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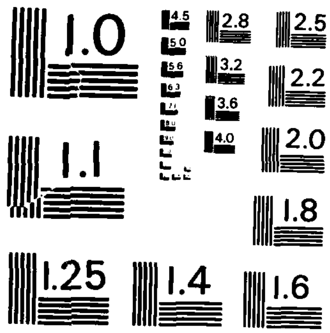

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AD-A163 667

INSTALLATION RESTORATION PROGRAM

PHASE I: RECORDS SEARCH

ANDERSEN AIR FORCE BASE, GUAM

PREPARED FOR:

UNITED STATES AIR FORCE
HQ SAC / DEPV
OFFUTT AFB, NEBRASKA

WITH THE
ASSISTANCE OF:

HQ AFESC / DEVP
TYNDALL AFB, FLORIDA

SUBMITTED BY:

REYNOLDS, SMITH AND HILLS, INC.
JACKSONVILLE, FLORIDA

ENVIRONMENTAL SCIENCE AND ENGINEERING, INC.
GAINESVILLE, FLORIDA

MARCH 1985

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11. Title: Installation Restoration Program, Phase I Records Search for Andersen AFB, GU

19. A search of USAF, state and federal agency records and interviews with past and present base personnel and agency representatives were conducted to identify past hazardous waste generation and disposal practices at Andersen AFB, Guam. Andersen AFB is located on the northeastern end of the island of Guam, Mariana Islands, in the southwest region of the Pacific Island (3,318 miles west of Hawaii, 1,499 miles east of the Phillipines, and 1,563 miles southwest of Japan). Twenty locations and/or facilities were identified as potential hazardous waste sites. Follow-on recommendations included alternate techniques for handling hazardous wastes, confirmation studies and in some cases, closure of existing hazardous waste disposal sites.

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INSTALLATION RESTORATION PROGRAM

PHASE I: RECORDS SEARCH

ANDERSEN AIR FORCE BASE, GUAM

Prepared for:

UNITED STATES AIR FORCE
HQ SAC/DEPV
Offutt AFB, Nebraska

With the Assistance of:

HQ AFESC/DEVP
Tyndall AFB, Florida

Submitted by:

REYNOLDS, SMITH AND HILLS, INC.
Jacksonville, Florida

ENVIRONMENTAL SCIENCE AND ENGINEERING, INC.
Gainesville, Florida

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EXECUTIVE SUMMARY

INTRODUCTION

The Department of Defense (DOD) has developed a program to identify and evaluate past hazardous material disposal sites on DOD property, to control the migration of hazardous contaminants, and to control hazards to health or welfare that may result from these past disposal operations. This program is known as the Installation Restoration Program (IRP) and consists of four phases: Phase I--Initial Assessment/ Records Search, Phase II--Confirmation and Quantification, Phase III-- Technology Base Development, and Phase IV--Operations/Remedial Actions. Environmental Science and Engineering, Inc. (ESE), as a subsidiary of Reynolds, Smith and Hills, Inc. (RS&H), conducted the Phase I study for Andersen Air Force Base (AAFB), with funds provided by the Strategic Air Command (SAC), under Contract No. F08637-83 G0010 5004.

INSTALLATION DESCRIPTION

AAFB is located on the northeastern end of the island of Guam, Mariana Islands, in the southwest region of the Pacific Ocean. The island of Guam is located 3,318 miles west of Hawaii, 1,499 miles east of the Philippines, and 1,563 miles southwest of Japan. The island of Guam is approximately 30 miles in length and varies from approximately 4 to 8.5 miles in width. Communities located near the main base include Yigo and Dededo. In addition to the main base area, other Air Force properties include Northwest Field, Andersen Petroleum Product Storage Annexes 1 and 2, Andersen Water Supply Annex (two locations), Andersen Air Force Station, AAFB South (also known as Andersen Administration Annex and Marbo Annex), Andersen Radio Beacon Annex, Andersen Communication Annexes 1 and 2, and various Andersen family housing annexes. The Air Force currently controls 20,811.12 acres of real property, with the largest section (15,463.28 acres) consisting of the AAFB main base, storage area, and Northwest Field. Many property holdings have been declared excess and are in the process of being transferred to the Navy and various agencies of the Government of Guam.

After U.S. Forces recaptured Guam during World War II, the Army Air Force constructed three bases: Harmon Field--an aircraft repair and maintenance facility; Northwest Field--a fighter plane base; and North Field--a base designed for B-29 bombers. At the end of the war, Harmon and Northwest Fields were closed. North Field was redesignated AAFB in 1949. Throughout the years of operation, AAFB has been a base of operations for bomber aircraft and their support activities.

Historically, aircraft stationed at Guam have included B-29s, B-50s, B-36s, B-47s, B-52s, and KC-135s. Currently, aircraft assigned to AAFB include B-52s and KC-135s. The B-52 aircraft are permanently assigned to AAFB, whereas the KC-135 aircraft and their associated support units are assigned on a rotational basis. The base is currently under the command of SAC's 3rd Air Division, and support functions are provided by various support groups of the 43rd Strategic Wing.

ENVIRONMENTAL SETTING

Environmental setting data relevant to the evaluation of past waste management practices at AAFB are described in the following paragraphs.

AAFB is located on a limestone plateau on the northern end of Guam. Elevations on the base range from mean sea level (msl) to more than 620 feet (ft) msl. The northern end of the island is characterized by steep limestone cliffs. The northern limestone plateau is relatively flat, except for two hills of volcanic origin [Mount Santa Rosa (858 ft msl) and Mataguac Hill (630 ft msl)] and one limestone dome (Barrigada Hill, 665 ft msl). The area also has numerous sinkholes and natural depressions.

No surface streams exist on the northern end of Guam. Storm water on AAFB is channeled relatively short distances into natural or manmade depressions in which dry injection wells have been drilled. These dry wells allow infiltration of surface waters into the aquifer. More than 100 of these injection wells have been installed on AAFB.

The major aquifer underlying AAFB is known as the Northern Lens Aquifer and consists of a parabasal unit, a basal unit, and a transition zone. The aquifer consists of a wedge of up to 150 ft of fresh water overlying salt water. Recharge occurs through the downward percolation of precipitation through the highly porous limestone overlying the aquifer and also through the dry injection wells.

Soils on AAFB are very thin and are residuals of weathered limestone and volcanic materials. The soils are very porous, have relatively high levels of organic materials (4 to 6 percent), and are locally known as Guam clay. These soils are highly susceptible to infiltration of contaminants.

Average annual rainfall at AAFB is 90.8 inches, with more than 60 percent occurring during the local wet season (July to November) at an average rate of more than 11 inches per month. Average monthly temperatures are relatively stable throughout the year, varying from a mean low of 75°F to a mean high of 84°F. An extreme minimum of 66°F in January and an extreme maximum of 91°F in August have been recorded.

Several threatened or endangered species are known to occur on AAFB and in the area, including Mariana fruit bat, Guam broadbill, Mariana crow, Micronesian kingfisher, Guam rail, and bridled white-eye. AAFB personnel, working with the Guam Aquatic and Wildlife Resources Division, are trying to both identify and maintain the habitat of the Guam rail. In known habitat areas, a trapping program has been established in an attempt to control the Philippine rat snake, a potential predator of the Guam rail.

As a result of the geohydrological environment and soil characteristics, conditions on AAFB are conducive to contaminant migration. Potential contaminant migration would occur both vertically and laterally through the porous limestone into the Northern Lens Aquifer, the largest freshwater aquifer used as a potable water source on Guam.

METHODOLOGY

During the course of this investigation, interviews were conducted with base personnel (past and current) familiar with past waste disposal practices; file searches were performed for past hazardous waste activities; interviews were held with local, state, and Federal agencies; and field inspections were conducted at past hazardous waste activity sites.

Sites identified as potentially containing hazardous contaminants resulting from past activities have been assessed using the Hazard Assessment Rating Methodology (HARM), in which factors such as site characteristics, waste characteristics, potential for contaminant migration, and waste management practices are considered. The details of the rating procedure are presented in App. G. The HARM system is designed to indicate the relative need for followup action (Phase II).

CONCLUSIONS

The goal of the IRP Phase I Study is to identify sites where there is a potential for environmental contamination resulting from past waste disposal practices and to assess the potential for contaminant migration from these sites. Twenty sites were identified at AAFB as having potential for environmental contamination and have been evaluated using the HARM system. The relative potential of the sites for environmental contamination was assessed, and sites which may require further study and monitoring were identified. These sites, dates of operation or occurrence, and the HARM results are given in Table 1. Site locations are shown in Figs. 1, 2, and 3. Sites of primary concern are those with higher HARM scores which have a higher potential for environmental contamination and should be investigated in Phase II. Sites of secondary concern are those with lower HARM scores and moderate

Table 1. Priority Ranking of Potential Contamination Sources on AAFB

Rank	Site	Figure	Designation	Date of Operation or Occurrence	Score
1	Landfill No. 25	2	LF-25	1945-1962	86
2	Landfill No. 1	1	LF-1	1945-present	65
3	Landfill No. 2	1	LF-2	1947-1974	65
4	Landfill No. 10	1	LF-10	Early to mid-1950s	65
5	Landfill No. 3	1	LF-3	1947-1977	64
6	Stormwater Drainage System, Zone No. 1	1	SDS-1	Late 1940s-present	62
7	Landfill No. 13	1	LF-13	1951-1956	62
8	Firefighter Training Area No. 1	1	FTA-1	1945-1958	59
9	Hazardous Waste Storage Area No. 1	1	HW-1	1950s-1983	58
10	Stormwater Drainage System, Zone No. 3	1	SDS-3	Late 1940s-present	57
11	Firefighter Training Area No. 2	1	FTA-2	1958-present	57
12	Stormwater Drainage System, Zone No. 2	1	SDS-2	Late 1940s-present	56
13	Chemical Disposal Site No. 1	1	CS-1	1970s	55
14	Landfill No. 16	1	LF-16	Late 1950s-early 1960s	54
15	Drum Storage Area No. 2	1	DS-2	?-present	50
16	Chemical Disposal Site No. 2	1	CS-2	1950-1952	45
17	Drum Storage Area No. 1	1	DS-1	?-present	43

Table 1. Priority Ranking of Potential Contamination Sources on AAFB (Continued, Page 2 of 2)

Rank	Site	Figure	Designation	Date of Operation or Occurrence	Score
18	Chemical Disposal Site No. 3	3	CS-3	1950s-1970s	41
19	Landfill No. 22	3	LF-22	Mid-1950s-early 1960s	38
20	Chemical Disposal Site No. 4	3	CS-4	1950s	37

Source: ESE, 1985.

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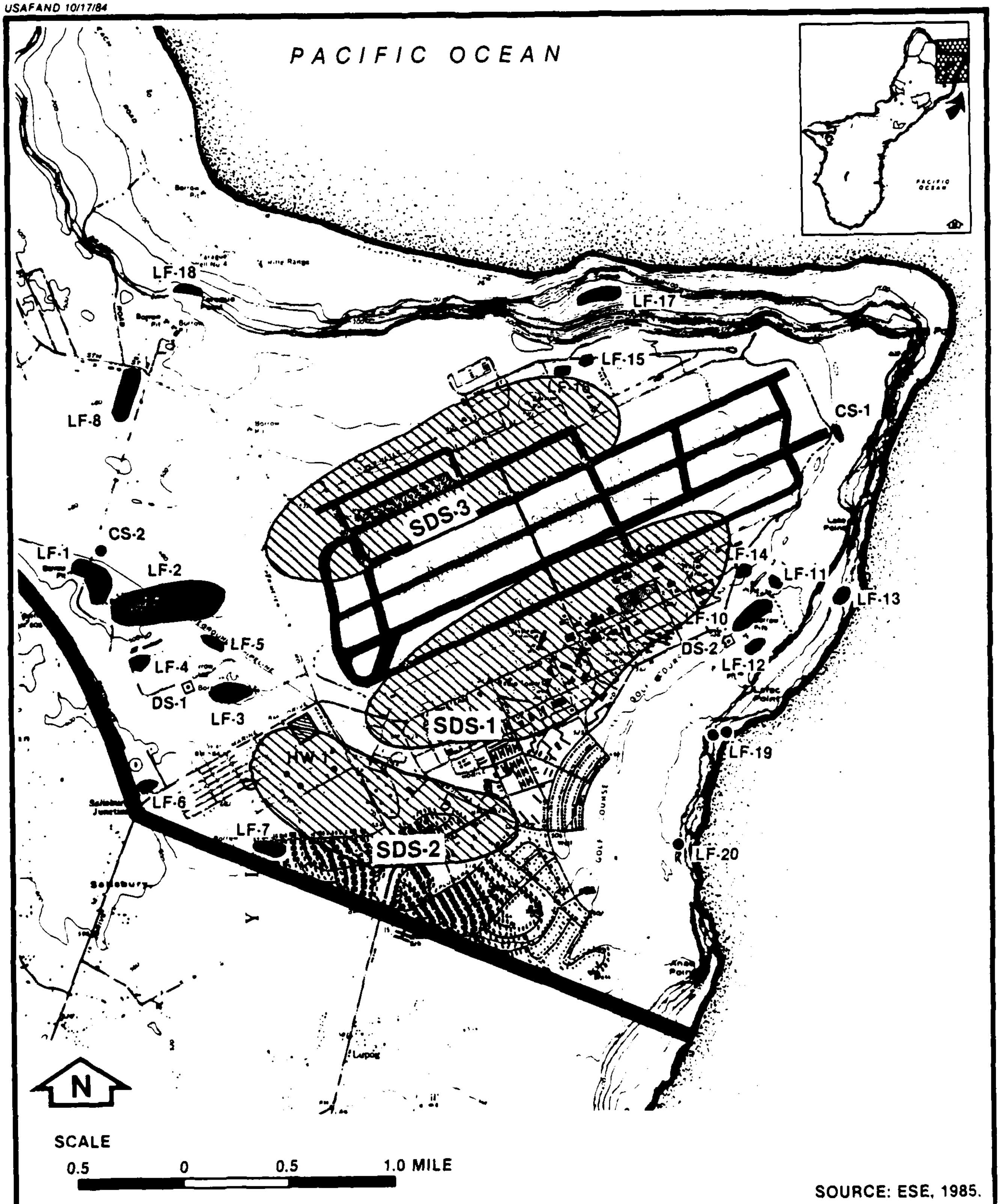

Figure 1
LOCATIONS OF POTENTIAL CONTAMINATION ON EASTERN PART OF AAFB

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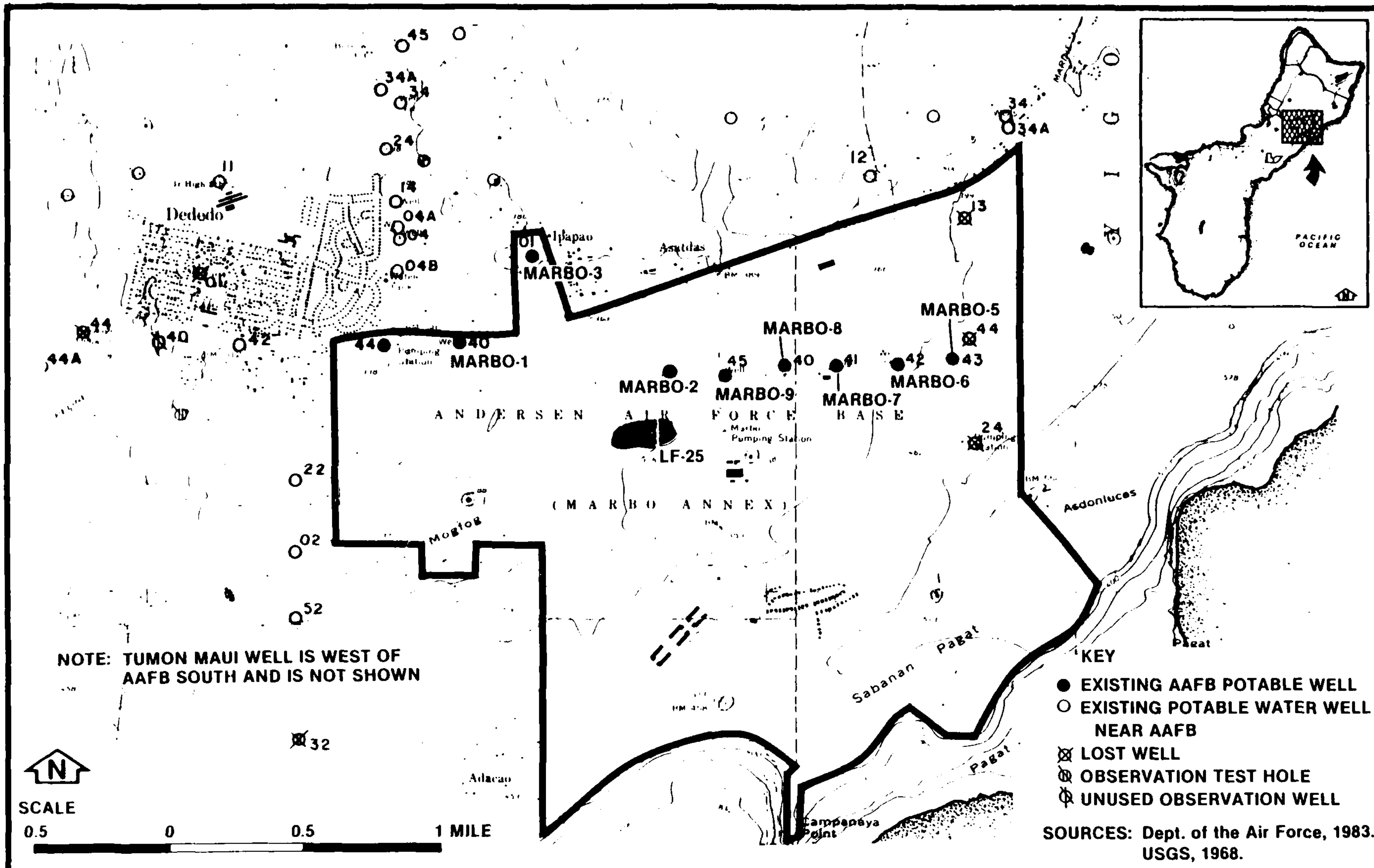

Figure 2
LOCATIONS OF POTENTIAL CONTAMINATION ON AAFB SOUTH (MARBO ANNEX)

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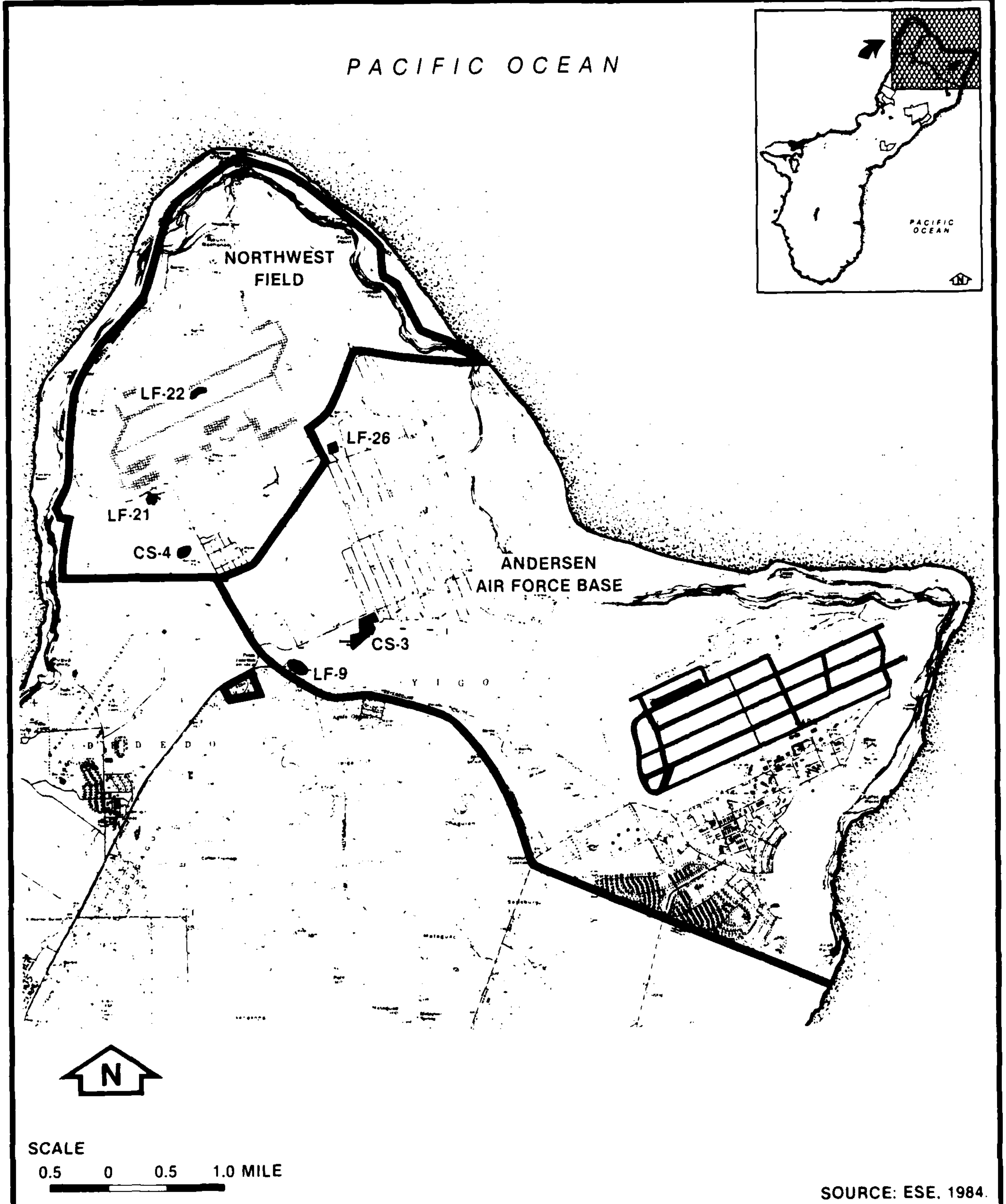

Figure 3
LOCATIONS OF POTENTIAL CONTAMINATION ON WESTERN PART OF AAFB AND NORTHWEST FIELD

INSTALLATION RESTORATION PROGRAM
Andersen Air Force Base

potential for environmental contamination. Further study at these sites is recommended, but the need for investigation is less than for the sites with higher rankings.

RECOMMENDATIONS

The recommended actions are intended to be used as a guide for the development and implementation of the Phase II study. The detailed recommendations developed for further assessment of environmental areas of concern are presented in Sec. 6.0. These recommendations are summarized as follows.

Landfill No. 25 (LF-25)	It is recommended that four monitor wells be installed around the landfill. These wells and other potable water supply wells on AAFB South, wells in the community of Dededo, and the Tumon Maui well should be sampled. The samples should be analyzed for the parameters in List A, Table 6.1-2. It is also recommended that a geophysical survey be performed to determine the areal extent of the landfill prior to installation of the monitor wells.
Landfill No. 1 (LF-1)	It is recommended that five monitoring wells be installed around the disposal complex on AAFB, of which LF-1 is the area currently operating as a landfill. A geophysical survey should be performed to delineate the boundaries of the fill area. In

addition, lysimeters should be installed at LF-1 and sampled during the wet season. Samples collected should be analyzed for the parameters in List A, Table 6.1-2.

Landfill No. 2 (LF-2)	It is recommended that a geophysical survey be performed to determine the areal extent of LF-2. Lysimeters should be installed and sampled during the wet season. Samples should be analyzed for the parameters in List A, Table 6.1-2.
Landfill No. 10 (LF-10)	A geophysical survey and the installation of lysimeters are recommended for LF-10. Samples should be collected during the wet season and analyzed for the parameters in List B, Table 6.1-2.
Landfill No. 3 (LF-3)	A geophysical survey and the installation of lysimeters are recommended for LF-3. Samples should be collected during the wet season and analyzed for the parameters in List A, Table 6.1-2.
Stormwater Drainage System, Zone No. 1 (SDS-1)	It is recommended that a survey be performed to determine the sources of potentially hazardous substances entering the storm drainage dry-well injection system. It is recommended that other methods of disposal be

	found for these potential contaminants. It is also recommended that consideration be given to closing and filling injection wells in certain areas where the control of potential contaminants is not feasible. No sampling program is recommended at the injection well sites in SDS-1.
Landfill No. 13 (LF-13)	A geophysical survey and the installation of lysimeters are recommended for LF-13. Samples collected should be analyzed for the parameters in List B, Table 6.1-2.
Firefighter Training Area No. 1 (FTA-1)	Lysimeters should be installed at FTA-1. In addition, a hydrocarbon survey should be performed using an organic vapor analyzer (OVA) during installation of the lysimeters. Samples collected should be analyzed for the parameters in List B, Table 6.1-2.
Hazardous Waste Storage Area No. 1 (HW-1)	HW-1 is in the area encompassed by the ground water monitoring program described under LF-1. No other monitoring is recommended.
Stormwater Drainage System, Zone No. 3 (SDS-3)	It is recommended that a survey be performed to determine the sources of potentially hazardous substances entering the storm drainage dry-well

	injection system. It is recommended that other methods of disposal be found for these potential contaminants. It is also recommended that consideration be given to closing and filling injection wells in certain areas where the control of potential contaminants is not feasible. No sampling program is recommended at the injection well sites in SDS-3.
Firefighter Training Area No. 2 (FTA-2)	It is recommended that lysimeters be installed at FTA-2 and sampled during the wet season. It is also recommended that a hydrocarbon survey be performed using an OVA during installation of the lysimeter boreholes. Samples collected at FTA-2 should be analyzed for the parameters in List B, Table 6.1-2.
Stormwater Drainage System, Zone No. 2 (SDS-2)	It is recommended that a survey be performed to determine the sources of potentially hazardous substances entering the storm drainage dry-well injection system. It is recommended that other methods of disposal be found for these potential contaminants. It is also recommended that consideration be given to closing and filling injection wells in certain areas where the control of potential

	contaminants is not feasible. No sampling program is recommended at the injection well sites in SDS-2.
Chemical Disposal Site No. 1 (CS-1)	It is recommended that the area be surveyed with an OVA. If organic vapors are detected to be emanating from the soils, lysimeters should be installed and monitored.
Landfill No. 16 (LF-16)	It is recommended that a geophysical survey be performed and lysimeters be installed at this site. Samples should be collected during the wet season and analyzed for the parameters in List B, Table 6.1-2.
Drum Storage Area No. 2 (DS-2)	Soil samples should be collected in this area and tested to determine if they are hazardous. These samples should be analyzed for the parameters in List C, Table 6.1-2.
Chemical Disposal Site No. 2 (CS-2)	It is recommended that soil samples be collected from this area and analyzed for the parameters in List C, Table 6.1-2.
Drum Storage Area No. 1 (DS-1)	It is recommended that soil samples be collected and analyzed for the parameters in List C, Table 6.1-2. Ground water monitoring for this area is recommended as described under LF-1.

Chemical Disposal Site No. 3 (CS-3)	It is recommended that signs be erected to warn personnel of the potential dangers from unexploded ordnance (UXO) in this area. No monitoring is recommended.
Landfill No. 22 (LF-22)	It is recommended that signs be erected to warn personnel of the potential dangers from UXO in this area. No monitoring is recommended.
Chemical Disposal Site No. 4 (CS-4)	It is recommended that a survey be conducted using an OVA to determine if any organic vapors are emanating from the soils. It is recommended that lysimeters be installed and sampled if organic vapors are detected.

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1.0

1.0 INTRODUCTION

1.1 BACKGROUND

Due to its primary mission, the U.S. Air Force (USAF) has long been engaged in 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 Sec. 6003 of the Act, Federal agencies are directed to assist the U.S. Environmental Protection Agency (EPA), and under Sec. 3012, state agencies are required to inventory past disposal sites and make the information available to the requesting agencies. To assure compliance with these hazardous waste regulations, the Department of Defense (DOD) developed the Installation Restoration Program (IRP). The current DOD IRP policy is contained in Defense Environmental Quality Program Policy Memorandum (DEQPPM) 81-5, dated Dec. 11, 1981, and implemented by USAF message dated Jan. 21, 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 waste disposal practices and to control hazards to health and welfare that resulted from these past operations. The IRP will be the basis for response actions on USAF installations under the provisions of the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) of 1980, as clarified by Executive Order 12316. CERCLA is the primary Federal legislation governing remedial action at the past hazardous waste disposal sites.

1.2 PURPOSE, AUTHORITY, AND SCOPE OF THE ASSESSMENT

The IRP has been developed as a 4-phase program, as follows:

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

Environmental Science and Engineering, Inc. (ESE) conducted the records search at Andersen Air Force Base (AAFB), with funds provided by the Strategic Air Command (SAC). This report contains a summary and evaluation of the information collected during Phase I of the IRP and recommendations for any necessary Phase II action.

The objective of Phase I was to identify the potential for environmental contamination from past waste disposal practices at AAFB and to assess the potential for contaminant migration. Activities performed in the Phase I study included the following:

1. Review of site records;
2. Interviews with personnel familiar with past generation and disposal activities;
3. Inventory of wastes;
4. Determination of estimated quantities and locations of current and past hazardous waste treatment, storage, and disposal;
5. Definition of the environmental setting at the base;
6. Review of past disposal practices and methods;
7. Performance of field and aerial inspections;
8. Gathering of pertinent information from Federal, state, and local agencies;
9. Assessment of potential for contaminant migration; and
10. Development of conclusions and recommendations for any necessary Phase II action.

ESE performed the onsite portion of the records search during August 1984. The following team of professionals was involved:

- o John D. Bonds, Ph.D., Senior Chemist and Team Leader, 21 years of professional experience.
- o Jeffrey J. Kosik, Engineer, 2 years of professional experience.
- o John R. Maxwell, Ecologist, 8 years of professional experience.
- o Donald F. McNeill, Geologist, 2 years of professional experience.

Detailed information on these individuals is presented in App. B.

1.3 METHODOLOGY

The methodology utilized in the AAFB records search began with a review of past and current industrial operations conducted at the base. Information was obtained from available records such as shop files and real property files, as well as interviews with past and current base employees from the various operating areas. Interviewees included current and former personnel associated with the mission of AAFB and tenant organizations onbase. A list of interviewees, by position and approximate years of service, is presented in App. C.

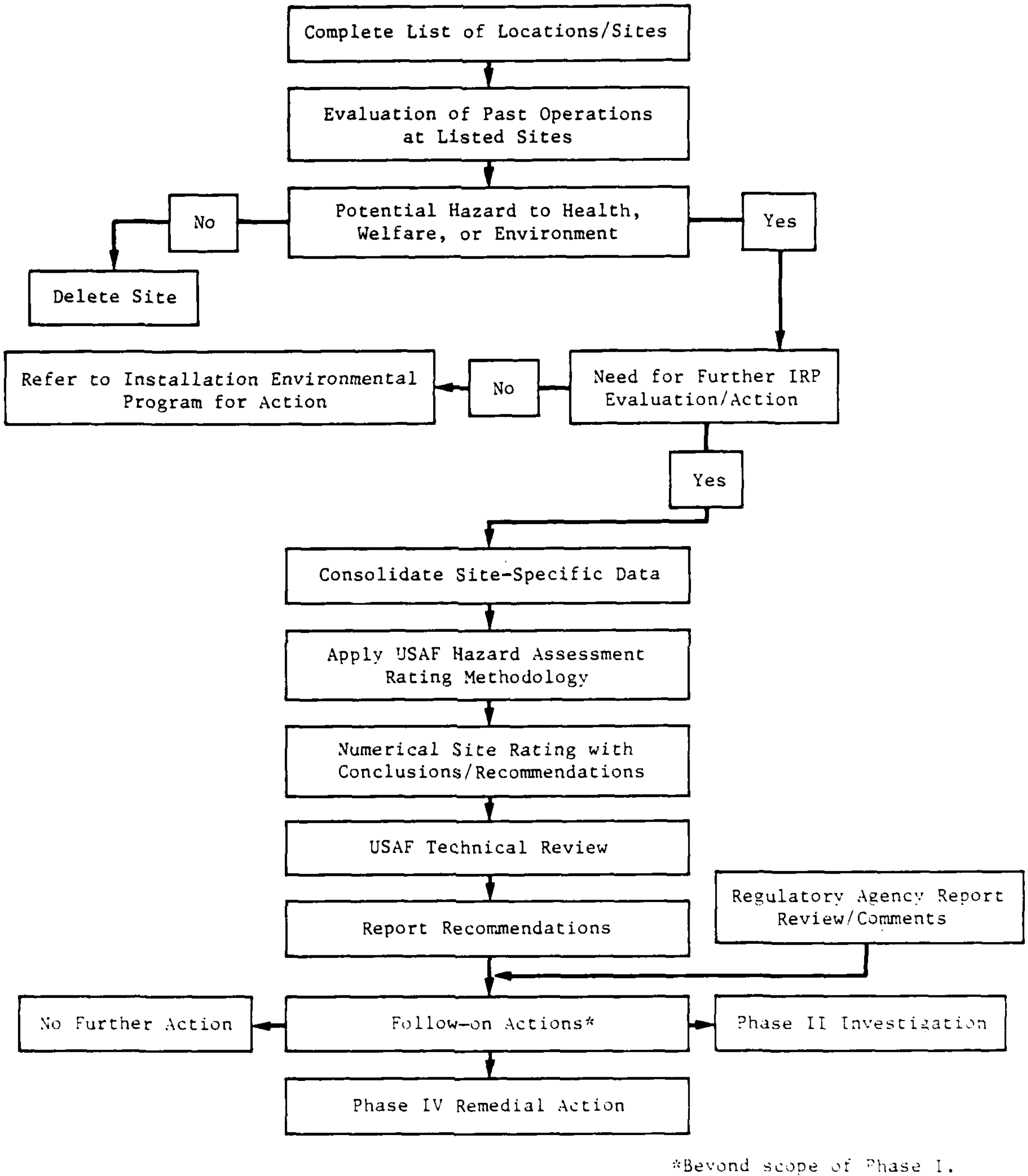
Concurrent with the base interviews, the applicable Federal, state, and local agencies were contacted for pertinent base-related environmental data. The outside records centers and agencies contacted and personnel interviewed are listed in App. C.

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

A general ground tour of the identified sites was then made by the ESE Project Team to gather site-specific information including: (1) visual evidence of environmental stress, (2) the presence of drainage ditches and systems, and (3) visual inspection for any obvious signs of contamination or leachate migration. A helicopter overflight was not available as part of the onsite visit.

Using the process shown in Fig. 1.3-1, a decision was then made, based on all of the above information, regarding the potential for hazardous material contamination at any of the identified sites. If no potential existed, the site was deleted from further consideration. If potential for contamination was identified, the potential for migration of the contaminant was assessed based on site-specific conditions. If there were no further environmental concerns, the site was deleted. If the potential for contaminant migration was considered significant, the site was evaluated and prioritized using the Hazard Assessment Rating Methodology (HARM). A discussion of the HARM system is presented in App. H.

PHASE I INSTALLATION RESTORATION PROGRAM
RECORDS SEARCH FLOWCHART



SOURCE: ESE, 1985.

Figure 1.3-1
DECISION PROCESS

INSTALLATION RESTORATION PROGRAM
Andersen Air Force Base

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2.0 INSTALLATION DESCRIPTION

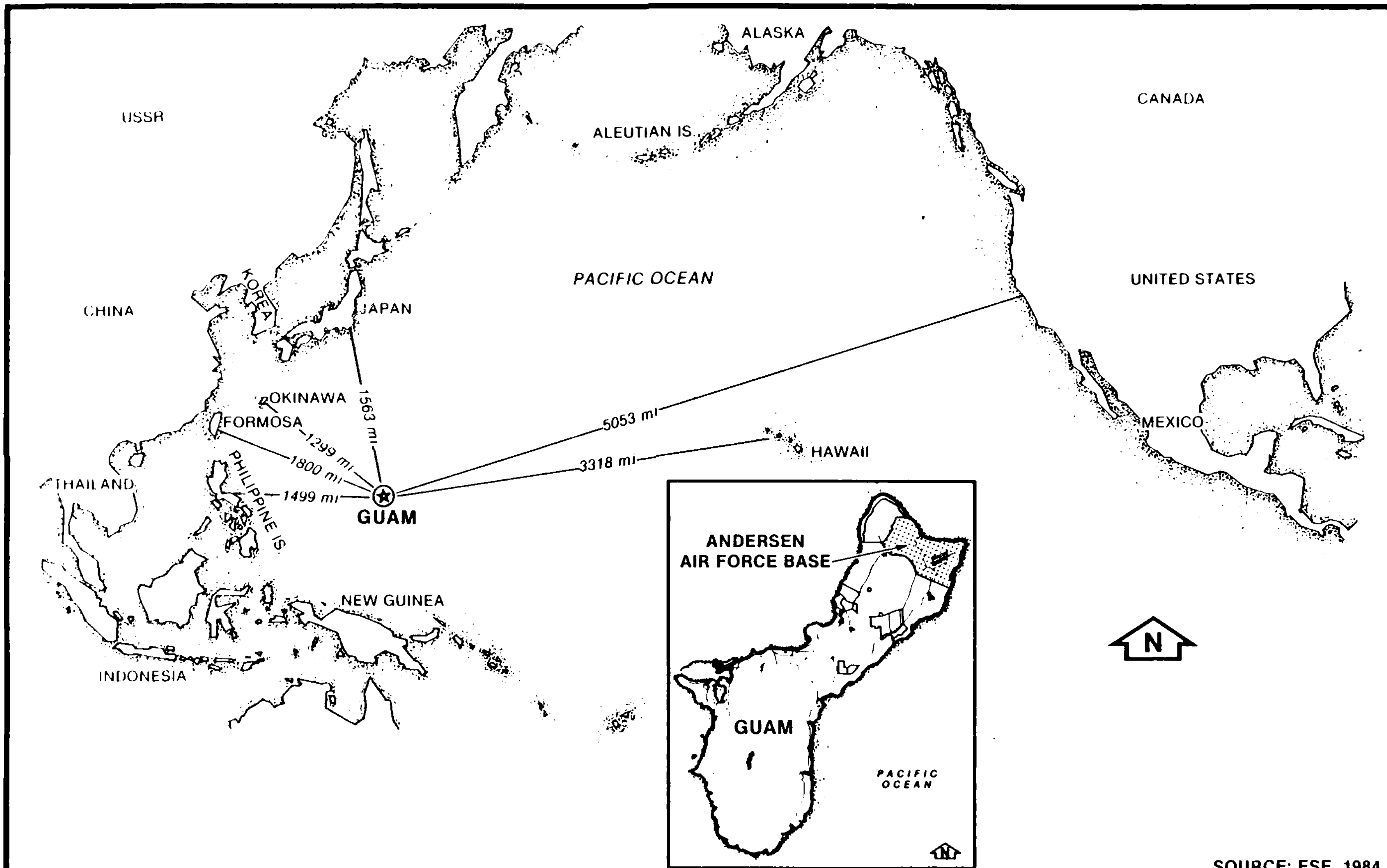
2.1 LOCATION, SIZE, AND BOUNDARIES

AAFB occupies the northeastern tip of Guam, with numerous annexes located throughout the northern half of the island. Guam is located in the Western Pacific Ocean, approximately 13 degrees north of the Equator and 3,318 miles west of Hawaii, 1,563 miles southwest of Japan, and 1,499 miles east of the Philippines (see Fig. 2.1-1). Guam is the most southern, most populous, and largest island of the Mariana Island group. It is 30 miles long, ranges in width from 4 to 8.5 miles, and has a total landmass of approximately 209 square miles.

The main base area of AAFB is bordered on the northwest/west by Northwest Field, with the Pacific Ocean to the northeast/east (see Fig. 2.1-2). The main base area and Northwest Field occupy a total of 15,463.28 acres (24.16 square miles) on the northeastern end of Guam. AAFB varies in width from 2 to 8 miles. Two of AAFB's largest annexes are AAFB South (2,497.4 acres), located 6 miles south of the main base, and Harmon Annex (1,817.28 acres), located immediately south of the U.S. Naval Communication Station Finegayan. In addition, AAFB has other properties on Guam which total 1,033.16 acres. Many of the AAFB properties, with the exception of the main base area, are undergoing actions to be declared excess and transferred to the U.S. Navy or the Government of Guam. Currently, the population on AAFB includes approximately 3,000 military personnel, 500 civilians, and 1,000 tenants.

2.2 HISTORY

During World War II, the Army Air Force built and maintained three air bases on Guam: Harmon Field, an aircraft depot and maintenance base; Northwest Field, a fighter base; and North Field, a B-29 facility.



SOURCE: ESE, 1984.

Figure 2.1-1
LOCATION MAP

INSTALLATION
RESTORATION PROGRAM
Andersen Air Force Base

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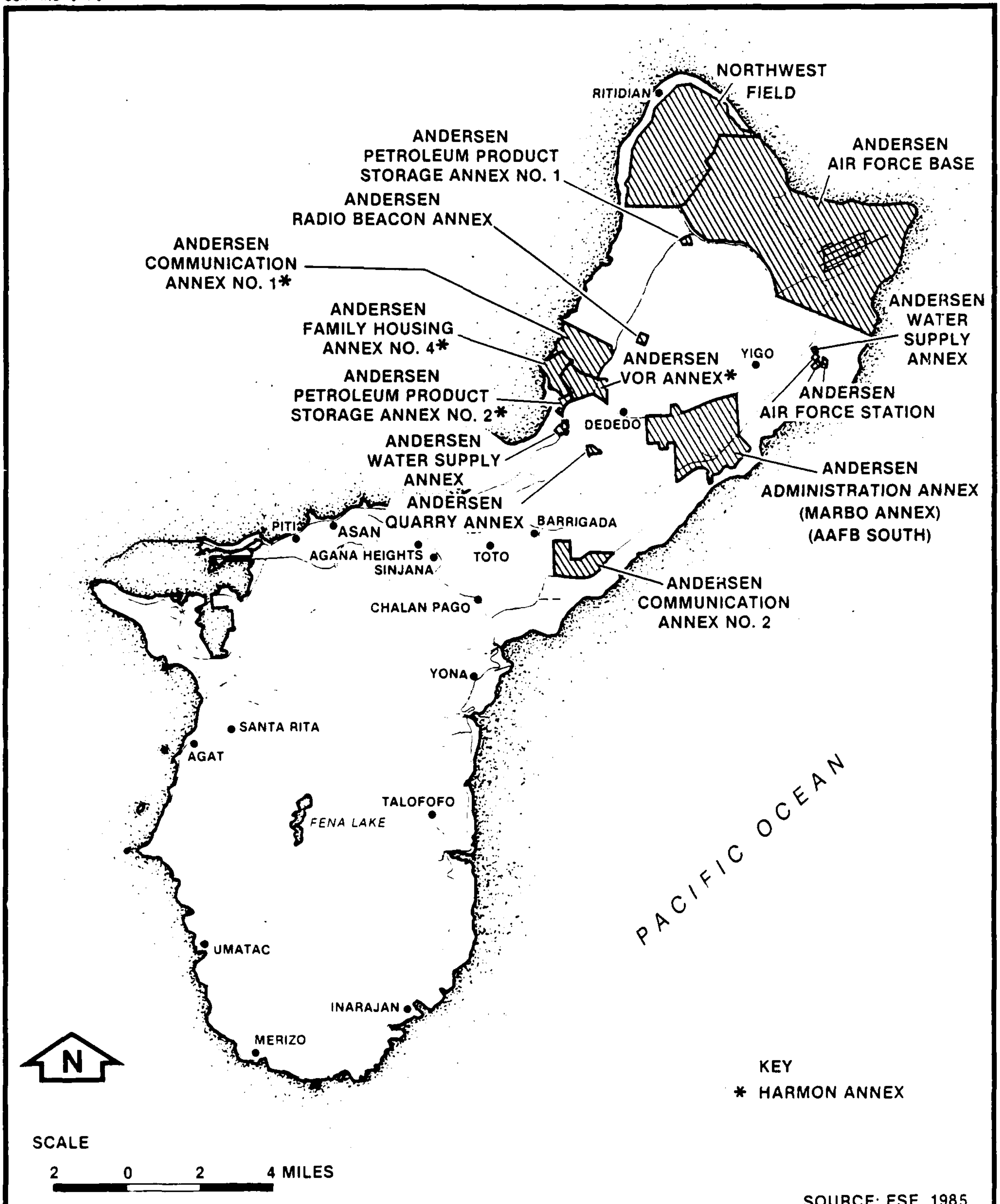

Figure 2.1-2
LOCATIONS OF AAFB PROPERTIES

INSTALLATION RESTORATION PROGRAM
Andersen Air Force Base

Soon after V-J Day, Harmon and Northwest Fields were closed. On Oct. 7, 1949, North Field was redesignated AAFB in honor of Brig. Gen. James Roy Andersen, who served as the Chief of Staff for Headquarters, Army Air Forces, Pacific Ocean Areas, from 1944 until his death in 1946. Harmon Field is now known as the AAFB Harmon Annex.

Host units assigned to AAFB have included the 314th Bomb Wing, from Jan. 17, 1945, to June 16, 1946; the Far East Air Forces, from 1946 to 1954; the 3rd Air Division, from 1955 to 1970; the 8th Air Force, from 1970 to 1974; and, again, the 3rd Air Division, since 1975. A more detailed chronology of units assigned to AAFB, with types of aircraft operated, is presented in Table 2.2-1.

When the 3rd Air Division was activated at AAFB on June 18, 1954, its mission was to exercise operational control of SAC wings on temporary duty in the Far East. Establishment of the 8th Air Force on AAFB in April 1970 was coincident with increased SAC operations in Southeast Asia.

The 43rd Strategic Wing, activated at AAFB on Apr. 1, 1970, participated in Arc Light missions (bombing operations in Southeast Asia) until August 1970, at which time the wing assumed an alert posture. As a result of increased enemy activity in South Vietnam, Operation Bullet Shot was implemented by SAC in February 1972. During the initial phases of this operation, the 43rd was the sole manager of the "D" and "G" model B-52 "Stratofortresses," making it the largest organization in the Air Force in terms of manpower and aircraft, which exceeded 150 at the height of Operation Bullet Shot. The 43rd was tasked to support Linebacker II bombing missions over Hanoi and Haiphong, North Vietnam. After the Vietnamese cease-fire was effected, the 43rd continued to support operations in Laos and Cambodia. On Aug. 15, 1973, the United States Congress officially ended the Arc Light operations, which were begun on June 18, 1965, by the 3960th Strategic Wing from AAFB.

Table 2.2-1. Chronology of AAFB Host Units and Aircraft Operated

Years	Host Units	Aircraft
1945-1946	314th Bomb Wing (BW)	B-29
1947-1954	Far East Air Forces	B-29/B-50/B-36*
1955	3rd Air Division (AD)/ 3960th Air Base Wing	B-36*/B-47*
1956	3rd AD/3960th Air Base Group (ABG)	B-36*/B-47*
1957-1962	3rd AD/3960th ABG	B-47*
1963	3rd AD/3960th Strategic Wing (SW)	B-47*
1964	3rd AD/3960th Combat Support Group	B-47*/B-52
1965-1968	3rd AD/3960th SW	B-52
1969	3rd AD/3960th SW and 4133rd BW	B-52
1970	8th Air Force (AF)/43rd SW	B-52
1971	8th AF/43rd SW and 72nd BW	B-52
1972	8th AF/43rd SW, 57th AD, and 72nd BW	B-52
1973	8th AF/43rd SW	B-52
1974	8th AF/43rd SW	B-52/KC-135*
1975-1984	3rd AD/43rd SW	B-52/KC-135*

*Rotational aircraft and support units.

Source: 3rd Air Division, 1984.

During early 1974, the 43rd began conversion from a temporary duty unit to a workable permanent station unit, which became fully operational on Jan. 1, 1975. In April 1975, the 43rd prepared to meet, house, feed, and later transport to stateside destinations Vietnamese refugees fleeing from South Vietnam. Named Operation New Life, this event continued for 119 days as 115,000 refugees filtered through Guam.

In response to the murders of two U.S. Army officers at Panmunjom, South Korea, the 43rd was tasked on Aug. 20, 1976, to fly B-52 show-of-force sorties over South Korea, providing wing aircrews with mountainous terrain avoidance training.

From April to July 1978, the 43rd responded to the needs of more than 4,000 fleeing Vietnamese refugees en route to sponsors in the United States. Also in July 1978, the 43rd participated in Global Shield, the first SAC command-wide readiness exercise. It was the most far-reaching and demanding test of SAC aircraft, missiles, and personnel in more than 20 years.

In search of areas in the Pacific where assigned aircrews could obtain low-level terrain avoidance training, in 1981 the 43rd completed an agreement with the Australian government to fly B-52 sorties over Australian land under Operation Busy Boomerang. Later in 1981, the 43rd began assisting statewide B-52 H units taking part in the Busy Island Task Force at AAFB, in which the units were deployed to Australia for similar training under Operation Glad Customer. Throughout the remainder of 1981 and in 1982, the 43rd participated in numerous joint-service and joint-nation exercises, while continuing to train in Korean and Australian low-level areas.

During Team Spirit '83 conducted in March 1983 in the Republic of Korea, the 43rd participated in the largest mine-laying exercise (MINEX) in the history of SAC and in the Western Pacific. In May 1983, the 43rd began converting from B-52D bombers to B-52G bombers as part of the SAC bomber rebasing plan; this conversion was completed in October 1983. In November, the 43rd participated in the Cope Jade/Theater Large Force Employment Exercise conducted in Korea, combining U.S. and Republic of Korea forces. The first major exercise involving the 43rd's newly assigned B-52G aircraft, its purpose was to evaluate the defense of Korea.

On Feb. 1, 1984, the 43rd was notified by HQ SAC that AAFB had been selected as the second base in the Air Force to equip B-52 aircraft with the Harpoon antiship missile, scheduled for completion by mid-1985. From Mar. 14-27, 1984, wing B-52 aircraft supported by Pacific Tanker Task Force KC-135 tankers participated in Team Spirit '84/MINEX, the largest joint/combined forces exercise in the world, conducted by the Republic of Korea and the U.S. Combined Forces Command. On Mar. 30, the 43rd began participation in the B-52G Westpac Rotation Program, in which B-52G aircraft are rotated with aircraft assigned to stateside units to combat the effects of saltwater corrosion on wing bombers.

2.3 MISSION AND ORGANIZATION

As part of SAC's global deterrent force, the 3rd Air Division, with headquarters at AAFB, is responsible for SAC operations in the Pacific area west of the International Date Line. The 3rd Air Division's subordinate units are the 43rd Strategic Wing at AAFB and the 376th Strategic Wing at Kadena Air Base, Okinawa.

