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F33657-E-0297
IRP Phase I Results Search

# INSTALLATION RESTORATION PROGRAM RECORDS SEARCH

## For Air Force Plant 59, Johnson City, New York

CH2M HILL

Prepared for

AIR FORCE ENGINEERING AND SERVICES CENTER
DIRECTORATE OF ENVIRONMENTAL PLANNING
TYNDALL AIR FORCE BASE, FLORIDA 32403
AND
AIR FORCE SYSTEMS COMMAND
AERONAUTICAL SYSTEMS DIVISION
WRIGHT-PATTERSON AIR FORCE BASE, OHIO 45433

OCTOBER 1984

## NOTICE

This report has been prepared for the United States Air Force by CH2M HILL SOUTHEAST, INC., for the purpose of aiding in the implementation of the Air Force Installation Restoration Program. It is not an endorsement of any product. The views expressed herein are those of the contractor and do not necessarily reflect the official views of the publishing agency, the United States Air Force, nor the Department of Defense.

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# INSTALLATION RESTORATION PROGRAM RECORDS SEARCH

FOR

AIR FORCE PLANT 59, JOHNSON CITY, NEW YORK

Prepared for

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

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AIR FORCE SYSTEMS COMMAND
AERONAUTICAL SYSTEMS DIVISION
WRIGHT-PATTERSON AIR FORCE BASE, OHIO 45433

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October 1984

Contract No. F08637-83-G0007-5000

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EXECUTIVE SUMMARY

EXECUTIVE SUMMARY

## A. INTRODUCTION

1. CH2M HILL was retained on March 1, 1984, to conduct the Air Force (AF) Plant 59 records search under Contract No. F08637-83-G007-5000, with funds provided by Aeronautical Systems Division (ASD).

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

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

4. The AF Plant 59 records search included a detailed review of pertinent installation records, contacts

with 16 government organizations for documents relevant to the records search effort, and an onsite installation visit conducted by CH2M HILL during the week of July 9 through July 11, 1984. Activities conducted during the onsite visit included interviews with 11 installation employees, ground tours of installation facilities, and a detailed search of installation records.

## B. MAJOR FINDINGS

1. Industrial operations at AF Plant 59 were performed by Remington Rand from 1942 to 1945, and by General Electric Company from 1949 to the present. The plant was idle during the intervening 4 years. Remington Rand manufactured airplane propellers; General Electric Company manufactures aerospace control and electrical systems. Manufacture of these aircraft-associated parts resulted in generation of varying quantities of the same waste products. Wastes generated are (a) waste oils, including cutting oils, lubricating oils, and coolants; (b) spent solvents, including degreasers; (c) spent process chemicals, including plating acids, caustics, chromium and cyanide solutions; and (d) paint residues. The total quantity of these wastes currently generated is about 50,000 gallons per year. Waste quantities are dependent on contractor workload and have varied over time.

2. In general, the standard procedures for past and present industrial waste disposal practices have been as follows: (1) concentrated plating baths have been neutralized in an aboveground holding tank and removed by a contractor (1952 to

present); (2) plating rinsewater was treated in a settling tank for metal precipitation prior to discharge to Outfall 001 (1952 to 1969); plating rinsewater was treated in a settling tank for chromium reduction and metal precipitation prior to discharge to Outfall 001 (1969 to July 1984); plating rinsewater is treated by an anion and cation exchange column and reused (July 1984 to present); (3) waste oils were primarily recovered, with some waste oils being discharged to an oil/water separator upstream of Outfall 002 (1942 to 1953); waste oils are discharged to two underground waste oil storage tanks and removed by a contractor (1953 to present); and (4) kerosene-based degreasing solvents were disposed of with the waste oils (1942 to 1969); spent solvents are drummed and removed by a contractor (1969 to present). More specific industrial waste disposal practices are summarized in Section IV.A.1, "Summary of Industrial Waste Disposal Practices".

3. Interviews with installation employees resulted in the identification of two hazardous waste spill sites at AF Plant 59 (see Figure 1 for site locations).

## C. CONCLUSIONS

1. Information obtained through interviews with 11 installation personnel, installation records, and field observations indicates that hazardous waste spills have occurred on AF Plant 59 property in the past.

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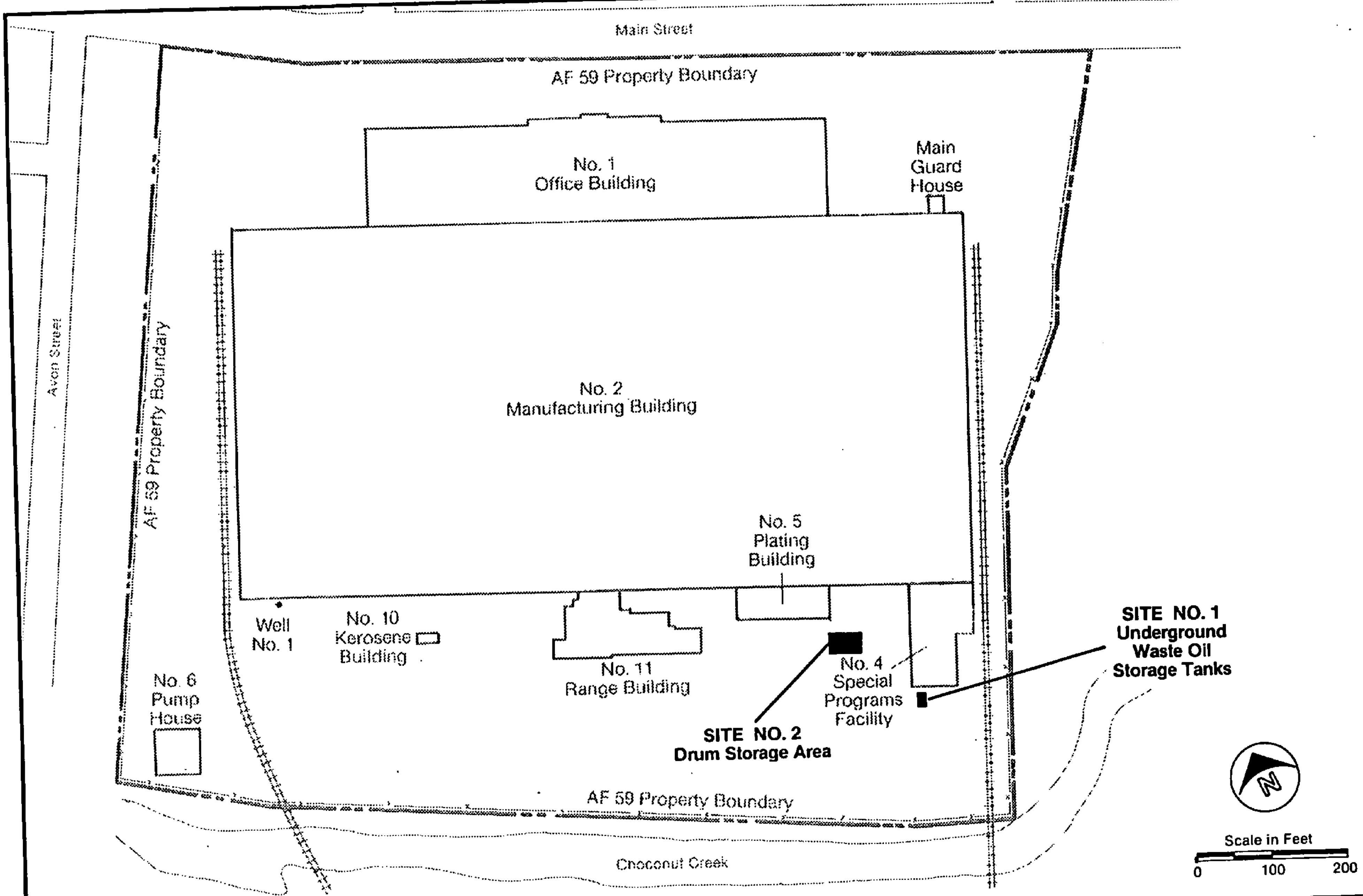


**FIGURE 1.**
Location Map of Identified Spill Sites at AF Plant 59.

2. No evidence of environmental stress resulting from past hazardous waste spills was observed at AF Plant 59.

3. Indirect evidence (confirmed by visual observation) of contamination exists at Site No. 1, Underground Waste Oil Storage Tanks.

4. The potential for surface-water migration of hazardous contaminants is moderately high at AF Plant 59 due to: (1) the moderate annual net precipitation rate, (2) the close proximity to Little Choconut Creek, (3) extensive paved areas surrounding the plant, and (4) the lined stormwater drainage channels and stormwater conduits which would convey any spills occurring on paved areas to Little Choconut Creek.

5. The potential for ground-water migration of hazardous contaminants is moderately high due to: (1) the moderate annual net precipitation rate, (2) the depth to ground water (approximately 15 feet), (3) high soil permeabilities, and (4) the absence of a continuous low-permeability confining stratum in the unsaturated zone.

6. Two spill sites were identified and rated at AF Plant 59. Table 1 presents the priority listing of the sites and their overall scores. Site No. 1, Underground Waste Oil Storage Tanks (overall score 65), is considered to be the area showing the most significant potential (relative to the other AF Plant 59 site) for environmental impact.

Table 1
PRIORITY LISTING OF SPILL SITES

| Site No. | Description | Overall Score |
|---|---|---|
| 1 | Underground Waste Oil Storage Tanks | 65 |
| 2 | Drum Storage Area | 46 |

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7. Site No. 2, Drum Storage Area (overall score 46), is not considered to present any significant environmental concern, and therefore no follow up on actions are recommended.

D. RECOMMENDATIONS

1. A limited Phase II monitoring program is recommended for Site No. 1, Underground Waste Oil Storage Tank, to confirm or rule out the presence and/or migration of hazardous contamination. The priority for monitoring at this site is considered moderate. Details of the limited Phase II program are provided in Section VI.

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

3. Other environmental recommendations in addition to the Phase II sampling include the following: (1) sample AF Plant 59 Well No. 1 and analyze in accordance with Section VI, (2) collect sediment samples, one upstream and two downstream of Outfall 001, from Little Choconut Creek and analyze in accordance with Section VI, and (3) determine the status of the out-of-service oil/water separator which used to service the old Oil Reclamation Building.

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# I. INTRODUCTION

# I. INTRODUCTION

## A. BACKGROUND

The United States Air Force (USAF), due to its primary mission, has long been engaged in a wide variety of operations dealing with toxic and hazardous materials. Federal, state, and local governments have developed strict regulations that require disposers to identify the locations and contents of disposal sites and take action to eliminate the hazards in an environmentally responsible manner.

The Department of Defense (DoD) developed the Installation Restoration Program (IRP) to ensure compliance with hazardous waste regulations. The current DoD IRP policy is contained in Defense Environmental Quality Program Policy Memorandum (DEQPPM) 81-5, dated 11 December 1981 and implemented by Headquarters Air Force message dated 21 January 1982. DEQPPM 81-5 re-issued and amplified all previous directives and memoranda on the IRP. DoD policy is to identify and fully evaluate suspected problems associated with past hazardous material contamination, and to control hazards to health and welfare that may have resulted from these past operations. The IRP will be the basis for assessment and response actions on Air Force installations under the provisions of the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) of 1980, as implemented by Executive Order 12316 and provisions of Subpart F of 40 CFR 300 (National Contingency Plan). CERCLA is the primary Federal legislation governing remedial actions at uncontrolled hazardous waste sites.

To conduct the IRP Hazardous Materials Disposal Sites Records Search for AF Plant 59, New York, CH2M HILL was retained on March 1, 1984, under Contract No. F08637-83-

G0007-5000 with funds provided by Aeronautical Systems Division (ASD).

The records search, Phase I of the DoD IRP, is intended to review installation records for the purpose of identifying possible hazardous waste-contaminated sites and assessing the potential for contaminant migration. Phase II (not part of this contract) consists of the necessary fieldwork to confirm the direction, rate of movement, and extent of contamination. Phase III (not part of this contract) consists of technology base development to support the development of project plans for controlling migration or restoring the installation. Phase IV (not part of this contract) includes those efforts that are required to control identified hazardous environmental conditions.

## B. AUTHORITY

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

## C. PURPOSE OF THE RECORDS SEARCH

The Phase I records search is designed to identify and evaluate suspected problems associated with past hazardous material disposal sites and spill sites on DoD facilities. The existence and potential for migration of hazardous material contaminants were evaluated at AF Plant 59 by reviewing the existing information and conducting an analysis of installation records. Pertinent information includes the history of operations, the geological and hydrogeological conditions that may have contributed to the migration of contaminants, and the ecological settings that indicated environmentally sensitive habitats or evidence of environmental stress. The evaluation is to determine which identified sites, if any, exhibit a significant potential for environmental impact and warrant further investigation. Sampling is not conducted during Phase I.

## D. SCOPE

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

The pre-performance meeting was held at AF Plant 59, New York, on June 8, 1984. Attendees at this meeting included representatives of the Air Force Engineering and Services Center (AFESC), Defense Contract Administrative Services (DCAS), General Electric Company, and CH2M HILL. The pre-performance meeting provided detailed project instructions, provided clarification and technical guidance by AFESC, and defined the responsibilities of all parties participating in the AF Plant 59 records search.

CH2M HILL conducted the on-site installation visit from July 9 through July 11, 1984. Activities performed during the on-site visit included a detailed search of installation records, facility and ground tours, and interviews with installation personnel. At the conclusion of the on-site visit, representatives of the DCAS and General Electric Company personnel were briefed on the preliminary findings. The CH2M HILL records search team included the following individuals:

1. Mr. Gregory T. McIntyre, Project Manager/ Environmental Engineer (M.S., Environmental and Water Resources Engineering, 1981).

2. Mr. Clifton J. McFarland, Assistant Project Manager/Chemical Engineer (B.S., Chemical Engineering, 1981).

3. Mr. Brian Painter, Hydrogeologist, (M.S., Hydrogeology, 1984).

4. Dr. Robert Knight, Ecologist (Ph.D., Systems Ecology, 1980).

Resumes of these team members are included in Appendix A. Dr. Knight was not a member of the site visit team.

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

Individuals from the Air Force and from General Electric Company who assisted in the AF Plant 59 records search include:

1. Captain Gail Graban, AFESC, Program Manager, Phase I

2. Mr. W. Patrick Gilligan, Plant Engineer, General Electric Company

3. Mr. James F. Clarke, Industrial Resource Specialist, DCAS--Binghamton

4. Mr. Donald K. Keyser, Administrative Contracting Officer, DCASMA--Syracuse

## E. METHODOLOGY

The methodology used in the AF Plant 59 records search is shown in Figure 2. First, a review of past and present industrial operations was conducted at the installation. Information was obtained from available records, such as contractor files and real property files, as well as interviews with employees from the various operating areas of the installation. The information obtained from interviewees on past activities was based on their best recollection. A list of interviewees from AF Plant 59, with areas of knowledge and years at the installation, is presented in Appendix C.

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

The records search team conducted a general ground tour of identified sites to gather site-specific information including evidence of environmental stress and the presence of nearby drainage ditches or surface-water bodies. These water bodies were visually inspected for any evidence of contamination or leachate migration.

A decision was then made, based on all of the above information, as to whether a potential existed for hazardous material contamination from any of the identified sites. If not, the site was deleted from further consideration.

