# FOCUSED REMEDIAL INVESTIGATION
# FORMER MANUFACTURED GAS PLANT SITE
# EAST STATION, ROCHESTER, NEW YORK
# INTERIM REPORT

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# EXECUTIVE SUMMARY

In 1998, Rochester Gas & Electric Corporation (RG&E) contracted with Ish Inc. to conduct a focused remedial investigation of the East Station former manufactured gas plant (MGP) site. Previously, in 1992, RG&E had retained Atlantic Environmental Services, Inc. and Remediation Technologies, Inc. to conduct a preliminary site investigation, perform a qualitative risk assessment, and outline appropriate Interim Remedial Measures (IRMs) for the East and West Station MGP sites.

The 1992 site investigation concluded that the East Station site contained elevated levels of polycyclic aromatic hydrocarbons (PAHs), cyanide, and metals in soils. DNAPL from unspecified source areas was found below the groundwater table and may have migrated along the bedrock surface. Middle distillate oil was also found in some areas. Groundwater analysis results indicated the presence of dissolved monocyclic aromatic hydrocarbons (MAHs), PAHs, and total cyanide in the overburden and the shallow bedrock aquifers a number of sampling wells. The study concluded that groundwater concentrations in three of the five overburden wells near the shoreline presented low risk to recreational users of the Genesee River surface water.

The qualitative risk assessment completed in 1992 indicated unacceptable risks from surface soils at two locations because of the presence of PAHs, and from subsurface soils because of the presence of benzene, toluene, xylenes, PAHs, and arsenic. As a result, RG&E implemented IRMs in 1993 and 1994 where portions of the northwest and southeast sections of the site were capped with clean fill to mitigate risk from exposure to contaminated soils.

The 1998 investigation was commissioned primarily to map and identify the sources of non-aqueous phase liquid (NAPL) found intermittently along the Genesee River shoreline; examine alternatives for addressing NAPL with the identification of the preferred method for controlling future releases (if any); characterize the contents of the tar well to select the most cost-effective and practical method for its remediation; and assess on-site groundwater quality for selecting action(s) necessary to meet New York State requirements appropriate for future use of the site. Subsequent to this 1998 study, additional work was undertaken in March 1999 to update and confirm previous groundwater contour information and groundwater quality data, obtain and evaluate cyanide speciation data on groundwater from selected monitoring wells, and compare volatile organic compounds (VOCs) and semivolatile compounds (SVOCs) data from standard analytical methods with data from draft U.S. EPA Method 3511. The results of this work are presented in the addendum to this report.

The project team, composed of Ish Inc. and META Environmental, Inc. (META), initiated a riverbank survey on September 17, 1998, during a period of reduced river flow, to map visible occurrences of NAPL and to collect samples along the riverbank for chromatographic "fingerprinting" and chemical analysis. Six sediment samples and three NAPL samples were collected and analyzed. The remaining field work was completed between October 21 and November 12, 1998. First, 20 piezometers were installed to collect on-site groundwater and NAPL samples for analysis. Then, nine bedrock borings, three of which were finished as bedrock wells, and eight overburden borings, six of which were finished as overburden wells, were completed. Next, hydraulic data were collected and the new and existing wells were sampled for volatile organic compounds (VOCs), semivolatile organic compounds (SVOCs), metals, and total cyanide. In addition, the tar well was characterized using three test pits and six borings advanced to the tar well floor. One of these borings was converted into a 2-inch diameter monitoring well and two other borings were converted into 4-inch diameter recovery wells.

The riverbank survey identified the presence of denser than water NAPL (DNAPL) at several locations from underneath the Bausch Street Bridge to approximately 750 feet down river. The NAPL, soil, and sediment samples collected during the field work were analyzed by gas chromatography with flame ionization detection (GC/FID) and the chromatographic "fingerprints" were separated into four categories based on the type of contamination present: petrogenic (petroleum-containing), pyrogenic (tar-containing), mixed (containing both petroleum and tar), and other materials or unknowns. The chemical analysis indicated that the DNAPL samples were tar and the sediment samples were tar-containing with no evidence of petroleum or light oil in any of the samples.

A total of 19 liquid samples were collected from selected piezometers and one bedrock well previously installed in the 1992 study. Fingerprinting analysis showed that most of these samples contained tar. Some samples exhibited petroleum fingerprints or mixed tar and middle distillate signatures.

Thirty-two split-spoon samples of overburden material from various borings at selected depths were collected and analyzed. Most of the samples contained DNAPL and/or evidence of one or more petroleum products.

During the drilling program, seven bedrock borings were cored to an approximate depth of 10 feet into the bedrock, one to a depth of 15 feet, and another one to a depth of 20 feet. The results from these borings showed that the tar well is located at a topographical bedrock high area of the site with the bedrock sloping in both a west/southwesterly direction toward the Genesee River and a north/northeasterly direction. While the shallow overburden material generally did not show much evidence of contamination, the study results did indicate that much of the site overburden material just above the overburden/bedrock interface has evidence of DNAPL. Varying tar fingerprint patterns and evidence of localized areas of impact suggest more than one source of DNAPL at the site. However, the data also suggest that DNAPL was released from the tar well and then horizontally migrated along the sloping bedrock surface in at least two directions to an unknown extent.

The study found that the bedrock at this site has both horizontal and vertical fractures with varying numbers of DNAPL-containing fractures. The bedrock corings and observations of DNAPL in the fractures suggest that the presence of complex horizontal and vertical fractures has enabled the DNAPL to migrate both vertically and horizontally in the bedrock. It also appears that the DNAPL may have gone deeper than 20 feet into the bedrock based on the presence of DNAPL within the rock core of one boring at this depth.

In addition to the DNAPL observed in the seeps, overburden, and bedrock, at least two different types of petroleum-based lighter than water NAPL (LNAPL) were observed in the overburden at the East Station site. One LNAPL found in the east central portion of the site was identified as weathered gas oil. Gas oil is a term for any middle distillate petroleum product commonly used in carburetted water gas or oil gas plants to enhance the illumination of the manufactured gas. These products are found commonly at former MGP sites, often in an extensively weathered state. A second LNAPL located in the vicinity of the light oil plant at the riverbank was identified as gasoline or naphtha and lube oil. It is likely that this LNAPL was a wash oil waste from the former light oil plant. Petroleum products which were similar to lubricating oils were used to scrub the gasoline-range hydrocarbons (termed "light oil") from the manufactured gas. The light oil was recovered from the "wash oil" by distillation, and the wash oil was used again until it was "spent". Spent wash oils were commonly used as boiler fuels at the plant, however, some may have been stored in tanks that leaked. Other samples from piezometers or soil borings also had evidence of petroleum-related contamination. Unlike the DNAPL tar contamination which was found in nearly every boring, the petroleum-related contamination was not found to be widespread. Instead, different types of petroleum-related contamination were found at discrete locations on-site. Based on their locations and compositions, these substances appear to have been used in the former MGP operations or related processes.

Following the measurement of static water table elevations on December 1, 1998, rising head slug tests were conducted in three wells. Then, groundwater samples were collected from eleven overburden wells and five bedrock wells for analysis of VOCs, SVOCs, metals and total cyanide.

The hydraulic data show that the groundwater gradient varies along the generalized east to west flow path, although it is notably steeper in the central portion of the site. Because of the screening of some wells across anisotropic layers of saturated materials, slug tests from wells MW-2 and MW-7 were used to calculate an average hydraulic conductivity and seepage velocity. Based on these data, the average groundwater velocity was estimated at about 150 feet per year, in a general westerly direction toward the river.

The most prominent analytes detected in the wells above the NYSDEC Class GA standards and guidance values were benzene, naphthalene, arsenic, iron, and total cyanide. The areas most impacted by benzene and naphthalene were proximate to the river from the southern property line extending northward about 750 feet, and at the northeast corner of the site. Arsenic concentrations were elevated at four wells in the northeast and northwest portions of the site and iron exceedances were detected in almost every well. With regard to total cyanide, although the Class GA standard was exceeded in seven wells (most prominently in the northern portion of the site), further speciation analysis was conducted to determine whether cyanide is present as the relatively non-toxic iron complexed species. Data regarding this speciation work is presented in the addendum to this report.

The groundwater quality data were first evaluated by comparing measured concentrations to predicted concentrations based on Raoult's Law. The comparison of measured concentrations of naphthalene and benzene in the on-site wells to corresponding Raoult's Law predicted maximum concentrations shows that the measured concentrations are representative of the dissolved groundwater quality of the site, as all measured concentrations for naphthalene and benzene are well below their respective predicted maximum site-specific solubilities. Also, low concentrations of higher molecular weight PAHs (very low aqueous solubilities) in the groundwater, such as pyrene, further suggest that the measured concentrations are representative of dissolved constituents, not biased by the presence of tarry colloids or sediments with sorbed PAHs.

Overall differences between predicted (Raoult's law) and measured concentrations of benzene and naphthalene from the site wells can be explained by several confounding issues. First, there is a strong likelihood of overlapping dissolved phase plumes (areally and vertically) as a result of the heterogeneous vertical distribution of chemicals in the saturated zone. Second, as a result of the installation of ten-foot well screens at some locations, the concentrations from narrow zones of impacted groundwater can become diluted over the screened interval. Third, the observed differences in hydraulic conductivities of the saturated materials will affect concentrations in samples collected at monitoring wells which are screened across anisotropic zones, preferentially recharging to the well from the most conductive unit. Therefore, the degree to which sample concentrations are affected, depends mostly on the concentrations of chemicals in the conductive unit.

A simple analytical transport/fate model (EPRI MYGRT™) was used to assess the migration of naphthalene and benzene as dissolved phase constituents from the eastern portion to the western portion of the site. MYGRT™ predicted that if the DNAPL in and around the tar well was removed in 2000, the naphthalene concentrations would fall below 0.010 mg/L (NYSDEC Class GA guidance value) in approximately fifty years assuming that the tar well area is the only source of dissolved phase naphthalene. With regard to benzene, the model predicts that if the DNAPL in and around the tar well was removed in 2000, it would take approximately 10 years for the benzene concentrations in groundwater to fall below the NYSDEC Class GA standard of 0.001 mg/L (assuming the tar well area is the only source of dissolved phase benzene).

The modeling exercise was based on the tar well as the largest known source of DNAPL tar in the overburden. However, the results from soil borings clearly identified other on-site locations which contained DNAPL and/or tarry soils in the overburden. The tar-containing soils in some of these other locations likely are sources of additional dissolved phase tar constituents to the groundwater in these areas, if not the entire site. As a result, the model simulations provided optimistic predictions of plume dissipation over time if the tar well source is controlled or eliminated.

In summary, while there was some LNAPL observed in the overburden at this site in a few locations, there was widespread evidence of DNAPL in the overburden and bedrock. Also, DNAPL was observed along the shoreline and shallow sediments of the Genesee River. Chemical characterization of several samples of DNAPL show it to be tar. However, several tar patterns were observed, suggesting varied sources and degrees of environmental weathering. A review of the site history points to the tar well and several other former MGP structures, including tar separators, tar purifiers, and gas holders, as potential DNAPL sources. For example, while the tar well currently contains tar to a depth of about 2.5 feet, information obtained during this study suggests that the tar well could have held considerably more tar in its more than 100-year history.

The groundwater from the overburden and bedrock wells generally showed elevated levels of naphthalene, benzene, and total cyanide. The highest level of dissolved naphthalene was observed in the monitoring well installed in the tar well, whereas the highest concentration of benzene was found near the river and downgradient of the area where oil tanks and light oil plant facilities operated. Although, the groundwater in the northwestern quarter of the site had relatively low levels of naphthalene and benzene, it contained relatively high amounts of total cyanide. Total cyanide appeared to be present at a concentration of about 2 mg/L in almost all of the groundwater wells in the northern half of the site where deposits of purifier residues were observed in the unsaturated zone soils.

The information generated from the soil and bedrock borings, as well as the tar well characterization and physical/chemical results for soil and DNAPL samples, will be used to evaluate alternatives for mitigating the NAPL near the riverbank and in the tar well. The feasibility study report (being prepared) will identify the alternatives and screen them on the basis of expected effectiveness, technical implementability, and cost.

Section 1

# INTRODUCTION

A focused remedial investigation was conducted by Ish Inc. of Sunnyvale, CA and META Environmental, Inc. (META) of Watertown, MA at Rochester Gas & Electric Corporation's (RG&E's) East Station former manufactured gas plant (MGP) site in Rochester, NY. The primary objectives of the work were to determine the extent and sources of nonaqueous phase liquid (NAPL) in the Genesee River, to evaluate a former tar well as a source of the tar, and to characterize groundwater quality at the site. The work consisted of a riverbank survey, a drive point investigation, a tar well characterization, and a soil and rock boring effort with the installation of wells to provide information on hydrogeology and an assessment of groundwater quality. Following the compilation and evaluation of data from soil, bedrock, groundwater, sediment, and NAPL samples, a feasibility study of remedial options will be completed and reported under separate cover.

## BACKGROUND

MGPs provided a source of gaseous fuel for lighting the cities and towns nationwide from the mid-1800s to the mid-1900s. These facilities converted coal and oil raw materials into usable gaseous fuel for the consumers. By-products of gas manufacturing included tars, tar/water emulsions, and purifier wastes that often were handled and stored on-site. Because of the uncertainty associated with the disposition of these by-products in the past, there is concern that releases of NAPL from historic tar-handling structures may have occurred, and may be affecting the surrounding environment. The observance of NAPL in the Genesee River promoted RG&E to initiate a focused remedial investigation/feasibility study to identify the sources and determine the extent of the NAPL at the East Station former MGP site, and to evaluate remedial measures that will control NAPL migration, if any.

## PROJECT OBJECTIVES

The four major objectives of the focused investigation were:

1. to map and identify the source(s) of NAPL observed adjacent to the site along the Genesee River,

2. to examine alternatives for mitigating NAPL migration and identify a preferred method which will not result in subsequent contaminant migration to other receptors (to be discussed in a subsequent feasibility study report),

3. to examine alternatives and select the most cost-effective and practical method for remediating the contents of a tar well located at the site and any NAPL which may have migrated from this structure (to be discussed in a subsequent feasibility study report), and

4. to assess on-site groundwater quality and determine what actions are necessary to meet New York State requirements and are appropriate for associated future possible uses of the site (any remedial actions to be discussed in a subsequent feasibility study report).

## SCOPE

In order to accomplish the objectives described above, a plan for the collection and analysis of soil, groundwater, sediment, and NAPL samples was prepared (Sampling and Analysis Plan (SAP), November 1998). Initially, a riverbank survey was completed to estimate the locations of NAPL and to collect NAPL and sediment samples along the riverbank for chromatographic chemical analysis and fingerprinting. Next, 20 piezometers were installed with the use of a direct-push truck-mounted GeoProbe™ system, to collect on-site groundwater and NAPL samples for chemical analysis and fingerprinting. Then, nine bedrock and eight overburden soil borings were advanced and soil samples collected. Finally, three bedrock monitoring wells and six overburden monitoring wells were installed to determine groundwater quality, as well as the presence and depth of lighter than water NAPLs (LNAPLs) and denser than water NAPLs (DNAPLs). In addition, the tar well was investigated using three test pits to locate and characterize the tar well walls, and by the advancement of six borings to the tar well floor. One of these borings was converted into a 2-inch diameter monitoring well and two of these borings were converted into 4-inch diameter recovery wells. During the advancement of these borings, split-spoon soil samples were collected for chemical analysis and fingerprinting.

Selected NAPL, sediment, and soil samples were analyzed for chemical fingerprinting, monocyclic aromatic hydrocarbons (MAHs), and polycyclic aromatic hydrocarbons (PAHs) using draft EPA Method 3570 with gas chromatography/flame ionization detection (GC/FID, EPA Method 8100). Groundwater samples were collected from new and previously installed wells and were analyzed by a New York State Certified laboratory using approved analytical methods for total metals, semivolatile organic compounds (SVOCs) (inclusive of petroleum constituents, PAHs, and phenols), volatile organic compounds (VOCs) (inclusive of the Spill Technology and Remediation Series (STARS) list), and total cyanide. NAPL samples collected from wells, piezometers, the river bed, and the tar well were analyzed for MAHs and PAHs. One NAPL sample was also analyzed for physical characteristics, including specific gravity and kinematic viscosity.

Upon completion of the chemical analysis, the resulting data were carefully reviewed to ensure that the identification and quantitation of each compound were properly done. Also, when present and identifiable, the type NAPL in a sample was determined. The type of NAPL present and location of each sample were summarized and are reported herein, thereby providing information on the magnitude and extent of NAPL distribution at the East Station site. Graphic summaries showing extent, magnitude, and source of NAPL are included, as well. The results from this sampling and analysis effort will be used to compare up to four remedial options during a feasibility study to be presented in a separate report.

Finally, groundwater elevations were measured in each well and the hydraulic head was determined during rising head slug tests in selected wells.

Subsequent to the work described in this report, additional groundwater sampling and analysis work was undertaken in March 1999 to update and confirm previous groundwater contour information and groundwater quality data, obtain and evaluate cyanide speciation data on groundwater from selected monitoring wells, and compare VOC and SVOC data from standard analytical methods with data from draft 3511-based methods. The results of this work will be presented in an addendum to this report.

Section 2

# SITE BACKGROUND

The following paragraphs provide an overview of the former East Station MGP site. Much of the information concerning the background of the site was summarized from a report previously prepared concerning this site, "Site Investigation Report for East Station MGP Site" by Atlantic Environmental Services, Inc. and Remediation Technologies, Inc., June 30, 1993 (Atlantic, 1993).

## SITE LOCATION AND LAYOUT

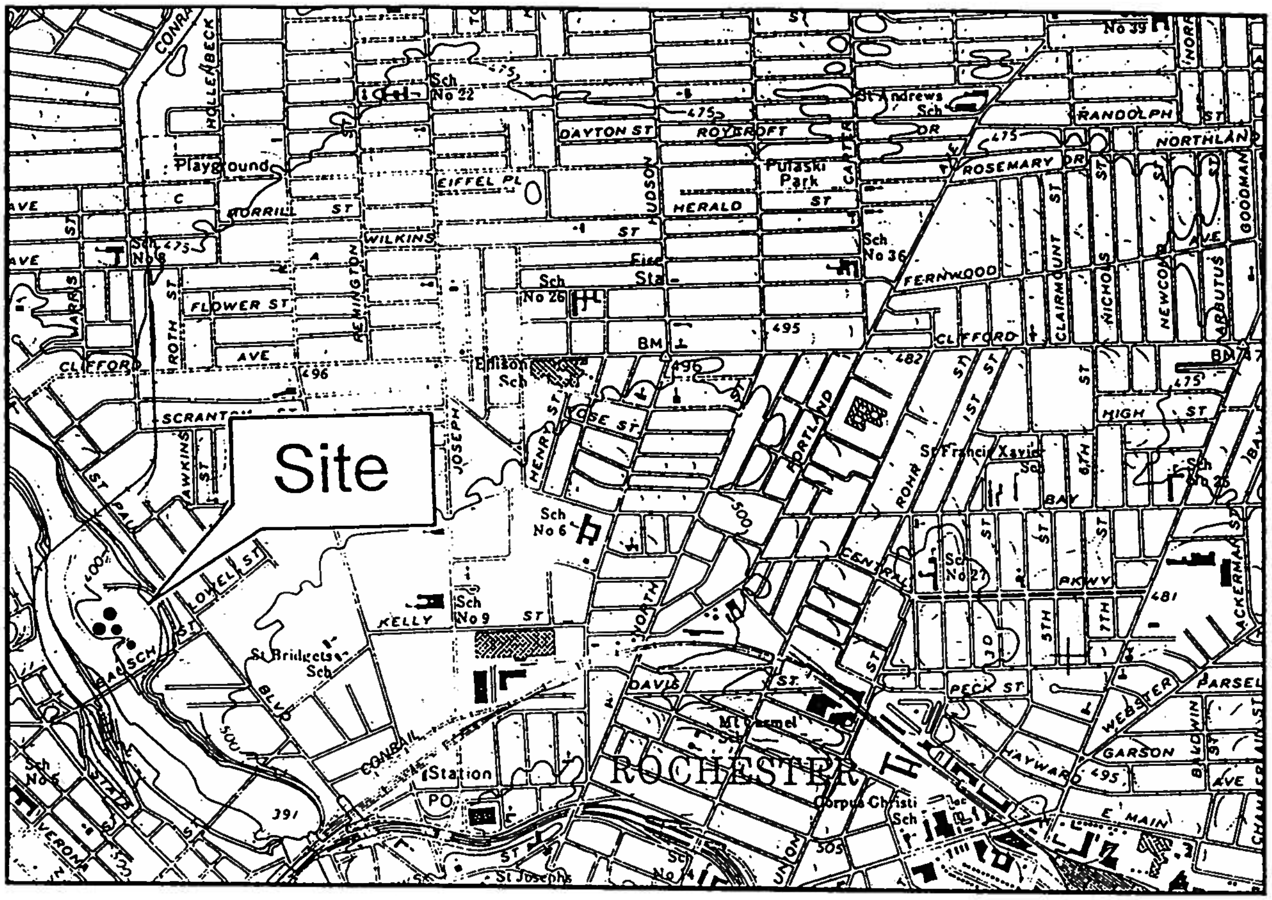
The East Station site comprises approximately 11 acres and is located north of the business district in the City of Rochester, NY within the Genesee River Gorge (Locus Map, Figure 2-1). The western side of the site is the Genesee River, on the east is Suntru Street, on the south is the Bausch Street Bridge, and the property to the north and east of the site is owned by Bausch and Lomb. Land uses within a mile radius of the site are a mixture of industrial, commercial, and residential.

There currently are three buildings on the northern portion of the site (RG&E Chemistry/Environmental Laboratory, RG&E Coal Laboratory, and RG&E Fossil Training Center), one storage building and a fenced high-pressure gas main in the central part of the site, and two unused surge tanks in the southern portion (Figure 2-2, Base Map). Part of the site is paved, the remainder of the site is covered by mixed vegetation.

The Genesee River, which forms the western boundary of the site, is a Class B surface water (suitable for fishing and contact recreation) according to the NYSDEC.

Figure 2-1

# Locus Map



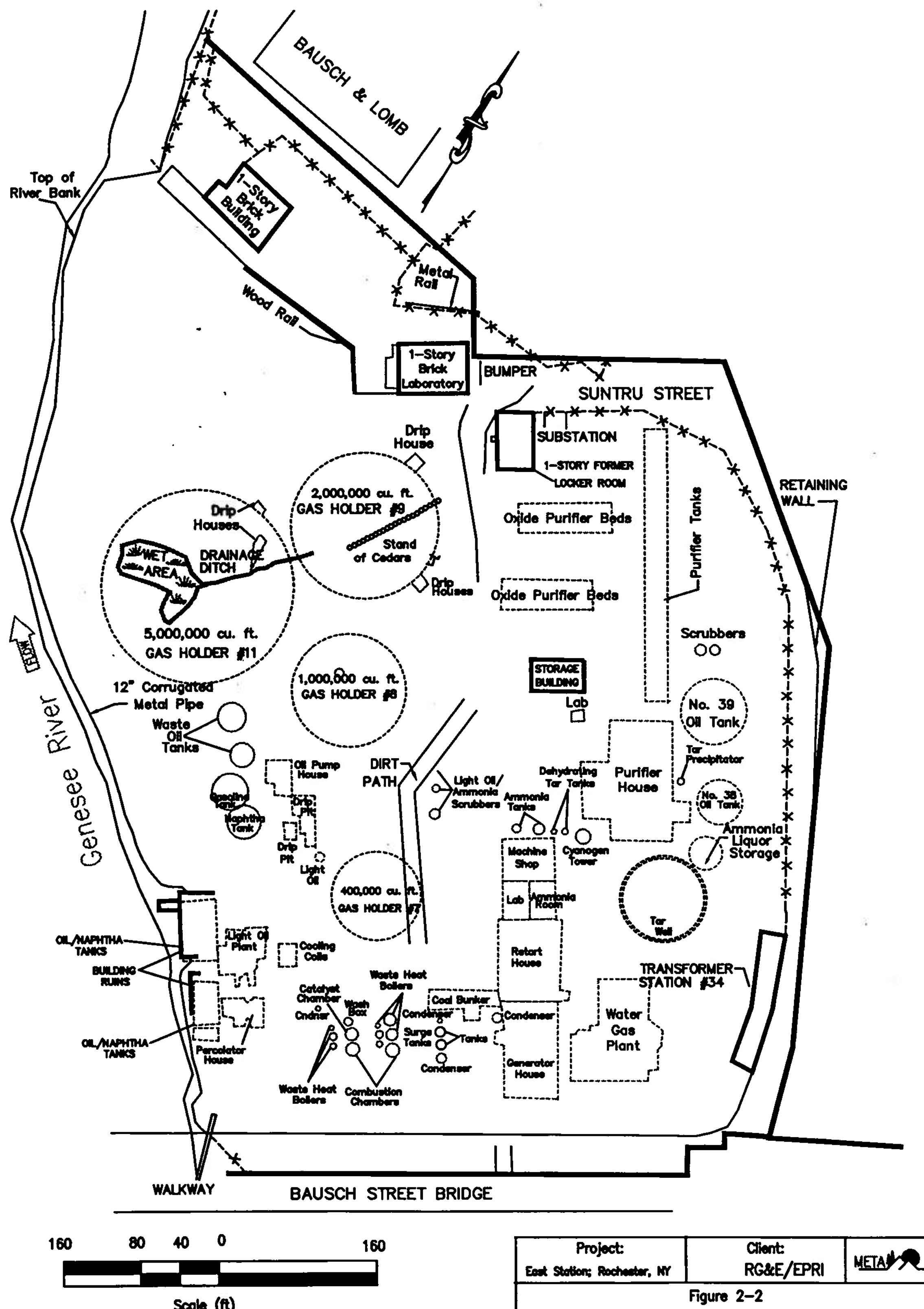


Scale 1:24000

1 | 1/2 | 0 | 1 Mile

One inch = 2,000 feet
Contour interval = 10 feet

Rochester, New York
1971 (photo revised 1978)




Map based on site map from Site Investigation Report for East Station MGP Site, Atlantic Environmental Services, Inc., June 1993.

| Project: East Station; Rochester, NY | Client: RG&E/EPRI | META |
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Figure 2-2
1998 Focused Remedial Investigation
Base Map

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## OVERVIEW OF SITE HISTORY

The history of the site was well-defined in Atlantic's 1993 report and confirmed by a file review conducted by META on October 21 to 22, 1998. Briefly stated, a coal carbonization MGP facility was constructed at the East Station site in 1872. The plant consisted of a single building housing the gas retorts and one gas holder. Two more gas holders were added between 1888 and 1892; buildings and equipment also were added around this time. An 1892 Sanborn map indicates that the original gas holder in the southeast corner of the site was being used to store gas at that time. However, a 1900 Rochester Plat map indicates that the same structure was used for tar storage (labeled "tar tank"). Also, a carburetted water gas (CWG) plant was added to the site between 1892 and 1900.

Gas production using the CWG process was initiated at East Station circa 1900, and by 1913, the majority of the gas produced at that facility was from CWG. Historical maps up until 1910 show a gas holder illustrated on the 1892 Sanborn map (currently referred to as the tar well) being present. However, the tar well is not shown on a 1911 Sanborn Fire Insurance Map, indicating its use was discontinued around that time (Morrison-Knudsen, 1986). Thus, based on the historical records, the same structure, referred to as the tar tank or tar well, was used to store tar from about the mid-1890s until 1911. During this time, tar generated in both the coal carbonization plant and the CWG plant may have been placed in the tar well.

The East Station gas manufacturing operations nearly ceased in 1917 when a new MGP facility was constructed at the West Station location, across the river from East Station and most of the gas production was carried out at this new plant. However, the gas produced at the West Station was purified at the East Station after it crossed the river through a piping system. In fact, historical documents indicated that from the mid-1920s until gas production was stopped in the 1950s at the West Station, East Station was used primarily to purify the gas produced at West Station, except when gas was needed for meeting peak demand.

Facilities at East Station were modified in 1952 to handle natural gas instead of the manufactured gas. The major modification was the construction of a catalytic reforming plant on the southern portion at the East Station which used catalyst pellets composed of nickel-coated ceramic. After demolition of the reforming plant, the three buildings on the northern portion of the site and the storage building in the middle of the site remained. Although the reforming plant was demolished in 1976, some of the pellets from the process were still on-site in the 1990s when the initial site investigation was performed. While these pellets represent a potential metals source in some areas of the site, the extent of their impact, particularly to surficial soils, has not been defined. Recognizing the need for additional metals data, the results of further groundwater sampling and analysis will be reported in an addendum to this report.

From the initial construction of the East Station MGP facility through its peak production years, several MGP components were constructed, including: retorts, carburetors, tar separators, purifiers, gas holders, a gas piping network from West to East Station, and a light oil recovery plant. In subsequent years, a Bengas production plant and a catalytic reforming plant were constructed on the site. Several of these components, such as the former gas holders (particularly the small holder used for tar storage), tar separators, the purifier boxes, and the piping are of interest as possible sources of MGP tar. In addition, areas where purifier operations and residues were located are likely sources of chemicals, particularly iron cyanide compounds. Also, gas oil storage tanks that were part of the carburetted water gas plant may be sources of petroleum distillate releases. Finally, some of the structures for the light oil plant, the Bengas plant, and the catalytic reforming plant, including any oil storage tanks, may be sources of chemicals such as light oil, spent wash oil, gasoline, or refinery residues.

In addition to the gas production, purification, and conversion activities at the East Station, two other historical site uses could be relevant to current site issues: the recovery of low molecular weight compounds for the production of TNT for World War I or other chemical products and the laboratory facilities located on-site. The recovery of light oils continued after the war with the manufacture of "Bengas", a substitute auto fuel. Other by-products from gas manufacture also were recovered at the East Station facility over the years, including: "creosote, pitch, ammonium thiocyanate (weed killer), and ammonium sulfate (fertilizer)". In addition, two of the on-site buildings have been used as laboratories. As a result, materials used or wastes generated from product recovery or to a lesser extent, laboratory activities, could have contributed to the current extent of environmental impacts at the East Station.

In 1992, a field investigation was carried out at the East Station site to provide information concerning the type and extent of MGP wastes. After the results of this previous study were evaluated, portions of the northwest and southeast sections of the site were capped with clean fill as Interim Remedial Measures (IRMs). During this activity, one of the monitoring wells (SW-2) was destroyed. Since the cessation of all manufacturing activities in 1976, the central and southern portions of the site have remained vacant, and the northern portion of the site has been used as a fossil energy training center and as a laboratory to meet chemical and environmental analytical needs of RG&E.

## PREVIOUS STUDY RESULTS

The results from the previous site investigation showed that the sources of environmental impacts at East Station originated from historical site uses, and the distribution of these impacts was affected by site-specific geohydrology. Visible or measurable depths of tar were observed at several locations, purifier waste was found in some portions of the site, and unspecified petroleum residues were noted at several locations.

The following paragraphs briefly describe the site geohydrology and investigation results from the previous site investigation work.

### Site Geohydrology

Based on the information presented in the 1993 Atlantic report, most of the East Station site sloped slightly upward toward the southeast. While the average elevation of the site was reported by Atlantic to be about 415 feet above National Geodetic Vertical Datum (NGVD), three small trenches oriented east/west were installed to accommodate underground electric facilities. The subsurface of the site was composed of a layer of fill covering stream alluvium which overlies bedrock. The fill depth at the site was approximately 8 feet at its minimum and 25 feet thick at its maximum, while the alluvial deposit was up to 16 feet thick. Although the fill was identified as consisting of primarily "imported excavation materials", it also contained MGP residues, including tar, in various locations.

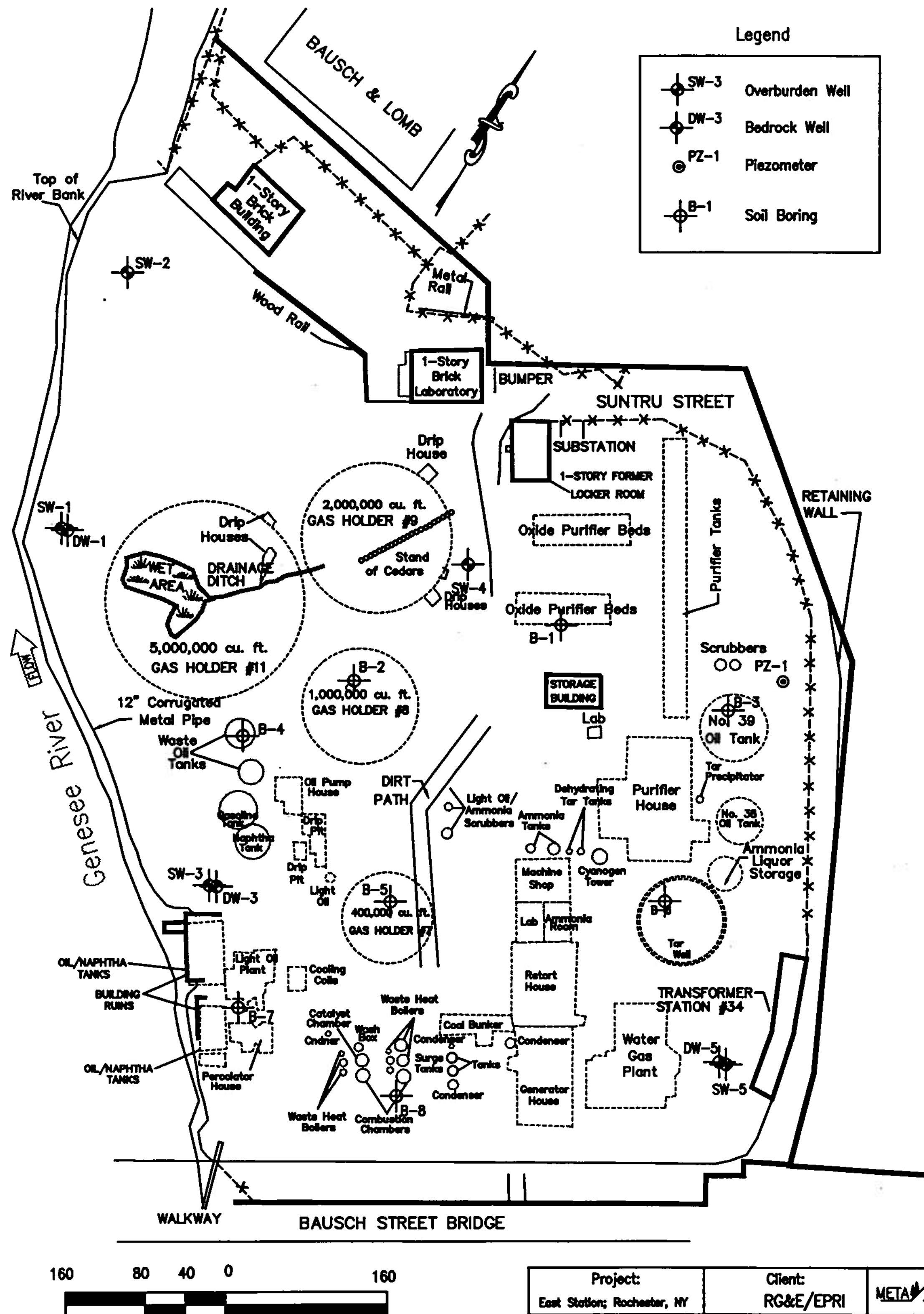
According to previous work (Figure 2-3 shows piezometer, soil boring, and well locations associated with the 1993 investigation), the bedrock (the Rochester Shale Formation) was found at 8 to 37 feet below grade at the site, tended to slope toward the river, and reportedly contained some troughs. However, bedrock elevations also showed some sloping toward the northeast in the vicinity of PZ-1 and the former oil tank nearby. The sloping of the bedrock and the presence of bedrock troughs could be significant in controlling the migration of DNAPLs away from source areas and the pooling of DNAPLs in some trough areas. In addition, the bedrock was identified as "highly weathered and fractured" which can facilitate the migration of DNAPL both vertically and laterally. The water table at the site generally was about 5 to 15 feet below grade and, based on previous work, the groundwater flow was toward the river. Based on this information, LNAPLs, dissolved chemicals, or substances adsorbed to particulate matter may be conveyed toward the Genesee River.

**Field Investigation**

The previous field investigation was carried out in June and July of 1992 (Atlantic, 1993) and consisted of several components, including: a soil gas survey, a test pit excavation program, the collection and analysis of surface soils, a soil boring program, and the installation and sampling of monitoring wells and a piezometer.

Soil Gas Survey Results

A total of 68 sampling points were used in the soil gas survey at depths of approximately 4 feet or less below surface grade. All but one of the soil gas samples had detectable peaks, with 25 of the 68 samples containing peaks for benzene, toluene, ethylbenzene, and xylenes (BTEX), mostly




Map based on site map from Site Investigation Report for East Station MGP Site, Atlantic Environmental Services, Inc., June 1993.

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| East Station; Rochester, NY | RG&E/EPRI | META |

Figure 2-3
Previously Installed Wells, Soil Borings, and Piezometer by Atlantic Environmental

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at low or trace levels. The highest responses for BTEX compounds were found in two samples along the northwest boundary of the site and were listed as being "indicative of light fraction petroleum products". One sample, located east/northeast of Holder No. 7, was indicative of typical MGP tar. Several other soil gas samples collected nearby also had low levels of BTEX indicative of MGP tar. Trace BTEX levels of unknown origin were observed in 10 of the 25 samples with BTEX peaks.

Test Pit Excavation Results

Thirteen test pit excavations were performed at the site to examine shallow geology, identify buried structures, and determine if shallow impacts were evident. Evidence of petroleum (odors, sheens, stains, or oil) was found at five locations. At one of these locations, the edge of the southern oxide purifier beds, "oil soaked wood" and oil saturated sand were observed. Other NAPL-impacted media were noted at three locations in the vicinity of the tar well and the Purifier House, as well as one location in the northwest portion of the site. At one location, west of the tar well, a three-inch layer of DNAPL was observed.

In addition, evidence of purifier waste was found at four locations, particularly between the purifier beds and the Purifier House. Blue staining and odors typical of purifier wastes were also noted in the northwest portion of the site.

Surface Soil Results

Five samples of surface soils were collected and analyzed for metals, cyanide, and PAHs. Three of the samples were collected from areas which had "visible MGP residuals" (two from areas with purifier waste and one where coke breeze was observed), one was from the silt along the riverbank, and the remaining sample was composited from "an area with no visible MGP residuals". Elevated total PAH levels (1,200 and 1,600 milligrams per kilogram (mg/kg)) were found in the two samples collected from areas with purifier waste. The silt sample contained 2.3 mg/kg, the coke breeze area sample had 1.4 mg/kg, and the composite sample had 96 mg/kg of total PAHs. The purpose of capping portions of the site with clean fill was to address these surface soil concerns.

All of the surficial soil samples had three or more metals (including arsenic and lead) at concentrations above expected background levels, with the exception of the silt sample which had all metal levels within background levels. Both the composite sample and the sample containing coke breeze had higher than expected levels of magnesium and zinc. In addition, elevated mercury levels were found in three of the samples.

Cyanide levels were highest (2,500 and 830 mg/kg) in the two samples with visible purifier waste. The only other sample which had detectable cyanide (29 mg/kg) was the composite sample. Contact with surface soil containing elevated cyanide levels was mitigated by implementing IRMs.

Soil/Rock Boring Results

Sixteen soil/rock borings were drilled, of which three were completed as bedrock wells, five were completed as overburden wells, and the remaining eight terminated at bedrock or the bottom of a structure. Evidence of petroleum or tar (odors, sheens, or staining) was observed during the drilling of nine of the sixteen borings. A total of twelve samples (plus two duplicates) were collected for analysis from these nine borings and from one boring where there was no evidence of petroleum or tar. Each sample was analyzed for PAHs, VOCs, cyanide, and metals. All twelve samples contained detectable levels of VOCs, with individual VOCs ranging in concentration from below the detection limit to 1,600 mg/kg of benzene in one sample of DNAPL collected from the tar well.

PAHs were detected in all of the subsurface soil samples with total PAH levels ranging from less than 1 mg/kg, at the expected background location in the eastern edge of the site, to 138,000 mg/kg in the tar well sample. Elevated PAH levels tended to be in the deeper soils, typically between 10 and 24 feet below grade, and were always observed below the water table.

Four of the soil samples contained arsenic levels above expected background concentrations and six other metals (copper, lead, magnesium, mercury, nickel, and selenium) were found above expected background levels in one or more of the samples. Cyanide was detected in all soils tested except for the background location (eastern portion of the site) and by the oxide purifier bed. Three samples had cyanide concentrations ranging from 180 to 370 mg/kg and all other samples had less than 65 mg/kg of cyanide.

Groundwater Monitoring Results

Groundwater samples from the three bedrock and five overburden wells were collected and analyzed for VOCs, SVOCs, metals, and cyanide. VOCs were detected in all samples, except for the bedrock and overburden background location at the southeastern corner of the site (SW-5 and DW-5). The highest benzene concentrations observed were 10 and 9.6 milligrams per liter (mg/L) in wells SW-3 and DW-3, respectively in the southwest area near the Genesee River.

All groundwater samples except SW-5 and DW-5 had detectable levels of one or more PAHs. Of particular interest was the detection of naphthalene, an indicator of MGP tar, in groundwater samples ranging in concentration between 0.0013 and 9.7 mg/L. The levels of higher molecular weight PAHs in the sample from the deep well (DW-3) near the naphtha tank were indicative of the presence of DNAPL in that well. With the exception of benzo(a)pyrene which, since it was detected in well DW-3 only, exceeded the current NYSDEC GA standard, no PAHs were detected above GA standards or guidance values in the groundwater samples.

