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INSTALLATION RESTORATION PROGRAM

Draft Final
REMEDIAL INVESTIGATION REPORT
Petroleum, Oil, and Lubricant Facility, Site 15

Volume I

174th Fighter Wing
New York Air National Guard
Hancock Field, Syracuse, New York

March 1997

HAZARDOUS WASTE REMEDIAL ACTIONS PROGRAM
Environmental Restoration and Waste Management Programs
Oak Ridge, Tennessee 37831-7606
managed by LOCKHEED MARTIN ENERGY SYSTEMS, INC.
for the U.S. DEPARTMENT OF ENERGY under contract DE-AC05-84OR21400

Installation Restoration Program

Remedial Investigation Report
Petroleum, Oil, and Lubricant Facility
Site 15

Volume I

Draft Final

174th FIGHTER WING
NEW YORK AIR NATIONAL GUARD
HANCOCK FIELD
SYRACUSE, NEW YORK

Prepared For
Air National Guard Readiness Center
Andrews Air Force Base, Maryland

Prepared by
HAZARDOUS WASTE REMEDIAL ACTIONS PROGRAM
Environmental Management and Enrichment Facilities
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LIST OF ACRONYMS AND ABBREVIATIONS

AID	argon ionization detector
ANGRC	Air National Guard Readiness Center
ARAR	applicable or relevant and appropriate requirement
BMDL	below method detection limit
BOD	biological oxygen demand
BTEX	benzene, toluene, ethylbenzene, xylenes
CLP	Contract Laboratory Program
CRQL	Contract Required Quantitation Limit
DOD	U.S. Department of Defense
DOE	U.S. Department of Energy
EE/CA	Engineering Evaluation/Cost Analysis
EPA	Environmental Protection Agency
FFS	Focused Feasibility Study
FS	Feasibility Study
FW	Fighter Wing
GC	gas chromatograph
HAZWRAP	Hazardous Waste Remedial Actions Program
I.D.	inside diameter
IDW	investigation-derived waste
IRP	Installation Restoration Program
JP	jet propulsion fuel
JP-4	jet propulsion fuel 4
JP-5	jet propulsion fuel 5
JP-8	jet propulsion fuel 8
MAP	Management Action Plan
MDL	Method Detection Limit
MW	monitoring well
NYANG	New York Air National Guard
NYSDEC	New York State Department of Environmental Conservation
O.D.	outside diameter
OWS	oil/water separator
PAH	polycyclic aromatic hydrocarbons
PCB	polychlorinated biphenyl
PTFE	polytetrafluoroethylene
PID	photoionization detector
POL	petroleum, oil and lubricant
PPE	Personal Protective Equipment
PRE	Preliminary Risk Evaluation
PRG	Preliminary Remediation Goal
PVC	polyvinyl chloride
RI	Remedial Investigation
SAIC	Science Applications International Corporation
SAP	Sampling and Analysis Plan
SI	Site Inspection

SOW	Statement of Work
SVOC	semivolatile organic compound
TAGM	Technical and Administrative Guidance Memorandum (NYSDEC)
TDS	total dissolved solids
TOC	total organic carbon
VOA	volatile organic analysis
VOC	volatile organic compound
WP	Work Plan

EXECUTIVE SUMMARY

The Hazardous Waste Remedial Actions Program (HAZWRAP) performed a Remedial Investigation (RI) at the Petroleum, Oil, and Lubricant (POL) Facility, Site 15, at the 174th Fighter Wing (FW) of the New York Air National Guard (NYANG), Hancock Field, Syracuse, New York. Hancock Field is located approximately 2 miles north-northeast of Syracuse in Onondaga County in central New York. The POL Facility consists of six 25,000-gal underground storage tanks and a pump house. Southeast of the pump house is an aboveground fuel storage tank. The POL Facility is located on the south side of the 174th FW property next to the southern boundary of the Base. The POL Facility was constructed in 1951 to store petroleum, oil, and lubricant and is currently scheduled to be decommissioned in 1997 when a new POL Facility, presently under construction, will be complete. In 1980, the aboveground tank was put in service.

Three spills reportedly have occurred at the POL Facility: a release of polychlorinated biphenyls (PCBs) before the 1980s; a release of an estimated 2,000 gal of jet fuel in 1990; and a more recent, smaller release of jet fuel in June 1994. All these releases reportedly occurred in the area of the pump house.

This report summarizes RI activities as part of the Installation Restoration Program at Site 15. The purpose of this RI was to define the nature and extent of PCB and jet fuel-related contamination of the soil and groundwater resulting from past activities at the POL site. During the course of investigation phenol was unexpectedly encountered, so the investigation was expanded to evaluate potential sources of phenol. The RI also was conducted to obtained sufficient detailed site data to aid in determining the appropriate remedial action.

The field investigations at the POL Facility were conducted in August 1995 and June 1996. The field approach included several screening methods used to aid in selecting confirmation sampling. Surface soil, subsurface soil, and groundwater samples were collected for laboratory confirmation analysis.

Soils at the site are characterized by an upper interval of silt and silty sands overlying an interval of fine- to medium-grained sands down to about 20 ft. Below this, stiff clayey silts are found. Depth to groundwater at the POL Facility ranges from approximately 10.5 feet to almost 16 feet. Groundwater flow is to the southeast toward North Branch of Ley Creek approximately 1300 ft away. Based on water level and slug test data from the upper 20 feet of the aquifer, a groundwater flow rate of 0.65 ft/year was estimated.

Volatile and Semivolatile Organic Compound Contamination

Jet fuel-related volatile organic compound (VOC) contamination was observed in three areas: northeast of the POL Facility pump house, southwest of the pump house, and in front of the pump house. The northeast and southwest contamination appears to follow the surface drainage. The most significant contamination in these areas is below about 2 ft and extends to the water table. Semivolatile organic compound (SVOC) contamination consists of jet fuel-related contamination, restricted mainly to an area on the northeast side of the pump house, and polycyclic aromatic hydrocarbon (PAH) and phenol contamination.

~~Contradict~~
Conclusion

Refer to natural
~~attenuation~~

Jet fuel-related VOC and SVOC contaminants in soil exceed the New York State Department of Environmental Conservation (NYSDEC) action limits. A Focused Feasibility Study (FFS) should be made to evaluate the most appropriate corrective action to remediate soils. This study should include the area in front of the pump house and the area on each side of the pump house. As part of the study, a preliminary risk evaluation or similar risk screening should be performed in order to evaluate contaminants, which although exceeding NYSDEC action levels, may not exceed preliminary remediation goals (PRGs). Because the POL Facility is being replaced, action to remove the soil contamination associated with the pump house and tanks should proceed during tank removal.

Groundwater has been contaminated by the jet fuel-related compounds. The extent of contamination is defined. The horizontal extent of the plume in a downgradient direction extends to the wooded area southeast of the site, 100 feet beyond the base boundary. A localized area of free product (about 6 in. thick) was found at the lead edge of the plume. Based on the nondetects from the analytical results from the two deep wells, contamination does not appear to have migrated vertically.

Jet fuel contamination in the surficial aquifer has exceed NYSDEC limits and requires remedial action. Interim remedial action should be developed and implemented to remove free product as a continuing source of groundwater contamination. Additionally, an FFS should be implemented to determine the most appropriate remedial action for abatement of the dissolved-phase contamination.

PCB Contamination

PCB contamination was found in front of and to either side of the pump house at the POL Facility. For the most part, the vertical extent of contamination was limited to the top 4 ft of soil. The highest concentration of PCBs was found directly in front of the pump house and over a 10-ft by 10-ft area extending vertically downward to the water table. Groundwater, however, does not appear to have been impacted. An area of surface soil contamination was also encountered on the other side of the concrete pad near the well that had a PCB hit during a previous sampling event in 1994. The well had been damaged prior to the 1994 sampling event. It is suspected that PCBs tested in this well were from surface soil contamination that migrated down the damaged well casing. The replacement well sample contained no PCBs. The damaged well should be properly abandoned.

PCB-contaminated soils exceed the NYSDEC cleanup limits and remedial action will be required. Because the POL Facility is being replaced, action to remove the soil contamination located in front of the pump house should proceed during tank removal. It is recommended that an FFS be performed to select an alternative for remediation of the PCB-contaminated soil.

Phenol Contamination

During the investigation of the jet fuel contamination, phenol was detected in many of the soil samples at levels above NYSDEC applicable or relevant and appropriate requirements. The detections appeared to be random and non-fuel-related; the highest concentrations were found in the background samples. A records search was initiated to determine the possible causes of the phenol contamination. The search determined that herbicide application had been performed in

May 1995, three months prior to the RI investigation sampling. Subsequent to the RI, a Basewide background sampling for phenol showed non-detects and tended to substantiate that the most-probable cause for the occurrences was through the prior application of herbicides. No remediation is recommended for the phenol-containing soils.

Section 1

1. INTRODUCTION

1.1 BACKGROUND

The Department of Defense (DOD) Installation Restoration Program (IRP) is responsible for identifying, evaluating, and remediating sites where past activities may threaten public health, public welfare, or the environment. Through an interagency agreement, DOD requested that the Department of Energy (DOE) provide technical assistance in implementing IRP activities. DOE has assigned responsibility for providing this technical assistance to the Hazardous Waste Remedial Actions Program (HAZWRAP) managed for DOE by Lockheed Martin Energy Systems, Inc.

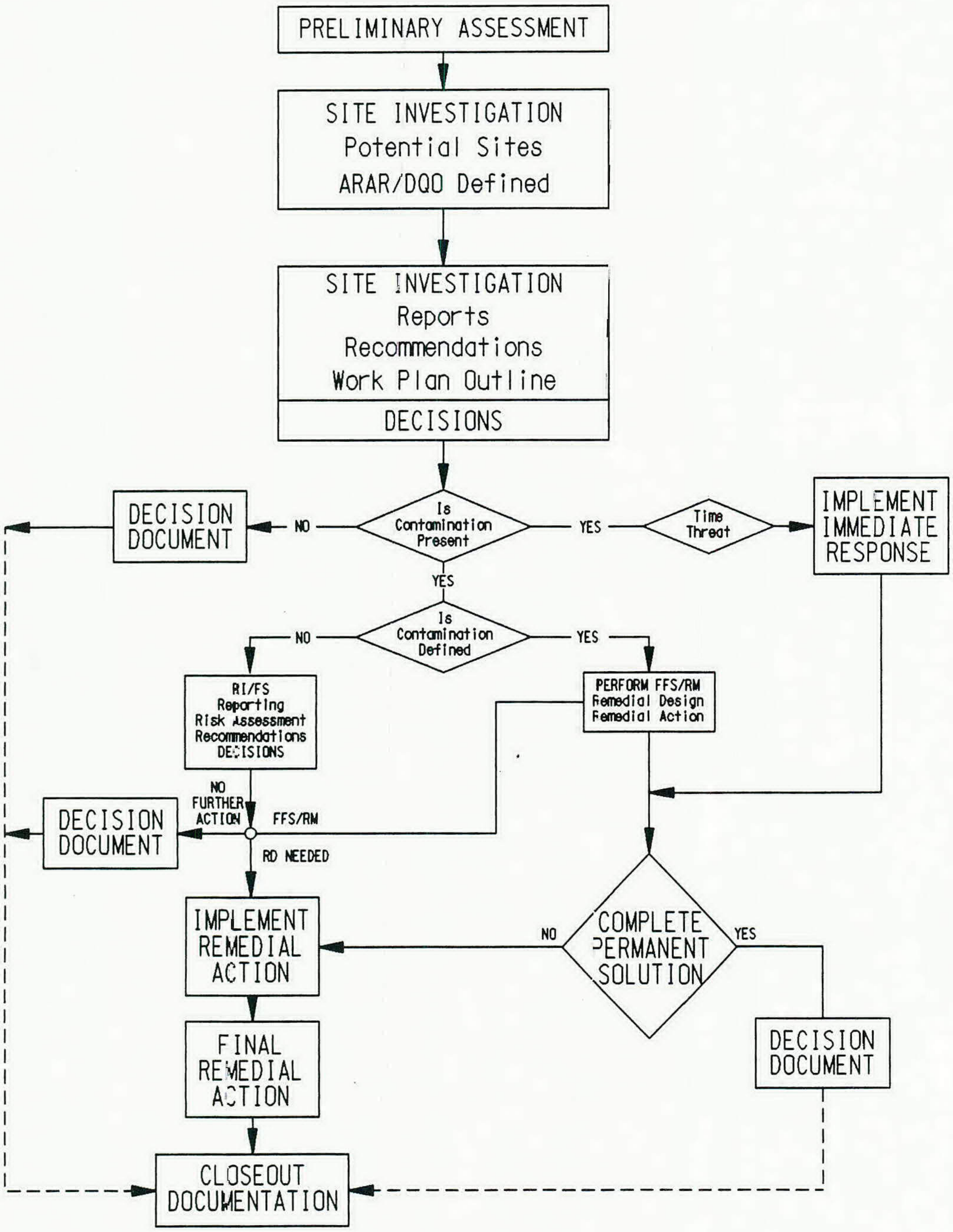
The IRP is similar to, and consistent with, the U.S. Environmental Protection Agency (EPA) Superfund program. Applicable legislation includes the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA); Superfund Amendment and Reauthorization Act (SARA); and Presidential Executive Order 12580 (January 23, 1987). The IRP involves the identification of former waste disposal sites at DOD installations. If contamination is identified, an evaluation of the extent of contamination is completed and remedial action is implemented (if necessary). Additional information is provided in the AFCEE handbook (AFCEE ESR 1991). The IRP emphasizes cooperation with state environmental regulatory agencies and public involvement through community relations planning.

The IRP consists of several tasks, each with specific work elements designed to flow from site characterization through development and implementation of remedial action (if needed). The major IRP tasks are identification through a Preliminary Assessment (PA); Site Inspection (SI)/Site Investigation; Remedial Investigation (RI); alternative evaluation through a Feasibility Study or Focused Feasibility Study; and Remedial Design/Remedial Action (Fig. 1-1).

The overall objective of the IRP is to identify potential environmental problems and provide timely remediation, where necessary, to protect public health and the environment from contamination associated with past hazardous waste spills and disposal practices at DOD facilities. The PA identifies Areas of Concern (AOCs) that require further investigation. Additional information (including field screening/analytical data) is then gathered during the SI to determine whether conditions in the AOCs warrant identifying them as "sites."

Those AOCs identified as sites typically require additional investigation to either confirm the presence of environmental contamination or to substantiate the absence of environmental contamination. The information is then used, in consultation with the appropriate regulatory agencies, to determine the need for further IRP activities. Those AOCs at which potential contamination is identified are designated as sites, and the IRP moves to the RI phase. The RI is conducted to evaluate the levels and extent of contamination at identified sites.

The RI activities were implemented through a Project Management Team that included personnel from the Air National Guard Readiness Center (ANGRC), the Base, HAZWRAP, and Energy Systems subcontractors. This team also included representatives from the New York State Department of Environmental Conservation (NYSDEC) and other regulatory agencies.



LEGEND

ARAR	APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS
DQO	DATA QUALITY OBJECTIVES
FFS/RM	FOCUSED FEASIBILITY STUDY/REMEDIAL MEASURE
RD	REMEDIAL DESIGN
RI/FS	REMEDIAL INVESTIGATION/FEASIBILITY STUDY
WP	WORK PLAN

HAZWRAP
HAZARDOUS WASTE REMEDIAL ACTIONS PROGRAM
DEPARTMENT OF ENERGY MANAGED BY LOCKHEED MARTIN ENERGY SYSTEMS, INC.

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DATE: 08-08-96
FILENAME: HANH008.DGN

Fig. 1-1. Installation Restoration Program Flow Chart, 174th FW, NYANG, Hancock Field, Syracuse, NY.

The ANGRC has requested the support of DOE in a remedial investigation of the Base POL Facility the 174th Fighter Wing (FW), New York Air National Guard (NYANG), at Hancock Field in Syracuse, New York (the Base).

The investigation activities conducted at the Base were determined from the Statement of Work for the investigation and from discussions held in March 1994 with representatives from the ANGRC, NYSDEC and HAZWRAP. An RI Work Plan (WP) and a Sampling and Analysis Plan (SAP) were finalized by Metcalf & Eddy in June 1995. The SAP consists of three parts: (1) the Field Sampling Plan (FSP), (2) the Quality Assurance Project Plan (QAPP), and (3) the site-specific Health and Safety Plan (HSP).

1.2 PURPOSE OF REMEDIAL INVESTIGATION

The purpose of this RI was to define the nature and extent of polychlorinated biphenyl (PCB) and jet fuel-related contamination of the soil and groundwater resulting from past activities at the POL site. Phenol was unexpectedly encountered during the course of investigation, so the investigation was expanded to evaluate potential sources of phenol. The RI obtained sufficient detailed site data to aid in determining the appropriate remedial action.

Section 2

2. INSTALLATION DESCRIPTION AND HISTORY

2.1 FACILITY DESCRIPTION AND HISTORY

2.1.1 Facility Description

Hancock Field, home of the 174th FW of the NYANG, is located approximately 2 miles north-northeast of Syracuse in Onondaga County in central New York, as shown on Fig. 2-1. The 174th FW of the NYANG is bordered to the east and south by the town of Dewitt, to the north by the town of Cicero, to the west by the town of Salina, and to the northeast by Syracuse International Airport. As described in the Management Action Plan (MAP) (Radian 1994), the facility encompasses 359 acres and is situated approximately 415 ft above sea level (see Fig. 2-2).

2.1.2 Facility History

Hancock Field was built in 1942 as a staging area for warplanes during World War II. After the war the 138th Fighter Squadron of the NYANG remained as the only tenant. Between 1946 and 1984 the 138th flew various fighter aircraft (summarized in the MAP). The 174th FW was established in 1984 and incorporated the 138th. Over the last few decades, both the mission and physical size of the Base have been reduced from the initial World War II capacity. Much of the airbase, including the runways, was converted to civilian use as Syracuse Hancock International Airport.

2.2 PETROLEUM, OIL, AND LUBRICANT SITE

2.2.1 Description of the Site

The POL Facility contains seven tanks containing jet propellant within an area of 2½ acres (Fig. 2-3). The site includes one 215,000-gal (Authorized by State of New York to hold no more than 135,000-gal) aboveground storage tank (ID 20001), six 25,000-gal underground storage tanks (ID 021–026), a Jet Fuel Transfer Pump House (Bldg 602), and systems for accepting fuel and delivering fuel to tanks. A portion of each of the six underground tanks is located under the pump building. A pipe from each tank protrudes above the ground surface outside the building and the depth of the fuel in each tank is measured with a large dipstick.

The POL Facility was constructed in 1951 to store petroleum, oil, and lubricant and is currently scheduled to be decommissioned in 1996, when a new POL Facility, presently under construction, will be complete. In 1980 the aboveground tank was put in service.

Most of the unpaved sections of the Base, including portions of the POL area, consist of managed (mowed) lawns. Two swales lead away from the POL area and toward North Branch Ley Creek. They typically have a small amount of water in them and are vegetated with tall grass or related plants. There are no field crops at, or adjacent to, the POL area. Existing large wetlands (Cicero Swamp) are located 2.75 miles to the northeast of the site. No unique or sensitive ecological receptors were identified at the POL area, either during site investigation

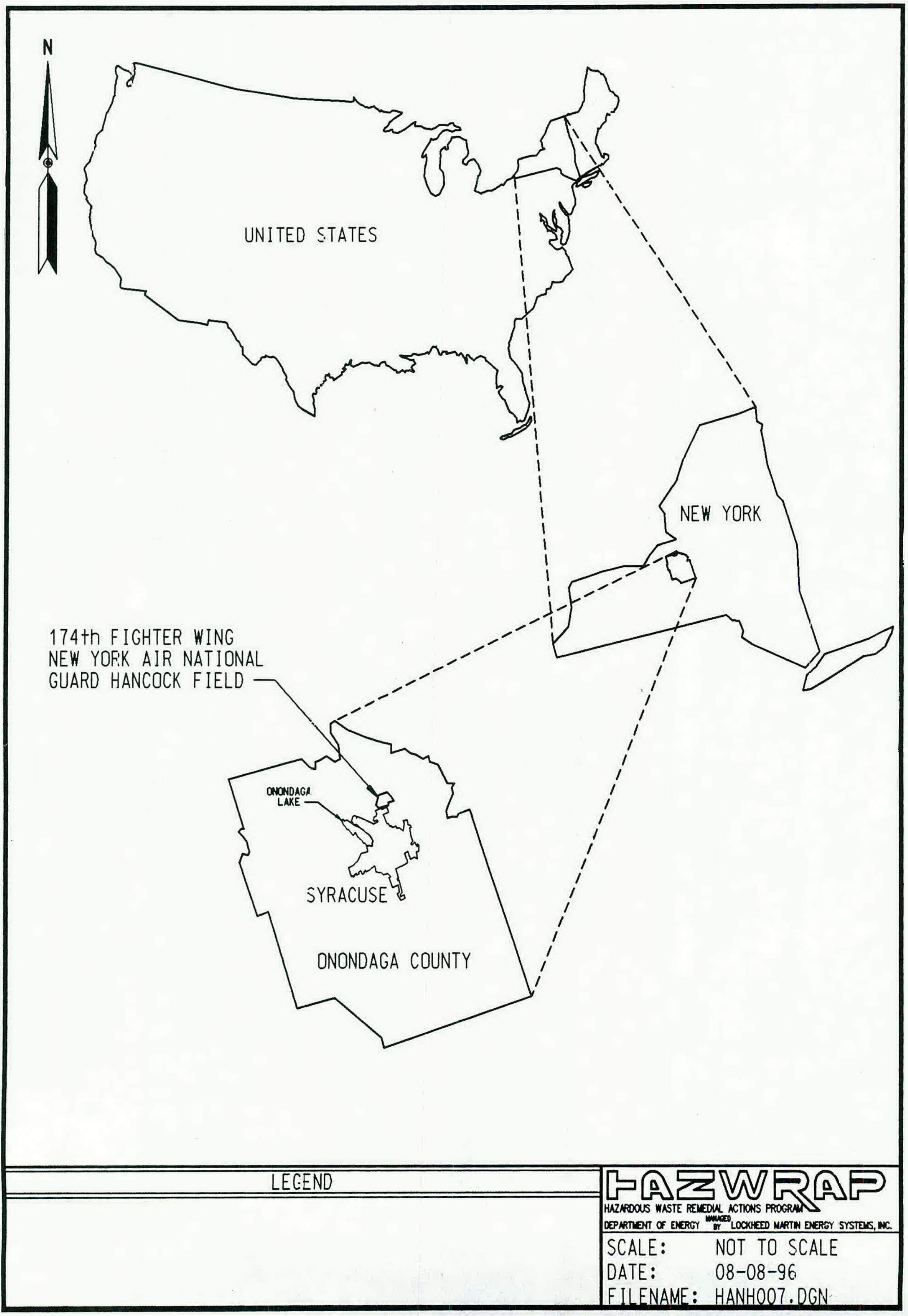


Fig. 2-1. Location of Hancock Field, 174th FW, NYANG, Hancock Field, Syracuse, NY.

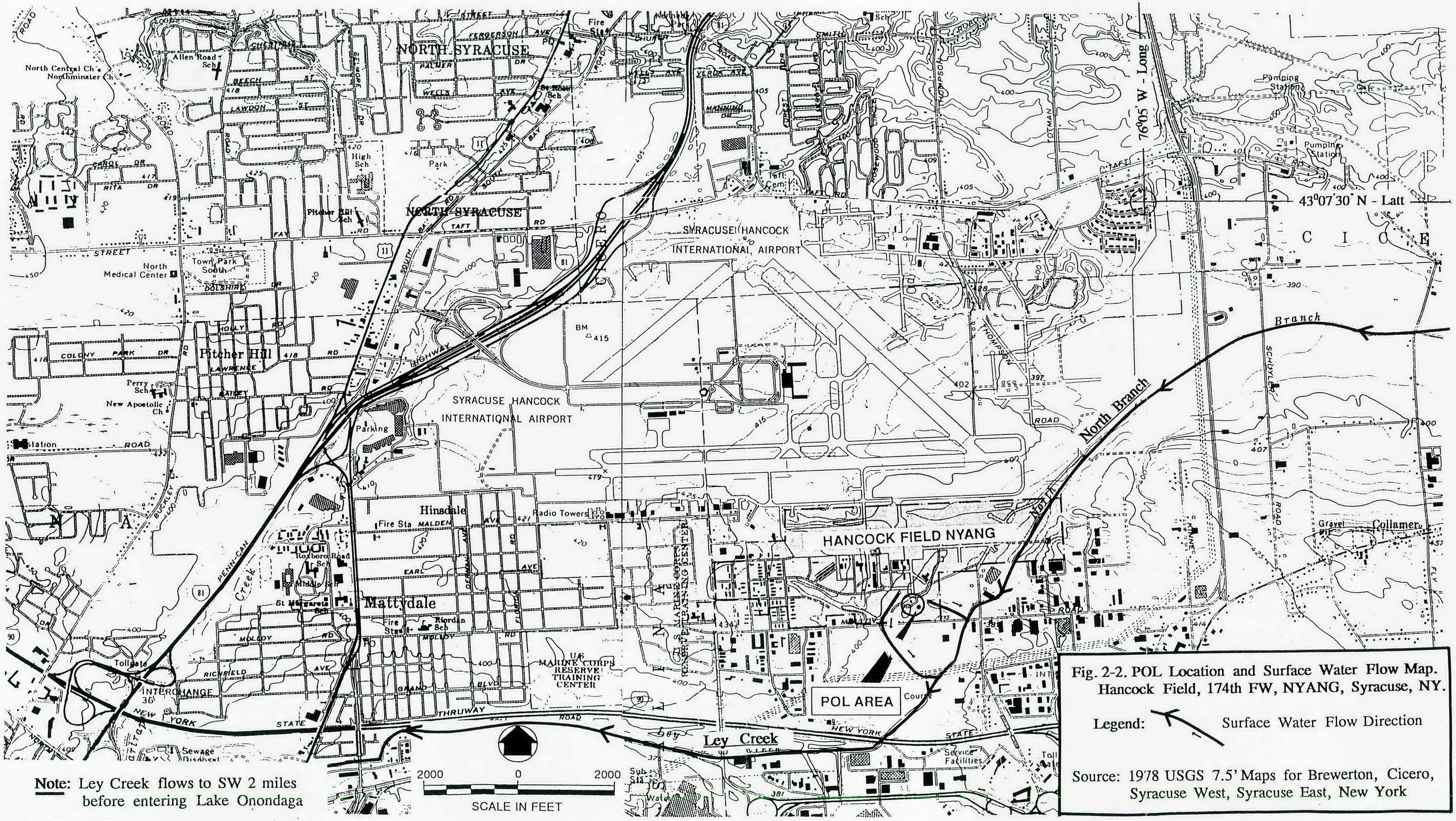


Fig. 2-2. POL Location and Surface Water Flow Map. Hancock Field, 174th FW, NYANG, Syracuse, NY.

Legend: ↖ Surface Water Flow Direction

Source: 1978 USGS 7.5' Maps for Brewerton, Cicero, Syracuse West, Syracuse East, New York

Note: Ley Creek flows to SW 2 miles before entering Lake Onondaga

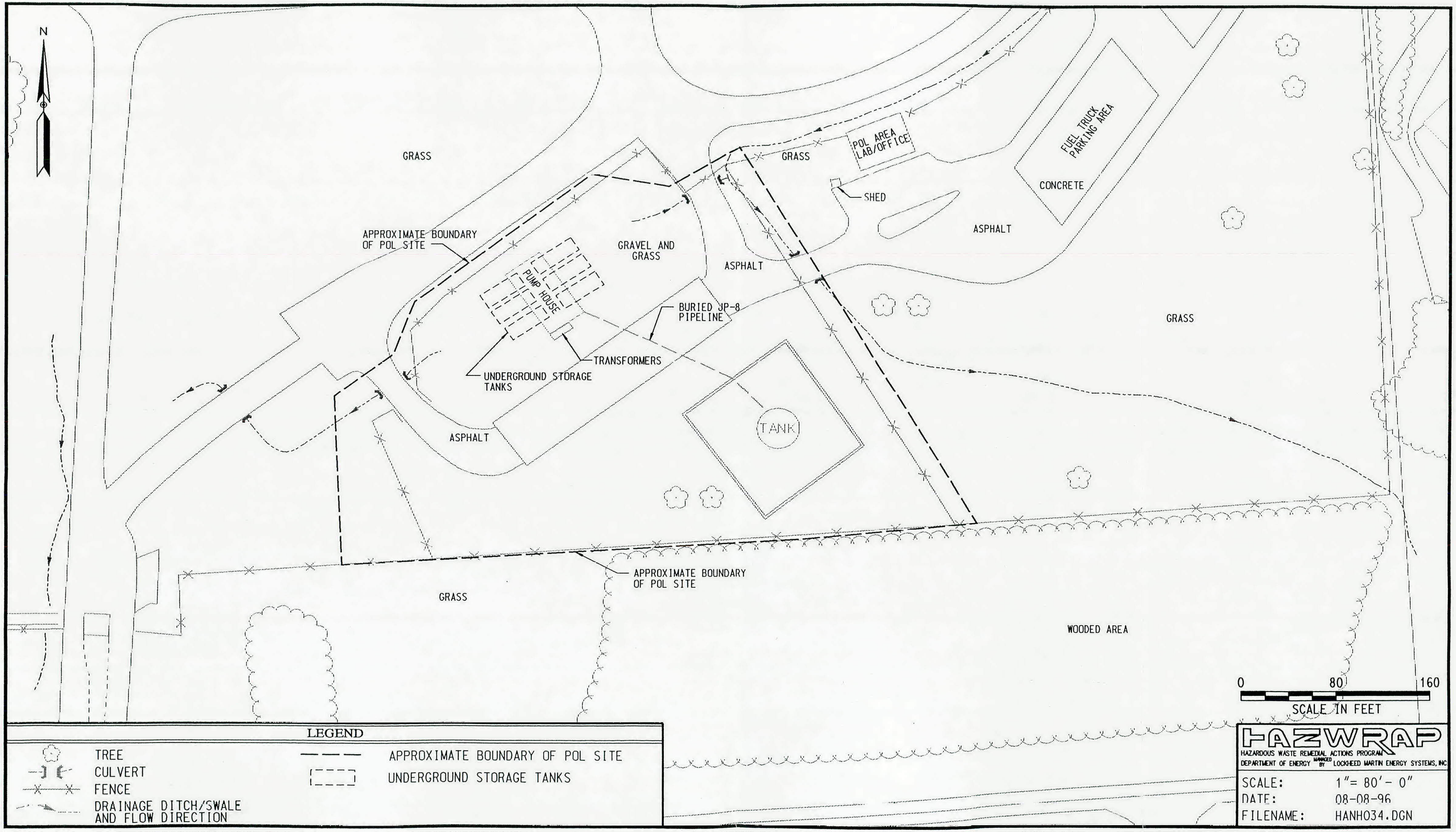


Fig. 2-3. POL Area, 174th FW, NYANG, Hancock Field, Syracuse, NY.

activities or by review of files at NYSDEC (Metcalf & Eddy 1992). The POL area is fenced. Mammals that might be expected in the general area include wolves, rabbits, woodchuck, and deer. Birds that would reasonably frequent the site might include killdeer, crows, robins, starlings, and sparrows. No wetlands animals were noted in the swales (Metcalf & Eddy 1992).

2.2.2 History of Releases at the Site

Three spills have reportedly occurred at the POL site: a release of PCBs before the 1980s; a release of an estimated 2,000 gal of jet fuel in 1990; and a more recent, smaller release of jet fuel in June 1994. All these releases reportedly occurred in the area of the pump house. The first was a release of PCBs, presumably from transformers at the southeast end of the fuel pump house.

DEC Spill numbers (?)

The second was a release of an estimated 2,000 gal of jet propulsion fuel (in this case, JP-4) inside the pump house in early 1990 (NYANG 1990). Some of the released fuel reportedly flowed out the doors of the building. The contaminated surface soils were removed as part of the cleanup response and the area was backfilled with gravel and crushed stone.

Inside the pump house are three drainage sumps containing PCB-contaminated sediment and an oil/water separator (OWS). The contaminated sediment is believed to have collected in the sumps before 1971. The 1990 spilled fuel reportedly entered the sumps and mixed with the PCB-contaminated sediment. The OWS was installed in the 1950s but was not connected to a holding tank; all product entered into a dry well outside the northwest end of the building and eventually drained into the underlying soil.

The third and most recent spill occurred on June 12, 1994. Approximately 150 gal of JP-8 overflowed onto the ground from underground storage tanks located under the northeast side of the building. The fuel was contained with absorbent pads before it was able to exit through the drainage ditch on the east side of the fueling oval.

2.2.3 Past Investigation Activities

The JP-4 spill of 1990 precipitated the installation of four monitoring wells in the area. Four sampling events occurred. One involved groundwater, another pit wipes, another aqueous samples from the pump house sump, and another soil removed from the spill area. Before the 1990 spill, the POL site had not been evaluated in any of the investigations conducted at the Base. The results from this sampling showed soil and groundwater had been contaminated with jet fuel constituents and further investigation was warranted. Consequently, further investigation of the POL site, in the form of an SI, was undertaken in the fall of 1990.

