RETEC

PRELIMINARY SITE ASSESSMENT REPORT

FOR

THE MINERAL SPRINGS ROAD
FORMER MANUFACTURED GAS PLANT SITE
WEST SENECA, NEW YORK

Prepared For:

NATIONAL FUEL GAS DISTRIBUTION CORPORATION
10 Lafayette Square
Buffalo, New York 14203

Prepared By:

REMEDIATION TECHNOLOGIES, INC.
1001 West Seneca Street
Ithaca, New York 14850

RETEC Project No. 3-2075-600

November 5, 1997

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Prepared By: James H. Edwards

Reviewed By: Bruce D. Coulombe/gsB

November 5, 1997

EXECUTIVE SUMMARY

Remediation Technologies, Inc. (RETEC) conducted a preliminary site assessment (PSA) at a former Manufactured Gas Plant (MGP) site on Mineral Springs Road in the Town of West Seneca, Erie County, New York. The objectives of the PSA were to:

- identify the nature and extent of constituents of interest (COI);
- determine if COI identified at the site constitute a significant threat to human health or the environment; and
- whether interim remedial measures (IRMs) may be appropriate at the site.

The significant field observations and analytical results of the PSA are as follows:

- Hydrocarbon odors, sheens, or product were observed in all but eleven of the fifty one soil borings performed.
- Approximately 45 cubic yards of surface soil impacted by purifier residuals and potentially lead paint under the electric transmission tower in the southwest corner of the site was found to exhibit hazardous characteristics for corrosivity and lead; this was the only instance of material tested and shown to be hazardous during this work.
- Other observed surface deposits of MGP residuals were limited to the eastern swale (purifier box residuals), the area south of Building 14 (purifier box residuals) and the vegetated area south of the former oil-water separators (tar "boils").
- Subsurface lenses of purifier box residuals were observed in the Eastern Swale Area, in the area south of Building 14, and in the compressed natural gas fueling area south of Building 3.
- Subsurface hydrocarbon product (flowable) was observed in the west bank of the eastern drainage ditch at a depth of 7 feet below ground surface, inside of and in the immediate vicinity of two former oil-water separators, and in one soil boring east of Building 10.
- Groundwater throughout the site was found to contain measurable levels of total cyanide.
- Groundwater at the downgradient property limits did not contain elevated levels of BTEX, PAHs or metals except at MW-13, which was found to contain benzene below the quantitation limit.

- Groundwater upgradient of the former MGP contained elevated levels of BTEX, PAHs, and cyanide.

- The health risks presented to onsite and offsite personnel are minimal with the exception of NFG workers who may conducted excavations in areas with MGP residuals; such personnel should avoid areas of known subsurface contamination or conduct such work according to approved health and safety protocols.

Based on the results of the investigation, RETEC has proposed the following additional investigative work and IRMs:

- The eastern swale should be regraded and armored to prevent erosion and exposure of purifier residuals to site workers.

- Hazardous (corrosive) materials consisting of a blue stained surface deposit of purifier residuals should be excavated from beneath the southwestern electric transmission tower and disposed of offsite.

- Additional surface soil sampling should be performed beneath the other four electric transmission towers to assess whether soils have been impacted by lead paint. The results of the sampling will determine the extent, if any, of soil needing excavation and disposal.

- Additional subsurface soil borings should be performed to further delineate the locations of hydrocarbon product and purifier box residuals.

- Three additional monitoring wells should be installed to aid in locating the source(s) of groundwater contaminants.

- Additional groundwater testing should be performed to quantify the risk, if any, associated with elevated concentrations of cyanide.

- Soil gas samples should be obtained around occupied buildings known to be near subsurface MGP residuals.

- A security fence should be installed along the southern property line to prevent public access to the site.

TABLE OF CONTENTS

SECTION **PAGE**

LIST OF APPENDICES

LIST OF TABLES

LIST OF FIGURES

FIGURE **PAGE**

1.0 INTRODUCTION

1.1 Statement of Purpose

This Preliminary Site Assessment (PSA) Report has been prepared for National Fuel Gas Distribution Corporation (NFG) by Remediation Technologies, Inc. (RETEC) to document an investigation conducted at the former manufactured gas plant (MGP) site on Mineral Springs Road in West Seneca, New York.

The purpose of this PSA Investigation was to collect sufficient environmental data to facilitate an evaluation of the following:

- the nature and extent of constituents of interest (COI) which may be present at the site;
- whether constituents identified at the site constitute a significant threat to human health or the environment; and
- whether interim remedial measures (IRMs) may be appropriate to mitigate an ongoing impact or migration of MGP residuals.

This investigation was carried out in accordance with the most recent and applicable guidelines of the NYSDEC, USEPA as well as the National Contingency Plan (NCP). The detailed scope of work for this PSA investigation is documented in the *Field Sampling and Analysis Plan (FSAP) for Mineral Springs Road, West Seneca, New York* (RETEC, 1997a). A site specific Health and Safety Plan (HASP) (RETEC, 1997b) was developed to support the field effort which contains the information and procedures which were followed during the investigation to protect the health and safety of the field personnel and the public.

1.2 Scope of Work

The scope of work for this investigation contained the following elements:

- a review of the site history and operations;
- surface water sampling and analysis;

- sediment sampling and analysis;
- surface soil sampling and analysis;
- soil borings and collection of subsurface soil samples;
- installation of shallow (water table) monitoring wells;
- collection of groundwater samples; and
- a survey of investigation monitoring points.

1.3 Report Organization

This PSA Report is organized into eight sections and appendices as follows:

- Section 2.0 presents site background information including a site description, site history and a summary of previous investigations.
- Section 3.0 describes the field procedures used to collect the environmental data at the site.
- Section 4.0 provides a summary of the regional and local geology and field observations made at the site.
- Section 5.0 presents a summary of analytical results for surface water, sediment, surface soil, subsurface soil and groundwater.
- Section 6.0 is a Data Usability Summary Report (DUSR) which reviews the analytical data quality.
- Section 7.0 presents a qualitative evaluation of the risk associated with MGP constituents, pathways, and receptors found at the site.
- Section 8.0 presents a summary and evaluation of the environmental findings.
- Section 9.0 provides a list of references cited in this report.

2.0 MINERAL SPRINGS GAS PLANT SITE

2.1 Site Description

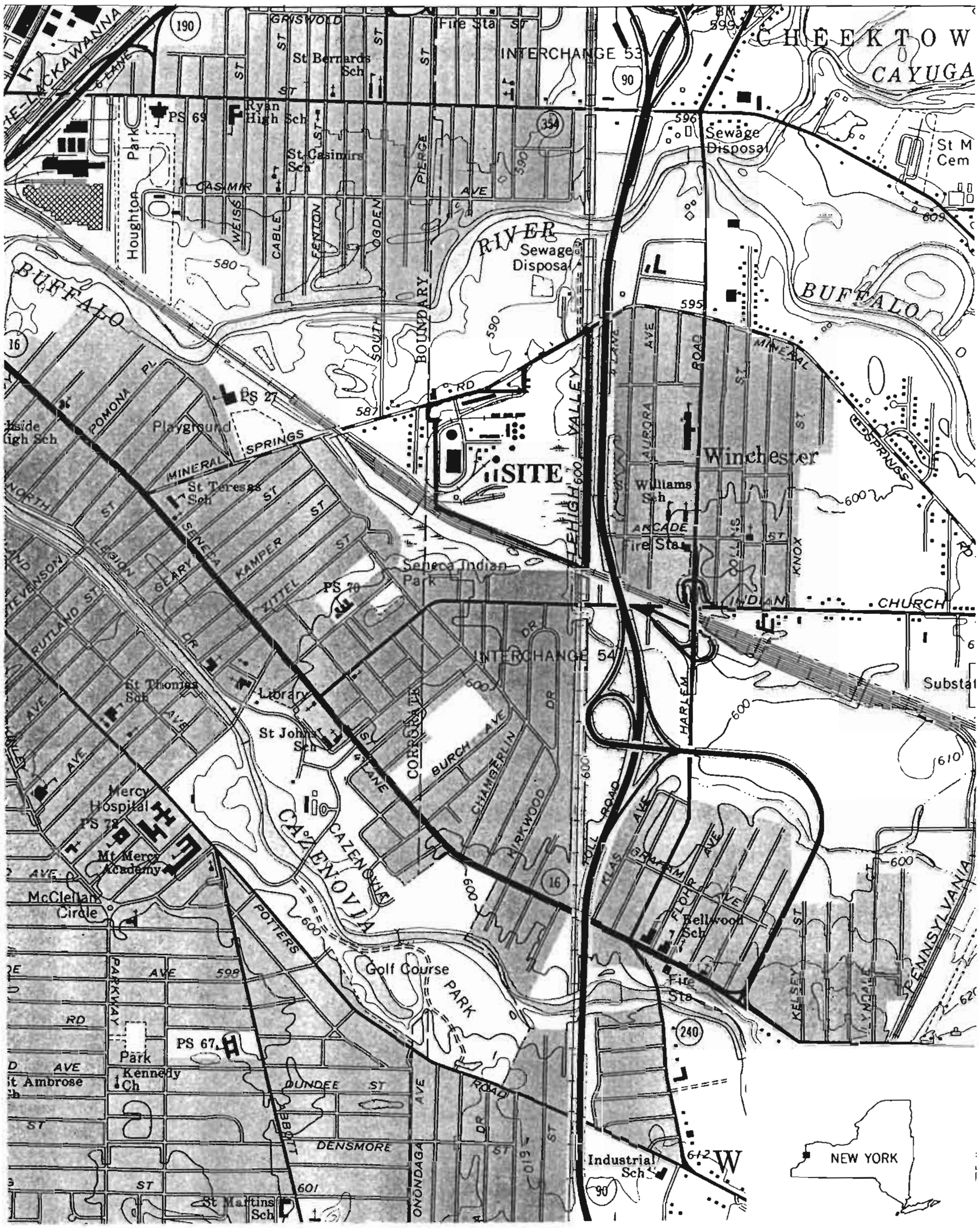
The former Mineral Springs Gas Plant site is located at 365 Mineral Springs Road in Erie County, New York. The majority of the site is located in the Town of West Seneca; however, the northwestern corner of the site is located within the City of Buffalo Corporate Boundary. The location of the site is shown in Figure 2-1. The site is currently owned by NFG and is used as a service center. The Tax Map parcels of land which comprise the site, shown on Figure 2-2, are as follows:

- Parcels A through M (Lot 130 ½) - the western most area of the site;
- Parcel N (a portion of Lot 128) - an area along Mineral Springs Road, currently part of the service center; the remainder of Lot 128 is residential and light commercial (auto body shop);
- Parcel O (Lot 131) - the central portion of the site where the majority of the former MGP operations occurred;
- Parcel P (portions of Lot 127 and Lot 132);
- Parcel Q (portions of Lot 132); and
- Parcel R (portions of Lots 127 and 132) - the eastern most area of the site located along the railroad tracks.

The current layout of the site, the locations of significant historical MGP structures and all of the environmental data points for the PSA fieldwork are shown in Figure 2-3 of this report.

Fed wetlands

Buildings, paved parking areas, lawn areas, a marsh area and wooded/scrub areas cover the majority of the site. Many of the MGP process buildings have been demolished; however, a number are still present and have been adapted for other uses. An active NFG construction and demolition debris landfill exists along the eastern edge of the site, between the former MGP location and the eastern rail track area. An area of recent controlled fill (gravel) covers a portion of the area south



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DATUM IS MEAN SEA LEVEL
DEPTH CURVES AND SOUNDINGS IN FEET—DATUM IS LOW WATER 568.6 FEET

FIGURE 2-1 MINERAL SPRINGS ROAD MGP SITE LOCATION MAP

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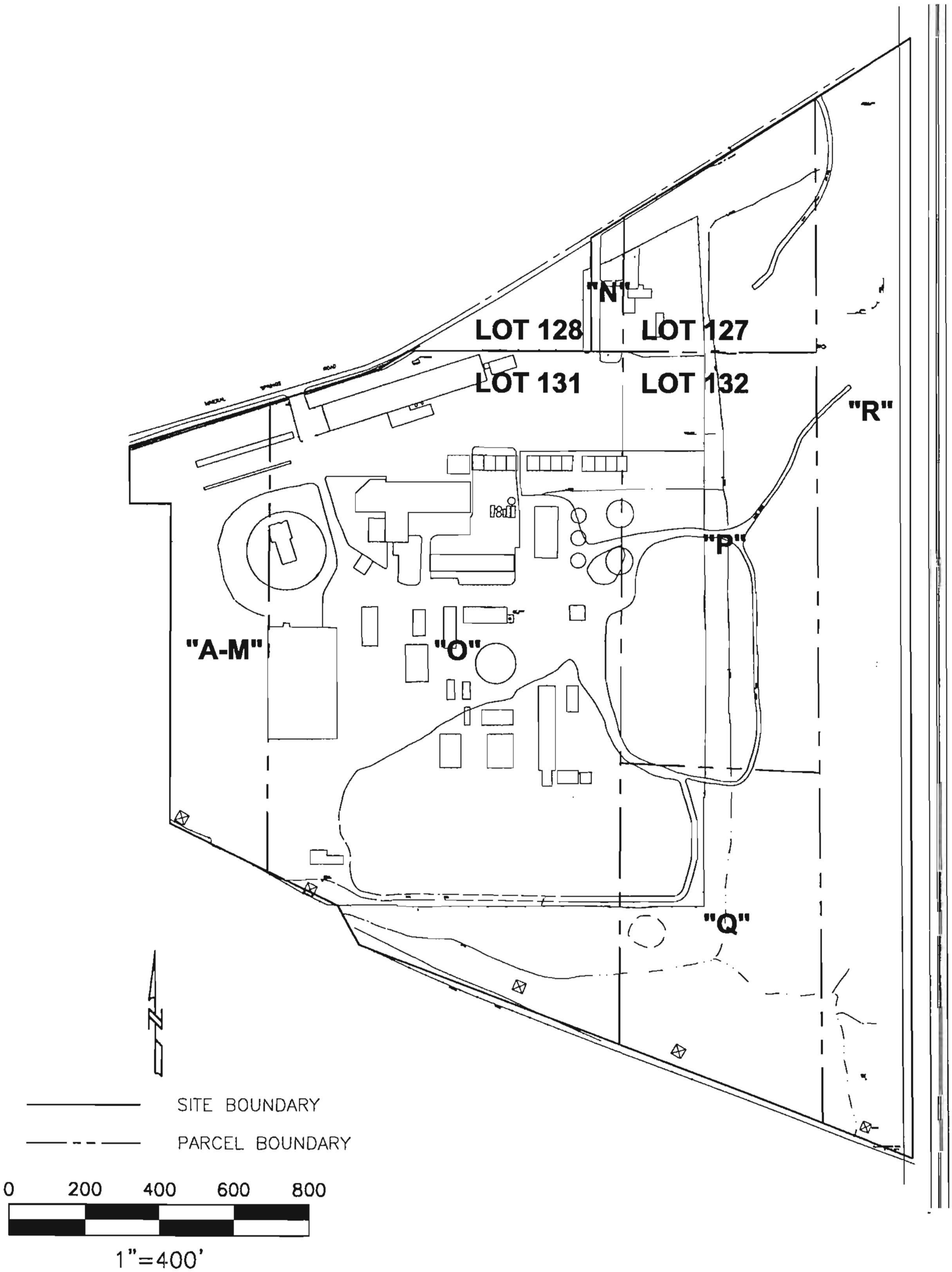

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0	RLL	10/01/97	DRAFT					
NO	DRWN	DATE	REVISION	CHKD	DATE	APPVD	DATE	CAD FILE FIG2-2

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DRAWING NO. FIGURE 2-2 REV.

of the Building 9 parking lot. This gravel area is currently used to store construction materials and pipe. A series of electric transmission towers are present along the southern boundary of the site. Surface water at the site flows southward in a drainage swale along the western edge of the landfill area where it joins a New York State Class D stream near the southeast corner of the site. This stream flows from east to west across the southern portion of the site into a 72-inch culvert and then into a storm sewer beneath Calais Avenue. The storm sewer then flows into the Buffalo River, located 1,000 feet north of the site.

Properties adjacent to the site are as follows:

- To the west the site is bounded by residential properties along Calais Avenue.

- To the north the site is bounded by Mineral Springs Road and then by residential and commercial properties and the Town of West Seneca Sewage Disposal and Composting Facility.

- To the east the site is bounded by rail tracks and then by the New York State Thruway.

- To the south the site is bounded by an active rail track and then by an abandoned industrial property (Madison Wire) and residential properties.

2.2 Site History

Informational Sources

The following information sources were reviewed to complete the history for the site:

- Erie County Land Title Records
- The Brown's Directories of American Gas Companies (Brown's Directories) for West Seneca, New York for the years 1887 through 1957.
- Sanborn Fire Insurance Maps for the years 1932, 1943 and 1958.
- Aerial photographs of the site for the years 1938, 1946, 1951 and 1969.
- Various historic facility maps of the site.

History of Operations

A chronological site history for the Mineral Springs MGP site is as follows:

- A 1926 Iroquois Gas Corporation facility map shows a single gas holder (500,000 cubic feet) located adjacent to a water gas plant, boiler house, a blue gas house, a retort house, an ammonia plant and two purifier houses.

- The first Sanborn Fire Insurance Map listing for the site occurred in 1932. The map shows the presence of a second gas holder (5 million cubic feet) and the addition of sixteen tanks including: four tar tanks, an oil tank, six ammonia tanks, three phenol tanks, a gasoline tank, a sulfuric acid tank and a caustic tank. From the 1932 map it is evident that both water gas and coal gas were produced at the site. A coke storage area was identified at the southeast corner of the MGP.

- A 1943 Sanborn map shows the removal of two ammonia tanks and the coal gas retort house.

- A 1943 Iroquois Gas Corporation facility map shows the removal of the retort house and producer house, the addition of a tar separator (No. 3) adjacent to the water gas house and the conversion of an ammonia tank to oil storage.

- A 1952 facility drawing shows the addition of two separator pits (No. 1 and No. 2).

- The last entry for gas production in the Brown's Directory is in 1957.

- A 1958 Sanborn map shows that an additional purifier box house and a 1 million gallon oil tank were added along the eastern portion of the MGP.

- A 1969 aerial photo shows the addition of a second 1 million gallon oil tank.

- The MGP ceased to produce gas in 1957 and was subsequently converted to a NFG maintenance and service center. The gas holders were dismantled and removed by the early 1970's.

As mentioned above, gas production at the Mineral Springs site was initially by coal gas and water gas processes. The coal was shipped in by train and likely stored in the southeast portion of the site. Gas oil was stored in the tanks located to the east of Building 10. Following the manufacture of the gas, the impurities (sulfur and cyanide compounds) were removed in the purifying boxes located on the north portion of the MGP. The western set of purifier boxes were used for the water gas, the eastern set for coal gas.

2.3 Previous Site Investigations

Previous investigations at the site have focused on:

- sampling and remediation of an oil-water separator pit;
- sediment and surface water quality testing in the Class D stream channel in the southern portion of the site; and
- soil borings completed within the footprint of the former western gas holder.

2.3.1 Former Oil-Water Separator Pit

Three previous investigations at the site have been focused on the area surrounding a decommissioned concrete in-ground oil-water separator pit (separator pit No.1, Figure 2-3). Petroleum contamination was found to have been released from this pit in 1987, resulting in a spill report to the NYSDEC Division of Spills Management (DSM) (Spill # 8702469). The following sections summarize the major actions which were carried out subsequent to the spill report.

Keystone Environmental - 1989

In October 1989, Keystone Environmental Resources, Inc., on behalf of NFG, completed decommissioning of the concrete separator pit. Keystone initiated the work following completion of a soil boring investigation which characterized the material in the pit and provided estimates of volumes of waste oils and sludges. Following the investigation, remedial action consisted of the following activities:

- onsite treatment of wastewater in the separator with subsequent discharge to the POTW;
- the removal of oil, sludge and debris with disposal at an incineration facility;
- pressure washing of the cement pit walls;
- wipe testing of the pit walls followed by analysis for PCBs; and
- backfill of the pit with clean fill.

The results of the project were compiled in the document: *Final Report, Cement Pit Decommissioning, January 1990* (Keystone, 1990).

Huntingdon/Empire Soils Investigations - 1994

Following decommissioning of the separator pit, Huntingdon/Empire Soils Investigations, Inc. (ESI), performed additional investigations and excavated contaminated soils in the vicinity of the former separator pit. Initially, the work was intended to monitor the groundwater in the area of the decommissioned pit. Three monitoring wells were installed followed by three groundwater sampling events. The results of the analyses of the samples indicated that volatile organic compounds were present in samples collected from one of the monitoring wells (MW2) at concentrations greater than NYSDEC Groundwater Standards. In November of 1994, ESI performed a soil gas survey south of the separator pit. The results of the soil gas survey indicated that hydrocarbon contamination extended approximately 70 feet south of the separator pit.

To reduce the level of hydrocarbon contamination around the south end of the former separator pit, ESI performed an additional investigation and excavation which included the following activities:

- excavation of hydrocarbon-impacted soils from around the south end of the separator;
- removal and treatment of hydrocarbon-impacted groundwater from the excavation;
- analysis of soil and water samples taken during the excavation; and
- backfilling the excavation with clean fill material.

During the excavation performed by ESI, approximately 420 tons of hydrocarbon impacted soil was removed from the southern area of the separator; however, the contractor was not able to remove all the detectable petroleum impacted material from the excavations. ESI also completed a test pit and analyzed soil samples from an additional separator pit at the site (separator pit No.3 - Figure 2-3). A complete summary of all phases of the work completed by ESI are presented in the document *Site Investigation Summary Report, National Fuel Gas Distribution Corporation, Mineral Springs Road Facility, West Seneca, New York* (ESI, 1995).

RETEC - 1995

RETEC performed an investigation in the area adjacent to separator pit No. 1 in 1995. The objective of the work was to further characterize the environmental condition of soil and groundwater around the former separator. Six new monitoring wells were installed as a result of the investigation. The investigation found that:

- Groundwater flow was towards the northwest in the area of the separator pit.
- Hydrocarbon compounds were present in concentrations greater than the NYSDEC groundwater standards or guidance values in four wells to the north and northwest of the former separator location.
- The detected compounds (BTEX, MTBE and naphthalene) were consistent with the reported discharge of petroleum products (unleaded gasoline, diesel fuel and tank bottoms) into the separator pit.

Subsequent to the investigation, groundwater from selected wells was sampled for one year on a quarterly basis for volatile and semivolatile organic compounds.

2.3.2 NYSDEC - Madison Wire Site

Recra Environmental, Inc. (Recra) and Ecology & Environment (E&E), under contract to NYSDEC, conducted investigations at the former Madison Wire site, a property which is located south of the former MGP site. Environmental samples were collected on the Mineral Springs MGP site during the investigations by Recra and E&E.

The Madison Wire site was in operation from the 1930s to 1982 and was identified as a disposal site (EPA ID NYD000512848) for heavy metals, cyanide, PAHs and pickle liquor (K062 Waste). The results of the investigations are summarized in the document: *Remedial Investigation Summary Report - Phase I and II, Madison Wire Site, West Seneca, New York* (E&E, 1990). The results of the sampling on the Mineral Springs MGP site are summarized in the following sections.

Surface Water Sampling

According to the E&E report, acidic pickling liquor waste waters were discharged throughout the early operations of the facility to the Class D stream which flows north from the Madison Wire site, beneath the railroad grade, and through the southern portion of the former Mineral Springs Road MGP site with final discharge into the Calais Ave. sewer. The location of the sewer is shown on Figure 2-3. In 1956, the Buffalo Sewer Authority investigated corrosion of the Calais Ave. sewer and found that discharges by Madison Wire had a low pH and high sulfate concentration. A neutralization process was installed in 1961; however further analyses of wastewater discharged in

June 1973 showed a low pH, high sulfate and the presence of cyanide and heavy metals (hexavalent chromium, cadmium, copper, iron, lead, manganese, nickel and zinc) (E&E, 1990).

Two surface water samples were collected from the stream within the boundaries of the Mineral Springs Road MGP site by E&E. Sample SW1 was collected from the stream section 300 feet east of the Calais Ave. sewer inlet. SW2 was collected from the stream section 15 feet north of the railroad tracks which separates the Mineral Springs site from the Madison Wire site. The samples were analyzed for metals, pesticides, PCBs, and total halogenated organics. The results of the analyses indicated that no significant concentrations of COI were detected in the samples.

Sediment Samples

Two sediment samples (SD1 and SD2) were collected by Recra from the same locations as E&E's surface water samples. The samples were analyzed for metals by the EP Toxicity Characterization method. The results of the analysis indicated that all concentrations were less than the regulatory standards. Sediment samples SD14 and SD15 were collected by E&E from the same sample locations as SD2 and SD1. The samples were analyzed for metals and PAHs. The results of the analyses indicated that the range of concentrations of chromium (85 to 87 mg/Kg), copper (163 to 193 mg/Kg) and lead (225 to 281 mg/Kg) were elevated above the concentrations found upgradient of the Madison Wire site. Concentrations of total PAHs ranged from 29 mg/Kg at SD14 to 17 mg/Kg at sample location SD15.

It is significant to note that E&E detected a concentration of benzene and several metals in concentrations greater than NYSDEC groundwater standards in well MW103-2 which is located approximately 500 feet south of the Mineral Springs Road MGP site boundary. This well was installed into a lower water unit identified at the site; however, E & E noted in their report that some connection was possible between the lower unit and an upper water bearing unit also identified at the site. Groundwater flow in the upper unit was mapped by E&E as flowing in the direction of the southeast portion of the Mineral Springs Road site (E&E, 1990).

2.3.3 Huntington/Empire Soils - 1994

ESI, under contract to NFG, conducted an investigation of subsurface conditions within the footprint of the western gas holder foundation in 1994. The objective of the work was to obtain engineering data for foundation footings for Building No. 5, and to determine the environmental condition of the subsurface soil. The results of the investigation are summarized as follows:

- Seven soil borings were completed in a fill soil to a depth of approximately 2.5 feet below ground surface. At this depth, the drilling tools were unable to advance deeper than a concrete foundation slab.

- At two of the boring locations, the concrete slab was cored. The concrete was found to be approximately 1 foot thick.

- No visual or olfactory evidence of impacts to soil were recorded by ESI on the borelogs completed during the investigation.

– what's under concrete

3.0 SITE INVESTIGATION

The PSA Investigation activities focused on defining the nature and extent of constituents of interest (COI) in surface water, sediment, soil and groundwater, and on developing a more detailed understanding of the geology and hydrogeology of the site. The PSA fieldwork focused on seven specific areas of the site as follows:

1) Southeast Drainage Ditch
2) Separator Pits Area
3) Eastern Swale Area
4) Subsurface Hydrocarbon Investigation Area
5) Surface Hydrocarbon Investigation Area
6) Southern Investigation Area
7) Perimeter Monitoring Well Network

The locations of the investigation areas are shown on Figure 3-1. Descriptions of all field activities conducted during the investigation are included in the following sections by each investigation area or specific field activity.

Maxim Technologies, Inc. of Buffalo, New York was contracted to provide drilling services during the soil boring and monitoring well installation tasks. Galson Laboratories of Syracuse, New York, was contracted to complete the chemical analysis of the samples. Galson is certified by the New York State Department of Health (NYSDOH) Environmental Laboratory Approval Program and the Analytical Services Protocol (ASP) program. The field work was conducted according to specifications presented in RETEC's Field Sampling and Analysis Plan (FSAP) (RETEC, 1997a) and site-specific Health and Safety plan (HASP).

3.1 Southeast Drainage Ditch Investigation

The investigation of COI in the Southeast Drainage Ditch Area included the collection of surface water and sediment samples. Both onsite and background surface water and sediment samples were collected. The objective of the sampling was to determine whether offsite and onsite releases of COI have impacted the former MGP site and to determine if COI may be impacting down gradient receptors. The location of the investigation area is shown on Figure 3-2. Sampling for each media is discussed separately in the following sections.

3.1.1 Surface Water Sampling

Surface Water Sample Locations

A total of six surface water samples were collected, including one background sample. Surface water sample SW1 was collected from the drainage ditch on the south side of the facility prior to its flow into the 72-inch culvert. Surface water sample SW2 was collected from the drainage ditch at the east side of the site, upstream of the influx of offsite stream water from the east. Surface water sample SW3 was collected from the ditch in an area which is four feet downstream of the outfall pipe which leads from an area of exposed purifier box residuals. Surface water sample (SW4) was collected from a drain pipe containing orange-colored water near the former purifier box area. Surface water sample SW5 was collected near an isolated hydrocarbon-impacted location adjacent to the bridge to the landfill area. Background surface water sample BSW2 was collected from the Class D stream as it flows onto the site from the southeast. Background surface water sample BSW1 (identified in the FSAP), was found to be dry at the time of the investigation. The locations of the surface water samples are shown on Figure 3-2.

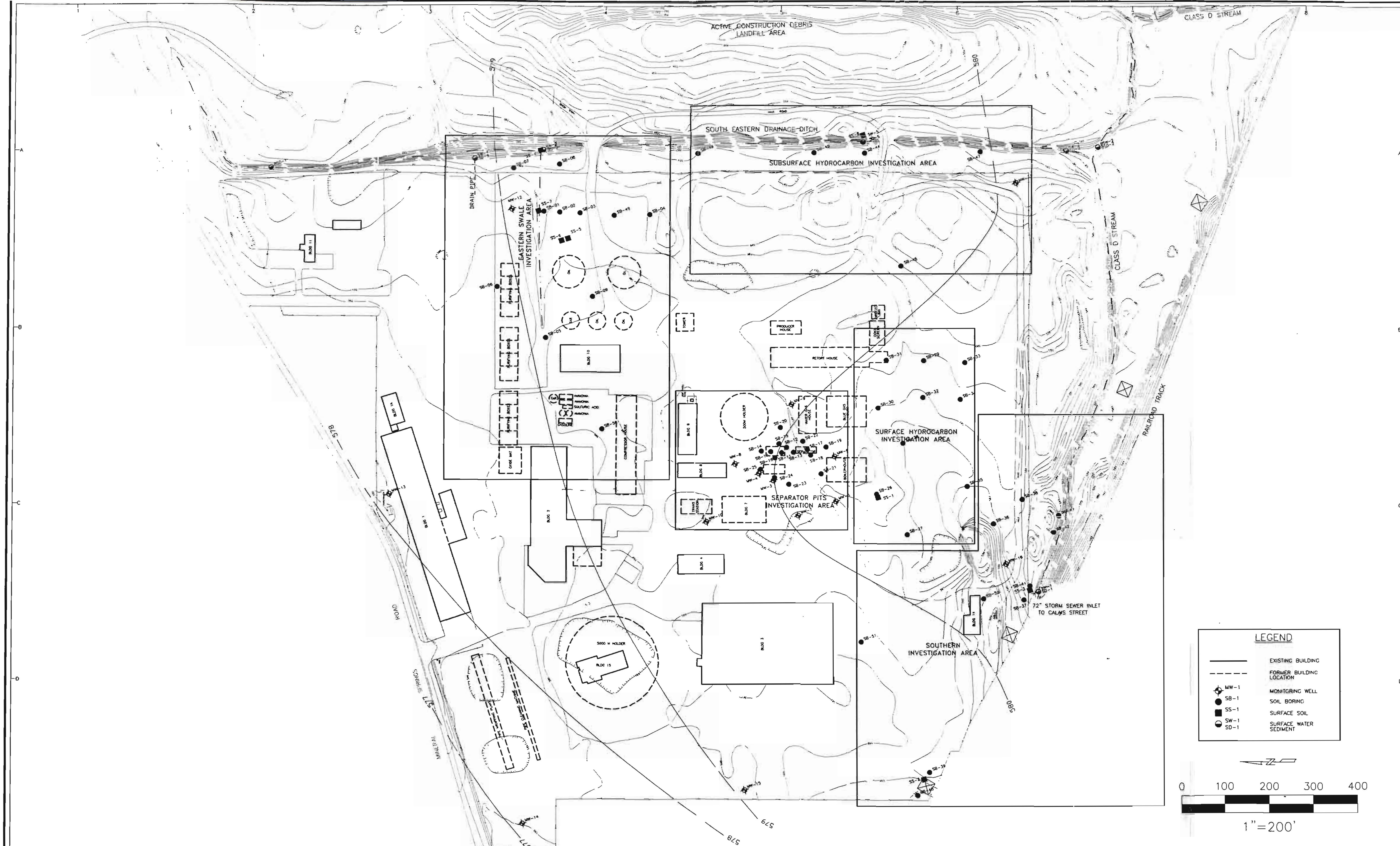
Surface Water Sample Methodology

Surface water samples were taken as grab samples from the approximate midpoint of the drainage ditch. Sampling followed procedures outlined in the FSAP (RETEC SOP 250). A representative portion of surface water was poured directly into laboratory-provided containers and sent to the laboratory for analysis of BTEX, PAHs and total cyanide.

3.1.2 Sediment Sampling

Sample Location and Quantity

A total of seven sediment samples were collected from within the boundary of the site. Five samples (SD1 to SD5) were taken around the former MGP, from the same locations as the surface water samples. Two background sediment samples were collected: from the drainage ditch to the north (BSD1) and to the east (BSD2) of the facility. The sample locations are shown on Figure 3-2.



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NATIONAL FUEL GAS
BUFFALO, NY
3-2075-680

CURRENT DATE 10/24/97 CAD FILE FIG3-1

INVESTIGATION AREA SUMMARY

MINERAL SPRINGS ROAD MGP SITE

RETEC REMEDIATION TECHNOLOGIES INC

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Sediment Sample Collection Procedures

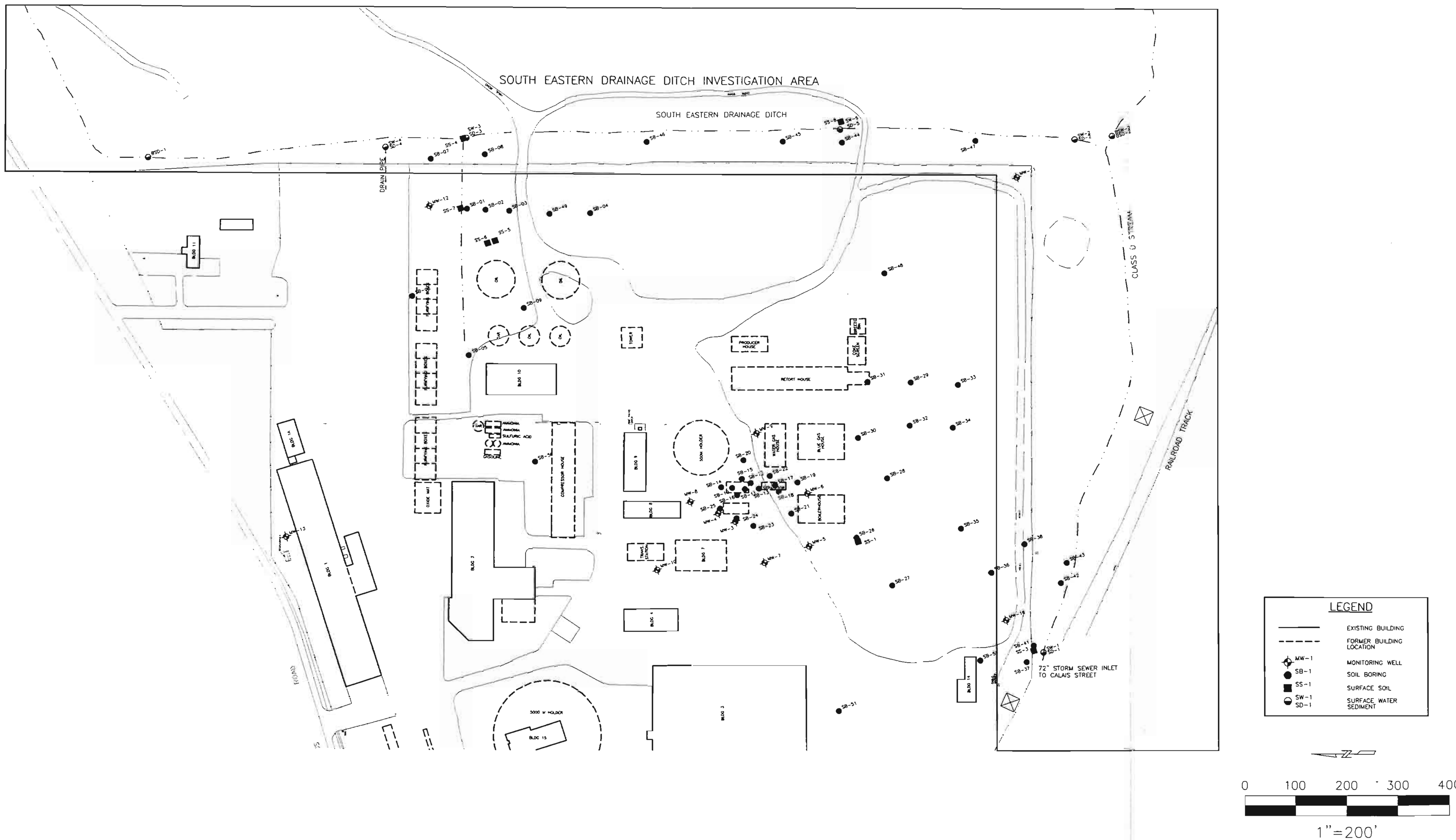
Sediment samples were taken as grab samples from the approximate midpoint of the drainage ditch. Sampling followed procedures outlined in the FSAP (RETEC SOP 260). Sediment samples were placed directly into laboratory-provided containers, specific for analysis of BTEX, PAHs, and cyanide. Sediment from sample locations SD1, SD3 and SD5 was analyzed for Total Organic Carbon (TOC).