The primary mission of the 43rd Strategic Wing, the host unit on AAFB, is to support SAC's deterrent mission and to provide support for contingency operations. Squadrons assigned to the 43rd Strategic Wing include:

- 60th Bombardment Squadron
- Pacific Tanker Task Force (PTTF)
- 43rd Munitions Maintenance Squadron (MMS)
- 43rd Organizational Maintenance Squadron (OMS)
- 43rd Avionics Maintenance Squadron (AMS)

- 43rd Field Maintenance Squadron (FMS)
- 43rd Supply Squadron
- 43rd Transportation Squadron (TS)
- 43rd Civil Engineering Squadron (CES)
- 43rd Combat Support Group (CSG)
- 43rd Security Police Squadron
- 43rd Services Squadron
- USAF Clinic at AAFB

The primary tenants on AAFB include:

- 605th Military Airlift Support Squadron (MASS)
- Det. 24, 1st Combat Evaluation Group
- Det. 4, 3904th Management Engineering Squadron (SACMET)
- Air Force Audit Agency (AFAA)
- Federal Aviation Administration (FAA)
- Det. 2, 9th Aeromedical Evacuation Squadron (AEROMED EVAC SQ)
- 54th Weather Reconnaissance Squadron
- Det. 4, Air Weather Service
- 27th Information Systems Squadron (ISS)
- Det. 11, 2nd Aircraft Delivery Group
- Det. 2, 1st Weather Wing
- Air Force Office of Special Investigations (AFOSI)
- Det. 5, Air Force Satellite Control Facility (Air Force Systems Command)

Descriptions of these squadrons and tenants and their missions are presented in App. D.

Tab

3.0

3.0 ENVIRONMENTAL SETTING

3.1 METEOROLOGY

AAFB is generally warm and humid, with two climatological seasons--a wet season from July to November and a dry season from January to May. The ocean dominates the island of Guam and is, in large part, responsible for its climate due to the presence of the north equatorial current and the northeast trade winds. Climatological data for AAFB are summarized in Table 3.1-1. These data were collected on AAFB over a 33-year period of record (May 1948 to December 1981). The average annual rainfall at AAFB is 90.8 inches, approximately 62 percent of which occurs in the wet season at an average mean of 11.3 inches per month. Historically, the largest amount of precipitation occurs in October (maximum of 37.1 inches), and the least amount of precipitation occurs in March (minimum of 0.3 inch).

Both the annual temperature and the relative humidity regimes at AAFB are highly influenced by the oceanic setting. This maritime influence produces a strong tempering effect on both temperature and humidity. The mean maximum temperatures are fairly constant, varying from 82°F in January to 84°F in September, with an annual mean of 83°F. The monthly mean minimum temperatures vary from 75°F to 77°F, with an annual mean minimum of 76°F. Recorded extreme temperatures vary from 66°F in January to 91°F in August. The relative humidity averages 84 to 89 percent in the morning, with a yearly average of 86 percent. The relative humidity averages 75 to 80 percent in the afternoons, with a yearly average of 77 percent.

The period from March through December is characterized by easterly winds with speeds averaging 7 to 11 knots. In January and February, the prevailing winds shift from E to ENE at 12 knots.

Due to its location on the island of Guam, AAFB is also subject to many tropical storms and an occasional typhoon. These storms are accompanied by high winds and heavy rainfall.

Table 3.1-1. Summary of Climatological Data for AAFB*

Parameter	Month												Annual
	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Total
Winds (knots)													
Prevailing	ENE12	ENE12	E11	E11	E10	E9	E7	E7	E7	E7	E10	E9	E9
Maximum	55	46	45	54	60	49	46	45	49	66	115	61	115
Temperature (°F)													
Extreme Maximum	86	89	87	88	90	90	90	91	90	89	89	87	91
Mean Maximum	82	82	82	83	84	84	84	84	84	84	84	83	83
Mean Minimum	75	75	75	76	77	77	76	76	76	76	77	76	76
Extreme Minimum	66	69	69	69	66	70	70	70	71	71	69	68	66
Relative Humidity (%)													
0400 LST†	84	84	85	85	85	86	89	89	89	89	87	85	86
1300 LST	76	75	75	75	75	76	78	78	80	80	79	78	77
Precipitation (inches)													
Maximum	17.3	12.4	14.7	24.0	26.8	9.4	15.4	26.3	23.3	37.1	17.8	16.9	37.1
Mean	5.3	4.3	3.9	4.0	6.0	5.0	9.2	11.8	13.6	13.8	8.2	5.7	90.8
Minimum	1.5	0.7	0.3	0.4	1.0	1.4	3.0	4.4	5.6	5.4	3.1	2.1	0.3
24-Hour Maximum	6.2	7.9	3.3	9.0	9.5	2.9	3.7	7.1	6.1	18.3	4.9	6.6	18.3
Evaporation (inches)	5.54	7.22	8.94	8.13	8.41	7.14	6.78	6.55	7.38	7.01	6.66	5.15	84.91

† LST = Local Standard Time.

* Location: Andersen AFB, Guam, Mariana Islands, Southwest Pacific.
Elevation: 613 ft.
Period of Record: May 1948 - December 1981.

Sources: Department of the Air Force, 1983.
43rd CES, n.d.

3.2 GEOGRAPHY

3.2.1 PHYSIOGRAPHY

AAFB is located on the northern half of the island of Guam. The northern section of the island is characterized by a limestone plateau which slopes to the southwest. Elevations on AAFB range from more than 620 feet (ft) to mean sea level (msl). The northern end of the island is marked by steep, fault-related cliffs. At the foot of the cliffs, terraces range from msl to approximately 100-ft elevation. The plateau surface on the northern half of the island is generally uniform, except for three hills: Barrigada Hill (665 ft), a limestone dome, and Mount Santa Rosa (858 ft) and Mataguac Hill (630 ft), which are both volcanic (Guam EPA, 1979). In the vicinity of AAFB, the plateau has numerous sinkholes which form natural depressions and surface impoundments.

3.2.2 SURFACE HYDROLOGY

AAFB has no perennial streams within its boundaries due to extremely high permeability of the underlying limestone. During periods of high precipitation, runoff within the AAFB cantonment area flows to ditches and channels which drain to more than 100 dry injection wells. Fig. 3.2-1 shows the locations of the dry wells on AAFB. On other, more pristine areas, runoff drains to numerous surface impoundments. Those impoundments are usually sinkholes or large fractures which drain surface runoff fairly rapidly. No ponds or lakes exist on AAFB, Northwest Field, AAFB South, or Harmon Annex.

3.3 GEOLOGY

3.3.1 GEOLOGIC SETTING

Guam, the southernmost island in the Mariana Island chain, is located at the apex of a large submarine ridge known as the Mariana Island Arc System. This island arc complex was formed as a result of subducting oceanic crust at plate boundaries. Geologically, the island can be divided into two sections. The northern half consists of limestone reef, bank, and pelagic deposits over basement volcanics; the southern half of the island is primarily volcanic, except for small, fringing reef deposits along the coastal sections.

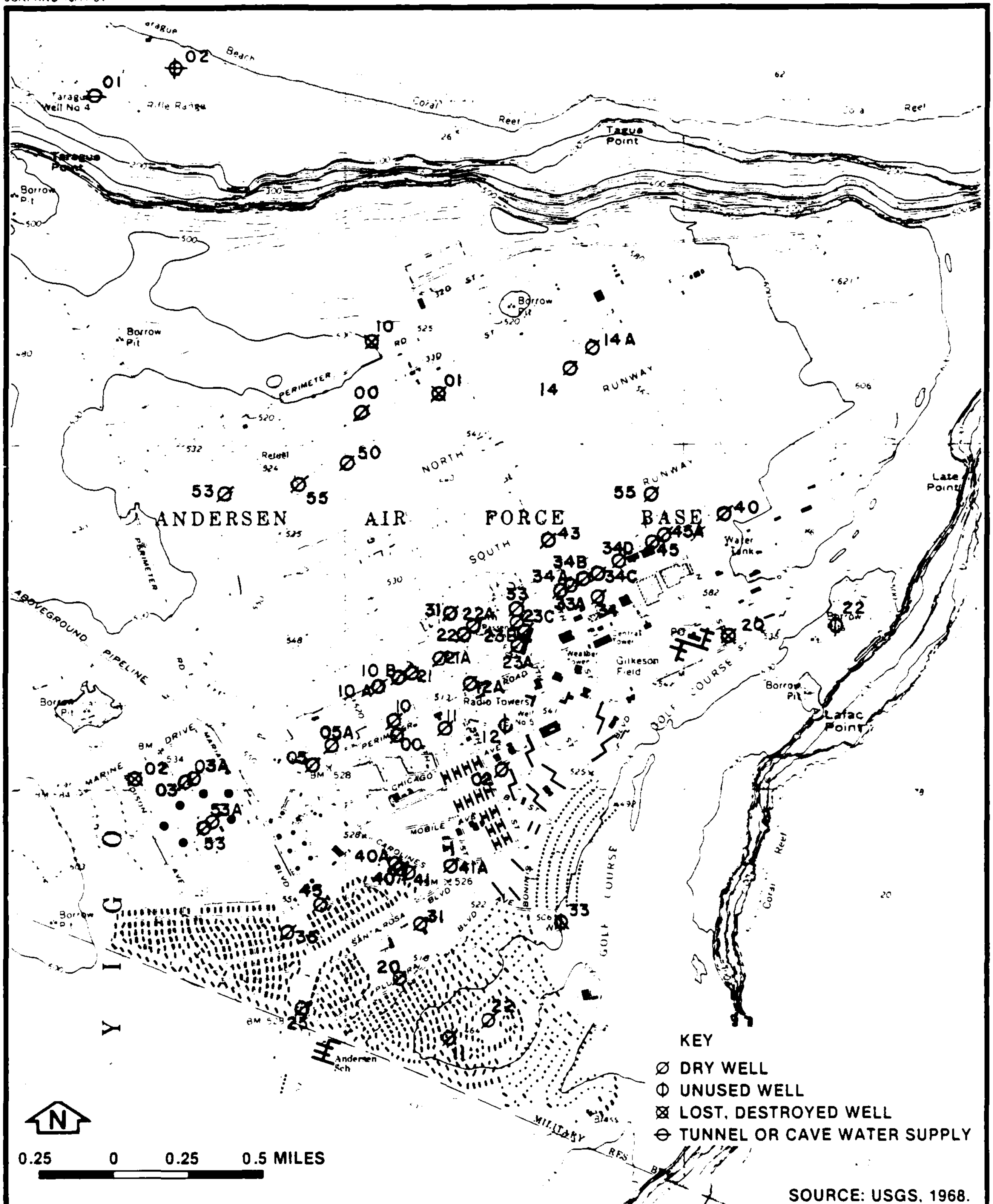

Figure 3.2-1
LOCATIONS OF DRY WELLS ON MAIN CANTONMENT AREA

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The volcanic basement underlying AAFB on the northern half of Guam shows a subsurface high in the vicinity from Mataguac Hill to Mount Santa Rosa to the area underlying the AAFB main gate. From this high area, basement volcanics slope out in a radial direction (see Fig. 3.3-1). The volcanic rocks of northern Guam probably formed during younger volcanic events than those to the south. Limestone deposition occurred first in a deep-water, pelagic environment. As the limestone sequence thickened, shallow-water coralgal facies began to dominate sedimentation and eventually connected with the southern half of the island. Figs. 3.3-2 and 3.3-3 show cross sections of the volcanic basement and limestone deposits in the vicinity of AAFB.

The geology underlying AAFB consists of three major formations: the volcanic Alutom Formation, the Barrigada Limestone, and the Mariana Limestone (see Fig. 3.3-4). The Alutom Formation is the oldest exposed formation on Guam and is most likely Eocene to Oligocene in age (approximately 50 million years old). The Alutom is an andesitic unit consisting of pyroclastics ranging from very fine tuffaceous shale to coarse conglomerate and breccia (Guam EPA, 1982b). Volcanic pillow basalts are also present, indicating deposition as a result of lava flows. The formation shows extensive faulting and folding as a result of its proximity to the tectonically active subduction zone. The volcanics exposed just south of AAFB at Mataguac Hill and Mount Santa Rosa and those underlying AAFB are part of the Alutom Formation. The formation is considered impermeable, except for numerous minor joints and faults.

The Barrigada Limestone is Miocene in age (20 million years old) and was deposited on the volcanic Alutom Formation in northern Guam. The formation surrounds the volcanic highs of Mataguac Hill, Mount Santa Rosa, and the subsurface high under Barrigada Hill (see Fig. 3.3-4). The unit was deposited as a deep-water limestone and is bright white, pure, and medium to coarse grained in an unweathered condition (Guam EPA, 1982b). The formation is highly fossiliferous, with abundant foraminifera in the basal units and mollusks and corals in the upper

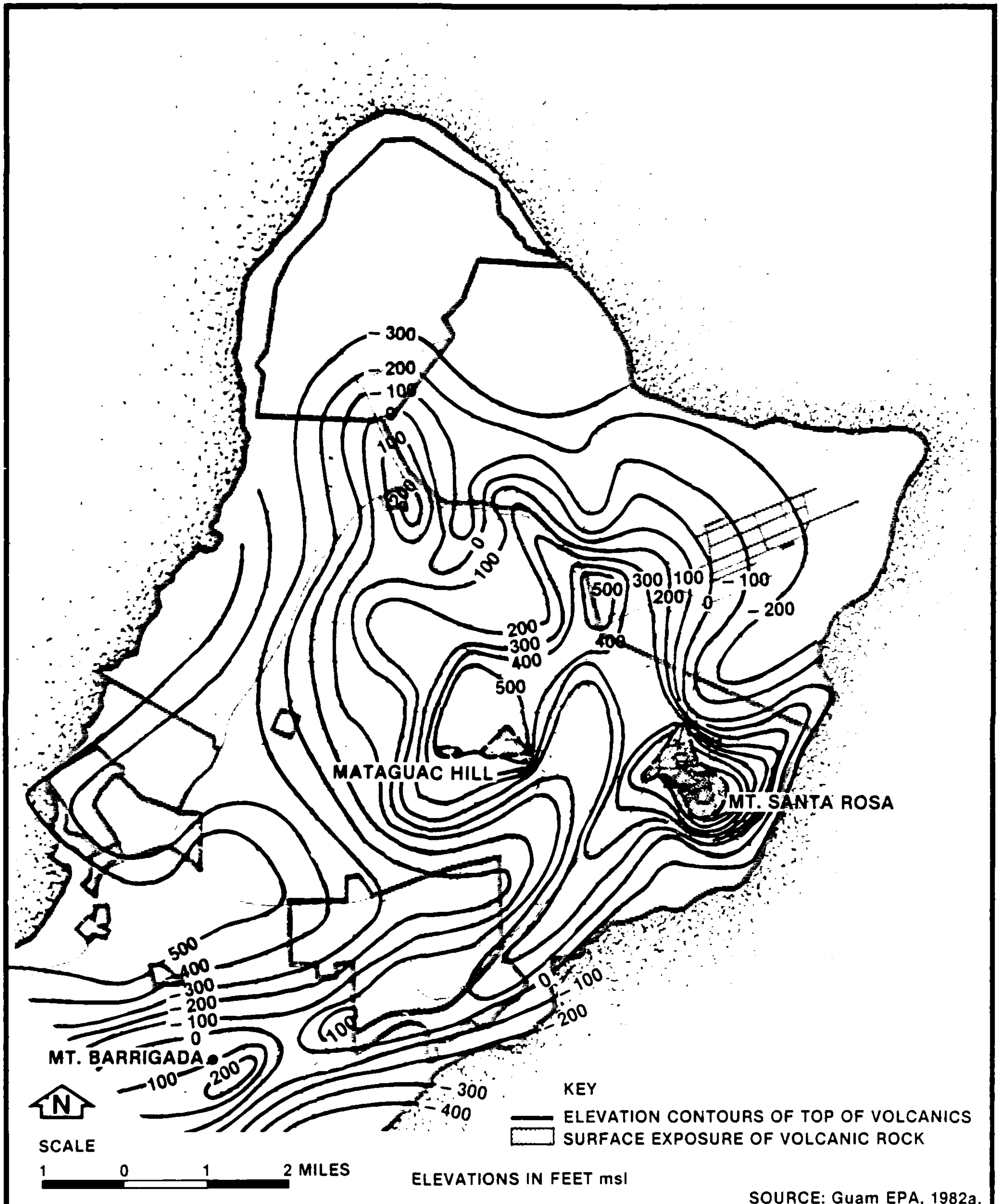

Figure 3.3-1
CONTOUR MAP OF THE VOLCANIC BASEMENT

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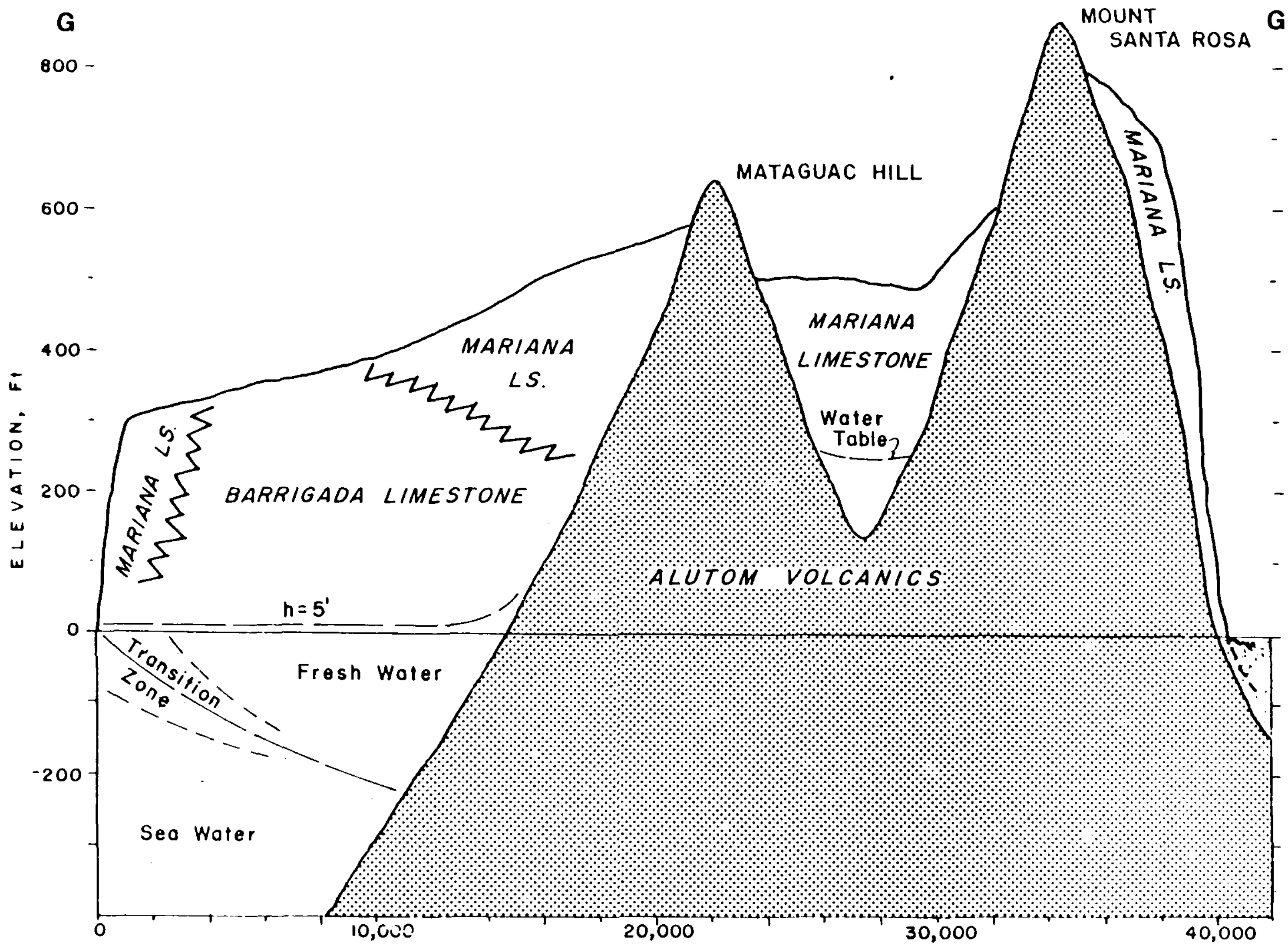

NOTE: FOR LOCATION OF CROSS SECTION, SEE FIGURE 3.3-4.

SOURCE: Mink, 1976.

Figure 3.3-2
CROSS SECTION THROUGH NORTHERN GUAM

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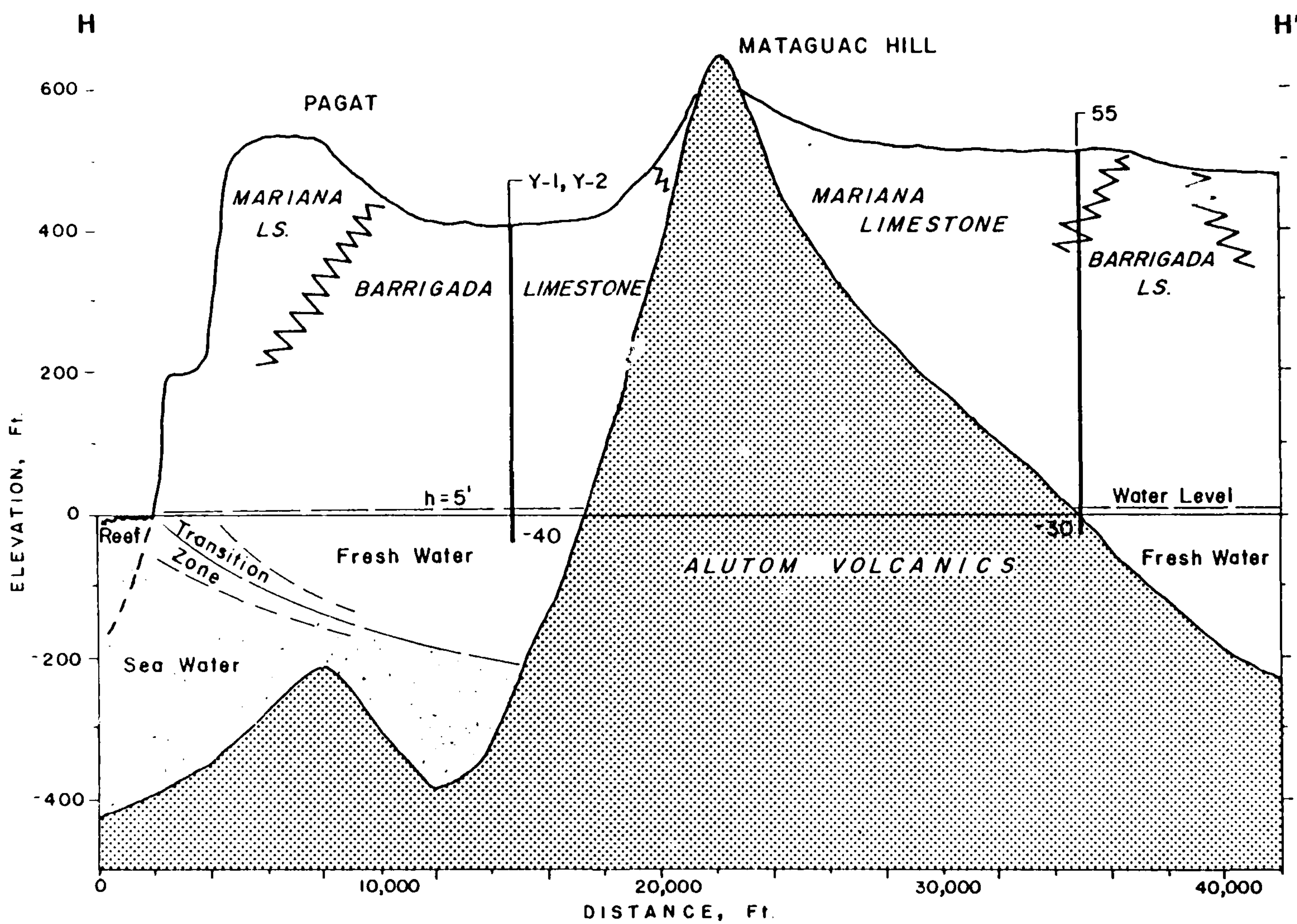

NOTE: FOR LOCATION OF CROSS SECTION, SEE FIGURE 3.3-4.

SOURCE: Mink, 1976.

Figure 3.3-3
CROSS SECTION THROUGH NORTHERN GUAM

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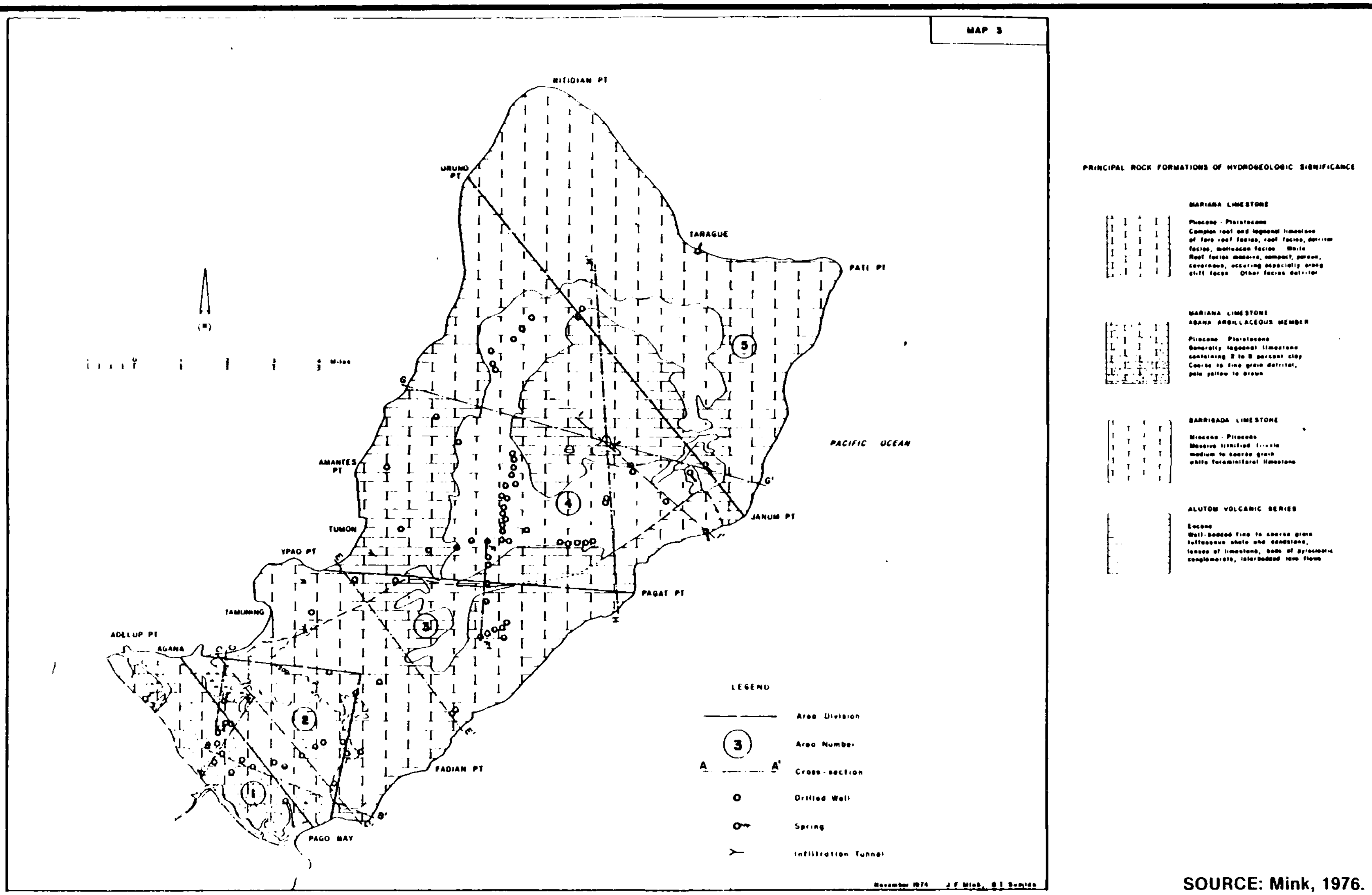

SOURCE: Mink, 1976.

Figure 3.3-4
GEOLOGIC MAP OF NORTHERN GUAM

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sections. This vertical paleoecologic change represents a facies change from a deep, depositional environment to a fairly shallow habitat, probably less than 200 ft of water.

The Mariana Limestone is of Plio-Pleistocene age (1.7 to 5 million years old) and comprises the majority of exposed limestone on Guam. The Barrigada Limestone represents an upward, transgressional facies change to a shallow-water depositional environment. Lithologically, the formation is massive and represents fore-reef, reef-proper, and back-reef carbonate environments. The reef facies is a well-cemented, crystalline coral limestone. The back-reef facies consists of granular limestone with some coral material near the reef and a fine-grained limestone with mollusk shells on the landward side.

Structurally, the island of Guam has undergone intermittent uplift due to its position in a relatively tectonic area. Uplift is believed greater in the northern half of the island, as evidenced by the terrace formations along the coastline. Fault activity is believed responsible for most of the steep cliffs on the northern end of the island. Currently, the island is in a passive stage of uplift; this can be seen by the development of fringing reefs off northern Guam.

3.3.2 SOILS

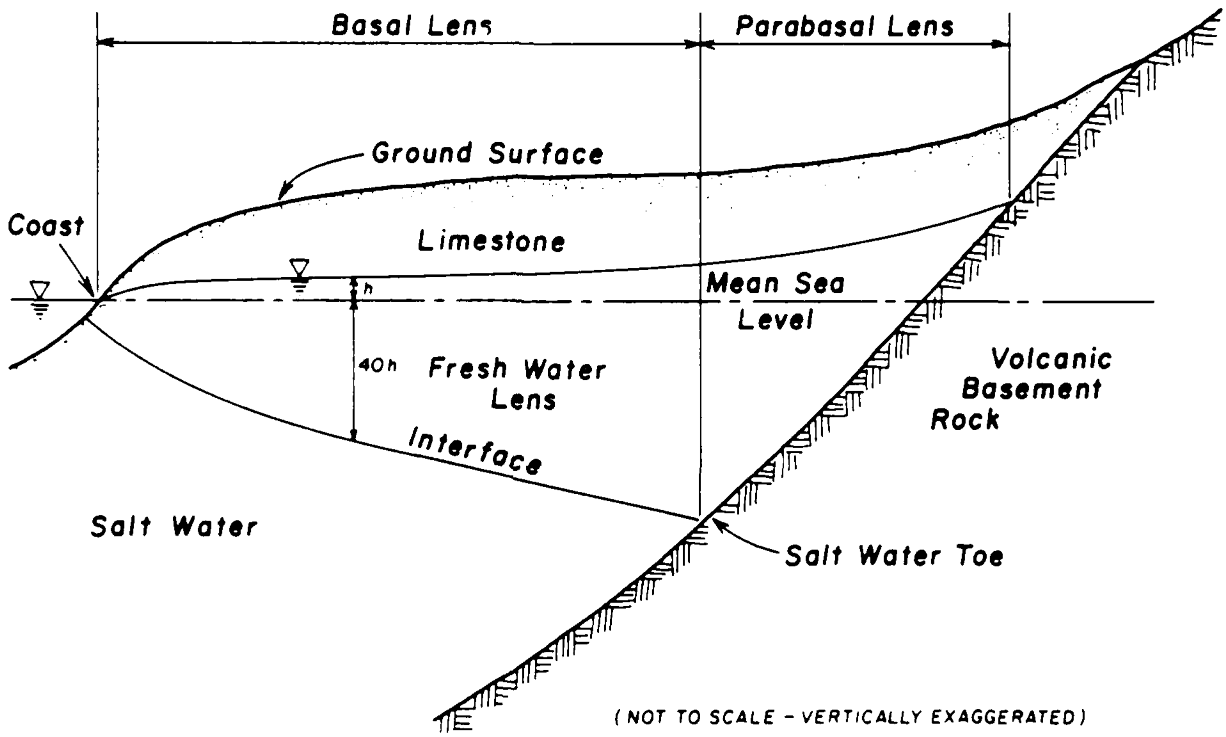
The soils on AAFB represent residual formation of weathered limestone with some incorporated volcanic material. The limestone exhibits a thin soil covering that consists of friable red soil which contains a large percentage of alumina and iron oxide. The principal chemical components of the soil, in percent by weight, are as follows: silica, 1.4; aluminum oxide, 42.5; iron oxide, 20; water, 24; titanium oxide, 2; phosphate, 1.6; manganese oxide, 1; calcium oxide, 1. The principal minerals of the Guam Clay are gibbsite and hematite (Feltz et al., 1970). The ion-exchange capacity of the surface soils ranges between 30 and 35 milliequivalents per 100 grams. The high ion-exchange capacity of the soil is due to the high content of organic matter in the surface soil (4 to 6 percent) (Feltz et al., 1970). The soil on the northern end of the island is locally known as the Guam Clay.

3.3.3 GEOHYDROLOGY

The aquifer underlying the northern section of Guam is composed of the Barrigada and Mariana Formations. As mentioned in Sec. 3.3.1, the units consist of highly permeable limestones overlying volcanic basement.

The aquifer system underlying the northern section of the island can be divided into three distinct units based on location and chloride content. The first lens, referred to as the parabasal, represents ground water which is underlain by impermeable volcanic formation. In general, this lens occurs from about 0 ft msl to 150 ft below msl. The parabasal lens is in hydraulic continuity with the basal lens, except that the fresh water is underlain by impermeable volcanic formations (Guam EPA, 1982b). The second unit is referred to as the basal lens. This lens is defined as the area in which fresh ground water is immediately underlain by salt water. The thickness of the freshwater lens over a saltwater body is controlled by the amount of head above sea level. Theoretically, when an aquifer is at equilibrium, for every foot of head above sea level, 40 ft of fresh water occurs below sea level. However, the third unit, referred to as the saline lens, occurs as a transition zone between the less dense fresh water and more dense salt water. The transition zone occurs as a result of stresses on the aquifer, such as tidal fluctuations, seasonal characteristics, and pumping (Guam EPA, 1982b). Fig. 3.3-5 shows the theoretical positions of the basal, parabasal, and saline units.

Total porosity in the phreatic zone of the freshwater lenses averaged 21 percent, using microscopic methods. Porosity analysis using geophysical methods determined total porosity to range from 13 to 20 percent in the northern section of the lens (Guam EPA, 1982a). Permeability in the limestone aquifer varies with change in total porosity within the subsurface. In general, permeability in the northern lens ranges from 3,000 to 1[illegible],[illegible] ft/day (Guam EPA, 1982a).



KEY

h = HYDRAULIC HEAD IN FEET

SOURCE: Guam EPA, 1982a.

Figure 3.3-5
THEORETICAL CROSS SECTION OF NORTHERN GUAM SHOWING BASAL, PARABASAL, AND SALINE UNITS

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Water level in the basal section of AAFB ranges from approximately 3 ft msl near the parabasal unit to about 2 ft msl near the coastal sections of the base. Fig. 3.3-6 shows ground water elevations in the vicinity of AAFB. Water levels in the parabasal unit on AAFB are unknown because no wells are drilled in that unit. Gradients in the parabasal unit are assumed to follow the same gradient as in the volcanic basement.

Recharge to the aquifer system occurs through downward percolation of precipitation and artificial recharge from dry wells in the vicinity of AAFB (see Fig. 3.2-1). Most recharge occurs in the wet season; little or no recharge occurs during the dry season. The aquifer is depleted by well withdrawal and natural leakage. The majority of leakage occurs around the periphery of northern Guam (Guam EPA, 1982b).

Potable water on AAFB is supplied by nine wells located on AAFB South (see Fig. 3.3-7) and Harmon Annex. The water is pumped to storage reservoirs for use at the main cantonment area. Details for the nine potable water supply wells are provided in Table 3.3-1.

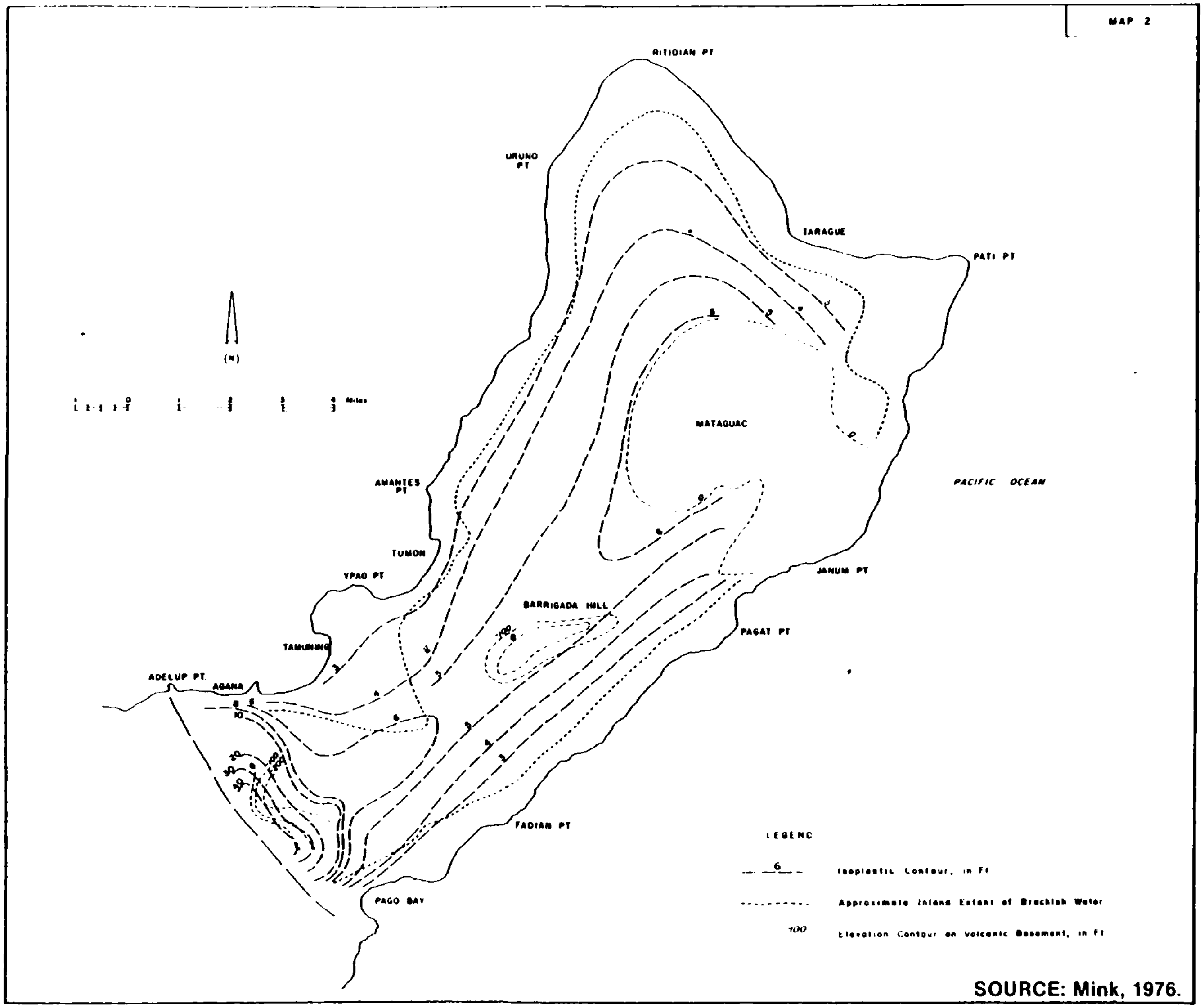
3.4 WATER QUALITY

3.4.1 SURFACE WATER QUALITY

Due to the absence of perennial streams and water bodies on AAFB, no surface water monitoring is conducted on the base. Storm runoff is drained to dry recharge wells and natural impoundments and infiltrates through the porous limestone very rapidly.

3.4.2 GROUND WATER QUALITY

Ground water in the limestone aquifer in the vicinity of AAFB can be classified as calcium-bicarbonate-type water, typical of a carbonate aquifer system. Parabasal ground water usually exhibits less than 30 milligrams per liter (mg/l) chloride, whereas basal ground water shows concentrations between 70 and 150 mg/l. Concentrations greater than 150 mg/l usually indicate saltwater encroachment or upconing in the basal aquifer.



SOURCE: Mink, 1976.

Figure 3.3-6
GROUND WATER ELEVATION ON NORTHERN GUAM

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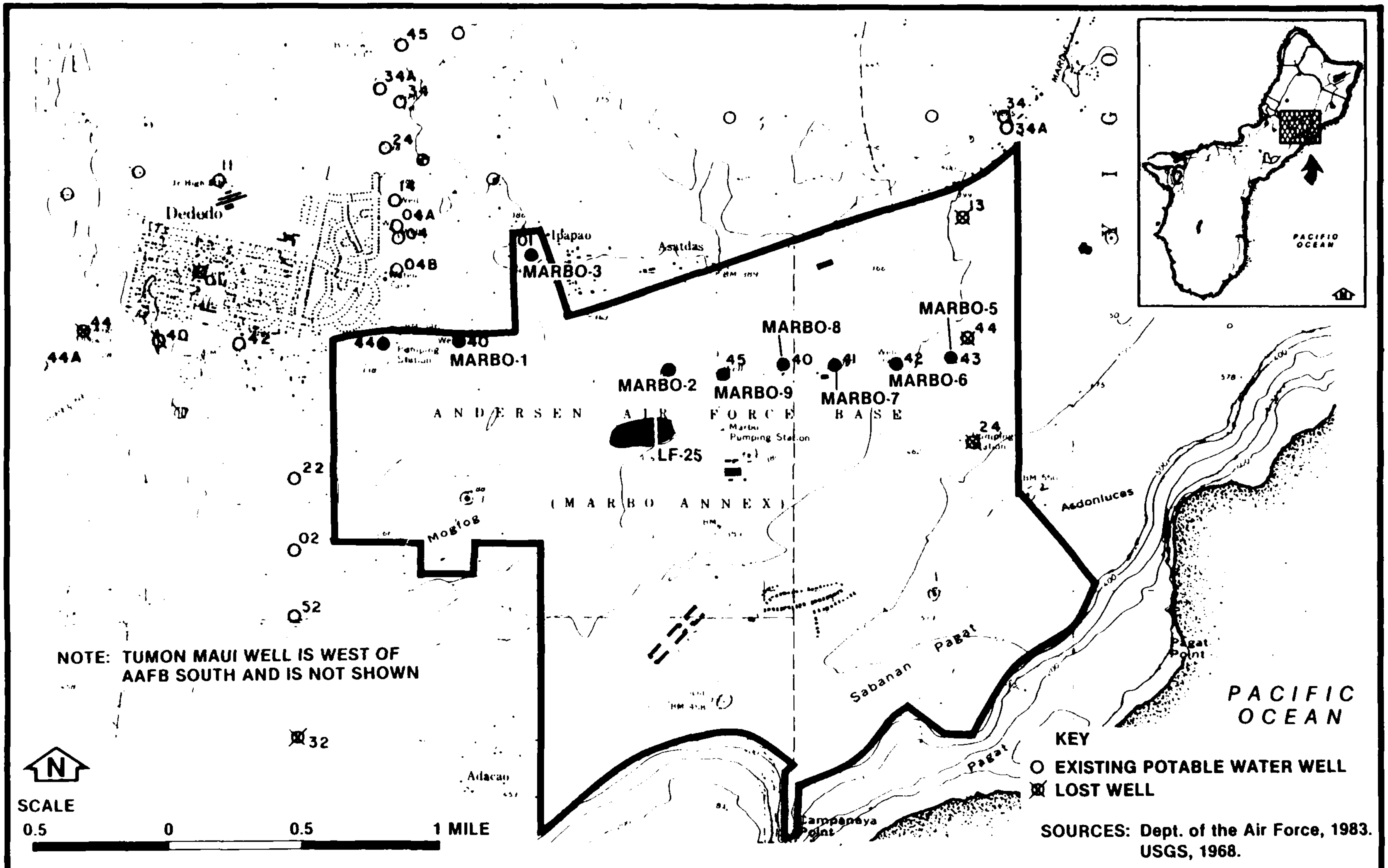

Figure 3.3-7
POTABLE WELL LOCATIONS ON AAFB SOUTH (MARBO ANNEX)

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Table 3.3-1. Details for Potable Water Supply Wells

Well	Depth of Well (ft)	Casing Diameter (in)	Date Constructed	Capacity (gpm)*	Current Status
Marbo-1	385	12	1944	225	Active supply for AAFB
Marbo-2	379	10	1945	215	Active supply for AAFB
Marbo-3	427	12	1944	215	Active supply for AAFB
Marbo-5	495	8	—	160	Active supply for AAFB
Marbo-6	497	12	1965	340	Active supply for AAFB
Marbo-7	408	12	1963	250	Active supply for AAFB
Marbo-8	390	12	1965	310	Active supply for AAFB
Marbo-9	389	12	1965	310	Active supply for AAFB
Tumon Maui	Open Cave	—	1947	690	Active supply for AAFB

* gpm = gallons per minute.

Sources: BES, 1984.
Dept. of the Air Force, 1983.

Potable well water quality data for AAFB are summarized in Table 3.4-1. Inorganic metals analysis shows generally good water quality. Elevated levels of iron and manganese were reported during two sampling intervals; however, these levels were not consistent in subsequent sampling periods. Chloride values for the potable supply system are well within acceptable ranges and show no increasing pattern.

Organic contamination by trichloroethylene (TCE) in the potable well system is summarized in Table 3.4-2. Analysis of TCE values shows contamination in a number of AAFB South supply wells. Marbo wells No. 1 and 2 (Marbo-1 and Marbo-2) show the greatest amount of contamination, with up to 5.2 and 39.0 micrograms per liter (ug/l), respectively. The remaining Marbo wells and the Tumon Maui well have all shown traces of TCE contamination. One possible source of contamination is a historical landfill site (LF-25) which was operated between 1945 and 1962 (see Sec. 4.2.1). This landfill was used for disposal of waste drycleaning fluids; waste petroleum, oils, and lubricants (POL); and waste degreasing solvents--all possible contaminant sources. Hydrologically, Marbo wells No. 1 and 2 are directly downgradient of the former disposal site. TCE, a halogenated hydrocarbon, is a heavy, colorless liquid with an odor resembling that of chloroform. Although high levels of exposure to this chemical have produced cancer in mice, the risk to humans from exposure through drinking water remains unknown.

Water quality at the current sanitary landfill (LF-1) is monitored by one well located north of the fill area. This well is located downgradient of the site to monitor leachate migration away from the landfill. However, leachate may be migrating to the east of this well based on elevations of the volcanic basement. Analysis of inorganic analytes shows a number of excessive parameters. Lead, iron, and zinc have shown elevated values in a number of sampling periods. These data, summarized in Table 3.4-3, indicate leachate is migrating downgradient from the disposal site or historical disposal sites within close

Table 3.4-1. Potable Water Quality Data (March 1978 and February 1982)

Analyte (ug/l)*	Marbo-1 3/78	Marbo-1 2/82	Marbo-2 3/78	Marbo-2 2/82	Marbo-3 3/78	Marbo-3 2/82	Marbo-5 3/78	Marbo-6 3/78	Marbo-6 2/82	Marbo-7 3/78	Marbo-7 2/82	Marbo-8 3/78	Marbo-8 2/82	Marbo-9 3/78	Marbo-9 2/82	Tumon Maui 3/78	Tumon Maui 2/82	Maximum Contaminant Level (MCL)†
Arsenic	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	50
Barium	<1,000	<1,000	<1,000	<1,000	<1,000	<1,000	<1,000	<1,000	<1,000	<1,000	<1,000	<1,000	<1,000	<1,000	<1,000	<1,000	<1,000	1,000
Cadmium	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	10
Chromium	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	50
Lead	<50	<20	<50	<20	<50	<20	<50	<50	<20	<50	<20	<50	<20	<50	<20	<50	<20	50
Mercury	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	2
Selenium	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	10
Silver	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	50
Copper	<20	68	<20	33	<20	36	<20	<20	47	<20	40	<20	28	<20	67	<20	51	1,000
Iron	240	2,169	320	<100	130	<100	240	160	<100	<100	<100	450	<100	125	<100	<100	<100	300
Manganese	<50	203	<50	51	<50	<50	<50	<50	<50	<50	<50	<50	51	<50	<50	<50	52	50
Calcium (mg/l)	9.2	63.9	8.2	70.6	7.2	97.6	6.1	7.2	60.4	7.2	57.8	7.2	61.5	7.2	59.2	13.0	74.2	NA**
Magnesium (mg/l)	10.0	9.5	10.3	9.9	11.6	10.2	15.2	14.3	11.8	14.6	12.3	13.6	12.1	16.0	13.7	10.0	9.8	NA
Sodium (mg/l)	—	21.9	—	20.6	—	19.1	—	—	23.2	—	21.2	—	21.0	—	22.0	—	31.2	NA
Nitrate as nitrogen (mg/l)	1.3	—	1.7	1.5	1.7	1.9	0.8	2.2	1.7	1.2	1.3	1.3	1.2	1.1	1.2	1.7	2.1	10
Alkalinity (mg/l)	232	213	220	210	220	223	210	160	137	200	197	204	203	204	201	264		NA
Chloride (mg/l)	60	40	43	40	40	32	52	56	40	40	40	40	40	60	40	84	—	250
Zinc	<50	—	<50	—	<50	—	<50	<50	—	<50	—	<50	—	<50	—	<50	—	5,000

* All values in ug/l unless noted otherwise.
† Code of Federal Regulations, Title 40, July 1, 1983.
** NA = Not applicable; no MCL established.

Sources: RCS, 1978, 1982.
ESE, 1985.

Table 3.4-2. TCE Contamination in Potable Water Supply Wells (ug/l)

Date	Marbo-1	Marbo-2	Marbo-3	Marbo-5	Marbo-6	Marbo-7	Marbo-8	Marbo-9	Tumon Maui
3/78	TR <1.5	39.0	TR <1.5	ND <1.5	ND <1.5	ND <1.5	ND <1.5	ND <1.5	ND <1.5
4/78	TR <1.5	33.7	TR <1.5	ND <1.5	ND <1.5	ND <1.5	ND <1.5	ND <1.5	TR <1.5
8/78	TR <1.5	30.9	ND <1.5	ND <1.5	ND <1.5	ND <1.5	ND <1.5	—	ND <1.5
10/78	1.9	29.9	TR <1.5	—	—	—	—	—	—
4/79	2.0	19.3	TR <1.5	—	--	--	--	--	--
10/79	1.5	22.2	TR <1.0	—	—	—	—	—	—
3/80	1.8	9.4	1.4	—	—	—	—	—	—
4/80	3.0	11.0	TR <1.0	—	—	—	—	—	—
7/80	1.0	8.6	TR <1.0	—	—	—	—	—	—
10/80	4.4	—	ND <1.0	—	—	—	—	—	—
5/81	TR <1.0	TR <1.0	TR <1.0	—	ND <0.5	TR <1.0	ND <0.5	ND <0.5	TR <1.0
2/82	5.2	—	TR <1.5	—	ND <0.5	ND <0.5	TR <1.0	TR <1.0	ND <0.5
9/82	TR <1.0	2.4	ND <0.5	—	—	ND <0.5	ND <0.5	ND <0.5	ND <0.5
2/83	1.2	4.3	—	0.5	0.5	0.5	0.5	1.0	0.5
3/83	1.0	7.2	1.0	—	0.5	—	—	1.0	—
7/83	4.8	4.5	1.0	0.1	0.2	0.1	—	ND	ND
12/83	1.7	—	0.2	—	0.8	ND	ND	0.1	0.2
3/84	—	1.4	ND	ND	—	ND	—	ND	ND
7/84	0.8	1.5	ND	ND	ND	ND	ND	ND	2.7

Notes: TR = Trace.
ND = None detected.

