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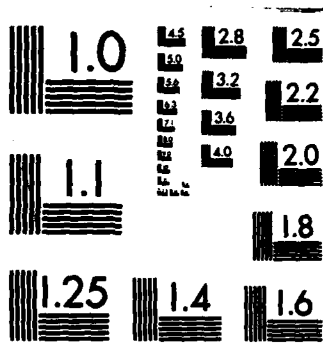

MICROCOPY RESOLUTION TEST CHART
NATIONAL BUREAU OF STANDARDS-1963-A

AD-A154 172

INSTALLATION RESTORATION PROGRAM
PHASE I: RECORDS SEARCH

COLUMBUS AIR FORCE BASE, MISSISSIPPI

Prepared for:

UNITED STATES AIR FORCE
HQ AFESC/DEVP
Tyndall AFB, Florida

and

HQ ATC/DEV
Randolf AFB, Texas

Submitted by:

REYNOLDS, SMITH AND HILLS
Jacksonville, Florida

ENVIRONMENTAL SCIENCE AND ENGINEERING, INC.
Gainesville, Florida

April 1985

APPENDIX J

BIBLIOGRAPHY

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20. ABSTRACT (Continue on reverse side if necessary and identify by block number)
A Phase I Initial Assessment under the Installation Restoration Program was conducted at Columbus Air Force Base, Columbus, Miss., from Mar. 19-24, 1984. Past and current employees were interviewed, records were reviewed, regulatory agencies were contacted, and ground reconnaissance was conducted. Past waste handling and disposal practices were evaluated, and 20 past waste disposal sites and one current site were identified. These sites were assessed using the Hazard Assessment Rating Methodology (HARM), but Phase II monitoring programs were not recommended for any of the sites. In addition, actions for three

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disposal sites are recommended, as well as upgrading the surface water monitoring program, for inclusion in the base environmental program.

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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 (ESE), Inc., under subcontract to Reynolds, Smith and Hills (RS&H), conducted the Phase I study of Columbus Air Force Base (AFB) and OLF Alpha, an auxiliary landing field. This volume contains the Initial Assessment/Records Search of Columbus AFB.

INSTALLATION DESCRIPTION

Columbus AFB is situated in eastern Mississippi in the northwest portion of Lowndes County. The base occupies 4,411 acres and the Buttahatchie and Tombigbee Rivers are to the north and west of the base, respectively. OLF Alpha is situated approximately 40 miles south of Columbus AFB. OLF Alpha occupies approximately 980 acres in Noxubee and Kemper Counties in eastern Mississippi.

Columbus AFB was originally activated in June 1941 and designated as Kaye Field in January 1942. The base served as a training base during World War II and was renamed Columbus Flying School in late 1942. The base was inactivated in 1946 and remained closed until 1951, when it was reopened to provide flight training during the Korean Conflict. In April 1955, the base real estate was transferred from the Air Training Command (ATC) to the Second Air Force of the Strategic Air Command

(SAC), and a building program was conducted by SAC until late 1958. From 1965 to 1969, aircraft and personnel from Columbus AFB were deployed in the western Pacific in support of U.S. military operations in Vietnam. Columbus AFB was returned to the jurisdiction of ATC in July 1969. Currently, Columbus AFB serves as the host unit for the 14th Flying Training Wing (FTW).

OLF Alpha was constructed as an auxiliary airfield for the naval air station (NAS) near Meridian, Miss. A commissioning of the installation was held in July 1969. OLF Alpha was used as an auxiliary field by the Navy until closure in 1972. It remained inactive until May 1978, at which time a lease agreement was reached between the U.S. Air Force and Meridian NAS, and OLF Alpha became the T-37 Auxiliary Airfield for Columbus AFB.

ENVIRONMENTAL SETTING

Environmental setting data relevant to past waste management practices at Columbus AFB are described in the following paragraphs. Due to the physical proximity of Columbus AFB and OLF Alpha, the environmental settings for both installations are nearly identical. The discussion below focused on Columbus AFB due to the absense of industrial facilities at OLF Alpha.

Columbus AFB is located in northeastern Mississippi and lies in the Tombigbee and Tennessee River Hill physiographic district of the Gulf Coastal Plain. The climate in the area is characterized by short, cool winters and long, warm summers, with approximately 56 inches of rainfall distributed fairly evenly throughout the year.

The Tombigbee and Buttahatchie Rivers are adjacent to Columbus AFB to the west and north, respectively. Surface water drainage from the base is primarily to the Tombigbee River, with the northeast portion of the base draining to the Buttahatchie River. The northwestern third of Columbus AFB is generally within the 100-year flood plain of both rivers; surface drainage in this area is poor, and ponding or flooding occurs occasionally. The remaining portion of Columbus AFB is above the 100-year flood plain, and this area is well drained by several small, perennial streams.

Soils on Columbus AFB are of the upper terrace Prentiss-Rosella-Steens Association (sand, silt, and clay loams) and the lower flood plain Cahaba-Prentiss-Guyton Association (silty and clayey loams). These soil associations cover approximately equal areas at Columbus AFB, with the upper terrace soils in the southeastern half of the base and the lower flood plain soils in the northwestern portion. These soils overlie gravel and sand deposits, which in turn overlie clay and sandy clay deposits.

Potable ground water at Columbus AFB is present in an unconfined shallow aquifer system and a deeper Cretaceous aquifer. The shallow aquifer is located in the gravel and sand units of the alluvial deposits. Depth to the top of the water table averages about 10 ft. Recharge occurs by downward infiltration of rainwater and subsurface runoff. Ground water movement is toward the northwest in the northern section of the installation.

This aquifer may be used as a source of water in domestic wells in the vicinity of the base and in four nonpotable wells on Columbus AFB. The deep aquifer consists of the Eutaw Group and the Tuscaloosa Formation. The Eutaw Aquifer is approximately 150 ft thick, with recharge occurring from infiltration in the outcrop belt. Regional water movement is in the down-dip direction to the west-southwest. The Tuscaloosa Aquifer consists of coarse-sand and gravel sections that yield up to 500 gpm.

The potable wells on Columbus AFB draw water from this highly permeable section of the formation. Recharge for this system occurs in the formation's outcrop area along the northeastern border of Mississippi and into the western sections of Alabama. Ground water in the Tuscaloosa Formation is under artesian conditions.

The climatic, surface hydrology, soils, and geohydrology conditions at Columbus AFB can be conducive for contaminant migration. Any contaminant migration would tend to be lateral rather than vertical due to clay and sandy clays underlying the shallow aquifer and the topographic influences of the Tombigbee and Buttahatchie Rivers. Migration of contaminants would be towards these river systems, primarily through sublateral shallow ground water flow and interception of the shallow ground water table by shallow streams or drainage ditches.

Faunal communities at Columbus AFB are limited by the development of the base land area. Undeveloped portions of Columbus AFB, primarily the southwestern corner and the base perimeter, consist of mixed pine hardwoods and pine plantation communities.

METHODOLOGY

During the course of the Phase I investigation of Columbus AFB, 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 reconnaissance inspections were conducted at past hazardous waste activity sites.

Sites identified at Columbus AFB 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. H. 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.

Fifteen sites were identified at Columbus AFB as having potential for environmental contamination and have been evaluated using the HARM system. There were no sites at OLF Alpha identified as having a potential for environmental contamination. 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 listed in Table 1. Site locations are shown in Fig. 1. Sites with higher HARM scores have a higher potential for environmental contamination and should be given first consideration for investigation in Phase II. Sites with lower HARM scores have a 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 scores.

RECOMMENDATIONS

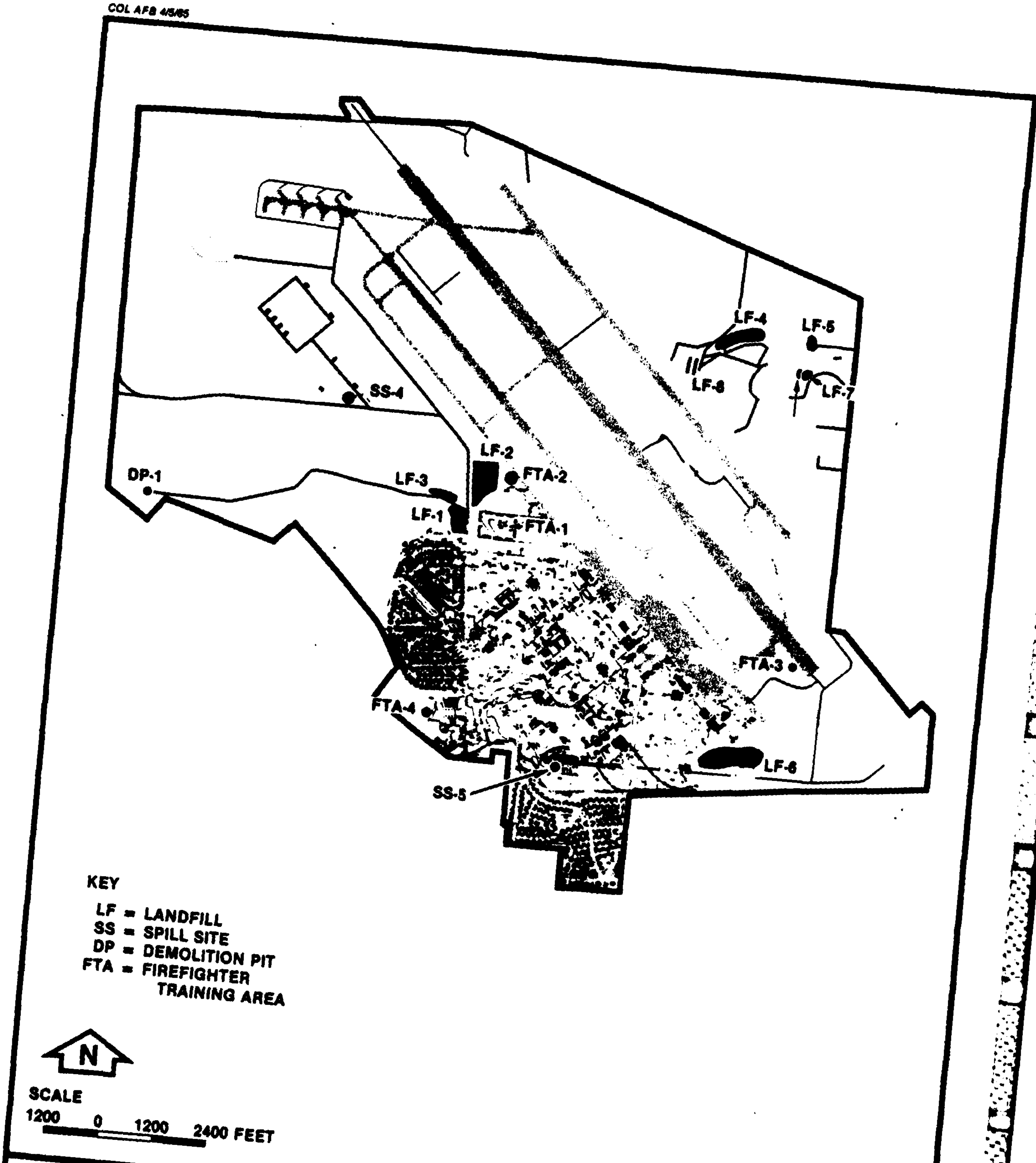
The recommended actions are intended to be used as a guide in the development and implementation of the Phase II study. The detailed recommendations developed for further assessment of environmental areas of concern are presented in Sec. 6.0. These recommendations are summarized as follows:

Landfill No. 3 Landfill No. 2 Firefighter Training Area No. 1 Landfill No. 1 Firefighter Training Area No. 2	Due to the proximity of these sites to each other, it is recommended that they be treated as a single monitoring area. Conduct surface geophysical surveys to determine if buried drums are present in landfills. Install two upgradient and four downgradient wells and monitor for parameters listed in Table 6.1-2.

Table 1. Priority Ranking of Potential Contamination Sources at Columbus AFB

Rank	Site Description	Designation	Date of Operation	Total Score
1	Landfill No. 3	LF-3	1960-1961	75
2	Spill Site No. 4	SS-4	1979	71
3	Spill Site No. 5	SS-5	1940s to present	67
4	Landfill No. 6	LF-6	1965-1974	66
5	Landfill No. 5	LF-5	1964-1967	65
6	Landfill No. 7	LF-7	1974-1976	64
	Firefighter Training Area No. 4	FTA-4	1951-1957	64
7	Landfill No. 2	LF-2	1956-1960	63
8	Landfill No. 4	LF-4	1962-1964	62
	Firefighter Training Area No. 1	FTA-1	1971-present	62
9	Landfill No. 1	LF-1	1943-1950s	61
	Firefighter Training Area No. 2	FTA-2	1958-1971	61
	Firefighter Training Area No. 3	FTA-3	1951-1957	61
10	Landfill No. 8	LF-8	1968-1969	47
11	Demolition Pit No. 1	DP-1	1958-1967	42

Source: ESE, 1985.



SOURCE: ESE, 1985.

Figure 1
LOCATIONS OF LANDFILLS, SPILL SITES, AND FIREFIGHTER TRAINING AREAS

INSTALLATION RESTORATION PROGRAM
Columbus Air Force Base

Spill Site No. 4	Install one upgradient and three downgradient wells. Take five soil/sediment samples from area surrounding the site and in the adjacent surface drainageway. Analyze all samples with pesticide/herbicide scan to include DDT, DDD, DDE, Kepone, Parathion, Aspon, and BHC.
Spill Site No. 5	Install one upgradient and two downgradient wells. Take three sediment samples from drainageway adjacent to tank farm. Analzye samples for parameters listed in Table 6.1-2.
Landfill No. 6	Install one upgradient and three downgradient wells. Analyze samples for parameters listed in Table 6.1-2.
Landfill No. 5 Landfill No. 7 Landfill No. 4	Due to the proximity of these sites to each other, it is recommended that they be treated as a single monitoring area. Conduct surface geophysical surveys to determine if buried drums are present in landfills. Install two upgradient and four downgradient wells and monitor for parameters listed in Table 6.1-2.
Firefighter Training Area No. 4	Install one upgradient and three downgradient wells. Analyze samples for parameters listed in Table 6.1-2.
Firefighter Training Area No. 3	Install one upgradient and three downgradient wells. Analyze samples for parameters listed in Table 6.1-2.
Demolition Pit No. 1	Test soils for explosives residue and leachable metals using the U.S. Environmental Protection Agency extraction procedure (EP) toxicity test.
Landfill No. 8	Continue existing radiological monitoring program.

Finally, although the underground waste petroleum, oils, and lubricants (POL) holding tanks located in Bldg. 322 are not suspected to be leaking or the site of significant spillage, it is recommended that a thorough inspection of the tanks be conducted. This thorough inspection is recommended because the tanks are more than 30 years old and in an environment potentially conducive to rusting and/or corrosion. The tanks play a vital role in the current waste disposal practices at Columbus AFB and, due to the tank capacities, any loss of structural integrity could have major environmental consequences.

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 hazardous contamination and to control hazards to health and welfare that resulted from these past operations. The IRP will be the basis for response actions on USAF installations under the provisions of the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) of 1980, as clarified by Executive Order 12316.

1.2 PURPOSE, AUTHORITY, AND SCOPE OF THE ASSESSMENT

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

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 Columbus Air Force Base (AFB), Miss., and its satellite installation, OLF Alpha, an auxiliary landing field, with funds provided by the Air Training Command (ATC). See Fig. 1.2-1 for the general locations of Columbus AFB and OLF Alpha. 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 Columbus AFB 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 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 March 1984. The following team of professionals was involved:

- C.R. Neff, P.E., Environmental Engineer and Team Leader, 8 years of professional experience.

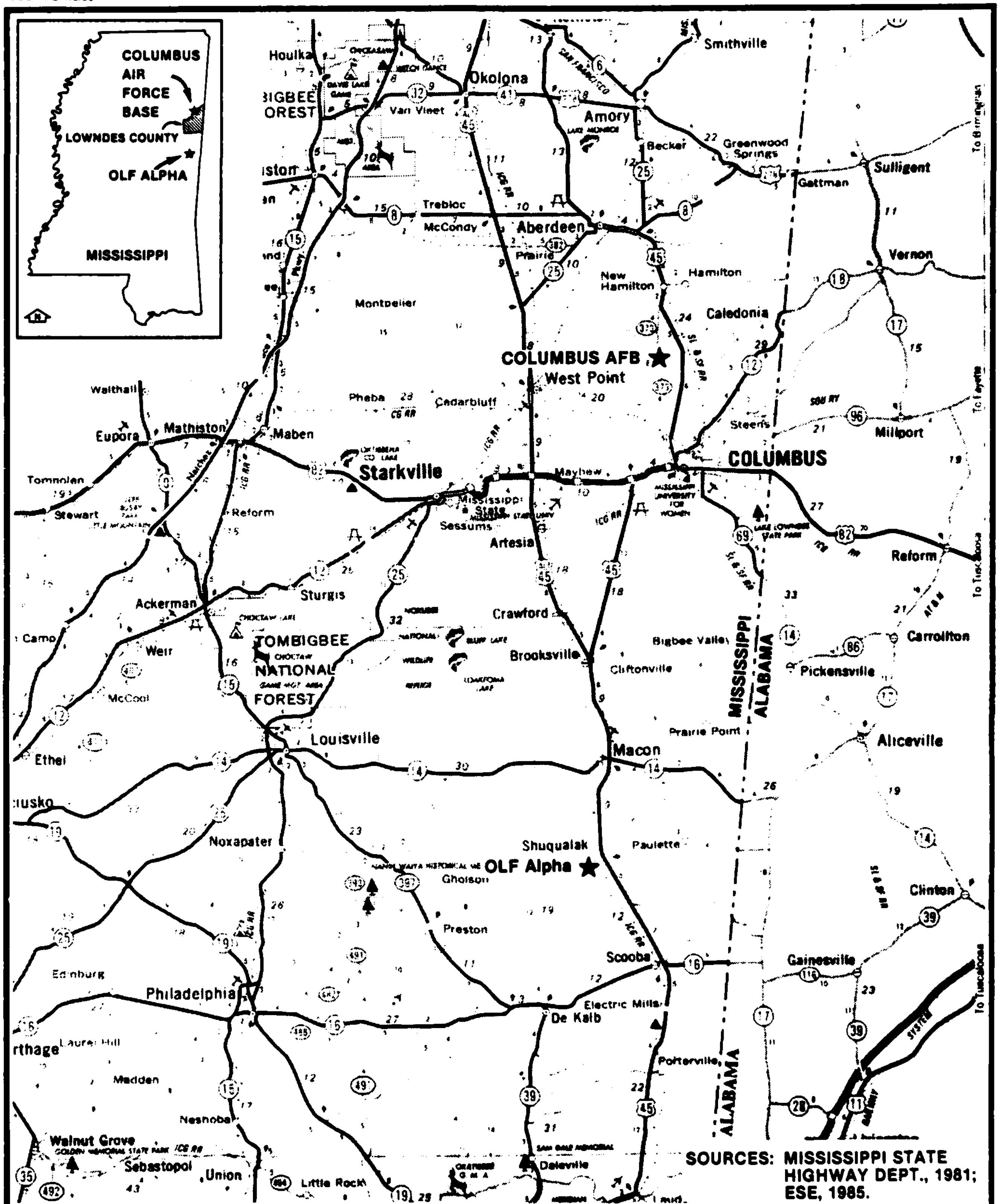


Figure 1.2-1
GENERAL LOCATION MAP FOR COLUMBUS AFB AND OLF ALPHA

INSTALLATION RESTORATION PROGRAM
Columbus Air Force Base

- o M.A. Keirn, Ph.D., Chemist and Biologist, 20 years of professional experience.
- o D.F. McNeill, Hydrogeologist, 3 years of professional experience.

Biographical data concerning these individuals are presented in App. B.

1.3 METHODOLOGY

The methodology utilized in the Columbus AFB 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 past personnel associated with the 14th Air Base Group (ABG), 14th Civil Engineering Squadron (CES), USAF Hospital Bioenvironmental Engineering Services (BES), 14th Organizational Maintenance Squadron (OMS), 14th Field Maintenance Squadron (FMS), 14th Student Squadron (SS), 14th Flying Training Wing (FTW), and tenant organizations on the base. A list of USAF interviewees, by position and approximate period of service, is presented in App. C.

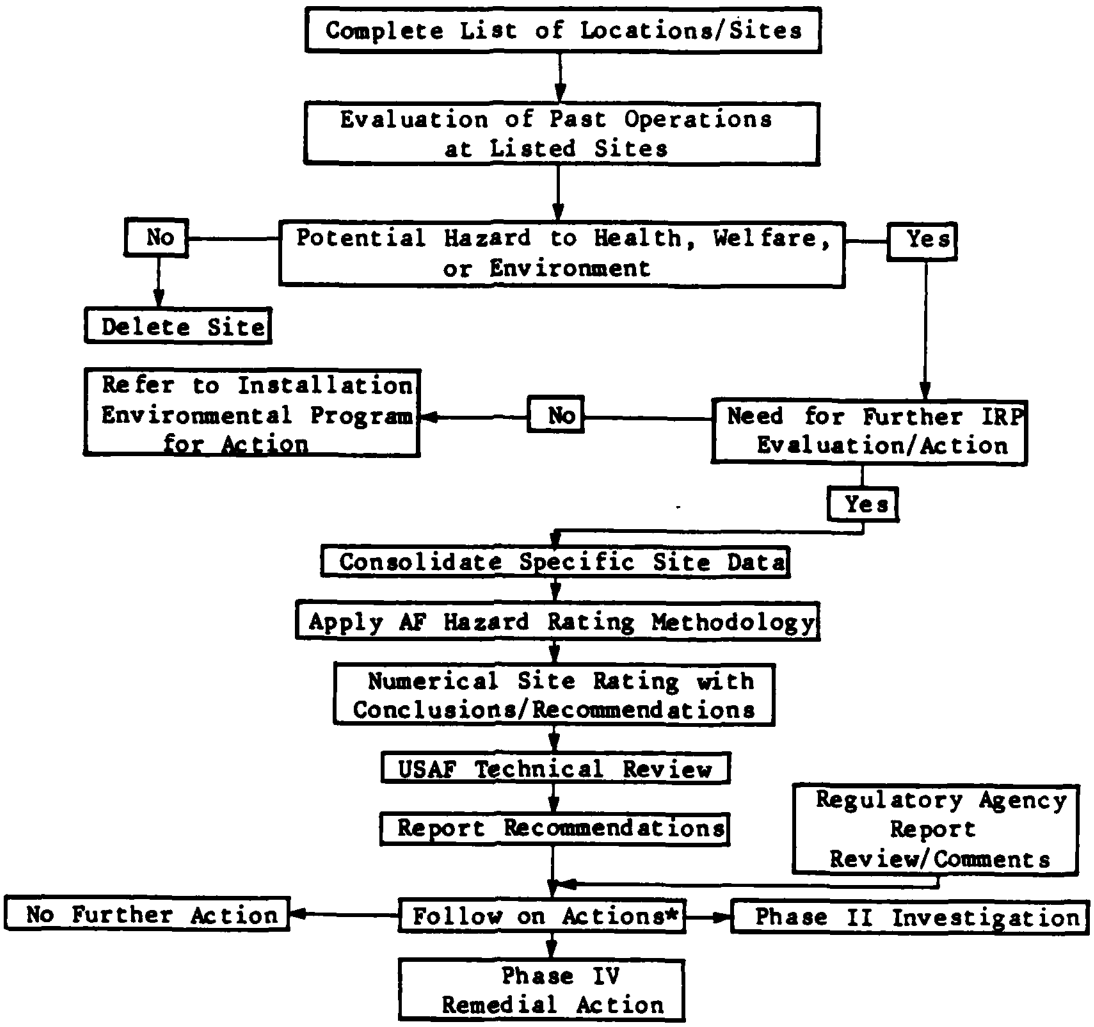
Concurrent with the base interviews, the applicable Federal, state, and local agencies were contacted for pertinent base-related environmental data. The outside records centers and agencies contacted and personnel interviewed are listed in App. C.

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 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 nearby drainage ditches or surface water bodies, and (3) visual inspection of these water bodies for any obvious signs of contamination or leachate migration. A helicopter overflight scheduled for the team had to be cancelled due to adverse weather conditions. Photographs from the site ground reconnaissance are presented in App. G.

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. The sites, which were evaluated using the HARM procedures, were also reviewed with regard to future land use restrictions.

Phase I Installation Restoration Program Records
Search Flow Chart



* Beyond Scope of Phase I

SOURCE: AFESC, 1984.

Figure 1.3-1
DECISION PROCESS

INSTALLATION RESTORATION PROGRAM
Columbus Air Force Base

2.0 INSTALLATION DESCRIPTION

2.1 LOCATION, SIZE, AND BOUNDARIES

Columbus AFB is located in the northwest portion of Lowndes County in eastern Mississippi (see Fig. 2.1-1). The Buttahatchie and Tombigbee Rivers are to the north and west of the base, respectively. The city of Columbus, in Lowndes County, is located approximately 10 miles south of Columbus AFB. Columbus AFB currently contains 4,411 acres comprised of runways and airfield operations, industrial areas, housing, recreational areas, and open space.

OLF Alpha is located in Noxubee and Kemper Counties in eastern Mississippi, 2 miles south of Shuqualak and approximately 40 miles south of Columbus (see Fig. 2.1-2). The airfield is in a rural area and is surrounded by woodlands, forest land, and farmland. OLF Alpha covers approximately 980 acres comprised of a runway, fire station, and open space. Due to the size and minimal level of activities conducted at OLF Alpha, it is discussed separately in App. K.

2.2 HISTORY

Columbus AFB began as a training facility for fighters and bombers during the rearming of America prior to World War II. Civic and business leaders of Columbus proposed the building of an airbase near their city, and the War Department approved the construction of a pilot training base on June 26, 1941. Under the control of the Southeastern Air Corps Training Center, Maxwell Field, Ala., the new airbase was used as an advanced pilot training facility for twin-engine aircraft. In November, 100 enlisted men arrived to man the first skeleton organizations of the base.

No name had been designated or suggested for the new base until Jan. 22, 1942. On that date, the War Department announced the installation's designation would be Kaye Field, honoring the late Capt. Sam Kaye, a World War I ace pilot.

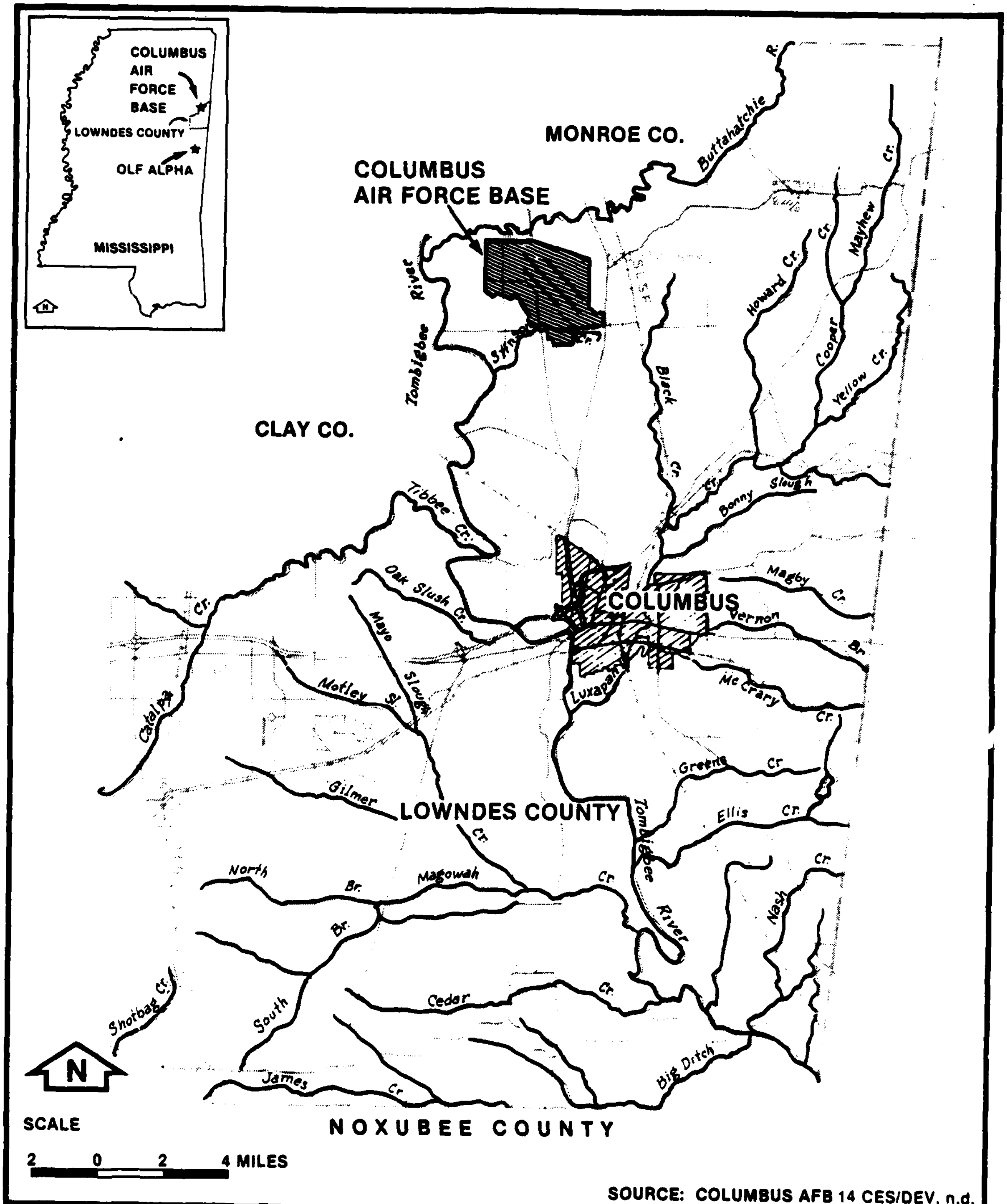


Figure 2.1-1
LOCATION MAP

INSTALLATION RESTORATION PROGRAM
Columbus Air Force Base

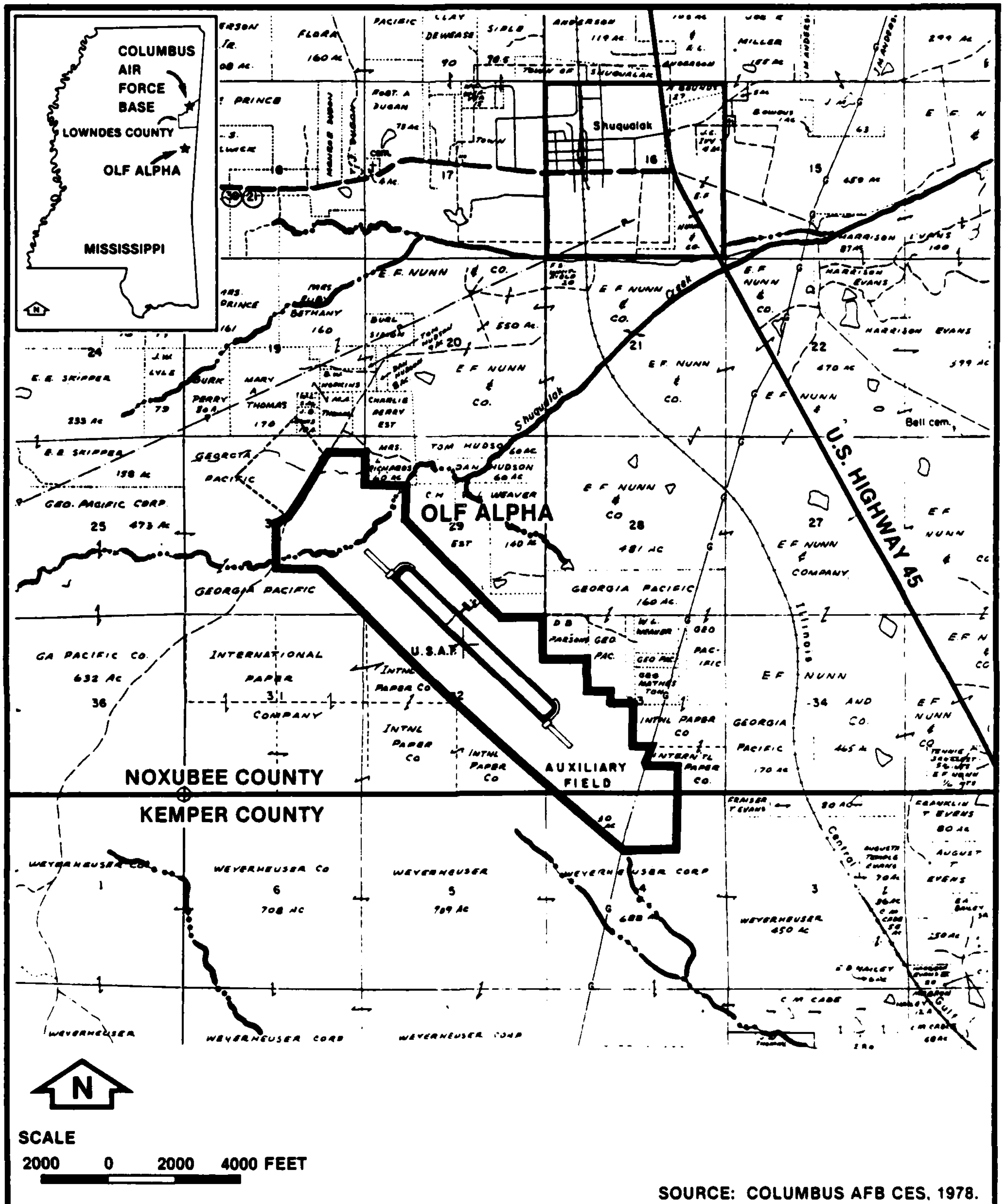


Figure 2.1-2
OLF ALPHA LOCATION MAP

INSTALLATION RESTORATION PROGRAM
Columbus Air Force Base

On Feb. 9, 1942, the first training class was begun with 25 cadets who had begun training at Barksdale Field, La. Thirty twin-engine aircraft--9 Lockheeds and 21 AT-8s--also arrived at that time. This small force gradually increased until 195 pilots per month were graduated. The number of aircraft onbase reached a total of 140.

