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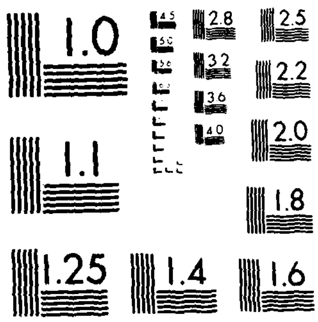

MICROCOPY RESOLUTION TEST CHART
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AD-A195 272

INSTALLATION RESTORATION PROGRAM

Preliminary Assessment Records Search

110th Tactical Air Support Group
Michigan Air National Guard
W.K. Kellogg Regional Airport
Battle Creek, Michigan

(1)

INSTALLATION RESTORATION PROGRAM
PRELIMINARY ASSESSMENT - RECORDS SEARCH

FOR

110th TACTICAL AIR SUPPORT GROUP
MICHIGAN AIR NATIONAL GUARD
W.K. KELLOGG REGIONAL AIRPORT
BATTLE CREEK, MICHIGAN

September 1987

Prepared for

National Guard Bureau
Andrews Air Force Base, Maryland 20331

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Contract No. DLA 900-82-C-4426

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EXECUTIVE SUMMARY

A. INTRODUCTION

The Hazardous Materials Technical Center (HMTC) was retained in January 1987 to conduct the Installation Restoration Program (IRP) Preliminary Assessment (PA) - Records Search of the 110th Tactical Air Support Group (TASG), Michigan Air National Guard, W.K. Kellogg Regional Airport, Battle Creek, Michigan (hereinafter referred to as the Base), under Contract No. DLA 900-82-C-4426 (Records Search). The Records Search included:

- an onsite visit including interviews with 22 Base personnel conducted by HMTC personnel during the period 12-16 January 1987;
- the acquisition and analysis of pertinent information and records on hazardous materials use and hazardous waste generation and disposal at the Base;
- the acquisition and analysis of available geologic, hydrologic, meteorologic, and environmental data from pertinent Federal, State, and local agencies, and;
- the identification of sites on the Base that may be potentially contaminated with hazardous materials/hazardous waste (HM/HW).

B. MAJOR FINDINGS

The major operations of the 110th TASG that have used and disposed of HM/HW include aircraft maintenance; aerospace ground equipment maintenance; ground vehicle maintenance; and petroleum, oil, and lubricant (POL) management and distribution. The operations involve such activities as corrosion control, nondestructive inspection, fuel cell maintenance, and engine maintenance. Waste oils, recovered fuels, spent cleaners, paint removers, thinners, strippers, and cleaning solvents were generated and disposed of by these activities.

Interviews with 22 Base personnel and a field survey resulted in the initial identification of 6 disposal and/or spill sites at the Base that are potentially contaminated with HM/HW:

Site No. 1 - POL Tank Area

Site No. 2 - Northwest Depressed Area

Site No. 3 - Fire Training Area

Site No. 4 - Abandoned Landfill

Site No. 5 - Former Coal Storage Area

Site No. 6 - Underground Fuel Storage Tank System

Two of the identified potentially contaminated HM/HW sites (Site No. 4 - Abandoned Landfill and Site No. 5 - Former Coal Storage Area) were not scored utilizing the U.S. Air Force Hazard Assessment Rating Methodology (HARM) because no specific data that HM/HW had been disposed of in the landfill was obtained during the Records Search process, and no records were available to indicate the amount of coal and time period stored in the coal storage area. However, based on experience of other Air Force Base IRP's, it is necessary to investigate these types of sites further to verify or refute the presence of HM/HW.

C. CONCLUSIONS

Four of the identified sites have been further evaluated and given a Hazard Assessment Score (HAS) utilizing HARM:

Site No. 1 - POL Tank Area (HAS-66)

Soil tests conducted in 1985 by Soil and Materials Engineering, Inc., a subcontractor to the ANG's contractor Ellis-Nacyaert and Genheimer Associates, Inc., have confirmed the presence of petroleum contamination at this site.

Site No. 2 - Northwest Depressed Area (HAS-54)

In addition to surface water runoff from an area of confirmed soil contamination, three storm drainage systems discharge to this site. One of the storm drainage systems drains the Central Base area and the Motor Pool pavement. The second drains the Western Aircraft Parking Apron, the Underground Fuel Storage Tank System Area, the Former Coal Storage area (presently the Base Supply Storage area), and passes under the POL Tank area; the third drains the water well and water tower area. Vegetative stress was evident at the discharge points of the first two systems into the site.

Site No. 3 - <u>Fire Training Area</u> (HAS-81)

Soil tests conducted in 1987 by SEG Laboratories, Inc. have confirmed the presence of petroleum products, petroleum additives, and 1,1,1-trichloroethane at this site.

Site No. 6 - <u>Underground Fuel Storage Tank System</u> (HAS-58)

A spill of approximately 2,000 gallons of fuel oil occurred at Site No. 6 during the 1970s. In addition, some leakage from the system was reported during the same period.

D. RECOMMENDATIONS

Because of the potential for contaminant migration, initial investigative stages of the IRP Site Investigation/Remedial Investigation/Feasibility Study (SI/RI/FS) are recommended for the six sites that are potentially contaminated with HM/HW from past operations. The primary purposes of the subsequent follow-up investigations are:

1. At Site Nos. 2, 5, and 6, to determine whether pollutants are or are not present, and

2. To determine whether groundwater at the six identified sites has been contaminated. If it has, to give quantification with respect to contaminant concentrations, the boundary of the contaminant plume, the rate of contaminant migration, and its direction.

I. INTRODUCTION

A. Background

The 110th Tactical Air Support Group (TASG) is located at the Michigan Air National Guard, W.K. Kellogg Regional Airport, Battle Creek, Michigan, (hereinafter referred to as the Base). The TASG was established in June, 1971. Both past and present operations have involved the use and disposal of materials and wastes that subsequently have been categorized as hazardous. Consequently, the National Guard Bureau has implemented its Installation Restoration Program (IRP). The IRP consists of the following:

Preliminary Assessment (PA) - Records Search (Installation Assessment) - identifying past spill or disposal sites posing a potential and/or actual hazard to public health or the environment.

Site Investigation/Remedial Investigation/Feasibility Study (SI/RI/FS) - acquiring data via field studies for the confirmation and quantification of environmental contamination that may have an adverse impact on public health or the environment; preparing a Remedial Action Plan (RAP); and, if directed by the National Guard Bureau, preparing designs and specifications.

Research, Development and Demonstration (RD & D) - Technology Base Development (if needed) - developing new technology for accomplishment of remediation.

Remedial Design/Remedial Action (RD/RA) - Implementation of Site Remedial Action.

B. Purpose

The purpose of this IRP PA - Records Search (hereinafter referred to as Records Search) is to identify and evaluate suspected problems associated with past hazardous waste handling procedures, disposal sites, and spill sites on the Base. The Hazardous Materials Technical Center (HMTC) visited the Base, reviewed existing environmental information, analyzed the Base records concerning the use and generation of HM/HW, and conducted interviews with past and present personnel of the Base who are familiar with past HM/HW management activities, and made a physical inspection of the suspected sites. Relevant information collected and analyzed as a part of the Records Search included: the Base history, with special emphasis on the history of the shop operations and their past HM/HW management procedures; local geological, hydrological, and meteorological conditions that could affect migration of contaminants; local land use, public utilities, and zoning requirements that affect the potential for exposure to contaminants; and the ecological settings that indicate environmentally sensitive habitats or evidence of environmental stress.

C. Scope

The scope of this Records Search is limited to the Base and includes

- An onsite visit;
- The acquisition of pertinent information and records on hazardous materials use and hazardous wastes generation and disposal practices at the Base;
- The acquisition of available geologic, hydrologic, meteorologic, land-use and zoning, critical habitat, and utility data from various Federal, Michigan State, and local agencies;
- A review and analysis of all information obtained; and
- The preparation of a report, to include recommendations for further actions.

The onsite visit, and interviews with past and present personnel were conducted during the period 12-16 January 1987. The HMTC Records Search effort was conducted by Mr. Jeffrey J. Spann, Environmental Scientist (B.S., Chemistry, 1979), Mr. Jeffrey D. Fletcher, Junior Staff Scientist (B.S., Geology, 1984), Mr. Mark D. Johnson, Geologist (B.S. Geology, 1980), and Mr. Raymond G. Clark, P.E., Program Manager (B.S. Mechanical Engineering, 1949). (Resumes are included as Appendix A.) Individuals who assisted in the Records Search included Mr. Henry H. Lowman, ANGSC, Primary Project Officer, SMS James L. Craig, Jr., ANGSC Alternate Project Officer, and selected members of the 110th TASG. The Base Point of Contact (POC) was Captain James L. Wenzel, Base Civil Engineer.

D. Methodology

A flow chart of the Records Search Methodology is presented in Figure 1. This Records Search Methodology ensures a comprehensive collection and review of pertinent site-specific information and is utilized in the identification and assessment of potentially contaminated hazardous waste spill/disposal sites.

The Records Search began with a site visit to the Base to identify all shop operations or activities on the Base that may have used hazardous material or generated hazardous waste. Next, an evaluation of past and present HM/HW handling procedures at the identified locations was made to determine whether environmental contamination may have occurred. The evaluation of past HM/HW handling practices was facilitated by extensive interviews with 22 past and present employees familiar with the various operating procedures at the Base. These interviews also defined the areas on the Base where waste materials, either intentionally or inadvertently, may have been used, spilled, stored, disposed of, or released into the environment.

Appendix B lists the interviewees' principal areas of knowledge and their years of experience with the Base. Historical records contained in the Base files were collected and reviewed to supplement the information obtained from interviews. Using the information outlined above, a list of past waste spill/disposal sites on the Base were identified for further evaluation. A general survey tour of the identified spill/disposal sites, the Base, and the surrounding area was conducted to determine the presence of visible contamination and to help the HMTC survey team assess the potential for contaminant migration. Particular attention was given to locating nearby drainage ditches, surface water bodies, residences, and wells.