Source: BES, 1978-1984.

Table 3.4-3. Water Quality Data from Landfill (LF-1) Monitor Well (Well No. 1)

Analyte (ug/l)*	5/78	5/78	5/78	5/78	6/78	7/79	12/79	3/80	7/80	6/82	6/82	1/84	MCL†
Arsenic	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	50
Barium	<1,000	<1,000	<1,000	<1,000	<1,000	<1,000	<1,000	<1,000	<1,000	<1,000	<1,000	<200	1,000
Cadmium	<10	<10	<10	<10	<10	22	<10	<10	<10	<10	<10	<10	10
Chromium	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	50
Lead	<50	<50	<50	<50	<50	54	50	<50	37	220	<50	22	50
Mercury	<2	<2	<2	<2	<2	<2	<2	<2	<2	<5	<5	<1	2
Selenium	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	10
Silver	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	50
Copper	<20	<20	<20	<20	<20	85	<20	<20	<20	<20	<20	<20	1,000
Iron	<100	<100	<100	<100	<100	2,300	2,670	943	299	37,880	1,835	4,610	300
Manganese	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	50
Calcium (mg/l)	—	—	—	—	—	87	64	64	122	—	—	170	NA**
Magnesium (mg/l)	—	—	—	—	—	3.3	3.9	4.2	3.7	4.3	—	4.0	NA
Nitrate as nitrogen (mg/l)	1.2	1.4	1.4	1.3	1.1	0.7	<0.1	<0.1	0.8	—	—	—	10
Alkalinity (mg/l)	—	—	—	—	—	273	336	389	282	—	—	430	NA
Chloride (mg/l)	24	24	36	32	20	24	32	156	16	—	—	430	250
Zinc	560	600	720	610	450	1,900	3,000	8,575	3,430	7,120	1,970	—	5,000

* All values in ug/l unless noted otherwise.
† Code of Federal Regulations, Title 40, July 1, 1983.
** NA = Not applicable; no MCL established.

Source: BES, 1978-1984.

proximity (see Sec. 4.2.1). Organic contamination by TCE in the landfill monitor well also confirms leachate migration downgradient of the disposal sites (see Table 3.4-4).

3.5 BIOTIC COMMUNITIES

AAFB is situated on a broad limestone plateau bounded along the coast by steep cliffs. In undeveloped areas, the predominant vegetation type is limestone forest found in various stages of succession. The forest is naturally maintained at subclimax stages by high winds associated with relatively frequent typhoons. Common plant species of the limestone forest are: breadfruit (Arctocarpus spp.), coconut palm (Cocos nucifera), papaya (Carica sp.), banyan (Ficus prolixa), and tangen-tangen (Leucaena glauca). Vegetation in the forest community is very dense due to a low degree of canopy closure, allowing much light to penetrate understory and ground levels.

Compared with the forest community, vegetation in developed areas of AAFB is very open. Large expanses of mown lawns predominate between buildings and along edges of roadways, parking lots, and runways. Some areas are landscaped with both native and non-native species of trees and shrubs.

Wildlife diversity on AAFB is relatively low. This is common on small islands or island groups that are isolated from other landmasses. Only two mammals are native to Guam, the Mariana fruit bat (Pteropus m. mariannus) and the little Mariana fruit bat (P. tokudae). Introduced mammals found on AAFB include wild hog (Sus scrofa), Guam deer (Cervus nigricans), black rat (Rattus rattus), Norway rat (R. norvegicus), Polynesian rat (R. exulans), house mouse (Mus musculus), and feral cats and dogs.

Amphibians and reptiles present on Guam include frogs, toads, anoles, geckos, skinks, monitor lizard (Varanus indicus), blind snake, and

Table 3.4-4. TCE Contamination in Landfill (LF-1) Monitor Well (Well No. 1)

Date	TCE (ug/l)
3/80	1.7
4/80	1.7
7/80	TR <1.0
10/80	1.2
3/81	TR <1.0
7/81	ND <0.5
3/83	1.0
12/83	0.5
3/84	ND

Notes: TR = Trace.
ND = None detected.

Source: BES, 1980-1984.

Philippine rat snake (*Boiga irregularis*). Both the monitor lizard and rat snake are introduced species and have adapted to conditions on Guam.

Ruderal areas on AAFB attract several species of birds including the Pacific golden plover (*Pluvialis dominica fulva*), Philippine turtle dove (*Streptopelia bitorquata dusumieri*), and black drongo (*Dricurus macrocercus harterti*). Birds commonly observed in limestone forests, cliff lines, and shore areas are the Chinese least bittern (*Ixobrychus sinensis*), Micronesian starling (*Aplonis opacus guami*), black drongo, white tern (*Gygis alba*), and white-tailed tropic bird (*Phaethon lepturus*).

Two species of mammals and seven birds on Guam are designated endangered by USFWS. These are the Mariana fruit bat, little Mariana fruit bat, Guam broadbill (*Mytagra freycineti*), Mariana crow (*Corvus kubaryi*), Mariana gallinule (*Gallinula chloropus guami*), Micronesian kingfisher (*Halcyon c. cinnamomina*), Guam rail (*Rallus owstoni*), Vanikoro swiftlet (*Aerodramus vanikorensis bartschi*), and bridled white-eye (*Zosterops c. conspicillata*). Although reasons for the decline of these species are not entirely understood, several factors are believed to be involved: habitat loss due to development activities, predation by non-native predators, over exploitation, disease, past use of harmful pesticides, and illegal shooting.

While critical habitat designation has been proposed for these endangered species, the U.S. Fish and Wildlife Service has determined that such designations would not be prudent. This is especially true for the two fruit bat species. Fruit bats have been heavily hunted for food and, even though protected, have experienced declines due to poaching. The little Mariana fruit bat has never been identified on any island except Guam. Because there have been no recent confirmed sightings, the little Mariana fruit bat may now be extinct. The Guam population of the Mariana fruit bat is restricted mainly to the cliff line forests on the north end of the island. Proposed management measures include continuing studies of fruit bat life history, captive propagation, and increased law enforcement.

Vanikoro swiftlets, once common in forests and caves of northern Guam, are now believed to number no more than 50 individuals. Although known swiftlet populations occur only in the southern portions of Guam, suitable habitat still exists within AAFB boundaries. The Mariana gallinule, a marsh bird, is not expected to occur on AAFB due to the absence of suitable freshwater habitat. The remaining five protected birds are found on AAFB in greatly reduced numbers. Their entire ranges are also reduced, some restricted to cliff lines and coastal basins on AAFB.

Recent studies indicate that the use of pesticides may no longer be contributing to the decline of these species. Poaching and illegal shooting are still factors in the case of the Guam rail and Mariana crow. The crow may also experience losses from competition with the black drongo, which utilizes similar habitat and food. Studies are currently being conducted to assess the effect of disease on Guam's endangered birds. A tropical mosquito (Culex quinquefasciatus) is thought to be a vector for avian disease and may be a major contributor to recent population declines. Predation by the Philippine rat snake and monitor lizard remains a serious problem for some species. Despite the fact that no significant loss of habitat is occurring on AAFB, the survival of the Guam rail, Mariana crow, Micronesian kingfisher, Guam broadbill, and bridled white-eye continues to be threatened by the apparent inability of the species to successfully compete for survival in their natural habitat.

3.6 ENVIRONMENTAL SETTING SUMMARY

AAFB is located on a limestone plateau on the northern end of Guam. Elevations on the base range from msl to more than 620 ft msl. The northern end of the island is characterized by steep limestone cliffs. The northern limestone plateau is relatively flat, except for two hills of volcanic origin [Mount Santa Rosa (858 ft msl) and Mataguac Hill (630 ft msl)] and one limestone dome (Barrigada Hill, 665 ft msl). The area also has numerous sinkholes and natural depressions.

No surface streams exist on the northern end of Guam. Storm water on AAFB is channeled relatively short distances into natural or manmade depressions in which dry injection wells have been drilled. These dry wells allow infiltration of surface waters into the aquifer. More than 100 of these injection wells have been installed on AAFB.

The major aquifer underlying AAFB is known as the Northern Lens Aquifer and consists of a parabasal unit, a basal unit, and a transition zone. the aquifer consists of a wedge of up to 150 ft of fresh water overlying salt water. Recharge occurs through the downward percolation of precipitation through the highly porous limestone overlying the aquifer and also through the dry injection wells.

Soils on AAFB are very thin and are residuals of weathered limestone and volcanic materials. The soils are very porous, have relatively high levels of organic materials (4 to 6 percent), and are locally known as Guam clay. These soils are highly susceptible to infiltration of contaminants.

Average annual rainfall at AAFB is 90.8 inches, with more than 60 percent occurring during the local wet season (July to November) at an average rate of more than 11 inches per month. Average monthly temperatures are relatively stable throughout the year, varying from a mean low of 75°F to a mean high of 84°F. An extreme minimum of 56°F in January and an extreme maximum of 91°F in August have been recorded.

Several threatened or endangered species are known to occur on AAFB and in the area, including Mariana fruit bat, Guam broadbill, Mariana crow, Micronesian kingfisher, Guam rail, and bridled white-eye. AAFB personnel, working with the Guam Aquatic and Wildlife Resources

Division, are trying to both identify and maintain the habitat of the Guam rail. In known habitat areas, a trapping program has been established in an attempt to control the Philippine rat snake, a potential predator of the Guam rail.

As a result of the geohydrological environment and soil characteristics, conditions on AAFB are conducive to contaminant migration. Potential contaminant migration would occur both vertically and laterally through the porous limestone into the Northern Lens Aquifer, the largest freshwater aquifer used as a potable water source on Guam.

Tab

4.0

4.0 FINDINGS

To assess hazardous waste management at AAFB, past activities of waste generation and disposal methods were reviewed. This section contains a summary of hazardous wastes generated, a description of waste disposal methods, an identification of the disposal sites onbase, and an evaluation of the potential for environmental contamination.

4.1 CURRENT AND PAST ACTIVITY REVIEW

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

AAFB operations described in this section are those which handle, store, or dispose of potentially toxic or hazardous materials. These operations include industrial and laboratory operations and activities in which pesticides, polychlorinated biphenyls (PCBs), POL, radiological materials, and explosives are handled. No large-scale product-manufacturing operations have been conducted at AAFB. Rather, the industrial operations described in this section are primarily maintenance-support functions provided for facilities, aircraft, and ground vehicles.

Since the initiation of industrial activity in 1945, various disposal practices for wastes (both onsite and offsite) have been used. In general, waste disposal methods conformed to standard practices for that time period. With the enactment of Federal regulations in the late 1970s controlling toxic and hazardous materials, many former disposal practices changed, and these wastes have since been disposed of through the Defense Property Disposal Office (DPDO) at the U.S. Naval Base on Guam.

AAFB hazardous wastes are periodically collected and shipped with Navy wastes to the United States for ultimate disposal. Waste POL are hauled to the U.S. Naval Base for inclusion in boiler fuels.

Industrial activity since early AAFB days has cycled from little activity to many times the amount of today's activity [i.e., during the Vietnam and Korean Conflicts and Operation New Life (see Sec. 2.2)]. Often, specific information concerning waste generation rates and waste types of the early industrial activity was not available. Therefore, unless otherwise stated, current waste types, generation rates, and shop locations are assumed to be representative of historical activity. App. E contains a list of shops currently operating on AAFB. Past and current shops, activities, and waste treatment, storage, and disposal practices are discussed in this section.

A summary of waste generation from AAFB industrial operations is presented in Table 4.1-1. Industrial shops, activities, and waste treatment, storage, and disposal are described in the following paragraphs. Waste disposal, hazardous or otherwise, that is handled by contract will be referred to as "contract disposal" throughout this report.

4.1.1 INDUSTRIAL OPERATIONS

4.1.1.1 43RD STRATEGIC WING

SUPPLY SQUADRON

Bulk Fuels Storage

The Bulk Fuels Storage area (which includes Bldg. 14507) generates waste fuel sludges [1,200 gallons per year (gal/yr)] and contaminated fuels (150,000 gal/yr). The contaminated fuels [mostly jet propellant No. 4 (JP-4)] were burned in firefighter training from 1945 to 1979. In 1979, a program was initiated to recycle the JP-4 to bulk storage. Fuel sludges have always been burned in firefighter training.

Table 4.1-1. Andersen AFB Industrial Operations (Shops)--Waste Generation

Shop Name	Location (Bldg. No.)	Waste Material	Waste Quantity (gal/yr)*	Waste Management Practices (1950–1980)
1. 43rd STRATEGIC WING				
A. Supply Squadron				
1. Bulk Fuels Storage	14507	Fuel sludges	1,200	Firefighter training (from before 1950 →)
		Contaminated fuels (mostly JP-4)	150,000	Firefighter training (from before 1950 to c. 1980); Used in AGE or recycled to bulk storage (c. 1980 →)
2. Fuels Laboratory	26203	Petroleum ether	60	Burned in firefighter training (c. 1955 →)
		Waste fuels (mixed)	150	Burned in firefighter training (c. 1955 →)
3. Liquid Oxygen Facility	26224	TCE	55	Contract disposal (from before 1950 →)
B. Avionics Maintenance Squadron				
1. Bomb/Navigation Shop	17000	Lube oil	25	AAFB landfill or burned in firefighter training (c. 1958–1964); Contract disposal (c. 1964 →)
2. Electronic Countermeasure Shop	17000	Lube oil	25	AAFB landfill or burned in firefighter training (c. 1968–1970); Contract disposal (c. 1970 →)
		Silicone oil	300	AAFB landfill or burned in firefighter training (c. 1968–1970); Contract disposal (c. 1970 →)

Table 4.1-1. Andersen AFB Industrial Operations (Shops)--Waste Generation (Continued, Page 2 of 16)

Shop Name	Location (Bldg. No.)	Waste Material	Waste Quantity (gal/yr)*	Waste Management Practices (1950–1980)
3. Defensive Fire Control Shop	17000	TCE	660	AAFB landfill or burned in firefighter training; Contract disposal
		Perchloroethylene	660	CD →
		Lube oil	100	AAFB landfill or burned in firefighter training; Contract disposal →
		Stoddard solvent (PD-680)	250	Contract disposal →
		Solvent (type unknown)	360	AAFB landfill or BFT; CD
C. Field Maintenance Squadron				
1. AGE Shop	23022	Stoddard solvent	360	Contract disposal →
		Sulfuric acid	120	Discharged to storm drain →
		Lube oil	2,900	AAFB landfill or BFT; Contract disposal →
		Waste fuel	20	AAFB landfill or BFT; Contract disposal →
		Synthetic oil	20	AAFB landfill or BFT; Contract disposal →
		Ethylene glycol	160	Discharged to sanitary sewer →
		Aircraft-cleaning compound (detergent)	2,600	Discharged to storm drain →

Table 4.1-1. Andersen AFB Industrial Operations (Shops)--Waste Generation (Continued, Page 3 of 16)

Shop Name	Location (Bldg. No.)	Waste Material	Waste Quantity (gal/yr)*	Waste Management Practices (1950–1980)
1. AGE Shop (continued)		Tires	25/yr	(pre-1960, dashed) AAFB landfill or contract disposal →
		Oil filters	100/yr	(pre-1960, dashed) AAFB landfill →
		Hydraulic fluid	120	(pre-1960, dashed) AAFB landfill or BFT (to 1970) | Contract disposal →
2. Industrial Corrosion Control Shop	2799	MEK	240	Contract disposal →
		Lacquer thinner	240	Contract disposal →
		Cellulose thinner	360	Contract disposal →
		Paint slops	250	Contract disposal →
		Alodine solution	25	Discharged to storm drain →
		Chromic acid	15 lb/yr	Discharged to storm drain →
		Water-soluble detergents	500	Discharged to storm drain →
		Paint stripper	230	Discharged to storm drain →
3. Jet Engine Support Shop	18004	Stoddard solvent	600	Contract disposal →
		TCE	600 (until 1970) 60 (since 1970)	AAFB landfill or BFT (1958–1970) | Contract disposal →
		Aircraft-cleaning compound	240	Discharged to storm drain (from 1958) →

Table 4.1-1. Andersen AFB Industrial Operations (Shops)--Waste Generation (Continued, Page 4 of 16)

	Shop Name	Location (Bldg. No.)	Waste Material	Waste Quantity (gal/yr)*	Waste Management Practices (1950 / 1960 / 1970 / 1980)
4.	Engine Conditioning Shop	18004	Waste JP-4	550	Included in AGE fuel
			Lube oil	10	AAFB landfill or BFT | Contract disposal
5.	Fuel Systems Maintenance Shop	18004	MEK	60	Allowed to evaporate to the atmosphere
			MIBK	60	Allowed to evaporate to the atmosphere
6.	Jet Engine Test Cell	2552	JP-4	200	Contract disposal
			Stoddard solvent	25	Contract disposal
			Lube oil	3,750	Contract disposal
			TCE	25	Contract disposal
			Aircraft-cleaning compound	60	Discharged to storm drain
7.	Nondestruct Inspection Lab	17006	Developer solution	120	Contract disposal
			Fixer solution	120	Contract disposal
			Stoddard solvent	480	Contract disposal
			Zyglo® penetrant	300	Contract disposal
			Zyglo® emulsifier	660	Contract disposal
			TCE	60	Contract disposal
			Kerosene	110	Contract disposal
			Film	Variable	Shipped to Navy base for silver recovery

Table 4.1-1. Andersen AFB Industrial Operations (Shops)--Waste Generation (Continued, Page 5 of 16)

Shop Name	Location (Bldg. No.)	Waste Material	Waste Quantity (gal/yr)*	Waste Management Practices (1950–1980)
8. Jet Engine Intermediate Maintenance Shop	18004	Hydraulic fluid	75	AAFB landfill or burned in firefighter training (~1955–1970); Contract disposal (1970–present)
		Contaminated fuels	75	AAFB landfill or burned in firefighter training (~1955–1970); Contract disposal (1970–present)
		Solvent (type unknown)	60	AAFB landfill or burned in firefighter training (~1955–1970); CD (~1970–1971)
		Stoddard solvent	60	Contract disposal (~1971–present)
		Carbon remover	10	AAFB landfill or burned in firefighter training (~1955–1970); Contract disposal (1970–present)
		Lube oil	600	AAFB landfill or burned in firefighter training (~1955–1970); Contract disposal (1970–present)
9. Aircraft Corrosion Control Shop	18021 (1961-1981)	Paint slops	950	AAFB landfill or BFT (1961–1970); Contract disposal (1970–present)
	18017 (1981-present)	Paint strippers	900	Discharged to storm drain (1961–present)
		MEK	360	AAFB landfill or BFT (1961–1970); Contract disposal (1970–present)
		Toluene	180	AAFB landfill or BFT (1961–1970); Contract disposal (1970–present)
		Alodine solution	100	Discharged to storm drain (1961–present)
		Chromic acid	50 lb/yr	Discharged to storm drain (1961–present)
		Detergents	2,000	Discharged to storm drain (1961–present)

Table 4.1-1. Andersen AFB Industrial Operations (Shops)--Waste Generation (Continued, Page 6 of 16)

Shop Name	Location (Bldg. No.)	Waste Material	Waste Quantity (gal/yr)*	Waste Management Practices (1950–1980)
10. Repair and Reclamation Shop	18004	Solvent (type unknown)	100	AAFB landfill or BFT; CD
		Stoddard solvent	100	Contract disposal →
		Paint stripper	660	Discharged to storm drain →
		Hydraulic fluid	240	AAFB landfill or BFT; Contract disposal →
		Aircraft-cleaning compound	200	Discharged to storm drain →
11. Pneudraulics Shop	18006	Hydraulic fluid	330	AAFB landfill or BFT; Contract disposal →
		Solvent (type unknown)	300	AAFB landfill or BFT; CD
		Stoddard solvent	300	Contract disposal →
D. Organizational Maintenance Squadron				
1. Nonpowered AGE Shop	18004	Hydraulic fluid	3,850	AAFB landfill or BFT; Contract disposal →
		Lube oil	15	AAFB landfill or BFT; Contract disposal →
		Solvent (type unknown)	480	AAFB landfill or BFT; CD
		Stoddard solvent	480	AAFB landfill or BFT; Contract disposal →
		Aircraft-cleaning compound	500	Discharged to storm drain →

Table 4.1-1. Andersen AFB Industrial Operations (Shops)--Waste Generation (Continued, Page 7 of 16)

	Shop Name	Location (Bldg. No.)	Waste Material	Waste Quantity (gal/yr)*	Waste Management Practices (1950–1980)
E.	Munitions Maintenance Squadron				
1.	Bomb Renovation Shop	9040	Paint thinner (25% MEK)	2,650	Contract disposal (from ~1980)
			Paint-booth sludge	5,700	Contract disposal (from ~1980)
			Sandblasting residue	1,320 lb/yr	Landspread onsite (from ~1980)
2.	Equipment Maintenance Shop	2600	Lube oil	180	AAFB landfill or BFT (to ~1970); Contract disposal
			Various solvents	60	AAFB landfill or BFT (to ~1970)
			Stoddard solvents	60	AAFB landfill (~1970–1980); Contract disposal
			Hydraulic fluid	240	AAFB landfill or BFT (to ~1970); Contract disposal
			Brake fluid	25	AAFB landfill or BFT (to ~1970); Contract disposal
			Paint thinners	150	AAFB landfill or BFT (to ~1970); Contract disposal
3.	Weapons Maintenance Shop	51150	TCE	100	AAFB landfill or BFT (to ~1970); Contract disposal
			MEK	50	AAFB landfill or BFT (to ~1970); Contract disposal
			Toluene	50	AAFB landfill or BFT (to ~1970); Contract disposal
			Solvent (type unknown)	50	AAFB landfill or BFT (to ~1970); CD
			Stoddard solvent	50	Contract disposal (from ~1970)
			Lube oil	50	AAFB landfill or BFT (to ~1970); Contract disposal

Table 4.1-1. Andersen AFB Industrial Operations (Shops)--Waste Generation (Continued, Page 8 of 16)

	Shop Name	Location (Bldg. No.)	Waste Material	Waste Quantity (gal/yr)*	Waste Management Practices (1950 / 1960 / 1970 / 1980)
4.	Packing and Crating Shop	9002	Lube oil	280	AAFB landfill or BFT → Contract disposal (from 1970)
			Hydraulic fluid	600	AAFB landfill or BFT → Contract disposal (from 1970)
			Grease	150 lb/yr	AAFB landfill
5.	Weapons Release Shop	51104	Hydraulic fluid	30	AAFB landfill or BFT → Contract disposal (from 1970)
			Aircraft-cleaning compound	25	Discharged to storm drain
6.	Vac-U-Blast Shop	9100	Lube oil	110	AAFB land-fill → Contract disposal (from 1970)
			Grease	240 lb/yr	AAFB landfill
7.	Line Delivery and Handling Shop	9004	Stoddard solvent	220	Contract disposal (from 1970)
			Lube oil	2,200	Contract disposal (from 1970)
			Grease	420 lb/yr	AAFB landfill (from 1970)
F.	Combat Support Group				
1.	Reproduction Shop	25018	Electrostatic solvent (contains ferro-cyanide and trace hydrogen cyanide)	6	Discharge to sanitary sewer

Table 4.1-1. Andersen AFB Industrial Operations (Shops)--Waste Generation (Continued, Page 9 of 16)

Shop Name	Location (Bldg. No.)	Waste Material	Waste Quantity (gal/yr)*	Waste Management Practices (1950 / 1960 / 1970 / 1980)
2. Auto Hobby Shop	26051	Lube oil	1,000	AAFB landfill (from 1960); Contract disposal (from ~1980) →
		Grease	Variable	AAFB landfill (from 1960); Contract disposal (from ~1980) →
		Stoddard solvent (PD-680)	15	Contract disposal (from ~1980) →
		Brake pads	Variable	AAFB landfill (from 1960) →
		Ethylene glycol	Variable	Storm drain (from 1960) →
		Batteries	Variable	AAFB landfill (from 1960); CD →
C. <u>Civil Engineering Squadron</u>				
1. Heavy Equipment Shop	20021	Lube oil	36	AAFB landfill or BFT; Contract disposal (from ~1970) →
		Aircraft-cleaning compound	60	Discharged to storm drain →
2. Fire Protection Branch	17002	Aircraft-cleaning compound	660	Discharged to storm drain →
		Fire extinguisher agent	13,500	Used in firefighter training, used in in firefighting, or landfilled at AAFB →

Table 4.1-1. Andersen AFB Industrial Operations (Shops)--Waste Generation (Continued, Page 10 of 16)

	Shop Name	Location (Bldg. No.)	Waste Material	Waste Quantity (gal/yr)*	Waste Management Practices (1950 – 1960 – 1970 – 1980)
3.	Fire Extinguisher Maintenance Shop	17002	Chlorobromomethane	200	AAFB landfill
			Potassium bicarbonate	200	AAFB landfill
4.	Roads and Grounds Shop	20021	Lube oil	660	AAFB landfill or BFT; Contract disposal
			Aircraft-cleaning compound	660	Discharged to grade
			Diesel fuel	1,200	Allowed to evaporate at jobsite
5.	Liquid Fuels Maintenance Shop	18001	Solvent (type unknown)	120	AAFB landfill or BFT
			Stoddard solvent	120	Contract disposal
			Lube oil	240	AAFB landfill or BFT; Contract disposal
			Fuel sludges	100	Shipped to Navy base for disposal; Weathered onsite; AAFB landfill
			Contaminated fuels	Variable	Burned in firefighter training
6.	Paint Shop	Site of passenger terminal (1946-1958)	Paint slops	180	Landspread at jobsite; Contract disposal
		210 (1958-1964)	Paint thinner	1,320	Evaporated at jobsite; Contract disposal

Table 4.1-1. Andersen AFB Industrial Operations (Shops)--Waste Generation (Continued, Page 11 of 16)

	Shop Name	Location (Bldg. No.)	Waste Material	Waste Quantity (gal/yr)*	Waste Management Practices (1950 – 1960 – 1970 – 1980)
6.	Paint Shop (continued)	18002 (1964-present)	Paint-booth sludge	Variable	AAFB landfill → Contract disposal
			Empty paint cans	Variable	AAFB landfill
7.	Power Production Shop	75 locations basewide	Contaminated fuel	50	AAFB landfill or BFT → Contract disposal
			Lube oil	700	AAFB landfill or BFT → Contract disposal
			Solvent (type unknown)	120	AAFB landfill or BFT → CD
			Stoddard solvent	120	Contract disposal
			Battery acid	55	Neutralized and discharged to sanitary sewer
			Battery carcasses	50/yr	Contract disposal
8.	Refrigeration Shop	18002	TCE	50	Evaporated at jobsite → Contract disposal
			Freon®	200	Evaporated at jobsite
			Lube oil	120	AAFB landfill or BFT → Contract disposal
9.	Wastewater Treatment Section	18001	Untreated effluent	Variable	Discharged to ocean → Pumped to PUAG for treatment
		13 locations basewide	Oil/water separator sludges	Variable	AAFB landfill → Contract disposal

Table 4.1-1. Andersen AFB Industrial Operations (Shops)--Waste Generation (Continued, Page 12 of 16)

Shop Name	Location (Bldg. No.)	Waste Material	Waste Quantity (gal/yr)*	Waste Management Practices (1950–1980)
10. Heating Shop	18001	Asbestos material	100 lb/yr	AAFB landfill
		Boiler blowdown	130,000	Discharged to storm drain
11. Refuse Collection	18001	Residential refuse	103,000 yd^3/yr	AAFB landfill
		Industrial refuse	145,000 yd^3/yr	AAFB landfill
H. <u>Security Police Squadron</u>				
1. Armory	2510	Rifle bore cleaner	20	Evaporated on ground
		Stoddard solvent (PD-680)	10	Evaporated on ground
2. Small-Arms Training	26026	Stoddard solvent (PD-680)	25	Evaporated on ground
I. <u>Transportation Squadron</u>				
1. Vehicle Maintenance Shop	18001	Lube oil	3,600	AAFB landfill or BFT; CD
		Solvent (type unknown)	180	AAFB landfill or BFT
		Stoddard solvent	180	AAFB landfill or BFT; CD

Table 4.1-1. Andersen AFB Industrial Operations (Shops)--Waste Generation (Continued, Page 13 of 16)

Shop Name	Location (Bldg. No.)	Waste Material	Waste Quantity (gal/yr)*	Waste Management Practices (1950 / 1960 / 1970 / 1980)
1. Vehicle Maintenance Shop (continued)		Brake fluid	50	AAFB landfill or BFT → CD
		Transmission fluid	150	AAFB landfill or BFT → CD
		Brake pads	Variable	AAFB landfill
		Brake shoes	Variable	Returned to the manufacturer for credit
		Ethylene glycol	350	Discharged to storm drain
2. Corrosion Control Shop	18040	Paint thinners	200	AAFB landfill or BFT → CD
		Paint slops	180	AAFB landfill or BFT → CD
3. Refueling Maintenance Shop	26229	Waste JP-4	6,000	Sold to local contractors → CD
		Waste MOGAS	1,200	Sold to local contractors → CD
		Lube oil	260	AAFB landfill or BFT → CD
		Transmission fluid	100	AAFB landfill or BFT → CD

Table 4.1-1. Andersen AFB Industrial Operations (Shops)--Waste Generation (Continued, Page 14 of 16)

Shop Name	Location (Bldg. No.)	Waste Material	Waste Quantity (gal/yr)*	Waste Management Practices (1950 – 1960 – 1970 – 1980)
4. Battery Shop	18001	Battery acid	500	Neutralized and discharged to sanitary sewer (dashed to ~1955, solid thereafter →)
		Battery carcasses	550/yr	Contract disposal (~1950 →)
5. Packing and Crating Shop	22000	Lube oil	1,000	Contract disposal (~1975 →)
		Hydraulic fluid	60	Contract disposal (~1975 →)
		Brake fluid	170	Contract disposal (~1975 →)
		Transmission fluid	480	Contract disposal (~1975 →)
6. Tire Shop	18040	Tires	1,400/yr	AAFB landfill or contract disposal (~1950 →)
II. TENANTS				
A. Base Exchange Office				
1. Service Station	26101	Lube oil	1,800	AAFB landfill (dashed, ~1967–1978); Contract disposal (~1978 →)
		Grease	Variable	AAFB landfill (dashed, ~1967–1978); Contract disposal (~1978 →)
		Stoddard solvent (PD-680)	660	AAFB landfill (dashed, ~1967–1978); Contract disposal (~1978 →)
		Brake linings	Variable	AAFB landfill (~1967 →)

Table 4.1-1. Andersen AFB Industrial Operations (Shops)--Waste Generation (Continued, Page 15 of 16)

Shop Name	Location (Bldg. No.)	Waste Material	Waste Quantity (gal/yr)*	Waste Management Practices (1950 – 1960 – 1970 – 1980)
1. Service Station (continued)		Tires	Variable	AAFB landfill (c. 1963 →)
		Ethylene glycol	Variable	Storm drain (c. 1963 →)
		Batteries	Variable	AAFB landfill (c. 1963 – c. 1983); CD (c. 1983 →)
B. Det. 5, Air Force Satellite Control Facility				
1. Power Plant	N.W. Field	Lube oil	1,200	*Contract disposal* (c. 1969 →)
		Stoddard solvent (PD-680)	440	Contract disposal (c. 1969 →)
		Aircraft-cleaning compound	495	Contract disposal (c. 1969 →)
C. 605th Military Airlift Support Squadron				
1. Propulsion Shop	19020	Lube oil	360	AAFB landfill (c. 1955 – c. 1980); Contract disposal (c. 1980 →)
		Solvent (type unknown)	100	AAFB landfill (c. 1955 – c. 1980); Contract disposal (c. 1980 →)
		Stoddard solvent (PD-680)	240	AAFB landfill (c. 1971 – c. 1980); Contract disposal (c. 1980 →)
		Hydraulic fluid	220	AAFB landfill (c. 1955 – c. 1980); Contract disposal (c. 1980 →)

Table 4.1-1. Andersen AFB Industrial Operations (Shops)--Waste Generation (Continued, Page 16 of 16)

Shop Name	Location (Bldg. No.)	Waste Material	Waste Quantity (gal/yr)*	Waste Management Practices (1950 / 1960 / 1970 / 1980)
2. Corrosion Control Shop	18029	MEK	660	Evaporated on shop grounds; Contract disposal
		Toluene	15	Evaporated on shop grounds; Contract disposal
		Lacquer thinner	60	Evaporated on shop grounds; Contract disposal
		Paint slops (lead based)	50	AAFB landfill; Contract disposal
		Paint strippers	25	Evaporated on shop grounds; Contract disposal
		Aircraft-cleaning compound	500	Discharged to storm drain
3. Jet Shop	19020	Lube oil	150	AAFB landfill; Contract disposal
		Stoddard solvent (PD-680)	350	AAFB landfill; Contract disposal
		Solvent (type unknown)	350	AAFB landfill

*Unit of measurement is gallons per year (gal/yr) unless indicated otherwise.

Key:

- ——— Confirmed timeframe and disposal data from shop personnel.
- — — Estimated timeframe and disposal data from shop personnel.
- TCE Trichloroethylene.
- AGE Aerospace Ground Equipment Shop.
- CD Contract disposal.
- BFT Burned in firefighter training.
- MEK Methyl ethyl ketone.
- MIBK Methyl isobutyl ketone.

Source: ESE, 1985.

Fuels Laboratory

The Fuels Laboratory (Bldg. 26203) produces waste petroleum ether (60 gal/yr) and a mixture of waste fuels (150 gal/yr). Both of these wastes have been burned in firefighter training since 1945.

Liquid Oxygen Facility

The Liquid Oxygen Facility (Bldg. 26224) generates waste TCE (55 gal/yr). Disposal of TCE has always been through contract disposal.

AVIONICS MAINTENANCE SQUADRON

(AMS laboratory operations are described in Sec. 4.1.2, Laboratory Activities.)

Bomb/Navigation Shop

The Bomb/Navigation Shop (Bldg. 17000) generated waste lube oil at a rate of 25 gal/yr. The waste lube oil was landfilled or burned in firefighter training from 1958 to 1964 and has been disposed of through contracts with local waste oil dealers since 1964. Listed hazardous wastes (40 CFR 260) are currently contract disposed through DPDO on the U.S. Naval Base on Guam. POL have been typically disposed of by burning in Navy ship boilers for heat recovery.

Electronic Countermeasure Shop

The Electronic Countermeasure Shop (Bldg. 17000) produces waste lube oil (25 gal/yr) and silicone oil (300 gal/yr). Disposal of these oils was by landfilling or burning in firefighter training from 1968 to 1969 and contract disposal from 1969 to present.

Defensive Fire Control Shop

The Defensive Fire Control Shop (Bldg. 17000) generates waste TCE (660 gal/yr), perchloroethylene (660 gal/yr), lube oil (100 gal/yr), and Stoddard solvent (250 gal/yr). In 1982, perchloroethylene was substituted for TCE as the solvent used in parts washing. The waste solvents and lube oil were landfilled or burned in firefighter training from 1968 to 1969 and contract disposed from 1969 to present.

FIELD MAINTENANCE SQUADRON

Aerospace Ground Equipment Shop

The Aerospace Ground Equipment (AGE) Shop (Bldg. 23022) generates waste solvents (360 gal/yr), sulfuric acid (120 gal/yr), lube oil (2,700 gal/yr), waste fuels (20 gal/yr), synthetic oil (20 gal/yr), ethylene glycol (160 gal/yr), aircraft-cleaning compound (detergent) (2,600 gal/yr), tires (25/yr), oil filters (100/yr), and hydraulic fluid (120 gal/yr). Solvents were changed in 1970 from chlorinated types to Stoddard solvent (PD-680). Disposal of the solvents, oils, fuels, and hydraulic fluid was through landfilling or burning in firefighter training from 1945 to 1969 and contract disposal from 1969 to present. The waste sulfuric acid and aircraft-cleaning compound have always been discharged to a storm drain. The ethylene glycol has always been discharged to the sanitary sewer. Tires have been both landfilled and contract disposed since 1945. Used oil filters have always been disposed of in the base landfills.

Industrial Corrosion Control Shop

The Industrial Corrosion Control Shop (Bldg. 2799) generates waste methyl ethyl ketone (MEK) (240 gal/yr), lacquer thinner (240 gal/yr), cellulose thinner (360 gal/yr), paint slops (250 gal/yr), alodine solution (25 gal/yr), chromic acid [15 pounds per year (lb/yr)], water-soluble detergents (500 gal/yr), and paint stripper (230 gal/yr). Since operational startup in 1973, the waste MEK, thinners, and paint slops have been contract disposed; the alodine solution, chromic acid, detergents, and paint strippers have been discharged to a storm drain.

Jet Engine Support Shop

The Jet Engine Support Shop (Bldg. 18004) generates waste Stoddard solvent (600 gal/yr), TCE (600 gal/yr from 1956 to 1970 and 60 gal/yr from 1970 to present), and aircraft-cleaning compound (240 gal/yr). In

1970, Stoddard solvent replaced TCE as the general degreasing solvent. Waste Stoddard solvent has been contract disposed since 1970. TCE was landfilled or burned in firefighter training from 1956 to 1969 and contract disposed from 1969 to present. The aircraft-cleaning compound has always been discharged to a storm drain.

Engine Conditioning Shop

The Engine Conditioning Shop (Bldg. 18004) produces waste JP-4 (550 gal/yr) and lube oil (10 gal/yr). Waste JP-4 has been mixed with AGE fuel since 1956. Waste lube oil was landfilled or burned in firefighter training from 1956 to 1969 and contract disposed from 1969 to present.

Fuel Systems Maintenance Shop

The Fuel Systems Maintenance Shop (Bldg. 18004) generates waste MEK (60 gal/yr) and methyl isobutyl ketone (MIBK) (60 gal/yr). Both waste solvents are allowed to evaporate onsite.

Jet Engine Test Cell

The Jet Engine Test Cell (Bldg. 2552) produces waste JP-4 (200 gal/yr), Stoddard solvent (25 gal/yr), lube oil (3,750 gal/yr), TCE (25 gal/yr), and aircraft-cleaning compound (60 gal/yr). All these materials, except the aircraft-cleaning compound, have been contract disposed since 1970. The cleaning compound has been discharged to a storm drain since 1970.

Nondestruct Inspection Lab

The Nondestruct (X-ray) Inspection Lab (Bldg. 17006) generates waste developer solution (120 gal/yr), fixer solution (120 gal/yr), Stoddard solvent (480 gal/yr), Zyglo® penetrant (300 gal/yr), Zyglo® emulsifier (660 gal/yr), TCE (60 gal/yr), kerosene (110 gal/yr), and film (variable). All these waste materials, except film, have been contract disposed since 1972. Waste film is shipped to DPDO at the Naval Base for silver recovery.

Jet Engine Intermediate Maintenance Shop

Wastes generated from the Jet Engine Intermediate Maintenance Shop (Bldg. 18004) include hydraulic fluid (75 gal/yr), contaminated fuels (75 gal/yr), Stoddard solvent (60 gal/yr), carbon remover (10 gal/yr), and lube oil (600 gal/yr). In 1970, solvent types were changed from chlorinated solvents to Stoddard solvent (PD-680). All these materials were landfilled or burned in firefighter training from 1956 to 1969 and contract disposed from 1969 to present.

Aircraft Corrosion Control Shop

The Aircraft Corrosion Control (ACC) Shop has been located in Bldg. 18021 (from 1961 to 1981) and Bldg. 18017 (from 1981 to present). Wastes generated include paint slops (950 gal/yr), paint thinners (900 gal/yr), MEK (360 gal/yr), toluene (180 gal/yr), alodine solution (100 gal/yr), chromic acid (50 lb/yr), and detergents (2,000 gal/yr). Disposal of the paint slops, MEK, and toluene was through landfilling or burning in firefighter training from 1961 to 1969 and contract disposal from 1969 to present. Waste alodine solution, chromic acid, and detergents have been discharged to a storm drain since 1961.

Repair and Reclamation Shop

The Repair and Reclamation Shop (Bldg. 18004) generates waste Stoddard solvent (100 gal/yr), paint stripper (660 gal/yr), hydraulic fluid (240 gal/yr), and aircraft-cleaning compound (200 gal/yr). In 1970, solvent types were changed from chlorinated solvents to Stoddard solvent. Disposal of the solvents and hydraulic fluid has been through landfilling or burning in firefighter training from 1956 to 1969 and contract disposed from 1969 to present. The waste paint stripper and cleaning compound have been discharged to a storm drain since 1956.

Pneudraulics Shop

The Pneudraulics Shop (Bldg. 18006) generates waste hydraulic fluid (330 gal/yr) and Stoddard solvent (300 gal/yr). In 1970, solvent types were changed from chlorinated solvents to PD-680. Both waste products were landfilled or burned in firefighter training from 1956 to 1969 and contract disposed from 1969 to present.

ORGANIZATIONAL MAINTENANCE SQUADRON

Nonpowered AGE Shop

The Nonpowered AGE Shop (Bldg. 18004) generates waste hydraulic fluid (3,850 gal/yr), lube oil (15 gal/yr), Stoddard solvent (480 gal/yr), and aircraft-cleaning compound (500 gal/yr). Disposal of hydraulic fluid, lube oil, and solvents was through landfilling or burning in firefighter training from 1945 to 1969 and contract disposal from 1969 to present. Aircraft-cleaning compound has been discharged to a storm drain since 1945.

MUNITIONS MAINTENANCE SQUADRON

Bomb Renovation Shop

The Bomb Renovation Shop (Bldg. 9040) generates waste paint thinner (2,650 gal/yr). Paint-booth sludges (5,700 gal/yr), and sandblasting residue (1,320 lb/yr). The Bomb Renovation Shop has been operational since 1979, and waste paint thinners and paint-booth sludges have always been contract disposed. Sandblasting residue is landspread onsite.

Equipment Maintenance Shop

The Equipment Maintenance Shop (Bldg. 2600) produces waste lube oil (180 gal/yr), Stoddard solvent (60 gal/yr), hydraulic fluid (240 gal/yr), brake fluid (25 gal/yr), and paint thinners (150 gal/yr). Disposal of the lube oil, hydraulic fluid, brake fluid, and paint thinner was through landfilling or burning in firefighter training from 1945 to 1969 and contract disposal from 1969 to present. In 1970, solvent types were changed. From 1945 to 1981, waste solvents were landfilled or burned in firefighter training; since 1981, they have been contract disposed.

Weapons Maintenance Shop

The Weapons Maintenance Shop (Bldg. 51150) produces waste TCE (100 gal/yr), MEK (50 gal/yr), toluene (50 gal/yr), Stoddard solvent (50 gal/yr), and lube oil (50 gal/yr). All these waste materials were landfilled or burned in firefighter training from 1945 to 1969 and contract disposed from 1969 to present.

Packing and Crating Shop

The Packing and Crating Shop (Bldg. 9002) produces waste lube oil (280 gal/yr), hydraulic fluid (600 gal/yr), and grease (150 lb/yr). Waste lube oil and hydraulic fluid have been landfilled or burned in firefighter training from 1945 to 1969 and contract disposed from 1969 to present. Waste grease has been landfilled since 1945.

Weapons Release Shop

The Weapons Release Shop (Bldg. 51104) generates waste hydraulic fluid (30 gal/yr) and aircraft-cleaning compound (25 gal/yr). Waste hydraulic fluid was landfilled or burned in the firefighter training from 1945 to 1969. Waste fluid has been contract disposed since 1969. Aircraft-cleaning compound has always been discharged to a storm drain.

Vac-U-Blast Shop

The Vac-U-Blast Shop (Bldg. 9100) generates waste lube oil (110 gal/yr) and grease (240 lb/yr). Waste lube oil was landfilled from 1966 to 1969 and contract disposed from 1969 to present. Waste grease has been landfilled since 1966.

Line Delivery and Handling Shop

The Line Delivery and Handling Shop (Bldg. 9004) produces waste Stoddard solvent (220 gal/yr), lube oil (2,200 gal/yr), and grease (420 lb/yr). Stoddard solvent and lube oil have been contract disposed since 1969. Grease has been landfilled since 1969.

COMBAT SUPPORT GROUP

Reproduction Shop

The Reproduction Shop (Bldg. 25018) generates approximately 6 gal/yr of an electrostatic solvent (containing ferrocyanide and hydrogen cyanide). The waste solvent has been discharged to the sanitary sewer since 1954.

Auto Hobby Shop

The Auto Hobby Shop (Bldg. 26051) produces waste lube oil (1,000 gal/yr), Stoddard solvent (15 gal/yr), and grease, brake pads, ethylene glycol, and batteries (all variable quantities). Waste lube oil and grease were landfilled from 1960 to 1978 and contract disposed from 1978 to present. Stoddard solvent has been contract disposed since 1978; brake pads have been landfilled since 1960. Ethylene glycol has been discharged to the storm drain since 1960. Used batteries were landfilled from 1960 to May 1984 and have been contract disposed since May.

CIVIL ENGINEERING SQUADRON

Heavy Equipment Shop

The Heavy Equipment Shop (Bldg. 20021) produces waste lube oil (36 gal/yr) and aircraft-cleaning compound (60 gal/yr). Lube oil was landfilled or burned in firefighter training from 1945 to 1969 and contract disposed from 1969 to present. Aircraft-cleaning compound has been discharged to a storm drain since 1945.

Fire Protection Branch

The Fire Protection Branch (headquartered at Bldg. 17002) generates waste aircraft-cleaning compound (660 gal/yr) and fire extinguisher agent (13,500 lb/yr). Since 1945, aircraft-cleaning compound has been discharged to the storm drain, and outdated fire extinguisher agent has been used in firefighter training, used in actual firefighting, or landfilled.

Fire Extinguisher Maintenance Shop

The Fire Extinguisher Maintenance Shop (Bldg. 17002) produces waste dry chemical (200 gal/yr) and potassium bicarbonate (200 gal/yr). Both chemicals have been landfilled since 1945.

Roads and Grounds Shop

The Roads and Grounds Shop (Bldg. 20021) produces waste lube oil (660 gal/yr), aircraft-cleaning compound (660 gal/yr), and diesel fuel (1,200 gal/yr). Waste lube oil was landfilled or burned in firefighter training from 1945 to 1969 and contract disposed from 1969 to present. Since 1945, diesel fuel (used to clean tools) has been allowed to evaporate at the job site, and aircraft-cleaning compound has been discharged to grade.

Liquid Fuels Maintenance Shop

The Liquid Fuels Maintenance Shop (Bldg. 18001) generates waste Stoddard solvent (120 gal/yr), lube oil (240 gal/yr), fuel sludges (100 gal/yr), and contaminated fuels (variable). Waste solvent and lube oil were landfilled or burned in firefighter training from 1945 to 1969 and contract disposed from 1969 to present.

Paint Shop

The Paint Shop (Bldg. 18002) generates waste paint thinner (1,320 gal/yr), paint slops (180 gal/yr), paint-booth sludge (variable), and empty paint cans (variable). Both paint slops and thinner were disposed of at the job site by landspreading and evaporation, respectively, from 1946 to 1975 and contract disposed from 1975 to present. Paint-booth sludge was landfilled from 1954 to 1975 and contract disposed from 1975 to present. Empty paint cans have been landfilled since 1946.

Power Production Section

The Power Production Section (75 standby generators basewide) generates waste lube oil (700 gal/yr), contaminated fuel (50 gal/yr), Stoddard solvent (120 gal/yr), battery acid (55 gal/yr), and battery carcasses

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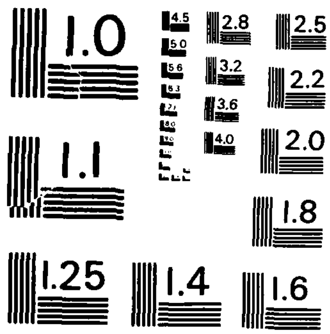

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(50/yr). Contaminated fuel, lube oil, and solvents were disposed through landfilling or burning in firefighter training from 1945 to 1969 and contract disposed from 1969 to present. Since 1945, neutralized battery acid has been discharged to the sanitary sewer, and battery carcasses have been contract disposed.

Refrigeration Shop

The Refrigeration Shop (Bldg. 18002) produces waste TCE (50 gal/yr), Freon® (200 gal/yr), and lube oil (120 gal/yr). Waste TCE was allowed to evaporate at the job site from 1945 to 1969 and contract disposed from 1969 to present. Freon® has always been allowed to evaporate at the job site. Waste lube oil was landfilled or burned in firefighter training from 1945 to 1969 and contract disposed from 1969 to present.

Wastewater Treatment Section

The Wastewater Treatment Section (administered out of Bldg. 18001) operated a sanitary wastewater lift station (Facility 1098) for the pumping of untreated sewage into the Pacific Ocean. This disposal practice was used from 1945 to 1978, when AAFB was tied into the Public Utility Agency of Guam (PUAG) sewage treatment system.

Thirteen oil/water separators are operational throughout AAFB. Listed below are the building numbers, capacities, and frequencies of cleanout of each separator.

Bldg. No.	Location	Capacity (gal)	Frequency of Cleanout
18001	Transportation	375	Monthly
18004	Jet Engine Shop	265	Quarterly
18004	OMS Shop	265	Quarterly
18006	Maintenance Shop	550	Quarterly
18020	Hangar	450	Monthly
19013	Aircraft Washrack	1,000	Monthly
23022	AGE Gas Station	420	Quarterly
26204	POL Washrack	600	Monthly
26229	Vehicle Refuel Shop	9,000	Quarterly

Bldg. No.	Location	Capacity (gal)	Frequency of Cleanout
26051	Base Exchange Garage	700	Quarterly
14526	Dumpster Washrack	600	Biweekly
2550	Jet Engine Test Cell	420	Monthly
--	Firefighter Training Area	Unknown	Unknown

Waste quantities of material removed (mostly water) are variable. Oil/water separator material was disposed of through landfilling from 1945 to 1969 and contract disposal from 1969 to present.

Heating Shop

The Heating Shop (Bldg. 18001) handles asbestos-containing material (100 lb/yr) and boiler blowdown (130,000 gal/yr). Material known to contain asbestos has been landfilled in accordance with applicable Federal regulations since 1982, and boiler blowdown has been discharged to a storm drain since 1945.

Refuse Collection

Refuse Collection (administered out of Bldg. 18001) handles residential [103,000 cubic yards per year (yd^3/yr)] and industrial refuse (145,000 yd^3/yr). All refuse material has been landfilled since 1945.

SECURITY POLICE SQUADRON

Armory

The Armory (Bldg. 2510) generates small amounts of waste rifle bore cleaner (200 gal/yr) and Stoddard solvent (10 gal/yr). Since 1964, disposal of both wastes has been through onsite evaporation.

Small-Arms Training

Small-Arms Training (Bldg. 26026) generates waste Stoddard solvent (25 gal/yr). Since 1964, disposal of waste solvent has been through onsite evaporation.