One month after the first pilot training class graduated from Kaye Field, the name of the base was changed to Columbus Flying School. The name was changed due to its similarity with the Navy's Key Field in Meridian, Miss.

A total of 7,766 students came to Columbus AFB for pilot training during the World War II period. When the war ended in 1945, the base strength had reached a peak of 2,300 enlisted men, 300 officers, and an average of 250 pilot cadets per class.

The base was closed in 1946 and remained inactive until 1951 when it was reopened as a contract flying school. Operated by California Eastern Airways, Inc., the base provided both primary and basic flight training for pilots during the Korean Conflict.

On Apr. 1, 1955, ATC transferred the base real estate to the Second Air Force of the Strategic Air Command (SAC). An active building program was instituted by SAC to prepare the old base for its new mission. In December 1957, SAC announced that Columbus AFB would become the home of a B-52 squadron and a KC-135 jet-refueling tanker squadron. On July 1, 1958, the 4228th Strategic Wing was activated. In 1959, 4228th ABG was reorganized to form the 4228th Combat Support Group. The first Stratotanker landed on the new runway on Jan. 7, 1959, and the first B-52 arrived from Carswell AFB on May 28, 1959.

Beginning in the summer of 1965, aircraft and personnel of Columbus AFB were deployed in a temporary duty status to the western Pacific, in support of U.S. military operations in Vietnam.

After more than 10 years as an SAC base, jurisdiction of Columbus AFB was returned to ATC with the deactivation of the 454th Bombardment Wing on July 1, 1969. The 3650th Pilot Training Wing assumed command, and Columbus AFB resumed pilot training activity. The host organization on Columbus AFB since June 9, 1972, has been the 14th FTW, which replaced the 3650th Pilot Training Wing.

OLF Alpha was constructed as an auxiliary airfield for the naval air station near Meridian, Miss. A commissioning of the installation was held on July 14, 1969. OLF Alpha was used as an auxiliary field by the Navy until 1972, at which time OLF Alpha was closed. It remained inactive until May 1978.

Since 1969, Columbus AFB has conducted undergraduate pilot training for ATC. The 37th Flying Training Squadron (FTS) used the Marion County, Ala. airport as the Hamilton Auxiliary Airfield for T-37 jet-pilot training. However, because of several geographic hazards in the vicinity of Hamilton Auxiliary Airfield, coupled with the fact that the uncontrolled airport also served the aircraft of the local civilian population, 37th FTS desired to procure another auxiliary airfield to be used only by T-37 aircraft. It was determined that OLF Alpha would provide the solution to the problem because it met the basic criteria for T-37 operations. Negotiations were begun with the Meridian Naval Air Station to acquire use of the field by USAF. A lease agreement was reached, and in May 1978, OLF Alpha became the new T-37 Auxiliary Airfield.

2.3 MISSION AND ORGANIZATION

The primary mission of the 14th FTW is to conduct undergraduate pilot training as prescribed by the Course Training Standards. Additionally, the 14th ABG is responsible for supporting training directives and for operating Columbus AFB and supporting the various tenant units at the base.

The tenant organizations at Columbus AFB are listed below. Descriptions of the major base tenant organizations and their missions are presented in App. D.

1948th Communications Squadron
24th Weather Squadron, Det. 2
Office of Special Investigations--Det. 811
3314th Management Engineering Squadron--Det. 8 (ATC)
Area Defense Council, Det. QD2G
Defense Investigative Service (DIS)
Operating Location E Field Training Det. 405 (ATC)
American Red Cross
Operating Location C Commissary Det. 3 (AFCOMS)
Defense Property Disposal Office (DPDO)

3.0 ENVIRONMENTAL SETTING

3.1 METEOROLOGY

Temperature and precipitation data for Columbus AFB are summarized in Table 3.1-1. The average annual rainfall for the area (based on 25 years of data) is 56.5 inches and, as seen in Table 3.1-1, the rainfall is distributed fairly evenly throughout the year. The pan evaporation rate for the base is approximately 54 inches per year, resulting in a net precipitation (i.e., rainfall minus evaporation) of 2.5 inches per year.

3.2 GEOGRAPHY

3.2.1 PHYSIOGRAPHY

Columbus AFB lies within the Tombigbee and Tennessee River Hill physiographic district of the Gulf Coastal Plain. In general, this physiographic district is characterized by low, smoothly rounded hills of 40 or 50 feet (ft) relief and larger hills and ridges with up to 200 ft relief. The area underlying Columbus AFB has been extensively modified by the Tombigbee River and its tributaries during several erosional/depositional cycles. The base itself is situated on distinct upper and lower terrace deposits that were formed as the Tombigbee River migrated westward. Columbus AFB is located in the Tombigbee River drainage basin and lies within the recharge area for the Eutaw Aquifer system. Relief at Columbus AFB ranges from 180 ft in the northwest section of the base to 223 ft in the southwest section of the installation.

3.2.2 SURFACE HYDROLOGY

Columbus AFB lies in the Gulf Coastal Plain, and the local surface hydrology of the site is strongly influenced by the physiographic characteristics. All surface water runoff and drainage at Columbus AFB originates on the installation. There are two fairly distinct

Table 3.1-1. Temperature and Precipitation Data for Columbus AFB

Month	Mean Temperature (°F)*	Mean Precipitation (inches)
January	43.5	5.6
February	47.0	5.2
March	53.9	6.1
April	63.4	5.8
May	70.9	3.9
June	77.8	3.2
July	80.6	5.6
August	80.0	3.7
September	74.6	2.9
October	63.5	3.0
November	52.7	3.9
December	45.8	5.9

* °F = degrees Fahrenheit.

Source: SCS, 1979.

hydrologic regimes at Columbus AFB--a flood plain region and a disected watershed region. The surface drainage features at Columbus AFB are shown in Fig. 3.2-1. The flood plain area is roughly located on the base property northwest of a line drawn from the base's southwest and northeast corners. The disected watershed area is predominately southeast of this line. The major drainageways at Columbus AFB are shown in Fig. 3.2-1.

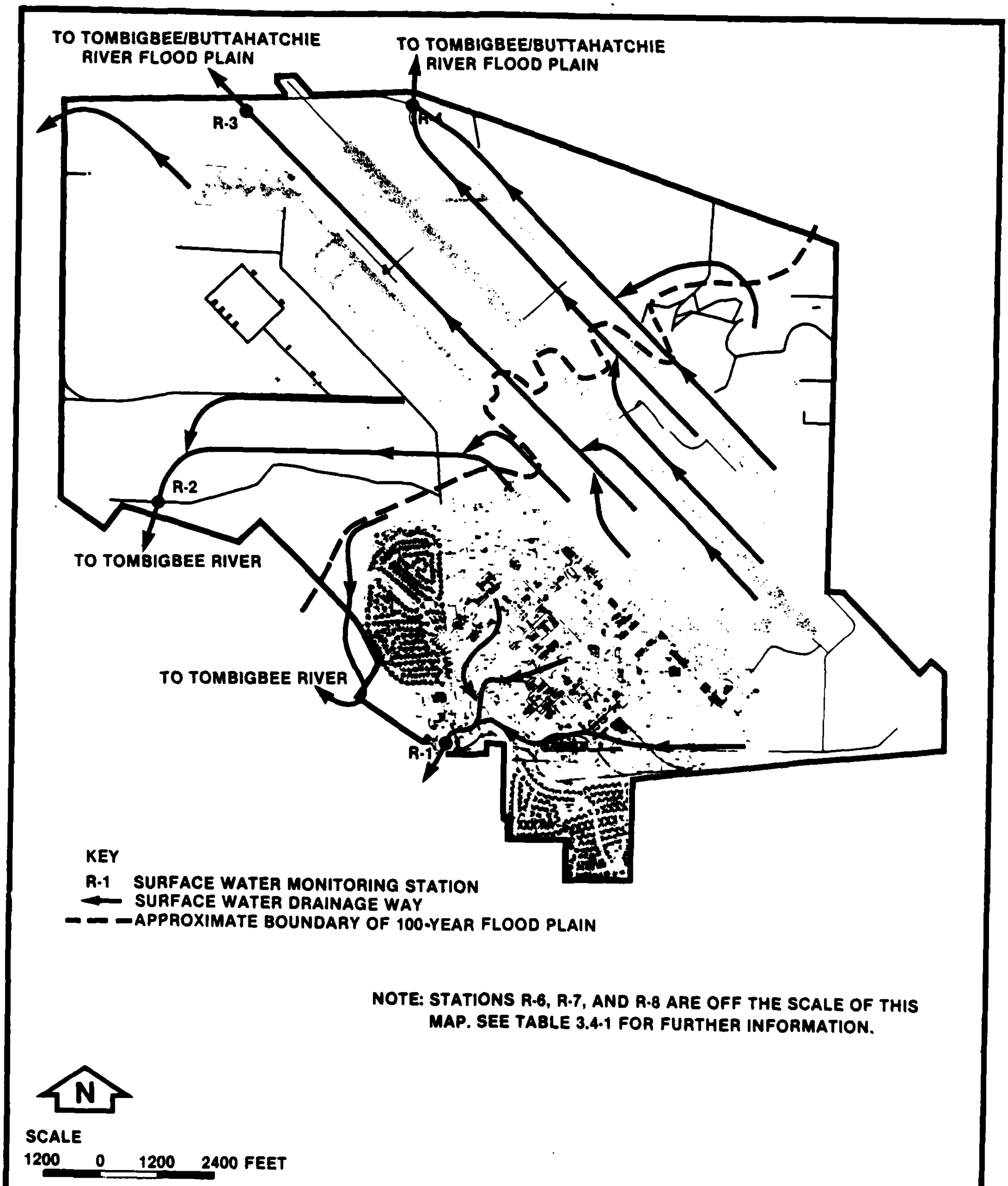
In the flood plain portion of the base, few natural drainageways are present, and topographic relief is slight to nonexistent. This area has occasional ponding and flooding caused by either local rainfall events (ponding) or the backwater effects of flooding on the Tombigbee River. Drainage in this area is predominately sheetflow towards the Tombigbee and Buttahatchie Rivers, with some drainage canals.

The disected watershed portion of the base is an area with moderate to slight topographic relief and several small natural drainageways at the foot of the area's rolling hills. Drainage in this area is largely confined to these small streams, and due to the small size of the various watersheds, the streams are perennial in nature. Drainage in the cantonment area of Columbus AFB is also greatly influenced by the storm sewer system in the area. This portion of Columbus AFB is above the 100-year flood stage. Surface drainage is towards the Tombigbee River.

3.3 GEOLOGY

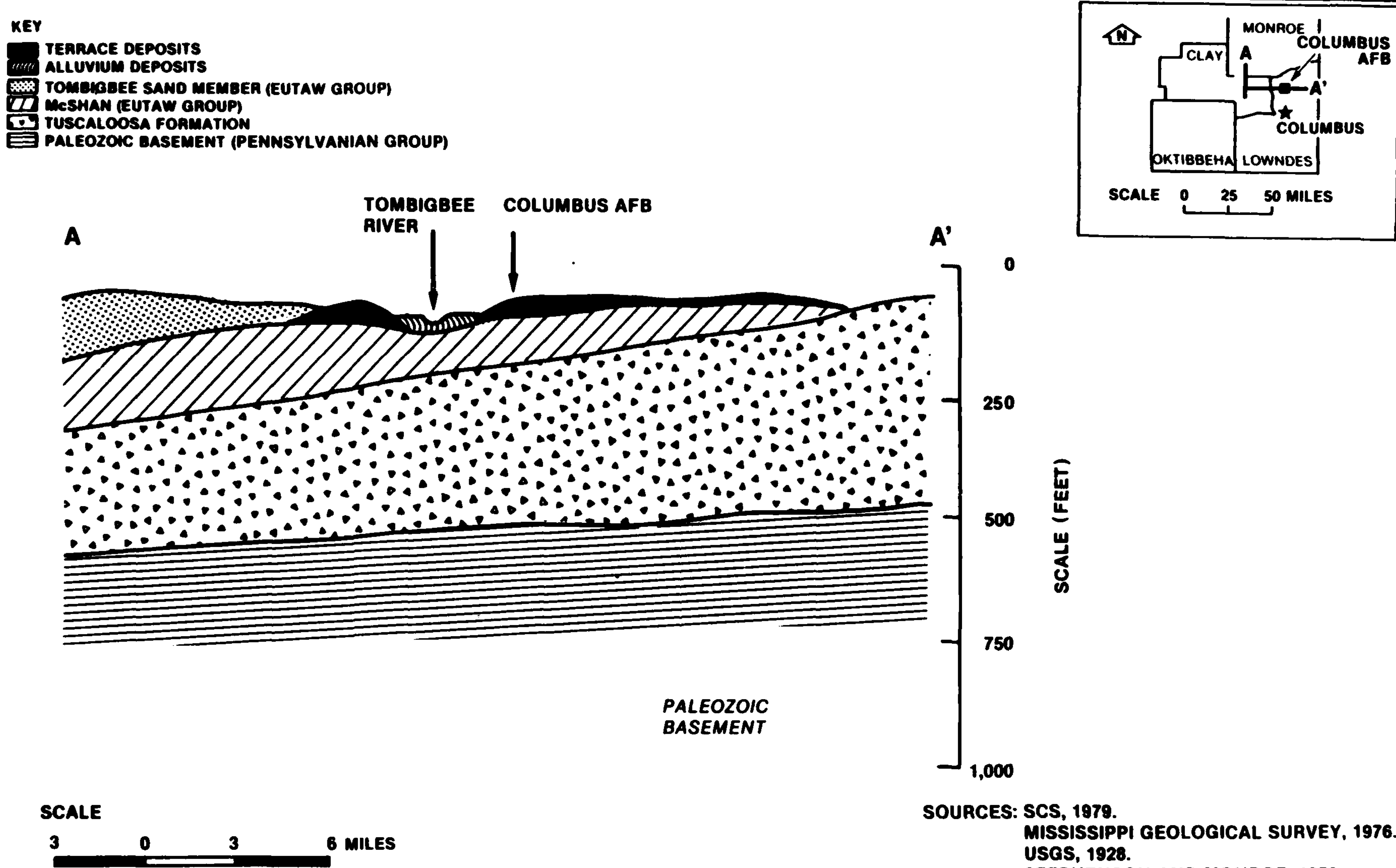
3.3.1 GEOLOGIC SETTING

Columbus AFB and the surrounding area are underlain by Cretaceous age sediments (see Fig. 3.3-1). These deposits dip to the west at approximately 30 ft per mile and occur at a depth of between 20 and 30 ft below land surface. The shallow deposits underlying the installation consist of fluvial sediments associated with the Tombigbee River. These sediments are Pleistocene and Holocene in age and cover most of the older Cretaceous deposits. The installation is situated



SOURCE: ESE, 1984.

Figure 3.2-1 SURFACE DRAINAGE FEATURES AT COLUMBUS AFB	INSTALLATION RESTORATION PROGRAM Columbus Air Force Base



SOURCES: SCS, 1979.
MISSISSIPPI GEOLOGICAL SURVEY, 1976.
USGS, 1928.
STEPHENSON AND MONROE, 1970.
ESE, 1984.

Figure 3.3-1
GEOLOGIC CROSS SECTION

INSTALLATION RESTORATION PROGRAM
Columbus Air Force Base

within the outcrop belt of the Cretaceous Eutaw Group, with the Cretaceous Selma Group outcropping to the west and the Tuscaloosa Formation to the east. Basement rock in the Columbus AFB area consists of Pennsylvanian shales and siltstones that range from 500 to 700 ft below land surface in the vicinity of the installation (Table 3.3-1).

The Tuscaloosa Formation crops out to the east of Columbus AFB and dips gently to the west with no surficial exposures present on the installation. The Tuscaloosa Formation occurs at approximately 200 to 300 ft below land surface near Columbus AFB and, petrologically, is composed of sands, clays, gravels, and lignite. The basal section of the formation consists mainly of gravel and sandy clay. The gravels are largely composed of angular to subangular, coarse chert derived from Paleozoic limestones of the basement complex. In the upper section, sands and clays overlie the basal gravel. The sand is generally fine, gray to green, ferruginous, micaceous, and often locally cemented to a hard sandstone. The clays are dark gray to brown and consist of thin beds or lenses; bentonite is present in the upper sections of the Tuscaloosa Formation.

Overlying the Tuscaloosa Formation is the Cretaceous Eutaw Group; this group consists of the lower McShan Formation and the overlying Tombigbee Sand Member. The McShan Formation is a shallow water marine deposit that rests unconformably on the Tuscaloosa Formation. The unit is predominantly fine-grained to medium-grained, micaceous, glauconitic sand with clay and shale in the middle and lower portions. The McShan Formation underlies Columbus AFB below the surficial fluvial deposits and has an approximate thickness of 150 ft. Because of its predominantly clayey nature, the McShan Formation acts as an aquiclude.

The overlying Tombigbee Sand Member is located west of Columbus AFB and is composed of approximately 100 ft of massive glauconitic sand with lesser amounts of silt and argillaceous material. Some sections of the unit exhibit a calcareous cement that forms a hard, resistant sandstone.

Table 3.3-1. Stratigraphy of Consolidated and Unconsolidated Deposits Near Columbus AFB

Era	System	Series	Group	Geologic Unit	Approximate Thickness (ft)	Lithology	Water-Bearing Characteristics
Cenozoic	Tertiary	Pleistocene		River Terrace Alluvium Deposits	20-30	Basal chert gravel overlain by sand, sandy silt, and silty clay	Unconfined water-table aquifer, local domestic wells
Mesozoic	Cretaceous	Gulfian	Eutaw Group	Tombigbee Sand Member	100	Gray, massive-bedded, very fine glauconitic marine sand with mixtures of silt and clay	Moderate hydraulic conductivity, well yield approximately 400 gpm
				Lower Eutaw-McShan Formation	100-300	Fine to very fine well-sorted, glauconitic marine sand interbedded with thin, gray, montmorillonitic clay	Moderate hydraulic conductivity, well yield approximately 400 gpm
			Tuscaloosa Group	Tuscaloosa Formation	300-800	Fine- to medium-grained sand and silty clays	Moderate hydraulic conductivity, well yield approximately 400 gpm
Paleozoic	Paleozoic Basement						

Sources: ESE, 1984; Mississippi Bureau of Geology, 1981; Mississippi Geological Survey, 1976; USGS, 1928; Stephenson and Monroe, 1970.

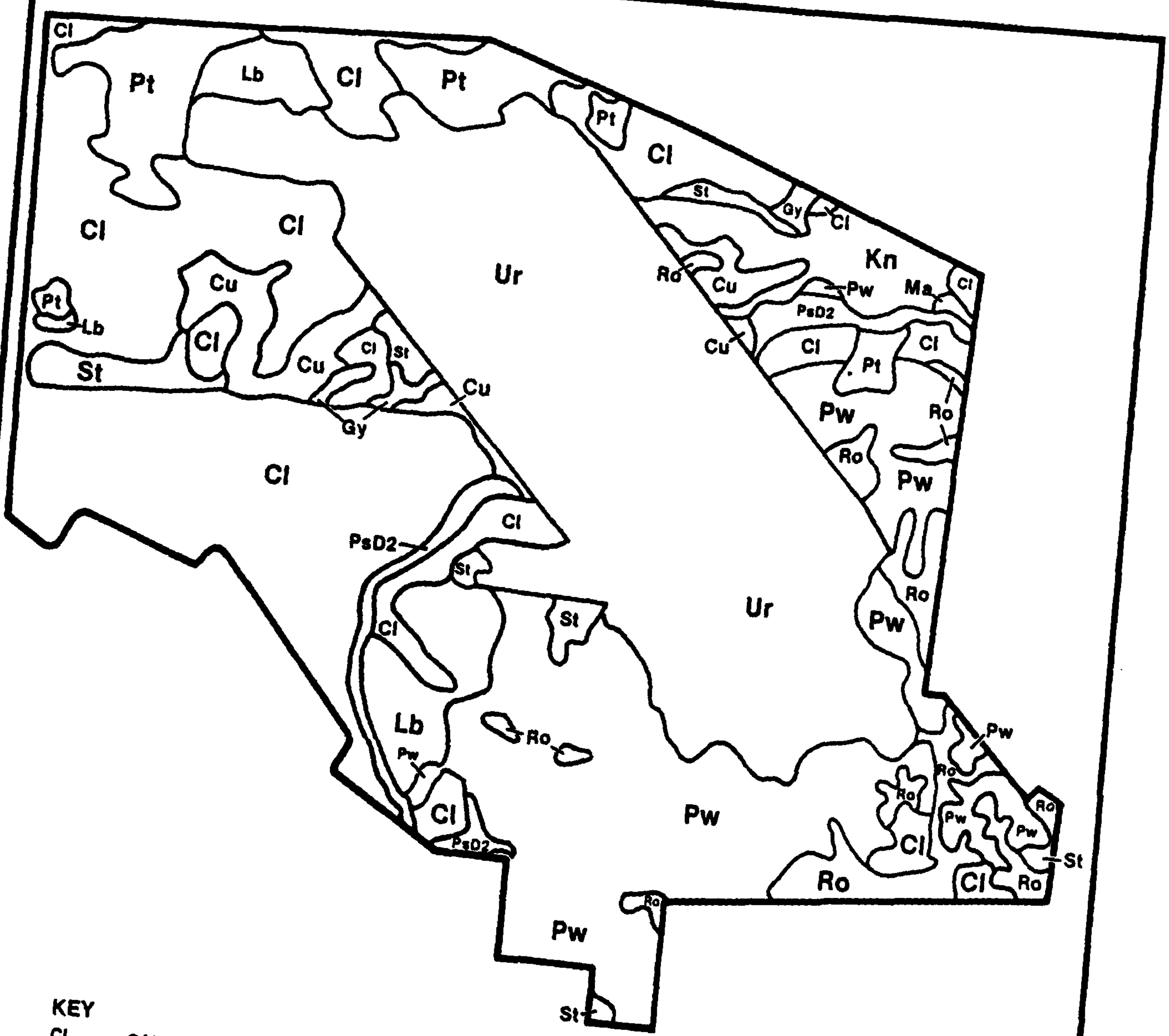
Overlying the Cretaceous Eutaw Group in the vicinity of Columbus AFB are Pleistocene and Holocene alluvial or terrace deposits (see Fig. 3.3-1). These deposits are the result of westward migration of the Tombigbee River. Topographic analysis near Columbus AFB reveals a number of terrace deposits that were formed as the river cut downward and migrated to the west. Thickness of the alluvial deposits ranges from 20 to 30 ft at Columbus AFB. The typical sequence shows a chert gravel-sand unit grading upward to a sandy-clayey unit and then to a silty-pure clay section at the surface. Many of the adjacent surface mining and abandoned borrow pits on Columbus AFB are and were directed at removing the gravel material in these terrace deposits.

3.3.2 SOILS

The U.S. Department of Agriculture, Soil Conservation Service (SCS, 1979) has mapped and identified the soils on Columbus AFB. Two regional soil associations are present on the installation: the upper terrace Prentiss-Rosella-Steens Association and the lower flood plain Cahaba-Prentiss-Guyton Association. The Prentiss-Rosella-Steens Association consists of moderately well to poorly drained soils with a 0- to 5-percent slope; the soils consist of sand, silt, and clay loams. The Cahaba-Prentiss-Guyton Association consists of moderately well to poorly drained soils with a 0- to 2-percent slope; these soils consist of silty and clayey loams.

Detailed soil mapping by SCS (1979) shows 12 distinct soil types present at Columbus AFB (see Fig. 3.3-2). These soil types represent slight differences in composition and texture.

Shallow soil borings obtained from foundation studies for buildings at Columbus AFB were used to construct a general shallow soil profile (see Fig. 3.3-3). The boring depths range from a few feet to approximately 30 ft. The four deep borings used in the profile show a 3- to 9-ft surficial clay unit over a relatively thin sand or clayey-sand unit. Below these units, a 15- to 21-ft gravel section occurs. This, in turn,



KEY

Cl	CAHABA, SILT-SAND-CLAY LOAM	PsD2	PIKEVILLE-SMITHDALE, SAND-CLAY LOAM
Cu	COLUMBUS, SILT-CLAY LOAM	Pt	PITS, SAND-GRAVEL BORROW PITS
Gy	GUYTON, SILT LOAM	Pw	PRENTISS/URBAN LAND, SAND-FINE SAND LOAM
Kn	KINSTON, CLAY-SANDY CLAY LOAM	Ro	ROSELLA, SILT LOAM
Lb	LATONIA, SAND LOAM	St	STEENS, FINE SANDY LOAM
Ma	MANTACHIE, SAND-CLAY LOAM	Ur	URBAN LAND, REWORKED, PAVED AREAS

N

SCALE
1200 0 1200 2400 FEET

SOURCE: SCS, 1979.

Figure 3.3-2
SURFACE SOIL MAP

INSTALLATION RESTORATION PROGRAM
Columbus Air Force Base

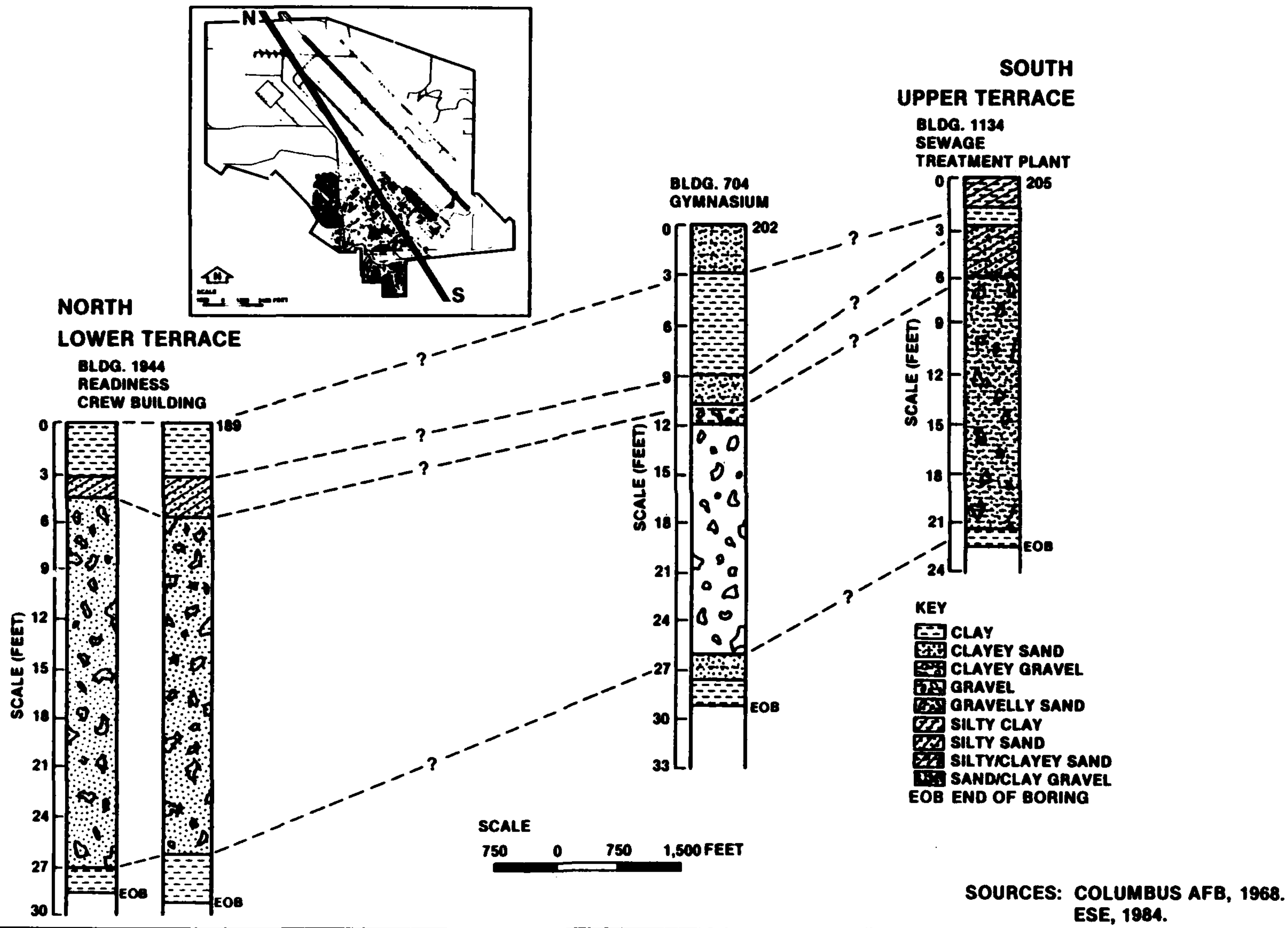


Figure 3.3-3
SHALLOW SOIL PROFILE

INSTALLATION
RESTORATION PROGRAM
Columbus Air Force Base

is underlain by a clay or sandy-clay unit where the borings terminate. These soil profiles are typical of river terrace and river flood plain deposits.

3.3.3 GEOHYDROLOGY

Regional Ground Water Regime

Ground water occurrences in the Columbus AFB region have been documented by the Mississippi Geological Survey and USGS. Ground water in the region occurs in two different aquifer systems--the unconfined shallow aquifer system and the confined aquifer system.

Unconfined Shallow Aquifer System

Water in the unconfined shallow aquifer is found in the gravel and sand units of the alluvial deposits. Depth to the top of the water table averages approximately 10 ft. The base of the aquifer is not defined in the soil borings and well logs but is most likely the silty-clayey unit underlying the sand and gravel. Recharge of the shallow aquifer at Columbus AFB occurs locally (i.e., no offbase recharge areas) by downward infiltration of rainwater and surface water runoff. Based on water level measurements taken the Tennessee Valley Authority (TVA) in seven shallow wells on the northern section of the base, ground water flow direction is toward the northwest (TVA, 1984). Discharge of the shallow aquifer is to the Tombigbee and Buttahatchie Rivers located west and north of the base. This aquifer may be used as a source of water in domestic wells in the vicinity of the base and supplies four nonpotable wells on Columbus AFB.

Confined Aquifer System

The confined aquifer system in the vicinity of Columbus AFB consists of the Eutaw Aquifer system, Tuscaloosa Aquifer system, and the Pennsylvanian Aquifer system.

The Eutaw Aquifer consists of the lower McShan Formation and the overlying Tombigbee Sand Member. The McShan Formation underlies

Columbus AFB and serves as an important aquifer for domestic wells in the vicinity of the installation. The aquifer is approximately 150 ft thick, with recharge occurring from infiltration in the outcrop belt which is located in the northeastern section of the state approximately 10 miles east of Columbus AFB. Regional water movement is in the down-dip direction to the west-southwest.

