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EA Work Plan-59
EA Project No. 10004.02

EA Engineering, Science, and Technology, Inc.

INSTALLATION RESTORATION PROGRAM

PHASE II STAGE 2

REMEDIAL INVESTIGATION/FEASIBILITY STUDY (RI/FS)

AIR FORCE PLANT 59
JOHNSON CITY, NEW YORK

EA Engineering, Science, and Technology, Inc.
Hunt Valley/Loveton Center
15 Loveton Circle
Sparks, Maryland 21152

December 1988

WORK PLAN, JUNE-DECEMBER 1988

APPROVED FOR PUBLIC RELEASE:
DISTRIBUTION IS UNLIMITED

Prepared for

Headquarters Air Force Systems Command
Aeronautical Systems Division/Facilities Management (ASD/PMDA)
Wright-Patterson Air Force Base, Ohio 45433-6503

USAF Occupational & Environmental Health Laboratory
Technical Services Division (USAFOEHL/TS)
Brooks Air Force Base, Texas 78235-5501

INSTALLATION RESTORATION PROGRAM

STAGE 2

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FOR

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USAF CONTRACT NO. F33615-87-D-4017, DELIVERY ORDER NO. 0002

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1. INTRODUCTION

On 20 June 1988, EA Engineering, Science, and Technology, Inc. was tasked by the U.S. Air Force Occupational and Environmental Health Laboratory (USAFOEHL), under Contract No. F33615-87-D-4017, to develop a Work Plan for an Installation Restoration Program (IRP) Phase II Stage 2 Remedial Investigation/Feasibility Study (RI/FS) of Air Force Plant No. 59 (AFP 59) in Johnson City, New York. Phase II activities begin with the development of technical approaches for evaluating identified potential hazardous waste sites. This Work Plan presents the technical approach planned for the Phase II Stage 2 RI/FS for AFP 59 under the Air Force's IRP.

1.1 AIR FORCE INSTALLATION RESTORATION PROGRAM

1.1.1 Program Origin

In October 1986, Congress passed and the President signed into law, the Superfund Amendments and Reauthorization Act of 1986 (SARA) as Public Law 98-499, 17 October 1986. These amendments required for the first time that all federal agencies, in responding to releases of hazardous substances, must follow all U.S. Environmental Protection Agency (U.S. EPA) rules and regulations, criteria, and guidelines as described in 42 U.S. Code 9620 (a). However, to fulfill its commitment to the nation's environmental program, the U.S. Air Force had earlier developed and implemented the IRP to ensure that discharges and releases from past disposal practices and spills were regulated to the same degree and extent as required by the Comprehensive Environmental Response Compensation and Liability Act (CERCLA).

In June of 1980, the Department of Defense (DOD) issued the Defense Environmental Quality Program Policy Memorandum (DEQPPM) 80-6. DEQPPM 80-6 mandated that hazardous waste disposal sites on DOD facilities be identified. The U.S. Air Force implemented DEQPPM 80-6 in December 1980. DOD revised and expanded existing IRP directives through DEQPPM 81-5 in 1981, and the U.S. Air Force implemented DEQPPM 81-5 in January 1982. On 10 November 1986, Headquarters, U.S. Air Force, directed that all IRP actions convert to the

U.S. EPA Remedial Investigation/Feasibility Study (RI/FS) methodology and other guidelines established by the U.S. EPA. This new approach enables the U.S. Air Force to develop and to evaluate the required remedial actions in conjunction with its investigative efforts. This new U.S. Air Force practice expedites the determination of the environmental effects of the releases and the evaluation and selection of the remedial actions necessary to regulate releases as required by Congress and the President.

1.1.2 Program Objectives

The objectives of the Air Force IRP are to assess the magnitude and extend of contamination at past hazardous waste disposal and spill sites on Air Force installations and develop remedial actions consistent with the NCP for those sites which pose a threat to human health and welfare or the environment.

1.1.3 Program Organization

The IRP is designed to ensure that identification, confirmation/qualification, and remedial response actions at Air Force installations are performed in accordance with CERCLA, SARA, and the NCP, and in a timely and cost-effective manner. Each phase of the IRP is briefly described below.

Phase I - The objective of this phase is to identify and prioritize past disposal or spill sites that may pose a hazard to public health or the environment as a result of contaminant migration.

Phase II - Data collection and subsequent site characterization are the main objectives of Phase II. This phase corresponds to the Remedial Investigation Program as described in the National Oil and Hazardous Substances Pollution Contingency Plan, also referred to as the National Contingency Plan (NCP) (40 CFR Part 300, 20 November 1985), and the SARA. The Remedial Investigation is conducted concurrently with the Feasibility Study (Phase IVA) during this effort.

Phase III - Technologies are developed in this phase, as needed, to remediate threats from hazardous waste sites and prevent the release of contaminants into the environment.

Phase IVA - Development, screening, and detailed analysis of remediation alternatives form the main portion of Phase IVA, which leads to the selection of a recommended remedial action alternative. This phase corresponds to the Feasibility Study Program as described in the NCP and in SARA.

Phase IVB - This phase involves the design, construction, and implementation of remedial alternatives.

Since the inception of the IRP, significant experience in all phases of the program has been gained and the program approach has evolved. Based on experience obtained at Air Force bases nationwide, the U.S. Air Force has adopted an approach that streamlines and integrates the phases and work elements of the program.

1.1.4 Program Documents

A Phase I Records Search of AFP 59 was completed in October 1984 by CH2M Hill, Gainesville, Florida. This phase identified and prioritized sites posing a potential threat to public health or the environment through contaminant migration, and recommended that field sampling and laboratory analysis be performed to confirm or deny the presence of environmental contamination at AFP 59.

A Phase II Stage 1 Confirmation/Quantification study of AFP 59 was completed in March 1988 by Fred C. Hart Associates, Inc., New York, New York. This study defined and quantified, through preliminary sampling and analysis, the presence of contamination at AFP 59, and recommended that additional Phase II studies be performed to further define the presence, evaluate potential sources, and determine the magnitude and extent of contamination at AFP 59. Table 1-1 summarizes the Stage 1 recommendations for further Phase II studies.

TABLE 1-1 IRP PHASE II STAGE 1 RECOMMENDATIONS

Location	Recommended Action	Rationale
All Monitoring Wells	Sample existing wells for priority pollutants; based on the results, continue to monitor ground-water VOCs, petroleum hydrocarbons, and primary metals or or priority pollutants. Assess ground-water flow patterns	To assess if other contaminants are present. Contaminant concentrations in ground water are trace levels and monitoring is necessary to quantify contaminants in ground water
Areas No. 1 and No. 2	Install shallow well near plating building	To monitor for potential migration of contaminants from underneath building (Area No. 2), and to detect possible contaminant releases from Area No. 1
Plant Site	Install three deep wells near the existing shallow wells. Install a well nest consisting of one deep well and one shallow well in the northwest corner of the site	To verify the existence/extent of any contaminants in the zone utilized for potable water; monitor ground-water quality downgradient of the site
	Perform a pumping test with the production well	To evaluate site-specific hydrologic conditions, and estab-extent of hydrologic connection between upper and lower water-bearing zones. This will help to determine whether downward migration of contaminants from the site are the source of the contaminants in the lower zone.
	Sample the surface water and sediment in Little Choconut Creek upstream and analyze for priority pollutants	To establish the contribution, if any, of contaminants in Little Choconut Creek as it recharges the underlying aquifer.

Source: Fred C. Hart Associates 1988.

1.2 DESCRIPTION OF CURRENT STUDY

This Work Plan, prepared by EA, presents the proposed Phase II Stage 2 RI/FS work activities to be implemented at AFP 59. The AFP 59 IRP RI/FS project involves further remedial investigation of two sites identified during prior IRP efforts, the facility as a whole, and a feasibility study of remedial alternatives (where appropriate). The remedial investigation will involve:

- Augmenting the existing database through continued literature search activities (e.g., obtaining most recent pumping data for municipal well fields, quality data from the Broome County Health Department, [BCHD], performing an offsite industrial and demographic survey, etc.).

- Performing soil borings and obtaining soil samples for subsurface geologic and hydrogeologic condition characterization.

- Installing 6 shallow and 9 deep aquifer monitoring wells (15 total), and obtaining ground-water samples from all existing and newly installed wells for priority pollutant analysis to establish the presence/absence of contamination at identified sites, and further define the magnitude, extent, and potential sources of the ground-water contamination detected at AFP 59 during the Stage 1 investigation.

- Baseline surface water and sediment sampling of Choconut Creek for priority pollutant analysis.

- Performing aquifer testing at select monitoring well locations and pump testing the plant's production well to assess the hydrogeologic characteristics of the underlying shallow and deep aquifer systems, their degree of interconnection, and to assess the hydraulic connection between Choconut Creek and the underlying Clinton Street-Ballpark Valley aquifer and the contamination observed in the production well at AFP 59.

- Ground-water flow and contaminant fate and transport modeling.

- Performing a survey of other potential sources of ground-water contamination in the vicinity of AFP 59.

- Identifying populations potentially affected, pathways of potential exposure, and performing a baseline health risk assessment from the database of information generated.

The feasibility study will incorporate the results of the field investigation and a qualitative risk assessment to identify and screen preliminary remediation technologies. The feasibility study will also be used to develop and evaluate remedial alternatives, as appropriate.

EA will accomplish the following actions in fulfillment of the requirements of the Statement of Work (SOW):

- Literature search.

- Identification of Applicable or Relevant and Appropriate Requirements (ARARs).

- Field investigation.

- Preparation of Qualitative Risk Assessment.

- Scoping and initial screening of remedial actions.

- Development of Data Quality Objectives (DQOs).

- Preparation of a final report.

1.2.1 Objectives

The Phase II Stage 1 investigation preliminarily confirmed the presence of contamination at AFP 59, however, the database generated were not sufficient to adequately assess the source(s), extent, and degree of the contamination found.

The primary objectives of this stage of the Phase II study are to implement a more detailed/comprehensive remedial investigation in order to:

- Provide information to determine more completely the types of contaminants at each site and within the plant boundaries as a whole, the environmental media (pathways) that are contaminated, and the areal and vertical extent of contamination.

- Develop detailed descriptions of the environmental factors that must be understood to design appropriate remedial actions.

- Apply the remedial investigation data to the screening and selection processes of the feasibility study.

All field activities and laboratory analysis will be performed in accordance with the Data Quality Objectives (DQOs) and the methods and procedures detailed in EA's Quality Assurance Project Plan (QAPP). DQOs are based on the concept that different data uses may require different data quality. Data quality is defined as the degree of uncertainty with respect to precision, accuracy, reproducibility, comparability, and completeness of a data set. Two broad categories of data quality for this project include:

- Screening (DQO Levels 1 and 2), which provides the lowest data quality but the most rapid results and which is used for the purposes of site health and safety monitoring, and initial site characterization. Screening analyses include onsite data measurements. For purposes of this project, DQO Level 1 data include onsite analysis of pH, temperature, and conductivity in the ground water and surface water. DQO Level 1 screening will also be used for selecting soil boring samples for Contract Laboratory Program (CLP) analysis (DQO Level 4) and for screening of air for organic vapors by use of an HNU Systems, Inc., photoionization detector (PID) or Organic Vapor Analyzer (OVA).

- Confirmational (DQO Level 4), which provides the highest level of data quality and documentation routinely available, and is used for purposes of verifying screening data. Confirmational analyses require full CLP analytical and data validation and documentation procedures. Confirmational analyses for this project include all of the ground water, soil, surface water, and sediment samples sent to a CLP lab for priority pollutant analysis.

1.2.2 Planning Documents

This Work Plan presents the overall approach and details the work activities that will be performed in order to meet the IRP Phase II RI/FS objective for AFP 59. The expected hazards and level of protective measures to be implemented in order to protect the health and safety of field personnel, are detailed in EA's Health and Safety Plan (H&SP). Field and laboratory QA/QC requirements for chemical analyses, laboratory operations, required detection limits, field operations, sampling, sample preservation, sample holding times, equipment decontamination, and chain-of-custody are detailed in the Quality Assurance Project Plan (QAPP). Both the H&SP and QAPP are provided as separate documents.

2. SITE BACKGROUND

Background information for AFP 59 was obtained primarily from the IRP Phase I report prepared by CH2M Hill, October 1984; the IRP Phase II Stage 1 report prepared by Fred C. Hart Associates, Inc., March 1988; a literature search, and a site visit conducted by EA on 8 July 1988.

2.1 HISTORY OF BASE ACTIVITIES

Remington Rand, Inc. was the first manufacturer to occupy AFP 59 making aluminum aircraft propellers at the plant from 1942 to 1945. The plant was closed for four years at the end of World War II. In April 1949, AFP 59 was reopened as an aircraft controls manufacturing facility. General Electric Company (GE) was contracted to operate the facility and the manufacturing process. The major process at that time was the manufacture of parts for electro-mechanical aircraft control systems. Plant activity peaked in 1967 at the height of the Vietnam War. Currently, manufacturing at AFP 59 operates on a three-shift schedule employing 2,300 people.

GE currently manufactures flight control, laser, weapons control, internal navigation, and guidance systems at AFP 59. These systems are used in various military aircraft including the F-18, F-15, F-111, and B-1. Control systems for the Boeing 757 and 767 commercial jets are also manufactured at the plant.

2.1.1 Description of Installation

AFP 59 is located in Broome County, New York, in the Village of Johnson City, about 3 mi west-northwest of the center of the City of Binghamton, and about 4 mi east of the center of the Village of Endicott. Other nearby towns (within 5 mi) include Maine, Chenango, Dickinson, Union, Binghamton, and Vestal. The location and vicinity of AFP 59 are shown in Figure 2-1, and a site map is shown in Figure 2-2.

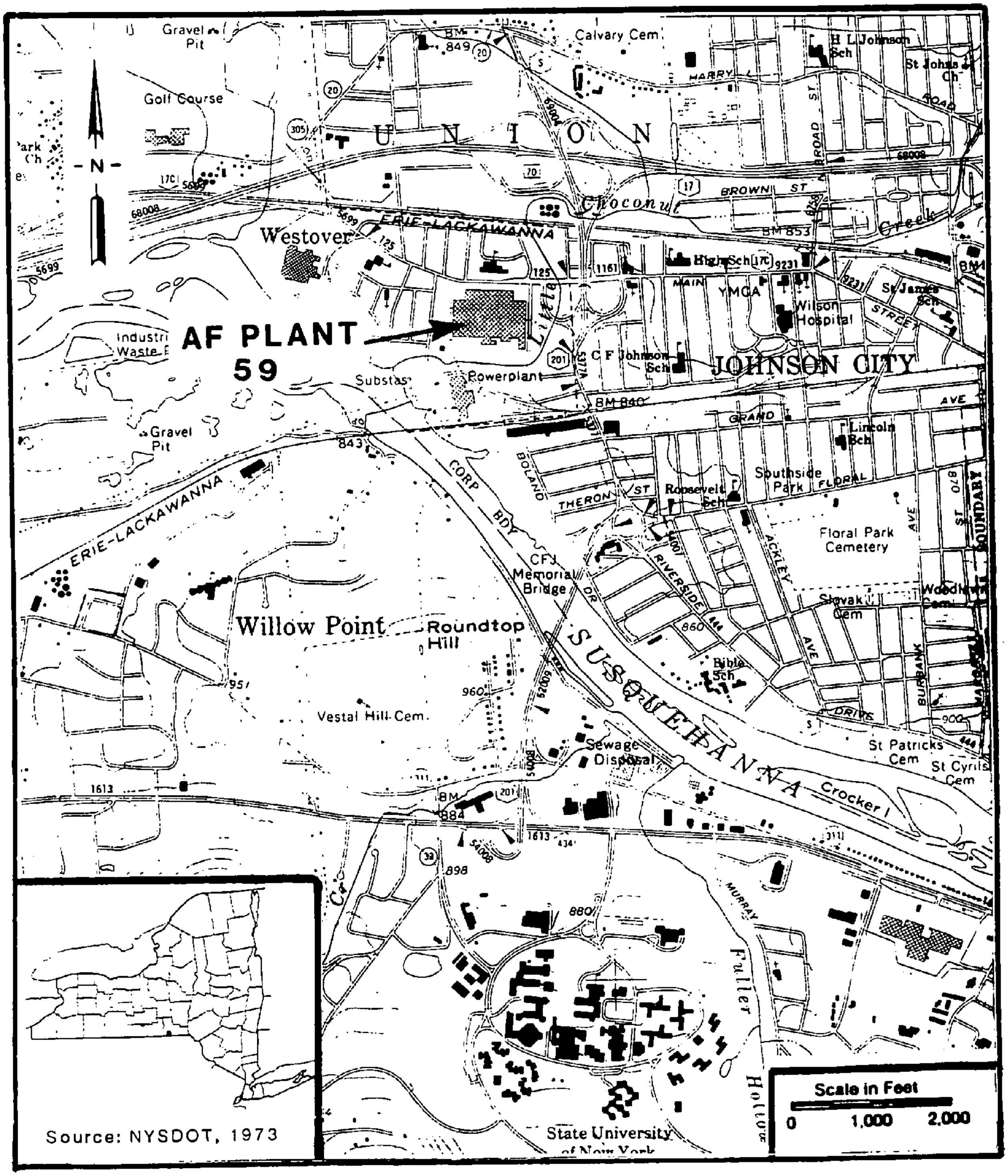
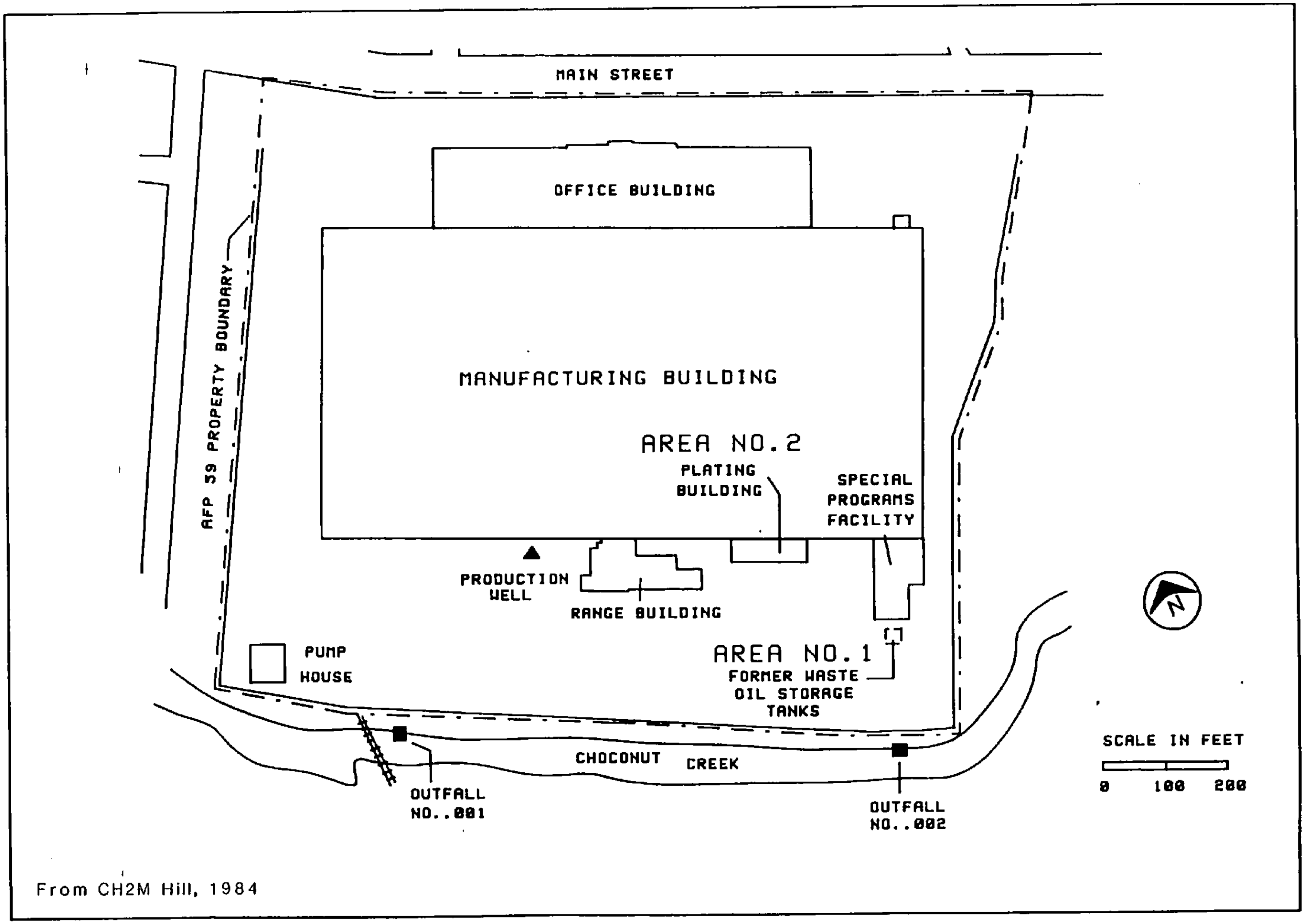


Figure 2-1. Location and vicinity map for AFP 59.



From CH2M Hill, 1984

FIGURE 2-2. SITE MAP OF AFP 59.

The total land area of AFP 59 is 29.6 acres. The main plant entrance is at 600 Main Street (New York State Route 17C), which is the northern boundary of the installation. The plant 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 ft west of the southwest corner of the plant. A 0.6-acre parking lot which is part of AFP 59 property, but not contiguous with the main plant-site, is located north of Main Street.

AFP 59 was designed and built in 1942 by PLANCOR, the Defense Plant Corporation. The original building contained 621,500 sq ft of floor space and has remained essentially unchanged.

Several improvements have been made to the outdoor facilities at AFP 59 over the years. In 1959, the gravel and dirt parking lots surrounding the manufacturing building were paved. In the mid-1960s, the State of New York built an earthen containment dike along the banks of Little Choconut Creek behind the facility as part of a flood control project. In 1974, a water supply well was drilled immediately south of the manufacturing building to reduce the plant's demand on municipal water supplies. A water recharge well for non-contact cooling water was also drilled at this time, however, it was abandoned shortly after installation due to failure of geologic strata (CH2M Hill 1984). GE discontinued use of a railroad spur into the facility in the early 1950s. The spur was paved over, and in 1980 the trestle over Little Choconut Creek was removed.

2.1.2 Past Waste Management Practices

Operations at AFP 59 have generated a variety of waste products, such as waste oils, including cutting oils, lubricating oils and coolants; spent solvents, including degreasing agents; spent process chemicals, including plating acids, caustics, chromium and cyanide solutions; and paint residues. The manufacturing operations currently generate about 50,000 gals per year of these wastes. The quantity of these wastes generated in the past varied proportionally to the manufacturing activity at the plant. The following summarizes past and present waste disposal practices used at the AFP 59:

- Concentrated plating baths have been neutralized in an above-ground holding tank and removed by a contractor (1952-Present).

- Plating rinsewater was treated in a settling tank to precipitate metals prior to discharge to Outfall No. 001 (1952-1969); plating rinsewater was treated in a settling tank for chromium reduction and metal precipitation prior to discharge to Outfall 001 (1969 - July 1984); plating rinsewater is currently treated using an anion and cation exchange column and reused (July 1984 - Present).