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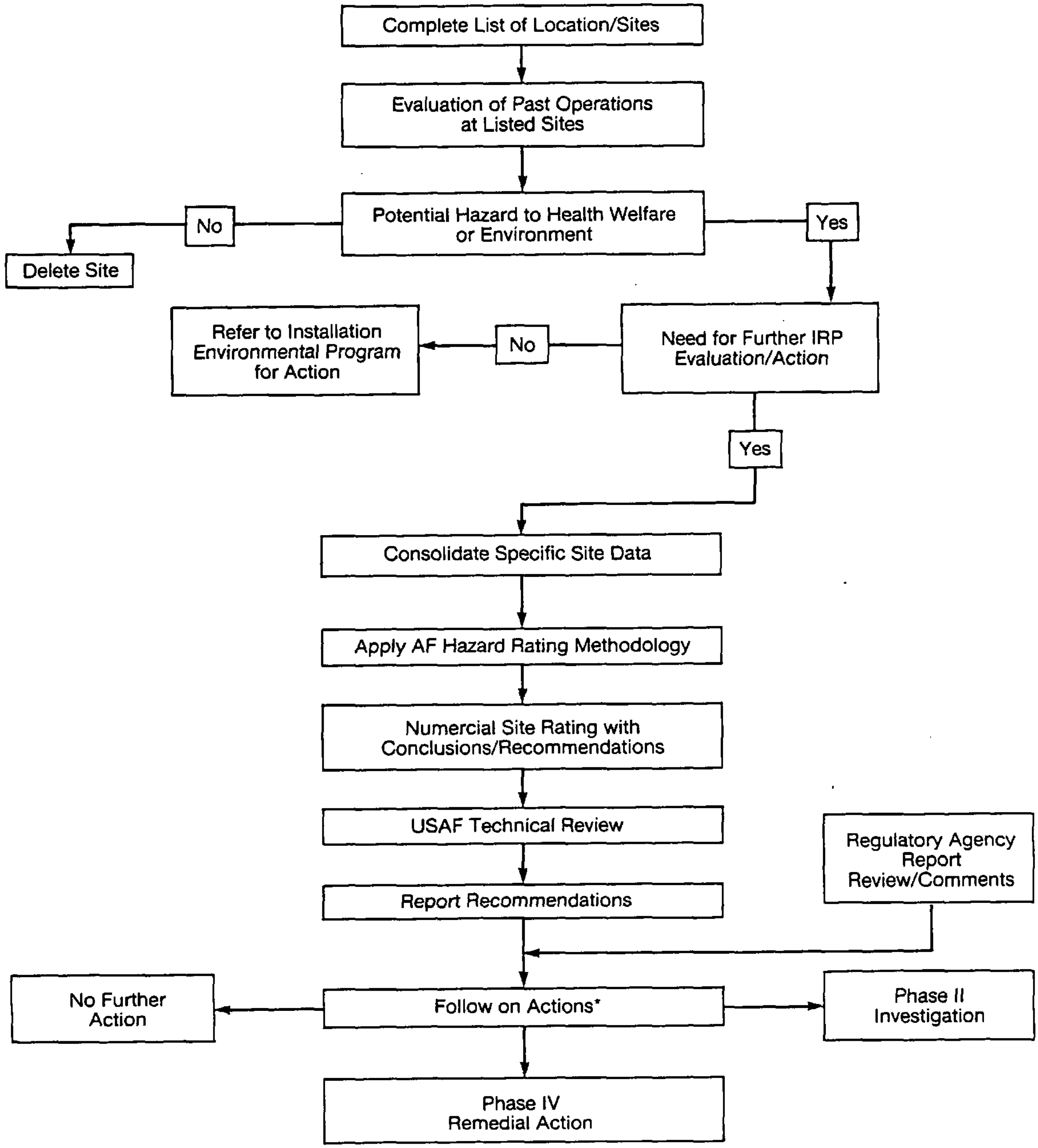
PHASE I INSTALLATION RESTORATION PROGRAM
RECORDS SEARCH FLOW CHART




*Beyond Scope of Phase I

**FIGURE 2.**
Records Search Methodology.

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

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

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II. INSTALLATION DESCRIPTION

## II. INSTALLATION DESCRIPTION

### A. LOCATION

AF Plant 59 is located in Broome County, New York, in the Village of Johnson City, about 3 miles west-northwest of the center of the City of Binghamton, and about 4 miles east of the center of the Village of Endicott. Other nearby towns (within 5 miles) include Maine, Chenango, Dickinson, Union, Binghamton, and Vestal. A location and vicinity map of AF Plant 59 is shown in Figure 3, and a site map is shown in Figure 4.

The total land area of AF Plant 59 is 29.6 acres. The main entrance of AF Plant 59 is at 600 Main Street (New York State Route 17C), which is the northern boundary of the installation. AF Plant 59 is located on a bend of Little Choconut Creek which runs just to the east and south of the installation. The confluence of Little Choconut Creek and the Susquehanna River is about 1,000 feet west of the southwest corner of the plant. A 0.6-acre parking lot which is part of AF Plant 59 property, but not contiguous with the main plantsite, is located north of Main Street.

### B. ORGANIZATION AND MISSION

AF Plant 59 is in an Air Force-owned electro-mechanical systems production facility operated under contract by the General Electric Company. Aircraft electronic equipment is manufactured for both military and commercial clients. Authority to use Government-owned facilities for non-government work is obtained on a continuing basis from the Defense Logistics Agency.

The mission of AF Plant 59 is the manufacture and assembly of electronic and electro-mechanical equipment. General Electric Company is currently producing flight

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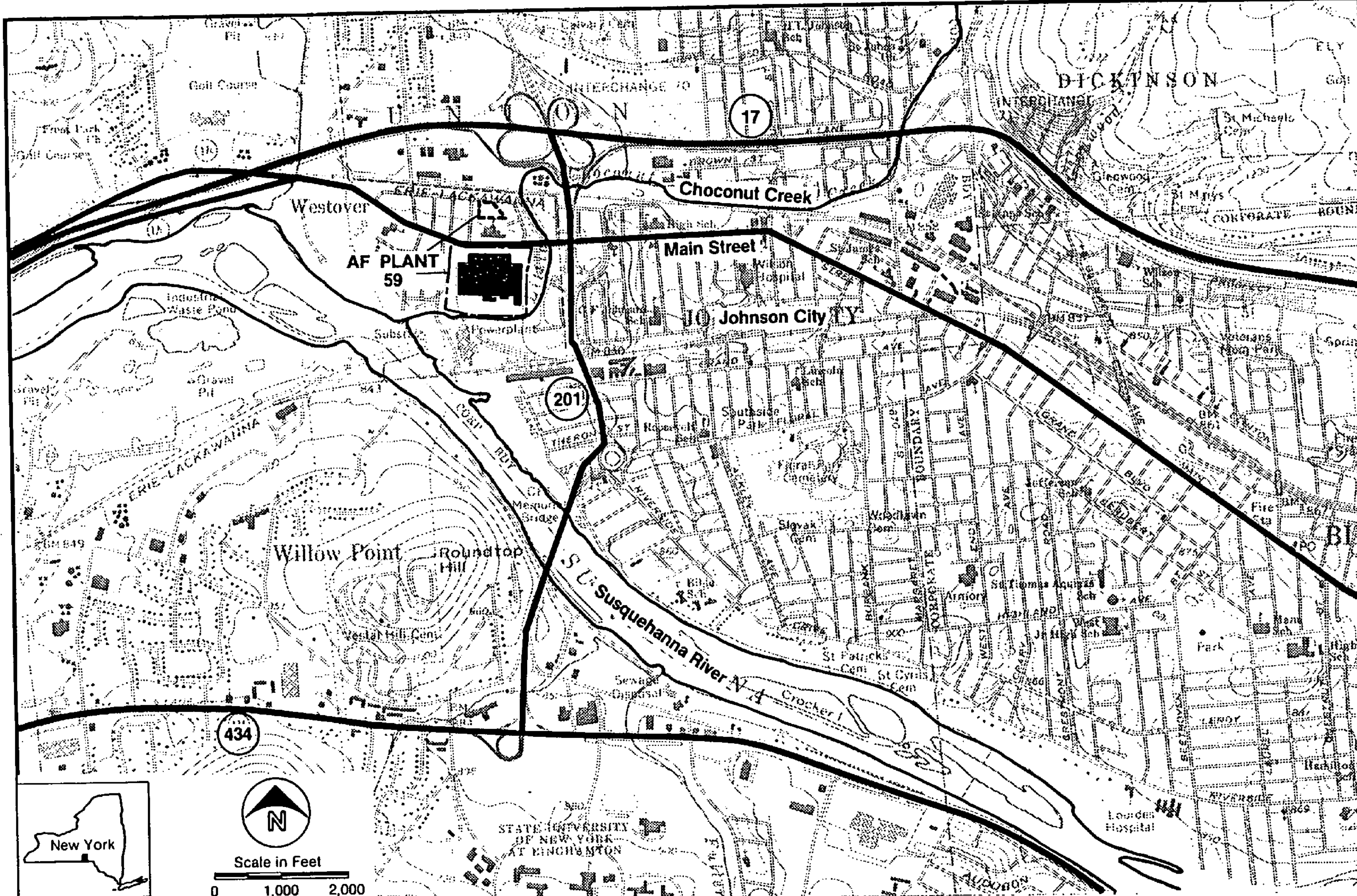


**FIGURE 3.**
Location and Vicinity Map of AF Plant 59.

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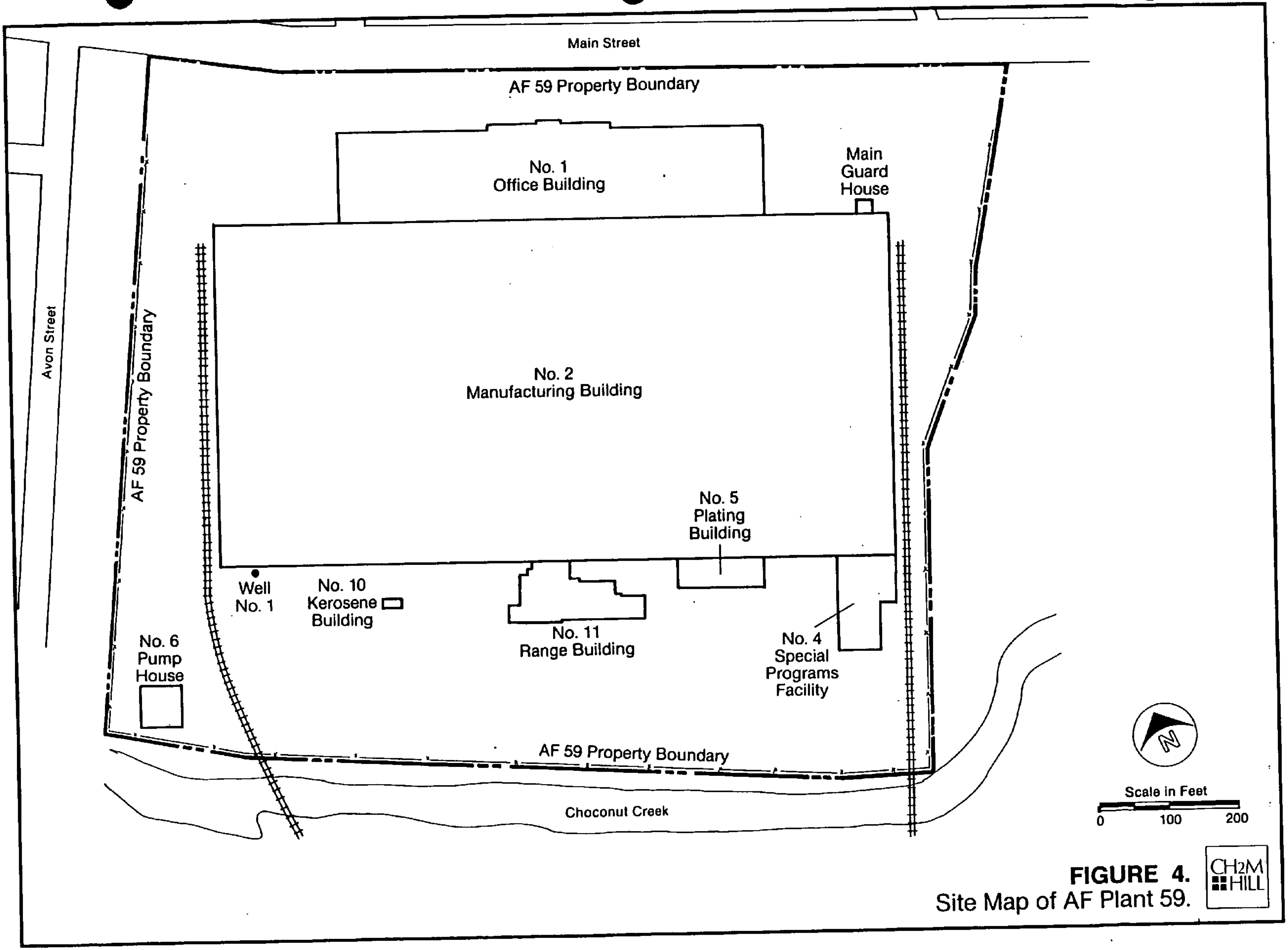


**FIGURE 4.**
Site Map of AF Plant 59.

control systems, weapons control systems, laser systems, internal navigation and guidance systems, and aerospace ground support equipment.

The DCAS--Syracuse is the host of AF Plant 59. The DCASMA--Syracuse staff is responsible for contract administration, environmental programs, and administrative functions. The work force at AF Plant 59 totals approximately 2,300 people. A detailed history of the facility is included in Appendix D, Installation History.

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III. ENVIRONMENTAL SETTING

# III. ENVIRONMENTAL SETTING

## A. METEOROLOGY

AF Plant 59 is located near 42° north latitude, in south-central New York near the Pennsylvania border. The climate is humid, maritime with pleasant summers, and long, cold winters. Weather is usually warm and humid when the air flow is from the south or southwest, and cold and less humid when the air flow is from the north or northwest. Maritime air masses from the mid- or north-Atlantic occasionally bring cloudy, damp, and cool weather when the air flow is from the east. Meteorological data summarizing the period from 1952 through 1982 are presented in Table 2 and briefly discussed below.

The average annual temperature for nearby Binghamton is 46°F. Monthly mean temperatures vary from 20°F in January to 69°F in July. The average daily minimum temperature in January is 13°F and the lowest recorded temperature is -20°F. The average daily maximum temperature in July is 78°F and the highest temperature recorded at Binghamton is 96°F in the month of September. Freezing temperatures occur at Binghamton on the average of 147 days per year.

Mean annual precipitation recorded in the vicinity of AF Plant 59 is about 37 inches per year. The wettest month is June and the driest is February. On the average, precipitation is evenly distributed throughout the year. Snowfall accounts for a large proportion of the total precipitation during the winter months with an annual average of about 85 inches at the Broome County airport. On the average, snowfall greater than 1.0 inch occurs on approximately 24 days per year. Mean annual lake evaporation, commonly used to estimate the mean annual evapotranspiration rate, is

Table 2
METEOROLOGICAL DATA SUMMARY FOR AF PLANT 59, NEW YORK
(1952-1982)

| | January | February | March | April | May | June | July | August | September | October | November | December | Annual |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Temperature (°F)** | | | | | | | | | | | | | |
| Mean | 20 | 23 | 31 | 44 | 55 | 64 | 69 | 67 | 60 | 49 | 38 | 26 | 46 |
| Average Daily Maximum | 28 | 30 | 39 | 54 | 65 | 77 | 78 | 76 | 69 | 58 | 45 | 33 | 54 |
| Average Daily Minimum | 13 | 15 | 24 | 35 | 46 | 55 | 59 | 58 | 51 | 40 | 32 | 20 | 37 |
| Highest Recorded | 63 | 66 | 82 | 85 | 89 | 94 | 95 | 94 | 96 | 82 | 77 | 65 | 96 |
| Lowest Recorded | -20 | -15 | -6 | 9 | 25 | 33 | 39 | 37 | 25 | 17 | 3 | -18 | -20 |
| **Precipitation (inches)** | | | | | | | | | | | | | |
| Mean | 2.5 | 2.3 | 2.8 | 3.1 | 3.2 | 3.7 | 3.4 | 3.4 | 3.3 | 3.0 | 3.0 | 2.9 | 36.6 |
| Maximum Monthly | 6.4 | 4.4 | 6.0 | 5.5 | 6.5 | 9.5 | 7.4 | 7.5 | 9.7 | 9.4 | 7.5 | 5.8 | 9.7 |
| Minimum Monthly | 0.8 | 0.5 | 0.7 | 1.6 | 0.8 | 1.0 | 0.8 | 0.6 | 0.6 | 0.3 | 1.0 | 0.9 | 0.3 |
| Maximum in 24 hours | 1.8 | 2.2 | 2.0 | 2.9 | 1.8 | 3.2 | 3.2 | 3.2 | 3.4 | 3.9 | 2.7 | 1.6 | 3.9 |
| Days with Thunderstorms | 0 | 0 | 1 | 2 | 4 | 7 | 7 | 5 | 3 | 1 | 0 | 0 | 30 |
| **Snowfall (inches)** | | | | | | | | | | | | | |
| Mean | 19.4 | 18.1 | 14.6 | 4.8 | 9.3 | 0.0 | 0.0 | 0.0 | T | 0.4 | 7.8 | 19.1 | 84.5 |
| Maximum Monthly | 41.0 | 44.3 | 33.5 | 16.4 | 3.4 | 0.0 | 0.0 | 0.0 | T | 2.6 | 24.4 | 59.6 | 59.6 |
| Maximum in 24 hours | 18.4 | 23.0 | 15.8 | 11.5 | 3.4 | 0.0 | 0.0 | 0.0 | T | 2.4 | 10.1 | 15.6 | 23.0 |
| **Relative Humidity (%)** | | | | | | | | | | | | | |
| Mean | 76 | 74 | 72 | 66 | 68 | 72 | 72 | 76 | 79 | 74 | 77 | 79 | 73 |
| **Surface Winds (knots)** | | | | | | | | | | | | | |
| Mean | 12 | 12 | 12 | 12 | 10 | 9 | 8 | 8 | 9 | 10 | 11 | 11 | 10 |
| Maximum | 59 | 66 | 61 | 52 | 54 | 60 | 58 | 58 | 42 | 72 | 57 | 59 | 72 |
| Prevailing Direction | WSW | SSE | NW | WNW | NNW | NNW | WSW | SSW | SSW | WSW | NNW | WSW | WSW |

T = Trace

Source: National Oceanic and Atmospheric Administration, Local Climatological Data, Binghamton, NY 1982.

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estimated to be 28 inches per year. Evapotranspiration over land areas may be greater or less than lake evaporation depending on vegetative cover type and moisture availability. Mean annual net precipitation (mean annual precipitation minus mean annual evapotranspiration) is approximately 9 inches per year.

Thunderstorm activity occurs at Binghamton an average of 30 days per year. The greatest number of these storms occurs between May and August. The maximum precipitation recorded in a 24-hour period is 3.9 inches, and the maximum 24-hour snowfall is 23.0 inches.

Mean daytime cloud cover is 73 percent at Binghamton with heavy fog present on an average of 52 days per year. Wind speed averages 10 knots; however, a maximum of 72 knots has been recorded. Prevailing wind direction is from the west-southwest during most of the year.