3.2 Separator Pits Investigation Area

Geoprobe borings were used to investigate the condition of soil in, or around, three separator pits within the Separator Pits Investigation Area (Figure 3-3). The footprint of each separator foundation was located using measurements obtained from historical facility drawings (Isbell-Porter, 1952) and information from previous investigations (ESI, 1995). The field work for each separator pit is discussed separately in the following sections.

3.2.1 Former Oil-Water Separator Pit No.1

As described above, separator pit No.1 and impacted soil to the south of the separator were remediated in 1990 and 1995, respectively. During the PSA, RETEC completed four additional soil borings around the separator. The objective of the testing was to determine if PCB compounds were present in the soil surrounding the separator and to use field characterization to determine the extent, if any, of hydrocarbon impacts to soil in the study area. The borings were strategically placed around the separator; however, no soil borings were completed inside of the separator or within the areas which were backfilled with clean soil following the remediation. One sample, a composite of soil from borings SB24 and SB25, was sent to the laboratory for analysis. A summary of the borings is presented in Table 3-1.



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SOUTHEAST DRAINAGE DITCH INVESTIGATION AREA

MINERAL SPRINGS ROAD MGP SITE

RETEC REMEDIATION TECHNOLOGIES INC

DRAWING NO. FIGURE 3-2 REV. 0

Table 3-1
Soil Boring Summary - Former Separator Pit No. 1

Identification	Total Depth of Boring (feet)	Laboratory Sample Designation and Analyses	Rationale
SB21	16.0	NT	Field characterization and PID screening
SB23	16.0	NT	Field characterization and PID screening
SB24	16.0	SB24/25(12-16) (note 1) PCB	PCB investigation, field characterization and PID screening
SB25	16.0	SB24/25(12-16) (note 1) PCB	PCB investigation, field characterization and PID screening

NT - not tested
(note 1) - represents a composite soil sample from two soil borings

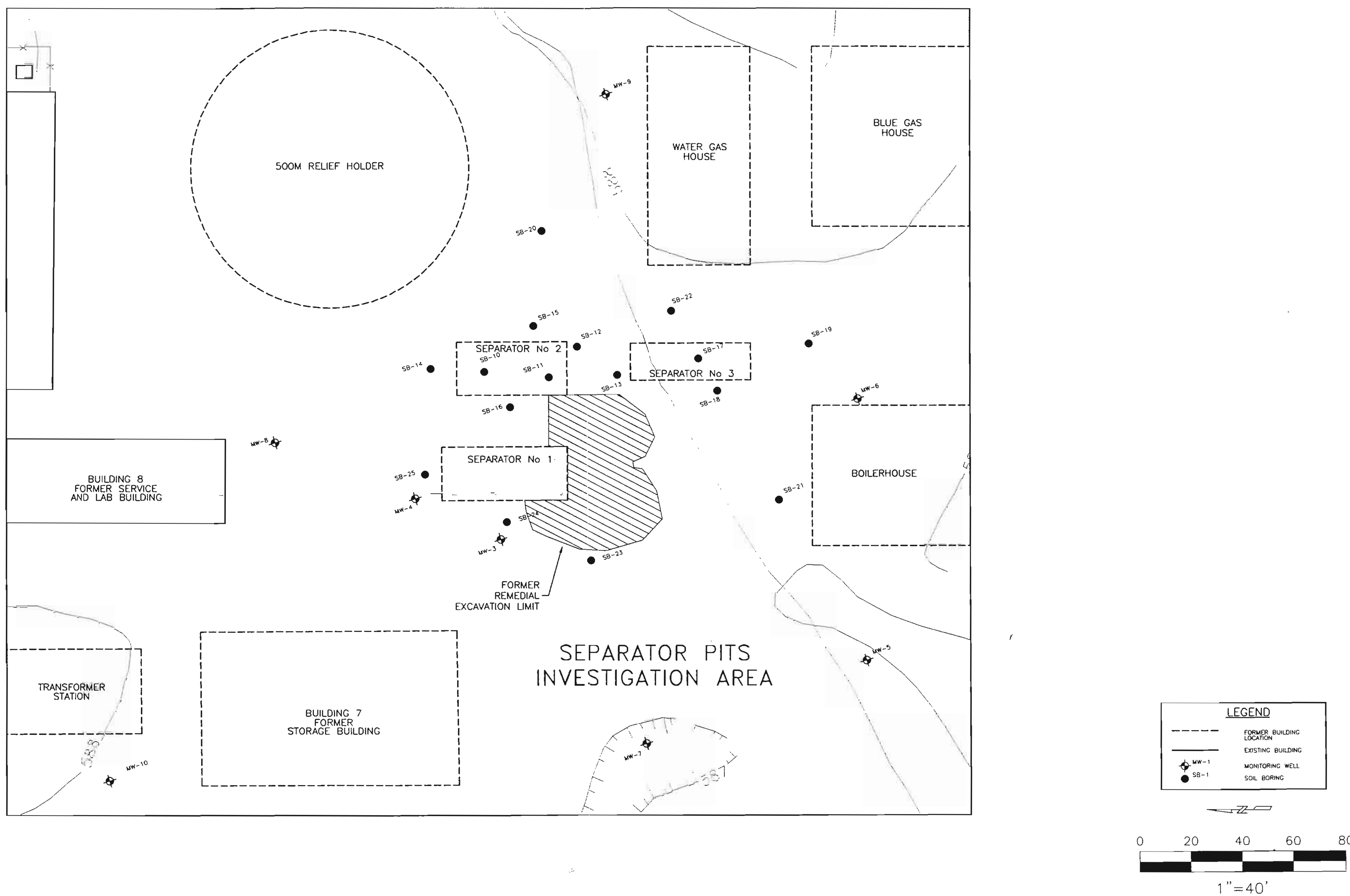
3.2.2 Separator Pit No. 2

A total of two borings (SB10 and SB11) were completed within the footprint of separator pit No. 2 during the investigation. One laboratory sample, SB10/11(4-8), was composited from the most visibly impacted soil from each of the respective borings at the specified depth. Five borings were completed around the separator. Table 3-2 provides a summary of the borings completed within and around the separator.

Table 3-2
Soil Boring Summary - Separator Pit No. 2

Identification	Total Depth of Boring (feet)	Laboratory Sample Designation and Analyses	Rationale
SB10	8.0	SB10/11(4-8) - BTEX, PAH, PCB and cyanide (note 1)	COI within the footprint of separator pit No. 2
SB11	8.0	SB10/11(4-8) - BTEX, PAH, PCB and cyanide (note 1)	COI within the footprint of separator pit No. 2
SB12	16.0	SB12(12-16) - BTEX, PAH, TOC and cyanide	COI in soil south of separator pit No. 2
SB14	16.0	NT	Field characterization and PID screening
SB15	8.0	NT	Field characterization and PID screening
SB16	12.0	NT	Field characterization and PID screening
SB20	12.0	SB20(8-12) - BTEX, PAH, and cyanide	COI in soil east of separator pit No. 2

NT - not tested
(note 1) - represents a composite soil sample from two soil borings



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SEPARATOR PITS
INVESTIGATION AREA

MINERAL SPRINGS ROAD MGP SITE

RETEC REMEDIATION TECHNOLOGIES INC

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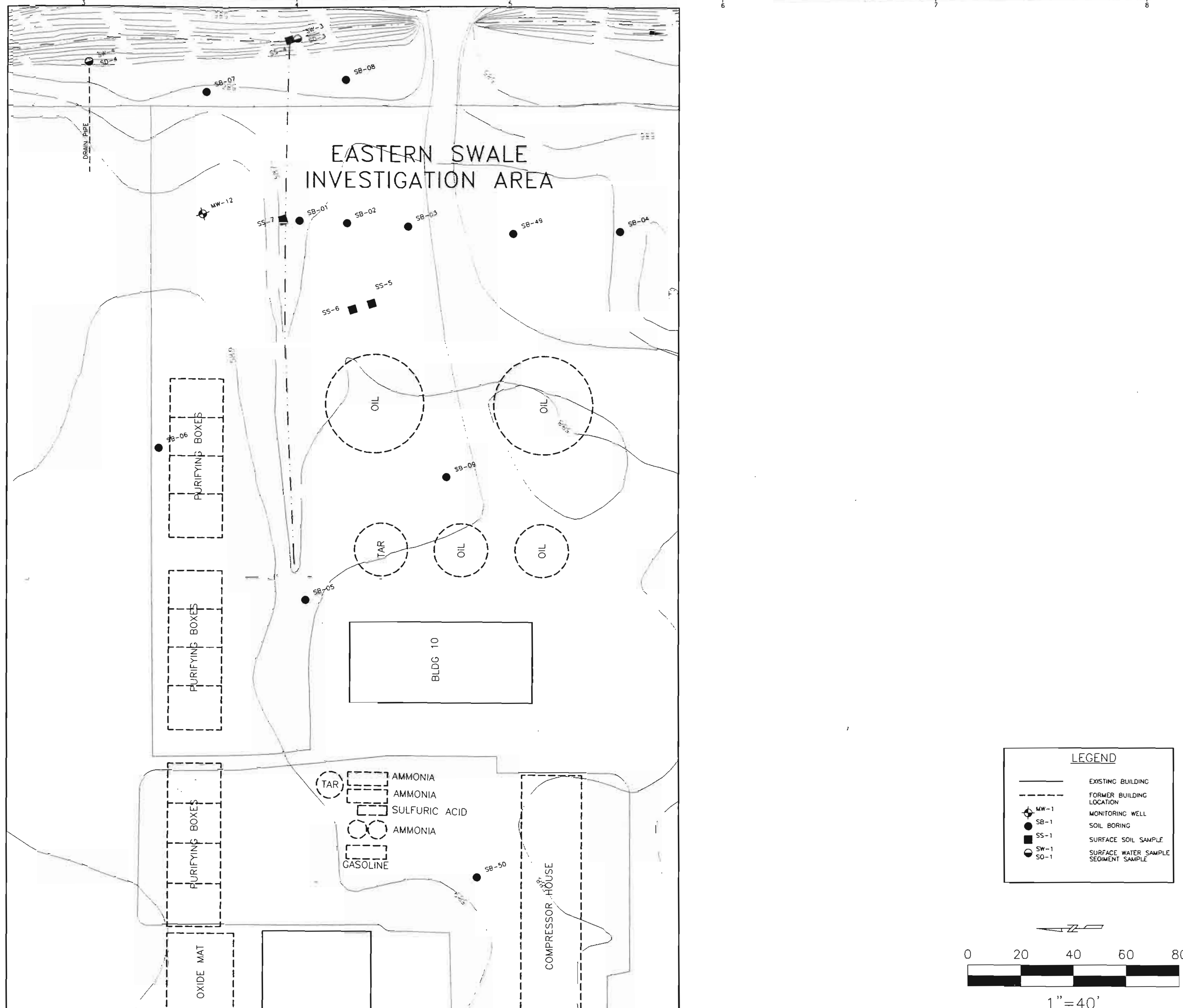

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EASTERN SWALE
INVESTIGATION AREA

MINERAL SPRINGS ROAD MGP SITE

RETEC
REMEDIATION TECHNOLOGIES INC

DRAWING NO. FIGURE 3-4 REV. 0

3.2.3 Separator Pit No. 3

A total of five borings were completed in, or around, separator No. 3. Table 3-3 provides a summary of the borings.

Table 3-3
Soil Boring Summary - Separator Pit No. 3

Identification	Total Depth of Boring (feet)	Laboratory Sample Designation and Analyses	Rationale
SB13	6.5	SB13(3-6.5) - BTEX, PAH cyanide	COI in soil north of separator pit No. 3
SB17	8.0	SB17(2-8) - BTEX, PAH, PCB and cyanide	COI within the footprint of separator pit No. 3
SB18	16.0	NT	Field characterization and PID screening
SB19	12.0	SB19(8-12) - BTEX, PAH and cyanide	COI in soil south of separator pit No. 3
SB22	16.0	NT	Field characterization and PID screening

NT - not tested

3.3 Eastern Swale Investigation Area

Four surface soil samples and eleven Geoprobe borings were completed in and around the Eastern Swale Area, as shown on Figure 3-4. The objective of the sampling was to determine the depth and lateral extent of the purifier box residuals which are exposed at the ground surface in the investigation area. A sample of the most impacted surface soil was sent to the laboratory for analysis to determine if the soil exhibited RCRA hazardous characteristics. Table 3-4 provides a summary of the surface and subsurface soil samples collected in the Eastern Swale Area.

In addition to the soil borings, one monitoring well (MW12) was installed in the study area. This well is discussed in Section 3.8.

Table 3-4
Soil Sample Summary
Eastern Swale Investigation Area

Identification	Total Depth of Boring or Sample (feet)	Laboratory Sample Designation and Analyses	Rationale
Surface Soil Samples			
SS4	0 - 0.5	BTEX, PAH, Cyanide, TAL Metals	Sample collected from area of exposed blue-stained wood chips (purifier box residuals) near swale outfall.
SS5	0 - 0.5	BTEX, PAH, Cyanide, TAL Metals and pH	Sample collected from root zone of non-stressed vegetation - eastern swale area.
SS6	0 - 0.5	BTEX, PAH, Cyanide, TAL Metals and pH	Sample collected from root zone of stressed vegetation - eastern swale area.
SS7	0 - 0.5	BTEX, PAH, Cyanide, TAL Metals, TOC, RCRA Hazardous Characteristics	Composite sample collected from bottom of drainage swale.
Geoprobe Soil Borings			
SB1	4.0	SB1(2-4) - BTEX, PAH, TOC and Cyanide	Extent of exposed purifier box residuals.
SB2	4.0	NT	Extent of exposed purifier box residuals.
SB3	4.0	NT	Extent of exposed purifier box residuals.
SB4	4.0	NT	Extent of exposed purifier box residuals.
SB5	8.0	NT	Extent of exposed purifier box residuals.
SB6	12.0	NT	Extent of exposed purifier box residuals.
SB7	4.0	NT	Extent of exposed purifier box residuals.
SB8	4.0	NT	Extent of exposed purifier box residuals.
SB9	6.5	NT	Extent of exposed purifier box residuals.
SB49	16.0	NT	Extent of exposed purifier box residuals.
SB50	16.0	SB50(10-14) - BTEX, PAH and cyanide	Planned building expansion area.

NT - not tested

3.4 Subsurface Hydrocarbon Investigation Area

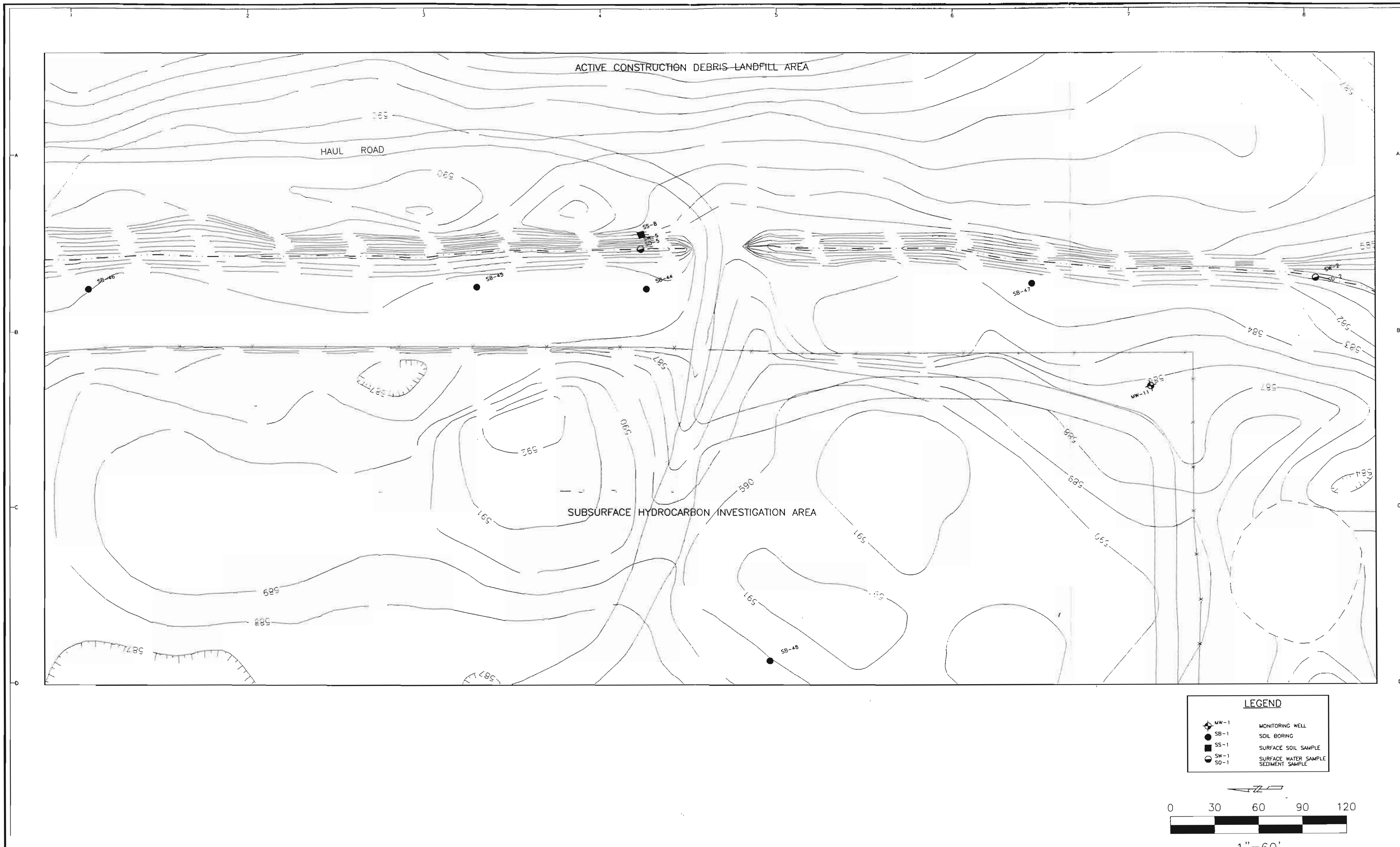
One surface soil sample and five Geoprobe soil borings were completed in the Subsurface Hydrocarbon Area as shown on Figure 3-5. In addition to the soil sampling, one monitoring well (MW11) was installed in the study area. A discussion of the well installation is included in Section 3.8. The objective of the fieldwork was to further define the extent of hydrocarbon impacted soil observed at ground surface in the area of sediment sample SD5.

Two laboratory samples, SB44 (8-12) and SB44 (12-16) were collected from boring SB44. The objective of the sampling was to determine the extent of COI at different depth intervals within the boring. Table 3-5 provides a summary of the samples.

Table 3-5
Soil Sample Summary
Subsurface Hydrocarbon Investigation Area

Identification	Total Depth of Boring or Sample (feet)	Laboratory Sample Designation and Analyses	Rationale
Surface Soil Samples			
SS8	0 - 0.5	BTEX, PAH, Cyanide, TAL Metals	To determine if purifier waste was present downstream of the area of exposed residuals
Geoprobe Soil Borings			
SB44	16.0	SB44(8-12) - BTEX, PAH and cyanide SB44(12-16) - BTEX, PAH and cyanide	Concentration of COI at two separate depth intervals within boring.
SB45	16.0	NT	Field characterization and PID screening
SB46	16.0	NT	Field characterization and PID screening
SB47	16.0	NT	Field characterization and PID screening
SB48	16.0	NT	Field characterization and PID screening

NT - not tested



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SUBSURFACE HYDROCARBON INVESTIGATION AREA

MINERAL SPRINGS ROAD MGP SITE

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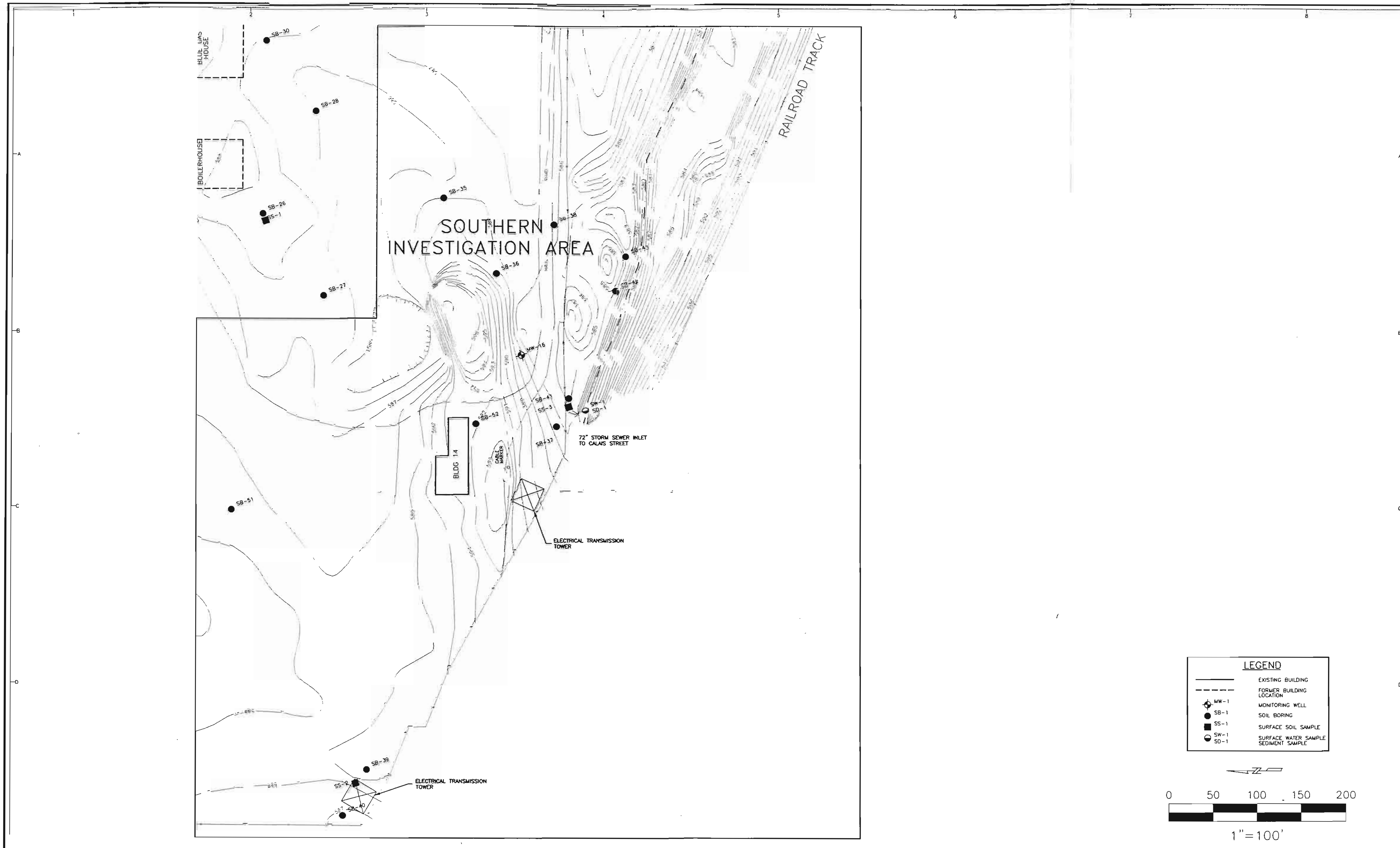
3.5 Surface Hydrocarbon Investigation Area

One surface soil sample and eleven Geoprobe borings were completed in the Surface Hydrocarbon Investigation Area shown in Figure 3-6. The objective of the sampling was to determine the lateral extent and depth of MGP constituents (tar-like materials) exposed at the ground surface in the area and to determine whether the exposed materials exhibited RCRA hazardous characteristics. Table 3-6 provides a summary of the surface soil and the sample soil borings completed in the investigation area.

Table 3-6
Soil Sample Summary
Surface Hydrocarbon Investigation Area

Identification	Total Depth of Boring/Sample (feet)	Laboratory Sample Designation and Analyses	Rationale
Surface Soil Sample			
SS1	0-0.5	SS1 - BTEX, PAH, cyanide, TOC and RCRA hazardous characteristics testing	Sample of exposed tar-like material
Geoprobe Soil Borings			
SB26	16.0	SB26(2-4) - BTEX, PAH and cyanide	To define extent and depth of COI.
SB27	16.0	NT	Field characterization and screening.
SB28	16.0	NT	Field characterization and screening.
SB29	16.0	SB29(10-16) - BTEX, PAH, cyanide and TOC	Extent of COI in impacted subsurface soil.
SB30	16.0	NT	Field characterization and screening.
SB31	16.0	NT	Field characterization and screening.
SB32	16.0	SB32(10-16) - BTEX, PAH and cyanide	Extent of COI in impacted subsurface soil.
SB33	16.0	NT	Field characterization and screening.
SB34	16.0	NT	Field characterization and screening.
SB35	16.0	NT	Field characterization and screening.
SB48	16.0	NT	Field characterization and screening.

NT - not tested



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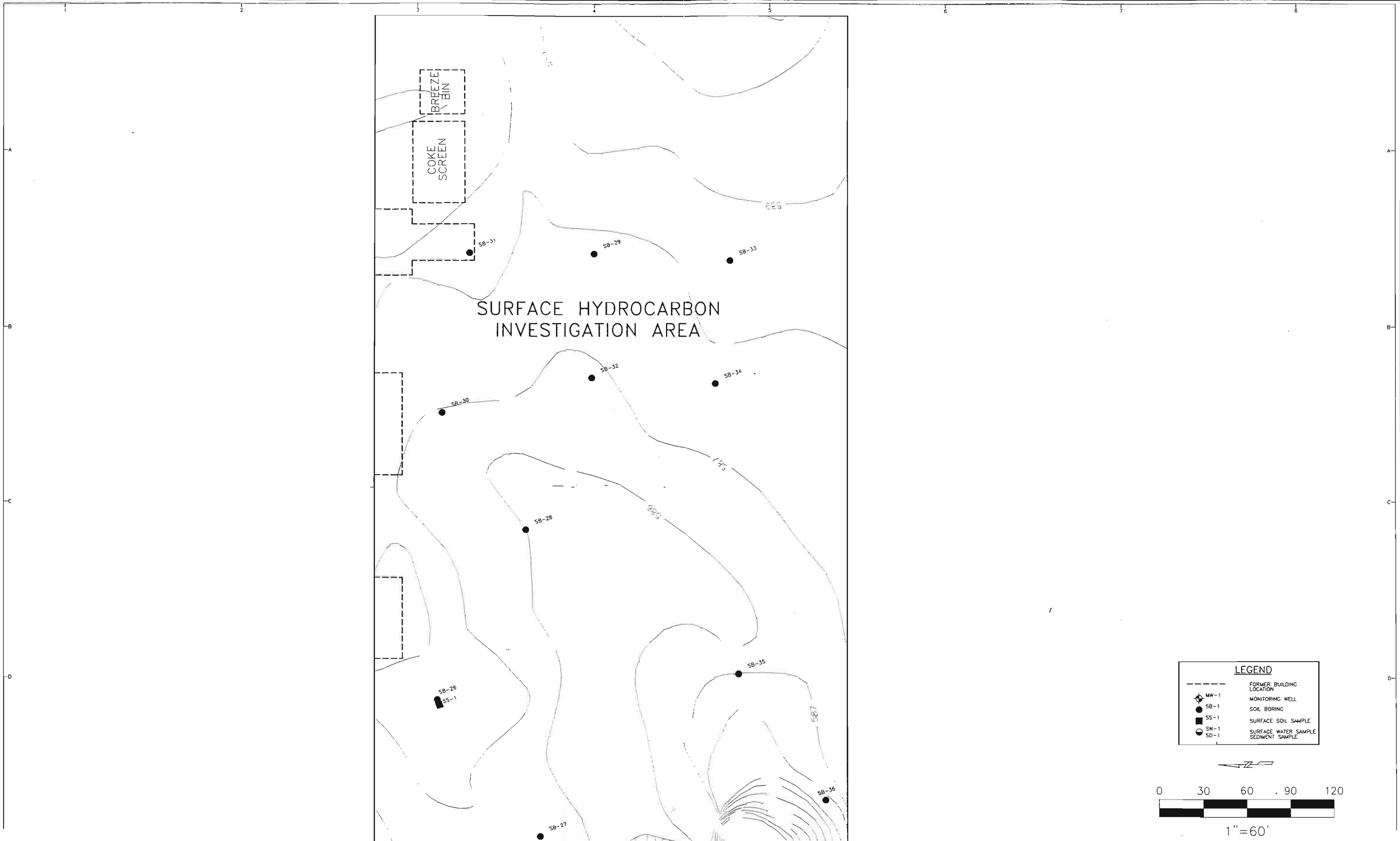
SOUTHERN
INVESTIGATION AREA

MINERAL SPRINGS ROAD MGP SITE

RETEC
REMEDIATION TECHNOLOGIES INC

DRAWING NO. FIGURE 3-7 | REV. 0



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SURFACE HYDROCARBON INVESTIGATION AREA

MINERAL SPRINGS ROAD MGP SITE

RETEC REMEDIATION TECHNOLOGIES INC

DRAWING NO. FIGURE 3-6 REV. 0

3.6 Southern Investigation Area

Two surface soil samples and ten Geoprobe borings were completed in the Southern Investigation Area during the PSA as shown on Figure 3-7. The objectives of the sampling were to:

- determine the depth and lateral extent of MGP constituents (purifier box residuals) which are present at the ground surface along the southern portion of the site;
- determine if MGP residuals in the investigation area are hazardous; and
- gather environmental and engineering data to address concerns regarding the structural integrity of the electrical transmission tower foundations present in the investigation area.

In addition to the soil borings, monitoring well MW16 is located within the investigation area. The well installation is discussed in Section 3.8.

Table 3-7 provides a summary of the samples collected in the Southern Investigation Area.

3.7 General Soil Boring And Sampling Methodology

The soil borings completed during the PSA were advanced using a truck-mounted Geoprobe drill rig. A 2-inch outside diameter, 4-foot long Macrocore sampling tube was used to advance the borehole. The tube sampler was equipped with a plastic liner. Each sample tube from the borehole was examined by the RETEC engineer for physical characteristics; for any visible evidence of MGP impacts to soil; and for jar headspace analysis with a photo-ionization detector (PID) equipped with a 10.6 eV bulb. Following completion of each Geoprobe boring, the borehole was filled to the ground surface with bentonite chips.

3.8 Perimeter Well Network

Six new monitoring wells were installed during the PSA. The objective of the well installation was to complete a network of wells surrounding the former MGP. Three wells were

Table 3-7
Soil Sample Summary
Southern Investigation Area

Identification	Total Depth of Boring/ Sample (feet)	Laboratory Sample Designation and Analyses	Rationale
Surface Soil Samples			
SS2	0-0.5	SS2 - BTEX, PAH, cyanide and RCRA hazardous characteristics	Most visibly impacted surface material beneath electric transmission tower.
SS3	0-0.5	SS3 - BTEX, PAH, cyanide and hazardous characteristics	Most visibly impacted surface material.
Geoprobe Borings			
SB36	16.0	SB36(2-6) - BTEX, PAH and cyanide	COI in area of exposed MGP constituents.
SB37	16.0	NT	Field characterization and screening.
SB38	16.0	NT	Field characterization and screening.
SB39	16.0	NT	Field characterization and screening.
SB40	16.0	NT	Field characterization and screening.
SB41	16.0	NT	Field characterization and screening.
SB42	16.0	SB42(4-6) - BTEX, PAH and cyanide	COI in area of exposed MGP constituents.
SB43	8.0	NT	Field characterization and screening.
SB51	16.0	SB5(4-6) - BTEX, PAH and cyanide	Proposed building expansion area.
SB52	20.0	NT	Field characterization and screening.

NT - not tested

installed along the northern (MW13 and MW14) and western (MW15) perimeter of the facility. Well MW12 was installed along the eastern facility boundary adjacent to the drainage ditch. A fifth well was installed at the southeast corner of the site (MW11) and a sixth well was installed (MW16) in the vicinity of the 72-inch culvert. Wells locations are shown on Figure 2-3.

3.8.1 Monitoring Well Installation

The monitoring well screens were placed to intercept the water table at the time of installation. Each well was constructed using 10 feet of machine-slotted, 2-inch diameter PVC well screen, with 0.020 inch slots. Blank, flush-threaded schedule 40 PVC casing was attached to the screen and extended to the ground surface. A sand pack was then installed around the length of the screen to 2 feet above the top of the screen. The grain size of the sand pack complemented the screen slot size (#1 Morie sand). A 2-foot thick, bentonite pellet subsurface seal was installed above the sand filter pack. Potable water was added to the bentonite and the seal was allowed to hydrate. A cement-bentonite grout mix was then placed to within 1 foot of ground surface. All wells (except MW14) were completed as above ground ("stick-up") installations with a steel protective casing, set into a cement surface seal. The well casings were sealed with air-tight well caps locked with a case-hardened steel lock to provide security. Subsurface drilling logs, which include the well construction diagrams, are provided in Appendix A. Table 3-8 provides a summary of the construction for each monitoring well installed during this investigation and the existing wells installed by Empire Soils Investigations in 1990, and RETEC in 1995.

3.9 Well Development

RETEC and Maxim mobilized to the site on July 21, 1997, to develop the five new monitoring wells. The objective of this work was to remove fine-grained sediment and fluid residue from the sandpack, to improve well efficiency, and to increase hydraulic communication between the well and the adjacent soil formation. A surge and pump method was chosen as the most suitable development technique for the wells. A bailer was used to actively surge and agitate the water column by forcing water back-and-forth through the well screen. Water was pumped from the wells with a submersible pump. Pumping was continued until the field parameters of pH, temperature, turbidity and conductivity had stabilized.

3.10 Groundwater Sampling

Groundwater samples were collected from both the newly installed wells (MW11 through MW16) and three existing wells (MW7, MW8 and MW10). Following development, the new wells were allowed to stabilize for a period of approximately one week. On July 22, 1997, RETEC mobilized to the site to complete the groundwater testing. Liquid level measurements were taken at each well location with a depth-to-water probe. Each of the wells was purged of three volumes of well water using a submersible pump. The objective of the work was to ensure that laboratory samples were representative of fresh formation groundwater. The field parameters of pH, temperature, conductivity and turbidity were periodically recorded. Groundwater samples were

Table 3-8
Monitoring Well Construction Summary
Mineral Springs Gas Plant Site

Well Number	Ground Surface Elevation Feet (Feet above MSL)	Top of PVC Riser Feet (Feet above MSL)	Total Depth Drilled (Feet)	Top of Screen Elevation (Feet above MSL)	Bottom of Screen Interval Depth (Feet)	Bottom of Screen Elevation (Feet above MSL)	Depth to Water 7/22/97 (Feet)	Elevation of Water 7/22/97 (Feet above MSL)
Existing Monitoring Wells (Note 1)								
MW3	587.93	587.81	12.0	585.81	12.0	575.81	NT	NT
MW4	588.18	587.95	14.4	583.55	14.4	573.55	NT	NT
MW5	587.95	587.74	14.0	583.95	14.0	573.95	NT	NT
MW6	588.77	588.55	15.0	583.77	15.0	573.77	NT	NT
MW7	587.56	587.31	15.2	582.38	15.2	572.36	7.18	580.13
MW8	588.14	587.90	14.2	583.94	14.2	573.94	8.05	579.85
MW9	588.31	587.93	15.4	582.89	15.4	572.89	NT	NT
MW10	587.97	587.71	15.0	582.97	15.0	572.97	7.84	579.87
Wells Installed During this Investigation								
MW11	587.34	590.03	18.0	584.34	18.0	569.34	9.75	580.28
MW12	588.74	591.40	15.0	583.74	15.0	573.74	11.95	579.45
MW13	590.51	591.85	20.0	582.33	20.0	572.33	13.68	578.17
MW14	590.02	589.81	20.0	580.02	20.0	570.02	12.45	577.36
MW15	588.95	590.93	18.0	580.95	18.0	570.95	11.82	579.11
MW16	586.46	588.99	18.0	578.46	18.0	568.46	8.82	580.17

(Note 1) - Monitoring wells MW3 and MW4 installed by Empire Soils (ESI,1995). Monitoring wells MW5 through MW10 installed by RETEC in 1995.

collected, using a bailer, when the variation between successive readings of temperature, pH and conductivity was less than 10%. All wells were sampled for VOCs, PAHs, cyanide and TAL metals.

