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

TASK 1 REPORT
PRELIMINARY SITE EVALUATION

Prepared for

New York State Electric and Gas Corp.
4500 Vestal Parkway East
Binghamton, New York 13903-1082

By

E.C. Jordan Co.
P.O. Box 7050, DTS
Portland, ME 04112

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INVESTIGATION OF THE FORMER COAL GASIFICATION SITE AT MECHANICVILLE, NEW YORK TASK 1 REPORT PRELIMINARY SITE EVALUATION

1.0 INTRODUCTION

1.1 Purpose

The former coal gasification site at Mechanicville, New York is currently being investigated by the E.C. Jordan Co. under contract to the New York State Electric and Gas Corporation (NYSEG). The investigation is divided into five tasks which will be conducted using a phased approach: (1) preliminary site evaluation; (2) initial field investigation program; (3) expanded problem definition program; (4) risk assessment; and (5) conceptual design.

The purpose of Task 1 is to develop an understanding of the site's history, environmental setting, and current condition based on available information and direct observation. The information gathered in Task 1 is then used to better define the nature and scope of Task 2 activities. This report summarizes the findings of Task 1 and provides justification and recommendations for activities to be undertaken during Task 2.

1.2 Scope

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 vertical stratigraphy of geologic materials; map the migration route of any conductive groundwater contaminant plume; and, identify subsurface anomalies which may warrant further investigation.

5. Preparation of a report presenting the findings of Task 1 including a plan showing significant natural and man-made features at the site and formulation of recommendations to address any suspected problems before proceeding with the Task 2 investigation.

Task 1 activities included a detailed site reconnaissance, interviews, and file searches. The site was visited by E.C. Jordan personnel on January 21, 1986 and May 5, 6, and 7, 1986. The current 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, current 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.

2.0 SITE DESCRIPTION

2.1 Location

The Mechanicville site is located in Saratoga County in the City of Mechanicville, New York (Figure 1). The coal gasification plant was located near the intersection of North Central Avenue and Ferris Lane. Two of the original gas plant structures are still standing at the site. The nearest surface water body is the Anthony Kill, a stream which borders the site on the north.

2.2 History of Gas Production

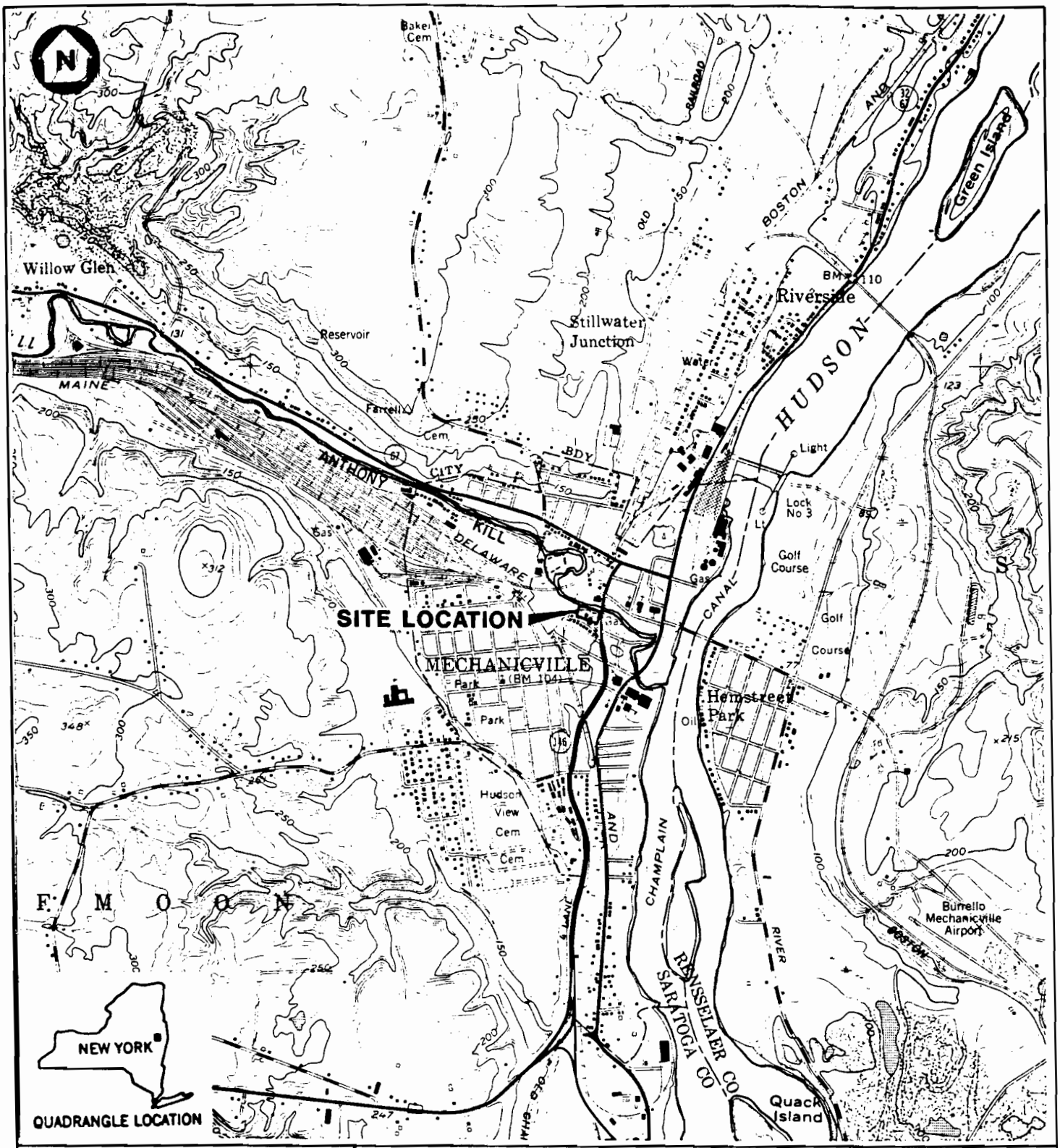
The history of coal gas production at the Mechanicville site dates from 1901. In that year, the Halfmoon Light, Heat & Power Co., founded in 1900, began distributing gas to the citizens of Mechanicville (Reference 1). Figure 2 shows the layout of the gas plant in its first years of operation, circa 1910 (Ref.2).

The plant was expanded circa 1911 when a $3\frac{1}{2}$-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 (Ref. 3). A second gas holder was also added during the expansion. The new gas holder had a 100,000 cubic feet capacity while the original holder held only 40,000 cubic feet of gas. In 1910, the company served approximately 325 gas customers (Ref.1).

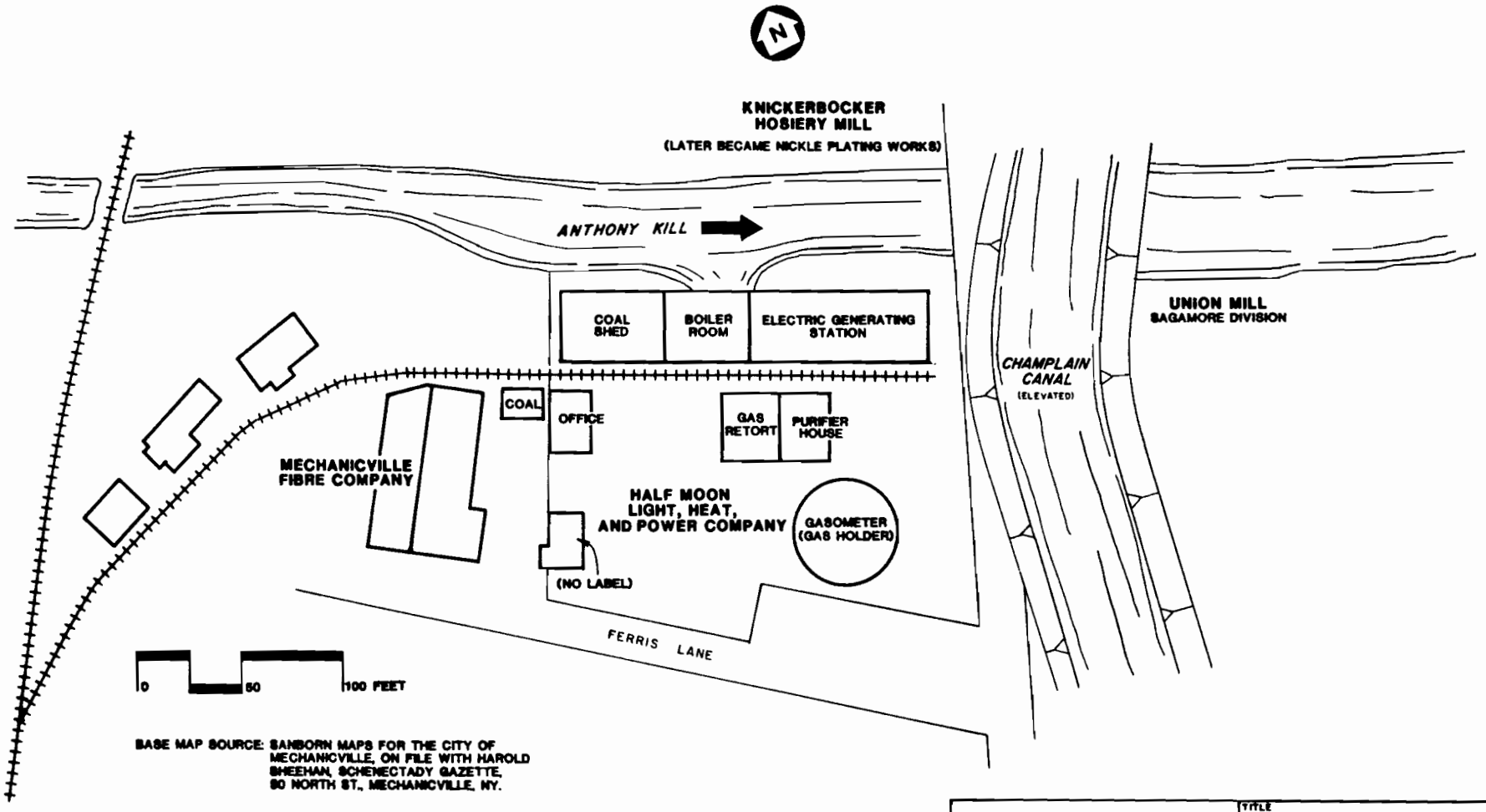
In 1924, the Halfmoon Light, Heat & Power Co. was acquired by the Associated Gas and Electric System and in 1928 it became part of the New York State Electric and Gas Corporation (NYSEG) (Ref.1). The plant layout in 1951 is depicted in Figure 3. Coal gas production continued at the site until 1955 (Ref. 4). NYSEG still owns the site which is now a natural gas and electric service center.