## B. GEOLOGY

### 1. General

AF Plant 59 is situated on valley fill sediments deposited by Pleistocene glaciers during the last ice age. This "fill" material is located in the trough-shaped valleys cut into the bedrock by glacial action. In general the valleys that have been filled in by glacial deposits are now occupied by a post-glacial river flood plain. AF Plant 59 is located in the flood plain of the post-glacial Susquehanna River. (A flood levee has been installed along Little Choconut Creek to eliminate the potential for flooding of the plant site and surrounding area.)

## 2. Bedrock Geology

The bedrock material that underlies the glacial deposits throughout southern New York consists of shales, siltstones, and sandstones. The genesis of these strata is a long-studied and classical orogenic event that occurred during the Devonian Period (345-410 million years ago). The fine clastic material typical of the area originated from the uplift of the Applachian range during the Acadian orogeny, with the clastic source area lying to the east. Vast amounts of sediment were deposited in the shallow oceanic environment lying to the west of the growing mountain range creating a "wedge" of sediment now known as the Catskill Clastic Wedge. After lithification, subsequent uplifting exposed the clastic bedrock to erosional forces that shaped the material to the preglaciation form.

## 3. Glacial Deposits

Most of the glacial deposits in the area are in-fillings of valleys with glacial meltwater deposits, although glacial till deposits occur in thin layers in most areas near AF Plant 59.

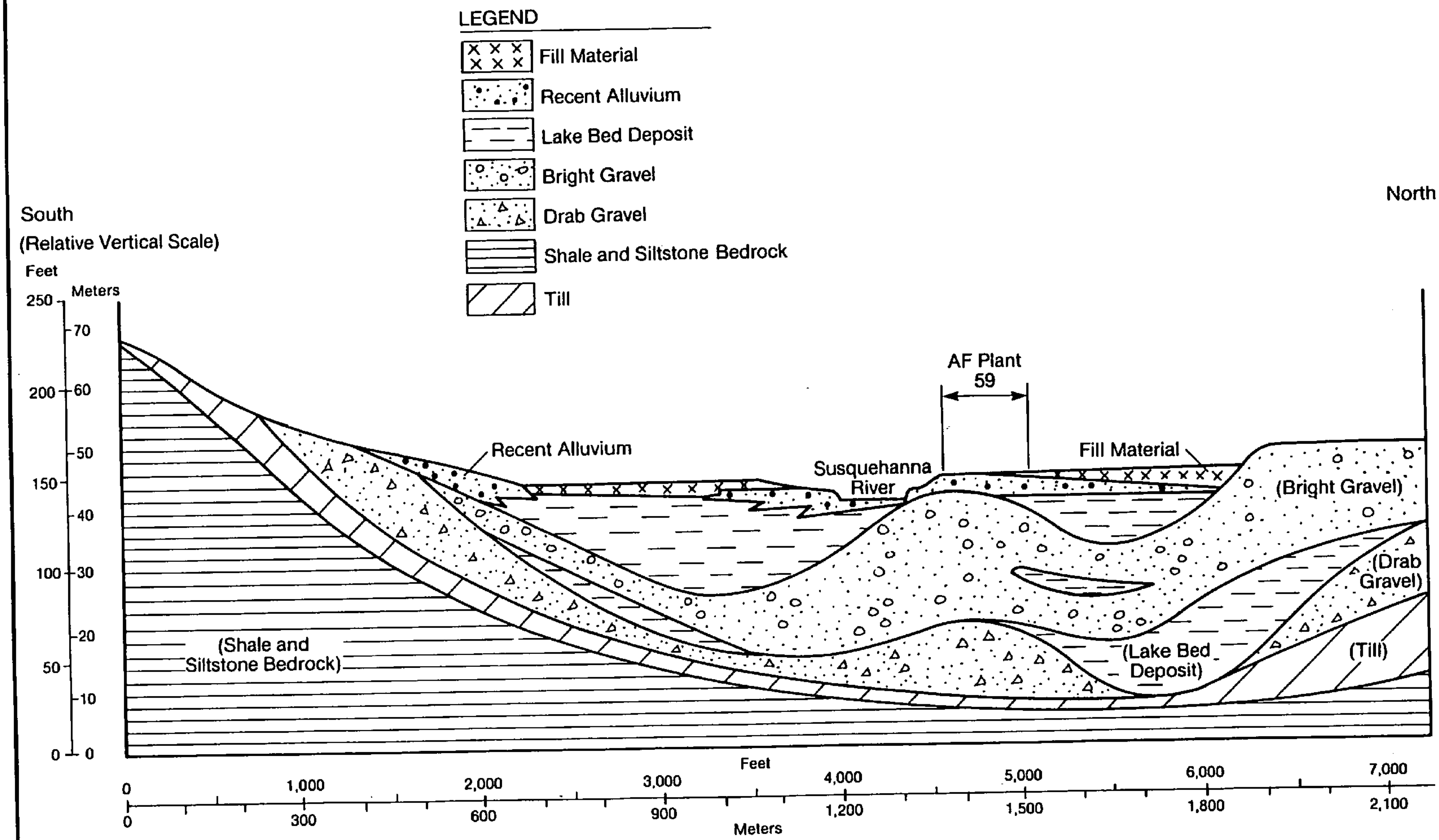
The glacial sediments that are commonly found as valley fill include fine lake sediments, sand, and gravel. These deposits are systemically classified as being "bright" or "drab" deposits. The bright deposits contain rock fragments that have been transported to the area from other areas having varied lithologies giving the deposits a colorful appearance. The drab deposits are composed almost entirely of fragments of local shale bedrock. These fragments were incorporated during scouring and plucking action of the glaciers as they moved into the area. The drab deposits are generally recognized as being older than the bright deposits, since they usually underlie the bright gravels in a gradational sequence. The clays and sands associated with the gravel deposits generally form an interfingering mix of lithologies in the valley fills. An idealized cross-section through the valley fill material at AF Plant 59 is shown in Figure 5.

The specific geology beneath AF Plant 59 is illustrated by drilling data from Water Well No. 1. Construction detail and the lithologic log for Well No. 1, which was drilled on May 16, 1974 at AF Plant 59, is shown in Figure 6. The location of Well No. 1 is shown in Figure 4. The lithology encountered during drilling, and the well construction is shown in Figure 6. The lithology can be described as being a series of gravels intermixed with clay and sand. The upper 27 feet of material is a series of sand and gravel apparently free of large amounts of silt and clay. Beneath the sandy gravel, a 37-foot thick zone of clay and gravel is present. Beneath the clay and gravel, another sand and gravel zone occurs, extending to the bedrock at 94 feet. As previously shown in Figure 5, the lithology is expected to be laterally variable across the area.

The surficial geology of the area surrounding AF Plant 59 also shows the surface reflection of the lateral variability of the geology. Figure 7 illustrates the surficial geology.

4. Soils

Soils present at AF Plant 59 are mostly cut and fill material emplaced during development and construction activities intended to raise building sites above the level




Source: New York State
Dept. of Environmental Conservation
Bulletin 73

**FIGURE 5.**
Idealized Geologic Cross Section Beneath AF Plant 59, Binghamton, New York.

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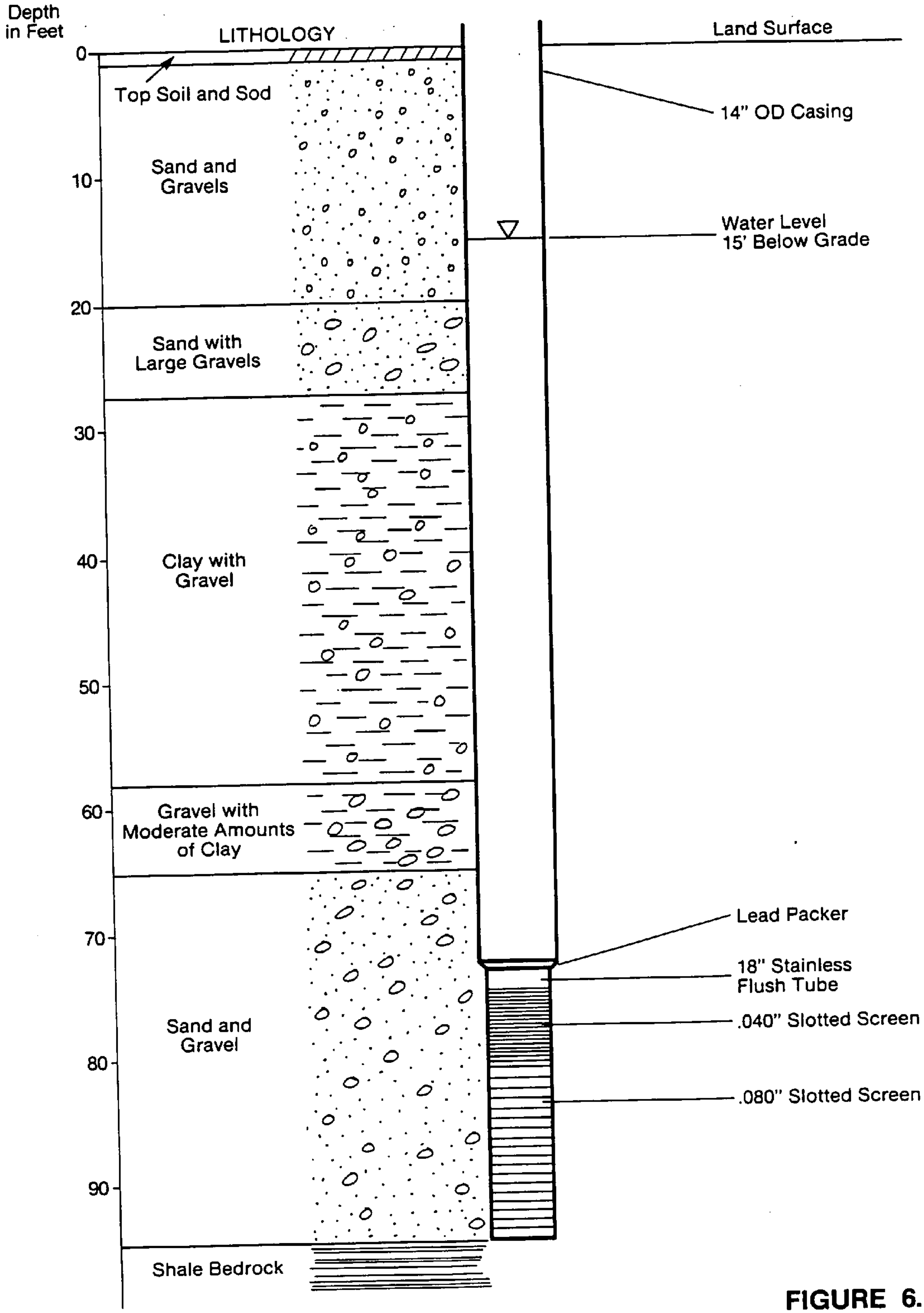


**FIGURE 6.**
Well Construction Detail and Lithologic Log for Well No. 1.
AF Plant 59—Drilled May 16, 1974.

CH2M HILL

of the flood plain. The plantsite rests on material characterized as silty in nature with intermixing of large gravels. The distribution of these soils at AF Plant 59 is shown in Figure 8.

The U.S. Department of Agriculture Soil Survey of Broome County, New York lists all of the engineering and construction properties of the cut and fill soils in the area as variable. From visual inspection of on-site soils, the permeability of the soils underlying AF Plant 59 appears to be relatively high due to a large amount of sandy material in the soil. Slopes on the site were gentle, and were under 5 percent in all areas except the flood protection levy. No great amounts of active erosion were observed on the levy.

## C. HYDROLOGY

### 1. Topography and Surface Hydrology

AF Plant 59 is located on the flood plain of the Susquehanna River. During non-flood periods, most of the storm water from AF Plant 59 drains into the Little Choconut Creek, a tributary of the Susquehanna River. The topography and surface water drainage of the plantsite is shown in Figure 9.

Storm-water runoff from a large part of the southern area of the plant discharges to Little Choconut Creek at Outfall 002 via the oil/water separator located behind the plating building. The oil/water separator serves as the main storm-water runoff route for the hazardous waste storage areas as well as the back loading dock and work areas of the plant. The oil/water separator discharges to a stormwater conduit that runs along the back of the plant, as shown in Figure 9, then discharges into Little Choconut Creek at Outfall 002. A pump located on the flood control structure makes discharge possible during flood conditions.