TRANSPORTATION SQUADRON

Vehicle Maintenance Shop

The Vehicle Maintenance Shop (Bldg. 18001) produces waste lube oil (3,600 gal/yr), Stoddard solvent (180 gal/yr), brake fluid (50 gal/yr), transmission fluid (150 gal/yr), ethylene glycol (350 gal/yr), and brake pads and brake shoes (both in variable quantities). In 1970, solvent types were changed from chlorinated to Stoddard solvent. Disposal of these POL was through landfilling or burning in firefighter training from 1945 to 1981 and contract disposal from 1981 to present. Since 1945, brake pads have been landfilled, brake shoes have been returned to the manufacturer for credit, and ethylene glycol has been discharged to a storm drain.

Corrosion Control Shop

Wastes generated from the Corrosion Control Shop (Bldg. 18040) include paint thinners and paint slops. Both wastes were landfilled or burned in firefighter training from 1945 to 1981 and have been contract disposed since 1981.

Refueling Maintenance Shop

The Refueling Maintenance Shop (Bldg. 26229) produces waste JP-4 (6,000 gal/yr), motor gasoline (MOGAS) (1,200 gal/yr), lube oil (260 gal/yr), and transmission fluid (100 gal/yr). Waste fuels were sold to local contractors from 1945 to 1981 and contract disposed from 1981 to present. Waste oil and transmission fluid were landfilled or burned in firefighter training from 1945 to 1981 and have been contract disposed since 1981.

Battery Shop

The Battery Shop (Bldg. 18001) generates waste battery acid (500 gal/yr) and battery carcasses (550/yr). Battery acid has been neutralized and discharged to the sanitary sewer since 1945. Battery carcasses have been contract disposed since 1945.

Packing and Crating Shop

The Packing and Crating Shop (Bldg. 22000) generates waste lube oil (1,000 gal/yr), hydraulic fluid (60 gal/yr), brake fluid (170 gal/yr), and transmission fluid (480 gal/yr). All these POL materials have been contract disposed since 1975.

Tire Shop

The Tire Shop (Bldg. 18040) generates 1,400 waste tires annually. Since 1945, disposal has been through landfilling or contract disposal (depending on tire condition).

4.1.1.2 TENANTS

BASE EXCHANGE OFFICE

Service Station

The Service Station (Bldg. 26101) produces waste lube oil (1,800 gal/yr), Stoddard solvent (25 gal/yr), and variable quantities of grease, brake linings, tires, ethylene glycol, and batteries. Disposal of the oil, grease, and solvent was through landfilling from 1963 to 1978 and contract disposal from 1978 to present. Brake linings and tires have been landfilled since 1963. Ethylene glycol has been discharged to a storm sewer since 1963. Used batteries were landfilled from 1963 to May 1984 and have been contract disposed since May.

DET. 5, AIR FORCE SATELLITE CONTROL FACILITY

Power Plant

The Det. 5 Power Plant (Northwest Field) produces waste lube oil (1,200 gal/yr), Stoddard solvent (440 gal/yr), and aircraft-cleaning compound (495 gal/yr). These wastes have been contract disposed since 1968.

605TH MILITARY AIRLIFT SUPPORT SQUADRON

Propulsion Shop

The Propulsion Shop (Bldg. 19020) produces waste lube oil (360 gal/yr), solvent (100 gal/yr), Stoddard solvent (240 gal/yr), and hydraulic fluid

(220 gal/yr). All these POL were landfilled from 1955 to 1979 and contract disposed from 1979 to present.

Corrosion Control Shop

The Corrosion Control Shop (Bldg. 18029) produces waste MEK (660 gal/yr), toluene (15 gal/yr), lacquer thinner (60 gal/yr), lead-based paint slops (50 gal/yr), paint strippers (25 gal/yr), and aircraft-cleaning compound (500 gal/yr). Waste paint strippers, thinners, and solvents were evaporated around the shop from 1955 to 1979 and have been contract disposed since 1979. Paint slops were landfilled from 1955 to 1979 and contract disposed from 1979 to present. Aircraft-cleaning compound has always been discharged to a storm drain.

Jet Shop

The Jet Shop (Bldg. 19020) generates waste lube oil (150 gal/yr) and Stoddards solvent (350 gal/yr). Solvent types were changed in 1970 from chlorinated to Stoddards solvent. Both oil and solvent have been landfilled from 1955 to 1979 and contract disposed from 1979 to present.

4.1.2 LABORATORY ACTIVITIES

Laboratory operations at AAFB are performed by the USAF Clinic (clinical, dental, and clinical X-ray laboratories), the 43rd AMS Precision Measurement Equipment Laboratory (PMEL), the 43rd CSG Photographic Laboratory, the 43rd CSG Reproduction Shop, and the 43rd AMS Photographic Laboratory. Wastes produced by these operations, waste quantities, and methods of disposal are shown in Table 4.1-2.

USAF Clinic

The major waste generated by the USAF Clinic at AAFB (clinical, dental, and clinical X-ray laboratories) is waste photographic solutions. The solutions generated by the dental laboratory are sent to the clinical X-ray group, where they are combined with silver-containing solutions generated by this group. Silver has been recovered from these solutions since 1968. Other wastes produced by the laboratories include amalgams

Table 4.1-2. Andersen AFB Industrial Operations (Laboratories)--Waste Generation

Laboratory Name	Location (Bldg. No.)	Waste Material	Waste Quantity	Waste Management Practices (1950 – 1960 – 1970 – 1980)
I. USAF CLINIC				
A. Pharmacy	26000	Out-of-date pharmaceu- ticals	Variable	? (dashed, ~1945–1955); Noncontrol items disposed of in landfill; control items to sanitary sewer or incinerated (~1955–present)
B. Clinic Laboratory	26000	Ethyl ether, phenol, acetone, formaldehyde, HCl	Variable	? (dashed, ~1945–1955); To sanitary sewer (~1955–present)
		Infectious wastes	Small (variable)	Dashed (~1945–1955); (1) Autoclaved and sent to landfill; (2) Incinerated at Bldg. 25003 (~1955–~1981); Sent to Navy for incineration (~1981–present)
C. Veterinarian	20011 (26000 from 1956 to 1964)	Paramite● (insecticide)	1 gal/mo	Disposed of on ground around kennels (~1963–present)
		Formaldehyde	1 pt/mo	To sanitary sewer (~1963–present)
		Hydrogen peroxide	1 pt/mo	
		Isopropyl alcohol	2 qt/mo	
D. Dental Lab	26000	Infectious wastes	Small (variable)	Autoclaved, sent to landfill (~1955–present)
		Amalgams	100 lb/yr	Dashed (~1955–1963); To hospital supply (~1963–present)
		Chloroform	Variable (small)	Used in process/evaporated (~1955–present)
		Methanol	1 pt/yr	
		Developing solutions	24 gal/mo	To sanitary sewer (~1945–1963); To X-ray clinic (~1963–present)
		Fixer solutions	24 gal/mo	

Table 4.1-2. Andersen AFB Industrial Operations (Laboratories)--Waste Generation (Continued, Page 2 of 3)

Laboratory Name	Location (Bldg. No.)	Waste Material	Waste Quantity	Waste Management Practices (1950–1980)
E. Clinic X-Ray Lab	26000	Developer solutions	50 gal/mo	? / To sanitary sewer / Silver recovery, then sanitary sewer
		Fixer solutions	100 gal/mo	
II. 43RD AMS PRECISION MEASUREMENT EQUIPMENT LABORATORY (PMEL)	286 (S. AAFB)	Mercury	2 lb	To DPDO for sale
		Methanol	1/2 pt	To sanitary landfill
		MEK	1 pt	
		Isopropyl alcohol	1 pt	
		Naphtha	1/2 pt	
		Ethyl alcohol	1/2 pt	
III. 43RD CSG PHOTO-GRAPHIC LAB	21001	D-76 developer	10 gal/mo	To sanitary sewer
		Replenisher/ color developer	15 gal/mo	To sanitary sewer
		Dektol® developer	50 gal/mo	To sanitary sewer
		Stop bath and replenisher*	10 gal/mo	To sanitary sewer
		Bleach	8 gal/mo	To sanitary sewer
		Ektaprint BAC®	10 gal/mo	To sanitary sewer
		Fixing bath solution	75 gal/mo	To sanitary sewer / Silver recovery
		Acetic acid*	5 gal/mo	To sanitary sewer
		NaOH	1 gal/mo	To sanitary sewer
		Film and photographic paper	Variable	To sanitary sewer / Silver recovery

Table 4.1-2. Andersen AFB Industrial Operations (Laboratories)--Waste Generation (Continued, Page 3 of 3)

Laboratory Name	Location (Bldg. No.)	Waste Material	Waste Quantity	Waste Management Practices (1950 / 1960 / 1970 / 1980)
IV. 43RD CSG REPRODUCTION SHOP	25018 (Bldg. 21000 from 1948 to 1973)	Blanket-rolla* solvent	7 gal	----- (est. ~1948–1955) / Solvent rags disposed of to sanitary landfill →
		Deglazing solvent	48 oz	
		Multilith electrostatic solution	4 gal	
		Dichloromethane	Variable (small)	
V. 43RD AMS PHOTOGRAPHIC LAB	17000 (1956)	Methyl alcohol	1 pt	----- (est. ~1960–1966) / To sanitary landfill →
VI. ARTS AND CRAFTS PHOTOGRAPHIC LAB	25005 (1964)	Fixer Developer	Variable (small)	To sanitary sewer → (from ~1963)

*No longer in use.

Key:
———— Confirmed timeframe and disposal data from shop personnel.
- - - - - Estimated timeframe and disposal data from shop personnel.

Source: ESE, 1985.

(sent to DPDO), infectious wastes and noncontrol out-of-date pharmaceuticals (sent to the landfill after autoclaving the infectious wastes), infectious materials (incinerated at Bldg. 23003 prior to 1981; now sent to the Naval Base for incineration and disposal), and dilute chemical solutions and solvents and controlled pharmaceuticals (disposed of in the sanitary sewer system). The clinic has been located in Bldg. 26000 since 1956. The veterinary activity, currently located in Bldg. 20011, was located in Bldg. 26000 from 1956 to 1964.

43rd AMS PMEL

The 43rd AMS PMEL operates a laboratory to check the calibration of various instruments. The major waste produced by this operation is metallic mercury removed from various instruments. The mercury is recovered and sent to DPDO for disposal. PMEL is located in Bldg. 286 on AAFB South.

43rd CSG Photographic Laboratory

The 43rd CSG operates photographic laboratories for the processing of black-and-white film, color print film, color slides, and motion picture film. The primary base photographic laboratory has been located in Bldg. 21001 since 1948. Prior to 1968, all wastewaters generated by the laboratory were disposed of in the sanitary sewer system. In 1968, a silver recovery program was initiated. Silver is now recovered from fixing bath solutions (75 gal/mo) and from scrap film, negatives, pictures, and print papers. After silver recovery, the fixing bath solutions and other chemical solutions used in the developing and printing process are disposed of to the sanitary sewer system.

43rd CSG Reproduction Shop

This activity, currently located in Bldg. 25018, was in Bldg. 21000 from 1948 to 1973. Wastes produced by this activity include rags saturated with Blanketrolla® solvent, deglazing solvent, multilith solution, and dichloromethane used to clean the reproduction equipment. Solvents contained in these solutions are usually chlorinated (e.g., TCE, dichloromethane). The waste rags containing small amounts of these solvents are usually disposed of in the landfill.

43rd AMS Photographic Laboratory

This operation produces only small quantities of rags saturated with methyl alcohol that are used to clean the photographic equipment, including lenses, mounted on aircraft. These rags are disposed of in the sanitary trash. No problems are anticipated from this disposal technique.

Arts and Crafts Photographic Laboratory

This operation, located in Bldg. 25005, generates small quantities of waste fixer and developer, which are disposed of in the sanitary sewer.

4.1.3 PESTICIDE HANDLING, STORAGE, AND DISPOSAL

Pesticides and herbicides are currently being used by the 43rd CES Entomology Section to maintain grounds and structures and to prevent pest-related health problems. Before 1984, the 43rd CES Roads and Grounds Shop was responsible for herbicide applications. Pest-control measures include health-related and structural insect and rodent-control rodent-control programs; weed-control at security fences, parking areas, and utility and antenna sites; and landscape maintenance programs.

Pesticides have been stored and handled in Bldg. 20010 since 1978. During the same period, herbicides have been stored and handled in Bldg. 20021. Prior to 1978, pesticide handling and storage had been conducted in a building which was located where the present MAC terminal stands. For an undetermined length of time up to approximately 1967, pesticides had been stored in an igloo (No. 8479) in the northwestern portion of AAFB.

Records of types and quantities of pesticides used are available from 1982 to present. No record or recollection of disposal of excess or outdated pesticides is available.

Until about 1977, pesticide wastewaters, generated by rinsing spray equipment, were disposed of on the ground at various rinse water sources. Since no designated area was used for repeated disposal of rinse water and due to the dilute concentration of pesticides in these wastes, no significant pesticide residuals are anticipated from these disposal practices. Since 1977, rinse waters have been used as diluent for subsequent formulations of the same pesticides. Empty pesticide containers have always been landfilled. Prior to the mid-1970s, the containers were landfilled without rinsing; subsequent to that time, all containers have been triple-rinsed and punctured or crushed prior to landfilling.

Two incidences of accidental pesticide and herbicide spills have occurred. The most recent spill occurred at the Harmon Annex tank farm on Feb. 8, 1984, when 1,500 gal of a Diuron/water mixture were released from a herbicide sprayer. The spill resulted from a broken hose and created a stream of herbicide which covered approximately 1/8 acre before seeping into the ground. The residual herbicide left on the ground surface was placed in metal drums and removed from the site for subsequent disposal. The spill posed no significant threat to humans or wildlife. There was no water in proximity to the spill. The herbicide spreader was taken for repairs and modifications of the valve system to avoid another incident. The Guam Environmental Protection Agency (EPA) was notified after the spill occurred and offered guidance and inspected the site upon completion of the cleanup. It was found that the cleanup was complete, and no further action was needed (43rd CES, 1984).

Another incident occurred in 1972 at the intersection of Tarague Beach Rd. and Pati Point Rd. At this location, approximately 100 gal of

3-percent malathion were drained from a tank trailer. No report of this incident or related action is available.

4.1.4 PCB HANDLING, STORAGE, AND DISPOSAL

The 43rd CES Electrical Shop performs electrical inspection, maintenance, and installation procedures on AAFB. However, the Public Works Center on the Naval Station (NS) has performed maintenance of transformers on AAFB, including those containing PCB fluids. Reworking has taken place on NS facilities since initial operation of AAFB. In 1976, a program to replace equipment containing PCB dielectric fluid with mineral-oil-filled equipment was initiated by the Navy Public Works Center. A list of transformers containing PCB fluids, transformer locations, and volume of fluid in each transformer is maintained by AAFB. An open storage area (Pad No. 20013, adjacent to Bldg. 20011) is currently used for storage of out-of-service electrical components. An inspection of this area revealed that all transformers had been removed. No evidence of dielectric fluid residues was observed at the site. Several minor leaks have occurred, as noted on the inspection sheet. Any fluids which have leaked are cleaned up by Navy personnel and taken to the Navy Public Works Center for disposal. No past PCB spill sites were identified.

4.1.5 POL HANDLING, STORAGE, AND DISPOSAL

The types of POL used and stored at AAFB include MOGAS, diesel fuel No. 2 (DF-2), fuel oil, kerosene, JP-4, liquified petroleum gas (LPG), petroleum-based solvents, hydraulic fluid, and lube oil.

In addition to fixed storage tanks, drums and smaller containers are used for aboveground storage of incoming and waste materials, mainly solvents, hydraulic fluid, and lube oil.

POL spill management is addressed in the Spill Prevention Control and Countermeasure (SPCC) Plan. This plan is revised regularly to ensure that it accurately reflects storage capacity and spill prevention/ containment.

Existing Aboveground POL Storage

The aboveground storage tanks range in capacity from 50 to 5,250,000 gal. Total aboveground storage tank capacity for MOGAS, DF-2, fuel oil, and JP-4 is approximately 45,836,000 gal. There were 40 aboveground tanks identified basewide, with spill-containment structures ranging from no containment to complete concrete enclosures. The POL types, capacities, facility numbers, and containment structures (if any) are listed in Table 4.1-3. The majority of the large aboveground tanks were constructed by USAF in the late 1940s.

Existing Underground POL Storage

A total of 110 existing underground storage tanks were identified at AAFB, with a total capacity of 18,580,000 gal. The number of tanks, POL types, capacities, and facility numbers are listed in Table 4.1-4. The majority of the large underground tanks are used for storing JP-4 for aircraft use and MOGAS and DF-2 for vehicular use.

Abandoned POL Storage

Only one abandoned tank was reported at AAFB. The 210,000-gal fuel oil storage tank is located at the old power plant (Bldg. 2618). This aboveground tank was completed in 1976. The tank is empty and does not represent any potential threat to the environment.

Waste POL Storage, Handling, and Disposal

Waste POL at AAFB include waste fuel, lube oil, petroleum-based solvents, and hydraulic fluid. The generation and disposal of waste POL are summarized in Table 4.1-1 (in Sec. 4.1-1).

Wastes are stored at their generation points in drums, aboveground tanks, and underground tanks until the maximum storage capacity is reached. Until 1969, the typical disposal practice for waste POL was

Table 4.1-3. Aboveground POL Storage Tanks

POL Type	Capacity (gal)	Facility	Containment
JP-4	420,000	26201	Dike
JP-4	420,000	26202	Dike
JP-4	420,000	26205	Dike
JP-4	420,000	26206	Dike
JP-4	1,260,000	26207	Dike
JP-4	1,260,000	26208	Dike
JP-4	1,680,000	26209	Dike
JP-4	1,680,000	26210	Dike
JP-4	1,260,000	26211	Dike
JP-4	1,260,000	26212	Dike
Diesel	8,400	26218	Dike
MOGAS	2,500	26219	Dike
MOGAS	2,500	26221	Dike
JP-4	840,000	00106	Dike
JP-4	840,000	00107	Dike
JP-4	840,000	00108	Dike
JP-4	840,000	00109	Dike
JP-4	840,000	00110	Dike
JP-4	5,250,000	14501	Dike
JP-4	5,250,000	14502	Dike
JP-4	5,250,000	14503	Dike
JP-4	5,250,000	14504	Dike
JP-4	5,250,000	14505	Dike
JP-4	5,250,000	14506	Dike
Mogas	1,000	18013	None
Diesel	500	1098	None
Diesel	500	1881	None
Diesel	500	2616	None
Diesel	250	17002	None
Diesel	1,500	18006	None
Diesel	1,000	18010	None
Diesel	500	21001	None
Diesel	500	21005	None
Diesel	5,000	23002	None
Diesel	50	24101	None
Diesel	275	26000	None
Diesel	1,000	27000	None
Diesel	30,000	10	Dike

Source: 43rd CES, 1983a.

Table 4.1-4. Underground POL Storage Tanks

POL Type	Number of Tanks	Total Capacity (gal)	Facility
JP-4	10	500,000	2520
JP-4	10	500,000	2527
JP-4	10	500,000	2534
JP-4	10	500,000	19000
JP-4	4	200,000	19035
JP-4	6	300,000	2620
JP-4	6	300,000	2625
JP-4	6	300,000	2630
JP-4	6	300,000	2635
JP-4	6	300,000	2740
Waste Oil/ Solvents	2	10,000	8034
MOGAS	1	25,167	20008
MOGAS	1	10,000	23022
MOGAS	1	10,000	26101
JP-4	1	2,100,000	301
JP-4	1	2,100,000	302
JP-4	1	2,100,000	303
JP-4	1	2,100,000	304
JP-4	1	2,100,000	305
JP-4	1	2,100,000	306
JP-4	1	2,100,000	307
Diesel	1	2,000	1091
Diesel	1	2,000	2509
Diesel	1	500	14507
Diesel	1	500	18001
Diesel	2	3,800	18002
Diesel	1	1,500	18007
Diesel	1	6,000	13017
Diesel	1	4,000	22022
Diesel	1	2,000	25001
Diesel	1	3,000	25002
Diesel	1	2,000	25005
Diesel	1	500	25008
Diesel	1	3,000	25010
Diesel	1	3,000	25013
Diesel	1	2,000	26006
Diesel	1	3,000	51150
Diesel	1	5,000	51154
Diesel	1	25,000	81
Diesel	1	4,000	680
Diesel	1	4,000	998
Diesel	1	4,000	1613

Source: 43rd CES, 1983a.

landfilling in the AAFB landfills or burning in firefighter training. Since 1969, waste POL have been contract disposed. A waste POL collection center is located at the west end of the south runway, off Perimeter Rd. Contract disposal is handled through DPDO.

4.1.6 RADIOACTIVE MATERIALS HANDLING, STORAGE, AND DISPOSAL

Various types of items containing radioactive materials are stored and used on AAFB, including sealed calibration sources, vacuum tubes, analytical instrumentation, and luminous dials. An inventory of radiological sources, quantities, storage and use locations, and license authorization is maintained by the AAFB Radiation Protection Officer (RPO). The only items containing radioactive materials that have been disposed of on AAFB are small quantities of vacuum tubes which have been disposed of in the landfill. Disposal of these items in the landfill is considered an acceptable practice because the quantities of radioactivity involved do not represent a threat to human health or safety.

4.1.7 EXPLOSIVE/REACTIVE MATERIALS HANDLING, STORAGE, AND DISPOSAL

Explosive ordnance disposal (EOD) on AAFB occurs at the EOD range located at the cliff line, east of the rifle range on Tarague Beach. The site has been used since at least 1968 and most likely prior to 1968. The site consists of a shallow trench approximately 12 ft by 30 ft, which is used for detonation or open burning. Recent soil data have indicated slight traces of lead in the soil at the treatment site (43rd CES, 1983b). Currently, a new burn kettle located near Bldg. 9032 is waiting to be permitted. This site will be used to handle small-arms munitions since archaeological finds in the current EOD area will require site closure. Much of the larger unserviceable ordnance is, and will continue to be, transported to the U.S. Navy base on Guam for detonation (43rd CES, 1983c). A small EOD range will be maintained at Northwest Field, located north of the runways. Due to the location of the existing EOD range, this site poses minimal potential for contamination or hazardous leachate formation. Based on the decision process outlined in Fig. 1.3-1, the site was deleted from further consideration.

4.2 WASTE DISPOSAL METHODS AND DISPOSAL SITES IDENTIFICATION, EVALUATION, AND HAZARD ASSESSMENT

4.2.1 STORMWATER DRAINAGE SYSTEM

The stormwater drainage system at AAFB consists of more than 100 dry wells to rapidly remove surface runoff. The majority of wells (approximately 77) are located in the flightline and fuel storage areas (see Fig. 3.2-1). The wells were drilled over a period of 20 years, between the late 1940s and mid-1960s. Dry wells are effective in removing runoff because they expose unweathered porous rock in the side wall of the well and operate with a large head differential between the well and the aquifer.

None of the dry wells on AAFB are currently open to the water table; however, this has little effect on their ability to directly recharge or influence the aquifer system (Feltz et al., 1970). These dry wells can act as direct conduits for contaminants to enter the aquifer. Sixteen shops on AAFB are discharging, or have discharged, wastes to the stormwater drainage system. The drainage system on AAFB has been divided into three geographic zones (SDS-1, SDS-2, and SDS-3) for potential aquifer contamination evaluation (see Fig. 4.2-1). Wastes discharged to the stormwater drainage system, shop names, and drainage zones are listed in Table 4.2-1. Due to the nature of the wastes discharged, minor fuel spills, and direct access to the aquifer system, these wells do have potential for contamination and migration of contaminants and, therefore, were ranked using the HARM process (see App. H). Conclusions and recommendations regarding these sites are presented in Secs. 5.0 and 6.0, respectively.

4.2.2 LANDFILLS

Twenty-six landfills that were used for either sanitary, industrial, or debris disposal were identified at AAFB. Landfill locations are identified on Figs. 4.2-2 through 4.2-5, and a summary of important landfill details is presented in Table 4.2-2.

USAFAND 10/17/84

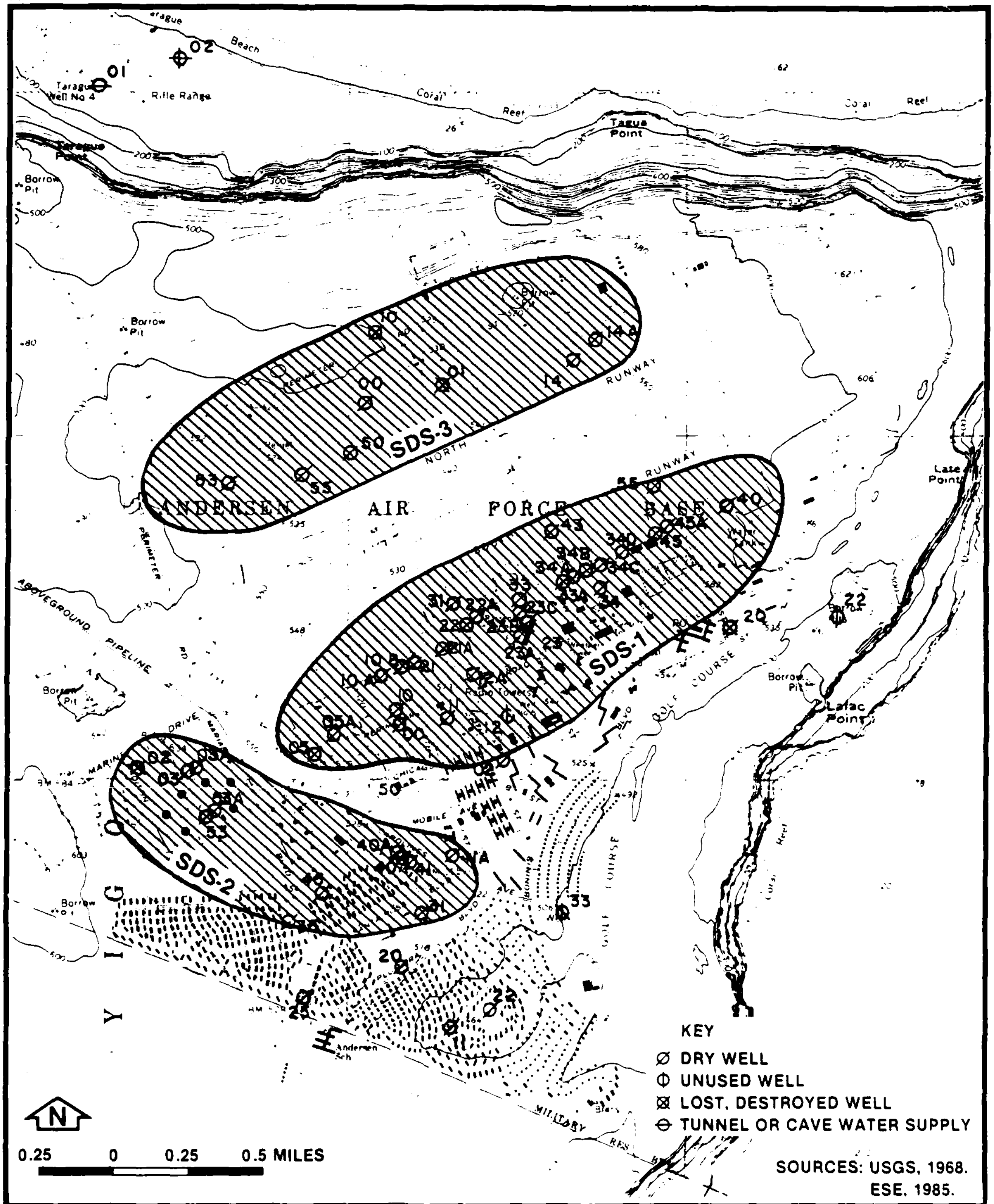

Figure 4.2-1 STORMWATER DRAINAGE SYSTEM EVALUATION ZONES	INSTALLATION RESTORATION PROGRAM Andersen Air Force Base

Table 4.2-1. Wastes Discharged to the Stormwater Drainage System on AAFB

Shop Name	Building No.	Waste Discharged	Drainage Zone*
AGE Shop	23022	Sulfuric acid, ethylene glycol	SDS-1
Jet Engine Support Shop	18004	Aircraft-cleaning compound	SDS-1
Aircraft Corrosion Control Shop	18017	Alodine solution, chromic acid, paint stripper, detergent	SDS-1
Repair and Reclamation Shop	18004	Paint stripper, cleaning compound	SDS-1
Nonpowered AGE Shop	18004	Aircraft-cleaning compound	SDS-1
Heavy Equipment Shop	20021	Aircraft-cleaning compound	SDS-1
Heating Shop	18001	Boiler blowdown	SDS-1
Vehicle Maintenance Shop	18001	Ethylene glycol	SDS-1
Corrosion Control Shop	18029	Aircraft-cleaning compound	SDS-1
Fire Station	17002	Aircraft-cleaning compound	SDS-1
Auto Hobby Shop	26051	Ethylene glycol	SDS-2
Service Station	26101	Ethylene glycol	SDS-2
Industrial Corrosion Control Shop	2799	Alodine solution, chromic acid, paint stripper, detergent	SDS-3
Jet Engine Test Cell	2552	Aircraft-cleaning compound	SDS-3
Weapons Release Shop	51104	Aircraft-cleaning compound	SDS-3

*Drainage Zones: SDS-1 = South Runway.
SDS-2 = Fuel Storage Area.
SDS-3 = North Runway.

Source: ESE, 1985.

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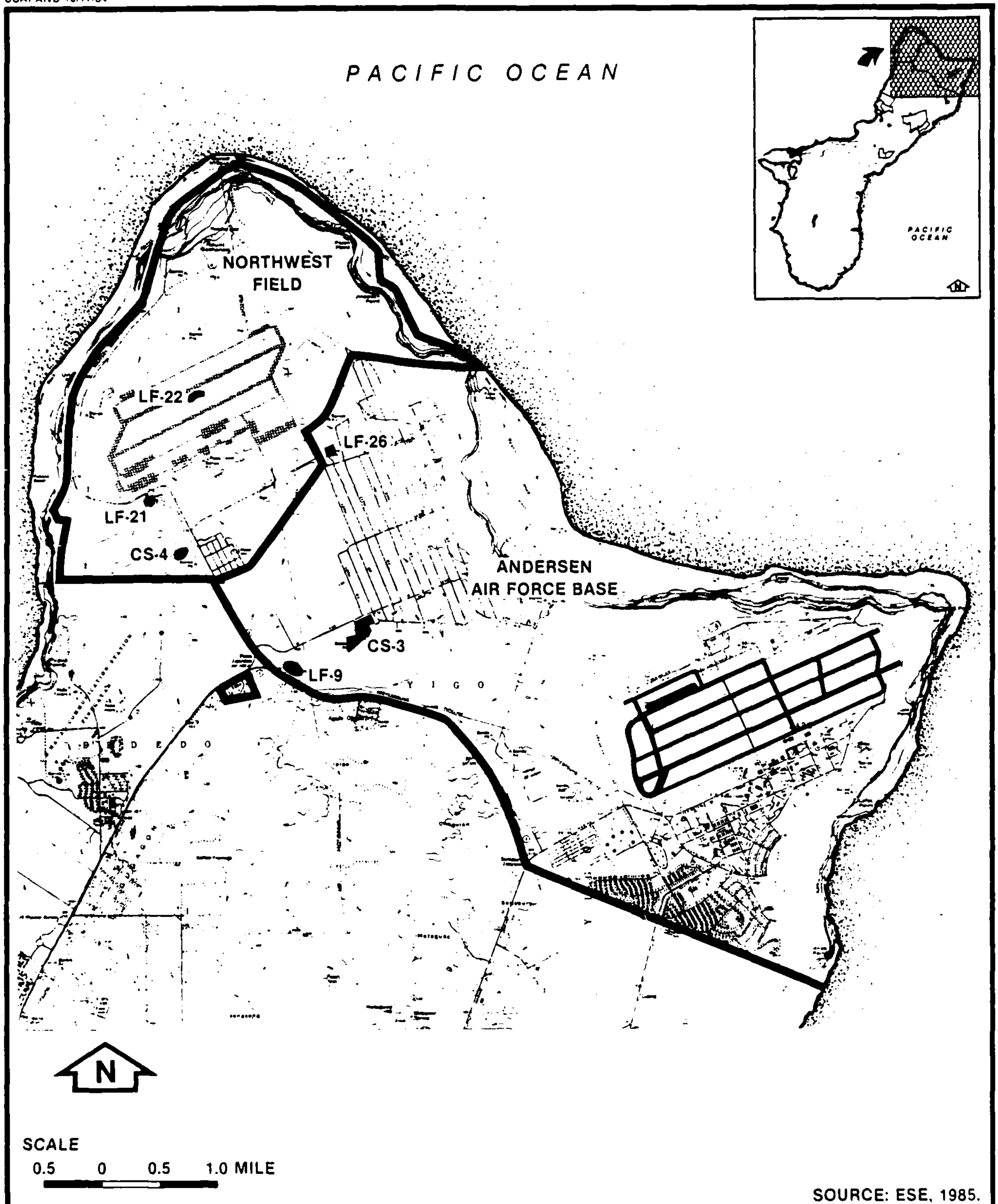
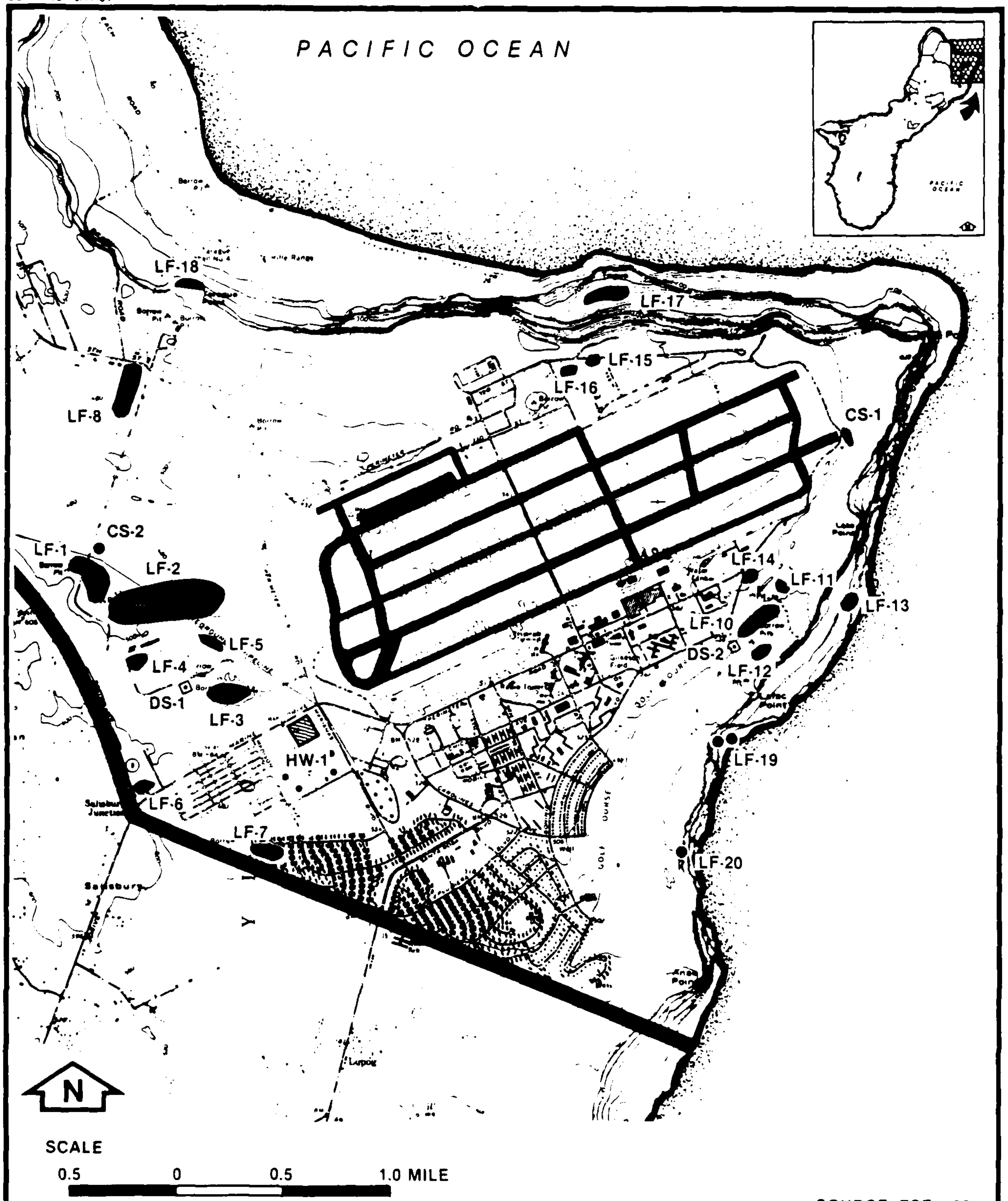


SOURCE: ESE, 1985.

Figure 4.2-2 **LANDFILL LOCATIONS AND DISPOSAL SITES ON WESTERN PART OF AAFB AND NORTHWEST FIELD**	**INSTALLATION RESTORATION PROGRAM** **Andersen Air Force Base**

USAFAND 10/17/84



SOURCE: ESE. 1985.

Figure 4.2-3 LANDFILL LOCATIONS AND DISPOSAL SITES ON EASTERN PART OF AAFB	INSTALLATION RESTORATION PROGRAM Andersen Air Force Base

USAFAND 10/17/84

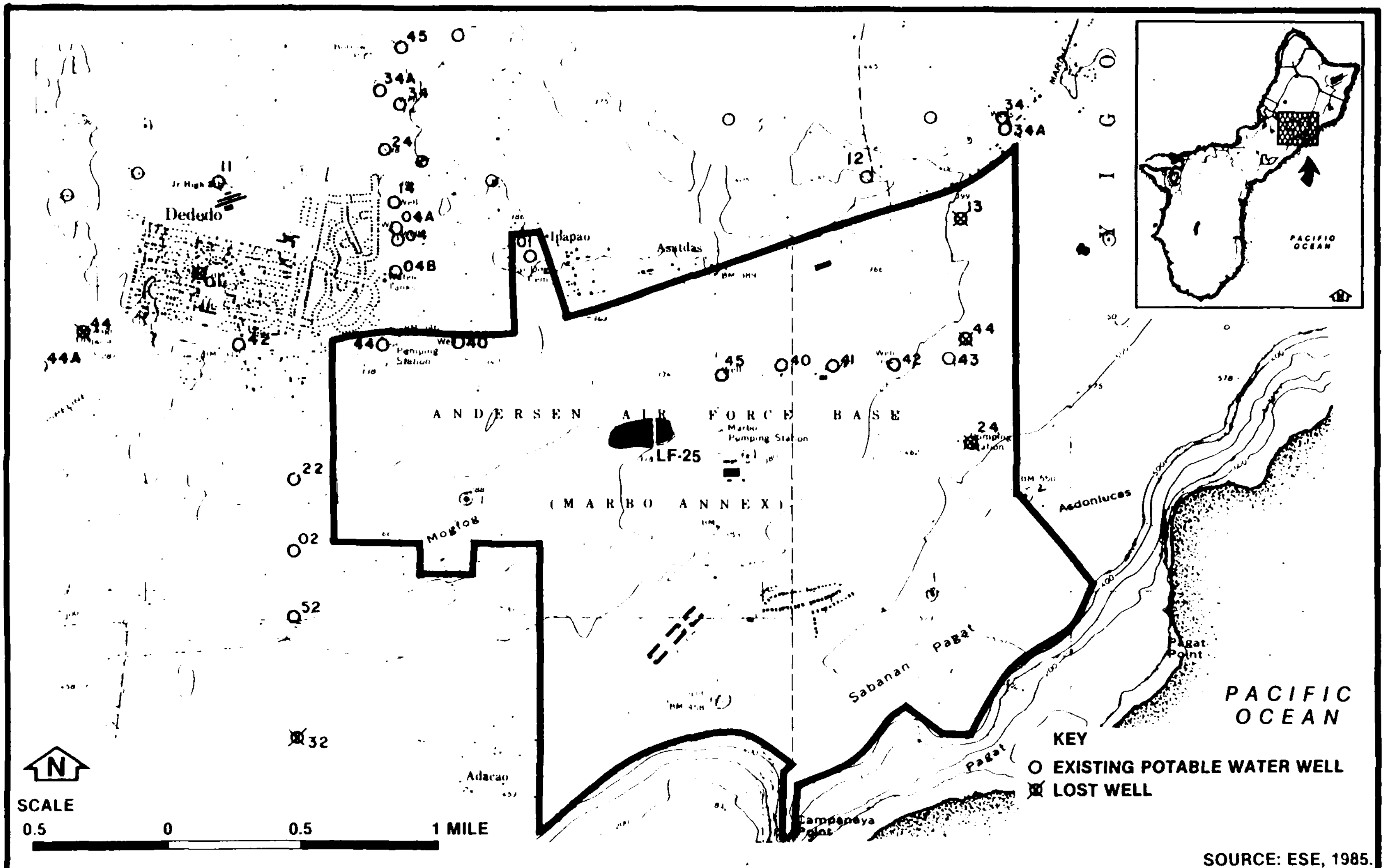


Figure 4.2-4
LANDFILL LOCATIONS ON AAFB SOUTH
(MARBO ANNEX)

INSTALLATION
RESTORATION PROGRAM
Andersen Air Force Base

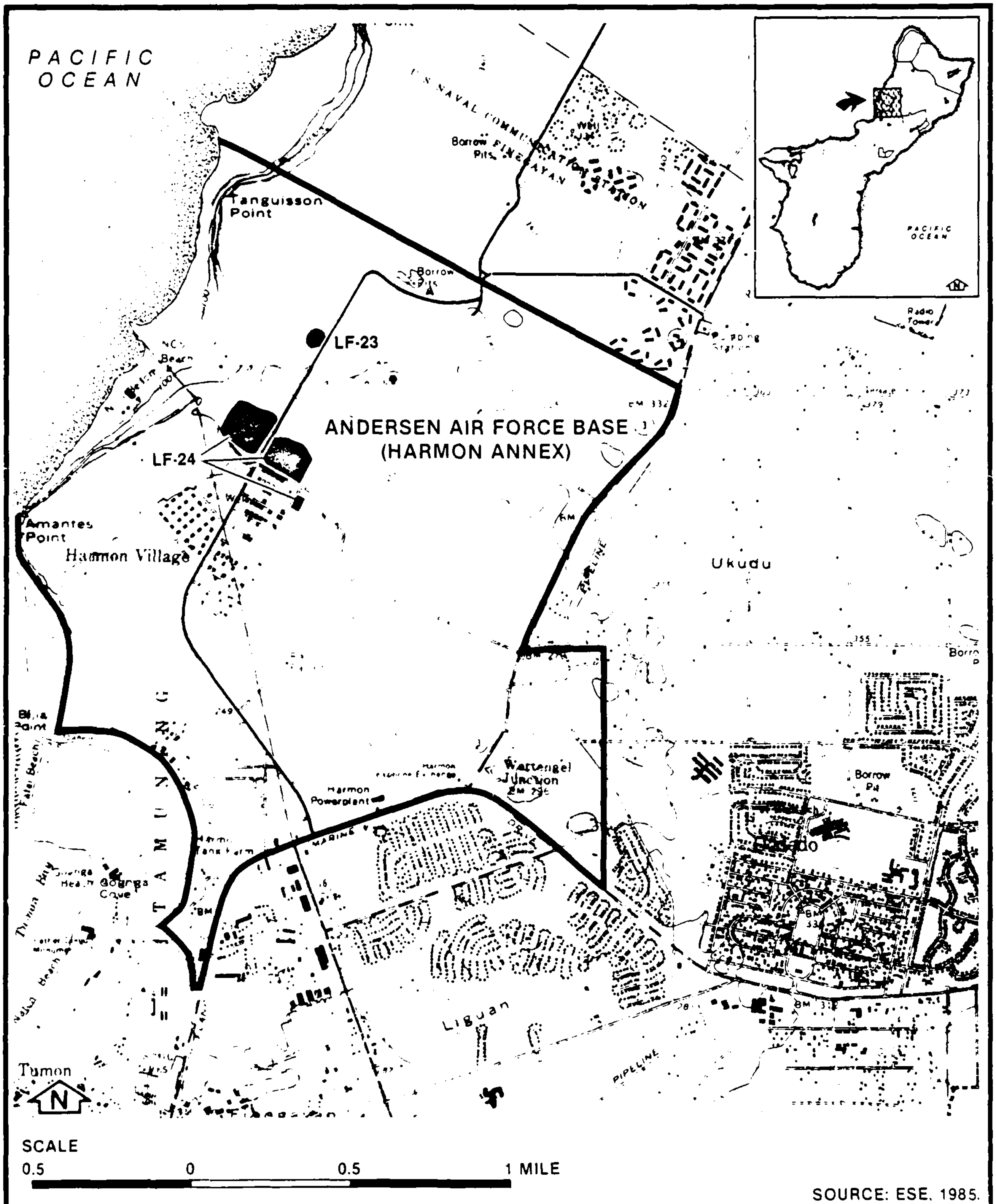


Figure 4.2-5
LANDFILL LOCATIONS ON HARMON ANNEX

INSTALLATION RESTORATION PROGRAM
Andersen Air Force Base

Table 4.2-2. Descriptions of Landfills on AAFB

Landfill No.	Dates of Operation	Approximate Size (acres)	Type of Waste	Method of Operation	Closure Status
LF-1	1944-present	20	Sanitary trash, waste POL, waste chemicals, metal, pesticides, construction debris, waste solvents	Area/pit fill	Currently in operation (daily cover)
LF-2	1947-1974	40	Sanitary trash, waste POL, waste chemicals, waste solvents, pesticides, scrap metal, construction debris, UXO	Trench fill with burning	Closed, soil cover, partially revegetated
LF-3	1947-1977	8	Waste chemical/ industrial wastes, sanitary trash, waste POL, pesticides, scrap metal, construction debris	Area fill	Closed, soil cover, partially revegetated
LF-4	1950s	6	Sanitary trash, construction debris, possible waste POL	Trench fill	Closed, soil cover, revegetated
LF-5	1950s	3	Sanitary trash	Trench fill	Closed, soil cover
LF-6	1953-1954	2	Sanitary trash	Trench/area fill	Closed, soil cover
LF-7	1956-1958	3	Sanitary trash	Trench fill	Closed, soil cover
LF-8	1946-1949	14	Asphalt material, waste liquids	Trench fill	Closed, soil cover, revegetated
LF-9	1949-1955	8	Sanitary trash, construction debris	Trench/area fill	Closed, soil cover, revegetated

Table 4.2-2. Descriptions of Landfills on AAFB (Continued, Page 2 of 3)

Landfill No.	Dates of Operation	Approximate Size (acres)	Type of Waste	Method of Operation	Closure Status
LF-10	1953-1954	2	Asphalt wastes, sanitary trash, scrap metal, drums	Area fill, dumping along cliff into sink/borrow pit	Closed, partially covered, visible from surface
LF-11	Early 1950s	1.5	Asphalt wastes, empty drums, solid/ construction debris	Area fill (?)	Closed, covered, revegetated
LF-12	Late 1950s	<1	Sanitary trash, possible asphalt wastes	Area fill	Closed, site heavily vegetated
LF-13	1951-1956	2	Sanitary trash, equipment, waste POL, waste chemicals	Area fill, surficial dump at foot of cliff	Closed, partially covered, revegetated
LF-14	1976	1	Construction debris, concrete, wood, etc.	Area fill	Closed, soil cover, revegetated
LF-15	Late 1950s-early 1960s	1	Sanitary trash, construction debris	Area fill	Closed, soil cover, partially revegetated
LF-16	Early 1960s	<1	Sanitary trash, construction debris, possible solvent burial and dumping (1970s)	Area fill	Closed, soil cover, partially revegetated
LF-17	1945-1949	2.5	Sanitary trash, equipment	Area fill at base of cliff	Closed, heavy vegetation
LF-18	1967-1968	<1	Asphalt wastes	Area fill at base of cliff	Closed, partial land scar
LF-19	1955	<1	Asphalt wastes (50-100 drums)	Area fill at base of cliff	Closed

Table 4.2-2. Descriptions of Landfills on AAFB (Continued, Page 3 of 3)

Landfill No.	Dates of Operation	Approximate Size (acres)	Type of Waste	Method of Operation	Closure Status
LF-20	1968	1	Sanitary trash	Area fill	Closed
LF-21	Mid-1950s-1963	1	Sanitary trash	Area fill/ borrow pit	Closed, soil cover
LF-22	Mid-1950s-early 1960s	<1	Sanitary trash, UXO, black powder	Area fill	Closed, soil cover
LF-23	Late 1950s	<1	Sanitary trash	Unknown	Closed
LF-24	1950s	8	Sanitary trash (?)	Trench fill	Closed, soil cover
LF-25	Mid-1940s-1962	12	Sanitary trash, waste POL, scrap vehicles, dry-cleaning wastes, construction debris	Trench fill	Closed, soil cover
LF-26	1966	2	Sanitary trash, construction debris	Trench fill	Closed

Source: ESE, 1985.

Landfill No. 1 (LF-1)

LF-1 is located approximately 5,000 ft west of the north runway and about 500 ft east of Guam Rte. 9. The landfill is approximately 20 acres in size and has operated since the mid-1940s. However, most landfill activity has occurred in the last 10 years. The area was originally a limerock borrow pit and has subsequently been refilled with waste material. Prior to 1975, the majority of fill was disposed of in a trench operation located immediately southeast of the current landfill (designated as LF-2). Fill material consisted of sanitary trash, unknown quantities of waste POL, unknown waste chemicals, pesticides, ferrous metal debris, unknown waste solvents, and various construction debris such as concrete and wood. The landfill continues to be operated as an area fill within the borrow pit. All trash disposed of at the site undergoes inspection for unacceptable wastes by a full-time attendant. Operation consists of separation of scrap metal and daily cover of sanitary trash. Due to the nature of past wastes disposed of at this landfill, this site does have potential for contamination and migration of contaminants and, therefore, was ranked using the HARM process (see App. H). Conclusions and recommendations regarding this site are presented in Secs. 5.0 and 6.0, respectively.

Landfill No. 2 (LF-2)

LF-2 is located adjacent to and immediately southeast of LF-1. The landfill is approximately 40 acres in size and was operated from 1947 to 1974. Fill consisted of base sanitary trash, unknown quantities of waste POL, waste solvents, waste chemicals, UXO, pesticides, ferrous metal debris, and construction debris. The landfill was operated as a trench/fill, with trenches about 300 to 400 ft long, 20 ft wide, and about 10 ft deep. Much of the accumulated trash was burned prior to trench closure. The trenches were oriented in a northwest-southeast direction. Currently, the area is covered with soil and partially revegetated; no fill material is exposed at the surface. This site does have potential for contamination and migration of contaminants and, therefore, was ranked using the HARM process (see App. H). Conclusions and recommendations regarding this site are presented in Secs. 5.0 and 6.0, respectively.

