiological malfunctions (including malfunctions in reproduction) or physical deformation, in such organisms or their offspring.

DOWNGRADIENT - A direction that is hydraulically down slope. The downgradient direction can be determined through a potentiometric survey or through the evaluation of existing water level elevations referenced to a common datum (mean sea level).

EP TOXICITY - A laboratory test designed to identify a solid waste as hazardous. A liquid extract from the solid waste is analyzed for selected metals and pesticides. If one or more of the parameters tested for is present in concentration greater than a maximum value then the solid waste is considered a hazardous waste in accordance with RCRA definition.

EVAPOTRANSPIRATION - Evaporation from the ground surface and transpiration through vegetation.

GROUND WATER - All subsurface water, especially that part that is in the zone of saturation.

HAZARDOUS WASTE (expanded version of the RCRA definition) - A solid waste which because of its quantity, concentration, or physical, chemical or infectious characteristics may -

(A) cause, or significantly contribute to an increase in mortality or an increase in serious irreversible or incapacitating reversible, illness; or

(B) pose a substantial present or potential hazard to human health or the environment when improperly treated, stored, transported or disposed of, or otherwise managed.

LEACHING - The separation or dissolving out of soluble constituents from a rock or ore body by percolation of water.

LOAM - A rich, permeable soil composed of a friable mixture of relatively equal and moderate proportions of clay, silt, and sand particles, and usually containing organic matter (humus) with a minor amount of gravelly material.

MIGRATION (Contaminant) - The movement of contaminants through pathways (ground water, surface water, soil, and air).

NET PRECIPITATION - Mean annual precipitation minus mean annual evapotranspiration. Evapotranspiration is sometimes estimated by pan evaporation measurements.

PD-680 (Type I and Type II) - A military specification for petroleum distillate used as a safety cleaning solvent. The primary difference between PD-680 Type I and Type II is the flash point of the material. The flash points are 100°F and 140°F for PD-680 Types I and II, respectively. Currently, only Type II is authorized for use at Air Force installations.

PERMEABILITY - The capacity of a porous rock, sediment, or soil for transmitting a fluid without impairment of the structure of the medium; it is a measure of the relative ease of fluid flow under unequal pressure.

PLAYA - A Spanish term used in the Southwest U.S. for a dried-up, vegetation-free, flat-floored area composed of thin, evenly stratified sheets of fine clay, silt, or sand,

and representing the bottom (lowermost or central) part of a shallow completely closed or undrained, desert lake basin in which water accumulates (as after a rain) and is quickly evaporated, usually leaving deposits of soluble salts. It may be hard or soft, and smooth or rough. The term is also applied to the basin containing an expanse of playa.

POTENTIOMETRIC SURFACE - An imaginary surface that represents the static head of ground water and is defined by the level to which water will rise in a cased well.

SOIL HORIZONS -

(A) A-Horizon - The uppermost mineral horizon of a soil; zone of leaching.

(B) B-Horizon - Occurs below the A-Horizon; the mineral horizon of a soil or the zone of accumulation.

(C) C-Horizon - Occurs below the B-Horizon; a mineral horizon of a soil consisting of unconsolidated rock material that is transitional in nature between the parent material below and the more developed horizons above.

SOLUM - Upper part of a soil profile, in which soil-forming processes occur; A and B horizons.

SPOTTING CHARGE - A small explosive charge, the size of a shotgun shell, which is contained in training ordnance to score the impact of training ordnance.

STRATA - Plural of stratum.

STRATUM - A single and distinct layer, of homogeneous or gradational sedimentary material (consolidated rock or unconsolidated earth) of any thickness, visually separable from other layers above and below by a discrete change in the character of the material deposited or by a sharp physical break in deposition, or by both.

UNSATURATED ZONE (Vadose Zone or Zone of Aeration) - A subsurface zone containing water under pressure less than that of the atmosphere, including water held by capillarity; and containing air or gases generally under atmospheric pressure. This zone is limited above by the land surface and below by the surface of the zone of saturation.

UPGRADIENT - A direction that is hydraulically up slope. The upgradient direction can be determined through a potentiometric survey or through the evaluation of existing water level elevations referenced to a common datum (mean sea level).

WATER TABLE - The upper limit of the portion of the ground completely saturated with water.

LIST OF ACRONYMS, ABBREVIATIONS, AND SYMBOLS USED IN THE TEXT

AFB	Air Force Base
AFESC	Air Force Engineering and Services Center
AFFF	Aqueous Film-Forming Foam
AFRES	Air Force Reserve
AG	Aboveground
AGE	Aerospace Ground Equipment
AVGAS	Aviation Gasoline
Bldg.	Building
bls	Below Land Surface
BOD_5	Biochemical Oxygen Demand (5-day)
BX	Base Exchange
°C	Degrees Celsius (Centigrade)
CE	Civil Engineering
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act (Superfund)
cm/sec	Centimeters per Second
COD	Chemical Oxygen Demand
DEQPPM	Defense Environmental Quality Program Policy Memorandum
DoD	Department of Defense
DPDO	Defense Property Disposal Office
EID	Environmental Improvement Division (New Mexico)
EOD	Explosive Ordnance Disposal
EPA	Environmental Protection Agency
°F	Degrees Fahrenheit
ft/min	Feet per Minute
gal/yr	Gallons per Year
gm/kg	Grams per Kilogram
gpd	Gallons per Day
gpm	Gallons per Minute
HARM	Hazard Assessment Rating Methodology
IRP	Installation Restoration Program
JP	Jet Petroleum
lb	Pounds

lb/yr	Pounds per Year
MAJCOM	Major Command
mg/l	Milligrams per Liter
mgd	Million Gallons per Day
mo.	Month
MOGAS	Motor Gasoline
mph	Miles per Hour
msl	Mean Sea Level
NDI	Non-Destructive Inspection
No.	Number
NPDES	National Pollutant Discharge Elimination System
OEHL	Occupational and Environmental Health Laboratory
PCB	Polychlorinated Biphenyls
POL	Petroleum, Oil, and Lubricants
ppm	Parts per Million
RCRA	Resource Conservation and Recovery Act
SCS	Soil Conservation Service
TAC	Tactical Air Command
TOC	Total Organic Carbon
TOX	Total Organic Halogen
UG	Underground
USAF	United States Air Force
USDA	United Stated Department of Agriculture
VOC	Volatile Organic Compound
μg/l	Micrograms per Liter

REFERENCES

1. Ash, Sidney R. Ground-Water Conditions in Northern Lea County, New Mexico. Hydrologic Investigations HA-62, U.S. Geological Survey, 1963.

2. Brotzman, R. L. and D. L. Hughes. Formal environmental assessment, Melrose Bombing and Gunnery Range, Cannon Air Force Base, New Mexico, 1976.

3. Cannon Air Force Base Telephone Directory, New Mexico, April 1982.

4. Cannon Air Force Base, Base Fact Sheets, Public Affairs Office, 1982.

5. Cronin, J. G. Ground Water in the Ogallala Formation in the Southern High Plains of Texas and New Mexico. Hydrologic Investigations Atlas HA-330, U.S. Geological Survey, 1969.

6. Environmental Sampling Data Laboratory Results for Potable Water Wells at Cannon AFB, New Mexico, 1981 and 1982.

7. Part A, EPA Hazardous Waste Permit Application, Cannon AFB, New Mexico, 1982.

8. EPA RCRA Compliance Inspection Report for Cannon AFB, New Mexico, July 1982.

9. Evaluation of Sanitary Landfill, Cannon AFB, New Mexico, June 1975.

10. Files from the Office of Bioenvironmental Engineering, USAF Hospital, Cannon AFB, New Mexico.

11. Files from the Office of the 27th Civil Engineering Squadron, Cannon AFB, New Mexico.

12. Fish and Wildlife/Outdoor Recreation Plans and Cooperative Agreements, Cannon AFB, New Mexico, April 1980.

13. Formal Environmental Assessment Melrose Bombing and Gunnery Range, Cannon AFB, New Mexico, December 1976.

14. Harrison, M. J. An evaluation of the bird/aircraft strike hazard at Cannon AFB, New Mexico. AFCEC/EV TM-76-1, 1976.

15. Howard, J. W. Reconnaissance of Ground-Water Conditions in Curry County, New Mexico. State of New Mexico, State Engineer Office, Technical Report No. 1, December, 1954.

16. Hubbard, J. P., M. C. Conway, H. Campbell, G. Schmitt, and M. D. Hatch. Handbook of species endangered in New Mexico. New Mexico Department Game and Fish, 1979.

17. Inspection of Tanks Containing Hazardous Liquids, Cannon AFB, New Mexico, August 1979.

18. Isaacs, W. Personal communication. New Mexico State Heritage Program, Department Natural Resources, 1983.

19. Krothe, N. C., Oliver, J. W., and Weeks, J. B. Dissolved Solids and Sodium in Water from the High Plains Aquifer in Parts of Colorado, Kansas, Nebraska, New Mexico, Oklahoma, South Dakota, Texas, and Wyoming. Hydrologic Investigations Atlas HA-658, U.S. Geological Survey, 1982.

20. Luckey, R. R., Gutentag, E. D., and Weeks, J. B. Water-Level and Saturated-Thickness Changes, Predevelopment to 1980, in the High Plains Aquifer in Parts of Colorado, Kansas, Nebraska, New Mexico, Oklahoma, South Dakota, Texas, and Wyoming. Hydrologic Investigation Atlas HA-652, U.S. Geologic Survey, 1981.

21. Morrison, B. Personal communication. New Mexico Department Game and Fish, 1983.

22. New Mexico Water Quality Control Commission, Santa Fe, New Mexico. Southern High Plains Water Quality Management Plan, January, 1976.

23. New Mexico Welcomes Cannon Air Force Base, Cannon AFB, New Mexico, 1982.

24. Proposed Draft Environmental Impact Statement, Real Estate Acquisition for Expansion of the Melrose Air Force Range, Curry and Roosevelt Counties, New Mexico, September 1980.

25. Specification for Removal of Fuel Waste, Cannon AFB, New Mexico, May 1978.

26. Tab A-1, Environmental Narrative, Cannon AFB, Clovis, New Mexico, December 1975.

27. Land Management Plan, Cannon AFB, New Mexico, April 1979.

28. Sanitary Landfill - Design, Construction, and Operation, Cannon AFB, New Mexico, December 1976.

29. 27th Tactical Fighter Wing--Hazardous Waste Management Plan, Cannon AFB, New Mexico, December 1982.

30. 27th Tactical Fighter Wing--Oil and Hazardous Substance Pollution Contingency Plan, Cannon AFB, New Mexico, January 1983.

31. U.S. Air Force Pest Management Program Review, Cannon AFB, New Mexico, February 1983.

32. USAF Real Property Inventory Detail List for Cannon AFB, New Mexico as of September 23, 1982.

33. U.S. Department of Agriculture, New Mexico Agricultural Experiment Station. Soil Survey, Curry County, New Mexico. Series 1953, No. 4, September 1958.

34. U.S. Department of Agriculture, New Mexico Agricultural Experiment Station. Soil Survey, Roosevelt County, New Mexico. March 1967.

35. Water Pollution Control Utility Operating Log, Cannon AFB, New Mexico, December 1981 through December 1982.

36. Water Utility Operating Logs, Cannon AFB, New Mexico, December 1981 through December 1982.

37. Weeks, J. B. and Gutentag, E. D. Bedrock Geology, Altitude of Base, and 1980 Saturated Thickness of the High Plains Aquifer in Parts of Colorado, Kansas, Nebraska, New Mexico, Oklahoma, South Dakota, Texas, and Wyoming. Hydrologic Investigations Atlas HA-648, U.S. Geological Survey, 1981.

38. Wildlife Management Plan for Melrose Range, New Mexico, Category I, Plan Period May 1978 to May 1983, Cannon AFB, New Mexico, 1978.

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B.S., Chemical Engineering, University of Florida, 1971

Experience

Mr. Moccia joined CH2M HILL in 1971 and is currently the Manager of the Chemical Processes Department. He is responsible for projects involving water treatment in the power industry, energy production, and industrial in-plant reuse/recycle processes. Since joining the firm, Mr. Moccia has participated in a wide variety of projects, including facility evaluations, pilot studies, and conceptual and engineering design for municipal and industrial wastewater treatment facilities.

Examples of Mr. Moccia's project-related experience include the following:

- Project management for design of three poultry process wastewater treatment facilities for Perdue, Inc.
- Project management for design of a biological-chemical wastewater treatment system for a tank car cleaning and maintenance facility for General American Transportation Corporation in Waycross, Georgia.
- Preliminary engineering for a 3.0-mgd reverse-osmosis water treatment plant for the Englewood Water District, Englewood, Florida.
- Process responsibilities for design of a 9.5-mgd activated sludge treatment plant, including sludge thickening and dewatering, for the City of Alexander City, Alabama.
- Preliminary design for a sludge drying and pelletizing facility for the City of Naples, Florida.

Professional Engineer Registration

Florida, Georgia, North Carolina

Membership in Organizations

Florida Engineering Society
Florida Pollution Control Association
National Society of Professional Engineers
Water Pollution Control Federation
Tau Beta Pi

GREGORY T. MCINTYRE
Environmental Engineer

Education

M.S., Environmental and Water Resources Engineering, Vanderbilt University, 1981
B.S., Environmental Engineering, University of Florida, 1980

Experience

Mr. McIntyre is a project engineer in CH2M HILL's Industrial Processes Division, the Department of Solid and Hazardous Waste. His responsibilities involve projects dealing with hazardous waste management, industrial waste treatment processes, and laboratory and pilot plant treatability studies.

Mr. McIntyre participated in the wastewater characterization, laboratory bench-scale treatability study, evaluation of existing pretreatment facilities, and conceptual design for the equalization and aerobic biological treatment of industrial wastewater for Hercules, Inc. (6/82)

Mr. McIntyre has participated in hazardous materials disposal site records searches for 5 U.S. Air Force installations throughout the United States. The purpose of the records searches is to assess the potential for hazardous contaminant migration from past disposal practices and to recommend follow-up actions. (12/82)

Mr. McIntyre participated in the physical, chemical, and biological monitoring study of the effluent discharge mixing zone and the evaluation of the wastewater treatment system performance for Air Products and Chemicals, Inc., Escambia Plant. (6/82)

Mr. McIntyre participated in the compilation and evaluation of existing ground-water data for Phase I of the Biscayne Aquifer/Dade County Superfund hazardous waste study. (6/82)

Before joining CH2M HILL in September 1981, Mr. McIntyre worked as a research assistant in graduate school and one of his activities included researching the removal of heavy metals, including copper, zinc and trivalent chromium, using a large-scale adsorbing colloid foam flotation pilot plant.

Professional Registration

Engineer-In-Training, Florida

GREGORY T. MCINTYRE

Membership in Organizations

American Society of Civil Engineers
American Water Works Association
Water Pollution Control Federation
Florida Pollution Control Federation
Tau Beta Pi

Publications

"Inexpensive Heavy Metal Removal By Foam Flotation." (Coauthors E.L. Thackston, J.J. Rodriguez, and D. J. Wilson). Proceedings of the 35th Annual Purdue Industrial Waste Conference, May 1981. Proceedings of the International Conference on Heavy Metals in the Environment, Amsterdam, September 1981. Proceedings of the 2nd Mediterranean Congress of Chemical Engineering, Barcelona, Spain, October 1981.

"Copper Removal by an Adsorbing Colliod Foam Flotation Pilot Plant." (Coauthors E. L. Thackston, J.J. Rodriguez, and D.J. Wilson). Separation Science and Technology, 17(2), 1982.

"Experimental Verification of the Mathematical Model of a Continuous Flow Flotation Column." (Coauthors J. E. Kiefer, J.J. Rodriguez, and D. J. Wilson). Separation Science and Technology, 17(3), 1982.

