New York State Department of Environmental Conservation

Thomas C. Jorling
Commissioner

July 2, 1992

James C. Hylind
NYS Electric and Gas Corporation
4500 Vestal Parkway East
P.O. Box 3607
Binghamton, NY 13902-3607

Subject: NYSEG-Mechanicville Site, #5-46-033
Final RI/FS Work Plan

Dear Mr. Hylind:

The final review of the NYSEG-Mechanicville Site's Work Plan for Phase IIA Supplemental RI/FS (June 1992) is complete. The work plan is considered approvable with the incorporation of the following clarifications:

1. NYSEG's Installation Procedures for Monitoring Wells and Piezometers at Former coal Gasification Sites (revision 3, June 1989) is to be amended according to the attached Addendum.

2. Due to some inconsistencies in the work plan text regarding sampling at the site (e.g., sample types and analytical methods), the Sampling Analysis Plan (Table 8-3) is to be considered correct and utilized.

With the incorporation of the above clarifications, the June 1992 RI/FS work plan appears approvable. Final approval of the work plan will only be granted through a consent order between NYSEG and the DEC.

Sincerely,

Daniel L. Steenberge, P.E.
Regional Remediation Engineer

James E. McClain
Environmental Engineer I

encl.

ADDENDUM TO:

NEW YORK STATE ELECTRIC & GAS CORPORATION
ENVIRONMENTAL MATTERS GROUP

INSTALLATION PROCEDURES
FOR
MONITORING WELLS AND PIEZOMETERS
AT
FORMER COAL GASIFICATION SITES

I. All substitutions, alliterations, and/or deviations stated or implied in this document must be approved in advance by the NYSDEC. Specific deviation/alterations noted that will prior NYSDEC approval are sections 4.1, 5.3, 5.4, 6.4, 7.4, 7.5 c, 7.6 a, 7.6 b, and 8.1 a.

II. Bentonite grout (not native material) must be used to fill the annular space above the bentonite seal.

III. Due to installation problems and the potential for contaminant migration sediment traps are not to be installed (as per section 7.2).

IV. Riser tops must be 4 inches +/- 1 inch (not 8 inches, per Section 8.1 c) below the top of the guard pipe.

V. Duplicate keys for all wells are to be provided to the Department of Environmental Conservation at the time of completion of the Remedial Investigation.

ABB
ASEA BROWN BOVERI

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JUL - 1 1992
Environmental Conservation
REGIONAL ENGINEER - REGION 5
RAY BROOK, NEW YORK 12977

04945-06

June 26, 1992

Mr. James McClain
New York State Department of Environmental Conservation
Ray Brook, New York 12977

Dear Mr. McClain:

Subject: **NYSEG's Mechanicville Former Gas Plant Site #546033**
Final Phase II Remedial Investigation Report and Work Plan for Phase IIA Supplemental Remedial Investigation and Feasibility Study

On behalf of New York State Electric and Gas Corporation (NYSEG), ABB Environmental Services (ABB-ES) is submitting to New York State Department of Environmental Conservation the final Phase II Remedial Investigation Report and Work Plan for Phase IIA Supplemental Remedial Investigation and Feasibility Study for NYSEG's former manufactured gas plant (MGP) site at Mechanicville, New York. This final report incorporates all changes made to previous draft versions (dated 4/21/92, 5/4/92, and 6/19/92) submitted to NYSDEC as well as the 6/25/92 comments from NYSDEC.

Please find enclosed three (3) copies of this final report. Contact Mr. Tom O'Meara at NYSEG or myself should you have any questions or comments.

Sincerely,

ABB ENVIRONMENTAL SERVICES, INC.

Daniel P. Ostrye

Daniel P. Ostrye
Project Manager

HC069220.096

cc: J. Hylind (NYSEG)
T. O'Meara (NYSEG)
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Investigation of the Former Coal Gasification Site at Mechanicville, New York

Phase II Remedial Investigation Report and Work Plan for Phase IIA Supplemental Remedial Investigation and Feasibility Study

Volume I of II - Text

Prepared for:

NEW YORK STATE
ELECTRIC & GAS CORPORATION
4500 Vestal Parkway East
Binghamton, New York

Prepared by:

ABB ENVIRONMENTAL SERVICES, INC.
110 Free Street
Portland, Maine

Revised June 1992

ABB Environmental Services, Inc.

ASEA BROWN BOVERI

INVESTIGATION OF THE FORMER COAL GASIFICATION SITE AT MECHANICVILLE, NEW YORK

PHASE II REMEDIAL INVESTIGATION REPORT AND WORKPLAN FOR PHASE IIA SUPPLEMENTAL REMEDIAL INVESTIGATION AND FEASIBILITY STUDY

Prepared for:

New York State Electric & Gas Corporation
Binghamton, New York

Prepared by:

ABB Environmental Services, Inc.
Portland, Maine

Project No.: 4945-06

REVISED JUNE 1992

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The former Mechanicville manufactured gas plant (MGP) site is located in Mechanicville, New York, along the Anthony Kill (a small tributary of the Hudson River). The site is a quarter-mile upstream of the Hudson River, on the western side of North Central Avenue. A gas manufacturing plant was operated at the site by New York State Electric and Gas Corporation (NYSEG) and its predecessor companies from 1901 until 1955. Most of the structures utilized in the coal gas manufacturing operation were cleaned out and demolished at the time of closure in 1955. Between 1955 and 1990, NYSEG operated natural gas and electric service center. The site is currently unoccupied. The site is being investigated because it was formerly used for coal gas manufacturing.

This report, has been prepared by ABB Environmental Services, Inc. (ABB-ES) and presents the results of the four phase remedial investigation (RI) for the Mechanicville site conducted over the period 1986 through 1990. The RI consisted of a Preliminary Site Evaluation (Task 1), an Initial Field Investigation Program (Task 2), an Expanded Problem Definition Program (Task 3), and a Risk Assessment (Task 4). Separate reports have been prepared and previously submitted to the New York State Department of Environmental Conservation (NYSDEC) describing the results of each phase. This report presents a consolidation of these four reports into a single document which conforms to the requirements of the New York State Department of Environmental Conservation (NYSDEC) for submittal of RI reports.

In addition, this report also includes recommendations to conduct certain supplemental investigation activities and a focused feasibility study to further delineate the distribution of MGP constituents in subsurface soils and groundwater and to evaluate certain options to mitigate future off-site migration of contaminants which have been detected at the site.

Samples of soil, groundwater, surface water, stream sediments and air were collected at and adjacent to the site and analyzed. Chemicals related to former coal gasification activities were found in soil and groundwater samples collected near the former gas plant structures. The highest chemical concentrations were observed on the northern and eastern portions of the site. Sediment data from the Anthony Kill, as well as groundwater data, indicate that site-derived chemicals are migrating into the surface waters of the Anthony Kill. However, site-derived chemicals were not found at elevated levels in surface water samples collected downstream of the site,

which indicates that chemicals are not entering the stream in sufficient quantities to be detected.

Contaminants of concern were selected following the field investigations. The carcinogenic contaminants of concern which were identified are polynuclear aromatic hydrocarbons (PAHs) and benzene. The noncarcinogenic contaminants of concern which were identified are toluene, ethylbenzene, styrene, trimethylbenzene, xylenes, noncarcinogenic PAHs, and cyanide.

Several chemicals identified in the groundwater exceeded the applicable New York State standards for those chemicals, although presently, there are no known groundwater users near or downgradient of the site. Potential pathways for humans to come into contact with coal-gas-related chemicals are through skin contact, ingestion, and inhalation. Because most of the site is covered by structures or has been paved, exposure to site-derived chemicals is expected to be limited primarily to excavation-related activities that could create contact and inhalation hazards. Contact with Anthony Kill sediments may additionally cause exposure for people on- and off-site. Chemicals found in air samples were well below federal and industry standards for permissible exposure levels.

For the public health risk assessment, ABB-ES estimated the potential carcinogenic and noncarcinogenic risks from site-related exposures under baseline conditions (i.e., current conditions and future conditions, assuming no construction or remedial action). It was determined that direct contact with on-site soil (surface and subsurface) and Anthony Kill sediments by area residents (specifically, older children), construction workers, or utility workers, would not be expected to pose a significant health risk under the assumed exposure conditions. Both carcinogenic and noncarcinogenic risks were within target risk levels. Future on-site excavation could also expose nearby residents to inhalation of airborne volatile and particulate-bound contaminants. ABB-ES concluded that inhalation of contaminants, volatilized or aerosolized by potential future site activities involving soil excavation, also does not pose a significant health risk to the general population.

The Mechanicville site is not located over a water supply aquifer. The nearest water supply wells are about one mile southwest of the site in the town of Halfmoon. Because Mechanicville site groundwater is neither currently used nor expected to be used in the foreseeable future as a source of drinking water, public health risks associated with the groundwater are negligible. Groundwater beneath the site,

however, does contain several contaminants at concentrations which exceed both USEPA and NY drinking water standards.

An evaluation of the environmental risks posed by contaminants detected in the surface water, groundwater, and sediment suggests that some potential for negative impacts does exist for organisms in the Anthony Kill. These risks appear to be relatively minor, for several reasons. Few compounds were determined to exceed their media-specific protective criteria, and the extent of these exceedances were minimal. Moreover, negative impacts were associated only with "worst case" conditions (e.g., stream low-flow conditions and use of maximum analyte levels for criteria comparisons), with no impacts expected under more typical assumptions. Finally, there is no evidence that contaminants are impacting downstream receptors. Levels of contaminants detected in the downstream surface water and sediment samples never exceeded relevant protective criteria, even under the most conservative assumptions.

Although no significant public health or environmental risks were identified, NYSEG proposed plans to conduct a feasibility study to mitigate the discharge of coal tars and contaminated groundwater to the Anthony Kill in the Fall of 1991. In addition, a Phase IIA Supplemental Remedial Investigation workplan has been developed to address NYSDEC's request for additional site characterization information. Specifically, the work plan focuses on assessing site surface soils for PCB contamination, further investigation of the western portion of the site to assess soil and groundwater quality, and installation of soil borings, monitoring wells, piezometers and seepage meters downgradient of the site to assess off site migration of site-related contaminants.

1.0 INTRODUCTION

1.1 PURPOSE OF THE REPORT

This Phase I Remedial Investigation (RI) Report was prepared by ABB Environmental Services, Inc. (ABB-ES) for the New York State Electric and Gas Corporation (NYSEG) under contract No. 85S-159, "Investigation of Former Coal Gasification Sites". It presents the results of remedial investigation activities at the former Mechanicville manufactured gas plant (MGP) site located in the village of Mechanicville, New York.

In order to evaluate any possible impact and assess potential threats to public health and the environment, NYSEG contracted ABB-ES, formerly the E.C. Jordan Co., to perform the remedial investigation activities described herein. This four-phase remedial investigation, conducted over the period 1986 through 1990, consisted of a Preliminary Site Evaluation (Task 1), and Initial Field Investigation Program (Task 2), an Expanded Problem Definition Program (Task 3), and a Risk Assessment (Task 4). Separate reports have been prepared for each phase (task) of the investigation.

The Task 1 Preliminary Site Evaluation developed an understanding of the site's history, environmental setting, and current condition through detailed site reconnaissance, interviews, and file searches. The scope of work completed for Task 1 included:

1. A historical review of the site to develop an understanding of the former gasification plant layout, operations, and surrounding land uses.

2. An air assessment of existing site conditions and a preliminary prediction of airborne contaminant concentrations expected during the site investigation.

3. A detailed site reconnaissance to become familiar with the area and identify locations for explorations, access requirements, and potential conflicts with above and below ground utilities.

4. A geophysical investigation utilizing seismic refraction, terrain conductivity, and ground-penetrating radar (GPR) to: delineate the bedrock surface; determine the vertical stratigraphy of geologic materials; map the migration route of any conductive groundwater contaminant plume; and identify subsurface anomalies that warrant further investigation.

From the findings of Task 1, a workplan was developed for Task 2 detailing investigation activities to establish background conditions, characterize contamination sources, determine transport routes and identify potential receptors. Task 2 explorations included test pits, soil borings, monitoring well installations, air, soil, groundwater, surface water and sediment sampling, laboratory chemical analyses, and a preliminary land use investigation.

Task 3, the Expanded Problem definition Program, was designed to (1) confirm Task 2 analytical results; (2) obtain further data on chemical distribution in soil and shallow bedrock at the site and site environs; (3) further investigate the potential for chemical migration in groundwater; (4) assess the air quality within buildings on the site; and (5) identify potential chemical receptors and potentially sensitive land uses. Task 3 field activities included a GPR survey adjacent to the Anthony Kill, additional soil borings and monitoring well installations; collection of soil, groundwater, surface water and air samples for chemical analyses; and a location and elevation survey.

Based on information obtained in Tasks 1 through 3, Task 4, the Risk Assessment, was designed to (1) identify and assess the potential risk associated with exposure to the chemicals on site, and (2) evaluate the need for and develop, if necessary, the scope, budget, and schedule for a conceptual design of possible remedial alternatives.

This report has been prepared to consolidate the results of these four reports into a single document which conforms to the requirements of the New York State Department of Environmental Conservation (NYSDEC) for submittal of Remedial Investigation reports. In addition to reporting the results of previous studies, this report also includes recommendations to conduct certain supplemental investigation activities and focused feasibility studies to further delineate the distribution of MGP constituents in subsurface soils and groundwater and to evaluate certain options to mitigate future off-site migration of contaminants which have been detected at the site.

The remedial investigation activities performed to date have been conducted in accordance with contract specific Quality Control/Quality Assurance and Health and Safety Plans.

1.2 SITE BACKGROUND

1.2.1 Site Description

The site is located in the City of Mechanicville, Saratoga County, New York (Figure 1-1). It consists of an approximately 1.8-acre parcel of land situated along the southern bank of the Anthony Kill (Figure 1-2). The site is bordered on the east by North Central Avenue (formerly the Champlain Canal), on the south by Ferris Lane and on the west by a set of railroad tracks. As evident in Figure 1-2, structures associated with coal gasification operations were concentrated on the eastern 1-acre of the site; where NYSEGs investigation efforts have focused.

Saratoga County is in the Valley and Ridge physiographic province of east-central New York (Heath, et al., 1963; Waller, et al., n.d.). The Hudson River forms the northeastern and eastern boundaries of Saratoga County; the Mohawk River, the largest tributary to the Hudson, forms the southeastern boundary.

The nearest surface water body, the Anthony Kill, is a small tributary that flows into the Hudson River at Mechanicville. The Mechanicville site is located adjacent to the southern bank of Anthony Kill, approximately one-quarter-mile upstream from its confluence with the Hudson River. The site lies in a glacial outwash plain, at approximately 95 feet above mean sea level (MSL).

The area is characterized by the Hudson River and its tributaries, which fill pre-glacial valleys carved into the bedrock. Topographic terraces to the north and south of Mechanicville are over 300 feet above MSL (USGS, 1980).

Environmental Setting. The Hudson Valley Region is divided by two climatic divisions (Capital District Consortium, 1975). The southeast portion has a warm, temperate, rainy climate with no dry season but warm summers. The northwestern portion has a cool or snow forest climate with no dry season but hot summers. The climate in this region can change rather suddenly from season to season and at times from day to day (Peterssen, 1958). Mean monthly temperatures at Stillwater, New

York, three miles north of Mechanicville, range from 56°F to 65°F from June through September and 13°F to 25°F from December through March. The average annual precipitation is approximately 45 inches with snowfall averaging 179 inches per year (NOAA, 1975).

Wind data reported for the Albany County Airport, which is 10 to 12 miles south of the Mechanicville site, indicate that the wind is primarily from the south from May through June. The prevailing wind for the remainder of the year is from the west-northwest. Wind velocities are generally moderate over the Hudson Valley Region with an average annual wind speed reported at the Albany County Airport of 8.8 miles per hour (mph), with monthly averages ranging from 6.9 to 10.4 mph (NOAA, 1971).

This information is corroborated by five-year wind data supplied by NYSDEC (Taylor, 1986b). The Albany County Airport monitors are located at an elevation of 292 feet above MSL compared to the approximate 95 feet MSL elevation of the Mechanicville site. The airport data are likely to be representative of the general wind conditions in the Albany County area; however, local micrometeorological conditions might be different. Local topography would favor a prevailing northwesterly wind direction for Mechanicville, New York (Taylor, 1986a).

The Hudson River Valley and its tributaries overlie highly folded and faulted shales originally deposited as sediments along the continental margin during the Ordovician Period, approximately 500 million years ago. The preglacial Hudson River Valley and its drainage system were probably similar to their present configuration; however the valleys may have been widened or deepened by subglacial erosion when the Laurentide Ice Sheet flowed south from Canada, covering the area.

As the ice sheet began its northward retreat from the area approximately 10,000 to 15,000 years ago, sediment-laden meltwater streams flowed through the Anthony Kill Valley, depositing sands and gravel in higher energy zones, and clays and silts in quieter water. These glacial fluvial deposits form the terraces which lie along the southern border of Mechanicville. Kettle holes, such as Round Lake, formed where blocks of ice were embedded in the glacial drift (Van Diver, 1985). As the glaciers receded, a postglacial lake filled the Hudson River Valley for several hundred years, leaving glacial lacustrine beach deposits at different elevations which mark the different lake levels (Heath, et al., 1963; USGS, 1980; Ruedemann, 1930). Meltwater

drainage slowed, leaving a now much undersized stream flowing through the Anthony Kill Valley.

Boring logs from the lowlands section of the Mechanicville area and mapping by the New York State Geological Survey indicate that the underlying shale bedrock formation is very shallow, approximately 0 to 15 feet below ground surface (Dick Ferraioli, Inc., 1986; Mechanicville Sewer District, n.d.; New York Department of Public Works, 1942). Borings drilled less than 1,000 feet southeast of the Mechanicville site encountered bedrock at approximately 12 feet. At this location, a thin zone of weathered rock or till overlies the bedrock and the till is overlain by brown sand and silt (Mechanicville Sewer District, n.d.).

In some locations, a clay layer is found overlying bedrock. According to local well drillers, the bedrock is highly fractured and folded (Dente, n.d.). Bedrock outcrops have been mapped beneath the Hudson River from Stillwater south to Mechanicville, along the Anthony Kill Valley from Mechanicville to Coons Crossing, and throughout the City of Mechanicville (Dineen, 1986).

West of Mechanicville, the unconsolidated deposits thicken and the shale is interbedded with sandstone. East of the site, limestone underlies the shale. A well drilled in 1916 for the West Virginia Pulp and Paper Co., which was located one-half mile northeast of the site, encountered shale from the ground surface to 1,000 feet, underlain by at least 1,000 feet of limestone (Heath, et al., 1963).

Because of the thin veneer of unconsolidated deposits and the relatively impermeable bedrock, there are no major identified aquifers in the Mechanicville area. Pockets of unconsolidated sands and gravel, which are exposed along the stream valleys, represent localized sources of groundwater. Stratified silts and clays overlying the till and bedrock in some areas act as impermeable barriers between the overlying sands and gravel and the underlying bedrock. This discontinuous confining layer has created some low-yield artesian conditions in the water-bearing rock of the stream valleys. Yields from the faults and joints in the rock range from 0.5 to 80 gallons per minute (gpm) with the average yield being 10 gpm. The water is reported to be highly mineralized (Heath et al., 1963).

The City of Mechanicville has historically used surface water supplies for a drinking water source. A few residences outside the city limits, however, use groundwater for drinking water (Renaldi, 1986). The closest domestic wells are nearly a mile

southwest of the site in the Town of Halfmoon. Based on information obtained during the records search, there are no active industrial wells in the Mechanicville area. There are two abandoned industrial wells: the West Virginia Pulp and Paper Co. well (2,157 feet deep), and a well drilled into the shale which was used by the former Mintzer Petroleum Co. (29 feet deep). The latter is located approximately 1.5 miles south of the site (Heath, et al., 1963). The former yields of these wells were not reported.

The Anthony Kill and the Hudson River are the closest surface water bodies to the site. The Anthony Kill borders the site to the north and the Hudson River is 1,500 feet to the east. The Anthony Kill flows out of Ballston Lake in a northeast direction, then bends sharply southeast and flows through Round Lake before flowing past the site and emptying into the Hudson River at Mechanicville. Plumb and Baker Brooks are smaller streams that flow south out of the hills to the north and join the Anthony Kill near Willow Glen, almost two miles upstream of the Mechanicville site.

Surface water is used to supply drinking water to the City of Mechanicville. The surface water reservoir, known as the Mechanicville Reservoir, and a primary water treatment plant are located two miles northwest of Mechanicville, north of Willow Glen (Figure 1-3). The reservoir is at an elevation of 263 feet above MSL.

Approximately 750,000 gallons per day (gpd) of water are pumped from the reservoir to 10,000 people in Mechanicville, including some areas in Stillwater and Halfmoon located east of Willow Glen. Some residents may use private wells (groundwater) or the Anthony Kill (surface water) for other purposes such as lawn watering or washing cars. A town sewer system serves most of the homes in Mechanicville (Barber, 1986).

The buildings at the Mechanicville site are supplied with town water and sewer. The exact locations of the water and sewer lines under the site are unknown; however, according to workers at the site and Department of Public Works officials, the water line probably extends from Ferris Lane between the former distribution gas holder and the radiator shop to the boiler house (McBride, et al., 1986; Renaldi, 1986). The sewer line probably extends from North Central Avenue to the substation and boiler house building. Surface runoff from the site flows into two on-site drainage catch basins that empty via underground culverts into the Anthony Kill. The locations of the drainage culverts are shown in Figure 1-2.

The section of the Anthony Kill from the Mechanicville city line to the Hudson River is a Class D stream in the New York State Stream Classification System. Class D waters are designated for secondary contact recreation but not for higher uses because of intermittent flow or water conditions that are not conducive to the propagation of game fish. Further upstream, between Coons Crossing and Mechanicville, the Anthony Kill is designated Class C (t). Class C waters are suitable for fishing and all other uses except as a source of water supply for drinking, culinary, or food processing purposes and primary contact recreation. The "(t)" denotes that this section is a trout stream (Environmental Conservation Law 17-0303).

NYSDEC has conducted water quality testing in the Anthony Kill downstream of Mechanicville at the Hudson River, and two miles upstream of the site at Plumb and Baker Brooks (NYSDEC, 1981). Water quality testing of several locations along the Hudson River in Saratoga County in 1981 cited water quality impairment from coliform bacteria, heavy metals, and polychlorinated biphenyls (PCBs). The water quality in Plumb Brook and Baker Brook is Class A, suitable for use as a water supply (NYSDEC, 1981).

The U.S. Geological Survey (USGS) maintains a full-time gauging station on the Hudson River at Mechanicville (Station #01335500). The drainage area upstream of the gauging station is 4,500 square miles. The minimum average 7-day, 10-year discharge for the water years 1931-1956 for the Hudson River at this station was 1,900 cubic feet per second (cfs). There are no full-time gauging stations on the Anthony Kill. The USGS has periodically taken base-flow measurements at the Anthony Kill station at Mechanicville (Station #01335700). The estimated low flow discharge at this station is 17 cfs for a drainage basin of 62.4 square miles (USGS, 1979).

Mechanicville was once a control station within the statewide ambient air monitoring network operated by the NYSDEC Bureau of Air Quality Surveillance. Budgetary constraints contributed to the deactivation of this control station in recent years. The station consisted of a high-volume air sampler operated monthly for the monitoring of total suspended particulates (TSP). The sampler was located on the roof of the WRONG High School at 10 North Main Street in the center of Mechanicville, at an elevation of 60 feet above grade. This location is about one to two miles south of the Mechanicville site.

The TSP results collected at this location from 1976 to 1982 range from 39 to 47 micrograms per cubic meter ($\mu g/m^3$). This range is below Federal Ambient Air Quality Standards of 75 $\mu g/m^3$. The value of 47 $\mu g/m^3$ was reported for 1981 and is the only year with a reading slightly above the pertinent New York State Ambient Air Standard of 45 $\mu g/m^3$. This increase in 1981 was believed to be due to local construction activities near the sampler location (NYSDEC, 1984; Delaware, 1986).

The air quality in Mechanicville is considered good by the NYSDEC Director of Air Quality for New York Region V. No volatile organic monitoring is known to have been conducted in the area. Poorer air quality was associated with the Tagson Paper Company and the local sewage treatment facility in the vicinity of Mechanicville (Hodgson, 1986; Stawarz, 1986; Savoys, 1986). Although no odor complaints have been recorded, minor odors have been detected from these facilities. Both facilities incinerate waste sludge intermittently, and are both located approximately one-half mile south of the Mechanicville city line in the small town of Halfmoon, New York.

The general southerly winds would most likely carry any aerial plume from these facilities to the east of the Mechanicville site environs; therefore no significant effects at the Mechanicville site are anticipated. A Boston and Maine Railroad line also runs near the northwest corner of the site. Diesel locomotive exhausts could impact the ambient air at the site. However, the difference between the coal tar materials and the diesel exhaust fumes will serve to eliminate any interference in the collected air samples. Also the intermittent nature of these diesel exhausts will further serve to minimize any effect from this source.

The most significant airborne migration pathway for coal gasification residues would be as absorbed organics on suspended particulate material. Although these compounds have a low odor threshold, their low vapor pressure suggests that volatilization is not a major concern. The Mechanicville site has been extensively modified since the coal gasification process ceased operation. A paved parking lot covers the areas where the gas holders, gas house, purifier, and oxide house were located. No significant air emissions are anticipated at these locations due to the paved surface.

Exposed surface soils exist only in small areas of the site, one of which is the former transformer storage area west of the present main office building. In the past, transformers known to contain PCBs were stored at this site. Surface soils from this area were removed in August 1984. The soil over the former filter beds is also

exposed. While sampling there in 1981, NYSEG employees encountered tar residues at depths of 5 to 6 feet. No coal tar residue-contaminated particulate emissions are expected from these small surface soil areas.

The northern boundary of the site is a steep bank which drops about 10 feet down to the Anthony Kill. This bank is covered with heavy vegetation with little exposed soil. Because contaminated groundwater could be released from seeps on this bank, vapor phase air emissions are possible. However, due to the low vapor pressure of the coal tar components, this type of emission is likely to be insignificant.

The Champlain Canal once bordered the site on the east. Completed in 1823, the canal connected the Hudson River at Waterford (south of Mechanicville) to Lake Champlain. The canal flowed through Mechanicville along what is now Central Avenue (Figure 1-4). Like the present roadway, the canal was elevated and the water surface was approximately 10 feet above the gas plant site. The hand-dug canal was approximately 12 feet deep and 30 feet wide. The canal was abandoned in 1916 when the Barge Canal opened and it became a receptacle for garbage, debris, and junk before it was completely filled with soil by the City of Mechanicville in 1917. Later, the state dug up the canal, removed the trash and debris, and prepared the roadbed for Central Avenue (Sheehan, n.d.).

1.2.2 Site History

The site housed a coal gasification plant near the intersection of North Central Avenue and Ferris Lane (Figures 1-4 and 1-5). The plant was operated by NYSEG and its predecessor companies from 1901 until 1955, at which time coal gas production ended because of the availability of natural gas. Most of the plant's aboveground structures were demolished and removed at the time of closure, including the coal storage shed, gas house, purifier and oxide houses, gas holders, oil tanks, and tar dehydrator (see Figures 1-4 and 1-5). Only the boiler room, indoor substation, and an old office building remain on site. The filter beds and relief gas holder were left in the ground and covered with soil (E.C. Jordan Co, 1987; 1989).

The Mechanicville site is being investigated because of its former use as a coal gasification facility. By-products of the coal gasification process included coal ash, condensate material from the gas house, wood chips from the purifier house, coal tar, and oil sludges. Ashes and clinkers were spread on the site, as were some of the spent wood chips. Residual tar was left both in the filter beds and in the base of the

relief holder. ABB-ES' investigations focused on the eastern portion of the site (approximately 1 acre), where coal gas production activities occurred.

History of Gas Production. The history of coal gas production at the Mechanicville site dates from 1901. In that year, the Halfmoon Light, Heat & Power Co., founded in 1900, began distributing gas to the citizens of Mechanicville. Figure 1-4 shows the layout of the gas plant in its first years of operation, circa 1910 (Sheehan, n.d.).

The plant was expanded about 1911 when a 3.5-foot water gas set was added to the original 5-foot set. A set consisted of a gas generator and associated apparatus; the dimensions refer to the inside diameter of the generator (USWAG, 1984). A distribution gas holder was also added during the expansion. The new gas holder had a 100,000 cubic foot capacity while the original relief gas holder held only 40,000 cubic feet of gas. The distribution holder was constructed above grade and contained cooled gas. Residual tar condensation is not likely to be associated with cooled gas storage. In 1910, the company served approximately 325 gas customers (Sheehan, n.d.).

In 1924, the Halfmoon Light, Heat & Power Co. was acquired by the Associated Gas and Electric System, and in 1928 it became part of NYSEG (Sheehan, n.d.). The plant layout in 1951 is depicted in Figure 1-5. Coal gas production continued at the site until 1955 (Elvins, 1986). NYSEG operated a natural gas and electric service center from 1955 until 1990 when the operation was relocated to a new service center located in the town of Halfmoon on Route 146. The site is currently unoccupied. The portion of the site which contains the former MGP facilities is bordered by a 6-foot chain link fence on the east, south and west perimeters and the Anthony Kill on the north.

During the years of coal gas production, Pennsylvania coal was delivered to the site by rail along the spur depicted in Figure 1-4. Anthracite coal used to make gas was stored outside next to the gas house. Soft bituminous coal fed to the boilers was stored in the coal shed (Elvins, 1986).

The process used to manufacture gas at the site was the water gas process. There are two types of water gas: blue gas and carburetted water gas (USWAG, 1984). NYSEG employees who worked at the gas plant in the 1950s described using the carburetted water gas process to produce a gas with 850 British thermal units (Btus) per cubic foot (McBride, et al., 1986).

It is likely that the blue gas process, which produced a gas with a heating value of just below 300 Btus per cubic foot, was used in the earlier years of operation. The two processes are quite similar. Blue gas was produced by passing steam over incandescent coke to aid in the recovery of hydrogen and other gases by reacting with the carbon. Because the steam lowered the temperature of the fuel bed, air blasts were needed periodically to restore the temperature. Thus, the process involved alternating cycles of steam injection and air blasts. The carburetted water gas process was developed to raise the Btu content of blue gas. This was done by passing blue gas through a carburetor where a spray of oil was added and then thermally cracking the oil in a superheater (USWAG, 1984).

At the Mechanicville plant, gas reportedly flowed from the gas house to the purifier house to the relief holder, and from there to the larger distribution holder. All piping was located underground (Elvins, 1986; McBride, et al., 1986). This flow path differs from the typical water gas plant where the gas was stored in the relief holder prior to being purified. The oxide house was apparently used to store fresh and/or spent oxide material used to purify the gas.

The oil used in the carburetted water gas process was stored in three aboveground oil tanks underneath a platform supporting the oxide house. Because of the sharp grade at the site, there was room to fit these tanks under the building next to the tracks. A fourth aboveground oil tank (10,000 gallons) was located between the two gas holders as shown in Figure 1-5.

The following by-products were generated at the Mechanicville gas plant: ash and condensate from the gas house; wood chips from the purifier house; and coal tar and oily sludges. No information was found concerning the methods employed to handle these materials in the early days of gas production at Mechanicville. However, it was common practice to dispose of ashes and spent oxide material on site. Also, the tars produced in gas plants were an important raw material for the flourishing tar distillation industry in the early 1900s (USWAG, 1984). NYSEG employees provided the following information about waste disposal in the 1940s and 1950s (Elvins, 1986; McBride, et al., 1986).

The ashes and clinkers (chunks of noncombusted material) were shoveled out of the generator at night and spread in the area between the relief holder and Ferris Lane. From there, they were picked up by anyone who had a use for them. During

Mr. Elvins' employment at the plant (1946 to 1956), for example, they were used to stabilize the banks of the Hudson River (Elvins, 1986).

The condensate from the water gas process was treated in the tar dehydrator (tar separator) (Figure 1-5). This was a 1,000-gallon tank used to separate the oil in the condensate from the water. The oil was subsequently used for fuel and the water was piped through three filter beds in series located behind the coal storage building for treatment (Figure 1-5). The beds were described as being made of wood and being approximately 10 feet long, 6 feet wide, and 4 feet deep. These wooden troughs were set into the ground and filled with coke. Baffles directed the flow through coke, which filtered out residual oil. After passing through the filter beds, the water was discharged to the Anthony Kill. The oily coke in the beds was collected periodically and burned in the gas house.

Wood chips treated with iron oxide were used to remove hydrogen sulfide from the gas in the purifier house. As the iron oxide absorbed the sulfur from the hydrogen sulfide gas and formed iron sulfides, the wood chips became inactive and required regeneration. This was accomplished by exposing them to air. The oxygen in the air converted the sulfide to free sulfur and restored the iron to active iron oxide. The iron also reacted with cyanide to produce ferrocyanides which could not be regenerated and did not react with hydrogen sulfide.

When free sulfur accumulated to about 50 percent of the mass and much of the iron was tied up in the ferrocyanides, the spent wood chips were replaced by fresh ones. NYSEG employees recalled several different methods of disposing of spent wood chips at the Mechanicville plant. Spent chips were: (1) incinerated by the City of Mechanicville from 1951 to 1955; (2) piled along the road until someone came and hauled them away; and (3) spread on the lot just west of the active plant area. It is known that several truckloads of spent wood chips were dumped at a NYSEG substation on Route 67 near Coons Crossing in the mid-1950s (NYSEG, n.d.; E.C. Jordan Co., 1986a).

The purified gas still contained some residual coal tar. The coal tar would settle out of the gas in the relief holder and mix with water in the bottom of the holder. This coal tar/water mixture was reportedly pumped into a truck and hauled off site periodically. According to plant employees, coal tar did not accumulate in the base of the larger distribution holder. This is consistent with other MGP sites since the distribution holder stored purified and cooled gas.

Gas production at the Mechanicville plant ended in 1955 when natural gas became available. Most of the aboveground structures including the coal storage shed, gas house, purifier and oxide house, gas holders, oil tanks, and tar dehydrator were demolished. The boiler house, indoor substation, and old office building were left standing. Mr. Elvins reported that the purifier house was cleaned out after plant shutdown but that the accumulated tar was left in the base of the relief gas holder. Gravel was used to fill in the below grade portions of both gas holders. The filter beds were covered with soil, apparently without prior removal of the coke.

Recent Site Use. The Mechanicville site, as it appears today, is depicted in Figure 1-2. The approximate locations of the gas plant structures that have been removed are superimposed on the present day plan.

After the closure of the Mechanicville gas plant in 1955, NYSEG converted the site to a natural gas and electric service center. A natural gas regulator house was constructed over a portion of the old distribution gas holder foundation. The former boiler room/substation building was converted to offices, a garage, and a supply storage/maintenance shop. The old office was used as a storage shed and toolhouse.

There was a buried gasoline storage tank containing unleaded fuel just off of the southeast corner of the old office. The 3,000-gallon tank was installed around 1974, and replaced an older tank which was reportedly taking in water. No gasoline leaks were reported (McBride, et al., 1986). This tank was removed in 1991 in accordance with NYS underground storage tank regulations. Hope Oatman (NYSDEC Region 5 Division of Environmental Quality) was on-site to verify that the tank was properly removed.

A second tank, located on the western half of the property, installed in 1982, was also addressed. This tank was 3,000 gallons and was used for diesel fuel storage. In March 1991, the contents of the tank were pumped and the tank was subsequently filled with sand. A test pit was made on the eastern portion of the tank on July 25, 1991 and Hope Oatman was there to verify that the tank did not leak.

The remaining developed portion of the site is a paved parking lot. The pavement covers the old railroad siding. At the time of ABB-ES' initial site visit, there were pipes, cables on spools, and capacitors stored in the southwest corner of the site near the natural gas distribution shed. There were also large metal bins filled with cables and scrap metal in the northeast portion of the site, near the intake to the storm

drainage culvert which conducts runoff flow from paved portions of the site beneath the boiler room to the Anthony Kill.

NYSEG has extended its property boundaries over the years by reclaiming the Anthony Kill embankment. Therefore, the stream appears wider in Figure 1-4 than in Figure 1-5.

In 1922, NYSEG purchased a 0.25-acre lot on the corner of Ferris Lane and North Central Street (Bevis, 1986). This property was vacant during most of the years the coal gas plant was operating. In the 1950s, NYSEG built the electrical substation that now stands on the lot. NYSEG also owns property on the west side of the site (see Figure 1-3). The land between the railroad tracks and the Anthony Kill was purchased by NYSEG in 1952 (Bevis, 1986), and the parcel between the railroad tracks and Ferris Lane was acquired in October 1987.

As shown in Figure 1-6, various portions of the site have been used for pole storage, vehicle parking and electrical equipment storage. The electrical equipment included both new and used transformers (which may have contained PCBs), regulators, capacitors, and other electrical equipment. Prior to the late 1970s, electrical equipment was stored on two wooden platforms shown in Figure 1-6. After the removal of these platforms in the late 1970s, the electrical equipment was stored in the vicinity of the banks Anthony Kill. The top 8 to 12 inches of soil beneath this transformer storage area was removed by NYSEG in August of 1984 due to observed oil stains. The soil was not tested for contamination prior to disposal (Badertscher, 1986) but was assumed to be contaminated with PCBs. Twelve drums of excavated soil were hauled to an approved disposal facility in Ohio and the excavated area was back filled with gravel.

In the early 1980s, an area was designated to store transformers prior to being sent for repair (Figure 1-6). As a result of routine inspection which identified several locations with minor oil stains, an area approximately 12 feet by 24 feet was excavated to a depth of about 2 feet on October 28, 1991 to remove potentially oil contaminated soil. The 29 tons of excavated soil was disposed of (with the assumption that it was contaminated with PCBs) at a secure landfill in Utah (USPCI). Following excavation, five samples were collected from the excavated area. One sample in the center of the excavation contained 1.0 ppm PCBs (Aroclor-1248). The other 4 samples did not exhibit any detectable PCB contamination. Site

restoration was performed by placing plastic sheeting in the excavation and placing clean soil to original grade.

Surrounding Land Use. In the early 1900s, use of the land surrounding the Mechanicville gas plant site was closely linked with two water bodies: the Anthony Kill, also known as Tenandeho Creek, and the Champlain Canal.

A head drop of 34 feet between Round Lake and the Hudson River fostered heavy industrialization along the banks of the Anthony Kill in the late 1800s and early 1900s. An article by Hal Sheehan, a local historian, lists numerous industries in the vicinity of the site, including a brewery, nickel plating works, lumber yard, foundry, bedding company, and mills (e.g., knitting, hosiery, planing, flax, grist, saw, and cotton). The locations of a few of these industries are depicted in Figure 1-4. A map dating from 1911 shows a residential neighborhood established south of the plant site, between Ferris Lane and Burke Avenue. (Sheehan, n.d.).

The heavy industrialization of the Anthony Kill ended as electricity replaced the waterwheel. The land use in the area gradually changed from industrial in the early gas plant years to commercial in the later years. For example, the Mechanicville Fiber Co., located just west of the site, became a radiator shop and distributor of bottled LP gas.

The other important surface water body in the plant vicinity was the Champlain Canal. Completed in 1823, the canal connected the Hudson River at Waterford (south of Mechanicville) with Lake Champlain. The canal flowed through Mechanicville along what is now Central Avenue (Figure 1-4). Like the present roadway, the canal was elevated and the water surface was approximately 10 feet above the gas plant site. Potatoes were the primary product shipped on the canal from Mechanicville. Hal Sheehan reports the typical land uses along the canal were shops, inns, manufacturers, mills, and saloons. The canal was abandoned in 1916 when the Barge Canal was opened. The empty canal became a receptacle for garbage, debris, and junk before it was completely filled with soil by the City of Mechanicville in 1917. Later, the state dug up the canal, removed the trash and debris, and prepared the road bed for Central Avenue.

Today, the area surrounding the gas plant site is in a mixed commercial/residential section of Mechanicville. The former nickel plating mill, located across the Anthony Kill north of the plant, is used by a car dealer as an overflow lot. A supermarket

and gas station occupy the property adjacent to the site on North Central Avenue and there are private residences along Ferris Lane to the south. Except for the car lot, the adjacent property north of the Anthony Kill is undeveloped.

1.2.3 Pertinent Site Investigative Activities

This section briefly describes site activities which occurred previous to and during the ABB-ES investigation which were outside the scope of ABB-ES's activities.

NYSEG collected soil samples from the filter beds area and the relief gas holder foundation in November 1981 (NYSEG, n.d.). Petroleum odors and tar residues were encountered at depths of 3 to 5 feet below ground surface (bgs) at both locations. The samples were analyzed for the four characteristics of hazardous wastes (as defined by 40 CFR Part 261, Subpart C): corrosivity, reactivity, ignitability, and extraction procedure (EP) toxicity. The samples did not exhibit the characteristics of hazardous waste, with the exception of the sample from the filter tanks which had a high level of sulfides (1,300 milligrams per kilogram [mg/kg]) and failed the reactivity test. The relief holder sample contained 40 milligrams per liter (mg/L) of total phenols (NYSEG, n.d.).

On August 15, 1986 an oily discharge was reported to NYSDEC in the Anthony Kill in the vicinity of the Central Avenue Bridge. DEC claimed that the discharge was associated with the construction activity which disturbed sediments in the Anthony Kill. The disturbance of the sediments resulted in an oily sheen. NYSDEC responded to the sheen by installing absorbent pads and an oil boom. NYSDEC requested that NYSEG reimburse the NYSDEC for the spill response cost associated with spill # 86-3241. NYSDEC sampling during the event found fuel oil in the sediments on the northern bank of the Anthony Kill across from the former manufactured gas plant site and low levels (10 ppm) of PAHs on the southern bank adjacent to the NYSEG site.

On September 9, 1986, NYSEG's environmental consultant, E. C. Jordan Co. (Jordan), was conducting a sampling event. Jordan's Robert Burger, observed and noted an oil sheen on the Anthony Kill. The Jordan crew followed the sheen upriver for approximately 200 feet and sampled the surface water. The contained 11 mg/l oil. Apparently, someone complained about the oil sheen and a NYSDEC contractor installed an oil boom along the northern bank of the Anthony Kill across from the

NYSEG manufactured gas plant site where DEC sampled the previous month. The location of the boom was not consistent with the upgradient source (Burger, 1986).

A similar spill event occurred in December of 1986. Although no samples were taken DEC claimed it was associated with the NYSEG site. NYSEG disagreed with NYSDEC claim that the September and December spills were associated with the NYSEG site. NYSDEC agreed that there are multiple upgradient sources in the area.

In September 1988, D.A. Collins Construction Company of Willow Glen began structural repairs to the Central Avenue Bridge. This work involved the construction of four new footings for the double archway and the installation of two new steel archways under the existing stone archway. During this construction program, the contractor built a temporary dam to diverge water from the archway while they were working on it. When the northern archway was dewatered an organic sheen was observed from the sediments. DEC informed NYSEG about the material and NYSEG installed an oil boom and absorbent pads to control the material. After reconstruction of the northern archway, debris and sediments were stockpiled on plastic on the property to the north of the Anthony Kill. This material was then sampled and analyzed to determine if it contained material associated with the former manufactured gas plant operations. The initial testing identified some low levels of organics that could have been associated with the former NYSEG operations. With verbal agreement from Jerry Bradley, the material was then transported to the NYSEG property.

Once NYSEG took responsibility for the sediments, NYSEG sampled the material for disposal purposes and found that the material was hazardous due to reactive sulfide. The material was manifested and disposed as a hazardous waste at an approved facility (Stablex Canada, Inc., Blainvelle, Quebec, Canada). **Insert Page 1-17a.**

1.3 Report Organization

The remainder of this document is organized in the following manner:

Section 2.0 describes in detail site investigatory activities undertaken throughout the duration of Tasks 1 through 4. Section 3.0 contains the physical site characterization. Section 4.0 summarizes the chemical distribution in various media and the probable

On June 28, 1989 20,000 kg of coal tar contaminated material (USEPA hazardous waste number D003) was disposed under manifest number NYA5836293. On August 9, 1989, an additional 20,000 kg of coat tar contaminated material was disposed under manifest number NYA8370243.

sources of those chemicals. Section 5.0 is a physical and chemical data assessment including comparison with regulatory standards, the fate and transport of chemicals, and a description of the contaminants of concern. Section 6.0 is the baseline risk assessment for human and environmental receptors. Section 7.0 presents the summary and conclusions of our findings at the Mechanicville site, in which data needs are identified and remedial action objectives are recommended. Section 8.0 is a Phase IIA Remedial Investigation Work Plan outlining the approach for further remedial investigation activities. This work plan also contains a site-specific Health and Safety Plan (HASP), Quality Assurance Project Plan (QAPP), and Citizen Participation Plan (CPP). A Focused Feasibility Study Work Plan to mitigate the discharge of coal tars and contaminated groundwater to the Anthony Kill is presented in Section 9.0.

2.0 SITE INVESTIGATION

The Task 1 Preliminary Site Evaluation, conducted in 1986, developed an understanding of the site's history, environmental setting, and current condition through detailed Site reconnaissance, interviews, and file searches. The scope of work completed for Task 1 included:

1. A historical review of the site to develop an understanding of the former gasification plant layout, operations, and surrounding land uses.

2. An air assessment of existing site conditions and a preliminary prediction of airborne contaminant concentrations expected during the site investigation.

3. A detailed site reconnaissance to become familiar with the area and identify locations for explorations, access requirements, and potential conflicts with above and below ground utilities.

4. A geophysical investigation utilizing seismic refraction, terrain conductivity, and GPR to: delineate the bedrock surface; determine the vertical stratigraphy of geologic materials; map the migration route of any conductive groundwater contaminant plume; and identify subsurface anomalies that warrant further investigation.

Task 1 activities included a detailed site reconnaissance, interviews, and file searches. The site was visited by ABB-ES personnel on January 21, 1986 and May 5, 6, and 7, 1986. Conditions at the site were documented with field notes and photographs. Interviews were held on May 5, 6, and 7, 1986 with the following persons:

- Art Elvins, retired NYSEG employee, Mechanicville, New York.

- John McBride, Mike Gilbert, and John McNeil, current NYSEG employees, Mechanicville service center.

- Louie Fasoli, NYSEG employee, Granville office.

- Lucille Bevis, Supervisor of Real Estate for NYSEG, Mechanicville office.
- Harold Sheehan, local historian.
- Vincent Barber, Plant Manager, Mechanicville Water Department.
- Michael Renaldi, Commissioner of Public Works, City of Mechanicville.

The following people were also contacted for information about the site and surrounding area:

- John Hamilton, Manager, Saratoga County Soil and Water Conservation District, Ballston Spa, New York.
- Lloyd Wagner, Water Resources Division, U.S. Geological Survey, Albany, New York.
- Robert Dineen, Senior Scientist, New York State Geological Survey, Albany, New York.
- George Hodgson, Environmental Coordinator, Saratoga County Environmental Management Council, Ballston Spa, New York.
- Dick Ferraioli, Well Driller, Altamont, New York.

Records and documents on file at the following locations were reviewed:

- NYSEG, Corporate Headquarters in Binghamton and the regional office in Mechanicville (James Marean and Robert Badertscher).
- Real Property Tax Services, Saratoga County Office, Ballston Spa, New York.
- Agricultural Stabilization and Conservation Service, Saratoga County Office, Ballston Spa, New York.

Specifically, from the site reconnaissance, interviews, and file reviews, it was learned that:

- Coal gas was produced at the site for 54 years, from 1901 until 1955.
- Coal tar residues accumulated in the base of the relief gas holder. The coal tar reportedly was left in the holder when it was demolished in 1955.
- Condensate from the water gas process was treated in a tar dehydrator and filter bed system before discharge to the Anthony Kill.
- Residual ash from the gas generator was reportedly stored on the site before removal by various users.
- Wood chips and oxide wastes from the purifying house were hauled off site for final disposal. Some spent chips may have been spread on the lot just west of the active plant area.

The Task 1 report summarized the potential environmental problems in soils, groundwater, surface water, and air at the Mechanicville site (Table 2-1). These potential problems were summarized for these media based on a number of technical factors including the chemicals present at the site, the chemical transport mechanisms, the expected persistence of chemicals in the environment, and existing or potential receptors of those chemicals.

Task 2, the Initial Field Investigation Program was conducted during the period 1986 to 1987. Data requirements for this task fell into four general categories:

1. Establishment of background conditions.
2. Characterization of contamination sources.
3. Determination of transport routes.
4. Identification of potential receptors.

To investigate the presence or absence of coal gasification wastes at the Mechanicville site, the following analytical parameters were included in the Task 2 soil and water analytical program: volatile organic compounds (VOCs), semivolatile organic compounds (SVOCs), total cyanide, ferro-ferri cyanide, total organic carbon

(TOC), total recoverable phenolics, iron, and zinc. Air samples were analyzed for polynuclear aromatic hydrocarbons (PAHs), iron, and VOCs.

The primary use of the Task 2 data was for problem identification, preliminary risk assessment, and preliminary in-house engineering rather than final engineering determinations. The explorations conducted for Task 2 consisted of test pits, soil borings, and monitoring well installations; air, soil, groundwater, surface water, and sediment sampling; laboratory chemical analyses; and a preliminary land use investigation. The detailed scope of work for Task 2 was described in the Work Plan for the Mechanicville site, submitted to NYSEG in April 1986.

Specifically, the Work Plan contained the following scope of work:

1. Prepare a site-specific Quality Assurance Project Plan (QAPP) and Health and Safety Plan (HASP).

2. Excavate five test pits for characterization of the subsurface geology at the site; install piezometers in two of the test pits to obtain groundwater level data; collect six soil samples for laboratory chemical analysis; and prepare test pit logs.

3. Drill eight soil borings and obtain eight soil samples for laboratory chemical analysis and site characterization; install six monitoring wells and one piezometer; and prepare boring logs and well installation diagrams.

4. Perform in situ permeability tests at all wells and obtain five rounds of groundwater level data from monitoring wells and piezometers.

5. Collect groundwater samples from six monitoring wells on a quarterly basis for laboratory chemical analysis (four sampling rounds completed between September 1986 and June 1987).

6. Collect surface water and sediment samples at three locations along the Anthony Kill on a quarterly basis for laboratory chemical analysis (four sampling rounds completed between September 1986 and June 1987).

7. Perform laboratory analysis of soil, groundwater, surface water, and sediment samples.

8. Conduct a topographic survey to identify relative locations and elevations of test pits, borings, monitoring wells, piezometers, and other pertinent features at the site.

9. Conduct a preliminary land use survey within a half-mile radius of the site.

10. Evaluate the geologic, hydrogeologic, and chemical data to develop an understanding of site conditions and chemical distribution.

11. Perform a preliminary assessment of the potential health and environmental risks posed by chemical constituents found at the site, and identify remedial alternatives to control the effects and risks.

12. Identify additional data requirements and propose a Task 3 program (including schedule and costs) to obtain the necessary data.

The Expanded Problem Definition Program (Task 3), conducted during the period 1987 through 1989, was designed to (1) confirm Task 2 analytical results; (2) obtain further data on chemical distribution in soil and shallow bedrock at the site and site environs; (3) further investigate the potential for chemical migration in groundwater; (4) assess the air quality within buildings on the site; and (5) identify potential chemical receptors and potentially sensitive land uses.

Task 3 consisted of the following subtasks:

1. A GPR survey performed adjacent to the site on the northern side of the Anthony Kill to extend the area of bedrock surface contouring.

2. Four shallow and three deep borings drilled for further site characterization, including chemical analysis of the soils encountered and bedrock characterization.

3. Groundwater monitoring wells installed in six of the seven borings to obtain further information on groundwater flow direction and

chemicals present in groundwater. Two rounds of groundwater sampling and analysis and two sets of water level observations were conducted in Task 3.

4. Rising-head permeability tests performed in the completed wells to determine the in situ hydraulic conductivities of soils. Packer pressure tests were conducted in the deep bedrock wells to determine the hydraulic conductivity of the bedrock at the site.

5. Task 3 soil and water samples analyzed for VOCs and SVOCs, iron, lead, zinc, cyanide compounds, phenolics, and TOC. Organic analyses were performed using GC/MS methods rather than the HPLC/ultraviolet (UV) methods used in Task 2.

6. A location and elevation survey completed for the Task 3 borings, monitoring wells, and surface water and sediment sampling locations. The site plan developed in Task 1 was updated to include Task 3 explorations.

7. Air quality samples collected at three indoor locations and one background location at the property-line fence to assess volatilized contaminant risk.

8. Evaluation and interpretation of geologic, hydrogeologic, and chemical data to provide an understanding of site conditions.

9. Identification of potential receptors of site-derived chemicals.

10. A proposed Task 4 program for assessing risks on site and at the site boundaries was outlined.

The scope of the Risk Assessment (Task 4) was developed based on information obtained during Tasks 1 through 3. The Risk Assessment was designed to (1) identify and assess the potential risk associated with exposure to the chemicals present on site, and (2) evaluate the need for and develop, if necessary, the scope for a Conceptual Design (Task 5).

The subtasks completed as part of the Task 4 Risk Assessment included the following:

1. Review and summary of Tasks 2 and 3 field investigation findings on the distribution of chemicals present on site.

2. Selection of contaminants of concern identified on site that represent potential hazards at the site.

3. Identification of possible pathways of exposure and potentially exposed populations at and near the site.

4. Identification of the potential hazards associated with exposure to the contaminants of concern including acute and chronic toxic effects of the compounds.

5. Identification of the dose/response data used to quantitatively assess risk (e.g., U.S. Environmental Protection Agency [USEPA] cancer potency factors and reference doses).

6. Comparison of the environmental concentrations of chemicals on-site to existing state and federal health-based criteria and standards.

7. Characterization of human health and environmental risks associated with exposure to site-related chemicals.

8. Establishment, if necessary, of Target Clean-up Levels (TCLs) to protect against future potential exposure to contaminants of concern.

9. Evaluation of the need for a Conceptual Remedial Design (Task 5).

2.1 GEOPHYSICAL INVESTIGATION

A geophysical survey was conducted at the site during Task 1 between June 2 and June 5, 1986 to:

1. Delineate the bedrock surface, which may direct the flow of any subsurface contaminants associated with past site activities.

2. Determine the vertical stratigraphy of geologic materials underlying the site and the way in which these materials may vary laterally.

3. Map the migration route(s) of any conductive groundwater contaminant plume(s) (if present) that could be related to past site activities.

4. Map the presence of any buried structures (i.e. tanks, utilities, etc.) to avoid in future exploration activities.

The geophysical investigation used three exploration techniques: (1) GPR, (2) continuous seismic refraction profiling, and (3) terrain conductivity profiling, also referred to as electromagnetic (EM) profiling. These techniques were selected as being the most appropriate, given the geologic setting and field conditions.

Methodology. The geophysical survey at the Mechanicville site was conducted within the two parking lots of the NYSEG facility on North Central Avenue. The survey area was approximately one acre in size.

The GPR and seismic refraction surveys were conducted along the traverse lines indicated on Figures 2-1 and 2-2. A 10-foot grid was established throughout the area of investigation with a compass and cloth tape before the survey.

The shallow anomalies identified on Figure 2-3 are probably due to demolition rubble (steel reinforcing from concrete structures), railroad spikes or rails, boulders or other relatively small objects not considered significant in characterizing the site geology. The anomalies were also non-continuous (buried pipelines typically will show a continuous response over the length of the pipe) indicating that they were not detecting the presence of a continuous utility line.

The GPR survey used a Geophysical Survey Systems, Inc., Subsurface Interface Radar (SIR) System B, a microprocessor-equipped system with a 300 MHz transducer. Because the soil at the site was saturated with water in some areas, it produced "ringing" in the radar records. A real-time digital filter with a background

removal algorithm was used to minimize this extraneous "noise" and facilitate interpretation of the GPR data.

The depth of penetration of the radar system was set at two different levels. The primary target of the first setting was the bedrock surface, predicted to be as deep as 15 feet below the ground surface. The instrument was set at 140 nanoseconds (two-way travel time), equivalent to a penetration depth of approximately 20 feet. The second instrument setting of 70 nanoseconds, or roughly 10 feet of penetration, was used to obtain enhanced resolution of shallower features such as buried utilities. Approximately 3,575 lineal feet of GPR profiling at each level of penetration were covered during the survey (Figure 2-1).

Seismic refraction profiling was accomplished with a Geometrics ES-2415F Signal Enhancement Seismograph. Individual seismometers (geophones) were separated by 10 feet, and multiple impacts (up to 12) of a 10-pound sledgehammer were used for an energy source. Five impact points were utilized for each seismic spread. Due to the limited size of the site, the length of most of the seismic spreads was 120 feet, although one of the spreads was 240 feet long. A total of 1,590 lineal feet of seismic refraction profiling was completed during this portion of the survey (Figure 2-2).

Terrain conductivity measurements were attempted on two different occasions during the Task 1 field effort with a Geonics EM 31 terrain conductivity meter. Because there was too much electrical interference to obtain reliable terrain conductivity data, this portion of the field program was curtailed.

Results. High quality data resulted from the GPR survey. The features noted on the radar records include the bedrock surface and various subsurface anomalies. Notable features mapped on Figure 2-3 include:

- shallow subsurface features (and their approximate depth in feet) that could represent buried utilities
- other shallow features (less than 2 feet) of probable minor importance
- the locations of two buried gasoline tanks
- the limits of excavations for former structures associated with the coal gasification facility

- zones of higher reflectance in overburden/bedrock that indicate higher moisture content or saturation

The shallow anomalies identified on Figure 2-3 are probably due to demolition rubble (steel reinforcing from concrete structures), railroad spikes or rails, boulders or other relatively small objects not considered significant in characterizing the site geology. The anomalies were also non-continuous (buried pipelines typically will show a continuous response over the length of the pipe), indicating that they were not detecting the presence of a continuous utility line.

The GPR survey revealed that the bedrock is from 8 to 17 feet deep. These depths are based on an assumed velocity of the radar wave through overburden materials. If the assumed velocity value is different from the actual velocity, bedrock depths will vary accordingly.

The results of the seismic refraction survey are presented on Figure 2-4. The seismic profiles can be thought of as pseudo-geologic sections with two layers: (1) overburden (including natural soils, fill, and demolition materials), and (2) bedrock. The seismic velocity value of the overburden varies through a fairly wide range, from 1,200 to 4,000 feet per second (ft/sec). These velocity differences probably reflect to some degree the moisture content of the overburden materials, but undoubtedly also reflect the complex variety of fill materials associated with past site activities that blanket the site.

Bedrock velocity values measured during the seismic survey varied from 8,000 to 12,000 ft/sec, a typical range of values for a shale deposit. The lower end of this range of values probably reflects a higher degree of fracturing occurring locally in the shale bedrock.

The correlation between bedrock elevations derived from GPR, seismic refraction, and preliminary field data was generally quite good, particularly for the eastern portion of the site.

A generalized bedrock contour map was constructed from the data (Figure 2-5), depicting the surface of the competent rock, but not that of the moderately to highly weathered shale above the competent rock that is several feet thick. The seismic data were weighed more heavily in the construction of this map. This is because the complex and highly variable subsurface conditions could have affected the

transmission velocity of the radar waves to an extent that is not adequately accounted for by the assumption of a single velocity value for the site.

Results of the Task 1 GPR and seismic refraction surveys correlated well with depths to bedrock observed during the boring program. During Task 3, in the first week of November 1987, these same geophysical techniques were used again to extend the bedrock surface contour map slightly east and north of the site. Figure 2-6 defines the extent of the geophysical survey. A 10-foot grid was established throughout the GPR investigation area; seismic refraction work was conducted along 50-foot grid lines. The Price Chopper parking lot, located across North Central Avenue east of the site, was not included in the survey because access to the lot was denied by the property owners when this portion of the study was conducted.

2.2 SOIL INVESTIGATIONS

This subsection describes the soil investigations from test pits and borings during Task 2 and Task 3 field activities as well as the surface soil sampling conducted during Task 4. Field logs are presented in Appendices A and B, including descriptions of the soil layers and field observations. Exploration and sampling procedures are further documented in the QAPP (E.C. Jordan Co., 1985).

2.2.1 Shallow Subsurface Soil Sampling

On July 21, 1986, J.H. Maloy Co., contracted through Empire Soils Investigations, Inc. (Empire), excavated six test pits with a backhoe at the Mechanicville site ranging in depth from 3 to 7.7 feet below ground surface. One test pit, labeled "Decon Pit" in Figure 2-7 was used to capture fluids from decontamination (i.e., steam-cleaning) of equipment. The remaining test pits, TP-1 through TP-5, were used to investigate subsurface geology, distribution of coal gasification wastes, and depth to groundwater. These test pits are also shown in Figure 2-7.

Test pit completion was witnessed by a ABB-ES field geologist. Test pit logs and field observations are presented in Appendix A. Six soil samples were obtained for laboratory chemical analysis and forwarded to ERCO Laboratories, a division of ENSECO, Inc., in Cambridge, Massachusetts. One sample each was collected from TP-1, TP-2, and TP-4; two samples and one duplicate were taken from TP-5. No samples were obtained from TP-3 or the decontamination pit.

Analytical samples were selected from soil layers that (1) contained visual signs of coal gasification wastes, (2) had a coal tar odor, or (3) showed detectable levels of organic vapors as measured with a PID. Thus, the test pit samples were targeted for waste material in shallow soil, where present.

2.2.2 Deep Subsurface Soil Sampling

Task 2 Borings. Eight borings (B-1 through B-8) were drilled at the site by Empire between July 23 and August 6, 1986 (see Figure 2-7). The borings were drilled to (1) investigate the subsurface geology, (2) evaluate the effects of former coal gasification activities on subsurface soils, (3) investigate the foundations of the former gas holders, and (4) permit installation of monitoring wells.

Boring locations were selected following consideration of former coal gasification activities, the test pit observations, the anticipated direction of groundwater flow, and the results of the GPR survey.

Borings were drilled to bedrock using hollow-stem augers; NX-sized cores (3-inch diameter) were used to drill into the shale bedrock at four borings (i.e., B-1, B-2, B-5, and B-6). Total boring depths ranged from 9 to 32 feet below ground surface. Continuous (2-foot) split-spoon samples were collected above the bedrock and continuous (5-foot) core samples were taken in the bedrock. All samples were scanned with a PID for organic vapors.

Reference soil samples (for physical characteristics) and analytical soil samples (for chemical analysis by ERCO Laboratories) were collected from each boring except B-6. Soil sampling was not conducted at B-6 because of its close proximity to B-4. Core samples collected at B-1, B-2, B-5, and B-6 were logged and placed in core boxes stored at the site. (Boring logs completed by ABB-ES field geologists are presented in Appendix B-1, along with a table summarizing field observations.)

Task 3 Borings. Seven borings (i.e., B-9 through B-15) were drilled at the site by North Star Drilling of Cortland, New York, between November 9 and 19, 1987 (see Figure 2-7). The borings were drilled to (1) further define the shallow subsurface geology, (2) provide data on the distribution and migration of chemicals in soil and bedrock on site, and (3) permit installation of monitoring wells. Boring locations were selected following consideration of the Task 2 findings regarding geology,

hydrogeology, and chemical distribution, as well as the Task 3 geophysical survey data.

Borings were drilled to bedrock using hollow-stem augers; 3-inch-diameter holes were drilled into the shale bedrock at four borings (i.e., B-11, B-13, B-14, and B-15). Boring depths ranged from 5.5 to 55.5 feet below ground surface. Continuous 2-foot long split-spoon samples were collected above the bedrock (except in B-9), and continuous 10-foot long core samples were taken in the bedrock. Samples were scanned with a photoionization detector (PID) for organic vapors. Reference soil samples (for physical characteristics) and analytical soil samples (for laboratory chemical analysis) were collected from each boring except B-11 and B-13. An analytical sample was not collected at B-11 because of the unexpectedly shallow bedrock. No samples were collected at B-13 because of its close proximity to B-12.

Core samples collected at B-11, B-13, B-14, and B-15 were logged and placed in core boxes. Boring and rock coring logs completed by an ABB-ES field geologist are presented in Appendix B-1, along with a table summarizing field observations.

2.2.3 Surface Soil Sampling

As part of Task 4, nine surface soil samples plus one duplicate (SS-1 through SS-9, plus SS-3A) were collected at the site in August 1989 (Figure 2-7). These samples were taken to characterize the extent of contamination in surface soils at the site.

2.3 GROUNDWATER INVESTIGATIONS

Task 2

Monitoring wells were installed in six of the eight boreholes drilled between July 23 and August 14, 1986. Each monitoring well number (i.e., MW-1 through MW-6) corresponds to the number of the borehole in which it was installed; monitoring well locations are shown in Figure 2-7.

The monitoring wells were installed to obtain water level measurements, permeability data, and water samples for laboratory chemical analyses. MW-1 was installed to provide groundwater information upgradient of the site; MW-2 through MW-5 were installed in locations anticipated to be downgradient of former coal gasification

structures. The screened zone (including the sand backfill) for these five wells coincided approximately with the top 10 feet of the water table, and spanned both soil and bedrock strata (see Appendix B-2). The sixth well, MW-6, was installed to provide data on water levels, water quality, fracture patterns, and permeability in the bedrock. The top of the screened zone for this well was positioned 5 feet below the bedrock surface and extended 10 feet into the bedrock, to a depth of 31 feet below ground surface.

Monitoring wells were constructed of 2-inch diameter, stainless steel pipe; flush-mounted protective casings were used on all wells except MW-1 where the casing was above ground. A 5-foot stainless steel well screen with 0.01-foot slots was used in each monitoring well. Wells were backfilled with clean Jersey sand and sealed with a minimum of 2 feet of bentonite pellets. Well installation diagrams appear in Appendix B-2.

MW-1 through MW-3 were developed using a hydraulic pump. The remaining wells, MW-4 through MW-6, were flushed out with an air compressor system. Rising-head permeability tests were started initially on MW-1, MW-2, and MW-5, but were halted when contamination was encountered during development. As an alternative to pumping contaminated water, falling-head permeability tests were performed on MW-1 through MW-5 after well development. A packer test was conducted at MW-6 to characterize the permeability of bedrock at the site. Methods and results for both falling-head and packer tests are provided in Appendix B-3.

To augment the well measurements, three piezometers were installed to provide water level data. Two piezometers (P-1 and P-2) were installed in TP-1 and TP-2, respectively, to give groundwater information on the eastern and western portions of the site. The third piezometer (P-3) was placed in B-7 (inside the perimeter of the former gas distribution holder) to allow water level measurements in this region. Locations of these piezometers are shown in Figure 2-7. The piezometers were constructed of a single section of 1/2-inch inside diameter (ID) polyvinyl chloride (PVC) piping with 1- to 3-foot hand-slotted screens. Although the piezometers were capped, protective casings were not installed.

Groundwater Sampling. Four rounds of groundwater sampling were conducted at the site during Task 2: in September and December of 1986, and March and June of 1987. During each round, water level measurements were taken at each well and piezometer; these data are presented in Appendix C-1.

Using dedicated bailers, groundwater samples were collected from each well, and quality assurance/quality control (QA/QC) samples (i.e., duplicates, trip blanks, sampler blanks, and filtration blanks) were obtained. Monitoring well sampling procedures were followed as detailed in Appendix C-2. Round 1 laboratory chemical analyses were completed by ERCO Laboratories. The remaining three rounds of samples were analyzed by NYSEG.

Task 3

Monitoring wells were installed in six of the seven new boreholes (B-9 through B-15). Each monitoring well number (i.e., MW-10 through MW-15) corresponds to the number of the borehole in which it was installed; monitoring well locations are shown in Figure 2-7.

The monitoring wells were installed to obtain water level measurements, permeability data, and water samples for laboratory chemical analysis. MW-10, MW-11, and MW-12 are shallow overburden wells, and MW-13, MW-14, and MW-15 are deeper bedrock wells. The shallow wells were positioned in the soil and/or shallow bedrock, while the deeper wells were sealed below the bedrock surface. All the wells were located in areas of the site where data were needed to evaluate chemical migration. Two of the deeper wells, MW-13 and MW-15, are next to shallow wells. These well pairs provide data on vertical seepage gradients at the site.

The screened zones (including the sand backfill) in MW-10, MW-11, and MW-12 were positioned to coincide approximately with the top 10 feet of the water table, and span soil and/or shallow bedrock strata. The screened zones of bedrock wells MW-13, MW-14, and MW-15 were positioned to intersect the most permeable zones in the bedrock, as determined by the packer pressure tests performed before placement. Packer test data are presented in Appendix B-3.

Monitoring wells were constructed using 10-foot-long, 2-inch ID, stainless steel well screens with 0.01-foot slots, except for MW-11, where a 5-foot screen was used because of the shallowness of bedrock. Flush-mounted, locking protective casings were installed on all wells. Wells were backfilled with clean, graded, quartzite sand, and sealed with a minimum of 2 feet of bentonite pellets. Well installation diagrams are included in Appendix B-2.

The wells were developed using an air compression system. If development water appeared contaminated, it was collected and drummed in U.S. Department of Transportation (DOT)-approved containers that were labeled and stored on-site. Upon completion of the well development, rising-head permeability tests were conducted on the wells. Additionally, packer pressure tests were conducted in the deep bedrock wells to characterize permeability of the bedrock at the site. Methods and results of rising-head and packer tests are provided in Appendix B-3.

Groundwater Sampling. Two rounds of groundwater sampling of the 12 Task 2 and Task 3 wells were conducted in December 1987 and March 1988. During each round, water level measurements were taken at each well. The water level data are presented in Appendix C-1. Using dedicated bailers, groundwater samples were collected from each well, and QA/QC samples (i.e., duplicates, trip blanks, sampler blanks, and filtration blanks) were obtained.

The monitoring well sampling procedures followed are detailed in Appendix C-2. Samples were submitted to NYSEG's laboratory for groundwater analyses. The chemical QA data supporting the results are presented in Appendix D-2.

2.4 Surface Water and Sediment Investigations

Task 2

Three surface water and three sediment sampling stations were selected to determine the distribution of organic and inorganic compounds along the Anthony Kill (see Figure 2-7). The sampling stations were upstream of the site (SW/SED-1), adjacent to the site near the outfall of the easternmost drainage culvert (SW/SED-2), and downstream of the site on the eastern side of the North Central Avenue Bridge (SW/SED-3).

Four rounds of surface water/sediment samples were collected in September and December of 1986, and March and June of 1987. During each round, one sample from each medium was collected at each sampling station; a duplicate sample from each medium was also collected in each round. Round 1 chemical analyses were completed by ERCO Laboratories. The remaining three rounds of samples were sent to NYSEG. NYSEG analyzed the surface water samples, but sent the sediment samples to ERCO Laboratories.

Task 3

Surface water and sediment samples were collected in December 1987 and March 1988 at the same locations as in Task 2 for SW/SED-1 and SW/SED-2. A third sampling location SW/SED-4, located downstream, was chosen based on the groundwater flow direction at the site, which suggests that site groundwater discharges to the Anthony Kill in the vicinity for SW-04. Two samples were collected from each medium at each sampling station and were submitted to NYSEG's laboratory for surface water and sediment analyses. The chemical QA data supporting the results are presented in Appendix D-2.

2.5 Contaminant Source Investigations

Maps of the Mechanicville site supplied by NYSEG identified the former locations of structures associated with the former MGP. The geophysical investigation conducted during Task 1 also helped in identifying the presence of buried structures such as fuel tanks, gas holder foundation and underground utilities.

Since the operational history of the site is fairly well documented, wastes associated with former MGP operations were expected to be found. Analysis of representative MAP waste sample (coal tar and spent oxide) were conducted (Appendix D-1). Samples were collected by NYSEG in November 1981 from the filter bed area and the former relief gas holder. Interviews with persons familiar with the former gas plant operations indicated that both these structures were filled-in without first removing MGP wastes which may have been present at the time of the backfilling (i.e. coke in the filter beds and coal tar in the relief gas holder). Soil sampling and soil removal actions have also occurred in areas in which transformers were stored and along the banks of the Anthony Kill.

2.6 Air Monitoring Program

To evaluate levels of benzene, toluene, ethylbenzene, and xylenes in the indoor air at the site, samples were collected in the office, the adjacent storeroom area, the separate garage building, and an additional background location at the property-line fence. Each location was sampled in duplicate for QC. Samples were collected using charcoal sorbent tubes; sampling pumps were calibrated in accordance with NIOSH

Method 1501. Samples were collected over a six-hour period, from approximately 10 a.m. to 4 p.m. on December 28, 1989.

Upon completion of the sample collection, the charcoal tube samples were delivered to the subcontracted analytical laboratory for analysis by solvent desorption with GC flame ionization detection (FID), in accordance with NIOSH Method 1501. A field-biased blank sample was collected and submitted to the laboratory for quality control blank analysis.

2.7 Topographic Surveys

Topography and exploration locations (i.e., test pits, borings, monitoring wells, piezometers, and geophysical control points) were surveyed by David A. Flanders Associates of Ballston Lake, New York, in late June of 1986 and early December of 1987. The surveyor determined exploration locations and ground elevations to the nearest 0.1 foot, and the uncapped riser elevations of the monitoring wells and piezometers to the nearest 0.01 foot.

The reference datum was a railroad spike in the utility pole located between the NYSEG substation and North Central Avenue, south of the site. This point was assumed to be at an elevation of 100 feet. Exploration locations were mapped on the base map developed in Task 1 (see Appendix E).

2.8 Land Use Survey

General land uses and cover types were surveyed for the area within a half-mile radius of the Mechanicville site. Existing land use maps, street maps, and aerial photographs were used for the survey, along with field checking. Potentially sensitive land uses, identified with the assistance of local officials and published data, included facilities for the very young, the elderly, and the infirm; that is, populations particularly sensitive to contaminants.

Potential contributors of chemicals to groundwater and surface water were identified from aerial photographs and during field checking. Potential contributors include locations where chemical substances are typically used and/or disposed of.

3.0 PHYSICAL SITE CHARACTERIZATION

The geology, hydrogeology, and hydrology of the Mechanicville site, as interpreted from data gathered in Tasks 1, 2, and 3, are described in this section, along with descriptions of the air quality and results of the land use survey.

3.1 GEOLOGY

The Saratoga County area is drained by the Hudson River and its tributaries. The Hudson River Valley is formed by highly folded and faulted shales originally deposited as sediments along the continental margin during the Ordovician Period, approximately 500 million years ago. The preglacial Hudson River Valley and its drainage system were probably similar to the present configuration. However, the valleys may have been widened or deepened by subglacial erosion when the Laurentide Ice Sheet flowed south over this area from Canada.

As the ice sheet began its northward retreat, sediment-laden meltwater streams flowed through the Anthony Kill Valley, depositing sands and gravel in the higher energy zones, and clays and silts in quieter water. These glaciofluvial deposits form the terraces that lie along the southern border of Mechanicville.

Subsurface conditions at the Mechanicville site were investigated during Task 2 by means of test pit and boring explorations, and during Task 3 by boring explorations. The shallow geology consists of 3 to 25 feet of fill and silty shale overlying a fractured shale bedrock. The bedrock surface is deepest in the southeastern portion of the site. An interpretation of site stratigraphy is illustrated through geologic profiles located on a plan view of the site (Figure 3-1). The profiles, shown in Figures 3-2 through 3-4, are constructed with a 10:1 vertical scale exaggeration.

The fill, which includes a silty sand and gravel and a clayey silt and fractured shale, forms the upper 8 to 25 feet of the site. In the southeastern portion of the site, where excavation for the relief gas holder occurred, and in the area between the building and the Anthony Kill, a silty shale unit underlies the fill deposits. This silty shale unit, 8 to 9 feet thick in B-4 and B-8 and 1.5 feet thick in B-14, is loose, moist, and lacks structure, and is interpreted to represent fill material (possibly disturbed weathered bedrock from on-site).

Isolated gravelly sand and silty clay till units were also encountered at the site. The unconsolidated deposits overlie a shale bedrock, which is severely weathered in its upper 1 to 2 feet and highly fractured in the upper 5 to 10 feet. Subsurface geologic conditions investigated at the site are described in the following paragraphs.

Fill. The uppermost fill consists primarily of brown to black silty sand and gravel with organic matter, ash, brick fragments, glass, and wood chips. Within the fill, there is considerable heterogeneity, including zones of clayey silt and fractured shale. The fill averages 8 to 25 feet thick across the site, but thins at the Anthony Kill (see Figures 3-2 and 3-3). The off-site lateral extent of the fill is unknown, but is expected to occur east of the site along North Central Avenue where the old Champlain Canal was filled.

Gravelly Sand. A brown, dense, gravelly sand was encountered in only one boring (B-1) at a depth of 8 feet below ground surface (see Figure 3-2). The gravelly sand unit is 1.5 to 4 feet thick. At B-1, the gravelly sand overlies weathered bedrock. The gravelly sand may be fill or, if the area has not been disturbed, a glaciofluvial deposit.

Silty Shale. In the southeastern portion of the site, between the present-day office building and the Anthony Kill, a silty shale unit overlies the bedrock. This unit consists of black to gray platy shale fragments with silt. The silty shale is loose, saturated, and lacks a consistent structure. These properties indicate this area might have been disturbed by excavation, backfilling, and grading during construction of the gas plant. The silty shale in these areas, interpreted to be fill material, varies in thickness across the site from 1 to 9 feet. It is thickest in the area of the former relief gas holder, near B-4, B-6, and B-8 (see Figure 3-2). The off-site lateral extent of the silty shale layer is unknown.

Till. A thin, discontinuous tan to light gray silty clay till with fine gravel was encountered at the top of the bedrock surface in one boring (B-4). The pocket of till is less than 1 foot thick and is located along the northern edge of a small bedrock trough. The till contained some natural organic matter, suggesting that this remnant till was the original postglacial topsoil at the site. Because the till appears to be laterally discontinuous, it is not anticipated to significantly influence groundwater flow at the site.

Shale Bedrock. The bedrock at the Mechanicville site is a thinly bedded gray shale with calcite inclusions. The upper 1 to 2 feet of the bedrock is severely weathered and contains silt and dry platy shale fragments. Bedrock crops out at several locations along the southern bank of the Anthony Kill. Based on measurements taken from these outcrops, the bedrock strikes nearly east-west, and bedding dips approximately 30 degrees to the south.

Bedrock core was obtained in eight borings beneath the highly weathered zone. As observed in the core, the upper portion of the bedrock contains fractures spaced between 2 inches to a foot apart. The primary fractures are parallel to bedding and secondary fractures exist at angles up to 90 degrees to the primary fractures. Some weathering has occurred along the fracture faces. In the deeper borings, more competent bedrock was encountered (i.e., deeper bedrock contained fewer fractures than shallow bedrock). Some of the deeper bedrock fractures contained coal tar or had a distinct coal tar odor. Groundwater movement in the bedrock occurs primarily through the fractures in response to the hydraulic gradient.

A bedrock surface contour map interpreted from the GPR and seismic refraction surveys and boring exploration data collected during Tasks 1, 2, and 3 is shown in Figure 2-6. The contour map depicts the surface of the competent bedrock; 1 to 2 feet of weathered rock lie directly above this unit. A bedrock high is near the former distribution gas holder. Bedrock appears to slope downward from this high, toward both the Anthony Kill (north) and North Central Avenue (east).

A small east-trending bedrock depression, approximately 5 feet deep, occurs in the center of the site near the location of the former relief gas holder (B-4 and B-6). This small depression could represent a relic postglacial stream channel. Another bedrock low is located in the north-central portion of the site near MW-5 and MW-15. This bowl-shaped depression may represent a postglacial stream scour depression. On the northern side of the Anthony Kill, bedrock slopes to the south, toward the stream channel.

3.2 HYDROGEOLOGY

The interpretation of hydrogeologic conditions at the site is based on field and laboratory permeability data and water level observations. The raw data are presented in Appendices B-3 and C-1, respectively. A discussion of the data follows.

Based on observations made during the excavation of borings and test pits, and groundwater measurements from piezometers and monitoring wells, the water table at the site exists at a depth ranging from approximately 2 to 20 feet below ground surface. The water table occurs principally in the fill during both high and low water table conditions. The saturated thickness of soils at the site ranges from approximately 3 to 25 feet.

The screens of MW-1, MW-2, MW-5, MW-10, and MW-11 intercept groundwater in the fill and shallow bedrock. MW-3, MW-4, and MW-12 and piezometers P-1 through P-3 monitor groundwater levels in the fill. MW-6, MW-13, MW-14, and MW-15 monitor groundwater levels at depth in the fractured bedrock and therefore were not considered in developing water table contours.

The water table contours for the site are shown in Figure 3-5. The contours were developed using groundwater levels observed on March 29, 1988, from MW-1 through MW-5, MW-10 through MW-12, and P-3. Water level data from P-1 and P-2 were excluded from interpretation because of artificially high water levels (see next paragraph). Groundwater level data collected in August, September, and December of 1987, and in March, June, and December of 1988, resulted in similar contours. Although water level data within bedrock are limited, they indicate that groundwater contours for the deeper bedrock would be similar in shape to the water table contours.

Data obtained from the Task 3 field program suggested that water levels obtained from P-1 and P-2 are artificially high due to the test pit construction of the piezometers. It is believed that the test pits are acting as precipitation and groundwater collecting basins, resulting in elevated groundwater level readings. Therefore, the P-1 and P-2 data were omitted when identifying the groundwater contours for Task 2 and Task 3.

Groundwater Flow Conditions. In Task 2, the water table sloped to the northeast, toward the Anthony Kill. The groundwater flow direction in the southeastern corner of the site, near the former relief gas holder, appeared more easterly, toward the Hudson River. It was interpreted that the easterly flow was controlled by the silty shale fill, the bedrock depression, and shallow bedrock fractures.

Task 3 data shown in Figure 3-5 also indicate that groundwater flow in the fill and shallow bedrock is northeasterly toward the Anthony Kill across the western and

northern portion of the site, and to the east toward the Hudson River across the remainder of the site. Groundwater migration across the western and northern portions of the site appears to be part of a local flow system, controlled by the presence of the Anthony Kill. On the eastern portion of the site, groundwater is migrating easterly along the east-west trending bedrock channel (see Figure 2-6). The regional flow west of the Hudson River where the site is located is also easterly.

The average horizontal gradient of the water table was calculated to be 0.05 feet/feet (ft/ft) across the site in March 1988. As discussed, the primary direction of groundwater flow is northeasterly, toward the Anthony Kill.

Water level data collected from the fill and bedrock wells indicate the vertical seepage gradients for the system. Water levels collected from well clusters in the fill and bedrock at MW-12/MW-13 and MW-4/MW-6 indicate downward vertical gradients. The average vertical groundwater gradient (based on water level data collected between August 1986 and March 1988) at MW-12/MW-13 was 0.06 ft/ft downward from the fill into the bedrock. At MW-4/MW-6, the average vertical groundwater gradient (based on water level data collected in December 1987 and March 1988) was calculated to be 0.02 ft/ft downward from the fill into the bedrock.

Water level data collected (in March 1988) for MW-5 and MW-15, both screened in the shallow bedrock, indicated that the shallow bedrock near the Anthony Kill has an upward gradient, potentially indicating discharge to the Anthony Kill from the groundwater system for this period. The surface water elevation data collected in both December 1987 and March 1988 support the presence of a groundwater discharge zone along the Anthony Kill site boundary. Because no surface water elevation data are available during what may be considered high flow in the Anthony Kill, it is not possible to identify whether the gradient could reverse in the vicinity of the stream during high flows.

Groundwater flow within the fractured rock is controlled by the orientation, size, and interconnection of the fractures. Based on visual observations of rock core from the upper 5 to 31 feet of the bedrock formation at eight borings, the primary fractures are oriented 30 to 45 degrees from horizontal. Groundwater movement would occur primarily along these fractures, and these fractures would provide the interconnection for groundwater migration from the bedrock to the fill material and vice versa.

The impervious asphalt paving and buildings covering most of the site currently limit direct infiltration by precipitation. Two storm drains located in the northern portion of the site collect surface runoff and discharge to the Anthony Kill. Limited rainwater infiltration into the site subsurface soils over the years has minimized the potential for waste constituents to be flushed downward into the groundwater. However, during the coal gas production years, the site was not paved, and conditions were more favorable for the mobilization of waste constituents. The date of paving is not known.

In situ permeability and packer tests were conducted in the monitoring wells during the Task 2 and Task 3 exploration programs to estimate hydraulic conductivities and groundwater flow rates in the soil, the shallow bedrock, and the deep bedrock. The results of in situ, falling-head, and rising-head permeability tests on the shallow wells screened primarily in the silty shale (i.e., MW-3, MW-4, and MW-10) indicate hydraulic conductivities ranging from $2.2x10^{-5}$ to $1.9x10^{-4}$ centimeters per second (cm/sec), or 0.06 to 0.54 feet per day (ft/day).

In situ permeability tests in the wells screened primarily in shallow bedrock (i.e., MW-1, MW-2, MW-5, and MW-11) indicate hydraulic conductivities ranging from $2.0x10^{-4}$ to $1.1x10^{-3}$ cm/sec, or 0.57 to 3.1 ft/day. The in situ permeability and packer tests conducted in the deeper bedrock wells (i.e., MW-6, MW-13, MW-14, and MW-15) indicate hydraulic conductivities ranging from $1.4x10^{-5}$ to $9.0x10^{-4}$ cm/sec, or 0.04 to 2.55 ft/day.

The upper fill consists of a heterogeneous mixture of materials that could have a broad range of permeabilities. The upper fill is not saturated; therefore, the range was not defined. The saturated thickness of fill is limited at the site; most wells were installed below the upper fill to monitor the groundwater flow. One well (MW-12) was installed in the lower fill and produced a hydraulic conductivity of $4.0x10^{-4}$ cm/sec, or 1.1 ft/day. A laboratory permeability test was performed on a sample of lower fill collected from test pit TP-1. This sample yielded a hydraulic conductivity of $2.7x10^{-8}$ cm/sec, or $7.5x10^{-5}$ ft/day. The extreme variance in permeability is due to the inherent differences in the fill material; MW-12 is installed in silty sand and gravel, whereas the sample tested from TP-1 is a clayey silt.

Groundwater velocity is a function of hydraulic conductivity, effective porosity, and groundwater gradient. The hydraulic conductivity of the silty shale was determined from Task 2 and Task 3 field tests to range from $2.2x10^{-5}$ to $1.9x10^{-4}$ cm/sec, or 0.06

to 0.54 ft/day. The geometric mean hydraulic conductivity is calculated to be $1.0x10^{-4}$ cm/sec, or 0.28 ft/day. Using an effective porosity of 0.25 for the silty shale (Davis, 1969), and a groundwater gradient of 0.06 ft/ft, the corresponding horizontal groundwater flow rate in the silty shale is approximately 20 feet per year (ft/yr).