During the years of coal gas production, Pennsylvania coal was delivered to the site by rail along the spur depicted in Figures 2 and 3. Anthracite coal was used to make gas and was stored outside adjacent to the gas house. Soft bituminous coal which was fed to the boilers was stored in the coal shed (Ref. 4).

The process used to manufacture gas at the site was the water gas process (Ref.1). There are two types of water gas: blue gas and carburetted water gas (Ref. 3). NYSEG employees who worked at the gas plant in the 1950's described using the carburetted water gas process to produce a gas with 850 Btu per cubic foot (Refs. 5, 6). It is likely that the blue gas process, which produced a gas with a heating value of just below 300 Btu 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

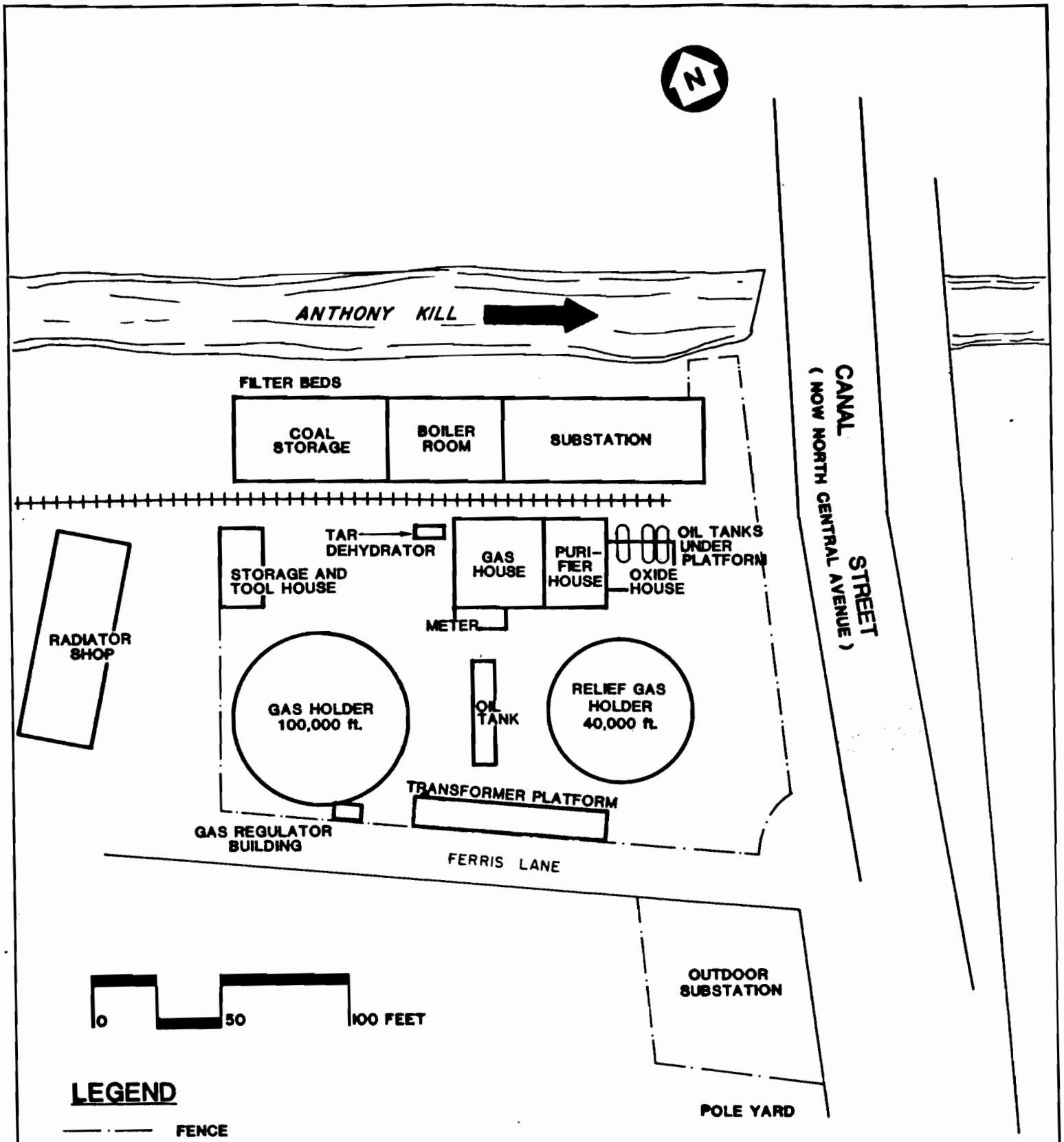


BASE MAP SOURCE: USGS QUADRANGLE MECHANICVILLE (1980)	E.C. JORDAN CO. CONSULTING ENGINEERS	TITLE: MECHANICVILLE SITE LOCATION MAP
SCALE IN FEET: 0 — 2000 — 4000	CLIENT: NEW YORK STATE ELECTRIC AND GAS CORP. BINGHAMTON, NEW YORK	INVESTIGATION OF FORMER COAL GASIFICATION SITES
		PROJECT NO. 4945-01 FIGURE 1



BASE MAP SOURCE: SANBORN MAPS FOR THE CITY OF MECHANICVILLE, ON FILE WITH HAROLD SHEEHAN, SCHENECTADY GAZETTE, 90 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. 4946-01 FIGURE 2



BASE MAP PREPARED BY BROWN, CROSBY, & CO., INC., ENGINEERING DEPARTMENT, 86 WALL ST. NEW YORK, APRIL 1951.

E.C. JORDAN CO. CONSULTING ENGINEERS	PLAN OF THE MECHANICVILLE COAL GASIFICATION PLANT CIRCA 1951
NEW YORK STATE ELECTRIC AND GAS CORP. BINGHAMTON, NEW YORK	INVESTIGATION OF FORMER COAL GASIFICATION SITES
	JOB NO. 4945-01 FIGURE 3

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 (Ref. 3).

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 (Refs. 4, 5, 6). This flow path differs from the typical water gas plant where the gas was stored in the relief holder prior to being purified (Ref. 3). The oxide house was apparently used for storage of spent and/or fresh oxide material used to purify the gas.

The oil used in the carburetted water gas process was stored in three above-ground 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 above ground oil tank (10,000 gallons) was located between the two gas holders as shown in Figure 3 (Refs. 4, 5, 6).

The following byproducts 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 (Ref. 3). NYSEG employees provided the following information about waste disposal in the 1940's and 1950's (Refs. 4, 5, 6).

The ashes and clinkers (chunks of uncombusted 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 (Ref. 4).

The condensate from the water gas process was treated in the tar dehydrator (tar separator) (Figure 3). This was a 1,000-gallon tank used to separate the oil in the condensate from the water (Ref. 5). 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 3). The beds were described as being made of wood and 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 (Refs. 5, 6).

Wood chips treated with iron oxide were used to remove hydrogen sulfide from the gas in the purifier house (Refs. 3, 5). 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 (Ref. 5); (2) piled along the road until someone came and hauled them away (Ref. 5); and (3) spread on the lot just west of the active plant area (Ref. 6). 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-1950's (Ref. 7). This site is currently under investigation by E.C. Jordan for NYSEG (Ref. 8).

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 (Refs. 4, 6).

Gas production at the Mechanicville plant ended in 1955 when natural gas became available (Ref. 4). Most of the above-ground 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 holder. Gravel was used to fill in the below grade portions of both gas holders (Ref. 4). The filter beds were covered with soil, apparently without prior removal of the coke (Ref. 5).

NYSEG collected soil samples from the filter beds area and the relief gas holder foundation in November 1981 (Ref. 7). Petroleum odors and tar residues were encountered at depths of 3 to 5 feet 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 EP toxicity. The samples did not exhibit any of the characteristics of hazardous waste, but the sample from the filter tanks had a high level of sulfides (1,300 mg/kg) and the relief holder sample contained 40 mg/ℓ of total phenols (Ref. 7).