In November and December 1990, PCBs were detected in samples of seepage water taken from inside the pump house and in near-surface soil samples collected from soil borings in the vicinity of the pump house. In the sump, PCB levels as high as 120 ppb for Aroclor-1260 and 15 ppb for Aroclor-1254 were detected. These results suggested PCBs were present beneath the pump house. Results for the near-surface soils ranged from nondetectable to 240,000 ppb for Aroclor-1260. Contamination was greatest at the area immediately south and west of the building. The horizontal and vertical extent of the PCB contamination to the south and east of the pump house was not established, nor was the extent of the PCB-contaminated soil beneath the building determined. Dibutylphthalate was also detected in the soil sampling.

Six additional monitoring wells were installed at the site during the 1990 SI to investigate possible groundwater contamination. The confirmatory study was intended to include sampling groundwater from those ten monitoring wells. Some samples of groundwater, sediment, and sump water revealed the presence of petroleum hydrocarbons consistent with a jet propulsion fuel source. No hydrocarbons were detected in the surface water. Groundwater contamination was greatest [2.3 ppm total petroleum hydrocarbons and 3,020 ppb total for benzene, toluene, ethylbenzene, and xylene (BTEX)] in Metcalf & Eddy monitoring well (MW) MW-06: the monitoring well closest to and downgradient of the southeast side of the pump house. For the SI, the extent of the jet fuel contamination in groundwater was defined and contamination was only detected as far downgradient as MW-02 and MW-03.

The vertical and lateral extent of PCB and jet fuel contamination in the soil was not determined during the SI.

A short-term risk evaluation was performed as part of the SI to determine whether remediation of the site could be postponed until after the POL Facility was decommissioned. Because it would be more practical to remediate the area after decommissioning rather than during active operation, the risk evaluation determined the delay would not result in a significant health risk, provided precautionary measures were taken and periodic sampling was conducted.

In 1992, all six underground storage tanks at the POL Facility and their associated piping were tightness tested by an independent contractor (United Detection Systems 1992). The tanks were volume/pressure tested with nitrogen; all tanks and lines were certified as testing tight.

The presence of jet fuel components in the groundwater at the POL site was confirmed by the confirmatory study conducted in 1994 (Metcalf & Eddy 1995). The current status of each of the ten existing monitoring wells was determined and the horizontal extent of jet fuel contamination established. No additional wells were found to contain jet fuel-related contamination; one of the wells was found to contain a very low concentration of PCBs. Contamination was not found in the most downgradient of the existing monitoring wells.

2.2.4 Remedial Activities Conducted to Date at the Site

Remedial work undertaken to date for the contaminated soils consists of removal of surface soil thought to be contaminated with jet fuel; subsequent backfilling with crushed stone or gravel occurred in 1990. Soil removed from the area of the spill was placed in a pile atop the fire training pad, which was Site FT-1 in the Phase II, Stage 2 report [Science Applications International Corporation (SAIC) 1989].

Section 3

3.2 PHYSIOGRAPHY

Hancock Field and the surrounding area are within the Ontario -Mohawk Lowland Region of the Central Lowland Physiographic Province, which extends from Albany to Buffalo, New York. This province has a relatively flat topography caused by glacial erosion and deposition during the Wisconsin Ice Age. The Ontario -Mohawk Lowland, the Tug Hill, and the Appalachian Upland physiographic regions constitute the Eastern Oswego River Basin, which drains into Lake Ontario. The basin includes almost all Onondaga County and large sections of the surrounding counties. The city of Syracuse lies in the approximate center of the basin and is the industrial and commercial center of this region of New York state.

The area within and around Hancock Field is typical of the Ontario -Mohawk Lowland Region. Dominant geomorphological features are not surficially obvious. Surrounding and within the Base are naturally occurring swamps and poorly drained areas. The original extent of these naturally occurring lowlands has been drastically altered because of on- and off-Base construction activities. Topography across the Base slopes gradually up from 385 feet above mean sea level in the southeast to approximately 425 feet above mean sea level at the west/northwest part of the Base.

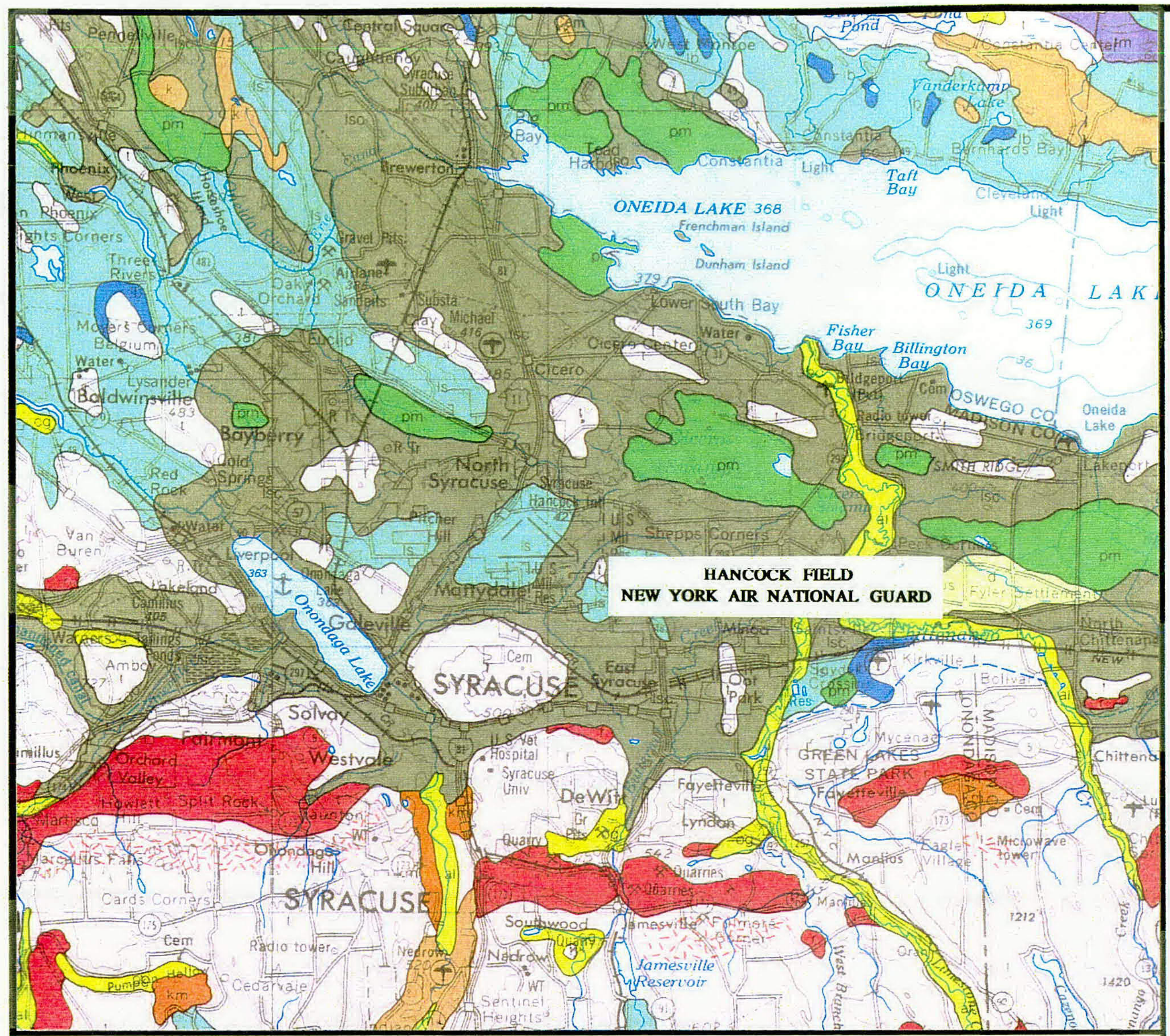
3.3 REGIONAL AND BASE GEOLOGY

3.3.1 Unconsolidated and Consolidated Sediments

The surficial geology of Hancock Field consists of glaciofluvial sediments deposited by glacial meltwaters overlying poorly sorted till deposited directly by the glaciers (Fig. 3-1). The glaciofluvial sediments include silty clays, sands, and gravels, with thicknesses ranging from 45 to 55 ft. The underlying till encountered consists of gravel, cobbles, and boulders entrained in a silty clay matrix and ranges from 30 to 100 ft in thickness.

The sediments in the area were deposited during the late Pleistocene Age by large sheets of glacial ice associated with Wisconsin Glaciation. The sediments were either deposited directly by the ice (i.e., till) or by meltwater streams and lakes (i.e., outwash) associated with continental glaciation. Those sediments that were laid down directly by glacial ice without being reworked by meltwaters include the morainal materials composed of till. Till essentially consists of an unstratified, unsorted, heterogeneous mixture of clay, silt, sand, gravel, and boulders. Two types of till are recognized at Hancock Field: the lodgement till and ablation till. Lodgement till represents the basal till layer, which lies directly on top of the Vernon Formation. Lodgement till is deposited by moving ice and is derived directly from the subglacial load. Lodgement till is compact from being highly compressed, is rich in clay, and is nearly impermeable. This thicker till layer often is overlain by a thinner, sometimes discontinuous, till deposit enriched in coarser materials that were presumably lowered from the glacial and subglacial loads of the glacier by ablation. Ablation till can be distinguished from lodgement till not only by its stratigraphic position, but also by its inherent looseness and lack of a lineated fabric.

The thickness of the till, which was controlled by the now-buried preglaciated landscape, exhibits considerable variation in the Ontario -Mohawk Lowland Region. Thicknesses of 30 ft are considered common, and in some areas the till may be as much as 200 ft thick. At Hancock Field, the combined till thickness appears to be in the 30-to-100-ft range.



LEGEND

MAP SYMBOLS

Contact

Esker

Glacial meltwater channel

2 • Dated radiocarbon locality

N

SCALE 1:250,000

5 0 5 10 15 20 Statute Miles

EXPLANATION

EXPLANATION

🟨 al - **Recent deposits**
Generally confined to floodplains within a valley,
oxidized, non-calcareous, fine sand to gravel,
in larger valleys may be overlain by silt,
subject to frequent flooding, thickness 1-10 meters.

🟨 alf - **alluvial fan**

🟩 pm - **Swamp deposits**
Peat-muck, organic silt and sand in poorly drained areas,
unoxidized,
may be overlying marl and lake silts,
potential land instability,
thickness generally 2-20 meters.

⬜ d - **Dunes**
Fine to medium sand,
well-sorted, stratified,
non-calcareous, unconsolidated,
generally wind-reworked lake sediments,
permeable, well-drained,
thickness variable (1-10 meters).

🟦 lb - **Lacustrine beach**
Generally well-sorted sand and gravel,
stratified, permeable and well-drained,
deposited at a lake shoreline,
generally non-calcareous,
wave-winnowed lag gravel in isolated drumlin localities,
thickness variable (2-10 meters).

🟦 ld - **Lacustrine delta**
Coarse to fine gravel and sand,
stratified, generally well-sorted,
deposited at a lake shoreline,
thickness variable (3-15 meters).

🟫 lsc - **Lacustrine silt and clay**
Generally laminated clay and silt
deposited in proglacial lakes,
generally calcareous,
potential land instability,
thickness variable (up to 50 meters).

🟦 ls - **Lacustrine sand**
Sand deposits associated with large bodies of water,
generally a near-shore deposit or near a sand source,
well-sorted, stratified,
generally quartz sand,
thickness variable (2-20 meters).

🟨 og - **Outwash sand and gravel**
Coarse to fine gravel with sand,
proglacial fluvial deposition,
well-rounded and stratified,
generally finer texture away from ice border,
thickness variable (2-20 meters).

🟧 k - **Kame deposits**
Includes kames, eskers, kame terraces, kame deltas,
coarse to fine gravel and/or sand,
deposition adjacent to ice,
lateral variability in sorting, coarseness and thickness,
locally firmly cemented with calcareous cement,
thickness variable (10-30 meters).

🟧 km - **Kame moraine**
Variable texture (size and sorting) from boulders to sand,
deposition at an ice margin during deglaciation,
locally cemented with calcareous cement,
thickness variable (10-30 meters).

🟪 tm - **Till moraine**
Much like till, but more variable in sorting,
generally more permeable than till,
deposition adjacent to ice,
more variably drained,
may be ablation till,
thickness variable (10-30 meters).

⬜ t - **Till**
Variable texture (e.g. clay, silt-clay, boulder clay),
usually poorly sorted diamict,
deposition beneath glacier ice,
generally calcareous in northern part of map,
relatively impermeable (loamy matrix),
variable clast content - ranging from abundant well-rounded diverse lithologies in valley tills to relatively angular, more limited lithologies in upland tills,
potential land instability on steep slopes,
thickness variable (1-50 meters).

🟥 r - **Bedrock**
Exposed or within 1 meter of surface,
the following types of rock may be exposed:
Paleozoic limestone, sandstone, shale.

▨ **Bedrock stipple overprint**
bedrock may be within 1-3 meters of surface,
may sporadically crop out,
variable mantle of rock debris and glacial till.

HAMH015.DGN

HAZWRAP
HAZARDOUS WASTE REMEDIAL ACTIONS PROGRAM
DEPARTMENT OF ENERGY MANAGED BY LOCKHEED MARTIN ENERGY SYSTEMS, INC.

Fig. 3-1. Surficial Geologic Map of the Syracuse Area, New York.

Throughout the Hancock Field area, till is overlain by glaciofluvial sediments deposited entirely by meltwaters released by the glacier. These meltwaters reworked previously deposited materials and redeposited these materials in lakes and braided streams.

Bedrock is encountered at depths ranging from 75 to 109 ft below land surface and is of the Upper Silurian Vernon Formation (Figs. 3-2 and 3-3). The Vernon Formation is a thinly bedded soft red shale with thin beds of green shale, gypsum, halite, and dolomite. The competence of this unit varies from soft and crumbly to dense and hard. The degree of competence appears to be proportional to the density of fractures in the shale. Major faults have not been identified or mapped within the study area; however, the shale is characterized by solutionally enlarged fractures, joints, and bedding planes.

The outcrop pattern beneath the glacial overburden extends east to west from Rome, New York, to just north of Buffalo, New York. The Vernon Formation attains a maximum thickness of 600 ft at Vernon, New York. Like other units in this region of New York, the Vernon Formation dips gently to the south at approximately 50 ft/mile.

3.3.2 Soils

The principal soils in the area of the Base are the Collamer series, the Colonie series, the Croghan series, the Hilton series, and the Niagara series. A silty loam of the Niagara Series underlies the POL area at the Base. Figure 3-4 shows the geographic distribution of the different types of soils in the Base area. A brief description of each soil type follows.

Collamer Series - The Collamer series consists of deep, moderately well drained, medium-textured silty loam soils on lake plains. These soils formed in stone-free lake-deposited silt and very fine sand that have a moderate content of clay and lime.

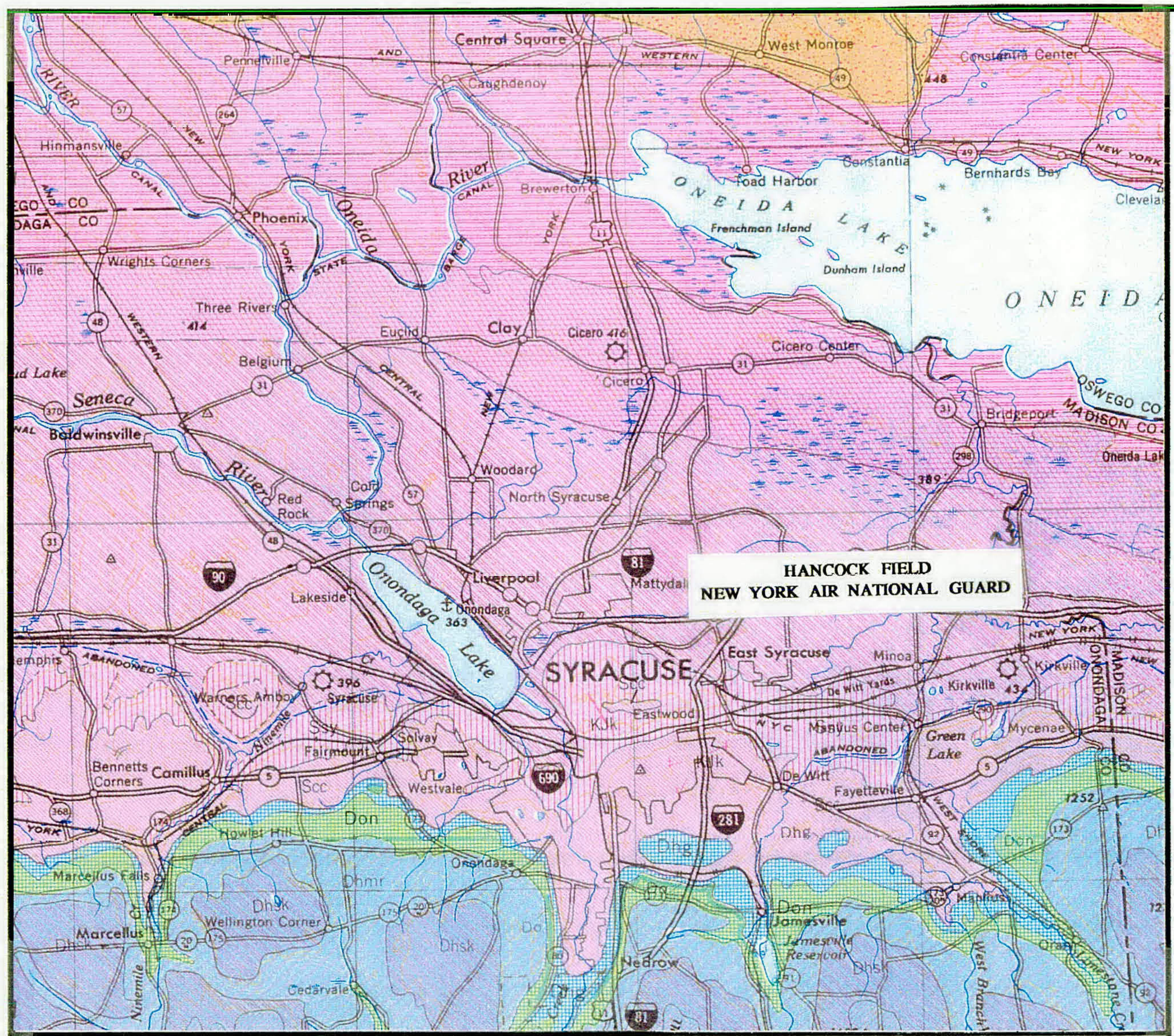
Colonie Series - The Colonie series consists of deep, coarse-textured, well-drained loamy fine sandy soils that formed in sandy lake deposits. These soils are on deltas that formed where sand was dropped from streams entering glacial lakes.

Croghan Series - The Croghan series consists of deep, moderately well drained, coarse-textured loamy fine sandy soils that formed in sand deposits of deltas on the lake plains. These soils are on the tops of broad sand deltas from which water drains slowly.

Hilton Series - The Hilton series consists of deep, moderately well drained, medium-textured, loamy soils that formed in calcareous glacial till derived mainly from sandstone and limestone and some shale. These soils are on uplands from which runoff is somewhat slow or where runoff accumulates to a slight degree.

Niagara Series - The Niagara series consists of deep, somewhat poorly drained, medium-textured silty loam soils that are medium to high in content of lime. These soils formed in relatively stone-free glacial-lake deposits of silt and very fine sand and moderate amounts of clay. They are on moderately low lake plains from which runoff is slow or from which they receive runoff or seepage from adjacent higher lying soils.

Urban Land - Urban land consists of areas so altered or obscured by urban works that identification of the soils is not feasible.



L E G E N D

MAP SYMBOLS

Observed or approximately located contact.

Conjectural contact; includes projections beneath extensive Quaternary cover and many contacts based on reconnaissance mapping.

Hypothetical contact; projection across upmapped area.

Inferred normal fault; hachures on relatively downthrown side.

Thrust or reverse fault, saw teeth on relatively overthrust block.

NOTE: Where the uniformity of lithology and availability of pattern combinations permit, the dominant lithology of a mapping unit is symbolized as follows:

Cross-hatch patterns:
- rhombic grid—dolostones
- rectangular grid—limestones

Line patterns:
- straight—pelitic rocks, shales, shales interbedded with siltstones and sandstones

Stipple patterns:
- regular red—quartz sandstones and quartzites
- random red—non-marine sedimentary rocks

An irregular lower margin on the "color boxes" signifies that the unit has an unconformable relationship with subjacent units, however not necessarily with the next unit listed. Wavy lines signify parallel unconformities; sawtooth lines signify angular unconformities.

Box outlined in red denotes igneous rocks

N

SCALE 1:250,000

5 0 5 10 15 20 Statute Miles

E X P L A N A T I O N

MESOZOIC

Lower Cretaceous

MESOZOIC INTRUSIVES

KJk	Kimberlite and alnoite dikes and diatremes.

PALEOZOIC

Upper Devonian

CONNEAUT GROUP
600-1000 ft. (180-300 m.)

Dct	Germania Formation—shale, sandstone; Whitesville Formation—shale, sandstone; Hinsdale Sandstone; Wellsville Formation—shale, sandstone; Cuba Sandstone.

CANADAWAY GROUP
800-1200 ft. (240-370 m.)

Dcy	Machias Formation—shale, siltstone; Rushford Sandstone; Caneadea, Canisteo, and Hume Shales; Canaseraga Sandstone; South Wales and Dunkirk Shales; In Pennsylvania: Towanda Formation—shale, sandstone.

JAVA GROUP
300-700 ft. (90-210 m.)

Dj	Wiscoy Formation—sandstone, shale; Hanover and Pipe Creek Shales.

WEST FALLS GROUP
1100-1600 ft. (340-490 m.)

Dwn	Nunda Formation—sandstone, shale.
Dwg	West Hill and Gardeau Formations—shale, siltstone; Rorricks Glen Shale; upper Beers Hill Shale; Grimes Siltstone.
Dwr	lower Beers Hill Shale; Dunn Hill, Millport, and Moreland Shales.
Dwc	Nunda Formation—sandstone, shale; West Hill Formation—shale, siltstone; Corning Shale.
Dwnm	"New Milford" Formation—sandstone, shale.
Dwrg	Gardeau Formation—shale, siltstone; Rorricks Glen Shale.
Dws	Slide Mountain Formation—sandstone, shale, conglomerate.
Dwm	Beers Hill Shale; Grimes Siltstone; Dunn Hill, Millport, and Moreland Shales

SONYEA GROUP
200-1000 ft. (60-300 m.)

Ds	In west: Cashaqua and Middlesex Shales. In east: Rye Point Shale; Rock Stream ("Enfield") Siltstone; Pulteney, Sawmill Creek, Johns Creek, and Montour Shales.

GENESEE GROUP AND TULLY LIMESTONE
200-1000 ft. (60-300 m.)

Dg	West River Shale; Genundewa Limestone; Penn Yan and Geneseo Shales; all except Geneseo replaced eastwardly by Ithaca Formation—shale, siltstone and Sherburne Siltstone.
Dgo	Oneonta Formation—shale, sandstone.
Dgu	Unadilla Formation—shale, siltstone.
Dt	Tully Limestone.

Middle Devonian

HAMILTON GROUP
600-1500 ft. (180-460 m.)

Dhmo	Moscow Formation—In west: Windom and Kashong Shales, Menteth Limestone Members; In east: Cooperstown Shale Member, Portland Point Limestone Member.
Dhlc	Ludlowville Formation—In west: Deep Run Shale, Tichenor Limestone, Wanakah and Ledyard Shale Members, Centerfield Limestone Member. In east: King Ferry Shale and other members, Stone Mill Sandstone Member.
Dhsk	Skaneateles Formation—In west: Levanna Shale and Stafford Limestone Members; In east: Butternut, Pompey, and Delphi Station Shale Members, Mottville Sandstone Member.
Dhmr	Marcellus Formation—In west: Oakta Creek Shale Member; In east: Cardiff and Chittenango Shale Members, Cherry Valley Limestone and Union Springs Shale Members.
Dhpm	Panther Mountain Formation—shale, siltstone, sandstone.

PALEOZOIC

Middle Devonian

Shales, Menteth Limestone Members; in east: Cooperstown Shale Member, Portland Point Limestone Member.

Dhld Ludlowville Formation—In west: Deep Run Shale, Tichenor Limestone, Wanakah and Ledyard Shale Members, Centerfield Limestone Member. In east: King Ferry Shale and other members, Stone Mill Sandstone Member.

Dhsk Skaneateles Formation—In west: Levanna Shale and Stafford Limestone Members; In east: Butternut, Pompey, and Delphi Station Shale Members, Mottville Sandstone Member.

Dhmr Marcellus Formation—In west: Oakta Creek Shale Member; In east: Cardiff and Chittenango Shale Members, Cherry Valley Limestone and Union Springs Shale Members.

Dhpm Panther Mountain Formation—shale, siltstone, sandstone.

ONONDAGA LIMESTONE AND ORISKANY SANDSTONE
75-150 ft. (23-45 m.)

Don	Onondaga Limestone—Seneca, Morehouse (cherty) and Nedrow Limestone Members, Edgecliff cherty Limestone Member, local bioherms.
Do	Oriskany Sandstone.

Lower Devonian

HELDERBERG GROUP
0-200 ft. (0-60 m.)

Dhg	Coeymans and Manlius Limestones; Rondout Dolostone.

Upper Silurian

AKRON DOLOSTONE, COBLESKILL LIMESTONE, AND SALINA GROUP
700-1000 ft. (210-300 m.)

Sab	Akron Dolostone; Bertie Formation—dolostone, shale.
Scy	Camillus and Syracuse Formations—shale, dolostone, gypsum, salt.
Scc	Cobleskill Limestone; Bertie and Camillus Formations—dolostone, shale.
Ssy	Syracuse Formation—dolostone, shale, gypsum, salt.
Sv	Vernon Formation—shale, dolostone.

LOCKPORT GROUP
80-175 ft. (25-55 m.)

Sl	Oak Orchard and Penfield Dolostones, both replaced eastwardly by Sconondoa Formation—limestone, dolostone.

Lower Silurian

CLINTON GROUP
150-325 ft. (40-100 m.)

Sr	Decew Dolostone; Rochester Shale.
Sik	Irondequoit Limestone; Williamson Shale; Wolcott Furnace Hematite; Wolcott Limestone; Sodus Shale; Bear Creek Shale; Wallington Limestone; Furnaceville Hematite; Maplewood Shale; Kodak Sandstone.
Scl	Herkimer Sandstone; Kirkland Hematite; Willowvale Shale; Westmoreland Hematite; Sauquoit Formation—sandstone, shale; Oneida Conglomerate.

MEDINA GROUP AND QUEENSTON FORMATION
0-900 ft. (0-270 m.)

Sm	Medina Group: Grimbsy Formation—sandstone, shale.
Oq	Queenston Formation—shale, siltstone.
SmOq	Undifferentiated Medina Group and Queenston Formation.

Upper Ordovician

LORRAINE GROUP
700-900 ft. (210-270 m.)

Os	Oswego Sandstone.
Opw	Pulaski and Whetstone Gulf Formations—siltstone, shale.

Middle Ordovician

TRENTON GROUP
100-300 ft. (30-90 m.)

Ou	Utica Shale.

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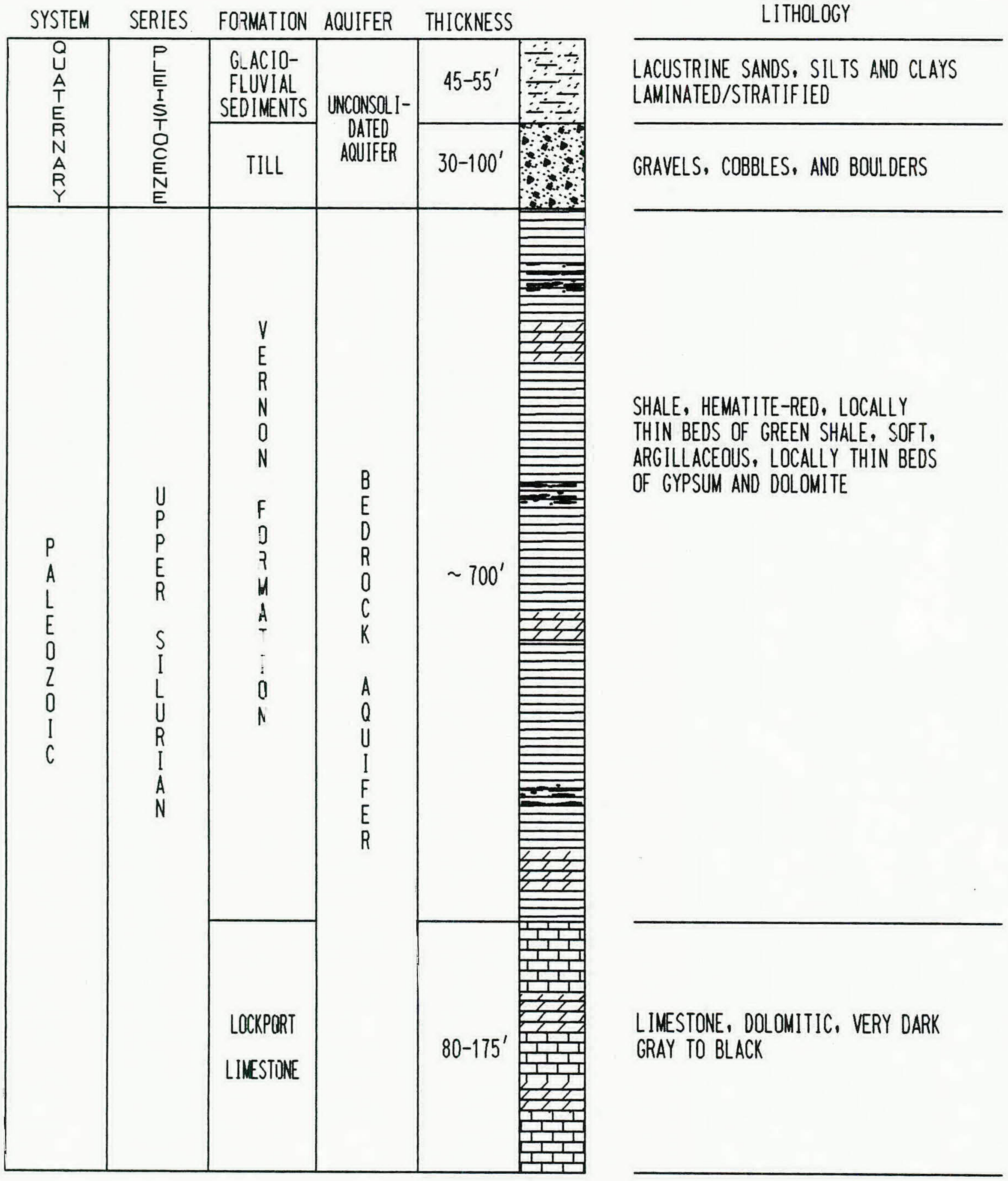
Fig. 3-2. Geologic Map of the Syracuse Area, New York.