- Waste oils were primarily recovered, with some waste oils being discharged to an oil/water separator upstream of Outfall No. 002 (1942-1953); waste oils were discharged to two underground waste oil storage tanks and removed by a contractor for disposal (1953-1985); waste oils are discharged to one above ground storage tank and oils are removed monthly by a private contractor (1985 - Present).

- Kerosene-based degreasing solvents were disposed of with the waste oils (1942-1969); spent solvents are drummed and removed by a contractor (1969 - Present).

2.2 SITE-SPECIFIC DESCRIPTIONS

Two potential contaminant source areas were identified during the Phase I and Phase II, Stage 1 investigations. This section provides detailed descriptions of the former underground waste oil storage tank area (Area No. 1) and the plating building (Area No. 2). Additionally, a specific description of the facilities two surface water outfalls are provided. Figure 2-2 provides the locations of these areas. Section 2.2.1 provides the historical and physical descriptions of these areas. Section 2.2.2 describes the waste types and contaminants identified in these areas.

2.2.1 Contaminant Source Area Descriptions

2.2.1.1 Area No. 1 - Former Underground Waste Oil Storage Tank

Area No. 1, located just south of the Special Programs Facility, Building No. 4, has been identified as a potential concern due to spillage associated with several underground oil storage tanks and the close proximity of municipal water supply wells. The Clinton Street-Ballpark Valley aquifer, the aquifer underlying the site, has been designated as a "sole source" aquifer in the Johnson City area. Historical data indicate that waste oils were routinely spilled in this area and could have caused underground contamination.

In the past, Area No. 1 has been used for the temporary storage of waste oils. Two interconnected 1,000-gal underground storage tanks were installed in 1953, and used until their removal in 1985. The underground waste oil tanks were inspected daily to prevent overtopping, however, waste oil spills occurred during the monthly removal of oils from the tanks. Interviews with employees indicate that the spills resulted from releasing of the residual waste oil in the vacuum truck suction hose. The area surrounding the tanks was backfilled with gravel during their installation. During tank removal operations, the gravel surrounding both tanks was found to be heavily stained. The stained gravel and soil around the tanks was excavated to a depth of 12 ft (approximately 6 ft below the bottom of both tanks) and removed from the site. The remaining soil was sampled by O'Brien and Gere Engineers, Inc. and determined to be non-hazardous (Schneider 1987). The two underground tanks have been replaced by one double-walled aboveground tank.

2.2.1.2 Area No. 2 - Plating Building

The Plating Building (Area No. 2) is identified and located on Figure 2-2. GE identified Area No. 2 as an area of concern at the beginning of the Phase II, Stage 1 investigation. The potential contamination source in this area is plating wastes, and is a concern because of the toxicity and persistence of heavy metals in plating wastes. GE personnel identified this area while repairing a leak in the underground sprinkler main beneath the plating building, where they observed discoloration in the soils.

GE and USAF personnel expressed concern that heavy metal contaminants might be present and that these contaminants could migrate to the ground water via the influx of water from the leaking sprinkler main which could accelerate the migration of potential contaminants.

2.2.1.3 Outfalls No. 001 and No. 002

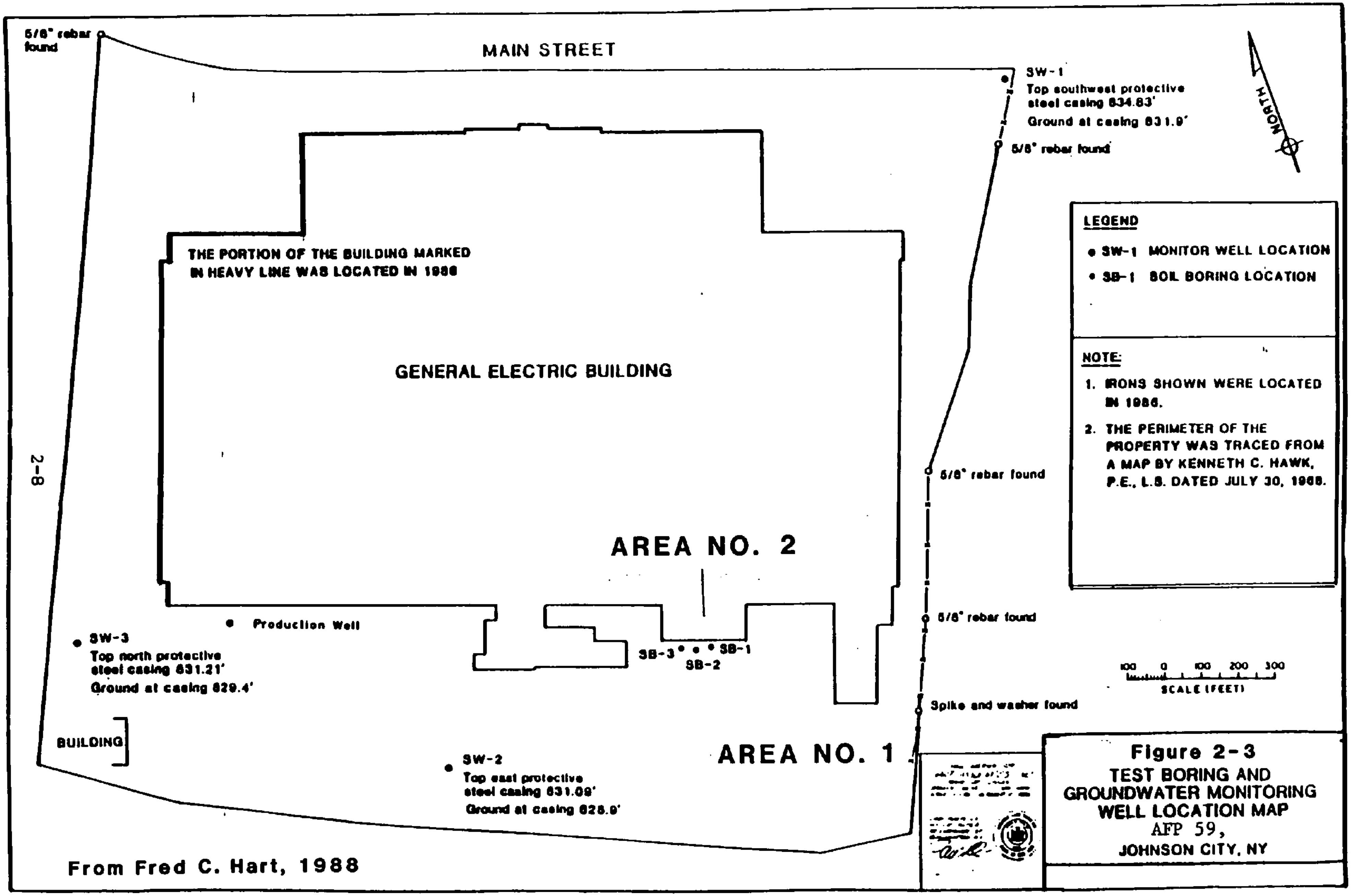
AFP 59 discharges wastewater, non-contact cooling water, and surface water runoff to two permitted outfalls which discharge to the Little Choconut Creek. Outfall No. 001 is located off the southwest corner of Building No. 2 and Outfall No. 002 is located off the southeast corner of Building No. 2 (Figure 2-2). The flow through each of these two outfalls averaged 165,000 gpd during 1983. These outfalls provide a major potential contaminant migration pathway to Choconut Creek. Baseline water quality sampling and analysis was not performed during the Stage 1 investigation.

2.2.2 Waste Description: Types and Contaminants

Sixteen soil boring and five ground-water samples were collected during the Phase II, Stage 1 investigation of AFP 59. Figure 2-3 provides the sample locations. Tables 2-1 through 2-4 provide the sample analytical results. Tables 2-5 and 2-6 provide a summary of the analytical results for subsurface soils and ground water, respectively.

2.2.2.1 Area 1 - Former Underground Waste Oil Storage Tanks

A review of both Phase I and Phase II, Stage 1 reports indicated that information is available on the waste types associated with Area 1, but no samples have been collected which can attribute specific contaminants to the underground storage tank area. From 1953 to 1985, the tanks were used to store



NOTE:

1. IRONS SHOWN WERE LOCATED IN 1986.
2. THE PERIMETER OF THE PROPERTY WAS TRACED FROM A MAP BY KENNETH C. HAWK, P.E., L.S. DATED JULY 30, 1988.

From Fred C. Hart, 1988

Figure 2-3
TEST BORING AND GROUNDWATER MONITORING WELL LOCATION MAP
AFP 59,
JOHNSON CITY, NY

TABLE 2-1 ANALYTICAL RESULTS - SOIL FROM BOREHOLE PROGRAM, AFP 59, JOHNSON CITY, NEW YORK*

		Parameters[a]							
Sample Identification		Arsenic EP Tox.	Barium EP Tox.	Cadmium EP Tox.	Chromium EP Tox.	Lead EP Tox.	Selenium EP Tox.	Silver EP Tox.	Total Chromium[c]
Sample Date: 9/9-12/86 Extraction Date: 10/1-2/86 Analysis Date: 10/8/86[b]	Detection Limit (mg/L)	0.01	0.05	0.01	0.02	0.02	0.01	0.01	1.0 (mg/kg)
AFP 59, SB-1,2′-4′, HART 002		<0.01	<0.05	<0.01	<0.02	<0.02	<0.01	<0.01	7.70
AFP 59, SB-1, 4′-6′, HART 003		<0.01	<0.05	<0.01	<0.02	0.08	<0.01	<0.01	12.4
AFP 59, SB-2, 0.5′-2′, HART 001		0.01	<0.05	<0.01	<0.02	0.06	<0.01	<0.01	12.6
AFP 59, SB-2, 6′-8′, HART 004		0.01	0.06	<0.01	<0.02	0.10	<0.01	<0.01	16.1
AFP 59, SB-3, 2′-4′, HART 001		0.01	<0.05	<0.01	<0.02	0.04	<0.01	<0.01	18.0
AFP 59, SB-3, 8′-10′, HART 004		<0.01	<0.05	<0.01	<0.02	0.07	<0.01	<0.01	67.4
AFP 59, Plating Room East, S2, GE 002		0.02	0.19	<0.01	<0.02	0.31	<0.01	<0.01	43.6
AFP 59, SW-1, 20′-22′, HART 005[d]		0.01	0.51	0.02	0.02	0.78	0.01	0.01	5.43

(a) EP Tox. mercury (Detection Limit is 0.001 mg/l) was analyzed for but not detected.
(b) Selenium analyzed 10/7/86
(c) Digestion of total chromium 9/25-26/86; Atomic absorption conducted 9/30/86
(d) Background sample taken from monitoring well borehole

* Source: Fred C. Hart Associates, 1988.

TABLE 2-2 ANALYTICAL RESULTS - SOIL FROM MONITORING WELL PROGRAM, AFP 59, JOHNSPM CITY, NEW YORK*

Sample Identification		Parameters(a)							
		Arsenic EP Tox.	Barium EP Tox.	Cadmium EP Tox.	Chromium EP Tox.	Lead EP Tox.	Selenium EP Tox.	Silver EP Tox.	Petroleum Hydrocarbons
Sample Date: 9/9-12/86 Extraction Date: 9/22-23/86 Analysis Date: 9/30/86[a]	Detection Limit (mg/L)	0.01	0.05	0.01	0.02	0.02	0.01	0.01	10.0 (mg/kg)
AFP 59, SW-1, 18'-20', HART 004		0.02	0.52	0.04	<0.02	0.16	<0.01	0.01	<10.0
AFP 59, SW-1, 24'-26', HART 007		0.02	0.44	0.02	<0.02	0.15	0.01	<0.01	11.4
AFP 59, SW-2, 22'-24', HART 009		0.01	0.35	0.02	<0.02	0.03	<0.01	<0.01	<10.0
AFP 59, SW-2, 24'-26', HART 010		0.01	0.20	0.01	<0.02	0.03	<0.01	<0.01	<10.0
AFP 59, SW-3, 22'-24', HART 009		<0.01	0.14	0.02	<0.02	0.05	<0.01	<0.01	<10.0
AFP 59, SW-3, 24'-26', HART 010		0.03	0.50	0.06	<0.02	0.18	0.01	0.01	<10.0
AFP 59, SW-4, 22'-24', HART 001(c)		<0.01	0.10	0.02	<0.02	0.06	<0.01	<0.01	<10.0
AFP 59, Field Blank, Water, Hart 001		NA(e)	NA	NA	NA	NA	NA	NA	<0.05
AFP 59, SW-3, Drum Composite, HART 013(f)		0.02	0.39	0.04	<0.02	0.71	<0.01	0.01	NA

(a) Cyanide (DL(g) is 0.35 mg/l) and EP Tox. Mercury (DL is 0.001 mg/l) were analyzed for, but were not detected. The Drum Composite sample (HART 013) and the Field Blank sample (Hart 001) were not analyzed for cyanide content.

(b) Selenium and Silver analyzed 9/29/86; Petroleum Hydrocarbons analyzed 10/2/86.

(c) Duplicate sample of AFP 59, SW-3,22'-24', HART 009.

(d) Water sample, mg/L.

(e) NA - Parameter not analyzed.

(f) Sample analyzed 9/25/85 except for mercury which was analyzed on 9/28/87.

(g) DL - Detection limit.

* Source: Fred C. Hart Associates, 1988.

TABLE 2-3 ANALYTICAL RESULTS FOR INORGANICS AND PETROLEUM HYDROCARBONS IN GROUND WATER, AFP 59, JOHNSON CITY, NEW YORK*

Sample Date: 9/23/86
Analysis Date: 9/25/86[(a)]

	Parameters									
Sample Identification	Barium	Cadmium	Lead	Arsenic	Silver	Chromium	Mercury	Selenium	Cyanide	Total Petroleum Hydrocarbons
Detection Limit (mg/L)	0.01	0.005	0.02	0.005	0.01	0.02	0.001	0.005	0.01	0.5
Analytical Method	E200.7	E200.7	E200.7	E206.2	E200.7	E200.7	E245.1	E270.2	A412D/SW9010	E418.1
AFP59, SW1, Water, Hart 001	0.21	0.007	0.30	0.02	<0.01	<0.02	<0.001	<0.005	<0.01	<0.5
AFP59, SW2, Water, Hart 002	<0.01	0.01	0.03	<0.005	<0.01	<0.02	<0.001	<0.005	<0.01	<0.5
AFP59, SW3, Water, Hart 003	0.05	<0.005	0.14	0.01	<0.01	<0.02	<0.001	<0.005	<0.01	<0.5
AFP59, SW4, Water, Hart 004(b)	<0.01	<0.005	0.07	0.01	<0.01	<0.02	<0.001	<0.005	<0.01	<0.5
AFP59, Production Well, Hart 007	0.14	<0.005	0.13	0.01	<0.01	<0.02	<0.001	<0.005	<0.01	0.6
Field Blank, Hart 005	NA(c)	NA	NA	NA	NA	NA	NA	NA	NA	<0.5

(a) Arsenic and Petroleum Hydrocarbons analyzed on 9/29/86 and 10/15/86 respectively.
(b) Duplicate Sample of AFP 59, SW-2, WATER, HART 002.
(c) NA - Parameter Not Analyzed

* Source: Fred C. Hart Associates, 1988.

TABLE 2-4 ANALYTICAL RESULTS FOR ORGANICS IN GROUND WATER, AFP 59, JOHNSON CITY, NEW YORK*

	1,1-dichloroethane		trans-1,2-dichloroethene		1,1,1-trichloroethane		trichloroethene	
	First Column	Confirmatory Analysis	First Column	Confirmatory Analysis	First Column	Confirmatory Analysis	First Column	Confirmatory Analysis
Detection Limit (ug/L)	1	1	1	1	2	2	2	2
Analytical Method	E601/602	E624	E601/602	E624	E601/602	E624	E601/602	E624
AFP 59 SW-1, Water, HART 001	<1	NA(a)	<1	NA	<2	NA	<2	NA
AFP 59, SW-2, Water, HART 002	<1	NA	<1	NA	<2	NA	<2	NA
AFP 59, SW-3, Water, HART 003	<1	<1	<1	<1	<2	<2	6	2
AFP 59, SW-4, Water, HART 004(b)	<1	NA	<1	NA	<2	NA	<2	NA
AFP 59, Production Well, HART 007	16	15	66	73	9	3	11	8
Field Blank, HART 005	<1	NA	<1	NA	<2	NA	<2	NA

(a) NA Second column confirmatory analysis not performed.
(b) Duplicate Sample of AFP 59, SW-2, WATER, HART 002.

* Source: Fred C. Hart Associates, 1988.

TABLE 2-5 SUBSTANCES OF CONCERN IN SUBSURFACE SOILS, AFP 59, JOHNSON CITY, NEW YORK*

Constituent	Maximum Allowable Concentration of Contaminants for EP Toxicity[(a)] (mg/L)	Borehole Program Concentration Range (mg/L)	# of Samples Above Method Detection Limit Total # of Samples	Monitoring Well Program Concentration Range (mg/L)	# of Samples Above Method Detection Limit Total # of Samples
Arsenic (EP TOX)	5.0	<0.01-0.02	5/8	<0.01-0.03	6/8
Barium (EP TOX)	100.0	<0.05-0.51	3/8	0.10-0.52	8/8
Cadmium (EP TOX)	1.0	<0.01-0.02	1/8	0.01-0.06	8/8
Chromium (EP TOX)	5.0	<0.02-0.02	1/8	<0.02	0/8
Lead (EP TOX)	5.0	<0.02-0.78	7/8	0.03-0.71	8/8
Selenium (EP TOX)	1.0	<0.01-0.01	1/8	<0.01-0.01	2/8
Silver (EP TOX)	5.0	<0.01-0.01	1/8	<0.01-0.01	3/8
Total Chromium (mg/kg)	*(b)	5.43-67.4	8/8	NA(c)	NA
Petroleum Hydrocarbons (mg/kg)	*	NA	NA	<10.0-11.4	1/8

(a) Concentrations contained in Appendix II, 40 CFR 261, Subpart D
(b) * Maximum concentration for soils not established for this parameter
(c) NA Sample was not analyzed for this parameter or not applicable

* Source: Fred C. Hart Associates, 1988.

TABLE 2-6 SUBSTANCES OF CONCERN IN GROUND WATER, AFP 59, JOHNSON CITY, NEW YORK

Constituent	Concentration Range (mg/L)	No. of Sample Constituent Detected/Total No. of Samples
Inorganics		
Arsenic	<0.005-0.02	4/5
Barium	<0.01-0.21	3/5
Cadmium	<0.005-0.01	2/5
Lead	0.03-0.30	5/5
Petroleum Hydrocarbons	<0.5-0.6	1/5
Organics	Concentration Range (ug/l)	
1,1-Dichloroethane	<1-16	1/5
trans-1,2-Dichloroethene	<1-66	1/5
1,1,1-Trichloroethane	<2-9	1/5
Trichloroethene	<2-11	2/5

Source: Fred C. Hart Associates, 1988.

waste oils collected from a number of different areas of the plant. Prior to 1969, non-chlorinated kerosene-based degreasers were stored in the underground tanks along with waste oils.

In 1985, the tanks were removed and replaced with an aboveground tank. Heavily stained gravels and soil were excavated and removed. Analysis of the remaining soil showed it to be non-hazardous. The absence of monitoring wells in close proximity (up- and downgradient) precludes a determination of whether or not ground water had been impacted. Ground-water sampling is required to investigate potential contaminant migration from Area No. 1.

2.2.2.2 Area 2 - Plating Building

Test Borings SB-1, SB-2, and SB-3 were drilled just south of the plating building. In addition to soil samples from the borings, a soil sample (S2, GE002), collected by GE employees from beneath the plating building was sent for laboratory analysis. Contaminants detected in Borings SB-1, SB-2, SB-3, and S2 include arsenic, barium, lead, and total chromium. Concentrations of lead and total chromium were higher in the deeper of the two samples in each boring. Compared to the three soil borings, sample S2 contained the highest concentration of metals, with the exception of total chromium. The highest concentration of total chromium (67.4 mg/kg) was found at the depth of 8-10 ft in Borehole SB-3. Concentrations of all metals did not exceed maximum allowable limits for EP Toxicity. It is not known whether or not ground-water contamination has occurred from the past activities in this area. The installation of ground-water monitoring wells downgradient of this area would be required. A well in this location would detect any potential ground-water contamination from both the plating area and from the former underground waste oil storage area.

2.2.2.3 Water Supply Well No. 1 and Outfalls No. 001 and No. 002

Results of several sampling events indicate that Production Well No. 1 contains some organic and lead contamination. The production well analysis found the presence of four volatile organic compounds: 1,1-dichloroethane, trans-1,2-dichloroethene, 1,1,1-trichloroethane, and trichloroethene. Only one shallow well, SW-3, had any detectable organic compounds. This could possibly indicate that there is a deeper organic ground-water contamination problem emanating from an offsite source. Levels of metals found in the production wells were consistent with levels found in the shallow wells. Analytical results from ground-water production wells in the vicinity of AFP 59 show that historically there has been organic contamination both upgradient in Johnson City Well No. 6, and downgradient, in Johnson City Well No. 3. Several of the same parameters found in the deep well were observed in these municipal wells (i.e., dichloroethane and trans-1,2-dichloroethene). A preliminary assessment indicates there could be a potential offsite source of organic contamination. Currently, there is insufficient data to define the source or sources of the contamination detected.

Outfalls No. 001 and No. 002 are direct discharge outfalls premitted under the New York State Pollution Discharge Elimination System (SPDES). The outfalls discharge to the Little Choconut Creek, approximately 1,000 ft upstream of the confluence of the creek and the Susquehanna River. Outfall No. 001 discharges treated plating rinsewater, non-coated cooling water, and storm water. Outfall No. 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 No. 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 No. 002 via an oil/water separator. The oil/water separator is located upstream from Outfall No. 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 No. 001 is monitored routinely for temperature, flow, oil and grease, suspended solids, chromium, nickel, and lead. Outfall No. 002 is monitored for temperature, flow, and pH. A summary of effluent monitoring data for Outfall No. 001 condensed from SPDES monitoring reports is presented in Table 2-7. 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 No. 001 for 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.

Volatile organic compounds (VOCs) currently in use at AFP 59 were analyzed for at the monitoring point for Outfall No. 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 13 February 1984. Results of the analysis are presented in Table 2-8. TCE was found at concentrations ranging from 23 to 120 ug/L; methylene chloride was found at concentrations ranging from 8 to 105 ug/L; 1,1,1-trichloroethane was found at concentrations up to

TABLE 2-7 EFFLUENT MONITORING DATA FROM AFP 59 OUTFALL NO. 001, SEPTEMBER 1983 - MAY 1984**

Parameter	3/84 - 5/84		12/83 - 2/84		9/83 - 11/83		6/83 - 8/83		3/83 - 5/83		12/82 - 1/83		9/82 - 11/82	
	Avg	Max	Avg	Max	Avg	Max	Avg	Max	Avg	Max	Avg	Max	Avg	Max
	(lb/day)		(lb/day)		(lb/day)		(lb/day)		(lb/day)		(kg/day)		(kg/day)	
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.
** Source: Fred C. Hart Associates, 1988.

TABLE 2-8 EFFLUENT ANALYSIS FOR VOLATILE ORGANIC COMPOUNDS, AFP 59 OUTFALL NO. 001*

	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

* Source: Fred C. Hart Associates, 1988.