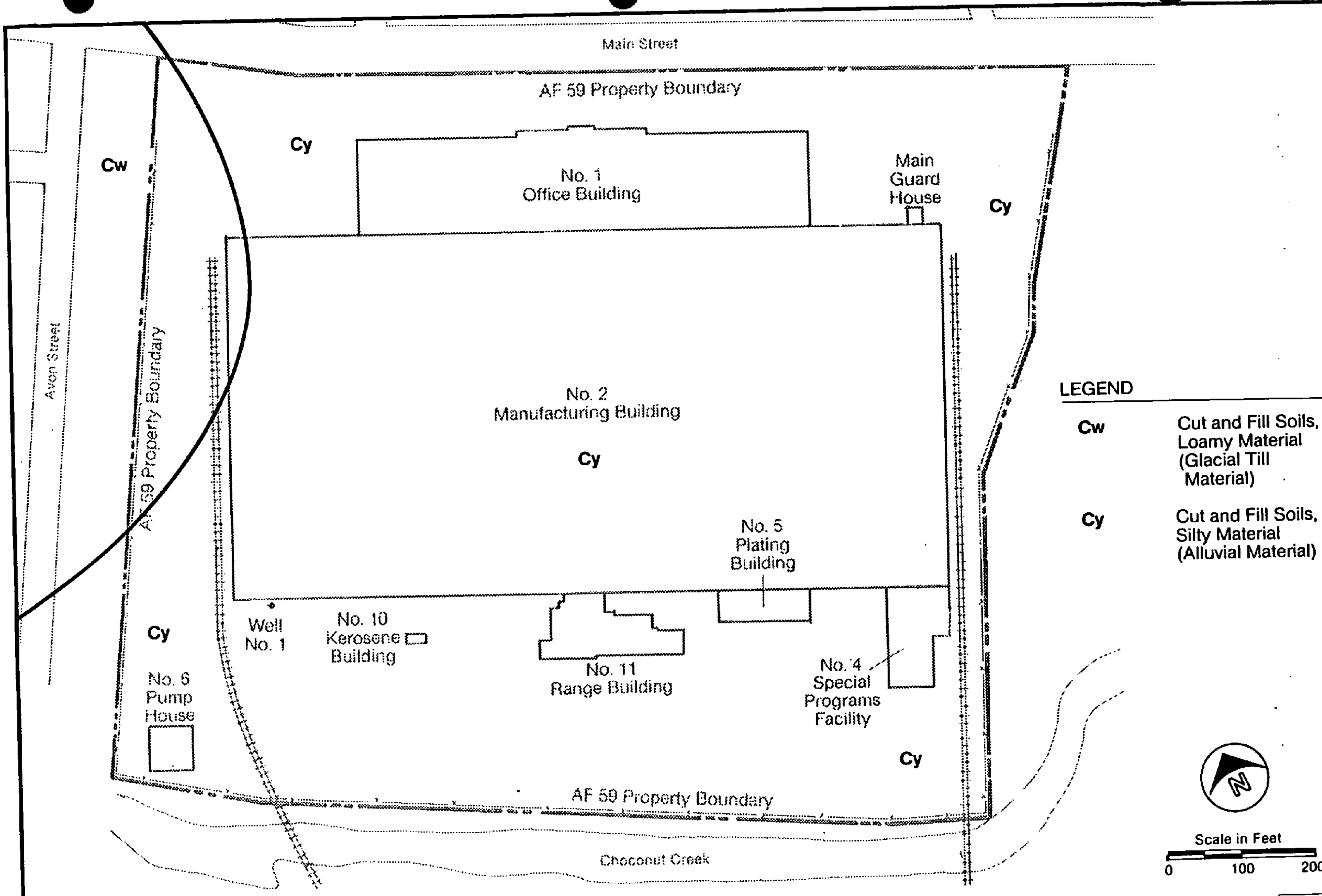


**FIGURE 8.**
Distribution of Soil Types at AF Plant 59.

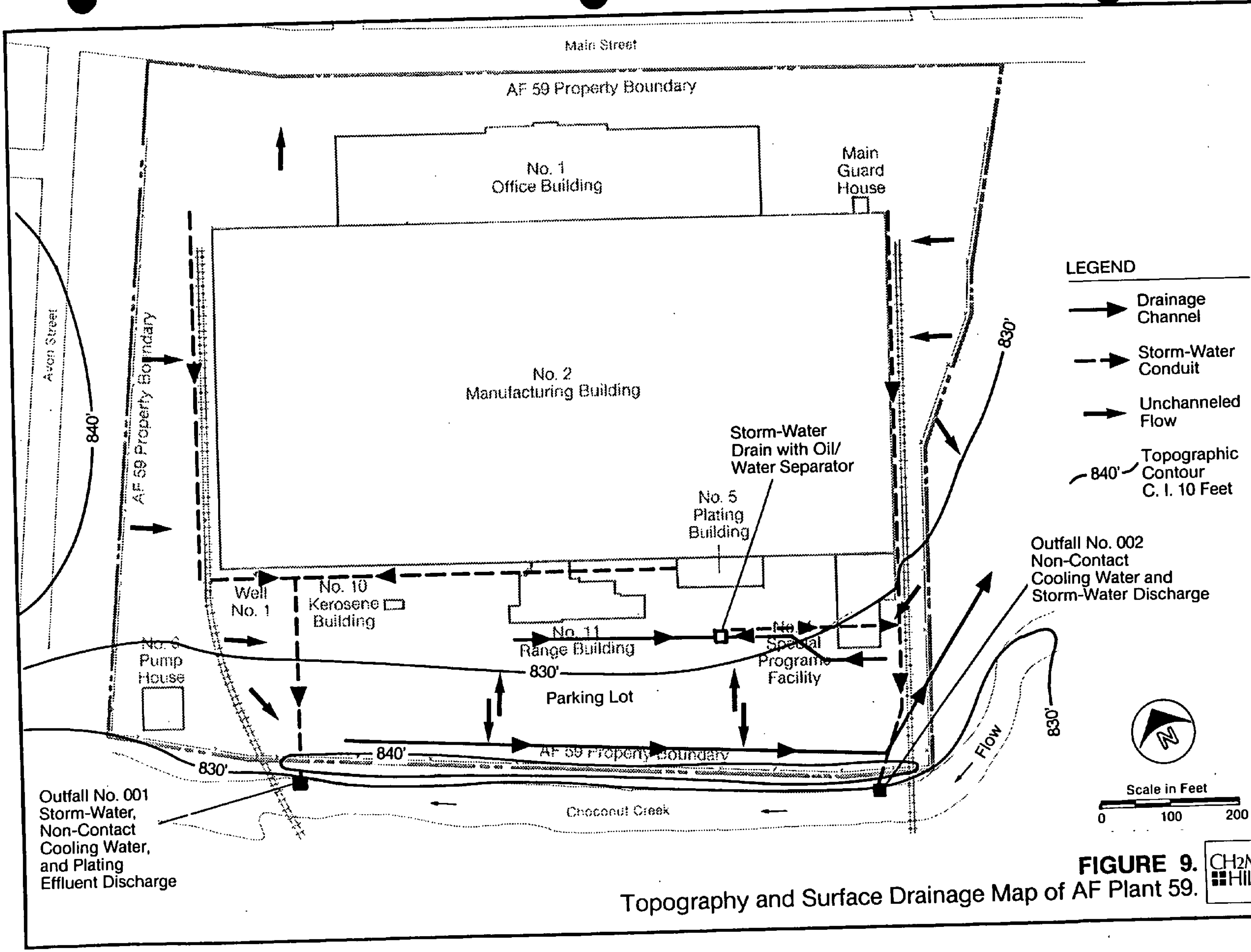


**FIGURE 9.**
Topography and Surface Drainage Map of AF Plant 59.

Storm-water runoff from the remaining areas of AF Plant 59 is generally directed off site in an unchannelized system, as shown in Figure 9. Storm-water from the south parking lot as well as storm-water from the eastern end of the plant drains into a small unnamed run to the east of the plant that eventually flows into Little Choconut Creek.

The potential for off-site migration of surface spills, other than oil products that would be captured by the oil/water separator, in the paved areas of the plant would be moderately high due to: (1) extensive paving of the area, (2) proximity to Little Choconut Creek and the Susquehanna River, (3) lined channels that would not retard contaminant movement.

The direct use of surface water for municipal water supply is apparently limited in the area of AF Plant 59. No municipal users are reported within 3 miles downstream of the AF Plant 59 outfall locations. The nearest municipal user of the Susquehanna River is the City of Binghamton. The surface water intakes for the City are near the confluence of the Chenango and Susquehanna Rivers, about 5 miles upstream of AF Plant 59.

2. <u>Ground Water Hydrology</u>

Ground water in Broome County is present in both bedrock and glacial material. The glacial material generally provides the quantities and quality of water sufficient for public supply, while the Devonian Bedrock material usually only provides limited quantities of water with wells averaging less than 10 gallons per minute (gpm). The bedrock material is therefore considered a limited ground-water source.

AF Plant 59 overlies a major glacial aquifer that provides water for Johnson City municipal supply. This aquifer, named the "Clinton Street-Ballpark Aquifer" in New York, DEC Bulletin 73, is generally confined to the pre-Susquehanna River channel that was filled with highly permeable sands and gravels by glacial meltwaters. The depth of the glacial material is about 90 feet at AF Plant 59 Well No. 1, with the main sand and gravel aquifer occupying the bottom 30 feet of the sequence (Figure 6). The aquifer thins towards the edges of the valley to the point where bedrock or glacial till is met and meltwater deposits are no longer present. Overlying the bottom 30 feet of highly permeable sands and gravels are layers of intermixed fine and coarse material that may act as confining beds for the main aquifer in some areas.

Hydraulic connection between the Clinton Street-Ballpark Aquifer and the Susquehanna River is well documented and a case of coliform bacteria contamination of a municipal well by ground-water movement from the river has been recorded in nearby Endicott. The aquifer is also connected to smaller feeder streams to the Susquehanna. This is evidenced by studies that have shown the water loss of Little Choconut Creek as the stream flows across the aquifer. In view of these facts, river and stream water quality would influence water quality in the aquifer.

The transmissivity (ability to transmit water) of the Clinton Street-Ballpark Aquifer generally ranges from $1.0 \times 10^4$ $ft^2/d$ to $5.3 \times 10^4$ $ft^2/d$ in the vicinity of AF Plant 59. With this relatively high transmissivity, recharge from surface streams, and infiltration from precipitation, well yields averaging 400 gallons per minute (gpm) can be sustained by the aquifer for long periods. In areas near the center of the aquifer, pumping rates higher than than 400 gpm are common.

The ground-water contours in the Clinton Street-Ballpark Aquifer in October 1967 are shown in Figure 10. These contours are believed to generally reflect present day levels. AF Plant 59 lies within the cone of depression of the municipal well field for Johnson City. The Johnson City well field consists of four wells pumping 3.3 mgd (2,290 gpm). The pumping effects of this well field create a general ground-water gradient of 2 ft/450 ft (.0044) across the southern end of the AF Plant 59 when AF Plant 59 Well No. 1 is not pumping. Ground-water flow direction is toward the Johnson City well cluster to the southwest of the plant.

Water use from Well No. 1 is about 350 gpm during plant operation hours. Well No. 1 has been in operation since 1974. During operating hours, Well No. 1 probably creates a cone of depression that induces ground- water flow within the plant boundaries towards the well. When Well No. 1 is shut down, the ground-water contours tend to revert to those shown in Figure 10 with flow underneath the plantsite being redirected towards the Johnson City Well Field to the southwest.

The potential for ground-water contaminant migration at AF Plant 59 is moderately high due to the presence of a heavily used aquifer underlying the plant, and a stream that recharges the aquifer flowing past the plant. Any contaminant entering the surficial sands and gravels would first have to migrate down about 15 feet to the water table. About 30 feet of relatively low permeability clay and gravel separate the upper part of the sediments from the heavily used lower aquifer. These low-permeability sediments would slow and attenuate contaminant movement to the aquifer. However, if contaminants reach the Clinton Street-Ballpark Aquifer travel time to Well No. 1 or the Johnson City municipal supply wells would be relatively short.

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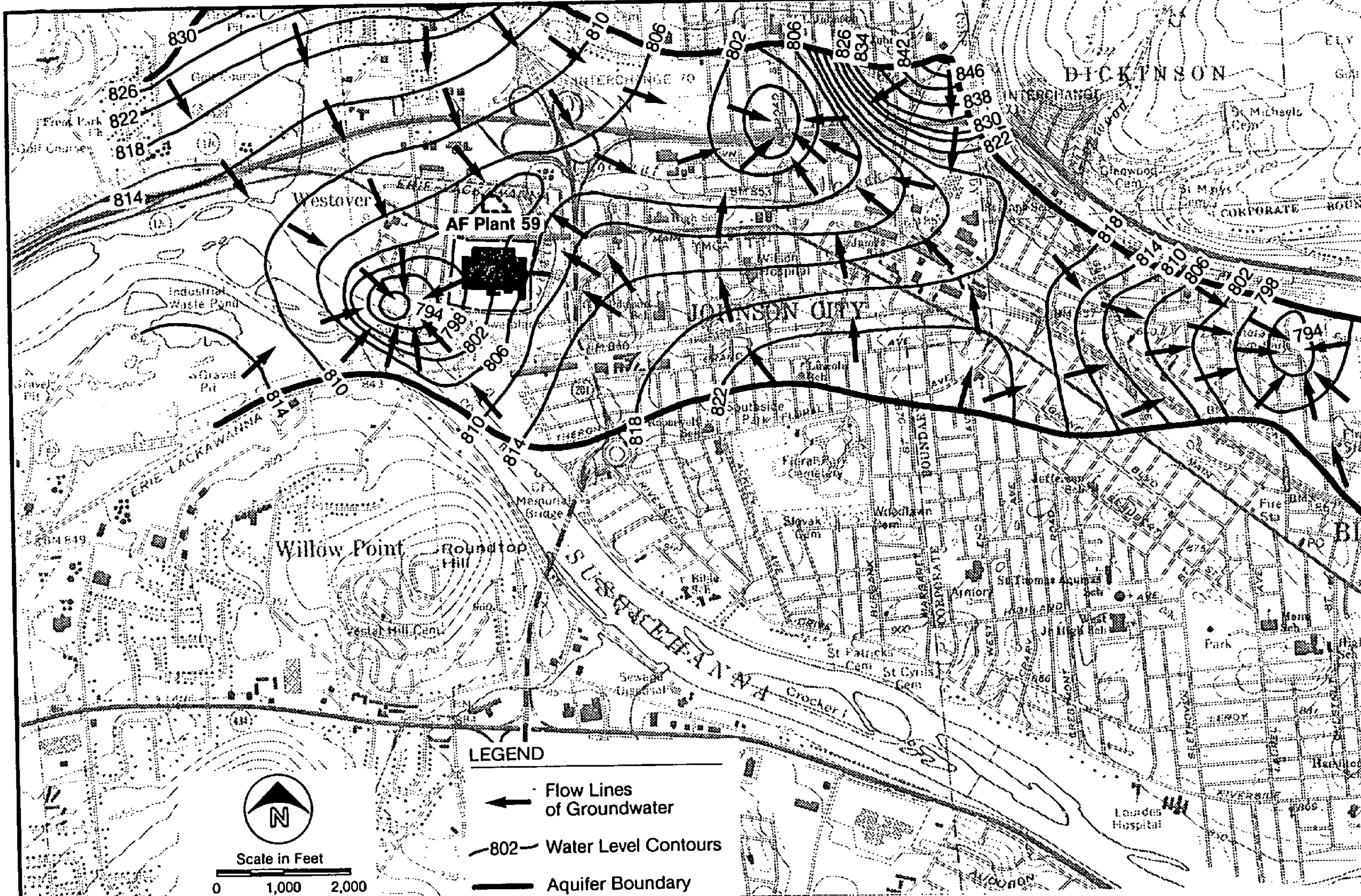


Source: New York State Dept. of Environmental Conservation Bulletin 73

**FIGURE 10.**
Water Level Contours and Flow Lines in the Clinton Street—Ballpark Aquifer, October 1967.

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AF Plant 59 is located in an urban area with other significant industrial activity. It is possible that other industrial facilities located hydraulically upgradient of AF Plant 59 could contaminate the ground water. Any ground water contamination upgradient of AF Plant 59 would migrate under AF Plant 59 property, possibly contaminating the on-site Well No. 1. If ground water contamination is discovered on AF Plant 59 property or downgradient of it, it would be necessary to conduct a detailed investigation to determine the source of the contamination.

The fate of contaminants released into the Little Choconut Creek is not entirely clear. Since the creek recharges the aquifer and flows into the Susquehanna, contaminant movement into the ground water is possible. However, this type of ground-water contamination is less likely to occur than contamination from direct infiltration. Dilution and stream bed attenuation will tend to restrict contaminant effects resulting from these processes.

## D. ECOLOGY

AF Plant 59 is located on the Appalachian Plateau, which is an upland area dissected by numerous stream and river valleys. The facility is located on the former floodplain of the Susquehanna River in an urbanized area that has been heavily cut and filled with silty materials. No natural plant or animal communities are present on the 29.6 acre site. The original plant communities probably present at the site were a bottomland-hardwood assemblage of trees and herbs that typically borders rivers and creeks in the area. Small stands of second-growth hardwood forest are located adjacent to AF Plant 59, along Little Choconut Creek and the Susquehanna River. Dominant tree species are generally sycamores, elms, willows, and others. No state or federal endangered or threatened terrestrial wildlife or plant species are known to occur in the vicinity of AF Plant 59.

AF Plant 59 is located near the Susquehanna River, which is a tributary to the Chesapeake Bay. The Chesapeake Bay flows to the Atlantic Ocean in Maryland. A total of 36 species of fish were collected in this river in the vicinity of Johnson City during an intensive study in 1976-1977. The most abundant fish species collected were smallmouth bass, white sucker, carp, northern hog sucker, walleye, and spotfin shiner. No endangered or threatened fish species were collected or are known to exist in the vicinity of AF Plant 59.

Algal populations in the Susquehanna River are dominated by diatoms and blue-greens, with highest standing crops in June and lowest in December. Small populations of aquatic macrophytes, especially Myriophyllum spp. and Potamogeton spp., are found in the Susquehanna River near its confluence with Little Choconut Creek. A total of 177 species of benthic macroinvertebrates were collected from this portion of the Susquehanna River in studies conducted in 1976. Reduced populations were noted downstream from the confluence of Little Choconut Creek, probably in response to the thermal discharge from the Gondey Station powerplant, which discharges once-through cooling water to the creek. Macroinvertebrate sampling sufficient to isolate effects of any AF Plant 59 discharges from those of the Gondey Station was not conducted.

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IV. FINDINGS

bulk metal chips/waste oil slurry from parts machining processes. The metal chips/waste oil slurry was placed in large bins located in the old Oil Reclamation Building, now the Special Programs Facility (Bldg. No. 4), where the oil was allowed to drain into drip pans, which were then emptied into an oil regeneration system. The de-oiled chips were then placed in large hoppers and transported off site in railroad cars. Any oil that drained from the hoppers was piped via a floor drain to an oil/water separator located outside Building No. 4. Effluent from the separator was discharged to the storm sewer system that emptied into Little Choconut Creek. Although information on this time period is limited, the most plausible reconstruction of events indicates that concentrated acid baths used in the plating processes were discharged to an open-top, in-ground holding tank where they were neutralized. These wastes were then transported off site. Plating rinsewater containing process chemicals, including chromium and other metals, was discharged to a settling tank and then to an outfall discharging into Little Choconut Creek. All other wastes, including spent cyanide baths and paint wastes, were drummed and then transported off site by various contractors.

- <u>1945-1949</u>: Plant idle.

- <u>1949-1953</u>: Wastes were handled in the same manner as in the period from 1942 through 1945 with few changes. Spent metal chips were transported off-site in trucks instead of rail cars. Combustible solid waste generated during this time period was burned in an on-site incinerator. A contractor transported the ash off site.

- 1953-1969: Two 1,000-gallon underground waste oil storage tanks were installed in 1953. Waste oils were no longer recycled, but were deposited in these storage tanks. A contractor removed the oil off site in a vacuum truck. Degreasing during this time period was done with a non-chlorinated kerosene-like substance that was also deposited in the waste oil tanks after use. Use of the incinerator was discontinued in 1968. All other waste disposal practices remained essentially unchanged.

- 1969-1974: Halogenated solvents including trichloroethylene (TCE), 1,1,1-trichloroethane, and Freon were introduced in 1969. Waste solvents were drummed and those that could be recycled were taken to an on-site recycling still. The bottoms sludge from the still and unrecoverable solvents were drummed and transported off site by a contractor. Ferrous sulfate was added to plating rinsewaters before entering the settling tank to reduce hexavalent chromium to trivalent chromium and precipitate the metals. This precipitate was occasionally transferred to the adjoining open-top, in-ground holding tank, which contained concentrated plating wastes for subsequent removal by a private contractor. Other waste disposal practices remained essentially unchanged.

- 1974-1980: All solid wastes were removed off site in unburned form. The paint shop switched from a waterwash process to a dry filter roll type media process in 1974. The used filter media were disposed with the other solid wastes. During this time, an improved housekeeping scheme was introduced for solvents, primarily acetone and methyl

ethyl ketone (MEK), used in the assembly area. Rags used to apply the solvents were collected and drummed for off-site disposal, whereas they were previously discarded with the solid waste. Spent solvents are now collected and drummed, whereas they were previously discarded in their pint jar containers in regular solid waste trashcans. All other waste disposal practices remained essentially unchanged.

- 1980-Present: In 1980, a new policy was adopted ensuring that no wastes were stored longer than 90 days before removal off AF Plant 59 for disposal. A new plating rinsewater treatment and reuse system was installed in 1984. After passing through the open-top, in-ground settling tank and grease trap, the plating rinsewater is now treated by anion and cation exchange columns and stored in an underground tank for reuse. A small amount of makeup water is required to balance losses from evaporation. All wastewater discharge to Little Choconut Creek can be eliminated, except for a provision to handle upset flow conditions. Regenerate brine is placed in the open-top, in-ground tank containing spent plating wastes. The system came on line in July 1984. Other disposal practices remain unchanged.

