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INSTALLATION RESTORATION PROGRAM RECORDS SEARCH FOR MACDILL AIR--ETC(U)
JUN 82 F08637-80-G-0010

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INSTALLATION RESTORATION PROGRAM RECORDS SEARCH

AD A118359

For MacDill Air Force Base, Florida

AUG 1 7 1982

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CH2M HILL

Superseded AD-A109611

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REPLY TO ATTN OF: DEEV

SUBJECT: Installation Restoration Program (IRP) Records Search, MacDill AFB

TO: See Distribution

1. We provided your office with copies of the subject report on or about 31 Dec 81. This study used a site rating model developed in Jun 1981 to identify the potential for contamination resulting from past disposal practices. On 26-27 Jan 82, representatives of USAF OEHL, AFESC, several major commands, Engineering Science, and CH2M Hill met at our office to develop an improved rating system. The new rating model, Hazardous Assesment Rating Methodology (HARM), is now used for all Air Force IRP studies. To maintain consistency, AFESC had their on-call contractors review their phase I studies performed before the advent of HARM and provide two additional appendices. The new appendices address the background of the HARM system and evaluate each of the phase I sites using the Jan 82 rating methodology.

2. Enclosed are copies of the added appendices for the Installation Restoration Program (IRP) Records Search at MacDill AFB. Request you attach these appendices to the phase I reports we provided you in Dec 81.

3. For AFRCE-ER: Request you distribute copies of the new appendices to the Regional Environmental Protection Agency and Florida Department of Environmental Regulation.

4. For DTIC: Request you integrate the enclosed appendices with the Installation Restoration Program Records Search for MacDill AFB into the National Technical Information System (NTIS). The report and new appendices are approved for public release with unlimited distribution.

5. Our project officer for IRP is Mr. Burnet, A/V 432-4430.

FOR THE COMMANDER

George C. Windrow

GEORGE C. WINDROW
Actg Dir of Eng & Env Plng

1 Atch
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Readiness is our Profession

INSTALLATION RESTORATION
PROGRAM RECORDS SEARCH

For

MACDILL AIR FORCE BASE, FLORIDA

DTIC
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Prepared for

AIR FORCE ENGINEERING AND SERVICES CENTER
DIRECTORATE OF ENVIRONMENTAL PLANNING
TYNDALL AIR FORCE BASE, FLORIDA 32403

By

CH2M HILL
Gainesville, Florida

June 1982
~~November 1981~~

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

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

AFB	Air Force Base
AFESC	Air Force Engineering and Services Center
AFFF	Aqueous Film-Forming Foam
AFLC	Air Force Logistics Center (San Antonio, Texas)
AFR	Air Force Range (Avon Park)
AGE	Aerospace Ground Equipment
AVGAS	Aviation gasoline
CE	Civil Engineering
CES	Civil Engineering Squadron
COD	Chemical oxygen demand
CRS	Component Repair Squadron
DANC	Decontamination agent, non-corrosive
DOD	Department of Defense
DPDO	Defense Property Disposal Office
EOD	Explosive ordnance disposal
EMS	Equipment Maintenance Squadron
EPA	Environmental Protection Agency
°F	Degrees Fahrenheit
ft	Foot (feet)
gpm	Gallons per minute
gpd/ft^2	Gallons per day per square foot
JCSE	Joint Communications Support Element
JP	Jet Petroleum
Max.	Maximum
MEK	Methyl ethyl ketone
Min.	Minimum
MOGAS	Motor gasoline
msl	Mean sea level
No.	Number
OEHL	Occupational and Environmental Health Laboratory
PCBs	Polychlorinated biphenyls
POL	Petroleum, oil, and lubricants

RCRA	Resource Conservation and Recovery Act
RDJTF	Rapid Deployment Joint Task Force
SAC	Strategic Air Command
TAC	Tactical Air Command
TCE	Trichloroethylene
TCF	Tactical Control Flight
TFW	Tactical Fighter Wing
TOC	Total organic carbon
USAF	United States Air Force

EXECUTIVE SUMMARY

EXECUTIVE SUMMARY

A. Introduction

1. CH2M HILL was retained by the Air Force Engineering and Services Center (AFESC) on May 15, 1981 to conduct the MacDill AFB Records Search under Contract No. F08637-80-G0010-0003.

2. The Department of Defense (DOD) policy was directed by Defense Environmental Quality Program Policy Memorandum 80-6 dated 24 June 1980 and implemented by Air Force message dated 2 December 1980 as a positive action to ensure compliance of military installations with the Resource Conservation and Recovery Act (RCRA) and implementing regulations. The purpose of the DOD policy is to control the migration of hazardous material contaminants from DOD installations.

3. To implement the DOD policy, a three-phase Installation Restoration Program has been directed. Phase I, the Records Search, is the identification of potential problems. Phase II is the quantification of the problem and determination of corrective measures that may be required. The third phase is to contain, correct, and/or mitigate identified or potential environmental hazards that may be the result of contaminant migration from the installation.

4. The MacDill AFB Records Search Program included a detailed review of pertinent installation records, contacts with 13 government and private agencies for documents relevant to the Records Search effort, and an onsite base visit conducted by

CH2M HILL during the week of July 6 through July 10, 1981. Activities conducted during the onsite base visit included interviews with 30 past and present key base employees, ground tours of base facilities, and a helicopter overflight to identify past disposal areas. The installations included in the Records Search Program were MacDill AFB, Fort Lonesome Radar Site, and Avon Park Air Force Range.

B. Major Findings

1. The major industrial operations at MacDill AFB involving hazardous chemicals and wastes include vehicle maintenance, aircraft equipment and component maintenance and aircraft washing, corrosion control, and painting. Since no large-scale industrial operations have been conducted at MacDill AFB, the quantities of waste oils, solvents, paint residues, and thinners generated has been small. Standard procedure for disposition of waste oils and solvents has been to sealed drums with ultimate disposition by DPDO through reuse, recycle, resale, or destruction. Since 1980, a reclaim tank near Building 68 has been used for temporary storage of contaminated fuels to be recovered for reuse.

2. Interviews with the 30 past and present base employees resulted in the identification of 11 landfills, 4 other disposal sites, and 8 hazardous material storage or spill sites and the approximate dates that these sites were in use. In general, the landfills were used for disposal of sanitary wastes and construction demolition debris, although small quantities of hazardous materials have reportedly been buried at each of the main base

landfills. These wastes could have included waste oil and solvents in drums, old paints and thinners, batteries, empty pesticide containers, electron tubes, PCB capacitors, and adhesives.

C. Conclusions

1. No direct evidence was found to indicate that migration of contaminants beyond MacDill AFB property exists.

2. Evidence obtained through interviews with past/present base personnel indicates that small quantities of hazardous wastes have been disposed of in the past.

3. A potential exists for migration of pollutants due to a high ground-water table and permeable soil conditions. However, the potential for migration beyond base property is low due to the low hydraulic gradient.

4. Table 7 provides a listing of the 23 identified sites and their overall rating scores. The following sites were identified as areas showing the most significant potential for contaminant migration relative to other sites:

   a. Site No. 16, Fuel Tank Farm, due primarily to its proximity to the mangrove swamp and off-base residences, and due to reported fuel saturation and past burial of leaded AVGAS sludge.

b. Site No. 11, Chemical Munitions Burial Site, due primarily to its proximity to the mangrove swamp and to the disposal of unknown types and quantities of chemicals.

c. Sites No. 3, 5, 6, 7, 8, and 9, past and current landfills, due primarily to their proximity to the mangrove swamp, to the absence of liners or leachate control systems, and to suspected burial of small quantities of hazardous wastes.

d. Site No. 13, Creosote Pit, due primarily to the absence of a liner, and to unknown waste quantities or closure procedures.

5. Sites No. 1, 2, 4, 10, 12, 14, 15, and 17-23 are not considered to pose a hazard for migration of contaminants.

D. Recommendations

1. Although no direct evidence of hazardous contaminant migration was found during the Records Search, it is recommended that a limited program be implemented to evaluate ground-water quality at specific sites. The recommended program includes:

- Site No. 16 (fuel tank farm); excavation of four backhoe pits, inspection of each pit for soil characteristics and evidence of fuel saturation, collection of water samples, and analysis of the samples for lead and oil and grease.

- Site No. 11 (Chemical Munitions Burial Site); implementation of a base-level effort, such as a magnetic survey, to locate and identify the nature of the materials.

- Site No. 3 (Landfill at Dog Kennel); analysis of water samples from the three existing wells for pH, pesticides, PCB, TOC, and COD.

- Sites No. 5, 6, 7, and 8 (past landfills) and Site No. 9 (current landfill); installation of two wells south of Sites 6 and 8, collection of water samples, and analysis of these samples for pH, pesticides, PCB, TOC, and COD.

- Site No. 13 (Creosote Pit); excavation of a 20-foot-long backhoe pit, inspection of pit for soil characteristics and presence of phenols (creosote).

2. Details of the program outlined above, including exact locations of sampling points, should be finalized as part of the Phase II program. In the event that contaminants are detected in the water samples collected from any of the wells or during visual inspection of the test pits, a more extensive field survey program should be implemented to determine the extent of the contaminant migration.

3. No follow-on work is recommended for the Fort Lonesome Radar Site.

4. A cursory examination of Avon Park Air Force Range revealed no direct evidence of hazardous contaminant migration from range property. However, little is

known about the nature or extent of materials deposited in present or past landfills. Three monitoring wells are recommended at Site No. 6 (past landfill), Site No. 7 (current landfill), and Site No. 11 (Pesticide Container Rinsewater Holding Basin). Water samples should be analyzed for pH, TOC, COD, and pesticides.

All four of the existing drinking water wells should be sampled and analyzed for primary pollutants.

The nature and extent of hazardous wastes handled or disposed of during the classified project at Avon Park AFR (Site No. 9) are not known. It is recommended that USAF investigate further the nature of this project and assess the need for Phase II monitoring.

I. INTRODUCTION

I. INTRODUCTION

A. Background

The primary legislation governing the management and disposal of solid waste is the Resource Conservation and Recovery Act (RCRA) of 1976. Regulations and implementing instructions for the Act are continuing to be developed by EPA. Under RCRA Section 3012 (Public Law 96-482, October 21, 1981) each state is required to inventory all past and present hazardous waste disposal sites. Section 6003 of RCRA requires Federal agencies to assist EPA and make available all requested information on past disposal practices. It is the intent of the Department of Defense (DOD) to comply fully in these as well as other requirements of RCRA. Simultaneous to the passage of RCRA, the DOD devised a comprehensive Installation Restoration Program (IRP). The purpose of the IRP is to identify, report, and correct environmental deficiencies from past disposal practices that could result in ground-water contamination and probable migration of contaminants beyond DOD installation boundaries. In response to RCRA and in anticipation of the Comprehensive Environmental Response, Compensation, and Liability Act of 1980, the DOD issued Defense Environmental Quality Program Policy Memorandum 80-6 (DEQPPM 80-6) on 24 June 1980 which directed the implementation of the IRP program.

To conduct the Installation Restoration Program Records Search for MacDill AFB, the AFESC retained CH2M HILL on May 15, 1981 under Contract No. F08637-80-G0010-0003. The installations included in the Records Search are MacDill AFB and the Avon Park Air Force Range (see Section VII), which is supported by MacDill AFB (Figure 1). Fort Lonesome is also included since this site has recently become supported by MacDill AFB under joint operation with the Federal Aviation Administration (FAA).

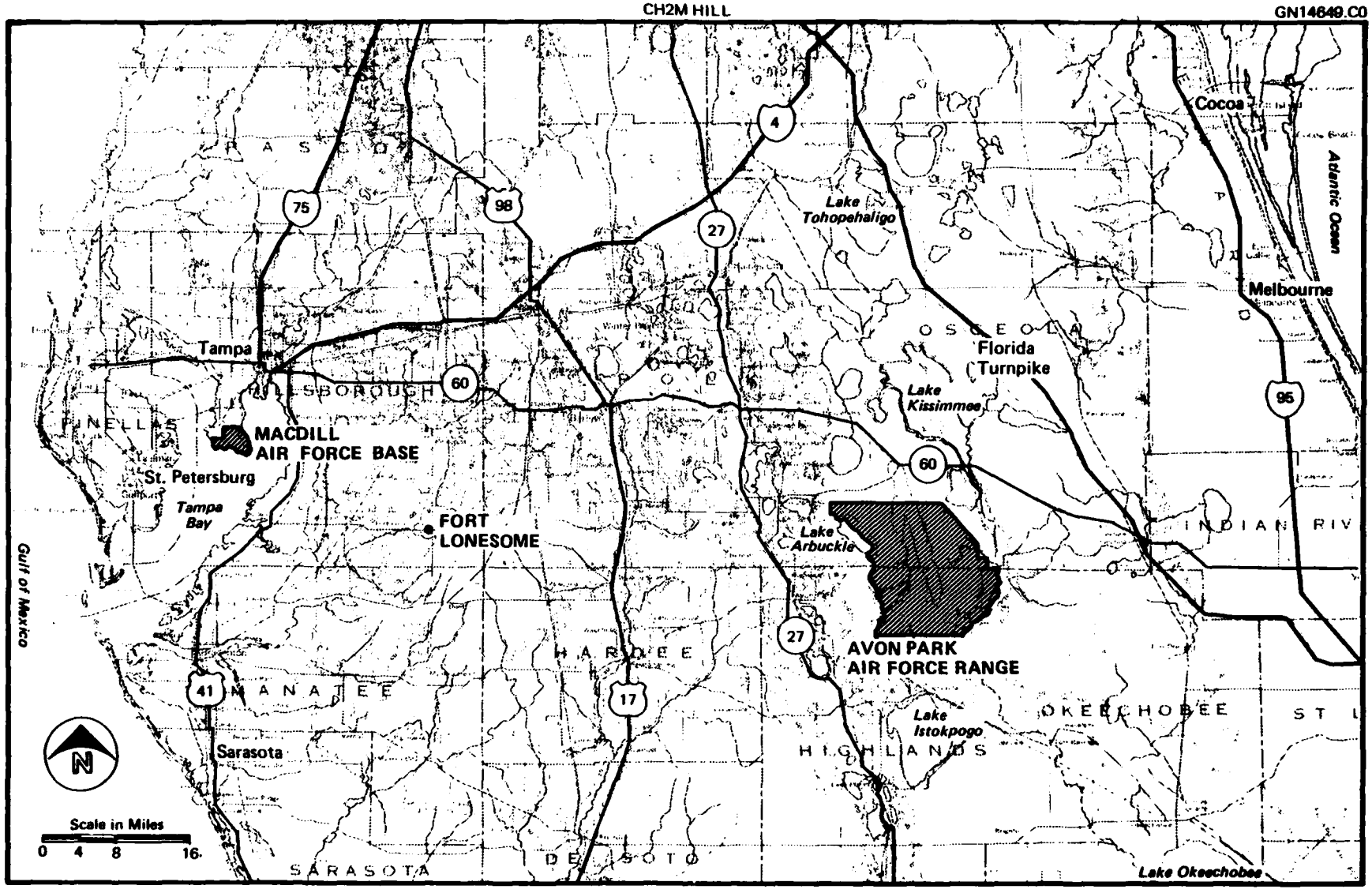

FIGURE 1. Location map.

The Records Search comprises Phase I of the Department of Defense (DOD) Installation Restoration Program and is intended to review installation records to identify possible hazardous waste contaminated sites. Phase I, the Records Search phase, is the identification of potential problems. Phase II is the quantification of the problems and determination of corrective measures that may be required. The third phase is to contain, correct, and/or mitigate identified or potential environmental hazards that may be the result of contaminant migration from the installation.

B. Authority

The identification of hazardous waste disposal sites at military installations was directed by Defense Environmental Quality Program Policy Memorandum 80-6 (DEQPPM 80-6) dated 24 June 1980, and implemented by Air Force message dated 2 December 1980, as a positive action to ensure compliance with the Resource Conservation and Recovery Act (RCRA) and implementing regulations.

C. Purpose of the Records Search

DOD policy is to control the migration of hazardous material contaminants from DOD installations and to abate contaminants that have an adverse impact on public health or the environment. This potential was evaluated at the MacDill AFB and Avon Park AFR by reviewing the existing information and conducting a detailed analysis of installation records. Pertinent information includes the history of operations, the geological and hydrogeological conditions which contribute to the migration of contaminants off the installation, and the ecological settings which indicate sensitive habitats or evidence of environmental stress resulting from contaminants.

D. Scope

The Records Search consisted of a pre-performance meeting, an onsite base visit, a review and analysis of the information obtained, and preparation of this report.

The pre-performance meeting was held at the office of FELEC Services, Inc., Colorado Springs, Colorado, on June 11 and 12, 1981. Attendees at this meeting included representatives of AFESC, USAF OEHL, Tactical Air Command (TAC), MacDill AFB, and CH2M HILL. The purpose of the pre-performance meeting was to provide detailed project instructions for the Records Search, to provide clarification and technical guidance by AFESC, and to define the responsibilities of all parties participating in the MacDill AFB Records Search.

Key individuals from the Air Force who assisted in the MacDill AFB Records Search included the following:

1. Mr. Bernard Lindenberg, AFESC, Program Manager, Phase I

2. Mr. Gil Burnet, TAC, Command Representative, Phase I

3. Mr. Brandon Blonshine (MacDill AFB), Environmental Coordinator

4. Major Gary Fishburn, USAF OEHL, Program Manager, Phase II

The onsite base visit was conducted by CH2M HILL from July 6 through July 10, 1981. Activities performed during the onsite base visit included a detailed search of installation records, ground and aerial tours of the installation,

and interviews with former and present key base personnel. The following individuals comprised the CH2M HILL Records Search team:

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

2. Mr. Bruce Haas, Assistant Project Manager (M.S. Civil Engineering, 1976)

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

4. Ms. Elizabeth Dodge, Ecologist (M.S. Environmental Health Engineering, 1978; M.S. Aquatic Biology, 1976)

Resumes of these key team members are included in Appendix A.

Various government and private agencies were contacted for documents relevant to the Records Search effort. Appendix B lists the agencies contacted during the Records Search.

E. Methodology

The methodology utilized in the MacDill AFB Records Search is shown graphically on Figure 2. First, a review of past and present industrial operations is conducted at the base. Information is obtained from available records such as shop files and real property files, as well as interviews with past and present base employees from most operating areas of the base. A list of the type of interviewees from MacDill AFB (total of 30 interviewees), including areas of knowledge and years of employment, is given in Appendix C.

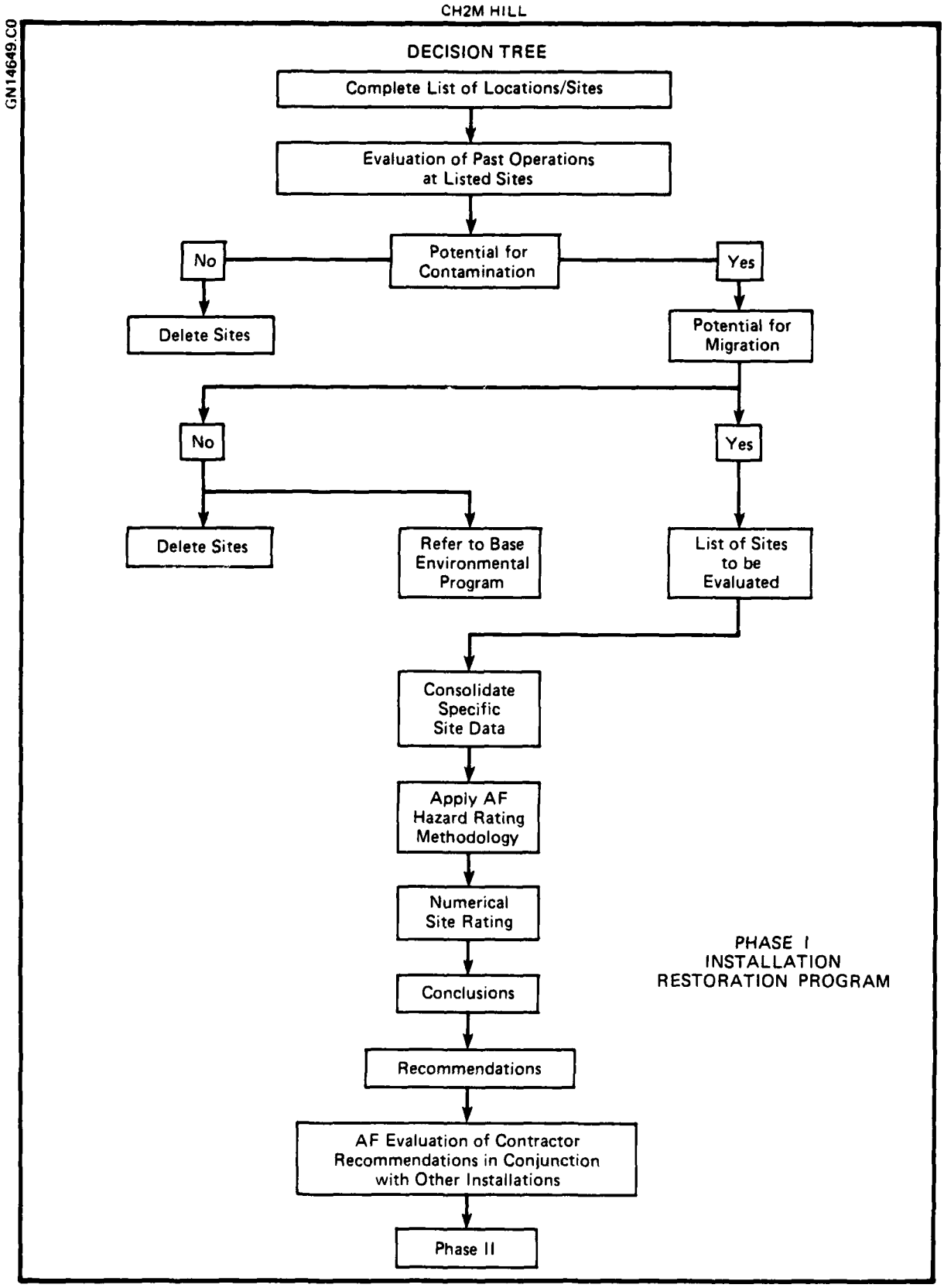

FIGURE 2. Records search methodology.

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

The Records Search Team is then given an aerial overflight and a general ground tour of identified sites (1) to gather site-specific information regarding evidence of environmental stress and the presence of nearby drainage ditches or surface-water bodies, and (2) to visually inspect these water bodies for any obvious signs of contamination or leachate migration.

A decision is then made, based on all of the above information, as to whether a potential exists for hazardous material contamination in any of the identified sites. If not, the site is deleted from further consideration. If minor operations and maintenance deficiencies are noted during the investigations, the condition is reported to Base Environmental Engineering for remedial action.

For those sites where a potential for contamination is identified, a determination of the potential for migration of the contamination off the installation boundaries is made by considering site-specific soil and ground-water conditions. If there is little potential for contaminant migration, then the site is deleted from further consideration. If the potential for contaminant migration is considered significant, then the site is evaluated and prioritized using the site rating methodology described in Section IV.B "Disposal Sites Identification and Evaluation."

The site rating indicates the relative potential for contaminant migration at each site. For those sites showing a higher potential, recommendations are made to quantify the potential contaminant migration problem under Phase II of the Installation Restoration Program. For those sites showing a medium potential, a limited Phase II program may be recommended to confirm that a serious contaminant migration problem does not exist. For those sites showing a lower potential, no further Phase II work would be recommended.

II. INSTALLATION DESCRIPTION

II. INSTALLATION DESCRIPTION

A. Location

MacDill Air Force Base is located on the southernmost tip of the Interbay Peninsula in Hillsborough County, Florida, about eight miles south of downtown Tampa. Hillsborough Bay borders the base on the east side, and Tampa Bay borders the base on the south; while the northern side of the base borders the City of Tampa. In addition to the 5,621 acres contained within the installation, MacDill AFB supports the following property off the base:

1. Fort Lonesome Radar Site

2. Avon Park Air Force Range

The locations of these properties are shown on Figure 1.

B. Organization and Mission

Construction of MacDill AFB, acquired for the Army Air Corps, began in December of 1939. The base was officially activated in April, 1941. After World War II, MacDill became an operational base of the Strategic Air Command (SAC). The base was transferred from SAC to Tactical Air Command (TAC) in July, 1962. A more detailed description of base history is included in Appendix D.

The current host unit at MacDill AFB is the 56th Tactical Fighter Wing (TFW), whose primary mission is to train aircrews and maintenance personnel and to maintain worldwide deployment capability. In 1980, the wing began converting from the F-4D Phantom to the new multirole fighter, the F-16; the conversion is scheduled to be complete in 1982.

III. ENVIRONMENTAL SETTING

III. Environmental Setting

A. Meteorological Data

The climate in the vicinity of MacDill Air Force Base is subtropical, with short mild winters and long hot summers. Major geographic features affecting the climate at MacDill AFB are the Gulf of Mexico, the Carribean Sea, and the Atlantic Ocean.

The annual average temperature at the base is 72°F, with an average daily maximum and minimum of 82°F and 63°F, respectively (see Table 1). Average monthly temperatures range from 60°F in January to 82°F in August. The Gulf of Mexico contributes to mild winters in the area and is responsible for high relative humidities. Monthly averages range from 50 to 90 percent relative humidity.

Average annual precipitation at MacDill AFB is 44.3 inches, almost 60 percent of which falls during the rainy season from mid-June to mid-September. Spring and fall are drier seasons, with slightly higher precipitation in the winter months. The average lake evaporation rate is approximately 50 inches per year. Actual evapotranspiration is less than this and is dependent on vegetative cover. Summer thunderstorms occur an average of 91 days each year, more than any other area of the United States. These storms have a significant cooling effect, with a typical thunderstorm causing temperatures to drop from the low 90's to the low 70's °F on summer afternoons.

Table 1
METEOROLOGICAL DATA FOR MACDILL AFB[a]

Parameter	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Annual
Temperature (°F)													
Average Daily Max.	70	71	75	81	86	89	89	90	89	84	76	71	81
Average Daily Min.	52	54	59	64	70	74	75	76	75	68	59	54	65
Normal	61	62.5	67	72.5	78	81.5	82	83	82	76	67.5	62.5	73
Precipitation (inches)													
Normal	2.27	2.94	2.99	1.60	3.10	4.86	7.05	7.21	5.72	2.49	1.66	2.39	44.28

Source: MacDill AFB, USAFETAC, Tab D, 4 April 1980.

[a]Period of Record: 1949-1980.

B. Geology

MacDill AFB is located at the southernmost tip of the Interbay Peninsula within the Middle Gulf Coastal Lowlands physiographic province. Figure 3 illustrates the major physiographic features in the vicinity of MacDill AFB.

Topography and relief at MacDill AFB are shown on Figure 4. Ground elevations are generally less than 10 feet above mean sea level, with much of the base less than 5 feet above mean sea level.

Surface deposits occurring at MacDill AFB consist of quartz sands which were deposited by Gulf and/or Bay currents and tides and may contain some organically cemented horizons at various depths. As is typical of tide/current deposition, this stratum has a variable thickness ranging from approximately 5 to 20 feet. The horizontal permeability of these sands is approximately 100 gallons per day per square foot (gpd/ft^2). The vertical permeability in this type of formation is typically one-half the horizontal permeability due to the stratification of the deposit. Vertical permeability is therefore estimated at approximately 50 gpd/ft^2.

Strata directly below the surface sands include clayey sand and sandy clay deposits with clay contents ranging from slightly less than 15 percent to over 50 percent. The higher the clay content of these strata the lower the permeability. A typical range of values for the coefficient of permeability of the clayey sands is 0.021 to 9.8 gpd/ft^2, whereas permeability values for the sandy clays are typically around 0.001 gpd/ft^2. This clayey layer forms the confining bed for the underlying artesian aquifer. The thickness of this stratum ranges from 2 to 20 feet at MacDill AFB.

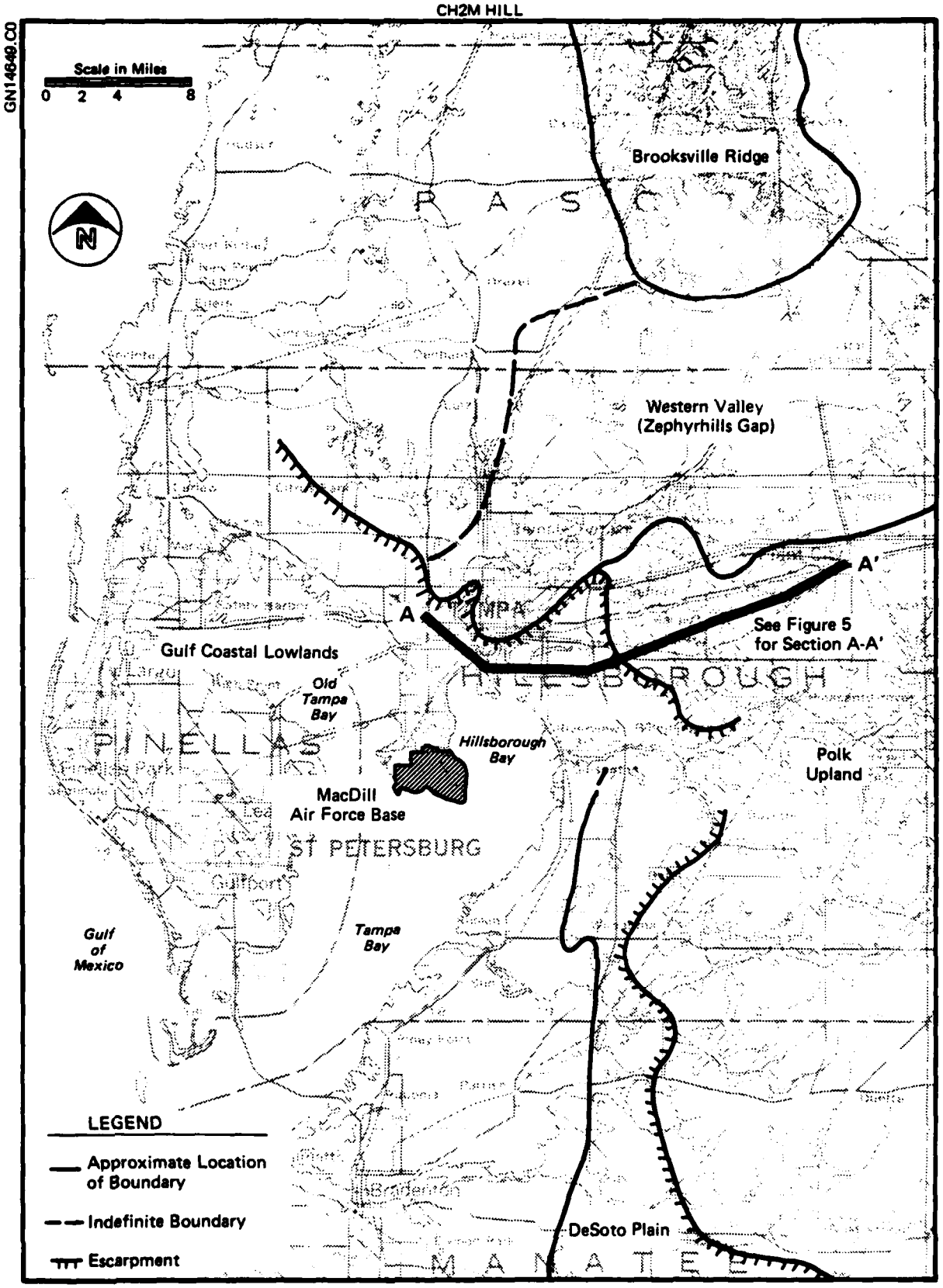

FIGURE 3. Physiographic map of MacDill AFB.

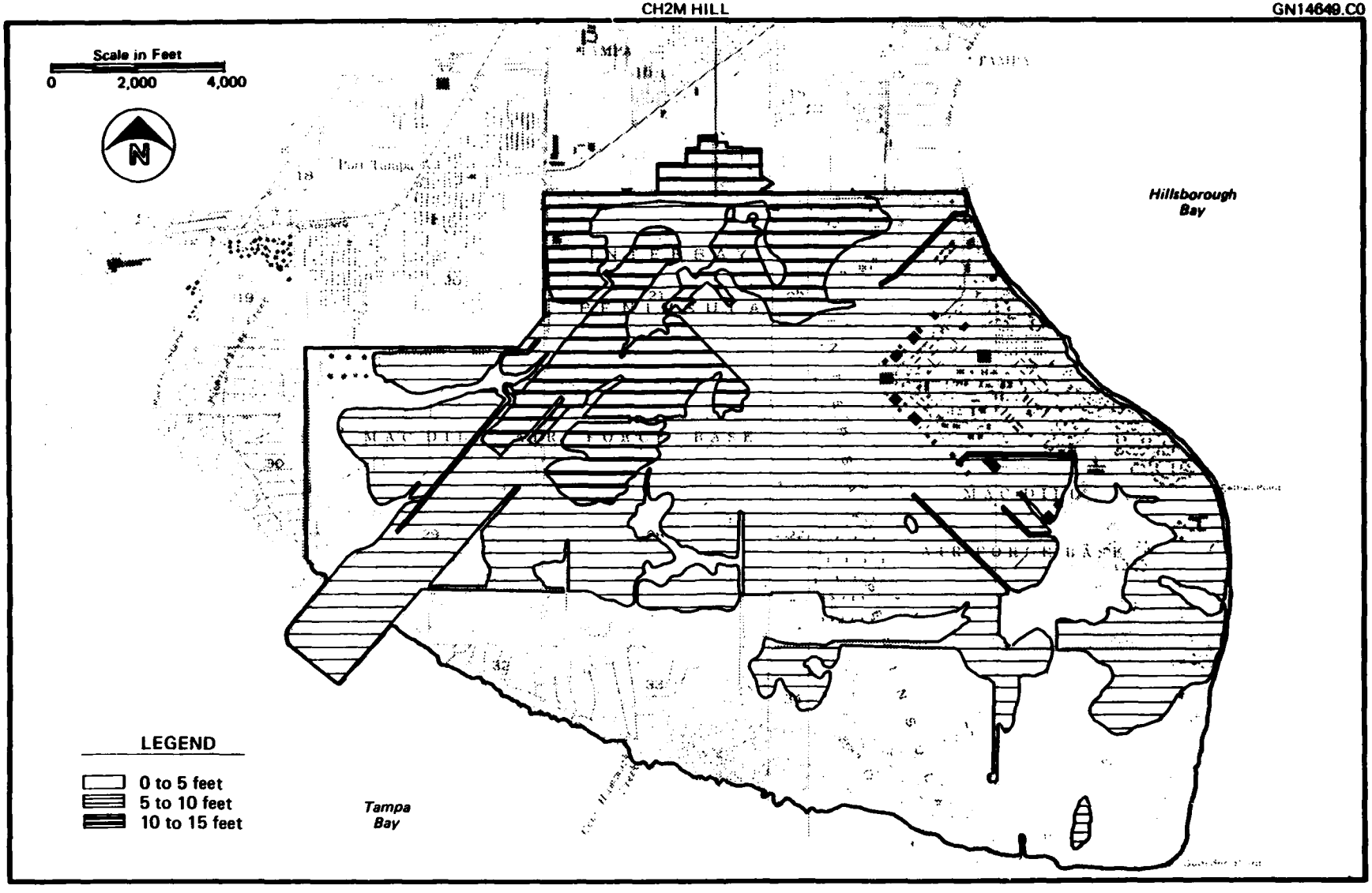

FIGURE 4. Topographic map of MacDill AFB.

Directly below this stratum of lower permeability is the upper unit of the Floridan aquifer, referred to as the Tampa Limestone. This unit consists of a gray or light tan to white limestone, which is usually sandy, fossiliferous in places, and commonly contains clay lenses and cavities. The limestone is generally dense and hard, especially where sandy, but may be soft in places where badly weathered. Commonly, the upper surface of the limestone is "case hardened" by impregnation with silicon dioxide derived from overlying sands (quartz sand is composed of silicon dioxide).

Permeability of the Tampa Limestone is greatly dependent on the degree of solution, variations in lithology, and the occurrence of clay lenses. The permeability of the rock itself is very low, ranging from 0.1 to 15 gpd/ft^2; however, due to solution of the limestone, a secondary permeability has developed along enlarged bedding planes, fractures, and joints. This increases greatly the permeability of the in-place formation as a whole compared to the rock itself. The Tampa Limestone formation has a coefficient of permeability on the order of 1,000 gpd/ft^2.

The Tampa Limestone marks the top of a thick sequence of carbonate rock consisting of limestone and dolomite which occurs to a depth of approximately 10,000 feet below land surface. The permeability of each carbonate stratum is also dependent on lithology and degree of solution. Generally, the deeper layers do not contain clay. As with the Tampa Limestone, secondary permeability along joints, fractures and bedding planes, and at erosion surfaces between formations is much more important than the permeability of the rock itself. Permeabilities within some sections of the limestone are extremely high, exceeding 500,000 gpd/ft^2.

These carbonate strata, together with the Tampa Limestone, make up the principal artesian aquifer in this area, providing water supply to the surrounding communities, to irrigation, and to mining. Table 2 summarizes the geologic formations occurring beneath MacDill AFB, including names and descriptions of each formation, and their use as water supply sources.

Below the carbonate rock at MacDill AFB there is a hard, dense crystalline rock referred to as the Basement Rock. Its presence is known from oil test wells, and it occurs at approximately 10,000 feet below land surface. The formation's physical properties are not precisely known since drilling ceases when this stratum is encountered. Figure 5 illustrates a typical geological cross section in the MacDill AFB vicinity.

C. Hydrology

MacDill AFB is located within an ill-defined lowland referred to as the "Coastal Streams" drainage basin. As the name implies, this basin is drained by a series of small shallow streams which flow directly toward the bays. Since the base is located at the tip of a peninsula, rainwater falling on the base runs off in three directions toward the surrounding water bodies. Runoff rates are quite low due to the lack of both elevation and relief. Drainage modifications, including canals and storm drainage systems, have aided in stormwater removal from streets and runways.