SYSTEM	SERIES	FORMATION	AQUIFER	THICKNESS	LITHOLOGY
QUATERNARY	PLEISTOCENE	GLACIO-FLUVIAL SEDIMENTS	UNCONSOLIDATED AQUIFER	45-55′	LACUSTRINE SANDS, SILTS AND CLAYS LAMINATED/STRATIFIED
		TILL		30-100′	GRAVELS, COBBLES, AND BOULDERS
PALEOZOIC	UPPER SILURIAN	VERNON FORMATION	BEDROCK AQUIFER	~ 700′	SHALE, HEMATITE-RED, LOCALLY THIN BEDS OF GREEN SHALE, SOFT, ARGILLACEOUS, LOCALLY THIN BEDS OF GYPSUM AND DOLOMITE
		LOCKPORT LIMESTONE		80-175′	LIMESTONE, DOLOMITIC, VERY DARK GRAY TO BLACK

LEGEND

▤	SHALE	▦	LIMESTONE
▤	GYPSUM	▨	DOLOMITE
░	SAND	▓	GRAVELS, COBBLES AND BOULDERS
░	CLAYEY SILT		

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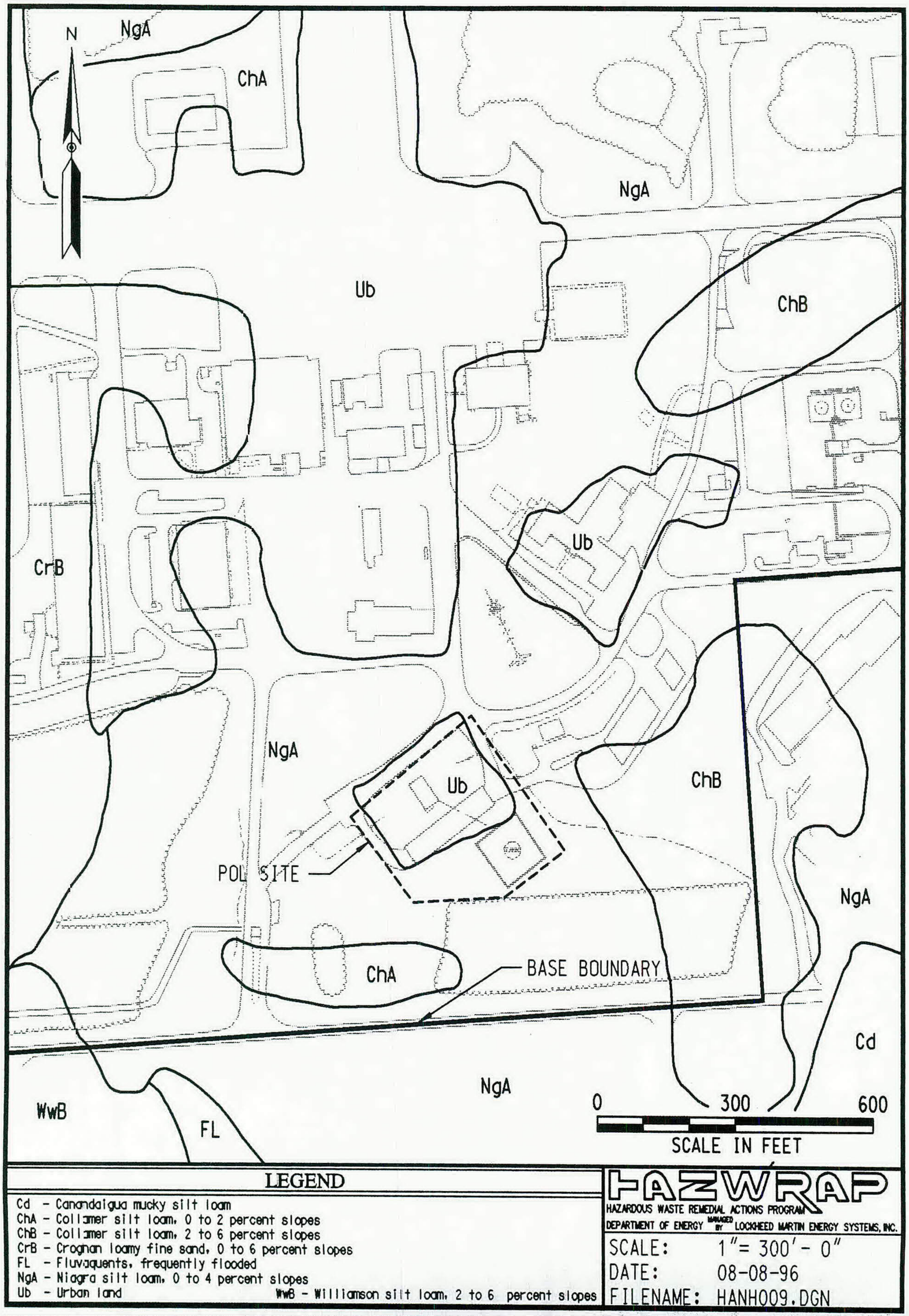
Fig. 3-3. Stratigraphic Column for the Hancock Field Area, Syracuse, New York.



LEGEND

Cd - Canandaigua mucky silt loam
ChA - Collamer silt loam, 0 to 2 percent slopes
ChB - Collamer silt loam, 2 to 6 percent slopes
CrB - Crognan loamy fine sand, 0 to 6 percent slopes
FL - Fluvaquents, frequently flooded
NgA - Niagra silt loam, 0 to 4 percent slopes
Ub - Urban land
WwB - Williamson silt loam, 2 to 6 percent slopes

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Fig. 3-4. Soils Map of the Hancock Field Area, 174th FW, NYANG, Hancock Field, Syracuse, NY.

3.4 HYDROLOGY

3.4.1 Surface Water

The surface water flow at Hancock Field has been drastically altered by construction activities. Figure 2-2 shows the surface water flow from the Base and Figure 2-3 shows the surface drainage at the POL area. Two drainage ditches conduct surface water runoff from the POL Facility in a southeasterly direction to North Branch (Ley Creek). North Branch (Ley Creek) is designated as a protected stream by NYSDEC and is 1300 ft southeast of the fuel pump house at the POL Facility. North Branch changes name to Ley Creek and flows approximately 4.1 miles to the west and southwest before entering Lake Onondaga.

3.4.2 Groundwater

Hancock Field lies within the Glaciated Central Groundwater Region. The area consists of a thick glacial covermass atop a thick unit of fractured shale (Vernon Formation). Wells screened within the shale reportedly yield as much as 300 gpm, although the average is only 25 gpm. These wide ranges in yield are caused by varying degrees of solutioning and infilling of openings with fines. Depending on grain size and degree of sorting, the unconsolidated glacial deposits can yield anywhere from less than 1 gpm to more than 500 gpm. Hydraulic conductivities for the dominant aquifers can range from 5 to 1,000 ft/day. The principal aquifers in the study area include portions of the Vernon Formation that possess a large number of fractures and joints and overlying well-sorted, fairly homogeneous glacial deposits consisting of sand and gravel.

Because of the nature of the lithology, the Vernon Formation is not particularly transmissive and does not contain large volumes of accessible water. Groundwater movement and storage is achieved through localized fractures and bedding planes and is enhanced as a consequence of solutional widening of existing fractures and joints in dolomite- and gypsum-rich intervals. Although the Vernon Formation has potential as a viable groundwater aquifer, the water quality is poor; it contains large concentrations of dissolved solids, salts, and/or sulfate and may be very hard. The water typically is used only for cooling, fire protection, sanitation, and some agricultural purposes; it is not for drinking.

Much of the groundwater stored within the Vernon Shale is under confining conditions because of a regionally continuous basal till layer that acts as a confining layer. Recharge of the shale is accomplished via the downward migration of groundwater from overlying glacial deposits where till is absent and/or direct infiltration at outcrops. By nature, these deposits are characterized by low effective porosities, low hydraulic conductivities (i.e., less than 10^{-7} ft/day), and low specific yields. Only small quantities of groundwater can be withdrawn from these units—enough perhaps for individual domestic wells. In the case of tills, rarely can more than 3 gpm be obtained.

The only glacial deposits that contain significant amounts of groundwater are the well-sorted homogeneous sands and gravels. In areas where these deposits are laterally extensive and readily recharged, large quantities of groundwater are available. These deposits are found mainly in the valleys and in scattered deposits in the lowlands. Groundwater within the sands and gravels is often under artesian conditions when overlying confining units are present. Groundwater in the vicinity of Hancock Field exists in both the glaciofluvial sediments and the Vernon Shale but not in the low-permeability till. The surficial (glaciofluvial) aquifer is low yielding and the groundwater is high in iron, calcium, and magnesium and is quite hard. Water in the bedrock aquifer exists under artesian conditions and is high in sulfate, chloride, and total dissolved solids (TDS). Water supplies in the vicinity of Hancock Field consist exclusively of surface water; therefore, neither aquifer is a source of drinking water.

Water levels have been measured from 5 to 11 ft below the ground surface at Hancock Field. The groundwater occurs under unconfined conditions, although the potential for partially confined conditions exist. Regional groundwater flow is to the south and southeast towards Ley Creek. Low hydraulic conductivities and gradients indicated low linear groundwater flow velocities on the order of 3 to 40 ft/year (Metcalf & Eddy 1992).

3.4.3 Background Water Quality

The natural quality of groundwater is generally poor across the middle of the Central New York Region. This natural condition results primarily from the presence of salt and gypsum within the shale units. Water flowing through and along the upper surfaces of these units has dissolved the salt and gypsum deposits in the fractures and joints, which results in the high sulfate, chloride, and TDS content of the water. At Hancock Field, the Vernon Shale that comprises the bedrock aquifer possesses the poorest quality (highly mineralized) groundwater in the region. TDS range from 1,560 to more than 34,000 mg/L; hardness ranges from 490 to 5,050 mg/L, sulfate ranges from 439 to 3,510 mg/L; and chloride ranges from 3.6 to 21,200 mg/L.

The upgradient drainage areas around Hancock Field that contribute to Ley Creek vary from open land to industrialized or urbanized areas, and the surface water and sediment quality of the streams entering Hancock Field vary accordingly. However, the only constituents that historically have been measured at levels above water quality criteria are iron and manganese, which are considered to be the result of the local geology.

3.5 WATER USE SURVEY

The Air National Guard Base is supplied water by the Onondaga County Water Authority. The county office does not have records of individual private drinking water wells within a 1-mile radius of the Base. Because of the availability of public water lines, it is assumed that all residences are served by the public water supply.

3.6 THREATENED AND ENDANGERED SPECIES AND CRITICAL HABITATS

The NYSDEC Conservation Wildlife Resources Center reviewed their New York Natural Heritage Program files with respect to the presence of rare animals, plants, and natural communities and/or significant wildlife habitats within 4 miles of the City of Syracuse, Onondaga County, New York State. Table 3-2 lists these rare animals, plants, and natural communities and/or significant wildlife habitats.

There are four state-listed communities within 4 miles of Syracuse: a bog, a swamp, a marsh, and a pond. These communities are unprotected because the State of New York does not define categories for communities. There are two animal species (reptiles) listed by the state as endangered (bog Turtle and Massasauga) and one animal species (the Black Tern) that is protected by the state. In addition there are 6 plant species within 4 miles of Syracuse that are listed by the state as rare, exploitary vulnerable, or threatened (see Table 3-2).

Table 3-2. Endangered, Threatened, Rare Species, High-quality Natural Communities and Natural Areas Within a 4-mile Radius of Hancock Field, Syracuse, New York

Town (USGS topographic map)	Last seen	Scientific common name	Element type	New York status
Cicero Cicero	1992	Black Spruce-Tamarack Bog Black Spruce-Tamarack Bog	Community	Unprotected
Cicero Cicero	1992	Silver Maple-Ash Swamp Silver Maple-Ash Swamp	Community	Unprotected
Cicero Cicero	1950	Clemmys Muhlenbergii Bog Turtle	Reptile	Endangered
Cicero Cicero	1992	Sistrurus Catenatus Catenatus Massasauga	Reptile	Endangered
Cicero Cicero	1992	Carex Seorsa Weak Stellate Sedge	Vascular Plant	Rare
Cicero Cicero	1992	Liparis Lilifolia Large Twayblade	Vascular Plant	Rare
Cicero Cicero	1991	Listera Australis Southern Twayblade	Vascular Plant	Rare
Cicero Cicero	1923	Scheuchzeria Palustris Pod Grass	Vascular Plant	Unprotected
City of Syracuse Syracuse East	1905	Calypso Bulbosa Calypso	Vascular Plant	Exploitably Vulnerable
City of Syracuse Syracuse East	1902	Valeriana Sitchensis Uliginosa Marsh Valerian	Vascular Plant	Threatened
Clay, Cicero Brewerton	1956	Childonias Niger Black Tern	Bird	Protected Special Concern
Salina Syracuse West	1980	Inland Salt Marsh Inland Salt Marsh	Community	Unprotected
Salina Syracuse West	1980	Inland Salt Pond Inland Salt Pond	Community	Unprotected

Section 4

4. FIELD PROGRAM

X

4.1 SUMMARY

Field effort was divided into two phases. The first phase was conducted in August 1995. The purpose of this effort was to characterize the extent of jet fuel contamination and PCB contamination. During this effort, phenol was detected at anomalously high values. Because phenol was detected, a second field effort was planned and performed in June 1996. The first field program consisted of three stages: screening activities, confirmation sampling, and geologic and hydrogeologic measurements. The second field program collected confirmation sampling at preselected locations. The locations of all screening and confirmation samples are shown on Figs. 4-1 and 4-2.

Screening activities included photoionization detector (PID) screening of soils for total volatile organic compounds (VOCs); field gas chromatograph (GC) screening of both soil and groundwater for benzene, toluene, ethylbenzene, and total xylenes (BTEX); and screening of soil samples for PCB compounds with immunoassay test kits. Soils were sampled for screening using Geoprobes and hand augers.

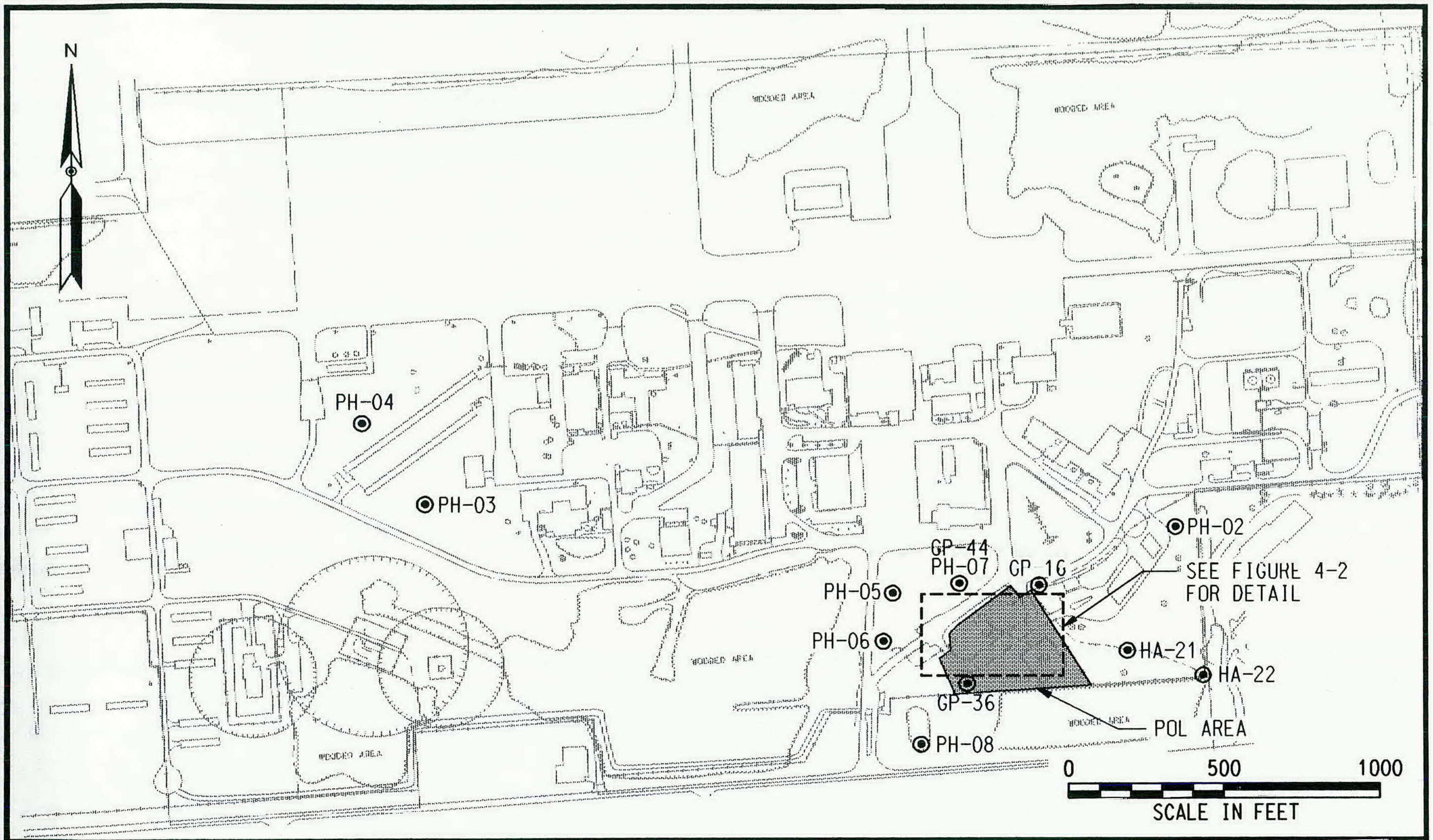
Confirmation activities were performed to verify and expand the field screening data. These activities included collecting soil samples by Geoprobe and subsequent laboratory analysis, installing monitoring wells, and sampling and analysis of groundwater. Some parameters such as total organic carbon (TOC) and metals were collected to obtain parameters for remediation purposes.

Geologic and hydrogeologic observations and measurements were collected to obtain information on soil properties and groundwater flow characteristics. These activities included soil characterization, groundwater elevation measurements, aquifer testing to determine hydraulic conductivities, and a location survey.

4.2 DEVIATIONS FROM THE WORK PLAN

During the performance of field activities, any changes enacted were documented by Field Change Request Forms. These are provided in Appendix A. Summarized below are the major changes.

- Samples taken for characterization of fuel spills were not analyzed for PCBs except in the area known to be contaminated with PCBs.
- Because the surface integrity of MW-6 had been compromised, it was not sampled and an alternate well was installed.
- Two deep monitoring wells were installed: one paired with the replacement well for MW-6, (MW-6S) and one paired with MW-12S.



LEGEND

PH-02 to 08 ◉	GEO-PROBE PHENOL SAMPLING LOCATIONS	GP-16,36 ◉	GEOPROBE FIELD SCREENING LOCATIONS
HA-21,22 ◉	HAND AUGER VOC, SVOC SAMPLING LOCATIONS	GP-44 ◉	GEOPROBE BACKGROUND VOC, SVOC LOCATION

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Fig. 4-1. Basewide and POL Area Sampling Locations, 174th FW, NYANG, Hancock Field, Syracuse, NY.

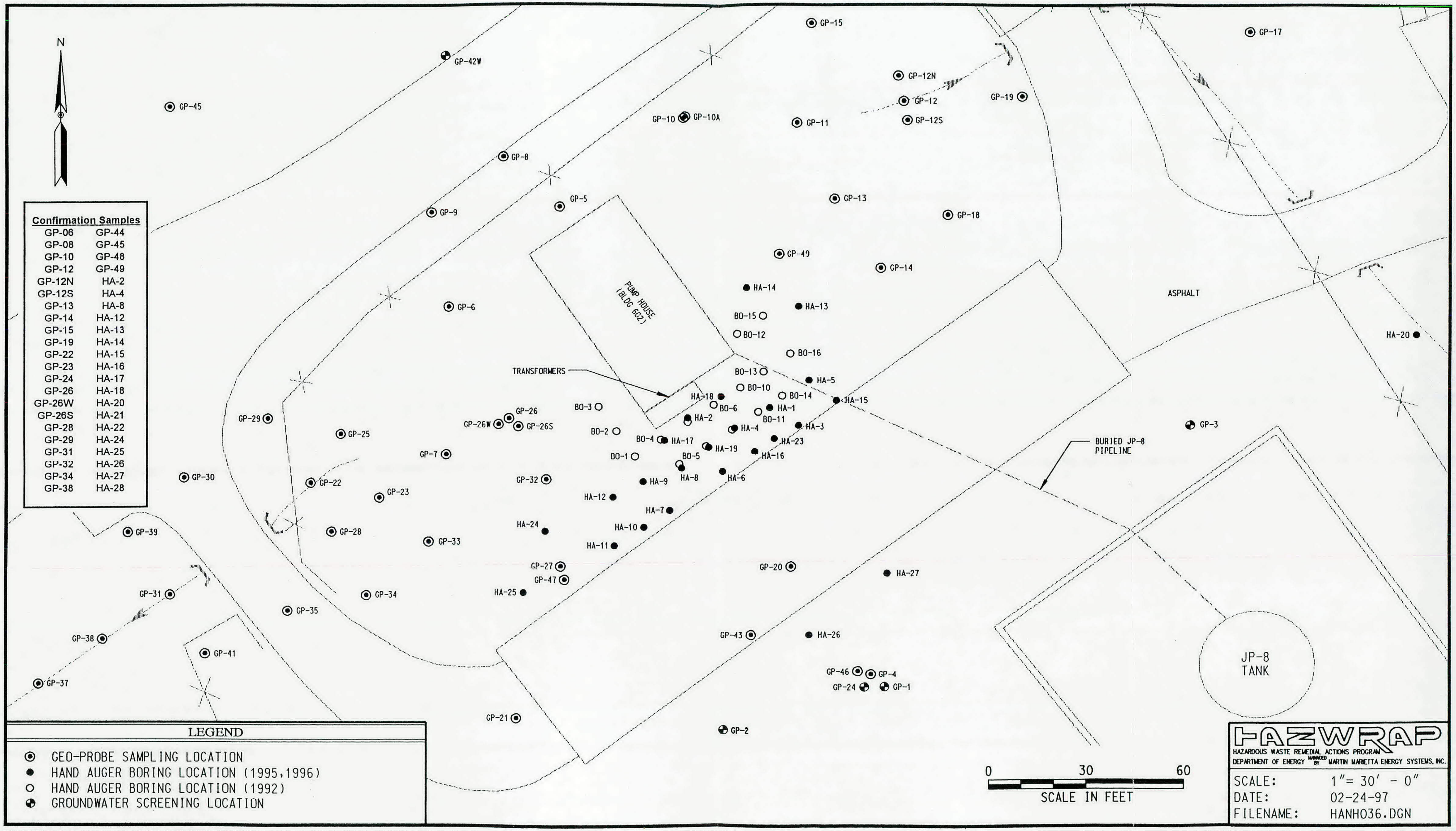


Fig. 4-2. POL Area Field Screening and Confirmation Sampling Locations, 124th FW, NYANG, Hancock Field, Syracuse, NY.

4.3 FIELD PROCEDURES

4.3.1 Operation of the Geoprobe System

The Geoprobe, which is a hydraulically powered percussion/probing machine, was used at the POL site to collect screening and confirmation soil samples and groundwater screening samples.

Both screening and confirmation soil samples were collected at the POL site using the Geoprobe large-bore sampler [2 ft in length and 1⅛ in. inside diameter (I.D.)]. The sampler was equipped with polytetrafluoroethylene (PTFE) (Teflon) or stainless steel liners. PTFE liners were used for screening soil samples and stainless steel liners were used for the confirmation soil samples. The sampler was pushed to the top of the desired sampling interval using the Geoprobe. The stop-pin was removed and the sampler advanced an additional 2 ft to core the soil sample. The sampler was then removed from the boring and the liner was retracted from the sampler. The sample in each end of the liner was screened with a PID. The liner was capped with Teflon tape and plastic end caps; marked as to sample number, analysis, and depth; sealed in a zip-lock bag, and placed in a cooler with ice. The sample was submitted to either the field analytical laboratory or a fixed-base laboratory.

Groundwater screening samples were collected using the Geoprobe screen point sampler. The 1-in. sampler was driven to depth, the screen opened, and a water sample collected via a tubing system. The 19-in. screen was encased in a perforated stainless steel sleeve. The screen section remained totally enclosed in the sheath until it was pushed out into the formation at the desired depth. The water sample was collected using Teflon tubing with a bottom check valve and a peristaltic pump.

4.3.2 Collection of Soil Samples Using a Hand Auger

Site conditions in the area in front of the southeast side of the pump house prevented the use of the Geoprobe to collect soil samples. These conditions included aboveground piping and other obstacles and numerous underground utilities. The location of underground utilities in this area was poorly documented, and the utilities could not be located using piping detection equipment. In this area, hand augering to collect soil samples was performed. Either 2¼-in.- or 3¼-in.-diam by 10-in.-long stainless steel soil recovery auger buckets were used. Because the soil samples were being composited, auger liners were not used. The auger could collect an approximately 6-in. soil sample per pass. The soil samples were extruded from the auger bucket and placed in a stainless steel bowl. The soil sample was then composited with a stainless steel spoon and transferred to glass jars.

4.3.3 Operation of the Field Gas Chromatograph

A GC equipped with a purge and trap system and an argon ionization detector (AID) was set up in the POL laboratory in Building 626 adjacent to the POL Facility. This GC was used to field screen soil samples for BTEX (benzene, toluene, ethylbenzene, and the isomers ortho-, meta-, and para- xylene). These analytes were used as indicators of petroleum hydrocarbon contamination.

A Sentex Sentograph Plus II™ GC was used for analysis of target compounds. The GC was equipped with a 30-m VOCOL ™ megabore column, an AID, and a purge and trap sample injection system. The GC was setup as follows:

- oven temperature, 55° C;
- purge gas flow rate, 76 mL/min;
- carrier gas pressure, 8 psi; and
- retention time window, ± 2–3%.

Samples were analyzed isothermally with a 30-min analytical run time. Check standards were analyzed to verify GC performance. Because of the volatile nature of the working standard, the initial multipoint calibration curve was used for calculating average response factors.

All calibration standards were made by diluting certified BTEX stock standards. A linear, three-point standard calibration was prepared for each analyte. An average response factor was calculated for each analyte by averaging the three response factors used for the three-point calibration.

Soil and groundwater samples were collected using the Geoprobe system. The sample liners were sealed with Teflon tape and plastic caps and placed in zip-lock bags. The samples were stored in a refrigerator located in the POL laboratory until analyzed. Water samples were collected in 40-mL volatile organic analysis (VOA) vials and stored in the POL refrigerator until analyzed. Samples were usually analyzed on the same day that they were collected.

Samples were analyzed under the same chromatographic conditions as the standards. The POL laboratory in Building 626 was used to prepare and analyze the samples. Soil samples were prepared by cutting the acetate liner in half with a clean stainless steel knife and taking soil from the center of the liner. The soil sample was weighed and 4 to 5 g placed into a VOA vial. If the sample was highly contaminated (as determined by a field PID reading >150 ppm and obvious petroleum odors), the sample was prepared in duplicate and the sample weight was reduced to 0.2 to 0.3 g. Deionized water was added to bring the total volume of soil and water to 20 mL. The VOA was shaken to disaggregate the soil and produce a suspension. The samples were set aside for 5 to 10 min to settle, then the headspace was tested with the PID. If the headspace concentration was greater than 200 ppm, the sample was not tested with the GC to avoid overloading the GC column and detector.

4.3.4 Use of the Field Immunoassay Kit To Screen for Polychlorinated Biphenyls

Millipore EnviroGard enzyme-controlled immunoassay test kits were used in the field to screen the soil samples for PCBs. These field kits provide real-time, semiquantitative screening results. The immunoassay field kit is sensitive to the following Aroclor compounds: 1016, 1242, 1248, 1254, and 1260 with 95% confidence against false negative responses. A sample of the composited soil sample was placed (using a stainless steel spoon) into a 40-mL VOA vial and the vial was carried to the field laboratory, where it was placed in a refrigerator until analyzed.

The immunoassay field laboratory was set up in the POL laboratory in Building 626 at the POL area. The immunoassay field kit required the following equipment for field analysis: soil extraction bottle kit, soil field laboratory, methanol, and water. The test procedure involved an extraction step of a 5-g aliquot of the soil sample (from the 40-mL VOA vial) using 5 to 10 mL of methanol then adding the extract to a conjugate solution in an antibody-coated test tube. After a 15-min incubation period (during which the PCB compounds link to the antibody coating in the test tubes), the tubes were emptied and rinsed with water then filled with a color-developing solution. After 2 min, the color density of the solution was measured using the diffraction photometer. The measured color density is inversely proportional to the concentration of the antigen compounds (PCBs) in the soil sample.

The optical density readings from the test tubes are compared to the calibration curve developed from the calibration standards (which are run concurrently with the samples). The calibration standards provided with the immunoassay field kit included 1, 5, 10, and 50 ppm Aroclors. Interpolating between the interior calibrator points was performed by multiplying the sample optical density readings by the appropriate calibrator range factor then adding or subtracting from the calibrator concentration. Extrapolating beyond the end points (1 ppm and 50 ppm) was performed by comparing the slopes of the calibrator data in the bracketed intervals and multiplying the change in slope between the center interval and the end intervals. This serves to extend the apparent trend of the calibration curve data beyond the calibrator end points.

4.3.5 Decontamination Procedures

The Geoprobe rods and the large-bore sampler used to collect the screening soil samples for BTEX were collected using the following procedure:

- scrub with a brush in potable water with Liquinox,
- steam rinse with potable water, and
- air dry.

The sampling equipment used to collect the confirmation soil samples for VOCs and semivolatile organic compounds (SVOCs), all screening and confirmation PCB samples, and all groundwater sampling equipment was decontaminated using the following procedure:

- scrub with a brush in potable water with Liquinox,
- steam rinse with potable water,
- deionized water rinse,
- hexane rinse,
- methanol rinse, and
- air dry.

4.4 SCREENING ACTIVITIES

4.4.1 Screening for Benzene, Toluene, Ethylbenzene, and Xylenes in Soil

Soil samples were collected using the Geoprobe large-bore sampler using PTFE liners. The soil sample on each end of the liner was screened with a PID. If the PID reading was less than 1000 ppm, the sample was submitted to the field GC laboratory for analysis. To avoid overloading the GC column and detector, soil samples with PID readings over 1000 ppm were not analyzed. The high PID readings indicated the soil samples contained significant hydrocarbon contamination and did not need analytical verification.

Both vertical and lateral screening soil samples were collected. Initially vertical soil screening samples were collected at various locations to determine the depth of contamination. Beginning at a depth of 1 ft and continuing to a depth of 9 ft, vertical (2-ft) soil screening samples were continuously collected. These soil samples were analyzed for BTEX using the field GC. The results of this vertical soil profiling determined the sampling depth of the lateral soil delineation samples.

Lateral soil screening samples were collected with the Geoprobe and analyzed with the field GC. The number and location of soil screening samples were sufficient to delineate the lateral extent of soil contamination at the site. The vertical soil profiles determined the sampling interval for the lateral delineation soil samples. The soil samples were screened olfactorily and with a PID; if hydrocarbons were detected by either of these means, an additional deeper soil sample was collected.

4.4.2 Screening for Polychlorinated Biphenyls in Soil

Soil samples were collected in front of the southeast side of the pump house at the POL site and analyzed in the field using an EnSys® Immunoassay test kit. This work was conducted to define the vertical and lateral extent of the PCB-contaminated soil in this area. The number of underground utilities in front of the pumphouse prevented the use of the Geoprobe immediately in front of the building. Because of this, it was necessary to collect soil samples by hand augering, using a 2 1/4" or 3 1/4" diameter by 10" long stainless steel auger recovery bucket for sample collection. The soil sample was transferred to a 40-mL VOA vial; marked as to sample number, depth, and analysis needed; and submitted to the field laboratory. The samples were analyzed for PCBs using an EnSys® Immunoassay test kit. The selection of samples screened by the immunoassay kits for lab analysis was based on the NYSDEC soil criteria for PCBs. A cutoff limit was applied whenever the samples indicated results below 10,000 μg/kg for subsurface soils and below 1,000 μg/kg for surficial soils. The field analytical data were periodically reviewed, and additional sampling was conducted until the lateral and vertical limits of the PCB-contaminated soil were defined. Soil samples were only collected to a depth of 10 ft to avoid dragging PCB-contaminated material to the water table.

4.4.3 Groundwater Screening

4.4.3.1 Vertical Groundwater Screening for Benzene, Toluene, Ethylbenzene, and Xylenes

Several two well clusters were drilled at the POL site to define the vertical extent of the groundwater contamination. To determine the screen depth intervals for these well clusters, vertical groundwater screening was conducted. The Geoprobe screen point sampler was used to collect groundwater samples at various depths. Groundwater samples were collected at discrete depths after purging 1 gal, 2 gal, and 3 gal of groundwater.

4.4.3.2 Lateral Groundwater Screening for Benzene, Toluene, Ethylbenzene, and Xylenes

To determine whether the groundwater contaminant plume had migrated to the farthest downgradient wells, these wells were sampled and analyzed with the field GC. In addition, one upgradient groundwater screening point was installed across the road northwest of the pump house with the Geoprobe.

4.5 CONFIRMATION ACTIVITIES

4.5.1 Soil Sampling

Field screening was used to select locations for taking confirmation samples. Two-foot stainless steel liners were used to collect confirmation soil samples. The liners were capped with Teflon tape and a plastic cap, sealed in a zip-lock bag, and shipped in coolers to Pace Environmental Laboratories for analysis. Soil samples were submitted to the laboratory for analysis for VOCs and SVOCs by Contract Laboratory Program (CLP) methods (EPA 1993). Because of the high phenol occurrence at the site, selected locations were chosen to evaluate its potential source and areal extent. These samples were analyzed for herbicides by EPA SW 846 Method 8150a and for SVOCs by EPA SW 846 Method 8070.

PCB samples were collected by hand augers from the area in front of the southeast side of the pump house. An additional sample was collected in a 4-oz wide-mouth jar and placed in a cooler. These samples were selected for laboratory analysis based on the results of immunoassay screening. Soil samples selected were submitted for analysis for PCBs by EPA SW 846 Method 8080. Because of the field observation of jet fuel contamination, most soil samples were also analyzed for VOCs and SVOCs by CLP methods.

4.5.2 Sediment Sampling

Sediment samples were collected using a 2¼-in.-diam stainless steel hand auger with a 2 in. by 8 in. stainless steel liner. At the sampling locations, the top 1 in. of organic material was removed. The stainless steel liner was placed inside the auger and a soil sample was collected from surface to a depth of 6 in. The stainless steel liner was removed from the auger and Teflon tape and a plastic cap were placed over the two ends. The liner was labeled with sample number, depth, and type of analysis; placed in a zip-lock bag; and shipped to the laboratory for analysis for VOCs and SVOCs.

4.5.3 Surface Water Sampling

Surface water samples were not collected during the August and September 1995 field effort because the drainage ditches at the POL site were dry. (The summer of 1995 was an unusually dry period for this area.)