## 2. Industrial Operations

Industrial operations at AF Plant 59 have primarily been the manufacture and assembly of aerospace control systems. Appendix E contains a master list of the industrial operations.

Most of the liquid wastes generated by the industrial operations can be categorized as waste oils, spent solvents, spent process chemicals, and paint residues. Waste oils generally refer to lubricating fluids, such as cutting oils. Spent solvents refer to liquids used for degreasing and general cleaning. This category includes various halogenated organic solvents such as TCE, 1,1,1-trichloroethane, Freon TF, and Freon TE. Freon TF and Freon TE are tradenames of DuPont Company. Freon TF is trichlorotriflouroethane; Freon TE is an azeotrope of trichlorotriflouroethane and SDA-30 ethanol.

Other solvents that are in common use include acetone and MEK. These solvents are used for degreasing in assembly areas.

Spent process chemicals include acids, caustics, chromium solutions, and cyanide solutions. These process chemicals result from the various metal preparation and treatment processes employed at AF Plant 59.

Paint residues include waste liquid paints contaminated with thinners and solvents, varnishes, and sludges collected during the periodic cleaning of paint booths. The sludges primarily contain paint particles.

The major types of industrial operations including estimated waste quantities and past and present disposal practices are summarized in Table 3. Descriptions of the major industrial activities currently being conducted at AF Plant 59 are provided below.

a. Aluminum Dip Brazing

Aluminum dip brazing at AF Plant 59 results in the generation of a spent caustic sludge that solidifies when cooled. Under current practice, these wastes are

Table 3
MAJOR INDUSTRIAL OPERATIONS SUMMARY

| Shop Name | Present Location (Room No.) | Waste Material | Current Estimated Waste Quantity (gal/yr) | Treatment/Storage/Disposal Methods 1940 1950 1960 1970 1980 |
|---|---|---|---|---|
| Aluminum Dip Brazing | 822 | Solidified caustic sludge | 70 | D |
| Plating Shop | 926 | Spent plating baths Nitric Acid/Chromic Acid/Muriatic Acid | 25,000 | A A |
| | | Spent cyanide baths | 1,350 | D D |
| Painting | 812 | Paint sludge | 1,500 | D |
| | | Varnish | 100 | D |
| | | Paint filters | Varies | T |
| Assembly Degreasing | 926 and Various | Savasol | 5,000 | O O U |
| | | TCE 1,1,1-trichloroethane Freon Still bottoms | 5,000 | D |
| Machining | Various | Cutting Oils Coolant | 12,000 | O O U |

Legend:
D: Drummed; transported offsite by contractor.
A: Stored in aboveground storage tank; removed offsite by contractor.
O: Run through oil reclamation system.
U: Stored in underground storage tank; removed offsite by contractor.
T: Disposed of in solid waste dumpster; removed offsite by contractor.

Table 3--continued

| Shop Name | Present Location (Room No.) | Waste Material | Current Estimated Waste Quantity (gal/yr) | Treatment/Storage/Disposal Methods 1940 1950 1960 1970 1980 |
|---|---|---|---|---|
| Waste Treatment | South of main bldg. | Metal bearing sludge | 500 | A (c. 1942–1945); A (1950–present) |
| Small Parts Degreasing | Various | Acetone<br>Methyl alcohol<br>MEK<br>Solvent soaked rags | 400 | T,D (1950–c. 1977); D (c. 1977–present) |
| Aluminum Black Oxide | 926 | $NaNO_3$ concentrate | 750 | D (c. 1963–present) |
| Laboratory Activities | Various | Copper Sulfate | 300 | A (c. 1969–present) |
| | | TCE<br>1,1,1-Trichloroethane<br>Acetone<br>MEK<br>Methyl Alcohol | 300 | D (1950–present) |

Legend:
- D: Drummed; transported offsite by contractor.
- A: Stored in aboveground storage tank; removed offsite by contractor.
- O: Run through oil reclamation system.
- U: Stored in underground storage tank; removed offsite by contractor.
- T: Disposed of in solid waste dumpster; removed offsite by contractor.

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drummed for subsequent removal by a private contractor. Approximately 70 gallons of this sludge is generated annually.

b. Plating Shop

Plating operations result in the generation of concentrated acid and caustic wastes. The acids are typically mixed sulfuric, nitric, muriatic, and chromic acids. Currently, these wastes are pumped to the plating waste storage tank and neutralized for subsequent removal by a private contractor. About 25,000 gallons of these wastes are generated annually.

The plating waste storage tank is an open-top, in-ground reinforced concrete rectangular tank. It is approximately 8 feet wide and 14 feet long. The walls of the tank are approximately 8 feet high; only one foot of that height is above grade. The tank is constructed of concrete with an inner layer of acid brick and a fiberglass inner liner.

The tank is inspected monthly immediately after it is emptied by the contracted waste hauler. The tank is well maintained, and leakage is not suspected.

The electroplating operation also produces spent copper cyanide, nickel cyanide, and cadmium cyanide. The cyanide wastes are drummed for subsequent removal by a private contractor. Approximately 1,300 gallons of cyanide wastes are produced each year.

c. Painting

Painting of various components results in the generation of waste paints, paint thinners, strippers, paint sludge, and dry filters. Waste paints, thinners, strippers, and paint sludge are generally drummed in 55-gallon containers and subsequently removed and disposed of by a private contractor. Approximately 1,500 gallons of paint sludge and 100 gallons of waste varnish are generated annually. Dry filters are disposed with the general solid waste, which is removed to the Broome County Landfill.

d. Assembly Degreasing

Vapor degreasing wastes primarily contain TCE, 1,1,1-trichloroethane, Freon TE, Freon TF, oils, and dirt. The wastes are generated from the periodic cleaning of degreasers located throughout the facility. Currently, two vapor degreasers and eight cold trap degreasers are in operation. Frequency of cleaning depends heavily on the extent of use. Freon TE and Freon TF are regenerated and recovered in an on-site still. TCE cannot be regenerated sufficiently to meet specifications. Wastes collected from degreasers and the still bottoms are put into 55-gallon drums for subsequent pickup and disposal by a private contractor. Approximately 5,000 gallons of chlorinated solvents are disposed yearly.

e. Machining

This operation results in the generation of waste cutting oils and coolant. The waste cutting oils and coolant are collected from the various machining areas of the plant by a "Spencer Vac" system, which consists of a small mobile collection tank and vacuum system. These wastes are then pumped from the "Spencer Vacs" to two 1,000-gallon underground waste oil tanks located outside of Building No. 4. The waste oil is temporarily stored for subsequent vacuum truck pickup and disposal by a private contractor. About 12,000 gallons of waste oils are generated annually. Money has been appropriated and a design is underway to exhume these two tanks and replace them with an aboveground waste oil storage tank.

f. Plating Rinsewater Treatment

Ion-exchange treatment of plating rinsewater treatment results in the generation of regenerate brine. This brine is placed in the plating waste holding tank and removed from the plant by a private contractor along with the plating wastes.

Prior to installation of the ion-exchange system in July 1984, treatment of plating rinsewater resulted in the generation of chromium bearing sludge. This sludge was similarly placed in the plating waste holding tank and removed from the plant by a private contractor. Roughly 500 gallons a year of this sludge is transferred to the plating waste holding tank for disposal.

g. Small Parts Degreasing

This operation results in the generation of spent acetone and MEK, along with solvent soaked swabs and cloths. The spent solvents are collected in 5-gallon waste solvent safety cans. They are then transferred to 55-gallon drums for subsequent removal off site by a private contractor. The solvent soaked swabs and cloths are collected, placed into 55-gallon drums, and also removed off site by a private contractor. About 400 gallons a year of these wastes are generated.

h. Aluminum Black Oxide

The aluminum black oxide process used at AF Plant 59 generates a sodium nitrate waste. Approximately

700 gallons of this waste is generated annually. It is drummed and transferred to the drum storage area for subsequent removal by a private contractor.

i. Laboratory Activities

Prototype electronic board etching is performed in the engineering labs. This process results in the production of approximately 300 gallons of copper sulfate waste a year. This waste is transferred to the outdoor plating waste holding tank. It is removed off site by a contractor along with the plating wastes.

In addition, approximately 300 gallons a year of various waste solvents are produced in laboratories. These wastes are drummed for subsequent removal by a private contractor.

3. Fuels

AF Plant 59 stores a modest amount of fuels throughout the facility. A list of the various fuel types, locations, and tank capacities is shown in Appendix F.

A spill containment dike has been constructed for each of three aboveground diesel tanks. The one underground tank was used until 1983 to store gasoline. It was removed in 1984. The gasoline tank was stick gauged when in use; inventories always balanced, and leakage was not suspected. Soil samples taken during excavation confirmed this.

The 1,000-gallon synthetic testing fuel tank contained JP-4 until 1965. This fuel has always been used to test various aircraft components. The switch was made to a lower flash point synthetic for safety reasons.

A formal Spill Prevention Control and Countermeasure (SPCC) plan has been prepared as part of the Hazardous Waste Management Manual for storage and management of fuels.

4. Polychlorinated Biphenyls (PCBs)

Typical sources of PCBs at AF Plant 59 include transformers and capacitors. All installation transformers and capacitors are inventoried annually. A total of 24 transformers and 18 sets of 9 large capacitors containing PCBs are in service. Appendix G lists all PCB-containing electrical equipment, their location, and the amount of oil contained in each. A total of 7,184 gallons of PCB-containing transformer coolant is in use at the installation.

Periodic preventive maintenance includes inspection and necessary repairs to any leaking equipment. PCB transformers and capacitors are inspected monthly. The transformers located outside have 6-inch containment curbs. Transformers and capacitors located inside on catwalks over the main manufacturing area rest on wooden planks and are not contained. Wastes generated are PCB-contaminated, alcohol soaked rags and PCB-contaminated protective clothing. These wastes are collected in drums located at the end of the catwalks over the main manufacturing area. A private contractor hauls the wastes off site. Over the past three years, one drum containing an average of 40 pounds of rags, gloves, and paper towels has been removed annually.

There were no reports or evidence of any reportable PCB spills from leaking or blown transformers.

5. Pesticides

A herbicide is occasionally used by AF Plant 59 maintenance personnel for weed control, particularly along the fence line. One 5-gallon can of concentrated herbicide is stored in the maintenance storage area. Approximately one can is used up every two years. The herbicide used at AF Plant 59 is "Zap" (EPA Registration No. 551-193), a nonselective weed killer manufactured by Baird and McGuire at Holbrook, MA.

No routine pesticide spraying is done at AF Plant 59. Any necessary spraying is contracted. The contractor brings all necessary equipment on site with him, and removes all spraying materials from the site when he leaves.

6. <u>Wastewater Treatment</u>

Untreated, domestic wastewater from AF Plant 59 is discharged to the Binghamton/Johnson City Joint Sewage Treatment System. These wastewaters are generated primarily in washrooms and the cafeteria, although one floor drain connects to the system. A local pretreatment ordinance is in development. However, AF Plant 59 has been identified as a "non-significant user" and will not be required to pretreat this wastewater stream.

AF Plant 59 has two direct discharge outfalls permitted under the New York State Pollution Discharge Elimination System (SPDES). The outfalls, located south of the plant building, discharge to Little Choconut Creek approximately 1,000 feet upstream of the confluence of the creek and the Susquehanna River. Outfall 001 discharges treated plating rinsewater, non-contact cooling water and storm-water. Outfall 002 discharges non-contact cooling water and storm-water.

Until July 1984, plating rinsewaters flowed by gravity from the plating room to a baffled settling tank.

Ferrous sulfate was added in the feed line to this tank to reduce hexavalent chromium to trivalent chromium and to precipitate the trivalent chromium. The effluent from the settling tank was then discharged at Outfall 001.

Plating rinsewaters currently flow by gravity from the plating room to a holding tank. After passing through a grease trap, the rinsewater is treated by anion and cation exchange columns and stored in an underground tank for reuse. A small amount of makeup water is required to balance losses from evaporation. There is no discharge to Little Choconut Creek, except for a provision to handle upset flow conditions.

The storm runoff from the maintenance yard, where drums of various solvent and oils are stored, is discharged through Outfall 002 via an oil/water separator. The oil/water separator is located upstream from Outfall 002 to remove oil and grease from this storm-water.

In accordance with the conditions of SPDES Permit No. NY 0004073, wastewater discharged from Outfall 001 is monitored routinely for temperature, flow, oil and grease, suspended solids, chromium, nickel, and lead. Outfall 002 is monitored for temperature, flow, and pH. A summary of effluent monitoring data for Outfall 001 condensed from SPDES monitoring reports is presented in Table 4. This table indicates that treated effluent has occasionally exceeded discharge limits in the past.

In addition to chromium, lead, and nickel, for which effluent limits have been established, cadmium, copper and tin are also plated. Cyanide is the anion base for several of the plating solutions. Monitoring for these four constituents is not required by the current SPDES permit. GE internally analyzed the water from Outfall 001 for

Table 4
EFFLUENT MONITORING DATA FROM AF PLANT 59 OUTFALL 001
September 1983 through May 1984

| Parameter | 3/84 - 5/84 (lb/day) Avg | Max | 12/83 - 2/84 (lb/day) Avg | Max | 9/83 - 11/83 (lb/day) Avg | Max | 6/83 - 8/83 (lb/day) Avg | Max | 3/83 - 5/83 (lb/day) Avg | Max | 12/82 - 1/83 (kg/day) Avg | Max | 9/82 - 11/82 (kg/day) Avg | Max |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Oil and Grease | -- | 13.4 | -- | 6.5 | 5.91 | 21.04 | 8.3 | 30.6* | 13.26 | 26.72* | 2.47 | 5.15 | 4.41 | 24.27* |
| Limits | -- | 15.0 | -- | 15.0 | 16.7 | 25.0 | 16.7 | 25.0 | 16.7 | 25.0 | 7.60 | 11.40 | 7.60 | 11.40 |
| Total Chromium | -- | 0.14 | -- | 1.01 | .520 | 1.153 | 0.6 | 1.45 | .29 | 1.02 | .13 | .29 | .10 | .70 |
| Limits | -- | 2.5 | -- | 2.5 | 1.25 | 2.5 | 1.25 | 2.5 | 1.25 | 2.5 | .57 | 1.14 | .57 | 1.14 |
| Chromium (Hex) | -- | .08 | -- | .07 | .151* | .501* | .064 | .263* | .17* | .58* | .09* | .25* | .08* | .63* |
| Limits | -- | .26 | -- | .26 | .13 | .26 | .13 | .26 | .13 | .26 | .06 | .12 | .06 | .12 |
| Lead | -- | .10 | -- | -- | | | | | | | | | | |
| Limits | -- | .13 | -- | .13 | | | | | | | | | | |
| Nickel | -- | .02 | -- | .07 | .125 | .366 | .10 | .43 | .06 | .17 | .03 | .08 | .02 | .07 |
| Limits | -- | .13 | -- | .13 | 1.25 | 2.5 | 1.25 | 2.5 | 1.25 | 2.5 | .57 | 1.14 | .57 | 1.14 |
| Suspended Solids | -- | 68.6* | -- | 50.0 | 28.4 | 102.5* | 42.96 | 71.07 | 32.33 | 85.10 | 4.63 | 12.66 | 1.97 | 3.85 |
| Limits | -- | 55.9 | -- | 55.9 | 49.9 | 99.8 | 49.9 | 99.8 | 49.9 | 99.8 | 22.70 | 45.40 | 22.70 | 45.40 |

*Parameter exceeded limits.

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cadmium, copper, and tin briefly in the 1970s. These contaminants were found at such low levels that monitoring for them has not been required by either the old NPDES permit, or the current SPDES permit.

The high levels of hexavalent chromium were traced to various problems with the old plating rinsewater treating system including mechanical failures of the ferrous sulfate addition mechanism and the general inability of the old system to treat slugs of hexavalent chromium adequately. The new wastewater treatment system, installed in July 1984, should provide better, and more consistent, chromium treatment.

Total suspended solids excursions were attributed to addition of too much ferrous sulfate in an attempt to control hexavalent chromium. This problem has been eliminated by installation of the new ion exchange treatment system.

The source of the oil and grease excursion has never been fully determined. However, the new grease trap that precedes the ion exchange column should remedy this problem.

7. Available Water Quality Data

All potable and most industrial water for AF Plant 59 is supplied by the Village of Johnson City. An additional source for non-contact cooling water is provided by an on-site well drilled in 1974 and located just south of the manufacturing building, as shown in Figure 4. This well has an internal casing diameter of 6 inches, a total depth of 95 feet, and is gravel packed and screened. A recharge well was drilled along with this supply well, but was abandoned shortly after due to failure of geologic strata.

The Village of Johnson City obtains its water from groundwater wells drilled into the Clinton Street-Ballpark Aquifer. AF Plant 59 consumes an average of $300 \times 10^6$ gallons per year (gpy) of city water and an additional $150 \times 10^6$ gpy from the on-site well.

AF Plant 59 discharges wastewater under SPDES Permit No. NY 0004073. The two permitted outfalls are shown in Figure 9. The average flow through each of these two outfalls averaged 165,000 gpd during 1983. The general effluent quality from the two outfalls is described in the preceding section and is summarized in Table 4.