Limited published data are available to estimate the porosity of fractured rock; therefore, a 'best' estimate for the site was selected. An effective porosity of 0.10 was estimated for the shallow bedrock (Freeze and Cherry, 1979). The hydraulic conductivity of the shallow bedrock was found to range from $2.0x10^{-4}$ to $1.1x10^{-3}$ cm/sec, or 0.57 to 3.1 ft/day, with the geometric mean of the hydraulic conductivity being $4.0x10^{-4}$ cm/sec, or 1.10 ft/day. With a groundwater gradient of 0.06 ft/ft, the corresponding horizontal groundwater flow rate for the shallow bedrock is approximately 200 ft/yr.

For the deeper bedrock, the hydraulic conductivity ranged from $1.4x10^{-5}$ to $9.0x10^{-4}$ cm/sec, or 0.04 to 2.55 ft/day, with the geometric mean of the hydraulic conductivity being $2.0x10^{-4}$ cm/sec, or 0.57 ft/day. Using an effective porosity of 0.10 for the deep bedrock as well (Davis, 1969), and a groundwater gradient of 0.06 ft/ft, the corresponding horizontal groundwater flow rate for the deeper bedrock is approximately 104 ft/yr.

In summary, based on the permeability data and seepage gradients, the primary zone of groundwater movement at the site is interpreted to exist within the fractured zones of the shallow bedrock.

Groundwater Usage. Historically, the City of Mechanicville used surface water supplies for a drinking water source. The Mechanicville reservoir is approximately three miles northwest of the site, at an elevation approximately 160 feet higher than the site. The reservoir is drained by Plum Brook, which flows into the Anthony Kill a few miles upstream of the site. A few residences outside the city limits, however, use groundwater for drinking water (Renaldi, 1986). The closest domestic wells are nearly a mile southwest (upgradient) of the site in the Town of Halfmoon. Based on information obtained during the records search, there are no active industrial wells in the Mechanicville area. There are two abandoned industrial wells: (1) the West Virginia Pulp and Paper Co. well (2,157 feet deep), located a half-mile northeast of the site; and (2) a bedrock well used by the former Mintzer Petroleum Co. (29 feet deep), located 1.5 miles south (upgradient) of the site (Heath, et al., 1963). The records that were examined did not report the yields of these wells.

3.3 HYDROLOGY

The Anthony Kill and Hudson River are two major surface water bodies near the site. The Anthony Kill flows out of Round Lake in a southeasterly direction, then bends eastward, flowing past the site and emptying into the Hudson River at Mechanicville (see Figure 1-1). The Hudson River is located approximately 1,500 feet east of the site.

Surface runoff from the site flows into two drainage catch basins that empty via underground culverts into the Anthony Kill. Locations of the culverts are shown in Figure 1-2.

Discharge. There are no continuous-record gauging stations on the Anthony Kill. The USGS has periodically taken base-flow measurements at the partial-record stations on the Anthony Kill at Mechanicville (Station No. 01335700: latitude 42°55'05" and longitude 73°42'53") and Coons Crossing (Station No. 01335698: latitude 42°55'13" and longitude 73°44'50") (USGS, 1979).

Coons Crossing is located upstream of the site, 3.1 miles to the northwest. Based on base flow measurements, ABB-ES estimated the annual low flow at the Mechanicville Station at 17 cfs for a drainage basin of 62.4 square miles. The average annual low flow at the Coons Crossing Station was estimated at 15 cfs for a drainage basin of 52.9 square miles.

The USGS maintains a partial-record gauging station on the Hudson River at Mechanicville (Station No. 01335500: latitude 42°54'45" and longitude 73°40'45"). The drainage area upstream of this station is 4,500 square miles. Based on data collected from 1931 to 1956, the seven-day, 10-year low flow at this station is 1,900 cfs (USGS, 1979).

Stream Water Quality. NYSDEC assigned a Class D stream classification to the section of the Anthony Kill from the Mechanicville city line to the Hudson River (Hodgson, 1986). Class D waters are designated by NYSDEC for secondary contact recreation, but no higher uses because of intermittent flow or water quality conditions that are not conducive to the propagation of game fish. Farther upstream, between Coons Crossing and Mechanicville, the Anthony Kill is designated Class C(t). Class C waters are suitable for fishing and all other uses, except primary

contact recreation or as a source of water for drinking, culinary, or food processing purposes. The "(t)" denotes that the water body is a trout stream (NYSDEC, 1981).

NYSDEC has conducted water quality testing downstream of Mechanicville on the Hudson River, and two miles upstream of the site at Plum Brook (which drains the water supply reservoir) (NYSDEC, 1981). The Hudson River test results (1981) showed water quality impairment from coliform bacteria, heavy metals, and PCBs. No impairment was evident at Plum Brook, which has a Class A designation (i.e., suitable for use as a water supply source) (NYSDEC, 1981). It should be noted that the Hudson River drainage basin upstream of the test point encompasses an enormous land area containing numerous potential sources of chemical contamination.

3.4 AIR

VOC contamination in test borings and monitoring wells located near the combination office/storeroom building led to concern that these VOCs could result in volatilized or airborne contamination of indoor air quality. General wind data and air quality data were compiled in Task 1 to assess general background conditions at the site (E.C. Jordan Co., 1986b).

Wind data reported for the Albany County Airport, which is 10 to 12 miles south of the Mechanicville site, indicate that the wind is primarily from the south from May through June. The prevailing wind for the remainder of the year is from the west-northwest. Wind velocities are generally moderate over the Hudson Valley Region with an average annual wind speed reported at the Albany County Airport of 8.8 mph, with monthly averages ranging from 6.9 to 10.4 mph (NOAA, 1971). The airport data are likely representative of general wind conditions in the Albany County area; however, local micrometeorological conditions may be different. Local topography would favor a prevailing northwesterly wind direction for Mechanicville (Taylor, 1986a).

Mechanicville was once a control station within the statewide ambient air monitoring network operated by NYSDEC's Bureau of Air Quality Surveillance. The station consisted of a high-volume air sampler operated monthly for the monitoring of TSP, 60 feet above grade, one to two miles south of the Mechanicville site. TSP results collected from 1976 to 1982 ranged from 39 to 47 $\mu g/m^3$, and were below federal

Ambient Air Quality Standards of 75 $\mu g/m^3$. No volatile organic monitoring is known to have been conducted in the area.

3.5 AREA LAND USE

General land uses and cover types were surveyed during Task 2 for the area within a half-mile radius of the site (Figure 3-6). Existing land use maps, street maps, and aerial photographs, combined with field checking, were used to determine general land uses. Potentially sensitive land uses were identified with the assistance of local officials and published data. Potential contributors of chemicals to groundwater and surface water were identified from aerial photographs and during field inspection. The site is currently unoccupied and surround by a 6-foot fence on three sides and the Anthony Kill to the north. Current land uses around the site are described in the following paragraphs.

General Land Use. Figure 3-6 depicts present land use and cover types for the area within a half-mile radius of the site. Land uses in the immediate vicinity of the site are both residential and commercial. Mechanicville's central business district, located east and south of the site, is characterized by a mixture of commercial, residential, public, and semipublic land uses, including retail stores, offices, municipal buildings (e.g., city hall, fire station, library, and community services), the post office, and several churches. The central business district is bordered on the east by the Hudson River. The portion of the land use study area on the eastern side of the Hudson River is predominantly residential.

Southwest of the site, land uses are primarily residential with a few interspersed commercial sites and parks. Railroad yards of the Delaware and Hudson, and Boston and Maine railroads are located west of the site. Land northwest and north of the site is primarily open space, with a few private residences and commercial facilities. The area northeast of the site is a mixture of commercial, residential, and industrial properties.

Potentially Sensitive Land Use. Segments of the human population particularly sensitive to contaminants include the very young, the elderly, and the infirm. The young are particularly sensitive because a given dose of a harmful material will have a greater effect on a smaller, lighter child than on a larger, heavier adult. A child's immune system is also more susceptible to negative impacts as physiological systems

develop. The elderly and infirm typically suffer from other medical problems that decrease the body's ability to fight chemical intake. Additionally, the elderly and the infirm could take medication for other health problems; effects of chemicals on the body may be exacerbated by these drugs.

Therefore, land uses that foster concentrations of these populations are of particular concern in conducting a risk assessment. At the Mechanicville site, these uses include day-care centers, schools, recreational areas, nursing homes, and elderly housing projects. Figure 3-6 shows the proximity of these land uses to the site.

4.0 CHEMICAL DISTRIBUTION

This section presents the analytical results for groundwater, surface water, soil and air samples collected during Tasks 1 through 4. The sections describing chemical results for each media are organized such that a summary of the analytical results for samples of that media is presented first, followed by a separate detailed discussion of the results from each task.

Task 2 chemical analyses of samples from the Mechanicville site were conducted by two laboratories. ERCO Laboratories completed analyses on soil, groundwater, and surface water samples for Round 1 sampling, and sediment samples for all four rounds. The NYSEG laboratory performed the water analyses (groundwater and surface water) for the Round 2 through Round 4 samples. The analytical parameters and methods are listed in Appendix D-1 discussed briefly herein. The analytical program was designed to measure constituents of coal tar and coal gas purification wastes, if present. Appendix D-1 also provides representative waste characterizations for coal tar and spent oxide wastes.

Organic analyses of most soil and sediment samples and the first round of groundwater and surface water samples were performed using HPLC with a UV detector. Confirmatory analyses were performed on several replicate soil and Round 1 groundwater samples using GC and a mass spectrometer (MS) detector. The GC/MS method is more specific than the HPLC/UV method in identifying organic compounds, and more accurate in quantitation. Typically, nonspecific detectors (e.g., the UV detector) tend to yield higher concentrations of chemicals than the MS for a given sample. The NYSEG laboratory used GC/MS methods exclusively for organic analyses of water samples from Rounds 2, 3, and 4.

The Task 3 sampling and chemical analysis program for Mechanicville included soil, groundwater, surface water, sediment and air samples. All samples (except for the air samples) were submitted to NYSEG's laboratory. The air samples were shipped to ESA Laboratories of Bedford, MA for analysis. NYSEG forwarded all soil samples to ERCO Laboratories, Cambridge, MA for analysis. December 1987 groundwater, surface water, and sediment samples were also forwarded to ERCO Laboratories for VOC and SVOC analyses. NYSEG analyzed March 1988 samples for these parameters. Upstate Laboratory in Syracuse, New York, performed all other groundwater, surface water, and sediment analyses for NYSEG.

Analytical parameters and methods are listed in Appendix D-1 and discussed briefly herein. The analytical program for soil and groundwater samples was not varied from Task 2 to Task 3, with one exception. Task 3 organic chemical analyses were performed using GC/MS analytical techniques. Minimum detection limits for both sets of data are in Appendix D-4.

The Task 4 Sampling and Chemical Analysis program for Mechanicville consisted of surface soil samples. Chemical analyses were conducted by three laboratories. PCB and cyanide analyses were conducted by Upstate Laboratory in Syracuse, New York; SVOA analyses were conducted by RECRA Environmental, Inc.; and VOA analyses were conducted by the NYSEG Laboratory. Analytical parameters and methods are listed in Appendix D-5.

4.1 CHEMICAL SOURCES

Potential sources of chemicals in groundwater and surface water near the site include aboveground and below ground tanks used for storing petroleum products, vehicle maintenance yards, a railroad yard, a coal storage and sales facility, vacant industrial property, and a drum disposal area. The drums were observed on the vacant lot just west of the site. There are about a dozen 55-gallon drums in poor condition lying on their sides in the grass. The contents and origin of these drums are not known. The location of the potential contributors identified in the land use survey are depicted in Figure 3-6.

As noted in the Task 1 Report (E.C. Jordan Co., 1986b), the segment of the Anthony Kill adjacent to the site was heavily industrialized in the late 1800s and early 1900s. There was a fiber manufacturing company where NYSEG's mechanics shop now stands; a nickel-plating factory just north of the site on the Anthony Kill; and a textile mill across North Central Avenue where the Price Chopper supermarket is now located. These and other past industrial sites in the area were very likely sources of chemicals, some of which may still be evident in the environment.

4.2 SOILS

Chemical Distribution in Soils: Summary

Subsurface Soil. Subsurface soil samples collected at the Mechanicville site were analyzed for VOCs, SVOCs, selected trace metals (i.e., iron and zinc), cyanide, total recoverable phenolics (phenols) and TOC. Sixteen locations were sampled.

Analyses of subsurface soil samples from the field investigation program showed the presence of coal tar and coal gasification-related compounds (i.e., VOCs, PAHs, and cyanide) near the former relief gas holder, purifier and oxide houses, and filter beds. The highest levels of VOCs and PAHs were detected in samples taken at or near these sites. Figure 4-1 shows the concentrations of total VOCs, total PAHs, and total cyanide in soil borings at the site, based on both Task 2 and Task 3 sampling results.

The highest levels of VOCs (3,800 and 3,410 mg/kg) were observed in samples taken at B-8 (at depths of 13.5 to 15.5 feet and 15.5 to 17.5 feet), which is located at the site of the former gas relief holder. The highest levels of PAHs were observed in samples taken from B-8 (5,440 mg/kg), TP-5 (8,500 mg/kg; adjacent to the filter beds), and B-3 (9,310 mg/kg in the vicinity of the former purifier and oxide houses). Deep soil samples (deeper than 15 feet) contained lower levels of organics than the samples collected from shallow soils.

Iron levels ranged from 18,000-35,000 mg/kg. The lower concentrations were in the deeper fine silty sand. Higher levels were seen in shallow fill samples. Zinc levels generally ranged from 32 to 390 mg/kg, except for one Task 2 sample (B-5/S-1), which contained 1,600 mg/kg.

Cyanide was detected in three subsurface soil samples at levels ranging from 1 to 3.2 mg/kg. These samples were collected in the vicinity of the former purifier and oxide houses. The concentration of cyanide in this area is most likely due to spillage during cleaning of the purifier house (Wilson and Stevens, 1981).

Phenolic compounds were found in four soil boring samples at depths of 4 to 11 feet. Concentrations ranged from 0.74 to 3.6 mg/kg. These samples were collected in the vicinity of the former filter beds and the former gas and purifier houses. Phenolics are widely distributed in the environment due to both natural (i.e., vegetative decomposition) and man-made processes. Tars and wastewaters at coal gas plants

are a source of phenolics; however, the tars produced by water gas plants such as the one at Mechanicville usually contain only negligible amounts of phenolics.

Surface Soil. Nine surface soil samples plus one duplicate sample were collected at the site in August 1989 to characterize the extent of contamination in site surface soils. The nine samples and one duplicate (SS-1 through SS-9, plus SS-3A), along with one trip blank, were sent to a laboratory for analysis. Samples SS-1, SS-2, SS-3, SS-3A, SS-4, and SS-5 were analyzed for cyanide, SVOCs, VOCs, and PCBs. The remaining samples, SS-6 through SS-9, were analyzed for PCBs only. Analytical methods and analysis results are shown in Appendix D-5.

The analytical results of the Task 4 surface soil sampling program were reviewed for QC/QA. Two issues were identified upon data review. The first relates to sample holding time. Although the soil samples were held for 50 days instead of the recommended 40 days, they were stored properly (in dark containers at 4° C) so that reliable analytical results are expected. The second issue relates to the relatively high detection limits for the VOC analyses. This is not thought to be a serious data issue at the Mechanicville site because VOCs would not be expected to be present at significant concentrations in surface soils. Volatilization over the many years since coal gasification activities terminated would most likely result in insignificant VOC levels in surface soils.

No PCBs were detected in any of the surface soil samples. This includes sample SS-5, which was taken next to the PCB waste oil drums (see Figure 2-7). Additionally, no VOCs were detected in samples SS-1 through SS-5. A trace of bromomethane was detected in sample SS-3, but at a concentration below the detection limit for that sample. In addition, this compound was not detected in the duplicate sample, SS-3A.

Cyanide was detected in two surface soil samples, SS-1 and SS-3A (no cyanide was detected in replicate sample SS-3) at 1.8 and 1.9 mg/kg, respectively. Both samples were collected from the area behind the garage offices and storeroom building, along the upper bank of the Anthony Kill. Several PAHs were detected in samples SS-1 through SS-4, including the duplicate sample. Concentrations of total PAHs ranged from 9.1 to 71 mg/kg. No PAHs were detected in sample SS-5.

Bis(2-ethylhexyl)phthalate (BEHP) was found in two samples plus the duplicate sample. Although this compound is a common laboratory contaminant, no BEHP

was detected in the laboratory blank; therefore, this compound could be present in the surface soil. One other SVOC, di-n-butyl phthalate, was detected in several samples. However, this is also a common laboratory contaminant and was found in the laboratory blank at similar concentrations. Therefore, this compound was not considered to be present in surface soils at the site.

4.2.1 Detailed Task 2 Description

Soil samples were analyzed for VOCs, SVOCs, selected trace metals (i.e., iron and zinc), cyanide, total recoverable phenolics (phenolics), and TOC. The six test pit samples were collected from depths of 3 to 7.5 feet below ground surface, and the eight boring samples were collected from 4- to 17.5-foot depths. The test pit samples were taken from the silty sand and gravel and clayey silt fill soils. Samples from B-2, B-3, B-4, and B-7 were from the silty sand and gravel fill, just above the silty shale. Samples from B-5 and B-8 were collected from within the silty shale and the B-1 sample was from a gravelly sand stratum observed only at that boring. Tables 4-1 and 4-2 present analytical results of these soil samples. Concentrations of the chemicals detected are expressed in mg/kg (parts per million [ppm]). Figure 4-2 illustrates the Task 2 distribution of selected chemicals in soil in the study area.

Organic chemicals associated with coal tar were found at the site. The analyses of samples B-3 and B-8 indicated the highest levels of VOCs and PAHs present in subsurface soil samples. B-8 was drilled into the former relief gas holder itself, while B-3 was downgradient of both the gas holder and the former purifier and oxide houses. The samples from B-8 contained visible coal tar, which had been left in the holder when the plant closed. B-8 had the highest total VOC concentration (3,800 mg/kg), while the highest total PAH level was obtained at B-3 (9,310 mg/kg). The confirmatory GC/MS analysis performed on B-8 indicated comparable results at generally lower concentrations than those reported by the HPLC analysis. Methylene chloride and carbon disulfide were detected in the GC/MS analysis of sample TP-5. Both compounds were detected at concentrations at or below 1 mg/kg and could be indicative of laboratory contamination.

The samples from TP-5 and B-5, collected near the former filter beds, were the most downgradient sampling locations relative to site activities. The samples were similar in VOC and PAH concentrations: 16 and 4,654 mg/kg at B-5, and 24 and 4,630 mg/kg at TP-5, respectively. The duplicate HPLC analytical results for TP-5 were comparable for VOCs, but relatively dissimilar for PAHs. The differences in

PAH concentrations may be attributable to the inherent heterogeneity of soil samples. A confirmatory GC/MS analysis was also performed on a sample from TP-5; the concentrations of compounds detected by GC/MS were generally lower than HPLC results. Total VOC and PAH concentrations in the GC/MS sample were 13.84 mg/kg and 1,137 mg/kg, respectively.

Analysis of sample B-7, collected from beneath the former distribution holder, indicated the presence of several VOCs and PAHs. A total VOC concentration of 4.3 mg/kg and total PAH concentration of 11.21 mg/kg were found at B-7. Higher PAH concentrations were detected in samples B-4 (796 mg/kg) and TP-4 (412 mg/kg), located downgradient of the former relief holder and the former tar dehydrator, respectively. The VOC concentrations in these samples were 10.32 mg/kg in B-4 and 0.848 mg/kg in TP-4.

No VOCs were found in four of the subsurface soil samples: TP-1, TP-2, B-1, and B-2. PAHs were detected in TP-2 (120 mg/kg), B-1 (154.2 mg/kg), and B-2 (trace concentrations); no PAHs were found in TP-1. Three of the samples (TP-1, TP-2, and B-1) were collected near the site boundaries, away from the former on-site coal gasification activities. The fourth sample (B-2) was collected near the center of the site, downgradient from the former gas distribution holder.

The results of the metal analyses at TP-1, considered a background sample, were 27,000 mg/kg for iron and 260 mg/kg for zinc. Iron and zinc concentrations in the remaining soil samples were close to the background levels with one exception: the sample from B-5, located near the former filter beds, contained an elevated concentration of zinc (1,600 mg/kg). Sample B-5 was taken from the silty shale, 10 to 11 feet below ground surface. The sample from nearby TP-5, which was taken at a shallower depth (3 to 4 feet below ground surface and above the water table), contained only 79 mg/kg zinc. One possible source of zinc at former coal gas plant sites is zinc acetate, which was commonly used as a corrosion inhibitor in gas holder sealing waters (Wilson and Stevens, 1981).

Laboratory results indicate the presence of cyanide in three of the soil samples (TP-2, B-3, and B-4), all of which were collected near the former purifier and oxide houses. Cyanide compounds are major constituents of spent oxide wastes; their presence in these samples is most likely attributable to spillage during cleaning of the purifier house (Wilson and Stevens, 1981). The sample from TP-2 contained ferro-

ferricyanide, and the samples from B-3 and B-4 contained amenable cyanide. The total cyanide concentrations in these samples ranged from 1.0 to 3.2 mg/kg.

Phenolics were detected in only two soil samples, B-3 (3.6 mg/kg) and B-5 (2.6 mg/kg), both of which were collected in areas near former site activities. Phenolics are widely distributed in the environment, due to both natural (i.e., vegetative decomposition) and man-made processes. Tars and wastewater are the sources of phenolics at coal gas plants, although tars produced by water gas plants, such as the one at Mechanicville, typically contain only negligible amounts of phenolics (USWAG, 1984).

TOC analysis is a generic test for organic material and measures VOCs and SVOCs, as well as naturally occurring biological material. The concentration of TOC in the background soil sample (TP-1) was 8,300 mg/kg. Only two other subsurface samples (TP-2 and B-2) contained lower TOC levels than the background sample. TOC values in the remaining soil samples ranged from 10,000 to 190,000 mg/kg. TOC results were predictable, given the site use history and results of the VOC and SVOC analyses, with one exception: the TOC concentration of 110,000 mg/kg at B-1 was higher than expected. While samples B-1 and TP-2 contained comparable concentrations of PAHs and no VOCs, the TOC concentration was two orders of magnitude higher at B-1. This seems to indicate that the gravelly sand at B-1 is higher in organic content than the silty sand and gravel fill that cover the site.

Based on analytical results for the soil samples, it appears that coal-tar and coal-gasification-related chemicals (i.e., VOCs, PAHs, and cyanide) are present in the subsurface environment in the study area of the site. Coal tar was observed beneath the base of the relief gas holder where the highest concentrations of organic chemicals were found. Significant levels of organic compounds were also found downgradient of this holder and adjacent to the former filter beds. Coal tar was also observed in the silty shale during drilling at B-3, B-4, B-5, and B-6, and in the overlying sand and gravel fill soils during test pit excavation at TP-4 and TP-5.

4.2.2 Detailed Task 3 Description

Analyses for VOCs, SVOCs, selected trace metals (i.e., iron and zinc), cyanide, total recoverable phenolics (phenols), and TOC were requested for all Task 3 soil samples. The laboratory performed VOC analysis on only two of the six samples submitted, for reasons that were not explained. The Task 3 soil samples were collected from

depths of 4 to 24 feet below ground surface. All six samples were taken from the silty sand fill above the shale bedrock. Analytical results for Task 3 soil samples are presented in Table 4-3. Concentrations of detected chemicals are expressed in mg/kg (ppm).

Analyses of soil samples from the Task 2 investigation program at Mechanicville showed the presence of coal tar and coal-gasification-related chemicals (i.e., VOCs, PAHs, and cyanide) near the former relief gas holder, purifier and oxide houses, and filter beds. Task 3 soil sampling was targeted primarily at further defining the distribution of chemicals in deep soil (near the soil/ bedrock interface) and in areas adjacent to former site structures and activities. Figure 4-1 illustrates the concentrations of total VOCs, total PAHs, and total cyanide in soil borings at the site, based on both Task 2 and Task 3 sampling results.

Deep soil samples (below 15 feet deep) contained lower levels of organics than the samples collected from shallow soils. No VOCs and a low level of PAHs (7.6 mg/kg) were detected in the deepest sample collected (B-12). The sample was taken from silty fine sand, 22 to 24 feet below ground surface near the garage building, approximately 75 feet from the former purifier and oxide houses. The sample was not analyzed for VOCs, and PAHs were not detected.

The highest levels of VOCs and PAHs were present in samples collected in and near the former relief gas holder, near the former purifier and oxide houses, and in the filter bed area. The highest levels of VOCs (3,800 and 3,410 mg/kg) were observed in samples collected at B-8 (at depths of 13.5 to 15.5 feet and 15.5 to 17.5 feet). B-8 is located at the site of the former relief gas holder. The highest levels of PAHs (9,310, 8,500, and 5,440 mg/kg) were observed in samples taken from B-3, TP-5, and B-8 at approximate depths of 5, 3.5, and 14.5 feet, respectively.

Task 3 Sample B-15, collected just above the shale bedrock (a composite sample collected from a depth of 4 to 8 feet) adjacent to the former filter beds, contained low levels of VOCs (1.45 mg/kg) and no detectable PAHs. In contrast, the shallow soil samples collected nearby from TP-5 and B-5 had much higher levels of VOCs (13.8 and 16.0 mg/kg, respectively) and PAHs (6,565 and 4,654 mg/kg, respectively).

To further define the extent of contamination in the vicinity of the former gas house, Sample B-9 was collected in Task 3 from silty sand 4 to 5.5 feet below ground surface. Sample B-9 was not analyzed for VOCs but contained 118 mg/kg of PAHs.

The level of PAHs found at B-9 was within the same order of magnitude as those found in TP-4, but was an order of magnitude less than those observed in B-3 and B-6.

Task 3 included no additional soil sampling in the area of the former distribution gas holder. Task 2 sampling indicated moderate levels of VOCs and PAHs (4.3 and 11.2 mg/kg, respectively, at a depth of 7 to 9 feet) beneath the distribution holder, and trace levels of PAHs but no detectable levels of VOCs adjacent to it at B-2.

Samples B-10 and B-1 were collected away from former coal gasification activities, near Ferris Lane. While Sample B-10 was not analyzed for VOCs, 1.48 mg/kg of PAHs were detected. A duplicate sample from B-10 contained 2.08 mg/kg of PAHs. VOCs were not detectable at B-1, but PAHs were found in the 8- to 10-foot sampling interval at 154 mg/kg.

Results of the metals analyses for both Task 2 and Task 3 soil samples show fairly narrow ranges for iron levels in the natural soils on site (18,000 to 35,000 mg/kg). Task 3 Sample B-10 from soil 16 to 18 feet below ground surface, considered upgradient from site activities, contained 24,000 mg/kg of iron. There is no evidence that iron levels in on-site soils are elevated by historical or current site activities.

Zinc levels in Task 3 soil samples were consistent with Task 2 results, ranging from 32 to 390 mg/kg. While one Task 2 sample (B-5/S-1) showed a high zinc concentration (1,600 mg/kg); no similar zinc concentrations were found in Task 3 samples. The high concentration of zinc at B-5 could be a result of the use of zinc acetate as a corrosion inhibitor in gas holder sealing waters, a common practice at former coal gas plants (Wilson and Stevens, 1981). Metal concentrations were generally lower in the deeper silty sand than in the overlying fill. This may be more related to the nature of the fill that to any historical or current on-site activities.

Cyanide was only detected in three soil samples, all in the vicinity of the former purifier and oxide houses. The presence of cyanide in the soil (at levels of 1.0 to 3.2 mg/kg) is most likely attributable to spillage during cleaning of the purifier house (Wilson and Stevens, 1981).

Phenolics were detected in two Task 3 soil samples: B-9 (0.74 mg/kg) and B-15 (2.6 mg/kg). Sample B-9 was collected adjacent to the former gas house, and Sample B-15 was obtained near the former filter beds. Phenolics were detected in

two Task 2 samples at higher levels at B-3 and B-5 (3.6 and 2.6 mg/kg, respectively). Phenolics are widely distributed in the environment, due to both natural (i.e., vegetative decomposition) and man-made processes. Tars and wastewater are the sources of phenolics at coal gas plants, although tars produced by water gas plants, such as the one at Mechanicville, typically contain only negligible amounts of phenolics. Site activities may have contributed to the detectable levels of phenolics in soils at the gas house and filter beds (USWAG, 1984).

TOC analysis is a generic test for organic material and measures all VOCs and SVOCs, as well as naturally occurring biological material. The TOC concentration in the Task 3 soil samples ranged from 22,000 to 42,000 mg/kg. All Task 3 TOC levels were within the range established by Task 2 sampling (8,300 to 190,000 mg/kg). The highest TOC levels (greater than 100,000 mg/kg) typically correlated to soil samples where the highest levels of VOCs and/or PAHs were observed.

Based on results of Task 2 and Task 3 soil sample analyses and the drilling program, coal-tar- and coal-gasification-related chemicals (i.e., VOCs, PAHs, and cyanide) are present in the site's subsurface environment. Field logs of B-3, B-4, B-5, B-6, B-9, B-10, B-12, B-13, and B-15, and test pit excavations TP-4 and TP-5 further document this. Visible coal tar contamination was observed at depths up to 16.8 feet in soils, and stained bedrock was observed in B-13 at a depth of 55 feet. The logs of the test pits and borings are presented in Appendices A and B, respectively.

4.3 GROUNDWATER

Chemical Distribution in Groundwater: Summary

Groundwater samples were collected from 12 wells at the site, and analyzed for VOCs, SVOCs, dissolved iron and zinc, cyanide, phenolics, and TOC. Conductivity, pH, and temperature were measured in the field.

Cyanide was detected in all wells except MW-11. The highest levels of total cyanide (0.58 to 0.8 mg/L) were observed at MW-12 during Task 3. During Task 2, a maximum level of 0.42 mg/L was reported at MW-3. Well MW-12 is located downgradient from the former relief gas holder, while MW-3 is downgradient from the former purifier/oxide structures.

Volatile aromatic compounds, a subset of VOCs, were detected consistently in all wells except MW-1, MW-2, and MW-11. MW-1, MW-10, and MW-11 are located upgradient of the historical coal gasification plant. MW-2 is downgradient from the former distribution gas holder, but soils data from B-2 and B-7 suggest little or no contamination in this area. Concentrations in the deep bedrock wells (i.e., MW-6, MW-13, MW-14, and MW-15) were generally greater than those detected in the shallow wells. Other VOCs, including 1,1,1-trichloroethane, 1,1-dichloroethane, and trichloroethylene were detected in several samples but they are not believed to be site-derived (E.C. Jordan Co., 1989; GRI, 1987).

PAHs were observed in at least one sample from all wells except MW-1, MW-2, and MW-11. The average concentrations of all the samples collected at each well ranged from nondetectable (at MW-1, MW-2, and MW-11) to 750 mg/L at MW-12. The maximum levels of 1,500 and 1,564 mg/L were observed at wells MW-12 and MW-5, respectively. The distribution of PAHs in groundwater is similar to the distribution in the soil, indicating that contaminated soil is the source of PAHs in groundwater.

Groundwater sampling data indicate that the detected PAHs are particulate in nature, rather than dissolved species. Some concentrations greatly exceed the solubility of PAHs in water, which ranges from 0.50 (micrograms per liter) μg/L for dibenzo(a,h)anthracene to 620 μg/L for indeno(1,2,3-cd)pyrene. Thus, the groundwater concentrations must not be indicative of dissolved PAH concentrations. This conclusion is consistent with the sampling protocol, because groundwater samples for organics are not filtered before analysis for organic contamination.

Dissolved iron was present in at least one sample from every well. Wells MW-1, MW-2, MW-10, and MW-11, considered to provide the most representative background concentrations, contained concentrations ranging from 0.04 to 1.4 mg/L. The wells with the highest concentrations of dissolved iron were MW-3, MW-4, MW-5, MW-6, and MW-12. These were the same wells that had the highest concentrations of PAHs.

Dissolved zinc was detected at least once in every well. Samples from MW-4 and MW-5 contained unusually high levels (0.52 to 1.09 mg/L). This may be related to the past site usage of zinc acetate as a corrosion inhibitor in gas holding seal water (Wilson and Stevens, 1981). Samples at other wells were fairly uniform (0.01 to 0.11 mg/L). This uniformity suggests that zinc is a natural constituent of site groundwater which has not been elevated by site activities (E.C. Jordan Co., 1989).

Total recoverable phenolics were detected in all wells. The maximum concentration in shallow wells was 17 mg/L while the maximum concentration in deep wells was 0.3 mg/L.

4.3.1 Detailed Task 2 Description

Groundwater samples were collected from each of the six Mechanicville monitoring wells on four separate occasions (September and December of 1986 and March and June of 1987). These samples, plus duplicates and blanks, were analyzed for VOCs, SVOCs, selected metals (i.e., iron and zinc), cyanide, phenolics, TOC, and sulfate. Conductivity, pH, and temperature were also measured in the field. Quality assurance samples included (1) sampler blanks prepared in the field and analyzed for the same parameters as groundwater samples; (2) trip blanks prepared before the fieldwork and analyzed for VOCs only; and (3) filtration blanks prepared in the field by running deionized water through the filter apparatus and analyzed for selected inorganics.

Results of the Task 2 groundwater analyses are presented in Table 4-4 (expressed in mg/L [ppm]), and the quality assurance sample results are in Appendices D-2 and D-3. The distribution of selected chemicals detected in two sampling rounds (December 1986 and June 1987) in groundwater is depicted in Figure 4-3. These two rounds were selected to illustrate seasonal variations in the data, with December representing a wet season (high water table) and June representing a dry season (low water table).

Volatile aromatic compounds, a subset of VOCs, were detected in groundwater from each of the wells except MW-2, located downgradient of the former gas distribution holder. However, low concentrations of volatile aromatics (0.015 mg/L) were found in only one sample from MW-1, located upgradient of the site. VOCs were detected in samples from the four remaining wells in all four sampling rounds. The highest levels of volatile aromatics were detected in samples from MW-6, the deepest of the six wells. Excluding the Round 1 HPLC results (which are typically overestimations), the volatile aromatic concentrations at MW-6 were between 4 and 6 mg/L. At MW-4, the shallow well adjacent to MW-6, the aromatics totaled between 2 and 4 mg/L (again, excluding the HPLC results). Both MW-4 and MW-6 are downgradient of the former gas relief holder. At MW-3 and MW-5, the total volatile aromatic concentrations were generally below 2 mg/L.

Other VOCs detected in groundwater included acetone and methylene chloride, which were found sporadically in samples from three of the wells: MW-1, MW-2, and MW-6. With the exception of one acetone concentration of 3.78 mg/L (MW-1), the detected concentrations were below 1 mg/L. Acetone was detected in the Round 2 sampler blank and the Round 3 trip blank, at concentrations lower than those detected in the environment samples (less than 0.1 mg/L). Methylene chloride was also found in the Round 3 trip blank and the Round 4 sampler blank (less than 0.01 mg/L). Both compounds are common laboratory contaminants that often are reported in environmental sampling results and which are not typically associated with coal gasification wastes. Therefore, they are not believed to be site-derived chemicals.

Laboratory analyses indicated the presence of PAHs in all wells. The highest PAH readings were obtained from MW-5, where concentrations were between 17 and 1,565 mg/L over three sampling rounds. (MW-5 was not sampled during Round 3 because of snow cover.) Between the first and fourth sampling rounds, the PAH concentrations in the groundwater at MW-5 increased by two orders of magnitude. This phenomenon was not observed at any of the other wells at the site. In fact, at MW-1, MW-4, and MW-6, total PAH concentrations decreased over this period.

Based on ABB-ES' understanding of the site, the increase at MW-5 cannot be explained. However, the decrease in PAHs at the other wells may be attributable to disturbances caused during well installation and development, and to the fact that the Round 1 data were produced by HPLC, as opposed to GC/MS. Excluding the HPLC results, total PAH concentrations ranged from "not detected" (ND) to 0.44 mg/L at MW-1; ND to 9.69 mg/L at MW-2; 3.35 to 6.16 mg/L at MW-3; 2.93 to 6.36 mg/L at MW-4; and 6.98 to 43.07 mg/L at MW-6.

BEHP was detected in low concentrations (generally less than 0.1 mg/L) in samples from four of the six wells; none was found in MW-5 or MW-6. This compound, often detected in environmental samples, is not a typical constituent of coal gasification wastes and might be a laboratory contaminant. The compound was also detected in two of the three GC/MS sampler blanks, also at low levels (less than 0.1 mg/L). Therefore, it is not believed to be a site-derived chemical.

On the other hand, the compound 2-methylnaphthalene is a constituent of coal tar (USWAG, 1984). It was detected in all downgradient wells in Round 4 samples.

The concentrations reported at MW-5 (197 to 247 mg/L) were significantly higher than those reported for the other four wells (0.14 to 7.17 mg/L).

Iron and zinc are natural constituents of groundwater (Todd, 1980). Iron was reported in samples from all wells. Low concentrations of iron were found at MW-1 and MW-2 (less than or equal to 0.5 mg/L, with much higher concentrations detected at the other four wells (1 to 61 mg/L. Therefore, the iron content of the groundwater on site appears to have been elevated by site activities. Zinc concentrations do not vary significantly between the upgradient and downgradient wells. The highest reported zinc concentration was 0.33 mg/L at MW-5 (Round 4). The remaining values were almost all at or below 0.1 mg/L.

Cyanide is not a natural component of groundwater. Both amenable (free) cyanide and ferro-ferricyanide were detected in the Mechanicville groundwater samples. At MW-1, MW-2, and MW-5, the concentrations of total cyanide were always less than 0.03 mg/L. At the remaining three wells, located next to the former purifier/oxide house, total cyanide concentrations ranged from 0.05 to 0.46 mg/L, predominantly in the complex form (i.e., ferro-ferricyanide). Predictably, the highest cyanide concentrations were found at MW-3, downgradient of the former purifier/oxide structures.

Phenolics, which were only included in the Round 1 and 4 analytical programs, were not detected in the upgradient samples, and were found in only one sample from MW-2 at 0.008 mg/L. Elevated concentrations of phenolics were present in samples from the four remaining downgradient wells. The range of phenolic concentrations at these wells was from 0.014 to 0.43 mg/L.

Sulfate analysis was requested during Round 2 only. Sulfate was present in all wells at concentrations ranging from 14.5 to 84 mg/L (74.6 mg/L was detected at the upgradient well, MW-1). Sulfate is a natural constituent of groundwater resulting from the oxidation of sulfide ores, gypsum, and anhydrite. Concentrations up to 300 mg/L are common in natural waters (Todd, 1980).

Finally, TOC concentrations in the groundwater samples all fell within a relatively small range: 3.2 to 30 mg/L. Samples from MW-1 and MW-2 generally contained less than 10 mg/L of TOC, while those from MW-3 through MW-6 generally contained greater than 10 mg/L. The TOC results provide further evidence of the impact of site activities on organics in groundwater.

To summarize, coal gasification waste-related chemicals (i.e., VOCs, PAHs, iron, cyanide, and phenolics) are present in elevated concentrations in groundwater within the study area of the site. These chemicals were found in the highest concentrations near the former locations of the relief gas holder, the purifier and oxide houses, and the filter beds. They were detected not only in the wells spanning the fill soils and shallow bedrock, but also in the deep bedrock well (MW-6).

4.3.2 Detailed Task 3 Description

During Task 3, groundwater samples were collected in December 1987 and March 1988 from the 12 wells at the site. The six Task 2 wells were sampled on four previous occasions (i.e., September and December of 1986, and March and June of 1987). All groundwater samples were analyzed for VOCs, SVOCs, dissolved iron and zinc, cyanide, phenolics, and TOC (see Appendix D-1). Conductivity, pH, and temperature were also measured in the field. QA samples included (1) sampler blanks prepared in the field and analyzed for the same parameters as groundwater samples; (2) trip blanks prepared before fieldwork and analyzed for VOCs only; and (3) filtration blanks prepared in the field by running deionized water through the filter apparatus (used for dissolved metals samples) and analyzing for selected inorganics. Appendices D-2 and D-3 contain results of QA/QC sample analyses.

Results of the Task 3 groundwater analyses (expressed in mg/L [ppm]) are presented in Table 4-5 and discussed in the following paragraphs.

An interpretation of the distribution of total VOCs in shallow groundwater, based on maximum concentrations detected during Task 3 sampling, is presented in Figure 4-4. Bedrock wells (i.e., MW-6, MW-13, MW-14, and MW-15) typically yielded higher concentrations of VOCs, with the lowest concentration found at MW-15 (0.03 mg/L) and the highest concentration found at MW-13 (15 mg/L).

Volatile aromatic compounds, a subset of VOCs, were detected consistently in all wells except MW-1, MW-2, MW-10, and MW-11. MW-1, MW-10, and MW-11 are located upgradient of the historical coal gasification plant. MW-2 is downgradient from the former distribution gas holder, but soils data from B-2 and B-7 suggest that little or no organic contaminants are in this area. Volatile aromatics were detected consistently in shallow bedrock wells MW-3, MW-4, MW-5, and MW-12, but were only present in soil samples at the corresponding locations B-3, B-4, and B-5. Volatile aromatics were detected at each of the deep bedrock wells (MW-6, MW-13,

MW-14, and MW-15) at concentrations typically greater than those in the shallower wells.

PAHs were observed in at least one sample from every groundwater monitoring well except MW-11. Average concentrations (averaged over all the samples collected at each well) ranged from ND at MW-11 to 700 mg/L at MW-12. PAHs were observed at maximum concentrations exceeding 100 mg/L in four wells: MW-3, MW-6, MW-5, and MW-12 (at 190, 746.2, 1,564.4, and 1,518 mg/L, respectively). PAHs were observed at maximum concentrations exceeding 10 mg/L at MW-13 and MW-14 (11.09 and 64.7 mg/L, respectively).

The distribution of PAHs across the site is similar to the distribution in the soil samples, indicating that contaminated soils are source areas for PAH contaminants found in the groundwater.

The highest organic chemical concentrations in groundwater were found at MW-12 (downgradient of the former relief gas holder), MW-3 (downgradient of the former oxide and purifier houses), and MW-5 (downgradient of the former filter beds); the lowest organic chemical concentrations were found in MW-11 (upgradient of the site), MW-2 (adjacent to the former gas distribution holder), and MW-10 (upgradient of the site). On at least one occasion, no organics were detected in MW-1, MW-2, and MW-11.

Other organic chemicals, including 1,1,1-trichloroethane, chlorobenzene, 1,1-dichloroethane, trichloroethylene, benzoic acid, and BEHP, were detected in several groundwater samples at concentrations below 0.1 mg/L. These organic compounds showed no pattern of occurrence regarding shallow versus deep wells or upgradient versus downgradient wells, and are not typically associated with coal gasification wastes. These compounds are not believed to be coal gasification plant-derived chemicals; however, they may be associated with site use following closure of the gas plant, or have an off-site origin.

Dissolved iron was present in at least one sample from every groundwater monitoring well. Concentrations in MW-1, MW-2, MW-10, and MW-11, which are considered to provide the most representative background concentrations for the site, ranged from 0.06 to 1.0 mg/L. The wells with the highest concentrations of dissolved iron were MW-4, MW-5, MW-3, MW-6, and MW-12 (61, 25, 20, 11, and 4.4 mg/L, respectively). These are the same wells that had the highest concentrations of PAHs,

indicating that the elevated iron levels in the groundwater are related to on-site contamination.

Dissolved zinc concentrations were fairly uniform in all groundwater samples. Zinc was detected at least once in every well, in concentrations ranging from 0.01 to 0.11 mg/L, except for one sample from MW-4 and both samples from MW-5, which contained unusually high levels (0.52, 0.54, and 1.09 mg/L, respectively). The maximum zinc concentration at MW-11 (an upgradient well) was 0.01 mg/L. The elevated levels of zinc found at MW-4 and MW-5 could be related to past site usage of zinc acetate which was commonly used as a corrosion inhibitor in gas holder sealing waters (Wilson and Stevens, 1981). The uniformity of zinc concentrations at other sampling locations suggests it is a natural constituent of site groundwater that has not been elevated by site activities.

Cyanide was detected in all wells except MW-11 during Task 3. The highest levels of total cyanide were detected at MW-12 (0.8 and 0.58 mg/L), located downgradient of the former relief gas holder. Other shallow wells contained cyanide in concentrations ranging from ND to 0.27 mg/L, while deep wells contained cyanide in concentrations ranging from ND to 0.15 mg/L.

Total recoverable phenolics were detected in all wells. The maximum concentration in upgradient well MW-11 was 0.005 mg/L. Phenolics concentrations in the deep wells ranged from ND to 0.064 mg/L, while concentrations in shallow wells ranged from ND to 0.058 mg/L.

TOC concentrations in the groundwater samples ranged from 2.2 to 61 mg/L, except for three samples in which free product (coal tar) was noted in December 1987 sampling. In these three wells (i.e., MW-3, MW-5, and MW-6), TOC levels ranged from 8,000 to 50,000 mg/L. TOC results do not correlate well with the VOC and SVOC analytical results, indicating there were other organic materials in the samples analyzed.

4.4 SURFACE WATER

Chemical Distribution in Surface Water: Summary

Surface water samples were analyzed for VOCs, SVOCs, iron, zinc, phenolics, cyanide, and TOC. No volatile aromatics were detected in any surface water samples. PAHs were detected once at the location adjacent to the site at a concentration of 0.105 mg/L. Other organics detected during Task 2 included methylene chloride (upstream), acetone (adjacent), and bis(2-ethylhexyl)phthalate (all locations). These compounds were found at concentrations less than 0.1 mg/L. They were also found in some sampler and trip blanks. During Task 3, bis(2-ethylhexyl)phthalate was found upstream on both sampling occasions at concentrations less than 0.5 mg/L; it was not found adjacent or downstream of the site. These three contaminants (methylene chloride, acetone, and bis(2-ethylhexyl)phthalate), when present at low concentrations, are common laboratory contaminants. It is unlikely that they are derived from the site (GRI, 1987).

Iron was found at all four locations at levels ranging from 0.2 to 1.8 mg/L. The highest concentration was found adjacent to the site. Zinc was detected in at least one sample from three locations; only the downstream sample collected during Task 3 had no detectable zinc. Concentrations ranged from 0.01 to 0.03 mg/L. Phenolics were detected in at least one sample from all locations except the upstream and adjacent locations sampled during Task 3. Cyanide was not detected in any of the Task 3 samples. It was detected in at least one sample in each Task 2 location.

4.4.1 Detailed Task 2 Description

Surface water samples were collected from three locations along the Anthony Kill during four sampling episodes (September and December of 1986 and March and June of 1987). Samples were collected from stations located upstream (SW-1), adjacent (SW-2), and downstream (SW-3) relative to the site. Samples were analyzed for VOCs, SVOCs, selected trace metals (i.e., iron and zinc), cyanide, phenolics, TOC, oil and grease, and sulfate. The analytical results are presented in Table 4-6 with concentrations expressed in mg/L (ppm). QA water samples included sampler blanks and trip blanks; the results are presented in Appendix D-2.

No volatile aromatics were detected in any surface water samples. PAHs were detected only at SW-2 in Round 4, with a total PAH concentration of 0.105 mg/L. Other organics detected in surface water included acetone (SW-2), methylene chloride (SW-1), and BEHP (all three stations). Because these compounds were found at low levels (less than 0.1 mg/L) and were also found in some sampler and trip blanks, their presence appears to be due to laboratory contamination. It is unlikely, then, that acetone, methylene chloride, and BEHP are site-derived chemicals.

The metals analyses indicate the presence of iron in samples from all three stations at comparable levels (0.037 to 1.09 mg/L). The highest concentration of iron was found at the upstream location (SW-1). Zinc was detected only in the Round 4 samples, and measured 0.01 mg/L at all three stations. Ferro-ferricyanide was found in Round 2 samples from each station (0.01 to 0.03 mg/L) and in Round 4 samples collected at SW-2 and SW-3 (0.01 mg/L). Phenolics were detected at the downstream sample (SW-3), in Round 1, and at SW-1 and SW-2 in Round 4. These results show no clear pattern of site contributions of these chemicals to the Anthony Kill.

Oil and grease analysis was performed at SW-1 and SW-3 during Round 1. This analysis was requested after an oily sheen originating upstream of the site was observed by ABB-ES samplers. The upstream sample contained 11 mg/L of oil and grease, but none was detected at the downstream station. This finding demonstrates that the source of the sheen was indeed upstream of the site.

Sulfate was analyzed during Round 2 only and was detected at similar concentrations in all three surface water samples (16.4 to 19.3 mg/L).

In summary, results of the analysis of surface water samples collected from the Anthony Kill do not show an adverse impact attributable to site activities. Even though it is likely that chemicals dissolved in groundwater are being discharged from the site to the stream, the resulting concentrations would be expected to be below detection limits due to volatilization and dilution. Compared to the low flow discharge of 17 cfs for the Anthony Kill, the site groundwater discharge is estimated to be less than 0.05 cfs (based on the average hydraulic conductivity of 1.9 ft/day for the unconsolidated soils and shallow bedrock). The Task 2 samples did provide evidence of chemical contributions to the Anthony Kill from upstream sources.

4.4.2 Detailed Task 3 Description

After Task 2 analytical results indicated that site-derived chemicals were not present in the Anthony Kill, Task 3 sampling was designed to further evaluate surface water conditions in the vicinity of the Mechanicville site.

Surface water samples were collected from three locations along the Anthony Kill during two sampling episodes (December 1987 and March 1988). Samples were collected upstream (SW-01), adjacent (SW-02), and downstream (SW-04) relative to the site. Locations SW-01 and SW-02 were sampled during Task 2. Downstream location SW-04 was chosen based on the groundwater flow direction at the site, which suggests that site groundwater discharges to the Anthony Kill in the vicinity of SW-04. Samples were analyzed for VOCs, SVOCs, selected trace metals (i.e., iron and zinc), cyanide, phenolics, and TOC. Analytical results are presented in Table 4-7, with concentrations expressed in mg/L (ppm). QA water samples included sampler blanks and trip blanks; results are presented in Appendix D-2.

No VOCs or PAHs were detected in any surface water samples. The only organic compound detected in surface water was BEHP, found at SW-01 (the upstream location) on both sampling occasions. This compound was detected at low levels (less than 0.5 mg/L) in a range attributable to laboratory contamination. Because it is present only at the upstream sampling location and at a low concentration, and because it is a common laboratory contaminant, it is unlikely that BEHP is a site-derived chemical.

Metals analyses indicate the presence of iron in samples from all three stations at comparable levels (0.20 to 1.8 mg/L). The highest concentration of iron was found at the location adjacent to the site (SW-02) during both sampling rounds. Zinc was detected in December 1987 samples at SW-02 (0.014 mg/L), and in March 1988 samples at SW-01 and SW-02 (0.02 to 0.03 mg/L). Phenolics were detected in the downstream sample (SW-03) in December 1987, but were not detected in any samples during March 1988. These results show no clear pattern of site contributions of these chemicals to the Anthony Kill.

4.5 SEDIMENT

Chemical Distribution in Sediment: Summary

Sediment samples collected from the same locations as surface water samples were analyzed for VOCs, SVOCs, iron, zinc, phenolics, TOC, and cyanide. Three VOCs were detected in the sediments. During Task 2, Round 3 sampling, benzene and toluene were found at a concentration of 0.07 mg/kg, adjacent to and downstream from the site. During Task 3, ethylbenzene was detected at a level of 0.087 mg/kg adjacent to the site, along with a trace concentration of benzene. These contaminants are associated with coal tar wastes as well as petroleum products and industrial chemicals.

Analysis of Task 2 and Task 3 sediment samples indicated that PAH concentrations adjacent to the site are elevated compared to upstream and downstream sampling locations. Sampling location SD-02 contained trace levels up to 75.8 mg/kg of total PAHs during Task 2 sampling, and trace levels to 5.1 mg/kg during Task 3 sampling.

Concentrations of iron and zinc were fairly consistent in the four locations. Iron concentrations ranged from 7,100-33,100 mg/kg while zinc concentrations ranged from 25 to 100 mg/kg. Cyanide compounds were not detected in any Task 2 samples, while in Task 3 a cyanide level of 1.3 mg/kg was detected adjacent to the site. Phenolics were detected in Task 2 Round 4 samples at all three locations at comparable levels (1.8-6.1 mg/kg). During Task 3, phenolic levels ranged from 0.68 to 2.3 mg/kg.

4.5.1 Detailed Task 2 Description

Sediment samples were collected during four sampling episodes (September and December of 1986 and March and June of 1987) from the same locations along the Anthony Kill as surface water samples. The samples were analyzed for VOCs, SVOCs, selected trace metals (i.e., iron and zinc), cyanide, phenolics, TOC, and sulfate. Analytical results are presented in Table 4-8 with concentrations expressed in mg/kg (ppm).

No volatile aromatic compounds were detected in any samples collected from SED-1, the upstream location. The only volatile aromatics detected at the other stations were during Round 3: benzene was detected at SED-2 (0.07 mg/kg), the midstream

location; and toluene was found at SED-3 (0.07 mg/kg), the downstream location. Acetone and methylene chloride were found in all the Round 4 sediment samples in similar concentrations. These VOCs are common contaminants not typically associated with coal tar wastes.

Several PAHs were detected at all three sampling locations. PAHs were detected at the upstream location (SED-1) during the first and second rounds of sampling only (7.3 to 8.6 mg/kg). At SED-2 adjacent to the site, PAHs were detected during all four rounds of sampling. The first and second rounds of samples at SED-3 contained PAHs (16.78 to 45.64 mg/kg), while only trace amounts were detected in Round 3 and no PAHs were found in Round 4. The Round 2 sample from SED-2 contained the highest concentration of total PAHs found in any of the sediment samples (75.8 mg/kg). It is important to note that data for Rounds 1 and 2 were obtained by HPLC. Looking just at the GC/MS analytical results from Rounds 3 and 4, it appears that PAH concentrations in Anthony Kill sediment directly adjacent to the site are elevated compared to concentrations measured at the upstream and downstream sampling locations.

All three sediment samples contained iron and zinc in fairly consistent concentrations. Iron levels ranged from 8,320 to 33,100 mg/kg, while zinc concentrations ranged from 31 to 100 mg/kg. Cyanide compounds were not detected in any sediment samples. Phenolics were detected in Round 4 samples at all three stations at comparable levels (1.8 to 6.1 mg/kg). Sulfate was detected at the midstream (SED-2) and downstream (SED-3) locations, in concentrations of 30 to 60 mg/kg. Thus, there is evidence that sulfate concentrations of the Anthony Kill sediments are elevated above background levels (upstream) due to site activities.

4.5.2 Detailed Task 3 Description

After Task 2 sampling suggested that site-derived chemicals were present in Anthony Kill sediments adjacent to the site, Task 3 sampling was designed to further evaluate whether site-derived chemicals are present in the Anthony Kill sediments. Task 3 samples were collected during two episodes (December 1987 and March 1988) from the same locations along the Anthony Kill as surface water samples. The samples were analyzed for VOCs and SVOCs. Task 3 analytical results are presented in Table 4-9 with concentrations expressed in mg/kg (ppm).

One volatile aromatic compound, ethylbenzene, was detected at low levels (0.087 mg/kg) in December 1987 at SD-02, the location adjacent to the site. A trace concentration of benzene was detected at SD-02 during the March 1988 sampling round. No other VOCs were detected in any of the sediment samples collected and analyzed during Task 3. In Task 2 sampling, benzene was detected at SD-02 (0.07 mg/kg) and toluene was detected at SD-03 (0.07 mg/kg). Ethylbenzene, benzene, and toluene are VOCs typically associated with coal tar wastes.

No PAHs were detected above trace concentrations at SD-01 or SD-04 in Task 3 samples. At SD-02 (adjacent to the site), PAHs were detected in December 1987 (4.6 mg/kg), while only trace amounts were detected in March 1988. PAHs were detected at all three locations sampled in Task 2. GC/MS analysis of Task 2 and Task 3 sediment samples indicated that PAH concentrations adjacent to the site are elevated compared to upstream and downstream sampling locations. At the upstream location, di-n-octylphthalate was detected in March 1988 (25 mg/kg). Di-n-octylphthalate is a common environmental sample contaminant not typically associated with coal tar wastes.

March 1988 sediment samples were not analyzed for metals, cyanide, or phenolics because previous analytical results for these compounds were judged sufficient. Among the December 1987 samples, iron concentrations were fairly consistent (7,100 to 8,700 mg/kg), while concentrations of zinc, cyanide, and phenolics at SD-02 adjacent to the site are above the range detected in other sediment samples.

Zinc and phenolic concentrations at SD-02 were 45 and 2.3 mg/kg, respectively, while the ranges at other locations were 25 to 28 mg/kg for zinc and 0.68 to 1.3 mg/kg for phenolics. The three June 1987 sediment samples contained phenolics at comparable levels (1.8 to 6.1 mg/kg). Although cyanide was not detected at other locations, nor in any of the Task 2 samples, 1.3 mg/kg of total cyanide was detected at SD-02.

4.6 AIR

During Task 3, indoor air samples were analyzed for the presence of benzene, toluene, ethylbenzene, and xylenes. Results of the indoor air sampling program, presented in Table 4-10, revealed low levels of benzene and toluene at most sampling locations. The only exception was benzene not being detected in the background

sample. Ethylbenzene and xylenes were below analytical detection limits for all samples.

The highest indoor levels of toluene and benzene were found in the storeroom. A possible source of benzene in the storeroom may be a forklift which is used in this area. Although the engine was not running during the sampling period, it is possible that residual gasoline vapors had volatilized into the air. Toluene was detected in the background sample at higher levels than two of the indoor samples. It was highest in the garage. It is possible that the sample was affected by vehicle use in the area.

Duplicate samples showed consistent results for all sample locations, indicating reproducibility among the data collected.

5.0 PHYSICAL AND CHEMICAL DATA ASSESSMENT

Chemicals related to the coal gasification process and wastestreams were detected in the soil and groundwater at or near the site. This section focuses on the significance of the field investigation findings at the site.

5.1 COMPARISON OF DATA TO REGULATORY STANDARDS

In this section, analytical results are compared to relevant or applicable standards and guidelines identified from the following sources: (1) New York State standards and guidance values (**Insert Page 5-1a**), (2) National Drinking Water Regulations, (3) USEPA Health Advisories, and (4) New York State Air Guide No. 1. Relevant and applicable standards and guidelines are listed in Table 5-1 and Table 5-2.

Regulatory standards and guidelines are not available for the chemicals detected in on-site soils. For groundwater and air, New York State standards and guidance values are used in this assessment for several reasons. First, New York State has established standards and guidelines for many of the chemicals detected at the Mechanicville site, including all those chemicals regulated at the federal level. Second, where both federal and state criteria exist for a given chemical, the New York State standard is generally more stringent. New York State standards are enforced by regulation, while guidance values are not enforceable by law.

5.1.1 Groundwater

The Mechanicville site is not located over a water supply aquifer. The nearest known water supply wells are about one mile southwest (upgradient) of the site in the Town of Halfmoon. Because Mechanicville groundwater is not currently used as a public potable water supply, drinking water standards are not currently applicable. They are included for hypothetical comparison purposes only and are listed in Table 5-1.

The New York State standards and guidelines are for groundwater used as a source of potable water. The federal Maximum Contaminant Levels (MCLs) are enforceable standards for water supply systems promulgated under the authority of the federal Safe Drinking Water Act (SDWA). Maximum Contaminant Level Goals

(NYSDEC. Division of Water, Technical and Operational Guidance Series [1.1.1]; November 15, 1991)

(MCLGs) are nonenforceable health goals established under the same act to prevent any adverse health effects or risks, without considering the cost or feasibility of attainment.

USEPA Health Advisories are nonenforceable guidelines established by the Office of Drinking Water. They are set at levels where adverse health effects are not expected. Carcinogenic risks are not considered in setting USEPA Health Advisories. However, these advisories consider the length of exposure to the chemical in drinking water. The values shown in Table 5-1 are for lifetime adult exposure. Assumptions were made about the weight of the exposed individuals and the amount of water ingested in developing these values.

As shown in Table 5-1, groundwater (Class GA) standards have been promulgated by New York State for 15 of the chemicals detected in groundwater beneath the Mechanicville site: benzene, toluene, ethylbenzene, styrene, xylenes, methylene chloride, trimethylbenzene, benzo(a)pyrene, BEHP, total regulated organics, iron, zinc, cyanide, phenolic compounds, and sulfate. Concentrations in excess of the New York State standard were measured for each of these chemicals except sulfate. The exceedances are graphically depicted in Figures 5-1 through 5-12 .

During Task 2, the standard for benzo(a)pyrene (ND levels) was exceeded at MW-3, MW-4, and MW-6 in at least one sampling round. Except for one exceedance, all of these occurred during Round 1 when HPLC analysis was used. One Task 3 sample from MW-5 exceeded the standard and trace levels were detected in samples from MW-3, MW-6, MW-12, and MW-13.

The benzene standard for groundwater (ND levels) was exceeded at MW-1, MW-3, MW-4, MW-5, and MW-6 in Task 2. During Task 3, the standard was exceeded at MW-3, MW-4, MW-5, MW-6, MW-12, MW-13, MW-14, and MW-15.

The styrene standard was exceeded in the MW-6 and MW-4 samples collected during Task 2. During Task 3, all four samples from MW-13 exceeded the standard. Styrene was not detected in any other wells during Task 3.

During Task 2, the New York State standard for regulated organics (0.1 mg/L) was exceeded at MW-1, MW-2, MW-3, MW-4, MW-5, and MW-6. During Task 3, the standard was exceeded at all wells except MW-2 and MW-11.

Phenolic compounds exceeded the 0.001 mg/L standard at MW-2, MW-3, MW-4, MW-5, and MW-6 during Task 2. In Task 3, the standard was exceeded in all wells except MW-11.

Total cyanide concentrations above the 0.1 mg/L standard were found at MW-3 and MW-6 during Task 2. During Task 3, the standard was exceeded in MW-3, MW-12, MW-13 and MW-14.

The iron standard of 0.3 mg/L was exceeded at MW-2, MW-3, MW-4, MW-5 and MW-6 during Task 2. During Task 3, concentrations above the standard were detected in all wells except MW-1, MW-2, MW-13, and MW-15.

The ethylbenzene standard of 0.005 mg/L was exceeded at MW-3, MW-4, MW-5 and MW-6 during Task 2. During Task 3, concentrations above the standard were detected at MW-3, MW-4, MW-5, MW-6, MW-12, MW-13, and MW-14.

The toluene standard of 0.005 mg/L was exceeded at MW-3, MW-4, MW-5 and MW-6 during Task 2. During Task 3, samples from MW-3, MW-4, MW-5, MW-6, MW-13, and MW-14 exceeded the standard.

Methylene chloride levels in MW-2 and MW-6 exceeded the standard of 0.005 mg/L during Task 2 and in MW-13 during Task 3.

Bis(2-ethylhexyl)phthalate was detected above the standard of 0.05 mg/L at MW-1, MW-2 and MW-3 during Task 2 and MW-10 during Task 3.

The trimethylbenzene standard of 0.005 mg/L was exceeded during Round 1 of Task 2 Sampling Data for trimethylbenzene was not available for subsequent sampling rounds.

The xylene standard of 0.005 mg/L was exceeded at MW-1, MW-3, MW-4, MW-5 and MW-6 during Task 2. During Task 3, the standard was exceeded at MW-3, MW-4, MW-5, MW-6, MW-10, MW-12 and MW-15.

The zinc standard of 0.3 mg/L was exceeded at the duplicate sample from MW-5 during Task 2. During Task 3, samples at MW-4 and MW-5 exceeded the standard.

The New York State Department of Health has also promulgated MCLs for most of the compounds of interest at Mechanicville. Table 5-3 identifies groundwater samples containing chemicals in excess of these drinking water standards.

New York State has guidance values for 16 chemicals detected at Mechanicville, all of which were exceeded at one or more monitoring wells. Groundwater samples containing chemicals in excess of the New York State guidance values are listed in Table 5-4.

5.1.2 Surface Water

Table 5-1 also contains relevant federal and state criteria for surface water. The New York State criteria are for Class D waters, the classification of the Anthony Kill near the Mechanicville site. USEPA Ambient Water Quality Criteria (AWQC) for aquatic life and human health are also listed.

Iron was the only chemical identified in Anthony Kill surface water samples that exceeded the New York State Class D standards. The iron standard of 0.3 mg/L was exceeded at all sampling locations (upstream, adjacent to the site, downstream) during both Task 2 and Task 3 sampling. The chronic AWQC for BEHP was exceeded during Task 2 sampling at all locations and, during Task 3, only at the upstream sampling location. BEHP was detected in a range attributable to laboratory contamination; therefore, it is unlikely to be a site-derived chemical.

5.1.3 Air

Modeled ambient air concentrations of site-derived chemicals can be compared to New York State Acceptable Ambient Levels (AALs). Measured indoor air concentrations of selected analytes (i.e., benzene, toluene, ethylbenzene, and xylene) can be compared to worker standards for indoor exposure.

Ambient Air. New York State has promulgated guidelines for various toxic air contaminants (NYSDEC, 1985-1986). There are no federal air regulations applicable to the atmospheric release of the contaminants of concern at the Mechanicville site.

The New York State Air Guide No. 1 establishes AALs and contaminant-specific levels for various air contaminants. Interim AALs are based on the threshold limit value/time-weighted average (TLV-TWA) concentration, adopted as guidance

criteria by the American Conference of Governmental Industrial Hygienists (ACGIH) (NYSDEC, 1985-1986). Contaminant-specific levels will be developed to replace interim AALs as more detailed data and information concerning these chemicals become available. Contaminant-specific AALs are based on an in-depth evaluation of the chemical in question; they are derived using a No Observed Effect Level (NOEL) and applying safety factors.

ACGIH criteria are for five-day, eight-hour workplace exposures and assume no exposure during nonworking hours. The New York State Interim AALs are equal to the ACGIH values divided by 300. This adjustment takes into account 24-hour exposure to the chemicals. AALs are annual average ambient concentrations that should not be exceeded for any off-site receptor. Table 5-2 shows AALs for contaminants of concern at the Mechanicville site. PAHs are considered "high" toxicity air contaminants. There are no chemical-specific AALs for this compound class.

A comparison of the modeled 24-hour ambient concentrations at the nearest off-site receptor (100 feet downwind) are compared to AALs in Table 5-5. For those compounds for which AALs exist, the modeled concentrations were several orders of magnitude lower than the respective AALs.

Indoor Air. Table 5-6 compares the results of the indoor air sampling program to various air standards and guidelines developed to protect workers exposed during an eight-hour workday. Permissible Exposure Levels (PELs) set by OSHA and guidelines established by ACGIH and NIOSH are identified. All samples with detectable levels of benzene and toluene were well below OSHA, NIOSH, and ACGIH standards or guidelines. Neither ethylbenzene nor xylene were detectable.

Regulatory standards and criteria are not available for chemicals detected in the soil or sediment, at either the federal or state levels.

5.2 Fate and Transport

Environmental conditions at the Mechanicville site are summarized in Table 5-7 and described in the following paragraphs.

Levels of chemicals found in Task 3 soil samples across the site are consistent with Task 2 findings and the site coal gasification process history. The highest levels of VOCs, PAHs, and cyanide exist in the shallow soils near the former gas house, purifier and oxide houses, filter beds, and relief gas holder. PAH levels are generally higher than VOC levels in the soil samples. In general, VOCs are more soluble in water than PAHs; therefore, PAHs tend to resist leaching from soils more than VOCs.

Most of the site is paved, which prevents infiltration of rainfall and limits vertical migration of chemicals in the soil. However, the regional groundwater flow direction from west to east might be a vehicle for transporting chemicals beneath the site. Therefore, shallow on-site soils are considered a continuing source of chemicals for on- and off-site groundwater contamination.

Task 4 surface soil analytical results indicate that site activities impacted surface soils. Cyanide was detected in two surface soil samples collected from the area behind the garage offices and storeroom building along the upper bank of the Anthony Kill. Several PAHs were detected in surface soil samples as well as bis(2-ethylhexyl)phthalate (BEHP). Since these areas of the site are unpaved, vertical migration of the chemicals in soil is possible due to infiltration of groundwater. Therefore, surface soils in unpaved areas are considered a continuing source of chemicals for on- and off-site groundwater contamination.

Task 2 and Task 3 groundwater analytical results indicate that site activities impacted water quality in soils, as well as in shallow and deep bedrock. Coal gasification waste-related chemicals (i.e., VOCs, PAHs, iron, cyanide, and phenolics) are present in elevated concentrations in on-site groundwater with respect to upgradient groundwater levels. These chemicals were found in the highest concentrations downgradient of the former relief gas holder, purifiers and oxide houses, and the filter beds. The area downgradient of the former relief gas holder, where elevated VOC and PAH levels were detected, is characterized by a bedrock trough, indicating that chemicals are traveling preferentially along the surface of the bedrock trough in the silty shale and shallow bedrock fractures.

In paired wells, PAH levels generally decrease with depth, while VOC levels increase with depth. The heavier, less mobile, PAH chemicals are being partly retained on the soils and along the shallow bedrock fractures. The more soluble VOC chemicals are migrating with the groundwater. Downward seepage gradients, measured in

paired wells in the bedrock trough along the eastern edge of the site, indicate that these chemicals are carried into the shallow and deeper bedrock. The upward seepage gradient on the bank of the Anthony Kill indicates that dissolved chemicals are discharging to the stream. Shallow and deep groundwater migrating off site to the north and east appear to be carrying elevated levels of VOCs, PAHs, and other coal-gasification waste-related chemicals off site.

Analytical results of surface water samples collected from the Anthony Kill do not show an adverse impact attributable to site activities. Although it is likely that chemicals dissolved in groundwater are being discharged from the site to the stream, the resulting surface water concentrations are below detection limits, due to volatilization and dilution. The site groundwater discharge is estimated at less than 0.005 cfs, based on an average hydraulic conductivity of 0.28 ft/day for the unconsolidated soils and 1.1 ft/day for the shallow bedrock. This discharge is less than 0.03 percent of the estimated average annual low flow of 17 cfs on the Anthony Kill at Mechanicville.

Task 2 and Task 3 sediment sampling results indicate that PAH, zinc, cyanide, and phenolic concentrations in the Anthony Kill sediments adjacent to the site are elevated above background levels (upstream) due to site activities; however, downstream sediments do not show elevated levels.

Task 3 air sampling results indicate that benzene and toluene are present at low levels in buildings on-site.

5.3 CONTAMINANTS OF CONCERN

Summary tables of subsurface soil, sediment, and groundwater data at the Mechanicville site were prepared for selected sampling locations. Sampling locations were chosen for statistical analysis on the basis of human exposure potential. It should be noted that the sampling program was designed to investigate areas where residuals from the coal gasification processes would be expected. The summary statistics presented in Tables 5-8 through 5-16 were used to select the contaminants of concern for the public health risk assessment and to represent the exposure point concentrations for the estimation of contaminant body dose levels.

The summary statistics shown in these tables include the frequency of detection, and the minimum, maximum, and arithmetic mean of concentrations. In computing the mean, "non-detects" were assigned the value of zero. This assignment tends to lower the mean, although not significantly, unless a detection limit is high.

Sampling locations used to represent the potential for human exposure to subsurface soils (see Tables 5-8 through 5-10) include Task 2 soil borings B-2, B-3, B-4, B-7, and B-8, and test pits TP-2, TP-4, and TP-5, and Task 3 boring B-9. As seen in Figure 2-7, these sampling locations correspond to the site parking lot (the area in front of the garage and offices) and the filter bed area. These areas were judged to represent locations on the site for possible future subsurface exploration and excavation.

Tables 5-11 through 5-13 contain summary statistics for selected sediment sampling locations. To model potential human exposure to sediments in the Anthony Kill, data for sampling locations adjacent to the site were selected. These include Task 2 and 3 data for sampling location SD-02, two NYSEG samples collected in November 1988, and one NYSDEC sample collected in October 1988.

Summary statistics that reflect the levels of site-related contaminants in on-site groundwater are presented in Tables 5-14 through 5-16. These data include all Task 2 and 3 monitoring well locations except upgradient wells MW-1, MW-10, and MW-11.

No contaminants of concern were chosen for surface water or groundwater. This is because there was no indication of site-related surface water contamination, based on the Task 2 and 3 surface water sampling results. Also, groundwater is not a current source of drinking water nor does it represent a potential source for the future. Therefore, ABB-ES' evaluation of the risks associated with groundwater consumption is limited to a comparison to groundwater or drinking water standards.

Chemicals were selected as contaminants of concern in subsurface soil, sediment, and indoor air based upon their concentrations, frequency of detection, and toxicologic properties. All chemicals detected in surface soil samples SS-1 through SS-4 were chosen as contaminants of concern for this medium. Table 5-17 lists the contaminants of concern selected for the risk assessment. All the contaminants of concern in Table 5-17 are associated with coal gasification activities (GRI, 1987).

Both carcinogenic and noncarcinogenic PAHs were detected at a high frequency and magnitude. Of the 16 PAHs detected at the site, seven have been classified as potential human carcinogens and were selected as contaminants of concern. These include benzo(b)fluoranthene, benzo(k)fluoranthene, benzo(a)anthracene, benzo(a)pyrene, chrysene, dibenzo(a,h)anthracene, and indeno(1,2,3-cd)pyrene. In addition, several PAHs were chosen as contaminants of concern to represent the noncarcinogenic hazards of PAHs. These include naphthalene, pyrene, acenaphthene, acenaphthylene, phenanthrene, fluoranthene, fluorene, anthracene, 2-methylnaphthalene, and benzo(g,h,i)perylene.

Although iron and zinc were found in all samples, they were not selected because they are of such low toxicity. In addition, levels in soil were similar to background levels at the site, while levels in sediment were within an average background range reported by Moore and Ramamoorthy (1984).

Other compounds such as acetone, bis(2-ethylhexyl)phthalate, butylbenzyl phthalate, di-n-octyl phthalate, carbon disulfide, 4-methylphenol, and propyl benzene were not chosen because of their low frequency of detection. In addition, some of these compounds are common laboratory contaminants and may not actually be present on the site.

6.0 BASELINE RISK ASSESSMENT

6.1 HUMAN HEALTH EVALUATION

6.1.1 Hazard Identification

In this section, the toxicological properties of the contaminants of concern, all of which are associated with coal gasification activities, are briefly reviewed. A detailed discussion of the health effects of all contaminants is presented in Appendix G.

Polynuclear Aromatic Hydrocarbons. Most PAHs in the environment are formed during the combustion of organic compounds. Major sources of PAHs include incomplete combustion of fuels for heating and manufacturing; burning of coals, gasoline, and diesel exhaust; and burning of municipal and agricultural wastes. Cigarette smoke also contains PAHs. To a limited extent, these compounds occur naturally (e.g., plants and bacteria synthesize PAHs during growth, and naturally caused brush and forest fires produce PAHs).

PAHs represent a class of several hundred compounds consisting of annelated (benzene) rings. PAHs are ubiquitous in the environment and most are formed during the combustion of organic compounds. Sixteen PAHs were detected at the Mechanicville site. Seven have been classified as potential human carcinogens (Carcinogen Assessment Group [CAG] B2 classification): benzo(b)fluoranthene, benzo(k)fluoranthene, benzo(a)anthracene, benzo(a)pyrene, chrysene, dibenzo(a,h)anthracene, and indeno(1,2,3-cd)pyrene (USEPA, 1984).

Several other PAHs are genotoxic but have not been shown to be carcinogenic (i.e., anthracene, benzo(g,h,i)perylene, fluoranthene, fluorene, phenanthrene, and pyrene). Numerous epidemiological studies of worker populations have shown a clear association between PAH-containing materials (e.g., soot, tars, and oils) and increased cancer risk (IARC, 1983).

Several noncarcinogenic PAHs were also detected at the site. One, naphthalene, was selected as a surrogate to represent noncarcinogenic PAH hazard potential. Except for naphthalene, little toxicological information exists on the other compounds.

PAHs are highly lipid-soluble and are absorbed via the gastrointestinal (GI) tract, skin, and lungs (USEPA, 1984). Many PAHs produce tumors in mouse skin when applied topically in solvents or as coal tar products. Therefore, dermal contact is a potentially important exposure route for these compounds. The degree of skin absorption of PAHs from contaminated soils, however, is not known (USEPA, 1984).

The USEPA cancer potency factors for oral and inhalation exposures of benzo(a)pyrene are 11.5 and 6.11 $(mg/kg/day)^{-1}$, respectively. These values are used to assess the carcinogenic risks associated with the mixture of carcinogenic PAHs found in the soil. (Potency factors are not available for the other carcinogenic PAHs.) Using the factor for benzo(a)pyrene to represent the potency of the seven identified carcinogenic compounds is widely practiced for risk assessment of PAHs. Although benzo(a)pyrene is one of the most potent carcinogenic PAHs, many other carcinogenic PAHs are known to be present in coal tar wastes that were not analytes in the methods used to test site soils.

The USEPA cancer potency factor is the upper 95 percent confidence limit of the slope of the dose-response curve for benzo(a)pyrene (using the linearized multistage extrapolation model). This means that, with 95 percent statistical certainty, the true potency is as stated or less. Therefore, it is highly unlikely that the true potency of benzo(a)pyrene is greater than stated, and it could be considerably lower. For these reasons, the calculated cancer risks associated with the various exposure levels are expected to represent upper limits of the true risk.

In addition to the USEPA-derived potency factors, ICF-Clement Associates developed new potency factors for benzo(a)pyrene using a different dose-response model than the USEPA. While the USEPA used the linearized multi-stage model, ICF-Clement used a newly-developed, two-stage biologically based model, which is a special case of the Moolgavkar and Knudson risk model (GRI, 1988a). These new oral and inhalation potency estimates for benzo(a)pyrene are 3.22 and 0.453 $(mg/kg/day)^{-1}$, respectively, and they can be used with the USEPA estimates to provide a range of possible cancer risks associated with PAHs.

ICF-Clement Associates also developed relative potency factors for other PAH compounds, based on their comparative potencies to that of benzo(a)pyrene. These comparative potencies are illustrated below:

PAH	Relative Potency
Benzo(a)pyrene	1.000
Benzo(a)anthracene	0.145
Benzo(b)fluoranthene	0.140
Benzo(k)fluoranthene	0.066
Benzo(g,h,i)perylene	0.022

PAH	Relative Potency
Chrysene	0.0044
Dibenzo(a,h)anthracene	1.1100
Indeno(1,2,3-c,d)pyrene	0.2320

Source: Atlantic Environmental Services (GRI, 1988a)

The merits and limitations of using the various cancer potency factors are discussed in detail in Appendix G-1.

Benzene. Benzene, a highly flammable volatile aromatic hydrocarbon, is used both as a gasoline additive and a chemical intermediate in the production of many compounds (e.g., styrene and phenol).

Benzene is recognized human carcinogen (IARC, 1982). Several epidemiological studies provided sufficient evidence of a causal relationship between benzene exposure and leukemia in humans. Benzene is a known inducer of aplastic anemia in humans, with a latency period of up to 10 years. It reduces the number of white blood cells and other blood components, which can progress to a reduction in all blood cell types. Similar adverse effects on the blood-cell-producing system occur in animals exposed to benzene. In both humans and animals, benzene exposure is associated with chromosomal damage, although it has not been shown to be mutagenic. Embryolethality has also been observed in experimental animals.

Exposure to high concentrations of benzene in the air causes central nervous system (CNS) depression and cardiovascular effects. Benzene has been reported to cause

subjective symptoms (e.g., headaches and nausea) with chronic exposure to as little as 100 ppm.

Naphthalene. Naphthalene is a PAH, and in this risk assessment, naphthalene is used to represent the toxicity of noncarcinogenic PAHs.

Naphthalene is absorbed most readily by the inhalation route in humans. Acute short-term exposure to naphthalene can lead to severe anemia. In severe exposure, ingestion causes gastroenteric distress, tremors, and convulsions. Corneal ulceration and cataracts have been observed in humans after repeated exposure to naphthalene vapors, which can also cause headache, nausea, and profuse perspiration. With dermal contact, naphthalene is a mild primary irritant. Naphthalene is not known to be a mutagen or carcinogen (Clayton and Clayton, 1981).

Toluene. Toluene is an important raw material for organic syntheses. It is used in the production of benzene, benzyl chloride, benzoic acid, phenol, cresols, vinyl toluene, TNT, and toluene diisocyanate. It is also used as a solvent for paints, rubber, and resins and as a component of motor and aviation fuels.

Acute and chronic exposures to 200 ppm or greater concentrations of toluene vapor cause eye irritation, headache, nausea, and other CNS effects in humans. In humans, acute exposures to very high concentrations can cause narcosis; however, exposures to quantities sufficient to produce unconsciousness fail to produce organ damage. There is no conclusive evidence that toluene is carcinogenic or mutagenic in animals or humans (USEPA, 1980a). The National Toxicology Program (NTP) is currently conducting an inhalation carcinogenicity bioassay in rats and mice.

Researchers have reported that toluene is embryotoxic and one study reported a high incidence of cleft palate in mice. There are no accounts of teratogenic effects in humans after exposure to toluene (USEPA, 1987).

Ethyl Benzene. The major use of ethyl benzene is as an intermediate in the production of styrene. It is also used in the manufacture of cellulose acetate and synthetic rubber. Significant quantities are consumed in connection with xylene, which may contain as much as 20 percent ethyl benzene as a solvent or diluent. These xylene/ethyl benzene mixtures are used as diluents in the paint industry, in agricultural sprays for insecticides, and in gasoline blends.

To date, ethyl benzene has not been evaluated by USEPA for human carcinogenicity potential. The target organs for health impacts from acute exposures are the eyes, upper respiratory system, skin, and CNS. No data on teratogenicity or mutagenicity of ethyl benzene were located by USEPA (1980b). Human toxicity of ethyl benzene is characterized by its irritancy to the skin and, less markedly, to the mucous membranes (ACGIH, 1986).

Xylene(s). Xylene is a VOC used as a solvent for prints, inks, and adhesives. Xylenes are components of detergents and other household and industrial products.

Xylene has not been found to be carcinogenic when administered orally to rats or mice. Xylene was not found to be mutagenic in a battery of short-term assays. Xylene is not teratogenic but has caused fetotoxicity in rats and mice. Acute exposure to high levels of xylene affects the CNS and irritates the mucous membranes. Short-term xylene exposure can cause eye, nose, and throat irritation at 200 ppm. There is some evidence that chronic exposures to less than 50 ppm can cause headaches and other CNS effects.

Cyanide. Both cyanide gases and salts are used in industrial processes. Hydrogen cyanide (HCN) is manufactured at 14 sites in the United States and is used as an intermediate in the production of nylon and other compounds. Minor uses of HCN include insecticides and rodenticides for fumigating enclosed spaces (e.g., grain storage areas). Cyanide salts are used mainly in the electroplating and metal-finishing industries. Minor applications of the salts include the manufacture of dyes and pigments, as well as use as insecticides and rodenticides.

Cyanide is a compound that can exist as a salt (e.g., potassium or sodium cyanide) or as a gas (e.g., HCN). Cyanides as a class are absorbed readily by the lungs, GI tract, and skin of animals and humans (USEPA, 1985). The fastest route of uptake for cyanide is the inhalation of gaseous HCN. Once cyanide is absorbed, it is readily distributed throughout the body. The liver can readily detoxify cyanide compounds. Therefore, cyanides absorbed from the GI tract first pass through the liver, where they are converted to less toxic compounds (usually thiocyanide), before systemic distribution. When inhalation is the route of exposure, systemic distribution occurs before the cyanide-containing blood passes through the liver. Therefore, the effective dose to target organs is higher for inhalation exposure than oral exposure for the same administered body dose.

Acute exposure to high levels of cyanides produces adverse effects on the central nervous, respiratory, and cardiovascular systems (ATSDR, 1988). Coma and/or death can be eventual outcomes. Lower level exposures produce rapid deep breathing, convulsions, and loss of consciousness (ATSDR, 1988). Skin irritation can result from contact with dust containing cyanide (ATSDR, 1988). Chronic exposures (months to years) to low levels of cyanides affect the CNS and the thyroid gland. No evidence exists to indicate that cyanide is carcinogenic (ATSDR, 1988).

Styrene. Styrene is a volatile aromatic compound produced primarily from the dehydrogenation of ethyl benzene. Styrene is used to produce polystyrene, which is a thermoplastic with excellent electrical properties and thermal stability.

Styrene is classified by USEPA as a possible human carcinogen (Group C) because there is limited evidence of carcinogenicity from animal studies but no human data. There is, however, no USEPA cancer potency factor for styrene.

The target organs for toxic effects are the CNS, the respiratory system, and the eyes and skin. There is some epidemiologic evidence suggesting reproductive effects.

Trimethylbenzene. Trimethylbenzenes are alkylated benzenes. This group of compounds, which include xylenes, toluene, and ethylbenzene, is a by-product of petroleum distillation and found in coke oven effluents. Trimethylbenzene is primarily used in industry as solvents, paint thinners, and motor fuel components. One of the three trimethylbenzene isomers has been identified as an insect attractant.

Little experimental work has been carried out on trimethylbenzene. It seems to have very similar properties to other alkylated benzenes, such as xylene and toluene. Like these compounds, trimethylbenzene is relatively nontoxic except with acute exposures to very high concentrations.

Trimethylbenzene, like other alkylated benzenes, is primarily a CNS depressant with such symptoms as irritability, nervousness, headache, nausea, and even narcosis. It is absorbed through the skin, gastrointestinal tract, and lungs; however, unlike other compounds of its class, it is not systemically toxic through dermal absorption. There have been reports of hypochromic anemia in peripheral blood and deviation from normal coagulation in workers exposed for many years to trimethylbenzene at air concentrations between 10 and 60 ppm.

6.1.2 Dose-Response Assessment

In risk assessments, the likely range of incremental risk associated with given levels and conditions of human exposure to a carcinogenic or noncarcinogenic substance is estimated. For carcinogens, the purpose of the dose-response assessment is to define the relationship between the dose of a substance and the likelihood of a carcinogenic effect. Noncarcinogens are thought to have a threshold level for health effects; therefore, USEPA has derived some guidelines based on acceptable exposure levels. The outcome of the dose-response assessment, when coupled with information or assumptions concerning the magnitude of human exposure, can provide a numerical estimate of risk.

Information derived from the hazard identification process is used to guide the dose-response assessment. This guidance is necessary for determining the appropriateness and limitations of the available data sets that might be used for dose/response extrapolation. Such guidance is important, because numerical risk estimates are not affected by the likelihood that an agent is in reality a human carcinogen. That is, a numerical risk estimate can often be derived for a substance even if the weight-of-evidence in support of human carcinogenicity is extremely weak.

Therefore, current USEPA guidelines state that agents classified in Groups A (human carcinogens) and B (probable human carcinogens), according to the weight-of-evidence stratification, are suitable for quantitative risk estimation. Agents categorized in Group C (possible human carcinogens) must be judged on a case-by-case basis, and agents in Groups D (not classified) and E (no evidence of human carcinogenicity) do not have risk estimates derived.