Surface-water hydrologic conditions at MacDill AFB are primarily controlled by storm drainage systems and small tidal streams. There are no major rivers or streams which enter or leave MacDill AFB. Broad Creek and Coon Hammock Creek, occurring within the mangrove swamp on the south side of the base, are the only surface-water features of any

Table 2
SUMMARY OF GEOLOGIC FORMATION IN THE VICINITY OF MACDILL AFB

Series		Formation	Thickness	Character of Material	Water Supply	Aquifer	Water Level
Pleistocene and Recent Pjocene		Undifferentiated	0-150	Sand, clay, and marl.	Sand yields up to 200 gpm in some areas and generally 5 to 10 gpm to wells less than 40 feet deep. Clay and marl do not yield usable quantities of water to wells.	Water table	Water level generally less than 10 feet. Water table follows topography in a subdued manner.
Miocene		Hawthorn formation	0-250	Clay, sand, and limestone. Limestone, near bottom of formation, is white to gray, soft, sandy, and porous	Limestone member yields up to 200 gpm.	Shallow artesian aquifer	Piezometric surface not defined. Water level is generally higher than that of nearby wells in principal artesian aquifer.
Miocene		Tampa limestone	80-400	White, cream, and gray, hard to soft, sandy limestone. Many molds of pelecypods and gastropods.	Yields up to 1,000 gpm. Supplies most domestic and commercial wells in county.	Principal artesian (Floridan)	Potentiometric surface shown on Figure 6.
Oligocene		Suwannee limestone		White, yellow, and light brown, soft to hard, dense, fine-grained limestone with chert lenses to 25 feet thick.			
Eocene	Ocala Group	Crystal River formation (Puri, 1957) Williston formation (Puri, 1957) Inglis limestone	90-300	Yellow-gray and brown soft, almost pure limestone. Mostly foraminiferal coquinas in pasty limestone matrix.	Rarely used for water supply because of low transmissibility		
Eocene		Aveon Park limestone	200+	Soft, chalky, cream to brown limestone containing beds of foraminiferal coquina and zones of brown to dark brown, hard, crystalline dolomitic limestone. Locally contains some gypsum.	Principal source of supply for wells yielding more than 500 gpm. Yield exceeds 5,000 gpm in some wells.		
Eocene		Lake City limestone	500				
Eocene		Oldsmar limestone	900	Fragmental dolomitic limestone with lenses of chert, thin shale beds, and some gypsum.	Not used for water supplies but is potential source of freshwater in north-central and northeastern part of county.		
Paleocene		Cedar Keys limestone	Not known	Not known.	Not used. Potential use not known.		

Note: After Menke.

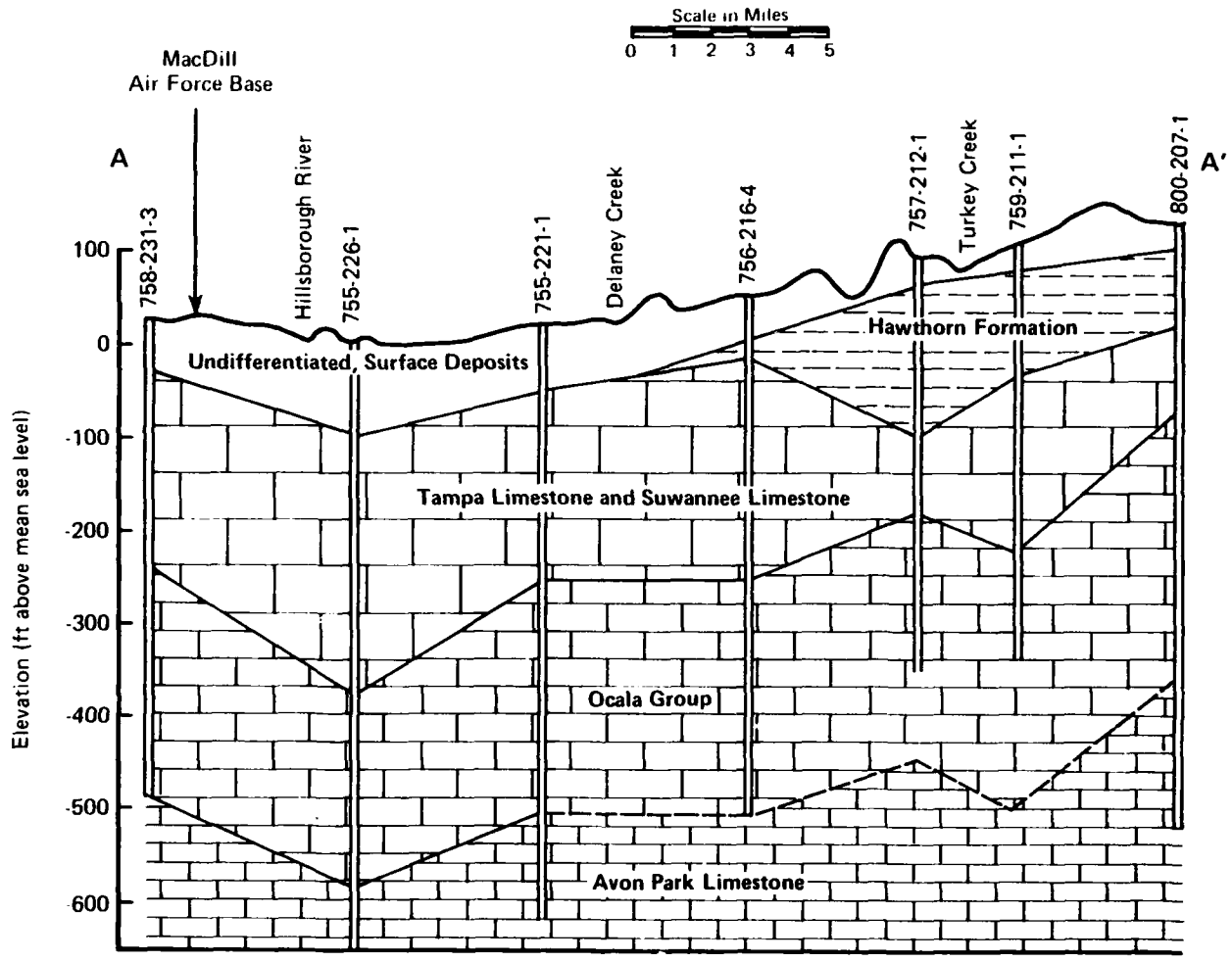

FIGURE 5. Geologic cross section of Hillsborough County (east-west trend).

significance on the base. These creeks are actually tidal inlets rather than streams and receive some runoff from the south side of the base as illustrated on Figure 6. The only other significant surface-water hydrologic feature is the base storm drainage system, which discharges to both Hillsborough and Tampa Bays.

Ground water occurs within two aquifer systems at MacDill AFB. Within the upper sands and clayey sands, ground water occurs under water table conditions at a depth of about 1 to 4 feet. Ground-water levels in this aquifer rise and fall freely in response to rainfall and evapotranspiration. Within the deeper limestone strata, ground water occurs under artesian or leaky artesian conditions; that is, ground-water levels do not respond as freely to local recharge or evapotranspiration. The two aquifer systems are separated by strata of low permeability, usually clay or sandy clay.

Recharge to the water table aquifer is provided by direct rainfall infiltration which permeates the upper unsaturated sand. Once the recharge reaches the water table, it will move laterally down-gradient toward the bays in the same direction as the surface drainage shown on Figure 6. This lateral movement is very slow, however, because of the low hydraulic gradient.

The water table aquifer is not used as a potable water source, although water quality within the aquifer is generally good. At the periphery of the base adjacent to the bays, natural water quality is degraded by the influence of saltwater. Pollutant contamination of the water table aquifer at waste disposal sites would be immediate, since recharge to the aquifer is direct from rainfall. Eventually, contaminants could enter either Hillsborough or Tampa Bay. There is a potential, therefore, for contaminant migration to surface waters.

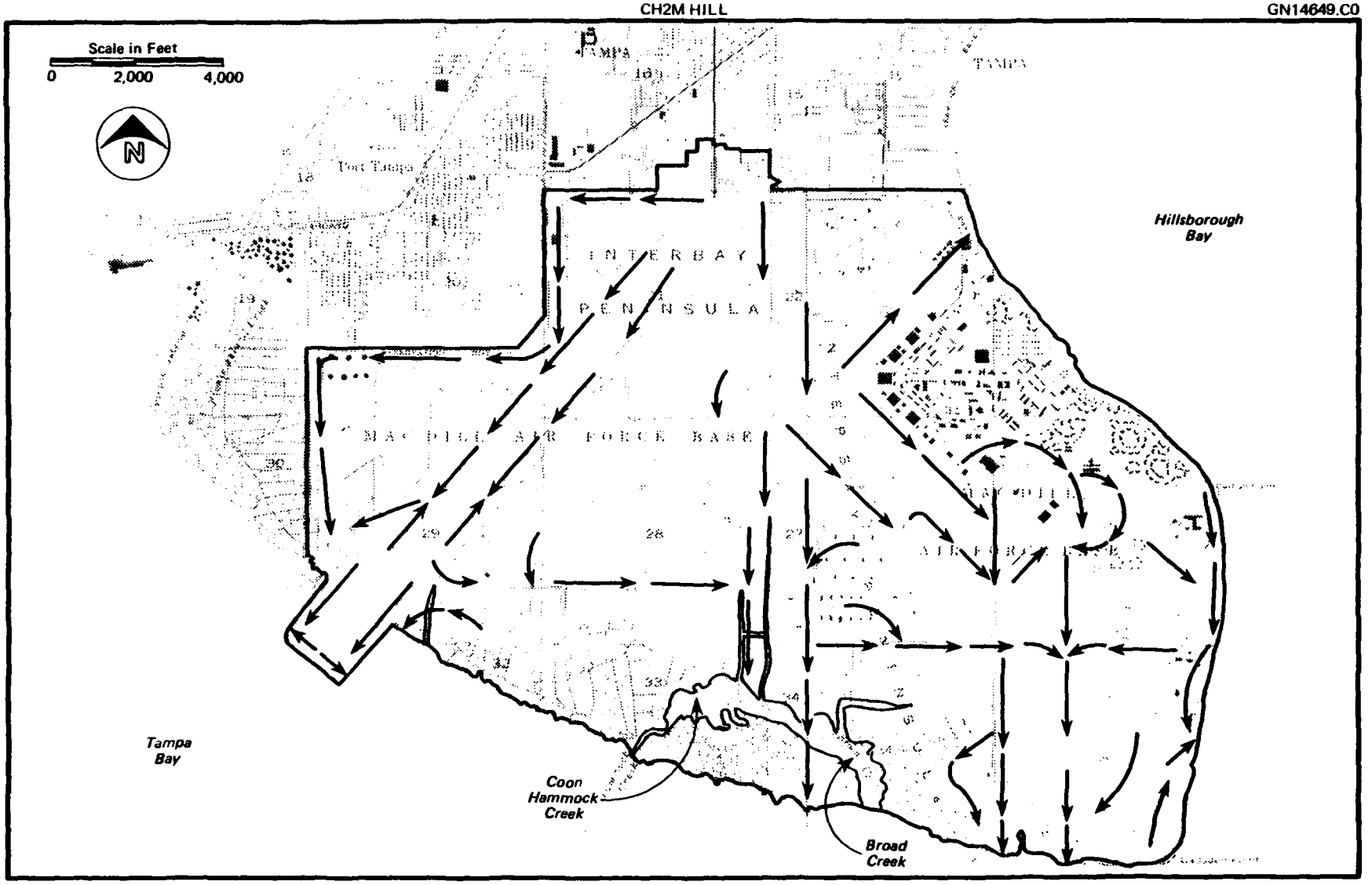

FIGURE 6. Surface drainage map of MacDill AFB.

Recharge to the deeper artesian aquifer (the Floridan aquifer) occurs primarily in those areas where the overlying confining beds are absent or breached by sinkholes. No sinkholes are known or suspected to exist in the MacDill AFB vicinity. A recent potentiometric survey of the Floridan aquifer, illustrated on Figure 7, indicates that a potentiometric high occurs approximately 30 miles to the northeast of MacDill AFB. Recharge to the Floridan aquifer is therefore expected in this area; ground-water flows from this potentiometric high, southwesterly toward MacDill AFB. The flow within the aquifer then goes either westerly to discharge in Old Tampa Bay or southeasterly toward potentiometric lows caused by centers of pumping on the east shore of Hillsborough Bay.

The difference in the piezometric water levels between the water table aquifer and the artesian aquifer is generally less than 5 feet at MacDill AFB. The direction of this vertical gradient is both upward and downward depending on rainfall, runoff, tides, and other factors influencing the actual piezometric levels. In addition, the hydraulic connection between these two aquifers is fairly poor. The confining beds, having a coefficient of leakance less than 5×10^{-4} gpd/ft^3, effectively prevent seepage between the aquifers. The potential for contaminants to enter the Floridan aquifer or to migrate to potable water supply wells is therefore very low.

Water quality within the upper Floridan aquifer at MacDill AFB is marginal to poor, being somewhat high in chloride concentration and total dissolved solids. Due to its close proximity to saltwater, there are no large withdrawals of ground-water from the Floridan aquifer at or near MacDill AFB. There is a lens of freshwater of very limited

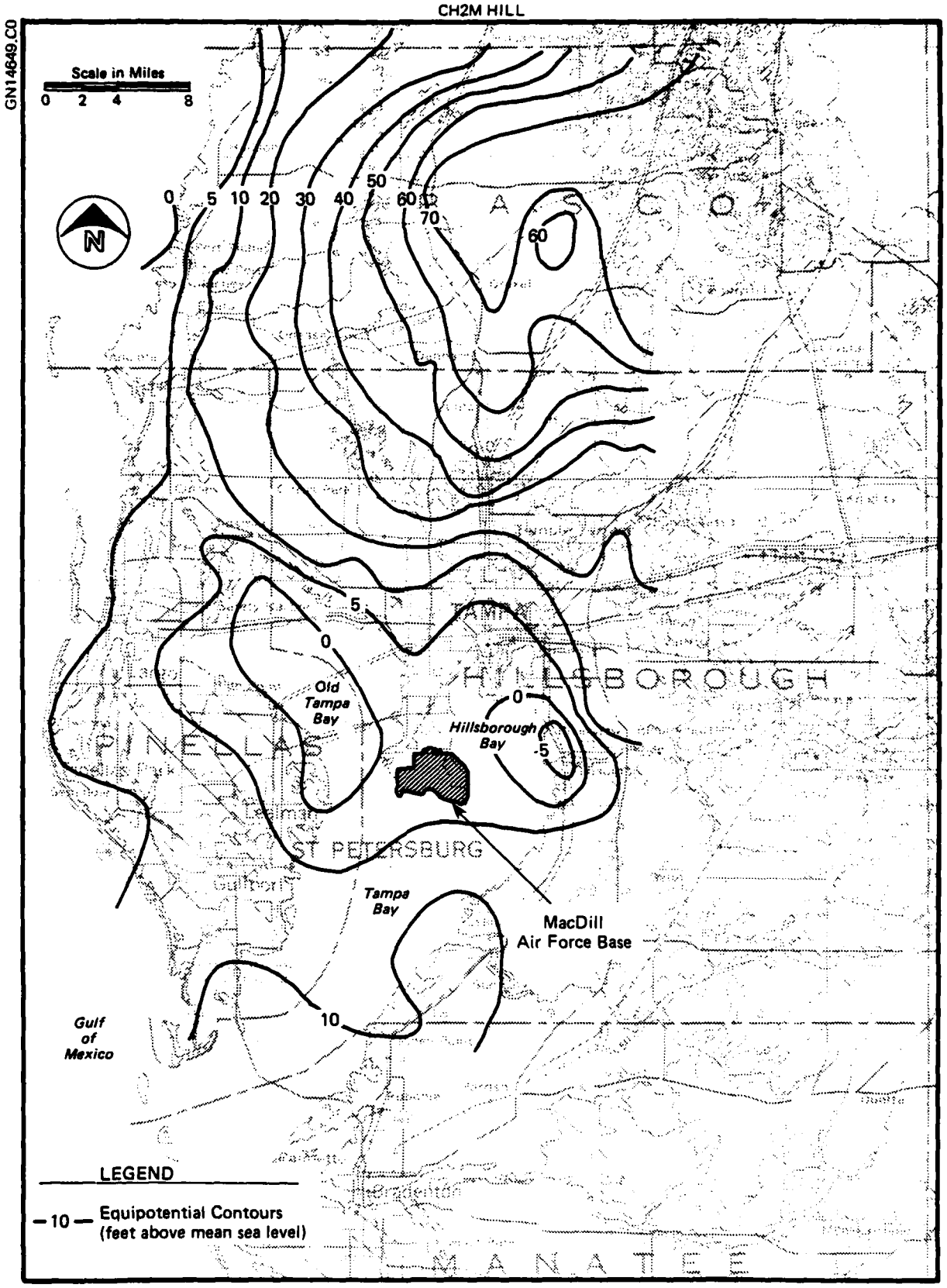

FIGURE 7. Potentiometric surface of the Floridan aquifer, May 1979.

extent occurring in the upper 50 feet of the Tampa Limestone, but this is not developable as a water supply source. Fresh, potable water is obtained by MacDill AFB from the City of Tampa. No potable water supplies are generated on-base.

D. Environmentally Sensitive Conditions

1. Habitat

MacDill AFB occupies more than 5,600 acres at the southern end of the Interbay Peninsula, of which 2,040 acres are undeveloped. A variety of native plant communities are present on the base, including mangrove swamps, hardwood hammocks, and pine flatwoods (see Figure 8).

The largest and most significant plant community and wildlife habitat area on MacDill AFB is the mangrove swamp which occupies the southern and western shores of the peninsula. Mangrove swamps are environmentally important because they are highly productive, serving as breeding and nursery grounds and an important primary food source for many of the over 400 species of shellfish, game and commercial fish, and waterfowl that inhabit Tampa Bay. In addition to their biological significance, mangroves also help stabilize shorelines by dissipating wave energies generated by storms. This protects coastal areas from damaging waves and erosion and helps prevent water quality degradation.

Located inland from the mangrove swamps on MacDill AFB is a zone of transition between the marine wetland environment of the swamp and the drier areas inland. This diverse zone is comprised of brush, pine flatwoods, and grassy areas interspersed with islands of mangroves and hardwood hammocks. Areas of brush composed of wax myrtle, Brazilian pepper, willow, and scrub oak are most extensive

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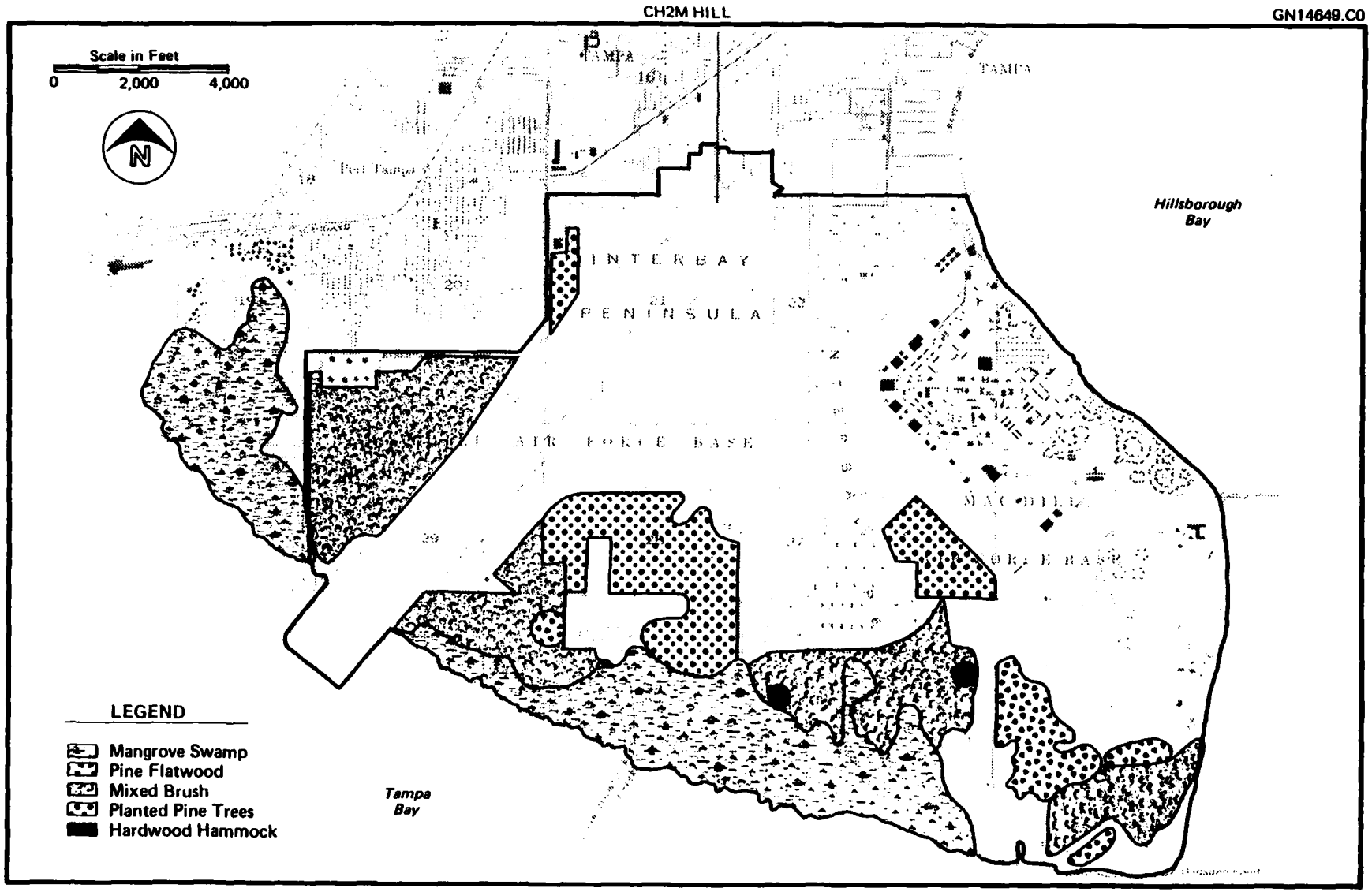

FIGURE 8. Major plant communities at MacDill AFB.

in the southern and western sections of the base. Flatwoods dominated by pines and palmettos with scattered shrubs are present mainly in the southeastern corner of the base. Stands of planted pine trees are also common throughout MacDill AFB. In the south-central portion of the transition zone several oak-dominated hardwood hammocks are interspersed in areas of brush.

Because of the variety of habitat types, the undeveloped areas of MacDill AFB support a diverse fauna. These include the marsh rabbit, gray fox, southern flying squirrel, fox squirrel, turkey vulture, marsh hawk, osprey, herons, pelicans, and many other species. The large game and commercial fish populations at Tampa Bay are also supported in part by the coastal habitat along MacDill AFB. Important commercial species include mullet, drum, spot, and mackerel.

2. Endangered and Threatened Species

No detailed investigations have been made of threatened and endangered species existing on MacDill AFB. However, the range of a number of species is known to include Hillsborough County. Based on this information, a list of threatened and endangered species which may possibly be found at the base is given in Table 3. Several threatened species have been sighted at MacDill AFB. Alligators are commonly seen in the mangrove swamp. A pair of southern bald eagles has been sighted, and at least two colonies of brown pelicans are known to use the swamp for feeding and roosting.

3. Environmental Stress

Cursory onsite investigations and review of available information on MacDill AFB revealed no significant environmental stresses caused by past or present hazardous

Table 3
THREATENED AND ENDANGERED ANIMALS AND PLANTS, HILLSBOROUGH COUNTY

Common Name	Scientific Name	Status[a] State	Status[a] Federal	Habitat
Florida Manatee	Trichechus manatus lativostris	E	E	coastal waters
American alligator	Alligator mississippiensis		T	marsh, lakes
Atlantic Green Turtle	Chelonia mydas mydas	E	E	coastal waters
Florida mouse	Peromyscus floridanus	T		scrub, flatwoods
Florida sandhill crane	Grus canadansis pratensis	T		marsh
Southern bald eagle	Haliaeetus leucocephalus leucocephalus	T	E	marsh
Eastern brown pelican	Pelicanus occidentalis carolinensis	T	E	coastal
Peregrine falcon	Falco peregrinus	E	E	transient
Red cockaded woodpecker	Picoides borealis	T	E	pine woods
Kirtland's warbler	Dendroica Kirtlandii	E	E	transient
Bachman's warbler	Vermivora bachmani	E	E	transient
Audubon's caracara	Caracara cheriway auduboni	T		open country
Southeastern american kestral	Falco sparverius paulus	T		pine forests & clearings
Snowy plover	Charadrius alexandrinus	E		transient
Florida gopher frog	Rana areolata aesopus	T		sand pine scrub
Florida gopher tortoise	Gopherus polyphemus	T		oak hammock, sand pine
Sherman's fox squirrel	Sciurus niger shermani	T		flatwoods, sandhills
Auricled spleenwort	Asplenium auritum	E		hardwood hammocks
Hand fern	Ophloglossum palmatum	E		mesic hammocks
Needle palm	Rhapidophyllum hystrix	T		mesic woods
Coontie	Zamia pumila	T		pine woods
Zephyr lilly	Zephyranthes atamasco	E		grassy areas
Rain lilly	Zephyranthes simpsoni	T		flatwoods

[a]E--"Endangered"
T--"Threatened"

waste disposal practices. Much of the original vegetation was removed or disturbed when the base was built.

The present base landfill site is a potential source of environmental stress because it is adjacent to the mangrove swamp, but no adverse effects have been reported. Application of sludge and treated effluent from the base wastewater treatment plant to areas of cultivated trees and grass also has caused no apparent biological stress. Environmental degradation associated with the use of pesticides and herbicides is also not in evidence.

IV. FINDINGS

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A. Activity Review

1. General

Major activities at MacDill AFB generating industrial wastes include vehicle maintenance; aircraft equipment and component maintenance; and aircraft corrosion control, including painting and washrack activities. Other significant activities include laboratory operations; training activities (arms, ordnance disposal, fire); and the storage and handling of toxic/hazardous materials.

2. Industrial Operations

The industrial activities at MacDill AFB involve primarily maintenance operations for assigned aircraft and support vehicles. A master list of industrial activities is included in Appendix E.

A review of base records and interviews with present and former base employees resulted in the identification of those industrial operations where the majority of industrial chemicals are handled and hazardous wastes are generated. Table 4 gives a summary of major industrial activities including the estimated hazardous waste quantities produced by these operations and the present and past disposition of these wastes, i.e., treatment, storage, or disposal. The major industrial activities are described in the following paragraphs. Treatment, storage, or disposal of all wastes generated at MacDill is discussed in Section IV.A.3.

TABLE 4
Major Industrial Operations Summary

Shop Name	Location (Bldg. No.)	Waste Material	Waste Quantity	T/S/D Methods[a] (1940 1950 1960 1970 1980)
56 EMS				
Aircraft Corrosion Control and Washrack	1065	MEK PD 680 Thinners Paint Remover	600 gal/yr 2,600 gal/yr 1,300 gal/yr 60 gal/yr	DPDO[b]
		Acids/Phosphates Alkaline Soaps	6 gal/yr 6,000 gal/yr	Storm drain to 1967 Oil/Water separator to sanitary sewer since 1967
Wheel and Tire Shop	H-2 & H-5	PD680 Paint Remover	30 gal/yr 100 gal/yr	DPDO
Egress Systems	H-1	PD680	30 gal/yr	DPDO disposal
Phase Systems	H-5	PD680 MEK	30 gal/yr 80 gal/yr	
Missile Maintenance	P 79	PD680	36 gal/yr	DPDO
Armament Systems	P-48	PD680	30 gal/yr	DPDO
Munitions Equipment Maintenance	843	PD680 Naphtha Toluene Paint Remover Paint Thinner	60 gal/yr 36 gal/yr 30 gal/yr 60 gal/yr 20 gal/yr	DPDO
Aerospace Ground Equipment	552	PD680 Paint Remover Ether Hydraulic Fluid Lubricants Transmission Fluid	300 gal/yr 1,000 gal/yr 40 gal/yr 1,200 gal/yr 1,200 gal/yr 200 gal/yr	DPDO
Fuel Cell	532	MEK Lubricants Hydrazine	80 gal/yr 15 gal/yr (no history)	DPDO
56 CRS				
Engine Maintenance	H-2	MEK Hydraulic Fluid	consumed 660 gal/yr	DPDO Oil/Water separator to sanitary sewer since 1973
Structural Repair	H-1	MEK Trichloroethane	40 gal/yr 12 gal/yr	DPDO
Pneudraulics	H-3	PD680 Trichloroethylene Carbon Remover	300 gal/yr 55 gal/yr 15 gal/yr	DPDO

Notes: ——— = Time frame of shop operation confirmed.
– – – = Time frame assumed.
[a] T/S/D = Treatment, Storage, or Disposal
[b] DPDO = Containerized and sent to DPDO for contractor sale or disposal.

TABLE 4
(Continued)

Shop Name	Location (Bldg. No.)	Waste Material	Waste Quantity	T/S/D Methods[a] (1940 1950 1960 1970 1980)
Electric-Battery Shop	H-5	MEK	6 gal/yr	
		PD680	100 gal/yr	DPDO[b]
		Trichloroethane	50 gal/yr	
		Trichloromethane	50 gal/yr	
		Sulfuric Acid	300 gal/yr	Neutralized/Sanitary Sewer
56 TRANSPORTATION				
Allied Trades Battery/Tire Vehicle Maintenance	500	PD680	650 gal/yr	
		Trichloroethylene	20 gal/yr	DPDO
		Miscellaneous Solvents	240 gal/yr	
		Paint Thinner	20 gal/yr	
		Hydraulic Fluid	420 gal/yr	
		Oils	1,560 gal/yr	Waste POL storage tank; DPDO
		Fuels	120 gal/yr	
		Sulfuric Acid	1,200 gal/yr	Neutralized/Sanitary Sewer
56 CES				
Power Production	1050	PD680	170 gal/yr	
		Trichloroethane	5 gal/yr	
		Paint Thinner	1,200 gal/yr	DPDO
		Hydraulic Fluid	25 gal/yr	
		Oils	1,800 gal/yr	
		Fuels	600 gal/yr	
		Sulfuric Acid	50 gal/yr	Neutralized/Sanitary Sewer
JCSE				
Generation/Battery Vehicle Maintenance	861/862	PD680	210 gal/yr	
		Paint Remover	60 gal/yr	
		Miscellaneous Solvents	620 gal/yr	
		Acetone	20 gal/yr	DPDO
		Paint Thinner	600 gal/yr	
		Alcohol	10 gal/yr	
		Paints	20 gal/yr	
		Hydraulic Fluid	180 gal/yr	
		Oils	2,000 gal/yr	
		Sulfuric Acid	80 gal/yr	Neutralized/Sanitary Sewer
		Hydrochloric Acid	10 gal/yr	
71st TCF	P-71	Xylene	30 gal/yr	
		Toluene	30 gal/yr	
		Mineral Spirits	30 gal/yr	DPDO
		Hydraulic Fluid	300 gal/yr	
		Oils	660 gal/yr	
		Fuels	180 gal/yr	
		Sulfuric Acid	40 gal/yr	Neutralized/Sanitary Sewer
		TOTAL	30,000 gal/yr	

Notes:
——— = Time frame of shop operation confirmed.
– – – = Time frame assumed.
[a]T/S/D = Treatment, Storage, or Disposal
[b]DPDO = Containerized and sent to DPDO for contractor sale or disposal.

Aircraft Corrosion Control

Aircraft corrosion control operations began in 1952 with the construction of the aircraft washrack. The facility, originally designated No. 1359, was redesignated Facility No. 525 in 1967. Wastes from the washrack activities, which include primarily alkaline soap solutions, were originally discharged directly to the storm drainage system. In 1967, an oil/water separator (Facility 518) was constructed that discharges to the sanitary sewer.

Acid cleaning and painting operations began at Building 536 in 1956 and were transferred to Building 1065 in 1979. Zinc chromate primers and polyurethane paints have been commonly used for corrosion control. Wastes generated from these operations include paint chips, methyl ethyl ketone (MEK), paint thinners, solvents, paint removers, and acid cleaning solutions.

Hangar Maintenance

Since the early 1940's, most aircraft maintenance operations have been conducted in the five aircraft hangars located along the flight line. It is expected that industrial activities conducted from 1941 to 1962 under the Army Air Corps and SAC commands were similar to the types of maintenance operations currently being conducted at MacDill AFB. None of the interviewees reported specific knowledge of industrial activities prior to the early 1960's.

The major operations currently performed in the aircraft hangars which generate significant quantities of hazardous wastes are summarized in Table 4 and include the wheel and tire shop, egress and phase systems maintenance, engine maintenance, structural repair, pneudraulics shop, and the electric-battery shop. In general, each shop

generates small quantities (less than 55 gallons per year) of waste solvents, including PD680, MEK, trichloroethane, and trichloromethane. The pneudraulics shop, located in Hangar 3, generates about 300 gallons per year of PD680, as well as small quantities of trichloroethylene and carbon remover. The Electric-Battery shop, located in Hangar 5, uses small quantities of dilute sulfuric acid. The waste acid is neutralized with potassium hydroxide prior to discharge to the sanitary sewer.

Munitions

Missile maintenance, armament systems maintenance, and munitions equipment maintenance have been conducted since the 1960's in Buildings P-79, P-48, and 843. Small quantities of wastes include PD680 cleaning solvent, naphtha, toluene, paint thinner, and paint remover as shown in Table 4.

Fuel Cell

The fuel cell (Building 532) was constructed in 1958 and generates about 80 gallons of MEK and 15 gallons of lubricants per year. Hydrazine has been handled at the facility since 1981; no hydrazine wastes have as yet been reported.

Aerospace Ground Equipment

Routine maintenance of Aerospace Ground Equipment has been performed since 1945 in Building 552. Common wastes include moderate quantities of solvents, paint remover, hydraulic fluid, lubricants, and transmission fluid.

Vehicle Maintenance

Vehicle maintenance is conducted by the 56 Transportation Squadron at five facilities on the base. Building 500, built in 1967, houses the Allied Trades, Battery/Tire, and Vehicle Maintenance Shops. Over 900 gallons of waste solvents and thinners are generated each year. In addition, 2,100 gallons of waste POL, including hydraulic fluid, waste oils, and fuels are generated. These waste POL, previously held in two 500-gallon tanks, are currently stored in a 1,000-gallon underground tank before being sent to DPDO for disposition. Sulfuric acid electrolyte is neutralized with sodium bicarbonate prior to discharge to the sanitary sewer.

Minor vehicle maintenance and refueling is conducted at four other locations (see Appendix E). General vehicle maintenance is conducted at the Building 527 service station, fire truck maintenance is conducted at the crash fire station, Building P-8, and aircraft refueling vehicle maintenance is conducted at Facility 1061. The Facility 1050 refueling shop, used for maintenance of air-transportable refueling equipment, was located from the late 1960's to 1978 in Building T-98 on the site of the current CE open storage area. In 1978, this refueling shop was moved to Building 1050, replacing a former hobby shop. Quantities of waste POL solvents generated in these shops are generally small (less than 50 gallons per year).

In addition, the 71st Tactical Control Flight (71 TCF) and the Joint Communications Support Element (JCSE) have their own vehicle maintenance shops. The 71 TCF shop is located in Building P-71 (1975 to present), and generates small quantities of waste POL and waste solvents including xylene, toluene, and mineral spirits. The JCSE vehicle maintenance and generation/battery shops have been located in Buildings 861 and 862, respectively, since 1970. Approximately 2,200 gallons of waste POL are generated each year.

Waste sulfuric and hydrochloric acid solutions are neutralized prior to discharge to the sanitary sewer.

Base Civil Engineering maintenance shops located in Buildings 740, 864, and 965 have reported no significant quantities of waste POL or solvents.

CES Power Production

Power production, now in Building 1050, was located in Building 1064 from 1943 to 1977. Moderate quantities of waste POL, solvents, and paint thinners are generated each year as shown in Table 4. Waste sulfuric acid (about 50 gallons per year) is neutralized prior to discharge to the sanitary sewer.

3. Industrial Waste Disposal Practices

There were never any large-scale "depot"-type industrial operations at MacDill AFB. The quantities of waste oils, solvents, paint residues, and thinners generated at MacDill have probably remained similar to waste quantities currently being generated, on the order of 25,000 to 35,000 gallons per year. Interviews with past and present base employees indicate that total annual wastes generated at MacDill AFB include approximately 4,500 gallons of PD680 solvent, 6,500 gallons of MEK and other solvents, 4,000 gallons of hydraulic fluid, and up to 20,000 gallons of waste oils.

The standard procedure for disposition of waste POL and solvents is to collect wastes at each maintenance shop in 55-gallon drums. These drums are then sent to DPDO for proper disposition. Proper disposition includes reuse, recycle, resale, or destruction. In general, the

wastes are sold to a private contractor who collects the wastes at each shop and removes them from the base. Temporary storage of drummed wastes is provided on a concrete pad on the site of the former base laundry (Facility 865). Approximately 30 drums of waste paint and 20 drums of waste fuel were observed at the site during a ground tour of the facility conducted by the Records Search Team. Until 1977, a small quantity of waste oils and solvents was sold by DPDO to Hillsborough County for use in mosquito control activities.

Between 1955 and 1974, most of the waste oils and solvents were taken to the designated fire training area located west of the old aircraft dispersal parking area. Up to 5,000 gallons may have been stored there at any given time. These wastes were disposed of during fire training exercises held about once per month.

In addition, interviews with past and present base employees indicated that waste oil and solvents in drums may have been dumped by maintenance personnel in either designated or unauthorized landfills. In view of the standard procedure for disposition of waste oils and solvents to the POL storage drums located at the fire training area and the small quantities of waste generated at MacDill AFB, the total quantity of wastes which may have gone to base landfills in the past is judged to be small.

Oil/water separators have been installed at the locations listed in Table 5. Since 1973, the effluent from most of these oil/water separators has been discharged to the sanitary sewer. Oil skimmings taken from the oil/water separators are collected in 55-gallon drums and delivered to DPDO for proper disposition.

Table 5
OIL/WATER SEPARATORS

Facility No.	Facility	Date Facility Constructed	Date Separator Installed	Connection
H-2	Vehicle Washrack	1941	1973	Sanitary Sewer
H-2	General Aircraft Maintenance	1941	1979	Sanitary Sewer
H-2	General Aircraft Maintenance	1941	1981	Sanitary Sewer
33	Vehicle Washrack (CE)	1941	1973	Sanitary Sewer
48	Weapons and Release Shop	1967	1967	Sanitary Sewer
56	Vehicle Washrack	1952	1973	Sanitary Sewer
117	Vehicle Washrack	1941	1973	Sanitary Sewer
500	Vehicle Washrack	1967	1967 1968	Storm Drain Sanitary Sewer
518	Aircraft Washrack	1967	1967	Sanitary Sewer
527	Vehicle Maintenance Shop	1942	1942 1973	Tile Drainfield Sanitary Sewer
552	AGE Washrack	1945	1973	Sanitary Sewer
806	Vehicle Washrack (CE)	1963	1973	Ground Application
860	Vehicle Washrack (JCSE)	1963	1963 1973	Storm Drain Sanitary Sewer
862	Vehicle Washrack (JCSE)	1970	1970 1973	Storm Drain Sanitary Sewer
1061	Vehicle Refueling Shop	1978	1978	Sanitary Sewer
1065	Aircraft Corrosion Control	1979	1980	Sanitary Sewer
1121	Fuel Tank Farm	1952	--	Storm Ditch
1144	Jet Engine Test Cell	1969	1969	Storm Ditch
1354	Power Check Pad	1960	1960	Storm Ditch
1359	Aircraft Washrack	1952	1952 1967	Storm Ditch Discontinued

The separators that do not discharge to the sanitary sewer include the CE Vehicle Washrack at Facility 806, the Jet Engine Test Cell, and the Power Check Pad. Since these washrack and test facilities are not frequently used, the amount of effluent discharged from the separators is small. The quantity of hazardous wastes which may be present in the effluent is therefore also judged to be small.