Volatile organic compounds (VOCs) currently in use at AF Plant 59 were analyzed for at the monitoring point for Outfall 001, located at the discharge of the rinsewater holding tank. Analysis was performed in August 1982, in July 1983, and on three consecutive days beginning February 13, 1984. Results of the analysis are presented in Table 5. TCE was found at concentrations ranging from 23 to 120 micrograms per liter (μg/L); methylene chloride was found at concentrations ranging from 8 to 105 μg/L; 1,1,1-trichloroethane was found at concentrations up to 2 μg/L; Freon was not detected. The source of these VOCs was attributed to poor housekeeping around the vapor degreasers located in the plating room. The plating room floor is composed of grating and any spills in the plating room would be discharged to the plating rinsewater settling tank prior to discharge to Outfall 001. The probable fate of these VOCs is volatilization into the atmosphere as the wastewater cascades over the outfall spillway.

Table 5
OUTFALL 001 EFFLUENT ANALYSIS FOR VOLATILE ORGANIC COMPOUNDS
AF PLANT 59

| | Concentrations (µg/L) | | | | |
|---|---|---|---|---|---|
| Date | Aug 82 | July 83 | 2/13/84 | 2/14/84 | 2/15/84 |
| 1,1,1-trichloroethane | 1 | 2 | ND[a] | ND[a] | ND[a] |
| Trichloroethylene (TCE) | 24 | 23 | 120 | 47 | 87 |
| Methylene chloride | -- | -- | 105 | 8 | 80 |
| Freons | -- | -- | ND[b] | ND[b] | ND[b] |

--: Not analyzed for

ND[a]: None detected; Detection limit 1.0 µg/L

ND[b]: None detected; Detection limit 5.0 µg/L

## B. DISPOSAL AND SPILL SITES IDENTIFICATION AND EVALUATION

Interviews were conducted with installation personnel (Appendix C) to identify disposal and spill sites at AF Plant 59. Using the flow chart process described in the "Methodology" section, a determination was made whether a potential exists for hazardous material contamination in any of the identified sites. These sites were then rated using the U.S. Air Force Hazard Assessment Rating Methodology, which was developed jointly by the Air Force, CH2M HILL, and Engineering-Science for specific application to the Air Force Installation Restoration Program. The HARM system considers four aspects of the hazard posed by a specific site: (1) the receptors of the contamination, (2) the waste and its characteristics, (3) potential pathways for waste contaminant migration, and (4) any efforts to contain the contaminants. Each of these categories contains a number of rating factors that are used in the overall hazard rating. A more detailed description of the HARM system is included in Appendix H.

Two spill sites were identified and rated at AF Plant 59. Copies of the completed rating forms are included in Appendix I, and a summary of the hazard ratings for the sites is presented in Table 6.

Descriptions of each site, including a brief discussion of the rating results and the most significant factors that contributed in the rating score, are presented below. Approximate locations of the sites are shown in Figure 11.

Table 6
SUMMARY OF DISPOSAL AND SPILL SITE RATINGS
AF PLANT 59

| Site No. | Site Description | Subscore (% of Maximum Possible Score in Each Category) | | | Factor for Waste Management Practices | Overall Score | Reference of Site Rating Form |
|---|---|---|---|---|---|---|---|
| | | Receptors | Characteristics | Pathways | | | |
| 1 | Underground Waste Oil Storage Tanks | 74 | 40 | 80 | 1.0 | 65 | I-1 |
| 2 | Drum Storage Area | 74 | 24 | 46 | 0.95 | 46 | I-3 |

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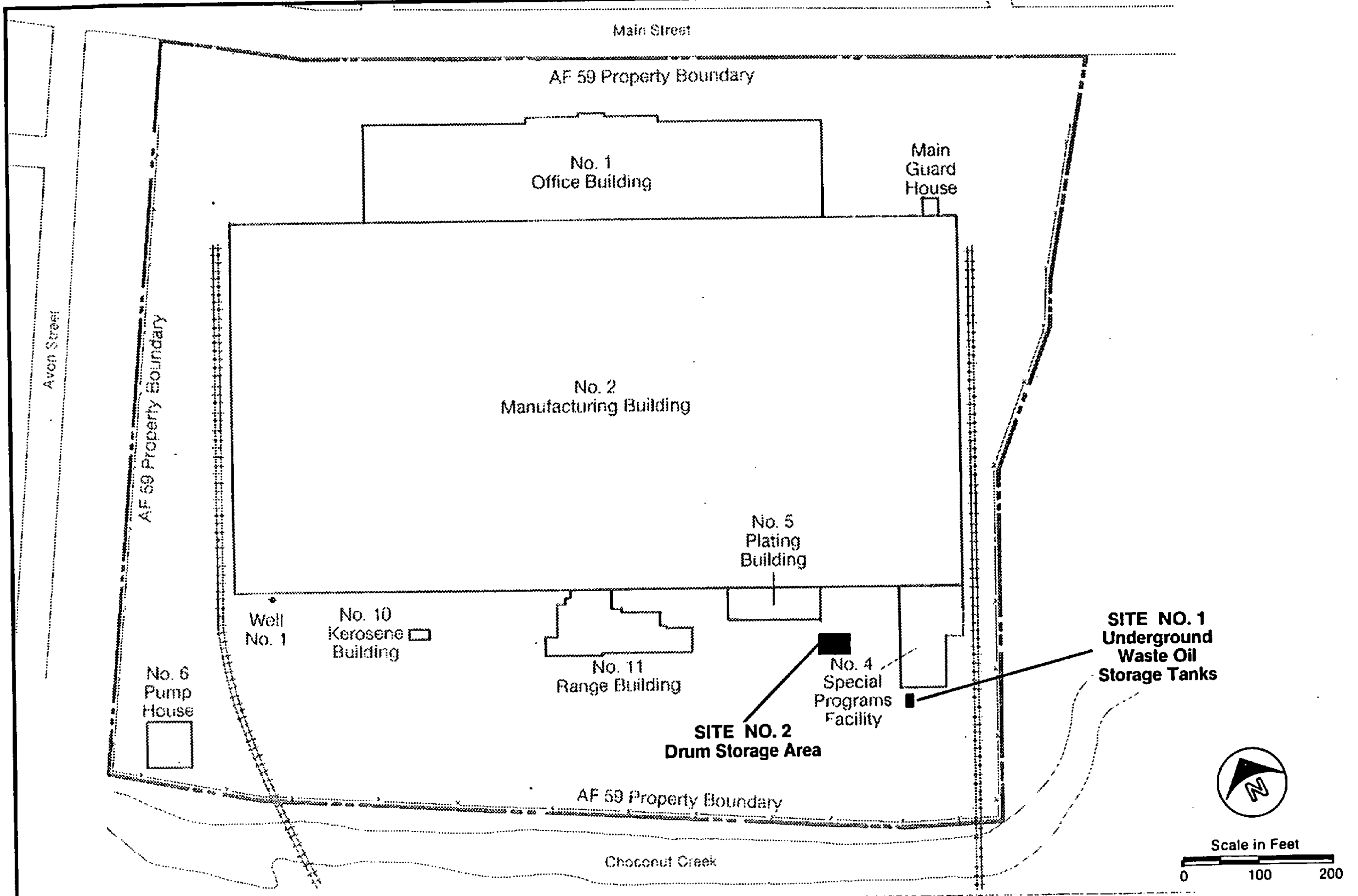


**FIGURE 11.**
Location Map of Identified Spill Sites at AF Plant 59.

CH2M HILL

- Site No. 1, Underground Waste Oil Storage Tanks (overall score 65), has been used for the temporary storage of waste oils since the two 1,000-gallon underground tanks were installed in 1953. Waste oils including synthetic hydraulic oils, cutting oils, and coolants are collected from the various machining areas of the plant by a "Spencer Vac" system, which consists of a small mobile collection tank and vacuum system. Prior to 1969, some non-chlorinated kerosene-based degreasers were also placed in the storage tanks. Once collected, the waste oils are then pumped from the "Spencer Vacs" by an air pump located inside the main building to the two underground waste oils tanks located outside of Building No. 4. The waste oils are then temporarily stored for subsequent vacuum truck pickup and disposal by a private contractor.

  The waste oil tanks are inspected daily to prevent overtopping of the tanks. However, waste oil spills have occurred during the contractor removal of the tank contents, which is conducted on a monthly basis. Interviewees reported that the spills were the result of the release of the residual volume of the vacuum truck suction hose. The area surrounding the tanks had been backfilled with gravel during their installation. The gravel area surrounding both tanks was heavily stained. In the past, the stained gravel had been removed and replaced with fresh gravel for aesthetic reasons.

  Funds have been appropriated for a design that is currently underway to remove the two underground tanks and replace them with an aboveground waste oil storage tank.

The overall HARM rating for this site is 65. The receptors subscore of 74 is due primarily to the distance to the nearest well (665 feet), the distance to the reservation boundary (180 feet), and the population served by ground-water supply within 3 miles of the site. The waste characteristics subscore is 40 because this spill area has received a small quantity of medium hazard waste materials with a persistence factor of 0.8. The pathways subscore is 80 because of indirect evidence of contamination based on visual observation.

- Site No. 2, Drum Storage Area (overall score 46), has been located behind the main building between Buildings No. 4 and No. 5 since the plant was activated. The Drum Storage Area was paved in approximately 1963 and then later upgraded in the late 1970. Prior to the paving of this area, an interviewee reported that some spillage as a result of poor housekeeping occurred in this area. Prior to 1963, waste materials mostly likely stored in the area included waste paints, some waste oils, and some spent kerosene-based degreasers. The contract files indicate that the top 8 inches of soil was removed during the paving operation conducted in 1963.

  The overall HARM rating for this site is 46. The receptors subscore of 74 is due primarily to the distance to the nearest well (605 feet), the distance to the reservation boundary (260 feet), and the population served by the ground-water supply within 3 miles of the site. The waste characteristics subscore is 24 because this area may have received a small quantity of medium hazard waste materials. There is an equal potential for both surface water and ground-water migration at this site. For surface water migration, the pathways subscore of 46 is due primarily to the distance to the nearest surface-water body (285 feet). For ground-water migration, the pathways subscore of 46 is due primarily to the soil permeability. This site received a waste management practices factor of 0.95 since the top 8 inches of soil was removed and the site is now paved.

## C. ENVIRONMENTAL STRESS

During the July 1984 site visit, both spill areas were examined for signs of environmental stress possibly related to the presence or migration of hazardous wastes. No signs of stress were detected during this investigation.

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# V. CONCLUSIONS

Table 7
PRIORITY LISTING OF SPILL SITES

| Site No. | Description | Overall Score |
|---|---|---|
| 1 | Underground Waste Oil Storage Tanks | 65 |
| 2 | Drum Storage Area | 46 |

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Underground Waste Oil Storage Tanks (overall score 65), is considered to be the area showing the most significant potential (relative to the other AF Plant 59 site) for environmental impact. The two 1,000-gallon underground storage tanks have been used for the storage of waste oils since their installation in 1953. Waste oils including synthetic hydraulic oils, cutting oils, and coolants are collected from the various machining areas of the plant and pumped to the two underground waste oil tanks located outside of Building No. 4. The waste oils are then temporarily stored for subsequent vacuum truck pickup and disposal by a private contractor. Spillage of waste oils has occurred during the contractor removal of the tank contents. During the site inspection, the gravel area surrounding the tanks was observed to be heavily stained with waste oils.

G. Site No. 2, Drum Storage Area (overall score 46), is not considered to present any significant environmental concern.

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# VI. RECOMMENDATIONS

## VI. RECOMMENDATIONS

### A. PHASE II PROGRAM

A limited Phase II monitoring program is recommended for Site No. 1, Underground Waste Oil Storage Tanks, to confirm or rule out the presence and/or migration of hazardous contaminants.

The location of Site No. 1 is shown on Figure 11. Currently there is an active project with appropriated funding to complete a design for removal of the two underground tanks and replacement with an aboveground waste oil storage tank. It is recommended that a limited Phase II sampling program be conducted during the implementation of the storage tank removal project. The gravel backfill surrounding the two underground tanks should be removed completely to the depth of the native soils. A geologist should be present to examine the soil profile and characteristics and to inspect for signs of contamination. Soil samples should be collected and analyzed in accordance with Table 8. The exact number of samples collected should be at the discretion of the geologist.

### B. OTHER ENVIRONMENTAL RECOMMENDATIONS

Other environmental recommendations that have resulted from the installation site visit and records search include the following:

1. AF Plant 59 Well No. 1 should be sampled and analyzed in accordance with Table 8. As discussed in Section III, C.2., "Ground Water Hydrology", Well No. 1 supplies 350 gpm of non-contact cooling

Table 8
RECOMMENDED ANALYSES AND
RATIONALE FOR RECOMMENDED ANLYSES

| Parameter | Rationale |
|---|---|
| Total Organic Halogens (TOX) or Volatile Organic Compounds (VOC) | Organic solvents used onsite (past and present); persistent components of fuels and other POL products, e.g., benzene and toluene. |
| Heavy Metals (lead, nickel, chromium, cadmium, copper, and tin) | Potential sources identified (plating and paint wastes). |
| Oil and Grease | Indicators of fuel spills and non-specific contamination |
| Cyanide | Potential source identified (plating wastes) [Recommendation B.1 only] |
| COD and TOC | Indicators of fuel spills and non-specific contamination [Recommendations B.1 and B.2 only] |

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water. During its operation, Well No. 1 probably creates a cone of depression that induces ground-water flow within the plant boundaries towards the well. The sampling of Well No. 1 should confirm or rule out the presence and/or migration of hazardous contaminants within the plant boundaries.

2. As described in Section IV. A.6, Wastewater Treatment, the routine monitoring of Outfall 001 in accordance with the SPDES Permit has revealed excursions above limitations for oil and grease, hexavalent chromium, and suspended solids. It is recommended that sediment samples, one upstream and two downstream, be collected from Little Choconut Creek and analyzed in accordance with Table 8 to ensure that there has not been any accumulation in the sediments.

3. It is recommended that the status of the oil/water separator located outside of Building No. 4 that serviced the old Oil Reclamation Building be determined. It is unknown if accumulated oils were removed before use of the oil/water separator was discontinued.

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APPENDICES

APPENDICES



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Appendix A
RESUMES OF TEAM MEMBERS

GREGORY T. MCINTYRE
Environmental Engineer

## Education

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

## Experience

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

Mr. McIntyre has extensive experience in hazardous waste projects. He participated in the development of the Remedial Action Master Plan (RAMP) for the Highlands Acid Pits and Bayou Sorrel Superfund hazardous waste sites. He was project manager for the Highlands Acid Pits RAMP. The purpose of the RAMP is to assemble and analyze existing data and to identify the scope and sequence of remedial projects.

Mr. McIntyre participated in the compilation and evaluation of existing groundwater data for Phase I of the Biscayne Aquifer/Dade County Superfund hazardous waste study. He also participated in the Phase II sampling, analytical, and investigative program for the protection of the Biscayne Aquifer and Environment in North Dade County, Florida.

Mr. McIntyre has been a team member in hazardous materials disposal site records searches for eight U.S. Air Force installations throughout the United States. He was the project manager for the Twin Cities Air Force Reserve Base Records Search. The purpose of the records search is to assess the potential for hazardous contaminant migration from past disposal practices and to recommend follow-up actions.

Mr. McIntyre's industrial wastewater experience includes wastewater characterization, laboratory bench-scale treatability study, evaluation of existing pretreatment facilities, and conceptual design for the equalization and aerobic biological treatment of industrial wastewater for Hercules, Inc.

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

Before joining CH2M HILL, Mr. McIntyre worked as a research assistant in graduate school. One of his responsibilities was to research the removal of heavy metals, including copper, zinc, and trivalent chromium, using a large-scale adsorbing colloid foam flotation pilot plant.

## Professional Registration

Engineer-In-Training, Florida

## Membership in Professional Organizations

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

## Publications

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

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

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

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

CLIFTON J. McFARLAND
Chemical Engineer

## Education

B.S., Chemical Engineer, Massachusetts Institute of Technology (1981)

## Experience

Mr. McFarland's engineering experience includes hazardous waste treatment, contaminated groundwater cleanup, and mechanical design of industrial process facilities.

During the evaluation of a hazardous materials disposal site at Air Force Plant 4 in Fort Worth, Texas, he was responsible for assessing and rating the relative hazard levels at the plant's various disposal sites. He also participated in the analysis of the operation of the plant's various wastewater treatment systems.

Mr. McFarland's project experience in the area of contaminated groundwater cleanup includes a conceptual design for Pratt & Whitney Aircraft of West Palm Beach, Florida. This work involved process design of various treatment alternatives, technical and economic evaluation of each alternative, a more detailed design of the proposed process, and computer modeling an air stripping column. He also assisted on a feasibility study conceptual design for groundwater cleanup for the Biscayne Aquifer/Dade County, Florida, Superfund site.

Before joining CH2M HILL, Mr. McFarland was a design engineer for a large petrochemical firm. He was responsible for design and construction of a major modification to a process plant cooling water system in Los Angeles, California. In addition, he was a member of the design team for a shale oil semi-works project in Salt Lake City, Utah.