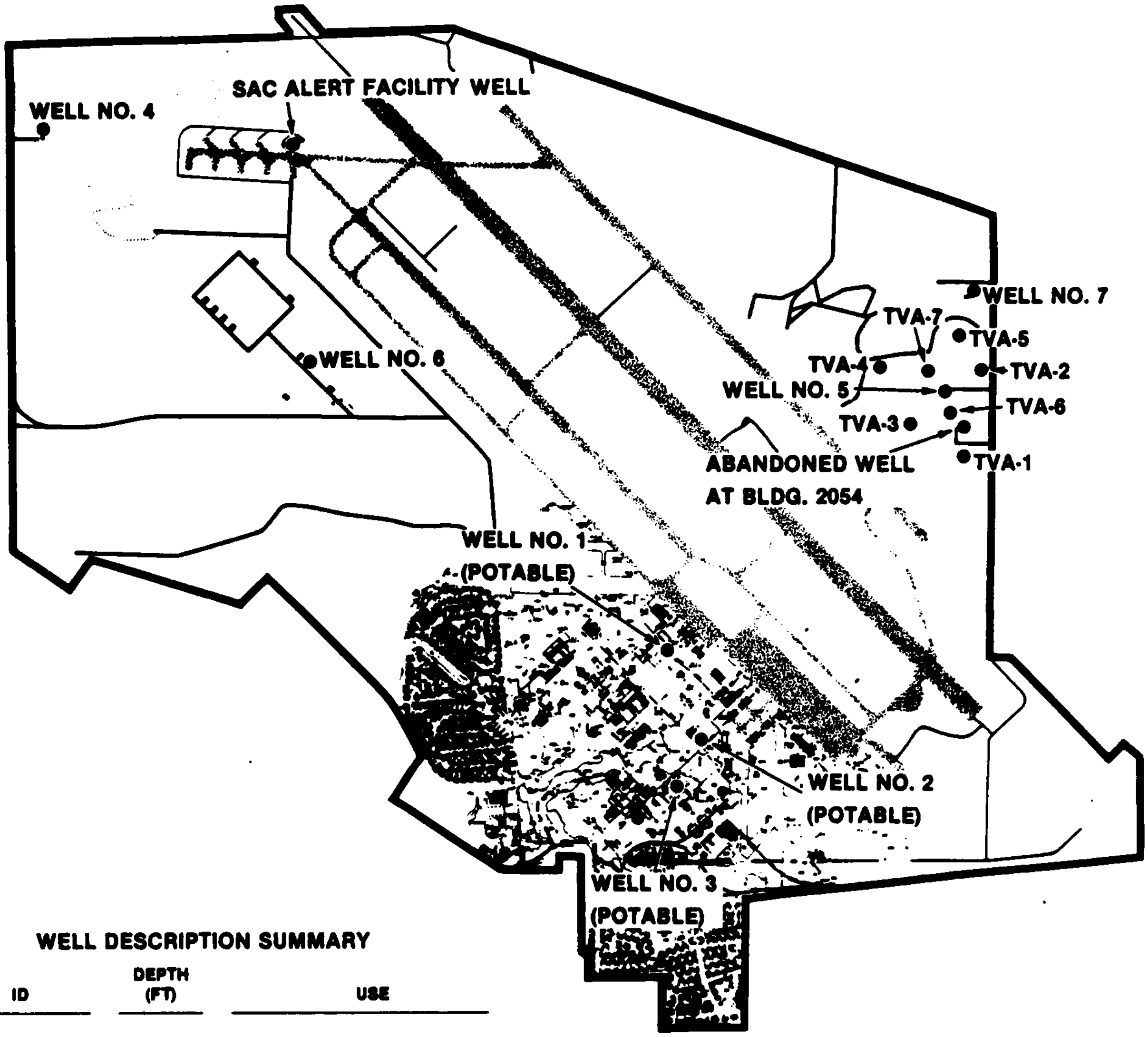
The Tuscaloosa Aquifer serves as an important aquifer for public and industrial water supply throughout most of northeastern Mississippi. Wells in the highly permeable zones in the aquifer can yield more than 500 gpm. The aquifer extends from the southern portion of Lowndes County to just east of Starkville and then north toward Houston, Miss. Recharge for this system occurs in the outcrop area along the northeastern border of Mississippi and into the western sections of Alabama. Water movement in this aquifer is in the down-dip direction toward the west-southwest. Water in this system is usually artesian, except where heavy pumping has lowered the potentiometric surface below land surface elevation.

The Pennsylvanian Aquifer underlying Columbus AFB is capable of producing fresh water from a few porous sandstones and limestones in the predominantly shale and siltstone sequence. Electrical logging in the vicinity of Columbus AFB has shown fresh water occurring in selective units of the Pennsylvanian units from approximately 700 to 940 ft. Recharge for the system occurs in the outcrop area of Alabama, with regional water movement to the west. Recharge may also be occurring by downward leakage from the basal gravels of the Tuscaloosa Formation. Currently, this deep aquifer system is not used due to the shallow sources of high quality water in the Tuscaloosa and Eutaw Aquifers.

Installation Water Wells

Potable water on Columbus AFB is supplied by three onbase wells. The locations of the three onbase wells, numbered 1 through 3, are shown on Fig. 3.3-4. The three potable production wells on Columbus AFB draw

COL AFB 4/5/85



WELL DESCRIPTION SUMMARY

ID	DEPTH (FT)	USE
NO. 1	456	POTABLE
NO. 2	445	POTABLE
NO. 3	425	POTABLE
NO. 4	N/A	NONPOTABLE USES
NO. 5	125	NONPOTABLE USES
NO. 6	N/A	NONPOTABLE USES
NO. 7	40	NONPOTABLE USES
BLDG. 2054	251	NOT IN USE
SAC ALERT	475	FIRE PROTECTION SUPPLY
TVA1-7	<50	WATER-LEVEL MONITORING

KEY

TVA TENNESSEE VALLEY AUTHORITY WELLS

N

SCALE

1200 0 1200 2400 FEET

SOURCES: COLUMBUS AFB, 1941.
TVA, 1984; ESE, 1985.

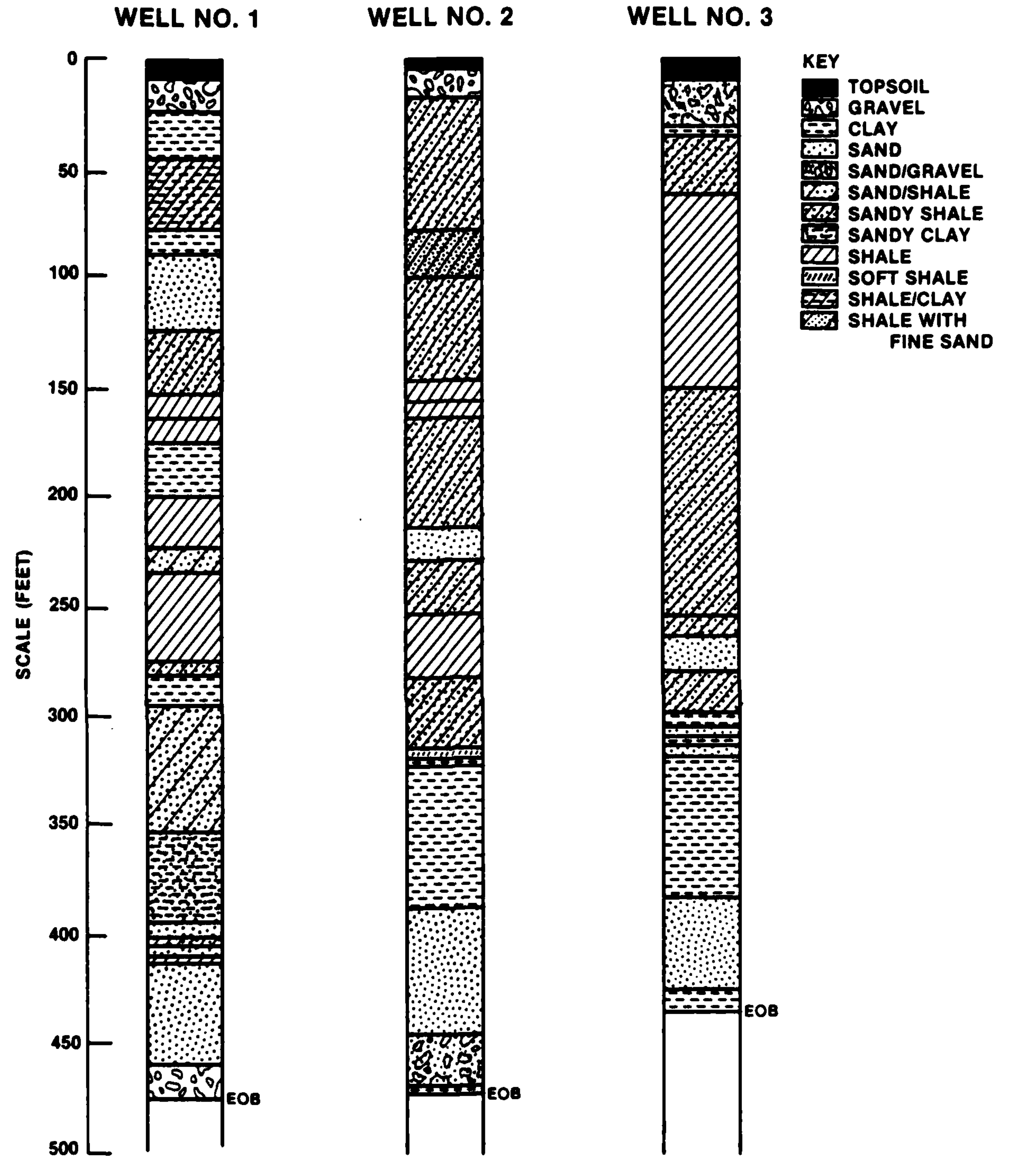
Figure 3.3-4
WELL LOCATIONS

INSTALLATION RESTORATION PROGRAM
Columbus Air Force Base

water from the extremely coarse sand and gravel sections (see Fig. 3.3-5). The wells range in depth from 425 to 456 ft. The wells are screened for 40 ft into the sand and gravel units of the Tuscaloosa Formation. Construction details of these wells are shown in Table 3.3-2 and in App. F. The wells exhibit good construction with a 2-inch annular ring of grout around the casing and 45 ft of gravel pack around the screened interval. The wells were most likely installed using the cable tool method because that method was commonly employed during the time period they were constructed. The water demand at Columbus AFB is seasonal, with high water demand occurring in the summer months [approximately 1 million gallons per day (MGD)] and low water consumption during the winter months (approximately 0.4 MGD). During periods of well usage, the three wells are pumped simultaneously at a rate of approximately 350 gallons per minute (gpm). With this pumping rate, during periods of high water demand, well usage is almost continuous. As a result of constant pumping and water withdrawal in the vicinity of the installation, the three formerly artesian wells now have water levels 30 ft below land surface. In 1980, the pumps in the three potable wells were lowered to accommodate a water level decrease of approximately 40 ft since initial installation.

A fourth deep potable well was constructed at the SAC Alert Facility in early 1960, with a depth of approximately 475 ft. Detailed logs and well construction data were not available for this well. The well functioned as a source of potable water for the small facility. In 1979, a potable water line was run from the main installation due to decreasing water quality from excessive iron concentrations. Currently, the well is used as a water source for fire protection only.

Four additional shallow wells are maintained on the installation for sanitary and livestock purposes. The two antenna facilities in the northwest and northeast sections of the base have shallow wells (Nos. 4 and 5). Well No. 5 has a diameter of 4 inches and a depth of 125 ft; the construction details for Well No. 4 were not available from



SOURCE: COLUMBUS AFB, 1941.

Figure 3.3-5
WELL LOGS FOR INSTALLATION WATER SUPPLY WELLS

INSTALLATION RESTORATION PROGRAM
Columbus Air Force Base

Table 3.3-2. Construction Details for Columbus AFB Water Supply Wells

Well	Year of Construction	Total Depth (ft)	Casing Depth (ft)	Screen Length (ft)	Construction Method	Well Diameter (inches)	Well Capacity (gpm)	Screen Interval (ft below surface)	Ground Elevation (ft-msl)
1	1941	456	408	40	Cable Tool	18	350-400	414-454	200.8
2	1941	445	396	40	Cable Tool	18	350-400	402-442	201.5
3	1942	425	378	40	Cable Tool	18	300-350	381-421	202.8

msl = Mean sea level.

Source: Columbus AFB, 1941.

Columbus AFB. These wells most likely draw from the shallow water table aquifer and the upper sections of the McShan Formation. The wells are used for sanitary purposes and do not function as a source of potable water. The third shallow well (No. 6) is located in the ammunition storage complex and serves a similar function as a sanitary water source and, if necessary, as fire control. The fourth shallow well (No. 7) is located at the horse stables in the northeast section of the base. This well is used to supply water for maintenance of the stable horses. The well is 30 ft in depth, with a 4-inch diameter; the water source is the unconsolidated terrace deposits.

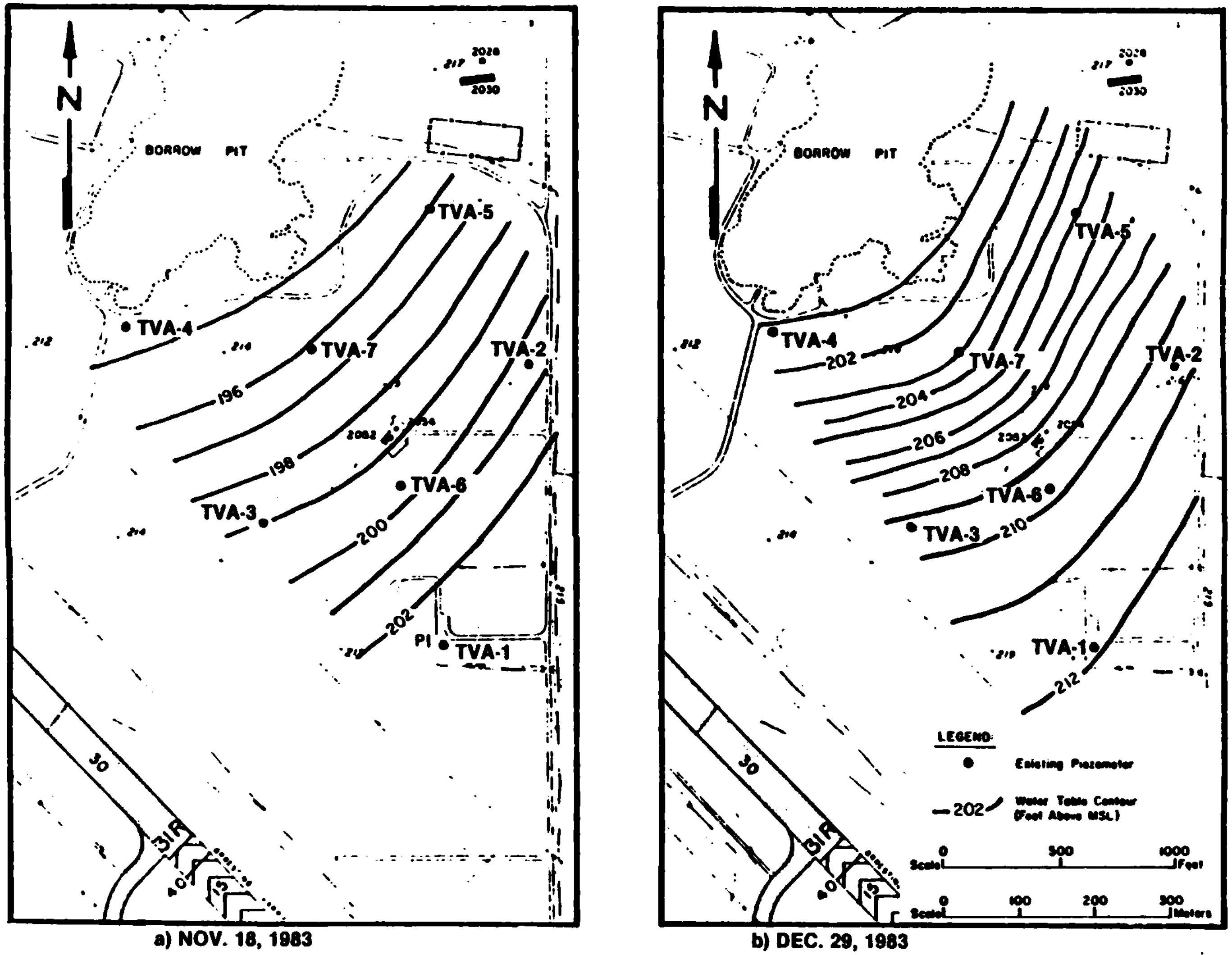
Seven shallow monitor wells (TVA-1 through TVA-7) have been installed by TVA near the eastern boundary of the base, north of the runway (see Fig. 3.3-4). The purpose of these wells is to monitor ground water movement and patterns over an extended period of time. Based on water level elevations from these wells, ground water flow direction is to the northwest on this section of the installation (see Fig. 3.3-6).

An abandoned well, located near Bldg. 2054, has a diameter of 4 inches and is 251 ft deep (see Fig. 3.3-4). This well has a submersible pump set at 238 ft and was taken out of service abandoned in early 1981, with no plans for future use, because it was not needed for supply.

3.4 WATER QUALITY

3.4.1 SURFACE WATER QUALITY

As described in Sec. 3.2.2, Columbus AFB lies in the drainage of the Tombigbee River and Buttahatchie River basins. The northwestern third of the installation, which contains the runway and the former nuclear weapons storage and maintenance area, lies within the 100-year flood plain of this river system. Surface runoff from the eastern and northern portion of the installation flows into the Buttahatchie River. Surface runoff from the western portion of the installation, which includes the cantonment area and housing areas, flows into the Tombigbee River.



SOURCE: TVA, 1984.

Figure 3.3-6
WATER-TABLE ELEVATIONS IN THE SHALLOW AQUIFER ON THE NORTHEASTERN SECTION OF COLUMBUS AFB

INSTALLATION RESTORATION PROGRAM
Columbus Air Force Base

The Columbus AFB sanitary sewage treatment plant (STP) discharges chlorinated secondary effluent through an outfall line to the Tombigbee River approximately 2 miles west of the installation. The Tombigbee and Buttahatchie Rivers adjacent to Columbus AFB are classified by the state of Mississippi for the propagation of fish and wildlife. No Storage and Retrieval (STORET) data from the EPA data base are available for the Buttahatchie River, Tombigbee River, or other surface drainages adjacent to Columbus AFB.

The Columbus AFB environmental monitoring program includes routine water quality monitoring at the STP, at four locations on Columbus AFB, and at three locations in the Tombigbee River. These latter include the river above the STP outfall, the river below the STP outfall, and the outfall itself. The locations of the four monitoring stations on Columbus AFB are shown in Fig. 3.4-1, and descriptions of the monitoring stations and base activities that discharge at these stations are listed in Table 3.4-1. Data are available for the period 1977 to 1984 at the BES Office for each of the four sampling stations on Columbus AFB and for Stations R-6 and R-7, located in the Tombigbee River. Data for 1982 and 1983 are presented for each of these stations in Table 3.4-2. The water quality data generally indicate that the STP discharges as well as the stormwater drainage discharges at Columbus AFB are free of oil and grease contamination, phenols, and are soft to moderately soft circumneutral waters. The data in Table 3.4-2 indicate that, at the National Pollutant Discharge Elimination System (NPDES) monitoring stations, water quality complies with applicable Mississippi water quality criteria.

It should be noted, however, that the station locations and the monitoring parameters included in this program have been designed to identify relatively large releases (i.e., spills) of contaminants from current operations. The 96-microgram-per-liter (ug/l) phenol result in October 1983 at Station R-6 upstream of the STP outfall is not attributable to Columbus AFB activities. Phenol analysis frequently

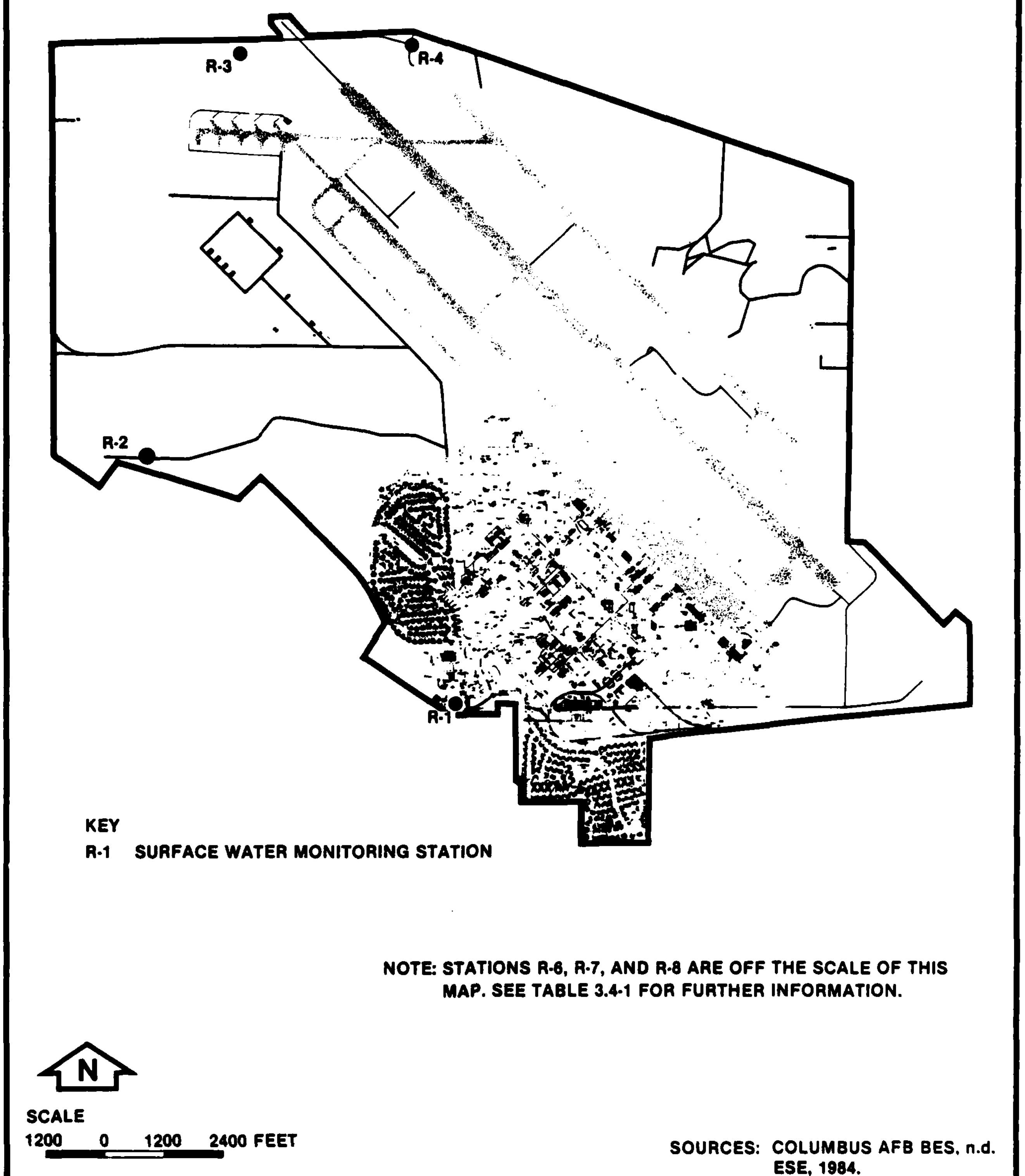


Figure 3.4-1
LOCATION OF SURFACE WATER MONITORING STATIONS INCLUDED IN THE COLUMBUS AFB ENVIRONMENTAL MONITORING PROGRAM

INSTALLATION RESTORATION PROGRAM
Columbus Air Force Base

Table 3.4-1. Surface Water Quality Stations Monitored in the Columbus AFB Environmental Monitoring Program

Station No.	State of Mississippi Identification*	Station Description	Remarks
R-1	0040-NS-001	South Gate Stream	Monitors water quality in drainage from the cantonment, housing, and main fuel storage areas. Receives storm-water discharges from all industrial operations and from fuel oil tank farm.
R-2	0040-NS-002	Drainage ditch (adjacent to southwest installation boundary)	Monitors water quality in surface runoff from former nuclear weapons storage area. Currently, storm water from Entomology Shop (Bldg. 1809) and the former ammunition burn pit discharges into this ditch.
R-3	0040-NS-003	Alert Facility Creek	This discharge is improperly located in Columbus AFB BES (n.d.). Monitors water quality in storm drainage from north end of runways and former nuclear weapons storage areas.
R-4	0040-NS-004	North Gate Creek	Monitors stormwater quality in drainage from runway areas. Also monitors water discharging from borrow pits to the north of the former landfill area.
R-6	00040-NS-006	Tombigbee River above sewage outfall	Monitors background water quality in Tombigbee River prior to discharge of Columbus AFB secondary effluent.
R-7	00040-NS-007	Tombigbee River below sewage outfall	Monitors water quality in Tombigbee River after mixing of underwater discharge of Columbus AFB secondary effluent.
R-8	00040-NS-008	Sewage outfall pipe at river, before entering river	Monitors quality of Columbus AFB secondary effluent immediately before discharge to Tombigbee River.

* NPDES Permit No. MS0001473.

Sources: Department of the Air Force, Directorate of Civil Engineering, 1981.
Columbus AFB BES, n.d., 1981, 1983a, 1983f.
ESE, 1984.

Table 3.4-2. Surface Water Quality Data from Columbus AFB Surface Water Monitoring Locations and STP Effluent in 1983

Parameter	Station R-1 Range	R-1 *	R-2 Range	R-2 *	R-3 Range	R-3 *	R-4 Range	R-4 *	R-6 Range	R-6 *	R-7 Range	R-7 *	R-8 Range	R-8 *
Flow (cfs)	0.77-17.75	24	0-4.26	24	0-40.8	24	0-3.42	24	—	—	—	—	—	—
pH (Standard Units)	6.8-7.0	24	6.8-7.1	18	6.8-7.0	12	6.8-7.3	13	6.8-7.5	5	6.8-7.2	4	7.0-7.5	3
Oil and Grease (mg/l)	0.5-2.9	4	<0.3-0.6	2	—	—	0.3-1.6	2	—	—	—	—	—	—
Suspended Solids (mg/l)	4-39	7	4-35	5	0-15	3	4	1	—	—	—	—	—	—
Dissolved Oxygen (mg/l)	7.8-12.4	7	8.2-12.0	3	9.4-11.4	5	10-11	3	—	—	—	—	—	—
BOD (mg/l)	0.95	1	—	—	—	—	—	—	—	—	—	—	—	—
Conductivity (umhos/cm)	72-110	4	73-75	2	54-56	2	52-63	2	48-139	4	87-225	5	—	—
Total Dissolved Solids (mg/l)	24-78	4	60-81	2	36-50	2	46-47	2	—	—	41-199	5	—	—
Phenols (ug/l)	<10	4	<10	2	<10	2	—	—	<10-96†	4	<10	5	<10	4
Orthophosphate (mg-P/l)	<0.10	4	<10	—	—	—	<10	2	—	—	—	—	—	—
Nitrate-Nitrogen (mg-N/l)	<0.02-0.5	4	—	—	—	—	—	—	—	—	—	—	—	—
2,4-D (ug/l)	0.06-0.09	4	—	—	—	—	—	—	—	—	—	—	—	—
Residual Chlorine (mg/l)	0	20	0	18	—	—	—	—	—	—	—	—	—	—
Total Chromium (ug/l)	—	—	—	—	—	—	—	—	—	—	—	—	<50-244**	4

* Number of observations.
† Three observations were <10 ug/l, and one observation was 96 ug/l.
** Three observations were <50 ug/l, and one observation was 244 ug/l.

NOTE: Descriptions of station locations are presented in Table 3.4-1.

Abbreviations:
cfs = cubic feet per second.
BOD = biochemical oxygen demand.
umhos/cm = micromhos per centimeter.
ug/l = micrograms per liter.

Sources: Columbus AFB BES, 1982, 1983b, 1983c, 1983f.
ESE, 1984.

gives misleading results on environmental samples as a result of phenolic natural plant breakdown products which give positive results but which do not indicate the presence of anthropogenic phenol releases.

3.4.2 GROUND WATER QUALITY

As described in Sec. 3.3, Columbus AFB is underlain by three aquifers. The potable water supply for Columbus AFB is taken from the Tuscaloosa Aquifer. A fourth potable well, no longer in use, is completed in the Tuscaloosa Aquifer. Four shallow wells, which are not for potable use, tap the shallow water table aquifer and the upper sections of the McShan Formation. The locations of these wells are shown in Fig. 3.3-4. Water quality data for both the potable and nonpotable water supply wells at Columbus AFB are available at the BES Office (Columbus AFB BES, 1983d). Available analyses include the health-related National Interim Primary Drinking Water Regulation (NIPDWR) compounds and trihalomethanes. All of the parameter levels were nondetectable at NIPDWR at the maximum contaminant level (MCL).

3.5 BIOTIC COMMUNITIES

Columbus AFB and the OLF Alpha Auxiliary Airfield are situated within the Tombigbee and Tennessee River hills district of the Gulf Coastal Plain. Features of this region which influence its biological resources are broad valleys, smoothly rounded hills, and occasional ridges with steep slopes (Columbus AFB, 1975, Revised 1978). Aside from natural physiographic conditions, the major forces controlling the biological conditions on the sites are from current land management practices. Plant communities on the sites are those associated with urban and ruderal lands, mixed pine hardwoods, and pine plantations.

Urban areas represent a significant portion of the Columbus AFB site. This land use type supports vegetation and wildlife associated with maintained grounds around buildings, athletic and training fields, golf courses, and drainage ditches. Dominant grasses in this community are Bermuda grass (*Cynodon dactylon*) and Emerald Zoysia grass (*Zoysia* sp.).

Tree and shrub species in urban areas include both native species and introduced ornamentals [i.e., red maple (Acer rubrum), sweetgum (Liquidambar styraciflua), magnolia (Magnolia grandiflora), oaks (Quercus spp.), yellow poplar (Liriodendron tulipifera), flowering dogwood (Cornus florida), American holly (Ilex opaca), common boxwood (Buxus sempervirens), azalea (Azalea sp.) and scarlet firethorns (Pyracantha coccinea) (Columbus AFB, 1982)].

Wildlife found in this area include rock dove (Columba livia), mourning dove (Zenadia macroura), Carolina wren (Thyrothorus ludovicanus), red-bellied woodpecker (Melanerpes carolinus), blue jay (Cyanocitta cristata), American robin (Turdus migratorius), common grackle (Quiscalus quiscula), bats, mice, rats, squirrels, and other cosmopolitan species.

Ruderal areas account for a major portion of the land on the installation in the form of open areas adjacent to runways and roads, landfills, and agricultural lands. Native plant species found in ruderal areas include broomsedge (Andropogon sp.), plumegrass (Erianthus sp.), switchgrass (Panicum virgatum), beggarticks (Bidens sp.), tick-clover (Desmodium sp.), and others. Agricultural lands support mainly soybeans, corn, and pastureland for grazing livestock. Wildlife diversity is low in ruderal areas due to limited habitat resources.

Wooded lands on and adjacent to the site support hardwood bottomlands associated with the river flood plains and pine plantations on drier upland areas. Loblolly pine (Pinus taeda) is the dominant planted pine and is used for pulp and sawtimber. Similar to the ruderal areas, the pine plantations have low plant species diversity and, therefore, support a limited number of wildlife species. Hardwood bottomlands on the site are subject to periodic flooding. This condition limits man's activities and, as a result, the bottomland community is in a more natural state compared with other onsite areas. Flood plain forests are composed primarily of tupelos (Nyssa spp.), sweetgum, oaks (Quercus spp.), and bald cypress (Taxodium distichum). Other tree species in this community include red maple, silver maple (Acer saccharinum), ash (Fraxinus sp.), willow (Salix nigra), cottonwood (Populus deltoides), hackberry (Celtis laevigata), and loblolly pine. Mammals which occur in lowlands on the site include white-footed and cotton mice (Peromyscus spp.), rice rats (Oryzomys palustris), cotton rats (Sigmodon hispidus), cottontail and swamp rabbits (Sylvilagus spp.), gray squirrel (Sciurus carolinensis), southern flying squirrel (Glaucomys volans), and Virginia white-tailed deer (Odocoileus virginianus). Hardwood bottomlands provide habitat for a variety of herpetofauna, including several species of turtles, lizards, snakes, salamanders, toads, and frogs. Some of the birds species which utilize bottomlands on the site are wading birds, wood duck (Aix sponsa), Cooper's hawk (Accipiter cooperii), red-shouldered hawk (Buteo lineatus), barred owl (Strix varia), yellow-billed cuckoo (Coccyzus americanus), pileated woodpecker (Dryocopus pileatus), and several species of passerines (song birds). It is reported that no threatened species are in the Columbus AFB area (Columbus AFB, 1975, Revised 1978).