Landfill No. 3 (LF-3)

LF-3 is located approximately 1,500 ft west of the Marine Dr. and Perimeter Rd. intersection, southeast of LF-1 and LF-2. The landfill is approximately 8 acres in size and was operated between 1947 and 1977. This site was used for disposal of various industrial wastes such as solvents, waste chemicals, pesticides, and waste POL. Construction debris, sanitary trash, and scrap metal were also disposed of at this landfill. The site was operated as an area fill along the southern half of an abandoned borrow pit. Periodic fires and burning were reported at this site prior to closure. Currently, the site is closed with a soil covering; however, site inspection revealed some metal debris visible from the surface. This site does have potential for contamination and migration of contaminants and, therefore, was ranked using the HARM process (see App. H). Conclusions and recommendations regarding this site are presented in Secs. 5.0 and 6.0, respectively.

Landfill No. 4 (LF-4)

LF-4 is located approximately 400 ft south of LF-2. The landfill is approximately 6 acres in size and was operated during the mid-1950s. Disposal at this site consisted of sanitary trash, construction debris, packing crates, and ferrous metal debris. No large quantities of waste POL or solvents were disposed of at this site. Currently, the site is soil covered and completely revegetated. This landfill has minimal potential for contamination or hazardous leachate formation. Based on the decision process outlined in Fig. 1.3-1, this site was deleted from further consideration.

Landfill No. 5 (LF-5)

LF-5 is located approximately 1,000 ft east of LF-4 and about 700 ft north of LF-3. The landfill is approximately 3 acres in size and was used in the mid- to late 1950s. The site was used for disposal of sanitary trash generated on AAFB. Fill operation consisted of trench/fill methods, with a trench orientation of northwest to southeast. Currently, the site is closed and has a complete soil cover with revegetation. This landfill has minimal potential for contamination or hazardous leachate formation. Based on the decision process outlined in Fig. 1.3-1, this site was deleted from further consideration.

Landfill No. 6 (LF-6)

LF-6 is located immediately north of the AAFB main gate on Marine Dr. The landfill is approximately 2 acres in size and was used between 1953 and 1954. Fill material consisted of sanitary trash from AAFB. The method of operation consisted of filling excavated areas on the small 2-acre site. Currently, the site is soil covered and partially revegetated. This landfill has minimal potential for contamination or hazardous leachate formation. Based on the decision process outlined in Fig. 1.3-1, this site was deleted from further consideration.

Landfill No. 7 (LF-7)

LF-7 is located beneath the housing area on Wake Lane, Kwajalein Lane, and Guadalcanal Lane. The site is approximately 3 acres in size and was used for disposal between 1956 and 1958. Fill material consisted of base sanitary trash. The landfill was operated using a trench/fill method. Currently, the site is soil covered and contains a number of housing units. This landfill has minimal potential for contamination or hazardous leachate formation. Based on the decision process outlined in Fig. 1.3-1, this site was deleted from further consideration.

Landfill No. 8 (LF-8)

LF-8 is located east of the EOD building (Bldg. 9001). The landfill site is approximately 14 acres in size and was used between 1946 and 1949. Material disposed of consisted of asphalt and asphaltic waste materials. The site was operated as a long, north-south trench for waste burial. Currently, the site is completely soil covered with heavy vegetation. This landfill has minimal potential for contamination or hazardous leachate formation. Based on the decision process outlined in Fig. 1.3-1, this site was deleted from further consideration.

Landfill No. 9 (LF-9)

LF-9 is located approximately 1,400 ft southeast of the Guam Rte. 9 and B Ave. intersection, on the north side of Rte. 9. The landfill is approximately 8 acres in size and was operated between 1949 and 1955. Fill material consisted of sanitary trash and concrete construction debris. The site was operated as a series of small trench/area excavations for trash disposal. Currently, the site is closed, soil covered, and revegetated. This landfill has minimal potential for contamination or hazardous leachate formation. Based on the decision process outlined in Fig. 1.3-1, this site was deleted from further consideration.

Landfill No. 10 (LF-10)

LF-10 is located at the east end of M St. near Bldg. 20021. The site is approximately 2 acres in size and was operated in the early to mid-1950s. Disposal consisted of asphalt wastes, scrap metals, empty 55-gal drums, sanitary wastes, construction debris, and occasional waste POL and solvents. Landfilling consisted of an area fill method, with dumping along the cliff of the borrow pit/sink. Currently, the debris is visible at the base of the pit/sink, and numerous 55-gal drums are exposed. This site does have potential for contamination and migration of contaminants and, therefore, was ranked using the HARM process (see App. H). Conclusions and recommendations regarding this site are presented in Secs. 5.0 and 6.0, respectively.

Landfill No. 11 (LF-11)

LF-11 is located approximately 400 ft northeast of LF-10. The site is about 1.5 acres in size and was used in the early 1950s. Waste disposal at this site consisted of asphaltic material, empty 55-gal drums, and construction debris. The method of operation was area fill.

Currently, the landfill is covered with soil and completely revegetated. Site identification from the ground was not possible due to the heavy vegetation. This landfill has minimal potential for contamination or hazardous leachate formation. Based on the decision process outlined in Fig. 1.3-1, this site was deleted from further consideration.

Landfill No. 12 (LF-12)

LF-12 is located approximately 250 ft southeast of LF-10. The site is less than 1 acre in size and was operated in the late 1950s. Fill consisted primarily of sanitary trash, with reported small quantities of asphaltic wastes. Disposal occurred in a small area fill. The site is now partially revegetated, with a complete soil covering. This landfill has minimal potential for contamination or hazardous leachate formation. Based on the decision process outlined in Fig. 1.3-1, this site was deleted from further consideration.

Landfill No. 13 (LF-13)

LF-13 is located approximately 1,200 ft northeast of LF-11, at the base of the cliff. The site was used for disposal between 1951 and 1956; the debris occupies an area of about 2 acres. Material disposed of at the site is believed to include sanitary trash, equipment, waste POL, and unknown waste chemicals. Currently, the site appears to be partially covered with low brush; however, various drums and metallic debris are visible from the top of the cliff. Due to the nature of the material and the unknown quantities, this site does have potential for contamination and, therefore, was ranked using the HARM process (see App. H). Conclusions and recommendations regarding this site are presented in Secs. 5.0 and 6.0, respectively.

Landfill No. 14 (LF-14)

LF-14 is located on the east end of Perimeter Rd., approximately 1,000 ft north of LF-10. The site is about 1 acre in size and was used for disposal in 1976. Fill consisted of concrete debris and other solid construction debris in a shallow excavated area. This landfill has no potential for contamination or hazardous leachate formation. Based on the decision process outlined in Fig. 1.3-1, this site was deleted from further consideration.

Landfill No. 15 (LF-15)

LF-15 is located approximately 500 ft east of the intersection between 32nd St. and 36th St., north of the flight line. The site is about 1 acre in size and was operated from the late 1950s to the early 1960s. Disposal consisted of sanitary trash and construction debris. The site was operated as an area fill, with shallow excavation followed by filling. Currently, the site is partially revegetated with grass and low brush. This landfill has minimal potential for contamination or hazardous leachate formation. Based on the decision process outlined in Fig. 1.3-1, this site was deleted from further consideration.

Landfill No. 16 (LF-16)

LF-16 is located approximately 100 ft east of LF-15, near Bldg. 2799. This site is less than 1 acre in size and was used with LF-15 for sanitary trash and debris disposal in the late 1950s to early 1960s. In addition, waste solvents were reported buried at this site. In 1981, drums containing TCE and lead-based paint wastes were discovered on this site. Spills and solvent dumping may have occurred as a result of storage and drum disintegration. In 1982, the discovered drums were removed to DPDO for proper disposal. This landfill/disposal site does have potential for contamination and contaminant migration and, therefore, was ranked using the HARM process (see App. H). Conclusions and recommendations regarding this site are presented in Secs. 5.0 and 6.0, respectively.

Landfill No. 17 (LF-17)

LF-17 is located about 1,000 ft north of LF-15 and about 1,000 ft east of the EOD range. The site is approximately 2.5 acres in size and was used between 1945 and 1949 for disposal of sanitary trash and excess equipment such as trucks and airplane parts. Disposal practice consisted of dumping off the steep-wall cliff to the lower terraces. An inspection of this site was not possible due to its isolation and heavy vegetation. However, due to the nature of material disposed, the landfill has minimal potential for contamination and hazardous leachate formation. Based on the decision process outlined in Fig. 1.3-1, this site was deleted from further consideration.

Landfill No. 18 (LF-18)

LF-18 is located at the foot of the cliff, about 1,500 ft north of LF-8. The site was used for waste disposal from 1967 to 1968 and comprises an area of less than 1 acre. Wastes disposed of from the cliff were asphaltic materials generated at an asphalt plant located at the MMS building. Empty asphalt drums and waste liquids similar to those disposed of in LF-8 are believed to have been dumped over the cliff. This landfill has minimal potential for contamination or hazardous leachate formation. Based on the decision process outlined in Fig. 1.3-1, this site was deleted from further consideration.

Landfill No. 19 (LF-19)

LF-19 is located at the foot of the cliff, approximately 2,500 ft east of Bldg. 25016 and 2,000 ft south of LF-12. The site consists of two small disposal areas, with a combined size of about 1 acre. The area was used for disposal of asphalt drums from housing construction in 1955. Approximately 50 to 70 drums were disposed of at this site. Field verification of the site was not possible due to the remote location at the foot of the cliff and heavy vegetation. This landfill has minimal potential for contamination or hazardous leachate formation. Based on the decision process outlined in Fig. 1.3-1, this site was deleted from further consideration.

Landfill No. 20 (LF-20)

LF-20 is located about 2,500 ft south of LF-19 and approximately 1,500 ft east of the 7th fairway on the AAFB golf course. The site is about 1 acre in size and was operated as an area fill in 1968. Material disposed of at the landfill consisted of sanitary trash from base operations and housing. Currently, the site is closed and unrecognizable due to heavy vegetation. This landfill has minimal potential for contamination or hazardous leachate formation. Based on the decision process outlined in Fig. 1.3-1, this site was deleted from further consideration.

Landfill No. 21 (LF-21)

LF-21 is located on Northwest Field, about 1,000 ft east of the intersection of Rte. 3 and M St. The site is approximately 1 acre in size and was operated as an area fill in an abandoned borrow pit. The area was used as a disposal area for sanitary trash between the mid-1950s and 1963. The site is now closed, covered with soil, and partially revegetated. This landfill has minimal potential for contamination or hazardous leachate formation. Based on the decision process outlined in Fig. 1.3-1, this site was deleted from further consideration.

Landfill No. 22 (LF-22)

LF-22 is located on Northwest Field between the north and south runways. The site is less than 1 acre in size and was operated as an area fill in an abandoned borrow pit. The fill operated from the mid-1950s to the early 1960s. Disposal material consisted of sanitary trash and unknown quantities of UXO and black powder. The site is now closed and covered with soil. This landfill does have potential for contamination and contaminant migration and, therefore, was ranked using the HARM process (see App. H). Conclusions and recommendations regarding this site are presented in Secs. 5.0 and 6.0, respectively.

Landfill No. 23 (LF-23)

LF-23 is located on the Harmon Annex about 2,600 ft north of Harmon Village. The site is less than 1 acre in size and was operated in the late 1950s. Sanitary trash is reported to have been disposed of at this site. The area is currently closed and covered with soil. This landfill has minimal potential for contamination or hazardous leachate formation. Based on the decision process outlined in Fig. 1.3-1, this site was deleted from further consideration.

Landfill No. 24 (LF-24)

LF-24 is located on Harmon Annex north of the Beach St. and 10th St. intersection, near Harmon Village. The site consists of three distinct areas separated by local streets and has a total area of about 8 acres. The landfill was used for disposal of sanitary trash in the 1950s, with a trench method. The site located west of Beach St. had a northeast-southwest trench orientation; the site east of Beach St. had an east-west trench orientation. Information detailing specific material disposed of at this site, other than sanitary trash, was limited. This landfill has minimal potential for contamination or hazardous leachate formation. Based on the decision process outlined in Fig. 1.3-1, this site was deleted from further consideration.

Landfill No. 25 (LF-25)

LF-25 is located at the Marbo Annex on Turner St., across from Bldg. 1123. The site is approximately 12 acres in size and was operated between 1945 and 1962. This landfill was used for disposal of sanitary trash, waste POL and solvents, scrap vehicles and equipment, construction debris, and waste drycleaning fluids. The landfill was located in close proximity to a motor pool, hospital, and drycleaner operated by the U.S. Army. These operations generated much of the wastes disposed of in the 1940s and 1950s. This landfill does have potential for contamination and contaminant migration and, therefore, was ranked using the HARM process (see App. H). Conclusions and recommendations regarding this site are presented in Secs. 5.0 and 6.0, respectively.

Landfill No. 26 (LF-26)

LF-26 is located about 500 ft north of the intersection of D Ave. and 13th St. on AAFB. The site is approximately 2 acres in size and was operated in 1966. The landfill was used for disposal of sanitary trash and construction debris. The fill was operated using a trench disposal method. The site is now closed and contains a soil covering. This landfill has minimal potential for contamination or hazardous leachate formation. Based on the decision process outlined in Fig. 1.3-1, this site was deleted from further consideration.

4.2.3 CHEMICAL DISPOSAL SITES

Seven chemical disposal sites (including the former hazardous waste storage area and drum storage areas) were identified on AAFB; their locations are shown in Figs. 4.2-2 and 4.2-3, and dates of operation, designations used in this report, waste descriptions, and other information are summarized in Table 4.2-3.

Chemical Disposal Site No. 1 (CS-1)

During the early 1970s, waste POL and chlorinated solvents produced at shops on the eastern end of the north and south runways were disposed of at the cliff area at the east end of the south runway. The quantities of wastes disposed of in the area are not known.

Although a ground survey of the site did not indicate any residual damage to vegetation in the area, POL and solvent residues may still be present in the soils.

This site has potential for contamination and migration of contaminants and, therefore, was ranked using the HARM process (see App. H). Conclusions and recommendations regarding this site are presented in Secs. 5.0 and 6.0, respectively.

Chemical Disposal Site No. 2 (CS-2)

This drum disposal area is located immediately north of the current AAFB landfill. The drums, reportedly containing asphalt, tars, and oils, were first stored at this site from 1950 to 1952. The drums are rusted and leaking. Soils in the area could be contaminated with oils and

Table 4.2-3. Summary of Information on AAFB Chemical Disposal Sites, Firefighter Training Areas, and Other Storage Sites

Site Description	Designation	Dates of Operation	Waste Description
Chemical Disposal Site No. 1	CS-1	Early 1970s	Waste POL and solvents
Chemical Disposal Site No. 2	CS-2	1950-1952	Drums containing asphalt, tars, and oils
Chemical Disposal Site No. 3	CS-3	1950s-1970s	UXO, both surficial and buried
Chemical Disposal Site No. 4	CS-4	1950s	Waste oil and solvents
Firefighter Training Area No. 1	FTA-1	1945-1958	Waste fuels, oils, and solvents
Firefighter Training Area No. 2	FTA-2	1958-Present	Waste fuels, oils, and solvents
Hazardous Waste Storage Area No. 1	HW-1	1950s-1983	POL products, solvents, and hazardous wastes
Drum Storage Area No. 1	DS-1	?-Present	Drums containing various POL products and solvents
Drum Storage Area No. 2	DS-2	?-Present	Drums containing asphalt, tars, and oils

Source: ESE, 1985.

tars. This storage area overlies the Northern Lens Aquifer, and the soils are very permeable.

This site has potential for contamination and migration of contaminants and, therefore, was ranked using the HARM process (see App. H). Conclusions and recommendations regarding this site are presented in Secs. 5.0 and 6.0, respectively.

Chemical Disposal Area No. 3 (CS-3)

CS-3 is located adjacent to the new EOD incinerator east of Potts Junction and south of the intersection of A and B Aves., in the AAFB ammunition storage area. Available information indicated that UXO, both buried and on the surface, is contained at this site. These items were disposed of in this area from 1950 to 1970.

This site has potential for contamination and migration of contaminants and, therefore, was ranked using the HARM process (see App. H). Conclusions and recommendations regarding this site are presented in Secs. 5.0 and 6.0, respectively.

Chemical Disposal Site No. 4 (CS-4)

CS-4 is located on Northwest Field, approximately 1 mile north of the intersection of Guam Rte. 3 and Rte. 9 at Potts Junction. The site is located directly north of the abandoned borrow pit and approximately 2,000 ft south of LF-21. This site was used for disposal of waste oils and waste solvents. Reportedly, the waste oil was dumped in a depression or sump. The site was operated for approximately 4 years from 1952 to 1956. No details as to exact quantities were available from personnel on AAFB.

This site has potential for contamination and migration of contaminants and, therefore, was ranked using the HARM process (see App. H). Conclusions and recommendations regarding this site are presented in Secs. 5.0 and 6.0, respectively.

Hazardous Waste Storage Area No. 1 (HW-1)

This former hazardous waste storage area consisted of a concrete pad in the southwestern corner of the intersection of Marine Dr. and Marianas Blvd. The pad was used as an outside storage area for POL and solvents until the late 1970s. The pad does not have barriers to contain runoff, and any spillage would run in a southerly direction off the pad toward a depression containing dry injection wells. No spills have been reported in this area. These wells represent a direct link to the aquifer. Hazardous wastes were stored on this pad from the late 1970s to late 1983.

This site has potential for contamination and migration of contaminants and, therefore, was ranked using the HARM process (see App. H). Conclusions and recommendations regarding this site are presented in Secs. 5.0 and 6.0, respectively.

Drum Storage Area No. 1 (DS-1)

DS-1 is located adjacent to Bldg. 14525, on the road leading toward the current AAFB landfill (LF-1). Numerous drums are stored at this site, and several are rusted and leaking. Labels are not legible on some of the drums.

Drums with legible labels indicate they contain POL products and solvents. This storage area is located directly over the Northern Lens Aquifer, and the soils are very permeable.

This site has potential for contamination and migration of contaminants and, therefore, was ranked using the HARM process (see App. H). Conclusions and recommendations regarding this site are presented in Secs. 5.0 and 6.0, respectively.

Drum Storage Site No. 2 (DS-2)

DS-2 is located immediately south and east of the Roads and Grounds Shops (Bldg. 20021) activity on AAFB. The storage area is used to contain drums of asphalt, oils, and tars. Drums at this site are stored in several groups. Numerous spills have occurred at this site, as evidenced by the oil-saturated soils.

This site has potential for contamination and migration of contaminants and, therefore, was ranked using the HARM process (see App. H). Conclusions and recommendations regarding this site are presented in Secs. 5.0 and 6.0, respectively.

4.2.4 FUEL SPILL SITES

The majority of the POL used and stored at AAFB are MOGAS, DF-2, and JP-4. Due to the nature of operations at AAFB, spillage of these fuels occurs regularly during transfer and bulk loading. Minor fuel spills (up to 100 gal) were fairly common during peak operational periods, such as the Vietnam and Korean Conflicts and Operation New Life, when several hundred aircraft were loaded and unloaded daily. This spillage is suspected to be limited primarily to the flightline docking bays and fuel distribution areas.

It was reported that any fuel spillage in or around the flightline area was immediately washed to the surrounding grounds or storm drain or allowed to percolate into the crushed coral pavement. Based on available records, no major fuel spills have been reported at AAFB in recent history.

4.2.5 FIREFIGHTER TRAINING AREAS

Firefighter training at AAFB has utilized two locations (see Fig. 4.2-6) since the base was constructed in the mid-1940s. FTA-1 is located directly north of the north runway overrun and was used for training between 1945 and 1958. Approximately 200 gal of waste and contaminated fuels are consumed per training exercise, with a training frequency of 1 to 2 exercises per month. The area was operated in an unlined area on top of exposed limestone.

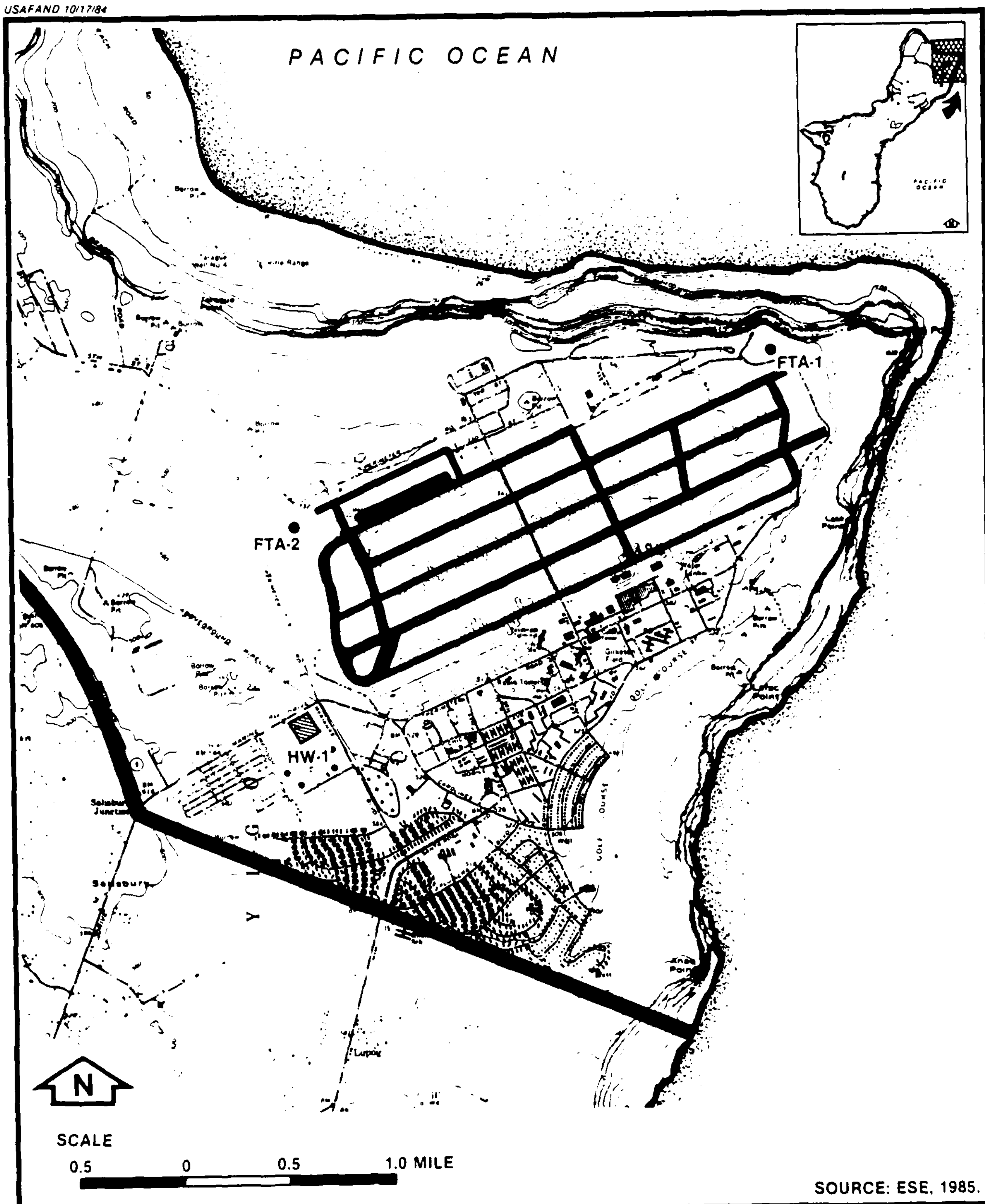


Figure 4.2-6
FIREFIGHTER TRAINING AREAS

INSTALLATION
RESTORATION PROGRAM
Andersen Air Force Base

FTA-2 is the current training area and has been operated since closure of FTA-1 in 1958. FTA-2 consists of a mock plane and smokehouse. The plane is enclosed in an unlined bermed area. FTA-2 has drainage to an oil/water separator located onsite. Fuel for past training exercises has consisted of contaminated JP-4, diesel, MOGAS, waste POL, and solvents. Fuel for the training exercises now consists of JP-4 and is stored in an aboveground tank with a capacity of about 2,000 gal. The current method of operation involves flooding the bermed area, spraying fuel on the water, and igniting the fuel.

Due to the nature of the porous rock, method of construction, and material burned, FTA-1 and FTA-2 have potential for contamination and, therefore, were ranked using the HARM process (see App. H). Conclusions and recommendations regarding both sites are presented in Secs. 5.0 and 6.0, respectively.

4.2.6 HAZARD ASSESSMENT EVALUATION

The review of past operation and maintenance functions and past waste management practices at AAFB has resulted in the identification of sites that were initially considered areas of concern, with potential for contamination and migration of contaminants. These sites, described in Secs. 4.2.1, 4.2.2, 4.2.3, 4.2.4, and 4.2.5, were evaluated using the decision process presented in Fig. 1.3-1 (in Sec. 1.3). Sites which were found to have no potential for contamination were deleted from further consideration. Sites which were found to have potential for contamination and migration of contaminants were further evaluated using the HARM system. The decision process logic used for each area of initial concern is presented in Table 4.2-4. Eighteen of the 38 disposal sites were found to have no potential for contamination or contaminant migration. The remaining 20 disposal sites (LF-1, LF-2, LF-3, LF-10, LF-13, LF-16, LF-22, LF-25, CS-1, CS-2, CS-3, CS-4, FTA-1, FTA-2, HW-1, DS-1, DS-2, SDS-1, SDS-2, and SDS-3) were further evaluated using the HARM system. Specific recommendations for each site are described in Sec. 6.0.

Table 4.2-4. Summary of Decision Process Logic for Areas of Initial Environmental Concern at AAFB

Site	Designation	Potential for Contamination	Potential for Contaminant Migration	Potential for Other Environmental Concern*	Refer to Base Environmental Programs	HARM Rating
Landfill No. 1	LF-1	Yes	Yes	No	N/A†	Yes
Landfill No. 2	LF-2	Yes	Yes	No	N/A	Yes
Landfill No. 3	LF-3	Yes	Yes	No	N/A	Yes
Landfill No. 4	LF-4	No	No	No	No	No
Landfill No. 5	LF-5	No	No	No	No	No
Landfill No. 6	LF-6	No	No	No	No	No
Landfill No. 7	LF-7	No	No	No	No	No
Landfill No. 8	LF-8	No	No	No	No	No
Landfill No. 9	LF-9	No	No	No	No	No
Landfill No. 10	LF-10	Yes	Yes	No	N/A	Yes
Landfill No. 11	LF-11	No	No	No	No	No
Landfill No. 12	LF-12	No	No	No	No	No
Landfill No. 13	LF-13	Yes	Yes	No	N/A	Yes
Landfill No. 14	LF-14	No	No	No	No	No
Landfill No. 15	LF-15	No	No	No	No	No
Landfill No. 16	LF-16	Yes	Yes	No	N/A	Yes
Landfill No. 17	LF-17	No	No	No	No	No
Landfill No. 18	LF-18	No	No	No	No	No
Landfill No. 19	LF-19	No	No	No	No	No
Landfill No. 20	LF-20	No	No	No	No	No
Landfill No. 21	LF-21	No	No	No	No	No
Landfill No. 22	LF-22	Yes	Yes	No	N/A	Yes
Landfill No. 23	LF-23	No	No	No	No	No
Landfill No. 24	LF-24	No	No	No	No	No
Landfill No. 25	LF-25	Yes	Yes	No	N/A	Yes
Landfill No. 26	LF-26	No	No	No	No	No

Table 4.2-4. Summary of Decision Process Logic for Areas of Initial Environmental Concern at AAFB (Continued, Page 2 of 3)

Site	Designation	Potential for Contamination	Potential for Contaminant Migration	Potential for Other Environmental Concern*	Refer to Base Environmental Programs	HARM Rating
Firefighter Training Area No. 1	FTA-1	Yes	Yes	No	N/A	Yes
Firefighter Training Area No. 2	FTA-2	Yes	Yes	No	N/A	Yes
Hazardous Waste Storage Area No. 1	HW-1	Yes	Yes	No	N/A	Yes
Chemical Disposal Site No. 1	CS-1	Yes	Yes	No	N/A	Yes
Chemical Disposal Site No. 2	CS-2	Yes	Yes	No	N/A	Yes
Chemical Disposal Site No. 3	CS-3	Yes	Yes	No	N/A	Yes
Chemical Disposal Site No. 4	CS-4	Yes	Yes	No	N/A	Yes
Drum Storage Area No. 1	DS-1	Yes	Yes	No	N/A	Yes
Drum Storage Area No. 2	DS-2	Yes	Yes	No	N/A	Yes

Table 4.2-4. Summary of Decision Process Logic for Areas of Initial Environmental Concern at AAFB (Continued, Page 3 of 3)

Site	Designation	Potential for Contamination	Potential for Contaminant Migration	Potential for Other Environmental Concern*	Refer to Base Environmental Programs	HARM Rating
Stormwater Drainage System, Zone No. 1	SDS-1	Yes	Yes	No	No	Yes
Stormwater Drainage System, Zone No. 2	SDS-2	Yes	Yes	No	No	Yes
Stormwater Drainage System, Zone No. 3	SDS-3	Yes	Yes	No	No	Yes

* Other environmental concerns include environmental problems that are not within the scope of this study (e.g., air pollution, occupational safety problems).
† N/A = Not applicable.

Source: ESE, 1985.

All sites identified in Table 4.2-4 as having a potential for contamination and contaminant migration were evaluated using the HARM system. The HARM system includes consideration of potential receptor characteristics, waste characteristics, pathways for migration, and specific site characteristics related to waste management practices. The details of the rating procedure are presented in App. G; results of the assessment are summarized in Table 4.2-5.

The HARM system is designed to indicate the relative need for remedial action. The information presented in Table 4.2-5 is intended for assigning priorities for further evaluation of the AAFB disposal areas in Sec. 5.0 (Conclusions) and Sec. 6.0 (Recommendations). The rating forms for the individual waste disposal sites at AAFB are presented in App. H. Photographs of some of the key disposal sites are included in App. F.

Table 4.2-5. Summary of HARM Scores for Potential Contamination Sources on AAFB

Rank	Site	Designation	Receptors Subscore	Waste Characteristics Subscore	Pathways Subscore	Waste Management Factor	Overall Total Score
1	Landfill No. 25	LF-25	72	100	100	0.95	86
2	Landfill No. 1	LF-1	64	100	41	0.95	65
3	Landfill No. 2	LF-2	64	100	41	0.95	65
4	Landfill No. 10	LF-10	63	80	63	0.95	65
5	Landfill No. 3	LF-3	59	100	41	0.95	64
6	Stormwater Drainage System, Zone No. 1	SDS-1	63	60	63	1.0	62
7	Landfill No. 13	LF-13	60	80	56	0.95	62
8	Firefighter Training Area No. 1	FTA-1	57	80	41	1.0	59
9	Hazardous Waste Storage Area No. 1	HW-1	68	60	56	0.95	58
10	Stormwater Drainage System, Zone No. 3	SDS-3	62	60	48	1.0	57
11	Firefighter Training Area No. 2	FTA-2	59	80	33	1.0	57
12	Stormwater Drainage System, Zone No. 2	SDS-2	67	60	41	1.0	56
13	Chemical Disposal Site No. 1	CS-1	58	60	58	0.95	55
14	Landfill No. 16	LF-16	58	60	48	0.95	54
15	Drum Storage Area No. 2	DS-2	63	24	63	1.0	50
16	Chemical Disposal Site No. 2	CS-2	64	30	41	1.0	45
17	Drum Storage Area No. 1	DS-1	64	24	41	1.0	43
18	Chemical Disposal Site No. 3	CS-3	79	9	41	0.95	41
19	Landfill No. 22	LF-22	56	15	48	0.95	38
20	Chemical Disposal Site No. 4	CS-4	47	30	41	0.95	37

Source: ESE, 1985.

Tab

5.0

5.0 CONCLUSIONS

The goal of the IRP Phase I study is to identify sites where there is potential for environmental contamination resulting from past waste disposal practices and to assess the probability of contaminant migration from these sites. The conclusions are based on the assessment of the information collected from the project team's field inspection, review of records and files, review of the environmental setting, and interviews with base personnel, past employees, and state and local government employees. The potential contamination sources identified at AAFB and the HARM scores for those sites are listed in Table 5.0-1. Evaluations and conclusions regarding each ranked site are summarized in the following paragraphs.

Landfill No. 25 (LF-25)

LF-25 is located on AAFB South. This landfill originated during the period of occupancy of the Army Air Force during the mid-1940s. The landfill continued to be used until approximately 1962. Items disposed of in LF-25 included waste POL, degreasing solvents (e.g., TCE), drycleaning fluids, and sanitary trash.

AAFB and the town of Dededo have potable water supply wells in this area. The soils in the area, along with the underlying limestone, are porous and susceptible to infiltration of contaminants. TCE and other organic constituents have been detected in some of the AAFB wells in this area. The source of these contaminants may be LF-25. This site received a HARM score of 86.

Landfill No. 1 (LF-1)

LF-1 is the current landfill for AAFB. This site has been operated as a landfill since 1944. The site covers approximately 20 acres. LF-1 has received sanitary trash, waste POL, waste chemicals, waste solvents, pesticides, scrap metal, and construction debris.

Table 5.0-1. Priority Ranking of Potential Contamination Sources on AAFB

Rank	Site	Designation	Date of Operation or Occurrence	Score
1	Landfill No. 25	LF-25	1945-1962	86
2	Landfill No. 1	LF-1	1945-present	65
3	Landfill No. 2	LF-2	1947-1974	65
4	Landfill No. 10	LF-10	Early to mid-1950s	65
5	Landfill No. 3	LF-3	1947-1977	64
6	Stormwater Drainage System, Zone No. 1	SDS-1	Late 1940s-present	62
7	Landfill No. 13	LF-13	1951-1956	62
8	Firefighter Training Area No. 1	FTA-1	1945-1958	59
9	Hazardous Waste Storage Area No. 1	HW-1	1950s-1983	58
10	Stormwater Drainage System, Zone No. 3	SDS-3	Late 1940s-present	57
[illegible]	Firefighter Training Area No. 2	FTA-2	1958-present	57
[illegible]	Stormwater Drainage System, Zone No. 2	SDS-2	Late 1940s-present	56
[illegible]	[illegible] Disposal Site [illegible]	CS-1	1970s	55
[illegible]	[illegible] No. 16	LF-16	Late 1950s-early 1960s	54
[illegible]	[illegible] Storage Area No. 2	DS-2	?-present	50
[illegible]	[illegible] Disposal Site [illegible]	CS-2	1950-1952	45
[illegible]	[illegible] Storage Area No. 1	DS-1	?-present	43
[illegible]	[illegible] Disposal Site No. 3	CS-3	1950s-1970s	41
[illegible]	Landfill No. 22	LF-22	Mid-1950s-early 1960s	38
20	Chemical Disposal Site No. 4	CS-4	1950s	37

Source: ESE, 1985.

The soils and subsurface under LF-1 are very permeable and serve as a recharge area for the Guam Northern Lens Aquifer. The potential exists for contaminants from this landfill to migrate into the aquifer. One monitor well currently exists at the site. TCE has been detected in this well.

AAFB plans to drill potable water supply wells into the aquifer under the base. It is not known whether the aquifer under AAFB contains any contaminants originating from LF-1; however, the landfill is upgradient of almost all areas where potable wells may be located and, therefore, represents a potential threat to the aquifer. This site received a HARM score of 65.

Landfill No. 2 (LF-2)

LF-2 is located in the same vicinity as LF-1. This landfill was operated from 1947 to 1974 and received sanitary trash, waste POL, solvents, waste chemicals, pesticide residues, scrap metals, and construction debris.

The soils under LF-2 are porous and subject to infiltration and contamination of the aquifer. This site received a HARM score of 65.

Landfill No. 10 (LF-10)

LF-10 is located on the cliff area of AAFB south of the cantonment area. This landfill was operated from 1953 to 1954 and received asphalt wastes, oils, metals, sanitary trash, and drums.

In addition to the disposal site being located over porous soils subject to infiltration, the cliff area is potential habitat for several endangered species of birds. This site received a HARM score of 65.

Landfill No. 3 (LF-3)

LF-3 is located over and upgradient of the Guam Northern Lens Aquifer, in the same vicinity as LF-1 and LF-2. This site received waste POL, solvents, industrial wastes, pesticides, sanitary trash, scrap metal, and construction debris. The landfill was operated from 1947 to 1977. This site received a HARM score of 64.

Stormwater Drainage System, Zone No. 1 (SDS-1)

Stormwater drainage injection wells in Zone No. 1 were installed from the late 1940s through the mid-1960s. These wells represent direct links to the aquifer. Items disposed of in SDS-1 include aircraft-cleaning compounds, paint stripper, alodine solution, chromic acid, sulfuric acid, ethylene glycol, and boiler blowdown waters. Other items which inadvertently enter the stormwater drainage system include oil from vehicular traffic on roadways and fuel from minor spillage during aircraft refueling operations on handstand areas. The injection well zone along the south runway industrial area was evaluated as a unit and received a HARM score of 62.

Landfill No. 13 (LF-13)

LF-13 was operated from 1951 to 1956. The landfill is located on the cliff area at the eastern end of the south runway. Items disposed of in this area included waste POL, solvents, waste chemicals, and sanitary trash. In addition to the disposal site being located on porous soils subject to infiltration, the cliff area is also potential habitat for several endangered species. This site received a HARM score of 62.

Firefighter Training Area No. 1 (FTA-1)

FTA-1 is located north of the east end of the north runway. The area was operated from 1945 to 1958 and received waste oils, contaminated fuels, and solvents. The soils under FTA-1 are very porous and highly susceptible to infiltration of contaminants. This area is also potential habitat for several endangered species, including the Guam rail. This site received a HARM score of 59.

Hazardous Waste Storage Area No. 1 (HW-1)

HW-1 is located in the vicinity of LF-1, LF-2, and LF-3 at the southwestern end of the south runway. An uncurbed concrete pad exists at this site which was used for the storage of hazardous materials from 1979 to 1983. This area was formerly used for the storage of fuels, oils, and solvents. Although no spills have been reported, any spillage at this site would enter the stormwater drainage system. The stormwater drainage system at this site consists of a manmade depression containing injection wells. The injection wells may provide a direct link to the Guam Northern Lens Aquifer. This site received a HARM score of 58.

Stormwater Drainage System, Zone No. 3 (SDS-3)

Stormwater drainage system injection wells in Zone No. 3 were installed from the late 1940s through the mid-1960s. These wells represent direct links to the aquifer. Items disposed of in SDS-3 include aircraft-cleaning compound, alodine solution, chromic acid, paint, paint stripper, and detergent. Other items which inadvertently enter the system include oil from vehicular traffic on roadways and fuel from minor spillage during refueling operations on hardstand areas. The injection well system along the north runway was evaluated as a unit and received a HARM score of 57.

Firefighter Training Area No. 2 (FTA-2)

FTA-2 is located at the west end of the north runway. This area has been used for firefighter training since 1958. Items used in training exercises include contaminated fuel, waste POL, and waste solvents. These items are now floated on water while burning during training; however, past operations were conducted by pouring the flammable materials directly on the soils of the area. The area in which FTA-2 is located is over the Guam Northern Lens Aquifer. In addition, this area is one of the known habitat areas for the few remaining individuals of the endangered Guam rail. This site received a HARM score of 57.

Stormwater Drainage System, Zone No. 2 (SDS-2)

Stormwater drainage system injection wells in Zone No. 2 were installed from the late 1940s through the mid-1960s. These wells represent direct links to the aquifer. Items disposed of in SDS-2 include ethylene glycol and detergent. Other items which inadvertently entered the system include POL from roadways. The former hazardous-waste disposal area (unbermed) was also located in this zone. The injection wells in this area were evaluated as a unit and received a HARM score of 56.

Chemical Disposal Site No. 1 (CS-1)

During the early 1970s, unknown quantities of waste chlorinated and nonchlorinated solvents and POL were disposed of at the cliff area on the east end of the south runway. This is an area of porous soil, subject to infiltration, and is also potential habitat for several endangered species. The site received a HARM score of 55.

Landfill No. 16 (LF-16)

LF-16 is located north of the center of the north runway, near the cliff area south of Tagua Point. This landfill was operated during the early 1960s and received mainly sanitary trash and construction debris. Drums containing solvents (including TCE) and waste oils were stored at the site and spillage occurred. This area has porous soil and is highly susceptible to the infiltration of contaminants. This area is also located in habitat suitable for several of the endangered species known to inhabit AAFB. This site received a HARM score of 54.

Drum Storage Area No. 2 (DS-2)

DS-2 is located on or adjacent to LF-10. The number of years this site has been used is unknown. The area is located on the cliffs, which are potential habitat for several endangered species. The soils in the area are porous and highly susceptible to contaminant infiltration. The soils in the area are contaminated from spillage and leakage from drums stored in the area. Discarded drums are also scattered in the dense vegetation surrounding the site. This site received a HARM score of 50.

Chemical Disposal Site No. 2 (CS-2)

CS-2 is an abandoned drum storage site located north of LF-1. Drums in this area reportedly contain waste oils and asphalt. In addition, the soils in this area are porous and highly susceptible to infiltration of contaminants. The area is also directly west of some of the last known habitat for the few remaining individuals of the endangered Guam rail. This area received a HARM score of 45.

Drum Storage Area No. 1 (DS-1)

DS-1 is located in the vicinity of LF-1, LF-2, and LF-3, near Bldg. 14525. More than 30 drums which contain various POL products and solvents are present at the site. The ground around the site indicates leakage and spillage has occurred. This area is located over very porous soils which are highly susceptible to infiltration. The Guam Northern Lens Aquifer is recharged in this area. This site received a HARM score of 43.

Chemical Disposal Site No. 3 (CS-3)

CS-3 is an area containing both aboveground and buried UXO. Although migration of these items is not expected, the site was rated due to the hazardous nature of explosives. The site received a HARM score of 41.

Landfill No. 22 (LF-22)

LF-22 was operated from the mid-1950s to the early 1960s. Items disposed of in this area include sanitary trash, UXO, and some black powder. Although migration is not expected, this site was ranked due to the hazardous nature of the discarded items. The site received a HARM score of 38.

Chemical Disposal Site No. 4 (CS-4)

CS-4 was operated during the 1950s in Northwest Field. This site received sanitary trash, waste oils, and solvents. The quantities were small; however, the soils are porous and susceptible to infiltration and contamination of the ground water. This site received a HARM score of 37.

T[illegible]

6.0

6.0 RECOMMENDATIONS

Seventeen sites were identified at AAFB as having potential for environmental contamination and have been evaluated using the HARM system. The relative potential of the sites for environmental contamination was assessed, and sites which may require further study and monitoring were identified. Sites of primary concern are those with higher HARM scores which have a higher potential for environmental contamination and should be investigated in Phase II. Sites of secondary concern are those with lower HARM scores and moderate potential for environmental contamination. Further study at these sites is recommended, but the need for investigation is less than for the sites with higher rankings.

6.1 PHASE II MONITORING RECOMMENDATIONS

The following actions are recommended to further assess the potential for environmental contamination from waste disposal areas at AAFB. The recommended actions are intended to be used as a guide in the development and implementation of the Phase II study. The recommendations include the approximate number of ground water monitoring wells, lysimeters, type(s) of samples to be collected (e.g., soil, water, sediment), and suspected contaminants for which analyses should be performed. The number of ground water monitoring wells recommended corresponds to the number of wells required to adequately determine whether contaminants are migrating from a given source. The final number of ground water monitoring wells required to determine the extent of and define the movement of contaminants from each site will be determined as part of the Phase II investigation. Geophysical methods for identifying the extent of some landfills and the locations of burial areas are recommended. Lysimeters are also recommended for sampling the unsaturated zone which exists in many of the disposal areas.

Recommended ground water monitoring should be performed on a quarterly basis for 1 year in order to assess contaminant migration under different precipitation regimes. All monitoring data should be evaluated throughout the program to determine the need for further action (if any).

All monitor wells should be of suitable construction to obtain samples free from induced contamination. Monitor wells should also be of sufficient diameter to allow the use of a submersible turbine pump. The wells should be installed at varying depths, depending on the site, and the screen should extend over the entire saturated interval and approximately 1 ft above the water table. The wells need to be screened above the water table to detect nonmiscible, floating contaminants, such as petroleum products. A detailed log of the well boring should be made, including well construction diagrams prepared by a registered geologist. The annulus should be grouted near ground surface to prevent the introduction of contaminants into the well. The well should be protected with pipe fitted with locking caps. The well should be developed to the fullest extent possible and surveyed both vertically and horizontally by a registered surveyor to obtain accurate well location distances and water level elevations. Water levels should be measured after well development and at the time of sampling. Slug tests should be conducted to determine horizontal permeability and to provide data for evaluation of flow rates.

Lysimeters should be installed in 6-inch boreholes drilled to depths equal to or below the depth of materials buried in the area to be monitored. The riser may be of polyvinyl chloride (PVC) construction. The area around the lysimeter in the borehole should be filled with a silica slurry. Bentonite should be used as a seal above the lysimeter. A detailed boring log should also be made during the installation of the lysimeter, including construction diagrams. A steel protective casing, with locking cap, should be installed to protect the lysimeter.

The recommended environmental monitoring program for the 20 sites is summarized in Table 6.1-1. The detailed approaches for the sites are described in this section. The set of parameter lists presented in Table 6.1-2 is keyed to the sample types and locations summarized in Table 6.1-1.

It is recommended that chemical analysis for metals include both total and dissolved fractions to quantify which metals are mobile, as well as the total amount of metal sorbed onto suspended materials and, hence, potentially available for leaching. Because the oil and grease analysis by EPA Method 413.2 (EPA, 1979) does not differentiate between extractables of biological origin or the mineral oils and greases of POL origin, the EPA Infrared (IR) Spectrophotometric Method for total recoverable petroleum hydrocarbons (EPA Method 418.1; EPA, 1979) is recommended for assessing POL contamination. Halogenated and nonhalogenated solvents are amenable to analysis by the gas chromatography/mass spectrometry (GC/MS) purge and trap method for volatile organic hydrocarbons (EPA Method 624). All water samples should be analyzed for pH and conductivity at the time of sampling.

Based on the HARM ranking, 15 of the 20 sites ranked are recommended for Phase II environmental surveys. Detailed recommendations for each site are presented in the following paragraphs.

Landfill No. 25 (LF-25)

The recommended Phase II monitoring for this site should include a geophysical survey. The geophysical survey should be conducted to determine the areal extent of LF-25. In addition, the existing potable supply wells on AAFB South, the Tumon Maui well, the Dededo wells (if available), and the four new monitor wells recommended to be installed at the approximate locations shown in Fig. 6.1-1 should be monitored for contaminants. The ground water flow from LF-25 is in a westerly direction. Pumping in the AAFB well field would increase the flow gradient from LF-25 toward the well field.

Table 6.1-1. Summary of Recommended Monitoring for AAFB Phase II Investigations

Site	Designation	HARM Score	Recommended Monitoring	Remarks
Landfill No. 25	LF-25	86	A geophysical survey should be completed to determine the areal extent of the landfill. Four monitor wells should be installed at LF-25 to extend into the aquifer (approximately 400 ft depth). These monitor wells, the existing potable wells on AAFB South (MARBO 1, 2, 3, 4, 5, 6, 7, and 9), and the Tumon Maui well should be sampled and analyzed for the parameters in List A, Table 6.1-2.	If contaminants are present, additional wells may be needed to determine the extent.
Landfill No. 1	LF-1	65	Five monitor wells should be installed to a depth of approximately 500 ft around the entire disposal complex consisting of LF-1, LF-2, LF-3, LF-4, LF-5, LF-6, CS-2, DS-1, and HW-1. These monitor wells should be located so that one is upgradient and the other four are downgradient. In addition, geophysical techniques should be employed to determine the areal extent of LF-1, LF-2, LF-3, LF-4, LF-5, and LF-6, and a minimum of two lysimeters should be installed around LF-1, LF-2, and LF-3 at a depth of 1 to 2 ft	If the lysimeters or monitor wells indicate the presence and migration of contaminants, additional lysimeters and/or monitor wells may be required to determine the extent.

Table 6.1-1. Summary of Recommended Monitoring for AAFB Phase II Investigations (Continued, Page 2 of 6)

Site	Designation	HARM Score	Recommended Monitoring	Remarks
Landfill No. 1 (Continued)	LF-1	65	below the depth of fill material in the landfill. The lysimeters should be installed immediately outside the fill area and should be monitored for organic vapors during installation. The lysimeters should be sampled during the wet season to determine the types of materials leaching from the landfill. All samples collected should be analyzed for the parameters in List A, Table 6.1-2.	
Landfill No. 2	LF-2	65	See LF-1.	See LF-1.
Landfill No. 10	LF-10	65	Perform geophysical techniques to determine the areal extent of LF-10. Install two lysimeters to a depth of approximately 1 to 2 ft below the fill material immediately outside the fill area. The lysimeter boreholes should be monitored for organic vapors during installation. The lysimeters should be sampled during the wet season to determine the types of materials leaching from the landfill area. All samples collected should be analyzed for the parameters in List B, Table 6.1-2.	If the lysimeters indicate the presence and migration of contaminants, additional lysimeters may be required to determine the extent.

Table 6.1-1. Summary of Recommended Monitoring for AAFB Phase II Investigations (Continued, Page 3 of 6)

Site	Designation	HARM Score	Recommended Monitoring	Remarks
Landfill No. 3	LF-3	64	See LF-1.	See LF-1.
Stormwater Drainage System, Zone No. 1	SDS-1	62	A survey should be performed to determine which wells are currently impacted by direct discharges or spillage in the industrial areas.	Consideration should be given to diverting potential hazardous substances to the treatment plant or finding other acceptable disposal alternatives. Consideration should also be given to closing and sealing wells in areas where contaminants could enter and be transported to the aquifer.
Landfill No. 13	LF-13	62	A geophysical survey should be performed to determine the areal extent of the fill area. Two lysimeters should be installed immediately adjacent to the fill area at an approximate depth of 1 to 2 ft below the fill material. Samples should be collected in the wet season and analyzed for the parameters in List B, Table 6.1-2.	If data indicate the presence of contaminants, additional lysimeters may be required to determine the extent.
Firefighter Training Area No. 1	FTA-1	59	Install two lysimeters to a depth of 10 ft on the north and east sides of the site. Monitor the lysimeter boreholes for hydrocarbons during construction. The lysimeters should be sampled during the wet season and analyzed for the parameters in List B, Table 6.1-2.	If sampling indicates contamination, additional lysimeters may be required to determine the extent.