During the sampling of wells MW13, MW14 and MW15, turbidity remained in excess of 50 NTU throughout purging and sampling. Following sampling for BTEX, PAH and cyanide, these wells were allowed to stabilize (approximately 24 hours) and a sample was collected for TAL metals with a disposable Teflon bailer. Table 3-9 provides a summary of the field parameters recorded during collection of groundwater samples.

3.11 Decontamination Procedures

All downhole drilling equipment used during the Geoprobe testing and monitoring well installation was pressure-washed between borings. All soil, well development and groundwater testing equipment was decontaminated with a sequence consisting of the following steps:

- removal of gross contamination by brushing, wiping, etc.;
- potable water and Alconox (detergent) solution wash;
- distilled water rinse;
- nitric acid solution rinse;
- reagent grade methanol rinse; and
- final distilled water (laboratory provided) rinse.

3.12 Waste Management

Fluids generated during the decontamination of drilling equipment were containerized on a decontamination pad consisting of a "cow trough" on a bermed area which was lined with a plastic sheeting liner. The decontamination fluids, well development and well purge water were containerized, labeled and temporarily stored onsite in 55-gallon drums.

Drill cuttings generated during the installation of Geoprobe borings and monitoring wells were containerized into 55-gallon drums and temporarily stored on the site. Personal protective equipment and Macro-Core sampling tubes were containerized into drums.

The results of the soil and water sample analyses, one water composite and one soil composite of the drummed material were used to characterize the waste materials for disposal.

Table 3-9
Groundwater Field Parameters Summary

Sample	pH	Temperature Degrees C	Conductivity umhos/cm	Turbidity NTU
MW7	6.32	11.4	890	15.8
MW8	6.35	12.1	1100	7.4
MW10	6.46	11.6	960	2.6
MW11	6.36	9.8	800	20.5
MW12	6.46	11.2	960	2.6
MW13	6.70	13.3	950	51.3
MW14	6.52	13.0	1009	22.4
MW15	6.49	11.6	740	17.6
MW16	6.05	11.0	1340	21.4

It is anticipated that the drums will be disposed of as non-hazardous waste at CID Disposal Facility in Chaffee, NY, following approval by the facility.

3.13 Survey

The ground surface, the elevation of the outer protective well casing and the elevation of the PVC well riser (reference elevation) of the new and existing wells were measured by differential leveling. The survey was completed by Douglas C. Myers Professional Land Surveyor P.C., of Arcade, New York. The survey data was tied into the elevation (mean sea level datum of 1929) of a benchmark established by McIntosh & McIntosh, P.C. Consulting Engineers of Lockport, New York, in 1987 (McIntosh, 1987). The reference point used was a bolt on a hydrant in the south western section of the site (elevation 589.44 MSL).

Horizontal monitoring well and soil boring locations as surveyed by Myers were tied by RETEC into the existing survey completed by McIntosh & McIntosh. The survey data generated during the investigation was used to construct a base map for the site. The elevations for the wells are presented in Table 3-8 (well construction summary) and on the contour map of the water table (Figure 4-3).

4.0 SITE PHYSICAL CONDITIONS

This section presents a summary of measurements and observations of the physical environment at the site, including both the geology and the hydrogeology of the site, and the man-made structures. This evaluation is based on the examination of surface conditions, Geoprobe soil borings and monitoring well installations.

4.1 General Geologic Overview

The site is located within the Lake Erie Plain in the Erie-Ontario Lowlands Physiographic Province. The Plain forms a 6 to 12 mile wide lowland between the Onondaga Escarpment and the Allegheny Plateau. Topography of the plain is comprised of smooth to gently rolling hills which rise in elevation towards the south. The overburden in the vicinity of the site is comprised of unconsolidated, poorly sorted glacial till and moraine deposits and clay-rich lacustrine deposits. These units form a thin mantle over bedrock in the area. The depth of the overburden at the site is unknown. Bedrock beneath the site is mapped as a shale of the middle-Devonian Skaneateles Shale Formation.

The site is characterized by low relief (less than 13 feet) with the ground surface sloping to the southwest. Surface water is conveyed onto the site from a ditch in the northeast area of the site and by a Class D stream from the south. Surface water flow in the eastern and southern areas of the site is collected in ditches and flows to the Class D stream, past a marsh area, into the 72-inch culvert to the Calais Ave. storm sewer and is conveyed through a series of culverts into the Buffalo River.

4.2 Description of Site Stratigraphy

Three stratigraphic units were identified from soil borings completed during the investigation. The units are summarized as follows:

- The uppermost unit consists of a fill which was present in the majority of the soil borings. The fill ranges in thickness from less than one foot at SB7 to over 10 feet at SB52. The fill material varies in composition, but is generally a gray silty clay, containing varying amounts of gravel, cinders, ash, brick fragments, coal fragments and concrete.

- Underlying the fill material a clay unit was found in the majority of the borings completed at the site. The clay was found to vary in thickness (up to 14 feet thick).

- Underlying the clay is a sand unit, the bottom of which was not encountered in any of the borings completed at the site. The sand was observed to vary greatly in grain size and to contain varying amounts of rounded gravel and cobbles.

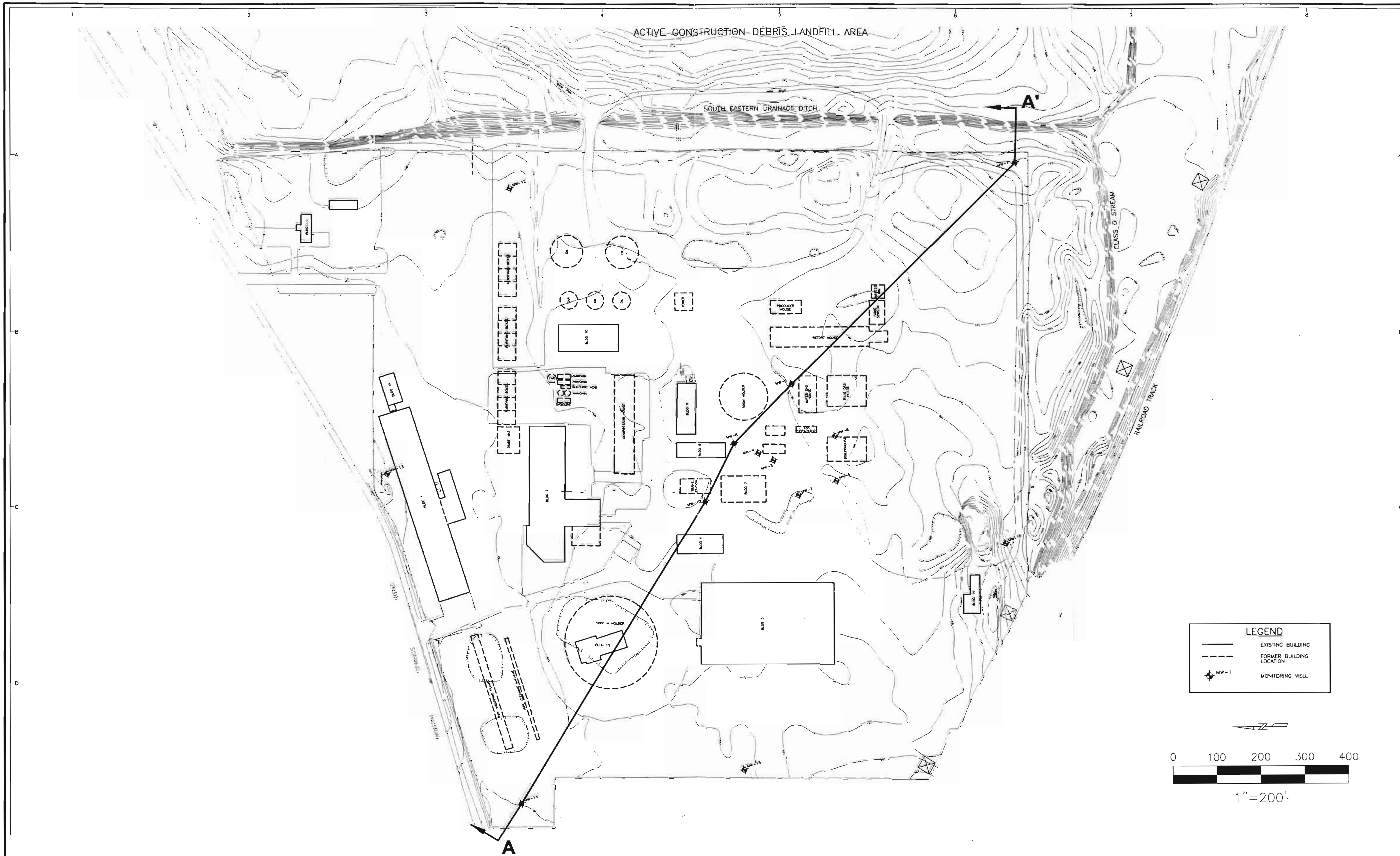
Data collected during the subsurface sampling was used to generate a cross-sectional view of the subsurface strata. The location of the cross-section is shown in Figure 4-1 and the cross-section is shown in Figure 4-2.

4.3 Site Hydrogeology

The depth to groundwater ranged from approximately 7 (MW7) to 13 (MW13) feet below the ground surface. The water level measurements from the monitoring wells were used to map the potentiometric surface of the water table and infer the direction of groundwater flow (Figure 4-3). Based on this water table map, the average horizontal gradient across the site (MW11 to MW14) was calculated to be 0.0018 feet/foot. The surface of the water table slopes in a northwesterly direction towards Mineral Springs Road and the Buffalo River. The direction of flow was found to be consistent with a previous site investigation (RETEC, 1995).

4.4 Field Observations

The environmental condition of six areas within the former MGP site were investigated during the PSA. The observations recorded by the RETEC engineer during the field work are presented in the following sections.



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CROSS SECTION
LOCATION MAP

MINERAL SPRINGS ROAD MGP SITE

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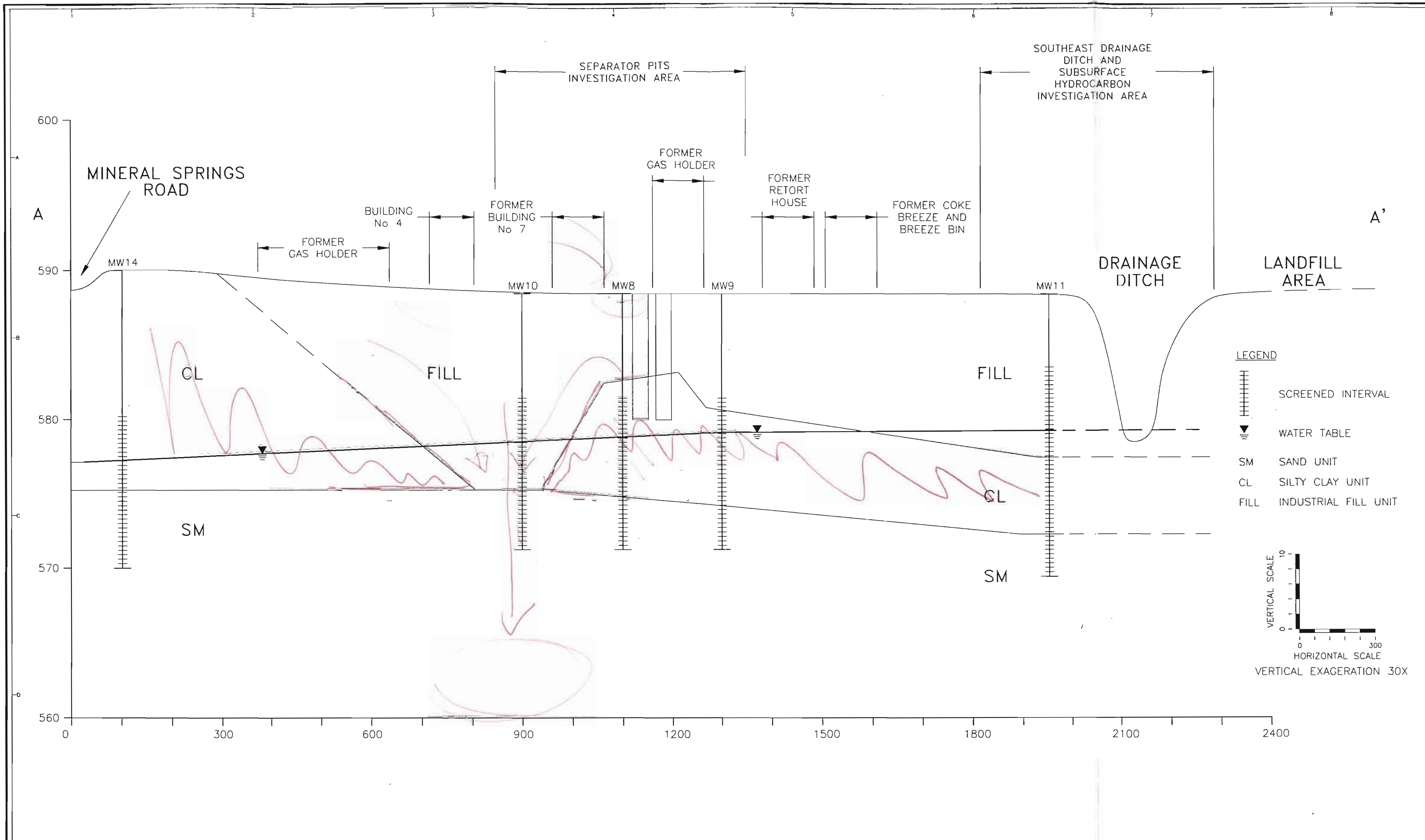

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GEOLOGIC CROSS SECTION A-A'

MINERAL SPRINGS ROAD MGP SITE

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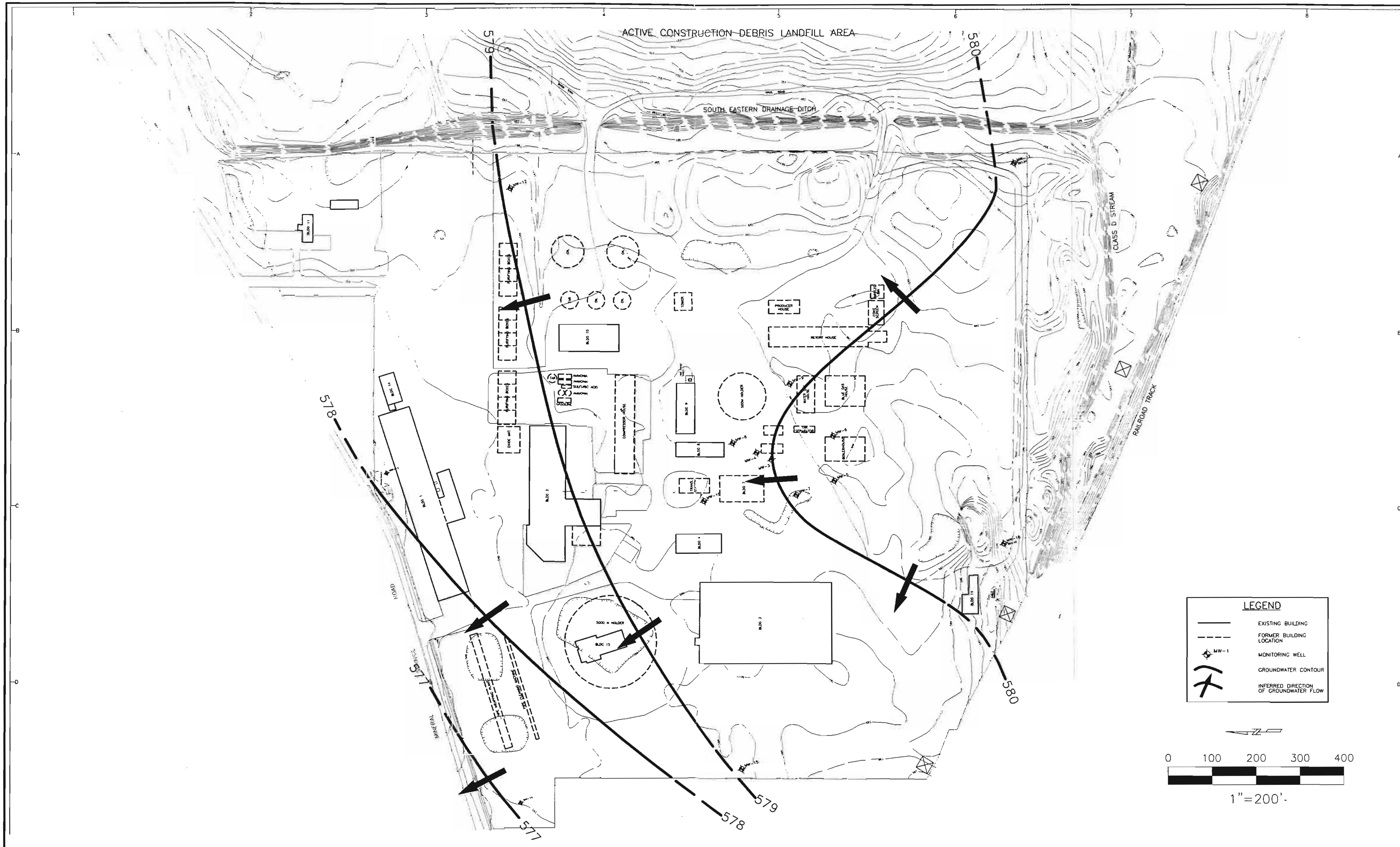

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MINERAL SPRINGS ROAD
GROUNDWATER CONTOURS

MINERAL SPRINGS ROAD MGP SITE

RETEC
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4.4.1 Southeastern Drainage Ditch

The following set of observations were made during the Southeastern Drainage Ditch Investigation:

- Visible evidence of MGP constituents was limited to a slight hydrocarbon sheen observed in surface water in the vicinity of sample location SD5. The previous discovery of this hydrocarbon sheen led to the addition of the Subsurface Hydrocarbon Investigation to the scope-of-work of this PSA.

- Purifier residuals, described as blue stained wood chips, were observed to have been carried by storm water into the ditch from the Eastern Swale Area.

- A thin horizontal band of blue stained soil was observed along the drainage ditch bank at SS8. The discoloration was limited to a thin crust on the soil surface and was not indicative of a subsurface lens of purifier residuals. The discoloration was at an approximate elevation of 584 feet above MSL and may represent a high water mark for the ditch.

- Orange stained soil was observed adjacent to the drain pipe north of the Eastern Swale Area. The location of the drain pipe is shown on Figure 3-4.

4.4.2 Separator Pits Area

Former Oil-Water Separator Pit No. 1

Facility drawings and maps from previous investigations were used to locate the footprint of the former oil-water separator. Four Geoprobe borings were completed around the separator as shown on Figure 3-3. The following set of observations were made during the field work:

- The footprint of the separator is currently capped by asphalt pavement.

- From soil borings completed around the pit, visible evidence of MGP constituents was limited to a trace hydrocarbon staining in boring SB23.

Separator Pit No. 2

A historical facility map and two Geoprobe borings were used to locate the footprint of the former separator pit No. 2. The following set of observations were recorded during the fieldwork:

- The pit is capped by the pavement of the facility parking lot.
- Geoprobe tools were unable to advance deeper than 8 feet bgs in the borings, the likely concrete floor of the pit.
- The pit foundation contains fill comprised of silty clay, brick fragments, concrete fragments.
- The bottom 5 feet of fill material was saturated with DNAPL. The DNAPL was black, had a low viscosity and a strong hydrocarbon odor.
- Water level measurements taken from within the footprint of the pit foundation (3 feet bgs) indicate that water is "perched" in the foundation approximately 5 feet above the surrounding water table.

Five Geoprobe borings were completed around the pit foundation. The objective of the borings was to further define the extent of COI in soil and groundwater in an area considered to be down gradient of the pit. The following observations were recorded by the field engineer during the sampling:

- Hydrocarbon odors, hydrocarbon soil staining and thin stringers of hydrocarbon product were observed in the subsurface soil samples completed immediately adjacent to the pit foundation (SB12, SB15 and SB16) at depths of less than 10 feet.
- Evidence of MGP constituents was limited to slight hydrocarbon odors and soil staining in the subsurface soil samples completed north of (20 feet - SB14) and to the east of (30 feet - SB20) the pit foundation.

Separator Pit No. 3

A historical facility map, surface observations, and one Geoprobe boring were used to locate the footprint of the former separator pit No.3. Additional information regarding the location and environmental condition of the holder was obtained from a previous investigation (Empire, 1995). The following observations were recorded during the PSA fieldwork:

- Geoprobe tools were unable to advance deeper than 8 feet bgs in the boring, the likely concrete floor of the pit.

- The pit foundation contains fill comprised of silty clay and brick fragments.

- Approximately 1 foot of DNAPL was observed at the base of the pit foundation. The DNAPL was black and had a low viscosity.

Five Geoprobe borings were completed around the pit foundation. The objective of the borings were to further define the extent of COI in soil adjacent to the foundation. The following observations were recorded by the field engineer during the sampling:

- Hydrocarbon odors, hydrocarbon soil staining and thin stringers of hydrocarbon product was observed in two subsurface soil samples completed adjacent to the pit foundation (10 feet west - SB18, and 15 feet east - SB22).

- At SB13, located to the north of the pit, a 2.5 foot thick layer of flowable hydrocarbon product was found mixed with fill material. Geoprobe tools were unable to advance deeper than a concrete structure at 6.5 feet bgs. The concrete is likely to be a portion of the footer for the pit foundation.

- Visible evidence of subsurface MGP constituents south of the pit were limited to traces of hydrocarbon soil staining at boring location SB19.

4.4.3 Eastern Swale Area

The following set of observations regarding the Eastern Swale were recorded during the fieldwork:

- MGP constituents, consisting of a 3 inch thick layer of purifier box residuals is partially exposed at the ground surface and throughout the swale.

- A one foot thick clay layer was observed to underlay the purifier residuals.

- Underlying the clay layer additional accumulations of purifier residuals were observed in thicknesses of up to 18 inches.

- Soil in subsurface borings advanced to 16 feet bgs contained visible hydrocarbon sheens, elevated PID readings and hydrocarbon odors.

- One subsurface boring, SB9, contained visible hydrocarbon product from 3 to 5 feet below ground surface.

4.4.4 Subsurface Hydrocarbon Area

The following observations were recorded during the fieldwork in the Subsurface Hydrocarbon Area:

- All of the borings in this area, with the exception of SB48, contained visible and PID evidence of hydrocarbon-impacted soil. Soils in those borings located along the ditch were observed to be saturated with flowable hydrocarbon product. The saturated soils were found from approximately 7 feet bgs to approximately 15 feet bgs in the borings.

- The hydrocarbon product was described as having a strong odor, having low viscosity and was black in color.

4.4.5 Surface Hydrocarbon Investigation Area

The following set of observations were made during the fieldwork in the Surface Hydrocarbon Investigation Area:

- Surface soil and subsurface soil in the immediate vicinity of soil boring SB26 contained a tar-like, semi-solid, hydrocarbon product.

- The tar-like material was estimated to be limited to an area approximately 20 by 20 feet and to have a thickness of 0.5 feet. The material was found beneath approximately 3 feet of overburden. The material is identifiable at the ground surface by the presence of "tar-boils".

- Visible evidence of MGP constituents in the remaining soil borings completed within the investigation area included several borings containing slight hydrocarbon soil staining and hydrocarbon odors.

- At soil boring location SB29, a thin stringer of hydrocarbon product was observed.

4.4.6 Southern Investigation Area

The following set of observations were made during the field work in the Southern Investigation Area:

- Purifier box residuals were found exposed at the ground surface beneath the electrical transmission tower in the southwest corner of the site. The occurrence of the surface waste is limited to a 20 by 24 by 3 feet deep area between borings SB39 and SB40. A 2-inch layer of purifier residuals was observed at a depth of four feet bgs in SB40. The estimated volume of the exposed residuals under the tower is 45 cubic yards.

- Purifier box residuals were observed to be scattered thinly (less than 3 inches thick) around the area of well MW16 and soil sample locations SS3 and SB42.

- Subsurface purifier box residuals were observed in thin layers in SB36, SB37, SB40, SB42, SB43 and SB51.

4.4.7 Perimeter Monitoring Well Network

During the installation of the six new wells during the PSA, visible evidence of impacted soil or groundwater was limited to two wells. During installation of well MW11, hydrocarbon product in stringers were observed in the subsurface soil. The stringers were found towards the bottom of the clay unit and towards the top of the sand unit. During the installation of well MW12, blue stained wood chips, typical of purifier box residuals, were observed from a depth of 1 to 3 feet bgs.

5.0 ANALYTICAL RESULTS

This section presents the analytical results of surface water, sediment, surface and subsurface soil and groundwater samples collected during the PSA Investigation. Subsurface soil samples are presented in terms of sampling depth. The laboratory results which provide the results of the analyses are summarized in tables in the following sections.

The soil and groundwater samples collected during the PSA were analyzed for MGP indicator parameters which included:

MGP Indicators

- BTEX compounds by ASP Method 95-1;
- PAH compounds by ASP Method 95-2;
- total cyanide by ASP Method CLP-M; and
- Target Analyte List (TAL) metals: aluminum, antimony, arsenic, barium, beryllium, cadmium, calcium, chromium, cobalt, copper, iron, lead, magnesium, mercury, nickel, potassium, selenium, silver, sodium, thallium, vanadium and zinc by Method CLP-M.

RCRA Hazardous Characteristics

- TCLP Volatiles by Method SW 846 8240
- TCLP Semi-Volatiles by Method SW 846 8270
- TCLP Pesticides by Method SW 846 8080
- TCLP Herbicides by Method SW 846 8150
- TCLP Metals
    - arsenic by Method SW 846 7061
    - barium by Method SW 846 6010
    - cadmium by Method SW 846 7130
    - chromium by Method SW 846 7190
    - lead by Method SW 846 7420
    - mercury by Method SW 846 7471
    - selenium by Method SW 846 7741
    - silver by Method SW 846 7760
- Reactivity by Method SW 846 9010 and 9030
- Ignitability by Method SW 846 1010
- Corrosivity by Method SW 846 1110

Total organic carbon was also analyzed by the Walkley Black method so that the BTEX and PAH concentrations could be compared to the guidance values cited in NYSDEC TAGM 4046.

To meet the data quality objectives for this project, NYSDEC 1995 Analytical Service Protocols (ASP) were used with Category B deliverables. Galson Laboratories of Syracuse, New York performed the laboratory analyses. Galson is currently listed with the New York Department of Health (NYSDOH) Environmental Laboratory Accreditation Program (ELAP) and has current CLP Certification for all Analyte categories. The Category B deliverables were reviewed by a RETEC chemist and a Data Usability Summary Report (DUSR) was prepared (Section 6).

The evaluation of soil and sediment results in the following sections is based on a comparison to NYSDEC concentrations listed in NYSDEC Division of Hazardous Waste Remediation Technical and Guidance Memorandum (TAGM) HWR-94-4046 - Determination of Soil Cleanup Objectives and Cleanup levels (January, 1994). The results of the analysis of groundwater and surface water are compared to NYSDEC 6NYCRR Part 703 Water Quality Standards and NYSDEC Division of Water Technical and Operational Guidance Series (TOGS) Memorandum 1.1.1 (October, 1993).

It should be noted that the Recommended Soil Cleanup Objectives for organic compounds published in NYSDEC TAGM 4046 are default values based on an assumed concentration of one percent total organic carbon in soil. Because site-specific TOC concentrations vary, the Allowable Soil Concentration for a site may change as well. The Allowable Soil Concentration is based in part on the potential for organic compounds to leach from the soil to groundwater. The potential for leaching is based on the Water-Soil Partitioning Theory, which states that the capacity of a soil to adsorb contamination is directly related to the amount of organic carbon in the soil (total organic carbon, or TOC) according to the equation:

$$\text{Allowable Soil Concentration } C_s = f \times K_{oc} \times C_w$$

Where: f = fraction of organic carbon of the natural soil medium

K_{oc} = partitioning coefficient between water and soil (which is a function of the solubility of the compound in water)

C_w = water quality value for the compound (from NYSDEC Division of Water TOGS 1.1.1)

For each compound of interest K_{oc} is assumed to be a constant, the value of which is published by the USEPA. Therefore if K_{oc} and C_w are fixed, the value of C_s is linearly dependent on f, the amount of organic carbon in the soil. According to the TAGM, the cleanup objectives should be adjusted for the actual organic carbon content at a site if it is known. If the actual amount of organic carbon in a soil is five percent, then the allowable concentration of a compound in soil will be five time greater than the published value based on one percent carbon. Note, however, that other factors are also given consideration in establishing the recommended cleanup objects, so the influence of TOC on leaching potential must be considered along with other site specific factors, as discussed in TAGM 4046.

5.1 Surface Water Analysis

Six surface water samples were collected during the PSA. The samples were analyzed for BTEX, PAH and cyanide. The results of the analyses are summarized in Table 5-1.

5.1.1 Surface Water BTEX Analysis

BTEX compounds were detected in one of the six surface water samples. Sample SW5 contained benzene in a concentration of 1 μg/L and xylenes in a concentration of 3 μg/L. Both concentrations were found to be below the method detection limits for the analyses and are estimated concentrations. The concentration of benzene was found to be less than the NYSDEC guidance value for Class D surface water for benzene of 6 μg/L. At the time of this report, no standard or guidance value is currently listed for xylenes for surface water.

5.1.2 Surface Water PAH Analysis

No PAH compounds were detected in concentrations greater than the method detection limits for the six surface water samples collected during the PSA.

Table 5-1
Surface Water Results
Mineral Springs Road MGP Site

Sample ID Date Sampled	BSW-02 07/22/97			SW1 07/22/97			SW2 07/22/97			SW3 07/23/97			SW4 07/23/97			SW5 07/22/97			NYSDEC Water Quality Standard Class D Waters	
	Result	LQ	VQ	Result	LQ	VQ	Result	LQ	VQ	Result	LQ	VQ	Result	LQ	VQ	Result	LQ	VQ		
BTEX (µg/L)																				
Benzene	5	U		5	U		5	U		5	U		5	U		1	J		6	g
Toluene	5	U		5	U		5	U		5	U		5	U		5	U		NL	
Ethylbenzene	5	U		5	U		5	U		5	U		5	U		5	U		NL	
Xylene (Total)	5	U		5	U		5	U		5	U		5	U		3	J		NL	
PAHs (µg/L)																				
Naphthalene	10	U		10	U		10	U		10	U		10	U		10	U		NL	
Acenaphthylene	10	U		10	U		10	U		10	U		10	U		10	U		NL	
Acenaphthene	10	U		10	U		10	U		10	U		10	U		10	U		NL	
Fluorene	10	U		10	U		10	U		10	U		10	U		10	U		NL	
Phenanthrene	10	U		10	U		10	U		10	U		10	U		10	U		NL	
Anthracene	10	U		10	U		10	U		10	U		10	U		10	U		NL	
Fluoranthene	10	U		10	U		10	U		10	U		10	U		10	U		NL	
Pyrene	10	U		10	U		10	U		10	U		10	U		10	U		NL	
Benz(a)Anthracene	10	U		10	U		10	U		10	U		10	U		10	U		NL	
Chrysene	10	U		10	U		10	U		10	U		10	U		10	U		NL	
Benzo(b)Fluoranthene	10	U		10	U		10	U		10	U		10	U		10	U		NL	
Benzo(k)Fluoranthene	10	U		10	U		10	U		10	U		10	U		10	U		NL	
Benzo(a)Pyrene	10	U		10	U		10	U		10	U		10	U		10	U		0.0012	g
Indeno(1,2,3-cd)Pyrene	10	U		10	U		10	U		10	U		10	U		10	U		NL	
Dibenz(a,h)Anthracene	10	U		10	U		10	U		10	U		10	U		10	U		NL	
Benzo(g,h,i)Perylene	10	U		10	U		10	U		10	U		10	U		10	U		NL	
GENERAL (µg/L)																				
Cyanide (Total)	10	U		12.2		J	77.5		J	137		J	736		J	96.4		J	22	s (Note 1)

Notes:
LQ - Laboratory Qualifier
VQ - Data Validation Qualifier
U - The material was analyzed for, but not detected. The associated numerical value is the minimum attainable detection limit for the sample.
J - The associated numerical value is an estimated quantity.
6 - Concentration exceeding NYS Ambient Water Quality Standards - Class D Water Class
Note 1 - Expressed as free cyanide - the sum of HCN and CN expressed in CN.
NL - Not Listed
g - Guidance Value
s - Standard

5.1.3 Surface Water Cyanide Analysis

Cyanide was detected in all five of the onsite surface water samples in concentrations which ranged from 12.2 μg/L in sample SW1 to 736 μg/L in sample SW4. Cyanide was not detected in concentrations greater than the method detection limits for background surface water sample BSW2.

The method of analysis used for determining the cyanide concentrations in these samples reports the cyanide detections as total cyanide. The NYSDEC Ambient Water Quality Standard listed in the TOGS Memorandum lists the standard for Class D streams as 22 μg/L for free cyanide (the sum of HCN and CN^- expressed as CN). Since a determination of free cyanide was not made no comparison to the standard was made; however, cyanide at MGP sites is typically found in the form of complex metal cyanides which are non-reactive and essentially non-toxic (GRI, 1996). Little, if any, cyanide at MGP sites is present as free cyanide.

5.2 Sediment Analysis

Five onsite and two background sediment samples were collected during the PSA. The samples were analyzed for BTEX, PAH and cyanide. The results of the analysis are summarized in Table 5-2 and are discussed in the following sections. The results of the sediment analyses are compared to NYSDEC TAGM 4046 Recommended Cleanup Objectives for Soils. Note, however, that the concentration of TOC in the sediments was found to be greater than the 1% level used to calculate allowable soil concentrations of organics in TAGM 4046 (see Section 5.0). The allowable concentration of BTEX and PAHs in sediments is therefore higher than the default values cited.

5.2.1 Sediment BTEX Analysis

BTEX compounds were detected in concentrations which were greater than the method detection limits in three out of seven sediment samples. No BTEX compounds were detected in the background sediment samples BSD1 and BSD2. Sample SD5 contained benzene in a concentration of 3.4 mg/Kg, a concentration greater than the TAGM Cleanup Objective of 0.06 mg/Kg. Toluene was found in SD2(0.11 mg/Kg), SD3 (0.006 mg/Kg) and SD5 (0.61 mg/Kg), concentrations which are less than the Cleanup Objective of 1.5 mg/Kg. Sample SD5 contained ethylbenzene in a concentration of 32 mg/Kg, a concentration greater than the Cleanup Objective of 5.5 mg/Kg. Xylene (total) was detected in SD5 in a concentration of 20 mg/Kg, a concentration greater than the Cleanup Objective of 1.2 mg/Kg.