3.6 ENVIRONMENTAL SETTING SUMMARY

Columbus AFB is located in northeastern Mississippi and lies in the Tombigbee and Tennessee River Hill physiographic district of the Gulf Coastal Plain. The climate in the area is characterized by short, cool winters and long, warm summers, with approximately 56 inches of rainfall distributed fairly evenly throughout the year.

The Tombigbee and Buttahatchie Rivers are adjacent to Columbus AFB to the west and north, respectively. Surface water drainage from the base is primarily to the Tombigbee River, with the northeast portion of the base draining to the Buttahatchie River. The northwestern third of Columbus AFB is generally within the 100-year flood plain of both rivers; surface drainage in this area is poor, and ponding or flooding occurs occasionally. The remaining portion of Columbus AFB is above the 100-year flood plain, and this area is well drained by several small, perennial streams.

Soils on Columbus AFB are of the upper terrace Prentiss-Rosella-Steens Association (sand, silt, and clay loams) and the lower flood plain Cahaba-Prentiss-Guyton Association (silty and clayey loams). These soil associations cover approximately equal areas at Columbus AFB, with the upper terrace soils in the southeastern half of the base and the lower flood plain soils in the northwestern portion. These soils overlie gravel and sand deposits, which in turn overlie clay and sandy clay deposits.

Potable ground water at Columbus AFB is present in an unconfined shallow aquifer system and a deeper Cretaceous aquifer. The shallow aquifer is located in the gravel and sand units of the alluvial deposits. Depth to the top of the water table averages about 10 ft. Recharge occurs by downward infiltration of rainwater and subsurface runoff. Ground water movement is toward the northwest in the northern section of the installation.

This aquifer may be used as a source of water in domestic wells in the vicinity of the base and in four nonpotable wells on Columbus AFB. The deep aquifer consists of the Eutaw Group and the Tuscaloosa Formation. The Eutaw Aquifer is approximately 150 ft thick, with recharge occurring from infiltration in the outcrop belt. Regional water movement is in the down-dip direction to the west-southwest. The Tuscaloosa Aquifer consists of coarse-sand and gravel sections that yield up to 500 gpm.

The potable wells on Columbus AFB draw water from this highly permeable section of the formation. Recharge for this system occurs in the formation's outcrop area along the northeastern border of Mississippi and into the western sections of Alabama. Ground water in the Tuscaloosa Formation is under artesian conditions.

The climatic, surface hydrology, soils, and geohydrology conditions at Columbus AFB can be conducive for contaminant migration. Any contaminant migration would tend to be lateral rather than vertical due to clay and sandy clays underlying the shallow aquifer and the topographic influences of the Tombigbee and Buttahatchie Rivers. Migration of contaminants would be towards these river systems, primarily through sublateral shallow ground water flow and interception of the shallow ground water table by shallow streams or drainage ditches.

Faunal communities at Columbus AFB are limited by the development of the base land area. Undeveloped portions of Columbus AFB, primarily the southwestern corner and the base perimeter, consist of mixed pine hardwoods and pine plantation communities.

4.0 FINDINGS

4.1 CURRENT AND PAST ACTIVITY REVIEW

4.1.1 INDUSTRIAL OPERATIONS

Industrial operations at Columbus AFB consist primarily of aircraft and vehicle maintenance repair activities. These operations are essentially unchanged since the base became operational in 1941. The primary difference between past and current industrial operations is the types of aircraft being maintained. The data base concerning industrial operations since the end of the SAC tenure is fairly complete. Data for the World War II period (1941 through 1946) and the SAC tenure (1955 through 1969) are not complete. Information on industrial operations during this period is not available for aircraft maintenance and repair activities. Conclusions regarding aircraft maintenance activities during the World War II period are based on the interpretation of aerial photography, interpolation of data from existing operations, and on experience based on past disposal practices at Air Force installations.

Unless otherwise stated, current waste generation rates are assumed to be representative of historical quantities. Likewise, current and historical industrial activities and shop locations are similar to historical facts unless otherwise stated. App. E contains a current list of shops on Columbus AFB. Past and current shops; activities; and waste treatment, storage, and disposal practices are discussed in this section.

BES provided a listing of industrial shops that was used as a basis for evaluating past and current waste generation and hazardous material disposal practices. BES individual shop files were also examined for information on hazardous material usage and hazardous waste generation and disposal practices. From this information, a master list of industrial shops was prepared, showing building locations; hazardous materials handlers; hazardous waste generators; and typical treatment, storage, and disposal methods. This master list is presented in App. E.

During the site visit, interviews were conducted with personnel from many of these industrial shops, including the shops that generate the largest amounts of hazardous wastes. Shop interviews focused on hazardous waste materials, waste quantities, and disposal methods. Disposal timeframes were prepared for each major hazardous waste from information provided by shop personnel, others familiar with shop operation and activities, and available reports. Information obtained from detailed shop review, including information on current and past shop locations, identification of hazardous waste, waste quantities, and disposal methods, is presented in Table 4.1-1. Disposal timeframes are also shown for major wastes. Table 4.1-1 does not include the shops which have not generated hazardous waste.

Generally, waste disposal practices at Columbus AFB have been through contractor disposal for waste petroleum, oils, and lubricants (POL) products and by either landfilling or contractor disposal for solid wastes. Waste POL products reportedly have been segregated and stored prior to disposal in four 10,000-gallon (*gal*) underground (UG) tanks since 1952. The four tanks are for waste oil, waste solvents, waste fuel (e.g., JP-4), and waste cleaning agents. However, based on knowledge of past disposal practices at Air Force installations, it was assumed that waste POL products were also landfilled and/or burned in firefighter training exercises during the 1950s and 1960s. Landfilling of sanitary solid waste was conducted at Columbus AFB until 1976; since 1976, these materials have been disposed of through a solid waste contractor.

Industrial operations at the shops listed in Table 4.1-1 are discussed in the following paragraphs. The building locations and waste quantities are presented in the table.

As described above, aircraft maintenance activities have probably been of a similar nature throughout the entire history of CAFB. The time lines for the activities/shops shown in Table 4.1-1 are taken as far

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

Shop Name	Location (Bldg. No.)	Waste Material	Waste Quantity	Methods of Treatment, Storage, and Disposal (1950 – 1960 – 1970 – 1980)
I. 14th FMS				
A. FUELS FLOW SHOP	218	1,1,1-Trichloroethane	5 gal/month	To DPDO (c. 1970–1980); To hazardous waste disposal contractor (c. 1980–present)
		PD-680	30 gal/month	To DPDO (c. 1970–1980); To hazardous waste disposal contractor (c. 1980–present)
B. WHEEL AND TIRE SHOP	220	PD-680	50 gal/month	To waste POL tank for contractor disposal (c. 1955–present)
C. TEST CELL SHOP	226	Aircraft engine oil	20 gal/month	To waste POL tank for contractor disposal (c. 1970–present)
		Cleaning compound	15 gal/month	To oil/water separator, water to STP, oil to contractor for disposal (c. 1970–present)
D. NDI LAB	246	Emulsifier	20 gal/month	To DPDO (c. 1970–1980); To hazardous waste disposal contractor (c. 1980–present)
		Fixing bath Photographic developer Replenisher	10 gal/month	To sanitary sewer, after silver recovery (c. 1970–present)
		Exxon® isopar	10 gal/month	To DPDO (c. 1970–1980); To hazardous waste disposal contractor (c. 1980–present)

Table 4.1-1. Columbus AFB Industrial Operations (Shops)—Waste Generation (Continued, Page 2 of 8)

Shop Name	Location (Bldg. No.)	Waste Material	Waste Quantity	Methods of Treatment, Storage, and Disposal (1950–1980)
D. NDI LAB (Continued)		Fluorescent dye	20 gal/month	To DPDO; To hazardous waste disposal contractor
E. PLATING SHOP	218	Hydrochloric acid	1 qt/month	To DPDO; To hazardous waste disposal contractor
		Phosphoric acid	5 gal/month	To DPDO; To hazardous waste disposal contractor
		Sulfuric acid	1 qt/month	To DPDO; To hazardous waste disposal contractor
		Sodium hydroxide	3 gal/month	To DPDO; To hazardous waste disposal contractor
		Cadmium oxide	0.25 gal/month	To DPDO; To hazardous waste disposal contractor
		Sodium cyanide	0.5 gal/month	To DPDO; To hazardous waste disposal contractor
		Chromic acid	9.2 gal/month	To DPDO; To hazardous waste disposal contractor

Table 4.1-1. Columbus AFB Industrial Operations (Shops)—Waste Generation (Continued, Page 3 of 8)

Shop Name	Location (Bldg. No.)	Waste Material	Waste Quantity	Methods of Treatment, Storage, and Disposal (1950 / 1960 / 1970 / 1980)
E. PLATING SHOP (Continued)		Sodium carbonate	0.5 qt/month	To DPDO → To hazardous waste disposal contractor
		Nitric acid	0.5 qt/month	To DPDO → To hazardous waste disposal contractor
F. CORROSION CONTROL SHOP	220, 262	Polyurethane stripper	400 gal/month	To POL/sludge separator, with water to sanitary sewer; Waste POL/ sludge to DPDO → Waste POL/ sludge to hazardous waste disposal contractor
		Metal conditioner	14 gal/month	To POL/sludge separator, with water to sanitary sewer; Waste POL/ sludge to DPDO → Waste POL/ sludge to hazardous waste disposal contractor
G. AGE SHOP	430	PD-680	55 gal/month	To waste accumulation tank for contractor disposal
		Waste oil	165 gal/month	To waste accumulation tank for contractor disposal

Table 4.1-1. Columbus AFB Industrial Operations (Shops)—Waste Generation (Continued, Page 4 of 8)

Shop Name	Location (Bldg. No.)	Waste Material	Waste Quantity	Methods of Treatment, Storage, and Disposal (1950–1980)
G. AGE SHOP (Continued)		Engine turbine cleaner	55 gal/month	To waste accumulation tank for contractor disposal
		Aircraft-cleaning compound	55 gal/month	To waste accumulation tank for contractor disposal
		Steam cleaning washwater	20 gal/month	To oil/water separator; water to sanitary sewer, oil disposal by contractor
H. MACHINE SHOP	220	Waste oil	35 gal/month	To waste POL tank; contractor disposal
I. ELECTRIC SHOP	630	Boric acid	20 lb/month	Neutralized, to sanitary sewer
		Sulfuric acid	25 gal/month	Neutralized, to sanitary sewer
J. PARTS CLEANING SHOP	218	Trichloroethane	110 gal/yr	To DPDO; To hazardous waste disposal contractor
		PD-680	110 gal/yr	To DPDO; To hazardous waste disposal contractor
		Rust remover	400 gal/yr	To DPDO; To hazardous waste disposal contractor

Table 4.1-1. Columbus AFB Industrial Operations (Shops)—Waste Generation (Continued, Page 5 of 8)

Shop Name	Location (Bldg. No.)	Waste Material	Waste Quantity	Methods of Treatment, Storage, and Disposal (1950 / 1960 / 1970 / 1980)
J. PARTS CLEANING SHOP (Continued)		Alkaline rust remover	55 gal/yr	To DPDO; To hazardous waste disposal contractor
		Alkaline de-scaler	400 gal/yr	To DPDO; To hazardous waste disposal contractor
		Alkaline permanganate	400 gal/yr	To DPDO; To hazardous waste disposal contractor
		Paint stripper	110 gal/yr	To DPDO; To hazardous waste disposal contractor
		Aluminum oxide	100 gal/yr	To DPDO; To hazardous waste disposal contractor
K. ENVIRONMENTAL SYSTEMS SHOP	630	Cleaning compound	3 gal/month	To DPDO
L. BALANCE SHOP	218	PD-680	7 gal/month	To waste POL tank; contractor disposal
		Waste oil	25 gal/month	To waste POL tank; contractor disposal
		Carbon remover	1 gal/month	To DPDO

Table 4.1-1. Columbus AFB Industrial Operations (Shops)—Waste Generation (Continued, Page 6 of 8)

Shop Name	Location (Bldg. No.)	Waste Material	Waste Quantity	Methods of Treatment, Storage, and Disposal (1950–1980)
L. BALANCE SHOP (Continued)		Fingerprint neutralizer	2 gal/yr	~1971 → To DPDO
II. 14th OMS				
A. REPAIR AND RECLAMATION SHOP	450, 456	PD-680	20 gal/month	~1955 → To DPDO
B. AIRCRAFT WASHRACK	228	Cleaning compound	330 gal/month	~1955 → To oil/water separator; water to sanitary sewer, oil disposed by contractor
		PD-680	25 gal/month	~1955 → To oil/water separator; water to sanitary sewer, oil disposed by contractor
C. AIRCRAFT MAINTENANCE SHOP	452, 454	Hydraulic fluid	180 gal/month	~1955 → To waste POL tank; contractor disposal
		Lubricating oil	120 gal/month	~1955 → To waste POL tank; contractor disposal
		PD-680	20 gal/month	~1955 → To waste POL tank; contractor disposal
		Aircraft soap	20 gal/month	~1955 → To oil/water separator; water to sanitary sewer, oil contractor disposed
III. 14th CES				
A. POWER PRODUCTION SHOP	1816	PD-680	55 gal/yr	~1955 → To waste POL tank; contractor disposal
		Paint stripper	15 gal/yr	~1955 → To waste POL tank; contractor disposal

Table 4.1-1. Columbus AFB Industrial Operations (Shops)—Waste Generation (Continued, Page 7 of 8)

Shop Name	Location (Bldg. No.)	Waste Material	Waste Quantity	Methods of Treatment, Storage, and Disposal (1950 – 1960 – 1970 – 1980)
B. LIQUID FUEL MAINTENANCE AREA	322	Waste POL	4 tanks each; maximum of 12,000 gal	Waste POL sold to contractor as needed →
C. PLUMBING SHOP	379	Sodium hydroxide	160 lb/month	To sanitary sewer - - - - - - - - - - - -> →
		Sulfuric acid	6 gal/month	To sanitary sewer - - - - - - - - - - - -> →
IV. MOTOR VEHICLE MAINTENANCE SHOP	303, 304, 317	PD-680	20 gal/ month	1940s—waste POL spread on roads, burned in FTA, or recycled; To waste POL tank for contractor disposal →
		Waste POL	60 gal/ month	1940s—waste POL spread on roads, burned in FTA, or recycled; To waste POL tank for contractor disposal →
		Lacquer thinner	15 gal/month	To oil/water separator; water to STP; floating waste to contractor for disposal; To DPDO →
		Enamel thinner	20 gal/month	To oil/water separator; water to STP; floating waste to contractor for disposal; To DPDO →

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

Shop Name	Location (Bldg. No.)	Waste Material	Waste Quantity	Methods of Treatment, Storage, and Disposal (1950–1980)
V. 14th ABG				
A. FIRING RANGE	980	PD-680	0.5 gal/month	To waste POL tank; contractor disposal
VI. BASE MEDICAL SERVICES				
A. DENTAL CLINIC	1040	Photographic developer and fixer	45 gal/month	Silver recovery; to sanitary sewer
B. X-RAY ROOM	1100	Photographic developer and fixer	120 gal/month	Silver recovery; to sanitary sewer
VII. MWR				
A. AUTO HOBBY SHOP	338	PD-680	15 gal/month	To DPDO

Key:
____ Confirmed timeframe data by shop personnel
\- - - - Estimated timeframe data by shop personnel.

Source: BES, 1984.

back as the historical evidence (e.g., presence of a building in aerial photography) permits. Prior to construction of a defined facility, it is presumed that the given activity was conducted as necessary adjacent to aircraft on the flight line or in hangar areas. Therefore, the location of generation points prior to the dates shown on the time line is not possible.

14th FMS

Fuels Flow Shop--The Fuels Flow Shop cleans, inspects, and tests aircraft fuel-system components. Parts cleaning is accomplished with an ultrasonic cleaner containing 1,1,1-trichloroethane (1,1,1-TCE) and PD-680 as a carbon remover. The waste 1,1,1-TCE and waste PD-680 contaminated with 1,1,1-TCE generated at the shop were redrummed and disposed of through DPDO from 1969 to 1981. Since 1981 these wastes have been disposed of through a hazardous waste disposal contract with the CES.

Wheel and Tire Shop--The general functions of the Wheel and Tire Shop are the inspection and cleaning of aircraft wheels and wheel bearings. Wheel bearings are chemically cleaned using PD-680 alone and in combination with oil in degreasing vats. Bearings are then reassembled and repacked in grease and replaced in the wheel and new tires mounted. The waste PD-680 generated has been transferred to the waste POL storage area and disposed of through a waste oil contractor since the late 1950s.

Test Cell Shop--The general function of the Test Cell Shop is the testing of malfunctioning engines at the trim pad by flightline support personnel to determine if the fault can be corrected without removing the engine. If this cannot be accomplished, flightline support removes the engine and sends it to the appropriate test cell for a bench check. When the malfunction is located, it is either corrected at the test cell or sent to the engine shop, depending on the severity of the problem. The engine is retested and returned to normal service following repairs. A carbo-blaster is used to remove heavy deposits of carbon from the intakes of the engine; crushed walnut shells are used as the blasting agent. Waste engine oil and oil from an oil/water separator have been disposed of through a waste oil contractor since 1969. Wastewater from the oil/water separator contains an alkali base soap and is discharged to the STP. The corrosion-prevention compound and paint primers used by the shop are consumed in the operation. Empty containers were landfilled at Columbus AFB from 1969 to 1976 and have been disposed of through the solid waste disposal contractor since 1976.

Nondestructive Inspection (NDI) Laboratory--The general function of the NDI Laboratory is to inspect aircraft structures and component parts to determine if flaws exist. Surface flaws are determined using a fluorescent, penetrant procedure on nonferrous metals and a magnaflux procedure on ferrous parts. For subsurface flaws, an ultrasonic method is used. Structural flaws are detected using radiographical procedures. Tasks performed during these procedures include film processing and viewing, blacklight inspection, and rinsing of various chemical solutions. The waste penetrants, dyes, and emulsifiers used in the NDI Laboratory have been disposed of through the hazardous waste contractor since 1977. Prior to 1977, these materials were disposed of through DPDO. Waste solvents evaporate in process; solvent cans are currently disposed of through the solid waste contractor. Prior to 1976, waste solvent cans were disposed of in the Columbus AFB landfill.

Plating Shop--The general function of the Plating Shop is the electroplating of aircraft and nonaircraft parts and equipment. Depending on the type of metal, various plating solutions and plating techniques are employed. The shop employs standard electroplating technology. Waste acids and plating solutions generated at the shop have been drummed and disposed of through the hazardous waste contractor since 1981. Prior to 1981, these waste solutions were disposed of through DPDO. Rinse water from the shop is discharged to the sanitary sewer.

Corrosion Control Shop--The general function of the Corrosion Control Shop is the stripping and repainting of aircraft. Generally, one aircraft per week is completely stripped and painted; additionally, major touchup paintings are performed. All aircraft parts are painted in the Corrosion Control Shop. Waste paint stripper and paint sludges generated at the shop are separated in a POL/water separator outside Bldg. 220. The waste sludges are periodically pumped out of the separator, drummed, and disposed of through the hazardous waste contractor. From 1969 through 1981, the waste sludge was disposed of through DPDO. Wastewater overflow from the POL/water separator is discharged to the sanitary sewer system. Waste paint thinners and solvents evaporate in process; empty cans have been disposed of through the solid waste contractor since 1977. From 1969 through 1977, empty cans were disposed of in the Columbus AFB landfill. Waste fusion oil, turbine cleaner, and solvents generated at the shop have been disposed of through the waste-oil contractor since the mid-1950s. The wastewater from the steam cleaning operation is routed to an oil/water separator. Wastewater is discharged to the sanitary sewer system, and the waste oil is disposed of through the waste-oil contractor.

Aerospace Ground Equipment (AGE) Shop--The general function of the AGE Shop is the inspection, maintenance, and repair of all flight-related ground equipment. Approximately 50 pieces are serviced at the AGE Shop and routinely cleaned in either a PD-680 degreaser or washed using a washrack located behind the shop. Waste engine oil, PD-680, and cleaning compounds generated at the shop have been disposed of through the waste-oil contractor. Water from the steam cleaning operation and washrack flows to an oil/water separator, with waste oil disposed of through the waste-oil contractor and wastewater discharged to the sanitary sewer system.

Machine Shop--The general function of the Machine Shop is the manufacture and rework of aircraft parts and other related equipment. The shop performs machining operations required in the manufacture or repair of aircraft-engine accessories and parts or tools and equipment designed for use in main and/or aircraft support equipment. Waste oil generated at the shop has been disposed of through the waste-oil contractor since the mid-1950s. Solvents used in the shop are consumed in the process, and empty cans have been disposed of through the solid waste contractor since 1977. From the mid-1950s through 1977, empty solvent cans were disposed of at the Columbus AFB landfill.

Electric Shop--The general function of the Electric Shop is the troubleshooting, overhauling, repairing, inspection, and functional checking of all aircraft electrical components and AGE. Recharges of lead-acid batteries for ground units are also performed at the shop. The Electric Shop also performs checks on all nickel-cadmium batteries used in the training aircraft. Nonfunctional batteries are neutralized prior to disposal. Waste battery acid generated is neutralized at the shop and discharged to the sanitary sewer system. This waste disposal practice has been ongoing since the mid-1950s.

Parts Cleaning Shop--The general function of the Parts Cleaning Shop is cleaning turbine engine components with various chemical agents. The waste solvents, rust removers, descaling agents, and paint strippers generated at the shop have been drummed and disposed of through the hazardous waste contractor since 1981. From 1969 until 1981, the waste materials were drummed and disposed of through DPDO.

Environmental Systems Shop--The general function of the Environmental Systems Shop is to perform the maintenance of the oxygen, air-conditioning, pressurization, and heating systems in the training aircraft. Waste cleaning compounds generated at the shop have been disposed of through DPDO since the mid-1950s. Waste solvents from the shop are evaporated in process, and waste cans have been disposed of through the solid waste contractor since 1976. From the mid-1950s until 1976, empty cans were disposed of in the Columbus AFB landfill.

Balance Shop--The general function of the Balance Shop is to balance the compressors and turbine wheels and to break down and rebuild power takeoff assemblies. Additionally, the shop performs the cleaning, inspection, and storage of bearings from the J-85 and J-69 aircraft engines. Waste solvents and waste engine oil generated at the shop have been disposed of through the waste-oil contractor. Waste carbon remover and fingerprint neutralizer have been redrummed and disposed of through DPDO since 1969. Penetrating oils, silicone lubricants, and paint are consumed in process, and empty containers have been disposed of through the solid waste contractor since 1977. From 1969 until 1977, empty containers were disposed of in the Columbus AFB landfill.

14th OMS

Repair and Reclamation Shop--The general function of the Repair and Reclamation Shop is the removal, disassembly, inspection, and repair of aircraft flight controls. Additionally, the shop performs aircraft landing-gear retraction tests, accomplishes realignment checks, and removes and replaces aircraft wings and other major components. Waste solvents generated at the shop has been disposed of through the waste-oil contractor since the mid-1950s. Cleaning solutions, lubricants, and sealing compounds used at the shop are consumed in process. Empty containers have been disposed of through the solid waste contractor since 1977. From the mid-1950s until 1977, empty containers were disposed of in the Columbus AFB landfill.

Aircraft Washrack--The general function of the Aircraft Washrack is the washing and servicing of the T-37 and T-38 aircraft. Aircraft cleaning soaps and PD-680 are used for the cleaning operations. After the cleaning, aircraft landing gear is repacked with grease. Approximately 88 aircraft per month are washed at the rack. Wastewater from the aircraft washrack area is discharged to an oil/water separator. Waste oil and cleaning compound is removed from the unit by contractor, and the wastewater is discharged to the sanitary sewer system.

Aircraft Maintenance Shop--The general function of the Aircraft Maintenance Shop is to perform periodic inspections, disassemble aircraft, and have aircraft parts repaired and reinstalled. In general, the maintenance shop controls the supply and flow of aircraft for training purposes. The waste hydraulic fluid, lubricating oil, and solvents generated at the shop have been disposed of through the waste-oil contractor since the mid-1950s. Washwater from the aircraft washrack is directed to an oil/water separator, with waste oil disposed of by the waste-oil contractor and wastewater discharged to the sanitary sewer system. The dry lubricant and adhesives used in the shop are consumed in process, and empty containers have been disposed of through the solid waste contractor since 1977. From the mid-1950s until 1977, these empty containers were disposed of in the Columbus AFB landfill.

14th CES

Entomology Shop--See Sec. 4.1.3.

Power Production Shop--The general function of the Power Production Shop is to perform the maintenance of ground power equipment. Additionally, the shop performs the charging and maintenance of lead-acid batteries used on ground power equipment. The waste solvents and paint strippers generated at the shop have been disposed of through the waste-oil contractor since the mid-1950s. Paint and acid used at the shop are consumed in process, and empty containers have been disposed of through the solid waste contractor since 1977. Prior to 1977, empty containers were disposed of in the Columbus AFB landfill.

Liquid Fuel Maintenance Area--The Liquid Fuel Maintenance Area provides UG storage facilities for all waste fuel and POL products. Additionally, routine maintenance is performed on the pump-houses, UG tanks, and other facilities associated with the waste POL storage facilities. The waste POL stored in the waste tanks in the Liquid Fuel Maintenance Area is disposed of through the waste-oil contractor on an as-needed basis.

Plumbing Shop--The general function of the Plumbing Shop is to perform the general repair and maintenance of all water and sewer mains on the base. Additionally, the Plumbing Shop performs maintenance on gas and air lines. The waste materials (primarily alkali solutions for pipe cleaning) used by the Plumbing Shop are discharged to the sanitary sewer system for numerous locations at Columbus AFB.

Exterior Electric Shop--See Sec. 4.1.4.

STP--The STP at Columbus AFB has been in operation in Bldg. 1134 since 1942. The STP is a standard-rate trickling-filter system with a capacity of 1 MGD. Treated effluent is discharged to the Tombigbee River in accordance with NPDES Permit No. MS0040258. Primary and secondary clarifier sludge is digested and then dried on sand drying beds; filtrate from the drying beds is returned to the head of the plant. Approximately 2,000 pounds (lb)/day of sludge is generated at Columbus AFB, and the digested sludge is landspread north of the parasail area. The STP sludge has been tested through the extraction procedure (EP) toxicity test and has been found to be nonhazardous (Columbus AFB BES, 1983c).

Motor Vehicle Maintenance Shop

Motor Vehicle Maintenance Shop--The Motor Vehicle Maintenance Shop is operated by a contractor, Tom Wright Auto Repairs of Montgomery, Ala. The maintenance shop has been contractor-operated since July 1, 1977; prior to this date, vehicle maintenance was performed by the 14th CES. The vehicle maintenance shop provides routine servicing and maintenance on approximately 240 vehicles assigned to the base. The number of vehicles assigned at Columbus AFB has remained relatively constant throughout the installation's history. In regard to battery maintenance, the maintenance shop provides battery charging only; unserviceable batteries are handled through a contractor. The waste crankcase oil, transmission fluid, brake fluid, and hydraulic fluid generated at the shop have been disposed of through waste-oil contractors since the early 1950s. During the World War II era, portions of these waste POL products were used for dust control on roads at Columbus AFB; additionally, some of the waste oil was either sold or used in firefighter training activities.

The shop has been equipped with spray-booth facilities since the late 1960s. The lacquer thinners and enamel thinners used in the paint shop are discharged to an oil/water separator. The waste oil from the separator was disposed of through a waste-oil contractor until 1981. Since 1981, these waste materials have been disposed of through DPDO. The wastewater from the oil/water separator is discharged to the STP.

14th ABG

Firing Range--The general function of the Firing Range is to conduct indoor/outdoor weapons training for M-16s, shotguns, grenade launchers, and .38-caliber (cal) pistols.

Base Medical Services

Dental Clinic--The general function of the Dental Clinic is to pour, trim, and handle impressions, and perform general dental work, including dental X-rays. The photographic chemicals used in the Dental Clinic are discharged to the sanitary sewer system. Prior to this discharge, the chemicals are treated in a silver recovery unit.

X-ray Room--The general function of the X-ray Room is to expose and process radiographic X-ray film in support of other hospital activities. The waste photographic chemicals from the X-ray lab are treated in a silver recovery unit prior to discharge to the sanitary sewer system.

MWR

Auto Hobby Shop--The Auto Hobby Shop provides the facilities for active military personnel at Columbus AFB to perform personal automotive maintenance. Waste oil generated at the shop is disposed of through the waste-oil contractor; waste PD-680 is disposed of through DPDO.

4.1.2 LABORATORY ACTIVITIES

Laboratory operations on Columbus AFB are performed by the 14th CES water treatment plant (WTP) laboratory; 14th CES STP laboratory; base medical services dental clinic, surgery, X-ray laboratory, and hospital clinic laboratory; FTW photography laboratory; supply fuels laboratory; the FMS PMEL; and the NDI laboratory. The activities at the PMEL laboratory, the NDI laboratory, and the base medical services surgery dental clinic and X-ray were described in Sec. 4.1.1. Laboratory operations, locations, wastes generated, and methods of treatment, storage, and disposal are summarized in Table 4.1-2 for the remaining laboratories. These laboratories are briefly described in the following paragraphs.

CES Water Treatment Laboratory

The Columbus AFB water treatment laboratory, located in Bldg. 604, is used for monitoring the chemical quality of the drinking water at Columbus AFB. This laboratory performs analyses for fluoride, pH, hardness, and iron. The laboratory dates back to the pre-SAC era and has always been located at the WTP. Diluted analytical reagents and dilute acids are disposed of currently as in the past by pouring down the laboratory sink drains, which are connected to the sanitary sewer. This laboratory generates approximately 50 gal/year of dilute reagents waste.

14th CES STP Laboratory

The Columbus AFB STP laboratory is located in Bldg. 1136, the STP. This laboratory also dates back to the pre-SAC era and provides analytical support for the operations of the wastewater treatment plant. Analyses performed at the STP laboratory are BOD, suspended solids determination, pH, hardness, and iron. An inventory of reagents used at this laboratory is available at BES. Waste diluted analytical reagents and waste dilute acids from this laboratory are disposed of by pouring down the laboratory sink drains to the sanitary sewer. Approximately 100 gal/year of waste reagents are generated.

Table 4.1-2. Laboratory Operations—Waste Generation

Laboratory Name	Building No.	Waste Material	Waste Quantity (gal/yr)	Methods of Treatment, Storage, and Disposal (1950 – 1960 – 1970 – 1980)
14th CES Water Treatment Laboratory	604	Diluted—analytical reagents; hydrochloric, sulfuric, and nitric acids	50	1941? Laboratory sink drains to sanitary sewer
14th CES Sewage Treatment Laboratory	1136	Diluted—analytical reagents; hydrochloric, sulfuric, and nitric acids	150	1941? Laboratory sink drains to sanitary sewer
Base Medical Services Clinical Laboratory	1100	Infectious materials, bacterial culture media, bacterial and tissue stains, diluted laboratory reagents	Variable	Media, infectious solid wastes—autoclaved, disposed of into sanitary landfills; liquid reagents—autoclaved, disposed of in laboratory sink drains to sanitary sewer
FTW Photography Laboratory (Contractor Operated)	820	Spent photographic solutions;	160	Discharged to sanitary sewer—no silver recovery
		scrap film	Variable	Taken offsite for disposal by contractor

Source: BES, 1984.

Base Medical Services Clinical Laboratory

The Hospital clinical laboratory, located in the Columbus AFB Hospital Bldg. 1100, has been operating since the mid-1950s. This laboratory performs microbiological testing and blood and urine analysis on Hospital patients. The waste materials generated are variable and include infectious materials, waste nutrient agar cultures, and other contaminated or pathological wastes generated by microbiological testing, staining reagents and dilute reagent acids. Liquid pathological wastes and reagents are autoclaved and disposed of by pouring the diluted sterilized materials down the laboratory sink drains into the sanitary sewer system. Solid infectious wastes are bagged, autoclaved, and disposed of in the solid waste collection system.

FTW Photography Laboratory

The photography laboratory, located in Bldg. 820, reportedly has been in existence since 1960. During its entire history of operation, this laboratory has been operated by a contractor. This laboratory processes black-and-white negatives and prints, color slides, and color prints. Wastes generated include approximately 160 gal/year of spent black-and-white and color photographic solutions and scrap film. Scrap film is taken offsite for disposal by the contractor. Spent photographic solutions from this laboratory are discharged to the sanitary sewer system without silver recovery.