4.5.4 Groundwater Sampling

4.5.4.1 Drilling and Installation of Groundwater Monitoring Wells

The groundwater quality monitoring wells were drilled using a Foremost Drill CT250 Torqmaster HSA drill rig owned and operated by American Auger and Ditching, Constantia, New York. Four and one-half inch I.D. [8¼-in. outside diameter (O.D.)] hollow stem augers were used. Split spoons were selectively collected at anticipated lithologic changes and logged. During drilling, the auger cuttings were lithologically logged. Shelby tubes were collected from selected borings for analysis for geotechnical parameters. All auger cuttings were placed in drums and labeled.

The wells were completed with 2 in. schedule 40 polyvinyl chloride (PVC) screen (10 slot) and riser. A 6-in.-long 2-in. PVC spearpoint was placed below the screen to assist in centering the screen in the boring. The screen and riser were set through the hollow stem augers and the sandpack (0 size sand) was poured down in the annulus between the screen and the hollow stem augers in the shallow borings. In the deep wells the sand was tremied using 1 in. PVC tremie pipe between the screen and the hollow stem augers. A 3-ft-thick bentonite seal was placed above the sandpack using a ⅜ in. bentonite hole plug.

To avoid potential vertical cross-contamination of the deeper part of the aquifer, the upper interval of the deep well at MW-12D was cased off. Six-inch (I.D.) black steel casing was set from the surface to a depth of 21½ ft. The casing annular space was grouted using a 3 to 5% bentonite grout from 21½ ft to the surface. The casing was grouted using 1 in. tremie line and the grout was mixed in a tub (8 gallons of water per 94-lb bag of cement) and pumped down the tremie line with the slurry pump on the drill rig. A 4-in. roller bit was used to drill the lower portion of this well. At the well cluster at MW-6, shallow groundwater contamination was not found and therefore the deep well did not require casing off of the upper part of the aquifer.

The monitoring wells southeast of the POL site in the wooded area were completed with aboveground protective casing with lockable caps and brass locks. The remaining wells were completed with flush mount well covers with compression caps and brass locks.

4.5.4.2 Development of Groundwater Monitoring Wells

The seven groundwater quality monitoring wells installed during this investigation were developed using either a Grundfos submersible pump or a bailer. Two of the wells (MW-5 and MW-6D) were slow rechargers and were developed using a bailer. The remaining five wells were developed with a Grundfos stainless steel and Teflon submersible pump. The well volume of water in the casing varied from ½ gal to 5 gal. The total volume pumped during development varied from 7 to 215 gal per well. All the well development data are included in the well development logs in Appendix B. Periodically during development the groundwater parameters (temperature, pH, conductivity, turbidity, and dissolved oxygen were measured using a Horiba U-10 water quality meter. Development continued until the groundwater parameters stabilized.

4.5.4.3 Sampling of Groundwater Monitoring Wells

The wells at the POL Facility were purged with a Geopump peristaltic pump before sampling. A minimum of three standing well volumes were purged. The water parameters were periodically measured with a Horiba U-10 water quality meter. The parameters measured were temperature, pH, conductivity, turbidity, and dissolved oxygen. The groundwater parameters were allowed to stabilize before sampling the well.

The wells were sampled using precleaned disposable Teflon bailers. Both filtered and unfiltered samples were collected for PCB analysis; unfiltered samples were collected for VOC and SVOC analysis. In addition, four wells were sampled for Target Analyte List metals, biological oxygen demand (BOD)/total suspended solids, and TOC. TAL metals samples were not filtered. Metals are not considered a site related problem and their concentration was determined in only 4 wells to determine the presence and/or concentration of metals that might be detrimental to potential remediation systems.

4.5.5 Lithologic Characterization

The lithology of the shallow sediments (surface to 20 ft) at the POL area has been characterized in a previous investigation (Metcalf & Eddy 1992). To characterize the lithology at the POL area from a depth of 20 ft to a depth of 40 ft, the Geoprobe large-bore sampler was used. A 2-ft sample was collected on 5-ft intervals from 20 to 40 ft. The soil sample was extruded from the sampler and described lithologically.

4.5.6 Aquifer Characterization

Aquifer characterization consisted of slug testing the groundwater monitoring wells. The slug tests consisted of slug-in (falling head) and slug-out (rising head) tests for the deep wells at the POL area and slug-out tests only for the shallow wells.

A 1-in.diam and 5-ft-long metal slug was used in wells with at least 6 to 8 ft of water column. A 2-ft metal slug was used in the shallow wells with less than 6 ft of water. A one-channel Hermit 1000C Datalogger and 15 psig pressure transducer were used for collecting and recording the slug test data.

The slug-in test procedure consisted of opening the well and measuring the height of the water column. Next, the pressure transducer was lowered into the well and positioned 1 ft above the bottom. While the well equilibrated, the Hermit was programmed for the test and the transducer was zeroed.

After the well had equilibrated, the Hermit was started and the slug was quickly and evenly lowered below the water in the well and secured. Because the Hermit allows for real-time display, the decline in water level was monitored. The test continued until the water level in the well had declined to within 90% of the original water level. At this point, the slug-in-test was terminated. The slug-out test involved the same procedures except the slug was removed from the well.

The data were entered into a Quattro Pro spreadsheet, where the data were manipulated and the initial shock wave was removed. The data were analyzed using the AQTESOLV. Confined and unconfined solutions (Cooper et al. 1967 and Bouwer and Rice 1976, respectively) were used for the data collected in the deep wells. The saturated thickness used for the confined solution was 35 ft. The Bouwer and Rice solution was used for the unconfined (shallow) wells.

4.6 UTILITY CLEARANCE AND SURVEYING

Base POL and Civil Engineering personnel were contacted to locate the underground utilities at the POL Facility. Maps and drawings were referenced to locate buried underground utilities.

Base personnel were able to trace the location of the underground flow line from the pump house to the aboveground storage tank. In front of the southeast side of the pump house were several underground electrical conduits and underground piping that could not specifically be located. To avoid damaging these underground utilities, all sampling in front of the pump house was completed with a hand auger to a depth of 10 ft. In addition, all electrical power to underground electrical lines in the area was turned off and locked out during this sampling activity.

Hawke Engineering, Binghamton, New York, were subcontracted to survey all Geoprobe, hand-augered, and monitoring well locations. The survey included ground and top of PVC casing elevations for newly installed monitoring wells. Appendix C contains a table of coordinates and a figure of locations.

4.7 INVESTIGATION-DERIVED WASTE

Materials generated from the RI field operations consisted of purge waters, decontamination fluids, soil cuttings, and miscellaneous solid materials [such as personal protective equipment (PPE) and disposable supplies (e.g., paper towels, adhesive tape, and packaging]. An inventory of the drums of investigation-derived waste (IDW) that were generated during this study is included as Appendix D.

4.7.1 Personal Protective Equipment and Consumable Supplies

PPE and other expendable supplies (e.g., paper towels and gloves) were placed in plastic bags and placed in two 55-gal drums and stored on pallets on the east side of the POL site. All remaining soil samples, glass jars, and other disposable supplies from the field laboratory was also placed in these two drums.

4.7.2 Soil Cuttings

Both the Geoprobe screening and confirmation soil sampling produced very little IDW. The Geoprobe direct push technology does not produce any soil cuttings because it displaces the soil sideways as it penetrates the ground. The only IDW produced was the excess soil sample that was not sent in for analysis. This small quantity of soil was placed back into the boring.

Hand augering produced a small quantity of drill cuttings that were placed back into the boring. All auger cuttings generated during the drilling of the groundwater monitoring wells was placed in 55-gal drums. The drums were marked as to contents and boring number and were dated. The drums were moved to the asphalt on the east side of the POL site and individually covered with plastic and then plastic taped. A total of seven drums containing auger soil cuttings were generated during this investigation.

4.7.3 Fluids

Decontamination water was generated during the decontamination of the stainless steel hand auger, stainless steel spoons, and stainless steel bowls. This decontamination water was held in the bottom of the decontamination pan. When the pan was full, a sample of the decontamination water was collected and analyzed for VOCs with the field GC. If the field GC did not indicate the presence of VOCs, the decontamination fluid was discharged onto the ground.

Development and purge water from the background well MW-5 and the side gradient well MW-13 was discharged onto the ground. The development and purge water from the remaining wells were drummed and the drums were marked as to contents and well number and were dated. The drums were moved to the asphalt on the east side of the POL site and individually covered with plastic and the plastic taped. A total of 12 drums of development and purge water was generated during this investigation.

4.7.4 Disposition of Investigation-Derived Waste

A separate letter recommending disposal options for all IDW generated during the field program was prepared and submitted to the Base. This letter is included in Appendix D.

Section 5

5. PETROLEUM, OIL, AND LUBRICANT FACILITY INVESTIGATION FINDINGS

5.1 SURFACE WATER FLOW

A map showing the drainage ditches in the vicinity of the POL Facility is shown as Fig. 5-1. An accurate topographic map of the POL Facility is not available; however, surface grade in the area surrounding the pump house is such as to promote drainage of potential spills toward the two drainage ditches to the northeast and southwest sides of the building. These ditches pass under the roadway on either side of the fueling oval. The drainage ditch/swale shown to flow to the southeast is considered the main path for surface water runoff from the POL area. However, it is observed that this swale/ditch also conducts water from other areas of the Base to the north of the POL area. No periods of surface water flow occurred at the POL area during the field investigation.

Surface water runoff continues to the southeast of the POL area by two drainage ditches and empties to the North Branch of Ley Creek. See Figure 2-2. The distance to North Branch is estimated as 1300 feet. From North Branch, water flows to the southwest to Ley Creek and then continues westward and then southwestward until it reaches Onondaga Lake. The overall distance from the entry points at North Branch to the lake is 4.2 miles.

5.2 GEOLOGIC AND HYDROGEOLOGIC INVESTIGATION RESULTS

Information regarding the subsurface geology of the POL area is based on geologic logs recorded during the advancement of five shallow and two deep soil borings used to install monitoring wells during the August 1995 field effort; data from soil borings for the preexisting monitoring wells were incorporated to more fully evaluate the lateral changes in lithologies.

Information pertaining to the hydrogeology of the POL area is based on groundwater level measurements obtained from both existing and newly installed wells and from hydraulic conductivities obtained from rising and falling head slug tests performed on four of the monitoring wells; data from previous investigations on hydraulic conductivities from wells to the north of the site are also considered.

5.2.1 Petroleum, Oil, and Lubricant Facility Geology

Subsurface geology interpreted from soil borings from recent previous investigations (Metcalf & Eddy 1992 and 1995) was confirmed by the five shallow soil borings advanced during the RI. Data from two deep borings used to install monitoring wells 6D and 12D provided additional lithologic data to depths of 38½ feet and 39½ ft, respectively.

Overburden soils consist of fine-grained sediments consistent with those of a glaciofluvial or glaciolacustrine depositional environment. Over the interval penetrated, subgrade soils are fairly uniform. The upper 10–15 ft of soil is characterized by relatively soft, dark-yellowish-brown silt and silty clay. Toward the southeast at MWs-12S and 12D, this interval thins to around 5 ft in thickness. Beneath the silty clay, fine- to medium-grained sands, yellowish brown to dark brown and with silt and trace amounts of clay occur down to a depth of approximately 20 ft. Underlying these silty sands is a lens of tan, stiff clayey silts representing a glacial till facies. The unit was

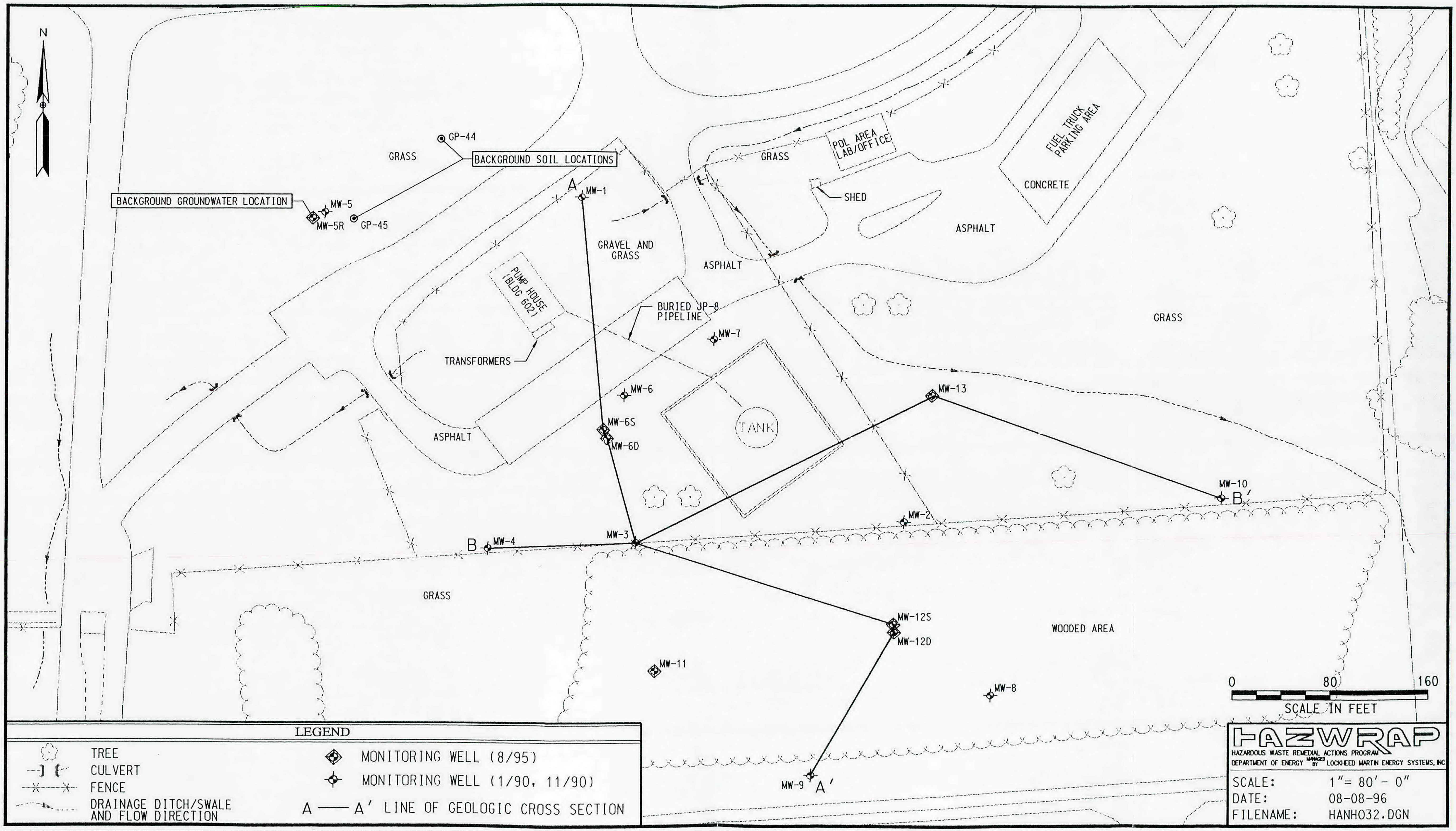


Fig. 5-1. Background Soil and Groundwater Locations, Surface Water Flow and Location of Geologic Cross Sections, POL Area, 174th FW, NYANG, Hancock Field, Syracuse, NY.

encountered in MW-4, MW-6d, and MW-12D; at MW-12D it is as much as 15 ft thick and at MW-4 some fine to coarse gravel is present within the lens. The lateral extent of this lithology beneath the POL area is not completely defined. The vertical extent is defined by the two deep wells. Figures 5-2 and 5-3 are interpretative geologic cross sections across north-south and east-west transects, respectively, across the POL area. The location of the cross sections is shown on Fig. 5-1.

5.2.2 Petroleum, Oil, and Lubricant Facility Hydrogeology

Water levels measured at fifteen monitoring wells at the POL Facility ranged from 10.53 to 15.81 ft below the top of the PVC casing. These data were obtained over a period of no rainfall from August 24 to August 26, 1995, and are presented on Table 5-1. A water table map based on these data is shown as Fig. 5-4. Groundwater flow is to the southeast toward North Branch of Ley Creek approximately 1300 ft away.

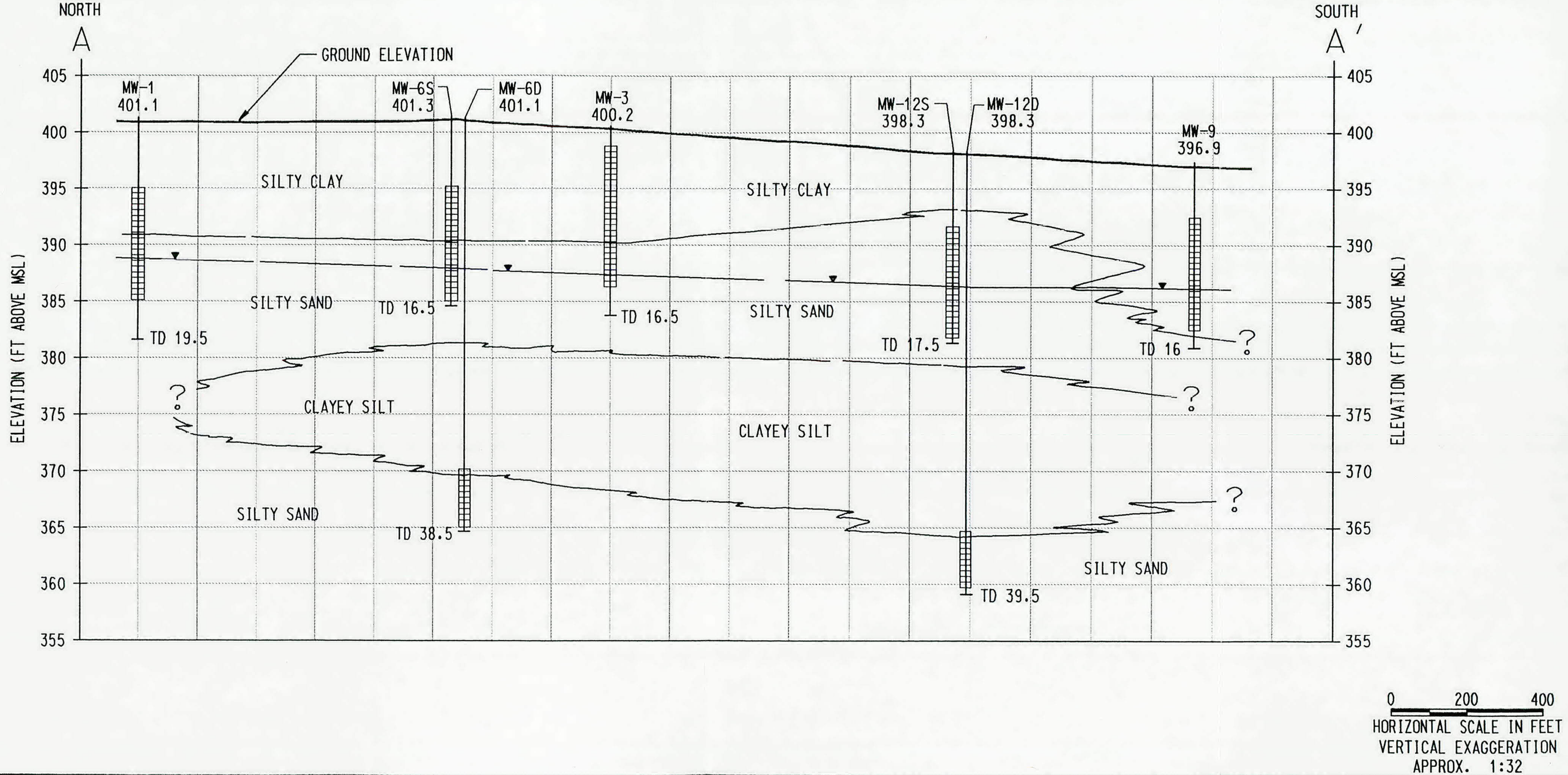
The horizontal hydraulic gradient is variable and ranges from 0.0045 ft/ft to 0.0065 ft/ft with an average across the site of 0.0049 ft/ft. The vertical hydraulic gradient measured at the well pair at MW-6S and MW-6D is calculated as a downward gradient of 0.01467 ft/ft. The gradient may be downward because the well pair is in the aquifer recharge zone or because restriction of flow caused by decreased permeability of the clayey silt layer separating the two wells screens. Although the interval may be thicker between MW-12S and MW-12D, it may be more transmissive. A slight downward gradient was also detected at monitoring well pair MW-12S and MW-12D; however the difference in elevation between these two wells was 0.02, the limit of accuracy of these measurements.

In situ hydraulic conductivity testing was conducted in 4 of the 15 monitoring wells, 2 shallow unconfined wells (MW-4 and MW-10), and the 2 deep confined or semiconfined wells (MW-6D and MW-12D). Test result are in Appendix E. Only slug-out or rising head tests were performed on the two shallow wells screened across the water table. Both rising head and falling head (slug-in) tests were conducted on the two deep monitoring wells where the top of the screened interval in the well is submerged below the water table. Hydraulic conductivities were obtained by both the Bouwer and Rice (1976) and Cooper et al. (1967) solutions for the confined aquifer and the Bouwer and Rice (1976) method for the unconfined aquifer. Hydraulic conductivities ranged from 1.2360E-04 ft/min to 2.1373E-07 ft/min; coincidentally, the high and low values were both obtained in MW-10. However, inspection of the slug test data from the slug test yielding 2.1373E-07 ft/min indicate the data to be spurious. Because of this, the value is not included in arriving at an average value for the shallow aquifer. The average hydraulic conductivity for the shallow unconfined aquifer is 1.0057E-04 ft/min and 2.8254E-04 ft/ min for the deep aquifer.

Groundwater seepage velocity for the POL area can be estimated from hydraulic conductivity (K), horizontal hydraulic gradient (i), and porosity (n) using the following equation:

$$\text{Seepage velocity} = \frac{K(i)}{n}$$

Using the average hydraulic conductivity of 1.0057E-04 ft/min (52.8 ft/year) obtained for the shallow aquifer, an average hydraulic gradient of 0.0049 ft/ft, and an assumed porosity of 40%



LEGEND

MW-6S 401.3	MONITORING WELL IDENTIFICATION GROUND ELEVATION (FT ABOVE MSL)
▥	MONITORING WELL SCREENED INTERVAL
TD 38.5	TOTAL DRILLED DEPTH OF MONITORING WELL (FT)
▼	GROUNDWATER ELEVATION (8/24 - 8/26 1995)

HAZWRAP
HAZARDOUS WASTE REMEDIAL ACTIONS PROGRAM
DEPARTMENT OF ENERGY MANAGED BY LOCKHEED MARTIN ENERGY SYSTEMS, INC.

SCALE: AS NOTED
DATE: 08-08-96
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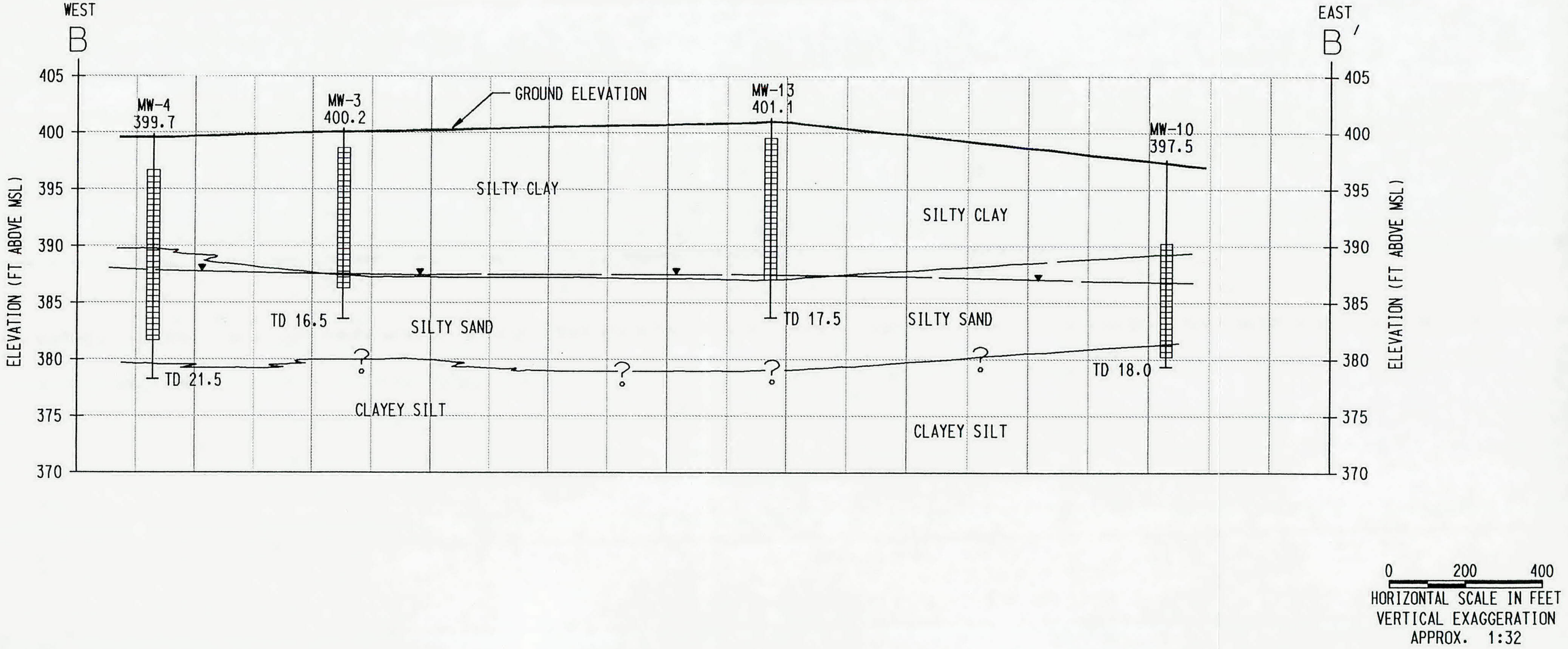
Fig. 5-2. Interpretative Geologic Cross Section A-A', POL Area, 174th FW, NYANG, Hancock Field, Syracuse, NY.



LEGEND

MW-13 401.1	MONITORING WELL IDENTIFICATION GROUND ELEVATION (FT ABOVE MSL)
▦	MONITORING WELL SCREENED INTERVAL
TD 17.5	TOTAL DRILLED DEPTH OF MONITORING WELL (FT)
▼	GROUNDWATER ELEVATION (8/24 - 8/26 1995)

HAZWRAP
HAZARDOUS WASTE REMEDIAL ACTIONS PROGRAM
DEPARTMENT OF ENERGY MANAGED BY LOCKHEED MARTIN ENERGY SYSTEMS, INC.

SCALE:	AS NOTED
DATE:	08-08-96
FILENAME:	HANHO25.DGN

Fig. 5-3. Interpretative Geologic Cross Section B-B', POL Area, 174th FW, NYANG, Hancock Field, Syracuse, NY.

(Freeze and Cherry 1979) for silty sands, a seepage velocity of 0.65 ft/year is calculated for the upper part of the unconfined aquifer.

Table 5-1. Water Level Elevation Data

Well	Screen interval	Depth to water (date)[a]	Ground elevation(b)	TOC elevation(c)	Water level elevation(d)
MW-1	6.60-16.60	12.00 (8/24/95)	401.32	400.94	388.94
MW-2	3.62-13.62	12.60 (8/26/95)	399.97	399.68	387.08
MW-3	3.62-13.62	12.64 (8/26/95)	400.40	400.05	387.41
MW-4	8.53-18.53	12.43 (8/26/95)	400.32	400.32	387.89
MW-5R	5.82-15.82	11.31 (8/25/95)	400.93	400.54	389.23
MW-6S	6.03-16.03	12.80 (8/25/95)	401.29	400.88	388.08
MW-6D	31.00-36.00	12.68 (8/24/95)	400.77	400.54	387.86
MW-7	4.63-14.63	13.68 (8/26/95)	402.06	401.90	388.22
MW-8	5.00-15.00	11.70 (8/26/95)	398.51	397.97	386.27
MW-9	3.50-13.50	10.77 (8/26/95)	NA	396.87	386.10
MW-10	6.60-16.60	10.53 (8/26/95)	NA	397.28	386.75
MW-11	8.86-18.86	15.81 (8/25/95)	400.12	402.47	386.66
MW-12S	10.44-20.44	13.65(e) (8/25/95)	398.26	400.19	386.54(e)
MW-12D	35.92-40.92	14.03 (8/25/95)	398.32	400.59	386.56
MW-13	7.38-17.38	13.33 (8/24/95)	401.12	400.94	387.61

(a) Depth to water measured in feet from top of PVC casing.
(b) Ground elevation measured in feet above mean sea level.
(c) Top of PVC casing (TOC) measured in feet above mean sea level.
(d) Water level elevation measured in feet above mean sea level.
(e) True water level = apparent water level - (specific gravity of JP8 × apparent thickness of free product)
= 14.19 - (0.81) × (0.67) = 13.65 ft.

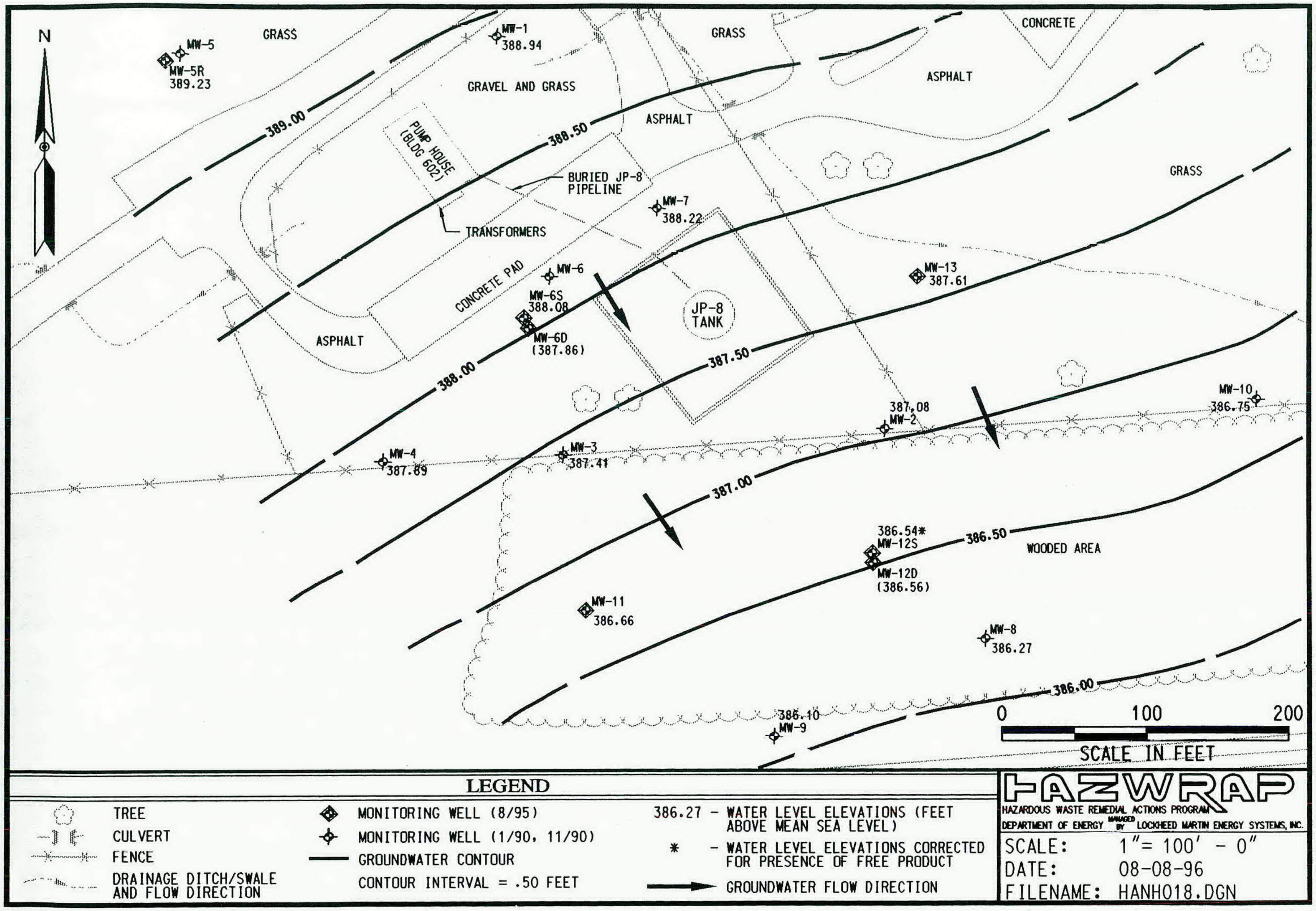


Fig. 5-4. Water Table Map (8/24-8/26, 1995), POL Area, 174th FW, NYANG, Hancock Field, Syracuse, NY.

5.3 BACKGROUND SAMPLING

Background samples were collected for both soil and groundwater to determine the naturally occurring or non-site related levels of contamination at the POL area. Background soil samples were collected by Geoprobe sampling and were sent to a fixed-base laboratory for chemical analysis. A background monitoring well was installed upgradient from the POL area to analyze for background levels of the contaminants of concern, VOCs, SVOCs, and PCBs.