Table 5-2

Sediment Results
Mineral Springs Road MGP Site

@ culvert @ turn [remediated section]

Sample ID	BSD-1			BSD-2			SD-1			SD-2			SD-3			SD-4			SD-5			NYSDEC Recommended Soil Cleanup Objective	SED Criteria FW Chronic
Date Sampled	07/23/97			07/23/97			07/23/97			07/23/97			07/23/97			07/23/97			07/23/97				
	Result	LQ	VQ	Result	LQ	VQ	Result	LQ	VQ	Result	LQ	VQ	Result	LQ	VQ	Result	LQ	VQ	Result	LQ	VQ		
BTEX (mg/Kg)																							
Benzene	0.025	U	UJ	0.007	U		0.011	U		0.034	U	UJ	0.008	U		0.009	U		3.4			0.06	28
Toluene	0.025	U	UJ	0.007	U		0.011	U		0.11		J	0.006	J		0.009	U		0.61	J		1.5	49
Ethylbenzene	0.025	U	UJ	0.007	U		0.011	U		0.028	J	J	0.003	J		0.009	U		32			5.5	24
Xylene (Total)	0.025	U	UJ	0.007	U		0.011	U		0.3		J	0.011			0.009	U		20			1.2	92
PAHs (mg/Kg)																							
Naphthalene	1.6	U	UJ	0.47	U		0.62	U		0.59	J		4.3			0.55	U		16	D		13	30
Acenaphthylene	1.6	U	UJ	0.47	U		0.62	U		0.081	J		0.54	U		0.55	U		1.4			41	-
Acenaphthene	1.6	U	UJ	0.47	U		0.62	U		0.23	J		0.41	J		0.55	U		1.2			50	140
Fluorene	1.6	U	UJ	0.47	U		0.62	U		0.29	J		1.7			0.55	U		3.2			50	8
Phenanthrene	1.6	U	UJ	0.47	U		0.18	J		1.7			19	D		0.3	J		13	D		50	120
Anthracene	1.6	U	UJ	0.47	U		0.62	U		0.28	J		0.75			0.55	U		2.3			50	107
Fluoranthene	1.6	U	UJ	0.061	J		0.54	J		3.5			5.6			0.38	J		3.1			50	1020
Pyrene	1.6	U	UJ	0.069	J		0.6	J		4.3			14	D		1			8.1			50	961
Benzo(a)Anthracene	1.6	U	UJ	0.47	U		0.21	J		1.3			2.7			0.28	J		1.7			0.224 or MDL	12
Chrysene	1.6	U	UJ	0.47	U		0.29	J		2.7			3			0.37	J		1.6			0.4	
Benzo(b)Fluoranthene	1.6	U	UJ	0.47	U		0.34	J		2.6			2			0.22	J		0.78			1.1	
Benzo(k)Fluoranthene	1.6	U	UJ	0.47	U		0.18	J		1.7			1.3			0.26	J		0.68			1.1	
Benzo(a)Pyrene	1.6	U	UJ	0.47	U		0.23	J		1.6			1.1			0.22	J		1.4			0.061 or MDL	
Indeno(1,2,3-cd)Pyrene	1.6	U	UJ	0.47	U		0.62	U		2.1			1.5			0.21	J		0.69			3.2	
Dibenz(a,h)Anthracene	1.6	U	UJ	0.47	U		0.62	U		0.84			0.63			0.55	U		0.32	J		0.014 or MDL	
Benzo(g,h,i)Perylene	1.6	U	UJ	0.47	U		0.23	J		1.9			1.8			0.3	J		0.96			50	
Total PAHs				0.13			2.64			25.71			59.79			3.54			56.43			< 500	
GENERAL																							
Cyanide (mg/Kg)	2.5	U		0.71	U		42.4		J	8.8		J	658		J	35.9		J	15.3		J	NL	
Total Organic Carbon (%)							4.2						3.6						2.5				

Notes:
LQ - Laboratory Qualifier
VQ - Data Validation Qualifier
U - The material was analyzed for, but not detected. The associated numerical value is the minimum attainable detection limit for the sample.
UJ - The material was analyzed for, but was not detected. The sample quantitation limit is an estimated quantity.
J - The associated numerical value is an estimated quantity.
D - Indicates an analysis at a secondary dilution.
MDL - Method Detection Limit
NL - Not Listed
6 Concentration exceeding regulatory limit.

5.2.2 Sediment PAH Analysis

PAH compounds were detected in six out of seven samples submitted for analysis. No PAH compounds were detected above the method detection limits for sample BSD1. Table 5-3 is a summary of the PAH compounds which were detected in concentrations greater than the cleanup objectives and the respective TAGM Cleanup Objective value using 1% TOC.

Table 5-3
Sediment Sample Results and TAGM Cleanup Objectives

Compound	TAGM 4046 Soil Cleanup Objective mg/Kg	Sample Exceeding Cleanup Objective mg/Kg
Naphthalene	13	SD5 - 16
Benzo(a)anthracene	0.224 or MDL	SD2 - 1.3 SD3 - 2.7 SD4 - 0.28 SD5 - 1.7
Chrysene	0.4	SD2 - 2.7 SD3 - 3.0 SD5 - 1.6
Benzo(b)fluoranthene	1.1	SD2 - 2.6 SD3 - 2.0
Benzo(k)fluoranthene	1.1	SD2 - 1.7 SD3 - 1.3
Benzo(a)pyrene	0.061 or MDL	SD1 - 0.23 SD2 - 1.6 SD3 - 1.1 SD4 - 0.22 SD5 - 1.4
Dibenz(a,h)anthracene	0.14 or MDL	SD2 - 0.84 SD3 - 0.63 SD5 - 0.32

MDL - Method Detection Limit

5.2.3 Sediment Cyanide Analysis

Cyanide was detected in all five of the sediment samples. Total cyanide concentrations ranged from 8.8 mg/Kg in SD2 to 658 mg/Kg in sediment from sample SD3. There is currently no eastern USA background concentration range for cyanide listed in TAGM 4046. It is likely that the cyanide concentrations are in the form of stable metal complexes. Stable metal-complexed cyanides are known to be essentially non-toxic, as recognized in NYSDEC guidance on cleanup levels (NYSDEC, 1994).

5.2.4 Sediment Total Organic Carbon Analysis

A total of three sediment samples were analyzed for total organic carbon (TOC) using the Walkley Black method of analysis. TOC results are summarized as follows:

- SD1 4.2 percent
- SD3 3.6 percent
- SD5 2.5 percent

These TOC results exceed the one percent value used in TAGM 4046 to calculate allowable concentrations of organics in soil. The relationship between TOC and allowable organics concentrations is linear, therefore, the site-specific allowable concentration is expected to be roughly two to four times the default TAGM value.

5.3 Surface Soil Analysis

Eight surface soil samples (SS1 - SS8) were collected during the investigation. These samples were obtained from soils which were visually impacted and they therefore represent a biased sample set and are not indicative of the surface soil conditions across the site. The samples were submitted to the laboratory for the analysis of BTEX, PAH, TAL metals and cyanide. Samples SS1, SS2, SS3 and SS7 were also submitted to the laboratory for analysis of RCRA hazardous characteristics. Analytical results for MGP indicators are presented in Table 5-4. Analytical results for the RCRA hazardous characteristics testing are presented in Table 5-5. The concentration of TOC in the surface soil was found to be greater than the 1% level used to calculate allowable soil concentrations of organics in TAGM 4046. The allowable concentration of BTEX and PAHs in surface soil may therefore be higher than the TAGM value.

Table 5-4
Surface Soil Results
Mineral Springs Road MGP Site

Sample ID	SS-1			SS-2			SS-3			SS-4			SS-5			SS-6			SS-7			SS-8			NYSDEC Recommended
Date Sampled	07/24/97			07/24/97			07/24/97			07/24/97			07/24/97			07/24/97			07/24/97			07/24/97			Soil Cleanup Objective
	Result	LQ	VQ	Result	LQ	VQ	Result	LQ	VQ	Result	LQ	VQ	Result	LQ	VQ	Result	LQ	VQ	Result	LQ	VQ	Result	LQ	VQ	
BTEX (mg/Kg)																									
Benzene	0.64	U		0.008	U	UJ	0.006	U	UJ	0.007	U		0.006	U	UJ	0.006	U		0.007	U	UJ	0.002	J	J	0.06
Toluene	0.12	J		0.007	J	UJ	0.004	J	UJ	0.014			0.006	U	UJ	0.006	U		0.005	J	UJ	0.006		UJ	1.5
Ethylbenzene	0.64	U		0.008	U	UJ	0.002	J	J	0.003	J		0.006	U	UJ	0.006	U		0.002	J	J	0.005	U	UJ	5.5
Xylene (Total)	0.3	J		0.005	J	J	0.006	U	UJ	0.024			0.006	U	UJ	0.006	U		0.005	J	J	0.002	J	J	1.2
PAHs (mg/Kg)																									
Naphthalene	1700			2.1			0.14	J		2.8			0.38	U		0.41	U		1.1			2.5	J		13
Acenaphthylene	1100			0.49			0.062	J		0.45			0.38	U		0.41	U		0.27	J		7.2	J		41
Acenaphthene	210	J		0.12	J		0.067	J		0.46			0.38	U		0.41	U		0.17	J		8.7	U		50
Fluorene	1100			0.11	J		0.077	J		1.7			0.38	U		0.41	U		0.65			2	J		50
Phenanthrene	4000			60	D		1.1			27	D		0.44			0.21	J		7.3			5.7	J		50
Anthracene	1200			0.48	U		0.2	J		0.89			0.059	J		0.41	U		0.45			2	J		50
Fluoranthene	3300			56	D		1.9			9.9	D		0.78			0.46			5.4			16			50
Pyrene	2900			31	D		2			17	D		0.78			0.46			6.9	D		55			50
Benz(a)Anthracene	1100			10	D		1.1			3.3			0.3	J		0.19	J		2.4			22			0.224 or MDL
Chrysene	920			15	D		1.6			3.6			0.39			0.25	J		2.8			29			0.4
Benzo(b)Fluoranthene	820			14	D		2			2.2			0.41			0.19	J		2.4			29			1.1
Benzo(k)Fluoranthene	830			7.6		J	1.6			1.6			0.25	J		0.19	J		2.4			24			1.1
Benzo(a)Pyrene	1000			2		J	1.2			1.2			0.31	J		0.19	J		1.3			38			0.061 or MDL
Indeno(1,2,3-cd)Pyrene	570			5	D		1.3			1.8			0.26	J		0.16	J		1.9			26			3.2
Dibenz(a,h)Anthracene	240	J		3.5		J	0.58			0.78			0.11	J		0.069	J		0.74			12			0.014 or MDL
Benzo(g,h,i)Perylene	590			4.4	JD		1.2			2.2			0.31	J		0.2	J		2			39			50
Total PAHs	21,580			211.3			16.1			76.9			4.4			2.63			38			309.4			< 500
																									NYSDEC Background Ranges
METALS (mg/Kg)																									
Aluminum	107			~94.7			1250			2860			10700			10400			3020			11600			33,000
Antimony	1.8	U		8.2	B	J	2.2	U		2.5	U		2.1	U		2.3	U		2.5	U		1.9	U		NA
Arsenic	1	U		150			16.1			13.6			4.8			5.6			13.2			13			3 - 12
Barium	1.9	B		1120			169			111			86.2			134			110			103			15 - 600
Beryllium	0.2	U		0.31	U		0.25	U		0.28	U		0.71	B		0.36	B		0.27	U		0.74	B		0 - 1.75
Cadmium	0.2	U		0.31	B		0.26	B		0.28	U		0.51	B		0.39	B		0.33	B		0.5	B		0.1 - 1
Calcium	646	B	J	171	B	J	560	B	J	5210		J	10300		J	8850		J	26800		J	3070		J	130 - 35,000
Chromium	0.4	U		5.9			8.6			14.1			18.4			47.9			22.6			30.3			1.5 - 40
Cobalt	0.2	U		8	B		2.7	B		3.4	B		11.1	B		12.3	B		2.9	B		5.9	B		2.5 - 60
Copper	1.3	B		301			13.3			20.4			21.4			34.6			23.9			69.2			1 - 50
Iron	899			9790			5140			34900			21900			46500			45100			29500			2,000 - 550,000
Lead	3.3			2650			62.9			109			56.1			31.6			87.8			85.3			200-500
Magnesium	131	B		14.3	B		201	B		905	B		5640			4030			733	B		3450			100 - 5,000
Manganese	7.7		J	27.5		J	20.9		J	75.4		J	727		J	859		J	85		J	126		J	50 - 5,000
Mercury	0.22		J	7.5		J	2.3		J	0.37		J	0.07	B	J	0.06	B	J	0.36		J	0.19		J	0.001 - 0.2
Nickel	0.4	U	J	3.6	B	J	2.8	B	J	5.7	B	J	17.2		J	20.2		J	6.3	B	J	22.1		J	0.5 - 25
Potassium	16.4	U		192	B		840	B		1490			836	B		889	B		1240	B		811	B		8,500 - 43,000
Selenium	1.5			2.3			1.6			1.1	U		0.93	U		1.9			1.1	U		1.2			0.1 - 3.9
Silver	0.2	U		7.9			0.25	U		0.3	B		0.23	U		0.25	U		0.28	B		0.21	U		NA
Sodium	50.7	U		155	U		305	B		306	B		58.9	U		64	U		733	B		291	B		6,000 - 8,000
Thallium	1.2	U		7.3	U		1.5	U		6.7	U		2.8	U		1.5	U		3.3	U		2.6	U		NA
Vanadium	0.33	B		7.8	B		12.3	B		18.1			23.9			30.4			19.7			23.5			1 - 300
Zinc	4.5		J	44.1		J	53.6		J	29		J	100		J	86.6		J	27.7		J	116		J	9 - 50
GENERAL																									
Cyanide (mg/Kg)	13			893			583			367			20.5			221			247			1.3			NL
Total Organic Carbon (%)	2.5						3												5.1						
pH (units)													7.3			2.6									

Notes:
LQ - Laboratory Qualifier
VQ - Data Validation Qualifier
U - The material was analyzed for, but not detected. The associated numerical value is the minimum attainable detection limit for the sample.
UJ - The material was analyzed for, but was not detected. The sample quantitation limit is an estimated quantity.
J - The associated numerical value is an estimated quantity.
D - Indicates an analysis at a secondary dilution.
B - Below the Contract Required Quantitation Limit (CRQL), but above the Instrument Detection Limit (IDL). (Metals Analysis Only)
SB - Site Background
MDL - Method Detection Limit
NL - Not Listed
6 Concentration exceeding regulatory limit.

Table 5-5
Surface Soil
Hazardous Characteristics Summary
Mineral Springs Road MGP Site

Sample ID	SS-1			SS-2			SS-3			SS-7			Regulatory
Date Sampled	7/24/97			7/24/97			7/24/97			7/24/97			Level
	Result	LQ	VQ	Result	LQ	VQ	Result	LQ	VQ	Result	LQ	VQ	
GENERAL													
Corrosivity (su)	7.2			1.2			3.8			2.3			2 to 12.5
Ignitability (deg F)	< 180			< 180			< 180			< 180			
Reactive Cyanide (mg/Kg)	20	U		20	U		20	U		20	U		250
Reactive Sulfide (mg/Kg)	20	U		20	U		20	U		20	U		500
TCLP Metals (mg/L)													
Arsenic	0.0066	B	J	0.016	B	J	0.0342	B	J	0.005	U	UJ	5
Barium	0.154	B	J	0.221	B	J	1.36	B	J	0.0983	B	J	100
Cadmium	0.0019	B	J	0.001	U	UJ	0.001	U	UJ	0.001	U	UJ	1
Chromium	0.0029	B	J	0.012	B	J	0.0099	B	J	0.0683	B	J	5
Lead	0.0215	B	J	9.16		J	0.322	B	J	0.0072	B	J	5
Mercury	0.0001	U	UJ	0.0001	U	UJ	0.001	B	J	0.0001	U	UJ	0.2
Selenium	0.004	U	UJ	0.004	U	UJ	0.004	U	UJ	0.0052	B	J	1
Silver	0.001	U	UJ	0.001	U	UJ	0.0014	B	J	0.001	U	UJ	5
TCLP Pest/Herbs (mg/L)													
Chlordane	0.0025	U	UJ	0.0025	U	UJ	0.0025	U	UJ	0.0025	U	UJ	0.03
Endrin	0.0005	U	UJ	0.0013		J	0.0005	U	UJ	0.0025		J	0.02
Heptachlor	0.00025	U	UJ	0.00025	U	UJ	0.00025	U	UJ	0.00025	U	UJ	0.008
Heptachlor Epoxide	0.00025	U	UJ	0.00025	U	UJ	0.00025	U	UJ	0.00025	U	UJ	0.008
Gamma-BHC (Lindane)	0.00025	U	UJ	0.00025	U	UJ	0.00025	U	UJ	0.00025	U	UJ	0.4
Methoxychlor	0.0025	U	UJ	0.0025	U	UJ	0.0025	U	UJ	0.0025	U	UJ	10
Toxaphene	0.005	U	UJ	0.005	U	UJ	0.005	U	UJ	0.005	U	UJ	0.5
2,4-D	0.1	U	UJ	0.1	U	UJ	0.1	U	UJ	0.1	U	UJ	10
2,4,5-Tp (Silvex)	0.01	U	UJ	0.01	U	UJ	0.01	U	UJ	0.01	U	UJ	1
TCLP BNAs (mg/L)													
Pyridine	0.006	J	J	0.003	J	J	0.1	U	UJ	0.1	U	UJ	5
1,4-Dichlorobenzene	0.01	U	UJ	0.01	U	UJ	0.01	U	UJ	0.01	U	UJ	7.5
2-Methylphenol	2.4	D	J	0.01	U	UJ	0.01	U	UJ	0.01	U	UJ	200
3&4-Methylphenol	4.6	D	J	0.02	U	UJ	0.02	U	UJ	0.02	U	UJ	200
Hexachloroethane	0.1	U	UJ	0.1	U	UJ	0.1	U	UJ	0.1	U	UJ	3
Nitrobenzene	0.01	U	UJ	0.01	U	UJ	0.01	U	UJ	0.01	U	UJ	2
Hexachlorobutadiene	0.01	U	UJ	0.01	U	UJ	0.01	U	UJ	0.01	U	UJ	0.5
2,4,6-Trichlorophenol	0.01	U	UJ	0.01	U	UJ	0.01	U	UJ	0.01	U	UJ	2
2,4,5-Trichlorophenol	0.01	U	UJ	0.01	U	UJ	0.01	U	UJ	0.01	U	UJ	400
2,4-Dinitrotoluene	0.01	U	UJ	0.01	U	UJ	0.01	U	UJ	0.01	U	UJ	0.13
Hexachlorobenzene	0.01	U	UJ	0.01	U	UJ	0.01	U	UJ	0.01	U	UJ	0.13
Pentachlorophenol	0.005	U	UJ	0.005	U	UJ	0.005	U	UJ	0.005	U	UJ	100
TCLP VOCs (mg/L)													
Vinyl Chloride	0.2	U	UJ	0.04	U	UJ	0.2	U	UJ	0.04	U	UJ	0.2
1,1-Dichloroethene	0.25	U	UJ	0.05	U	UJ	0.25	U	UJ	0.05	U	UJ	0.7
1,2-Dichloroethane	0.25	U	UJ	0.05	U	UJ	0.25	U	UJ	0.05	U	UJ	0.5
2-Butanone	0.5	U	UJ	0.1	U	UJ	0.5	U	UJ	0.1	U	UJ	200
Carbon Tetrachloride	0.25	U	UJ	0.05	U	UJ	0.25	U	UJ	0.05	U	UJ	0.5
Trichloroethene	0.25	U	UJ	0.05	U	UJ	0.25	U	UJ	0.05	U	UJ	0.5
Benzene	0.4		J	0.05	U	UJ	0.25	U	UJ	0.05	U	UJ	0.5
Tetrachloroethene	0.25	U	UJ	0.05	U	UJ	0.25	U	UJ	0.05	U	UJ	0.7
Chlorobenzene	0.25	U	UJ	0.05	U	UJ	0.25	U	UJ	0.05	U	UJ	100

Notes:
LQ - Laboratory Qualifier
VQ - Data Validation Qualifier
U - The material was analyzed for, but not detected. The associated numerical value is the minimum attainable detection limit for the sample.
UJ - The material was analyzed for, but was not detected. The sample quantitation limit is an estimated quantity.
J - The associated numerical value is an estimated quantity.
B - Below the Contract Required Quantitation Limit (CRQL), but above the Instrument Detection Limit (IDL) (Metals Only).
6 Concentration exceeding Regulatory Limit.

5.3.1 Surface Soil BTEX Analysis

BTEX compounds were detected in six of the eight surface soil samples. All of the BTEX detections from these samples were found to be less than the NYSDEC TAGM 4046 Cleanup Objective values. The results of the analyses, and the TAGM Cleanup Objective values are presented in Table 5-4.

5.3.2 Surface Soil PAH Analysis

Concentrations of individual PAH compounds exceeding the TAGM Cleanup Objectives were found in each of the eight surface soil samples. Concentrations of total PAHs exceeding the cleanup objective of less than 500 mg/Kg were found only at SS1. Table 5-6 is a summary of the individual PAH compounds which were detected in concentrations exceeding the cleanup objectives and the respective sample locations.

5.3.3 Surface Soil Cyanide Analysis

Cyanide was detected in each of the eight surface soil samples. Concentrations of total cyanide ranged from 1.3 mg/Kg in sample SS8 to 893 mg/Kg in sample SS2. At the time of this report, no eastern USA background concentration is listed in TAGM 4046. Measurements of free or amendable cyanide were not made; however, cyanide at found at MGP sites is frequently in the form of stable metal-complexed cyanides which are known to be essentially non-toxic (GRI, 1996).

5.3.4 Surface Soil TAL Metals Analysis

All TAL metals except thallium were detected in the eight samples. Table 5-7 presents a summary of the range of concentrations of all the metals detected, the TAGM 4046 background value or range for eastern USA soils or New York State soils and the sample locations exceeding the background ranges.

Table 5-6
PAH Surface Soil Results
And TAGM Cleanup Objectives

Compound	Range in Concentration mg/Kg	TAGM 4046 Soil Cleanup Objective mg/Kg	Samples Exceeding Cleanup Objective
Naphthalene	0.14 to 1700	13	SS1
Acenaphthylene	0.27 to 1100	41	SS1
Acenaphthene	0.067 to 210	50	SS1
Fluorene	0.077 to 1100	50	SS1
Phenanthrene	0.21 to 4000	50	SS1, SS2
Anthracene	0.059 to 1200	50	SS1
Fluoranthene	0.460 to 3300	50	SS1, SS2
Pyrene	0.46 to 2900	50	SS1, SS8
Benzo(a)anthracene	0.19 to 1100	0.224 or MDL	SS1, SS2, SS3, SS4, SS5, SS7, SS8
Chrysene	0.25 to 920	0.4	SS1, SS2, SS3, SS4, SS7, SS8
Benzo(b)fluoranthene	0.19 to 820	1.1	SS1, SS2, SS3, SS4, SS7, SS8
Benzo(k)fluoranthene	0.19 to 830	1.1	SS1, SS2, SS3, SS4, SS7, SS8
Benzo(a)pyrene	0.19 to 1000	0.061 or MDL	SS1, SS2, SS3, SS4, SS5, SS6, SS7, SS8
Indeno(1,2,3-cd) pyrene	0.16 to 570	3.2	SS1, SS2, SS3, SS4, SS8
Dibenzo(a,h)anthracene	0.069 to 240	0.014 or MDL	SS1, SS2, SS5, SS6, SS7, SS8
Benzo(g,h,i)perylene	0.2 to 590	50	SS1

MDL - Method Detection Limit

Table 5-7
Surface Soil TAL Metals Results
And TAGM Background Values

Metal	Range of Concentrations in Samples (mg/Kg)	TAGM 4046 Background Range (mg/Kg)	Samples Exceeding Background Range
Aluminum	94.7 to 11,600	33,000 (1)	
Antimony	ND< 1.8 to 8.2	NA	
Arsenic	ND < 1 to 150	3 to 12 (2)	SS2, SS3, SS4, SS7, SS8
Barium	1.9 to 1,120	15 to 600 (1)	SS2
Beryllium	ND < 0.2 to 0.74	0 to 1.75 (1)	
Cadmium	ND < 0.2 to 0.39	0.1 to 1.0 (1)	
Calcium	171 to 26,800	130 to 35,000 (2)	
Chromium	ND < 0.4 to 47.9	1.5 to 40 (2)	SS6
Cobalt	ND < 0.2 to 12.3	2.5 to 60 (2)	
Copper	1.3 to 301	1 to 50 (1)	SS2, SS7, SS8
Iron	899 to 46,500	21,000 to 550,000 (1)	
Lead	3.3 to 2,650	200 to 500 (3)	SS2
Magnesium	14.3 to 4,030	100 to 5,000 (1)	SS5
Manganese	7.7 to 859	50 to 5,000 (1)	
Mercury	0.06 to 7.5	0.001 to 0.2 (1)	SS1, SS2, SS3, SS4, SS7
Nickel	ND < 0.4 to 22.1	0.5 to 25 (1)	
Potassium	ND < 16.4 to 1490	8,500 to 43,000 (2)	
Selenium	ND < 0.93 to 1.9	0.1 to 3.9	
Silver	ND < 0.2 to 7.9	NA	
Sodium	ND < 50.7 to 733	6,000 to 8,000 (1)	
Vanadium	0.33 to 30.4	1 to 300 (1)	
Zinc	4.5 to 116	9 to 50 (1)	SS3, SS5, SS6, SS8

NA - No range currently listed in TAGM 4046.

(1) - Background range for eastern USA soils.

(2) - Background range for New York State Soils.

(3) - Background range listed in TAGM 4046 for lead in metropolitan or suburban areas.

5.3.5 Surface Soil Total Organic Carbon Analysis

A total of three surface soil samples were analyzed for total organic carbon (TOC) using the Walkley Black method of analysis. TOC results are summarized as follows:

- SS1 2.5 percent
- SS3 3.0 percent
- SS7 5.1 percent

These TOC results exceed the one percent value used in TAGM 4046 to calculate allowable concentrations of organics in soil. The relationship between TOC and allowable organics concentrations is linear, therefore, the site-specific allowable concentration is expected to be roughly two to four times the default TAGM value.

5.4 Surface Soil RCRA Hazardous Characteristics Analysis

Four surface soil samples (SS1, SS2, SS3 and SS7) were sent to the laboratory for analysis of RCRA hazardous characteristics. The results of the analyses and the respective regulatory levels are presented in Table 5-5. The results indicate that the concentration for lead (TCLP) for sample SS2 was found to be 9.16 mg/L, a concentration greater than the regulatory level of 5 mg/L. Sample SS2 was also found to be corrosive. The corrosivity of SS2 was 1.2, a value less than the acceptable regulatory range of between 2 and 12. The corrositivity of this soil, taken from an area of purifier box residuals, is likely due to a high sulfur (and sulfuric acid) content. Low pH and corrositivity is a frequent component of purifier residuals (GRI, 1996).

5.5 Subsurface Soils Analysis

Seventeen subsurface soil samples were collected during the Geoprobe soil boring testing. The samples represent the most impacted interval within selected borings based on visual observations and PID screening. Samples SB10/11 (4-8) and SB24/25 (12-16) were collected as composite samples from the respective boring locations. The remaining samples were collected as grab samples. The results of the analyses are presented in Table 5-8.

Table 5-8
Subsurface Soil Results
Mineral Springs Road MGP Site

Sample ID	SB-01 (2-4)			SB-10/11 (4-8)			SB-12 (12-16)			SB-13 (3-6.5)		
Date Sampled	07/09/97			07/09/97			07/09/97			07/09/97		
	Result	LQ	VQ	Result	LQ	VQ	Result	LQ	VQ	Result	LQ	VQ
BTEX (mg/Kg)												
Benzene	0.86	U		240			1	J		16		
Toluene	0.64	J		600			3.8			51		
Ethylbenzene	0.75	J		270			64			110		
Xylene (Total)	13			460			60			96		
PAHs (mg/Kg)												
Naphthalene	460	D		1600	D		240	D		590	D	
Acenaphthylene	41			140			14			17		
Acenaphthene	41		J	23	J	J	45		J	120	D	J
Fluorene	160			120			34			66		
Phenanthrene	790	D		380			75	D		190	D	
Anthracene	100			91			22			60		
Fluoranthene	130			130			19			38		
Pyrene	400	D		310			53			100	D	
Benz(a)Anthracene	84			72			11			25		J
Chrysene	81			76			11			24		J
Benzo(b)Fluoranthene	29			30	J		4.7			8		
Benzo(k)Fluoranthene	33			42	J		4			9.1		
Benzo(a)Pyrene	48			69			10			20		
Indeno(1,2,3-cd)Pyrene	26		J	22	J		4.1		J	9.9		J
Dibenz(a,h)Anthracene	14	J	J	8.9	J		2.1	J	J	5.4		J
Benzo(g,h,i)Perylene	37		J	37	J		6.9		J	15		J
Total PAHs	2,474			3,151			555.8			1297.4		
PCBs (mg/Kg)												
Aroclor-1016				0.04	U							
Aroclor-1221				0.08	U							
Aroclor-1232				0.04	U							
Aroclor-1242				0.04	U							
Aroclor-1248				1.5								
Aroclor-1254				1.1	D							
Aroclor-1260				0.04	U							
Total PCBs				2.6								
GENERAL												
Cyanide (mg/Kg)	923		J	46.1		J	0.55	U		0.66	U	
Total Organic Carbon (%)	20.5						0.49					

Sample ID	SB-17 (2-8)			SB-19 (8-12)			SB-20 (8-12)			SB-24/25 (12-16)			SB-26 (2-4)			NYSDEC Recommended Soil Cleanup Objective
Date Sampled	07/10/97			07/10/97			07/09/97			07/10/97			07/10/97			
	Result	LQ	VQ	Result	LQ	VQ	Result	LQ	VQ	Result	LQ	VQ	Result	LQ	VQ	
BTEX (mg/Kg)																
Benzene	3.8	U		0.004	J		0.006	U					7.2	J		0.06
Toluene	3.1	J		0.008	U		0.006	U					4.8	J		1.5
Ethylbenzene	6.6			0.008	U		0.006	U					7.4	U		5.5
Xylene (Total)	6.4			0.008	U		0.006	U					7	J		1.2
PAHs (mg/Kg)																
Naphthalene	74	D		0.13	J		0.46	J					560	D		13
Acenaphthylene	20			0.52	U		0.84	U					280	D		41
Acenaphthene	4.4		J	0.52	U	R	0.84	U	R				47		J	50
Fluorene	18			0.52	U		0.84	U					220	D		50
Phenanthrene	56	D		0.52	U		0.17	J					720	D		50
Anthracene	14			0.52	U		0.84	U					220	D		50
Fluoranthene	33			0.13	J		0.092	J					590	D		50
Pyrene	68	D	J	0.2	J		0.16	J					460	D	J	50
Benz(a)Anthracene	26			0.078	J		0.84	U					180	D		0.224 or MDL
Chrysene	30			0.1	J		0.84	U					160	JD		0.4
Benzo(b)Fluoranthene	18			0.062	J		0.84	U					120	JD		1.1
Benzo(k)Fluoranthene	15			0.099	J		0.84	U					140		J	1.1
Benzo(a)Pyrene	30			0.092	J		0.84	U					160	JD		0.061 or MDL
Indeno(1,2,3-cd)Pyrene	16		J	0.52	U	UJ	0.84	U	UJ				140		J	3.2
Dibenz(a,h)Anthracene	8.2		J	0.52	U	UJ	0.84	U	UJ				64		J	0.014 or MDL
Benzo(g,h,i)Perylene	26		J	0.52	U	UJ	0.84	U	UJ				140		J	50
Total PAHs	456.6			0.9			0.9						4,201			< 500
PCBs (mg/Kg)																
Aroclor-1016	0.041	U								0.042	U					
Aroclor-1221	0.081	U								0.084	U					
Aroclor-1232	0.041	U								0.042	U					
Aroclor-1242	0.041	U								0.042	U					
Aroclor-1248	0.026	JP	J							0.042	U					
Aroclor-1254	0.041	U								0.042	U					
Aroclor-1260	0.072									0.042	U					
Total PCBs	0.098															< 10
GENERAL																
Cyanide (mg/Kg)	0.85		J	0.75	U		0.6	U					2.3		J	NL
Total Organic Carbon (%)																

Notes:
LQ - Laboratory Qualifier
VQ - Data Validation Qualifier
U - The material was analyzed for, but not detected. The associated numerical value is the minimum attainable detection limit for the sample.
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R - The data are unusable (compound may or may not be present).
J - The associated numerical value is an estimated quantity.
D - Indicates an analysis at a secondary dilution.
P - This flag is used for a pesticide/Aroclor target analyte when there is greater than 25% difference for detected concentrations between the two GC columns.
g - Guidance
s - Standard
MDL - Method Detection Limit
NL - Not listed
6 Concentrations exceeding Regulatory Limit

Table 5-8 (continued)
Subsurface Soil Results

Sample ID	SB-29 (10-16)			SB-32 (10-16)			SB-36 (2-6)			SB-42 (4-6)			SB-44 (12-16)			SB-44 (8-12)			SB-50 (10-14)			SB-51 (4-6)			NYSDEC Recommended Soil Cleanup Objective
Date Sampled	07/11/97			07/11/97			07/11/97			07/23/97			07/23/97			07/23/97			07/23/97			07/23/97			
	Result	LQ	VQ	Result	LQ	VQ	Result	LQ	VQ	Result	LQ	VQ	Result	LQ	VQ	Result	LQ	VQ	Result	LQ	VQ	Result	LQ	VQ	
BTEX (mg/Kg)																									
Benzene	0.47			0.049	U		0.008	U	UJ	0.007	U	UJ	0.69	U		0.76	U		1.1	D		0.007	U		0.06
Toluene	0.37			0.019	J		0.002	J	J	0.007	U	UJ	0.31	J		1.3			0.89	D		0.007	U		1.5
Ethylbenzene	6.4			0.24			0.005	J	J	0.003	J	J	2.4			7.3			8.4	D		0.007	U		5.5
Xylene (Total)	5.8			0.43			0.007	J	J	0.002	J	J	2.4			17			6.5	D		0.007	U		1.2
PAHs (mg/Kg)																									
Naphthalene	73	D		11	D		0.18	J		0.45	U		22	D		57	D		3.2			0.097	J		13
Acenaphthylene	3			0.21	J		0.5	U		0.45	U		2.3			8.3			0.061	J		0.053	J		41
Acenaphthene	10		J	2.1		J	0.5	U	R	0.45	U		1.9			2.4			0.061	J		0.045	J		50
Fluorene	8.9			1.2			0.5	U		0.45	U		1.9			5.5			0.054	J		0.12	J		50
Phenanthrene	28	D		3.8			0.28	J		0.13	J		2.8			10			0.33	J		0.86			50
Anthracene	7.5			0.97			0.5	U		0.45	U		0.79			2.9			0.058	J		0.15	J		50
Fluoranthene	8.2			1			0.49	J		0.23	J		0.64			2.2			0.31	J		0.71			50
Pyrene	19	D	J	2.2			0.72			0.25	J		1.5			5.1			0.83			1.5			50
Benz(a)Anthracene	5.7			0.6	J		0.64			0.15	J		0.36			1.2	J		0.35	J		0.53			0.224 or MDL
Chrysene	5.2			0.58	J		0.71			0.17	J		0.29	J		0.95	J		0.44			0.53			0.4
Benzo(b)Fluoranthene	2.2			0.24	J		0.84			0.15	J		0.13	J		0.55	J		0.35	J		0.35	J		1.1
Benzo(k)Fluoranthene	3.1			0.3	J		0.82			0.12	J		0.13	J		0.45	J		0.33	J		0.36	J		1.1
Benzo(a)Pyrene	6			0.61	J		0.41	J		0.12	J		0.3	J		1.1	J		0.35	J		0.38	J		0.061 or MDL
Indeno(1,2,3-cd)Pyrene	1.8		J	0.21	J	J	0.58		J	0.083	J		0.084	J		0.29	J		0.15	J		0.18	J		3.2
Dibenz(a,h)Anthracene	1	J	J	0.65	U	UJ	0.26	J	J	0.45	U		0.042	J		1.8	U		0.079	J		0.084	J		0.014 or MDL
Benzo(g,h,i)Perylene	3		J	0.26	J	J	0.59		J	0.083	J		0.12	J		0.42	J		0.2	J		0.23	J		50
Total PAHs	185.6			24.74			6.52			1.49			35.29			98.36			7.15			6.18			< 500
PCBs (mg/Kg)																									
Aroclor-1016																									
Aroclor-1221																									
Aroclor-1232																									
Aroclor-1242																									
Aroclor-1248																									
Aroclor-1254																									
Aroclor-1260																									
Total PCBs																									< 10
GENERAL																									
Cyanide (mg/Kg)	1.5		J	0.97	U		378		J	27.6			0.55	U		0.6	U		0.88			53.9			NL
Total Organic Carbon (%)	4.8																								

Notes:
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R - The data are unusable (compound may or may not be present).
J - The associated numerical value is an estimated quantity.
D - Indicates an analysis at a secondary dilution.
P - This flag is used for a pesticide/Aroclor target analyte when there is greater than 25% difference for detected concentrations between the two GC columns.
g - Guidance
s - Standard
MDL - Method Detection Limit
NL - Not listed
6 Concentrations exceeding Regulatory Limit

5.5.1 Subsurface Soil - BTEX Analysis

BTEX compounds were detected in concentrations which were greater than the method detection limits in fifteen of the sixteen subsurface soil samples tested. BTEX detections from ten of these samples was found to be greater than the NYSDEC TAGM 4046 Cleanup Objective values. Table 5-9 presents a summary of the BTEX detections which were greater than the TAGM Cleanup Objectives.