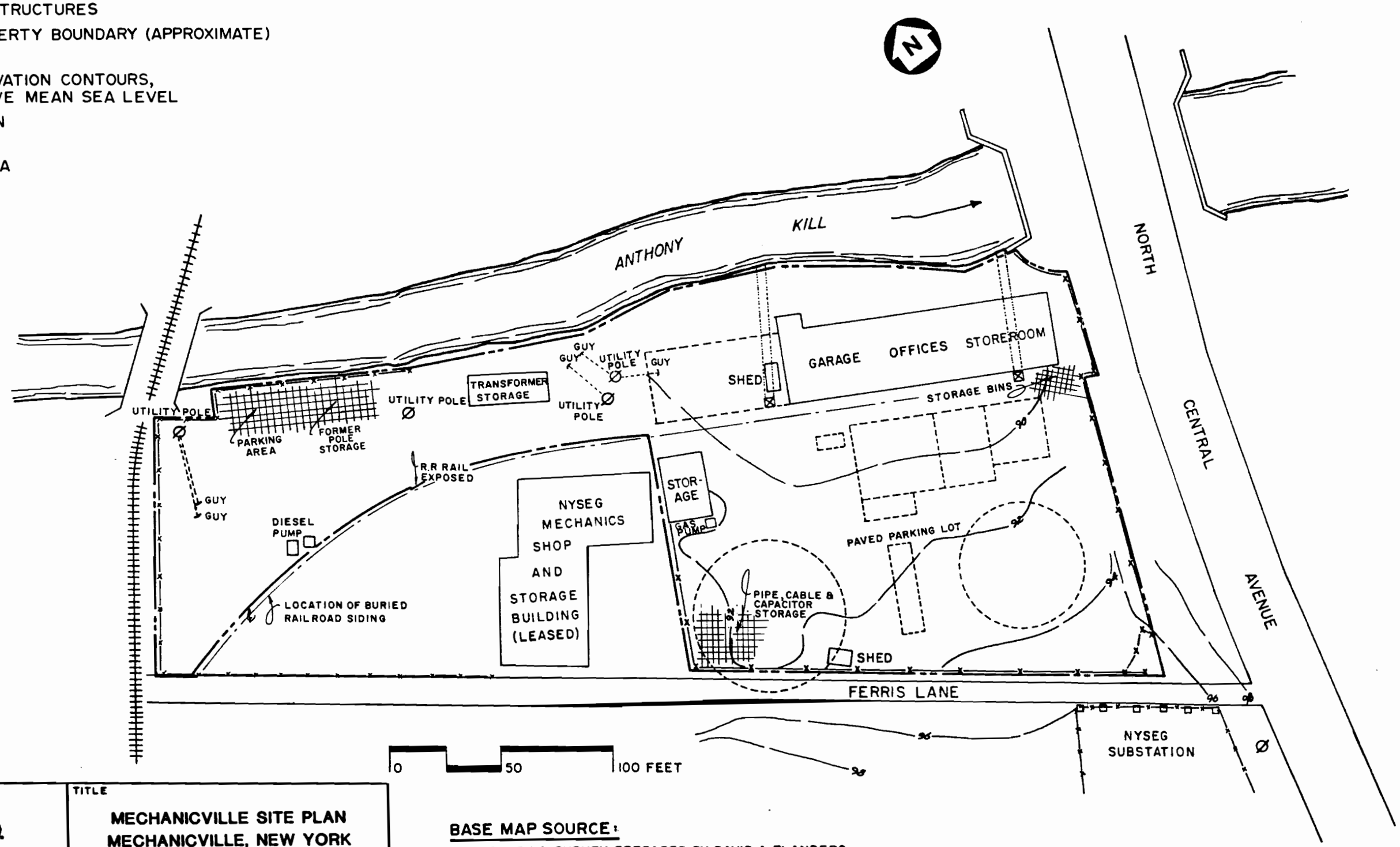
2.3 Recent Site Use History

The Mechanicville site, as it appears today, is depicted in Figure 4. 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 distribution shed was constructed over a portion of the old distribution gas holder. The former boiler room/substation building was converted to offices, a garage, and a supply storage maintenance shop. The old office is now used as a storage shed and toolhouse. There is a buried gasoline storage tank containing unleaded fuel just off of the southeast corner of the old office. The 2,000-gallon tank, installed around 1980, replaced an older tank which was reportedly taking in water. No gasoline leaks were reported (Ref. 6).

LEGEND

- APPROXIMATE LOCATION OF FORMER GAS PLANT STRUCTURES
- NYSEG PROPERTY BOUNDARY (APPROXIMATE)
- FENCE
- GROUND ELEVATION CONTOURS, IN FEET ABOVE MEAN SEA LEVEL
- STORM DRAIN
- CULVERT
- STORAGE AREA



E.C. JORDAN CO. CONSULTING ENGINEERS	TITLE: MECHANICVILLE SITE PLAN 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 4

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).

The remaining developed portion of the site is a paved parking lot. The pavement covers the old railroad siding. At the time of the 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 (Figure 4).

In 1922, NYSEG purchased a 0.25 acre lot on the corner of Ferris Lane and North Central Street. This property was vacant during most of the years the coal gas plant was operating. NYSEG built the electrical substation which now stands on the lot in 1953. NYSEG also owns property on the west side of the site (see Figure 4). The land between the railroad tracks and the Anthony Kill was purchased by NYSEG in 1952 (Ref. 9). As shown in Figure 4, portions of it have been used for pole and transformer storage and vehicle parking. The top 8 to 12 inches of soil beneath the transformer storage area were removed by NYSEG in August 1984 due to observed oil stains. Twelve drums of excavated soil were hauled to an approved disposal facility in Ohio and the excavated area was refilled with gravel. The soil was not tested for contamination prior to disposal (Ref. 10). There is also an active underground diesel fuel tank with a fuel pump on the west side of the lot. The railroad siding is buried under the blacktop which covers most of the lot.

2.4 Surrounding Land Use

2.4.1 Gas Production Years. In the early 1900's, the land use 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 1800's and early 1900's. An article by Hal Sheehan, the 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, hosier, planing, flax, grist, saw, and cotton) (Ref. 1). The locations of a few of these industries are depicted in Figure 2. A map dating from 1911 shows a residential neighborhood became established south of the plant site, between Ferris Lane and Burke Avenue. (Ref. 2).

The heavy industrialization of the Anthony Kill ended as electricity replaced the water wheel. The land use in the area 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 2). Like the present roadway, the canal was elevated and the water surface was approximately 10 feet above the gas plant site. The canal, which was hand dug, was approximately 30 feet wide and 12 feet deep. 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, saloons, and brothels (Ref. 1).

The Champlain 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 (Ref. 1).

2.4.2 Present Day. The gas plant site is in a mixed commercial/residential section of Mechanicville. The former nickel plating mill, located to the north across the Anthony Kill from the plant, is now 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. NYSEG leases the former radiator shop just west of the site and uses the building as a mechanics shop and storage area. Except for the car lot, the adjacent property north of the Anthony Kill is undeveloped.

3.0 ENVIRONMENTAL SETTING

3.1 Climate

The Hudson Valley Region is divided by two climatic divisions (Ref. 11). 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 (Ref. 12). Mean monthly temperatures at Stillwater, New York, 3 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 (Ref. 13).

Wind data reported for the Albany County Airport, which is 10 to 12 miles south of the Mechanicville site, indicate that the wind is 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 (Ref. 14). This information is corroborated by five year wind rose data supplied by the New York State Department of Environmental Conservation (NYSDEC) (Ref. 15). The Albany County Airport monitors are located at an elevation of 292 feet above mean sea level (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 may be different. Local topography would favor a prevailing northwesterly wind direction for Mechanicville, New York (Ref. 16).

3.2 Physiography

Saratoga County is located in the Valley and Ridge Physiographic Province, in the east-cental part of New York (Ref. 17, 18). The area is characterized by the Hudson River and its tributaries which fill pre-glacial valleys carved into

the bedrock. The Hudson River forms the northeastern and eastern boundary of Saratoga County and 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 located along the southern border of the Anthony Kill, one-quarter of a mile upstream of the confluence of the Anthony Kill and the Hudson River. The site lies in an outwash plain, at approximately 95 feet above MSL. Topographic terraces to the north and south of Mechanicville are over 300 feet above MSL (Ref. 19).

3.3 Geology and Soils

3.3.1 Regional. The Hudson River Valley and its tributaries overlie highly folded and faulted shales which were 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 gravels 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. (Ref. 20). 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. (Refs. 17, 19, 21). Meltwater drainage slowed, leaving a now much undersized stream flowing through the Anthony Kill Valley.

3.3.2 Local. 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 (Refs. 22, 23, 24). 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 (Ref. 23). In some locations, a clay layer is found overlying bedrock. According to local well drillers, the bedrock is highly fractured and folded (Ref. 25). 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 (Ref. 26). 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 (Ref. 17).

3.4 Groundwater

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 gravels, 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 gravels 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 (Ref. 17).

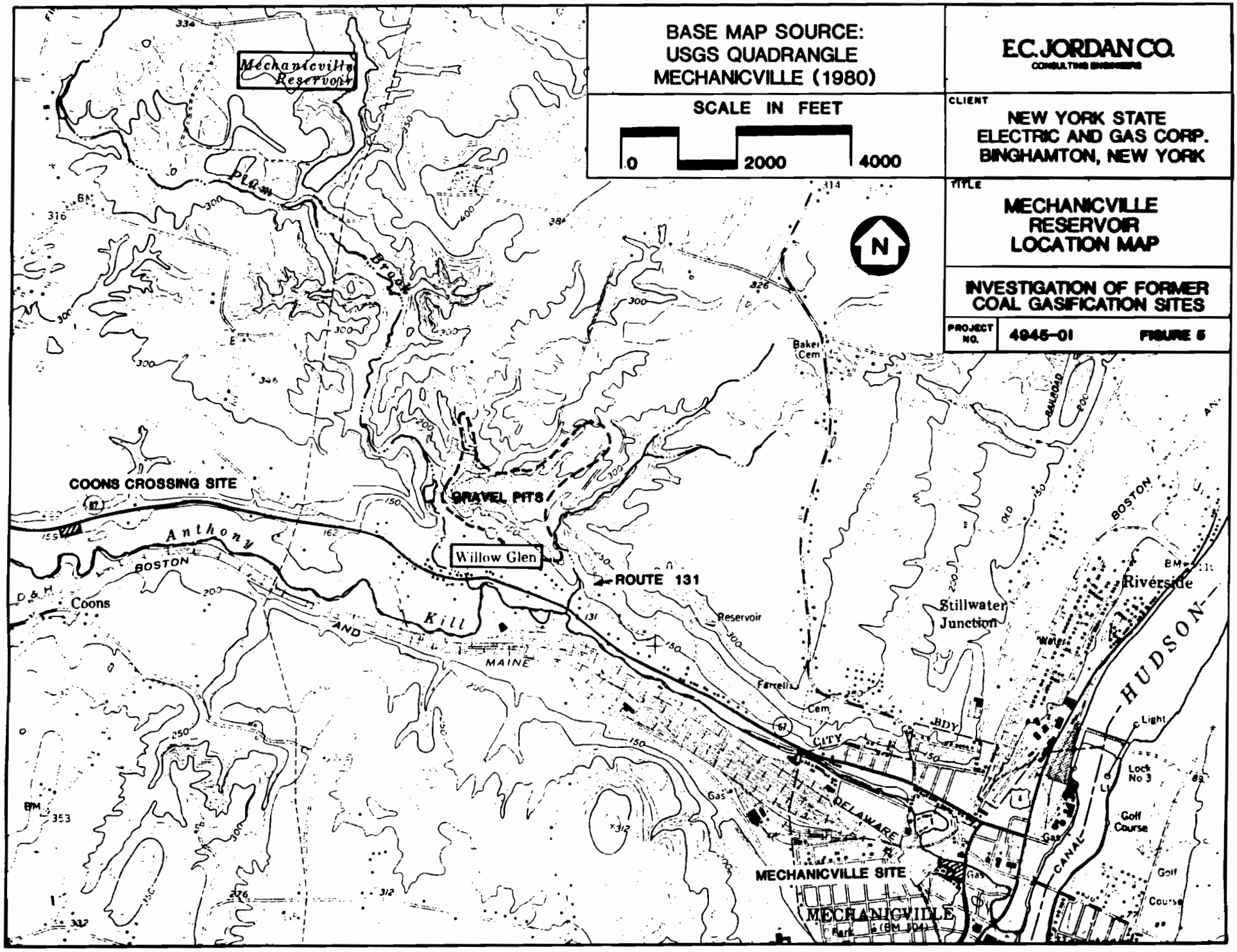
The groundwater surface at the site is expected to occur between the soil layer and the shallow bedrock formation (Ref. 7). However, a perched water table may occur above the sand/clay interface (Ref. 26). Based on the topographic setting and location of the Anthony Kill and the Hudson River, groundwater is anticipated to be moving to the north, discharging to the Anthony Kill. Groundwater flow directions on-site, however, may be locally controlled by subsurface conditions.