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 No. 001. The probable fate of these VOCs is volatilization into the atmosphere as the wastewater cascades over the outfall spillway.

2.2.3 Potential Pathways Affected

Air

Based on the nature of the site surface, the majority of which is covered by a building and paved, migration of contaminants via this pathway is not considered to be significant.

Soil

Available pathways through soil at this site include transport to offsite areas via surface-water runoff from the unpaved areas and contaminants leaching into the ground water. At the onset of the Stage 1 investigation, Area No. 2 was identified as a potential source of contamination because of observed soil discoloration. The potential for vertical migration of contaminants due to soil leaching is a potential source of the contamination detected in ground water in this area of AFP 59. Discoloration of soils potentially contaminated from plating wastes was observed while GE personnel were repairing a broken sprinkler main. Area No. 1 is no longer a source of soil contamination. Contaminated soils observed in this area were excavated and disposed.

Surface Water

The storm sewer system at AFP 59 empties directly into Little Choconut Creek. Little Choconut Creek and the Susquehana River recharge the Clinton Street-Ballpark Valley aquifer. There are two possible surface water pathway scenarios. First, if contaminants were discharged into the storm sewer system at the plant, they would flow directly to Little Choconut Creek. Second, if potential contaminants were leached from the soil and into a stormwater system they would flow into the surface water system. In addition to the potential surface water pathways associated with the two outfall pipes, the potential for off-base surface water contaminant sources exists. The surface water pathway must be further investigated by collecting surface water and sediment samples directly from the Choconut Creek. At least one set of samples should be collected upstream to measure background concentrations.

Ground Water

The primary pathway of concern for the AFP 59 site is contaminated ground water. The Clinton Street-Ballpark Valley aquifer has been designated as a sole source aquifer and is tapped by many public supply wells. Both Area No. 1 and Area No. 2 are potential sources of ground-water contamination. Area No. 1 has been remediated, but contaminants associated with the historical spills and stained soil may still be present in the ground water. Area No. 2 has not been remediated and may be contributing to the contamination detected in the ground water. Additional off-base sources of ground-water contamination may be impacting the AFP 59 ground water. Historically, organic contamination has been documented in municipal production wells both upgradient and downgradient of AFP 59. The ground-water pathway must be further investigated in order to assess the contributions of Area No. 1 and Area No. 2 to the ground-water contamination.

2.2.4 Off-Base Contamination

Off-base contamination is a major concern at AFP 59. The plant is located in an industrial area with several potential source facilities nearby. Contamination has been detected upgradient of the plant in both surface water and ground water. Further evaluation of off-base contamination will be conducted as part of the IRP Phase II Stage 2 investigation.

3. ENVIRONMENTAL SETTING

3.1 GEOGRAPHIC SETTING

AFP 59 is located on the floodplain of the Susquehanna River within the Appalachian Plateau physiographic province. The geography of the Appalachian Plateau is characterized by relatively undisturbed, nearly horizontal sedimentary rocks bisected by streams. Surface runoff from the plant drains to Little Choconut Creek, which discharges to the Susquehanna River.

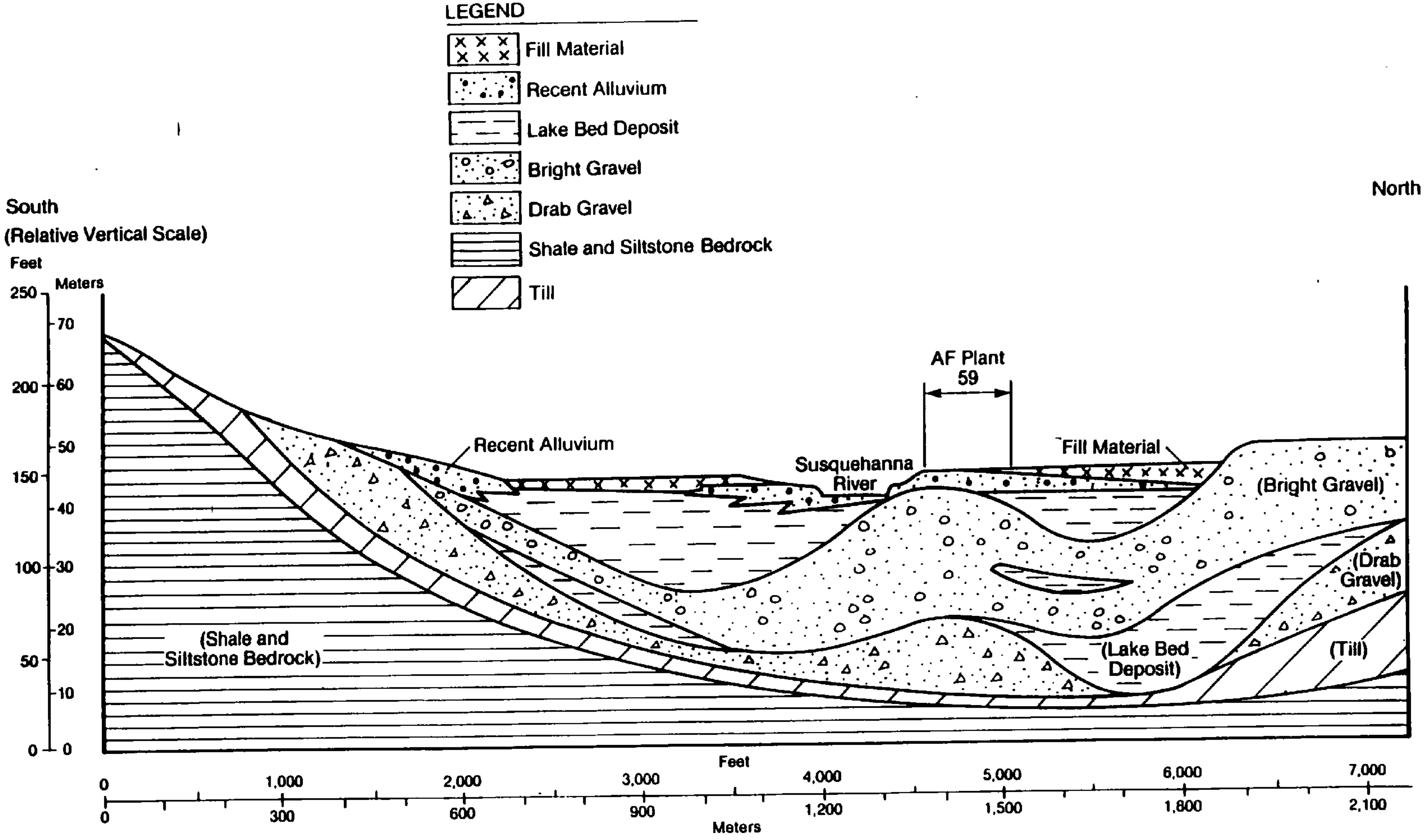
The plant is bordered on the north side by Main Street, and on the east and south by Little Choconut Creek. A residential area is located immediately west of the site. The topography of the site is fairly flat, and varies in elevation from 830 to 840 ft above mean sea level (msl). Land use surrounding the plant includes transportation, commercial, forest land/recreation, and industrial use.

Surface materials at the site consist of cut and fill soils. These include silty soils of alluvial origin that do not support heavy loads well, and are subject to erosion. The western edge of the site is covered by loamy materials of glacial origin that have been disturbed, or reworked, by man.

3.2 GEOLOGY

The geology of the Susquehanna River Basin and vicinity consists of glacial valley fill sediments of Pleistocene age. The glacial deposits of the Susquehanna River Basin consist of clay, silt, sand, and gravel. The bedrock underlying the glacial deposits throughout southern New York consists of shale, siltstones, and sandstones. The Sonyea Group, consisting of shales and minor siltstones, underlies the Johnson City area (Figure 3-1, Table 3-1).

To date, Fred C. Hart, Inc., has drilled a total of six test borings at AFP 59. Data collected during this investigation indicate that the plant site is underlain by unconsolidated alluvial and glacial sediments. These sediments



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

Figure 3-1

Idealized Geologic Cross-Section Beneath AF Plant 59, Binghamton, New York.

TABLE 3-1 GEOLOGIC UNITS IN AND NEAR THE CLINTON STREET-BALLPARK AQUIFER

Geologic unit (youngest to oldest)	Number in Figure II-3	Lithology (materials composing unit)	Distribution, thickness, and position	Hydrologic significance
Fill	8	Chiefly trash and ashes; some sand, gravel, and other materials	Most natural depressions in Binghamton and Johnson City have been raised 5 to 20 feet by fill; some are now unrecognizable.	Not tapped by wells. Increases dissolved-solids concentration and acidity of infiltrating water, but effect decreases as age of fill increases.
Flood-plain silt	7	Brown silt and very fine sand with roots and a little fine organic matter.	Mantles lowlands inundated during major floods; typically 5 to 15 feet thick. May rest on all older units (1-5).	Not tapped by wells. Poor permeability limits recharge of underlying aquifers from floodwater and possibly from heavy rainfall.
Alluvial fan	6	Gravel, moderately sand and in general moderately silty. Most stones are flat pieces of local shale or siltstone.	Deposited by small streams where they enter the Susquehanna valley. May rest on all older units (1-5).	Permeable, but too thin to supply large-capacity wells. Water from small streams infiltrates through alluvial fan deposits to stratified glacial deposits.
Older river alluvium	5	Sand and gravel, bright but leached partially to completely free of limestone.	Interfingers with and overlies late-glacial lake beds near Chenango River as much as 35 feet thick. Relation to other units uncertain. May cap stratified glacial deposits beneath flood-plain silt elsewhere, but is not recognized or mapped.	High permeability and in good hydraulic contact with Chenango River. Could be tapped by large-capacity wells.

TABLE 3-1 (Cont.)

Geologic unit (youngest to oldest)	Number in Figure II-3	Lithology (materials composing unit)	Distribution, thickness, and position	Hydrologic significance
Late-glacial	4	Silt and very fine sand with some clay and scattered tiny plant fragments; commonly grades into peat or highly organic silt at top.	Fills irregular depressions left when ice blocks melted, chiefly in a narrow east-west zone near deepest part of bedrock valley; as much as 80 feet thick. Generally overlies bright gravel.	A significant barrier to infiltration and groundwater flow in many places.
Stratified glacial deposits	3			
Bright gravel	3c	Sandy gravel and pebbly sand containing variable amounts of silt; highly calcareous. Upper part very bright (35 to 75 percent of the pebbles are limestone and other rock types not derived from local bedrock). Lower part moderately bright (15 to 30 percent exotic pebbles).	Present over much of the valley as broad terraces or underlying younger units; thickness varies widely, locally exceeds 100 feet.	High permeability, tapped by several large-capacity wells, but locally above water table. The abundant limestone in this unit causes water that migrates through it to have high hardness (250-400 milligrams per liter).
Lake beds	3b	Silt to fine sand, some clay, no plant fragments.	Lenses may occur anywhere within unit 3, but seem to be most common between the bright and drab gravels.	A significant barrier to infiltration and groundwater flow in places.

TABLE 3-1 (Cont.)

Geologic unit (youngest to oldest)	Number in Figure II-3	Lithology (materials composing unit)	Distribution, thickness, and position	Hydrologic significance
Drab gravel	3a	Sandy gravel and pebbly sand with variable amounts of silt; weakly calcareous. Pebbles are almost entirely local shale and siltstone, with 10 percent or less exotic rock types.	Present at land surface along north and south sides of valley; commonly underlies bright gravel (directly or with intervening lake beds) in central part of valley; varies widely in thickness.	High permeability; tapped by several large-capacity wells.
Glacial till	2	Mixture of silt, clay, gravel, and sand, tough and compact; commonly called hardpan. May contain minor sand and gravel lenses.	Immediately overlies bedrock. Only about 1 foot thick in places, but forms low hills in southern part of Susquehanna valley.	Very poor permeability. Low hills of till prevent movement of water between aquifer and Susquehanna River for 3 miles west from Chenango River.
Bedrock	1	Interbedded shale and siltstone	Present everywhere beneath other units.	Poor permeability; serves as north, and part of south, aquifer boundary, but yields 100 to 300 gallons per minute of salty water to wells several hundred feet deep.

From: New York State Dept. of Environmental Conservation, Bulletin No. 73, 1977.

consist of brown sand and silt, with occasional lenses of gravel and trace amounts of clay. A geologic cross-section using the new and existing boring data at AFP 59 is shown in Figure 3-2.

During installation of the existing production well, data regarding the subsurface geology were collected. In the vicinity of the production well, clay and gravel are found from 27 to 58 ft below ground surface. Gravel with lesser amounts of clay was identified to a depth of 65 ft. Sand and gravel are found between 65 ft and 94 ft below ground surface. Bedrock is encountered at a depth of 94 ft.

At one time, Little Choconut Creek flowed across the southeastern portion of the site. The stream channel has since been rerouted to its present location. The abandoned stream channel was backfilled consistent with the surrounding grade. The majority of the site is covered by soils and flood plain deposits of Little Choconut Creek or the Susquehanna River (Figure 2-2). Lateral variations in sediment types in the vicinity of the abandoned stream channel were produced by the natural meandering of the stream channel.

3.3 HYDROGEOLOGY

AFP 59 is located within the Susquehanna River Basin. Eighty-five percent of the basin area is characterized by bedrock uplands dissected by narrow valleys and covered with a thin layer of glacial till. Broad sediment valleys comprise the remaining 15 percent of the Susquehanna River Basin. These valleys consist of 70-500 ft of stratified glacial drift atop bedrock. The Clinton Street-Ballpark Valley aquifer, which supplies ground water to Johnson City residents, is one of these "stratified aquifers."

The Clinton Street-Ballpark Valley aquifer extends from the western part of Binghamton through the central part of Johnson City. The aquifer underlies three square mi of urban land in the Susquehanna River Valley. The geologic zone that contains the aquifer is composed mainly of permeable sand and gravel, with occasional silt lenses. In 1985, the-Clinton Street-Ballpark Valley - aquifer was designated as a sole-source aquifer by the U.S. EPA under the Safe

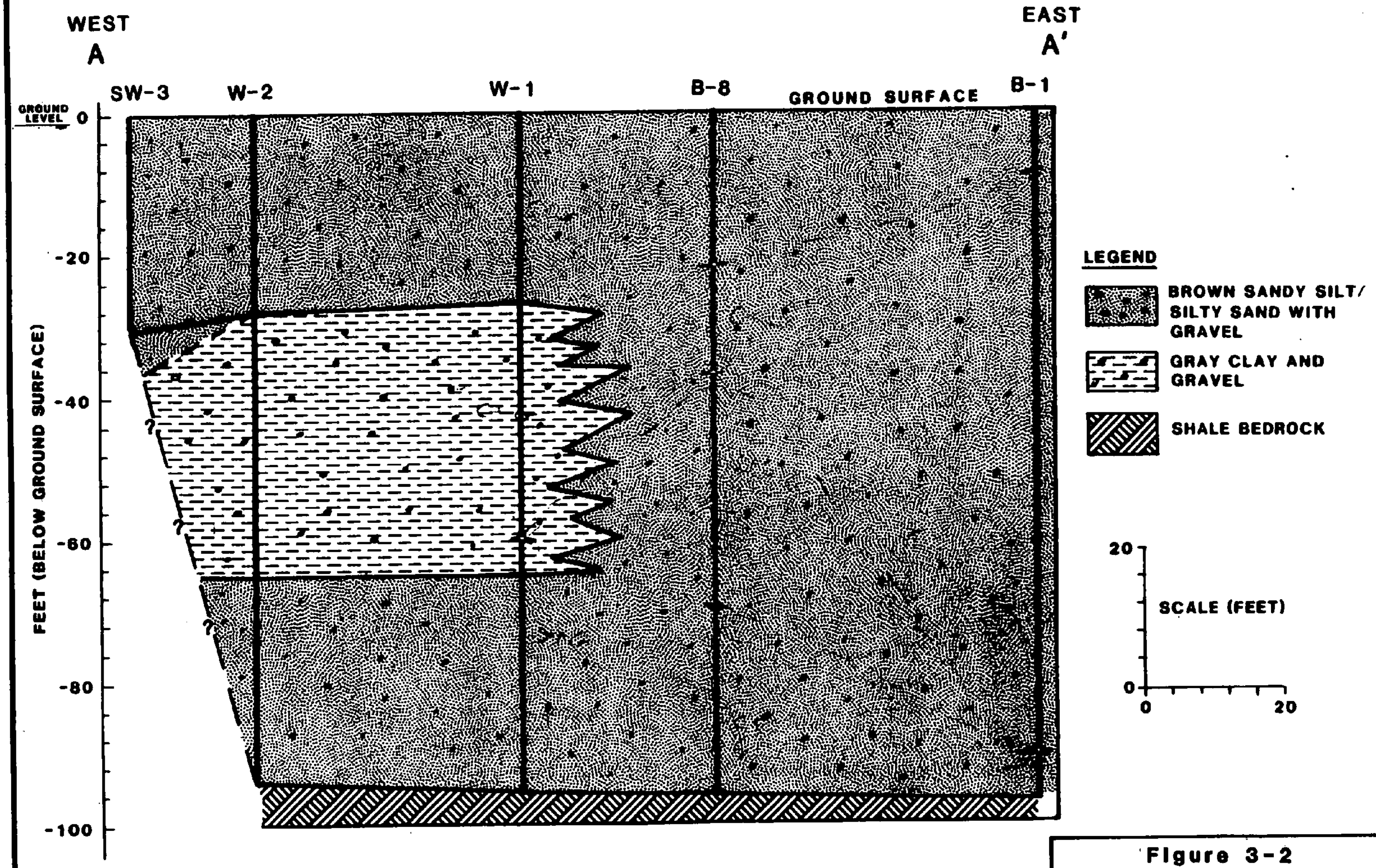


Figure 3-2
WEST-EAST
GEOLOGIC CROSS-SECTION
OF USAF PLANT NO. 59
JOHNSON CITY, NY

From Fred C. Hart, 1988

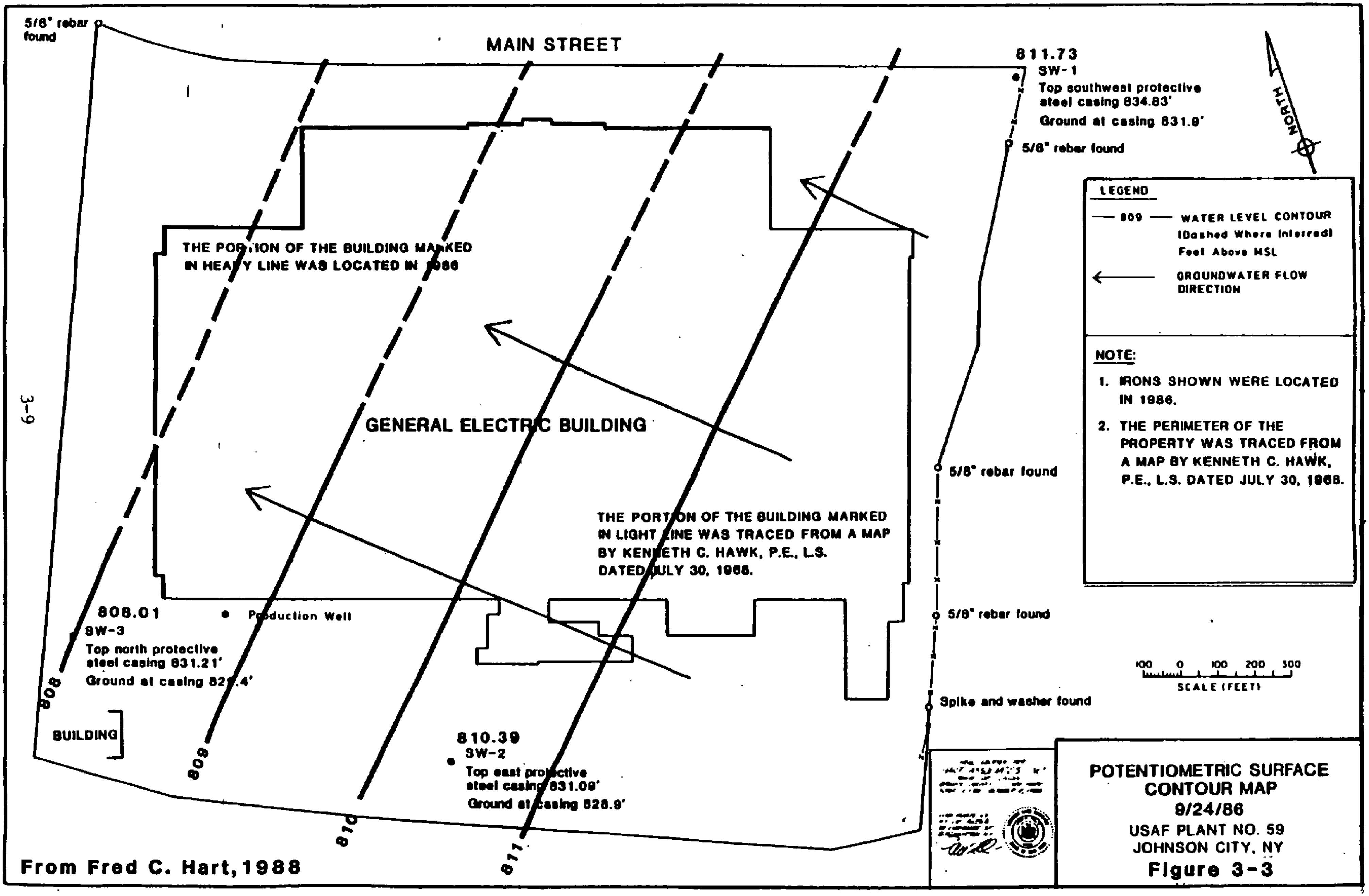
Drinking Water Act (50 Federal Register 2026, 14 January 1985). This classification was made because the aquifer is the principal source of drinking water for 128,000 residents of Broome and Tioga counties. Since the aquifer is overlain by permeable, unconsolidated glacial and alluvial deposits, it is highly susceptable to contamination through surface recharge.

The IRP Phase II Stage 1 hydrogeologic investigation conducted concentrated on the shallow water-bearing zone of the Clinton Street-Ballpark Valley aquifer. Beneath the site, water table elevations range from 808 to 812 ft above msl (approximately 20 ft below grade). The direction of ground-water flow was initially believed to be southwest toward three municipal supply wells and the Susquehanna River (CH2M Hill 1984). Data from monitoring wells, however, indicate that the direction of ground-water flow is toward the northwest (Figures 3-3 and 3-4). This conclusion is consistent with the regional flow direction determined in 1981 (USGS 1982).

Approximately 3.3 million gals per day (2,290 gpm) of ground water are pumped from Johnson City's municipal wells (Figure 3-5). This pumping creates a ground-water gradient of 0.0044 (2 ft/450 ft) across the southern portion of AFP 59. Pumping the onsite production well (Well No. 1) at a normal rate of 350 gpm causes the ground-water gradient to decrease to about 0.0022 (1 ft/450 ft).

The transmissivity of the aquifer in the vicinity of AFP 59 generally ranges from 10,000 ft^2/day to 50,000 ft^2/day. The combination of high transmissivity values, recharge from streams, and infiltration of precipitation permit average well yields of 400 gals per minute to be sustained for long periods.