Table 5-9
Subsurface Soil BTEX Results and TAGM Cleanup Objectives

Compound	NYSDEC TAGM Cleanup Objective (mg/Kg)	Sample Location and Concentration (mg/Kg)
Benzene	0.06	SB10/11(4-8) - 240 SB12(12-16) - 1.0 SB13(3-6.5) - 16 SB26(2-4) - 7.2 SB29(10-16) -0.47 SB50(10-14) - 1.1
Toluene	1.5	SB10/11(4-8) - 600 SB12(12-16) - 3.8 SB13(3-6.5) - 51 SB17(2-8) - 3.1 SB26(2-4) - 4.8
Ethylbenzene	5.5	SB10/11(4-8) - 270 SB12(12-16) - 64 SB13(3-6.5) - 110 SB17(2-8) - 6.6 SB29(10-16) - 6.4 SB44(8-12) - 7.3 SB50(10-14) - 8.4
Xylene(total)	1.2	SB1(2-4) - 13 SB10/11(4-8) - 460 SB12(12-16) - 60 SB13(3-6.5) - 96 SB17(2-8) - 6.4 SB26 (2-4) - 7 SB29(10-16) - 5.8 SB44(8-12) - 17 SB44(12-16) - 2.4 SB50(10-14) - 6.5

5.5.2 Subsurface Soil - PAH Analysis

PAH compounds were detected in each of the subsurface soil samples analyzed by the laboratory. The concentrations of one or more individual PAHs exceeded the NYSDEC TAGM Soil

Cleanup Objectives in all but one sample (SB20). Five subsurface soil samples were found to exceed the recommended cleanup objective of less than 500 mg/Kg total PAHs. The sample locations, and total PAH concentrations are as follows:

- SB1 (2-4) - 2,474 mg/Kg
- SB10/11 (4-8) - 3,151 mg/Kg
- SB12 (12-16) - 555.8 mg/Kg
- SB13 (3-6.5) - 1,297.4 mg/Kg
- SB26 (2-4) - 4,201 mg/Kg

5.5.3 Subsurface Soil PCB Analysis

A total of three subsurface soil samples were submitted for the analysis of PCB compounds. PCBs were detected above the method detection limits in two of the samples. Aroclor-1248 was detected in sample SB10/11(4-8) in a concentration of 1.9 mg/Kg and in sample SB17(2-8) in a concentration of 0.026 mg/Kg. Aroclor-1254 was detected in sample SB10/11(4-8) in a concentration of 1.1 mg/Kg. Aroclor-1260 was detected in sample SB17(2-8) in a concentration of 0.072 mg/Kg. The concentrations of total PCBs for both sample locations was found to be less than the TAGM 4046 recommended Cleanup Objective of 10 mg/Kg for subsurface soil.

5.5.4 Subsurface Soil - Cyanide Analysis

Cyanide was detected in nine out of the sixteen subsurface soil samples. Total cyanide concentrations ranged from 0.85 mg/Kg in SB17 (2-8) to 923 mg/Kg in sample SB1 (2-4). Sample SB1(2-4) was collected from material that was comprised of homogeneous purifier box residuals. As previously mentioned, there is currently no eastern USA background concentration range listed in TAGM 4046 for cyanide. Cyanide found at MGP sites is frequently in the form of stable metal-complexed cyanides which are known to be essentially non-toxic (GRI, 1996), as recognized in NYSDEC guidance on cleanup levels (NYSDEC, 1994).

5.5.5 Subsurface Soil - Total Organic Carbon Analysis

A total of two subsurface soil samples were analyzed for total organic carbon (TOC) using the Walkley Black method of analysis. TOC results are summarized as follows:

- SB12(12-16) 0.49 percent
- SB29(10-16) 3.0 percent

The TOC results from SB29 exceed the one percent value used in TAGM 4046 to calculate allowable concentrations of organics in soil. Soil boring SB12 was advanced close to the outside wall of Separator Pit No. 2 and was likely to contain a high fraction of clean granular backfill, hence the lower than (site-wide) average TOC content. The relationship between TOC and allowable organics concentrations is linear, therefore, the site-specific allowable concentration is expected to be roughly two to four times the default TAGM value.

5.6 Groundwater Analysis

A total of nine groundwater samples were taken during the investigation. Three samples were collected from the existing wells surrounding the former separator. Six samples were taken from the new wells installed during the investigation. All samples were analyzed for VOC, PAH, cyanide and TAL metals. A summary of the results of the groundwater analyses are provided in Table 5-10.

5.6.1 Groundwater - VOC Analysis

Of the seven groundwater samples, five samples contained volatile organic compounds in concentrations greater than the NYSDEC 6NYCRR Part 703 Water Quality Standards. The groundwater standards and the sample VOC concentrations are summarized in Table 5-11.

5.6.2 Groundwater - PAH Analysis

Groundwater samples from MW7, MW8 and MW11 contained PAHs in concentrations greater than the method detection limits. No groundwater standards are currently listed in NYSDEC 6NYCRR Part 703 for these compounds; however, guidance values have been established. Table 5-12 summarizes the PAH detections which were found to exceed NYSDEC guidance values.

5.6.3 Groundwater - TAL Metals Analysis

Nine samples of groundwater were submitted to the laboratory for analysis of TAL metals. The results of the analyses are shown on Table 5-10. Aluminum, barium, calcium, cobalt, copper, nickel, potassium, silver, thallium, vanadium and zinc were detected in the groundwater samples in

Table 5-10
Groundwater Results
Mineral Springs Road MGP Site

Sample ID / Date Sampled	MW-07 07/22/97 Result	LQ	VQ	MW-08 07/22/97 Result	LQ	VQ	MW-10 07/22/97 Result	LQ	VQ
BTEX (µg/L)									
Benzene	4900			1200			5	U	
Toluene	750			62	U		5	U	
Ethylbenzene	2900			220			5	U	
Xylene (Total)	1200			230			5	U	
PAHs (µg/L)									
Naphthalene	2400	D	J	2000	D		10	U	
Acenaphthylene	95	U		120	U		10	U	
Acenaphthene	180			15	J		10	U	
Fluorene	45	J		120	U		10	U	
Phenanthrene	37	J		120	U		10	U	
Anthracene	95	U		120	U		10	U	
Fluoranthene	95	U		120	U		10	U	
Pyrene	95	U		120	U		10	U	
Benz(a)Anthracene	95	U		120	U		10	U	
Chrysene	95	U		120	U		10	U	
Benzo(b)Fluoranthene	95	U		120	U		10	U	
Benzo(k)Fluoranthene	95	U		120	U		10	U	
Benzo(a)Pyrene	95	U		120	U		10	U	
Indeno(1,2,3-cd)Pyrene	95	U		120	U		10	U	
Dibenz(a,h)Anthracene	95	U		120	U		10	U	
Benzo(g,h,i)Perylene	95	U		120	U		10	U	
METALS (µg/L)									
Aluminum	116	B		63	U		281		
Antimony	9	U		9	U		9	U	
Arsenic	5	U		5	U		5	U	
Barium	229			390			303		
Beryllium	1	U		1	U		1	U	
Cadmium	1	U		1	U		1	U	
Calcium	184000			183000			192000		
Chromium	2	U		2	U		2	U	
Cobalt	2	B		2.3	B		1.7	B	
Copper	2	B	U	1.9	B	U	81.6		
Iron	14600			34100			24400		
Lead	2	U		2	U		2	U	
Magnesium	28900			34400			31100		
Manganese	1430			1520			3010		
Mercury	0.1	U		0.1	U		0.1	U	
Nickel	2	U		2	U		2.7	B	
Potassium	3310	B		3870	B		1870	B	
Selenium	4	U		4	U		4	U	
Silver	1	U		1.2	B		1	U	
Sodium	98800		J	152000		J	99500		J
Thallium	6	U		6	U		6	U	
Vanadium	1	U		1	U		1	U	
Zinc	2	U		2	U		55		
GENERAL (µg/L)									
Cyanide	189		J	236		J	334		J

Sample ID / Date Sampled	MW-11 07/22/97 Result	LQ	VQ	MW-12 07/22/97 Result	LQ	VQ	MW-13 07/22-23/97 Result	LQ	VQ
BTEX (µg/L)									
Benzene	35			17			4	J	
Toluene	17			5	U		5	U	
Ethylbenzene	94			5	U		5	U	
Xylene (Total)	83			5	U		5	U	
PAHs (µg/L)									
Naphthalene	140			10	U		11	U	
Acenaphthylene	9	J		10	U		11	U	
Acenaphthene	7	J		10	U		11	U	
Fluorene	10	U		10	U		11	U	
Phenanthrene	10	U		10	U		11	U	
Anthracene	10	U		10	U		11	U	
Fluoranthene	10	U		10	U		11	U	
Pyrene	10	U		10	U		11	U	
Benz(a)Anthracene	10	U		10	U		11	U	
Chrysene	10	U		10	U		11	U	
Benzo(b)Fluoranthene	10	U		10	U		11	U	
Benzo(k)Fluoranthene	10	U		10	U		11	U	
Benzo(a)Pyrene	10	U		10	U		11	U	
Indeno(1,2,3-cd)Pyrene	10	U		10	U		11	U	
Dibenz(a,h)Anthracene	10	U		10	U		11	U	
Benzo(g,h,i)Perylene	10	U		10	U		11	U	
METALS (µg/L)									
Aluminum	243			500			1200		
Antimony	9	U		9	U		9	U	
Arsenic	5	U		5	U		5	U	
Barium	199	B		75.4	B		108	B	
Beryllium	1	U		1	U		1	U	
Cadmium	1	U		1	U		1	U	
Calcium	184000			290000			114000		
Chromium	2	U		2	U		2	U	
Cobalt	2.4	B		2.4	B		1.3	B	
Copper	5.4	B	U	6.5	B	U	9.9	B	U
Iron	23400			109000			2180		
Lead	2	U		2	U		2	U	
Magnesium	31500			109000			34800		
Manganese	1650			15400			293		
Mercury	0.1	U		0.1	U		0.1	U	
Nickel	2.1	B		2	U		6.4	B	
Potassium	1780	B		6520			936	B	
Selenium	4	U		4	U		4	U	
Silver	1	U		1	U		1	U	
Sodium	64300		J	150000		J	13700		J
Thallium	6	U		7.4	B		6	U	
Vanadium	1	U		6.3	B		1.4	B	
Zinc	3.4	B	U	2	U		14.3	B	
GENERAL (µg/L)									
Cyanide	1040		J	375		J	323		J

Sample ID / Date Sampled	MW-14 07/22-23/97 Result	LQ	VQ	MW-15 07/22-23/97 Result	LQ	VQ	MW-16 07/22/97 Result	LQ	VQ	Groundwater Standard / Guidance Value
BTEX (µg/L)										
Benzene	5	U		5	U		5	U		0.7 s
Toluene	5	U		5	U		5	U		5 s
Ethylbenzene	5	U		5	U		5	U		5 s
Xylene (Total)	5	U		5	U		5	U		5 s (ea.)
PAHs (µg/L)										
Naphthalene	3	J		1	J		10	U		10 g
Acenaphthylene	10	U		10	U		10	U		20 g
Acenaphthene	10	U		10	U		10	U		20 g
Fluorene	10	U		10	U		10	U		50 g
Phenanthrene	10	U		10	U		10	U		50 g
Anthracene	10	U		10	U		10	U		50 g
Fluoranthene	10	U		10	U		10	U		50 g
Pyrene	10	U		10	U		10	U		50 g
Benz(a)Anthracene	10	U		10	U		10	U		0.002 g
Chrysene	10	U		10	U		10	U		0.002 g
Benzo(b)Fluoranthene	10	U		10	U		10	U		0.002 g
Benzo(k)Fluoranthene	10	U		10	U		10	U		0.002 g
Benzo(a)Pyrene	10	U		10	U		10	U		0.002 or MDL
Indeno(1,2,3-cd)Pyrene	10	U		10	U		10	U		0.002 g
Dibenz(a,h)Anthracene	10	U		10	U		10	U		NL
Benzo(g,h,i)Perylene	10	U		10	U		10	U		5 g
METALS (µg/L)										
Aluminum	242			245			495			NL
Antimony	9	U		9	U		9	U		3 g
Arsenic	5	U		5	U		5	U		25 s
Barium	176	B		107	B		40.8	B		1000 s
Beryllium	1	U		1	U		1	U		3 g
Cadmium	1	U		1	U		1	U		10 s
Calcium	139000			98500			226000			NL
Chromium	2	U		2	U		2	U		50 s
Cobalt	3.5	B		2.8	B		4.5	B		NL
Copper	5.7	B	U	5.4	B	U	8.1	B	U	200 s
Iron	5590			9330			146000			300 s
Lead	2	U		2	U		2	U		25 s
Magnesium	29300			34300			104000			35000 s
Manganese	2180			565			1970			300 s
Mercury	0.1	U		0.1	U		0.1	U		2 s
Nickel	6.9	B		4.9	B		4.7	B		NL
Potassium	2850	B		568	B		10400			NL
Selenium	4	U		4	U		4	U		10 s
Silver	1	U		1	U		1	U		50 s
Sodium	144000		J	16800		J	61900		J	20000 s
Thallium	6	U		6	U		6	U		4 g
Vanadium	1	U		1	U		1	U		NL
Zinc	9.4	B	U	5.8	B	U	2	U		300 s
GENERAL (µg/L)										
Cyanide	644		J	78.8		J	346		J	100 s

Notes:
LQ - Laboratory Qualifier
VQ - Data Validation Qualifier
U - The material was analyzed for, but not detected. The associated numerical value is the minimum attainable detection limit for the sample.
J - The associated numerical value is an estimated quantity.
B - Below the Contract Required Quantitation Limit (CRQL), but above the Instrument Detection Limit (IDL). (Metals Analysis Only)
D - Indicates an analysis at a secondary dilution.
g - Guidance
s - Standard
MDL - Method Detection Limit
NL - Not listed
6 - Concentrations exceeding Regulatory Limit.

Table 5-11
Groundwater VOC Results

Compound	Groundwater Standard (µg/L)	Sample and Concentration (µg/L)
Benzene	0.7	MW7 - 4900 MW8 - 1200 MW11 - 35 MW12 - 17 MW13 - 4
Toluene	5	MW7 - 750 MW11 - 17
Ethylbenzene	5	MW7 - 2900 MW8 - 220 MW11 - 94
Xylene (total sum of isomers)	5	MW7 - 1200 MW8 - 230 MW11 - 83

Table 5-12
PAH Groundwater Results

Compound	Groundwater Guidance Value (µg/L)	Sample and Concentration (µg/L)
Naphthalene	10	MW7 - 2400 MW8 - 2000 MW11 - 140
Acenaphthene	20	MW7 - 180

concentrations above the method detection limits. All detections were found to be below the guidance values or standards for groundwater in New York State. Note that, at the time of this report, no guidance values or standards are listed for groundwater for aluminum, calcium, cobalt, nickel, potassium or vanadium.

Antimony, arsenic, beryllium, cadmium, chromium, lead, mercury, and selenium were not detected above the method detection limits for any of the groundwater samples taken during the investigation.

Iron was detected in all well samples in concentrations exceeding the groundwater standards of 300 µg/L. Manganese and sodium were detected in all wells, with the exception of MW13, in concentrations exceeding the groundwater standards of 300 µg/L and 20,000 µg/L, respectively. Sodium is not typically a concern associated with MGP sites. Magnesium was detected in wells MW12 and MW16 in concentrations greater than the standard of 35,000 µg/L. Naturally occurring concentrations of iron and manganese frequently exceed groundwater standards due to natural hardness.

5.6.4 Groundwater - Cyanide Analysis

Total cyanide was detected in all of the nine groundwater samples in concentrations greater than the method detection limits. With the exception of well MW15, all cyanide detections were found to be greater than the NYSDEC groundwater standard of 100 µg/L. No discernable pattern was found for the groundwater cyanide detections at the site. The most up gradient well location at the site (MW11) was found to have the greatest concentration of cyanide (1,040 µg/L).

6.0 DATA USABILITY SUMMARY REPORT

This data usability report is provided for samples collected from the Mineral Springs Service Center in West Seneca, New York during the periods from July 9, 1997 through July 11, 1997 and July 22, 1997 through July 24, 1997. A total of 25 soil samples, 7 sediment samples, 15 water samples, 4 equipment blanks, and 7 trip blanks were submitted for analysis. Also, four surface soil samples were submitted for TCLP analysis. These samples were contained in four SDGs (i.e., L37925, L38103, L38127, and L38474). Analytical methods employed were:

- BTEX by NYSDEC ASP 95-1;
- PAHs by NYSDEC ASP 95-2;
- PCBs by NYSDEC ASP 95-3;
- TAL Inorganics by NYSDEC ASP CLP-M;
- Total Organic Carbon (TOC) by Walkley-Black Titration;
- RCRA Characteristics by SW846 9045, 1010, 7.3.3.2 and 7.3.4.2; and
- TCLP by SW846 8240, 8270, 8080, 8150, and 6010.

In order to evaluate the usability of the data, the following Quality Control (QC) operations were considered:

- Sample Collection and Preservation (Chain-of-Custody review),
- Holding Times,
- Instrument Tuning Criteria (GC/MS),
- Instrument Calibration (initial and continuing calibrations),
- Laboratory Control Sample (LCS) Recoveries,
- Surrogate Spike Recoveries (organics),
- Internal Standard Area Recoveries (organics),
- Blank Sample Results (laboratory blanks, field blanks, equipment blanks, and method blanks),
- Spike Sample Recoveries (analytical spikes and matrix spikes),
- Duplicate Sample Results (matrix spike duplicates, laboratory duplicates, field duplicates).

The BTEX, PAH, PCB, metals, and TCLP data were subjected to a data usability review based on the USEPA Contract Laboratory Program National Functional Guidelines for Organic and Inorganic Data Review (EPA, 1994). Based upon this review, each result was classified as one of the following:

- valid, useable - all QC within acceptable limits; no qualifiers added;

- estimated, useable - certain QC criteria not met due to matrix interferences or minor laboratory deficiencies; result should be considered an estimated value; (J) or (UJ) qualifier added; or

- invalid, unusable - data suffers from serious matrix interferences or laboratory deficiencies; results are considered unusable; (R) qualifier added.

The following sections summarize the results of the data review. All validation qualifiers are shown in the summary tables presented in Section 5 of this report in the third column (labeled VQ) for each sample. The first and second columns are the result and laboratory qualifiers (labeled LQ), respectively. It should be noted that the data validation qualifier always overrides the laboratory qualifier (e.g. if LQ=J and VQ=UJ, the sample result is considered a non-detect and the quantitation limit is considered to be estimated).

6.1 Volatile Organics (BTEX)

Water, soil, and sediment samples were analyzed for BTEX according to NYSDEC-ASP method 95-1. Chain-of-Custodies were complete and signed-off; and samples were received at or below 4° Celsius. All samples were analyzed within the holding times required by the ASP method.

Instrument tuning and calibration requirements were within method specifications. One surrogate recovery was above QC limits in sample SS-8. Detected results for this sample were qualified as estimated (J) due to the high surrogate recovery. Internal standard areas were outside QC limits for samples: SB-36(2-6), SB-42(4-6), SS-2, SS-3, SS-5, SS-7, SS-8, BSD-1, and SD-2. These samples were re-analyzed with no improvement in the internal standard area recoveries. These low recoveries were possibly do to matrix effects. All of the associated compounds were qualified as estimated (J) for detects, and (UJ) for non-detects. Laboratory blanks showed no contamination above the required detection limits. However, the Equipment Blank collected on 7/24/97 contained toluene at a concentration of 2 (J) μg/L. Associated samples with a detected concentration of toluene were qualified if the sample concentration was less than five times the blank concentration. That is, the quantitation limit for toluene was elevated to the concentration found in each sample (e.g. 0.006 becomes 0.006 U) for the following samples: SS-2, SS-3, SS-7, and SS-8. A slightly low recovery was observed in the matrix spike duplicate (MSD) associated with SDG #L37925 which also caused the RPD to be outside QC limits. However, matrix spike data alone cannot be used to evaluate the precision and accuracy of individual samples. Therefore, no validation qualifiers were added based upon these criteria. Blank spike recoveries were all within QC limits.

No validation qualifiers were added to the water samples. It should be noted that the dilution factors listed on the Form I's for sample SB-29(10-16) and SB-29(10-16)DL were switched. This was apparently a typographical error and did not effect the results.

6.2 Polynuclear Aromatic Hydrocarbons (PAHs)

Water, soil and sediment samples were analyzed for PAHs according to NYSDEC - ASP method 95-2. Chain-of-Custodies were complete and signed-off; and samples were received at or below 4° Celsius. All samples were extracted and analyzed within the required holding times, however, it should be noted that the time between sample collection and laboratory receipt was greater than 48 hours for sample SB-20(8-12). Based on professional judgement, no validation qualifiers were added.

The instrument tune dated 8/7/97 @ 21:29 had a Percent Relative Abundance of 39.1% for peak 442, which was below the criteria of 40-100%. The laboratory was notified and confirmed that the criteria was set incorrectly on the instrument at 39%. The problem was corrected at the laboratory. This instrument tune was associated with sample MW-07DL; and, based on professional judgement, no qualifier was added for this exceedence. The calibration requirements were met for all parameters of interest with the exception of the continuing calibration verification (CCV) from 8/7/97 @ 21:45 which was also associated with sample MW-07DL. The %D for naphthalene and pyrene exceeded the QC limit of 25%. Naphthalene was the only value reported from this analysis. Based upon this exceedence the result for naphthalene was qualified as estimated (J). Surrogate recoveries were within required limits for all samples, except BSD-1, which had three low surrogate recoveries in the first run and two low recoveries in the re-analysis. These low surrogate recoveries were most likely caused by matrix interference. All of the results for this sample were non-detect, and, therefore qualified as estimated (UJ). Internal standard area recoveries were low in several samples: SS-2, SD-5, SB-12(12-16), SB-13(3-6.5), SB-26(2-4), SB-29(10-16), and SB-44(12-16). However, the only reported values that required qualification were for benzo(k)fluoranthene, benzo(a)pyrene, and dibenzo(a,h)anthracene in sample SS-2; benz(a)anthracene and chrysene in sample SB-13(3-6.5); and benzo(k)fluoranthene, indeno(1,2,3-cd)pyrene, dibenzo(a,h)anthracene, and benzo(g,h,i)perylene in sample SB-26(2-4). These values were qualified as estimated (J). Laboratory blanks showed no contamination above the required detection limits. Poor recoveries and RPDs outside the required limits were observed in most of the matrix spikes. These outliers could possibly have been caused by matrix interference or high concentrations in the original samples. However, matrix spike data alone cannot be used to evaluate the precision and accuracy of individual samples. Therefore, no validation qualifiers were added based upon these criteria. The Blank spike recovery for acenaphthene associated with SDG #L37925 was below QC limits. All samples associated with this SDG were qualified. All detected acenaphthene values were qualified as estimated (J). All non-detected acenaphthene values were qualified as unusable (R). Acenaphthene was qualified as unusable for the following samples: SB-19(8-12), SB-20(8-12), and SB-36(2-6).

6.3 Polychlorinated Biphenyls (PCBs)

Three soil samples and one Equipment Blank were analyzed for PCBs according to NYSDEC - ASP method 95-3. Chain-of-Custodies were complete and signed-off and samples were received at or below 4° Celsius. All samples were extracted and analyzed within the required holding times.

Instrument calibrations requirements were within method specifications. Surrogate spike recoveries were all within QC limits. Method blanks and the Equipment blank did not show contamination above the required reporting limit. The MS/MSD (SB-10/11 (4-8)) recoveries were above QC limits due to the presence of Arochlor-1248 and Arochlor-1254 in the sample. However, the associated blank spike met the recovery criteria. The reported value for Arochlor-1248 in sample SB-17 (2-8) was qualified as estimated (J) due to a greater than 25% difference between the two GC columns. No additional qualifiers were added to the PCB data.

6.4 Inorganics

Analysis for TAL inorganics was performed for water, soil and sediment samples according to NYSDEC ASP method CLP-M. All metals with the exception of mercury were analyzed by inductively coupled plasma (ICP) spectroscopy. Mercury was determined by cold vapor atomic absorption spectroscopy. Cyanide was determined by manual spectrophotometric analysis. Chain-of-Custodies were complete and signed-off and samples were received at or below 4° Celsius. All analyses were performed within the method required holding times.

The percent recovery (%R) for cyanide (126.6%) was above QC limits on the initial calibration performed on 8/1/97. Detected concentrations of cyanide were qualified as estimated (J) in the following associated samples: SD-1, SD-2, SD-3, SD-4, and SD-5. Interference check samples were all within QC limits. The preparation blank from SDG #L38103 contained copper and zinc at concentrations above the instrument detection limit (IDL). Associated samples with detected concentrations of compounds were qualified if the sample concentration was less than five times the blank concentration. That is, the quantitation limit for copper or zinc was elevated to the concentration found in each sample (e.g. 2.0B becomes 2.0U) for the following samples: MW-07, MW-08, MW-11, MW-12, MW-13, MW-14, MW-15, and MW-16.

Several inorganics results were qualified as estimated (J) due to poor spike sample recovery (Sb, CN), poor LCS recovery (CN), precision between sample duplicates (Ca, Mn, Hg), or the percent difference on the ICP Serial Dilution (Ni, Zn, Na).

No additional data qualifiers were added to the metals data.

6.5 TCLP

Four soil samples were analyzed for TCLP by SW846 8240, 8270, 8080, 8150, and 6010. Chain-of-Custodies were complete and signed-off and samples were received at or below 4° Celsius. These samples were extracted 15 days outside of the required holding time per the authorization of the project manager. All TCLP analysis results were qualified as estimated (J or UJ).

Instrument tuning and calibration requirements were within method specifications. Three BNA surrogates were outside QC limits in sample SS-1; however, the associated parameters had already been qualified for holding time exceedence. No further qualification was necessary. One pesticide surrogate was above QC limits for sample SS-1, possibly due to matrix interference. No qualification was necessary. Internal standards were outside QC limits for sample SS-1, but no further qualification was necessary due to the holding time exceedence. Laboratory blanks showed no contamination above the required detection limits. The blank spike recovery for pyridine was below QC limits. No further qualification was necessary due to the holding time exceedence.

6.6 Field Duplicates

Field duplicates were not collected from this site. However, some RPDs were calculated using the laboratory duplicates (MS/MSDs). The RPD ranges for laboratory duplicates were considered to be the acceptable limits for these samples. Sample SB-10/11 (4-8) was compared to its laboratory duplicates (MS/MSD). All parameters were within the acceptable criteria for RPD between these laboratory duplicates. It should be noted that Arochlor-1248 and Arochlor-1254 were detected in the original sample SB-10/11 (4-8), but not in the MS or MSD. No RPDs could be calculated. Sample MW-07 was compared to its laboratory duplicates (MS/MSD). All parameters were within the acceptable criteria for RPD between these samples. Sample SS-7 was compared to its laboratory duplicates (MS/MSD). All parameters were within the acceptable criteria for RPD between these samples. It should be noted that some of the values used to calculate the RPDs were considered to be estimated because they were either above the calibration range or below the CRDL. Laboratory spikes were not requested due to the known holding time exceedence for the TCLP analysis.

No validation qualifiers were added based upon laboratory duplicate results.

7.0 QUALITATIVE EVALUATION OF POTENTIAL RISKS

This section integrates existing data gathered at the Mineral Springs Road MGP Site and qualitatively identifies potential risks associated with impacted media. This qualitative evaluation is accomplished by identifying potential sources, migration routes, receptors and exposure pathways at the Mineral Springs Road Site.

7.1 Site Setting

The Mineral Springs Road Site is owned by NFG. The site is the location of an NFG service center, a construction and demolition debris landfill, and electrical transmission towers. These uses are consistent with the zoning of the site for commercial or light industrial use. The service center occupies much of the site, encompasses the former MGP process area, and is fenced so access is restricted. Most of the service center is covered with buildings, pavement, gravel or landscaped grass. The landfill is east of the service center, is active and is covered with fill with some vegetation. The transmission towers run along the southern boundary of the site. The surface beneath these towers is covered with grasses and shrubs that are infrequently cut.

The northern boundary of the area is a fence that runs along Mineral Springs Road, from Calais Avenue to the New York State Thruway. To the north of this boundary are residences and a facility that treats sewage sludge. The western boundary consists of residential lots located on Calais Avenue. The eastern boundary is a railroad track. Further east is the New York Thruway. The southern boundary is a raised railroad track right-of-way. Further south is an abandoned industrial property (formerly Madison Wire).

7.2 Potential Sources, Migration Routes, Receptors and Exposure Pathways

The potential sources, migration routes, receptors and exposure pathways for the Mineral Springs site are discussed in this subsection.

7.2.1 Potential Sources and Migration Routes

There are principally two source materials for MGP constituents at the Mineral Springs site. One potential source material is hydrocarbon materials which were either used as feedstock or generated during plant operation. The other potential source material is purifier residuals generated during the purification of the manufactured gas.

Hydrocarbon materials were found in three parts of the site. In the Separator Pits Investigation Area, DNAPL was found in separator pits numbered 2 and 3 and in soil around all three separators. DNAPL was also found principally in subsurface soil in the Subsurface Hydrocarbon Investigation Area, although evidence of MGP constituents was also found in a surface soil sample from this area (SS8). Highly localized DNAPL impacts were also found in surficial soils in the Surface Hydrocarbon Investigation Area.

Purifier residuals were found at a number of locations. Purifier residuals were found up to three feet thick in the Eastern Swale Area. Thin layers of purifier residuals were also found in the Southern Investigation Area. Finally, evidence of purifier residuals was obtained in subsurface samples collected from soil boring SB51 south of Building No. 3.

Based on these potential sources, the potential migration routes of the COI in the study area are summarized as follows:

- emissions to air in the form of volatilized gases (primarily the lower molecular weight PAHs) and fugitive dust from surface soil;
- volatilization of chemicals from subsurface soil to soil gas and subsequent intrusion of soil gas into a building;
- erosion of surface soil during rainfall events, solubilization or desorption of COI to runoff water, and transport of eroded soil and dissolved COI with runoff to drainage ditches;
- leaching of constituents from soil and tar-like materials to groundwater;
- discharge of onsite groundwater to onsite drainage ditches; and
- transfer of constituents dissolved in onsite groundwater to offsite groundwater.

Emissions of volatilized gases and fugitive dust are unlikely to be significant for a variety of reasons. First, the most volatile constituents at MGP sites are BTEX. No surface soils had total BTEX concentrations exceeding 1 mg/Kg, so there is little BTEX available in surface soil to volatilize. Second, the PAH that is most volatile is naphthalene, which was present at concentrations of 2.8 mg/Kg or less in all surface soil samples except SS1. Sample SS1 was taken from a tar boil and is representative of a very small surface area of the site. There are, therefore, not enough tar boils at the surface to represent a significant source for volatile emissions of naphthalene. For fugitive dust emissions to be significant, a significant portion of the surface soil must be bare.

However, little of the site surface has bare, exposed soil, so fugitive dust emissions are unlikely to be significant at this site.

In addition to volatilization and release to the surface, chemicals can volatilize from subsurface soil into soil gas and then migrate from soil gas into buildings through cracks in the building basement or foundation. This migration route is usually significant only if a building basement is built into LNAPL or DNAPL impacted soil, or if there is LNAPL on the water table immediately beneath a building. There is no evidence of such conditions at any existing buildings on the site. However, subsurface conditions around all buildings have not been investigated.

Surface water runoff occurs during rainfall events, where the COI are either attached to soil particles which are suspended in water flowing overland into drainage ditches or are dissolved into rainwater which flows overland into drainage ditches. If COI are present in groundwater and groundwater discharges to the drainage ditches, then COI can also be discharged into the drainage ditches with groundwater. There is evidence that both migration mechanisms may be operating at the Mineral Springs site. The highest cyanide sediment concentrations occur near the two areas with purifier residuals at or near the surface. The cyanide concentration at SD3 is 658 mg/Kg. This sample is located downstream of the Eastern Swale Investigation Area where purifier residuals were found. The next highest cyanide sediment concentration occurs at SD1 (42.4 mg/Kg) which is adjacent to the Southern Investigation Area where purifier residuals were also observed. The highest BTEX and second highest PAH concentrations in sediment occur at SD5 which is next to the Subsurface Hydrocarbon Investigation Area. DNAPL was found in the subsurface in this area and a sheen has been observed on the water at SW5.

While BTEX, PAHs and cyanide have been detected in sediments, there is little evidence that these constituents impact surface water when it leaves the site and discharges to the storm sewer. BTEX and PAHs were not detected in SW1, the water sample taken before water discharges to the storm sewer. In fact, PAHs were not detected in any surface water samples and BTEX were only detected in SW1 where they were found below the analytical detection limits. Cyanide was detected in sample SW1, but the level of 12.2 μg/L is the lowest of the five onsite surface water samples. Thus, cyanide appears to attenuate from the Eastern Swale Investigation Area, where the highest cyanide concentration was found (736 μg/L in SW4), to the storm sewer inlet, where the lowest concentration was obtained (12.2 μg/L at SW1). Also, the cyanide measured at this site is total cyanide and virtually all total cyanide at MGP sites is complexed cyanide. The most toxic form of cyanide is free cyanide, which is highly reactive. In contrast, complexed cyanide is very stable, unreactive and essentially nontoxic (GRI, 1996).

The potential for COI in groundwater to migrate offsite is addressed in Section 7.2.3.

7.2.2 Potential Onsite Receptors and Exposure Pathways

Potential current receptors for the Mineral Springs Road MGP Site are presented in Table 7-1. Under current site uses, possible receptors include indoor workers, outdoor workers, excavators and local residents. The site is expected to be used as a service center by NFG for the foreseeable future, therefore future receptors are the same as current receptors.

If there is LNAPL or DNAPL in the subsurface beneath a building, then constituents can partition from the NAPL to the soil water and then to the soil gas, and migrate with soil gas as it travels through cracks in the basement or foundation into the air within the building. As discussed previously, there is no evidence that such conditions exist at any existing buildings on the site, although subsurface conditions around all buildings have not been investigated. If these conditions are present at an existing building, the ventilation system will reduce the concentration of constituents in intruding air. If new buildings are constructed on the site, vapor intrusion is a potential pathway.

Outdoor workers are individuals who maintain the grassy areas of the site or who deposit or retrieve items from areas of the site where construction materials and pipes are staged. These individuals may be potentially exposed to COI in surface soils via incidental ingestion, dermal contact and inhalation of volatilized constituents and fugitive dust. Grass cutting and lawn maintenance are limited to the warmer months and the existence of the grass provides a barrier to direct contact with the soil. Much of construction material staging work is done on an area covered by gravel, so the opportunity to directly contact soil and be exposed via incidental ingestion and dermal contact is limited.

On a very infrequent basis, subsurface utility lines may require repair. In this case, excavators will remove soil to uncover the lines and in the process can be exposed to constituents in both surface and subsurface soil. These exposures would be through incidental ingestion, dermal contact and inhalation of volatilized constituents and fugitive dust.

In theory, local residents can be indirectly exposed to constituents in surface soil through the processes of volatilization and fugitive dust emission and subsequent dispersion with wind to offsite areas. Exposure from these migration pathways are likely to be low. BTEX compounds were close to or below detection limits in all surface soil samples, so the only potentially volatile constituents

Table 7-1
Current and Future Onsite Receptors

Receptor	Source Medium	Exposure Medium	Intake Route	Comments
Indoor Worker	Subsurface Soil and NAPL	Air	Inhalation	There is no evidence of NAPL under any buildings, so this pathway may be incomplete. If the pathway is complete, building ventilation will significantly reduce the concentrations of intruding vapors.
Outdoor Worker	Surface Soil	Soil Air	Ingestion & Dermal Inhalation	Pathways potentially complete. Partial soil cover and grass limits access to soil during grounds keeping activities. Gravel cover limits access to soil during staging of construction material.
Excavator	Surface Soil Subsurface Soil and NAPL	Soil Air Soil	Ingestion & Dermal Inhalation & Ingestion & Dermal	Pathways potentially complete but direct exposure to soil is infrequent. Pathways potentially complete but excavation work is infrequent.
Local Resident	Surface Soil	Air	Inhalation	Volatile and fugitive dust emissions are expected to be very low, so this pathway is essentially incomplete.

are the low molecular weight PAHs (principally naphthalene) which have a much lower propensity to volatilize than BTEX and lower toxicities than benzene (i.e., the lower molecular weight PAHs are not considered carcinogenic). Also, the concentrations of naphthalene, the most volatile of the low molecular weight PAHs, were low in all the surface soil samples except the tar boil sample. Exposures from fugitive dust emissions are typically very low even at sites with high concentrations of constituents in surface soil and there are almost no residuals exposed to the surface at this site. Exposures to local residents from volatilization and fugitive dust emissions are thus likely to be essentially incomplete.

7.2.3 Evaluation of Groundwater Migration and Use

Groundwater on and near the site is currently not used as a source of drinking water. Since the Town of West Seneca is serviced by a municipal water supply, the groundwater under the site is not expected to be used as a source of drinking water at any time in the foreseeable future.