The City of Mechanicville has historically used surface water supplies for a drinking water source. A few residences outside of the city limits, however, use groundwater for drinking water (Ref. 27). 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), described previously; and, a well drilled into the shale which was used by the former Mintzer Petroleum Co. (29-feet deep). The latter is located one and a half miles south of the site (Ref. 17). The former yields of these wells were not reported.

3.5 Surface Water

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 which flow south out of the hills to the north and join the Anthony Kill near Willow Glen, almost 2 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 5). 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


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 5
N
Mechanicville Reservoir
Plum Brook
COONS CROSSING SITE
GRAVEL PITS
Willow Glen
ROUTE 131
Anthony
BOSTON
D & H
Coons
Kill
AND
MAINE
Reservoir
Stillwater
Junction
Riverside
HUDSON
Baker Cem
Farrell Cem
CITY
BDY
DELAWARE
CANAL
Lock No 3
Golf Course
MECHANICVILLE SITE
MECHANICVILLE
Park
RAILROAD
Gas
Light

private wells (groundwater) or the Anthony Kill (surface water) for other purposes such as lawn watering or washing cars. A town sewer system serves a majority of the homes in Mechanicville (Ref. 28).

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 (Refs. 5, 6, 27). 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 which empty via underground culverts into the Anthony Kill. The locations of the drainage culverts are shown in Figure 4.

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 no higher uses because of intermittent flow or water conditions which 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 (Ref. 29). NYSDEC has conducted water quality testing downstream of Mechanicville at the Hudson River, and 2 miles upstream at Plumb and Baker Brooks (Ref. 30). 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 PCB's. The water quality in Plumb Brook and Baker Brook is Class A, suitable for use as a water supply (Ref. 30).

The U.S. Geological Survey 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 U.S. Geological Survey 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 (Ref. 31).

3.6 Air

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 High School at 10 North Main Street in the center of Mechanicville, at an elevation of 60 feet above grade. This location is about 1 to 2 miles south of the Mechanicville site. The TSP results collected at this location from 1976 to 1982 range from 39 to 47 $\mu g/m^3$. 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 (Refs. 32, 33).

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 (Refs. 34, 35, 36). Although no odor complaints have been recorded, minor odors have been detected from these facilities. Both of the facilities incinerate waste sludge intermittently. The facilities 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 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 transformer storage area west of the present main office building. The transformers currently stored in this area may contain polychlorinated biphenols (PCBs). In the past, transformers known to contain PCBs were stored at this site. As previously discussed, 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. Since contaminated groundwater could be released from seeps on this bank, vapor phase air emissions are possible. Due to the low vapor pressure of the coal tar components, this type of emission is likely to be insignificant.

4.0 GEOPHYSICAL INVESTIGATION

4.1 Introduction

A geophysical survey was conducted at the Mechanicville former coal gasification site between June 2 and June 5, 1986. The purpose for this work was to:

- o delineate the bedrock surface, which may direct the flow of any subsurface contaminants associated with past site activities;
- o determine the vertical stratigraphy of geologic materials underlying the site and the way in which these materials may vary laterally;
- o map the migration route(s) of any conductive groundwater contaminant plume(s) (if present) which may be related to past site activities;
- o map the presence of any buried structures (tanks, utilities, etc.) which will be important to avoid in future exploration activities.

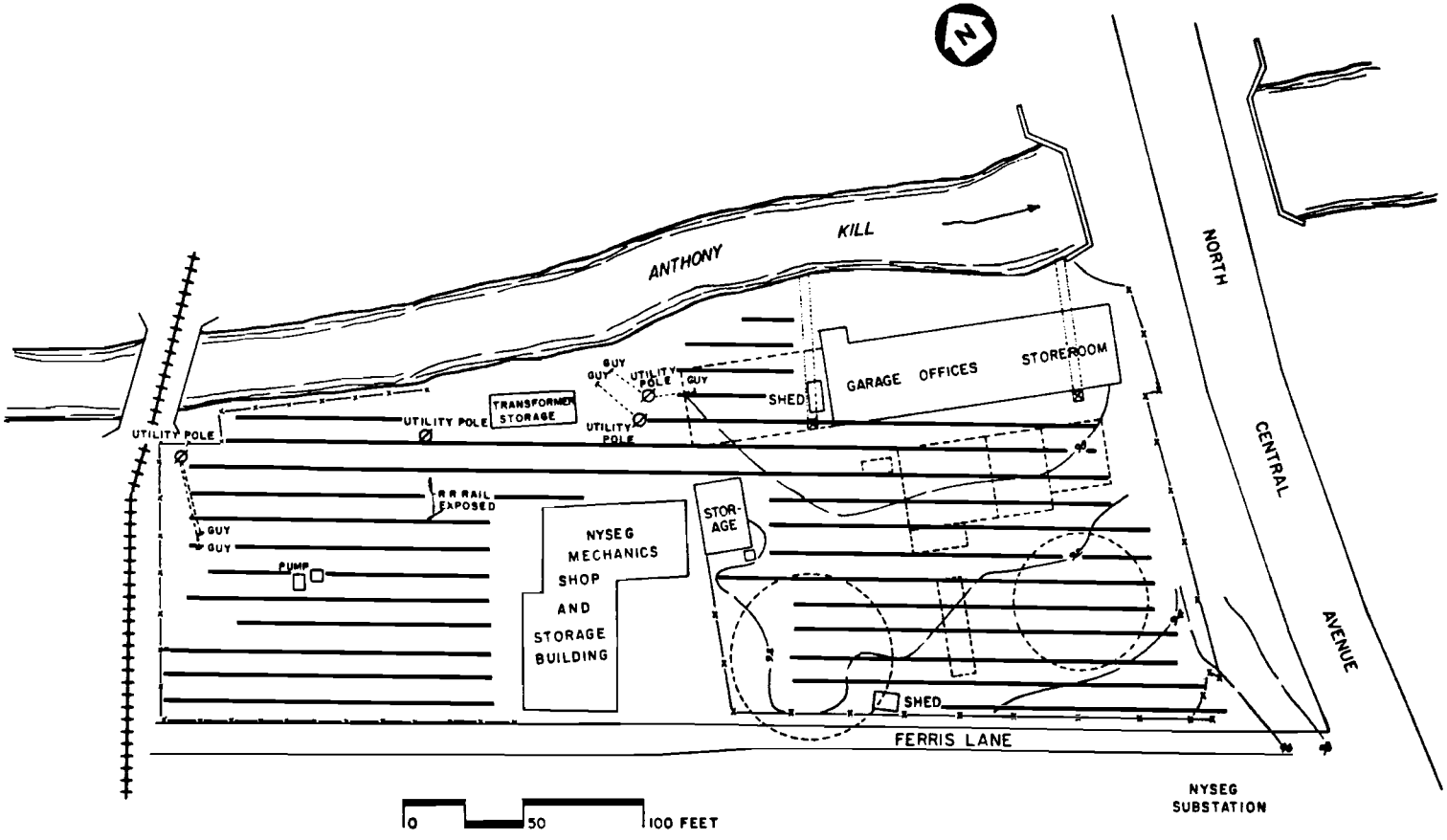
The geophysical survey used three exploration techniques. These were ground-penetrating radar (GPR), continuous seismic refraction profiling, and terrain conductivity profiling, also referred to as electromagnetic (EM) profiling. Other techniques were evaluated, but these three were selected as being the most appropriate, given the geologic setting and field conditions.

4.2 Methodology

The geophysical survey at the Mechanicville site was conducted within the two parking lots of the NYSEG facility on North Central Avenue (Figure 4). The survey area is approximately one acre in size.

The ground-penetrating radar and seismic refraction surveys were conducted along the traverse lines indicated on Figures 6 and 7. A 10-foot grid was established throughout the area of investigation with a compass and cloth tape prior to the start of the survey.

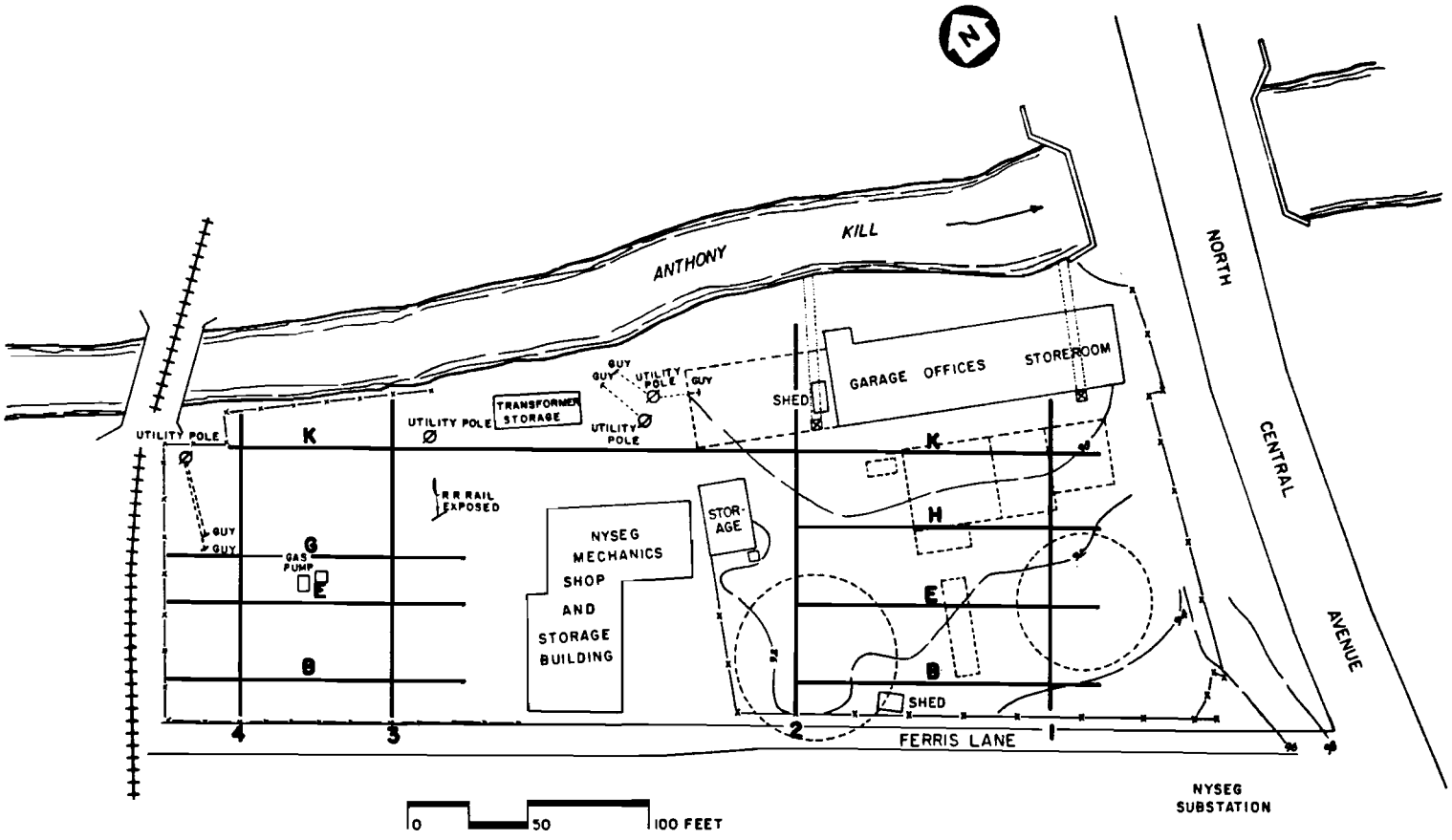
The GPR survey utilized a Geophysical Survey Systems, Inc. Subsurface Interface Radar (SIR) System 8. This is a microprocessor-equipped system with a 300 MHz transducer. Because the soil at the site was saturated with water in some areas, it produced "ringing" in the radar records. A real-time digital filter with a background removal algorithm was used to minimize this extraneous "noise" and thereby 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 up to 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 3575 lineal feet of GPR profiling at each level of penetration were covered during the survey (Figure 6).