Metals were detected in all groundwater samples. All samples exceeded the current NYSDEC Class GA groundwater standard of 0.3 mg/L for iron, five samples exceeded the current standard of 0.25 mg/L for arsenic, two samples exceeded the current standard of 0.05 mg/L for chromium, two samples exceeded the current standard of 0.025 mg/L for lead, two samples exceeded the current standard of 0.0007 mg/L for mercury, two samples exceeded the current standard of 0.1 mg/L for nickel, and all samples exceeded the current guidance value of 35 mg/L for magnesium. Cyanide was also detected in all groundwater samples at concentrations between 0.01 and 4.9 mg/L of total cyanide. Eight of the cyanide samples exceeded the current standard of 0.2 mg/L.

Final Results Summary

Several different MGP and non-MGP residues were observed in various areas of the site, including: tar, middle distillate products (used for MGP and non-MGP purposes), purifier waste, and metals. Although evidence of MGP wastes was found over most of the site based on the test pit and soil boring results, the areal and vertical extent of tar-impacted media was not determined. Soils containing elevated concentrations of PAHs were found below the water table at depths from between 10 and 24 feet below surface grade. Several groundwater samples contained MAHs and PAHs.

Evidence of middle distillate products was found in several locations during the test pit and soil boring programs. Most of the petroleum-related impacts were observed at or near the water table. Purifier wastes were observed at a few locations and cyanide was detected in groundwater samples, typically near historic purifier operations or in downgradient locations. Elevated levels of metals were also found in soil and groundwater samples at several locations.

Section 3

# FIELD INVESTIGATION

The 1998 field investigation at the former East Station MGP facility was carried out in two parts, each of which had several components, as outlined below:

Part I Work

- Riverbank Survey
- Drive Point Piezometer Program
- NAPL Characterization

Part II Work

- Soil Boring Program
- Monitoring Well Installation and Sampling
- Tar Well Characterization - Test pit excavations, soil borings, and well installations

Additional site investigation and monitoring were completed in 1999. Results are presented in the Addendum to this report. The following subsections describe what was done during each portion of the 1998 investigation.

## PART I WORK

Initially, a survey of the entire shoreline along the western site boundary was completed to identify the locations and quantify, to the extent possible, occurrence of NAPL in the Genesee River. The physical and chemical properties of the NAPL were compared to those of NAPLs collected from on-site piezometers.

**Riverbank Survey**

NAPL Surveys

The first portion of this work was carried out from September 17 to September 18, 1998 and consisted of a reconnaissance of shallow sediments for indications of NAPL during the period of reduced river flow (August 8 to September 24, 1998). For the survey, META personnel walked the entire shoreline and noted that NAPL and sheens were present in several locations.

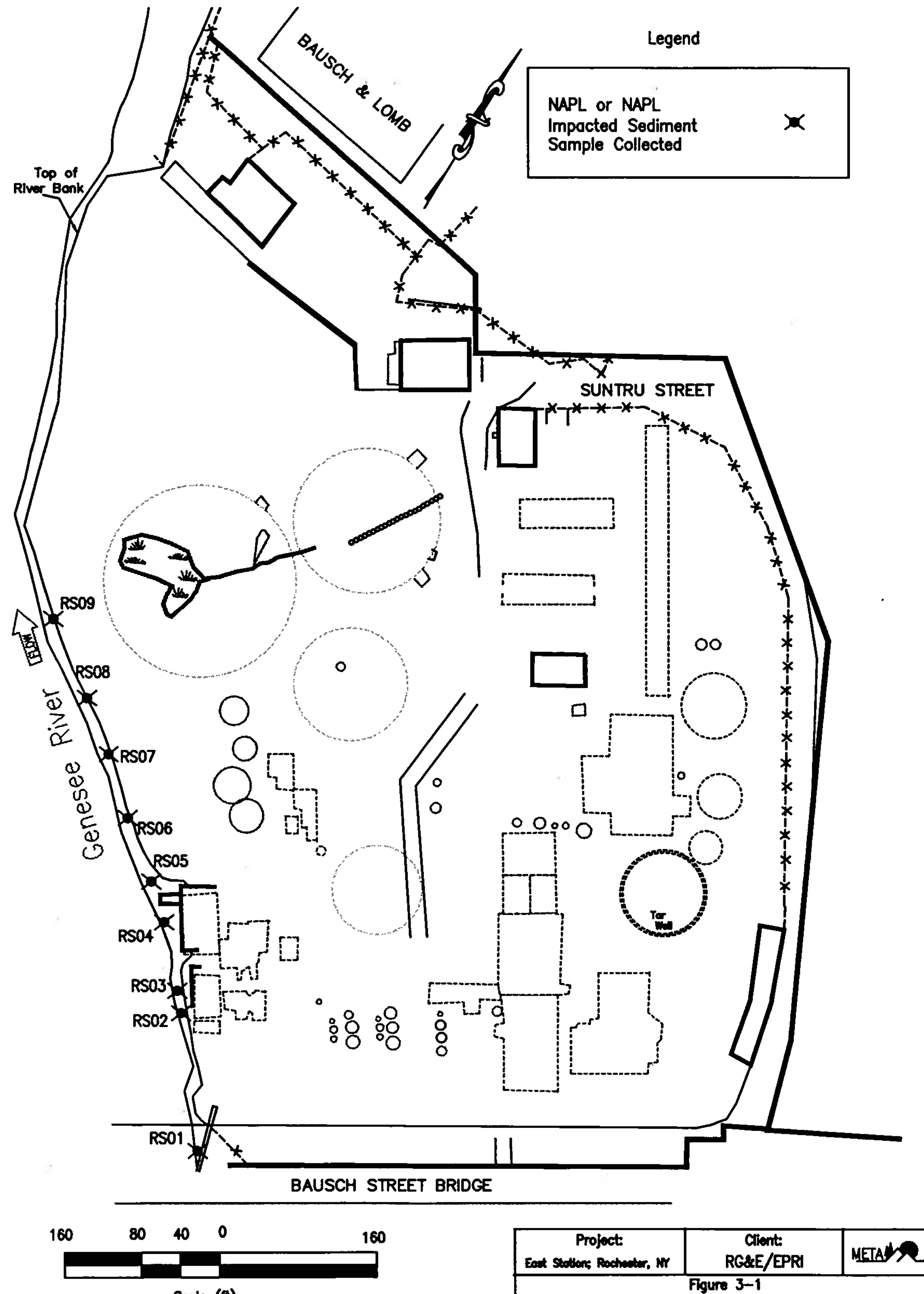
Shoreline Screening

In addition to the NAPL survey, the riverbank was sampled in Part I from September 17 to 18, 1998. Screening of the riverbank and shallow sediments was achieved using three different sampling methodologies. Two of the methods involved peristaltic pumping of DNAPL from either sediment pore space or directly from pooled areas on the sediment surface. The third method involved the collection of shallow DNAPL-containing sediment utilizing a stainless steel trowel. Three samples of NAPL and 6 samples of NAPL-containing sediment were collected for chemical fingerprinting analysis. These samples were obtained from the locations shown on Figure 3-1.

**Drive Point Piezometer Program**

On-Site NAPL and Groundwater Screening

Between October 21 and 24, 1998, the remaining field portion of the initial work was completed. This work involved sampling the on-site saturated zone in selected areas of the site using a truck mounted drive point Geoprobe™ rig in conjunction with the installation of temporary piezometers. The piezometers generally were screened from the bedrock surface (as indicated by refusal) to above the water table and NAPLs in the piezometers were identified with the use of a hydrocarbon/water interface probe. Confirmation of NAPLs was accomplished by sampling with a peristaltic pump and/or bailer sampler. A total of 20 piezometers were installed, as shown in Figure 3-2. Tables 3-1 and 3-2 summarize the locations, depths, and static water table data for each piezometer. Samples with LNAPL or DNAPL were collected from those piezometers containing NAPLs and analyzed for




Map based on site map from Site Investigation Report for East Station MGP Site, Atlantic Environmental Services, Inc., June 1993.

| Project: | Client: | |
|---|---|---|
| East Station; Rochester, NY | RG&E/EPRI | META |

Figure 3-1
1998 Focused Remedial Investigation
Riverbank Reconnaissance
Sampling Locations

| Filename: | Drawn by: | Approved by: | Date: |
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MAHs, PAHs, and hydrocarbon fingerprinting by GC/FID. In addition, an aqueous sample was collected from the bottom of piezometer PZ-09 for VOC analysis because of the presence of an unusual odor. The results of the piezometer sampling and analysis are summarized in Section 6 (Table 6-2).

**Chemical Characterization of Samples**

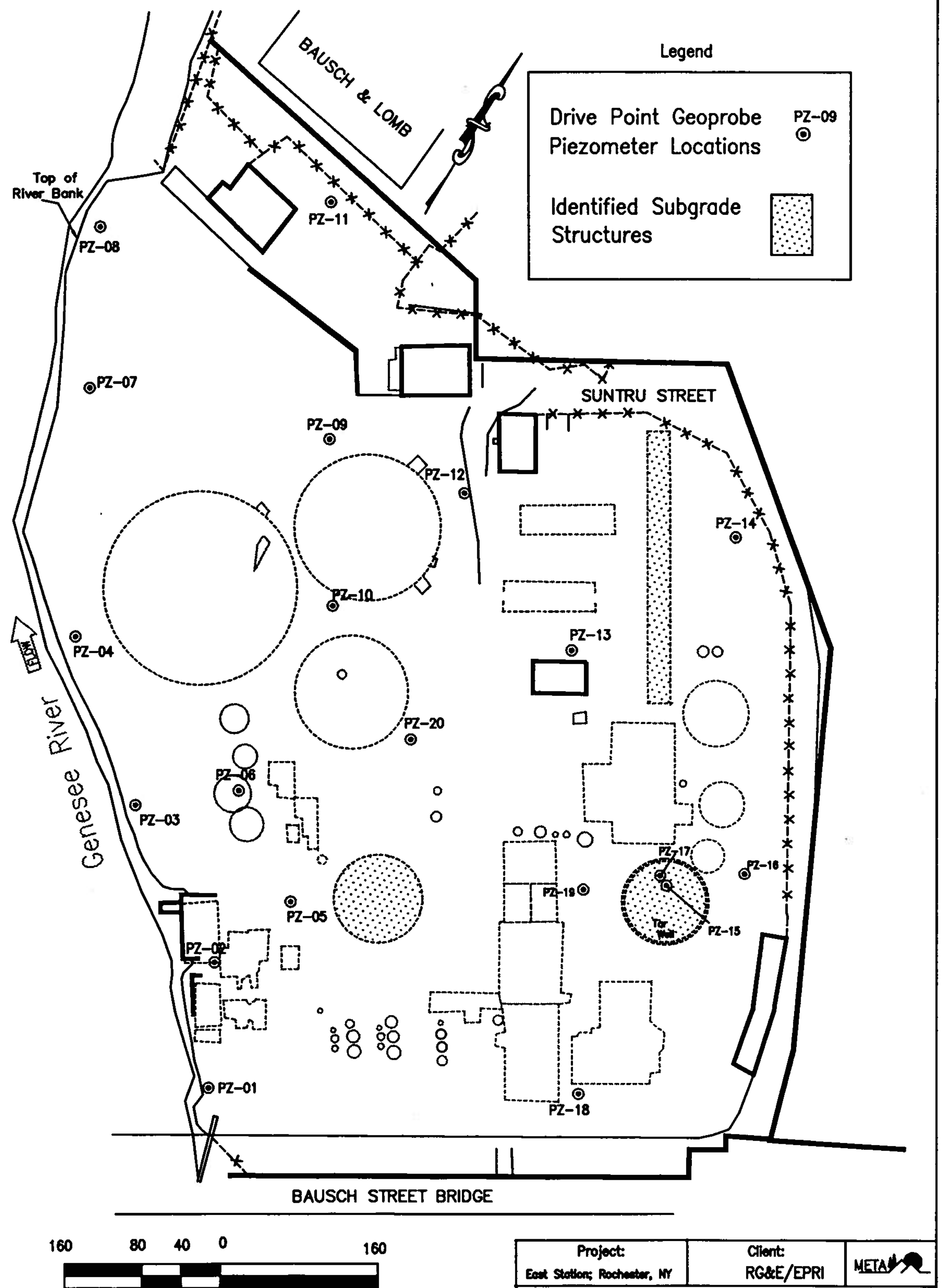
All NAPL, sediment, and aqueous samples collected during the shoreline reconnaissance and piezometer sampling were analyzed for MAHs and PAHs and hydrocarbon fingerprints by GC/FID. A fingerprint "library" of all samples was generated to aid in the identification of NAPL-containing media.

## PART II WORK

Although the Part I results provided considerable information concerning the NAPL in sediment and on-site, additional work was required to satisfy the project objectives. Specifically, borings were needed to further delineate the areal and vertical distribution of NAPL, and to examine potential occurrence of NAPL in bedrock. In addition, characterization of the former tar well was needed to determine whether it still is or was a likely source of NAPL to the surrounding area and to obtain data for preliminary remedial design purposes. Finally, it was necessary to install and sample both overburden and bedrock wells to determine on-site groundwater quality.

**Bedrock and Soil Boring/Monitoring Well Program**

Between October 26 and November 12, 1998, the bedrock and soil boring portion of the field investigation was carried out. During this work, a total of 23 borings were completed, as shown on Figure 3-3 and listed in Table 3-3. The soil boring logs are provided in Appendix A. Of the 23 soil/bedrock borings, 14 were overburden and 9 were advanced into the bedrock. The nine bedrock borings were advanced approximately 10 to 20 feet deep into the competent bedrock.




Map based on site map from Site Investigation Report for East Station MGP Site, Atlantic Environmental Services, Inc., June 1993.

| Project: East Station; Rochester, NY | Client: RG&E/EPRI | META |
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**Figure 3-2**
**1998 Focused Remedial Investigation Piezometer Locations**

| Filename: | Drawn by: | Approved by: | Date: |
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| REDINV.DWG | SRM | IS | 8/12/1999 |

Table 3-1

**Drive Point Piezometer Locations and Total Depths**

| Piezometer I.D. | Location | Total Depth (bgs) |
|---|---|---|
| PZ-01 | Southern corner of site, adjacent to river bank | 22.46 |
| PZ-02 | Near Light Oil Plant, adjacent to river bank | 18.10 |
| PZ-03 | Southwestern portion of site, adjacent to river bank | 19.86 |
| PZ-04 | Western portion of site, adjacent to river bank | 18.92 |
| PZ-05 | Adjacent to western edge of former gas holder #7 | 20.95 |
| PZ-06 | Near the gasoline tank, southwestern portion of site | 23.50 |
| PZ-07 | Along western boundary, adjacent to river bank | 20.86 |
| PZ-08 | Along western boundary, adjacent to river bank | 18.66 |
| PZ-09 | Northwest of former gas holder #9 | 15.29 |
| PZ-10 | Northwest of former gas holder #8 | 19.16 |
| PZ-11 | Northern fence line, in parking lot | 14.35 (F.M.) |
| PZ-12 | Northeast of former gas holder #9 | 16.08 |
| PZ-13 | North side of existing storage building | 15.61 |
| PZ-14 | Northern corner of site property | 21.13 |
| PZ-15 | Within the tar well | 22.00 |
| PZ-16 | Eastern fence line, base of hill, adjacent tar well | 30.80 |
| PZ-17 | Within the tar well | 23.00 |
| PZ-18 | Southeastern fence line, near former water gas plant | 35.22 |
| PZ-19 | West of tar well, outside the tar well | 25.20 |
| PZ-20 | Center of site property, southeast of gas holder #8 | 17.62 |

Note: (F.M.) - Finished with a flush mount Christy Box.

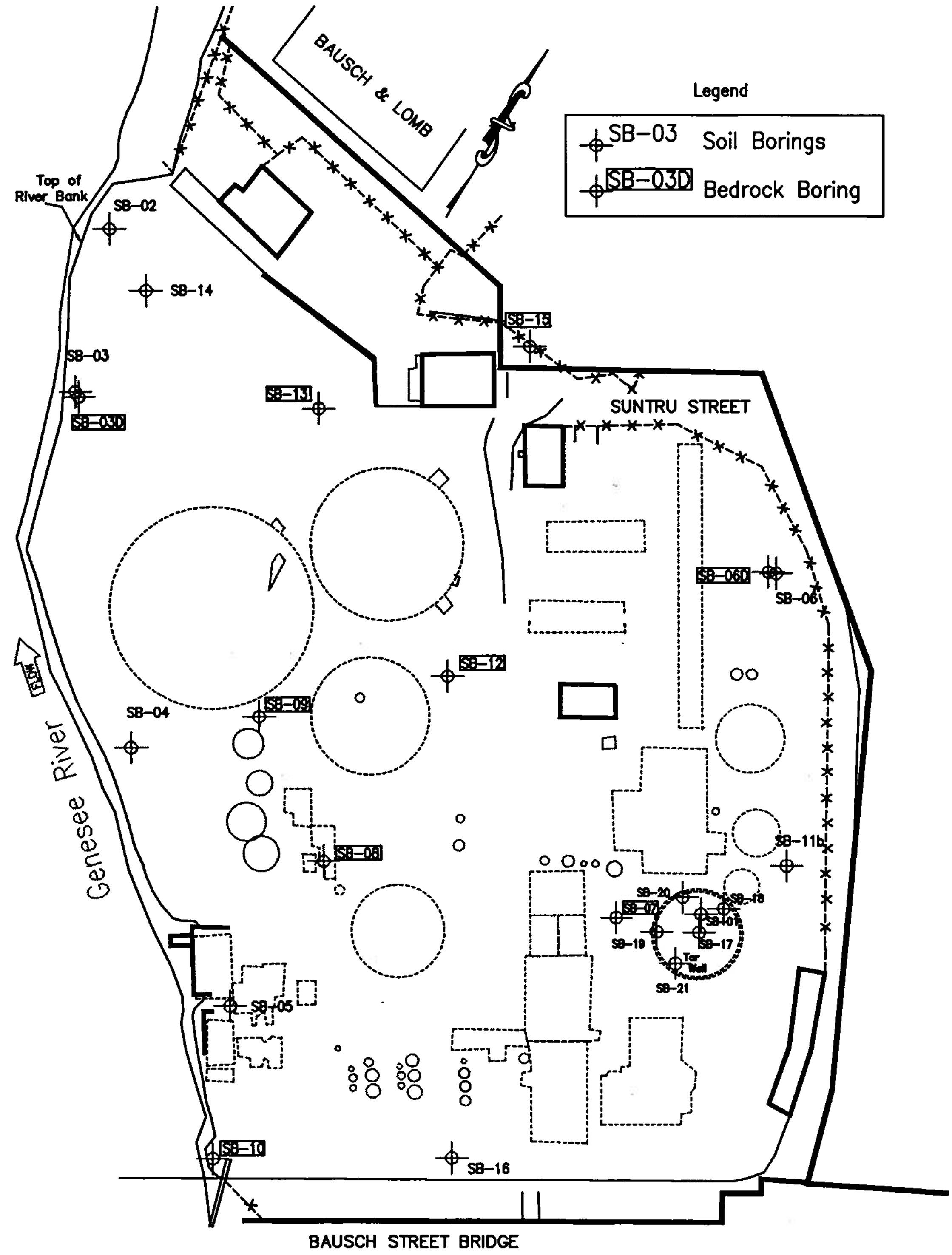
bgs - below ground surface, feet

Table 3-2

**Drive Point Piezometer Static Water Level Data**

| Piezometer I.D. | Ground Elevation (Feet Above MSL) | Top of Casing (TOC) Elevation (Feet Above MSL) | Total Depth From TOC (Feet) | Depth to G.W. From TOC (Feet) |
|---|---|---|---|---|
| PZ-01 | 412.4 | 414.62 | 24.60 | 19.28 |
| PZ-02 | 411.8 | 413.41 | 19.67 | 16.69 |
| PZ-03 | 405.0 | 407.68 | 22.56 | 16.57 |
| PZ-04 | 400.6 | 403.76 | 22.09 | 12.45 |
| PZ-05 | 418.9 | 421.37 | 23.51 | Dry |
| PZ-06 | 416.0 | 419.25 | 26.72 | 23.71 |
| PZ-07 | 403.9 | 407.00 | 24.11 | 16.15 |
| PZ-08 | 401.4 | 404.40 | 21.51 | 13.47 |
| PZ-09 | 407.0 | 410.21 | 18.49 | 13.18 |
| PZ-10 | 411.9 | 415.59 | 22.76 | 18.61 |
| PZ-11 | 402.4 | 402.15 | 14.61 | 8.79 |
| PZ-12 | 413.3 | 416.70 | 19.53 | 11.24 |
| PZ-13 | 416.8 | 420.52 | 19.40 | 12.81 |
| PZ-14 | 418.7 | 421.86 | 24.28 | NA |
| PZ-15 | 427.0 | 429.52 | ~24.5 | 15.49 |
| PZ-16 | 427.4 | 430.81 | 34.25 | 23.37 |
| PZ-17 | 426.9 | 430.02 | ~25.5 | 15.98 |
| PZ-18 | 434.0 | 437.56 | 38.87 | 29.02 |
| PZ-19 | 424.6 | 428.04 | 28.62 | 19.18 |
| PZ-20 | 413.0 | 416.38 | 22.79 | 17.58 |
| A-PZ-1 | 420.8 | 422.78 | 19.62 | 14.63 |

Note: MSL - Mean Sea Level




160 80 40 0 160

Scale (ft)

Map based on site map from Site Investigation Report for East Station MGP Site, Atlantic Environmental Services, Inc., June 1993.

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**Figure 3-3**
**1998 Focused Remedial Investigation**
**Soil Boring Locations**

| Filename: | Drawn by: | Approved by: | Date: |
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| REDINV.DWG | SRM | IS | 8/12/1999 |

Table 3-3

**Soil Boring and Monitoring Well Information**

| Soil Boring/Well | Location | Overburden/Bedrock | Total Depth (Feet, bgs) |
|---|---|---|---|
| SB-01/MW-1 | Just off center, inside the tar well | Overburden boring/well | 23.3 |
| SB-02/MW-2 | Northwest corner, adjacent river bank | Overburden boring/well | 19.6 |
| SB-03/MW-3 | Western boundary, adjacent river bank | Overburden boring/well | 20.1 |
| SB-03D/MW-3D | Western boundary, adjacent river bank | Bedrock core/bedrock well | 35.3 |
| SB-04/MW-4 | Western boundary, adjacent river bank | Overburden boring/well | 15.9 |
| SB-05B/MW-5 | Western boundary, Light Oil Plant | Overburden boring/well | 18.0 |
| SB-06/MW-6 | Northeast corner of site | Overburden boring/well | 21.3 |
| SB-06D/MW-6D | Northeast corner of site | Bedrock core/bedrock well | 41.5 |
| SB-07 | Just west of tar well | Overburden boring/bedrock core | 36.0 |
| SB-08 | West-central portion of site | Overburden boring/bedrock core | 33.0 |
| SB-09 | Between former Gas Holders #11 & #8 | Overburden boring/bedrock core | 34.0 |
| SB-10/MW-8D | Southwest corner, adjacent river bank | Overburden boring/bedrock well | 40.0 |
| SB-11/MW-7 | Eastern edge of site, northeast of tar well | Overburden boring/well | 31.2 |
| SB-12 | Center of site, northeast of Gas Holder # 8 | Overburden boring/bedrock core | 27.0 |
| SB-13 | Northwest-central portion of site | Overburden boring/bedrock core | 31.5 |
| SB-14 | Northwest corner, near MW-2 | Surface soils only | 6.0 |
| SB-15 | North of laboratory building | Overburden boring/bedrock core | 29.0 |
| SB-16 | Southern property boundary | Overburden boring only | 23.1 |
| SB-17B | Center of tar well | Overburden boring only | 20.1 |
| SB-18B | Northern edge of tar well, inside well | Overburden boring only | 25.0 |
| SB-19/MW-10 | Southwestern edge of tar well, inside the well | Overburden boring/4"recovery well | 24.0 |
| SB-20/MW-9 | Northwestern edge of tar well, inside the well | Overburden boring/4" recovery well | 24.1 |
| SB-21 | Southern edge of tar well, inside the well | Overburden boring only | 16.7 |

Note: 1. Well IDs with D signifies a double cased bedrock well.
2. bgs. - Below ground surface

The 14 overburden borings terminated at the bedrock interface or tar well bottom, with the exception of SB-14. Boring SB-14 was only advanced 6 feet because its purpose was to collect a near-surface soil sample for mercury analysis. A total of 34 samples were collected and analyzed for MAHs and PAHs, and hydrocarbon fingerprinting by GC/FID.

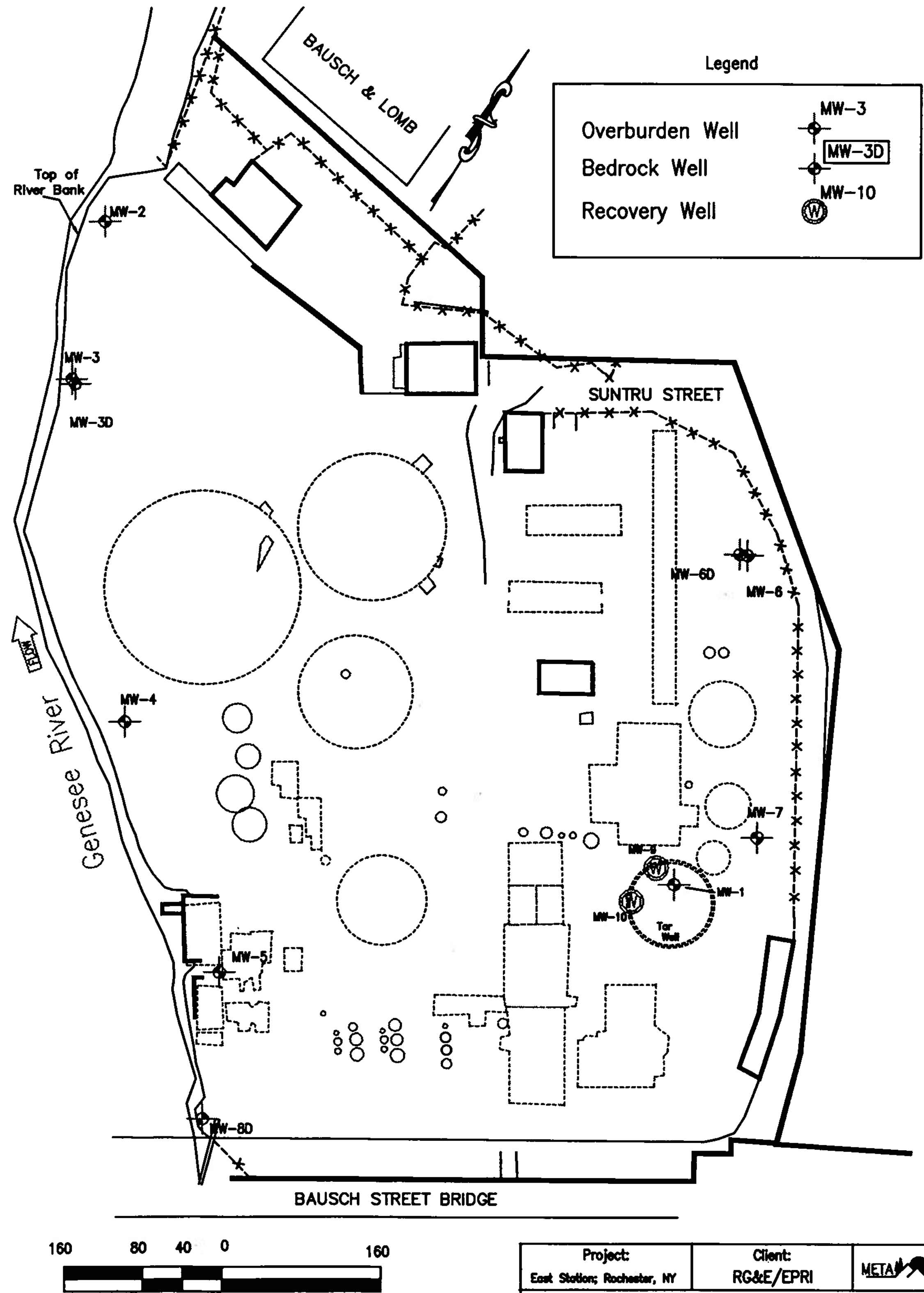
**Monitoring Well Installation and Sampling**

The installation of groundwater monitoring wells was carried out during the soil boring program (October 26 through November 12, 1998). Figure 3-4 shows the locations of the 1998 investigation groundwater monitoring wells and Table 3-3 provides information on the type, location, and depth for each well.

Of the nine bedrock borings, three were finished as double cased 2-inch diameter monitoring wells (the outer casing tied to the competent bedrock). These three deep well locations were selected after review of the results from the Part I field work and based on information obtained from borings as the Part II work was progressing. The bedrock wells were screened from the bottom of the borehole up to the interface of the competent bedrock (approximately 10 feet) to characterize the groundwater quality in the shallow fracture zone in the upper bedrock as indicated on the soil boring logs (Appendix A for bedrock well construction detail).

Of the 14 overburden borings, seven were finished as 2-inch diameter overburden wells and two were finished as 4-inch diameter recovery wells. The overburden monitoring wells utilized 5 to 12-foot screens which were vertically placed in accordance with the designated NAPL type (determined by previous investigation work and Part I Geoprobe™ piezometer observations) in proximity to that boring location (e.g., DNAPL - deep interval, LNAPL - intersecting the water table). (Appendix A for overburden well construction detail and soil boring logs).

During the week of November 30, 1998, groundwater samples were collected from all on-site wells (new and existing) following the development of the newly installed wells and stabilization




Map based on site map from Site Investigation Report for East Station MGP Site, Atlantic Environmental Services, Inc., June 1993.

| Project: East Station; Rochester, NY | Client: RG&E/EPRI | META |
|---|---|---|
| Figure 3-4<br>1998 Focused Remedial Investigation<br>Well Locations | | |

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of the water table. Groundwater samples were analyzed for VOCs (including solvents, chlorinated solvents, petroleum hydrocarbons, and MAHs); SVOCs (including PAHs, petroleum hydrocarbons, and phenols); total cyanide; and metals.

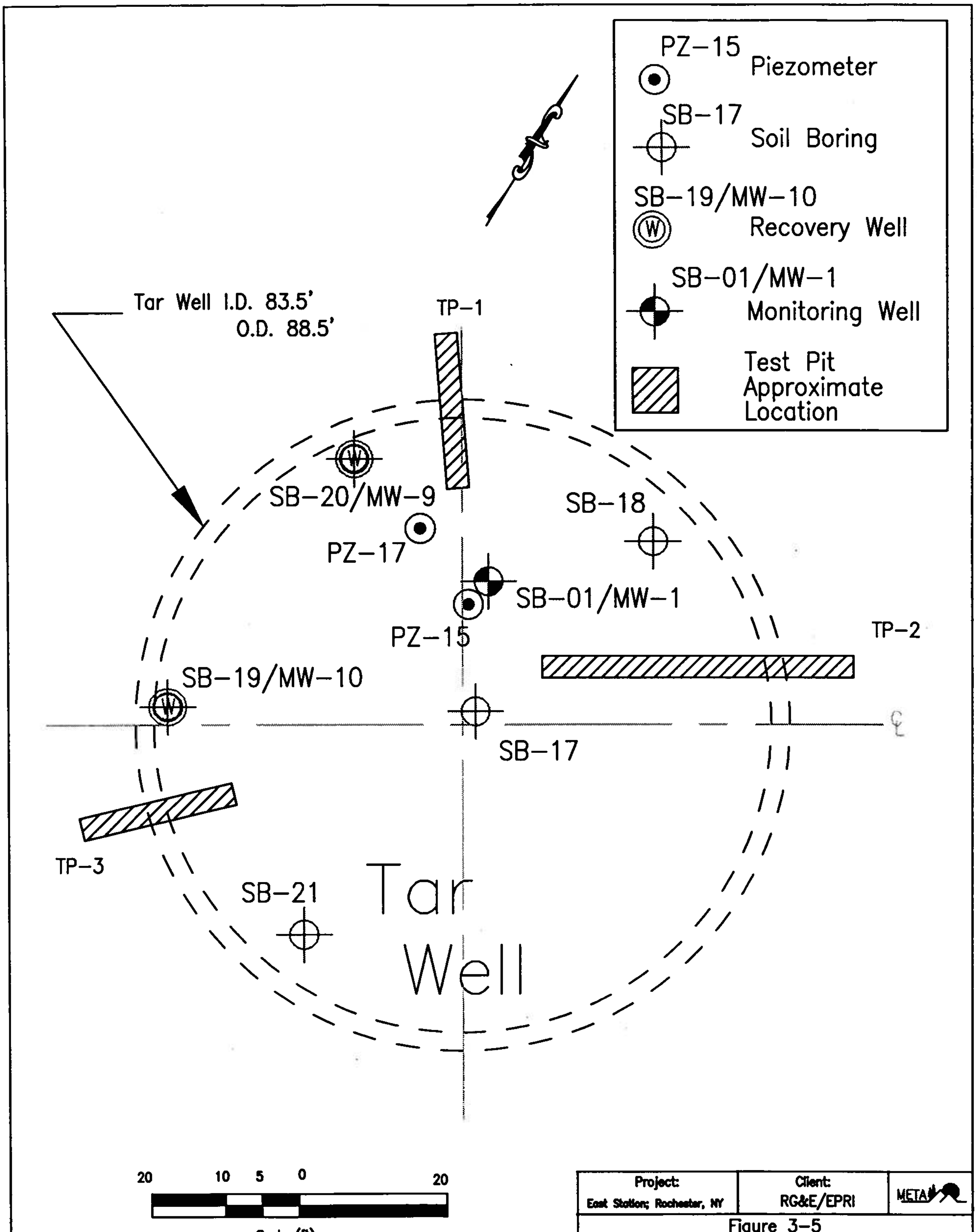
**Tar Well Characterization**

During the Part I and at the beginning of the Part II work, two piezometers (PZ-15 and PZ-17) and a boring/2-inch diameter monitoring well (SB-01/MW-1) were installed near the center of the tar well with points of termination at the tar well brick floor. On November 3, 1998, a pumpable tar sample was collected from MW-1 and was evaluated for specific gravity and viscosity. On November 6, 1998, test pits were excavated at three locations, based on historical maps showing the expected location of the tar well, to identify the outer limits of the tar well structure. Test pit logs are included as Appendix B.

Based on the information obtained during the test pit work and prior work, five overburden soil borings (SB-17 through SB-21) were advanced on November 11 to 12, 1998 to the bottom of the tar well, as shown in Figure 3-5. The first boring (SB-17) was placed in the approximate center of the tar well. The next two borings (SB-18 and SB-19) were placed to complete a modified diagonal pattern extending across the diameter of the tar well wall. Based on the extent of tar observed near the tar well walls, two additional borings (SB-20 and SB-21) were advanced at the locations shown on Figure 3-5. Then, two 4-inch diameter recovery wells were installed at locations SB-19 and SB-20 inside the tar well.

**Surveying of Sampling Locations**

All intrusive sampling locations including soil borings, overburden wells, bedrock wells, temporary drive-point piezometers, and river bank reconnaissance sampling points were surveyed on November 20, 1998 by Waters Land Surveying. All the borings, wells, and piezometers completed at the site are shown on Figure 3-6.




Map based on site map from Site Investigation Report for East Station MGP Site, Atlantic Environmental Services, Inc., June 1993.

| Project: East Station; Rochester, NY | Client: RG&E/EPRI | META |
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Figure 3-5
1998 Focused Remedial Investigation
Tar Well Characterization

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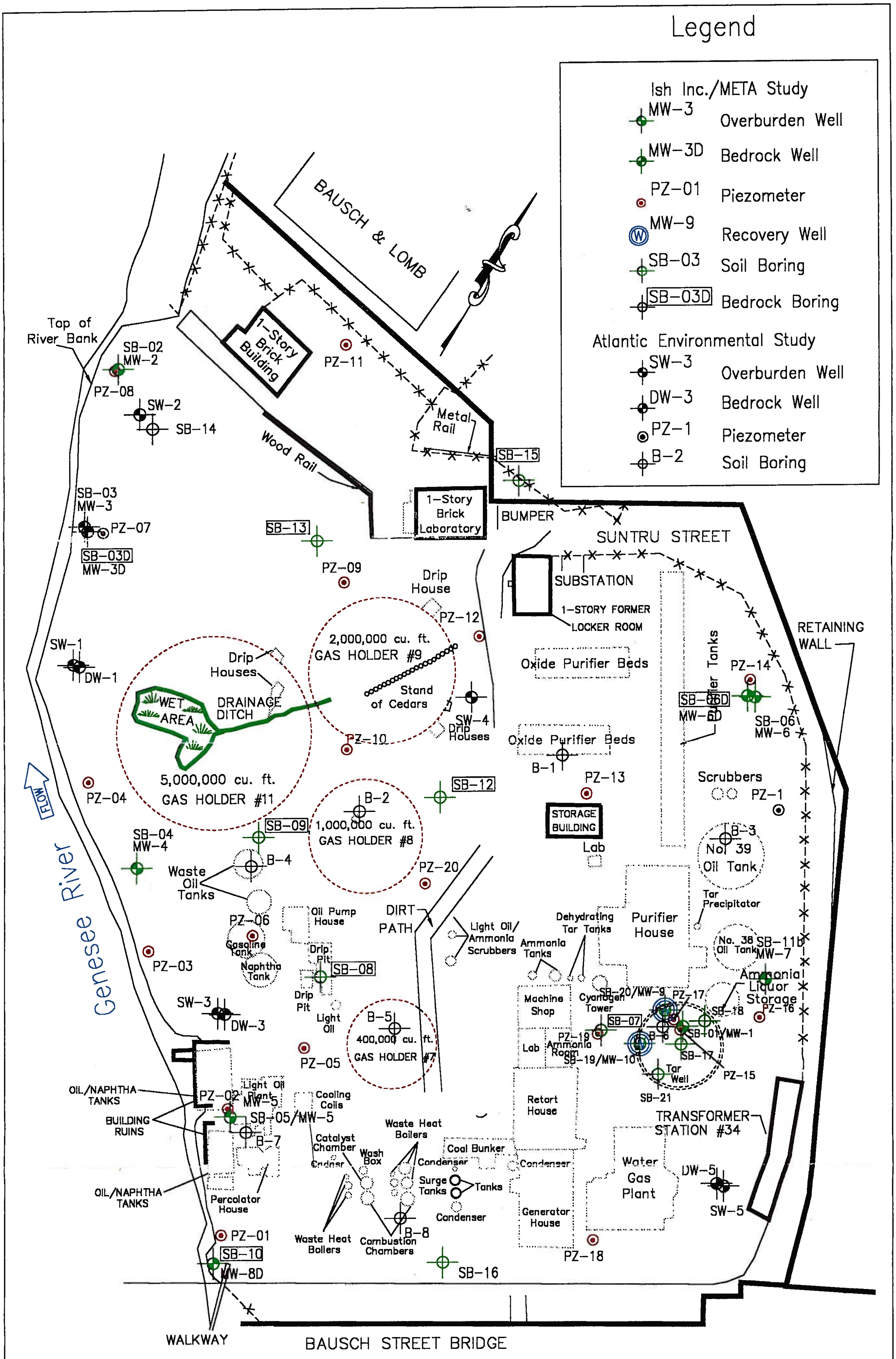


100 50 25 0 100

Scale (ft)

Map based on site map from Site Investigation Report for East Station MGP Site, Atlantic Environmental Services, Inc., June 1993.

| Project: East Station; Rochester, NY | Client: RG&E/EPRI | META |
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| Figure 3-6 1998 Focused Remedial Investigation Soil Boring Piezometer and Well Locations | | |

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Section 4

# SAMPLE COLLECTION AND HANDLING PROCEDURES

The following subsections provide a description of the sample collection and handling procedures used for the field investigations at the East Station former MGP site.

## PART I WORK

### Riverbank Survey

From September 15 to 30, 1998, the river pool elevation (between the Upper and Middle Falls) was lowered for routine dam maintenance. During this time period, META performed a shoreline reconnaissance along the Genesee riverbank. NAPL was located by both visual observations and shallow intrusive sediment probing.

Specific locations of NAPL were identified along the exposed river sediments, approximately 5 to 10 feet below the normal pool elevation which is 391 feet above mean sea level (MSL). Other locations of NAPL were identified by overturning rocks and probing the shallow exposed sediments with a hand auger. At some locations, it was necessary to probe the sediments that remained under water with a Geoprobe™ Drive Point Sampler because of limited riverbank access resulting from the extensive use of rip rap to stabilize the existing riverbank.

Representative samples of NAPL-impacted sediments were collected with the use of a hand auger and/or a spade. Sediment and NAPL samples were placed directly into 4-ounce jars with septa-lined caps and labeled. Between each sample collection event, all equipment was properly decontaminated to avoid affecting the chemical integrity of the next sample.

At some locations, only a NAPL sample was collected. These types of samples were collected via peristaltic pumping of NAPL directly into 40 mL VOA vials with septa-lined caps through disposable polyethylene tubing. At a few locations, NAPL was peristaltically pumped directly from small visible pools overlying the river bottom. At other locations where sediments and river water were deeper than 2 feet, the drive point sampler was used. For these locations, the drive point sampler was manually advanced into the sediments, the screen was exposed, and samples of NAPL/pore water were recovered. A schematic drawing of the drive point sampler is shown in Figure 4-1.

After a vial was filled with a NAPL or a NAPL/porewater sample and labeled, the polyethylene tubing was discarded and the equipment was decontaminated, prior to the collection of the next sample.