Table 6.1-1. Summary of Recommended Monitoring for AAFB Phase II Investigations (Continued, Page 4 of 6)

Site	Designation	HARM Score	Recommended Monitoring	Remarks
Hazardous Waste Storage Area No. 1	HW-1	58	See LF-1.	See LF-1.
Stormwater Drainage System Zone No. 3	SDS-3	57	See SDS-1.	See SDS-1.
Firefighter Training Area No. 2	FTA-2	57	Install two lysimeters to a depth of 10 ft on the north and east sides of the area. Monitor the lysimeter boreholes for hydrocarbons during installation. The lysimeters should be sampled in the wet season and analyzed for the parameters in List B, Table 6.1-2.	If contaminants are found, additional lysimeters may be needed to determine the extent of the contaminant migration.
Stormwater Drainage System Zone No. 2	SDS-2	56	See SDS-1.	See SDS-1.
Landfill No. 16	LF-16	54	Perform a geophysical survey to determine the areal extent of this fill area. Install two lysimeters adjacent to the fill area, and sample and analyze during the wet season for the parameters in List B, Table 6.1-2.	If contaminants are found, additional lysimeters may be needed to determine the extent of the contaminant migration.
Chemical Disposal Site No. 1	CS-1	55	Survey the area with an organic vapor analyzer (OVA) to determine if any organic vapors are emanating from this area.	If organic vapors are detected, lysimeters can be installed to determine the types of contaminants and the extent of contamination.

Table 6.1-1. Summary of Recommended Monitoring for AAFB Phase II Investigations (Continued, Page 5 of 6)

Site	Designation	HARM Score	Recommended Monitoring	Remarks
Drum Storage Area No. 2	DS-2	50	Collect samples of the oil-contaminated soils, and determine if they are hazardous materials by analyzing for the parameters in List C, Table 6.1-2.	If the soils are contaminated with hazardous substances, they will require removal and proper disposal. Drums stored in this area should be relocated to an area where spillage can be contained and controlled.
Chemical Disposal Site No. 2	CS-2	45	Collect soil samples and analyze for the parameters in List C, Table 6.1-2, to determine if soils are contaminated by hazardous materials. This area is also included in the ground water monitoring program recommended for LF-1.	Drums stored at this site should be removed for proper disposal.
Drum Storage Area No. 1	DS-1	45	Collect soil samples and analyze for the parameters in List C, Table 6.1-2, to determine if soils are contaminated by hazardous materials. Ground water monitoring for this area is recommended as described for LF-1.	If soils are contaminated, they will require removal and proper disposal. Drums stored in this area should be relocated to an area where spillage can be contained and controlled.
Chemical Disposal Site No. 3	CS-3	41	No monitoring is recommended at this site.	Signs should be erected around this area to warn of the possible presence of UXO.
Landfill No. 22	LF-22	38	No monitoring is recommended at this site.	Signs should be erected around this area to warn of the possible presence of UXO.

Table 6.1-1. Summary of Recommended Monitoring for AAFB Phase II Investigations (Continued, Page 6 of 6)

Site	Designation	HARM Score	Recommended Monitoring	Remarks
Chemical Disposal Site No. 4	CS-4	37	Survey the area with an OVA to determine if any organic vapors are emanating from the area.	If organic vapors are detected, lysimeters can be installed to determine the types of contaminants and the extent of contamination.

Source: ESE, 1985.

Table 6.1-2. Recommended List of Analytical Parameters for AAFB Phase II Investigations

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<u>List A</u>

- Priority Pollutants
  - Volatile Organics
  - Base Neutral Extractables
  - Acid Extractables
  - Pesticides
    - Endrin
    - Lindane
    - Methoxychlor
    - Toxaphene
    - 2,4-D
    - 2,4,5-T
    - DDT
  - PCB
  - Metals
    - Cadmium
    - Chromium
    - Copper
    - Lead
    - Mercury
    - Arsenic
    - Barium
    - Selenium
    - Silver
  - Cyanide
  - Sulfate
  - Nitrate
  - Fluoride
  - pH
  - Conductivity

<u>List B</u>

- Total Organic Halogens
- Total Organic Carbon
- Phenols
- Oil and Grease

<u>List C</u>

- Priority Pollutants
  - Volatile Organics
  - Base Neutral Extractables
  - Acid Extractables
  - Pesticides
    - Endrin
    - Lindane
    - Methoxychlor
    - Toxaphene
    - 2,4-D
    - 2,4,5-T
    - DDT

Source: ESE, 1985.

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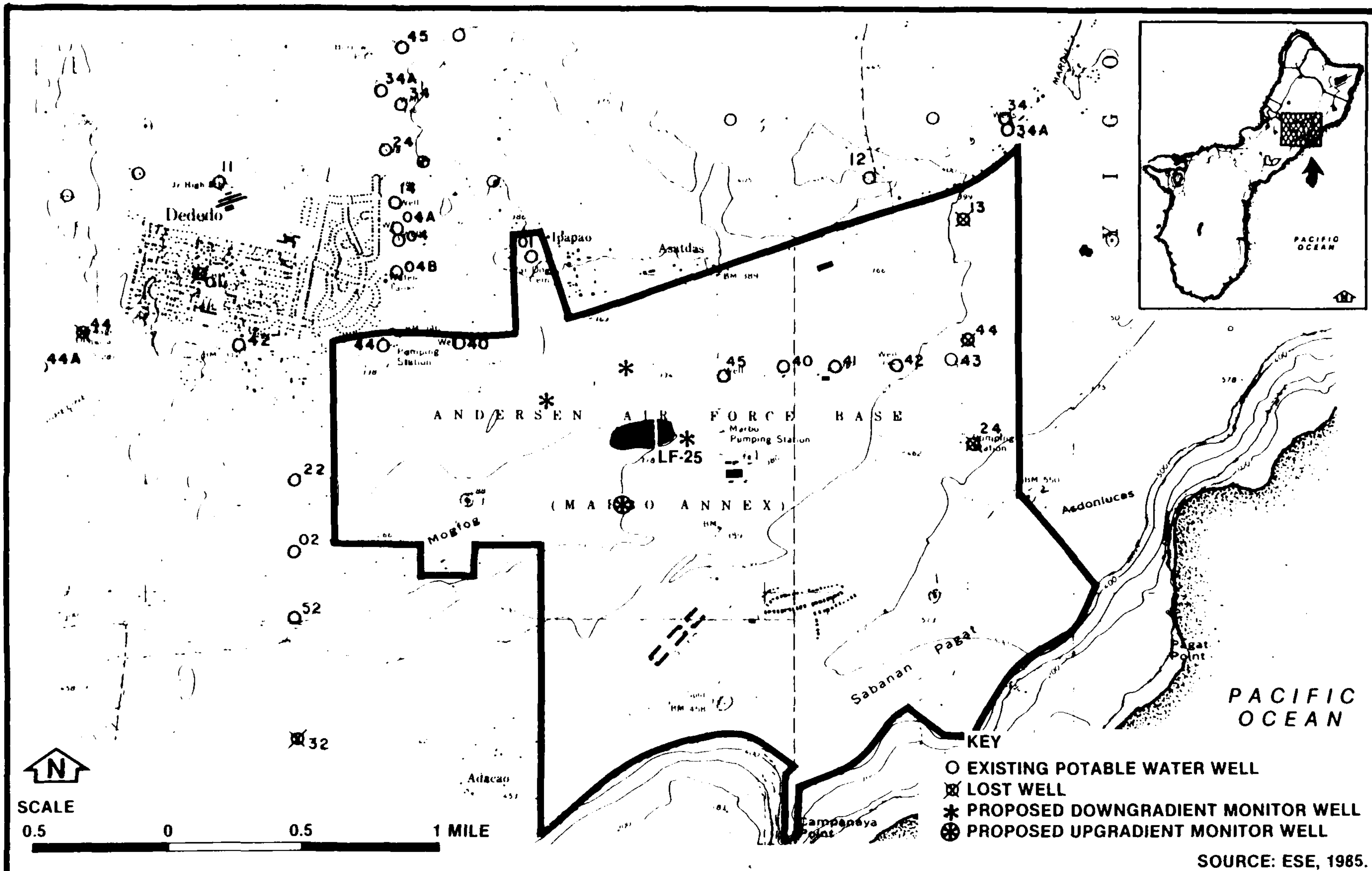

Figure 6.1-1
PROPOSED MONITOR WELL LOCATIONS AT LF-25
ON AAFB SOUTH (MARBO ANNEX)

INSTALLATION
RESTORATION PROGRAM
Andersen Air Force Base

The sites recommended for the monitor wells were selected based on the ground water potentiometric gradients (see Fig. 3.3-1). It is recommended that these wells be of sufficient diameter to contain a turbine pump which will be used to transport water samples to the surface. The wells will be approximately 400 ft deep and should be screened throughout the saturated zone. Samples from the new wells and the existing wells should be analyzed for the parameters in List A, Table 6.1-2.

If contamination is found, additional wells near the actual landfill site may be necessary to determine if the landfill is the point source for contaminants.

Landfill No. 1 (LF-1)

LF-1 currently has one monitor well which is sampled and analyzed on a periodic basis. LF-1 is one of a series of landfills, disposal sites, storage areas, and training areas which are located in one general area of the base, and all are upgradient and in the recharge zone for the Guam Northern Lens Aquifer. The recommended Phase II monitoring program for this area consists of installing five wells (one upgradient and four downgradient) for use in monitoring the water quality of the aquifer. The locations of these proposed monitor wells are shown in Fig. 6.1-2. These sites were selected based on an assumed ground water flow direction. Samples should be collected from these wells and analyzed for the parameters in List A, Table 6.1-2.

A geophysical survey should also be conducted at LF-1 to determine the areal extent of the fill. After completion of the geophysical survey, a minimum of two lysimeters should be installed immediately outside of the landfill area and sampled during the wet season to determine if contaminants are migrating from the landfills. The approximate locations for the lysimeters are shown in Fig. 6.1-2, and the parameters for which the samples should be analyzed are found in List A, Table 6.1-2.

USAFAND 10/17/84

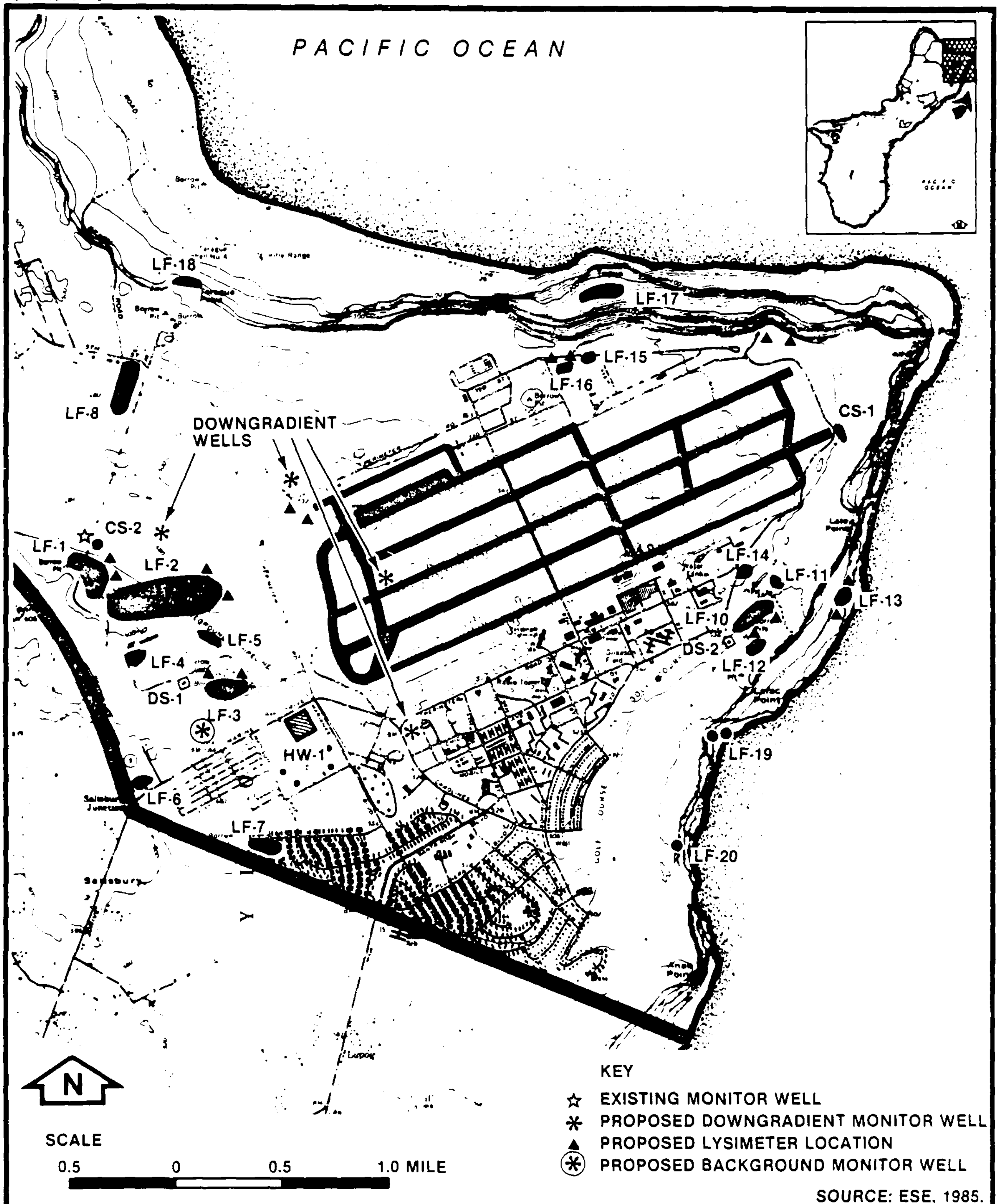

Figure 6.1-2
PROPOSED MONITOR WELL AND
LYSIMETER LOCATIONS ON AAFB

INSTALLATION
RESTORATION PROGRAM
Andersen Air Force Base

Landfill No. 2 (LF-2)

LF-2 is in the area where ground water monitoring should be performed as described under LF-1. In addition, the areal extent of LF-2 should also be determined through a geophysical survey, and lysimeters should be installed as shown in Fig. 6.1-2. The lysimeters should be installed to a depth of 1 to 2 ft below the fill material in the landfill. The lysimeters should be sampled in the wet season. The ground water and lysimeter samples should be analyzed for the parameters in List A, Table 6.1-2. If contaminants are found in the lysimeter samples, additional lysimeters and monitoring may be required to determine the extent of contamination.

Landfill No. 10 (LF-10)

The monitoring program recommended for LF-10 includes a geophysical survey and installation of lysimeters. The geophysical survey should be performed to determine the areal extent of LF-10. After this determination, the lysimeters should be installed immediately adjacent to the fill area boundary (see Fig. 6.1-2) to a depth of 1 to 2 ft below the bottom of the fill material. Samples should be collected from the lysimeters during the wet season and analyzed for the parameters in List B, Table 6.1-2. If contaminants are found, the installation of additional lysimeters may be required in order to determine the extent of contamination.

Landfill No. 3 (LF-3)

LF-3 is in the area where ground water is recommended for monitoring as described under LF-1. This landfill should also be subjected to geophysical analysis to determine size and installation of lysimeters to collect water samples from the unsaturated soils. The lysimeters should be installed immediately outside the landfill boundary to a depth of 1 to 2 ft below the fill material. The samples from the lysimeters should be collected during the wet season and analyzed for the parameters in List A, Table 6.1-2.

Stormwater Drainage System, Zone No. 1 (SDS-1)

This area contains injection wells which receive stormwater discharges and serve as conduits to the aquifer. Some of SDS-1 receives potentially hazardous substances from the industrial areas near the south runway. No monitoring is recommended for these areas. It is recommended, however, that a survey be performed to determine which wells are directly impacted by industrial discharges and that consideration be given to finding other means of disposal for the discharges. Closing and filling of the injection wells should also be considered as a method to eliminate any direct contamination of the aquifer.

Landfill No. 13 (LF-13)

A geophysical survey and the installation of lysimeters are recommended for LF-13. The geophysical survey is recommended to determine the areal extent of the fill area in order to emplace the lysimeters immediately adjacent to the fill material (see Fig. 6.1-2). The lysimeters should be installed to a depth of 1 to 2 ft below the bottom of the fill material in LF-13. Samples should be collected during the wet season and analyzed for the parameters in List B, Table 6.1-2. If contaminants are found in the samples, additional lysimeters may be required to determine the extent of contamination.

Firefighter Training Area No. 1 (FTA-1)

The monitoring recommended for FTA-1 includes the installation of lysimeters and monitoring for hydrocarbon vapors. The lysimeters should be installed to a depth of approximately 10 ft directly in the area formerly used as FTA-1. During installation of the boreholes for the lysimeters, monitoring should be performed with an OVA to determine if organic vapors are emanating from the subsoils. The lysimeters should be sampled during the wet season and analyzed for the parameters in List B, Table 6.1-2.

Hazardous Waste Storage Area No. 1 (HW-1)

The former hazardous waste storage site is located in the area to be monitored as part of the ground water monitoring program described under LF-1. The Bioenvironmental Engineering Section (BES) has taken soil samples adjacent to the former storage pad and analyzed for extraction procedure (EP) toxic metals in the past. No monitoring has been conducted for potential organic contaminants. No contamination by toxic metals was detected. The primary concern from this site, potential organic contaminants (e.g., TCE) reaching the aquifer through the dry injection wells located directly adjacent to the uncurbed pad on the south side, will be addressed by the recommended ground water monitoring program. No spills have been reported at this site.

Stormwater Drainage System, Zone No. 3 (SDS-3)

This area contains injection wells which receive stormwater runoff and serve as conduits to the aquifer. No sampling is recommended for this area; however, a survey should be performed to determine potential sources of hazardous substances which can enter the stormwater system in this area and the feasibility of diverting these substances to other more suitable treatment programs. Consideration should also be given to closing and filling injection wells in areas where other suitable disposal methods are not feasible.

Firefighter Training Area No. 2 (FTA-2)

The monitoring for FTA-2 includes the installation of lysimeters and monitoring for the presence of hydrocarbon vapors. The lysimeters should be installed to a depth of approximately 10 ft in areas where spillage and runoff would be expected. During installation of the lysimeter boreholes, monitoring should be conducted to determine if organic vapors are emanating from the subsoils. The lysimeters should be sampled in the wet season and analyzed for the parameters in List B, Table 6.1-2. This area overlies the Guam Northern Lens Aquifer and deep ground water monitoring should be performed as recommended under LF-1.

Stormwater Drainage System, Zone No. 2 (SDS-2)

This area contains injection wells which receive stormwater runoff and serve as conduits to the aquifer. No sampling is recommended for this area; however, a survey should be performed to determine potential sources of hazardous substances which can enter the stormwater system in this area and the feasibility of diverting these substances to other more suitable treatment programs. Consideration should also be given to closing and filling injection wells in areas where other suitable disposal methods are not feasible.

Chemical Disposal Site No. 1 (CS-1)

A survey should be conducted at CS-1 using an OVA to determine if any organic vapors are emanating from the area. If organic vapors are found, the installation of lysimeters may be necessary to determine the extent of contamination.

Landfill No. 16 (LF-16)

The recommended monitoring program for LF-16 includes a geophysical survey and the installation of lysimeters. The geophysical survey should be used to determine the areal extent of the landfill in order to position the lysimeters directly adjacent to the fill area. The lysimeters should be installed to a depth of 1 to 2 ft below the bottom of the fill material. The lysimeters should be sampled during the wet season and the samples analyzed for the parameters in List B, Table 6.1-2.

Drum Storage Area No. 2 (DS-2)

The recommended monitoring for DS-2 consists of collecting soil samples from the area visually contaminated with POL. These samples should be analyzed for the parameters in List C, Table 6.1-2, to determine if they would be classified as hazardous. If hazardous contaminants are detected, the soils will require removal and disposal as hazardous materials. Drums stored in this area should be removed to an area where spillage can be contained and controlled.

Chemical Disposal Site No. 2 (CS-2)

CS-2 is in an area in which ground water monitoring should be conducted as described under LF-1. In addition, soil samples should be collected around this site and analyzed for the parameters in List C, Table 6.1-2. The drums stored at this site should be properly disposed of or removed to an area where spillage and leakage can be contained and controlled.

Drum Storage Area No. 1 (DS-1)

Soil samples should be taken from the areas at DS-1 where spills are evident. These samples should be analyzed for the parameters in List C, Table 6.1-2, to determine if they contain hazardous materials. If contaminated by hazardous materials, the soil will require removal and disposal as hazardous waste. In addition, the drums stored in this area should be properly disposed of or moved to an area where spillage and leakage can be contained and controlled.

Chemical Disposal Site No. 3 (CS-3)

The main contaminant at this site is UXO. The recommended action for this site is to post warning signs in the area. No monitoring program is recommended.

Landfill No. 22 (LF-22)

No monitoring program is recommended for LF-22. The main contaminant at the site is UXO, which has little or no migration potential. It is recommended, however, that the area be posted with warning signs to alert personnel to the potential dangers.

Chemical Disposal Site No. 4 (CS-4)

The recommended monitoring program for CS-4 consists of a survey of the area for hydrocarbon vapors conducted using an OVA analyzer. If organic vapors are detected, lysimeters should be installed to determine the extent of contamination.

6.2 RECOMMENDED GUIDELINES FOR LAND USE RESTRICTIONS

It is desirable to have land use restrictions for the identified disposal sites for the following reasons: (1) to provide the continued protection of human health, welfare, and the environment; (2) to 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 sites at AAFB are presented in Table 6.2-1. Descriptions of the land use restriction guidelines are presented in Table 6.2-2. Land use restrictions at sites recommended for Phase II monitoring should be reevaluated upon completion of the Phase II monitoring program and changes made where appropriate.

Table 6.2-1. Recommended Guidelines for Future Land Use Restrictions at Potential Contamination Sites

Site	Recommended Guidelines for Future Land Use Restrictions											
	Construction on the site	Excavation	Well construction on or near the site	Agricultural use	Silvicultural use	Water infiltration (runon, ponding, irrigation)	Recreational use	Burning or ignition source	Disposal operations	Vehicular traffic	Material storage	Housing on or near the site
Landfill No. 25	R	R	R	R	NR	R	NR	NR	R	NR	R	R
Landfill No. 1	R	R	R	R	NR	R	NR	NR	PU	NR	PU	R
Landfill No. 2	R	R	R	R	NR	R	NR	NR	R	NR	R	R
Landfill No. 10	R	R	R	R	NR	R	NR	NR	R	NR	R	R
Landfill No. 3	R	R	R	R	NR	R	NR	NR	R	NR	R	R
Stormwater Drainage System, Zone No. 1	R	R	PU	NA	NR	PU	NR	NR	R	NR	R	R
Landfill No. 13	R	R	R	R	NR	R	NR	NR	R	NR	R	R
Firefighter Training Area No. 1	NR	NR	R	R	NR	NR	NR	NR	R	NR	R	R
Hazardous Waste Storage Area No. 1	NR	NR	R	R	NR	NR	NR	NR	R	NR	R	R
Stormwater Drainage System, Zone No. 3	R	R	PU	NA	NR	PU	NR	NR	R	NR	R	R
Firefighter Training Area No. 2	R	R	R	R	NR	NR	NR	R	NA	NR	R	R
Stormwater Drainage System, Zone No. 2	R	R	PU	NA	NR	PU	NR	NR	R	NR	R	R
Chemical Disposal Site No. 1	R	R	R	R	NR	NR	NR	NR	R	NR	R	R
Landfill No. 16	R	R	R	R	NR	R	NR	NR	R	NR	R	R
Drum Storage Area No. 2	R	NR	R	R	NR	NR	NR	R	R	NR	PU	R
Chemical Disposal Site No. 2	NR	NR	R	R	NR	NR	NR	R	R	NR	NR	R
Drum Storage Area No. 1	NR	NR	R	R	NR	NR	NR	R	R	NR	PU	R
Chemical Disposal Site No. 3	R	R	R	R	R	NR	R	R	R	R	R	R
Landfill No. 22	R	R	R	R	NR	R	NR	NR	R	R	R	R
Chemical Disposal Site No. 4	R	R	R	R	NR	R	NR	NR	R	NR	R	R

Key:
R = Restriction.
NR = No restriction.
NA = Not applicable.
PU = Present use.

Note: See Table 6.2-2 for definitions of land use restrictions.
Source: ESE, 1985.

Table 6.2-2. Descriptions of Guidelines for Land Use Restrictions

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

Source: ESE, 1984.

Tab

B.b.

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Tab

A

APPENDIX A

GLOSSARY OF TERMINOLOGY, ABBREVIATIONS, AND ACRONYMS

APPENDIX A
GLOSSARY OF TERMINOLOGY, ABBREVIATIONS, AND ACRONYMS

AAFB	Andersen Air Force Base
AFAA	Air Force Audit Agency
AFB	Air Force Base
AFOSI	Air Force Office of Special Investigations
AGE	Aerospace Ground Equipment
Alodine solution	A solution used to provide a protective coating for aluminum; manufactured by Amchem Products, Inc.; the exact ingredients are propietary; however, a known hazardous ingredient is 5-10% fluozirconic Acid, which can decompose to hydrogen fluoride gas.
AMS	Avionics Maintenance Squadron
Aquifer	A geologic formation, group of formations, or part of a formation capable of yielding water to a well or spring
BES	Bioenvironmental Engineering Section
BFT	Burned in Firefighter Training
CD	Contract disposal
CERAP	Combined Center/Radar Approach Control
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CES	Civil Engineering Squadron
Chromium	A metal used in plating, cleaning, and other industrial applications; highly toxic to aquatic life at low concentrations, toxic to humans at higher levels
Contaminated fuel	Fuel which does not meet specifications for recovery or recycle

Contamination	Degradation of natural water quality to the extent that its usefulness is impaired; degree of permissible contamination depends on intended use of water
Contract disposal	Contract disposal indicates that AAFB has identified and contracted with a local firm to remove and dispose of wastes generated on the base.
CS	chemical disposal site
CSG	Combat Support Group
DS	drum storage area
DEQPPM	Defense Environmental Quality Program Policy Memorandum
Det.	Detachment
DF-2	diesel fuel No. 2
Disposal of hazardous waste	Discharge, deposit, injection, dumping, spilling, or placing of any hazardous waste into or on land or water so that such waste, or any constituent thereof, may enter the environment, be emitted into the air, or be discharged into any waters, including ground water
DOD	Department of Defense
Downgradient	In the direction of decreasing hydraulic static head; the direction in which ground water flows
DPDO	Defense Property Disposal Office
Effluent	Liquid waste discharged in its natural state or partially or completed treated, from a manufacturing or treatment process
EOD	Explosive Ordnance Detachment
EP	Extraction procedure--EPA's standard laboratory procedure for leachate generation
EPA	U.S. Environmental Protection Agency
ESE	Environmental Science and Engineering, Inc.
FMS	Field Maintenance Squadron

ft	foot (feet)
FTA	firefighter training area
gal	gallon(s)
gal/yr	gallon(s) per year
GC/MS	gas chromatography/mass spectrometry
gpm	gallon(s) per minute
Ground water	Water beneath the land surface in the saturated zone that is under atmospheric or artesian pressure
HARM	Hazard Assessment Rating Methodology
Hazardous waste	As defined in RCRA, a solid waste or combination of solid wastes which because of its quantity, concentration, or physical, chemical, or infectious characteristics may cause or significantly contribute to an increase in mortality or an increase in serious, irreversible, or incapacitating reversible illness; or pose a substantial present or potential hazard to human health or the environment when improperly treated, stored, transported, disposed of, or otherwise managed
HW	hazardous waste storage area
Infiltration	Movement of water through the soil surface into the ground
Injection well	A well installed for the purpose of facilitating surface water infiltration into the aquifer.
IR	infrared
Iron	A metal commonly found in water as a consequence of dissolution of geologic materials; relatively nontoxic
IRP	Installation Restoration Program
Jobsite disposal	Jobsite disposal includes evaporation at the jobsite and landspreading.
JP-4	jet propellant No. 4

lb/yr	pound(s) per year
Leachate	A solution resulting from the separation or dissolving of soluble or particulate constituents from solid waste or other man-placed medium by percolation of water
Leaching	The process by which soluble materials in the soil, such as nutrients, pesticide chemicals, or contaminants, are washed into a lower layer of soil or are dissolved and carried away by water
Lead	A metal additive to gasoline and used in other industrial applications; toxic to humans and aquatic life; bioaccumulates
LF	landfill
Liner	A continuous layer of natural or manmade materials beneath or on the sides of a surface impoundment, landfill, or landfill cell which restricts the downward or lateral escape of hazardous waste, hazardous waste constituents, or leachate
LOX	liquid oxygen
LPG	liquified petroleum gas
Lysimeter	A ground water collection device situated in the unsaturated, vodose zone; this collection system is used to monitor water quality migrating from a point source prior to entering the aquifer system.
MAC	Military Airlift Command
MASS	Military Airlift Support Squadron
MEK	methyl ethyl ketone, a solvent used in paint thinner, stripper, and a wide variety of industrial applications; suspected to be toxic to humans at high levels; potentially toxic to aquatic life
MET	Management Engineering Team
mg/l	milligrams per liter

MIBK	methyl isobutyl ketone, a solvent used in paint stripper, thinner, and a wide variety of industrial applications; suspected to be toxic to humans at high levels; potentially toxic to aquatic life
MINEX	mine-laying exercise
MMS	Munitions Maintenance Squadron
MOGAS	motor gasoline
msl	mean sea level
N/A	not applicable
NS	Naval Station
NCOIC	Noncommissioned Officer-in-Charge
Nitrate	A common anion in natural water
OIC	Officer-in-Charge
OMS	Organizational Maintenance Squadron
OVA	organic vapor analyzer
PCB	Polychlorinated biphenyl--liquid used as a dielectric in electrical equipment; suspected human carcinogen; bioaccumulate in the food chain and causes toxicity to higher trophic levels
PD-680	Petroleum-based cleaning solvent
Percolation	Movement of moisture by gravity or hydrostatic pressure through interstices of unsaturated rock or soil
Permeability	The capacity of a porous rock, soil, or sediment of transmitting a fluid without damage to the structure of the medium
pH	Negative logarithm of hydrogen ion concentration; an expression of acidity or alkalinity
PMEL	Precision Measurement Equipment Laboratory
POL	petroleum, oils, and lubricants
PTTF	Pacific Tanker Task Force

PUAG	Public Utility Agency of Guam
PVC	polyvinyl chloride plastic
RCRA	Resource Conservation and Recovery Act
RPO	Radiation Protection Officer
RS&H	Reynolds, Smith and Hills
SAC	Strategic Air Command
SDS	stormwater drainage system
Silver	A metal used in photographic emulsions and other industrial operations; toxic to humans and aquatic life at low concentrations
Slug Test	A single-well aquifer test to determine the hydraulic conductivity of a specific (screened) section of an aquifer; procedure: a volume of water is instantaneously displaced as a PVC slug is lowered into or removed from the well; the change in water level is monitored and recorded, as the well returns to equilibrium, and the data gathered during the test are analyzed by comparison with a theoretical response.
SPCC	Spill Prevention Control and Countermeasure (Plan)
Spill	An unplanned release or discharge of a hazardous waste onto or into air, land, or water
STR	Strategic Training Range
Sulfate	A common anion in sea water
TAC	Tactical Air Command
TCE	trichloroethylene, a commonly used degreasing solvent; toxic to aquatic life and humans has been shown to be a carcinogen in limited animal species at high doses.
TS	Transportation Squadron
ug/l	microgram(s) per liter
Upgradient	In the direction of increasing hydraulic static head; the direction opposite to the prevailing flow of ground water

APPENDIX B

TEAM MEMBER BIBLIOGRAPHY

ESE PROFESSIONAL RESUME

JOHN D. BONDS, Ph.D.
Senior Scientist/Project Manager

SPECIALIZATION

Project Management, Atmospheric Chemistry, Water Chemistry, Industrial Hygiene, Quality Assurance, Hazardous Waste

RECENT EXPERIENCE

Initial Assessment Studies for the United States Air Force, Team Leader--Comprehensive studies at 2 Air Force bases to determine both past and present history with regard to the use and disposal of toxic and hazardous materials. Conducted in accordance with the Department of Defense Installation Restoration Program policies.

Initial Assessment for Hazardous Wastes at Army Installations, Team Leader--Comprehensive study at 48 Army installations to determine both past and present history with respect to the use of hazardous substances, quantities used, disposal methods and disposal sites. Also includes a current assessment of safety practices and compliance with regulations.

Initial Assessment Studies for the Naval Energy and Environmental Support Activity, Team Leader--Evaluating 2 Naval installations with regard to past hazardous waste generation, storage, treatment, and disposal practices. Investigations include records review, aerial and ground site surveys, employee interviews, and limited sampling and analysis including geophysical techniques. Determine extent of contamination at former disposal/spill sites, potential for contaminant migration, and potential effects on human health and the environment.

Phase II Confirmation Studies to Determine the Presence and Migration of Hazardous Wastes from Military Installations, Team Leader--Five comprehensive field studies to determine the actual sites where hazardous substances were used, their current concentrations in soils, surface waters and groundwater, and an assessment of the quantities which may migrate from the installation. The study also included recommendations for decontamination operations.

Determination of Hazardous Chemicals in Landfills, Project Manager--Several studies in which field sampling techniques and laboratory methods were developed to determine the existence and concentrations of explosive gases generated by landfill operations, priority pollutants escaping to the atmosphere and contaminating the groundwater.

Preparation of Quality Assurance Guidelines for EPA Project Officers, Project Manager--Preparation of QA guidelines for use by EPA project officers in selecting contractors for projects requiring sampling and analysis. Also included guidelines for quality assurance audits of the field sampling and analysis portion of any awarded contract. EPA publication 600/9-79-046 entitled Quality Assurance Guidelines for IERL-Ci Project Officers was produced under this project.

Air Compliance Testing of Industrial Sources, Project Manager--Various projects involving compliance testing at petroleum refineries, Kraft pulp mills, power plants, iron and aluminum smelting operations, and various other industries.

Ambient Air Monitoring, Project Manager--Various projects to determine ambient air concentrations of sulfur oxides, particulates, nitrogen oxides, carbon monoxide, photochemical oxidants, priority pollutant organics, and hydrocarbons.

EDUCATION

Ph.D.	1969	Analytical Chemistry	University of Alabama
B.S.	1963	Chemistry	University of Alabama

U.S. EPA Air Pollution Training Institute: Quality Assurance for Air Pollution Measurement Systems--workshop graduate (1977)

ASSOCIATIONS

American Chemical Society
American Industrial Hygiene Association
Air Pollution Control Association

REPORTS AND PUBLICATIONS

Over 50 reports and publications on Installation Assessments, source air emissions, hazardous materials and quality assurance.

JEFFREY J. KOSIK, B.S.E.
Associate Engineer

ESE PROFESSIONAL RESUME

SPECIALIZATION

Hazardous Waste Management, Water and Wastewater Treatment, Water Supply and Field of Investigations

RECENT EXPERIENCE

Initial Assessment Studies for the United States Air Force, Team Engineer--Comprehensive studies at 2 Air Force bases to determine both past and present history with regard to the use and disposal of toxic and hazardous materials. Conducted in accordance with the Department of Defense Installation Restoration Program policies.

Reassessment for Hazardous Wastes at Army Installation, Team Engineer--Comprehensive study at an Army installation to determine both past and present history with respect to the use of hazardous substances, quantities used, disposal methods and disposal sites. Also includes a current assessment of safety practices and compliance with regulations.

Hazardous Waste Survey and Assessment and Review of Potential Liability for a Major U.S. Industrial Corporation, Project Engineer--Comprehensive survey of over 50 corporate facilities to determine past and present activities with respect to the use of hazardous substances, quantities used, disposal methods, disposal sites and potential legal liability of those activities. Study also includes an assessment of compliance with regulations.

Industrial Wastewater Treatment/Disposal Systems Design and Permitting, Project Engineer--Several projects for the conceptual and final design of a treatment/disposal system, design of treatment instrumentation systems, and permitting.

Effluent Guidelines Development for the Pharmaceuticals Manufacturing Point Source Category, Project Engineer-- Comprehensive study for wastewater characterization, treatment system performance evaluation, and estimation of installation and operating costs for treatment systems to remove toxic and co ventional pollutants.

EDUCATION

B.S.E. 1982 Environmental Engineering University of Florida
1984 Hazardous Materials/Site Investigations Training Course

AFFILIATIONS

Society of Environmental Engineers
American Water Works Association
Water Pollution Control Federation
Boy Scouts of America
American Red Cross

JOHN R. MAXWELL, B.A.
Field Biologist

ESE PROFESSIONAL RESUME

SPECIALIZATION

Field Biology, Vegetation Sampling and Mapping, Specimen Preservation, Materials Management, Computer-Oriented Data Reduction, Aerial Photography Survey and Review

RECENT EXPERIENCE

Wildlife Technician for Transmission Line Corridor--Provided habitat information impact assessment, and expert testimony in selection study and application hearing for 175-mile 500-kV transmission corridor for Florida Power & Light Company.

Field Team Coordinator for Terrestrial Ecology Surveys--Surveys conducted tor two coal-fired power plants in central and northern Florida.

Vegetative Sampling, Small Mammal Trapping, and Vegetation Mapping--Site certification application for Crystal River Units 4 and 5, Florida Power Corporation.

Endangered Species Reconnaissance, Senior Field Technician--in Orange County, Florida, including Red-Cockaded Woodpecker and Gopher Tortoise for Orlando Utilities Commission.

Aerial Photography Review, Aerial Survey, Small Mammal Trapping, and Endangered Species Survey--Surveys were conducted for siting a 300-MW coal-fired power plant in southern New Jersey.

Aerial Photography Review for Biological Sample Collection--Toxic chemical deactivation project in central Alabama.

Field Supervisor--Survey of Red-Cockaded Woodpecker habitats in Gulf, Marion and Baker counties, Florida.

Senior Field Technician for Wetlands and Wildlife Survey--Surveys conducted for proposed phosphate mine in DeSoto and Manatee Counties, Florida.

Biological Sample Collection, Senior Field Technician--Sample for toxic chemical deactivation project in central Alabama.

Quarterly Terrestrial Field Surveys and Mapping of Vegetation, Flora, and Wildlife--EIS Process at Naval Weapons Facility, Charleston County, South Carolina.

Plant Tissue Analyses--Operated field monitoring networks for plant tissue analyses at three sites in central Florida.

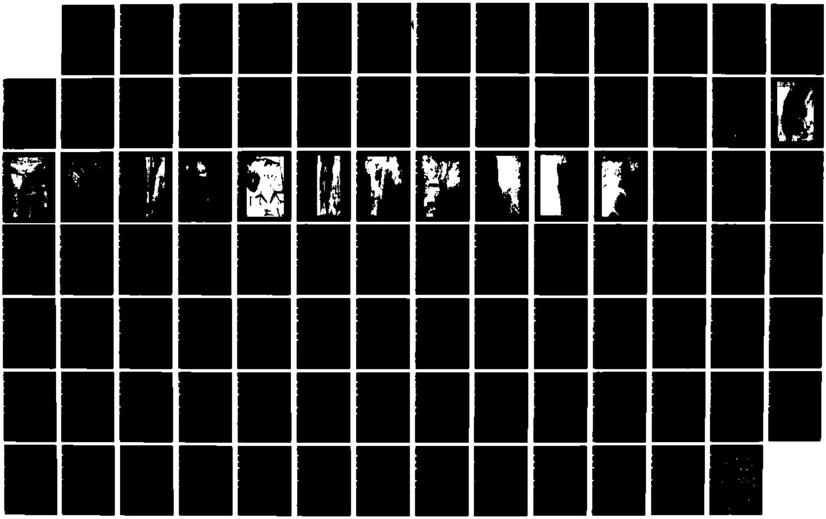
Quantitative Field Sampling--Participated in quantitative field sampling for wetlands transition zone vegetation in Hillsborough County, Florida.

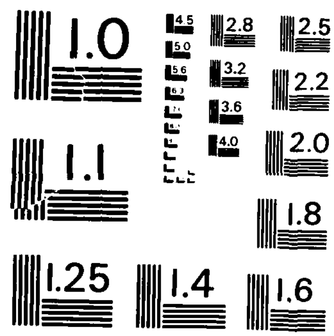
Vegetation Sampling, Wildlife Survey, Vegetative Mapping, and Data Reduction--Two environmental impact statements for proposed cement plant and limestone quarry near Mobile, Alabama, Ideal Basic Industries.

EDUCATION

B.A.	1975	Biology	Trenton State College

AD-A163 667 INSTALLATION RESTORATION PROGRAM PHASE I RECORDS SEARCH 3/3
ANDERSEN AIR FORC. (U) ENVIRONMENTAL SCIENCE AND
ENGINEERING INC GAINESVILLE FL J D BONDS ET AL. MAR 85
UNCLASSIFIED F08637-83-G-0010 F/G 13/2 NL





MICROCOPY RESOLUTION TEST CHART
NATIONAL BUREAU OF STANDARDS-1963-A

DONALD F. McNEILL, M.S.

Professional Resume

Areas of Specialization

Hydrogeology, Ground Water Monitoring and Evaluation, Clastic Sedimentology, Carbonate Sedimentology, Peat and Organic Sediment Analysis, Geomorphology, Stratigraphy, Field Mapping, and Sampling Techniques

Experience

Associate Scientist, Water Resources Department, Gainesville, Florida, 1983 to present.

Florida Department of Environmental Regulation, Site Contamination Assessment, Project Hydrogeologist--Investigated organic and inorganic contamination at City Chemical Company, Orlando, Florida. Assessment of shallow aquifer with respect to contaminant migration.

EDB Contamination Investigation, Project Hydrogeologist--Investigated EDB contamination of drinking water wells at Sanford, Florida, including drilling and field sampling, installation of piezometers, measuring water levels and sampling wells, evaluating alternatives, and preparing report.

Adcom Wire Company, Project Hydrogeologist--Development of a ground water monitoring plan for a wire galvanizing plant including site analysis, geohydrology, and proposed ground water monitoring network.

Orange County, Project Hydrogeologist--Development of a ground water monitoring plan for a sanitary landfill near Orange, Florida. Project consisted of monitor well installation, measuring water levels, geohydrologic evaluation and report preparation.

U.S. Army Toxic and Hazardous Materials Agency, Project Geologist--Installation assessment of Ft. Riley, Kansas. Geohydrologic assessment of present and past waste disposal methods, responsible for evaluation of the potential for migration of contaminants in the subsurface.

U.S. Army Toxic and Hazardous Materials Agency, Project Geologist--Installation assessment of Military District of Washington. Geohydrologic assessment of present and past waste disposal methods, responsible for evaluation of the potential for migration of contaminants in the subsurface.

U.S. Army Toxic and Hazardous Materials Agency, Project Geologist--Installation assessment of West Virginia Ordnance Works. Geologic and ground water investigation of past waste disposal methods. Responsible for evaluation of ground water contamination and off-post contaminants migration.

U.S. Air Force Installation Restoration Program, Project Geologist--Installation assessment of Columbus, Andersen, and Vandenburg Air Force Bases. Responsible for geohydrologic evaluation of sanitary and solid waste disposal areas, and the potential for off-post migration.

Minerals Management Service, Project Geologist--Responsible for sediment core and sediment trap analysis for evaluation of sediment transport in selected areas of the Gulf of Mexico.

Research Assistant, Department of Geology, University of Florida, 1981 to 1983.

University of Florida, Research Associate--Texaco U.S.A.- funded research grant involving the development of a method of increasing BTU values in autochthonous mineral-rich peats and organic sediments.

Department of Energy and Governor's Energy Office, State of Florida, Research Assistant--Florida fuel grade peat assessment program conducted through the University of Florida; involved sampling, mapping, and analysis of Florida fuel peat resources.

Education

M.S.	1983	Geology	University of Florida
B.S.	1981	Geology	State University of New York

Affiliations

American Association of Petroleum Geologists--Energy Minerals Division
Geological Society of America
Southeastern Geological Society
Society of Economic Paleontologists and Mineralogists

Publications

Griffin, G.M., Wieland, C.C., and McNeill, D.F. 1982. Assessment of the Fuel Grade Peat Resources of Florida. U.S. Department of Energy and the Governor's Energy Office, State of Florida, Tallahassee, Florida.

McNeill, D.F., and Stauble, D.K. 1985. Coastal Geology and the Occurance of Beackrock; Central Florida Atlantic Coast. Geological Society of America, Field Trip for 1985 Annual Meeting, Orlando, Florida (in preparation).

McNeill, D.F., and Sawyer, R.K. 1984. A Method for Increasing BTU Values in Autochthonous Mineral Rich Organic Sediments (in preparation).

APPENDIX C

LIST OF INTERVIEWEES

APPENDIX C

LIST OF INTERVIEWEES

Interviewee	Years of Service at AAFB
Noncommissioned Officer-In-Charge (NCOIC), Structural Section Manager, 43rd CES	1
Paint Shop Foreman, 43rd CES	34
Painter, 43rd CES	36
Carpentry Shop Foreman, 43rd CES	35
NCOIC, Mechanical Section, Superintendent	1
Liquid Fuels Foreman, 43rd CES	30
NCOIC, Heating Shop Foreman, 43rd CES	1
NCOIC, Refrigeration Shop Foreman, 43rd CES	1
Engineering Assistant, 43rd CES	7
Engineering Assistant, 43rd CES	1
Transportation Supervisor, 43rd TS	5
NCOIC, Fueling Maintenance Foreman, 43rd TS	1
Body Shop Foreman, 43rd TS	33
General Purpose Shop Foreman, 43rd TS	25
Electrical Section, Superintendent, 43rd CES	6
Pavement and Grounds, Supervisor, 43rd CES	34
Officer-In-Charge (OIC), Maintenance Supervisor, 43rd OMS	2
NCOIC, Defensive Fire Control Shop Supervisor, 43rd AMS	2
NCOIC, Field Shop Chief, 43rd AMS	2
Commander, Det. 24	1
OIC, Maintenance Supervisor, 43rd FMS	2
NCOIC, Fabrication Branch, 43rd FMS	2
Acting NCOIC, ACC Shop Chief, 43rd FMS	1

Interviewee	Years of Service at AAFB
NCOIC, Nondestruct Test Lab, 43rd FMS	2
Aircraft Maintenance Technician, 43rd FMS	4
Aircraft Maintenance Technician, 43rd FMS	2
NCOIC, Machine Shop Foreman, 43rd FMS	2
NCOIC, Aerospace Systems Branch Chief, 43rd FMS	1
NCOIC, Fuels Systems Maintenance, 43rd FMS	2
OIC, Maintenance Supervisor, 43rd MMS	1
NCOIC, Branch Chief, 43rd FMS	2
NCOIC, Jet Engine Maintenance, 43rd FMS	2
NCOIC, Jet Engine Conditioning, 43rd FMS	2
NCOIC, AGE Shop Branch Chief, 43rd FMS	4
NCOIC, AGE Shop, 43rd FMS	2
Chief Enlisted Manager, 43rd OMS	2
OIC, Fuels Management Officer, 43rd Supply Squadron	3
NCOIC, Photographic Laboratory	1
NCOIC, Maintenance Superintendent, 605th MASS	2
NCOIC, Bomb Renovation, 43rd MMS	1
Crew Chief, Bomb Renovation, 43rd MMS	2
Chief Ammunition Inspector, 43rd MMS	32
Superintendent, Roads and Grounds, 43rd CES	35
Foreman, Entomology Shop, 43rd CES	2
Entomology Aide, 43rd CES	36
Pest Controller, 43rd CES	20
Superintendent, Electrical Shop, 43rd CES	6
Electrician, 43rd CES	23
Supervisor, Morale, Welfare, and Recreation Division	1

Interviewee	Years of Service at AAFB
NCOIC, Reproduction Services	1
Manager, Auto Hobby Shop	2
Manager, Base Exchange Garage	1
Supervisor, Security Policy Command Section	1
NCOIC, Clinical Laboratory	2
NCOIC, Dental Laboratory	2
NCOIC, Dental Clinic	1
NCOIC, 43rd CSG Photographic Laboratory	2
NCOIC, 43rd CES Drafting and Surveying Section	2
Engineering Technician, 43rd CES Drafting and Surveying Section	3
Resource Plant Manager, AAFB Clinic	34
NCOIC, Pharmacy	1
OIC, 43rd CES Security	2
NCOIC, BES	2
OIC, BES	1
Manager, 43rd CES Real Estate	34
Fire Chief	3
Demolition Technician, EOD	2
Civilian Technician, BES	30
NCOIC, Det. 5 Power Plant	2

Outside Agency Contacts

Mr. Gary Wiles, Biologist
Aquatic and Wildlife Resources Division
Guam Department of Agriculture
Managilad, Guam 96910
671/734-3944

Outside Agency Contacts

Mr. James Branch, Administrator
Guam Environmental Protection Agency
P.O. Box 2999
Agana, Guam 96910
671/646-8863

Mr. James Canto, Administrator
Guam Environmental Protection Agency
P.O. Box 2999
Agana, Guam 96910
671/646-8863

Mr. Gregg Ikehara
United States Department of Interior
Geological Survey
Water Resources Division
104 Public Works Center
U.S. Naval Station, Guam 96910
671/339-9123

Mr. Dave Beck
United States Department of Interior
Geological Survey
Water Resources Division
104 Public Works Center
U.S. Naval Station, Guam 96910
671/339-9123

Mr. Dan Davis
United States Department of the Interior
Geological Survey
Water Resources Division
P.O. Box 50166
Honolulu, Hawaii 96850

Mr. Charles Huxel, USGS Honolulu, Hawaii
United States Department of the Interior
Geological Survey
Water Resources Division
P.O. Box 50166
Honolulu, Hawaii 96850

APPENDIX D

ORGANIZATIONS, MISSIONS, AND TENANT ACTIVITIES

APPENDIX D

ORGANIZATIONS, MISSIONS, AND TENANT ACTIVITIES

43RD STRATEGIC WING

The 43rd is the host unit on AAFB and a subordinate unit of the 3rd Air Division, part of the SAC's global deterrent force. The primary mission of the 43rd is to support SAC's deterrent mission and to provide support for contingency operations. The 43rd's Headquarters Squadron provides administrative support for the Operations, Maintenance, and Resource Management Deputates as well as the Public Affairs, Safety, and Social Actions Divisions.

60th Bombardment Squadron

The 60th flies the 8-engine B-52G Stratofortress in highly varied roles throughout the Western Pacific area. In support of the Emergency War Order commitment, as well as its other roles, the 60th flies more than 60 training sorties per month. The flights vary from local refueling and radar-bomb-scoring missions to training flights over the Republic of Korea and Australia and sea surveillance.

Pacific Tanker Task Force

The PTTF provides support in the Western Pacific and Indian Ocean areas for the deployment of forces in response to a strategic or tactical threat situation. Air refueling missions flown by aircrews assigned to AAFB include support for SAC B-52s, training and exercises Cope Thunder and Team Spirit for Pacific Air forces fighter units, and Joint U.S. Air Force/Navy operations. The tankers also support fighter deliveries to and from Asia to the U.S. mainland, as well as refuel C-5As and C-141Bs on missions across the Western Pacific. Planning, coordination, and aircrew control for these air refueling operations are accomplished by the PTTF.

43rd Munitions Maintenance Squadron

The mission of the 43rd MMS is to store, maintain, and configure the weapons of the 43rd Strategic Wing. A major portion of their effort is devoted to the care and maintenance of the munitions stored in the 43rd's 5,000-acre arsenal, the largest in SAC.

43rd Organizational Maintenance Squadron

The 43rd OMS provides organizational-level maintenance support (aircraft inspection and servicing operations) for assigned B-52G aircraft and KC-135 aircraft performing temporary duty in support of the PTTF. In addition, the 43rd OMS provides a staff function, an alert force capability, and a support equipment function to maintain assigned AGE and aircraft alternate mission equipment.