"Pilot Plant Studies of Copper, Zinc, and Trivalent Chromium Removal By Adsorbing Colloid Foam Flotation." (Coauthors E.L. Thackston, J.J. Rodriguez, and D. J. Wilson). Tennessee Water Resources Research Center, Research Report No. 88, August 1981.

"Pilot Plant Study of Copper, Zinc, and Trivalent Chromium Removal by Adsorbing Colloid Foam Flotation." M.S. Thesis, Vanderbilt University, 1981.

■ GARY E. EICHLER
Hydrogeologist

Education

M.S., Engineering Geology, University of Florida, 1974
B.S., Construction and Geology, Utica College of Syracuse University, 1972

Experience

Mr. Eichler has been responsible for ground-water projects for both water supply and effluent disposal. Studies have included site selection, well design, construction services, monitoring and testing programs, determination of aquifer characteristics, and well field design. In addition, Mr. Eichler has conducted numerous studies to determine pollution potential of toxic and hazardous wastes. Types of projects for which Mr. Eicher has been directly responsble for include:

- Exploration drilling, testing, and design of well fields for potable water supply with an installed capacity of over 65 mgd.
- Determination of pollutant travel time and direction of movement at hazardous waste disposal sites.
- Geophysical logging and testing programs for deep disposal wells for both municipal and hazardous waste.
- Aquifer modeling studies completed to predict effects of future ground-water withdrawal.
- Determination of saltwater intrusion potential and design of associated monitoring programs.

Prior to joining CH2M HILL in 1976, Mr. Eichler was an engineering geologist with Environmental Science and Engineering, Inc., of Gainesville, Florida. Responsibilities there included project management, soils investigations, siting studies, ground-water and surface-water reports, and Federal and state environmental impact studies. He has professional capabilities in the following areas.

- Hydrogeology. Water supply well location, aquifer testing, well field layout, injection well testing and monitoring program design, and well construction inspection.
- Water resources inventory. Potentiometric mapping, water yield, and availability determinations.
- Site investigations. Determination of subsurface conditions, primarily in soil media. Determination of stratigraphic correlation and associated physical properties for engineering design.
- Environmental permitting. Federal, state, regional, and local permit studies associated with industrial and mining projects.

GARY E. EICHLER

- Clay mineralogy. Clay mineral reactions primarily associated with lime stabilization for highways and other engineering projects. Participated in a Brazilian highway project and developed laboratory analysis for lime-soil reactions.
- Engineering geology. Geologic exploration, soil property determinations for engineering design, and water and earth materials interactions associated with construction.
- Geophysics. Well logging and interpretation.

Mr. Eichler directed the laboratory analysis of tropical soils to determine engineering properties and reaction potential with lime additives for a Brazilian highway project. He also assisted in the preparation and presentation of a seminar on lime stabilization sponsored by the National Lime Association.

Membership in Organizations

American Institute of Professional Geologists
American Water Resources Association
Association of Engineering Geologists
Geological Society of America
Southeastern Geological Society
National Water Well Association

Publications

Engineering Properties and Lime Stabilization of Tropically Weathered Soils. M.S. thesis, Department of Geology, University of Florida. August 1974.

Certifications

Certified Professional Geologist
Certificate No. 4544

BRIAN H. WINCHESTER
Department Manager, Environmental Sciences

Education

B.S., Wildlife Ecology, University of Florida, 1973

Experience

Mr. Winchester has broad experience in study design and implementation of field sampling programs, data interpretation, impact assessment and prediction, impact mitigation and remedial method development, report preparation and review, and expert consultation at client/agency hearings. He has successfully prepared numerous Environmental Impact Statements (EIS's), Developments of Regional Impact (DRI's), and environmental assessments for a variety of industries, utilities, and public agencies.

- EIS Studies—Designed and directed terrestrial and wetland biology studies for alternative Trident Submarine Base sites in Florida, Georgia, South Carolina, Virginia, and Rhode Island. Conducted biota inventories and assessed impacts of maintenance dredging along the 300-mile Gulf Intracoastal Waterway, Louisiana. Mapped biotic communities and assessed impacts of watercourse channelization on the 9-square-mile California Lake Watershed, Florida.

- DRI Studies—Managed or assisted in preparing five phosphate mine DRI's in central Florida. Helped develop mining and reclamation plans and provided technical input at client/agency hearings. Also provided biological baseline and impact assessment data for beneficiation plant sitings. Conducted biotic community inventories, delineated wetlands, and prepared DRI's for three proposed residential developments in central and southern Florida.

- Wetlands Studies—Assessed capacity of a 450-acre swamp in northeastern Florida to assimilate secondarily treated sewage. Investigated feasibility of enhancing a 30,000-acre marsh in northern Florida and wet prairie wetlands in southern Mississippi with municipal wastewater. Assessed impacts of water-table drawdown on Florida wetland vegetation in Palm Beach and Pasco Counties. Developed cost-effective, time-effective methodology for estimating the ecological value of freshwater wetlands and applied the technique to over 800 wetlands in central peninsular Florida; prepared wetland maps for Pasco, Pinellas, Hillsborough, Manatee, and Collier Counties; and assessed potential dredge and fill impacts on numerous wetlands.

- Industry Studies—Managed two 2-year biological monitoring studies assessing potential impacts of industrial effluents in upper Escambia Bay, Florida. Conducted baseline terrestrial and estuarine aquatic quarterly sampling for a proposed clean fuels facility in Jacksonville, Florida. Assessed impacts of oil and gas industry development in Tampa Bay area. Predicted SO_2 and NO_X air emission impacts on vegetation for a proposed caprolactam facility in southern Alabama.

BRIAN H. WINCHESTER

- Hazardous Waste Studies—Assessed ecological impacts associated with hazardous substances and their disposal at 13 USAF installations located throughout the U.S.

- Power Plant Studies—Studied aquatic biota entrained at a Miami generating station. Assessed impacts of blowdown on plant communities surrounding two Florida generating stations. Assessed alternative transmission line ROW's in Alachua County. Assisted in delineation of biotic communities for a generating station expansion in Crystal River, Florida. Prepared environmental assessments for siting power plants in western and northeastern Washington.

- Transportation/Corridor Studies—Evaluated biological impacts associated with alternative routings of major new highways in Pinellas and Duval Counties, Florida. Assessed environmental impacts of upgrading a telephone communications corridor extending from Windermere to Tampa. Prepared an ecological assessment for a proposed interstate highway interchange in Flagler County.

- Rare and Endangered Biota Research—Managed research on the ecology and management of a recently rediscovered endangered mammal. Conducted numerous endangered biota inventories.

Membership in Organizations

Society of Wetland Scientists
Ecological Society of America
City of Gainesville Hazardous Materials and Water Quality Committees

Publications

Mr. Winchester has authored several technical papers on wetland ecology, rare and endangered species management, and other topics. Representative papers include the following:

"Assessing Ecological Value of Central Florida Wetlands: A Case Study." *Proceedings of the Eighth Annual Conference on the Restoration and Creation of Wetlands* pages 25-38. 1981.

"Valuation of Coastal Plain Wetlands in the Southeastern United States." *Symposium on Progress in Wetlands Utilization and Management* (in press). 1981.

"Ecology and Management of the Colonial Pocket Gopher: A Progress Report," (with R. S. DeLotelle, J. R. Newman, and J. T. McClave). *Proceedings of the Rare and Endangered Wildlife Symposium*, Athens, Georgia. pp. 173-184. 1978.

"The Ecological Effects of Arsenic Emitted From Non-Ferrous Smelters," (with F. E. Benenati and T. P. King). U.S. EPA, EPA 560/6-77-011. 1976.

Appendix B
OUTSIDE AGENCY CONTACT LIST

1. U.S.D.A. Soil Conservation Service
   Albuquerque, New Mexico
   Mr. George Anderson
   505/766-3277

2. U.S.D.A. Soil Conservation Service
   Clovis, New Mexico
   Mr. Richard Shaw
   505/763-7412

3. U.S. Department of the Interior
   Bureau of Land Management
   Roswell, New Mexico
   Mr. Mike Howard
   505/622-7670

4. U.S. Environmental Protection Agency
   Albuquerque, New Mexico
   Mr. Rick Meyerhein
   505/841-2555

5. U.S. Environmental Protection Agency
   Dallas, Texas
   Ms. Sheryl Fought
   214/767-2850

6. U.S. Environmental Protection Agency
   Dallas, Texas
   Mr. Scott Nicholson
   214/767-2850

7. U.S. Fish and Wildlife Service
   Albuquerque, New Mexico
   Mr. Gary Halvorson
   505/766-3972

8. U.S. Geological Survey
   Las Cruces Office
   Las Cruces, New Mexico
   Mr. Brandon Orr
   505/646-1335

9. U.S. Geological Survey
   Water Resources Division
   Albuquerque, New Mexico
   Mr. Don Hart
   505/766-2810

10. New Mexico State University
    Water Resources Research Institute
    Las Cruces, New Mexico
    Dr. Peter Herman
    505/646-4337

11. State of New Mexico
    Bureau of Mines and Mineral Resources
    Socorro, New Mexico
    Mr. W. J. Stone
    505/835-5420

12. State of New Mexico
    Department of Game and Fish
    Santa Fe, New Mexico
    Mr. Bruce Morrison
    Mr. John Hubbard
    505/827-7885

13. State of New Mexico
    Department of Natural Resources
    Interstate Streams Commission
    Santa Fe, New Mexico
    Mr. Phil Mutz
    505/827-6160

14. State of New Mexico
    Department of Natural Resources
    Soil and Water Conservation
    Santa Fe, New Mexico
    Mr. Walt Hisenberg
    505/827-7867

15. State of New Mexico
    Department of Natural Resources
    State Heritage Program
    Santa Fe, New Mexico
    Mr. Bill Isaacs
    505/827-7867

16. State of New Mexico
    Environmental Improvement Division
    Clovis Field Office
    Clovis, New Mexico
    Mr. David Tanner
    Mr. Nile Fellows
    505/762-3728

17. State of New Mexico
    Environmental Improvement Division
    Hazardous Waste Unit
    Santa Fe, New Mexico
    Mr. Jack Ellvinger
    505/984-0020

18. State of New Mexico
Environmental Improvement Division
Santa Fe, New Mexico
Mr. Randy Hicks
505/984-0020

19. State of New Mexico
Environmental Improvement Division
Solid Waste Unit
Santa Fe, New Mexico
Mr. Ray Sisneros
505/984-0020

20. State of New Mexico
Environmental Improvement Division
Water Pollution Control
Santa Fe, New Mexico
Mr. Tony Dry Polcher
505/984-0020

21. State of New Mexico
State Engineer, Deming Office
Deming, New Mexico
Mr. Lewis Putnam
505/546-2851

22. State of New Mexico
State Engineer, Roswell Office
Roswell, New Mexico
Mr. Delbert Nelson
505/622-6521

23. Muleshoe National Wildlife Refuge
Muleshoe, Texas
Mr. Al Jones
806/946-3341

Appendix C
CANNON AFB RECORDS SEARCH INTERVIEW LIST

Interviewee	Area of Knowledge	Years at Installation
1	Heavy Equipment Operation	31
2	Defense Property Disposal Office	9
3	Civil Engineering	29
4	Civil Engineering	19
5	Civil Engineering	1
6	Transportation/Supply	32
7	Base Supply	24
8	Electric Shop	22
9	Exterior Electric	6
10	Morale, Welfare, and Recreation	22
11	Water and Wastewater	20
12	Heavy Equipment Operation	10
13	Heavy Equipment Operation	11
14	Explosive Ordnance Disposal	2
15	Melrose Bombing Range	10
16	Fire Department	23
17	Corrosion Control	11
18	Defense Property Disposal Office	4
19	Bioenvironmental Engineering	1
20	Environmental Coordination	3
21	Fuels Distribution	7
22	Equipment Maintenance Squadron	6
23	Equipment Maintenance Squadron	7
24	Equipment Maintenance Squadron	2
25	Transportation	25
26	Entomology	2
27	Environmental Planning	1
28	Component Repair Squadron	1
29	Component Repair Squadron	8
30	Component Repair Squadron	2
31	Component Repair Squadron	1
32	Component Repair Squadron	2
33	Equipment Maintenance Squadron	3
34	Equipment Maintenance Squadron	2
35	Equipment Maintenance Squadron	2
36	Equipment Maintenance Squadron	1
37	Transportation	1

Appendix D
INSTALLATION HISTORY

The information regarding the history of Cannon AFB was obtained from the Tab A-1 Environmental Narrative, 1975 (Reference No. 26) and Air Force Fact Sheets, 1982 (Reference No. 3).

The history of Cannon AFB began in 1929, when Portair Field was established on the site. Portair was a civilian passenger terminal for early commercial transcontinental flights. Passengers flew in Ford Trimotor "Tin Goose" by day, then transferred to Pullman trains for night travel. In the 1930s Portair was renamed Clovis Municipal Airport.

In 1942, after the United States had entered World War II, the Army Air Corps took control of the civilian airfield. It was known then as Clovis Army Air Base. The first military unit to use the facility was a glider detachment, arriving in June 1942. Construction of the base began in August 1942.

The 16th Bombardment Operational Wing arrived in February 1943. The 16th was a training unit for B-24, B-17, and then B-29 heavy bombers. In early 1945 the base was renamed Clovis Army Air Field. Flying, bombing, and gunnery classes continued through the end of World War II. By mid-1946, however, the airfield was placed on a reduced operational status and flying activities decreased. The installation was deactivated in May 1947.

The base was reassigned to the Tactical Air Command in July 1951. The first unit, the 140th Fighter-Bomber Wing, arrived in October of that year. The 140th was composed of Air National Guard elements from Colorado, Utah, and Wyoming. It flew the P-51 "Mustang" conventional fighter. The 140th formally reactivated the airfield in November 1951, as Clovis Air Force Base.

At the end of 1952 the 140th returned to Air National Guard control. The 50th Fighter-Bomber Wing, another fighter unit, was activated at the base in January 1953 and began flying the F-86 "Sabre" jet fighter. It served at the base until it was transferred overseas in August of that year.

Clovis Air Force Base's next F-86 unit was the 388th Fighter-Bomber Wing, activated in November 1953. The 388th was sent overseas in November 1954. It was relieved at the base by the 312th Fighter-Bomber Group.

A second fighter-bomber group, the 474th, transferred to Clovis Air Force Base from Taegu, Korea, in December 1954. The base became a major training installation for "Sabre" pilots.

Several changes occurred at Clovis Air Force Base in 1957. In June the base was renamed Cannon Air Force Base in honor of the late General John K. Cannon, a former commander of the Tactical Air Command. One week earlier the base had become a permanent installation.

In October of the same year, the 312th and 474th Fighter Bomber Groups were redesignated tactical fighter wings. The 832nd Air Division was activated to oversee their activities.

The first F-100 "Super Sabre" arrived at Cannon late in 1957. The F-100 would become the principal base aircraft for the next [illegible] years.

Cannon F-100s and crews deployed to Taiwan during the 1958 Formosa Crisis. They also deployed to Turkey the same year.

In 1959 the 312th was deactivated and was replaced at Cannon by the 27th Tactical Fighter Wing. The 27th, another F-100 unit, transferred to Cannon from Bergstrom Air Force Base, Texas. Succeeding major deployments of Cannon's F-100s took place during the 1961 Berlin Crisis and the 1962 Cuban Crisis.

The 27th deployed the first F-100 squadron, the 481st Tactical Fighter Squadron, to Tan Son Nhut Air Base, Vietnam, in 1964. Other deployments to Thailand followed. The 474th Tactical Fighter Wing moved to Luke Air Force Base, Arizona, in September 1965.