Regardless of the weight-of-evidence, there are major uncertainties in derived risk estimates, which are due to experimental and epidemiologic variability, as well as problems in extrapolating both from animals to humans and from high to low doses. Three major issues impact the validity of dose-response assessments used to derive risk estimates: (1) the selection of a study (i.e., data set) upon which to base the calculations; (2) the mathematical model used to extrapolate from experimental observations at high doses to predicted occurrences at very low doses; and (3) the conversion to an equivalent human dose corresponding to the animal dose used. USEPA provides guidance in these three areas.

Study selection involves the identification of a data set that provides sufficient, well-documented dose/response information to enable a valid extrapolation. Ideally, human data are preferable to animal data, although adequate human data sets are relatively uncommon. Therefore, it is often necessary to seek dose/response information from a species that biologically resembles humans (e.g., with respect to metabolism, physiology, and pharmacokinetics), and where the route of administration is similar to the expected mode of human exposure (e.g., inhalation and ingestion). Cancer incidence data should allow for determination of statistically significant elevations in the occurrence of tumors at specific target organ sites.

The low levels of cancer risk that are generally considered acceptable in community settings (typically $1x10^{-5}$ to $1x10^{-6}$) cannot be measured directly, either by animal experiments or epidemiologic studies. Therefore, different extrapolation models have been developed to estimate cancer risk associated with extremely low doses, based on the observed responses that occur at high doses. Current theories on the carcinogenic process led to the belief that carcinogenesis is associated with a low-dose linearity and linear nonthreshold dose-response relationship. The mathematical formulation typically chosen to describe the dose-risk relationship at low doses is the linearized multi-stage model. Although this is generally regarded as the base of many of the current mathematical extrapolation models, USEPA cautions that no solid scientific basis exists for any extrapolation model and that the risk estimates made with such models are intended to be plausible upper limits (i.e., the true risk is not likely to be higher than the estimate, but it could be as low as zero).

The determination of human equivalent doses by conversion of doses administered to experimental animals requires the assumption that humans and animals are equally sensitive to the toxic effects of a substance, if the same dose per unit body surface area is absorbed by each species. Further assumptions for dose conversions involve standardized scaling factors to account for differences between humans and experimental animals with respect to lifespan, body size, breathing rates, and other physiologic parameters. In addition, evaluation of risks associated with one route of administration (e.g., inhalation) when tests in animals involve a different route (e.g., ingestion) requires additional assumptions with corresponding additional uncertainties. These uncertainties should be acknowledged and explained as thoroughly as possible.

Use of Mathematical Models in Derivation of a Cancer Potency Factor. The USEPA cancer potency factors (CPFs) are derived by use of the linearized multi-staged

procedure. USEPA recognizes that this method produces very conservative risk estimates and that other mathematical models exist. Several dose/response models are available for low-dose extrapolation. These include the probit, the multi-hit, the logit, and the multi-stage models. These models are generally statistical in character and are not derived from biological arguments, except for the multistage model, which has been used to support the somatic mutation hypothesis of carcinogenesis. In the *Guidelines for Carcinogen Risk Assessment* (51FR33997), USEPA states:

> No single mathematical procedure is recognized as the most appropriate for low-dose extrapolation in carcinogenesis. When relevant biological evidence on mechanism of action exists (e.g., pharmacokinetics or target organ dose), the models or procedures employed should be consistent with the evidence. When data and information are limited, however, and when much uncertainty exists regarding the mechanism of carcinogenic action, models or procedures that incorporate low-dose linearity are preferred when compatible with the limited information.

USEPA policy is to use the linearized multistage model unless there is adequate scientific justification for using another model. The multistage model is used for the extrapolation because it is the most general model, with other models approximating some form of the multistage model according to the values of the parameters. The goodness of fit of experimental data is not, however, an appropriate means for justifying the use of one model over another.

USEPA emphasizes in the guidelines that the linearized multi-stage model leads to a plausible upper limit to the risk that is consistent with some proposed mechanisms of carcinogenesis. Such an estimate, however, does not necessarily give a realistic prediction of the risk. The true value of the risk is unknown and may be as low as zero. An established procedure does not yet exist for making "most likely" or "best" estimates of risk within the range of uncertainty defined by the upper- and lower-limit estimates. The point estimate generated from the model is not used because a question remains as to the shape of the dose-response curve beyond the experimental exposure level.

Therefore, the upper-bound estimate of the carcinogenic potency is derived when animal bioassay data are used. This upper-bound estimate can be taken as a plausible estimate if the true dose/response curve is actually linear at low doses. The other reason why the upper-bound estimate is used instead of the point

estimate is that, in some cases, the point estimate is extremely unstable, depending on where the lowest experimental dose is, while the upper-bound estimate is much more stable.

For several reasons, estimates such as the unit risk, when based on animal studies, provide only an approximate indication of the absolute risk in populations exposed to known carcinogen concentrations. There may be important differences between animals and humans in target site susceptibility, immunological responses, hormone function, dietary factors, and disease. Unit risk estimates can be useful, however, in making rough comparisons of the relative potency of a given agent, as compared to other carcinogens.

Derivation of the unit risk estimate requires calculation of the slope of the dose-risk relationship, which is obtained by application of the extrapolation model. The dose-risk slope value, q_1, is taken as an upper bound of the potency of the chemical in inducing cancer at low doses; it is referred to as the CPF. Therefore, at a given dose d, q_1 x d is a 95 percent upper confidence limit on the extra lifetime risk (probability) of cancer occurring.

The USEPA Integrated Risk Information System (IRIS) is a database that USEPA has established that contains all evaluated data on many toxic substances found at hazardous waste sites. This database was employed by ABB-ES to identify the CPFs and reference doses (RfDs) applicable to this risk assessment. A reference dose is the dose-response value used to assess noncarcinogenic effects. It is defined as an estimate of a daily exposure level for the human population, including sensitive subpopulations, that is likely to be without an appreciable risk of deleterious effects during a lifetime. Where no information was found in IRIS, other government documents were used (e.g., Superfund Public Health Evaluation Manual update 1987 and Health Effects Assessment documents). Tables 6-1 through 6-3 present the dose-response data used in this risk assessment for the contaminants of concern at the Mechanicville site, including CPF or RfD values, source of these values, the study type used to determine these values, and toxicokinetic factors (TKFs).

As stated, ICF-Clement Associates has developed new oral and inhalation potency factors for benzo(a)pyrene based on a different extrapolation model than that used by the USEPA. ICF-Clement's model is a two-stage, biologically-based model that produces oral and inhalation potency factors 72 and 93 percent lower

than the USEPA factors. ICF-Clement's estimates can be used to provide a range of possible cancer risks associated with PAHs.

Toxicokinetic Factor. To estimate the risk to human health posed by the presence of chemicals in soil and sediment at the Mechanicville site, ABB-ES first estimated the exposure dose of each constituent. The exposure dose is similar to the administered dose of a laboratory experiment. The experimentally based cancer potency factors and reference doses used in quantitative risk assessment are based on administered doses in most cases.

The TKF is defined as the ratio of the estimated absorption factor for the site-specific medium and route of exposure to the known or estimated absorption factor for the laboratory study from which the cancer potency factor or the reference dose was derived. Use of this factor allows ABB-ES to make appropriate adjustments if the efficiency of absorption is known or expected to differ because of physiological effects and/or matrix or vehicle effects.

TKFs can be less than 1.0 or greater than 1.0, depending on the particular circumstances at hand. If it is thought that absorption from the site-specific exposure is the same as absorption in the laboratory study, then the TKF is 1.0.

In the absence of detailed toxicological information on every compound of interest, it has been common practice for risk assessors to use a default value of 1.0. This approach is not always adequately protective of public health, because there are many cases in which it is expected that absorption from the site-related exposure would be higher than that in the laboratory study. In this assessment, the absorption by inhalation of cyanide adsorbed to soil particles would be expected to be higher than in the diet study upon which its dose/response value is based.

For carcinogenic PAHs and cyanide, specific TKFs were derived based on a review of relevant toxicological data. These TKFs are described in the dose/response profile for each compound (see Appendix G-1).

For the other contaminants of concern, ABB-ES has estimated compound-specific TKFs based on a conservative, internally consistent algorithm as shown in Table 6-3. The procedure requires that the route of exposure and the vehicle be known for all studies from which CPFs or reference doses were derived by

USEPA. This information is discussed in the dose-response profile for each contaminant of concern. The algorithm requires the use of numerous assumptions regarding systemic absorption of the constituents. These assumptions are reasonable and are presented in the following paragraphs.

TKFs were derived for three situations: (1) dermal uptake from soil, (2) ingestion of soil, and (3) inhalation of volatilized compounds or particulates. The dose-response values listed in Tables 6-1 and 6-2 were derived from several types of studies. Most oral values were derived from studies in which animals were administered the test compound orally either by gavage, in drinking water, or in diet. However, some oral dose-response values (i.e., for benzene and toluene) were based on inhalation studies. Most inhalation dose/response values were based on inhalation studies.

The TKF values for situations 1 and 2 are listed in Tables 6-1 and Table 6-3. The assumptions employed in deriving them are discussed below:

- Absorption from gavage studies (in which feeding is by stomach tube) is similar to absorption from drinking water studies.

- Absorption of compounds from drinking water in humans is similar to absorption in laboratory animals from drinking water or gavage.

- Absorption of volatile compounds via inhalation in animals is similar to absorption from drinking water. That is, in both cases absorption is assumed to be very high.

The above assumptions are conservative and reasonable. Their application results in a series of TKFs that can be applied to specific contaminants of concern depending on the nature of the study from which the dose/response values were derived. In some cases, the TKFs are 1.0 or greater than 1.0. For instance, the GI absorption of a constituent such as PAHs from soil may be as great as it is from diet.

Because the CPF is based on a dietary study, a TKF of 0.5-1.0 is used to account for the difference in absorption expected for the estimated exposure at the Mechanicville site. In other cases, the TKFs are less than 1.0. For instance, dermal absorption of a compound such as xylene from soil is expected to be less

than absorption when the compound is administered by gavage. Thus, the TKF for this compound for dermal uptake from soil is 0.05-0.25.

In the derivation of TKFs, for most of the contaminants of concern, ABB-ES assumes the following:

- Absorption of vapors at the site is the same as absorption of vapors in a laboratory study.
- Absorption of vapors at the site is the same as absorption from gavage in a laboratory study.
- Absorption of inhaled particles at the site is the same as absorption of vapors in a laboratory study; however, 75 percent of the inhaled particles is assumed to remain in the lungs and be available for absorption.

Therefore, the TKFs for most of these compounds are 1.0 for volatilized compounds and 0.75 for particulates (see Table 6-2).

The exceptions are PAHs and amenable cyanide. The cancer inhalation potency factor for PAHs is based on an inhalation study where hamsters were exposed to benzo(a)pyrene in a sodium chloride aerosol. It is assumed that absorption from soil particulates is the same as absorption from the sodium chloride aerosol; therefore, the TKF is 1.0. ABB-ES assumed that 75 percent of PAH particulates are retained in the lungs compared to volatilized PAHs; thus, the TKF for volatilized PAHs is 1.33. The inhalation TKF for amenable cyanide (particulates) is 7.5 based on route-specific metabolic differences. Its derivation is explained in the dose-response section for cyanide in Appendix G-1. Table 6-2 also contains the inhalation TKFs used in the risk scenarios.

6.1.3 Exposure Assessment

The purpose of this exposure assessment is to identify and characterize potential exposures at the Mechanicville site. The exposure assessment consists of three steps. First, the exposure pathway analysis identifies potential pathways by which individuals could be exposed to site-related contamination. Second, the exposed population analysis identifies populations around the site who might be exposed.

Finally, the methods to calculate incurred body doses resulting from these exposures are presented, along with some of the assumptions and parameters that are used in these calculations.

Introduction. The Mechanicville site is currently unoccupied. However, NYSEG has other plans for the site. NYSEG does not intend to sell the site, but it expects to lease the site (O'Meara and Martin, 1989). There are currently two potential bidders to lease the property: the city (to use the site as a storage lot), and a private car dealership (to use it as a car lot). Leasing of the site may require regrading the site and removing existing underground and aboveground structures.

Because of the contamination found at the site, it is possible that individuals may be exposed to site-related contamination. Under current conditions, the potential for exposure of nearby residents and site trespassers is limited because the site is not easily accessible. The property is bordered on three sides by a fence, and on the fourth side by a steep embankment along the Anthony Kill Stream.

Exposure Pathway Analysis. There are several pathways by which individuals on or near the site may be exposed to site-related contamination. These pathways involve exposure to soil, groundwater, surface water, air, and sediment. Table 6-4 presents the exposure pathways evaluated in this risk assessment.

Soil Exposure Pathway. Contamination was found in surface and subsurface soil, thus individuals who might contact these soils could be exposed to site-related contamination. Surface soil along the Anthony Kill bank was found to contain SVOCs. Subsurface soils near the former gas plant structure locations were found to contain VOCs, SVOCs, and some inorganic compounds.

Because the area along the Anthony Kill is not fenced, the potential exists for trespassers to gain access to the site and contact soil contaminants. However, a steep embankment limits access to the site, making the potential for this exposure very low. Furthermore, most of the site is covered by asphalt or buildings. It is assumed that trespassers could only be exposed to surface soil behind the office building near the Anthony Kill, an area that is densely vegetated. If trespassers were to gain access to other areas of the site, it is unlikely that they would dig below the surface to contact contaminated soil. Because the exposure of

trespassers to contaminated subsurface soil is unlikely, only surface soil exposure will be assessed under this exposure scenario.

Subsurface soil could be uncovered during excavation activities in the future (or regrading if the site is leased). Such activities might include the servicing of underground sewer, water, or other utility lines. Workers could contact contaminated soil and uncovered stockpiled materials. Therefore, exposure of workers (i.e., utility workers) to excavated soil will be evaluated in this report.

Groundwater Exposure Pathway. Contamination was found in groundwater. However, there appear to be no exposures to this medium, for two reasons. First, as shown in the Tasks 2 and 3 Reports, most of the groundwater under the site appears to discharge directly into the Anthony Kill, except for groundwater in the southern and eastern portions of the site that moves easterly towards the Hudson River.

Second, there are no known current users of the groundwater near or downgradient of the Mechanicville site. The City of Mechanicville obtains its drinking water from a surface water reservoir approximately three miles northeast of the site, at an elevation approximately 160 feet higher than the site. The closest domestic wells are nearly a mile southwest (upgradient) of the site in the Town of Halfmoon, and no active industrial wells were identified in the Mechanicville area. Two abandoned industrial wells are located northeast and south of the site. Neither appear to be downgradient from the site. Although some groundwater moves east of the site before discharging into the river, there are no known receptors, so groundwater is not considered a potential current or future exposure pathway.

Surface Water Exposure Pathway. Surface water of the Anthony Kill represents another potential pathway for exposure to site-related contaminants. Surface water runoff from the site flows into two drainage catch basins that empty via underground culverts into the Anthony Kill. Another potential source of site-related contamination to Anthony Kill surface water is on-site shallow groundwater, which discharges to the stream.

NYSDEC has classified the section of stream from the Mechanicville city line to the Hudson River as Class D (usable for secondary noncontact recreation such as boating). Use of this section of the Anthony Kill for secondary recreation has

been confirmed by the City of Mechanicville (Erano, 1989). Every spring there is a canoe race down the Anthony Kill, going through Mechanicville, to the Hudson River.

Because of the proximity of residential neighborhoods to the site, and because the stream is used for recreational purposes, it is likely that people contact the surface water in the Anthony Kill. Surface water data collected from the Anthony Kill do not indicate that site-related contaminants are present at detectable levels. Therefore, exposure by this pathway will not be assessed further.

Sediment Exposure Pathway. Site-related contaminants were found in the sediments of the Anthony Kill, primarily in the samples collected adjacent to the site (SED-2). Individuals who might contact these sediments could be exposed to site-related contamination. In addition to the contaminants found in the sediments, there has been an unconfirmed report of coal tar from the site seeping into the Anthony Kill (E.C. Jordan Co., 1989).

Public contact with contaminated sediments is possible because the stream is used for recreational purposes. Also, each year residents of Mechanicville clear away debris that collects in the stream for an annual canoe race to the Hudson River (Erano, 1989). Sediment exposure could occur if canoeists get out of their boats and contact the contaminated sediments. On occasion, town workers enter the stream near the site to clear debris or to work on the North Central Avenue Bridge. During such activities, workers could be exposed to contaminated sediments. Therefore, potential exposures of both the general public and construction workers to contaminants in the sediments of the Anthony Kill will be assessed.

Inhalation Exposure Pathway. The possibility of current site users inhaling VOCs was investigated by monitoring indoor air on the site.

Residents living near the site could be exposed to site-related contaminants by the inhalation of fugitive dust. Coal tar contaminants could be released to the air during the excavation of contaminated soil from such activities as underground utility repair. If the excavated soil were to remain stockpiled on the site, the soil pile could act as a source of fugitive dust. Contaminants can become airborne by vaporizing or by aerosolizing as particulate-bound contaminants from wind erosion of excavated soil. These contaminants could potentially be inhaled by residents

downwind of the Mechanicville site during the period such activities occur. Therefore, exposure of residents to site-related compounds via the inhalation pathway will be evaluated.

Utility workers may also be exposed to these volatile compounds and particulate emissions. Worker exposure will be evaluated by comparing modeled ambient concentrations to worker health standards, to assess compliance with health and safety regulations.

Air Quality Monitoring of Fugitive Air Emissions. Future inhalation exposures at the Mechanicville site are possible during activities such as underground utility repair. This section presents the air modeling approach used to predict particle and VOC emissions and the resulting downwind air concentrations.

Currently, the Mechanicville site is not a source of fugitive air emissions because the site is covered with buildings and asphalt paving. However, if construction activities occurred (e.g., excavation of a trench to repair utility lines), contaminated shallow soils (at an average depth of 7 feet) could be dispersed into the air. In addition, VOCs could become airborne due to volatilization.

As discussed, two future potential scenarios involving excavation of soil have been identified in this risk assessment: removal of coal tar-related structures and utility repair. Because ABB-ES predicted the duration of volatile emissions to be 10 times longer for utility repair compared with tank removal, only utility repair activities are modeled.

ABB-ES used a two-step modeling process to estimate atmospheric concentrations of air contaminants potentially emitted from the Mechanicville site. In the first step, we estimated contaminant emission rates. In the second step, we estimated downwind ambient concentrations using air dispersion modeling.

The modeling process is summarized in the following paragraphs and is discussed in detail in Appendix G-4.

To predict emission rates for nonvolatile contaminants (i.e., PAHs and amenable cyanide), ABB-ES used USEPA-developed particle emission rates due to wind erosion and assumed the contaminant fraction of the particles to be equal to the soil fraction (Cowherd et al., 1985). For VOCs (assumed to be a source of

exposure only during utility repair work when subsurface soil is exposed for more than a couple of days), ABB-ES estimated volatilization emission rates based on the total mass of each contaminant that could be volatilized. ABB-ES found that emission rates for volatilized contaminants, under assumed conditions, greatly exceeded the contaminant emission rates for particles.

ABB-ES predicted emission rates of contaminants from the Mechanicville site for both particles (dust) and VOCs using the following modeling methods.

To predict total inhalable fugitive dust emissions, ABB-ES applied equations based on field research of surface mines and storage piles for various materials (Cowherd et al., 1985). These equations can be used to estimate contaminant emissions assuming contaminant concentration in the airborne dust equals the measured chemical concentrations in the surface soil.

Airborne inhalable particulate matter, defined as particles with an aerodynamic diameter equal to or smaller than 10 micrometers (μm), are denoted by the symbol PM_{10}. Inhalable particulates can be retained by the body upon inhalation and contribute to inhalation exposure.

Estimates of contaminant emission rates were based upon PM_{10} emission factors for wind erosion, the duration of construction activities, the mass fraction of contaminant in the soil, and the exposed surface area of the contaminated soil (see Appendix G-4).

The volatilization of contaminants through the soil is a complex process involving the mass transfer of volatiles from the soil particles into the air pores in the soil, mass transfer through the soil pore spaces, and mass transfer from the soil surface into the ambient air. To estimate the volatilization rates of organic chemicals from the contaminated soil, ABB-ES used a simplified but conservative approach.

Based on the mean soil concentration measured at the Mechanicville site, the mass (grams) of the contaminant in the soil for two soil volume cases was estimated. Contaminant emission rates due to volatilization from the surface soils were calculated (see Table G-4-2 in Appendix G-4) for the following two cases:

Most probable:	10 percent of VOC mass emitted over 20-day period
Worst case:	100 percent of VOC mass emitted over 30-day period

For the two cases, the emission rates due to volatilization from the exposed soil are assumed to remain constant over the specified period.

After estimating contaminant emission rates for the different scenarios, ABB-ES used air dispersion models to estimate ambient air concentrations at selected distances to the receptor from the Mechanicville site. For modeling purposes, ABB-ES considered the soil piles from the hypothetical future site construction to be area sources with dimensions equaling the exposed soil surface area. Contaminant emissions were assumed to be mixed uniformly over a height equal to the height of the soil pile.

The ambient air concentrations were predicted as hourly values of contaminant concentrations. To relate these predictions to longer averaging times, conservative scaling factors recommended by USEPA (1977) were used to estimate longer-duration exposure concentrations. The 1-hour average concentration predictions were multiplied by 0.40 to obtain 24-hour average off-site concentrations, and by 0.70 to obtain 8-hour average on-site concentrations (see Appendix G-4).

The estimated ambient air concentrations due to fugitive dust emissions from soil erosion for the utility repair scenario are presented in Tables G-4-3 and G-4-4 in Appendix G-4. The ambient 1-hour average concentration was calculated based on an assumed D atmospheric stability class, and windspeeds of 4.0 m/s and 21.4 m/sec. These windspeeds are based on local climatological data to represent the most-probable and maximum hourly windspeeds, respectively.

Based on the emission rates for volatilization from surface soil, Table G-4-5 provides the chemical-specific 1-hour average VOC concentrations for the two contaminated soil volume cases (i.e., two utility repair scenarios). The ambient 1-hour average concentrations were calculated based on an assumed atmospheric stability Class D and wind speed values of 2.0 and 4.0 m/sec. These assumed wind speeds are low, to be extremely conservative. It is unlikely that there would be 2.0 m/sec winds at a D stability class for extended periods.

Additional Potential Routes of Exposure. If the site were to be used in the future for other purposes, existing above- and below-ground structures would most likely be removed. The site could be regraded, which might lead to potential dermal and inhalation exposures.

Exposed Population Assessment. In this section, the general characteristics of the human population who represent potential receptors to site-related contamination will be discussed. The discussion includes identification of particularly sensitive subpopulations within the vicinity of the Mechanicville site, and land uses that would be associated with these populations.

Several subpopulations are particularly sensitive to chemical exposures: the very young, the very old, and the infirm. The young are particularly sensitive to chemical insult. This is because an equivalent dose of a harmful chemical will have a greater effect on a child than on an adult due to the child's smaller body weight (a dose is expressed as milligrams of contaminant per kilogram of body weight). A child's immature immune system is also more susceptible to insult than an adult's. The old and the infirm are sensitive because they typically suffer from other medical problems that decrease the body's ability to fight chemical insult. Also, the elderly and the infirm may take medication for health problems that can exacerbate the effects of harmful chemicals on the body.

According to the 1980 US Census, the population of Mechanicville was 5,500. Of these 5,500, 733 people were under the age of 10, 621 were ages 10 to 18, and 943 were over 65. Approximately half of the people of Mechanicville can be considered to be potentially sensitive individuals.

Potentially sensitive subpopulations are often associated with certain land uses. These include day-care centers, schools, recreational areas, nursing homes, hospitals, waterways used for drinking water, and agricultural land used for food production.

Figure 3-6 shows land use within a one-half mile radius of the Mechanicville site. The area surrounding the site is primarily residential. Potentially sensitive land uses within a one-half mile radius from the Mechanicville site include a nursery school, an elementary school, a special education school, a day-care center, an elderly housing project, several parks and playgrounds, and a large area of recreational/open space.

Calculation of Body Dose Levels. To estimate incurred body dose levels, two hypothetical exposure scenarios were developed (see Appendix G-3). These reflect realistic worst case and most probable case exposure conditions. These scenarios differ by varying exposure parameters (e.g., duration of exposure,

frequency of contact) and by varying environmental concentrations, using either the maximum concentration detected (realistic worst case) or the average concentration (most probable case). This approach provides a range of potentially incurred body dose levels that would presumably bracket actual exposures for a hypothetical individual. The hypothetical populations for these exposure scenarios are categorized as the general population, children (ages 1 to 6), older children (ages 8 to 18), and utility or construction workers.

Incurred body dose levels were calculated for dermal, oral, and inhalation exposures by multiplying the concentration of each contaminant by appropriate exposure parameters or factors. These factors include the following: frequency and duration of exposure, ventilation rate or sediment/soil contact rate, and the appropriate TKF. The equations used to calculate incurred body dose levels for carcinogenic and noncarcinogenic compounds are presented in Table 6-5.

Incurred body doses were estimated for both current and future potential exposures. Current exposures include the potential exposure of older children (ages 8 to 18) and workers to site-related contamination in sediments of the Anthony Kill (adjacent to the site) and older children (ages 8 to 18) to surface soil. These exposures could occur by direct contact with and incidental ingestion of sediments and soil. (Incidental ingestion can occur when sediment or soil on a person's hands is transferred to food or cigarettes, and is then ingested.)

Future exposures include potential exposures to contaminated subsurface soil on the site during excavation activities. Workers on the site could be exposed by direct contact with and incidental ingestion of subsurface soil, and inhalation of volatilized organic compounds and airborne particulate contaminants. Future exposures can also include the general population, residents downwind of the site who may be exposed to VOCs and airborne particulate contaminants during excavation activities.

As discussed, incurred body doses were calculated for current potential exposures to site-related contaminants in sediments from the Anthony Kill. These doses were estimated for two populations: older children (ages 8 to 18) and construction workers.

Sediment Exposure Scenarios. Parameters used for body dose calculations of older children exposed to sediments are presented in Table 6-6. For this scenario,

"children" refers to age 8 up to age 18 (children under 8 years of age would not be as likely to canoe the Anthony Kill). Older children were chosen to represent the general population because they are more sensitive to chemical insult than adults and because it is more probable for older children to get out of their canoes and contact the sediments than adults.

The average body weight of the 8 to 18 age group is 45 kilograms (kg) (Anderson, et al., 1985). The surface area exposed is assumed to be the hands, forearms, feet, and lower legs, and it is based on the 50th percentile (most probable) and 95th percentile (realistic worst). A frequency of one exposure per year was chosen to represent the most probable case because the canoe race occurs only once per year. Two exposures per year were assumed for the realistic worst case scenario.

Even though older children could be exposed to Anthony Kill sediments more than once a year, it is unlikely that they would be adjacent to the site during each exposure. In addition, because it is most likely that only older children (i.e., ages 13-18) would be allowed to canoe down the stream, five years was chosen as a most probable exposure duration, while 10 years was chosen as the realistic worst case. Ten years represents the maximum possible exposure duration for the ages of 8 to 18.

Table 6-7 presents the parameters used for calculating incurred body doses of construction workers exposed to sediments in the Anthony Kill. It is assumed that construction workers could be exposed to contaminated sediments while performing such activities as repairing the Central Avenue Bridge. Only hands and forearms were assumed to be exposed because workers would most likely wear long pants, boots, and shirts that would limit the exposed surface area. The 50th percentile was used to calculate the most probable case surface area, while the 95th percentile was used to calculate the realistic worst case surface area.

It was assumed that some sediment could remain on the hands after working and be incidentally ingested, and that the frequency of these exposures would be five or 10 days per year. The duration of exposure was assumed to be three years for the most probable case and 10 years for the realistic worst case. Although construction-type work could occur for several years, it is unlikely that a particular worker would return to the same place for more than 10 years.

Soil Exposure Scenario. Table 6-8 presents the parameters used for calculating incurred body doses of trespassers to surface soil. Many of these parameters are the same as for sediment exposures. The potentially exposed population was assumed to be the same – older children between the ages of 8 and 18 with an average body weight of 45 kg. Surface area, soil contacted, amount incidentally ingested, and the total exposure duration were also assumed to be the same. The frequency of exposure, however, differs in that exposure to surface soil is assumed to occur five days per year for a most probable case, and 10 days per year for a realistic worst case. Few exposures are assumed because access to the site is gained only by climbing a steep, highly vegetated slope.

Exposure Parameters for Future Potential Exposure. Incurred body doses were estimated for future potential exposures to both subsurface soil and air emissions. Subsurface soil exposure body doses were calculated for utility workers, while incurred body doses from inhalation of contaminants were estimated for the general population.

Subsurface Soil Exposure Scenario. Table 6-9 presents the exposure parameters used to estimate incurred body doses to utility workers via direct contact with and incidental ingestion of contaminated soil. Utility workers' hands and forearms only were assumed to be exposed to subsurface soil. It was also assumed that the frequency of utility repair activities in which the worker might be exposed to soil was relatively low (one or two days per year), although the pile of excavated soil could sit around for several days. The duration of exposure was assumed to be over a two- or four-year period, meaning that a worker could return to the site in subsequent years.

Inhalation Exposure Scenario. Exposure to VOCs on the site was evaluated by sampling indoor air. Table 6-10 presents the exposure parameters used to estimate incurred body doses due to inhalation of airborne particulates and volatile contaminants during utility repair activities. Although the general population downwind of the site could be exposed to particulate dust and volatiles, exposure doses were estimated for children only, ages 1 to 6, because they represent the most sensitive population. To estimate a child's incurred body dose due to inhalation exposure, ABB-ES assumed that the child could be exposed 24 hours a day at two different locations and during three different activities. These include attending pre-school and playing and sleeping at home. It is assumed that both locations are downwind of the site. The child was

assumed to attend the nearest identified school, which was at an estimated distance of 750 feet from the site. The child was also assumed to live at the nearest identified residence, which is approximately 100 feet from the site.

Inhalation rates for the three activities are different: light activity during school, moderate activity during play, and a resting rate while asleep. Although actual utility repair might only take one or two days, the soil pile that was assumed to be stockpiled on the site could potentially remain on the site for several days after the repair work. Thus, chemicals in the soil could volatilize, and particulates could be blown downwind, increasing the time that a child could be exposed to site-related contaminants. The soil pile was assumed to sit for 20 days (most probable case) or 25 days (realistic worst case), corresponding to exposure durations of 20 or 25 days.

As mentioned earlier, incurred body doses will not be estimated for workers on site. Instead, the estimated concentrations of contaminants in air will be compared to OSHA standards, specifically PELs.

Finally, although potentially contaminated subsurface soil could remain in a pile for several days at the site, incurred body doses for children due to direct contact with these soils will not be estimated. This is because, as stated, access to the site is restricted.

6.1.4 Air Quality Modeling of Fugitive Air Emissions

Future inhalation exposures at the Mechanicville site are possible during activities such as underground utility repair. This section presents the air modeling approach used to predict particle and VOC emissions and the resulting downwind air concentrations.

Introduction. Currently, the Mechanicville site is not a source of fugitive air emissions because the site is covered with buildings and asphalt paving. However, if construction activities occurred (e.g., excavation of a trench to repair utility lines), contaminated shallow soils (at an average depth of 7 feet) could be dispersed into the air. In addition, VOCs could become airborne due to volatilization. As discussed in Section 6.1.3, two future potential scenarios involving excavation of soil have been identified in this risk assessment: removal of coal tar-related structures and utility repair. Since ABB-ES predicted the

duration of volatile emissions to be 10 times longer for utility repair compared with tank removal, only utility repair activities are modeled.

ABB-ES used a two-step modeling process to estimate atmospheric concentrations of air contaminants potentially emitted from the Mechanicville site. In the first step, ABB-ES estimated contaminant emission rates. In the second step, ABB-ES estimated downwind ambient concentrations using air dispersion modeling.

The modeling process is summarized in the following paragraphs and is discussed in detail in Appendix G-4.

To predict emission rates for nonvolatile contaminants (i.e., PAHs and amenable cyanide), ABB-ES used USEPA-developed particle emission rates due to wind erosion and assumed the contaminant fraction of the particles to be equal to the soil fraction (Cowherd, 1985). For VOCs (assumed to be a source of exposure only during utility repair work when subsurface soil is exposed for more than a couple of days, ABB-ES estimated volatilization emission rates based on the total mass of each contaminant which could be volatilized. ABB-ES found that emission rates for volatilized contaminants, under assumed conditions, greatly exceeded the contaminant emission rates for particles.

Estimate of Emissions. ABB-ES predicted emission rates of contaminants from the Mechanicville site for both particles (dust) and VOCs using the modeling methods described in this section.

Fugitive Dust Emissions. To predict total inhalable fugitive dust emissions, ABB-ES applied equations based on field research of surface mines and storage piles for various materials (Cowherd, 1985). These equations can be used to estimate contaminant emissions assuming contaminant concentration in the airborne dust equals the measured chemical concentrations in the surface soil.

Airborne inhalable particulate matter, defined as particles with an aerodynamic diameter equal to or smaller than 10 micrometers (um), are denoted by the symbol PM_{10}. Inhalable particulates can be retained by the body upon inhalation and contribute to inhalation exposure.

Estimates of contaminant emission rates were based upon PM_{10} emission factors for wind erosion, the duration of construction activities, the mass fraction of

contaminant in the soil, and the exposed surface area of the contaminated soil (see Appendix G-4).

Volatilization Rates from Soil. The volatilization of contaminants through the soil is a complex process involving the mass transfer of volatiles from the soil particles into the air pores in the soil, mass transfer through the soil pore spaces, and mass transfer from the soil surface into the ambient air. To estimate the volatilization rates of organic chemicals from the contaminated soil, ABB-ES used a simplified but conservative approach.

Based on the mean soil concentration measured at the Mechanicville site, the mass (grams) of the contaminant in the soil for two soil volume cases was estimated. Contaminant emission rates due to volatilization from the surface soils were calculated (see Table G-6-2 in Appendix G-4) for the following two cases:

Most probable:	10 percent of VOC mass emitted over 20-day period
Worst case:	100 percent of VOC mass emitted over 30-day period

For the two cases, the emission rates due to volatilization from the exposed soil are assumed to remain constant over the specified period.

Air Quality Dispersion Models. After estimating contaminant emission rates for the different scenarios, ABB-ES used air dispersion models to estimate ambient air concentrations at selected distances to the receptor from the Mechanicville site. For modeling purposes, ABB-ES considered the soil piles from the hypothetical future site construction to be area sources with dimensions equaling the exposed soil surface area. Contaminant emissions were assumed to be mixed uniformly over a height equal to the height of the soil pile.

The ambient air concentrations were predicted as hourly values of contaminant concentrations. In order to relate these predictions to longer averaging times, conservative scaling factors recommended by USEPA (1977) were used to estimate longer-duration exposure concentrations. The 1-hour average concentration predictions were multiplied by 0.40 to obtain 24-hour average off-site concentrations, and by 0.70 to obtain 8-hour average on-site concentrations (see Appendix G-4).

Air Quality Modeling Results. The estimated ambient air concentrations due to fugitive dust emissions from soil erosion for the utility repair scenario are presented in Tables 6-4-3 and 6-4-4 in Appendix 6-4. The ambient 1-hour average concentration was calculated based on an assumed D atmospheric stability class, and windspeeds of 4.0 m/s and 21.4 m/sec. These windspeeds are based on local climatological data to represent the most-probable and maximum hourly windspeeds, respectively.

Based on the emission rates for volatilization from surface soil, Table 6-4-5 provides the chemical-specific 1-hour average VOC concentrations for the two contaminated soil volume cases (i.e., two utility repair scenarios). The ambient 1-hour average concentrations were calculated based on an assumed D atmospheric stability class and wind speed values of 2.0 and 4.0 m/sec. These assumed wind speeds are low, to be extremely conservative. It is unlikely that there would be 2.0 m/sec winds at a D stability class for extended periods.

6.1.5 Risk Characterization

This subsection characterizes the risks to those populations who could potentially be exposed to contamination found at the Mechanicville site. The type and extent of risks depend on the nature, duration, and frequency of exposure to contaminants, as well as the characteristics of the populations exposed. This exposure-related information combined with the dose-response data are the basis for this risk characterization.

Carcinogenic and noncarcinogenic risk estimates were calculated for each of the hypothetical exposure scenarios discussed in Subsection 6.1.3. Two types of hypothetical exposure scenarios were developed to reflect realistic worst and most probable case exposure conditions: older children (ages 8 to 18) being exposed to on-site surface soil and sediment in the Anthony Kill, construction workers exposed to sediment, utility workers exposed to on-site subsurface soil, and children exposed to off-site volatile compounds and particulate dusts emanating from excavated soil.

Carcinogenic risk estimates were determined by multiplying the body-dose level for each carcinogen by its USEPA carcinogenic potency value and, for PAHs, by the ICF-Clement potency value as well. This calculation results in an estimate of

an individual's incremental or excess cancer risk due to exposure to site-related contamination.

Noncarcinogenic risk estimates were determined by dividing the body-dose level for each noncarcinogen by the relevant standard, criterion, or guideline, resulting in a ratio called the risk ratio. Noncarcinogenic risk ratios for the individual compounds were then summed together to form a Hazard Index (see Appendix G-3). To put these risk estimates into perspective, they were evaluated against target risk levels.

Target risk levels for carcinogenic compounds have been adopted from USEPA guidelines stating that the total incremental carcinogenic risk for an individual resulting from exposure at a hazardous waste site should be between 10^{-4} and 10^{-6}. (A risk of 10^{-4} is interpreted as a 1 in 10,000 chance of an individual developing cancer during a lifetime, as a result of the exposure.) Based on these guidelines, the risk characterization in this report refers to the carcinogenic risk estimates as being "below the target range" when risks are less than 10^{-6}, "within the target range" when risks are between 10^{-4} and 10^{-6}, and "above the target range" when risks are above 10^{-4}. Historically, regulatory agencies have considered risks between 10^{-5} and 10^{-6} to be acceptable.

For noncarcinogenic compounds, the Hazard Index is compared to 1. If the Hazard Index is less than or equal to 1, no adverse health effects are anticipated from the predicted body-dose level. If the index is greater than 1, the predicted body-dose level could potentially result in adverse health effects. This determination is necessarily imprecise, because the derivation of the relevant standard or guideline involves the use of multiple safety factors. In addition, the risk ratios for individual compounds should properly be summed only if the target organ or mechanisms of action are identical for the compounds. Therefore, the potential for adverse health effects of a mixture having a Hazard Index greater than one must be evaluated on a case-by-case basis.

Risks Due to Soil Exposures. Both carcinogenic and noncarcinogenic risks were estimated for exposure to contaminated soil at the Mechanicville site. The two populations who could potentially be exposed are older children, ages 8 to 18, and utility workers. Risks were estimated for older children exposed to surface soil, and utility workers exposed to subsurface soil.

Potential Risks to Teenagers and Older Children. Risk estimates were calculated for teenagers and older children potentially exposed to contaminated surface soil at the Mechanicville site. This population (ages 8 to 18) was selected because it represents the one with the highest exposure potential; older children play unsupervised, are mobile, and could trespass onto the site and be exposed to surface soil. The risk estimates are presented in Table 6-11.

The incremental carcinogenic risk estimated for the most probable case scenario is 2.3×10^{-6} and for the realistic worst case, 1.8×10^{-5}. The excess risk is essentially due to exposure to the carcinogenic PAHs. Both estimates are within the USEPA target range. Using the CPF developed by ICF-Clement Associates (1987a and b), carcinogenic risks of 6.5×10^{-7} and 5.0×10^{-6} were estimated for the most probable and realistic worst cases, respectively. These estimates are below and within the USEPA target range.

Noncarcinogenic risks are 0.00011 for the most probable case scenario, and 0.0013 for the realistic worst case scenario. Both of these are well below 1. Therefore no significant adverse health effects would be expected due to the exposure of older children to contaminated soil under the assumed conditions of exposure.

Potential Risks to Utility Workers. Risk estimates were also calculated for utility workers who could be exposed to contaminated subsurface soil during future utility repair work (Table 6-12). Using the USEPA CPF, total incremental carcinogenic risks for the most probable case scenario were estimated at 1.3×10^{-7}. Although there were two carcinogenic compounds detected in the subsurface soil, more than 99 percent of the risk is attributed to the presence of carcinogenic PAHs. Risk for the realistic worst case was estimated at 3.5×10^{-5}. This is also attributable to the presence of carcinogenic PAHs. Both risk estimates are within the USEPA's target range.

Using the PAH potency factor developed by Clement Associates (1987a and b), carcinogenic risks were estimated at 3.6×10^{-8} and 9.9×10^{-6} for the most probable and realistic worst cases, respectively. These are below and within the USEPA target range.

The noncarcinogenic Hazard Indices were significantly less than 1 for both scenarios, with an index of 0.000016 for the most probable case and 0.0022 for the realistic worst case. Because the Hazard Index for both scenarios was well below

one, no adverse health effects would be expected in utility workers exposed to subsurface soil at the Mechanicville site under the assumed exposure conditions.

Risks Due to Sediment Exposures. Both carcinogenic and noncarcinogenic risks were estimated for exposure to sediment in the Anthony Kill. The two populations who could potentially be exposed are older children and construction workers.

Potential Risks to Older Children. Risk estimates were calculated for older children potentially exposed to site-related contamination in the sediments of the Anthony Kill adjacent to the site (Table 6-13). Using the USEPA potency factor for PAHs, total incremental carcinogenic risks were below the USEPA target range for the most probable case scenario (9.4×10^{-9}), and within the target range for the realistic worst case scenario (2.1×10^{-6}). Carcinogenic PAHs contributed to more than 99 percent of the total incremental risk in both cases.

Using the PAH potency factor developed by ICF-Clement Associates (1987a and b) carcinogenic risks were estimated at 2.6×10^{-9} and 5.8×10^{-7} for the most probable and realistic worst cases, respectively. Both estimates are below the USEPA target range. The Hazard Index was estimated at 0.000003 for the most probable case and 0.0002 for the realistic worst case. These Hazard Indices are significantly below 1. Therefore, no adverse health effects would be expected from the exposure of older children to contaminated sediments.

Potential Risks to Workers. Risks were estimated for construction workers potentially exposed to contaminated sediments of the Anthony Kill. They are presented in Table 6-14. Using the USEPA potency factor, incremental carcinogenic risk estimates were below the USEPA target range for the most probable case (1.3×10^{-8}) and within the target range for the realistic worst case (3.4×10^{-6}). Carcinogenic PAHs contributed to more than 99 percent of the total risk in both cases. Using the PAH potency factor developed by ICF-Clement Associates (1987a and b), carcinogenic risks were estimated at 3.7×10^{-9} and 9.6×10^{-7} for the most probable and realistic worst cases, respectively. Both estimates are below the USEPA target range.

Hazard Indices were below 1 for both the most probable and realistic worst case, with indices of 0.0000052 and 0.0003, respectively. Because both indices are

significantly below one, no adverse health effects would be expected due to contaminated sediments during assumed construction-type activities.

Risks Due to Inhalation of Volatile Organic Compounds and Particulates. Both carcinogenic and noncarcinogenic risk estimates were calculated for exposure to VOCs and particulate dust originating from a hypothetical soil pile excavated and stockpiled on-site during utility repair work. The population assumed to be exposed were young children living downwind of the site. This population was used because it represents the most sensitive group.

Potential Risks to Young Children. Risk estimates were calculated for young children, ages 1 to 6, assumed to inhale VOCs and particulates originating on site (Table 6-15). Using the USEPA potency factor for PAHs, the total incremental carcinogenic risk was estimated at 2.2×10^{-7} for the most probable case and 1.3×10^{-5} for the realistic worst case. Both estimates are within the USEPA target range. The major contributor to these estimates is carcinogenic PAHs, at 85 and 86 percent of the total risk for the most probable and realistic worst cases, respectively. Using the PAH potency factor developed by ICF-Clement Associates (1987a and b), carcinogenic risks were estimated at 4.9×10^{-8} and 2.6×10^{-6} for the most probable and realistic worst cases, respectively. Both estimates are below or within the USEPA target range.

The Hazard Index was estimated at 0.00035 for the most probable case and 0.018 for the realistic worst case. Both indices are well below 1. Therefore, no adverse health effects would be expected due to the inhalation of VOCs or fugitive dust particulates originating at the Mechanicville site under the assumed conditions of exposure.

Uncertainty/Limitations in Risk Assessment. Regardless of the type of risk estimate developed, it should be emphasized that all estimates of risk are based on numerous assumptions that introduce many uncertainties into the risk characterization process. Assumptions such as frequency and duration of exposure are subjective decisions based on knowledge of site conditions. Absorption rates are often unknown for specific chemicals, and the pharmacokinetics of a contaminant can differ between the specific site and the laboratory study from which the dose/response criterion was derived. In addition, the use of established standards or guidelines, such as the dose-response value,

introduces additional uncertainties into the risk estimates due to the following factors:

- potential adverse human health effects are extrapolated from effects seen in animal studies
- effects observed at low doses are often extrapolated from effects seen at high doses
- atmospheric concentrations of contaminants volatilizing from soil are often estimated using models
- dose-response effects are often estimated using models

By using a range of realistic exposure assumptions, it is ABB-ES' opinion that the uncertainty inherent in the risk characterization process has been minimized to the best extent possible. Both lower and upper bounds for risk have been provided for each exposure scenario. These estimates are designed to ensure human health protection. These should be used to determine the location and relative magnitude of risk at the site, and the relative magnitude of risk among media.

Summary. Table 6-16 presents a summary of estimated risks due to exposure to contamination in soil and sediment at the Mechanicville site. All incremental carcinogenic risks were either within or below the USEPA target range of 10^{-4} to 10^{-6}. Carcinogenic PAHs appear to be the major contributor to these risks. In addition, all Hazard Indices of noncarcinogenic risks were well below 1, indicating that no adverse noncarcinogenic health effects would be expected due to exposure.

Based on the results/conditions of this quantitative risk assessment, ABB-ES concludes that, under the assumed exposure conditions, contaminants found at this site do not pose a significant health risk to workers on the site or to residents around the site. As has been done in the past, the site health and safety plan should be followed during any future exploratory work on the Mechanicville site to prevent or minimize undue exposure.

6.2 ENVIRONMENTAL EVALUATION

The primary objectives of the environmental assessment for the Mechanicville site are to characterize the environmental receptors associated with the site; evaluate present and future impacts; and if appropriate, provide sufficient information to support remedial alternatives and develop mitigative measures to address any adverse effects. The risk assessment focused primarily on the Anthony Kill, as this stream is directly adjacent to the site. Potentially affected media investigated include soil, surface water, groundwater, and sediment.

Environmental Receptors. Environmental receptors potentially affected by site-related chemicals include aquatic organisms in the Anthony Kill, and terrestrial wildlife that use the area. Due to the industrialized nature of the area, and the lack of suitable habitats, it is unlikely that the site is significantly utilized by wildlife.

Although the surficial soil is contaminated with PAHs, the exposed soil consists primarily of packed gravel unsuitable for soil invertebrates. Consequently, a movement of contaminants through the terrestrial food web is considered unlikely. In addition, the relative importance of this exposure pathway is minimized by the small size of the site and the low wildlife-carrying capacity of the surrounding commercial area.

Aquatic habitats adjacent to the site are potentially at risk because these areas can function as contaminant sinks and groundwater discharge areas. As overland runoff and groundwater discharge to the Anthony Kill, potential contaminants transported in these flows can accumulate in sediment or be directly discharged to surface water. Accumulated contaminants in sediment can resist breakdown and contribute to water quality degradation over time. There is also the potential for impact to downstream areas. Potential aquatic receptor taxa include fish, macroinvertebrates, plankton, and amphibians. Limited data exist on the species present in adjacent aquatic areas.

NYSDEC has assigned two stream classifications to the Anthony Kill. The section upstream from the Mechanicville city line is classified as C(t). Class C waters are suitable for fishing and all other uses except as a source of water supply for drinking, culinary, or food processing purposes or primary contact recreation. The "t" denotes that this segment of the stream is a trout stream. In

Mechanicville, the stream is classified as D. Class D waters are designated for secondary contact recreation, but no higher classification uses because of intermittent flow or water conditions that do not support the propagation of game fish.

According to the records of the New York State Wildlife Resources Center, no endangered, threatened, or species of special concern occur in proximity of the site.

Environmental Risk Assessment. This subsection presents an assessment of risk to environmental receptors from contaminated surface water, groundwater, and sediments.

Surface Water. As part of the Task 2 field investigation, four rounds of surface water samples were collected at three locations along the Anthony Kill during 1986 and 1987. Location SW-1 is situated upstream of the site, location SW-2 is situated adjacent to the site, and location SW-3 is situated downstream. Samples were collected in September and December of 1986, and March and June of 1987.

In the Task 3 field investigation, two additional surface water sampling rounds were performed, again at three locations along the Anthony Kill. However, during this field investigation, a new sample location (SW-4) further downstream was chosen to replace SW-3, based on a more complete understanding of the extent of groundwater discharge to the stream. A statistical summary of compounds detected during the surface water sampling is presented in Table 6-17. Mean values presented in Table 6-17, as well as the tables which follow, were calculated using zeros for sample data reported as ND. The range of concentrations at which these compounds were detected are presented in Table 6-18, along with relevant water quality standards.

Only BEHP, 2-methylnaphthalene and two inorganics (cyanide and iron) were detected at levels exceeding the AWQC or the New York Class D Standards. However, the levels of BEHP and the two inorganic compounds were not elevated, compared with the upstream location.

In addition, 2-methylnaphthalene was only detected once (in a location adjacent to the site) during the surface water sampling program, and was not detected in a duplicate sample taken concurrently. Three other PAH compounds,

acenaphthene, acenaphthylene and pyrene, were also detected at levels below their respective AWQC in the surface water sample which contained 2-methylnaphthalene. These compounds were not detected in the associated duplicate sample. The presence of PAHs in surface water appears to be infrequent. Levels are low when detected adjacent to the site and are not detected in downstream surface water samples. Therefore, the impact of PAH releases on stream water quality is expected to be minimal.

Groundwater. Although no environmental receptors are exposed directly to groundwater at the site, the majority of groundwater beneath the site discharges to the Anthony Kill (E.C. Jordan Co., 1987 and 1989), and stream quality could potentially be affected. Therefore an assessment of the potential impact of groundwater constituents discharging in the Anthony Kill was conducted.

Data used in this evaluation included analytical results from groundwater samples collected from the 12 site wells during December 1987 and March 1988, as part of the Task 3 Investigation, and the six Task 2 wells sampled on four previous occasions (September and December of 1986, and March and June of 1987). A summary of these analytical data is presented in Table 6-19, and maximum levels of each chemical were used in conjunction with a dilution factor, described below, to estimate potential groundwater impacts on the Anthony Kill.

To conservatively assess potential impacts of groundwater discharge to the Anthony Kill, an estimate of stream water quality under low flow conditions was made. The estimated stream concentrations were conservatively computed using the reported average low flow over a seven-day period with a 10-year recurrence interval (i.e., 7Q10) and the estimated groundwater discharge rate to the stream. The reported 7Q10 for the Anthony Kill is 17 cfs.

The estimated groundwater discharge rate was computed using a 500-foot length of the stream and a stream bank depth of 1 foot. The stream bottom is composed primarily of competent bedrock, and given the relative permeability of the soil, it is reasonable to assume that most of the groundwater discharge occurs through the stream bank soils. Using the estimated hydraulic conductivity for the on-site soils (200 feet per year or 6.3×10^{-6} feet per second) and a stream bank area of 500 square feet, the groundwater discharge rate is 0.003 cfs. Therefore, under low flow conditions during which dilution effect would be minimized, the estimated stream dilution factor is 5,363.

Estimated low flow stream concentrations were computed for all chemicals detected in groundwater at the site. For chemicals detected at levels below their reported solubilities the maximum observed groundwater concentration was divided by the estimated dilution factor to calculate the low flow stream concentrations. For those chemicals detected at levels that exceeded the respective reported solubilities, the maximum solubility reported in the literature was divided by the estimated low flow dilution factor to calculate the low flow stream concentrations.

The estimated low flow stream concentrations and the AWQC are listed in Table 6-19 along with groundwater concentration ranges and maximum reported solubility values. The estimated low flow concentrations are below the respective water quality criteria for all listed chemicals. This correlates with available stream water quality data where only 2-methylnaphthalene was detected at a level (0.035 mg/L) slightly exceeding the ambient water quality criterion (0.027 mg/L). The sample was collected adjacent to the site where the dilution is incomplete. Downstream samples showed no exceedance of the AWQC as predicted by the dilution estimates.

Sediments. Task 2 sediment samples were collected during four sampling episodes at three locations in the Anthony Kill concurrently with surface water collections. Task 3 samples were collected during two episodes (December 1987 and March 1988) from the same locations along the Anthony Kill as surface water samples. Additional sediment samples were taken by NYSEG personnel on November 1988 from a location adjacent to the site, and two samples were collected by NYSDEC personnel under the Route 146 bridge.

These analytical results were divided into three groups (upstream, adjacent, and downstream) and statistically summarized (Table 6-20). A number of VOCs, PAHs, and metals were detected in these samples. Sediment concentrations of two VOCs, 18 SVOCs, and one inorganic compound were higher adjacent to the site than at the upstream reference location (E.C. Jordan Co., 1987 and 1989).

There are no final standards or criteria for the protection of aquatic life for chemical levels in sediment. However, interim sediment criteria values have been established (USEPA 1988). These interim criteria are based on the Equilibrium Partitioning Approach (USEPA 1988), which estimates the interstitial water concentration of the contaminant given the TOC sediment concentration and the

partitioning coefficient between the two media. From this relationship, chronic AWQC are used to establish the "no-effect" concentration in the interstitial water. Thus, toxicity to benthic organisms is correlated to the interstitial, or pore water concentration, and not directly to the total concentration of the contaminant in the sediment.

Interim sediment criteria have been developed for only six of the chemicals (all PAHs) found during the sediment sampling program conducted for the Mechanicville site. These criteria, presented in Table 6-21, can be directly compared to the TOC-normalized PAH concentrations detected in Anthony Kill sediment. Chemical concentrations must be normalized because the extent to which PAHs and other hydrophobic organic compounds are bound to sediment, and hence unavailable to biota, is directly related to the amount of organic carbon (USEPA, 1988). In addition, available Effect Range Low (ER-L) values (Long and Morgan, 1990) have been provided. These values are derived from an exhaustive compilation of the available sediment toxicological information, and are interpreted as levels at which most aquatic organisms would not likely be impacted due to exposure to contaminated sediment. ER-L values are available for 13 of the constituents detected in Anthony Kill sediment.

The normalized average sediment concentrations measured upstream, adjacent to, and downstream of the site, along with available Interim Sediment Quality Criteria (SQC), associated confidence intervals and ER-Ls, are listed in Table 6-21. The confidence interval represents the range within which (with 95 percent certainty) the actual sediment criterion should fall, and is based on the uncertainty associated with the derivation of the protective criteria. The lower value of the interval represents the sediment concentration that, with 97.5 percent certainty, will be protective of aquatic biota. Similarly, the upper value represents a concentration at which deleterious effects are to be expected, with a similar degree of certainty, in at least some aquatic species.

To evaluate the potential impacts associated with chemical levels in sediment, chemical concentrations were compared with the available SQC and associated confidence intervals. The potential for deleterious effects exists when the concentration at which a chemical is detected falls within the confidence interval of the particular SQC. Chemicals detected at concentrations in the sediment below the lower value of the confidence interval are likely having no deleterious effects upon aquatic receptor organisms; similarly, chemicals detected at

concentrations above the upper value are likely having an impact on at least some species.

For the sediment quality criteria presented, the maximum concentration of phenanthrene in sediments adjacent to the site exceeds the SQC. This indicates that there is a possibility that phenanthrene is impacting some components of the aquatic community in the Anthony Kill. Due to the fact that average concentrations(Table 6-20)do fall below the actual SQC itself, however, this possibility is considered of minor concern. Maximum concentrations of the other PAH concentrations, for which SQC are available, do not exceed SQCs and are predicted to represent no risk of adverse impacts to aquatic receptors and no ER-L value was exceeded by the maximum concentration of constituents detected in Anthony Kill sediment. The potential effect on aquatic life of other sediment chemical concentrations cannot be evaluated due to the lack of applicable standards or criteria. However, the chemicals evaluated are considered to be representative of other similar compounds.

Two site-specific factors further reduce the potential for negative impacts that elevated PAH levels in the sediments have on stream biota in the Anthony Kill. First, because the stream is fairly fast moving (17 cfs under low flow conditions) and the substrate is rocky, with exposed bedrock in places, it is not likely that the benthic community is well developed in the vicinity of the Mechanicville site. Consequently, the abundance and diversity of aquatic receptors is expected to be quite limited.

In addition, the significant reduction in PAH levels in sediment in the downstream locations indicates that there is, at present, little migration of contaminants down the Anthony Kill. These results suggest that while elevated PAH levels are present in sediments of the Anthony Kill adjacent to the site, the levels are likely having little or no impact on freshwater life. Moreover, any potential impacts would be limited to a small area adjacent to the site.

This evaluation suggests that any potential adverse effects, due to the presence of PAHs in sediments, are quite minimal.

Conclusions. There is no indication that any threatened, endangered or species of special concern occur in the general vicinity of the site. Aquatic organisms

(including benthic species) are the environmental receptors most likely to be affected by site-related contamination.

An evaluation of the risks posed by contaminants detected in the surface water, groundwater and sediment suggests that some potential for impacts does exist for organisms existing in the Anthony Kill in a limited area adjacent to the site. However, these risks appear to be relatively minor, for several reasons. Few compounds were determined to exceed their media-specific protective criteria, and the extent of these exceedances were minimal. Moreover, potential impacts were associated only with "worst case" conditions (e.g., stream low-flow conditions), with no impacts expected under more typical assumptions. Finally, there is no evidence that contaminants are being transported downstream at significant levels. Levels of contaminants detected in the downstream surface water and sediment samples never exceeded relevant protective criteria, even under the most conservative assumptions.

7.0 SUMMARY AND CONCLUSIONS

7.1 SUMMARY

The findings of the field investigations and analytical programs conducted during Task 2, Task 3, and Task 4 at the Mechanicville site are summarized in this section.

In brief, the findings are as follows:

- The shallow geology consists of 8 to 25 feet of heterogeneous fill deposits including a silty sand and gravel, a clayey silt and fractured shale, and a silty shale, all overlying fractured shale bedrock.
- The water table is approximately 5 to 10 feet below ground surface. Groundwater movement is principally within the silty shale and underlying bedrock fractures.
- Regional groundwater flow is west to east across the site, toward the Hudson River. Locally, groundwater flows to the north-northwest, discharging to the Anthony Kill.
- Land use in the vicinity of the site is both residential and commercial. Day-care centers, schools, recreational areas, nursing homes, and elderly housing projects are located in the vicinity of the Mechanicville site.

7.1.1 Nature and Extent of Contamination

Subsurface Soil

Analyses of subsurface soil samples from the field investigation program showed the presence of coal tar and coal gasification-related compounds (i.e., VOCs, PAHs, and cyanide) near the former relief gas holder, purifier and oxide houses, and filter beds. The highest levels of VOCs and PAHs were detected in samples taken at or near these sites. The highest levels of VOCs (3,800 and 3,410 mg/kg) were observed in samples taken at B-8 (at depths of 13.5 to 15.5 feet and 15.5 to

17.5 feet) which is located beneath the foundation of the former gas relief holder. The highest levels of PAHs were observed in samples taken from B-8 (5,440 mg/kg), TP-5 (8,500 mg/kg; adjacent to the filter beds) and B-3 (9,310 mg/kg in the vicinity of the former purifier and oxide houses). Deep soil samples (lower than 15 feet deep) contained lower levels of organics than the samples collected from shallow soils.

Iron levels ranged from 18,000 to 35,000 mg/kg. The lower concentrations were in the deeper fine silty sand. Higher levels were seen in shallow fill samples. Zinc levels generally ranged from 32 to 390 mg/kg, except for one Task 2 sample (B-5/S-1), which contained 1,600 mg/kg.

Cyanide was detected in three subsurface soil samples at levels ranging from 1 to 3.2 mg/kg. These samples were collected in the vicinity of the former purifier and oxide houses. The concentration of cyanide in this area is most likely due to spillage during cleaning of the purifier house (Wilson and Stevens, 1981).

Phenolic compounds were found in four soil boring samples at depths of 4 to 11 feet. Concentrations ranged from 0.74 to 3.6 mg/kg. These samples were collected in the vicinity of the former filter beds and the former gas and purifier houses. Phenolics are widely distributed in the environment due to both natural (i.e., vegetative decomposition) and man-made processes. Tars and wastewaters at coal gas plants are a source of phenolics; however, the tars produced by water gas plants such as the one at Mechanicville usually contain only negligible amounts of phenolics.

Surface Soil

No PCBs were detected in any of the surface soil samples that were collected. This includes sample SS-5, which was obtained next to the PCB waste-oil drums. Additionally, no VOCs were detected in samples SS-1 through SS-5. A trace of bromomethane was detected in sample SS-3, but at a concentration below the detection limit for that sample. In addition, this compound was not detected in the duplicate sample, SS-3A.

Cyanide was detected in two surface soil samples, SS-1 and SS-3A (no cyanide was detected in replicate sample SS-3) at 1.8 and 1.9 mg/kg, respectively. Both samples were collected from the area behind the garage offices and storeroom

building, along the upper bank of the Anthony Kill. Several PAHs were detected in samples SS-1 through SS-4, including the duplicate sample. Concentrations of total PAHs ranged from 9.1 mg/kg to 71 mg/kg. No PAHs were detected in sample SS-5. BEHP was found in two samples plus the duplicate sample. Although this compound is a common laboratory contaminant, no BEHP was detected in the laboratory blank, therefore this compound is considered to be present in the surface soil. One other SVOC, di-n-butyl phthalate, was detected in several samples. However, this is also a common laboratory contaminant and was found in the laboratory blank at similar concentrations. Therefore this compound was not considered to be present in surface soils at the site.

Groundwater

Cyanide was detected in all wells except MW-11. The highest levels of total cyanide (0.58 - 0.8 mg/L) were observed at MW-12 during Task 3. During Task 2, a maximum level of 0.42 mg/L was reported at MW-3. Well MW-12 is located downgradient from the former relief gas holder while MW-3 is downgradient from the former purifier/oxide structures.

Volatile aromatic compounds, a subset of VOCs, were detected consistently in all wells except MW-1, MW-2, and MW-11. MW-1, MW-10, and MW-11 are located upgradient of the historical coal gasification plant. MW-2 is downgradient from the former distribution gas holder, but soils data from B-2 and B-7 suggest little or no contamination in this area. Concentrations in the deep bedrock wells (MW-6, MW-13, MW-14, and MW-15) were generally greater than those detected in the shallow wells. Other VOCs, including 1,1,1-trichloroethane, 1,1-dichloroethane, and trichloroethylene were detected in several samples but they are not believed to be site-derived (E.C. Jordan Co., 1989; GRI, 1987).

PAHs were observed in at least one sample from all wells except MW-1, MW-2, and MW-11. The average concentrations of all the samples collected at each well ranged from nondetectable (at MW-1, MW-2, and MW-11) to 750 mg/L at MW-12. The maximum levels of 1,500 and 1,564 mg/L were observed at wells MW-12 and MW-5, respectively. The distribution of PAHs in the groundwater is similar to the distribution in the soil, indicating that contaminated soil is the source of PAHs in the groundwater.

The groundwater sampling data indicate that the detected PAHs are particulate in nature, rather than dissolved species. Some concentrations measured greatly exceed the solubility of PAHs in water. The solubility of PAHs ranges from 0.50 μg/L for dibenzo(a,h)anthracene to 620 μg/L for indeno(1,2,3-cd)pyrene. Thus, the groundwater concentrations must not be indicative of dissolved PAH concentrations. This conclusion is consistent with the sampling protocol, because groundwater samples for organics are not filtered prior to analysis for organic contamination.

Dissolved iron was present in at least one sample from every well. Wells MW-1, MW-2, MW-10, and MW-11, considered to provide the most representative background concentrations, contained concentrations ranging from 0.04 to 1.4 mg/L. The wells with the highest concentrations of dissolved iron were MW-3, MW-4, MW-5, MW-6, and MW-12. These were the same wells that had the highest concentrations of PAHs.

Dissolved zinc was detected at least once in every well. Samples from MW-4 and MW-5 contained unusually high levels (0.52 to 1.09 mg/L). This may be related to the past site usage of zinc acetate. Samples at other wells were fairly uniform (0.01 to 0.11 mg/L). This uniformity suggests that zinc is a natural constituent of site groundwater which has not been elevated by site activities (E.C. Jordan Co., 1989).

Total recoverable phenolics were detected in all wells. The maximum concentration in shallow wells was 17 mg/L while the maximum concentration in deep wells was 0.3 mg/L.

Surface Water

No volatile aromatics were detected in any surface water samples. PAHs were detected once at the location adjacent to the site at a concentration of 0.105 mg/L. Other organics detected during Task 2 included methylene chloride (upstream), acetone (adjacent), and BEHP (all locations). These compounds were found at concentrations less than 0.1 mg/L. They were also found in some sampler and trip blanks. During Task 3, BEHP was found upstream on both sampling occasions at concentrations less than 0.5 mg/L; it was not found adjacent or downstream of the site. These three contaminants (methylene chloride,

acetone, and BEHP), when present at low concentrations, are common laboratory contaminants. It is unlikely that they are derived from the site (GRI, 1987).

Iron was found at all four locations at levels ranging from 0.2 to 1.8 mg/L. The highest concentration was found adjacent to the site. Zinc was detected in at least one sample from three locations; only the downstream sample taken during Task 3 had no detectable zinc. Concentrations ranged from 0.01 to 0.03 mg/L. Phenolics were detected in at least one sample from all locations except the upstream and adjacent locations sampled during Task 3. Cyanide was not detected in any of the Task 3 samples. It was detected in at least one sample in each Task 2 location.

Sediment

Three VOCs were detected in the sediments. During Task 2, Round 3 sampling, benzene and toluene were found at a concentration of 0.07 mg/kg, adjacent to and downstream from the site. During Task 3, ethylbenzene was detected at a level of 0.087 mg/kg adjacent to the site, along with a trace concentration of benzene. These contaminants are associated with coal tar wastes as well as petroleum products and industrial chemicals.

Analysis of Task 2 and Task 3 sediment samples indicated that PAH concentrations adjacent to the site are elevated compared to upstream and downstream sampling locations. Sampling location SD-02 contained trace levels up to 75.8 mg/kg of total PAHs during Task 2 sampling, and trace levels to 5.1 mg/kg during Task 3 sampling.

Concentrations of iron and zinc were fairly consistent in the four locations. Iron concentrations ranged from 7,100 to 33,100 mg/kg while zinc concentrations ranged from 25 to 100 mg/kg. Cyanide compounds were not detected in any Task 2 samples while in Task 3 a cyanide level of 1.3 mg/kg was detected adjacent to the site. Phenolics were detected in Task 2 Round 4 samples at all three locations at comparable levels (1.8 to 6.1 mg/kg). During Task 3, phenolic levels ranged from 0.68 to 2.3 mg/kg.

Indoor Air

The results of the indoor air program revealed low levels of benzene and toluene at most sampling locations. The only exception was benzene not being detected in the background sample. Ethyl benzene and xylenes were below analytical detection limits for all samples.

The highest indoor levels of toluene and benzene were found in the storeroom. A possible source of benzene in the storeroom may be a forklift used in this area. Although the engine was not running during the sampling period, it is possible that residual gasoline vapors had volatilized into the air. Toluene was detected in the background sample at higher levels than two of the indoor samples. It was highest in the garage. It is possible that the sample was affected by vehicle use in the area.

Contaminants of Concern

No contaminants of concern were chosen for surface water or groundwater. This is because there was no indication of site-related surface water contamination, based on the Task 2 and 3 surface water sampling results. Also, groundwater is not a current source of drinking water nor does it represent a potential source for the future. Therefore ABB-ES' evaluation of the risks associated with groundwater consumption is limited to a comparison of the concentrations found to groundwater or drinking water standards.

Chemicals were selected as contaminants of concern in subsurface soil, sediment, and indoor air based upon their concentrations, frequency of detection, and toxicologic properties. All chemicals detected in surface soil samples SS-1 through SS-4 were chosen as contaminants of concern for this medium. All of the contaminants of concern are associated with coal gasification activities.

Both carcinogenic and noncarcinogenic PAHs were detected at a high frequency and magnitude. Of the sixteen PAHs detected at the site, seven have been classified as potential human carcinogens and were selected as contaminants of concern. These include benzo(b)fluoranthene, benzo(k)fluoranthene, benzo(a)anthracene, benzo(a)pyrene, chrysene, dibenzo(a,h)anthracene, and indeno(1,2,3-cd)pyrene. In addition, several PAHs were chosen as contaminants of concern to represent the noncarcinogenic hazards of PAHs. These include

naphthalene, pyrene, acenaphthene, acenaphthylene, phenanthrene, fluoranthene, fluorene, anthracene, 2-methylnaphthalene, and benzo(g,h,i)perylene.

Although iron and zinc were found in all samples, they were not selected because they are of such low toxicity. In addition, levels in soil were similar to background levels at the site, while levels in sediment were within an average background range.

Other compounds such as acetone, bis(2-ethylhexyl phthalate), butylbenzyl phthalate, di-n-octyl phthalate, carbon disulfide, 4-methylphenol and propyl benzene were not chosen because of their low frequency of detection. In addition, some of these compounds are common laboratory contaminants and therefore may not actually be present on the site.

7.1.2 Fate and Transport

Chemicals related to former coal gasification activities are present in the soils and in the shallow and deep groundwater near the former gas plant structures; specifically, the purifier and oxide houses, the relief gas holder, and the filter beds.

The concentrations of seven chemicals (i.e., benzo(a)pyrene, benzene, styrene, total cyanide, iron, regulated organics, and phenolics) in shallow and deep groundwater exceeded the applicable state standards for these chemicals. Benzene and toluene were found in all air quality samples collected, but concentrations did not exceed applicable OSHA, ACGIH, and NIOSH standards.

The primary routes identified for off-site chemical migration are via groundwater in the shallow and deep bedrock fractures, and the silty shale fill. Chemical migration is influenced by an east-trending shallow bedrock trough located downgradient of the relief gas holder.

Migratory pathways for chemical migration or transport off-site include air (primarily during excavation of site soils), surface water, groundwater, and sediments.

Potential receptors for chemicals found at the site include more sensitive segments of the population, including the elderly, young children, and the infirm.

Additionally, people in the vicinity of the site may be exposed to airborne chemicals predominantly during excavation activities.

7.1.3 Risk Assessment

The significant findings of the Risk Assessment are as follows:

- The contaminants of concern identified in the soil and sediment at the Mechanicville site include carcinogenic PAHs and benzene and several noncarcinogens (toluene, ethyl benzene, styrene, PAHs, trimethylbenzene, xylenes, and cyanide).

- For the public health risk assessment, ABB-ES identified probable exposure pathways by which people could come in contact with site-derived chemicals under current and future conditions, assuming no remedial action at the site. These included the following: direct contact with and incidental ingestion of surface soil, subsurface soil, and Anthony Kill sediment, and inhalation of volatile compounds and soil particulates.

- Potential carcinogenic and noncarcinogenic risks to human health were estimated under these assumed exposure pathways. Estimated incremental lifetime carcinogenic risks were within the USEPA target risk range for both the most probable and realistic worst exposure scenarios, for all of the exposure pathways identified. (USEPA guidelines state that the total incremental carcinogenic risk for an individual resulting from exposure at a hazardous waste site should be between 10^{-4} and 10^{-6}; a risk of 10^{-4} is interpreted as an additional 1 in 10,000 chance of an individual developing cancer during a lifetime, as a result of the exposure.)

  The noncarcinogenic Hazard Indices were all well below the cutoff of 1.0 (Appendix G-3), indicating that no significant adverse noncarcinogenic effects would be expected.

- Because Mechanicville site groundwater is not currently used or expected to be used in the foreseeable future as a source of drinking water, public health risks associated with the groundwater are

negligible. Groundwater beneath the site, however, does contain several contaminants at levels above both USEPA and New York drinking water standards.

- It is unlikely that the site is significantly utilized by wildlife because of the industrial nature of the area and the lack of suitable habitats. Aquatic organisms in the Anthony Kill, immediately adjacent to the site, were determined to be the environmental receptors most likely to be affected by site-related contamination.

- Contaminated groundwater from the site is discharging to the Anthony Kill, however, due to the dilution, volatilization of VOAs, and sorption of PAHs to soils (PAHs are relatively insoluble in water), no detectable concentrations of site related contaminants are present in the Anthony Kill.

7.2 CONCLUSIONS

The conclusions from the Tasks 1 through 4 field investigations and analytical programs are summarized as follows:

- The soils and groundwater in the former active plant area contain chemicals related to the coal gasification process.

- Coal gasification wastes in the subsurface environment are a continuing source of chemicals to soil and groundwater, and groundwater is the vehicle of transport.

- Downward seepage gradients within the bedrock trough near North Central Avenue may be carrying chemicals down into shallow and deeper bedrock fractures.

- Chemicals are migrating northeasterly in the groundwater at the site, discharging to the Anthony Kill, and migrating easterly toward the Hudson River. The Anthony Kill is a groundwater discharge zone, however, dilution effects, volatilization and sorption to soils

result in the absence of detectable concentration of VOAs or PAHs in surface water.

- Under current site conditions, the potential for public exposure to the contaminants of concern is low, for two reasons: (1) most of the site is paved or covered with buildings and access to the site is limited, restricting the possibility of contact with contaminated soil or volatilized contaminants; and (2) the groundwater at the site is not used as a drinking water source.

  Therefore, ABB-ES concludes that, under the assumed conditions of exposure, no significant adverse health effects would be anticipated.

- As has been done in the past, the site health and safety plan should be followed during any future exploratory work on the Mechanicville site to prevent or minimize undue exposure.

- The results of the environmental risk assessment indicate that some potential for impacts does exist for aquatic organisms living in the Anthony Kill immediately adjacent to the site. However, these risks appear relatively minor, for several reasons. Few compounds were present at levels in excess of their environmental criteria, the extent of exceedances was minimal, and potential impacts were associated only with "worst case" conditions, with no impacts expected under typical conditions. Also, the amount of benthic habitat is limited due to the streambed morphology and exposed bedrock, with little sediment accumulation.

- Finally, there is no evidence that contaminants are being transported downstream at significant levels. Levels of contaminants in the downstream surface water and sediment samples did not exceed protective criteria, even under the most conservative assumptions.

7.2.1 Data Needs and Recommendations for Future Work

Data needs have been identified that need to be addressed to meet the requirements of the Comprehensive Environmental Response, Compensation, and

Liability Act (CERCLA) for Remedial Investigations. These data needs are as follows:

- Investigate the property north of the Anthony Kill across from the site to determine if a hydraulic connection exists between site groundwater and groundwater north of the Anthony Kill. If a hydraulic connection exists, collection and chemical analyses of groundwater samples may be necessary to determine any impacts to groundwater quality caused by the site.

- Delineate the nature and extent of site-related contamination east of North Central Avenue. An east-trending bedrock trough was identified in the area of the former relief gas holder and a component of groundwater flow at the site is in an easterly direction.

- Investigate the western portion of the site for groundwater and soil contamination due to the possible disposal of wood chips and oxide wastes in this area. The nature of shallow subsurface anomalies identified during the Task 1 GPR survey will also be assessed.

- Several areas on the eastern and western portions of the site were identified as having been storage areas for PCB-containing transformers and capacitors as well as various electrical equipment. Sampling of these areas for PCB contamination is necessary.

7.2.2 Recommended Remedial Action Objectives

To address the data needs identified in the previous subsection, the Phase IIA Supplemental Remedial Investigation Work Plan was developed. On- and off-site investigation activities are proposed to (1) investigate the potential for PCB contamination on the site, (2) to determine the nature and effect of site-derived contamination east of the site, (3) to determine if a hydraulic connection exists between the site groundwater and groundwater north of the Anthony Kill, (4) to further define the areas and rates of site groundwater discharge to the Anthony Kill, and (5) to assess the potential for site related contamination on the western portion of the site.

8.0 PHASE IIA SUPPLEMENTAL REMEDIAL INVESTIGATION WORK PLAN

This section outlines the proposed supplemental Remedial Investigation (RI) activities to be implemented by NYSEG. A site-specific Health and Safety Plan (HASP), a Quality Assurance Project Plan (QAPP), and a Citizen Participation Plan (CCP) have been developed in conjunction with this proposed supplemental RI work plan and are contained in Appendices H, I and J, respectively.

8.1 REMEDIAL INVESTIGATION AND TECHNICAL APPROACH

ABB-ES has prepared this Phase IIA Supplemental Remedial Investigation Work Plan for NYSEG under Contract No. 85S-159, Investigation of Former Coal Gasification Sites. This work plan outlines the scope for site investigations to be performed under Task 5, as a supplement to previous site investigations conducted under Tasks 1 through 4 at the Mechanicville site. All supplemental RI work will be conducted under the site-specific HASP and QAPP developed in conjunction with this work plan.

8.1.1 Project Background

Previous work completed on the Mechanicville site has been described in Sections 1 through 7 of this report. The work consisted of four basic tasks. Task 1, the Preliminary Site Evaluation, included the collection of historical data, interviews, site reconnaissance, and a geophysical investigation. Task 2, the Initial Field Investigation Program, included test pits, soil borings, monitoring well and piezometer installation, groundwater, surface water, sediment, and soil sampling and analyses, a site survey, and a preliminary land use survey. Task 3, the Expanded Problem Definition Program, consisted of an additional geophysical survey, soil borings, monitoring well installation, groundwater, surface water and sediment sampling, air monitoring and a site survey. Task 4 was a Risk Assessment based on the findings in Tasks 1 through 3.

Although no significant public health or environmental risks were identified during Tasks 1 through 4, this Phase IIA Supplemental Remedial Investigation Work Plan has been developed to address NYSDEC's request for additional site characterization.

8.1.2 Objectives for Supplemental Work

The objective of this work plan is to establish a program of further investigation of the site that will address concerns offered by NYSDEC. ABB-ES has developed a scope of work to further define the distribution of coal gasification waste products off-site and PCB contamination both on-site and off-site. The objectives to be addressed by this supplemental remedial investigation and the scope of work proposed to meet each objective are shown in Table 8-1.

This work plan is organized as follows: Section 8.2 outlines the Field Sampling and Analysis Plan; Section 8.3 describes the report to be generated as a result of these investigations; and Section 8.4 presents the proposed project schedule.

8.2 Field Sampling and Analysis Plan

8.2.1 Technical Approach

This subsection describes the technical approach for the supplemental RI to be conducted at the Mechanicville site and includes a summary of the following components:

- geophysical investigation
- soil investigation
- hydrogeologic investigation
- sediment investigation
- seepage meter investigation

Geophysical Investigation

A seismic refraction survey will be conducted on the property occupied by a Price Chopper supermarket east of the site, directly across North Central Avenue and adjacent to the Anthony Kill, to identify the depth and configuration of the bedrock surface and track the east-trending bedrock trough which was identified at the eastern site border across the Price Chopper property. The area to be covered by the seismic refraction survey is shown in Figure 8-1.

Soil Investigation

The soil investigation is designed to investigate, among other things, the presence of contaminants related to the former MGP operations in the subsurface soils. The soil investigation will gather information on:

- subsurface soil conditions east (downgradient) of the site where previous on-site investigations have indicated probable off-site migration of MGP contaminants;
- subsurface soil conditions west of the site in the upgradient portion of the property;
- shallow subsurface soil conditions in areas formerly used for transformer, capacitor and other miscellaneous electrical equipment storage; and
- shallow subsurface soil conditions west of the site (not historically occupied by MGP operations) where wood chips and spent oxide wastes may have been periodically disposed.

Three types of soil explorations will be conducted at the site: soil borings to the bedrock surface, bedrock coring, and shallow subsurface soil sampling. The locations of these explorations are shown in Figure 8-1. Permission from private property owners will be necessary to conduct explorations east of the site. A total of three soil borings are planned to be completed as monitoring wells. Three additional borings and two additional monitoring wells may be installed if visible evidence of contamination is encountered in the initial downgradient boring.

Generally, soil samples will be submitted for laboratory analyses based on field observations and PID screening results. A boring log will be prepared for each boring location containing among other things, the results of field observations and PID screening.

Shallow subsurface samples will be collected west of the site to assess the potential presence and impact of chemical residues from spent oxide wastes and wood chips on the soils. Wood chips were used as a bulking agent with iron oxides for hydrogen sulfide removal from the manufactured gas. Sample locations SS-20 through SS-24,

shown in Figure 8-1, will be sampled as composites for 0 to 12 inches below the surface if unpaved or from the 12 inch interval immediately below the pavement. It is not known for how long the site has been paved, but it was probably subsequent to closure of the MGP since the railroad tracks and demolished structures are buried and paved over.

Shallow subsurface samples will also be collected from the six electrical equipment storage areas shown on Figure 8-2. Each storage area will be subdivided into four equal-sized areas. Four samples will be collected from each sub-area from the 3- to 12-inch depth interval and for PCB analysis from each storage area. Additional samples will be collected at locations other than the six storage areas if visible evidence of oil stains is encountered.

Hydrogeologic Investigation

The objectives of the hydrogeologic investigation are to: characterize the quality of groundwater in the overburden and shallow bedrock east of the site; characterize the quality of upgradient groundwater west of the site; determine the groundwater flow direction west and east of the site; and determine the relationship between groundwater underlying the site, the Anthony Kill, and groundwater north of the Anthony Kill.

A total of three monitoring wells will be installed, two overburden wells (MW-16 and MW-17) and one bedrock well (MW-18). An additional two monitoring wells may be installed downgradient of MW-17/MW-18 if visible evidence of contamination is encountered in these borings.

A total of eight piezometers will be installed along the banks of the Anthony Kill (P-3 through P-10) to determine groundwater surface elevations adjacent to the Anthony Kill (see Figure 8-1). Four piezometers will be installed along each bank, two adjacent to the site and two downstream of the site. The exact locations of the downgradient piezometers will be determined through interpretation of seismic refraction survey data indicating probable areas of site groundwater discharge to the Anthony Kill. Water levels from each of these piezometers will be obtained during both groundwater sampling rounds. Water surface elevations in the Anthony Kill adjacent to the piezometers will also be measured to determine if recharging or discharging conditions exist.

Sediment Investigation

Sediment samples will be collected along the southern bank of the Anthony Kill to aid in the placement of seepage meters in groundwater discharge zones and to determine the presence of MGP related constituents. Sample locations will be determined through visual observations of stream bank conditions. A minimum of six sediment samples will be collected for laboratory analysis; approximate location are shown in Figure 8-1. Where sufficient sediment thickness allows, two to three depth intervals will be sampled at each location to profile potential discharge zones. These samples will be screened with a PID meter and also infrared spectroscopy (IR) and ultraviolet fluorescence (UV) methods to detect the presence of total petroleum hydrocarbons (TPH) and polynuclear aromatic hydrocarbons (PAH), respectively. Samples to be submitted for laboratory analysis will be based on the screening results.

Seepage Meter Investigation

Seepage meters will be installed at approximately three locations along the southern bank of the Anthony Kill adjacent to the site and at approximately two locations downstream of the site, depending on the number of discharge areas identified based on piezometer levels and sediment sample field screening. Discharge rates will be measured and seep water analytical samples will be collected if discharging conditions are encountered.

8.2.2 Geophysical Investigation

The seismic refraction survey will be conducted on the property occupied by Price Chopper east of the site, directly across North Central Avenue. The area to be covered by the seismic refraction survey is shown in Figure 8-1. The seismic refraction profiling method is an indirect means of determining the thickness and velocity values of the various seismic layers underlying a site. There is often a direct correlation between geologic strata and the layers defined during a seismic refraction investigation. For the Mechanicville site, the focus of seismic refraction will be to characterize the bedrock surface.

Seismic refraction is based on the measurement of the time required for elastic waves, generated at a point source with either a weight impact (sledge hammer) or small buried charges of explosives to travel to a series of sensitive listening devices

called geophones, or seismometers. Geophones are placed at known intervals along a straight line on the ground surface and connected by special multi-conductor cables to the 24-channel seismograph. The seismograph records the elastic wave arrivals from the energy source along the seismic spread, acquiring separate data for each geophone position.

The data are interpreted by first accurately measuring the individual transit times at each geophone position, then constructing a graph of these times versus their distance from the energy source. The geophysicist then determines by inspection of the time-distance graphs the number of subsurface seismic layers present. Straight line segments of best fit are drawn onto the graph, each layer being represented by a line of different slope. The inverse of the slope of each line is the (apparent) velocity value for each layer. The distance from the origin (or energy source) of the "crossover point" between two layers is proportional to the thickness of the overlying layer.

The identification of various materials can be made with a knowledge of seismic velocity values based on other engineering studies, and on correlations with various test borings taken near seismic lines. The results of the seismic refraction survey will be used to place the downgradient borings/monitoring wells in the bedrock trough and/or the interpreted groundwater migration pathway and will be included in the Phase IIA Supplemental RI Report.

8.2.3 Soil Investigation

8.2.3.1 Soil Borings. The rationale for each soil boring is shown in Table 8-2. Anticipated boring locations are shown on Figure 8-1. Borings B-16 and B-17 will be completed to bedrock. The depth of these two borings are estimated to be 10 feet and 30 feet bgs, respectively. Boring B-18 will be drilled to bedrock, (approximately 30 feet bgs) then cored 15 feet into bedrock. Borings B-16 through B-18 will be completed as monitoring wells. If visible evidence of soil contamination is encountered in B-17, three additional borings (B-19, B-20, and B-21) will be completed to bedrock (estimated 40-foot depth) approximately 100 feet further east of the site in a line perpendicular to any bedrock valley observed to provide additional information on the extent of soil contamination east of the site. If visible evidence of contamination is encountered in the MW-17 or MW-18 borings, one to two additional borings/monitoring wells will be installed behind the Price Chopper

building downgradient from MW-17 and MW-18 to provide additional information on the extent of groundwater contamination further east of the site.

All borings completed to the bedrock surface (except B-18) will be drilled by using 4.25-inch inner diameter (ID) hollow-stem augers with continuous 3-inch outer diameter (OD) split-spoon sampling. B-18 will not be sampled since it is adjacent to B-17. Boring B-18 will be advanced 15 feet into bedrock by NX-coring. Core samples will be taken continuously. For boring B-18, the double-cased drilling technique will be used since it is anticipated that a confining silty sand layer potentially overlain by coal tar will be encountered 1 to 2 feet above the bedrock surface as observed in borings B-12 and B-13 completed during Task 3. Drilling methods are described in the NYSEG contract QAPP (Jordan, 1986c).

Field observations will be made on all soil samples collected from the borings and logged with respect to geologic/soil characterization. All information from soil borings will be logged by an ABB-ES geologist according to the procedures outlined in the NYSEG Contract QAPP (Jordan, 1986c). Split-spoon samples will also be field-screened for coal-tar related residues by visual observations and odor, and for VOCs by use of a PID. At a minimum, one soil sample from each boring will be submitted for laboratory analyses based on field observation and PID screening results.