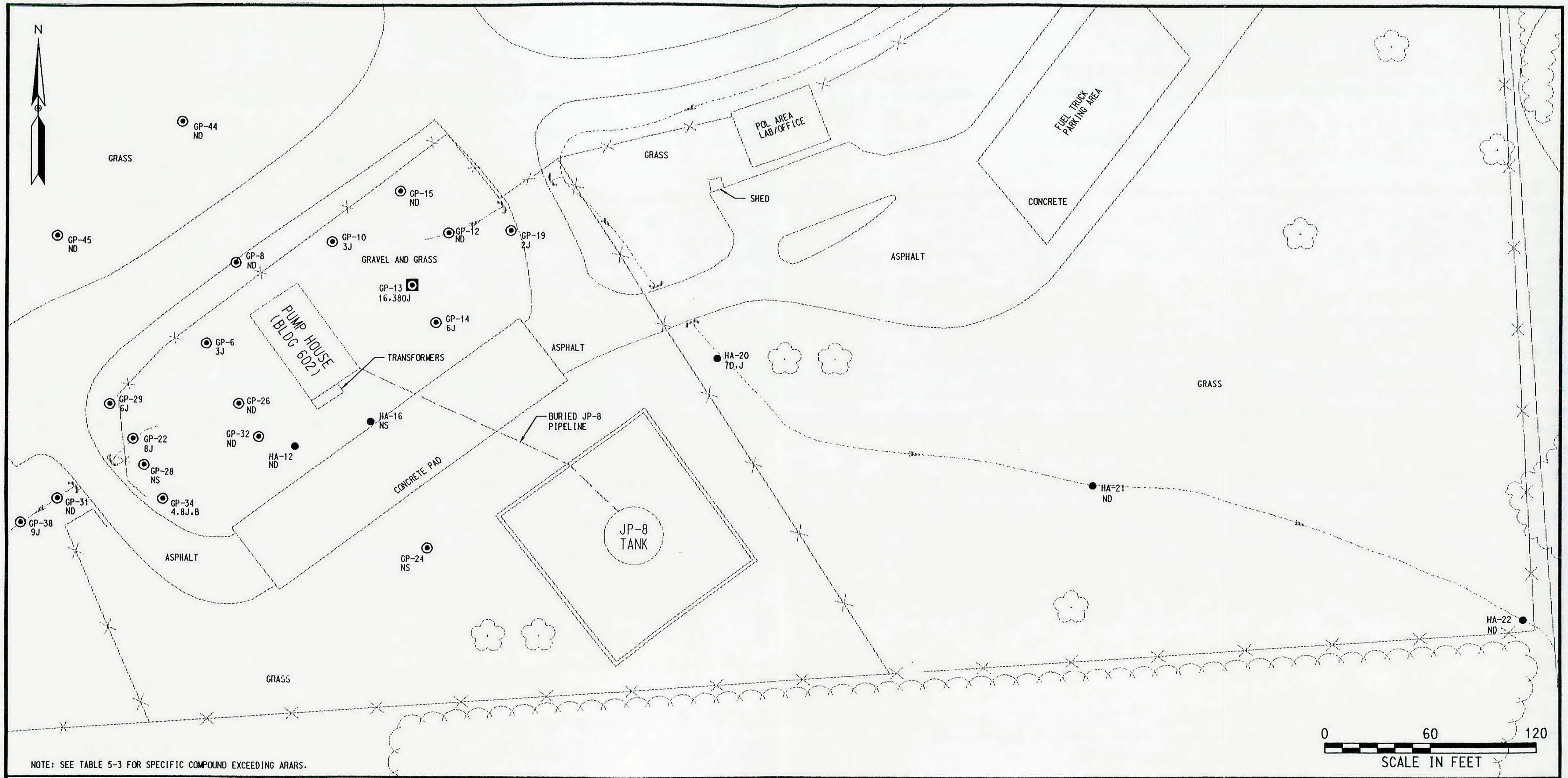
5.3.1 Soil Confirmation Results

Background soil samples were collected from an area to the northwest of the POL Facility at Geoprobe locations GP-44 and GP-45 and were analyzed for VOCs, SVOCs, and PCBs. The locations of the two sample points are across the road to the northwest of the POL Facility and are shown on Fig. 5-1. VOCs and SVOCs were analyzed by EPA CLP 3/90 Method and PCBs by EPA SW 846 Method 8080. As metals were not a contaminant of concern, inorganic analyses were not preformed. The detection results from the background soil samples are summarized on Table 5-2. The laboratory analytical data tables are presented in Appendix F, which also includes a brief quality control summary. All soil samples have a persistent occurrence of low levels of methylene chloride and acetone. The occurrence of these compounds was qualified as laboratory contaminants with either a J (estimated value) or B (occurs in associated blank) both; similarly, the presence of low level (1J μg/kg) 2-hexanone at GP-44 was attributed to laboratory contamination.

For VOCs, both background samples had nondetects in the 0–2-ft and 5–7-ft intervals, exclusive of the laboratory contaminants. At the 8–10-ft interval, immediately overlying the approximate capillary fringe, GP-44 had no volatile contamination; analysis of GP-45 showed very low levels of ethyl benzene (1J μg/kg) and total xylene (4JB μg/kg). For SVOCs, the only compound detected was phenol at both sampling locations and at all sampling depth intervals. These concentrations ranged from a low of 40J μg/kg from 0–2 ft at GP-45 to a high of 6000D μg/kg at the 8–10-ft interval from GP-44. The applicable or relevant and appropriate requirement (ARAR) applied for phenol in the NYSDEC Technical and Administrative Guidance Memorandum (NYSDEC 1994) is 30 μg/kg. Because of the unexpected high levels of phenol contamination found in the background samples, an additional investigation to determine the source and areal extent of phenol contamination was conducted. The results of this secondary field investigation (see Sect. 5.5.4) determined the background values obtained for phenol at GP-44 and GP-45 were anomalous. PCBs were sampled from the 0–2-ft interval at both locations and found not to be present at GP-45; they were present at a concentration of 44 μg/kg at GP-44. The ARAR specified for PCB (Aroclor 1260) in surface soils is 1000 μg/kg.

5.3.2 Groundwater Confirmation Results

Groundwater samples from MW-5R, the up-gradient background replacement well for MW-5, were analyzed for VOCs and SVOCs by EPA CLP 3/90 Method and PCBs by EPA Method 8080. The location of the background well is shown on Fig. 5-1. As metals were not a contaminant of concern, inorganic analyses were not performed. Analytical results of the background samples revealed no VOC, SVOC, or PCB contamination present in the groundwater (Table 5-2 and Appendix F). This is consistent with analytical results of nondetect for VOCs obtained from the then background well MW-5 during the SI conducted in 1992.



NOTE: SEE TABLE 5-3 FOR SPECIFIC COMPOUND EXCEEDING ARARS.

LEGEND

TREE
CULVERT
FENCE
DRAINAGE DITCH/SWALE AND FLOW DIRECTION

◉ GEO-PROBE SAMPLING LOCATION
● HAND AUGER BORING LOCATION

NS - NOT SAMPLED AT THIS DEPTH
ND - NON DETECT
8 - TOTAL BTEX (µG/KG)
▣ - ONE OR MORE BTEX COMPOUND EXCEEDS ARARS

J - ONE OR MORE BTEX CONCENTRATIONS ESTIMATED
B - ONE OR MORE BTEX CONCENTRATIONS FOUND IN BLANK
D - BTEX COMPOUND IDENTIFIED AT A SECONDARY DILUTION FACTOR

HAZWRAP
HAZARDOUS WASTE REMEDIAL ACTIONS PROGRAM
DEPARTMENT OF ENERGY MANAGED BY LOCKHEED MARTIN ENERGY SYSTEMS, INC

SCALE: 1″= 60′- 0″
DATE: 02-24-97
FILENAME: HANH029.DGN

Fig. 5-5a. Soils Analytical Data Map, Total BTEX Concentrations-Surficial (0 - 2 ft), POL Area, 174th FW, NYANG, Hancock Field, Syracuse, NY.

Table 5-2. Summary of Background Soil and Groundwater Analytical Data

	ARARs (Soil)	GP-44			GP45			MW-5R
		0-2 ft soil	5-7 ft soil	8-10 ft soil	0-2 ft soil	5-7 ft soil	8-10 ft soil	water
VOCs-CLP Method								
Ethylbenzene	5,500	ND	ND	ND	ND	ND	1J	ND
Xylene(Total)	1200	ND	ND	ND	ND	ND	4JB	ND
SVOCs-CLP Method								
Phenol	30	220J	240J	6000D	40J	500	1200	ND
Fluoranthene	50,000	ND	ND	ND	35J	ND	ND	ND
Pyrene	50,000	ND	ND	ND	26J	ND	ND	ND
PCBs-Method 8080								
Aroclor 1260	*	44	NS	ND	NS	NS	NS	NS

Note: All concentrations are in ug/kg
ND = Not Detected
NS = Not Sampled at this depth
J = Result is an estimated value
* = NYSDEC ARARs for PCBs in surface soils is 1000 ug/kg and 10,000 ug/kg for subsurface soils

Table 5-3. Summary of Results for Petroleum Indicator Compounds in Groundwater

SAMPLE INFORMATION																																
LOCATION			MW-1		MW-2		MW-3		MW-4		MW-5R		MW-6D		MW-6S		MW-7		MW-8		MW-9		MW-10		MW-10		MW-11		MW-12D		MW-13	
SAMPLE DEPTH (ft.)			6.6-16.6		3.6-13.6		3.6-13.6		8.5-18.5		5.8-15.8		31.0-36.0		4.6-14.6		4.6-14.6		5-15		3.5-13.5		6.6-16.6		6.6-16.6 dup		8.8-18.8		35.9-40.9		7.3-17.3	
SAMPLE NUMBER:			MW-1X		MW-2X[a]		MW-3X		MW-4X		MW-5X		MW-6D		MW-6S[a]		MW-7X		MW-8X		MW-9X		MW-10		MW10D		MW-11[a]		MW12D		MW-13	
DATE SAMPLED:			08/24/95		08/26/95		08/26/95		08/26/95		08/28/95		08/25/95		08/26/95		08/26/95		08/27/95		08/27/95		08/26/95		826/1995		08/25/95		08/25/95		08/25/95	
ANALYTICAL INFORMATION																																
VOCs																																
DATE ANALYZED:			08/29/95		08/30/95		08/30/95		08/30/95		08/30/95		08/30/95		08/29/95		08/30/95		08/30/95		08/30/95		08/30/95		08/30/95		08/29/95		08/29/95		08/29/95	
Analyte	**CRQL[b]**	**ARAR[c]**	**Result**	**Q[d]**	**Result**	**Q**	**Result**	**Q**	**Result**	**Q**	**Result**	**Q**	**Result**	**Q**	**Result**	**Q**	**Result**	**Q**	**Result**	**Q**	**Result**	**Q**	**Result**	**Q**	**Result**	**Q**	**Result**	**Q**	**Result**	**Q**	**Result**	**Q**
Benzene	10	0.7	ND[e]		ND		130		ND		ND		ND		48	D	21		ND		ND		ND		ND		220	D	ND		ND	
Toluene	10	5	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		1	J	ND		ND	
Ethylbenzene	10	5	ND		400	D	42		2	J	ND		5	J	81		85		ND		ND		ND		ND		84		ND		ND	
Xylene (total)	10	5	ND		1200	D	6	J	2	J	ND		14		240	D	170		ND		2	J	ND		ND		140		1	J	ND	
Units	ug/L	ug/L	ug/L		ug/L		ug/L		ug/L		ug/L		ug/L		ug/L		ug/L		ug/L		ug/L		ug/L		ug/L		ug/L		ug/L		ug/L	
SVOCs																																
DATE EXTRACTED			8/30/95		8/30/95		8/30/95		8/30/95		8/30/95		8/30/95		8/30/95		8/30/95		8/30/95		8/30/95		8/30/95		8/30/95		8/30/95		8/30/95		8/30/95	
DATE ANALYZED.			9/15/95		9/15/95		9/15/95		9/14/95		9/15/95		9/15/95		9/18/95		9/15/95		9/15/95		9/15/95		9/14/95		9/14/95		9/15/95		9/15/95		9/15/95	
Analyte	**CRQL**	**ARAR**		**Q**		**Q**		**Q**		**Q**		**Q**		**Q**		**Q**		**Q**		**Q**		**Q**		**Q**		**Q**		**Q**		**Q**		**Q**
Phenol	10	NS[f]	ND		10		2	J	ND		ND		ND		ND		ND		ND		ND		ND		ND		6	J	ND		ND	
Naphthalene	10	10	ND		56		ND		ND		ND		0.6	J	30		1	J	ND		ND		ND		ND		30		ND		ND	
2-Methylnaphthalene	10	NS	ND		34		ND		ND		ND		0.4	J	26		5	J	ND		ND		ND		ND		0.8	J	ND		ND	
Acenaphthene	25	20	ND		ND		ND		ND		ND		ND		1	J	ND		ND		ND		ND		ND		ND		ND		ND	
Fluorene	25	50	ND		ND		ND		ND		ND		ND		0.7	J	ND		ND		ND		ND		ND		ND		ND		ND	
Phenanthrene	10	50	ND		ND		ND		ND		ND		ND		1	J	ND		ND		ND		ND		ND		ND		ND		ND	
Anthracene	10	NS	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
Fluoranthene	10	50	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
Pyrene	10	50	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
Benzo(a)Anthracene	10	NS	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
Chrysene	10	NS	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
Benzo(b)fluoranthene	10	NS	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
Benzo(k)fluoranthene	10	NS	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
Benzo(a)pyrene	10	STND[g]	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
Units	ug/L	ug/L	ug/L		ug/L		ug/L		ug/L		ug/L		ug/L		ug/L		ug/L		ug/L		ug/L		ug/L		ug/L		ug/L		ug/L		ug/L	

▨ 500 Result = or exceed NYSDEC ARARs

[a] This sample was rerun, or diluted and rerun for VOCs. The reported result is the result obtained from the diluted/undiluted analyses with the highest degree of confidence.

[b] CRQL = Contract Required Detection Limit

[c] ARAR=Applicable or Relevant and Appropriate Requirement
The ARAR applied is the NYSDEC Division of Water Technical and Operational Guidance Series (1.1.1) Ambient Water Quality Standards and Guidance Values

[d] Data Qualifiers
J=Reported result is an estimated value (falls between the established MDL and CRQL)
D=compounds identified at a secondary dilution factor

[e] ND=Not Detected Above the MDL (Method Detection Limit)

[f] NS=No standard is defined for that compound

[g] STND=The standard is non-detect

5.4 SOIL AND GROUNDWATER SCREENING RESULTS

Screening activities at the site involved PID screening of soil samples, monitoring well head space and drill cuttings, field GC screening of soil and groundwater samples, and screening of soils with PCB test kits. Field screening of soils for BTEX by a field GC was used to assist in determining the boundaries of contamination and for selecting confirmational samples for fixed-base laboratory analysis. Immunoassay test kits to screen for PCBs in soil were used to direct both horizontal and vertical sampling for fixed-base laboratory analysis in the vicinity of the POL pump house. The results of these activities are discussed below.

5.4.1 Soil Screening Results

PID readings obtained from the ends of the sample liners were used as the basis for selecting samples for analysis with the field GC. The results of the PID screening are included as part of the monitoring well boring logs and Geoprobe push logs, Appendices G and H, respectively. Screening locations are shown on the survey figure in Appendix C. Field screening results were used to select confirmation samples.

During the investigation, 77 soil samples were collected and prepared for analysis. Of these, 56 were analyzed by the portable GC, 16 were not run based on the high screening concentrations and petroleum odors observed while initially processing the samples, and 5 samples overloaded the GC column and detector. The results of the field GC screening are included in a report summarizing the methodology, quality assurance, and data in Appendix I. Benzene concentrations range from below method detection limit (BMDL) to 19,320 μg/kg; for toluene from BMDL to 18,415 μg/kg; for ethylbenzene from BMDL to 66,240 μg/kg, and for total xylenes from BMDL to 39,970 μg/kg.

A total of 54 soil samples were screened with the immunoassay PCB field test kits. The field kit—which is sensitive to Aroclor compounds 1016, 1242, 1248, 1254, and 1260—has a 95% confidence against false negative responses. However, the PCB data may be positively biased by the presence of petroleum hydrocarbons in the soil samples. The results are compiled and summarized in a report detailing the field screening using the immunoassay PCB test kits presented in Appendix J. Results ranged from nondetect to values as high as 83.6 ppm interpolated between calibrator points and as high as 321.5 ppm extrapolated beyond end points of the calibration curves.

5.4.2 Groundwater Screening Results

During the investigation, 13 groundwater samples were analyzed for BTEX compounds. The concentrations of analytes found ranged from BMDL to 198 μg/L for benzene, from BMDL to 40 μg/L for toluene, from BMDL to 50 μg/L for ethylbenzene, and from BMDL to 371 μg/L for total xylenes. The analytical data and a report on quality assurance is presented in Appendix F.

5.5 SOIL CONFIRMATION AND DELINEATION RESULTS

Vertical soil confirmational and delineation samples for VOC and SVOC analysis were directed at three broadly defined depth intervals: surficial (0–2 ft), intermediate, and approximate capillary fringe.

Collection of soil samples for PCB analysis was confined to surficial and intermediate intervals. Care was taken to avoid sampling near the water table in the area of known PCB contamination to avoid the potential for introducing PCB contamination to the groundwater.

Complete analytical data for VOC, SVOC, and PCB analysis from the first field effort are provided in Appendix F. Appendix K contains analytical data for SVOCs, PCBs, and herbicides from the second field effort. Samples for VOC and SVOC analysis were analyzed by EPA CLP 3/90 Method and PCBs by EPA SW 846 Method 8080 and herbicides by EPA SW 846 Method 8150b. Summary Tables 5-4, 5-5a, and 5-5b provide the significant detections and Figs. 5-5a through 5-7b present vertical and lateral distribution.

5.5.1 Volatile Organic Compound Soil Confirmation and Delineation

Nineteen surficial soil samples were collected from the 0–2-ft interval and analyzed for VOCs (see Table 5-4 and Fig. 5-5a). Three samples collected along the main drainage ditch from the POL area are included in these data. Of the sampling locations analyzed for VOCs, only GP-13 had concentrations of fuel indicator compounds exceeding NYSDEC ARARS. At GP-13, concentration of total xylenes was 16,000 μg/kg; the soil cleanup level set by the State is 1200 μg/kg.

Seven soil samples were analyzed for VOCs at intermediate depth intervals ranging from 2 ft to 9 ft below land surface. Three sampling locations had detections of fuel components that exceeded NYSDEC soil action cleanup levels (see Table 5-4 and Fig. 5-5b). In all three samples, the compound exceeding state ARARS was total xylenes. Detections for xylenes were 3700 μg/kg for HA-16 from 2–4 ft, 5200 μg/kg from GP-22 from 4–6 ft, and 1800J μg/kg at GP-26 from 5–7 ft; the ARAR set by the state for total xylenes is 1200 μg/kg.

Fifteen sampling locations were selected for VOC analysis from the capillary fringe interval; sample depths ranged from 8–10 ft and from 10–12 ft. Analytical data are presented on Table 5-4 and Fig. 5-5c. At five locations at the depth sampled, VOCs exceeded state ARARs. Two of these sampling locations were the same as ones where the shallower intermediate depth intervals also exceeded NYSDEC cleanup levels. These two are HA-16, which had a total xylene concentration of 2800 μg/kg, and GP-26, which had levels of total xylenes of 28,000 μg/kg in addition to an ethylbenzene concentration of 7400 μg/kg; the state ARAR for ethylbenzene is 5500 μg/kg. GP-28, located just south of GP-22 on the west side of the pump house, also exceeded the state ARAR for total xylenes; total xylene concentration was found to be at 4800 μg/kg. Two samples (one was the duplicate) were taken from the 10–12-ft interval from GP-06, which is northwest of the pump house. The duplicate sample (collected farthest from the water table) was not significantly contaminated. The sample collected close to the water table contained significant contamination. Benzene concentration was 1500 μg/kg; toluene was 2000 μg/kg; ethylbenzene was 63,000 (D) μg/kg, and xylene was 28,000 (D) μg/kg. The ARARs

Table 5-4. Summary of Results for Petroleum Indicator Compounds in Soil

SAMPLE INFORMATION																						
LOCATION			GP06		GP06		GP06		GP08		GP08		GP10		GP10		GP10		GP12		GP12	
DEPTH			0-2 ft		10-12 ft		10-12 ft dup		0-2 ft		10-12 ft		0-2 ft		5-7 ft		10-12 ft		0-2 ft		4-6 ft	
SAMPLE NUMBER:			G0602		G0610		G061D		G0802		G0810		G1002		G1057		G1010		G1202		G1246	
DATE SAMPLED:			08/08/95		08/08/95		08/08/95		08/08/95		08/08/95		08/07/95		08/07/95		08/07/95		08/07/95		08/07/95	
ANALYTICAL INFORMATION																						
VOCs																						
DATE ANALYZED:			08/15/95		8/18/1995		08/12/95		08/11/95		08/14/95		08/08/95		08/09/95		08/14/95		08/09/95		08/08/95	
Analyte	**CRQL**	**ARAR**	**Result**	**Q**	**Result**	**Q**	**Result**	**Q**	**Result**	**Q**	**Result**	**Q**	**Result**	**Q**	**Result**	**Q**	**Result**	**Q**	**Result**	**Q**	**Result**	**Q**
Benzene	10	60	ND		**1500**		53		ND		1400	U	ND		ND		1500	U	ND		ND	
Toluene	10	1500	ND		**2000**		4	J	ND		1400	U	1	J	ND		1500	U	ND		ND	
Ethylbenzene	10	5500	3	J	**63000**	D	60		ND		1400	U	ND		400		200	J	ND		480	
Xylene (total)	10	1200	ND		**28000**	D	220		ND		1400	U	2	J	1100		1500	U	ND		1000	
Units	ug/Kg	ug/Kg	ug/Kg		ug/Kg		ug/Kg		ug/Kg		ug/Kg		ug/Kg		ug/Kg		ug/Kg		ug/Kg		ug/Kg	
SVOCs																						
DATE EXTRACTED			8/23/95		8/11/95		8/11/95		8/11/95		8/11/95		8/16/95		8/16/95		8/10/95		8/9/95		8/9/95	
DATE ANALYZED:			8/28/95		8/23/95		8/24/95		8/22/95		8/22/95		8/23/95		8/24/95		8/15/95		8/15/95		8/14/95	
Analyte	**CRQL**	**ARAR**		**Q**		**Q**		**Q**		**Q**		**Q**		**Q**		**Q**		**Q**		**Q**		**Q**
Phenol	330	30	**500**		**1600**		**1000**		24	J	**390**		**300**	J	ND		12000	U	**170**	J	**5200**	D
Naphthalene	330	1300	350		420		48	J	ND		ND		35	J	**3800**		12000	U	ND		420	DJ
2-Methylnaphthalene	330	3640	530		700		71	J	ND		ND		41	J	**9800**		600	J	ND		990	D
Acenaphthene	330	50000	ND		150	J	ND		ND		ND		59	J	ND		12000	U	ND		ND	
Fluorene	330	50000	76	J	180	J	ND		ND		ND		110	J	160	J	12000	U	ND		36	DJ
Phenanthrene	330	50000	88	J	1300		250	J	20	J	ND		1100		150	J	640	J	ND		12	J
Anthracene	330	50000	ND		390	J	76	J	ND		ND		210	J	ND		12000	U	ND		ND	
Fluoranthene	330	50000	100	J	1300		330	J	170	J	90	J	1600		140	J	560	J	ND		ND	
Pyrene	330	50000	82	J	1000		320	J	170	J	51	J	1400		ND		720	J	ND		ND	
Benzo(a)Anthracene	330	224	ND		**590**		94	J	120	J	ND		**1100**		ND		12000	U	ND		ND	
Chrysene	330	400	53	J	**470**		100	J	120	J	ND		**1100**		ND		12000	U	ND		ND	
Benzo(b)fluoranthene	330	1100	69	J	480		ND		130	J	ND		**1500**		ND		12000	U	ND		ND	
Benzo(k)fluoranthene	330	1100	23	J	130	J	ND		45	J	ND		490		ND		12000	U	ND		ND	
Benzo(a)pyrene	330	61	ND		**290**	J	ND		**130**	J	ND		**1100**		ND		12000	U	ND		ND	
Units	ug/Kg	ug/Kg	ug/Kg		ug/Kg		ug/Kg		ug/Kg		ug/Kg		ug/Kg		ug/Kg		ug/Kg		ug/Kg		ug/Kg	

500 Results > or = to NYSDEC ARARs

ND=Not Detected Above the MDL (Method Detection Limit)

Data Qualifiers

J=Reported result falls between the established MDL and CRQL

D=compounds identified at a secondary dilution factor

U=compound not detected at the medium level method CRQL shown

Table 5-4. Summary of Results for Petroleum Indicator Compounds in Soil

SAMPLE INFORMATION																								
LOCATION			GP12		GP13		GP14		GP14		GP15		GP15		GP19		GP19		GP19		GP22		GP22	
DEPTH			8-10 ft		0-2 ft		0-2 ft		8-10 ft		0-2 ft		10-12 ft		0-2 ft		0-2 ft dup		10-12 ft		0-2 ft		4-6 ft	
SAMPLE NUMBER:			G1281		G1302		G1402		G1481		G1502		G1510		G1902		G192D		G1910		G2202		G2246	
DATE SAMPLED:			08/07/95		08/07/95		08/07/95		08/07/95		08/07/95		08/07/95		08/07/95		08/07/95		08/08/95		08/08/95		08/08/95	
ANALYTICAL INFORMATION																								
VOCs																								
DATE ANALYZED:			08/11/95		08/11/95		08/09/95		08/09/95		08/09/95		08/09/95		08/09/95		08/09/95		08/15/95		08/10/95		08/10/95	
Analyte	**CRQL**	**ARAR**	**Result**	**Q**	**Result**	**Q**	**Result**	**Q**	**Result**	**Q**	**Result**	**Q**	**Result**	**Q**	**Result**	**Q**	**Result**	**Q**	**Result**	**Q**	**Result**	**Q**	**Result**	**Q**
Benzene	10	60	1400	U	1400	U	ND		4	J	ND		ND		ND		ND		ND		ND		1500	U
Toluene	10	1500	1400	U	1400	U	ND		ND		ND		ND		ND		ND		0.9	J	ND		1500	U
Ethylbenzene	10	5500	840	J	380	J	ND		6	J	ND		1	J	ND		ND		ND		3	J	4100	
Xylene (total)	10	1200	**2200**		**16000**		6	J	2	J	ND		ND		2	J	1	J	ND		5	J	**5200**	
Units	ug/Kg	ug/Kg	ug/Kg		ug/Kg		ug/Kg		ug/Kg		ug/Kg		ug/Kg		ug/Kg		ug/Kg		ug/Kg		ug/Kg		ug/Kg	
SVOCs																								
DATE EXTRACTED			8/10/95		8/10/95		8/9/95		8/9/95				8/16/95		8/16/95		8/9/95		8/11/95		8/11/95		8/11/95	
DATE ANALYZED:			8/16/95		8/16/95		8/15/95		8/15/95		8/15/95		8/23/95		8/23/95		8/15/95		8/23/95		8/21/95		8/21/95	
Analyte	**CRQL**	**ARAR**		**Q**		**Q**		**Q**		**Q**		**Q**		**Q**		**Q**		**Q**		**Q**		**Q**		**Q**
Phenol	330	30	**2700**	J	12000	U	**53**	J	**64**	J	**130**	J	**260**	J	**68**	J	**49**	J	**150**	J	ND		ND	
Naphthalene	330	1300	**1900**	J	**13000**		4	J	ND		ND		ND		ND		ND		ND		ND		940	
2-Methylnaphthalene	330	3640	**8900**	J	**28000**		9	J	ND		ND		ND		ND		11	J	ND		ND		1900	
Acenaphthene	330	50000	12000	U	12000	U	ND		ND		ND		ND		18	J	11	J	ND		ND		ND	
Fluorene	330	50000	260	J	580	J	ND		ND		ND		ND		32	J	19	J	ND		ND		29	J
Phenanthrene	330	50000	12000	U	12000	U	48	J	22	J	ND		ND		600		120	J	24	J	29	J	18	J
Anthracene	330	50000	12000	U	12000	U	ND		ND		ND		ND		86	J	22	J	ND		ND		ND	
Fluoranthene	330	50000	12000	U	12000	U	150	J	ND		ND		ND		940		92	J	30	J	70	J	410	J
Pyrene	330	50000	12000	U	12000	U	160	J	ND		ND		ND		940		110	J	300	J	50	J	410	J
Benzo(a)Anthracene	330	224	12000	U	12000	U	87	J	ND		ND		ND		**560**		56	J	ND		ND		ND	
Chrysene	330	400	12000	U	12000	U	110	J	ND		ND		ND		**620**		58	J	ND		ND		ND	
Benzo(b)fluoranthene	330	1100	12000	U	12000	U	140	J	ND		ND		ND		760		38	J	ND		49	J	410	J
Benzo(k)fluoranthene	330	1100	12000	U	12000	U	60	J	ND		ND		ND		240	J	14	J	ND		27	J	410	J
Benzo(a)pyrene	330	61	12000	U	12000	U	**86**	J	ND		ND		ND		**490**		ND		**240**	J	ND		ND	
Units	ug/Kg	ug/Kg	ug/Kg		ug/Kg		ug/Kg		ug/Kg		ug/Kg		ug/Kg		ug/Kg		ug/Kg		ug/Kg		ug/Kg		ug/Kg	

▨ 500 Results > or = to NYSDEC ARARs

ND=Not Detected Above the MDL (Method Detection Limit)

Data Qualifiers

J=Reported result falls between the established MDL and CRQL

D=compounds identified at a secondary dilution factor

U=compound not detected at the medium level method CRQL shown

Table 5-4. Summary of Results for Petroleum Indicator Compounds in Soil

SAMPLE INFORMATION																						
LOCATION			GP22		GP24		GP26		GP26		GP26		GP28		G29		GP29		GP31		GP31	
DEPTH			8-10 ft		2-4 ft		0-2 ft		10-12 ft		5-7 ft		10-12 ft		0-2 ft		10-12 ft		0-2 ft		3-5 ft	
SAMPLE NUMBER:			G2281		G2424		G2602		G2610		G2657		G2810		G2902		G2910		G3102		G3135	
DATE SAMPLED:			08/08/95		08/08/95		08/08/95		08/08/95		08/08/95		08/10/95		08/08/95		08/08/95		08/08/95		08/08/95	
ANALYTICAL INFORMATION																						
VOCs																						
DATE ANALYZED:			08/10/95		08/12/95		08/11/95		08/11/95		08/11/95		08/21/95		08/12/95		08/11/95		08/11/95		08/10/95	
Analyte	**CRQL**	**ARAR**	**Result**	**Q**	**Result**	**Q**	**Result**	**Q**	**Result**	**Q**	**Result**	**Q**	**Result**	**Q**	**Result**	**Q**	**Result**	**Q**	**Result**	**Q**	**Result**	**Q**
Benzene	10	60	ND		ND		ND		1400	U	1300	U	1400	U	ND		ND		ND		ND	
Toluene	10	1500	ND		ND		ND		1400	U	1300	U	1400	U	ND		ND		ND		ND	
Ethylbenzene	10	5500	200		ND		ND		**7400**		450	BJ	1300	J	2	J	ND		ND		1	J
Xylene (total)	10	1200	250		ND		ND		**28000**		**1800**	J	**4800**		4	J	ND		ND		1	J
Units	ug/Kg	ug/Kg	ug/Kg		ug/Kg		ug/Kg		ug/Kg		ug/Kg		ug/Kg		ug/Kg		ug/Kg		ug/Kg		ug/Kg	
SVOCs																						
DATE EXTRACTED			8/11/95		8/11/95		8/11/95		8/11/95		8/11/95		8/16/95		8/11/95		8/11/95		8/11/95		8/11/95	
DATE ANALYZED:			8/21/95		8/22/95		8/21/95		8/21/95		8/21/95		8/25/95		8/23/95		8/22/95		8/22/95		8/21/95	
Analyte	**CRQL**	**ARAR**		**Q**		**Q**		**Q**		**Q**		**Q**		**Q**		**Q**		**Q**		**Q**		**Q**
Phenol	330	30	**160**	J	12	J	**140**	J	ND		ND		ND		**3200**	J	**280**	J	**94**	J	ND	
Naphthalene	330	1300	54	J	ND		ND		**1800**		1200		610		260	J	ND		ND		ND	
2-Methylnaphthalene	330	3640	98	J	ND		ND		3000		2100		1500	D	160	J	ND		ND		ND	
Acenaphthene	330	50000	ND		ND		ND		350	J	280	J	91	DJ	410	J	ND		ND		ND	
Fluorene	330	50000	ND		ND		ND		360	J	280	J	75	DJ	630	J	ND		ND		ND	
Phenanthrene	330	50000	ND		ND		140	J	1700		1400		230	DJ	7600		ND		110	J	ND	
Anthracene	330	50000	ND		ND		ND		640		480		53	J	970	J	ND		ND		ND	
Fluoranthene	330	50000	ND		ND		410		2100		1600		200	J	9000		ND		270	J	ND	
Pyrene	330	50000	ND		ND		210	J	1200		1100		170	DJ	8100		ND		140	J	ND	
Benzo(a)Anthracene	330	224	ND		ND		140	J	**680**		**580**		62	J	**5000**		ND		96	J	ND	
Chrysene	330	400	ND		ND		180	J	**570**		**440**		52	J	**5100**		ND		110	J	ND	
Benzo(b)fluoranthene	330	1100	ND		ND		230	J	510		480		46	J	**6000**		ND		150	J	ND	
Benzo(k)fluoranthene	330	1100	ND		ND		72	J	200	J	150	J	24	J	**1800**	J	ND		44	J	ND	
Benzo(a)pyrene	330	61	ND		ND		**140**	J	**360**	J	**290**	J	ND		**3000**	J	ND		**97**	J	ND	
Units	ug/Kg	ug/Kg	ug/Kg		ug/Kg		ug/Kg		ug/Kg		ug/Kg		ug/Kg		ug/Kg		ug/Kg		ug/Kg		ug/Kg	