43rd Avionics Maintenance Squadron

The 43rd AMS supports the wing mission in three areas: aircraft maintenance, aircrew training devices, and precision measuring equipment maintenance. Primarily, the 43rd AMS is responsible for keeping the electronic systems of SAC B-52G and KC-135 aircraft at AAFB in a constant state of readiness. Also, the 43rd AMS equips and maintains flight simulators for each crew position of the B-52G. The PMEL calibrates and repairs special tools or equipment for all USAF units and associated government agencies on Guam.

43rd Field Maintenance Squadron

The 43rd FMS provides maintenance ranging from intermediate-level repair of jet engines to servicing of AGE. The 21 sections of the 43rd FMS are assigned to specialized duties such as troubleshooting complex aircraft systems and performing fabrication maintenance tasks.

43rd Supply Squadron

The 43rd Supply Squadron is comprised of six branches which provide direct support to all SAC and tenant organizations assigned to AAFB. The supply account manages an average of 65,000 supply and equipment line items with a value of $69 million. The Fuels Management Branch operates the largest fuels storage, pipeline, and hydrant distribution operation in the Air Force. The branch also operates the only military-run liquid oxygen (LOX) production plant in SAC. The Fuels Management Branch supports all exercises held in the Western Pacific and issues more than 60 million gallons of JP-4 and 80,000 gallons of LOX annually to more than 7,000 base assigned and transient aircraft.

<u>43rd Transportation Squadron</u>

The 43rd TS is SAC's only overseas transportation squadron. Vehicle Operations, Vehicle Maintenance, and Traffic Management (the three major branches) manage the resources available to provide dependable transportation to all AAFB units. Vehicle Operations is responsible for the overall management of the base vehicle fleet comprised of approximately 800 vehicles. In addition, they provide aircrew transport, U-drive-it, and taxi support for more than 40 different organizations at AAFB. The Vehicle Maintenance Section provides vehicle repairs to the fourth largest vehicle fleet in SAC. The Traffic Management Office is responsible for the movement and receipt of cargo by air and surface, the preparation and packaging of cargo, the movement of assigned personnel, and the shipment and receipt of personal property such as household goods or unaccompanied baggage.

<u>43rd Civil Engineering Squadron</u>

The 43rd CES is responsible for the maintenance, repair, and operation of all facilities on AAFB and its potable water supply and distribution system, two active runways and associated taxiways and aprons, industrial buildings, and 1,751 military family housing units. The 43rd CES also maintains a fire department to provide fire protection for the base.

43rd Combat Support Group

The 43rd CSG headquarters section provide administrative support for Headquarters 3rd Air Division, Base Administration, Personnel, Base Operations, Staff Judge Advocate, Base Chapel, Disaster Preparedness, and Morale, Welfare, and Recreation activities.

43rd Security Police Squadron

The 43rd Security Police Squadron is the largest squadron of military people assigned to the 43rd Strategic Wing and has a primary mission of protecting priority resources. Security people work around the clock securing the B-52 Stratofortresses and transient KC-135 Stratotankers, C-5A Galaxies, C-141B Starlifters, F-16 Fighting Falcons, F-15 Eagles, F-4 Phantoms, and many others. Duties include mobilized sentries, entry control, fire team, alarm response, and related duties as required by special security standards.

43rd Services Squadron

The 43rd Services Squadron provides food service, billeting, linen exchange, furnishings management, mortuary affairs, base military honors team management, and consumer liaison with the Air Force Commissary Service and the Army Air Force Exchange Service.

USAF Clinic at AAFB

The primary source of professional health care for AAFB is the USAF Clinic. Outpatient services include aeromedical services, primary care, pediatrics, obstetrics/gynecology, mental health, optometry, immunizations, and 24-hour emergency room services. Dental care including general dentistry, periodontics, prosthodontics, and orthodontics is also provided.

TENANTS

605th Military Airlift Support Squadron

The 605th MASS provides service to DOD passengers, aircrews, and shippers of military cargo. The Air Terminal Branch operates the Military Airlift Command (MAC) passenger terminal in Bldg. 17002 and serves arriving and departing passengers.

The Maintenance Branch provides maintenance upkeep of the WC-130 aircraft flown by the Typhoon Chasers of the 54th Weather Reconnaissance Squadron. The 605th MASS aircraft maintenance people also service 200 en-route C-5s, C-141s, C-130s, MAC contract carriers, and presidential support missions that transit AAFB each month. Critical spare parts for MAC aircraft are handled by the Supply Branch.

Det. 24, 1st Combat Evaluation Group

The mission of Det. 24 is to validate SAC aircraft navigation, weapons delivery, and electronic warfare systems in the Pacific area. Det. 24 is located on a Strategic Training Range (STR) site on Ritidian Point on Northwest Field. To accomplish its mission, Det. 24 has two radar systems--one used for STR scoring and the second for stimulating an electronic warfare environment.

Det. 4, 3904th Management Engineering Squadron

SACMET is charged with aiding the senior staff and squadron commanders to provide efficient and economical utilization of the more than 5,200 SAC manpower authorizations of the 3rd Air Division located at AAFB and Kadena AB, Japan. SACMET accomplishes its mission through development and application of SAC and AF manpower standards, as well as providing client consultant services known as Management Advisory Studies.

Air Force Audit Agency

The AFAA, with Headquarters at Norton AFB, Calif., is designated as a separate operating agency. The AFAA employs certified public accountants and certified internal auditors and draws people from every functional area of the Air Force. The mission is to provide Air force management with an independent, objective, and constructive evaluation of the effectiveness and efficiency with which managerial responsibilities are performed. Audits are performed in financial, operational, and support activities using advanced statistical techniques, unique computer inquiries, Air Force directives, and the AFAA staff.

Federal Aviation Administration

The Guam Combined Center/Radar Approach Control facility (CERAP) is the FAA facility responsible for providing air traffic control services to all Instrument Flight Rules air traffic in the Guam control area--a 250-nautical-mile radius of the island. CERAP's primary mission is to provide a safe, orderly, and expeditious flow of air traffic locally and to and from the island. In addition to its en-route and terminal air traffic control functions, CERAP is also currently responsible for providing Precision Approach Radar approaches to AAFB. CERAP is an integral part of, and participates in, USAF operational readiness inspections, disaster preparedness operations, and defense readiness.

Det. 2, 9th Aeromedical Evacuation Squadron

Det. 2, 9th AEROMED EVACS, provides aeromedical evacuation services for U.S. Armed Forces and Veterans Administration beneficiaries. In performing the peacetime mission and maintaining readiness for wartime support, Det. 2 provides a unique resource which can be employed quickly in the national interest. The primary mission of this detachment is to coordinate the air movement of all patients for the U.S. Naval Regional Medical Center and AAFB Clinic through and from Guam in support of Asia and other Pacific area operations as directed; maintain liaison with medical units utilizing the MAC Pacific Aeromedical Evacuation System, and related local support units upon which the Aeromedical System relies for ancillary support requirements.

54th Weather Reconnaissance Squadron and Det. 4, Air Weather Service

Collectively known as the "Typhoon Chasers," these units provide aerial weather reconnaissance of tropical cyclones throughout the Western Pacific. The co-located units are responsible for the area west of the International Date Line to the coast of Africa and north of the equator. They also provide air sampling support to atmospheric research, perform specialized weather reconnaissance for the Tactical Air Command (TAC), SAC, and Manned Space Flight Program, and aid in air search and rescue throughout the U.S. Trust Territory of the Pacific Islands.

27th Information Systems Squadron

The 27th Communications Squadron is responsible for the management, operation, and maintenance of most communications--electronics and air traffic facilities/systems on AAFB. The 27th is the second largest communications squadron in SAC.

Det. 11, 2nd Aircraft Delivery Group

The mission of Det. 11 is to exercise operational control of tactical aircraft and crews to assure the safe, efficient, and expeditious movement of aircraft within the Western Pacific. These areas include Australia, the Philippines, Japan, Korea, Taiwan, and Hawaii. In addition, the detachment performs movement control team functions in support of TAC Pacific Air Forces and USAF Readiness Command tactical fighter and reconnaissance deployments.

Det. 2, 1st Weather Wing

Det. 2's primary mission is to provide 24-hour weather service to the flying activities at AAFB. Such services include operational forecasts, severe weather warnings, radar monitor for the entire island of Guam, pilot to metro service, and hourly and special observations that keep the base appraised of the current weather situation.

Air Force Office of Special Investigations

AFOSI is a centrally directed separate operating agency with headquarters at Bolling AFB, Washington, D.C. AFOSI's mission is to provide criminal, fraud, and counterintelligence investigative services to commanders at all levels of USAF activities. AFOSI functions only as a fact-finding agency and initiates investigations at the request of USAF commanders. The requesting authority always determines the appropriate action to be taken.

Det. 5 Air Force Satellite Control Facility

Det. 5 is part of a worldwide trading system which commands, controls, and receives telemetry from all DOD satellite and shuttle activities.

Source: Dept. of the Air Force, 1984.

APPENDIX E

MASTER LIST OF SHOPS

APPENDIX E

MASTER LIST OF SHOPS

Shop Name	Current Location (Bldg. No.)	Handles Hazardous Materials	Generates Hazardous Wastes	Typical Treatment, Storage, and Disposal Methods
43RD STRATEGIC WING				
Supply Squadron				
Bulk Fuels Storage	14057	No	No	
Fuels Distribution Shop	26203	No	No	
Fuels Lab	26203	No	No	
Cyrogenic Fuels (liquid oxygen)	26224	Yes	Yes	Contract disposal
Avionics Maintenance Squadron				
Bomb/Navigation Shop	17000	No	No	
Defensive Fire Control Shop	17000	Yes	Yes	Contract disposal
Photo Shop	17000	No	No	
EWS Shop	17000	No	No	
Radio Shop	17000	No	No	
Radar Shop	17000	No	No	
Doppler Shop	17000	No	No	
Flight Control Shop	17000	No	No	
Instrument Shop	17000	No	No	
PMEL (located on south AAFB)	286	No	No	
Electronic Counter-Measure Shop	17000	No	No	
Communications Shop	17000	No	No	
Auto Flight Control Shop	17000	No	No	
Inertial Navigation Shop	17000	No	No	
Instrument Navigation Shop	17000	No	No	
Field Maintenance Squadron				
AGE Shop	23022	Yes	Yes	Discharged to storm drain
Industrial Corrosion Control Shop	2799	Yes	Yes	Contract disposal
Jet Engine Support Shop	18004	Yes	Yes	Contract disposal

APPENDIX E

MASTER LIST OF SHOPS
(Continued, Page 2 of 5)

Shop Name	Current Location (Bldg. No.)	Handles Hazardous Materials	Generates Hazardous Wastes	Typical Treatment, Storage, and Disposal Methods
Engine Conditioning Shop	18004	No	No	
Environmental Systems Shop	18004	No	No	
Fuel Systems Maintenance Shop	18004	Yes	Yes	Onsite evaporation
Jet Engine Test Cell	2552	Yes	Yes	Contract disposal
Nondestruct Inspection Lab	17006	Yes	Yes	Contract disposal
Jet Engine Intermediate Maintenance Shop	18004	No	No	
Aircraft Corrosion Control Shop	18017	Yes	Yes	Contract disposal
Repair and Reclamation Shop	18004	No	No	
Sheet Metal Shop	18004	No	No	
Survival Equipment Shop	18004	No	No	
Welding Shop	18004	No	No	
Pneudralics Shop	18006	No	No	
Machine Shop	18004	No	No	
Structural Repair Shop	18004	No	No	
Wheel and Tire Shop	18006	No	No	
<u>Organizational Maintenance Squadron</u>				
Nonpowered AGE Shop	18004	No	No	
B-52 Section	19020	No	No	
Transient Maintenance Shop	19020	No	No	
Phase Dock	19020	No	No	
<u>Munitions Maintenance Squadron</u>				
Bomb Maintenance Shop	9040	No	No	
Bomb Renovation Shop	9041	Yes	Yes	Contract disposal
Equipment Maintenance Shop	2600	No	No	
EOD Shop	51112	No	No	
Packing and Crating Shop	9002	No	No	

APPENDIX E

MASTER LIST OF SHOPS
(Continued, Page 3 of 5)

Shop Name	Current Location (Bldg. No.)	Handles Hazardous Materials	Generates Hazardous Wastes	Typical Treatment, Storage, and Disposal Methods
Weapons Maintenance Shop	51150	Yes	Yes	Contract disposal
Weapons Release Shop	51104	No	No	
Awaiting Maintenance Shop	51104	No	No	
Line Delivery and Handling Shop	9004	No	No	
SRAM	9000	No	No	
Mine Maintenance Shop	9000	No	No	
Vac-U-Blast Shop	9100	No	No	
<u>Combat Support Group</u>				
Auto Hobby Shop	25060	No	No	
Bowling Alley	25005	No	No	
Ceramics Hobby Shop	25005	No	No	
Photo Lab	21001	No	No	
Reproduction Shop	25018	Yes	Yes	Discharged to sanitary sewer
Small-Arms Training	26026	No	No	
Wood Hobby Shop	26022	No	No	
Photo Hobby Shop	25005	No	No	
<u>Civil Engineering Squadron</u>				
Carpentry Shop	18001	No	No	
Entomology Shop	20010	No	No	
Heavy Equipment Shop	20021	No	No	
Fire Protection Branch	17002	No	No	
Fire Extinguisher Maintenance Shop	17002	No	No	
Roads and Grounds Shop	20021	No	No	
Housing Maintenance	18001	No	No	

APPENDIX E

MASTER LIST OF SHOPS
(Continued, Page 4 of 5)

Shop Name	Current Location (Bldg. No.)	Handles Hazardous Materials	Generates Hazardous Wastes	Typical Treatment, Storage, and Disposal Methods
Interior Electric Shop	18001	No	No	
Liquid Fuels Maintenance Shop	18001	No	No	
Paint Shop	18001	Yes	Yes	Contract disposal
Power Production	Basewide	Yes	Yes	Discharged to sanitary sewer
Refrigeration Shop	18001	Yes	Yes	Contract disposal
Sheet Metal Shop	18001	No	No	
Water and Waste Treatment	20010	No	No	
Heating Shop	18001	No	No	
Sanitary Landfill	18001	No	No	
Refuse Collection	18001	No	No	
Transportation Squadron				
Vehicle Maintenance Shop	18001	No	No	
Corrosion Control Shop	18040	Yes	Yes	Contract disposal
Packing and Crating Shop	22000	Yes	Yes	Discharged to storm drain
Refueling Maintenance Shop	26229	No	No	
Base Equipment Maintenance Shop	18001	No	No	
Minor Maintenance Shop	18001	No	No	
Battery Shop	18001	Yes	Yes	Neutralization
Tire Shop	18040	No	No	
Security Police Squadron				
Armory	2510	No	No	
Small-Arms Training	26026	No	No	

APPENDIX E

MASTER LIST OF SHOPS
(Continued, Page 5 of 5)

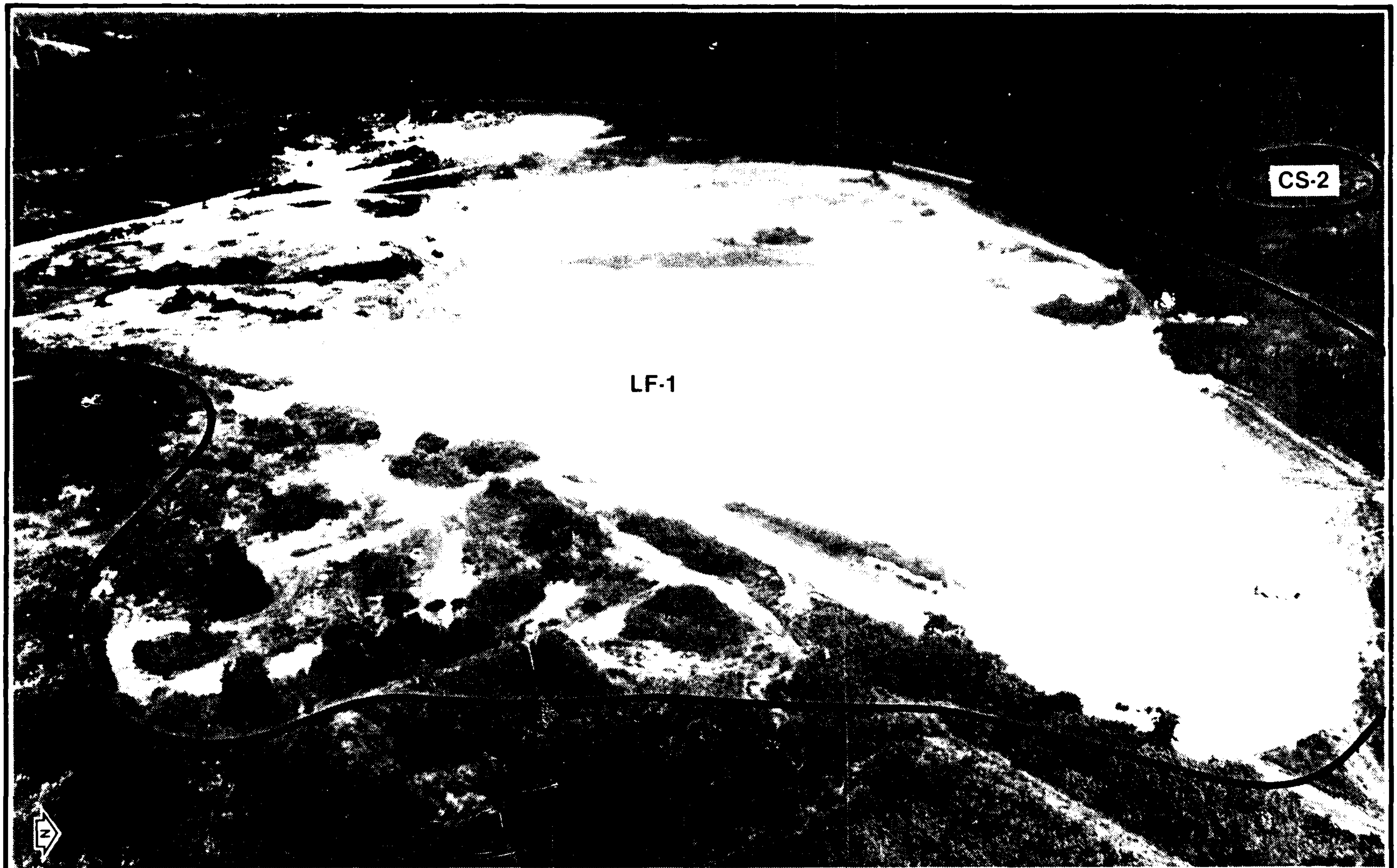
Shop Name	Current Location (Bldg. No.)	Handles Hazardous Materials	Generates Hazardous Wastes	Typical Treatment, Storage, and Disposal Methods
TENANTS				
Base Exchange Office				
Service Station	26101	No	No	
Laundry/Dry Cleaners	25009	No	No	
Det. 5, Air Force Satellite Control Facility				
Power Plant	NW Field	No	No	
Air Conditioning Shop	NW Field	No	No	
605th Military Airlift Support Squadron				
Jet Shop	19020	No	No	
Propulsion Shop	19020	No	No	
Environmental Systems Shop	19020	No	No	
Structural Repair Shop	18027	No	No	
Corrosion Control Shop	18029	Yes	Yes	Contract disposal
Nonpowered AGE Shop	18027	No	No	
Enroute Flightline	18028	No	No	
WC-130 Shop	18028	No	No	

APPENDIX F

PHOTOGRAPHS

LANDFILL NO. 25 (LF-25), SOUTH AAFB
DRAINAGE AREA

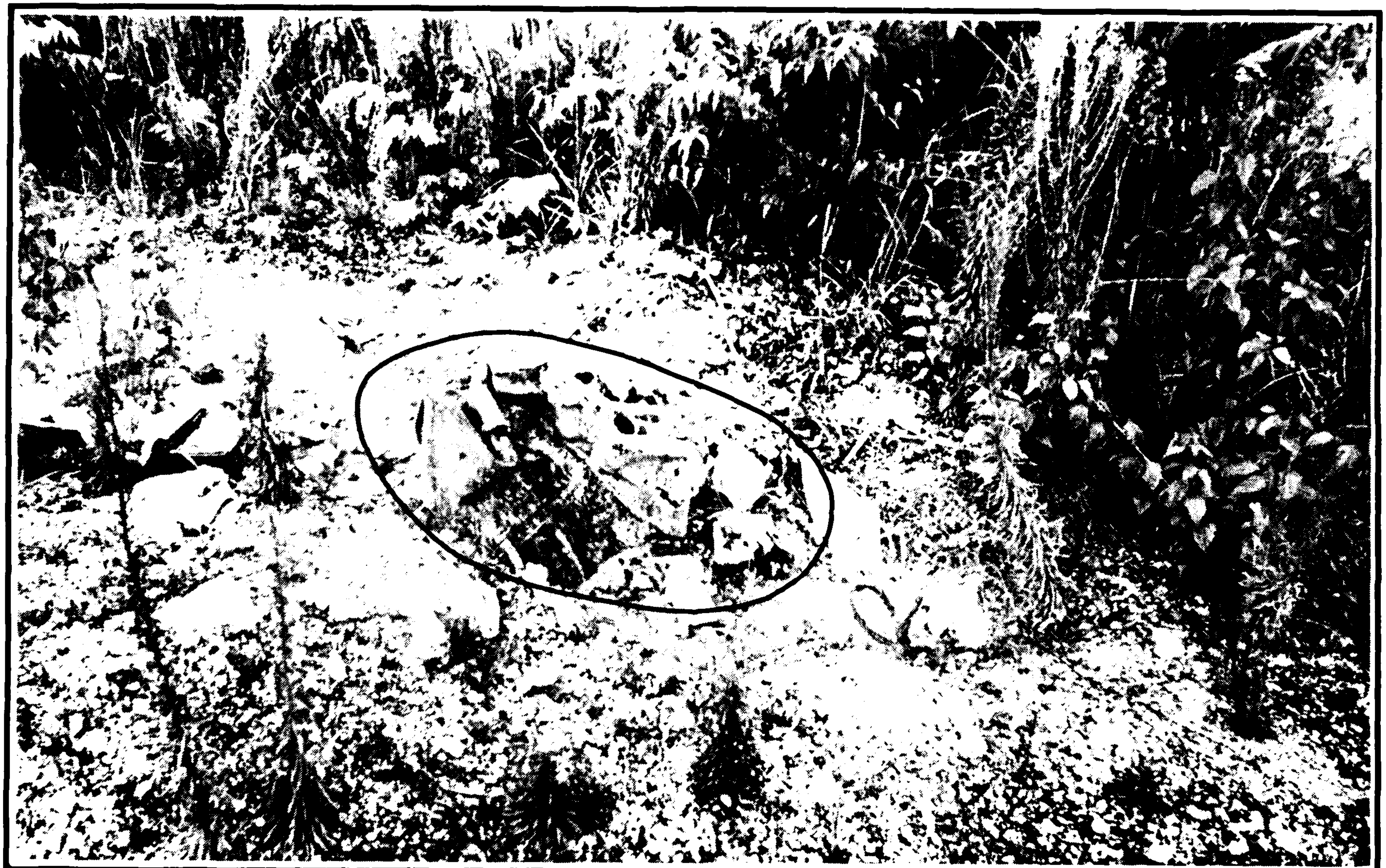
INSTALLATION
RESTORATION PROGRAM
Andersen Air Force Base



CURRENT AAFB LANDFILL (LF-1) AND CHEMICAL DISPOSAL SITE NO. 2 (CS-2)

INSTALLATION RESTORATION PROGRAM
Andersen Air Force Base

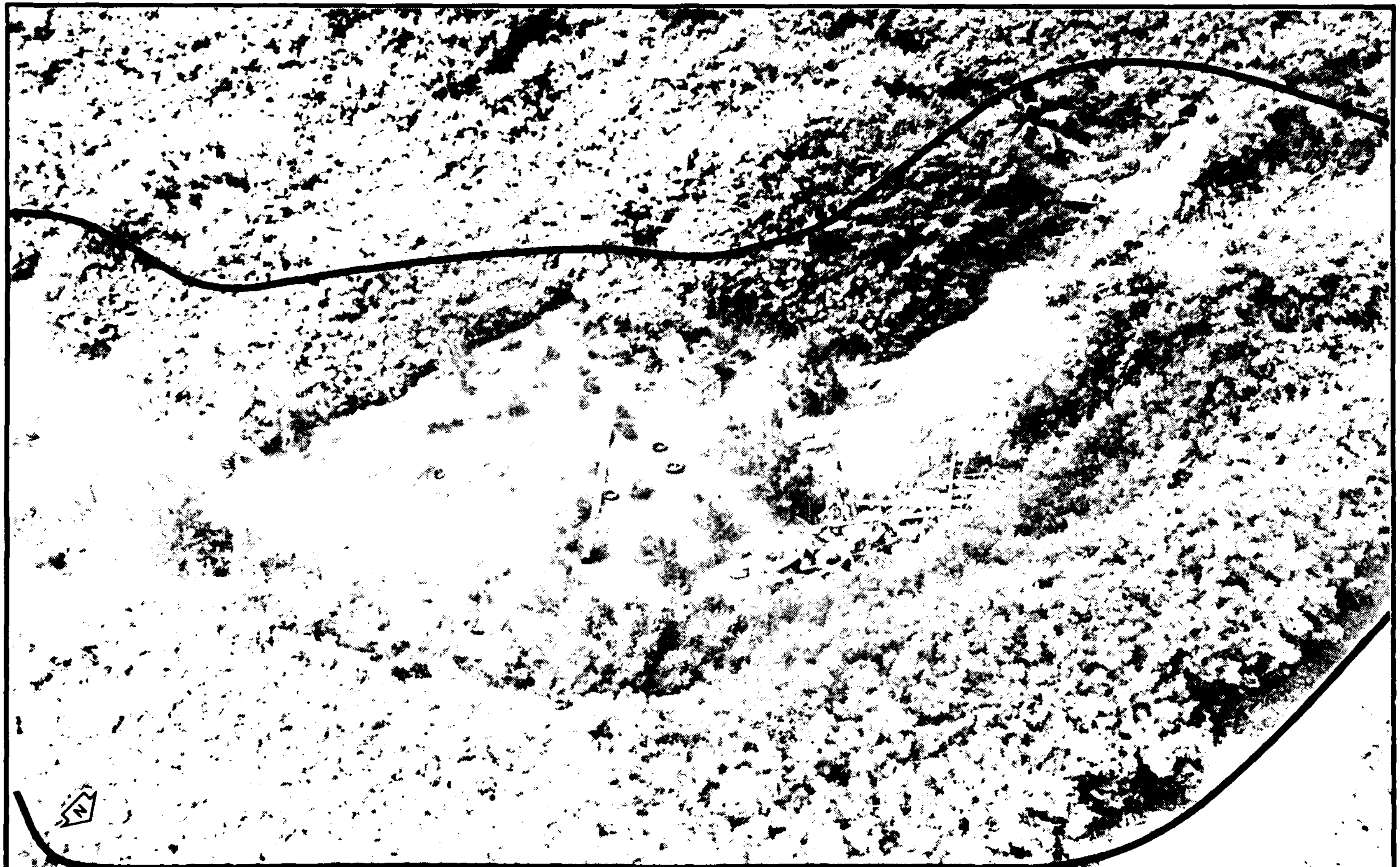
USAFAND 10.17.84



CRUSHED 55-GALLON DRUM AND OTHER DEBRIS
EXPOSED TO SURFACE IN LF-2 AREA

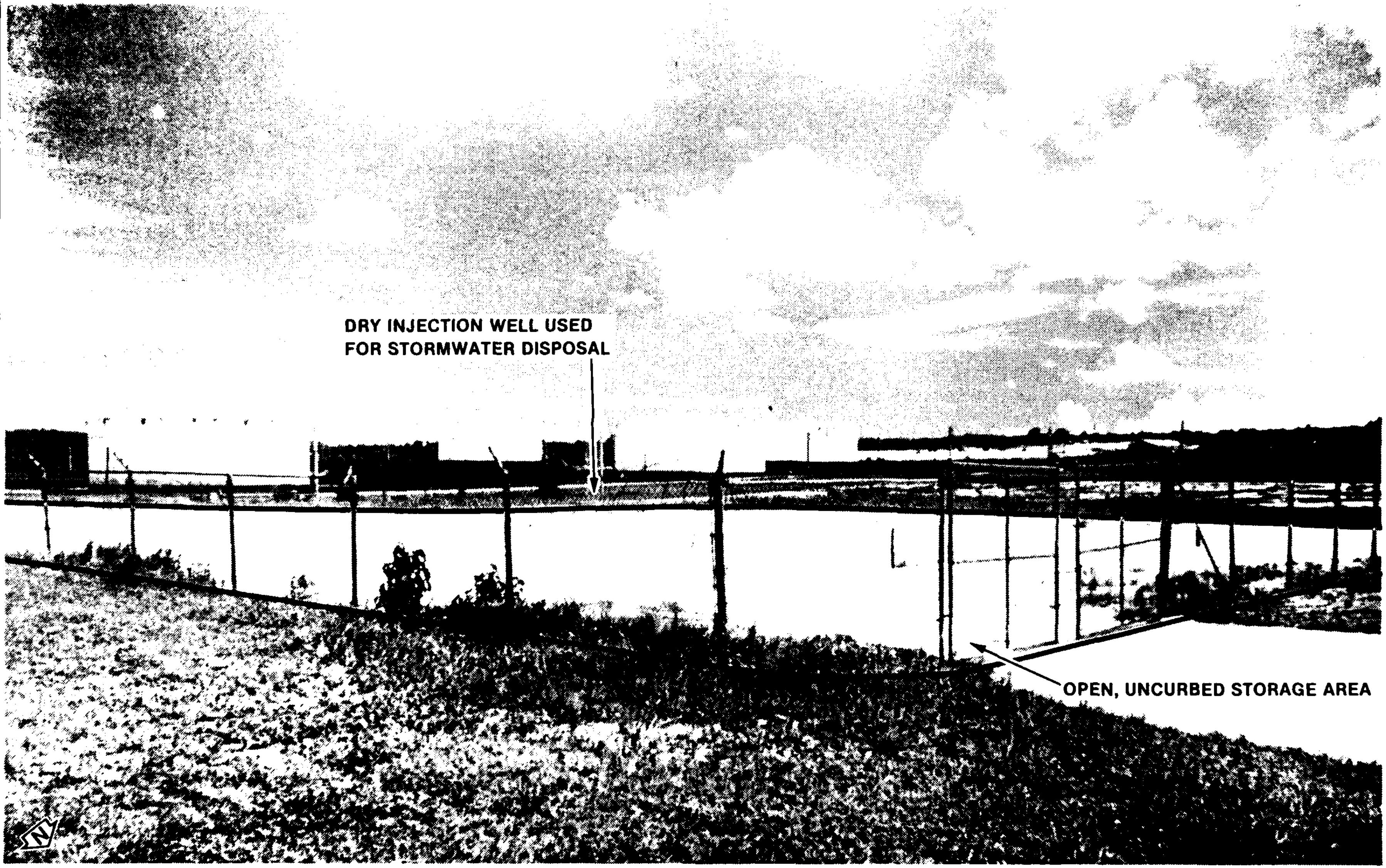
INSTALLATION
RESTORATION PROGRAM
Andersen Air Force Base

USAF AND 10.17.84



FORMER LANDFILL AREA (LF-10)

INSTALLATION
RESTORATION PROGRAM
Andersen Air Force Base



FORMER HAZARDOUS WASTE STORAGE AREA (HW-1)

INSTALLATION
RESTORATION PROGRAM
Andersen Air Force Base

USAFAND 10 17 84

DRY INJECTION WELLS USED FOR DISPOSAL
OF STORM WATER IN SDS-1 AREA

INSTALLATION
RESTORATION PROGRAM
Andersen Air Force Base

FIREFIGHTER TRAINING AREA NO. 2 (FTA-2)

INSTALLATION
RESTORATION PROGRAM
Andersen Air Force Base

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FIREFIGHTER TRAINING AREA NO. 2 (FTA-2)

INSTALLATION
RESTORATION PROGRAM
Andersen Air Force Base

USAFAND 10 17 84

DRUM STORAGE AREA NO. 2 (DS-2)

INSTALLATION
RESTORATION PROGRAM
Andersen Air Force Base

DRUM STORAGE AREA NO. 1 (DS-1)

INSTALLATION
RESTORATION PROGRAM
Andersen Air Force Base

USAFAND 10.17.84

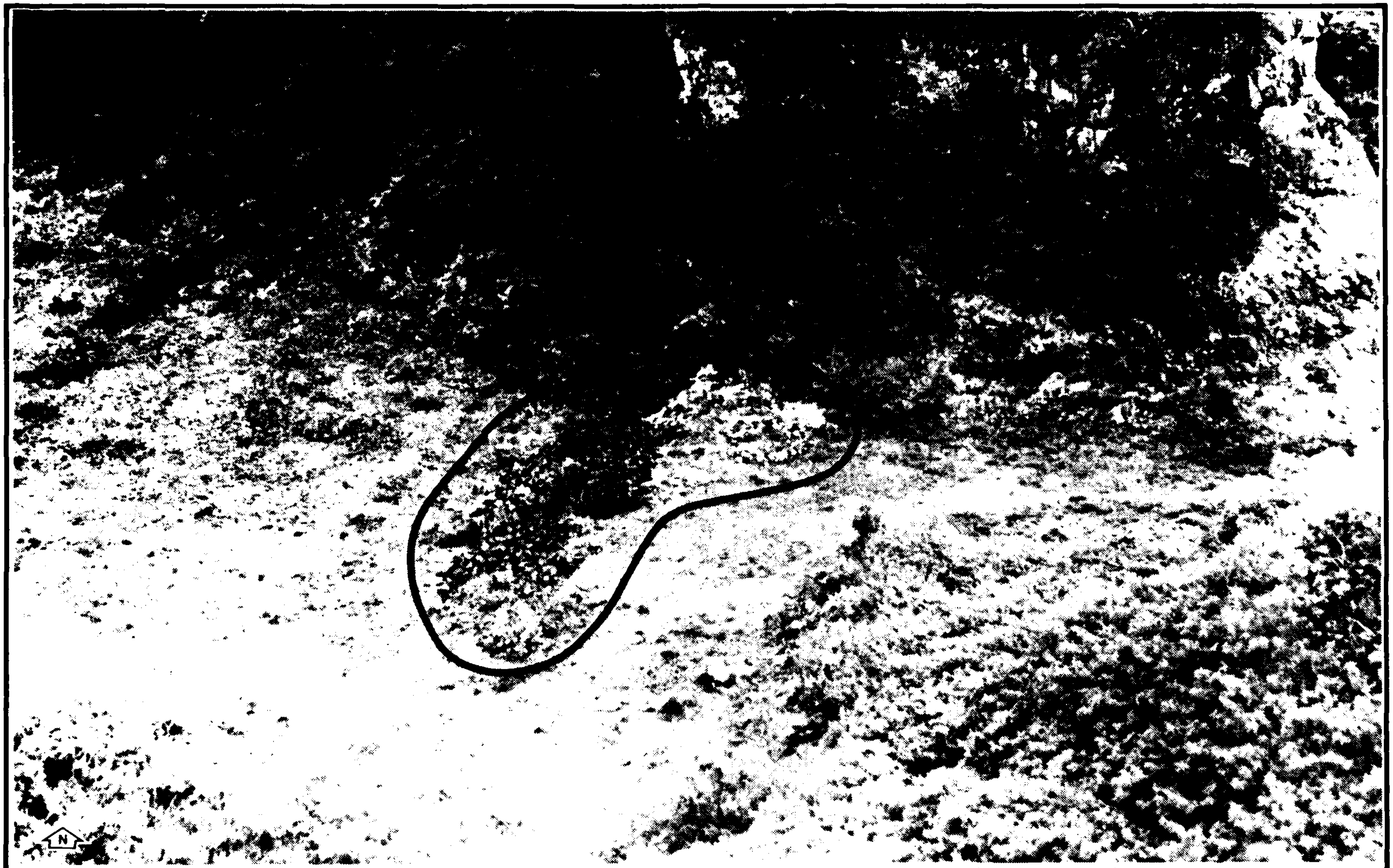
RIFLE RANGE AND EOD DISPOSAL AREA
AT TARAGUE BEACH ON AAFB

INSTALLATION
RESTORATION PROGRAM
Andersen Air Force Base

USAFAND 10/17/84

AAFB EOD RANGE AT TARAGUE BEACH

INSTALLATION
RESTORATION PROGRAM
Andersen Air Force Base



LANDFILL NO. 18 (LF-18)
(ASPHALT DRUMS, OIL OVER CLIFF, 1968)

INSTALLATION
RESTORATION PROGRAM
Andersen Air Force Base

APPENDIX G

USAF IRP HAZARD ASSESSMENT RATING METHODOLOGY

APPENDIX G

USAF INSTALLATION RESTORATION PROGRAM
HAZARD ASSESSMENT RATING METHODOLOGY

BACKGROUND

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

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

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

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

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

PURPOSE

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

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

DESCRIPTION OF MODEL

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

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

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

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

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

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

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

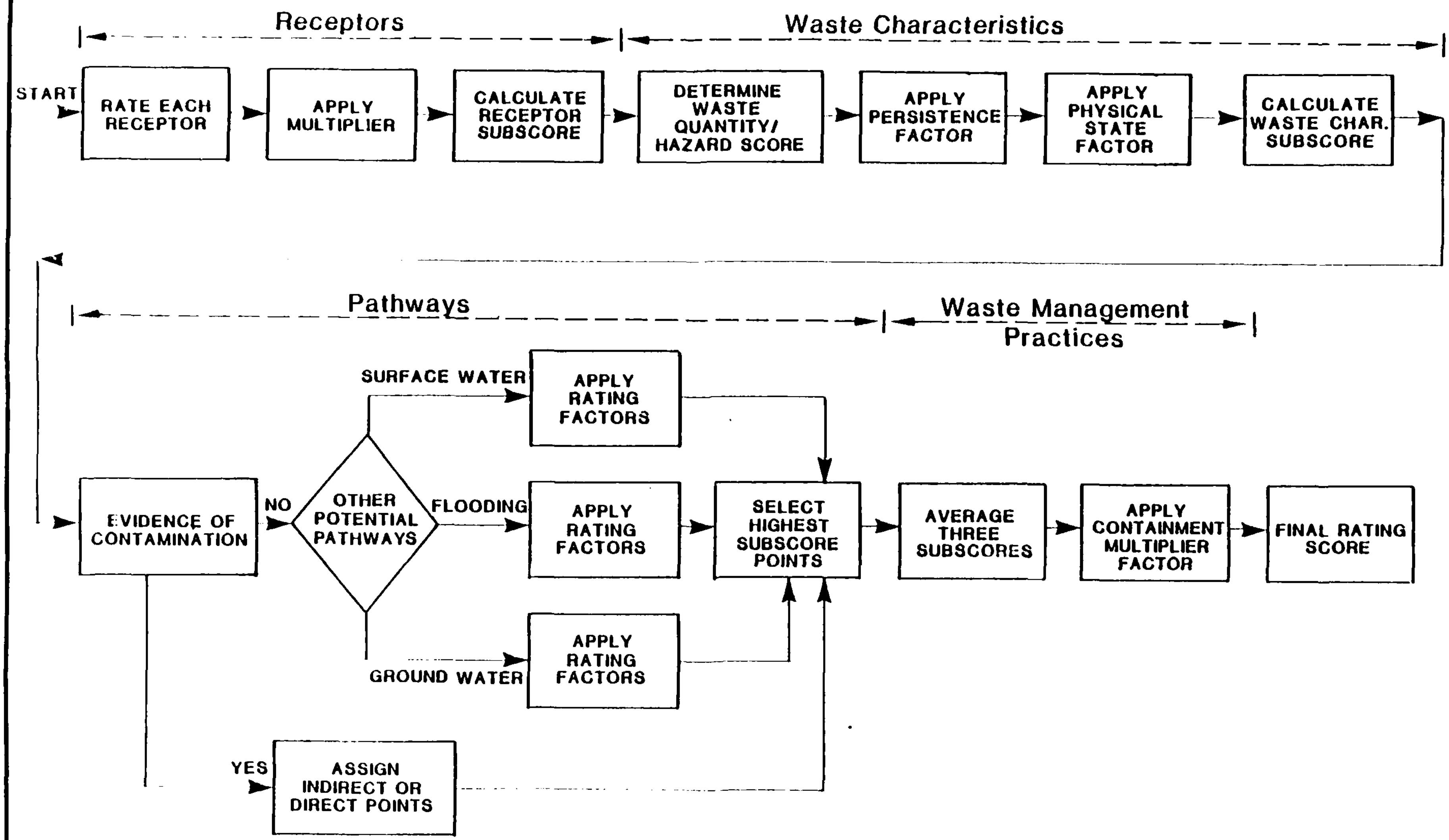


FIGURE 2

HAZARD ASSESSMENT RATING METHODOLOGY FORM

NAME OF SITE ______________________

LOCATION ______________________

DATE OF OPERATION OR OCCURRENCE ______________________

OWNER/OPERATOR ______________________

COMMENTS/DESCRIPTION ______________________

SITE RATED BY ______________________

I. RECEPTORS

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

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

II. WASTE CHARACTERISTICS

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

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

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

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

____ X ____ = ____

C. Apply physical state multiplier

Subscore B X Physical State Multiplier = Waste Characteristics Subscore

____ X ____ = ____

FIGURE 2 (Continued)

III. PATHWAYS

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

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

Subscore ______

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

1. Surface water migration

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

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

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

Subscore (100 x factor score/3) ______

3. Ground-water migration

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

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

C. Highest pathway subscore.

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

Pathways Subscore ______

IV. WASTE MANAGEMENT PRACTICES

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

Receptors ______
Waste Characteristics ______
Pathways ______

Total ______ divided by 3 = ______
Gross Total Score

B. Apply factor for waste containment from waste management practices

Gross Total Score X Waste Management Practices Factor = Final Score

______ X ______ = ______

TABLE 1

HAZARD ASSESSMENT RATING METHODOLOGY GUIDELINES

I. RECEPTORS CATEGORY

Rating Factors	Rating Scale Levels 0	1	2	3	Multiplier
A. Population within 1,000 feet (includes on-base facilities)	0	1 - 25	26 - 100	Greater than 100	4
B. Distance to nearest water well	Greater than 3 miles	1 to 3 miles	3,001 feet to 1 mile	0 to 3,000 feet	10
C. Land Use/Zoning (within 1 mile radius)	Completely remote (zoning not applicable)	Agricultural	Commercial or industrial	Residential	3
D. Distance to installation boundary	Greater than 2 miles	1 to 2 miles	1,001 feet to 1 mile	0 to 1,000 feet	6
E. Critical environments (within 1 mile radius)	Not a critical environment	Natural areas	Pristine natural areas; minor wetlands; preserved areas; presence of economically important natural resources susceptible to contamination.	Major habitat of an endangered or threatened species; presence of recharge area; major wetlands.	10
F. Water quality/use designation of nearest surface water body	Agricultural or industrial use.	Recreation, propagation and management of fish and wildlife.	Shellfish propagation and harvesting.	Potable water supplies	6
G. Ground-Water use of uppermost aquifer	Not used, other sources readily available.	Commercial, industrial, or irrigation, very limited other water sources.	Drinking water, municipal water available.	Drinking water, no municipal water available; commercial, industrial, or irrigation, no other water source available.	9
H. Population served by surface water supplies within 3 miles downstream of site	0	1 - 50	51 - 1,000	Greater than 1,000	6
I. Population served by aquifer supplies within 3 miles of site	0	1 - 50	51 - 1,000	Greater than 1, 000	6

TABLE 1 (Continued)

HAZARD ASSESSMENT RATING METHODOLOGY GUIDELINES

II. WASTE CHARACTERISTICS

A-1 Hazardous Waste Quantity

S = Small quantity (<5 tons or 20 drums of liquid)
M = Moderate quantity (5 to 20 tons or 21 to 85 drums of liquid)
L = Large quantity (>20 tons or 85 drums of liquid)

A-2 Confidence Level of Information

C = Confirmed confidence level (minimum criteria below)

- o Verbal reports from interviewer (at least 2) or written information from the records.
- o Knowledge of types and quantities of wastes generated by shops and other areas on base.
- o Based on the above, a determination of the types and quantities of waste disposed of at the site.

S = Suspected confidence level

- o No verbal reports or conflicting verbal reports and no written information from the *records*.
- o Logic based on a knowledge of the types and quantities of hazardous wastes generated at the base, and a history of past waste disposal practices indicate that these wastes were disposed of at a *site*.

A-3 Hazard Rating

Hazard Category	Rating Scale Levels: 0	1	2	3
Toxicity	Sax's Level 0	Sax's Level 1	Sax's Level 2	Sax's Level 3
Ignitability	Flash point greater than 200°F	Flash point at 140°F to 200°F	Flash point at 80°F to 140°F	Flash point less than 80°F
Radioactivity	At or below background levels	1 to 3 times background levels	3 to 5 times background levels	Over 5 times background levels

Use the *highest individual rating* based on toxicity, ignitability and radioactivity and determine the hazard rating.

Hazard Rating	Points
High (H)	3
Medium (M)	2
Low (L)	1

TABLE 1 (Continued)

HAZARD ASSESSMENT RATING METHODOLOGY GUIDELINES

II. WASTE CHARACTERISTICS (Continued)

Waste Characteristics Matrix

Point Rating	Hazardous Waste Quantity	Confidence Level of Information	Hazard Rating
100	L	C	H
80	L	C	M
	M	C	H
70	L	S	H
60	S	C	H
	M	C	M
50	L	S	M
	L	C	L
	M	S	H
	S	C	M
40	S	S	H
	M	S	M
	M	C	L
	L	S	L
30	S	C	L
	M	S	L
	S	S	M
20	S	S	L

Notes:
For a site with more than one hazardous waste, the waste quantities may be added using the following rules:
Confidence Level
- o Confirmed confidence levels (C) can be added
- o Suspected confidence levels (S) can be added
- o Confirmed confidence levels cannot be added with suspected confidence levels

Waste Hazard Rating
- o Wastes with the same hazard rating can be added
- o Wastes with different hazard ratings can only be added in a downgrade mode, e.g., MCM + SCH = LCM if the total quantity is greater than 20 tons.

Example: Several wastes may be present at a site, each having an MCM designation (60 points). By adding the quantities of each waste, the designation may change to LCM (80 points). In this case, the correct point rating for the waste is 80.

B. Persistence Multiplier for Point Rating

Persistence Criteria	Multiply Point Rating From Part A by the Following
Metals, polycyclic compounds, and halogenated hydrocarbons	1.0
Substituted and other ring compounds	0.9
Straight chain hydrocarbons	0.8
Easily biodegradable compounds	0.4

C. Physical State Multiplier

Physical State	Multiply Point Total From Parts A and B by the Following
Liquid	1.0
Sludge	0.75
Solid	0.50

TABLE 1 (Continued)

HAZARD ASSESSMENT RATING METHODOLOGY GUIDELINES,

III. PATHWAYS CATEGORY

A. Evidence of Contamination

Direct evidence is obtained from laboratory analyses of hazardous contaminants present above natural background levels in surface water, ground water, or air. Evidence should confirm that the source of contamination is the site being evaluated.

Indirect evidence might be from visual observation (i.e., leachate), vegetation stress, sludge deposits, presence of taste and odors in drinking water, or reported discharges that cannot be directly confirmed as resulting from the site, but the site is greatly suspected of being a source of contamination.