Selected soil boring samples will be submitted to NYSEG for laboratory analysis of volatile organics (NYSDEC ASP 91-1), semivolatile organics (NYSDEC ASP 91-2), reactive cyanides (USEPA Method 9010) and reactive sulfide (USEPA Method 9030) and inorganics (see Section 8.2.8).

Cuttings generated by the hollow-stem auger technique will be placed into 55-gallon drums, labeled, covered, and stored within the site property boundaries, pending subsequent testing for hazardous waste characteristics and disposal by NYSEG. Wash water generated by the double-cased method will be transported to the site and, after settling of solids, the supernate along with the decontamination water, will be allowed to infiltrate into an on-site groundwater recharge pit. The area used as a recharge pit will be covered with clean soil when it is no longer needed in accordance with NYSDEC TAGM "Disposal of Contaminated Groundwater Generated During Remedial Investigation". Settled solids will be stored on-site in 55-gallon drums along with the drill cuttings.

8.2.3.2 Shallow Subsurface Soil Sampling. A total of six (five plus one duplicate) shallow subsurface soil samples will be collected from the west of the site (SS-20 through SS-24) as shown in Figure 8-1. The rationale for these samples, as indicated in Table 8-2, is to evaluate whether chemicals from reported disposal of spent oxide wastes and wood chips are present on this area of the NYSEG property. Samples will be collected with a stainless steel trowel or spoon or a spade from 0 to 12 inches below the pavement (or bgs if unpaved) and composited. Samples will be submitted to NYSEG for laboratory analyses of reactive cyanide (USEPA Method 9010) and sulfide (USEPA Method 9030).

A total of 27 shallow subsurface samples (SS-25 through SS-48 plus three duplicates) will be collected from the six electrical equipment storage areas shown on Figure 8-2. Each storage area will be subdivided into four equal-sized areas. Four samples will be collected from each sub-area from the 3- to 12-inch depth interval and composited, resulting in four composite samples for PCB analysis from each storage area. The sample grid spacing is further described in the QAPP (Appendix I). Additional samples will be collected at locations other than the six storage areas if visible evidence of oil stains is encountered. Samples will be collected with a stainless steel trowel or spoon or a spade. Samples will be submitted to the NYSEG laboratory for PCB analysis (NYSDEC ASP 91-3) (see Section 8.2.8).

8.2.4 Hydrogeologic Investigation

8.2.4.1 Monitoring Well/Piezometer Installation. This program is proposed to further characterize the distribution of the groundwater plume downgradient of the site (MW-17, MW-18, and possibly MW-21 and MW-22) and to provide additional upgradient groundwater quality information (MW-16). The monitoring wells will be constructed of 2-inch OD stainless steel. The final location of the downgradient wells will be based on a review of current on-site groundwater level measurements, the seismic refraction survey, and property access. All new monitoring wells will be surveyed into the existing Mechanicville site monitoring well network following their installation. These wells will also serve to better define the groundwater flow direction downgradient of the site. The monitoring well pair, MW-17/MW-18, will also be useful in determining the presence of vertical gradients between the bedrock and the overburden.

Proposed locations of the wells are shown in Figure 8-1. Permission from private property owners will be necessary to install all off-site wells and piezometers as they

are currently located. A description of the drilling methods to be used for the monitoring well borings is contained in Section 8.2.3.

In addition to the monitoring well installations, eight 1-inch PVC piezometers (P-3 through P-10) will be installed with a hand auger or hand driven into the ground to a depth of no greater than five feet along both banks of the Anthony Kill as shown in Figure 8-1. Well point piezometers will serve as groundwater level measurement points to be incorporated into the shallow groundwater flow contour maps for the Mechanicville site and, in conjunction with measured surface water elevations, used to indicate discharging or recharging conditions. This will enable better evaluation of shallow groundwater flow directions, gradients, and velocities from the site to these areas. These piezometers, in conjunction with water level data from the overburden/bedrock monitoring well pair MW-15/MW-5, will also indicate determine the presence of vertical gradients along the Anthony Kill, adjacent to the site. The rationale and proposed depths for all monitoring wells and piezometers are presented in Table 8-2.

In general, specific details of the monitoring well installations are provided in the QAPP (Appendix I). Any deviations from the installation specified in the QAPP must be approved by both NYSEG and NYSDEC. Monitoring wells will be installed according to NYSEG procedures for monitoring wells and piezometers of former coal gasification plant sites (NYSEG, 1989). Based on previous site information, it is anticipated that well screens will be stainless steel, 10-slot (0.010 inch screen), with silica sand filter pack. The sand will be No. 0 Morie sand, with the uppermost six inches of the sand pack being No. 00 Morie sand, a finer material. A monitoring well installation report, including individual well construction details, will be prepared.

The preferred well development technique will be the surge (or surge-block) technique. During this development technique, in situ well water is forced out, and pulled into the well screen. This technique will draw silt-sized material entrained within the sand filterpack during well installation into the well. The accumulated silt within the well can then be periodically removed by bailing or pumping the well. The advantage of this development technique is that it will generate less water than continuous pumping development or air-lift development and it effectively removes fine-grained sediments surrounding the well screen. If this technique is not effective, the pumping or air-lift methods will be used as alternates. The development water generated will be pumped into closed-top 55-gallon drums and transported to the

site. The development water will be allowed to infiltrate into an on-site groundwater recharge pit. The area used as a recharge pit will be covered with clean soil when it is no longer needed in accordance with NYSDEC TAGM "Disposal of Contaminated Groundwater Generated During Remedial Investigation".

8.2.4.2 Hydraulic Conductivity Testing. As part of this task, rising-head permeability tests will be conducted on all new wells to determine the horizontal hydraulic conductivities of the geologic strata being monitored. Rising-head tests will be performed by temporarily depressing the water level in the wells, using compressed air or a slug, and recording time and water level recovery using an in situ Hermit data logger and pressure transducer or water level indicator.

8.2.4.3 Water Level Measurements. Water level measurements will be taken at existing monitoring wells and piezometers associated with the site with an electronic water level meter using the top of the riser pipe as the reference datum. Elevations of top of risers of new monitoring wells will be surveyed subsequent to installation. Surface water elevations will be established in reference to adjacent piezometers. Water level measurement procedures are outlined in the site-specific QAPP in Appendix I.

8.2.4.4 Groundwater Sampling and Analysis. The well installation program will be followed by one round of groundwater sampling of all wells. Data quality requirements for the groundwater sampling are presented in Section 8.2.8. Sample collection procedures are described in the site-specific QAPP in Appendix I.

Groundwater samples will be analyzed in the field for temperature, pH, and conductivity and sent to a laboratory for analysis of volatile organics (NYSDEC ASP 91-1), semivolatile organics (NYSDEC ASP 91-2), inorganics, and turbidity. Subsection 8.2.8.1 details the sample analysis parameters.

8.2.5 Sediment Investigation

The sediment sampling and screening will be conducted on samples collected from the southern bank of the Anthony Kill, adjacent to and downstream of the site. Sample locations will be determined in the field through visual observation of the stream bank conditions (i.e., stained sediments, flowing seeps, stressed vegetation) and evaluation of the hydrogeology of the site incorporating the additional wells and piezometers. A minimum of seven sediment samples (SD-1 through SD-6 plus one

duplicate) will be collected for laboratory analysis of volatile organics (NYSDEC ASP 91-1), semivolatile organics (NYSDEC ASP 91-2), inorganics, total organic carbon, reactive cyanide (USEPA Method 9010) and reactive sulfide (USEPA Method 9030). Approximate locations are shown in Figure 8-1. Sediment sampling and field screening will be used to locate seepage meter investigation areas by identifying areas of the stream bank containing site-related chemicals. The sediment sampling rationale is contained in Table 8-2.

Sediment samples will be collected using stainless steel spoons or trowels, teflon or glass coring tubes in shallow surface water, and gravity cores in deeper waters as outlined in the site-specific QAPP in Appendix I. Samples will be collected at two to three depths at each location to profile sediment quality in potential discharge zones. If no sediment deposits are available, samples will be collected from the submersed interface of the bedrock and the streambank overburden.

All sediment samples will be examined in the field for visual signs of contamination and screened using a PID meter. Sediment samples collected will also be tested for the presence of PAH and TPH using the UV fluorescence and IR spectroscopy screening methods.

The UV fluorescence screening procedure involves the extraction of a soil sample in an organic solvent and comparison of the fluorescence of the extract to the fluorescence of a known standard which can be either a specific PAH or a mixture of PAH. Since many other extractable organics, including naturally occurring compounds, also fluoresce; this screening can produce false positive results. However, the absence of fluorescent matter in a sample generally confirms the absence of medium to high levels of manufactured gas plant contaminants. The degree to which false positives are encountered is related to subsequent site uses, presence of natural lignite in soils, and vegetation.

The IR screening procedure is an adaptation of the laboratory procedure for measuring TPH. The adaptations are primarily related to sample volumes and extraction protocols which result in reduced analytical times. The results of TPH screening are more variable than laboratory results but provide useful data, especially where elevated levels (i.e., greater than 250 parts per million) are encountered. These screening results will be used to select which sediment samples will be submitted for laboratory analysis.

8.2.6 Seepage Meter Investigation

The purpose of the seepage meter investigation is to determine seepage rates of site-derived groundwater into the Anthony Kill and determine the quality of seep water both adjacent to and downgradient of the site.

Seepage meters will be installed at approximately three locations adjacent to and two locations downstream of the site. The exact location and number of seepage meters actually installed will be determined by visual observation of the stream bank for stained sediments or flowing seeps and field screening of sediment samples for TPHs and PAHs. Therefore, seepage meter locations are not shown on Figure 8-1. The rationale for the seepage meter location is summarized in Table 8-2.

Design specifications and interpretative methods for the data collected from the seepage meters are contained in the site-specific QAPP located in Appendix I. A brief description of seepage meter construction follows.

Seepage meters are constructed of 55-gallon, steel drums, cut in half along the horizontal plane. A 3/8-inch ID section of threaded pipe is fitted through the end of the drum with rubber washers and two nuts on either side of the drum end. The nuts are tightened to create a water-tight seal around the pipe, and each drum is checked for leaks.

A rubber hose is then fitted to the pipe, the other end of which is connected to a plastic bladder bag obtained from a medical supplier. The bag is equipped with a one-way valve on the drum end of the bag, and a flip valve for emptying the other end of the bag. The drum and bag are then fully submersed in water and pressed firmly into the stream bottom. Because the drums have neutral buoyancy, they must be anchored. To ensure no disturbance or movement, a wooden stake is driven adjacent to each drum, and a 3-inch-thick cinder block is slipped over the stake, to rest on top of and secure the drum. The bag is then submersed under water with a sinker. This completes the seepage meter installation; each stake is marked to identify the meter.

Flow into the meter through the stream bed is measured by closing the flip valve on the bag and allowing the bag to fill for several hours or days. The volume of seepage water collected in the bag over a measured time interval provides a groundwater seepage rate into the Anthony Kill for the area covered by the seepage meter.

Seepage water will also collected and submitted for laboratory chemical analyses for volatile organics (NYSDEC ASP 91-4), semivolatile organics (NYSDEC ASP 91-2), and inorganics (see Section 8.2.8).

If seepage meters prove ineffective in collecting seepage water, surface water samples of the Anthony Kill will be collected from the approximate locations that the sediment samples will be collected.

8.2.7 Site Survey

Subsequent to field sampling activities described in Subsections 8.2.3 through 8.2.6, a location and elevation survey will be conducted to horizontally locate all Phase IIA exploration locations and vertically locate monitoring wells, and piezometers. The coordinate system established for Tasks 1 through 3 will be used for this survey.

8.2.8 Sample Analyses/Data Quality

8.2.8.1 Sample Analysis Plan. Table 8-3 presents the sample analysis plan, including samples to be collected, the media and investigation from which they are generated, expected number of samples, analyses, and data quality objective (DQO). Footnotes at the bottom of the table provide sample-specific information. NYSEG laboratories will coordinate all analytical services, and when analyses must be performed by a New York State certified laboratory (i.e., for Level IV data quality) they will subcontract, to one or more of the following: Galson Laboratories in Syracuse, New York; Friend Laboratories in Waverly, Pennsylvania; and UPSTATE in Syracuse, New York. All analytical laboratories used by NYSEG for this site will be certified by the NYSDOH for ELAP-CLP category and will maintain their certification throughout the duration of the project.

8.2.8.2 Data Quality Validation. Two levels of data quality, USEPA Level III and Level IV (USEPA, 1988; USEPA, 1989b), are needed for the soil, groundwater and seep samples submitted for analyses in order to perform the two levels of data validation required. The specific levels of validation for each individual sample are shown in Table 8-3. All samples undergoing NYSDEC ASP analyses will have Level IV validation; all other samples will have Level III validation. Level III allows the use of non-contract laboratory program (CLP) methods, but requires that the analytical methods be accepted by EPA; the data is typically used for risk assessment, site characterization, alternative evaluation, and engineering design. Level IV data

quality will require New York State Analytical Services Protocol (ASP) methods and data packages similar to the contract laboratory program (CLP), and the data is used for risk assessment, alternative evaluation, and engineering design for sites that are near heavily populated areas, or are likely to undergo litigation. For Level IV validation, 10% of the samples will undergo full validation and 90% will undergo blank validation only.

ABB-ES or another environmental consultant will be providing third-party validation and review of analytical results. The validation of analytical measurements consists of a systematic process of reviewing data to provide assurance that the data are adequate for their intended use. Performance verification will be done for all data. During performance verification, the Chain of Custody and Analytical Request Forms (ARFs) are reviewed to determine if the analytical method requested is the method the laboratory used. Blank corrections will also be made to the data based on instrument method blank results. These activities are included in Level III data validation procedures. Level IV or full validation (i.e., according to New York State ASP and USEPA CLP protocols) requires more thorough quality control (QA/QC) documentation. Level IV validation will include the following activities:

- reviewing measurement system calibration and calibration verification;
- reviewing quality control activities;
- reviewing field sample data records and chain-of-custody;
- reviewing intermediate calculations; and
- certifying the process.

8.3 Data Analysis/Report Preparation

The report on the Phase IIA Supplemental Remedial Investigation will present an expanded understanding of: the distribution of site-related chemical in soil, groundwater and sediments both on-site and off-site; the discharge rate of site-related chemicals to the Anthony Kill; and the relationship between groundwater beneath the site, north of the site, and the Anthony Kill. The report will also present a discussion of potential impacts on downgradient areas and proposed interim remedial

actions identified as a result of the proposed focused feasibility study (see Section 9.0). The report will first be issued as a draft to NYSEG for internal review and then for submittal to NYSDEC for review. The Phase IIA Supplemental Remedial Investigation Report will address the following issues:

- summary of previous investigations and reports; and Phase IIA activities
- summary of site history to include uses of western portion of the site;
- expanded understanding of site hydrogeology and downgradient hydrogeology;
- characterization of groundwater seepage areas in the Anthony Kill;
- distribution of site-related chemicals in surface soils across the site;
- distribution of chemicals in groundwater on- and off-site;
- review of regulatory standards and guidelines with respect to additional data;
- review of risk assessment with respect to additional data; and
- conclusions of supplemental investigations, review of proposed remedial actions, and recommendations for any further actions.

8.4 SCHEDULE

The tentative schedule for Phase IIA Supplemental RI activities and compilation of the associated report is shown in Figure 8-3. This supplemental site investigation and report preparation is anticipated to take 7 months, though the schedule presented in this report is subject to negotiation.

9.0 PHASE IIA FOCUSED FEASIBILITY STUDY WORK PLAN

This Focused Feasibility Study Work Plan was prepared by ABB-ES for a Focused Feasibility Study (FFS) for the Mechanicville former MGP site (the Site) located in the City of Mechanicville, Saratoga County, New York. The purpose of the FFS is to develop a remedial measure that will reduce or mitigate the release of site-related contaminants to the section of the Anthony Kill adjoining the Site.

Brief descriptions of the Mechanicville Site and the investigative activities performed to date are presented in Section 8.1 of this work plan. The remedial objectives for the Site are discussed in Section 8.2. The technical approach to the FFS, including a general description of the remedial alternatives to be evaluated, is presented in Section 8.3. ABB-ES' project organization and a proposed project schedule are provided in Sections 8.4 and 8.5, respectively.

9.1 Background Information

The FFS will be based on Site data presented in five reports prepared previously: (1) Preliminary Site Evaluation - Task 1 (August 1986); (2) Quality Control/Quality Assurance and Health and Safety Plans (November 1986); (3) Initial Field Investigation Program - Task 2 (December 1987); (4) Expanded Problem Definition Program - Task 3 (September 1989); and (5) Final Risk Assessment Report - Task 4 (August 1990). The remainder of this section briefly summarizes findings from these documents.

The Site is located in Mechanicville, Saratoga County, New York. The Hudson River forms the northeastern and eastern boundaries of Saratoga County; the Mohawk River, which is the largest tributary to the Hudson, forms the southeastern boundary. The Anthony Kill, a small tributary, flows into the Hudson River at Mechanicville. The Mechanicville Site is adjacent to the Anthony Kill, one quarter-mile upstream from its confluence with the Hudson River.

The Champlain Canal once bordered the Site on the east. Completed in 1823, the canal connected the Hudson River at Waterford (south of Mechanicville) to Lake Champlain. The canal flowed through Mechanicville along what is now

Central Avenue. Like the present roadway, the canal was elevated and the water surface was approximately 10 feet above the gas plant site. The hand dug canal was approximately 12 feet deep and 30 feet wide. The Champlain Canal, abandoned in 1916 when the Barge Canal opened, became a receptacle for garbage, debris, and junk before it was completely filled with soil by the City of Mechanicville in 1917. Later, the state dug up the canal, removed the trash and debris, and prepared the roadbed for Central Avenue.

The Site housed a coal gasification plant operated by NYSEG predecessor companies from 1901 until 1955, at which time coal gas production was terminated because of the availability of natural gas. Most of the aboveground structures were demolished at the time of closure and removed. Only the original boiler room/substation building and office building remain on the Site.

After closure of the Mechanicville gas plant in 1955, NYSEG converted the Site to a natural gas and electric service center. The former boiler room/substation building was converted to offices, a garage, and a storeroom. The office was used as a storage building and tool house. Most of the Site is occupied by buildings or is paved. The service center operation was relocated in October of 1990 and the Site is currently unoccupied. Access to the Site is controlled by fencing to the east, south, and west, and the Anthony Kill to the north.

The Initial Field Investigation (Task 2) and Expanded Problem Definition (Task 3) Programs detected the presence of chemicals related to former coal gasification activities. They included VOCs, SVOCs including PAHs, and metals. These were found in both the soil and shallow and deep groundwater samples collected near the former plant structures, specifically the purifier and oxide houses, the relief gas holder, and the filter beds.

The subsurface MGP wastes are a source of chemicals to soil and groundwater, thus making groundwater a vehicle of transport. Compounds are migrating northeasterly in the groundwater potentially discharging to the Anthony Kill. However, Site-derived compounds were not found at elevated levels in surface water samples collected downstream of the Site, which suggests that compounds are not entering the stream in sufficient quantities to be detected. Notwithstanding, NYSEG wishes to evaluate, via the FFS, remedial alternatives which would reduce or eliminate the release of Site-related contaminants to the section of Anthony Kill adjoining the site.

9.2 RESPONSE OBJECTIVES

The purpose of the Mechanicville FFS is to develop, screen, and evaluate potential remedial alternatives to reduce or eliminate the release of Site-related contaminants to the section of Anthony Kill adjoining the Site. Specifically, the reduction or elimination of the release of Site-related contaminants to the Anthony Kill will be evaluated in terms of the following migration pathways:

- the movement of coal tar into Anthony Kill; coal tar was observed in subsurface explorations to be present above a confining silt layer 1 to 4 feet above the bedrock surface

- the discharge of Site-contaminated groundwater to the Anthony Kill or to downgradient areas.

The FFS will address primarily the contaminated flow component from the Site. Information from previous reports indicates separate flow components off Site to the north to the Anthony Kill and to the east toward North Central Avenue.

9.3 TECHNICAL APPROACH

The feasibility study will serve as the process to identify and evaluate remedial alternatives selected for the Site. Through guidance provided by the USEPA, the feasibility study offers a flexible process familiar to most environmental regulatory agencies that can be tailored to the specific response objectives determined for the Site. Because the Site objectives are well defined and restricted to source control only, a focused study is proposed.

The Mechanicville FFS alternatives development process begins with identification of technologies that will either stand alone or be combined to form remedial alternatives. A summary of the alternatives development planned for the Site follows.

9.3.1 Remedial Technologies Identification

Remedial technologies were identified based on a review of literature and experience in developing other feasibility studies. Three technologies have been

identified to control the migration of contaminated groundwater and/or coal tar: barrier walls, subsurface drains, and extraction wells. These technologies were determined to be potentially applicable to attain the stated response objectives.

Three types of barrier walls to restrict lateral coal tar flow in the overburden soils and divert or contain groundwater flow will be evaluated: grout curtains, slurry walls, and driven sheet piles. Grouting is a process in which a fluid material is injected into a soil or rock mass to reduce water movement or impart increased strength to the formation. Once in place within the formation voids, the fluids solidify or gel, thus greatly reducing the permeability and imparting increased mechanical strength to the grouted mass.

Slurry walls are formed through a slurry trench construction process. A trench is excavated through or under a slurry of bentonite clay and water. The trench is then backfilled with an engineered mixture of materials having the desired permeability properties.

Sheet pile driving can be used to construct a high strength, low-permeability barrier wall without the need for excavation. Interlocking steel sheet piles are driven into the ground with a drop or vibratory hammer. With time, fine soil particles are washed into the seams and water cutoff is affected. For applications in very coarse soils, it is possible to grout the piling seams.

Considerations in the barrier wall evaluation will be ease of installation, effectiveness at meeting the response objectives, costs, contaminated soil disposal, chemical interactions with site contaminants, and ease of maintenance or repair. A single barrier wall structure will be chosen from the three evaluated. The chosen barrier will be incorporated into those alternatives that include a barrier wall for containment or diversion of groundwater.

Subsurface drains are essentially a buried conduit used to collect groundwater by gravity flow. Subsurface drains can be used to contain or remove a leachate plume or to lower the groundwater table near a disposal site to prevent contact of water with waste materials. Subsurface drains can be applied with liners or other barrier materials to restrict inflow to one side of the drain (one-sided drain). They may also be used in conjunction with groundwater cutoff barriers to prevent buildup of groundwater upgradient of the barrier.

An evaluation of one-sided and two-sided subsurface drains will be conducted in the FFS to determine the most effective configuration for attaining the desired effect or hydraulic gradients and water levels.

Extraction wells may be applicable at the Mechanicville Site to: (1) lower the groundwater table to reduce water contact with Site contaminants; (2) contain the plume through manipulation of the hydraulic gradient; and (3) remove and treat the contaminated groundwater and flush the contaminated soil.

9.3.2 Remedial Alternatives Development

Six alternatives that have the potential to mitigate contaminant migration to the Anthony Kill, plus a no action alternative were identified. The seven alternatives are:

- No Action
- Downgradient Subsurface Drains
- Downgradient Barrier Wall
- Downgradient Extraction Wells
- Downgradient Barrier Wall with Extraction Wells
- Upgradient Subsurface Drains
- Upgradient Subsurface Drains with Downgradient Barrier Wall

1. No Action - The no action response does not consider the implementation of any remedial technologies or process options. Therefore, human health and environmental risks of exposure to existing contamination at the Mechanicville site would not change. The No Action option is retained for consideration in accordance with National Contingency Plan (NCP) regulations and CERCLA, as amended. The No Action Alternative provides a baseline of comparison for other technologies and process options.

2. Downgradient Subsurface Drains - This alternative involves the installation of a one-sided subsurface drain to intercept and collect contaminated groundwater and possibly coal tar, thereby minimizing the amount of contamination discharging from the site into the Anthony Kill. Major issues to consider include placement of drains relative to existing structures, disposal of contaminated soil, treatment of contaminated

groundwater, clogging the drain with coal tar, and evaluation of head differential across a one-sided drain system due to lowering of the groundwater table.

3. Downgradient Barrier Wall - In this alternative, the mitigation of coal tar discharge to the Anthony Kill will be evaluated. This alternative would potentially reduce the loading of coal tar on the Anthony Kill sediments. Major issues to be considered include mounding of coal tar behind the wall and possible excavation of contaminated soils (with slurry wall option).

4. Downgradient Extraction Wells - In this alternative, downgradient extraction wells would be installed to intercept contaminated groundwater discharge to the Anthony Kill. This alternative could also be designed to achieve contaminant flushing and aquifer restoration. Major issues include well spacing and placement relative to existing Site structures, and treatment of contaminated groundwater.

5. Downgradient Barrier Wall with Extraction Wells - This alternative involves the installation of a low-permeability downgradient barrier wall to minimize contaminated groundwater and coal tar migration to the Anthony Kill. Extraction wells would be utilized to remove the excess groundwater for treatment and maintain the desired water table elevation. This alternative could be modified to achieve a groundwater remediation scenario. Major issues to be considered include potentially contaminated soil excavation (with slurry wall option) and demolition of existing structures.

6. Upgradient Subsurface Drains - This alternative would be designed to intercept upgradient groundwater and divert it into the Anthony Kill, thereby minimizing flow across the Site and contaminant migration into the Anthony Kill. This would be the alternative with the lowest cost and could be upgraded at a later time to include groundwater extraction and treatment. Because the surface of the Site is paved, recharge would be minimal as would groundwater discharge from the Site. The major issue to contend with here is the maintenance of minimal head differential across a one-sided drain.

7. Upgradient Subsurface Drains with Downgradient Barrier Wall - In this alternative, an upgradient subsurface drain diverts uncontaminated groundwater away from the Site and a downgradient barrier wall prevents off-site migration of coal tar. This would result in a reduced volume of water migrating onto the Site and a reduction in the migration of coal tar off site. Major issues included possible head differential across a one-sided subsurface drain due to lowered water table and migration of contaminated groundwater resulting from incomplete diversion of the upgradient groundwater flow.

These six alternatives would be screened on the basis of effectiveness, implementability, and cost, leaving four alternatives to undergo detailed evaluation. Detailed evaluation will consist of evaluating the seven alternatives in terms of the following criteria:

- short-term effectiveness
- long-term effectiveness and permanence
- reduction of contaminant toxicity, mobility, or volume
- implementability
- cost
- compliance with regulatory criteria
- overall protection of human health and the environment
- regulatory acceptance
- community acceptance

Evaluation of remedial technologies (i.e., subsurface, drains, extraction wells, and barrier walls) designed to alter groundwater flow conditions will involve the use of an analytical model to assess the impact of the structure on the surrounding subsurface flow regime. The model will aid in determining what additional site data collection may be needed to better define groundwater flow east of the site toward and beyond North Central Avenue.

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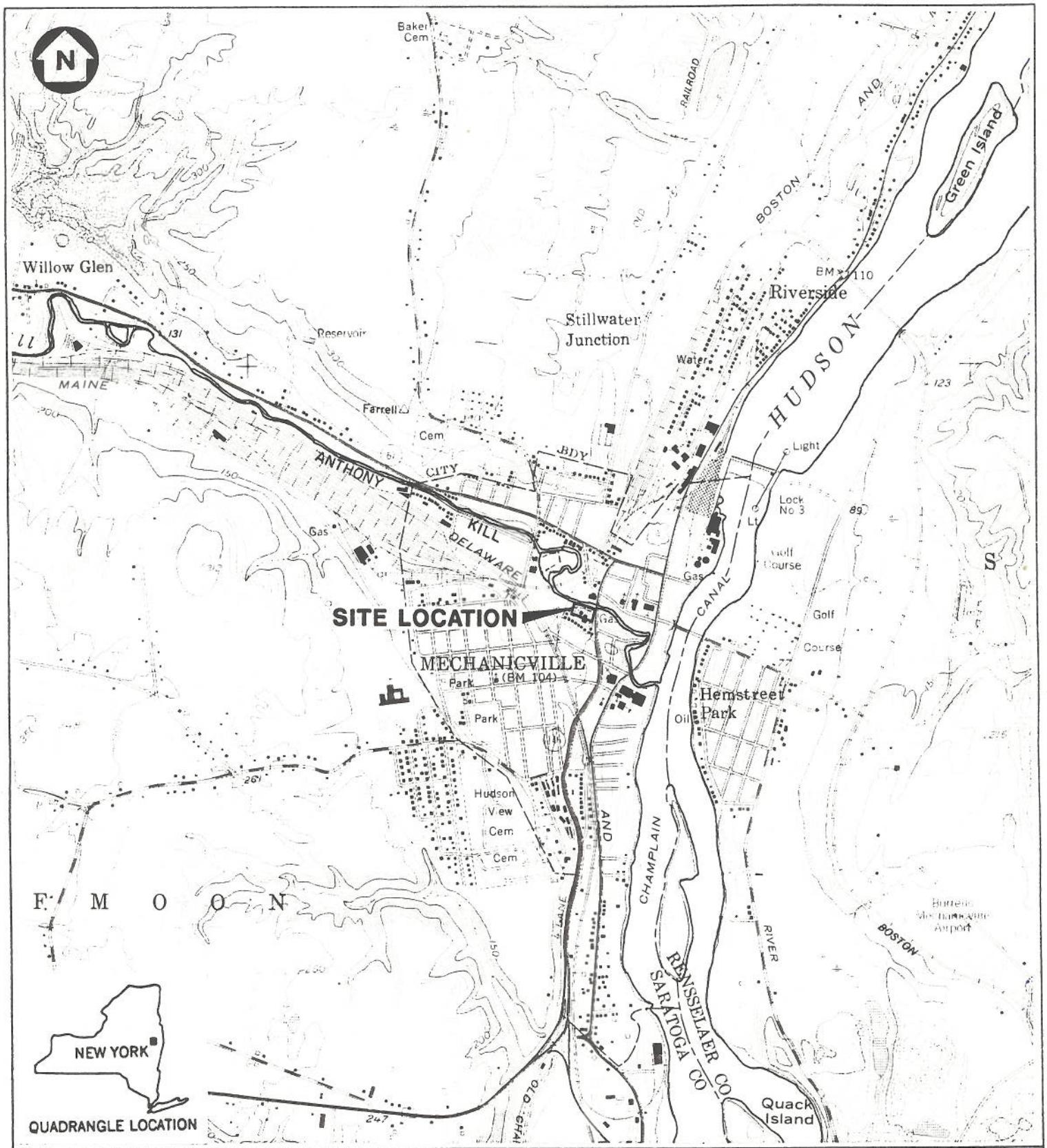
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ABB-ES	ABB Environmental Services, Inc.
AAL	Acceptable Ambient Level
ACGIH	American Conference of Governmental Industrial Hygienists
ARF	Analytical Request Form
ASP	Analytical Services Protocol
AWQC	Ambient Water Quality Criteria
BEHP	bis(2-ethylhexyl)phthalate
Btu	British thermal unit
bgs	below ground surface
CAG	Carcinogen Assessment Group
cfs	cubic feet per second
CLP	Contract Laboratory Program
cm/sec	centimeters per second
CNS	central nervous system
CPF	cancer potency factor
CPP	Citizen Participation Plan
DOT	Department of Transportation
DQO	Data Quality Objective
EM	electromagnetic
EP	Extraction Procedure
FFS	Focused Feasibility Study
FID	flame ionization detection
ft/ft	feet per foot
ft/sec	feet per second
ft/yr	feet per year
GC	gas chromatography
GI	gastrointestinal
gpd	gallons per day
gpm	gallons per minute
GPR	ground-penetrating radar
HASP	Health and Safety Plan

HCN	hydrogen cyanide
HPLC	high-performance liquid chromatography
ID	inside diameter
IR	infrared
IRIS	Integrated Risk Information System
kg	kilograms
MCLs	Maximum Contaminant Levels
MCLGs	Maximum Contaminant Level Goals
mg/kg	milligrams per kilogram
mg/L	milligrams per liter
MGP	manufactured gas plant
mph	miles per hour
MS	mass spectrometry
MSL	mean sea level
NCP	National Contingency Plan
ND	nondetected
NIOSH	National Institute for Occupational Safety and Health
NOEL	No Observed Effect Level
NTP	National Toxicology Program
NYSDEC	New York State Department of Environmental Conservation
NYSEG	New York State Electric and Gas Corporation
OD	outside diameter
OSHA	Occupational Safety and Health Administration
PAHs	polynuclear aromatic hydrocarbons
PCBs	polychlorinated biphenyls
PEL	Permissible Exposure Level
PID	photoionization detector
PM_{10}	inhalable particulate matter
ppm	part per million
PVC	polyvinyl chloride

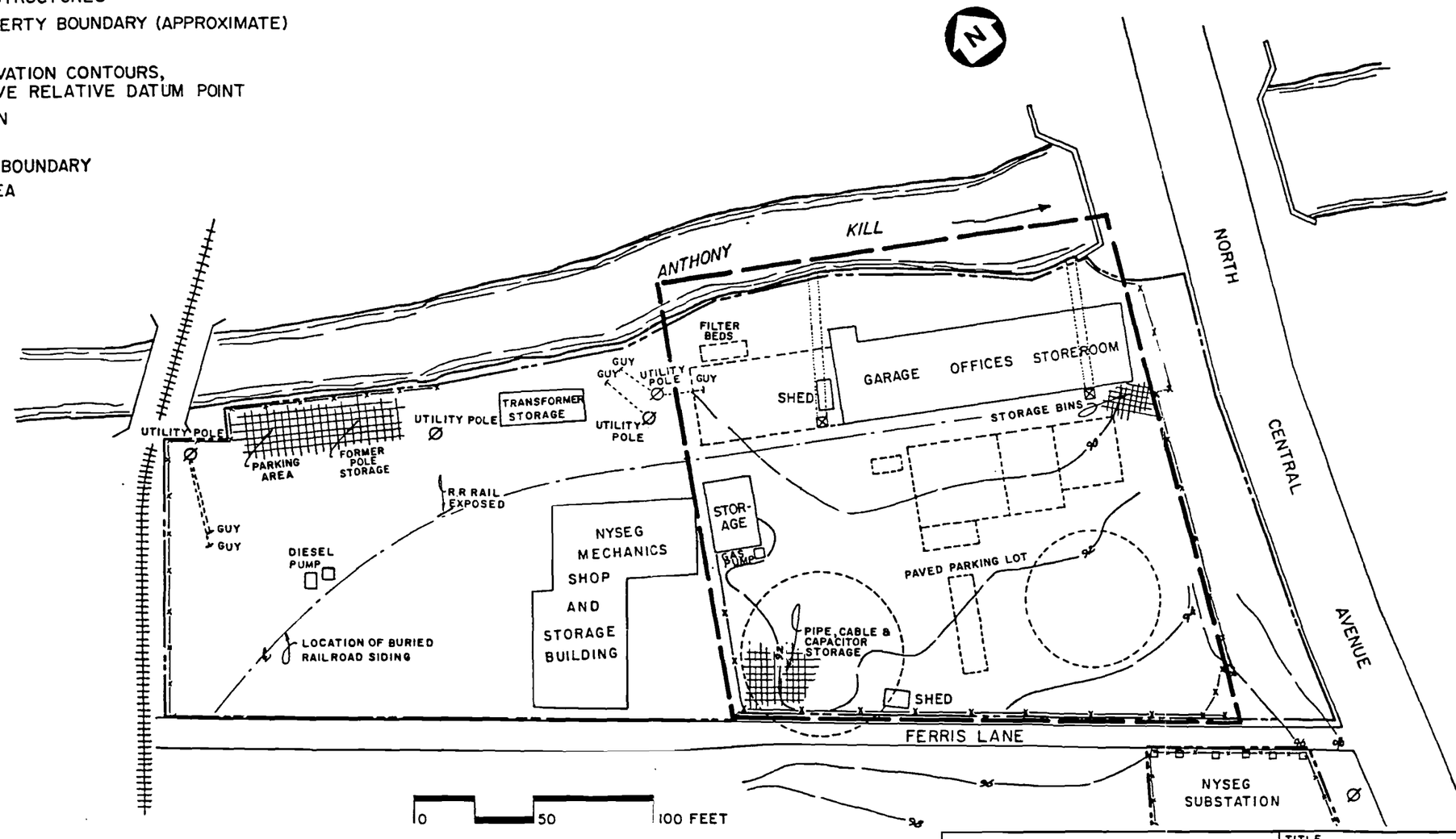
QA/QC	quality assurance/quality control
QAPP	Quality Assurance Project Plan
RfD	reference dose
RI	Remedial Investigation
SDWA	Safe Drinking Water Act
SIR	Subsurface Interface Radar
SQC	sediment quality criteria
SVOCs	semivolatile organic compounds
TCL	target clean-up level
TKF	toxicokinetic factor
TLV	Threshold Limit Values
TOC	total organic carbon
TPH	total petroleum hydrocarbons
TSP	total suspended particulates
TWA	time-weighted average
USEPA	U.S. Environmental Protection Agency
USGS	U.S. Geological Survey
UV	ultraviolet
VOCs	volatile organic compound
μg/L	micrograms per liter
μm	micrometers
$\mu g/m^3$	micrograms per cubic meter



BASE MAP SOURCE: USGS QUADRANGLE MECHANICVILLE (1980)	E.C. JORDAN CO. CONSULTING ENGINEERS	TITLE: MECHANICVILLE SITE LOCATION MAP
SCALE IN FEET: 0 — 2000 — 4000	CLIENT: NEW YORK STATE ELECTRIC AND GAS CORP. BINGHAMTON, NEW YORK	INVESTIGATION OF FORMER COAL GASIFICATION SITES
		PROJECT NO. 4945-04 — FIGURE 1-1

LEGEND

- APPROXIMATE LOCATION OF FORMER GAS PLANT STRUCTURES
- NYSEG PROPERTY BOUNDARY (APPROXIMATE)
- FENCE
- 90 GROUND ELEVATION CONTOURS, IN FEET ABOVE RELATIVE DATUM POINT
- STORM DRAIN
- CULVERT
- STUDY AREA BOUNDARY
- STORAGE AREA



BASE MAP SOURCE:

TOPOGRAPHIC SURVEY PREPARED BY DAVID A. FLANDERS ASSOCIATES, 6 MORNINGSIDE DRIVE, BALLSTON LAKE, NEW YORK, DATED 6/26/86 (86-72-S). REVISED 12/87.

ELEVATIONS BASED ON ASSUMED DATUM OF 100.00' AT R.R. SPIKE IN UTILITY POLE LOCATED 25' SOUTH OF FERRIS LANE AND NORTH CENTRAL AVENUE.

E.C. JORDAN CO.
CONSULTING ENGINEERS

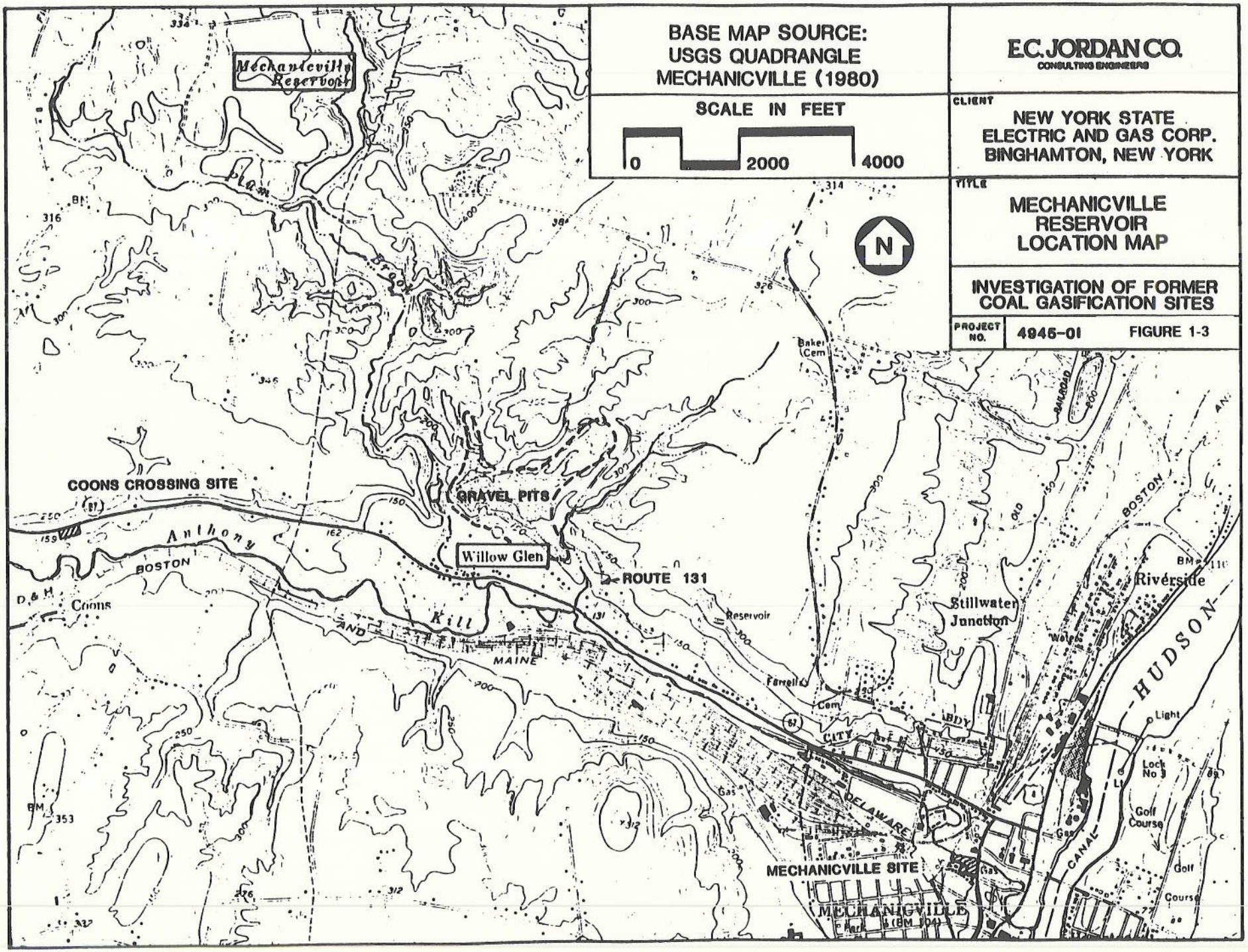
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BINGHAMTON, NEW YORK

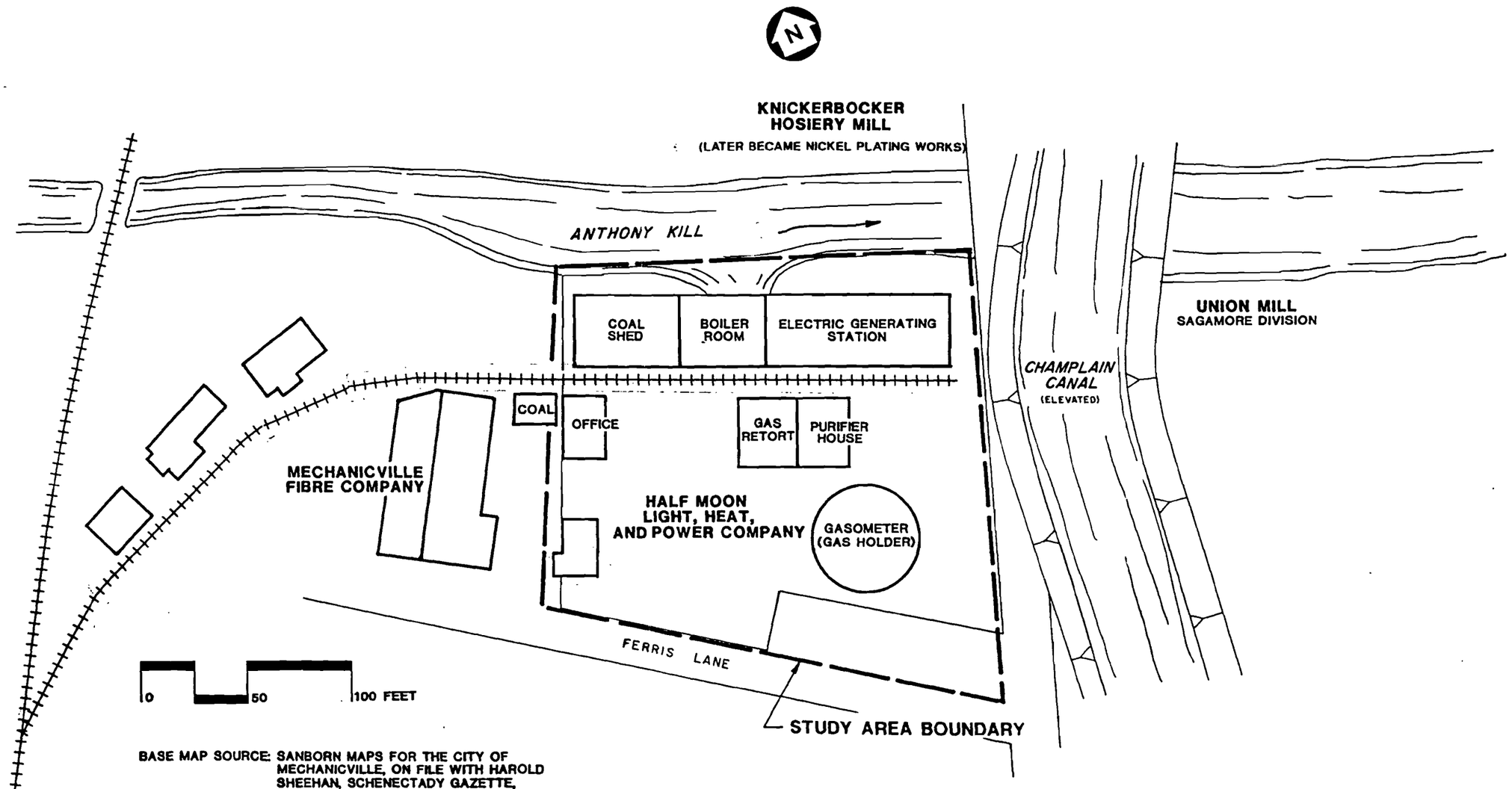
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MECHANICVILLE, NEW YORK

INVESTIGATION OF FORMER COAL GASIFICATION SITES

PROJECT NO. 4945-04

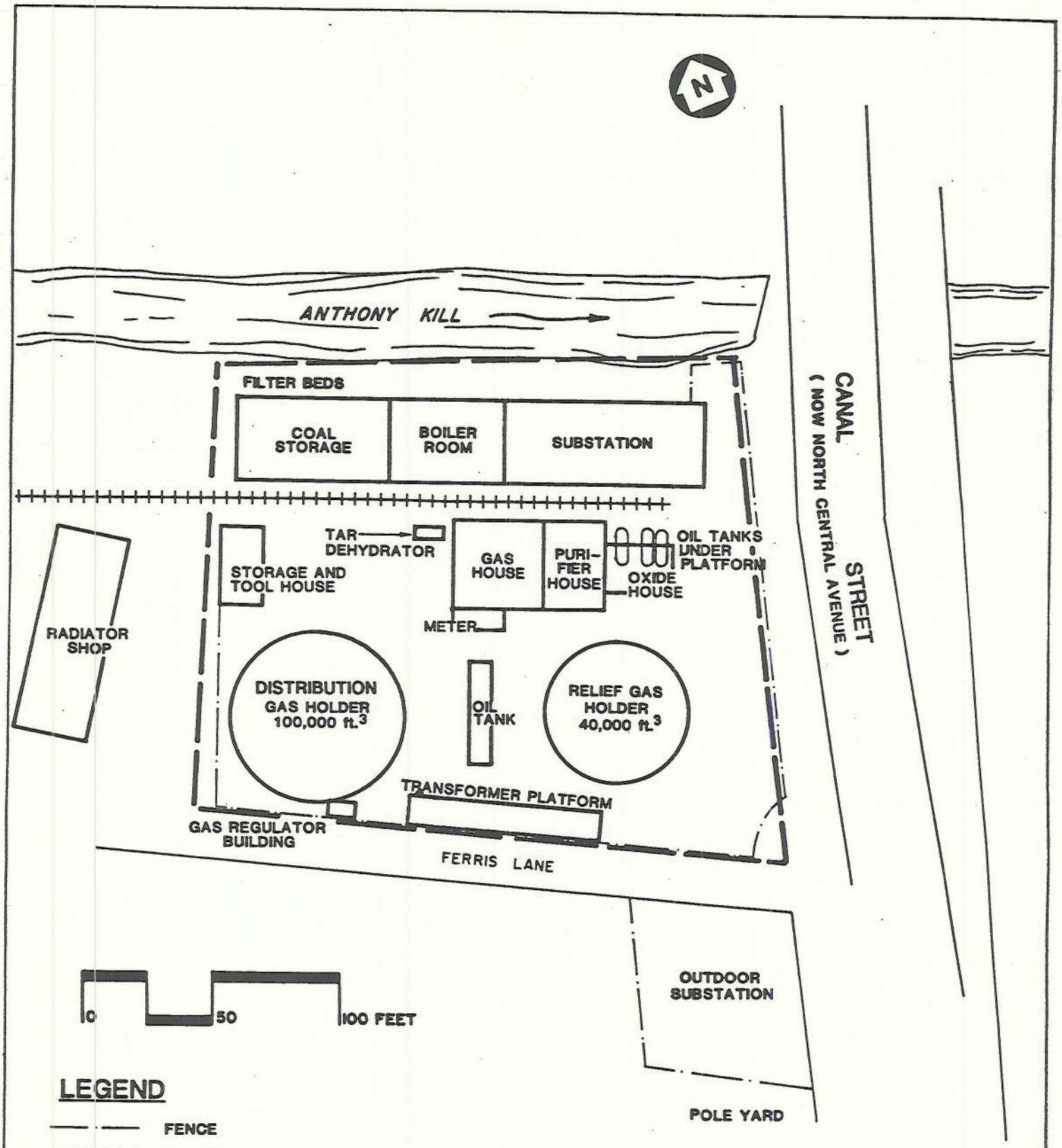
FIGURE 1-2


BASE MAP SOURCE:
USGS QUADRANGLE
MECHANICVILLE (1980)
SCALE IN FEET
0
2000
4000
E.C. JORDAN CO.
CONSULTING ENGINEERS
CLIENT
NEW YORK STATE
ELECTRIC AND GAS CORP.
BINGHAMTON, NEW YORK
TITLE
MECHANICVILLE
RESERVOIR
LOCATION MAP
INVESTIGATION OF FORMER
COAL GASIFICATION SITES
PROJECT NO.
4945-01
FIGURE 1-3
N
Mechanicville Reservoir
COONS CROSSING SITE
GRAVEL PITS
Willow Glen
ROUTE 131
Anthony
BOSTON
D & H
Coons
Kill
MAINE
Reservoir
Stillwater Junction
Riverside
HUDSON
Ferrell Cem
CITY
DELAWARE
MECHANICVILLE SITE
MECHANICVILLE
Baker Cem
RAILROAD
Golf Course
CANAL
Lock No 3
Light
BM 353



BASE MAP SOURCE: SANBORN MAPS FOR THE CITY OF MECHANICVILLE, ON FILE WITH HAROLD SHEEHAN, SCHENECTADY GAZETTE, 50 NORTH ST., MECHANICVILLE, NY.

E.C. JORDAN CO. CONSULTING ENGINEERS	TITLE PLAN OF MECHANICVILLE COAL GASIFICATION PLANT CIRCA 1910
CLIENT NEW YORK STATE ELECTRIC AND GAS CORP. BINGHAMTON, NEW YORK	INVESTIGATION OF FORMER COAL GASIFICATION SITES
	PROJECT NO. 4945-04 **FIGURE 1-4**



LEGEND

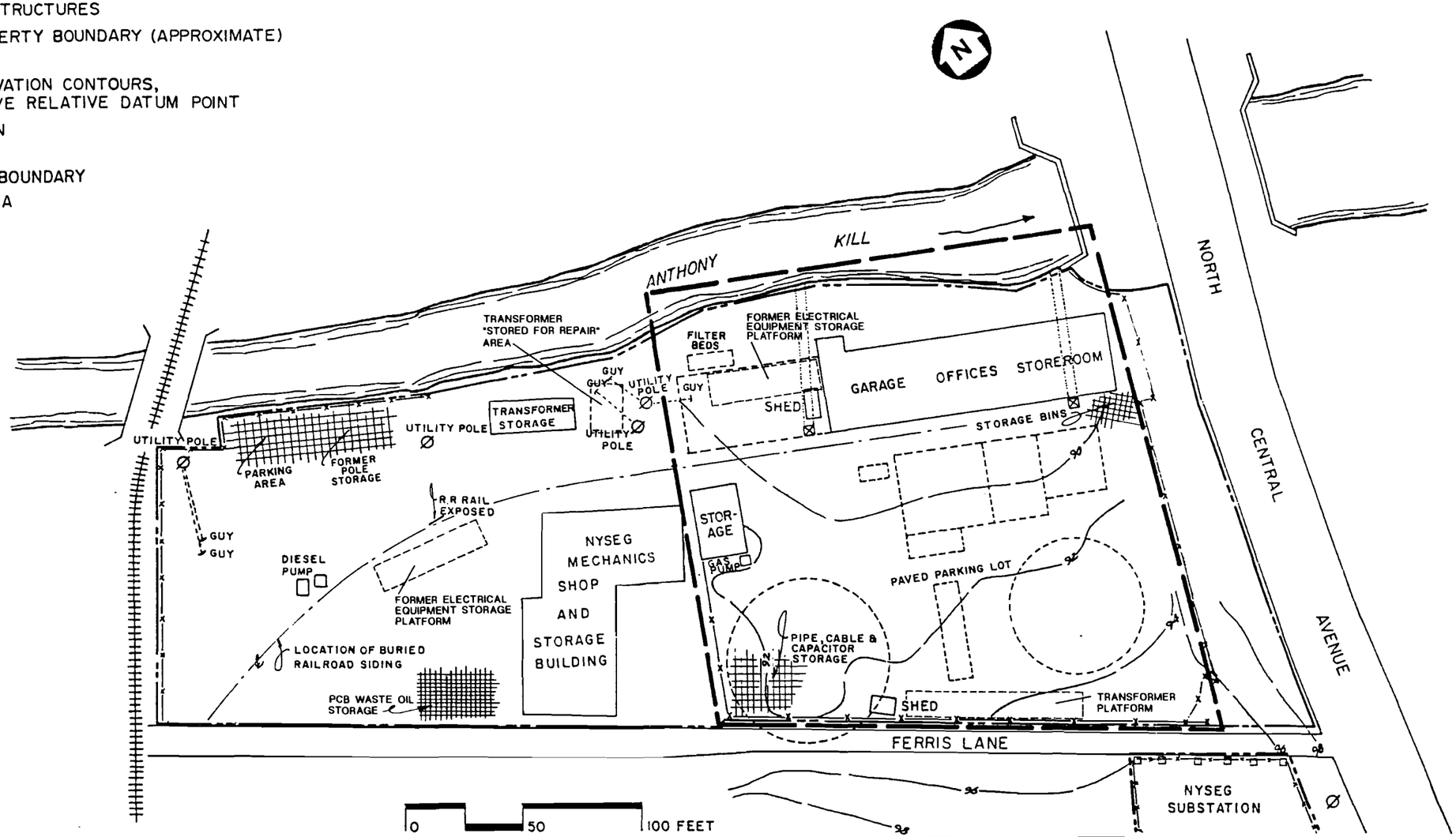
- FENCE
- RAILROAD SIDING
- STUDY AREA BOUNDARY

BASE MAP PREPARED BY BROWN, CROSBY, & CO., INC., ENGINEERING DEPARTMENT, 96 WALL ST., NEW YORK, APRIL 1951.

E.C. JORDAN CO. CONSULTING ENGINEERS	PLAN OF MECHANICVILLE COAL GASIFICATION PLANT CIRCA 1951
NEW YORK STATE ELECTRIC AND GAS CORP. BINGHAMTON, NEW YORK	INVESTIGATION OF FORMER COAL GASIFICATION SITES
	JOB NO. 4945-04 FIGURE 1-5

LEGEND

- APPROXIMATE LOCATION OF FORMER GAS PLANT STRUCTURES
- NYSEG PROPERTY BOUNDARY (APPROXIMATE)
- FENCE
- 90 GROUND ELEVATION CONTOURS, IN FEET ABOVE RELATIVE DATUM POINT
- STORM DRAIN
- CULVERT
- STUDY AREA BOUNDARY
- STORAGE AREA



TASK 2

BASE MAP SOURCE:

TOPOGRAPHIC SURVEY PREPARED BY DAVID A. FLANDERS ASSOCIATES, 6 MORNINGSIDE DRIVE, BALLSTON LAKE, NEW YORK, DATED 6/26/86 (86-72-S). REVISED 12/87.

ELEVATIONS BASED ON ASSUMED DATUM OF 100.00' AT R.R. SPIKE IN UTILITY POLE LOCATED 25' SOUTH OF FERRIS LANE AND NORTH CENTRAL AVENUE.

E.C. JORDAN CO.
CONSULTING ENGINEERS

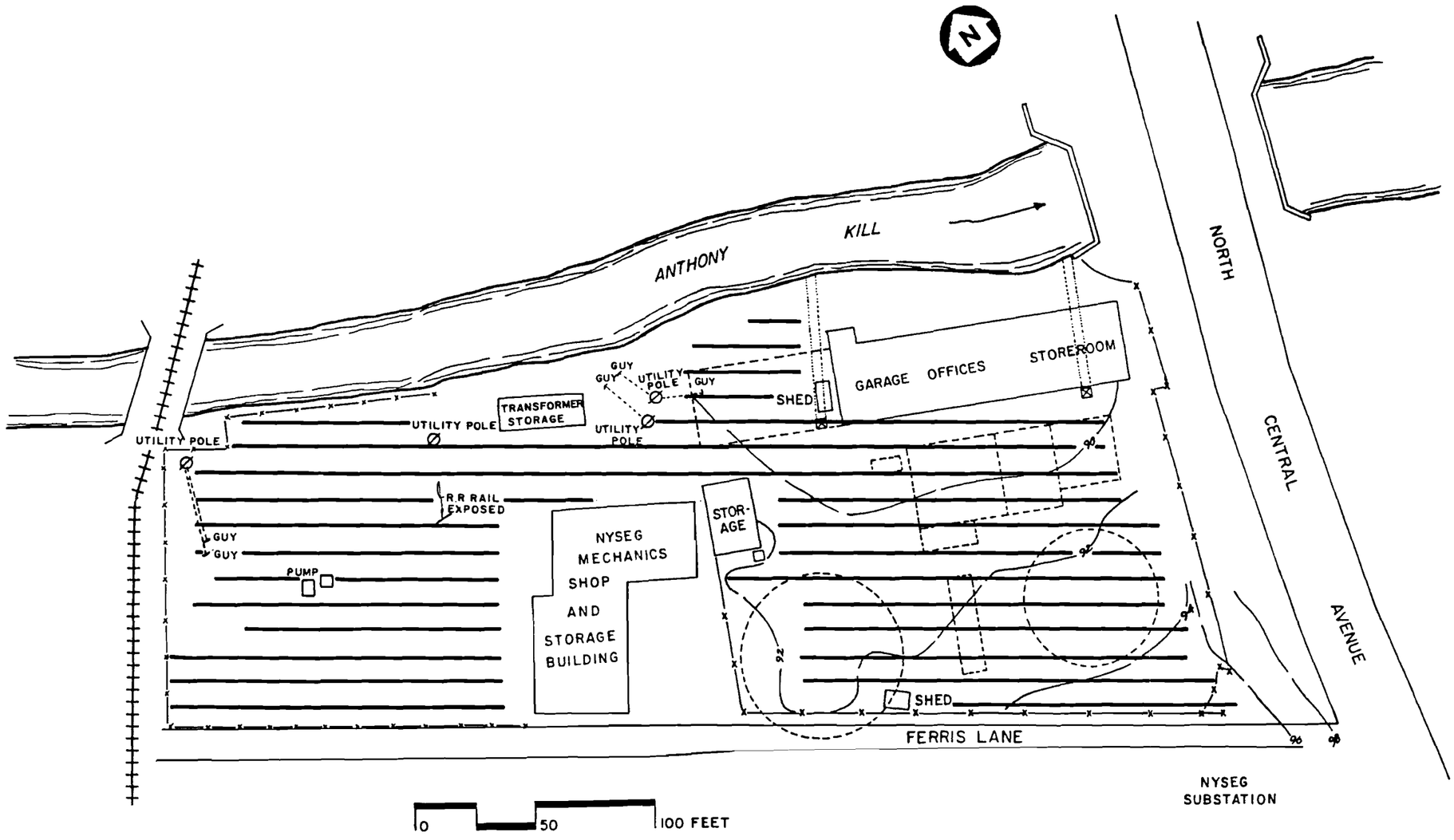
TITLE
FORMER ELECTRICAL EQUIPMENT STORAGE AREAS
MECHANICVILLE, NEW YORK

CLIENT
NEW YORK STATE ELECTRIC AND GAS CORP.
BINGHAMTON, NEW YORK

INVESTIGATION OF FORMER COAL GASIFICATION SITES

PROJECT NO. 4945-04

FIGURE 1-6



E.C. JORDAN CO.
CONSULTING ENGINEERS

CLIENT
NEW YORK STATE ELECTRIC AND GAS CORP.
BINGHAMTON, NEW YORK

TITLE
GEOPHYSICAL SURVEY
GROUND PENETRATING RADAR COVERAGE
MECHANICVILLE, NEW YORK

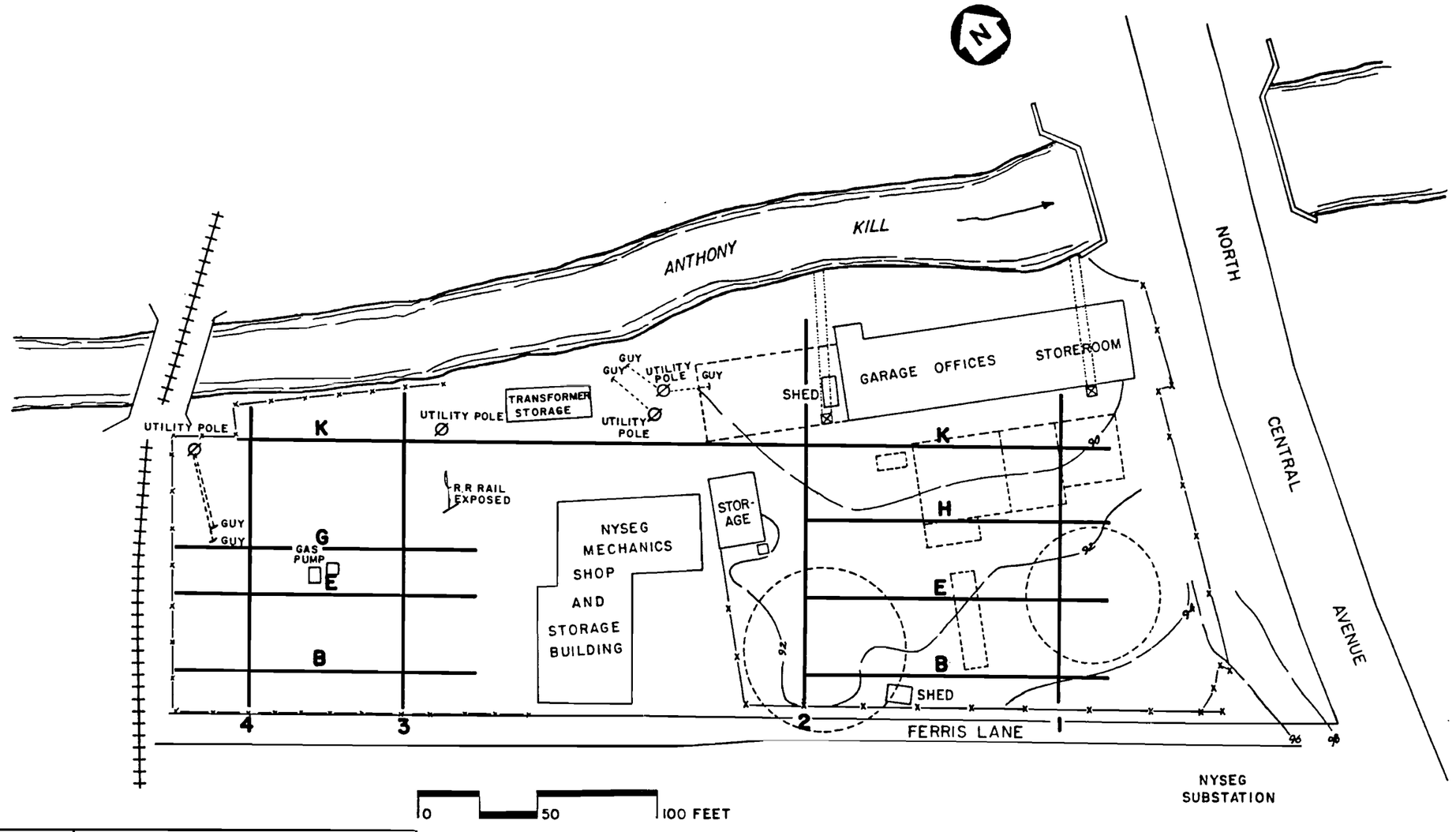
INVESTIGATION OF FORMER COAL GASIFICATION SITES

PROJECT NO. 4945-01

FIGURE 2-1

BASE MAP SOURCE:

TOPOGRAPHIC SURVEY PREPARED BY DAVID A. FLANDERS ASSOCIATES, 6 MORNINGSIDE DRIVE, BALLSTON LAKE, NEW YORK DATED 6/26/86 (86-72-S).



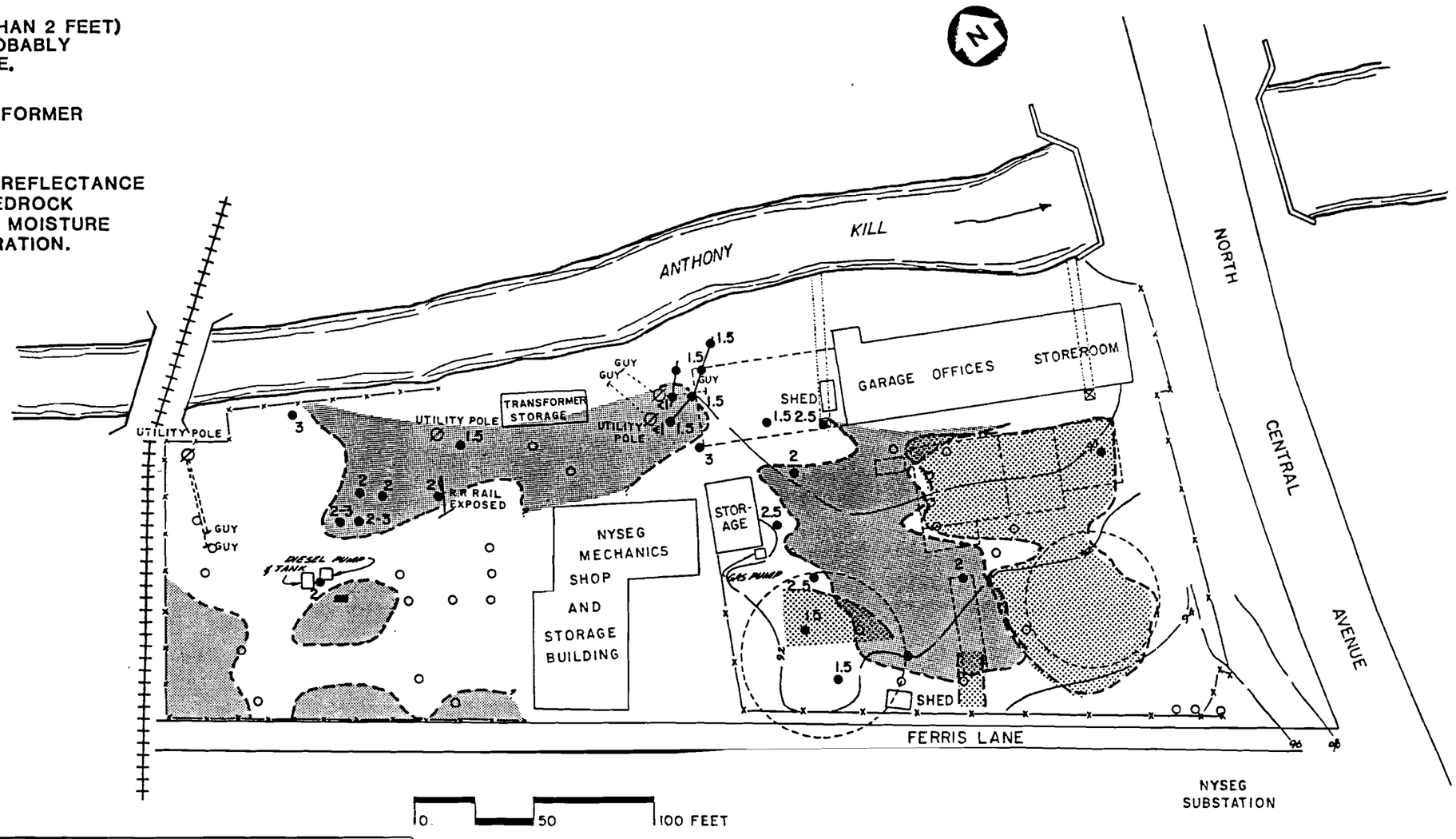
E.C. JORDAN CO. CONSULTING ENGINEERS	TITLE GEOPHYSICAL SURVEY SEISMIC REFRACTION COVERAGE MECHANICVILLE, NEW YORK
CLIENT NEW YORK STATE ELECTRIC AND GAS CORP. BINGHAMTON, NEW YORK	INVESTIGATION OF FORMER COAL GASIFICATION SITES
	PROJECT NO. 4945-01 FIGURE 2-2

BASE MAP SOURCE:

TOPOGRAPHIC SURVEY PREPARED BY DAVID A. FLANDERS ASSOCIATES, 6 MORNINGSIDE DRIVE, BALLSTON LAKE, NEW YORK DATED 6/26/86 (86-72-S).

LEGEND

- ● SUBSURFACE ANOMALIES AND DEPTH(FT) - POSSIBLE BURIED UTILITIES.
- ○ SHALLOW(LESS THAN 2 FEET) ANOMALIES OF PROBABLY MINOR IMPORTANCE.
- EXCAVATIONS FOR FORMER STRUCTURE.
- ZONES OF HIGHER REFLECTANCE IN OVERBURDEN/BEDROCK INDICATING HIGHER MOISTURE CONTENT OR SATURATION.

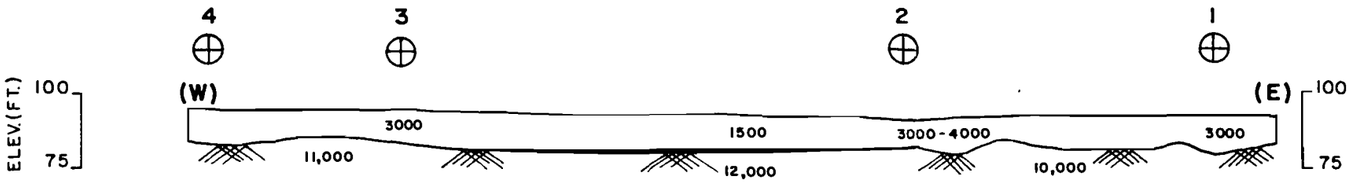


E.C. JORDAN CO. CONSULTING ENGINEERS	TITLE: SCHEMATIC OF RESULTS OF GPR INVESTIGATION MECHANICVILLE SITE
CLIENT: NEW YORK STATE ELECTRIC AND GAS CORP. BINGHAMTON, NEW YORK	INVESTIGATION OF FORMER COAL GASIFICATION SITES
	PROJECT NO. 4945-01 **FIGURE 2-3**

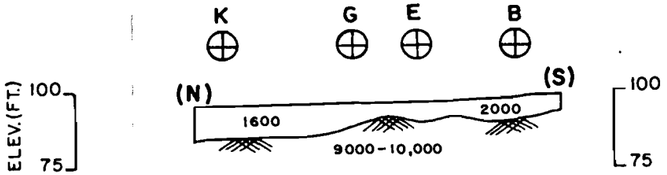
BASE MAP SOURCE:

TOPOGRAPHIC SURVEY PREPARED BY DAVID A. FLANDERS ASSOCIATES, 6 MORNINGSIDE DRIVE, BALLSTON LAKE, NEW YORK DATED 6/26/86 (86-72-S).

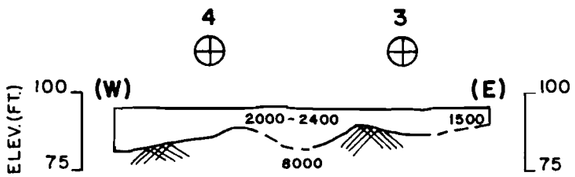
LINE K



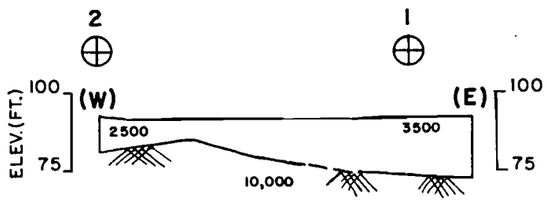
LINE 4



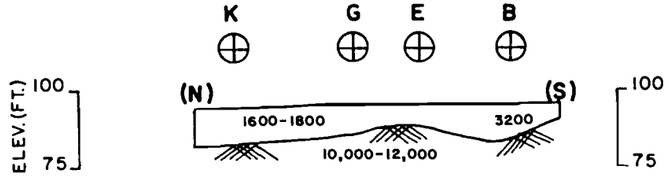
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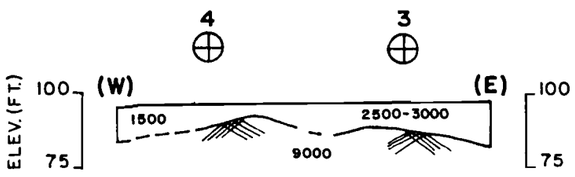
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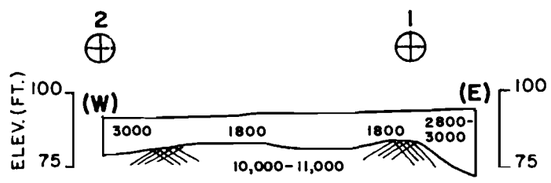
LINE 3



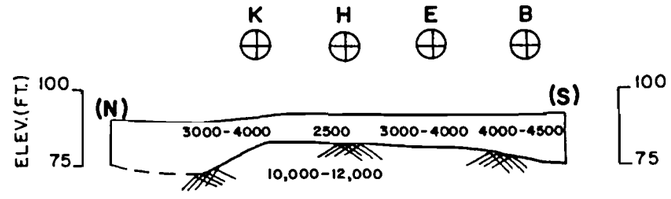
LINE E



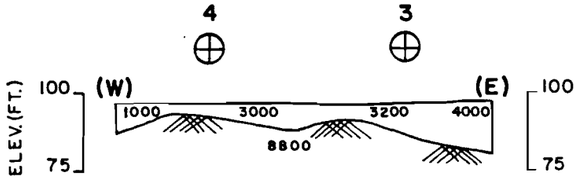
LINE E (con't.)



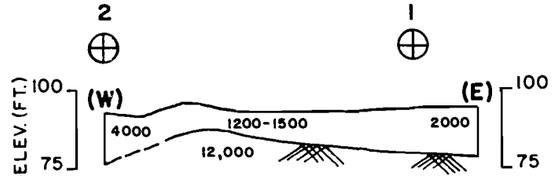
LINE 2



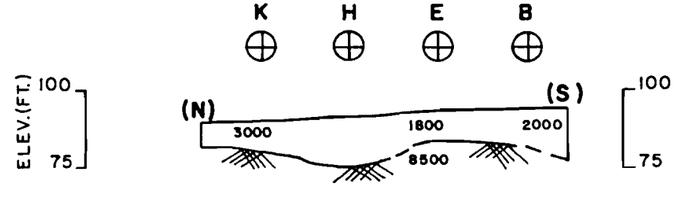
LINE B



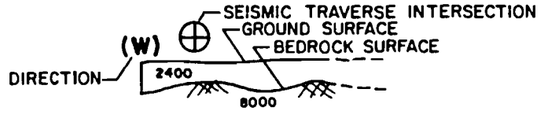
LINE B (con't)



LINE I



LEGEND



NOTES: 1. SEISMIC VELOCITY VALUES ARE IN FEET PER SECOND.

2. ELEVATIONS ALONG TRAVERSES ARE BASED ON SURVEY MAPS PROVIDED BY DAVID A. FLANDERS ASSOC.

3. SEE TEXT FOR A DISCUSSION OF THE RESULTS OF SEISMIC SURVEY.

E.C. JORDAN CO.
CONSULTING ENGINEERS

CLIENT
NEW YORK STATE ELECTRIC AND GAS CORP.
BINGHAMTON, NEW YORK

TITLE
SEISMIC REFRACTION PROFILES
MECHANICVILLE SITE
MECHANICVILLE, NEW YORK

INVESTIGATION OF FORMER COAL GASIFICATION SITES

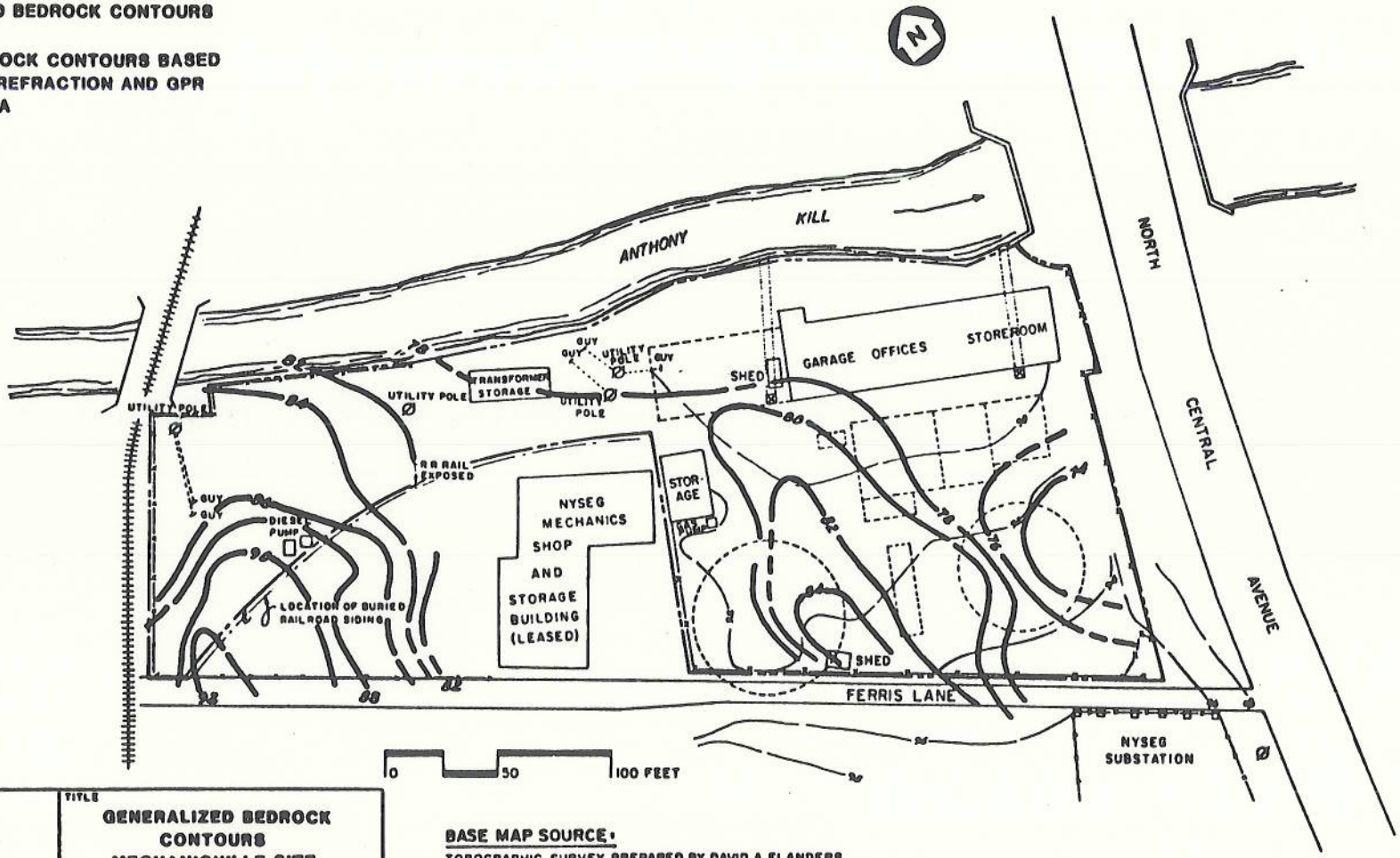
PROJECT NO. 4945-01 **FIGURE 2-4**

LEGEND

GROUND ELEVATION CONTOURS, IN FEET ABOVE MEAN SEA LEVEL

GENERALIZED BEDROCK CONTOURS

NOTE: BEDROCK CONTOURS BASED ON SEISMIC REFRACTION AND GPR SURVEY DATA



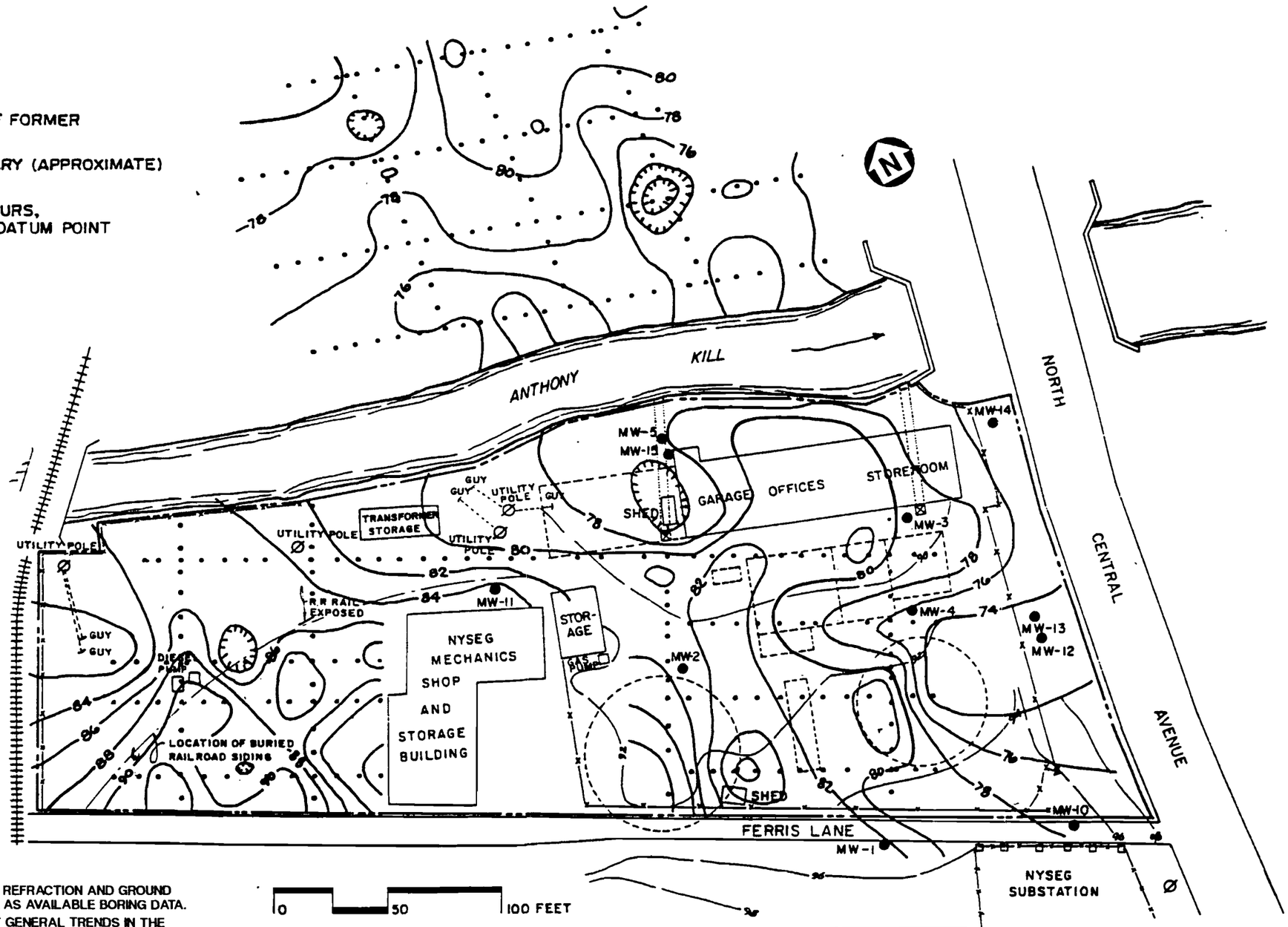
E.C. JORDAN CO. CONSULTING ENGINEERS	TITLE: GENERALIZED BEDROCK CONTOURS MECHANICVILLE SITE	
CLIENT: NEW YORK STATE ELECTRIC AND GAS CORP. BINGHAMTON, NEW YORK	INVESTIGATION OF FORMER COAL GASIFICATION SITES	
	PROJECT NO. 4846-01	FIGURE 2-5

BASE MAP SOURCE:

TOPOGRAPHIC SURVEY PREPARED BY DAVID A. FLANDERS ASSOCIATES, 6 MORNINGSIDE DRIVE, GALLSTON LAKE, NEW YORK DATED 6/26/86 (86-72-S).

LEGEND

- APPROXIMATE LOCATION OF FORMER GAS PLANT STRUCTURES
- NYSEG PROPERTY BOUNDARY (APPROXIMATE)
- FENCE
- GROUND ELEVATION CONTOURS, IN FEET ABOVE RELATIVE DATUM POINT
- STORM DRAIN
- INTERPRETED BEDROCK SURFACE CONTOUR
- MONITORING WELL LOCATION
- LOCATION OF GEOPHYSICAL SURVEY LINE
- DEPRESSION



0 50 100 FEET

NOTES:
1. BEDROCK CONTOURS BASED ON SEISMIC REFRACTION AND GROUND PENETRATING RADAR SURVEYS AS WELL AS AVAILABLE BORING DATA.
2. CONTOURS INTERPRETED TO REPRESENT GENERAL TRENDS IN THE BEDROCK SURFACE.
3. THE CONTOUR INTERVAL (2 FEET) INDICATES DEGREE OF ACCURACY (±1 TO 2 FEET) REPRESENTED BY INTERPRETATION.