500 Results > or = to NYSDEC ARARs

ND=Not Detected Above the MDL (Method Detection Limit)

Data Qualifiers

J=Reported result falls between the established MDL and CRQL
D=compounds identified at a secondary dilution factor
U=compound not detected at the medium level method CRQL shown

Table 5-4. Summary of Results for Petroleum Indicator Compounds in Soil

SAMPLE INFORMATION																								
LOCATION			GP31		GP32		GP32		GP34		GP34		GP38		GP38		GP38		GP44		GP44		GP44	
DEPTH			7-9 ft		0-2 ft		8-10 ft		0-2 ft		8-10 ft		0-2 ft		0-2 ft dup		8-10 ft		0-0.5 ft		0-2 ft		5-7 ft	
SAMPLE NUMBER:			G3179		G3202		G3281		G3402		G3481		G3802		G382D		G3881		G4406		G4402		G4457	
DATE SAMPLED:			08/08/95		08/08/95		08/08/95		08/08/95		08/08/95		08/08/95		08/08/95		08/08/95		08/10/95		08/10/95		08/10/95	
ANALYTICAL INFORMATION																								
VOCs																								
DATE ANALYZED:			08/10/95		08/11/95		08/11/95		08/15/95		08/11/95		08/11/95		08/15/95		08/11/95		08/21/95		08/15/95		08/15/95	
Analyte	**CRQL**	**ARAR**	**Result**	**Q**	**Result**	**Q**	**Result**	**Q**	**Result**	**Q**	**Result**	**Q**	**Result**	**Q**	**Result**	**Q**	**Result**	**Q**	**Result**	**Q**	**Result**	**Q**	**Result**	**Q**
Benzene	10	60	ND		ND		27		ND		ND		ND		ND		ND		1500	U	ND		ND	
Toluene	10	1500	ND		ND		ND		0.8	J	ND		ND		ND		ND		1500	U	ND		ND	
Ethylbenzene	10	5500	5	J	ND		85		ND		ND		ND		2	J	1	J	1400	J	ND		ND	
Xylene (total)	10	1200	16		ND		86		4	JB	0.9	J	0.9	J	7	J	4	J	▨ 6000		ND		ND	
Units	ug/Kg	ug/Kg	ug/Kg		ug/Kg		ug/Kg		ug/Kg		ug/Kg		ug/Kg		ug/Kg		ug/Kg		ug/Kg		ug/Kg		ug/Kg	
SVOCs																								
DATE EXTRACTED			8/11/95		8/11/95		8/11/95		8/11/95		8/11/95		8/11/95		8/11/95		8/11/95		8/16/95		8/16/95		8/16/95	
DATE ANALYZED:			8/21/95		8/22/95		8/21/95		8/22/95		8/22/95		8/21/95		8/22/95		8/21/95		8/25/95		8/24/95		8/24/95	
Analyte	**CRQL**	**ARAR**		**Q**		**Q**		**Q**		**Q**		**Q**		**Q**		**Q**		**Q**		**Q**		**Q**		**Q**
Phenol	330	30	▨ 200	J	▨ 310	J	▨ 1100		▨ 820		ND		▨ 1800		▨ 930		▨ 360	J	ND		▨ 220	J	▨ 240	J
Naphthalene	330	1300	ND		ND		100	J	16	J	ND		ND		9	J	ND		1000		ND		ND	
2-Methylnaphthalene	330	3640	ND		21	J	240	J	28	J	ND		ND		8	J	ND		2200		ND		ND	
Acenaphthene	330	50000	ND		ND		32	J	ND		ND		ND		ND		ND		120	J	ND		ND	
Fluorene	330	50000	ND		ND		34	J	ND		ND		ND		ND		ND		120	J	ND		ND	
Phenanthrene	330	50000	ND		ND		210	J	ND		ND		ND		190	J	ND		410		ND		ND	
Anthracene	330	50000	ND		ND		80	J	ND		ND		ND		31	J	ND		110	J	ND		ND	
Fluoranthene	330	50000	ND		ND		310	J	38	J	ND		ND		470		ND		420		ND		ND	
Pyrene	330	50000	ND		26	J	190	J	ND		ND		ND		180	J	ND		260	J	ND		ND	
Benzo(a)Anthracene	330	224	ND		ND		120	J	ND		ND		ND		160	J	ND		130	J	ND		ND	
Chrysene	330	400	ND		ND		110	J	ND		ND		ND		230	J	ND		100	J	ND		ND	
Benzo(b)fluoranthene	330	1100	ND		ND		91	J	ND		ND		ND		330	J	ND		110	J	ND		ND	
Benzo(k)fluoranthene	330	1100	ND		ND		22	J	ND		ND		ND		110	J	ND		30	J	ND		ND	
Benzo(a)pyrene	330	61	ND		ND		ND		ND		ND		ND		▨ 100	J	ND		ND		ND		ND	
Units	ug/Kg	ug/Kg	ug/Kg		ug/Kg		ug/Kg		ug/Kg		ug/Kg		ug/Kg		ug/Kg		ug/Kg		ug/Kg		ug/Kg		ug/Kg	

▨ 500 Results > or = to NYSDEC ARARs

ND=Not Detected Above the MDL (Method Detection Limit)

Data Qualifiers

J=Reported result falls between the established MDL and CRQL
D=compounds identified at a secondary dilution factor
U=compound not detected at the medium level method CRQL shown

Table 5-4. Summary of Results for Petroleum Indicator Compounds in Soil

SAMPLE INFORMATION																						
LOCATION			GP44		GP45		GP45		GP45		HA12		HA16		HA16		HA20		HA21		HA22	
DEPTH			8-10 ft		0-2 ft		5-7 ft		8-10 ft		0-2 ft		2-4 ft		8-10 ft		0-0.5 ft		0-0.5 ft		0-0.5 ft	
SAMPLE NUMBER:			G4481		G4502		G4557		G4581		H1202		H1624		H1681		H2006		H2106		H2206	
DATE SAMPLED:			08/10/95		08/10/95		08/10/95		08/10/95		08/10/95		08/10/95		08/10/95		08/10/95		08/10/95		08/10/95	
ANALYTICAL INFORMATION																						
VOCs																						
DATE ANALYZED:			08/15/95		08/17/95		08/18/95		08/15/95		08/21/95		08/21/95		08/21/95		08/18/95		08/20/95		08/21/95	
Analyte	**CRQL**	**ARAR**	**Result**	**Q**	**Result**	**Q**	**Result**	**Q**	**Result**	**Q**	**Result**	**Q**	**Result**	**Q**	**Result**	**Q**	**Result**	**Q**	**Result**	**Q**	**Result**	**Q**
Benzene	10	60	ND		ND		ND		ND		ND		1200	U	1500	U	ND		1400	U	1700	U
Toluene	10	1500	ND		ND		ND		ND		ND		1200	U	1500	U	ND		1400	U	1700	U
Ethylbenzene	10	5500	ND		ND		ND		1	J	ND		210	J	810	J	ND		1400	U	1700	U
Xylene (total)	10	1200	ND		ND		ND		4	JB	ND		3700		2800		7	DJ	1400	U	1700	U
Units	ug/Kg	ug/Kg	ug/Kg		ug/Kg		ug/Kg		ug/Kg		ug/Kg		ug/Kg		ug/Kg		ug/Kg		ug/Kg		ug/Kg	
SVOCs																						
DATE EXTRACTED			8/16/95		8/16/95		8/16/95		8/16/95		8/16/95		8/22/95		8/16/95		8/16/95		8/16/95		8/16/95	
DATE ANALYZED:			8/24/95		8/24/95		8/24/95		8/24/95		8/25/95		8/25/95		8/25/95		8/25/95		8/25/95		8/25/95	
Analyte	**CRQL**	**ARAR**		**Q**		**Q**		**Q**		**Q**		**Q**		**Q**		**Q**		**Q**		**Q**		**Q**
Phenol	330	30	6000	D	40	J	500		1200		ND		11000	U	ND		ND		ND		ND	
Naphthalene	330	1300	ND		ND		ND		ND		ND		11000	U	400	J	ND		ND		15	J
2-Methylnaphthalene	330	3640	ND		ND		ND		ND		ND		2600	J	830		ND		ND		ND	
Acenaphthene	330	50000	ND		ND		ND		ND		ND		620	J	75	J	ND		ND		90	J
Fluorene	330	50000	ND		ND		ND		ND		ND		480	J	78	J	ND		26	J	140	J
Phenanthrene	330	50000	ND		ND		ND		ND		76	J	1900	J	340	J	75	J	250	J	1200	
Anthracene	330	50000	ND		ND		ND		ND		ND		470	J	83	J	ND		42	J	290	J
Fluoranthene	330	50000	ND		35	J	ND		ND		150	J	1600	J	360	J	150	J	460		1600	
Pyrene	330	50000	ND		26	J	ND		ND		87	J	1400	J	200	J	92	J	280	J	1300	
Benzo(a)Anthracene	330	224	ND		ND		ND		ND		51	J	11000	U	96	J	57	J	200	J	780	
Chrysene	330	400	ND		ND		ND		ND		73	J	11000	U	74	J	68	J	190	J	740	
Benzo(b)fluoranthene	330	1100	ND		ND		ND		ND		90	J	11000	U	77	J	85	J	250	J	860	
Benzo(k)fluoranthene	330	1100	ND		ND		ND		ND		31	J	11000	U	25	J	23	J	84	J	270	J
Benzo(a)pyrene	330	61	ND		ND		ND		ND		65	J	11000	U	ND		ND		130	J	700	
Units	ug/Kg	ug/Kg	ug/Kg		ug/Kg		ug/Kg		g/Kg		ug/Kg		ug/Kg		ug/Kg		ug/Kg		ug/Kg		ug/Kg	

500 Results > or = to NYSDEC ARARs

ND=Not Detected Above the MDL (Method Detection Limit)

Data Qualifiers

J=Reported result falls between the established MDL and CRQL

D=compounds identified at a secondary dilution factor

U=compound not detected at the medium level method CRQL shown

TABLE 5-5a. Summary of PCB Results in Surface Soil

Location Number	Sample Date	Sample Depth	Sample Number	Analyte	Result (ug/Kg)	CRQL (ug/Kg)	ARAR (ug/Kg)
SURFACE SAMPLES WITH PCBS GREATER THAN ARARS							
BO-4	1990	0-2 ft.	BO-4	PCB-1260	13,000	17	1,000
BO-5	1990	0-2 ft.	BO-5	PCB-1260	35,000	17	1,000
BO-6	1990	0-2 ft.	BO-6	PCB-1260	110,000	17	1,000
BO-7	1990	0-2 ft.	BO-7	PCB-1260	240,000	17	1,000
BO-8	1990	0-2 ft.	BO-8	PCB-1260	14,000	17	1,000
BO-9	1990	0-2 ft.	BO-9	PCB-1260	240,000	17	1,000
BO-14	1990	0-2 ft.	BO-14	PCB-1260	97,000	17	1,000
BO-15	1990	0-2 ft.	BO-15	PCB-1260	1,300	17	1,000
HA-26	6/11/96	0-2 ft.	HN HA26 0002	PCB-1260	1,600	71	1,000
HA-27	6/11/96	0-2 ft.	HN HA27 0002	PCB-1260	3,000	71	1,000
GP47	8/11/95	0-2 ft.	G4702*	PCB-1260	2,700	17	1,000
SURFACE SAMPLES WITH PCBS LESS THAN ARARS							
BO-1	1990	0-2 ft.	BO-1	PCB-1260	56	17	1,000
BO-2	1990	0-2 ft.	BO-2	PCB-1260	ND	17	1,000
BO-3	1990	0-2 ft.	BO-3	PCB-1260	ND	17	1,000
BO-10	1990	0-2 ft.	BO-10	PCB-1260	130	17	1,000
BO-11	1990	0-2 ft.	BO-11	PCB-1260	930	17	1,000
BO-12	1990	0-2 ft.	BO-12	PCB-1260	190	17	1,000
BO-13	1990	0-2 ft.	BO-13	PCB-1260	280	17	1,000
BO-16	1990	0-2 ft.	BO-16	PCB-1260	100	17	1,000
HA12	8/10/95	0-2 ft.	H1202	PCB-1260	140	17	1,000
HA20	8/10/95	0-0.5 ft.	H2006	PCB-1260	27	17	1,000
HA21	8/10/95	0-0.5 ft.	H2106	PCB-1260	ND*	17	1,000
HA22	8/10/95	0-0.5 ft.	H2206	PCB-1260	ND*	17	1,000
HA24	6/11/96	0-2 ft.	HN HA24 0002	PCB-1260	200	71	1,000
HA 25	6/11/96	0-2 ft.	HN HA25 0002	PCB-1260	72	71	1,000
GP13	8/11/95	0-2 ft.	G1302	PCB-1260	180	17	1,000
GP22	8/11/95	0-2 ft.	G2202	PCB-1260	260	17	1,000
GP23	8/11/95	0-2 ft.	G2302	PCB-1260	66	17	1,000
GP29	8/11/95	0-2 ft.	G2902	PCB-1260	570	17	1,000
GP31	8/11/95	0-2 ft.	G3102	PCB-1260	ND*	17	1,000
GP44	8/10/95	0-2 ft.	G4402	PCB-1260	44	17	1,000
GP45	8/10/95	0-2 ft.	G4502	PCB-1260	ND*	17	1,000
GP48	8/11/95	0-2 ft.	G4802	PCB-1260	400	17	1,000
GP48	8/11/95	0-2 ft.	G482D	PCB-1260	150	17	1,000
GP49	8/11/95	0-2 ft.	G4902	PCB-1260	30	17	1,000

*ND=Not Detected at concentrations greater than the established MDLs for target compounds

*Sample was diluted because of high concentrations of compounds in sample, therefore target compounds at low concentrations may not be identified

TABLE 5-5b. Summary of PCB Results in Subsurface Soil

Sample Information				Analytical Information			
Location Number	Sample Date	Sample Depth	Sample Number	Analyte	Results (ug/Kg)	CRQL (ug/Kg)	ARAR (ug/Kg)
SUBSURFACE SAMPLES WITH PCBS GREATER THAN ARARS							
HA8	8/10/95	2-4 ft.	H0824*	PCB-1260	62,000	17	10,000
HA4	8/10/95	4-6 ft.	H4406*	PCB-1260	21000	17	10,000
HA4	8/10/95	8-10 ft.	H4810*	PCB-1260	150,000	17	10,000
SUBSURFACE SAMPLES WITH PCBS LESS THAN ARARS							
HA16	8/10/95	2-4 ft.	H1624	PCB-1260	2600	17	10,000
HA16	8/10/95	8-10 ft.	H1681	PCB-1260	320	17	10,000
HA28	8/10/95	8-10 ft.	H2810	PCB-1260	360	17	10,000
HA26	6/11/96	2-4 ft.	HN HA26 0204	PCB-1260	210	82	10,000
HA27	6/11/96	2-4 ft.	HN HA27 0204	PCB-1260	80	80	10,000
GP10	8/11/95	2-4 ft.	G1024	PCB-1260	230	17	10,000
GP12N	8/11/95	2-4 ft.	G12N2	PCB-1260	ND*	17	10,000
GP12S	8/11/95	2-4 ft.	G12S2	PCB-1260	ND*	17	10,000
GP13	8/11/95	2-4 ft.	G1324	PCB-1260	ND*	17	10,000
GP26W	8/11/95	2-4 ft.	G26W2	PCB-1260	ND*	17	10,000
GP26S	8/11/95	2-4 ft.	G26S2	PCB-1260	ND*	17	10,000
GP26S	8/11/95	2-4 ft.	G26SD	PCB-1260	ND*	17	10,000
GP29	8/11/95	2-4 ft.	G2924	PCB-1260	ND*	17	10,000

*ND=Not Detected at concentrations greater than the established MDLs for target compounds

*Sample was diluted because of high concentrations of compounds in sample, therefore target compounds at low concentrations may not be identified

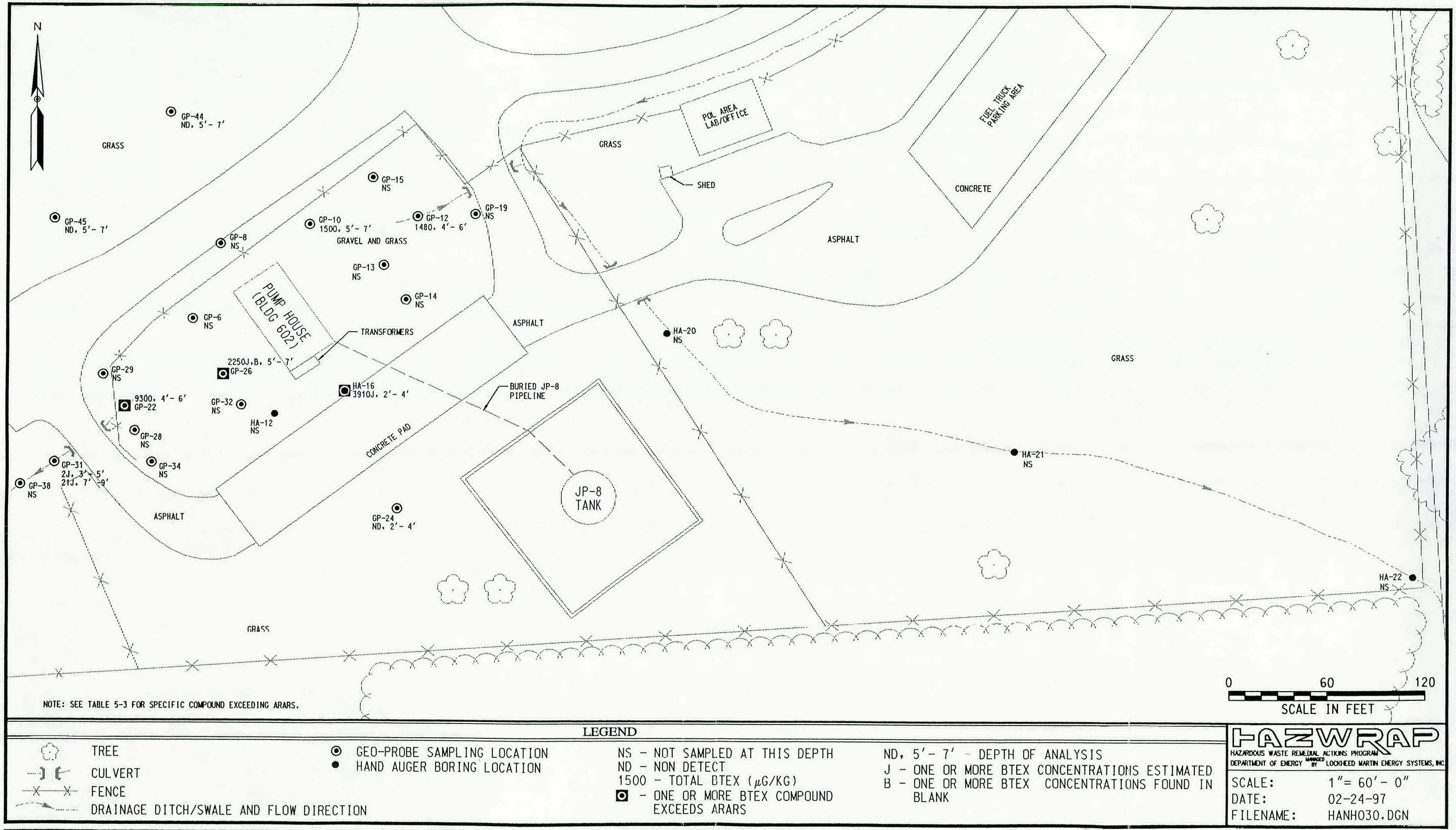


Fig. 5-5b. Soils Analytical Data Map, Total BTEX Concentrations-Intermediate Depths, POL Area, 174th FW, NYANG, Hancock Field, Syracuse, NY.

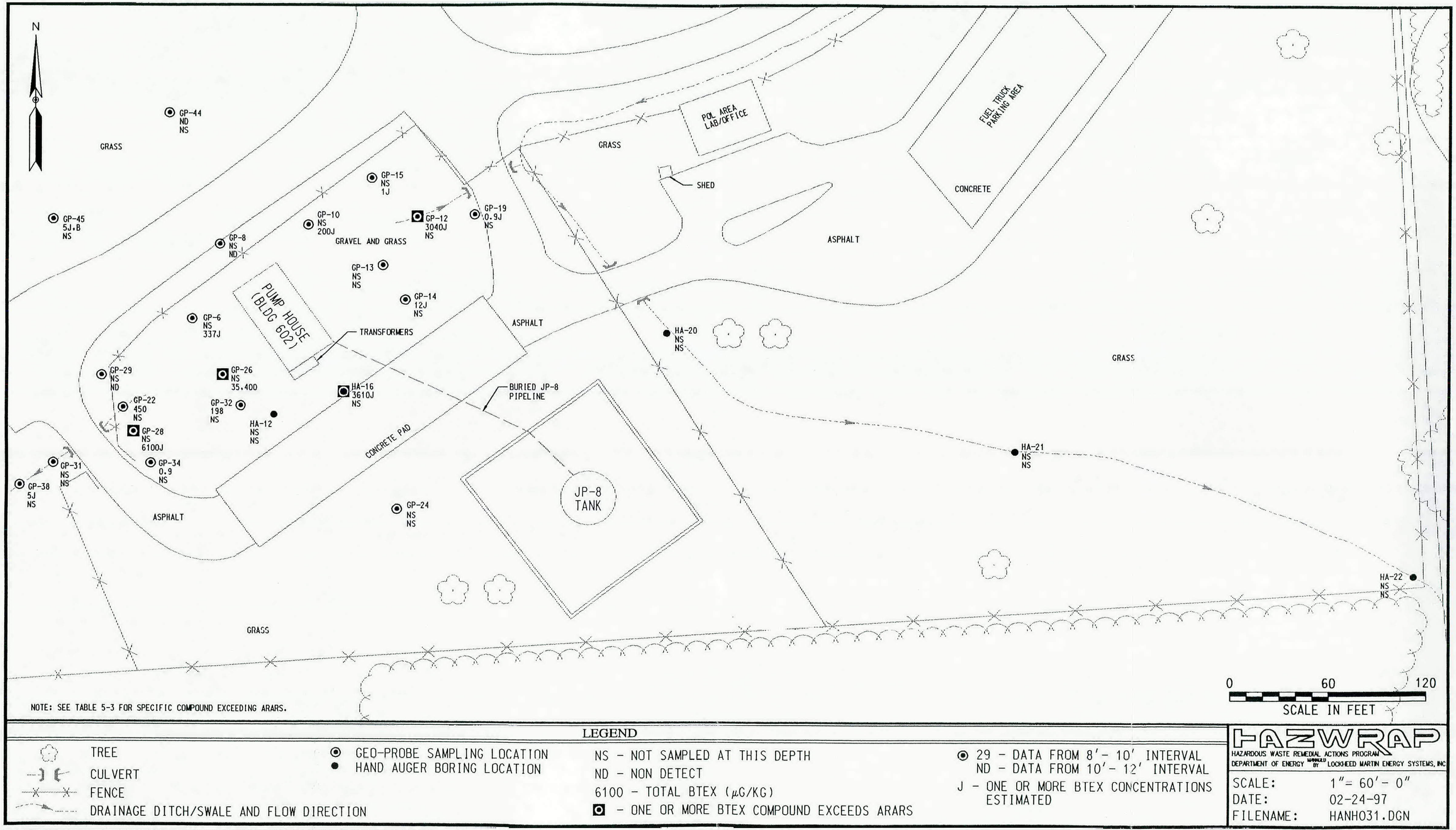


Fig. 5-5c. Soils Analytical Data Map, Total BTEX Concentrations-Capillary Fringe, POL Area, 174th FW, NYANG, Hancock Field, Syracuse, NY.

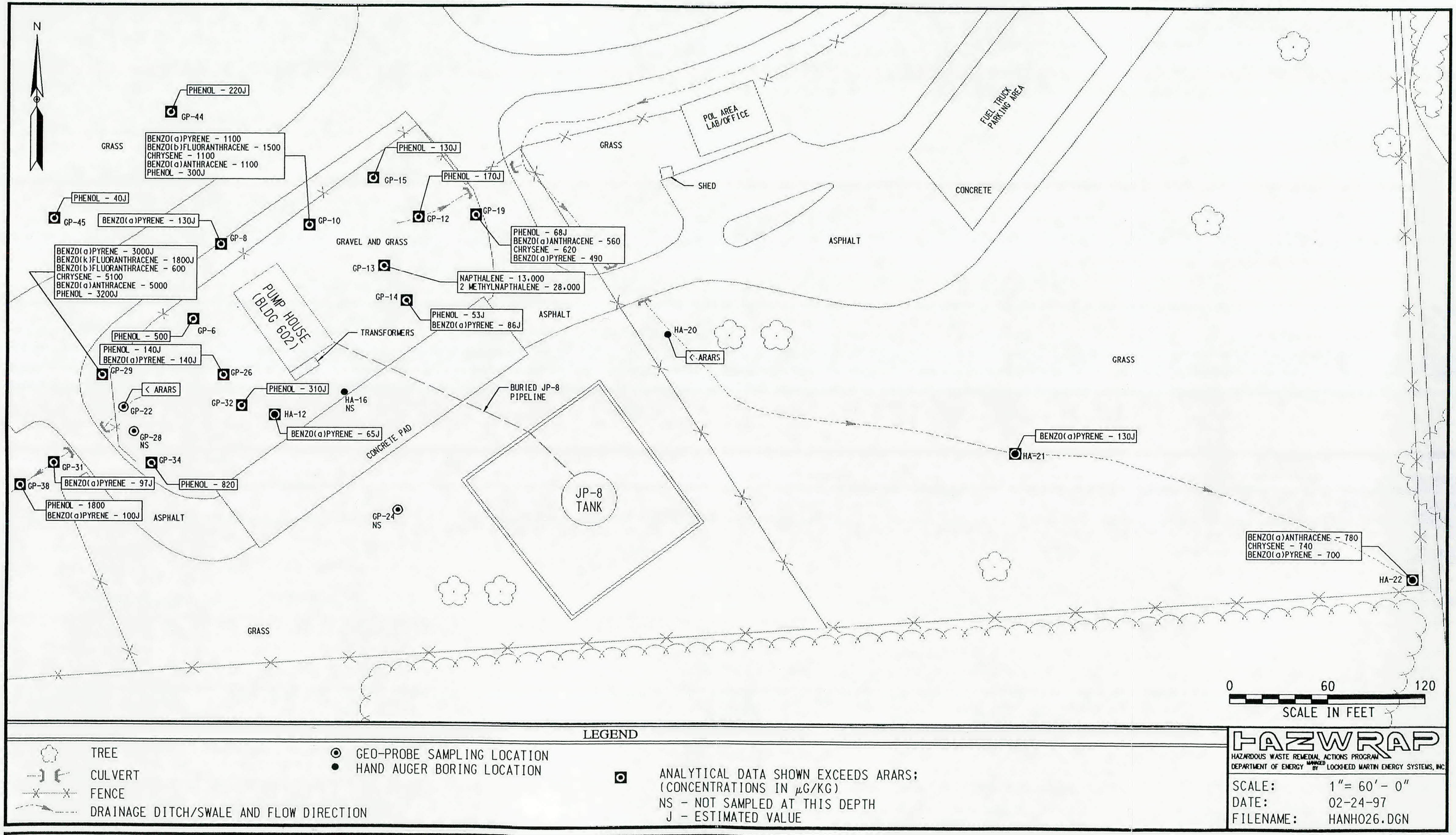


Fig. 5-6a. Soils Analytical Data Map, Semivolatile Concentrations-Surficial (0-2 ft), POL Area, 174th FW, NYANG, Hancock Field, Syracuse, NY.