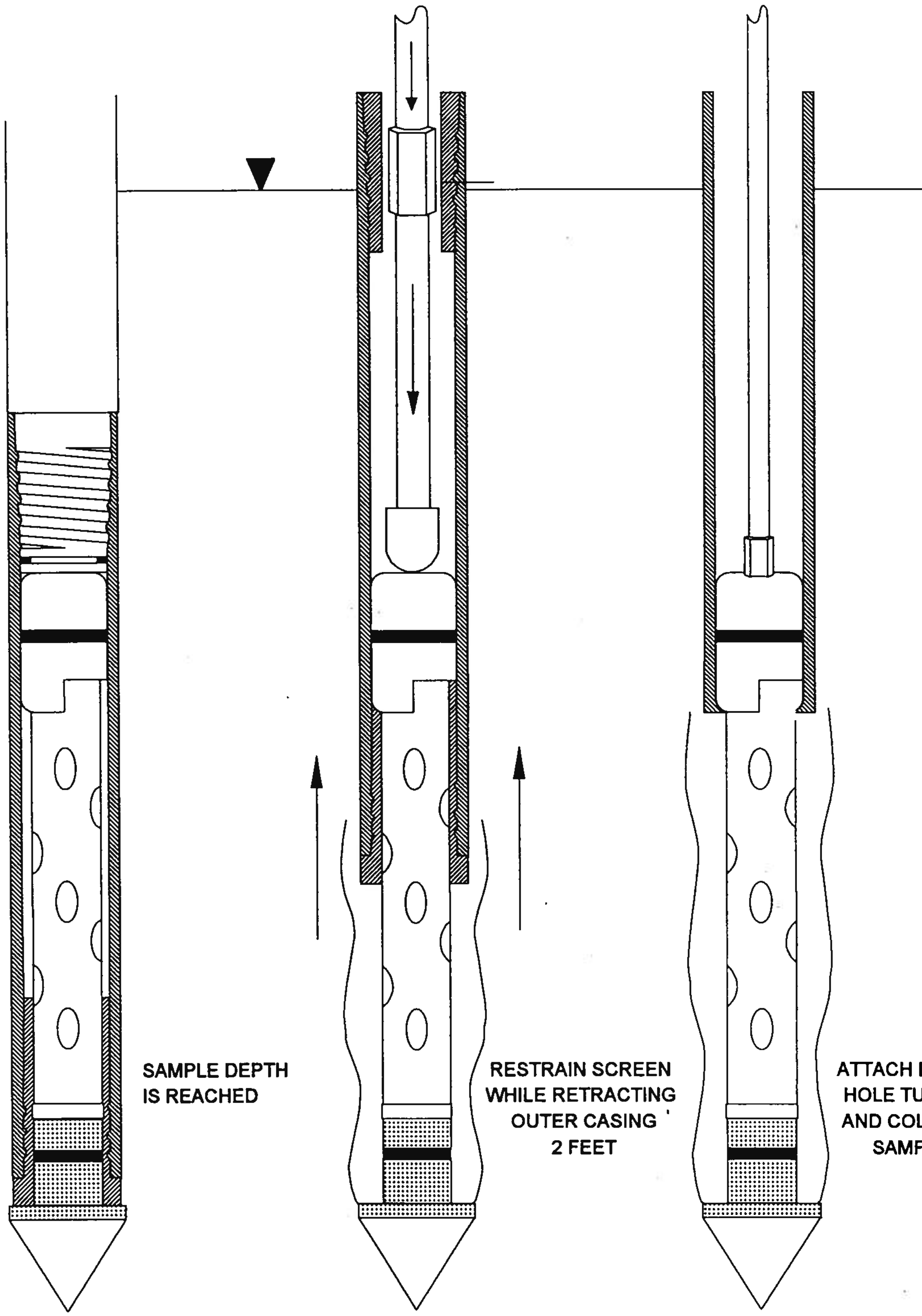
**Drive Point Piezometer Program**

At predetermined locations, drive point piezometers were advanced to bedrock with the use of a Geoprobe™ direct push rig. The field team used existing water level data to ensure that the proper length of screen was used to encompass the entire saturated overburden. Following review of these data, sections of Geoprobe™ rod were linked together with an expendable tip at the end.

Once driven to the appropriate depth (refusal/bedrock), one-inch schedule 40 PVC pipe with 0.010 inch slotted screen was inserted within the Geoprobe™ casing. The rod was then pulled (leaving the tip downhole) and the piezometer was left in place. Once the piezometer was in place, standard Granusil No. 00 sand was backfilled around the screen. The sand was brought up to a minimum of 2 feet above the top of the screen after which granular bentonite was filled to grade. The above grade portion of the PVC was then capped and locked.

Figure 4-1

**Drive Point Sampler**



## PART II WORK

**Drilling Procedures**

Bedrock borings were completed by drilling through the overburden with 4¼-inch hollow stem augers until refusal was reached at the anticipated depth to bedrock. Samples from the overburden were collected and logged as necessary. Once the bedrock was reached a 4-inch temporary casing was spun into the bedrock to isolate the bedrock from the overburden. After a good seal was formed between the temporary casing and the bedrock, a two-inch diameter core-barrel was used to cut the bedrock cores by direct rotary drilling method. Bedrock cores were collected in 5-foot sections. The cuttings from the boring were brought to the surface by water which was continuously circulated through the borehole during the drilling. After completion of the boring the used drilling fluids were stored on-site until proper disposal procedures were determined. Each section of the bedrock was logged and stored in a corebox. If no well was installed at the location, the borehole was sealed with bentonite grout.

Bedrock wells were constructed as double cased wells with 2-inch diameter inner PVC and 4-inch diameter outer stainless steel casings. Bedrock borings finished as monitoring wells had the boring reamed with a 4-inch diameter rotary bit. The Bedrock wells were screened using 0.010 slotted screen from the base of the boring up to the interface of the competent bedrock (approximately 10 feet). A 6-inch diameter guard pipe with a locking cap was placed over the well at the surface. Appendix A presents the details of the bedrock well construction.

The overburden monitoring wells were drilled by direct rotary method using 4 ¼-inch hollow stem augers. Samples from the boring were collected and logged as necessary. Wells in the overburden borings were installed with 2-inch diameter PVC and had 5 to 12-foot screens using 0.010 slotted screen, which were vertically placed based on the type of impacted media present. Appendix A shows overburden well construction detail and soil boring logs.

Two DNAPL recovery wells were installed in the tar well. The borings were drilled with 6 ¼-inch hollow stem augers. The borings were terminated when the base of the tar well was reached. The wells were constructed of 4-inch diameter PVC with 18 inches of 0.030 slotted screen which had 0.125-inch drill holes in it to allow the tar to flow into the screen more easily. The wells were packed with ¾-inch calcite gravel to facilitate movement of tar into the screen. A 6-inch diameter guard pipe with locking cap was installed at the surface for well security.

**Soil Sampling**

During the drilling portion of the work, 38 soil samples from the overburden split-spoons and rock cores were collected for MAH/PAH analysis and hydrocarbon fingerprinting by GC/FID. These samples were selected based on visual or suspected NAPL (elevated PID readings) and typically were indicative of worst case levels of contamination. A clean stainless steel spatula was used to transfer the soils from the split-spoon to 4-ounce glass jars with septa-lined tops. Then, the jars were labeled appropriately, placed on ice maintained at 4° C, and shipped to META's laboratory. The analytical results are summarized in Section 6 (Table 6-3).

**Groundwater Development and Sampling**

All monitoring wells were finished with a locking guard pipe. Also, a concrete pad was constructed around each well or nested set of wells for protection purposes, as well as for shedding precipitation away from the well.

Following installation of the wells, they were developed using 1-inch disposable tubing and a trash pump with a foot-valve, to remove cuttings and silt according to MET 6020. The wells were developed until the water attained visual clarity. Development water was stored in a 21,000 gallon frac tank. Water samples from the frac tank were analyzed chemically and RG&E then disposed of the frac tank contents through the county combined sewer, in accordance with approved regulatory discharge procedures.

Water level data were collected from all well locations on November 20 and again on December 1, 1998 to ensure that the water table had reached equilibration. These two measurements were recorded to account for any variations due to localized influences from the intrusive work. The

December 1, 1998 water level data are summarized in Section 6 and were used to develop the groundwater contour maps shown in that section.

Prior to the commencement of well sampling on December 1, 1998, a hydrocarbon/water interface probe was inserted to determine whether a NAPL was present. Then, at least three well volumes of water were evacuated from each well before groundwater samples were collected for chemical analysis. During purging, temperature, pH, and conductivity were monitored and recorded. Following purging, groundwater sampling was conducted in accordance with MET6021 and completed on December 3, 1998. Care was taken to place the downhole polyethylene tubing in the center of the screened interval so as not to preferentially collect any NAPL at a given well location.

Groundwater samples were analyzed by Chemtech Consulting Group (CHEMTECH) of Englewood, NJ in accordance with the New York State Analytical Services Protocol (ASP). Samples were analyzed for VOCs (including solvents, chlorinated solvents, petroleum hydrocarbons, and MAHs); SVOCs (including PAHs, petroleum hydrocarbons, and phenols); total cyanide; and metals. Duplicate samples were collected from well MW-2 for these analytes and the comparative results are presented in Section 6.

**SAMPLE IDENTIFICATION**

Each sample was assigned a unique field sample ID according to the following scheme:

ES-SB01 ( ) or P01 or MW01 or SW/DW1

where:

| | |
|---|---|
| ES | East Station former MGP site |
| SB01 | Sequential number representing soil boring (sampling depth, in feet) |
| P01 | Sequential number representing piezometer |
| MW01 | Sequential number representing new monitoring well |
| SW/DW | Sequential number representing existing monitoring well (from the 1992 work) |

## SAMPLE HANDLING

All soil samples for MAH/PAH and fingerprint analyses were collected in 4-ounce glass jars with Teflon™ - lined lids. Sample jars were filled completely, leaving no headspace. All NAPL samples were collected in 40 mL glass vials. Groundwater samples were collected in 1-liter amber glass bottles for SVOC analysis, in duplicate 40 mL glass vials preserved with hydrochloric acid for VOC analysis, in 500 mL plastic bottles preserved with nitric acid for metals analysis, and in 500 mL plastic bottles preserved with sodium hydroxide for cyanide analysis.

All sample jars were labeled with the appropriate information, including: date and time of collection, sample ID, depth of collection, and analysis to be performed.

After collection, all sample containers were placed in a field cooler until they were prepared for shipment. Samples were shipped for next day delivery in coolers containing cubed ice in air tight freezer bags. Sample jars were overpacked with bubble bags and styrofoam packing peanuts to ensure that sample integrity was not compromised during shipment.

Proper chain of custody (COC) documentation (MET6022) accompanied all samples shipped to CHEMTECH and META. All COC records are provided in Appendix C.

## DECONTAMINATION

A temporary area for the decontamination of field equipment was set up proximate to the existing laboratory building in the northern portion of the site. This area was designated by a section of plastic sheeting placed on the ground. All decontamination of field equipment occurred in this area.

All non-disposable field sampling equipment used for the collection of soil, such as split-spoons, continuous cores, spatulas, spoons, and trowels, was decontaminated after each use by the following procedure:

- knock, scrape, or wipe off excess soil,
- pre-rinse with tap water,
- wash with non-phosphate detergent and tap water,
- rinse with tap water,
- rinse with methanol,
- rinse with distilled water, and
- air dry on a designated clean surface.

During the soil sampling portion of the work, an equipment rinsate blank was collected and analyzed for MAHs/PAHs weekly as described in the Quality Assurance Project Plan (QAPP) of the SAP. For example, after the split-spoon sampler was decontaminated and prior to collecting the next sample, it was rinsed with deionized water and the rinsate collected as the equipment rinsate blank. Equipment rinsate blanks from the drilling work were collected on October 29, 1998 (ES-RB01), November 9, 1998 (ES-RB02), and November 12, 1998 (ES-RB03). During the groundwater sampling event (December 1 - 3, 1998), three trip blanks (ES-TB01, ES-TB02, and ES-TB03) were transported along with the samples and analyzed for VOCs, in accordance with the QAPP.

An area for the temporary storage of wastewater and decontamination fluids and methanol was designated in proximity to the laboratory building.

## WASTE HANDLING

Contaminated soil cuttings were temporarily stored on-site in five 55-gallon drums. A composite soil sample (ES-DC-1) was collected from these drums on December 3, 1998 and sent to CHEMTECH to be characterized for TCLP VOCs, TCLP metals, TCLP SVOCs, reactivity, and paint filter test. The results of these analyses are presented in Section 6.

Most of the contaminated wastewater generated from decontamination was temporarily stored in a 21,000 gallon capacity frac tank. The frac tank was removed from the site on December 3, 1998.

Prior to disposal of this wastewater to the publicly owned treatment works (POTW) on or about November 12, 1998, it was characterized for MAHs and PAHs based on two samples (ES-WW01 and ES-WW02). These wastewater characterization results are shown in Section 6. In addition, after cleaning the frac tank, a mixture of frac tank rinse water and wastewater was placed into eight 55-gallon drums for eventual disposal to the POTW. On December 3, 1998, a sample of the 1,000 gallon Ag tank (ES-WW-3), which contained the more contaminated wastewater, was sampled and sent to CHEMTECH to be characterized for TCLP VOCs, TCLP metals, TCLP SVOCs, reactivity, and pH. Also, a sample of the Ag tank was sent to META for MAH and PAH analysis (ES-WW03).

**HEALTH AND SAFETY**

Prior to collecting any subsurface soil samples, a "safety area" was designated. This area encompassed the drive point and drilling unit extending outward to a 25-foot radius around the rig, and was designated by the use of orange safety cones and/or yellow caution tape. Only authorized employees wearing the proper safety and protective gear were allowed inside the safety area. All logging, sampling, and decontamination procedures were carried out within the perimeter of the safety area. Modified Level D personal protection was used. The level of protection required by site workers, if warranted by changing conditions, would have been upgraded as discussed in the site-specific Health and Safety Plan (HASP) of the SAP.

In addition, the underground utility locating service for the State of New York was contacted for an underground utility check at least 3 days prior to conducting any subsurface investigations at the site. Final drive point and soil boring locations were determined after clearance by this service.

Section 5

# ANALYTICAL PROCEDURES

The following paragraphs list and briefly describe the methods of analysis and the QA/QC measures that were used for this project to assure that high quality data were generated. Detailed descriptions of analytical methodology and quality control operations and criteria were provided in the QAPP.

Sample containers were precleaned QC-acceptable vessels and all samples were stored in accordance with the QAPP to ensure sample integrity. Any samples that were collected for shipment to a laboratory were packed and shipped in accordance with the QAPP, and COC procedures were used to document sample possession.

In addition, blank, spike, and duplicate samples were analyzed to provide checks regarding impacts of sampling and sample handling on analytical results, variation among samples, and analytical precision and accuracy.

## SOIL ANALYSIS

As described in Section 4, samples were collected into precleaned sample jars and shipped overnight to the laboratory. During log-in at the laboratory, the sample identification, date and time of collection, the priority designation of each sample, and any notation regarding sample integrity or preservation were entered in the laboratory database.

After log-in, all samples received at the laboratory were stored in a designated refrigerator at approximately 4° C.

**MAH/PAH Quantitation by Draft EPA Method 3570 with GC/FID**

A portion of each soil sample was extracted and analyzed for monocyclic aromatic hydrocarbons (MAHs) and polycyclic aromatic hydrocarbons (PAHs), and hydrocarbon fingerprinting by META using draft EPA Method 3570 with GC/FID (EPA Method 8100 modified). Method details and QC parameters are provided in the QAPP.

## NAPL ANALYSIS

NAPL samples were quantitatively diluted in methylene chloride and analyzed by the same GC/FID method as the soils. Method details and QC parameters were provided in the QAPP.

## AQUEOUS ANALYSIS

**MAH/PAH Analysis**

Aqueous samples were extracted by draft EPA Method 3511 developed for the simultaneous determination of MAHs, PAHs, and hydrocarbon fingerprinting, and analyzed by the same GC/FID method as used for soil and NAPL samples.

**Metals Analysis**

Groundwater samples were analyzed for priority pollutant metals, with the exception of mercury, by inductively coupled plasma argon spectroscopy (ICAP) (EPA Method 6000 Series). Mercury was analyzed by cold vapor methodology in accordance with EPA Method 7470/7471. The method detection limits (MDLs) for these metals are provided in Table 5-1.

**Cyanide Analysis**

Groundwater samples were analyzed for total cyanide as per EPA Method 9012A with an MDL of 10 μg/L.

Table 5-1

## Method Detection Limits for Metals in Water

| Metal | Method Detection Limit, $\mu g/L$ |
|---|---|
| Aluminum | 200 |
| Antimony | 60 |
| Arsenic | 10 |
| Barium | 200 |
| Beryllium | 5 |
| Cadmium | 5 |
| Calcium | 5,000 |
| Chromium | 10 |
| Cobolt | 50 |
| Copper | 25 |
| Iron | 100 |
| Lead | 3 |
| Magnesium | 5,000 |
| Manganese | 15 |
| Mercury | 0.2 |
| Nickel | 40 |
| Potassium | 5,000 |
| Selenium | 5 |
| Silver | 10 |
| Sodium | 5,000 |
| Thallium | 10 |
| Vanadium | 50 |
| Zinc | 20 |

**SVOC Analysis**

Groundwater samples were analyzed for SVOCs using EPA Method 8270 with an MDL for each compound as shown in Table 5-2.

**VOC Analysis**

Groundwater samples were analyzed for VOCs using EPA Method 8260 with an MDL for each compound as shown in Table 5-3.

## QUALITY ASSURANCE/ QUALITY CONTROL

Quality assurance was the responsibility of the Quality Assurance Officer (QAO). The QAO aided in the development of the detailed QAPP in which all aspects of quality management were defined. Throughout the study, the QAO monitored the field and laboratory operations to ensure adherence to the procedures and criteria of the QAPP.

Table 5-2

## Method Detection Limits for SVOCs in Water

| SVOCs | in $\mu$g/L | SVOCs | in $\mu$g/L |
|---|---|---|---|
| bis(2-Chloroethyl)ether | 3.57 | Aniline | 1.11 |
| Phenol | 2.08 | 2-Chlorphenol | 0.95 |
| 1,3-Dichlorobenzene | 0.91 | 1,4-Dichlorobenzene | 0.56 |
| 1,2-Dichlorobenzene | 0.43 | 2,2'-Oxybis(1-chloropropane) | 1.35 |
| Benzyl alcohol | 1.29 | 2-Methylphenol | 0.78 |
| Hexachloroethane | 1.05 | n-Nitroso-di-n-propylamine | 0.95 |
| 4-Methylphenol | 1.66 | Nitrobenzene | 0.72 |
| Isophorone | 0.97 | 2-Nitrophenol | 0.85 |
| 2,4-Dimethylphenol | 0.76 | bis(2-Chloroethoxy)methane | 0.81 |
| 2,4-Dichlorophenol | 0.70 | 1,2,4-Trichlorobenzene | 2.77 |
| Naphthalene | 0.94 | Benzoic Acid | 1.23 |
| 4-Chloroaniline | 1.33 | Hexachlorobutadiene | 0.75 |
| 4-Chloro-3-methylphenol | 0.94 | 2-Methylnaphthalene | 0.55 |
| Hexachlorocyclopentadiene | 0.76 | 2,4,6-Trichlorophenol | 0.86 |
| 2,4,5-Trichlorophenol | 1.73 | 2-Chloronaphthalene | 0.74 |
| 2-Nitroaniline | 0.90 | Acenaphthylene | 0.86 |
| Dimethylphthalate | 1.04 | 2,6-Dinitrotoluene | 0.66 |
| 3-Nitroaniline | 3.09 | Acenaphthene | 0.67 |
| 2,4-Dinitrophenol | 1.00 | Dibenzofuran | 0.80 |
| 4-Nitrophenol | 1.36 | 2,4-Dinitrotoluene | 3.28 |
| Fluorene | 0.73 | Diethylphthalate | 1.05 |
| 4-Chlorophenyl-phenylether | 0.98 | 4-Nitroaniline | 2.63 |
| 4,6-Dinitro-2-methylphenol | 0.42 | n-Nitrosodiphenylamine | 1.24 |

Table 5-2 (Cont'd)

## Method Detection Limits for SVOCs in Water

| SVOCs | in $\mu g/L$ | SVOCs | in $\mu g/L$ |
|---|---|---|---|
| 4-Bromophenyl-phenylether | 0.74 | Hexachlorobenzene | 0.99 |
| Pentachlorophenol | 1.07 | Phenanthrene | 1.13 |
| Anthracene | 0.65 | Carbazole | 2.39 |
| Di-n-butylphthalate | 1.09 | Fluoranthene | 1.18 |
| Benzidine | 1.74 | Pyrene | 0.84 |
| Butylbenzylphthalate | 0.80 | Benz(a)anthracene | 0.81 |
| 3,3'-Dichlorobenzidine | 0.33 | Chrysene | 0.75 |
| bis(2-Ethylhexyl)phthalate | 0.78 | Di-n-octylphthalate | 1.57 |
| Benzo(b)fluoranthene | 2.12 | Benzo(k)fluoranthene | 5.19 |
| Benzo(a)pyrene | 1.61 | Indeno(1,2,3-cd)pyrene | 2.68 |
| Dibenz(a,h)anthracene | 3.31 | Benzo(g,h,i)perylene | 3.34 |
| Pyridine | 2.41 | N-nitroso-dimethylamine | 1.38 |

Table 5-3

## Method Detection Limits for VOCs in Water

| VOCs | in $\mu g/L$ | VOCs | in $\mu g/L$ |
|---|---|---|---|
| 1,1-Dichloroethene | 0.31 | cis-1,2-Dichloroethene | 0.38 |
| trans-1,2-Dichloroethene | 0.30 | 2,2-Dichloropropane | 0.47 |
| Bromodichloremethane | 0.47 | Bromochloromethane | 0.48 |
| Bromomethane | 0.54 | Bromoform | 0.29 |
| Chloroform | 0.35 | 1,2-Dichloroethane | 0.42 |
| Chloroethane | 0.53 | Dibromochloromethane | 0.40 |
| Dichlorodifluoromethane | 0.30 | 1,1,1-Trichloroethane | 0.26 |
| Trichlorotrifluoromethane | 0.24 | 1,1-Dichloroethane | 0.42 |
| 1,1-Dichloropropene | 0.24 | Carbon Tetrachloride | 0.17 |
| Acetone | 2.04 | Benzene | 0.43 |
| 2,2-Dichloropropane | 0.47 | Trichloroethene | 0.94 |
| 1,2-Dibromoethane | 0.34 | Dibromomethane | 0.49 |
| Bromodichloromethane | 0.47 | Toluene | 0.26 |
| 1,1,2-Trichloroethane | 0.57 | 1,3-Dichloropropane | 0.34 |
| 1,2-Dichloropropane | 0.35 | Tetrachlorethene | 0.36 |
| Chlorobenzene | 0.40 | 1,1,1,2-Tetrachloroethane | 0.34 |
| Methylene Chloride | 0.44 | Ethylbenzene | 0.31 |
| m/p-Xylenes | 0.24 | Styrene | 0.39 |
| o-Xylene | 0.35 | 1,1,2,2-Tetrachloroethane | 0.50 |
| 1,2,3-Trichloropropane | 0.39 | N-propylbenzene | 0.39 |
| 2-Butanone | 1.34 | 2-Chlorotoluene | 0.39 |
| Isopropylbenzene | 0.30 | 4-Chlorotoluene | 0.39 |
| Bromobenzene | 0.43 | 1,3,5-Trimethylbenzene | 0.35 |

Table 5-3 (Cont'd)

## Method Detection Limits for VOCs in Water

| VOCs | in $\mu g/L$ | VOCs | in $\mu g/L$ |
|---|---|---|---|
| tert-Butylbenzene | 0.30 | 1,2,4-Trimethylbenzene | 0.46 |
| 1,3-Dichlorobenzene | 0.40 | sec-Butylbenzene | 0.30 |
| 1,4-Dichlorobenzene | 0.22 | 4-Isopropyltoluene | 0.43 |
| 1,2-Dichlorobenzene | 0.31 | n-Butylbenzene | 0.38 |
| 1,2-Dibromo-3-Chloropropane | 0.69 | 1,2,4-Trichlorobenzene | 0.60 |
| Naphthalene | 0.94 | Hexachlorobutadiene | 0.35 |
| 1,2,3-Trichlorobenzene | 0.66 | Vinyl Chloride | 0.40 |

Section 6

# DATA PRESENTATION

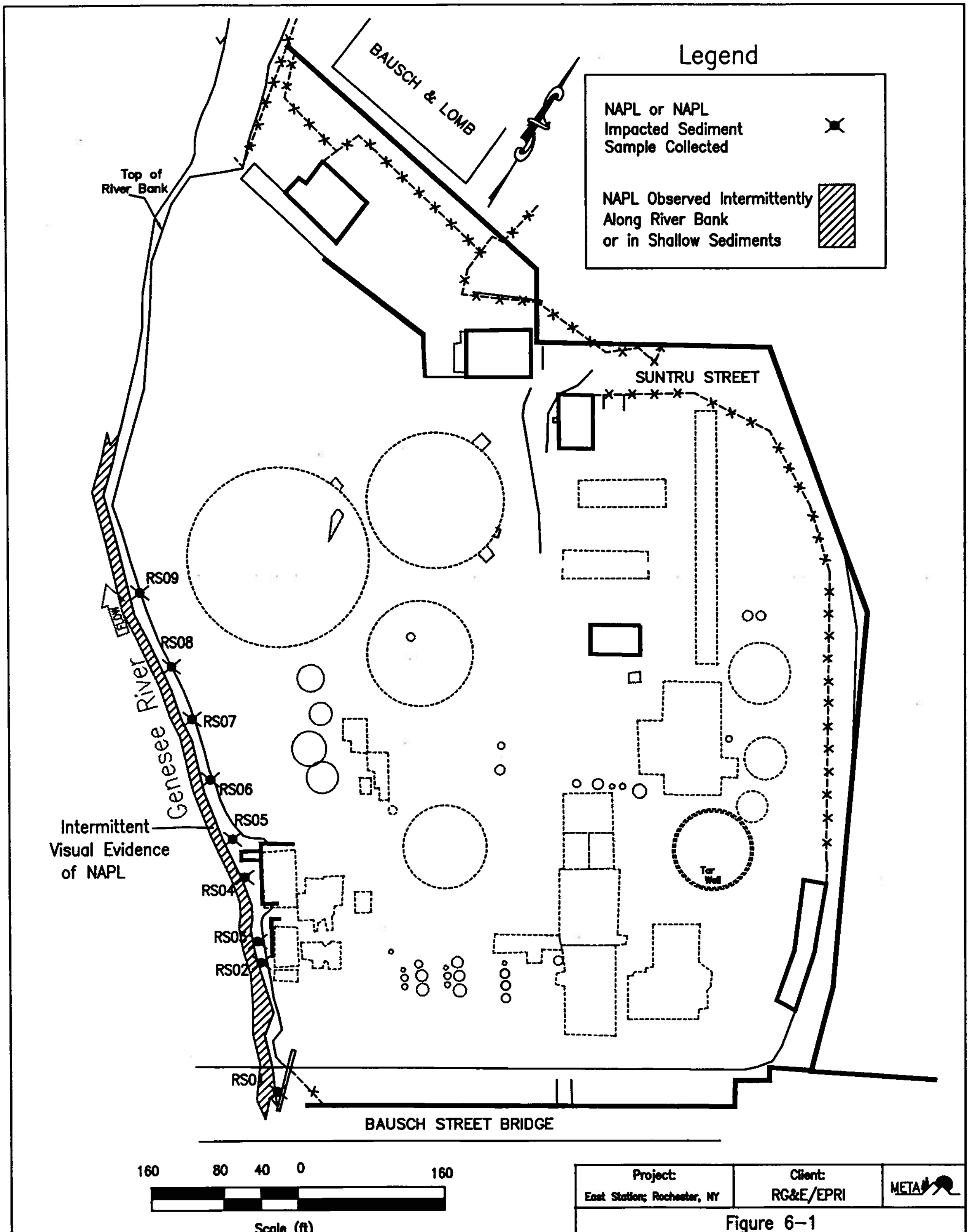
The following subsections present the results from the riverbank survey and the data from soil, sediment, groundwater, NAPL, waste, and QA/QC samples. Section 7 provides the discussion and interpretation of these results.

## RIVERBANK SURVEY RESULTS

Evidence of NAPL was observed at several locations at the exposed face of the riverbank and within the shallow sediments, particularly northward from the Bausch Street Bridge to approximately 750 feet down river, as shown on Figure 6-1. A total of six sediment samples and three DNAPL samples were collected during the riverbank survey for GC/FID fingerprinting. The results of these samples are summarized in Table 6-1 and the riverbank sampling locations are shown on Figure 6-1. Chromatograms for these samples are included in Appendix D and the MAH and PAH data are provided in Appendix E.

As shown in Table 6-1, all of the sediment samples had detectable MAHs and PAHs (5.2 to 6.6 mg/kg for total MAHs and 37 to 1,700 mg/kg for total PAHs). The three DNAPL samples had concentrations of 8,400 to 14,000 mg/kg for total MAHs and 170,000 to 200,000 mg/kg for total PAHs, and were chromatographically identified as being "tar." Nevertheless, all of the sediment samples had GC fingerprints which were identified as being "tar-containing".

None of the sediment or DNAPL samples contained any evidence of a petroleum product.




Map based on site map from Site Investigation Report for East Station MGP Site, Atlantic Environmental Services, Inc., June 1993.

| Project: East Station; Rochester, NY | Client: RG&E/EPRI | META |
|---|---|---|

Figure 6-1
1998 Focused Remedial Investigation
Riverbank Sampling Locations

| Filename: | Drawn by: | Approved by: | Date: |
|---|---|---|---|
| REDINV.DWG | SRM | IS | 8/12/1999 |

Table 6-1

**Riverbank Survey Results**

| Sample Location | Sample Type | Fingerprint | Total MAHs, mg/kg | Total PAHs, mg/kg |
|---|---|---|---|---|
| RS01 | DNAPL | T | 8,400 | 190,000 |
| RS02 | sediment | TC | 10 | 180 |
| RS03 | sediment | TC | 41 | 1,700 |
| RS04 | DNAPL | T | 12,000 | 170,000 |
| RS05 | sediment | TC | 66 | 580 |
| RS06 | sediment | TC | 5.2 | 37 |
| RS07 | sediment | TC | 5.4 | 63 |
| RS08 | DNAPL | T | 14,000 | 200,000 |
| RS09 | sediment | TC | 6.6 | 150 |

T (tar with no evidence of refined petroleum or light oil)
TC (tar-containing sediment with no evidence of refined petroleum or light oil)

Note: While the chromatographic patterns were very similar among the samples, there were some small differences. However, no other hydrocarbon substances, such as refined petroleum product or light oil, were indicated by the chromatographic fingerprints.

## PIEZOMETER SAMPLING RESULTS

A total of 19 liquid samples were collected from selected piezometers and one of the existing monitoring wells for GC/FID fingerprinting. Table 6-2 summarizes the fingerprinting results, the MAH and PAH data, and indicates whether the sample was collected from the top or bottom of the piezometer. These results are discussed in the subsection on fingerprinting, the chromatograms for these samples are included in Appendix D, and the full MAH and PAH data are provided in Appendix E.

Samples collected from the bottoms of three piezometers (PZ-03, PZ-07, and PZ-17) contained DNAPL, while floating organic liquids (LNAPLs) were collected from the tops of two piezometers (PZ-02 and PZ-16). Also, some NAPL was present in the bottom of piezometers APZ-1 and PZ-13.

The three DNAPL samples ranged in concentrations of total MAHs from 4,300 to 16,000 mg/kg and total PAHs from 140,000 to 240,000 mg/kg. The two LNAPL samples contained between 1,100 and 11,000 mg/kg of total MAHs and 39,000 and 40,000 mg/kg of total PAHs. Twelve of the remaining 14 samples contained some type of tar-related signature, such as dissolved phase tar. Two of these samples also contained evidence of a petroleum product. Thus, 13 of the 19 samples had tar-related residues, two samples had petroleum-related residues, two samples had a mixture of tar and petroleum, one sample had no detectable MAHs or PAHs, and one sample had some low concentrations of PAHs and other organic substances, with no discernable pattern.

## BEDROCK AND SOIL BORING/MONITORING WELL PROGRAM RESULTS

### Overview of Site Geology

The stratigraphy of the bedrock and the overburden soils was determined from inspection and logging of samples collected during borings completed for the present work and from past work at the site (Atlantic, 1993). One bedrock unit (Rochester Shale Member of the Clinton Group) and two overburden units (fill material and alluvial deposits) were identified. Rochester Shale outcrops are

Table 6-2

**Piezometer Sample Results**

| Location | Fingerprint | Total MAHs | Total PAHs |
|---|---|---|---|
| PZ-01 top | predominantly MAHs and naphthalene, much less PAHs, no UCM (unresolved complex mixture) or alkanes | 8.5 mg/L | 5.6 mg/L |
| APZ-1 Bot. | predominantly MAHs and PAHs, slight UCM [NAPL] | 190 mg/kg | 4,300 mg/kg |
| PZ-02 top | predominantly MAHs and naphthalene and large high molecular weight UCM [LNAPL] | 11,000 mg/kg | 40,000 mg/kg |
| PZ-03 Bot. | predominantly MAHs and PAHs, no UCM [DNAPL] | 16,000 mg/kg | 240,000 mg/kg |
| PZ-04 Bot. | predominantly 3-, 4-, 5-, and 6-ring PAHs, less MAHs and 2-ring PAHs, moderate mid-range UCM | 1.5 mg/L | 1.6 mg/L |
| PZ-06 top | predominantly MAHs and naphthalene, much less PAHs, no UCM or alkanes | 4.4 mg/L | 6.8 mg/L |
| PZ-06 Bot. | predominantly MAHs and PAHs, slight UCM | 6.7 mg/L | 26 mg/L |
| PZ-07 top | predominantly MAHs and PAHs, slight UCM | 20 mg/L | 650 mg/L |
| PZ-07 Bot. | predominantly MAHs and PAHs, slight UCM [DNAPL] | 4,300 mg/kg | 140,000 mg/kg |
| PZ-09 Bot. | no detected MAHs/PAHs, UCM, or other features | < 0.01 mg/L | < 0.01 mg/L |
| PZ-12 Bot. | predominantly MAHs and low molecular weight PAHs, less high molecular weight PAHs, slight UCM and no alkanes | 1.7 mg/L | 2.7 mg/L |
| PZ-13 top | predominantly MAHs and low molecular weight PAHs, less high molecular weight PAHs, no UCM or alkanes | 1.2 mg/L | 1.5 mg/L |
| PZ-13 Bot | low concentrations of MAHs and PAHs, slight UCM [NAPL] | 6.6 mg/kg | 140 mg/kg |
| PZ-16 top | predominantly PAHs and prominent UCM, notable isoprenoid hydrocarbons [LNAPL] | 1,100 mg/kg | 39,000 mg/kg |
| PZ-17 Bot. | predominantly MAHs and PAHs, slight UCM [DNAPL] | 11,000 mg/kg | 180,000 mg/kg |
| PZ-19 top | predominantly MAHs and PAHs, slight UCM | 7.6 mg/L | 90 mg/L |
| PZ-19 Bot. | predominantly MAHs and PAHs, slight UCM | 15 mg/L | 190 mg/L |
| PZ-20 top | predominantly MAHs/PAHs, prominent late eluting UCM | 26 mg/L | 830 mg/L |
| DW-3B | predominantly MAHs and PAHs, slight UCM | 160 mg/L | 2,500 mg/L |

evident in a cliff face just west of the river. The Rochester Shale is also believed to be beneath a thin layer of overburden material and behind a retaining wall along the east face of the river gorge.

The overburden at the site consists mainly of fill which at some locations is directly on top of bedrock and at other locations is underlain by alluvial deposits, and then the bedrock. The fill consists of mainly sand-sized particles with fragments of clinker, ash, cinders, slag, purifier material, glass, pebbles, coal, concrete, brick, and fire brick with some layers of clay and silt. Much of this fill is imported excavation materials and MGP-related residuals (Atlantic, 1993).

The alluvial deposits at the site consist of poor to well-sorted gravel to clay-sized material which tend to become thicker away from the river. The dominant alluvial deposit is clay with bands of pebbles and sand, which was found in several borings.

Previous studies conducted at the site (Atlantic, 1993) located the bedrock (Rochester Shale) from 8 to 37 feet below ground surface. The Rochester Shale was formed in the Silurian Period and is light to dark grey, fine grained, fossiliferous dolomitic mudstone with interbeds of dolomite and limestone, trace pits and vugs, vertical fractures, and horizontal fractures.

Borings across the river from the East Station site were completed for a preliminary review for NYS superfund site No. 828044 (Morrison-Knudsen Engineers, Inc., 1986). One of these borings was located about 300 feet west of the East Station site and located the Rochester Shale/Irondequoit Limestone contact at an elevation of 394.3 feet above MSL. The bedrock surface elevation of the East Station site ranges from 382 to 403 feet above MSL. Other borings located across the river from the site also placed this interface (shale/limestone) at about 394 feet above MSL plus or minus 4 feet. Based on the previous work, (Morrison-Knudsen Engineers, Inc., 1986 and Scherzer, 1983), the interface of Rochester Shale with the Irondequoit Limestone is expected to be located at about the same elevation on the East Station site as on the western side of the gorge. This expectation exists because the bedrock in the area has a strike of N75°E and a dip of about 50 feet per mile in the direction N15°E. Therefore, the elevation of the contact (shale/limestone) will not significantly change from one side of the river to another. Previous work, Atlantic, 1993, labeled the Rochester Shale to elevations of 356 feet above MSL. For the current investigation, bedrock on the East Station site is referred to as Rochester Shale.

The Irondequoit Limestone was also formed in the Silurian Period and is medium grey, fine to medium grained, thin to medium bedded, fossiliferous with interbeded dark grey shale, and thin to very thin dolomitic shale. The Rochester Shale and the Irondequoit limestone are similar in appearance and in hydrogeologic properties. This similarity makes them difficult to distinguish from one another. The fact that the borings completed by Morrison-Knudsen Engineers, Inc., were drilled to the Furnaceville Hematite Member of the Reynales Limestone allows for a more accurate interpretation of the rock units which tend to have several of the common properties. This hematite level should appear at an elevation of 320 to 330 feet above MSL on the East Station site (Morrison-Knudsen Engineers, Inc., 1986 and Scherzer, 1983). Future deep bedrock work at the site could locate the Furnaceville Hematite which could be used as a basis of bedrock interpretation.

Based on data for the recharge of the bedrock wells, the vertical fractures (joints) are likely to intersect the horizontal fractures and provide a pathway for the transmission of both groundwater and DNAPL. Regional joint orientation can be found in the rosette diagram shown as Figure 6-2. An on-site local bedrock high was found in the eastern corner near the Bausch Street Bridge and wells SW-5 and DW-5. The highest bedrock elevation is near PZ-16 in proximity to the former combustion chambers, waste heat boilers, and the tar well. The general slope of the bedrock at the site is from east to west toward the river, with a steeper slope in the middle of the site and a more gentle slope near the river. However, the rock slopes to the east in the vicinity of MW-7.

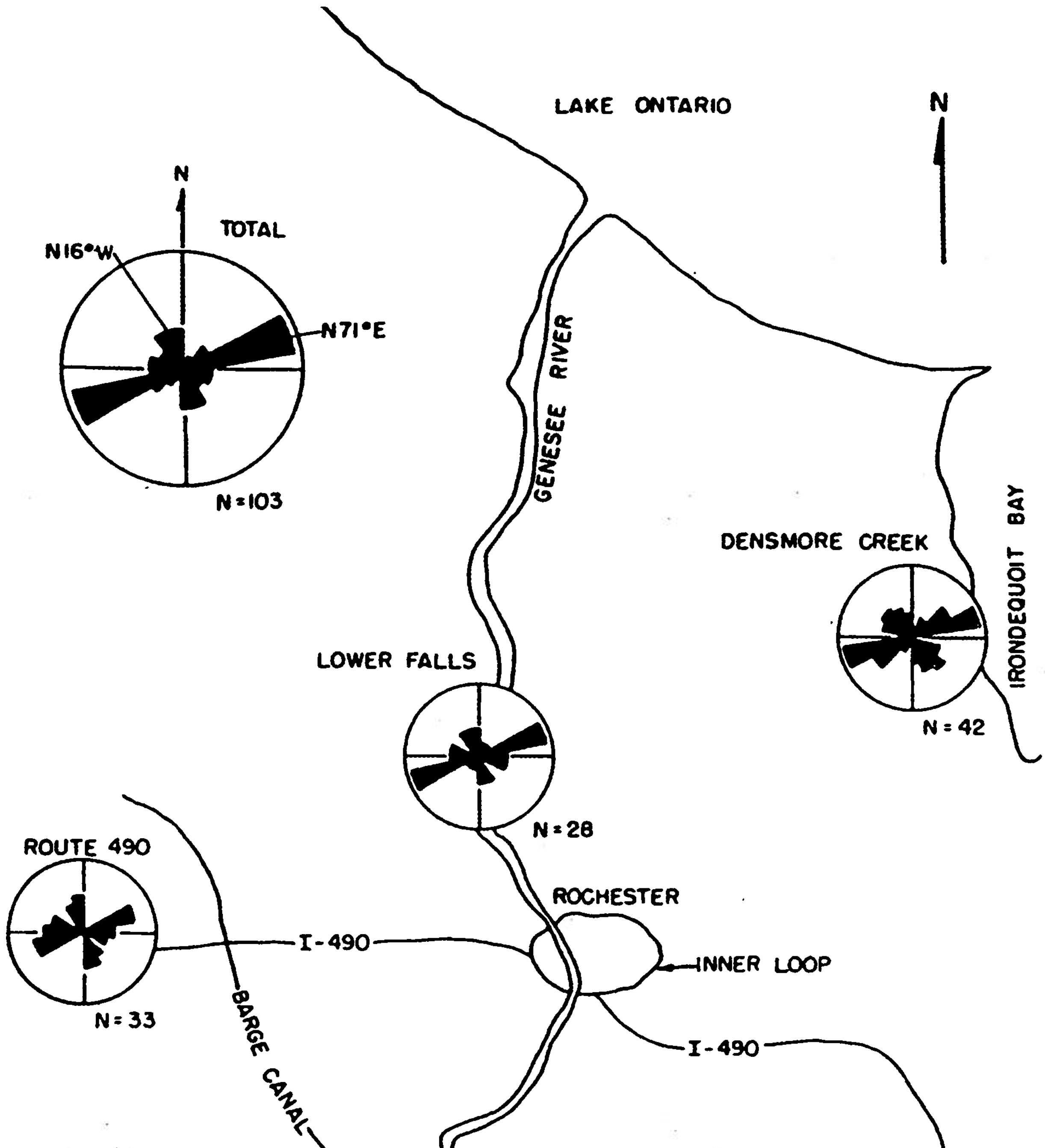
In addition, the surface of the bedrock is significantly weathered in some locations.