BASE MAP SOURCE:

TOPOGRAPHIC SURVEY PREPARED BY DAVID A. FLANDERS ASSOCIATES, 6 MORNINGSIDE DRIVE, BALLSTON LAKE, NEW YORK DATED 6/26/86 (86-72-S).

E.C JORDAN CO. CONSULTING ENGINEERS	**BEDROCK SURFACE CONTOURS MECHANICVILLE SITE**
NEW YORK STATE ELECTRIC AND GAS CORP. BINGHAMTON, NEW YORK	INVESTIGATION OF FORMER COAL GASIFICATION SITES
4945-03	**FIGURE 2-6**

LEGEND

- APPROXIMATE LOCATION OF FORMER GAS PLANT STRUCTURES
- NYSEG PROPERTY BOUNDARY (APPROXIMATE)
- FENCE
- GROUND ELEVATION CONTOURS, IN FEET ABOVE RELATIVE DATUM POINT
- STORM DRAIN
- CULVERT
- STUDY AREA BOUNDARY AND GEOPHYSICAL SURVEY BOUNDARY

TASK 2:

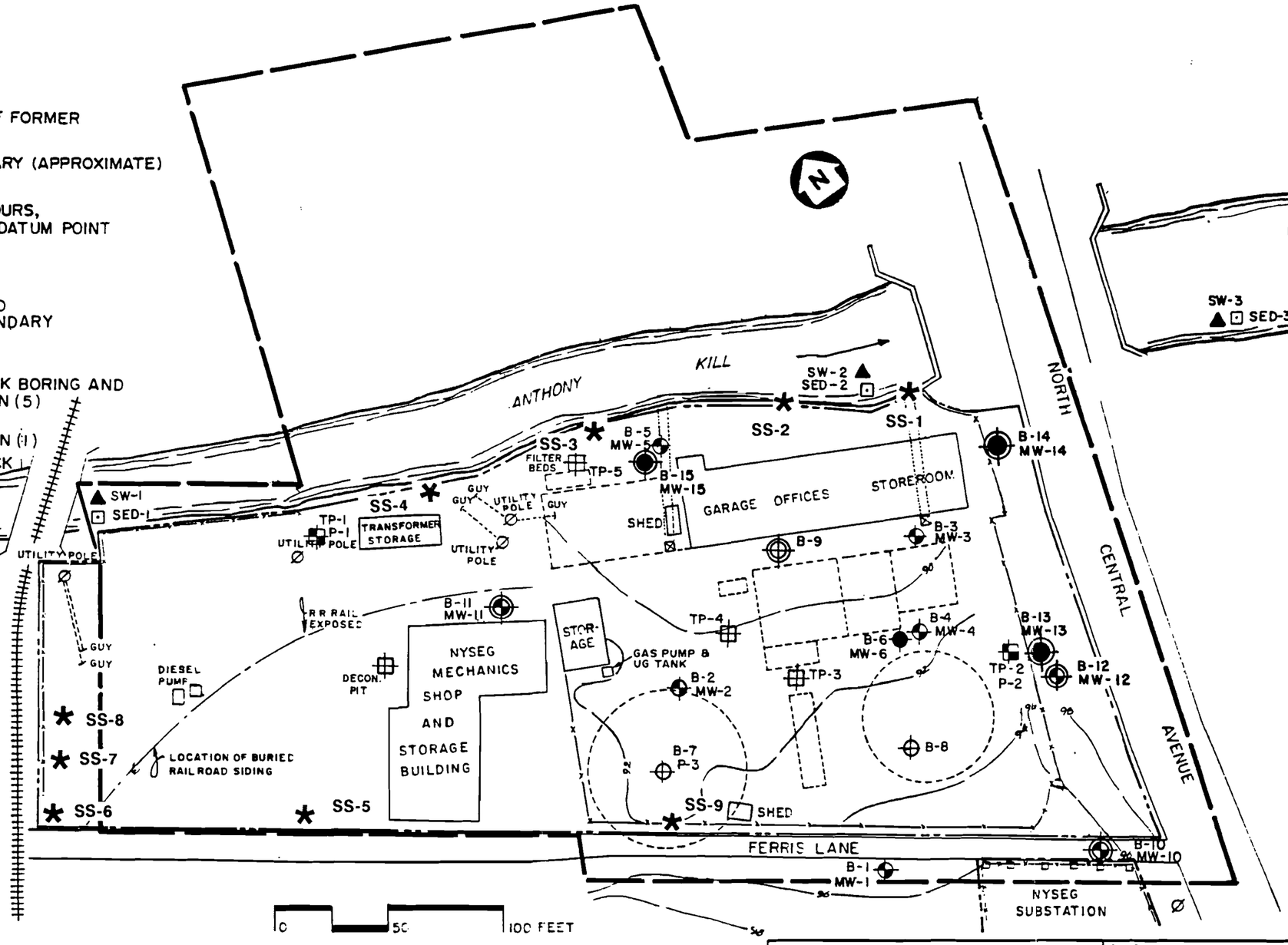
- SOIL AND SHALLOW BEDROCK BORING AND MONITORING WELL LOCATION (5)
- DEEP BEDROCK BORING AND MONITORING WELL LOCATION (1)
- SOIL AND SHALLOW BEDROCK BORING LOCATION (2)
- TEST PIT AND PIEZOMETER LOCATION (2)
- TEST PIT LOCATION (3)
- SURFACE WATER SAMPLE LOCATION (3)
- SEDIMENT SAMPLE LOCATION (3)

TASK 3:

- SOIL/SHALLOW BEDROCK BORING AND MONITORING WELL LOCATION (3)
- DEEP BEDROCK BORING AND MONITORING WELL LOCATION (3)
- SOIL BORING LOCATION (1)
- SURFACE WATER SAMPLE LOCATION (1)
- SEDIMENT SAMPLE LOCATION (1)

TASK 4:

- SURFACE SOIL SAMPLE LOCATION



BASE MAP SOURCE:

TOPOGRAPHIC SURVEY PREPARED BY DAVID A. FLANDERS ASSOCIATES, 6 MORNINGSIDE DRIVE, BALLSTON LAKE, NEW YORK, DATED 6/26/86 (86-72-S). REVISED 12/87.

ELEVATIONS BASED ON ASSUMED DATUM OF 100.00' AT R.R. SPIKE IN UTILITY POLE LOCATED 25' SOUTH OF INTERSECTION OF FERRIS LANE AND NORTH CENTRAL AVENUE.

E.C. JORDAN CO.
CONSULTING ENGINEERS

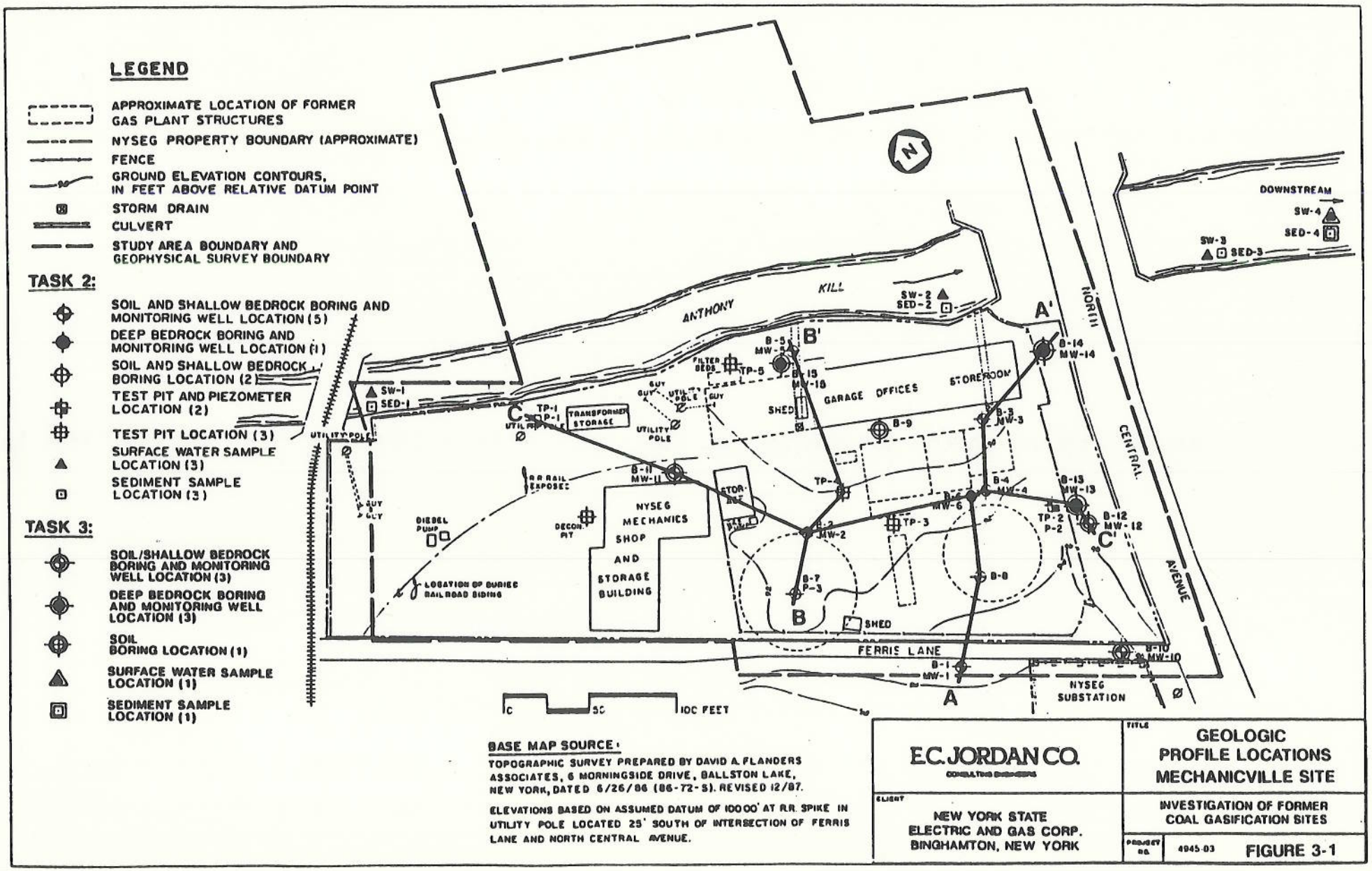
CLIENT
NEW YORK STATE ELECTRIC AND GAS CORP.
BINGHAMTON, NEW YORK

TITLE
TASKS 2, 3, AND 4
EXPLORATION LOCATIONS
MECHANICVILLE SITE

INVESTIGATION OF FORMER COAL GASIFICATION SITES

PROJECT NO. 4945-04

FIGURE 2-7



BASE MAP SOURCE:

TOPOGRAPHIC SURVEY PREPARED BY DAVID A. FLANDERS ASSOCIATES, 6 MORNINGSIDE DRIVE, BALLSTON LAKE, NEW YORK, DATED 6/26/86 (86-72-S). REVISED 12/87.

ELEVATIONS BASED ON ASSUMED DATUM OF 100.00' AT R.R. SPIKE IN UTILITY POLE LOCATED 25' SOUTH OF INTERSECTION OF FERRIS LANE AND NORTH CENTRAL AVENUE.

E.C. JORDAN CO.
CONSULTING ENGINEERS

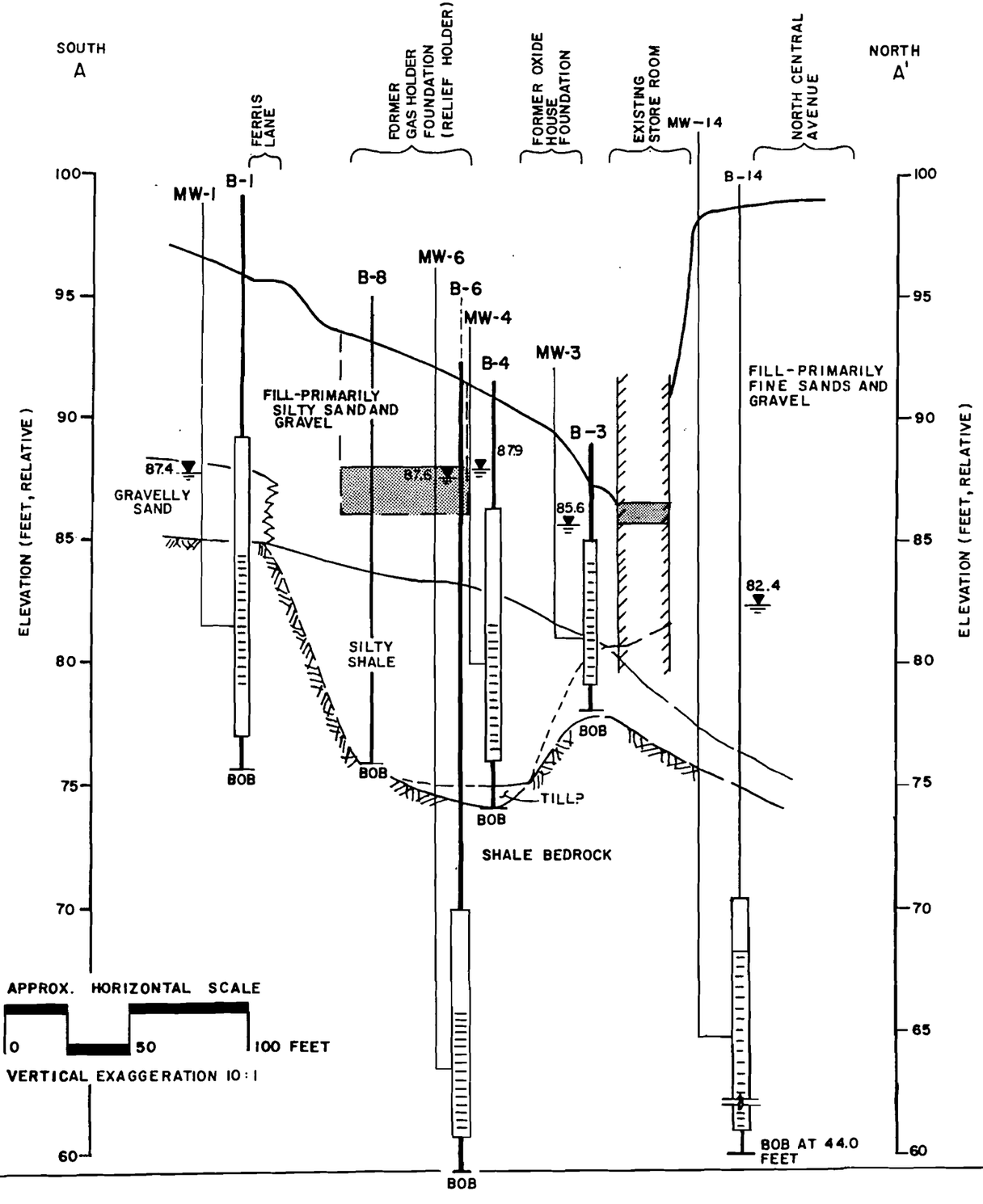
CLIENT
NEW YORK STATE ELECTRIC AND GAS CORP.
BINGHAMTON, NEW YORK

TITLE
GEOLOGIC PROFILE LOCATIONS MECHANICVILLE SITE

INVESTIGATION OF FORMER COAL GASIFICATION SITES

PROJECT NO. 4945-03

FIGURE 3-1



GEOLOGIC DESCRIPTIONS

FILL: PRIMARILY SILTY SAND AND GRAVEL WITH ORGANIC MATTER, ASH, BRICK FRAGMENTS, GLASS, AND WOOD CHIPS WITH ZONES OF HIGHER CLAYEY SILT AND FRACTURED SHALE CONTENT.

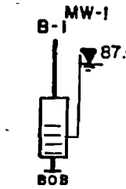
GRAVELLY SAND: DISCONTINUOUS BROWN TO DARK GRAY SAND AND GRAVEL.

SILTY SHALE: BLACK TO GRAY PLATY SHALE FRAGMENTS WITH INTERSTITIAL SILT. LOOSE AND SATURATED. POSSIBLY FILL.

TILL: DISCONTINUOUS TAN TO LIGHT GRAY SILTY CLAY TILL WITH FINE GRAVEL.

SHALE BEDROCK: LAMINATED, BROKEN, DARK GRAY SHALE WITH CALCITE VEINS AND INCLUSIONS. BEDDING DIPS 30-40° FROM HORIZONTAL; FRACTURES ARE 0-90° FROM BEDDING PLANES. UPPER 1 TO 2 FEET SEVERELY WEATHERED.

LEGEND



BORING AND MONITORING WELL LOCATION

OBSERVED WATER LEVEL (FEET, RELATIVE) ON MARCH 29, 1988

EFFECTIVE SCREEN LENGTH (ACTUAL SCREEN SHOWN AS ▤)

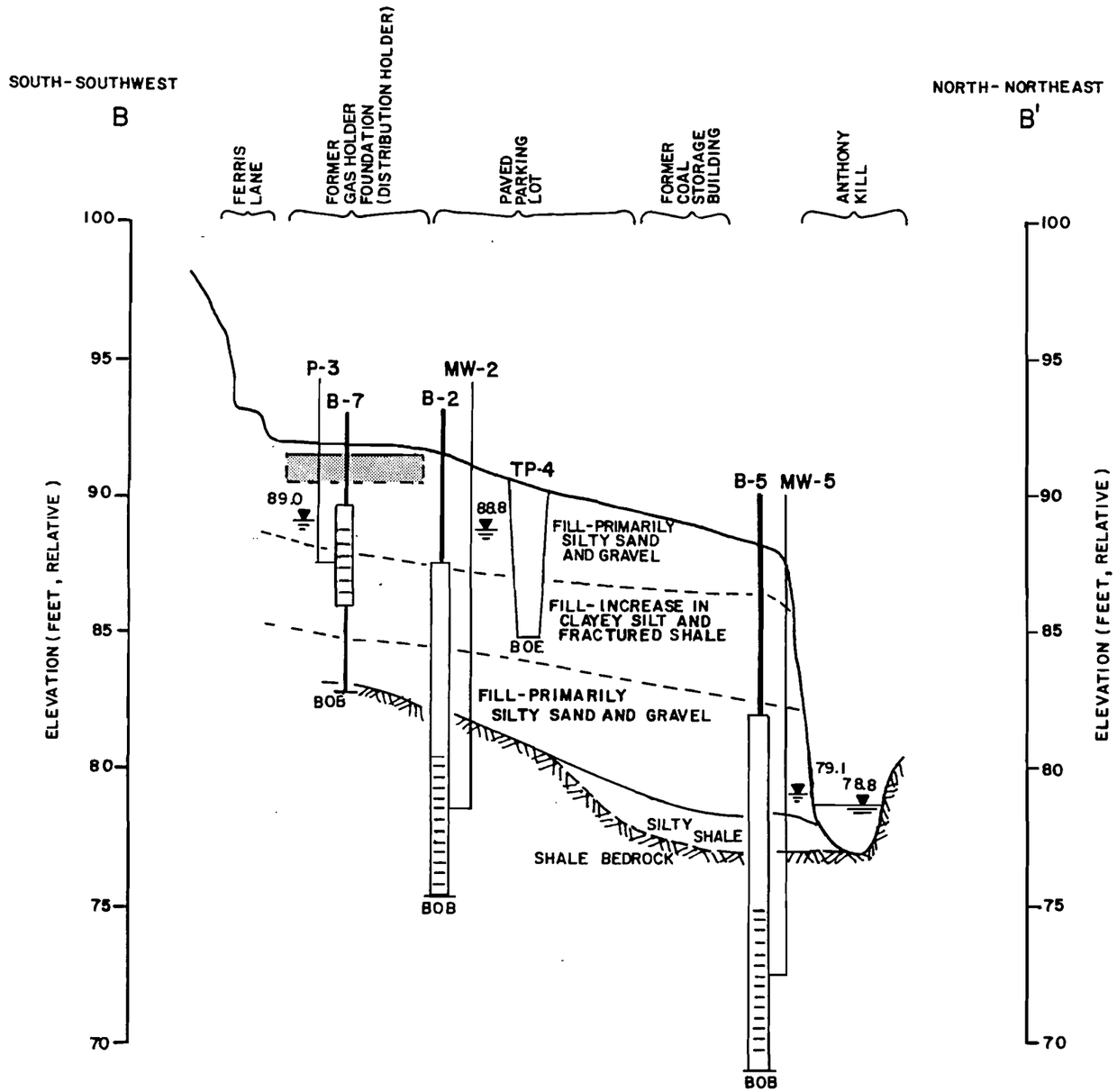
BOTTOM OF BORING

79.3 OBSERVED SURFACE WATER LEVEL (FEET, RELATIVE) ON MARCH 29, 1988

NOTES

1. SEE FIGURE 3-1 FOR LOCATION AND ORIENTATION OF PROFILE.
2. PROFILE IS BASED ON AN INTERPRETATION OF AVAILABLE SUBSURFACE EXPLORATIONS. ACTUAL CONDITIONS MAY VARY FROM THOSE SHOWN.
3. ELEVATIONS BASED ON ASSUMED DATUM OF 100.00' AT R.R. SPIKE IN UTILITY POLE LOCATED 25' SOUTH OF INTERSECTION OF FERRIS LANE AND NORTH CENTRAL AVENUE.
4. FOUNDATION STRUCTURE LOCATIONS SHOWN ARE APPROXIMATE.

E.C. JORDAN CO. CONSULTING ENGINEERS	INTERPRETIVE GEOLOGIC PROFILE A-A' MECHANICVILLE SITE
NEW YORK STATE ELECTRIC AND GAS CORP. BINGHAMTON, NEW YORK	INVESTIGATION OF FORMER COAL GASIFICATION SITES
4945-04	FIGURE 3-2



APPROX. HORIZONTAL SCALE

0 50 100 FEET

VERTICAL EXAGGERATION 10:1

GEOLOGIC DESCRIPTIONS

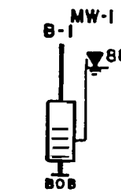
FILL: PRIMARILY SILTY SAND AND GRAVEL WITH ORGANIC MATTER, ASH, BRICK FRAGMENTS, GLASS, AND WOOD CHIPS WITH ZONES OF HIGHER CLAYEY SILT AND FRACTURED SHALE CONTENT.

GRAVELLY SAND: DISCONTINUOUS BROWN TO DARK GRAY SAND AND GRAVEL.

SILTY SHALE: BLACK TO GRAY PLATY SHALE FRAGMENTS WITH INTERSTITIAL SILT. LOOSE AND SATURATED. POSSIBLY FILL.

SHALE BEDROCK: LAMINATED, BROKEN, DARK GRAY SHALE WITH CALCITE VEINS AND INCLUSIONS. BEDDING DIPS 30-40° FROM HORIZONTAL; FRACTURES ARE 0-90° FROM BEDDING PLANES. UPPER 1 TO 2 FEET SEVERELY WEATHERED.

LEGEND

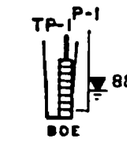


BORING AND MONITORING WELL LOCATION

OBSERVED WATER LEVEL (FEET, RELATIVE) ON MARCH 29, 1988

EFFECTIVE SCREEN LENGTH (ACTUAL SCREEN SHOWN AS ⊟)

BOTTOM OF BORING

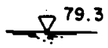


TEST PIT AND PIEZOMETER LOCATION

OBSERVED WATER LEVEL (FEET, RELATIVE) ON MARCH 29, 1988

PIEZOMETER SCREEN

BOTTOM OF EXPLORATION



OBSERVED SURFACE WATER LEVEL (FEET, RELATIVE) ON MARCH 29, 1988

NOTES

1. SEE FIGURE 3-1 FOR LOCATION AND ORIENTATION OF PROFILE.
2. PROFILE IS BASED ON AN INTERPRETATION OF AVAILABLE SUBSURFACE EXPLORATIONS. ACTUAL CONDITIONS MAY VARY FROM THOSE SHOWN.
3. ELEVATIONS BASED ON ASSUMED DATUM OF 100.00' AT R.R. SPIKE IN UTILITY POLE LOCATED 25' SOUTH OF INTERSECTION OF FERRIS LANE AND NORTH CENTRAL AVENUE.
4. FOUNDATION STRUCTURE LOCATIONS SHOWN ARE APPROXIMATE.

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CONSULTING ENGINEERS

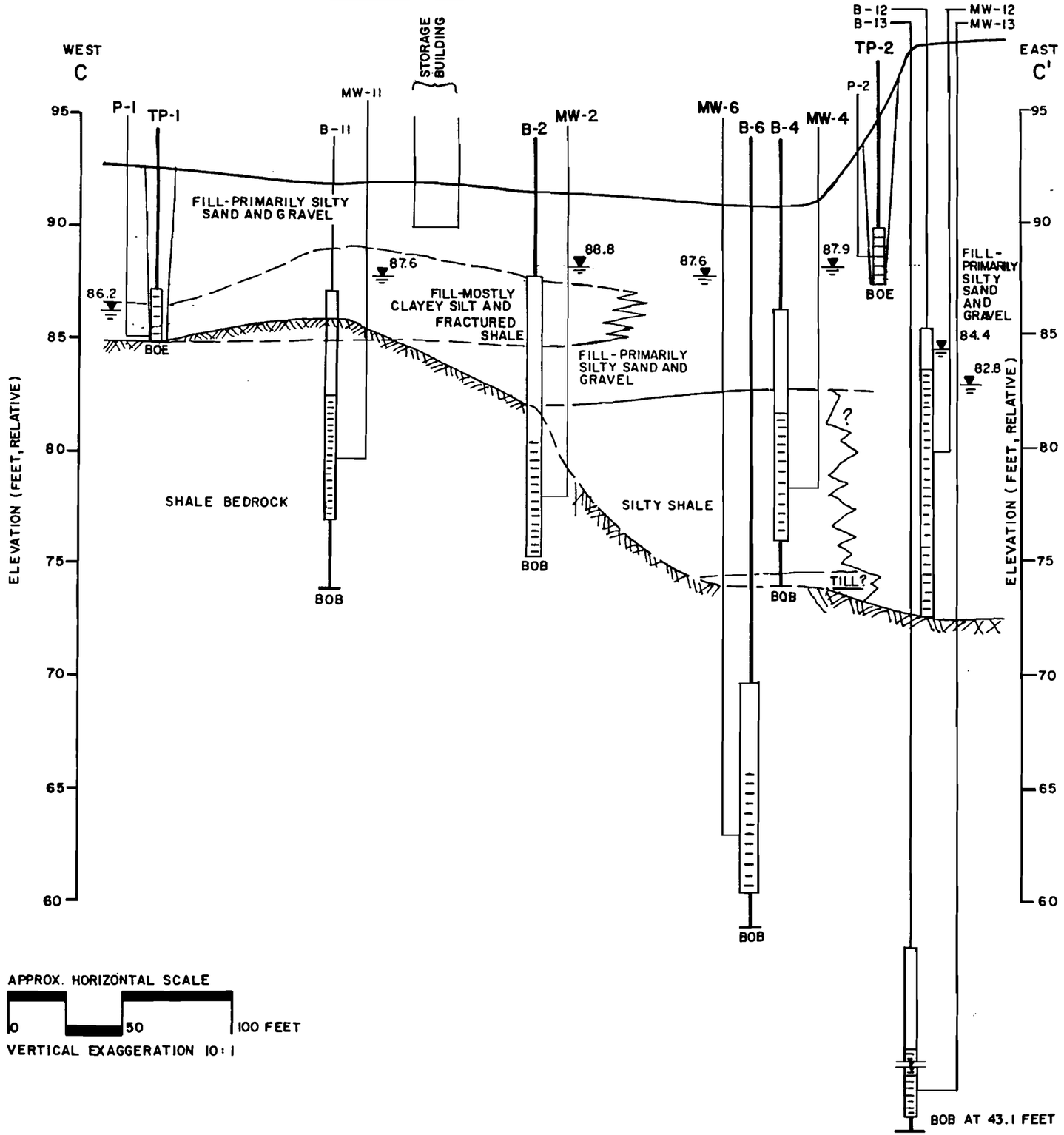
INTERPRETIVE GEOLOGIC PROFILE B–B'
MECHANICVILLE SITE

NEW YORK STATE ELECTRIC AND GAS CORP.
BINGHAMTON, NEW YORK

INVESTIGATION OF FORMER COAL GASIFICATION SITES

4945-04

FIGURE 3-3



APPROX. HORIZONTAL SCALE

0 50 100 FEET

VERTICAL EXAGGERATION 10:1

GEOLOGIC DESCRIPTIONS

FILL: PRIMARILY SILTY SAND AND GRAVEL WITH ORGANIC MATTER, ASH, BRICK FRAGMENTS, GLASS, AND WOOD CHIPS WITH ZONES OF HIGHER CLAYEY SILT AND FRACTURED SHALE CONTENT.

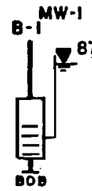
GRAVELLY SAND: DISCONTINUOUS BROWN TO DARK GRAY SAND AND GRAVEL.

SILTY SHALE: BLACK TO GRAY PLATY SHALE FRAGMENTS WITH INTERSTITIAL SILT. LOOSE AND SATURATED. POSSIBLY FILL.

TILL: DISCONTINUOUS TAN TO LIGHT GRAY SILTY CLAY TILL WITH FINE GRAVEL.

SHALE BEDROCK: LAMINATED, BROKEN, DARK GRAY SHALE WITH CALCITE VEINS AND INCLUSIONS. BEDDING DIPS 30-40° FROM HORIZONTAL; FRACTURES ARE 0-90° FROM BEDDING PLANES. UPPER 1 TO 2 FEET SEVERELY WEATHERED.

LEGEND

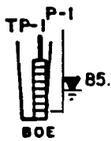


BORING AND MONITORING WELL LOCATION

OBSERVED WATER LEVEL (FEET, RELATIVE) ON MARCH 29, 1988

EFFECTIVE SCREEN LENGTH (ACTUAL SCREEN SHOWN AS ▭)

BOTTOM OF BORING



TEST PIT AND PIEZOMETER LOCATION

OBSERVED WATER LEVEL (FEET, RELATIVE) ON MARCH 29, 1988

PIEZOMETER SCREEN

BOTTOM OF EXPLORATION

NOTES

1. SEE FIGURE 3-1 FOR LOCATION AND ORIENTATION OF PROFILE.
2. PROFILE IS BASED ON AN INTERPRETATION OF AVAILABLE SUBSURFACE EXPLORATIONS. ACTUAL CONDITIONS MAY VARY FROM THOSE SHOWN.
3. ELEVATIONS BASED ON ASSUMED DATUM OF 100.00' AT R.R. SPIKE IN UTILITY POLE LOCATED 25' SOUTH OF INTERSECTION OF FERRIS LANE AND NORTH CENTRAL AVENUE.
4. FOUNDATION STRUCTURE LOCATIONS SHOWN ARE APPROXIMATE.

E.C. JORDAN CO.
CONSULTING ENGINEERS

INTERPRETIVE GEOLOGIC PROFILE C-C'
MECHANICVILLE SITE

NEW YORK STATE ELECTRIC AND GAS CORP.
BINGHAMTON, NEW YORK

INVESTIGATION OF FORMER COAL GASIFICATION SITES

4945-04

FIGURE 3-4

LEGEND

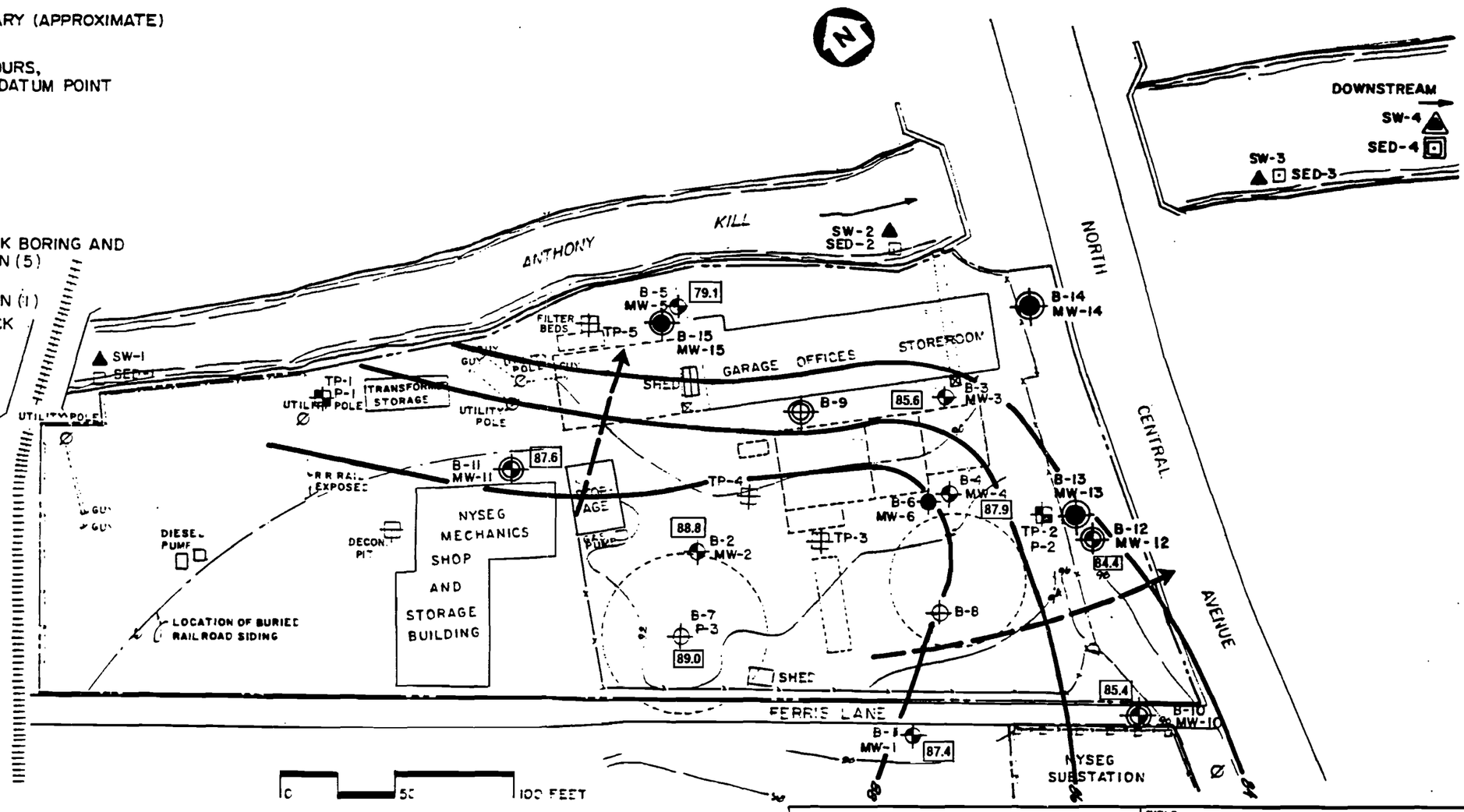
- APPROXIMATE LOCATION OF FORMER GAS PLANT STRUCTURES
- NYSEG PROPERTY BOUNDARY (APPROXIMATE)
- FENCE
- GROUND ELEVATION CONTOURS, IN FEET ABOVE RELATIVE DATUM POINT
- STORM DRAIN

TASK 2:

- SOIL AND SHALLOW BEDROCK BORING AND MONITORING WELL LOCATION (5)
- DEEP BEDROCK BORING AND MONITORING WELL LOCATION (1)
- SOIL AND SHALLOW BEDROCK BORING LOCATION (2)
- TEST PIT AND PIEZOMETER LOCATION (2)
- TEST PIT LOCATION (3)
- SURFACE WATER SAMPLE LOCATION (3)
- SEDIMENT SAMPLE LOCATION (3)

TASK 3:

- SOIL/SHALLOW BEDROCK BORING AND MONITORING WELL LOCATION (3)
- DEEP BEDROCK BORING AND MONITORING WELL LOCATION (3)
- SOIL BORING LOCATION (1)
- SURFACE WATER SAMPLE LOCATION (1)
- SEDIMENT SAMPLE LOCATION (1)
- 89.0 WATER LEVEL (FT. RELATIVE) OBSERVED ON MARCH 29, 1988
- INTERPRETED GROUNDWATER SURFACE CONTOUR
- INTERPRETED GROUNDWATER FLOW DIRECTION



BASE MAP SOURCE:

TOPOGRAPHIC SURVEY PREPARED BY DAVID A. FLANDERS ASSOCIATES, 6 MORNINGSIDE DRIVE, BALLSTON LAKE, NEW YORK, DATED 6/26/86 (86-72-S). REVISED 12/87.

ELEVATIONS BASED ON ASSUMED DATUM OF 100.00' AT R.R. SPIKE IN UTILITY POLE LOCATED 25' SOUTH OF INTERSECTION OF FERRIS LANE AND NORTH CENTRAL AVENUE.

E.C. JORDAN CO.
CONSULTING ENGINEERS

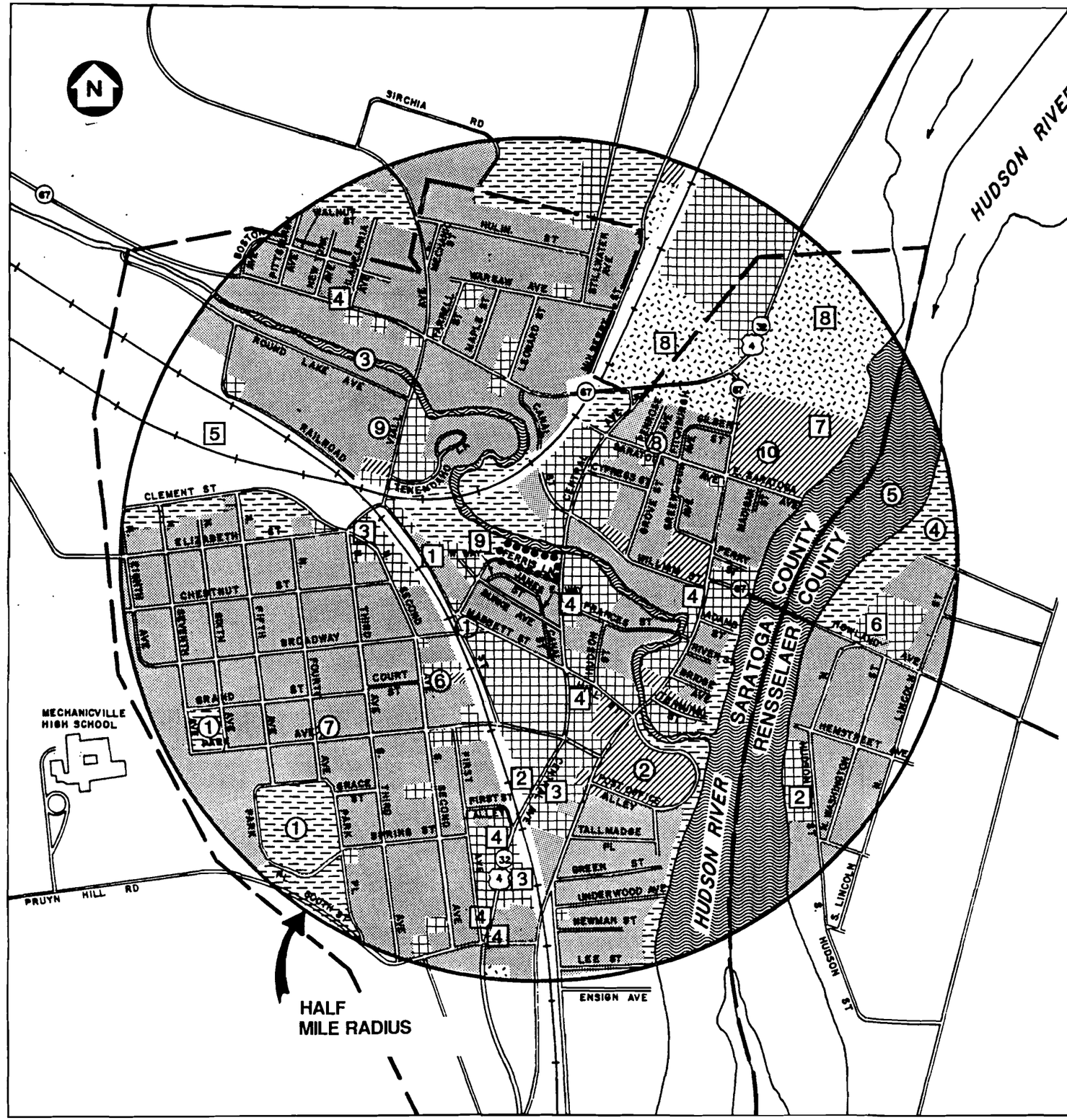
TITLE
WATER TABLE CONTOURS
MECHANICVILLE SITE
MARCH 1988

CLIENT
NEW YORK STATE
ELECTRIC AND GAS CORP.
BINGHAMTON, NEW YORK

INVESTIGATION OF FORMER COAL GASIFICATION SITES

PROJECT NO. 4945-03

FIGURE 3-5



LEGEND

- (1) PARKS AND PLAYGROUNDS
- (2) MECHANICVILLE ELEMENTARY SCHOOL
- (3) ANTHONY KILL
- (4) MECHANICVILLE COUNTRYCLUB
- (5) HUDSON RIVER
- (6) SCHOOL – SPECIAL EDUCATION
- (7) NURSERY SCHOOL
- (8) HEADSTART PROGRAM – PRESCHOOL DAY CARE
- (9) ELDERLY HOUSING
- (10) MECHANICVILLE SENIOR CITIZENS CENTER

- [1] ABOVE GROUND OIL STORAGE TANKS
- [2] PETROLEUM PRODUCTS STORAGE AND DIST.
- [3] AUTO REPAIR
- [4] GAS STATION
- [5] RAILROAD
- [6] COAL STORAGE AND SALES
- [7] OLD TANK FARM SITE
- [8] VACANT INDUSTRIAL LAND
- [9] DUMPED 55-GALLON DRUMS

- RESIDENTIAL
- COMMERCIAL /INDUSTRIAL
- RECREATIONAL/OPEN SPACE
- TRANSPORTATION
- WATER
- PUBLIC INSTITUTIONAL
- URBAN DISTURBED
- SITE LOCATION
- (1) TO (10) POTENTIALLY SENSITIVE LAND USES
- [1] TO [9] POTENTIAL CONTRIBUTORS OF CHEMICALS TO GROUND WATER AND SURFACE WATER

BASE MAP SOURCE:
MECHANICVILLE AREA MAP,
ADIRONDACK ASSOCIATES, 1985

SCALE IN FEET
0 500 1000

E.C. JORDAN CO.
CONSULTING ENGINEERS

NEW YORK STATE
ELECTRIC AND GAS CORP.
BINGHAMTON, NEW YORK

LAND USE MAP
MECHANICVILLE SITE

INVESTIGATION OF FORMER
COAL GASIFICATION SITES

JOB NO. 4945-04

FIGURE 3-6

LEGEND

- APPROXIMATE LOCATION OF FORMER GAS PLANT STRUCTURES
- NYSEG PROPERTY BOUNDARY (APPROXIMATE)
- FENCE
- GROUND ELEVATION CONTOURS, IN FEET ABOVE RELATIVE DATUM POINT
- STORM DRAIN

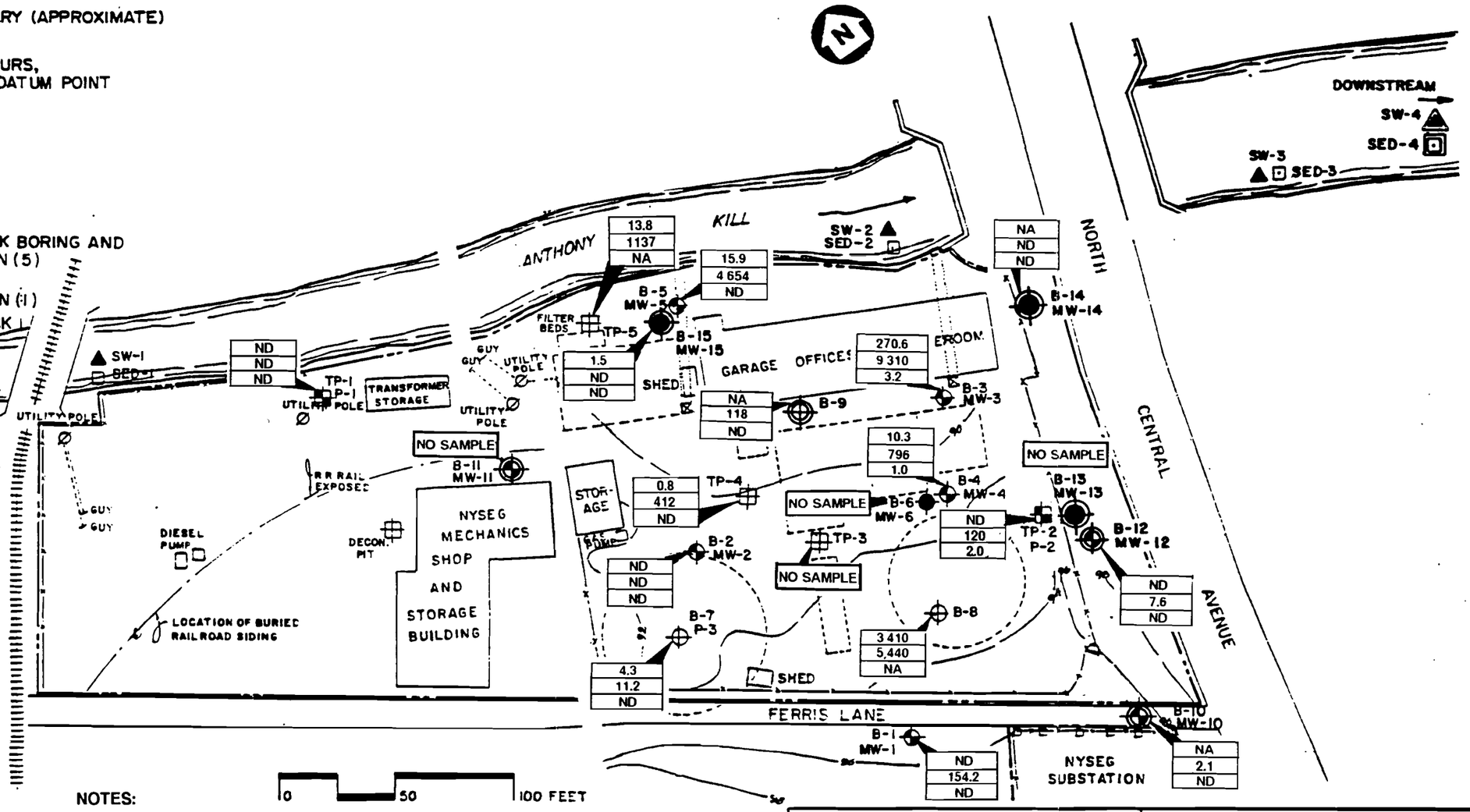
TASK 2:

- SOIL AND SHALLOW BEDROCK BORING AND MONITORING WELL LOCATION (5)
- DEEP BEDROCK BORING AND MONITORING WELL LOCATION (1)
- SOIL AND SHALLOW BEDROCK BORING LOCATION (2)
- TEST PIT AND PIEZOMETER LOCATION (2)
- TEST PIT LOCATION (3)
- SURFACE WATER SAMPLE LOCATION (3)
- SEDIMENT SAMPLE LOCATION (3)

TASK 3:

- SOIL/SHALLOW BEDROCK BORING AND MONITORING WELL LOCATION (3)
- DEEP BEDROCK BORING AND MONITORING WELL LOCATION (3)
- SOIL BORING LOCATION (1)
- SURFACE WATER SAMPLE LOCATION (1)
- SEDIMENT SAMPLE LOCATION (1)

TOTAL VOCs TOTAL PAHs TOTAL CN	CONCENTRATIONS DETECTED IN SOIL BORINGS IN mg/kg DURING TASK 2 AND TASK 3 SAMPLING EVENTS.
NA	NOT ANALYZED
ND	NOT DETECTED



NOTES:

1. HPLC ORGANIC ANALYSIS RESULTS ARE SHOWN EXCEPT WHERE GC/MS RESULTS ARE AVAILABLE (TP-5; B-8, B-9, B-10, B-12, B-14, AND B-15).
2. WHERE DUPLICATE SAMPLES WERE ANALYZED BY THE SAME TECHNIQUE, THE HIGHER VALUE IS SHOWN.
3. SAMPLES WERE COLLECTED AT DEPTHS BETWEEN 3 AND 24 FEET BELOW GROUND SURFACE.
4. ALL SAMPLES EXCEPT TP-5 AND B-9 WERE COLLECTED BELOW THE WATER TABLE.

BASE MAP SOURCE:

TOPOGRAPHIC SURVEY PREPARED BY DAVID A. FLANDERS ASSOCIATES, 6 MORNINGSIDE DRIVE, BALSTON LAKE, NEW YORK, DATED 6/26/86 (86-72-S). REVISED 12/87. ELEVATIONS BASED ON ASSUMED DATUM OF 100.00' AT R.R. SPIKE IN UTILITY POLE LOCATED 25' SOUTH OF INTERSECTION OF FERRIS LANE AND NORTH CENTRAL AVENUE.

E.C. JORDAN CO.
CONSULTING ENGINEERS

TITLE: DISTRIBUTION OF CHEMICALS IN SOILS MECHANICVILLE SITE

CLIENT: NEW YORK STATE ELECTRIC AND GAS CORP. BINGHAMTON, NEW YORK

INVESTIGATION OF FORMER COAL GASIFICATION SITES

PROJECT NO. 4945-04

FIGURE 4-1

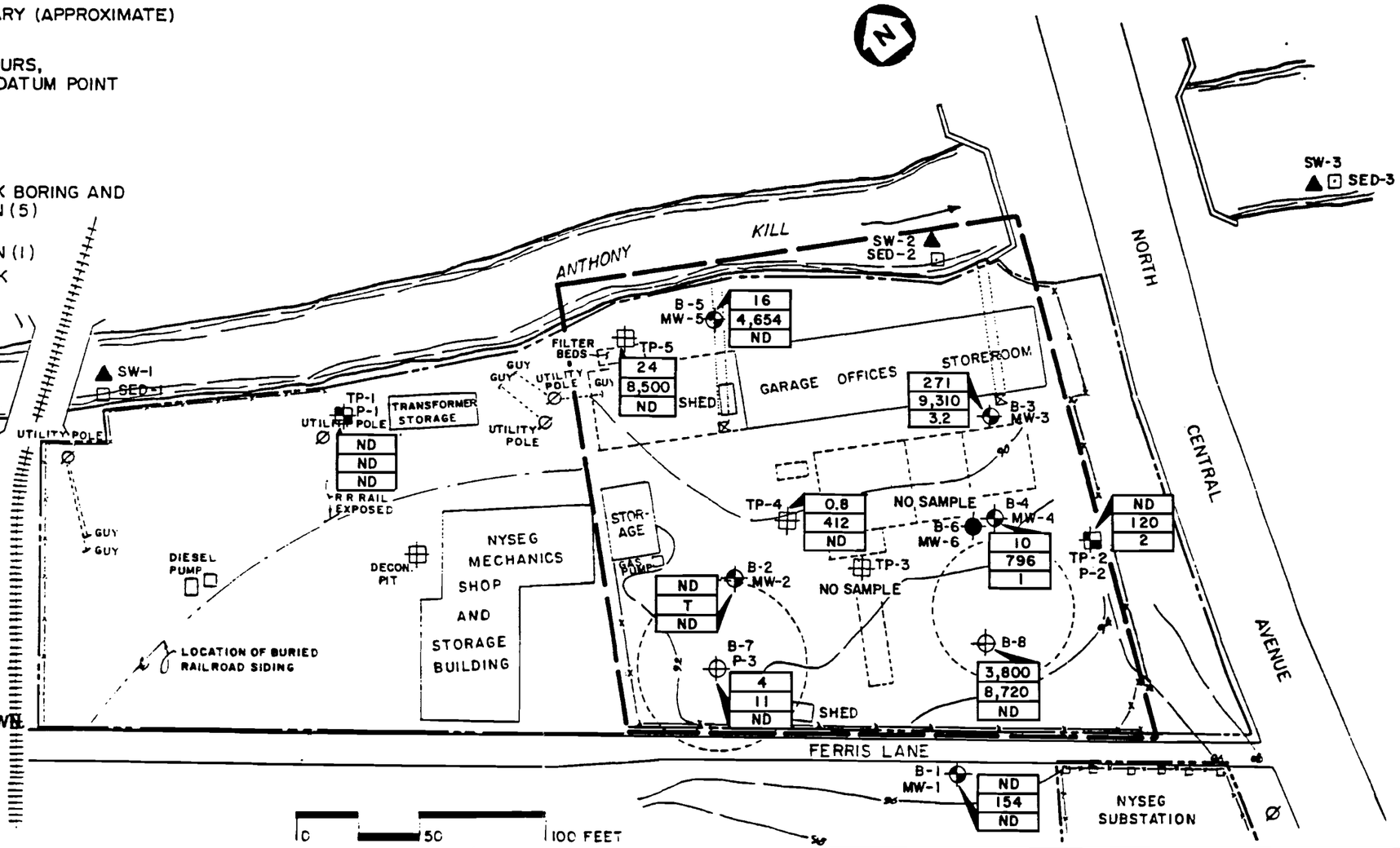
LEGEND

- APPROXIMATE LOCATION OF FORMER GAS PLANT STRUCTURES
- NYSEG PROPERTY BOUNDARY (APPROXIMATE)
- FENCE
- GROUND ELEVATION CONTOURS, IN FEET ABOVE RELATIVE DATUM POINT
- STORM DRAIN
- CULVERT
- STUDY AREA BOUNDARY
- SOIL AND SHALLOW BEDROCK BORING AND MONITORING WELL LOCATION (5)
- DEEP BEDROCK BORING AND MONITORING WELL LOCATION (1)
- SOIL AND SHALLOW BEDROCK BORING LOCATION (2)
- TEST PIT AND PIEZOMETER LOCATION (2)
- TEST PIT LOCATION (3)
- SURFACE WATER SAMPLE LOCATION (3)
- SEDIMENT SAMPLE LOCATION (3)

TOTAL VOCs	CONCENTRATIONS DETECTED IN SOIL SAMPLES IN mg/kg. DURING JULY/AUGUST 1986 SAMPLING EVENT.
TOTAL PAHs	
TOTAL CN	

NOTES:

1. FOR CONSISTENCY, ONLY HPLC ORGANIC ANALYSES RESULTS ARE SHOWN.
2. WHERE DUPLICATE SAMPLES WERE ANALYZED, THE HIGHER VALUE IS SHOWN.
3. SAMPLES WERE COLLECTED AT DEPTHS BETWEEN 3 AND 11 FEET BELOW GROUND SURFACE WITH THE EXCEPTION OF B-8 WHICH WAS 13.5 TO 15.5 FEET DEEP.
4. ALL SAMPLES EXCEPT TP-5 WERE COLLECTED BELOW THE HIGHEST OBSERVED WATER TABLE LEVEL.



BASE MAP SOURCE:

TOPOGRAPHIC SURVEY PREPARED BY DAVID A. FLANDERS ASSOCIATES, 6 MORNINGSIDE DRIVE, BALLSTON LAKE, NEW YORK, DATED 6/26/86 (86-72-S). REVISED 12/87.

ELEVATIONS BASED ON ASSUMED DATUM OF 100.00' AT R.R. SPIKE IN UTILITY POLE LOCATED 25' SOUTH OF INTERSECTION OF FERRIS LANE AND NORTH CENTRAL AVENUE.

TASK 2

E.C. JORDAN CO.
CONSULTING ENGINEERS

TITLE: DISTRIBUTION OF SELECTED CHEMICALS IN SOIL MECHANICVILLE SITE

CLIENT: NEW YORK STATE ELECTRIC AND GAS CORP. BINGHAMTON, NEW YORK

INVESTIGATION OF FORMER COAL GASIFICATION SITES

PROJECT NO. 4945-02 FIGURE 4-2

LEGEND

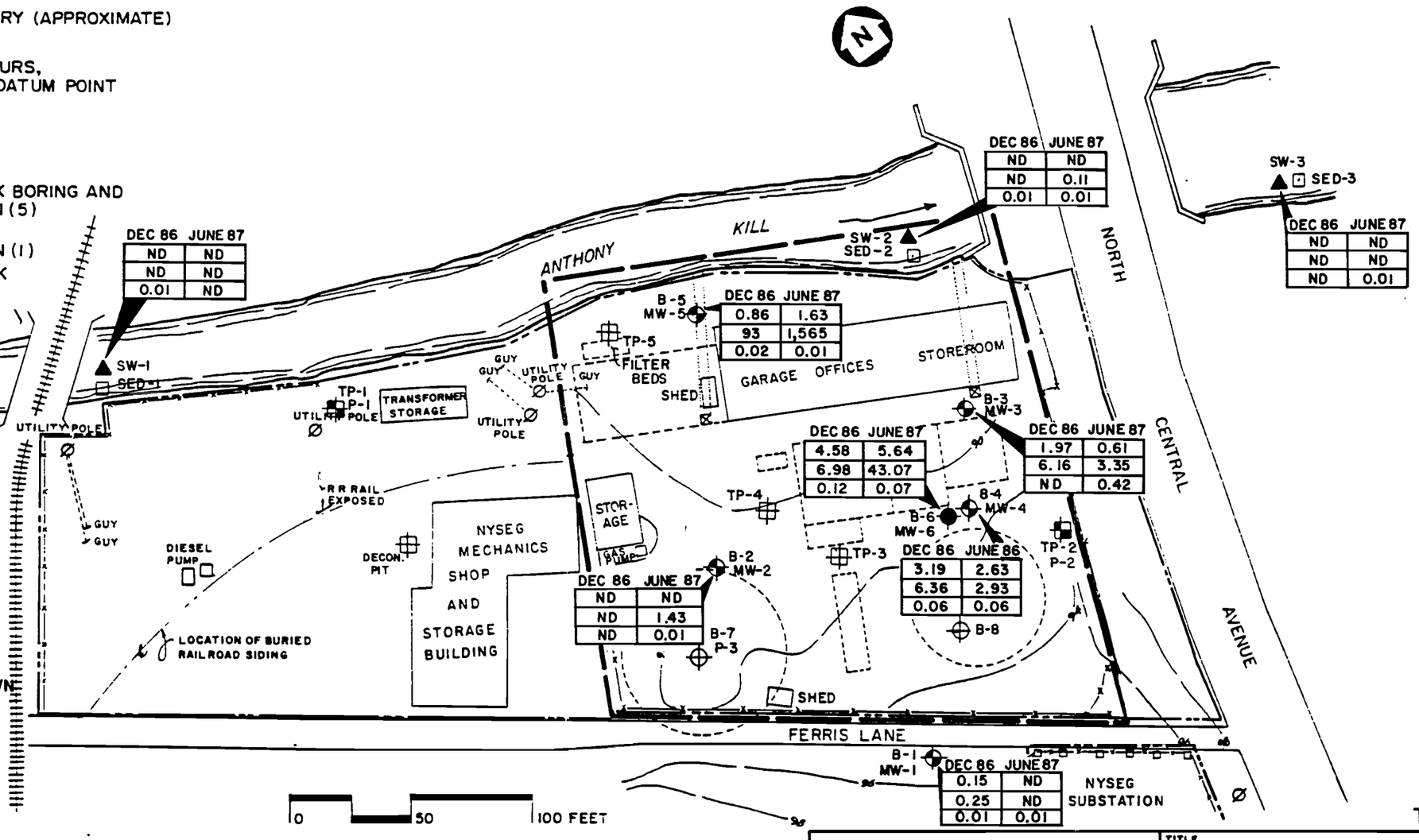
- APPROXIMATE LOCATION OF FORMER GAS PLANT STRUCTURES
- NYSEG PROPERTY BOUNDARY (APPROXIMATE)
- FENCE
- GROUND ELEVATION CONTOURS, IN FEET ABOVE RELATIVE DATUM POINT
- STORM DRAIN
- CULVERT
- STUDY AREA BOUNDARY
- SOIL AND SHALLOW BEDROCK BORING AND MONITORING WELL LOCATION (5)
- DEEP BEDROCK BORING AND MONITORING WELL LOCATION (1)
- SOIL AND SHALLOW BEDROCK BORING LOCATION (2)
- TEST PIT AND PIEZOMETER LOCATION (2)
- TEST PIT LOCATION (3)
- SURFACE WATER SAMPLE LOCATION (3)
- SEDIMENT SAMPLE LOCATION (3)

TOTAL VOCs
TOTAL PAHs
TOTAL CN

CONCENTRATIONS DETECTED IN GROUNDWATER SAMPLES IN mg/l.

NOTES:

1. ALL ORGANIC CONCENTRATIONS ARE FROM GC/MS ANALYSES.
2. WHERE DUPLICATE SAMPLES WERE ANALYZED, THE HIGHER VALUE IS SHOWN.
3. RESULTS ARE SHOWN FOR TWO SAMPLING EVENTS: DECEMBER 1986 AND JUNE 1987, AS LABELLED.
4. B-6 IS THE ONLY BEDROCK WELL; THE REMAINING WELLS SPAN BOTH SOIL AND BEDROCK ZONES.



BASE MAP SOURCE:

TOPOGRAPHIC SURVEY PREPARED BY DAVID A. FLANDERS ASSOCIATES, 6 MORNINGSIDE DRIVE, BALLSTON LAKE, NEW YORK, DATED 6/26/86 (86-72-S). REVISED 12/87.

ELEVATIONS BASED ON ASSUMED DATUM OF 100.00' AT R.R. SPIKE IN UTILITY POLE LOCATED 25' SOUTH OF INTERSECTION OF FERRIS LANE AND NORTH CENTRAL AVENUE.

E.C. JORDAN CO.
CONSULTING ENGINEERS

CLIENT
NEW YORK STATE ELECTRIC AND GAS CORP.
BINGHAMTON, NEW YORK

TITLE
DISTRIBUTION OF SELECTED CHEMICALS IN GROUNDWATER AND SURFACE WATER
MECHANICVILLE SITE
INVESTIGATION OF FORMER COAL GASIFICATION SITES

PROJECT NO. 4945-02 FIGURE 4-3

TASK 2

LEGEND

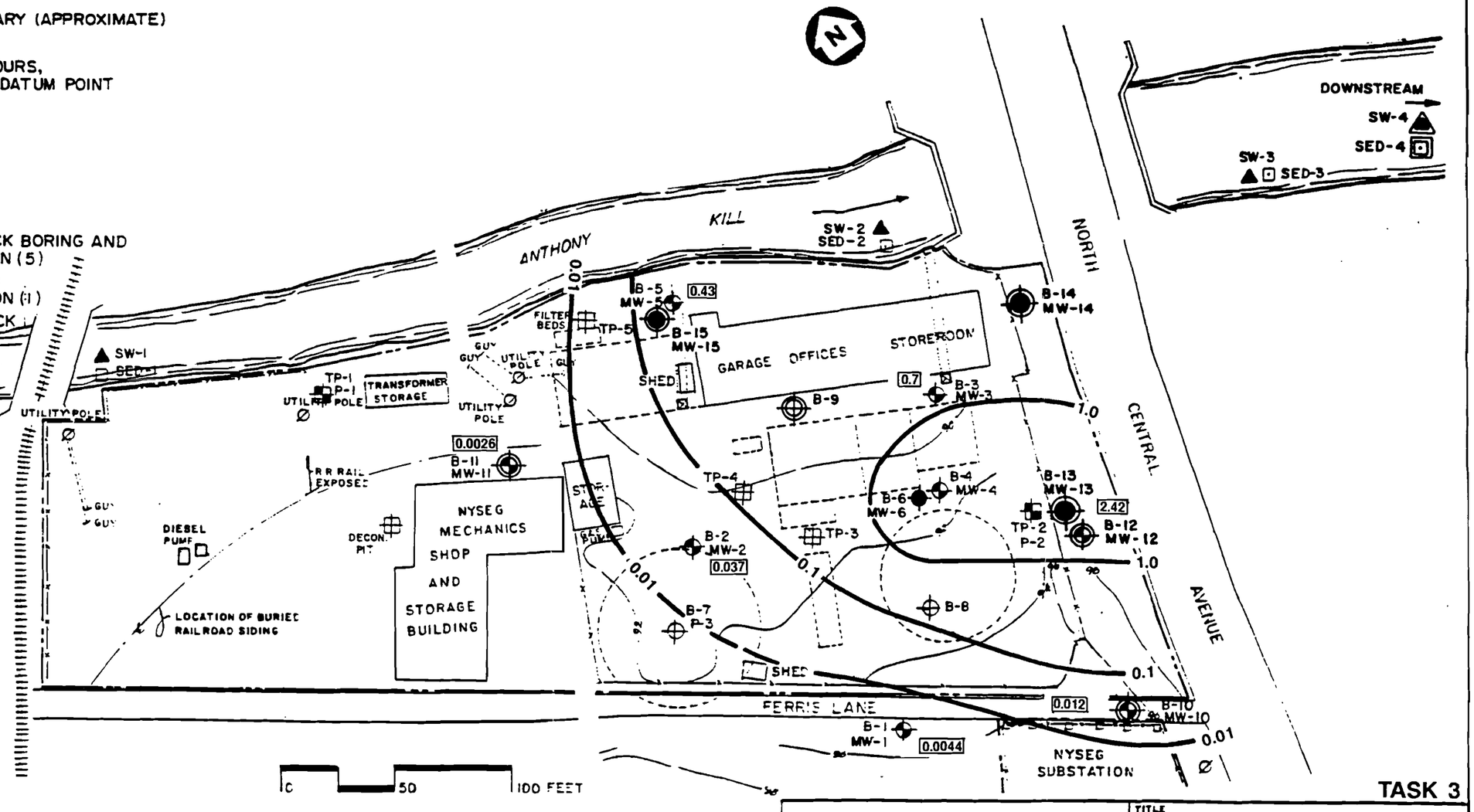
- APPROXIMATE LOCATION OF FORMER GAS PLANT STRUCTURES
- NYSEG PROPERTY BOUNDARY (APPROXIMATE)
- FENCE
- GROUND ELEVATION CONTOURS, IN FEET ABOVE RELATIVE DATUM POINT
- STORM DRAIN
- STUDY AREA BOUNDARY

TASK 2:

- SOIL AND SHALLOW BEDROCK BORING AND MONITORING WELL LOCATION (5)
- DEEP BEDROCK BORING AND MONITORING WELL LOCATION (1)
- SOIL AND SHALLOW BEDROCK BORING LOCATION (2)
- TEST PIT AND PIEZOMETER LOCATION (2)
- TEST PIT LOCATION (3)
- SURFACE WATER SAMPLE LOCATION (3)
- SEDIMENT SAMPLE LOCATION (3)

TASK 3:

- SOIL/SHALLOW BEDROCK BORING AND MONITORING WELL LOCATION (3)
- DEEP BEDROCK BORING AND MONITORING WELL LOCATION (3)
- SOIL BORING LOCATION (1)
- SURFACE WATER SAMPLE LOCATION (1)
- SEDIMENT SAMPLE LOCATION (1)
- 1.0 — INTERPRETIVE CONTOUR OF MAXIMUM CONCENTRATION (in mg/l) OF TOTAL VOCs IN SHALLOW GROUNDWATER DURING TASK 3
- 2.42 — MAXIMUM CONCENTRATION IN mg/l OF TOTAL VOCs IN SAMPLE COLLECTED DURING TASK 3



TASK 3

BASE MAP SOURCE:

TOPOGRAPHIC SURVEY PREPARED BY DAVID A. FLANDERS ASSOCIATES, 6 MORNINGSIDE DRIVE, BALLSTON LAKE, NEW YORK, DATED 6/26/86 (86-72-S). REVISED 12/87.

ELEVATIONS BASED ON ASSUMED DATUM OF 100.00' AT R.R. SPIKE IN UTILITY POLE LOCATED 25' SOUTH OF INTERSECTION OF FERRIS LANE AND NORTH CENTRAL AVENUE.

E.C. JORDAN CO.
CONSULTING ENGINEERS

TITLE: DISTRIBUTION OF TOTAL VOCs IN SHALLOW GROUNDWATER MECHANICVILLE SITE

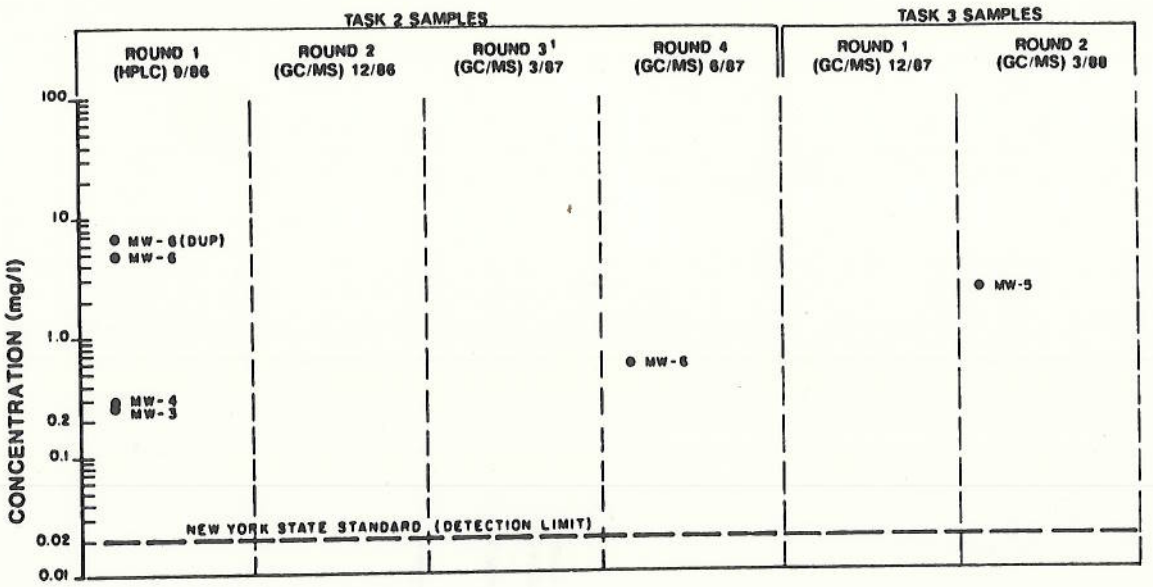
CLIENT: NEW YORK STATE ELECTRIC AND GAS CORP. BINGHAMTON, NEW YORK

INVESTIGATION OF FORMER COAL GASIFICATION SITES

PROJECT NO. 4945-03

FIGURE 4-4

BENZO (a) PYRENE IN GROUNDWATER



SAMPLES IN WHICH BENZO (a) PYRENE WAS NOT DETECTED

ROUND 1 (HPLC) 9/86	ROUND 2 (GC/MS) 12/86	ROUND 3[1] (GC/MS) 3/87	ROUND 4 (GC/MS) 6/87	ROUND 1 (GC/MS) 12/87	ROUND 2 (GC/MS) 3/88
MW-1[2]	MW-1	MW-1	MW-1	MW-1	MW-1
MW-1(GC/MS)[2]	MW-2	MW-2	MW-2	MW-2	MW-2
MW-2	MW-2(DUP)	MW-3	MW-3	MW-3[2]	MW-2(DUP)
MW-3(GC/MS)[2]	MW-3	MW-4	MW-4	MW-4	MW-3[2]
MW-5	MW-4	MW-6	MW-5	MW-5	MW-4
	MW-5	MW-6(DUP)	MW-5(DUP)	MW-6[2]	MW-6
	MW-6			MW-10	MW-10
				MW-11	MW-11
				MW-11(DUP)	MW-12[2]
				MW-12	MW-13[2]
				MW-13	MW-13(DUP)[2]
				MW-14	MW-14
				MW-15	MW-15
				MW-15(DUP)	

[1] MW-5 WAS NOT SAMPLED IN ROUND 3.
[2] TRACE CONCENTRATIONS DETECTED BELOW QUANTIFIABLE REPORTING LIMIT

E.C. JORDAN CO.
CONSULTING ENGINEERS

TITLE
BENZO (a) PYRENE IN GROUNDWATER
MECHANICVILLE SITE

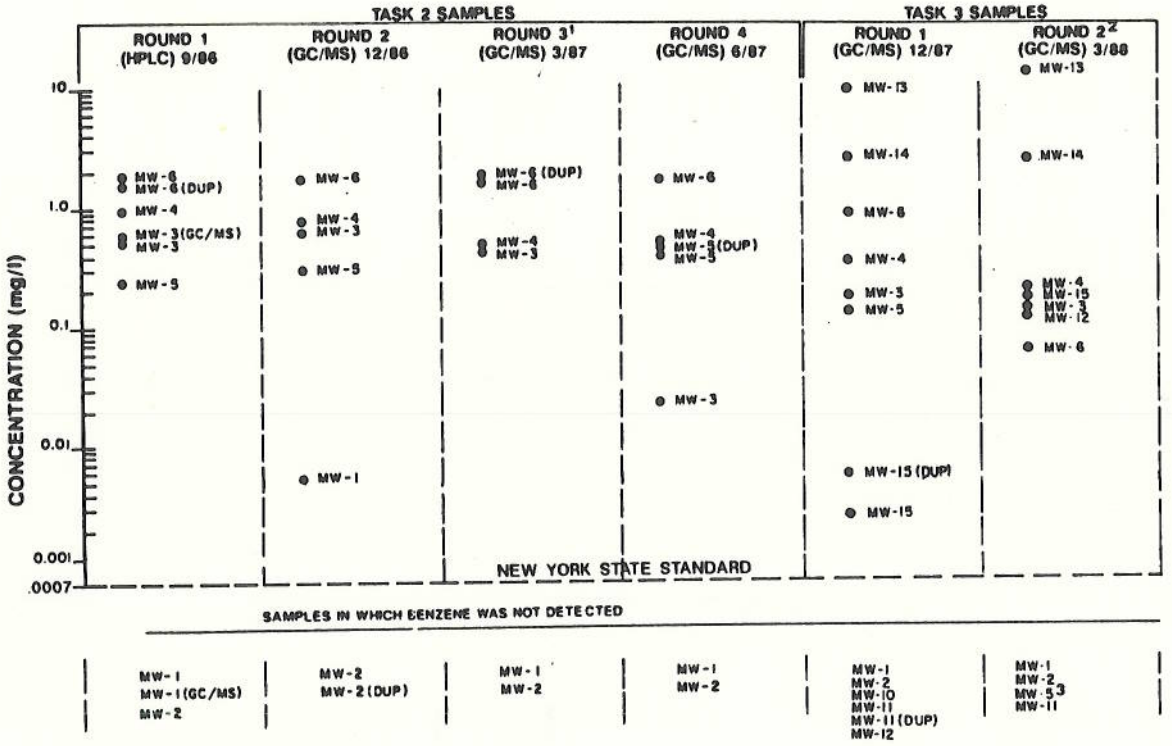
CLIENT
NEW YORK STATE
ELECTRIC AND GAS CORP.
BINGHAMTON, NEW YORK

INVESTIGATION OF FORMER
COAL GASIFICATION SITES

PROJECT NO. 4945-04

FIGURE 5-1

BENZENE IN GROUNDWATER



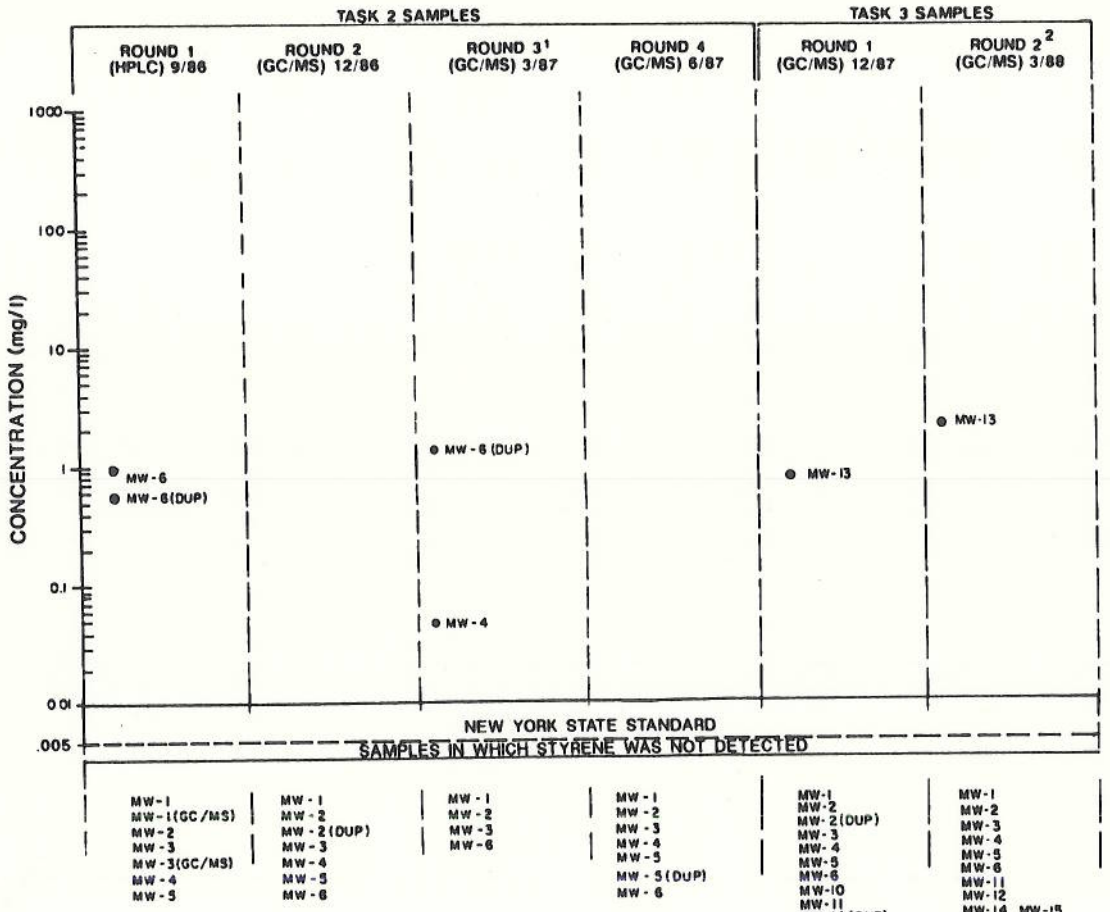
[1] MW-5 WAS NOT SAMPLED IN ROUND 3.

[2] BENZENE ANALYSIS WAS NOT PERFORMED ON ROUND 2 SAMPLES. MW-2(DUP), MW-10, AND MW-13(DUP).

[3] TRACE CONCENTRATIONS DETECTED BELOW QUANTIFIABLE REPORTING LIMIT.

E.C. JORDAN CO. CONSULTING ENGINEERS	TITLE: BENZENE IN GROUNDWATER MECHANICVILLE SITE
CLIENT: NEW YORK STATE ELECTRIC AND GAS CORP. BINGHAMTON, NEW YORK	INVESTIGATION OF FORMER COAL GASIFICATION SITES
	PROJECT NO. 4945-04 FIGURE 5-2

STYRENE IN GROUNDWATER



[1] MW-5 WAS NOT SAMPLED ON ROUND 3.

[2] STYRENE ANALYSIS WAS NOT PERFORMED ON ROUND 2 SAMPLES MW-2(DUP), MW-10, AND MW-13(DUP).

E.C. JORDAN CO.
CONSULTING ENGINEERS

TITLE
STYRENE IN GROUNDWATER
MECHANICVILLE SITE

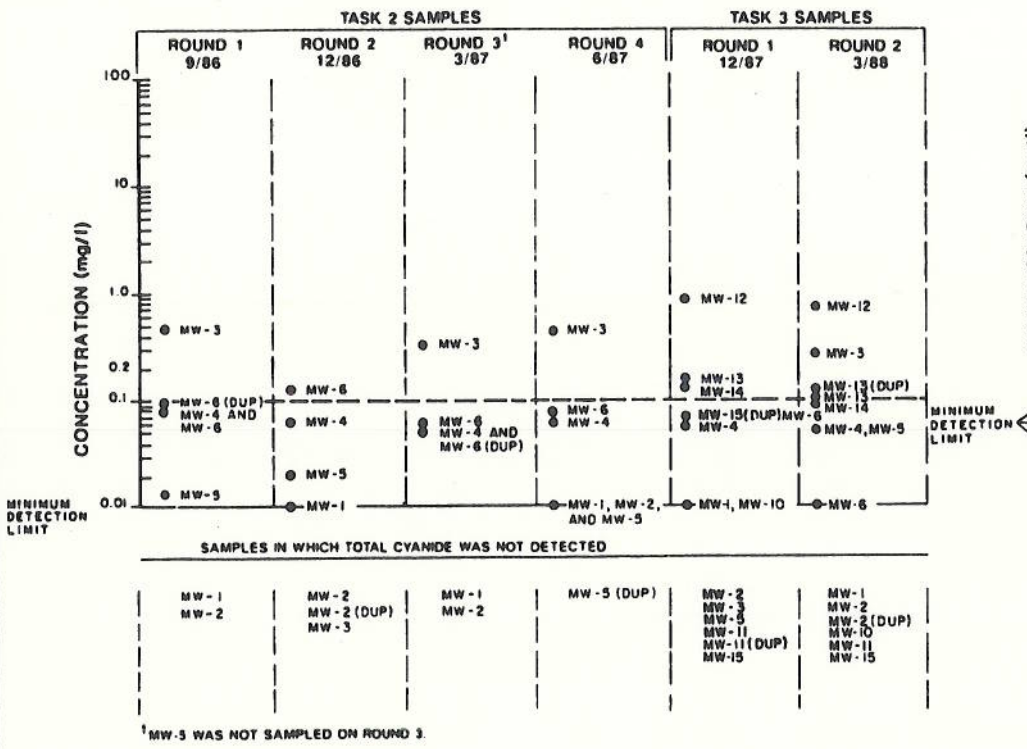
CLIENT
NEW YORK STATE
ELECTRIC AND GAS CORP.
BINGHAMTON, NEW YORK

INVESTIGATION OF FORMER
COAL GASIFICATION SITES

PROJECT NO. 4945-04

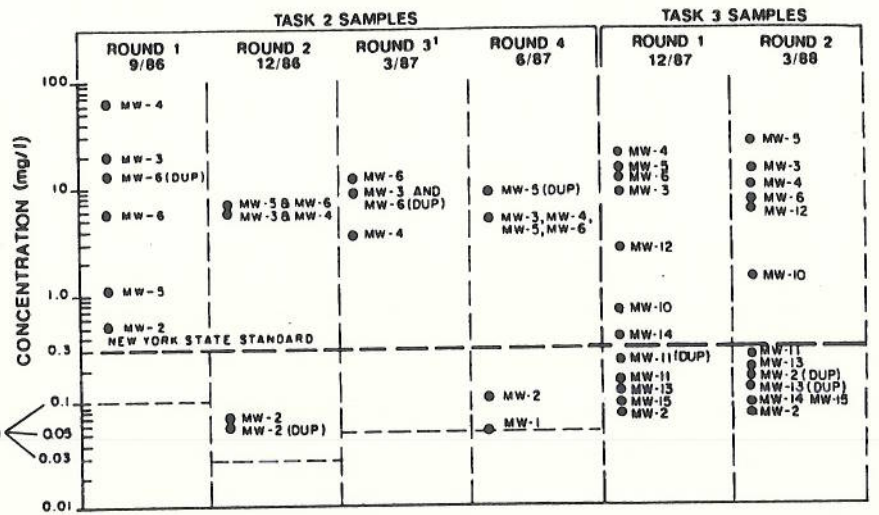
FIGURE 5-3

TOTAL CYANIDE IN GROUNDWATER



[1] MW-5 WAS NOT SAMPLED ON ROUND 3.

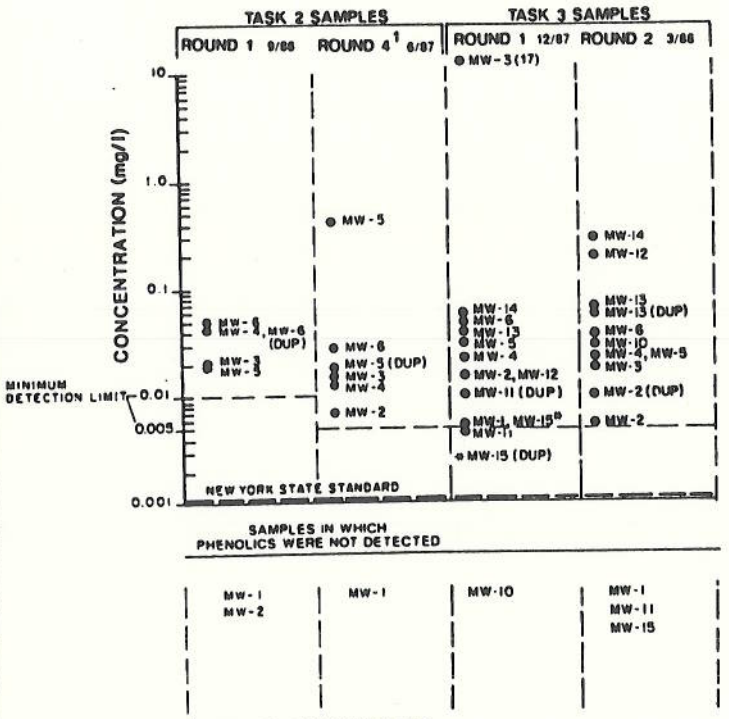
IRON IN GROUNDWATER



[1] MW-5 WAS NOT SAMPLED ON ROUND 3.