E.C. JORDAN CO. CONSULTING ENGINEERS	TITLE: GEOPHYSICAL SURVEY GROUND PENETRATING RADAR COVERAGE MECHANICVILLE, NEW YORK
CLIENT: NEW YORK STATE ELECTRIC AND GAS CORP. BINGHAMTON, NEW YORK	INVESTIGATION OF FORMER COAL GASIFICATION SITES
	PROJECT NO. 4946-01 FIGURE 6

BASE MAP SOURCE:

TOPOGRAPHIC SURVEY PREPARED BY DAVID A. FLANDERS ASSOCIATES, 6 MORNINGSIDE DRIVE, BALLSTON LAKE, NEW YORK DATED 6/26/86 (86-72-3).



E.C. JORDAN CO.
CONSULTING ENGINEERS

CLIENT
NEW YORK STATE ELECTRIC AND GAS CORP.
BINGHAMTON, NEW YORK

TITLE
GEOPHYSICAL SURVEY
SEISMIC REFRACTION COVERAGE
MECHANICVILLE, NEW YORK

INVESTIGATION OF FORMER COAL GASIFICATION SITES

PROJECT NO. 4945-01 FIGURE 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).

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 in length. A total of 1,590 lineal feet of seismic refraction profiling was completed during this portion of the survey (Figure 7).

Terrain conductivity measurements were attempted on two different occasions during the field effort with a Geonics EM 31 terrain conductivity meter. It was determined during these brief site walkovers that there was too much electrical interference to obtain reliable terrain conductivity data and this portion of the field program was curtailed.

4.3 Results

The data from the GPR survey were generally of very good quality. The features which were noted on the radar records include the bedrock surface and various subsurface anomalies. Features which have been noted and which are mapped on Figure 8 include:

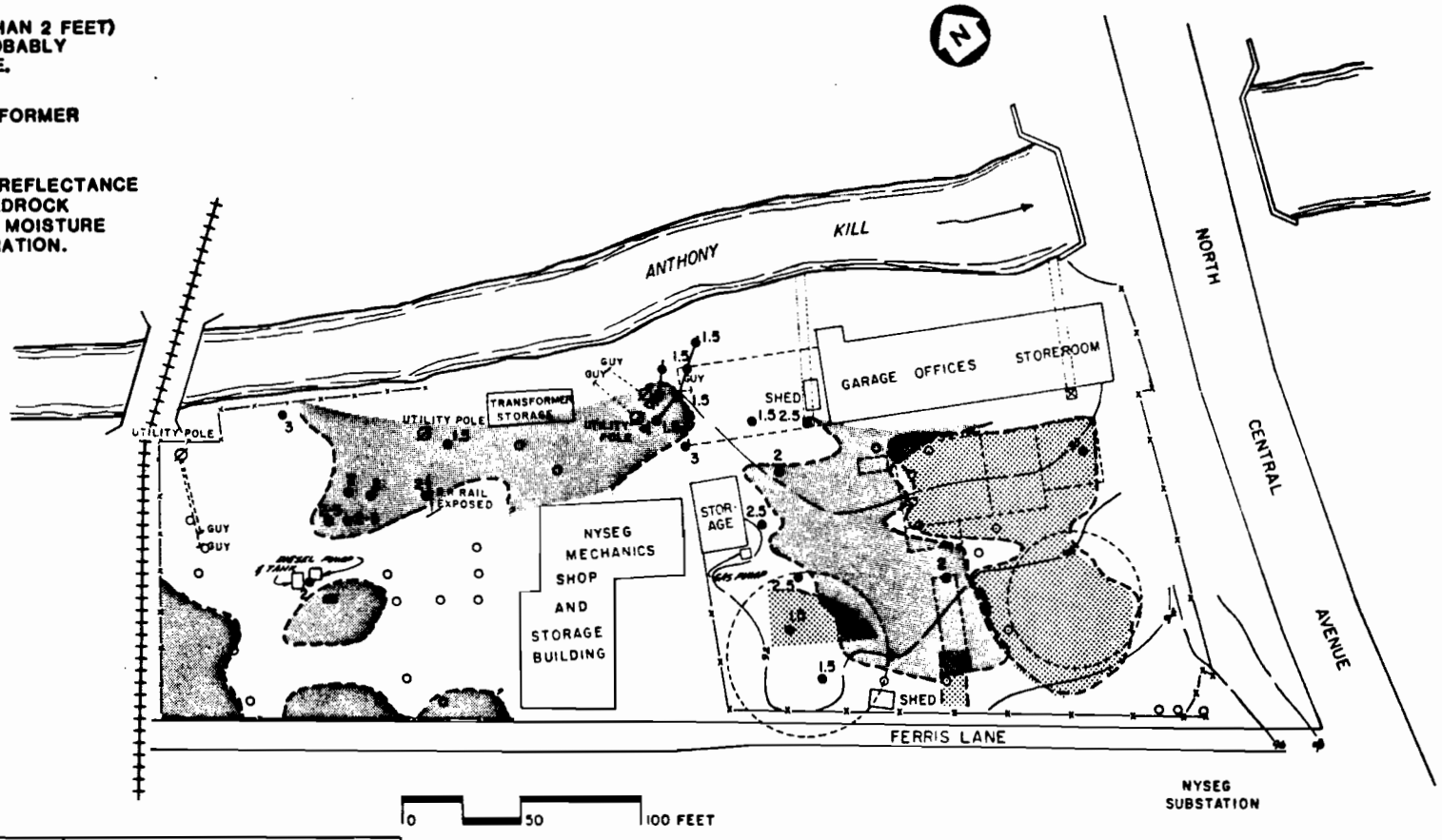
- shallow subsurface features (and their approximate depth in feet) which may represent buried utilities;
- other shallow features (less than 2 feet) of probable minor importance;
- the locations of two buried gasoline tanks;
- the limits of excavations for former structures which were associated with the coal gasification facility; and
- zones of higher reflectance in overburden/bedrock which indicate higher moisture content or saturation.

The GPR survey reveals 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, the bedrock depths will vary accordingly. Test borings in several locations will be helpful in establishing what corrections, if any, should be made to the reported values.

The results of the seismic refraction survey are presented on Figure 9. The seismic profiles can be thought of as pseudo-geologic sections with two layers: overburden (including natural soils, fill and demolition materials) and bedrock. The seismic velocity value of the overburden varies through a fairly wide range, from 1,200 to 4,000 feet per second (fps). These velocity differences probably reflect to some degree the moisture content of the overburden materials, but undoubtedly also reflect the complex variety of various fill materials which now blanket the site and which are associated with past site activities.

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.

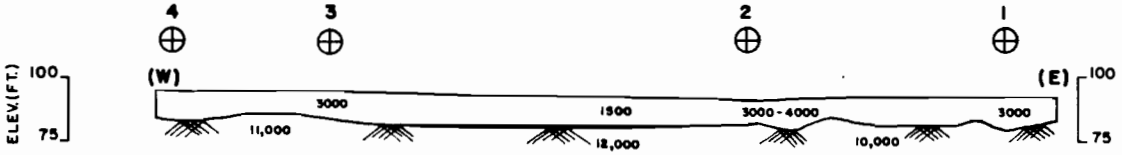


E.C. JORDAN CO. CONSULTING ENGINEERS	TITLE: SCHEMATIC OF RESULTS OF GPR INVESTIGATION MECHANICVILLE SITE	
CLIENT: NEW YORK STATE ELECTRIC AND GAS CORP. BINGHAMTON, NEW YORK	INVESTIGATION OF FORMER COAL GASIFICATION SITES	
	PROJECT NO. 4945-01	FIGURE 8

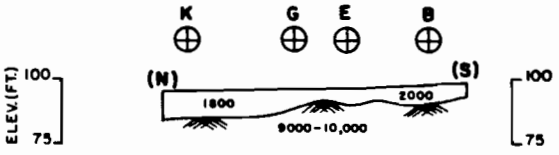
BASE MAP SOURCE:

TOPOGRAPHIC SURVEY PREPARED BY DAVID A. FLANDERS ASSOCIATES, 6 MORNINGSIDE DRIVE, BALLSTON LAKE, NEW YORK DATED 6/26/86 (86-72-S).