Three oil/water separators are located at the bulk fuels tank farm at the fuels truck loading stand, the liquid fuels pump station, and the surface-water discharge point. These separators discharge following rainstorms, and therefore operate intermittently. Visual observations of these separators made by the Records Search team during a ground tour of the facility indicated no problems with their operation. Tests have reportedly been conducted on the effluent from the separators and have not indicated the presence of significant quantities of POL, fuels, or other hazardous wastes.

Contaminated fuels have been stored in a 12,000-gallon underground storage tank at Facility 68 since the early 1970's. Originally, the contaminated fuel was sold by DPDO to off-base contractors or used in fire training exercises. Since 1980, the fuel has been reclaimed and reused in aircraft by combining with noncontaminated fuel.

4. Laboratory Operations

Laboratory operations at MacDill AFB include fuels testing labs, a precision measurement equipment lab, a non-destructive inspection lab, a photo lab, and hospital labs. An inventory of these laboratories is given below:

Building Number	Type or Description
1101	AFLC Fuels Lab
1121	AFLC Fuels Lab
1062	Base Fuels Lab
0042	Precision Measurement Equipment Lab
0014	Non-Destructive Inspection Lab
0025	Base Photo Lab
0711	Hospital Labs

Fuels testing labs engage in routine quality control testing of fuels used on the base. Small quantities of spent chemicals, waste fuels, and oils are collected and sent to DPDO for proper disposition. Laboratory and sanitary wastewater discharge to a septic tank and drain field.

The precision measurement equipment (PME) and non-destructive inspection (NDI) labs use basically dry processes. Any waste oils or solvents used are collected in drums and sent to DPDO for proper disposition. Small quantities of wastes generated at the NDI lab include 40 gallons of PD680, 50 gallons of kerosene, and 12 gallons of penetrant each year, which are delivered to Redistribution and Marketing before being sent to DPDO for proper disposition. Approximately 100 pounds of contaminated mercury is recovered each year in the PME lab and is sent to Wright-Patterson AFB for distillation.

Photographic processing labs use wet chemical processes. Spent chemical solutions are treated to recover silver, and the solutions are discharged to the sanitary sewer.

The hospital labs dispose of pathological and infectious materials in an incinerator located adjacent to the base hospital. Common chemical solutions are discharged to the sanitary sewer. Silver recovery is practiced in the Dental X-ray lab.

5. Training

a. Munitions

Arms testing is conducted at MacDill at the small arms range located adjacent to the dog kennels. Periodically, metals are recovered for salvage purposes. A bombing range is located at the Avon Park Air Force Range and is discussed in a subsequent section (Section VII).

Munitions disposal operations are conducted at the Explosive Ordnance Disposal (EOD) site south of Southshore Road. Former EOD operations were reportedly conducted at an old M-1 range, adjacent to the existing small arms range. Operations, which have included detonation of explosive charges and destruction of volatile chemicals, have virtually ceased since 1978. The present EOD range has been used primarily for training purposes; most ordnance disposal operations occur at the Avon Park range. The EOD site at MacDill AFB remains active as a training facility and for use in times of emergency. No significant amounts of hazardous residues are suspected at the EOD site.

b. Fire Training

Fire training activities at MacDill have been conducted at two fire training burn pits located in the same general vicinity in the old aircraft dispersal parking area. These sites were designated as fire training areas in 1955; training exercises have alternated between the two sites ever since.

Originally, comingled waste POL and solvents were used in fire training activities and were stored in 55-gallon drums at the sites. Approximately 100 drums were

kept at the facility for such storage. The waste POL was then dumped into pits and ignited when training activities were conducted. Most the POL waste was consumed in the fire; the quantities of POL waste which may have percolated into the ground from these exercises is judged to be small. One of the interviewees reported that POL waste was sometimes dumped by flight line personnel directly into the burn pits instead of being placed in the storage drums. Small quantities of POL waste may have percolated into the ground as a result of this unauthorized practice.

Since 1974, only fuel with less than 10 percent contamination has been used in fire training exercises, in accordance with new regulations. A fuel storage tank was installed at the northern facility in 1979, although it has not been used yet. The fuel (generally JP-4 containing water) is delivered to the site by truck and pumped into the burn pits on top of a layer of water just before training exercises are to commence. Approximately 500 to 700 gallons of fuel is used per exercise; an average of two exercises are conducted each month.

Prior to 1969, a protein foam was used to put out the fires. Since then an agent referred to as AFFF has been used. AFFF's are non-corrosive, biodegradable fluorocarbon surfactants with foam stabilizers and are not considered to pose a potential for hazardous material contamination.

6. Storage/Handling of Materials

The storage and handling of toxic and/or hazardous materials occurs at the following areas:

a. Fuels

The main POL storage area is located in the northwest corner of the base, near the DPDO facilities.

Fuels are delivered through pipelines from the Port of Tampa and are stored in seven above-ground and diked fuel storage tanks having a total capacity of 10.5 million gallons. The tanks, constructed between 1952 and 1953, have been used for storing AVGAS, diesel, JP-4, and JP-5.

Some minor spills have occurred in the past, usually as a result of overtopping of the storage tanks or minor leakage from pipes. These spills occur infrequently and are contained in the diked areas surrounding the tanks. Most of the spilled fuel is recovered; however, some minor seepage into the ground has occurred. One interviewee reported that fuel was detected seeping into an excavation in the area in about 1975. Also, the area around one of the tanks was reportedly ignited by a welding operation during the repair of a leaking pipe.

Major fuel tanks are desludged every 3 to 5 years to remove small quantities of residue containing mostly water, rust, and sediment. Prior to the mid-1960's, it was standard practice to dispose of the sludge in shallow trenches adjacent to the tank, allow the sludge to weather, and then fill the trench with dirt. After the mid-1960's and into the early 1970's, the sludge was taken to a concrete slab on the site of the former base laundry facility near the Port of Tampa gate and allowed to weather. The weathered sludge was then disposed of in the main base landfill operating at that time (Site No. 8 on Figure 9). Some of this sludge contained lead from AVGAS storage tanks, and has probably resulted in localized contamination of the soil with lead. No sludge has been generated or disposed of since the early 1970's; procedures for future sludge disposal are currently being investigated by fuels loading personnel.

The fuel supply areas for aircraft and vehicles on the flight line are located at the fuel pump stations at Buildings 72, 75, 76, and 77. There are a total of 60 fuels

storage tanks in the four areas with a total capacity of 2.5 million gallons. In addition, there are 6 defueling tanks with a combined capacity of 250,000 gallons. Fuels currently stored include JP-4 and AVGAS. No major spills or leaks from these tanks have been reported.

There are numerous smaller fuels storage tanks at various locations around the base in below- and above-ground tanks. The fuels that are stored include JP-4, AVGAS, MOGAS, diesel, No. 2 fuel oil, and kerosene. An inventory of fuels storage tanks, including location, capacity, and type of fuel stored, is given in Appendix F.

Two fuel leaks near the jet engine test cell (Building 1144) have been documented. In 1973, a leak resulted from the improper plugging of a 3,500-gallon buried storage tank and the improper welding of an influent fuel line. The leak was detected when maintenance personnel noticed a discrepancy between quantities of JP-4 fuel delivered and used at the facility. Perimeter ditches and sumps were used to effectively remove the fuel from the ground water.

In 1980, a lawn mower operating in a ditch northwest of Building 1144 ruptured an exposed JP-4 pipeline. Approximately 3,000 gallons of spilled fuel in the ditch was removed by pumping to a service contractor's tank. No significant seepage of fuel into the ground is suspected.

The Records Search did not reveal any other problems with past or present major fuel leaks from the storage tanks or distribution lines. There is no indication of fuel saturation or reports of unusual petroleum odors or oil slicks emanating from the ground or in drainage ditches at any other areas on the base.

A few abandoned underground tanks have been reported at MacDill AFB. These tanks, which contained diesel, No. 2 fuel oil and contaminated aviation fuel, are listed in Appendix F. One interviewee reported that several old tanks which operated by means of an "Aqua-System" were abandoned in the 1950's and 1960's near Buildings P-6, 48, and 35. No other record of these abandoned tanks is available. Standard procedure when abandoning a tank has been to pump out the remaining fuel and to fill the tank with sand. No problems were identified during the Records Search to indicate fuel saturation from any abandoned tanks.

b. Polycholorinated Biphenyls

Currently, out-of-service transformers containing PCB's are stored in Building No. 880, a concrete block building which was built in 1981 on the site of the former base laundry. No information was found to indicate specific storage areas prior to 1978, although used PCB transformers were delivered to DPDO for proper disposition. Small PCB leaks from transformers located at the liquid fuels pump stations (Buildings 72, 75, 76, and 77) have been reported. The transformers are located in concrete block buildings with concrete floors. The spills, generally due to leaking valves, were of small quantities, and have been mitigated using an absorbant to soak up the spill. Action has been taken to prevent future such spills.

Out-of-service sealed capacitors containing about one gallon of PCB oil are currently sent to DPDO for proper disposition. Prior to the late 1970's, these capacitors were disposed of in the base sanitary landfills. The number of used capacitors placed in landfills and the total quantity of PCB oil is expected to be small.

c. Hydrazine Storage

Hydrazine is used in emergency power sources in the new F-16 Phantom fighters. Handling and storage of hydrazine began in 1980, when the F-16's were introduced at MacDill AFB. The hydrazine was stored temporarily on a concrete pad north of Southshore Road, across from the CE washrack. In 1981, a new facility, No. 1070, was constructed for permanent hydrazine storage near the flight line. Contamination due to hydrazine was not found to be a problem at MacDill AFB.

d. Chemical Agents

Chemical agents were reportedly stored from about 1945 to 1958 in a fenced area adjacent to the old Strategic Air Command operations area, an area now used by the United States Rapid Deployment Joint Task Force (Building 1105). No documentation was available to indicate what agents were stored or how they were removed from the site. Allegedly, some of these materials could have been buried in the vicinity of Building 1105, or just across Southshore Road in a chemical munitions burial site (Site No. 11, Figure 9).

e. Pesticides

Herbicides and other pesticides have been applied on-base for weed and pest control. Herbicide operations are generally handled by the paving and grounds personnel. Other pesticide applications are under the supervision of the Base Entomologist. Commonly used chemicals include baygon, diazinon, malathion, chlordane, dibrom, silvex, and 2,4-D and are used for control of mosquitos and various other pests such as cockroaches, fleas, rats, ants, and subterranean termites.

Mosquito control is practiced most heavily from April through October. Ground operations consist of fogging with the organophosphate compound, malathion. When mosquito trap counts are sufficiently high (more than 120 female mosquitoes), the County is asked to aerial spray the base. The chemical most commonly used for aerial application is dibrom.

Pesticides are stored in Buildings 1093, 32, 701, and 1138. An inventory of pesticide types, quantities, and storage locations is included in Appendix F.

Empty pesticide containers are rinsed three times, crushed or punctured, and disposed of at the base sanitary landfill in accordance with standard regulations. Rinsewater is disposed of at the site of the pesticide application. The quantities of waste pesticides resulting from rinsing of empty containers or application equipment from past operations is judged to be small.

Interviews with present Entomology personnel did not reveal when present disposal procedures were implemented; however, since pesticides are consumed during application, no significant residual hazardous wastes are suspected from previous disposal practices. The Records Search did not reveal any apparent contamination problems from past pesticide usage.

f. Biological Agents

No evidence of manufacture, storage, or use of biological agents was found at MacDill AFB.

g. Radioactive Materials

Some low-level radioactive waste consisting of spent electron tubes is generated at the Avionics Maintenance Shop (Building P-6) and the 1928 Communications Group.

Previously, spent tubes were sealed in 55-gallon drums and sent to Kelley AFB, Texas, for disposal under the coordination of base Bioenvironmental Engineering. Since 1980, electron tubes have been disposed of in the base sanitary landfill in accordance with current acceptable practice due to the low level of radioactivity. Small quantities of these low-level radioactive electron tubes may have been disposed of in base sanitary landfills in the past also. No documentation was found to indicate past disposal of other types of radioactive materials at MacDill AFB.

7. Sewage Treatment

The existing base sewage treatment and disposal facility was constructed in 1953 and expanded in 1973. Sewage treatment consists of an activated-sludge-type secondary treatment process. The plant has a design capacity of 1.2 mgd and an average daily effluent discharge rate of 0.8 mgd. The majority of this flow is domestic sewage; small quantities of industrial sewage are pretreated using oil/water separators (see Table 5) which were generally connected to the sanitary sewer in the early 1970's.

Originally, the plant effluent was discharged directly to Hillsborough Bay. In 1976, land application of the effluent was begun at four spray irrigation sites south of the flight line. These sites presently include 25 acres of planted pines and 100 acres of special hybrid grass which is harvested for hay.

Sludge is generated at a rate of about 18,000 gallons per month with a concentration of about 6 percent solids. The sludge was originally disposed of directly in Hillsborough Bay. From the late 1950's until about 1970, and intermittently thereafter until 1975, the sludge was disposed of in the base sanitary landfills. It was also used as a soil

conditioner on the golf course from 1970 to 1975. Since 1976, sludge has been disposed of by land application on the old aircraft dispersal parking area.

The Records Search did not reveal any potential for hazardous material contamination from past or present sewage treatment and disposal practices. Base personnel are currently analyzing the waste characteristics of the sludge; no documentation suggests that hazardous material contaminants are present in the sludge or in the treated effluent.

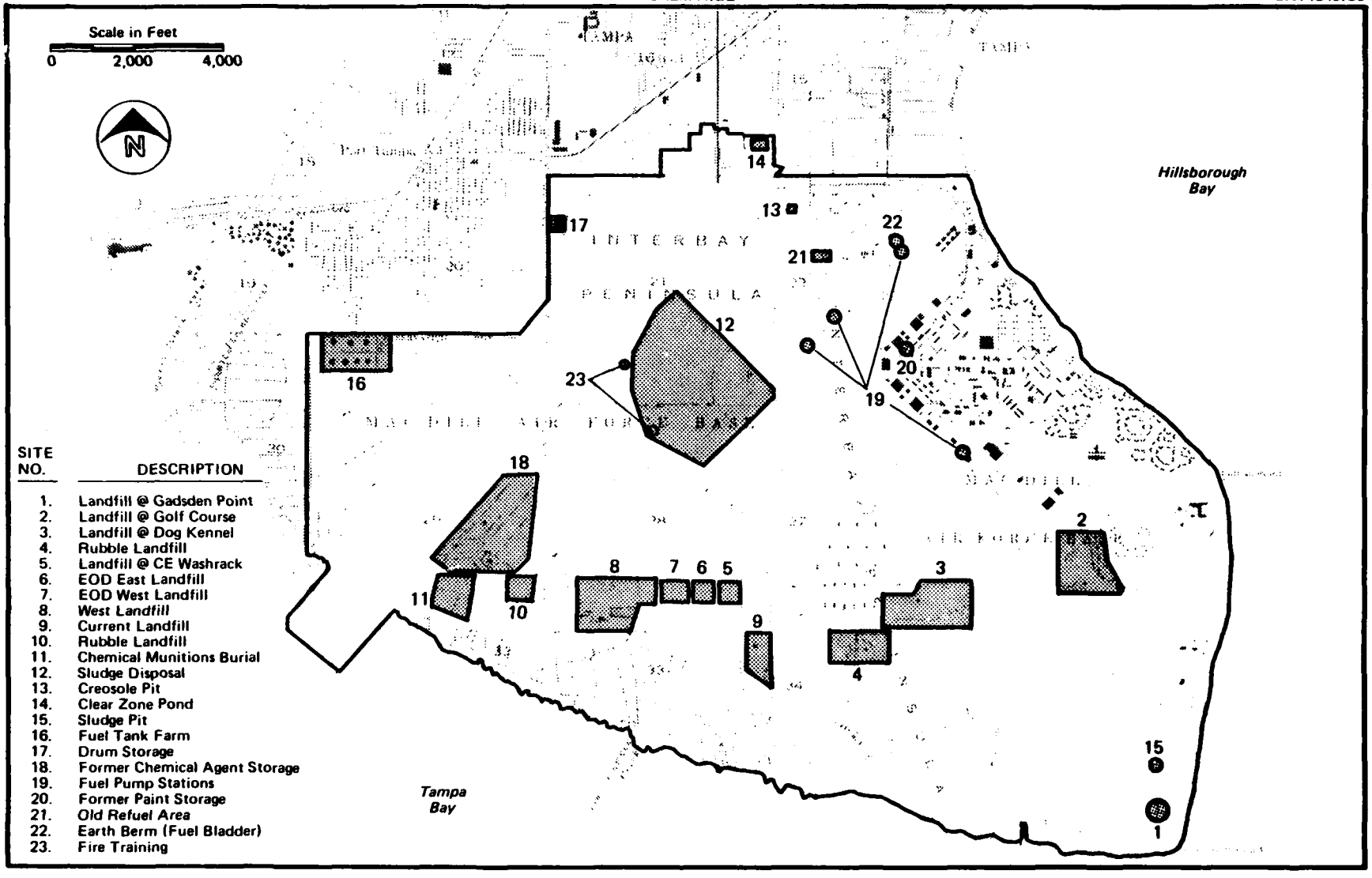
B. Disposal Sites Identification and Evaluation

1. Disposal Sites Identificaton

Interviews with 30 past and present key base personnel (Appendix C) resulted in the identification of 23 disposal sites at MacDill AFB. The sites, shown on Figure 9, include 11 current or former landfills, four other waste disposal areas, and eight material storage or handling areas. Disposal sites at Avon Park AFR are discussed in Section VII.

The following is a brief description of each site identified during the interviews and Records Search at MacDill AFB. The approximate dates that each site was in use are given on Figure 10.

- Site No. 1, located near the Gadsden Point Recreation Area, is a general refuse landfill of small extent that was used prior to 1945. The existence of the landfill was reported by one interviewee, but not substantiated by others. Since no industrial operations were being conducted at the time the landfill was allegedly being used, no hazardous materials are suspected at this site.



SITE NO.	DESCRIPTION
1.	Landfill @ Gadsden Point
2.	Landfill @ Golf Course
3.	Landfill @ Dog Kennel
4.	Rubble Landfill
5.	Landfill @ CE Washrack
6.	EOD East Landfill
7.	EOD West Landfill
8.	West Landfill
9.	Current Landfill
10.	Rubble Landfill
11.	Chemical Munitions Burial
12.	Sludge Disposal
13.	Creosole Pit
14.	Clear Zone Pond
15.	Sludge Pit
16.	Fuel Tank Farm
17.	Drum Storage
18.	Former Chemical Agent Storage
19.	Fuel Pump Stations
20.	Former Paint Storage
21.	Old Refuel Area
22.	Earth Berm (Fuel Bladder)
23.	Fire Training

FIGURE 9. Location map of possible contaminated areas at MacDill AFB.

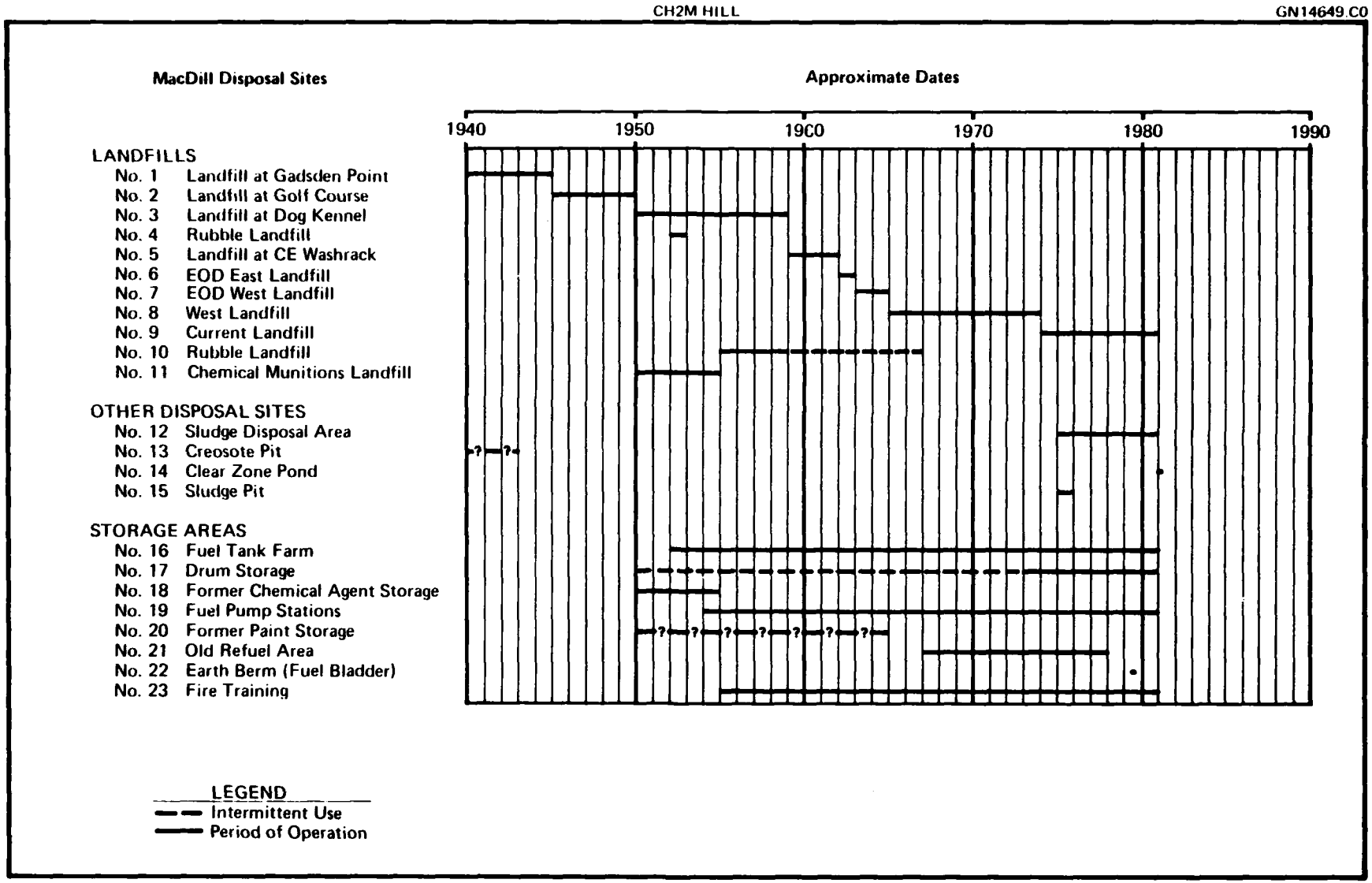


FIGURE 10. Historical summary of disposal activities at MacDill AFB.

- Site No. 2, located in the area of Lake McClelland and fairways 15 and 16 at the present golf course, was used from about 1945 to 1950. The landfill is reported to contain primarily concrete rubble although general refuse may have been disposed of also. The remains of trees killed in a frost in 1955 or 1956 were reportedly also buried at this site. No known or suspected industrial wastes or hazardous wastes were disposed of at this site.

- Site No. 3 is located east of munitions storage in the area around the existing dog kennel and was in use from about 1950 to 1959 for disposal of general refuse. Several interviewees reported that some paint cans, solvents, garbage, and PCB-containing capacitors may have been disposed of in this area. Quantities of hazardous materials disposed of here are judged to be small.

- Site No. 4 was a rubble and debris disposal area of unknown extent which is located south of munitions storage. This landfill was reportedly used in 1952 and 1953, although this was substantiated by only one interviewee. No known or suspected industrial or hazardous wastes were disposed of at this site.

- Sites No. 5, 6, and 7 are located south of Southshore Road near the present EOD disposal area. Site No. 5 was used between 1959 and 1962, Site No. 6 between 1962 and 1963, and Site No. 7 between 1963 and 1965. All three sites contain general refuse. Standard operation of these landfills included burning of rubbish, although burning was discontinued in the mid-1960's when the western part of Site No. 7 was in use. These

sites were being used during the time when the major industrial activities which generate hazardous wastes at MacDill AFB were in operation. Since the total quantity of hazardous wastes generated from industrial activities has been small, these landfills are designated as sites where suspected small quantities of hazardous wastes were disposed of.

- Site No. 8 , the largest of the landfills identified, was used between 1965 and 1973 and is located just west of Site No. 7 between Southshore Road and the mangrove swamps. As with Sites 5, 6, and 7, this site was being used during the time when major industrial activities which generate hazardous wastes were in operation, and is designated as a site where suspected small quantities of hazardous wastes were disposed of.

- Site No. 9 is the current landfill located southwest of munitions storage. The landfill has been in operation since 1973, and is nearing capacity. This site also is designated as an area where suspected small quantities of hazardous wastes were diposed of. The proposed future landfill is located east of the current site and has not been addressed in this Records Search since no wastes have as yet been disposed of there.

There is no detailed documentation of the types of materials deposited in past landfill areas of MacDill AFB. Since the base has not been heavily involved in industrial activities, the majority of the waste material was typical of municipal-type refuse, consisting of garbage and construction debris. Small quantities of hazardous wastes including some waste oil and solvents, old paints and thinners, old

battery casings, empty pesticide and herbicide containers, electron tubes, PCB capacitors, tires, adhesives, and construction debris are suspected to exist in the major base landfills (Sites 3, 5, 6, 7, 8, and 9).

Sludge from the sewage treatment plant was deposited in landfills until about 1970, then intermittently until 1975, and is therefore expected to be present at Sites 5, 6, 7, 8, and 9. This sludge is not considered to be a hazardous waste material. Weathered AVGAS sludge containing tetraethyl lead was reportedly disposed of in landfills from the mid-1960's to the early 1970's, and is therefore expected in Site No. 8.

None of the interviewees recalled any incidents in the past in which large quantities of unusual, toxic, or hazardous wastes were sent to MacDill AFB landfills for disposal.

- Site No. 10, located south of Southshore Road across from the existing RDJTF, is reported to contain wood and concrete rubble from the demolition of the old chemical agent storage area, and was used intermittently between 1955 and 1967 for rubble disposal. Traces of chemicals or isolated dumpings of waste chemicals might be present in the rubble and debris, although no documentation was found to substantiate this. Therefore, no hazardous wastes are known or suspected of being disposed of at this site.

- Site No. 11, located adjacent to the drainage canal west of Site No. 10, may have been used to dispose of chemicals from the old chemical agent storage area between 1950 and 1955. The types and quantities of chemicals disposed of are not known. Some of the interviewees reported that small

canisters two feet in length were unearthed in 1956. Gases seeping from the canisters caused extreme eye irritation in the workmen. The canisters were subsequently reburied in place. Deposits of white phosphorus that ignited when exposed have also been reported in this area.

- Site No. 12, located in the aircraft dispersal parking area between the taxiways, has been used for the disposal of sludge from the sewage treatment plant since 1975. No hazardous wastes are known to be present in the sludge.

- Site No. 13 was the former site of a small pit used for creosote treatment of wood for use at MacDill AFB prior to 1945. The pit was located near the base comissary less than 100 feet southeast of an existing stormwater detention basin and west of a former CE storage area. No surface evidence remains of the pit; no documentation indicates how much of the creosote may have percolated into the ground or was removed. Therefore, only small quantities of hazardous wastes are suspected.

- Site No. 14 is located on property recently acquired from a local resident for the runway clear zone. Drums containing pesticides were allegedly being stored in a building on the property when the building was bulldozed down. Evidence of the drums or of pollution of the adjacent pond has not been found. Water quality analyses performed by USAF OEHL on water samples from the pond revealed no contamination.

- Site No. 15, located on the old landing strip near Gadsden Point, contains a small pit that was

filled with sludge from the wastewater treatment plant in 1975 or 1976. Since the sludge is not considered hazardous, no known hazardous wastes have been disposed of at the site.

- Site No. 16, the bulk fuel tank farm, has been in operation since about 1952 and has been identified as a possible fuel-saturated area. Fuel was once reported seeping into an excavation in the area. In addition, AVGAS sludge containing tetraethyl lead was reportedly buried within the earth levee areas around the tanks. Therefore, small quantities of residual hazardous wastes are suspected.

- Site No. 17 is the existing storage area for out-of-service electrical transformers containing PCBs. The transformers are currently stored in a protected building on a concrete pad on the site of the former base laundry facility. The pad is also used for temporary storage of drums containing waste oils, solvents, and paints and had been used between 1965 and 1973 for weathering of AVGAS sludge before the sludge was removed to Landfill No. 8. Small quantities of hazardous wastes are suspected.

- Site No. 18 is the former chemical storage area, currently the site of RDJTF and Taxiways 33 and 34. The area was apparently used for the storage of chemicals and other unknown chemical agents until about 1955. No evidence of residual contamination or of the burial of chemicals in this area was reported by any of the interviewees.

- Site No. 19 includes four separate fuel pump stations located around the flight line (Buildings 72, 75, 76, and 77). Leakage of PCB from transformers located at each pump station has been

detected, although leakage is contained within the concrete buildings. Minor leakage from fuel lines and buried tanks at each site is suspected to have occurred over the years, although no direct documentation was revealed during the Records Search.

- Site No. 20 is located south of Building No. 28 in a former paint storage area. One interviewee reported that a laborer, when working around Building 28 prior to 1965, became mired in paint, suggesting that a paint disposal pit may have been present there at one time. No residual hazardous wastes are known or suspected at this site.

- Site No. 21 is the current CE open storage area. The site was formerly a refuel area and was identified by some of the interviewees as a possible fuel-saturated area with suspected small quantities of hazardous wastes.

- Site No. 22 is an earth-bermed basin with a permeable gravel base used for maintaining fuel bladders. In 1979, one of these bladders ruptured, spilling about 1,000 gallons of JP-5 across the basin, some of which probably infiltrated into the ground. A small quantity of residual fuel may still be present.

- Site No. 23 is the fire training area located west of the old aircraft dispersal parking area. The site has been used for almost 30 years for fire training activities. As described previously, these activities involved pouring waste fuels into pits, igniting them, then extinguishing the fire using AFFF. Before 1974, waste oils and solvents were stored in drums at the facility and used in

training exercises. Most of the POL waste was consumed in the fire training exercises; however, some minor percolation into the ground may have occurred. Additional percolation of POL wastes may have resulted from unauthorized dumping of these wastes in the burn pits by flight line personnel. Total waste quantities which may have entered the ground water are judged to be small.

Other minor spill incidents were reported during the interviews, but the quantities of materials spilled were small and the materials were cleaned up and removed following the spills. These reported spills include:

1. Rupture of corroded barrels containing a decontamination agent (DANC) at the old CE open storage area (now the jogging track). Drums were repaired by EOD and removed to DPDO for proper disposition.

2. Trichloroethylene spill near Port of Tampa gate caused when drums fell off a truck. Drums were secured by EOD following the spill of less than 25 gallons.

3. Malathion spill on a roadway surface was mopped up with an adsorbant. Waste material was sealed in drums and removed to the current landfill.

4. Underground fuel leak at the jet engine test cell (Building 1144) and rupture of exposed JP-4 pipeline in ditch near Building 1144 described earlier in this section. No residual contaminated wastes are suspected at either of these spill sites.

2. Disposal Site Evaluation

The 23 identified disposal sites were evaluated using a system for rating the hazard potential of waste disposal facilities that was developed by JRB Associates, Inc., of McLean, Virginia, for the U.S. Environmental Protection Agency. This system was modified by CH2M HILL and Engineering-Science for specific application to the Air Force Installation Restoration Program.

The AF system consists of 31 rating factors that are divided into 4 categories: receptors, pathways, waste characteristics, and waste management practices. Scores in these categories are used to evaluate the principal targets of contamination, the mechanisms for migration, the hazards posed by the contaminants, and the facility's design and operation, respectively. Relative scores from each category are combined to give an overall score using appropriate weighting factors. A more detailed description of this hazard evaluation methodology is included in Appendix G. Copies of the rating forms completed for each site are included in Appendix H.

The following is a brief discussion of the results of the site assessments, summarizing major site characteristics in each of the four rating categories. A summary of the results of the site assessments, using the modified rating system, is given in Table 6.

a. Receptors

This category assesses the human population and critical environments which may potentially be affected by hazardous materials released from a waste disposal site.

Table 6
SUMMARY OF RESULTS OF SITE ASSESSMENTS[a]

Site No.	Site Description (Weighting Factor):	Subscores (% of Maximum Possible Score in Each Category) Receptors 0.22	Pathways 0.30	Waste Characteristic 0.24	Waste Management Practices 0.24	Overall Score (Weighted Average)	Page Reference of Site Rating Form
Landfills							
1	Landfill at Gadsden Point	39	42	30	62	44	H-1
2	Landfill at Golf Course	30	42	30	67	42	H-3
3	Landfill at Dog Kennel	37	55	50	67	53	H-5
4	Rubble Landfill	35	42	30	57	41	H-7
5	Landfill at CE Washrack						
6	EOD East Landfill	35	57	50	60	51	H-9
7	EOD West Landfill						
8	West Landfill	35	57	50	65	52	H-11
9	Current Landfill	35	57	50	60	51	H-13
10	Rubble Landfill	35	57	30	60	46	H-15
11	Chemical Munitions Burial Site	35	59	60	66	56	H-17
Other Disposal Sites							
12	Sludge Disposal Area	20	50	40	35	37	H-19
13	Creosote Pit	22	55	50	60	48	H-21
14	Clear Zone Pond	22	38	30	55	37	H-23
15	Sludge	35	57	40	49	46	H-25
Storage Areas							
16	Fuel Tank Farm	49	57	50	71	57	H-27
17	Drum Storage	46	40	50	39	43	H-29
18	Former Chemical Agent Storage	39	44	50	52	46	H-31
19	Fuel Pump Stations	17	50	50	38	40	H-33
20	Former Paint Storage	17	53	30	49	39	H-35
21	Old Refuel Area (CE Storage)	17	42	50	45	39	H-37
22	Earth Berm (fuel bladders)	17	55	50	38	41	H-39
23	Fire Training Area	17	39	30	31	30	H-41

[a]Basis of rating is system developed by JRB Associates, Inc. of McLean, Virginia, and modified by CH2M HILL and Engineering-Science for application to Air Force Installation Restoration Program Records Search.

Most of the identified sites received low ratings in this category since the sites are remote from population areas and potable water supply wells. Many of the sites, however, are located near wetlands or the mangrove swamp, and are within 1 mile of the reservation boundary, i.e., one of the surrounding bays. The water quality designations of the bays are either Class 2 or Class 3; Tampa Bay has a Class 2 designation, and Hillsborough Bay has a Class 3 designation.

Sites which received a moderate score in this category include the Fuel Tank Farm (No. 16) and the Drum Storage Area (No. 17) due to their proximity to residential off-base housing and wetlands.

b. Pathways

This category assesses the potential routes and mechanisms by which hazardous materials can escape from a waste disposal site.

The potential for migration can be considered along two primary routes: vertically to the Floridan aquifer, or laterally to surface water bodies. The potential for migration to water wells in the Floridan aquifer is generally low since (1) confining strata of low vertical permeability effectively separate the Floridan aquifer from the ground-water aquifer, (2) recharge to the Floridan aquifer does not occur locally, and (3) downgradient potable wells are located on the east shore of Hillsborough Bay over 5 miles from the site so that low concentrations of pollutants would be considerably diluted during migration. The main base drinking water supply is obtained from the City of Tampa.

The potential for migration to surface waters is somewhat higher since (1) there is a high ground-water table and a high lateral permeability of the soil, and (2) the distance to the nearest surface waters is short. Therefore, many of the sites received high ratings; however, the slope of the ground-water table, or the hydraulic gradient, is relatively flat so that migration of contaminants would be very slow.

The pathways category also rates the potential for migration based on the evidence and level of water or soil contamination. Only indirect evidence of either type of contamination was found during the Records Search. Moderate levels of soil contamination are suspected at the Chemical Munitions Burial site (No. 11) due to the reported presence of unknown gas canisters and white phosphorus.

c. Waste Characteristics

This category assesses the potential hazards posed by the waste materials present in a disposal site. The waste characteristics that are evaluated include the probable type and relative quantities of waste materials present as well as the degree of certainty as to their existence, whether known, suspected, or unknown. The potential for contaminant migration is low if no known quantities of hazardous materials are present, even if the site has receptors and pathways favorable to migration.

Most of the identified sites have no known hazardous wastes present. The remaining sites may allegedly contain small quantities of hazardous materials; however, only at the Chemical Munitions Burial Site (No. 11) have known small quantities been reported.

d. Waste Management Practices

This category assesses the design characteristics and management practices at a given disposal site as they relate to the site's environmental impact. It also examines the measures that have been taken to minimize exposure to hazardous wastes.

Many of the identified sites received moderate scores in this category since (1) the sites were not designated hazardous waste landfills; (2) they do not have liners, leachate, or gas collection systems, impervious covers, or accurate records; (3) the ground-water table is high so that the bottoms of most of the landfills are frequently submerged; and (4) total waste quantities are often moderate, even though hazardous waste quantities may be small.

V. CONCLUSIONS

V. CONCLUSIONS

A. No direct evidence was found to indicate that migration of contaminants beyond MacDill AFB property exists.

B. Evidence obtained through interviews with past/present base personnel indicates that small quantities of hazardous wastes have been disposed of in the past.

C. A potential exists for migration of pollutants due to a high ground-water table and permeable soil conditions. However, the potential for migration beyond base property is low due to the low hydraulic gradient.