**Overburden Soils Data**

Twenty six split-spoon soil samples from various borings at selected depth intervals were analyzed for fingerprinting and MAH/PAHs by GC/FID, and one sample (from boring SB-14) was analyzed

Figure 6-2

**Rosette Diagrams of Major Joint Orientations**




Source: Scherzer, 1983

Scale: 1 inch = 6000 feet

for mercury (Hg). The results from these samples are summarized in Table 6-3 and discussed in the fingerprinting subsection. In general, based on the boring logs, little evidence of odors or staining was present from 0 to 10 feet in the site's central and western portions and 0 to 6 feet in the eastern portion.

As shown in Table 6-3, 17 of the 26 samples contained tar or evidence of tar, three samples had evidence of one or more petroleum types, four samples had evidence of both tar and petroleum, and the remaining two samples did not have discernable chemical patterns. The chromatograms are included in Appendix D, the complete MAH and PAH data set for the soil samples is included in Appendix E, and the mercury results are included in Appendix G. Cross-sectional views of the borings along selected transects are provided in Figures 6-3 through 6-5.

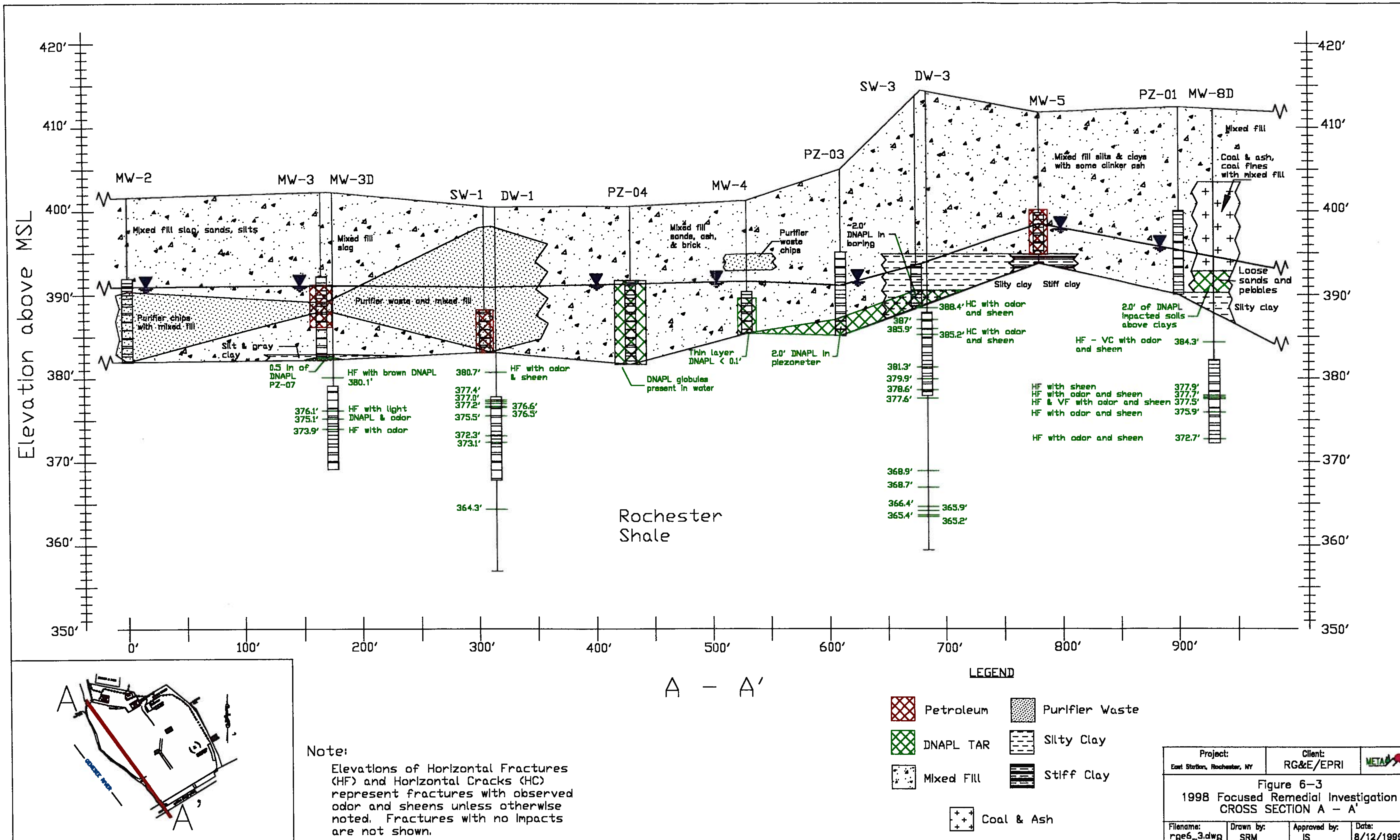
**Data From Bedrock Borings**

Bedrock borings were cored to an approximate 10-foot depth of penetration at five locations (SB-07, SB-08, SB-09, SB-12, and SB-13). In addition, three bedrock borings were converted into bedrock monitoring wells at locations MW-3D (15 feet of rock penetration), MW-6D (20 feet of rock penetration) and SB-10/MW-8D (10 feet of rock penetration). Cross-sectional views of the borings along selected transects are provided in Figures 6-3 through 6-5.

Figure 6-3, the cross section along the riverbank, illustrates several important features. For example, DNAPL was observed at all locations sampled along transect A-A' during this investigation, except MW-2 and PZ-01. All of the DNAPL-containing soils were found in the bottom few feet of the overburden, just above the overburden/bedrock interface. These observations are similar to those made during the previous investigation (Atlantic, 1993). At the PZ-03 location where there is a drop in the bedrock elevation from SW-3, the DNAPL was about two feet thick and appeared to be "pooled" above the bedrock. Evidence of DNAPL in the bedrock was noted in all four bedrock borings. In addition, purifier wastes were observed at several locations, particularly in the northwestern portion of the site. Finally, an LNAPL, identified as lube oil, was observed in MW-5 and fuel or gas oil was observed at MW-3 and SW-1.

## Table 6-3
## Split-spoon Soil Sample Results

| Location | Fingerprint | Total MAHs, mg/kg | Total PAHs, mg/kg |
|---|---|---|---|
| SB-01 (12.6-12.8) | predominantly MAHs and PAHs, no UCM | 1,400 | 88,000 |
| SB-01 (21.6-22) | predominantly MAHs and PAHs, no UCM | 340 | 5,000 |
| SB-01 (22.9-23.3) | predominantly MAHs and PAHs, no UCM | 530 | 14,000 |
| SB-02 (15.4-15.7) | predominantly 3-, 4-, 5-, and 6-ring PAHs, less MAHs and 2-ring PAHs, moderate late- eluting UCM, possible alkane series | 23 | 190 |
| SB-02 (19-19.3) | predominantly 3-, 4-, 5-, and 6-ring PAHs, less MAHs and 2-ring PAHs, prominent late- eluting UCM | 5.8 | 70 |
| SB-03 (11.7-12) | prominent mid-weight bell-shaped UCM, no normal alkane series, visible isoprenoid hydrocarbons, little MAHs and PAHs | 11 | interferences |
| SB-03 (13.7-14.0) | prominent mid-weight bell-shaped UCM, no normal alkane series, visible isoprenoid hydrocarbons, little MAHs and PAHs | 3.4 | 270 |
| SB-04 (7.7-8.0) | STC (soil w/tar contam) | 300 | 2,400 |
| SB-04 (11.4-11.7) | predominantly 3-, 4-, 5-, and 6-ring PAHs, less MAHs and 2-ring PAHs, moderate late- eluting UCM | 240 | 1,500 |
| SB-05 (11.3-11.7) | predominantly MAHs and PAHs, prominent late eluting UCM | 280 | 5,100 |
| SB-06 (11.8-12) | predominantly MAHs and PAHs, no UCM | 1.6 | 48 |
| SB-06 (20.9-21.3) | predominantly 3-, 4-, 5-, and 6-ring PAHs, less MAHs and 2-ring PAHs, moderate mid-weight UCM, possible isoprenoid hydrocarbons | 25 | 540 |
| SB-6D (36.1-36.3) | predominantly MAHs and PAHs, no UCM | 1.2 | 480 |
| SB-07 (15.8-16) | predominantly MAHs and PAHs, no UCM | 61 | 2,600 |
| SB-07B (25.4-25.7) | predominantly MAHs and PAHs, no UCM | 210 | 5,600 |
| SB-08 (20.9-21.2) | predominantly MAHs and PAHs, no UCM | 400 | 4,100 |
| SB-09 (22.8-23) | predominantly MAHs and PAHs, large mid-weight UCM, isoprenoid hydrocarbons | 63 | 940 |
| SB-10 (19.3-20.0) | predominantly MAHs and PAHs, slight UCM | 21 | 2,700 |
| SB-10 (22.2-2.5) | predominantly MAHs and PAHs, slight UCM | 54 | 2,000 |
| SB-11B (19.5-19.7) | predominantly gasoline-range hydrocarbons, prominent gas oil-range UCM, isoprenoid hydrocarbons, low amounts of PAHs | 7.0 | 96 |
| SB-11B (31.5-31.8) | predominantly MAHs and PAHs, slight UCM | 31 | 2,700 |
| SB-13 (18.7-18.9) | unknown | 4.5 | 21 |
| SB-14 (2.0-6.0) | 0.72 mg/kg Hg | | |
| SB-15 (9.6-9.8) | nothing detected | 0.37 | 1.9 |
| SB-15 (15.5-15.7) | predominantly PAHs, no UCM | 0.92 | 14 |
| SB-16 (19.4-19.6) | predominantly 4-, 5-, and 6-ring PAHs, no MAHs and 2- and 3-ring PAHs, moderate mid-weight UCM, possible isoprenoid hydrocarbons | 1.5 | 110 |
| SB-16 (22.8-23) | predominantly MAHs and PAHs, slight UCM | 39 | 2,400 |




Note:
Elevations of Horizontal Fractures (HF) and Horizontal Cracks (HC) represent fractures with observed odor and sheens unless otherwise noted. Fractures with no impacts are not shown.

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|---|---|---|

Figure 6-3
1998 Focused Remedial Investigation
CROSS SECTION A – A'

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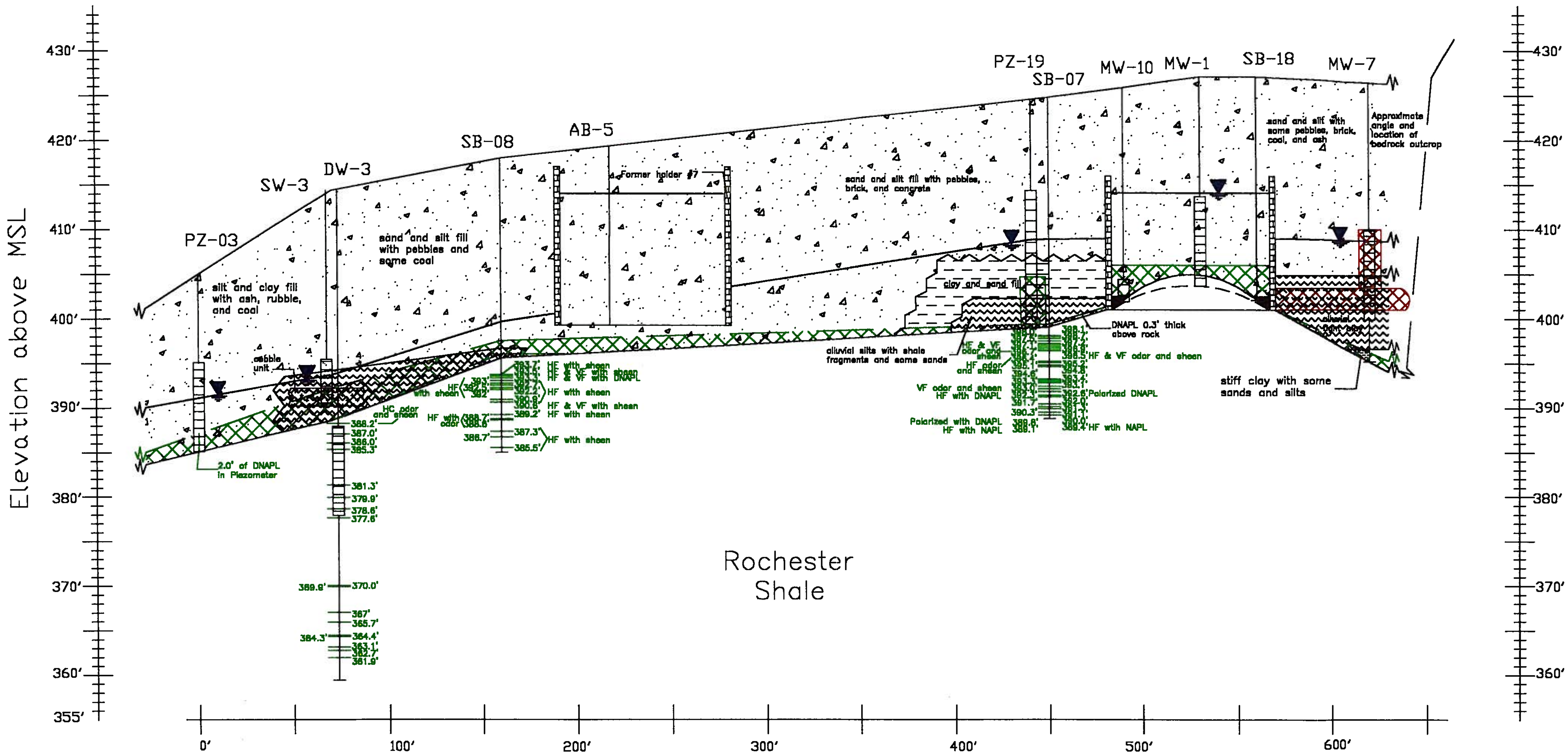


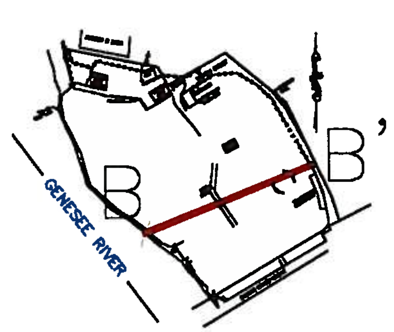


Note: Elevations of Horizontal Fractures (HF) and Horizontal Cracks (HC) represent fractures with observed odor and sheens unless otherwise noted. Fractures with no impacts are not shown.

**LEGEND**

- Petroleum
- DNAPL TAR
- Fill Sand & Silt
- Cobble unit
- Alluvial Silt & Clay
- Clay & Sand Fill

1":60'

| Project: East Station, Rochester, NY | Client: RG&E/EPRI | META |
|---|---|---|
| Figure 6-4<br>1998 Focused Remedial Investigation<br>CROSS SECTION B – B' | | |

| Filename: rge6_4.dwg | Drawn by: SRM | Approved by: IS | Date: 8/12/1999 |
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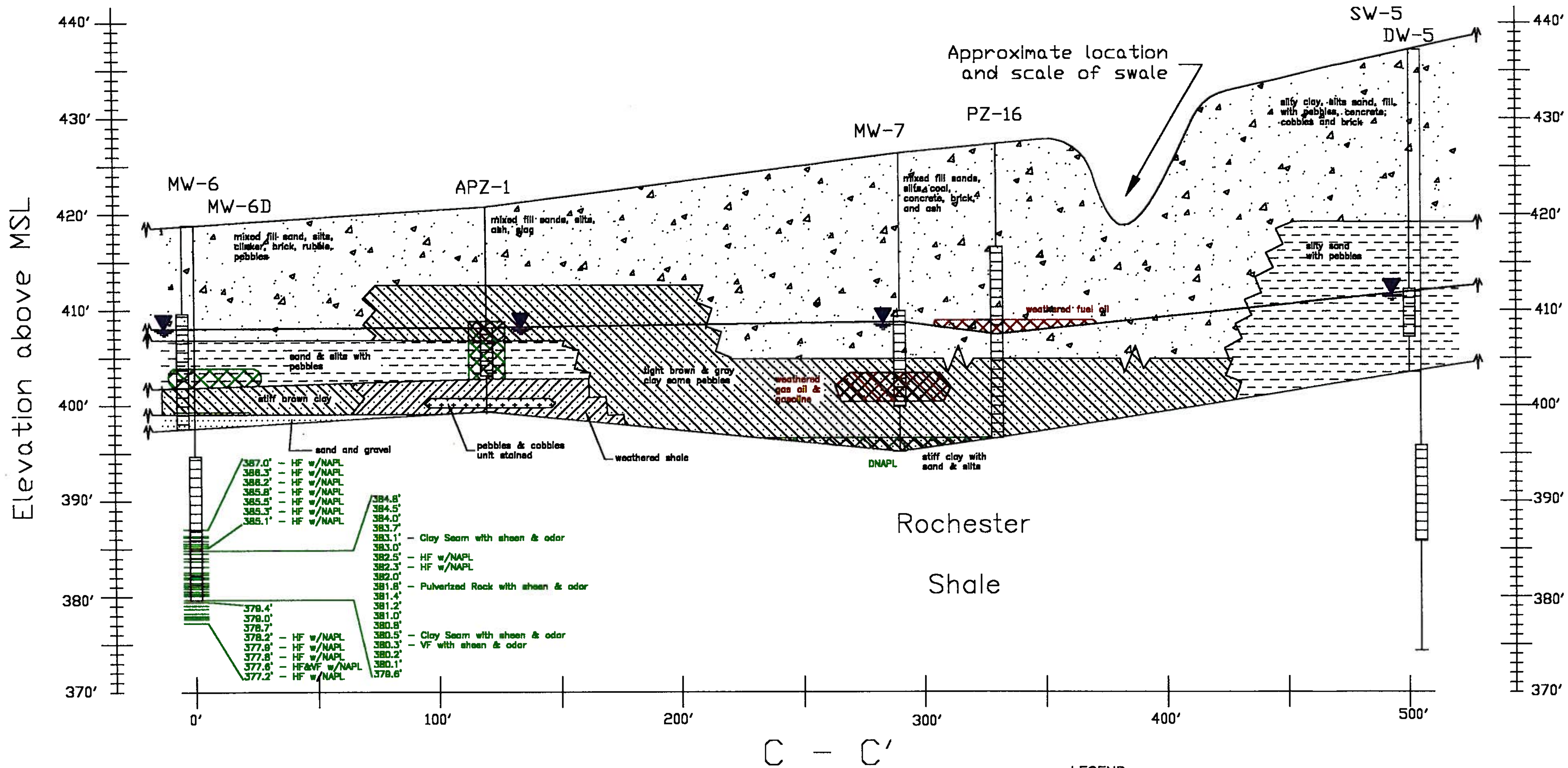
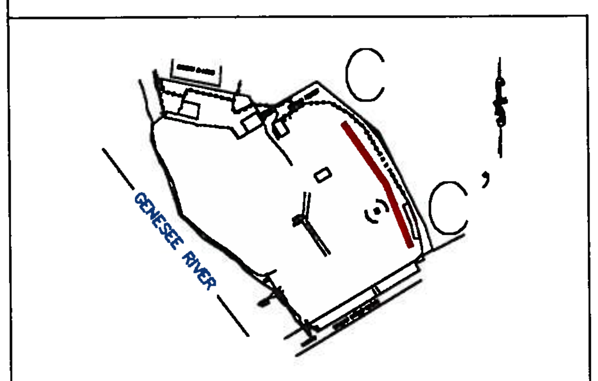



Note:
Elevations of Horizontal Fractures (HF) and Horizontal Cracks (HC) represent fractures with observed odor and sheens unless otherwise noted. Fractures with no impacts are not shown.

| Project: East Station, Rochester, NY | Client: RG&E/EPRI | META |
|---|---|---|

Figure 6–5
1998 Focused Remedial Investigation
CROSS SECTION C–C'

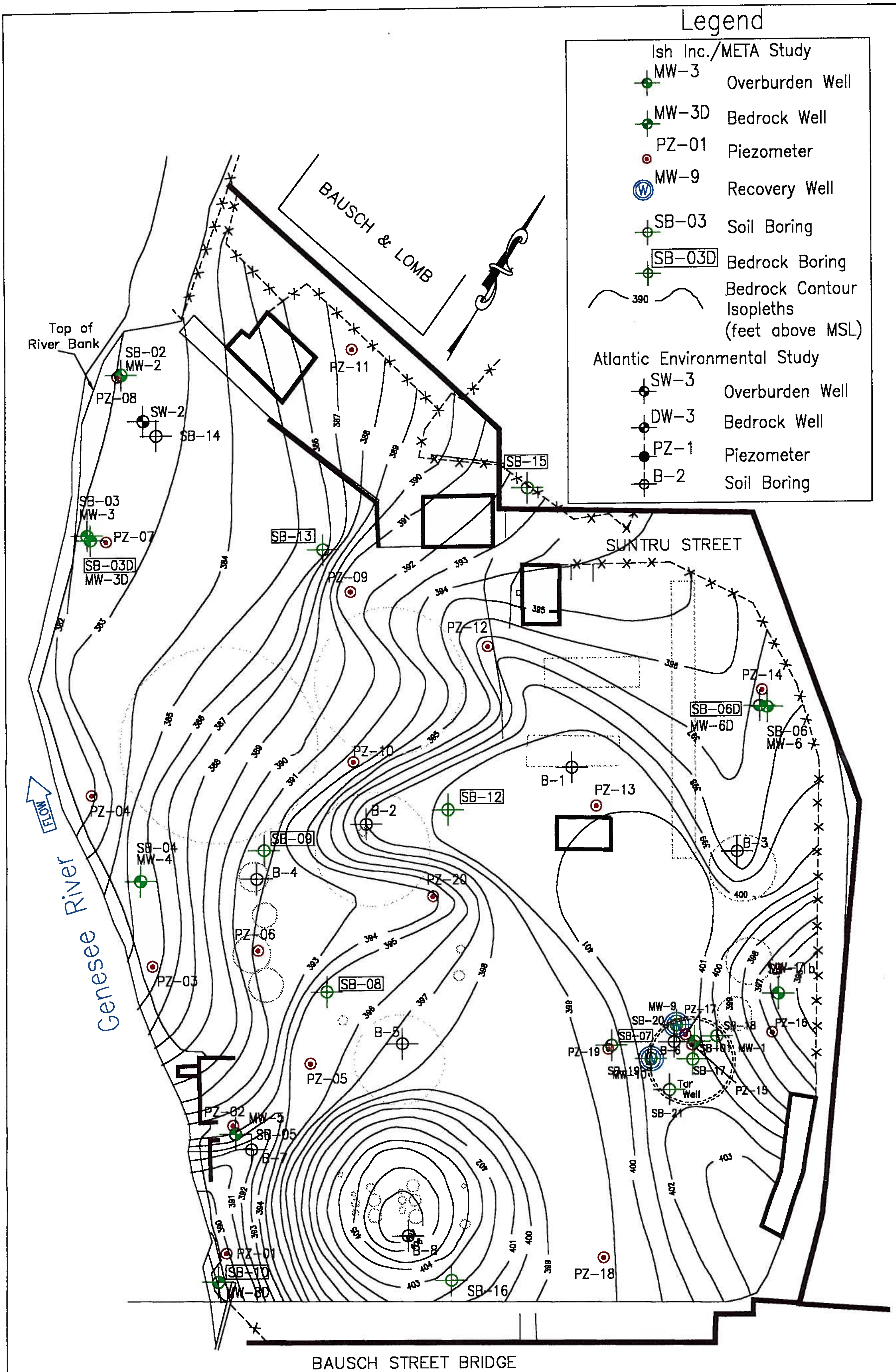
| Filename: | Drawn by: | Approved by: | Date: |
|---|---|---|---|
| RGE6_5.DWG | SRM | IS | 8/12/1999 |

Figure 6-4 illustrates the cross section from the river past the tar well in an approximately west to east orientation. As shown in this figure, the tar well is located in a bedrock high area with sloping bedrock both westerly towards the river and easterly away from the river. The bedrock sloped sharply downward between SB-08 and PZ-03 (near the riverbank) and between the tar well and the bedrock outcrop. Evidence of DNAPL was observed in the overburden at all locations sampled and generally was found just above the bedrock. Bedrock contained DNAPL at all locations. LNAPL was observed only at the MW-7 location and was identified as gasoline with a weathered gas oil-range product.

The weathered petroleum product found in SB-11B (19.5-19.7) [MW-7] was collected near the former oil storage tanks at a depth which was close to the interface of an alluvial deposit and fill material (Figure 6-4). Also, the water table was about two feet above the sample depth. Petroleum-like odors were noted from just above the water table to approximately seven feet below the water table. It is likely that as the water table rose and fell with seasonal changes or engineered river flow modifications, the LNAPL present adhered to soil over that distance forming a smear zone. In this way, the LNAPL can be found below the water table in various locations.

Figure 6-5 illustrates the cross section oriented parallel to the river along the eastern portion of the site. As shown in this figure, there is evidence of a DNAPL pool at a bedrock low point corresponding to well MW-7 which is embedded within stiff clay. DNAPL also exists above the bedrock surface along a stiff brown clay confining layer that extends laterally from piezometer APZ-1 to well MW-6D. Finally, an LNAPL is indicated at piezometer PZ-16 and within light brown clay below the water table at well MW-7.

Based on the 1998 and the 1992 borings, a bedrock contour map was developed as shown in Figure 6-6. The bedrock contour map shows that the tar well is located in a bedrock high area and that the bedrock drops off both toward the river and north/northeast toward the retaining wall near MW-07. The bedrock high at the site (407 feet above MSL) is located in the area beneath the former waste heat boilers. This area was investigated during previous work conducted by Atlantic, 1993 and no




100 50 25 0 100

Scale (ft)

Map based on site map from Site Investigation Report for East Station MGP Site, Atlantic Environmental Services, Inc., June 1993.

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|---|---|---|
| East Station; Rochester, NY | RG&E/EPRI | META |

Figure 6-6

1998 Focused Remedial Investigation

Bedrock Contour Map

| Filename: | Drawn by: | Approved by: | Date: |
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| REDINV.DWG | SRM | IS | 8/12/1999 |

other borings and or piezometers for the current study were placed in the immediate area (closest being SB-16 which located bedrock at 402 feet above MSL). It is possible that the boring completed near the former waste heat boilers in 1992 encountered an anomaly. This is possible because the bedrock contour drawn depicts a steeply graded mound of bedrock (Figure 6-6) which is unlikely given the geomorphological history of the area. If an irregularity was encountered then the contours depicted near the former waste heat boilers in Figure 6-6 will be inaccurate. Further investigation will better define the characteristics of the bedrock in this area.

In addition, Figure 6-7 shows the location of each bedrock boring, its fracture pattern, and the NAPL impacts associated with the fractures. This information is summarized in Table 6-4, which lists the number of fractures in each 5-foot section of bedrock, along with the number and percent of fractures containing DNAPL. As indicated in this table, all of the bedrock borings had evidence of DNAPL in at least one fracture, and in six of the nine borings, 25% or more of the fractures in one or more sections contained DNAPL.

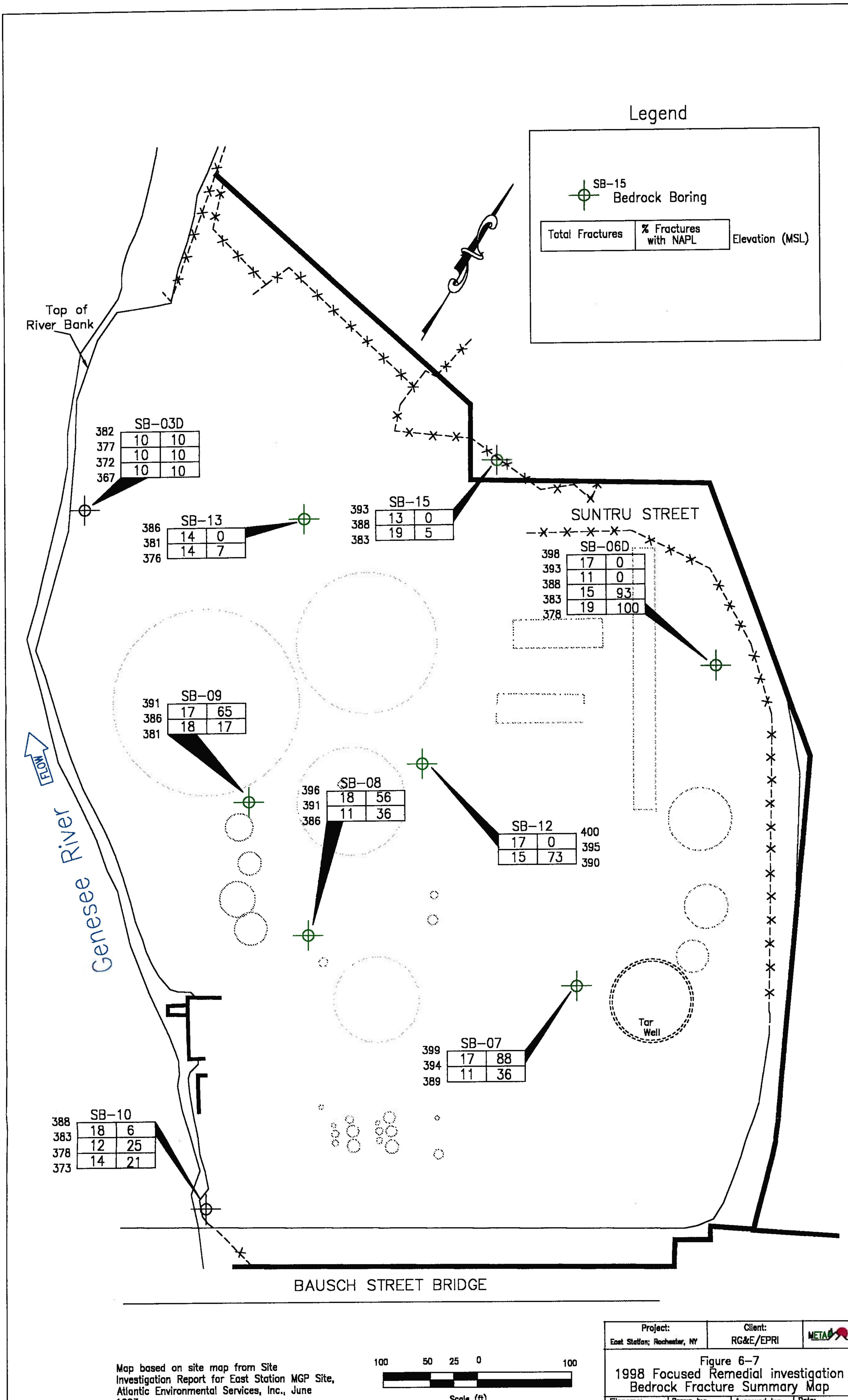
## Well Installation Data

### Well Installation Summary

Overburden wells were installed at seven locations (SB-01/MW-1, SB-02/MW-2, SB-03/MW-3, SB-04/MW-4, SB-05/MW-5, SB-06/MW-6, SB-11B/MW-7). Bedrock wells were installed at three locations (MW-3D, MW-6D, and SB-10/MW-8D). Two 4-inch recovery wells were installed in the tar well (SB-20/MW-9 and SB-10/MW-10).

### Static Water Table Elevations

The site was surveyed on November 20, 1998 by Waters Land Surveying of Rome, New York. Based on this survey, the static water table elevations were determined by adjusting the survey data to the depth to groundwater measurements taken on December 1, 1998. The water table elevation data, inclusive of the presence of any NAPLs, are summarized in Table 6-5.




Map based on site map from Site Investigation Report for East Station MGP Site, Atlantic Environmental Services, Inc., June 1993.

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| Figure 6-7<br>1998 Focused Remedial investigation<br>Bedrock Fracture Summary Map | | |

| Filename: REDINV.DWG | Drawn by: SRM | Approved by: IS | Date: 8/12/1999 |
|---|---|---|---|

Table 6-4

## Extent of NAPL in Bedrock Fractures

| Bedrock Boring | Elevation Range, feet MSL | No. of Fractures | No. of Fractures w/DNAPL | % Fractures w/DNAPL |
|---|---|---|---|---|
| SB-03D | 382-377 | 10 | 1 | 10 |
| | 377-372 | 12 | 0 | 0 |
| | 372-367 | 13 | 0 | 0 |
| SB-06D | 398-393 | 17 | 0 | 0 |
| | 393-388 | 11 | 0 | 0 |
| | 388-383 | 15 | 14 | 93 |
| | 383-378 | 19 | 19 | 100 |
| SB-07 | 399-394 | 17 | 15 | 88 |
| | 394-389 | 11 | 4 | 36 |
| SB-08 | 396-391 | 18 | 10 | 56 |
| | 391-386 | 11 | 4 | 36 |
| SB-09 | 391-386 | 17 | 11 | 65 |
| | 386-381 | 18 | 3 | 17 |
| SB-10 | 388-383 | 18 | 1 | 5.6 |
| | 383-378 | 12 | 3 | 25 |
| | 378-373 | 14 | 3 | 21 |
| SB-12 | 400-395 | 17 | 0 | 0 |
| | 395-390 | 15 | 11 | 73 |
| SB-13 | 386-381 | 14 | 0 | 0 |
| | 381-376 | 14 | 1 | 7.1 |
| SB-15 | 393-388 | 13 | 0 | 0 |
| | 388-383 | 19 | 1 | 5.3 |

Table 6-5

## Monitoring Well and Groundwater Elevations

| Monitoring Well I.D. | Ground Elevation (Feet Above MSL) | Top Of Casing (TOC) Elevation (Feet Above MSL) | Depth to G.W. From TOC (Feet) | Screen Interval (From TOC) | Screen Length (Feet) |
|---|---|---|---|---|---|
| *New Wells* | | | | | |
| MW-1 | 427.1 | 429.57 | 15.43 | 15.8 - 25.8 | 10.0 |
| MW-2 | 401.6 | 403.68 | 12.69 | 11.7 - 21.7 | 10.0 |
| MW-3 | 402.3 | 404.91 | 13.83 | 12.7 - 22.7 | 10.0 |
| MW-3D | 402.6 | 405.03 | 14.39 | 27.7 - 37.7 | 10.0 |
| MW-4 | 401.3 | 403.78 | 12.14 | 13.4 - 18.4 | 5.0 |
| MW-5 | 411.8 | 414.23 | 15.73 | 14.4 - 19.4 | 5.0 |
| MW-6 | 418.9 | 421.24 | 13.22 | 11.6 - 23.6 | 12.0 |
| MW-6D | 418.5 | 421.16 | 13.22 | 29.2 - 44.2 | 15.0 |
| MW-7 | 426.4 | 428.82 | 20.06 | 18.9 - 28.9 | 10.0 |
| MW-8D | 412.2 | 414.67 | 22.34 | 32.5 - 42.5 | 10.0 |
| MW-9(recovery) | 426.4 | 429.01 | NA | 25.2 - 26.7 | 1.5 |
| MW-10(recovery) | 425.9 | 428.46 | NA | 24.6 - 26.1 | 1.5 |
| *Existing Wells Installed in 1992 Study* | | | | | |
| SW-1 | 400.5 | 402.18 | 11.27 | 13.9 - 18.9 | 5.0 |
| DW-1 | 400.3 | 401.92 | 11.25 | 24.1 - 34.1 | 10.0 |
| SW-3 | 414.4 | 416.28 | 22.53 | 20.9 - 25.9 | 5.0 |
| DW-3 | 414.9 | 416.60 | 24.75 | 28.7 - 38.7 | 10.0 |
| SW-4 | 414.2 | 415.98 | 10.10 | 10.8 - 15.8 | 5.0 |
| SW-5 | 437.2 | 439.09 | 27.21 | 26.9 - 31.9 | 5.0 |
| DW-5 | 436.8 | 438.75 | 26.79 | 42.9 - 52.9 | 10.0 |

Note: 1. Groundwater elevation data recorded on 12/1/98.
2. MSL - Mean Sea Level
3. Bgs. - Below ground surface

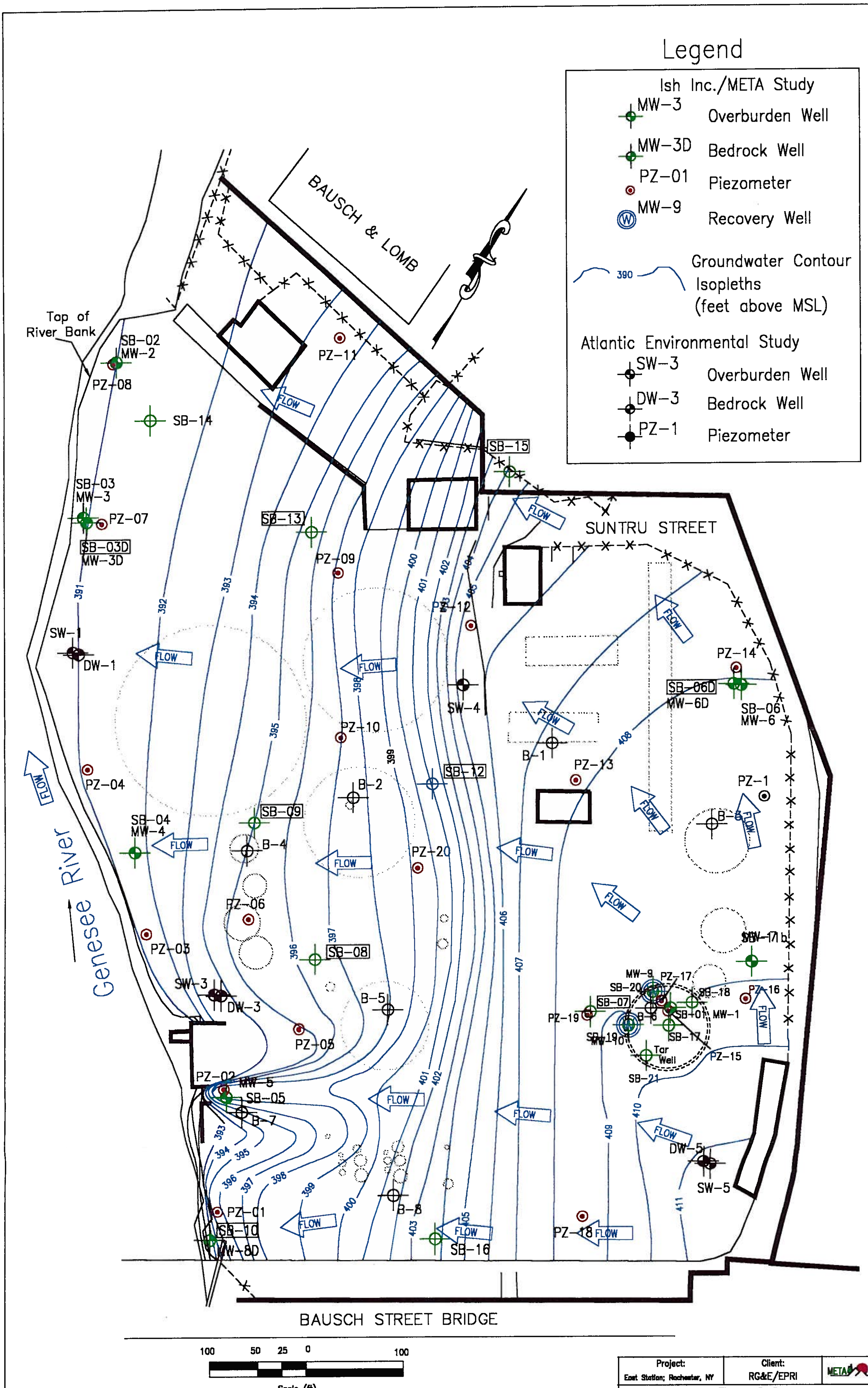
**Hydraulic Data**

Hydraulic Gradients (Overburden)

Previous work (Atlantic, 1993) determined an average groundwater gradient of 0.027 feet per foot (ft/ft) across the site (east to west flow path) based on groundwater elevations at APZ-1 and SW-1. The 1998 work at the site has provided additional monitoring well and piezometer locations and associated supplemental areal groundwater elevations (12/1/98) as depicted in the groundwater contour map (Figure 6-8). The equipotential lines developed from these data show that the groundwater gradient varies along the generalized east to west flow path, although somewhat steeper in the central portion of the site.

For example, the local groundwater gradient at MW-7, 0.004 ft/ft (eastern portion of the site) and MW-2, 0.009 ft/ft (western portion of the site) are up to an order of magnitude less than the local gradient at SW-4, 0.067 ft/ft (central portion of the site). Also, the gradient along much of the western portion of the site is similar to that of the eastern portion of the site although slightly steeper. In addition, the hydraulic gradients in the eastern portion of the site (e.g., MW-7) and the central portion of the site (e.g., SW-4) seem to be influenced by the bedrock contour. For example, the slope of the top of the bedrock in proximity of SW-4 (Figure 6-6) is relatively steep (0.050 ft/ft) and is perpendicular to the river in direction. This local bedrock contour seems to coincide with the steep hydraulic gradient found in the vicinity of SW-4 (0.067 ft/ft), also generally sloping toward the river. The groundwater gradient at MW-7 (eastern portion of the site) is more gentle (0.004 ft/ft) and slopes to the north, towards MW-6. The bedrock contour between monitoring wells MW-7 and MW-6 slopes in two directions (Figure 6-6). In proximity of MW-7, the bedrock slopes to the east, toward the bedrock outcrop. The bedrock contour closer to MW-6 seems to slope to the north northwest. The localized magnitude and direction of the hydraulic gradient (to the north) in the eastern portion of the site is likely influenced by the local bedrock contour.