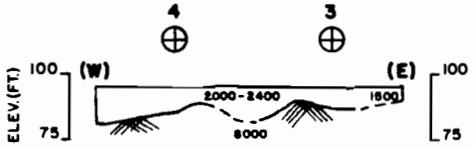
LINE K



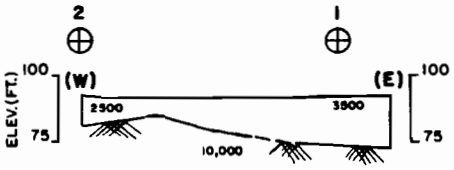
LINE 4



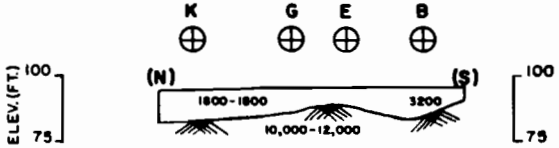
LINE G



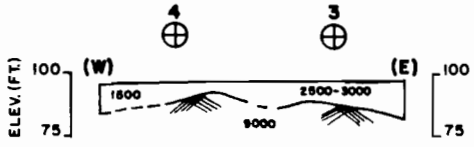
LINE H



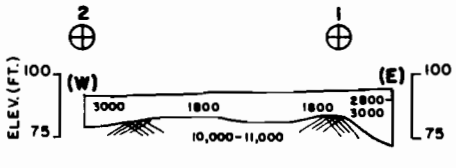
LINE 3



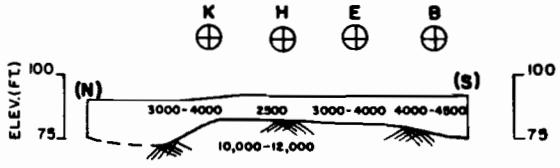
LINE E



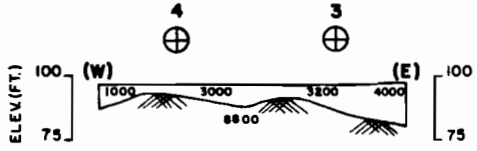
LINE E (con't.)



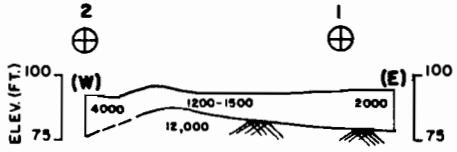
LINE 2



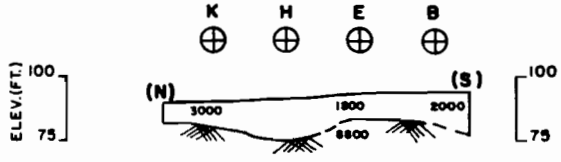
LINE B



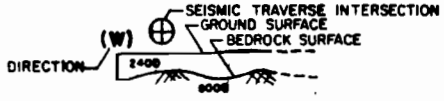
LINE B (con't)



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 9

Bedrock velocity values measured during the seismic survey vary from 8,000 to 12,000 fps, a typical range of values for a shale deposit. The lower end of the 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 is generally quite good, particularly on the eastern portion of the site. A generalized bedrock contour map has been constructed from the data (Figure 10). The map depicts the surface of the competent rock, not that of the moderately to highly weathered shale which lies above the competent rock and which is several feet thick. The seismic data have been weighed more heavily in the construction of this map. This is because the complex and highly variable subsurface conditions may affect 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.

5.0 FURTHER INVESTIGATIONS

5.1 Summary of Available Data on Coal Gasification Wastes

Jordan recommends that further investigations into possible environmental contamination problems at the Mechanicville site be conducted. This recommendation is based on the following historical information and direct observations. The information suggests that coal gasification-related residues are likely to be present in the subsurface environment at the site. From the site reconnaissance, interviews, and file reviews, it was learned that:

1. Coal gas was produced at the site for a period of 54 years, from 1901 until 1955.

2. Coal tar residues accumulated in the base of the relief gas holder. The coal tar was reportedly left in the holder when it was demolished in 1955. During collection of a sample from the relief holder in November 1981, NYSEG employees reported petroleum odors and visible coal tar residues in the soil at depths of 3 to 5 feet. A sample of the tar contained 40 mg/ℓ of total phenols.

3. Condensate from the water gas process was treated in a tar dehydrator and filter bed system before discharge to the Anthony Kill. NYSEG employees noted petroleum odors and tar residues in the filter bed area during collection of a sample in November 1981. The sample contained 1,300 mg/kg of sulfide.

4. Residual ash from the gas generator was reportedly stored on the site before removal by various users.

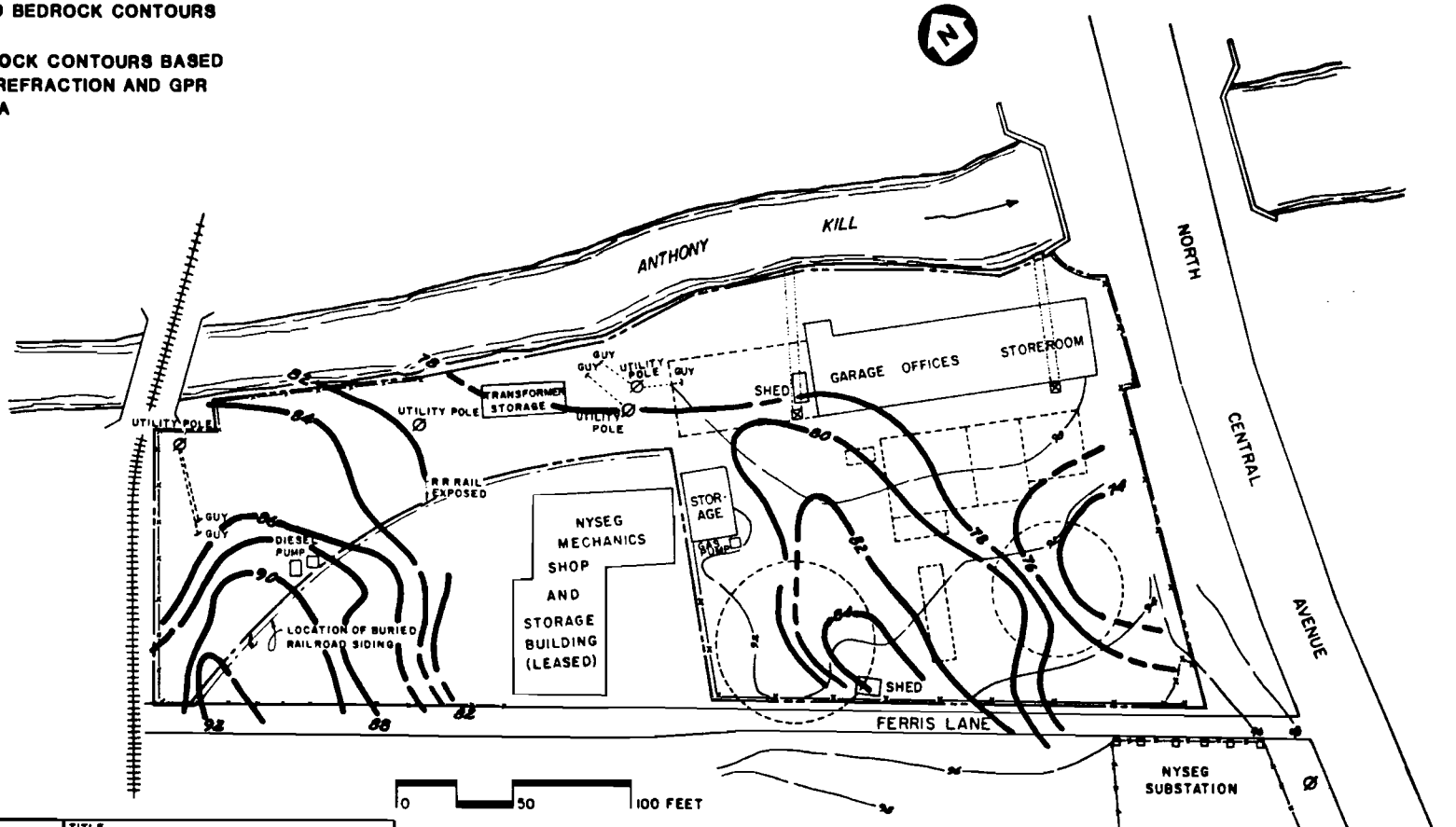
5. Wood chips and oxide wastes from the purifying house were hauled off-site for final disposal. Some spent chips may have been spread on the lot just west of the active plant area.

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. 4945-01	FIGURE 10

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).

5.2 Preinvestigative Evaluation

The objectives of the Task 2 and Task 3 investigations for the Mechanicville site are to obtain sufficient site specific field data to determine if there is an environmental problem at the site and to allow site characterization, risk assessment, and identification of appropriate remedial alternatives. The preinvestigative evaluation is undertaken to assure that the investigation will develop the necessary data. Potential remedial technologies are identified and the work plan is reviewed to verify that the field program will develop sufficient data to enable the specific remedial technologies to be evaluated. As the project progresses and our understanding of the site increases, these technologies will be reviewed and refined as necessary. Additional data needs which may be identified in Task 2 will be satisfied in Task 3.

Table 1 summarizes the potential environmental problems existing at the Mechanicville site. The media addressed in Table 1 are soils, groundwater, surface water, and air. The potential environmental problems have been 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.

Based on the environmental problems which may be identified at the site, several remedial technologies have been considered for each media. These technologies are identified in Table 2. Comments are provided for each of the remedial technologies considered.

5.2.1 Data Needs. The data requirements fall into four general categories:

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

Table 3 lists specific data requirements in each of these categories for the Mechanicville site.

5.2.2 Data Quality Requirements. In order to investigate the presence or absence of coal gasification wastes at the Mechanicville site, the following parameters will be included in the soil and water analytical program: volatile organics, semi-volatile organics, total cyanide, ferro-ferri cyanide, total organic carbon, total recoverable phenolics, iron and zinc. Air samples will be analyzed for polynuclear aromatic hydrocarbons (PAHs), iron, and volatile organic compounds.

The primary use of the Task 2 data is for problem identification, preliminary risk assessment, and preliminary in-house engineering rather than final engineering determinations. The methods used to analyze for the above parameters must be appropriate for this use. In addition, analytical methods for air, soil, and water samples must generate data that are comparable so that rela-

TABLE 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 1 (Cont.)

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.