Groundwater on the site either discharges to the drainage ditches or flows north toward the Buffalo River. The discharge of groundwater to the drainage ditches was discussed previously. The migration of COIs to the Buffalo River is not expected to be significant for a number of reasons.

The highest concentrations of BTEX and PAHs in groundwater occur in the central part of the site, such as MW7 and MW8 near the Separator Pits Investigation Area, and MW11 near the Subsurface Hydrocarbon Investigation Area. The concentrations in the most down gradient wells, MW12, MW13 and MW14, are much lower. BTEX and total PAH concentrations are 229 µg/L and 156 µg/L in MW11, but 17 µg/L and non-detect in MW12 which is down gradient. Similarly, the concentrations of BTEX in MW7 and MW8 are 9,750 µg/L and 1,650 µg/L, while BTEX in the down gradient wells MW13 and MW14 are 4 µg/L and non-detect. The concentrations of PAHs in MW7 and MW8 are 2,660 µg/L and 2,015 µg/L, while PAHs were not detected in the down gradient wells MW13 and MW14. BTEX are relatively mobile in groundwater, but they are also biodegradable. The dramatic reduction of concentrations between the center of the site and the down gradient perimeter suggests that (1) groundwater is moving slowly (the water table is relatively flat), (2) biodegradation is occurring, or (3) both phenomena are operating simultaneously. PAHs are much less mobile than the BTEX, although these chemicals are also biodegradable. The absence of PAHs in the down gradient wells is consistent with these chemical properties. The low levels of BTEX and the non-detects for PAHs in the groundwater at the down gradient perimeter wells suggests that any discharges of these constituents to the Buffalo River will be insignificant.

The situation for cyanide is not as straightforward. Cyanide concentrations in groundwater are similar in all wells on the site. In fact, the highest cyanide concentration occurs at MW11 (1,040 µg/L), the most up gradient well. The abandoned industrial facility to the south of the site reportedly used cyanide in their production processes, so cyanide may be in groundwater coming onto the site. The key point with respect to cyanide is that the cyanide measured in the groundwater is total cyanide. As discussed previously, virtually all total cyanide at MGP sites is complexed cyanide. The most toxic form of cyanide is free cyanide, which is highly reactive, while complexed cyanide is very stable, unreactive and essentially nontoxic (GRI, 1996). Thus, while cyanide is present in down gradient wells and may be leaving the site and eventually discharging to the Buffalo River, the form of cyanide in the groundwater is almost certainly unreactive, nontoxic complexed cyanide. Thus, the river is not expected to be impacted by any discharges of cyanide that may be occurring.

8.0 CONCLUSIONS

This section summarizes the findings of the PSA. An overview of the nature and extent of COI is presented by area of concern and by media. Recommendations for future actions are also presented.

8.1 Site Geology

The following provides a set of conclusions related to the geology of the site:

- A surface layer of mixed fill material was found on the majority of the site.
- The fill is comprised of silty clay, coal fragments, brick fragments, cinders, ashes and concrete fragments.
- The fill thickness is variable. Fill is thickest (up to 8 feet) in the Separator Pits Investigation Area, Surface Hydrocarbon and Southern Investigation Area. Fill is approximately 1 foot thick in the Subsurface Hydrocarbon Investigation Area and 3 feet thick in the Eastern Swale Area.
- Underlying the fill in the majority of borings completed at the site is a silty clay unit. The clay unit ranges in thickness across the site. The unit was thickest in the Surface Hydrocarbon Area (14 feet).
- Underlying the clay is a sand and gravel unit. The sand was found to contain varying amounts of rounded gravel.

8.2 Site Hydrogeology

The following provides a set of conclusions related to the hydrogeology of the site:

- June 1997 water level measurements indicate the depth to water varies across the site, ranging from approximately 7 feet bgs (MW7) to 14 feet bgs (MW13).
- Groundwater flow beneath the site is northwest towards Mineral Springs Road and the Buffalo River with a gradient of 0.0018 feet/foot.

- Groundwater was found to be elevated or "mounded" in the area of MW5, MW6 and MW9. This finding is consistent with previous investigation results (RETEC, 1995). The groundwater mound may be attributed to subsurface structures or foundations in the area or to the diminished thickness of the silty clay unit.

- At the time of the investigation, groundwater was likely to be in contact with surface water in the southeast drainage ditch and Class D stream. The elevation of groundwater was approximately 580 feet above MSL at MW11 and MW12. These elevations were higher than the surveyed ditch bottom of approximately 579 feet above MSL.

8.3 Nature and Extent of COI

Six media were observed to be of concern at the site including surface water, sediments, surface soil, subsurface soil, groundwater and NAPL. A set of conclusions related to each media is summarized in the following sections.

8.3.1 Surface Water

- No detectable organic COI was found in surface water as it leaves the site via the 72-inch diameter culvert to the Calais Avenue storm sewer system.

- No PAH or BTEX compounds were detected above method detection limits for any of the surface water samples. A benzene concentration of 1 μg/L was estimated by the laboratory for SW5. This concentration is below the NYSDEC Class D Water Quality Guidance Value of 6 μg/L.

- Concentrations of total cyanide ranged from 12.2 μg/L at SW1 to 736 μg/L at SW4. The NYSDEC Water Quality Standards for free cyanide (sum of HCN and CN^-) is 22 μg/L. Analysis of free cyanide was not completed for the surface water samples.

8.3.2 Sediments

The following provides a set of conclusions related to the sediment sampling and analysis conducted at the site:

- At sample location SD5, BTEX compounds were detected in concentrations greater than TAGM Cleanup Objectives.

- Concentrations of individual PAH compounds which exceeded cleanup objectives were detected at SD2, SD3, SD4 and SD5. Total PAH concentrations at each location was less than the TAGM Cleanup Objective value of 500 mg/Kg.

- Total organic carbon exceeded 1% in the sediment samples.

- Concentrations of COI up gradient of the site (and down gradient of Madison Wire) were found to be below method detection limits.

8.3.3 Surface Soil

The following provides a set of conclusions to the surface soil sampling and analysis conducted at the site:

- No BTEX compounds were detected in concentrations greater than the NYSDEC TAGM 4046 Cleanup Objective Values.

- Individual PAH compounds in concentrations exceeding TAGM Cleanup Objectives were found in all eight samples. Only sample SS1 contained total PAHs in a concentration exceeding the cleanup objective concentration of less than 500 mg/Kg.

- Total organic carbon exceeded 1% in the surface soil samples.

- Elevated levels (above TAGM Background Ranges) of arsenic, barium, chromium, copper, lead, magnesium, mercury and zinc were detected in site surface soils. Elevated concentrations of arsenic, copper and zinc are frequently detected in MGP sites (GRI, 1996).

- Cyanide concentrations were greatest at SS2, SS3 and SS4. These samples were collected from soil where blue staining and wood chips were present. The presence of cyanide is likely due to past contact of surface soil with the purifier box residuals.

- Soil from SS2 (beneath the electrical transmission tower) was found to have a TCLP lead concentration of 9.16 mg/L, a concentration greater than the regulatory level of 5 mg/L. The results of corrositivity testing indicate the pH of the sample was less than (i.e. in exceedence of) the hazardous waste regulatory level of 2. The presence of lead in this concentration may be attributed to paints containing lead used on the tower. Corrositivity of the soil is likely due to the high sulfur content of the purifier box residuals.

8.3.4 Subsurface Soil

The following provides a set of conclusions related to the subsurface soil sampling and analysis conducted at the site:

- Hydrocarbon odors, staining or product were observed in all but 11 of the 51 borings completed at the site.

- Elevated BTEX concentrations (above TAGM Cleanup Objectives) were found in nine of the sixteen borings tested.

- Elevated individual PAH concentrations were found in fourteen out of sixteen borings tested. Of these samples five exceeded the TAGM Cleanup Objectives for total PAHs.

- Cyanide was detected in two samples (SB36 and SB1) in concentrations which are elevated above average concentrations at the site. No eastern USA background range for cyanide is listed in the TAGM 4046. Measurements of free or amendable cyanide were not made.

8.3.5 Groundwater

The following provides a set of conclusions related to the groundwater sampling and analysis conducted at the site:

- BTEX compounds in groundwater samples MW7, MW8, MW11, MW12 and MW13 were found to exceed the NYSDEC Groundwater Quality Standards.

- The concentration of benzene (4' μg/L) in well MW13 was less than the Method Detection Limit and was estimated by the laboratory. The concentration; however, is greater than the NYSDEC Groundwater Standard Value of 0.7 μg/L.

- Concentrations of naphthalene in MW7, MW8 and MW11 were found to exceed the NYSDEC Groundwater Guidance Values. Acenaphthene in MW7 also exceeded the groundwater guidance value.

- The results obtained from testing of wells in the Separator Pits Investigation Area (MW7, MW8 and MW10) are similar to previous results obtained by RETEC.

- Detected metals concentrations exceeding NYSDEC Groundwater Standard Values were limited to iron, magnesium, manganese, sodium and thallium.

- Cyanide was found in concentrations exceeding NYSDEC Groundwater Standards in all wells except MW15. The presence of cyanide in the wells is likely a result of the presence of purifier box residuals at the site; however the highest concentrations of cyanide were found in the most up gradient well MW11, the well closest to (and downgradient of) the former Madison Wire site.

8.3.6 Tar-Like Material and NAPL

Stringers of tar-like materials were observed in unsaturated subsurface soils immediately adjacent to separator pits No. 2 and No. 3. The source of this material is likely to be the separator pits. The tar-like material occurs in small, discrete layers and lenses.

Layers of DNAPL, mixed with fill material, were found in separator pits No. 2 and No. 3 during completion of the soil borings. A maximum of 125 cubic yards of DNAPL-impacted fill for pit No. 2 and 25 cubic yards for pit No. 3 were estimated to be present, assuming historical drawings are correct and the DNAPL is evenly distributed in the thickness observed in the soil borings. Hydrocarbon impact was limited to slight odors only in borings made radially around the separator pit area (SB14, 19, 20, 21, 23, 24 and 25).

8.4 Areas of Concern

A summary of the areas of concern is presented in the following sections. Areas of concern were selected based on the presence of tar-like materials and/or elevated COI levels (above NYSDEC TAGM Cleanup Criteria or NYSDEC 6NYCRR Part 703 Water Quality Standards) in surface and subsurface soils, or groundwater.

8.4.1 Separator Pit No. 1

- No significant MGP constituents were detected in soil from SB21 and SB23 located south and west of the soil removed in 1995.

- Evidence of MGP impacts to subsurface soil at borings SB24 and SB25 was limited to slight hydrocarbon odors.

- No PCB compounds were detected in subsurface soil surrounding (SB24 and SB25) the former separator. The results of the PCB testing confirm the results of previous investigations.

8.4.2 Separator Pit No. 2

- Separator pit No. 2 is a concrete pit approximately 20 by 48 feet in size, has a concrete floor 8 feet bgs and contains fill material.

- From 5 to 8 feet bgs, the fill is saturated with a black, low viscosity tar-like DNAPL.

- Laboratory samples collected from within the separator indicate that concentrations of BTEX compounds and PAHs were elevated above NYSDEC TAGM 4046 Recommended Cleanup Objectives.

- PCB compounds Arochlor 1248 and 1254 were detected in concentrations above the Method Detection Limits; however the concentrations were below the NYSDEC TAGM Cleanup Objectives (< 10 ppm total PCBs for subsurface soil).

- Subsurface soil surrounding separator pit No. 2 was found to contain evidence of hydrocarbon impact, including elevated PID readings, hydrocarbon soil staining and hydrocarbon odors. Concentrations of BTEX and PAH were found to be greater than the NYSDEC TAGM 4046 Recommended Soil Cleanup Objectives.

- At SB20 and SB14, evidence of impact was limited to slight hydrocarbon staining and slight hydrocarbon odors. Analysis of SB20 showed concentrations of BTEX and PAH compounds were not detected by the laboratory or were less than NYSDEC Recommended Cleanup Objectives.

8.4.3 Separator Pit No. 3

- A 14 by 45 foot subsurface separator pit foundation was found to have a concrete floor 8 feet bgs and contain fill material.

- From 7 to 8 feet bgs the fill is saturated with a black, low viscosity, tar-like DNAPL.

- Analytical testing of the fill material within the pit foundations indicate that BTEX and PAH are elevated above NYSDEC TAGM 4046 Recommended Cleanup Objectives. The results confirm testing completed by ESI in 1995.

- PCB analysis from the sample within the pit foundation indicates that Arochlor 1248 and 1260 are present in the fill soil; however, the concentrations of these compounds are only slightly above the Method Detection Limits. The results confirm testing done from within the separator pit by ESI (ESI, 1995). No PCB compounds were detected above the Method Detection Limits for a soil sample from within the pit.

- Subsurface soil surrounding the separator contains evidence of impacts, including visible hydrocarbon staining, hydrocarbon odors, and stringers of hydrocarbon product at boring SB18.

- Laboratory testing of subsurface soil to the south of the separator (SB19) indicate that concentrations of COI were either not detected above Method Detection Limits, or were below TAGM 4046 Cleanup Objectives.

- Evidence of impact in SB21 and SB22 was limited to slight hydrocarbon odors or staining.

8.4.4 Eastern Swale Investigation Area

- Purifier box residuals are exposed at the ground surface in the investigation area. These materials were observed to be present in the drainage ditch as a result of erosion.

- The thickest accumulations (up to three feet) were found adjacent to the drainage ditch swale.

- Concentrations of BTEX in surface soil samples were found to be below NYSDEC Soil Cleanup Objectives.

- Surface soil concentrations of individual PAHs were above TAGM Cleanup Objectives; however, concentrations of total PAHs were less than the Cleanup Objectives of less than 500 mg/Kg.

- Concentrations of arsenic, chromium, magnesium, mercury and zinc were detected in the surface soil samples in concentrations slightly greater than the TAGM 4046 Background Ranges for eastern USA or New York State soils.

- Surface soil analyzed for RCRA hazardous characteristics indicate that the soil is non-hazardous.

- Analysis of two subsurface soil samples indicate that BTEX and PAHs are present in concentrations greater than TAGM 4046 Cleanup Objectives. The concentration of total PAHs for sample SB1 (2-4) was found to be greater than the Cleanup Objective of less than 500 mg/Kg total PAHs.

- Groundwater testing within the Eastern Swale Area indicates that benzene, iron, magnesium, manganese, sodium and thallium were found in concentrations exceeding NYSDEC standards.

- Flowable hydrocarbon product was observed in soil boring SB9 from 2 to 3 feet bgs.

- Visual indications of purifier residuals were observed in all borings in this area except SB7, SB8, SB4, SB9 and SB6.

8.4.5 Subsurface Hydrocarbon Investigation Area

- Soil sample SS8, taken along the drainage ditch bank, displayed a blue stained streak which was at the surface only.

- Analysis of the sample of the soil indicated concentrations of BTEX are below TAGM Cleanup Objectives. Concentrations of eight individual PAHs are greater than cleanup objectives; however, total PAH concentrations is less than the cleanup objective of less than 500 mg/Kg. Copper and zinc were elevated slightly above background ranges.

- Subsurface soil in each of the borings completed in this area were found to be saturated with hydrocarbon product. The approximate thickness of the saturated sediments was approximately 8 feet (7 feet bgs to 15 feet bgs).

- Laboratory testing of the impacted subsurface soil (SB44 8-12) indicates BTEX concentrations and individual PAH compounds are elevated above TAGM Cleanup Objectives.

- Groundwater testing (MW11) fr6m the study area indicates that benzene, toluene, ethylbenzene and xylene, naphthalene and cyanide were above NYSDEC Groundwater Standards Guidance Values.

8.4.6 Surface Hydrocarbon Investigation Area

- MGP constituents (tar-like materials) are present at ground surface in the investigation area.

- The tar-like accumulations appear to be limited to the vicinity of SB26.

- A sample of the tar-like material (SS1) was tested by the laboratory. All PAH compounds were found to be greater than TAGM 4046 Cleanup

Objectives. Total PAH concentration (21,580 mg/Kg) was found to be greater than the Cleanup Objective for total PAHs (less than 500 mg/Kg).

- Laboratory analysis of subsurface soil from SB26 (a thin lens of tar saturated soil) was found to contain BTEX compounds and individual and total PAH concentrations greater than the TAGM 4046 Cleanup Objectives.

- Subsurface soil collected from the remaining soil borings in the area were found to contain slight or no hydrocarbon odors except SB29 and SB31 which had visible hydrocarbon sheens and/or slight hydrocarbon product stringers.

- Laboratory analysis of subsurface soil from these borings (SB29 and SB32) indicate that several individual PAH compounds were found to be greater than TAGM Cleanup Objectives; however, total PAH concentrations were less than the cleanup objective of 500 mg/Kg. BTEX compounds were found to be greater than TAGM Objectives in boring SB29.

8.4.7 Southern Investigation Area

Purifier box residuals were found to be exposed at the ground surface in the area in isolated pockets. For discussion purposes the investigation area has been divided into the following two separate areas.

Electric Transmission Tower Area

- An estimated volume of 45 cubic yards of soil impacted by purifier box residuals was found beneath the electrical transmission tower in the southwest corner of the site. The extent of the impact is limited to the area between borings SB39 and SB40.

- A sample of soil impacted by the purifier box residuals (SS2) beneath the transmission tower was found to exceed hazardous characteristics regulatory levels for lead and corrositivity.

- Surface soil sample SS2 was found to contain nine individual PAHs exceeding TAGM Cleanup Objectives, and concentrations of arsenic, barium, copper, lead and mercury in concentrations exceeding background soil ranges.

- Niagara Mohawk Power Corporation inspected the transmission towers in conjunction with the PSA field work. The results of their inspection was that the tower foundations were structurally sound.

- Groundwater testing results downgradient of the tower area (MW15) indicated that no organic COI were found in concentrations above NYSDEC Standards. Concentrations of inorganic COI greater than the standards were limited to iron, manganese and sodium.

Southeast of Building 14

- Testing of surface soil impacted by purifier residuals (SS3) indicated that the sample did not exceed regulatory levels for hazardous characteristics. Concentrations of six individual PAHs exceeded TAGM objectives; however the concentration of total PAHs (16.1 mg/Kg) was well below the cleanup objective of less than 500 mg/Kg.

- Purifier box residuals were present in lenses (up to 0.5 feet thick) in subsurface soil borings. Thicker accumulations were not observed during the investigation of this area.

- Laboratory analysis of subsurface soil samples SB36, SB42 and SB51 indicate that BTEX was not present above TAGM Cleanup Objectives. Concentrations of individual PAHs were greater than the cleanup objectives; however, total PAHs were less than the 500 mg/Kg cleanup objective for these samples.

- The results of water (SW1), sediment (SD1) and groundwater (MW16) testing in the study area indicate that concentrations of organic COI were below cleanup objectives of NYSDEC Water Quality Standards or Guidance Values. Concentrations of inorganic COI exceeding regulatory levels were limited to iron, magnesium, manganese, sodium and cyanide.

8.5 Recommendations

8.5.1 Interim Remedial Measures (IRMs)

IRMs are warranted when existing site conditions pose an immediate threat to human health or the environment. Such conditions often come about due to ongoing releases of contaminants to surface water, sediment or groundwater where exposure pathways allow the receptors to come into contact with the materials; and where contaminant exposure yields acute health hazards. The PSA investigation identified several areas where there is potential for exposure to contaminants at the site. These areas are discussed in the following sections.

Eastern Swale Area

MGP constituents, consisting of purifier box residuals, are exposed at ground surface in the eastern swale area. RETEC recommends that soil containing these materials be stabilized. Grading and lining the ditch with a geotextile fabric and gravel will prevent erosion of the soil, limit potential migration of COI, and prevent contact by persons working in the area. The scope of work and design for this IRM is presented in the Field Sampling and Analysis Plan (RETEC, 1997a).

Electrical Transmission Tower

Hazardous (corrosive) material consisting of soil impacted by purifier box residuals was found beneath the electric transmissions tower in the southwest corner of the site. RETEC recommends excavation and off site disposal of the visually delineable (blue stained) surface deposit of purifier residuals under the tower.

Sample SS2 also contained lead in hazardous concentrations. RETEC recommends that additional soil sampling be performed under all five transmission towers at the site. TCLP testing will determine the extent of the lead contamination in each of these five areas. Soil found to be hazardous should be excavated and disposed of.

8.5.2 Additional Investigations

Additional Subsurface Hydrocarbon Investigation

RETEC recommends that additional soil borings be completed at the site to further define the nature and extent of COI found during the PSA investigation. Investigation areas are as follows:

- Within the footprint of the eastern gas holder, an area which has yet to be investigated.
- Within the footprint of historical petroleum (and other MGP associated tanks) to the east and west of Building 10.
- In the Subsurface Hydrocarbon Area, to further define the extent of NAPL found in the area. Samples of the hydrocarbon-impacted soil should be analyzed by IR spectral technique to determine the nature and possible source of the hydrocarbon material.

- In the area around SB51, to further define the extent of subsurface purifier box residuals.

- Around the former location of the purifying boxes, to further define the subsurface distribution of purifier box residuals.

Groundwater Investigation

RETEC recommends that additional wells be installed at the site. The objective of this work will be to further define COI in groundwater identified during the PSA. Well locations include:

- One new well in the southeastern corner of the site. This well will serve as an additional up gradient well. The well planned for this purpose (MW11) was found to contain COI in concentrations above NYSDEC groundwater standards.

- Two new wells should be installed along the eastern boundary of the site. The objective of the wells will be to monitor groundwater conditions up gradient and cross-gradient of the C&D Landfill. PSA well MW12, planned for this purpose, was found to contain COI in concentrations greater than the groundwater standards.

Groundwater Testing

RETEC recommends that additional groundwater testing be completed at the site for existing wells and the new wells discussed above. The scope of work includes:

- Analysis of the new wells for MGP indicators.

- Re-analysis of groundwater at well location MW13 for volatile organic compounds to confirm the presence of detected trace amounts of COI.

- Re-testing of all wells for cyanide. The laboratory methods used should determine the concentrations of weak-acid dissociable (free) cyanide.

Soil Gas Survey

During the PSA investigation, NAPL was found in Geoprobe soil borings in several areas of the site. High concentrations of COI in soil gas, if present as a result of volatilization of the NAPL, is a potential concern to site workers in buildings within these areas. RETEC recommends a focused soil gas survey to determine if volatile organic compounds are present in elevated concentrations in soil gas around Buildings No. 2, 8, 9 and 10.

Site Control

RETEC recommends that a perimeter fence be installed on the southern boundary of the property. The objective of the fence will be to limit public access to the site.

9.0 REFERENCES

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NYSDEC, 1992, *STARS Memo #1, Petroleum-Contaminated Soil Guidance Policy.*

NYSDEC, 1993, *Ambient Water Quality Standards and Guidance Values*, Division of Water Technical and Operational Guidance Series (1.1.1), October 1993.

NYSDEC, 1994. *Revised TAGM - Determination of Soil Cleanup Objectives and Cleanup Levels*, Memorandum from Michael J.O'Toole, HWR-94-4046, January.

RETEC, 1995a, *Site Investigation Summary Report, Mineral Springs Road, Buffalo, New York.*

RETEC, 1997a, *Field Sampling and Analysis Plan (FSAP) for Mineral Springs Road, West Seneca, New York* .

RETEC, 1997b, *Site Specific Health and Safety Plan, Mineral Springs Road, West Seneca, New York.*

Sullivan - McKeegan Co. Inc., 1985, Aerial Photograph, *Location of Proposed Fill Area - National Fuel Gas Property*, West Seneca, New York.

APPENDIX A

BORING AND WELL INSTALLATION LOGS

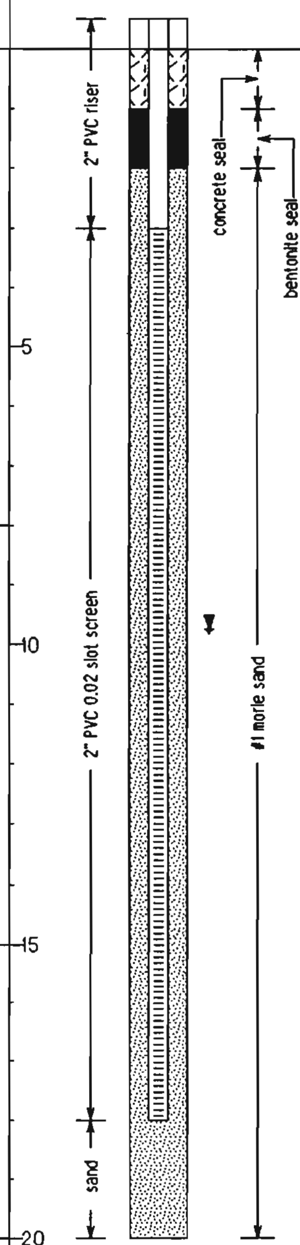
RETEC
REMEDIATION TECHNOLOGIES, INC.

MONITORING WELL LOG
MW-11

PROJECT NO.: 3-2075-680	DRILLING CO.: MAXIM	MP ELEVATION: 590.03
CLIENT: NATIONAL FUEL GAS	DRILLER: RON BROWN	SURFACE ELEVATION: 587.34
LOCATION: MINERAL SPRINGS ROAD	METHOD:	WATER LEVEL DURING DRILLING: 9.75
START DATE: 6-30-97	CASING I.D.:	PVC STICK-UP: 2 1/2'
GEOLOGIST: MARK HOFFERBERT	TOTAL DEPTH: 18	AUGER O.D./I.D. 4.25" ID

DEPTH (feet)	SAMPLE TIME	BLOW COUNTS	RECOVERY	PID Headspace (ppm)	SAMPLE DEPTH	SOIL CLASS	LITHOLOGY	DESCRIPTION
				0.0	0-2	FILL		Fill material consisting of: 80% Clay 20% Debris.
				0.0	2-4			
5				0.0	4-6			
				2.9	6-8			
				2.2	8-10	CL		Becomes SILTY CLAY, high plasticity, moist.
10				180	10-12			Trace hydrocarbon sheen and hydrocarbon odor.
				86	12-14			
15				30	14-16	SW		Becomes SAND, uniform, poorly sorted, loose. Trace gravel, slight hydrocarbon sheen and odor.
				25	16-18			
				22	18-20			
20								End of boring.

WELL CONSTRUCTION



REMARKS:

RETEC

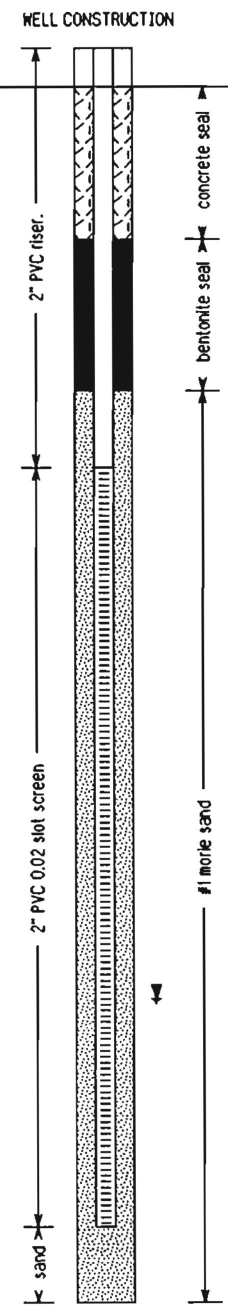
REMEDIATION TECHNOLOGIES, INC.

MONITORING WELL LOG
MW-12

PROJECT NO.: 3-2075-680	DRILLING CO.: MAXIM	MP ELEVATION: 591.40
CLIENT: NATIONAL FUEL GAS	DRILLER: RON BROWN	SURFACE ELEVATION: 588.74
LOCATION: MINERAL SPRINGS ROAD	METHOD:	WATER LEVEL DURING DRILLING: 11.95
START DATE: 7-1-97	CASING I.D.:	PVC STICK-UP: 2 1/2'
GEOLOGIST: MARK HOFFERBERT	TOTAL DEPTH: 15.0	AUGER O.D./I.D. 4.25" ID

DEPTH (feet)	SAMPLE TIME	BLOW COUNTS	RECOVERY	PID Headspace (ppm)	SAMPLE DEPTH	SOIL CLASS	LITHOLOGY	DESCRIPTION
								0-0.5' Topsoil.
				0.9	0.5-2	FILL		Fill material consisting of Ash/cinders, black wood chips.
				5.4	2-4			Black wood chips and peat mixture, slight hydrocarbon odor.
				NA		CL		SILTY CLAY, uniform, firm, medium plasticity, gray.
5				4.5	4-6			
				6.1	6-8			
				9.0	8-10			
10				4.5	10-12			
								Becomes wet.
				1.8	12-14			
15				1.9	14-16	SP		Becomes sand, gray, loose, coarse, poorly sorted. 30% Gravel, gray, rounded.
								End of boring.

WELL CONSTRUCTION



REMARKS:
NA-not applicable.

RETEC

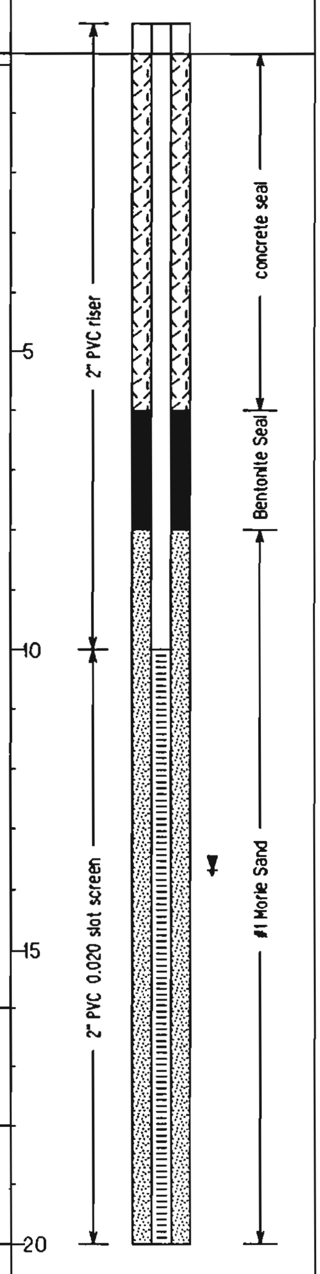
REMEDIATION TECHNOLOGIES, INC.

MONITORING WELL LOG
MW-13

PROJECT NO.: 3-2075-680	DRILLING CO.: MAXIM	MP ELEVATION: 591.85
CLIENT: NATIONAL FUEL GAS	DRILLER: RON BROWN	SURFACE ELEVATION: 592.33
LOCATION: MINERAL SPRINGS ROAD	METHOD:	WATER LEVEL DURING DRILLING: 13.68
START DATE: 7-2-97	CASING I.D.:	PVC STICK-UP: 2 1/2'
GEOLOGIST: MARK HOFFERBERT	TOTAL DEPTH: 20	AUGER O.D./I.D. 4.25" ID

DEPTH (feet)	SAMPLE TIME	BLOW COUNTS	RECOVERY	PID Headspace (ppm)	SAMPLE DEPTH	SOIL CLASS	LITHOLOGY	DESCRIPTION
						CL		0-0.2' Topsoil
				0.0	0.2-2			CLAY, gray, uniform, firm, medium plasticity, moist.
				0.0	2-4			
5				0.0	4-6			
				0.0	6-8			
				0.0	8-10			
10				0.0	10-12			
				0.0	12-14			
15				0.0	14-16			
				0.4	16-18	GP		Becomes GRAVEL, gray, loose, poorly sorted, wet. 30% Sand, gray. 10% Silt.
				0.1	18-20	SP		SAND, loose, coarse, poorly sorted.
20								End of boring.

WELL CONSTRUCTION



REMARKS:

RETEC

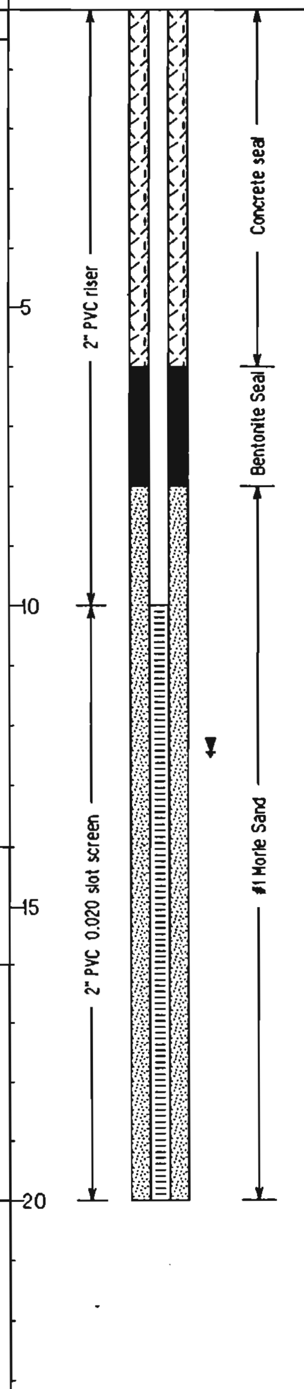
REMEDIATION TECHNOLOGIES, INC.

MONITORING WELL LOG
MW-14

PROJECT NO.: 3-2075-680	DRILLING CO.: MAXIM	MP ELEVATION: 589.81
CLIENT: NATIONAL FUEL GAS	DRILLER: RON BROWN	SURFACE ELEVATION: 590.02
LOCATION: MINERAL SPRINGS ROAD	METHOD:	WATER LEVEL DURING DRILLING: 12.45
START DATE: 7-2-97	CASING I.D.:	PVC STICK-UP: NA
GEOLOGIST: MARK HOFFERBERT	TOTAL DEPTH: 20	AUGER O.D./I.D. 4.25" ID

DEPTH (feet)	SAMPLE TIME	BLOW COUNTS	RECOVERY	PID Headspace (ppm)	SAMPLE DEPTH	SOIL CLASS	DESCRIPTION
							0-0.5' Asphalt pavement.
				0.9	0.5-2	CL	SILTY CLAY, gray, uniform, firm, medium plasticity, moist.
				0.4	2-4		
5				0.0	4-6		
				0.0	6-8		
				0.0	8-10		
10				0.0	10-12		Becomes wet.
				0.0	12-14		
15				0.0	14-16	ML	CLAYEY SILT, gray, firm, wet.
				0.0	16-18	SM	SILTY SAND, gray, loose, poorly sorted, wet.
20				0.0	18-20		
							End of boring.

WELL CONSTRUCTION



REMARKS:

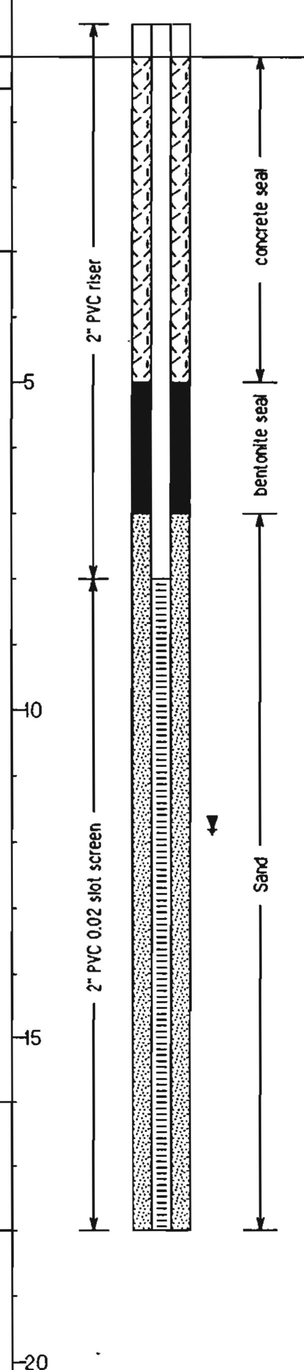
RETEC
REMEDIATION TECHNOLOGIES, INC.