D. Table 7 provides a listing of the 23 identified sites and their overall rating scores. The following sites were identified as areas showing the most significant potential for contaminant migration:

1. Site No. 16, Fuel Tank Farm, due primarily to:

   - Proximity to the mangrove swamp
   - Proximity to off-base residences
   - Reported past burial of leaded AVGAS sludge
   - Reported fuel saturation below ground

2. Site No. 11, Chemical Munitions Burial Site, due primarily to:

   - Proximity to the mangrove swamp
   - Disposal of unknown types and quantities of chemicals

Table 7
PRIORITY LISTING OF DISPOSAL SITES

Sites Warranting Additional Study

Site No.	Site Description	Overall Score
16	Fuel Tank Farm	57
11	Chemical Munitions Burial Site	56
3	Landfill at Dog Kennel	53
8	West Landfill	52
5, 6, 7	Landfills at CE Washrack, EOD East and EOD West	51
9	Current Landfill	51
13	Creosote Pit	48

Sites Not Warranting Additional Study

Site No.	Site Description	Overall Score
10	Rubble Landfill	46
15	Sludge Pit	46
1	Landfill at Gadsden Point	44
17	Drum Storage Area	43
2	Landfill at Golf Course	42
18	Former Chemical Agent Storage	41
4	Rubble Landfill	41
22	Earth Berm (fuel bladders)	41
19	Fuel Pump Stations	40
21	Old Refuel Area (CE storage)	39
20	Former Paint Storage	39
12	Sludge Disposal Area	37
14	Clear Zone Pond	37
23	Fire Training Area	35

3. Sites No. 3, 5, 6, 7, 8, and 9, past and current landfills, due primarily to:

   - Proximity to the mangrove swamp
   - Suspected small quantities of hazardous wastes
   - Absence of liners or leachate control systems

4. Site No. 13, Creosote Pit, due primarily to:

   - Absence of liner
   - Unknown quantity
   - Unknown closure procedure

E. Sites No. 1, 2, 4, 10, 12, 14, 15, and 17-23 are not considered to pose a hazard for migration of contaminants.

VI. RECOMMENDATIONS

VI. RECOMMENDATIONS

Although no direct evidence of hazardous contaminant migration was found during the Records Search, it is recommended that a limited program (Phase II) be implemented to evaluate ground-water quality at specific sites as outlined below:

- Site No. 16; Tank Farm. Excavate a minimum of four backhoe test pits around the facility to a depth at least 2 feet below ground-water level. Each test pit should be visually inspected for soil characteristics and stratification of fuels. A water sample should be collected from each test pit and analyzed for lead content and oil and grease.

- Site No. 11; Chemical Munitions Burial Site. The type, quantity, and condition of the materials reportedly buried at the site are unknown. It is recommended that a base level effort be implemented to locate and identify the materials. Since it is suspected that the materials are buried in metal containers, a magnet survey could be used to locate the containers. Based on the nature of the materials found, a decision can be made whether to monitor or remove the materials.

- Site No. 3; Landfill at Dog Kennel. Analyze water samples taken from from all three existing monitoring wells for pH, pesticides,[1], PCB, TOC, and COD.

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[1]Pesticides analyses should include Endrin, Lindane, Methoxychlor, Toxaphene, Chlordane, Dieldrin, DDT, 2,4-D, and 2,4,5-TP Silvex.

- Sites No. 5, 6, 7, and 8; past landfills, and Site No. 9, current landfill. Install one monitoring well south of Site No. 6 and one well south of Site No. 8. The wells should be drilled to the top of the clayey strata occurring at a depth of about 20 feet. The length of screened well pipe should be determined during the well installation. Water samples should be collected from each well at least once and analyzed for pH, pesticides,[1], PCB, TOC, and COD. The need for future monitoring at Site No. 9 should be evaluated following the results of the monitoring conducted at Sites No. 6 and 8.

- Site No. 13; Creosote Pit. Excavate a backhoe test pit at least 20 feet long over the suspected area to a depth of at least 2 feet below ground-water level. The test pit should be visually inspected for soil characteristics and presence of phenols (creosote).

Details of the program outlined above, including the exact location of sampling points, should be finalized as part of the Phase II program.

It is not the intent of the Records Search to assess the depth or location of any contaminated plume, the direction or rate of movement of such a plume, or the background (upgradient) ground-water quality. In the event that contaminants are detected during visual inspection of the test

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[1]Pesticides analyses should include Endrin, Lindane, Methoxychlor, Toxaphene, Chlordane, Dieldrin, DDT, 2,4-D, and 2,4,5-TP Silvex.

pits or in the water samples collected from any of the wells, a more extensive field survey program should be implemented to determine the extent of the contaminant migration. The Phase II Contractor should be responsible for evaluating the results of the program outlined above and for recommending additional monitoring, as appropriate.

VII. AUXILIARY FACILITIES

VII. AUXILIARY FACILITIES

A. Avon Park Air Force Range

1. Description of Range

The Avon Park Air Force Range (AFR) is located in central Florida in Polk and Highlands Counties approximately 65 miles east of Tampa. The range covers 106,210 acres, of which 103,484 acres are unimproved land.

In 1942, the Army Air Corps constructed the Avon Park Range to train air crews for service in World War II. The installation, which at that time included additional leased acreage in Okeechobee County, became the world's largest bombing range. At the end of the war, the base personnel dropped to less than 500 people, who were involved in stripping and salvaging buildings and equipment. In 1950, the base was officially deactivated.

The U.S. Bureau of Prisons opened a minimum security prison camp on the base in 1951. Today it is the State of Florida's Avon Park Correctional Institution. The Biological Department, Camp Detrick, Maryland, obtained permission to use the Hangar Building and 30 acres of land for experiments, presumably between 1955 and 1966.

In 1956, the base (now called the Avon Park Auxiliary Airfield) was merged with the Range and assigned to Strategic Air Command (SAC) at MacDill AFB. In 1962, the Range was reassigned from SAC to the Tactical Air Command (TAC).

The 56th Tactical Fighter Wing at MacDill AFB is responsible for operation and maintenance of the Air Force Range at Avon Park. The mission of Avon Park AFR is to

provide support and maintenance of range facilities for bombing, strafing, and electronic warfare training of aircrews. The range is used for bombing practice by Air Force units from throughout the Southeast and by Reserve and National Guard units for artillery firing, parachute jump training, and ground exercises.

Cattle grazing is conducted by local cattlemen on over 96,000 acres of land leased from the Avon Park Range. Reforestation and timber management is performed on about 21,000 acres of pine plantations. Cooperative activity with the Florida Game and Fresh Water Fish Commission allows public access for hunting, fishing, and camping and provides for wildlife management of over 98,000 acres.

2. Environmental Setting

a. Geology and Hydrology

Avon Park AFR is located within the Highlands Ridge and Eastern Flatland physiographic provinces situated west of the Kissimmee River. The Highlands or Lake Wales Ridge region includes a narrow, elongated area of rolling uplands with numerous hills and lakes. Elevations range from 40 to 200 feet above mean sea level. Most of the lakes are deep and circular and were created by sinkhole formation. The Eastern Flatlands region consists of flat areas bounded by the ridge on the west, extending to the coastal plain on the east. Elevations on the flatland range from 30 to 100 feet above sea level.

Major surface-water features at Avon Park include Lake Arbuckle, Arbuckle Creek (which flows from Lake Arbuckle to Lake Istopoga to the south), and Morgan Hole Creek. The Kissimmee River traverses part of the east Range boundary. There are also numerous lakes and ponds located on the flatland in the eastern portion of the Range

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Surface deposits at Avon Park AFR consist of quartz sand, peat, and river alluvium, to a depth of approximately 20 feet. At higher elevations along the ridge, surface sands are about 100 feet thick. Permeability of the surface sands is approximately 100 gpd/ft^2. Below the surface sands, the Tamiami and Hawthorn Formations are present. These strata, consisting mostly of clay, are approximately 300 feet thick at Avon Park AFR and form a very effective confining layer of extremely low permeability. Below the Hawthorn Formation there is a thick sequence of carbonate rock consisting of limestone and dolomite. This carbonate section, in particular the Lake City limestone occurring at approximately 900 feet below land surface, is the principal source of water in this area, and is referred to as the Floridan aquifer.

Ground water occurs under both water table and artesian conditions at Avon Park AFR. The water table aquifer occurs in the surface sand deposits and is recharged locally by rainfall. The water table aquifer is the first to receive any surface contamination. Movement within this zone is very slow due to low hydraulic gradients. Discharge of water from the aquifer is by evapotranspiration, lateral seepage to a stream or lake, or downward movement to the Floridan aquifer in areas where the underlying clay confining layer has been breached by sinkhole development.

The Floridan aquifer occurs under artesian conditions; that is, water levels in wells completed in this aquifer will rise above the top of the aquifer. The clay confining beds of the Tamiami and Hawthorn Formations effectively prevent vertical movement of water from the water table to the Floridan aquifer. However, recharge can occur where sinkholes have breached the confining beds. This has occurred at some of the lakes along the ridge, including Lake Arbuckle. Therefore, contaminants reaching

one of these lakes could also reach the Floridan aquifer through the hydraulic connection provided by the sinkholes.

The Floridan aquifer provides nearly all of the municipal and irrigation water in the area. Avon Park AFR receives its water supply from two wells located near Lake Arbuckle and two wells located near the air field. This system is maintained by the Florida Department of Corrections.

b. Environmentally Sensitive Areas

The major habitat types found at Avon Park AFR are flatwoods, swamps, marshes and sloughs, and sand scrub. Most of the undeveloped land on the range is flatwoods characterized by slash and longleaf pine with an understory of grasses and palmetto and including some pine plantations. Fresh marshes, sloughs, and sand ponds, primarily along Arbuckle Creek and the Kissimmee River, make up about 16,500 acres of the range, and are comprised mostly of grasses with some woody shrubs. Swampland makes up about 8,200 acres of the range. The largest areas of swamp are located along the shores of Lake Arbuckle and Morgan Hole Creek; however, numerous smaller swamps and cypress domes occur in damp low-lying areas. These swamps are thickly forested areas made up of cypress, gum, bay, oaks, slash pine, and cabbage palm. Running north-south in the center of Avon Park AFR is a dry sandy ridge with a dense cover of scrub oak, longleaf and sand pine, palmetto, and other woody shrubs. This sand scrub association covers about 6,000 acres in the range.

Of the habitats found at Avon Park AFR, the most environmentally sensitive are the swamps and marshes, and the sand scrub area. Wetlands are ecologically valuable areas because they support a diverse fauna, help stabilize

stream banks, and enhance water quality in lakes and streams by filtering pollutants carried in stormwater runoff. The sand scrub area provides cover for a variety of wildlife. The deep, sandy nature of the soils in this area makes the ridge a fragile environment. Because the habitat types are so diverse, Avon Park AFR supports a wide variety of wildlife including white-tailed deer, bobcat, rabbits, alligators, snapping turtles, turkey, woodpeckers, herons, and ducks.

Detailed investigations of threatened and endangered species at Avon Park AFR have been conducted. All species listed in Table 8, with the exception of the Florida panther, have been verified as existing on the installation. The Florida panther may also be potentially found at Avon Park AFR.

No widespread environmental stress caused by handling of hazardous substances at Avon Park AFR was found in a cursory investigation of the Range. Only a relatively small portion of the Range is developed. Localized areas of environmental disturbance include the landfill sites, material storage areas, and the test bombing ranges. These areas have been established for a number of years and do not appear to have widespread effects on biota of the Range.

3. Findings

Past landfill sites and disposal sites for rubble from former building demolition are shown on Figure 11. These landfills probably received a variety of materials typical of municipal-type refuse, and may include waste oils, solvents, paints, pesticide containers, and petroleum products.

Solid waste is currently collected and disposed of in Site No. 7, a landfill northeast of the Auxiliary Air

Table 8
THREATENED AND ENDANGERED SPECIES POTENTIALLY FOUND AT
AVON PARK AIR FORCE RANGE

Common Name	Scientific Name	Status[a] State	Status[a] Federal	Habitat
American alligator	*Alligator mississippiensis*		T	Marsh, lakes
Florida sandhill crane	*Grus canadensis pratensis*	T		Marsh
Southern bald eagle	*Haliaeetus leucocephalus*	T	E	Marsh
Red-cockaded woodpecker	*Picoides borealis*	T	E	Pine woods
Florida panther	*Felis concolor coryi*	E	E	Undisturbed land
Eastern indigo snake	*Drymarchon corais couperi*	T	T	Dry sandy areas
Florida gopher tortoise	*Gopherus polyphemus*	T		Sand pine
Florida scrub jay	*Aphelocoma coerulescens*	T		Oak scrub
Audubon's caracara	*Caracara cheriway auduboni*	T		Open country

[a]E--Endangered
T--Threatened

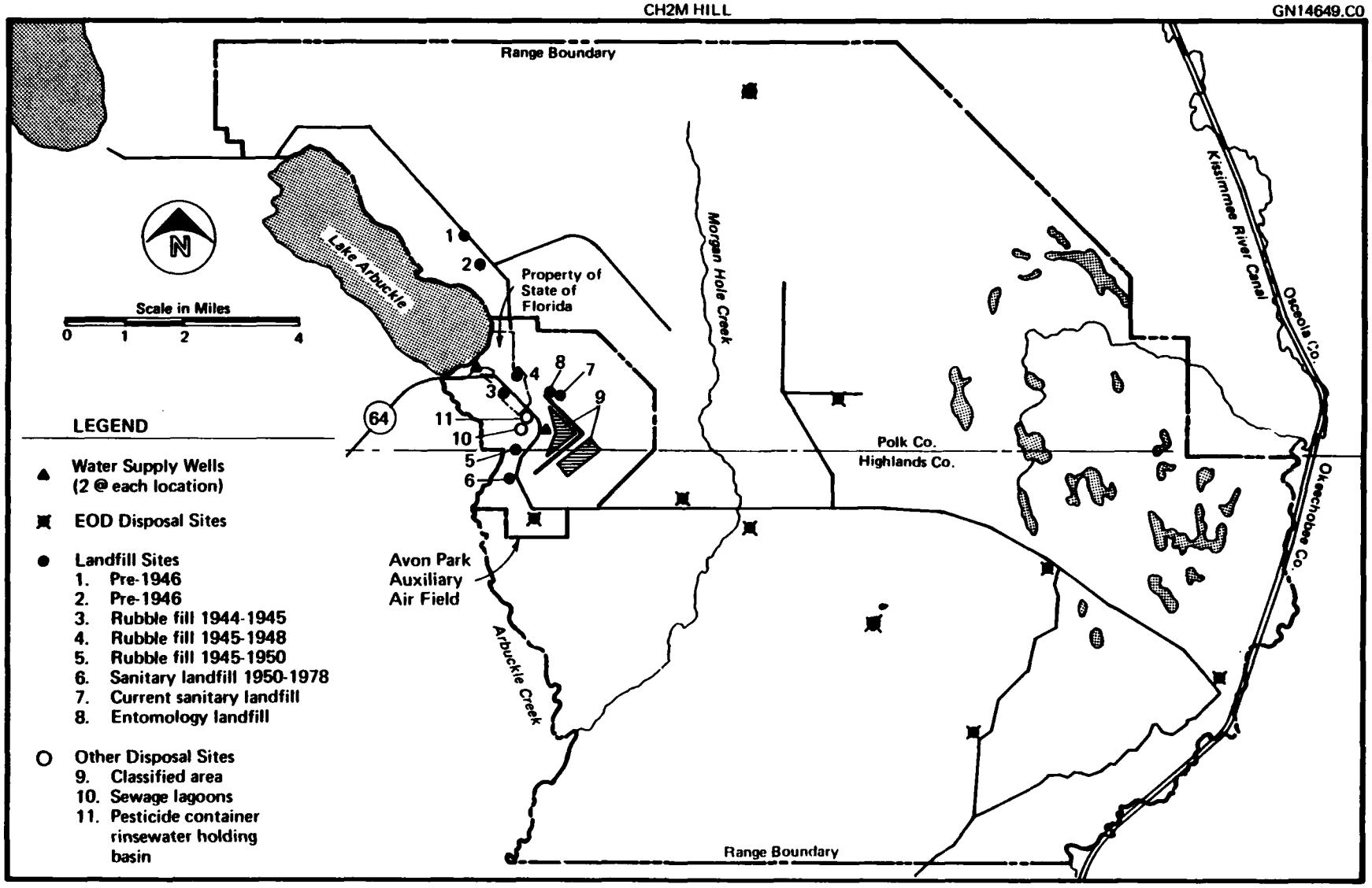

FIGURE 11. Location map of identified disposal sites at Avon Park Air Force Range.

Field that has been in use since about 1978. No garbage or large quantities of hazardous wastes are known to have been deposited in this landfill.

Spent pesticide containers are routinely rinsed, then punctured or crushed and disposed of in Site No. 8, the entomology landfill. Rinsewater is disposed of at Site No. 11 in a concrete-lined basin, formerly part of the sewage treatment facilities, and allowed to evaporate. From visual observation it appears likely that cracks may be present in the bottom of this basin, causing possible leakage.

Explosive ordnance is probably scattered across most of the range, and may include live or exploded charges in both real or practice bombs. Numerous disposal sites, shown on Figure 11, have been used for detonation and disposal of explosive ordnance which has been collected following a bomb drop. Explosive ordnance, although a potential safety hazard, is not considered a potential source of ground-water contamination.

A classified project was reportedly conducted from 1955 to 1958 in an area around the Auxiliary Air Field (Site No. 9). The nature of this project is not known, and the types, quantities, or disposal of either chemical or biological agents used in this project could not be determined.

4. Conclusions and Recommendations

The Records Search at Avon Park was intended as a cursory look at past hazardous waste disposal practices. No direct evidence of hazardous contaminant migration from the Avon Park Air Force Range is apparent. However, little is known about the nature or extent of materials deposited in present or past landfills. Because the base was closed so

long ago, it is doubtful that an extension of the Records Search would disclose any significant new information. It is therefore recommended to install ground-water monitoring wells at the following locations to check for possible contaminants:

- Sites No. 6 and 7; Past and Current Landfills. Install one well west of Site No. 6 and one well east of Site No. 7. Analyze water samples from each well for pH, TOC, COD, and pesticides.[1]

- Site No. 11; Pesticide Container Rinsewater Holding Basin. Install one well west of the basin and analyze a water sample for TOC, COD, and pesticides.[1]

The Phase II Contractor should be responsible for all details of the monitoring well installations including exact location of sampling points and depths of wells.

All four of the existing drinking water wells, shown on Figure 11, should be sampled and analyzed for primary pollutants, in accordance with the Primary Drinking Water Standards.

The nature and extent of hazardous wastes handled or disposed of during the classified project (Site No. 9) are not known. It is recommended that USAF investigate further the nature of this project and assess the need for Phase II monitoring.

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[1]Pesticides analyses should include Endrin, Lindane, Methoxychlor, Toxaphene, Chlordane, Dieldrin, DDT, 2,4-D, and 2,4,5-TP Silvex.

B. Fort Lonesome Radar Site

The Records Search included a helicopter overflight of the Fort Lonesome facility, a radar station jointly operated by the Air Force and the Federal Aviation Administration which was constructed and put into operation in about 1979. Due to the nature of the installation, no known hazardous chemicals are handled and no PCB-contamining transformers are present. No known hazardous wastes have been disposed of at this installation.

REFERENCES

REFERENCES

1. Florida Department of Administration, Division of State Planning, Bureau of Comprehensive Planning. "The Florida Soils Atlas for Regional Planning Districts VII and VIII." July 1975.

2. Wolansky, R. M., D. K. Yobbi, L. R. Mills, and W. N. Woodham. "Water Table in the Surficial Aquifer and Potentiometric Surface of the Floridan Aquifer in Selected Well Fields, West-Central Florida, May 1979."

3. "TAB A-1, Environmental Narrative" MacDill Air Force Base, Tampa, Florida. December 15, 1975, revised January 31, 1977, May 20, 1978, and March 30, 1979.

4. U.S. Army Engineer District Jacksonville, Jacksonville, Florida. "Final Environmental Impact Statement Tampa Harbor Project." December 1974.

5. Sinclear, William C. "Hydrogeologic Characteristics of the Surficial Aquifer in Northwest Hillsborough County Florida," U.S.G.S., Bureau of Geology, Florida Department of Natural Resources Information Circular No. 86, 1974.

6. Cherry, R. N., J. W. Stewart, and J. A. Mann. "General Hydrology of the Middle Gulf Area, Florida," U.S.G.S., Bureau of Geology, Florida Department of Natural Resources. Report of Investigation No. 56, 1970.

7. Menke, C. G., E. W. Meredith, and W. S. Wetterhall. "Water Resources of Hillsborough County, Florida." U.S.G.S., Florida Geologic Survey, Report of Investigation No. 25, 1961.

8. United States Department of Agriculture Soil Conservation Service in Cooperation with Florida Agricultural Experiment Station. "Soil Survey, Hillsborough County, Florida.

9. Hillsborough County Planning Commission. "Natural Environment and Development, A Planning Background Report." April 1974.

10. Dames and Moore. "Central Hillsborough County--Tampa 201 Facility Plan." June 1979.

11. Bishop, E. W. "Geology and Ground-Water Resources of Highlands County, Florida." U.S.G.S., Florida Geological Survey, Report of Investigation No. 15, 1956.

12. U.S. Air Force, Tactical Air Command. "Formal Environmental Assessment, Avon Park Bombing Range." MacDill Air Force Base, Tampa, Florida. February 10, 1972, revised December 20, 1976.

13. U.S. Air Force. "Natural Resources Conservation, Avon Park Air Force Range." Dick Henderson Advertising, Lake Placid, Florida 1980.

14. MacDill AFB Oil and Hazardous Substances Pollution Contingency (OHSPC) Plan. January 1980.

15. MacDill AFB Base Sanitary Landfill Design and Operations Plan. Prepared by Base Environmental Coordinator, September 1976.

16. Memo to DEMP from Lt. Colonel D. P. Gibbs, Chief of Operations, concerning Sanitary Landfill Operations, August 27, 1979.

17. Memo to DEMP from Capt. T. E. Kupferer, Bioenvironmental Engineer, concerning salvaging at Sanitary Landfill, July 11, 1978.

18. Maintenance Operating Instruction 136-6, "Demoliton Range Operation", and 136-27, "Inpsection of Munitions Residue," March 10, 1980.

19. Memo to DE from Capt. T. E. Kupferer, Bioenvironmental Engineer, concerning Illegal Sanitary Landfill, March 27, 1978.

20. MacDill AFB Hazardous Waste Permit Application to EPA, November 14, 1980.

21. Memo to DEEV from Lt. Colonel F. L. Freshcorn, Chief of Supply, concerning stock quantities of hazardous materials, October 27, 1978.

22. Pesticide Summary Reports, RCS DD-I&L (AR) 1080, March 1977 to March 1981.

23. Diaz, Seckinger & Associates, Inc., Tampa, Florida. "Comprehensive Plan, Soil Boring Plan, MacDill AFB," 8 sheets. Tab No. C-6. Revision September 30, 1979.

24. USAF, "Comprehensive Plan, MacDill AFB," revised annually, including:

    Storm Drainage System 4 sheets, TAB G-3
    Composite Tide Map, 1 sheet, TAB G-3.1
    Pollution Control, 1 sheet, TAB G-2.1
    Natural Habitat Map, 1 sheet, TAB ENV-1
    Sanitary Sewage System, 6 sheets, TAB G-2
    Aerial Photograph, 4 sheets, TAB C-7.1
    Base Landfill History Map, TAB unrecorded

Range Base Plan--small scale, TAB RC-2
Range Vicinity Map, 3 sheets, TAB RB-2
Range Real Estate Map, 5 sheets, TAB RC-4

25. Glace & Radcliffe, Inc., St. Petersburg, Florida. "Comprehensive Plan, MacDill AFB," including:

Range Storm Drainage System, 3 sheets, TAB RG-3, February 22, 1979.
Range Sanitary Sewage System, 3 sheets, TAB RG-2, January 22, 1979.
Range Aerial Photograph, 2 sheets, TAB RC-7.1, December 31, 1980.
Range Aerial Photograph, 4 sheets, TAB RC-7.2, December 31, 1980.

26. U.S. Department of Interior, Geological Survey. Maps of the Gibsonton and Port Tampa Quadrangles, Florida, revision 1969.

27. "Florida's Suncoast Salutes MacDill Air Force Base." American Publishers, Inc., San Diego, California, 1980, pp 47.

28. "Spill Report, Jenkin's Property." B. P. Blonshine, Environmental Coordinator, April 1981.

29. "Pollution Incident Notification Format." F. Schmoll, Deputy Civil Engineer, February 1973.

30. "Pollution Incident Report." A. Burns, Acting Chief, Environmental Planning, May 1980.

31. "Pollution Incident Report." B. P. Blonshine, Chief, Environmental Planning, July 1979.

32. White, William A. "The Geomorphology of the Florida Peninsula." Florida Bureau of Geology, Geological Bulletin No. 51, 1970.

33. USAF "Real Property Inventory Detail List," MacDill AFB, September 30, 1981.

34. Kroop, R. K., and Martin, J. E., "Treatability of Aqueous Film-Forming Foams Used for Fire Fighting," Air Force Weapons Laboratory, Kirtland AFB, NM, February 1974.

35. Inventory of Requisitioned Chemicals, USAF OEHL Bio-environmental Engineering, MacDill AFB, 1975-1981.

36. Inventory of Waste Products Generation, Environmental Coordinator, MacDill AFB.

Appendix A
RESUMES OF KEY TEAM MEMBERS

DAVID M. MOCCIA

Education

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

Experience

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

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

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

Professional Engineer Registration

Florida, Georgia, North Carolina

Membership in Organizations

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

GN0E80

BRUCE JAMES HAAS
Geotechnical Engineer

Education

M.S., Civil Engineering, University of Wisconsin, 1976
B.S., Civil Engineering, University of Wisconsin, 1975
Studies as exchange student, Technische Universitat, Munich, West Germany, 1974-1975

Experience

Mr. Haas' major responsibilities with the firm include field exploration and geotechnical investigations for foundation and general earthwork design projects. Examples of project-related assignments include:

- Resident inspector for construction of Phase IIa of dike rehabilitations for the Madison, Wisconsin, Metropolitan Sewerage District. This project involved the use of fabric reinforcement and wood waste as dike fill to reconstruct and stabilize existing sludge lagoon dikes located on highly compressible, low-strength marsh deposits.

- Design engineer and resident inspector for a 6-mgd wastewater treatment plant and a 3,000-foot-long effluent pipeline, both supported by timber piles, for the Grand Strand Water and Sewer Authority, Conway, South Carolina.

- Consulting engineer for full-scale model construction, instrumentation, and analysis of a reinforced-earth-type sacked concrete retaining wall system for Kabil Developments Corporation, Medford, Oregon.

Mr. Haas has performed numerous foundation investigations and geotechnical designs, including:

- Savage Wastewater Treatment Plant, Savage, Maryland.

- Madison Metropolitan Sewerage District, Madison, Wisconsin.

- Eugene/Springfield Metropolitan Wastewater Treatment Plant, Eugene, Oregon.

- Oyster Water-Based Recreation Facility, Oyster, Virginia.

- Reedy Creek Utilities Company, Walt Disney World, Florida.

- Harriman Utilities Board, Harriman, Tennessee.

- Louisville and Jefferson County Metropolitan Sewage District, Louisville, Kentucky.

Professional Engineer Registration

Wisconsin, Florida

GN0381

BRUCE JAMES HAAS

Membership in Organizations

American Society of Civil Engineers

Publications

"Proposed Criteria for Interpreting Stability of Lakeshore Bluffs," *Engineering Geology*, 1980, with T. B. Edil.

GARY E. EICHLER
Hydrogeologist

Education

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

Experience

Mr. Eichler has been responsible for ground-water projects for both water supply and effluent disposal. Studies have included site selection, well design, construction services, monitoring and testing programs, determination of aquifer characteristics, and well field design. Examples of projects on which Mr. Eichler has worked include:

- Palm Coast, Florida. Conducted a test well program to determine available ground-water resources of a 250,000-person coastal development.

- Live Oak, Florida. Determination of geologic conditions at a pond failure site; identification of failure causes and recommendation for redesign of the facility compatible with site geology.

- Quaker Oats Company, Belle Glade, Florida. Test pumping and water quality sampling for an injection well facility; provided operational design criteria for the disposal system and determined aquifer characteristics.

- St. Augustine, Florida. Prepared a program of exploration and testing to locate a future supply of water; determined hydrogeologic conditions, located potential well sites, and initiated a test program.

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

- Hydrogeology. Water supply well location, aquifer testing, well field layout, injection well testing and monitoring program design, and well construction inspection.

- Water resources inventory. Potentiometric mapping, water yield, and availability determinations.

GARY E. EICHLER

- Site investigations. Determination of subsurface conditions, primarily in soil media. Determination of stratigraphic correlation and associated physical properties for engineering design.

- Environmental permitting. Federal, state, regional, and local permit studies associated with industrial and mining projects.

- Clay mineralogy. Clay mineral reactions primarily associated with lime stabilization for highways and other engineering projects. Participated in a Brazilian highway project and developed laboratory analysis for lime-soil reactions.

- Engineering geology. Geologic exploration, soil property determinations for engineering design, and water and earth materials interactions associated with construction.

- Geophysics. Well logging and interpretation.

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

Membership in Organizations

American Water Resources Association
Association of Engineering Geologists
Geological Society of America
Southeastern Geological Society

Publications

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

ELIZABETH E. DODGE
Environmental Scientist

Education

M.S., *Environmental Health Engineering*, Notre Dame University, 1978
M.S., Aquatic Biology, Notre Dame University, 1976
B.S., Biology, Mary Washington College, 1974

Experience

Ms. Dodge joined CH2M HILL in 1978 as an environmental scientist specializing in the areas of water chemistry and aquatic biology. She has contributed to a variety of water resources projects including:

- Production of the environmental assessment for a large project to upgrade the wastewater conveyance and treatment system for the city of Milwaukee, Wisconsin. Evaluated impacts of system expansion and combined sewer overflow elimination on water quality, aquatic biology, and public health and safety.

- Environmental assessment for expansion of an 80-mgd wastewater treatment facility discharging to Lake Michigan. Helped design and carry out field sampling programs for water quality, fish and aquatic invertebrates.

- Analysis of effects of backflows from Chicago, Illinois, rivers on Lake Michigan water quality. Tasks include computerized analysis of historical data and compilation of water quality and effluent standards.

Prior to joining CH2M HILL, Ms. Dodge assisted in studies on innovative lake reclamation methods. Her primary involvement was in water quality monitoring with special emphasis on the environmental chemistry of metals. Ms. Dodge's graduate research dealt with the biological effects of heavy metal speciation.

Publications

"The Effect of Chemical Speciation on Copper Uptake by *Chironomus tentans*." E.E. Dodge and T.L. Theis. Environmental Science and Technology. Vol. 13. October 1979. pp. 1287-88.

"A Study of the Relationship Between Phytoplankton Abundance and Trace Metal Concentration in Eutrophic Lake Charles East, Indiana, Using Correlation Techniques." D.F. Spencer, E.E. Dodge and others. Proceedings of the Indiana Academy of Science. 1977.

Membership in Organizations

American Association for the Advancement of Science
American Water Resources Association
Freshwater Biological Society

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Appendix B
OUTSIDE AGENCY CONTACT LIST

Appendix B
OUTSIDE AGENCY CONTACT LIST

1. Hillsborough County Environmental Protection Commission. Mr. Tom Cardinal (813) 272-5960.

2. Hillsborough County Health Department--Environmental Engineer (813) 272-6310.

3. Hillsborough County Planning Commission, Mr. Hans Zarboch (813) 272-5940.

4. Hillsborough County Soil and Water District (813) 272-6634.

5. Florida Department of Environmental Regulation, Mr. Andy Barry (213) 985-7402.

6. Florida Game and Freshwater Fish Commission (800) 282-8002.

7. Florida Department of Natural Resources--Marine Research Lab. (813) 896-8626.

8. U.S. Environmental Protection Agency, Region IV, Atlanta, Georgia (404) 881-4727.

9. U.S. Fish and Wildlife Service, Mr. John Montanari (813) 893-3624.

10. Hillsborough County Solid Waste Control, Mr. Gillilam (813) 272-6655.

11. U.S. Geological Survey, Tampa Office, Mr. Mario Fernandez (813) 228-2124.

12. City of Tampa, Water Resources Coordinator, Mr. Rick Geragty (813) 229-8771.

13. Southwest Florida Water Management District, Mr. Mike Keene and Ed Comers (904) 796-7211.

Appendix C
MACDILL AFB RECORDS SEARCH INTERVIEW LIST

Appendix C
MACDILL AFB RECORDS SEARCH INTERVIEW LIST

Interviewee	Areas of Knowledge	Years at Installation
1.	Civil Engineering	36
2.	Civil Engineering	28
3.	Civil Engineering	17
4.	Entomology	8
5.	Equipment Operator	26
6.	Equipment Operator	20
7.	Fire Department	9
8.	Fire Department	8
9.	Vehicle Maintenance	6
10.	Fuels	4
11.	Fuels	30
12.	Structures	11
13.	Sanitation	9
14.	Pavement and Grounds	33
15.	Electric	17
16.	Exterior Electric	19
17.	Joint Communications Support Element	3
18.	Component Repair Squadron	3
19.	Aerospace Ground Equipment	3
20.	Component Repair Squadron	5
21.	Explosive Ordnance Disposal	6
22.	Operations and Maintenance	24
23.	Defense Property Disposal Office	24
24.	Bioenvironmental Engineering	3
25.	Bioenvironmental Engineering	3
26.	Environmental Coordinator	4
27.	Agronomic Research (Avon Park)	11
28.	Maintenance (Avon Park)	23
29.	Civil Engineering (Avon Park)	9
30.	Entomology (Avon Park)	6

Appendix D
INSTALLATION HISTORY

Appendix D
INSTALLATION HISTORY

Base History

MacDill Air Force Base was acquired for the Army Air Corps by the United States Government and Hillsborough County on 9 October 1939. The original acreage was fee land comprised of 5,494.5 acres. The Government paid $118,610.00 and Hillsborough County paid $97,000.00 for the original real estate.

Construction of permanent-type facilities began 15 December 1939, under the supervision of the United States Army Quartermaster Corps and all work was transferred to the jurisdiction of the Corps of Engineers, United States Army on 2 January 1941.

With the advent of hostilities in World War II, permanent-type construction was stopped and additional theater-of-operation and mobilization wood-type construction was accomplished. All of the theater-of-operation type facilities have been disposed of and the mobilization type facilities are being disposed of annually as permanent-type construction for replacement becomes available.

The first troops arrived at the base on 11 March 1940 and by 1 May 1940, more than 1,000 personnel were assigned to the base. The first squadron of aircraft consisted of four B-17s and 10 two-motored Douglas Bombers which were flown from Langley Field, Virginia, to the base on 16 May 1940.

The installation was officially activated as MacDill Army Air Base on 15 April 1941, named for Colonel Leslie MacDill, who was killed in an air crash in Washington, D.C., 8 November 1938. The first Commanding Officer was Colonel Clarence L. Tinker.

MacDill's first mission was transitional training. During World War II, airmen in every operational theater trained at MacDill in B-17 and B-26 aircraft. A list of aircraft that are known to have been stationed at MacDill is given in Table C-1.

After World War II, MacDill became an operational base of Strategic Air Command. At that time the base returned to a concentrated training program. The many SAC units stationed at MacDill between 1946 and 1961 included the Sixth Air Division, the 305th, 306th, 397th, and 498th Bombardment Wings, and the 311th Reconnaissance Wing.

When the Korean conflict began, the 307th Bombardment Wing was one of the first Air Force units to move its aircraft and personnel overseas. In 1959, the 305th Bombardment Wing was transferred to Bunker Hill Air Force Base, Indiana, and was immediately replaced with an Air Defense Weapons Wing which was equipped with assorted fighter aircraft. The Air Defense Weapons Wing was deactivated in 1960.

On 28 November 1960, the Department of Defense announced that activity at MacDill would be reduced and a major portion of the base closed by June 1962. The date was later changed to 1 April 1961. The closing was later rescinded.

In September 1961, the United States Strike Command was activated and headquartered at MacDill. General Paul D. Adams, United States Army, was the first commander in chief.

Table C-1

SAC AIRCRAFT STATIONED AT MACDILL AFB[a]

Aircraft Type	Dates Stationed
RC-45 (F-2)	March 1946 to June 1946
RB-17	February 1947 to July 1948
KB-29	January 1950 to July 1951
B-29	September 1950 to May 1951
JC-97	July 1951 to July 1962
B-47	April 1951 to April 1963
F-4C	February 1963 to present
B-57	1965 to unknown
F-4D	October 1977 to present
F-16	1980 to present

[a]TAC Command.

The base was transferred from SAC to Tactical Air Command on 1 July 1962. With the transfer from SAC to TAC, the 836th Air Division and the 12th and 15th Tactical Fighter Wings were activated. The mission of these units was to train a fighting force.

MacDill received the first Air Force McDonnell Douglas F-4C Phantom II jet aircraft on 4 February 1963. In March 1965, it became the first base in the Air Force to have two operationally ready F-4C wings assigned.

Late in 1965, the 12th Tactical Fighter Wing was transferred to Vietnam and the 15th Tactical Fighter Wing became a Replacement Training Unit (RTU). The mission was preparing aircrews for combat in Southeast Asia. The wing also gained two B-57 units--the 13th Bomb Squadron (Tactical) and the 4424th Combat Crew Training Squadron--during the same period.

The 13th later was transferred to SEA and the 4424th later was deactivated.

On 1 October 1970, the 15th Tactical Fighter Wing was deactivated and was replaced by the First Tactical Fighter Wing.

In early 1971, the First Tactical Fighter Wing was returned to its former role as a replacement training unit, and in March 1971 began reporting directly to Ninth Air Force as the 836th Air Division was deactivated at MacDill.

The United States Strike Command was replaced by United States Readiness Command on 1 January 1972.

On 1 July 1975, the wing at MacDill was redesignated the 56th Tactical Fighter Wing, as the First moved to Langley AFB, Virginia. MacDill acquired the F-4D on 5 October 1977. In 1980, the wing began converting from the F-4D Phantom to the new multirole fighter, the F-16. The F-16 has greater maneuverability and acceleration, uses less fuel, and generates less noise than the F-4. The conversion to the F-16 is scheduled to be complete in 1982.

Primary Mission

The wing's primary mission is to train pilots and navigators in the F-4D Phantom and F-16 Fighting Falcon. Four squadrons, the 61st, 62nd, 63rd, and 13th Tactical Fighter Squadrons, and the 13th Tactical Fighter Training Squadron, carry out this mission.

The mission of the 56th Tactical Fighter Wing, MacDill's host unit, is to train replacement aircrews for the F-4D Phantom II jet fighter-bomber and the F-16 Fighting Falcon. The training program, for both pilots and weapon systems officers, consists of approximately 6 months of intensive classroom, simulator, and flying training.

The Wing is also responsible for operation and maintenance of the Air Force Range at Avon Park, Florida. The range is used for bombing practice by units from throughout the southeastern United States. It is also used by Reserve and National Guard units for "live firing" exercises.

Support for the flying operations and the Avon Park Air Force Range is provided by the 56th Combat Support Group. Some of the functions of the group are civil engineering, food services, recreation, and law enforcement security.

The USAF Regional Hospital provides a full range of medical services.