In December 1965, the base's mission changed to that of a replacement training unit. The 27th Tactical Fighter Wing became the largest such unit in Tactical Air Command.

F-100 training ended at Cannon in June 1969. The following month the base's first ten F-111s arrived. These aircraft were F-111As, which operated at Cannon for several months before returning to their permanent base, Nellis Air Force Base, Nevada.

The 27th was reequipped with the F-111E in October, 1969. Two years later the F-111Es were reassigned to the 20th Tactical Fighter Wing, Royal Air Force, Upper Heyford, United Kingdom. The last F-111E left Cannon in July 1971.

The first F-111D arrived at Cannon on November 13, 1971. The aircraft's Mark II avionics, the first to use digital computers, made the "D" the most advanced of all F-111 models.

The 832nd Air Division was deactivated in July 1975, leaving the 27th Tactical Fighter Wing the principal Air

Force unit at Cannon Air Force Base. The 27th is the only wing--and Cannon the only base--to operate the F-111D.

In early 1981, the 27th Tactical Fighter Wing was designated a Rapid Deployment Joint Task Force member.

PRIMARY MISSION

The 27th Tactical Fighter Wing is currently the primary host unit at Cannon AFB. The primary mission is to develop and maintain an F-111 tactical fighter wing capable of day, night, and all-weather combat operations, and to provide replacement training of combat aircrews for tactical organizations worldwide.

TENANT MISSION

The major tenants at Cannon AFB and their mission are summarized below:

2040th Communications Squadron provides communications-electronics, air traffic control, and navigational aids support to all Cannon units.

Detachment 11, 25th Weather Squadron provides full weather support to the wing and other base units, and all transient aircraft.

Detachment 2, 4400th Management Engineering Squadron oversees the manpower management engineering programs at Cannon AFB.

Detachment 526, 3751 Field Training Squadron provides weapons systems, associated, aircrew familiarization, and associated equipment training for the F-111D aircraft.

Defense Property Disposal Office (DPDO) provides support to Cannon AFB and Reese AFB by disposing of excess and surplus property.

Appendix E
MASTER LIST OF INDUSTRIAL OPERATIONS

Shop Name	Present Location and Dates (Building No.)		Past Location and Dates (Building No.)	Handles Hazardous Materials	Generates Hazardous Waste	Current Treatment/Storage/Disposal Methods
27th Aircraft Generation Squadron						
Flightline Maintenance	Flightline	1952-Pres		X	X	Fire department training
27th Civil Engineering Squadron						
Carpentry	354, 357	1969-Pres		X	--	Consumed in use
Electrical	357	1969-Pres		X	--	Consumed in use
Entomology	2160	1963-Pres		X	--	Consumed in use
Fire Extinguisher	130	1960-Pres		--	--	
Liquid Fuels Management	389	1970-Pres		X	X	DPDO
Plumbing	357	1969-Pres		X	--	Consumed in use
Power Production	120	1958-Pres		X	--	Consumed in use
Protective Coating	357	1969-Pres		X	--	Consumed in use
Water Plant	336	1960-Pres		--	--	
	338, 339	1943-Pres		--	--	
Welding	357	1969-Pres		--	--	
27th Component Repair Squadron						
Automatic Test Stations	620	1961-Pres		X	--	Consumed in use
Engine Test Cells	2330, 5114	1967-Pres		X	X	UG waste oil tank[a], fire department training
Fiberglass/Structural Repair	680	1965-Pres		X	--	Consumed in use
Jet Engine	680	1965-Pres		X	X	UG waste oil tank, fire department training, DPDO
Machine	680	1965-Pres		X	--	Consumed in use
Manual Test Station	620	1961-Pres		X	--	Consumed in use
Metal Processing	680	1965-Pres		--	--	
NICAD Battery	680	1965-Pres		X	X	Dilution to sanitary sewer
NDI	185	1943-Pres		X	X	Silver recovery to sanitary sewer
Pneudraulics	680	1965-Pres		X	X	DPDO
PMEL	620	1961-Pres		X	--	Consumed in use
27th Equipment Maintenance Squadron						
Corrosion Control	196	1969-Pres		X	X	DPDO
Fuel Systems	196	1969-Pres		X	X	Fire department training
Lead Acid Battery	185	1943-Pres		X	X	Neutralization to sanitary sewer
Repair and Reclamation	129	1943-Pres		X	--	Consumed in use
AGE	186	1971-Pres		X	X	UG waste oil tank, oil/water separator to storm drainage
Washrack	165	1966-Pres		X	X	Oil/water separator to storm drainage
Wheel and Tire	194	1969-Pres		X	X	DPDO

[a]UG waste oil tank = 20,000-gallon underground waste oil tank (Facility No. 4028); contractor removal through DPDO

Appendix E--Continued

Shop Name	Present Location and Dates (Building No.)		Past Location and Dates (Building No.)	Handles Hazardous Materials	Generates Hazardous Waste	Current Treatment/Storage/Disposal Methods
27th Morale, Welfare, and Recreation Squadron						
Auto Hobby	494	1982-Pres	214 1966-1982	X	X	UG waste tanks at Building No. 494
Wood Hobby	75	1978-Pres		--	--	
27th Supply Squadron						
Fuels Laboratory	216	1962-Pres		X	X	DPDO
27th Transportation Squadron						
Battery	379	1965-Pres		X	X	Neutralization to sanitary sewer
Dynamometer	375	1968-Pres		X	--	Consumed in use
General Purpose	375	1968-Pres		X	X	UG waste oil tank, DPDO
Machine	379	1965-Pres		X	--	Consumed in use
Packing and Crating	302	1942-Pres		--	--	
Paint	375	1968-Pres		X	X	DPDO
Refueling Maintenance	326	1960-Pres		X	X	Fire department training
Special Purpose	379	1965-Pres		X	X	UG waste oil tank,[a] DPDO
Tire	335	1955-Pres		X	--	Consumed in use
Welding	357	1969-Pres		--	--	
USAF Hospital						
Dental Services	1400	1968-Pres	Old Hospital[b]	X	X	Consumed in use, sanitary sewer
Medical Laboratory	1400	1968-Pres	Old Hospital	--	--	
Medical X-ray	1400	1968-Pres	Old Hospital	X	X	Sanitary sewer
Surgery	1400	1968-Pres	Old Hospital	--	--	
2040th Communications Squadron	S-10	1962-Pres		--	--	

[a]UG waste oil tank = 20,000-gallon underground waste oil tank (Facility No. 4028); contractor removal through DPDO

[b]Old USAF Hospital Cannon has been torn down; it was previously located to the southwest of the Family Housing Area and consisted of multiple buildings (Building Nos. 902, 904 to 906, 914 to 918, 921 to 923, 932 to 939, 941 to 945, 955 to 959).

Appendix F
INVENTORY OF EXISTING POL STORAGE TANKS

Facility No./ Location	Type POL	Capacity (gal)	Aboveground (AG) Underground (UG)
108	Diesel	2,000	UG
121	Diesel	2,000	UG
129	Diesel	2,000	UG
136	Solvent	300	AG
140	Diesel	550	UG
163	Diesel	550	UG
170	Diesel	2,000	UG
181	Diesel	550	UG
182-A	MOGAS	2,000	UG
182-B	Diesel	2,000	UG
185	Diesel	4,000	UG
187	JP-4	6,000	UG
240	Asphalt	8,400	AG
241	Asphalt	8,400	AG
243	Diesel	600	AG
368	MOGAS	6,000	UG
368	MOGAS	6,000	UG
368	MOGAS	6,000	UG
368	MOGAS	6,000	UG
376	MOGAS	5,000	UG
377	MOGAS	5,000	UG
378	MOGAS	25,000	AG
390	Recovered JP-4	2,000	UG
394	JP-4	420,000	AG
395	JP-4	840,000	AG
396	JP-4	840,000	AG
398	MOGAS	10,000	AG
399	Diesel	20,000	AG
443	Diesel	1,500	UG
444	Diesel	1,500	UG
728	Diesel	1,000	UG
1400	Diesel	24,000	UG
2110	Diesel	550	UG
2160	Diesel	550	AG
2276	Diesel	550	UG
2280	Diesel	1,000	UG
2285	Diesel	1,000	UG
2300	Diesel	550	UG
2302	Diesel	550	UG
2307	Diesel	550	UG
2313	Diesel	550	UG
2319	Diesel	3,000	AG
2321	Diesel	550	UG
2327	Diesel	650	UG
2328	Diesel	3,000	UG
2330	Diesel	550	UG
2331	JP-4	2,500	AG
2332	JP-4	5,000	AG

Appendix F--Continued

Facility No./ Location	Type POL	Capacity (gal)	Aboveground (AG) Underground (UG)
2333	JP-4	2,000	AG
3117	Diesel	1,000	UG
3118	MOGAS	1,000	UG
3121-A	Diesel	550	UG
3121-B	Diesel	250	UG
4028	Waste oil	20,000	UG
5113	JP-4	2,500	AG
5114	JP-4	5,000	AG

Appendix G
INVENTORY OF OIL/WATER SEPARATORS

Location (Building No.)	Date of Installation	Approximate Capacity (gallons)[a]	Discharge
108	--	500	Sanitary Sewer
119	1963	375	Sanitary Sewer
121	--	500	Sanitary Sewer
129	1958	500	Sanitary Sewer
165	1966	600	Storm Drainage System
170	--	500	Sanitary Sewer
186	1971	600	Sanitary Sewer
186	1971	600	Sanitary Sewer
194	1969	200	Storm Drainage System
195	1969	200	Storm Drainage System
196	1969	200	Storm Drainage System
379	1965	500	Sanitary Sewer
680[b]	1965	--	Sanitary Sewer
4095[b]	1977	--	Leaching Field
5077[b]	1957	760	Sanitary Sewer
5077[b]	1957	760	Sanitary Sewer
5077	1957	1,675	Sanitary Sewer
5114	1965	100	Leaching Field
5120	1969	100	Leaching Field
5121	1969	100	Leaching Field
5144[c]	1960	1,700	Sanitary Sewer

[a]Total tank capacities.

[b]Vehicle washrack sump.

[c]Two washrack sumps and a sand trap.

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 the USAF Occupational and Environmental Health Laboratory (OEHL), Air Force Engineering and Services Center (AFESC), Engineering-Science (ES) and CH2M 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 CH2M 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.

Site scores are developed using the appropriate ranking factors according to the method presented in the flow chart (Figure 1). The site rating form is provided on Figure 2 and the rating factor guidelines are provided in Table 1.

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, the potential pathways for waste contaminant migration, and any efforts to contain the contamination. 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. Scores for sites at which there is no containment are not reduced. 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 management practices category factor to the sum of the scores for the other three categories.

FIGURE 1

HAZARD ASSESSMENT RATING METHODOLOGY FLOW CHART

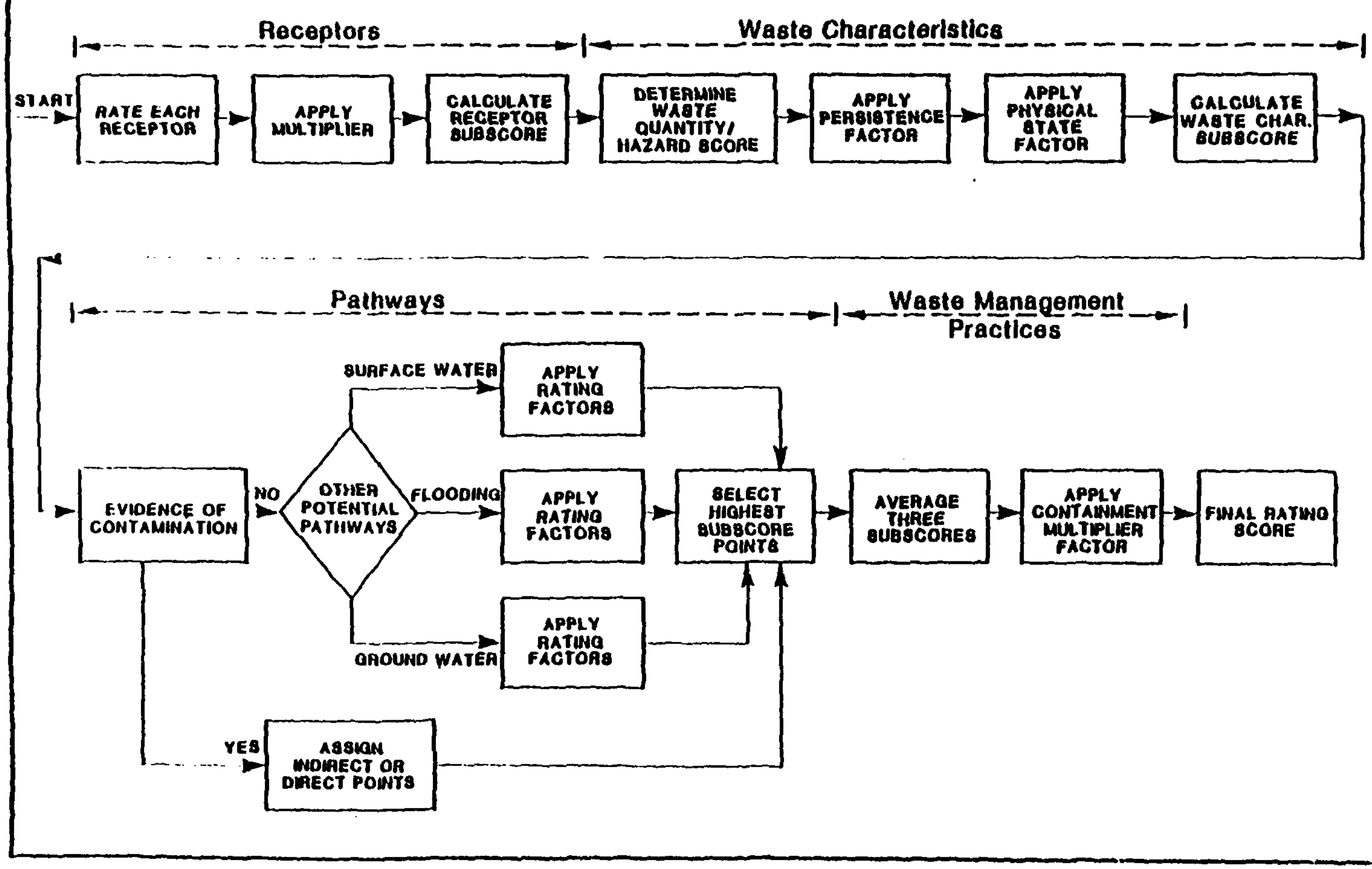

FIGURE 2

HAZARDOUS ASSESSMENT RATING FORM

NAME OF SITE ______________________________

LOCATION ______________________________

DATE OF OPERATION OR OCCURRENCE ______________________________

OWNER/OPERATOR ______________________________

COMMENTS/DESCRIPTION ______________________________

SITE RATED BY ______________________________

I. RECEPTORS

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

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

II. WASTE CHARACTERISTICS

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

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

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

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

______ X ______ = ______

C. Apply physical state multiplier

Subscore B X Physical State Multiplier = Waste Characteristics Subscore

______ X ______ = ______

III. PATHWAYS

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

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

Subscore _____

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

1. Surface water migration

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
Distance to nearest surface water		8		
Net precipitation		6		
Surface erosion		8		
Surface permeability		6		
Rainfall intensity		8		