The hydraulic gradient in the western portion of the site will fluctuate as a function of pool elevation changes in the Genesee River. Also, the groundwater contour map shows an area of steep gradient proximate to the former Light Oil Plant (MW-5). At this location, groundwater flow is obstructed




Map based on site map from Site Investigation Report for East Station MGP Site, Atlantic Environmental Services, Inc., June 1993.

Groundwater elevations depicted were recorded during the 12/1/98 sampling event.

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Figure 6-8
1998 Focused Remedial Investigation
Groundwater Contour Map

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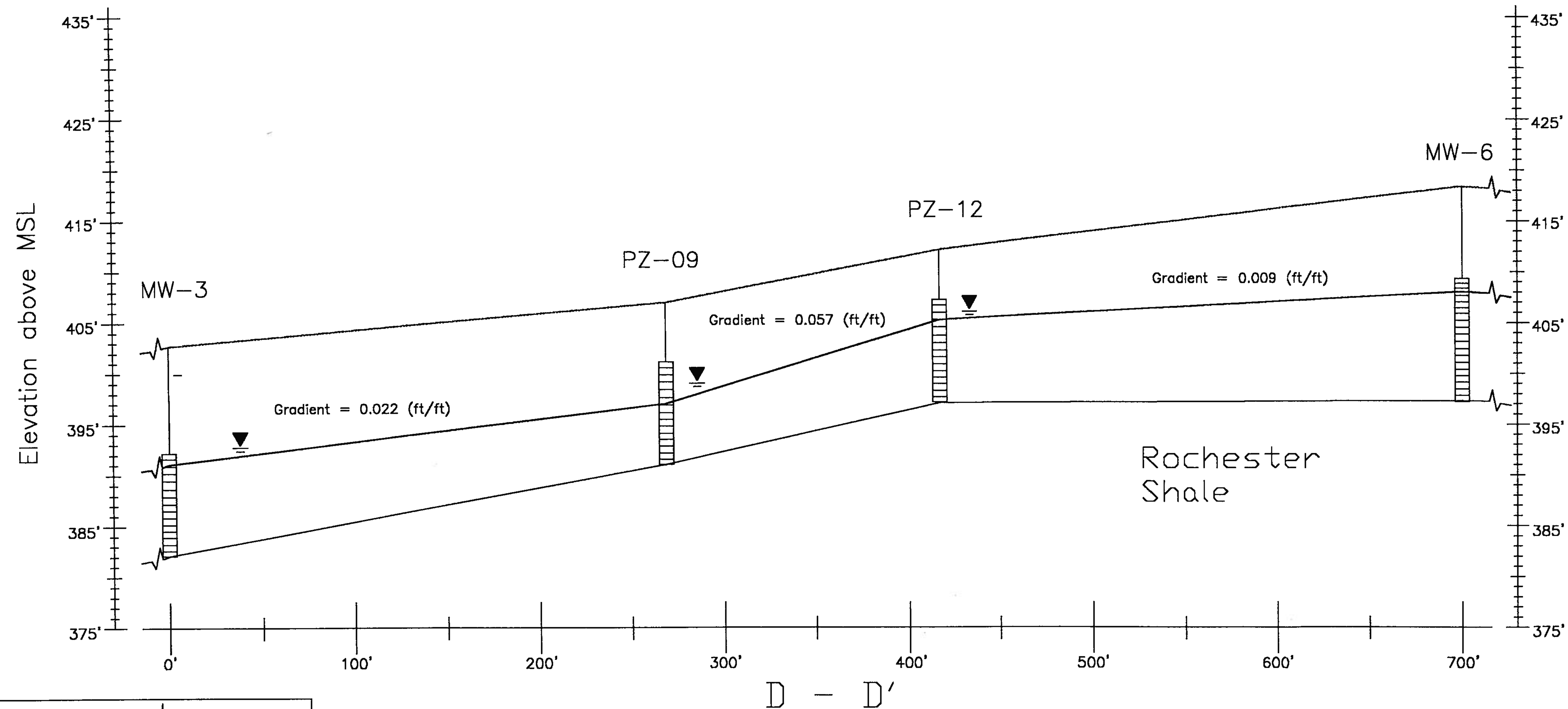
| REDINV.DWG | SRM | IS | 8/12/1999 |

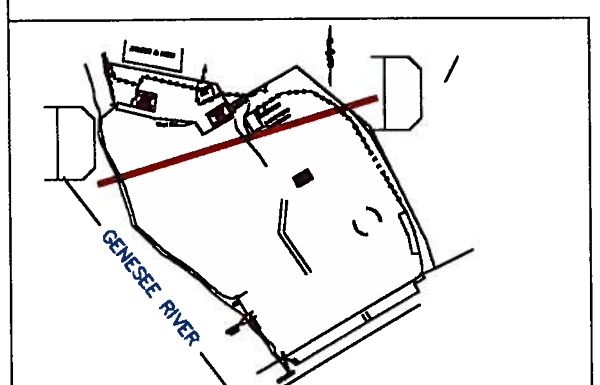
by the existing foundations (base of foundations assumed lower in elevation than the water table) thereby causing the water to flow to the river through the restricted pathway between the existing foundations of the buildings, resulting in an increased gradient from the restricted flow path and subsequent increased localized head.

It is difficult to obtain a true average gradient for the entire site due to the rather flat water table in the northeast portion of the site where the flow is parallel to the river as compared to the rest of the site. However, an average groundwater gradient for the site was calculated using several potential groundwater flow paths. The calculated mean east to west gradient at the site is 0.023 ft/ft, which is similar to the estimate of 0.027 ft/ft by Atlantic, 1993. By inspecting the water-level data and plotting several groundwater elevations along the east-west flow path D-D' (MW-6, PZ-12, PZ-09, and MW-3) (Figure 6-9), three areas of gradient change are evident. The eastern third of the site shows a very gentle gradient (0.009 ft/ft), the middle of the site has a steep gradient (0.057 ft/ft), and the western portion of the site has an intermediate gradient of 0.022 ft/ft. The arithmetic mean of these three gradients (0.029 ft/ft) closely compares to both the aforementioned calculated arithmetic mean of 0.023 ft/ft and the Atlantic (1993) gradient 0.027 ft/ft.

<u>Hydraulic Conductivity (Overburden)</u>

Limited saturated hydraulic conductivity ($K_{Sat}$) tests were performed at three well locations. At monitoring wells MW-7 (eastern side of the site property), SW-4 (central portion of the site property), and MW-2 (western side of the site property), rising head slug tests were performed to estimate the hydraulic conductivity of the unconfined aquifer in the overburden material. These wells were chosen for testing because of the known contrasts in materials within which the wells were screened, as well as for their areal distribution across the site.




NOTE:
Cross section illistrates gradient changes along pictured east/west flow path

1":60'

| Project: East Station, Rochester, NY | Client: RG&E/EPRI | META |
|---|---|---|
| Figure 6-9<br>1998 Focused Remedial Investigation<br>CROSS SECTION D − D' | | |

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| RGE6_9.DWG | SRM | CCJ | 2/9/1999 |

The rising head tests were performed by lowering a PVC slug of known displacement into each well. After equilibrium was reached, the slug was rapidly removed from the well, causing an instantaneous decrease in water level within the well. The recovery of water into the well was recorded with a Hermitt 2000™ Data Logger with associated downhole pressure transducer. The rising head tests were performed a minimum of three times at each well as a check for test integrity. The data were analyzed using AQTESOLV™ groundwater evaluation software and the Bouwer and Rice method for slug tests in unconfined aquifers. Results of the hydraulic conductivity testing and calculated groundwater flow velocities for each well are summarized in Table 6-6.

Table 6-6

**Estimated Hydraulic Conductivities and Groundwater Flow Velocities**

| Well ID | Saturated Hydraulic Conductivity (K) (ft/day) | Hydraulic Gradient[b] (I) (ft/ft) | Groundwater Flow Velocity[c] (V) (ft/day) | Groundwater Seepage Velocity[d] (V) (ft/day) |
|---|---|---|---|---|
| MW-2 | 31.45[a] | 0.009 | 0.28 | 0.70 |
| SW-4 | 142.0[a] | 0.067 | 9.51 | 23.77 |
| MW-7 | 15.67[a] | 0.004 | 0.06 | 0.15 |

[a] Value represents the numerical mean of three tests.
[b] Calculated using equipotential lines based on the 12/1/98 well gauging data.
[c] Groundwater flow velocity is equal to Darcinian velocity V=KI.
[d] Groundwater seepage velocity (V) = KI/n, assumed porosity (n) = 0.40.

The range of hydraulic conductivities measured at wells MW-2, SW-4, and MW-7 illustrates the saturated conductivity differences in materials at each well screen location. For example at MW-7, the well screen covers approximately 3.5 feet of saturated fill (silts, sands, and rubble) and approximately 6 feet of saturated clays. Conversely, the well screen at SW-4 was placed in approximately 5 feet of saturated alluvial deposits comprised of fine sands and silts with a 1 foot layer of cobbles and pebbles at the top of the well screen. The representativeness of these conductivities is limited by the fact that when a slug test is performed at a well screened across anisotropic layers of saturated materials, the recharge of groundwater to the well preferentially comes from the unit of highest hydraulic conductivity.

A geometric mean of 22.2 feet per day (ft/day) for the two measured hydraulic conductivities (assuming that the range of hydraulic conductivities measured at wells MW-2 and MW-7 are representative of hydraulic conductivities across the entire site) can be used to represent the average hydraulic conductivity of the unconfined, heterogeneous aquifer material. (Several authors, including Domenico & Schwartz, 1990, have determined that the average hydraulic conductivities are best described by geometric rather than arithmetic means.) The measured saturated hydraulic conductivity at SW-4 (142.0 ft/day) seemed extremely high and was not included in the mean hydraulic conductivity calculation. It is likely that the measured hydraulic conductivity at SW-4 is significantly higher than MW-2 and MW-7 because of preferential recharge to the well from the 1 ft thick gravel unit (top one foot of well screen) within which the well is screened. This well was not included in the average hydraulic conductivity or seepage velocity calculations as these characteristics would be skewed by the influence of the highly conductive one foot gravel unit. For a more accurate representative average of saturated hydraulic conductivity for the site, more slug tests at other existing monitoring wells might be warranted.

The hydraulic conductivity of the Rochester Shale was not measured in this investigation. However, due to the fractured nature of the bedrock at the site, further investigation to determine the hydraulic properties of the shale unit seems warranted.

<u>Groundwater Flow (Overburden)</u>

The groundwater contour map (Figure 6-8) shows that the general groundwater flow direction is toward the west, ultimately discharging to the Genesee River. However, the flow direction along the eastern portion of the site is to the north, parallel to the river before shifting to the northwest and then to the west near MW-6. This flow field is inferred from a limited number of measured groundwater elevations. Therefore, it is possible that the actual flow direction has a more westerly component in the eastern portion because of groundwater discharge to the overburden from the adjacent bedrock outcrop along the eastern gorge wall (Figure 6-4). The equipotential lines may in fact parallel the river as well as the bedrock outcrop, further indicative of the general east to west flow.

The range of groundwater seepage velocities at the well locations tested for hydraulic conductivity (MW-2, MW-7, and SW-4) were quite variable. Although the seepage velocities at MW-2 and MW-7 were similar, 0.70 ft/day and 0.15 ft/day respectively. However, the seepage velocity at SW-4 was considerably higher at 23.8 ft/day. It is hypothesized that the reason for this high seepage velocity is the result of the high hydraulic conductivity (via slug test) measured at this location, as discussed in the previous subsection. All calculated seepage velocities discussed, assumed a saturated porosity of 40 percent. An average groundwater seepage velocity can be calculated by multiplying the geometric mean of the hydraulic conductivity measurements (excluding SW-4) by the calculated arithmetic average hydraulic gradient of several flow paths over the entire site (0.023 ft/ft) (which compares with the calculated arithmetic mean gradient of the flow path depicted in Figure 6-9, 0.029 ft/ft) divided by an assumed porosity of 40 percent (0.40). Therefore, the calculated average seepage velocity for groundwater at the site is 1.27 ft/day.

**Well Sampling Data**

All new and previously installed monitoring wells were sampled and analyzed for VOCs, SVOCs, metals, and total cyanide, with the exception that VOCs and SVOCs were not determined in well DW-3 because of the presence of tar. All the analytical results and associated detection limits for the groundwater samples are included in Appendix F.

VOC Data

All of the VOCs shown in Table 6-7 were detected in one or more of the monitoring wells. As indicated in this table, all of these compounds, except for 2-hexanone, 4-methyl-2-pentanone (no standard), acetone, acrolein, acrylonitrile, carbon disulfide (no standard), methylene chloride, and

# Table 6-7
## Groundwater Analytical Results for Volatile Organics
## Units (mg/L)
## (Detected Compounds Only)

| Analyte | NYSDEC Class GA, H(WS) | Well ID | | | | | |
|---|---|---|---|---|---|---|---|
| | | DW-1 | DW-6 | MW-1 | MW-2 | MW-2DUP | MW-3 |
| 1,2,4,-Trimethylbenzene | 0.005 | **0.410 D** | ND | **0.140** | 0.003 | **0.006** | ND |
| 1,3,5-Trimethylbenzene | 0.005 | **0.073** | ND | **0.043** | 0.005 | ND | ND |
| 2-Hexanone | 0.050 * | ND | ND | ND | ND | ND | ND |
| 4-Isopropyltoluene | 0.005 | **0.008** | ND | ND | ND | 0.002 | ND |
| 4-Methyl-2-Pentanone | NA | ND | ND | ND | ND | ND | ND |
| Acetone | 0.050 * | ND | ND | ND | ND | ND | ND |
| Acrolein | 0.005 | ND | ND | ND | ND | ND | ND |
| Acrylonitrile | 0.005 | ND | ND | ND | ND | ND | ND |
| Benzene | 0.001 | **6.40 D** | ND | **3.50 D** | **0.024** | **0.036** | **0.015** |
| Carbon Disulfide | NA | ND | ND | ND | ND | ND | ND |
| Ethylbenzene | 0.005 | **1.60 D** | ND | **0.360 D** | **0.011** | **0.017** | ND |
| Isopropylbenzene | 0.005 | **0.055** | ND | **0.006** | 0.004 | **0.007** | **0.013** |
| 1,3-Xylene + 1,4-Xylene | 0.010 * * | **1.20 D** | ND | **0.60 D** | ND | 0.003 | ND |
| 1,2-Xylene | 0.005 | **0.760 D** | ND | **0.30 D** | ND | 0.002 | ND |
| Methylene Chloride | 0.005 | ND | ND | ND | ND | ND | ND |
| n-Propylbenzene | 0.005 | **0.025** | ND | 0.004 | 0.003 | 0.005 | ND |
| Naphthalene | 0.010 * | **3.80 D** | ND | **9.30 D** | **0.020** | **0.032** | **0.089** |
| sec-Butylbenzene | 0.005 | ND | ND | ND | ND | 0.003 | ND |
| Styrene | 0.005 | **0.022** | ND | **0.260 D** | ND | ND | ND |
| Toluene | 0.005 | **0.680 D** | ND | **1.80 D** | 0.002 | 0.003 | ND |

Class GA, TypeH(WS) - Protection of Groundwater for Drinking Purposes

All ground water samples were collected on 12/1/98, 12/2/98, and 12/3/98.
All values are Standards unless denoted with an * which indicates a Guidance Value.
* * Indicates Standard is based on sum of 1,3-Xylene and 1,4-Xylene as data was reported.
Standards and Guidance Values taken from NYSDEC Technical and Operational Guidance Series (TOGS) 1.1.1.. (Updated June 1998)

Bolded concentrations have exceeded the NYSDEC Class GA water quality standards or guidance values.
"J" values indicate that the concentration is below the method detection limit.
"D" values indicate the result is from a secondary dilution analysis.
"E" values indicate dilution required but not run.
"NA" indicates No Standard Available.
"ND" indicates non-detect, refer to Appendix F for detection limits.

## Table 6-7
## Groundwater Analytical Results for Volatile Organics
## Units (mg/L)
## (Detected Compounds Only)

| Analyte | NYSDEC Class GA, H(WS) | Well ID | | | | | |
|---|---|---|---|---|---|---|---|
| | | MW-3D | MW-4 | MW-5 | MW-6 | MW-6D | MW-7 |
| 1,2,4,-Trimethylbenzene | 0.005 | **0.023** | **0.780 D** | **0.120** | **0.270 D** | **0.078** | **0.049** |
| 1,3,5-Trimethylbenzene | 0.005 | **0.008** | **0.180** | **0.064** | **0.490 D** | **0.023** | 0.002 |
| 2-Hexanone | 0.050 * | ND | ND | 0.002 J | ND | ND | ND |
| 4-Isopropyltoluene | 0.005 | ND | **0.008** | ND | **0.007** | 0.005 | 0.002 |
| 4-Methyl-2-Pentanone | NA | ND | ND | 0.002 J | ND | ND | ND |
| Acetone | 0.050 * | ND | 0.008 | 0.008 | 0.005 | 0.005 | ND |
| Acrolein | 0.005 | ND | ND | ND | ND | ND | ND |
| Acrylonitrile | 0.005 | ND | ND | ND | ND | ND | ND |
| Benzene | 0.001 | **0.990 D** | **16.0 D** | **5.30 D** | **3.10 D** | **0.160** | ND |
| Carbon Disulfide | NA | ND | 0.004 J | ND | ND | ND | ND |
| Ethylbenzene | 0.005 | **0.310 D** | **1.50 D** | **0.280 D** | **0.940 D** | **0.350 D** | **0.009** |
| Isopropylbenzene | 0.005 | 0.005 | **0.068** | **0.007** | **0.03** | **0.016** | **0.016** |
| 1,3-Xylene + 1,4-Xylene | 0.010 * * | **0.110** | **3.60 D** | **0.470 D** | **0.930 D** | **0.190** | ND |
| 1,2-Xylene | 0.005 | **0.084** | **1.60 D** | **0.260 D** | **0.820 D** | **0.130** | ND |
| Methylene Chloride | 0.005 | ND | ND | ND | ND | 0.003 | 0.002 |
| n-Propylbenzene | 0.005 | ND | **0.032** | 0.002 | **0.025** | **0.006** | **0.012** |
| Naphthalene | 0.010 * | **0.430 D** | **7.60 D** | **3.30 D** | **4.40 D** | **1.90 D** | **0.260 D** |
| sec-Butylbenzene | 0.005 | ND | ND | ND | ND | ND | ND |
| Styrene | 0.005 | **0.008** | ND | ND | ND | ND | ND |
| Toluene | 0.005 | **0.067** | **7.10 D** | **0.096** | **0.330 D** | **0.110** | ND |

Class GA, TypeH(WS) - Protection of Groundwater for Drinking Purposes

All ground water samples were collected on 12/1/98, 12/2/98, and 12/3/98.
All values are Standards unless denoted with an * which indicates a Guidance Value.
* * Indicates Standard is based on sum of 1,3-Xylene and 1,4-Xylene as data was reported.
Standards and Guidance Values taken from NYSDEC Technical and Operational Guidance Series (TOGS) 1.1.1.. (Updated June 1998)

Bolded concentrations have exceeded the NYSDEC Class GA water quality standards or guidance values.
"J" values indicate that the concentration is below the method detection limit.
"D" values indicate the result is from a secondary dilution analysis.
"E" values indicate dilution required but not run.
"NA" indicates No Standard Available.
"ND" indicates non-detect, refer to Appendix F for detection limits.

# Table 6-7
## Groundwater Analytical Results for Volatile Organics
## Units (mg/L)
## (Detected Compounds Only)

| Analyte | NYSDEC Class GA, H(WS) | Well ID | | | | |
|---|---|---|---|---|---|---|
| | | MW-8D | SW-1 | SW-3 | SW-4 | SW-5 |
| 1,2,4,-Trimethylbenzene | 0.005 | **0.190** | **0.400 D** | **0.009** | **0.310 D** | ND |
| 1,3,5-Trimethylbenzene | 0.005 | **0.042** | ND | 0.004 | ND | ND |
| 2-Hexanone | 0.050 * | ND | ND | ND | ND | ND |
| 4-Isopropyltoluene | 0.005 | 0.005 | 0.004 | ND | **0.008** | ND |
| 4-Methyl-2-Pentanone | NA | ND | ND | ND | ND | ND |
| Acetone | 0.050 * | ND | ND | ND | ND | ND |
| Acrolein | 0.005 | ND | ND | ND | ND | 0.004 J |
| Acrylonitrile | 0.005 | ND | ND | ND | ND | 0.005 J |
| Benzene | 0.001 | **2.40** | **0.38** | **0.051** | **0.160** | ND |
| Carbon Disulfide | NA | ND | 0.015 | ND | ND | ND |
| Ethylbenzene | 0.005 | ND | **0.430 D** | **0.021** | **0.290 D** | ND |
| Isopropylbenzene | 0.005 | **0.044** | **0.016** | ND | **0.034** | ND |
| 1,3-Xylene + 1,4-Xylene | 0.010 * * | **0.096** | **0.013** | 0.010 | **0.21** | ND |
| 1,2-Xylene | 0.005 | **0.150** | **0.024** | **0.011** | **0.010** | ND |
| Methylene Chloride | 0.005 | ND | ND | ND | ND | ND |
| n-Propylbenzene | 0.005 | **0.011** | **0.029** | ND | **0.036** | ND |
| Naphthalene | 0.010 * | **1.50 E** | ND | **0.049** | **0.077** | ND |
| sec-Butylbenzene | 0.005 | ND | ND | ND | 0.003 | ND |
| Styrene | 0.005 | ND | ND | ND | ND | ND |
| Toluene | 0.005 | **0.025** | **0.006** | ND | 0.002 | ND |

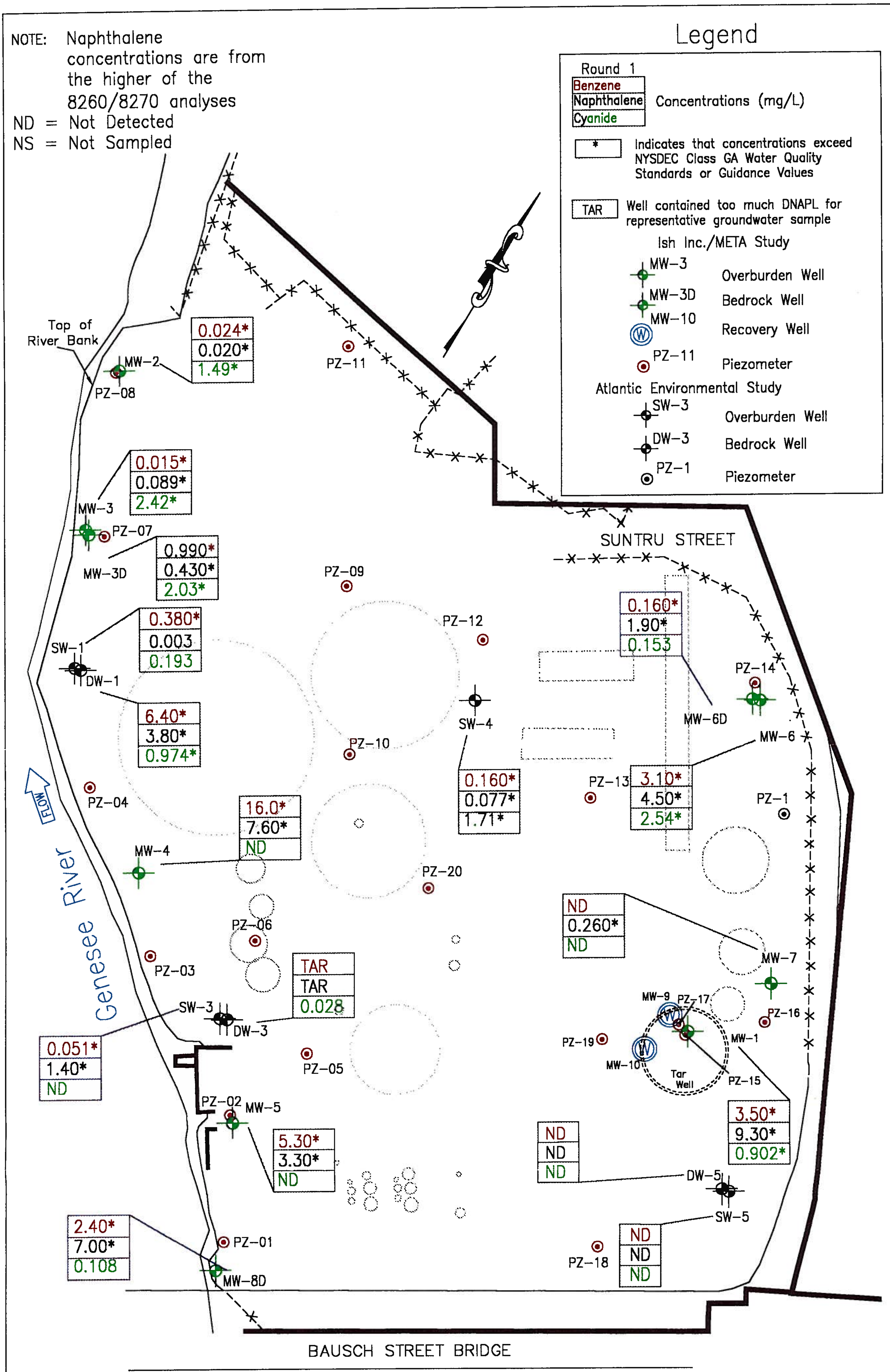
Class GA, TypeH(WS) - Protection of Groundwater for Drinking Purposes

All ground water samples were collected on 12/1/98, 12/2/98, and 12/3/98.
All values are Standards unless denoted with an * which indicates a Guidance Value.
* * Indicates Standard is based on sum of 1,3-Xylene and 1,4-Xylene as data was reported.
Standards and Guidance Values taken from NYSDEC Technical and Operational Guidance Series (TOGS) 1.1.1.. (Updated June 1998)

Bolded concentrations have exceeded the NYSDEC Class GA water quality standards or guidance values.
"J" values indicate that the concentration is below the method detection limit.
"D" values indicate the result is from a secondary dilution analysis.
"E" values indicate dilution required but not run.
"NA" indicates No Standard Available.
"ND" indicates non-detect, refer to Appendix F for detection limits.

sec-butylbenzene, were detected at concentrations that exceeded the NYSDEC Class GA standards and guidance values for the protection of drinking water. The Class GA standard for 1,2,4-trimethylbenzene (0.005 mg/L) was exceeded at wells DW-1, MW-1, MW-2, MW-3D, MW-4, MW-5, MW-6, MW-6D, MW-7, MW-8D, SW-1, SW-3, and SW-4, with a maximum value of 0.78 mg/L at MW-4. The concentrations detected for 1,3,5-trimethylbenzene exceeded the Class GA standard of 0.005 mg/L at wells DW-1, MW-1, MW-3D, MW-4, MW-5, MW-6, MW-6D, and MW-8D, with a maximum value of 0.49 mg/L at MW-6. The Class GA standard for 4-isopropyltoluene (0.005 mg/L) was exceeded at only four wells (DW-1, MW-4, MW-6, and SW-4) with a maximum concentration of 0.008 mg/L detected in three of the wells. Benzene concentrations exceeded the drinking water standards at all of the wells, except for DW-5, MW-7, and SW-5, with a maximum value of 16.0 mg/L at MW-4. The areal extent of benzene impacts to groundwater is shown on Figure 6-10.

All but four wells (DW-5, MW-3, MW-8D, and SW-5) had ethylbenzene concentrations above its Class GA standard of 0.005 mg/L, with a maximum concentration of 1.60 mg/L detected in DW-1. Isopropylbenzene concentrations were above drinking water standards at every well except DW-5, MW-3D, SW-3, and SW-5. The maximum concentration was detected in MW-4 (0.068 mg/L). The drinking water standard based on the sum of the allowable concentrations for 1,3- and 1,4-xylene (0.010 mg/L) was exceeded at wells DW-1, MW-1, MW-3D, MW-4, MW-5, MW-6, MW-6D, MW-8D, SW-1, and SW-4, with a maximum value of 3.60 mg/L at MW-4. Similarly, the Class GA standard of 0.005 mg/L for 1,2-xylene was exceeded at these same wells and at SW-3. Also, the maximum concentration of 1,2-xylene was found in MW-4 (1.60 mg/L). The n-propylbenzene concentrations exceeded the drinking water standards at eight wells (DW-1, MW-4, MW-6, MW-6D, MW-7, MW-8D, SW-1, and SW-4) with a maximum of 0.036 mg/L detected in SW-4. Naphthalene concentrations exceeded the Class GA guidance value (0.010 mg/L) at all of the wells, except for DW-5, SW-1, and SW-5. The maximum naphthalene concentration of 9.30 mg/L was detected in MW-1. Styrene was detected above its drinking water standard of 0.005 mg/L at three wells (DW-1, MW-1, and MW-3D) with a maximum concentration of 0.26 mg/L found in MW-1. Lastly, toluene




| Project: East Station; Rochester, NY | Client: RG&E/EPRI | META |
|---|---|---|

Figure 6-10
1998 Focused Remedial Investigation
Aqueous Concentrations of Selected Analytes

| Filename: REDINV.DWG | Drawn by: SRM | Approved by: IS | Date: 8/12/1999 |
|---|---|---|---|

was detected above its Class GA standard (0.005 mg/L) in wells DW-1, MW-1, MW-3D, MW-4, MW-5, MW-6, MW-6D, MW-8D, and SW-1, with a maximum value of 7.10 mg/L in MW-4.

SVOC Data

All of the SVOCs shown in Table 6-8 were detected in one or more of the monitoring wells. As indicated in this table, 2-methylphenol, 3+4-methylphenol, 2-methylnaphthalene, acenaphthylene, benzoic acid, and dibenzofuran do not have NYSDEC Class GA water quality standards or guidance values. All of the other compounds listed, except for anthracene, diethyl phthalate, fluoranthene, and pyrene, were detected at concentrations above the Class GA NYSDEC standards and guidance values for the protection of drinking water.

The Class GA guidance value for 2,4-dimethylphenol ( 0.050 mg/L) was exceeded at only MW-4 and MW-1, with the latter having a maximum concentration of 0.37 mg/L. Acenaphthene was detected above its Class GA guidance value of 0.020 mg/L at wells DW-1, MW-1, MW-2, MW-4, MW-6, MW-6D, MW-7, MW-8D, and SW-3, with a maximum value of 0.076 mg/L at SW-3. Bis(2-ethylhexyl)phthalate was not detected in any wells, except for DW-1, where it was measured at 0.013 mg/L, which is above the Class GA standard of 0.005 mg/L. Fluorene concentrations exceeded the drinking water guidance value of 0.050 mg/L at only one well (MW-1), where it was measured at 0.052 mg/L. Naphthalene was detected above the Class GA guidance value of 0.010 mg/L at all but four wells (DW-5, MW-3D, SW-1, and SW-5), with a maximum concentration of 9.00 mg/L at MW-1. The areal extent of impacted groundwater for naphthalene is shown on Figure 6-10. Phenanthrene, similar to fluorene, exceeded the Class GA guidance value of 0.050 mg/L at only MW-1 with a concentration of 0.066 mg/L. Lastly, the Class GA groundwater standard of 0.001 mg/L for the sum of all phenolic compounds, based on the protection of aesthetic waters, was exceeded at wells DW-1, MW-1, MW-2, MW-4, MW-5, MW-6, MW-8D, and SW-3. The maximum concentration for the sum of all phenolic compounds was 0.463 mg/L (MW-1).

# Table 6-8
# Groundwater Analytical Results for Semivolatile Organics
## Units (mg/L)
## (Detected Compounds Only)

| Analyte | NYSDEC Class GA, H(WS) | NYSDEC Class GA, E | Well ID | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | | DW-1 | DW-5 | MW-1 | MW-2 | MW-2DUP | MW-3 |
| 2,4-Dimethylphenol | 0.050 * | | 0.018 | ND | **0.370 JD** | 0.003 J | 0.002 J | ND |
| 2-Methylphenol | NA | | 0.007 J | ND | 0.039 | ND | ND | ND |
| 3+4 Methylphenol | NA | | ND | ND | 0.054 | ND | ND | ND |
| Sum of All Phenolic Compounds | | 0.001 | **0.025** | ND | **0.463** | **0.003** | **0.002** | ND |
| 2-Methylnaphthalene | NA | | 0.280 JD | ND | 0.930 JD | 0.001 J | ND | 0.001 J |
| Acenaphthene | 0.020 * | | **0.039** | ND | **0.068** | 0.008 J | **0.006 J** | 0.004 J |
| Acenaphthylene | NA | | 0.004 J | ND | 0.370 JD | ND | ND | 0.001 J |
| Anthracene | 0.050 * | | 0.006 J | ND | 0.012 | 0.002 J | 0.001 J | ND |
| Benzoic Acid | NA | | ND | ND | ND | ND | ND | ND |
| bis(2-ethylhexyl)phthalate | 0.005 | | **0.013** | ND | ND | ND | ND | ND |
| Dibenzofuran | NA | | 0.004 J | ND | 0.024 | 0.002 J | 0.002 J | 0.002 J |
| Diethyl phthalate | 0.050 * | | ND | 0.001 J | ND | ND | ND | ND |
| Fluoranthene | 0.050 * | | 0.002 J | ND | 0.005 J | ND | ND | ND |
| Fluorene | 0.050 * | | 0.018 | ND | **0.052** | 0.005 J | 0.004 J | 0.004 J |
| Naphthalene | 0.010 * | | **1.90 D** | ND | **9.00 D** | **0.016** | **0.013** | **0.024** |
| Phenanthrene | 0.050 * | | 0.024 | ND | **0.066** | 0.007 J | 0.005 J | ND |
| Pyrene | 0.050 * | | 0.002 J | ND | 0.006 J | ND | ND | ND |

Class GA, Type H(WS) - Protection of Groundwater for Drinking Purposes
Class GA, Type E - Protection of Aesthetic Waters

All ground water samples were collected on 12/1/98, 12/2/98, and 12/3/98.
All values are Standards unless denoted with an * which indicates a Guidance Value.
Standards and Guidance Values taken from NYSDEC Technical and Operational Guidance Series (TOGS) 1.1.1.. (Updated June 1998)

Blank entries indicate that the compound was not detected above the detection limit, see Table 5-3 for individual compound detection limits.
Bolded concentrations have exceeded the NYSDEC Class GA water quality standards or guidance values
"J" values indicate that the concentration is below the method detection limit.
"D" values indicate the result is from a secondary dilution analysis.
"NA" indicates No Standard Available.
"ND" indicates non-detect, refer to Appendix F for detection limits.

# Table 6-8
# Groundwater Analytical Results for Semivolatile Organics
## Units (mg/L)
## (Detected Compounds Only)

| Analyte | NYSDEC Class GA, H(WS) | NYSDEC Class GA, E | Well ID | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | | MW-3D | MW-4 | MW-5 | MW-6 | MW-6D | MW-7 |
| 2,4-Dimethylphenol | 0.050 * | | ND | **0.100 JD** | 0.006 J | 0.023 | ND | ND |
| 2-Methylphenol | NA | | ND | 0.077 JD | ND | ND | ND | ND |
| 3+4 Methylphenol | NA | | ND | 0.08 | ND | ND | ND | ND |
| Sum of All Phenolic Compounds | | 0.001 | ND | **0.257** | **0.006** | **0.023** | ND | ND |
| 2-Methylnaphthalene | NA | | ND | 0.250 JD | 0.012 | 0.110 JD | 0.180 JD | 0.062 |
| Acenaphthene | 0.020 * | | 0.004 J | **0.038** | 0.004 J | **0.052** | **0.058** | **0.058** |
| Acenaphthylene | NA | | ND | 0.008 J | ND | 0.032 | 0.038 JD | ND |
| Anthracene | 0.050 * | | ND | 0.007 J | ND | 0.008 J | 0.006 J | 0.010 J |
| Benzoic Acid | NA | | ND | 0.010 J | 0.008 J | ND | ND | ND |
| bis(2-ethylhexyl)phthalate | 0.005 | | ND | | ND | ND | ND | ND |
| Dibenzofuran | NA | | ND | 0.004 J | ND | 0.004 J | 0.002 J | 0.002 J |
| Diethyl phthalate | 0.050 * | | ND | | ND | ND | ND | ND |
| Fluoranthene | 0.050 * | | ND | 0.002 J | ND | 0.003 J | 0.002 J | 0.004 J |
| Fluorene | 0.050 * | | ND | 0.019 | ND | 0.026 | 0.025 | 0.019 |
| Naphthalene | 0.010 * | | ND | **1.70 D** | **0.390 D** | **4.50 D** | **0.57** | **0.088 D** |
| Phenanthrene | 0.050 * | | ND | 0.03 | ND | 0.034 | 0.031 | 0.026 |
| Pyrene | 0.050 * | | ND | 0.002 J | ND | 0.004 J | 0.002 J | 0.006 J |

Class GA, Type H(WS) - Protection of Groundwater for Drinking Purposes
Class GA, Type E - Protection of Aesthetic Waters

All ground water samples were collected on 12/1/98, 12/2/98, and 12/3/98.
All values are Standards unless denoted with an * which indicates a Guidance Value.
Standards and Guidance Values taken from NYSDEC Technical and Operational Guidance Series (TOGS) 1.1.1.. (Updated June 1998)

Blank entries indicate that the compound was not detected above the detection limit, see Table 5-3 for individual compound detection limits.
Bolded concentrations have exceeded the NYSDEC Class GA water quality standards or guidance values
"J" values indicate that the concentration is below the method detection limit.
"D" values indicate the result is from a secondary dilution analysis.
"NA" indicates No Standard Available.
"ND" indicates non-detect, refer to Appendix F for detection limits.

# Table 6-8
# Groundwater Analytical Results for Semivolatile Organics
## Units (mg/L)
## (Detected Compounds Only)

| Analyte | NYSDEC Class GA, H(WS) | NYSDEC Class GA, E | Well ID | | | | |
|---|---|---|---|---|---|---|---|
| | | | MW-8D | SW-1 | SW-3 | SW-4 | SW-5 |
| 2,4-Dimethylphenol | 0.050 * | | 0.005 J | 0.001 J | 0.012 | ND | ND |
| 2-Methylphenol | NA | | ND | ND | ND | ND | ND |
| 3+4 Methylphenol | NA | | ND | ND | ND | ND | ND |
| Sum of All Phenolic Compounds | | 0.001 | **0.005** | 0.001 | **0.012** | ND | ND |
| 2-Methylnaphthalene | NA | | 0.870 JD | 0.090 D | 0.140 JD | 0.079 | ND |
| Acenaphthene | 0.020 * | | **0.064** | 0.012 | **0.076** | 0.017 | ND |
| Acenaphthylene | NA | | 0.002 J | ND | 0.063 | 0.003 J | ND |
| Anthracene | 0.050 * | | 0.002 J | 0.003 J | 0.006 J | ND | ND |
| Benzoic Acid | NA | | ND | ND | ND | ND | ND |
| bis(2-ethylhexyl)phthalate | 0.005 | | ND | ND | ND | ND | ND |
| Dibenzofuran | NA | | 0.004 J | 0.003 J | 0.026 | 0.005 J | ND |
| Diethyl phthalate | 0.050 * | | ND | ND | ND | ND | ND |
| Fluoranthene | 0.050 * | | ND | 0.001 J | 0.003 J | 0.001 J | ND |
| Fluorene | 0.050 * | | 0.018 | 0.014 | 0.03 | 0.008 J | ND |
| Naphthalene | 0.010 * | | **7.00 D** | 0.003 J | **1.40 D** | **0.016** | ND |
| Phenanthrene | 0.050 * | | 0.014 | 0.011 | 0.019 | 0.008 J | ND |
| Pyrene | 0.050 * | | ND | 0.001 J | 0.002 J | ND | ND |

Class GA, Type H(WS) - Protection of Groundwater for Drinking Purposes
Class GA, Type E - Protection of Aesthetic Waters

All ground water samples were collected on 12/1/98, 12/2/98, and 12/3/98.
All values are Standards unless denoted with an * which indicates a Guidance Value.
Standards and Guidance Values taken from NYSDEC Technical and Operational Guidance Series (TOGS) 1.1.1.. (Updated June 1998)

Blank entries indicate that the compound was not detected above the detection limit, see Table 5-3 for individual compound detection limits.
Bolded concentrations have exceeded the NYSDEC Class GA water quality standards or guidance values
"J" values indicate that the concentration is below the method detection limit.
"D" values indicate the result is from a secondary dilution analysis.
"NA" indicates No Standard Available.
"ND" indicates non-detect, refer to Appendix F for detection limits.

MAHs and PAHs in Groundwater

The groundwater quality data (Table 6-9) show that four overburden wells (MW-1, MW-4, MW-5, MW-6) contain the highest concentrations of dissolved MAH compounds, with benzene being the most abundant constituent ranging from 3.1 to 16 mg/L.

PAHs are found to be above detection limit in the groundwater samples from these wells. Measured naphthalene concentrations in these water samples range from 1.7 to 9.3 mg/L. All other PAHs (fluorene, phenanthrene, pyrene) are between non-detect to 0.052 mg/L. These four wells are located in or close to the locations where DNAPL is present.

The groundwater quality data (Table 6-10) from the remaining overburden wells (MW-2, MW-3, MW-1, SW-1, SW-3, and SW-4), show the lowest concentrations of dissolved MAH and PAH compounds measured at the East Station site. Benzene ranges from non-detect to a maximum of 0.16 mg/L. Naphthalene concentrations are below 0.1 mg/L except in SW-3. All these wells are located in the northwest quarter of the site indicating that the degradation of groundwater quality in this portion of the site is minimal and may be a result of transport of dissolved constituents from the northeastern portion of the site.