In order to assess the ground-water flow rates at the site, hydraulic conductivity was estimated based on descriptions of the subsurface material. These descriptions were correlated with published descriptions and hydraulic conductivities for the Clinton Street-Ballpark Valley aquifer (New York State Department of Environmental Conservation [NYSDEC] 1977). The hydraulic conductivity was estimated to be 1,000 ft/day. Based on a measured gradient of 1 ft/450 ft or 0.0022, the specific discharge in the area of the site was calculated to be approximately 2.2 ft/day.

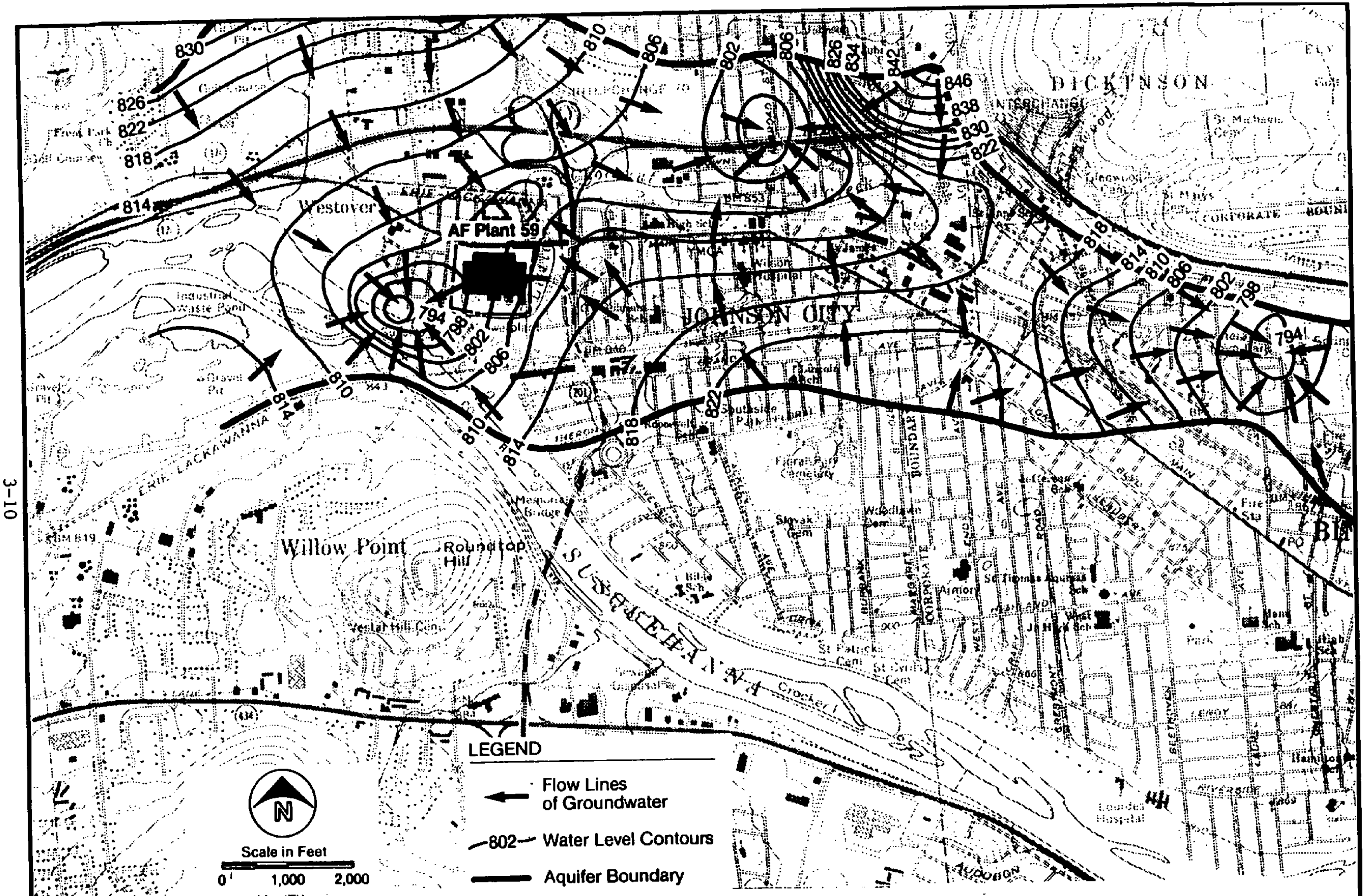


NOTE:

1. IRONS SHOWN WERE LOCATED IN 1986.
2. THE PERIMETER OF THE PROPERTY WAS TRACED FROM A MAP BY KENNETH C. HAWK, P.E., L.S. DATED JULY 30, 1988.

POTENTIOMETRIC SURFACE CONTOUR MAP
9/24/86
USAF PLANT NO. 59
JOHNSON CITY, NY
Figure 3-3

From Fred C. Hart, 1988



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

Figure 3-4

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

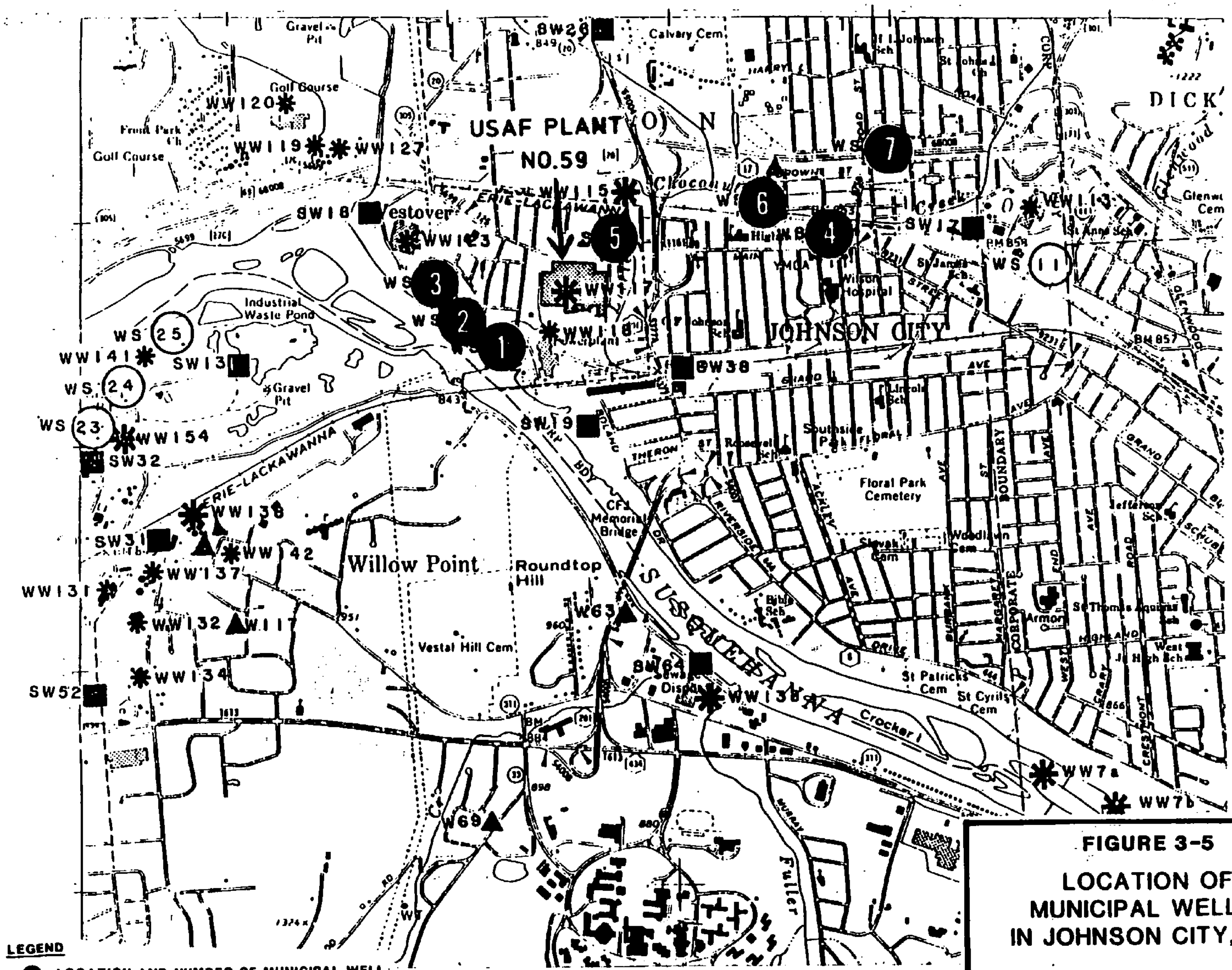


FIGURE 3-5

LOCATION OF MUNICIPAL WELLS IN JOHNSON CITY, NY

LEGEND

● LOCATION AND NUMBER OF MUNICIPAL WELL

SOURCE: BROOME CO. HEALTH DEPT., 1987

3.4 ECOLOGY

AFP 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 had 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 AFP 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 AFP 59.

AFP 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 AFP 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 power plant, which discharges once-through cooling water to the creek. Macroinvertebrate samples sufficient to isolate effects of any AFP 59 discharges from those of the Gondey Station was not conducted.

3.5 METEOROLOGY

The climate in the vicinity of AFP 59 is humid, maritime with mild summers and long, cold winters. The prevailing wind direction is west-southwest. 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.

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 AFP 59 is about 37 in. per year. The greatest precipitation occurs in June and the least in February. For the most part, 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 in. at the Broome County airport. Snowfall greater than 1.0 in occurs approximately 24 days per year. Mean annual lake evaporation, commonly used to estimate the mean annual evapotranspiration rate, is estimated to be 28 in. per year. Evapotranspiration over land areas may be greater or lesser than lake evaporation, depending upon the amount and type of vegetation and the availability of moisture.

4. PROFILE OF POTENTIAL CONTAMINANTS

4.1 CONTAMINANT PROPERTIES

4.1.1 Arsenic

4.1.1.1 Toxicology

Arsenic compounds are irritants of the skin, mucous membranes, and eyes. Arsenical dermatoses and epidermal carcinoma are reported risks of exposure to arsenic compounds, as are other forms of cancer. Chronic arsenic intoxication by ingestion is characterized by weakness, anorexia, gastrointestinal disturbances, peripheral neuropathy, and skin disorders. Arsenic compounds have been reported to be teratogenic, ferotoxic, and embryotoxic in several animal species.

In epidemiologic studies, both the trivalent (such as arsenic trioxide) and the pentvalent compounds (such as lead arsenate and calcium arsenate) have been strongly implicated as causes of lung cancer, lymphatic cancer, and skin cancer.

4.1.1.2 Persistence and Migration Potential

In the natural environment, arsenic has four different oxidation states, and chemical speciation is important in determining arsenic's distribution and mobility. Interconversions of the +3 and +5 states, as well as organic complexation, are the most important. Arsenic is generally quite mobile in the environment. In the aquatic environment, volatilization is important when biological activity or highly reducing conditions produce arsine or methylarsenics. Sorption by the sediment is an important fate for the chemical. Arsenic is metabolized to organic arsenicals by a number of organisms; this increases arsenic's mobility in the environment. Because of its general mobility, arsenic tends to cycle through the environment.

4.1.2 Barium

4.1.2.1 Toxicology

Certain compounds of barium are irritants of the eyes, mucous membranes, and skin. Inhalation of barium compounds has caused a benign pneumoconiosis.

The most important effect of acute barium poisoning is a strong, prolonged stimulant action on muscle. Smooth, cardiac, and skeletal muscles are all affected. Ingestion of barium carbonate by humans causes gastroenteritis, muscular paralysis, slow pulse rate, extrasystoles, and hypokalemia. Intravenous injection of barium compounds in animals causes a strong, prolonged stimulation of all forms of muscle, resulting in hyperistalisis, bladder contraction, vasoconstriction, and irregular contraction of the central nervous system, followed by paralysis. High doses are hemolytic.

4.1.2.2 Persistence and Migration Potential

Barium is extremely reactive, decomposes in water, and readily forms insoluble carbonate and sulfate salts. Barium is generally present in solution in surface or ground water only in trace amounts. Large amounts will not dissolve because natural waters usually contain sulfate, and the solubility of barium sulfate is generally low. Barium is not soluble at more than a few parts per million in water that contains sulfate at more than a few parts per million. However, barium sulfate may become considerably more soluble in the presence of chloride and other anions. Monitoring programs show that it is rare to find barium in drinking water at concentrations greater than 1 mg/liter. Atmospheric transport of barium, in the form of particulates, can occur. Bioaccumulation is not an important process for barium.

4.1.3 Cadmium

4.1.3.1 Toxicology

Cadmium fume is a severe pulmonary irritant. Cadmium dust is also a pulmonary irritant, but it is less potent than cadmium fume because it has a larger particle size. The dust, at high concentrations, could be expected to cause the same physiologic effects as those arising from fume exposure. Several inorganic cadmium compounds cause malignant tumors in animals.

Most acute intoxications have been caused by inhalation of cadmium fume at concentrations which did not provide warning symptoms of irritation. Concentration of fume responsible for fatalities have been 40-50 mg/m3 for five hours. Non-fatal pneumonitis has been reported from concentrations of 0.5-2.5 mg/m^3, while relatively mild cases have been attributed to even lower concentrations.

In experimental animals, cadmium exposure has caused pulmonary fibrosis, but this has not been documented in humans. Repeated exposure to lower levels of cadmium in air has resulted in chronic poisoning characterized by irreversible lung injury of emphysematous type. This is accompanied by abnormal lung function, renal tubular damage and urinary excretion of a specific low molecular weight protein. Absorbed cadmium is retained by the body to a large extent, and excretion is very slow.

Exposure to cadmium has been implicated in a significant increase in prostrate and respiratory tract cancer. Rats injected subcutaneously or intramuscularly developed rhabdomyosarcomas and fibrosarcomas; with cadmium sulfate or cadmium sulfide, local sarcomas; and with cadmium chloride, local pleomorphic sarcomas and testicular interstitial cell tumors.

4.1.3.2 Persistence and Migration Potential

Cadmium is relatively mobile in the aquatic environment compared to other heavy metals (Clemont Associates, Inc. 1985). It is removed from aqueous media by complexing with organic materials and subsequently being absorbed to the sediment. It appears that cadmium moves slowly through soil, but only limited information on soil transport is available. Cadmium uptake by plants is not a significant mechanism for depletion of soil accumulations but may be significant for human exposure.

4.1.4 Chromium

4.1.4.1 Toxicology

The hexavalent form of chromium is of major toxicological importance in higher organisms. A variety of chromate (Cr VI) salts are carcinogenic in rats and an excess of lung cancer has been observed among workers in the chromate-producing industry. Cr VI compounds can cause DNA and chromosome damage in animals and humans, and Cr (VI) trioxide is teratogenic in the hamster. Inhalation of hexavalent chromium salts causes irritation and inflammation of the nasal mucosa, and ulceration and perforation of the nasal septum. Cr VI also produces kidney damage in animals and humans. The liver is also sensitive to the toxic effects of hexavalent Cr, but apparently less so than the kidneys or respiratory system. Cr III is less toxic than Cr VI; its main effect in humans is a form of contact dermatitis in sensitive individuals.

4.1.4.2 Persistence and Migration Potential

Chromium is a heavy metal that generally exists in either a trivalent or hexavalent oxidation state. Hexavalent chromium (Cr VI) is rather soluble and is quite mobile in ground water and surface water. However, in the presence of reducing agents it is rapidly converted to trivalent chromium (Cr III), which is strongly adsorbed to soil components and consequently is much less mobile in the soil matrix.

Most Cr III in the aquatic environment is hydrolyzed and precipitates as chromium hydroxide. Sorption to sediments and bioaccumulation will remove much of the remaining Cr III from solution. Cr III is adsorbed only weakly to inorganic materials. Cr III and Cr VI are readily interconvertible in nature depending on microenvironmental conditions such as pH, hardness, and the types of other compounds present. Soluble forms of chromium accumulate if ambient conditions favor Cr VI. Conditions favorable for conversion to Cr III lead to precipitation and absorption of chromium in sediments.

4.1.5 1,1-Dichloroethane (Ethylidene Chloride)

4.1.5.1 Toxicology

At high concentrations, ethylidene chloride causes narcosis in animals, and it is expected that severe exposure will cause the same effect in humans.

There have been no reported cases of human overexposure by inhalation; prolonged or repeated skin contact can produce a slight burn.

Rats exposed to 32,000 ppm for 30 minutes survived but died after 2.5 hours of exposure. The most consistent findings in animals exposed to concentrations of above 8,000 ppm for up to seven hours were unspecified pathologic changes in the kidney and liver and, at much high concentrations (near 64,000 ppm), damage to the lungs as well. Repeated daily exposure of several specied to 1,000 ppm for six months resulted in no evidence of changes attributable to the exposure.

The liquid applied to the intact or abraded skin of rabbits produced slight edema and very slight necrosis after the sixth of ten daily applications. Instilled in the eyes of rabbits, there was immediate, moderate conjunctival irritation and swelling, which subsided within a week.

Although the liquid may be absorbed through the skin, it is apparently not absorbed in amounts sufficient to produce systemic injury.

4.1.5.2 Persistence and Migration Potential

The 1,1-dichloroethane disperses from surface water primarily by volatilization into the troposphere, where is it is subsequently broken down by hydroxylation. Because of its water solubility and relatively low log octanol/water partition coefficient, 1,1-dichloroethane potentially could move through soil and enter the ground water, but due to its high volatility, it most likely is not very persistent in aquatic environments.

4.1.6 Lead

4.1.6.1 Toxicology

Prolonged absorption of lead or its inorganic compounds results in severe gastrointestinal disturbances and anemia; with more serious intoxication there is neuromuscular dysfunction, while the most severe lead exposure may result in encephalopathy.

The onset of symptoms of lead poisoning or plumbism is often abrupt; presenting complaints are often weakness, weight loss, lassitude, insomnia, and hypotension. Associated with these is a disturbance of the gastrointestinal tract which includes constipation, anorexia, and abdominal discomfort or actual colic, which may be excruciating. Physical signs are usually facial pallor, malnutrition, abdominal tenderness, and pallor of the eye grounds. The anemia often associated with lead poisoning is of the hypochromic, normocytic type with reduction in mean corpuscular hemoglobin; stippling of erythrocytes and reticulocytosis is evident. On gingival tissues, a line or band of punctate blue or blue-black pigmentation (lead line) may appear, but only the presence of poor dental hygiene; this is not pathognomic of lead poisoning.

There are several reports that lead administered to animals in high doses is carcinogenic. Lead penetrates the placental barrier and has caused congenital abnormalities in animals. Excessive exposure to lead during pregnancy has resulted in neurologic disorders in infants, although the possibility of postnatal exposure of the infants to lead cannot be excluded.

4.1.6.2 Persistence and Migration Potential

Some industrially produced lead compounds are readily soluble in water (Clemont Associates, Inc., 1985). However, metallic lead and the common lead minerals are insoluble in water.

Movement of lead and its inorganic and organolead compounds as particulates in the atmosphere is a major environmental transport process. Lead carried in the atmosphere can be removed by either wet or dry deposition. Although little evidence is available concerning the photolysis of lead compounds in natural waters, photolysis in the atmosphere occurs readily. These atmospheric processes are important in determining the form of lead entering aquatic and terrestrial systems. Sorption processes appear to exert a dominant effect on the distribution of lead in the environment. Adsorption to inorganic solids, organic materials, and hydrous iron and manganese oxides usually controls the mobility of lead and results in a strong partitioning of lead to the bed desiments in aquatic systems. The sorption mechanism most important in a particular system varies with geological setting, pH, Eh, availability of ligands, dissolved and particulate ion concentrations, salinity, and chemical composition. The equilibrium solubility of lead with carbonate, sulfate, and sulfide is low. Over most of the normal pH range, lead carbonate, and lead sulfate control solubility of lead in aerobic conditions, and lead sulfide and the metal control solubility in anaerobic conditions. Lead is strongly complexed to organic materials present in aquatic systems and soil. Lead in soil is not easily taken up by plants, and therefore its availability to terrestrial organisms is somewhat limited.

Bioaccumulation of lead has been demonstrated for a variety of organisms, and bioconcentration factors are within the range of 100-1,000. Microcosm studies indicate that lead is not biomagnified through the food chain. Biomethylation of lead by microorganisms can remobilize lead to the environment. The ultimate sink of lead is probably the deep oceans.

4.1.7 Nickel

4.1.7.1 Toxicology

Metallic nickel and certain nickel compounds cause sensitization dermatitis; nickel dust may cause nasal or lung cancer in humans; nickel fume in high concentrations is a respiratory irritant.

"Nickel itch" is a dermatitis resulting from sensitization to nickel; the first symptom is usually pruritus, which occurs up to seven days before skin eruption appears. The primary skin eruption is erythematous or follicular; it may be followed by superficial discrete ulcers which discharge and become crusted, or by eczema.

Several nickel compounds are mutagenic and can cause chromosomal alterations.

Several epidemiologic studies have shown an increased incidence of cancer of the paranasal sinuses and lungs among workers in nickel refineries and factories; suspicion of carcinogenicity has been focused primarily on respirable particles of nickel, nickel subsulfide, nickel oxide, and on nickel carbonyl vapor; many of the exposures included other carcinogens.

4.1.7.2 Persistence and Migration Potential

Nickel is a highly mobile metal in aquatic systems because many nickel compounds are highly soluble in water. However, the insoluble sulfide is formed under reducing conditions and in the presence of sulfur. Above pH 9, precipitation of the hydroxide or carbonate exerts some control on nickel mobility. In aerobic environments below pH 9, soluble compounds are formed with hydroxide, carbonate, sulfate, and organic ligands.

In general, nickel is not accumulated in significant amounts by aquatic organisms. Bioconcentration factors are usually on the order of 100-1,000. Uptake of nickel from the soil by plants can also occur. Photolysis, volatilization, and biotransformation are not important environmental fate processes for nickel.

4.1.8 Selenium

4.1.8.1 Toxicology

Elemental selenium and selenium compounds as dusts, vapors, and fumes are irritants of the eyes, mucous membranes, and skin. There is no evidence that selenium is carcinogenic in humans. Exposure may be by oral, inhalation, or dermal routes, and effects in humans and experimental animals are similar. Acute effects include degeneration of the liver, kidneys, and myocardia hemorrhages in the digestive tract, and brain damage. Eye, nose, and throat irritation may also occur with inhalation exposure. Chronic toxicity in humans appears to occur only in areas where foods containing excessive concentrations of selenium are ingested.

4.1.8.2 Persistence and Migration Potential

In aerobic waters and at high pH, selenium is present in the selenite (+4) or selenate (+6) oxidation state. These chemical species are very soluble, and it is probable that most of the selenium released into the aquatic environment is transported in these forms to the oceans. Under reducing conditions and at low pH, elemental selenium or metal selenides can be formed. Similar chemical speciation patterns affect the transport of selenium in soil. In poorly aerated, acidic soil, insoluble forms predominate. In well-aerated, alkaline soil, soluble forms of selenium subject to leaching and compounds readily taken up by plants tend to be formed.

Sorption by bed sediments or suspended solids, and precipitation with hydrous iron oxides are probably the major control on mobility of selenium in aerobic waters. However, most selenium in aquatic systems is probably transported as the dissolved species. Experimental studies indicate that selenium is quite mobile in clays, especially under alkaline conditions.