HMTC

PRELIMINARY ASSESSMENT
INSTALLATION
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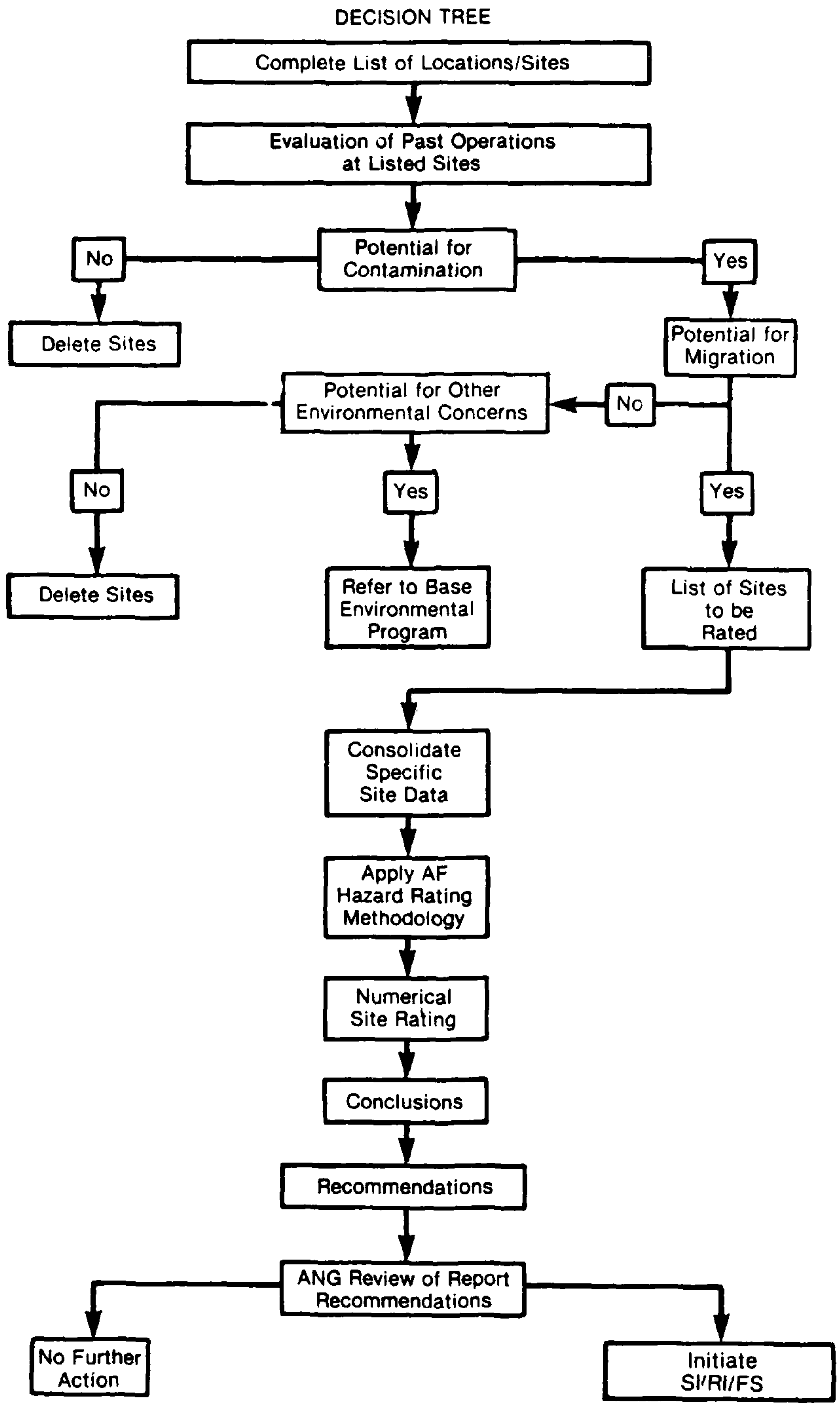
Figure 1.
Records Search Methodology Flow Chart.



Detailed geological, hydrological, meteorological, development (land use and zoning), and environmental data for the area of study was also obtained from the POC, or from appropriate Federal, Michigan State and local agencies (Appendix C). Following a detailed analysis of all the information obtained, it was determined that six sites are potentially contaminated with HM/HW and the potential for contaminant migration exists. Where sufficient information was available, sites were numerically scored utilizing the Air Force Hazard Assessment Rating Methodology (HARM). Recommendations for follow-up investigations at the six potentially contaminated sites were developed.

II. INSTALLATION DESCRIPTION

A. Location

The 110th TASG is located at the W.K. Kellogg Regional Airport, Battle Creek Michigan. In June 1986, the area occupied by the 110th TASG was increased by approximately 225 acres, to a total of 315 acres, when additional property was leased (see Figure 2).

In the area immediately north of the airport is a gravel pit, cropland, and industrial property. To the northeast, east, and southeast, the airport is bounded by low density residential one- and two-family structures within the cities of Battle Creek and Springfield. West and south of the airport, land use is largely cropland, forest, or shrubland. Figure 2 shows original and current boundaries of the Base covered by this Records Search.

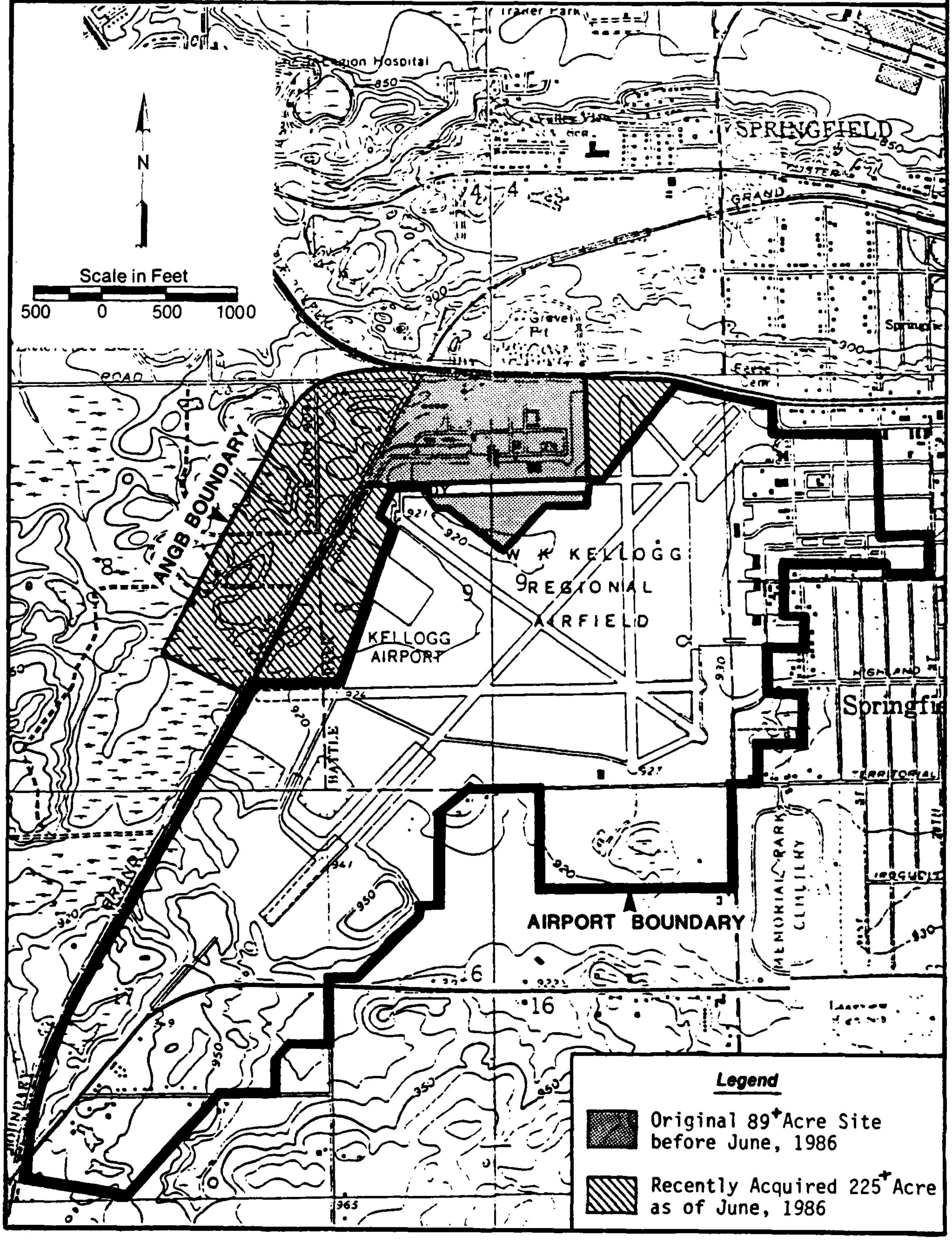
B. History

In November 1923, the Battle Creek Chamber of Commerce approved a plan to build an airport on the Garrett C. Wells Farm at Tuttle's Corners, on Prairie Road in Battle Creek. In September 1924, a lease with an option to buy the site was signed by the Chamber of Commerce. In 1928, W.K. Kellogg donated $60,000 to purchase the airport site and make improvements. The airfield was named the W.K. Kellogg Airport.

In June 1942, the W.K. Kellogg airport transferred to military status and all civilian flying was banned at the airport. The Army Air Corps used the airport as a base to train pilots and crews for combat duty and to stage crews for overseas. During the Air Corps use of the field, the existing runways were lengthened and new runways were built. Buildings were also erected to house the crews and support the military functions. The airport reverted to civilian status on 15 June 1948.

HMTC Adapted From E.A. Hichok and Assoc. Report (November, 1985)

Figure 2.
Location Map of Michigan ANG, W.K. Kellogg Regional Airport, Battle Creek, Michigan.



On 21 December 1946, 29 men were sworn into Battle Creek's "National Guard Air Corps" at Percy Jones General Hospital by Colonel F. Anderson, State Guard Air Corps Commander. Fifteen former Air Corps officers were appointed in the new unit on the same day. At the same time, the Michigan Governor, Kim Sigler, designated Kellogg Field headquarters for the 172nd Fighter Squadron of the Michigan Air National Guard. This was the first such squadron in National Guard history.

Commander of the new Air Guard unit was Captain Ross M. Norwood. Federal recognition came on 16 September 1947. The original authorized strength of 86 officers and enlisted men (33 in the fighter squadron, 9 in the utility flight, and 44 assigned to Detachment B of the 227th Air Service Group) was expanded to an authorized total of 50 officers and 300 enlisted men. Hangar facilities at Kellogg Field were sufficient to provide for the arrival of 25 P-51 Mustang aircraft; four A-26 light bombers; two AT-6 trainers; two L-5 liaison planes; and one C-47 "Gooney Bird". The 172nd was awarded the Spaatz Trophy as the outstanding unit in the 66th Fighter Wing in 1950.

From February 1951 through December 1952, the unit was federalized and the Base reverted to a caretaker status. In 1954, the unit transitioned from the P-51s to the F-86, a pure jet aircraft. In 1955, they were upgraded to the F-89. In 1956, the 172nd Squadron was upgraded to the 110th Fighter Group (Air Defense). Then, on 12 April 1958, it was again redesignated to the 172nd Tactical Reconnaissance Squadron and assigned the RB-57 aircraft.

The 110th Tactical Air Support Group (TASG), flying O-2 aircraft, was established on 11 June 1971, replacing the 172nd Tactical Reconnaissance Group with its RB-57 aircraft. In October 1980, the 110th TASG was assigned the OA-37 Dragonfly aircraft. The mission of the 110th TASG is to assist the Army in accomplishing its objectives on the battlefield. Through the Air Support Operations Center (ASOC), the Air Force provides fast reaction tactical air support to ground units. The ASOC has the primary responsibility for coordinating and integrating air support, and also has operational control over Tactical Air Control Parties.