There are five bedrock wells (DW-1, DW-3, MW-3D, MW-6D, and MW-8D) at the site (Table 6-11). The well DW-3 could not be sampled for groundwater quality because of the presence of DNAPL. These wells show considerable variability in dissolved concentrations of MAH and PAH compounds. For example, MW-3D, located near the river to the northwest, had almost 1 mg/L of benzene but no PAHs. Well DW-1 also had MAH compounds as well as moderate levels of dissolved PAHs. Both MW-6D and MW-8D are located in the bedrock zone where DNAPL coal tar was identified to be present in the fractures. The groundwater quality data from these two wells also show the differences. The well MW-8D has no dissolved benzene present but is high in naphthalene, generally indicating that the water quality is the result of dissolution of the tar constituents. The groundwater from well MW-6D does contain nominal amounts of benzene and

Table 6-9

## Overburden Wells Heavily Impacted by MAH/PAHs, mg/L

| Compound | MW-1 | MW-4 | MW-5 | MW-6 |
|---|---|---|---|---|
| Benzene | 3.5 | 16 | 5.3 | 3.1 |
| Ethylbenzene | 0.36 | 1.5 | 0.28 | 0.94 |
| 1,3 + 1,4 Xylene | 0.60 | 3.6 | 0.47 | 0.93 |
| 1,2 Xylene | 0.30 | 1.6 | 0.26 | 0.82 |
| Toluene | 1.8 | 7.1 | 0.096 | 0.33 |
| Naphthalene (VOC data) | 9.3 | 7.6 | 3.3 | 4.4 |
| 2-Methylnaphthalene | 0.93 | 0.25 | 0.012 | 0.11 |
| Fluorene | 0.052 | 0.019 | <0.01 | 0.026 |
| Naphthalene (SVOC data) | 9.0 | 1.7 | 0.39 | 4.5 |
| Phenanthrene | 0.066 | 0.03 | <0.01 | 0.0034 |
| Pyrene | 0.006 | 0.002 | <0.01 | 0.004 |

Table 6-10

## Overburden Wells Minimally Impacted by MAH/PAHs, mg/L

| Compound | MW-2 | MW-3 | MW-7 | SW-1 | SW-3 | SW-4 |
|---|---|---|---|---|---|---|
| Benzene | 0.024 | 0.015 | ND | ND | 0.051 | 0.16 |
| Ethylbenzene | 0.011 | ND | 0.009 | 0.043 | 0.021 | 0.29 |
| 1,3 + 1,4 Xylene | ND | ND | ND | 0.013 | 0.01 | 0.21 |
| 1,2 Xylene | ND | ND | ND | 0.024 | 0.011 | 0.01 |
| Toluene | 0.002 | ND | ND | ND | ND | 0.002 |
| Naphthalene (VOC data) | 0.02 | 0.089 | 0.26 | ND | 0.049 | 0.077 |
| 2-Methylnaphthalene | 0.001 | ND | 0.062 | 0.09 | 0.14 | 0.079 |
| Fluorene | 0.005 | 0.004 | 0.019 | 0.014 | 0.03 | 0.008 |
| Naphthalene (SVOC data) | 0.016 | 0.024 | 0.088 | 0.003 | 1.4 | 0.016 |
| Phenanthrene | 0.007 | ND | 0.026 | 0.011 | 0.019 | 0.008 |
| Pyrene | ND | ND | 0.006 | 0.001 | 0.002 | ND |

other MAHs and also contains somewhat lower dissolved levels of PAH compounds although naphthalene ranged from 0.57 to 1.9 mg/L.

The variability in the bedrock water quality appears to be caused by two major factors. First, the dissolution of constituents from DNAPLs with different chemical compositions results in different solution concentrations. Second, environmental processes such as dilution and degradation alter the chemistry of organic compounds in the groundwater to varying degrees.

Overall the groundwater quality data from the overburden and bedrock wells indicate that water-quality in the northwestern quadrant is least affected by the MAH and PAH compounds and is variously affected at the rest of the site.

Table 6-11

**Bedrock Wells Impacted by MAH/PAHs, mg/L**

| Compound | MW-3D | MW-6D | MW-8D | DW-1 |
|---|---|---|---|---|
| Benzene | 0.99 | 0.16 | ND | 6.4 |
| Ethylbenzene | 0.31 | 0.35 | ND | 1.6 |
| 1,3 + 1,4 Xylene | 0.11 | 0.19 | 0.096 | 1.2 |
| 1,2 Xylene | 0.084 | 0.13 | 0.15 | 0.76 |
| Toluene | 0.067 | 0.11 | 0.025 | 0.68 |
| Naphthalene (VOC data) | 0.43 | 1.9 | 5.7 | 3.8 |
| 2-Methylnaphthalene | ND | 0.18 | 0.87 | 0.28 |
| Fluorene | ND | 0.025 | 0.018 | 0.018 |
| Naphthalene (SVOC data) | ND | 0.57 | 7.0 | 1.9 |
| Phenanthrene | ND | 0.031 | 0.14 | 0.024 |
| Pyrene | ND | 0.002 | ND | 0.002 |

Metals Data

All of the metals shown in Table 6-12 were detected in one or more of the monitoring wells. As indicated in this table, aluminum, calcium, cobalt, potassium, and vanadium do not have NYSDEC Class GA water quality standards or guidance values. All of the other compounds listed, except for arsenic, iron, magnesium, manganese, nickel, sodium, and thallium, were detected at concentrations below the NYSDEC Class GA standards and guidance values for the protection of drinking water.

Arsenic was detected above the Class GA standard of 0.025 mg/L at MW-3, MW-6, SW-1, and SW-4, with a maximum concentration of 3.69 mg/L found at MW-3. The iron drinking water standard of 0.3 mg/L was exceeded at every well, except for DW-5. The maximum iron concentration was 133 mg/L, which was detected in MW-4. Magnesium was detected above the Class GA guidance value of 35 mg/L at most of the wells, excluding DW-1, DW-5, MW-3D, MW-7, and SW-5. The highest magnesium concentration was 216 mg/L at DW-3. Manganese was detected above the drinking water standard of 0.003 mg/L at every well location, except for MW-3D, with a maximum concentration of 2.09 mg/L at MW-2. As a result of the many exceedances for both iron and manganese, the standard for the sum of iron and manganese was exceeded at almost every well. Only DW-5 and MW-3D had the sum of the two metals below the Class GA standard of 0.5 mg/L. Nickel was detected above the drinking water standard of 0.10 mg/L only at wells DW-5 (0.16 mg/L) and SW-5 (0.34 mg/L). Sodium was the only metal found to exceed the Class GA standard (20.0 mg/L) at every well location, with concentrations ranging from 31.2 (MW-5) to 2,370 mg/L (SW-4). Lastly, thallium was detected above its Class GA guidance value of 0.0005 mg/L at MW-2, MW-6, and SW-3, with a maximum concentration of 0.005 at MW-2. It should be noted that blank contamination was noted for each of these thallium sample results.

# Table 6-12
# Groundwater Analytical Results for Metals and Total Cyanide
## Units (mg/L)
## (Detected Analytes Only)

| Analyte | NYSDEC Class GA, H(WS) | Well ID | | | | | |
|---|---|---|---|---|---|---|---|
| | | DW-1 | DW-3 | DW-5 | MW-1 | MW-2 | MW-2DUP |
| Aluminum | NA | ND | ND | ND | ND | 0.015 B | 0.026 B |
| Arsenic | 0.025 | ND | 0.012 | ND | 0.004 B | 0.009 B | 0.013 |
| Barium | 1.0 | 0.246 E | 0.352 E | 0.078 BE | 0.064 B E | 0.019 BE | 0.012 BE |
| Calcium | NA | 34.5 E | 90.5 E | 70.8 E | 163 E | 356 E | 357 E |
| Chromium | 0.05 | ND | ND | 0.011 | ND | 0.004 B | 0.005 B |
| Cobalt | NA | ND | ND | ND | ND | ND | ND |
| Copper | 0.20 | 0.023 B | 0.014 B | 0.015 B | 0.013 B | ND | 0.008 B |
| Iron (Fe) | 0.3 | **0.758 E** | **0.573 E** | 0.177 E | **7.15 E** | **99.8 E** | **99.6 E** |
| Magnesium | 35 * | 24.1 | **216** | 31.1 | **37.2** | **132** | **133** |
| Manganese (Mn) | 0.003 | **0.016 E** | **0.140 E** | **0.028 E** | **0.436 E** | **2.06 E** | **2.09 E** |
| Fe + Mn | 0.5 | **0.774** | **0.713** | 0.205 | **7.59** | **102** | **102** |
| Nickel | 0.10 | 0.002 B | 0.001 B | **0.164** | 0.004 B | ND | ND |
| Potassium | NA | 24.4 E | 9.70 E | 17.9 E | 5.56 E | 17.3 E | 17.6 E |
| Selenium | 0.010 | ND | ND | ND | ND | ND | ND |
| Sodium | 20.0 | **527** | **329** | **739** | **95.1** | **375** | **389** |
| Thallium | 0.0005 * | ND | ND | ND | ND | **0.003 B** | **0.005 B** |
| Vanadium | NA | ND | 0.004 B | ND | ND | 0.007 B | 0.007 B |
| Zinc | 2 * | 0.045 | 0.030 | 0.033 | 0.036 | 0.021 | 0.022 |
| Cyanide | 0.20 | **0.974** | 0.028 | ND | **0.902** | **1.49** | **1.51** |

Class GA, Type H(WS) - Protection of Groundwater for Drinking Purposes

All ground water samples were collected on 12/1/98, 12/2/98, and 12/3/98.
All values are Standards unless denoted with an * which indicates a Guidance Value.
Standards and Guidance Values taken from NYSDEC Technical and Operational Guidance Series (TOGS) 1.1.1.. (Updated June 1998)

Blank entries indicate the compound was not detected above the detection limit, see table 5-3 for individual compound detection limits.
Bolded concentrations have exceeded the NYSDEC Class GA water quality standards or guidance values.
"B" indicates less than the required detection limit , but greater than or equal to the instrument detection limit.
"E" indicates estimated due to interferences.
"NA" indicates No Standard Available
"ND" indicates non-detect, refer to Appendix F for detection limits.

# Table 6-12
## Groundwater Analytical Results for Metals and Total Cyanide
## Units (mg/L)
## (Detected Analytes Only)

| Analyte | NYSDEC Class GA, H(WS) | Well ID | | | | | |
|---|---|---|---|---|---|---|---|
| | | MW-3 | MW-3D | MW-4 | MW-5 | MW-6 | MW-6D |
| Aluminum | NA | ND | ND | 0.038 B | ND | 0.009 B | ND |
| Arsenic | 0.025 | **3.69** | ND | 0.007 B | ND | **0.734** | ND |
| Barium | 1.0 | 0.040 BE | 0.022 BE | 0.036 BE | 0.111 BE | 0.428 E | 0.150 BE |
| Calcium | NA | 186 E | 9.98 E | 201 E | 141 E | 92.7 E | 237 E |
| Chromium | 0.05 | 0.003 B | ND | 0.005 B | ND | ND | ND |
| Cobalt | NA | 0.006 B | ND | ND | ND | ND | ND |
| Copper | 0.20 | 0.009 B | 0.017 B | ND | 0.021 B | 0.025 | 0.015 B |
| Iron (Fe) | 0.3 | **58.5 E** | **0.493 E** | **133 E** | **6.55 E** | **5.13 E** | **1.86 E** |
| Magnesium | 35 * | **55.0** | 8.20 | **35.3** | **79.4** | **108** | **109** |
| Manganese (Mn) | 0.003 | **2.02 E** | 0.003 BE | **1.67 E** | **0.295 E** | **0.410 E** | **0.085 E** |
| Fe + Mn | 0.5 | **60.5** | 0.496 | **135** | **6.85** | **5.54** | **1.95** |
| Nickel | 0.10 | 0.002 B | ND | 0.002 B | 0.002 B | 0.002 B | ND |
| Potassium | NA | 9.69 E | 13.3 E | 10.5 E | 5.22 E | 14.9 E | 21.8 E |
| Selenium | 0.010 | ND | ND | ND | ND | **0.007** | ND |
| Sodium | 20.0 | **425** | **391** | **214** | **31.2** | **1,640** | **196** |
| Thallium | 0.0005 * | ND | ND | ND | ND | **0.002 B** | ND |
| Vanadium | NA | 0.004 B | ND | 0.008 B | 0.003 B | 0.006 B | ND |
| Zinc | 2 * | 0.042 | 0.040 | 0.026 | 0.035 | 0.031 | 0.033 |
| Cyanide | 0.20 | **2.42** | **2.03** | ND | ND | **2.54** | 0.153 |

Class GA, Type H(WS) - Protection of Groundwater for Drinking Purposes

All ground water samples were collected on 12/1/98, 12/2/98, and 12/3/98.
All values are Standards unless denoted with an * which indicates a Guidance Value.
Standards and Guidance Values taken from NYSDEC Technical and Operational Guidance Series (TOGS) 1.1.1.. (Updated June 1998)

Blank entries indicate the compound was not detected above the detection limit, see table 5-3 for individual compound detection limits.
Bolded concentrations have exceeded the NYSDEC Class GA water quality standards or guidance values.
"B" indicates less than the required detection limit , but greater than or equal to the instrument detection limit.
"E" indicates estimated due to interferences.
"NA" indicates No Standard Available
"ND" indicates non-detect, refer to Appendix F for detection limits.

# Table 6-12
# Groundwater Analytical Results for Metals and Total Cyanide
## Units (mg/L)
## (Detected Analytes Only)

| Analyte | NYSDEC Class GA, H(WS) | Well ID | | | | | |
|---|---|---|---|---|---|---|---|
| | | MW-7 | MW-8D | SW-1 | SW-3 | SW-4 | SW-5 |
| Aluminum | NA | ND | ND | ND | ND | ND | ND |
| Arsenic | 0.025 | ND | ND | **0.298** | 0.012 | **0.244** | ND |
| Barium | 1.0 | 0.087 BE | 0.472 E | 0.048 BE | 0.416 E | 0.114 BE | 0.066 BE |
| Calcium | NA | 51.6 E | 74.8 E | 96.6 E | 96.6 E | 101 E | 65.8 E |
| Chromium | 0.05 | 0.004 B | ND | 0.002 B | ND | ND | 0.015 |
| Cobalt | NA | ND | ND | 0.009 B | ND | ND | 0.003 B |
| Copper | 0.20 | 0.015 B | 0.020 B | 0.019 B | 0.017 B | 0.006 B | 0.018 B |
| Iron (Fe) | 0.3 | **1.46 E** | **1.870 E** | **1.47 E** | **0.912 E** | **1.01 E** | **2.26 E** |
| Magnesium | 35 * | 19.6 | **61.8** | **55.1** | **206** | **68.0** | 29.3 |
| Manganese (Mn) | 0.003 | **0.117 E** | **0.068 E** | **0.087 E** | **0.164 E** | **0.059 E** | **0.060 E** |
| Fe + Mn | 0.5 | **1.58** | **1.94** | **1.56** | **1.08** | **1.07** | **2.32** |
| Nickel | 0.10 | 0.003 B | 0.001 B | 0.001 B | 0.003 B | 0.009 B | **0.336** |
| Potassium | NA | 6.48 E | 8.69 E | 9.67 E | 7.96 E | 17.8 E | 17.1 E |
| Selenium | 0.010 | ND | ND | ND | ND | ND | ND |
| Sodium | 20.0 | **618** | **176** | **664** | **348** | **2,370** | **639** |
| Thallium | 0.0005 * | ND | ND | ND | **0.004 B** | ND | ND |
| Vanadium | NA | ND | ND | 0.005 B | 0.003 B | ND | ND |
| Zinc | 2 * | 0.031 | 0.034 | 0.036 | 0.027 | 0.025 | 0.036 |
| Cyanide | 0.20 | ND | 0.108 | 0.193 | ND | **1.71** | ND |

Class GA, Type H(WS) - Protection of Groundwater for Drinking Purposes

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Standards and Guidance Values taken from NYSDEC Technical and Operational Guidance Series (TOGS) 1.1.1.. (Updated June 1998)

Blank entries indicate the compound was not detected above the detection limit, see table 5-3 for individual compound detection limits.
Bolded concentrations have exceeded the NYSDEC Class GA water quality standards or guidance values.
"B" indicates less than the required detection limit , but greater than or equal to the instrument detection limit.
"E" indicates estimated due to interferences.
"NA" indicates No Standard Available
"ND" indicates non-detect, refer to Appendix F for detection limits.

Total Cyanide Data

Cyanide was detected in every well except DW-5, MW-4, MW-5, MW-7, SW-3, and SW-5, as summarized in Table 6-12. The Class GA Standard was exceeded in wells DW-1, MW-1, MW-2, MW-3, MW-3D, MW-6, and SW-4, with concentrations in these wells ranging from 0.9 to 2.5 mg/L.

Results show that elevated total cyanide concentrations (>0.9 mg/L) primarily were found in the northeast corner of the site, the northwest corner, and at the tar well. The source of these cyanide concentrations in the northeast and northwest corners of the site appears to be purifier waste observed at these areas. The range in total cyanide concentrations is non-detect to 2.54 mg/L. No cyanide was found in wells MW-4, MW-7, SW-3, SW-5, and DW-5. The highest level, 2.54 mg/L, was found in well MW-6. Table 6-13 shows the concentrations of total cyanide found in the overburden and bedrock wells.

In light of the history of the site operation and site investigation results, it is postulated that the purifier wastes may have been deposited in the fill material present on the site. Further speciation analysis could provide a confirmation that most of the total cyanide in the groundwater is iron complexed species and is a result of dissolution of the purifier wastes in the unsaturated and probably the saturated zone. The areal extent of cyanide impacted groundwater is shown in Figure 6-10.

**Tar Well Characterization**

Test Pit Excavations

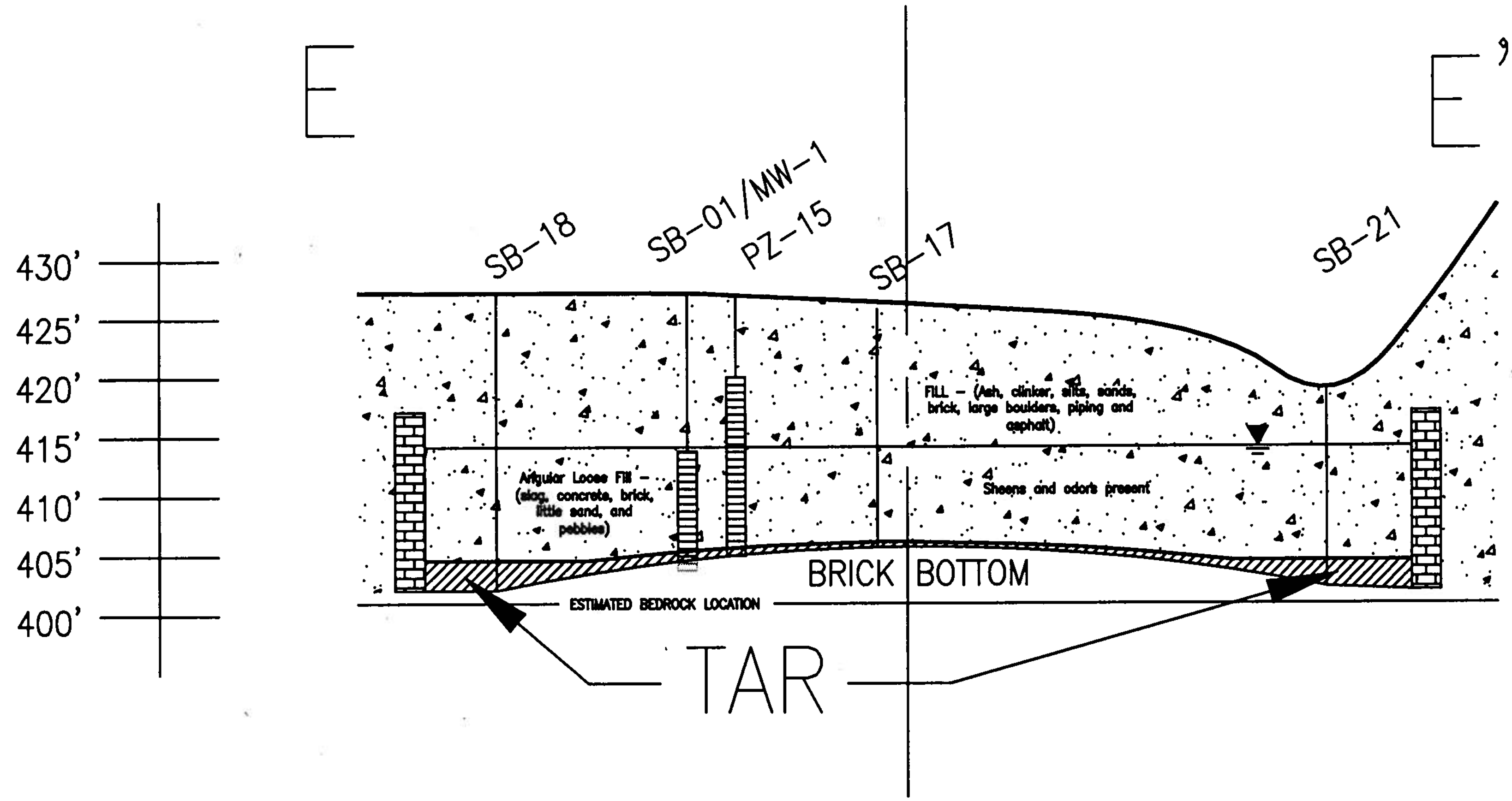
Three test pits spaced approximately 120 degrees apart were excavated at the anticipated perimeter of the tar well. Test pit logs are included in Appendix B. A schematic diagram showing the type of material overlaying and within the tar well is represented by Figure 6-11. As illustrated in this figure, the surface topography slopes to the south and west. The material above and in the tar well is primarily fill and the internal diameter of the tar well is approximately 83.5 feet.

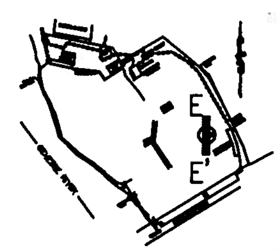
Table 6-13

## Cyanide Concentration in Overburden and Bedrock Wells, mg/L

| Well No. | Total Cyanide |
|---|---|
| *Overburden Wells* | |
| MW-1 | 0.902 |
| MW-2 | 1.49 |
| MW-3 | 2.42 |
| MW-4 | ND |
| MW-6 | 2.54 |
| MW-7 | ND |
| SW-1 | 0.193 |
| SW-3 | ND |
| SW-4 | 1.71 |
| SW-5 | ND |
| *Bedrock Wells* | |
| MW-3D | 2.03 |
| MW-6D | 0.153 |
| MW-8D | 0.108 |
| DW-1 | 0.974 |
| DW-3 | 0.028 |
| DW-5 | ND |

ND = Non-detect




Approximate Scale
1":15'

| Project: East Station, Rochester, NY | Client: RG&E/EPRI | META |
|---|---|---|
| Figure 6-11 | | |
| 1998 Focused Remedial Investigation Tar Well Cross Section | | |
| Filename: RGE8_11.DWG | Drawn by: SAH | Approved by: CCJ |
| Date: 1/12/1999 | | |

Soil Boring Work

Five 2-inch diameter borings were advanced in the tar well. The first three borings (SB-17, SB-18, and SB-19) were located in a modified diagonal pattern. The final two borings (SB-20 and SB-21) were placed approximately three feet from the northwestern and southwestern edges of the tar well wall. A layer of tar was observed at the mounded brick bottom of the tar well at thicknesses ranging from approximately 0.5 to 2.5 feet. Tar-impacted split-spoon soil samples were collected from each of the borings and analyzed for MAH/PAHs and hydrocarbon fingerprinting by GC/FID. These data along with the split-spoon soil data obtained from the earlier soil boring advanced at the tar well (SB-01), are summarized in Table 6-14.

All 11 samples of soil from the tar well were identified as being tarry soil (TS) with total MAH concentrations ranging from 250 to 19,000 mg/kg and total PAH concentrations ranging from 5,000 to 300,000 mg/kg. Chromatograms for the soil samples are included in Appendix D and the complete MAH and PAH data set for the soil samples is provided in Appendix E.

Well Installation Work

After the final two borings were advanced at the tar well, they were redrilled with 6 1/4-inch diameter augers to facilitate the installation of 4-inch diameter recovery wells (MW-9 and MW-10) These wells were evaluated on December 2, 1998 for tar recovery potentials. On that date it was determined that approximately 0.7 feet of DNAPL had accumulated in recovery well MW-9 and 2 feet had accumulated in recovery well MW-10 since their installation on November 12, 1998.

Tar Characteristics

The sample of tar collected from MW-1 had a kinematic viscosity of 618.2 cSt @ 25°C and a specific gravity of 1.141 (Appendix G). This viscosity is similar to a heavy machine oil (Handbook of Chemistry & Physics, 1987). Movement of tar through saturated overburden is affected by several factors, including capillary forces, head pressure, and the physical properties of the tar. Based on its viscosity and specific gravity, the tar from MW-1 has the potential to move through the saturated zone under the appropriate geohydrologic conditions.

Table 6-14

**Split-spoon Soil Sample Results in the Tar Well, mg/kg**

| Location | Fingerprint | Total MAHs | Total PAHs |
|---|---|---|---|
| SB-01 (12.6-12.8) | TS (tarry soil) | 1,400 | 88,000 |
| SB-01 (21.6-22) | TS | 340 | 5,000 |
| SB-01 (22.9-23.3) | TS | 530 | 14,000 |
| SB-17B (19.7-19.9) | TS | 2,900 | 71,000 |
| SB-18B (22.7-23.0) | TS | 2,500 | 64,000 |
| SB-18B (24.7-25) | TS | 9,100 | 180,000 |
| SB-19 (20.8-21) | TS | 250 | 8,900 |
| SB-20 (23.4-23.6) | TS | 19,000 | 300,000 |
| SB-20 (23.8-24.1) | TS | 7,300 | 150,000 |
| SB-21 (14.7-15.0) | TS | 1,200 | 52,000 |
| SB-21 (16.3-16.4) | TS | 8,300 | 180,000 |

## GC/FID FINGERPRINTING RESULTS

### Overview of GC/FID Fingerprinting

The GC/FID method has several features which makes it particularly useful for identifying complex hydrocarbon mixtures, such as tars and oils. For example, the separation of the compounds in a sample which occurs in the GC generally parallels the boiling points of those compounds. Therefore, certain refined petroleum products, generated by the distillation of crude oil and which differ in their boiling point ranges, are distinguishable by where they appear on a chromatogram. Also, because the FID responds nearly the same to any hydrocarbon, regardless of the size or structure of the molecule, the relative abundances of compounds in a sample are easily noted by the relative heights of the peaks in the chromatogram.

Two general features of the GC/FID chromatograms were used for interpreting the sample results from this investigation. First, the patterns of individual peaks and the sizes and shapes of any baseline features were examined qualitatively for similarities and differences among chromatograms for the various samples. This process was used to place samples into different categories corresponding to potential sources. For example, the presence of a bell-shaped baseline "hump", or unresolved complex mixture (UCM), is indicative of petrogenic sources, such as refined petroleum products. The presence of a regular series of normal alkanes and certain isoprenoid hydrocarbons, including pristane and phytane, is also indicative of some petroleum products. Thus, when the chromatographic "signatures" are present, a determination can be made concerning the presence of particular petroleum products.

Second, the presence and relative abundance of MAHs and PAHs was examined. These compounds are known to dominate the chromatograms of pyrogenic sources, such as the tars and soot produced by many incomplete combustion and pyrolysis (high temperature) processes including those by former gas manufacturing processes. In contrast, MAHs and PAHs are present at much lower relative amounts in petrogenic sources, such as refined petroleum products.

<u>**General Classification of Samples**</u>

In environmental forensic studies, it is often helpful to separate samples based on chemical or physical properties, and draw conclusions regarding their relationships based on the similarity or lack of similarity of one or more of those properties. For example, all the samples at a site which are shown to contain diesel fuel by chemical analysis could be classified as "containing diesel," and may be related to a common source. Alternatively, all samples at a site which contain an organic phase which is less dense than water, could be classified as "containing LNAPL," possibly originating from multiple sources. The LNAPL group will contain samples with diesel fuel, however the diesel subgroup will not necessarily contain all the LNAPLs. Therefore, using LNAPL as a primary grouping alone may not allow a link to be made between a diesel-containing sample and its source. Thus, the choice of classifications depends as much on the objectives of the study as on the nature of the data.

Hydrocarbons are the principal type of chemicals found at former MGP sites. Hydrocarbons can be divided into four basic classes: petrogenic substances, pyrogenic substances, mixed materials, and other materials or unknown.

Petrogenic Substances

Petrogenic substances can be defined as substances originating from petroleum, including crude oil, fuels, lubricants, and derivatives of those materials.

Pyrogenic Substances

Pyrogenic substances can be defined as substances originating from high temperature processes, including: incomplete combustion, pyrolysis, cracking, and destructive distillation. Pyrogenic substances can be generated from numerous organic starting materials, such as oil, coal, and vegetation.

Tar is a pyrogenic material, and MGP tar includes several types of tar produced from coal or oil as a by-product of gas production at former MGPs. MGP tars are complex hydrocarbon mixtures which contain relatively high amounts of MAHs and parent PAHs, with naphthalene often being the most dominant PAH compound. While there is some variability in the composition of MGP tars because of the coal or oil used as the starting material and the conditions of gas manufacture, the GC/FID chromatograms of MGP tars are generally alike. MGP tars are also similar to some other pyrogenic substances, such as by-product coke oven tars, which are used for a variety of products, such as roofing materials, road tars, driveway sealers, pharmaceuticals, and creosote.

Mixed Materials

Occasionally, a sample will contain both petrogenic and pyrogenic signatures. The composition of these samples can be categorized as "mixed."

Other Materials or Unknown

Sometimes samples at MGP sites contain synthetic hydrocarbons, natural organic materials, or other substances which are unknown. The composition of these samples can be categorized as "other materials" or "unknown."

**Specific Classification of Samples**

Often is it important to classify samples more narrowly. For example, within the petrogenic group, samples may contain gasoline, heating oil, or lubricating oil. These classifications are determined by matching the composition and resulting chromatographic patterns to those of known materials. This level of classification is often successful for refined petroleum products.

However, further classifying pyrogenic materials into groups such as MGP tar, coke oven tar, wood tar, and others is more challenging because the variability among pyrogenic materials can be both less than, as well as greater than that of petrogenic substances. For example, gasoline and diesel fuel, two petrogenic substances, have clearly different chemical compositions which are notable in their chromatographic patterns. In contrast, the chemical compositions of many pyrogenic substances are largely the same. However, the chemical compositions and chromatographic patterns of diesel fuels from different sources are quite similar, and distinguishing diesel samples can be difficult. Again in contrast, a number of notably different tar patterns can be found at a single MGP site.

Other chemical or physical properties may be used to further classify samples as needed. For example, often a weathered substance can be distinguished from a fresh substance. This is true for both petrogenic and pyrogenic materials. Also, the amount of contamination present may be used to further distinguish samples.

**Sample Classification for the East Station Site**

For the purposes of this investigation, samples were grouped into four major classes, including petrogenic, pyrogenic, mixed, and unknown. Mixed represents those samples that contain both petrogenic and pyrogenic substances and unknown includes those sample for which there was no recognizable pattern, either because of the nature of the sample contents or because the concentrations were too low.

The samples were separated further by specific constituent type, such as gasoline, diesel, lubricating oil, etc., when possible. In addition, if environmental weathering effects were observed, the samples were separated according to the degree of weathering. Finally, the samples were distinguished by the amount of contamination present in the sample including: 1) those samples which were collected as non-aqueous phase liquids from seeps, piezometers, or wells, 2) soil samples which contained sufficient amounts of hydrocarbons such that droplets, smears, sheens, etc. were noted or assumed, and 3) those samples which did not contain or create droplets, smears, sheens, etc., or were assumed to not create a separate phase based on contaminant levels.

The following classes of contamination were empirically developed and used to fingerprint NAPL, sediment, soil, and bedrock samples:

| Class | Description | Fingerprint |
|---|---|---|
| • petrogenic | pure phase gasoline, diesel, lube, etc. | by name |
| | soil with petroleum products at > 500 ppm | "name" in soil |
| | soil with petroleum products at < 500 ppm | soil containing "name" |
| • pyrogenic | tar collected as a separate phase | tar |
| | soil with tar at > 1000 ppm total PAHs | tarry soil (TS) |
| | soil with tar at < 1000 ppm total PAHs | soil with tar (SWT) |
| • mixed | | |
| • unknown | | |

**Fingerprinting Results for East Station Samples**

All the GC/FID fingerprint chromatograms are provided in Appendix D and the concentrations of MAHs and PAHs determined from the GC/FID analyses are provided in Appendix E.

Table 6-15 provides a qualitative description and grouping for each sample analyzed for GC/FID fingerprint. Also, the justification for group placement is included. The GC/FID chromatograms for the samples were examined closely and grouped by similarity as follows:

<u>Petrogenic Substances</u>

Several LNAPL or soil samples contained petrogenic substances, including gasoline or naphtha, middle weight distillates, and lubricating oil type materials. In addition, several samples contained mixtures of petrogenic substances and tars or fractions of tars. The presence of petrogenic materials at the site is not unexpected given the long industrial history and the nature of the operations conducted on the site. For example, the carburetted water gas (CWG) plant used large amounts of refined petroleum products for gas enrichment. The most common "carburetting fluid" used at CWG plants was a middle weight distillate of crude oil, termed gas oil. Samples PZ-16T, PZ-20T, and SB-11B (19.5-19.7) all appear to contain gas oil-range material.

The types of petrogenic substances found on-site are listed in Table 6-15 and presented in the following subsections.

<u>Refined Petroleum Products</u> - Two samples, SB-03 (11.7-12.0) and SB-03 (13.7-14.0), contained a weathered mid-weight fuel oil. In addition to the fuel oil, sample SB-03 (13.7-14.0) contained low concentrations of high molecular weight PAHs, not commonly associated with fuel oils.

<u>Wash Oil, Waste Oil, and Light Oil</u> - Three samples, PZ-02T, SB-05a (11.3-11.7), and SB-09 (22.8-23.0), contained a bell-shaped UCM centered at about 30 minutes and characteristic of lubricating or hydraulic oil. In addition, sample PZ-02T was an LNAPL which also contained gasoline-range hydrocarbons. The combination of gasoline-range hydrocarbons and a lubricating oil is indicative of light oil recovery waste. Samples SB-05a (11.3-11.7) and SB-09 (22.8-23.0) contained different oils as well as notable amounts of PAHs. It was not possible to determine whether these materials were released as mixtures or whether they indicate multiple sources of release.

## Table 6-15
## GC/FID Fingerprinting Results

| Field ID | Observations | Class | Fingerprint[1] |
|---|---|---|---|
| PZ-01T | predominantly MAHs and naphthalene, much less PAHs, no UCM[2] or alkanes | pyrogenic | water soluble fraction tar |
| PZ-01B | predominantly MAHs and PAHs, slight UCM | pyrogenic | SWT[3] |
| PZ-02T | predominantly MAHs and naphthalene and large high molecular weight UCM | mixed | gasoline or naphtha + lube oil |
| PZ-03B | predominantly MAHs and PAHs, no UCM | pyrogenic | tar |
| PZ-04B | predominantly 3-, 4-, 5-, and 6-ring PAHs, less MAHs and 2-ring PAHs, moderate mid-range UCM | mixed | SWT (weathered) + unknown |
| PZ-06T | predominantly MAHs and naphthalene, much less PAHs, no UCM or alkanes | pyrogenic | water soluble fraction tar |
| PZ-06B | predominantly MAHs and PAHs, slight UCM | pyrogenic | SWT |
| PZ-07T | predominantly MAHs and PAHs, slight UCM | pyrogenic | tar |
| PZ-07B | predominantly MAHs and PAHs, slight UCM | pyrogenic | tar |
| PZ-09B | no detected MAHs/ PAHs, UCM, or other features | unknown | |
| PZ-12B | predominantly MAHs and low molecular weight PAHs, less high molecular weight PAHs, slight UCM and no alkanes | pyrogenic | water soluble fraction tar + trace sediment with tar |
| PZ-13T | predominantly MAHs and low molecular weight PAHs, less high molecular weight PAHs, no UCM or alkanes | pyrogenic | water soluble fraction tar + sediment |
| PZ-13B | low concentrations of MAHs and PAHs, slight UCM | pyrogenic | unknown |
| PZ-16T | predominantly PAHs and prominent UCM, notable isoprenoid hydrocarbons | mixed | tar + gas oil (weathered) |
| PZ-17B | predominantly MAHs and PAHs, slight UCM | pyrogenic | tar |
| PZ-19T | predominantly MAHs and PAHs, slight UCM | pyrogenic | SWT |
| PZ-19B | predominantly MAHs and PAHs, slight UCM | pyrogenic | SWT |
| PZ-20T | predominantly MAHs and PAHs, prominent late eluting UCM | mixed | SWT + unknown |
| DW-3B | predominantly MAHs and PAHs, slight UCM | pyrogenic | tar |

**Table 6-15, Cont.'d**
**GC/FID Fingerprinting Results**

| Field ID | Observations | Class | Fingerprint |
|---|---|---|---|
| RS01 | predominantly MAHs and PAHs, slight UCM | pyrogenic | tar |
| RS02 | predominantly MAHs and PAHs, no UCM | pyrogenic | SWT |
| RS03 | predominantly MAHs and PAHs, slight UCM | pyrogenic | TS[4] |
| RS04 | predominantly MAHs and PAHs, no UCM | pyrogenic | tar |
| RS05 | predominantly MAHs and PAHs, no UCM | pyrogenic | SWT |
| RS06 | predominantly MAHs and PAHs, no UCM | pyrogenic | SWT |
| RS07 | predominantly MAHs and PAHs, no UCM | pyrogenic | SWT |
| RS08 | predominantly MAHs and PAHs, no UCM | pyrogenic | tar |
| RS09 | predominantly MAHs and PAHs, no UCM | pyrogenic | SWT, weathered |
| SB-01 (12.6-12.8) | predominantly MAHs and PAHs, no UCM | pyrogenic | TS |
| SB-01 (21.6-22.0) | predominantly MAHs and PAHs, no UCM | pyrogenic | TS |
| SB-01 (22.9-23.3) | predominantly MAHs and PAHs, no UCM | pyrogenic | TS |
| SB-02 (19.0-19.3) | predominantly 3-, 4-, 5-, and 6-ring PAHs, less MAHs and 2-ring PAHs, moderate late- eluting UCM, possible alkane series | mixed | SWT (weathered) + unknown |
| SB-02 (15.4-15.7) | predominantly 3-, 4-, 5-, and 6-ring PAHs, less MAHs and 2-ring PAHs, prominent late- eluting UCM | mixed | SWT (weathered) + unknown |
| SB-03 (13.7-14.0) | prominent mid-weight bell-shaped UCM, no normal alkane series, visible isoprenoid hydrocarbons, little MAHs and PAHs | petrogenic | gas oil-range fuel, moderately weathered |
| SB-03 (11.7-12.0) | prominent mid-weight bell-shaped UCM, no normal alkane series, visible isoprenoid hydrocarbons, little MAHs and PAHs | petrogenic | gas oil-range fuel, weathered |
| SB-04 (11.4-11.7) | predominantly 3-, 4-, 5-, and 6-ring PAHs, less MAHs and 2-ring PAHs, moderate late- eluting UCM | mixed | TS (weathered) + unknown |

| Table 6-15, Cont.'d<br>GC/FID Fingerprinting Results | | | |
|---|---|---|---|
| **Field ID** | **Observations** | **Class** | **Fingerprint** |
| SB-05A (11.3-11.7) | predominantly MAHs and PAHs, prominent late eluting UCM | mixed | TS + lube oil |
| SB-06 (11.8-12.0) | predominantly MAHs and PAHs, no UCM | pyrogenic | SWT |
| SB-06 (20.9-21.3) | predominantly 3-, 4-, 5-, and 6-ring PAHs, less MAHs and 2-ring PAHs, moderate mid-weight UCM, possible isoprenoid hydrocarbons | mixed | SWT + gas oil-range fuel, weathered |
| SB-06D (36.1-36.3) | predominantly MAHs and PAHs, no UCM | pyrogenic | SWT (rock), weathered |
| SB-07 (15.8-16.0) | predominantly MAHs and PAHs, no UCM | pyrogenic | TS |
| SB-07B (25.4-25.7) | predominantly MAHs and PAHs, no UCM | pyrogenic | TS |
| SB-08 (20.9-21.1) | predominantly MAHs and PAHs, no UCM | pyrogenic | TS |
| SB-09 (22.8-23.0) | predominantly MAHs and PAHs, large mid-weight UCM, isoprenoid hydrocarbons | mixed | SWT, unknown weathered petroleum |
| SB-10 (19.3-20.0) | predominantly MAHs and PAHs, slight UCM | pyrogenic | TS, weathered |
| SB-10 (22.2-22.5) | predominantly MAHs and PAHs, slight UCM | pyrogenic | TS, weathered |
| SB-11B (19.5-19.7) | notable gasoline-range hydrocarbons, prominent gas oil-range UCM, isoprenoid hydrocarbons, relatively low amounts of PAHs | mixed | gasoline + gas oil-range fuel (weathered) + SWT |
| SB-11B (31.5-31.8) | predominantly MAHs and PAHs, slight UCM | pyrogenic | TS |
| SB-15 (9.6-9.8) | | unknown | |
| SB-15 (15.5-15.7) | predominantly PAHs, no UCM | pyrogenic | SWT |
| SB-16 (19.4-19.6) | predominantly 4-, 5-, and 6-ring PAHs, little MAHs and 2- and 3-ring PAHs, moderate mid-weight UCM, possible isoprenoid hydrocarbons | mixed | SWT + gas oil-range fuel (weathered) |
| SB-16 (22.8-23.0) | predominantly MAHs and PAHs, slight UCM | pyrogenic | TS |
| SB-17B (19.7-19.9) | predominantly MAHs and PAHs, no UCM | pyrogenic | TS |

| Table 6-15, Cont.'d<br>GC/FID Fingerprinting Results | | | |
|---|---|---|---|
| **Field ID** | **Observations** | **Class** | **Fingerprint** |
| SB-18B (22.7-23.0) | predominantly MAHs and PAHs, no UCM | pyrogenic | TS |
| SB-18B (24.7-25.0) | predominantly MAHs and PAHs, no UCM | pyrogenic | TS |
| SB-19 (20.8-21.0) | predominantly MAHs and PAHs, no UCM | pyrogenic | TS |
| SB-20 (23.4-23.6) | predominantly MAHs and PAHs, no UCM | pyrogenic | TS |
| SB-20 (23.8-24.1) | predominantly MAHs and PAHs, no UCM | pyrogenic | TS |
| SB-21 (14.7-15.0) | predominantly MAHs and PAHs, no UCM | pyrogenic | TS |
| SB-21 (16.3-16.4) | predominantly MAHs and PAHs, no UCM | pyrogenic | TS |

[1] qualitative identification based on GC/FID fingerprints and chemical concentrations
[2] UCM - an unresolved complex mixture or "hump"
[3] Soil with tar
[4] Tarry soil

Petroleum and Mixtures - Several samples contained both petrogenic and pyrogenic substances. These samples are discussed in the subsection on mixtures.