MONITORING WELL LOG
MW-15

PROJECT NO.: 3-2075-680	DRILLING CO.: MAXIM	MP ELEVATION: 590.93
CLIENT: NATIONAL FUEL GAS	DRILLER: RON BROWN	SURFACE ELEVATION: 588.95
LOCATION: MINERAL SPRINGS ROAD	METHOD:	WATER LEVEL DURING DRILLING: 11.82
START DATE: 7-1-97	CASING I.D.:	PVC STICK-UP: 2 1/2'
GEOLOGIST: MARK HOFFERBERT	TOTAL DEPTH: 18	AUGER O.D./I.D. 4.25" ID

DEPTH (feet)	SAMPLE TIME	BLOW COUNTS	RECOVERY	PID Headspace (ppm)	SAMPLE DEPTH	SOIL CLASS	LITHOLOGY	DESCRIPTION
						FILL		0-0.5' Topsoil
				23	0.5-2			Fill material consisting of: silty clay and cinders.
				0.0	2-4	CL		SILTY CLAY, gray, firm, medium plasticity.
5				0.0	4-6			
				0.0	6-8			
				0.0	8-10			
10				0.0	10-12			
				0.0	12-14			
15				0.0	14-16			Becomes wet.
				0.0	16-18	SP		SAND, gray, coarse, loose, wet.
								End of boring.
20								

WELL CONSTRUCTION



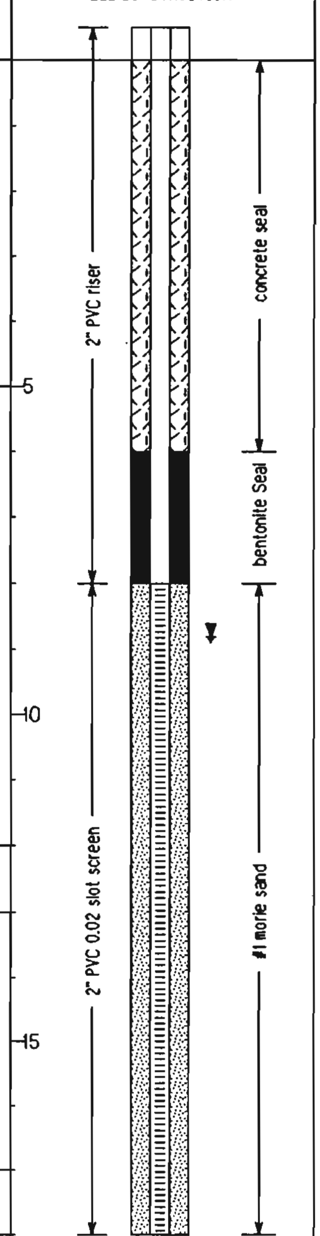
REMARKS:

MONITORING WELL LOG
MW-16

RETEC
REMEDIATION TECHNOLOGIES, INC.

PROJECT NO.: 3-2075-680	DRILLING CO.: MAXIM	MP ELEVATION: 588.99
CLIENT: NATIONAL FUEL GAS	DRILLER: RON BROWN	SURFACE ELEVATION: 586.46
LOCATION: MINERAL SPRINGS ROAD	METHOD:	WATER LEVEL DURING DRILLING: 8.82
START DATE: 7-1-97	CASING I.D.:	PVC STICK-UP: 2 1/2'
GEOLOGIST: MARK HOFFERBERT	TOTAL DEPTH: 18	AUGER O.D./I.D. 4.25" ID

DEPTH (feet)	SAMPLE TIME	BLOW COUNTS	RECOVERY	PID Headspace (ppm)	SAMPLE DEPTH	SOIL CLASS	LITHOLOGY	DESCRIPTION
				1.3	0-2	FILL		Fill material consisting of: Cinders, ash and debris. Blue staining from 1.3 to 3'.
				0.0	2-4			
5				20	4-6	CL		CLAY, gray, firm, medium plasticity, wet.
				5.9	6-8			Blue Stain at 8' below ground surface.
				4.1	8-10			
10				2.0	10-12			
				0.0	12-14	ML		SANDY SILT, dry gray.
						CL		CLAY, gray, firm, medium plasticity, wet.
15				0.0	14-16			
				0.0	16-18	SP		SAND, gray, coarse, poorly sorted, wet.
20								End of boring.



REMARKS:

RETEC

REMEDIATION TECHNOLOGIES, INC.

BORING LOG
BORING SB-01

PROJECT NO.: 3-2075-680	DRILLING CO.: MAXIM	MP ELEVATION:
CLIENT: NATIONAL FUEL GAS	DRILLER: RON BROWN	SURFACE ELEVATION:
LOCATION: MINERAL SPRING ROAD	METHOD: GEOPROBE	WATER LEVEL DURING DRILLING: NA
START DATE: 7-9-97	CASING I.D.:	STICK-UP: NA
GEOLOGIST: MARK HOFFERBERT	TOTAL DEPTH: 4	AUGER O.D./I.D.: 2" ID

DEPTH (feet)	RECOVERY (ft)	SAMPLE DEPTH	PID HEADSPACE (ppm)	BLOW COUNTS	SOIL CLASS	LITHOLOGY	DESCRIPTION
							0-0.6 Topsoil.
					FILL		Fill material consisting of: Clay and debris, orange, moist. 0.3' of blue stained wood chips mixed with soil. 1' thick layer of blue stained wood chips mixed with soil.
		(2-4)			CL		SILTY CLAY, gray, firm, moist.
							End of boring
5							
10							

REMARKS:
SB-01 (2-4) analyzed for BTEX, PAH, TOC and cyanide.

RETEC

REMEDIATION TECHNOLOGIES, INC.

BORING LOG
BORING SB-02

PROJECT NO.: 3-2075-680	DRILLING CO.: MAXIM	MP ELEVATION:
CLIENT: NATIONAL FUEL GAS	DRILLER: RON BROWN	SURFACE ELEVATION:
LOCATION: MINERAL SPRINGS ROAD	METHOD: GEOPROBE	WATER LEVEL DURING DRILLING: NA
START DATE: 7-9-97	CASING I.D.:	STICK-UP: NA
GEOLOGIST: MARK HOFFERBERT	TOTAL DEPTH: 4	AUGER O.D./I.D.: 2" ID

DEPTH (feet)	RECOVERY (ft)	SAMPLE DEPTH	PID HEADSPACE (ppm)	BLOW COUNTS	SOIL CLASS	LITHOLOGY	DESCRIPTION
							0-0.6 Topsoil.
					FILL		Fill material consisting of: 50% CLAY 50% Gravel, gray, rounded. At 2-3', becomes soil mixed with blue stained wood chips, loose, moist
					CL		SILTY CLAY, gray, firm, moist.
5							End of boring.
10							

REMARKS:

REMEDIATION TECHNOLOGIES, INC.

BORING LOG
BORING SB-03

PROJECT NO.: 3-2075-680	DRILLING CO.: MAXIM	MP ELEVATION:
CLIENT: NATIONAL FUEL GAS	DRILLER: RON BROWN	SURFACE ELEVATION:
LOCATION: MINERAL SPRINGS ROAD	METHOD: GEOPROBE	WATER LEVEL DURING DRILLING: NA
START DATE: 7-9-97	CASING I.D.:	STICK-UP: NA
GEOLOGIST: MARK HOFFERBERT	TOTAL DEPTH: 4	AUGER O.D./I.D.: 2" ID

DEPTH (feet)	RECOVERY (ft)	SAMPLE DEPTH	PID HEADSPACE (ppm)	BLOW COUNTS	SOIL CLASS	LITHOLOGY	DESCRIPTION
							0-0.6 Topsoil
					FILL		Fill material consisting of: Silty Clay and debris.
							Becomes soil mixed with blue stained wood chips, loose, moist, trace hydrocarbon product.
					CL		SILTY CLAY, gray, firm, medium plasticity, moist.
							End of boring.
5							
10							

REMARKS:

REMEDIATION TECHNOLOGIES, INC.

BORING LOG
BORING SB-04

PROJECT NO.: 3-2075-680	DRILLING CO.: MAXIM	MP ELEVATION:
CLIENT: NAITONAL FUEL GAS	DRILLER: RON BROWN	SURFACE ELEVATION:
LOCATION: MINERAL SPRINGS ROAD	METHOD: GEOPROBE	WATER LEVEL DURING DRILLING: NA
START DATE: 7-9-97	CASING I.D.:	STICK-UP: NA
GEOLOGIST: MARK HOFFERBERT	TOTAL DEPTH: 4	AUGER O.D./I.D.: 2" ID

DEPTH (feet)	RECOVERY (ft)	SAMPLE DEPTH	PID HEADSPACE (ppm)	BLOW COUNTS	SOIL CLASS	LITHOLOGY	DESCRIPTION
					FILL		0-0.6' Fill material consisting of: Gray, rounded gravel. Becomes SILTY CLAY, gray, firm, moist. Fill material consisting of: Clay, brick fragments and ash.
					CL		SILTY CLAY, gray, firm, medium plasticity, moist.
5							End of boring.
10							

REMARKS:

RETEC

REMEDIATION TECHNOLOGIES, INC.

BORING LOG
BORING SB-05

PROJECT NO.: 3-2075-680	DRILLING CO.: MAXIM	MP ELEVATION:
CLIENT: NATIONAL FUEL GAS	DRILLER: RON BROWN	SURFACE ELEVATION:
LOCATION: MINERAL SPRINGS ROAD	METHOD: GEOPROBE	WATER LEVEL DURING DRILLING: NA
START DATE: 7-9-97	CASING I.D.:	STICK-UP: NA
GEOLOGIST: MARK HOFFERBERT	TOTAL DEPTH: 8	AUGER O.D./I.D.: 2" ID

DEPTH (feet)	RECOVERY (ft)	SAMPLE DEPTH	PID HEADSPACE (ppm)	BLOW COUNTS	SOIL CLASS	LITHOLOGY	DESCRIPTION
							0-1' Topsoil.
					FILL		Fill material from 1-1.5', Soil mixed with blue stained wood chips.
					CH		Clay to 3.5' below ground surface.
					CL		3.5-4.0' SILTY CLAY with 0.4" lense of ash, slight hydrocarbon odor. Becomes CLAY, black hydrocarbon staining and slight hydrocarbon odor.
5							CLAY, gray, firm, moist.
							End of boring.
10							

REMARKS:

REMEDIATION TECHNOLOGIES, INC.

BORING LOG
BORING SB-06

PROJECT NO.: 3-2075-680	DRILLING CO.: MAXIM	MP ELEVATION:
CLIENT: NATIONAL FUEL GAS	DRILLER: RON BROWN	SURFACE ELEVATION:
LOCATION: MINERAL SPRINGS ROAD	METHOD: GEOPROBE	WATER LEVEL DURING DRILLING: NA
START DATE: 7-9-97	CASING I.D.:	STICK-UP: NA
GEOLOGIST: MARK HOFFERBERT	TOTAL DEPTH: 3	AUGER O.D./I.D.: 2" ID

DEPTH (feet)	RECOVERY (ft)	SAMPLE DEPTH	PID HEADSPACE (ppm)	BLOW COUNTS	SOIL CLASS	LITHOLOGY	DESCRIPTION
							0-0.5' Topsoil.
					FILL		Fill material consisting of: Clay and debris. Becomes black ash with slight hydrocarbon odor.
					CL		Becomes SILTY CLAY, firm, moist, medium plasticity.
							End of boring.
5							

REMARKS:

REMEDIATION TECHNOLOGIES, INC.

BORING LOG
BORING SB-07

PROJECT NO.: 3-2075-680	DRILLING CO.: MAXIM	MP ELEVATION:
CLIENT: NATIONAL FUEL GAS	DRILLER: RON BROWN	SURFACE ELEVATION:
LOCATION: MINERAL SPRINGS ROAD	METHOD: GEOPROBE	WATER LEVEL DURING DRILLING: NA
START DATE: 7-9-97	CASING I.D.:	STICK-UP: NA
GEOLOGIST: MARK HOFFERBERT	TOTAL DEPTH: 4	AUGER O.D./I.D.: 2" ID

DEPTH (feet)	RECOVERY (ft)	SAMPLE DEPTH	PID HEADSPACE (ppm)	BLOW COUNTS	SOIL CLASS	LITHOLOGY	DESCRIPTION
					CL		SILTY CLAY, gray, firm, moist, medium plasticity. Gravel lens at 1' below ground surface.
							End of boring.
5							
10							

REMARKS:

RETEC

REMEDIATION TECHNOLOGIES, INC.

BORING LOG
BORING SB-08

PROJECT NO.: 3-2075-680	DRILLING CO.: MAXIM	MP ELEVATION:
CLIENT: NATIONAL FUEL GAS	DRILLER: RON BROWN	SURFACE ELEVATION:
LOCATION: MINERAL SPRINGS ROAD	METHOD: GEOPROBE	WATER LEVEL DURING DRILLING: NA
START DATE: 7-9-97	CASING I.D.:	STICK-UP: NA
GEOLOGIST: MARK HOFFERBERT	TOTAL DEPTH: 4	AUGER O.D./I.D.: 2" ID

DEPTH (feet)	RECOVERY (ft)	SAMPLE DEPTH	PID HEADSPACE (ppm)	BLOW COUNTS	SOIL CLASS	LITHOLOGY	DESCRIPTION
							0-0.6' Topsoil.
					FILL		Fill material consisting of: Clay and gravel. Coal fragments in lens.
					CL		SILTY CLAY, gray, firm, medium plasticity, moist.
							End of boring.
5							
10							

REMARKS:

RETEC

REMEDIATION TECHNOLOGIES, INC.

BORING LOG
BORING SB-09

PROJECT NO.: 3-2075-680	DRILLING CO.: MAXIM	MP ELEVATION:
CLIENT: NATIONAL FUEL GAS	DRILLER: RON BROWN	SURFACE ELEVATION:
LOCATION: MINERAL SPRINGS ROAD	METHOD: GEOPROBE	WATER LEVEL DURING DRILLING: NA
START DATE: 7-9-97	CASING I.D.:	STICK-UP: NA
GEOLOGIST: MARK HOFFERBERT	TOTAL DEPTH: 6.5	AUGER O.D./I.D.: 2" ID

DEPTH (feet)	RECOVERY (ft)	SAMPLE DEPTH	PID HEADSPACE (ppm)	BLOW COUNTS	SOIL CLASS	LITHOLOGY	DESCRIPTION
							0-0.5' Topsoil.
					FILL		Fill material consisting of: Gravely Clay, gray, moist.
							Becomes fill material consisting of: Gravel mixed with hydrocarbon product.
							Becomes fill material consisting of: Sand, gravel and slag mixture,
							Fill consisting of Coal fragments and gravel mixed with hydrocarbon product.
5							
					CL		CLAY, black hydrocarbon like staining, hydrocarbon odor, moist.
							End of boring.
10							

REMARKS:

REMEDIATION TECHNOLOGIES, INC.

BORING LOG
BORING SB-10

PROJECT NO.: 3-2075-680	DRILLING CO.: MAXIM	MP ELEVATION:
CLIENT: NATIONAL FUEL GAS	DRILLER: RON BROWN	SURFACE ELEVATION:
LOCATION: MINERAL SPRINGS ROAD	METHOD: GEOPROBE	WATER LEVEL DURING DRILLING: 3.0
START DATE: 7-9-97	CASING I.D.:	STICK-UP: NA
GEOLOGIST: MARK HOFFERBERT	TOTAL DEPTH: 8	AUGER O.D./I.D.: 2" ID

DEPTH (feet)	RECOVERY (ft)	SAMPLE DEPTH	PID HEADSPACE (ppm)	BLOW COUNTS	SOIL CLASS	LITHOLOGY	DESCRIPTION
					FILL		Fill material consisting of: Clayey Silt, brick fragments, concrete fragments.
			29				
			22.8				Becomes wet.
5			125				Fill becomes saturated with hydrocarbon product, black, low viscosity, strong hydrocarbon odor.
			877				
							Concrete.
							End of boring.
10							

REMARKS:
Sample SB10/11 (4-8) analyzed for BTEX, PAH, PCBs and cyanide.

RETEC

REMEDIATION TECHNOLOGIES, INC.

BORING LOG
BORING SB-11

PROJECT NO.: 3-2075-680	DRILLING CO.: MAXIM	MP ELEVATION:
CLIENT: NATIONAL FUEL GAS	DRILLER: RON BROWN	SURFACE ELEVATION:
LOCATION: MINERAL SPRINGS ROAD	METHOD: GEOPROBE	WATER LEVEL DURING DRILLING: 3.0
START DATE: 7-9-97	CASING I.D.:	STICK-UP: NA
GEOLOGIST: MARK HOFFERBERT	TOTAL DEPTH: 8	AUGER O.D./I.D.: 2" ID

DEPTH (feet)	RECOVERY (ft)	SAMPLE DEPTH	PID HEADSPACE (ppm)	BLOW COUNTS	SOIL CLASS	LITHOLOGY	DESCRIPTION
					FILL		Fill material consisting of: Clayey Silt, brick fragments, concrete fragments.
			10.8				
			18.3				
5			35.4				Fill becomes saturated with hydrocarbon product, black, low viscosity, strong hydrocarbon odor.
			737				
							Concrete.
							End of boring.
10							

REMARKS:
Sample SB10/11 (4-8) analyzed for BTEX, PAH, PCBs and cyanide.

RETEC

REMEDIATION TECHNOLOGIES, INC.

BORING LOG
BORING SB-12

PROJECT NO.: 3-2075-680	DRILLING CO.: MAXIM	MP ELEVATION:
CLIENT: NATIONAL FUEL GAS	DRILLER: RON BROWN	SURFACE ELEVATION:
LOCATION: MINERAL SPRINGS ROAD	METHOD: GEOPROBE	WATER LEVEL DURING DRILLING: NA
START DATE: 7-9-97	CASING I.D.:	STICK-UP: NA
GEOLOGIST: MARK HOFFERBERT	TOTAL DEPTH: 16	AUGER O.D./I.D.: 2" ID

DEPTH (feet)	RECOVERY (ft)	SAMPLE DEPTH	PID HEADSPACE (ppm)	BLOW COUNTS	SOIL CLASS	LITHOLOGY	DESCRIPTION
0					FILL		Fill material consisting of Silty Clay, gravel, brick and concrete fragments.
			18				
							Becomes fill material consisting of: clay and debris, slight hydrocarbon odor.
			108				
5			33				
			38.7				7-10', becomes fill material saturated with hydrocarbon product.
			195				
10					CL		Becomes clay, black hydrocarbon staining, firm, medium plasticity slight hydrocarbon odor.
			75				
		12–16					Clay, black hydrocarbon staining, firm, medium plasticity, slight hydrocarbon odor.
			138				
15			183		GP		Silty Gravel, wet, loose, poorly sorted.
16							End of boring.

REMARKS:
Sample SB12 (12-16) analyzed for BTEX, PAH, TOC and cyanide.

RETEC

REMEDIATION TECHNOLOGIES, INC.

BORING LOG
BORING SB-13

PROJECT NO.: 3-2075-680	DRILLING CO.: MAXIM	MP ELEVATION:
CLIENT: NATIONAL FUEL GAS	DRILLER: RON BROWN	SURFACE ELEVATION:
LOCATION: MINERAL SPRINGS ROAD	METHOD: GEOPROBE	WATER LEVEL DURING DRILLING: NA
START DATE: 7-9-97	CASING I.D.:	STICK-UP: NA
GEOLOGIST: MARK HOFFERBERT	TOTAL DEPTH: 6	AUGER O.D./I.D.: 2" ID

DEPTH (feet)	RECOVERY (ft)	SAMPLE DEPTH	PID HEADSPACE (ppm)	BLOW COUNTS	SOIL CLASS	LITHOLOGY	DESCRIPTION
					FILL		Fill material consisting of: Silty Clay mixed with concrete and brick fragments.
			14.1				
			67				SAND, black hydrocarbon staining, moist.
					CL		SILTY CLAY, saturated with hydrocarbon product, black, low viscosity, strong hydrocarbon odor.
			467				
5			79				
							Concrete.
							End of boring.
10							

REMARKS:
Sample SB-13 (3-6.5) analyzed for BTEX, PAH, and cyanide.

RETEC

REMEDIATION TECHNOLOGIES, INC.

BORING LOG
BORING SB-14

PROJECT NO.: 3-2075-680	DRILLING CO.: MAXIM	MP ELEVATION:
CLIENT: NATIONAL FUEL GAS	DRILLER: RON BROWN	SURFACE ELEVATION:
LOCATION: MINERAL SPRINGS ROD	METHOD: GEOPROBE	WATER LEVEL DURING DRILLING: NA
START DATE: 7-9-97	CASING I.D.:	STICK-UP: NA
GEOLOGIST: MARK HOFFERBERT	TOTAL DEPTH: 16	AUGER O.D./I.D.: 2" ID

DEPTH (feet)	RECOVERY (ft)	SAMPLE DEPTH	PID HEADSPACE (ppm)	BLOW COUNTS	SOIL CLASS	LITHOLOGY	DESCRIPTION
		0-2	10.9		FILL		Fill material consisting of: Silty clay mixed with concrete and brick fragments, trace black hydrocarbon staining.
		2-4	10.0		CL		Clay, black hydrocarbon staining, firm, moist.
5		4-6	13.7				
		6-8	8.1				Clay, gray, firm, slight hydrocarbon odor.
		8-10	9.1				Clay, black hydrocarbon staining, slight hydrocarbon odor.
10		10-12	8.7				Clay, gray, firm, slight hydrocarbon odor.
		12-16	11.1		SM		Silty sand, gray, poorly sorted, wet.
15			10.7				
							End of boring.

REMARKS:

RETEC

REMEDIATION TECHNOLOGIES, INC.

BORING LOG
BORING SB-15

PROJECT NO.: 3-2075-680	DRILLING CO.: MAXIM	MP ELEVATION:
CLIENT: NATIONAL FUEL GAS	DRILLER: RON BROWN	SURFACE ELEVATION:
LOCATION: MINERAL SPRINGS ROAD	METHOD: GEOPROBE	WATER LEVEL DURING DRILLING: NA
START DATE: 7-9-97	CASING I.D.:	STICK-UP: NA
GEOLOGIST: MARK HOFFERBERT	TOTAL DEPTH: 8	AUGER O.D./I.D.: 2" ID

DEPTH (feet)	RECOVERY (ft)	SAMPLE DEPTH	PID HEADSPACE (ppm)	BLOW COUNTS	SOIL CLASS	LITHOLOGY	DESCRIPTION
		0-2	10.2		FILL		Fill material consisting of: Silty Clay mixed with concrete and brick fragments.
		2-4	46.3		CL		Clay, black hydrocarbon staining, slight hydrocarbon odor.
							Clay, visible hydrocarbon product.
5		4-6	20.0				
		6-8	NA				Concrete at 8' below ground surface.
							End of boring.
10							

REMARKS:

RETEC

REMEDIATION TECHNOLOGIES, INC.

BORING LOG
BORING SB-16

PROJECT NO.: 3-2075-680	DRILLING CO.: MAXIM	MP ELEVATION:
CLIENT: NATIONAL FUEL GAS	DRILLER: RON BROWN	SURFACE ELEVATION:
LOCATION: MINERAL SPRINGS ROAD	METHOD: GEOPROBE	WATER LEVEL DURING DRILLING: NA
START DATE: 7-9-97	CASING I.D.:	STICK-UP: NA
GEOLOGIST: MARK HOFFERBERT	TOTAL DEPTH: 12	AUGER O.D./I.D.: 2" ID

DEPTH (feet)	RECOVERY (ft)	SAMPLE DEPTH	PID HEADSPACE (ppm)	BLOW COUNTS	SOIL CLASS	LITHOLOGY	DESCRIPTION
		0-2	5.0		FILL		Fill material consisting of: Silty clay mixed with brick and concrete fragments.
					CL		SILTY CLAY, firm, medium plasticity, black hydrocarbon staining, strong hydrocarbon odor.
		2-4	302				
5		4-6	17				
		6-8	33				
		8-10	NA				CLAY, firm, medium plasticity.
10		10-12	6.1				
							End of boring.

REMARKS:

RETEC

REMEDIATION TECHNOLOGIES, INC.

BORING LOG
BORING SB-17

PROJECT NO.: 3-2075-680	DRILLING CO.: MAXIM	MP ELEVATION:
CLIENT: NATIONAL FUEL GAS	DRILLER: RON BROWN	SURFACE ELEVATION:
LOCATION: MINERAL SPRINGS ROAD	METHOD: GEOPROBE	WATER LEVEL DURING DRILLING: NA
START DATE: 7-10-97	CASING I.D.:	STICK-UP: NA
GEOLOGIST: MARK HOFFERBERT	TOTAL DEPTH: 8	AUGER O.D./I.D.: 2" ID

DEPTH (feet)	RECOVERY (ft)	SAMPLE DEPTH	PID HEADSPACE (ppm)	BLOW COUNTS	SOIL CLASS	LITHOLOGY	DESCRIPTION
					FILL		Fill material consisting of: SILTY CLAY mixed with brick fragments.
			4.4				
			9.0				
5			NA				
			181				Fill becomes saturated with hydrocarbon product.
							Concrete at 8.0' below ground surface.
							End of boring.
10							

REMARKS:
Sample SB-17 (2-8) analyzed for BTEX, PAH, PCB and cyanide.

RETEC

REMEDIATION TECHNOLOGIES, INC.

BORING LOG
BORING SB-20

PROJECT NO.: 3-2075-680	DRILLING CO.: MAXIM	MP ELEVATION:
CLIENT: NATIONAL FUEL GAS	DRILLER: RON BROWN	SURFACE ELEVATION:
LOCATION: MINERAL SPRINGS ROAD	METHOD: GEOPROBE	WATER LEVEL DURING DRILLING: NA
START DATE: 7-9-97	CASING I.D.:	STICK-UP: NA
GEOLOGIST: MARK HOFFERBERT	TOTAL DEPTH: 12	AUGER O.D./I.D.: 2"

DEPTH (feet)	RECOVERY (ft)	SAMPLE DEPTH	PID HEADSPACE (ppm)	BLOW COUNTS	SOIL CLASS	LITHOLOGY	DESCRIPTION
0					FILL		Fill material consisting of: Silty clay mixed with gravel, concrete and bricks.
1			11.9				
2					CL		SILTY CLAY, trace black hydrocarbon staining and slight hydrocarbon odor.
3			4.1				
4							SANDY CLAY, gray, firm wet.
5			15.1				
7			85				
8		8-12			SM		SILTY SAND, gray, loose, poorly sorted.
9			10.7				
10							
11			29				
12							End of boring.

REMARKS:
Sample SB-20 (8-12) analyzed for BTEX, PAH and cyanide.

RETEC

REMEDIATION TECHNOLOGIES, INC.

BORING LOG
BORING SB-21

PROJECT NO.: 3-2075-680	DRILLING CO.: MAXIM	MP ELEVATION:
CLIENT: NATIONAL FUEL GAS	DRILLER: RON BROWN	SURFACE ELEVATION:
LOCATION: MINERAL SPRINGS ROAD	METHOD: GEOPROBE	WATER LEVEL DURING DRILLING: NA
START DATE: 7-10-97	CASING I.D.:	STICK-UP: NA
GEOLOGIST: MARK HOFFERBERT	TOTAL DEPTH: 16	AUGER O.D./I.D.: 2"

DEPTH (feet)	RECOVERY (ft)	SAMPLE DEPTH	PID HEADSPACE (ppm)	BLOW COUNTS	SOIL CLASS	LITHOLOGY	DESCRIPTION
		0-2	1.6		FILL		Fill material consisting of: Gravel and brick fragments.
		2-4	5.0				Fill consisting of: Silt and debris.
5		4-6	2.0				
		6-8	1.2				Fill material consisting of: clay, gravel and debris.
		8-10	0.8				
10		10-12	1.6		CL		SILTY CLAY, firm, medium plasticity.
		12-14	1.5				SILTY CLAY, trace sand, gray, wet.
15		14-16	2.1				
							End of boring.

REMARKS:

RETEC

REMEDIATION TECHNOLOGIES, INC.

BORING LOG
BORING SB-22

PROJECT NO.: 3-2075-680	DRILLING CO.: MAXIM	MP ELEVATION:
CLIENT: NATIONAL FUEL GAS	DRILLER: RON BROWN	SURFACE ELEVATION:
LOCATION: MINERAL SPRINGS ROAD	METHOD: GEOPROBE	WATER LEVEL DURING DRILLING: NA
START DATE: 7-10-97	CASING I.D.:	STICK-UP: NA
GEOLOGIST: MARK HOFFERBERT	TOTAL DEPTH: 18	AUGER O.D./I.D.: 2"

DEPTH (feet)	RECOVERY (ft)	SAMPLE DEPTH	PID HEADSPACE (ppm)	BLOW COUNTS	SOIL CLASS	LITHOLOGY	DESCRIPTION
		0-2	4.7		FILL		Fill material consisting of: Gravel, cobbles and silty clay.
		2-4	4.7				Fill material consisting of gravel.
5		4-6	9.0				Black hydrocarbon staining and hydrocarbon odor.
		6-8	5.4		CL		CLAY, gray, firm, moist, slight hydrocarbon odor.
		8-10	6.1				
10		10-12	5.0				CLAY, trace silt and gravel, wet. Visible hydrocarbon sheen, slight hydrocarbon odor.
		12-14	3.7				
15		14-16	1.2		SC		CLAYEY SAND, gray, firm, slight hydrocarbon odor.
		16-18	NA		SP		SAND, gray, medium.
20							End of boring.

REMARKS:
NA-not applicable.

REMEDIATION TECHNOLOGIES, INC.

BORING LOG
BORING SB-23

PROJECT NO.: 3-2075-680	DRILLING CO.: MAXIM	MP ELEVATION:
CLIENT: NATIONAL FUEL GAS	DRILLER: RON BROWN	SURFACE ELEVATION:
LOCATION: MINERAL SPRINGS ROAD	METHOD: GEOPROBE	WATER LEVEL DURING DRILLING: NA
START DATE: 7-10-97	CASING I.D.:	STICK-UP: NA
GEOLOGIST: MARK HOFFERBERT	TOTAL DEPTH: 16	AUGER O.D./I.D.: 2"

DEPTH (feet)	RECOVERY (ft)	SAMPLE DEPTH	PID HEADSPACE (ppm)	BLOW COUNTS	SOIL CLASS	LITHOLOGY	DESCRIPTION
		0-2	0.7		FILL		Fill material consisting of: Debris, silty sand, gravel.
		2-4	2.3				Black hydrocarbon staining, slight hydrocarbon odor.
5		4-6	1.9		CL		SILTY CLAY, gray, firm, medium plasticity.
		6-8	1.8				
		8-10	1.8				Trace gravel, becomes wet.
10		10-12	1.1				
		12-14	1.8		SC		CLAYEY SAND, trace gravel. SAND, gray, loose, wet.
15		14-16	0.6				
							End of boring.

REMARKS:

REMEDIATION TECHNOLOGIES, INC.

BORING LOG
BORING SB-24

PROJECT NO.: 3-2075-680	DRILLING CO.: MAXIM	MP ELEVATION:
CLIENT: NATIONAL FUEL GAS	DRILLER: RON BROWN	SURFACE ELEVATION:
LOCATION: MINERAL SPRINGS ROAD	METHOD: GEOPROBE	WATER LEVEL DURING DRILLING: NA
START DATE: 7-10-97	CASING I.D.:	STICK-UP: NA
GEOLOGIST: MARK HOFFERBERT	TOTAL DEPTH: 16	AUGER O.D./I.D.: 2"

DEPTH (feet)	RECOVERY (ft)	SAMPLE DEPTH	PID HEADSPACE (ppm)	BLOW COUNTS	SOIL CLASS	LITHOLOGY	DESCRIPTION
					FILL		Fill material consisting of: Gravel, silty Clay and debris.
			2.2				
			0.6				
					CL		SANDY CLAY, gray, frim, moist, trace gravel.
5			NA				
			3.5				Becomes wet.
							SILTY CLAY, gray, firm, wet.
			1.6				
10							SANDY CLAY, gray, firm, wet.
			1.3				
		12-16			SM		SAND, gray, loose, coarse, wet, slight hydrocarbon odor.
			1.3				
15			3.1				
							End of boring

REMARKS:
Sample SB24-25 (12-16) analyzed for PCB. (composite sample)
NA-not applicable.

RETEC

REMEDIATION TECHNOLOGIES, INC.

BORING LOG
BORING SB-25

PROJECT NO.: 3-2075-680	DRILLING CO.: MAXIM	MP ELEVATION:
CLIENT: NATIONAL FUEL GAS	DRILLER: RON BROWN	SURFACE ELEVATION:
LOCATION: MINERAL SPRINGS ROAD	METHOD: GEOPROBE	WATER LEVEL DURING DRILLING: NA
START DATE: 7-10-97	CASING I.D.:	STICK-UP: NA
GEOLOGIST: MARK HOFFERBERT	TOTAL DEPTH: 16	AUGER O.D./I.D.: 2"

DEPTH (feet)	RECOVERY (ft)	SAMPLE DEPTH	PID HEADSPACE (ppm)	BLOW COUNTS	SOIL CLASS	LITHOLOGY	DESCRIPTION
0					FILL		Fill material consisting of: Silty clay, gravel and cinders.
1			1.8				
3			0.8				
4							Fill consists of: Silty clay, cinders, brick fragments and gravel.
5							
6			1.8				
8					GP		SILTY GRAVEL, gray, poorly sorted, trace cobbles, wet.
9			0.5				
10					CL		SANDY CLAY, gray, firm, slight hydrocarbon odor.
11			0.7				
12		12–16					
13			2.0		SM		SAND, gray, loose, wet.
15			1.1				
16							End of boring.

REMARKS:
Sample SB24/25 (12-16) analyzed for PCBs. (composite sample)

RETEC

REMEDIATION TECHNOLOGIES, INC.

BORING LOG
BORING SB-26

PROJECT NO.: 3-2075-680	DRILLING CO.: MAXIM	MP ELEVATION:
CLIENT: NATIONAL FUEL GAS	DRILLER: RON BROWN	SURFACE ELEVATION:
LOCATION: MINERAL SPRINGS ROAD	METHOD: GEOPROBE	WATER LEVEL DURING DRILLING: NA
START DATE: 7-10-97	CASING I.D.:	STICK-UP: NA
GEOLOGIST: MARK HOFFERBERT	TOTAL DEPTH: 16	AUGER O.D./I.D.: 2"

DEPTH (feet)	RECOVERY (ft)	SAMPLE DEPTH	PID HEADSPACE (ppm)	BLOW COUNTS
1			2.6	
2–4		Sample		
3			33.0	
5			2.6	
7			0.8	
9			1.5	
11			2.1	
13			2.7	
15			1.6	

SOIL CLASS	DESCRIPTION
FILL	Fill material consisting of: Cinders, concrete fragments and gravel. 0.5' thick lens of tar-like material mixed with gravel.
CL	CLAY, gray, firm, medium plasticity.
SC	CLAYEY SAND, gray, loose, wet, trace gravel.
CL	CLAY, gray, firm, wet, trace gravel.
	End of boring.

REMARKS:
Sample SB26 (2-4) analyzed for BTEX, PAH, and cyanide.

RETEC

REMEDIATION TECHNOLOGIES, INC.

BORING LOG
BORING SB-27

PROJECT NO.: 3-2075-680	DRILLING CO.: MAXIM	MP ELEVATION:
CLIENT: NATIONAL FUEL GAS	DRILLER: RON BROWN	SURFACE ELEVATION:
LOCATION: MINERAL SPRINGS ROAD	METHOD: GEOPROBE	WATER LEVEL DURING DRILLING: NA
START DATE:	CASING I.D.:	STICK-UP: NA
GEOLOGIST: MARK HOFFERBERT	TOTAL DEPTH: 16	AUGER O.D./I.D.: 2"

DEPTH (feet)	RECOVERY (ft)	SAMPLE DEPTH	PID HEADSPACE (ppm)	BLOW COUNTS	SOIL CLASS	LITHOLOGY	DESCRIPTION
		0-2	0.5		FILL		Fill material consisting of: coal fragments, cinders, silty clay.
		2-4	2.4				3-4' becomes black cinders.
5		4-6	0.5				
		6-8	0.5		CL		SANDY CLAY, gray, firm, medium plasticity, moist.
		8-10	0.9				
10		10-12	1.2				Slight hydrocarbon odor.
		12-14	1.4		SC		CLAYEY SAND, gray, firm, slight hydrocarbon odor, wet.
15		14-16	1.3		GP		SANDY GRAVEL, gray, loose, wet, slight hydrocarbon odor.
							End of boring.

REMARKS:

RETEC

REMEDIATION TECHNOLOGIES, INC.

BORING LOG
BORING SB-28

PROJECT NO.: 3-2075-680	DRILLING CO.: MAXIM	MP ELEVATION:
CLIENT: NATIONAL FUEL GAS	DRILLER: RON BROWN	SURFACE ELEVATION:
LOCATION: MINERAL SPRINGS ROAD	METHOD: GEOPROBE	WATER LEVEL DURING DRILLING: NA
START DATE: 7-10-97	CASING I.D.:	STICK-UP: NA
GEOLOGIST: MARK HOFFERBERT	TOTAL DEPTH: 16	AUGER O.D./I.D.: 2"

DEPTH (feet)	RECOVERY (ft)	SAMPLE DEPTH	PID HEADSPACE (ppm)	BLOW COUNTS	SOIL CLASS	LITHOLOGY	DESCRIPTION
		0-2	1.2		FILL		Fill material consisting of: Cinders, brick fragments, wood fragments, coal fragments.
		2-4	2.2				Slight hydrocarbon odor.
5		4-6	1.3		CL		SILTY CLAY, gray, firm, medium plasticity.
		6-8	1.6				
		8-10	4.1				
10		10-12	0.9		SP		SAND, gray, loose, coarse.
		12-14	1.3				Becomes wet.
15		14-16	3.1				
							End of boring.