III. ENVIRONMENTAL SETTING

A. Meteorology

The meteorological information presented below is from local climatological data for the Battle Creek, Michigan area compiled by the National Oceanic and Atmospheric Administration (NOAA). The climate in the Battle Creek area alternates between continental and semi-marine, depending on meteorological conditions. The marine type is due to the influence of the Great Lakes and is governed by the force and direction of the wind. When there is little or no wind, the weather becomes continental in character, which is characterized by pronounced fluctuations in temperature (e.g., hot weather in summer and severe cold in winter). However, a strong wind from the lakes may immediately transform the weather into a semi-marine type.

Since large bodies of water are less responsive to temperature changes than land, the Great Lakes hold the winter cold longer in the spring, and the summer heat longer in the fall than the land areas. Thus, the Battle Creek area has cooler summers and milder winters because of the lake effect.

Precipitation is fairly well distributed through the year, and no conspicuous annual variation is noted, although there is about 1 inch less precipitation per month in winter than in summer. The heavier amounts in summer are the result of sudden and quick thunderstorms, which occur mostly in May and June. Snow fall for the Battle Creek area is moderate, averaging about 52 inches per year.

The Battle Creek area has an average annual precipitation of 30.73 inches, based on the period from 1956 to 1985. By calculating net precipitation according to the method outlined in the Federal Register (47 FR 31224, 16 July 1982), a net precipitation value of 0.73 inches per year is obtained. Rainfall intensity based on 1 year frequency, 24-hour duration rainfall is 2.25 inches (calculated according to 47 FR 31235, 11 July 1982, Figure 8).

B. Geology

The geological and hydrological information presented below is from a 1985 environment assessment of the Base by Eugene A. Hickock and Associates and a 1985 U.S. Geological Survey report.

The Base is located in the Central Stable Physiographical Province. This province is further divided into areas, one of which is the Michigan Basin, which encompasses the entire State of Michigan. The center of the basin is located almost directly in the middle of the lower peninsula of the State. The basin is characterized by the younger Pennsylvanian Period (300 million years old) rocks in the center, and older Cambrian Period (540 million years old) rocks at its outer boundary. The bedrock exposed at or near the surface of the Base includes typical sedimentary rock types such as the sandstones and siltstones of the Marshall Formation.

The Marshall Formation was deposited during the Mississippian Period (320 to 360 million years ago). It is fluvial in origin and is composed predominantly of alternating sandstone and siltstone layers. The formation has an irregular topography and a highly variable thickness.

At the Base, the Marshall Formation is overlain by glacial deposits of the Quaternary Period (less than 2 million years old). These surficial deposits consist primarily of glacial outwash and moraine deposits. The outwash deposits are generally sand and gravel with localized clays and organic materials. The clays and organic materials often correspond with depressions and wetlands. The moraine deposits are located along the brinks where the glacial ice had once been. In this area, moraine deposits are represented by low ridges with bouldery slopes with significant clay silt fractions at the basal contacts.

According to the U.S. Soil Conservation Service, the soils at Battle Creek consist primarily of three soil series: the Brady, the Houghton, and the Oshtemo. The soils are described as follows:

Brady Series, 0 to 2 percent slopes - This mapping unit consists of somewhat poorly drained soils formed in sandy glaciofluvial deposits on outwash.

Houghton Series, 0 to 2 percent slopes - This mapping unit consists of very poorly drained soils formed in herbaceous organic deposits, in bogs, and other depressional areas within outwash plains, lake plains, till plains, and moraines.

Oshtemo Series, 0 to 12 percent slopes - This mapping unit consists of well-drained soils formed in loamy and sandy glaciofluvial deposits on outwash plains and moraines.

In general, the permeability of these soils range from moderate (4.2×10^{-4} to 1.4×10^{-3} cm/sec) to rapid (4.2×10^{-3} to 1.4×10^{-2} cm/sec).

C. Hydrology

Surface Water

The Kalamazoo River is located approximately 1.5 miles north of the Base. Approximately one third of the annual precipitation in the vicinity of the Base flows into the Kalamazoo River by direct runoff or percolates into the ground and discharges into the Kalamazoo River by underground flow. The remaining annual precipitation is returned to the atmosphere by evaporation and transpiration from plants (Vanlier, 1966).

Storm water from the northern half of the Base discharges into small streams flowing in a northerly direction to the underground storm sewer systems and collects in the Northwest Depressed Area (Site No. 2). Storm water from the southern half of the Base drains in a southwesterly direction and ultimately discharges into wetlands. The 1986 Topographic Map of the W.K. Kellogg Airfield, prepared by the ANG, indicates there are no surface streams discharging from these wetlands.

Because of the generally low relief at the Base, several manmade drainage ditches have been constructed to improve surface water drainage. At the northern portion of the Base, in the vicinity of the industrial facilities, a drainage ditch channels water toward a depressed area located in the northwest corner of the Base property. A second manmade drainage ditch, located in the southern portion of the Base, carries runoff in a south-westerly direction under the Grand Trunk Western Railroad tracks into a wetlands area.

The Base is not within an area classified as a floodplain (Hickock, 1985). According to the Flood Insurance Rate Map (FIRM) for the City of Battle Creek, the W.K. Kellogg Airfield, including the Base, is in "Zone C," an area of minimal flooding from rivers (Federal Emergency Management Agency, FIRM, 14 April, 1983).

Groundwater

The Marshall Formation is an important water source in the Battle Creek area and many wells draw from this formation.

The Marshall Formation is comprised of four alternating sandstone and siltstone layers. The sandstone layers are the water-bearing zones in the Marshall Formation. Municipal wells are screened in the lower sandstone layer. The siltstone layers within the Marshall Formation tend to impede the downward movement of groundwater. The thickness of the Marshall Formation in the vicinity of the installation varies from approximately 10 feet along the southerly boundary to about 30 feet near the northerly boundary (Hickock, 1985).

Within the Marshall Formation, the water table or piezometric surface conforms somewhat to the land surface. The "hills" in the water table underlie hills seen on land. The "lows" in the water table coincide with low areas on land (Vanlier, 1966). Thus, the regional groundwater flow direction in the Marshall Formation under the Base is generally northward towards the Kalamazoo River (Hickock, 1985). Within the Battle Creek area, most of the flow in the Kalamazoo River during dry weather is a result of groundwater discharge (Vanlier, 1966).

A shallow water table at the Base is within the surficial deposits at a depth of approximately 10 feet. The surface (surficial deposits) and subsurface (Marshall Formation) hydrologic systems are interconnected. The groundwater flow direction in the surficial deposits are therefore in the same general direction as the flow within the Marshall Formation (Vanlier, 1966). In the surficial deposit, precipitation tends to infiltrate rapidly through the soils and continues to move readily through the glacial drift to the Marshall Formation. Because of the geological and hydrological characteristics of these systems, they are susceptible to surface-derived contamination. It also appears that there are significant amounts of clays in the glacial drift at random locations which do not form a confining layer. Though downward movement of water may be slowed by clay in some locations, there is no evidence of perched water tables (Hickock, 1985).

IV. SITE EVALUATION

A. Activity Review

A review of installation records and interviews with past and present personnel at the Base resulted in the identification of specific operations within each activity in which the majority of industrial chemicals are handled and hazardous wastes are generated. Table 1 summarizes the major operations associated with each activity, provides estimates of the quantities of waste currently being generated by these operations, and describes the past and present disposal practices for the wastes. Based on information gathered, any operation that is not listed in Table 1 has been determined to produce negligible (less than 5 gallons/year) quantities of wastes requiring disposal.

B. Disposal/Spill Site Identification, Evaluation, and Hazard Assessment

Interviews with 22 Base personnel (Appendix B) and subsequent site inspections resulted in the identification of six waste disposal/spill sites. It was determined that all of the sites are potentially contaminated with HM/HW, with a potential for migration; therefore, they should be further evaluated. Four of the six sites were rated using HARM (Appendix D). Figure 3 illustrates the locations of the scored/unscored sites. A copy of the completed Hazardous Assessment Rating Form is found in Appendix E. Table 2 summarizes the Hazard Assessment Score (HAS) of the scored sites.

<u>Site No. 1 - POL Tank Area</u> (HAS-66)

Four 25,000-gallon aboveground POL tanks are presently located in the northwest corner of the original Base property (see Figure 3). Except for the period of 1973-1974, when the city of Battle Creek used these tanks for storage of No. 4 heating fuel, these tanks have not been used since 1949; and they have never been used by the ANG. The tanks were repaired prior to use by the city of Battle Creek but it was reported that leakage occurred at some of the repair patches. Containment berms were originally constructed around the POL storage tanks. In 1985, however, the containment berms were leveled and the berm mate-

Table 1. Hazardous Materials/Hazardous Waste Disposal Summary: Michigan ANG, W.K. Kellogg Regional Airport, Battle Creek, Michigan

Shop Name	Building Number	Hazardous Materials/Hazardous Waste	Estimated Quantities (Gal./year)	Method of Treatment/Storage/Disposal 1960 1970 1980 1987
Pneudraulics Shop	6900	Hydraulic Fluid	125	'------------CONTR---------------------'*'
Motor Pool	6908	Drycleaning Solvent	100	'------------CONTR---------------------'*'
		Sulfuric Acid	60	'------------NEUT SAN--------------------'
		Antifreeze	150	'------------CONTR---------------------'*'
		Thinners	50	'------------CONTR---------------------'*'
		Oils	650	'------------CONTR---------------------'*'
		Hydraulic Fluid	100	'------------CONTR---------------------'*'
		Transmission/Brake Fluid	25	'------------CONTR---------------------'*'
		Methyl Ethyl Ketone	50	'------------CONTR---------------------'*'
Jet Engine Propulsion	6900	Turbo Jet Engine Oil	100	'------------CONTR---------------------'*'
		PD-680	420	'------------CONTR---------------------'*'
AGE	6901	Paint Remover	10	'------------CONTR---------------------'*'
		Lube Oil	30	'------------CONTR---------------------'*'
		Paint Stripper	6	'------------CONTR---------------------'*'
		Dekron II AFT	30	'------------CONTR---------------------'*'
		Hydraulic Oil/Fluid	40	'------------CONTR---------------------'*'
Lead Acid Battery Shop	6998	Sulfuric Acid	30	'------------NEUT SAN--------------------'
Fuel System	6900	Calibration Fluid	25	'------------CONTR---------------------'*'
		Jet Fuel (JP-4)	180	'-----FT-----'------N/A----'-----FT----'*'

CONTR - To Supply then dispose of through Contractor
FT - Disposed of during fire training
NEUT SAN - Neutralized and disposed of in sanitary sewer
* - Disposed of by Defense Reutilization and Marketing Office
N/A - Not Applicable

Table 1. Hazardous Materials/Hazardous Waste Disposal Summary: Michigan ANG, W.K. Kellogg Regional Airport, Battle Creek, Michigan (Continued)

Shop Name	Building Number	Hazardous Materials/Hazardous Waste	Estimated Quantities (Gal./year)	Method of Treatment/Storage/Disposal 1960 1970 1980 1987
Munitions Maintenance	6901/6916	PD-680	5	'--------------CONTR-----------------'*'
Fuels Lab	6909	Potassium Dichromate	6	'--------------NEUT SAN----------------'
		Sulfuric Acid	6	'--------------NEUT SAN----------------'
Operational Maintenance	6900	PD-680	120	'--------------FT-------------------'*' *FT
		Drycleaning Solvent	120	'--------------FT-------------------'*' *FT
		Lube Oil	70	'--------------CONTR-----------------'*'
		Hydraulic Fluid	110	'--------------CONTR-----------------'*'
Corrosion Control	6900	Paint Remover	25	'--------------CONTR-----------------'*'
		MEK	60	'--------------CONTR-----------------'*'

CONTR - To Supply then dispose of through Contractor
FT - Disposed of during fire training
NEUT SAN - Neutralized and disposed of in sanitary sewer
* - Disposed of by Defense Reutilization and Marketing Office

NOTE: All information taken from Hazardous Materials Data Sheets (HMD) and interviews with guard personnel.