Pyrogenic Substances

Most samples collected at the site contained pyrogenic substances or mixtures of pyrogenic substances with petroleum products. These types of materials are common at former MGP sites because tar, a pyrogenic substance, was a major by-product of the gas manufacturing process. In fact, several samples collected at the East Station Site from piezometers or wells were DNAPL tars. In addition, several soil samples contained sufficient amounts of tar so that the tar was clearly visible as a separate organic phase.

There was some variability in the GC/FID patterns observed for the samples which contained only pyrogenic substances or principally pyrogenic substances. A visual inspection of the chromatograms was used to classify the samples into four groups containing pyrogenic contamination based on their similarity. The samples collected from within the tar well are shown in bold italics.

Group 1 - These samples had a pyrogenic pattern where ethylbenzene was present at higher concentrations than xylenes, where 2-methylnaphthalene was more abundant than 1-methylnaphthalene, where acenaphthene was more abundant than acenaphthylene or fluorene, and where pyrene was more abundant than fluoranthene.

***SB-01 (21.6-22.0), SB-19 (20.8-21.0),***
PZ-03B, PZ-06B, PZ-19T, PZ-19B,
SB-06D (36.1-36.6), SB-07 (15.8-16.0), SB-07 (25.4-25.7)
DW-3B
RS01, RS03, RS04, RS05, RS08, RS09

Group 2 - These samples had a pyrogenic pattern where ethylbenzene was typically more abundant than xylenes, where 2-methylnaphthalene was less abundant than 1-methylnaphthalene, where acenaphthene was more abundant than acenaphthylene or fluorene, and where pyrene was more abundant than fluoranthene. In addition, several samples in this group appeared to be weathered, and their placement in the group should be considered an estimate.

SB-08 (20.9-21.2), SB-10 (19.3-20.0), SB-10 (22.2-22.5), SB-11B (31.5-31.8),
SB-16 (22.8-23.0),
RS02

Group 3 - These samples had a pyrogenic pattern where ethylbenzene was typically less abundant than xylenes, where 2-methylnaphthalene was more abundant than 1-methylnaphthalene, where acenaphthylene was more abundant than acenaphthene, and where pyrene was more abundant than fluoranthene.

***SB-01 (12.6-12.8), SB-01 (22.9-23.3), SB-18B (22.7-23.0), SB-21 (14.7-15.0),***
PZ-07T, PZ-07B

Group 4 - These samples had a pyrogenic pattern where ethylbenzene was typically less abundant than xylenes, where 2-methylnaphthalene was more abundant than 1-methylnaphthalene, where acenaphthylene, dibenzofuran, and fluorene were about equally abundant and more abundant than acenaphthene, and where pyrene was less abundant than fluoranthene.

***SB-17B (19.7-19.9), SB-18B (24.7-25.0), SB-20 (23.4-23.6), SB-20 (23.8-24.1),***
***SB-21 (16.3-16.4),***
*PZ-17B*

Note that there are tar well samples in three of the four groups, indicating a notable variability in GC/FID pattern among the samples within the tar well. The variability was not unexpected since the tar well may have received tar over two or more decades from two separate MGP processes. Batch to batch differences in tar composition were likely and would be reflected in the GC/FID fingerprints. Also, some weathering of the tar occurred over time, particularly at the fringes of tar pools, further altering the GC/FID fingerprint. Because of the variability in tar patterns within the tar well, several tar types found outside the tar well may have originated from the tar well. Conversely, the variability in GC/FID fingerprints within the tar well confounds the linking of tars found outside the tar well to the tar well as the source. Therefore, GC/FID fingerprinting alone, cannot eliminate the tar well as a possible source of tar found elsewhere on the site. Alternatively, the tar well tar is not unique and therefore similar tar found elsewhere may have originated from other sources/structures.

Mixtures

Nine samples contained mixtures of substantial amounts of petrogenic and pyrogenic substances. For example, samples PZ-16T, PZ-20T, and SB-11B (19.5-19.7) contained both mid-weight fuel oil, possibly gas oil, and PAHs. The fuel oil components of the samples appear substantially weathered, suggesting an old release. In addition, sample SB-11B (19.5-19.7) contains gasoline-range hydrocarbons, indicating the simultaneous presence of gasoline or naphtha.

Other samples appeared to contain mixtures of pyrogenic and petrogenic substances, however the types or sources of those materials could not be determined from the data. Those samples included SB-02 (15.4-15.7), SB-02 (19.0-19.3), SB-04 (11.4-11.7), SB-06 (20.9-21.3), and SB-16 (19.4-19.6). It was not possible to determine whether these materials were released as mixtures or whether they indicate multiple sources of contamination in the sample.

Unknowns

Several samples contained measurable hydrocarbons at concentrations too low to give a clear GC/FID pattern. Those samples included RS06, RS07, SB-06 (11.8-12.0), PZ-13B, PZ-09B, SB-13 (18.7-18.9), SB-15 (9.6-9.8), and SB-15 (15.5-15.7). Descriptions of the compositions of these samples and suggestions for their possible sources are provided in Table 6-15.

Water Soluble Fraction of Tar or Oil

The chromatograms of several aqueous samples, collected from piezometers, appeared to be dominated by the dissolved phase tar constituents present. Those samples included, PZ-01T, PZ-06T, PZ-12B, and PZ-13T. In addition to the dissolved phase tar, sample PZ-12B appears to contain low concentrations of tar also, which was likely present as a sheen. Finally, sample PZ-13T appears to contain small amounts of a mid-weight fuel oil, also present as a sheen.

The GC/MS chromatograms from the analyses of groundwater samples, for volatile and semivolatile compounds, were qualitatively reviewed for indicators of the sources of organic compounds present, if any. The presence and amount of MAHs and PAHs, the presence and amounts of other constituents, and the constituent patterns were used for source identification. Based on this review, the samples were found to contain substances as summarized in Table 6-16.

## QA/QC DATA RESULTS

All samples were received at the laboratory in good condition and at the proper temperature. A cursory review of the groundwater data packages from CHEMTECH was conducted. The review included a check of data completeness, review of QC summaries and data summaries, and a search for anything that appeared unexpected. In general, the data are very good, while there are some QC results which would get a "J" flag in a full data validation, there were no indications that would require data to be rejected. The following comments apply to the data review:

1. 1,2-Dichloroethane was reported at low levels in samples MW-6, MW-3D, MW-8D, DW-1, MW-1, MW-4, MW-5, and SW-1; however the mass spectra and retention times indicate that it was a false positive.

2. In a full validation, methylene chloride and acetone, which were reported in a few samples, would be flagged as ND because of their presence in a blank.

3. One or two low level detects for metals would also be flagged as ND because of their presence in blanks.

Table 6-16

## Groundwater GC/MS Fingerprinting Results

| Well ID | Observations | VOC/SVOC Comparison |
|---|---|---|
| DW-1 | WSF tar[1] | consistent data |
| DW-5 | ND[2] | consistent data |
| MW-1 | WSF tar | consistent data |
| MW-2 | WSF tar and weathered gas oil-range hydrocarbons | consistent data |
| MW-3 | Weathered gas oil | consistent data |
| MW-3D | Unknown, too low | VOC indicates WSF tar |
| MW-4 | WSF tar and gas oil-range UCM[3] | consistent data |
| MW-5 | WSF tar and gas oil-range UCM | consistent data |
| MW-6 | WSF tar and UCM gas oil-range | consistent data |
| MW-6D | WSF tar | consistent data |
| MW-7 | WSF tar and gas oil-range UCM | consistent data |
| MW-8D | WSF tar | consistent data |
| SW-1 | WSF tar | consistent data |
| SW-3 | WSF tar | consistent data |
| SW-4 | WSF tar and slight gas oil-range UCM | consistent data |
| SW-5 | ND | consistent data |

1 Water Soluble Fraction
2 Non-detect
3 Unresolved Complex Mixture

4. The surrogate recoveries for the SVOCs were consistently low (50 to 80%); this may indicate that the reported results are lower than their true values in many samples.

CHEMTECH addressed these comments and submitted revised data presented in Appendix F.

**Rinsate and Trip Blanks**

Rinsate and trip blank results are summarized in Table 6-17, the sample duplicate results for the selected analytes are summarized in Table 6-18, and complete results are included in Appendices E and F. The source of the 15 µg/L of benzene in rinsate blank ES-RB02 was likely associated with an organic solvent used to remove tar from the augers. The analytical laboratory is the likely source of the acetone in ES-TB03 since acetone was also detected in a laboratory blank.

Table 6-17

**Rinsate and Trip Blank Data**

| Sample ID | Results |
|---|---|
| ES-RB01 | ND[1] |
| ES-RB02 | 15 µg/L of benzene, all other analytes were ND[1] |
| ES-RB03 | ND[1] |
| ES-TB01 | ND[2] |
| ES-TB02 | ND[2] |
| ES-TB03 | 2.5 µg/L of acetone, all other analytes were ND[2] |

1 < 0.01 mg/L for each MAH and PAH analyte, refer to Appendix E
2 < 0.0001 to 0.005 mg/L for each VOC analyte, refer to Appendix F

Table 6-18

**Comparison of Field Duplicate Results, µg/L[1]**

| Analyte | ES-MW-2 | ES-MW-2Dup |
|---|---|---|
| Aluminum | 15 | 26 |
| Arsenic | 9.7 | 13 |
| Barium | 19 | 20 |
| Calcium | 360,000 | 360,000 |
| Chromium | 4.2 | 4.9 |
| Copper | < 1.0 | 8.1 |
| Iron | 100,000 | 100,000 |
| Magnesium | 130,000 | 130,000 |
| Manganese | 2,100 | 2,100 |
| Potassium | 17,000 | 18,000 |
| Sodium | 380,000 | 390,000 |
| Thallium | 2.9 | 5.0 |
| Vanadium | 6.6 | 6.5 |
| Zinc | 21 | 22 |
| Cyanide | 1,500 | 1,500 |
| 2,4 Dimethylphenol | 2.6 (estimated) | 1.9 (estimated) |
| Naphthalene (SVOC | 16 | 13 |
| Naphthalene (VOC Method) | 20 | 32 |
| 2-methylnaphthalene | 1.3 (estimated) | < 10 |
| Acenaphthene | 7.8 (estimated) | 6.0 (estimated) |
| Dibenzofuran | 2.0 (estimated) | 1.5 (estimated) |
| Fluorene | 5.1 (estimated) | 3.9 (estimated) |
| Phenanthrene | 6.9 (estimated) | 5.0 (estimated) |
| Anthracene | 1.5 (estimated) | 1.1 (estimated) |
| Benzene | 24 | 36 |
| Toluene | 2.3 | 3.3 |
| Ethylbenzene | 11 | 17 |
| Xylenes | 5.0 | < 2.2 |
| Isopropylbenzene | 4.3 | 7.2 |
| N-propylbenzene | 3.0 | 5.1 |
| 1,3,5-trimethylbenzene | 4.6 | < 1.1 |
| 1,2,4-trimethylbenzene | 3.3 | 5.5 |
| Sec-butylbenzene | < 0.6 | 2.7 |
| 4-isopropyltoluene | < 0.5 | 2.1 |

1 a complete set of analytes, inclusive of the non-detects and tentatively identified compounds is included in Appendix F

## WASTE CHARACTERIZATION RESULTS

### Waste Soil Characterization Results

The waste characterization results obtained by analyzing the composite soil sample (ES-DC-1) collected on December 3, 1998 from the drums of soil cuttings are presented in Table 6-19, Appendix E, and Appendix G.

### Wastewater Characterization Results

Characterization of the contents of the frac tank, based on MAH/PAH analysis of liquid samples WW01 and WW02, are provided in Appendix E. The total MAHs were 0.17 mg/L for WW01 and 0.6 mg/L for WW02. The total PAHs were 1.15 mg/L for WW01 and 1.83 mg/L for WW02. The waste characterization results for the Ag tank wastewater (ES-WW-3) collected on December 3, 1998 are presented in Table 6-19 and Appendix G. The MAH and PAH concentrations representative of the Ag tank contents (sample ES-WW03) were 7.9 and 3.3 mg/L, respectively and are included in Appendix E.

Table 6-19

**Soil and Wastewater Characterization Results**

| Sample (ID) | Reactivity | TCLP VOCs, mg/L | TCLP metals, mg/L | TCLP SVOCs, mg/L | Paint filter Test (soil) pH (aqueous) |
|---|---|---|---|---|---|
| Soil (ES-DC-1) | ND[1] | 0.06 benzene[2] | 0.07 arsenic<br><0.002 lead<br>0.019 barium<br>< 0.001 cadmium<br>< 0.0002 mercury<br>< 0.005 selenium<br>0.01 silver<br>0.003 chromium | ND[3] | < 1 mL/kg |
| Aqueous (ES-WW-3) | ND[1] | 0.26 benzene[2] | 0.045 arsenic<br>0.003 lead<br>0.04 barium<br>< 0.001 cadmium<br>0.0005 mercury<br>< 0.005 selenium<br>< 0.002 silver<br>0.004 chromium | 0.13 total methylphenols[3] (estimated) | 8.05 |

1 < 53 mg/kg sulfide reactivity, <1.05 mg/kg cyanide reactivity
2 all other VOCs < 0.05 mg/L
3 all other SVOCs < 0.1 to 0.25 mg/L

Section 7

# DISCUSSION OF RESULTS

The results of the work performed to date at the East Station former MGP site indicate that one or more types of contaminants are present over a large portion of the site. The three major issues examined during this focused investigation are as follows:

1. DNAPL

   DNAPL in the river,

   DNAPL in the overburden, and

   DNAPL in the shallow bedrock.

2. LNAPL

   LNAPL in the overburden.

3. Groundwater

   On-site presence of MAHs, PAHs, metals, and cyanide.

The following paragraphs provide discussions of these issues.

**DNAPL**

Of primary concern at the East Station former MGP site is the subsurface distribution of DNAPL tar that was a by-product from historical gas production. This type of material was found over much of the site in the overburden and/or shallow bedrock. In addition, during the riverbank survey, DNAPL was observed at several locations adjacent to the site along the Genesee River. Several potential sources of DNAPL observed on-site in the overburden or shallow bedrock were identified from historical records including the former gas holder in the eastern portion of the site that had been used for tar storage.

The release of the tar from the well and its migration through the overburden and bedrock appears to have taken place over many years as indicated by several site- and tar-specific factors, including the following:

1. The bottom one to two feet of overburden generally is composed of alluvial deposits (clay, sand, gravel, silt) or fill materials (sand, ash, clinkers), both of which contained evidence of tar in several on-site areas, thereby indicating that these matrices facilitated the migration of fluid tar from one area to another.

2. At several locations, the material at the overburden/bedrock interface was observed to be highly weathered (very porous and crumbly) and, as a result, fluid tar could potentially migrate through this material into the bedrock fractures.

3. Both horizontal and vertical fractures were observed in the bedrock cores. The cores contained from 10 to 19 horizontal fractures per five-foot section (Table 6-4). These fractures allowed for the lateral and vertical movement of the tar through the bedrock.

4. The tar well is located in a high bedrock elevation, thereby allowing the tar to flow at the overburden/bedrock interface, into the bedrock and away from the tar well.

5. The depth of tar originally in the tar well could have acted as a static head and caused the tar to migrate by seeking any fractures or gaps in the bottom or sides of the tar well.

6. As a result of its age (constructed in 1882 and used until circa 1910) and large diameter (ID of 83.5 feet), a considerable volume of tar could have been stored in the tar well during that period of time. Even though the maximum thickness of tar in the well is now about 2.5 feet, it is likely that the tar well contained more tar during its nearly 30 years of use. Furthermore, it is likely that during that time, tars with somewhat different compositions were placed in the tar well as the plant operations changed. The slight chemical differences observed in the tar samples collected from the tar well during this investigation, could be a result of the deposition of different tars during the operation of the East Station MGP.

7. The pumpable tar collected from the tar well has a kinematic viscosity of 618 cSt @ 25°C which is sufficiently low for the tar to be fluid and mobile.

8. The specific gravity of the tar currently in the well is 1.141, making it a denser than water, non-aqueous phase liquid or DNAPL.

Based on these factors and both chemical and physical evidence from the investigation, the tar well is inferred to be a major source of the DNAPL at the site. For example, as presented in Section 6, 34 of the tar-containing samples were separated into four categories, referred to as Groups 1 through 4, based on their chromatographic fingerprints. All 12 of the tar or tarry soil samples collected from the tar well belonged in three of the four groups (Groups 1, 3, and 4). Only six samples, five from soil borings and one river sediment sample, had the characteristics of Group 2 which was not found in any of the tar well samples. The 16 remaining DNAPL, sediment, soil, and bedrock samples all matched either the Group 1 or Group 3 fingerprints, indicating that they have the same chemical signature as the samples from the tar well.

While the data do not show the tar well to be the only source of DNAPL, the tar well appears to be a major source of the DNAPL observed. Further, there were sources of DNAPL other than the tar well at this site at some time in the past. These sources likely include past plant housekeeping practices which could have resulted in some tar disposal in discrete areas of the site and the pumping of gas or tar from one location to another which could have led to intermittent leaks of tar along pipelines. Furthermore, some tar could have been in Gas Holders #7 and #8, as well as numerous smaller structures, such as the tar separators, precipitators, dehydrators, and gas purifiers.

The following paragraphs provide further details concerning the DNAPL observed in specific locations and the likely connection to the tar well.

**NAPL in the Genesee River**

When the river level was lowered, NAPL was observed in several locations along an approximate 750 foot length of the exposed riverbank (Figure 6-1) from under the Bausch Street Bridge down river. Evidence of NAPL was observed in the form of small pools, sheens, NAPL-containing sediments, and staining. At three specific locations (Figure 6-1), NAPL appeared to be emanating from the sediments or rip-rap into the river either from above the lowered pool elevation (RS02) or directly into the river at the base (RS01 and RS08). Neither the magnitude of these NAPL pools nor their connection to on-site NAPL, were directly delineated.

Samples of NAPL collected during the riverbank survey were analyzed and the results were compared to the results for samples collected from the tar well and from other locations on-site. An examination of the average total MAH and PAH concentrations for both the tarry samples from the tar well (Tables 6-2, 6-3, and 6-4) and the NAPL samples from the riverbank (Table 6-1) indicates a marked similarity in the concentrations of MAHs and PAHs present, as shown in Table 7-1.

Table 7-1

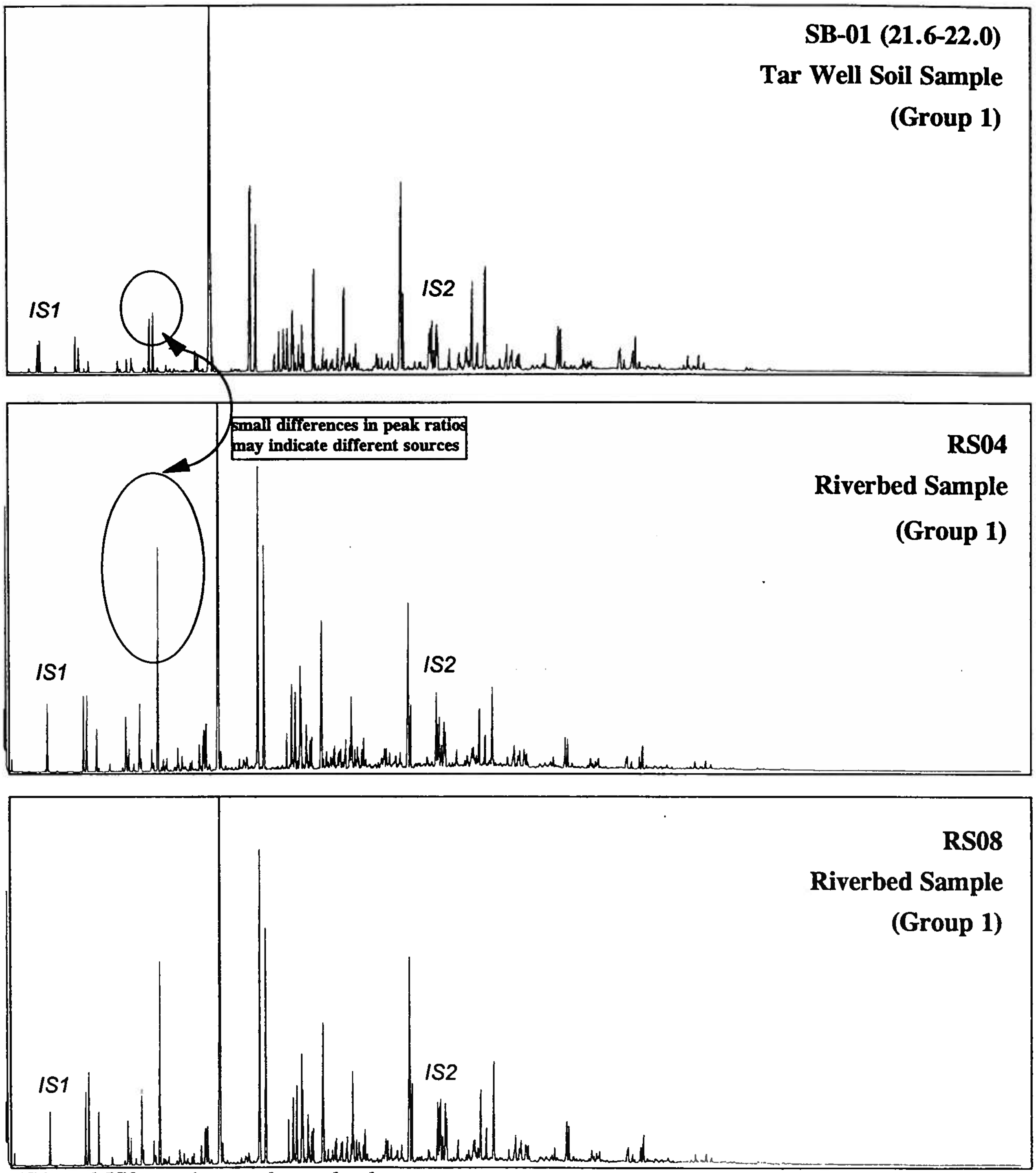
**Comparison of Tar Well and Riverbed NAPL Samples**

| Sample Type | Average MAHs, mg/kg | Average PAHs, mg/kg |
|---|---|---|
| 4 tarry soils from tar well borings | 11,000 | 200,000 |
| 1 DNAPL tar sample from the tar well (PZ-17) | 11,000 | 180,000 |
| 3 NAPL from riverbed samples (RS01, RS04, RS08) | 11,000 | 190,000 |

As presented in Section 6, NAPL samples collected from the riverbed area were chromatographically similar, but not identical to some samples from the tar well, as shown in Figure 7-1. In this figure, the chromatographic fingerprints for a tarry soil sample from the tar well (SB-01) and two NAPL samples (RS04 and RS08) from the riverbed area are compared and shown to be similar. All three of these samples were identified as having a Group 1 pyrogenic pattern. Furthermore, four of the remaining seven samples collected from the riverbed area (RS01, RS03, RS05, and RS09) also were identified as having Group 1 characteristics. However, as stated previously, there were several

Figure 7-1

## Tar Well Soil and Riverbed NAPL Sample GC Group 1 Fingerprints




*IS1 and IS2 are internal standards*

potential sources of NAPL on the site other than the tar well, and no direct link to the tar well was established with these data.

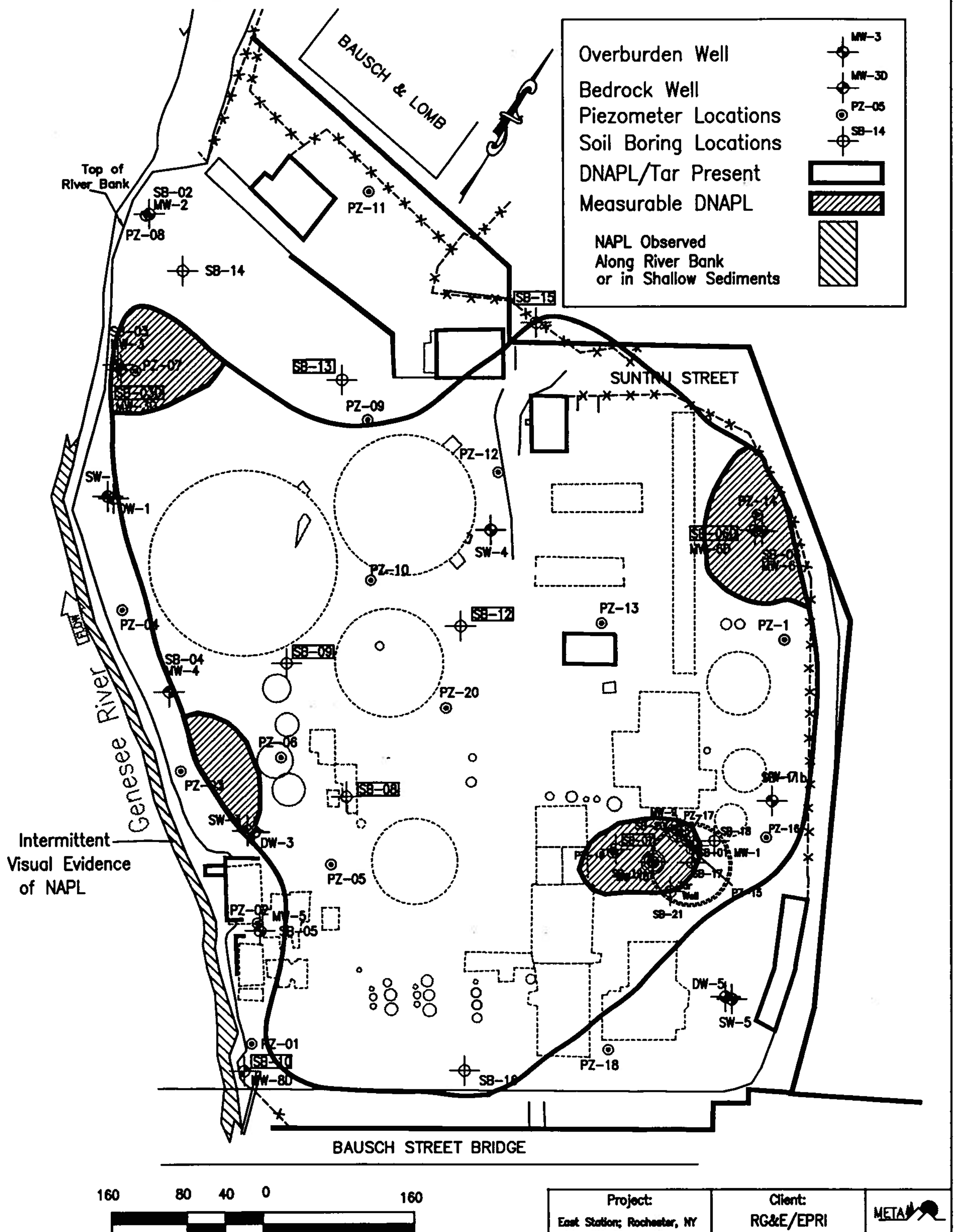
These results provide chemical evidence that a significant portion of the NAPL observed in the riverbed area is essentially the same material as the DNAPL found in the tar well. However, a similar NAPL also was found in piezometers PZ-03 and PZ-06, suggesting that other NAPL sources are likely. Further, since neither the magnitude of the NAPL pools in the riverbed area nor their connection to on-site sources was determined directly, other NAPL release scenarios could not be eliminated. Further field investigations are needed to accurately determine the connection between sources and migrated NAPL at the site.

**DNAPL in the Overburden**

Figure 7-2 shows the estimated areal extent of DNAPL in the overburden. As illustrated in this figure, physical and chemical evidence of the presence of DNAPL in the overburden was found in most locations sampled during the field work. The physical evidence typically was in the form of sheens, stringers, or globs of DNAPL found below the water table in soil borings or in the water from the piezometers or monitoring wells and odors indicative of MGP tar. Chemical evidence of tar in soil samples was found, typically at depths of 10 feet or more below the ground surface (Figures 6-3, 6-4, and 6-5), with samples identified as "tarry soils" (Table 6-3) having total PAH concentrations ranging from 1,500 to 5,600 mg/kg. Despite the field observation that these samples were highly tarry, the PAH levels correspond to only about 0.75 to 2.8 percent by weight of pure tar in the soil, calculated as follows using 200,000 mg/kg PAHs for tar based on the tarry samples listed in Table 7-1:

$$\frac{(1{,}500 \text{ to } 5{,}600)\text{ mg PAHs}}{\text{kg of soil}} \times \frac{\text{kg tar}}{(200{,}000)\text{ mg PAHs}} \times 100\% = 0.75 \text{ to } 2.8\% \text{ tar in soil}$$

This calculation indicates that the soils were not saturated with tar as their appearance might have suggested. Rather, less than 10% of the available pore space contained tar. In addition to this small




Map based on site map from Site Investigation Report for East Station MGP Site, Atlantic Environmental Services, Inc., June 1993.

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|---|---|---|
| East Station; Rochester, NY | RG&E/EPRI | META |

Figure 7-2
1998 Focused Remedial Investigation
Areal Estimate of
DNAPL in Overburden

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| REDINV.DWG | SRM | IS | 8/12/1999 |

amount of tar in soil, measurable DNAPL was observed in a few locations at other on-site locations, such as in the bottoms of piezometers PZ-03 and PZ-07. The largest amount of DNAPL in the overburden was found in the tar well, with up to about 2.5 feet of DNAPL tar observed at the bottom of the tar well. Based on this finding, the tar well was identified as the largest reservoir of DNAPL found in the overburden during this and previous investigations. The tar well currently contains at least 20,000 gallons of tar.

The tar well borings indicated that there is a 3-foot layer of fill with NAPL sheens located directly above the 2.5-foot tar layer at the bottom of the well, implying that tar probably occupied this fill area at some past time.

Conservative estimates of tar volumes currently in the on-site overburden were calculated for light tar-containing and heavy tar-containing areas using the following two sets of assumptions:

1. <u>For light tar-containing areas</u>
   0.5 feet is the average thickness of the DNAPL-containing soil,
   1.0% by weight is the average amount of tar in the soil, and
   is distributed over 80% of the site area.

2. <u>For heavy tar-containing areas</u>
   2.0 feet is the average thickness of the DNAPL-containing soil,
   2.5% by weight is the average amount of tar in the soil, and
   is distributed over 10% of the site area.

Based on these two sets of assumptions, calculations indicate that about 20,000 gallons of tar account for the over 80% coverage of the site and about 25,000 gallons of tar would be needed to cover 10% of the site, totaling 45,000 gallons of tar for all the tar in the overburden. This volume of tar could have come from the tar well and would amount to slightly more than a one foot thick layer of tar in the tar well that migrated.

While this estimate indicates that the amount of tar observed in the overburden soils could have come from the tar well, it does not prove that it did. However, there is other physical and chemical evidence strongly that at least a portion of it did. For example, tar was observed in the soil boring (SB-07) directly outside of the tar well, to the west, clearly showing that tar released from the well has migrated to the outside and flowed by gravity in the downgradient direction.

As illustrated in Figures 7-3, 7-4, and 7-5, the chromatographic patterns for the DNAPL samples collected from the bottoms of piezometers PZ-03, PZ-06, and PZ-07; a tarry soil collected from SB-07 (located west of the tar well); and a DNAPL sample from the bottom of PZ-19 (located near SB-07), were categorized as either Group 1 or Group 3 patterns observed in samples collected from the tar well. These results all corroborate that the tar well was a likely source of DNAPL in the overburden. However, the GC/FID patterns, while very similar, are not exact. Therefore, the DNAPLs found in PZ-03, PZ-06, PZ-07, PZ-19, and SB-07 could have come from a source(s) other than the tar well.

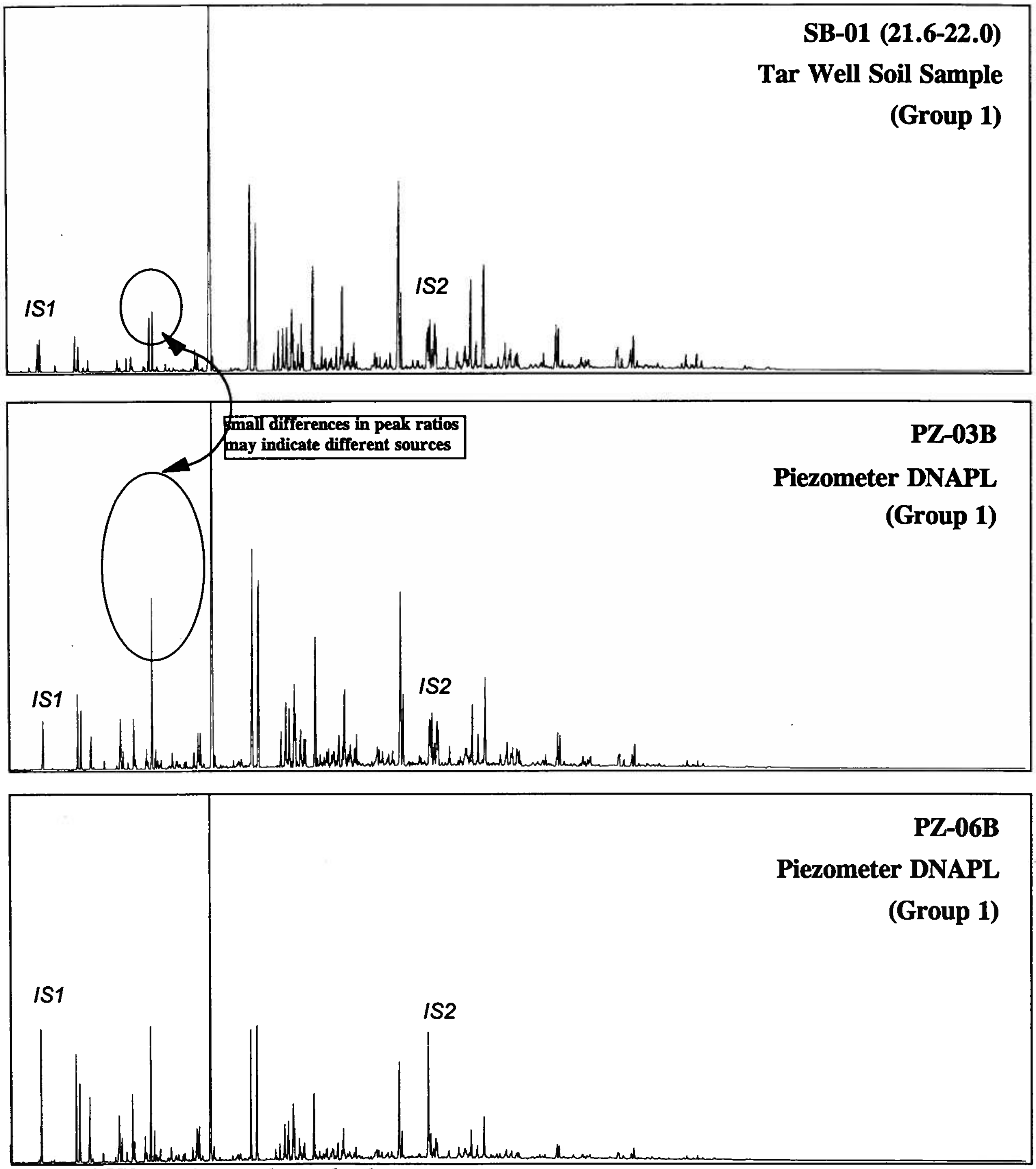
**DNAPL in the Shallow Bedrock**

All nine locations where bedrock cores were collected had at least one fracture that contained DNAPL. Figure 7-6 was prepared based on these results and shows that the estimated extent of DNAPL in shallow bedrock covers most of the site and that there is a portion of the site in the northeast which contains DNAPL in the deep bedrock.

In each of the borings, the number of fractures in each 5-foot section of bedrock were similar, varying only from 10 to 19 fractures. Although most of the fractures observed were horizontal, some vertical fractures were also observed. The nature and extent of the fractures would allow for both the lateral and vertical movement of DNAPL in a scattered pattern, with the potential for significant movement in the horizontal and vertical directions.