Subtotals _____ _____

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

2. Flooding

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

Subscore (100 x factor score/3) _____

3. Ground-water migration

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

Subtotals _____ _____

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

C. Highest pathway subscore.

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

Pathways Subscore _____

IV. WASTE MANAGEMENT PRACTICES

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

Receptors _____
Waste Characteristics _____
Pathways _____

Total _____ divided by 3 = _____
Gross Total Score

B. Apply factor for waste containment from waste management practices

Gross Total Score X Waste Management Practices Factor = Final Score

_____ X _____ = \[\]

Table 1
HAZARDOUS ASSESSMENT RATING METHODOLOGY GUIDELINES

I. RECEPTORS CATEGORY

Rating Factors	Rating Scale Levels 0	1	2	3	Multiplier
A. Population within 1,000 feet (includes on-base facilities)	0	1-25	26-100	Greater than 100	4
B. Distance to nearest water well	Greater than 3 miles	1 to 3 miles	3,001 feet to 1 mile	0 to 3,000 feet	10
C. Land Use/Zoning (within 1-mile radius)	Completely remote (zoning not applicable)	Agricultural	Commercial or industrial	Residential	3
D. Distance to installation boundary	Greater than 2 miles	1 to 2 miles	1,001 feet to 1 mile	0 to 1,000 feet	6
E. Critical environments (within 1-mile radius)	Not a critical environment	Natural areas	Pristine natural areas; minor wetlands; preserved areas; presence of economically important natural resources susceptible to contamination	Major habitat of an endangered or threatened species; presence of recharge area; major wetlands	10
F. Water quality/use designation of nearest surface water body	Agricultural or industrial use	Recreation, propagation and management of fish and wildlife	Shellfish propagation and harvesting	Potable water supplies	6
G. Ground-water use of uppermost aquifer	Not used, other sources readily available	Commercial, industrial, or irrigation, very limited other water sources	Drinking water, municipal water available	Drinking water, no municipal water available; commercial, industrial, or irrigation, no other water source available	9
H. Population served by surface water supplies within 3 miles downstream of site	0	1-15	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

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

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

Rating Factors	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

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

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 Factors	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 inches	-10 to +5 inches	+5 to +20 inches	Greater than +20 inches	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-hour rainfall	<1.0 inch	1.0 to 2.0 inches	2.1 to 3.0 inches	>3.0 inches	8
B-2 Potential for Flooding					
Floodplain	Beyond 100-year floodplain	In 100-year floodplain	In 10-year floodplain	Floods annually	1
B-3 Potential for Ground-Water Contamination					
Depth to ground water	Greater than 500 feet	50 to 500 feet	11 to 50 feet	0 to 10 feet	8
Net precipitation	Less than -10 inches	-10 to +5 inches	+5 to + 20 inches	Greater than +20 inches	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

Table 1--Continued

B-3 Potential for Ground-Water Contamination--Continued

Rating Factors	Rating Scale Levels 0	1	2	3	Multiplier
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 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

IV. WASTE MANAGEMENT PRACTICES CATEGORY

A. This category adjusts the total risk as determined from the receptors, pathways, and waste characteristics categories for waste management practices and engineering controls designed to reduce this risk. The total risk is determined by first averaging the receptors, pathways, and waste characteristics subscores.

B. Waste Management Practices Factor

The following multipliers are then applied to the total risk points (from A):

Waste Management Practice	Multiplier
No containment	1.0
Limited containment	0.95
Fully contained and in full compliance	0.10

Guidelines for fully contained:

Landfills:

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

Surface Impoundments:

- o Liners in good condition
- o Sound dikes and adequate freeboard
- 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

Fire Protection 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-6-3, then leave blank for calculation of factor score and maximum possible score.

GNR68A

HAZARDOUS ASSESSMENT RATING FORM

NAME OF SITE: Site No. 1 - Landfill No. 1

LOCATION: Cannon AFB

DATE OF OPERATION OR OCCURRENCE: 1943-1946

OWNER/OPERATOR: Cannon AFB

COMMENTS/DESCRIPTION: Original Landfill

SITE RATED BY: D. Moccia, G. McIntyre

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	0	10	0	30
F.	Water quality of nearest surface-water body	0	6	0	18
G.	Ground-water use of uppermost aquifer	3	9	27	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	114	180

Receptors subscore (100 x factor score subtotal/maximum subtotal) 63

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

1.0 x 60 = 60

C. Apply physical state multiplier

Subscore B x Physical State Multiplier = Waste Characteristics Subscore

1.0 x 60 = 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 --

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

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
1. Surface-water migration				
Distance to nearest surface water	2	8	16	24
Net precipitation	0	6	0	18
Surface erosion	1	8	8	24
Surface permeability	1	6	6	18
Rainfall intensity	2	8	16	24
		Subtotals	46	108
Subscore (100 x factor score subtotal/maximum score subtotal)				43
2. Flooding	0	1	0	3
	Subscore (100 x factor score/3)			0
3. Ground-water migration				
Depth to ground water	1	8	8	24
Net precipitation	0	6	0	18
Soil permeability	0	8	0	24
Subsurface flows	0	8	0	24
Direct access to ground water	NA	8	--	--
		Subtotals	8	90
Subscore (100 x factor score subtotal/maximum score subtotal)				9

C. Highest pathway subscore

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

Pathways Subscore 43

IV. WASTE MANAGEMENT PRACTICES

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

Receptors	63
Waste Characteristics	60
Pathways	43
Total 166 divided by 3 =	55.33 Gross Total Score

B. Apply factor for waste containment from waste management practices

Gross Total Score x Waste Management Practices Factor = Final Score

55.33 x 1.0 55

HAZARDOUS ASSESSMENT RATING FORM

NAME OF SITE: Site No. 2 - Landfill No. 2

LOCATION: Cannon AFB

DATE OF OPERATION OR OCCURRENCE: 1946-47; 1952-59

OWNER/OPERATOR: Cannon AFB

COMMENTS/DESCRIPTION: Landfill

SITE RATED BY: D. Moccia, G. McIntyre

I. RECEPTORS

	Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
A.	Population within 1,000 feet of site	0	4	0	12
B.	Distance to nearest well	3	10	30	30
C.	Land use/zoning within 1 mile radius	2	3	6	9
D.	Distance to reservation boundary	3	6	18	18
E.	Critical environments within 1 mile radius of site	0	10	0	30
F.	Water quality of nearest surface-water body	0	6	0	18
G.	Ground-water use of uppermost aquifer	3	9	27	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 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) 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	--
B. Rate the migration potential for three potential pathways: surface-water migration, flooding, and ground-water migration. Select the highest rating, and proceed to C.				
1. Surface-water migration				
Distance to nearest surface water	1	8	8	24
Net precipitation	0	6	0	18
Surface erosion	1	8	8	24
Surface permeability	1	6	6	18
Rainfall intensity	2	8	16	24
		Subtotals	38	108
Subscore (100 x factor score subtotal/maximum score subtotal)				35
2. Flooding	0	1	0	3
	Subscore (100 x factor score/3)			0
3. Ground-water migration				
Depth to ground water	1	8	8	24
Net precipitation	0	6	0	18
Soil permeability	0	8	0	24
Subsurface flows	0	8	0	24
Direct access to ground water	NA	8	--	--
		Subtotals	8	90
Subscore (100 x factor score subtotal/maximum score subtotal)				9

C. Highest pathway subscore

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

Pathways Subscore **35**

IV. WASTE MANAGEMENT PRACTICES

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

Receptors	55
Waste Characteristics	60
Pathways	50
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**

HAZARDOUS ASSESSMENT RATING FORM

NAME OF SITE: Site No. 3 - Landfill No. 3

LOCATION: Cannon AFB

DATE OF OPERATION OR OCCURRENCE: 1959-1967

OWNER/OPERATOR: Cannon AFB

COMMENTS/DESCRIPTION: Landfill No. 3

SITE RATED BY: D. Moccia, G. McIntyre

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	2	10	20	30
C.	Land use/zoning within 1 mile radius	1	3	3	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	0	6	0	18
G.	Ground-water use of uppermost aquifer	3	9	27	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	96	180

Receptors subscore (100 x factor score subtotal/maximum subtotal) 53

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 --

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

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
1. Surface-water migration				
Distance to nearest surface water	3	8	24	24
Net precipitation	0	6	0	18
Surface erosion	1	8	8	24
Surface permeability	1	6	6	18
Rainfall intensity	2	8	16	24
		Subtotals	54	108
Subscore (100 x factor score subtotal/maximum score subtotal)				50
2. Flooding	0	1	0	3
	Subscore (100 x factor score/3)			0
3. Ground-water migration				
Depth to ground water	1	8	8	24
Net precipitation	0	6	0	18
Soil permeability	0	8	0	24
Subsurface flows	0	8	0	24
Direct access to ground water	NA	8	--	--
		Subtotals	8	90
Subscore (100 x factor score subtotal/maximum score subtotal)				9

C. Highest pathway subscore

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

Pathways Subscore 50

IV. WASTE MANAGEMENT PRACTICES

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

Receptors	53
Waste Characteristics	60
Pathways	50
Total 163 divided by 3 =	54.33 Gross Total Score

B. Apply factor for waste containment from waste management practices

Gross Total Score x Waste Management Practices Factor = Final Score

54.33 x 1.0 = 54

HAZARDOUS ASSESSMENT RATING FORM

NAME OF SITE: Site No. 4 - Landfill No. 4

LOCATION: Cannon AFB

DATE OF OPERATION OR OCCURRENCE: 1967-1968

OWNER/OPERATOR: Cannon AFB

COMMENTS/DESCRIPTION: Landfill

SITE RATED BY: D. Moccia, G. McIntyre

I. RECEPTORS

	Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
A.	Population within 1,000 feet of site	0	4	0	12
B.	Distance to nearest well	3	10	30	30
C.	Land use/zoning within 1 mile radius	1	3	3	9
D.	Distance to reservation boundary	3	6	18	18
E.	Critical environments within 1 mile radius of site	1	10	10	30
F.	Water quality of nearest surface-water body	0	6	0	18
G.	Ground-water use of uppermost aquifer	3	9	27	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	106	180

Receptors subscore (100 x factor score subtotal/maximum subtotal) 59

II. WASTE CHARACTERISTICS

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

1. Waste quantity (S = small, M = medium, L = large) 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	--
B. Rate the migration potential for three potential pathways: surface-water migration, flooding, and ground-water migration. Select the highest rating, and proceed to C.				
1. Surface-water migration				
Distance to nearest surface water	3	8	24	24
Net precipitation	0	6	0	18
Surface erosion	1	8	8	24
Surface permeability	1	6	6	18
Rainfall intensity	2	8	16	24
		Subtotals	54	108
Subscore (100 x factor score subtotal/maximum score subtotal)				50
2. Flooding	0	1	0	3
	Subscore (100 x factor score/3)			0
3. Ground-water migration				
Depth to ground water	1	8	8	24
Net precipitation	0	6	0	18
Soil permeability	0	8	0	24
Subsurface flows	0	8	0	24
Direct access to ground water	NA	8	--	--
		Subtotals	8	90
Subscore (100 x factor score subtotal/maximum score subtotal)				9

C. Highest pathway subscore

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

Pathways Subscore **50**

IV. WASTE MANAGEMENT PRACTICES

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

Receptors	59
Waste Characteristics	60
Pathways	50
Total 169 divided by 3 =	56.33 Gross Total Score

B. Apply factor for waste containment from waste management practices

Gross Total Score x Waste Management Practices Factor = Final Score

56.33 x 1.0 = **56**

HAZARDOUS ASSESSMENT RATING FORM

NAME OF SITE: Site No. 5 - Landfill No. 45

LOCATION: Cannon AFB

DATE OF OPERATION OR OCCURRENCE: 1968-present

OWNER/OPERATOR: Cannon AFB

COMMENTS/DESCRIPTION: Landfill

SITE RATED BY: D. Moccia, G. McIntyre

I. RECEPTORS

	Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
A.	Population within 1,000 feet of site	0	4	0	12
B.	Distance to nearest well	3	10	30	30
C.	Land use/zoning within 1 mile radius	1	3	3	9
D.	Distance to reservation boundary	3	6	18	18
E.	Critical environments within 1 mile radius of site	0	10	0	30
F.	Water quality of nearest surface-water body	0	6	0	18
G.	Ground-water use of uppermost aquifer	3	9	27	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	96	180

Receptors subscore (100 x factor score subtotal/maximum subtotal) 53

II. WASTE CHARACTERISTICS

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

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

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

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

100 x 1.0 = 100

C. Apply physical state multiplier

Subscore B x Physical State Multiplier = Waste Characteristics Subscore

100 x 1.0 = 100

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 three potential pathways: surface-water migration, flooding, and ground-water migration. Select the highest rating, and proceed to C.

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
1. Surface-water migration				
Distance to nearest surface water	0	8	0	24
Net precipitation	0	6	0	18
Surface erosion	1	8	8	24
Surface permeability	1	6	6	18
Rainfall intensity	2	8	16	24
		Subtotals	30	108
Subscore (100 x factor score subtotal/maximum score subtotal)				28
2. Flooding	0	1	0	3
	Subscore (100 x factor score/3)			0
3. Ground-water migration				
Depth to ground water	1	8	8	24
Net precipitation	0	6	0	18
Soil permeability	0	8	0	24
Subsurface flows	0	8	0	24
Direct access to ground water	NA	8	--	--
		Subtotals	8	90
Subscore (100 x factor score subtotal/maximum score subtotal)				9

C. Highest pathway subscore

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

Pathways Subscore 28

IV. WASTE MANAGEMENT PRACTICES

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

Receptors	53
Waste Characteristics	100
Pathways	28
Total 181 divided by 3 =	60.33 Gross Total Score

B. Apply factor for waste containment from waste management practices

Gross Total Score x Waste Management Practices Factor = Final Score

60.33 x 1.0 = 60

HAZARDOUS ASSESSMENT RATING FORM

NAME OF SITE: Site No. 6 - Fire Department Training Area No. 1

LOCATION: Cannon AFB

DATE OF OPERATION OR OCCURRENCE: 1959-68

OWNER/OPERATOR: Cannon AFB

COMMENTS/DESCRIPTION: Fire Department Training Exercises

SITE RATED BY: D. Moccia, G. McIntyre

I. RECEPTORS

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

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

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

80 x 1.0 = 80

C. Apply physical state multiplier

Subscore B x Physical State Multiplier = Waste Characteristics Subscore

80 x 1.0 = 80

III. PATHWAYS

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

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

Subscore --

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

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
1. Surface-water migration				
Distance to nearest surface water	1	8	8	24
Net precipitation	0	6	0	18
Surface erosion	1	8	8	24
Surface permeability	1	6	6	18
Rainfall intensity	2	8	16	24
		Subtotals	38	108
Subscore (100 x factor score subtotal/maximum score subtotal)				35
2. Flooding	0	1	0	3
	Subscore (100 x factor score/3)			0
3. Ground-water migration				
Depth to ground water	1	8	8	24
Net precipitation	0	6	0	18
Soil permeability	0	8	0	24
Subsurface flows	0	8	0	24
Direct access to ground water	NA	8	--	--
		Subtotals	8	90
Subscore (100 x factor score subtotal/maximum score subtotal)				9

C. Highest pathway subscore

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

Pathways Subscore 35

IV. WASTE MANAGEMENT PRACTICES

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

Receptors	55
Waste Characteristics	80
Pathways	35
Total 170 divided by 3 =	56.67 Gross Total Score