Tenant Mission

Tactical Air Command and other tenant units assigned to MacDill Air Force Base and their missions are as follows:

a. United States Readiness Command. To provide a reserve of combat-ready general purpose USAF and Army forces based in the continental United States to reinforce unified commands overseas, and to conduct readiness exercises to ensure a high level of readiness and rapid reaction capability.

b. Detachment 1, 20th Missile Warning Squadron (SAC). To provide detection and warning of sea-launched ballistic missiles.

c. Field Training Department 311. To provide maintenance training on the F-4E weapon system, instruction in maintenance management, as well as administration and management of the on-the-job training program.

d. 71st Tactical Control Flight. To provide an operationally ready Forward Air Control Post for the Tactical Air Control System and to provide advisory assistance to Air Force Reserve Forces counterparts as directed by the intermediate gaining command.

e. 1928th Communications Group. To operate and maintain fixed communications at MacDill Air Force Base in support of the 56th Tactical Fighter Wing, 56th Combat Support Group, and Headquarters U.S. Readiness Command.

f. Detachment 10, 4400th Management Engineering Squadron (TAC). To provide the capability for improved management of USAF/TAC resources through the development and maintenance of manpower standards; assistance to TAC commanders in the areas of manpower and organization and management engineering services in the form of management advisory studies to furnish solutions to management problems.

g. 37th Aeromedical Evacuation Group. To train and maintain proficiency to provide aeromedical evacuation support to combat ground forces from forward assault airfields using opportune aircraft.

h. Detachment 21, Headquarters San Antonio Air Logistics Center. To provide analytical services to the Air Force commands in the fields of propellants, oxidizers, lubricants, cryogenic materials, fuels, chemicals, instrument oils, and hydraulic fluids.

REFERENCE: Tab A-1, Environmental Narrative, revised 11 September, 1981 by Public Affairs Division MacDill AFB.

Appendix E
MASTER LIST OF INDUSTRIAL SHOPS AND LABORATORIES

Appendix E
MASTER LIST OF INDUSTRIAL SHOPS AND LABORATORIES

Name	Present Location and Dates (Facility No.)	Past Location and Dates (Facility No.)	Generates Significant Quantities of Hazardous Wastes (See Table 4)	Oil/Water Separator (See Table 5)
56 Equipment Maintenance Squadron				
Aircraft Corrosion Control	1065 (1979–1981)	536 (1959–1979)	X	X
Aircraft Washrack	525 (1967–1981)	1359 (1952–1967)	X	X
Wheel and Tire Shop	H-2, H-5 (1941–1981)		X	X
Egress Systems	H-1 (1941–1981)		X	
Transient Alert	H-1 (1941–1981)			
Phase Systems	H-5 (1941–1981)		X	
Weapons and Release Systems	535 (1956–1981)			
Missile Maintenance	P-79 (1959–1981)		X	
Armament Systems	P-48 (1967–1981)		X	X
Munitions Maintenance	839 (1965–1981)			
Munitions Equipment Maintenance	843 (1956–1981)		X	
EOD	700 (1959–1981)			
Aerospace Ground Equipment	552 (1945–1981)		X	X
Fuel Cell	532 (1958–1981)		X	
56 Component Repair Squadron				
Engine Maintenance	H-2 (1941–1981)		X	
Environmental Systems	H-2 (1941–1981)			
Machine Shop	H-1 (1941–1981)			
Structural Repair	H-1 (1941–1981)		X	
Welding	H-1 (1941–1981)			
Pneudraulics	H-3 (1941–1981)		X	
Electric-Battery	H-5 (1941–1981)		X	
Avionics Maintenance	P-6 (1953–1981)			
Survival Equipment Shop	200 (1955–1981)			
Aircraft General Purpose	180 (1953–1981)			
Power Check Pad	1355 (1960–1981)			X
Test Cell	1144 (1969–1981)			X
PME Lab	P-42 (1942–1981)			
NDI Lab	14 (1971–1981)			
56 Aircraft Generation Squadron				
Flight Line Maintenance	Flight Line (1941–1981)			
Support	H-3 (1941–1981)			
Munitions	1360/1361 (1977–1981)			

Appendix E—Continued

Name	Present Location and Dates (Facility No.)	Past Location and Dates (Facility No.)	Generates Significant Quantities of Hazardous Wastes (See Table 4)	Oil/Water Separator (See Table 5)
56 Transportation Squadron				
Allied Trades	500 (1967–1981)		X	
Battery-Tire Shop	500 (1967–1981)		X	
Vehicle Maintenance	500 (1967–1981)		X	X
Vehicle Maintenance	527 (1942–1981)			X
Refueling Shop	1050 (1978–1981)	T-98 (1967–1978)		
Aircraft Refueling Vehicles	1061 (1978–1981)			X
Fire Truck Maintenance	P-8 (1952–1981)			
56 Civil Engineering Squadron				
Base Maintenance	740 (1950–1981)			
Base Maintenance	864 (1943–1981)			
Vehicle Service Rack	806 (1963–1981)			X
Power Production	1050 (1977–1981)	1064 (1943–1977)	X	
Heat Shop	32 (1941–1981)			
Liquid Fuels	1064 (1943–1981)			
Water Treatment Plant	927/928 (1942–1981)			
Sewage Treatment Plant	63 (1953–1981)			
Fire Department	P-26 (1941–1981)			
Fire Training	59 (1951–1981)			
Entomology	35 (1941–1981)			
Paint	32 (1941–1981)			
Pavements and Grounds	33 (1941–1981)			X
Refrigeration/Air Conditioning	29 (1941–1981)			
Plumbing	29 (1941–1981)			
Electric	29 (1941–1981)			
Carpenter Shop	29 (1941–1981)			
56 Combat Support Group				
Photo Lab	25 (1959–1981)			
Hobby Shop	305 (1976–1981)	1050 (1944–1976)		
Vehicle Service Rack	1055 (1964–1981)			X
Vehicle Refueling	1045 (1950–1981)			
Base Reproductions	374 (1959–1981)			
Small Arms	881 (1943–1981)			

Appendix E—Continued

Name	Present Location and Dates (Facility No.)	Past Location and Dates (Facility No.)	Generates Significant Quantities of Hazardous Wastes (See Table 4)	Oil/Water Separator (See Table 5)
56 Hospital	711 (1956–1981)			
56 Supply				
Mobile Refuel/Fuels Lab	1062 (1973–1981)			
Hydraulic Fuels Buildings	72 (1954–1981)			
Hydraulic Fuels Buildings	75 (1954–1981)			
Hydraulic Fuels Buildings	76 (1954–1981)			
Hydraulic Fuels Buildings	77 (1954–1981)			
Air Force Logistics Center/DFSP				
Fuels Analysis Lab	1101 (1959–1981)			
Fuels Analysis Lab	1121 (1955–1981)			
Joint Communications Support Element				
Generation/Battery	862 (1970–1981)		X	X
Vehicle Maintenance	862 (1970–1981)		X	X
Communications/Electronics	861 (1970–1981)			
Army Aviation	H-1 (1970–1981)			
Rapid Deployment Joint Task Force	1105 (1959–1981)			
71 Tactical Control Flight	P-71 (1975–1981)		X	
1928 Communications Group				
Communications Maintenance	13 (1954–1981)			
Communications Maintenance	57 (1951–1981)			
Communications Maintenance	1132 (1954–1981)			
Communications Facility	P-40 (1951–1981)			

Appendix F
INVENTORY OF STORAGE TANKS

Appendix F
INVENTORY OF STORAGE TANKS

Facility No.	Material Type	Capacity (gallons)	Type of Tank (Above/Below Ground)
AIRCRAFT FUELS			
77	JP-4	10-25,000	Below
77	JP-4	1-25,000	Below
829	JP-4	1,000	Above
1144	JP-4	3,500	Below
76	JP-4	1-50,000	Below
76	JP-4	20-50,000	Below
76	JP-4	1-50,000	Below
75	JP-4	20-50,000	Below
75	JP-4	1-50,000	Below
72	AVGAS	10-25,000	Below
72	AVGAS	1-25,000	Below
71	JP-4	1,000	Above
802	JP-4	600	Above
PB-1	JP-4	600	Above
551	JP-4	2-600	Above
1125	JP-4	1-1,750,000	Above/diked
1126	JP-4	1-1,750,000	Above/diked
1127	JP-4	1-1,750,000	Above/diked
1128	JP-4	1-1,100,000	Above/diked
1129	JP-4	1-850,000	Above/diked
1130	JP-4	1-1,750,000	Above/diked
1131	AVGAS	1-1,750,000	Above/diked
VEHICLE AND MARINE FUELS			
98	MOGAS	1,000	Above
527	MOGAS	4-5,000	Below
		8-1,000	Below
551	MOGAS	1,200	Above/Diked
33	MOGAS	1-500	Below
	Diesel	1-500	Below
352	Diesel	600	Above
45	MOGAS	2-12,000	Below
	Diesel	1-12,000	Below
701	MOGAS	500	Above
663	MOGAS	1-1,000	Below
		1-600	Above
1102	MOGAS	250	Above
	Diesel	500	Above

GENERATOR FUELS

76	Diesel	108	Above
54	Diesel	250	Above
501	Diesel	15,000	Below
1	Diesel	500	Above
40	Diesel	500	Below
373	ABANDONED	3,000	Below
191	Diesel	500	Above
712	Diesel	1-5,000	Above
		2-700	Above

Facility No.	Material Type	Capacity (gallons)	Type of Tank (Above/Below Ground)
831	Diesel	2-12,000	Above/Diked
		1-25,000	Above/Diked
717	Diesel	5,000	Below
694	Diesel	15,000	Below
805	Diesel	2-3,000	Above/Diked
1105	Diesel	500	Above
1115	MOGAS	1-250	Above
		1-500	Above
RSU 04	Diesel	110	Above
58	Diesel	2,000	Below
1138	ABANDONED	550	Below
1135	Diesel	15,000	Below
1156	Diesel	1,000	Below
1108	Diesel	1,000	Below
RSU 22	Diesel	110	Above
1145	Diesel	500	Below
867	MOGAS	500	Below
1161	Diesel	1,000	Below
1157	Diesel	1,000	Below

HEATING FUELS

528	No. 2 Fuel	1,000	Below
526	No. 2 Fuel	1,450	Below
552	No. 2 Fuel	250	Below
6	No. 2 Fuel	1,000	Below
55	No. 2 Fuel	1,450	Below
54	No. 2 Fuel	1,450	Below
205	No. 2 Fuel	2,500	Below
397	No. 2 Fuel	1,000	Below
7	No. 2 Fuel	560	Below
36	No. 2 Fuel	750	Below
374	No. 2 Fuel	4,000	Below
200	No. 2 Fuel	1,200	Below
53	No. 2 Fuel	1,450	Below
703	No. 2 Fuel	500	Below
90	No. 2 Fuel	1,000	Below
49	No. 2 Fuel	560	Below

HEATING FUELS--Continued

52	No. 2 Fuel	1,450	Below
79	No. 2 Fuel	1,000	Below
710	No. 2 Fuel	1,000	Below
708	No. 2 Fuel	2-25,000	Above/Diked
714	No. 2 Fuel	2,000	Below
719	Kerosene	110	Above
65	No. 2 Fuel	550	Below
82	ABANDONED	2,500	Below
717	No. 2 Fuel	300	Above
663	Kerosene	110	Above
882	Kerosene	300	Above
821	Kerosene	2-110	Above
		1-55	Above

Facility No.	Material Type	Capacity (gallons)	Type of Tank (Above/Below Ground)
846	ABANDONED	1,000	Below
845	ABANDONED	1,000	Below
843	No. 2 Fuel	2,055	Below
1105	No. 2 Fuel	1,500	Below
1133	No. 2 Fuel	1,000	Below
1121	No. 2 Fuel	1,000	Below
1102	Kerosene	100	Above
865	No. 2 Fuel	1,450	Above

MISCELLANEOUS MATERIALS

68	Contaminated Fuel	1-12,000	Below
68	ABANDONED	2-25,000	Below
07 Stor.	Lube Oil	65-55	Above
83	Lube Oil	2-510	Above
500	Waste Oil	1-1,000	Below
802	Lube Oil	500	Above
866	Liquid Asphalt	2-11,000	Above
866	Asphalt Tack Coat	1,000	Above
701	Sulfuric Acid	105	Above

PESTICIDES

1093	97% Malathion	220	Above
	47% Chlordane	75	Above
	57% Malathion	80	Above
	1% Baygon (in oil)	35	Above
	47.5% Diazinon	20	Above
32	Amate X	1,250 lb	Above
	Hyvar X	2,000 lb	Above
	Dalapon	2,000 lb	Above
	Kuron	50	Above
	Cutrin	50	Above
	VC-13	20	Above

PESTICIDES--Continued

719	Ama Plus 2.4D	200	Above
701	Balon	2,000 lb	Above
	Dasonit	2,000 lb	Above
	Fungicide	1,000 lb	Above
	Weed Killer	1,000 lb	Above
	Fertilizer	40 tons	Above

Appendix G
SITE HAZARD EVALUATION METHODOLOGY

HQ AIR FORCE ENGINEERING AND SERVICES CENTER
AND
USAF OCCUPATIONAL AND ENVIRONMENTAL HEALTH LABORATORY

SITE RATING METHODOLOGY

FOR

PHASE I
INSTALLATION RESTORATION PROGRAM

July 1981

SITE RATING METHODOLOGY

FOR

PHASE I INSTALLATION RESTORATION PROGRAM

1. This site rating methodology for Phase I of the Installation Restoration Program (IRP) has been jointly developed by CH_2M Hill and Engineering-Science based on experience in performing Record Searches at several Air Force installations. This standard site rating system should be used for all Air Force IRP Records Search efforts to assist in Air Force prioritization and commitment of resources for Phase II survey actions.

2. The basis for the rating system is the document developed by JRB Associates, Inc. for the EPA Hazardous Waste Enforcement office. The JRB system was modified to accurately address specific Air Force installation conditions and to provide meaningful comparison of landfills and contaminated areas other than landfills.

3. Questions pertaining to use of the Air Force Site Rating Methodology should be addressed to either Mr. Lindenberg, AFESC/DEVP, AUTOVON 970-6189 (Commercial (904) 283-6189) or Major Fishburn, AF OEHL/EC, AUTOVON 240-3305 (Commercial (512) 536-3305).

Note: Both CH_2M Hill and Engineering-Science are Engineering Support contractors for the US Air Force.

WASTE DISPOSAL SITE AND SPILL AREA ASSESSMENT AND RATING FORM

Name of Site _____

Location _____

Owner/Operator _____

Comments _____

RATING FACTOR	FACTOR RATING (0-3)	MULTIPLIER	FACTOR SCORE	MAXIMUM POSSIBLE SCORE
RECEPTORS				
Population Within 1,000 Feet		4		
Distance to Nearest Drinking Water Well		15		
Distance to Reservation Boundary		6		
Land Use/Zoning		3		
Critical Environments		12		
Water Quality of Nearby Surface Water Body		6		
Number of Assumed Values = ____ Out of 6		SUBTOTALS	_____	_____
Percentage of Assumed Values = ____%		SUBSCORE		_____
Number of Missing Values = ____ Out of 6		(Factor Score Divided by Maximum Score and Multiplied by 100)		
Percentage of Missing Values = ____%				

PATHWAYS				
Evidence of Water Contamination		10		
Level of Water Contamination		15		
Type of Contamination, Soil/Biota		5		
Distance to Nearest Surface Water		4		
Depth to Groundwater		7		
Net Precipitation		6		
Soil Permeability		6		
Bedrock Permeability		4		
Depth to Bedrock		4		
Surface Erosion		4		
Number of Assumed Values = ____ Out of 10		SUBTOTALS	_____	_____
Percentage of Assumed Values = ____%		SUBSCORE		_____
Number of Missing Values = ____ Out of 10		(Factor Score Divided by Maximum Score and Multiplied by 100)		
Percentage of Missing Values = ____%				

WASTE CHARACTERISTICS

Hazardous Rating: Judgemental rating from 30 to 100 points based on the following guidelines:

Points	
30	Closed domestic-type landfill, old site, no known hazardous wastes
40	Closed domestic-type landfill, recent site, no known hazardous wastes
50	Suspected small quantities of hazardous wastes
60	Known small quantities of hazardous wastes
70	Suspected moderate quantities of hazardous wastes
80	Known moderate quantites of hazardous wastes
90	Suspected large quantities of hazardous wastes
100	Known large quantities of hazardous wastes

SUBSCORE _____

Reason for Assigned Hazardous Rating:

WASTE MANAGEMENT PRACTICES

RATING FACTOR	FACTOR RATING (0-3)	MULTIPLIER	FACTOR SCORE	MAXIMUM POSSIBLE SCORE
Record Accuracy and Ease of Access to Site		7		
Hazardous Waste Quantity		7		
Total Waste Quantity		4		
Waste Incompatibility		3		
Absence of Liners or Confining Beds		6		
Use of Leachate Collection System		6		
Use of Gas Collection Systems		2		
Site Closure		8		
Subsurface Flows		7		

Number of Assumed Values = ____ Out of 9

Percentage of Assumed Values = ____%

Number of Missing and Non-Applicable Values = ____ Out of 9

Percentage of Missing and Non-Applicalbe Values = ____%

SUBTOTALS _____ _____

SUBSCORE _____

(Factor Score Divided by Maximum Score and Multiplied by 100)

Overall Number of Assumed Values = ____ Out of 25

Overall Percentage of Assumed Values = ____%

OVERALL SCORE _____

(Receptors Subscore X 0.22 plus
Pathways Subscore X 0.30 plus
Waste Characteristics Subscore X 0.24 plus
Waste Management Subscore X 0.24)

RATING FACTOR SYSTEM GUIDELINES

RECEPTORS

Rating Factors	Rating Scale Levels 0	1	2	3
Population within 1,000 Feet	0	1 to 25	26 to 100	Greater than 100
Distance to Nearest Drinking Water Well	Greater than 3 miles	1 to 3 miles	3,001 feet to 1 mile	0 to 3,000 feet
Distance to Reservation Boundary	Greater than 2 miles	1 to 2 miles	1,001 feet to 1 mile	0 to 1,000 feet
Land Use/Zoning	Completely remote (zoning not applicable)	Agricultural	Commercial or industrial	Residential
Critical Environments	Not a critical environment	Pristine natural areas	Wetlands; flood plains, and preserved areas; presence of economically important natural resources	Major habitat of an endangered or threatened species; presence of recharge area
Water Quality 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
	PATHWAYS			
Evidence of Water Contamination	No contamination	Indirect evidence	Positive proof from direct observation	Positive proof from laboratory analyses
Level of Water Contamination	No contamination	Low levels, trace levels, or levels less than maximum contaminant level (MCL) or EPA drinking water standards	Moderate levels or levels near MCL or EPA drinking water standards	High levels greater than MCL or EPA drinking water standards
Type of Contamination Soil/Biota	No contamination	Suspected contamination	Moderate contamination	Severe contamination
Distance to Nearest Surface Water	Greater than 1 mile	2,001 feet to 1 mile	501 feet to 2,000 feet	0 to 500 feet
Depth to Ground Water	Greater than 500 feet	51 to 500 feet	11 to 50 feet	0 to 10 feet
Net Precipitation	Less than −10 inches	−10 to +5 inches	+5 to +20 inches	Greater than +20 inches
Soil Permeability	Greater than 50% clay ($<10^{-6}$ cm/s)	30% to 50% clay (10^{-4} to 10^{-6} cm/s)	15% to 30% clay (10^{-2} to 10^{-4} cm/s)	0% to 15% clay ($>10^{-2}$ cm/s)
Bedrock Permeability	Impermeable ($<10^{-6}$ cm/s)	Relatively impermeable (10^{-4} to 10^{-6} cm/s)	Relatively impermeable (10^{-2} to 10^{-4} cm/s)	Very permeable ($>10^{-2}$ cm/s)
Depth to Bedrock	Greater than 60 feet	31 to 60 feet	11 to 30 feet	0 to 10 feet
Surface Erosion	None	Slight	Moderate	Severe

WASTE CHARACTERISTICS

Judgemental hazardous rating from 30 to 100 points based on the following guidelines:

Points	Condition
30	Closed domestic-type landfill, old site, no known hazardous wastes
40	Closed domestic-type landfill, recent site, no known hazardous wastes
50	Suspected small quantities of hazardous wastes
60	Known small quantities of hazardous wastes
70	Suspected moderate quantities of hazardous wastes
80	Known moderate quantities of hazardous wastes
90	Suspected large quantities of hazardous wastes
100	Known large quantities of hazardous wastes

WASTE MANAGEMENT PRACTICES

	Rating Scale Levels			
Rating Factors	0	1	2	3
Record Accuracy and Ease of Access to Site	Accurate records, no unauthorized dumping	Accurate records, no barriers	Incomplete records, no barriers	No records, no barriers
Hazardous Waste Quantity	<1 ton	1 to 5 tons	5 to 20 tons	>20 tons
Total Waste Quantity	0 to 10 acre feet	11 to 100 acre feet	101 to 250 acre feet	Greater than 250 acre feet
Waste Incompatibility	No incompatible wastes are present	Present, but does not pose a hazard	Present and may pose a future hazard	Present and posing an immediate hazard
Absence of Liners or Confining Strata	Liner and confining strata	Liner or confining strata	Low quality liner or low permeability strata	No liner, no confining strata
Use of Leachate Collection Systems	Adequate collection and treatment	Inadequate collection or treatment	Inadequate collection and treatment	No collection or treatment
Use of Gas Collection Systems	Adequate collection and treatment	Collection and controlled flaring	Venting or inadequate treatment	No collection or treatment
Site Closure	Impermeable cover	Low permeability cover	Permeable cover	Abandoned site, no cover
Subsurface Flows	Bottom of landfill greater than 5 feet above high ground-water level	Bottom of landfill occasionally submerged	Bottom of fill frequently submerged	Bottom of fill located below mean ground-water level

JRB RATING SYSTEM
INTRODUCTION AND METHODOLOGY

Source: "Methodology for Rating the Hazard Potential of Waste Disposal Sites" JRB Associates, Inc., December 15, 1980

Note: This is an excerpt from the above-referenced document. For more detailed information refer to that source.

CHAPTER 1.0 INTRODUCTION

As part of EPA's nationwide waste management program, land disposal facilities containing hazardous wastes will be investigated and evaluated. Remedial action plans will be formulated for those sites presenting a significant hazard. Because resources for this task are limited, the initial focus of the work must be on the most hazardous sites. Under the auspices of EPA's Office of Enforcement, JRB Associates has devised a methodology for selecting sites for investigation based on their high potential for environmental impact.

This methodology has several advantages over other rating systems:

- It is easy to use
- It does not require users to have an extensive technical background
- It uses readily available information
- It does not require complex chemical or hydrological analyses
- It does not require users to visit the facilities in question
- It allows sites to be rated even if some data needs cannot be met.

The system consists of 31 rating factors that are divided into 4 categories: receptors; pathways; waste characteristics; and waste management practices. Factors in the receptors category determine the prime targets of environmental contamination. Factors in the pathways category assess mechanisms for contaminant migration. Factors in the waste characteristics category examine the types of hazards posed by contaminants in the site. Factors in the waste management practices category evaluate the quality of the facility's design and operation. Each rating factor has an associated four-level scale. Because all of these factors are not of equal importance, each also has been assigned a weighing factor, called a multiplier. Raters must simply decide

which level of the rating factor's scale is most appropriate for a given site and multiply the numeric value of that level by the corresponding multiplier. The sum of the products for the 31 factors divided by the maximum possible score and multiplied by 100 is the site's rating. The ratings are on a scale of 0 to 100 and can be interpreted in relative or absolute terms.

Users can assign additional points when the rating factors do not adequately address all of the problems of a site. However, only a limited number of additional points can be assigned. This arrangement helps to ensure that a site's rating is both complete and objective.

The methodology has been designed primarily for landfills, surface impoundments, and other types of land-based storage and disposal facilities. Incinerators and waste treatment facilities, however, are beyond scope with the exception of the solid wastes produced by them.

Site ratings should be performed as part of an overall investigation procedure. Prior to a site visit, ratings can be based on published materials, public and private records, and contacts with knowledgable parties. The results of this type of rating can be used to determine which sites present the greatest potential hazard and should be visited first. A final rating can be obtained with information obtained from a visit to a site. This rating can be used as a tool to help determine how limited resources should be spent for additional sampling, which may be required to fill data gaps, and for preparing remedial action plans and/or enforcement cases for sites that represent particularly severe hazards.

The methodology's validity has been tested at sites across the country. This testing includes comparing ratings completed for the same facilities both by different raters, and before and after site visits. Officials of New Jersey's Department of Environmental Protection agreed that the ratings on 30 sites in their state were good reflections of the true hazard potential of those sites. These results show that the methodology is an exceptionally useful and efficient tool for classifying and ranking the hazard potential of land disposal facilities.

The methodology is discussed in more detail in the following four chapters. Chapter 2 describes the six basic components of the methodology. Chapter 3 identifies sources of information for the system and describes how to resolve data gaps. Chapter 4 presents the step-by-step procedure for rating sites, and Chapter 5 discusses how site ratings can be used. The three appendices provide guidance for rating sites. Finally, the glossary located at the end of this document defines all terms related to the methodology.

CHAPTER 2.0 DESCRIPTION OF THE METHODOLOGY

The site rating methodology has been developed in terms of six elements. These are:

- Factor categories
- Rating factors
- Rating scales
- Multipliers
- Additional points
- Hazard potential scores.

These elements are described below.

2.1 FACTOR CATEGORIES

In assessing the environmental impacts of any hazardous waste disposal site, four considerations must be addressed. These are:

- Receptors
- Pathways
- Waste characteristics
- Waste management practices.

Receptors refer to the biota (human and non-human) which are potentially affected by the materials released from a waste disposal site. Within this category, special attention is given to human populations and critical environments. Pathways refer to aspects of the routes by which hazardous materials can escape from a given site. The focus of this cateory is on the ease of migration of water soluble pollutants and on contamination due to the site. Waste characteristics refer to the types of hazards posed by materials in the facility in terms of both their health-related effects and their environmental mobility. Waste management practices refer to the design characteristics and management practices of a given disposal site as they

relate to the site's environmental impact. In particular, this category examines measures that are being taken to minimize exposure to hazardous wastes.

The prime importance of the factor categories is in partitioning the rating factors into manageable groups so that site ratings can be more easily and completely interpreted. This topic is discussed in greater detail in Chapter 5.

2.2 RATING FACTORS

The initial rating of a waste disposal facility is based on a set of 31 rating factors. Each of these has been assigned to one of the four factor categories. The receptors catgegory has five rating factors:

- "Residential population within 1,000 feet" and "Distance to the nearest off-site building" measure the potential for human exposure to the site
- "Distance to the nearest drinking-water well" measures the potential for human ingestion of contaminants should underlying aquifers be polluted
- "Land use/zoning" evaluates the current and anticipated uses of the surrounding area
- "Critical environments" assesses the potential for adversely affecting important biological resources and fragile natural settings.

The pathways category contains nine rating factors concerned with the potential migration and attenuation of contaminants. The primary focus is on waterborne pollutants, since they can affect the greatest number of people.

- "Distance to the nearest surface water" and "Depth to groundwater" measure the availability of pollutant migration routes
- "Soil permeability," "bedrock permeability," and "depth to bedrock" measure the potential for contaminant attenuation and ease of migration

- "Net precipitation" uses annual precipitation and evapotranspiration to estimate the amount of leachate a site produces

- "Evidence of contamination," "type of contamination," and "level of contamination" evaluate pollution currently apparent at the site.

The waste characteristics category contains rating factors which examine the waste's environmental mobility and the adverse effects it can cause.

- "Solubility," "volatility," and "physical state" measure the extent to which mobile wastes can leave the site

- "Toxicity," "radioactivity," and "persistence" assess the site's potential to cause health-related injuries

- "Ignitability," "reactivity," and "corrosiveness" evaluate the possibility of fire, explosion, or similar emergencies.

The waste management practices factor category evaluates site design and operation. This category includes eight rating factors:

- "Use of leachate collection systems," "use of gas collection systems," and "use of liners" examine features of site design for containing contamination

- "Site security" assesses the measures taken to limit site access

- "Total waste quantity" and "hazardous waste quantity" measure the quantity of waste in the site, and thus, the potential magnitude of resulting contamination

- "Waste incompatibility" evaluates the potential for incompatible wastes to combine and pose a hazard

- "Use of containers" assesses the adequacy of using containers to isolate wastes.

These factors have been selected because they are relevant to an evaluation of any land-based disposal facility. The definition and purpose of each rating factor appear in Appendix A.

2.3 RATING SCALES

For each of the factors, a four-level rating scale has been developed which provides factor-specific levels ranging from "0" (indicating no potential hazard) to "3" (indicating a high potential hazard). The rating factors and their corresponding rating scales for each of the factor categories are listed in Table 1. These scales have been defined so that the rating factors typically can be evaluated on the basis of readily available information from published materials, public and private records, contacts with knowledgeable parties, or site visits. Raters compare the information collected for a site with the limits set in the scales, and see which level of each scale most closely fits the information. The numeric value of that level is the factor rating for that factor. This process is described in more detail in Chapter 4. Additional guidance for assessing the rating scales appears in Appendix A.

2.4 MULTIPLIERS

The rating factors do not all assess the same magnitude of potential environmental impact. Consequently, a numerical value called a multiplier has been assigned to each factor in accordance with the relative magnitude of impact that it does assess. These values are multiplied, hence the term multiplier, by the appropriate factor ratings (see Section 2.3) to result in factor scores for each of the rating factors. The 31 multipliers appear as the third column from the right on the methodology's two-page Rating Form (see Figure 3).

2.5 ADDITIONAL POINTS

Special features of a facility's location, design, or operation are frequently encountered that cannot be handled satisfactorily by rating factors alone. These features might present hazards that are unusually serious, unique to the site, or not assessable by rating scales. For example, an extremely high population density near a site should be considered even more hazardous than the rating factor for "population within 1,000 feet" indicates.

Power lines running through sites containing explosive or flammable wastes, though not generally typical of waste disposal sites, should be considered a potential hazard. Finally, the function of the nearest off-site building might indicate a serious threat of human exposure exists, even though types of functions cannot be quantitatively evaluated by rating scales the way distance can be. In such cases, raters should assign a greater hazard potential score to a site than it might otherwise receive by using the additional points system. To guide raters as to the types of situations that might warrant additional points, several examples have been identified for each of the factor categories. These are:

RECEPTORS

- Use of site by local residents
- Neighboring land use
- Neighboring transportation routes, drinking water supplies, and important natural resources.

PATHWAYS

- Extreme runoff and erosion problems
- Slope instability
- Flooding
- Seismic activity.

WASTE CHARACTERISTICS

- Carcinogenicity, mutagenicity, and teratogenicity
- Infectiousness
- Low biodegradability
- High-level radioactivity.

WASTE MANAGEMENT PRACTICES

- Excessively large waste quantities
- Open burning of wastes
- Site abandonment
- Unsafe disposal practices
- Inadequate cover
- Inadequate safety precautions
- Inadequate recordkeeping.

Table 1. Rating Factors and Scales for Each of the Four Factor Categories (Continued)

RATING FACTORS	RATING SCALE LEVELS			
	0	1	2	3
RECEPTORS				
POPULATION WITHIN 1,000 FEET	0	1 TO 25	26 TO 100	GREATER THAN 100
DISTANCE TO NEAREST DRINKING-WATER WELL	GREATER THAN 3 MILES	1 TO 3 MILES	3,001 FEET TO 1 MILE	0 TO 3,000 FEET
DISTANCE TO NEAREST OFF-SITE BUILDING	GREATER THAN 2 MILES	1 TO 2 MILES	1,001 FEET TO 1 MILE	0 TO 1,000 FEET
LAND USE/ZONING	COMPLETELY REMOTE (ZONING NOT APPLICABLE)	AGRICULTURAL	COMMERCIAL OR INDUSTRIAL	RESIDENTIAL
CRITICAL ENVIRONMENTS	NOT A CRITICAL ENVIRONMENT	PRISTINE NATURAL AREAS	WETLANDS, FLOOD-PLAINS, AND PRESERVED AREAS	MAJOR HABITAT OF AN ENDANGERED OR THREATENED SPECIES
PATHWAYS				
EVIDENCE OF CONTAMINATION	NO CONTAMINATION	INDIRECT EVIDENCE	POSITIVE PROOF FROM DIRECT OBSERVATION	POSITIVE PROOF FROM LABORATORY ANALYSES
LEVEL OF CONTAMINATION	NO CONTAMINATION	LOW LEVELS, TRACE LEVELS, OR UNKNOWN LEVELS	MODERATE LEVELS OR LEVELS THAT CANNOT BE SENSED DURING A SITE VISIT BUT WHICH CAN BE CONFIRMED BY A LABORATORY ANALYSIS	HIGH LEVELS OR LEVELS THAT CAN BE SENSED EASILY BY INVESTIGATORS DURING A SITE VISIT
TYPE OF CONTAMINATION	NO CONTAMINATION	SOIL CONTAMINATION ONLY	BIOTA CONTAMINATION	AIR, WATER, OR FOOD-STUFF CONTAMINATION
DISTANCE TO NEAREST SURFACE WATER	GREATER THAN 5 MILES	1 TO 5 MILES	1,001 FEET TO 1 MILE	0 TO 1,000 FEET
DEPTH TO GROUNDWATER	GREATER THAN 100 FEET	51 TO 100 FEET	21 TO 50 FEET	0 TO 20 FEET
NET PRECIPITATION	LESS THAN -10 INCHES	-10 TO -5 INCHES	-5 TO -20 INCHES	GREATER THAN -20 INCHES
SOIL PERMEABILITY	GREATER THAN 50% CLAY	30% TO 50% CLAY	15% TO 30% CLAY	0 TO 15% CLAY
BEDROCK PERMEABILITY	IMPERMEABLE	RELATIVELY IMPERMEABLE	RELATIVELY PERMEABLE	VERY PERMEABLE
DEPTH TO BEDROCK	GREATER THAN 60 FEET	31 TO 60 FEET	11 TO 30 FEET	0 TO 10 FEET

Table 1

RATING FACTORS AND SCALES FOR EACH OF THE FOUR FACTOR CATEGORIES

RATING FACTORS	RATING SCALE LEVELS			
	0	1	2	3
WASTE CHARACTERISTICS				
TOXICITY	SAX'S LEVEL 0 OR NFPA'S LEVEL 0	SAX'S LEVEL 1 OR NFPA'S LEVEL 1	SAX'S LEVEL 2 OR NFPA'S LEVEL 2	SAX'S LEVEL 3 OR NFPA'S LEVELS 3 OR 4
RADIOACTIVITY	AT OR BELOW BACKGROUND LEVELS	1 TO 3 TIMES BACKGROUND LEVELS	3 TO 5 TIMES BACKGROUND LEVELS	OVER 5 TIMES BACKGROUND LEVELS
PERSISTENCE	EASILY BIODEGRADABLE COMPOUNDS	STRAIGHT CHAIN HYDROCARBONS	SUBSTITUTED AND OTHER RING COMPOUNDS	METALS, POLYCYCLIC COMPOUNDS, AND HALOGENATED HYDROCARBONS
IGNITABILITY	FLASH POINT GREATER THAN 200° OR NFPA'S LEVEL 0	FLASH POINT OF 140°F. to 200°F. OR NFPA'S LEVEL 1	FLASH POINT OF 80°F. TO 140°F. OR NFPA'S LEVEL 2	FLASH POINT LESS THAN 80°F. OR NFPA'S LEVELS 3 OR 4
REACTIVITY	NFPA'S LEVEL 0	NFPA'S LEVEL 1	NFPA'S LEVEL 2	NFPA'S LEVELS 3 OR 4
CORROSIVENESS	pH OF 6 TO 9	pH OF 5 TO 6 OR 9 TO 10	pH OF 3 TO 5 OR 10 TO 12	pH OF 1 TO 3 OR 12 TO 14
SOLUBILITY	INSOLUBLE	SLIGHTLY SOLUBLE	SOLUBLE	VERY SOLUBLE
VOLATILITY	VAPOR PRESSURE LESS THAN 0.1 mm Hg	VAPOR PRESSURE OF 0.1 TO 25 mm Hg	VAPOR PRESSURE OF 78 TO 25 mm Hg	VAPOR PRESSURE GREATER THAN 78 mm Hg
PHYSICAL STATE	SOLID	SLUDGE	LIQUID	GAS
WASTE MANAGEMENT PRACTICES				
SITE SECURITY	SECURE FENCE WITH LOCK	SECURITY GUARD BUT NO FENCE	REMOTE LOCATION OR BREACHABLE FENCE	NO BARRIERS
HAZARDOUS WASTE QUANTITY	0 TO 250 TONS	251 TO 1,000 TONS	1,001 TO 2000 TONS	GREATER THAN 2,000 TONS
TOTAL WASTE QUANTITY	0 TO 10 ACRE FEET	11 TO 100 ACRE FEET	101 TO 250 ACRE FEET	GREATER THAN 250 ACRE FEET
WASTE INCOMPATIBILITY	NO INCOMPATIBLE WASTES ARE PRESENT	PRESENT, BUT DOES NOT POSE A HAZARD	PRESENT AND MAY POSE A FUTURE HAZARD	PRESENT AND POSING AN IMMEDIATE HAZARD
USE OF LINERS	CLAY OR OTHER LINER RESISTENT TO ORGANIC COMPOUNDS	SYNTHETIC OR CONCRETE LINER	ASPHALT-BASE LINER	NO LINER USED
USE OF LEACHATE COLLECTION SYSTEMS	ADEQUATE COLLECTION AND TREATMENT	INADEQUATE COLLECTION OR TREATMENT	INADEQUATE COLLECTION AND TREATMENT	NO COLLECTION OR TREATMENT
USE OF GAS COLLECTION SYSTEMS	ADEQUATE COLLECTION AND TREATMENT	COLLECTION AND CONTROLLED FLARING	VENTING OR INADEQUATE TREATMENT	NO COLLECTION OR TREATMENT
USE AND CONDITION OF CONTAINERS	CONTAINERS ARE USED AND APPEAR TO BE IN GOOD CONDITION	CONTAINERS ARE USED BUT A FEW ARE LEAKING	CONTAINERS ARE USED BUT MANY ARE LEAKING	NO CONTAINERS ARE USED

While this list is by no means exhaustive, and other examples may be encountered by raters using the methodology, it does include the more commonly occurring situations. Appendix B provides guidance on the number of additional points that should be assigned for these situations.

In order to maintain the objectivity of the rating methodology while allowing the assignment of additional points, the following limits are placed on the number of additional points that may be assigned in each factor category:

- Receptors 50 points
- Pathways 25 points
- Waste characteristics 20 points
- Waste management practices 30 points.

The number of additional points allowed in each factor category is a function of the total available rating factor points and the relative importance of the category.

The actual procedure for assigning additional points is outlined in Chapter 4.

2.6 HAZARD POTENTIAL SCORES

The result of a site rating is a set of five hazard potential scores. These scores are:

- Overall score
- Receptors subscore
- Pathways subscore
- Waste characteristics subscore
- Waste management practices subscore.

The overall score is based on all the rating factors and additional points that are used to rate a site. Each subscore is based on those rating factors

and additional points in that factor category which are used to rate a site. All of these scores are normalized so that they are on a scale of 0 to 100. The normalization procedure is described in Chapter 4. Associated with every hazard potential score is a percentage of missing and assumed data. These percentages flag scores that are based on large amounts of missing data and, generally, measure the reliability of the scores. Chapter 5 describes how to interpret these scores.