TABLE 2

PRELIMINARY IDENTIFICATION OF REMEDIAL ALTERNATIVES
FOR THE MECHANICVILLE SITE

MEDIUM	CONCEPTUAL ACTION	REMEDIAL MEASURE	REMARKS
Soils	Removal	Excavation and Disposal - contaminated soils - waste deposits	Off-site disposal will involve excavation and removal of contaminated soils and waste deposits with subsequent transportation to another location. Potential impact on air quality during excavation.
	Containment	Capping, Grading, Revegetation - wastes - contaminated soils	Commonly implemented together, they will prevent the movement of wastes and contaminated soils into the environment from erosion. The cap will also reduce infiltration and, therefore, the rate of leaching of chemicals from the soils into the groundwater. At the same time, volatilization of chemicals to the air is reduced.
		Slurry Wall	Generally used in conjunction with extraction and treatment of groundwater.
	Treatment	Solidification	Large quantity of soils would be involved. Potential impact on air quality during excavation.
		Extraction (soil flushing)	Not applicable for large quantities of material with diverse compositions. A variety of treatment technologies are potentially applicable to extracted wastes. Extracted soils may still contain much contamination.
		Land Treatment	Generally not effective for high molecular weight organic or metallic contaminated materials. Requires suitable land be available. Surface application will require revegetation to control erosion and periodic cultivation to stimulate biological activity.
	Access Control	Posting Fencing Land Restrictions	May not be applicable for a complete remedial action plan, but may be used as an element of a comprehensive plan. Will be considered in conjunction with other technologies.
	No Action		To be considered in conjunction with other technologies.
Groundwater	Removal/Treatment	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. Extent of contamination and required operating period is not known. May require years of operation.
		Stripping or Carbon Adsorption	Stripping may cause air contamination without proper and expensive controls applicable to organic constituents; contaminated carbon filters require appropriate disposal.

TABLE 2 (Cont.)

PRELIMINARY IDENTIFICATION OF REMEDIAL ALTERNATIVES
FOR THE MECHANICVILLE SITE

MEDIUM	CONCEPTUAL ACTION	REMEDIAL MEASURE	REMARKS
Groundwater (continued)	In-situ Treatment	Biostimulation	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, precipitation, etc. may be applicable to highly contaminated waters.
	Containment	Slurry Wall Capping	Generally used in conjunction with extraction and treatment of groundwater. See Soils.
	Diversion	Low Permeable Barriers	Prevent chemical migration within shallow aquifer.
		Injection Wells/Interceptor Trenches	Control groundwater flow direction. Generally used in conjunction with groundwater extraction.
	No Action		To be considered in conjunction with other technologies.
Surface Water	Containment	Capping - wastes - contaminated soil - sediments	Capping will prevent surficial contamination from eroding into surface waters.
	Removal/Treatment	Extraction of Surface Water via Pumping	Ponded water on the site could be handled in conjunction with groundwater treatment.
	No Action		To be considered in conjunction with other technologies.
Air	Removal of Source	Excavation	Major excavation to remove source of volatilizing chemicals may result in short-term degradation of air quality when soils are exposed to the atmosphere.
	Control	Capping - clay liner - synthetic liner	The addition of a cover will considerably reduce the release of volatilized chemicals and may require collection and removal of contained vapors.
	No Action		To be considered in conjunction with other technologies.

TABLE 3
TASK 2 DATA REQUIREMENTS
MECHANICVILLE SITE

GENERAL DATA REQUIREMENT	SPECIFIC DATA REQUIREMENT	RELATED TASK 2 ACTIVITY*
A. Establishment of Background Conditions	Analytical data from soil, groundwater, surface water, sediment, and air samples collected from areas not expected to be influenced by former coal gasification plant activities.	Samples collected and analyzed from boring B-1, monitoring well MW-1, surface water station SW-1, sediment station SED-1, and air station A-1.
B. Characterization of Contaminant Sources		
1. Location	Confirmation of location of gas holder foundations.	Borings B-7 and B-8.
	Soil conditions adjacent to former coal gasification structures.	Test pits TP-2 through TP-5; borings B-2 through B-5.
	Soil conditions in area of reported ash and oxide waste disposal.	Test pit TP-1.
2. Chemical nature	Analytical data from soil, groundwater, surface water, sediment, and air samples collected from areas potentially impacted by former coal gasification activities.	Analyses of samples from TP-1 through TP-5, B-2 through B-8, MW-2 through MW-6, SW-2, SED-2, and air stations A-2 and A-3.
	Chemical data which will allow confirmation of HPLC data and differentiation between coal gasification-related contamination and and other contaminant sources.	Use of GC/MS analysis on samples from 2 monitoring wells and 2 borings or test pits, and all air stations.
C. Determination of Potential Transport Routes		
1. Airborne transport	Meteorological data (wind speed, wind direction, ambient temperature, humidity)	Meteorological monitoring during air sampling.
	Air quality data downwind of site.	Sampling and analysis at A-4.
2. Groundwater transport	Site stratigraphy; identification of changes in soil permeability.	All borings and test pits; permeability and packer tests.
	Groundwater gradient.	Water level measurements in monitoring wells and piezometers. Vertical gradient from nested wells (MW-4 and MW-6).
	Quality of groundwater downgradient of potential sources of contamination.	Sampling and analysis at MW-2 through MW-6.
3. Surface water transport	Quality of surface water and sediment downstream of the site.	Sampling and analysis at SW-3 and SED-3.
D. Identification of Potential Receptors	Identification of potentially sensitive land uses.	Land use survey within ½-mile of site boundaries.
	Evaluation of groundwater discharge points and potentially impacted surface water bodies (Anthony Kill).	Water level measurements in wells and plotting of groundwater contours; surface water studies of the Anthony Kill, including water use and determination of MA7CD/10 and MA30CD/10.**
	Evaluation of potential for direct human contact with waste.	Identifying surface/near surface sources of contamination.

* See Figure 11 for locations.

** Minimum annual 7-consecutive-day flow over a 10-year period and minimum annual 30-consecutive-day flow over a 10-year period.

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tionships between contaminants in different media can be examined. The data must also be of a quality which will allow comparison between site conditions and regulatory criteria. Where sources of contamination not related to past use of the site for coal gasification are present, the analytical methods must provide sufficient information to allow contaminant source identification.

5.3 Task 2 Activities

The explorations recommended for Task 2 are designed to meet the data requirements described above, as shown in Table 3. They will consist 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 proposed test pit, boring, monitoring well, and sampling locations are shown in Figure 11.

Similarly, the analytical program is designed to fulfill the data quality requirements discussed previously. The organic analyses for soil, groundwater, surface water, and sediment will be done by GC/PID, with GC/MS confirmation on two soil samples and two groundwater samples from each of the first two sampling rounds. This program will allow comparison of data from different media and will yield concentrations at the practical quantitative level which is sufficient for comparison with regulatory and health criteria. The air analytical program proposed in the work plan calls for GC/PID analysis without GC/MS confirmation. It has been our experience that there is a strong potential for false positives and positive bias using the proposed method. We recommend that a more specific detector be used on all air samples collected at Mechanicville. The recommended method for PAH analysis is GC/MS (Method 8270).

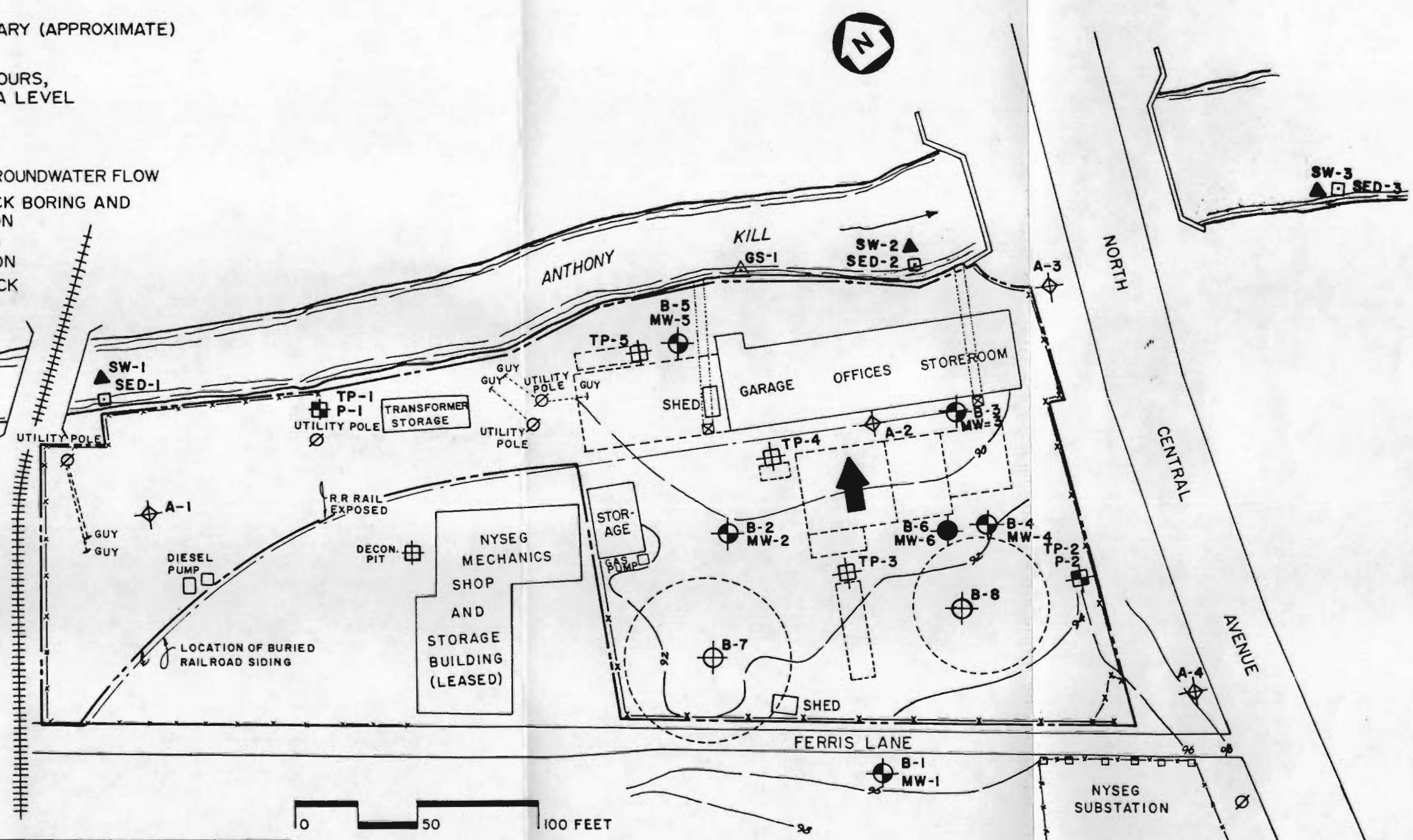
A report will be prepared to assess the data obtained in Task 2 in conjunction with the site information developed in Task 1. On the basis of the Task 2 findings, a preliminary risk assessment will be performed and recommendations will be provided where appropriate. The recommendation may include continued investigation (Task 3), monitoring the existing situation, or discontinuing the program.