HMTC

Adapted From:
Resource Statement Battle
Creek Air National Guard
Base (September 30, 1986)

Figure 3.
Location of Rated/Unrated Sites at Michigan ANG, W.K. Kellogg Regional Airport, Battle Creek, Michigan.

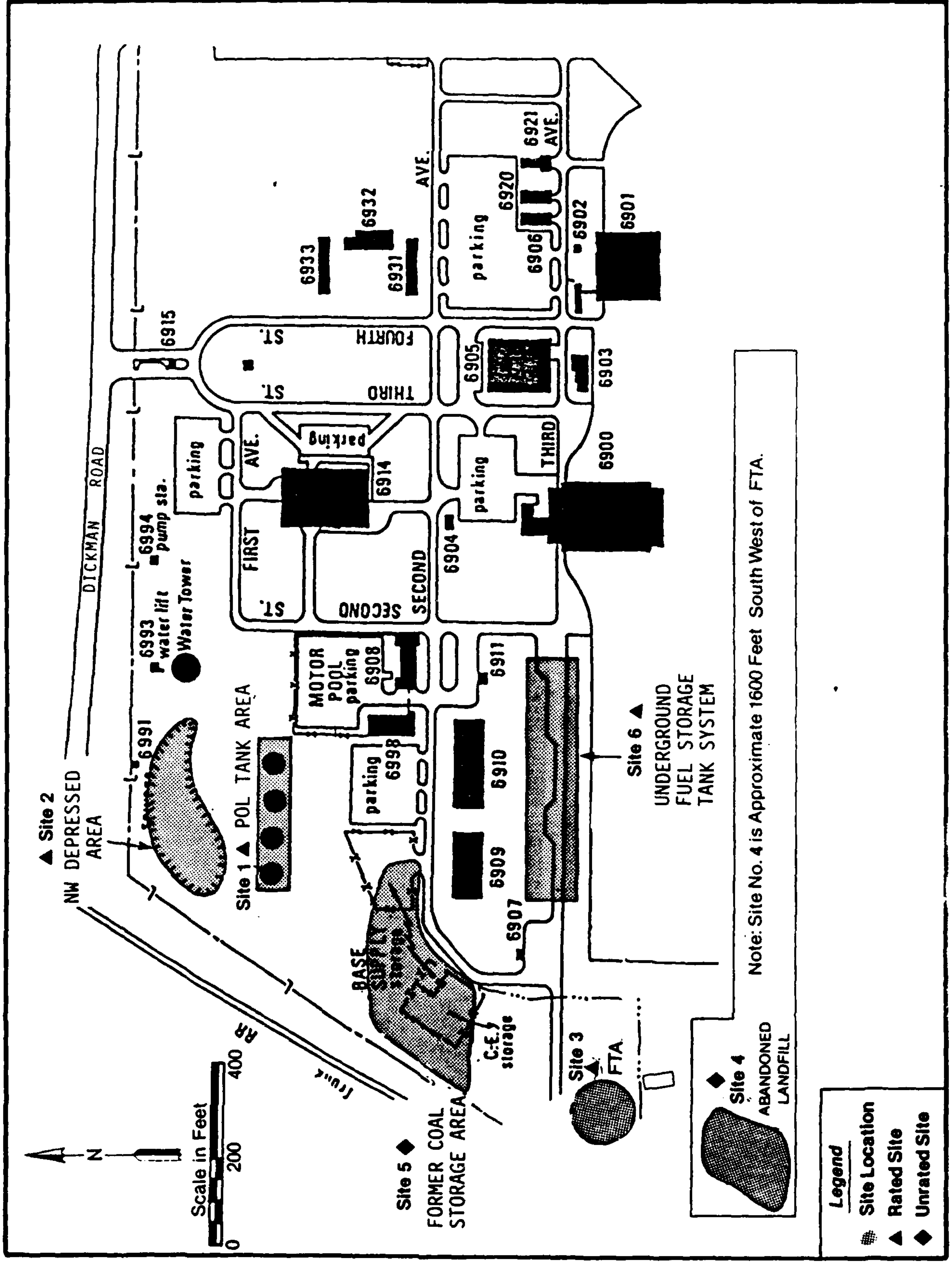


Table 2. Site Hazard Assessment Scores (as derived from HARM): Michigan ANG, W.K. Kellogg Regional Airport, Battle Creek, Michigan

Site Priority	Site Number	Site Description	Receptor	Waste Characteristics	Pathway	Waste Management Practices	Overall Score
1	3	Fire Training Area (FTA)	74	80	100	0.95	81
2	1	POL Tank Area	74	24	100	1.00	66
3	6	Underground Fuel Storage Tank System	74	32	68	1.00	58
4	2	NW Depressed Area	74	18	80	0.95	54

rials were spread on the surrounding land area.

Field tests conducted on 29 August and 4 September 1985 by Soil and Materials Engineers, Inc., (SME) of Battle Creek, Michigan confirmed the presence of petroleum contamination to a depth of at least 5 feet in the soil surrounding these tanks. SME served as a subcontractor to Ellis-Nacyaert and Genheimer Associates, Inc., (ENG), who was hired in 1985 by the Air National Guard to begin initial site investigations prior to removal of the tanks. The soil borings were routine work typically conducted for such jobs and were not in response to a particular spill incident.

Because field tests have indicated that the soils surrounding the POL tanks are contaminated with POL products, a HAS has been determined for this site. For the purpose of utilizing HARM, the quantity of POL products possibly spilled at this site is estimated to be as much as 0 and 1,000 gallons. The only reported spillage from the tanks was through patched areas in the tank which were repaired by the city of Battle Creek when they were identified.

Site No. 2 - Northwest Depressed Area (HAS-54)

The Northwest Depressed Area is located on the northwestern edge of the original Base property, adjacent to the POL Tank Area (see Figure 3). This area collects surface water runoff from the western half of the original Base and has no surface discharge structure or spillway.

In addition to surface water runoff, three storm drainage systems were observed emptying into the site. One of these storm drainage systems is from the Central Base and Motor Pool areas. This system was constructed in 1977 and augmented in the summer of 1986. Storm water from the Motor Pool pavement drains to the northwest, where it is discharged into a concrete basin and then into an underground drain, which intersects the storm drain from the Central Base area and finally discharges to this site. The second system drains the Western Aircraft Parking Apron, the Underground Fuel Storage Tank System Area, the Former Coal Storage Area, and the present Base Supply Open Storage Area before discharging to this site. The third system drains the pump house-water tank area. Vegetative stress is evident at the area where the first two systems discharge into the site.

A HAS has been determined at this site because of noticeable vegetative stress at the storm drainage discharge points into this site, and because surface water runoff from a confirmed area of soil contamination also drains into the site. It is not possible to determine an exact quantity of contaminated materials which may have drained into the site. The known sources of contaminated materials are contaminated soil sediments, transported by surface water runoff and drainage from the Motor Pool pavement and Aircraft Parking Apron which could include fuels, oils and lubricants, which may have dripped on the pavements. These sources, however, would not exceed the HARM small quantity criteria of 5 tons or 20 drums of liquid waste.

Site No. 3 - Fire Training Area (FTA) (HAS-81)

This site is located on the west side of the original Base property (see Figure 3). The fire training area is approximately 85 feet in diameter and surrounded by a berm. The interior of the area is highly stained. It was reported that the fire training activities have, at times, moved between the POL storage tank area and its current location; however, there is little evidence of environmental stress on the exterior of the berm. Fire training activities at this site terminated in 1986.

During fire training exercises, a mixture of contaminated fuels, shop lubricants and oils, paint removers, thinners and strippers, and/or cleaning solvents from the various shops were mixed with clean JP-4 drawn from the supply tanks, not exceeding a 1:10 ratio, floated on top of water in the pit and ignited. The resulting fire would consume approximately 70% of the flammable material. Over a 10 year period (1977-1987), the Base burned between 5,400 and 7,400 gallons of fuels, shop lubricants and oils, paint removers, thinners and strippers, and/or cleaning solvents annually during fire training exercises, resulting in a total residue of between 16,000 and 20,000 gallons of material at this site.

On January 23, 1987, soil samples were collected by SEG laboratories from two areas within the bermed area of the FTA. Soil samples were taken at the surface and at 3 foot intervals to a depth of 12 feet. All of the samples, including those at the 12 foot level, contain constituents of petroleum products or additives. These constituents include oil and grease, benzene, ethyl benzene, xylenes, toluene, and lead (additives). An elevated level of 1,1,1-trichloroethane was also detected in the boring samples. 1,1,1-trichloroethane is a solvent and not a constituent of, or additive to, petroleum products such as gasoline and JP-4. Based upon these sampling results, it appears that petroleum, additives, and solvent-related contamination exists within the FTA to a depth of at least 12 feet. Because of the confirmation of contaminants at this site, the quantity of residue material disposed of at this site, and the potential for contaminant migration from the site, a HAS has been determined.

Site No. 4 - Abandoned Landfill (Unrated)

This site is located approximately 1,600 feet southwest of the FTA and is located on the property acquired by the Base in 1986 (see Figure 3). Large pieces of concrete and asphalt are present at the site.

According to installation personnel interviewed, this landfill was a dumping ground for runway construction debris. Also visible at this site are empty 55-gallon drums and 1-gallon cans. Markings on the cans indicated they originally contained paint thinners and drycleaning solvents. There were, however, no records to indicate if the drums and cans were full or empty when they were deposited in the landfill. There have been no reports of HW/HM disposal at this site. Based on the information available through the Records Search process, a HAS cannot be determined. However, additional IRP investigations at this site are warranted and should be undertaken.

Site No. 5 - Former Coal Storage Area (Unrated)

The former coal storage area is located between Site No. 1 (Fuel Storage Area), Site No. 3 (Fire Training Area), the present Base Supply Storage Area, and the West Base perimeter (see Figure 3). Coal was stored here during the occupancy of the airfield by the U.S. Army Air Corps. Pieces of coal, which appear to be bituminous, abound on the surface of this area. Contaminants, such as the heavy metals and sulfides found in coal, can be transported from a site by surface runoff or by groundwater flow when the contaminants percolate into the ground. Based on information available through the Records Search process, a HAS cannot be determined. However, additional IRP investigations at this site are warranted and should be undertaken.