B. Apply factor for waste containment from waste management practices

Gross Total Score x Waste Management Practices Factor = Final Score

56.67 x 1.0 = 57

HAZARDOUS ASSESSMENT RATING FORM

NAME OF SITE: Site No. 7 - Fire Department Training Area No. 2

LOCATION: Cannon AFB

DATE OF OPERATION OR OCCURRENCE: 1968-74

OWNER/OPERATOR: Cannon AFB

COMMENTS/DESCRIPTION: Fire Department Training Exercises

SITE RATED BY: D. Moccia, G. McIntyre

I. RECEPTORS

	Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
A.	Population within 1,000 feet of site	0	4	0	12
B.	Distance to nearest well	3	10	30	30
C.	Land use/zoning within 1 mile radius	1	3	3	9
D.	Distance to reservation boundary	2	6	12	18
E.	Critical environments within 1 mile radius of site	0	10	0	30
F.	Water quality of nearest surface-water body	0	6	0	18
G.	Ground-water use of uppermost aquifer	3	9	27	27
H.	Population served by surface-water supply within 3 miles downstream of site	0	6	0	18
I.	Population served by ground-water supply within 3 miles of site	3	6	18	18
			Subtotals	90	180

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

II. WASTE CHARACTERISTICS

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

1. Waste quantity (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	--
B. Rate the migration potential for three potential pathways: surface-water migration, flooding, and ground-water migration. Select the highest rating, and proceed to C.				
1. Surface-water migration				
Distance to nearest surface water	0	8	0	24
Net precipitation	0	6	0	18
Surface erosion	1	8	8	24
Surface permeability	1	6	6	18
Rainfall intensity	2	8	16	24
		Subtotals	30	108
Subscore (100 x factor score subtotal/maximum score subtotal)				28
2. Flooding	0	1	0	3
	Subscore (100 x factor score/3)			0
3. Ground-water migration				
Depth to ground water	1	8	8	24
Net precipitation	0	6	0	18
Soil permeability	0	8	0	24
Subsurface flows	0	8	0	24
Direct access to ground water	NA	8	--	--
		Subtotals	8	90
Subscore (100 x factor score subtotal/maximum score subtotal)				9

C. Highest pathway subscore

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

Pathways Subscore **28**

IV. WASTE MANAGEMENT PRACTICES

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

Receptors	50
Waste Characteristics	48
Pathways	28
Total 126 divided by 3 =	42 Gross Total Score

B. Apply factor for waste containment from waste management practices

Gross Total Score x Waste Management Practices Factor = Final Score

42 x 1.0 = **42**

HAZARDOUS ASSESSMENT RATING FORM

NAME OF SITE: Site No. 8 - Fire Department Training Area No. 3

LOCATION: Cannon AFB

DATE OF OPERATION OR OCCURRENCE: 1968-1974

OWNER/OPERATOR: Cannon AFB

COMMENTS/DESCRIPTION: Fire Department Training Exercises

SITE RATED BY: D. Moccia, G. McIntyre

I. RECEPTORS

	Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
A.	Population within 1,000 feet of site	0	4	0	12
B.	Distance to nearest well	3	10	30	30
C.	Land use/zoning within 1 mile radius	1	3	3	9
D.	Distance to reservation boundary	2	6	12	18
E.	Critical environments within 1 mile radius of site	0	10	0	30
F.	Water quality of nearest surface-water body	0	6	0	18
G.	Ground-water use of uppermost aquifer	3	9	27	27
H.	Population served by surface-water supply within 3 miles downstream of site	0	6	0	18
I.	Population served by ground-water supply within 3 miles of site	3	6	18	18
			Subtotals	90	180

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

II. WASTE CHARACTERISTICS

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

1. Waste quantity (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 --

B. Rate the migration potential for three 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	0	8	0	24
Net precipitation	0	6	0	18
Surface erosion	1	8	8	24
Surface permeability	1	6	6	18
Rainfall intensity	2	8	16	24
		Subtotals	30	108

Subscore (100 x factor score subtotal/maximum score subtotal) 28

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	1	8	8	24
Net precipitation	0	6	0	18
Soil permeability	0	8	0	24
Subsurface flows	0	8	0	24
Direct access to ground water	NA	8	--	--
		Subtotals	8	90

Subscore (100 x factor score subtotal/maximum score subtotal) 9

C. Highest pathway subscore

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

Pathways Subscore **28**

IV. WASTE MANAGEMENT PRACTICES

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

Receptors	50
Waste Characteristics	46
Pathways	28
Total 126 divided by 3 =	42
	Gross Total Score

B. Apply factor for waste containment from waste management practices

Gross Total Score x Waste Management Practices Factor = Final Score

42 x 1.0 = **42**

HAZARDOUS ASSESSMENT RATING FORM

NAME OF SITE: Site No. 9 - Fire Department Training Area No. 4

LOCATION: Cannon AFB

DATE OF OPERATION OR OCCURRENCE: 1974-present

OWNER/OPERATOR: Cannon AFB

COMMENTS/DESCRIPTION: Fire Department Training Exercises/Fuel Observed in Tire Ruts

SITE RATED BY: D. Moccia, G. McIntyre

I. RECEPTORS

	Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
A.	Population within 1,000 feet of site	0	4	0	12
B.	Distance to nearest well	3	10	30	30
C.	Land use/zoning within 1 mile radius	1	3	3	9
D.	Distance to reservation boundary	3	6	18	18
E.	Critical environments within 1 mile radius of site	0	10	0	30
F.	Water quality of nearest surface-water body	0	6	0	18
G.	Ground-water use of uppermost aquifer	3	9	27	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	96	180

Receptors subscore (100 x factor score subtotal/maximum subtotal) 53

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 1.0 = 64

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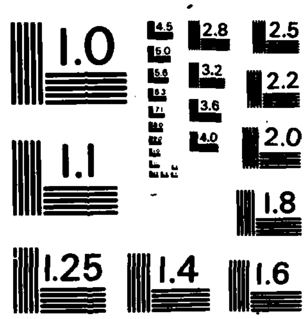
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2.5
2.8
3.2
3.6
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4.5
5.0

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 three potential pathways: surface-water migration, flooding, and ground-water migration. Select the highest rating, and proceed to C.				
1. Surface-water migration				
Distance to nearest surface water	0	8	0	24
Net precipitation	0	6	0	18
Surface erosion	1	8	8	24
Surface permeability	1	6	6	18
Rainfall intensity	2	8	16	24
		Subtotals	30	108
Subscore (100 x factor score subtotal/maximum score subtotal)				28
2. Flooding	0	1	0	3
	Subscore (100 x factor score/3)			0
3. Ground-water migration				
Depth to ground water	1	8	8	24
Net precipitation	0	6	0	18
Soil permeability	0	8	C	24
Subsurface flows	0	8	0	24
Direct access to ground water	NA	R	--	--
		Subtotals	8	90
Subscore (100 x factor score subtotal/maximum score subtotal)				9

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	53
Waste Characteristics	64
Pathways	80
Total 197 divided by 3 =	65.67
	Gross Total Score

B. Apply factor for waste containment from waste management practices

Gross Total Score x Waste Management Practices Factor = Final Score

65.67 x 1.0 = 66

HAZARDOUS ASSESSMENT RATING FORM

NAME OF SITE: Site No. 11 - Engine Test Cell Overflow Pit and Leaching Field

LOCATION: Cannon AFB

DATE OF OPERATION OR OCCURRENCE: --

OWNER/OPERATOR: Cannon AFB

COMMENTS/DESCRIPTION: Overloaded Oil/Water Separator; Overflow Pit Filled with Black POL Type Liquid

SITE RATED BY: D. Moccia, G. McIntyre

I. RECEPTORS

	Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
A.	Population within 1,000 feet of site	1	4	4	12
B.	Distance to nearest well	3	10	30	30
C.	Land use/zoning within 1 mile radius	1	3	3	9
D.	Distance to reservation boundary	2	6	12	18
E.	Critical environments within 1 mile radius of site	0	10	0	30
F.	Water quality of nearest surface-water body	0	6	0	18
G.	Ground-water use of uppermost aquifer	3	9	27	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	94	180

Receptors subscore (100 x factor score subtotal/maximum 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) 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	80
B. Rate the migration potential for three potential pathways: surface-water migration, flooding, and ground-water migration. Select the highest rating, and proceed to C.				
1. Surface-water migration				
Distance to nearest surface water	1	8	8	24
Net precipitation	0	6	0	18
Surface erosion	1	8	8	24
Surface permeability	1	6	6	18
Rainfall intensity	2	8	16	24
		Subtotals	38	108
Subscore (100 x factor score subtotal/maximum score subtotal)				35
2. Flooding	0	1	0	3
	Subscore (100 x factor score/3)			0
3. Ground-water migration				
Depth to ground water	1	8	8	24
Net precipitation	0	6	0	18
Soil permeability	0	8	0	24
Subsurface flows	0	8	0	24
Direct access to ground water	NA	8	--	--
		Subtotals	8	90
Subscore (100 x factor score subtotal/maximum score subtotal)				9

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	52
Waste Characteristics	40
Pathways	80
Total 172 divided by 3 =	57.33 Gross Total Score

B. Apply factor for waste containment from waste management practices

Gross Total Score x Waste Management Practices Factor = Final Score

57.33 x 1.0 = 57

HAZARDOUS ASSESSMENT RATING FORM

NAME OF SITE: Site No. 12 - Stormwater Collection Point

LOCATION: Cannon AFB

DATE OF OPERATION OR OCCURRENCE: 1943 to present

OWNER/OPERATOR: Cannon AFB

COMMENTS/DESCRIPTION: Receives storm drainage from flightline

SITE RATED BY: D. Moccia, G. McIntyre

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	0	10	0	30
F.	Water quality of nearest surface-water body	0	6	0	18
G.	Ground-water use of uppermost aquifer	3	9	27	27
H.	Population served by surface-water supply within 3 miles downstream of site	0	6	0	18
I.	Population served by ground-water supply within 3 miles of site	3	6	18	18
			Subtotals	103	180

Receptors subscore (100 x factor score subtotal/maximum subtotal) 57

II. WASTE CHARACTERISTICS

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

1. Waste quantity (S = small, M = medium, L = large) 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 --

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

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
1. Surface-water migration				
Distance to nearest surface water	3	8	24	24
Net precipitation	0	6	0	18
Surface erosion	1	8	8	24
Surface permeability	1	6	6	18
Rainfall intensity	2	8	16	24
		Subtotals	54	108
Subscore (100 x factor score subtotal/maximum score subtotal)				50
2. Flooding	0	1	0	3
	Subscore (100 x factor score/3)			0
3. Ground-water migration				
Depth to ground water	1	8	8	24
Net precipitation	0	6	0	18
Soil permeability	0	8	0	24
Subsurface flows	0	8	0	24
Direct access to ground water	NA	8	--	--
		Subtotals	8	90
Subscore (100 x factor score subtotal/maximum score subtotal)				9

C. Highest pathway subscore

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

Pathways Subscore 50

IV. WASTE MANAGEMENT PRACTICES

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

Receptors	57
Waste Characteristics	40
Pathways	50
Total 147 divided by 3 =	49.00
	Gross Total Score

B. Apply factor for waste containment from waste management practices

Gross Total Score x Waste Management Practices Factor = Final Score

49.00 x 1.0 = 49

HAZARDOUS ASSESSMENT RATING FORM

NAME OF SITE: Site No. 13 - Sanitary Sewage Lift Station Overflow Site

LOCATION: Cannon AFB

DATE OF OPERATION OR OCCURRENCE: 1983

OWNER/OPERATOR: Cannon AFB

COMMENTS/DESCRIPTION: Pumps froze, domestic sewage overflow

SITE RATED BY: D. Moccia, G. McIntyre

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	0	10	0	30
F.	Water quality of nearest surface-water body	0	6	0	18
G.	Ground-water use of uppermost aquifer	3	9	27	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	114	180

Receptors subscore (100 x factor score subtotal/maximum subtotal) **63**

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 0.8 = 48

C. Apply physical state multiplier

Subscore B x Physical State Multiplier = Waste Characteristics Subscore

48 x 0.75 = **36**

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 three potential pathways: surface-water migration, flooding, and ground-water migration. Select the highest rating, and proceed to C.				
1. Surface-water migration				
Distance to nearest surface water	2	8	16	24
Net precipitation	0	6	0	18
Surface erosion	1	8	8	24
Surface permeability	1	6	6	18
Rainfall intensity	2	8	16	24
		Subtotals	46	108
Subscore (100 x factor score subtotal/maximum score subtotal)				43
2. Flooding	0	1	0	3
	Subscore (100 x factor score/3)			0
3. Ground-water migration				
Depth to ground water	1	8	8	24
Net precipitation	0	6	0	18
Soil permeability	0	8	0	24
Subsurface flows	0	8	0	24
Direct access to ground water	NA	8	--	--
		Subtotals	8	90
Subscore (100 x factor score subtotal/maximum score subtotal)				9

C. Highest pathway subscore

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

Pathways Subscore 43

IV. WASTE MANAGEMENT PRACTICES

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

Receptors	63
Waste Characteristics	36
Pathways	43
Total 142 divided by 3 =	47.33 Gross Total Score

B. Apply factor for waste containment from waste management practices

Gross Total Score x Waste Management Practices Factor = Final Score

47.33 x 1.0 = 47

HAZARDOUS ASSESSMENT RATING FORM

NAME OF SITE: Site No. 14 - Sludge Weathering Pit

LOCATION: Cannon AFB

DATE OF OPERATION OR OCCURRENCE: 1960s to 1970s

OWNER/OPERATOR: Cannon AFB

COMMENTS/DESCRIPTION: Weathering of fuel tank cleaning sludge

SITE RATED BY: D. Moccia, G. McIntyre

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	3	3	9	9
D.	Distance to reservation boundary	3	6	18	18
E.	Critical environments within 1 mile radius of site	0	10	0	30
F.	Water quality of nearest surface-water body	0	6	0	18
G.	Ground-water use of uppermost aquifer	3	9	27	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	106	180

Receptors subscore (100 x factor score subtotal/maximum subtotal) 59

II. WASTE CHARACTERISTICS

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

1. Waste quantity (S = small, M = medium, L = large) 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 --

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

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
1. Surface-water migration				
Distance to nearest surface water	3	8	24	24
Net precipitation	0	6	0	18
Surface erosion	1	8	8	24
Surface permeability	1	6	6	18
Rainfall intensity	2	8	16	24
		Subtotals	54	108
Subscore (100 x factor score subtotal/maximum score subtotal)				50
2. Flooding	0	1	0	3
	Subscore (100 x factor score/3)			0
3. Ground-water migration				
Depth to ground water	1	8	8	24
Net precipitation	0	6	0	18
Soil permeability	0	8	0	24
Subsurface flows	0	8	0	24
Direct access to ground water	NA	8	--	--
		Subtotals	8	90
Subscore (100 x factor score subtotal/maximum score subtotal)				9

C. Highest pathway subscore

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

Pathways Subscore 50

IV. WASTE MANAGEMENT PRACTICES

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

Receptors	59
Waste Characteristics	48
Pathways	50
Total 157 divided by 3 =	52.33
	Gross Total Score

B. Apply factor for waste containment from waste management practices

Gross Total Score x Waste Management Practices Factor = Final Score

52.33 x 1.0 = 52

HAZARDOUS ASSESSMENT RATING FORM

NAME OF SITE: Site No. 15 - AGE Drainage Ditch

LOCATION: Cannon AFB

DATE OF OPERATION OR OCCURRENCE: --

OWNER/OPERATOR: Cannon AFB

COMMENTS/DESCRIPTION: Evidence of POL contamination observed in ditch

SITE RATED BY: D. Moccia, G. McIntyre

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	3	3	9	9
D.	Distance to reservation boundary	2	6	12	18
E.	Critical environments within 1 mile radius of site	0	10	0	30
F.	Water quality of nearest surface-water body	0	6	0	18
G.	Ground-water use of uppermost aquifer	3	9	27	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	100	180

Receptors subscore (100 x factor score subtotal/maximum 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) 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 80