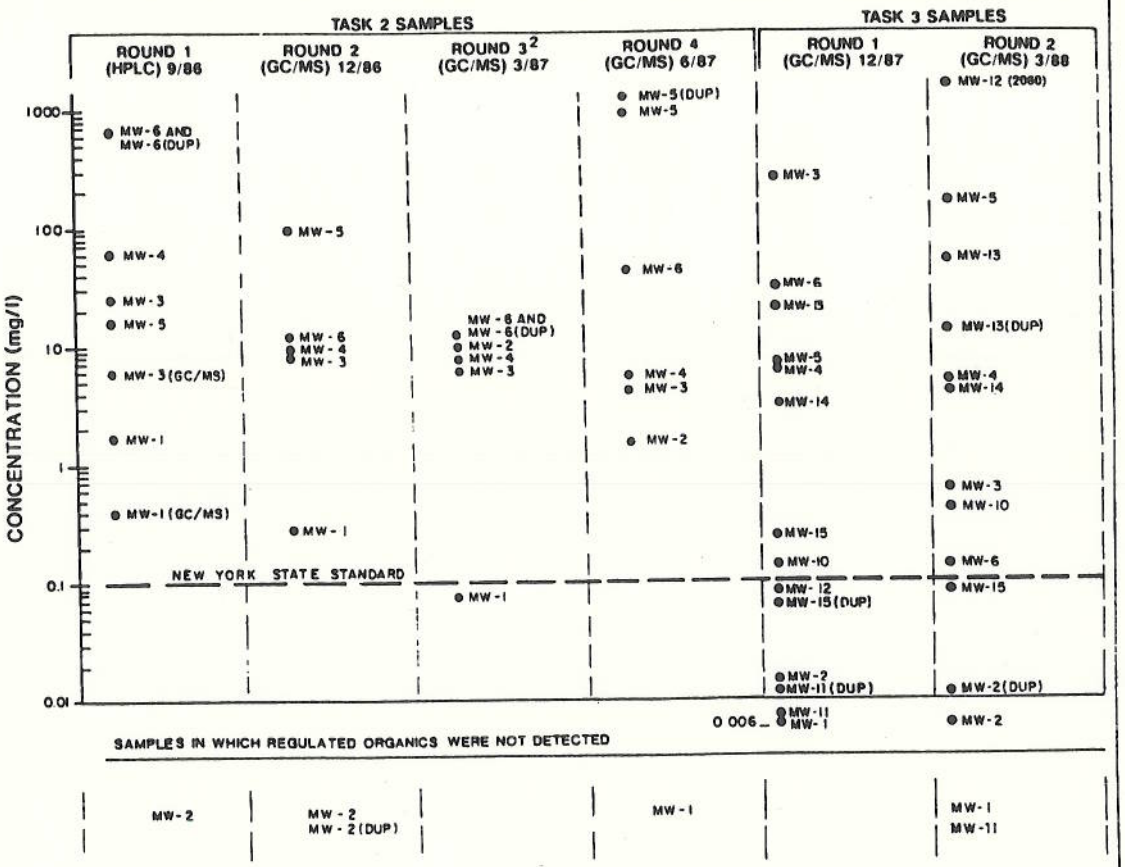
E.C. JORDAN CO. CONSULTING ENGINEERS	TITLE: TOTAL CYANIDE AND IRON IN GROUNDWATER MECHANICVILLE SITE
CLIENT: NEW YORK STATE ELECTRIC AND GAS CORP. BINGHAMTON, NEW YORK	INVESTIGATION OF FORMER COAL GASIFICATION SITES
	PROJECT NO. 4945-04 FIGURE 5-4

PHENOLICS IN GROUNDWATER



[1] PHENOLICS ANALYSIS WAS NOT PERFORMED ON SAMPLES FROM ROUNDS 2 AND 3.

TOTAL NEW YORK STATE REGULATED ORGANICS IN GROUNDWATER[1]



[2] MW-5 WAS NOT SAMPLED ON ROUND 3.

[1] THE N.Y. STATE CLASS GA STANDARD FOR ORGANICS INCLUDES PHENOLIC COMPOUNDS, VOLATILE ORGANICS, AND SEMI-VOLATILE ORGANICS, EXCEPT FOR ACETONE, STYRENE, ACENAPHTHYLENE, BENZO(G,H,I)PENYLENE, DIBENZO(A,H)ANTHRACENE, AND BIS(2-ETHYLHEXYL)PHTHALATE.

E.C. JORDAN CO.
CONSULTING ENGINEERS

TITLE
PHENOLICS AND TOTAL N.Y. STATE REGULATED ORGANICS IN GROUNDWATER
MECHANICVILLE SITE

CLIENT
NEW YORK STATE ELECTRIC AND GAS CORP.
BINGHAMTON, NEW YORK

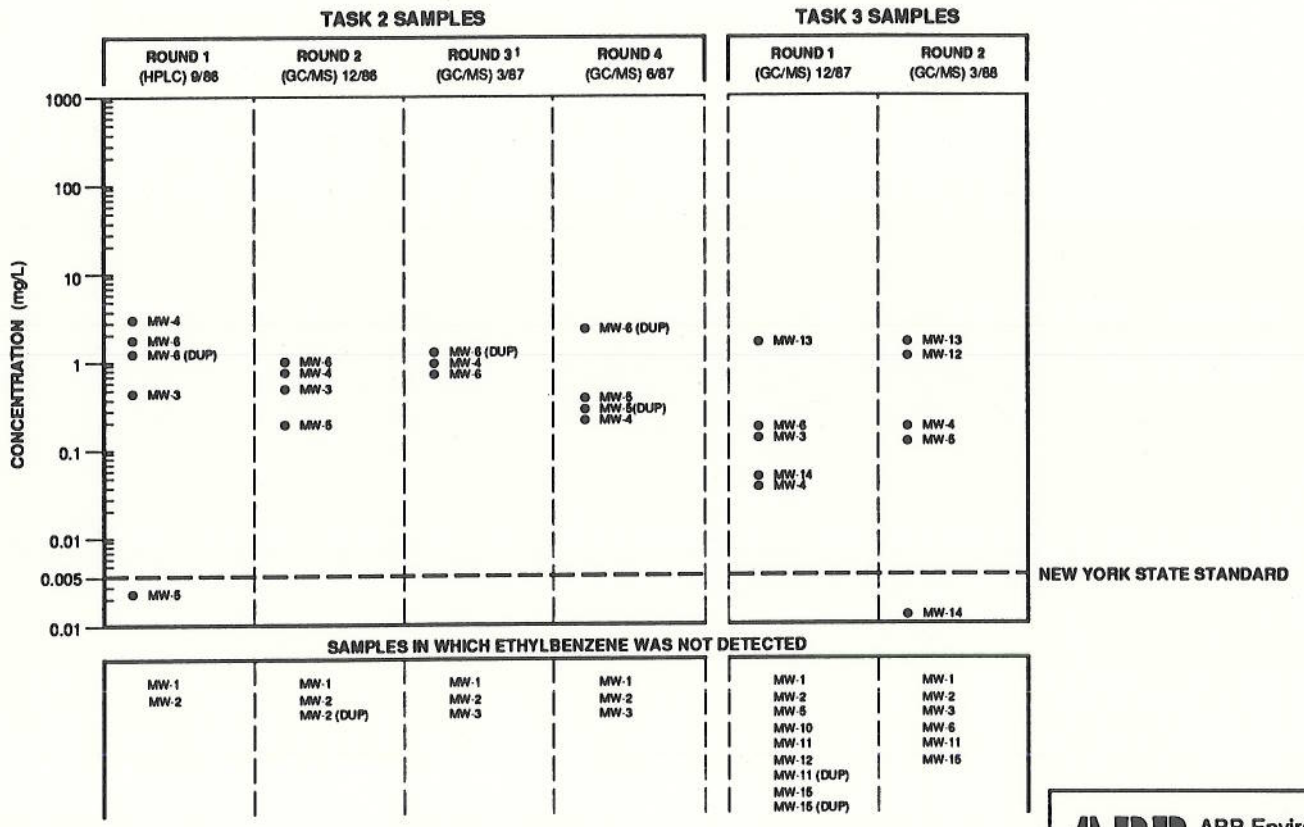
INVESTIGATION OF FORMER COAL GASIFICATION SITES

PROJECT NO. 4945-04

FIGURE 5-5

080023026

ETHYLBENZENE IN GROUNDWATER



NOTE: 1 - MW-6 WAS NOT SAMPLED IN ROUND 3.

ABB Environmental Services, Inc.

TITLE: ETHYLBENZENE IN GROUNDWATER MECHANICVILLE SITE

CLIENT: NEW YORK STATE ELECTRIC AND GAS CORP. BINGHAMTON, NEW YORK

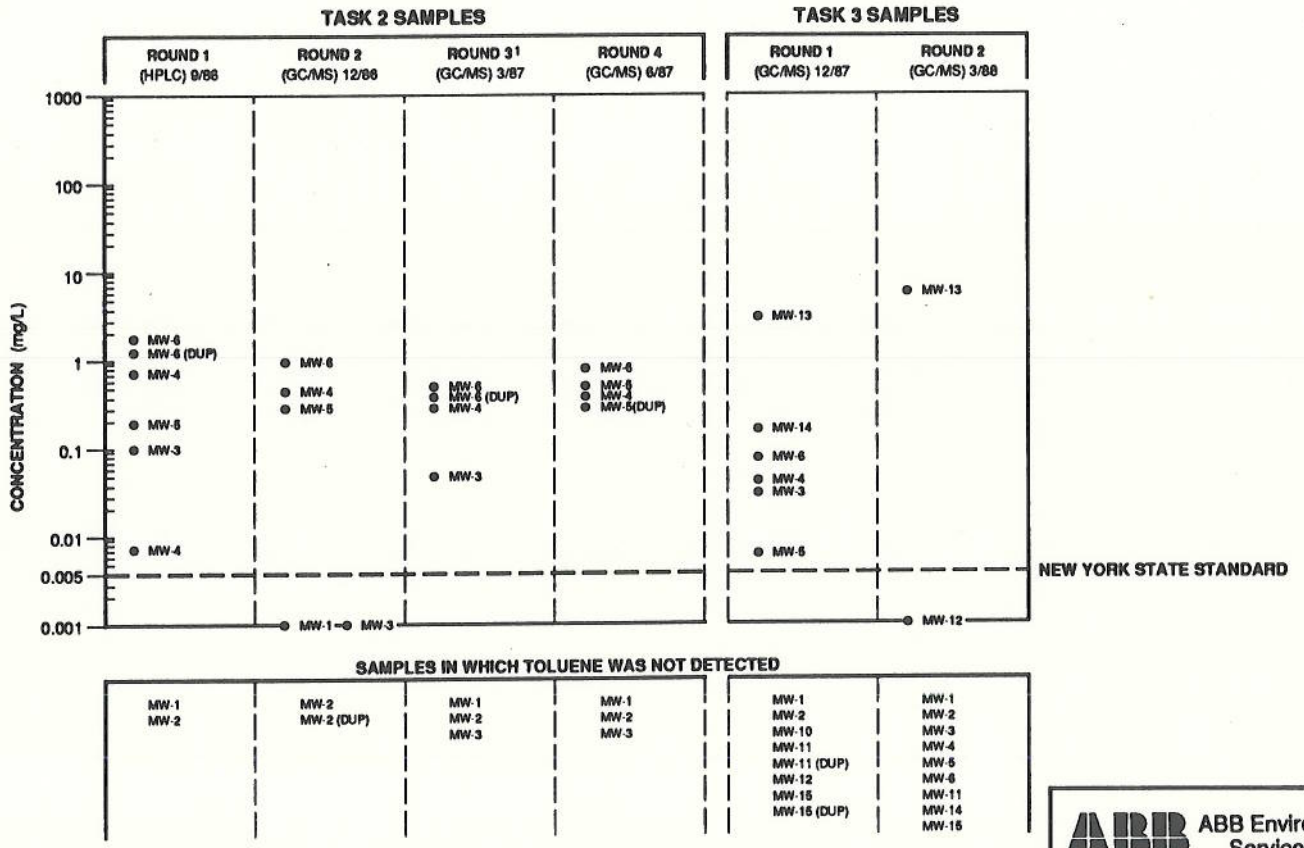
INVESTIGATION OF FORMER COAL GASIFICATION SITES

PROJECT NO. 4945-06

FIGURE 5-6

8202080

TOLUENE IN GROUNDWATER



NOTE: 1 - MW-6 WAS NOT SAMPLED IN ROUND 3.

ABB Environmental Services, Inc.
ASEA BROWN BOVERI

CLIENT
NEW YORK STATE ELECTRIC AND GAS CORP.
BINGHAMTON, NEW YORK

TITLE
TOLUENE IN GROUNDWATER MECHANICVILLE SITE

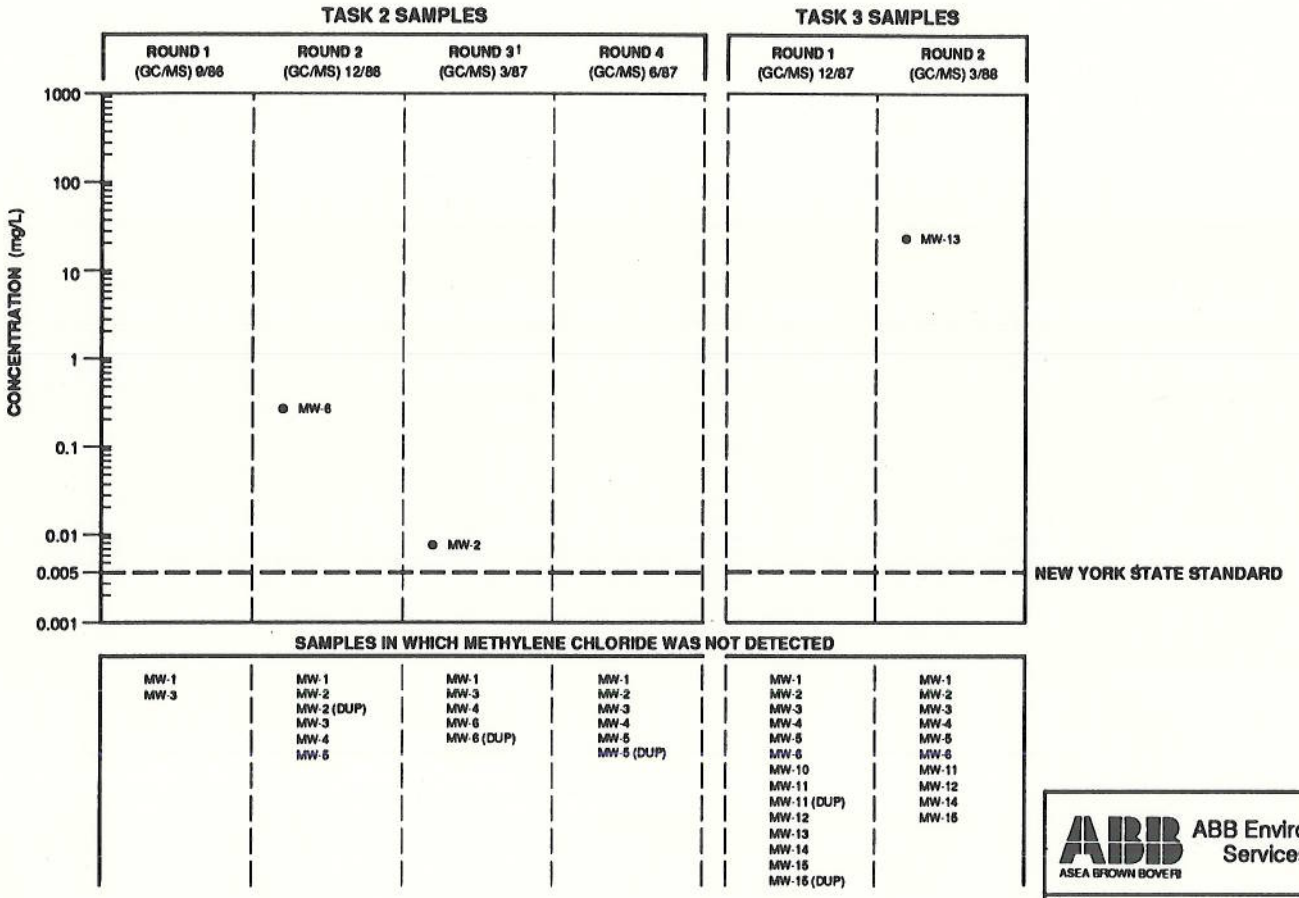
INVESTIGATION OF FORMER COAL GASIFICATION SITES

PROJECT NO. 4945-06

FIGURE 5-7

06002026

METHYLENE CHLORIDE IN GROUNDWATER



NOTE: 1 - MW-6 WAS NOT SAMPLED IN ROUND 3.

ABB Environmental Services, Inc.

ASEA BROWN BOVERI

TITLE: METHYLENE CHLORIDE IN GROUNDWATER MECHANICVILLE SITE

CLIENT: NEW YORK STATE ELECTRIC AND GAS CORP. BINGHAMTON, NEW YORK

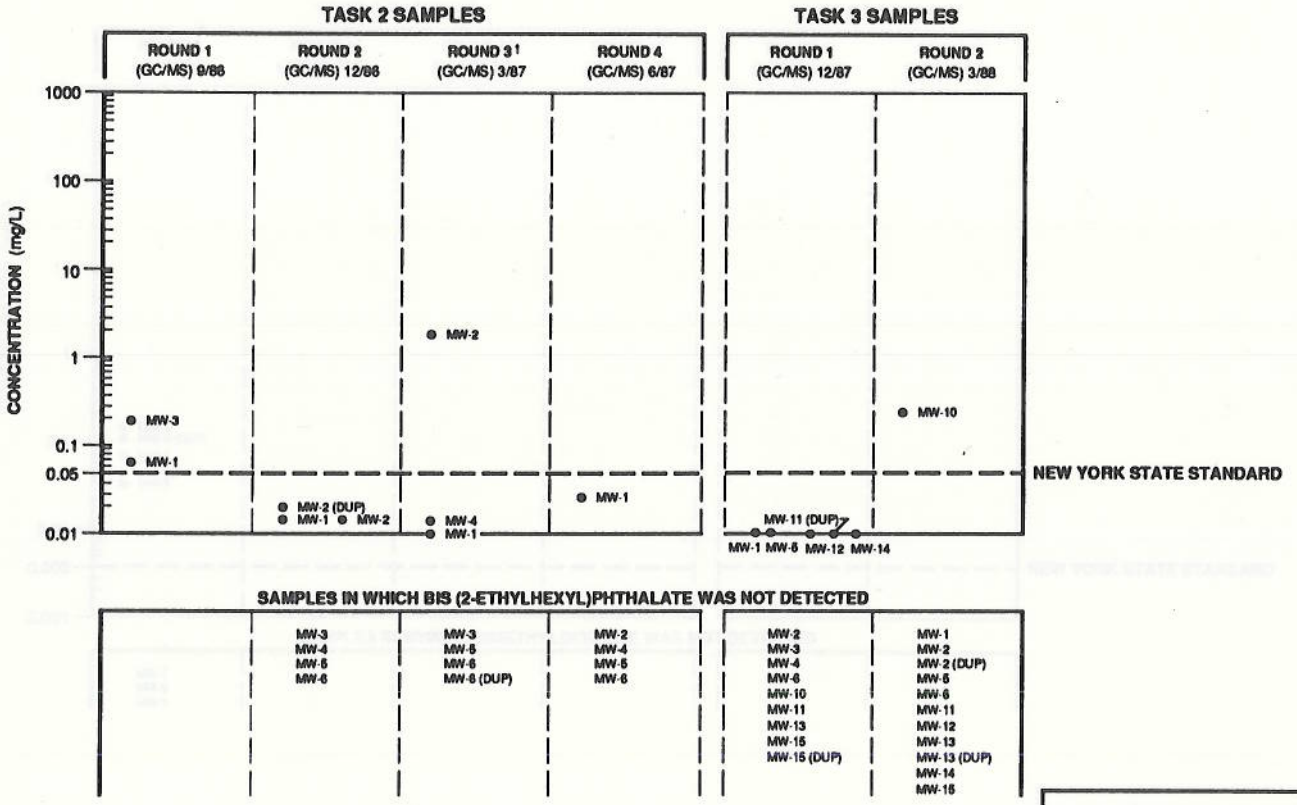
INVESTIGATION OF FORMER COAL GASIFICATION SITES

PROJECT NO. 4945-06

FIGURE 5-8

0226080

BIS (2-ETHYLHEXYL) PHTHALATE IN GROUNDWATER



SAMPLES IN WHICH BIS (2-ETHYLHEXYL)PHTHALATE WAS NOT DETECTED

ROUND 1 (GC/MS) 9/86	ROUND 2 (GC/MS) 12/86	ROUND 3 1 (GC/MS) 3/87	ROUND 4 (GC/MS) 6/87	ROUND 1 (GC/MS) 12/87	ROUND 2 (GC/MS) 3/88
MW-3	MW-3	MW-3	MW-2	MW-2	MW-1
MW-4	MW-5	MW-5	MW-4	MW-3	MW-2
MW-5	MW-6	MW-6	MW-5	MW-4	MW-2 (DUP)
MW-6	MW-6 (DUP)		MW-6	MW-6	MW-5
				MW-10	MW-6
				MW-11	MW-11
				MW-13	MW-12
				MW-15	MW-13
				MW-15 (DUP)	MW-13 (DUP)
					MW-14
					MW-15

NOTE: 1 - MW-5 WAS NOT SAMPLED IN ROUND 3.

ABB Environmental Services, Inc.
ASEA BROWN BOVERI

TITLE: BIS (2-ETHYLHEXYL) PHTHALATE IN GROUNDWATER MECHANICVILLE SITE

CLIENT: NEW YORK STATE ELECTRIC AND GAS CORP. BINGHAMTON, NEW YORK

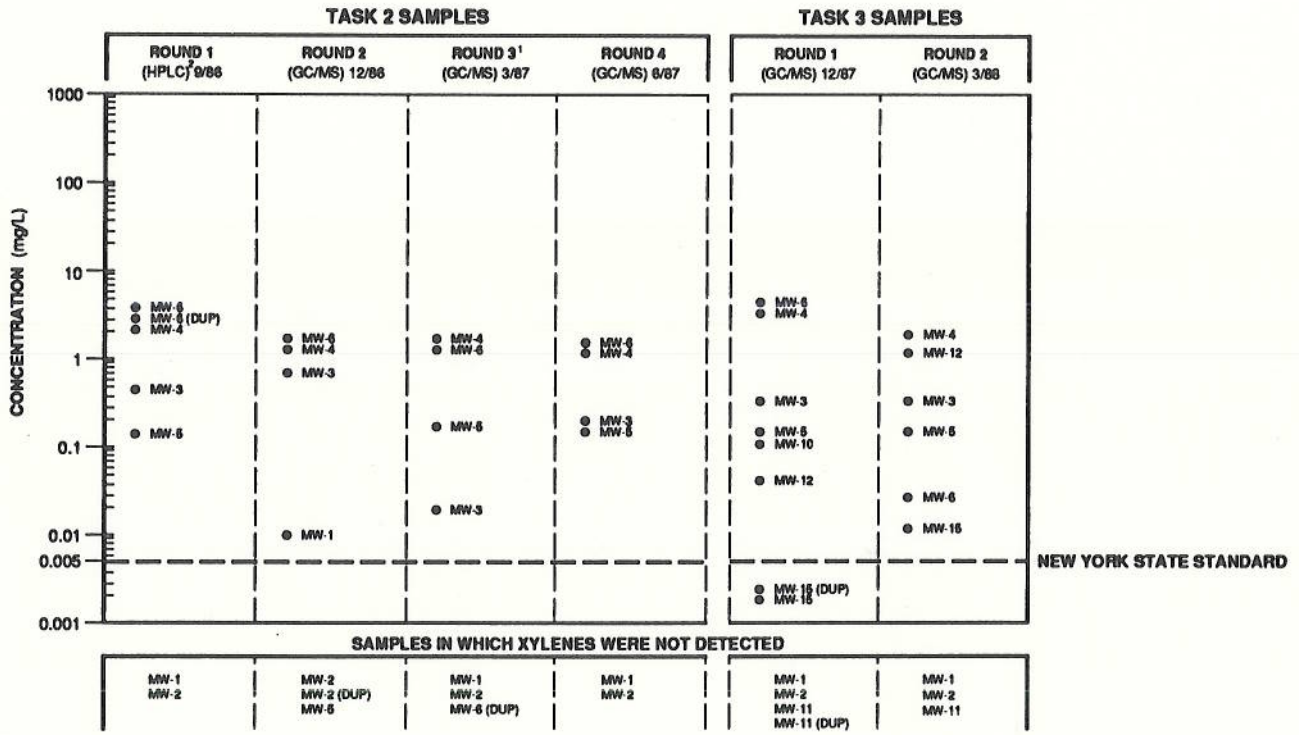
INVESTIGATION OF FORMER COAL GASIFICATION SITES

PROJECT NO. 4945-06

FIGURE 5-9

08002026

TOTAL XYLENES IN GROUNDWATER



NOTE: 1 - MW-6 WAS NOT SAMPLED IN ROUND 3.
2 - HPLC RESULTS WERE SUMMED TO OBTAIN A TOTAL VALUE.

ABB Environmental Services, Inc.

CLIENT
NEW YORK STATE ELECTRIC AND GAS CORP.
BINGHAMTON, NEW YORK

TITLE
TOTAL XYLENES IN GROUNDWATER MECHANICVILLE SITE

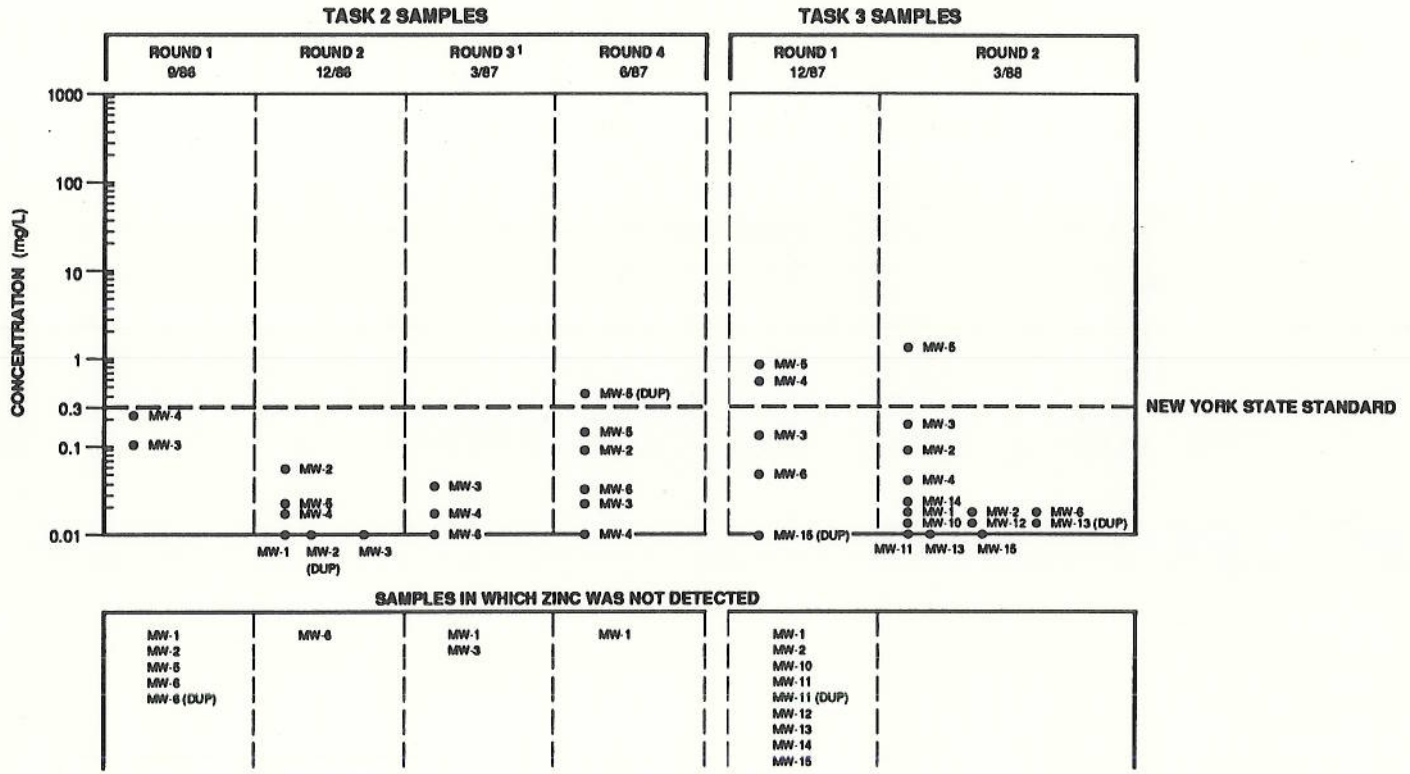
INVESTIGATION OF FORMER COAL GASIFICATION SITES

PROJECT NO. 4945-06

FIGURE 5-11

8202080

ZINC IN GROUNDWATER



NOTE: 1 - MW-6 WAS NOT SAMPLED IN ROUND 3.

ABB Environmental Services, Inc.

CLIENT
NEW YORK STATE ELECTRIC AND GAS CORP.
BINGHAMTON, NEW YORK

TITLE
ZINC
IN GROUNDWATER
MECHANICVILLE SITE

INVESTIGATION OF FORMER COAL GASIFICATION SITES

PROJECT NO. 4945-06

FIGURE 5-12

LEGEND

- APPROXIMATE LOCATION OF FORMER GAS PLANT STRUCTURES
- NYSEG PROPERTY BOUNDARY (APPROXIMATE)
- FENCE
- GROUND ELEVATION CONTOURS, IN FEET ABOVE RELATIVE DATUM POINT
- STORM DRAIN
- CULVERT
- STUDY AREA BOUNDARY AND GEOPHYSICAL SURVEY BOUNDARY

TASK 2:

- SOIL AND SHALLOW BEDROCK BORING AND MONITORING WELL LOCATION (5)
- DEEP BEDROCK BORING AND MONITORING WELL LOCATION (1)
- SOIL AND SHALLOW BEDROCK BORING LOCATION (2)
- TEST PIT AND PIEZOMETER LOCATION (2)
- TEST PIT LOCATION (3)
- SURFACE WATER SAMPLE LOCATION (3)
- SEDIMENT SAMPLE LOCATION (3)

TASK 3:

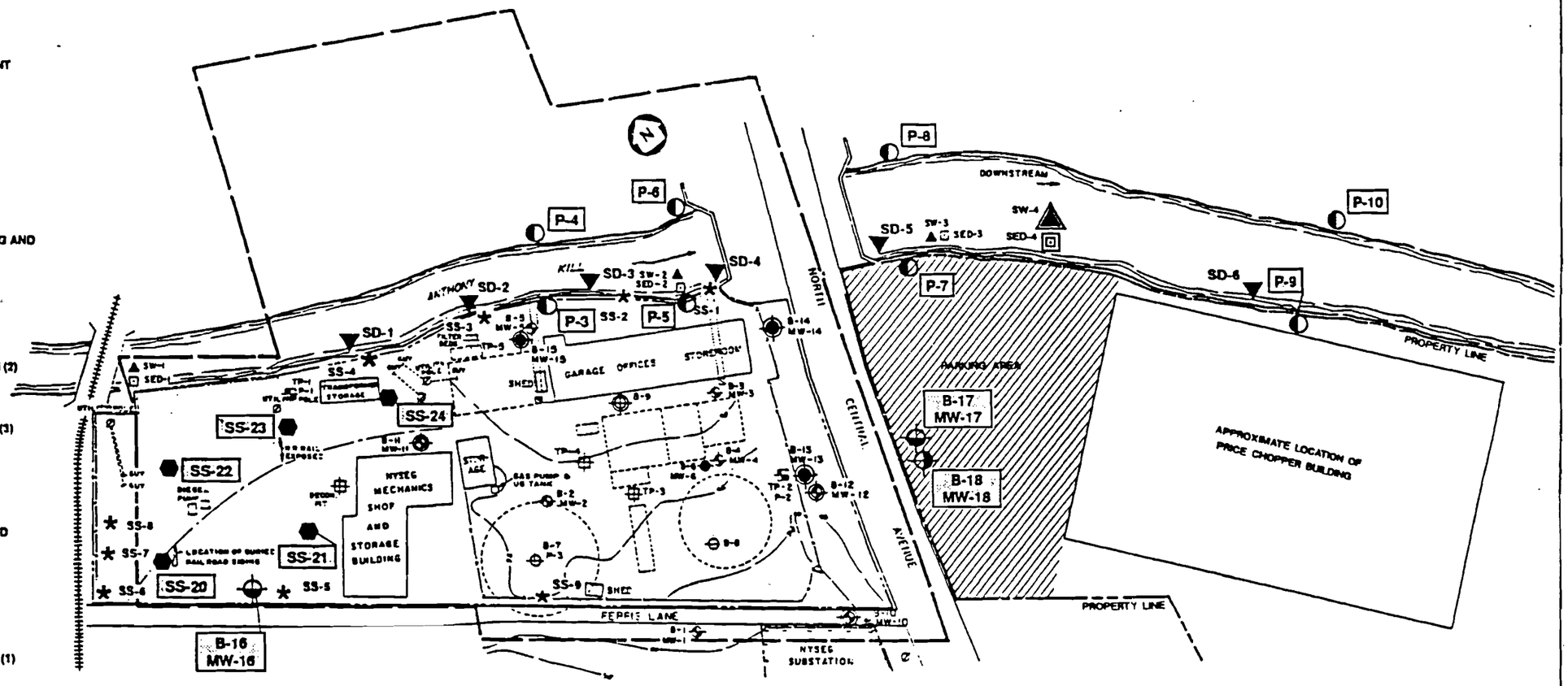
- SOIL/SHALLOW BEDROCK BORING AND MONITORING WELL LOCATION (3)
- DEEP BEDROCK BORING AND MONITORING WELL LOCATION (3)
- SOIL BORING LOCATION (1)
- SURFACE WATER SAMPLE LOCATION (1)
- SEDIMENT SAMPLE LOCATION (1)

TASK 4:

- SURFACE SOIL SAMPLE LOCATION

PHASE IIA RI:

- AREA TO BE COVERED BY SEISMIC REFRACTION SURVEY
- SOIL BORING AND WATER TABLE MONITORING WELL
- SOIL/SHALLOW BEDROCK BORING AND BEDROCK MONITORING WELL
- SHALLOW SUBSURFACE SOIL SAMPLING LOCATION
- PIEZOMETER
- SEDIMENT SAMPLE LOCATION



BASE MAP SOURCE:

TOPOGRAPHIC SURVEY PREPARED BY DAVID A. FLANDERS ASSOCIATES, 6 MORNINGSIDE DRIVE, BALLSTON LAKE, NEW YORK, DATED 6/26/86 (86-72-S), REVISED 12/87.

ELEVATIONS BASED ON ASSUMED DATUM OF 100.00' AT R.R. SPIKE IN UTILITY POLE LOCATED 25' SOUTH OF INTERSECTION OF FERRIS LANE AND NORTH CENTRAL AVENUE.

AREA EAST OF NORTH CENTRAL AVENUE INTERPRETED FROM AERIAL PHOTOGRAPHS AND TAX MAP 262.53, CITY OF MECHANICVILLE.

ABB Environmental Services, Inc.

PROPOSED PHASE IIA MGP - RELATED SAMPLING LOCATIONS MECHANICVILLE SITE

NEW YORK STATE ELECTRIC AND GAS CORP. BINGHAMTON, NEW YORK

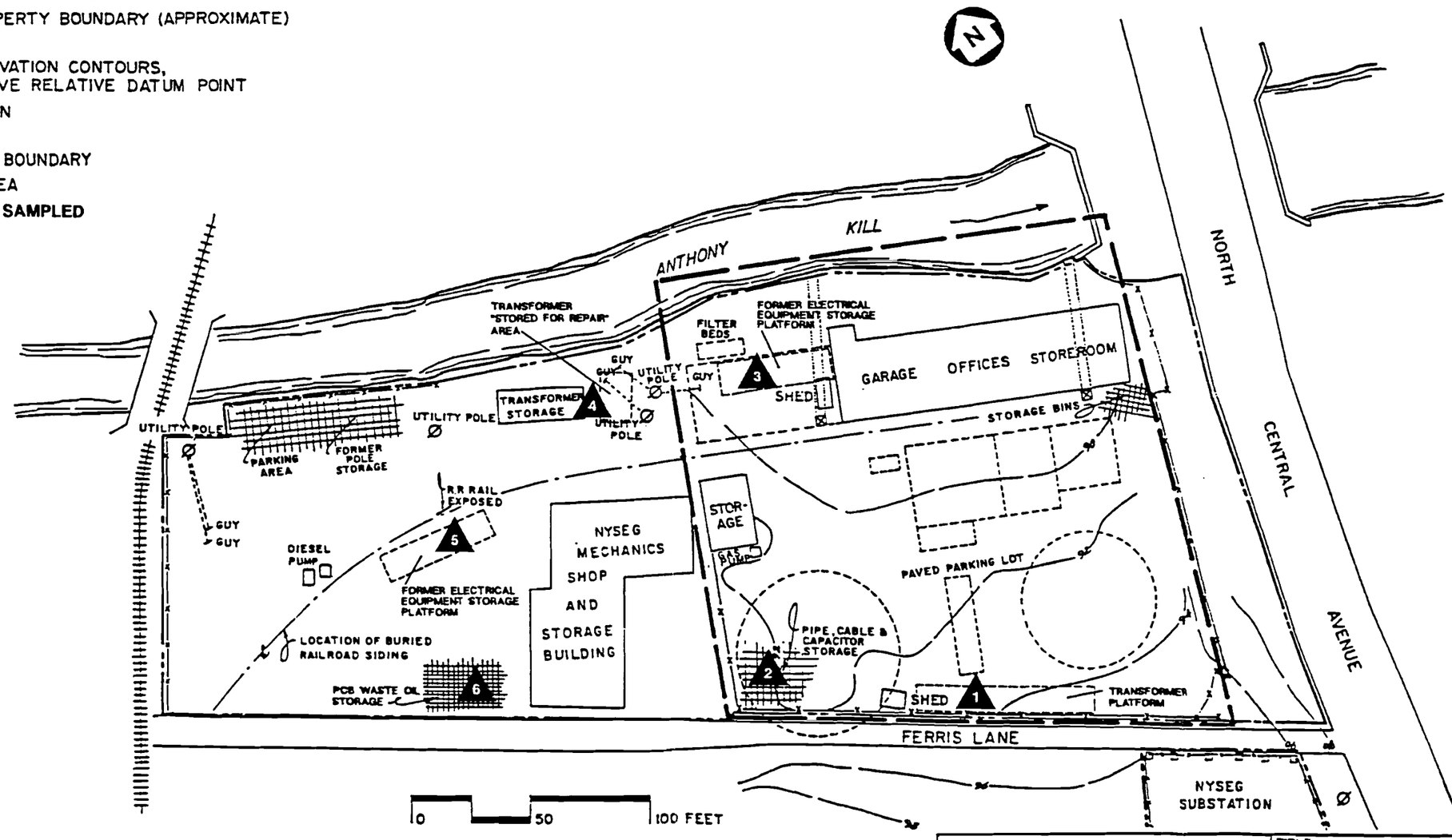
INVESTIGATION OF FORMER COAL GASIFICATION SITES

PROJECT NO. 4945-06

FIGURE 8-1

LEGEND

- APPROXIMATE LOCATION OF FORMER GAS PLANT STRUCTURES
- NYSEG PROPERTY BOUNDARY (APPROXIMATE)
- FENCE
- 90 GROUND ELEVATION CONTOURS, IN FEET ABOVE RELATIVE DATUM POINT
- STORM DRAIN
- CULVERT
- STUDY AREA BOUNDARY
- STORAGE AREA
- 1 **AREA TO BE SAMPLED FOR PCBs**



BASE MAP SOURCE:

TOPOGRAPHIC SURVEY PREPARED BY DAVID A. FLANDERS ASSOCIATES, 6 MORNINGSIDE DRIVE, BALLSTON LAKE, NEW YORK, DATED 6/26/86 (86-72-S). REVISED 12/87.

ELEVATIONS BASED ON ASSUMED DATUM OF 100.00' AT R.R. SPIKE IN UTILITY POLE LOCATED 25' SOUTH OF FERRIS LANE AND NORTH CENTRAL AVENUE.

ABB Environmental Services, Inc.
ASEA BROWN BOVERI

TITLE

PROPOSED PHASE II PCB SAMPLING AREAS MECHANICVILLE SITE

CLIENT

NEW YORK STATE ELECTRIC AND GAS CORP. BINGHAMTON, NEW YORK

INVESTIGATION OF FORMER COAL GASIFICATION SITES

PROJECT NO. 4945-06

FIGURE 8-2

9202161D

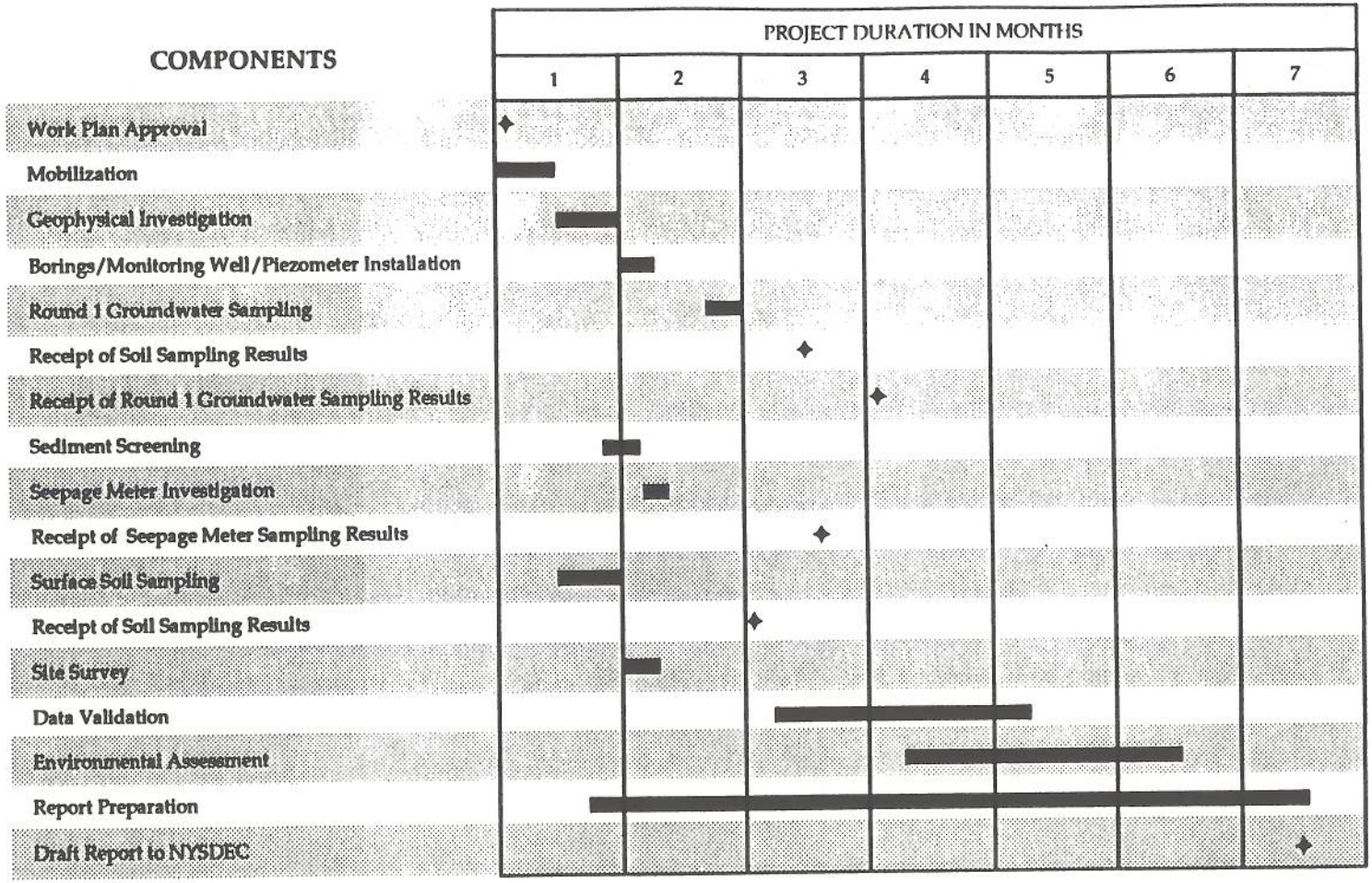


FIGURE 8-3
PROPOSED PROJECT SCHEDULE
PHASE IIA SUPPLEMENTAL REMEDIAL INVESTIGATION
MECHANICVILLE SITE
ABB Environmental Services, Inc.

TABLE 2-1

SUMMARY OF POTENTIAL ENVIRONMENTAL CONCERNS AT THE MECHANICVILLE SITE

TECHNICAL FACTORS	ON-SITE SOILS	GROUNDWATER	SURFACE WATER	AIR
Chemicals Present	The samples collected by NYSEG at the site appeared to contain coal gasification wastes. The following chemicals may be present in the soils: - benzene - toluene - ethylbenzene - xylenes - naphthalene - polynuclear aromatic hydrocarbons - heavy metals - phenols - cyanides - sulfides	There are no groundwater wells at the site and no groundwater samples have been collected. Chemicals that may be expected in groundwater if coal gasification wastes were deposited on site are: - benzene - toluene - ethylbenzene - xylenes - naphthalene - phenols - cyanide Low concentrations of polynuclear aromatic hydrocarbons may also be found in the groundwater.	The Anthony Kill borders the site on the north. No surface water or sediment samples have been collected. Chemicals that may be expected in these media if coal gasification wastes were deposited on-site are: - benzene - toluene - ethylbenzene - xylenes - naphthalene - polynuclear aromatic hydrocarbons - heavy metals - phenols - cyanides - sulfides	No air samples have been collected at the site. Because the site is paved, the probability that volatile chemicals present in the soil may also be present in the air is low as long as the paved surface is undisturbed. Volatile chemicals would be expected to be released during drilling or test pitting activities.
Chemical Transport Mechanism	Volatilization to air and/or seepage and leaching of soluble or free liquid wastes to groundwater.	The groundwater surface is expected to be within 10 feet of the ground surface, between the till and the shallow shale bedrock. Shallow groundwater movement is anticipated to be to the north with discharge to the Anthony Kill. There are no identified aquifers in the Mechanicville area.	Surface water drainage from the site is to the north into the Anthony Kill. Runoff is channeled to the stream through 2 culverts. Subsurface contaminants could be carried to the stream via groundwater discharge.	Volatilization and particulate migration occur via wind scour; however, most of the site is paved. Volatilization is the primary route when materials are exposed. Winds in the area are generally from the northwest.

TABLE 2-1 (continued)

SUMMARY OF POTENTIAL ENVIRONMENTAL CONCERNS AT THE MECHANICVILLE SITE

TECHNICAL FACTORS	ON-SITE SOILS	GROUNDWATER	SURFACE WATER	AIR
Expected Persistence of Chemicals in the Environment	Biodegration of coal tar present in the soils is very slow or nonexistent. The volatile fraction of the coal tar (benzene, toluene, ethylbenzene, and xylenes) is expected to leach slowly into groundwater or vaporize slowly into the air. Naphthalene, phenols, and cyanides are also expected to leach into the groundwater slowly. The polynuclear aromatic hydrocarbons and the heavy metals are not expected to vaporize or leach into the groundwater at any significant rate.	Any constituent of coal tar present in the groundwater is not expected to biodegrade very rapidly except perhaps the phenols. These constituents are expected to remain in groundwater until it discharges to a surface water body where vaporization will eventually occur.	Any constituents of coal tar present in the surface water are expected to move through the environment with the water. Coal tar constituents in the sediments are expected to remain for a long period of time. Biodegradation of these chemicals is predicted to be very slow.	Contaminants are rapidly dispersed and susceptible to photo-oxidation.
Existing or Potential Receptors of Chemicals	The probability of direct contact to humans or animals is low since the site is paved. However, leaching and volatilization may transport these chemicals to other media such as groundwater and expose humans and animals off-site.	Groundwater may discharge to the Anthony Kill. There are no active domestic or industrial water wells in Mechanicville. Residents of Halfmoon, west of Mechanicville, use well water. The closest domestic water wells are nearly a mile from the site in the southwest direction.	Direct contact with the surface water by humans is probable since the Anthony Kill is used for recreational boating during the warmer months of the year. There is a higher probability of contact by animals since they use the stream for a longer period during the year. The movement of surface water away from the site may expose humans and animals downstream. However, chemical concentrations will be rapidly diluted as the stream enters the Hudson River.	Humans or animals in the vicinity of the site are potential receptors of any chemicals present in the air.

01/19/88

TABLE 4-1

CHEMICALS FOUND IN TASK 2 TEST PIT SAMPLES
MECHANICVILLE SITE

SAMPLE IDENTIFIER ORGANICS ANALYSIS (1)	TP-1/S-1 HPLC	TP-2/S-1 HPLC	TP-4/S-1 HPLC	TP-5/S-1 HPLC	TP-5/S-1 HPLC DUP	TP-5/S-1 GC/MS
DATE OF SAMPLE COLLECTION	7/21/86	7/21/86	7/21/86	7/21/86	7/21/86	7/21/86
SAMPLE DEPTH (FT)	6.5-7.0	7.0-7.5	3.0-4.0	3.0-4.0	3.0-4.0	4.0-6.0
ZONE SAMPLED	FILL	FILL	FILL	FILL	FILL	FILL
VOLATILE ORGANICS (MG/KG)						
-VOLATILE AROMATICS-						
BENZENE	ND (2)	ND	0.220	ND	ND	ND
TOLUENE	ND	ND	0.160	1.000	0.750	0.640
ETHYLBENZENE	ND	ND	0.150	6.600	6.100	2.200
STYRENE	ND	ND	ND	ND	ND	ND
TOTAL XYLENES	-- (3)	--	--	--	--	11.000
m-XYLENE	ND	ND	0.091	4.100	3.100	--
o-XYLENE	ND	ND	0.082	3.900	3.000	--
p-XYLENE	ND	ND	0.062	2.100	1.600	--
TRIMETHYLBENZENE	ND	ND	ND	4.600	5.100	--
n-PROPYLBENZENE	ND	ND	0.083	2.100	2.000	--
-OTHER-						
ACETONE	--	--	--	--	--	ND
METHYLENE CHLORIDE	--	--	--	--	--	1.000
CARBON DISULFIDE	--	--	--	--	--	0.110
TOTAL VOLATILE AROMATICS	ND	ND	0.848	24.400	21.650	13.840
SEMIVOLATILE ORGANICS (MG/KG)						
-PAH-						
ACENAPHTHENE	ND	(4)	ND	290.000	(4)	140.000
ACENAPHTHYLENE	ND	ND	(5)	(5)	(5)	33.000
ANTHRACENE	ND	ND	25.000	470.000	220.000	67.000
BENZO(b)FLUORANTHENE	ND	ND	23.000	ND	ND	13.000
BENZO(k)FLUORANTHENE	ND	ND	ND	ND	ND	21.000
BENZO(g,h,i)PERYLENE	ND	ND	18.000	ND	ND	13.000
BENZO(a)ANTHRACENE	ND	ND	(6)	(6)	ND	38.000
BENZO(a)PYRENE	ND	(4)	13.000	(4)	ND	36.000
CHRYSENE	ND	ND	39.000	110.000	ND	32.000
DIBENZO(a,h)ANTHRACENE	ND	ND	13.000	ND	ND	(4)
FLUORANTHENE	ND	45.000	84.000	980.000	220.000	78.000
FLUORENE	ND	18.000	31.000	620.000	2600.000	89.000
INDENO(1,2,3-cd)-PYRENE	ND	ND	ND	ND	ND	ND
NAPHTHALENE	ND	ND	19.000	350.000	5200.000	120.000
PHENANTHRENE	ND	12.000	31.000	810.000	260.000	210.000
PYRENE	ND	45.000	96.000	1100.000	ND	250.000
-OTHER-						
BIS(2-ETHYLHEXYL)PHTHALATE	--	--	--	--	--	ND
TOTAL PAH	ND	120.000	412.000	4630.000	9500.000	1137.000
OTHER CHEMICALS (MG/KG)						
-METALS-						
IRON	27000	35000	27000	31000	35000	--
ZINC	260	120	87	79	220	--
-CYANIDE-						
TOTAL CYANIDE	ND	2.0	ND	ND	ND	--
AMENABLE CYANIDE	ND	ND	ND	ND	ND	--
FERRO-FERRI CYANIDE	ND	2.0	ND	ND	ND	--
-OTHER-						
TOTAL RECOVERABLE PHENOLICS	ND	ND	ND	ND	ND	--
TOTAL ORGANIC CARBON	8300	1400	10000	30000	26000	--

NOTES:
(1) INDICATES SAMPLE WAS ANALYZED BY GC/MS (EPA METHODS 8240 AND 8270) OR BY HPLC (EPA METHODS 8020 AND 8310).
(2) ND = NOT DETECTED (SEE APPENDIX B-4 FOR MINIMUM DETECTION LIMITS).
(3) -- = NOT ANALYZED OR NOT APPLICABLE.
(4) TRACE CONCENTRATIONS DETECTED BELOW THE QUANTIFIABLE REPORTING LIMIT.
(5) ACENAPHTHYLENE AND NAPHTHALENE, CO-ELUTED.

12/17/87

TABLE 4-2

CHEMICALS FOUND IN TASK 2 SOIL BORING SAMPLES
MECHANICVILLE SITE

SAMPLE IDENTIFIER	B-1/S-1	B-2/S-1	B-3/S-1	B-4/S-1	B-5/S-1	B-7/S-1	B-8/S-1	B-9/S-1
ORGANICS ANALYSIS (1)	HPLC	HPLC	HPLC	HPLC	HPLC	HPLC	HPLC	GC/MS
DATE OF SAMPLE COLLECTION	7/23/86	8/1/86	8/5/86	7/29/86	8/4/86	7/31/86	8/6/86	8/6/86
SAMPLE DEPTH (FT)	8.0-10.0	8.0-9.5	4.0-6.0	6.0-8.0	10.0-11.0	7.0-9.0	13.5-15.5	15.5-17.5
ZONE SAMPLED	GRAVELLY SAND	FILL	FILL AND SILTY SHALE	FILL AND SILTY SHALE	SILTY SHALE	FILL	SILTY SHALE	SILTY SHALE
VOLATILE ORGANICS (MG/KG)								
-VOLATILE AROMATICS-								
BENZENE	ND (2)	ND	13.000	ND	0.980	2.400	640.000	330.000
TOLUENE	ND	ND	8.600	0.310	1.600	1.300	840.000	660.000
ETHYLBENZENE	ND	ND	120.000	2.300	6.300	0.170	440.000	250.000
STYRENE	ND	ND	ND	ND	ND	0.180	780.000	720.000
TOTAL XYLENES	-- (3)	--	--	--	--	--	--	1400.000
m-XYLENE	ND	ND	25.000	0.640	1.500	0.180	400.000	--
o-XYLENE	ND	ND	44.000	2.400	ND	ND	320.000	--
p-XYLENE	ND	ND	25.000	0.370	1.500	0.075	210.000	--
TRIMETHYLBENZENE	ND	ND	35.000	3.800	4.200	ND	170.000	--
n-PROPYLBENZENE	ND	ND	ND	ND	ND	ND	ND	--
-OTHER-								
ACETONE	--	--	--	--	--	--	--	ND
METHYLENE CHLORIDE	--	--	--	--	--	--	--	ND
CARBON DISULFIDE	--	--	--	--	--	--	--	ND
TOTAL VOLATILE AROMATICS	ND	ND	270.600	10.320	15.980	4.305	3300.000	3410.000
SEMIVOLATILE ORGANICS (MG/KG)								
-PAH-								
ACENAPHTHENE	9.000	(4)	380.000	42.000	250.000	(4)	500.000	(4)
ACENAPHTHYLENE	ND	(5)	(5)	(5)	(5)	(5)	(5)	670.000
ANTHRACENE	8.000	(4)	670.000	80.000	450.000	(4)	550.000	270.000
BENZO(b)FLUORANTHENE	5.700	ND	(4)	ND	120.000	(4)	200.000	(4)
BENZO(k)FLUORANTHENE	(4)	ND	240.000	ND	ND	0.930	ND	(4)
BENZO(g,h,i)PERYLENE	(4)	ND	(4)	ND	ND	1.400	140.000	(4)
BENZO(a)ANTHRACENE	(6)	(6)	(6)	(6)	ND	(6)	(6)	(4)
BENZO(a)PYRENE	6.200	ND	200.000	(4)	94.000	1.100	140.000	(4)
CHRYSENE	17.000	(4)	780.000	100.000	ND	0.800	490.000	(4)
DIBENZO(a,h)ANTHRACENE	5.300	ND	ND	ND	ND	1.300	ND	ND
FLUORANTHENE	44.000	(4)	1100.000	130.000	750.000	0.890	850.000	750.000
FLUORENE	34.000	(4)	1300.000	120.000	620.000	1.100	2100.000	380.000
INDENO(1,2,3-cd)-PYRENE	ND	ND	ND	ND	ND	ND	ND	(4)
NAPHTHALENE	ND	(4)	2300.000	44.000	760.000	1.900	1500.000	2500.000
PHENANTHRENE	13.000	(4)	940.000	110.000	630.000	0.870	760.000	570.000
PYRENE	11.000	(4)	1400.000	170.000	980.000	0.870	1400.000	460.000
-OTHER-								
BIS(2-ETHYLHEXYL)PHTHALATE	--	--	--	--	--	--	--	ND
TOTAL PAH	154.200	(4)	9310.000	796.000	4654.000	11.210	8720.000	5440.000
OTHER CHEMICALS (MG/KG)								
-METALS-								
IRON	34000	30000	31000	35000	27000	26000	19000	--
ZINC	190	75	130	80	1600	320	61	--
-CYANIDE-								
TOTAL CYANIDE	ND	ND	3.2	1.0	ND	ND	ND	--
AMENABLE CYANIDE	ND	ND	3.2	1.0	ND	ND	ND	--
FERRO-FERRI CYANIDE	ND	ND	ND	ND	ND	ND	ND	--
-OTHER-								
TOTAL RECOVERABLE PHENOLICS	ND	ND	3.6	ND	2.6	ND	ND	--
TOTAL ORGANIC CARBON	110000	6800	100000	23000	110000	76000	190000	--

NOTES:
(1) INDICATES SAMPLE WAS ANALYZED BY GC/MS (EPA METHODS 8240 AND 8270) OR BY HPLC (EPA METHODS 8020 AND 8310).
(2) ND = NOT DETECTED (SEE APPENDIX B-4 FOR MINIMUM DETECTION LIMITS).
(3) -- = NOT ANALYZED
(4) TRACE CONCENTRATIONS DETECTED BELOW THE QUANTIFIABLE REPORTING LIMIT.
(5) ACENAPHTHYLENE AND NAPHTHALENE, COELUTED.
(6) BENZO(a)ANTHRACENE AND CHRYSENE, COELUTED.

TABLE 4-3

Task 3 Soil Boring Analytical Results
Mechanicville Site

SAMPLE IDENTIFIER:	B-09(S-1)	B-10(S-2)	B-10(S-2) DUP-503	B-12(S-2)	B-14(S-2)	B-15(S-1)
DATE OF SAMPLE COLLECTION:	11/17/87	11/17/87	11/17/87	11/19/87	11/17/87	11/19/87
DEPTH (Ft.):	4-5.5	16-18	16-18	22-24	18-20	4-8
ZONE SAMPLED:	Silty sand	Silty sand	Silty sand	Silty fine sand	Silty fine sand	Fill
**** Volatile Organics (mg/kg) (1) ****						
-VOLATILE AROMATICS-						
Benzene	-- (2)	--	--	ND	--	ND
Toluene	--	--	--	ND	--	ND
Ethylbenzene	--	--	--	ND	--	0.570
Styrene	--	--	--	ND	--	ND
Total Xylenes	--	--	--	ND	--	0.880
- OTHER -						
Methylene Chloride	--	--	--	ND	--	ND
2-Butanone	--	--	--	ND	--	ND
Total Volatile Aromatics	--	--	--	ND	--	1.4
Total Volatile Organics	--	--	--	ND	--	1.4
**** Semi-Volatile Organics (mg/kg) (1) ****						
-PAH-						
Acenaphthene	T (3)	T	0.53	2.35	ND	ND
Acenaphthylene	ND (4)	T	T	ND	ND	ND
Anthracene	T	T	T	0.8	ND	ND
Benzo(b)Fluoranthene	T	T	ND	ND	ND	ND
Benzo(k)Fluoranthene	(5)	(5)	ND	ND	ND	ND
Benzo(g,h,i,)Perylene	T	ND	ND	ND	ND	ND
Benzo(a)Anthracene	T	T	T	ND	ND	ND
Benzo(a)Pyrene	T	T	T	ND	ND	ND
Chrysene	T	T	T	ND	ND	ND
Fluoranthene	T	T	T	1.01	ND	ND
Fluorene	T	T	T	1.25	ND	ND
Indeno(1,2,3-cd)Pyrene	T	ND	ND	ND	ND	ND
Naphthalene	60	T	0.45	ND	ND	ND
Phenanthrene	58	0.88	1.1	0.8	ND	ND
Pyrene	T	0.6	T	1.39	ND	ND
-OTHER-						
2-Methylnaphthalene	T	T	T	ND	ND	ND
Dibenzofuran	ND	T	T	ND	ND	ND
bis(2-Ethylhexyl)phthalate	ND	ND	ND	R (6)	T	R
Total PAH	120	1.5	2.1	7.6	ND	ND
Total Semi-Volatile Organic	120	1.5	2.1	7.6	T	ND
**** Other Chemicals (mg/kg) ****						
-METALS-						
Iron	28000	24000	22000	18000	21000	23000
Zinc	59	42	44	32	49	390
-CYANIDE-						
Total Cyanide	ND	ND	ND	ND	ND	ND
Undistilled Cyanide (7)	ND	ND	ND	ND	ND	ND
-OTHER-						
Total Recoverable Phenolics	0.74	ND	ND	ND	ND	2.6
Total Organic Carbon	33000	22000	24000	22000	32000	42000

NOTES:
(1) VOCs and SVOCs analyzed by GC/MS (USEPA Method 8240 and 8270).
(2) -- = Not analyzed (Laboratory Error).
(3) T = Trace concentrations detected below the quantifiable reporting limit.
(4) ND = Not detected (See Appendix B-4 for minimum detection limits).
(5) Benzo(b)Fluoranthene and Benzo(k)Fluoranthene coeluted.
(6) Data rejected because analysis of blank indicated sampling or lab-derived contamination.
(7) Undistilled CN = Free and dissociable CN-; method used detected most, but not necessarily all, of amenable CN- present.

TABLE 4-4
CHEMICALS FOUND IN TASK 2 GROUNDWATER SAMPLES
MECHANICVILLE SITE

WELL IDENTIFIER	MW-1					MW-2					MW-3				
SAMPLE IDENTIFIER	MW-101	MW-101	MW-201	MW-301	MW-401	MW-102	MW-202	MW-202	MW-302	MW-402	MW-103	MW-103	MW-203	MW-303	MW-403
ORGANICS ANALYSIS (1)	HPLC	GC/MS	GC/MS	GC/MS	GC/MS	HPLC	GC/MS	GC/MS DUP	GC/MS	GC/MS	HPLC	GC/MS	GC/MS	GC/MS	GC/MS
DATE OF SAMPLE COLLECTION	9/9/86	9/9/86	12/2/86	3/10/87	6/2/87	9/9/86	12/2/86	12/2/86	3/10/87	6/2/87	9/9/86	9/9/86	12/2/86	3/10/87	6/2/87
VOLATILE ORGANICS (MG/L)															
-VOLATILE AROMATICS-															
BENZENE	ND (2)	ND	0.0055	ND	ND	ND	ND	ND	ND	ND	0.530	0.560	0.608	0.429	0.230
TOLUENE	ND	ND	(4)	ND	ND	ND	ND	ND	ND	ND	0.100	0.120	(4)	0.0576	ND
ETHYLBENZENE	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.640	0.910	0.715	ND	ND
STYRENE	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
TOTAL XYLENE	-- (3)	ND	0.010	ND	ND	--	ND	ND	ND	ND	--	0.770	0.640	0.0329	0.379
m - XYLENE	ND	--	--	--	--	ND	--	--	--	--	0.110	--	--	--	--
o - XYLENE	ND	--	--	--	--	ND	--	--	--	--	0.300	--	--	--	--
p - XYLENE	ND	--	--	--	--	ND	--	--	--	--	0.140	--	--	--	--
TRIMETHYLBENZENE	ND	--	--	--	--	ND	--	--	--	--	ND	--	--	--	--
-OTHER-															
ACETONE	--	0.220	3.780	0.059	ND	--	ND	ND	0.0536	ND	--	ND	ND	ND	ND
METHYLENE CHLORIDE	--	ND	ND	ND	ND	--	ND	ND	0.0086	ND	--	ND	ND	ND	ND
TOTAL VOLATILE AROMATICS	ND	ND	0.0155	ND	ND	ND	ND	ND	ND	ND	1.820	2.360	1.967	0.5195	0.609
SEMIVOLATILE ORGANICS (MG/L)															
-PAH-															
ACENAPHTHENE	0.110	0.022	0.012	ND	ND	ND	ND	ND	1.030	0.902	ND	0.420	ND	0.537	0.524
ACENAPHTHYLENE	0.250	0.048	0.018	ND	ND	ND	ND	ND	ND	0.084	2.500	(4)	ND	ND	ND
ANTHRACENE	(4)	(4)	0.031	ND	ND	ND	ND	ND	ND	ND	0.300	(4)	ND	0.226	0.140
BENZO(b)FLUORANTHENE	ND	(4,5)	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
BENZO(k)FLUORANTHENE	ND	(5)	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
BENZO(g,h,i)PERYLENE	ND	(4)	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
BENZO(a)ANTHRACENE	(6)	(4)	ND	ND	ND	ND	ND	ND	ND	ND	(6)	(4)	ND	0.102	ND
BENZO(a)PYRENE	(4)	(4)	ND	ND	ND	ND	ND	ND	ND	ND	0.280	(4)	ND	ND	ND
CHRYSENE	0.024	(4)	ND	ND	ND	ND	ND	ND	ND	ND	0.880	(4)	ND	ND	ND
DIBENZO(a,h)ANTHRACENE	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
FLUORANTHENE	0.061	0.024	ND	ND	ND	ND	ND	ND	0.930	ND	2.700	(4)	0.680	0.223	0.174
FLUORENE	0.240	0.026	0.010	ND	ND	ND	ND	ND	ND	ND	4.700	(4)	0.660	0.197	0.198
INDENO(1,2,3,-cd)PYRENE	ND	(4)	ND	ND	ND	ND	ND	ND	ND	ND	ND	(4)	ND	ND	ND
NAPHTHALENE	1.200	0.260	0.136	ND	ND	ND	ND	ND	6.034	0.445	13.000	2.600	4.130	2.480	1.914
PHENANTHRENE	0.051	0.039	0.028	ND	ND	ND	ND	ND	1.700	ND	1.300	0.440	ND	0.624	0.140
PYRENE	0.044	0.025	0.017	(4)	ND	ND	ND	ND	ND	ND	0.660	0.200	0.690	0.431	0.264
-OTHER-															
BIS(2-ETHYLHEXYL)PHTHALATE	--	0.073	0.016	(4)	0.040	--	0.016	0.018	1.710	ND	--	0.250	ND	ND	ND
2-METHYLNAPHTHALENE	--	ND	ND	ND	ND	--	ND	ND	ND	0.144	--	ND	ND	ND	0.856
TOTAL PAH	1.980	0.444	0.252	(4)	ND	ND	ND	ND	9.694	1.431	26.320	3.660	6.160	4.820	3.354

TABLE 4-4 (continued)
CHEMICALS FOUND IN TASK 2 GROUNDWATER SAMPLES
MECHANICVILLE SITE

WELL IDENTIFIER	MW-1					MW-2					MW-3				
SAMPLE IDENTIFIER	MW-101	MW-101	MW-201	MW-301	MW-401	MW-102	MW-202	MW-202 DUP	MW-302	MW-402	MW-103	MW-103	MW-203	MW-303	MW-403
ORGANICS ANALYSIS (1)	HPLC	GC/MS	GC/MS	GC/MS	GC/MS	HPLC	GC/MS	GC/MS	GC/MS	GC/MS	HPLC	GC/MS	GC/MS	GC/MS	GC/MS
DATE OF SAMPLE COLLECTION	9/9/86	9/9/86	12/2/86	3/10/87	6/2/87	9/9/86	12/2/86	12/2/86	3/10/87	6/2/87	9/9/86	9/9/86	12/2/86	3/10/87	6/2/87
OTHER CHEMICALS (MG/L)															
-METALS-															
IRON	ND	--	ND	ND	0.05	0.50	0.07	0.06	ND	0.10	20.00	--	6.60	9.70	4.90
ZINC	ND	--	0.007	ND	ND	ND	0.072	0.005	ND	0.09	0.11	--	0.008	0.03	0.02
-CYANIDE-															
TOTAL CYANIDE (12)	ND	--	0.01	ND	0.01	ND	ND	ND	ND	0.01	0.46	--	ND	0.320	0.42
AMENABLE CYANIDE	ND	--	--	ND	ND	ND	ND	--	ND	ND	ND	--	--	ND	ND
FERRO-FERRI CYANIDE	ND	--	0.03	ND	0.01	ND	ND	0.02	ND	0.01	0.46	--	0.05	0.320	0.42
-OTHER-															
TOTAL RECOVERABLE PHENOLICS	ND	--	--	--	ND	ND	--	--	--	0.008	0.020	--	--	--	0.015
TOTAL ORGANIC CARBON	4.1	--	14	3.2	4.2	4.6	9	6	3.7	4.1	11	--	24	15.3	11
SULFATE	--	--	74.6	--	--	--	65.2	60.6	--	--	--	--	17.7	--	--
TOTAL NEW YORK STATE REGULATED ORGANICS (7)	1.730	0.396	0.250	0.000	ND	ND	ND	ND	9.694	1.355	25.660	6.020	8.127	5.340	3.978
FIELD MEASUREMENTS															
pH (8)	5.3	5.3	6.7	7.5	6.6	6.0	6.4	6.4	7.6	6.8	(11)	(11)	(11)	(11)	(11)
CONDUCTIVITY (9)	1830	1830	370	2040	1315	1680	786	786	1890	1225	(11)	(11)	(11)	(11)	(11)
TEMPERATURE (10)	11.2	11.2	8.4	5.9	10.0	17.8	13.3	13.3	3.2	12.6	(11)	(11)	(11)	(11)	(11)

NOTES:
(1) INDICATES WHETHER SAMPLE VALUES WERE OBTAINED BY GC/MS OR HPLC METHODS.
(2) ND = NOT DETECTED (SEE APPENDIX B-4 FOR MINIMUM DETECTION LIMITS).
(3) -- = NOT ANALYZED
(4) TRACE CONCENTRATIONS DETECTED BELOW QUANTIFIABLE REPORTING LIMIT.
(5) BENZO(b)FLOURANTHENE AND BENZO(k)FLOURANTHENE, COELUTED.
(6) BENZO(a)ANTHRACENE AND CHRYSENE, COELUTED.
(7) THE N.Y. STATE CLASS GA GROUNDWATER STANDARD FOR ORGANICS INCLUDES PHENOLIC COMPOUNDS, VOLATILE ORGANICS, AND SEMIVOLATILE ORGANICS EXCEPT FOR ACETONE, STYRENE, ACENAPHTHALENE, BENZO(g,h,i)PERYLENE, DIBENZ(a,h)ANTHRACENE, AND BIS(2-ETHYLHEXYL)PHTHALATE.
(8) pH READINGS IN STANDARD UNITS
(9) CONDUCTIVITY IN MICROMHOS/CM
(10) TEMPERATURE IN DEGREES CELSIUS
(11) INDICATES SAMPLE TOO CONTAMINATED TO SUBMERGE PROBES.
(12) TOTAL CYANIDE CONCENTRATION MAY BE LOWER THAN CYANIDE COMPONENTS DUE TO LOW DETECTION LEVELS AND ACCURACY OF ANALYTICAL METHODS

TABLE 4-4 (continued)
CHEMICALS FOUND IN TASK 2 GROUNDWATER SAMPLES
MECHANICVILLE SITE

WELL IDENTIFIER	MW-4				MW-5-(12)				MW-6					
SAMPLE IDENTIFIER	MW-104	MW-204	MW-304	MW-404	MW-105	MW-205	MW-405	MW-405 DUP	MW-106	MW-106 DUP	MW-206	MW-306	MW-306 DUP	MW-406
ORGANICS ANALYSIS (1)	HPLC	GC/MS	GC/MS	GC/MS	HPLC	GC/MS	GC/MS	GC/MS	HPLC	HPLC	GC/MS	GC/MS	GC/MS	GC/MS
DATE OF SAMPLE COLLECTION	9/9/86	12/2/86	3/10/87	6/2/87	9/9/86	12/2/86	6/2/87	6/2/87	9/9/86	9/9/86	12/2/86	3/10/87	3/10/87	6/2/87
VOLATILE ORGANICS (MG/L)														
-VOLATILE AROMATICS-														
BENZENE	0.950	0.673	0.482	0.494	0.240	0.298	0.412	0.440	1.900	1.600	1.690	1.520	1.630	1.613
TOLUENE	0.760	0.487	0.335	0.409	0.200	0.295	0.400	0.362	1.600	1.200	0.815	0.353	0.353	0.616
ETHYLBENZENE	2.300	0.803	1.140	0.378	0.071	0.270	0.541	0.464	1.700	1.300	0.855	0.943	1.500	1.956
STYRENE	ND	ND	0.051	ND	ND	ND	ND	ND	0.920	0.610	ND	ND	1.370	ND
TOTAL XYLENE	--	1.230	1.440	1.347	--	ND	0.273	0.227	--	--	1.220	1.270	ND	1.452
m - XYLENE	0.850	--	--	--	0.065	--	--	--	1.200	1.000	--	--	--	--
o - XYLENE	0.810	--	--	--	0.120	--	--	--	0.940	0.770	--	--	--	--
p - XYLENE	0.430	--	--	--	0.058	--	--	--	0.570	0.450	--	--	--	--
TRIMETHYLBENZENE	0.088	--	--	--	0.046	--	--	--	0.120	0.100	--	--	--	--
-OTHER-														
ACETONE	--	ND	ND	ND	--	ND	ND	ND	--	--	0.850	ND	ND	ND
METHYLENE CHLORIDE	--	ND	ND	ND	--	ND	ND	ND	--	--	0.350	ND	ND	ND
TOTAL VOLATILE AROMATICS	6.188	3.193	3.448	2.628	0.800	0.863	1.626	1.493	8.950	7.030	4.580	4.086	4.853	5.637
SEMIVOLATILE ORGANICS (MG/L) PPM														
-PAH-														
ACENAPHTHENE	0.980	0.240	0.187	0.218	0.260	17.300	150.280	195.500	37.000	48.000	ND	0.890	1.200	3.580
ACENAPHTHYLENE	8.300	ND	0.041	0.218	2.400	ND	150.280	197.200	26.000	59.000	ND	ND	ND	3.300
ANTHRACENE	0.510	ND	ND	ND	ND	7.600	178.330	227.800	11.000	16.000	ND	ND	ND	5.290
BENZO(b)FLUORANTHENE	ND	ND	ND	ND	ND	ND	ND	ND	4.000	6.600	ND	ND	ND	0.540
BENZO(k)FLUORANTHENE	ND	ND	ND	ND	ND	ND	ND	ND	7.200	4.100	ND	ND	ND	0.580
BENZO(g,h,i)PERYLENE	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
BENZO(a)ANTHRACENE	(6)	ND	ND	ND	ND	ND	18.360	23.970	(6)	(6)	ND	ND	ND	ND
BENZO(a)PYRENE	0.290	ND	ND	ND	ND	ND	ND	ND	4.800	6.500	ND	ND	ND	0.560
CHRYSENE	1.400	ND	ND	ND	ND	ND	ND	26.350	25.000	17.000	ND	ND	ND	0.680
DIBENZO(a,h)ANTHRACENE	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
FLUORANTHENE	4.200	ND	0.014	ND	0.150	6.300	43.860	59.500	93.000	74.000	ND	ND	1.310	2.510
FLUORENE	13.000	ND	0.026	0.100	3.900	7.600	62.220	80.920	120.000	140.000	ND	ND	ND	1.980
INDENO(1,2,3,-cd)PYRENE	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
NAPHTHALENE	33.000	6.120	3.970	2.392	11.000	39.400	331.500	413.100	280.000	300.000	6.980	5.040	5.910	18.760
PHENANTHRENE	2.000	ND	ND	ND	ND	6.700	178.330	227.800	36.000	45.000	ND	1.340	1.530	5.290
PYRENE	1.000	ND	0.027	ND	(4)	8.100	93.450	112.370	36.000	30.000	ND	0.843	ND	ND
-OTHER-														
BIS(2-ETHYLHEXYL)PHTHALATE	--	ND	0.013	ND	--	ND	ND	ND	--	--	ND	ND	ND	ND
2-METHYLNAPHTHALENE	--	ND	ND	0.580	--	ND	197.200	247.690	--	--	ND	ND	ND	7.170
TOTAL PAH	64.680	6.360	4.265	2.928	17.710	93.000	1206.610	1564.510	680.000	746.200	6.980	8.113	9.950	43.070

1564.51

TABLE 4-4 (continued)

CHEMICALS FOUND IN TASK 2 GROUNDWATER SAMPLES
MECHANICVILLE SITE

WELL IDENTIFIER	MW-4				MW-5-(12)				MW-6					
SAMPLE IDENTIFIER	MW-104	MW-204	MW-304	MW-404	MW-105	MW-205	MW-305	MW-405 DUP	MW-106	MW-106 DUP	MW-206	MW-306	MW-306 DUP	MW-406
ORGANICS ANALYSIS (1)	HPLC	GC/MS	GC/MS	GC/MS	HPLC	GC/MS	GC/MS	GC/MS	HPLC	HPLC	GC/MS	GC/MS	GC/MS	GC/MS
DATE OF SAMPLE COLLECTION	9/9/86	12/2/86	3/10/87	6/2/87	9/9/86	12/2/86	6/2/87	6/2/87	9/9/86	9/9/86	12/2/86	3/10/87	3/10/87	6/2/87
OTHER CHEMICALS (MG/L)														
-METALS-														
IRON	61.00	6.50	3.86	5.10	1.10	7.50	5.10	9.40	5.50	14.00	7.60	10.10	9.70	4.80
ZINC	0.29	0.02	0.02	0.01	ND	0.021	0.16	0.33	ND	ND	ND	0.01	0.01	0.03
-CYANIDE-														
TOTAL CYANIDE (13)	0.072	0.06	0.050	0.06	0.013	0.02	0.01	ND	0.075	0.081	0.12	0.060	0.050	0.07
AMENABLE CYANIDE	ND	0.04	ND	ND	0.013	--	ND	ND	0.026	0.024	0.10	ND	ND	ND
FERRO-FERRI CYANIDE	0.072	0.02	0.050	0.06	ND	0.06	0.01	0.01	0.049	0.057	0.02	0.060	0.050	0.07
-OTHER-														
TOTAL RECOVERABLE PHENOLICS	0.043	--	--	0.014	0.019	--	0.43	0.017	0.050	0.043	--	--	--	0.031
TOTAL ORGANIC CARBON	12	20	5.2	9.4	7.4	30	16	12	16	16	28	12.5	13.7	14
SULFATE	--	30.9	--	--	--	84.0	--	--	--	--	14.5	--	--	--
TOTAL NEW YORK STATE REGULATED ORGANICS (7)	62.611	9.553	7.621	5.352	16.129	93.863	1058.386	1368.820	662.080	693.663	11.910	12.199	13.433	45.438
FIELD MEASUREMENTS														
pH (8)	(11)	(11)	(11)	(11)	5.8	6.4	(11)	(11)	5.7	5.7	6.9	7.7	7.7	6.7
CONDUCTIVITY (9)	(11)	(11)	(11)	(11)	1640	680	(11)	(11)	1930	1930	1136	2300	2300	1385
TEMPERATURE (10)	(11)	(11)	(11)	(11)	12.7	12.0	(11)	(11)	16.0	16.0	14.3	6.0	6.0	13.1

NOTES:
(1) INDICATES WHETHER SAMPLE VALUES WERE OBTAINED BY GC/MS OR HPLC METHODS.
(2) ND = NOT DETECTED (SEE APPENDIX B-4 FOR MINIMUM DETECTION LIMITS).
(3) -- = NOT ANALYZED
(4) TRACE CONCENTRATIONS DETECTED BELOW QUANTIFIABLE REPORTING LIMIT.
(5) BENZO(b)FLOURANTHENE AND BENZO(k)FLOURANTHENE, COELUTED.
(6) BENZO(a)ANTHRACENE AND CHRYSENE, COELUTED.
(7) THE N.Y. STATE CLASS GA GROUNDWATER STANDARD FOR ORGANICS INCLUDES PHENOLIC COMPOUNDS, VOLATILE ORGANICS, AND SEMIVOLATILE ORGANICS EXCEPT FOR ACETONE, STYRENE, ACENAPHTHALENE, BENZO(g,h,i)PERYLENE, DIBENZO(a,h)ANTHRACENE, AND BIS(2-ETHYLHEXYL)PHTHALATE.
(8) pH READINGS IN STANDARD UNITS
(9) CONDUCTIVITY IN MICROMHOS/CM
(10) TEMPERATURE IN DEGREES CELSIUS
(11) INDICATES SAMPLE TOO CONTAMINATED TO SUBMERGE PROBES.
(12) MW-5 ROUND 3 SAMPLING WAS NOT CONDUCTED DUE TO WEATHER OBSTRUCTIONS.
(13) TOTAL CYANIDE CONCENTRATION MAY BE LOWER THAN CYANIDE COMPONENTS DUE TO LOW DETECTION LEVELS AND ACCURACY OF ANALYTICAL METHODS

TABLE 4-5

Task 3 Groundwater Analytical Results
Mechanicville Site

WELL IDENTIFIER	MW-01		MW-02		
SCREENED ZONE	SOIL/SHALLOW BEDROCK		SOIL/SHALLOW BEDROCK		
SAMPLE IDENTIFIER	MW-01	MW-01	MW-02	MW-02	MW-02 DUP
DATE OF SAMPLE COLLECTION	12/22/87	3/29/88	12/22/87	3/29/88	3/29/88
-VOLATILE AROMATICS-	** Volatile Organics (mg/l) (1) **				
Benzene	ND (2)	ND	ND	ND	-- (4)
Toluene	ND	ND	ND	ND	--
Ethylbenzene	ND	ND	ND	ND	--
Styrene	ND	ND	ND	ND	--
Total Xylenes	ND	ND	ND	ND	--
-OTHER-					
Methylene Chloride	ND	ND	ND	ND	--
2-Butanone	ND	ND	ND	ND	--
1,1,1-Trichloroethane	ND	ND	ND	ND	--
Vinyl Acetate	ND	ND	ND	ND	--
2-Hexanone	ND	ND	ND	ND	--
Chlorobenzene	ND	T	ND	T	--
1,1-Dichloroethane	ND	ND	ND	ND	--
Trichloroethene	ND	ND	ND	ND	--
Total Volatile Aromatics	ND	ND	ND	ND	--
Total Volatile Organics	ND	T	ND	T	--
	** Semi-Volatile Organics (mg/l) (1) **				
-PAH-					
Acenaphthene	ND	ND	ND	ND	ND
Acenaphthylene	ND	ND	ND	ND	ND
Anthracene	ND	ND	ND	ND	ND
Benzo(b)Fluoranthene	ND	ND	ND	ND	ND
Benzo(k)Fluoranthene (9)	ND	ND	ND	ND	ND
Benzo(g,h,i)Perylene	ND	ND	ND	ND	ND
Benzo(a)Anthracene	ND	ND	ND	ND	ND
Benzo(a)Pyrene	ND	ND	ND	ND	ND
Chrysene	ND	ND	ND	ND	ND
Fluoranthene	ND	ND	ND	ND	ND
Fluorene	ND	ND	ND	ND	ND
Indeno(1,2,3-cd)Pyrene	ND	ND	ND	ND	ND
Naphthalene	ND	ND	ND	ND	ND
Phenanthrene	ND	ND	ND	ND	ND
Pyrene	ND	ND	ND	ND	ND
-OTHER-					
2,4 - Dimethylphenol	ND	ND	ND	ND	ND
2,4-Dinitrotoluene	ND	ND	ND	ND	ND
2,6-Dinitrotoluene	ND	ND	ND	ND	ND
2-Chloronaphthalene	ND	ND	ND	ND	ND
2-Methylnaphthalene	ND	ND	ND	ND	ND
2-Methylphenol	ND	ND	ND	ND	ND
2-Nitroaniline	ND	ND	ND	ND	ND
3-Nitroaniline	ND	ND	ND	ND	ND
4,6 - Dinitro-2-Methylphenol	ND	ND	ND	ND	ND
4-Methylphenol	ND	ND	ND	ND	ND
4-Nitroaniline	ND	ND	ND	ND	ND
4-Nitrophenol	ND	ND	ND	ND	ND
Benzoic Acid	ND	ND	ND	ND	ND
Benzyl Alcohol	ND	ND	ND	ND	ND
Butylbenzylphthalate	ND	ND	ND	ND	ND
Dibenzofuran	ND	ND	ND	ND	ND
Hexachloroethane	ND	ND	ND	ND	ND
N-Nitrosodiphenylamine	ND	ND	ND	ND	ND
Nitrobenzene	ND	ND	ND	ND	ND
Phenol	ND	ND	ND	ND	ND
bis(2-Ethylhexyl)phthalate	T (3)	ND	T	ND	ND
Total PAH	ND	ND	ND	ND	ND
Total Semi-Volatile Organics	T	ND	T	ND	ND
	** Other Chemicals (mg/l) **				
-DISSOLVED METALS-					
Iron	0.07	ND	0.04	0.12	0.23
Zinc	ND	0.02	ND	0.02	0.1
-CYANIDE-					
Total Cyanide (13)	0.01	ND	ND	ND	ND
Undistilled Cyanide (10)	ND	ND	ND	ND	ND
-OTHER-					
Total Recoverable Phenolics	0.006	ND	0.016	0.006	0.011
Total Organic Carbon	3.4	2.8	2.9	2.2	2.8
Total New York State Regulated Organics (5)	0.006	ND	0.0160	0.006	0.011
pH (6)	7.5	6.5	7.7	6.6	6.7
Conductivity (7)	1125	1389	1153	1159	1302
Temperature (8)	11.1	10.2	11.9	7.0	7.0

NOTES:
(1) Sample values were obtained by GC/MS (USEPA Methods 624 and 625).
(2) ND = Not detected (see Appendix B-4 for Minimum Detection Limits).
(3) T = Trace (Concentrations detected below quantifiable reporting limits).
(4) -- = Not analyzed (Laboratory reported vial was received broken).
(5) The N.Y. State Class GA Groundwater Standard for Organics includes phenolic compounds, volatile organics and semivolatile organics; except for Acetone, Styrene, Acenaphthalene, Benzo(g,h,i)Perylene, Dibenzo(a,h)Anthracene and bis(2-Ethylhexyl)phthalate.
(6) pH readings in standard units.
(7) Conductivity readings in micromhos/cm.
(8) Temperature in degrees Celsius.
(9) Benzo(b)Fluoranthene and Benzo(k)Fluoranthene coelute.
(10) Undistilled CN = Free and dissociable CN-; method used and detected most, but not necessarily all, of the amenable CN- present.
(11) Sample too contaminated to submerge probes.
(12) Free Product in well.
(13) Total cyanide concentration may be less than distilled cyanide concentration due to analytical methods used and low detection levels.
(14) NR = Not Reported.