Site No. 6 - Underground Fuel Storage Tank System (HAS-58)

Three underground fuel storage tanks, formerly an aqua-system, with associated piping and dispensing equipment, are located southeast of Building 6910 (see Figure 3). These tanks have a combined storage capacity of 100,000 gallons. They are currently used to store JP-4 fuel. In the 1970s, the local community college used two of the tanks for storage of fuel oil. Some leakage from the system was reported at that time; subsequently, the tanks have been relined. It was also reported that, on at least one occasion, a spill to the ground of approximately 2,000 gallons of fuel occurred from the pumping system.

C. Critical Habitats/Endangered or Threatened Species

Phone conversations with personnel from the Michigan Department of Natural Resources confirmed that there are no endangered or threatened species of flora or fauna in the vicinity of the Base. Wetlands exist in the central portion of an area west of the railroad and in an area which forms a southern boundary in the same location. These wetlands are not critical habitats; there are no wilderness areas within one mile of the Base.

D. Other Pertinent Findings

- o Waste oils have not been reported to be used on the Base's roads for dust control.
- o Sanitary sewage is discharged into the municipal sewer system and is treated offsite.
- o There are PCB transformers and capacitors at the Base. Leakage occurred

from one transformer on the northeast corner of Building 6905, which was damaged by lightning. Soil samples confirmed that this spill was cleaned up and disposed of properly by an ANG contractor.

- During the site visit, several widely scattered fire training burn areas were identified on the new property leased by the ANG. These fire training burn areas were natural depressions in the ground, located along the western boundary of the new property. In mid 1950, these natural depressions were utilized to a maximum of two times each for fire training. Up to 250 gallons of fuel was poured into the ground depression and ignited. The resulting fire would consume up to 70% of the fuel. Except for the natural depression in the ground surface, there is no evidence to indicate the areas were utilized for this purpose.

V. CONCLUSIONS

- Information obtained through interviews with 22 personnel of the Base, review of Base records, and field observations have resulted in the identification of 6 disposal/spill sites at the Base. These sites are potentially contaminated with HM/HW.

- One site (Site No. 4 - Abandoned Landfill) did not receive a HAS because there were no records to indicate that any HM/HW had actually been disposed of at this site.

- One site (Site No. 5 - Former Coal Storage Area) did not receive a HAS because no records exist quantifying the amount of coal stored here during the U.S. Army Air Corps occupancy.

VI. RECOMMENDATIONS

The following recommendations are made to ascertain if groundwater at the six identified sites has been contaminated, and to confirm or refute that Base generated contaminants are migrating off the Base.

Site No. 1 - POL Tank Area

Soil contamination at this site has been confirmed. Subsequent IRP analysis should be undertaken to determine the extent of soil contamination and to determine if groundwater has been contaminated.

Site No. 2 - Northwest Depressed Area

Further IRP analysis at this site is required to determine if contamination exists.

Site No. 3 - Fire Training Area (FTA)

Soil contamination at this site has been confirmed. Subsequent IRP analysis should be performed to determine the extent of soil contamination and to determine if groundwater contamination exists.

Site No. 4 - Abandoned Landfill

Further IRP analysis at this site is required to determine if contamination exists.

Site No. 5 - Former Coal Storage Area

Further IRP analysis at this site is required to determine if contamination exists.

Site No. 6 - Underground Fuel Storage Tank System

Further IRP analysis at this site is required to determine if contamination exists.

Base Perimeter

Further IRP analysis along the north and west Base perimeter is required to determine if any contamination is migrating from the Base.

GLOSSARY OF TERMS

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

CONTAMINANT - As defined by Section 101(f)(33) of SARA shall include, but not be limited to, any element, substance, compound, or mixture, including disease-causing agents, which after release into the environment and upon exposure, ingestion, inhalation, or assimilation into any organism, either directly from the environment or indirectly by ingestion through food chains, will or may reasonably be anticipated to cause death, disease, behavioral abnormalities, cancer, genetic mutation, physiological malfunctions (including malfunctions in reproduction), or physical deformation in such organisms or their offspring; except that the term "contaminant" shall not include petroleum, including crude oil or any fraction thereof which is not otherwise specifically listed or designated as a hazardous substance under:

(a) any substance designated pursuant to Section 311(b)(2)(A) of the Federal Water Pollution Control Act,

(b) any element, compound, mixture, solution, or substance designated pursuant to Section 102 of this Act,

(c) any hazardous waste having the characteristics identified under or listed pursuant to Section 3001 of the Solid Waste Disposal Act (but not including any waste the regulation of which under the Solid Waste Disposal Act has been suspended by Act of Congress),

(d) any toxic pollutant listed under Section 307(a) of the Federal Water Pollution Control Act,

(e) any hazardous air pollutant listed under Section 112 of the Clean Air Act, and

(f) any imminently hazardous chemical substance or mixture with respect to which the administrator has taken action pursuant to Section 7 of the Toxic Substance Control Act;

and shall not include natural gas, liquified natural gas, or synthetic gas of pipeline quality (or mixtures of natural gas and such synthetic gas).

CRITICAL HABITAT - The native environment of an animal or plant which, due either to the uniqueness of the organism or the sensitivity of the environment, is susceptible to adverse reactions to environmental changes such as may be induced by chemical contaminants.

DOWNGRADIENT - A direction that is hydraulically downslope; the direction in which groundwater flows.

ENDANGERED SPECIES - Wildlife species that are designated as endangered by the U.S. Fish and Wildlife Service.

GROUNDWATER - Refers to the subsurface water that occurs beneath the water table in soils and geologic formations that are fully saturated.

HARM - Hazard Assessment Rating Methodology - A system adopted and used by the United States Air Force to develop and maintain a priority listing of potentially contaminated sites on installations and facilities for remedial action based on potential hazard to public health, welfare, and environmental impacts. (Reference: DEQPPM 81-5, 11 December 1981).

HAS - Hazard Assessment Score - The score developed by utilizing the Hazardous Assessment Rating Methodology (HARM).

HAZARDOUS MATERIAL - Any substance or mixture of substances having properties capable of producing adverse effects on the health and safety of the human being. Specific regulatory definitions also found in OSHA and DOT rules.

HAZARDOUS WASTE - A solid or liquid waste that, because of its quantity, concentration, or physical, chemical, or infectious characteristics may:

a. Cause, or significantly contribute to, an increase in mortality or an increase in serious or incapacitating reversible illness; or

b. Pose a substantial present or potential hazard to human health or the environment when improperly treated, stored, transported or disposed of, or otherwise managed.

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

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

PIEZOMETRIC SURFACE - The surface to which the water from a given aquifer will rise under its full head. As used in this report, it refers to the water table.

SOIL PERMEABILITY - The characteristic of the soil that enables water to move downward through the profile. Permeability is measured as to the number of inches per hour that water moves downward through the saturated soil.

Terms describing permeability are:

Very Slow	- less than 0.06 inches per hour (less than 4.2×10^{-5} cm/sec)
Slow	- 0.06 to 0.20 inches per hour (4.23×10^{-5} to 1.4×10^{-4} cm/sec)
Moderately Slow	- 0.2 to 0.6 inches per hour (1.4×10^{-4} cm/sec)
Moderate	- 0.6 to 2.0 inches per hour ($4.2 \times 10^{-4} \times 10^{-3}$ cm/sec)
Moderately Rapid	- 2.0 to 6.0 inches per hour (1.4×10^{-3} to 4.2×10^{-3} cm/sec)
Rapid	- 6.0 to 20 inches per hour (4.2×10^{-3} to 1.4×10^{-2} cm/sec)
Very Rapid	- more than 20 inches per hour (more than 1.4×10^{-2} cm/sec)

(Reference: U.S.D.A. Soil Survey)

SURFACE WATER - All water exposed at the ground surfaces including streams, rivers, ponds, and lakes.

THREATENED SPECIES - Wildlife species that are designated as threatened by the U.S. Fish and Wildlife Service.

TOPOGRAPHY - The general conformation of a land surface, including its relief and the position of its natural and manmade features.

UPGRADIENT - A direction that is hydraulically upslope.

WATER TABLE - As used in this report, the water table is the surface below which all the openings, or voids, in the ground are filled with water. It is the surface at which water stands in shallow wells, or would stand if a well were drilled.

WETLANDS - An area subject to permanent or prolonged inundation or saturation that exhibits plant communities adapted to this environment.

WILDERNESS AREA - An area unaffected by anthropogenic activities and deemed worthy of special attention to maintain its natural condition.

BIBLIOGRAPHY

1. Environmental Assessment of the Acquisition and Development of 225 Acres, 110th Tactical Air Support Group, Michigan Air National Guard, W.K. Kellogg Regional Airport, Eugene A. Hickock and Associates, November, 1985.

2. Federal Register (47 FR 31224), 16 July 1982.

3. Federal Register (47 FR 31235), 16 July 1982.

4. Ground-Water Resources of the Battle Creek Area, Michigan, Kenneth E. Vanlier, 1966.

5. History of the Battle Creek ANG (16 September 1947 -16 September 1972).

6. National Oceanic and Atmospheric Administration, Local Climatological Data, Annual Summaries with Comparative Data for the Battle Creek, Michigan Area, 1985.

7. Resource Statement, Battle Creek Air National Guard Base (September 1986).

8. Water Well Records of wells within the vicinity of the installation from the Michigan Department of Public Health.

9. Base Master Plan.

10. Existing Airfield Layout.

11. Active Underground Utility Systems (Drainage Map).

12. Base Electrical System Plan.

13. General Site Plan.

14. Tank Storage Capacity List.

15. Fuel Systems Storage Facilities (coordinates with Tank Storage Capacity List).

16. Quaternary Geology of Michigan (1982).

17. Quaternary Geology of Michigan with Surface Water Drainage Divides (1984).

18. USGS Topographic Map.

19. Environmental Assessment (Hickock Report, November 1985).

20. Chemicals List, (Draft Report, ANGB, Lists Chemicals and years used).

21. Recoverable and Waste Petroleum Plan 19-14; 29 August 1986.

22. Addendum to October 11, 1985 Report Jet Fuel Storage Facility, Air National Guard, Battle Creek, Michigan SME Project No. K/8526, Soil and Materials Engineers, Inc., October 17, 1985.

23. Geohydrology and Ground-Water Flow at Verona Well Field, Battle Creek, Michigan, U.S. Geologic Survey Water-Resources Investigations Report 85-4056, 1985.

APPENDIX A

Resumes of Search Team Members

RAYMOND G. CLARK, JR.