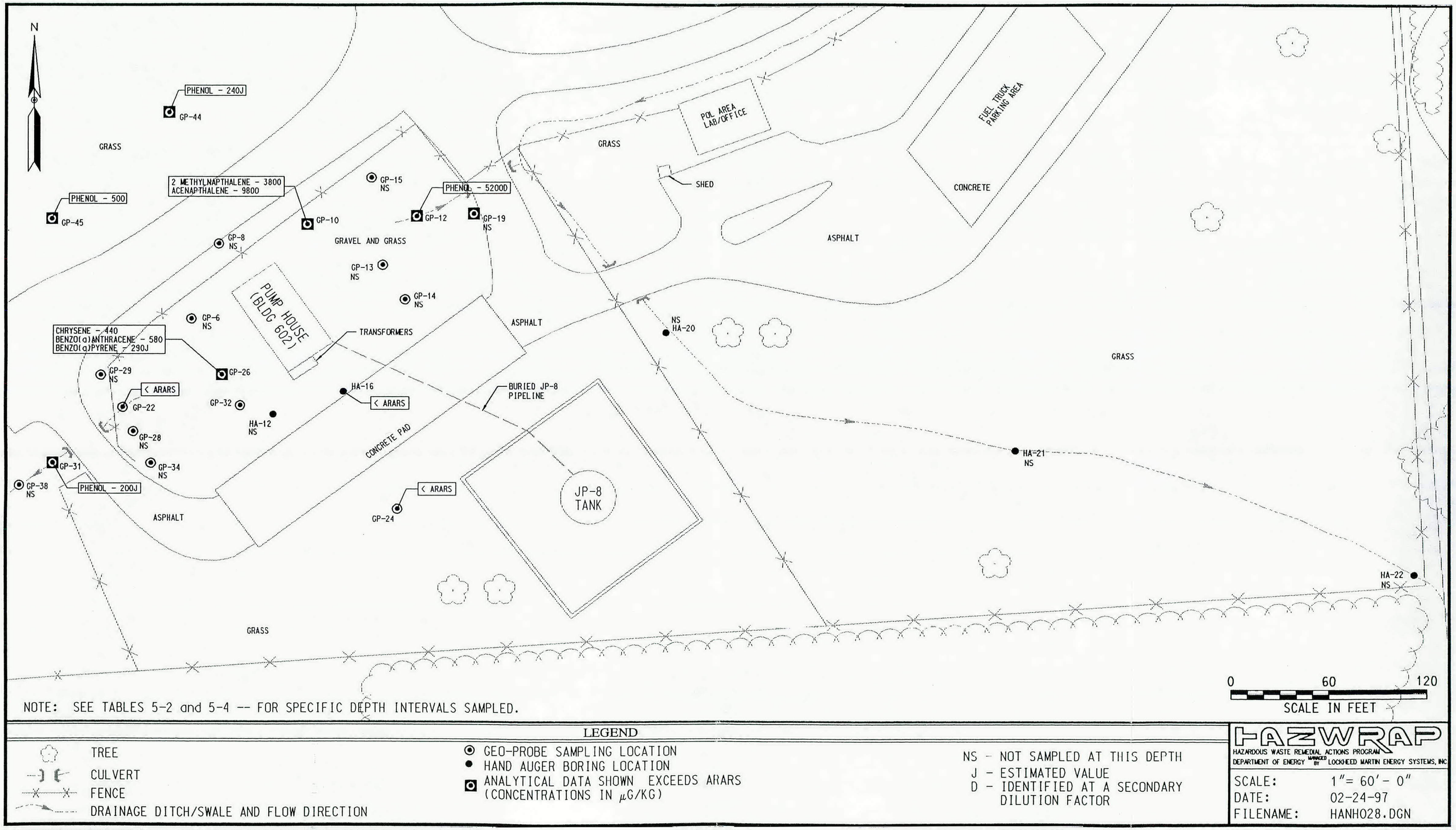
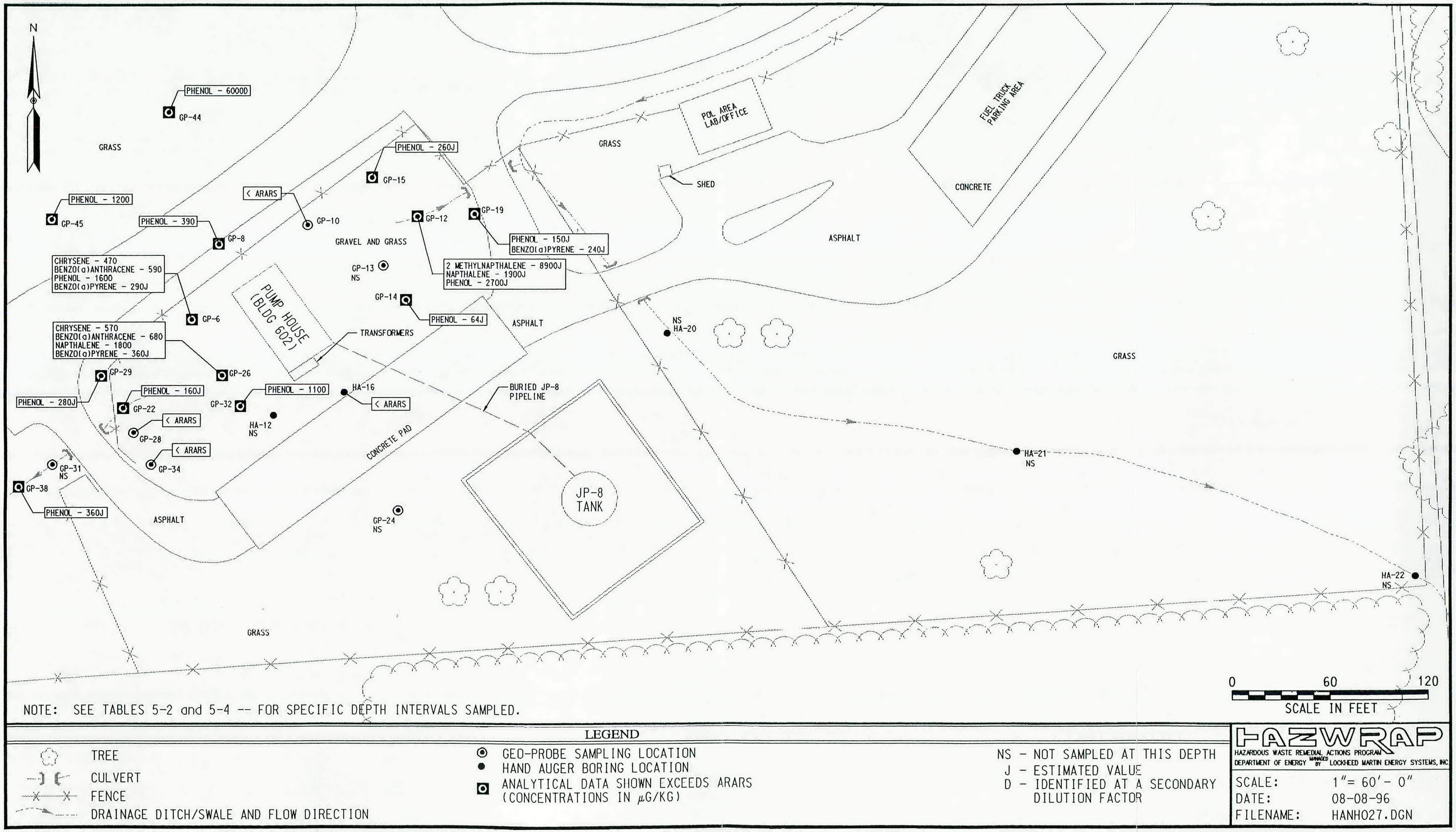
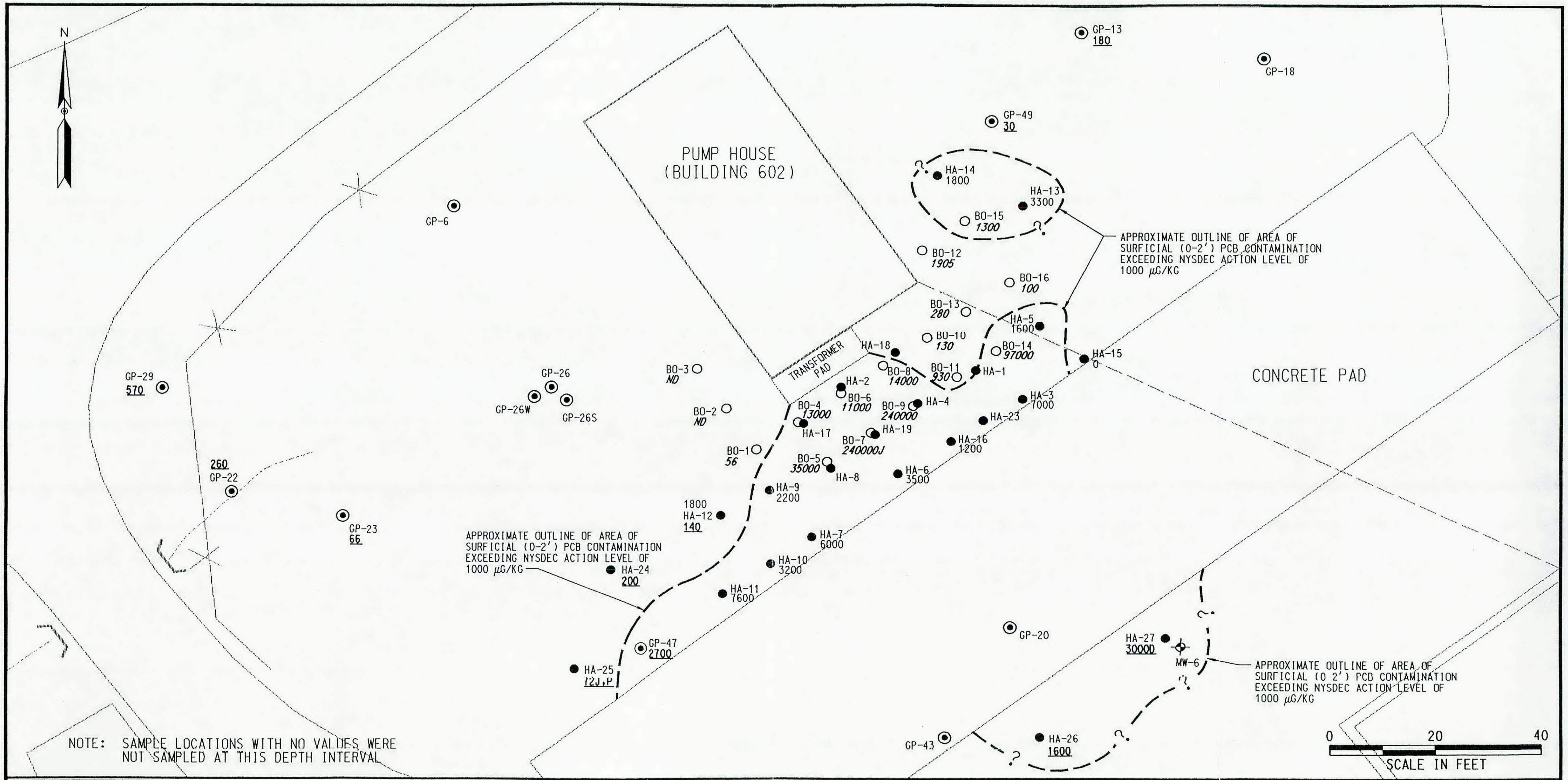


Fig. 5-6b. Soils Analytical Data Map, Semivolatile Concentrations-Intermediate Depths, POL Area, 174th FW, NYANG, Hancock Field, Syracuse, NY.



NOTE: SEE TABLES 5-2 and 5-4 -- FOR SPECIFIC DEPTH INTERVALS SAMPLED.

Fig. 5-6c. Soils Analytical Data Map, Semivolatile Concentrations-Approximate Capillary Fringe, POL Area, 174th FW, NYANG, Hancock Field, Syracuse, NY.



LEGEND

◉ GEO-PROBE BORING, (1995)	ND - NON DETECT	*250* - FIXED BASE LAB AROCLOR 1260 CONCENTRATION, SI 1992 IN μG/KG
● HAND AUGER BORING, (1995,1996)	J - ESTIMATED VALUE	570 - FIXED BASE LAB AROCLOR 1260 CONCENTRATION, RI 1995,1996 IN μG/KG
○ HAND AUGER BORING, (1992)	P - >25% CONC. BETWEEN GC COLUMNS	3200 - FIELD SCREENED AROCLOR 1260 CONCENTRATION, RI 1995 IN μG/KG
⌖ GEO-PROBE BORING, (1995)		

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Fig. 5-7a. PCB Concentrations Surface Soils (0-2 ft), Fixed Base Lab Data From SI (1992), RI (1995) and Field Screening Data RI (1995), POL Area, 174th FW, NYANG, Hancock Field, Syracuse, NY.

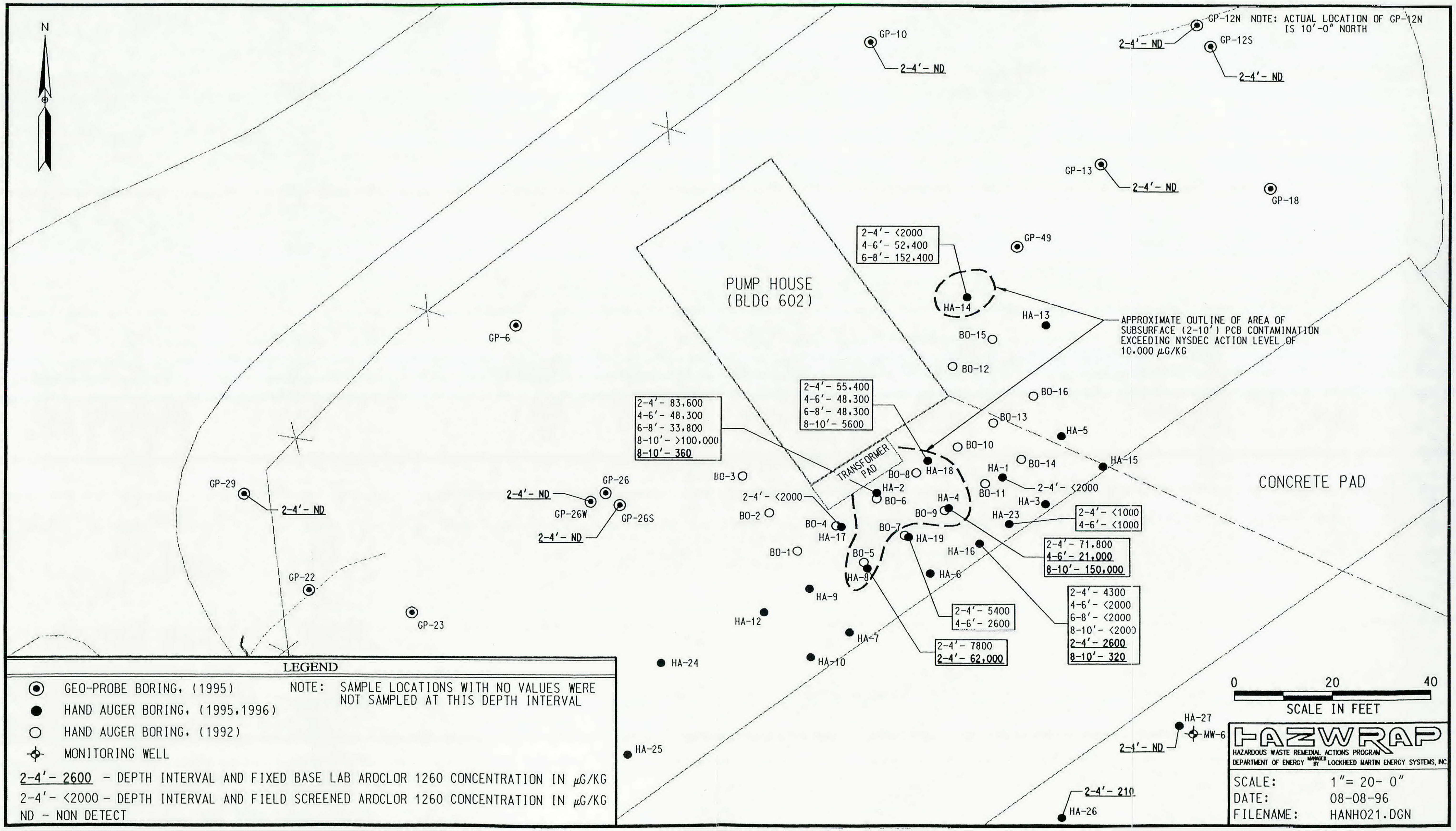


Fig. 5-7b. PCB Concentrations Subsurface Soils (2-10 ft), Fixed Base Lab Data from RI (1995) and Field Screening Data RI (1995), POL Area, 174th FW, NYANG, Hancock Field, Syracuse, NY.

are 60 μg/kg for benzene and 1500 μg/kg for toluene. On the east side of the pump house, GP-12 was also found to be above state cleanup levels for xylene with a concentration in the soil at 2200 μg/kg. GP-12 is located in a downgradient surficial flow path from high surficial contamination found at GP-13.

5.5.2 Semivolatile Organic Compound Soil Confirmation and Delineation

Nineteen soil samples were collected from the 0–2-ft interval and analyzed for SVOC compounds; three samples from along the shallow drainage ditch to the southeast of the facility are included in these data. The analytical data are presented on Table 5-4 and Fig. 5-6a. More than one-half (53%) of the samples analyzed were found to contain phenol at levels above the NYSDEC soil ARAR of 30 μg/kg; values exceeding cleanup levels ranged from 53J μg/kg at GP-14 to 3200J μg/kg at GP-29. Because of the unexpected occurrence of relatively high levels of phenol, a subsequent investigation to determine the source and extent of phenol contamination was performed. In addition to the phenol, PAHs at various levels of concentration were detected. Among those detected more than once at levels above state cleanup levels were benzo(a)anthracene (4 detections), chrysene (4 detections), benzo(a)pyrene (3 detections), and benzo(b)fluoranthene (2 detections). Naphthalene, 2-methylnaphthalene, and benzo(k)fluoranthene were each detected one time at levels above state ARARS.

Intermediate depth samples for SVOCs were selected from seven sampling locations. Four of these locations had detections above ARARs. These data are presented on Table 5-4 and Fig. 5-6b. Two samples other than the background samples discussed in Sect. 5.2.2 had exceedances for phenols: GP-12 and GP-31. Two other locations—GP-10 and GP-26—were above soil cleanup levels for acenapthene and 2 methylnaphthalene and benzo(a)anthracene and chrysene, respectively.

Fifteen soil samples over the approximate interval of the capillary fringe were analyzed for SVOCs. Eleven samples, or 73%, exceeded state ARARS for phenol. Exclusive of the two background samples, the concentrations ranged from 64J μg/kg to 2700J μg/kg (see Table 5-4 and Fig. 5-6c). Two sampling locations (in addition to phenol contamination) had SVOC and PAH contamination above ARARS: GP-12 (2-methylnaphthalene at 8900J μg/kg and naphthalene at 1900J μg/kg) and GP-6 (benzo(a)anthracene at 590 μg/kg and chrysene at 470 μg/kg). GP-26, although not contaminated at depth with phenol, had naphthalene, chrysene, and benzo(a)anthracene concentrations exceeding ARARs.

5.5.3 Polychlorinated Biphenyls Soil Confirmation and Delineation

The analytical results for PCB analyses for surface and subsurface soils are presented on Tables 5-5a and 5-5b. The data are separated into surface soils (0–2 ft) and subsurface soils (2–10 ft) on Fig. 5-7a and Fig. 5-7b, respectively. To avoid introducing PCB contamination to the groundwater, Geoprobe push locations were terminated before encountering water. Data from fixed-base laboratory analyses from the SI conducted in 1992 and the RI data obtained from Geoprobe and hand augers from this investigation are presented; field screening data from immunoassay kits are also shown on the figures.

Analytical results obtained from 20 surface soil samples from the present field investigation (Table 5-5a) show PCB concentrations for Aroclor 1260 ranging from nondetect to as high as

21,000 μg/kg. The area of main contamination extends from the transformer pad in front of the pump house and to either side along the concrete fuel transfer pad (Fig. 5-7a). The contamination is defined by the hand auger samples with the letter designation "HA" from this investigation and those with a "BO" designation from the SI (Metcalf & Eddy 1992). A second, partially defined area of contamination was found present across the concrete pad in the vicinity of MW-6. A third, discrete area of surficial contamination was also delineated to the immediate area southeast of the pump house. Field screening with immunoassay soil test kits helped in the delineation and selection of samples for laboratory analysis. For surficial soils, the NYSDEC cleanup action level for PCB contamination is 1000 μg/kg.

Delineation of subsurface PCB Aroclor 1260 contamination relied on a combination of fixed-base laboratory analytical data and the immunoassay soil test kits (see Table 5-5a and Fig. 5-7b). Using both the laboratory and field screening data, two areas of contamination with depth were defined. It is noted that the area of surficial contamination found on the southeast side of the concrete pad did not extend at depth. The NYSDEC soil action cleanup level for PCBs in the subsurface is set at 10,000 μg/kg. In the absence of verifying laboratory data, field-screened samples with values for Aroclor 1260 above 10,000 μg/kg were assumed to be delineating values.

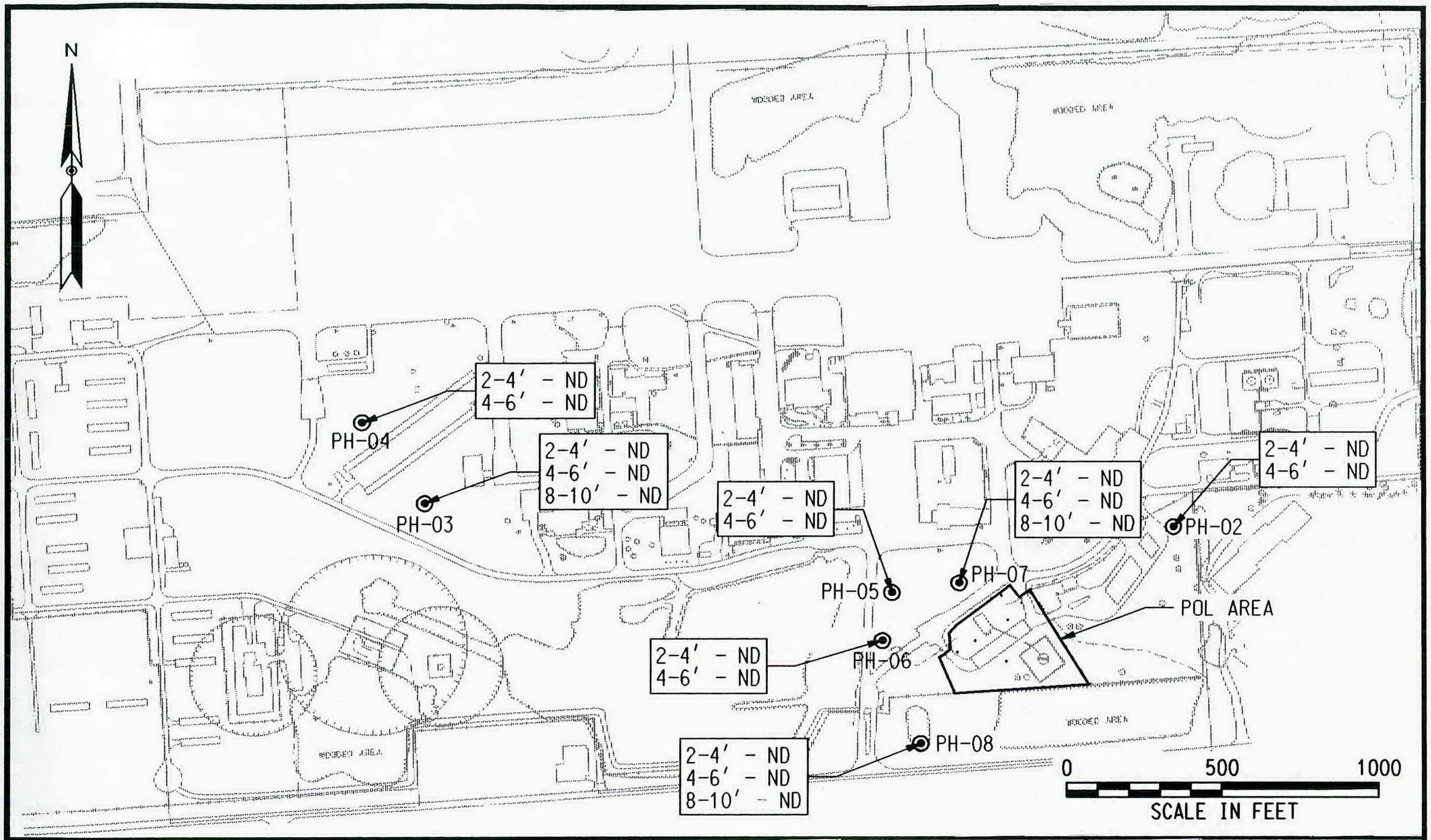
5.5.4 Phenol Soil Investigation

The near ubiquitous occurrence of phenol at relatively high concentrations found both at the site and in background samples necessitated additional research and a second field mobilization to determine its possible source and areal extent. The additional research indicated the most likely sources for the phenol were (1) past agricultural practices related to apple production before and during the construction of the Base and (2) recent application of herbicides for broadleaf weed control. The broadleaf herbicides used at the Base contain 2,4-D and phenol is one of the products of degradation of 2,4-D. The data from the record search is presented in a Technical Memorandum (HAZWRAP 1996a) submitted to NYSDEC. Seven sampling sites, one of which approximated the background sample GP-44, were selectively chosen to explore both these potential sources at the Base. A Technical Memorandum detailing the sampling plan for phenol (HAZWRAP 1996b) was submitted to NYSDEC. Figure 5-8 shows the sample locations for the phenol investigation. The results of the investigation indicated no detects above ARARs for phenol by Method 8270 and for phenolic-containing and other herbicides by Method 8150A. Because of the nondetects, a data summary table was not prepared. The complete set of laboratory data is in Appendix K. The occurrence of PAHs at levels above NYSDEC soil cleanup levels were found at PH05 at both sampling depths and at PH07 at the 0–2-ft interval.

WHY PHENOL
HITS BUT
NO HERBS?

5.6 GROUNDWATER CONFIRMATION AND DELINEATION RESULTS

Groundwater confirmational sampling for VOCs, SVOCs, and PCBs were collected from 14 monitoring wells. VOCs and SVOCs were analyzed by CLP Methods and PCBs by Method 8080. Monitoring well MW-12S was not sampled because of the presence of free product in the well. Groundwater samples for target analyte metals were collected from four monitoring wells; metals were not considered a contaminant of concern at the POL area but were analyzed for to assist in remediation planning. In addition and for the same purpose, four monitoring wells were sampled and analyzed for TOC, BOD, and TDS.



LEGEND

⊙ PH-04	GEO-PROBE SAMPLING LOCATION
ND	NON DETECT
2-4′ - ND	SAMPLE DEPTH AND PHENOL DATA

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Fig. 5-8. Sampling Locations and Soils Analytical Data Map, Phenol Concentrations, 174th FW, NYANG, Hancock Field, Syracuse, NY.

5.6.1 Volatile Organic Compound Groundwater Confirmation and Delineation

Six of the 14 monitoring wells analyzed for VOCs in the groundwater had 1 or more BTEX compound in excess of NYSDEC ARARS (see Table 5-3 and Fig. 5-9). Monitoring well MW-12S was not analyzed because of the presence of free product in the well. Benzene concentrations ranged from nondetect to a maximum of 220 μg/L in MW-11. The NYSDEC ARAR for benzene is 0.7 μg/L. Concentrations for toluene were nondetect in 13 of the wells sampled; in MW-11, the concentration of 1J μg/L was below the state ARAR of 5 μg/L. Ethylbenzene concentrations were nondetect or below NYSDEC ARARS in 8 of the 14 wells sampled. In the area of the groundwater plume, detections ranged from 5 μg/L in MW-6D to a maximum of 400 μg/L in MW-2. Detections of total xylenes were recorded in 9 of the 14 wells. Concentrations ranged from nondetects to 2J μg/L outside the plume in MW-4 and MW-9. Within the plume outline, detects ranged from a low of 1J μg/L at MW-12D to a maximum of 1200 μg/L at MW-2.

5.6.2 Semivolatile Organic Compound Groundwater Confirmation and Delineation

Naphthalene and 2-methylnaphthalene, the two most common SVOC contaminants found, were in 5 of the 6 wells where SVOC contamination was found (see Table 5-3 and Fig. 5-10). Three of the 14 monitoring wells sampled had SVOC concentrations exceeding state ARARS for groundwater. The exceedances were for naphthalene, which has a NYSDEC ARAR of 30 μg/L; analytical results for this compound were 30 μg/L for both MW-6S and MW-11 and 56 μg/L for MW-2. MW-12S was not sampled because of the presence of free product in the well. The SVOC 2-methylnaphthalene has no ARAR but was present in five wells at concentrations ranging from 0.4J (MW-6D) to 34 μg/L (MW-2). Three of the wells had low-level concentrations of phenol; 2J μg/L in MW-3, 6J μg/L in MW-11, and 10 μg/L in MW-2. The SVOCs acenaphthalene, fluorene, and phenanthrene were detected in MW-6S, but below state ARARS.

5.6.3 Polychlorinated Biphenyl Groundwater Confirmation

None of the 14 monitoring wells analyzed for PCB compounds in the groundwater had detections. Both filtered and unfiltered samples were collected and analyzed using SW 846 Method 8080. Table 5-6 summarizes the data; Appendix F provides the results. During groundwater sampling done in 1994, one well, MW-6, had a 0.62 μg/L detection of Aroclor 1260; this well was not resampled because of the damaging of the well and subsequent loss of sample integrity. The presence of PCB found in the earlier sampling event in this one well would appear to be related to the surficial contamination of PCB found in the present field investigation and the possible entry to the groundwater via the damaged well.

5.7 NATIVE SOIL AND GROUNDWATER QUALITY SAMPLING RESULTS

TOC content for the soils was analyzed in five soil Geoprobe sampling locations. Data are presented on Table 5-7 for the results from GP-6, GP-10, GP-12, GP-14, and GP-22. Analytical results vary from a low of 26 mg/kg to a high of 2700 mg/kg. In all cases (except for GP-22) the TOC content is observed to decrease with depth. Table 5-8 presents total solids in soil.

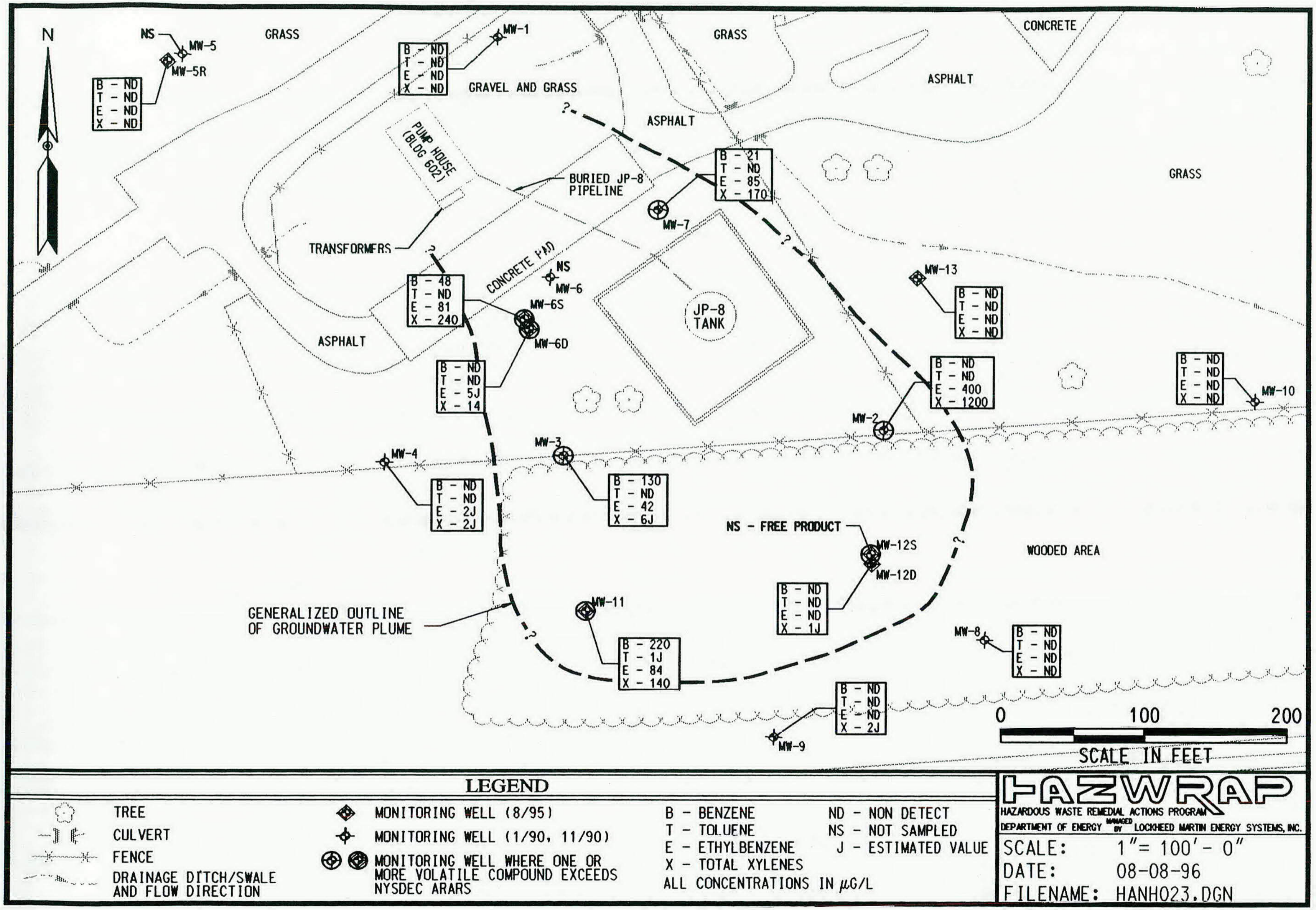

Fig. 5-9. Groundwater Sampling Results for Volatile Compounds - 1995, POL Area, 174th FW, NYANG, Hancock Field, Syracuse, NY.

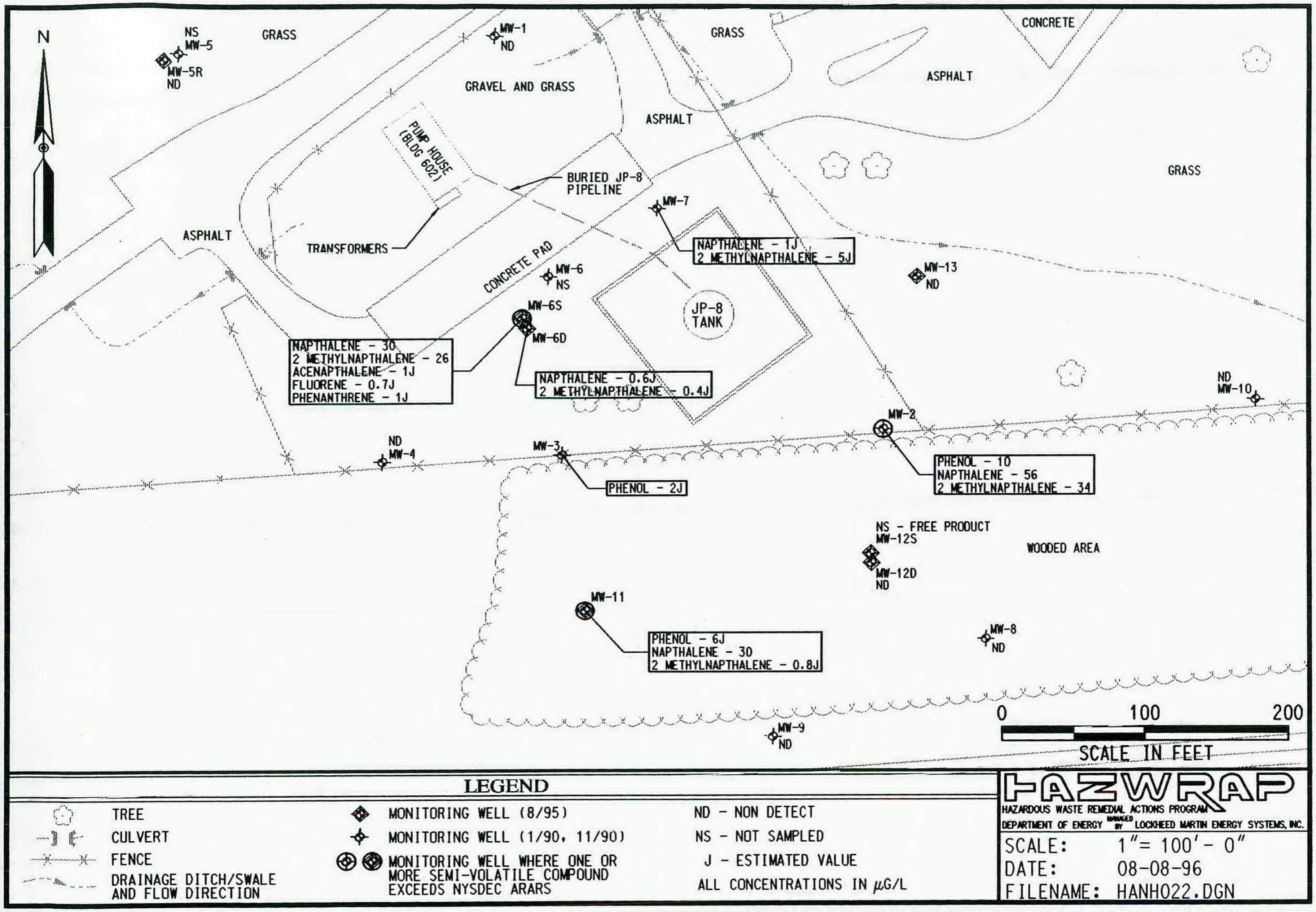

Fig. 5-10. Groundwater Sampling Results for Semivolatile Compounds - 1995, POL Area, 174th FW, NYANG, Hancock Field, Syracuse, NY.