TABLE 4-5 (continued)
Task 3 Groundwater Analytical Results
Mechanicville Site

WELL IDENTIFIER	MW-03		MW-04		MW-05	
SCREENED ZONE	SOIL		SOIL		SOIL/SHALLOW BEDROCK	
SAMPLE IDENTIFIER	MW-03	MW-03	MW-04	MW-04	MW-05	MW-05
DATE OF SAMPLE COLLECTION	12/22/87	3/30/88	12/22/87	3/30/88	12/22/87	3/30/88
-VOLATILE AROMATICS-	** Volatile Organics (mg/l) (1) **					
Benzene	0.17	0.15	0.26	0.2	0.15	T
Toluene	0.021	ND	0.23	ND	0.094	ND
Ethylbenzene	0.11	ND	0.058	0.17	ND	0.054
Styrene	ND (2)	ND	ND	ND	ND	ND
Total Xylenes	0.40	0.42	2.2	1.3	0.19	0.16
-OTHER-						
Methylene Chloride	ND	ND	ND	ND	ND	ND
2-Butanone	ND	ND	ND	ND	ND	ND
1,1,1-Trichloroethane	ND	ND	ND	ND	ND	ND
Vinyl Acetate	ND	ND	ND	T	ND	ND
2-Hexanone	ND	ND	ND	ND	ND	ND
Chlorobenzene	ND	ND	ND	ND	ND	ND
1,1-Dichloroethane	ND	ND	ND	ND	ND	ND
Trichloroethene	ND	ND	ND	ND	ND	ND
Total Volatile Aromatics	0.70	0.57	2.8	1.67	0.43	0.214
Total Volatile Organics	0.70	0.57	2.8	1.67	0.43	0.214
	** Semi-Volatile Organics (mg/l) (1) **					
-PAH-						
Acenaphthene	30	ND	T	T	0.51	22
Acenaphthylene	T (3)	ND	T	T	T	2.7
Anthracene	9.7	ND	ND	T	T	ND
Benzo(b)Fluoranthene	T	ND	ND	ND	ND	ND
Benzo(k)Fluoranthene (9)	ND	ND	ND	ND	ND	1.3
Benzo(g,h,i)Perylene	ND	ND	ND	ND	ND	ND
Benzo(a)Anthracene	T	ND	ND	ND	ND	2.6
Benzo(a)Pyrene	T	T	ND	ND	ND	2.4
Chrysene	T	ND	ND	ND	ND	ND
Fluoranthene	12	T	ND	T	T	9.4
Fluorene	13	ND	T	T	T	10
Indeno(1,2,3-cd)Pyrene	ND	ND	ND	ND	ND	ND
Naphthalene	64	ND	1.9	1.4	3.6	30
Phenanthrene	38	ND	T	T	0.32	26
Pyrene	21	ND	ND	ND	T	1.4
-OTHER-						
2,4 - Dimethylphenol	ND	ND	ND	ND	ND	ND
2,4-Dinitrotoluene	ND	T	ND	ND	ND	ND
2,6-Dinitrotoluene	ND	ND	ND	ND	ND	T
2-Chloronaphthalene	ND	ND	ND	ND	ND	T
2-Methylnaphthalene	34	ND	0.65	0.78	1.1	35
2-Methylphenol	ND	ND	ND	ND	ND	ND
2-Nitroaniline	ND	T	ND	ND	ND	T
3-Nitroaniline	ND	ND	ND	ND	ND	T
4,6 - Dinitro-2-Methylphenol	ND	ND	ND	ND	ND	ND
4-Methylphenol	ND	ND	ND	ND	ND	T
4-Nitroaniline	ND	T	ND	ND	ND	T
4-Nitrophenol	ND	ND	ND	ND	ND	ND
Benzoic Acid	ND	ND	ND	ND	ND	ND
Benzyl Alcohol	ND	ND	ND	ND	ND	T
Butylbenzylphthalate	ND	ND	ND	T	ND	ND
Dibenzofuran	T	T	ND	ND	T	2
Hexachloroethane	ND	ND	ND	ND	ND	ND
N-Nitrosodiphenylamine	ND	ND	ND	ND	ND	T
Nitrobenzene	ND	ND	ND	ND	ND	ND
Phenol	ND	ND	T	ND	ND	ND
bis(2-Ethylhexyl)phthalate	ND	ND	ND	ND	T	ND
Total PAH	190	ND	1.9	1.4	4.4	110
Total Semi-Volatile Organics	220	ND	2.6	2.18	5.5	142.2
	** Other Chemicals (mg/l) **					
-DISSOLVED METALS-						
Iron	8.8	14.4	20	9.25	13	25
Zinc	0.11	0.2	0.52	0.05	0.54	1.09
-CYANIDE-						
Total Cyanide (13)	ND	0.27	0.05	0.05	ND	0.05
Undistilled Cyanide (10)	--	ND	ND	ND	ND	ND
-OTHER-						
Total Recoverable Phenolics	17	0.025	0.021	0.027	0.028	0.026
Total Organic Carbon	50,000 (12)	42	8.4	9.9	8,000 (12)	21
Total New York State Regulated Organics (5)	237.7	0.595	5.421	3.877	5.598	142.34
pH (6)	(11)	(11)	(11)	(11)	(11)	(11)
Conductivity (7)	(11)	(11)	(11)	(11)	(11)	(11)
Temperature (8)	(11)	(11)	(11)	(11)	(11)	(11)

NOTES:
(1) Sample values were obtained by GC/MS (USEPA Methods 624 and 625).
(2) ND = Not detected (see Appendix B-4 for Minimum Detection Limits).
(3) T = Trace (Concentrations detected below quantifiable reporting limits).
(4) -- = Not analyzed (Laboratory reported vial was received broken).
(5) The N.Y. State Class GA Groundwater Standard for Organics includes phenolic compounds, volatile organics and semivolatile organics; except for Acetone, Styrene, Acenaphthalene, Benzo(g,h,i)Perylene, Dibenzo(a,h)Anthracene and bis(2-Ethylhexyl)phthalate.
(6) pH readings in standard units.
(7) Conductivity readings in micromhos/cm.
(8) Temperature in degrees Celsius.
(9) Benzo(b)Fluoranthene and Benzo(k)Fluoranthene coelute.
(10) Undistilled CN = Free and dissociable CN-; method used and detected most, but not necessarily all, of the amenable CN- present.
(11) Sample too contaminated to submerge probes.
(12) Free Product in well. e CN- present.
(13) Total cyanide concentration may be less than distilled cyanide concentration due to analytical methods used and low detection levels.
(14) NR = Not Reported.

TABLE 4-5 (continued)
Task 3 Groundwater Analytical Results
Mechanicville Site

WELL IDENTIFIER	MW-06	MW-06	MW-10	MW-10
SCREENED ZONE	BEDROCK	BEDROCK	SOIL	SOIL
SAMPLE IDENTIFIER	MW-06	MW-06	MW-10	MW-10
DATE OF SAMPLE COLLECTION	12/22/87	3/30/88	12/22/87	3/29/88
-VOLATILE AROMATICS-		** Volatile Organics (mg/l) (1) **		
Benzene	0.88	0.06	ND (2)	-- (4)
Toluene	0.13	ND	ND	--
Ethylbenzene	0.14	ND	ND	--
Styrene	ND	ND	ND	--
Total Xylenes	2.4	0.04	0.012	--
-OTHER-				
Methylene Chloride	ND	ND	ND	--
2-Butanone	ND	ND	ND	--
1,1,1-Trichloroethane	ND	ND	ND	--
Vinyl Acetate	ND	ND	ND	--
2-Hexanone	ND	ND	ND	--
Chlorobenzene	ND	ND	ND	--
1,1-Dichloroethane	ND	ND	ND	--
Trichloroethene	ND	ND	ND	--
Total Volatile Aromatics	3.6	0.1	0.012	--
Total Volatile Organics	3.6	0.1	0.012	--
		** Semi-Volatile Organics (mg/l) (1) **		
-PAH-				
Acenaphthene	2.2	T	0.10	T
Acenaphthylene	T	T	T (3)	ND
Anthracene	0.89	T	T	ND
Benzo(b)Fluoranthene	T	ND	ND	T
Benzo(k)Fluoranthene (9)	T	ND	ND	ND
Benzo(g,h,i)Perylene	T	T	ND	ND
Benzo(a)Anthracene	T	ND	ND	T
Benzo(a)Pyrene	T	ND	ND	ND
Chrysene	1.0	T	T	T
Fluoranthene	1.1	ND	0.028	ND
Fluorene	T	ND	ND	ND
Indeno(1,2,3-cd)Pyrene	12	ND	ND	ND
Naphthalene	3.5	T	T	ND
Phenanthrene	1.6	T	T	ND
Pyrene				
-OTHER-				
2,4 - Dimethylphenol	ND	ND	ND	ND
2,4-Dinitrotoluene	ND	ND	ND	ND
2,6-Dinitrotoluene	ND	ND	ND	T
2-Chloronaphthalene	ND	ND	ND	ND
2-Methylnaphthalene	4.6	ND	T	ND
2-Methylphenol	ND	ND	ND	ND
2-Nitroaniline	ND	ND	ND	ND
3-Nitroaniline	ND	ND	ND	ND
4,6 - Dinitro-2-Methylphenol	ND	ND	ND	T
4-Methylphenol	ND	ND	ND	ND
4-Nitroaniline	ND	ND	ND	ND
4-Nitrophenol	ND	ND	ND	T
Benzoic Acid	ND	ND	ND	ND
Benzyl Alcohol	ND	ND	ND	ND
Butylbenzylphthalate	ND	ND	ND	ND
Dibenzofuran	T	ND	T	ND
Hexachloroethane	ND	ND	ND	T
N-Nitrosodiphenylamine	ND	ND	ND	ND
Nitrobenzene	ND	ND	ND	ND
Phenol	ND	T	ND	ND
bis(2-Ethylhexyl)phthalate		ND		0.41
Total PAH	22	ND	0.13	ND
Total Semi-Volatile Organics	27	ND	0.13	0.41
		** Other Chemicals (mg/l) **		
-DISSOLVED METALS-				
Iron	11	5.95	0.64	1.41
Zinc	0.048	0.02	ND	0.02
-CYANIDE-				
Total Cyanide (13)	0.06	0.01	0.01	ND
Undistilled Cyanide (10)	0.07	ND	ND	ND
-OTHER-				
Total Recoverable Phenolics	0.056	0.037	ND	0.029
Total Organic Carbon	10,000 (12)	31	61	11
Total New York State Regulated Organics (5)	30.656	0.137	0.142	0.439
pH (6)	7.7	(11)	7.5	6.6
Conductivity (7)	1154	(11)	1262	1576
Temperature (8)	12.0	(11)	12.4	9.6

NOTES:
(1) Sample values were obtained by GC/MS (USEPA Methods 624 and 625).
(2) ND = Not detected (see Appendix B-4 for Minimum Detection Limits).
(3) T = Trace (Concentrations detected below quantifiable reporting limits).
(4) -- = Not analyzed (Laboratory reported vial was received broken).
(5) The N.Y. State Class GA Groundwater Standard for Organics includes phenolic compounds, volatile organics and semivolatile organics; except for Acetone, Styrene, Acenaphthalene, Benzo(g,h,i)Perylene, Dibenzo(a,h)Anthracene and bis(2-Ethylhexyl)phthalate.
(6) pH readings in standard units.
(7) Conductivity readings in micromhos/cm.
(8) Temperature in degrees Celsius.
(9) Benzo(b)Fluoranthene and Benzo(k)Fluoranthene coelute.
(10) Undistilled CN = Free and dissociable CN-; method used and detected most, but not necessarily all, of the amenable CN- present.
(11) Sample too contaminated to submerge probes.
(12) Free Product in well.
(13) Total cyanide concentration may be less than distilled cyanide concentration due to analytical methods used and low detection levels.
(14) NR = Not Reported.

TABLE 4-5 (continued)
Task 3 Groundwater Analytical Results
Mechanicville Site

WELL IDENTIFIER	MW-11			MW-12	
SCREENED ZONE	SOIL/SHALLOW BEDROCK			SOIL	
SAMPLE IDENTIFIER	MW-11	MW-11 Dup	MW-11	MW-12	MW-12
DATE OF SAMPLE COLLECTION	12/22/87	12/22/87	3/29/88	12/22/87	3/29/88
-VOLATILE AROMATICS-		** Volatile Organics (mg/l) (1) **			
Benzene	ND	ND	ND	ND	0.12
Toluene	ND	ND	ND	ND	T
Ethylbenzene	ND	ND	ND	ND	1.1
Styrene	ND	ND	ND	ND	ND
Total Xylenes	ND	ND	ND	0.075	1.2
-OTHER-					
Methylene Chloride	ND	ND	ND	ND	ND
2-Butanone	ND	ND	ND	ND	T
1,1,1-Trichloroethane	0.0026	0.0044	ND	ND	ND
Vinyl Acetate	ND	ND	ND	ND	ND
2-Hexanone	ND	ND	ND	ND	ND
Chlorobenzene	ND	ND	ND	ND	ND
1,1-Dichloroethane	ND	ND	ND	ND	ND
Trichloroethene	ND	ND	ND	ND	ND
Total Volatile Aromatics	ND	ND	ND	0.075	2.4
Total Volatile Organics	0.0026	0.0044	ND	0.075	2.4
		** Semi-Volatile Organics (mg/l) (1) **			
-PAH-					
Acenaphthene	ND	ND	ND	ND	210
Acenaphthylene	ND	ND	ND	ND	T
Anthracene	ND	ND	ND	ND	86
Benzo(b)Fluoranthene	ND	ND	ND	ND	T
Benzo(k)Fluoranthene (9)	ND	ND	ND	ND	T
Benzo(g,h,i)Perylene	ND	ND	ND	ND	ND
Benzo(a)Anthracene	ND	ND	ND	ND	T
Benzo(a)Pyrene	ND	ND	ND	ND	T
Chrysene	ND	ND	ND	ND	T
Fluoranthene	ND	ND	ND	ND	82
Fluorene	ND	ND	ND	ND	110
Indeno(1,2,3-cd)Pyrene	ND	ND	ND	ND	ND
Naphthalene	ND	ND	ND	ND	580
Phenanthrene	ND	ND	ND	ND	320
Pyrene	ND	ND	ND	ND	130
-OTHER-					
2,4 - Dimethylphenol	ND	ND	ND	ND	ND
2,4-Dinitrotoluene	ND	ND	ND	ND	ND
2,6-Dinitrotoluene	ND	ND	ND	ND	ND
2-Chloronaphthalene	ND	ND	ND	ND	ND
2-Methylnaphthalene	ND	ND	ND	ND	540
2-Methylphenol	ND	ND	ND	ND	ND
2-Nitroaniline	ND	ND	T	ND	ND
3-Nitroaniline	ND	ND	ND	ND	ND
4,6 - Dinitro-2-Methylphenol	ND	ND	ND	ND	ND
4-Methylphenol	ND	ND	ND	ND	ND
4-Nitroaniline	ND	ND	ND	ND	ND
4-Nitrophenol	ND	ND	ND	ND	ND
Benzoic Acid	ND	ND	ND	ND	ND
Benzyl Alcohol	ND	ND	ND	ND	ND
Butylbenzylphthalate	ND	ND	ND	ND	T
Dibenzofuran	ND	ND	ND	ND	ND
Hexachloroethane	ND	ND	ND	ND	ND
N-Nitrosodiphenylamine	ND	ND	ND	ND	ND
Nitrobenzene	ND	ND	ND	ND	ND
Phenol	ND	T	ND	T	ND
bis(2-Ethylhexyl)phthalate	ND				
Total PAH	ND	ND	ND	ND	1500
Total Semi-Volatile Organics	ND	T	ND	ND	2100
		** Other Chemicals (mg/l) **			
-DISSOLVED METALS-					
Iron	0.15	0.26	0.28	2.7	4.45
Zinc	ND	ND	0.01	ND	0.02
-CYANIDE-					
Total Cyanide (13)	ND	ND	ND	0.8	0.58
Undistilled Cyanide (10)	ND	ND	ND	0.02	ND
-OTHER-					
Total Recoverable Phenolics	0.005	0.01	ND	0.016	0.2
Total Organic Carbon	5.4	8.9	4.9	18	13
Total New York State Regulated Organics (5)	0.0076	0.0144	ND	0.091	2060.6
pH (6)	7.6	7.6	6.9	7.4	(11)
Conductivity (7)	785	1098	939	1470	(11)
Temperature (8)	11.7	11.1	9.1	11.3	(11)

NOTES:
(1) Sample values were obtained by GC/MS (USEPA Methods 624 and 625).
(2) ND = Not detected (see Appendix B-4 for Minimum Detection Limits).
(3) T = Trace (Concentrations detected below quantifiable reporting limits).
(4) -- = Not analyzed (Laboratory reported vial was received broken).
(5) The N.Y. State Class GA Groundwater Standard for Organics includes phenolic compounds, volatile organics and semivolatile organics; except for Acetone, Styrene, Acenaphthalene, Benzo(g,h,i)Perylene, Dibenzo(a,h)Anthracene and bis(2-Ethylhexyl)phthalate.
(6) pH readings in standard units.
(7) Conductivity readings in micromhos/cm.
(8) Temperature in degrees Celsius.
(9) Benzo(b)Fluoranthene and Benzo(k)Fluoranthene coelute.
(10) Undistilled CN = Free and dissociable CN^-; method used and detected most, but not necessarily all, of the amenable CN^- present.
(11) Sample too contaminated to submerge probes.
(12) Free Product in well.
(13) Total cyanide concentration may be less than distilled cyanide concentration due to analytical methods used and low detection levels.
(14) NR = Not Reported

TABLE 4-5 (continued)
Task 3 Groundwater Analytical Results
Mechanicville Site

WELL IDENTIFIER	MW-13	MW-13	MW-13	MW-14	MW-14
SCREENED ZONE	BEDROCK	BEDROCK		BEDROCK	
SAMPLE IDENTIFIER	MW-13	MW-13	MW-13 Dup	MW-14	MW-14
DATE OF SAMPLE COLLECTION	12/22/87	3/29/88	3/29/88	12/22/87	3/29/88
-VOLATILE AROMATICS-		** Volatile Organics (mg/l) (1) **			
Benzene	9.6	12	-- (4)	2.3	2.2
Toluene	3.6	6.4	--	0.34	ND
Ethylbenzene	2.0	2	--	0.061	T
Styrene	0.94	1.8	--	ND	ND
Total Xylenes	2.2	3.5	--	0.79	0.16
-OTHER-					
Methylene Chloride	ND	36	--	ND	ND
2-Butanone	ND	ND	--	ND	ND
1,1,1-Trichloroethane	ND	ND	--	ND	ND
Vinyl Acetate	ND	ND	--	ND	ND
2-Hexanone	ND	ND	--	ND	ND
Chlorobenzene	ND	ND	--	ND	ND
1,1-Dichloroethane	ND	ND	--	ND	ND
Trichloroethene	0.053	ND	--	ND	ND
Total Volatile Aromatics	18	26	--	3.5	2.4
Total Volatile Organics	18	62	--	3.5	2.4
		** Semi-Volatile Organics (mg/l) (1) **			
-PAH-					
Acenaphthene	T	T	T	0.069	0.076
Acenaphthylene	T	0.94	0.72	T	T
Anthracene	ND	T	T	T	ND
Benzo(b)Fluoranthene	ND	T	T	ND	ND
Benzo(k)Fluoranthene (9)	ND	T	ND	ND	ND
Benzo(g,h,i)Perylene	ND	ND	ND	ND	ND
Benzo(a)Anthracene	ND	T	T	ND	ND
Benzo(a)Pyrene	ND	T	T	ND	ND
Chrysene	ND	T	T	ND	ND
Fluoranthene	T	0.3	T	ND	ND
Fluorene	ND	ND	ND	T	T
Indeno(1,2,3-cd)Pyrene	4.6	ND	ND	ND	ND
Naphthalene	T	8.1	7.8	T	1.8
Phenanthrene	ND	1.3	0.92	T	T
Pyrene		0.45	0.33	ND	ND
-OTHER-					
2,4 - Dimethylphenol	ND	ND	ND	ND	T
2,4-Dinitrotoluene	ND	T	ND	ND	ND
2,6-Dinitrotoluene	ND	T	ND	ND	ND
2-Chloronaphthalene	ND	ND	ND	ND	ND
2-Methylnaphthalene	0.78	2.7	2.1	0.080	0.22
2-Methylphenol	T	ND	ND	T	T
2-Nitroaniline	ND	ND	ND	ND	ND
3-Nitroaniline	ND	ND	ND	ND	ND
4,6 - Dinitro-2-Methylphenol	ND	ND	ND	ND	ND
4-Methylphenol	T	ND	ND	0.029	ND
4-Nitroaniline	ND	ND	ND	ND	ND
4-Nitrophenol	ND	ND	ND	ND	ND
Benzoic Acid	ND	ND	ND	ND	T
Benzyl Alcohol	ND	ND	ND	ND	ND
Butylbenzylphthalate	ND	ND	ND	ND	ND
Dibenzofuran	ND	T	T	ND	ND
Hexachloroethane	ND	ND	ND	ND	ND
N-Nitrosodiphenylamine	ND	ND	ND	ND	ND
Nitrobenzene	ND	ND	ND	ND	ND
Phenol	0.58	ND	ND	0.36	T
bis(2-Ethylhexyl)phthalate	ND	ND	ND	T	ND
Total PAH	4.6	11	9.8	0.069	1.9
Total Semi-Volatile Organics	6.0	14	12	0.54	2.1
		** Other Chemicals (mg/l) **			
-DISSOLVED METALS-					
Iron	0.14	0.26	0.18	0.4	0.16
Zinc	ND	0.01	0.02	ND	0.03
-CYANIDE-					
Total Cyanide (13)	0.15	0.1	0.13	0.12	0.09
Undistilled Cyanide (10)	ND	ND	ND	0.02	ND
-OTHER-					
Total Recoverable Phenolics	0.053	0.064	0.058	0.063	0.3
Total Organic Carbon	9	7.6	8.5	9.2	8.6
Total New York State Regulated Organics (5)	23.113	42.814	11.928	4.103	4.756
pH (6)	7.7	6.7	6.4	7.6	6.6
Conductivity (7)	1133	1332	1589	1157	1450
Temperature (8)	12.1	11.6	10.9	12.1	10.1

NOTES:
(1) Sample values were obtained by GC/MS (USEPA Methods 624 and 625).
(2) ND = Not detected (see Appendix B-4 for Minimum Detection Limits).
(3) T = Trace (Concentrations detected below quantifiable reporting limits).
(4) -- = Not analyzed (Laboratory reported vial was received broken).
(5) The N.Y. State Class GA Groundwater Standard for Organics includes phenolic compounds, volatile organics and semivolatile organics; except for Acetone, Styrene, Acenaphthalene, Benzo(g,h,i)Perylene, Dibenzo(a,h)Anthracene and bis(2-Ethylhexyl)phthalate.
(6) pH readings in standard units.
(7) Conductivity readings in micromhos/cm.
(8) Temperature in degrees Celsius.
(9) Benzo(b)Fluoranthene and Benzo(k)Fluoranthene coelute.
(10) Undistilled CN = Free and dissociable CN-; method used and detected most, but not necessarily all, of the amenable CN- present.
(11) Sample too contaminated to submerge probes.
(12) Free Product in well.
(13) Total cyanide concentration may be less than distilled cyanide concentration due to analytical methods used and low detection levels.
(14) NR = Not Reported

TABLE 4-5 (continued)

Task 3 Groundwater Analytical Results
Mechanicville Site

WELL IDENTIFIER	MW-15	MW-15	MW-15
SCREENED ZONE	BEDROCK	BEDROCK	BEDROCK
SAMPLE IDENTIFIER	MW-15	MW-15 Dup	MW-15
DATE OF SAMPLE COLLECTION	12/22/87	12/22/87	3/29/88
-VOLATILE AROMATICS-		** Volatile Organics (mg/l) (1) **	
Benzene	0.0026	0.0058	0.018
Toluene	ND	ND	ND
Ethylbenzene	ND	ND	ND
Styrene	ND	ND	ND
Total Xylenes	0.0027	0.0031	0.013
-OTHER-			
Methylene Chloride	ND	ND	ND
2-Butanone	ND	ND	ND
1,1,1-Trichloroethane	0.017	0.025	0.012
Vinyl Acetate	ND	ND	ND
2-Hexanone	ND	ND	T
Chlorobenzene	ND	ND	ND
1,1-Dichloroethane	0.0033	0.0031	ND
Trichloroethene	ND	ND	ND
Total Volatile Aromatics	0.0053	0.0089	0.031
Total Volatile Organics	0.026	0.037	0.043
		** Semi-Volatile Organics (mg/l) (1) **	
-PAH-			
Acenaphthene	0.040	0.026	0.031
Acenaphthylene	0.045	0.027	T
Anthracene	ND	ND	ND
Benzo(b)Fluoranthene	ND	ND	ND
Benzo(k)Fluoranthene (9)	ND	ND	ND
Benzo(g,h,i)Perylene	ND	ND	ND
Benzo(a)Anthracene	ND	ND	ND
Benzo(a)Pyrene	ND	ND	ND
Chrysene	ND	ND	ND
Fluoranthene	ND	ND	ND
Fluorene	T	T	0.011
Indeno(1,2,3-cd)Pyrene	ND	ND	ND
Naphthalene	0.091	T	T
Phenanthrene	T	T	T
Pyrene	ND	ND	T
-OTHER-			
2,4 - Dimethylphenol	ND	ND	ND
2,4-Dinitrotoluene	ND	ND	ND
2,6-Dinitrotoluene	ND	ND	ND
2-Chloronaphthalene	ND	ND	ND
2-Methylnaphthalene	0.030	T	ND
2-Methylphenol	ND	ND	ND
2-Nitroaniline	ND	ND	ND
3-Nitroaniline	ND	ND	ND
4,6 - Dinitro-2-Methylphenol	ND	ND	ND
4-Methylphenol	ND	ND	ND
4-Nitroaniline	ND	ND	ND
4-Nitrophenol	ND	ND	ND
Benzoic Acid	ND	ND	ND
Benzyl Alcohol	ND	ND	T
Butylbenzylphthalate	ND	ND	ND
Dibenzofuran	ND	ND	T
Hexachloroethane	ND	ND	ND
N-Nitrosodiphenylamine	ND	ND	ND
Nitrobenzene	ND	ND	T
Phenol	ND	ND	T
bis(2-Ethylhexyl)phthalate	ND	ND	ND
Total PAH	0.18	0.053	0.042
Total Semi-Volatile Organics	0.21	0.053	0.042
		** Other Chemicals (mg/l) **	
-DISSOLVED METALS-			
Iron	0.13	ND	0.16
Zinc	ND	0.014	0.01
-CYANIDE-			
Total Cyanide (13)	ND	0.06	ND
Undistilled Cyanide (10)	ND	ND	ND
-OTHER-			
Total Recoverable Phenolics	0.006	0.006	ND
Total Organic Carbon	2.9	3.2	3.9
Total New York State Regulated Organics (5)	0.242	0.069	0.085
pH (6)	7.9	7.9	7.2
Conductivity (7)	949	1125	1029
Temperature (8)	12.1	11.4	13.4

NOTES:
(1) Sample values were obtained by GC/MS (USEPA Methods 624 and 625).
(2) ND = Not detected (see Appendix B-4 for Minimum Detection Limits).
(3) T = Trace (Concentrations detected below quantifiable reporting limits).
(4) -- = Not analyzed (Laboratory reported vial was received broken).
(5) The N.Y. State Class GA Groundwater Standard for Organics includes phenolic compounds, volatile organics and semivolatile organics; except for Acetone, Styrene, Acenaphthalene, Benzo(g,h,i)Perylene, Dibenzo(a,h)Anthracene and bis(2-Ethylhexyl)phthalate.
(6) pH readings in standard units.
(7) Conductivity readings in micromhos/cm.
(8) Temperature in degrees Celsius.
(9) Benzo(b)Fluoranthene and Benzo(k)Fluoranthene coelute.
(10) Undistilled CN = Free and dissociable CN-; method used and detected most, but not necessarily all, of the amenable CN- present.
(11) Sample too contaminated to submerge probes.
(12) Free Product in well.
(13) Total cyanide concentration may be less than distilled cyanide concentration due to analytical methods used and low detection levels.
(14) NR = Not Reported.

TABLE 3-3
Task 3 Surface Water Analytical Results
Mechanicville Site

SITE IDENTIFIER:	------UPSTREAM------		------ADJACENT------		-----DOWNSTREAM------	
SAMPLE IDENTIFIER:	SW-01	SW-01	SW-02	SW-02	SW-04	SW-04
DATE OF SAMPLE COLLECTION:	12/22/87	3/30/88	12/22/87	3/30/88	12/22/87	3/30/88
** Volatile Organics (mg/l) **						
- VOLATILE AROMATICS -						
Benzene	ND (1)	ND	ND	-- (2)		
Toluene	ND	ND	ND	--	ND	--
Ethylbenzene	ND	ND	ND	--	ND	--
Styrene	ND	ND	ND	--	ND	--
Total Xylenes	ND	ND	ND	--	ND	--
- OTHER -						
Methylene Chloride	ND	ND	ND	--	ND	--
2-Butanone	ND	ND	ND	--	ND	--
Total Volatile Aromatics	ND	ND	ND	--	ND	--
Total Volatile Organics	ND	ND	ND	--	ND	--
** Semi-Volatile Organics (mg/l) **						
-PAH-						
Acenaphthene	ND	ND	ND	ND	ND	ND
Acenaphthylene	ND	ND	ND	ND	ND	ND
Anthracene	ND	ND	ND	ND	ND	ND
Benzo(b)Fluoranthene	ND	ND	ND	ND	ND	ND
Benzo(k)Fluoranthene	ND	ND	ND	ND	ND	ND
Benzo(g,h,i)Perylene	ND	ND	ND	ND	ND	ND
Benzo(a)Anthracene	ND	ND	ND	ND	ND	ND
Benzo(a)Pyrene	ND	ND	ND	ND	ND	ND
Chrysene	ND	ND	ND	ND	ND	ND
Fluoranthene	ND	ND	ND	ND	ND	ND
Fluorene	ND	ND	ND	ND	ND	ND
Indeno(1,2,3-cd)Pyrene	ND	ND	ND	ND	ND	ND
Naphthalene	ND	ND	ND	ND	ND	ND
Phenanthrene	ND	ND	ND	ND	ND	ND
Pyrene	ND	ND	ND	ND	ND	ND
-OTHER-						
bis (2-Ethylhexyl) Phthalate	0.39	0.034	ND	ND	ND	ND
Total PAH	ND	ND	ND	ND	ND	ND
Total Semi-Volatile Organics	0.39	0.034	ND	ND	ND	ND
** Other Chemicals (mg/l) **						
-METALS-						
Iron	0.20	0.38	1.1	1.8	0.24	0.42
Zinc	ND	0.03	0.014	0.02	ND	ND
-CYANIDE-						
Total Cyanide	ND	ND	ND	ND	ND	ND
Undistilled Cyanide (3)	ND	ND	ND	ND	ND	ND
-OTHER-						
Total Recoverable Phenolics	ND	ND	ND	ND	ND	0.011
Total Organic Carbon	6.1	4.2	6.1	4.9	4.8	4.7

NOTES:
(1) ND = Not detected (see Appendix B-4 for minimum detection limits).
(2) NA = Not analyzed (laboratory reported vial was received broken).
(3) Undistilled CN = Free dissociable CN-; method used detected most, but not necessarily all, of amenable CN- present

TABLE 3-4
Task 3 Sediment Analytical Results
Mechanicville Site

SITE IDENTIFIER	----UPSTREAM----		----ADJACENT----		----------DOWNSTREAM----------			
SAMPLE IDENTIFIER	SD-01	SD-01	SD-02	SD-02	SD-04	DUP-01	SD-04	SD-DUP
DATE OF SAMPLE COLLECTION	12/22/87	3/30/88	12/22/87	3/30/88	12/22/87	12/22/87	3/30/88	3/30/88
				** Volatile Organics (mg/kg) **				
-VOLATILE AROMATICS-								
Benzene	ND (1)	ND	ND	T	ND	ND	ND	ND
Toluene	ND	ND	ND	ND	ND	ND	ND	ND
Ethylbenzene	ND	ND	0.087	ND	ND	ND	ND	ND
Styrene	ND	ND	ND	ND	ND	ND	ND	ND
Total Xylenes	ND	ND	ND	ND	ND	ND	ND	ND
-OTHER-								
Methylene Chloride	ND	R (3)	ND	R	ND	ND	R	R
2-Butanone	ND	R	ND	R	ND	ND	R	R
Total Volatile Aromatics	ND	ND	0.087	T	ND	ND	ND	ND
Total Volatile Organics	ND	ND	0.087	T	ND	ND	ND	ND
				** Semi-Volatile Organics (mg/kg) **				
-PAH-								
Acenaphthene	ND	ND	T	ND	ND	ND	ND	ND
Acenaphthylene	ND	ND	T	ND	ND	ND	ND	ND
Anthracene	ND	ND	T	ND	ND	ND	ND	ND
Benzo(a)Anthracene	T	ND	0.53	ND	ND	ND	ND	ND
Benzo(b)Fluoranthene	ND	ND	0.94	ND	ND	ND	ND	ND
Benzo(k)Fluoranthene	ND	ND	(5)	ND	ND	ND	ND	ND
Benzo(g,h,i,)Perylene	ND	ND	T	ND	ND	ND	ND	ND
Benzo(a)Pyrene	ND	ND	0.59	ND	ND	ND	ND	ND
Chrysene	T (2)	ND	0.58	ND	ND	ND	ND	ND
Dibenz(a,h)Anthracene	ND	ND	T	ND	ND	ND	ND	ND
Fluoranthene	T	ND	T	ND	T	T	ND	ND
Fluorene	ND	ND	T	ND	ND	ND	ND	ND
Indeno(1,2,3-cd)Pyrene	ND	ND	T	ND	ND	ND	ND	ND
Naphthalene	ND	ND	0.48	ND	ND	T	ND	ND
Phenanthrene	T	ND	0.9	T	T	T	ND	ND
Pyrene	T	ND	1.1	ND	T	T	ND	ND
-OTHER-								
4-Methylphenol	ND	ND	T	ND	ND	ND	ND	ND
2-Methylnaphthalene	ND	ND	T	ND	ND	ND	ND	ND
Butylbenzylphthalate	ND	ND	T	ND	ND	ND	ND	ND
bis(2-Ethylhexyl)phthalate	ND	ND	T	ND	ND	ND	ND	ND
Di-n-octylphthalate	ND	25	ND	T	ND	ND	T	T
Total PAH	T	ND	5.1	T	T	T	ND	ND
Total Semi-Volatile Organics	T	25	5.1	T	T	T	T	T
-METALS-								
Iron	7700	NR (4)	8400	NR	8700	7100	NR	NR
Zinc	27	NR	45	NR	25	28	NR	NR
-CYANIDE-								
Total Cyanide (ppm) (6)	ND	NR	1.3	NR	ND	ND	NR	NR
Undistilled Cyanide	ND	NR	ND	NR	ND	ND	NR	NR
-OTHER-								
Total Recoverable Phenolics	1.3	NR	2.3	NR	1.2	0.68	NR	NR
Total Organic Carbon	12000	NR	32000	NR	18000	11000	NR	NR

NOTES:

(1) ND = Not detected (See Appendix B-4 for minimum detection limits).
(2) T = Trace concentrations detected below the quantifiable reporting limits.
(3) R = Data rejected because analysis of blank indicated sampling or lab-derived contamination
(4) NR = Analysis not requested
(5) Benzo(b)Fluoranthene and Benzo(k)Fluoranthene coeluted.
(6) Undistilled CN = Free and dissociable CN-; method used detected most, but not necessarily all, of the amenable CN- present.

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TABLE 4-2
CRITERIA FOR CHEMICALS FOUND IN GROUNDWATER AND SURFACE WATER
MECHANICVILLE SITE

	NEW YORK STATE AMBIENT WATER QUALITY STANDARDS AND GUIDANCE VALUES (1)				NATIONAL DRINKING WATER REGULATIONS		EPA HEALTH ADVISORIES(4)	EPA AMBIENT WATER QUALITY CRITERIA (5)				
	CLASS D SURFACE WATER		CLASS GA GROUNDWATER					--AQUATIC LIFE(6)--		HUMAN HEALTH(9)		
	STANDARDS	GUIDANCE VALUES	STANDARDS	GUIDANCE VALUES	MAXIMUM CONTAMINANT LEVELS(2)	MAXIMUM CONTAMINANT LEVEL GOAL(3)	LIFETIME ADULT EXPOSURE	ACUTE (7)	CHRONIC (8)	DRINKING WATER ONLY (10)	FISH CONSUMPTION ONLY	DRINKING WATER AND FISH CONSUMPTION
VOLATILE ORGANICS (MG/L)												
LATILE AROMATICS-	----	0.006	ND(11)	----	0.005(12)	0	----	5.3	----	0.00067	----	0.00066
ZENE	----	----	----	0.05	----	2 (12)	11	17.5	----	15	424	14.3
UENE	----	----	----	0.05	----	0.68 (12)	3.40	32	----	2.40	3.28	1.4
YLBENZENE	----	----	0.931	----	----	0.140(12)	----	----	----	----	----	----
RENE	----	----	----	0.05	----	0.44 (12)	2.20	----	----	----	----	----
AL XYLENE	----	----	----	----	----	----	----	----	----	----	----	----
XYLENE	----	----	----	----	----	----	----	----	----	----	----	----
XYLENE	----	----	----	----	----	----	----	----	----	----	----	----
XYLENE	----	----	----	0.05	----	----	----	----	----	----	----	----
IMETHYLBENZENE	----	----	----	----	----	----	----	----	----	----	----	----
THER-	----	----	----	----	----	----	----	12	----	----	----	----
ETONE	----	----	----	0.05	----	----	----					
HYLENE CHLORIDE												
SEMIVOLATILE ORGANICS (MG/L)												
AH-	----	----	----	0.02	----	----	----	0.52	----	0.02(13)	----	0.02(13)
ENAPHTHENE	----	----	----	----	----	----	----	----	----	----	----	----
ENAPHTHYLENE	----	----	----	0.05	----	----	----	----	----	----	----	----
THRACENE	----	----	----	0.000002	----	----	----	----	----	0.0000031	----	0.0000028
NZO(b)FLUORANTHENE	----	----	----	0.000002	----	----	----	----	----	0.0000031	----	0.0000028
NZO(k)FLUORANTHENE	----	----	----	----	----	----	----	----	----	----	----	----
NZO(g,h,i)PERYLENE	----	----	----	0.000002	----	----	----	----	----	0.0000031	----	0.0000028
NZO(a)ANTHRACENE	----	----	----	----	----	----	----	----	----	0.0000031	----	0.0000028
NZO(a)PYRENE	----	0.0000012	ND	0.000002	----	----	----	----	----	0.0000031	----	0.0000028
RYSENE	----	----	----	----	----	----	----	----	----	----	----	----
BENZO(a,h,)ANTHRACENE	----	----	----	0.05	----	----	----	3.98	----	0.19	0.054	0.042
UORANTHENE	----	----	----	0.05	----	----	----	----	----	----	----	----
UORENE	----	----	----	0.000002	----	----	----	----	----	0.0000031	----	0.0000028
DENE(1,2,3-cd)PYRENE	----	----	----	0.01	----	----	----	2.3	0.62	----	----	----
APHTHALENE	----	----	----	0.05	----	----	----	----	----	----	----	----
ENANTHRENE	----	----	----	0.05	----	----	----	----	----	----	----	----
RENE	----	----	----	----	----	----	----	----	----	0.0000031	----	0.0000028
TAL CARCINOGENIC PAH	----	----	4.2	----	----	----	----	0.94	0.003	21	50	15
THER-												
S(2-ETHYLHEXYL)PHTHALATE	----	----	0.1	----	----	----	----	----	----	----	----	----
TAL NEW YORK STATE GULATED ORGANICS (14)												

TABLE 4-2 (CONTINUED)
CRITERIA FOR CHEMICALS FOUND IN GROUNDWATER AND SURFACE WATER
MECHANICVILLE SITE

	NEW YORK STATE AMBIENT WATER QUALITY STANDARDS AND GUIDANCE VALUES (1)				NATIONAL DRINKING WATER REGULATIONS		EPA HEALTH ADVISORIES(4)	EPA AMBIENT WATER QUALITY CRITERIA (5)				
	CLASS D SURFACE WATER		CLASS GA GROUNDWATER					AQUATIC LIFE(6)		HUMAN HEALTH(9)		
	STANDARDS	GUIDANCE VALUES	STANDARDS	GUIDANCE VALUES	MAXIMUM CONTAMINANT LEVELS(2)	MAXIMUM CONTAMINANT LEVEL GOAL(3)	LIFETIME ADULT EXPOSURE	ACUTE (7)	CHRONIC (8)	DRINKING WATER ONLY (10)	FISH CONSUMPTION ONLY	DRINKING WATER AND FISH CONSUMPTION
OTHER CHEMICALS (MG/L)												
-METALS-												
IRON	0.03	----	0.3	----	----	0.3(15)	----	----	----	----	----	----
ZINC	(16)	----	5	----	----	5(15)	----	----	----	5(13)	----	5(13)
-CYANIDE-												
TOTAL CYANIDE	----	----	0.2	----	----	----	0.75	----	----	----	----	----
FERRO-FERRI CYANIDE	----	----	----	----	----	----	----	----	----	----	----	----
FREE CYANIDE	0.022	----	----	----	----	----	----	0.0035	0.052	0.2	----	0.2
-OTHER-												
TOTAL RECOVERABLE PHENOLICS (17)	----	----	0.001	----	----	----	----	----	----	3.5	----	3.5
TOTAL ORGANIC CARBON	----	----	----	----	----	----	----	----	----	----	----	----
SULFATE	----	----	250.0	----	----	----	----	----	----	----	----	----

NOTES:
(1) NYSDEC TECHNICAL AND OPERATIONAL GUIDANCE SERIES 85-W-38 AS REVISED APRIL 1, 1987. CLASS D SURFACE WATERS ARE SUITABLE FOR SECONDARY CONTACT RECREATION; CLASS GA DENOTES FRESH GROUNDWATER WHICH IS A SOURCE OF POTABLE WATER SUPPLY.
(2) MCLs (MAXIMUM CONTAMINANT LEVELS) ARE ENFORCEABLE STANDARDS FOR PUBLIC WATER SUPPLY SYSTEMS PROMULGATED UNDER THE SAFE DRINKING WATER ACT (40 CFR PART 141).
(3) MCLGs (MAXIMUM CONTAMINANT LEVEL GOALS) ARE PROPOSED NON-ENFORCEABLE HEALTH GOALS AND HAVE BEEN SET AT A LEVEL OF NO KNOWN OR ANTICIPATED HEALTH AFFECTS.
(4) EPA HEALTH ADVISORIES (FORMERLY SNARLs) ARE NON-ENFORCEABLE CRITERIA ESTABLISHED BY THE OFFICE OF DRINKING WATER. THEY ARE SET AT LEVELS WHERE ADVERSE HEALTH EFFECTS ARE NOT EXPECTED.
(5) WATER QUALITY CRITERIA WERE FORMULATED TO PROTECT AQUATIC LIFE AND HUMAN HEALTH FROM POLLUTANTS IN SURFACE WATERS. (40 CFR SUMMARY, FRI, NOV. 28, 1980, P. 79318-79379). WATER QUALITY CRITERIA HAVE NO REGULATORY IMPACT, BUT ARE USEFUL IN ESTABLISHING WATER QUALITY-BASED EFFLUENT LIMITATIONS, WATER QUALITY STANDARDS, AND TOXIC POLLUTANT EFFLUENT STANDARDS.
(6) GUIDANCE CRITERIA FOR THE PROTECTION OF FRESHWATER AQUATIC LIFE. CONCENTRATIONS SPECIFIED SHOULD PROTECT MOST (BUT NOT NECESSARILY ALL) AQUATIC FRESHWATER LIFE AND ITS USES.
(7) THE ACUTE TOXICITY LEVEL IS THE MAXIMUM TO WHICH ORGANISMS CAN BE EXPOSED WITHOUT SIGNIFICANT RISK OF ADVERSE IMPACT.
(8) CHRONIC TOXICITY LEVEL IS THE 24-HOUR AVERAGE VALUE THAT ORGANISMS CAN BE EXPOSED TO WITHOUT SIGNIFICANT RISK OF ADVERSE IMPACT.
(9) HUMAN HEALTH GUIDELINES WERE DERIVED BASED ON "GUIDELINES AND METHODOLOGY USED IN THE PREPARATION OF HEALTH EFFECT ASSESSMENT CHAPTERS OF THE CONSENT DEGREE WATER CRITERIA DOCUMENTS" DEVELOPED BY EPA'S OFFICE OF RESEARCH AND DEVELOPMENT.
(10) THESE ADJUSTED CRITERIA, FOR DRINKING WATER INGESTION ONLY, WERE DERIVED FROM PUBLISHED EPA AWQC FOR COMBINED FISH AND DRINKING WATER INGESTION AND FOR FISH INGESTION ALONE. THESE ADJUSTED VALUES ARE NOT OFFICIAL EPA AWQC, BUT MAY BE APPROPRIATE FOR SUPERFUND SITES WITH CONTAMINATED GROUNDWATER. (USEPA SUPERFUND PUBLIC HEALTH EVALUATION MANUAL, OCTOBER 1986, PAGES 61-64).
(11) ND = DETECTABLE BY USEPA METHODS 602 OR 624 (BENZENE) OR METHODS 610 OR 625 (BENZO(a)PYRENE).
(12) PROPOSED
(13) TO PROTECT AGAINST TASTE AND ODOR EFFECTS; NOT HEALTH BASED.
(14) NEW YORK STATE HAS A MAXIMUM WATER QUALITY VALUE OF 0.1 MG/L OF DESIGNATED ORGANIC CHEMICALS FOR SURFACE WATER AND GROUNDWATER DISCHARGES REQUIRING PERMITS. THE DESIGNATED ORGANICS INCLUDE ALL OF THE ORGANIC CHEMICALS LISTED EXCEPT ACENAPHTHYLENE, BENZO(g,h,i)PERYLENE DIBENZO(a,h)ANTHRACENE, AND STYRENE.
(15) SECONDARY MAXIMUM CONTAMINANT LEVELS WHICH APPLY TO PUBLIC WATER SYSTEMS. THESE REGULATIONS CONTROL CONTAMINANTS IN DRINKING WATER THAT PRIMARILY AFFECT THE AESTHETIC QUALITIES RELATING TO THE PUBLIC ACCEPTANCE OF DRINKING WATER (40 CFR PART 143).
(16) ZINC STANDARD FOR CLASS D WATERS IS DETERMINED BY THE FORMULA EXP(0.83[LN(PPM HARDNESS)]+1.95) AND APPLIES TO THE ACID SOLUBLE FORM.
(17) AS MEASURE BY APHA METHOD 510.B WHICH IS EQUIVALANT TO EPA METHOD 420.1 (SEE APHA, 1985; USEPA, 1983).

TABLE 4-3

TASK 3 GROUNDWATER SAMPLES CONTAINING CHEMICALS
IN EXCESS OF NEW YORK STATE GUIDANCE VALUES
MECHANICVILLE SITE

CHEMICAL	GUIDANCE VALUE (mg/ℓ)[1]	WELL NUMBER	ROUND NUMBER
Volatile Aromatics			
Toluene	0.05	MW-4	1
		MW-5	1
		MW-6	1
		MW-13	1,2
		MW-14	1
Ethylbenzene	0.05	MW-3	1
		MW-4	1,2
		MW-5	2
		MW-6	1
		MW-12	2
		MW-13	1,2
		MW-14	1
Total Xylene	0.05	MW-3	1,2
		MW-4	1,2
		MW-5	1,2
		MW-6	1
		MW-12	1,2
		MW-13	1,2
		MW-14	1,2
Methylene Chloride		MW-13	2
PAHs			
Acenaphthene	0.02	MW-3	1
		MW-5	1,2
		MW-6	1
		MW-10	1
		MW-12	2
		MW-14	1,2
		MW-15	1,2
Anthracene	0.05	MW-3	1
		MW-6	1
		MW-12	2
Benzo(k)Fluoranthene	0.000002	MW-5	2

TABLE 4-3 (Continued)

TASK 3 GROUNDWATER SAMPLES CONTAINING CHEMICALS
IN EXCESS OF NEW YORK STATE GUIDANCE VALUES
MECHANICVILLE SITE

CHEMICAL	GUIDANCE VALUE (mg/ℓ)[1]	WELL NUMBER	ROUND NUMBER
Fluoranthene	0.05	MW-3	1
		MW-5	2
		MW-6	1
		MW-12	2
		MW-13	2
Fluorene	0.05	MW-3	1
		MW-5	2
		MW-6	1
		MW-12	2
Naphthalene	0.01	MW-3	1
		MW-4	1,2
		MW-5	1,2
		MW-6	1
		MW-12	2
		MW-13	1,2
		MW-14	2
		MW-15	1
Phenanthrene	0.05	MW-3	1
		MW-5	1,2
		MW-6	1
		MW-12	2
		MW-13	2
Pyrene	0.05	MW-3	1
		MW-5	2
		MW-6	1
		MW-12	2
		MW-13	2

[1]NYSDEC, Division of Water; Technical and Operational Guidance Series 86-W-38; April 1987.

TABLE 4-4

PERMISSIBLE EXPOSURE LIMITS - AIR (ppm)
MECHANICVILLE SITE

Substance	OSHA			NIOSH	ACGIH	
	TWA	CC	Peak	TWA	TLV	STEL
Benzene	10	25	50	1	10	25
Toluene	200	300	500	100	100	150
Ethylbenzene	100	--	--	--	100	125
Xylene	100	--	--	100	100	150

Notes:

TWA = Time Weighted Average (8-hr)

CC = Ceiling Concentration

Peak = Maximum Duration 10 minutes in 8 hours

TLV = Threshold Limit Value

STEL = Short-term (15-minute) Exposure Limit

TABLE 4-5

TOXICOLOGICAL PROPERTIES OF COMPOUNDS IDENTIFIED
IN VARIOUS MEDIA
MECHANICVILLE SITE

COMPOUND CLASS	MEDIA IDENTIFIED IN	SPECIFIC COMPOUNDS	TOXICOLOGICAL PROPERTIES[1]
latile Organic Compounds	Groundwater	Toluene, benzene, xylenes, ethylbenzene, trimethylbenzene, styrene	These aromatic compounds are absorbed readily through the respiratory and gastrointestinal (GI) tracts and can also be absorbed through the skin. Benzene has the potential to cause cancer. Depending on the dose received, the other compounds can exert toxic effects on the liver and kidneys; they can also act as central nervous system (CNS) depressants and respiratory irritants.
	Subsurface Soil	All of the above plus n-propylbenzene	
	Sediment	Toluene, benzene	
	Air	Toluene, benzene	
nivolatile Compounds			
o PAHs	Groundwater	Acenaphthene, acenaphthylene, anthracene, benzofluoranthenes, benzo(g,h,i)perylene, benzo(a) anthracene, benzo(a)pyrene, chrysene, fluoranthene, fluorene, indeno(1,2,3-cd) pyrene, naphthalene, phenanthrene, pyrene.	PAHs are a diverse group of compounds of varying toxicity. They are highly lipid-soluble and are absorbed through the GI and respiratory tracts, and to a lesser degree, through the skin. Many PAHs have been shown to be potentially carcinogenic. Other PAHs are thought to be noncarcinogenic; these include fluorene, anthracene, pyrene, naphthalene, phenanthrene, and fluoranthene. The acute toxicity and chronic toxicity of low level exposures are not well understood.
	Subsurface soil Sediment	All of the above plus dibenzo(a,h)anthracene	
o Phenolic compounds	Groundwater Subsurface soil Surface water	Total recoverable phenolics	Depending on the dose, these compounds can produce liver and kidney toxicity and CNS effects. They can act as respiratory and skin irritants.
organic Compounds	Groundwater	Iron, zinc, cyanide, sulfate	Iron and zinc are essential nutrients. However, they can produce objectionable effects such as staining, bad taste, and GI irritation at high levels. Bioavailable cyanide can exert toxic effects on the liver, kidneys, CNS, and cardiovascular system at high levels. Sulfate is a natural constituent of groundwater which affects taste in high concentrations (500 mg/ℓ).
	Subsurface soil	Iron, zinc, cyanide	
	Surface water	Iron, cyanide, sulfate	
	Sediment	Iron, zinc, sulfate	

In assessing the risks to public health and the environment posed by these chemicals, not only toxicological properties but also potential receptors and probable exposure conditions must be considered. These factors will be addressed in the Task 4 risk assessment.

TABLE 4-3

PRELIMINARY IDENTIFICATION OF REMEDIAL ALTERNATIVES
MECHANICVILLE SITE

MEDIUM	CONCEPTUAL ACTION	REMEDIAL MEASURE	REMARKS
Soil/Sediment	Containment	Capping	Much of the site is presently covered with asphalt and structures. An impervious cap could further reduce infiltration and, therefore, the rate of leaching of chemicals from the soils into the groundwater. A cap would also reduce contact potential. Not applicable to sediment.
	Removal	Excavation and Transport	Involves excavation and removal with subsequent transportation to another location. Potential impact on air quality during excavation and long-term liability at disposal site should be considered. Dredging is also an option for sediment.
	Disposal	Landfilling	Landfill selection depends on whether wastes are hazardous or nonhazardous. If hazardous, they must be disposed of in a properly licensed RCRA landfill.
	Treatment	Incineration	A proven technology, it destroys organics effectively. On-site units require test burns prior to full-scale use.
		Biodegradation	Several recent applications of this technology to coal tar and coal-tar-contaminated soils have been reported in literature. This treatment requires experimentation to determine the proper organisms and optimal operating conditions. It can be applied in situ, through land-farming, or by use of a batch reactor vessel.
		Solidification	Involves mixing the waste with cement or similar additives to incorporate the waste into the cement matrix. Process improves waste handling and is inexpensive. Does not destroy compounds but reduces toxicity by reducing contaminant mobility and availability to biota. Method is currently commercially available.
		Soil Aeration	This process removes organic contaminants from soil/sediment by partitioning. Some further treatment system may be required to treat the air, and potential impacts on air quality must be evaluated. The effect of this process on semivolatile contaminants would have to be evaluated prior to implementation.
		Vacuum Extraction	Underground wells are operated under a vacuum to volatilize and extract soil gases. Vacuum system is constructed on-site to remove and collect volatile and semivolatile compounds from the unsaturated soil zone. May require extensive carbon air treatment system to treat the off-gases. Effectiveness on semivolatile compounds would have to be evaluated prior to implementation. Not applicable to sediment.
	Access Control	Posting Fencing Land Restrictions	Prevents contact with hazardous constituents. Will be considered in conjunction with other technologies. Not applicable to sediment.
	No Action		To be considered in conjunction with other technologies.

PRELIMINARY IDENTIFICATION OF REMEDIAL ALTERNATIVES
MECHANICVILLE SITE

MEDIUM	CONCEPTUAL ACTION	REMEDIAL MEASURE	REMARKS
Groundwater	Containment	Capping	See soils.
	Diversion	Low Permeable Barriers	Retard lateral chemical migration within the soil and weathered bedrock zone by positioning on the competent bedrock surface. Would not retard vertical migration or chemical movement in bedrock fractures.
		Injection Wells/Interceptor Trenches	Control groundwater flow direction. Generally used in conjunction with groundwater extraction.
	In-situ Treatment	Biodegradation	Analysis/culture of the contaminated water to determine the present activity and nutrient levels needed to stimulate hydrocarbon-utilizing bacteria.
		Aquifer Flushing	May include the use of chemical additives. Often used in conjunction with groundwater removal.
		Other Technologies	Cost-effectiveness is dependent on concentration and types of contamination. Physical or physical/chemical technologies such as oxidation and precipitation may be applicable to highly contaminated waters.
	Removal	Extraction of Groundwater via Pumping	If large volumes of water are to be extracted, on-site treatment may be appropriate. May include recharge or discharge to surface drainage. Distribution of contamination and required operating period is not known. May require years of operation.
	Treatment	Carbon Adsorption	Contaminated carbon filters require appropriate disposal or regeneration. Data regarding process efficiency and applicability are available.
		Biodegradation	On-site biological treatment may be considered if large volumes of groundwater require treatment. Extracted groundwater may also be released to publicly owned treatment works for secondary biological treatment depending on present plant capacity, waste characteristics, and feasibility.
		Steam Stripping	Steam stripping is essentially a continuous fractional distillation process using steam to remove organics from aqueous wastes. Residuals, including steam condensate, recovered solvents, and "stripped" effluent must be disposed of or treated.
		Incineration	Likely to destroy organic wastes in groundwater, but process cost is expected to be high.
		UV/Oxidation	UV light is used to enhance the reactivity of oxidants (e.g., ozone or hydrogen peroxide) with organics. Hydrocarbons and chlorinated solvents are effectively destroyed. However, UV light cannot effectively catalyze reactions in opaque solutions. Process by products (e.g., off-gas, froth) are a concern with concentrated wastestreams.
	No Action		To be considered in conjunction with other technologies.

TABLE 6-1

COST OF RISK ASSESSMENT PROGRAM (TASK 4)
MECHANICVILLE SITE

Activity	Hours	Cost ($)
Labor		
Project Management	50	4,284
Data Analysis/Report Preparation		
Exposure Assessment	227	12,733
Dose Response Evaluation	47	2,562
Risk Characterization	227	12,733
Engineering Evaluation	115	5,552
Drafting	14	313
Secretarial	10	209
Total Labor Costs	690	$38,386
Other: Word Processing, Mailing, Reproduction		$ 850
TOTAL COSTS		$39,236

01/19/88

TABLE 4-6
CHEMICALS FOUND IN TASK 2 SURFACE WATER SAMPLES
MECHANICVILLE SITE

SITE IDENTIFIER	SW-1					SW-2						SW-3				
SAMPLE IDENTIFIER	SW-101	SW-201	SW-301	SW-301 DUP	SW-401	SW-102	SW-202	SW-202 DUP	SW-302	SW-402	SW-402 DUP	SW-103	SW-103 DUP	SW-203	SW-303	SW-403
ORGANICS ANALYSIS (1)	HPLC	GC/MS	GC/MS	GC/MS	GC/MS	HPLC	GC/MS	GC/MS	GC/MS	GC/MS	GC/MS	HPLC	HPLC	GC/MS	GC/MS	GC/MS
DATE OF SAMPLE COLLECTION	9/9/86	12/2/86	3/10/87	3/10/87	6/2/87	9/9/86	12/2/86	12/2/86	3/10/87	6/2/87	6/2/87	9/9/86	9/9/86	12/2/86	3/10/87	6/2/87
VOLATILE ORGANICS (MG/L)																
-VOLATILE AROMATICS-																
BENZENE	ND (2)	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
TOLUENE	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
ETHYLBENZENE	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
STYRENE	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	--	--	ND	ND	ND
TOTAL XYLENE	-- (3)	ND	ND	ND	ND	--	ND	ND	ND	ND	ND	ND	ND	--	--	--
o - XYLENE	ND	--	--	--	--	ND	--	--	--	--	--	ND	ND	--	--	--
m - XYLENE	ND	--	--	--	--	ND	--	--	--	--	--	ND	ND	--	--	--
p - XYLENE	ND	--	--	--	--	ND	--	--	--	--	--	ND	ND	--	--	--
TRIMETHYLBENZENE	ND	--	--	--	--	ND	--	--	--	--	--					
-OTHER-																
ACETONE	--	ND	ND	ND	ND	--	ND	0.010	ND	ND	ND	--	--	ND	ND	ND
METHYLENE CHLORIDE	--	--	0.0054	ND	ND	--	--	--	ND	ND	ND	--	--	--	ND	ND
TOTAL VOLATILE AROMATICS	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
SEMIVOLATILE ORGANICS (MG/L)																
-PAH-																
ACENAPHTHENE	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.042	ND	ND	ND	ND	ND	ND
ACENAPHTHYLENE	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.043	ND	ND	ND	ND	ND	ND
ANTHRACENE	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
BENZO(b)FLUORANTHENE	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
BENZO(k)FLUORANTHENE	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
BENZO(g,h,i)PERYLENE	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
BENZO(a)ANTHRACENE	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
BENZO(a)PYRENE	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
CHRYSENE	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
DIBENZO(a,h)ANTHRACENE	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
FLUORANTHENE	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
FLUORENE	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
INDENO(1,2,3,-cd)PYRENE	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
NAPHTHALENE	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
PHENANTHRENE	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.020	ND	ND	ND	ND	ND	ND
PYRENE	ND	ND	ND	ND	ND	ND	ND	ND	ND							
-OTHER-																
BIS(2-ETHYLHEXYL)PHTHALATE	--	ND	ND	ND	0.016	--	ND	ND	ND	ND	0.012	--	--	0.025	ND	0.030
2-METHYLNAPHTHALENE	--	ND	ND	ND	ND	--	ND	ND	ND	0.069	ND	--	--	ND	ND	ND
TOTAL PAH	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.105	ND	ND	ND	ND	ND	ND

TABLE 4-6 (continued)

CHEMICALS FOUND IN TASK 2 SURFACE WATER SAMPLES
MECHANICVILLE SITE

SITE IDENTIFIER	SW-1					SW-2						SW-3				
SAMPLE IDENTIFIER	SW-101	SW-201	SW-301	SW-301 DUP	SW-401	SW-102	SW-202	SW-202 DUP	SW-302	SW-402	SW-402 DUP	SW-103	SW-103 DUP	SW-203	SW-303	SW-403
ORGANICS ANALYSIS (1)	HPLC	GC/MS	GC/MS	GC/MS	GC/MS	HPLC	GC/MS	GC/MS	GC/MS	GC/MS	GC/MS	HPLC	HPLC	GC/MS	GC/MS	GC/MS
DATE OF SAMPLE COLLECTION	9/9/86	12/2/86	3/10/87	3/10/87	6/2/87	9/9/86	12/2/86	12/2/86	3/10/87	6/2/87	6/2/87	9/9/86	9/9/86	12/2/86	3/10/87	6/2/87
						‡‡OTHER CHEMICALS (MG/L)‡‡										
-METALS-																
IRON	0.23	0.47	1.09	0.99	0.037	0.23	0.40	0.45	0.79	0.36	0.33	0.22	0.24	0.41	0.78	0.33
ZINC	ND	ND	ND	ND	0.010	ND	ND	ND	ND	ND	0.01	ND	ND	ND	ND	0.01
-CYANIDE-																
TOTAL CYANIDE (4)	ND	0.01	ND	ND	ND	ND	0.01	ND	ND	0.01	ND	ND	ND	ND	ND	ND
AMENABLE CYANIDE	ND	ND	ND	ND	ND	ND	--	--	ND	ND	ND	ND	ND	--	ND	ND
FERRO-FERRI CYANIDE	ND	0.01	ND	ND	ND	ND	0.02	0.03	ND	0.01	ND	ND	ND	0.01	ND	0.01
-OTHER-																
TOTAL RECOVERABLE PHENOLICS	ND	--	--	--	0.24	ND	--	--	--	0.013	0.005	ND	0.037	--	--	ND
TOTAL ORGANIC CARBON	5.5	11	11.9	7.3	6.4	ND	10	9	7.5	6.0	6.0	5.0	5.4	10.0	6.2	5.5
OIL AND GREASE	11	--	--	--	--	--	--	--	--	--	--	ND	--	--	--	--
SULFATE	--	16.4	--	--	--	--	19.3	18.6	--	--	--	--	--	18.4	--	--

NOTES:
(1) INDICATES SAMPLE VALUES WERE OBTAINED BY GC/MS (EPA METHODS 624 AND 625) OR BY HPLC (EPA METHODS 602 AND 610).
(2) ND = NOT DETECTED (SEE APPENDIX B-4 FOR MINIMUM DETECTION LIMITS).
(3) -- = NOT ANALYZED
(4) TOTAL CYANIDE CONCENTRATION MAY BE LOWER THAN CYANIDE COMPONENTS DUE TO LOW DETECTION LEVELS AND ACCURACY OF ANALYTICAL METHODS

TABLE 4-7
Task 3 Surface Water Analytical Results
Mechanicville Site

SITE IDENTIFIER:	------UPSTREAM------		------ADJACENT------		-----DOWNSTREAM------	
SAMPLE IDENTIFIER:	SW-01	SW-01	SW-02	SW-02	SW-04	SW-04
DATE OF SAMPLE COLLECTION:	12/22/87	3/30/88	12/22/87	3/30/88	12/22/87	3/30/88
** Volatile Organics (mg/l) **						
- VOLATILE AROMATICS -						
Benzene	ND (1)	ND	ND	-- (2)		
Toluene	ND	ND	ND	--	ND	--
Ethylbenzene	ND	ND	ND	--	ND	--
Styrene	ND	ND	ND	--	ND	--
Total Xylenes	ND	ND	ND	--	ND	--
- OTHER -						
Methylene Chloride	ND	ND	ND	--	ND	--
2-Butanone	ND	ND	ND	--	ND	--
Total Volatile Aromatics	ND	ND	ND	--	ND	--
Total Volatile Organics	ND	ND	ND	--	ND	--
** Semi-Volatile Organics (mg/l) **						
-PAH-						
Acenaphthene	ND	ND	ND	ND	ND	ND
Acenaphthylene	ND	ND	ND	ND	ND	ND
Anthracene	ND	ND	ND	ND	ND	ND
Benzo(b)Fluoranthene	ND	ND	ND	ND	ND	ND
Benzo(k)Fluoranthene	ND	ND	ND	ND	ND	ND
Benzo(g,h,i)Perylene	ND	ND	ND	ND	ND	ND
Benzo(a)Anthracene	ND	ND	ND	ND	ND	ND
Benzo(a)Pyrene	ND	ND	ND	ND	ND	ND
Chrysene	ND	ND	ND	ND	ND	ND
Fluoranthene	ND	ND	ND	ND	ND	ND
Fluorene	ND	ND	ND	ND	ND	ND
Indeno(1,2,3-cd)Pyrene	ND	ND	ND	ND	ND	ND
Naphthalene	ND	ND	ND	ND	ND	ND
Phenanthrene	ND	ND	ND	ND	ND	ND
Pyrene	ND	ND	ND	ND	ND	ND
-OTHER-						
bis (2-Ethylhexyl) Phthalate	0.39	0.034	ND	ND	ND	ND
Total PAH	ND	ND	ND	ND	ND	ND
Total Semi-Volatile Organics	0.39	0.034	ND	ND	ND	ND
** Other Chemicals (mg/l) **						
-METALS-						
Iron	0.20	0.38	1.1	1.8	0.24	0.42
Zinc	ND	0.03	0.014	0.02	ND	ND
-CYANIDE-						
Total Cyanide	ND	ND	ND	ND	ND	ND
Undistilled Cyanide (3)	ND	ND	ND	ND	ND	ND
-OTHER-						
Total Recoverable Phenolics	ND	ND	ND	ND	ND	0.011
Total Organic Carbon	6.1	4.2	6.1	4.9	4.8	4.7

NOTES:
(1) ND = Not detected (see Appendix B-4 for minimum detection limits).
(2) NA = Not analyzed (laboratory reported vial was received broken).
(3) Undistilled CN = Free dissociable CN-; method used detected most, but not necessarily all, of amenable CN- present

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TABLE 4-8
CHEMICALS FOUND IN TASK 2 SEDIMENT SAMPLES
MECHANICVILLE SITE

SITE IDENTIFIER	SED-1					SED-2						SED-3				
SAMPLE IDENTIFIER	SED-101	SED-201	SED-301	SED-301 DUP	SED-401	SED-102	SED-202	SED-202 DUP	SED-302	SED-402	SED-402 DUP	SED-103	SED-103 DUP	SED-203	SED-303	SED-403
ORGANICS ANALYSIS (1)	HPLC	HPLC	GC/MS	GC/MS	GC/MS	HPLC	HPLC	HPLC	GC/MS	GC/MS	GC/MS	HPLC	HPLC	HPLC	GC/MS	GC/MS
DATE OF SAMPLE COLLECTION	9/9/86	12/2/86	3/10/87	3/10/87	6/2/87	9/9/86	12/2/86	12/2/86	3/10/87	6/2/87	6/2/87	9/9/86	9/9/86	12/2/86	3/10/87	6/2/87
VOLATILE ORGANICS (MG/KG)																
-VOLATILE AROMATICS-																
BENZENE	ND (2)	ND	ND	ND	ND	ND	ND	ND	0.07	ND	ND	ND	ND	ND	ND	ND
TOLUENE	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.070	ND
ETHYLBENZENE	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
STYRENE	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
TOTAL XYLENE	-- (3)	--	ND	ND	ND	--	--	--	ND	ND	ND	--	--	--	ND	ND
o - XYLENE	ND	ND	--	--	--	ND	ND	ND	--	--	--	ND	ND	ND	--	--
m - XYLENE	ND	ND	--	--	--	ND	ND	ND	--	--	--	ND	ND	ND	--	--
p - XYLENE	ND	ND	--	--	--	ND	ND	ND	--	--	--	ND	ND	ND	--	--
-OTHER-																
CHLOROETHENE	--	--	ND	ND	5.300	--	--	--	ND	6.600	3.800	--	--	--	ND	4.300
METHYLENE CHLORIDE	--	--	ND	ND	2.400	--	--	--	ND	3.000	2.900	--	--	--	ND	2.300
TOTAL VOLATILE AROMATICS	ND	ND	ND	ND	ND	ND	ND	ND	0.07	ND	ND	ND	ND	ND	0.07	ND
SEMIVOLATILE ORGANICS (MG/KG)																
-PAH-																
ACENAPHTHENE	(4)	ND	ND	ND	ND	(4)	ND	ND	ND	0.700	1.600	0.910	1.100	(4)	ND	ND
ACENAPHTHYLENE	0.740	ND	ND	ND	ND	0.900	ND	ND	ND	ND	1.300	2.700	3.500	8.800	ND	ND
ANTHRACENE	(4)	(4)	ND	ND	ND	(4)	(4)	(4)	(4)	ND	ND	1.100	1.200	(4)	(4)	ND
BENZO(b)FLUORANTHENE	(4)	0.580	ND	ND	ND	(4)	(4)	2.000	(4,5)	ND	ND	1.000	0.940	0.630	(4,5)	ND
BENZO(k)FLUORANTHENE	(4)	(5)	ND	ND	ND	(4)	(5)	4.800	(4,5)	ND	ND	0.930	1.000	(5)	(4,5)	ND
BENZO(g,h,i)PERYLENE	ND	3.100	ND	ND	ND	ND	(4)	15.000	ND	ND	ND	ND	ND	4.400	(4)	ND
BENZO(a)ANTHRACENE	(6)	(6)	ND	ND	ND	(6)	(6)	(6)	(4)	ND	ND	(6)	(6)	(5)	(4)	ND
BENZO(a)PYRENE	(4)	0.450	ND	ND	ND	(4)	(4)	6.100	(4)	ND	ND	0.740	0.800	0.650	(4)	ND
CHRYSENE	0.520	0.610	ND	ND	ND	0.460	(4)	8.500	(4)	ND	ND	2.000	2.100	(4)	(4)	ND
DIBENZO(a,h)ANTHRACENE	ND	0.930	ND	ND	ND	(4)	ND	7.100	ND	ND	ND	ND	1.600	2.300	ND	ND
FLUORANTHENE	0.960	0.470	ND	ND	ND	0.920	(4)	5.600	(4)	ND	ND	2.200	4.700	(4)	(4)	ND
FLUORENE	1.500	ND	ND	ND	ND	1.400	ND	ND	ND	ND	0.500	4.000	4.300	ND	ND	ND
INDENO(1,2,3,-cd)PYRENE	ND	(7)	ND	ND	ND	(4)	ND	(7)	ND	ND	ND	(4)	(4)	(7)	(4)	ND
NAPHTHALENE	3.600	ND	ND	ND	ND	3.300	ND	19.000	(4)	4.400	13.000	10.000	19.000	ND	ND	ND
PHENANTHRENE	0.570	0.290	ND	ND	ND	(4)	(4)	1.800	(4)	ND	ND	2.000	2.300	(4)	(4)	ND
PYRENE	0.690	0.770	ND	ND	ND	0.960	(4)	5.900	(4)	ND	ND	1.900	3.100	(4)	(4)	ND
-OTHER-																
BIS(2-ETHYLHEXYL)PHTHALATE	--	--	(4)	ND	ND	--	--	--	(4)	ND	ND	--	--	--	(4)	ND
2-METHYLNAPHTHALENE	--	--	ND	ND	ND	--	--	--	ND	0.900	ND	--	--	--	ND	ND
DI-N-BUTYL PHTHALATE	--	--	--	--	2.100	--	--	--	--	ND	4.000	--	--	--	--	3.200
TOTAL PAH	8.580	7.300	ND	ND	ND	7.940	(3)	75.800	(4)	5.100	16.400	29.480	45.640	16.780	(4)	ND

TABLE 4-8 (continued)
CHEMICALS FOUND IN TASK 2 SEDIMENT SAMPLES
MECHANICVILLE SITE

SITE IDENTIFIER	SED-1					SED-2						SED-3				
SAMPLE IDENTIFIER	SED-101	SED-201	SED-301	SED-301	SED-401	SED-102	SED-202	SED-202	SED-302	SED-402	SED-402	SED-103	SED-103	SED-203	SED-303	SED-403
ORGANICS ANALYSIS (1)	HPLC	HPLC	GC/MS	GC/MS	GC/MS	HPLC	HPLC	HPLC	GC/MS	GC/MS	GC/MS	HPLC	HPLC	HPLC	GC/MS	GC/MS
DATE OF SAMPLE COLLECTION	9/9/86	12/2/86	3/10/87	3/10/87	6/2/87	9/9/86	12/2/86	12/2/86	3/10/87	6/2/87	6/2/87	9/9/86	9/9/86	12/2/86	3/10/87	6/2/87
##OTHER CHEMICALS (MG/KG)##																
-METALS-																
IRON	16000	9200	10800	8320	15600	21000	19000	16000	9980	30800	23600	13000	13000	20000	13000	33100
ZINC	47	36	37	31	--	51	69	100	46	--	--	65	60	88	76	--
-CYANIDE-																
TOTAL CYANIDE	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
AMENABLE CYANIDE	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	--
FERRO-FERRI CYANIDE	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	--
-OTHER-																
TOTAL RECOVERABLE PHENOLICS	ND	ND	ND	ND	3.1	ND	ND	ND	ND	6.1	3.1	ND	ND	ND	ND	1.8
TOTAL ORGANIC CARBON	3000	4600	4790	3320	9700	7700	3500	7600	16100	11000	22000	4500	4600	4600	9350	15000
SULFATE	--	ND	--	--	--	--	60	40	--	--	--	--	--	30	--	--

NOTES:
(1) INDICATES WHETHER SAMPLE VALUES WERE OBTAINED BY GC/MS OR HPLC METHODS.
(2) ND = NOT DETECTED (SEE APPENDIX B-4 FOR MINIMUM DETECTION LIMITS).
(3) -- = NOT ANALYZED
(4) TRACE CONCENTRATIONS DETECTED BELOW THE REPORTING LIMIT.
(5) BENZO(b)FLUORANTHENE AND BENZO(k)FLUORANTHENE, COELUTED.
(6) BENZO(a)ANTHRACENE AND CHRYSENE, COELUTED.
(7) INDENO(1,2,3-cd)PYRENE AND BENZO(g,h,i)PERYLENE, COELUTED.

TABLE 4-9

Task 3 Sediment Analytical Results
Mechanicville Site

SITE IDENTIFIER	----UPSTREAM----		----ADJACENT----		----------DOWNSTREAM----------			
SAMPLE IDENTIFIER	SD-01	SD-01	SD-02	SD-02	SD-04	DUP-01	SD-04	SD-DUP
DATE OF SAMPLE COLLECTION	12/22/87	3/30/88	12/22/87	3/30/88	12/22/87	12/22/87	3/30/88	3/30/88
** Volatile Organics (mg/kg) **								
-VOLATILE AROMATICS-								
Benzene	ND (1)	ND	ND	T	ND	ND	ND	ND
Toluene	ND	ND	ND	ND	ND	ND	ND	ND
Ethylbenzene	ND	ND	0.087	ND	ND	ND	ND	ND
Styrene	ND	ND	ND	ND	ND	ND	ND	ND
Total Xylenes	ND	ND	ND	ND	ND	ND	ND	ND
-OTHER-								
Methylene Chloride	ND	R (3)	ND	R	ND	ND	R	R
2-Butanone	ND	R	ND	R	ND	ND	R	R
Total Volatile Aromatics	ND	ND	0.087	T	ND	ND	ND	ND
Total Volatile Organics	ND	ND	0.087	T	ND	ND	ND	ND
** Semi-Volatile Organics (mg/kg) **								
-PAH-								
Acenaphthene	ND	ND	T	ND	ND	ND	ND	ND
Acenaphthylene	ND	ND	T	ND	ND	ND	ND	ND
Anthracene	ND	ND	T	ND	ND	ND	ND	ND
Benzo(a)Anthracene	T	ND	0.53	ND	ND	ND	ND	ND
Benzo(b)Fluoranthene	ND	ND	0.94	ND	ND	ND	ND	ND
Benzo(k)Fluoranthene	ND	ND	(5)	ND	ND	ND	ND	ND
Benzo(g,h,i,)Perylene	ND	ND	T	ND	ND	ND	ND	ND
Benzo(a)Pyrene	ND	ND	0.59	ND	ND	ND	ND	ND
Chrysene	T (2)	ND	0.58	ND	ND	ND	ND	ND
Dibenz(a,h)Anthracene	ND	ND	T	ND	ND	ND	ND	ND
Fluoranthene	T	ND	T	ND	T	T	ND	ND
Fluorene	ND	ND	T	ND	ND	ND	ND	ND
Indeno(1,2,3-cd)Pyrene	ND	ND	T	ND	ND	ND	ND	ND
Naphthalene	ND	ND	0.48	ND	ND	T	ND	ND
Phenanthrene	T	ND	0.9	T	T	T	ND	ND
Pyrene	T	ND	1.1	ND	T	T	ND	ND
-OTHER-								
4-Methylphenol	ND	ND	T	ND	ND	ND	ND	ND
2-Methylnaphthalene	ND	ND	T	ND	ND	ND	ND	ND
Butylbenzylphthalate	ND	ND	T	ND	ND	ND	ND	ND
bis(2-Ethylhexyl)phthalate	ND	ND	T	ND	ND	ND	ND	ND
Di-n-octylphthalate	ND	25	ND	T	ND	ND	T	T
Total PAH	T	ND	5.1	T	T	T	ND	ND
Total Semi-Volatile Organics	T	25	5.1	T	T	T	T	T
-METALS-								
Iron	7700	NR (4)	8400	NR	8700	7100	NR	NR
Zinc	27	NR	45	NR	25	28	NR	NR
-CYANIDE-								
Total Cyanide (ppm) (6)	ND	NR	1.3	NR	ND	ND	NR	NR
Undistilled Cyanide	ND	NR	ND	NR	ND	ND	NR	NR
-OTHER-								
Total Recoverable Phenolics	1.3	NR	2.3	NR	1.2	0.68	NR	NR
Total Organic Carbon	12000	NR	32000	NR	18000	11000	NR	NR

NOTES:

(1) ND = Not detected (See Appendix B-4 for minimum detection limits).
(2) T = Trace concentrations detected below the quantifiable reporting limits.
(3) R = Data rejected because analysis of blank indicated sampling or lab-derived contamination
(4) NR = Analysis not requested
(5) Benzo(b)Fluoranthene and Benzo(k)Fluoranthene coeluted.
(6) Undistilled CN = Free and dissociable CN-; method used detected most, but not necessarily all, of the amenable CN- present.

TABLE 4-10

TASK 3 AIR ANALYTICAL RESULTS - ppm
MECHANICVILLE SITE

	Office		Garage		Storeroom		Background	
Sample Identifier	OF-01	OF-02	GA-01	GA-02	ST-01	ST-02	BA-01	BA-01
Date of Sample Collection	12/28/88	12/28/88	12/28/88	12/28/88	12/28/88	12/28/88	12/28/88	12/28/88
Volatile Aromatics[1]								
Benzene	0.03	0.031	0.016	0.015	0.043	0.043	ND[2]	ND
Toluene	0.009	0.009	0.048	0.048	0.012	0.012	0.037	0.028
Ethylbenzene	ND	ND	ND	ND	ND	ND	ND	ND
Xylenes	ND	ND	ND	ND	ND	ND	ND	ND
Total Volatile Aromatics	0.039	0.040	0.064	0.063	0.055	0.055	0.037	0.028

NOTES:

[1] Samples analyzed by NIOSH Method 1501 by ESA Laboratories in Bedford, MA.

[2] ND = Not detected. The minimum detection limits are: benzene - 0.013 ppm; ethylbenzene and xylenes - 0.01 ppm.

TABLE 5-1
CRITERIA FOR CHEMICALS FOUND IN GROUNDWATER AND SURFACE WATER MECHANICVILLE SITE

	NEW YORK STATE AMBIENT WATER QUALITY STANDARDS AND GUIDANCE VALUES(1)				NATIONAL DRINKING WATER REGULATIONS		EPA HEALTH ADVISORIES(4)	EPA AMBIENT WATER QUALITY CRITERIA(5)					N Y STATE DRINKING WATER REGULATIONS
	CLASS D --SURFACE WATER-- STANDARDS	GUIDANCE VALUES	CLASS GA --GROUNDWATER-- STANDARDS	GUIDANCE VALUES	MAXIMUM CONTAMINANT LEVELS(2)	MAXIMUM CONTAMINANT LEVEL GOAL(3)	LIFETIME ADULT EXPOSURE	AQUATIC LIFE(6) ACUTE (7)	CHRONIC (8)	DRINKING WATER ONLY (10)	FISH CONSUMPTION ONLY	DRINKING WATER AND FISH CONSUMPTION	MAXIMUM CONTAMINANT LEVELS(18)
						OTHER CHEMICALS (mg/l)							
-METALS-													
IRON	0.3	------	0.3	------	------	0.3(15)	------	------	------	------	------	------	0.3(15)
ZINC	(16)	------	0.3	------	------	5(15)	------	------	------	5(13)	------	5(13)	5.0(15)
-CYANIDE-		------		------	------	------	------	------	------	------	------	------	------
TOTAL CYANIDE	------	------	0.1	------	------	------	0.2	------	------	------	------	------	------
FERRO-FERRI CYANIDE	------	------	------	------	------	------	------	------	------	------	------	------	------
FREE CYANIDE	0.022	------	------	------	------	------	------	0.0035	0.052	0.2	------	0.2	------
-OTHER-		------		------	------	------	------	------	------	------	------	------	------
TOTAL RECOVERABLE PHENOLIC	0.005(19)	------	0.001	------	------	------	------	------	------	3.5	------	3.5	------
TOTAL ORGANIC CARBON	------	------	------	------	------	------	------	------	------	------	------	------	250(15)
SULFATE	------	------	250	------	------	------	------	------	------	------	------	------	

NOTES:
(1) NYSDEC TECHNICAL AND OPERATIONAL GUIDANCE SERIES (1.1.1) AS REVISED NOVEMBER 1991. CLASS D SURFACE WATER ARE SUITABLE FOR SECONDARY CONTACT RECREATION; CLASS GA DENOTES FRESH GROUNDWATER WHICH IS A SOURCE OF POTABLE WATER SUPPLY.
(2) MCLs (MAXIMUM CONTAMINANT LEVELS) ARE ENFORCEABLE STANDARDS FOR PUBLIC WATER SUPPLY SYSTEMS PROMULGATED UNDER THE SAFE DRINKING WATER ACT(40CFR PART 141).
(3) MCLGs(MAXIMUM CONTAMINANT LEVEL GOALS) ARE PROPOSED NON-ENFORCEABLE HEALTH GOALS AND HAVE BEEN SET AT A LEVEL OF NO KNOWN OR ANTICIPATED HEALTH AFFECTS.
(4) EPA HEALTH ADVISORIES(FORMERLY SNARLs) ARE NON-ENFORCEABLE CRITERIA ESTABLISHED BY THE OFFICE OF DRINKING WATER. THEY ARE SET AT LEVELS WHERE ADVERSE HEALTH EFFECTS ARE NOT EXPECTED.
(5) WATER QUALITY CRITERIA WERE FORMULATED TO PROTECT AQUATIC LIFE AND HUMAN HEALTH FROM POLLUTANTS IN SURFACE WATERS. (40 CFR SUMMARY, FRI, NOV. 28, 1980, P. 79318-79379). WATER QUALITY CRITERIA HAVE NO REGULATORY IMPACT, BUT ARE USEFUL IN ESTABLISHING WATER QUALITY-BASED EFFLUENT LIMITATIONS, WATER QUALITY STANDARDS, AND TOXIC POLLUTANT EFFLUENT STANDARDS.
(6) GUIDANCE CRITERIA FOR THE PROTECTION OF FRESHWATER AQUATIC LIFE. CONCENTRATIONS SPECIFIED SHOULD PROTECT MOST (BUT NOT NECESSARILY ALL) AQUATIC FRESHWATER LIFE AND ITS USES.
(7) THE ACUTE TOXICITY LEVEL IS THE MAXIMUM TO WHICH ORGANISMS CAN BE EXPOSED WITHOUT SIGNIFICANT RISK OF ADVERSE IMPACT.
(8) CHRONIC TOXICITY LEVEL IS THE 24-HOUR AVERAGE VALUE THAT ORGANISMS CAN BE EXPOSED TO WITHOUT SIGNIFICANT RISK
(9) HUMAN HEALTH GUIDELINES WERE DERIVED BASED ON "GUIDELINES AND METHODOLOGY USED IN THE PREPARATION OF HEALTH EFFECT ASSESSMENT CHAPTERS OF THE CONSENT WATER CRITERIA DOCUMENTS DEVELOPED BY EPA's OFFICE OF RESEARCH AND DEVELOPMENT.
(10) THESE ADJUSTED CRITERIA, FOR DRINKING WATER INGESTION ONLY WERE DERIVED FROM PUBLISHED EPA AWQC FOR COMBINED FISH AND DRINKING WATER INGESTION AND FOR FISH INGESTION ALONE. THESE ADJUSTED VALUES ARE NOT OFFICIAL EPA AWQC, BUT MAY BE APPROPRIATE FOR SUPERFUND SITES WITH CONTAMINATED GROUNDWATER. (USEPA SUPERFUND PUBLIC HEALTH EVALUATION MANUAL, OCTOBER 1986, PAGES 61-64.)
(11) ND = DETECTABLE BY USEPA METHODS 610 OR 625 (BENZO(a)PYRENE).
(12) PROPOSED
(13) TO PROTECT AGAINST TASTE AND ODOR EFFECTS; NOT HEALTH BASED.
(14) NEW YORK STATE HAS A MAXIMUM WATER QUALITY VALUE OF 0.1 MG/L OF DESIGNATED ORGANIC CHEMICALS FOR SURFACE WATER AND GROUNDWATER DISCHARGES REQUIRING PERMITS. THE DESIGNATED ORGANICS INCLUDE ALL OF THE ORGANIC CHEMICALS LISTED EXCEPT ACENAPHTHYLENE, BENZO(g,h,i)PERYLENE DIBENZO(a,h)ANTHRACENE, AND STYRENE.
(15) SECONDARY MAXIMUM CONTAMINANT LEVELS WHICH APPLY TO PUBLIC WATER SYSTEMS. THESE REGULATIONS CONTROL CONTAMINANTS IN DRINKING WATER THAT PRIMARILY AFFECT THE AESTHETIC QUALITIES RELATING TO THE PUBLIC ACCEPTANCE OF DRINKING WATER (40CFR PART 143).
(16) ZINC STANDARD FOR CLASS D WATERS IS DETERMINED BY THE FORMULA EXP(0.83[LN(PPH HARDNESS)] + 1.95) AND APPLIES TO THE ACID SOLUBLE FORM.
(17) AS MEASURE BY APHA METHOD 510.8 WHICH IS EQUIVALENT TO EPA METHOD 420.1 (SEE APHA 1985; USEPA, 1983).
(18) N.Y. DEPT. OF HEALTH REGULATIONS, SUBPART 5-1 OF PART 5 OF TITLE 10, EFFECTIVE 1/19/90.
(19) REFERS TO TOTAL UNCHLORINATED PHENOLIC COMPOUNDS.