EDUCATION

Completed graduate engineering courses, George Washington University, 1957
B.S., mechanical engineering, University of Maryland, 1949

SPECIALIZED TRAINING

Grad. European Command Military Assistance School, Stuttgart, 1969
Grad. Army Psychological Warfare School, Fort Bragg, 1963
Grad. Sanz School of Languages, D.C., 1963
Grad. DOD Military Assistance Institute, Arlington, 1963
Grad. Defense Procurement Management Course, Fort Lee, 1960
Grad. Engineer Officer's Advanced Course, Fort Belvoir, 1958

CERTIFICATIONS

Registered Professional Engineer: Kentucky (#4341); Virginia (#8303); Florida (#36228)

EXPERIENCE

Twenty-nine years of experience in engineering design, planning and management including construction and construction management, environmental, operations and maintenance, repair and utilities, research and development, electrical, mechanical, master planning and city management. Over six years' logistical experience including planning and programming of military assistance materiel and training for foreign countries, serving as liaison with American private industry, and directing materiel storage activities in an overseas area. Over two years' experience as an engineering instructor. Extensive experience in personnel management, cost reduction programs, and systems improvement.

EMPLOYMENT

Dynamac Corporation (1986-present): Program Manager

Responsible for activities relating to Phases I, II and IV of the U.S. Air Force Installation Restoration Program including records search, review and evaluation of previous studies; preparation of statements of work, feasibility studies; preparation of remedial action plans, designs and specifications; review of said studies/plans to ensure that they are in conformance with requirements; review of environmental studies and reports; and preparation of Air Force Installation Restoration Program Management Guidance.

Howard Needles Tammen & Bergendoff (HNTB) (1981-1986): Manager

Responsible, as Project Manager, for: design of a new concourse complex at Miami International Airport to include terminal building, roadway system, aircraft apron, drainage channel relocation, satellite building with underground pedestrian tunnel, and associated underground utility corridors, to include subsurface aircraft fueling systems, with an estimated construction cost of $163 million; a cargo vehicle tunnel under the crosswind runway with an estimated construction cost of $15 million; design and construction of two large corporate jet aircraft hangars; and for the hydrocarbon recovery program to include investigation, analysis, design of recovery systems, monitoring of recovery systems, and planning and design of residual recovery systems utilizing biodegradation. Participated, as sub-consultant, in Air Force IRP seminar.

HNTB (1979-1981): Airport Engineer

Responsibilities included development of master plan for Iowa Air National Guard base; project initiation assistance for a new regional airport in Florida; engineering assistance for new facilities design and construction for Maryland Air National Guard; master plan for city maintenance facilities, Orlando, Florida; in-country master plan and preliminary engineering project management for Madrid, Spain, International Airport; and project management of master plan for Whiting Naval Air Station and outlying fields in Florida.

HNTB (1974-1979): Design Engineer

Responsibilities included development of feasibility and site selection studies for reliever airports in Cleveland and Atlanta; site selection and facilities requirements for the Office of Aeronautical Charting and Cartography, NOAA; and onsite mechanical and electrical engineering design for terminal improvements at Baltimore-Washington International Airport, Maryland.

HNTB (1972-1974): Airport Engineer

Responsible for development of portions of the master plan and preliminary engineering for a new international airport for Lisbon, Portugal, estimated to cost $250 million.

Self-employed (1971-1972): Private Consultant

Responsible for engineering planning and installation of a production line for multimillion-dollar contract in Madrid, Spain, to fabricate transmissions and differentials for U.S. Army vehicles.

U.S. Army, Corps of Engineers (1969-1971): Chief, Materiel & Programs

Directed materiel planning and military training programs of military assistance to the Spanish Army. Controlled arrival and acceptance of materiel by host government. Served as liaison/advisor to American industry interested in conducting business with Spanish government. Was Engineer Advisor to Spanish Army Construction, Armament and Combat Engineers, also the Engineer Academy and Engineer School of Application.

Corps of Engineers (1968-1969): Chief, R&D Branch, OCE

Directed office responsible to Chief of Engineers for research and development. Developed research studies in new concepts of bridging, new explosives, family of construction equipment, night vision equipment, expedient airfield surfacing, expedient aircraft fueling systems, water purification equipment and policies, prefabricated buildings, etc. Achieved Department of Army acceptance for development and testing of new floating bridge. Participated in high-level Department Committee charged with development of a Tactical Gap Crossing Capability Model.

Corps of Engineers (1967-1968): Division Engineer

Facilities engineer in Korea. Was fully responsible for management and maintenance of 96 compounds within 245 square miles including 6,000+ buildings, 1 million linear feet of electrical distribution lines, 18 water purification and distribution systems, sanitary sewage disposal systems, roads, bridges, and fire protection facilities with real property value of more than $256 million. Planned and developed the first five-year master plan for this area. Administered $12 million budget and $2 million engineer supply operation. Was in responsible charge of over 500 persons. Developed and obtained approval for additional projects worth $9 million for essential maintenance and repair. Directed cost reduction programs that produced more than $500,000 savings to the United States in the first year.

Corps of Engineers (1963-1967): Engineer Advisor

Engineer and aviation advisor to the Spanish Army. Developed major modernization program for Spanish Army Engineers, including programming of modern engineer and mobile maintenance equipment. Directed U.S. portion of construction, testing and acceptance of six powder plants, one shell loading facility, an Engineer School of Application, and depot rebuild facilities for engineer, artillery, and armor equipment. Planned and developed organization of a helicopter battalion for the Spanish Army. Responsible for sales, delivery, assembly and testing of 12 new helicopters in country. Provided U.S. assistance to unit until self-sufficiency was achieved. Was U.S. advisor to Engineer Academy, School of Application and Polytechnic Institute.

Corps of Engineers (1960-1963): Deputy District Engineer

Responsible for planning and development of extensive construction projects in the Ohio River Basin for flood control and canalization, including dam, lock, bridge, and building construction, highway relocation, watershed studies, real estate acquisitions and dispositions. Was contracting officer for more than $75 *million of projects per year.* Supervised approximately 1,300 personnel, including 300 engineers. Planned and directed cost reduction programs amounting to more than $200,000 per year. Programmed and controlled development of a modern radio and control net in a four-state area.

Corps of Engineers (1959-1960): Area Engineer

Directed construction of a large airfield in Ohio as Contracting Officer's representative. Assured that all construction (runway, steam power plant, fuel transfer and loading facilities, utilities, buildings, etc.) complied with terms of plans and specifications. Was onsite liaison between Air Force and contractors.

Corps of Engineers (1958-1959): Chief, Supply Branch

Managed engineer supply yard containing over $21 million construction supplies and engineer equipment. Directed in-storage maintenance, processing and deprocessing of equipment. Achieved complete survey of items on hand, a new locator system and complete rewarehousing, resulting in approximately $159,000 savings in the first year.

Corps of Engineers (1957-1958): Student

U.S. Army Engineer School, Engineer Officer's Advanced Course.

Corps of Engineers (1954-1957): Engineer Manager

Managed engineer construction projects and was assigned to staff and faculty of the Engineer School. Was in charge of instruction on engineer equipment utilization, management and maintenance. Directed Electronic Section of the school. Coordinated preparation of five-year master plan for the Department of Mechanical and Technical Equipment.

Corps of Engineers (1949-1954): Engineer Commander

Positions of minor but increasing importance and responsibility in engineering management, communications, demolitions, construction administration and logistics.

PROFESSIONAL AFFILIATIONS

Member, National Society of Professional Engineers
Fellow, Society of American Military Engineers
Member, American Society of Civil Engineers
Member, Virginia Engineering Society
Member, Project Management Institute

HARDWARE

IBM PC

SOFTWARE

Lotus 1-2-3, D Base III Plus, Framework, Project Scheduler 5000, Harvard Project Manager, Volkswriter, Microsoft Project

MARK D. JOHNSON

EDUCATION

B.S., geology, James Madison University, 1980

EXPERIENCE

Seven years' technical experience including geologic mapping, subsurface investigations, foundation inspections, groundwater monitoring, pumping and observation well installation, geotechnical instrumentation, groundwater assessment, preparation of Air Force Installation Restoration Program Guidance and preparation of statements of work for the Air Force and the Air National Guard.

EMPLOYMENT

Dynamac Corporation (1984-present): Staff Scientist/Geologist

Primarily responsible for preparing statements of work for Phase IV-A of the Air Force's Installation Restoration Program, statements of work for Phase II and Phase IV-A of the Air National Guard's Installation Restoration Program, and assessing groundwater of hazardous waste disposal/spill sites on military installations for the purpose of determining rates and extents of contaminant migration and for developing site investigations, remedial investigations and identifying remedial actions. Prepared management guidance document for the Air Force's Installation Restoration Program.

Bechtel Associates Professional Corporation (1981-1984): Geologist

Performed the following duties in conjunction with major civil engineering projects including subways, nuclear power plants and buildings: prepared geologic maps of surface and subsurface facilities in rock and soil including tunnels, foundations and vaults; assessed groundwater conditions in connection with construction activities and groundwater control systems; monitored the installation of permanent and temporary dewatering systems and observation wells; monitored surface and subsurface settlement of tunnels; and participated in subsurface investigations.

Schnabel Engineering Associates (1981): Geologist

Inspected foundations and backfill placement.

PROFESSIONAL AFFILIATIONS

Association of Engineering Geologists
National Water Well Association/Association of Ground Water Scientists and Engineers
British Tunneling Society

JEFFREY J. SPANN

EDUCATION

B.S., chemistry, Lincoln University, 1979

CERTIFICATIONS

Environmentalist, Maryland Hazardous Materials Conference
Technician, Maryland CHS Vehicle Operations for Hazardous Materials

SECURITY CLEARANCE

Secret/DISCO

EXPERIENCE

SIX years of technical and management experience in all aspects of hazardous waste/materials management. Developed National Institutes of Health (NIH) protocol for removal and disposal of hazardous waste for compliance with federal regulations such as the Resource Conservation and Recovery Act, Department of Transportation and the Environmental Protection Agency. Was a member of the NIH Emergency Response Team responsible for chemical spill cleanups, chemical decontamination procedures and personnel protection.

EMPLOYMENT

Dynamac Corporation, HMTC (1984-present): Environmental Scientist

Works on assignments in hazardous materials/hazardous waste management. Conducted an extensive evaluation, including site visits, of U.S. Army installations for USE Solvent Elimination Program for U.S. Army Materiel Command (AMC). Was contributing author of DOD instructional manual 4145.19, Storage and Handling of Hazardous Materials. Conducted an extensive evaluation, including site inspections, of government-owned/contractor-operated polychlorinated biphenyl storage facilities for U.S. Army Materials Development and Readiness Command. Provides expertise to the Hazardous Materials Technical Center on all aspects of hazardous materials/hazardous waste management including transportation, storage, handling, and disposal.