Selenium is bioaccumulated by aquatic and terrestrial organisms. Although dietary intake is thought to be the most important source of selenium in many organisms, little biomagnification appears to take place. Conversion of selenium to inert and insoluble forms may occur in terrestrial and aquatic organisms. However, selenium can be methylated by a variety of organisms, including benthic microflora. In a reducing environment, hydrogen selenide (H2Se) may be formed. Both the methylated forms and H2Se are volatile, and can be released to the atmosphere. Consequently, remobilization of selenium from aquatic and terrestrial systems, through biotransformation to volatile forms and subsequent atmospheric transport, can result in significant recycling.

4.1.9 Silver

4.1.9.1 Toxicology

The dust of silver and its soluble compounds causes local or generalized impregnation of the mucous membranes, skin, and eyes with silver, a condition termed argyria.

Localized argyria occurs in the skin and eyes where grey-blue patches of pigmentation are formed without evidence of tissue reaction. Generalized argyria is recognized by the widespread pigmentation of the skin and may be seen first in the conjunctiva, with some localization in the inner canthus. Argyrosis of the respiratory tract has been described in two workers involved in the manufacture of silver nitrate; their only symptom was mild chronic bronchitis; bronchoscopy revealed tracheobronchial pigmentation; biopsy of the nasal mucous membrane showed silver deposition in the subepithelial area. It has been estimated that gradually accumulated intake of from 1 to 5 g. of silver will lead to generalized argyria.

4.1.9.2 Persistence and Migration Potential

Silver can exist in several chemical forms in aqueous systems. Metallic silver, which has very low solubility, is stable over much of the eH-pH range for water. Concentrations of hydrated silver cations, usually present as the univalent species, may be controlled by reaction with chloride, bromide, and iodide ions to give insoluble silver halides. Precipitation of agCl may exert a major control on solubility of silver where chloride concentrations are relatively high. Under the reducing conditions often found in bed sediments, formation of insoluble silver sulfides and metallic silver may also control levels of soluble silver species. Silver is strongly sorbed by manganese dioxide, ferric hydroxide, and clay minerals. Sorption is probably the dominant process leading to removal of dissolved silver from the water column. In general, concentrations of silver are higher in the bed sediments than in overlying waters. For example, these concentrations were reported to differ by a factor of 1,000 in an alpine lake.

Bioaccumulation of silver by aquatic plants, invertebrates, and vertebrates occurs readily and appears to depend primarily on sorption/desorption from sediments. However, the amount of silver partitioned to the biota appears to be minor in comparison with the amount partitioned to the sediments. Little food-chain magnification seems to occur. Photolysis, volatilization, atmospheric transport, and biotransformation do not appear to be important fate or transport processes for silver.

4.1.10 Trans-1,2-Dichloroethane (1,2-trans-DCE)

4.1.10.1 Toxicology

The 1,2-trans-DCE is a central nervous system depressant and causes injury to the liver and kidneys. There are no reports of carcinogenic or teratogenic activity by ethylene dichloride in animals or humans.

Exposure via inhalation to high vapor concentrations has been found to cause nausea, vomiting, weakness, tremor, and cramps in human.

Eye contact with either the liquid or with high concentrations of vapor causes immediate discomfort, with conjunctival hyperemia and slight corneal injury; corneal burns from splashes recover quickly with no scarring. Prolonged skin exposure, as from contact with soaked clothing, produces severe irritation, moderate edema, and necrosis; systemic effects may ensue, as the liquid is readily absorbed through the skin. Repeated skin contact may cause rough, red, dry skin due to solvent action.

4.1.10.2 Persistence and Migration Potential

Due to the relatively high vapor pressure of 1,2-trans-dichloroethylene volatilization from aquatic systems to the atmosphere is quite rapid and appears to be the primary transport process. Aerial transport of this compound can occur and is partly responsible for its relatively wide environmental distribution. Although little applicable information is available, adsorption is probably an insignificant environmental fate process for 1,2-trans-DCE.

The relatively low log octanol/water partition coefficient of 1,2-trans-DCE suggests that bioaccumulation also is a relatively insignificant process. Although no information pertaining specifically to biodegradation of 1,2-trans-DCE is available, results with similar compounds suggest that this process probably occurs but at a very slow rate.

Photooxidation in the troposphere appears to be the dominant environmental fate of 1,2-trans-DCE. Once in the troposphere, the compound is attacked at the double bond by hydroxyl radicals, resulting in the formation of formic acid, hydrochloric acid, carbon monoxide, and formaldehyde. The half-life of 1,2- trans-DCE in the troposphere is estimated to be less than one day. Given the properties of similar compounds, photolysis of 1,2-trans-DCE in aquatic systems and photodissociation in the terrestrial environment are probably insignificant.

4.1.11 1,1,1-Trichloroethane

4.1.11.1 Toxicology

1,1,1-trichloroethane causes central nervous system depression. Human subjects exposed to 900-1,000 ppm for 20 minutes experienced light-headedness, incoordination, and impaired equilibrium; transient eye irritation has also been reported at similar concentrations. Reports have indicated mild kidney and liver injury in humans from severe exposure; animal experiments have confirmed the potential for liver, but not for kidney, injury. Skin irritation has occurred from experimental skin exposure to the liquid. The liquid can ben absorbed to a moderate degree through the skin.

4.1.11.2 Persistence and Migration Potential

The 1,1,1-trichloroethane (1,1,1-TCA) disperses from surface water primarily by volatilization. Several studies have indicated that 1,1,1-trichloroethane may be adsorbed onto organic materials in the sediment, but this is probably not an important route of elimination from surface water. 1,1,1-trichloroethane can be transported in the ground water, but the speed of transport depends on the composition of the soil.

Photooxidation by reaction with hydroxyl radicals in the atmosphere is probably the principal fate process for this chemical.

4.1.12 Trichloroethene (Trichloroethylene)

4.1.12.1 Toxicology

Trichloroethylene is a central nervous system depressant and a mild irritant of the respiratory tract; It causes injury to the cardiovascular system, gastrointestinal system, the liver, and the kidneys.

Impairment of psychophysiologic efficiency has been described in tests on human experimental subjects exposed to vapor concentrations of 500 ppm for 1.5 hours (preceded by 1.25 hours of exposure as the room level was built up to 500 ppm); mild irritation of the upper respiratory tract was also reported.

Chronic exposure to trichloroethylene may produce double vision, changes in color perception, blindness, loss of coordination and sense of smell, and impairment of the tactile senses. Intolerance to alcohol, tremor, giddiness, bradycardia, and anxiety have been found in workers chronically exposed to 5-630 ppm.

The liquid can penetrate the skin. Prolonged skin contact may cause irritation and formation of vesicles, and repeated immersion of hands in the liquid has caused paralysis of the fingers. A few drops of the liquid in the eye will result in transient pain and conjunctival irritation.

4.1.12.2 Persistence and Migration Potential

Trichloroethylene (TCE) rapidly volatilizes into the atmosphere where it reacts with hydroxyl radicals to produce hydrochloric acid, carbon monoxide, carbon dioxide, and carboxylic acid. This is probably the most important transport and fate process for trichloroethylene in surface water and in the upper layer of soil. TCE adsorbs to organic materials and can be bioaccumulated to some degree. However, it is unclear whether trichloroethylene bound to organic material can be degraded by microorganisms or must be desorbed to be destroyed. There is some evidence that higher organisms can metabolize TCE. Trichloroethylene leaches into the ground water fairly readily, and it is a common contaminant of ground water around hazardous waste sites.

4.2 APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS (ARAR)

Remedial action objectives and cleanup criteria are based on the identification of the most applicable or relevant and appropriate requirements (ARARs) that alternatives will need to attain. The first step is to identify health-based requirements which will assure the protection of human health and the environment. The next step is to identify the appropriate federal and state regulatory requirements which the response action should attain. In general, this process presumes that alternatives will be formulated and refined to ensure that they attain all of the appropriate ARARs.

ARARs for the AFP 59 remedial activities will be provided by the EPA and NYDEC according to the above criteria. Table 4-1 provides existing health and regulatory criteria which provide a basis for selecting ARARs.

4.3 PATHWAYS AND RECEPTORS

This section provides a summary of the pathways and potential receptors identified for the AFP 59 site.

4.3.1 Summary of Air Pathway

- Source: Contaminated surface soils at AFP 59; wind-blown contaminants and volatile emissions. This pathway is not believed to be of concern for AFP 59.

- Pathway: Emissions of volatiles into the ambient air at AFP 59; transport of particulates offsite by wind.

- Potential Receptors: Onsite personnel and workers in areas surrounding the site.

TABLE 4-1 COMPARISON OF SUBSTANCES OF CONCERN IN GROUND WATER WITH RELEVANT CRITERIA, STANDARDS AND GUIDANCE VALUES, AFP 59, JOHNSON CITY, NEW YORK

Parameter	Range of Concentrations (mg/L)	Safe Drinking Water Act Maximum Contaminant Levels (MCLs) (mg/L)[a]	Preliminary Protective Concentration Limits (PPCLs) (mg/L)[b]	EPA Drinking Water Health Advisories (mg/L)[c]	Proposed Maximum Contaminant Level Goals (MCLGs) (mg/L)[d]	New York State Ambient Water Quality Standards & Guidance Values (NYSAWQSGVs) (mg/L)[e]
Barium	<0.01 - 0.21	1.0	1.0 (MCL)	1.8 (adult, lifetime)	1.5	1.0[S]
Cadmium	<0.005 - 0.01	0.010	0.01 (MCL) or 0.00000449 (UCR)	0.043 (infant, 1-day) 0.008 (infant, 10-day) 0.005 (infant, longer term) 0.018 (adult, longer term) 0.018 (adult, lifetime)	0.005	0.010[S]
Lead	0.03 - 0.30	0.05	0.155 (ADI) or 0.05 (MCL)	0.020 mg/day (infant, longer term) 0.020 mg/day (adult, longer term) 0.020 mg/day (adult, lifetime)	0.020	0.025[S]
Arsenic	<0.005 - 0.02	0.05	0.05 (MCL) or 0.0000025 (UCR)	0.050 (infant, 1- and 10-day) 0.050 (infant & adult, longer term) 0.050 (adult, lifetime)	0.05	0.025[S]

TABLE 4-1 (Cont.)

Parameter	Range of Concentrations (mg/L)	Safe Drinking Water Act Maximum Contaminant Levels (MCLs) (mg/L)[(a)]	Preliminary Protective Concentration Limits (PPCLs) (mg/L)[(b)]	EPA Drinking Water Health Advisories (mg/L)[(c)]	Proposed Maximum Contaminant Level Goals (MCLGs) (mg/L)[(d)]	New York State Ambient Water Quality Standards & Guidance Values (NYSAWQSGVs) (mg/L)[(e)]
Total Petroleum Hydrocarbons	<0.5 - 0.6	NA[(f)]	NA	NA	NA	1.0[(g)]
1,1-Dichloroethane	<0.001 - 0.016	NA	4.05	NA	NA	0.050[GV]
trans-1,2-Dichloroethene	<0.001 - 0.066	NA	NA	2.72 (infant, 1-day) 1.0 (infant, 10-day) 1.0 (infant, longer term) 3.5 (adult, longer term) 0.35 (adult, lifetime)	0.07	0.050[GV]
1,1,1-Trichloroethane	<0.002 - 0.009	0.200	19.0 (ADI)	140.0 (infant, 1-day) 35.0 (infant, 10-day) 35.0 (infant, longer term) 125.0 (adult, longer term) 1.0 (adult, lifetime)	NA	0.050[GV]
Trichloroethene	<0.002 - 0.011	0.005	.00184 (UCR)	NA	NA	0.010[S]

TABLE 4-1 (Cont.)

(a) USEPA 40 CFR 141 (National Primary Drinking Water Standards); 52 Federal Register 25712, July 8, 1987.

(b) USEPA Compilation of Agency reviewed health effects data for 40 CFR 261, Appendix VIII "Hazardous Constituents". UCR or unit cancer risk indicates a chemical with carcinogenic potential. Recommended level for protection of human health is zero based on a non-threshold assumption for this chemical. Level indicated corresponds to a 10^{-6} risk from lifetime exposure (70 years) for a 70 kg adult.

(c) Superfund Public Health Evaluation Manual, October 1986, USEPA Office of Emergency and Remedial Response, Office of Solid Waste and Emergency Response. EPA Drinking Water Health Advisories are based upon exposures for a 10 kg infant or a 70 kg adult. Longer term health advisories are for exposures ranging from several months to several years and should generally be compared only to estimated short-term concentrations.

(d) Proposed MCLGs, Federal Register, Vol. 50, No. 219, Wednesday, November 13, 1985, pp. 46935-47022.

(e) Quality standards for Class GA are the most stringent of (1) maximum contaminant levels (MCLs) for drinking water established in 10 NYCRR subpart 5-1, (2) MCLS established under the Safe Drinking Water Act, (3) Standards for raw water quality established under 10\NYCRR Part 170, or (4) the standards listed below. S = Standard; GV = Guidance Value

(f) NA - Not applicable. No standard or guidance established.

(g) Recommended Cleanup Standard for Groundwater, New Jersey Department of Environmental Protection.

* Source: Fred C. Hart Associates, 1988.

4.3.2 Summary of Soil Pathway

- Source: Subsurface soils containing low concentrations of heavy metals.

- Pathway: Direct contact; lateral migration of soils or contaminants offsite and into nearby surface waters due to run-off from precipitation via the storm sewer system and vertical migration to the ground water.

- Potential Receptors: Onsite personnel; nearby surface waters; human receptors associated with direct contact and ingestion of these waters.

4.3.3 Surface Waters

- Source: Migration of contaminated soils via drainage into storm sewer system and nearby surface waters.

- Pathway: Storm sewer system into Little Choconut Creek; Susquehanna River.

- Potential Receptors: Populations of humans and organisms potentially ingesting and in direct contact with downgradient surface waters; organisms in direct contact or associated with contaminated sediments and populations ingesting such organisms; infiltration of surface water into the Clinton Street-Ballpark sole source aquifer.

4.3.4 Ground Water

- Source: Waste materials stored and used in industrial processes onsite, including volatile organic compounds, heavy metals, and total petroleum hydrocarbons. In addition, organic constituents have been found in several of the Johnson City municipal wells both upgradient and downgradient of AFP 59.

- Pathway: Vertical transport of contaminants from offsite and from onsite soils into ground water; horizontal and vertical ground-water flow.

- Potential Receptors: Human populations potentially ingesting ground water via potable water supply wells. The Johnson City well field is less than 1,000 feet from the site; wells are located north, east and southwest of AFP 59. The Clinton Street-Ballpark aquifer has been designated as a sole source aquifer.

4.4 ENVIRONMENTAL/HEALTH EFFECTS

The environmental and health effects of the AFP 59 contaminants are summarized in Table 4-2. Additional information pertaining to the contaminants environmental and toxicological properties is provided in Section 4.1.

4.5 DATA REQUIREMENTS

In previous investigations conducted by Fred C. Hart Associates, Inc., shallow wells were drilled in locations that would not provide an accurate depiction of potential contamination of the Clinton Street-Ballpark Valley aquifer from Area 1 and Area 2. Wells need to be drilled in locations indicative of the northwest aquifer flow. Potential contaminant trends from Area 1 and Area 2 as well as off-base sources must be more thoroughly investigated.

A detailed sampling plan needs to be developed to determine surface water contamination in the vicinity of the AFP 59 site. This will further define the extent of contaminant migration from Area 1 and Area 2 and also investigate whether contaminants migrate to the installation from any off-base sources. Information/data gaps which prohibit an adequate characterization of the presence and extent of contamination at AFP 59 are presented and further discussed in Chapter 5.

TABLE 4-2 TOXICITY CLASSIFICATION OF COMPOUNDS DETECTED AT AFP 59

Constituent	Toxic Hazard Review
Volatiles	
1,1-dichloroethane	Experimental TER, ETA; MOD oral; hepatotoxic in experimental animals
Trans-1,2-dichloroethene	Human CNS; skin irritant
1,1,1-trichloroethane	Human PSY, GIT, CNS, MOD skin irritant
Trichloroethene	MUT data, experimental ETA, TER, CARC
Metals	
Cadmium	Experimental CARC, TER, ETA, NEO; MUT data; human SYS
Chromium	Experimental ETA, CARC
Nickel	Experimental CARC, ETA, NEO
Lead	Human CNS; moderate irritant; +- CARC (lungs, kidneys); experimental TER
Arsenic	Human CARC, SKN, GIT; experimental TER, ETA, +-CARC; MUT data
Silver	Experimental ETA; human SKN
Selenium	Experimental ETA and CARC; skin irritant

NOTE: CARC = Carcinogenic effects
CNS = Central nervous system effects
EQA = Equivocal tumorigenic agent
GIT = Gastrointestinal tract effects
MOD = Moderate irritant effects
MUT = Mutagen
NEO = Neoplastic effects
PSY = Psychotropic effects
SKN = Skin effects (systemic)
SYS = Systemic effects
TER = Teratogenic effects

Source: Sax, N. Irving. Dangerous Properties of Industrial Materials; Sixth Edition, Van Nostrand Reinhold Company, New York, 1984.

5. BASIS FOR PROGRAM APPROACH

The Phase II Stage 2 IRP investigation approach for AFP 59 was developed based upon the information provided in the Phase I and Phase II Stage 1 reports, information obtained through a literature search, and a site visit performed 8 July 1988.

The currently available database of site-specific information is highly limited and does not adequately characterize the presence, source(s), migration patterns, and hazard potential associated with individual site areas of concern and the facility as a whole. The major data gaps that will be addressed during the Phase II Stage 2 program include:

- Available ground-water quality data for AFP 59 is based on samples obtained from three monitoring wells which are positioned at perimeter locations and screened in the upper-most portion of the Clinton Street-Ballpark Valley aquifer, and the plants non-contact process cooling water production well, which is screened in the lower-most portion of the Clinton Street-Ballpark Valley aquifer. The analytical data reveal the presence of heavy metal and chlorinated organic contamination within the Clinton Street-Ballpark Valley aquifer beneath AFP 59. However, the source(s) and extent of the contamination cannot be determined due to the limited number and depths of the monitoring points and the inappropriate positioning of the wells relative to the prevailing ground-water flow direction.

- The lack of upgradient and downgradient monitoring wells in close proximity of the former underground storage tank area (Area No. 1) and the electroplating facility (Area No. 2) preclude an assessment of whether or not ground-water contamination has resulted from past activities in these areas of AFP 59.

- The analytical database developed from the Stage 1 investigation do not provide an adequate baseline characterization of the full range of potentially hazardous constituents utilized during past operations at AFP 59. The analytical program implemented during the Stage 1 site investigation was limited to the constituents likely to be present within two specified areas of the plant only.

- An underlying clay layer is present between the upper and lower water bearing zones of the Clinton Street-Ballpark Valley aquifer beneath AFP 59. However, the extent, permeability, and influence of this underlying clay layer on contaminant migration between the upper and lower water bearing zones of the Clinton Street-Ballpark valley aquifer beneath AFP 59 is not known and cannot be determined from the currently available database.

- Surface streams reportedly provide a major source of recharge to the Clinton Street-Ballpark Valley aquifer in the vicinity of AFP 59. Prolonged pumping of the plant's production well could induce ground-water recharge from Choconut Creek, which borders AFP 59. However, the extent to which Choconut Creek is in communication with the plants production well and may be impacting ground-water quality at AFP 59 is not known.

- Surface runoff and process waste water discharge through the plants outfalls to Choconut Creek provides one of the primary contaminant migration/exposure routes from AFP 59. However, baseline analytical data for Choconut Creek are currently unavailable.

- The plant is situated in a mixed industrial, commercial, and residential land use area and analytical data from wells upgradient of AFP 59 have shown historical organics contamination similar to that observed in the deep production well at AFP 59. The Stage 1 findings suggest that off-base sources may be contributing to the contamination of ground water within the deeper zones of the Clinton Street-Ballpark Valley aquifer. The extent to which ground-water quality beneath AFP 59 is being influenced by potential offsite sources is not known.

5.1 ORGANIZATION OF EFFORT

The Phase II Stage 2 site investigation program is designed to monitor the potential presence and extent of contamination which may be emanating from the two previously identified areas of concern within AFP 59 (electroplating building and former underground storage tank area), AFP 59 as a whole, and the influence of offsite conditions on ground-water quality at AFP 59.

The tasks to be performed as part of the Phase II Stage 2 effort for AFP-59 are intended to provide for timely and cost-effective collection of data for valid site characterization for use in evaluating potential risks to human health and the environment from the presence and migration of contaminants, and to support feasibility studies and remedial alternative assessment.

5.2 DISCUSSION OF IRP PHASE II STAGE 2 RI/FS TASKS

Prior to initiating field sampling and analytical activities, a literature search will be conducted to fill both general and site-specific data gaps. The search will focus on obtaining data that are needed to further establish offsite conditions in the proximity of AFP 59 (Section 5.2.2.2) and to assess potential public health risks (Section 5.2.2.6). General information collection will include, and will not be limited to:

- Additional information describing regional hydrogeology and water quality of the Clinton Street-Ballpark Valley aquifer.

- Additional data describing flow conditions and water quality of Choconut Creek.

- Location of all existing and abandoned wells within 1 mile distance of AFP 59.

- Historical and current pumping data and water quality data for Johnson City's municipal supply wells.

- Description of local land use and demographics within a 1-mile radius of AFP 59, including a profile of the population using drinking water from municipal water supply wells most likely to be threatened by ground-water contamination.

- Further description of human-health effects caused by compounds of concern.

Sources of information which will be reviewed include federal and state geological agency reports, academic theses and related university research, municipality and county reports, and historical and current aerial photographs. AFP 59 files will be reviewed to determine if any records have been overlooked. Information in past IRP reports also will be reviewed and referenced when applicable. Gaps in data or analysis that prevent adequate determination of contaminant migration patterns or other factors which are critical to assessing the hazard potential associated with individual sites or the facility as a whole, will be identified in the literature search and a recommended approach for acquiring missing data made.

5.2.1 Field Investigation Tasks

Within two weeks of initiating field activities, a preliminary site visit will be conducted to identify sampling and monitoring locations and prepare the site for drilling activities. The following activities will be performed during the preliminary site visit:

- Meet with plant officials to present/discuss proposed field work activities. Obtain a briefing on plant rules; obtain passes and register vehicles and field personnel.

- Identify final well and sampling locations, and access routes for approval by plant officials.

- Establish staging area for drilling equipment and supplies. Establish decontamination area; identify water source(s).

- Establish/identify staging area for drummed drilling waste material (cuttings, liquids, etc.).
- Clear well locations for the presence of underground utility lines.
- Establish a working schedule/plan with plant officials that will be least disruptive to ongoing plant activities.

After the preliminary site visit activities are accomplished, well drilling activities will begin, and will follow the drilling/well installation protocol presented in the following sections.

5.2.1.1 Monitoring Well Installation

Presently, there is an existing deep aquifer production well and three shallow aquifer monitoring wells at AFP 59. Because of the limited number and positioning of these wells relative to the prevailing ground-water flow direction, the potential effects of past activities at AFP 59 on ground-water quality could not be adequately assessed.