Table 5-6. **Results of PCB Compounds in Groundwater**

Analyte (Aroclor)	CRQL[a]	MDL[b]	Filtered MWs 1–13[c]	Unfiltered MWs 1–13[c]
1016	0.50	21	ND	ND
1221	1.00	66	ND	ND
1232	0.50	31	ND	ND
1242	0.50	20	ND	ND
1248	0.50	16	ND	ND
1254	0.50	25	ND	ND
1260	0.50	20	ND	ND

a Contract-required Quantitation Limit; units in μg/L.
b Method detection limit.
c Monitoring wells MW-5, MW-6, and MW-12S not sampled.

BOD for the groundwater from four representative monitoring wells was determined by EPA Method 405.1. The data are presented on Table 5-9 and show values 6.0 mg/L in three of the wells (MW-6S, MW-7, MW-11) and 10 mg/L in one well (MW-2).

TDS were analyzed for by Method 160.2 in the same four wells. Results varied from a low of 62 mg/L in MW-6S to a high of 350 mg/L for MW-7. The TOC of the groundwater was analyzed using Method 415.1; the results for the wells analyzed ranged from 3.0 mg/L in MW-7 to 5.3 mg/L in MW-6S (see Table 5-9).

Four wells were sampled to determine the presence and/or concentration of metals that might be detrimental to potential remediation systems. Although metals are not considered a site-related problem, concentrations of six metals in the four wells sampled for inorganics exceeded ARARS (see Table 5-10). The monitoring wells sampled are considered representative of background conditions for metals. The metals with exceedances were aluminum, with an ARAR of 100 μg/L, had 300 μg/L in MW-11; cobalt, with an ARAR of 5 μg/L, had 7.3 μg/L in MW-6S; iron, with an ARARs 300 μg/L, in all four wells ranging from 1440 μg/L to 14,200 μg/L; magnesium, with an ARAR of 35,000 μg/L, had 36,200 μg/L in MW-6S and 44,500 μg/L in MW-11; manganese, with an ARAR of 300 μg/L, had 376 μg/L in MW-7, 449 μg/L in MW-11, and 1490 in MW-6S; sodium, with an ARAR of 20,000 μg/L, had 23,100 μg/L in MW-11, 24,500 μg/L in MW-6S, and 219,300 μg/L in MW-7.

Table 5-7. Total Organic Carbon Content in Soil

SAMPLE LOCATION:	GP6	GP6	GP6dup	GP10
Depth	0-2 ft	10-12 ft	10-12 ft	0-2 ft
DATE SAMPLED:	08/08/95	08/08/95	08/08/95	08/07/95
DATE ANALYZED:	09/01/95	09/01/95	09/01/95	09/01/95
Result (mg/Kg)	650	2700	240	120
SAMPLE LOCAITON:	GP10	GP12	GP12	GP14
Depth	10-12 ft	4-6 ft	8-10 ft	0-2 ft
DATE SAMPLED:	08/07/95	08/07/95	08/07/95	08/07/95
DATE ANALYZED:	09/01/95	09/01/95	09/01/95	09/01/95
Result (mg/Kg)	240	100	260	740
SAMPLE LOCAITON:	GP14	GP22	GP22	
Depth	8-10 ft	0-2 ft	8-10 ft	
DATE SAMPLED:	08/07/95	08/08/95	08/08/95	
DATE ANALYZED:	09/01/95	09/01/95	09/01/95	
Result (mg/Kg)	1600	66	26	

Table 5-8. Total Solids in Soil

SAMPLE LOCATION:	GP10	GP12N	GP12S	GP13	GP13	GP22	GP23	GP26W
Depth:	0-2 ft	0-2 ft	0-2 ft	0-2 ft	2-4 ft	0-2 ft	0-2 ft	0-2 ft
DATE SAMPLED:	08/16/95	08/16/95	08/16/95	08/16/95	08/16/95	08/16/95	08/16/95	08/16/95
DATE ANALYZED:	08/17/95	08/17/95	08/17/95	08/17/95	08/17/95	08/17/95	08/17/95	08/17/95
Result (wt%)	94.	88.	88.	95.	81.	88.	88.	88.
SAMPLE LOCATION:	GP26S	GP26SDup	GP28	GP29	GP29	GP31	GP44	GP44
Depth:	0-2 ft	0-2 FT	8-10 FT	0-2 ft	2-4 ft	0-2 ft	0-.05 ft	0-2 ft
DATE SAMPLED:	08/16/95	08/16/95	08/14/95	08/16/95	08/16/95	08/16/95	08/14/95	08/14/95
DATE ANALYZED:	08/17/95	08/17/95	08/15/95	08/17/95	08/17/95	08/17/95	08/15/95	08/15/95
Result (wt%)	86.	89.	83.	94.	80.	84.	81.	90.
SAMPLE LOCATION:	G[44	GP44	GP45	GP45	GP47	GP48	GP48Dup	GP49
Depth:	5-7 ft	8-10 ft	0-2 ft	8-10 ft	0-2 ft	0-2 ft	0-2 ft	0-2 ft
DATE SAMPLED:	08/14/95	08/14/95	08/14/95	08/14/95	08/16/95	08/16/95	08/16/95	08/16/95
DATE ANALYZED:	08/15/95	08/15/95	08/15/95	08/15/95	08/17/95	08/17/95	08/17/95	08/17/95
Result (wt%)	80.	77.	87.	80.	88.	82.	81.	90.
SAMPLE LOCATION:	HA08	HA12	HA16	HA16	HA20	HA21	HA22	
Depth:	2-4 ft	0-2 ft	2-4 ft	8-10 ft	0-.05 ft	0-.05 ft	0-.05 ft	
DATE SAMPLED:	08/14/95	08/14/95	08/14/95	08/14/95	08/14/95	08/14/95	08/14/95	
DATE ANALYZED:	08/15/95	08/15/95	08/15/95	08/15/95	08/15/95	08/15/95	08/15/95	
Result (wt%)	82.	84.	88.	79.	92.	88.	71.	

Table 5-9. Remedial Investigation Parameters in Groundwater

BIOLOGICAL OXYGEN DEMAND				
SAMPLE NUMBER:	MW-2X	MW-6S	MW-7X	MW-11
DATE SAMPLED:	08/31/95	08/31/95	08/31/95	08/31/95
DATE ANALYZED:	09/05/95	09/05/95	09/05/95	09/05/95
Result (mg/L)	10.	6.0	6.0	6.0
TOTAL DISSOLVED SOLIDS				
SAMPLE NUMBER:	MW-2X	MW-6S	MW-7X	MW-11
DATE SAMPLED:	08/30/95	08/28/95	08/30/95	08/28/95
DATE ANALYZED:	08/31/95	08/29/95	08/31/95	08/29/95
Result (mg/L)	160.	62.	350.	160.
TOTAL ORGANIC CARBON				
SAMPLE NUMBER:	MW-2X	MW-6S	MW-7X	MW-11
DATE SAMPLED:	08/26/95	08/27/95	08/26/95	08/27/95
DATE ANALYZED:	08/29/95	08/29/95	08/29/95	08/29/95
Result (mg/L)	4.1	5.3	3.0	4.6

Table 5-10. Summary of Target Analyte Metals in Groundwater

SAMPLE INFORMATION														
LOCATION			MW-2			MW-6S			MW-7			MW-11		
SCREENED INTERVAL (ft.)			3.6-13.6			4.6-14.6			4.6-14.6			8.8-18.8		
SAMPLE NUMBER:			MW-2X			MW-6S			MW-7X			MW-11		
DATE SAMPLED:			08/26/95			08/25/95			08/26/95			08/25/95		
ANALYTICAL INFORMATION														
TAL METALS														
DATE ANALYZED:			09/13/95			09/13/95			09/13/95			09/13/95		
Analyte	**CRDL**	**ARAR**[a]	**Result**	**C**[b]	**Q**[c]	**Result**	**C**	**Q**	**Result**	**C**	**Q**	**Result**	**C**	**Q**
Aluminum	200	100	ND			82.1	B		14.5			300		
Antimony	60	NS[d]	ND[e]		N	ND		N	ND		N	ND		N
Arsenic	10	NS	38		N*	3.8	B	N*	ND		N*	52	B	N*
Barium	200	1000	61.6	B		71	B		202			314		
Beryllium	5	11 or 1100[f]	ND			ND			0.12			ND		
Cadmium	5	10	ND			ND			ND			ND		
Calcium	5000	NS	82700			116000			ND			119000		
Chromium	10	11	ND			ND			0.54			ND		
Cobalt	50	5	ND			7.3	B		3.2	B		4.3	B	
Copper	25	200	1.2	B		4.4	B		ND			16.7	B	
Iron	100	300	4610		N*	1440		N*	14200		N*	9670		N*
Lead	3	25	ND			2.7	B		ND		W	6.3		
Magnesium	5000	35000	11300		N	36200		N	19400		N	44500		N
Manganese	15	300	282		N	1490		N	376		N	449		N
Mercury	0.2	2	ND			ND			ND			ND		
Nickel	40	NS	ND			ND			ND			ND		
Potassium	5000	NS	525	B		1090	B		408	B		672	B	
Selenium	5	10	ND		N	0.83	B	WN	ND		N	ND		WN
Silver	10	50	ND			ND			ND			ND		
Sodium	5000	20000	8580		N	24500		N	29300		N	23100		N
Thallium	10	NS	ND			ND		W	ND			ND		
Vanadium	50	14	ND			0.72	B		ND			0.76	B	
Zinc	20	300	2.1	B		ND			ND			18.7	B	
Units	ug/L	ug/L	ug/L			ug/L			ug/L			ug/L		

500 Results > or = to NYSDEC ARARs

[a] ARAR=Applicable or Relevant and Appropriate Requirements
The ARAR applied is the NYSDEC Division of Water Technical and Operational Guidance Series (1.1.1) Ambient Water Quality Standards and Guidance Values for Drinking Water

[b] "C" Laboratory Data Qualifiers
B=reported value is less than the CRDL, but greater than the IDL

[c] "Q" Laboratory Data Qualifiers
E=the reported value is estimated due to interference
M=duplicate injection precision not met
N=spiked sample recovery not within control limits
S=the reported value was determined by the method of standard additions
W=post-digestion spike for the furnace AA analysis is out of control limits
*=duplicate analysis is not within control limits
+correlation coefficient for the MSA is less than 0.995

[d] NS=No Standard

[e] ND=Not Detected

[f] The ARAR for Be is 11 ug/L when water hardness is less than or equal to 75 ppm, and 1100 ug/L when the hardness exceeds 75 ppm.

Section 6

6. CONCLUSIONS

6.1 SOIL CONTAMINATION

6.1.1 VOC Contamination

VOC contamination by fuel components in excess of state ARARs is restricted to total xylenes with one exceedance for ethylbenzene. Contamination appears to be largely confined to two relatively narrow northeast-southwest-trending bands 30 to 40 ft wide on either side of the pump house. Figure 6-1. Both of these areas of contamination are consistent with overflow spills from the underground storage tanks on either side of the pump house and surface flow to the drainage ditches exiting the area. Because of the variation in soil matrix and permeability, any vertical descent of fuel occurring during flow to the drainage ditches would be reflected by a variation in concentration at a particular depth. However, the overall vertical and lateral extent of contamination is defined. A smaller area of contamination sampled by HA-16 directly in front of the building may be a remnant related to a reported release of jet fuel inside the pump house that resulted in a reported flow out of the doors of the building.

6.1.2 SVOC Contamination

The area of SVOC contamination, exclusive of phenols, is shown on Fig. 6-2 and is characterized by PAHs and fuel constituents. The occurrence of the PAHs is generally restricted to the northwest side of the POL oval and outside the refuelling area. The areas bordering the asphalt roadway may be sampling locations where the degradation of the asphalt road surface has allowed transportation of PAH compounds to the roadside. This would not be inconsistent with the occurrence of PAHs found at the distal end of the drainage ditches.

The more-fuel-related compounds such as naphthalene and 2-methylnaphthalene appear to be restricted to the three Geoprobe sample locations of GP-12, GP-13, and GP-26—where fuel-related spills are suggested by VOC contamination at several depths—and GP-10. Inspection of individual chromatograms supports the interpretation of apparent fuel patterns.

The presence of phenol in soils at the POL Facility is nearly ubiquitous; its widespread occurrence does not appear to be depth restricted or areally controlled (see Figs. 5-6a through 5-6c). As pointed out in Sect. 5.3.2, the highest reported value of 6000 μg/kg was found in the capillary fringe data for one of the background Geoprobe locations. If phenol concentrations are considered a separate issue, the areal and vertical extent of SVOC contamination that exceeds NYSDEC cleanup levels is greatly reduced.

6.1.3 PCB Contamination

The area defined by Aroclor 1260 contamination is mainly confined to the surficial soils in an area extending from the transformer pad in front of the building and to either side up to, and adjacent to, the concrete parking pad in front of the pump house. The area delineated is similar to that outlined in the 1992 field effort, although it is more clearly defined on its southwest and northeast boundaries. A second area of contamination was found across the concrete pad in the vicinity of MW-6. The location of this contamination and its absence at depth is consistent with runoff from

UNDER Concrete Pad Sampled?

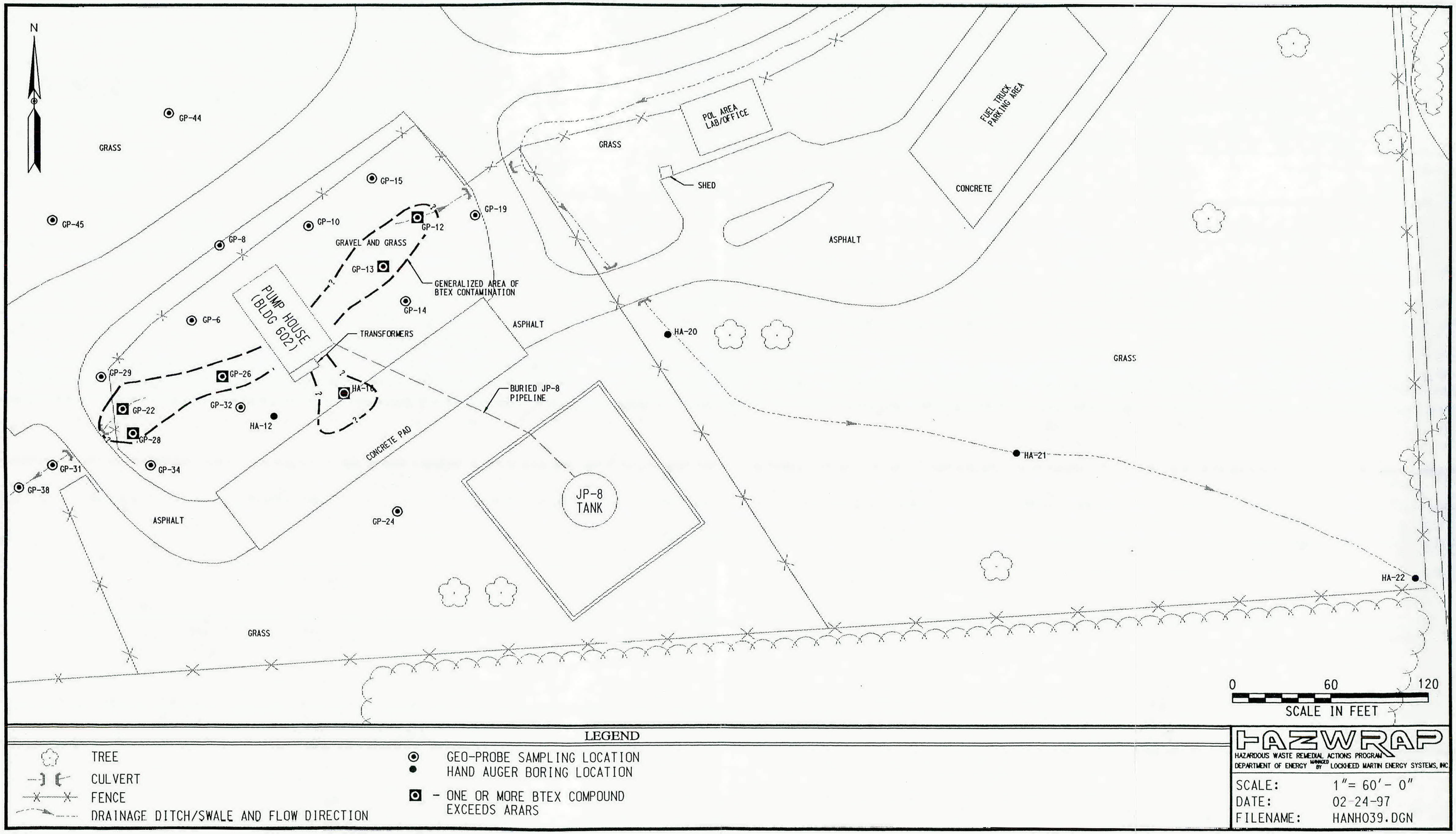

Fig. 6-1. Area of BTEX Contamination, POL Area, 174th FW, NYANG, Hancock Field, Syracuse, NY.

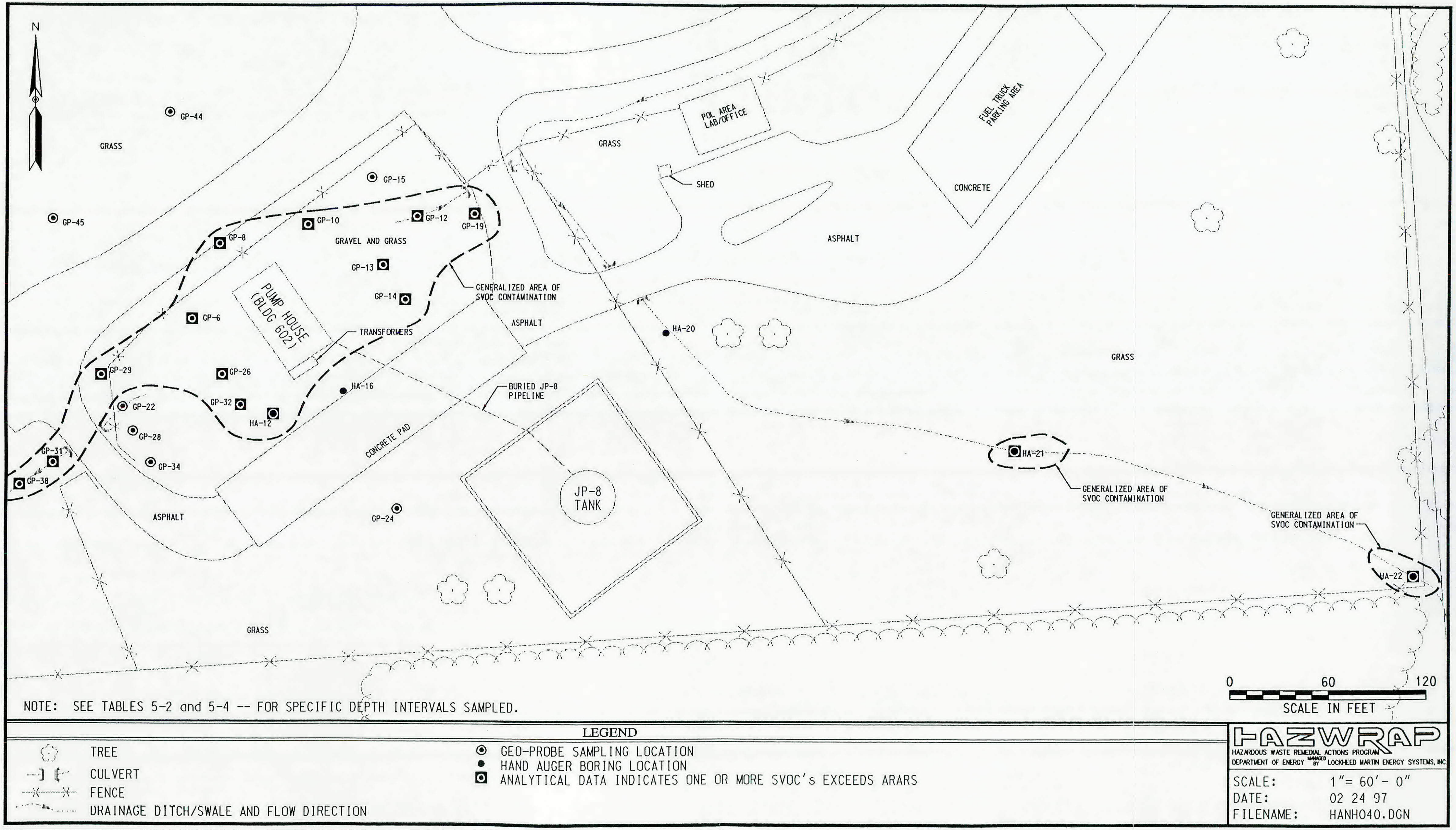

Fig. 6-2. Area of SVOC Soil Contamination, (Exclusive of Phenol Contamination), POL Area, 174th FW, NYANG, Hancock Field, Syracuse, NY.

the main PCB spill area. It also appears this surface flow may be responsible for the low level of PCB contamination found in the damaged MW-6 in the 1994 sampling event. A separated and smaller area of unknown origin is defined to the northeast of the building. At depth, the area of contamination in front of the pump house diminishes significantly; across the concrete pad the 2–4-ft sampling interval was found to be clean. Much of the areal extent of PCB contamination is defined by the validity of the soil immunoassay test kits.

2

6.1.4 Phenol Contamination

The occurrence of phenol in both background samples and those from the POL Facility itself, sometimes at high levels, are attributed to soil contamination through prior application of herbicides for broadleaf weed control. A records search indicated 3 months prior to the RI sampling event in August 1995, applications of a phenol-bearing herbicide had been made to the lawn area north of the POL Facility and along fence lines (HAZWRAP 1996a). In the subsequent phenol investigation conducted in June of 1996, no prior application of herbicides had been performed (verbal communication, MSgt R.Mansfield 1996). Areas selected for sampling where apple production had taken place (PH02, PH05, PH07) or where apple trees still exist (PH06 and PH08) did not indicate phenol contamination.

0-2' (?)
INTERVAL

6.2 GROUNDWATER CONTAMINATION

6.2.1 VOC Contamination

A comparison of contaminant concentrations between data obtained in 1994 and this investigation reveals a consistent decrease in concentration of BTEX components in most of the wells. This decrease is consistent with the natural attenuation of BTEX components in the groundwater. Figure 6-3 provides a visual comparison between the two most recent sampling events—1995 and 1994—and that from the 1990 sampling. The data show decreases in wells MW-2, MW-3, MW-7, and MW-6 vs MW-6S; MW-1, MW-8, and MW-10 show unchanged nondetects between the events. Monitoring wells MW-4 and MW-9 show slight increases from nondetections to estimated 2J μg/L concentrations.

The installation of MW-13 with nondetects encountered for BTEX effectively closes out the plume's sidegradient boundary to the east-southeast. Installation of MW-12S and MW-11 with free product found in MW-12S and BTEX detections in MW-11 define the approximate leading edge of the plume at a midpoint position between these wells and MW-8 and MW-9.

6.2.2 SVOC Contamination

SVOC compounds were not previously analyzed for in the groundwater. Wells that had nondetects for VOC fuel components also had nondetects for SVOCs. Except for MW-03, the wells that had BTEX contamination also contained the SVOC contaminants naphthalene and 2-methylnaphthalene characteristic of fuels contamination. Three of these wells (MW-6S, MW-2, MW-11) exceeded NYSDEC ARARs for naphthalene.

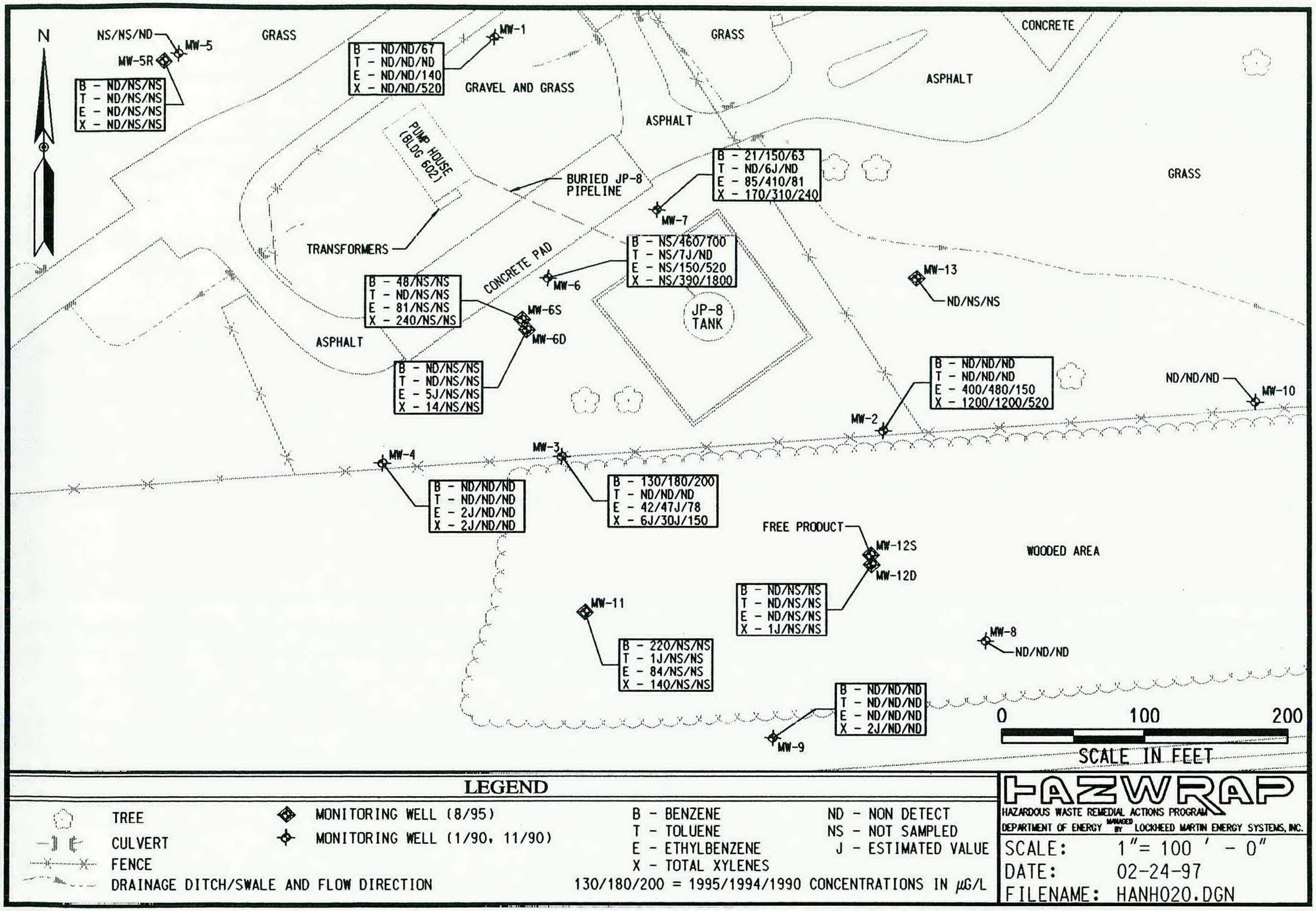

Fig. 6-3. Comparison of Groundwater Sampling Results From 1995/1994/1990, POL Area, 174th FW, NYANG, Hancock Field, Syracuse, NY.

6.2.3 PCB Contamination

No PCB contamination was found in any of the groundwater monitoring wells sampled. The absence of PCBs is attributed to the relative volume of the originally documented PCB spill, cleanup activities after the spill, and the relative high adsorption rate of PCB to soil and its subsequent vertical attenuation. The PCB found in a prior sampling event (1994) in MW-6 is concluded to be from a surface entry path because of the loss of the integrity of the well's annular seal.

Section 7

7. RECOMMENDATIONS

7.1 Soils

Based on the conclusions reached during the RI, corrective action will be required to remediate soils at the POL Facility. Both jet fuel-related VOC and SVOC contamination, PAHs and PCB contamination exceed NYSDEC action levels. Because the POL Facility is being replaced, action to remediate the soil contamination should proceed at the time of tank removal.

- A Focused Feasibility Study (FFS) should be made to evaluate the most appropriate corrective action to remediate soils. This study should include the area in front of the pump house and the areas on each side of the pump house. As part of the study, a Preliminary Risk Evaluation (PRE) or similar risk screening should be performed in order to evaluate contaminants, which although exceeding NYSDEC ARARs, may not exceed preliminary remediation goals (PRGs).

- Further delineation of PCB contaminated soil is required. The lateral extent of PCB contamination on the southeast side of the concrete pad has not been adequately defined.

- No remedial action is recommended for the presence of phenol at the POL Facility or background areas of the Base. Phenol was detected above the NYSDEC action level during the first phase of this investigation. Its occurrence, however, is attributed to broadleaf weed control applications and is not site related.

7.2 Groundwater

Groundwater contamination at the POL Facility will require remediation. BTEX and naphthalene in the groundwater were found to be above NYSDEC limits; free product was encountered in one downgradient well.

- An FFS should be implemented to evaluate the most appropriate remedial action alternative, including natural attenuation, for plume contamination. Further delineation of free product should also be addressed during the next phase.

- Interim remedial action should be developed and implemented to remove free product as a continuing source of groundwater contamination and evaluate off-Base migration of dissolved-phase contamination.

7.3 Other

Both damaged wells MW-6 and MW-5 should be abandoned according to NYSDEC abandonment procedures.

Section 8

8. REFERENCES

AFCEE ESR, 1991. Handbook to Support the Installation Restoration Program (IRP) Statements of Work: Volume I - Remedial Investigation/Feasibility Study, Environmental Restoration Division (ESR) Environmental Services Office, Air Force Center for Environmental Excellence (AFCEE), Brooks Air Force Base, Texas, May 1991.

Bouwer, H. and Rice, R. C., 1976. "A Slug Test Method for Determining Hydraulic Conductivity of Unconfined Aquifers with Completely or Partially Penetrating Wells," Water Resources Research, 12:423-28.

Cooper, H. H., Bredehoeft, J. and Papadopolos, I., 1967. "Response of a Finite Diameter Well to an Instantaneous Charge of Water," Water Resources Research, 3:263-69.

Freeze and Cherry 1979. Groundwater, Prentice-Hall, Inc, Englewood Cliffs, New Jersey.

HAZWRAP 1996a. Technical Memorandum: Summary and Record Search for Phenol at the Petroleum, Oil, Lubricant Facility, Lockheed Martin Energy Systems, Inc., Oak Ridge, Tennessee, April 1996.

HAZWRAP 1996b. Technical Memorandum: Phenol Sampling Plan for the Petroleum, Oil, Lubricant Facility, Lockheed Martin Energy Systems, Inc., Oak Ridge, Tennessee, May 1996.

Metcalf & Eddy, 1992. Base POL Area Site Investigation Report and Pesticide Storage Area Supplementary Site Investigation Report - 174 TFW/Hancock Field, New York Air National Guard, Metcalf & Eddy, Inc., Wakefield, Massachusetts, June 1992.

NYANG, 1990. New York Air National Guard, Spill Report Number 90-01019, "Jet Fuel and PCB Contamination Sample Analysis and Site Information." Memorandum to Ms. Helen L. Capone, NYSDEC, June 25, 1990, with attachments.

New York State Department of Environmental Conservation, 1994. Division Technical and Administrative Guidance Memorandum (TAGM): Determination of Soil Cleanup Objectives and Cleanup Levels, January 24, 1994.

Radian, 1994. Installation Restoration Program Management Action Plan 174th Fighter Wing, New York Air National Guard, Hancock Field, Syracuse, New York. Prepared by Radian Corporation for the Air National Guard Readiness Center, Andrews Air Force Base, Maryland, July 1994.

Science Applications International Corporation, 1989. Installation Restoration Program; Phase II Confirmational/ Quantification; Stage 2. Final Report prepared by Science Applications International Corporation for National Guard Bureau and U.S. Air Force (USAFOEHL), June 1989.

United Detection Systems, Inc., 1992. United Detection Systems, Inc., Tank Tightness Test Reports, June 1992.

U.S. EPA, 1993. Contract Laboratory Program, Statement of Work for Organics Analysis: Multi-Media, Multi-Concentration, Revisions through OLM01.9, July 1993.