Advanced Environmental Technology Corporation (1981-1984): Chemist/ Technical Supervisor

As technical supervisor for hazardous materials/waste management at the National Institutes of Health (NIH), managed the removal of hazardous materials/wastes from research, administrative, and maintenance facilities on NIH's main and satellite campuses. Consulted with the Environmental Protection Branch of NIH regarding laboratory safety. Responsible for the packaging of hazardous waste materials including explosives, as well as cylinder disposal. Responsible for all documentation such as the manifesting of hazardous waste material leaving NIH and traveling to appropriate TSDF and landfill facilities. Supervised the training of staff in hazardous waste management procedures and disciplines and the evaluation of collection and disposal procedures for improvements and/or revisions on NIH's main and satellite campuses.

HARDWARE/SOFTWARE

IBM PC XT and AT, Lotus 1-2-3

JEFFREY D. FLETCHER

EDUCATION

B.S., geology, Millersville University, 1984

EXPERIENCE

Technical and field experience includes geologic mapping, water well site location, and construction of water table maps. Also performed site surveys and prepared records searches for Phase I of the Installation Restoration Program, and performed hazardous waste site assessments for the Federal Bureau of Prisons.

EMPLOYMENT

Dynamac Corporation, HMTC (1986-present): Junior Staff Scientist/Geologist

Responsibilities include site surveys and preparation of records searches for Phase I of the Installation Restoration Program for the Air National Guard, and hazardous waste site assessments for the Federal Bureau of Prisons Hazardous Waste Site Investigation Program. Efforts include assessment of hazardous waste disposal sites for the purpose of determining rates and extents of contaminant migration and for identifying remedial actions.

Fletcher-Lowright and Assoc., Consulting Geologists (1984-1985): Geohydrology Aide

Primary duties included site location of water wells, analysis of well yield data through the use of computers, and construction of water table maps.

APPENDIX B

Interviewee Information

List of Interviewee Identification Numbers

Interviewee Number	Primary Duty Assignment	Years Associated With Michigan ANGB
1	Civil Engineering	5
2	POL Management	22
3	Fire Department	10
4	Jet Engine SHop	6
5	Aerospace Systems	20
6	Aerospace Systems	10
7	Facilities Management	16
8	Environmental & Occupational Safety and Health	2
9	Aerospace Systems	20
10	Procurement	37
11	Safety	17
12	Facilities Maintenance	29
13	Facilities Maintenance	23
14	Base Supply	12
15	Civil Engineering	8
16	Base Supply	11
17	Fabrication	16
18	Safety	15
19	POL Management	14
20	Transportation	13
21	Aerospace	8
22	Warehouse	12

Appendix C

Outside Agency Information and Contact List

OUTSIDE AGENCY CONTACT LIST

1. National Oceanic and Atmospheric Administration
   6001 Executive Boulevard
   Rockville, Maryland 20853

2. United States Geological Survey
   12201 Sunrise Valley Drive
   Reston, Virginia 22092

3. SEG Laboratories, Inc.
   1120 May Street
   Lansing, Michigan 48906

4. Michigan Department of Public Health
   3500 North Logan Street
   Lansing, Michigan 48909

5. Soil and Materials Engineers, Inc.
   4561 West Dickman Road
   Battle Creek, Michigan 49015

6. Calhoun County Department of Public Health
   Battle Creek, Michigan 49013

7. Michigan Department of Natural Resources
   301 East Louis Glick Highway
   Jackson, Michigan 49201

8. Ellis-Nacyaert and Genheimer Associates, Inc.
   3290 West Big Beaver Road
   Troy, Michigan 48084

APPENDIX D

USAF Hazard Assessment Rating Methodology

USAF HAZARD ASSESSMENT RATING METHODOLOGY

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).

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 National Guard in setting priorities for follow-on site investigations.

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 Records Search portion (Phase I) of the IRP. Scoring judgment 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. 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 of this report). The site rating form and the rating factor guideline are provided at the end of this appendix.

As with the previous model, this model considers four aspects of the hazard posed by a specific site: possible receptors of the contamination, the waste and its characteristics, the potential pathways for contamination migration, and any efforts that were made to contain the wastes resulting from a spill.

The receptors category rating is based on four rating factors: the potential for human exposure to the site, the potential for human ingestion of contaminants should underlying aquifers be polluted, the current and anticipated uses of the surrounding area, and the potential for adverse effects upon important biological resources and fragile natural settings. The potential for human exposure is evaluated on the basis of the total population within 1,000 feet of the site, and the distance between the site and the base boundary. The potential for human ingestion of contaminants is based on the distance between the site and the nearest well, the groundwater use of the uppermost aquifer, and population served by the groundwater supply within 3 miles of the site. The uses of the surrounding area are determined by the zoning within a 1-mile radius. Determination of whether or not critical environments exist within a 1-mile radius of the site predicts the potential for adverse effects from the site upon important biological resources and fragile natural settings. Each rating factor is numerically evaluated (0-3) and increased by a multiplier. The maximum possible score is also computed. The factor score and maximum possible scores are totaled, and the receptors subscore computed as follows: receptors subscore = (100 x factor score subtotal/maximum score subtotal).

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 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: surface-water migration, flooding, and groundwater migration. 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 the three possible routes is used. The three pathways are evaluated and the highest score among all four of the potential scores is used.

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

HAZARDOUS ASSESSMENT RATING FORM

NAME OF SITE ____________________

LOCATION ____________________

DATE OF OPERATION OR OCCURRENCE ____________________

OWNER/OPERATOR ____________________

COMMENTS/DESCRIPTION ____________________

SITE RATED BY ____________________

1. 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 installation 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) ____

11. WASTE CHARACTERISTICS

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

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

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

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

____ X ____ = ____

C. Apply physical state multiplier

Subscore B X Physical State Multiplier = Waste Characteristics Subscore

____ X ____ = ____

III. PATHWAYS

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

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

Subscore ______

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

1. Surface water migration

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

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

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

Subscore (100 X factor score/3) ______

3. Ground water migration

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

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

C. Highest pathway subscore.

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

Pathways Subscore ______

IV. WASTE MANAGEMENT PRACTICES

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

Receptors ______
Waste Characteristics ______
Pathways ______

Total ______ divided by 3 = ______
Gross Total Score

B. Apply factor for waste containment from waste management practices

Gross Total Score X Waste Management Practices Factor = Final Score

______ X ______ = ☐

HAZARDOUS ASSESSMENT RATING METHODOLOGY GUIDELINES

1. RECEPTORS CATEGORY

Rating Factors	Rating Scale Levels: 0	1	2	3	Multiplier
A. Population within 1,000 feet (includes on-base facilities)	0	1-25	26-100	Greater than 100	4
B. Distance to nearest water well	Greater than 3 miles	1 to 3 miles	3,001 feet to 1 mile	0 to 3,000 feet	10
C. Land Use/Zoning (within 1-mile radius)	Completely remote (zoning not applicable)	Agricultural	Commercial or Industrial	Residential	3
D. Distance to installation boundary	Greater than 2 miles	1 to 2 miles	1,001 feet to 1 mile	0 to 1,000 feet	6
E. Critical environments (within 1-mile radius)	Not a critical environment	Natural areas	Pristine natural areas; minor wetlands; preserved areas; presence of economically important natural resources susceptible to contamination	Major habitat of an endangered or threatened species; presence of recharge area; major wetlands	10
F. Water quality/use designation of nearest surface water body	Agricultural or Industrial use	Recreation, propagation and management of fish and wildlife	Shellfish propagation and harvesting	Potable water supplies	6
G. Ground-water use of uppermost aquifer	Not used, other sources readily available	Commercial, industrial, or irrigation, very limited other water sources	Drinking water, municipal water available	Drinking water, no municipal water available; commercial, industrial, or irrigation, no other water source available	9
H. Population served by surface water supplies within 3 miles downstream of site	0	1-15	51-1,000	Greater than 1,000	6
I. Population served by aquifer supplies within 3 miles of site	0	1-50	51-1,000	Greater than 1,000	6

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)	S = Suspected confidence level
o Verbal reports from interviewer (at least 2) or written information from the records	o No verbal reports or conflicting verbal reports and no written information from the records
o Knowledge of types and quantities of wastes generated by shops and other areas on base	o Logic based on a knowledge of the types and quantities of hazardous wastes generated at the base, and a history of past waste disposal practices indicate that these wastes were disposed of at a site

A-3 Hazard Rating

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

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

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

II. WASTE CHARACTERISTICS--Continued

Waste Characteristics Matrix

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

Notes:
For a site with more than one hazardous waste, the waste quantities may be added using the following rules:

Confidence Level
- o Confirmed confidence levels (C) can be added.
- o Suspected confidence levels (S) can be added.
- o Confirmed confidence levels cannot be added with suspected confidence levels.

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

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

B. Persistence Multiplier for Point Rating

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

C. Physical State Multiplier

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

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 Factors	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 inches	-10 to +5 inches	+5 to +20 inches	Greater than +20 inches	6
Surface erosion	None	Slight	Moderate	Severe	8
Surface permeability	0% to 15% clay ($>10^{-2}$ cm/sec)	15% to 30% clay (10^{-2} to 10^{-4} cm/sec)	30% to 50% clay (10^{-4} to 10^{-6} cm/sec)	Greater than 50% clay ($>10^{-6}$ cm/sec)	6
Rainfall intensity based on 1-year 24-hour rainfall	<1.0 inch	1.0 to 2.0 inches	2.1 to 3.0 inches	>3.0 inches	8
(Thunderstorms)	0-5 0	6-35 30	36-49 60	>50 100	

B-2 Potential for Flooding

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

B-3 Potential for Ground-Water Contamination

Rating Factors	0	1	2	3	Multiplier
Depth to ground water	Greater than 500 feet	50 to 500 feet	11 to 50 feet	0 to 10 feet	8
Net precipitation	Less than -10 inches	-10 to +5 inches	+5 to + 20 inches	Greater than +20 inches	6
Soil permeability	Greater than 50% clay ($>10^{-6}$ cm/sec)	30% to 50% clay (10^{-4} to 10^{-6} cm/sec)	15% to 30% clay (10^{-2} to 10^{-4} cm/sec)	0% to 15% clay ($<10^{-2}$ cm/sec)	8

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

Rating Factors	Rating Scale Levels 0	1	2	3	Multiplier
Subsurface flows	Bottom of site greater than 5 feet above high ground-water level	Bottom of site occasionally submerged	Bottom of site frequently submerged	Bottom of site located below mean ground-water level	8
Direct access to ground water (through faults, fractures, faulty well casings, subsidence, fissures, etc.)	No evidence of risk	Low risk	Moderate risk	High risk	8

IV. WASTE MANAGEMENT PRACTICES CATEGORY

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

B. Waste Management Practices Factor

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

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

Guidelines for fully contained:

Landfills:

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

Surface Impoundments:

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

Spills:

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

Fire Protection Training Areas:

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

General Note: If data are not available or known to be complete the factor ratings under items I-A through I, III-B-1, or III-6-3, then leave blank for calculation of factor score and maximum possible score.