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

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
1. Surface-water migration				
Distance to nearest surface water	3	8	24	24
Net precipitation	0	6	0	18
Surface erosion	1	8	8	24
Surface permeability	1	6	6	18
Rainfall intensity	2	8	16	24
		Subtotals	54	108
Subscore (100 x factor score subtotal/maximum score subtotal)				50
2. Flooding	0	1	0	3
	Subscore (100 x factor score/3)			0
3. Ground-water migration				
Depth to ground water	1	8	8	24
Net precipitation	0	6	0	18
Soil permeability	0	8	0	24
Subsurface flows	0	8	0	24
Direct access to ground water	NA	8	--	--
		Subtotals	8	90
Subscore (100 x factor score subtotal/maximum score subtotal)				9

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	56
Waste Characteristics	40
Pathways	80
Total 176 divided by 3 =	58.67
	Gross Total Score

B. Apply factor for waste containment from waste management practices

Gross Total Score x Waste Management Practices Factor = Final Score

58.67 x 1.0 = 59

HAZARDOUS ASSESSMENT RATING FORM

NAME OF SITE: Site No. 16 - Solvent Disposal Site

LOCATION: Cannon AFB

DATE OF OPERATION OR OCCURRENCE: Unknown, suspect mid to late 1970s

OWNER/OPERATOR: Cannon AFB

COMMENTS/DESCRIPTION: Two solvent drums emptied to shallow pit

SITE RATED BY: D. Moccia, G. McIntyre

I. RECEPTORS

	Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
A.	Population within 1,000 feet of site	0	4	0	12
B.	Distance to nearest well	3	10	30	30
C.	Land use/zoning within 1 mile radius	2	3	6	9
D.	Distance to reservation boundary	3	6	18	18
E.	Critical environments within 1 mile radius of site	0	10	0	30
F.	Water quality of nearest surface-water body	0	6	0	18
G.	Ground-water use of uppermost aquifer	3	9	27	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 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) 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	--
B. Rate the migration potential for three potential pathways: surface-water migration, flooding, and ground-water migration. Select the highest rating, and proceed to C.				
1. Surface-water migration				
Distance to nearest surface water	1	8	8	24
Net precipitation	0	6	0	18
Surface erosion	1	8	8	24
Surface permeability	1	6	6	18
Rainfall intensity	2	8	16	24
		Subtotals	38	108
Subscore (100 x factor score subtotal/maximum score subtotal)				35
2. Flooding	0	1	0	3
	Subscore (100 x factor score/3)			0
3. Ground-water migration				
Depth to ground water	1	8	8	24
Net precipitation	0	6	0	18
Soil permeability	0	8	0	24
Subsurface flows	0	8	0	24
Direct access to ground water	NA	8	--	--
		Subtotals	8	90
Subscore (100 x factor score subtotal/maximum score subtotal)				9

C. Highest pathway subscore

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

Pathways Subscore 35

IV. WASTE MANAGEMENT PRACTICES

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

Receptors	55
Waste Characteristics	60
Pathways	35
Total 150 divided by 3 =	50.00 Gross Total Score

B. Apply factor for waste containment from waste management practices

Gross Total Score x Waste Management Practices Factor = Final Score

50.00 x 1.0 = 50

HAZARDOUS ASSESSMENT RATING FORM

NAME OF SITE: Site No. 17 - Entomology Rinse Area

LOCATION: Cannon AFB

DATE OF OPERATION OR OCCURRENCE: --

OWNER/OPERATOR: Cannon AFB

COMMENTS/DESCRIPTION: Entomology equipment rinsed and drained

SITE RATED BY: D. Moccia, G. McIntyre

I. RECEPTORS

	Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
A.	Population within 1,000 feet of site	0	4	0	12
B.	Distance to nearest well	3	10	30	30
C.	Land use/zoning within 1 mile radius	2	3	6	9
D.	Distance to reservation boundary	2	6	12	18
E.	Critical environments within 1 mile radius of site	1	10	10	30
F.	Water quality of nearest surface-water body	0	6	0	18
G.	Ground-water use of uppermost aquifer	3	9	27	27
H.	Population served by surface-water supply within 3 miles downstream of site	0	6	0	18
I.	Population served by ground-water supply within 3 miles of site	3	6	18	18
			Subtotals	103	180

Receptors subscore (100 x factor score subtotal/maximum subtotal) 57

II. WASTE CHARACTERISTICS

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

1. Waste quantity (S = small, M = medium, L = large) 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	--
B. Rate the migration potential for three potential pathways: surface-water migration, flooding, and ground-water migration. Select the highest rating, and proceed to C.				
1. Surface-water migration				
Distance to nearest surface water	2	8	16	24
Net precipitation	0	6	0	18
Surface erosion	1	8	8	24
Surface permeability	1	6	6	18
Rainfall intensity	2	8	16	24
		Subtotals	46	108
Subscore (100 x factor score subtotal/maximum score subtotal)				43
2. Flooding	0	1	0	3
	Subscore (100 x factor score/3)			0
3. Ground-water migration				
Depth to ground water	1	8	8	24
Net precipitation	0	6	0	18
Soil permeability	0	8	0	24
Subsurface flows	0	8	0	24
Direct access to ground water	NA	8	--	--
		Subtotals	8	90
Subscore (100 x factor score subtotal/maximum score subtotal)				9

C. Highest pathway subscore

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

Pathways Subscore **43**

IV. WASTE MANAGEMENT PRACTICES

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

Receptors	57
Waste Characteristics	40
Pathways	43
Total 140 divided by 3 =	46.67
	Gross Total Score

B. Apply factor for waste containment from waste management practices

Gross Total Score x Waste Management Practices Factor = Final Score

46.67 x 1.0 = **47**

HAZARDOUS ASSESSMENT RATING FORM

NAME OF SITE: Site No. 18 - JP-4 Fuel Spill

LOCATION: Cannon AFB

DATE OF OPERATION OR OCCURRENCE: 1980

OWNER/OPERATOR: Cannon AFB

COMMENTS/DESCRIPTION: Fuel spill from A/C fuel tank

SITE RATED BY: D. Moccia, G. McIntyre

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	2	10	20	30
C.	Land use/zoning within 1 mile radius	3	3	9	9
D.	Distance to reservation boundary	2	6	12	18
E.	Critical environments within 1 mile radius of site	0	10	0	30
F.	Water quality of nearest surface-water body	0	6	0	18
G.	Ground-water use of uppermost aquifer	3	9	27	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	94	180

Receptors subscore (100 x factor score subtotal/maximum 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 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	--
B. Rate the migration potential for three potential pathways: surface-water migration, flooding, and ground-water migration. Select the highest rating, and proceed to C.				
1. Surface-water migration				
Distance to nearest surface water	2	8	16	24
Net precipitation	0	6	0	18
Surface erosion	1	8	8	24
Surface permeability	1	6	6	18
Rainfall intensity	2	8	16	24
		Subtotals	46	108
Subscore (100 x factor score subtotal/maximum score subtotal)				43
2. Flooding	0	1	0	3
	Subscore (100 x factor score/3)			0
3. Ground-water migration				
Depth to ground water	1	8	8	24
Net precipitation	0	6	0	18
Soil permeability	0	8	0	24
Subsurface flows	0	8	0	24
Direct access to ground water	NA	8	--	--
		Subtotals	8	90
Subscore (100 x factor score subtotal/maximum score subtotal)				9

C. Highest pathway subscore

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

Pathways Subscore **43**

IV. WASTE MANAGEMENT PRACTICES

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

Receptors	52
Waste Characteristics	48
Pathways	43
Total 143 divided by 3 =	47.67 Gross Total Score

B. Apply factor for waste containment from waste management practices

Gross Total Score x Waste Management Practices Factor = Final Score

47.67 x 1.0 = **48**

HAZARDOUS ASSESSMENT RATING FORM

NAME OF SITE: Site No. 19 - MOGAS Spill

LOCATION: Cannon AFB

DATE OF OPERATION OR OCCURRENCE: Early 1960s

OWNER/OPERATOR: Cannon AFB

COMMENTS/DESCRIPTION: Two occasions, MOGAS spills

SITE RATED BY: D. Moccia, G. McIntyre

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	3	3	9	9
D.	Distance to reservation boundary	2	6	12	18
E.	Critical environments within 1 mile radius of site	0	10	0	30
F.	Water quality of nearest surface-water body	0	6	0	18
G.	Ground-water use of uppermost aquifer	3	9	27	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	104	180

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

3. Hazard rating (H = high, M = medium, L = low) H

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

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

50 x 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 --

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

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
1. Surface-water migration				
Distance to nearest surface water	2	8	16	24
Net precipitation	0	6	0	18
Surface erosion	1	8	8	24
Surface permeability	1	6	6	18
Rainfall intensity	2	8	16	24
		Subtotals	46	108
Subscore (100 x factor score subtotal/maximum score subtotal)				43
2. Flooding	0	1	0	3
	Subscore (100 x factor score/3)			0
3. Ground-water migration				
Depth to ground water	1	8	8	24
Net precipitation	0	6	0	18
Soil permeability	0	8	0	24
Subsurface flows	0	8	0	24
Direct access to ground water	NA	8	--	--
		Subtotals	8	90
Subscore (100 x factor score subtotal/maximum score subtotal)				9

C. Highest pathway subscore

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

Pathways Subscore 43

IV. WASTE MANAGEMENT PRACTICES

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

Receptors	58
Waste Characteristics	40
Pathways	43
Total 141 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

Appendix J
GUIDELINES FOR A LIMITED PHASE II MONITORING PROGRAM FOR CANNON AFB

I. INTRODUCTION

The Phase II Installation Restoration Program will generate the field data needed to confirm or rule out the existence of hazardous contaminant migration at the identified sites. If appropriate, these data will be used in developing conceptual engineering remedial action alternatives.

Phase II will proceed in two or three parts (A, B, and C) depending on the findings in the first two parts. A Preliminary Survey is performed in Phase IIA. The purpose of this survey is to define the work plan, to determine the approach to be utilized in accomplishing the requirement of Phase II, and to estimate costs associated with performing the detailed surveys recommended for Phase IIB.

Phase IIB involves actual sampling and analysis to verify the presence and, if possible, the extent of movement of contamination. Following analysis of monitoring well samples, additional monitoring wells or other sampling methodologies may be required. This process may proceed through multiple iterations until sufficient data have been gathered to adequately confirm or deny the contamination and extent of movement. A Phase IIB report shall include the concentration, extent, directions, and rates of migration of the contamination; and, if possible, an assessment of hazards related to the contamination and the need for corrective action.

If the Phase IIB work does not generate adequate data to estimate the concentration, extent, and rate of migration of the contamination and assess most of the hazards related to the contamination, the Phase IIB report shall include recommendations for future monitoring wells, samples, etc. Based on the recommendations in the Phase IIB report, USAF OEHL may recommend to MAJCOM additional monitoring, sampling, or the initiation of Phase IIC. Phase IIC would involve additional quantification to define the directions and rates of migration of the contamination from the confirmed sites identified in Phase IIB. Once a final Phase IIC report has been written and approved, required phased follow-on actions can be programmed.

II. SAMPLING LOCATIONS, ANALYSES, AND DATA EVALUATION

Sampling is recommended for: (1) the zone consisting of the Fire Department Training Area No. 4 (Site No. 9) and Landfill No. 5 (Site No. 5), (2) the AGE Drainage Ditch (Site No. 15) and (3) the Fire Department Training Area No. 1 (Site No. 6) (see Figure 18 for locations). Recommended preliminary sampling locations are shown on Figures 19, 20, and 21. Final sampling point selection should be done by the Phase II contractor after a preliminary site visit. The purpose of the preliminary site visit will be to:

- Establish base contact
- Observe and record site features
- Establish approximate areal limits of the sites
- Locate utilities present at sites, if any
- Identify any unusual or potentially hazardous conditions, if any, that could impact well installation or sampling programs
- Select the final sampling locations

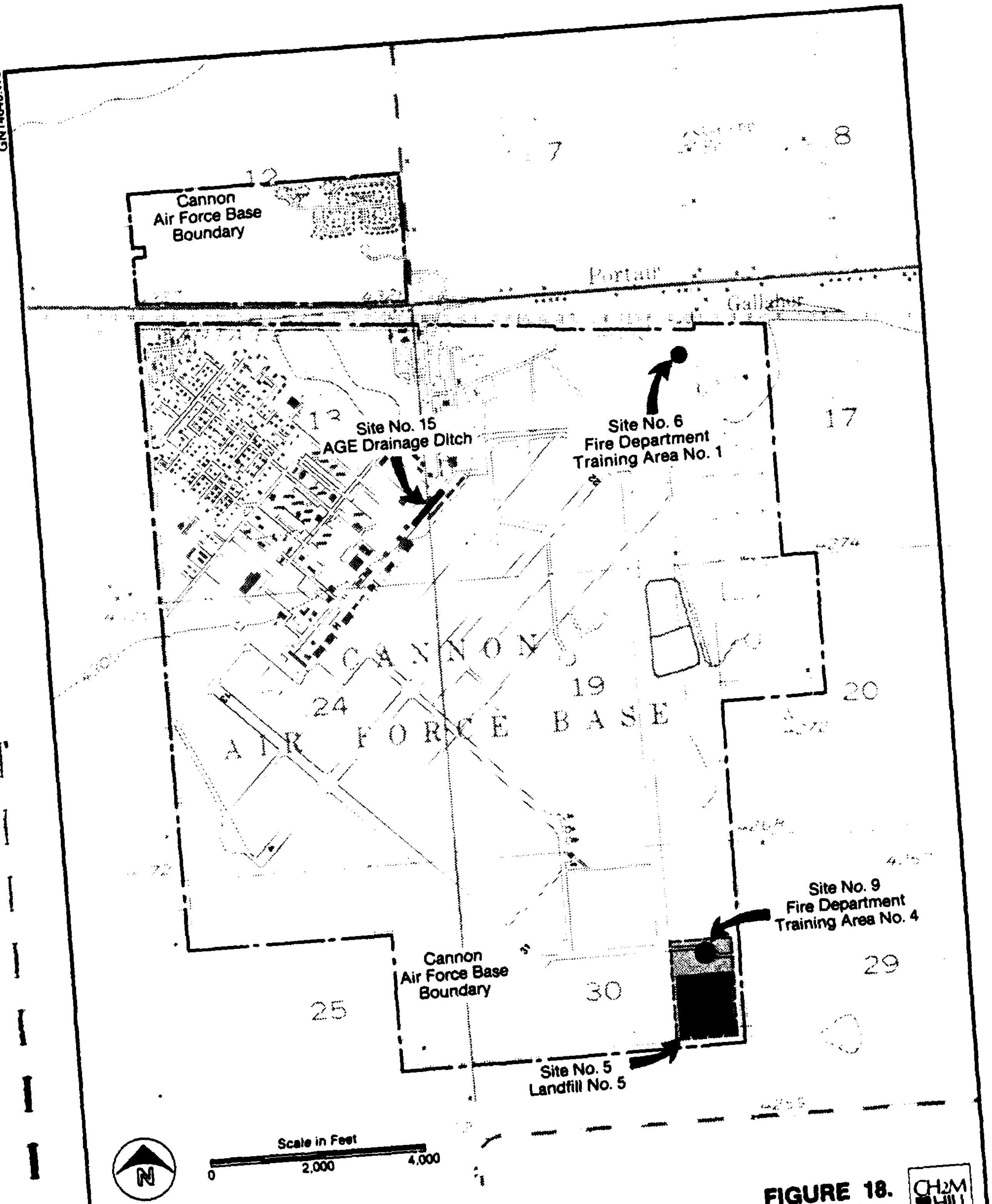

FIGURE 18.
Location Map of Sites Recommended for Limited Phase II Monitoring.