In order to adequately quantify the potential effect of past activities at AFP 59 on ground-water quality, a total of 15 monitoring wells, to include 3 individual deep wells (located within 10 ft of the existing 3 shallow wells) and 6 well clusters (a shallow and deep well) positioned within a 10-ft radius from one another) will be installed at AFP 59 in order to:

- Determine whether AFP 59 is contributing to ground-water contamination in the area.
- Determine and further define the nature of contaminants leaving the plant.
- Determine the extent (rate and direction) of contaminant migration.
- Provide more precise information on the physical characteristics of underlying geology and ground-water flow direction and rates.

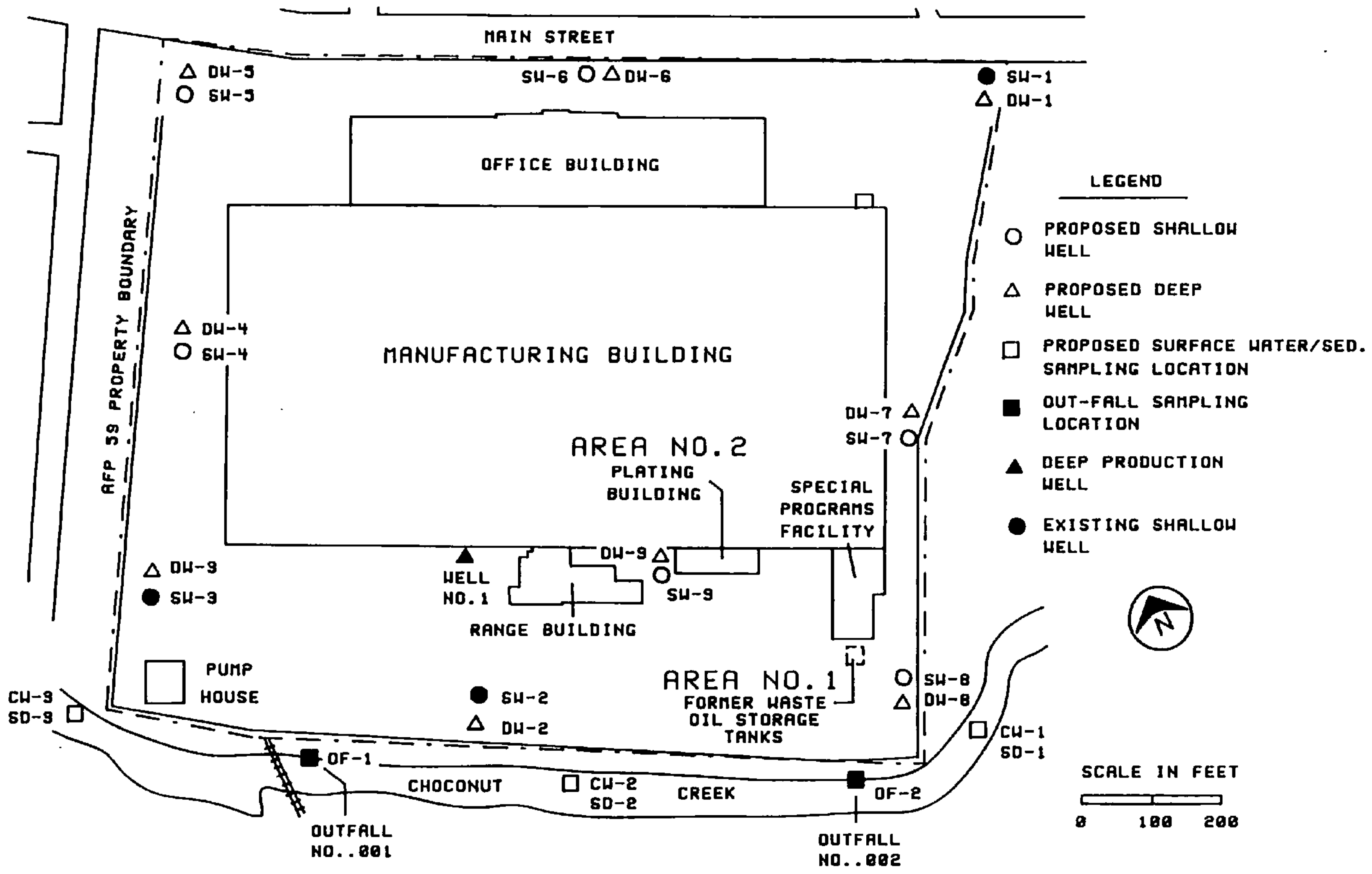
- Provide analytical data for evaluating potential sources of contaminants present in the deep aquifer.

- Provide site-specific quantitative information upon which recommendations regarding further actions can be made.

The proposed monitoring network is shown in Figure 5-1. The monitoring well network is designed to characterize upgradient (background) and downgradient water quality within both the upper and lower water-bearing zones of the Clinton Street-Ballpark Valley aquifer, and is designed to monitor and accommodate natural variations in ground-water movement and induced shifts in ground-water flow directions which may occur as a result of alternate water use and pumping at Johnson City's municipal water supply wells (located within 1,000 ft to the northwest and southeast of AFP 59) and the plant's production well (Figure 3-5).

Water quality data obtained from Monitoring Wells SW-9 and DW-9, located downgradient of the former underground waste oil storage area (Area No. 1) and the plant's electroplating building (Area No. 2) will provide for a determination of whether ground-water quality and the plant's production well has been impacted by past activities in these areas. Perimeter monitoring wells will provide for an assessment of water quality changes as it enters and exits the facility as a whole. Lithologic data obtained during borehole drilling combined with water level and aquifer test data will provide for an assessment of the hydraulic properties of the shallow and deep water-bearing zones and their degree of interconnection, and the rate and direction of ground-water flow. Based on this information and the results of sampling analyses, predictions can then be made concerning the extent contaminants may have migrated using ground-water flow/contaminant transport modeling (Section 5.2.2.5).

The following sections detail the well installation, aquifer testing, sampling, and analytical methods and procedures that will be implemented.



Base map from CH2M Hill, 1984

FIGURE 5-1. SITE MAP OF AFP 59 SHOWING PROPOSED PHASE II STAGE 2 MONITORING LOCATIONS.

5.2.1.1.1 Shallow Monitoring Well Installation

A total of six shallow monitoring wells will be installed at a depth interval coincident with that of previously installed wells in order to monitor the uppermost portion of the Clinton Street-Ballpark Valley aquifer. Each of the shallow wells will be completed to an average depth of approximately 35 ft below ground surface and screened 7 ft into the prevailing water table. The wells will be installed with a truck-mounted drill rig using 4.25-in. ID hollow-stem augers.

Drilling will not be performed until the selected site has been cleared for drilling by AFP 59 (GE) officials and without the supervision of an EA geologist. Borehole drilling will proceed without the use of water, if possible, to avoid the introduction of foreign materials into the aquifer. If the use of water is necessary during drilling (e.g., to prevent sand from heaving up inside the augers), water from an approved potable water source will be used. The volume of water introduced into the well will be recorded by the supervisory geologist and approximately five times this amount will be purged from the well during well development. For the purposes of lithologic descriptions, split-spoon samples will be obtained at 5-ft intervals to the water table, then continuously through the saturated interval to the completion depth using the Standard Penetration Test (ASTMD-1586). All split-spoon samples and soil cuttings of the well will be monitored for the presence of organic compounds with a photionization meter (HNu) or an Organic Vapor Analyzer (OVA).

All auger cutting descriptions, water-level readings, air monitoring readings, and other pertinent observations will be logged by the EA supervisory geologist. All split-spoon samples of unconsolidated sediment will be collected and visually identified by the supervisory geologist using the Unified Soil Classification System. Standard indentification practices detailed in ASTM D 2488 will be followed. The following information will be recorded by the supervisory geologist, at a minimum:

- Sediment sample interval
- Sampling hammer weight and distance of fall
- Blow count (per 6-in. interval)
- Amount of sample recovered
- Sample color
- Sample texture
- Sample moisture content (dry, moist, wet)
- Organic vapor readings
- Any unusual characteristics
- Depth to water
- Drill rig behavior and penetration rate

Representative sediment samples from each sampled interval will be placed in glass jars with screw-type lids for future reference. Each sample container will be labeled with the site name and the boring and sample number. No geotechnical data will be written on the container that is not specified on the boring log. Jars will be stored in cardboard boxes and kept from freezing.

Shallow monitoring well installation will be accomplished through in-place, hollow-stem augers. Each well will be constructed of Schedule 40, threaded (glue not allowed), flush-joint 2-in. diameter PVC, and will include 10 ft of 2-in. diameter machine-slotted PVC screen bottom-plugged (installed 3 ft above and 7 ft below the water table) with a slot size of 0.01-in. Clean silica sand backfill, suitable for the formation and screen slot size (e.g., No. 1 well gravel), will be placed around the screen to 2 ft above the screen. A 5-ft bentonite seal will be placed immediately above the silica sand and the annular space above the bentonite seal grouted to land surface with a Type I Portland cement/bentonite slurry.

The following procedure will be used for shallow well installation. Once the augers have been advanced to the finished depth and the auger plug removed, the screen and riser pipe will be steam cleaned, assembled, and lowered down the hollow-stem and the augers not raised more than about 2.5 ft. Well gravel (clean silica sand backfill) will be added, as needed, and its level sounded. This procedure will be repeated until the sand pack extends a minimum of 2 ft above the top of the screen. The augers will then be raised approximately 5 ft above the top of the sand pack and a 5-ft layer of bentonite pellets will be added, and allowed to hydrate, to form a seal over the sand pack. A 1-in. tremie pipe will be lowered down the annulus between the PVC casing and augers to about 5 ft above the bentonite seal, and grout will be tremied into the annulus until grout is observed at ground surface. The grout will be composed by weight of 10 parts Portland Cement to one-half part bentonite, with 6.5 gals of water per 94-lb bag of cement. Simultaneously, the tremie pipe and augers will be slowly withdrawn, and additional grout added until it extends to a level which will allow surface completion.

Surface completion of the monitoring wells will be coordinated with the Base Point of Contact (POC) to determine whether they are to be completed flush with or projected above the ground surface. Depending on the concern in the area, well surface completion will be as follows:

1. If well stick-up is of concern in an area, the well will be completed flush with the land surface by cutting the casing 2-3 in. below land surface and installing a protective locking lid consisting of a cast-iron valve box assembly. The lid assembly will be centered in a 3-ft diameter concrete pad sloping away from the valve box to ensure that free drainage is maintained within the valve box. A screw-type casing to prevent infiltration of surface water and 1 ft clearance between the casing top and the bottom of the valve box will be provided.

2. If an above-ground surface completion is used, the PVC well casing will be extended 2.5 ft above land surface and will be fitted with a loose fitting casing cap. The PVC casing will be shielded with a steel guard pipe (sleeve) which is placed over the casing and cap and seated in a 2-ft x 2-ft x 4-in. concrete surface pad which slopes away from the well sleeve. A lockable cap or lid will be installed on the guard pipe. A maximum of four traffic ballards, consisting of 3-in. diameter cement-filled steel guard posts, will be installed radially from each wellhead, recessed approximately 2-ft into the ground and set in concrete. Both the flush and above-ground well assemblies will be provided with corrosion-resistant locks which have either identical keys or are keyed for opening with one master key.

5.2.1.1.2 Deep Monitoring Well Installation

A total of 9 deep wells will be installed into the lower portion of the Clinton Street-Ballpark Valley aquifer and screened at a depth interval coincident with that of the plant's production well.

Based on the available information, it is anticipated that the deep wells will be completed to an average depth of approximately 95 ft below ground surface and will contain 20 ft of screen.

The deep wells will be installed with a truck-mounted drill rig using 10-in. OD, 6-1/4-in. ID hollow-stem augers. Borehole drilling, soil sampling, and data collection will be conducted as previously detailed for shallow monitoring well installation. However, split-spoon sampling will be performed at 5-ft intervals beginning from the bottom depth of the shallow monitoring wells to the completion depth using the Standard Penetration Test (ASTMD-1586). If soil samples cannot be obtained in the coarser material anticipated in the deeper zones using a standard 2-in. split-spoon, a large diameter (3-in.) split-spoon will be driven to obtain soil samples. The sampler dimensions, hammer weight, length of hammer drop, and blow counts will be recorded on the boring log by the supervisory geologist.

Deep monitoring well installation will also be accomplished through in-place, hollow-stem augers. Each well will be constructed of Schedule 40, threaded (glue not allowed), flush-joint, 4-in. diameter PVC, and will contain 20 ft of bottom-plugged 4-in. diameter machine-slotted PVC screen with a slot size of 0.01-in. Clean silica sand backfill, suitable for the formation and screen slot size, will be placed around the screen and up to the bottom of the confining layer. A 5-ft bentonite seal will be placed immediately above the silica sand, and the annular space above the bentonite seal grouted with a Portland cement/bentonite slurry to 5 ft below the top of the confining layer. A 5-ft layer of bentonite will then be placed immediately above the cement/bentonite slurry to seal the upper water zone from the lower water-bearing zone. Immediately above the bentonite seal, the formation comprising the saturated interval of the shallow water-bearing zone will be allowed to collapse around the PVC riser. Clean silica sand, if necessary, will be added to supplement backfilling around the PVC casing until it extends to 2 ft above the prevailing water table surface. A 2-ft bentonite seal will then be applied and the annular space above the bentonite seal grouted to land surface with a cement/bentonite slurry. This procedure is necessary to prevent grout contamination of the shallow water-bearing zone in the proximity of the shallow well screens.

Surface completion of the monitoring wells will be coordinated with the Base POC to determine whether they are to be completed flush with or projected above the ground surface as was previously described for shallow well installation.

5.2.1.1.3 Soil Sampling for Geotechnical Parameter Determination

Soil samples will be obtained from each of the boring locations for grain size (sieve) analysis and permeability testing. One sample for grain-size analysis and permeability testing each will be obtained from near the midpoint of the screened interval of each shallow well, and 2 samples each will be obtained from the screened interval of the deep wells. One sample of the underlying clay unit will also be obtained for falling head permeability testing during deep well borehole drilling. The purpose of these samples is to quantitatively characterize the underlying aquifer and potentially confining formation materials such that horizontal and vertical contaminant transport estimates can be made.

Samples for grain-size analysis will be obtained with a standard 2-in. diameter split-spoon sampler. If soil samples cannot be obtained in the coarse material, anticipated in the deeper zone, with a 2-in. split-spoon, an attempt will be made to obtain samples with a larger diameter (3-in.) sampler. Undisturbed soil samples for permeability testing will be obtained with a Shelby tube sampler. Both ends of the retrieved Shelby tube will be sealed and no other form of sampling/analysis will be attempted from the tube to protect the integrity of the undisturbed samples. Should the formation materials prevent Shelby tube sampling, a Dennison Core Barrel Sampler will be used to obtain samples for permeability testing. The Dennison sampler is a dual-tubed sampler with a brass inner tube, which is advanced by rotary methods to obtain an undisturbed sample.

5.2.1.1.4 Well Development

All ground-water monitoring wells will be developed as part of the well installation process. Development will be performed in order to create a good hydraulic connection between the well and the aquifer in which it is screened. This is important for obtaining reliable ground-water data and representative ground-water samples. Well development is achieved by removing fine grained geologic materials away from the well screen. Each well will be developed as soon as practical after completion by surging and bailing to remove the heavy sediments, then surging and pumping with a centrifugal or submersible pump.

Development will begin at the bottom of the well, working up to the top of the screen and then back down to the bottom in increments of approximately 2-3 ft. Development will consist of surging and pumping each interval until the discharged water is turbid free to the unaided eye and up to 5 casing volumes plus 5 times the amount of water introduced during borehole drilling (if any) have been removed from the well. If a well should pump dry before the 5 casing volumes have been removed, the well will be allowed to recharge for a short period of time and then pumped dry again. This process will be repeated for a maximum of 1 hour.

Part of the well development process will consist of washing the well cap and the interior of the PVC well riser using the water being purged from the well. The result of this operation will be a well casing free of extraneous materials (grout, bentonite, sand, etc.). This washing will be conducted during the development process, and not after.

The submersible pump or pump intake line will be raised slowly from the bottom until it breaks suction. This will ensure that no water that has been affected by the drilling will be left in the well. The water level and field measurements of pH, temperature, and specific conductance will be obtained before, during, and after development using electrometric devices (U.S. EPA 600/4-

79-020). A new, fresh length of flexible polyethylene pipe will be used for each well developed, to prevent potential cross-contamination of the wells. All water removed from the well during development which is suspected to be contaminated (based on color, odor, and OVA/HNu readings) will be containerized. Containers will be 55-gal drums approved by the NYSDOT for the transportation of hazardous materials. Containers will be placed on wooden pallets and left onsite at a temporary staging area designated by GE officials for subsequent hazardous constituency characterization (Section 5.2.1.4.4).

5.2.1.1.5 Decontamination

Before drilling the first well, between drilling of wells, and after drilling the final well (in each phase), all drilling, measuring, and sampling equipment (augers, rods, split spoons, etc.) that have contacted potentially contaminated soils or water will be decontaminated. These procedures are necessary to prevent cross-contamination of wells.

All equipment to be decontaminated will be laid out on blocks (above ground) and steam0-cleaned with water from the approved potable water source. A decontamination area will be constructed for this purpose. Immediately prior to installation, the PVC well pipe, screen, and protective steel casing will be steam-cleaned. All pumps, pipes, hoses, and other equipment that cannot be internally scrubbed will be flushed with clean water. Decontamination fluids and other associated wastes will be collected in drums and stored in a temporary storage area for subsequent hazardous constituency characterization (Section 5.2.1.4.4). It will be the responsibility of the supervisory geologist to ensure complete equipment decontamination is carried out.

5.2.1.1.6 Well Site Restoration

At each boring/monitoring well location, polyethylene sheeting will be laid out and drilled through to help confine the borehole cuttings and keep the drilling area clean. Following well installation, uncontaminated cuttings will be spread over the general area in the vicinity of the borehole or transported to more suitable areas for disposal as determined and designated by GE officials. Borehole cuttings exhibiting potentially hazardous characteristics (e.g., unusual color, odor, organic vapor readings, etc.) will be containerized in NYSDOT approved 55-gal drums and moved to a temporary staging area designated by GE officials. Each well site will be cleaned and restored to near pre-existing conditions.

5.2.1.2 Well Abandonment

An existing shallow monitoring well (GE exploratory boring No. 5), located west of the manufacturing building, was observed to have an improper surface seal during the site visit (July 1988) and a capped water recharge well (formerly used for the disposal of single pass non-contact cooling water) will be abandoned during the well installation phase of the field program. The monitoring well is completed flush to the ground surface in a paved parking lot. According to a plant official, the well was struck by a snow plow during snow removal operations (Schneider 1988). The protective steel tank box, cement color, and PVC are cracked, allowing surface water runoff to enter the well. The former recharge well underlies the black-top pavement of the southwest parking area for the plant. These wells provide conduits for the potential migration of contaminants into the underlying aquifer.

The wells will be abandoned by grouting in accordance with New York State guidelines. The grout will be composed by weight of 10 parts cement to 1/2 part bentonite with 6.5 gal of approved water per 94-lb bag of cement. The grout will be pumped through a tremie pipe (discharge placed at the bottom of a well) until undiluted grout is observed at the top of the well, forming a continuous grout column from the bottom of the well to ground surface. After 24 hours, the well will be checked for grout settlement and additional grout added, if needed. If possible, the steel tank box will be removed from the monitoring well, and the well extracted prior to grouting. The parking lot surface will then be patched with Sakrete blacktopping.

5.2.1.3 Surveying

In order to determine the direction of ground-water flow, and to assess whether a hydraulic gradient exists from Choconut Creek to the underlying aquifer, the horizontal coordinates and elevations of each newly installed monitoring well and each surface water and sediment sampling location (Section 5.2.1.4.2) will be surveyed by a New York State registered licensed surveyor. In addition, the four existing wells (three shallow monitoring wells and the production well) will be surveyed to provide a uniform database for the survey. Benchmarks shall be established from, and traceable to, a U.S. Coast and Geodetic Survey (USCGS) or U.S. Geological Survey (USGS) survey marker. This will be a third order survey. Vertical elevations and horizontal locations will be measured to an accuracy of 0.01 ft and 1 ft, respectively. Surveying of the wells will be to the top of the PVC riser casing which will be notched where the elevations are established. (The notch provides a reference point for all water level measurements.) All survey positions will be recorded on a base map of AFP 59. All benchmark locations will be clearly identified on the base map.

5.2.1.4 Analytical Sampling Activities

The purpose of data collection, sample collection, and laboratory analysis is to determine whether any contaminants generated from installation activities are entering the environment. The field investigation is used to determine the source, extent, and migration of any identified contaminants, and the magnitude of contamination relative to ARARs and any naturally occurring or background concentration for specific compounds. In order to provide a comprehensive baseline characterization for the facility as a whole, all new and existing wells, surface water, and sediment from Choconut Creek will be sampled and analyzed for the 126 parameter priority pollutants (as established by 40 CFR 136 "Guidelines Establishing Test Procedures for Analysis of Pollutants Under the Clean Water Act"). Figure 5-1 illustrates the location of all the sampling points for the Stage 2 investigation effort and the field/sample numbering system that will be implemented. Table 5-1 summarizes the number and type of samples which will be collected during various phases of field activity performance. All sampling will be conducted by experienced personnel under the direct supervision of the project geologist. All sampling will be accomplished under a rigorous chain-of-custody protocol in accordance with the QAPP. The following sections describe the sampling activities to be performed.

TABLE 5-1 SAMPLING AND ANALYTICAL SUMMARY, IRP PHASE II STAGE 2, APP 59

Activity/Parameter*	Number of Samples Soil/Sediment	Water	Total	Second Column Concentration (VOC)
Borehole Drilling				
Priority Pollutants (Estimated)	27		27	13
Permeability	33		33	
Grain Size Distribution	24		24	
Choconut Creek Sampling				
Priority Pollutants	3	5	8	4
Temperature	3	5	8	
pH	3	5	8	
Specific Conductivity	3	5	8	
Ground Water Sampling				
Priority Pollutants		19	19	10
Temperature		19	19	
pH		19	19	
Specific Conductivity		19	19	
Aquifer Testing				
VOC		10	10	5
Metals (Total)		10	10	
Temperature		13	13	
pH		13	13	
Conductivity				
Waste (Drum) Sampling (Estimated)				
Metals (EP TOX)	9		9	
Total Metals (Priority Pollutants)		10	10	
VOC	9	10	10	5
BNA	9	10	19	
QA/QC				
Field Blank (Prior Pollutants)		5	5	2
Bailer Wash (Prior Pollutants)		18	18	9
Duplicate (Prior Pollutants)	4	3	7	3

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* Priority Pollutants = U.S. EPA Priority Pollutant Compounds; VOC = Volatile Organic Compounds; BNA = Base/Neutral and Acid Extractable Organic Compounds.

5.2.1.4.1 Soil Sampling

One composite soil sample will be obtained for priority pollutant analysis from each deep well location. In addition, any soil exhibiting potentially hazardous characteristics (e.g., unusual coloration, odor, organic vapor readings, etc.) during borehole drilling will be collected for priority pollutant analysis. Samples will be obtained with a decontaminated split-spoon sampler, labeled, packaged, and shipped to a CLP laboratory for chemical analysis in accordance with the procedures detailed in the QAPP. For cost estimating purposes, it is assumed that three samples will be obtained at each cluster well location (27 samples total) for chemical analysis.