Appendix H
SITE ASSESSMENT AND RATING FORMS

WASTE DISPOSAL SITE AND SPILL AREA ASSESSMENT AND RATING FORM

Name of Site (1) LANDFILL pre-1945
Location MacDill AFB
Owner/Operator MacDill AFB
Comments

RATING FACTOR	FACTOR RATING (0-3)	MULTIPLIER	FACTOR SCORE	MAXIMUM POSSIBLE SCORE
RECEPTORS				
Population Within 1,000 Feet	0	4	0	12
Distance to Nearest Drinking Water Well	0	15	0	45
Distance to Reservation Boundary	3	6	18	18
Land Use/Zoning	0	3	0	9
Critical Environments	2	12	24	36
Water Quality of Nearby Surface Water Body	2	6	12	18
Number of Assumed Values = 0 Out of 6		SUBTOTALS	54	138
Percentage of Assumed Values = 0 %		SUBSCORE		39
Number of Missing Values = 0 Out of 6		(Factor Score Divided by Maximum Score and Multiplied by 100)		
Percentage of Missing Values = 0 %				

PATHWAYS				
Evidence of Water Contamination	0	10	0	30
Level of Water Contamination	0	15	0	45
Type of Contamination, Soil/Biota	0	5	0	15
Distance to Nearest Surface Water	3	4	12	12
Depth to Groundwater	3	7	21	21
Net Precipitation	1	6	6	18
Soil Permeability	3	6	18	18
Bedrock Permeability	3	4	12	12
Depth to Bedrock	3	4	12	12
Surface Erosion	0	4	0	12
Number of Assumed Values = 0 Out of 10		SUBTOTALS	81	195
Percentage of Assumed Values = 0 %		SUBSCORE		42
Number of Missing Values = 0 Out of 10		(Factor Score Divided by Maximum Score and Multiplied by 100)		
Percentage of Missing Values = 0 %				

WASTE CHARACTERISTICS

Hazardous Rating: Judgemental rating from 30 to 100 points based on the following guidelines:

Points	
30	Closed domestic-type landfill, old site, no known hazardous wastes
40	Closed domestic-type landfill, recent site, no known hazardous wastes
50	Suspected small quantities of hazardous wastes
60	Known small quantities of hazardous wastes
70	Suspected moderate quantities of hazardous wastes
80	Known moderate quantites of hazardous wastes
90	Suspected large quantities of hazardous wastes
100	Known large quantities of hazardous wastes

Reason for Assigned Hazardous Rating: No hazardous wastes known or suspected

SUBSCORE 30

WASTE MANAGEMENT PRACTICES

RATING FACTOR		FACTOR RATING (0-3)	MULTIPLIER	FACTOR SCORE	MAXIMUM POSSIBLE SCORE
Record Accuracy and Ease of Access to Site		3	7	21	21
Hazardous Waste Quantity	assumed	0	7	0	21
Total Waste Quantity	assumed	0	4	0	12
Waste Incompatibility	assumed	0	3	0	9
Absence of Liners or Confining Beds	[redacted]	3	6	18	18
Use of Leachate Collection System		3	6	18	18
Use of Gas Collection Systems		3	2	6	6
Site Closure		2	8	16	24
Subsurface Flows	assumed	2	7	14	21

Number of Assumed Values = 4 Out of 9

Percentage of Assumed Values = 44 %

Number of Missing and Non-Applicable Values = 0 Out of 9

Percentage of Missing and Non-Applicalbe Values = 0 %

SUBTOTALS 93 150

SUBSCORE 62

(Factor Score Divided by Maximum Score and Multiplied by 100)

Overall Number of Assumed Values = 4 Out of 25

Overall Percentage of Assumed Values = 16 %

OVERALL SCORE [redacted] 44 ✓

(Receptors Subscore X 0.22 plus
Pathways Subscore X 0.30 plus
Waste Characteristics Subscore X 0.24 plus
Waste Management Subscore X 0.24)

WASTE DISPOSAL SITE AND SPILL AREA ASSESSMENT AND RATING FORM

Name of Site (2) Landfill golf course
Location MacDill
Owner/Operator MacDill
Comments operation up to ≈ 1950

RATING FACTOR	FACTOR RATING (0-3)	MULTIPLIER	FACTOR SCORE	MAXIMUM POSSIBLE SCORE
RECEPTORS				
Population Within 1,000 Feet 20 units	3	4	12	12
Distance to Nearest Drinking Water Well	0	15	0	45
Distance to Reservation Boundary	2	6	12	18
Land Use/Zoning	2	3	6	9
Critical Environments	0	12	0	36
Water Quality of Nearby Surface Water Body	2	6	12	18
Number of Assumed Values = 0 Out of 6		SUBTOTALS	42	138
Percentage of Assumed Values = 0 %		SUBSCORE		30
Number of Missing Values = 0 Out of 6		(Factor Score Divided by Maximum Score and Multiplied by 100)		
Percentage of Missing Values = 0 %				

PATHWAYS				
Evidence of Water Contamination	0	10	0	30
Level of Water Contamination	0	15	0	45
Type of Contamination, Soil/Biota	0	5	0	15
Distance to Nearest Surface Water	3	4	12	12
Depth to Groundwater	3	7	21	21
Net Precipitation	1	6	6	18
Soil Permeability	3	6	18	18
Bedrock Permeability	3	4	12	12
Depth to Bedrock	3	4	12	12
Surface Erosion	0	4	0	12
Number of Assumed Values = 0 Out of 10		SUBTOTALS	81	195
Percentage of Assumed Values = 0 %		SUBSCORE		42
Number of Missing Values = 0 Out of 10		(Factor Score Divided by Maximum Score and Multiplied by 100)		
Percentage of Missing Values = 0 %				

WASTE CHARACTERISTICS

Hazardous Rating: Judgemental rating from 30 to 100 points based on the following guidelines:

Points	
30	Closed domestic-type landfill, old site, no known hazardous wastes
40	Closed domestic-type landfill, recent site, no known hazardous wastes
50	Suspected small quantities of hazardous wastes
60	Known small quantities of hazardous wastes
70	Suspected moderate quantities of hazardous wastes
80	Known moderate quantites of hazardous wastes
90	Suspected large quantities of hazardous wastes
100	Known large quantities of hazardous wastes

SUBSCORE 30

Reason for Assigned Hazardous Rating: suspected rubble and frost-damaged trees only

WASTE MANAGEMENT PRACTICES

RATING FACTOR	FACTOR RATING (0-3)	MULTIPLIER	FACTOR SCORE	MAXIMUM POSSIBLE SCORE
Record Accuracy and Ease of Access to Site	3	7	21	21
Hazardous Waste Quantity assumed	0	7	0	21
Total Waste Quantity assumed	2	4	8	12
Waste Incompatibility assumed	0	3	0	9
Absence of Liners or Confining Beds	3	6	18	18
Use of Leachate Collection System	3	6	18	18
Use of Gas Collection Systems	3	2	6	6
Site Closure	2	8	16	24
Subsurface Flows	2	7	14	21
		SUBTOTALS	101	150
		SUBSCORE		67

Number of Assumed Values = 3 Out of 9

Percentage of Assumed Values = 33%

Number of Missing and Non-Applicable Values = 0 Out of 9

Percentage of Missing and Non-Applicalbe Values = 0%

(Factor Score Divided by Maximum Score and Multiplied by 100)

Overall Number of Assumed Values = 3 Out of 25

Overall Percentage of Assumed Values = 12%

OVERALL SCORE [redacted] 42

(Receptors Subscore X 0.22 plus
Pathways Subscore X 0.30 plus
Waste Characteristics Subscore X 0.24 plus
Waste Management Subscore X 0.24)

WASTE DISPOSAL SITE AND SPILL AREA ASSESSMENT AND RATING FORM

Name of Site (3) Land fill dog kennel
Location Mac Dill
Owner/Operator Mac Dill
Comments operation ± 1950 to 1959

RATING FACTOR	FACTOR RATING (0-3)	MULTIPLIER	FACTOR SCORE	MAXIMUM POSSIBLE SCORE
RECEPTORS				
Population Within 1,000 Feet	0	4	0	12
Distance to Nearest Drinking Water Well	0	15	0	45
Distance to Reservation Boundary	2	6	12	18
Land Use/Zoning harvesting hay	1	3	3	9
Critical Environments	2	12	24	36
Water Quality of Nearby Surface Water Body	2	6	12	18
Number of Assumed Values = 0 Out of 6		SUBTOTALS	51	138
Percentage of Assumed Values = 0 %		SUBSCORE		37
Number of Missing Values = 0 Out of 6		(Factor Score Divided by Maximum Score and Multiplied by 100)		
Percentage of Missing Values = 0 %				

PATHWAYS					
Evidence of Water Contamination		1	10	10	30
Level of Water Contamination	assumed	1	15	15	45
Type of Contamination, Soil/Biota	assumed	1	5	5	15
Distance to Nearest Surface Water		2	4	8	12
Depth to Groundwater		3	7	21	21
Net Precipitation		1	6	6	18
Soil Permeability		3	6	18	18
Bedrock Permeability		3	4	12	12
Depth to Bedrock		3	4	12	12
Surface Erosion		0	4	0	12
Number of Assumed Values = 2 Out of 10		SUBTOTALS		107	195
Percentage of Assumed Values = 20 %		SUBSCORE			55
Number of Missing Values = 0 Out of 10		(Factor Score Divided by Maximum Score and Multiplied by 100)			
Percentage of Missing Values = 0 %					

WASTE CHARACTERISTICS

Hazardous Rating: Judgemental rating from 30 to 100 points based on the following guidelines:

Points	
30	Closed domestic-type landfill, old site, no known hazardous wastes
40	Closed domestic-type landfill, recent site, no known hazardous wastes
50	Suspected small quantities of hazardous wastes
60	Known small quantities of hazardous wastes
70	Suspected moderate quantities of hazardous wastes
80	Known moderate quantites of hazardous wastes
90	Suspected large quantities of hazardous wastes
100	Known large quantities of hazardous wastes

SUBSCORE 50

Reason for Assigned Hazardous Rating:
based on interviews, suspect old paint cans, solvents, garbage, PCB capacitors

WASTE MANAGEMENT PRACTICES

RATING FACTOR		FACTOR RATING (0-3)	MULTIPLIER	FACTOR SCORE	MAXIMUM POSSIBLE SCORE
Record Accuracy and Ease of Access to Site		3	7	21	21
Hazardous Waste Quantity	assume	0	7	0	21
Total Waste Quantity		2	4	8	12
Waste Incompatibility	assume	0	3	0	9
Absence of Liners or Confining Beds		3	6	18	18
Use of Leachate Collection System		3	6	18	18
Use of Gas Collection Systems		3	2	6	6
Site Closure		2	8	16	24
Subsurface Flows		2	7	14	21
			SUBTOTALS	101	150
			SUBSCORE		67

Number of Assumed Values = 2 Out of 9
Percentage of Assumed Values = 22%
Number of Missing and Non-Applicable Values = 0 Out of 9
Percentage of Missing and Non-Applicalbe Values = 0%

(Factor Score Divided by Maximum Score and Multiplied by 100)

Overall Number of Assumed Values = 4 Out of 25
Overall Percentage of Assumed Values = 16%

OVERALL SCORE [redacted] 53

(Receptors Subscore X 0.22 plus
Pathways Subscore X 0.30 plus
Waste Characteristics Subscore X 0.24 plus
Waste Management Subscore X 0.24)

WASTE DISPOSAL SITE AND SPILL AREA ASSESSMENT AND RATING FORM

Name of Site (4) Land fill
Location MacDill
Owner/Operator MacDill
Comments operation 52-53

RATING FACTOR	FACTOR RATING (0-3)	MULTIPLIER	FACTOR SCORE	MAXIMUM POSSIBLE SCORE
RECEPTORS				
Population Within 1,000 Feet	0	4	0	12
Distance to Nearest Drinking Water Well	0	15	0	45
Distance to Reservation Boundary	2	6	12	18
Land Use/Zoning	0	3	0	9
Critical Environments	2	12	24	36
Water Quality of Nearby Surface Water Body	2	6	12	18
Number of Assumed Values = 0 Out of 6		SUBTOTALS	48	138
Percentage of Assumed Values = 0 %		SUBSCORE		35
Number of Missing Values = 0 Out of 6		(Factor Score Divided by Maximum Score and Multiplied by 100)		
Percentage of Missing Values = 0 %				

PATHWAYS				
Evidence of Water Contamination	0	10	0	30
Level of Water Contamination	0	15	0	45
Type of Contamination, Soil/Biota	0	5	0	15
Distance to Nearest Surface Water	3	4	12	12
Depth to Groundwater	3	7	21	21
Net Precipitation	1	6	6	18
Soil Permeability	3	6	18	18
Bedrock Permeability	3	4	12	12
Depth to Bedrock	3	4	12	12
Surface Erosion	0	4	0	12
Number of Assumed Values = 0 Out of 10		SUBTOTALS	81	145
Percentage of Assumed Values = 0 %		SUBSCORE		[redacted] 42
Number of Missing Values = 0 Out of 10		(Factor Score Divided by Maximum Score and Multiplied by 100)		
Percentage of Missing Values = 0 %				

WASTE CHARACTERISTICS

Hazardous Rating: Judgemental rating from 30 to 100 points based on the following guidelines:

Points	
30	Closed domestic-type landfill, old site, no known hazardous wastes
40	Closed domestic-type landfill, recent site, no known hazardous wastes
50	Suspected small quantities of hazardous wastes
60	Known small quantities of hazardous wastes
70	Suspected moderate quantities of hazardous wastes
80	Known moderate quantites of hazardous wastes
90	Suspected large quantities of hazardous wastes
100	Known large quantities of hazardous wastes

SUBSCORE 30

Reason for Assigned Hazardous Rating: low suspicion of existance, mostly rubble fill

WASTE MANAGEMENT PRACTICES

RATING FACTOR		FACTOR RATING (0-3)	MULTIPLIER	FACTOR SCORE	MAXIMUM POSSIBLE SCORE
Record Accuracy and Ease of Access to Site		3	7	21	21
Hazardous Waste Quantity	assume	0	7	0	21
Total Waste Quantity	assume	0	4	0	12
Waste Incompatibility	assume	0	3	0	9
Absence of Liners or Confining Beds		3	6	18	18
Use of Leachate Collection System		3	6	18	18
Use of Gas Collection Systems		3	2	6	6
Site Closure		2	8	16	24
Subsurface Flows		1	7	7	21

Number of Assumed Values = 3 Out of 9

Percentage of Assumed Values = 33%

Number of Missing and Non-Applicable Values = 0 Out of 9

Percentage of Missing and Non-Applicalbe Values = 0%

SUBTOTALS 86 150

SUBSCORE 57

(Factor Score Divided by Maximum Score and Multiplied by 100)

Overall Number of Assumed Values = 3 Out of 25

Overall Percentage of Assumed Values = 12%

OVERALL SCORE 41

(Receptors Subscore X 0.22 plus
Pathways Subscore X 0.30 plus
Waste Characteristics Subscore X 0.24 plus
Waste Management Subscore X 0.24)

WASTE DISPOSAL SITE AND SPILL AREA ASSESSMENT AND RATING FORM

Name of Site (5) Landfills (6) + (7) also rated here
Location Mac Dill
Owner/Operator Mac Dill
Comments Operated (5) 1959-62
(6) 1962-63
(7) 1963-65

RATING FACTOR	FACTOR RATING (0-3)	MULTIPLIER	FACTOR SCORE	MAXIMUM POSSIBLE SCORE
RECEPTORS				
Population Within 1,000 Feet	0	4	0	12
Distance to Nearest Drinking Water Well	0	15	0	45
Distance to Reservation Boundary	2	6	12	18
Land Use/Zoning	0	3	0	9
Critical Environments	2	12	24	36
Water Quality of Nearby Surface Water Body	2	6	12	18
Number of Assumed Values = 0 Out of 6	SUBTOTALS		48	138
Percentage of Assumed Values = 0 %	SUBSCORE			35
Number of Missing Values = 0 Out of 6	(Factor Score Divided by Maximum Score and Multiplied by 100)			
Percentage of Missing Values = 0 %				

PATHWAYS				
Evidence of Water Contamination	1	10	10	30
Level of Water Contamination	1	15	15	45
Type of Contamination, Soil/Biota	1	5	5	15
Distance to Nearest Surface Water	3	4	12	12
Depth to Groundwater	3	7	21	21
Net Precipitation	1	6	6	18
Soil Permeability	3	6	18	18
Bedrock Permeability	3	4	12	12
Depth to Bedrock	3	4	12	12
Surface Erosion	0	4	0	12
Number of Assumed Values = 0 Out of 10	SUBTOTALS		111	~~[illegible]~~ 195
Percentage of Assumed Values = 0 %	SUBSCORE			~~[illegible]~~ 57
Number of Missing Values = 0 Out of 10	(Factor Score Divided by Maximum Score and Multiplied by 100)			
Percentage of Missing Values = 0 %				

WASTE CHARACTERISTICS

Hazardous Rating: Judgemental rating from 30 to 100 points based on the following guidelines:

Points	
30	Closed domestic-type landfill, old site, no known hazardous wastes
40	Closed domestic-type landfill, recent site, no known hazardous wastes
50	Suspected small quantities of hazardous wastes
60	Known small quantities of hazardous wastes
70	Suspected moderate quantities of hazardous wastes
80	Known moderate quantites of hazardous wastes
90	Suspected large quantities of hazardous wastes
100	Known large quantities of hazardous wastes

SUBSCORE 50

Reason for Assigned Hazardous Rating: Burning of wastes operating procedure at that time.

WASTE MANAGEMENT PRACTICES

RATING FACTOR	FACTOR RATING (0-3)	MULTIPLIER	FACTOR SCORE	MAXIMUM POSSIBLE SCORE
Record Accuracy and Ease of Access to Site	3	7	21	21
Hazardous Waste Quantity assume	0	7	0	21
Total Waste Quantity	1	4	4	12
Waste Incompatibility assume	0	3	0	9
Absence of Liners or Confining Beds	3	6	18	18
Use of Leachate Collection System	3	6	18	18
Use of Gas Collection Systems	3	2	6	6
Site Closure	2	8	16	24
Subsurface Flows	1	7	7	21
		SUBTOTALS	90	150
		SUBSCORE		60

Number of Assumed Values = 2 Out of 9

Percentage of Assumed Values = 22

Number of Missing and Non-Applicable Values = 0 Out of 9

Percentage of Missing and Non-Applicalbe Values = 0

(Factor Score Divided by Maximum Score and Multiplied by 100)

Overall Number of Assumed Values = 2 Out of 25

Overall Percentage of Assumed Values = 8

OVERALL SCORE 51

(Receptors Subscore X 0.22 plus
Pathways Subscore X 0.30 plus
Waste Characteristics Subscore X 0.24 plus
Waste Management Subscore X 0.24)

WASTE DISPOSAL SITE AND SPILL AREA ASSESSMENT AND RATING FORM

Name of Site (8) Landfill
Location MacDill
Owner/Operator MacDill
Comments Operation 1965-73

RATING FACTOR	FACTOR RATING (0-3)	MULTIPLIER	FACTOR SCORE	MAXIMUM POSSIBLE SCORE
RECEPTORS				
Population Within 1,000 Feet	0	4	0	12
Distance to Nearest Drinking Water Well	0	15	0	45
Distance to Reservation Boundary	2	6	12	18
Land Use/Zoning	0	3	0	9
Critical Environments	2	12	24	36
Water Quality of Nearby Surface Water Body	2	6	12	18
Number of Assumed Values = 0 Out of 6		SUBTOTALS	48	138
Percentage of Assumed Values = 0 %		SUBSCORE		35
Number of Missing Values = 0 Out of 6		(Factor Score Divided by Maximum Score and Multiplied by 100)		
Percentage of Missing Values = 0 %				

PATHWAYS				
Evidence of Water Contamination	1	10	10	30
Level of Water Contamination	1	15	15	45
Type of Contamination, Soil/Biota	1	5	5	15
Distance to Nearest Surface Water	3	4	12	12
Depth to Groundwater	3	7	21	21
Net Precipitation	1	6	6	18
Soil Permeability	3	6	18	18
Bedrock Permeability	3	4	12	12
Depth to Bedrock	3	4	12	12
Surface Erosion	0	4	0	12
Number of Assumed Values = 0 Out of 10		SUBTOTALS	111	145
Percentage of Assumed Values = 0 %		SUBSCORE		57
Number of Missing Values = 0 Out of 10		(Factor Score Divided by Maximum Score and Multiplied by 100)		
Percentage of Missing Values = 0 %				

WASTE CHARACTERISTICS

Hazardous Rating: Judgemental rating from 30 to 100 points based on the following guidelines:

Points	
30	Closed domestic-type landfill, old site, no known hazardous wastes
40	Closed domestic-type landfill, recent site, no known hazardous wastes
50	Suspected small quantities of hazardous wastes
60	Known small quantities of hazardous wastes
70	Suspected moderate quantities of hazardous wastes
80	Known moderate quantites of hazardous wastes
90	Suspected large quantities of hazardous wastes
100	Known large quantities of hazardous wastes

SUBSCORE 50

Reason for Assigned Hazardous Rating:
No burning of wastes

WASTE MANAGEMENT PRACTICES

RATING FACTOR	FACTOR RATING (0-3)	MULTIPLIER	FACTOR SCORE	MAXIMUM POSSIBLE SCORE
Record Accuracy and Ease of Access to Site	3	7	21	21
Hazardous Waste Quantity assume	0	7	0	21
Total Waste Quantity	2	4	8	12
Waste Incompatibility assume	1	3	3	9
Absence of Liners or Confining Beds	3	6	18	18
Use of Leachate Collection System	3	6	18	18
Use of Gas Collection Systems	3	2	6	6
Site Closure	2	8	16	24
Subsurface Flows	1	7	7	21

Number of Assumed Values = 2 Out of 9
Percentage of Assumed Values = 22%
Number of Missing and Non-Applicable Values = 0 Out of 9
Percentage of Missing and Non-Applicalbe Values = 0%

SUBTOTALS 97 150
SUBSCORE 65
(Factor Score Divided by Maximum Score and Multiplied by 100)

Overall Number of Assumed Values = 2 Out of 25
Overall Percentage of Assumed Values = 8%

OVERALL SCORE 52
(Receptors Subscore X 0.22 plus
Pathways Subscore X 0.30 plus
Waste Characteristics Subscore X 0.24 plus
Waste Management Subscore X 0.24)

WASTE DISPOSAL SITE AND SPILL AREA ASSESSMENT AND RATING FORM

Name of Site (2) Landfill current
Location MacDill AFB
Owner/Operator MacDill AFB
Comments operation 1974-81

RATING FACTOR	FACTOR RATING (0-3)	MULTIPLIER	FACTOR SCORE	MAXIMUM POSSIBLE SCORE
RECEPTORS				
Population Within 1,000 Feet	0	4	0	12
Distance to Nearest Drinking Water Well	0	15	0	45
Distance to Reservation Boundary	2	6	12	18
Land Use/Zoning	0	3	0	9
Critical Environments	2	12	24	36
Water Quality of Nearby Surface Water Body	2	6	12	18
Number of Assumed Values = 0 Out of 6		SUBTOTALS	48	138
Percentage of Assumed Values = 0 %		SUBSCORE		35
Number of Missing Values = 0 Out of 6		(Factor Score Divided by Maximum Score and Multiplied by 100)		
Percentage of Missing Values = 0 %				

PATHWAYS				
Evidence of Water Contamination	1	10	10	30
Level of Water Contamination	1	15	15	45
Type of Contamination, Soil/Biota	1	5	5	15
Distance to Nearest Surface Water	3	4	12	12
Depth to Groundwater	3	7	21	21
Net Precipitation	1	6	6	18
Soil Permeability	3	6	18	18
Bedrock Permeability	3	4	12	12
Depth to Bedrock	3	4	12	12
Surface Erosion	0	4	0	12
Number of Assumed Values = 0 Out of 10		SUBTOTALS	111	195
Percentage of Assumed Values = 0 %		SUBSCORE		57
Number of Missing Values = 0 Out of 10		(Factor Score Divided by Maximum Score and Multiplied by 100)		
Percentage of Missing Values = 0 %				

WASTE CHARACTERISTICS

Hazardous Rating: Judgemental rating from 30 to 100 points based on the following guidelines:

Points

30	Closed domestic-type landfill, old site, no known hazardous wastes
40	Closed domestic-type landfill, recent site, no known hazardous wastes
50	Suspected small quantities of hazardous wastes
60	Known small quantities of hazardous wastes
70	Suspected moderate quantities of hazardous wastes
80	Known moderate quantites of hazardous wastes
90	Suspected large quantities of hazardous wastes
100	Known large quantities of hazardous wastes

SUBSCORE 50

Reason for Assigned Hazardous Rating:
Recent site, not closed.

WASTE MANAGEMENT PRACTICES

RATING FACTOR	FACTOR RATING (0-3)	MULTIPLIER	FACTOR SCORE	MAXIMUM POSSIBLE SCORE
Record Accuracy and Ease of Access to Site	2	7	14	21
Hazardous Waste Quantity	0	7	0	21
Total Waste Quantity	2	4	8	12
Waste Incompatibility assume	~~0~~ 1	3	~~0~~ 3	9
Absence of Liners or Confining Beds	3	6	18	18
Use of Leachate Collection System	3	6	18	18
Use of Gas Collection Systems	3	2	6	6
Site Closure	2	8	16	24
Subsurface Flows	1	7	7	21
		SUBTOTALS	90	150
		SUBSCORE		60

Number of Assumed Values = 1 Out of 9
Percentage of Assumed Values = 11%
Number of Missing and Non-Applicable Values = 0 Out of 9
Percentage of Missing and Non-Applicalbe Values = 0%

(Factor Score Divided by Maximum Score and Multiplied by 100)

Overall Number of Assumed Values = 1 Out of 25
Overall Percentage of Assumed Values = 4%

OVERALL SCORE 51

(Receptors Subscore X 0.22 plus
Pathways Subscore X 0.30 plus
Waste Characteristics Subscore X 0.24 plus
Waste Management Subscore X 0.24)

WASTE DISPOSAL SITE AND SPILL AREA ASSESSMENT AND RATING FORM

Name of Site (10) Landfill - demolition rubble
Location MacDill
Owner/Operator MacDill
Comments demolition of chem. storage area (SAC)

RATING FACTOR	FACTOR RATING (0-3)	MULTIPLIER	FACTOR SCORE	MAXIMUM POSSIBLE SCORE
RECEPTORS				
Population Within 1,000 Feet	0	4	0	12
Distance to Nearest Drinking Water Well	0	15	0	45
Distance to Reservation Boundary	2	6	12	18
Land Use/Zoning	0	3	0	9
Critical Environments	2	12	24	36
Water Quality of Nearby Surface Water Body	2	6	12	18

Number of Assumed Values = 0 Out of 6
Percentage of Assumed Values = 0 %
Number of Missing Values = 0 Out of 6
Percentage of Missing Values = 0 %

SUBTOTALS 48 / 138
SUBSCORE 35
(Factor Score Divided by Maximum Score and Multiplied by 100)

RATING FACTOR	FACTOR RATING (0-3)	MULTIPLIER	FACTOR SCORE	MAXIMUM POSSIBLE SCORE
PATHWAYS				
Evidence of Water Contamination	1	10	10	30
Level of Water Contamination	1	15	15	45
Type of Contamination, Soil/Biota	1	5	5	15
Distance to Nearest Surface Water	3	4	12	12
Depth to Groundwater	3	7	21	21
Net Precipitation	1	6	6	18
Soil Permeability	3	6	18	18
Bedrock Permeability	3	4	12	12
Depth to Bedrock	3	4	12	12
Surface Erosion	0	4	0	12

Number of Assumed Values = 0 Out of 10
Percentage of Assumed Values = 0 %
Number of Missing Values = 0 Out of 10
Percentage of Missing Values = 0 %

SUBTOTALS 111 / 195
SUBSCORE 57
(Factor Score Divided by Maximum Score and Multiplied by 100)

WASTE CHARACTERISTICS

Hazardous Rating: Judgemental rating from 30 to 100 points based on the following guidelines:

Points	
30	Closed domestic-type landfill, old site, no known hazardous wastes
40	Closed domestic-type landfill, recent site, no known hazardous wastes
50	Suspected small quantities of hazardous wastes
60	Known small quantities of hazardous wastes
70	Suspected moderate quantities of hazardous wastes
80	Known moderate quantites of hazardous wastes
90	Suspected large quantities of hazardous wastes
100	Known large quantities of hazardous wastes

SUBSCORE 30

Reason for Assigned Hazardous Rating:

WASTE MANAGEMENT PRACTICES

RATING FACTOR	FACTOR RATING (0-3)	MULTIPLIER	FACTOR SCORE	MAXIMUM POSSIBLE SCORE
Record Accuracy and Ease of Access to Site	3	7	21	21
Hazardous Waste Quantity assumed	0	7	0	21
Total Waste Quantity	1	4	4	12
Waste Incompatibility suspected rubble	0	3	0	9
Absence of Liners or Confining Beds	3	6	18	18
Use of Leachate Collection System	3	6	18	18
Use of Gas Collection Systems	3	2	6	6
Site Closure	2	8	16	24
Subsurface Flows	1	7	7	21
		SUBTOTALS	90	150
		SUBSCORE		60

Number of Assumed Values = 1 Out of 9
Percentage of Assumed Values = 11%
Number of Missing and Non-Applicable Values = 0 Out of 9
Percentage of Missing and Non-Applicalbe Values = 0%

(Factor Score Divided by Maximum Score and Multiplied by 100)

Overall Number of Assumed Values = 1 Out of 25
Overall Percentage of Assumed Values = 4%

OVERALL SCORE 46

(Receptors Subscore X 0.22 plus
Pathways Subscore X 0.30 plus
Waste Characteristics Subscore X 0.24 plus
Waste Management Subscore X 0.24)

WASTE DISPOSAL SITE AND SPILL AREA ASSESSMENT AND RATING FORM

Name of Site (11) Chemical Munitions Burial Site
Location MacDill
Owner/Operator MacDill
Comments "gas canisters" and phosphorus dug up.

RATING FACTOR	FACTOR RATING (0-3)	MULTIPLIER	FACTOR SCORE	MAXIMUM POSSIBLE SCORE
RECEPTORS				
Population Within 1,000 Feet	0	4	0	12
Distance to Nearest Drinking Water Well	0	15	0	45
Distance to Reservation Boundary	2	6	12	18
Land Use/Zoning	0	3	0	9
Critical Environments	2	12	24	36
Water Quality of Nearby Surface Water Body	2	6	12	18
Number of Assumed Values = 0 Out of 6		SUBTOTALS	48	138
Percentage of Assumed Values = 0 %		SUBSCORE		35
Number of Missing Values = 0 Out of 6		(Factor Score Divided by Maximum Score and Multiplied by 100)		
Percentage of Missing Values = 0 %				

PATHWAYS				
Evidence of Water Contamination	1	10	10	30
Level of Water Contamination	1	15	15	45
Type of Contamination, Soil/Biota	2	5	10	15
Distance to Nearest Surface Water	3	4	12	12
Depth to Groundwater	3	7	21	21
Net Precipitation	1	6	6	18
Soil Permeability	3	6	18	18
Bedrock Permeability	3	4	12	12
Depth to Bedrock	3	4	12	12
Surface Erosion	0	4	0	12
Number of Assumed Values = 0 Out of 10		SUBTOTALS	116	195
Percentage of Assumed Values = 0 %		SUBSCORE		59
Number of Missing Values = 0 Out of 10		(Factor Score Divided by Maximum Score and Multiplied by 100)		
Percentage of Missing Values = 0 %				

WASTE CHARACTERISTICS

Hazardous Rating: Judgemental rating from 30 to 100 points based on the following guidelines:

Points	
30	Closed domestic-type landfill, old site, no known hazardous wastes
40	Closed domestic-type landfill, recent site, no known hazardous wastes
50	Suspected small quantities of hazardous wastes
60	Known small quantities of hazardous wastes
70	Suspected moderate quantities of hazardous wastes
80	Known moderate quantites of hazardous wastes
90	Suspected large quantities of hazardous wastes
100	Known large quantities of hazardous wastes

SUBSCORE 60

Reason for Assigned Hazardous Rating:

gas canisters + phosphorus have been excavated

WASTE MANAGEMENT PRACTICES

RATING FACTOR	FACTOR RATING (0-3)	MULTIPLIER	FACTOR SCORE	MAXIMUM POSSIBLE SCORE
Record Accuracy and Ease of Access to Site	3	7	21	21
Hazardous Waste Quantity assumed	1	7	7	21
Total Waste Quantity	0	4	0	12
Waste Incompatibility ignition + fumes reported	2	3	6	9
Absence of Liners or Confining Beds	3	6	18	18
Use of Leachate Collection System	3	6	18	18
Use of Gas Collection Systems	3	2	6	6
Site Closure	2	8	16	24
Subsurface Flows	1	7	7	21
		SUBTOTALS	99	150
		SUBSCORE		66

Number of Assumed Values = 1 Out of 9

Percentage of Assumed Values = 11 %

Number of Missing and Non-Applicable Values = 0 Out of 9

Percentage of Missing and Non-Applicalbe Values = 0 %

(Factor Score Divided by Maximum Score and Multiplied by 100)

Overall Number of Assumed Values = 1 Out of 25

Overall Percentage of Assumed Values = 4 %

OVERALL SCORE 56

(Receptors Subscore X 0.22 plus
Pathways Subscore X 0.30 plus
Waste Characteristics Subscore X 0.24 plus
Waste Management Subscore X 0.24)

WASTE DISPOSAL SITE AND SPILL AREA ASSESSMENT AND RATING FORM

Name of Site (12) Sludge Disposal
Location Mac Dill
Owner/Operator Mac Dill
Comments "pea patch" since 1976

RATING FACTOR	FACTOR RATING (0-3)	MULTIPLIER	FACTOR SCORE	MAXIMUM POSSIBLE SCORE
RECEPTORS				
Population Within 1,000 Feet	0	4	0	12
Distance to Nearest Drinking Water Well	0	15	0	45
Distance to Reservation Boundary	2	6	12	18
Land Use/Zoning	1	3	3	9
Critical Environments	0	12	0	36
Water Quality of Nearby Surface Water Body	2	6	12	18
Number of Assumed Values = 0 Out of 6		SUBTOTALS	27	138
Percentage of Assumed Values = 0 %		SUBSCORE		20
Number of Missing Values = 0 Out of 6		(Factor Score Divided by Maximum Score and Multiplied by 100)		
Percentage of Missing Values = 0 %				

PATHWAYS				
Evidence of Water Contamination	0	10	0	30
Level of Water Contamination	1	15	15	45
Type of Contamination, Soil/Biota	1	5	5	15
Distance to Nearest Surface Water	2	4	8	12
Depth to Groundwater	3	7	21	21
Net Precipitation	1	6	6	18
Soil Permeability	3	6	18	18
Bedrock Permeability	3	4	12	12
Depth to Bedrock	3	4	12	12
Surface Erosion	0	4	0	12
Number of Assumed Values = 0 Out of 10		SUBTOTALS	97	195
Percentage of Assumed Values = 0 %		SUBSCORE		50
Number of Missing Values = 0 Out of 10		(Factor Score Divided by Maximum Score and Multiplied by 100)		
Percentage of Missing Values = 0 %				

WASTE CHARACTERISTICS

Hazardous Rating: Judgemental rating from 30 to 100 points based on the following guidelines:

Points	
30	Closed domestic-type landfill, old site, no known hazardous wastes
40	Closed domestic-type landfill, recent site, no known hazardous wastes
50	Suspected small quantities of hazardous wastes
60	Known small quantities of hazardous wastes
70	Suspected moderate quantities of hazardous wastes
80	Known moderate quantites of hazardous wastes
90	Suspected large quantities of hazardous wastes
100	Known large quantities of hazardous wastes

SUBSCORE 40

Reason for Assigned Hazardous Rating:
No known hazardous materials in sludge

WASTE MANAGEMENT PRACTICES

RATING FACTOR	FACTOR RATING (0-3)	MULTIPLIER	FACTOR SCORE	MAXIMUM POSSIBLE SCORE
Record Accuracy and Ease of Access to Site	2	7	14	21
Hazardous Waste Quantity	0	7	0	21
Total Waste Quantity	1	4	4	12
Waste Incompatibility	0	3	0	9
Absence of Liners or Confining Beds	3	6	18	18
Use of Leachate Collection System N/A	–	6	–	–
Use of Gas Collection Systems N/A	–	2	–	–
Site Closure N/A	–	8	–	–
Subsurface Flows	0	7	0	21

Number of Assumed Values = 0 Out of 9
Percentage of Assumed Values = 0%
Number of Missing and Non-Applicable Values = 3 Out of 9
Percentage of Missing and Non-Applicalbe Values = 33%

SUBTOTALS 36 102
SUBSCORE 35
(Factor Score Divided by Maximum Score and Multiplied by 100)

Overall Number of Assumed Values = 0 Out of 25
Overall Percentage of Assumed Values = 0%

OVERALL SCORE 37
(Receptors Subscore X 0.22 plus
Pathways Subscore X 0.30 plus
Waste Characteristics Subscore X 0.24 plus
Waste Management Subscore X 0.24)

WASTE DISPOSAL SITE AND SPILL AREA ASSESSMENT AND RATING FORM

Name of Site (13) Creosote pit
Location Mac Dill
Owner/Operator Mac Dill
Comments ≐ 1945 open pit, about 30' long x 20' wide

RATING FACTOR	FACTOR RATING (0-3)	MULTIPLIER	FACTOR SCORE	MAXIMUM POSSIBLE SCORE
RECEPTORS				
Population Within 1,000 Feet	0	4	0	12
Distance to Nearest Drinking Water Well	0	15	0	45
Distance to Reservation Boundary	3	6	18	18
Land Use/Zoning next to commissary	2	3	6	9
Critical Environments	0	12	0	36
Water Quality of Nearby Surface Water Body	1	6	6	18
		SUBTOTALS	30	138
		SUBSCORE		22

Number of Assumed Values = 0 Out of 6
Percentage of Assumed Values = 0 %
Number of Missing Values = 0 Out of 6
Percentage of Missing Values = 0 %

(Factor Score Divided by Maximum Score and Multiplied by 100)

PATHWAYS				
Evidence of Water Contamination	1	10	10	30
Level of Water Contamination	1	15	15	45
Type of Contamination, Soil/Biota	1	5	5	15
Distance to Nearest Surface Water	2	4	8	12
Depth to Groundwater	3	7	21	21
Net Precipitation	1	6	6	18
Soil Permeability	3	6	18	18
Bedrock Permeability	3	4	12	12
Depth to Bedrock	3	4	12	12
Surface Erosion	0	4	0	12
		SUBTOTALS	107	195
		SUBSCORE		55

Number of Assumed Values = 0 Out of 10
Percentage of Assumed Values = 0 %
Number of Missing Values = 0 Out of 10
Percentage of Missing Values = 0 %

(Factor Score Divided by Maximum Score and Multiplied by 100)

WASTE CHARACTERISTICS

Hazardous Rating: Judgemental rating from 30 to 100 points based on the following guidelines:

Points	
30	Closed domestic-type landfill, old site, no known hazardous wastes
40	Closed domestic-type landfill, recent site, no known hazardous wastes
50	Suspected small quantities of hazardous wastes
60	Known small quantities of hazardous wastes
70	Suspected moderate quantities of hazardous wastes
80	Known moderate quantites of hazardous wastes
90	Suspected large quantities of hazardous wastes
100	Known large quantities of hazardous wastes

SUBSCORE 50

Reason for Assigned Hazardous Rating:
closure of pit, removal of creosote not documented

WASTE MANAGEMENT PRACTICES

RATING FACTOR	FACTOR RATING (0-3)	MULTIPLIER	FACTOR SCORE	MAXIMUM POSSIBLE SCORE
Record Accuracy and Ease of Access to Site	3	7	21	21
Hazardous Waste Quantity [assumed 1"]	1	7	7	21
Total Waste Quantity	0	4	0	12
Waste Incompatibility	0	3	0	9
Absence of Liners or Confining Beds	3	6	18	18
Use of Leachate Collection System	3	6	18	18
Use of Gas Collection Systems N/A	—	2	—	—
Site Closure	2	8	16	24
Subsurface Flows	1	7	7	21
		SUBTOTALS	87	144
		SUBSCORE		60.