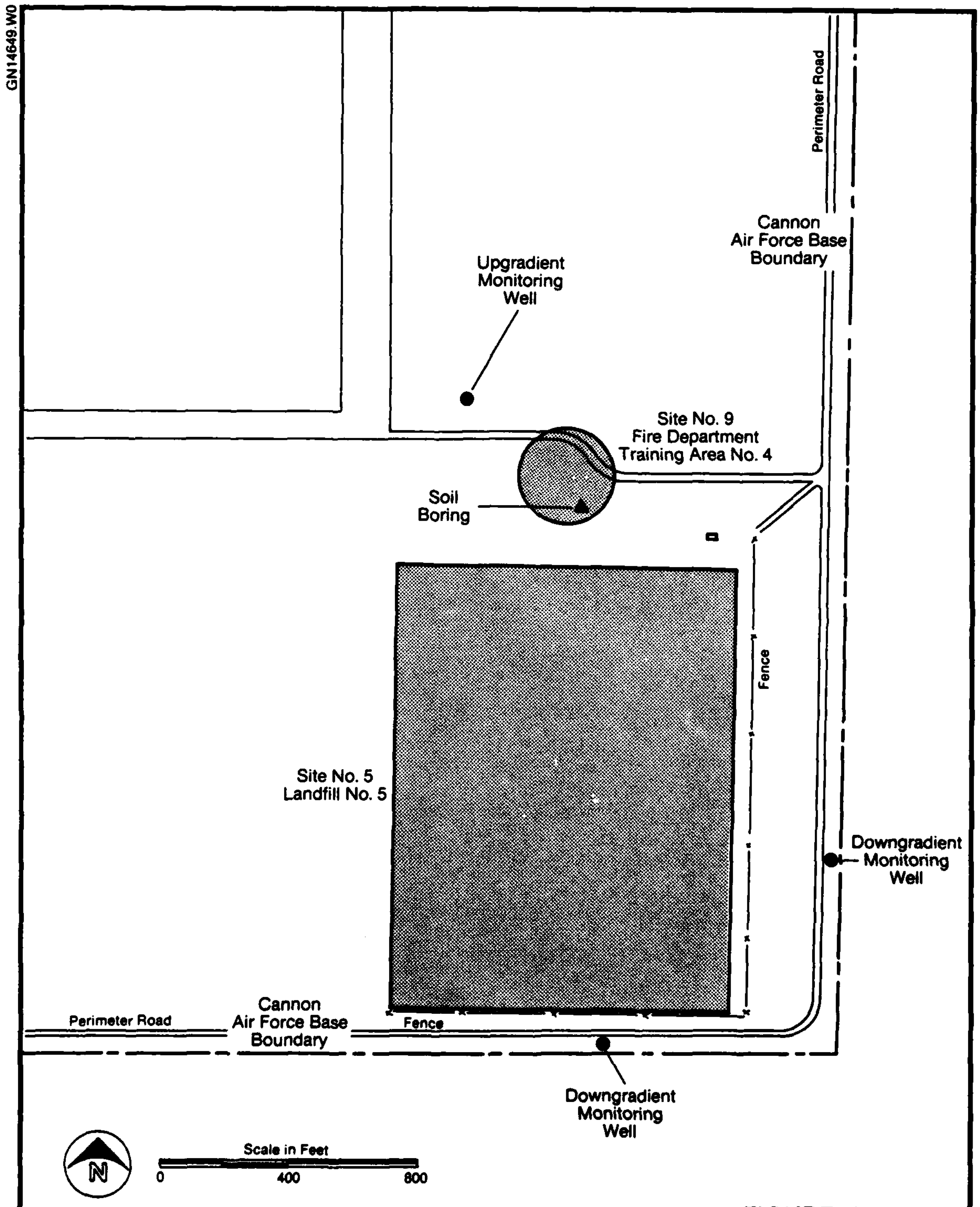

FIGURE 19.
Recommended Preliminary Sampling Locations for Zone Consisting of Sites No. 9 and No. 5—Fire Training Area No. 4 and Landfill No. 5, Respectively.

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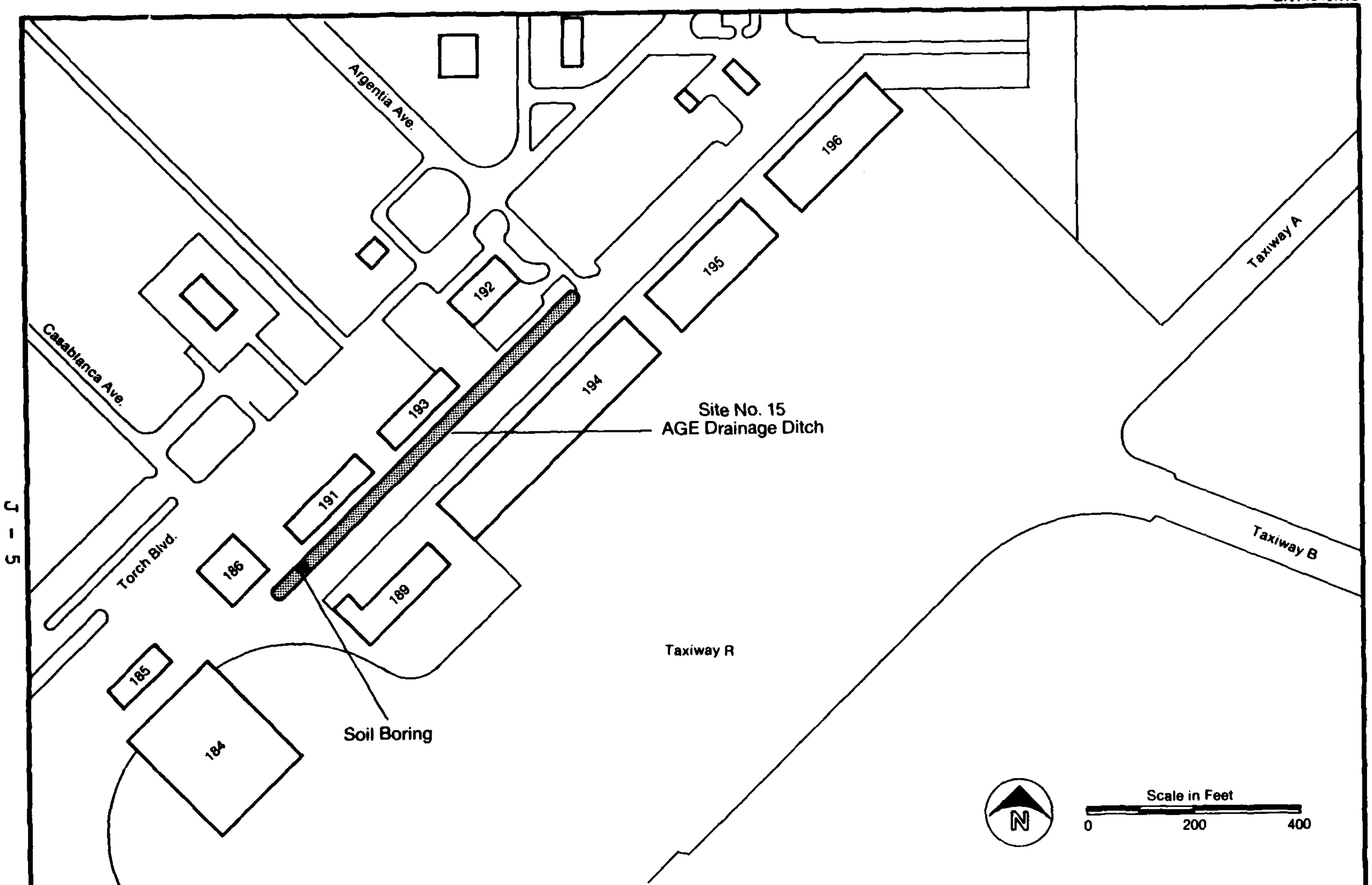

FIGURE 20.
Recommended Preliminary Sampling Location for Site No. 15—AGE Drainage Ditch.

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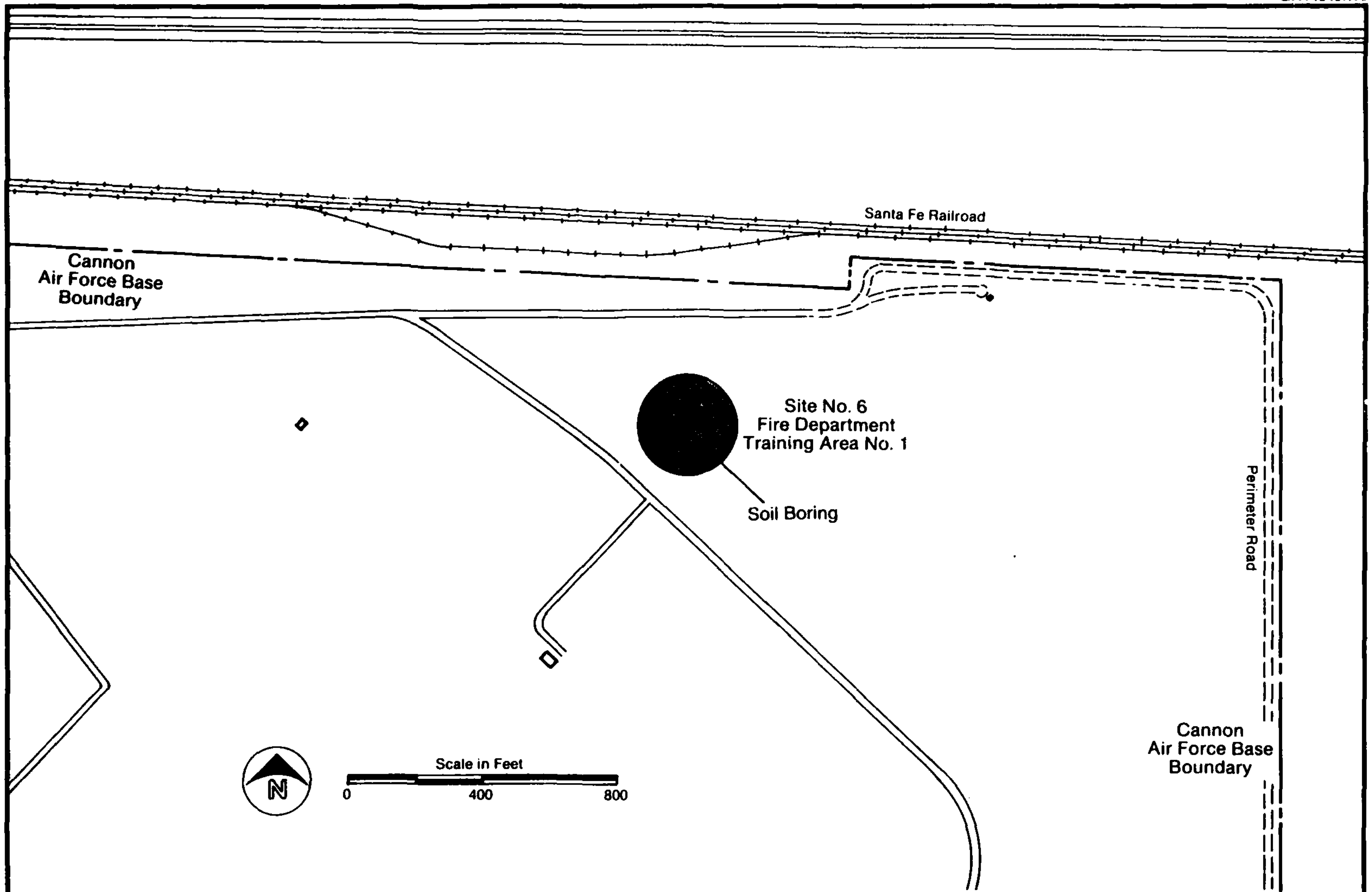

FIGURE 21.
Recommended Preliminary Sampling Location for Site No. 6—
Fire Department Training Area No. 1.

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The analyses suggested for the limited Phase II program have been described previously in Section VI, "Recommendations," Table 8. Soil samples collected at Sites No. 9, 15 and 6 should be collected once. Ground-water samples collected from monitoring wells at the zone consisting of Sites No. 9 and 5 should be collected on two occasions at least 30 days apart.

The data collected should be evaluated in terms of applicable ground- and surface-water quality criteria. If water quality standards or criteria are not available for some of the parameters, then it is suggested that available toxicological information be used.

For the zone consisting of Sites No. 9 and 5 (ground-water samples), three general cases are possible:

<u>Case 1</u>: Both samples indicate pollutants are not present or are present at levels below the recommended water quality standards or criteria or below recommended levels based on toxicological information.

<u>Case 2</u>: Both samples indicate pollutants <u>are</u> present and at levels higher than the recommended water quality standards or criteria or the recommended levels based on toxicological information.

<u>Case 3</u>: One of the two samples shows the presence of pollutants at levels higher than the recommended water quality standards or criteria or the recommended levels based on toxicological information.

Suggested actions for dealing with each case are given below:

Case 1 Action--If none of the analyzed pollutants are detected, delete the study site from further consideration. If one or more pollutants are detected but at levels lower than the recommended levels, then based upon an evaluation of the number, type, and concentrations of pollutants found, consideration should be given to continued monitoring or deleting the site from further action.

Case 2 Action--Develop a program to determine the extent of contaminant migration. As a minimum, the following would be applicable:

- Confirm ground-water flow direction.
- Establish background ground-water quality.
- Define local extent of leachate plume.
- Define the rock profile, soil material types, and distribution.
- Obtain any additional information deemed necessary by the contractor to develop conceptual remedial action alternatives.

Case 3 Action--Collect a third sample at least 30 days after the second sample was collected. If the third sample shows the presence of contaminants in excess of the recommended levels, follow Case 2 action. If the sample shows no contaminants present or at levels below the recommended levels, follow Case 1 action. This additional sampling is recommended as a precaution to ensure that significant contaminant migration is not occurring from the site.

For Sites No. 9, 15, and 6 (soil samples), two general cases are possible:

Case 1: The samples indicate that pollutants are not present or are present at low levels.

Case 2: The samples indicate that pollutants are present at high levels.

Suggested actions for dealing with each case are given below:

Case 1 Action--If none of the analyzed pollutants are detected, delete the study site from further consideration. If one or more pollutants are detected but at low levels, then based upon an evaluation of the number, type, and concentration of pollutants found, consideration should be given to continued monitoring or deleting the site from further action.

Case 2 Action--Develop a program to determine the extent of contaminant migration. As a minimum, the following would be applicable at each study sites:

o Define vertical extent of contaminant migration, e.g., deeper soil borings.

o Define the areal extent of contaminant migration with more sampling locations.

o Define the necessity of monitoring well installation based on an evaluation of the data obtained from the additional soil borings.

III. MONITORING WELL INSTALLATION

Construction of monitoring wells during either the initial field investigation or the remedial investigation should follow the procedures described in this appendix. A qualified and experienced geologist or geotechnical engineer should be present with each rig throughout the well drilling to direct progress of the work, log all soil samples, record all pertinent observations, and label all samples. This field representative should also direct the development of the wells and conduct the field permeability tests (aquifer tests).

Soil Sampling and Logging

A soil boring should be made at each proposed monitoring well location prior to installation of the well casing. The results of the soil boring will be used to confirm the anticipated soil stratification, permeabilities, bedrock depth and type, and ground-water table. Details of the monitoring well construction may be adjusted appropriately based on these findings, including screened interval, depth of well, gravel-pack gradation, screen slot size, or installation/development methodology. In addition, soil samples will be obtained which may be used to confirm anticipated soil properties such as gradation, plasticity, or permeability by performing appropriate laboratory tests. In addition, soil samples may be submitted for pollutant analysis based upon the discretion of the field representative and any observations of contamination made during the soil sample logging.