4.1.3 PESTICIDE HANDLING, STORAGE, AND DISPOSAL

Pesticides have been and are being used by the 14th CES Entomology Shop to maintain grounds and structures to prevent pest-related health problems. The pest-control program for the grounds at Columbus AFB is described in the Land Management Plan (Columbus AFB, 1982). Computerized inventories are kept on pesticides in stock at Columbus AFB. A review of the inventories for the last half of 1983 (Columbus AFB CES, 1983a and 1983b) indicated no banned pesticides were kept at Columbus AFB. Pest-control services include:

1. Household, structural, health-related, and nuisance insect-control and rodent-control programs;

2. Weed control at security fences, parking areas, and utility sites; and
3. Programs involving turf areas, the golf course, and ornamental trees and shrubs.

Pesticides and herbicides have been stored in the Entomology Shop (Bldg. 1809) since the departure of the SAC in 1969. Prior to that time, these materials were stored at Base Supply (Bldg. 158). No records of the handling or use of pesticides exist prior to the initiation of SAC operations in 1959. Until about 1977, pesticide wastewaters generated by rinsing spray equipment were disposed of on the ground either at the Entomology Shop or at various rinse water sources. Since 1977, rinse waters have been either sprayed over the area treated or used as a diluent for subsequent formulations of the same pesticides. Empty pesticide containers were landfilled at Columbus AFB prior to 1977; since then, they have been disposed of through the solid waste contractor. 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.

An inspection of the entomology shop conducted in 1979 found that there were at least five leaking drums of pesticides within the entomology shop area. The material leaking from the drums flowed off the asphalt apron surrounding the shop building and infiltrated into the surrounding soils. Reportedly, the vegetation in the area was severely impacted from the spills. Additionally, the rinse sink in the shop building discharged directly onto the ground adacent to the building. The total quantity of spilled and leaking material from the entomology shop is unknown. No evidence of vegetation stress exists currently.

Disposal of excess or outdated stocks of pesticides has been through DPDO. Reportedly, no burials of large amounts of pesticides have occurred at Columbus AFB. It was reported that approximately 20 aerosol cans of DDT and 12 drums (20 gal each) of DDT were in stock at Columbus

AFB in the mid-1970s. When DDT was banned for use as a pesticide, the stocks were disposed of through DPDO. Reportedly, these stocks were sent to the hazardous waste landfill near Livingston, Ala.

Based on the presence of the pesticide spill within the vicinity of the entomology shop, it is suspected that some residual pesticide may still be present in either the soils or the ground water immediately surrounding the building. Based on the small quantities of residual pesticides expected to be in the empty pesticide containers that were landfilled, it is not likely that the handling and disposal of these containers represents a significant potential for environmental contamination in the landfills.

4.1.4 PCB HANDLING, STORAGE, AND DISPOSAL

The 14th CES Exterior Electric Shop has responsibility for maintenance of electric equipment on Columbus AFB. Reportedly, transformers and electrical equipment have not been reworked at Columbus AFB in the past. Prior to 1978, all out-of-service transformers were sold. Since that time, all transformers have been tested for PCB content when taken out of service, and those with less than 50 parts per million (ppm) have been sold through DPDO. Transformers contaminated with PCB materials are disposed of offbase by a hazardous waste disposal contractor. Records of tests performed on all out-of-service transformers and disposal contracts since 1980 are available at the BES (Columbus AFB BES, 1983c).

In accordance with the Toxic Substances Control Act (TSCA), which controls PCBs, all potentially PCB-containing in-service items have been properly marked and are routinely inspected. Columbus AFB maintains a guide for PCB spill control and compliance (Columbus AFB, n.d.). Appended to this guide are records of inspection of all suspected PCB-containing electrical equipment. The following PCB-containing electrical equipment is located onbase:

1. A transformer which contains 110 gal of the PCB material Askarel is located at the communications facility in Bldg. 1860.
2. Three pole-mounted transformers are located adjacent to Bldg. 850. Three large capacitors suspected to contain PCBs are located along the main entrance road adjacent to the security police office at Bldg. 104.
3. Two suspected PCB-containing transformers are located along Independence Ave. to the west of the golf course.

Reportedly, a minor spill occurred at the transformer location in Bldg. 1860. In 1981, reportedly this spill was cleaned up in accordance with TSCA requirements as described in the Guide for PCB Spill Control and Compliance (Columbus AFB, n.d.), and the PCB material and associated cleanup materials were properly labeled, packaged, and disposed of by the hazardous-waste contractor.

Based on the historical handling of PCB-containing equipment and potentially PCB-containing electrical equipment, it is unlikely that significant PCB contamination of the environment as a result of PCB disposal has occurred or is occurring at Columbus AFB.

4.1.5 POL HANDLING, STORAGE, AND DISPOSAL

The POL products used at Columbus AFB include JP-4 jet fuel, heating fuel oil, aviation gasoline (AVGAS), automotive gasoline (MOGAS), diesel fuel, engine oil and lubricants, and solvents. These POL products, with the exception of engine oil, lubricants, and solvents, are stored in bulk storage facilities as summarized in Table 4.1-3. Bulk storage tanks are of steel construction; underground (UG) tanks are painted and/or coated to reduce corrosion potential. Aboveground (AG) storage tanks with capacities greater than 1,000 gal are bermed with asphaltic materials.

The tank farm at Columbus AFB has been located in the southern portion of the base since the 1940s (see Fig. 4.1-1 for location). The total

Table 4.1-3. Summary of POL Storage Facilities at Columbus AFB

Building No.	Tank Capacity (gal)	Aboveground or Belowground Tank	POL Type
152	250	AG	H
306	1,000	BG	H
317	550	BG	H
319	1,000	BG	F (Diesel)
324	1,000	BG	H
325	1,000	BG	H
335	1,000	BG	H
362	550	BG	H
364	550	BG	H
410	550	BG	H
450	6,000 (3 x 2,000)	AG	H
604	1,000	BG	H
634	400	BG	H
636	1,000	BG	H
712	1,000	BG	H
715	500	BG	H
728	550	BG	H
736	500	BG	H
820	1,000	BG	H
844	1,000	BG	H
850	280	BG	F (MOGAS)
878	550	BG	H
900	280	BG	H
900	550	BG	H
904	300	AG	H
910	1,000	BG	H
914	1,000	BG	H
916	1,000	BG	H
938	1,000	BG	H
980	250	AG	H
1004	500	BG	H
1036	1,000	BG	H
1040	1,000	BG	H
1052	550	BG	H
1114	1,000	BG	H
1135	560	BG	H
1138	1,000	BG	H
1808	750	BG	H
1810	550	BG	H
1816	250	AG	H
1860	1,000	BG	H
1860	1,000	BG	F (Diesel)
1944	550	BG	F (Diesel)
1944	400	AG	F
2052	1,000	BG	H
2052	1,000	BG	F

NOTE: H = Heating oil.
F = Fuel oil.

Table 4.1-3. Summary of POL Storage Facilities at Columbus AFB (Continued, Page 2 of 4)

Building No.	Tank Capacity (gal)	Aboveground or Belowground Tank	POL Type
158	8,000	BG	H
216	3,000	BG	H
218	3,600	BG	H
220	10,600	BG	H
226	2,000	BG	H
230	2,000	BG	H
234	3,000	BG	H
236	3,000	BG	H
246	5,000	BG	H
262	6,000	BG	H
304	2,000	BG	H
319	6,000	BG	F (MOGAS)
319	6,000	BG	F (MOGAS)
348	2,000	BG	H
379	1,000	BG	H
425	2,000	BG	F (JP-4)
425	2,000	BG	F (JP-4)
425	2,000	BG	F (Gasoline)
268	2,500	BG	H
430	3,000	BG	H
454	3,000	BG	H
510	1,500	BG	H
530	1,500	BG	H
540	6,000	BG	H
542	6,000	BG	H
544	4,000	BG	H
546	6,000	BG	H
548	6,000	BG	H
560	6,000	BG	H
630	2,000	BG	H
640	2,000	BG	H
704	10,000	BG	H
708	2,500	BG	H
830	2,000	BG	H
834	3,000	BG	F
862	1,500	BG	H
862	3,000	BG	H
932	1,500	BG	H
926	2,000	BG	H
944	6,000	BG	H
954	2,000	BG	H
956	2,000	BG	H
958	2,500	BG	H
964	2,500	BG	H
966	2,500	BG	H

NOTE: H = Heating oil.
F = Fuel oil.

Table 4.1-3. Summary of POL Storage Facilities at Columbus AFB (Continued, Page 3 of 4)

Building No.	Tank Capacity (gal)	Aboveground or Belowground Tank	POL Type
990	3-10,000	BG	F (MOGAS)
1046	2,500	BG	H
1050	2,000	BG	H
1100	5,000	BG	H
1100	5,000	BG	H
1100	1,000	BG	F (Diesel)
1809	5,000	BG	F
1944	2,000	BG	H
1918	1-2,000	BG	JP-4
1922	1-2,000	BG	JP-4
322	1-12,000	BG	Hydraulic fluid
322	1-12,000	BG	Contaminated JP-4
322	1-12,000	BG	Waste solvents/ thinners
322	1-1,000	BG	Waste motor oil
224	4,000	AG	F (JP-4)
224	4,000	AG	F (JP-4)
450N	3,000	AG	H
450S	3,000	AG	H
452N	3,000	AG	H
452S	3,000	AG	H
456N	3,000	AG	H
456S	3,000	AG	H
1918	8-50,000	BG	JP-4
1922	8-50,000	BG	JP-4
120	1-25,000	BG	AVGAS
122	1-25,000	BG	MOGAS
Tank #1	5,000 barrels	AG	JP-4
Tank #2	10,000 barrels	AG	JP-4
Tank #3	10,000 barrels	AG	JP-4
Tank #4	10,000 barrels	AG	H (Diesel)
Tank #5	2,380 barrels	AG	H (Diesel)
Tank #6	15,000 barrels	AG	JP-4
160	4,000	BG	H
208	1,000	BG	H
228	275	AG	H
370	550	BG	H
411	550	BG	H

Table 4.1-3. Summary of POL Storage Facilities at Columbus AFB (Continued, Page 4 of 4)

Building No.	Tank Capacity (gal)	Aboveground or Belowground Tank	POL Type
955	1,000	BG	H
726	550	BG	H
1138	1,000	BG	H
510	1,500	BG	H
1801	550	AG	F (Diesel)
2010	280	BG	F (Diesel)
1947	500	BG	F (Diesel)
229	500	BG	F (Diesel)
604	300	BG	F (Diesel)
722	280	BG	F (Diesel)
1921	300	AG	F (Diesel)
268	280	BG	F (Diesel)
1946	100	AG	F (Diesel)
844	280	BG	F (Diesel)
208	55	AG	F (Diesel)
362	55	AG	F (Diesel)
363	55	AG	F (Diesel)
528	55	AG	F (Diesel)
640	55	AG	F (Diesel)
830	55	AG	F (Diesel)
858	55	AG	F (Diesel)
864	55	AG	F (Diesel)
1841	55	AG	F (Diesel)
1842	55	AG	F (Diesel)
7222	55	AG	F (Diesel)
8672	55	AG	F (Diesel)

Note: H = Heating oil.
F = Fuel oil.

Sources: ESE, 1984.
Columbus AFB BES, 1976.

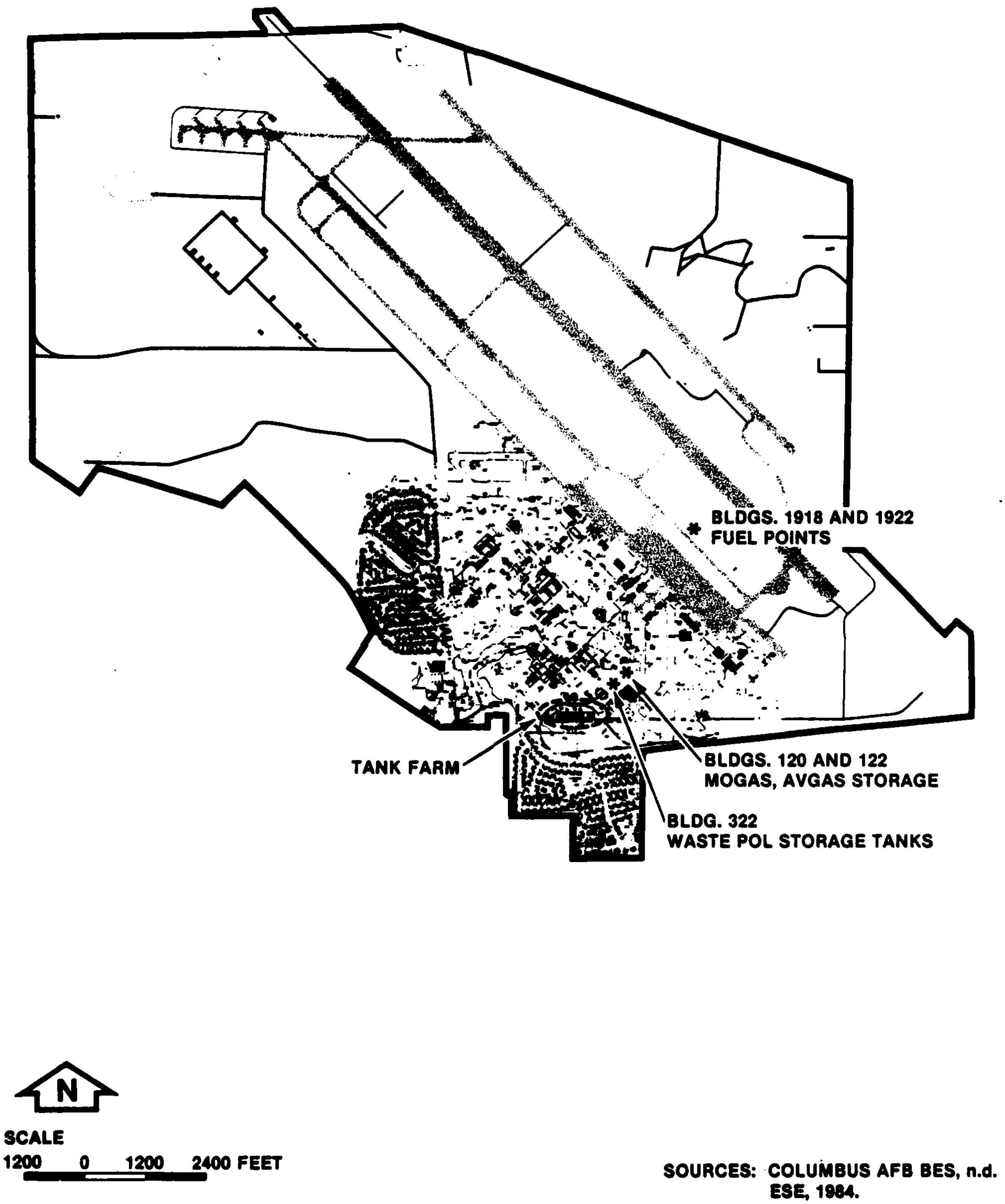


Figure 4.1-1
MAJOR POL STORAGE AREAS

INSTALLATION
RESTORATION PROGRAM
Columbus Air Force Base

storage capacity at the tank farm is approximately 52,000 barrels stored in six tanks that are bermed and lined with asphaltic materials. There are no records of major fuel spills (i.e., in excess of 1,000 gal) at the tank farm; however, based on the size and intensity of usage of the facility, it is probable that small spills occur periodically. During an OEHL inspection in July 1983, an oil sheen was noted on the drainage ditch immediately south of the tank farm. During the March 1984 site visit, there was no sheen evident in the ditch, and visual examination of the stream sediments did not reveal any oily substances. The previously observed sheen may have been caused by either a small fuel spill or by stormwater runoff from the tank farm area.

The solvents primarily used at Columbus AFB are PD-680 (a nonchlorinated aliphatic petroleum distillant) and trichloroethane. Quantities and locations of waste solvents are presented in Table 4.1-1. Solvents and engine oils are stored in either 55-gal or 5-gal drums.

The Columbus AFB Spill Prevention Control and Countermeasure (SPCC) Plan has been in effect since 1976. The plan includes daily inventory monitoring and visual inspection of all AG POL storage tanks. Additionally, the plan includes periodic inventory checks and other inspection methods to monitor for losses in UG storage tanks. These tanks are reported in the SPCC Plan to be in good condition and not leaking.

The disposal of contaminated, used, or waste petroleum products at Columbus AFB reportedly has been primarily through contractor disposal since the early 1950s. The UG waste tanks are of steel construction, have a capacity of 12,000 gal each, and were installed at Bldg. 322 in 1952 (see Fig. 4.1-1). These tanks are used for the temporary storage of waste engine oil, contaminated JP-4 fuel, and waste solvents and other POL products. The disposal of these waste materials is handled by contractor on an as-needed basis. The tanks reportedly were last pressure-tested in 1981. The tanks were reported by Civil Engineering personnel to be in good condition, with no leaks evident. Although the UG waste tanks are reported to be in good condition and not leaking, further testing of the structural integrity of these tanks is warranted given their steel construction, types and volumes of materials stored, and the importance of these tanks to the base's waste management system. Recommendations for additional testing are provided in Sec. 6.2.

Prior to 1952 (i.e., during World War II operations), waste oils and possibly waste chlorinated solvents were used for dust control on Columbus AFB roads, and waste fuels were used in the firefighter training activities. It is also suspected that potentially large quantities of waste POL from this era were disposed of by landfilling. A discussion of the firefighter training activities is presented in Sec. 4.2.2.

Examination of historical aerial photographs gives no evidence of large-scale waste POL or POL storage tank sludge disposal through either landfilling or by disposal or burn pits. However, based on practices at other Air Force installations, it is suspected that POL wastes and POL tank sludges have been landfilled at Columbus AFB.

Columbus AFB has promulgated plans for the management of contaminated/ used liquid petroleum products and has developed an oil and hazardous substance pollution contingency plan. Both of these waste POL handling plans have been in effect since at least 1981.

The only current exception to contractor disposal of waste JP-4 is the occasional burning of off-specification fuels at the firefighter training area.

4.1.6 FIREFIGHTER TRAINING ACTIVITIES

See Sec. 4.2.2.

4.1.7 RADIOACTIVE MATERIALS HANDLING, STORAGE, AND DISPOSAL

The only radiological materials currently handled on Columbus AFB are two sealed sources used in Radiac calibrators. These are stored and used by the FMS PMEL. This laboratory is located in Bldg. 1040. An inventory of these items and a license for their use are maintained by the base medical services BES Office. The Columbus AFB BEE is the designated Radiological Protection Officer.

Reportedly, during the period of SAC use of Columbus AFB (1959 to 1969), approximately 50 engine filters from B-52 aircraft and several radio and electronic tubes were buried in a site located northeast of the runway (see Fig. 4.2-1, LF-8). Reportedly, this burial occurred during 1968 and 1969. The engine filters were considered to be contaminated by small amounts of radionuclides that were in the stratosphere as a result of aboveground nuclear weapons testing. The filters are buried in two parallel trenches which were approximately 18 inches wide, 2 to 3 ft deep, and 25 ft long. The amounts of radionuclides potentially buried in this site were reported by base Civil Engineering personnel to be of no concern to the Atomic Energy Commission or the Nuclear Regulatory Commission; therefore, the filters and tubes did not require disposal as radioactive waste. Base Civil Engineering personnel reported that the land surface of the area has been periodically surface-checked for radiation, and no values above background have been recorded. To prevent the excavation of these materials, the area is posted with "Radiation Warning" signs. Because of the small amount and nature of the radioactive material in this disposal site, the site is not considered to be significantly contaminated. Hazard assessment of this site is described in Sec. 4.2.1. No records were found that indicated releases or disposal of other radiological materials on Columbus AFB.

4.1.8 EXPLOSIVE/REACTIVE MATERIALS HANDLING, STORAGE, AND DISPOSAL

Small quantities of explosive devices used for aircraft ejection seats and emergency canopy removal are stored at the Egress Shop (Bldg. 260). Access to the storage area in the shop is controlled. Operation of this shop is described in Sec. 4.1.1. A record of the munitions handled by this shop is maintained by the BES.

Limited amounts of small-arms ammunition are stored at Bldg. 980, the small-arms range. This range consists of covered firing points and an outdoor target area/backstop. Small-arms training using M-16s, shotguns, and .38-cal pistols occurs at the small-arms range at Bldg. 980 and at the small-arms range located at the western boundary of Columbus AFB. Since 1967, all ammunition for disposal and all munitions from the Egress Shop have been turned over to the U.S. Army 40th Explosive Ordnance Detachment (EOD) at Camp Shelby, Miss. Prior to 1967, limited amounts of small-arms ammunition were burned at the site (Fig. 4.2-1, Site DP-1) adjacent to the small-arms range. No records were found that indicated the disposal or demolition of other explosives or ordnance on Columbus AFB. The small-arms ammunition burn site is further assessed in Sec. 4.2.2.

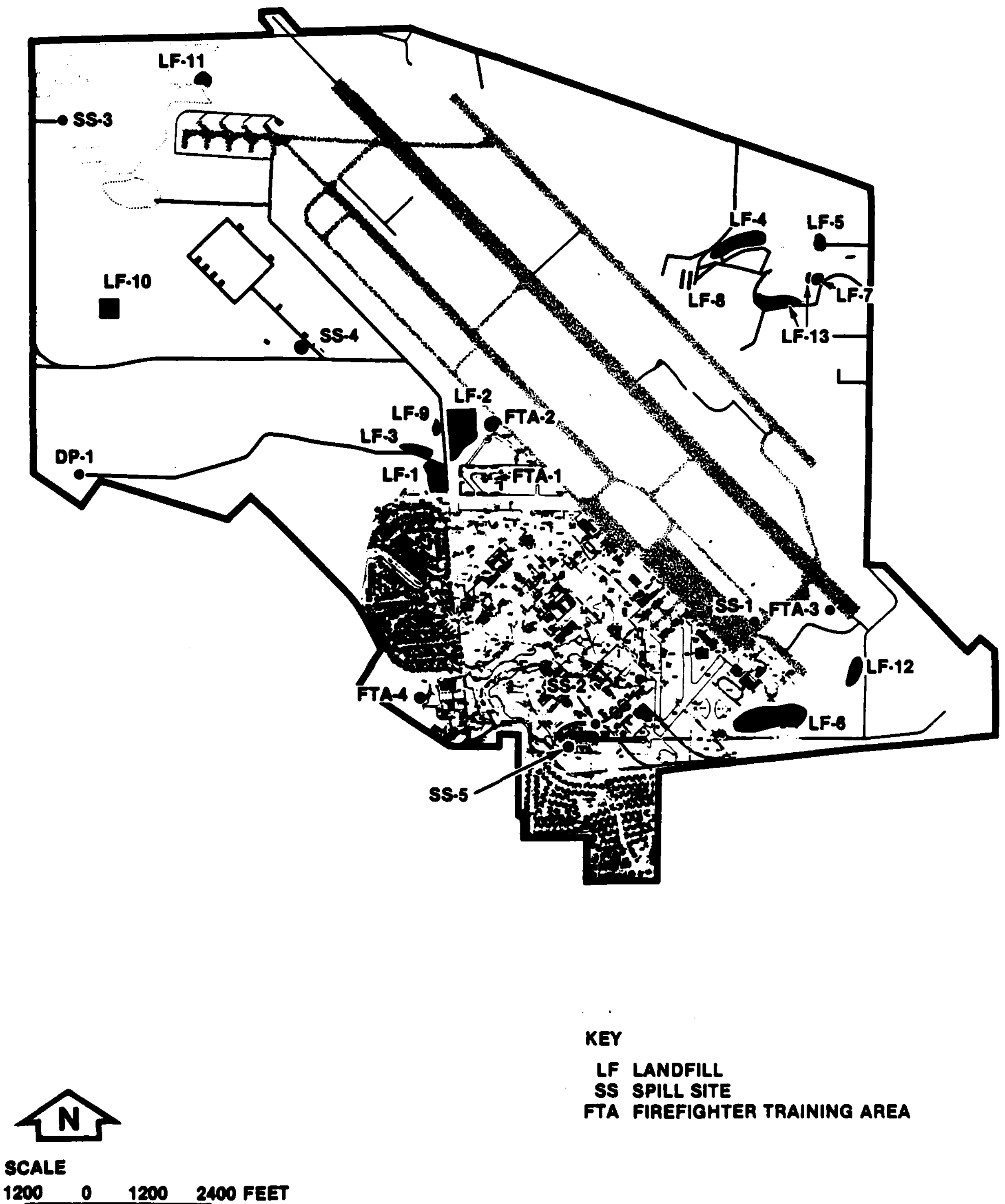
4.2 WASTE DISPOSAL METHODS AND DISPOSAL SITES IDENTIFICATION, EVALUATION, AND HAZARD ASSESSMENT

4.2.1 LANDFILLS

Thirteen landfills that were used for either sanitary waste, industrial waste, or debris disposal were identified at Columbus AFB. Landfill locations are identified on Fig. 4.2-1, and a summary of the landfill details has been presented in Table 4.2-1.

Landfill No. 1 (LF-1)

LF-1 is located in the central section of the base, immediately north of the State Village housing area. The landfill is approximately 8 acres in size and was used for disposal between mid-1940s and the early 1950s. The area may have been a borrow pit prior to landfilling. Some material consists of solid debris and unburned material such as concrete, metal, and large trees. Additionally, the landfill may contain some sanitary fill or ash from an incinerator that was operating during the early 1940s. Because this was the only known landfill to have been operation during the World War II era, it is suspected that potentially large



SOURCE: ESE, 1984.

Figure 4.2-1 **LOCATIONS OF LANDFILLS AND FIREFIGHTER TRAINING AREAS**	**INSTALLATION RESTORATION PROGRAM** **Columbus Air Force Base**

Table 4.2-1. Descriptions of Landfills on Columbus AFB

Landfill No.	Dates of Operation	Approximate Size (acres)	Depth (ft)	Type of Waste	Method of Operation	Closure Status	Surface Drainage	Approximate Depth to Water Table (ft)
1	1943(?)-1950s	8	8-10	Solid, Unburnable Debris, Concrete, Some Sanitary Material; Waste Solvents Suspected	Trench/Pit Fill	Closed, Soil-Grass Cover	Tombigbee River	<10
2	1956-1960	13	10	Sanitary Fill; Base Trash, Metal; Waste Solvents Suspected	Trench/Pit Fill	Closed, Soil-Grass Cover	Tombigbee River	<10
3	1960-1961	1.5	5	Sanitary Fill; Base Trash; Waste Solvents Suspected	Trench/Pit Fill	Closed, Soil Cover	Tombigbee River	2
4	1962-1964	13	8-10	Sanitary Fill; Base Trash, Small Amount Oil, Metal Aircraft Parts, Construction Debris; Waste Solvents Suspected	Borrow Pit Fill Burning (North Section)	Closed, Soil-Grass Cover	Buttahatchie River to Tombigbee River	<10
5	1964-1967	1.5	10-15	Sanitary Fill; Base Trash, Small Amount Oil, Construction Debris; Waste Solvents Suspected	Borrow Pit Fill	Closed, Soil-Grass Cover	Buttahatchie River to Tombigbee River	<10
6	1965-1974	13	8-10	Sanitary Fill; Base Trash, Metal and Concrete Debris; Waste Solvents Suspected	Trench and Fill	Closed, Soil-Grass Cover	Tombigbee River	2
7	1974-1976	2	10-12	Sanitary Fill; Base Trash; Waste Solvents Suspected	Trench/Pit Fill	Closed, Soil Cover	Buttahatchie River to River	<10
8	1968-1969	<0.25	2-3	Radioactive B-52 Filters (50)	25' x 18" x 3' Trench	Closed, Soil-Vegetation Cover	Buttahatchie River to Tombigbee River	<10

Table 4.2-1. Descriptions of Landfills on Columbus AFB (Continued, Page 2 of 2)

Landfill No.	Dates of Operation	Approximate Size (acres)	Depth (ft)	Type of Waste	Method of Operation	Closure Status	Surface Drainage	Approximate Depth to Water Table (ft)
9	1960s	2	5	Construction Debris; Concrete	Area/Pit Fill	Closed, Soil-Grass Cover	Tombigbee River	5
10	1965-1969	4	5-7	Construction Debris; Concrete, Wood	Area/Pit Fill	Closed, Soil-Grass Cover	Tombigbee River	5
11	1960s	2	5	Construction Debris; Concrete	Borrow Pit Fill	Closed, Soil-Grass Cover	Buttahatchie River to Tombigbee River	5
12	1980	1	3-4	Construction Debris; Concrete, Wood, Trees	Low Area Filled	Closed, Soil-Grass Cover	Tombigbee River	5
13	1976-Present (1984)	4	10	Construction Debris; Concrete, Wood, Metal, etc.	Borrow Pit Fill	Operational, Filled Areas Have Soil Cover	Buttahatchie River to Tombigbee River	<10

SCS soil survey for Lowndes County lists a soil permeability range of 10^{-2} to 10^{-4} cm/sec for all landfill areas.

Source: ESE, 1984.

volumes of waste oil and waste solvents and POL tank sludge were also disposed of in this landfill based on the duration of operation and usual USAF disposal practices during the period of operation.

Currently, the landfill is completely closed and exhibits good cover material. This landfill is suspected to contain large quantities of waste and has the potential for contaminant migration. The site was ranked using the HARM methodology (see App. I). Conclusions and recommendations regarding LF-1 are presented in Secs. 5 and 6, respectively.

Landfill No. 2 (LF-2)

LF-2 is located just northeast of LF-1, across Independence Ave. The landfill is approximately 13 acres in size and was used as a disposal area for sanitary materials between 1956 and 1960. Fill consisted of base sanitary trash, industrial waste, solid debris, and small amounts of ferrous metal debris. The method of landfilling consisted of a trench/pit fill type, with early filling in the southern section and later filling to the north. It was not reported whether the trenches encountered the water table during operation. Burning was not conducted at this location, and the landfill operated with daily cover of the fill material. Currently, the landfill is completely closed with an adequate soil cover. A small ditch flowing past the toe of the fill showed no evidence of stress at the time of the site visit and contained populations of aquatic and semiaquatic fauna.

Although this landfill was in operation during the same time that the waste POL holding tanks were in operation, based on practices at other Air Force installations, it is suspected that potentially large quantities of waste solvents and oil and POL tank sludge were disposed of in this landfill. Therefore, this landfill is suspected to contain hazardous waste material and has the potential for contaminant migration. The site was ranked using the HARM methodology (see App. I). Conclusions and recommendations regarding LF-2 are presented in Secs. 5 and 6, respectively.

Landfill No. 3 (LF-3)

LF-3 is located immediately north of LF-1, on the north side of the small dirt road leading to the outdoor small-arms range. This landfill is approximately 1.5 acres in size and was operated between 1960 and 1961. This area was used to dispose of sanitary material and possibly waste solvents and POL material after the closure of LF-2. The presence of waste solvents and oil is suspected in this landfill based on practices at other Air Force installations. The operation consisted of an east-west trench fill but was discontinued due to the shallow water table filling in the trench areas. Currently, the area is covered with soil, and no fill material is exposed at the surface.

This site is suspected of containing contamination and has the potential for migration of contaminants; therefore, the site was ranked using the HARM methodology (see App. I). Conclusions and recommendations regarding this site are presented in Secs. 5 and 6, respectively.

Landfill No. 4 (LF-4)

LF-4 is located in the northeast corner of the installation. The landfill is approximately 13 acres in size and operated between 1962 and 1964. This site was used for the disposal of sanitary trash, scrap airplane parts, small quantities of waste aircraft oil, and potentially contains waste solvents and oil. Landfilling consisted of accumulation in an abandoned borrow pit with old aircraft material in the southern section and burning of sanitary fill in the northern half. The known volume of waste aircraft oil consists of approximately 300 to 500 gal in small containers of 5 gal or less. The total quantity of waste solvents or other POL products in the landfill is unknown; the presence of this material is suspected due to known disposal practices at other Air Force installations.

Currently, the landfill is completely closed with an adequate soil cover. This site has the potential for contamination and migration of contaminants and, therefore, was ranked using the HARM methodology (see

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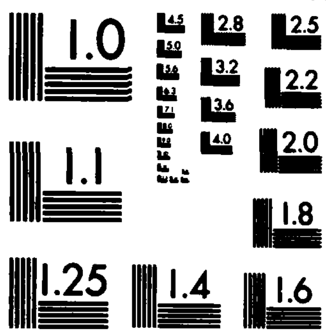

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App. I). Conclusions and recommendations regarding this site are presented in Secs. 5 and 6, respectively.