Number of Assumed Values = 1 Out of 9
Percentage of Assumed Values = 11 %
Number of Missing and Non-Applicable Values = 1 Out of 9
Percentage of Missing and Non-Applicalbe Values = 11 %

(Factor Score Divided by Maximum Score and Multiplied by 100)

Overall Number of Assumed Values = 1 Out of 25
Overall Percentage of Assumed Values = 4 %

OVERALL SCORE 48

(Receptors Subscore X 0.22 plus
Pathways Subscore X 0.30 plus
Waste Characteristics Subscore X 0.24 plus
Waste Management Subscore X 0.24)

WASTE DISPOSAL SITE AND SPILL AREA ASSESSMENT AND RATING FORM

Name of Site (14) Clear Zone Pond
Location Mac Dill
Owner/Operator Mac Dill
Comments Reported burial of pesticide drums

RATING FACTOR	FACTOR RATING (0-3)	MULTIPLIER	FACTOR SCORE	MAXIMUM POSSIBLE SCORE
RECEPTORS				
Population Within 1,000 Feet ± 3 homes	1	4	4	12
Distance to Nearest Drinking Water Well	0	15	0	45
Distance to Reservation Boundary	3	6	18	18
Land Use/Zoning	1	3	3	9
Critical Environments	0	12	0	36
Water Quality of Nearby Surface Water Body	1	6	6	18
Number of Assumed Values = 0 Out of 6		SUBTOTALS	31	138
Percentage of Assumed Values = 0 %		SUBSCORE		22
Number of Missing Values = 0 Out of 6		(Factor Score Divided by Maximum Score and Multiplied by 100)		
Percentage of Missing Values = 0 %				

PATHWAYS				
Evidence of Water Contamination	0	10	0	30
Level of Water Contamination	0	15	0	45
Type of Contamination, Soil/Biota	0	5	0	15
Distance to Nearest Surface Water	3	4	12	12
Depth to Groundwater	3	7	21	21
Net Precipitation	1	6	6	18
Soil Permeability	2	6	12	18
Bedrock Permeability	3	4	12	12
Depth to Bedrock	3	4	12	12
Surface Erosion	0	4	0	12
Number of Assumed Values = 0 Out of 10		SUBTOTALS	75	195
Percentage of Assumed Values = 0 %		SUBSCORE		38
Number of Missing Values = 0 Out of 10		(Factor Score Divided by Maximum Score and Multiplied by 100)		
Percentage of Missing Values = 0 %				

WASTE CHARACTERISTICS

Hazardous Rating: Judgemental rating from 30 to 100 points based on the following guidelines:

Points	
30	Closed domestic-type landfill, old site, no known hazardous wastes
40	Closed domestic-type landfill, recent site, no known hazardous wastes
50	Suspected small quantities of hazardous wastes
60	Known small quantities of hazardous wastes
70	Suspected moderate quantities of hazardous wastes
80	Known moderate quantites of hazardous wastes
90	Suspected large quantities of hazardous wastes
100	Known large quantities of hazardous wastes

SUBSCORE 30

Reason for Assigned Hazardous Rating:
Reported waste barrels not substantiated by other witnesses

WASTE MANAGEMENT PRACTICES

RATING FACTOR	FACTOR RATING (0-3)	MULTIPLIER	FACTOR SCORE	MAXIMUM POSSIBLE SCORE
Record Accuracy and Ease of Access to Site	3	7	21	21
Hazardous Waste Quantity assumed	0	7	0	21
Total Waste Quantity	0	4	0	12
Waste Incompatibility assumed	0	3	0	9
Absence of Liners or Confining Beds	3	6	18	18
Use of Leachate Collection System N/A	—	6	—	—
Use of Gas Collection Systems N/A	—	2	—	—
Site Closure	2	8	16	24
Subsurface Flows	2	7	14	21

Number of Assumed Values = 2 Out of 9
Percentage of Assumed Values = 22%
Number of Missing and Non-Applicable Values = 2 Out of 9
Percentage of Missing and Non-Applicalbe Values = 22%

SUBTOTALS 62 126
SUBSCORE 55
(Factor Score Divided by Maximum Score and Multiplied by 100)

Overall Number of Assumed Values = 2 Out of 25
Overall Percentage of Assumed Values = 0%

OVERALL SCORE 37

(Receptors Subscore X 0.22 plus
Pathways Subscore X 0.30 plus
Waste Characteristics Subscore X 0.24 plus
Waste Management Subscore X 0.24)

WASTE DISPOSAL SITE AND SPILL AREA ASSESSMENT AND RATING FORM

Name of Site (15) sludge pit
Location Mac Dill
Owner/Operator Mac Dill
Comments Small pit near Gadsden Point; motorcyclist became mired in sludge.

RATING FACTOR	FACTOR RATING (0-3)	MULTIPLIER	FACTOR SCORE	MAXIMUM POSSIBLE SCORE
RECEPTORS				
Population Within 1,000 Feet	0	4	0	12
Distance to Nearest Drinking Water Well	0	15	0	45
Distance to Reservation Boundary	3	6	18	18
Land Use/Zoning	0	3	0	9
Critical Environments	2	12	24	36
Water Quality of Nearby Surface Water Body	1	6	6	18
Number of Assumed Values = 0 Out of 6		SUBTOTALS	48	138
Percentage of Assumed Values = 0 %		SUBSCORE		35
Number of Missing Values = 0 Out of 6		(Factor Score Divided by Maximum Score and Multiplied by 100)		
Percentage of Missing Values = 0 %				

PATHWAYS				
Evidence of Water Contamination	1	10	10	30
Level of Water Contamination	1	15	15	45
Type of Contamination, Soil/Biota	1	5	5	15
Distance to Nearest Surface Water	3	4	12	12
Depth to Groundwater	3	7	21	21
Net Precipitation	1	6	6	18
Soil Permeability	3	6	19	18
Bedrock Permeability	3	4	12	12
Depth to Bedrock	3	4	12	12
Surface Erosion	0	4	0	12
Number of Assumed Values = 0 Out of 10		SUBTOTALS	111	195
Percentage of Assumed Values = 0 %		SUBSCORE		57
Number of Missing Values = 0 Out of 10		(Factor Score Divided by Maximum Score and Multiplied by 100)		
Percentage of Missing Values = 0 %				

WASTE CHARACTERISTICS

Hazardous Rating: Judgemental rating from 30 to 100 points based on the following guidelines:

Points	
30	Closed domestic-type landfill, old site, no known hazardous wastes
40	Closed domestic-type landfill, recent site, no known hazardous wastes
50	Suspected small quantities of hazardous wastes
60	Known small quantities of hazardous wastes
70	Suspected moderate quantities of hazardous wastes
80	Known moderate quantites of hazardous wastes
90	Suspected large quantities of hazardous wastes
100	Known large quantities of hazardous wastes

SUBSCORE ~~60~~ 40

Reason for Assigned Hazardous Rating:

WASTE MANAGEMENT PRACTICES

RATING FACTOR	FACTOR RATING (0-3)	MULTIPLIER	FACTOR SCORE	MAXIMUM POSSIBLE SCORE
Record Accuracy and Ease of Access to Site	3	7	21	21
Hazardous Waste Quantity assume	0	7	0	21
Total Waste Quantity	0	4	0	12
Waste Incompatibility assume	0	3	0	9
Absence of Liners or Confining Beds	3	6	18	18
Use of Leachate Collection System N/A	—	6	—	—
Use of Gas Collection Systems N/A	—	2	—	—
Site Closure	2	8	16	24
Subsurface Flows	1	7	7	21

Number of Assumed Values = 2 Out of 9

Percentage of Assumed Values = 22 %

Number of Missing and Non-Applicable Values = 2 Out of 9

Percentage of Missing and Non-Applicalbe Values = 22 %

SUBTOTALS 62 ~~126~~

SUBSCORE 49

(Factor Score Divided by Maximum Score and Multiplied by 100)

Overall Number of Assumed Values = 2 Out of 25

Overall Percentage of Assumed Values = 8 %

OVERALL SCORE 46

(Receptors Subscore X 0.22 plus
Pathways Subscore X 0.30 plus
Waste Characteristics Subscore X 0.24 plus
Waste Management Subscore X 0.24)

WASTE DISPOSAL SITE AND SPILL AREA ASSESSMENT AND RATING FORM

Name of Site (16) Tank Farm
Location MacDill
Owner/Operator MacDill
Comments suspected saturation of ground w/ fuel

RATING FACTOR	FACTOR RATING (0-3)	MULTIPLIER	FACTOR SCORE	MAXIMUM POSSIBLE SCORE
RECEPTORS				
Population Within 1,000 Feet 14 homes	2	4	8	12
Distance to Nearest Drinking Water Well	0	15	0	45
Distance to Reservation Boundary	3	6	18	18
Land Use/Zoning	2	3	6	9
Critical Environments	2	12	24	36
Water Quality of Nearby Surface Water Body	2	6	12	18
Number of Assumed Values = 0 Out of 6		SUBTOTALS	68	138
Percentage of Assumed Values = 0 %		SUBSCORE		49
Number of Missing Values = 0 Out of 6		(Factor Score Divided by Maximum Score and Multiplied by 100)		
Percentage of Missing Values = 0 %				

PATHWAYS				
Evidence of Water Contamination	1	10	10	30
Level of Water Contamination	1	15	15	45
Type of Contamination, Soil/Biota	1	5	5	15
Distance to Nearest Surface Water	3	4	12	12
Depth to Groundwater	3	7	21	21
Net Precipitation	1	6	6	18
Soil Permeability	3	6	18	18
Bedrock Permeability	3	4	12	12
Depth to Bedrock	3	4	12	12
Surface Erosion	0	4	0	12
Number of Assumed Values = 0 Out of 10		SUBTOTALS	111	195
Percentage of Assumed Values = 0 %		SUBSCORE		57
Number of Missing Values = 0 Out of 10		(Factor Score Divided by Maximum Score and Multiplied by 100)		
Percentage of Missing Values = 0 %				

WASTE CHARACTERISTICS

Hazardous Rating: Judgemental rating from 30 to 100 points based on the following guidelines:

Points	
30	Closed domestic-type landfill, old site, no known hazardous wastes
40	Closed domestic-type landfill, recent site, no known hazardous wastes
50	Suspected small quantities of hazardous wastes
60	Known small quantities of hazardous wastes
70	Suspected moderate quantities of hazardous wastes
80	Known moderate quantites of hazardous wastes
90	Suspected large quantities of hazardous wastes
100	Known large quantities of hazardous wastes

SUBSCORE 50

Reason for Assigned Hazardous Rating:
possible buried Avgas sludge; evidence of fuel saturation reported during telephone company excavation.

WASTE MANAGEMENT PRACTICES

RATING FACTOR	FACTOR RATING (0-3)	MULTIPLIER	FACTOR SCORE	MAXIMUM POSSIBLE SCORE
Record Accuracy and Ease of Access to Site	2	7	14	21
Hazardous Waste Quantity 89 acres ± [redacted] 1" assumed	3	7	21	21
Total Waste Quantity	0	4	0	12
Waste Incompatibility assume	0	3	0	9
Absence of Liners or Confining Beds	3	6	18	18
Use of Leachate Collection System N/A	—	6	—	—
Use of Gas Collection Systems N/A	—	2	—	—
Site Closure	2	8	16	24
Subsurface Flows	3	7	21	21
		SUBTOTALS	90	126
		SUBSCORE		[redacted] 71

Number of Assumed Values = 2 Out of 9
Percentage of Assumed Values = 22%
Number of Missing and Non-Applicable Values = 2 Out of 9
Percentage of Missing and Non-Applicalbe Values = 22%

(Factor Score Divided by Maximum Score and Multiplied by 100)

Overall Number of Assumed Values = 2 Out of 25
Overall Percentage of Assumed Values = 8%

OVERALL SCORE 57

(Receptors Subscore X 0.22 plus
Pathways Subscore X 0.30 plus
Waste Characteristics Subscore X 0.24 plus
Waste Management Subscore X 0.24)

WASTE DISPOSAL SITE AND SPILL AREA ASSESSMENT AND RATING FORM

Name of Site (17) Drum storage

Location

Owner/Operator

Comments old laundry; former Argon sludge drying; paint and POL drum storage; PCB storage.

RATING FACTOR	FACTOR RATING (0-3)	MULTIPLIER	FACTOR SCORE	MAXIMUM POSSIBLE SCORE
RECEPTORS				
Population Within 1,000 Feet ±8 homes	1	4	4	12
Distance to Nearest Drinking Water Well	0	15	0	45
Distance to Reservation Boundary	3	6	18	18
Land Use/Zoning	2	3	6	9
Critical Environments	2	12	24	36
Water Quality of Nearby Surface Water Body	2	6	12	18
Number of Assumed Values = 0 Out of 6	SUBTOTALS		64	138
Percentage of Assumed Values = 0 %	SUBSCORE			46
Number of Missing Values = 0 Out of 6	(Factor Score Divided by Maximum Score and Multiplied by 100)			
Percentage of Missing Values = 0 %				

PATHWAYS				
Evidence of Water Contamination	0	10	0	30
Level of Water Contamination	0	15	0	45
Type of Contamination, Soil/Biota	1	5	5	15
Distance to Nearest Surface Water	1	4	4	12
Depth to Groundwater	3	7	21	21
Net Precipitation	1	6	6	18
Soil Permeability	3	6	18	18
Bedrock Permeability	3	4	12	12
Depth to Bedrock	3	4	12	12
Surface Erosion	0	4	0	12
Number of Assumed Values = 0 Out of 10	SUBTOTALS		78	195
Percentage of Assumed Values = 0 %	SUBSCORE			40
Number of Missing Values = 0 Out of 10	(Factor Score Divided by Maximum Score and Multiplied by 100)			
Percentage of Missing Values = 0 %				

WASTE CHARACTERISTICS

Hazardous Rating: Judgemental rating from 30 to 100 points based on the following guidelines:

Points	
30	Closed domestic-type landfill, old site, no known hazardous wastes
40	Closed domestic-type landfill, recent site, no known hazardous wastes
50	Suspected small quantities of hazardous wastes
60	Known small quantities of hazardous wastes
70	Suspected moderate quantities of hazardous wastes
80	Known moderate quantites of hazardous wastes
90	Suspected large quantities of hazardous wastes
100	Known large quantities of hazardous wastes

SUBSCORE 50

Reason for Assigned Hazardous Rating:

WASTE MANAGEMENT PRACTICES

RATING FACTOR	FACTOR RATING (0-3)	MULTIPLIER	FACTOR SCORE	MAXIMUM POSSIBLE SCORE
Record Accuracy and Ease of Access to Site	3	7	21	21
Hazardous Waste Quantity assumed	0	7	0	21
Total Waste Quantity	0	4	0	12
Waste Incompatibility assumed	0	3	0	9
Absence of Liners or Confining Beds . slab.	2	6	12	18
Use of Leachate Collection System N/A	—	6	—	—
Use of Gas Collection Systems N/A	—	2	—	—
Site Closure N/A	—	8	—	—
Subsurface Flows	1	7	7	21

Number of Assumed Values = 2 Out of 9

Percentage of Assumed Values = 22 %

Number of Missing and Non-Applicable Values = 3 Out of 9

Percentage of Missing and Non-Applicalbe Values = 33 %

SUBTOTALS 40 102

SUBSCORE 39

(Factor Score Divided by Maximum Score and Multiplied by 100)

Overall Number of Assumed Values = 2 Out of 25

Overall Percentage of Assumed Values = 8 %

OVERALL SCORE 43

(Receptors Subscore X 0.22 plus
Pathways Subscore X 0.30 plus
Waste Characteristics Subscore X 0.24 plus
Waste Management Subscore X 0.24)

WASTE DISPOSAL SITE AND SPILL AREA ASSESSMENT AND RATING FORM

Name of Site (18) Former chemical agent storage
Location MacDill
Owner/Operator MacDill
Comments Presently Readiness Command Area

RATING FACTOR	FACTOR RATING (0-3)	MULTIPLIER	FACTOR SCORE	MAXIMUM POSSIBLE SCORE
RECEPTORS				
Population Within 1,000 Feet	0	4	0	12
Distance to Nearest Drinking Water Well	0	15	0	45
Distance to Reservation Boundary	2	6	12	18
Land Use/Zoning	2	3	6	9
Critical Environments	2	12	24	36
Water Quality of Nearby Surface Water Body	2	6	12	18
Number of Assumed Values = 0 Out of 6		SUBTOTALS	54	138
Percentage of Assumed Values = 0 %		SUBSCORE		39
Number of Missing Values = 0 Out of 6		(Factor Score Divided by Maximum Score and Multiplied by 100)		
Percentage of Missing Values = 0 %				

PATHWAYS				
Evidence of Water Contamination	0	10	0	30
Level of Water Contamination	0	15	0	45
Type of Contamination, Soil/Biota	~~0~~ 1	5	~~0~~ 5	15
Distance to Nearest Surface Water	3	4	12	12
Depth to Groundwater	3	7	21	21
Net Precipitation	1	6	6	18
Soil Permeability	3	6	18	18
Bedrock Permeability	3	4	12	12
Depth to Bedrock	3	4	12	12
Surface Erosion	0	4	0	12
Number of Assumed Values = 0 Out of 10		SUBTOTALS	86	195
Percentage of Assumed Values = 0 %		SUBSCORE		44
Number of Missing Values = 0 Out of 10		(Factor Score Divided by Maximum Score and Multiplied by 100)		
Percentage of Missing Values = 0 %				

WASTE CHARACTERISTICS

Hazardous Rating: Judgemental rating from 30 to 100 points based on the following guidelines:

Points	
30	Closed domestic-type landfill, old site, no known hazardous wastes
40	Closed domestic-type landfill, recent site, no known hazardous wastes
50	Suspected small quantities of hazardous wastes
60	Known small quantities of hazardous wastes
70	Suspected moderate quantities of hazardous wastes
80	Known moderate quantites of hazardous wastes
90	Suspected large quantities of hazardous wastes
100	Known large quantities of hazardous wastes

SUBSCORE 30

Reason for Assigned Hazardous Rating:

No direct reports or suspected burial of chemicals

WASTE MANAGEMENT PRACTICES

RATING FACTOR	FACTOR RATING (0-3)	MULTIPLIER	FACTOR SCORE	MAXIMUM POSSIBLE SCORE
Record Accuracy and Ease of Access to Site	3	7	21	21
Hazardous Waste Quantity assumed	0	7	0	21
Total Waste Quantity	0	4	0	12
Waste Incompatibility assumed	1	3	3	9
Absence of Liners or Confining Beds	3	6	18	18
Use of Leachate Collection System N/A	—	6	—	—
Use of Gas Collection Systems N/A	—	2	—	—
Site Closure	2	8	16	24
Subsurface Flows	1	7	7	21
		SUBTOTALS	65	126
		SUBSCORE		52

Number of Assumed Values = 2 Out of 9

Percentage of Assumed Values = 22%

Number of Missing and Non-Applicable Values = 2 Out of 9

Percentage of Missing and Non-Applicalbe Values = 22%

(Factor Score Divided by Maximum Score and Multiplied by 100)

Overall Number of Assumed Values = 2 Out of 25

Overall Percentage of Assumed Values = 8%

OVERALL SCORE 41

(Receptors Subscore X 0.22 plus
Pathways Subscore X 0.30 plus
Waste Characteristics Subscore x 0.24 plus
Waste Management Subscore X 0.24)

WASTE DISPOSAL SITE AND SPILL AREA ASSESSMENT AND RATING FORM

Name of Site (19) Fuel pump stations
Location MacDill
Owner/Operator MacDill
Comments Four pump stations located near Flight Line

RATING FACTOR	FACTOR RATING (0-3)	MULTIPLIER	FACTOR SCORE	MAXIMUM POSSIBLE SCORE
RECEPTORS				
Population Within 1,000 Feet	0	4	0	12
Distance to Nearest Drinking Water Well	0	15	0	45
Distance to Reservation Boundary	2	6	12	18
Land Use/Zoning	2	3	6	9
Critical Environments	0	12	0	36
Water Quality of Nearby Surface Water Body	1	6	6	18
Number of Assumed Values = 0 Out of 6		SUBTOTALS	24	138
Percentage of Assumed Values = 0 %		SUBSCORE		17
Number of Missing Values = 0 Out of 6		(Factor Score Divided by Maximum Score and Multiplied by 100)		
Percentage of Missing Values = 0 %				

PATHWAYS				
Evidence of Water Contamination	0	10	0	30
Level of Water Contamination	1	15	15	45
Type of Contamination, Soil/Biota	1	5	5	15
Distance to Nearest Surface Water	2	4	8	12
Depth to Groundwater	3	7	21	21
Net Precipitation	1	6	6	18
Soil Permeability	3	6	18	18
Bedrock Permeability	3	4	12	12
Depth to Bedrock	3	4	12	12
Surface Erosion	0	4	0	[illegible]
Number of Assumed Values = 0 Out of 10		SUBTOTALS	97	[illegible]
Percentage of Assumed Values = 0 %		SUBSCORE		[illegible]
Number of Missing Values = 0 Out of 10		(Factor Score Divided by Maximum Score and Multiplied by 100)		
Percentage of Missing Values = 0 %				

AD-A118 359 CH2M HILL GAINESVILLE FL F/G 13/2
INSTALLATION RESTORATION PROGRAM RECORDS SEARCH FOR MACDILL AIR--ETC(U)
JUN 82 F08637-80-G-0010
UNCLASSIFIED NL

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WASTE CHARACTERISTICS

Hazardous Rating: Judgemental rating from 30 to 100 points based on the following guidelines:

Points	
30	Closed domestic-type landfill, old site, no known hazardous wastes
40	Closed domestic-type landfill, recent site, no known hazardous wastes
50	Suspected small quantities of hazardous wastes
60	Known small quantities of hazardous wastes
70	Suspected moderate quantities of hazardous wastes
80	Known moderate quantites of hazardous wastes
90	Suspected large quantities of hazardous wastes
100	Known large quantities of hazardous wastes

SUBSCORE 30

Reason for Assigned Hazardous Rating:
PCB transformer leaks observed restricted to bldg.
Fuel tank or line leaks suspected.

WASTE MANAGEMENT PRACTICES

RATING FACTOR	FACTOR RATING (0-3)	MULTIPLIER	FACTOR SCORE	MAXIMUM POSSIBLE SCORE
Record Accuracy and Ease of Access to Site	3	7	23	21
Hazardous Waste Quantity assumed	0	7	0	21
Total Waste Quantity	0	4	0	12
Waste Incompatibility	0	3	0	9
Absence of Liners or Confining Beds	3	6	18	18
Use of Leachate Collection System N/A	—	6	—	—
Use of Gas Collection Systems N/A	—	2	—	—
Site Closure N/A	—	8	—	—
Subsurface Flows	0	7	0	21
		SUBTOTALS	59	102
		SUBSCORE		58

Number of Assumed Values = 1 Out of 9
Percentage of Assumed Values = 11%
Number of Missing and Non-Applicable Values = 3 Out of 9
Percentage of Missing and Non-Applicalbe Values = 33%

(Factor Score Divided by Maximum Score and Multiplied by 100)

Overall Number of Assumed Values = 1 Out of 25
Overall Percentage of Assumed Values = 4%

OVERALL SCORE 40

(Receptors Subscore X 0.22 plus
Pathways Subscore X 0.30 plus
Waste Characteristics Subscore X 0.24 plus
Waste Management Subscore X 0.24)

WASTE DISPOSAL SITE AND SPILL AREA ASSESSMENT AND RATING FORM

Name of Site (20) Former Paint Storage
Location Mac Dill
Owner/Operator Mac Dill
Comments paint-saturation of ground reported

RATING FACTOR	FACTOR RATING (0-3)	MULTIPLIER	FACTOR SCORE	MAXIMUM POSSIBLE SCORE
RECEPTORS				
Population Within 1,000 Feet	0	4	0	12
Distance to Nearest Drinking Water Well	0	15	0	45
Distance to Reservation Boundary	2	6	12	18
Land Use/Zoning	2	3	6	9
Critical Environments	0	12	0	36
Water Quality of Nearby Surface Water Body	1	6	6	18
Number of Assumed Values = 0 Out of 6		SUBTOTALS	24	138
Percentage of Assumed Values = 0 %		SUBSCORE		17
Number of Missing Values = 0 Out of 6		(Factor Score Divided by Maximum Score and Multiplied by 100)		
Percentage of Missing Values = 0 %				

PATHWAYS				
Evidence of Water Contamination	1	10	10	30
Level of Water Contamination	1	15	15	45
Type of Contamination, Soil/Biota	1	5	5	15
Distance to Nearest Surface Water	1	4	4	12
Depth to Groundwater	3	7	21	21
Net Precipitation	1	6	6	18
Soil Permeability	3	6	18	18
Bedrock Permeability	3	4	12	12
Depth to Bedrock	3	4	12	12
Surface Erosion	0	4	0	12
Number of Assumed Values = 0 Out of 10		SUBTOTALS	102	195
Percentage of Assumed Values = 0 %		SUBSCORE		53
Number of Missing Values = 0 Out of 10		(Factor Score Divided by Maximum Score and Multiplied by 100)		
Percentage of Missing Values = 0 %				

WASTE CHARACTERISTICS

Hazardous Rating: Judgemental rating from 30 to 100 points based on the following guidelines:

Points	
30	Closed domestic-type landfill, old site, no known hazardous wastes
40	Closed domestic-type landfill, recent site, no known hazardous wastes
50	Suspected small quantities of hazardous wastes
60	Known small quantities of hazardous wastes
70	Suspected moderate quantities of hazardous wastes
80	Known moderate quantites of hazardous wastes
90	Suspected large quantities of hazardous wastes
100	Known large quantities of hazardous wastes

SUBSCORE 30

Reason for Assigned Hazardous Rating:
No substantiation of reported paint saturation

WASTE MANAGEMENT PRACTICES

RATING FACTOR	FACTOR RATING (0-3)	MULTIPLIER	FACTOR SCORE	MAXIMUM POSSIBLE SCORE
Record Accuracy and Ease of Access to Site	3	7	21	21
Hazardous Waste Quantity	0	7	0	21
Total Waste Quantity	0	4	0	12
Waste Incompatibility	0	3	0	9
Absence of Liners or Confining Beds	3	6	18	18
Use of Leachate Collection System N/A	–	6	–	–
Use of Gas Collection Systems N/A	–	2	–	–
Site Closure	2	8	16	24
Subsurface Flows	1	7	7	21

Number of Assumed Values = 0 Out of 9
Percentage of Assumed Values = 0 %
Number of Missing and Non-Applicable Values = 2 Out of 9
Percentage of Missing and Non-Applicalbe Values = 22 %

SUBTOTALS 62 124
SUBSCORE 49
(Factor Score Divided by Maximum Score and Multiplied by 100)

Overall Number of Assumed Values = 0 Out of 25
Overall Percentage of Assumed Values = 0 %

OVERALL SCORE 39

(Receptors Subscore X 0.22 plus
Pathways Subscore X 0.30 plus
Waste Characteristics Subscore X 0.24 plus
Waste Management Subscore X 0.24)

WASTE DISPOSAL SITE AND SPILL AREA ASSESSMENT AND RATING FORM

Name of Site (21) Old refuel area / current CE storage
Location Mac Dill
Owner/Operator Mac Dill
Comments possible fuel-stabilized ground

RATING FACTOR	FACTOR RATING (0-3)	MULTIPLIER	FACTOR SCORE	MAXIMUM POSSIBLE SCORE
RECEPTORS				
Population Within 1,000 Feet	0	4	0	12
Distance to Nearest Drinking Water Well	0	15	0	45
Distance to Reservation Boundary	2	6	12	18
Land Use/Zoning	2	3	6	9
Critical Environments	0	12	0	36
Water Quality of Nearby Surface Water Body	1	6	6	18
Number of Assumed Values = 0 Out of 6		SUBTOTALS	24	138
Percentage of Assumed Values = 0 %		SUBSCORE		17
Number of Missing Values = 0 Out of 6		(Factor Score Divided by Maximum Score and Multiplied by 100)		
Percentage of Missing Values = 0 %				

PATHWAYS				
Evidence of Water Contamination	0	10	0	30
Level of Water Contamination	0	15	0	45
Type of Contamination, Soil/Biota	1	5	5	15
Distance to Nearest Surface Water	2	4	8	12
Depth to Groundwater	3	7	21	21
Net Precipitation	1	6	6	18
Soil Permeability	3	6	18	18
Bedrock Permeability	3	4	12	12
Depth to Bedrock	3	4	12	12
Surface Erosion	0	4	0	12
Number of Assumed Values = 0 Out of 10		SUBTOTALS	82	195
Percentage of Assumed Values = 0 %		SUBSCORE		42
Number of Missing Values = 0 Out of 10		(Factor Score Divided by Maximum Score and Multiplied by 100)		
Percentage of Missing Values = 0 %				

WASTE CHARACTERISTICS

Hazardous Rating: Judgemental rating from 30 to 100 points based on the following guidelines:

Points	
30	Closed domestic-type landfill, old site, no known hazardous wastes
40	Closed domestic-type landfill, recent site, no known hazardous wastes
50	Suspected small quantities of hazardous wastes
60	Known small quantities of hazardous wastes
70	Suspected moderate quantities of hazardous wastes
80	Known moderate quantites of hazardous wastes
90	Suspected large quantities of hazardous wastes
100	Known large quantities of hazardous wastes

SUBSCORE 50

Reason for Assigned Hazardous Rating:
possible fuel-saturation

WASTE MANAGEMENT PRACTICES

RATING FACTOR		FACTOR RATING (0-3)	MULTIPLIER	FACTOR SCORE	MAXIMUM POSSIBLE SCORE
Record Accuracy and Ease of Access to Site		3	7	21	21
Hazardous Waste Quantity	assumed	0	7	0	21
Total Waste Quantity		0	4	0	12
Waste Incompatibility	assumed	0	3	0	9
Absence of Liners or Confining Beds		3	6	18	18
Use of Leachate Collection System	N/A	—	6	—	—
Use of Gas Collection Systems	N/A	—	2	—	—
Site Closure	N/A	—	8	—	—
Subsurface Flows		1	7	7	21

Number of Assumed Values = 2 Out of 9
Percentage of Assumed Values = 22%
Number of Missing and Non-Applicable Values = 3 Out of 9
Percentage of Missing and Non-Applicalbe Values = 33%

SUBTOTALS 46 102
SUBSCORE 45
(Factor Score Divided by Maximum Score and Multiplied by 100)

Overall Number of Assumed Values = 2 Out of 25
Overall Percentage of Assumed Values = 8%

OVERALL SCORE 39
(Receptors Subscore X 0.22 plus
Pathways Subscore X 0.30 plus
Waste Characteristics Subscore X 0.24 plus
Waste Management Subscore X 0.24)

WASTE DISPOSAL SITE AND SPILL AREA ASSESSMENT AND RATING FORM

Name of Site (22) Bladder storage - earth berm
Location MacDill
Owner/Operator MacDill
Comments JP-4 spill

RATING FACTOR	FACTOR RATING (0-3)	MULTIPLIER	FACTOR SCORE	MAXIMUM POSSIBLE SCORE
RECEPTORS				
Population Within 1,000 Feet	0	4	0	12
Distance to Nearest Drinking Water Well	0	15	0	45
Distance to Reservation Boundary	2	6	12	18
Land Use/Zoning	2	3	6	9
Critical Environments	0	12	0	36
Water Quality of Nearby Surface Water Body	1	6	6	18
Number of Assumed Values = 0 Out of 6		SUBTOTALS	24	138
Percentage of Assumed Values = 0 %		SUBSCORE		17
Number of Missing Values = 0 Out of 6		(Factor Score Divided by Maximum Score and Multiplied by 100)		
Percentage of Missing Values = 0 %				

PATHWAYS				
Evidence of Water Contamination	1	10	10	30
Level of Water Contamination	1	15	15	45
Type of Contamination, Soil/Biota	1	5	5	15
Distance to Nearest Surface Water	2	4	8	12
Depth to Groundwater	3	7	21	21
Net Precipitation	1	6	6	18
Soil Permeability	3	6	18	18
Bedrock Permeability	3	4	12	12
Depth to Bedrock	3	4	12	12
Surface Erosion	0	4	0	12
Number of Assumed Values = 0 Out of 10		SUBTOTALS	107	195
Percentage of Assumed Values = 0 %		SUBSCORE		55
Number of Missing Values = 0 Out of 10		(Factor Score Divided by Maximum Score and Multiplied by 100)		
Percentage of Missing Values = 0 %				

WASTE CHARACTERISTICS

Hazardous Rating: Judgemental rating from 30 to 100 points based on the following guidelines:

Points	
30	Closed domestic-type landfill, old site, no known hazardous wastes
40	Closed domestic-type landfill, recent site, no known hazardous wastes
50	Suspected small quantities of hazardous wastes
60	Known small quantities of hazardous wastes
70	Suspected moderate quantities of hazardous wastes
80	Known moderate quantites of hazardous wastes
90	Suspected large quantities of hazardous wastes
100	Known large quantities of hazardous wastes

SUBSCORE 50

Reason for Assigned Hazardous Rating:

WASTE MANAGEMENT PRACTICES

RATING FACTOR	FACTOR RATING (0-3)	MULTIPLIER	FACTOR SCORE	MAXIMUM POSSIBLE SCORE
Record Accuracy and Ease of Access to Site	2	7	14	21
Hazardous Waste Quantity 1000-gal spill	0	7	0	21
Total Waste Quantity	0	4	0	12
Waste Incompatibility assume	0	3	0	9
Absence of Liners or Confining Beds	3	6	18	18
Use of Leachate Collection System N/A	—	6	—	—
Use of Gas Collection Systems N/A	—	2	—	—
Site Closure N/A	—	8	—	—
Subsurface Flows	1	7	7	21

Number of Assumed Values = 0 Out of 9

Percentage of Assumed Values = 11%

Number of Missing and Non-Applicable Values = 3 Out of 9

Percentage of Missing and Non-Applicalbe Values = 33%

SUBTOTALS 39 102

SUBSCORE 38

(Factor Score Divided by Maximum Score and Multiplied by 100)

Overall Number of Assumed Values = 1 Out of 25

Overall Percentage of Assumed Values = 4%

OVERALL SCORE 41

(Receptors Subscore X 0.22 plus
Pathways Subscore X 0.30 plus
Waste Characteristics Subscore X 0.24 plus
Waste Management Subscore X 0.24)

WASTE DISPOSAL SITE AND SPILL AREA ASSESSMENT AND RATING FORM

Name of Site (23) Fire Training Area
Location MacDill AFB
Owner/Operator MacDill AFB
Comments since 1955

RATING FACTOR	FACTOR RATING (0-3)	MULTIPLIER	FACTOR SCORE	MAXIMUM POSSIBLE SCORE
RECEPTORS				
Population Within 1,000 Feet	0	4	0	12
Distance to Nearest Drinking Water Well	0	15	0	45
Distance to Reservation Boundary	2	6	12	18
Land Use/Zoning	0	3	0	9
Critical Environments	0	12	0	36
Water Quality of Nearby Surface Water Body	2	6	12	18
Number of Assumed Values = 0 Out of 6		SUBTOTALS	24	138
Percentage of Assumed Values = 0 %		SUBSCORE		17
Number of Missing Values = 0 Out of 6		(Factor Score Divided by Maximum Score and Multiplied by 100)		
Percentage of Missing Values = 0 %				

PATHWAYS				
Evidence of Water Contamination	0	10	0	30
Level of Water Contamination	0	15	0	45
Type of Contamination, Soil/Biota	0	5	0	15
Distance to Nearest Surface Water	2	4	8	12
Depth to Groundwater	3	7	21	21
Net Precipitation	1	6	6	18
Soil Permeability	3	6	18	18
Bedrock Permeability	3	4	12	12
Depth to Bedrock	3	4	12	12
Surface Erosion	0	4	0	12
Number of Assumed Values = 0 Out of 10		SUBTOTALS	77	195
Percentage of Assumed Values = 0 %		SUBSCORE		39
Number of Missing Values = 0 Out of 10		(Factor Score Divided by Maximum Score and Multiplied by 100)		
Percentage of Missing Values = 0 %				

WASTE CHARACTERISTICS

Hazardous Rating: Judgemental rating from 30 to 100 points based on the following guidelines:

Points	
30	Closed domestic-type landfill, old site, no known hazardous wastes
40	Closed domestic-type landfill, recent site, no known hazardous wastes
50	Suspected small quantities of hazardous wastes
60	Known small quantities of hazardous wastes
70	Suspected moderate quantities of hazardous wastes
80	Known moderate quantites of hazardous wastes
90	Suspected large quantities of hazardous wastes
100	Known large quantities of hazardous wastes

SUBSCORE 50

Reason for Assigned Hazardous Rating:
Wastes consumed during exercises; suspected percolation of waste / POL from past disposal practices.