CNR122

APPENDIX E

Site Hazardous Rating Forms

110th Tactical Air Support Group
Michigan Air National Guard
W.K. Kellogg Regional Airport
Battle Creek Michigan

USAF Hazard Assessment Rating Methodology
Factor Rating Criteria

1. RECEPTORS

Population within 1,000 feet of site:	Approximately 75
Distance to nearest well:	Less than 1/2 mile
Land use/zoning within 1 mile radius:	Industrial/Residential
Distance to installation boundary:	
Site No. 1	Less than 300 feet
Site No. 2	Less than 100 feet
Site No. 3	Less than 200 feet
Site No. 5	Less than 500 feet
Critical environments within 1 mile:	Wetlands/Recharge Area
Water Quality of nearest surface water body:	Recreation
Groundwater use of uppermost aquifer:	Drinking (Limited use)
Population served by surface water supply within 3 miles downstream of site:	0
Population served by groundwater supply within 3 miles of site:	More than 1,000

2. WASTE CHARACTERISTICS

Quantity

Site No. 1	Less than 1,000 gallons
Site No. 2	Less than 1,000 gallons
Site No. 3	More than 17,500 gallons
Site No. 5	Approximately 2,000 gallons

110th Tactical Air Support Group
Michigan Air National Guard
W.K. Kellogg Regional Airport
Battle Creek Michigan

USAF Hazard Assessment Rating Methodology
Factor Rating Criteria (Continued)

2. WASTE CHARACTERISTICS (Continued)

Confidence Level

Site No. 1	Confirmed
Site No. 2	Suspected
Site No. 3	Confirmed
Site No. 5	Confirmed

Hazard Rating

Site No. 1	Low
Site No. 2	Low
Site No. 3	Medium
Site No. 5	Low

3. PATHWAYS

Surface Water Migration

Distance to nearest surface water:	About 500 feet
Net precipitation:	+ 0.73 inches
Surface erosion	None
Surface permeability:	1.4×10^{-2} to 4.2×10^{-4}
Rainfall intensity:	2.25 inches

Flooding: Beyond 100-year floodplain

110th Tactical Air Support Group
Michigan Air National Guard
W.K. Kellogg Regional Airport
Battle Creek Michigan

USAF Hazard Assessment Rating Methodology
Factor Rating Criteria (Continued)

3. PATHWAYS (Continued)

Groundwater Migration

Depth to groundwater:	10 feet
Net precipitation:	+ 0.73 inches
Soil permeability:	1.4×10^{-2} to 4.2×10^{-4}
Subsurface flow:	Occasionally submerged
Direct access to groundwater:	High risk

HAZARDOUS ASSESSMENT RATING FORM

NAME OF SITE Site No. 1 - POL Tank Area

LOCATION Michigan Air National Guard, W.K. Kellogg Regional Airport, Battle Creek, MI

DATE OF OPERATION OR OCCURRENCE Approximately 1973 - 1974

OWNER/OPERATOR 110th Civil Engineer Squadron, Michigan Air National Guard

COMMENTS/DESCRIPTION Four POL Storage Tanks

SITE RATED BY HMTC

I. RECEPTORS

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
A. Population within 1,000 feet of site	2	4	8	12
B. Distance to nearest well	3	10	30	30
C. Land use/zoning within 1 mile radius	2	3	6	9
D. Distance to installation boundary	3	6	18	18
E. Critical environments within 1 mile radius of site	3	10	30	30
F. Water quality of nearest surface water body	1	6	6	18
G. Ground water use of uppermost aquifer	2	9	18	27
H. Population served by surface water supply within 3 miles downstream of site	0	6	0	18
I. Population served by ground-water supply within 3 miles of site	3	6	18	18
		Subtotals	134	180

Receptors subscore (100 X factor score subtotal/maximum score subtotal) 74

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) L

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

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

30 x 0.8 = 24

C. Apply physical state multiplier

Subscore B X Physical State Multiplier = Waste Characteristics Subscore

24 x 1.0 = 24

III. PATHWAYS

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

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

Subscore 100

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

1. Surface water migration

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

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

2. Flooding

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

Subscore (100 X factor score/3) ______

3. Ground water migration

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

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

C. Highest pathway subscore.

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

Pathways Subscore 100

IV. WASTE MANAGEMENT PRACTICES

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

Receptors	74
Waste Characteristics	24
Pathways	100
Total 198 divided by 3 =	66
	Gross Total Score

B. Apply factor for waste containment from waste management practices

Gross Total Score X Waste Management Practices Factor = Final Score

66 x 1.00 = $\boxed{66}$

HAZARDOUS ASSESSMENT RATING FORM

NAME OF SITE Site No. 2 - Drainage Swale

LOCATION Michigan Air National Guard, W. K. Kellogg Regional Airport, Battle Creek , MI.

DATE OF OPERATION OR OCCURRENCE Approximately 1971- 1984

OWNER/OPERATOR 110th Civil Engineer Squadron, Michigan Air National Guard

COMMENTS/DESCRIPTION Drainage Swale

SITE RATED BY HMTC

I. RECEPTORS

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
A. Population within 1,000 feet of site	2	4	8	12
B. Distance to nearest well	3	10	30	30
C. Land use/zoning within 1 mile radius	2	3	6	9
D. Distance to installation boundary	3	6	18	18
E. Critical environments within 1 mile radius of site	3	10	30	30
F. Water quality of nearest surface water body	1	6	6	18
G. Ground water use of uppermost aquifer	2	9	18	27
H. Population served by surface water supply within 3 miles downstream of site	0	6	0	18
I. Population served by ground-water supply within 3 miles of site	3	6	18	18
		Subtotals	134	180

Receptors subscore (100 X factor score subtotal/maximum score subtotal) 74

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) L

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

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

20 x 0.9 = 18

C. Apply physical state multiplier

Subscore B X Physical State Multiplier = Waste Characteristics Subscore

18 x 1.0 = 18

HAZARDOUS ASSESSMENT RATING FORM

III. PATHWAYS

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

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

Subscore 80

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

1. Surface water migration

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
Distance to nearest surface water	2	8	16	24
Net precipitation	1	6	6	18
Surface erosion	0	8	0	24
Surface permeability	1	6	6	18
Rainfall intensity	2	8	16	24
Subtotals			44	108

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

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

Subscore (100 X factor score/3) 0

3. Ground water migration

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
Depth to ground water	3	8	24	24
Net precipitation	1	6	6	18
Soil permeability	2	8	16	24
Subsurface flows	1	8	8	24
Direct access to ground water	3	8	24	24
Subtotals			78	114

Subscore (100 X factor score subtotal/maximum score subtotal) 68

C. Highest pathway subscore.

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

Pathways Subscore 80

IV. WASTE MANAGEMENT PRACTICES

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

Receptors	74
Waste Characteristics	18
Pathways	80

Total 172 divided by 3 = 57 Gross Total Sco

B. Apply factor for waste containment from waste management practices

Gross Total Score X Waste Management Practices Factor = Final Score

57 x 0.95 = $\boxed{54}$

HAZARDOUS ASSESSMENT RATING FORM

NAME OF SITE Site No. 3 - Fire Training Pit (FTP)

LOCATION Michigan Air National Guard, W.K. Kellogg Regional Airport, Battle Creek, MI

DATE OF OPERATION OR OCCURRENCE Approximately 1977

OWNER/OPERATOR 110th Civil Engineer Squadron, Michigan Air National Guard

COMMENTS/DESCRIPTION Site designated for fire training exercises

SITE RATED BY HMTC

I. RECEPTORS

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
A. Population within 1,000 feet of site	2	4	8	12
B. Distance to nearest well	3	10	30	30
C. Land use/zoning within 1 mile radius	2	3	6	9
D. Distance to installation boundary	3	6	18	18
E. Critical environments within 1 mile radius of site	3	10	30	30
F. Water quality of nearest surface water body	1	6	6	18
G. Ground water use of uppermost aquifer	2	9	18	27
H. Population served by surface water supply within 3 miles downstream of site	0	6	0	18
I. Population served by ground-water supply within 3 miles of site	3	6	18	18
		Subtotals	134	180

Receptors subscore (100 X factor score subtotal/maximum score subtotal) 74

II. WASTE CHARACTERISTICS

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

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

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 100

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

1. Surface water migration

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

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

2. Flooding

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

Subscore (100 X factor score/3) ______

3. Ground water migration

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

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

C. Highest pathway subscore.

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

Pathways Subscore 100

IV. WASTE MANAGEMENT PRACTICES

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

Receptors 74
Waste Characteristics 80
Pathways 100

Total 254 divided by 3 = 85
Gross Total Score

B. Apply factor for waste containment from waste management practices

Gross Total Score X Waste Management Practices Factor = Final Score

85 x 0.95 = $\boxed{81}$

HAZARDOUS ASSESSMENT RATING FORM

NAME OF SITE No. 6 - Underground Fuel Storage Tank System

LOCATION Michigan Air National Guard, W.K. Kellogg Regional Airport, Battle Creek, MI

DATE OF OPERATION OR OCCURRENCE Unknown

OWNER/OPERATOR 110th Civil Engineering Squadron Michigan Air National Guard

COMMENTS/DESCRIPTION Underground Fuel Storage Tanks

SITE RATED BY HMTC

I. RECEPTORS

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
A. Population within 1,000 feet of site	2	4	8	12
B. Distance to nearest well	3	10	30	30
C. Land use/zoning within 1 mile radius	2	3	6	9
D. Distance to installation boundary	3	6	18	18
E. Critical environments within 1 mile radius of site	3	10	30	30
F. Water quality of nearest surface water body	1	6	6	18
G. Ground water use of uppermost aquifer	2	9	18	27
H. Population served by surface water supply within 3 miles downstream of site	0	6	0	18
I. Population served by ground-water supply within 3 miles of site	3	6	18	18
		Subtotals	134	180

Receptors subscore (100 X factor score subtotal/maximum score subtotal) 74

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) L

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

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

40 x 0.8 = 32

C. Apply physical state multiplier

Subscore B X Physical State Multiplier = Waste Characteristics Subscore

32 x 1.0 = 32

III. PATHWAYS

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

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

Subscore 0

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

1. Surface water migration

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
Distance to nearest surface water	3	8	24	24
Net precipitation	1	6	6	18
Surface erosion	0	8	0	24
Surface permeability	1	6	6	18
Rainfall intensity	2	8	16	24
Subtotals			34	108

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

2. Flooding

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

Subscore (100 X factor score/3) ____

3. Ground water migration

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
Depth to ground water	3	8	24	24
Net precipitation	1	6	6	18
Soil permeability	2	8	16	24
Subsurface flows	1	8	8	24
Direct access to ground water	3	8	24	24
Subtotals			78	114

Subscore (100 X factor score subtotal/maximum score subtotal) 68

C. Highest pathway subscore.

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

Pathways Subscore 68

IV. WASTE MANAGEMENT PRACTICES

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

Receptors 74
Waste Characteristics 32
Pathways 68
Total 174 divided by 3 = 58
Gross Total Score

B. Apply factor for waste containment from waste management practices

Gross Total Score X Waste Management Practices Factor = Final Score

58 x 1 = $\boxed{58}$

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