## Membership in Professional Organizations

American Institute of Chemical Engineers
Tau Beta Pi Honorary Society

## Publications

The reactions of 1,2-dichloroethane in the presence of calcium oxide. Bachelor's thesis. Department of Chemical Engineering, Massachusetts Institute of Technology. May 1981.

BRIAN D. PAINTER
Hydrogeologist

## Education

M.S., Groundwater Hydrology, Ohio University (1983)
B.S., Geology, Northern Kentucky University (1981)

## Experience

Mr. Painter is responsible for technical involvement in groundwater supply and contamination work, mainly in the eastern district. His duties include determination of pollutant movement in groundwater aquifer evaluation by pump testing, monitoring well siting, and field inspection of drilling activities.

Mr. Painter's responsibilities also include preparation of technical reports on the hydrogeology of hazardous waste sites, with emphasis on pollutant effects on potable groundwater supplies. He has prepared several of these reports to date.

Mr. Painter served as a resident hydrogeologist and inspector for a prototype recharge-recovery well system for General Development Utilities' Peace River Water Plant, DeSoto County, Florida. His duties during his 6 weeks on the site included conducting aquifer tests, assisting in geophysical logging and interpretation, and report preparation.

Other areas of technical hydrogeology Mr. Painter has been involved with include the use of three-dimensional computer models to evaluate water resource potential and the use of models to predict pollutant movement in groundwater. Mr. Painter also has training in surface water hydrology and recharge evaluation methods.

## Memberships in Professional Organizations

National Water Well Association
Sigma Gamma Epsilon Geologic Fraternity

## Publications

A Three-Dimensional Hydrologic Model of Lee County, Florida. Master's Thesis. Ohio University, Athens, Ohio. Ohio University Press. 1983.

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ROBERT L. KNIGHT
Ecologist

## Education

Ph.D., Systems Ecology, University of Florida
M.S.P.H., Environmental Chemistry and Biology, University of North Carolina
B.A., Zoology, University of North Carolina

## Experience

Dr. Knight's responsibilities at CH2M HILL involve all aspects of environmental study, including design and implementation of field studies, data analysis and interpretation, project management, environmental systems overview analysis, impact analysis, prediction, and assessment. His experience has covered a wide range of applied research problems in aquatic and terrestrial environments, including computer simulation analyses.

Dr. Knight has managed several marine ecology field studies in Florida including: a 4-year study of estuarine metabolism at the Crystal River Nuclear Power Plant; a baseline conditions assessment of seagrass and oyster reef ecology in the Withlacoochee and Crystal Bays; and a 1-year productivity study and preparation of a simulation model of the Indian River estuary.

Dr. Knight participated in the design and implementation of long-term studies of fate and effects of toxic metals in stream mesocosms. He had direct responsibility for the chemical and biological monitoring of algal and insect populations, prepared a toxicity simulation model for cadmium, and developed general techniques for quantification of toxicity in biological systems.

Dr. Knight performed extensive field work at Silver Springs, Florida, to investigate the relationship between plant productivity and consumer organizations. As one part of that study, he developed a new microcosm design for the study of flowing aquatic systems.

Dr. Knight has conducted several studies on the feasibility of using natural and artificial wetlands for the assimilation of domestic wastewaters. Wetland systems include Spartina salt marshes and pocosins in North and South Carolina, hardwood swamp and prairie wetlands in Florida, and a marsh wetland in Mississippi. He has played a major role in site investigations and in developing management criteria for wetland and land treatment systems.

ROBERT L. KNIGHT

Dr. Knight has participated in a number of hazardous waste studies, including three Superfund sites, a hazardous waste landfill, and six Air Force bases, nationwide. He has prepared ecological assessments of susceptible environments and has participated in water quality sampling in groundwater studies.

Dr. Knight has considerable expertise in the study of phytoplankton and other algae in aquatic systems. He has conducted field verification studies of the Algal Assay Procedure, studied the effects of power plant entrainment on phytoplankton, and provided taxonomy and enumeration of phytoplankton and periphyton from rivers and streams.

<u>Publications</u>

Dr. Knight has authored several technical papers on ecosystem metabolism, phytoplankton ecology, and heavy metal dynamics in aquatic systems. Representative papers include:

<u>Energy Model of a Cadmium Stream with Correlation of Embodied Energy and Toxicity Effect</u>. EPA-600/53-048. U.S. EPA, Athens, Georgia. 1982.

"In Defense of Ecosystems," co-authored with D. Swaney. <u>American Naturalist</u>, 117:991-992, 1981.

"A Control Hypothesis for Ecosystems--Energetics and Quantification with the Toxic Metal Cadmium," in W. Mitsch, R. W. Bosserman, and J.M. Klopatek (eds.) <u>Energy and Ecological Modelling</u>. Elsevier Publishing Co., pp. 601-615, 1981.

<u>Record of Estuarine and Salt March Metabolism at Crystal River, Florida</u>, 1977-1981, co-authored with W. F. Coggins. Final Summary Report to Florida Power Corporation, Dept. of Environmental and Engineering Sciences, University of Florida, Gainesville. 1982.

"Large-Scale Microcosms for Assessing Fates and Effects of Trace Contaminants," co-authored with J. W. Bowling, J. P. Giesy, and H. J. Kania. In: J. P. Giesy (ed.) <u>Microcosms in Ecological Research</u>, USDE pp. 224-247, 1980.

"Fates of Cadmium Introduced into Channel Microcosms," co-authored J. P. Giesy, J. W. Bowling, H. J. Kania, and S. Mashburn. <u>Environment International</u>, 5:159-175, 1981.

<u>Energy Basis of Control in Aquatic Ecosystems</u>. Ph.D. Dissertation, University of Florida. 1980.

ROBERT L. KNIGHT

Fate and Biological Effects of Mercury Introduced into Artificial Streams, co-authored with H. J. Kania and R. J. Beyers. PEA-600/3-76-060. U.S. EPA, Athens, Georgia. 1976.

Effects of Entrainment and Thermal Shock on Phytoplankton Numbers and Diversity. Department of Environmental Sciences and Engineering, Publication 336, University of North Carolina, Chapel Hill. 1973.

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Appendix B
OUTSIDE AGENCY CONTACT LIST

Appendix B
OUTSIDE AGENCY CONTACT LIST

1. New York Department of Environmental Conservation
   Binghamton Sub-Office
   Binghamton, New York
   Mr. Larry Lepak
   607/773-7763

2. Broome County Environmental Management Council
   Binghamton, New York
   Mr. John Kowalchyk, Environment Resources
   607/772-2116

3. Broome County Health Department
   Division of Environmental Health
   Binghamton, New York
   Mr. Robert Denz
   607/772-2887

4. United States Environmental Protection Agency
   RCRA Inspection--Region 2
   New York, New York
   Ms. Catharine Massimino, Inspecting Engineering
   212/264-1317

5. New York Department of Environmental Conservation
   Albany, New York
   Mr. Jerry Rider
   518/457-3691

6. Johnson City Water Department
   Johnson City, New York
   Mr. Sid Wheeler, Superintendent
   607/797-2523

7. U.S. Geological Survey
   Hydrology Section
   Albany, New York
   Mr. Alan Randall
   518/472-3663

8. U.S. Fish and Wildlife Service
   Endangered Species Program
   Boston, Massachusetts
   Mr. Paul Nickerson
   617/965-5100

9. New York Department of Environmental Conservation
Division of Wildlife
Cortland, New York
Mr. John Proud
607/753-3095

10. New York Department of Environmental Conservation
Division of Wildlife
Delmar, New York
Mr. Larry Brown
515/439-7486

11. U.S. Fish and Wildlife Service
State Office of Wildlife Assistance
Albany, New York
Mr. Jim Forbes
518/472-6492

12. U.S. Department of Agriculture
Soil Conservation Service
Binghamton, New York
Mr. Ron Fletcher
607/773-2691

13. U.S. Department of Commerce
National Oceanographic and Atmospheric Administration
Climatic Data Center
Ashville, North Carolina
704/259-0682

14. Broome County Planning Department
Binghamton, New York
Ms. Claudia Stallman
607/772-2114

15. New York State Electric & Gas Company
Binghamton, New York
Mr. Ray Tuttle
607/729-2551

16. New York Department of Environmental Conservation
Division of Fisheries and Wildlife
Cortland, New York
Mr. Tom Chiotti
607/753-3095

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Appendix C
AF PLANT 59 RECORDS SEARCH INTERVIEW LIST

## Appendix C
## AIR FORCE PLANT 59 RECORDS SEARCH INTERVIEW LIST

| Interviewee | Area of Knowledge | Years at Installation |
|---|---|---|
| 1 | Plant Engineer | 16 |
| 2 | Plant Maintenance/Plumbing | 34 |
| 3 | Oiler | 3 |
| 4 | Plant Maintenance and Service | 5 |
| 5 | Plant Maintenance | 34 |
| 6 | Plating Shop | 18 |
| 7 | Plant Safety | 11 |
| 8 | Plant Maintenance | 33 |
| 9 | Manufacturing Tooling | 19 |
| 10 | Shop Operators | 18 |
| 11 | Contract/Environmental Services | 40 |

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# Appendix D
# INSTALLATION HISTORY

Appendix D

# INSTALLATION HISTORY

Air Force Plant 59 was designed and built by PLANCOR, the Defense Plant Corporation, a subsidiary of the Reconstruction Finance Corporation in 1942. The original building contained 621,500 square feet of floor space and has remained essentially unchanged. The plant was originally served by a spur off the Erie-Lackawanna railroad line.

The original contractor at the plant was Remington Rand, Incorporated. Remington Rand manufactured aluminum aircraft propellers for the Second World War effort from 1942 to 1945. Operations at the plant were curtailed immediately after VE Day, and the plant was idle for slightly over 3 years.

In April 1949, Air Force Plant 59 was reopened as an aircraft controls manufacturing facility with General Electric Company as the sole contractor. The major manufacturing process at that time was parts machining for electro-mechanical control systems. Machine shop activity peaked in 1967 at the height of the Vietnam War effort.

Activity at the plant dropped off markedly in the 1970s. Parts machinery activities were further curtailed as a result of technological advances that have made control systems more strictly electrical in nature. Currently, 2,300 employees work at Air Force Plant 59 on three shifts.

Several improvements have been made to the outdoor facilities at Air Force Plant 59 over the years. In 1958, the gravel and dirt parking lots surrounding the manufacturing building were paved. New York State built an earthen containment dike along the banks of the Little Choconut Creek as part of a mid-1960s flood control project. A water supply well was drilled immediately south of the manufacturing building to reduce the plant's usage of municipal water in 1974. A water recharge well for non-contact cooling water was also drilled at this time but its use was quickly discontinued due to subsurface subsidence. General Electric Company discontinued its use of the railroad spur in the early 1950s, the spur was paved over, and the trestle over Little Choconut Creek was eventually removed in 1980.

General Electric Company currently manufactures flight control, laser systems, weapons control, internal navigation, and guidance systems at Air Force Plant 59. These systems are used in various military aircraft including the F-18, F-15, F-111, and B-1. In addition, a small amount of work is done for Boeing 757 and 767 commercial jets.

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Appendix E
MASTER LIST OF INDUSTRIAL ACTIVITIES

Appendix E
MASTER LIST OF INDUSTRIAL OPERATIONS

| Shop or Process | Location (Room No.) | Dates of Operation | Handles Hazardous Materials | Generates Hazardous Waste | Current Waste Management Methods |
|---|---|---|---|---|---|
| Electroplating | 926 | 1949-Pres. | X | X | Tank storage/neutralization/vacuum trucked offsite |
| Electroplating Rinsing | 926 | 1949-Pres. | X | X | Precipitation/Effluent to Outfall 001 |
| Degreasing | Various | 1949-Pres. | X | X | Drummed/transported offsite |
| Aluminum Dip Brazing | 822 | 1949-Pres. | X | X | Drummed/transported offsite |
| Paint Shop | 812 | 1949-Pres. | X | X | Drummed/transported offsite |
| Aluminum Black Oxide Process | 926 | 1949-Pres. | X | X | Drummed/transported offsite |
| Assembly | Various | 1949-Pres. | X | X | Drummed/transported offsite (some recycling) |
| Transformer Maintenance | Catwalks | 1949-Pres. | X | X | Drummed/transported offsite |
| Etching | 820 | 1970-Pres. | X | X | Drummed/transported offsite |
| Fabrication | Various | 1949-Pres. | X | X | Tank storage/vacuum trucked offsite |
| Herbicide Spraying | Fenceline | 1949-Pres. | X | -- | Consumed in use |
| Software Development | 372 | 1955-Pres. | -- | -- | |
| Hardware Development | Various | 1949-Pres. | -- | -- | |
| Component Failure Analysis Lab | Various | 1949-Pres. | -- | -- | |
| Electronic Testing | 401 | 1949-Pres. | -- | -- | |
| Optics Lab | Various | 1949-Pres. | -- | -- | |
| Weapons Control Lab | 523 | 1949-Pres. | -- | -- | |
| Chemical Milling | 729 | 1949-Pres. | X | X | Drummed/transported offsite |
| Environmental Test Stations | Various | 1949-Pres. | -- | -- | |
| Sheet Metal Shop | 823 | 1949-Pres. | -- | -- | |
| Weld Shop | 826 | 1949-Pres. | -- | -- | |

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Appendix F
INVENTORY OF EXISTING FUEL STORAGE TANKS

Appendix F

INVENTORY OF EXISTING FUEL STORAGE TANKS

| Location | Fuel | Tank Capacity (gal) | Aboveground or Underground | In Use or Not In Use |
|---|---|---|---|---|
| Maintenance Garage | Gasoline | 1,000 | U | N |
| Compressor Room | Diesel Fuel | 275 | A | I |
| East of Hydraulic Pump Room | Diesel Fuel | 500 | A | I |
| Pump House--Res. Site | Diesel Fuel | 275 | A | I |
| Fuel Storage Building (South of Exist 15) | Synthetic Testing Fuel | 1,000 | A | I |

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Appendix G
ELECTRICAL EQUIPMENT CONTAINING PCBs

## Appendix G
## ELECTRICAL EQUIPMENT CONTAINING PCBs

| Number or Service Area | Location | Quantity of PCB Containing Oil (gal) |
|---|---|---|
| **Transformers:** | | |
| 1 | North Catwalk | 290 |
| 2 | North Catwalk | 290 |
| 3 | North Catwalk | 290 |
| 4 | North Catwalk | 290 |
| 5 | North Catwalk | 290 |
| 6 | North Catwalk | 290 |
| 7 | North Catwalk | 290 |
| 8 | South Catwalk | 290 |
| 9 | South Catwalk | 290 |
| 10 | South Catwalk | 290 |
| 11 | South Catwalk | 290 |
| 12 | South Catwalk | 290 |
| 13 | South Catwalk | 290 |
| 14 | South Catwalk | 290 |
| 15 | South Catwalk | 290 |
| 16 | South Catwalk | 290 |
| 17 | South Catwalk | 290 |
| 18 | South Catwalk | 290 |
| East. Admin. Building | Outside of Garage | 150 |
| West Admin. Building | Outside Exit 20 | 130 |
| Center Admin. Building | Courtyard | 120 |
| Computer Room | Courtyard | 150 |
| Elec. Systems Std. Prod. | North Catwalk | 485 |
| VSCF Test & Rdt. | Outside East Plt. Rm. | 425 |
| **Capacitors:** | | |
| 1 | North Catwalk | 28 |
| 2 | North Catwalk | 28 |
| 3 | North Catwalk | 28 |
| 4 | North Catwalk | 28 |
| 5 | North Catwalk | 28 |
| 6 | North Catwalk | 28 |
| 7 | North Catwalk | 28 |
| 8 | South Catwalk | 28 |
| 9 | South Catwalk | 28 |
| 10 | South Catwalk | 28 |

| Number or Service Area | Location | Quantity of PCB Containing Oil (gal) |
|---|---|---|
| 11 | South Catwalk | 28 |
| 12 | South Catwalk | 28 |
| 13 | South Catwalk | 28 |
| 14 | South Catwalk | 28 |
| 15 | South Catwalk | 28 |
| 16 | South Catwalk | 28 |
| 17 | South Catwalk | 28 |
| 18 | South Catwalk | 28 |
| 19 | South Catwalk | 28 |
| Total Quantity PCB Containing Oils | | 7,184 |

R216

# Appendix H
# HAZARD ASSESSMENT RATING METHODOLOGY

## USAF INSTALLATION RESTORATION PROGRAM
## HAZARD ASSESSMENT RATING METHODOLOGY

BACKGROUND

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

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

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

The first site rating model was developed in June 1981 at a meeting with representatives from the USAF Occupational and Environmental Health Laboratory (OEHL), Air Force Engineering and Services Center (AFESC), Engineering-Science (ES) and CH2M HILL. The basis for this model was a system developed for EPA by JRB Associates of McLean, Virginia. The JRB model was modified to meet Air Force needs.

After using this model for 6 months at over 20 Air Force installations, certain inadequacies became apparent. Therefore, on January 26 and 27, 1982, representatives of

USAF OEHL, AFESC, various major commands, Engineering Science, and CH2M HILL met to address the inadequacies. The result of the meeting was a new site rating model designed to present a better picture of the hazards posed by sites at Air Force installations. The new rating model described in this presentation is referred to as the Hazard Assessment Rating Methodology.