Landfill No. 5 (LF-5)

LF-5 is located in the northeast corner of the installation, immediately east of LF-4. The landfill is approximately 1.5 acres in size and was used for disposal between 1964 and 1967. Known fill material consisted of sanitary trash, construction debris, and a small amount of waste oil. Additionally, it is suspected that the landfill contains waste solvents and other POL products based on the disposal practices at other Air Force installations. The fill operated along the edge of an old borrow pit, with landfilling progressing into the open pit area.

Currently, concrete debris is visible in the wall of the filled area, and the top section of the landfill is properly covered with soil. This site does have potential for contamination and migration of contaminants and, therefore, was ranked using the HARM methodology (see App. I). Conclusions and recommendations regarding this site are presented in Secs. 5 and 6, respectively.

Landfill No. 6 (LF-6)

LF-6 is located in the southeast corner of the installation, directly south of the end of the main runway. The landfill is approximately 13 acres in size and operated as a disposal area between 1964 and 1974. Fill material consisted of sanitary trash, ferrous metal debris, and concrete debris. Also, it is suspected that the landfill contains potentially large quantities of waste solvents and waste POL materials. Burning was not conducted at this site.

North-south trenches were used for trash disposal, with initial operations on the west side and subsequent filling toward the east. On the east side of this landfill, no trenches were used due to a near-surface water table. Trash was filled on the surface and covered with soil. At the time of the site visit, the landfill was closed with an adequate soil cover. This landfill is suspected of containing contaminant materials and has the potential for migration of contaminants. Therefore, this site war ranked using the HARM methodology (see App. I). Conclusions and recommendations regarding this site are presented in Secs. 5 and 6, respectively.

Landfill No. 7 (LF-7)

LF-7 is located in the northeast corner of the installation, adjacent to LF-5. The landfill is approximately 2 acres in size and operated as a disposal area between 1974 and 1976. Known fill material consisted of base sanitary waste and potentially contains some construction debris and waste POL and solvents. The operation was located adjacent to the borrow pit and used the trench/pit fill method. This area was the last sanitary landfill operated at Columbus AFB. After 1976, sanitary waste were contract hauled offbase to an improved sanitary landfill. Additionally, after 1976, all industrial wastes (including waste solvents and waste POL materials) were contract disposed.

Currently, the landfill is covered, and a debris fill operates at its western boundary. This landfill is suspected of containing contaminant materials and has the potential for migration for contaminants. Therefore, this site was ranked using the HARM methodology (see App. I). Conclusions and recommendations regarding this site are presented in Secs. 5 and 6, respectively.

Landfill No. 8 (LF-8)

LF-8 is located in the northeast section of the installation, immediately west of LF-4. This disposal site is less than 0.25 acre in size and was used in 1968 and 1969. The material disposed of consisted of approximately 50 low-level radioactive filters from B-52 aircraft. The filters are about 2 cubic feet (ft^3) in size and were buried in two parallel trenches. The trenches were about 18 inches wide, 2 to 3 ft deep, and 25 ft long. The area has been surface checked for radiation, and no excessive values were recorded. This site does have potential for contamination and migration of contaminants and, therefore, was ranked using the HARM process (see App. I). Conclusions and recommendations regarding this site are presented in Secs. 5.0 and 6.0, respectively.

Landfill No. 9 (LF-9)

LF-9 is located in the central section of the base, between LF-2 and LF-3. This landfill operated in the 1960s and was about 2 acres in size. Material disposed of at this site consisted of construction debris, with the majority being concrete rubble. The method of operation used was an area/pit type. Currently, the site is covered and has a natural gas well located on the western edge of its boundary. This landfill has minimal or no 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.

Landfill No. 10 (LF-10)

LF-10 is located in the northwest section of the installation, near the parasail area. The disposal area is about 4 acres in size and operated between 1965 and 1969. The area fill consisted of concrete and wood construction debris along with large tree material. Currently, this area is completely covered with soil, and no debris is visible. This landfill has minimal or no 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.

Landfill No. 11 (LF-11)

LF-11 is located in the northwest section of the installation, north of the Readiness Crew Building. The disposal area is approximately 2 acres in size and operated in the 1960s. Concrete debris was disposed of at this site. This landfill has minimal or no 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.

Landfill No. 12 (LF-12)

LF-12 is located in the southeast section of the installation, in the approach zone for the runways. The site is about 1 acre in size and consisted of a naturally low area that was filled with construction debris and trees in 1980. This landfill has minimal or no 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.

Landfill No. 13 (LF-13)

LF-13 is located in the northeast section of the installation, adjacent to LF-7. This disposal area is about 4 acres in size and has been operating since 1976. The material disposed of includes concrete debris, scrap ferrous metal, wood construction debris, and a number of old automobile tires. This fill is operated along the edge of an old borrow pit and covered as it progressed outward. The fill is enclosed by a wire fence, and material entering the area is controlled by the 14th CES at Columbus AFB. This landfill has minimal or no 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.

4.2.2 DISPOSAL PITS

Review of historical records, maps, and aerial photographs and interviews with past and current employees at Columbus AFB indicate that disposal pits for chemical or liquid wastes have not been used at Columbus AFB.

Firefighter training at Columbus AFB is currently conducted at the Fire Department Drill Area [Firefighter Training Area (FTA) 1], located between the State Village housing development and the main runway area (see Fig. 4.2-1). The site consists of a mock aircraft and small building; the aircraft is on an unbermed section of an old concrete runway. This training area operation has been used approximately one to two times per month since 1971. A typical training session consumes 100 to 150 gal of JP-4 fuel and contaminated JP-4.

Prior to 1971, training operations were conducted in an unlined and unbermed burning pit located about 500 ft north of the current training area (FTA-2). The pit was approximately 30 ft in diameter with a 4- to 6-ft depth. The pit was used approximately twice a month during the late 1950s and 1960s. Contaminated jet fuel and small amounts of waste oil were used for burning; approximately 300 to 500 gal were burned during each exercise. The waste fuel was stored in an UG tank adjacent to the pit area; the tank is still in place with two exposed openings.

Two smaller unlined and unbermed pits were used for training activities in the early to mid-1950s. FTA-3 consists of a small pit near the south end of the main runway. This site was used to burn small amounts of waste oil. FTA-4 was located behind the base hospital; this area was also used for training purposes and for burning small quantities of waste oil.

Because all four firefighter training areas have potential for contamination and contaminant migration, these sites have been ranked using the HARM process (see App. I). Conclusions and recommendations regarding these sites are presented in Secs. 5.0 and 6.0, respectively.

The former EOD ammunition burning pit [Demolition Pit (DP-1)] is located near the installation boundary in the southwest corner of Columbus AFB (see Fig. 4.2-1). Prior to 1967, this site was used to destroy unserviceable small-arms ammunition by burning in a single open pit. No ammunition has been destroyed at Columbus AFB since that time, and no other explosives or ordnance were destroyed at the ammunition burning pit. Reportedly, only small and highly unviable quantities of ammunition were destroyed at this site. Records of quantities destroyed are not available.

The ammunition burning pit is located within the 100-year flood plain in low river bottomland of the Cahaba-Prentiss-Guyton Association and is, therefore, a poorly drained, relatively impermeable hydrogeologic environment. Water table conditions would be expected to be high for a large portion of the year. Residues of unburned explosives and propellants (e.g., nitroaromatic compounds) as well as metals from primer explosives are environmentally persistent and represent potential contaminants. These materials, if present, can migrate slowly in the shallow ground water or surface water during flooding toward the installation boundary to the west and south or off the installation via the surface drainage located to the east. Because there is a potential for contamination and contaminant migration at this site, it was rated using the HARM methodology presented in App. I.

4.2.3 SPILL SITES

No major liquid or chemical spills of over 1,000 gal were reported on installation records or discovered from interviews conducted with current and past base personnel. Fuel and/or oil spills of less than 1,000 gal have occurred infrequently; these spills were contained and controlled, and waste materials were properly disposed of. Two spills have been reported by the BES Office; these sites are Spill Site No. 1 (SS-1) for a phenol spill and SS-2 for a fuel oil spill (see Fig. 4.2-1 and Sec. 3.4.1).

The phenol spill (SS-1) at the aircraft washrack was caused by a pass valve kept open for 18 months. This spill resulted in contamination of the south gate stream at 0.69 ug/l phenol. The applicable water quality standard for phenol is 1 ug/l. This phenol spill was corrected by repairing the bypass switch at the aircraft washrack. No residual contamination or continuing contaminant migration from this source is likely.

The fuel oil spill (SS-2) resulted from a minor fuel oil spill (quantity unknown) in the boiler room at Bldg. 317. The fuel oil spill was contained initially by being trapped on a mass of dead tree limbs, branches, and weeds present at the entrance to the culvert at the POL tank farm. A barrier (Columbus AFB BES, 1984) was placed in the stream and the POL trapped in the stream removed. This one-time fuel oil spill was cleaned up to the maximum extent possible. Little or no residual contamination or continuing contaminant migration is likely from this source.

A minor PCB spill at Bldg. 1860 was reported by CE Exterior Electric in 1981. This site, SS-3, was cleaned up in accordance with TSCA requirements, and the leaked material and all cleanup materials were properly labeled, packaged, and disposed of by the hazardous waste contractor.

During an inspection of the Entomology Shop (Bldg. 1809) in 1979, it was reported that there were at least five leaking pesticide drums on the asphalt apron surrounding the shop. Leaked materials from these drums had flowed onto the surrounding soils, and the vegetation in the immediate vicinity was severely impacted. Also, the formulation sink in the shop was reported to drain directly onto the ground surface. The total quantity of material leaked and/or spilled is unknown. This site was designated as Spill Site 4 (SS-4) and, due to the uncontrolled nature of the spill, was ranked using the HARM methodology.

The tank farm area at Columbus AFB was designated as SS-5 because of the likelihood of numerous small POL spills in the area and the sparse data regarding tank cleaning and past maintenance practices. The area was ranked using the HARM methodology because of the potential for large quantities of POL to have been spilled in the area over the past 40 years.

With the exception of SS-4 and SS-5, the spills at Columbus AFB have had minimal potential for contamination, and all spills have been cleaned up in accordance with EPA regulations. Based on the decision process outlined in Fig. 1.3-1, SS-1 through SS-3 were deleted from further consideration.

4.2.4 HAZARD EVALUATION ASSESSMENT

The review of past operation and maintenance functions and past waste management practices at Columbus AFB has resulted in the identification of 23 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, and 4.2.3, were evaluated using the decision process presented in Fig. 1.3-1 (in Sec. 1.3). The results of this decision process are summarized in Table 4.2-2. Eight sites were found to have little or no potential for contamination and were deleted from further consideration. These sites are landfills LF-9 through LF-13 and spill sites SS-1 through SS-3. Fifteen sites were found to have potential for contamination and migration of contaminants, and these sites were further evaluated using the HARM system. Additional monitoring programs at one of the sites studied were deemed necessary under other base environmental programs. This site is identified under the column "Refer to Base Environmental Programs" in Table 4.2-2 and is addressed in the specific recommendations described in Sec. 6.0.

All sites identified in Table 4.2-2 as having contamination and potential for 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. H; results of the assessment are summarized in Table 4.2-3. The HARM system is designed to indicate the relative need for Phase II action. The information presented in Table 4.2-3 is intended for assigning priorities for further evaluation of the Columbus AFB disposal areas (Sec. 5.0--Conclusions and Sec. 6.0--Recommendations). The rating forms for the individual waste disposal sites at Columbus AFB are presented in App. I. Photographs of some of the key disposal sites are included in App. G.

Table 4.2-2. Summary of Decision Process Logic for Areas of Initial Environmental Concern at Columbus AFB

Site Description	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	No	Yes
Landfill No. 2	LF-2	Yes	Yes	No	No	Yes
Landfill No. 3	LF-3	Yes	Yes	No	No	Yes
Landfill No. 4	LF-4	Yes	Yes	No	No	Yes
Landfill No. 5	LF-5	Yes	Yes	No	No	Yes
Landfill No. 6	LF-6	Yes	Yes	No	No	Yes
Landfill No. 7	LF-7	Yes	Yes	No	No	Yes
Landfill No. 8	LF-8	Yes	Yes	No	No	Yes
Landfill No. 9	LF-9	No	No	No	No	No
Landfill No. 10	LF-10	No	No	No	No	No
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	No	No	No	No	No
Firefighter Training Area No. 1	FTA-1	Yes	Yes	No	No	Yes
Firefighter Training Area No. 2	FTA-2	Yes	Yes	No	No	Yes
Firefighter Training Area No. 3	FTA-3	Yes	Yes	No	No	Yes
Firefighter Training Area No. 4	FTA-4	Yes	Yes	No	No	Yes
Spill Site No. 1	SS-1	No	No	No	No	No
Spill Site No. 2	SS-2	No	No	No	No	No
Spill Site No. 3	SS-3	No	No	No	No	No
Spill Site No. 4	SS-4	Yes	Yes	No	No	Yes
Spill Site No. 5	SS-5	Yes	Yes	No	No	Yes
EOD Demolition Pit	DP-1	Yes	Yes	No	Yes	Yes

* Other environmental concerns include environmental problems that are not within the scope of this study (e.g., air pollution, occupational safety requirements).

Source: ESE, 1984.

Table 4.2-3. Summary of HARM Scores for Potential Contamination Sources on Columbus AFB

Rank	Site Description	Report Designation	Receptor Score	Waste Characteristics Score	Pathways Score	Waste Management Factor	Total Score
1	Landfill No. 3	LF-3	56	70	100	1.0	75
2	Spill Site No. 4	SS-4	54	60	100	1.0	71
3	Spill Site No. 5	SS-5	67	70	63	1.0	67
4	Landfill No. 6	LF-6	64	70	63	1.0	66
5	Landfill No. 5	LF-5	57	70	67	1.0	65
6	Landfill No. 7	LF-7	60	70	63	1.0	64
	Firefighter Training Area No. 4	FTA-4	55	70	63	1.0	64
7	Landfill No. 2	LF-2	51	70	67	1.0	63
8	Landfill No. 4	LF-4	48	70	67	1.0	62
	Firefighter Training Area No. 1	FTA-1	59	70	56	1.0	62
9	Landfill No. 1	LF-1	58	70	56	1.0	61
	Firefighter Training Area No. 2	FTA-2	51	70	63	1.0	61
	Firefighter Training Area No. 3	FTA-3	49	70	63	1.0	61
10	Landfill No. 8	LF-8	48	30	63	1.0	47
11	Demolition Pit No. 1	DP-1	49	20	56	1.0	42

Source: ESE, 1984.

5.0 CONCLUSIONS

The goal of the IRP Phase I study is to identify sites where there is potential from 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 review of records and files, field inspection, review of the environmental setting, interviews with base personnel and past employees, and data and interviews from regulatory agencies.

There are 13 former landfills at CAFB; 5 of these received construction debris only and, therefore, do not have a potential for contamination. Of the eight remaining landfills, seven (LF-1 through LF-7) are suspected to have received large quantities of waste solvents and/or POL products, and two (LF-4 and LF-5) are known to have received small amounts of waste POL (primarily engine oil). The remaining landfill (LF-8) contains B-52 engine filters potentially contaminated with radioactive fallout. These eight landfills were rated using the HARM methodology. The results are summarized in Table 5.0-1, and site locations are shown in Fig. 5.0-1; detailed rating sheets are presented in App. I.

LF-3 received the highest HARM score of all sites investigated. This HARM score of 75 was due primarily to the frequent flooding conditions exhibited at the site and the suspected presence of potentially large concentrations of waste solvents and waste POL products.

LF-6 was ranked number 4 overall and had a total HARM score of 66. The HARM score for this site was due primarily to the suspected presence of large quantities of waste solvents and POL products and the proximity of the site to base water supply wells. It should be noted that the most

Table 5.0-1. Summary of HARM Ratings

Rank	Site Description	Designation	Date of Operation	Total Score
1	Landfill No. 3	LF-3	1960-1961	75
2	Spill Site No. 4	SS-4	1979	71
3	Spill Site No. 5	SS-5	1940s to present	67
4	Landfill No. 6	LF-6	1965-1974	66
5	Landfill No. 5	LF-5	1964-1967	65
6	Landfill No. 7	LF-7	1974-1976	64
	Firefighter Training Area No. 4	FTA-4	1951-1957	64
7	Landfill No. 2	LF-2	1956-1960	63
8	Landfill No. 4	LF-4	1962-1964	62
	Firefighter Training Area No. 1	FTA-1	1971-present	62
9	Landfill No. 1	LF-1	1943-1950s	61
	Firefighter Training Area No. 2	FTA-2	1958-1971	61
	Firefighter Training Area No. 3	FTA-3	1951-1957	61
10	Landfill No. 8	LF-8	1968-1969	47
11	Demolition Pit No. 1	DP-1	1958-1967	42

Source: ESE, 1984.

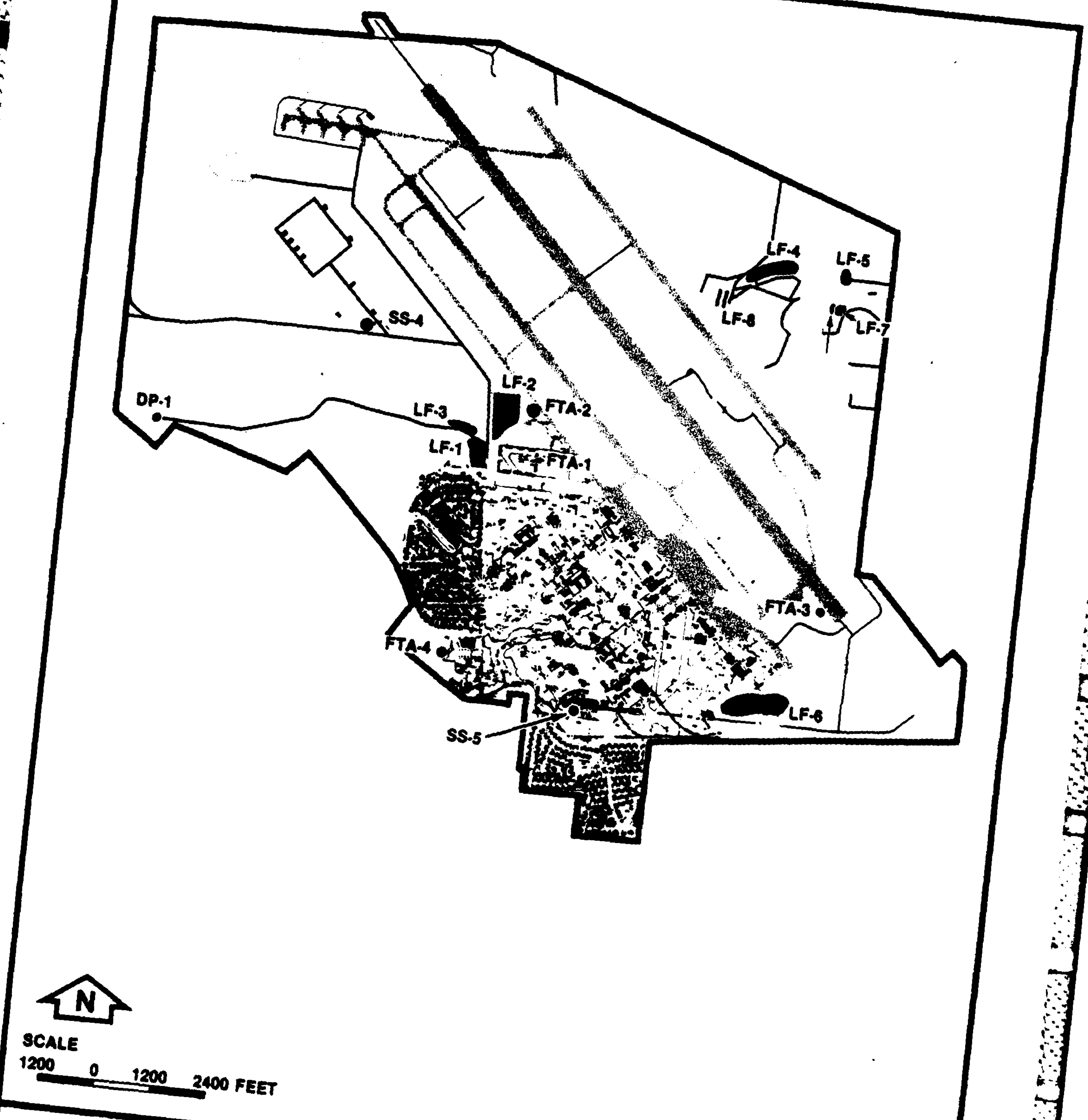

Figure 5.0-1
LOCATIONS OF LANDFILLS AND FIREFIGHTER TRAINING AREAS

SOURCE: ESE, 1984.

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probable zone of contamination near LF-6 is the shallow aquifer, and this aquifer is separated from the source of base potable water by a thick clay aquiclude.

LF-5 was ranked number 5 overall and had a total HARM score of 65. The reason for the score is the suspected presence of potentially large quantities of waste solvents and POL products. Additionally, the site is prone to occasional flooding. Additionally, it should be noted that LF-5 is on a parcel of land awaiting excess from Columbus AFB.

LF-7 was ranked number 6 overall and had a total HARM score of 64. The primary reason for the HARM score was the suspected presence of potentially large quantities of waste solvents and other POL products.

LF-2 was ranked number 7 overall and had a total HARM score of 63. The primary reason for this HARM score is the suspected presence of potentially large quantities of waste solvents and other waste POL products. Additionally, the site is prone to occasional flooding.

LF-4 was ranked number 8 overall and had a total HARM score of 62. The primary reason for this HARM score was the suspected presence of potentially large quantities of waste solvents and other waste POL products, and the site is prone to occasional flooding.

LF-1 was ranked number 9 overall and had a total HARM score of 61. The primary reason for the HARM score was the suspected presence of potentially large quantities of waste solvents and other waste POL products.

LF-8 was ranked number 10 overall and had a total HARM score of 47. The BES Office at Columbus AFB conducts periodic monitoring of the site for radiation and consistently has reported values which do not differ from background.

The four firefighter training areas (FTA-1 through FTA-4) at Columbus AFB have HARM rating scores ranging from 64 to 61. FTA-4 was ranked number 6 overall and had a total HARM score of 64. FTA-1 was ranked number 8 overall and had a total HARM score of 62; FTA-2 and FTA-3 were both ranked number 9 overall and had a total HARM score of 61. All four firefighter training areas were suspected to contain waste engine oil potentially contaminated with chlorinated solvents in addition to the known presence of JP4 contaminated with water. FTA-4 and FTA-1 had identical receptor scores; however, FTA-4 exhibits physical characteristics that are slightly more conducive to contaminant migration than FTA-1.

Spill Site No. 4 (SS-4) was ranked number 2 overall and had a total HARM score of 71. The reasons for this HARM score are the documented presence of small quantities of hazardous materials (pesticides) and the frequency of flooding within the area.

Spill Site No. 5 (SS-5) was ranked number 3 overall and had a total HARM score of 67. The reasons for the HARM score are the suspected presence of large quantities of POL materials and the proximity of the site to a stream and the center of the base.

The Demolition Pit (DP-2) was ranked number 10 overall and has a HARM score of 37. The quantities of material detonated and/or burned in this pit were small, and destruction of the material was reported to be nearly complete.

6.0 RECOMMENDATIONS

Fifteen sites identified at Columbus AFB as having potential for environmental contamination have been evaluated using the HARM methodology. The relative potential of the sites for environmental contamination was assessed, and sites which may require further study and monitoring were identified. Sites with higher HARM scores have a higher potential for environmental contamination and should be given first consideration for investigation in Phase II. Sites with lower HARM scores have a moderate potential for environmental contamination. Further studies at these sites are recommended, but the need for investigation is less than for the sites with higher scores.

6.1 PHASE II RECOMMENDATIONS

The following actions are recommended to further assess the potential for environmental contamination from waste disposal areas at Columbus AFB. 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, types of samples to be collected (e.g., soil, water, sediment), and suspected contaminants for which analysis 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 to find the movement of contaminants from each site will be determined as part of the Phase II investigation.

Due to the suspected presence of contaminants in the landfill areas at Columbus AFB, geophysical surveys are recommended to attempt to locate any buried wastes at the sites. Additionally, the monitoring parameters to be analyzed at the sites are screening parameters rather than analyte-specific lists due to the suspected nature of contamination. Recommended ground water monitoring should be performed on a periodic basis for approximately 1 year to assess contaminant migration under different seasons and rainfall/flooding/water table conditions. All monitoring data should be evaluated throughout the program to determine need for further action, if needed.

All monitor wells should be constructed of 2-inch polyvinyl chloride (PVC), threaded-joint casing, and factory-slotted screen. The wells should be installed to a total depth of 25 to 30 ft, 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. Although the shallow aquifer is generally less than 50 ft thick, a depth of 25 to 30 ft for the monitor wells is recommended because the dominant ground water flow is expected to be lateral toward adjacent surface waters rather than vertical. This lateral movement is due to the presence of underlying McShane Formation, which has a very low permeability and serves as an aquiclude in the area.

A detailed log of each well boring should be made, including well construction diagrams. Shelby tube samples collected during drilling should be tested to determine vertical permeability. The annula surrounding the screen should be filled with a filter pack of medium to fine sand. The top of the filter pack should be bentonite sealed, and the annula should be grouted to the surface. The wells should be protected with 8-inch pipe fitted with locking caps. The wells 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 level 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 ground water flow rates.

The recommended Phase II environmental monitoring program for 13 of the 15 sites is summarized in Table 6.1-1. No Phase II studies are recommended at two sites, DP-1 and LF-8.

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

Site(s)	Designation	HARM Score(s)	Recommended Monitoring	Remarks
Landfill No. 3 Landfill No. 2 Firefighter Training Area No. 1 Landfill No. 1 Firefighter Training Area No. 2	LF-3 LF-2 FTA-1 LF-1 FTA-2	75 63 62 61 61	Due to the proximity of these sites to each other, it is recommended that they be treated as a single monitoring area. Conduct surface geophysical surveys to determine if buried drums are present in landfills. Install two upgradient and four downgradient wells and monitor for parameters listed in Table 6.1-2.	If screening parameters indicate contamination, expand parameter list to include specific chlorinated and nonchlorinated solvents (e.g., TCE, methylene chloride, MIBK, MEK).
Spill Site No. 4	SS-4	71	Install one upgradient and three downgradient wells. Take five soil/sediment samples from area surrounding the site and in the adjacent surface drainageway. Analyze all samples with Pesticide/Herbicide scan to include DDT, DDD, DDE, Kepone, Parathion, Aspon, and BHC.	Continue monitoring if sampling indicates contamination. Additional wells may be necessary to assess extent of contamination.
Spill Site No. 5	SS-5	67	Install one upgradient and two downgradient wells. Take three sediment samples from drainageway adjacent to tank farm. Analyze samples for parameters listed in Table 6.1-2.	If screening parameters indicate contamination, the parameter list may be expanded to include specific POL contaminants.
Landfill No. 6	LF-6	66	Install one upgradient and three downgradient wells. Analyze samples for parameters listed in Table 6.1-2.	If screening parameter indicates contamination, expand parameter list to include specific chlorinated and nonchlorinated solvents (e.g., TCE, methylene chloride, MIBK, MEK).

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

Site(s)	Designation	HARM Score(s)	Recommended Monitoring	Remarks
Landfill No. 5 Landfill No. 7 Landfill No. 4	LF-5 LF-7 LF-4	65 64 62	Due to the promixity of these sites to each other, it is recommended that they be treated as a single monitoring area. Conduct surface geophysical surveys to determine if buried drums are present in landfills. Install two upgradient and four downgradient wells and monitor for parameters listed in Table 6.1-2.	If screening parameters indicate contamination, expand parameter list to include specific chlorinated and nonchlorinated solvents (e.g., TCE, methylene chloride, MIBK, MEK).
Firefighter Training Area No. 4	FTA-4	64	Install one upgradient and three downgradient wells. Analyze samples for parameters listed in Table 6.1-2.	If screening parameter indicates contamination, expand parameter list to include specific solvents (e.g., TCE, methylene chloride, MIBK, MEK).
Firefighter Training Area No. 3	FTA-3	61	Install one upgradient and three downgradient wells. Analyze samples for parameters listed in Table 6.1-2.	If screening parameter indicates contamination, expand parameter list to include specific solvents (e.g., TCE, methylene chloride, MIBK, MEK).

Source: ESE, 1984.

The detailed approaches for the sites recommended for Phase II studies are described in this section. The parameter list presented in Table 6.1-2 is keyed to the locations summarized in Table 6.1-1. Due to the proximity of several of the landfills and disposal areas to each other, several disposal sites have been grouped into a single monitoring unit. The grouping of the several sites into one monitoring unit is considered necessary because of potential interferences from adjacent sites if each disposal were to be analyzed separately. Detailed recommendations for each site or monitoring unit are presented in the following paragraphs.

In addition to the Phase II monitoring recommendations, monitoring at one site (DP-1) is recommended for inclusion in the base environmental program. Also, continued monitoring at LF-8 is recommended as part of the base environmental program.

<u>Landfills No. 1, 2, and 3 and Firefighter Training Areas No. 1 and 2</u>

The monitoring program for this group of sites should include the installation of two upgradient and four downgradient wells. The two upgradient wells should be located immediately north and east of the state village military housing area; the four downgradient wells should be located in a semi-circle surrounding the cluster of sites. Additionally, it is recommended that surface geophysical surveys be conducted at the three landfills to determine if any buried drums are present. The wells should be sampled for the parameters listed in Table 6.1-2.

<u>Spill Site No. 4</u>

The monitoring program for this site should include the installation of one upgradient and three downgradient wells. The upgradient well should be located to the south of Bldg. 1809, and the three downgradient wells should be located to the west, north, and east of Bldg. 1809. Additionally, it is recommended that sediment samples be taken from the soil immediately surrounding the apron at Bldg. 1809 and from the

Table 6.1-2. Summary of Recommended Parameters for Ground Water Analyses at Columbus AFB

Analyte	Analytical Method	Detection Limit
Oil and Grease (O&G), IR Method	EPA Method 413.2*	100 ug/l
Total Organic Carbon (TOC)	EPA Method 415.1*	1,000 ug/l**
Total Organic Halogens (TOX)	EPA Method 9020†	5 ug/l**
pH	EPA Method 150.1*	
Specific Conductance	EPA Method 120.1*	1 umho/cm

* Methods for Chemical Analysis of Water and Wastes, EPA-600/4-79-020, (EPA, March 1979).

† Test for Evaluation of Solid Waste Management, Physical-Chemical Method, SW-86, 2nd Ed. (EPA, 1983).

** Detection levels for TOC and TOX must be three times the noise level of the instrument; laboratory distilled water must show no response. If so, corrections of positive results must be made.

Source: ESE, 1984.

surface drainageway which flows west immediately south of the building. The ground water samples should be analyzed for the parameters listed in Table 6.1-2, and the soil and sediment samples should be analyzed for pesticide and herbicide scan.

Spill Site No. 5

The monitoring program for this site should include one upgradient well and three downgradient wells. The upgradient well should be located south of the drainageway adjacent to the tank farm; the three downgradient wells should be located to the west, north, and east of the tank farm area. The wells should be sampled for the parameters listed in Table 6.1-2.

Landfill No. 6

The monitoring program for this site should include one upgradient and three downgradient wells. The upgradient well should be located in the vicinity of the main gate to Columbus AFB; the three downgradient wells should be located near the recreational area immediately north of the security police office due south of Bldg. 219 and due south of Bldg. 224. The wells should be sampled for the parameters listed in Table 6.1-2.

Landfills No. 4, 5, and 7

The monitoring program for this group of sites should include two upgradient wells and four downgradient wells. The two upgradient wells should be located to the northwest of Bldg. 2054; the four downgradient wells should be located to the north and west of the group of landfills. In addition to the ground water monitoring program, it is recommended that surface geophysical surveys be conducted in the area to determine if any buried drums are located in the landfills. The wells should be sampled for the parameters listed in Table 6.1-2.

It should be noted that there is a cluster of shallow wells in the vicinity of these landfills that were installed by TVA to monitor ground water elevations in the area. If possible, these wells may be used for ground water monitoring purposes.