5.2.1.4.2 Ground-Water Sampling

A total of 19 wells will be sampled which will include 9 newly installed deep wells, 6 newly installed shallow wells, 3 existing shallow wells, and 1 existing deep production well. Sampling will be performed at least two weeks after well development to allow the aquifer to return to equilibrium.

To ensure a representative sample of the aquifer is obtained, 3-5 times the calculated volume of standing water in the well will be purged from each well prior to sample acquisition. In the event of low yielding wells, the well will be purged to dryness and allowed to recover prior to sample acquisition.
A round of static water level measurements will be obtained with an electronic water level indicator (QED) both prior to and after purging to ensure recovery before sampling.

Monitoring well purging will be accomplished with a centrifugal or submersible pump equipped with a 1/2- to 1-in. diameter flexible polyethylene pipe suction line. A new, unused length of pipe will be used for each well to prevent cross-contamination of wells. The pipe will be stored in large plastic bags, until ready for use, and will be handled with new, clean surgical gloves for each well. Additionally, the pipe will not be allowed to become contaminated by touching the ground. The suction pipe will be lowered to the bottom of the well and the pump started. After the required volume of water has been nearly evacuated from the well, the suction line is raised in intervals to the water surface and allowed to pump for a short time at each stop. The suction line is then removed from the water and is allowed to purge itself and the discharge hose. The suction line or pump is then removed from the well and the volume purged recorded. Purged well water suspected to be contaminated will be collected and containerized in NYSDOT approved drums and stored onsite for subsequent hazardous constituency characterization (Section 5.2.1.4.4).

Upon completion of the purging operation, ground-water samples will be obtained from each monitoring well using dedicated (a separate bailer for each well) bottom-filling teflon bailers. Tap samples will be obtained by directly filling appropriate sample containers at a discharge line at the well head of the plant's production well. Prior to arrival at the site, each bailer will be decontaminated in the laboratory, wrapped in aluminum foil, and placed in sealed plastic bags. The decontamination procedure will consist of washing with hot water and Alkanox soap followed by a hot water rinse, methanol rinses, and air drying. Prior to sample acquisition at a selected monitoring well, the sampler will be rinsed with distilled water. A distilled water rinse sample from each bailer will be obtained for 126 parameter priority pollutant analysis. The sampling effort will also include a trip blank to further validate data generated.

At each monitoring well, the bailer will be lowered into the well with new (unused) polypropylene twine. A new pair of disposable surgical gloves will be used to handle the bailer at each well. The bailer will be lowered into each well slowly to minimize the potential for agitation and aeration of the water sample. Samples will be placed into a sampling container containing an appropriate preservative for the parameter to be analyzed. Samples which will be analyzed for metals will be field-filtered through 0.45-micron filter paper. Measurements of pH and conductivity will also be obtained in the field. All samples will be kept on ice to maintain 4 C or below immediately after sampling. The samples will be packaged and shipped via overnight carrier (e.g., Federal Express) to the laboratory for immediate chemical analysis.

5.2.1.4.3 Surface Water/Sediment Sampling

In order to obtain baseline quantitative data for assessing whether past activities at AFP 59 may have impacted Choconut Creek and the degree to which Choconut Creek may be impacting ground-water quality at AFP 59, a surface water and sediment sample will be obtained from each of the three locations along Choconut Creek for priority pollutant analysis.

As is shown in Figure 5-1, the sampling approach for Choconut Creek includes an upstream (of AFP 59) sampling station for establishing background water quality, a downstream sampling station for assessing net water quality changes, and a midstream sampling station between the two outfalls from AFP 59. Data obtained from the midstream sampling station can be used to assess water quality changes up and downstream of each outfall, and provides a mechanism for assessing potential source areas within AFP 59. Should rainy weather conditions occur at the time of sampling and result in outfall discharge, an effluent sample will be collected from each of the outfalls. Samples will be collected by directly filling appropriate sampling containers for the parameters to be tested.

An attempt will be made to obtain surface water and sediment samples from Choconut Creek using grab sampling techniques. In this method, samples are obtained by wading into the Creek and directly filling sampling containers. Sampling will be initiated at the downstream station, and upstream (background) sampling will be performed last. This procedure is necessary to avoid any water quality changes which may occur as a result of wading activities. Should the depth of standing water and composition of underlying sediments prohibit wading, a nalgene scoop with a 10-ft extension handle (or similar device) will be used to collect samples. The collected sample will then be transferred directly to an appropriate container for laboratory shipment and analysis. Field measurements of temperature, pH, and specific conductance will also be obtained at each location. All sampling equipment will be decontaminated prior to sample acquisition at each location, and all sampling activities will be documented in accordance with the QAPP.

5.2.1.4.4 Waste Materials Sampling

All waste materials generated during the field effort which are suspected to be hazardous (based on color, odor, organic vapor readings, etc.) will be containerized in drums which have been approved by the NYSDOT for the transportation of hazardous materials. Waste materials to be containerized will include soil boring/well drilling cuttings, decontamination rinse waters, and discharge water from well development and purging (prior to sampling). Drums will be placed on wooden pallets and placed in a staging area designated by AFP 59 (GE) officials. AFP 59 will be responsible for the ultimate disposal of containerized wastes.

After field sampling activities have been completed, one composite waste liquid and one composite waste solid (soil) sample will be obtained from the contents of the drummed materials from each cluster well location and containerized decontamination rinse waters for volatile organic compounds, base/neutral and acid extractable organic compounds, EP Toxicity metals (solids) and total metals (liquids) analysis to determine if the wastes must be disposed of as hazardous waste. Composite sampling will be performed by obtaining an equivalent volume of grab sample from each of the drums.

5.2.1.4.5 Field QA/QC Sampling

During the sampling effort, quality control samples will be collected based on the number and type of sampling being conducted. At a minimum, the following quality control samples will be collected:

- One field blank prior to initiating sampling on a given day. This sample consists of pouring reagent water into the sample containers and carrying these samples while collecting media samples in the field. The sample is then analyzed for the spectrum of parameters tested for on that given day. Field blanks are utilized to evaluate the field sampling procedure.

- One bailer wash from each bailer. This sample consists of reagent water poured through the bailer and into the sample containers immediately prior to sample collection. Bailer washes are utilized during ground-water sampling to verify the effectiveness of the decontamination prcedure.

- One randomly collected duplicate sample for every 10 samples of each medium submitted for analysis. These samples are collected at the same time and in the same manner as the normal laboratory sample. The results of the duplicate analysis are used to evaluate the reproducibility of laboratory results.

The Field Operations Supervisor will ensure all sampling is performed in strict accordance with the QAPP.

5.2.1.5 Aquifer Testing

EA currently proposes to perform short-term (1- to 2-hour) pumping tests at each of the monitoring well pairs installed, and a long-term (at least 72-hour) pumping test at the AFP 59 Production Well No. 1. The purpose of the aquifer testing program proposed is to obtain data for use in assessing the hydraulic characteristics of the shallow and deep water-bearing zones of the Clinton Street- Ballpark Valley aquifer beneath AFP 59, the extent of their interconnection, and the extent to which Choconut Creek may be recharging the underlying aquifer, such that an overall evaluation of potential ground-water flow and contamination transport can be made.

Revision of the proposed specifications for aquifer testing may be necessary and will be determined: (1) after EA's reconnaissance of AFP 59 Production Well No. 1 and its current condition, and review of the pumping records, and (2) after completion of the planned shallow and deep test borings/monitoring wells which will aid in understanding the site specific hydrogeology.

The short-term continuous discharge testing of each of the monitoring well pairs will include a 1- to 2- hour pumping test of each well and observing/ recording the water levels in both wells of each pair during pumping and recovery portions of the test. Water level recording will be performed using in situ Hermit data loggers and transducers (or similar equipment). Such testing would provide data for use in evaluation of the aquifer characteristics of the shallow and deep portions of the unconsolidated sediment, and the hydraulic connection between the two water-bearing zones.

The long-term continuous discharge testing of AFP 59 Production Well No. 1 is proposed to be performed in two stages. The first stage would be performed after the aquifer water level recovers (stabilizes) fully under non-pumping conditions and at a continuous discharge rate of approximately 350 gpm until stabilization of the cone-of-depression (water level drawdown) is observed for at least 6 hours in all pairs of onsite monitoring wells. Upon achieving stabilization of the cone-of-depression, the discharge rate would be increased to a maximum rate (currently anticipated to be about 600 gpm) that will draw the water level in the production well down to the base of the clay layer which reportedly overlies the lower aquifer zone at a depth of 65 ft below grade. Again, the pumping will be continued until stabilization of the cone-of-depression is observed for at least 6 hours in all pairs of onsite monitoring wells. The pump will then be stopped, and the water level recovery monitored in all onsite wells. The depth to water will be monitored and recorded in all wells using in situ Hermit data loggers and transducers (or similar equipment). Additionally, a staff/stream gauge would be established near the shore of Choconut Creek for monitoring of the surface water level before and during the pumping test. During the test, three samples of the discharged ground water from the production well and each well of two of the well clusters along Choconut Creek (SW, DW-2 and SW, DW-8; Figure 5-1) will be collected: (1) approximately 2 hours after the pump is started, (2) just before the end of the 350 gpm continuous discharge phase, and (3) just before the end of the 600 gpm continuous discharge phase, for total metals and volatile organic compound analysis (contaminants presently detected in ground water at AFP 59). Measurement of temperature, pH, and specific conductance will also be obtained. It is noted that the analytical program may be revised and targeted based upon preliminary analytical data for the aforementioned wells and surface water samples from Choconut Creek. These data will be used to assess whether contaminants may be migrating from Choconut Creek and impacting ground-water quality at AFP 59. Ground-water modeling will be performed as part of this effort (Section 5.2.2.6).

5.2.2 Evaluation Tasks

5.2.2.1 Data Management Plan

For this project, all data management activities will be centered around the Installation Restoration Program Information Management System (IRPIMS) currently in use by the USAF. EA's in-house data management activities will be based on the SAS system operating in a DOS environment on AT-compatible personal computers. This system will be used to manage and analyze all technical data, including site information, well characteristics, hydrogeologic, geologic, as well as physical and chemical sampling results generated by this study. SAS is a powerful, yet user friendly system with a network of ready-to-use procedures, to handle all data management analysis and graphical data presentation necessary for this project. The SAS system is fully compatible across mainframe, mini, and personal computers using the same syntax and commands. EA currently uses SAS for much of its large scale data collection projects, including hazardous waste site investigations. As scheduled, EA will provide to the USAF all technical data as ASCII files on floppy disks using the USAFOEHL/TS-specified ADD format.

EA recognizes the importance of having the data in computer files which accurately reflect information collected by field and laboratory activities. To ensure this accuracy, EA proposes the following multistep data handling and quality assurance procedures. First, all data collected will be recorded in the appropriate forms using predefined codes as defined in USAFOEHL/TS Data Loading Handbook (June 1988). Second, prior to data entry, all data sheets will be checked by another person to ensure completeness and legibility. Also during this step, any obvious errors and miscodings will be checked and corrected. Next, double keypunch data entry will be conducted using SAS data entry "windows." These "windows" create a simulated data form on the computer monitor with labeled fields to be filled in with data from the appropriate data form. Information from each form will be entered twice. The software will then compare the two sets of data and identify any discrepancies so that the operator may correct the anomalous value(s). When both sets match, the program will allow the operator to enter data from another form. In addition to streamlining the keypunching, the "window" program creates the appropriate SAS files with assigned variable names from the data entered. After each batch of forms are entered, file listing will be compared back to the original data sheet (100 percent QC) for accuracy and completeness. Finally, on a regular basis, newly entered data sets will be checked for missing or duplicate entries, included codes, or anomalous values. Each of these potential errors will be checked and corrected, if necessary, prior to delivery of the final data step.

EA feels confident that the overall data management plan will ensure delivery of accurate and complete data files for their use. However, given the magnitude and importance of this project, this level of effort towards quality assurance is a sound investment.

5.2.2.2 Off-Site Surveys

Off-site surveys will be conducted to determine the status of surrounding conditions. An industrial/commercial facility survey will be performed in an attempt to identify possible upgradient sources, within 1 mi, of similar ground-water contamination that may affect AFP 59. The locations, general operations, hazardous waste management practices, and current contamination problems will be identified. Analytical data from wells monitored by the Broome County Health Department (BCHD), NYSDEC, or NYSDOH for ground-water contamination on industrial/commercial property will also be included. Information will be obtained from the Johnson City Chamber of Commerce, BCHD, Broome County Public Works, NYSDEC, NYSDOH records, interviews with officials, and ground-water monitoring records, if available. Aerial photographs will be reviewed and a cursory "windshield" survey will also be conducted to verify facility locations and identify other possible contamination sources. Industrial facility information will be compiled, and each facility identified as a possible contamination source will be plotted on a site map. Water supply use and pumping data will also be obtained from the Johnson City Water

Department for the municipal well fields located northeast and southeast of AFP 59. The data obtained will be used to assess ground-water conditions in the vicinity of AFP 59 and to evaluate potential impacts to ground-water quality within the Clinton Street-Ballpark Valley aquifer beneath AFP 59.

In addition to this information, demographic/land use data will be obtained from the county and municipal planning and zoning agencies, Chamber of Commerce, and census bureau. Demographic and land use data will be compiled, tabulated, and displayed on a site map, as appropriate, and will be used in the Health Risk Assessment process to identify populations which may be at risk as a result of past activities at AFP 59.

5.2.2.3 Evaluation and Screening of Data

During each task of the site survey, data will be collected and evaluated in order to aid the data collection of subsequent tasks. All field activity data will be documented in log books which will be retained for future reference. Data required for complete entry into the IRPIMS will be recorded and maintained on appropriate field log sheets. Geologic logs and well construction diagrams will be developed for each monitoring well, and water level, aquifer test data, and water quality data will be tabulated and incorporated into a ground-water flow/transport model so assessments can be made on the rate and direction of ground-water flow and potential extent of contaminant migration.

Sample acquisition, chemical analysis, and data screening will be performed in accordance with the methods and procedures detailed in the QAPP. Data received from the CLP laboratory will be validated in accordance with U.S. EPA Functional Guidelines for evaluating organics analysis. Factors which will be considered include holding times, instrument time and performance, instrument calibration, blanks, surrogate recoveries, matrix spike/duplicates, plus other QC parameters. The specifications provided in USAFOEHL/TS "IRP Analytical Protocols" (March 1988) and "Handbook to Support IRP Statements of Work for Remedial Investigation/Feasibility Study" (April 1988) will be strictly adhered to.

Key elements in the Risk Assessment screening process for public health evaluations will include comparison of site concentrations to background concentration levels of chemicals in appropriate media. Chemicals occurring at background concentrations will not be considered to be site-related and will not be evaluated in the assessment. In addition, chemicals present in blanks (i.e., laboratory contaminants) will not be selected for detailed analysis. Previous investigations detailed a relatively small number of chemicals at AFP 59. However, a large number of products and individual compounds were handled at the facility in the past. The Stage 2 Program includes an expanded analytical scope (full priority pollutant analysis), therefore, it is uncertain what level of screening will be required for this site investigation of AFP 59 at this time. Additional data information needs, when necessary, will be identified and recommendations on the most appropriate methods for obtaining this information will also be addressed.

5.2.2.4 Map Preparation

Data collected and generated from the site investigation activities will be plotted and mapped. Map preparation will be performed in accordance with USAFOEHL/TS "Handbook to Support the IRP Statements of Work for Remedial Investigation/Feasibility Studies," Version 2.0, dated April 1988 as presented below.

As a minimum, the following figures/maps will be prepared as part of the Stage 2 effort:

- Regional location map
- Base map
- General location map of IRP sites
- Hydrogeological cross-sections by region
- Hydrogeological cross-sections by base
- Isoconcentration contour maps depicting (principal contaminats of concern as appropriate)
- Stratigraphic column(s)
- Water table elevation and potentiometric surface contour map
- Surficial geologic map

- Soil association or soil series map
- Site-specific maps of well location, boreholes, and surface water sampling locations
- Well location map for base
- Well location map within 3 mi of base
- Location of proposed and existing monitoring wells, boreholes, surface water sampling sites, and other sampling locations (for individual sites)
- Location map for geological and hydrogeological cross-sections
- USGS topographic maps with installation boundaries clearly delineated
- Topographic maps of the installation prepared by Installation Civil Engineer (smaller contour interval than USGS)
- Surface water drainage map showing directions of flow and divides
- Map showing off-site industries contiguous to the base
- Isopach map soils and other surficial deposits (overburden isopach map)
- Bar charts and detected contaminant levels superimposed on installation map near sampling locations (as appropriate)
- Map and delineating contaminant plume(s) (as appropriate)
- Well completion diagrams
- Well logs with continuous lithologic descriptions of units penetrated by the borehole
- Monitoring well construction details.

Emphasis will be placed on providing as many illustrations as possible to provide assistance in conveying spatial relationships to reviewers of the final report. Maps will be designed so that they are clear, simple, and easy to interpret. All necessary information will be provided in accompanying legends. A base map of AFP 59 as well as other selected figures will be digitized. If available, existing digitized map files will be used. EA will coordinate with USAFOEHL/TS for computer hardware/software compatibility and the technical program manager for map feature requirements and availability of previously digitized map data. The digitized data and maps will be provided to USAFOEHL/TS technical project manager on 5-1/4-in. or 3-1/2-in. computer disks along with copies of the installation base map.

5.2.2.5 Treatability Studies

The need for a treatability study will be determined on completion of the remedial investigation. At this time, however, it is anticipated that a treatability study will be incorporated into the remedial design and completed during subsequent phases/stages of the IRP, if necessary.

5.2.2.6 Modeling

The modeling of ground-water flow and constituent transport at the AFP 59 will be performed using existing models. The principal model used by EA for modeling ground-water flow is the USGS Modular Finite-Difference Ground-Water Flow Model (MODFLOW) (McDonald and Harbaugh 1984). Constituent transport is examined using the USGS two-dimensional solute transport model (Konikow and Bredehoeft 1978). EA maintains both a mainframe (VAX-785) and an IBM-PC version of each of these models.

MODFLOW is capable of simulating three-dimensional ground-water flow within an aquifer using a block-centered finite-difference approach. Layers can be simulated as being confined, unconfined, or a combination of both. The program structure consists of a main program and a series of highly independent subfractions or modules. Each module deals with a specific feature of the hydrologic system such as pumping and recharge at individual wells, leakage from a recharge to riverbeds, and infiltration from a precipitation. By selecting the desired modules, the program may be tailored to individual sites.

At the AFP 59, the ground-water flow module will be used to examine each of the areas of concern and the installation as a whole. The ground-water flow field associated with the observed heads in the shallow and deeper portions of the underlying aquifer will be calculated. These flows will also be a function of the hydraulic conductivities calculated from aquifer pump tests. As part of the project, both long-term and short-term pump test data will be generated and used to model the interconnectivity between the surface and deeper aquifers. By simulating the pump test with the MODFLOW model, the hydraulic conductivity or leakage rate between the two aquifers may be determined. This is accomplished by treating the hydraulic conductivity or leakage rate as a fitting parameter and matching the observed drawdown in the observation wells. The inclusion of the Choconut Creek riverbed in the above model runs will provide information regarding the extent of its hydraulic connection with the underlying aquifer system.

The USGS 2-dimensional solute transport model simulates solute transport in flowing ground water by computing changes in concentration over time caused by the processes of convective transport, hydrodynamic dispersion, and mixing from fluid sources. The model couples the ground-water flow equation with the solute transport equation. The ground-water flow equation is solved by finite-difference approximation, and it uses the method of characteristics to solve the solute-transport equation. The latter uses a particle tracking procedure to represent convective transport and a finite-difference equation for hydrodynamic dispersion. The necessary time step is automatically determined by the program to meet several stability criteria.

The solute transport model will be applied in the ground-water assessment of AFP 59 in either a 2-dimensional horizontal mode or a two-dimensional vertical mode. In the 2-dimensional horizontal mode, the model would illustrate contaminant plume movement within a single aquifer. In the 2-dimensional vertical mode, the model would calculate the movement of the plume through the confining layer and into the deeper aquifer. The projected time scales needed for such movement between aquifers will provide for an assessment of the potential origin of contaminants already present.

5.2.2.7 Public Health Evaluation/Risk Assessment

A Public Health Evaluation will be performed to address the potential human health effects associated with AFP 59 sites under the no-action alternative which assumes that no remedial actions take place at the site and that no restrictions are placed on the future of the site. Evaluation of the no-action alternative is required under Section 300.68 (f) (v) of the National Contingency Plan. By conducting such an assessment, EA will be able to identify if remedial actions are indicated for AFP 59. In addition, the Public Health Evaluation will also provide a basis for determining the reduction in risk resulting from remediation (as necessary). The main steps in such an assessment, which will be performed in accordance with the latest U.S. EPA policy and guidance on risk assessment in general, are outlined below.

5.2.2.7.1 Chemicals of Concern

The first step in the Public Health Evaluation will be to review the results of the environmental sampling and other information developed during the Stage 2 investigation in order to identify chemicals of potential concern for detailed study in the Public Health Evaluation. Key elements in the screening process are a comparison of site concentrations to background levels of chemicals in appropriate media; that is, chemicals occurring at background concentrations will not be considered to be site-related and will not be evaluated in the assessment. In addition, chemicals present in blanks (i.e., laboratory contaminants) will not be selected for the detailed analysis. Previous investigations detailed a relatively small number of chemicals at AFP 59. However, a large number of products and individual compounds were handled at the facility in the past. It is uncertain what level of screening will be required for this site.

5.2.2.7.2 Exposure Assessment

The objective of the exposure assessment is to identify actual or potential routes of exposure and characterize the likely magnitude of exposure to human receptors. These exposures will be characterized by constructing exposure scenarios.

- Each exposure scenario will define the source of contamination, the route of transport, possible receptors, and the likely route of exposure (ingestion, inhalation, or direct contact).

- For each exposure scenario, concentrations in relevant environmental media (air, ground water, soil) at the receptor location will be identified. Where concentrations have not been measured at the exposure point, estimates of conditions may be made using models. For example, future ground-water concentrations may be estimated using dispersion models.

- Chemical intakes for each exposure scenario will be estimated based on frequency and duration of exposure and rate of media intake (e.g., amount of water consumed per day). The assumptions used in these estimates will be stated clearly and documented to the extent possible. The assumptions will be selected to represent a "most probable exposure case" and a "plausible worst-case exposure case."

The principal potential pathway of exposure at AFP 59 is consumption and contact with ground water. Less plausible, but possible, exposure pathways are contact with soils onsite and inhalation of volatilized contaminants. The extent of contamination and the hydrogeologic characteristics of the site have been inadequately defined and it is difficult to predict the critical exposure pathways at this time.

5.2.2.7.3 Toxicity Assessment

Critical toxicity values will be identified for each chemical of concern. In the qualitative risk assessment, these toxicity values will be combined with the exposure intakes described above. Toxicity data will be presented in the following forms:

- For carcinogens, the carcinogenic potency factor, in terms of risk to the population per unit exposure.

- For noncarcinogens, the reference dose (RfD) which is a benchmark daily intake level that is not anticipated to result in adverse effects.

- For chemicals for which no critical toxicity values are available, a semi-quantitative characterization based on any pertinent information that is available.