TABLE 5-1 (continued)

CRITERIA FOR CHEMICALS FOUND IN GROUNDWATER AND SURFACE WATER
MECHANICVILLE SITE

	NEW YORK STATE AMBIENT WATER QUALITY STANDARDS AND GUIDANCE VALUES(1)				NATIONAL DRINKING WATER REGULATIONS		EPA HEALTH ADVISORIES(4)	EPA AMBIENT WATER QUALITY CRITERIA(5)					N Y STATE DRINKING WATER REGULATIONS
	CLASS D ---SURFACE WATER--- STANDARDS	GUIDANCE VALUES	CLASS GA --GROUNDWATER--- STANDARDS	GUIDANCE VALUES	MAXIMUM CONTAMINANT LEVELS(2)	MAXIMUM CONTAMINANT LEVEL GOAL(3)	LIFETIME ADULT EXPOSURE	AQUATIC LIFE(6) ACUTE (7)	CHRONIC (8)	DRINKING WATER ONLY (10)	FISH CONSUMPTION ONLY	DRINKING WATER AND FISH CONSUMPTION	MAXIMUM CONTAMINANT LEVELS(18)
-METALS-						*OTHER CHEMICALS (mg/l)*							
IRON	0.3	------	0.3	------	------	0.3(15)	------	------	------	------	------	------	0.3(15)
ZINC	(16)	------	0.03	------	------	5(15)	------	------	------	5(13)	------	5(13)	5.0(15)
-CYANIDE-		------		------	------	------	------	------	------	------	------	------	------
TOTAL CYANIDE	------	------	0.1	------	------	------	0.2	------	------	------	------	------	------
FERRO-FERRI CYANIDE	------	------	------	------	------	------	------	------	------	------	------	------	------
FREE CYANIDE	0.022	------	------	------	------	------	------	0.0035	0.052	0.2	------	0.2	------
-OTHER-		------		------	------	------	------	------	------	------	------	------	------
TOTAL RECOVERABLE PHENOLIC	0.005(19)	------	0.001	------	------	------	------	------	------	3.5	------	3.5	------
TOTAL ORGANIC CARBON	------	------	------	------	------	------	------	------	------	------	------	------	------
SULFATE	------	------	250	------	------	------	------	------	------	------	------	------	250(15)

NOTES:

(1) NYSDEC TECHNICAL AND OPERATIONAL GUIDANCE SERIES (1.1.1) AS REVISED NOVEMBER 1991. CLASS D SURFACE WATER ARE SUITABLE FOR SECONDARY CONTACT RECREATION; CLASS GA DENOTES FRESH GROUNDWATER WHICH IS A SOURCE OF POTABLE WATER SUPPLY.

(2) MCLs (MAXIMUM CONTAMINANT LEVELS) ARE ENFORCEABLE STANDARDS FOR PUBLIC WATER SUPPLY SYSTEMS PROMULGATED UNDER THE SAFE DRINKING WATER ACT(40CFR PART 141).

(3) MCLGs(MAXIMUM CONTAMINANT LEVEL GOALS) ARE PROPOSED NON-ENFORCEABLE HEALTH GOALS AND HAVE BEEN SET AT A LEVEL OF NO KNOWN OR ANTICIPATED HEALTH AFFECTS.

(4) EPA HEALTH ADVISORIES(FORMERLY SNARLs) ARE NON-ENFORCEABLE CRITERIA ESTABLISHED BY THE OFFICE OF DRINKING WATER. THEY ARE SET AT LEVELS WHERE ADVERSE HEALTH EFFECTS ARE NOT EXPECTED.

(5) WATER QUALITY CRITERIA WERE FORMULATED TO PROTECT AQUATIC LIFE AND HUMAN HEALTH FROM POLLUTANTS IN SURFACE WATERS. (40 CFR SUMMARY, FRI, NOV. 28, 1980, P. 79318-79379). WATER QUALITY CRITERIA HAVE NO REGULATORY IMPACT, BUT ARE USEFUL IN ESTABLISHING WATER QUALITY-BASED EFFLUENT LIMITATIONS, WATER QUALITY STANDARDS, AND TOXIC POLLUTANT EFFLUENT STANDARDS.

(6) GUIDANCE CRITERIA FOR THE PROTECTION OF FRESHWATER AQUATIC LIFE. CONCENTRATIONS SPECIFIED SHOULD PROTECT MOST (BUT NOT NECESSARILY ALL) AQUATIC FRESHWATER LIFE AND ITS USES.

(7) THE ACUTE TOXICITY LEVEL IS THE MAXIMUM TO WHICH ORGANISMS CAN BE EXPOSED WITHOUT SIGNIFICANT RISK OF ADVERSE IMPACT.

(8) CHRONIC TOXICITY LEVEL IS THE 24-HOUR AVERAGE VALUE THAT ORGANISMS CAN BE EXPOSED TO WITHOUT SIGNIFICANT RISK

(9) HUMAN HEALTH GUIDELINES WERE DERIVED BASED ON "GUIDELINES AND METHODOLOGY USED IN THE PREPARATION OF HEALTH EFFECT ASSESSMENT CHAPTERS OF THE CONSENT WATER CRITERIA DOCUMENTS DEVELOPED BY EPA's OFFICE OF RESEARCH AND DEVELOPMENT.

(10) THESE ADJUSTED CRITERIA, FOR DRINKING WATER INGESTION ONLY , WERE DERIVED FROM PUBLISHED EPA AWQC FOR COMBINED FISH AND DRINKING WATER INGESTION AND FOR FISH INGESTION ALONE. THESE ADJUSTED VALUES ARE NOT OFFICIAL EPA AWQC, BUT MAY BE APPROPRIATE FOR SUPERFUND SITES WITH CONTAMINATED GROUNDWATER. (USEPA SUPERFUND PUBLIC HEALTH EVALUATION MANUAL, OCTOBER 1986, PAGES 61-64.)

(11) ND = DETECTABLE BY USEPA METHODS 610 OR 625 (BENZO(a)PYRENE).

(12) PROPOSED

(13) TO PROTECT AGAINST TASTE AND ODOR EFFECTS; NOT HEALTH BASED.

(14) NEW YORK STATE HAS A MAXIMUM WATER QUALITY VALUE OF 0.1 MG/L OF DESIGNATED ORGANIC CHEMICALS FOR SURFACE WATER AND GROUNDWATER DISCHARGES REQUIRING PERMITS. THE DESIGNATED ORGANICS INCLUDE ALL OF THE ORGANIC CHEMICALS LISTED EXCEPT ACENAPHTHYLENE, BENZO(g,h,i)PERYLENE DIBENZO(a,h)ANTHRACENE, AND STYRENE.

(15) SECONDARY MAXIMUM CONTAMINANT LEVELS WHICH APPLY TO PUBLIC WATER SYSTEMS. THESE REGULATIONS CONTROL CONTAMINANTS IN DRINKING WATER THAT PRIMARILY AFFECT THE AESTHETIC QUALITIES RELATING TO THE PUBLIC ACCEPTANCE OF DRINKING WATER (40CFR PART 143).

(16) ZINC STANDARD FOR CLASS D WATERS IS DETERMINED BY THE FORMULA EXP(0.83[LN(PPH HARDNESS)] + 1.95) AND APPLIES TO THE ACID SOLUBLE FORM.

(17) AS MEASURE BY APHA METHOD 510.8 WHICH IS EQUIVALENT TO EPA METHOD 420.1 (SEE APHA 1985; USEPA, 1983).

(18) N.Y. DEPT. OF HEALTH REGULATIONS, SUBPART 5-1 OF PART 5 OF TITLE 10, EFFECTIVE 1/19/90.

(19) REFERS TO TOTAL UNCHLORINATED PHENOLIC COMPOUNDS.

TABLE 5-2

POTENTIALLY APPLICABLE STANDARDS AND GUIDELINES
FOR AIRBORNE CHEMICALS MODELED FROM TASK 2 AND TASK 3 SOIL SAMPLES
MECHANICVILLE SITE

CONTAMINANT	NEW YORK STATE AALs (ug/m3)
-VOLATILE AROMATICS-	
Benzene	100 (1)
Toluene	7,500 (1)
Ethyl Benzene	1,450 (1)
Styrene	716 (1)
Xylene	1,450 (1)
-OTHER-	
Methylene Chloride	1,167 (1)
-PAH-	
Acenaphthene	-- (2)
Acenaphthylene	--
Anthracene	--
Benzo(b)Fluoranthene	--
Benzo(k)Fluoranthene	--
Benzo(g,h,i)Perylene	--
Benzo(a)Anthracene	--
Benzo(a)Pyrene	--
Chrysene	--
Dibenzo(a,h)Anthracene	--
Fluoranthene	--
Fluorene	--
Ideneo(1,2,3-cd)Pyrene	--
Naphthalene	167
Phenanthrene	--
Pyrene	--
-OTHER-	
Bis(2-Ethylhexyl)Phthalate	--

TABLE 5-2 (continued)

POTENTIALLY APPLICABLE STANDARDS AND GUIDELINES
FOR AIRBORNE CHEMICALS MODELED FROM TASK 2 AND TASK 3 SOIL SAMPLES
MECHANICVILLE SITE

CONTAMINANT	NEW YORK STATE AALs (ug/m^3)
-METALS-	
Iron	0.167 (3)
Zinc	--
-CYANIDE-	
Total Cyanide	16.7 (1)(4)
Ferro-Ferri Cyanide	--
Amenable Cyanide	--
-OTHER-	
Total Recoverable Phenolics	--
Total Organic Carbon	--
Total New York State Regulated Organics	--

NOTES:

(1) Interim Ambient Air Level (AAL), Derived from American Conference of Governmental and Industrial Hygienists Time-weighted Average Threshold Limit Value (ACGIH TWA-TLV).

(2) Not available

(3) Proposed AAL - Personal Communication with Stanley Byer, NYSDEC, 12/14/88.

(4) As cyanide.

PAH = Polynuclear Aromatic Hydrocarbon.

TABLE 5-3

GROUNDWATER SAMPLES CONTAINING CHEMICALS
IN EXCESS OF NEW YORK STATE DEPARTMENT OF HEALTH
MAXIMUM CONTAMINANT LEVELS
MECHANICVILLE SITE

CHEMICAL	MCL (mg/L)[1]	WELL NUMBER
Volatile Aromatics		
Benzene	0.005	MW-1, MW-3, MW-4, MW-5, MW-6 MW-12, MW-13, MW-14, MW-15
Toluene	0.005	MW-3, MW-4, MW-5, MW-6, MW-13, MW-14
Ethylbenzene	0.005	MW-3, MW-4, MW-5, MW-6, MW-12, MW-13, MW-14
Styrene	0.005	MW-4, MW-6, MW-13
Total Xylenes	0.005	MW-1, MW-3, MW-4, MW-5, MW-6, MW-10, MW-12, MW-13, MW-14, MW-15
Trimethylbenzene	0.005	MW-4, MW-5, MW-6
Methylene Chloride	0.005	MW-2, MW-6,MW-13
PAHs		
Acenaphthene	0.05	MW-1, MW-2, MW-3, MW-4, MW-5, MW-6, MW-10, MW-12, MW-14
Acenaphthylene	0.05	MW-1, MW-2, MW-3, MW-4, MW-5, MW-6, MW-13
Anthracene	0.05	MW-3, MW-4, MW-5, MW-6, MW-12
Benzo(b)fluoranthene	0.05	MW-6
Benzo(k)fluoranthene	0.05	MW-5, MW-6
Benzo(a)anthracene	0.05	MW-3, MW-5
Benzo(a)pyrene	0.05	MW-3, MW-4, MW-6
Chrysene	0.05	MW-3, MW-4, MW-5, MW-6
Fluoranthene	0.05	MW-1, MW-2, MW-3, MW-4, MW-5, MW-6, MW-12, MW-13

TABLE 5-3 (continued)

GROUNDWATER SAMPLES CONTAINING CHEMICALS
IN EXCESS OF NEW YORK STATE DEPARTMENT OF HEALTH
MAXIMUM CONTAMINANT LEVELS
MECHANICVILLE SITE

CHEMICAL	MCL (mg/L)[1]	WELL NUMBER
Naphthalene	0.05	MW-1, MW-2, MW-3, MW-4, MW-5, MW-6, MW-12, MW-13, MW-14
Phenanthrene	0.05	MW-1, MW-2, MW-3, MW-4, MW-5, MW-6, MW-12, MW-13
Pyrene	0.05	MW-3, MW-4, MW-5, MW-6, MW-12, MW-13
Other Chemicals		
Bis (2-Ethylhexyl) Phthalate	0.05	MW-1, MW-2, MW-3, MW-10
Iron	0.3*	MW-2, MW-3, MW-4, MW-5, MW-6, MW-10, MW-12
Zinc	5.0*	MW-4, MW-5

Notes:

(1) NY Dept. of Health Regulations, Title 1C, Part 5, Subpart 5-1; effective 1/19/90
(2) POL - Principal Organic Contaminant
UOL - Unspecified Organic Contaminant
* - Secondary MCL

TABLE 5-4

GROUNDWATER SAMPLES CONTAINING CHEMICALS
IN EXCESS OF NEW YORK STATE STANDARDS/GUIDANCE VALUES
MECHANICVILLE SITE

CHEMICAL	STANDARDS/GUIDANCE VALUE (mg/l)[1,2]	WELL NUMBER
Volatile Aromatics		
Benzene	0.0007(S)	MW-1 MW-3 MW-4 MW-5 MW-6 MW-12 MW-13 MW-14 MW-15
Toluene	0.005(S)	MW-3 MW-4 MW-5 MW-6 MW-13 MW-14
Ethylbenzene	0.005(S)	MW-3 MW-4 MW-5 MW-6 MW-12 MW-13 MW-14
Styrene	0.005(S)	MW-4 MW-6 MW-13
Total Xylene	0.05(G)	MW-3 MW-4 MW-5 MW-6 MW-12 MW-13 MW-14
Trimethylbenzene	0.005(S)	MW-4 MW-5 MW-6
Methylene Chloride	0.005(S)	MW-2 MW-6 MW-13

TABLE 5-4 (continued)

GROUNDWATER SAMPLES CONTAINING CHEMICALS
IN EXCESS OF NEW YORK STATE STANDARDS/GUIDANCE VALUES
MECHANICVILLE SITE

CHEMICAL	STANDARDS/GUIDANCE VALUE (mg/l)[1,2]	WELL NUMBER
PAHs		
Acenaphthene	0.02(G)	MW-1 MW-2 MW-3 MW-5 MW-6 MW-10 MW-12 MW-14 MW-15
Anthracene	0.05(G)	MW-3 MW-4 MW-5 MW-6 MW-12
Benzo(k)Fluoranthene	0.000002(G)	MW-5 MW-6
Benzo(a)Anthracene	0.000002(G)	MW-3 MW-5
Benzo(b)Fluoranthene	0.000002(G)	MW-6
Benzo(a)Fluoranthene	0.000002(G)	MW-3 MW-5
Fluoranthene	0.05(G)	MW-1 MW-2 MW-3 MW-4 MW-5 MW-6 MW-12 MW-13
Fluorene	0.05(G)	MW-1 MW-3 MW-4 MW-5 MW-6 MW-12

TABLE 5-4 (continued)

GROUNDWATER SAMPLES CONTAINING CHEMICALS
IN EXCESS OF NEW YORK STATE GUIDANCE VALUES
MECHANICVILLE SITE

CHEMICAL	STANDARDS/GUIDANCE VALUE (mg/l)[1,2]	WELL NUMBER
Naphthalene	0.01(G)	MW-1 MW-2 MW-3 MW-4 MW-5 MW-6 MW-12 MW-13 MW-14 MW-15
Phenanthrene	0.05(G)	MW-1 MW-2 MW-3 MW-4 MW-5 MW-6 MW-12 MW-13
Pyrene	0.05(G)	MW-3 MW-4 MW-5 MW-6 MW-12 MW-13
Chrysene	0.000002(G)	MW-1 MW-3 MW-4 MW-5 MW-6
OTHER		
Bis(2-ethylhexyl)Phthalate	0.05(S)	MW-1 MW-2 MW-3 MW-10

[1]NYSDEC, Division of Water; Technical and Operational Guidance Series (1.1.1) November 1991
[2](S) denotes standard, (G) denotes guidance value

TABLE 5-5

COMPARISON OF MODELED AMBIENT CONCENTRATIONS
AT 100 FT. DOWNWIND
OF SITE TO NEW YORK STATE
ACCEPTABLE AMBIENT LEVELS (ug/m^3)
MECHANICVILLE SITE

CONTAMINANT	NY AAL (ug/m^3)	MODELED 24-HOUR AVERAGE CONCENTRATION	
		MOST PROBABLE	REALISTIC WORST
CARCINOGENS			
Benzene	100	0.3	12.8
Methylene chloride	1167	0.001	0.06
NONCARCINOGENS			
Cyanide	16.7	0.00002	0.0009
Ethylbenzene	1450	0.2	10.1
Styrene	716	0.4	18.4
Toluene	7500	0.4	18.6
Xylenes	1450	0.9	37.7

TABLE 5-6

COMPARISON OF INDOOR AIR SAMPLING RESULTS
TO WORKER STANDARDS AND GUIDELINES
MECHANICVILLE SITE

	Worker Standards and Guidelines						Air Analytical Results - ppm							
							Office		Garage		Storeroom		Background	
	OSHA			NIOSH	ACGIH		OF-01	OF-02	GA-01	GA-02	ST-01	ST-02	BA-01	BA-02
Substance	TWA	CC	Peak	TWA	TLV	STEL	12/88	12/88	12/88	12/88	12/88	12/88	12/88	12/88
Benzene	10	25	50	1	10	25	0.03	0.031	0.016	0.015	0.043	0.043	ND	ND
Toluene	200	300	500	100	100	150	0.009	0.009	0.048	0.048	0.012	0.012	0.037	0.028

ND = Not detected. The minimum detection limits are: benzene - 0.013 ppm; ethylbenzene and xylenes - 0.01 ppm.

TWA = Time Weighted Average (8-hr)

CC = Ceiling Concentration

Peak = Maximum Duration 10 minutes in 8 hours

TLV = Threshold Limit Value

STEL = Short-Term (15 minute) Exposure Limit

TABLE 5-7
SUMMARY OF ENVIRONMENTAL CONDITIONS
MECHANICVILLE

TECHNICAL FACTORS	SURFACE SOILS	SUBSURFACE SOILS	GROUNDWATER
Chemicals Present	The following chemicals were detected in the surface soils at the site - cyanide - PAHs	The following chemicals were detected in the subsurface soils near former coal gasification structures: - VOCs - PAHs - iron and zinc - cyanide compounds - phenolic compounds These chemicals were found in samples collected from the fill soils and silty sand.	The following chemicals were detected in groundwater at the site: -VOCs -PAHs -iron and zinc -cyanide compounds -phenolic compounds -sulfate These chemicals were found in samples collected from roughly the top 10 feet of the water table and from the deeper bedrock.
Chemical Transport Mechanism	PAHs are highly insoluble in water and therefore fairly immobile in the soil environment. Amenable cyanide is soluble and may be mobilized in the soil.	Because chemicals were detected below the water table, transport of soluble chemicals(VOCs, metals, phenolics) in shallow groundwater is likely. Both PAHs and complex cyanides are highly insoluble in water and therefore fairly immobile in the soil environment.	The interpreted direction of shallow groundwater flow is to the north-northeast, with an easterly component in the southeastern corner of the site. Shallow groundwater discharges to the Anthony Kill; regional groundwater flows easterly, toward the Hudson River. Groundwater flow within the fractured rock is controlled by the orientation, size, and interconnection of the fractures. A downward gradient was observed at two multi-level well clusters, while an upward gradient exists at the cluster adjacent to the Anthony Kill.

(continued)

TABLE 5-7
SUMMARY OF ENVIRONMENTAL CONDITIONS
MECHANICVILLE

TECHNICAL FACTORS	SURFACE SOILS	SUBSURFACE SOILS	GROUNDWATER
Expected Persistence of Chemicals in the Environment	PAHs strongly adsorb to soil particles, especially soils high in organic content. PAHs undergo microbial degradation and are readily metabolized by multi-cellular organisms. The lower molecular weight PAHs (e.g., naphthalene, acenaphthene, fluorene) are degraded more rapidly than the higher molecular weight compounds (benzo(a) pyrene, indeno(1,2,3-cd)pyrene, dibenzo(a,h)anthracene). Amendable cyanide is soluble and biodegradable.	There is only a slight tendency for most VOCs to adsorb to soil particles and they are expected to move with groundwater or slowly volatilize. They also are easily biodegradable by soil bacteria. PAHs strongly adsorb to soil particles, especially soils high in organic content. PAHs undergo microbial degradation and are readily metabolized by multi-cellular organisms. The lower molecular weight PAHs (e.g., naphthalene, acenaphthene, fluorene) are degraded more rapidly that the higher molecular weight compounds (benzo(a) pyrene, indeno(1,2,3-cd)pyrene, dibenzo(a,h)anthracene). Trace metals are non-volatile. Their environmental fate depends on soil/water interactions which are controlled by pH, cation exchange capacity, and organic matter content, among other factors. Amendable cyanide is soluble and biodegradable. Ferro-ferricyanides are stable compounds which are difficult to degrade. Therefore, they will persist in the soil environment. Under highly acidic or highly alkaline conditions, fero-ferricyanides may become soluble. They can be transformed to amenable cyanide and hydrogen cyanide gas under highly acidic conditions. Phenolic compounds have a relatively low volatility and high solubility.	VOCs in ground water are expected to biodegrade over time. PAHs are relatively insoluble in water, but leaching to groundwater does occur. Dissolved PAHs in groundwater are subject to microbial degradation. However, biodegradation probably occurs more slowly in aquatic systems than in soil. Dissolved PAHs may also undergo rapid, direct photolysis when oxidants are available. The volatility of PAH compounds is low. The behavior of trace metals in groundwater is complex. However, their mobility in groundwater can be significantly retarded by adsorption and precipitation reactions. Amenable cyanide forms a single anion in water which is biodegradable. Ferro-ferricyanides in water form a metal cyanide radical which is difficult to degrade and likely to persist. Phenolic compounds are soluble and biodegradable.

(continued)

TABLE 5-7
SUMMARY OF ENVIRONMENTAL CONDITIONS
MECHANICVILLE

TECHNICAL FACTORS	SURFACE SOILS	SUBSURFACE SOILS	GROUNDWATER
Existing or Potential Receptors of Chemicals	The potential for exposure to chemicals in surface soils is low since most of the site is paved and fenced off.	The probability of direct exposure of humans or animals to chemicals in the soil is low because the site is paved. If excavation were made at the site, however, workers and area residents could be exposed to these chemicals.	Exposure to chemicals in the shallow groundwater may occur during building and utility excavations or through basement seeps in the site vicinity. The only direct groundwater usage in the are is through a few domestic wells nearly 1 mile southwest (upgradient) of the site. Because shallow groundwater appears to flow north-northeast from the site, these wells are unlikely to be receptors of site-derived chemicals.

(continued)

TABLE 5-7
SUMMARY OF ENVIRONMENTAL CONDITIONS
MECHANICVILLE

TECHNICAL FACTORS	SURFACE WATER	SEDIMENT	AIR
Chemicals Present	The following chemicals were found in the Anthony Kill, adjacent to the site: - iron and zinc - cyanide compounds - phenolic compounds - sulfate These chemicals were primarily detected adjacent to the site. Higher concentrations of iron were detected adjacent to the site in Task 3. Higher concentrations of iron and phenols were detected upgradient of the site during Task 2.	The following chemicals were detected in sediments from the Anthony Kill, adjacent to the site: - benzene, toluene, and ethylbenzene - PAHs - iron and zinc - sulfate Benzene, toluene, and sulfate were found in samples adjacent to and /or downstream of the site. PAHs, iron, and zinc were detected upstream as well as downstream and adjacent to the site; with higher concentrations detected adjacent to and downgradient of the site.	The following chemicals were detected in indoor air samples at the site: - benzene - toluene Toluene was also found in the background samples.
Chemical Transport Mechanism	Dissolved and sediment-attached chemicals in the Anthony Kill may be transported downstream to the Hudson River (approximately a quarter mile).	Sediments deposited in the Anthony Kill may be resuspended during high flow/high energy conditions and carried farther downstream of the site.	Volatile and semivolatile organics found in the soils and sediments at the site may volatilize if these chemicals are exposed to the atmosphere by excavation. Similarly, winds may suspend soil and sediment particles containing site-derived contamination and carry these particles off-site, if exposed.

(continued)

TABLE 5-7
SUMMARY OF ENVIRONMENTAL CONDITIONS
MECHANICVILLE

TECHNICAL FACTORS	SURFACE WATER	SEDIMENT	AIR
Expected Persistence of Chemicals in the Environment	See Groundwater	See Soil	VOCs in air are expected to disperse quickly outdoors. In a closed environment with poor ventilation, the VOC dispersion rate would be much slower.
Existing or Potential Receptors of Chemicals	Direct contact with the surface water by humans is likely in this highly populated area, even though this section of the Anthony Kill is designated for secondary contact recreation only (Class D). Aquatic organisms in the stream are also potential receptors of chemicals.	As with surface water, direct contact with chemicals in sediments is a concern in this urban area, especially for recreational users of the Anthony Kill.	Workers and area residents could be exposed to a airborne contaminants during excavation of contaminated soil.

S2soil

TABLE 5-8

SUMMARY STATISTICS OF SELECTED SUBSURFACE SOIL SAMPLING LOCATIONS
VOLATILE ORGANIC COMPOUNDS
MECHANICVILLE SITE

VOLATILE ORGANICS	ARITHMETIC MEAN (mg/kg)	MAXIMUM (mg/kg)	MINIMUM (mg/kg)	FREQUENCY OF DETECTION
BENZENE	103.6	640	0	5/10
TOLUENE	151.2	840	0	8/10
ETHYLBENZENE	82.1	440	0	8/10
STYRENE	150.0	780	0	3/10
TOTAL XYLENES	306.0	1400	0.235	8/8
TRIMETHYLBENZENE	26.7	170	0	4/8
n-PROPYLBENZENE	0.3	2.05	0	2/8
ACETONE	0.0	0	0	0/2
METHYLENE CHLORIDE	0.5	1	0	1/2
CARBON DISULFIDE	0.1	0.11	0	1/2
2-BUTANONE				0

NOTES:

Includes Task 2 soil borings B-2, B-3, B-4, B-7, and B-8
and test pits TP-2, TP-4, and TP-5, and Task 3 boring B-09.

Frequency of detection equals the number of times a compound was found
(above the detection limit) over the number of samples in which it was analyzed.

S2soil

TABLE 5-9

SUMMARY STATISTICS OF SELECTED SUBSURFACE SOIL SAMPLING LOCATIONS
SEMI-VOLATILE ORGANIC COMPOUNDS
MECHANICVILLE SITE

SEMI-VOLATILE ORGANICS	ARITHMETIC MEAN (mg/kg)	MAXIMUM (mg/kg)	MINIMUM (mg/kg)	FREQUENCY OF DETECTION
ACENAPHTHENE	128.8	600	0	10/11
ACENAPHTHYLENE	365.8	1388	0	9/11
ANTHRACENE	183.0	670	0	10/11
BENZO(b)FLUORANTHENE	35.4	200	0	7/11
BENZO(k)FLUORANTHENE	30.0	240	0	5/11
BENZO(g,h,i)PERYLENE	29.3	140	0	7/11
BENZO(a)ANTHRACENE	76.5	390	0	10/11
BENZO(a)PYRENE	45.2	200	0	10/11
CHRYSENE	76.2	390	0	10/11
DIBENZO(a,h)ANTHRACENE	1.3	13	0	3/11
FLUORANTHENE	285.2	1100	0.28	11/11
FLUORENE	514.3	2100	0.28	11/11
INDENO(1,2,3-cd)-PYRENE	6.1	65	0	2/11
NAPHTHALENE	545.5	2500	0	10/11
PHENANTHRENE	320.7	940	0.28	11/11
PYRENE	398.7	1400	0.28	11/11
BIS(2-ETHYLHEXYL)PHTHALATE	0.0	0	0	0/3
2-METHYLNAPHTHALENE	13.0	13	13	1/11
DIBENZOFURAN	-	-	-	
TOTAL CARCINOGENIC PAHS	271.0	1305	0.28	11/11
TOTAL PAHS	3040.0	9480	2.38	11/11

NOTES:

Includes Task 2 soil borings B-2, B-3, B-4, B-7, and B-8 and test pits TP-2, TP-4, and TP-5, and Task 3 boring B-09.

Frequency of detection equals the number of times a compound was found (above the detection limit) over the number of samples in which it was analyzed.

S2soil

TABLE 5-10

SUMMARY STATISTICS OF SELECTED SUBSURFACE SOIL SAMPLING LOCATIONS
INORGANIC COMPOUNDS
MECHANICVILLE SITE

INORGANICS	ARITHMETIC MEAN (mg/kg)	MAXIMUM (mg/kg)	MINIMUM (mg/kg)	FREQUENCY OF DETECTION
IRON	29333.3	35000	19000	9/9
ZINC	120.2	320	59	9/9
-CYANIDE-				
TOTAL CYANIDE	0.7	3.2	0	3/9
AMENABLE CYANIDE	0.5	3.2	0	2/8
FERRO-FERRI CYANIDE	0.3	2	0	1/8
-OTHER-				
TOTAL RECOVERABLE PHENOLICS	0.5	3.6	0	2/9
TOTAL ORGANIC CARBON	51133.3	190000	1400	9/9

NOTES:

Includes Task 2 soil borings B-2, B-3, B-4, B-7, and B-8
and test pits TP-2, TP-4, and TP-5, and Task 3 boring B-09.

Frequency of detection equals the number of times a compound was found
(above the detection limit) over the number of samples in which it was analyzed.

S2tbls

TABLE 5-11

SUMMARY STATISTICS FOR SELECTED SEDIMENT SAMPLING LOCATIONS
VOLATILE ORGANIC COMPOUNDS
MECHANICVILLE SITE

VOLATILE ORGANICS	ARITHMETIC MEAN (mg/kg)	MAXIMUM (mg/kg)	MINIMUM (mg/kg)	FREQUENCY OF DETECTION
Benzene	0.0330	0.095	0	2/5
Toluene	0.0000	0	0	0/5
Ethylbenzene	0.0174	0.087	0	1/5
Styrene	0.0000	0	0	0/5
Total Xylenes	0.0000	0	0	0/5
Acetone	2.6000	5.2	0	1/2
Methylene Chloride	0.7375	2.95	0	1/4
2-Butanone	0.0000	0	0	0/2

NOTES:

Includes Task 2 samples SED-302 and SED-402;Task 3 sample at SD-02;
two NYSEG samples collected in 11/88, and ; the NYSDEC sample of 10/88.

Frequency of detection equals the number of times a compound was found
(above the detection limit) over the number of samples in which it was analyzed.

S2tbls

TABLE 5-12

SUMMARY STATISTICS FOR SELECTED SEDIMENT SAMPLING LOCATIONS
SEMIVOLATILE ORGANIC COMPOUNDS
MECHANICVILLE SITE

SEMI-VOLATILE ORGANICS	ARITHMETIC (mg/kg)	MAXIMUM (mg/kg)	MINIMUM (mg/kg)	FREQUENCY OF DETECTION
Acenaphthene	0.5093	1.6	0	4/7
Acenaphthylene	0.8664	3	0	4/7
Anthracene	0.7593	1.63	0	5/7
Benzo(b)Fluoranthene	0.2371	0.95	0	3/7
Benzo(k)Fluoranthene	0.9729	3.1	0	4/7
Benzo(g,h,i,)Perylene	0.1307	0.4	0	3/7
Benzo(a)Pyrene	0.8386	2	0	5/7
Benzo(a)Anthracene	0.8143	2.5	0	4/7
Chrysene	0.7643	2.3	0	4/7
Dibenz(a,h)Anthracene	0.0307	0.215	0	1/7
Fluoranthene	2.8486	10	0	5/7
Fluorene	0.4364	1.59	0	4/7
Indeno(1,2,3-cd)Pyrene	0.1021	0.3	0	3/7
Naphthalene	2.0543	8.7	0	6/7
Phenanthrene	2.0871	5.49	0	6/7
Pyrene	2.4743	7.6	0	5/7
4-Methylphenol	0.0430	0.215	0	1/5
2-Methylnaphthalene	0.6750	2.66	0	5/7
Butylbenzylphthalate	0.0430	0.215	0	1/5
bis(2-Ethylhexyl)phthalate	0.8264	2.8	0	4/7
Di-n-octylphthalate	0.0330	0.165	0	1/5
Dibutyl phthalate	1.1750	2	0	3/4
Total Carcinogenic PAHs	3.7600	10.2	0	5/7
Total PAHs	16.0	38.9	0.95	7/7

NOTES:

Includes Task 2 samples SED-302 and SED-402;Task 3 sample at SD-02;
two NYSEG samples collected in 11/88, and ; the NYSDEC sample of 10/88.

Frequency of detection equals the number of times a compound was found
(above the detection limit) over the number of samples in which it was anlayzed.

S2tbls

TABLE 5-13

SUMMARY STATISTICS FOR SELECTED SEDIMENT SAMPLING LOCATIONS
INORGANIC COMPOUNDS
MECHANICVILLE SITE

INORGANICS	ARITHMETIC MEAN (mg/kg)	MAXIMUM (mg/kg)	MINIMUM (mg/kg)	FREQUENCY OF DETECTION
Iron	15193.3	27200	8400	3/3
Zinc	45.5	46	45	2/2
-CYANIDE-				
Total Cyanide (ppm)	0.4	1.3	0	1/3
-OTHER-				
Total Recoverable Phenolics	2.3	4.6	0	2/3
Total Organic Carbon	21533.3	32000	16100	3/3
Sulfate	-	-	-	-

NOTES:

Includes Task 2 samples SED-302 and SED-402;Task 3 samples at SD-02;
two NYSEG samples collected in 11/88, and; the NYSDEC sample of 10/88.

Frequency of detection equals the number of times a compound was found
(above the detection limit) over the number of samples in which it was analyzed.

S-2tabs

TABLE 5-14

SUMMARY STATISTICS FOR GROUNDWATER FROM SELECTED DOWNGRADIENT WELLS

VOLATILE ORGANIC COMPOUNDS
MECHANICVILLE SITE

VOLATILE ORGANICS	ARITHMETIC MEAN (mg/l)	MAXIMUM (mg/l)	MINIMUM (mg/l)	FREQUENCY OF DETECTION
BENZENE	1.12774	12.000	0	27/33
TOLUENE	0.44912	6.400	0	19/33
ETHYLBENZENE	0.43933	2.000	0	20/33
STYRENE	0.10533	1.800	0	4/33
TOTAL XYLENE	0.74081	3.500	0	27/33
TRIMETHYLBENZENE	-	-	-	0
ACETONE	0.06071	0.850	0	1/14
METHYLENE CHLORIDE	1.13594	36.000	0	2/32
2-BUTANONE	0.00139	0.025	0	1/18
1,1,1-TRICHLOROETHANE	0.00183	0.021	0	2/18
VINYL ACETATE	0.00556	0.100	0	1/18
2-HEXANONE	0.00028	0.005	0	1/18
CHLOROBENZENE	0.00007	0.001	0	1/18
1,1-DICHLOROETHANE	0.00018	0.003	0	1/18
TRICHLOROETHENE	0.00294	0.053	0	1/18

NOTES:

Includes all Task 2 and 3 monitoring wells except upgradient wells MW-1, MW-10, and MW-11.

Frequency of detection equals the number of times a compound was found
(above the detection limit) over the number of samples in which it was analyzed.

S-2tabs

TABLE 5-15

SUMMARY STATISTICS FOR GROUNDWATER FROM SELECTED DOWNGRADIENT WELLS
SEMIVOLATILE ORGANIC COMPOUNDS
MECHANICVILLE SITE

SEMIVOLATILE ORGANICS	ARITHMETIC MEAN (mg/l)	MAXIMUM (mg/l)	MINIMUM (mg/l)	FREQUENCY OF DETECTION
BENZO(b)FLUORANTHENE	0.8308	25.000	0	6/33
BENZO(k)FLUORANTHENE	0.8680	25.000	0	6/33
BENZO(g,h,i)PERYLENE	0.0121	0.400	0	1/33
BENZO(a)ANTHRACENE	1.5607	25.000	0	8/32
BENZO(a)PYRENE	0.9665	25.000	0	8/33
CHRYSENE	1.2873	25.000	0	7/33
DIBENZO(a,h)ANTHRACENE	0.0000	0.000	0	0/33
FLUORANTHENE	5.1082	82.000	0	19/33
FLUORENE	6.5798	110.000	0	21/33
INDENO(1,2,3,-cd)PYRENE	0.0152	0.400	0	2/33
NAPHTHALENE	35.7671	580.000	0	27/33
PHENANTHRENE	18.4497	320.000	0	22/33
PYRENE	8.1093	130.000	0	16/33
2,4-DIMETHYLPHENOL	0.0014	0.025	0	1/18
2,4-DINITROTOLUENE	0.0207	0.310	0	2/18
2,6-DINITROTOLUENE	0.0202	0.300	0	2/18
2-CHLORONAPHTHALENE	0.0167	0.300	0	1/18
2-METHYLNAPHTHALENE	25.7826	540.000	0	17/33
2-METHYLPHENOL	0.0297	0.300	0	4/18
2-NITROANILINE	0.1722	1.550	0	2/18
3-NITROANILINE	0.0861	1.550	0	1/18
4,6-DINITRO-2-METHYLPHENOL	0.0000	0.000	0	0/18
4-METHYLPHENOL	0.0202	0.200	0	3/18
4-NITROANILINE	0.0861	1.550	0	1/18
4-NITROPHENOL	0.0000	0.000	0	0/18
BENZOIC ACID	0.0875	1.550	0	2/18
BENZYL ALCOHOL	0.0003	0.005	0	1/18
BUTYLBENZYLPHTHALATE	0.0069	0.125	0	1/18
DIBENZOFURAN	1.7089	25.000	0	8/18
HEXACHLOROETHANE	0.0000	0.000	0	0/18
N-NITROSODIPHENYLAMIME	0.0167	0.300	0	1/18
NITROBENZENE	0.0003	0.005	0	1/18
PHENOL	0.0622	0.580	0	6/18
BIS(2-ETHYLHEXYL)PHTHALATE	0.0648	1.710	0	8/33
TOTAL CARCINOGENIC PAHS	5.4800	125.000	0	11/33
TOTAL PAHS	109.0000	1668.000	0	29/33

NOTES:

Includes all Task 2 and 3 monitoring wells except upgradient wells MW-1, MW-10, and MW-11.

Frequency of detection equals the number of times a compound was found
(above the detection limit) over the number of samples in which it was analyzed.

TABLE 5-16

SUMMARY STATISTICS FOR GROUNDWATER FROM SELECTED DOWNGRADIENT WELLS
INORGANIC COMPOUNDS
MECHANICVILLE SITE

INORGANICS	ARITHMETIC MEAN (mg/l)	MAXIMUM (mg/l)	MINIMUM (mg/l)	FREQUENCY OF DETECTION
IRON	5.930	25.000	0	31/32
ZINC	0.102	1.090	0	26/32
-CYANIDE-				
TOTAL CYANIDE	0.111	0.800	0	24/32
AMENABLE CYANIDE	0.012	0.100	0	2/12
FERRO-FERRI CYANIDE	0.083	0.420	0	13/14
UNDISTILLED CYANIDE	0.006	0.070	0	3/17
TOTAL RECOVERABLE PHENOLICS	0.793	17.000	0	22/23
TOTAL ORGANIC CARBON	1679.662	50000.000	2.500	30/30
SULFATE	42.000	84.000	14.500	5/5
TOTAL NEW YORK STATE REGULATED ORGANICS (7)	120.670	2060.600	0	32/33

NOTES:

Includes all Task 2 and 3 monitoring wells except upgradient wells MW-1, MW-10, and MW-11.

Frequency of detection equals the number of times a compound was found (above the detection limit) over the number of samples in which it was analyzed.

TABLE 5-17

CONTAMINANTS OF CONCERN
MECHANICVILLE SITE

CARCINOGENS	MEDIUM IN WHICH DETECTED
Carcinogenic PAHs[1]	Soil, Sediment
Benzene	Soil, Sediment, Indoor Air
NONCARCINOGENS	
Toluene	Soil, Indoor Air
Xylene	Soil
Ethyl Benzene	Soil, Sediment
Styrene	Soil
Noncarcinogenic PAHs[2]	Soil, Sediment
Cyanide	Soil, Sediment
Trimethylbenzene	Soil

NOTES:

1 Include benzo(b)fluoranthene, benzo(k)fluoranthene, benzo(a)anthracene, benzo(a)pyrene, chrysene, dibenzo(a,h)anthracene, and indeno(1,2,3-cd)pyrene.

2 Include acenaphthene, acenaphthylene, anthracene, benzo(g,h,i)perylene, fluoranthene, fluorene, naphthalene, phenanthrene, pyrene, and 2-methylnaphthalene (sediment only).

mechdr

TABLE 6-1

ORAL DOSE RESPONSE DATA
MECHANICVILLE SITE

COMPOUND	DOSE-RESPONSE VALUE	UNIT	SOURCE	DATE	STUDY TYPE *	TOXICOKINETIC FACTORS Most Probable/Realistic Worst: SOIL (oral)	SOIL (dermal)
CARCINOGENS							
PAHs (1)	11.5	(mg/kg/day)-1	SPHEM (6)	Oct 87	diet	0.50 / 1.00	0.01 / 0.10
PAHs (2)	3.22	(mg/kg/day)-1	AES (9)	1988	diet	0.50 / 1.00	0.01 / 0.10
Benzene	0.02	(mg/kg/day)-1	IRIS (7)	Aug 89	inhalation	0.10 / 0.50	0.05 / 0.25
NONCARCINOGENS							
Toluene (3)	0.3	mg/kg/day	IRIS	Aug 89	inhalation	0.05 / 0.25	0.025 /0.125
Xylenes	2.0	mg/kg/day	IRIS	Aug 89	gavage	0.10 / 0.50	0.050 /0.250
Ethylbenzene (4)	0.1	mg/kg/day	IRIS	Aug 89	gavage	0.10 / 0.50	0.050 /0.250
Cyanide	0.02	mg/kg/day	IRIS	Aug 89	diet	0.5 / 1.00	1.000 / 2.50
Styrene	0.2	mg/kg/day	IRIS	Aug 89	gavage	0.1 / 0.5	0.050 / 0.25
Noncarcinogenic PAHs (5)	0.4	mg/kg/day	SPHEM	Sept 88	diet	0.5 / 1.00	0.010 / 0.10
Trimethylbenzene (5)	2.0	mg/kg/day	IRIS	Aug 89	gavage	0.10 / 0.50	0.050 / 0.25

(1) USEPA dose/response value for benzo(a)pyrene
(2) ICF-Clement dose/response value for benzo(a)pyrene
(3) Toluene study based on 50% absorption
(4) Ethylbenzene administered in olive oil
(5) Dose/response value for naphthalene
(6) Dose/response value for xylenes
(7) Superfund Public Health Evaluation Manual
(8) USEPA Integrated Risk Information System
(9) Atlantic Environmental Services (AES), 1988

mechdri

TABLE 6-2

INHALATION DOSE RESPONSE DATA
MECHANICVILLE SITE

COMPOUND	DOSE-RESPONSE VALUE	UNIT	SOURCE	DATE	STUDY TYPE *	TOXICOKINETIC FACTORS: INHALATION TKF Volatile	TOXICOKINETIC FACTORS: INHALATION TKF Particulate
CARCINOGENS							
PAHs (1)	6.1	(mg/kg/day)-1	SPHEM(6)	Oct 87	inhalation	N/A (8)	1.00
PAHs (2)	0.453	(mg/kg/day)-1	AES (9)	1988	inhalation	N/A (8)	1.00
Benzene	0.029	(mg/kg/day)-1	IRIS(7)	Aug 89	inhalation	1.00	N/A
NONCARCINOGENS							
Toluene	1.0	mg/kg/day	IRIS	Sept 88	inhalation	1.00	N/A
Xylenes	0.4	mg/kg/day	AIC	Sept 88	inhalation	1.00	N/A
Ethylbenzene (3)	0.1	mg/kg/day	IRIS	Aug 89	gavage	1.00	N/A
Cyanide (3)	0.02	mg/kg/day	IRIS	Nov 88	diet	N/A	7.50
Styrene (3)	0.2	mg/kg/day	IRIS	Sept 88	gavage	1.00	N/A
Noncarcinogenic PAHs (4)	0.4	mg/kg/day	SPHEM	April 89	diet	N/A	0.75
Trimethylbenzene (5)	0.4	mg/kg/day	AIC	Sept 88	inhalation	1.00	N/A

(1) USEPA dose/response value for benzo(a)pyrene
(2) ICF-Clement dose/response value for benzo(a)pyrene
(3) Inhalation dose/response value is not available for this compound; therefore, the oral dose/response value was used
(4) Dose/response value for naphthalene
(5) Dose/response value for xylene
(6) Superfund Public Health Evaluation Manual
(7) USEPA Integrated Risk Information System
(8) Not applicable
(9) Atlantic Environmental Services (AES), 1988

TABLE 6-3

TOXICOKINETIC FACTORS (TKFs)
MECHANICVILLE SITE

STUDY TYPE	DERMAL/SOIL	ORAL/SOIL
Gavage	0.05/0.25[1]	0.1/0.5
Drinking Water	0.05/0.25	0.1/0.5
Diet	.01/0.10	0.5/1.0
Inhalation	0.05/0.25[2]	0.1/0.5[2]

Notes:
[1] Most probable case/realistic worst case.

[2] Multiplied by the absorption-factor from inhalation study, if any.

TABLE 6-4

EXPOSURE PATHWAYS
MECHANICVILLE SITE

MEDIUM	POINT OF EXPOSURE	ROUTE OF EXPOSURE	EXPOSED POPULATION	STATUS
Subsurface Soils	On-Site	-Dermal absorption -Incidental ingestion	Utility Workers	Future
Surface soils	On-Site (Stream bank area)	-Dermal absorption -Incidental ingestion	Trespassers	Current
Air Emissions	On-Site,	-Inhalation	Site Residents	Current
			Construction Workers	Future
	Off-Site, dispersion		Children	Future
Sediments	Off-Site (adjacent to site)	-Dermal absorption -Incidental ingestion	Recreational river users	Current
			Construction Workers	

TABLE 6-5

EQUATIONS USED TO ESTIMATE BODY DOSES

MECHANICVILLE SITE

CARCINOGENS

1. Inhalation:

$$\text{Average Daily Dose Over Lifetime (mg/kg/day)} = \text{Concentration in Medium } (ug/m^3) \times \text{Amount of Air Inhaled } (m^3) \text{ per Event} \times \frac{1}{\text{Body Wt. (kg)}}$$

$$\times \frac{\text{Events/yr}}{365 \text{ days/yr}} \times \frac{\text{Yrs. Exposure}}{70 \text{ years}} \times \text{TKF}^{1} \times \frac{1 \text{ mg}}{1{,}000 \text{ ug}}$$

2. Direct Contact and Incidental Ingestion, Soil or Sediment

$$\text{Average Daily Dose Over Lifetime (mg/kg/day)} = \text{Concentration in Medium } (ug/g) \times [(\text{Soil Contacted } (g) \text{ per Event} \times \text{Dermal TKF}) + (\text{Soil Ingested } (g) \text{ per Event} \times \text{Oral TKF})] \times \frac{1}{\text{Body Wt. (kg)}}$$

$$\times \frac{\text{Events/yr}}{365 \text{ days/yr}} \times \frac{\text{Yrs. Exposure}}{70 \text{ years}} \times \frac{1 \text{ mg}}{1{,}000 \text{ ug}}$$

TABLE 6-5 (continued)

EQUATIONS USED TO ESTIMATE BODY DOSES
MECHANICVILLE SITE

NONCARCINOGENS

1. Inhalation:

$$\text{Average Daily Dose Over Period of Exposure (mg/kg/day)} = \text{Concentration in Medium } (\mu g/m^3) \times \text{Amount of Air Inhaled } (m^3) \text{ per Event} \times \frac{1}{\text{Body Wt. (kg)}} \times \frac{\text{Events/yr}}{365 \text{ days/yr}} \times \text{TKF} \times \frac{1 \text{ mg}}{1{,}000 \text{ ug}}$$

2. Direct Contact and Incidental Ingestion, Soil or Sediment:

$$\text{Average Daily Dose Level Over Period of Exposure (mg/kg/day)} = \text{Concentration in Medium } (\mu g/g) \times (\text{Soil Contacted (g) per Event} \times \text{Dermal TKF}) + (\text{Soil Ingested (g) per Event} \times \text{Oral TKF}) \times \frac{1}{\text{Body Wt. (kg)}} \times \frac{\text{Events/yr}}{365 \text{ days/yr}} \times \frac{1 \text{ mg}}{1{,}000 \text{ ug}}$$

Note: TKF = Toxicokinetic Factor

TABLE 6-6

DERMAL AND ORAL EXPOSURE TO CONTAMINATED SEDIMENTS
DURING RECREATIONAL ACTIVITIES (1)
MECHANICVILLE SITE

	MOST PROBABLE CASE	WORST CASE
Average Body Weight (2)	45 kg	45 kg
Surface Area Exposed (3)	4970 cm^2	6097 cm^2
Soil Contacted (unit deposition) (4)	0.5 mg/cm^2	1.5 mg/cm^2
Incidental Ingestion (5)	50 mg/event	100 mg/event
Frequency of Exposure	1 events/yr	2 events/yr
Total Exposure Duration	5 yrs	10 yrs

Notes:

(1) Older children, ages 8 through 18

(2) Average body weight, males and females, Anderson et al., 1985

(3) Hands, forearms, feet, and lower legs, USEPA, 1989

(4) Shaum, 1984

(5) Lagoy, 1987

TABLE 6-7

DERMAL AND ORAL EXPOSURE TO CONTAMINATED SEDIMENTS DURING CONSTRUCTION WORK IN THE ANTHONY KILL (1) MECHANICVILLE SITE

	MOST PROBABLE CASE	REALISTIC WORST CASE
Average Body Weight	70 kg	70 kg
Surface Area Exposed (2)	2300 cm^2	2830cm^2
Sediment Contacted (unit deposition) (3)	0.5 mg/cm^2	1.5 mg/cm^2
Sediment Ingestion (4)	50 mg/event	100 mg/event
Frequency of Exposure	5 events/yr	10 events/yr
Total Exposure Duration	3 yrs	10 yrs

Notes

(1) Construction Workers

(2) Hands and forearms, Anderson et al., 1985

(3) Shaum, 1984

(4) Lagoy, 1987

TABLE 6-8

DERMAL AND ORAL EXPOSURE TO CONTAMINATED SURFACE SOIL
DURING RECREATIONAL ACTIVITIES (1)
MECHANICVILLE SITE

	MOST PROBABLE CASE	REALISTIC WORST CASE
Average Body Weight (2)	45 kg	45 kg
Surface Area Exposed (3)	4970 cm^2	6097 cm^2
Soil Contacted (unit deposition) (4)	0.5 mg/cm^2	1.5 mg/cm^2
Incidental Ingestion (5)	50 mg/event	100 mg/event
Frequency of Exposure	5 events/yr	10 events/yr
Total Exposure Duration	5 yrs	10 yrs

Notes:

(1) Older children, ages 8 through 18

(2) Average body weight, males and females, Anderson et al., 1985

(3) Hands, forearms, feet, and lower legs, USEPA, 1989

(4) Shaum, 1984

(5) Lagoy, 1987

TABLE 6-9

DERMAL AND ORAL EXPOSURE TO CONTAMINATED SOILS
DURING UTILITY WORK (1)
MECHANICVILLE SITE

	MOST PROBABLE CASE	REALISTIC WORST CASE
Average Body Weight	70 kg	70 kg
Surface Area Exposed (2)	2300 cm^2	2830 cm^2
Soil Contacted (unit deposition) (3)	0.5 mg/cm^2	1.5 mg/cm^2
Incidental Soil Ingestion (4)	50 mg/event	100 mg/event
Frequency of Exposure	1 day/yr	2 days/yr
Total Exposure Duration	2 yrs	4 yrs

Notes:

(1) Utility Workers

(2) Hands and forearms, Anderson et al., 1985

(3) Shaum, 1984

(4) Lagoy, 1987

TABLE 6-10

FUTURE INHALATION EXPOSURES (1)
DURING UTILITY WORK AND EXCAVATION
MECHANICVILLE SITE

	MOST PROBABLE CASE	REALISTIC WORST CASE
Average Body Weight	21 kg	21 kg
Duration of Utility Repair Activity	20 days	25 days
I. Child at Preschool		
Distance from Activity	750 ft	750 ft
Duration of Exposure	8 hrs	8 hrs
Inhalation Rate (light activity) (2)	0.8 m^3/hr	0.8 m^3/hr
II. Child at Home		
Distance from Activity	100 ft	100 ft
Duration of Exposure	6 hrs	6 hrs
Inhalation Rate (moderate activity) (2)	2.0 m^3/hr	2.0 m^3/hr
III. Child Asleep		
Distance from Activity	100 ft	100 ft
Duration of Exposure	10 hrs	10 hrs
Inhalation Rate (2)	0.4 m^3/hr	0.4 m^3/hr

Notes:

(1) Child 1 - 6 years of age, inhalation of volatile compounds and particulates

(2) USEPA, 1987

TABLE 6-11

RISK ESTIMATES FOR EXPOSURE OF OLDER CHILDREN
TO SURFACE SOIL
MECHANICVILLE SITE

Compound	Most Probable Case	Realistic Worst Case
	Incremental Lifetime Carcinogenic Risk Estimates	
Carcinogenic PAHs	2.3×10^{-6}(1) 6.5×10^{-7}(2)	1.8×10^{-5}(1) 5.0×10^{-6}(2)
Total:	2.3×10^{-6}(1) 6.5×10^{-7}(2)	1.8×10^{-5}(1) 5.0×10^{-6}(2)
	Noncarcinogenic Hazard Ratios	
Cyanide (amenable)	9.7×10^{-5}	1.3×10^{-3}
Noncarcinogenic PAHs	8.5×10^{-6}	2.7×10^{-5}
Total:	1.1×10^{-4}	1.3×10^{-3}

(1) Using USEPA Potency Factor
(2) Using ICF-Clement (1987) Potency Factor

TABLE 6-12

RISK ESTIMATES FOR EXPOSURE OF UTILITY WORKERS
TO SUBSURFACE SOIL
MECHANICVILLE SITE

Compound	Most Probable Case	Realistic Worst Case
	Incremental Lifetime Carcinogenic Risk Estimates	
Benzene	2.1×10^{-10}	9.2×10^{-8}
Carcinogenic PAHs	1.3×10^{-7}(1) 3.5×10^{-8}(2)	3.5×10^{-5}(1) 9.8×10^{-6}(2)
Total:	1.3×10^{-7}(1) 3.6×10^{-8}(2)	3.5×10^{-5}(1) 9.9×10^{-6}(2)
	Noncarcinogenic Hazard Ratios	
Cyanide (amenable)	1.2×10^{-6}	1.3×10^{-4}
Ethyl Benzene	2.0×10^{-6}	3.8×10^{-4}
Noncarcinogenic PAHs	9.9×10^{-6}	1.1×10^{-3}
Styrene	1.8×10^{-6}	3.4×10^{-4}
Toluene	6.2×10^{-7}	1.2×10^{-4}
Trimethylbenzene	3.3×10^{-8}	7.4×10^{-6}
Xylene (total)	3.7×10^{-7}	6.1×10^{-5}
Total:	1.6×10^{-5}	2.2×10^{-3}

(1) Using USEPA Potency Factor
(2) Using ICF-Clement (1987) Potency Factor

TABLE 6-13

RISK ESTIMATES FOR EXPOSURE OF CHILDREN
TO SEDIMENT
MECHANICVILLE SITE

Compound	Most Probable Case	Realistic Worst Case
	Incremental Lifetime Carcinogenic Risk Estimates	
Benzene	5.4×10^{-13}	1.1×10^{-10}
Carcinogenic PAHs	9.4×10^{-9}(1) 2.6×10^{-9}(2)	2.1×10^{-6}(1) 5.8×10^{-7}(2)
Total:	9.4×10^{-9}(1) 2.6×10^{-9}(2)	2.1×10^{-6}(1) 5.8×10^{-7}(2)
	Noncarcinogenic Hazard Ratios	
Cyanide (total)	3.3×10^{-6}	1.8×10^{-4}
Ethyl Benzene	1.4×10^{-9}	2.5×10^{-7}
Noncarcinogenic PAHs	9.7×10^{-8}	1.3×10^{-5}
Total:	3.4×10^{-6}	2.0×10^{-4}

(1) Using USEPA Potency Factor
(2) Using ICF-Clement (1987) Potency Factor

TABLE 6-14

RISK ESTIMATES FOR EXPOSURE OF WORKERS
TO SEDIMENT
MECHANICVILLE SITE

Compound	Most Probable Case	Realistic Worst Case
	Incremental Lifetime Carcinogenic Risk Estimates	
Benzene	5.0×10^{-13}	1.7×10^{-10}
Carcinogenic PAHs	1.3×10^{-8}(1) 3.7×10^{-9}(2)	3.4×10^{-6}(1) 9.6×10^{-7}(2)
Total:	1.3×10^{-8}(1) 3.7×10^{-9}(2)	3.4×10^{-6}(1) 9.6×10^{-7}(2)
	Noncarcinogenic Hazard Ratios	
Cyanide (total)	5.0×10^{-6}	2.7×10^{-4}
Ethyl Benzene	2.1×10^{-9}	3.8×10^{-7}
Noncarcinogenic PAHs	2.3×10^{-7}	2.2×10^{-5}
Total:	5.2×10^{-6}	3.0×10^{-4}

(1) Using USEPA Potency Factor
(2) Using ICF-Clement (1987) Potency Factor

TABLE 6-15

RISK ESTIMATES FOR EXPOSURE OF YOUNG CHILDREN
TO SOIL CONTAMINATION VIA INHALATION
MECHANICVILLE SITE

Compound	Most Probable Case	Realistic Worst Case
	Incremental Lifetime Carcinogenic Risk Estimates	
Benzene	3.5×10^{-8}	1.8×10^{-6}
Carcinogenic PAHs	1.9×10^{-7}(1) 1.4×10^{-8}(2)	1.1×10^{-5}(1) 8.3×10^{-7}(2)
Total:	2.2×10^{-7}(1) 4.9×10^{-8}(2)	1.3×10^{-5}(1) 2.6×10^{-6}(2)
	Noncarcinogenic Hazard Ratios	
Cyanide (amenable)	3.5×10^{-7}	2.0×10^{-5}
Ethyl Benzene	1.1×10^{-4}	5.7×10^{-3}
Noncarcinogenic PAHs	7.0×10^{-6}	4.1×10^{-4}
Styrene	1.0×10^{-4}	5.2×10^{-3}
Toluene	2.0×10^{-5}	1.1×10^{-3}
Trimethylbenzene	9.0×10^{-6}	4.6×10^{-4}
Xylene (total)	1.0×10^{-4}	5.3×10^{-3}
Total:	3.5×10^{-4}	1.8×10^{-2}

(1) Using USEPA Potency Factor
(2) Using ICF-Clement (1987) Potency Factor

TABLE 6-16

SUMMARY OF RISK ESTIMATES BY MEDIUM
MECHANICVILLE SITE

Medium	Most Probable Case	Realistic Worst Case
	Incremental Lifetime Carcinogenic Risk Estimates	
Surface Soil, Children	2.3×10^{-6}(1) 6.5×10^{-7}(2)	1.8×10^{-5}(1) 5.0×10^{-6}(2)
Subsurface Soil, Worker	1.3×10^{-7}(1) 3.6×10^{-8}(2)	3.5×10^{-5}(1) 9.9×10^{-6}(2)
Sediment, Children	9.4×10^{-9}(1) 2.6×10^{-9}(2)	2.1×10^{-6}(1) 5.8×10^{-7}(2)
Sediment, Workers	1.3×10^{-8}(1) 3.7×10^{-9}(2)	3.4×10^{-6}(1) 9.6×10^{-7}(2)
Inhalation, Children	2.2×10^{-7}(1) 4.9×10^{-8}(2)	1.3×10^{-5}(1) 2.6×10^{-6}(2)
	Noncarcinogenic Hazard Ratios	
Surface Soil, Children	1.1×10^{-4}	1.3×10^{-3}
Subsurface Soil, Worker	1.6×10^{-5}	2.2×10^{-3}
Sediment, Children	3.4×10^{-6}	2.0×10^{-4}
Sediment, Workers	5.2×10^{-6}	3.0×10^{-4}
Inhalation, Children	3.5×10^{-4}	1.8×10^{-2}

(1) Using USEPA Potency Factor
(2) Using ICF-Clement (1987) Potency Factor

MC_TAB_1.WK1

TABLE 6-17

SUMMARY OF CHEMICALS DETECTED IN SURFACE WATER
MECHANICVILLE SITE

CHEMICAL	UPSTREAM			ADJACENT			DOWNSTREAM		
	MEAN	MAX	DETECTION FREQUENCY	MEAN	MAX	DETECTION FREQUENCY	MEAN	MAX	DETECTION FREQUENCY
ACETONE	ND	-	0/3	3.3E-03	1.0E-02	1/3	ND	-	0/3
METHYLENE CHLORIDE	1.1E-03	5.4E-03	1/5	ND	-	0/4	ND	-	0/4
ACENAPHTHENE	ND	-	0/5	4.2E-03	2.1E-02	1/5	ND	-	0/5
ACENAPHTHYLENE	ND	-	0/5	4.4E-03	2.2E-02	1/5	ND	-	0/5
PYRENE	ND	-	0/5	2.0E-03	1.0E-02	1/5	ND	-	0/5
BIS(2-ETHYLHEXYL)PHTHALATE	8.8E-02	3.9E-01	3/5	1.2E-03	6.0E-03	1/5	1.1E-02	3.0E-02	2/5
2-METHYLNAPHTHALENE	ND	-	0/3	1.1E-02	3.5E-02	1/3	ND	-	0/5
CYANIDE (total)	2.0E-03	1.0E-02	1/5	2.0E-03	1.0E-02	2/5	2.0E-03	1.0E-02	1/5
IRON	4.2E-01	1.0E+00	5/5	8.9E-01	1.8E+00	5/5	4.4E-01	7.8E-01	5/5
ZINC	8.0E-03	3.0E-02	2/5	7.8E-03	2.0E-02	3/5	2.0E-03	1.0E-02	1/5

NOTES:
a Only chemicals found above detection limits presented.
b All compounds expressed in mg/l unless otherwise noted.
c ND = Not detected.

MP_TAB-2.WK1

TABLE 6-18

COMPARISON OF CHEMICALS FOUND IN SURFACE WATER SAMPLES WITH STANDARDS AND CRITERIA FOR THE PROTECTION OF AQUATIC LIFE
MECHANICVILLE SITE

COMPOUND	RANGE OF CONCENTRATIONS	CHRONIC AWQC		NEW YORK STATE CLASS D STANDARDS	NEW YORK STATE CLASS C STANDARDS
ACETONE	ND - 0.01	9.7	f	---	---
METHYLENE CHLORIDE	ND - 0.0054	11	g	---	---
ACENAPHTHENE	ND - 0.021	0.52		---	---
ACENAPHTHYLENE	ND - 0.022	0.037	f	---	---
PYRENE	ND - 0.01	0.013		---	---
BIS(2-ETHYLHEXYL)PHTHALATE	ND - 0.39	0.012	f	---	0.0006
2-METHYLNAPHTHALENE	ND - 0.035	0.027	f	---	---
CYANIDE	ND - 0.01	0.0052		0.022	0.0052
IRON	0.037 - 1.8	1.0		0.3	0.3
ZINC	ND - 0.02	0.11		0.23	0.03

NOTES:

a Only those compounds found above detection limits presented.
b All compounds expressed in mg/l unless otherwise noted.
c Ambient Water Quality Criteria (USEPA, 1986) for freshwater species, assuming hardness of 100mg/l.
d NYSDEC (1986). Creek is currently graded Class D in the vicinity of the site. Assuming hardness of 100mg/l.
e Not detected (see Task 2 Report Appendix for minimum detection limits [Jordan, 1987]).
f Based on a 10-fold safety factor of an estimated EC50 value for Daphnia magna, using a QSAR equation from Hermens et al., 1984
g Criterion for total halomethanes.

MP_TAB-3.WK1

TABLE 6-19

COMPARISON OF CHEMICALS FORUND IN GROUNDWATER SAMPLES WITH STANDARDS
AND CRITERIA FOR THE PROTECTION OF AQUATIC LIFE
ASSUMING DILUTION WITH RECEIVING WATER DURING LOW FLOW CONDITIONS

COMPOUND	RANGE OF CONCENTRATIONS IN GROUNDWATER	REPORTED MAXIMUM SOLUBILITY	ESTIMATED CONCENTRATION IN ANTHONY KILL ASSUMING DILUTION	CHRONIC AWQC	NEW YORK STATE CLASS D STANDARDS/ GUIDANCE VALUES
BENZENE	ND-12.0		2.003-03	0.0530 i	0.0060000
TOLUENE	ND-6.4		1.00E-03	0.1750 i	---
ETHYLBENZENE	ND-2.0		4.00E-04	0.3200 i	---
TOTAL XYLENES	ND-3.5		7.00E-04	0.0530 h	---
ACENAPNTHENE	ND-210.0	3.42000	6.38E-04	0.5200	---
ACENAPHTHYLENE	ND-173.74	3.93000	7.33E-04	0.0370 h	---
ANTHRACENE	ND-203.07	1.29000	2.41E-04	0.0120 h	---
BENZO(b)FLUORANTHENE	ND-25.0	0.14000	2.61E-05	0.0010 h	---
BENZO(k)FLUORANTHENE	ND-25.0	0.00055	1.03E-07	0.0010 h	---
BENZO(a)ANTHRACENE	ND-25.0	0.04400	8.20E-06	0.0030	---
BENZO(A)PYRENE	ND-25.0	0.00380	7.09E-07	0.0012	0.0000012
CHRYSENE	ND-25.0	0.00600	1.12E-06	0.0020 h	---
FLUORANTHENE	ND-82.0	0.26000	4.85E-05	0.0130 j	---
FLUORENE	ND-110.0	1.98000	3.69E-04	0.0120 h	---
NAPHTHALENE	ND-580.0	34.40000	6.41E-03	0.6200	---
PHENANTHRENE	ND-320.0	1.29000	2.41E-04	0.0360	---
PYRENE	ND-130.0	0.14000	2.61E-05	0.0130	---
2-METHYLNAPHTHALENE	ND-540.0	28.00000	5.22E-03	0.0270 h	---
PHENOL	ND-0.58		1.00E-04	2.5600	0.0050000
BIS(2-ETHYLHEXYL)PHTHALATE	ND-1.71	0.40000	7.46E-05	0.0120 h	---
IRON	ND-25.0		5.00E-03	1.0000	0.3000000
TOTAL CYANIDE	ND-0.8		2.00E-04	0.0052	0.2200000
ZINC	ND-1.09		2.00E-04	0.1100	0.2300000

NOTES:

a See text for criteria for selecting compounds.
b All compounds expressed in mg/l unless otherwise noted.
c Including all wells sampled in 1986 and 1987.
d dilution factor of 5363 used; from ratio of annual low-flow estimate in Anthony Kill (17cfs) to groundwater flow(0.003 cfs) in shallow bedrock. See text for assumptions.
e Ambeint Water Quality Criteria(USEPA, 1986) for freshwater species, assuming hardness of 100mg/l.
f NYSDEC (1986). Creek is currently graded Class D in the vicinity of the site. Assuming hardness of 100mg/l.
g Not detected(see task 2 Report Appendix for minimum detection Limits [Jordan, 1987]).
h Based on a 10-fold safety factor applied to the estimated EC50 value for Daphnia magna using a QSAR equation from Hermens et al., 1984
i Estimated from acute AWQC using a ratio of 100:1.
j EPA, 1988.
k See Appendix F for references to PAH solubility data.

MC_TAB-4.WK1

TABLE 6-20

SUMMARY OF CHEMICALS DETECTED IN ANTHONY KILL SEDIMENT
MECHANICVILLE SITE

CHEMICAL	UPSTREAM			ADJACENT			DOWNSTREAM		
	MEAN	MAX	DETECTION FREQUENCY	MEAN	MAX	DETECTION FREQUENCY	MEAN	MAX	DETECTION FREQUENCY
ACETONE	2.6E+00	5.3E+00	1/2	2.6E+00	5.2E+00	1/2	2.0E+00	4.0E+00	1/2
BENZENE	ND	-	0/4	1.8E-02	7.0E-02	1/4	ND	-	0/4
ETHYLBENZENE	ND	-	0/4	2.2E-02	8.7E-02	1/4	ND	-	0/4
METHYLENE CHLORIDE	6.0E-01	2.4E+00	1/4	7.4E-01	3.0E+00	1/4	5.7E-01	2.3E+00	1/4
TOLUENE	ND	-	0/4	ND	-	0/4	1.8E-02	7.0E-02	1/4
ACENAPHTHENE	ND	-	0/4	5.9E-01	1.6E+00	4/6	ND	-	0/4
ACENAPHTHYLENE	ND	-	0/4	1.0E+00	3.0E+00	4/6	ND	-	0/4
ANTHRACENE	ND	-	0/4	7.5E-01	1.6E+00	5/7	1.2E-01	4.7E-01	1/4
BENZO(b)FLUORANTHENE	ND	-	0/4	2.8E-01	4.8E-01	3/5	1.2E-01	4.7E-01	1/4
BENZO(k)FLUORANTHENE	ND	-	0/4	1.1E+00	3.1E+00	5/7	1.2E-01	4.7E-01	1/4
BENZO(g,h,i)PERYLENE	ND	-	0/4	1.4E-01	4.0E-01	3/6	1.2E-01	4.7E-01	1/4
BENZO(a)ANTHRACENE	4.1E-02	1.7E-01	1/4	9.5E-01	2.5E+00	4/6	1.2E-01	4.7E-01	1/4
BENZO(a)PYRENE	ND	-	0/4	8.4E-01	2.0E+00	5/7	1.2E-01	4.7E-01	1/4
CHRYSENE	4.1E-02	1.7E-01	1/4	8.9E-01	2.3E+00	4/6	1.2E-01	4.7E-01	1/4
DIBENZO(a,h)ANTHRACENE	ND	-	0/4	2.8E-02	1.7E-01	1/6	ND	-	0/4
FLUORANTHENE	4.1E-02	1.7E-01	1/4	2.7E+00	1.0E+01	5/7	1.6E-01	4.7E-01	2/4
FLUORENE	ND	-	0/4	1.0E-01	4.0E-01	3/5	ND	-	0/4
INDENO(1,2,3-cd)PYRENE	ND	-	0/4	1.1E-01	3.0E-01	3/6	1.2E-01	4.7E-01	1/4
NAPHTHALENE	ND	-	0/4	2.1E+00	8.7E+00	6/7	4.1E-02	1.7E-01	1/4
PHENANTHRENE	4.1E-02	1.7E-01	1/4	2.1E+00	5.5E+00	6/7	1.6E-01	4.7E-01	2/4
PYRENE	4.1E-02	1.7E-01	1/4	2.5E+00	7.6E+00	5/7	1.6E-01	4.7E-01	2/4
BIS(2-ETHYLHEXYL)PHTHALATE	1.4E-01	5.5E-01	1/4	9.6E-01	2.8E+00	4/6	1.1E-01	4.5E-01	1/4
2-METHYLNAPHTHALENE	ND	-	0/4	6.7E-01	2.7E+00	5/7	ND	-	0/4
DI-N-BUTYL PHTHALATE	2.1E+00	2.1E+00	1/1	2.0E+00	2.0E+00	1/1	3.2E+00	3.2E+00	1/1
DI-N-OCTYL PHTHALATE	1.3E+01	1.3E+01	1/1	5.0E-01	5.0E-01	1/1	5.8E-01	9.0E-01	1/1
CYANIDE (total)	ND	-	0/3	4.3E-01	1.3E+00	1/3	ND	-	0/3
IRON	1.1E+04	1.6E+04	3/3	1.5E+04	2.7E+04	3/3	1.8E+04	3.3E+04	3/3
ZINC	3.2E+01	3.4E+01	2/2	4.6E+01	4.6E+01	2/2	5.1E+01	7.6E+01	2/2

NOTES:
a Only those compounds found above detection limits are presented.
b All compounds expressed in mg/kg unless otherwise noted.
c ND = Not detected.

TABLE 6-21

COMPARISON OF CHEMICAL CONCENTRATIONS WITH EFFECT RANGE LOW VALUES (ER-Ls) AND INTERIM SEDIMENT QUALITY CRITERIA FOR THE PROTECTION OF AQUATIC LIFE
MECHANICVILLE SITE

			UPSTREAM		ADJACENT		DOWNSTREAM	
COMPOUND	ER-L (a) (mg/kg)	SQC (b) (mg/kg C)	MAXIMUM CONCENTRATION (mg/kg)	NORMALIZED CONCENTRATION (mg/kg C) (c)	MAXIMUM CONCENTRATION (mg/kg)	NORMALIZED CONCENTRATION (mg/kg C)	MAXIMUM CONCENTRATION (mg/kg)	NORMALIZED CONCENTRATION (mg/kg C)
Acenaphthene	150	140 (64-300)	nd		1.63	75.8	nd	
Anthracene	85	na	nd		1.6	74.4	0.47	36.4
Benzo(a)anthracene	230	1317 (217-7,999)	0.17	19.8	2.5	116.3	0.47	36.4
Benzo(a)pyrene	400	1063 (225-5018)	nd		2	93.0	0.47	36.4
Chrysene	400	na	0.17	19.8	2.3	107.0	0.47	36.4
Dibenzo(a,h)anthracene	60	na	nd		0.17	7.9	nd	
Fluoranthene	600	1020 (470-2,190)	0.17	19.8	10	465.1	0.47	36.4
Fluorene	35	na	nd		0.4	18.6	nd	
2-Methylnaphthalene	65	na	nd		2.7	125.6	nd	
Naphthalene	340	na	nd		8.7	404.7	nd	
Phenanthrene	225	120 (56-260)	0.17	19.8	5.5	255.8	0.47	36.4
Pyrene	350	1311 (265-6465)	0.17	19.8	7.6	353.5	0.47	36.4
Zinc	120	na	34		46		76	

NOTES:

a Effects Range Low, the concentration at the low end of the range at which effects have been observed, equivalent to the 10th percentile concentration (Long and Morgan, 1991).

b Interim Sediment Quality Criterion, expressed as mg per kg of sediment carbon. Figures in brackets are the lower and upper 95% confidence interval values.

c Chemical concentration expressed in terms of kilograms of carbon, obtained by multiplying the chemical concentration by the total organic carbon concentration of 0.86%, 2.15%, and 1.29% for the upstream, adjacent, and downstream locations, respectively.

d "na" = none available; "nd" = not detected; shaded areas indicate concentrations that exceed either the criterion/guideline.

TABLE 8-1

SCOPE OF ACTIVITIES
PHASE IIA SUPPLEMENTAL REMEDIAL INVESTIGATION
MECHANICVILLE SITE

	OBJECTIVE		SCOPE OF WORK
A.	Characterize contamination east of North Central Avenue	1.	Map bedrock topography east of site (on Price Chopper property) using seismic refraction to trace east trending bedrock valley.
		2.	Install boring and one shallow/deep monitoring well pair in bedrock valley on western portion of Price Chopper property, east of North Central Avenue
		3.	Collect shallow and deep soil samples form boring and groundwater samples from monitoring well.
		4.	Install three deep soil borings further downgradient of monitoring well pair if visible evidence of contamination is observed.
		5.	Install one to two additional soil borings/monitoring wells behind the Price Chopper building if visible evidence of contamination is encountered.
B.	Assess PCB contamination in former electrical equipment storage areas	1.	Conduct PCB sampling and analysis of each storage area at depths of approximately 3 and 12 inches below the surface.
		2.	Sample areas showing visible evidence of oil stains.
C.	Assess the area west of the former MGP location for contamination	1.	Define site history of "Mechanics Shop/Storage Building" (former radiator shop) to determine potential contaminant sources.
		2.	Conduct surface/shallow subsurface sampling.
		3.	Install boring/monitoring well to assess deep subsurface soils and groundwater quality at an upgradient location.
D.	Evaluate hydraulic connection between site groundwater, the Anthony Kill and groundwater north of the Anthony Kill	1.	Install piezometers on both banks of the Anthony Kill adjacent and downstream of the site.
		2.	Survey elevations of newly installed piezometers and monitoring wells (Objectives A, C and D) and measure stream and groundwater elevations.
		3.	Screen (UV/IR) sediment samples along southern bank of Anthony Kill to locate discharge zones and to place seepage meters.
		4.	Sample sediments to profile discharge areas.
		5.	Install seepage meters and measure discharge rate and groundwater (seep) quality if discharging conditions are encountered.

TABLE 8-2
TECHNICAL APPROACH RATIONALE

PHASE IIA REMEDIAL INVESTIGATION WORK PLAN
MECHANICVILLE SITE

TYPE/ID	LOCATION	ESTIMATED DEPTH (FEET)	RATIONALE
SOIL INVESTIGATION			
SOIL BORINGS			
B-16	West of site, adjacent to southern property line.	10 (to bedrock)	Obtain information on the subsurface soil in an upgradient location on the west of the site where previous investigations did not focus. To be completed as a water table monitoring well.
B-17	In bedrock trough, east and adjacent to North Central Avenue.	30 (to bedrock)	Obtain information on the subsurface soil downgradient of the site where coal tar and related chemicals could potentially migrate. To be completed as a water table monitoring well.
B-18	Same as B-17.	45	Obtain information on the bedrock quality and structure in the bedrock trough. To be completed as a bedrock monitoring well.
B-19 through B-21	Downgradient of B-17 and B-18.	40 (to bedrock)	To be completed only if soil contamination is encountered in B-17. These borings will form a line transecting the bedrock trough (if discernable) to obtain information on the extent of subsurface soil contamination further downgradient of the site.

TABLE 8-2 (cont'd)
TECHNICAL APPROACH RATIONALE

PHASE IIA REMEDIAL INVESTIGATION WORK PLAN
MECHANICVILLE SITE

TYPE/ID	LOCATION	ESTIMATED DEPTH (FEET)	RATIONALE
B-22 through B-23	Behind Price Chopper building.	Unknown	Exact location currently unknown. If groundwater contamination is encountered in wells installed in B-17 and B-18, these borings will be completed as monitoring wells to obtain information on groundwater quality further downgradient of the site.
SHALLOW SUBSURFACE SOIL SAMPLING			
SS-20 through SS-24	West of site.	0-1	Obtain information to characterize surface soil contamination (cyanides and PAHs) due to reported spent oxide disposal in this area.
SS-25 through SS-28	PCB Sampling Area 1 (see Figure 8-1).	0-1	Obtain information on potential PCB soil contamination due to former storage of PCB containing electrical equipment.
SS-29 through SS-32	PCB Sampling Area 2 (see Figure 8-1).	0-1	Obtain information on potential PCB soil contamination due to former storage of PCB containing electrical equipment.
SS-33 through SS-36	PCB Sampling Area 3 (see Figure 8-1).	0-1	Obtain information on potential PCB soil contamination due to former storage of PCB containing electrical equipment.

TABLE 8-2 (cont'd)
TECHNICAL APPROACH RATIONALE

PHASE IIA REMEDIAL INVESTIGATION WORK PLAN
MECHANICVILLE SITE

TYPE/ID	LOCATION	ESTIMATED DEPTH (FEET)	RATIONALE
SS-37 through SS-40	PCB Sampling Area 4 (see Figure 8-1).	0-1	Obtain information on potential PCB soil contamination due to former storage of PCB containing electrical equipment.
SS-41 through SS-44	PCB Sampling Area 5 (see Figure 8-1).	0-1	Obtain information on potential PCB soil contamination due to former storage of PCB containing electrical equipment.
SS-45 through SS-48	PCB Sampling Area 6 (see Figure 8-1).	0-1	Obtain information on potential PCB soil contamination due to former storage of PCB containing electrical equipment.
HYDROGEOLOGIC INVESTIGATION			
MONITORING WELLS			
MW-16 (B-16)	West of site, adjacent to southern property line.	10	Well will be screened to straddle the water table. Characterize upgradient groundwater west of the site and provide additional groundwater surface measuring point to better define groundwater flow across the site.
MW-17 (B-17)	In bedrock trough, east and adjacent to North Central Avenue.	30	Will be screened above any confining soil strata or on top of bedrock. Characterize groundwater in bedrock trough, expected to be migrating from the site and to contain coal tar constituents.

TABLE 8-2 (cont'd)
TECHNICAL APPROACH RATIONALE

PHASE IIA REMEDIAL INVESTIGATION WORK PLAN
MECHANICVILLE SITE

TYPE/ID	LOCATION	ESTIMATED DEPTH (FEET)	RATIONALE
MW-18 (B-18)	Same as MW-17.	45	Will be screened in the top 10 to 15 feet of bedrock. Characterize bedrock groundwater quality in expected plume migration pathway and determine vertical hydraulic gradients.
MW-22 through MW-23 (B-22 through B-23)	Behind Price Chopper building.	Unknown	Exact location unknown. Will be installed in expected plume migration pathway to monitor groundwater quality further downgradient of the site if contamination is encountered in MW-17 or MW-18.
PIEZOMETERS			
P-3, P-5	Southern bank of Anthony Kill, adjacent to the site.	—	Evaluate relationship of groundwater levels to surface water levels adjacent to the site to determine if discharging or recharging conditions exist.
P-4, P-6	Northern bank of Anthony Kill, across from the site.	—	Evaluate relationship of groundwater levels to surface water levels adjacent to the site to determine if discharging or recharging conditions exist.
P-7, P-9	Southern bank of Anthony Kill, downgradient of the site.	—	Exact locations to be determined in the field. Evaluate relationship of groundwater levels to surface water levels downgradient of the site to determine if discharging or recharging conditions exist.

TABLE 8-2 (cont'd)
TECHNICAL APPROACH RATIONALE

PHASE IIA REMEDIAL INVESTIGATION WORK PLAN
MECHANICVILLE SITE

TYPE/ID	LOCATION	ESTIMATED DEPTH (FEET)	RATIONALE
P-8, P-10	Northern bank of the Anthony Kill, downgradient of the site.	—	Exact locations to be determined in the field. Evaluate relationship of groundwater levels to surface water levels downgradient of the site to determine if discharging or recharging conditions exist.
SEDIMENT SAMPLING	Locations to be determined in the field.	—	Assess chemical quality of sediments in areas anticipated to be groundwater discharge locations from the site. Sediment sampling and screening to be used to determine locations of seepage meters.
SEEPAGE METER INVESTIGATION	Locations to be determined in the field.	—	Assess discharge rates of site groundwater to the Anthony Kill adjacent to and downgradient of the site.

TABLE 8-3
NYSEG MECHANICVILLE SITE

PHASE IIA REMEDIAL INVESTIGATION
SAMPLE ANALYSIS PLAN

TYPE OF INVESTIGATION	MEDIUM	TOTAL EXPECTED NO. OF SAMPLES	VOAs NYSDEC ASP 91-1	VOAs NYSDEC ASP 91-4	SVOAs NYSDEC ASP 91-2	INORGANICS (SEE NOTES 2 AND 3) FILTERED	INORGANICS (SEE NOTES 2 AND 3) TOTAL	REACTIVE CYANIDE USEPA METHOD 9010	REACTIVE SULFIDE USEPA METHOD 9030	PCBs (9) USEPA METHOD 8080	TURBIDITY	MATRIX SPIKE	MATRIX SPIKE DUPLICATE	LEVEL OF DATA QUALITY(5)
Borings (1)	Soil	2 samples 1 duplicate 3 total (1)	3		3		3	3	3			1	1	IV
Shallow Subsurface Soil Sampling	Soil	5 samples 1 duplicate 6 total						6	6			1	1	IV
		24 samples 3 duplicates 27 total								27		2	2	III
Sediment	Soil	6 samples 1 duplicates 7 total	7		7		7	7	7			1	1	IV
Monitoring Wells: (6, 8)	Water	15 samples 2 duplicate 17 total	14	3	17	17	17				17	1	1	IV
Seep Meters or Surface Water (7)	Water	5 samples 1 duplicate 6 total		6	6	6	6				6	1	1	IV

Notes:

1. A minimum of one sample from each boring sampled will be submitted for laboratory analysis from the contaminated area or the well screen depth or both if different.
2. Analytes include Fe, Zn, Al, Cd, Sb, Co, Cu, Mn, Ni, Pb, Cr, and total amenable, and ferro-ferric cyanide. ASP Superfund CLP analytical methods will be used.
3. Filtered/unfiltered applicable to groundwater samples for metals.
4. ASP denotes NYSDEC Analytical Services Protocol, December 1991 revision.
5. All data validation performed according to USEPA protocol. 10% of samples will be subject to full validation, 90% to blank validation.
6. Samples from MW-22 and MW-23 behind Price Chopper will only be collected if these wells are deemed necessary and installed. Therefore, they are not included in this table.
7. Five seep meter/surface water samples will be collected. Surface water samples will be taken inplace of seepage meter samples where seepage meters prove ineffective.
8. All existing monitoring wells are to utilize NYSDEC ASP 91-1 for VOAs. All proposed wells (i.e., MW-16, MW-17, MW-18, MW-22 and MW-23) are to utilize NYSDEC ASP 91-4.
9. All PCB analyses will be performed using USEPA Method 8080 by NYSEG laboratories or NYSDOH ELAP-CLP certified laboratories.