Firefighter Training Area No. 4

The monitoring program for this site should include the installation of one upgradient and three downgradient wells. The upgradient well should be located north and west of the youth recreation center (Bldg. 1114); the three downgradient wells should be located to the north and to the west of the USAF hospital (Bldg. 1100). The wells should be sampled for the parameters listed in Table 6.1-2.

Firefighter Training Area No. 3

The monitoring program for this site should include the installation of one upgradient and three downgradient wells. The upgradient well should be located northeast of Bldg. 226. The three downgradient wells should be located in a line parallel to the taxiway forming the southeastern boundary of the airfield. The wells should be sampled for the parameters listed in Table 6.1-2.

Firefighter Training Area No. 3

The monitoring program for this site should include the installation of one upgradient and three downgradient wells. The upgradient well should be located northeast of Bldg. 226. The three downgradient wells should be located in a line parallel to the taxiway forming the southeastern boundary of the airfield. The wells should be tested for the parameters listed in Table 6.1-2.

6.2 BASE ENVIRONMENTAL PROGRAM RECOMMENDATIONS

It is recommended that Columbus AFB test the soils of the EOD demolition pit (DP-1) for explosives residues and for leachable metals using the EPA EP toxicity test. If no significant quantities of explosives/propellant residues remain and if metals are not extractable at levels predicted to be hazardous (by virtue of toxicity), no further testing is required. If large quantities of metals are leachable, as predicted from the test, a ground water monitoring program may be required to define the extent of migration. If significant explosives/propellants remain in the soils, a similar program focused on these materials may be required.

It is also recommended that Columbus AFB continue their radiological monitoring of Landfill No. 8 (LF-8). If the radiological measurements at the site continue to be similar to background levels, Columbus AFB may desire to either reduce the frequency of monitoring or eliminate this monitoring point.

Finally, although the UG waste POL holding tanks located Bldg. 322 are not suspected to be leaking or the site of significant spillage, it is recommended that a thorough inspection of the tanks be conducted. This thorough inspection is recommended because the tanks are over 30 years old and in an environment potentially conducive to rusting and/or corrosion. The tanks play a vital role in the current waste disposal practices at Columbus AFB and, due to the tank capacities, any loss of structural integrity could have major environmental consequences.

APPENDIX A

GLOSSARY OF TERMINOLOGY, ABBREVIATIONS, AND ACRONYMS

APPENDIX A

GLOSSARY OF TERMINOLOGY, ABBREVIATIONS, AND ACRONYMS

ABG	Air Base Group
AFB	Air Force Base
AG	Aboveground
AGE	Aerospace ground equipment
Aquifer	A geologic formation, group of formations, or part of a formation capable of yielding water to a well or spring
ATC	Air Training Command
AVGAS	aviation gasoline
BES	Bioenvironmental Engineering Services
BOD	biochemical oxygen demand
Columbus AFB	Columbus Air Force Base
cal	caliber
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CES	Civil Engineering Squadron
cfs	cubic feet per second
Circumneutral	Water with a pH at or near 7 units
cm/sec	centimeters per second
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
CS	Communications Squadron
DDT	dichlorodiphenyltrichloroethane
DEQPPM	Defense Environmental Quality Program Policy Memorandum
Det.	Detachment
DIS	Defense Investigative Service

Disected watershed	A stream pattern where numerous, small, intermittent drainageways traverse any area with randomly occurring topographic features; also referred to as a contorted stream pattern
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
DO	Deputy Commander for Operations
DOD	Department of Defense
Downgradient	In the direction of decreasing hydraulic static head; the direction in which ground water flows
DP	demolition pit
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.
°F	degrees Fahrenheit
Fluvial	Sediments deposited through river floodplain deposition
FMS	Field Maintenance Squadron
ft	feet
ft^3	cubic feet
FTA	firefighter training area
FTS	Flying Training Squadron
FTW	Flying Training Wing
Fusel oil	Oil used in the preparation of lacquers and/or as a solvent for resins and waxes
gal	gallon
gal/yr	gallons per year
Glauconitic	A green mineral closely related to the micas, comprised essentially of hydrous potassium iron silicates

gpm	gallons 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
HQ	Headquarters
Infiltration	Movement of water through the soil surface into the ground
IRP	Installation Restoration Program
lb	pounds
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
LF	landfill
MA	Deputy Commander for Maintenance
MCL	maximum contaminant level
Methyl ethyl ketone (MEK)	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
MGD	million gallons per day
mg/l	milligrams per liter

Methyl isobutyl ketone (MIBK)	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
MOGAS	automotive gasoline
msl	mean sea level
NA	not applicable
NCO	Noncommissioned Officer
NCOIC	Noncommissioned Officer-in-Charge
NDI	Nondestructive Inspection
NIPDWR	National Interim Primary Drinking Water Regulation batteries, plating, and other industrial applications; highly toxic to humans and aquatic life
NPDES	National Pollutant Discharge Elimination System
OIC	Officer-in-Charge
OMS	Organizational Maintenance Squadron
Pan evaporation	Measurement of free-standing water evaporation from a standard basin
PCB	*Polychlorinated* biphenyl--liquid used as a dielectric in electrical equipment; suspected human carcinogen; bioaccumulates 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
ppm	parts per million
RCRA	Resource Conservation and Recovery Act
RPO	Radiological Protection Officer
RS&H	Reynolds, Smith and Hills

Ruderal	Initial vegetative succession in poor or disturbed soils
SAC	Strategic Air Command
SCS	U.S. Department of Agriculture Soil Conservation Service
SPCC	Spill Prevention Control and Countermeasure (Plan)
Spill	An unplanned release or discharge of a hazardous waste onto or into air, land, or water
SS	Student Squadron
STORET	Storage and Retrieval
STP	sewage treatment plant
TCE	trichloroethylene, a commonly used degreasing solvent; toxic to aquatic life and a suspected human carcinogen
TSCA	Toxic Substances Control Act
TVA	Tennessee Valley Authority
uCi	microcuries
UG	underground
ug/l	micrograms per liter
umhos/cm	micromhos per centimeter
Unconformably	Geologic strata not succeeding the underlying strata in immediate order of age and in parallel position
Upgradient	In the direction of increasing hydraulic static head; the direction opposite to the prevailing flow of ground water
USAF	U.S. Air Force
USGS	U.S. Geological Survey
VOA	volatile organic analysis
Water table	Surface of a body of unconfined ground water at which the pressure is equal to that of the atmosphere
WTP	water treatment plant

APPENDIX B

TEAM MEMBER BIOGRAPHICAL DATA

C. RICHARD NEFF, M.S.
Staff Engineer/Project Manager

ESE
PROFESSIONAL RESUME

SPECIALIZATION

Water Quality, Hydrology, Environmental Engineering

RECENT EXPERIENCE

Environmental Audits and Records Search of U.S. Army Facilities, Project Team Engineer--Onsite environmental surveys to assess current and past waste management activities at military installations. Team engineer inspects industrial operations, POL storage and transfer facilities, wastewater treatment facilities, RCRA status, and central records.

Environmental Licensing Study for Peat-Harvesting Project, Project Manager--Georgia-Pacific Corporation's 5,600-acre proposed peat-harvesting project in north central Florida.

Environmental Assessment for Proposed Peat Synthetic Fuels, Project Engineer--Peat Methanol Associates proposed peat-to-methanol conversion facilities in North Carolina.

Environmental Assessments, Project Manager--Environmental assessment of a 50,000-acre development in central Florida and for a water quality baseline study for a 15,000-acre east central Florida development. Responsibilities included operation of the Soil Conservation Service's TR-20 and WSP-2 hydrological models; permit preparation for several FDER and Corps of Engineers wetlands permits and SFWMD surface water management permit.

NPDES Studies, Project Manager--NPDES permit compliance studies for Tampa Electric Company's three generating stations.

Water Quality Studies, Project Manager--Escambia River mixing zone and water quality analyses study for Monsanto Textiles Company. Water quality and nonpoint source pollution studies on Kiawah Island, S.C.

EDUCATION

M.S.	1978	Civil Engineering	University of Virginia
B.S.	1976	Environmental Engineering	University of Florida

PUBLICATIONS

Neff, C.R. 1978. Characterizing Urban Sediments, Presented at the Virginia Section of the Water Pollution Control Federation Conference; Roanoke, Virginia.

DONALD F. McNEILL, M.S.
Associate Scientist

ESE
PROFESSIONAL RESUME

SPECIALIZATION

Clastic sedimentology, carbonate sedimentology, geohydrology, organic sediment analysis, geomorphology, stratigraphy, field mapping, and sampling techniques

RECENT EXPERIENCE

Project Hydrogeologist, EDB Contamination Investigation--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 Scientist--Development of a ground water monitoring plan for a wire galvanizing plant, including site analysis, geohydrology, and proposed ground water monitoring network.

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.

University of Florida, Graduate Teaching Assistant--Instructor for a graduate level laboratory class in clastic sedimentology and associated techniques.

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

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. 1983. Field Guide to the Pleistocene Anastasia Formation in Northern Florida.

MICHAEL A. KEIRN, Ph.D.
Senior Scientist

ESE PROFESSIONAL RESUME

SPECIALIZATION

Hazardous Waste Management, Aquatic/Wetland Ecology, Microbiology, Water Quality

RECENT EXPERIENCE

Environmental Contamination Survey of Vint Hill Farms Station, Project Manager--Exploration survey of ground water and surface water contamination migration (metals, cyanide, phenol, solvents) at a U.S. Army installation in Virginia. Disposal sites include landfill, former lagoon, and land industrial sludge disposal area. Responsible for cost control, schedule, coordination of field/laboratory activities, quality control, and contamination assessment report.

Environmental Survey of Gateway Army Ammunition Plant, Project Manager--Confirmatory study of PCB, metals, asbestos, solvents contamination of buildings, sewers, and soils at U.S. Army installation due for excessing action. Responsible for cost control, schedule, coordination of sampling and analysis, and contamination assessment.

Environmental Survey and Decontamination Plan for Alabama Army Ammunition Plant, Project Manager--10-manyear hazardous waste exploratory and confirmatory sampling and analysis survey of a 5,000-acre U.S. Army munitions plant. Responsible for cost control, schedules, quality control, field survey crew training, and coordination of analytical methods development for complex nitro-organics. Survey addressed contamination of soil, surface water, sediment, ground water, biota, and man-made structures.

Initial Assessment Studies for the Naval Energy and Environmental Support Activity, Project Chemist/Ecologist--Evaluated a Naval installation 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. Determine extent of contamination at former disposal/spill sites, potential for contaminant migration, and Potential effects on human health and the environment.

Assessment of Potential Biological Effects of a Pulp Mill Discharge on the Flint River, Project Director--Principal investgation for the conduct of acute and chronic toxicity studies for eight animal and algal species to treated effluent. Responsible for overall direction of project, client interaction, and development of assessment. Required both onsite and laboratory toxicity studies.

Evaluation of Methods for Wetlands Transition Zones Evaluation, COE, Project Director--Project Director for the assessment of procedures for determining the wetland/upland transition zones in Florida and in Louisiana. Provided overall project guidance and direction for two separate projects/tasks.

Evaluation of Toxicant Extraction Procedures, Project Manager--Provided a review of toxicant extraction leaching procedures. Included EP toxicity tests, ASTM procedures, and University of Wisconsin test as a response to an EPA call for comment on the RCRA extraction procedure, as it relates to the cement industry.

Environmental Survey and Cleanup of PCB-Contaminated Equipment Maintenance Yard, Quality Assurance Manager--Supervised quality control procedures for field sampling and onsite laboratory analytical effort to determine the extent of PCB contamination in soils and surface waters for Arkansas Power and Light Company. Approximately 300 soil samples were taken over a period of 6 days using extremely sensitive procedures to avoid cross-contamination of samples and to delineate the areal extent of contamination.

Development of Water Quality Criteria for Selected Munitions Compounds, Subproject Manager--Participated in surveys of TNT and RDX/HMX environmental impact and development of water quality criteria for selected military munitions: nitrocellulose, glycerol trinitrate (nitroglycerin), RDX and HMX, and white phosphorus (P4), under contract to the U.S. Army Medical Research and Development Command.

Chemistry/Environmental Fate--Helped to develop a program to investigate the ecology and physiology of bacteria which form nitrogen-fixing symbioses with tropical grasses.

EDUCATION

Ph.D.	1977	Environmental Engineering Sciences	University of Florida
M.S.	1968	Environmental Engineering Sciences	University of Florida
B.S.	1965	Biological Sciences	Purdue University

COMMITTEES

Member, Standard Methods Committee for Periphyton; AWWA, APHA, WPCF

PUBLICATIONS

Fourteen technical publications in the fields of environmental fate of munitions compounds, limnology and water disinfection.

APPENDIX C

LIST OF INTERVIEWEES AND OUTSIDE CONTACTS

APPENDIX C

LIST OF INTERVIEWEES AND OUTSIDE CONTACTS

COLUMBUS AFB INTERVIEWEE	Years of Service
14th CES	
1. Civil Engineering Personnel	26
2. Engineering Construction Staff Personnel	24
3. Environmental Staff Personnel	7
4. Base History Staff Personnel	18
5. Water and Wastewater Plant Personnel	25
6. Water and Wastewater Plant Personnel	2
7. Fire Department Staff Personnel	29
8. Electrical Shop Personnel	26
9. Plumbing Shop Personnel	1
10. Landfill Personnel	25
11. Entomology Shop Personnel	14
12. Fire Department Staff Personnel	11
13. Drafting Personnel	16
USAF Hospital	
1. Base Bioenvironmental Engineering Personnel	2
2. Base Bioenvironmental Engineering Personnel	3
3. Dental Laboratory Personnel	19
4. Hospital Clinical Laboratory Personnel	3
5. Dental Clinic Stores Personnel	2
6. Hospital Maintenance Personnel	4
7. Hospital Maintenance Personnel	6
8. Hospital Laboratory Personnel	
9. X-Ray Laboratory Personnel	
14th FMS	
1. AGE Shop Personnel	4
2. NDI Laboratory Personnel	4
3. J-69 and J-85 Engine Maintenance Shop Personnel	7
4. Metals Processing Shop Personnel	4
5. Corrosion Control Shop Personnel	6
6. Supply Personnel	24
7. Transportation Division Personnel	13
8. Washrack Personnel	2

	Years of Service
14th SS	
1. Supply Squadron Staff Personnel	24
2. Supply Squadron Staff Personnel	26
14th ABG	
1. Safety Office Pewrsonnel	14
2. Photo Laboratory Personnel	7
TENANT/DPDO	
1. DPDO Personnel	7

OUTSIDE RECORDS CENTERS AND AGENCY CONTACTS

Dan Thomson	U.S. Environmental Protection Agency (EPA), Region IV, Atlanta, GA
Judy Endicott	Albert F. Simpson Historical Research Center, Maxwell AFB, AL
Leroy Jackson	National Archives and Records Service, Modern Military Branch, Washington, DC
Richard Spurr	National Archives and Records Service, Cartographic and Architectural Branch, Alexandria, VA
Fred Pernell	Washington National Records Center, Suitland, MD
Capt. Cober Mr. Jernnigan	U.S. Air Force History Office, Bolling AFB, Washington, DC
	U.S. EPA STORET Water Quality Data Base--Computer Access
J. Mark Boggs	Tennessee Valley Authority, Norris, TN
	Mississippi Bureau of Geology, Jackson, MS
	Mississippi Department of Wildlife Conservation, Jackson, MS
Ronald Greg	Department of Defense, Memphis Defense Depot, Memphis, TN
Bill Morris	Department of Defense, Defense Logistics Agency, Post Sales Office, Battle Creek, MI
John Herrmann	Mississippi Bureau of Pollution Contrtol, Solid Waste Division, Jackson, MS
Bill Holland	U.S. EPA, Region IV, Solid Waste Section, Atlanta, GA
Jim Cook	U.S. EPA, Region IV, CERCLA Section, Atlanta, GA
Ron Joiner	U.S. EPA, Region IV, CERCLA Section, Atlanta, GA
Rich Ferrazzuolo	U.S. EPA, Region IV, CERCLA Section, Atlanta, GA
Dick Kibbler	USAF, HQ AF/LEEV, Bolling AFB, MD
Dean Bard	USAF, HQ SAC/DEMV, Offutt AFB, NE
Jack Turner	Lowndes County Health Department, Columbus, MS

APPENDIX D

ORGANIZATION, MISSIONS, AND TENANT ACTIVITIES

APPENDIX D

ORGANIZATION, MISSIONS, AND TENANT ACTIVITIES

PRIMARY ORGANIZATIONS

14th FLYING TRAINING WING

The 14th FTW is a unit of ATC, Randolph AFB, Tex. The primary mission of the 14th FTW is undergraduate pilot training. The wing has two operational squadrons, the 37th flying the T-37 and the 50th flying the T-38.

In terms of manpower, the wing has more than 3,800 people assigned, of whom more than 910 are civilian employees. It has a full complement of organic support assigned under the tri-deputy organizational concept.

Reporting directly to the commander of the 14th FTW are three deputy commanders (Operations, Maintenance, and Resource Management), the 14th ABG Commander, three staff agencies (Public Affairs, Safety, and Social Actions), and the Senior Enlisted Advisor.

DEPUTY COMMANDER FOR OPERATIONS

The Deputy Commander for Operations (DO) is responsible for the flying operations of the 14th FTW. Reporting to the DO are two flying training squadrons (37th and 50th), the 14th SS, and four divisions (Operations, Administrative Branch, Base Operations, and Standardization and Evaluation).

DIRECTOR OF OPERATIONS, 14th STUDENT SQUADRON

The 14th SS is responsible for administrative work and all academic classes and military training involved in flying training. Each training class is assigned a class commander who is a member of the 14th SS.

37TH FLYING TRAINING SQUADRON

The 37th FTS is responsible for the first phase of pilot training. This training is accomplished in the Cessna T-37 "Tweet" in the 37th FTS. The Tweet is a subsonic aircraft with top speeds of 350 mph and a ceiling of 25,000 ft. Students in the 37th FTS learn basic flying procedures as well as advanced instruction in aerobatic, instrument, night, and formation flying.

50TH FLYING TRAINING SQUADRON

The 50th FTS is responsible for the second phase of pilot training. Students who have mastered all the aspects of flying the T-37 move to the 50th FTS and the Northrop T-38 Talon. The T-38 is a supersonic aircraft with a top speed of 800 mph and a ceiling of 50,000 ft. As in the T-37, the student practices navigation, formation, and instrument flying and flies 2-day, cross-country missions and solo out-and-backs.

DEPUTY COMMANDER FOR MAINTENANCE

The Deputy Commander for Maintenance (MA) is responsible for maintaining and scheduling both the T-37 and T-38 aircraft assigned to the wing, as well as management of the entire maintenance complex and ensuring that maintenance performed on assigned equipment is timely and of high quality. Reporting to the MA are five agencies (Maintenance Control; Job Control; Quality Control; Materiel Control; and Plans, Scheduling, and Documentation) and two squadrons (Field Maintenance and Organizational Maintenance).

14TH FIELD MAINTENANCE SQUADRON

The 14th FMS is responsible for aircraft maintenance repair in support of the Wing's Undergraduate Pilot Training mission. The squadron consists of specialists assigned to five different branches: Avionics, Aerospace Systems, Aerospace Ground Equipment, Fabrication, and Propulsion. The squadron also provides interservice support for the U.S. Navy by performing J-85 jet engine intermediate maintenance, aircraft painting, and repair of aircraft components. PMEL provides calibration for all base units and three Air National Guard units. Squadron personnel additionally support ATC aircraft requiring maintenance east of the Mississippi River. Personnel assigned to MA staff agencies are assigned to the squadron.

14TH ORGANIZATIONAL MAINTENANCE SQUADRON

The 14th OMS has primary custody of more than 100 T-38A and 98 T-37B aircraft. The T-38 Aircraft Maintenance Branch performs launch, recovery, minor maintenance, and minor inspections on the T-38A Talon Supersonic Trainer aircraft; the T-37 Aircraft Maintenance Branch performs launch, recovery, minor maintenance, and minor inspections on the T-37B Subsonic Trainer Aircraft; the T-37 Branch also provides temporary duty support, under the Accelerated Copilot Enrichment Program, to four SAC bases in the geographical area. Complex organizational-level aircraft maintenance is performed by the Repair and Reclamation Branch for both T-38A and T-37B aircraft. The Inspection Branch performs in-depth periodic inspections of assigned T-38 and T-37 aircraft. Additionally, the Inspection Branch and Repair and Reclamation Branch provide interservice T-38 aircraft organizational maintenance for the U.S. Navy. Squadron personnel are also detailed to areas east of the Mississippi River to provide any maintenance support required for ATC aircraft temporarily in those areas.

14th SUPPLY SQUADRON

Base Supply provides supplies, equipment, and fuels support to all host and tenant agencies associated with the 14th FTW.

AIR BASE GROUP COMMANDER

The 14th ABG consists of a work force of approximately 375 military and 225 civilian personnel providing base support and services to the 14th FTW and other organizations located or tenanted on the base. The commander of the ABG serves as the base commander in exercising command and control over the Civil Engineering Squadron, Headquarters Squadron; Security Police; Readiness Division; Administrative Division; Chaplain;

Staff Judge Advocate; Personnel Division; Services Division; and the Morale, Welfare, and Recreation Division. In addition to the 14th ABG divisions, the Headquarters Squadron provides orderly room functions for the Wing Safety Division, Social Actions Division, Public Affairs Division, and the Wing Commander.

TRANSPORTATION

The Transportation Division provides Traffic Management and Vehicle Support services for the base. Vehicle Maintenance and Operations are provided by a civilian contractor.

COMPTROLLER

The mission of the 14th FTW Comptroller Division is to budget and pay for all salaries, supplies, and services required to operate the Base and support the Wing misssion. In addition, the division provides HQ ATC and Air Staff with an accurate accounting of all monies expended. *It also provides data automation services to each unit and tenant* organization.

INTERNATIONAL TRAINING OFFICE

The Foreign Training Office is responsible for the administration, welfare, and support of more than 130 allied students. Students from Italy, UNAB Arab Emirates, Singapore, Jordan, Ecuador, Portugal, and Indonesia receive training from various agencies onbase. These agencies include T-37 and T-38 pilot training, Radar Approach Control, the Maintenance area, Supply, Safety, Consolidated Base Personnel, Physiological Training, and Fire Protection.

USAF HOSPITAL

The USAF Hospital at Columbus AFB is a modern, well-equipped facility offering a broad range of medical care. Those specialties not available are offered at the nearby referral hospitals at Maxwell AFB, Ala., and

Keesler AFB, Miss. There are also civilian specialists in the immediate area as well as local hospitals.

DENTAL SERVICES

The Dental Clinic at Columbus AFB provides dental care for the military personnel stationed at Columbus AFB.

TENANTS

1948TH COMMUNICATIONS SQUADRON

The 1948th Communications Squadron's primary mission is to provide air-traffic control and base communications services in support of the 14th FTW undergraduate pilot training mission. The squadron is responsible for supervising the engineering, installation, operation, and maintenance of onbase communications, air traffic control services, and air navigational aids for USAF and other selected government and civilian agencies.

FIELD TRAINING DETACHMENT 318

Field Training Det. 318 is responsible for onsite formal technical instruction required to qualify personnel in the skills, knowledge, and techniques needed to operate, maintain, and control T-37 and T-38 aircraft and supporting equipment.

AREA DEFENSE COUNSEL, DETACHMENT QD2G

Det. QD2G provides defense services for USAF personnel, including court-martial, Article 15s, and discharge actions. The Area Defense is a tenant organization and is not part of ATC or the 14th FTW command structure.

AIR FORCE OFFICE OF SPECIAL INVESTIGATIONS

Det. 811 of the Office of Special Investigations has the mission of providing criminal, fraud, counterintelligence, and special investigative services for the Commander, Columbus AFB.

DEFENSE INVESTIGATIVE SERVICES

DIS is a centrally directed DOD agency with headquarters in Washington, D.C. Its mission is to conduct personal security investigations for all DOD components and provide specialized investigative services to the department.

3314TH MANAGEMENT ENGINEERING TEAM

The primary responsibility of the Management Engineering Detachment (MET) 8 at Columbus AFB is to act as the divisional-level extension of the Director of Manpower and Organization, HQ ATC. All base matters pertaining to manpower authorizations and management engineering programs are the responsibility of MET 8.

In conjunction with this duty and responsibility at Columbus AFB, MET 8 performs management engineering studies, management advisory studies, and government cost study analysis to determine unit authorization requirements and increase management efficiency and productivity. MET 8 evaluates all requests pertaining to changes and transfers of manpower authorizations.

24TH WEATHER SQUADRON, DETACHMENT 2

The 24th Weather Squadron is responsible for providing flight weather data and conditions and weather forecasting in support of the flight operations at Columbus AFB.

DEFENSE PROPERTY DISPOSAL OFFICE

DPDO receives, processes, stores, safeguards, and disposes of excess and surplus government property in the manner most advantageous to the government.

APPENDIX E

MASTER LIST OF SHOPS

APPENDIX E

MASTER LIST OF SHOPS

Shop Name	Current Location (Bldg. No.)	Handles Regulated Hazardous Materials	Generates Regulated Hazardous Waste	Typical Treatment Storage, and Disposal Methods
PRIMARY ORGANIZATIONS				
14th FMS				
Fuels Flow	218	Yes	Yes	Contract disposal
Wheel and Tire	220	No	No	
Sheet Metal	220	No	No	
Test Cell	226	No	No	
Fuels Systems	246	Yes	No	
NDI Lab	246	Yes	Yes	Contract disposal
Plating	218	Yes	Yes	Contract disposal
Corrosion Control	220,262	Yes	Yes	Contract disposal
AGE	430	No	No	
Machine Shop	220	Yes	No	
Electric	630	No	No	
Parts Cleaning	218	Yes	Yes	Contract disposal
Egress	260	No	No	
Welding	218	No	No	
Environmental Systems	630	Yes	No	
Afterburner	218	No	No	
Balance Room	218	Yes	Yes	Contract disposal
PMEL	1040	No	No	
Instrument	630	No	No	
14th OMS				
Repair and Reclamation	450,456	No	No	
Washrack	228	No	No	
T-38 Maintenance	452	No	No	
T-37 Maintenance	454	No	No	
14th CES				
Entomology	367	Yes	No	
Power Production	1816	Yes	Yes	Contract disposal
Refrigeration	379	No	No	
Heating	379	No	No	
Liquid Fuel Maintenance	322	No	No	
Plumbing	379	No	No	
Sheet Metal	379	No	No	
Paint	379	No	No	
Exterior Electric	379	Yes	Yes	Contract disposal

APPENDIX E

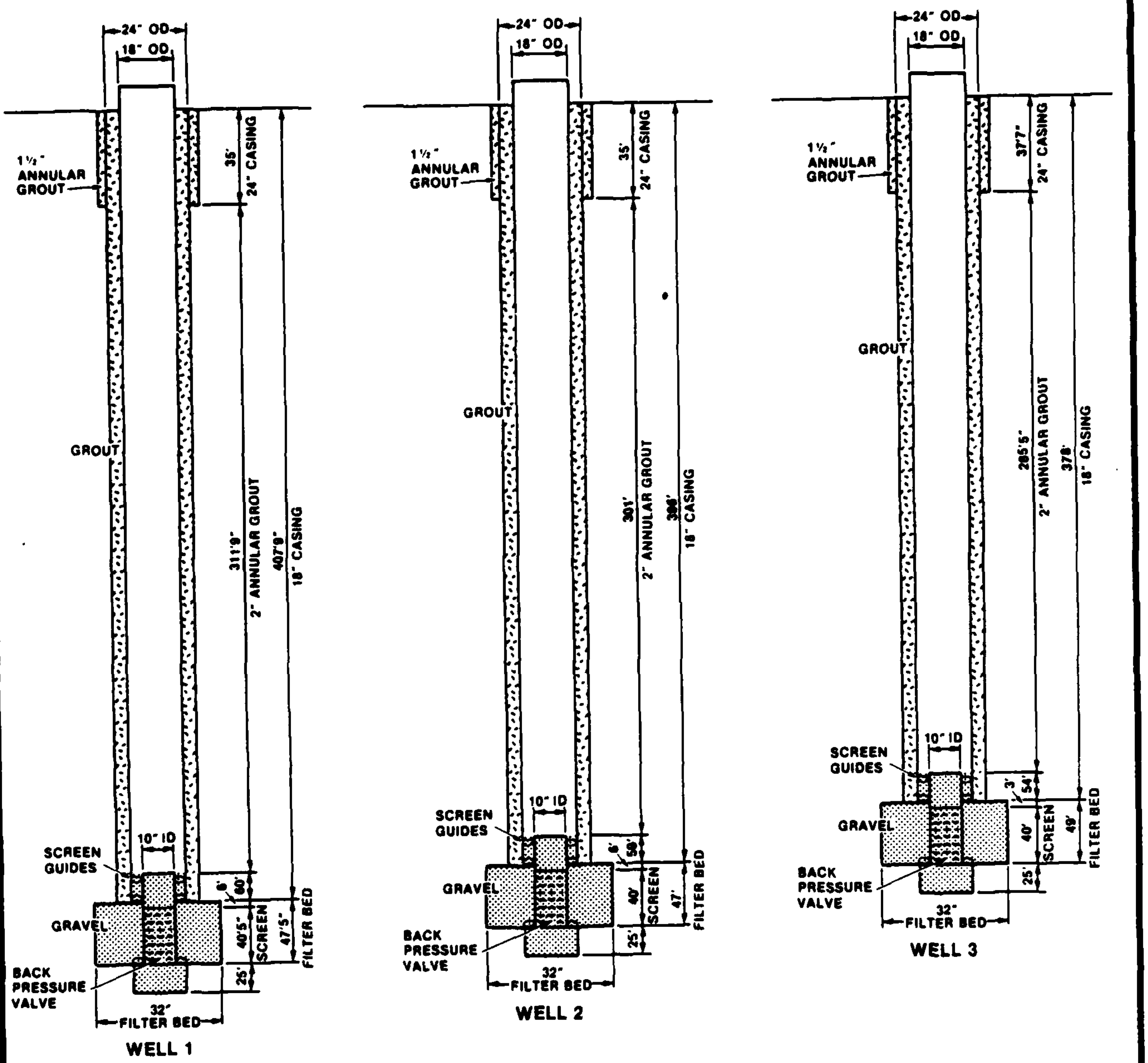
MASTER LIST OF SHOPS
(Continued, Page 2 of 2)

Shop Name	Current Location (Bldg. No.)	Handles Hazardous Materials	Generates Hazardous Waste	Typical Treatment Storage, and Disposal Methods
Transportation				
Motor Vehicle Maintenance	303,304 317	Yes	Yes	Contract disposal
14th ABG				
Base Reproduction	216	Yes	No	
Firing Range	980	No	No	
Auto Hobby Shop	338	No	No	
Photographic Laboratory	900	No	No	
TENANTS				
1948th Communications Sq.				
Radio Maintenance	1046	Yes	No	
Radar Maintenance	1801	No	No	
Hospital				
Surgery	1100	Yes	Yes	Contract disposal
X-Ray	1100	Yes	Yes	Silver recovery; discharge to STP
Dental Clinic	1004	Yes	Yes	Silver recovery; discharge to STP

Source: ESE, 1985.

APPENDIX F

WELL CONSTRUCTION DETAILS



NOT TO SCALE

SOURCE: COLUMBUS AFB, 1941.

Figure F-1 **WELL CONSTRUCTION DETAILS**	**INSTALLATION RESTORATION PROGRAM** **Columbus Air Force Base**

APPENDIX G

PHOTOGRAPHS OF DISPOSAL/SPILL SITES

APPENDIX G

PHOTOGRAPHS OF DISPOSAL/SPILL SITES

The aerial reconnaissance of Columbus AFB, scheduled for the morning of Mar. 24, 1984, was canceled due to weather conditions and, therefore, no aerial photographs of the base disposal sites are available. The following ground photographs are presented in lieu of the aerials.

DATE: MARCH 1984.