In addition to critical toxicity values, any applicable or relevant and appropriate requirements (ARARs) that have been established for the chemicals of concern will be identified. Currently, U.S. EPA considers maximum contaminant level goals (MCLGs) and maximum contaminant levels (MCLs) promulgated under the Safe Drinking Water Act, Ambient Water Quality Criteria (AWQC) developed under the Clean Water Act, National Ambient Air Quality Standards (NAAQS) and promulgated state environmental standards to be potential ARARs. The contaminated media of greatest concern at AFP 59 is ground water, and the MCLs and appropripate New York State standards are likely ARARs for this site.

5.2.2.7.4 Risk Assessment

According to the procedures for Public Health Evaluations developed by U.S. EPA, the potential adverse effects on human health should be assessed where possible by comparing concentrations found at or near the site with ARARs that have been developed. For example, ground-water concentrations of chemicals will be compared to the MCLs. However, if suitable ARARs are not available for all the chemicals of concern and for all exposure scenarios considered, a qualitative risk assessment will also be performed for all of the chemicals of concern. It is anticipated that ARARs will not be available for all of the chemicals of concern of for all of the environmental media (e.g., soil) that will be considered in this assessment.

Evaluation of the noncarcinogenic health risks associated with contaminants of concern is based primarily on a comparison of the estimated daily intake of the indicated chemicals with appropriate critical toxicity values for the protection of human health described above. For potential carcinogens, the estimated cancer risks associated with exposure are calculated using U.S. EPA-derived cancer potency factors. Specifically, excess lifetime cancer risks are obtained by multiplying the cancer potency factors by the daily intake of the contaminant under consideration. This procedure is considered to be appropriate for low doses such as would potentially result from this site.

In this assessment, the effects of exposure to each of the contaminants under the scenarios evaluated will initially be considered separately. However, pollutants occur together, and individuals may be exposed to a mixture of the contaminants. Consequently, it is important to recognize the potential adverse effects that these mixtures can have on humans. Suitable data are not available to characterize the effects of chemical mixtures similar to those present or near AFP 59. As suggested in the U.S. EPA guidance for evaluating mixtures, however, it may be useful to sum the excess cancer risks or to calculate hazard indices for chemical mixtures.

Risk assessments will be conducted separately for each exposure pathway. Results will be presented separately for the "average exposure case" and the "plausible maximum case" exposure assumptions. The risk assessments for each exposure pathway will include a discussion of the uncertainties in the estimates.

5.2.3 Feasibility Study Tasks

Feasibility studies will be performed by incorporating the results of the field investigation and qualitative risk assessment to identify and screen preliminary remediation technologies and will be used to develop and evaluate remedial alternatives, as appropriate, and to the extent allowable from the database of information compiled.

The initial activity in the feasibility study process is to define the objective of the remedial action effort. The next step is to develop and screen remedial alternatives, and finally, to select the appropriate response action. The process of developing and screening alternatives is a repetitive process that may take place at several points in the RI/FS process.

The various feasibility study tasks will be conducted concurrently with performance of the remedial investigation. The tasks are described in Sections 5.2.3.1 through 5.2.3.6. As more site data are collected, alternatives will be developed, screened, and rescreened to reflect the improved understanding of the site.

5.2.3.1 Identification of General Response Actions

All significant site contamination problems and pathways of contamination that have been identified during the remedial investigation stages will provide information for identification of the general response actions without necessarily identifying specific technologies. General response actions considered will include the "no action" alternative as a baseline against which other actions can be measured.

The selection of preliminary remedial actions depends on the identification of certain critical parameters, including:

- The identification of all contaminated media (i.e., surface water, ground water, soils, air, etc.).
- The identification of all contaminants and their physical characteristics and relative toxicities.
- The identification of all contaminant migration pathways.
- The identification of the location of all potential contaminant receptors and their relative sensitivity to the contaminants at the point of contact.

As these parameters become better defined through the remedial investigations, the selection of appropriate remedial actions becomes more accurate.

General response actions can be developed if the contaminants, the contaminated media, and the potential contaminant migration pathways are known. The Phase II Stage 2 remedial investigation will provide sufficient information about the contaminant types and their natures, the types of media affected, and the migration pathways to allow the identification of general response actions for the sites in question.

5.2.3.2 Identification and Screening Technologies

Applicable and feasible technologies will be identified for each general response action along with any related potential ARARs that may be used as performance criteria (Section 5.2.2.8). The applicable technologies will be individually rated by screening them with regard to the following criteria:

- Technical feasibility
- Environmental, public health, and institutional impacts
- Cost

Each applicable remedial technology, by itself, may not address all hazards or problems identified at the site. Technologies that have passed the technology screening will be used to form more definitive alternatives.

5.2.3.3 Development of Remedial Alternatives

In the process of developing remedial alternatives, acceptable engineering practice will be used to determine which of the screened technologies appear most suitable for the site. Consideration will be given to recycling, reuse, waste minimization, waste destruction, or other advanced, innovative, or alternative technologies, as appropriate.

As part of this feasibility study task, at least one alternative for each of the following will, at a minimum, be evaluated within the requirements of the feasibility study guidance:

- Alternatives for treatment or disposal at an offsite facility approved by U.S. EPA and NYSDEC, as appropriate.

- Alternatives which attain applicable and relevant federal public health or environmental standards.

- As appropriate, alternatives which exceed applicable and relevant public health or environmental standards.

- Alternatives which do not attain applicable or relevant public health or environmental standards, but which reduce the likelihood of present or future threat from the hazardous substances. This must include an alternative which closely approaches the level of protection provided by the applicable or relevant standards and meets CERCLA's objectives of adequately protecting human health and environment.

- The no action alternative will also be considered.

In some cases, there may be overlap between the developed alternatives or alternatives may be developed that, through changes in the design, fit more than one of the categories.

5.2.3.4 Screening of Alternatives for Human Health, Environmental, and Cost Factors

Remedial alternatives developed will be screened on the basis of public health and environmental criteria, followed by an order of magnitude "cost screening." The applicability of each alternative relative to the others will be assessed. Alternatives will be eliminated that do not provide adequate protection for human health and the environment, or that are much more costly than others without providing significantly greater protection.

The remedial alternatives will be screened on the basis of both capital costs and operating and maintenance costs, reflecting site-specific conditions.

5.2.3.5 Detailed Analysis of Alternatives

Alternatives remaining after the initial screening the previous step will undergo further analysis. Criteria by which the alternatives will be assessed include the following:

- Technical Evaluation of Alternatives - Each remedial alternative will be evaluated for performance, reliability, implementability, and safety. The performance evaluation will consider both the effectiveness of each alternative to prevent or minimize substantial danger to human health or the environment, and the useful life of the alternative to maintain this level of effectiveness. Reliability will be evaluated in terms of the operation and maintenance (O&M) requirements, such as frequency and complexity of O&M and costs to install and operate, as well as demonstrated performance. Implementability will consider factors such as constructability and the time necessary to implement the alternative and to achieve beneficial results. Short-term and long-term threats to the safety of nearby communities and environments, as well as to the workers at the site, will be considered in evaluating the alternatives.

- Institutional Requirements Evaluation - Primary consideration in selecting remedial actions will be given to remedies that attain applicable ARARs.

- Exposure Assessment - A risk assessment will be performed to evaluate the types, amounts, and concentrations of chemicals at a site; their toxic effects; the proximity of target populations; the likelihood of chemical release and migration from the site; and the human health and environmental risks related to specific AFP 59 sites. At sites where management of migration is an option, a quantitative exposure assessment will be undertaken. Following the risk assessment, estimated environmental concentrations of the selected indicator chemicals will be compared to applicable ARARs. Each alternative will be evaluated with respect to the extent it attains, exceeds, or falls short of the applicable ARARs. If applicable ARARs are not available, health-based levels will be developed.

- Environmental Impact Evaluation - Evaluation of environmental impacts will be performed to determine which remedial alternatives will achieve adequate protection and improvement of the environment at those sites where environmental damage is an important consideration.

An environmental assessment of the "no action" alternative will be performed for all sites. This environmental assessment describes the current site situation and the environmental condition anticipated if no emergency or remedial actions are taken.

If an alternative does not result in significant adverse impacts and, therefore, does not require preparation of a detailed environmental assessment of adverse effects, a statement will be prepared that documents that finding and summarizes the supporting reasoning.

Assembled remedial alternatives will be evaluated for long-term and short-term effects. The level of detail in the evaluation will depend on the degree of actual or potential damage to the environmentally sensitive areas, violation of environmental standards, short- and long-term effects, and irreversible commitments of resources.

Each alternative will be evaluated by considering beneficial effects, such as changes in the release of contaminants and final environmental conditions, improvements in the biological environment, and improvements in the resources that people use. Expected adverse effects of remedial construction or operations will also be considered in addition to the effects of the final remedy.

- Detailed Cost Analysis of Selected Alternatives - Detailed cost analysis of selected remedial alternatives will include the following steps:
  - Estimation of capital, operation, and maintenance costs;
  - Present worth analysis; and
  - Sensitivity analysis.

5.2.3.6 Selection of Recommended Alternative

After completion of the detailed analysis of alternatives, a summary will be prepared comparing the alternatives to assist in selecting a cost-effective remedy in accordance with the NCP and SARA. The Defense Prioritization System will be used to score all sites where a remedial alternative has been selected.

will be used to score all sites where a remedial alternative has been selected. The selection process will give primary consideration to remedies attaining or exceeding ARARs and which are protective of human health and the environment.

6. REPORTING REQUIREMENTS

Monthly R&D Status Reports, an Informal Technical Information Report, Decision Documents, and Draft and Final versions of the IRP Phase II Stage 2 Report for AFP 59 will be prepared as part of this effort. All reports submitted will be prepared in accordance with USAFOEHL/TS "Handbook to Support the IRP Statement of Work for RI/FS," Version 2.0, dated April 1988, as described in the following sections.

6.1 MONTHLY STATUS REPORTS

Monthly R&D Status Reports will be prepared by EA's project manager to describe the technical and financial progress of the report. The purpose of the R&D Status report is to inform the USAFOEHL Technical Program Manager of the progress of the project and to justify the manhours billed during the reporting period. These reports will discuss the following items:

- Identification of site and activity
- Status of work at the site and progress to date
- Percentage of completion and schedule status
- Difficulties encountered during the reporting period
- Actions being taken to rectify problems
- Activities planned for the next month
- Changes in personnel.

The Monthly Progress Report will list target and actual completion dates for each element of activity, including project completion, and will provide an explanation of any deviation from the milestones in the Work Plan. The level of detail will support the hours claimed in the Performance and Cost Report sent at the same time. The report will identify activities such as well installation and sampling, analysis of data, report writing, and other items requiring major manpower commitments. Submission of chapters or sections of the technical report, as well as tabulated field and laboratory results with the R&D Status Report as they are drafted, will also be performed.

6.2 INFORMAL TECHNICAL INFORMATION REPORT

No later than three weeks after all laboratory analyses have been completed, all analytical results will be tabulated and forwarded to USAFOEHL/TS in an Informal Technical Information Report. In addition to the analytical results, the report will contain:

- The time and date of sample collection, holding times, extraction and analysis; the method used; and Method Detection Limits achieved.

- The analytical test results for QA/QC samples including: chain-of-custody forms, method blanks, check samples, surrogate spike recoveries, duplicates, matrix spikes, matrix spikes duplicates, a list of laboratory QA/QC control limits, a glossary of terms and symbols, and a discussion of analytical problems and corrective actions taken.

- Cross-reference tables of laboratory sample numbers and field sample numbers; and a cross-reference of field sample numbers to wells, boreholes, sites, etc.

6.3 IRP PHASE II STAGE 2 RI/FS REPORT

A Draft Report delineating all activities and findings of the Stage 2 RI/FS effort will be prepared at the culmination of this effort and forwarded to USAFOEHL/TS for review and comment. The format and information requirements contained in the Handbook will be strictly adhered to. The Draft Report will be thoroughly screened for format and grammatical errors through in-house peer technical review prior to being submitted to USAFOEHL/TS.

The report will summarize the results of the field investigation and record researches and present the data and conclusions in a clear, concise record. At a minimum, the report will include a discussion of the regional/site-specific hydrogelogy, field activities and sampling methods implemented, well and boring logs, well construction data, ground-water (potentiometric) surface data and maps, water and soil analysis results, hydrogelogic cross sections, modeling data, and the laboratory and field QA/QC methods and procedures implemented.

In addition to presenting the information/data generated during this stage of the IRP, the information and data generated during prior IRP work efforts at AFP 59 will be used to establish trends and develop conclusions and recommendations. All investigative work done at each site and within the facility as a whole will be integrated to reflect the total cumulative information for work done at AFP 59.

The report will present the results of the data evaluation and risk assessment and will include a detailed discussion of additional data needs and any follow-on remedial investigation/feasibility study that may be required (including long-term monitoring). A recommended approach for each site (or the facility as a whole) will be provided. Should the findings of Stage 2 activities indicate that no further action is required, a Technical Decision to Support No Further Action will be prepared, as indicated in Section 6.4.

Following review and comment of the Draft Report by USAFOEHL/TS, a Final Report incorporating USAFOEHL/TS comments will be prepared and submitted.

6.4 DECISION DOCUMENTS

Should the results and findings of the Phase II Stage 2 investigative activities indicate that no futher action is required at a site of concern, a Technical Decision to Support No Further Action will be prepared. The decision document will be prepared in accordance with the Handbook requirements for a Category 1 Site.

7. SCHEDULING AND STAFFING

7.1 PROJECT ORGANIZATION

The IRP Phase II Stage 2 investigation of AFP 59 will be performed from EA's Northeast Regional Office located in Middletown, New York. The project will be led by Mr. Andris Lapins, CPG, who will be responsible for the day-to-day management of all aspects of the project. He will report to the USAFOEHL/TS Technical Program Manager and EA's Defense Program Manager, Mr. Charles Flynn. Figure 7-1 illustrates the proposed project organization.

7.2 FIELD TEAM ORGANIZATION

EA's project field team will consist of a combination of the following personnel:

- Project Manager
- Site Safety Officer
- Field Operations Supervisor
- Staff Geologist
- Technicians

Subcontractors will be employed to provide well drilling and surveying support. One individual may perform more than one of the functions listed above. The specific responsibilities for field team numbers are described below.

Project Manager

The Project Manager will be present at the beginning of field operations. He will brief the team on the objectives of the sampling program and general procedures to be followed. In his absence from the site, the Field Operations Supervisor will be his representative.

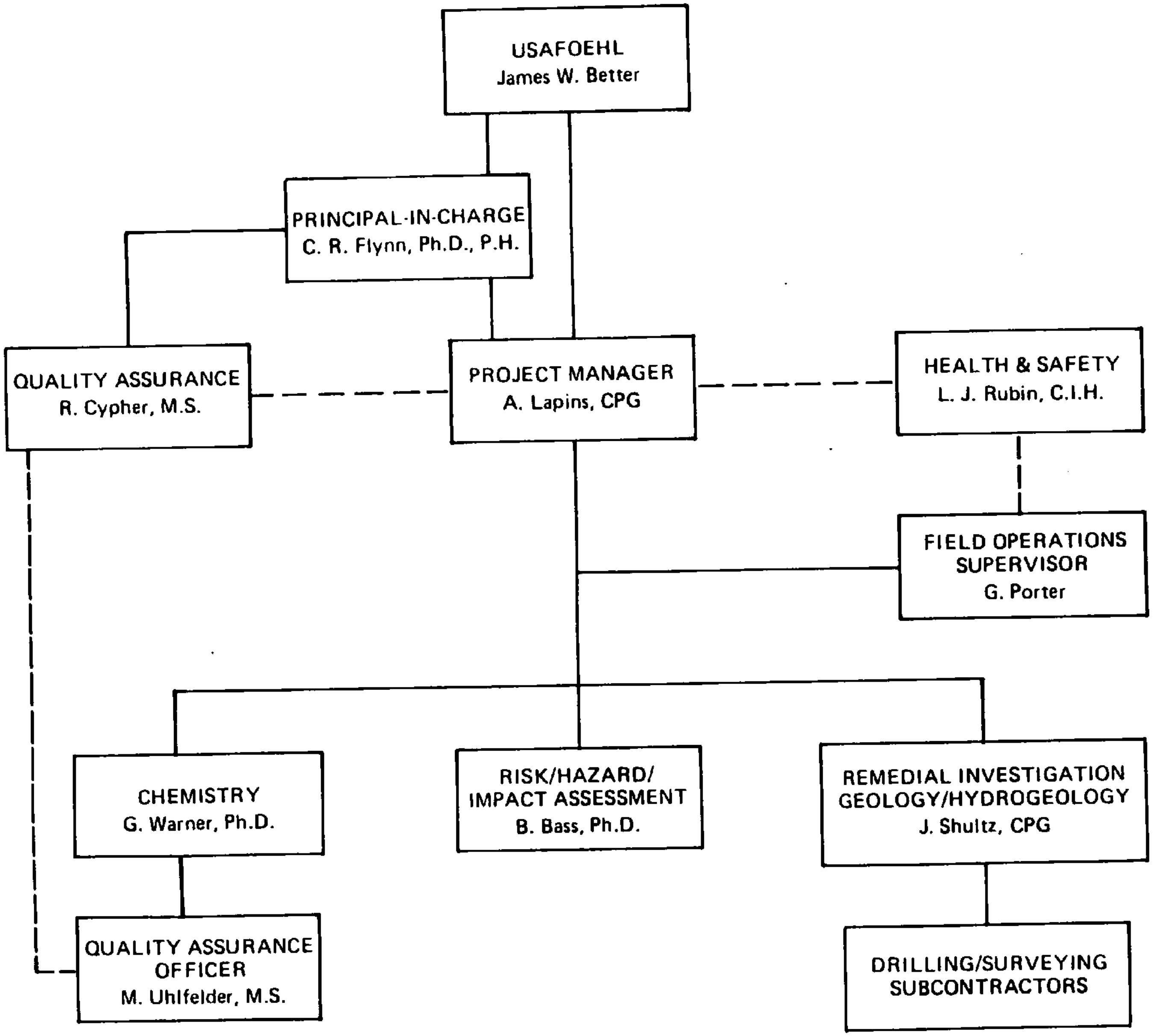


Figure 7-1. Project organization.

In the absence of the (GE) Air Force field personnel, the Project Manager (or Field Team Leader) will direct all inquiries to the USAFOEHL/TS Technical Program Manager.

Site Safety Officer

The Site Safety Officer will be responsible for the adherence to all site safety requirements by the team members. The Safety Officer will assist in conducting site briefing·meetings and will perform the final safety check. Additional responsibilities are:

- Updating equipment or procedures based upon new information gathered during the site inspection.

- Upgrading the levels of protection based upon site observations. Enforcing the "buddy system" where appropriate.

- Determining and posting locations and routes to medical facilities, inlcuding poison control centers; arranging for emergency transportation to medical facilities.

- Notifying local public emergency officers, i.e., police and fire departments, of the nature of the team's operations and posting their telephone numbers.

- Entering exclusion areas in emergencies when at least one other member of the field team is available to stay behind and notify emergency services; or after he/she has notified emergency services.

- Examining work party members for symptoms of exposure or stress.

- Providing emergency medical care and first aid as necessary onsite. The Safety Officer has the ultimate responsibility to stop any operation that threatens the health or safety of the team or surrounding populace.

Field Operations Supervisor

The Field Operations Supervisor will be responsible for the coordination of all drilling and sampling efforts, will assure the availability and maintenance of all sampling equipment and materials, and provide for shipping and packing materials. He will supervise the completion of all chain-of-custody records, the proper handling and shipping of the samples collected, be responsible for the accurate completion of Field Log Books, and represent the Project Manager in his absence.

Geologist

The geologist will be responsible for directing drilling activities and installation of monitoring wells, including soil sampling, and initial development.

Technician

The Sample Preparation technician will assist in packaging and shipping samples. He/she will be responsible for completing all chain-of-custody forms. He/she will dispense sample containers, sample identification tags, etc., to the team members and retain records for control purposes.

Field personnel will be adequately trained and certified with regard to hazardous waste site operations.

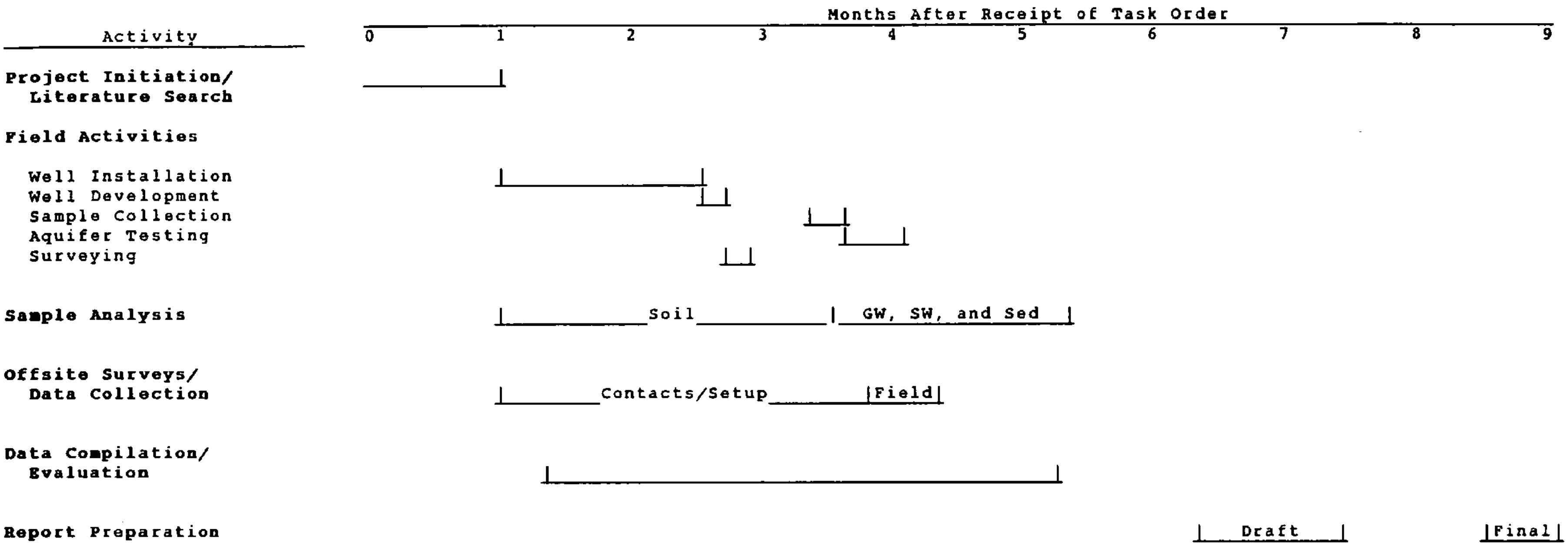
For site-specific training, field personnel will receive the project Work Plan, QAPP, and Site Safety Plan in a timely manner to allow for a sufficient review period. Prior to the initiation of site sampling, a field staff orientation and briefing will be held to acquaint personnel with the site, with the operation of any unfamiliar sampling equipment, and to assign field responsibilities.

All sampling activities will be based on, and will be in compliance with, the site level of protection classification, as described in the Site Safety Plan for AFP 59.

7.3 SCHEDULE

Table 7-1 summarizes the project schedule. It is presented in terms of task and overall job performance from an arbitrary starting point. Every effort will be made to meet these task deadlines, however, unforseen drilling and weather conditions may require adjustment of this schedule.

TABLE 7-1 PROPOSED SCHEDULE FOR AFP 59 PHASE II STAGE 2



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