The detailed scope of work for Task 2 is described in the Work Plan for the Mechanicville site, submitted to NYSEG in April, 1986. The following modifications to the scope of work are recommended based on information developed in Task 1.

Test pit TP-1 should be moved from the active site boundary to the area of the adjacent lot on the west where ash and spent wood chips may have been spread. The test pit will also be used to explore the zone of higher reflectance identified during the GPR survey. As previously planned, a piezometer should be installed in the test pit to obtain additional groundwater level data, provided appropriate conditions exist. The locations of two other explorations have been adjusted as a result of the geophysical survey. Boring B-8 has been moved slightly to the west where anomalies related to former construction

LEGEND

- APPROXIMATE LOCATION OF FORMER GAS PLANT STRUCTURES
- NYSEG PROPERTY BOUNDARY (APPROXIMATE)
- FENCE
- 90 — GROUND ELEVATION CONTOURS, IN FEET ABOVE MEAN SEA LEVEL
- STORM DRAIN
- CULVERT
- EXPECTED DIRECTION OF GROUNDWATER FLOW
- B-1 to B-5, MW-1 to MW-5 — SOIL AND SHALLOW BEDROCK BORING AND MONITORING WELL LOCATION
- B-6, MW-6 — DEEP BEDROCK BORING AND MONITORING WELL LOCATION
- B-7, B-8 — SOIL AND SHALLOW BEDROCK BORING LOCATION
- TP-1, TP-2, P-1, P-2 — TEST PIT AND PIEZOMETER LOCATION
- TP-3 to TP-5 — TEST PIT LOCATION
- SW-1 to SW-3 — SURFACE WATER SAMPLE LOCATION
- SED-1 to SED-3 — SEDIMENT SAMPLE LOCATION
- A-1 to A-4 — AIR SAMPLE LOCATION
- GS-1 — GROUNDWATER SEEP SAMPLE LOCATION



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TITLE
MECHANICVILLE SITE PLAN WITH PROPOSED EXPLORATION LOCATIONS

INVESTIGATION OF FORMER COAL GASIFICATION SITES

PROJECT NO. 4945-01 **FIGURE 11**

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).

activities were detected with GPR. TP-5 has been moved to the east end of the filter bed area away from what may be an underground cable. No change in cost is anticipated.

The likelihood that sampling of groundwater seeps at two locations along the banks of the Anthony Kill will be possible is remote. Seeps were not observed during the site reconnaissance in early May and therefore are not likely to be present at other times of the year at the site. Therefore, for budgetary purposes, the number of seep samples has been reduced from 8 to 2. This modification would result in a reduction in analytical costs.

A third sediment sample should be collected at the downstream location. This sample would provide necessary information on the movement of contaminants downstream. An increase in analytical costs would result.

Finally, air samples should be analyzed using the GC/MS method as discussed above. This modification would increase the analytical costs of the program. With the use of GC/MS, however, the number of samples analyzed could be reduced from 12 (2 rounds) to 6 (1 round). Throat preparation for all three rounds of sampling would still be necessary. Since the work plan was written, GCA has taken over the task of throat preparation for High-Vol samplers at a higher cost than that previously charged by ERCO. (ERCO no longer performs this work.) The net impact of all these changes on the air analytical budget would be an increase.

As shown in Table 4, the net impact of these modifications is to increase the cost of the Task 2 program.

6.0 SCHEDULE

Jordan will begin the Task 2 investigation program the week of July 21, 1986. A site-specific Quality Assurance Project Plan (QAPP) and Health and Safety Plan (HASP) will be prepared before starting the field program. A generic QAPP and HASP have already been submitted to NYSEG. A tentative schedule for field activities is shown in Table 5.

Jordan intends to keep NYSEG informed of findings and progress of the test pit and drilling programs at least twice per week and immediately if any unexpected conditions are encountered. During other field activities, Jordan plans at least weekly contact with NYSEG.

TABLE 5

TENTATIVE SCHEDULE FOR TASK 2 FIELD ACTIVITIES AT
THE MECHANICVILLE SITE

Activity	Schedule
Exploratory Borings/Monitoring Well Installation/Test Pits	July 1986
Elevation Survey	September 1986
Air Sampling	September 1986
Groundwater/Surface Water/ Sediment Sampling	Sept. and Dec., 1986; March and June, 1987
Land Use Survey	August 1986

REFERENCES

1. Records and newspaper articles on file with Harold Sheehan, local Mechanicville historian and reporter for the Schenectady Gazette, 50 North Main St., Mechanicville, NY (518-664-3347).

2. Sanborn maps for the City of Mechanicville, NY, available through Harold Sheehan.

3. Environmental Research & Technology, Inc. and Koppers Co., Inc., 1984. Handbook on Manufactured Gas Plant Sites. Prepared for Utility Solid Waste Activities Group, Superfund Committee, Washington, DC.

4. Interview on May 6, 1986 with Art Elvins, retired employee of New York State Electric and Gas Corporation (NYSEG), RD 1, Box 135, Mechanicville, NY 12118 (518-664-4315).

5. Interview on May 5, 1986 with John McBride, employee of NYSEG, Park Plaza, Mechanicville, NY 12118 (518-664-7371 ext. 34).

6. Interview on May 5, 1986 with Mike Gilbert and John McNeil, employees of NYSEG, Park Plaza, Mechanicville, NY 12118 (518-664-7371 ext. 34).

7. Records on file at NYSEG, 4500 Vestal Parkway East, Binghamton, NY 13903-1082.

8. E.C. Jordan Co., "Investigation of Former Coal Gasification Sites: Mechanicville/Coons Crossing, Stillwater, NY" Work Plan prepared for NYSEG, April 1986.

9. Interview on May 6, 1986 with Lucille Bevis, Supervisor of Real Estate for NYSEG, Park Plaza, Mechanicville, NY 12118 (518-664-7371).

10. Telephone conversation on June 10, 1986 with Robert Badertscher, Berkshire District Manager for NYSEG, Park Plaza, Mechanicville, NY 12118 (518-664-7371).

11. "A Case for the Location of the Solar Energy Research Institute in the Capital District," Presented by the Capital District Consortium for a Solar Energy Research Institute, December 1975.

12. Petterssen, S., 1958. Introduction to Meteorology, 2nd Edition, McGraw Hill, New York, NY.

13. National Oceanic and Atmospheric Administration, "Climatography of the United States No. 20, Climate of Stillwater, New York," National Climatic Center, Asheville, NC, December, 1975.

14. National Oceanic and Atmospheric Administration, "Local Climatological Data, Annual Summary With Comparative Data, Albany, New York," National Climatic Center, Asheville, NC, 1971.

15. Letter of May 21, 1986, from Richard S. Taylor, Chief, Forecast Section, Division of Air Resources, NYSDEC, Albany, NY, to Diana Kilroe, GCA Technology Division, Bedford, MA.

16. Phone conversation with Mr. Richard Taylor, NYSDEC, Albany, NY on May 18, 1986.

17. Heath, R.C., F.K. Mack and J.A. Tannenbaum, 1963. Ground-Water Studies in Saratoga County, New York. U.S. Geological Survey Bulletin GW-49, Albany, NY pp. 1-42.

18. Waller, Roger M., Edward J. Koszalka and Deborah S. Snavely, (Date unknown). National Water Summary-New York. U.S. Geological Survey Water-Supply Paper 2275 pp. 323-328.

19. U.S. Geological Survey, Mechanicville Quadrangle, 7.5 Minute Series, Photo-revised, 1980.

20. Van Diver, Bradford B., 1985. Roadside Geology of New York. Mountain Press Publishing Co., Missoula, MT, 397 pp.

21. Ruedemann, Rudolf, 1930. Geology of the Capital District (Albany, Cohoes, Troy and Schenectedy Quadrangles). New York State Museum Bulletin No. 285.

22. Well logs from Dick Ferraioli, Inc. Well Drillers, Altamont, RD1, NY. Jan. 24, 1986.

23. Well logs for the Mechanicville Sewer District obtained from George Hodgson, Saratoga County Environmental Management Council, Ballston Spa, NY 12020.

24. Well logs from New York Department of Public Works, Division of Construction. 1942. Supplied by Robert W. Craver, NY Department of Transportation.

25. Telephone conversation with Fred Dente of Empire Soils Investigation Inc., 585 Troy-Schenectady Road, Latham, NY 12110 (518-783-1555).

26. Interview on May 6, 1986 with Robert Dineen of the New York State Geological Survey, Albany, NY (518-473-8056).

27. Interview on May 6, 1986 with Michael Renaldi, Commissioner of Public Works, South Central Avenue, Mechanicville, NY (518-664-7171).

28. Interview on May 7, 1986 with Vincent Barber, Mechanicville Water Department, 36 North Main St., Mechanicville, NY 12118 (518-664-3751).

29. Environmental Conservation Law 17-0303, "Chapter X Division of Water Resources, Part 700: Test of Analytical Determinations," Section 700.5.

30. NYSDEC, 1981. Saratoga County Stressed Segment Analysis. For segments in Moreau, Northumberland, Saratoga, Stillwater, Halfmoon, Waterford, Mechanicville, and Malta.

31. U.S. Geological Survey, 1979. Low Flow Frequency Analysis of Streams in New York. In cooperation with NYSDEC, Bulletin 74, Albany, New York.

32. NYSDEC, "New York State Air Quality Report, Ambient Air Monitoring System, Annual 1984," DAR-85-1, Division of Air Resources.

33. Phone conversation with Mr. Bill Delaware, NYSDEC, Albany, NY, on May 30, 1986.

34. Phone conversation with Mr. George Hodgson, Saratoga County Environmental Management Counsel, Ballston Spa, NY, on May 16, 1986.

35. Phone conversation with Mr. Mike Stawarz, NYSDEC, Region V, on May 18, 1986.

36. Phone conversation with Mr. Ed Savoys, NYSDEC, Region V, on May 19, 1986.