The soil borings should be made using a 4- to 6-inch nominal diameter rotary drill rig. Disturbed soil samples are to be taken at 5-foot intervals and at other intermediate depths as may be required to adequately describe the subsurface conditions in the judgment of the field representative. Samples should be taken by thoroughly circulating drilling fluid at each interval and collecting the composite interval sample as close to the borehole as possible. After sampling has been completed, the soil borings should be properly sealed to prevent a pathway for contaminant migration.

The soils encountered should be classified by the field inspector in accordance with the Unified Soil Classification System (ASTM D2488) and in accordance with any specific DoD requirements. The soil description should include the soil name, gradation or plasticity, estimated particle-size distribution, color, consistency, soil structure or minerology, local or geologic name, and the USGS group symbol. Any abnormalities encountered during the drilling operations, such as changes in drilling rates or stratification, should be noted.

Well Installation

The recommended construction of each well is shown schematically on Figure 22. In general, the wells at Site No. 5 should be installed so that the slotted section of the well is located between a depth of 330 to 400 feet below the ground surface, within the Ogallala Formation. Final depth of the well is expected to be approximately 400 feet below the ground surface.

The wells should be drilled using a mud rotary drill rig at least 8 inches in diameter by reaming the borehole made during the soil boring. Well casings should consist of 4-inch-diameter Schedule 40 PVC pipe with threaded (screw-type) joints; no adhesive compounds should be used. The well screen will vary in length, depending on the total

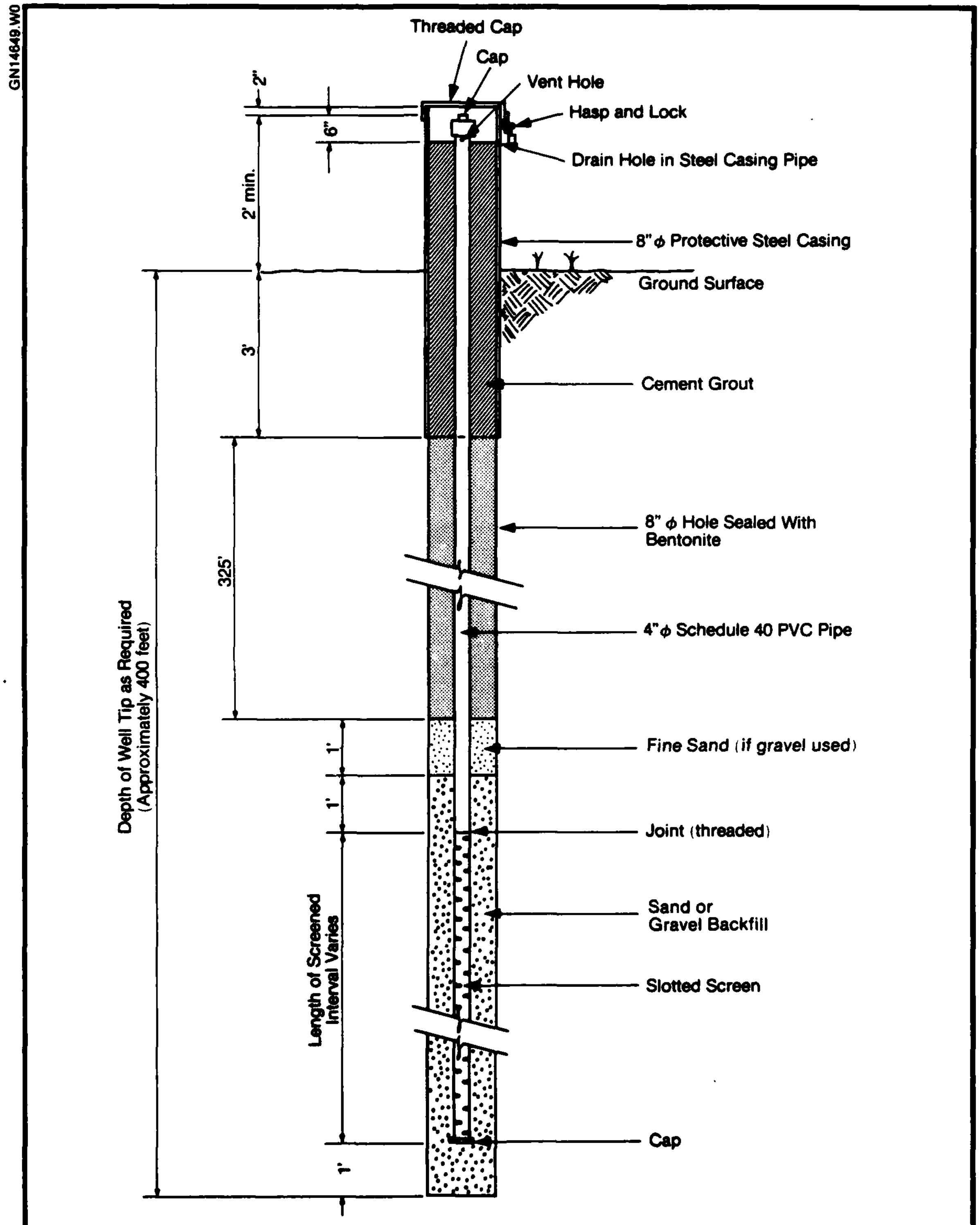

FIGURE 22.
Typical Monitoring Well Installation.

depth of the well. The screen should consist of factory-fabricated slots between .01 and .04 inches wide.

The well casing and screen should be centered in the 8-inch hole. A washed, medium-grained sand, similar to concrete sand (ASTM C33) should then be placed around the screen and the hole. The Phase II contractor should be responsible for selecting the exact slot size and backfill gradation for the well.

Above the sand or gravel backfill, a 325-foot interval of bentonite clay pellets should be used to seal the well. Neat cement grout, consisting of about 7 gallons of water per 94-pound bag of Portland cement, should be used to fill the annulus above the bentonite at the ground surface.

Each well casing should rise about 2 feet above the ground surface and should be capped with an unthreaded, removable PVC cap. A 8-inch-diameter iron pipe should be placed over the casing and embedded at least 3 feet. A cap should be placed on top of the iron pipe, with a hasp and key-lock padlock to secure the well.

Well Development

Once a well has been completed, it should be developed by bailing the hole a minimum of 5 times its volume below the water table, or until the resulting water is, in the opinion of the field representative, sufficiently clear to ensure proper functioning of the developed well. Methods of well development that cause reversals of flow, or surging, through the screen may be used. Static water levels should be measured and recorded both prior to and at least 24 hours following well development.

Aquifer tests consisting of falling or rising head field permeability tests should be performed in each completed and developed well.

Well Survey

Each monitoring well should be surveyed to establish horizontal control within about 3 feet; these locations should be shown on existing installation maps. Vertical control should be established within about 0.1 foot with respect to USGS datum (mean sea level) for the ground surface and the top of each PVC well casing.

IV. SAMPLING PROTOCOL GUIDELINES

A sampling protocol is a plan that addresses the steps necessary to ensure the technical adequacy and validity of a sampling and analysis program. A sampling program should address the following items:

- Sample bottle preparation
- Sampling procedure
- Sample preservation and holding times
- Sample shipping
- Record keeping
- Analytical procedures
- Quality assurance

Sample Bottle Preparation

Sample bottle preparation includes selecting the type and size container and the proper cleaning procedure to protect against sample contamination. All three items are dependent upon the parameter to be tested for. EPA-recommended procedures for sample bottle preparation should be followed.

Sampling Procedure

Specific sampling procedures must be developed. These procedures are dependent on the nature of the sampling location (i.e., well, surface stream, etc.), the size of sample required, and any special techniques necessary due to the nature of the parameter or parameters to be tested.

Sample Preservation and Holding Times

Requirements for sample preservation and holding times are specific to the parameters being tested. Typical preservation techniques may include adding a chemical preservative to the sample and keeping the sample cooled to 4°C until time for analysis. Holding times are critical. When properly preserved, some samples can be stored for days while others should be analyzed as soon as possible. EPA-recommended sample preservation procedures and holding times should be adhered to.

Sample Shipping

Sample shipping should be planned to minimize in-transit times. Proper protection should be provided to minimize the possibility of breakage or sample spoilage.

Record Keeping

Record keeping should include tagging each sample with the pertinent information such as sample number, location, time of collection, required analyses, etc. Chain-of-custody records should be maintained to provide a record of the routing of each sample and the names of the personnel receiving and handling the samples.

Analytical Procedures

The analytical procedures to be used must be standard approved methods and should be properly referenced. Any deviations from standard approved procedures should be well documented and agreed to by the proper parties in advance.

Quality Assurance

Quality assurance of analytical results should be maintained throughout a sampling program. Elements of a quality assurance program may include the periodic analysis of blank samples to determine if sample contamination is occurring. To verify the accuracy of the laboratory, samples spiked with a known quantity of the constituent to be tested should occasionally be submitted for analysis. Another technique to verify laboratory accuracy involves splitting samples between the prime lab and one or more other labs.

V. HEALTH AND SAFETY PLAN

A. The Phase II contractor must take appropriate measures to ensure the health and safety of his employees. Each of the study sites was visited by the Phase I contractor and, based on his visits, the sites do not appear to pose a significant hazard to visiting personnel. The samples that will be collected at each site are water and soil samples as opposed to "hazardous waste" samples and no need for unusual levels of personal protection are anticipated. Nonetheless, the Phase II contractor will have the final responsibility for determining the necessary health and safety measures.

B. The Phase II contractor should have health and safety plans that address, as a minimum, the following items:

- Responsibility of employees with regard to safety
- Pathways of personal physical exposure
- Initial hazard assessment
- Emergency treatment
- Safety and protective equipment

1. Employee Safety

When visiting the sites, employees should use common sense, judgment, and experience. They should have reviewed in advance all existing data on the site to determine if any safety precautions are necessary. Smoking is not permitted in the vicinity of the Fire Department Training Area No. 4 (Site No. 9).

2. Pathways of Physical Exposure

The Phase I study indicated that hazardous wastes may have been disposed of in the past at the identified sites. Because of the potential for exposure to these wastes, personnel should be aware of the pathways by which the materials can enter their body and how to prevent that entry. There are four (4) pathways:

- o Inhalation
- o Skin absorption
- o Ingestion
- o Eye contact

Inhalation is best prevented by not breathing in direct proximity to the waste or using a respirator appropriate for the type of hazardous material.

To prevent or minimize skin absorption, a combination of gloves, boots, hats, and coveralls should be worn. Although this clothing does not provide absolute protection, it should provide ample protection for personnel working at either of the sites.

To prevent ingestion, do not eat, drink, or smoke during visits to the sites.

To prevent eye contact, wear safety glasses, chemical goggles, or a face shield (without side perforations); do not rub eyes; and do not wear contact lenses. (Contact lenses cannot be worn with self-contained breathing apparatus or respirators.)

3. <u>Initial Site Hazard Assessment</u>

Although the Phase I contractor has visited the identified study sites and perceives no imminent hazard associated with the sites, the Phase II contractor should satisfy himself that hazards do not exist at the sites. He should review all available information on the sites and toxicological data on any materials suspected of being present at the sites to determine what protective clothing and equipment are required for the site visits. He should satisfy himself that fire, explosion, high levels of air contaminants, and nuclear radiation hazards are not present prior to entering either site.

4. Emergency Treatment

Before entering each site, the field team should know the locations and telephone numbers of the nearest emergency facilities (medical, fire, police, etc.). It is advisable that all field personnel have training in first aid and be prepared to provide emergency treatment for inhalation or ingestion of hazardous materials and skin exposure to or eye contact with hazardous materials.

5. Safety and Personnel Protective Equipment

For adequate protection against exposure to hazardous substances, should they be encountered at the identified sites, it is advisable that all employees have available first aid and safety equipment, protective clothing, and respiratory equipment. As a minimum, first aid equipment should include a first aid kit and a first aid handbook. Other first aid items include a supply of clean water, a potable eyewash unit, and oxygen bottles. Safety equipment might include an explosivity meter, radiation detector, organic vapor analyzer, and a list of emergency telephone numbers.

Protective clothing that might be needed in the field includes safety glasses, goggles and/or face shield, protective boots, protective gloves, spill-resistant coveralls, or plain coveralls with chemical protective apron worn over them.

Three kinds of respiratory protection devices are available:

- Self-contained breathing apparatus (SCBA)
- Supplied air or air line respirator
- Air-purifying respirator

Determination of the proper type to use and its use requires formal training. The self-contained breathing apparatus provides the most complete breathing protection for periods of time based on the amount of breathing air supplied and the breathing demand of the wearer. Normally, protection is provided for about 20 minutes.

The supplied air device delivers air through a supply hose and is generally used for long-term entry into a hazardous area.

The air-purifying device removes contaminants from the atmosphere to some degree and can be used only in atmospheres containing sufficient oxygen to sustain life.

Should it be determined that respiratory equipment is warranted at the identified study site, the latter would probably be the most applicable device.

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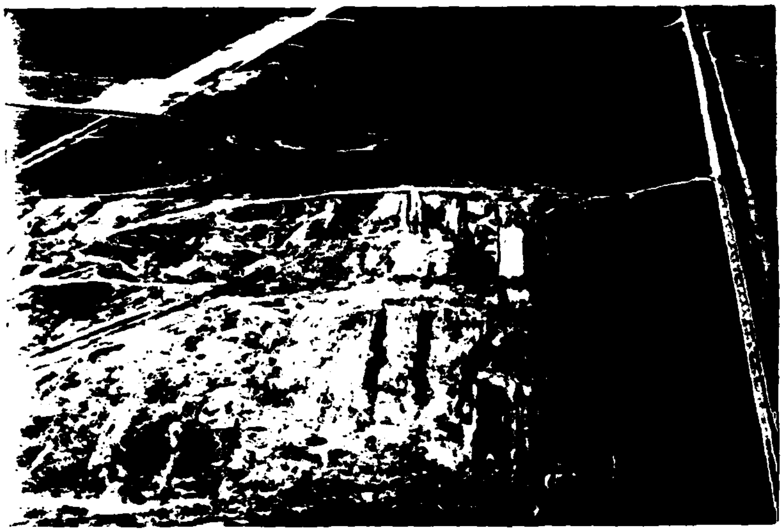
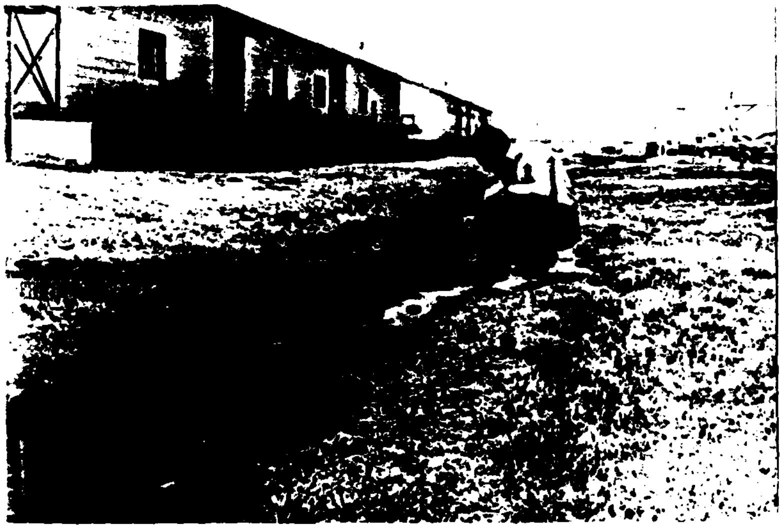


Site No. 9—Fire Department Training Area No. 4 (Upper Center) and Site No. 5—Landfill No. 5 (Looking North).



Site No. 15—AGE Drainage Ditch (Looking Northeast)

FIGURE 23.
Photographs of Sites No. 9, 5, and 15.

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