B-1 POTENTIAL FOR SURFACE WATER CONTAMINATION

Rating Factor	Rating Scale Levels 0	1	2	3	Multiplier
Distance to nearest surface water (includes drainage ditches and storm sewers)	Greater than 1 mile	2,001 feet to 1 mile	501 feet to 2,000 feet	0 to 500 feet	8
Net precipitation	Less than -10 in.	-10 to + 5 in.	+5 to +20 in.	Greater than +20 in.	6
Surface erosion	None	Slight	Moderate	Severe	8
Surface permeability	0% to 15% clay ($>10^{-2}$ cm/sec)	15% to 30% clay (10^{-2} to 10^{-4} cm/sec)	30% to 50% clay (10^{-4} to 10^{-6} cm/sec)	Greater than 50% clay ($<10^{-6}$ cm/sec)	6
Rainfall intensity based on 1 year 24-hr rainfall	<1.0 inch	1.0-2.0 inches	2.1-3.0 inches	>3.0 inches	8

B-2 POTENTIAL FOR FLOODING

Rating Factor	0	1	2	3	Multiplier
Floodplain	Beyond 100-year floodplain	In 25-year floodplain	In 10-year floodplain	Floods annually	1

B-3 POTENTIAL FOR GROUND-WATER CONTAMINATION

Rating Factor	0	1	2	3	Multiplier
Depth to ground water	Greater than 500 ft	50 to 500 feet	11 to 50 feet	0 to 10 feet	8
Net precipitation	Less than -10 in.	-10 to +5 in.	+5 to +20 in.	Greater than +20 in.	6
Soil permeability	Greater than 50% clay ($>10^{-6}$ cm/sec)	30% to 50% clay (10^{-4} to 10^{-6} cm/sec)	15% to 30% clay (10^{-2} to 10^{-4} cm/sec)	0% to 15% clay ($<10^{-2}$ cm/sec)	8
Subsurface flows	Bottom of site greater than 5 feet above high ground-water level	Bottom of site occasionally submerged	Bottom of site frequently submerged	Bottom of site located below mean ground-water level	8
Direct access to ground water (through faults, fractures, faulty well casings, subsurface features, etc.)	No evidence of risk	Low risk	Moderate risk	High risk	8

TABLE 1 (Continued)

HAZARD ASSESSMENT RATING METHODOLOGY GUIDELINES

IV. WASTE MANAGEMENT PRACTICES CATEGORY

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

B. WASTE MANAGEMENT PRACTICES FACTOR

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

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

Guidelines for fully contained:

Landfills:

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

Spills:

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

Surface Impoundments:

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

Fire Proection Training Areas:

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

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

APPENDIX H

HAZARD ASSESSMENT RATING METHODOLOGY FORMS

HAZARD ASSESSMENT RATING METHODOLOGY FORM

Name of Site: Landfill No. 25 (LF-25)

Location: Marbo Annex [illegible] r Bldg. 1123

Date of Operation or Occurrence: 1945 - 1962

Owner/Operator: AAFB

Comments/Description: Contains waste POL and TCE solvents

Site Rated By: J. Bonds, J. Kosik, and D. McNeill

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	3	10	30	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			130	180
Receptors subscore (100 x factor score subtotal/maximum score subtotal)				22

II. WASTE CHARACTERISTICS

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

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

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

B. Apply persistence factor:
Factor Subscore A x Persistence Factor =
Subscore B 100 x 1.0 = [illegible]

C. Apply physical state multiplier:
Subscore B x Physical State Multiplier =
Waste Characteristics Subscore 100 x 1.0 = [illegible]

HAZARD ASSESSMENT RATING METHODOLOGY FORM
(Continued, Page 2 of 2)

III. PATHWAYS

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

Subscore 100

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)	Multi-plier	Factor Score	Maximum Possible Score
1. Surface water migration				
Distance to nearest surface water	___	8	___	24
Net precipitation	___	6	___	18
Surface erosion	___	8	___	24
Surface permeability	___	6	___	18
Rainfall intensity	___	8	___	24
SUBTOTALS			___	108
Subscore (100 x factor score subtotal/maximum score subtotal)				___
2. Flooding	___	1	___	3
Subscore (100 x factor score/3)				___
3. Ground water migration				
Depth to ground water	___	8	___	24
Net precipitation	___	6	___	18
Soil permeability	___	8	___	24
Subsurface flows	___	8	___	24
Direct access to ground water	___	8	___	24
SUBTOTALS			___	114
Subscore (100 x factor score subtotal/maximum score subtotal)				___

C. Highest pathway subscore

Enter the highest subscore value from A, B-1, B-2, or B-3 above. Pathways Subscore 100

IV. WASTE MANAGEMENT PRACTICES

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

Receptors	72
Waste Characteristics	100
Pathways	100
TOTAL	272 divided by 3 = 91 Gross total score

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

[illegible] x [illegible] = 86

HAZARD ASSESSMENT RATING METHODOLOGY FORM

Name of Site: Landfill No. 1 (LF-1)

Location: 1 mile west of north runway, 500 ft east of Guam Rte.9

Date of Operation or Occurrence: 1945 - Present

Owner/Operator: AAFB

Comments/Description: Contains waste oils, chlorinated solvents, and pesticides

Site Rated By: J. Bonds, J. Kosik, and D. McNeill

I. RECEPTORS

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
A. Population within 1,000 feet of site	1	4	4	12
B. Distance to nearest well	1	10	10	30
C. Land use/zoning within 1-mile radius	3	3	9	9
D. Distance to reservation boundary	3	6	18	18
E. Critical environments within 1-mile radius of site	3	10	30	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			116	180
Receptors subscore (100 x factor score subtotal/maximum score subtotal)				64

II. WASTE CHARACTERISTICS

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

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

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

B. Apply persistence factor:
Factor Subscore A x Persistence Factor = Subscore B   100 x [illegible] = 100

C. Apply physical state multiplier:
Subscore B x Physical State Multiplier = Waste Characteristics Subscore   [illegible] x [illegible] = [illegible]

HAZARD ASSESSMENT RATING METHODOLOGY FORM
(Continued, Page 2 of 2)

III. PATHWAYS

A. If there is evidence of migration of hazardous contaminants, assign maximum factor subscore of 100 points for direct evidence or 80 points for indirect evidence. If direct evidence exists, 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)	Multi-plier	Factor Score	Maximum Possible Score
1. Surface water migration				
Distance to nearest surface water	0	8	0	24
Net precipitation	1	6	6	18
Surface erosion	1	8	8	24
Surface permeability	1	6	6	18
Rainfall intensity	3	8	24	24
SUBTOTALS			44	108
Subscore (100 x factor score subtotal/maximum score subtotal)				41
2. Flooding	0	1	0	3
Subscore (100 x factor score/3)				0
3. Ground water migration				
Depth to ground water	0	8	0	24
Net precipitation	1	6	6	18
Soil permeability	2	8	16	24
Subsurface flows	0	8	0	24
Direct access to ground water	1	8	8	24
SUBTOTALS			30	114
Subscore (100 x factor score subtotal/maximum score subtotal)				26

C. Highest pathway subscore

Enter the highest subscore value from A, B-1, B-2, or B-3 above. Pathways Subscore 41

IV. WASTE MANAGEMENT PRACTICES

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

Receptors	64
Waste Characteristics	100
Pathways	41
TOTAL	205 divided by 3 = 68 Gross total score

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

68 x 1.00 = 68

HAZARD ASSESSMENT RATING METHODOLOGY FORM

Name of Site: Landfill No. 2 (LF-2)

Location: Southwest of LF-1

Date of Operation or Occurrence: 1947 - 1974

Owner/Operator: AAFB

Comments/Description: Contains waste oil, pesticides, ordnance, and chlorinated solvents

Site Rated By: J. Bonds, J. Kosik, and D. McNeill

I. RECEPTORS

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
A. Population within 1,000 feet of site	1	4	4	12
B. Distance to nearest well	1	10	10	30
C. Land use/zoning within 1-mile radius	3	3	9	9
D. Distance to reservation boundary	3	6	18	18
E. Critical environments within 1-mile radius of site	3	10	30	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			116	180
Receptors subscore (100 x factor score subtotal/maximum score subtotal)				64

II. WASTE CHARACTERISTICS

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

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

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

B. Apply persistence factor:
Factor Subscore A x Persistence Factor = Subscore B 100 x 1.0 = 100

C. Apply physical state multiplier:
Subscore B x Physical State Multiplier = Waste Characteristics Subscore 100 x 1.0 = 100

HAZARD ASSESSMENT RATING METHODOLOGY FORM
(Continued, Page 2 of 2)

III. PATHWAYS

A. If there is evidence of migration of hazardous contaminants, assign maximum factor subscore of 100 points for direct evidence or 30 points for indirect evidence. If direct evidence exists, 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)	Multi-plier	Factor Score	Maximum Possible Score
1. Surface water migration				
Distance to nearest surface water	0	8	0	24
Net precipitation	1	6	6	18
Surface erosion	1	8	8	24
Surface permeability	1	6	6	18
Rainfall intensity	3	8	24	24
SUBTOTALS			44	108
Subscore (100 x factor score subtotal/maximum score subtotal)				41
2. Flooding	0	1	0	3
Subscore (100 x factor score/3)				0
3. Ground water migration				
Depth to ground water	0	8	0	24
Net precipitation	1	6	6	18
Soil permeability	2	8	16	24
Subsurface flows	0	8	0	24
Direct access to ground water	1	8	8	24
SUBTOTALS			30	114
Subscore (100 x factor score subtotal/maximum score subtotal)				26

C. Highest pathway subscore

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

Pathways Subscore 41

IV. WASTE MANAGEMENT PRACTICES

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

Receptors [illegible]
Waste Characteristics 100
Pathways 41
TOTAL [illegible] divided by 3 = [illegible] Gross total score

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

[illegible] x [illegible] = [illegible]

HAZARD ASSESSMENT RATING METHODOLOGY FORM

Name of Site: Landfill No. 10 (LF-10)

Location: East end of M Street

Date of Operation or Occurrence: early to mid-1950s

Owner/Operator: AAFB

Comments/Description: Contains POL, solvents, 55-gal drums, and asphaltic wastes

Site Rated By: J. Bonds, J. Kosik, and D. McNeill

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	0	10	0	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	3	10	30	30
F. Water quality of nearest surface water body	1	6	6	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 score 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 (1=small, 2=medium, 3=large) 2
2. Confidence level (1=confirmed, 2=suspected) 1
3. Hazard rating (1=low, 2=medium, 3=high) 3

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

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

HAZARD ASSESSMENT RATING METHODOLOGY FORM
(Continued, Page 2 of 2)

III. PATHWAYS

A. If there is evidence of migration of hazardous contaminants, assign maximum factor subscore of 100 points for direct evidence or 80 points for indirect evidence. If direct evidence exists, 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)	Multi- plier	Factor Score	Maximum Possible Score
1. Surface water migration				
Distance to nearest surface water	2	8	16	24
Net precipitation	1	6	6	18
Surface erosion	2	8	16	24
Surface permeability	1	6	6	18
Rainfall intensity	3	8	24	24
SUBTOTALS			68	108
Subscore (100 x factor score subtotal/ maximum score subtotal)				63
2. Flooding	0	1	0	3
Subscore (100 x factor score/3)				0
3. Ground water migration				
Depth to ground water	0	8	0	24
Net precipitation	1	6	6	18
Soil permeability	2	8	16	24
Subsurface flows	0	8	0	24
Direct access to ground water	1	8	8	24
SUBTOTALS			30	114
Subscore (100 x factor score subtotal/ maximum score subtotal)				26

C. Highest pathway subscore

Enter the highest subscore value from A, B-1, B-2, or B-3 above. Pathways Subscore 63

IV. WASTE MANAGEMENT PRACTICES

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

Receptors	63
Waste Characteristics	80
Pathways	63
TOTAL	206 divided by 3 = 69 Gross total score

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

69 x 0.95 = [illegible]

HAZARD ASSESSMENT RATING METHODOLOGY FORM

Name of Site: Landfill No. 3 (LF-3)

Location: Southeast of LF-1 and LF-2

Date of Operation or Occurrence: 1947 - 1977

Owner/Operator: AAFB

Comments/Description: Contains chlorinated solvents, waste chemicals, and waste oils

Site Rated By: J. Bonds, J. Kosik, and D. McNeill

I. RECEPTORS

Rating Factor	Factor Rating (0-3)	Multi-plier	Factor Score	Maximum Possible Score
A. Population within 1,000 feet of site	1	4	4	12
B. Distance to nearest well	1	10	10	30
C. Land use/zoning within 1-mile radius	2	3	6	9
D. Distance to reservation boundary	2	6	12	18
E. Critical environments within 1-mile radius of site	3	10	30	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			107	180
Receptors subscore (100 x factor score subtotal/maximum score subtotal)				59

II. WASTE CHARACTERISTICS

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

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

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

B. Apply persistence factor:
Factor Subscore A x Persistence Factor = Subscore B
100 x [illegible] = [illegible]

C. Apply physical state multiplier:
Subscore B x Physical State Multiplier = Waste Characteristics Subscore
[illegible] x [illegible] = [illegible]

HAZARD ASSESSMENT RATING METHODOLOGY FORM
(Continued, Page 2 of 2)

III. PATHWAYS

A. If there is evidence of migration of hazardous contaminants, assign maximum factor subscore of 100 points for direct evidence or 80 points for indirect evidence. If direct evidence exists, 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)	Multi-plier	Factor Score	Maximum Possible Score
1. Surface water migration				
Distance to nearest surface water	0	8	0	24
Net precipitation	1	6	6	18
Surface erosion	1	8	8	24
Surface permeability	1	6	6	18
Rainfall intensity	3	8	24	24
SUBTOTALS			44	108
Subscore (100 x factor score subtotal/maximum score subtotal)				41
2. Flooding	0	1	0	3
Subscore (100 x factor score/3)				0
3. Ground water migration				
Depth to ground water	0	8	0	24
Net precipitation	1	6	6	18
Soil permeability	2	8	16	24
Subsurface flows	0	8	0	24
Direct access to ground water	2	8	16	24
SUBTOTALS			42	114
Subscore (100 x factor score subtotal/maximum score subtotal)				37

C. Highest pathway subscore

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

Pathways Subscore 41

IV. WASTE MANAGEMENT PRACTICES

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

Receptors	59	
Waste Characteristics	100	
Pathways	41	
TOTAL	200	divided by 3 = 67 Gross total score

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

67 x 0.95 = 64

HAZARD ASSESSMENT RATING METHODOLOGY FORM

Name of Site: Stormwater Drainage System, Zone No. 1 (SDS-1)

Location: South Flightline, Main Industrial Area

Date of Operation or Occurrence: Late 1940s - present

Owner/Operator: AAFB

Comments/Description: *Approximately 50 injection wells for drainage*

Site Rated By: D. McNeill and J. Kosik

I. RECEPTORS

Rating Factor	Factor Rating (0-3)	Multi-plier	Factor Score	Maximum Possible Score
A. Population within 1,000 feet of site	3	4	12	12
B. Distance to nearest well	0	10	0	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	3	10	30	30
F. Water quality of nearest surface water body	1	6	6	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 score 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 (1=small, 2=medium, 3=large) — 2
2. Confidence level (1=confirmed, 2=suspected) — 2
3. Hazard rating (1=low, 2=medium, 3=high) — 2

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

B. Apply persistence factor:
Factor Subscore A x Persistence Factor = Subscore B — 60 x 1.0 = 60

C. Apply physical state multiplier:
Subscore B x Physical State Multiplier = Waste Characteristics Subscore — 60 x 1.0 = 60

HAZARD ASSESSMENT RATING METHODOLOGY FORM
(Continued, Page 2 of 2)

III. PATHWAYS

A. If there is evidence of migration of hazardous contaminants, assign maximum factor subscore of 100 points for direct evidence or 80 points for indirect evidence. If direct evidence exists, 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	1	6	6	18
Surface erosion	2	8	16	24
Surface permeability	1	6	6	18
Rainfall intensity	3	8	24	24
SUBTOTALS			68	108
Subscore (100 x factor score subtotal/maximum score subtotal)				63
2. Flooding	0	1	0	3
Subscore (100 x factor score/3)				0
3. Ground water migration				
Depth to ground water	0	8	0	24
Net precipitation	1	6	6	18
Soil permeability	2	8	16	24
Subsurface flows	0	8	0	24
Direct access to ground water	1	8	8	24
SUBTOTALS			30	114
Subscore (100 x factor score subtotal/maximum score subtotal)				26

C. Highest pathway subscore

Enter the highest subscore value from A, B-1, B-2, or B-3 above. Pathways Subscore 63

IV. WASTE MANAGEMENT PRACTICES

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

Receptors	63
Waste Characteristics	60
Pathways	63
TOTAL	186

TOTAL 186 divided by 3 = 62 Gross total score

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

62 x 1.0 = 62

HAZARD ASSESSMENT RATING METHODOLOGY FORM

Name of Site: Landfill No. 13 (LF-13)

Location: East of LF-10, LF-11, and LF-13, on cliff area

Date of Operation or Occurrence: 1951-1956

Owner/Operator: AAFB

Comments/Description: Contains waste POL, solvents, and chemicals

Site Rated By: J. Bonds, J. Kosik, and D. McNeill

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	0	10	0	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	3	10	30	30
F. Water quality of nearest surface water body	1	6	6	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			109	180
Receptors subscore (100 x factor score subtotal/maximum score subtotal)				60

II. WASTE CHARACTERISTICS

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

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

Factor Subscore A (from 20 to 100 based on factor score matrix) 30

B. Apply persistence factor:
Factor Subscore A x Persistence Factor = Subscore B   30 x 1.0 = 30

C. Apply physical state multiplier:
Subscore B x Physical State Multiplier = Waste Characteristics Subscore   30 x 1.0 = 30

HAZARD ASSESSMENT RATING METHODOLOGY FORM
(Continued, Page 2 of 2)

III. PATHWAYS

A. If there is evidence of migration of hazardous contaminants, assign maximum factor subscore of 100 points for direct evidence or 80 points for indirect evidence. If direct evidence exists, 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	1	6	6	18
Surface erosion	1	8	8	24
Surface permeability	1	6	6	18
Rainfall intensity	3	8	24	24
SUBTOTALS			60	108
Subscore (100 x factor score subtotal/maximum score subtotal)				56
2. Flooding	0	1	0	3
Subscore (100 x factor score/3)				0
3. Ground water migration				
Depth to ground water	0	8	0	24
Net precipitation	1	6	6	18
Soil permeability	2	8	16	24
Subsurface flows	0	8	0	24
Direct access to ground water	1	8	8	24
SUBTOTALS			30	114
Subscore (100 x factor score subtotal/maximum score subtotal)				26

C. Highest pathway subscore

Enter the highest subscore value from A, B-1, B-2, or B-3 above. Pathways Subscore 56

IV. WASTE MANAGEMENT PRACTICES

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

Receptors	60
Waste Characteristics	80
Pathways	56
TOTAL	196 divided by 3 = 65 Gross total score

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

65 x 0.95 = 62

HAZARD ASSESSMENT RATING METHODOLOGY FORM

Name of Site: Firefighter Training Area No. 1 (FTA-1)

Location: Northeast end of north runway, outside Perimeter Rd.

Date of Operation or Occurrence: 1945 - 1958

Owner/Operator: AAFB

Comments/Description: Waste oil and chlorinated solvents were burned here

Site Rated By: J. Bonds, J. Kosik, and D. McNeill

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	0	10	0	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	3	10	30	30
F. Water quality of nearest surface water body	1	6	6	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 score subtotal)				55

II. WASTE CHARACTERISTICS

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

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

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

B. Apply persistence factor:
Factor Subscore A x Persistence Factor = Subscore B 80 x 1 = 30

C. Apply physical state multiplier:
Subscore B x Physical State Multiplier = Waste Characteristics Subscore 80 x 1 = 80

HAZARD ASSESSMENT RATING METHODOLOGY FORM
(Continued, Page 2 of 2)

III. PATHWAYS

A. If there is evidence of migration of hazardous contaminants, assign maximum factor subscore of 100 points for direct evidence or 80 points for indirect evidence. If direct evidence exists, 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	1	6	6	18
Surface erosion	0	8	0	24
Surface permeability	1	6	6	18
Rainfall intensity	3	8	24	24
SUBTOTALS			44	108
Subscore (100 x factor score subtotal/maximum score subtotal)				41
2. Flooding	___	1	___	3
Subscore (100 x factor score/3)				0
3. Ground water migration				
Depth to ground water	0	8	0	24
Net precipitation	1	6	6	18
Soil permeability	2	8	16	24
Subsurface flows	0	8	0	24
Direct access to ground water	0	8	0	24
SUBTOTALS			22	114
Subscore (100 x factor score subtotal/maximum score subtotal)				19

C. Highest pathway subscore

Enter the highest subscore value from A, B-1, B-2, or B-3 above. Pathways Subscore 41

IV. WASTE MANAGEMENT PRACTICES

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

Receptors	55
Waste Characteristics	30
Pathways	41
TOTAL	126 divided by 3 = 59 Gross total score

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

[illegible] x [illegible] = [illegible]

HAZARD ASSESSMENT RATING METHODOLOGY FORM

Name of Site: Hazardous Waste Storage Area No. 1 (HW-1)

Location: Concrete pad SW of Marine Dr. Intersection with Marianas Rd.

Date of Operation or Occurrence: 1950s - 1983

Owner/Operator: AAFB

Comments/Description: Used for storage of POL/solvents prior to hazardous wastes

Site Rated By: J. Bonds, J. Kosik, and D. McNeill

I. RECEPTORS

Rating Factor	Factor Rating (0-3)	Multi-plier	Factor Score	Maximum Possible Score
A. Population within 1,000 feet of site	1	4	4	12
B. Distance to nearest well	1	10	10	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	3	10	30	30
F. Water quality of nearest surface water body	1	6	6	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			122	180

Receptors subscore (100 x factor score subtotal/maximum score subtotal) 68

II. WASTE CHARACTERISTICS

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

1. Waste quantity (1=small, 2=medium, 3=large) 1
2. Confidence level (1=confirmed, 2=suspected) [illegible]
3. Hazard rating (1=low, 2=medium, 3=high) 3

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

B. Apply persistence factor:
Factor Subscore A x Persistence Factor = Subscore B [illegible] x [illegible] = [illegible]

C. Apply physical state multiplier:
Subscore B x Physical State Multiplier = Waste Characteristics Subscore [illegible] x [illegible] = [illegible]

HAZARD ASSESSMENT RATING METHODOLOGY FORM
(Continued, Page 2 of 2)

III. PATHWAYS

A. If there is evidence of migration of hazardous contaminants, assign maximum factor subscore of 100 points for direct evidence or 80 points for indirect evidence. If direct evidence exists, 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)	Multi-plier	Factor Score	Maximum Possible Score
1. Surface water migration				
Distance to nearest surface water	3	8	24	24
Net precipitation	1	6	6	18
Surface erosion	0	8	0	24
Surface permeability	1	6	6	18
Rainfall intensity	3	8	24	24
SUBTOTALS			60	108
Subscore (100 x factor score subtotal/maximum score subtotal)				56
2. Flooding	0	1	0	3
Subscore (100 x factor score/3)				0
3. Ground water migration				
Depth to ground water	0	8	0	24
Net precipitation	1	6	6	18
Soil permeability	2	8	16	24
Subsurface flows	0	8	0	24
Direct access to ground water	3	8	24	24
SUBTOTALS			46	114
Subscore (100 x factor score subtotal/maximum score subtotal)				40

C. Highest pathway subscore

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

Pathways Subscore 56

IV. WASTE MANAGEMENT PRACTICES

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

Receptors	68
Waste Characteristics	60
Pathways	56
TOTAL	184 divided by 3 = 61 Gross total score

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

61 x .15 = [illegible]

HAZARD ASSESSMENT RATING METHODOLOGY FORM

Name of Site: Stormwater Drainage System, Zone No. 3 (SDS-3)

Location: North Flightline

Date of Operation or Occurrence: Late 1940s - present

Owner/Operator: AAFB

Comments/Description: Approximately 10 injection wells for drainage

Site Rated By: D. McNeill and J. Kosik

I. RECEPTORS

Rating Factor	Factor Rating (0-3)	Multi-plier	Factor Score	Maximum Possible Score
A. Population within 1,000 feet of site	3	4	12	12
B. Distance to nearest well	0	10	0	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	3	10	30	30
F. Water quality of nearest surface water body	1	6	6	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			111	180
Receptors subscore (100 x factor score subtotal/maximum score subtotal)				62

II. WASTE CHARACTERISTICS

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

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

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

B. Apply persistence factor:
Factor Subscore A x Persistence Factor = Subscore B
60 x 1.0 = [illegible]

C. Apply physical state multiplier:
Subscore B x Physical State Multiplier = Waste Characteristics Subscore
60 x 1.0 = [illegible]

HAZARD ASSESSMENT RATING METHODOLOGY FORM
(Continued, Page 2 of 2)

III. PATHWAYS

A. If there is evidence of migration of hazardous contaminants, assign maximum factor subscore of 100 points for direct evidence or 80 points for indirect evidence. If direct evidence exists, 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)	Multi-plier	Factor Score	Maximum Possible Score
1. Surface water migration				
Distance to nearest surface water	1	8	8	24
Net precipitation	1	6	6	18
Surface erosion	1	8	8	24
Surface permeability	1	6	6	18
Rainfall intensity	3	8	24	24
SUBTOTALS			52	108
Subscore (100 x factor score subtotal/maximum score subtotal)				48
2. Flooding	0	1	0	3
Subscore (100 x factor score/3)				0
3. Ground water migration				
Depth to ground water	0	8	0	24
Net precipitation	1	6	6	18
Soil permeability	2	8	16	24
Subsurface flows	0	8	0	24
Direct access to ground water	1	8	8	24
SUBTOTALS			30	114
Subscore (100 x factor score subtotal/maximum score subtotal)				26

C. Highest pathway subscore

Enter the highest subscore value from A, B-1, B-2, or B-3 above. Pathways Subscore 48

IV. WASTE MANAGEMENT PRACTICES

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

Receptors	62
Waste Characteristics	60
Pathways	48
TOTAL	170 divided by 3 = 57 Gross total score

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

57 x 1.0 = 57

HAZARD ASSESSMENT RATING METHODOLOGY FORM

Name of Site: Firefighter Training Area No. 2 (FTA-2)

Location: Intersection of 5th St. and Perimeter Rd.

Date of Operation or Occurrence: 1958 - Present

Owner/Operator: AAFB

Comments/Description: Waste oil and chlorinated solvents are burned here

Site Rated By: J. Bonds, J. Kosik, and D. McNeill

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	1	10	10	30
C. Land use/zoning within 1-mile radius	2	3	6	9
D. Distance to reservation boundary	1	6	6	18
E. Critical environments within 1-mile radius of site	3	10	30	30
F. Water quality of nearest surface water body	1	6	6	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 score subtotal)				57

II. WASTE CHARACTERISTICS

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

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

Factor Subscore A (from 20 to 100 based on factor score matrix) — 30

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

30 x 1 = 30

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

30 x 1 = 30

HAZARD ASSESSMENT RATING METHODOLOGY FORM
(Continued, Page 2 of 2)

III. PATHWAYS

A. If there is evidence of migration of hazardous contaminants, assign maximum factor subscore of 100 points for direct evidence or 80 points for indirect evidence. If direct evidence exists, 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)	Multi-plier	Factor Score	Maximum Possible Score
1. Surface water migration				
Distance to nearest surface water	0	8	0	24
Net precipitation	1	6	6	18
Surface erosion	0	8	0	24
Surface permeability	1	6	6	18
Rainfall intensity	3	8	24	24
SUBTOTALS			36	108
Subscore (100 x factor score subtotal/maximum score subtotal)				33
2. Flooding	0	1	0	3
Subscore (100 x factor score/3)				0
3. Ground water migration				
Depth to ground water	0	8	0	24
Net precipitation	1	6	6	18
Soil permeability	2	8	16	24
Subsurface flows	0	8	0	24
Direct access to ground water	0	8	0	24
SUBTOTALS			22	114
Subscore (100 x factor score subtotal/maximum score subtotal)				19

C. Highest pathway subscore

Enter the highest subscore value from A, B-1, B-2, or B-3 above. Pathways Subscore 33

IV. WASTE MANAGEMENT PRACTICES

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

Receptors	57
Waste Characteristics	30
Pathways	33
TOTAL	170 divided by 3 = [illegible] Gross total score

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

[illegible] x [illegible] = [illegible]

HAZARD ASSESSMENT RATING METHODOLOGY FORM

Name of Site: Stormwater Drainage System, Zone No. 2 (SDS-2)

Location: North Housing Area/Fuel Storage Area

Date of Operation or Occurrence: Late 1940s - present

Owner/Operator: AAFB

Comments/Description: Approximately 40 injection wells for drainage

Site Rated By: D. McNeill and J. Kosik

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	1	10	10	30
C. Land use/zoning within 1-mile radius	2	3	6	9
D. Distance to reservation boundary	2	6	12	18
E. Critical environments within 1-mile radius of site	3	10	30	30
F. Water quality of nearest surface water body	0	6	6	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			121	180

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

II. WASTE CHARACTERISTICS

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

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

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

B. Apply persistence factor:
Factor Subscore A x Persistence Factor = Subscore B
60 x 1.0 = 60

C. Apply physical state multiplier:
Subscore B x Physical State Multiplier = Waste Characteristics Subscore
60 x 1.0 = 60

HAZARD ASSESSMENT RATING METHODOLOGY FORM
(Continued, Page 2 of 2)

III. PATHWAYS

A. If there is evidence of migration of hazardous contaminants, assign maximum factor subscore of 100 points for direct evidence or 80 points for indirect evidence. If direct evidence exists, 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)	Multi-plier	Factor Score	Maximum Possible Score
1. Surface water migration				
Distance to nearest surface water	0	8	0	24
Net precipitation	1	6	6	18
Surface erosion	1	8	8	24
Surface permeability	1	6	6	18
Rainfall intensity	3	8	24	24
SUBTOTALS			44	108
Subscore (100 x factor score subtotal/maximum score subtotal)				41
2. Flooding	0	1	0	3
Subscore (100 x factor score/3)				0
3. Ground water migration				
Depth to ground water	0	8	0	24
Net precipitation	1	6	6	18
Soil permeability	2	8	16	24
Subsurface flows	0	8	0	24
Direct access to ground water	2	8	16	24
SUBTOTALS			38	114
Subscore (100 x factor score subtotal/maximum score subtotal)				33

C. Highest pathway subscore

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

Pathways Subscore 41

IV. WASTE MANAGEMENT PRACTICES

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

Receptors	67
Waste Characteristics	60
Pathways	41
TOTAL	168

divided by 3 = 56 Gross total score

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

56 x 1.0 = 56

HAZARD ASSESSMENT RATING METHODOLOGY FORM

Name of Site: *Chemical Disposal Site No. 1 (CS-1)*

Location: East end of South Runway

Date of Operation or Occurrence: 1970s

Owner/Operator: AAFB

Comments/Description: Contains waste POL/solvents

Site Rated By: J. Bonds, J. Kosik, and D. McNeill

I. RECEPTORS

Rating Factor	Factor Rating (0-3)	Multi-plier	Factor Score	Maximum Possible Score
A. Population within 1,000 feet of site	0	4	0	12
B. Distance to nearest well	0	10	0	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	3	10	30	30
F. Water quality of nearest surface water body	1	6	6	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			105	180
Receptors subscore (100 x factor score subtotal/maximum score subtotal)				58

II. WASTE CHARACTERISTICS

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

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

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

B. Apply persistence factor:
Factor Subscore A x Persistence Factor = Subscore B
60 x 1 = 60

C. Apply physical state multiplier:
Subscore B x Physical State Multiplier = Waste Characteristics Subscore
60 x 1 = 60

HAZARD ASSESSMENT RATING METHODOLOGY FORM
(Continued, Page 2 of 2)

III. PATHWAYS

A. If there is evidence of migration of hazardous contaminants, assign maximum factor subscore of 100 points for direct evidence or 80 points for indirect evidence. If direct evidence exists, 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)	Multi-plier	Factor Score	Maximum Possible Score
1. Surface water migration				
Distance to nearest surface water	2	8	16	24
Net precipitation	1	6	6	18
Surface erosion	1	8	8	24
Surface permeability	1	6	6	18
Rainfall intensity	3	8	24	24
SUBTOTALS			60	108
Subscore (100 x factor score subtotal/maximum score subtotal)				56
2. Flooding	0	1	0	3
Subscore (100 x factor score/3)				0
3. Ground water migration				
Depth to ground water	0	8	0	24
Net precipitation	1	6	6	18
Soil permeability	2	8	16	24
Subsurface flows	0	8	0	24
Direct access to ground water	0	8	0	24
SUBTOTALS			22	114
Subscore (100 x factor score subtotal/maximum score subtotal)				19

C. Highest pathway subscore

Enter the highest subscore value from A, B-1, B-2, or B-3 above. Pathways Subscore 56

IV. WASTE MANAGEMENT PRACTICES

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

Receptors	58
Waste Characteristics	60
Pathways	56
TOTAL	174 divided by 3 = 58 Gross total score

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

58 x 0.95 = 55

HAZARD ASSESSMENT RATING METHODOLOGY FORM

Name of Site: Landfill No. 16 (LF-16)

Location: Near Bldg. 2799

Date of Operation or Occurrence: Late 1950s - early 1960s

Owner/Operator: AAFB

Comments/Description: Contains waste solvents and oils; also used as drum storage area for several years

Site Rated By: J. Bonds, J. Kosik, and D. McNeill

I. RECEPTORS

Rating Factor	Factor Rating (0-3)	Multi-plier	Factor Score	Maximum Possible Score
A. Population within 1,000 feet of site	3	4	12	12
B. Distance to nearest well	0	10	0	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	3	10	30	30
F. Water quality of nearest surface water body	1	6	6	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			111	180

Receptors subscore (100 x factor score subtotal/maximum score subtotal) 62

II. WASTE CHARACTERISTICS

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

1. Waste quantity (1=small, 2=medium, 3=large) [illegible]
2. Confidence level (1=confirmed, 2=suspected) 1
3. Hazard rating (1=low, 2=medium, 3=high) 3

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

B. Apply persistence factor:
Factor Subscore A x Persistence Factor = Subscore B
[illegible] x [illegible] = [illegible]

C. Apply physical state multiplier:
Subscore B x Physical State Multiplier = Waste Characteristics Subscore
[illegible] x 1 = [illegible]

HAZARD ASSESSMENT RATING METHODOLOGY FORM
(Continued, Page 2 of 2)

III. PATHWAYS

A. If there is evidence of migration of hazardous contaminants, assign maximum factor subscore of 100 points for direct evidence or 80 points for indirect evidence. If direct evidence exists, 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	1	6	6	18
Surface erosion	1	8	8	24
Surface permeability	1	6	6	18
Rainfall intensity	3	8	24	24
SUBTOTALS			52	108
Subscore (100 x factor score subtotal/maximum score subtotal)				48
2. Flooding	0	1	0	3
Subscore (100 x factor score/3)				0
3. Ground water migration				
Depth to ground water	0	8	0	24
Net precipitation	1	6	6	18
Soil permeability	2	8	16	24
Subsurface flows	0	8	0	24
Direct access to ground water	1	8	8	24
SUBTOTALS			30	114
Subscore (100 x factor score subtotal/maximum score subtotal)				26

C. Highest pathway subscore

Enter the highest subscore value from A, B-1, B-2, or B-3 above. Pathways Subscore 48

IV. WASTE MANAGEMENT PRACTICES

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

Receptors	62
Waste Characteristics	60
Pathways	48
TOTAL	170 divided by 3 = 57 Gross total score

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

[illegible] x [illegible] = [illegible]

HAZARD ASSESSMENT RATING METHODOLOGY FORM

Name of Site: Drum Storage Area No. 2 (DS-2)

Location: SE of Roads and Grounds Shop

Date of Operation or Occurrence: ? - Present

Owner/Operator: AAFB

Comments/Description: Several storage areas containing leaking drums

Site Rated By: J. Bonds, J. Kosik, and D. McNeill

I. RECEPTORS

Rating Factor	Factor Rating (0-3)	Multi-plier	Factor Score	Maximum Possible Score
A. Population within 1,000 feet of site	3	4	12	12
B. Distance to nearest well	0	10	0	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	3	10	30	30
F. Water quality of nearest surface water body	1	6	6	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 score 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 (1=small, 2=medium, 3=large) 2
2. Confidence level (1=confirmed, 2=suspected) 1
3. Hazard rating (1=low, 2=medium, 3=high) 1

Factor Subscore A (from 20 to 100 based on factor score matrix) 30

B. Apply persistence factor:
Factor Subscore A x Persistence Factor = Subscore B
30 x 0.8 = 24

C. Apply physical state multiplier:
Subscore B x Physical State Multiplier = Waste Characteristics Subscore
24 x 1 = 24

HAZARD ASSESSMENT RATING METHODOLOGY FORM
(Continued, Page 2 of 2)

III. PATHWAYS

A. If there is evidence of migration of hazardous contaminants, assign maximum factor subscore of 100 points for direct evidence or 80 points for indirect evidence. If direct evidence exists, 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)	Multi-plier	Factor Score	Maximum Possible Score
1. Surface water migration				
Distance to nearest surface water	2	8	16	24
Net precipitation	1	6	6	18
Surface erosion	2	8	16	24
Surface permeability	1	6	6	18
Rainfall intensity	3	8	24	24
SUBTOTALS			68	108
Subscore (100 x factor score subtotal/maximum score subtotal)				63
2. Flooding	0	1	0	3
Subscore (100 x factor score/3)				0
3. Ground water migration				
Depth to ground water	0	8	0	24
Net precipitation	1	6	6	18
Soil permeability	2	8	16	24
Subsurface flows	0	8	0	24
Direct access to ground water	1	8	8	24
SUBTOTALS			30	114
Subscore (100 x factor score subtotal/maximum score subtotal)				26

C. Highest pathway subscore

Enter the highest subscore value from A, B-1, B-2, or B-3 above. Pathways Subscore 63

IV. WASTE MANAGEMENT PRACTICES

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

Receptors	63
Waste Characteristics	24
Pathways	63
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.

[illegible] x [illegible] = [illegible]

HAZARD ASSESSMENT RATING METHODOLOGY FORM

Name of Site: Chemical Disposal Site No. 2 (CS-2)

Location: North of LF-1

Date of Operation or Occurrence: 1950-1952

Owner/Operator: AAFB

Comments/Description: Contains asphalt, oils, and tars

Site Rated By: J. Bonds, J. Kosik, and D. McNeill

I. RECEPTORS

Rating Factor	Factor Rating (0-3)	Multi-plier	Factor Score	Maximum Possible Score
A. Population within 1,000 feet of site	1	4	4	12
B. Distance to nearest well	1	10	10	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	3	10	30	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			116	180
Receptors subscore (100 x factor score subtotal/maximum score subtotal)				64

II. WASTE CHARACTERISTICS

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

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

Factor Subscore A (from 20 to 100 based on factor score matrix) 30

B. Apply persistence factor:
Factor Subscore A x Persistence Factor = Subscore B
30 x [illegible] = [illegible]

C. Apply physical state multiplier:
Subscore B x Physical State Multiplier = Waste Characteristics Subscore
[illegible] x [illegible] = [illegible]

HAZARD ASSESSMENT RATING METHODOLOGY FORM
(Continued, Page 2 of 2)

III. PATHWAYS

A. If there is evidence of migration of hazardous contaminants, assign maximum factor subscore of 100 points for direct evidence or 80 points for indirect evidence. If direct evidence exists, 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)	Multi-plier	Factor Score	Maximum Possible Score
1. Surface water migration				
Distance to nearest surface water	0	8	0	24
Net precipitation	1	6	6	18
Surface erosion	1	8	8	24
Surface permeability	1	6	6	18
Rainfall intensity	3	8	24	24
SUBTOTALS			44	108
Subscore (100 x factor score subtotal/maximum score subtotal)				41
2. Flooding	0	1	0	3
Subscore (100 x factor score/3)				0
3. Ground water migration				
Depth to ground water	0	8	0	24
Net precipitation	1	6	6	18
Soil permeability	2	8	16	24
Subsurface flows	0	8	0	24
Direct access to ground water	1	8	8	24
SUBTOTALS			30	114
Subscore (100 x factor score subtotal/maximum score subtotal)				26

C. Highest pathway subscore

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

Pathways Subscore 41

IV. WASTE MANAGEMENT PRACTICES

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

Receptors 64
Waste Characteristics 30
Pathways 41
TOTAL 135 divided by 3 = 45 Gross total score

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

[illegible] x [illegible] = [illegible]

HAZARD ASSESSMENT RATING METHODOLOGY FORM

Name of Site: Drum Storage Area No. 1 (DS-1)

Location: On road to LF-1

Date of Operation or Occurrence: ? - Present

Owner/Operator: AAFB

Comments/Description: Drums rusting and leaking--contain POL and solvents

Site Rated By: J. Bonds, J. Kosik, and D. McNeill

I. RECEPTORS

Rating Factor	Factor Rating (0-3)	Multi-plier	Factor Score	Maximum Possible Score
A. Population within 1,000 feet of site	1	4	4	12
B. Distance to nearest well	1	10	10	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	3	10	30	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			116	180
Receptors subscore (100 x factor score subtotal/maximum score subtotal)				64

II. WASTE CHARACTERISTICS

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

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

Factor Subscore A (from 20 to 100 based on factor score matrix) 30

B. Apply persistence factor:
Factor Subscore A x Persistence Factor = Subscore B
30 x .8 = 24

C. Apply physical state multiplier:
Subscore B x Physical State Multiplier = Waste Characteristics Subscore
24 x 1 = 24

HAZARD ASSESSMENT RATING METHODOLOGY FORM
(Continued, Page 2 of 2)

III. PATHWAYS

A. If there is evidence of migration of hazardous contaminants, assign maximum factor subscore of 100 points for direct evidence or 80 points for indirect evidence. If direct evidence exists, 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)	Multi-plier	Factor Score	Maximum Possible Score
1. Surface water migration				
Distance to nearest surface water	0	8	0	24
Net precipitation	1	6	6	18
Surface erosion	1	8	8	24
Surface permeability	1	6	6	18
Rainfall intensity	3	8	24	24
SUBTOTALS			44	108
Subscore (100 x factor score subtotal/maximum score subtotal)				41
2. Flooding	0	1	0	3
Subscore (100 x factor score/3)				0
3. Ground water migration				
Depth to ground water	0	8	0	24
Net precipitation	1	6	6	18
Soil permeability	2	8	16	24
Subsurface flows	0	8	0	24
Direct access to ground water	0	8	0	24
SUBTOTALS			22	114
Subscore (100 x factor score subtotal/maximum score subtotal)				19

C. Highest pathway subscore

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

Pathways Subscore 41

IV. WASTE MANAGEMENT PRACTICES

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

Receptors	54	
Waste Characteristics	34	
Pathways	41	
TOTAL	129	divided by 3 = 43 Gross total score

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

43 x 1 = 43

HAZARD ASSESSMENT RATING METHODOLOGY FORM

Name of Site: Chemical Disposal Site No. 3 (CS-3)

Location: South of intersection of A and B Aves. on AAFB Storage Area

Date of Operation or Occurrence: 1950s - 1970s

Owner/Operator: AAFB

Comments/Description: Contains surficial and buried UXO

Site Rated By: J. Bonds, J. Kosik, and D. McNeill

I. RECEPTORS

Rating Factor	Factor Rating (0-3)	Multi-plier	Factor Score	Maximum Possible Score
A. Population within 1,000 feet of site	1	4	4	12
B. Distance to nearest 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	3	10	30	30
F. Water quality of nearest surface water body	1	6	6	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			142	180
Receptors subscore (100 x factor score subtotal/maximum score subtotal)				79

II. WASTE CHARACTERISTICS

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

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

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

B. Apply persistence factor:
Factor Subscore A x Persistence Factor = Subscore B
20 x 0.9 = 18

C. Apply physical state multiplier:
Subscore B x Physical State Multiplier = Waste Characteristics Subscore
18 x 0.5 = 9

HAZARD ASSESSMENT RATING METHODOLOGY FORM
(Continued, Page 2 of 2)

III. PATHWAYS

A. If there is evidence of migration of hazardous contaminants, assign maximum factor subscore of 100 points for direct evidence or 80 points for indirect evidence. If direct evidence exists, 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)	Multi-plier	Factor Score	Maximum Possible Score
1. Surface water migration				
Distance to nearest surface water	0	8	0	24
Net precipitation	1	6	6	18
Surface erosion	1	8	8	24
Surface permeability	1	6	6	18
Rainfall intensity	3	8	24	24
SUBTOTALS			44	108
Subscore (100 x factor score subtotal/maximum score subtotal)				41
2. Flooding	0	1	0	3
Subscore (100 x factor score/3)				0
3. Ground water migration				
Depth to ground water	0	8	0	24
Net precipitation	1	6	6	18
Soil permeability	2	8	16	24
Subsurface flows	0	8	0	24
Direct access to ground water	0	8	0	24
SUBTOTALS			22	114
Subscore (100 x factor score subtotal/maximum score subtotal)				19

C. Highest pathway subscore

Enter the highest subscore value from A, B-1, B-2, or B-3 above. Pathways Subscore 41

IV. WASTE MANAGEMENT PRACTICES

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

Receptors	79
Waste Characteristics	9
Pathways	41
TOTAL	129 divided by 3 = 43 Gross total score

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

43 x 1.0 = 43

HAZARD ASSESSMENT RATING METHODOLOGY FORM

Name of Site: Landfill No. 22 (LF-22)

Location: Northwest Field between north and south runways

Date of Operation or Occurrence: Mid 1950s - early 1960s

Owner/Operator: AAFB

Comments/Description: Contains UXO

Site Rated By: J. Bonds, J. Kosik, and D. McNeill

I. RECEPTORS

Rating Factor	Factor Rating (0-3)	Multi-plier	Factor Score	Maximum Possible Score
A. Population within 1,000 feet of site	1	4	4	12
B. Distance to nearest well	1	10	10	30
C. Land use/zoning within 1-mile radius	2	3	6	9
D. Distance to reservation boundary	1	6	6	18
E. Critical environments within 1-mile radius of site	3	10	30	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			101	180
Receptors subscore (100 x factor score subtotal/maximum score subtotal)				56

II. WASTE CHARACTERISTICS

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

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

Factor Subscore A (from 20 to 100 based on factor score matrix) — 30

B. Apply persistence factor:
Factor Subscore A x Persistence Factor = Subscore B — 30 x 0.9 = 27

C. Apply physical state multiplier:
Subscore B x Physical State Multiplier = Waste Characteristics Subscore — 30 x 0.50 = 15

HAZARD ASSESSMENT RATING METHODOLOGY FORM
(Continued, Page 2 of 2)

III. PATHWAYS

A. If there is evidence of migration of hazardous contaminants, assign maximum factor subscore of 100 points for direct evidence or 80 points for indirect evidence. If direct evidence exists, 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)	Multi-plier	Factor Score	Maximum Possible Score
1. Surface water migration				
Distance to nearest surface water	1	8	8	24
Net precipitation	1	6	6	18
Surface erosion	1	8	8	24
Surface permeability	1	6	6	18
Rainfall intensity	3	8	24	24
SUBTOTALS			52	108
Subscore (100 x factor score subtotal/maximum score subtotal)				48
2. Flooding	0	1	0	3
Subscore (100 x factor score/3)				0
3. Ground water migration				
Depth to ground water	0	8	0	24
Net precipitation	1	6	6	18
Soil permeability	2	8	16	24
Subsurface flows	0	8	0	24
Direct access to ground water	1	8	8	24
SUBTOTALS			30	114
Subscore (100 x factor score subtotal/maximum score subtotal)				26

C. Highest pathway subscore

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

Pathways Subscore 48

IV. WASTE MANAGEMENT PRACTICES

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

Receptors [illegible]
Waste Characteristics 15
Pathways 48
TOTAL 119 divided by 3 = [illegible] Gross total score

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

40 x 0.95 = 38

HAZARD ASSESSMENT RATING METHODOLOGY FORM

Name of Site: Chemical Disposal Site No. 4 (CS-4)

Location: 100 yd west of Guam Rte. 3, approximately 1 mi north of Potts Junction

Date of Operation or Occurrence: 1950s

Owner/Operator: AAFB

Comments/Description:

Site Rated By: J. Bonds, J. Kosik, and D. McNeill

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	1	10	10	30
C. Land use/zoning within 1-mile radius	2	3	6	9
D. Distance to reservation boundary	3	6	18	18
E. Critical environments within 1-mile radius of site	0	10	0	30
F. Water quality of nearest surface water body	1	6	6	18
G. Ground water use of uppermost aquifer	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			85	180
Receptors subscore (100 x factor score subtotal/maximum score subtotal)				47

II. WASTE CHARACTERISTICS

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

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

Factor Subscore A (from 20 to 100 based on factor score matrix) 30

B. Apply persistence factor:
Factor Subscore A x Persistence Factor = Subscore B
30 x 1.0 = 30

C. Apply physical state multiplier:
Subscore B x Physical State Multiplier = Waste Characteristics Subscore
30 x 1.0 = 30

HAZARD ASSESSMENT RATING METHODOLOGY FORM
(Continued, Page 2 of 2)

III. PATHWAYS

A. If there is evidence of migration of hazardous contaminants, assign maximum factor subscore of 100 points for direct evidence or 80 points for indirect evidence. If direct evidence exists, 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)	Multi-plier	Factor Score	Maximum Possible Score
1. Surface water migration				
Distance to nearest surface water	0	8	0	24
Net precipitation	1	6	6	18
Surface erosion	1	8	8	24
Surface permeability	1	6	6	18
Rainfall intensity	3	8	24	24
SUBTOTALS			44	108
Subscore (100 x factor score subtotal/maximum score subtotal)				41
2. Flooding	0	1	0	3
Subscore (100 x factor score/3)				0
3. Ground water migration				
Depth to ground water	0	8	0	24
Net precipitation	1	6	6	18
Soil permeability	2	8	16	24
Subsurface flows	0	8	0	24
Direct access to ground water	1	8	8	24
SUBTOTALS			30	114
Subscore (100 x factor score subtotal/maximum score subtotal)				26

C. Highest pathway subscore

Enter the highest subscore value from A, B-1, B-2, or B-3 above. Pathways Subscore 41

IV. WASTE MANAGEMENT PRACTICES

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

Receptors 47

Waste Characteristics 30

Pathways 41

TOTAL 118 divided by 3 = 39 Gross total score

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

39 x .95 = 37

APPENDIX I

INDEX OF REFERENCES TO POTENTIAL CONTAMINATION SOURCES

APPENDIX I
INDEX OF REFERENCES TO POTENTIAL CONTAMINATION SOURCES

Site	Designation	References (Page Numbers)
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Landfill No. 2	LF-2	5, 7, 11, 4-48, 4-51, 4-54, 4-69, 4-70, 4-74, 5-2, 5-3, 5-6, 6-4, 6-5, 6-13, 6-14, 6-20, F-3, H-5
Landfill No. 3	LF-3	5, 7, 11, 4-48, 4-51, 4-55, 4-69, 4-70, 4-74, 5-2, 5-3, 5-4, 5-6, 6-4, 6-6, 6-13, 6-14, 6-20, H-9
Landfill No. 10	LF-10	5, 7, 11, 4-48, 4-52, 4-57, 4-69, 4-70, 4-74, 5-2, 5-3, 5-5, 6-5, 6-13, 6-14, 6-20, F-4
Landfill No. 13	LF-13	5, 7, 10, 12, 4-48, 4-52, 4-58, 4-69, 4-70, 4-74, 5-2, 5-4, 6-6, 6-13, 6-15, 6-20, H-13
Landfill No. 16	LF-16	5, 7, 14, 4-48, 4-52, 4-59, 4-69, 4-70, 4-74, 5-2, 5-6, 6-7, 6-13, 6-17, 6-20, H-27
Landfill No. 22	LF-22	6, 9, 15, 4-47, 4-53, 4-61, 4-69, 4-70, 4-74, 5-2, 5-7, 6-8, 6-13, 6-18, 6-20, H-37
Landfill No. 25	LF-25	5, 8, 10, 3-15, 3-17, 4-49, 4-53, 4-62, 4-69, 4-70, 4-74, 5-1, 5-2, 6-3, 6-4, 6-11, 6-20, F-1, H-1

Site	Designation	References (Page Numbers)
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Chemical Disposal Site No. 3	CS-3	6, 9, 15, 4-47, 4-64, 4-65, 4-68, 4-69, 4-71, 4-74, 5-2, 5-7, 6-8, 6-13, 6-18, 6-20, H-35
Chemical Disposal Site No. 4	CS-4	6, 9, 15, 4-47, 4-64, 4-65, 4-68, 4-69, 4-71, 4-74, 5-2, 5-7, 6-9, 6-13, 6-18, 6-20, H-39
Hazardous Waste Storage Area No. 1	HW-1	5, 7, 12, 4-48, 4-64, 4-66, 4-68, 4-69, 4-71, 4-74, 5-5, 6-4, 6-7, 6-13, 6-16, 6-20, F-5, H-17
Firefighter Training Area No. 1	FTA-1	5, 7, 12, 4-64, 4-66, 4-67, 4-68, 4-69, 4-71, 4-74, 5-2, 5-4, 6-6, 6-15, 6-20, H-15
Firefighter Training No. 2	FTA-2	5, 7, 13, 4-64, 4-66, 4-68, 4-69, 4-71, 4-74, 5-5, 6-7, 6-16, 6-20, F-7, F-8, H-21
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Drum Storage Area No. 2	DS-2	5, 7, 14, 4-48, 4-64, 4-66, 4-68, 4-69, 4-71, 4-74, 5-2, 5-6, 6-8, 6-13, 6-17, 6-20, F-9, H-29

Site	Designation	References (Page Numbers)
Stormwater Drainage System, Zone No. 1	SDS-1	5, 7, 11, 4-44, 4-45, 4-46, 4-69, 4-72, 4-74, 5-2, 5-4, 6-6, 6-15, 6-20, F-6, H-11
Stormwater Drainage System, Zone No. 2	SDS-2	5, 7, 13, 4-44, 4-45, 4-46, 4-69, 4-72, 4-74, 5-2, 5-6, 6-7, 6-17, 6-20, H-23
Stormwater Drainage System, Zone No. 3	SDS-3	5, 7, 12, 4-44, 4-45, 4-46, 4-69, 4-72, 4-74, 5-2, 5-5, 6-7, 6-16, 6-20, H-19

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