PURPOSE

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

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

DESCRIPTION OF MODEL

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

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

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

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

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

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

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

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

FIGURE 1

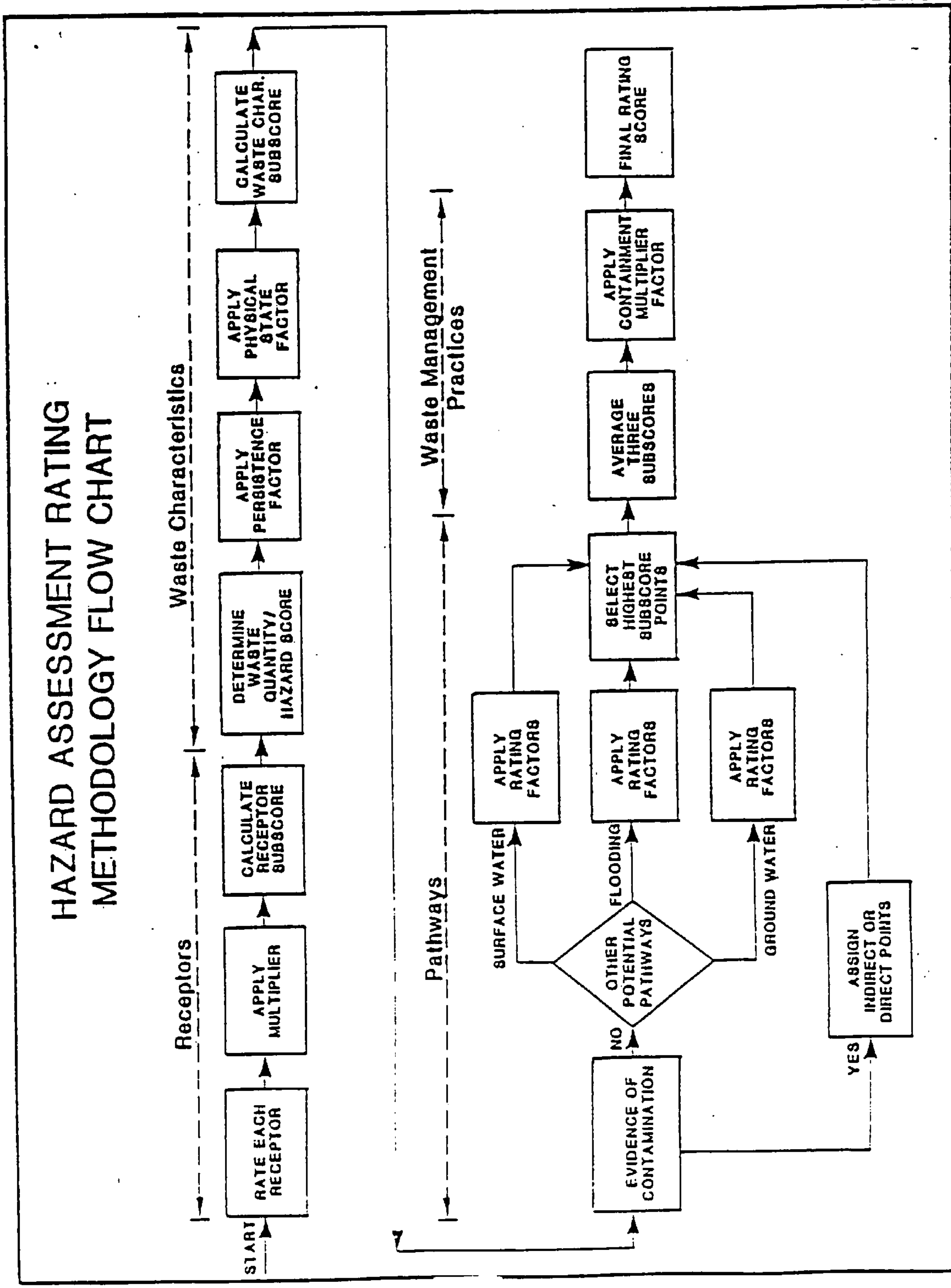
HAZARD ASSESSMENT RATING
METHODOLOGY FLOW CHART
Receptors
Waste Characteristics
Pathways
Waste Management Practices
START
RATE EACH RECEPTOR
APPLY MULTIPLIER
CALCULATE RECEPTOR SUBSCORE
DETERMINE WASTE QUANTITY/ HAZARD SCORE
APPLY PERSISTENCE FACTOR
APPLY PHYSICAL STATE FACTOR
CALCULATE WASTE CHAR. SUBSCORE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

FIGURE 2

# HAZARDOUS ASSESSMENT RATING FORM



NAME OF SITE ____________________

LOCATION ____________________

DATE OF OPERATION OR OCCURRENCE ____________________

OWNER/OPERATOR ____________________

COMMENTS/DESCRIPTION ____________________

SITE RATED BY ____________________

## I. RECEPTORS

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

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

## II. WASTE CHARACTERISTICS

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

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

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

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

______ X ______ = ______

C. Apply physical state multiplier

Subscore B X Physical State Multiplier = Waste Characteristics Subscore

______ X ______ = ______

## III. PATHWAYS

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

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

Subscore ______

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

1. Surface water migration

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

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

2. Flooding

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

Subscore (100 x factor score/3) ______

3. Ground-water migration

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

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

C. Highest pathway subscore.

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

Pathways Subscore ______

## IV. WASTE MANAGEMENT PRACTICES

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

Receptors ______
Waste Characteristics ______
Pathways ______

Total ______ divided by 3 = ______
Gross Total Score

B. Apply factor for waste containment from waste management practices

Gross Total Score X Waste Management Practices Factor = Final Score

______ X ______ = ______

Table 1
HAZARDOUS ASSESSMENT RATING METHODOLOGY GUIDELINES

I. RECEPTORS CATEGORY

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

Table 1--Continued

## II. WASTE CHARACTERISTICS

### A-1 Hazardous Waste Quantity

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

### A-2 Confidence Level of Information

C = Confirmed confidence level (minimum criteria below)

- o Verbal reports from interviewer (at least 2) or written information from the records
- o Knowledge of types and quantities of wastes generated by shops and other areas on base

S = Suspected confidence level

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

### A-3 Hazard Rating

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

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

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

Table 1--Continued

II. WASTE CHARACTERISTICS--Continued

Waste Characteristics Matrix

| Point Rating | Hazardous Waste Quantity | Confidence Level of Information | Hazard Rating |
|---|---|---|---|
| 100 | L | C | H |
| 80 | L | C | H |
| | 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

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

C. Physical State Multiplier

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

Table 1--Continued

III. PATHWAYS CATEGORY

A. Evidence of Contamination

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

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

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 ($10$ to $10^{-4}$ cm/sec) | 30% to 50% clay ($10^{-4}$ to $10^{-6}$ cm/sec) | Greater than 50% clay ($>10^{-6}$ cm/sec) | 6 |
| Rainfall intensity based on 1-year 24-hour rainfall | <1.0 inch | 1.0 to 2.0 inches | 2.1 to 3.0 inches | >3.0 inches | 8 |

B-2 Potential for Flooding

| 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 |

Table 1--Continued

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

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

IV. WASTE MANAGEMENT PRACTICES CATEGORY

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

B. Waste Management Practices Factor

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

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

Guidelines for fully contained:

Landfills:

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

Surface Impoundments:

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

Spills:

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

Fire Protection Training Areas:

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

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

Appendix I
SITE RATING FORMS

HAZARDOUS ASSESSMENT RATING FORM



NAME OF SITE: Site No. 1--Underground Waste Oil Storage Tanks

LOCATION: Air Force Plant 59

DATE OF OPERATION OR OCCURRENCE: 1953 to Present

OWNER/OPERATOR: Air Force Plant 59

COMMENTS/DESCRIPTION: Storage of Waste Cutting Oils

SITE RATED BY: G. McIntyre and C. McFarland

I. RECEPTORS

| | Rating Factor | Factor Rating (0-3) | Multiplier | Factor Score | Maximum Possible Score |
|---|---|---|---|---|---|
| A. | Population within 1,000 feet of site | 3 | 4 | 12 | 12 |
| B. | Distance to nearest well | 3 | 10 | 30 | 30 |
| C. | Land use/zoning within 1 mile radius | 3 | 3 | 9 | 9 |
| D. | Distance to reservation boundary | 3 | 6 | 18 | 18 |
| E. | Critical environments within 1 mile radius of site | 1 | 10 | 10 | 30 |
| F. | Water quality of nearest surface-water body | 3 | 6 | 18 | 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 | 133 | 180 |

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

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

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

50 x 0.8 = 40

C. Apply physical state multiplier

Subscore B x Physical State Multiplier = Waste Characteristics Subscore

40 x 1.0 = 40

III. PATHWAYS

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

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

Subscore 80

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

| Rating Factor | Factor Rating (0-3) | Multiplier | Factor Score | Maximum Possible Score |
|---|---|---|---|---|
| 1. Surface-water migration | | | | |
| Distance to nearest surface water | 3 | 8 | 24 | 24 |
| Net precipitation | 2 | 6 | 12 | 18 |
| Surface erosion | 0 | 8 | 0 | 24 |
| Surface permeability | 0 | 6 | 0 | 18 |
| Rainfall intensity | 1 | 8 | 8 | 24 |
| | | Subtotals | 44 | 108 |
| Subscore (100 x factor score subtotal/maximum score subtotal) | | | | 41 |
| 2. Flooding | 1 | 1 | 1 | 100 |
| | | Subscore (100 x factor score/3) | | 33 |
| 3. Ground-water migration | | | | |
| Depth to ground water | 2 | 8 | 16 | 24 |
| Net precipitation | 2 | 6 | 12 | 18 |
| Soil permeability | 3 | 8 | 24 | 24 |
| Subsurface flows | 0 | 8 | 0 | 24 |
| Direct access to ground water | 0 | 8 | 0 | 24 |
| | | Subtotals | 52 | 114 |
| Subscore (100 x factor score subtotal/maximum score subtotal) | | | | 46 |

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 | 40 |
| Pathways | 80 |
| Total 194 divided by 3 = | 64.7 Gross Total Score |

B. Apply factor for waste containment from waste management practices

Gross Total Score x Waste Management Practices Factor = Final Score

64.7 x 1.0 — 65

# HAZARDOUS ASSESSMENT RATING FORM



NAME OF SITE: Site No. 2--Drum Storage Area

LOCATION: Air Force Plant 59

DATE OF OPERATION OR OCCURRENCE: 1949 to 1963

OWNER/OPERATOR: Air Force Plant 59

COMMENTS/DESCRIPTION: Small Spillage as a result of Poor Housekeeping

SITE RATED BY: G. McIntyre and C. McFarland

## I. RECEPTORS

| | Rating Factor | Factor Rating (0-3) | Multiplier | Factor Score | Maximum Possible Score |
|---|---|---|---|---|---|
| A. | Population within 1,000 feet of site | 3 | 4 | 12 | 12 |
| B. | Distance to nearest well | 3 | 10 | 30 | 30 |
| C. | Land use/zoning within 1 mile radius | 3 | 3 | 9 | 9 |
| D. | Distance to reservation boundary | 3 | 6 | 18 | 18 |
| E. | Critical environments within 1 mile radius of site | 1 | 10 | 10 | 30 |
| F. | Water quality of nearest surface-water body | 3 | 6 | 18 | 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 | 133 | 180 |

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

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 | 0 |
| B. Rate the migration potential for three potential pathways: surface-water migration, flooding, and ground-water migration. Select the highest rating, and proceed to C. | | | | |
| 1. Surface-water migration | | | | |
| Distance to nearest surface water | 3 | 8 | 24 | 24 |
| Net precipitation | 2 | 6 | 12 | 18 |
| Surface erosion | 0 | 8 | 0 | 24 |
| Surface permeability | 1 | 6 | 6 | 18 |
| Rainfall intensity | 1 | 8 | 8 | 24 |
| | | Subtotals | 50 | 108 |
| Subscore (100 x factor score subtotal/maximum score subtotal) | | | | 46 |
| 2. Flooding | 1 | 1 | 1 | 100 |
| | | Subscore (100 x factor score/3) | | 33 |
| 3. Ground-water migration | | | | |
| Depth to ground water | 2 | 8 | 16 | 24 |
| Net precipitation | 2 | 6 | 12 | 18 |
| Soil permeability | 3 | 8 | 24 | 24 |
| Subsurface flows | 0 | 8 | 0 | 24 |
| Direct access to ground water | 0 | 8 | 0 | 24 |
| | | Subtotals | 52 | 114 |
| Subscore (100 x factor score subtotal/maximum score subtotal) | | | | 46 |

C. Highest pathway subscore

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

Pathways Subscore 46

IV. WASTE MANAGEMENT PRACTICES

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

| | |
|---|---|
| Receptors | 74 |
| Waste Characteristics | 24 |
| Pathways | 46 |
| Total 144 divided by 3 = | 48.0 Gross Total Score |

B. Apply factor for waste containment from waste management practices

Gross Total Score x Waste Management Practices Factor = Final Score

48.0 x 0.95 46

# Appendix J
# GLOSSARY OF TERMS

GLOSSARY OF TERMS

ALLUVIUM - A general term for clay, silt, sand, gravel, or similar unconsolidated detrital material deposited during comparatively recent geologic time by a stream or other body of running water as a sorted or semisorted sediment in the bed of the stream or on its flood plain or delta, or as a code or fan at the base of a mountain slope; especially such a deposit of fine-grained texture deposited during time of flood.

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

BENTHIC - Pertaining to the bottom of ocean, lake, or stream. Also forms of life that are bottom dwelling underwater.

BLUE GREENS - A bluish-green group of algae of the phylum cyanophyta.

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

CONTAMINANT - As defined by section 104(a)(2) of CERCLA, shall include, but not be limited to, any element, substance, compound, or mixture, including disease causing agents that, 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.

DIATOMS - A microspic single-celled plant growing in marine or fresh water.

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

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

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

FRACTURES - As a mineral characteristic, the way in which a mineral breaks when it does not have cleavage. May be conchoidal (shell-shaped), fibrous, hackly, or uneven.

GLACIAL TILL - Unsorted and unstratified drift, generally unconsolidated, deposited directly by and underneath a glacier without subsequent reworking by water from the glacier, and consisting of a heterogeneous mixture of clay, sand, gravel, and boulders varying widely in size and shape.

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

HAZARDOUS WASTE (expanded version of the RCRA definition) - A solid waste 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 irreversible or incapacitating reversible, illness; or

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

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

LITHIFICATION - The conversion of a newly deposited, unconsolidated sediment into a coherent and solid rock.

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

MACROPHYTE: A macroscopic plant found in an aquatic environment.

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

NET PRECIPITATION - Mean annual precipitation minus mean annual evapotranspiration.

OROGENIC - Pertaining to the process by which structures within mountain areas were formed, including faulting, folding, and thrusting.

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.

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

SOIL HORIZONS -

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

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

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

STRATA - Plural of stratum.

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

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

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

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

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# Appendix K
# LIST OF ACRONYMS, ABBREVIATIONS, AND SYMBOLS USED IN THE TEXT

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

| | |
|---|---|
| AF | Air Force |
| AFESC | Air Force Engineering and Services Center |
| AFPRO | Air Force Plant Representative Office |
| AG | Aboveground |
| ASD | Aeronautical Systems Division |
| Bldg. | Building |
| bls | Below Land Surface |
| °C | Degrees Celsius (Centigrade) |
| CERCLA | Comprehensive Environmental Response, Compensation, and Liability Act (Superfund) |
| CFR | Code of Federal Regulations |
| cm/sec | Centimeters per Second |
| DCAS | Defense Contract Administrative Services |
| DEC | Department of Enviornmental Conservation |
| DEQPPM | Defense Environmental Quality Program Policy Memorandum |
| DoD | Department of Defense |
| EPA | Environmental Protection Agency |
| °F | Degrees Fahrenheit |
| ft/min | Feet per Minute |
| $ft^2/d$ | Square feet per Day |
| gal/yr | Gallons per Year |
| GE | General Electric Company |
| gpd | Gallons per Day |
| gpm | Gallons per Minute |
| gpy | Gallons per Year |
| HARM | Hazard Assessment Rating Methodology |
| IRP | Installation Restoration Program |
| JP | Jet Petroleum |
| kg/day | Kilograms per Day |
| lb | Pounds |
| lb/day | Pounds per Day |
| lb/yr | Pounds per Year |
| MEK | Methyl Ethyl Ketone |

| | |
|---|---|
| mg/L | Milligrams per Liter |
| mgd | Million Gallons per Day |
| mo. | Month |
| mph | Miles per Hour |
| msl | Mean Sea Level |
| No. | Number |
| NPDES | National Pollutant Discharge Elimination System |
| OEHL | Occupational and Environmental Health Laboratory |
| PCB | Polychlorinated Biphenyls |
| ppm | Parts per Million |
| RCRA | Resource Conservation and Recovery Act |
| SCS | Soil Conservation Service |
| SPDES | New York State Pollution Discharge Elimination System |
| Spp. | Species |
| TCE | Trichloroethylene |
| TSS | Total Suspended Solids |
| UG | Underground |
| USAF | United States Air Force |
| USDA | United States Department of Agriculture |
| VOC | Volatile Organic Compound |
| µg/L | Micrograms per Liter |

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# Appendix L
# REFERENCES

REFERENCES

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