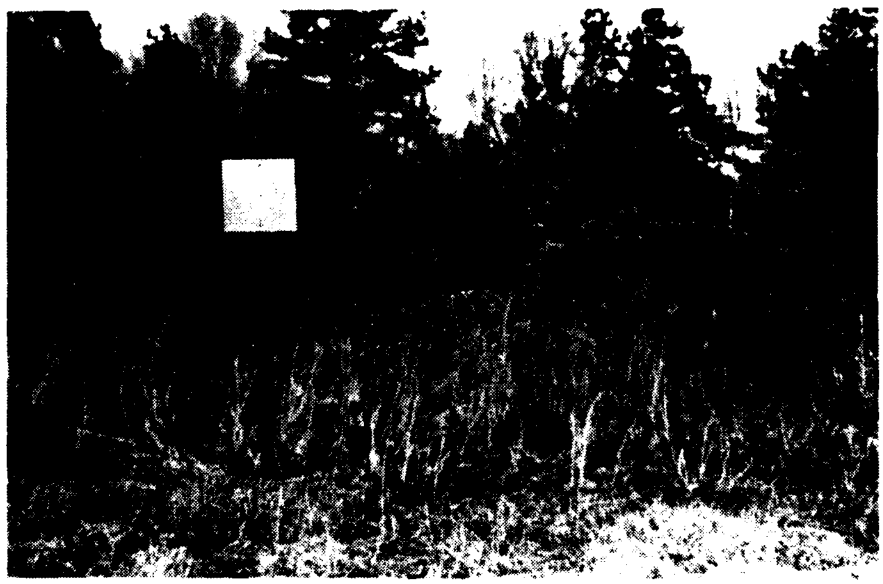
Figure G-1
LANDFILL NO. 6 (TOP)

LANDFILL NO. 2 (BOTTOM)

INSTALLATION RESTORATION PROGRAM
Columbus Air Force Base

DATE: MARCH 1984.

Figure G-2 **LANDFILL NO. 13 (TOP)** **LANDFILL NO. 7 (BOTTOM)**	**INSTALLATION** **RESTORATION PROGRAM** **Columbus Air Force Base**



DATE: MARCH 1984.

Figure G-3
LANDFILL NO. 4 (TOP)

LANDFILL NO. 8 (BOTTOM)

INSTALLATION RESTORATION PROGRAM
Columbus Air Force Base

DATE: MARCH 1984.

Figure G-4 **LANDFILL NO. 1**	**INSTALLATION RESTORATION PROGRAM** **Columbus Air Force Base**

APPENDIX H

USAF IRP HAZARD ASSESSMENT RATING METHODOLOGY

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

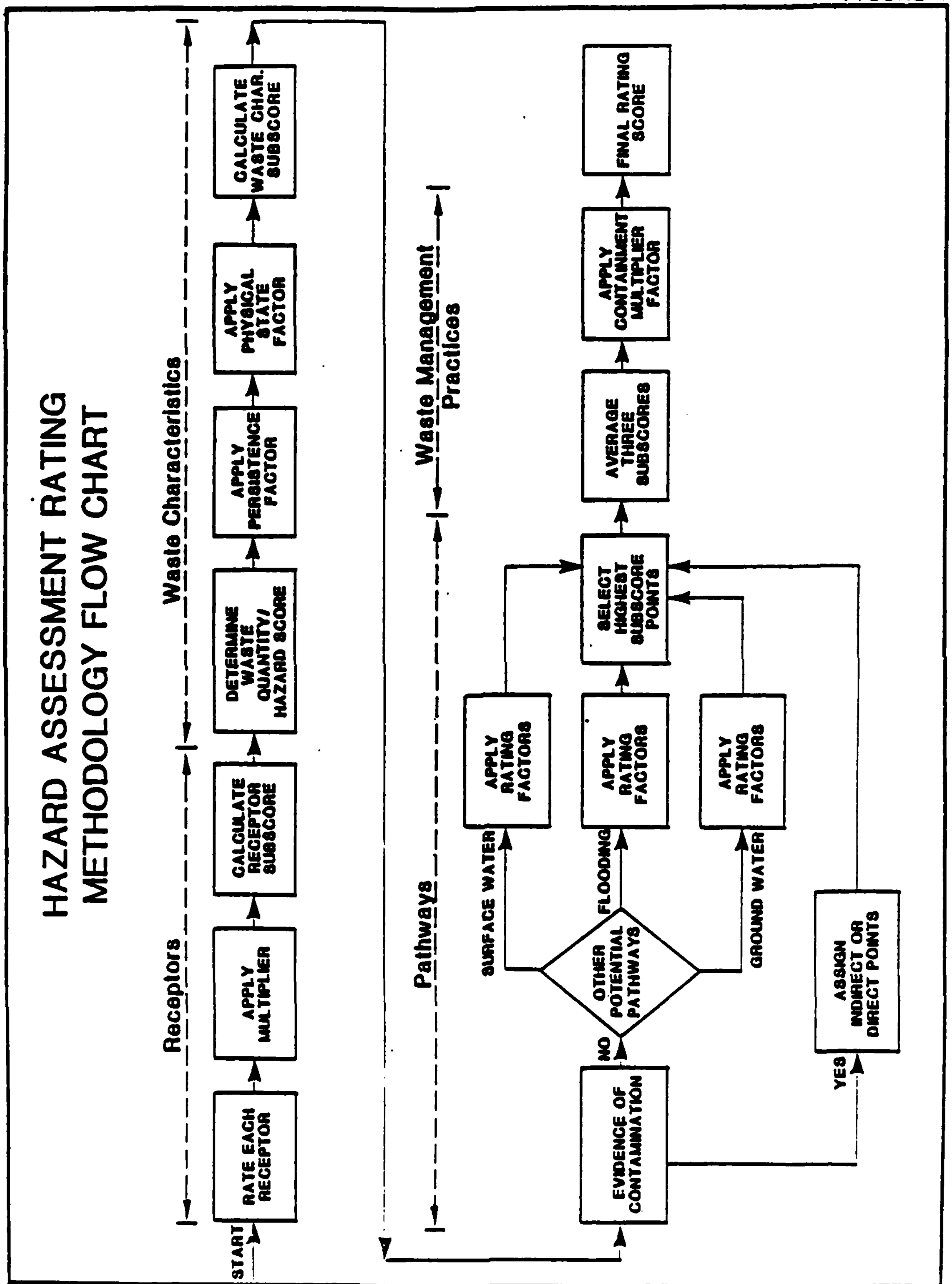

HAZARD ASSESSMENT RATING
METHODOLOGY FLOW CHART
Receptors
Waste Characteristics
START
RATE EACH RECEPTOR
APPLY MULTIPLIER
CALCULATE RECEPTOR SUBSCORE
DETERMINE WASTE QUANTITY/ HAZARD SCORE
APPLY PERSISTENCE FACTOR
APPLY PHYSICAL STATE FACTOR
CALCULATE WASTE CHAR. SUBSCORE
Pathways
Waste Management Practices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

FIGURE 2

HAZARD ASSESSMENT RATING METHODOLOGY FORM

NAME OF SITE ______

LOCATION ______

DATE OF OPERATION OR OCCURRENCE ______

OWNER/OPERATOR ______

COMMENTS/DESCRIPTION ______

SITE RATED BY ______

I. RECEPTORS

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

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

II. WASTE CHARACTERISTICS

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

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

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

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

______ X ______ = ______

C. Apply physical state multiplier

Subscore B X Physical State Multiplier = Waste Characteristics Subscore

______ X ______ = ______

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) ______

2. Flooding

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

Subscore (100 x factor score/3) ______

3. Ground-water migration

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

Subtotals ______ ______

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

C. Highest pathway subscore.

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

Pathways Subscore ______

IV. WASTE MANAGEMENT PRACTICES

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

Receptors ______
Waste Characteristics ______
Pathways ______

Total ______ divided by 3 = ______
Gross Total Score

B. Apply factor for waste containment from waste management practices

Gross Total Score X Waste Management Practices Factor = Final Score

______ X ______ = ______

TABLE 1

HAZARD ASSESSMENT RATING METHODOLOGY GUIDELINES

I. RECEPTORS CATEGORY

Rating Factors	Rating Scale Levels: 0	1	2	3	Multiplier
A. Population within 1,000 feet (includes on-base facilities)	0	1 - 25	26 - 100	Greater than 100	4
B. Distance to nearest water well	Greater than 3 miles	1 to 3 miles	3,001 feet to 1 mile	0 to 3,000 feet	10
C. Land Use/Zoning (within 1 mile radius)	Completely remote (zoning not applicable)	Agricultural	Commercial or industrial	Residential	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	H
	M	C	H
70	L	S	H
60	S	C	H
	M	C	M
50	L	S	M
	L	C	L
	M	S	M
	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. [illegible]vidence of Contamination

Direc[illegible]. 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 cas[illegible] sub[illegible] [illegible]e f[illegible] [illegible]n,	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 Protection Training Areas:

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

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

APPENDIX I

HAZARD ASSESSMENT RATING METHODOLOGY FORMS

HAZARD ASSESSMENT RATING METHODOLOGY FORM

Name of Site: Firefighter Training Area No. 1

Location:

Date of Operation or Occurrence: 1971 to Present

Owner/Operator: Columbus AFB

Comments/Description: Active

Site Rated By: C.R. Neff

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	2	6	12	18
E. Critical environments within 1-mile radius of site	0	10	0	30
F. Water quality of nearest surface water body	1	6	6	18
G. Ground water use of uppermost aquifer	3	9	27	27
H. Population served by surface water supply within 3 miles downstream of site	0	6	0	18
I. Population served by ground water supply within 3 miles of site	3	6	18	18
SUBTOTALS			106	180
Receptors subscore (100 x factor score subtotal/maximum 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) — 70

B. Apply persistence factor:
Factor Subscore A x Persistence Factor = Subscore B — 70 x 1.0 = 70

C. Apply physical state multiplier:
Subscore B x Physical State Multiplier = Waste Characteristics Subscore — 70 x 1.0 = 70

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	3	8	24	24
Net precipitation	1	6	6	18
Soil permeability	2	8	16	24
Subsurface flows	1	8	8	24
Direct access to ground water	1	8	8	24
SUBTOTALS			62	114
Subscore (100 x factor score subtotal/maximum score subtotal)				54

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	59	
Waste Characteristics	70	
Pathways	56	
TOTAL	185	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: Firefighter Training Area No. 2

Location:

Date of Operation or Occurrence: 1958(est.) to 1972

Owner/Operator: Columbus AFB

Comments/Description: Closed

Site Rated By: C.R. Neff

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	2	10	20	30
C. Land use/zoning within 1-mile radius	3	3	9	9
D. Distance to reservation boundary	2	6	12	18
E. Critical environments within 1-mile radius of site	0	10	0	30
F. Water quality of nearest surface water body	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			92	180
Receptors subscore (100 x factor score subtotal/maximum score subtotal)				51

II. WASTE CHARACTERISTICS

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

1. Waste quantity (1=small, 2=medium, 3=large) 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) 70

B. Apply persistence factor:
Factor Subscore A x Persistence Factor =
Subscore B 70 x 1.0 = 70

C. Apply physical state multiplier:
Subscore B x Physical State Multiplier =
Waste Characteristics Subscore 70 x 1.0 = 70

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	1	8	8	24
Surface permeability	1	6	8	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	3	8	24	24
Net precipitation	1	6	6	18
Soil permeability	2	8	16	24
Subsurface flows	1	8	8	24
Direct access to ground water	1	8	8	24
SUBTOTALS			62	114
Subscore (100 x factor score subtotal/ maximum score subtotal)				54

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	51
Waste Characteristics	70
Pathways	63
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 1.0 = 61

HAZARD ASSESSMENT RATING METHODOLOGY FORM

Name of Site: Firefighter Training Area No. 3

Location: South end of Main Runway

Date of Operation or Occurrence: 1951-1957 (est.)

Owner/Operator: Columbus AFB

Comments/Description: Closed

Site Rated By: C.R. Neff

I. RECEPTORS

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
A. Population within 1,000 feet of site	0	4	0	12
B. Distance to nearest well	2	10	20	30
C. Land use/zoning within 1-mile radius	2	3	6	9
D. Distance to reservation boundary	2	6	12	18
E. Critical environments within 1-mile radius of site	0	10	0	30
F. Water quality of nearest surface water body	1	6	6	18
G. Ground water use of uppermost aquifer	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			89	180
Receptors subscore (100 x factor score subtotal/maximum score subtotal)				49

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) 70

B. Apply persistence factor:
Factor Subscore A x Persistence Factor = Subscore B
70 x 1.0 = 70

C. Apply physical state multiplier:
Subscore B x Physical State Multiplier = Waste Characteristics Subscore
70 x 1.0 = 70

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	1	8	8	24
Surface permeability	1	6	6	18
Rainfall intensity	3	8	24	24
SUBTOTALS			68	108
Subscore (100 x factor score subtotal/ maximum score subtotal)				63
2. Flooding	0	1	0	3
Subscore (100 x factor score/3)				0
3. Ground water migration				
Depth to ground water	3	8	24	24
Net precipitation	1	6	6	18
Soil permeability	2	8	16	24
Subsurface flows	1	8	8	24
Direct access to ground water	1	8	8	24
SUBTOTALS			62	114
Subscore (100 x factor score subtotal/ maximum score subtotal)				54

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	49
Waste Characteristics	70
Pathways	63
TOTAL	182

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 1.0 = 61

HAZARD ASSESSMENT RATING METHODOLOGY FORM

Name of Site: Firefighter Training Area No. 4

Location: West of Bldg. 1100

Date of Operation or Occurrence: 1951-1957(est.)

Owner/Operator: Columbus AFB

Comments/Description: Closed

Site Rated By: C.R. Neff

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	2	10	20	30
C. Land use/zoning within 1-mile radius	2	3	6	9
D. Distance to reservation boundary	3	6	18	18
E. Critical environments within 1-mile radius of site	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			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) 70

B. Apply persistence factor:
Factor Subscore A x Persistence Factor =
Subscore B 70 x 1.0 = 70

C. Apply physical state multiplier:
Subscore B x Physical State Multiplier =
Waste Characteristics Subscore 70 x 1.0 = 70

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	1	8	8	24
Surface permeability	1	6	6	18
Rainfall intensity	3	8	24	24
SUBTOTALS			68	108
Subscore (100 x factor score subtotal/maximum score subtotal)				63
2. Flooding	0	1	0	3
Subscore (100 x factor score/3)				0
3. Ground water migration				
Depth to ground water	3	8	24	24
Net precipitation	1	6	6	18
Soil permeability	2	8	16	24
Subsurface flows	1	8	8	24
Direct access to ground water	1	8	8	24
SUBTOTALS			62	114
Subscore (100 x factor score subtotal/maximum score subtotal)				54

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	59
Waste Characteristics	70
Pathways	63
TOTAL	192

divided by 3 = 64 Gross total score

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

64 x 1.0 = 64

HAZARD ASSESSMENT RATING METHODOLOGY FORM

Name of Site: Landfill No. 4

Location: Northeast Corner of Columbus AFB

Date of Operation or Occurrence: 1962-1964

Owner/Operator: Columbus AFB

Comments/Description: Landfill Closed

Site Rated By: C.R. Neff

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	2	10	10	30
C. Land use/zoning within 1-mile radius	1	3	3	9
D. Distance to reservation boundary	2	6	12	18
E. Critical environments within 1-mile radius of site	1	10	10	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			86	180
Receptors subscore (100 x factor score subtotal/maximum score subtotal)				48

II. **WASTE CHARACTERISTICS**

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

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

Factor Subscore A (from 20 to 100 based on factor score matrix) 70

B. Apply persistence factor:
Factor Subscore A x Persistence Factor = Subscore B
70 x 1.0 = 70

C. Apply physical state multiplier:
Subscore B x Physical State Multiplier = Waste Characteristics Subscore
70 x 1.0 = 70

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	1	8	8	24
Surface permeability	1	6	6	18
Rainfall intensity	3	8	24	24
SUBTOTALS			68	108
Subscore (100 x factor score subtotal/maximum score subtotal)				63
2. Flooding	2	1	2	3
Subscore (100 x factor score/3)				67
3. Ground water migration				
Depth to ground water	3	8	24	24
Net precipitation	1	6	6	18
Soil permeability	2	8	16	24
Subsurface flows	2	8	16	24
Direct access to ground water	1	8	8	24
SUBTOTALS			70	114
Subscore (100 x factor score subtotal/maximum score subtotal)				61

C. Highest pathway subscore

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

Pathways Subscore 67

IV. WASTE MANAGEMENT PRACTICES

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

Receptors	48	
Waste Characteristics	70	
Pathways	67	
TOTAL	185	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.5

Location: Northeast Corner of Columbus AFB

Date of Operation or Occurrence: 1964-1967

Owner/Operator: Columbus AFB

Comments/Description: Landfill Closed

Site Rated By: C.R. Neff

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	2	10	20	30
C. Land use/zoning within 1-mile radius	3	3	9	9
D. Distance to reservation boundary	2	6	12	18
E. Critical environments within 1-mile radius of site	1	10	10	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			102	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) 3
2. Confidence level (1=confirmed, 2=suspected) 2
3. Hazard rating (1=low, 2=medium, 3=high) 3

Factor Subscore A (from 20 to 100 based on factor score matrix) 70

B. Apply persistence factor:
Factor Subscore A x Persistence Factor = Subscore B
70 x 1.0 = 70

C. Apply physical state multiplier:
Subscore B x Physical State Multiplier = Waste Characteristics Subscore
70 x 1.0 = 70

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	3	8	24	24
Net precipitation	1	6	6	18
Surface erosion	1	8	8	24
Surface permeability	1	6	6	18
Rainfall intensity	3	8	24	24
SUBTOTALS			68	108
Subscore (100 x factor score subtotal/maximum score subtotal)				63
2. Flooding	2	1	2	3
Subscore (100 x factor score/3)				67
3. Ground water migration				
Depth to ground water	3	8	24	24
Net precipitation	1	6	6	18
Soil permeability	2	8	16	24
Subsurface flows	2	8	16	24
Direct access to ground water	1	8	8	24
SUBTOTALS			70	114
Subscore (100 x factor score subtotal/maximum score subtotal)				61

C. Highest pathway subscore

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

Pathways Subscore 67

IV. WASTE MANAGEMENT PRACTICES

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

Receptors	57
Waste Characteristics	70
Pathways	67
TOTAL	194 divided by 3 = 65 Gross total score

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

65 x 1.0 = 65

HAZARD ASSESSMENT RATING METHODOLOGY FORM

Name of Site: Landfill No. 8

Location: Northeast Corner of Columbus AFB

Date of Operation or Occurrence: 1968-1969

Owner/Operator: Columbus AFB

Comments/Description: Landfill Closed

Site Rated By: C. R. Neff

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	1	10	10	30
C. Land use/zoning within 1-mile radius	1	3	3	9
D. Distance to reservation boundary	2	6	12	18
E. Critical environments within 1-mile radius of site	1	10	10	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			86	180

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

II. WASTE CHARACTERISTICS

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

1. Waste quantity (1=small, 2=medium, 3=large) 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 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	3	8	24	24
Net precipitation	1	6	6	18
Surface erosion	1	8	8	24
Surface permeability	1	6	6	18
Rainfall intensity	3	8	24	24
SUBTOTALS			68	108
Subscore (100 x factor score subtotal/ maximum score subtotal)				63
2. Flooding	0	1	0	3
Subscore (100 x factor score/3)				0
3. Ground water migration				
Depth to ground water	3	8	24	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			54	114
Subscore (100 x factor score subtotal/ maximum score subtotal)				47

C. Highest pathway subscore

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

IV. WASTE MANAGEMENT PRACTICES

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

Receptors	48
Waste Characteristics	30
Pathways	63
TOTAL	141

divided by 3 = 47 Gross total score

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

47 x 1.0 = 47

HAZARD ASSESSMENT RATING METHODOLOGY FORM

Name of Site: Demolition Area

Location: Southwest Corner of Columbus AFB

Date of Operation or Occurrence:

Owner/Operator: Columbus AFB

Comments/Description:

Site Rated By: C.R. Neff, M.A. Keirn

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	1	10	10	30
C. Land use/zoning within 1-mile radius	0	3	0	9
D. Distance to reservation boundary	3	6	18	18
E. Critical environments within 1-mile radius of site	1	10	10	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			89	180
Receptors subscore (100 x factor score subtotal/maximum score subtotal)				49

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) 2
3. Hazard rating (1=low, 2=medium, 3=high) 3

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

B. Apply persistence factor:
Factor Subscore A x Persistence Factor = Subscore B
40 x 1.0 = 40

C. Apply physical state multiplier:
Subscore B x Physical State Multiplier = Waste Characteristics Subscore
40 x 0.5 = 40

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	1	1	1	3
Subscore (100 x factor score/3)				33
3. Ground water migration				
Depth to ground water	3	8	24	24
Net precipitation	1	6	6	18
Soil permeability	2	8	16	24
Subsurface flows	1	8	8	24
Direct access to ground water	1	8	8	24
SUBTOTALS			62	114
Subscore (100 x factor score subtotal/maximum score subtotal)				54

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	49
Waste Characteristics	20
Pathways	56
TOTAL	125 divided by 3 = 42 Gross total score

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

42 x 1.0 = 42

HAZARD ASSESSMENT RATING METHODOLOGY FORM

Name of Site: Landfill No. 1

Location: West of FTA-1

Date of Operation or Occurrence: 1940s to early 1950s

Owner/Operator: Columbus AFB

Comments/Description: Closed

Site Rated By: C.R. Neff

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	2	10	20	30
C. Land use/zoning within 1-mile radius	3	3	9	9
D. Distance to reservation boundary	2	6	12	18
E. Critical environments within 1-mile radius of site	0	10	0	30
F. Water quality of nearest surface water body	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			104	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) 3
2. Confidence level (1=confirmed, 2=suspected) 2
3. Hazard rating (1=low, 2=medium, 3=high) 3

Factor Subscore A (from 20 to 100 based on factor score matrix) 70

B. Apply persistence factor:
Factor Subscore A x Persistence Factor =
Subscore B 70 x 1.0 = 70

C. Apply physical state multiplier:
Subscore B x Physical State Multiplier =
Waste Characteristics Subscore 70 x 1.0 = 70

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	3	8	24	24
Net precipitation	1	6	6	18
Soil permeability	2	8	16	24
Subsurface flows	1	8	8	24
Direct access to ground water	1	8	8	24
SUBTOTALS			62	114
Subscore (100 x factor score subtotal/maximum score subtotal)				54

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	70
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 1.0 = 61

HAZARD ASSESSMENT RATING METHODOLOGY FORM

Name of Site: Landfill No.2

Location: North of FTA-1

Date of Operation or Occurrence: 1956-1960

Owner/Operator: Columbus AFB

Comments/Description: Closed

Site Rated By: C. R. Neff

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	2	10	20	30
C. Land use/zoning within 1-mile radius	3	3	9	9
D. Distance to reservation boundary	2	6	12	18
E. Critical environments within 1-mile radius of site	0	10	0	30
F. Water quality of nearest surface water body	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			92	180
Receptors subscore (100 x factor score subtotal/maximum score subtotal)				51

II. WASTE CHARACTERISTICS

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

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

Factor Subscore A (from 20 to 100 based on factor score matrix) 70

B. Apply persistence factor:
Factor Subscore A x Persistence Factor =
Subscore B 70 x 1.0 = 70

C. Apply physical state multiplier:
Subscore B x Physical State Multiplier =
Waste Characteristics Subscore 70 x 1.0 = 70

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	1	8	8	24
Surface permeability	1	6	6	18
Rainfall intensity	3	8	24	24
SUBTOTALS			68	108
Subscore (100 x factor score subtotal/ maximum score subtotal)				63
2. Flooding	2	1	2	3
Subscore (100 x factor score/3)				67
3. Ground water migration				
Depth to ground water	3	8	24	24
Net precipitation	1	6	6	18
Soil permeability	2	8	16	24
Subsurface flows	1	8	8	24
Direct access to ground water	1	8	8	24
SUBTOTALS			62	114
Subscore (100 x factor score subtotal/ maximum score subtotal)				54

C. Highest pathway subscore

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

Pathways Subscore 67

IV. WASTE MANAGEMENT PRACTICES

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

Receptors 51

Waste Characteristics 70

Pathways 67

TOTAL 188 divided by 3 = 63 Gross total score

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

63 x 1.0 = 63

HAZARD ASSESSMENT RATING METHODOLOGY FORM

Name of Site: Landfill No. 3

Location: North of LF-1

Date of Operation or Occurrence: 1960-1961

Owner/Operator: Columbus AFB

Comments/Description: Closed

Site Rated By: C. R. Neff

I. RECEPTORS

Rating Factor	Factor Rating (0-3)	Multi-plier	Factor Score	Maximum Possible Score
A. Population within 1,000 feet of site	2	4	8	12
B. Distance to nearest well	2	10	20	30
C. Land use/zoning within 1-mile radius	3	3	9	9
D. Distance to reservation boundary	2	6	12	18
E. Critical environments within 1-mile radius of site	0	10	0	30
F. Water quality of nearest surface water body	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			100	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) 3
2. Confidence level (1=confirmed, 2=suspected) 2
3. Hazard rating (1=low, 2=medium, 3=high) 3

Factor Subscore A (from 20 to 100 based on factor score matrix) 70

B. Apply persistence factor:
Factor Subscore A x Persistence Factor = Subscore B
70 x 1.0 = 70

C. Apply physical state multiplier:
Subscore B x Physical State Multiplier = Waste Characteristics Subscore
70 x 1.0 = 70

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	1	8	8	24
Surface permeability	1	6	6	18
Rainfall intensity	3	8	24	24
SUBTOTALS			68	108
Subscore (100 x factor score subtotal/maximum score subtotal)				63
2. Flooding	3	1	3	3
Subscore (100 x factor score/3)				100
3. Ground water migration				
Depth to ground water	3	8	24	24
Net precipitation	1	6	6	18
Soil permeability	2	8	16	24
Subsurface flows	3	8	24	24
Direct access to ground water	1	8	8	24
SUBTOTALS			78	114
Subscore (100 x factor score subtotal/maximum score subtotal)				68

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 56

Waste Characteristics 70

Pathways 100

TOTAL 226 divided by 3 = 75 Gross total score

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

75 x 1.0 = 75

HAZARD ASSESSMENT RATING METHODOLOGY FORM

Name of Site: Landfill No. 6

Location: North of Base Southern Boundary

Date of Operation or Occurrence: 1965-1974

Owner/Operator: Columbus AFB

Comments/Description: Closed

Site Rated By: C. R. Neff

I. **RECEPTORS**

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

Factor Subscore A (from 20 to 100 based on factor score matrix) 70

B. Apply persistence factor:
Factor Subscore A x Persistence Factor = Subscore B 70 x 1.0 = 70

C. Apply physical state multiplier:
Subscore B x Physical State Multiplier = Waste Characteristics Subscore 70 x 1.0 = 70

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	1	8	8	24
Surface permeability	1	6	6	18
Rainfall intensity	3	8	24	24
SUBTOTALS			68	108
Subscore (100 x factor score subtotal/ maximum score subtotal)				63
2. Flooding	0	1	0	3
Subscore (100 x factor score/3)				0
3. Ground water migration				
Depth to ground water	3	8	24	24
Net precipitation	1	6	6	18
Soil permeability	2	8	16	24
Subsurface flows	1	8	8	24
Direct access to ground water	1	8	8	24
SUBTOTALS			62	114
Subscore (100 x factor score subtotal/ maximum score subtotal)				54

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	64
Waste Characteristics	70
Pathways	63
TOTAL	197

divided by 3 = 66 Gross total score

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

66 x 1.0 = 66

HAZARD ASSESSMENT RATING METHODOLOGY FORM

Name of Site: Landfill No.7

Location: South of LF-5

Date of Operation or Occurrence: 1974-1976

Owner/Operator: Columbus AFB

Comments/Description: Closed

Site Rated By: C.R. Neff

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	2	10	20	30
C. Land use/zoning within 1-mile radius	3	3	9	9
D. Distance to reservation boundary	3	6	18	18
E. Critical environments within 1-mile radius of site	1	10	10	30
F. Water quality of nearest surface water body	1	6	6	18
G. Ground water use of uppermost aquifer	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			108	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) 3
2. Confidence level (1=confirmed, 2=suspected) 2
3. Hazard rating (1=low, 2=medium, 3=high) 3

Factor Subscore A (from 20 to 100 based on factor score matrix) 70

B. Apply persistence factor:
Factor Subscore A x Persistence Factor = Subscore B
70 x 1.0 = 70

C. Apply physical state multiplier:
Subscore B x Physical State Multiplier = Waste Characteristics Subscore
70 x 1.0 = 70

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	1	8	8	24
Surface permeability	1	6	6	18
Rainfall intensity	3	8	24	24
SUBTOTALS			68	108
Subscore (100 x factor score subtotal/maximum score subtotal)				63
2. Flooding	0	1	0	3
Subscore (100 x factor score/3)				0
3. Ground water migration				
Depth to ground water	3	8	24	24
Net precipitation	1	6	6	18
Soil permeability	2	8	16	24
Subsurface flows	2	8	16	24
Direct access to ground water	1	8	8	24
SUBTOTALS			70	114
Subscore (100 x factor score subtotal/maximum score subtotal)				61

C. Highest pathway subscore

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

Pathways Subscore 63

IV. WASTE MANAGEMENT PRACTICES

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

Receptors	60
Waste Characteristics	70
Pathways	63
TOTAL	193

divided by 3 = 64 Gross total score

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

64 x 1.0 = 64

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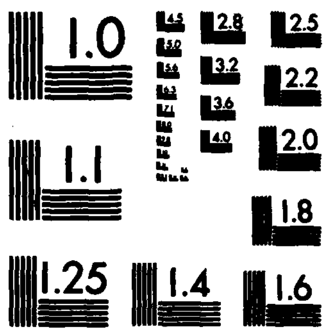

MICROCOPY RESOLUTION TEST CHART
NATIONAL BUREAU OF STANDARDS-1963-A

HAZARD ASSESSMENT RATING METHODOLOGY FORM

Name of Site: Spill Site No. 4

Location: Bldg. 1803

Date of Operation or Occurrence: 1979

Owner/Operator: Columbus AFB

Comments/Description:

Site Rated By: C.R. Neff

I. RECEPTORS

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
A. Population within 1,000 feet of site	1	4	4	12
B. Distance to nearest well	3	10	30	30
C. Land use/zoning within 1-mile radius	2	3	6	9
D. Distance to reservation boundary	2	6	6	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			97	180

Receptors subscore (100 x factor score subtotal/maximum score subtotal) 54

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 1.0 = 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	3	8	24	24
Net precipitation	1	6	6	18
Surface erosion	1	8	8	24
Surface permeability	1	6	6	18
Rainfall intensity	3	8	24	24
SUBTOTALS			68	108
Subscore (100 x factor score subtotal/ maximum score subtotal)				63
2. Flooding	3	1	3	3
Subscore (100 x factor score/3)				100
3. Ground water migration				
Depth to ground water	3	8	24	24
Net precipitation	1	6	6	18
Soil permeability	[illegible]	8	16	24
Subsurface flows	1	8	8	24
Direct access to ground water	1	8	8	24
SUBTOTALS			62	114
Subscore (100 x factor score subtotal/ maximum score subtotal)				54

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	54	
Waste Characteristics	60	
Pathways	100	
TOTAL	214	divided by 3 = 71 Gross total score

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

71 x 1.0 = 71

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APPENDIX K

OLF ALPHA DESCRIPTION

APPENDIX K
OLF ALPHA DESCRIPTION

ENVIRONMENTAL SETTING

Due to the physical proximity of OLF Alpha to Columbus AFB, the environmental settings of the two installations are nearly identical. The meteorological data presented in Sec. 3.1 for Columbus AFB are also applicable to OLF Alpha. Geographically, both installations are located in the Tombigbee and Tennessee River Hill physiographic district of the Gulf Coastal Plain (see Sec. 3.2.1 for description). Topographic relief at OLF Alpha ranges from 250 ft near the center of the site to 210 ft in the northwest and southeast corners. Surface water runoff for the northern portion of OLF Alpha is to Shuqualak Creek and in the southern portion runoff is toward an unnamed tributary of Wahalak Creek. Both creeks drain into the Tombigbee River.

The geologic setting, soils, and geohydrology of OLF Alpha cannot be precisely defined because of a lack of site-specific data. Due to the proximity of the two sites, however, geologic conditions at OLF Alpha can be assumed to be generally similar to those encountered at Columbus AFB (see Sec. 3.3 for description).

Water quality data for both ground and surface waters do not exist for OLF Alpha. The biotic communities at OLF Alpha are identical to those exhibited at Columbus AFB (see Sec. 3.5 for description).

INDUSTRIAL ACTIVITY

OLF Alpha serves as an auxiliary landing field for Columbus AFB and does not conduct any industrial activities related to aircraft maintenance or operation or any related or support activities. There are no industrial shops, administrative services, support services, or residential buildings at OLF Alpha; the physical structures at the installation consist solely of a runway, a control tower, and a fire station house. Operations at OLF Alpha are limited to daylight hours on weekdays for auxiliary training purposes and emergency landings.

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