WASTE MANAGEMENT PRACTICES

RATING FACTOR	FACTOR RATING (0-3)	MULTIPLIER	FACTOR SCORE	MAXIMUM POSSIBLE SCORE
Record Accuracy and Ease of Access to Site	2	7	14	21
Hazardous Waste Quantity	0	7	0	21
Total Waste Quantity	0	4	0	12
Waste Incompatibility	0	3	0	9
Absence of Liners or Confining Beds	3	6	18	18
Use of Leachate Collection System N/A	—	6	—	—
Use of Gas Collection Systems N/A	—	2	—	—
Site Closure N/A	—	8	—	—
Subsurface Flows	0	7	0	21
		SUBTOTALS	32	102
		SUBSCORE		31

Number of Assumed Values = 0 Out of 9
Percentage of Assumed Values = 0%
Number of Missing and Non-Applicable Values = 3 Out of 9
Percentage of Missing and Non-Applicalbe Values = 33%

(Factor Score Divided by Maximum Score and Multiplied by 100)

Overall Number of Assumed Values = 0 Out of 25
Overall Percentage of Assumed Values = 0%

OVERALL SCORE 35

(Receptors Subscore X 0.22 plus
Pathways Subscore X 0.30 plus
Waste Characteristics Subscore X 0.24 plus
Waste Management Subscore X 0.24)

INSTALLATION RESTORATION
PROGRAM RECORDS SEARCH

HAZARD ASSESSMENT RATING METHODOLOGY FOR MACDILL AIR FORCE BASE, FLORIDA

Prepared for

Air Force Engineering and Services Center
Directorate of Environmental Planning
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Appendix I
NEW HAZARDOUS 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.

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

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

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

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

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

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

SITE RATING
METHODOLOGY FLOW CHART

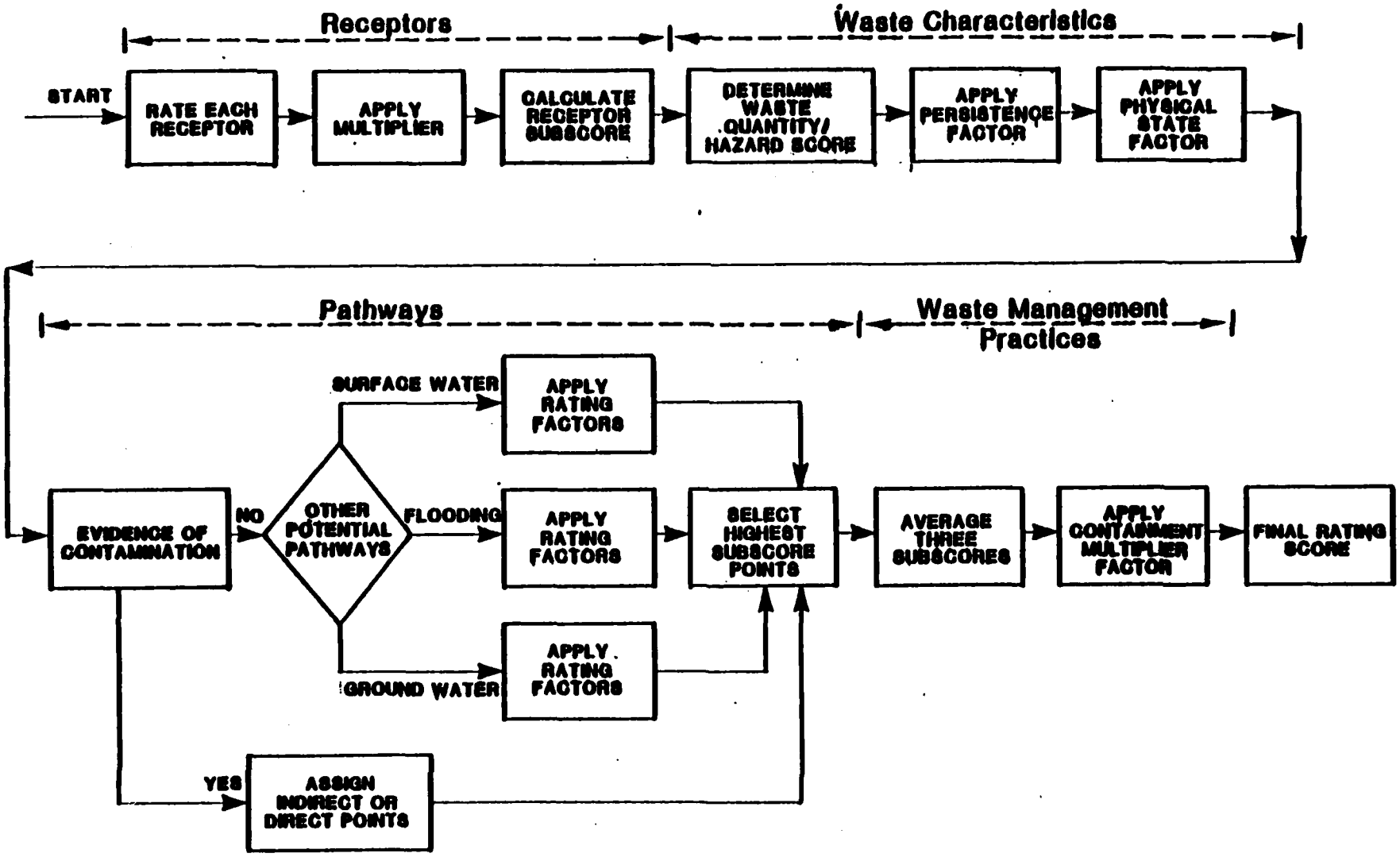

FIGURE 1

FIGURE 2

HAZARDOUS ASSESSMENT RATING FORM

NAME OF SITE _____

LOCATION _____

DATE OF OPERATION OR OCCURRENCE _____

OWNER/OPERATOR _____

COMMENTS/DESCRIPTION _____

SITE RATED BY _____

I. RECEPTORS

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

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

II. WASTE CHARACTERISTICS

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

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

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

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

_____ X _____ = _____

C. Apply physical state multiplier

Subscore B X Physical State Multiplier = Waste Characteristics Subscore

_____ X _____ = _____

III. PATHWAYS

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

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

Subscore _____

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

1. Surface water migration

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

Flooding		1		

Subscore (100 x factor score/3) _____

3. Ground-water migration

Depth to ground water		8		
Net precipitation		6		
Soil permeability		8		
Subsurface flows		8		
Direct access to ground water		8		
		Subtotals	_____	_____

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

C. Highest pathway subscore.

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

Pathways Subscore _____

IV. WASTE MANAGEMENT PRACTICES

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

Receptors _____
Waste Characteristics _____
Pathways _____

Total _____ divided by 3 = _____
Gross Total Score

B. Apply factor for waste containment from waste management practices

Gross Total Score X Waste Management Practices Factor = Final Score

_____ X _____ = [ ]

TABLE 1

HAZARDOUS ASSESSMENT RATING METHODOLOGY GUIDELINES

I. RECEPTORS CATEGORY

Rating Factors	Rating Scale Levels 0	1	2	3	Multiplier
A. Population within 1,000 feet (includes on-base facilities)	0	1 - 25	26 - 100	Greater than 100	4
B. Distance to nearest water well	Greater than 3 miles	1 to 3 miles	3,001 feet to 1 mile	0 to 3,000 feet	10
C. Distance to installation boundary	Greater than 2 miles	1 to 2 miles	1,001 feet to 1 mile	0 to 1,000 feet	3
D. Land Use/Zoning (within 1 mile radius)	Completely remote (zoning not applicable)	Agricultural	Commercial or industrial	Residential	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)

HAZARDOUS ASSESSMENT RATING METHODOLOGY GUIDELINES (Cont'd)

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)

HAZARDOUS ASSESSMENT RATING METHODOLOGY GUIDELINES (Cont'd)

II. WASTE CHARACTERISTICS (Continued)

Waste Characteristics Matrix

Point Rating	Hazardous Waste Quantity	Confidence Level of Information	Hazard Rating
100	L	C	H
80	L	C	M
	M	C	H
70	L	S	H
60	S	C	H
	M	C	M
50	L	S	M
	L	C	L
	M	S	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 + SCM = 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)

HAZARDOUS ASSESSMENT RATING METHODOLOGY GUIDELINES (Cont'd)

III. PATHWAYS CATEGORY

A. Evidence of Contamination

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

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

B-1 POTENTIAL FOR SURFACE WATER CONTAMINATION

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

B-2 POTENTIAL FOR FLOODING

Floodplain	Beyond 100-year floodplain	In 25-year floodplain	In 10-year floodplain	Floods annually	1

B-3 POTENTIAL FOR GROUND-WATER CONTAMINATION

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

TABLE 1 (Continued)

HAZARDOUS ASSESSMENT RATING METHODOLOGY GUIDELINES (Cont'd)

IV. WASTE MANAGEMENT PRACTICES CATEGORY

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

B. WASTE MANAGEMENT PRACTICES FACTOR

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

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

Guidelines for fully contained:

Landfills:

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

Surface Impoundments:

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

Spills:

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

Fire Protection Training Areas:

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

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

Appendix J
NEW SITE RATING FORMS

Table 1
SUMMARY OF RESULTS OF SITE ASSESSMENTS

Site No.	Site Description	Subscores (% of Maximum Possible Score in Each Category) Receptors	Pathways	Waste Characteristics	Overall Score (Sum of Subscores/3)
3	Landfill at Dog Kennel	43	69	70	61
5	Landfill at CE Washrack	36	69	50	52
6	EOD East Landfill	36	69	50	52
7	EOD West Landfill	36	69	50	52
8	West Landfill	36	69	70	58
9	Current Landfill	36	69	70	58
11	Chemical Munitions Burial Site	39	69	80	63
13	Creosote Pit	31	69	50	50
16	Fuel Tank Farm	47	87	80	71
17	AVGAS Sludge Weathering	45	69	45	53
21	Old Refueling Area	25	69	40	45
22	Earth Berm (Fuel Bladders)	25	69	48	47
23	Fire Department Training Area	25	60	80	55

HAZARDOUS ASSESSMENT RATING FORM

NAME OF SITE: No. 3, Landfill at Dog Kennel

LOCATION: MacDill AFB

DATE OF OPERATION OR OCCURRENCE: 1950 to 1959

OWNER/OPERATOR: MacDill AFB

COMMENTS/DESCRIPTION: May have received waste oils and solvents

SITE RATED BY: G. McIntyre

I. RECEPTORS

	Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
A.	Population within 1,000 feet of site	0	4	0	12
B.	Distance to nearest well	0	10	0	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	2	10	30	30
F.	Water quality of nearest surface-water body	2	6	12	18
G.	Ground-water use of uppermost aquifer	1	9	9	27
H.	Population served by surface-water supply within 3 miles downstream of site	0	6	0	18
I.	Population served by ground-water supply within 3 miles of site	2	6	12	18
			Subtotals	78	180

Receptors subscore (100 x factor score subtotal/maximum subtotal) 43

II. WASTE CHARACTERISTICS

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

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

2. Confidence level (C = confirmed, S = suspected) S

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

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

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III. PATHWAYS

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
A. If there is evidence of migration of hazardous contaminants, assign maximum factor subscore of 100 points for direct evidence or 80 points for indirect evidence. If direct evidence exists then proceed to C. If no evidence or indirect evidence exists, proceed to B.				
			Subscore	--
B. Rate the migration potential for three potential pathways: surface-water migration, flooding, and ground-water migration. Select the highest rating, and proceed to C.				
1. Surface-water migration				
Distance to nearest surface water	3	8	24	24
Net precipitation	1	6	6	18
Surface erosion	0	8	0	24
Surface permeability	0	6	0	18
Rainfall intensity	3	8	24	24
		Subtotals	54	108
Subscore (100 x factor score subtotal/maximum score subtotal)				50
2. Flooding	30	1	30	100
	Subscore (100 x factor score/3)			30
3. Ground-water migration				
Depth to ground water	3	8	24	24
Net precipitation	1	6	6	18
Soil permeability	3	8	24	24
Subsurface flows	1	8	8	24
Direct access to ground water	N/A	8	--	--
		Subtotals	62	90
Subscore (100 x factor score subtotal/maximum score subtotal)				69

C. Highest pathway subscore

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

Pathways Subscore 69

IV. WASTE MANAGEMENT PRACTICES

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

Receptors	43
Waste Characteristics	70
Pathways	69
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

HAZARDOUS ASSESSMENT RATING FORM

NAME OF SITE: No. 5, 6, and 7, Landfills Near EOD Disposal Area

LOCATION: MacDill AFB

DATE OF OPERATION OR OCCURRENCE: No. 5, 1959 to 1962, No. 6, 1962 to 1963, No. 7, 1963 to 1965

OWNER/OPERATOR: MacDill AFB

COMMENTS/DESCRIPTION: Burning and burial of general refusé, possibly waste solvents

SITE RATED BY: G. McIntyre

I. RECEPTORS

	Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
A.	Population within 1,000 feet of site	0	4	0	12
B.	Distance to nearest well	0	10	0	30
C.	Land use/zoning within 1 mile radius	0	3	0	9
D.	Distance to reservation boundary	2	6	12	18
E.	Critical environments within 1 mile radius of site	2	10	20	30
F.	Water quality of nearest surface-water body	2	6	12	18
G.	Ground-water use of uppermost aquifer	1	9	9	27
H.	Population served by surface-water supply within 3 miles downstream of site	0	6	0	18
I.	Population served by ground-water supply within 3 miles of site	2	6	12	18
			Subtotals	65	180

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

II. WASTE CHARACTERISTICS

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

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

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

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

50 x 1.0 = 50

C. Apply physical state multiplier

Subscore B x Physical State Multiplier = Waste Characteristics Subscore

50 x 1.0 = 50

III. PATHWAYS

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
A. If there is evidence of migration of hazardous contaminants, assign maximum factor subscore of 100 points for direct evidence or 80 points for indirect evidence. If direct evidence exists then proceed to C. If no evidence or indirect evidence exists, proceed to B.				
			Subscore	--
B. Rate the migration potential for three potential pathways: surface-water migration, flooding, and ground-water migration. Select the highest rating, and proceed to C.				
1. Surface-water migration				
Distance to nearest surface water	3	8	24	24
Net precipitation	1	6	6	18
Surface erosion	0	8	0	24
Surface permeability	0	6	0	18
Rainfall intensity	3	8	24	24
		Subtotals	54	108
Subscore (100 x factor score subtotal/maximum score subtotal)				50
2. Flooding	30	1	30	100
	Subscore (100 x factor score/3)			30
3. Ground-water migration				
Depth to ground water	3	8	24	24
Net precipitation	1	6	6	18
Soil permeability	3	8	24	24
Subsurface flows	1	8	8	24
Direct access to ground water	N/A	8	--	--
		Subtotals	62	90
Subscore (100 x factor score subtotal/maximum score subtotal)				69

C. Highest pathway subscore

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

Pathways Subscore 69

IV. WASTE MANAGEMENT PRACTICES

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

Receptors	36
Waste Characteristics	50
Pathways	69
Total 155 divided by 3 =	52
	Gross Total Sc

B. Apply factor for waste containment from waste management practices

Gross Total Score x Waste Management Practices Factor = Final Score

52 x 1.0 = 52

HAZARDOUS ASSESSMENT RATING FORM

NAME OF SITE: No. 8, West Landfill

LOCATION: MacDill AFB

DATE OF OPERATION OR OCCURRENCE: 1965 to 1973

OWNER/OPERATOR: MacDill AFB

COMMENTS/DESCRIPTION: May have received waste oils and solvents

SITE RATED BY: G. McIntyre

I. RECEPTORS

	Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
A.	Population within 1,000 feet of site	0	4	0	12
B.	Distance to nearest well	0	10	0	30
C.	Land use/zoning within 1 mile radius	0	3	0	9
D.	Distance to reservation boundary	2	6	12	18
E.	Critical environments within 1 mile radius of site	2	10	20	30
F.	Water quality of nearest surface-water body	2	6	12	18
G.	Ground-water use of uppermost aquifer	1	9	9	27
H.	Population served by surface-water supply within 3 miles downstream of site	0	6	0	18
I.	Population served by ground-water supply within 3 miles of site	2	6	12	18
			Subtotals	65	180

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

II. WASTE CHARACTERISTICS

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

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

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

III. PATHWAYS

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
A. If there is evidence of migration of hazardous contaminants, assign maximum factor subscore of 100 points for direct evidence or 80 points for indirect evidence. If direct evidence exists then proceed to C. If no evidence or indirect evidence exists, proceed to B.				
			Subscore	--
B. Rate the migration potential for three potential pathways: surface-water migration, flooding, and ground-water migration. Select the highest rating, and proceed to C.				
1. Surface-water migration				
Distance to nearest surface water	3	8	24	24
Net precipitation	1	6	6	18
Surface erosion	0	8	0	24
Surface permeability	0	6	0	18
Rainfall intensity	3	8	24	24
		Subtotals	54	108
Subscore (100 x factor score subtotal/maximum score subtotal)				50
2. Flooding	30	1	30	100
	Subscore (100 x factor score/3)			30
3. Ground-water migration				
Depth to ground water	3	8	24	24
Net precipitation	1	6	6	18
Soil permeability	3	8	24	24
Subsurface flows	1	8	8	24
Direct access to ground water	N/A	8	--	--
		Subtotals	52	90
Subscore (100 x factor score subtotal/maximum score subtotal)				69

C. Highest pathway subscore

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

Pathways Subscore 69

IV. WASTE MANAGEMENT PRACTICES

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

Receptors	36
Waste Characteristics	70
Pathways	69
Total 175 divided by 3 =	58
	Gross Total Sc

B. Apply factor for waste containment from waste management practices

Gross Total Score x Waste Management Practices Factor = Final Score

58 x 1.0 = 58

III. PATHWAYS

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
A. If there is evidence of migration of hazardous contaminants, assign maximum factor subscore of 100 points for direct evidence or 80 points for indirect evidence. If direct evidence exists then proceed to C. If no evidence or indirect evidence exists, proceed to B.				
			Subscore	--
B. Rate the migration potential for three potential pathways: surface-water migration, flooding, and ground-water migration. Select the highest rating, and proceed to C.				
1. Surface-water migration				
Distance to nearest surface water	3	8	24	24
Net precipitation	1	6	6	18
Surface erosion	0	8	0	24
Surface permeability	0	6	0	18
Rainfall intensity	3	8	24	24
		Subtotals	54	108
Subscore (100 x factor score subtotal/maximum score subtotal)				50
2. Flooding	30	1	30	100
	Subscore (100 x factor score/3)			30
3. Ground-water migration				
Depth to ground water	3	8	24	24
Net precipitation	1	6	6	18
Soil permeability	3	8	24	24
Subsurface flows	1	8	8	24
Direct access to ground water	N/A	8	--	--
		Subtotals	52	90
Subscore (100 x factor score subtotal/maximum score subtotal)				69

C. Highest pathway subscore

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

Pathways Subscore 69

IV. WASTE MANAGEMENT PRACTICES

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

Receptors	36
Waste Characteristics	70
Pathways	69
Total 175 divided by 3 =	58
	Gross Total Sc

B. Apply factor for waste containment from waste management practices

Gross Total Score x Waste Management Practices Factor = Final Score

58 x 1.0 = 58

HAZARDOUS ASSESSMENT RATING FORM

NAME OF SITE: No. 9, Current Landfill

LOCATION: MacDill AFB

DATE OF OPERATION OR OCCURRENCE: 1974 to 1981

OWNER/OPERATOR: MacDill AFB

COMMENTS/DESCRIPTION: May have received waste oils and solvents

SITE RATED BY: G. McIntyre

I. RECEPTORS

	Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
A.	Population within 1,000 feet of site	0	4	0	12
B.	Distance to nearest well	0	10	0	30
C.	Land use/zoning within 1 mile radius	0	3	0	9
D.	Distance to reservation boundary	2	6	12	18
E.	Critical environments within 1 mile radius of site	2	10	20	30
F.	Water quality of nearest surface-water body	2	6	12	18
G.	Ground-water use of uppermost aquifer	1	9	9	27
H.	Population served by surface-water supply within 3 miles downstream of site	0	6	0	18
I.	Population served by ground-water supply within 3 miles of site	2	6	12	18
			Subtotals	65	180

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

II. WASTE CHARACTERISTICS

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

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

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

III. PATHWAYS

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

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

Subscore --

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

1. Surface-water migration

Distance to nearest surface water	3	8	24	24
Net precipitation	1	6	6	18
Surface erosion	0	8	0	24
Surface permeability	0	6	0	18
Rainfall intensity	3	8	24	24
		Subtotals	54	108

Subscore (100 x factor score subtotal/maximum score subtotal) 50

2. Flooding

Flooding	30	1	30	100

Subscore (100 x factor score/3) 30

3. Ground-water migration

Depth to ground water	3	8	24	24
Net precipitation	1	6	6	18
Soil permeability	3	8	24	24
Subsurface flows	1	8	6	24
Direct access to ground water	N/A	8	--	--
		Subtotals	62	90

Subscore (100 x factor score subtotal/maximum score subtotal) 69

C. Highest pathway subscore

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

Pathways Subscore 69

IV. WASTE MANAGEMENT PRACTICES

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

Receptors	36
Waste Characteristics	70
Pathways	69
Total 175 divided by 3 =	58
	Gross Total Score

B. Apply factor for waste containment from waste management practices

Gross Total Score x Waste Management Practices Factor = Final Score

58 x 1.0 = 58

HAZARDOUS ASSESSMENT RATING FORM

NAME OF SITE: No. 11, Chemical Munitions Burial Site

LOCATION: MacDill AFB

DATE OF OPERATION OR OCCURRENCE: 1950 to 1955

OWNER/OPERATOR: MacDill AFB

COMMENTS/DESCRIPTION: Disposal of unknown chemicals, "gass canisters" dug up at site

SITE RATED BY: G. McIntyre

I. RECEPTORS

	Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
A.	Population within 1,000 feet of site	0	4	0	12
B.	Distance to nearest well	0	10	0	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	2	10	20	30
F.	Water quality of nearest surface-water body	2	6	12	18
G.	Ground-water use of uppermost aquifer	1	9	9	27
H.	Population served by surface-water supply within 3 miles downstream of site	0	6	0	18
I.	Population served by ground-water supply within 3 miles of site	2	6	12	18
			Subtotals	71	180

Receptors subscore (100 x factor score subtotal/maximum subtotal) 39

II. WASTE CHARACTERISTICS

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

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

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

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

80 x 1.0 = 80

C. Apply physical state multiplier

Subscore B x Physical State Multiplier = Waste Characteristics Subscore

80 x 1.0 = 80

III. PATHWAYS

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
A. If there is evidence of migration of hazardous contaminants, assign maximum factor subscore of 100 points for direct evidence or 80 points for indirect evidence. If direct evidence exists then proceed to C. If no evidence or indirect evidence exists, proceed to B.				
			Subscore	--
B. Rate the migration potential for three potential pathways: surface-water migration, flooding, and ground-water migration. Select the highest rating, and proceed to C.				
1. Surface-water migration				
Distance to nearest surface water	3	8	24	24
Net precipitation	1	6	6	18
Surface erosion	0	8	0	24
Surface permeability	0	6	0	18
Rainfall intensity	3	8	24	24
		Subtotals	54	108
Subscore (100 x factor score subtotal/maximum score subtotal)				50
2. Flooding	30	1	30	100
	Subscore (100 x factor score/3)			30
3. Ground-water migration				
Depth to ground water	3	8	24	24
Net precipitation	1	6	6	18
Soil permeability	3	8	24	24
Subsurface flows	1	8	8	24
Direct access to ground water	N/A	8	--	--
		Subtotals	62	90
Subscore (100 x factor score subtotal/maximum score subtotal)				69

C. Highest pathway subscore

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

Pathways Subscore 69

IV. WASTE MANAGEMENT PRACTICES

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

Receptors	39
Waste Characteristics	80
Pathways	69
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

HAZARDOUS ASSESSMENT RATING FORM

NAME OF SITE: No. 13, Creosote Pit

LOCATION: MacDill AFB

DATE OF OPERATION OR OCCURRENCE: Prior to 1945

OWNER/OPERATOR: MacDill AFB

COMMENTS/DESCRIPTION: Cresote treatment of wood, possible percolation to ground

SITE RATED BY: G. McIntyre

I. RECEPTORS

	Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
A.	Population within 1,000 feet of site	1	4	4	12
B.	Distance to nearest well	0	10	0	30
C.	Land use/zoning within 1 mile radius	2	3	6	9
D.	Distance to reservation boundary	3	6	18	18
E.	Critical environments within 1 mile radius of site	0	10	0	30
F.	Water quality of nearest surface-water body	1	6	6	18
G.	Ground-water use of uppermost aquifer	1	9	9	27
H.	Population served by surface-water supply within 3 miles downstream of site	0	6	0	18
I.	Population served by ground-water supply within 3 miles of site	2	6	12	18
			Subtotals	55	180

Receptors subscore (100 x factor score subtotal/maximum subtotal) 31

II. WASTE CHARACTERISTICS

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

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

2. Confidence level (C = confirmed, S = suspected) S

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

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

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

50 x 1.0 = 50

C. Apply physical state multiplier

Subscore B x Physical State Multiplier = Waste Characteristics Subscore

50 x 1.0 = 50

III. PATHWAYS

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

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

Subscore --

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

1. Surface-water migration

Distance to nearest surface water	2	8	16	24
Net precipitation	1	6	6	18
Surface erosion	0	8	0	24
Surface permeability	0	6	0	18
Rainfall intensity	3	8	24	24
		Subtotals	46	108

Subscore (100 x factor score subtotal/maximum score subtotal) 43

2. Flooding

	3-	1	30	100

Subscore (100 x factor score/3) 30

3. Ground-water migration

Depth to ground water	3	8	24	24
Net precipitation	1	6	6	18
Soil permeability	3	8	24	24
Subsurface flows	1	8	8	24
Direct access to ground water	N/A	8	--	--
		Subtotals	62	90

Subscore (100 x factor score subtotal/maximum score subtotal) 69

C. Highest pathway subscore

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

Pathways Subscore 69

IV. WASTE MANAGEMENT PRACTICES

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

Receptors	31
Waste Characteristics	50
Pathways	69
Total 150 divided by 3 =	50
	Gross Total Sco

B. Apply factor for waste containment from waste management practices

Gross Total Score x Waste Management Practices Factor = Final Score

50 x 1.0 = 50

HAZARDOUS ASSESSMENT RATING FORM

NAME OF SITE: No. 16, Fuel Tank Farm

LOCATION: MacDill AFB

DATE OF OPERATION OR OCCURRENCE: 1952 to present

OWNER/OPERATOR: MacDill AFB

COMMENTS/DESCRIPTION: Fuel-saturated area, AVGAS sludge burial

SITE RATED BY: G. McIntyre

I. RECEPTORS

	Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
A.	Population within 1,000 feet of site	2	4	8	12
B.	Distance to nearest well	0	10	0	30
C.	Land use/zoning within 1 mile radius	2	3	6	9
D.	Distance to reservation boundary	3	6	18	18
E.	Critical environments within 1 mile radius of site	2	10	20	30
F.	Water quality of nearest surface-water body	2	6	12	18
G.	Ground-water use of uppermost aquifer	1	9	9	27
H.	Population served by surface-water supply within 3 miles downstream of site	0	6	0	18
I.	Population served by ground-water supply within 3 miles of site	2	6	12	18
			Subtotals	85	180

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

II. WASTE CHARACTERISTICS

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

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

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

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

80 x 1.0 = 80

C. Apply physical state multiplier

Subscore B x Physical State Multiplier = Waste Characteristics Subscore

80 x 1.0 = 80

III. PATHWAYS

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
A. If there is evidence of migration of hazardous contaminants, assign maximum factor subscore of 100 points for direct evidence or 80 points for indirect evidence. If direct evidence exists then proceed to C. If no evidence or indirect evidence exists, proceed to B.				
			Subscore	80
B. Rate the migration potential for three potential pathways: surface-water migration, flooding, and ground-water migration. Select the highest rating, and proceed to C.				
1. Surface-water migration				
Distance to nearest surface water	3	8	24	24
Net precipitation	1	6	6	18
Surface erosion	0	8	0	24
Surface permeability	0	6	0	18
Rainfall intensity	3	8	24	24
		Subtotals	54	108
Subscore (100 x factor score subtotal/maximum score subtotal)				50
2. Flooding	30	1	30	100
	Subscore (100 x factor score/3)			30
3. Ground-water migration				
Depth to ground water	3	8	24	24
Net precipitation	1	6	6	18
Soil permeability	3	8	24	24
Subsurface flows	3	8	24	24
Direct access to ground water	N/A	8	--	--
		Subtotals	78	90
Subscore (100 x factor score subtotal/maximum score subtotal)				87

C. Highest pathway subscore

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

Pathways Subscore 87

IV. WASTE MANAGEMENT PRACTICES

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

Receptors	47
Waste Characteristics	80
Pathways	87
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

HAZARDOUS ASSESSMENT RATING FORM

NAME OF SITE: No. 17, AVGAS Sludge Weathering (Drum Storage Area)

LOCATION: MacDill AFB

DATE OF OPERATION OR OCCURRENCE: 1965 to 1973

OWNER/OPERATOR: MacDill AFB

COMMENTS/DESCRIPTION: Site used for AVGAS sludge weathering

SITE RATED BY: G. McIntyre

I. RECEPTORS

	Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
A.	Population within 1,000 feet of site	1	4	4	12
B.	Distance to nearest well	0	10	0	30
C.	Land use/zoning within 1 mile radius	2	3	6	9
D.	Distance to reservation boundary	3	6	18	18
E.	Critical environments within 1 mile radius of site	2	10	20	30
F.	Water quality of nearest surface-water body	2	6	12	18
G.	Ground-water use of uppermost aquifer	1	9	9	27
H.	Population served by surface-water supply within 3 miles downstream of site	0	6	0	18
I.	Population served by ground-water supply within 3 miles of site	2	6	12	18
			Subtotals	81	180

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

II. WASTE CHARACTERISTICS

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

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

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

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

60 x 1.0 = 60

C. Apply physical state multiplier

Subscore B x Physical State Multiplier = Waste Characteristics Subscore

60 x 1.0 = 60

III. PATHWAYS

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
A. If there is evidence of migration of hazardous contaminants, assign maximum factor subscore of 100 points for direct evidence or 80 points for indirect evidence. If direct evidence exists then proceed to C. If no evidence or indirect evidence exists, proceed to B.				
			Subscore	--
B. Rate the migration potential for three potential pathways: surface-water migration, flooding, and ground-water migration. Select the highest rating, and proceed to C.				
1. Surface-water migration				
Distance to nearest surface water	1	8	8	24
Net precipitation	1	6	6	18
Surface erosion	0	8	0	24
Surface permeability	0	6	0	18
Rainfall intensity	3	8	24	24
		Subtotals	38	108
Subscore (100 x factor score subtotal/maximum score subtotal)				35
2. Flooding	30	1	30	100
	Subscore (100 x factor score/3)			30
3. Ground-water migration				
Depth to ground water	3	8	24	24
Net precipitation	1	6	6	18
Soil permeability	3	8	24	24
Subsurface flows	1	8	8	24
Direct access to ground water	N/A	8	--	--
		Subtotals	62	90
Subscore (100 x factor score subtotal/maximum score subtotal)				69

C. Highest pathway subscore

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

Pathways Subscore 69

IV. WASTE MANAGEMENT PRACTICES

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

Receptors	45
Waste Characteristics	45
Pathways	69
Total 159 divided by 3 =	53
	Gross Total Score

B. Apply factor for waste containment from waste management practices

Gross Total Score x Waste Management Practices Factor = Final Score

53 x 1.0 = 53

HAZARDOUS ASSESSMENT RATING FORM

NAME OF SITE: No. 21, Old Refueling Area

LOCATION: MacDill AFB

DATE OF OPERATION OR OCCURRENCE: --

OWNER/OPERATOR: MacDill AFB

COMMENTS/DESCRIPTION: Possible fuel-saturated area

SITE RATED BY: G. McIntyre

I. RECEPTORS

	Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
A.	Population within 1,000 feet of site	0	4	0	12
B.	Distance to nearest well	0	10	0	30
C.	Land use/zoning within 1 mile radius	2	3	6	9
D.	Distance to reservation boundary	2	6	12	18
E.	Critical environments within 1 mile radius of site	0	10	0	30
F.	Water quality of nearest surface-water body	1	6	6	18
G.	Ground-water use of uppermost aquifer	1	9	9	27
H.	Population served by surface-water supply within 3 miles downstream of site	0	6	0	18
I.	Population served by ground-water supply within 3 miles of site	2	6	12	18
			Subtotals	45	180

Receptors subscore (100 x factor score subtotal/maximum subtotal) 25

II. WASTE CHARACTERISTICS

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

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

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

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

40 x 1.0 = 40

C. Apply physical state multiplier

Subscore B x Physical State Multiplier = Waste Characteristics Subscore

40 x 1.0 = 40

III. PATHWAYS

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
A. If there is evidence of migration of hazardous contaminants, assign maximum factor subscore of 100 points for direct evidence or 80 points for indirect evidence. If direct evidence exists then proceed to C. If no evidence or indirect evidence exists, proceed to B.				
			Subscore	--
B. Rate the migration potential for three potential pathways: surface-water migration, flooding, and ground-water migration. Select the highest rating, and proceed to C.				
1. Surface-water migration				
Distance to nearest surface water	2	8	16	24
Net precipitation	1	6	6	18
Surface erosion	0	8	0	24
Surface permeability	0	6	0	18
Rainfall intensity	3	8	24	24
		Subtotals	46	108
Subscore (100 x factor score subtotal/maximum score subtotal)				43
2. Flooding	30	1	30	100
	Subscore (100 x factor score/3)			30
3. Ground-water migration				
Depth to ground water	3	8	24	24
Net precipitation	1	6	6	18
Soil permeability	3	8	24	24
Subsurface flows	1	8	8	24
Direct access to ground water	N/A	8	--	--
		Subtotals	62	90
Subscore (100 x factor score subtotal/maximum score subtotal)				69

C. Highest pathway subscore

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

Pathways Subscore 69

IV. WASTE MANAGEMENT PRACTICES

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

Receptors	25
Waste Characteristics	40
Pathways	69
Total 134 divided by 3 =	45
	Gross Total Sco

B. Apply factor for waste containment from waste management practices

Gross Total Score x Waste Management Practices Factor = Final Score

45 x 1.0 = 45

HAZARDOUS ASSESSMENT RATING FORM

NAME OF SITE: No. 22, Earth Berm (Fuel Bladder)

LOCATION: MacDill AFB

DATE OF OPERATION OR OCCURRENCE: 1979

OWNER/OPERATOR: MacDill AFB

COMMENTS/DESCRIPTION: 1,000-Gallon JP-5 fuel spill

SITE RATED BY: G. McIntyre

I. RECEPTORS

	Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
A.	Population within 1,000 feet of site	0	4	0	12
B.	Distance to nearest well	0	10	0	30
C.	Land use/zoning within 1 mile radius	2	3	6	9
D.	Distance to reservation boundary	2	6	12	18
E.	Critical environments within 1 mile radius of site	0	10	0	30
F.	Water quality of nearest surface-water body	1	6	6	18
G.	Ground-water use of uppermost aquifer	1	9	9	27
H.	Population served by surface-water supply within 3 miles downstream of site	0	6	0	18
I.	Population served by ground-water supply within 3 miles of site	2	6	12	18
			Subtotals	45	180

Receptors subscore (100 x factor score subtotal/maximum subtotal) 25

II. WASTE CHARACTERISTICS

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

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

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

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

60 x 0.8 = 48

C. Apply physical state multiplier

Subscore B x Physical State Multiplier = Waste Characteristics Subscore

48 x .10 = 48

III. PATHWAYS

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

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

Subscore --

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

1. Surface-water migration

Distance to nearest surface water	2	8	16	24
Net precipitation	1	6	6	18
Surface erosion	0	8	0	24
Surface permeability	0	6	0	18
Rainfall intensity	3	8	24	24
		Subtotals	46	108

Subscore (100 x factor score subtotal/maximum score subtotal) 43

2. Flooding

Flooding	30	1	30	100

Subscore (100 x factor score/3) 30

3. Ground-water migration

Depth to ground water	3	8	24	24
Net precipitation	1	6	6	18
Soil permeability	3	8	24	24
Subsurface flows	1	8	8	24
Direct access to ground water	N/A	8	--	--
		Subtotals	62	90

Subscore (100 x factor score subtotal/maximum score subtotal) 69

C. Highest pathway subscore

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

Pathways Subscore 69

IV. WASTE MANAGEMENT PRACTICES

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

Receptors	25
Waste Characteristics	48
Pathways	69
Total 142 divided by 3 =	47
	Gross Total Sc

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

HAZARDOUS ASSESSMENT RATING FORM

NAME OF SITE: No. 23, Fire Department Training Area

LOCATION: MacDill AFB

DATE OF OPERATION OR OCCURRENCE: 1955 to present

OWNER/OPERATOR: MacDill AFB

COMMENTS/DESCRIPTION: Site used for fire department training exercises

SITE RATED BY: G. McIntyre

I. RECEPTORS

	Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
A.	Population within 1,000 feet of site	0	4	0	12
B.	Distance to nearest well	0	10	0	30
C.	Land use/zoning within 1 mile radius	0	3	0	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	2	6	12	18
G.	Ground-water use of uppermost aquifer	1	9	9	27
H.	Population served by surface-water supply within 3 miles downstream of site	0	6	0	18
I.	Population served by ground-water supply within 3 miles of site	2	6	12	18
			Subtotals	45	180

Receptors subscore (100 x factor score subtotal/maximum subtotal) 25

II. WASTE CHARACTERISTICS

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

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

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

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

80 x 1.0 = 80

C. Apply physical state multiplier

Subscore B x Physical State Multiplier = Waste Characteristics Subscore

80 x 1.0 = 80

III. PATHWAYS

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
A. If there is evidence of migration of hazardous contaminants, assign maximum factor subscore of 100 points for direct evidence or 80 points for indirect evidence. If direct evidence exists then proceed to C. If no evidence or indirect evidence exists, proceed to B.				
			Subscore	--
B. Rate the migration potential for three potential pathways: surface-water migration, flooding, and ground-water migration. Select the highest rating, and proceed to C.				
1. Surface-water migration				
Distance to nearest surface water	2	8	16	24
Net precipitation	1	6	6	18
Surface erosion	0	8	0	24
Surface permeability	0	6	0	18
Rainfall intensity	3	8	24	24
		Subtotals	46	108
Subscore (100 x factor score subtotal/maximum score subtotal)				43
2. Flooding	30	1	30	100
	Subscore (100 x factor score/3)			30
3. Ground-water migration				
Depth to ground water	3	8	24	24
Net precipitation	1	6	6	18
Soil permeability	3	8	24	24
Subsurface flows	0	8	0	24
Direct access to ground water	N/A	8	--	--
		Subtotals	54	90
Subscore (100 x factor score subtotal/maximum score subtotal)				60

C. Highest pathway subscore

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

Pathways Subscore 60

IV. WASTE MANAGEMENT PRACTICES

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

Receptors	25
Waste Characteristics	80
Pathways	60
Total 165 divided by 3 =	55
	Gross Total Sco

B. Apply factor for waste containment from waste management practices

Gross Total Score x Waste Management Practices Factor = Final Score

55 x 1.0 = 55