REMARKS:

RETEC

REMEDIATION TECHNOLOGIES, INC.

BORING LOG
BORING SB-29

PROJECT NO.: 3-2075-680	DRILLING CO.: MAXIM	MP ELEVATION:
CLIENT: NATIONAL FUEL GAS	DRILLER: RON BROWN	SURFACE ELEVATION:
LOCATION: MINERAL SPRINGS ROAD	METHOD: GEOPROBE	WATER LEVEL DURING DRILLING: NA
START DATE: 7-11-97	CASING I.D.:	STICK-UP: NA
GEOLOGIST: MARK HOFFERBERT	TOTAL DEPTH: 16	AUGER O.D./I.D.: 2"

DEPTH (feet)	RECOVERY (ft)	SAMPLE DEPTH	PID HEADSPACE (ppm)	BLOW COUNTS	SOIL CLASS	LITHOLOGY	DESCRIPTION
					FILL		Fill material consisting of: Brick fragments, gravel, silty clay and cinders.
			9.4				
			9.8				Becomes brick and coal fragments and cinders, slight odor.
					CL		SANDY CLAY, gray, firm, moist.
5			13.7				
			10.1				
			7.6				
10							
			44				Becomes soft, trace brown silt.
			89				Becomes wet, visible hydrocarbon product.
15			39.2				Clay, strong hydrocarbon odor.
							End of boring.

REMARKS:
Sample SB29 (10-16) analyzed for BTEX, PAHs, TOC and cyanide.

BORING LOG
BORING SB-30

REMEDIATION TECHNOLOGIES, INC.

PROJECT NO.: 3-2075-680	DRILLING CO.: MAXIM	MP ELEVATION:
CLIENT: NATIONAL FUEL GAS	DRILLER: RON BROWN	SURFACE ELEVATION:
LOCATION: MINERAL SPRINGS ROAD	METHOD: GEOPROBE	WATER LEVEL DURING DRILLING: NA
START DATE: 7-11-97	CASING I.D.:	STICK-UP: NA
GEOLOGIST: MARK HOFFERBERT	TOTAL DEPTH: 16	AUGER O.D./I.D.: 2"

DEPTH (feet)	RECOVERY (ft)	SAMPLE DEPTH	PID HEADSPACE (ppm)	BLOW COUNTS	SOIL CLASS	LITHOLOGY	DESCRIPTION
					FILL		Fill material consisting of: Brick fragments, cinders, gravel and silty clay.
		0-2	2.1				
		2-4	1.3				
			1.9				
5		4-6					
			2.5				Clay pipe fragments.
		6-8	NA				
					CL		CLAY, gray, firm, medium plasticity.
		8-10	3.3				
10							
		10-12	1.3				
		12-14	1.2				Wet, slight hydrocarbon odor.
					SP		SAND, gray, loose, medium, wet.
15		14-16	4.5				
							End of boring.

REMARKS:
NA-not applicable.

REMEDIATION TECHNOLOGIES, INC.

BORING LOG
BORING SB-31

PROJECT NO.: 3-2075-680	DRILLING CO.: MAXIM	MP ELEVATION:
CLIENT: NATIONAL FUEL GAS	DRILLER: RON BROWN	SURFACE ELEVATION:
LOCATION: MINERAL SPRINGS ROAD	METHOD: GEOPROBE	WATER LEVEL DURING DRILLING: NA
START DATE:	CASING I.D.:	STICK-UP: NA
GEOLOGIST: MARK HOFFERBERT	TOTAL DEPTH: 16	AUGER O.D./I.D.: 2"

DEPTH (feet)	RECOVERY (ft)	SAMPLE DEPTH	PID HEADSPACE (ppm)	BLOW COUNTS	SOIL CLASS	LITHOLOGY	DESCRIPTION
					FILL		Fill material consisting of: Silty Clay, gravel cinders, ashes.
		0-2	2.1				
		2-4	131				3-4' Cinders.
			73				
5		4-6	53				0.5' lens of cinders, strong hydrocarbon odor.
					CL		CLAY, gray, firm, medium plasticity, slight hydrocarbon odor.
		6-8	50.3				
		8-10	19				
10							
		10-12	101				
							Visible hydrocabon sheen, strong hydrocarbon odor.
		12-14	73				
							CLAY becomes wet, slight hydrocarbon odor.
15		14-16	32				SANDY CLAY, gray, firm, wet.
							End of boring.

REMARKS:

REMEDIATION TECHNOLOGIES, INC.

BORING LOG
BORING SB-32

PROJECT NO.: 3-2075-680	DRILLING CO.: MAXIM	MP ELEVATION:
CLIENT: NATIONAL FUEL GAS	DRILLER: RON BROWN	SURFACE ELEVATION:
LOCATION: MINERAL SPRINGS ROAD	METHOD: GEOPROBE	WATER LEVEL DURING DRILLING: NA
START DATE: 7-11-97	CASING I.D.:	STICK-UP: NA
GEOLOGIST: MARK HOFFERBERT	TOTAL DEPTH: 16	AUGER O.D./I.D.: 2"

DEPTH (feet)	RECOVERY (ft)	SAMPLE DEPTH	PID HEADSPACE (ppm)	BLOW COUNTS	SOIL CLASS	LITHOLOGY	DESCRIPTION
					FILL		Fill material consisting of: rock fragments, cinders, brick fragments.
			3.0				
			2.3				3-4' Sand lens, brown, loose.
5			2.5				Brick fragments.
			4.5		CL		SANDY CLAY, gray, loose, medium plasticity, wet.
			3.0				
10							
			6.6				
			5.0				
							Trace of gravel.
					SP		SAND, gray, coarse, wet.
15			3.8				
							End of boring.

REMARKS:
Sample SB32 (10-16) analyzed for BTEX, PAHs and cyanide.

RETEC

REMEDIATION TECHNOLOGIES, INC.

BORING LOG
BORING SB-33

PROJECT NO.: 3-2075-680	DRILLING CO.: MAXIM	MP ELEVATION:
CLIENT: NATIONAL FUEL GAS	DRILLER: RON BROWN	SURFACE ELEVATION:
LOCATION: MINERAL SPRINGS ROAD	METHOD: GEOPROBE	WATER LEVEL DURING DRILLING: NA
START DATE: 7-11-97	CASING I.D.:	STICK-UP: NA
GEOLOGIST: MARK HOFFERBERT	TOTAL DEPTH: 16	AUGER O.D./I.D.: 2"

DEPTH (feet)	RECOVERY (ft)	SAMPLE DEPTH	PID HEADSPACE (ppm)	BLOW COUNTS	SOIL CLASS	LITHOLOGY	DESCRIPTION
		0-2	0.8		FILL		Fill material consisting of: silty clay, rock fragments and concrete fragments.
		2-4	1.9				
5		4-6	1.5				
		6-8	1.5				Cinders and sand mixed with fill material.
		8-10	2.9		CL		CLAY, gray, medium plasicity, moist.
10		10-12	2.9				
		12-14	4.1				Becomes wet, slight hydrocarbon odor.
15		14-16	3.4		SP		Gravely sand, gray, loose, wet, slight hydrocarbon odor.
							End of boring.

REMARKS:

REMEDIATION TECHNOLOGIES, INC.

BORING LOG
BORING SB-34

PROJECT NO.: 3-2075-680	DRILLING CO.: MAXIM	MP ELEVATION:
CLIENT: NATIONAL FUEL GAS	DRILLER: RON BROWN	SURFACE ELEVATION:
LOCATION: MINERAL SPRINGS ROAD	METHOD: GEOPROBE	WATER LEVEL DURING DRILLING: NA
START DATE: 7-11-97	CASING I.D.:	STICK-UP: NA
GEOLOGIST: MARK HOFFERBERT	TOTAL DEPTH: 16	AUGER O.D./I.D.: 2"

DEPTH (feet)	RECOVERY (ft)	SAMPLE DEPTH	PID HEADSPACE (ppm)	BLOW COUNTS	SOIL CLASS	LITHOLOGY	DESCRIPTION
		0-2	4.2		FILL		Fill material consisting of: rock fragments, coal fragments, cinders and concrete fragments.
		2-4	2.4				
5		4-6	3.0				0.4' lens of coal fragments.
		6-8	3.6		CL		SANDY CLAY, gray, firm, medium plasticity, moist.
		8-10	11.3				
10		10-12	NA				
		12-14	8.9		SP		SAND, gray, loose, coarse, moist. Becomes wet.
15		14-16	10.9				Trace gravel at 16' below ground surface.
							End of boring.

REMARKS:
NA-not applicable.

RETEC

REMEDIATION TECHNOLOGIES, INC.

BORING LOG
BORING SB-35

PROJECT NO.: 3-2075-680	DRILLING CO.: MAXIM	MP ELEVATION:
CLIENT: NATIONAL FUEL GAS	DRILLER: RON BROWN	SURFACE ELEVATION:
LOCATION: MINERAL SPRINGS	METHOD: GEOPROBE	WATER LEVEL DURING DRILLING: NA
START DATE: 7-11-97	CASING I.D.:	STICK-UP: NA
GEOLOGIST: MARK HOFFERBERT	TOTAL DEPTH: 16	AUGER O.D./I.D.: 2"

DEPTH (feet)	RECOVERY (ft)	SAMPLE DEPTH	PID HEADSPACE (ppm)	BLOW COUNTS	SOIL CLASS	LITHOLOGY	DESCRIPTION
		0-2	6.5		FILL		Fill material consisting of: silty clay, brick fragments.
		2-4	4.2				
5		4-6	2.2		CL		CLAY, gray, firm, medium plasticity, moist.
		6-8	1.8				
		8-10	2.0				
10		10-12	1.8				Trace sand.
		12-14	2.2		SP		SAND, gray, loose, poorly sorted, wet.
15		14-16	2.2				
							End of boring.

REMARKS:

RETEC

REMEDIATION TECHNOLOGIES, INC.

BORING LOG
BORING SB-36

PROJECT NO.: 3-2075-680	DRILLING CO.: MAXIM	MP ELEVATION:
CLIENT: NATIONAL FUEL GAS	DRILLER: RON BROWN	SURFACE ELEVATION:
LOCATION: MINERAL SPRINGS ROAD	METHOD: GEOPROBE	WATER LEVEL DURING DRILLING: NA
START DATE: 7-11-97	CASING I.D.:	STICK-UP: NA
GEOLOGIST: MARK HOFFERBERT	TOTAL DEPTH: 16	AUGER O.D./I.D.: 2"

DEPTH (feet)	RECOVERY (ft)	SAMPLE DEPTH	PID HEADSPACE (ppm)	BLOW COUNTS	SOIL CLASS	LITHOLOGY	DESCRIPTION
							0-0.5' Topsoil.
			0.8		FILL		Fill material consisting of: rock fragments and silty clay.
			2.0				Becomes mixture of silty clay and blue stained wood chips.
5			2.0				
							Gray, medium plasticity.
			1.6				
							1' Layer of blue stained wood chips mixed with silt.
			1.4		CL		SILTY CLAY, gray, firm, medium plasticity.
10							
			1.2				
			1.8				
					SM		SILTY SAND, gray, loose, poorly sorted, trace rounded gravel.
15			1.6				
							End of boring.

REMARKS:
Sample SB36 (2-6) analyzed for BTEX, PAHs and cyanide.

REMEDIATION TECHNOLOGIES, INC.

BORING LOG
BORING SB-37

PROJECT NO.: 3-2075-680	DRILLING CO.: MAXIM	MP ELEVATION:
CLIENT: NATIONAL FUEL GAS	DRILLER: RON BROWN	SURFACE ELEVATION:
LOCATION: MINERAL SPRINGS ROAD	METHOD: GEOPROBE	WATER LEVEL DURING DRILLING: NA
START DATE: 7-11-97	CASING I.D.:	STICK-UP: NA
GEOLOGIST: MARK HOFFERBERT	TOTAL DEPTH: 16	AUGER O.D./I.D.: 2"

DEPTH (feet)	RECOVERY (ft)	SAMPLE DEPTH	PID HEADSPACE (ppm)	BLOW COUNTS	SOIL CLASS	LITHOLOGY	DESCRIPTION
							0-0.5' Topsoil.
		0-2	6.9		FILL		Fill material consisting of: Silty Clay, gravel and debris.
		2-4	5.7				0.5' thick layer of blue stained wood chips, wet.
5		4-6	0.7		CL		CLAY, gray with blue staining, slight hydrocarbon odor.
							GRAVELY CLAY, gray loose, slight hydrocarbon odor.
		6-8	3.1				CLAY, gray, firm, medium plasticity.
		8-10	3.2				
10		10-12	4.6				
		12-14	2.6		SP		SAND, gray, coarse, loose, poorly sorted, wet.
15		14-16	4.1				Trace gravel
							End of boring.

REMARKS:

REMEDIATION TECHNOLOGIES, INC.

BORING LOG
BORING SB-38

PROJECT NO.: 3-2075-680	DRILLING CO.: MAXIM	MP ELEVATION:
CLIENT: NATIONAL FUEL GAS	DRILLER: RON BROWN	SURFACE ELEVATION:
LOCATION: MINERAL SPRINGS ROAD	METHOD: GEOPROBE	WATER LEVEL DURING DRILLING: NA
START DATE: 7-11-97	CASING I.D.:	STICK-UP: NA
GEOLOGIST: MARK HOFFERBERT	TOTAL DEPTH: 16	AUGER O.D./I.D.: 2"

DEPTH (feet)	RECOVERY (ft)	SAMPLE DEPTH	PID HEADSPACE (ppm)	BLOW COUNTS	SOIL CLASS	LITHOLOGY	DESCRIPTION
							0-0.5' Topsoil.
		0-2	4.8		FILL		Fill material consisting of silty clay and gravel.
		2-4	4.9				
5		4-6	2.2		CL		SILTY CLAY, gray, firm, medium plasticity, moist.
		6-8	5.9				
		8-10	2.8				
10		10-12	0.7				Becomes wet.
		12-14	2.8		SP		SAND, gray, loose, poorly sorted, wet.
15		14-16	1.6				
							End of boring.

REMARKS:

RETEC

REMEDIATION TECHNOLOGIES, INC.

BORING LOG
BORING SB-39

PROJECT NO.: 3-2075-680	DRILLING CO.: MAXIM	MP ELEVATION:
CLIENT: NATIONAL FUEL GAS	DRILLER: RON BROWN	SURFACE ELEVATION:
LOCATION: MINERAL SPRINGS ROAD	METHOD: GEOPROBE	WATER LEVEL DURING DRILLING: NA
START DATE: 7-11-97	CASING I.D.:	STICK-UP: NA
GEOLOGIST: MARK HOFFERBERT	TOTAL DEPTH: 16	AUGER O.D./I.D.: 2"

DEPTH (feet)	RECOVERY (ft)	SAMPLE DEPTH	PID HEADSPACE (ppm)	BLOW COUNTS	SOIL CLASS	LITHOLOGY	DESCRIPTION
							0-0.5' Topsoil.
		0-2	0.7		FILL		Fill material consisting of: Clayey silt, gravel and debris.
		2-4	3.4				
5		4-6	1.5				
		6-8	1.2		SP		SAND, gray, loose, poorly sorted. Becomes wet.
		8-10	1.4				
10		10-12	1.4				
		12-14	1.1				
15		14-16	1.1				SAND, trace clay in nodules.
							End of boring.

REMARKS:

RETEC

REMEDIATION TECHNOLOGIES, INC.

BORING LOG
BORING SB-40

PROJECT NO.: 3-2075-680	DRILLING CO.: MAXIM	MP ELEVATION:
CLIENT: NATIONAL FUEL GAS	DRILLER: RON BROWN	SURFACE ELEVATION:
LOCATION: MINERAL SPRINGS ROAD	METHOD: GEOPROBE	WATER LEVEL DURING DRILLING: NA
START DATE: 7-11-97	CASING I.D.:	STICK-UP: NA
GEOLOGIST: MARK HOFFERBERT	TOTAL DEPTH: 16	AUGER O.D./I.D.: 2"

DEPTH (feet)	RECOVERY (ft)	SAMPLE DEPTH	PID HEADSPACE (ppm)	BLOW COUNTS	SOIL CLASS	LITHOLOGY	DESCRIPTION
		0-2	0.4		FILL		Fill material consisting of: Gravel cobbles, silty clay.
		2-4	0.5				Blue stained woood chips in 0.2' thick lens.
5		4-6	0.8				Slight hydrocarbon odor.
		6-8	0.6		CL		SILTY CLAY, gray, medium plasticity, firm, moist.
		8-10	0.5				
10		10-12	0.4				
		12-14	0.5				Becomes wet.
15		14-16	0.5				
							End of boring.

REMARKS:

RETEC

REMEDIATION TECHNOLOGIES, INC.

BORING LOG
BORING SB-41

PROJECT NO.: 3-2075-680	DRILLING CO.: MAXIM	MP ELEVATION:
CLIENT: NATIONAL FUEL GAS	DRILLER: RON BROWN	SURFACE ELEVATION:
LOCATION: MINERAL SPRINGS ROAD	METHOD: GEOPROBE	WATER LEVEL DURING DRILLING: NA
START DATE: 7-23-97	CASING I.D.:	STICK-UP: NA
GEOLOGIST: MARK HOFFERBERT	TOTAL DEPTH: 16	AUGER O.D./I.D.: 2"

DEPTH (feet)	RECOVERY (ft)	SAMPLE DEPTH	PID HEADSPACE (ppm)	BLOW COUNTS	SOIL CLASS	LITHOLOGY	DESCRIPTION
							0-0.5' Topsoil.
		0-2	0.0		FILL		Fill material consisting of silty clay, gravel and debris.
		2-4	0.0		CL		SILTY CLAY, gray, firm.
					SP		Becomes wet.
5		4-6	0.0		CL		SAND, gray, loose.
							Layer of gravel, slight hydrocarbon odor.
		6-8	0.0				SILTY CLAY, gray, firm, moist.
							SILTY CLAY, visible hydrocarbon sheen, slight hydrocarbon odor, wet.
		8-10	0.0				
10		10-12	0.0				
		12-14	0.0				Lens of gravel, wet.
15		14-16	0.0				
							Clay, concrete.
							End of boring.

REMARKS:

RETEC

REMEDIATION TECHNOLOGIES, INC.

BORING LOG
BORING SB-42

PROJECT NO.: 3-2075-680	DRILLING CO.: MAXIM	MP ELEVATION:
CLIENT: NATIONAL FUEL GAS	DRILLER: RON BROWN	SURFACE ELEVATION:
LOCATION: MINERAL SPRINGS ROAD	METHOD: GEOPROBE	WATER LEVEL DURING DRILLING: NA
START DATE: 7-23-97	CASING I.D.:	STICK-UP: NA
GEOLOGIST: MARK HOFFERBERT	TOTAL DEPTH: 16	AUGER O.D./I.D.: 2"

DEPTH (feet)	RECOVERY (ft)	SAMPLE DEPTH	PID HEADSPACE (ppm)	BLOW COUNTS	SOIL CLASS	LITHOLOGY	DESCRIPTION
					FILL		Fill material consisting of: Gravel, coal fragments and silty clay.
			0.0				
			3.6				
							Gravel and blue stained wood chips mixed with clay.
5		(4-6)	2.0				
					CL		SILTY CLAY, brown, loose, moist.
			1.0				
			1.5				
10							
			0.0				
							Becomes wet.
			0.0				
					SP		SAND, gray, loose, poorly sorted 50% Gravel, rounded.
15			0.0				
							End of boring.

REMARKS:
SB42 (4-6) analyzed for BTEX, PAH, and cyanide.

RETEC

REMEDIATION TECHNOLOGIES, INC.

BORING LOG
BORING SB-43

PROJECT NO.: 3-2075-680	DRILLING CO.: MAXIM	MP ELEVATION:
CLIENT: NATIONAL FUEL GAS	DRILLER: RON BROWN	SURFACE ELEVATION:
LOCATION: MINERAL SPRINGS ROAD	METHOD: GEOPROBE	WATER LEVEL DURING DRILLING: NA
START DATE: 7-23-97	CASING I.D.:	STICK-UP: NA
GEOLOGIST: MARK HOFFERBERT	TOTAL DEPTH: 8	AUGER O.D./I.D.: 2"

DEPTH (feet)	RECOVERY (ft)	SAMPLE DEPTH	PID HEADSPACE (ppm)	BLOW COUNTS	SOIL CLASS	LITHOLOGY	DESCRIPTION
							0-0.5' Topsoil.
		0-2	0.0		FILL		Fill material consisting of gravel, silty clay and debris.
		2-4	0.0		CL		CLAY, gray, firm. Lens of 0.2' of blue stained wood chips.
5		4-6	0.0				
		6-8	0.0				SILTY CLAY, brown, firm, moist.
							End of boring.
10							

REMARKS:

RETEC

REMEDIATION TECHNOLOGIES, INC.

BORING LOG
BORING SB-44

PROJECT NO.: 3-2075-680	DRILLING CO.: MAXIM	MP ELEVATION:
CLIENT: NATIONAL FUEL GAS	DRILLER: RON BROWN	SURFACE ELEVATION:
LOCATION: MINERAL SPRINGS ROAD	METHOD: GEOPROBE	WATER LEVEL DURING DRILLING: NA
START DATE: 7-23-97	CASING I.D.:	STICK-UP: NA
GEOLOGIST: MARK HOFFERBERT	TOTAL DEPTH: 16	AUGER O.D./I.D.: 2"

DEPTH (feet)	RECOVERY (ft)	SAMPLE DEPTH	PID HEADSPACE (ppm)	BLOW COUNTS	SOIL CLASS	LITHOLOGY	DESCRIPTION
					FILL		Fill material consisting of: Gravel and debris.
			1.0		CL		SILTY CLAY, gray, firm, moist.
			1.0				
5			1.0				
			8.7		SP		Becomes wet. SAND, gray, loose, wet, visible hydrocarbon product in stringers.
		8-12	NA				
10							
			2.7		GP		SANDY GRAVEL, gray, loose, poorly sorted, visible hydrocarbon product in stringers.
		12-16	2.8				SANDY GRAVEL, gray, rounded, poorly sorted, trace hydrocarbon sheen.
15			1.0				
							End of boring.

REMARKS:
NA-not applicable.
Sample SB44 (8-12) analyzed for BTEX, PAH and cyanide.
Sample SB44 (12-16) analyzed for BTEX, PAH and cyanide.

RETEC

REMEDIATION TECHNOLOGIES, INC.

BORING LOG
BORING SB-45

PROJECT NO.: 3-2075-680	DRILLING CO.: MAXIM	MP ELEVATION:
CLIENT: NATIONAL FUEL GAS	DRILLER: RON BROWN	SURFACE ELEVATION:
LOCATION: MINERAL SPRINGS ROAD	METHOD: GEOPROBE	WATER LEVEL DURING DRILLING: NA
START DATE: 7-23-97	CASING I.D.:	STICK-UP: NA
GEOLOGIST: MARK HOFFERBERT	TOTAL DEPTH: 16	AUGER O.D./I.D.: 2"

DEPTH (feet)	RECOVERY (ft)	SAMPLE DEPTH	PID HEADSPACE (ppm)	BLOW COUNTS	SOIL CLASS	LITHOLOGY	DESCRIPTION
							0-0.5' Topsoil.
		0-2	0.0		FILL		Fill material consisting of Gravel.
		2-4	0.0		CL		SILTY CLAY gray, firm, medium plasticity.
5		4-6	0.0				
		6-8	0.0				Becomes wet. Visible hydrocarbon product in stringers.
		8-10	0.0		SP		SILTY GRAVEL, gray, poorly sorted, visible hydrocarbon product in stringers.
10		10-12	17.0				
		12-14	7.0				SILTY GRAVEL, gray, loose, poorly sorted, visible hydrocarbon product in stringers.
15		14-16	6.0				
							End of boring.

REMARKS:

RETEC

REMEDIATION TECHNOLOGIES, INC.

BORING LOG
BORING SB-46

PROJECT NO.: 3-2075-680	DRILLING CO.: MAXIM	MP ELEVATION:
CLIENT: NATIONAL FUEL GAS	DRILLER: RON BROWN	SURFACE ELEVATION:
LOCATION: MINERAL SPRINGS ROAD	METHOD: GEOPROBE	WATER LEVEL DURING DRILLING: NA
START DATE: 7-23-97	CASING I.D.:	STICK-UP: NA
GEOLOGIST: MARK HOFFERBERT	TOTAL DEPTH: 16	AUGER O.D./I.D.: 2"

DEPTH (feet)	RECOVERY (ft)	SAMPLE DEPTH	PID HEADSPACE (ppm)	BLOW COUNTS	SOIL CLASS	LITHOLOGY	DESCRIPTION
							0-0.5' Topsoil.
		0-2	4.4		FILL		Fill material consisting of: cinders, gravel and silty clay.
		2-4	5.2		CL		SILTY CLAY, gray, firm, medium plasticity.
5		4-6	4.4				Hydrocarbon odor.
		6-8	3.6				
		8-10	0.0				SILTY CLAY, gray, hydrocarbon odor.
10		10-12	60				Visible hydrocarbon product in stringers.
		12-14	8.3		GP		GRAVEL, gray, loose, rounded, slight hydrocarbon odor.
15		14-16	4.3		SP		SAND, gray, loose, coarse, poorly sorted, wet.
							End of boring.

REMARKS:

RETEC

REMEDIATION TECHNOLOGIES, INC.

BORING LOG
BORING SB-47

PROJECT NO.: 3-2075-680	DRILLING CO.: MAXIM	MP ELEVATION:
CLIENT: NATIONAL FUEL GAS	DRILLER: RON BROWN	SURFACE ELEVATION:
LOCATION: MINERAL SPRINGS ROAD	METHOD: GEOPROBE	WATER LEVEL DURING DRILLING: NA
START DATE: 7-23-97	CASING I.D.:	STICK-UP: NA
GEOLOGIST: MARK HOFFERBERT	TOTAL DEPTH: 16	AUGER O.D./I.D.: 2"

DEPTH (feet)	RECOVERY (ft)	SAMPLE DEPTH	PID HEADSPACE (ppm)	BLOW COUNTS	SOIL CLASS	LITHOLOGY	DESCRIPTION
							0-0.5' Topsoil.
		0-2	25		CL		SILTY CLAY, gray, firm, moist.
		2-4	20				
5	NR	4-6	NA				
	NR	6-8	NA				Visible hydrocarbon product in stringers.
		8-10	150				
10		10-12	91				SANDY CLAY, visible hydrocarbon product in stringers.
		12-14	112		SP		SAND, gray loose, visible hydrocarbon product in stringers
15		14-16	71		GP		GRAVEL, gray, poorly sorted, visible hydrocarbon product in stringers.
							End of boring.

REMARKS:
NA-not applicable.
NR-no recovery.

RETEC

REMEDIATION TECHNOLOGIES, INC.

BORING LOG
BORING SB-48

PROJECT NO.: 3-2075-680	DRILLING CO.: MAXIM	MP ELEVATION:
CLIENT: NATIONAL FUEL GAS	DRILLER: RON BROWN	SURFACE ELEVATION:
LOCATION: MINERAL SPRINGS ROAD	METHOD: GEOPROBE	WATER LEVEL DURING DRILLING: NA
START DATE: 7-23-97	CASING I.D.:	STICK-UP: NA
GEOLOGIST: MARK HOFFERBERT	TOTAL DEPTH: 16	AUGER O.D./I.D.: 2"

DEPTH (feet)	RECOVERY (ft)	SAMPLE DEPTH	PID HEADSPACE (ppm)	BLOW COUNTS	SOIL CLASS	LITHOLOGY	DESCRIPTION
		0-2	0.0		FILL		Fill material consisting of: concrete fragments and silt clay.
		2-4	0.0				
5		4-6	0.0				
		6-8	0.0				Fill material consisting of: coal fragments and silty clay.
		8-10	0.0		CL		SILTY CLAY, gray, firm, medium plasticity.
10		10-12	0.0				
		12-14	0.0				
					SP		SAND, gray, coarse, poorly sorted, wet.
15		14-16	4.6		GP		GRAVEL, rounded, loose, wet.
							End of boring.

REMARKS:

REMEDIATION TECHNOLOGIES, INC.

BORING LOG
BORING SB-49

PROJECT NO.: 3-2075-680	DRILLING CO.: MAXIM	MP ELEVATION:
CLIENT: NATIONAL FUEL GAS	DRILLER: RON BROWN	SURFACE ELEVATION:
LOCATION: MINERAL SPRINGS ROAD	METHOD: GEOPROBE	WATER LEVEL DURING DRILLING: NA
START DATE: 7-23-97	CASING I.D.:	STICK-UP: NA
GEOLOGIST: MARK HOFFERBERT	TOTAL DEPTH: 16	AUGER O.D./I.D.: 2"

DEPTH (feet)	RECOVERY (ft)	SAMPLE DEPTH	PID HEADSPACE (ppm)	BLOW COUNTS	SOIL CLASS	LITHOLOGY	DESCRIPTION
					FILL		Fill material consisting of: silty clay and debris.
		0-2	NA				
							0.4' lens of blue stained wood chips, saturated with hydrocarbon product.
		2-4	4.6		CL		SILTY CLAY, gray, firm, moist.
							0.4' lens of visible hydrocarbon product in clay.
5		4-6	33				
		6-8	21				
		8-10	3.4				
10		10-12	1.7				Becomes wet.
		12-14	2.4				SANDY CLAY, gray, firm, wet.
15		14-16	4.4		GP		GRAVEL, gray, loose, poorly sorted, wet.
							End of boring.

REMARKS:
NA-not applicable.

RETEC

REMEDIATION TECHNOLOGIES, INC.

BORING LOG
BORING SB-50

PROJECT NO.: 3-2075-680	DRILLING CO.: MAXIM	MP ELEVATION:
CLIENT: NATIONAL FUEL GAS	DRILLER: RON BROWN	SURFACE ELEVATION:
LOCATION: MINERAL SPRINGS ROAD	METHOD: GEOPROBE	WATER LEVEL DURING DRILLING: NA
START DATE: 7-23-97	CASING I.D.:	STICK-UP: NA
GEOLOGIST: MARK HOFFERBERT	TOTAL DEPTH: 16	AUGER O.D./I.D.: 2"

DEPTH (feet)	RECOVERY (ft)	SAMPLE DEPTH	PID HEADSPACE (ppm)	BLOW COUNTS	SOIL CLASS	LITHOLOGY	DESCRIPTION
							0-0.5' Topsoil.
			3.7		FILL		Fill material consisting of silty clay and gravel.
			3.7				
					CL		Clay, firm gray, moist.
5			5.4				
			5.4				
							1.0' lens of clay with slight hydrocarbon odor.
			73				
10							
			26				
							Becomes wet, hydrocarbon sheen and odor.
			10.6				
							CLAY, gray, firm, wet.
15			20.1				
							End of boring.

REMARKS:
Sample SB50 (10-14) analyzed for BTEX, PAH and cyanide.

RETEC

REMEDIATION TECHNOLOGIES, INC.

BORING LOG
BORING SB-51

PROJECT NO.: 3-2075-680	DRILLING CO.: MAXIM	MP ELEVATION:
CLIENT: NATIONAL FUEL GAS	DRILLER: RON BROWN	SURFACE ELEVATION:
LOCATION: MINERAL SPRINGS ROAD	METHOD: GEOPROBE	WATER LEVEL DURING DRILLING: NA
START DATE: 7-23-97	CASING I.D.:	STICK-UP: NA
GEOLOGIST: MARK HOFFERBERT	TOTAL DEPTH: 16	AUGER O.D./I.D.: 2"

DEPTH (feet)	RECOVERY (ft)	SAMPLE DEPTH	PID HEADSPACE (ppm)	BLOW COUNTS	SOIL CLASS	LITHOLOGY	DESCRIPTION
							0-0.5' Asphalt pavement.
			5.5		FILL		Fill material consisting of: concrete fragments and silty clay.
			0.0				3.5-5' Blue stained wood chips, moist.
5			2.6		CL		CLAY, gray, firm, moist, medium plasticity.
			0.0				
			0.0				
10			0.0				
			0.0		SP		SAND, gray, loose, poorly sorted, 50% gray, gravel, rounded.
15			0.0				
							End of boring.

REMARKS:
Sample SB51 (4-6) analyzed for BTEX, PAH and cyanide.

REMEDIATION TECHNOLOGIES, INC.

BORING LOG
BORING SB-52

PROJECT NO.: 3-2075-680	DRILLING CO.: MAXIM	MP ELEVATION:
CLIENT: NATIONAL FUEL GAS	DRILLER: RON BROWN	SURFACE ELEVATION:
LOCATION: MINERAL SPRINGS ROAD	METHOD: GEOPROBE	WATER LEVEL DURING DRILLING: NA
START DATE: 7-23-97	CASING I.D.:	STICK-UP: NA
GEOLOGIST: MARK HOFFERBERT	TOTAL DEPTH: 20	AUGER O.D./I.D.: 2"

DEPTH (feet)	RECOVERY (ft)	SAMPLE DEPTH	PID HEADSPACE (ppm)	BLOW COUNTS	SOIL CLASS	LITHOLOGY	DESCRIPTION
0		0-4	1.0		FILL		Fill material consisting of: coal fragments, brick fragments, wood, gravel and silty clay.
5		4-8	2.8				
		8-10	0.0				
10		10-12	1.0		CL		CLAY, gray, frim, medium plasticity, moist.
		12-14	0.0		SP		GRAVELY SAND, gray, loose, poorly sorted, wet.
15		14-16	0.0		CL		CLAY, gray, firm, wet.
		16-20	1.0		GP		GRAVEL, loose, poorly sorted, wet.
					CL		CLAY, gray, firm, wet.
20							End of boring.

REMARKS:

REMEDIATION TECHNOLOGIES, INC.

BORING LOG
BORING SB-18

PROJECT NO.: 3-2075-680	DRILLING CO.: MAXIM	MP ELEVATION:
CLIENT: NATIONAL FUEL GAS	DRILLER: RON BROWN	SURFACE ELEVATION:
LOCATION: MINERAL SPRINGS ROAD	METHOD: GEOPROBE	WATER LEVEL DURING DRILLING: NA
START DATE: 7-10-97	CASING I.D.:	STICK-UP: NA
GEOLOGIST: MARK HOFFERBERT	TOTAL DEPTH: 16	AUGER O.D./I.D.: 2" ID

DEPTH (feet)	RECOVERY (ft)	SAMPLE DEPTH	PID HEADSPACE (ppm)	BLOW COUNTS	SOIL CLASS	LITHOLOGY	DESCRIPTION
		0-2	5.8		FILL		Fill material consisting of: Silty clay mixed with concrete and brick fragments. Black hydrocarbon staining, slight hydrocarbon odor.
		2-4	13.8				
5		4-6	9.0		CL		SANDY CLAY, gray, firm, moist, stringers of hydrocarbon product
		6-8	77				
10	NR	8-12	NA		GP		GRAVEL mixed with stringers of hydrocarbon product. Poor sample recovery.
15	NR	12-16	70		CL		CLAY saturated with hydrocarbon product. Poor sample recovery.
							End of boring.

REMARKS:
NA-not applicable.
NR-no recovery.

RETEC

REMEDIATION TECHNOLOGIES, INC.

BORING LOG
BORING SB-19

PROJECT NO.: 3-2075-680	DRILLING CO.: MAXIM	MP ELEVATION:
CLIENT: NATIONAL FUEL GAS	DRILLER: RON BROWN	SURFACE ELEVATION:
LOCATION: MINERAL SPRINGS ROAD	METHOD: GEOPROBE	WATER LEVEL DURING DRILLING: NA
START DATE: 7-10-97	CASING I.D.:	STICK-UP: NA
GEOLOGIST: MARK HOFFERBERT	TOTAL DEPTH: 12	AUGER O.D./I.D.: 2" ID

DEPTH (feet)	RECOVERY (ft)	SAMPLE DEPTH	PID HEADSPACE (ppm)	BLOW COUNTS	SOIL CLASS	LITHOLOGY	DESCRIPTION
			12.2		FILL		Fill material consisting of: Silty Clay mixed with concrete and brick fragments.
			1.9				Fill with black hydrocarbon staining.
					CL		SANDY CLAY, gray, firm.
5			1.8		SM		SILTY SAND, gray, moist.
			1.3		CL		SILTY CLAY, gray, firm, moist.
			1.3		SM		SAND, gray, coarse, loose, moist.
10			10.7		CH		CLAY, gray, firm, medium plasticity, moist.
							End of boring.

REMARKS:
Sample SB19 (8-12) analyzed for BTEX, PAH and cyanide.