Figure 7-3

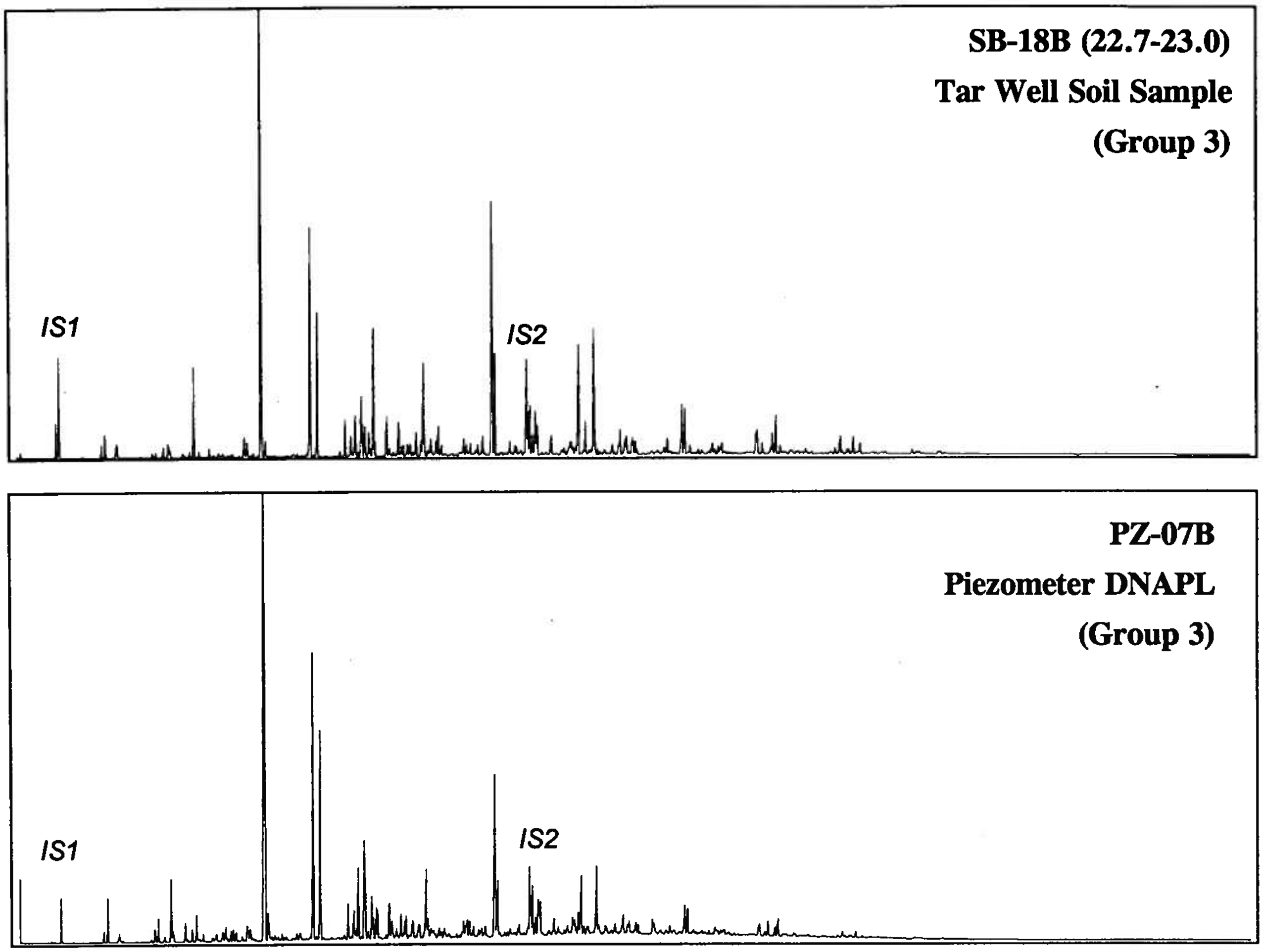
## Tar Well Soil and Piezometer DNAPL Sample GC Group 1 Fingerprints




*IS1 and IS2 are internal standards*

Figure 7-4

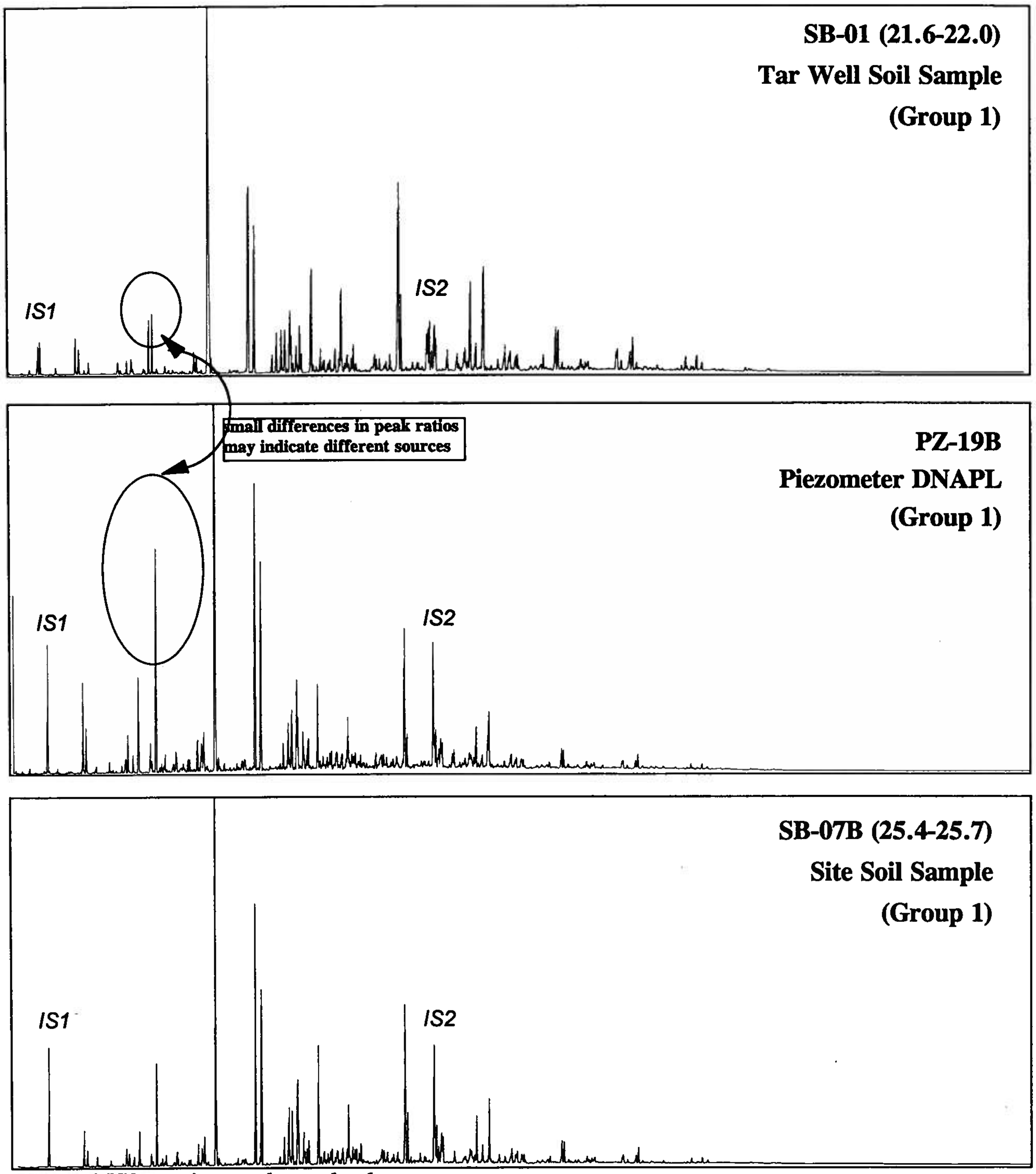
## Tar Well Soil and Piezometer DNAPL Sample GC Group 3 Fingerprints



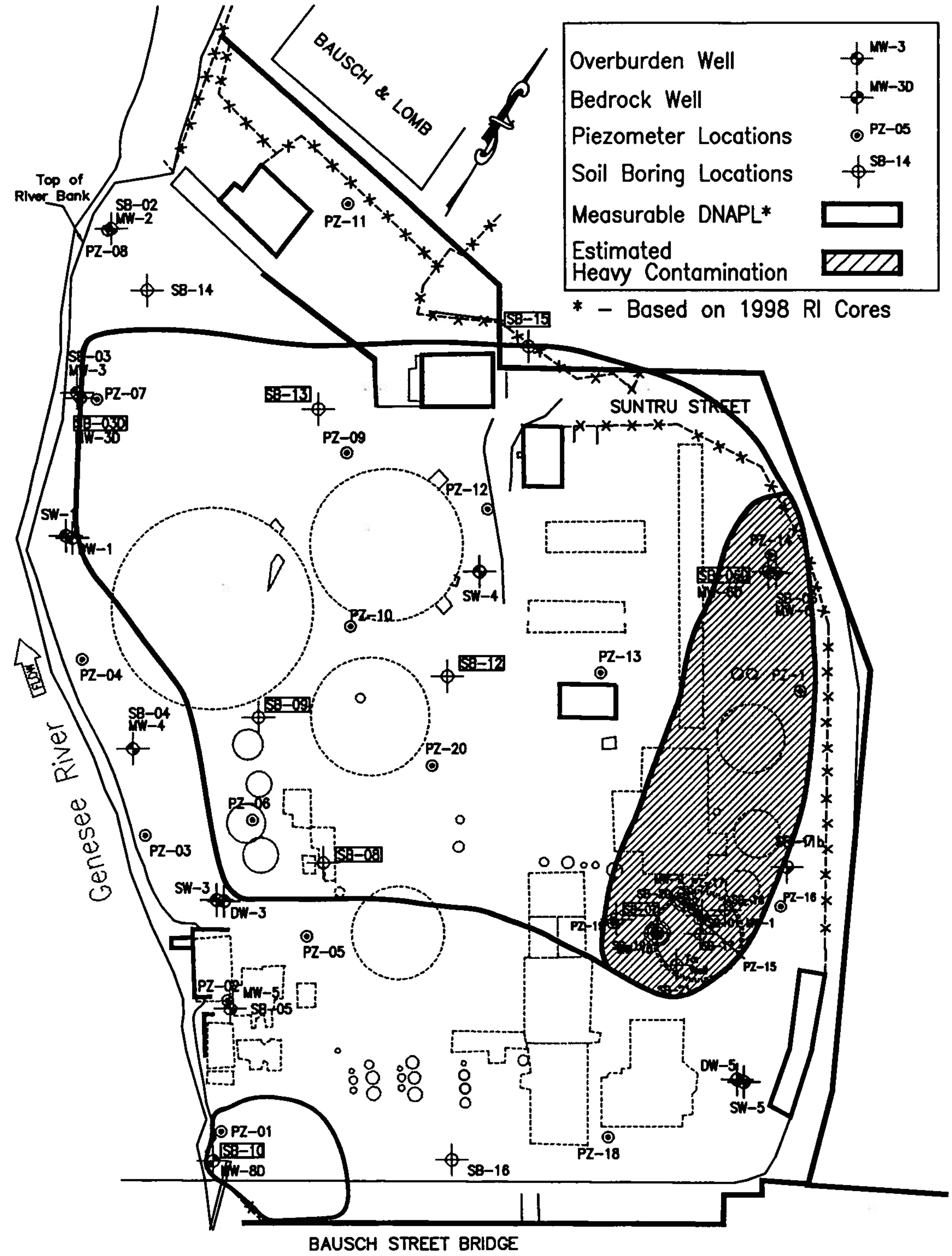

*IS1 and IS2 are internal standards*

Figure 7-5

**Tar Well Soil, Piezometer DNAPL, and Soil Boring Sample GC Group 1 Fingerprints**




*IS1 and IS2 are internal standards*




160 80 40 0 160

Scale (ft)

Map based on site map from Site Investigation Report for East Station MGP Site, Atlantic Environmental Services, Inc., June 1993.

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Figure 7-6
1998 Focused Remedial Investigation
Areal Estimate
of DNAPL in Bedrock

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At six of the locations, multiple fractures were observed to contain DNAPL (Table 6-4, Figure 7-6). However, at the other three locations (MW-3D, SB-13, and SB-15) in the northwest portion of the site, only one fracture was observed to contain DNAPL (Table 6-4). At MW-3D, the only fracture which contained DNAPL was in the top 5-foot section of bedrock directly below the overburden/bedrock interface. Because no other fractures in the bedrock from 5 to 15 feet deep had any evidence of DNAPL, the DNAPL observed at this location appears to be from the overburden. This conclusion is consistent with the collection of DNAPL from the bottom of the nearby piezometer (PZ-07). Whether the tar observed in PZ-07 and MW-03D migrated there from remote sources or was co-disposed in this area with purifier waste is not clear at this time.

The extent of DNAPL in the bedrock fractures across the site are consistent with DNAPL movement from the tar well in a west/southwesterly direction and in a northerly direction toward Suntru Street. Examining the bedrock in these two directions reveals the following:

1. The bedrock contour diagram (Figure 6-6) and the cross section B-B' (Figure 6-4) both show that the tar well is placed in a bedrock high zone, thereby facilitating movement of the DNAPL through the bedrock/overburden interface and to the lower bedrock locations in more than one direction, including to the north (MW-6D) and to the west/southwest.

2. Just west of the tar well, DNAPL was found in boring SB-07 in 88% of the fractures directly below the overburden/bedrock interface (elevation of about 399 to 394 feet) and in 35% of the fractures five feet below this level. These results suggest movement of DNAPL from the overburden downward into the fractured bedrock.

3. At locations west/southwest of the tar well, the majority of the DNAPL was found deeper in the bedrock than at SB-07. For example, at SB-08 and SB-12 (both about equidistant from the tar well) more than 50% of the fractures contained DNAPL between about 396 and 390 feet above MSL. At SB-09, further west of the tar well, the majority of DNAPL in the fractures was found between 391 to 386 feet above

MSL. These results suggest a lateral flow of tar away from the tar well with some vertical movement.

4. At locations further south/southwest of the tar well, such as MW-8D, the DNAPL was found only in the deeper bedrock zone. For MW-8D, DNAPL was found in fractures between 388 and 373 feet with more fractures containing DNAPL in the bottom ten feet than in the top five feet. These results also are consistent with a lateral flow of the DNAPL with some vertical migration.

5. In the northern portion of the site, at location MW-6D, 93 percent (14 of 15) and 100 percent (19 of 19) of the fractures contained DNAPL at 388 to 383 feet and 383 to 378 feet, respectively. The presence of tar at bedrock elevations (between 388 and 378 feet) well below that of the bottom of the tar well (402 feet) is consistent with the lateral and vertical movement of DNAPL in the fractures observed.

In addition, a bedrock sample containing DNAPL residue from boring MW-6D was analyzed and found to be chemically similar for the higher molecular weight PAHs observed in a tarry soil sample collected from the tar well, as shown in Figure 7-7. Both of these samples were identified as having the chromatographic fingerprint indicative of Group 1. These results provide further evidence that the DNAPL observed in the bedrock at MW-6D originated from the tar well. The bedrock sample collected from MW-6D contained 480 mg/kg of total PAHs, or less than about 0.24% by weight of the tar in the tar well, calculated as follows:

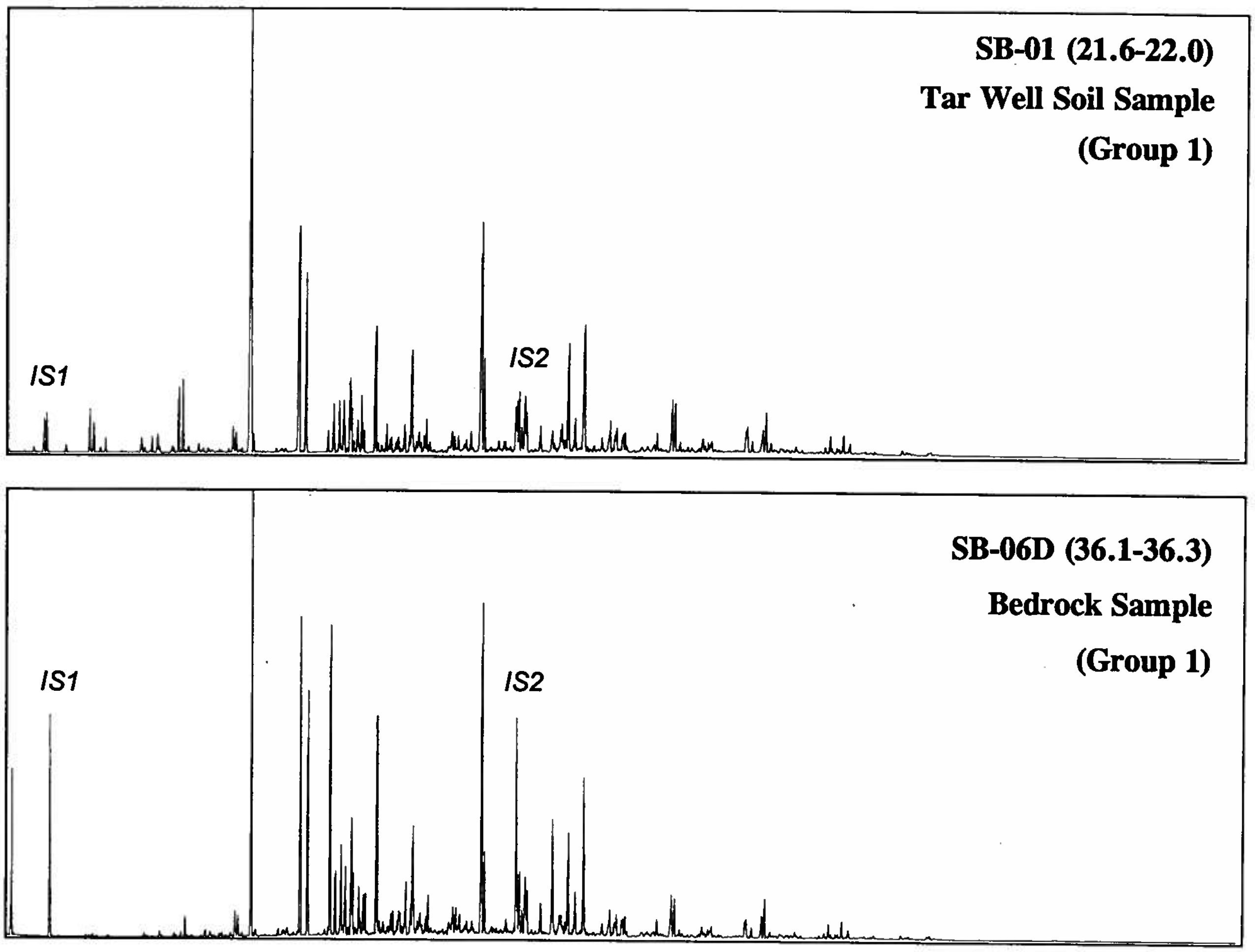
$$\frac{(480)\text{ mg PAHs}}{\text{kg of bedrock}} \times \frac{\text{kg tar}}{(200{,}000)\text{ mg PAHs}} \times 100\% = 0.24\%\text{ tar in bedrock}$$

Conservative estimates of volume of tar currently in the on-site bedrock were calculated using the following assumptions:

15 feet is the average thickness of the DNAPL in bedrock
0.1% by weight is the average amount of tar in the bedrock
this level of contamination extends over 60% of the site area

Figure 7-7

## Tar Well Soil and Bedrock Sample GC Group 1 Fingerprints




*IS1 and IS2 are internal standards*

Based on this set of assumptions, about 79,000 gallons of tar would be needed to result in a bedrock DNAPL distribution covering over 60% of the site. As in the case of the overburden tar volume estimation, this volume of tar could have come from the tar well and would amount to less than a two-foot thick layer of tar that escaped from the well.

However, the estimated volume of tar in the bedrock at the site has a high degree of uncertainty for several reasons, including: only one bedrock sample was collected and analyzed and the bedrock sample came from the most contaminated bedrock core found at the site. More importantly, the vertical extent of the DNAPL migration at this site has not been determined as only one of the eight locations tested had no DNAPL in the deepest bedrock core sampled. All of the other locations had from 5% to 100% of the fractures containing DNAPL at the deepest core examined to a depth of 20 feet in the bedrock. Thus, the 15 feet average thickness of DNAPL in bedrock could be erroneous.

**DNAPL Summary**

DNAPL is found to be widespread at the site in the overburden and bedrock. Geological, physical, and chemical evidence all support the inference that the tar well was a significant source of the DNAPL and may be releasing DNAPL to the subsurface still. It should be noted that only the lower portion of the overburden material contains DNAPL leaving several feet of the near surface soils to be free of any tar or other NAPL.

The connection between the tar well and the DNAPL observed in the overburden and bedrock may cover a large portion of the site, while other sources of DNAPL appear to have existed in other areas, particularly along the western portion of the site near the Bausch Street Bridge. These localized sources of DNAPL appear to be unrelated to the tar well.

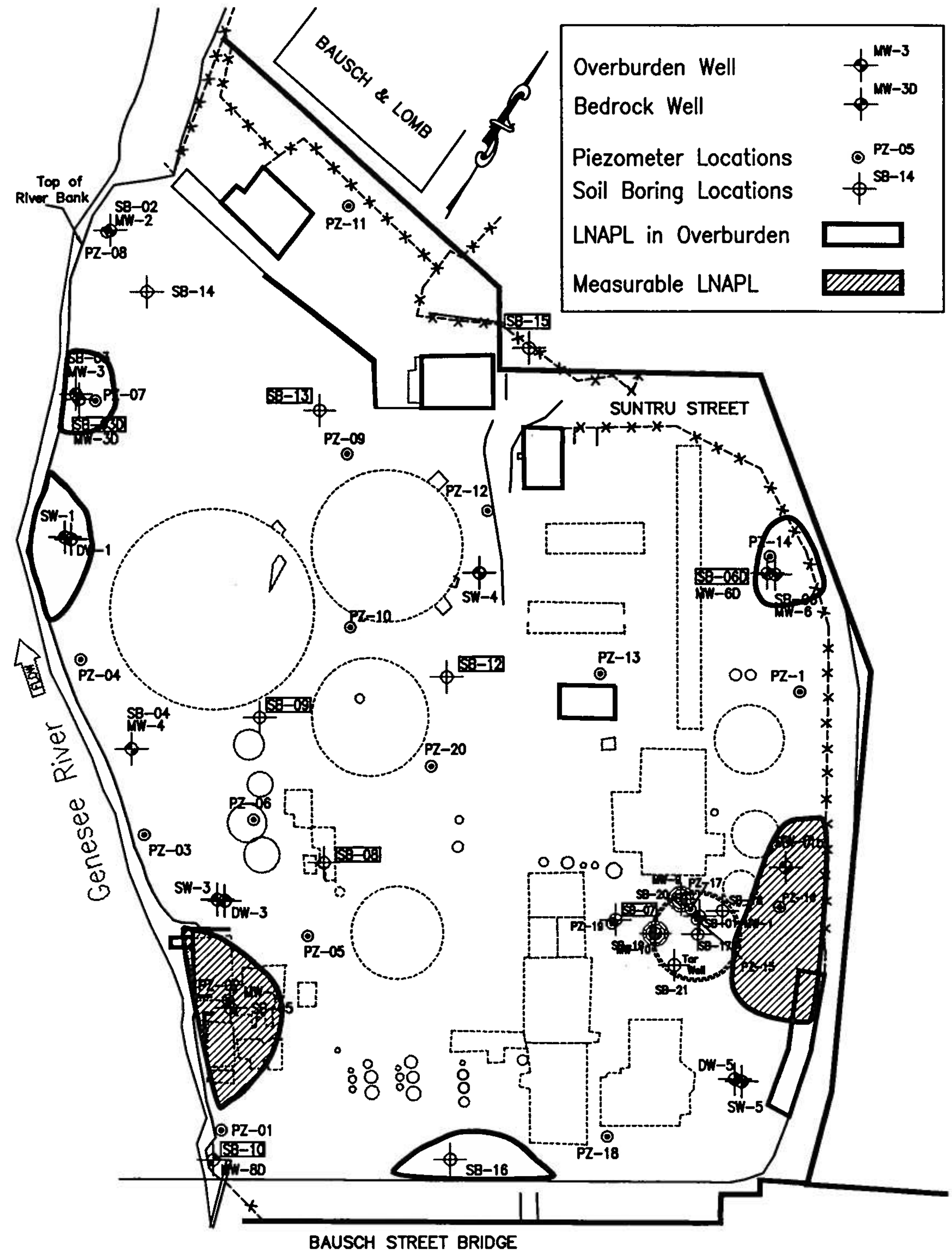
## LNAPL

### LNAPL in the Overburden

There were at least two different types of LNAPL observed on-site during the field work, as shown in Figure 7-8. At PZ-16, located approximately east of the tar well, an LNAPL was found and identified as a weathered gas oil. As stated previously, gas oil is a term for any middle distillate petroleum product commonly used in carburetted water gas or oil gas plants to enhance the illumination of the manufactured gas. Typically, it was similar to modern diesel oil. When released into the environment, these substances "weather" in a predictable way by the action of processes such as dissolution, evaporation, and biodegradation.

On the southwestern portion of the site at PZ-02, located in the vicinity of the light oil plant and the riverbank, another LNAPL was found. This LNAPL may be from a former storage tank and was identified as a gasoline or naphtha plus lube oil. As discussed previously, it is likely that this LNAPL was a wash oil waste from the former light oil plant. Petroleum products which were similar to lubricating oils were used to scrub the gasoline-range hydrocarbons (termed "light oil") from the manufactured gas. The light oil was recovered from the "wash oil" by distillation, and the wash oil was used repeatedly until it was "spent". Spent wash oils were commonly used as boiler fuels at the plant, however, some may have been stored in tanks that leaked.

Evidence of LNAPL also was observed in two other piezometers and in eight of the soil borings. For example, a lube oil fingerprint was observed in soil collected at SB-05 which is located near PZ-02. The fingerprint of a middle petroleum distillate, potentially gas oil, was noted in a soil sample from SB-11B, located near PZ-16, as well as several other borings (SB-03, SB-06, and SB-16). Finally, unidentifiable substances were noted in two piezometer samples (PZ-04 and PZ-20) and three soil borings (SB-02, SB-04, and SB-09). All of these unidentified substances contained substantial concentrations of PAHs, as well as, unresolved complex mixtures, and are consistent with MGP waste.




160 80 40 0 160

Scale (ft)

Map based on site map from Site Investigation Report for East Station MGP Site, Atlantic Environmental Services, Inc., June 1993.

| Project: East Station; Rochester, NY | Client: RG&E/EPRI | META |
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Figure 7-8
1998 Focused Remedial Investigation
Areal Estimate of
LNAPL in Overburden

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Based on these findings, soil containing a few petroleum products was observed at a number of on-site locations. However, these locations appear to be discrete areas and do not appear to extend over great distances. Also, based on their locations and compositions, these substances appear to have been used in the former MGP operations or related processes.

## GROUNDWATER

### Raoult's Law Calculations

The primary process controlling the release of MAHs and PAHs from tar at this site is solubility. Raoult's Law states that the concentration in the aqueous phase of a chemical is proportional to the mole fraction of the chemical in the organic phase. Thus, with tar-specific chemical and physical information, maximum aqueous (dissolved) concentrations can be predicted. Raoult's Law is as follows:

$$C_w = (M_i)\,(MW_{ct})(S_l)(10^{-3})$$

where:

| | | |
|---|---|---|
| $M_i$ | = | the concentration of constituent of interest in the tar (mg/kg) |
| $MW_{ct}$ | = | the average molecular weight of the tar (g/g-mole) |
| $S_l$ | = | pure liquid chemical solubility in moles/L |
| $10^{-3}$ | = | conversion factor |

For the purposes of this discussion, dissolved concentrations of benzene and naphthalene will be the focus. To calculate the maximum aqueous naphthalene concentration expected at this site, the highest naphthalene concentration measured in any tarry sample (99,200 mg/kg, measured in sample SB-20 [23.4 - 23.6]) was used. An average molecular weight for the pumpable tar of 250 g/g-mole was used based on similar molecular weights for pumpable tars measured by EPRI (EPRI, 1993). Because naphthalene is crystalline in its pure form at 25°C, its calculated super-cooled liquid solubility ($S_{sci}$), 7.943E-4 moles/L (EPRI, 1992) was used. Therefore, based on Raoult's Law, the maximum calculated dissolved naphthalene concentration in the groundwater at the site is approximately 19.7 mg/L. The highest measured naphthalene concentration at any well location is 9.30 mg/L (MW-1, located within the tar well).

Similarly, using the same average molecular weight of the pumpable tar (250 g/g-mole), the highest benzene concentration observed in the tar 5,670 mg/kg, measured in sample SB-20 (23.4 - 23.6), and the aqueous solubility of benzene (2.3E-2 moles/L), the calculated maximum dissolved benzene concentration was 32.3 mg/L. The highest benzene concentration measured at any well location is 16 mg/L (MW-4).

The comparison of measured concentrations of naphthalene and benzene in the on-site wells to corresponding Raoult's Law predicted maximum concentrations shows that the measured concentrations are representative of the dissolved groundwater quality of the site, as all measured concentrations for naphthalene and benzene are well below their respective predicted maximum site-specific solubilities. Also, low concentrations of higher molecular weight PAHs (very low aqueous solubilities) in the groundwater, such as pyrene, further suggest that the measured concentrations are representative of dissolved constituents, not falsely elevated by the presence of tarry colloids or sediments with sorbed PAHs. For example, no groundwater concentrations for pyrene exceed the maximum soluble concentration of 0.031 mg/L, as calculated by Raoult's Law (using the same molecular weight for tar and a super-cooled solubility of 6.5E-6 moles/L).

The verified presence of LNAPLs in the overburden could also be contributing to the diminished groundwater quality at the site. Dissolution of MAHs and PAHs from the LNAPLs is likely responsible for some of the localized groundwater impacts. For example, based on Raoult's Law, the maximum input of benzene and naphthalene to the groundwater from the two localized areas where measurable LNAPLs were observed (proximate to PZ-16 and PZ-02), was calculated and the results are provided in Table 7-2.

Table 7-2

## Raoult's Law Calculations and Results for the Site-Specific LNAPLs

| Location of NAPL | Constituent | $M_i$ (mg/kg) | $MW_{ct}$ (g/mole) | $S_l$ (moles/L) | Maximum Dissolved Solubility (mg/L) |
|---|---|---|---|---|---|
| PZ-02 (Naphtha) | Benzene | 2,820 | 88[b] | 2.28E-2 | 5.65 |
| PZ-16 (Fuel Oil) | Benzene | 139 | 227[a] | 2.28E-2 | 0.73 |
| PZ-02 (Naphtha) | Naphthalene | 23,400 | 88[b] | 7.94E-4 | 1.64 |
| PZ-16 (Fuel Oil) | Naphthalene | 10,300 | 227[a] | 7.94E-4 | 1.86 |

[a] Average molecular weight as listed in Lee, 1992.

[b] Estimated value based on the approximated molecular weight of leaded gasoline as listed by MADEP, 1990. Molecular weights of gasoline were substituted for naphtha because of the fact that both substances consist primarily of light-end fractions and no data could be found regarding molecular weights of naphtha.

The maximum calculated groundwater concentrations for benzene and naphthalene from the LNAPL collected at PZ-02 are 5.65 mg/L and 1.64 mg/L respectively. The measured concentrations at MW-5 for benzene (5.30 mg/L) and naphthalene (3.30 mg/L) are similar to the predicted concentrations within a factor of 2. However, the predicted concentrations near PZ-16 for benzene (0.73 mg/L) and naphthalene (1.86 mg/L) do not compare as well to the respective groundwater concentrations of less than 9.0E-4 mg/L and 0.26 mg/L, measured at MW-7. Regardless, these correlations indicate that the two LNAPLs observed in the subsurface are contributing to at least a localized groundwater impact and the dissolved plumes likely are migrating along the groundwater flow path.

Overall differences between predicted (Raoult's law) and measured concentrations of benzene and naphthalene from the site wells can be explained by several confounding issues. First, there is a strong likelihood of overlapping dissolved phase plumes (areally and vertically) as a result of the vertical distribution of source materials in the saturated zone. Second, as shown in Figure 7-2, the presence of DNAPL tar in the overburden at the site is widespread. This DNAPL can act as a source of soluble MAH and PAH constituents to the groundwater, wherever the DNAPL is found. Since the DNAPL was observed at most locations on top of the bedrock, the vertical impact from the dissolved phase DNAPL constituents is likely limited to one to two feet above the top of the tar. Third, as a result of the installation of ten-foot well screens at some locations, the concentrations from this one to two foot zone of impacted groundwater can become diluted over the screened interval. Fourth, the observed differences in hydraulic conductivities of the saturated materials will effect concentrations in samples collected at monitoring wells which are screened across anisotropic zones, preferentially recharging to the well from the most conductive unit. The phenomenon can influence the vertical distribution pattern of the plumes.

**Groundwater Modeling for Naphthalene and Benzene in the Overburden Aquifer**

A simple analytical transport/fate model was used to assess the migration of naphthalene and benzene as dissolved phase constituents from the eastern portion to the western portion of the site.

For modeling purposes, the DNAPL in the tar well was considered the source of chemicals in groundwater and was postulated to release leachate which then would migrate along the groundwater flow paths undergoing dispersion, retardation, and degradation. The tar well source was assumed to be 90-feet wide with measured groundwater concentrations from MW-1 providing the initial leachate concentrations (referred to in MYGRT™ as the $C_o$ concentration) for input into the two-dimensional groundwater solute transport model (MYGRT™).

For the model simulations, the DNAPL source was assumed to have begun leaching in 1890 at constant concentrations for the entire time period between 1890 and 1999. EPRI's MYGRT™ V2.0 (1989) was used to carry out the calculations. The distances between MW-1 and SW-1, SW-3, and MW-4 were obtained to establish the transport distances for the MYGRT™ calculations.

The leachate concentrations and the transport distances between the source and downgradient wells are summarized in Table 7-3, along with the transport parameters used. Because of the approximate

10-foot thickness of the overburden aquifer and the presence of DNAPL sources in the saturated zone, all modeling was done using a two-dimensional saturated zone transport/fate format.

Table 7-3

**Model Simulation Data and Parameters**

| Source | Leachate Concentration |
|---|---|
| Southeast side near tar well | Naphthalene: 9.3 mg/L<br>Benzene: 3.5 mg/L |
| **Wells** | **Distance Between** |
| MW-1 and SW-3 | 400 feet |
| MW-1 and MW-4 | 575 feet |
| MW-1 and SW-1 | 775 feet |

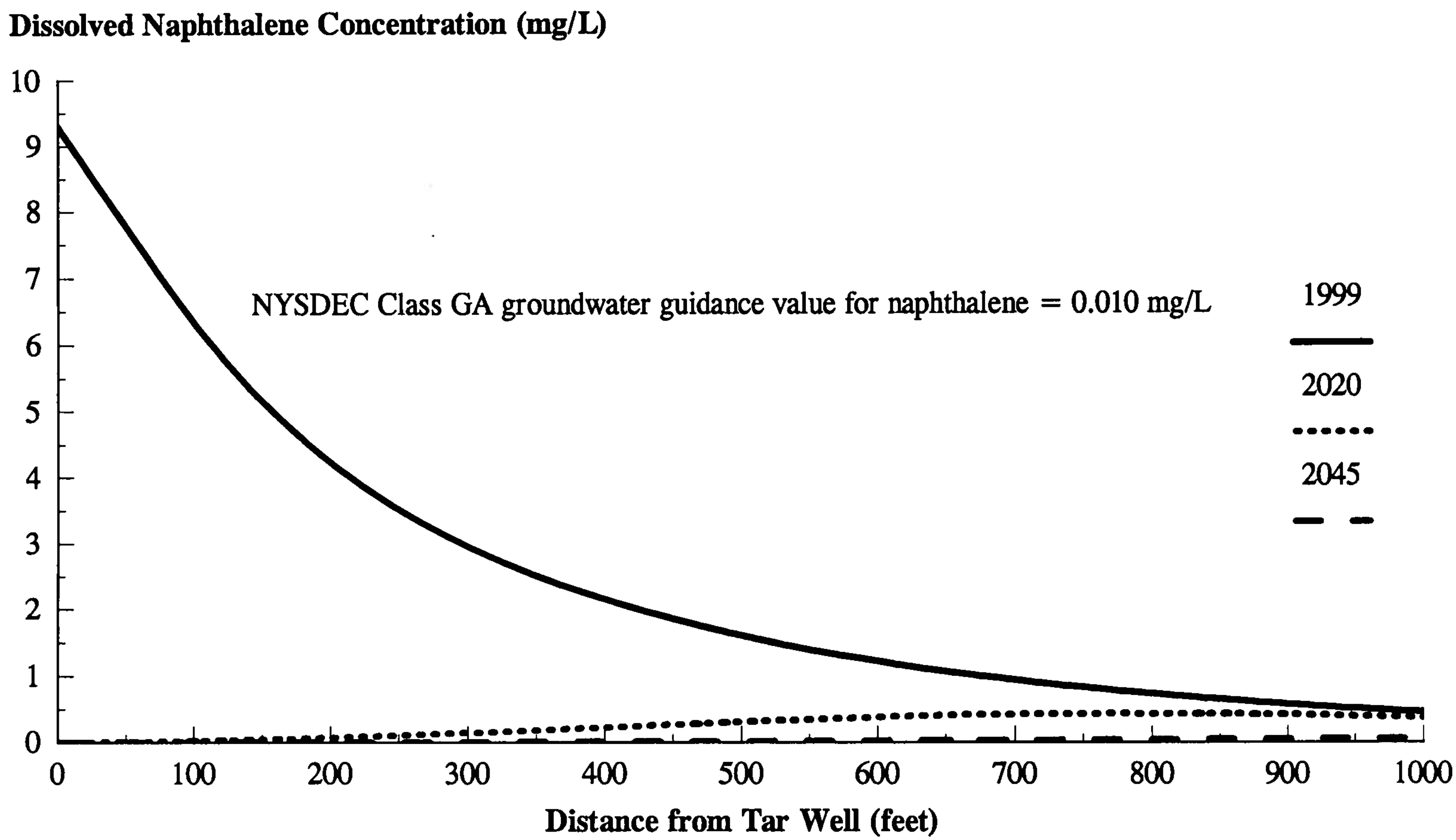
| Transport Parameters Used | |
|---|---|
| Seepage Velocity | 150 ft/yr |
| Dispersion: Longitudinal | 4,920 $ft^2/yr$ |
| Dispersion: Transverse | 49.2 $ft^2/yr$ |
| Retardation factor for Naphthalene | 7.2 |
| Degradation rate for Naphthalene | 0.045/yr |
| Retardation factor for Benzene | 2 |
| Degradation rate for Benzene | 0.35/yr |

Case 1: Naphthalene Transport

The results of the naphthalene model predictions for the tar well source for concentration versus distance and concentration versus time are shown in Figures 7-9 and 7-10, respectively. Figure 7-9 shows the theoretical MYGRT™ predicted naphthalene concentrations in groundwater if the tar well source was removed in 1999. Based on the input assumptions (Table 7-3), the model predicts that it will take approximately 50 years for naphthalene levels to fall below the 0.010 mg/L NYSDEC GA standard, assuming that the tar well is the only source of naphthalene to the groundwater.

Figure 7-9

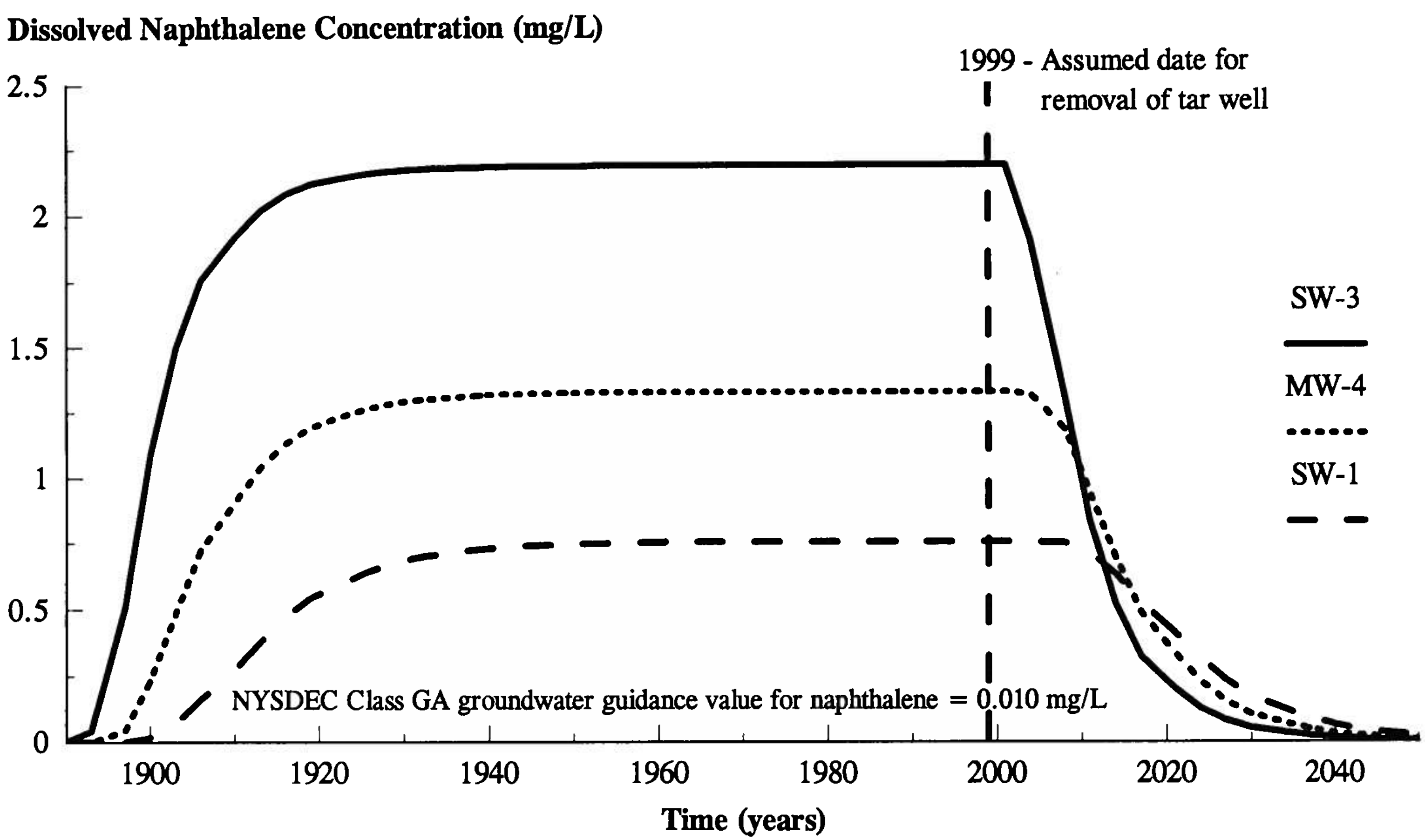
## Theoretical Naphthalene Concentrations in Groundwater with Distance at Multiple Times




This simulation assumes that the DNAPL in the tar well is the only source of naphthalene to the groundwater. Predicted concentrations in figure are representative of centerline plume flow path.

Figure 7-10

**Theoretical Naphthalene Concentrations in Groundwater at Several Downgradient Well Locations over Time**




This simulation assumes that the DNAPL in the tar well is the only source of naphthalene to the groundwater, that each well is placed in the centerline of the plume, and that the tar well is removed in 1999.

MYGRT™ calculations show that a steady-state naphthalene concentration of about 2.2 mg/L would be found at well SW-3 (400 feet from the source) if all the assumptions and inputs were correct (Figure 7-10). The measured concentration of naphthalene at well SW-3 is 1.4 mg/L, less than the MYGRT™ calculated value, but within a relative percent difference of 45. It is, therefore, reasonable to infer that the groundwater transport of dissolved naphthalene from the tar well may be responsible for the observed concentrations, however, it is uncertain if this well is located in the centerline of the naphthalene plume.

Using the same parameters, MYGRT™ calculations yielded a naphthalene concentration of approximately 1.3 mg/L at well MW-4 (575 feet from the tar well), as shown in Figure 7-9. However, the measured naphthalene at this well is 7.6 mg/L, nearly six times higher than the predicted value and nearly as high as the concentration observed within the tar well (9.3 mg/L).

The presence of DNAPL both in the shallow overburden material and in the bedrock near the river has been confirmed by the field work at the site. Tar/water partitioning chemistry commonly yields naphthalene concentrations in the aqueous phase between 5 and 12 mg/L. East Station groundwater data are consistent with this partition chemistry for naphthalene. However, as can be seen in the addendum to this report, the second round of groundwater sampling and analysis data shows a lower naphthalene concentration of 1.1 mg/L that is more consistent with the MYGRT™ prediction, although still indicating some variability in the observed concentration. Therefore, while the MYGRT™ based prediction of 1.3 mg/L for MW-4 is comparable to the second round concentration, groundwater quality at that well may be influenced by the nearby presence of tar and its partitioning chemistry that gave rise to the higher observed concentration in the first sampling round.

MYGRT™ predicted a steady-state naphthalene concentration of about 0.75 mg/L for well SW-1 (Figure 7-10). However, the measured naphthalene concentration is only 0.003 mg/L, more than two orders of magnitude lower than the predicted value. This difference indicates that SW-1 does not appear to be affected by the leachate generated from the tar well. As can be seen in the addendum, SW-1 groundwater shows naphthalene concentrations of 0.021 mg/L in the second sampling round which is still 35 times lower than the MYGRT™ predictions. The groundwater quality data from the wells (e.g., SW-4, PZ-10) located upgradient of SW-1 also show very low naphthalene concentrations. The groundwater flow-field indicates that SW-1 is located some 400 feet north of the centerline of leachate migration from the tar well. Combining these hydraulic and upgradient well water quality data, it is inferred that SW-1 water quality is minimally influenced by the migration of tar well leachate and MYGRT™ predictions are overestimates.

Case 2: Benzene Transport

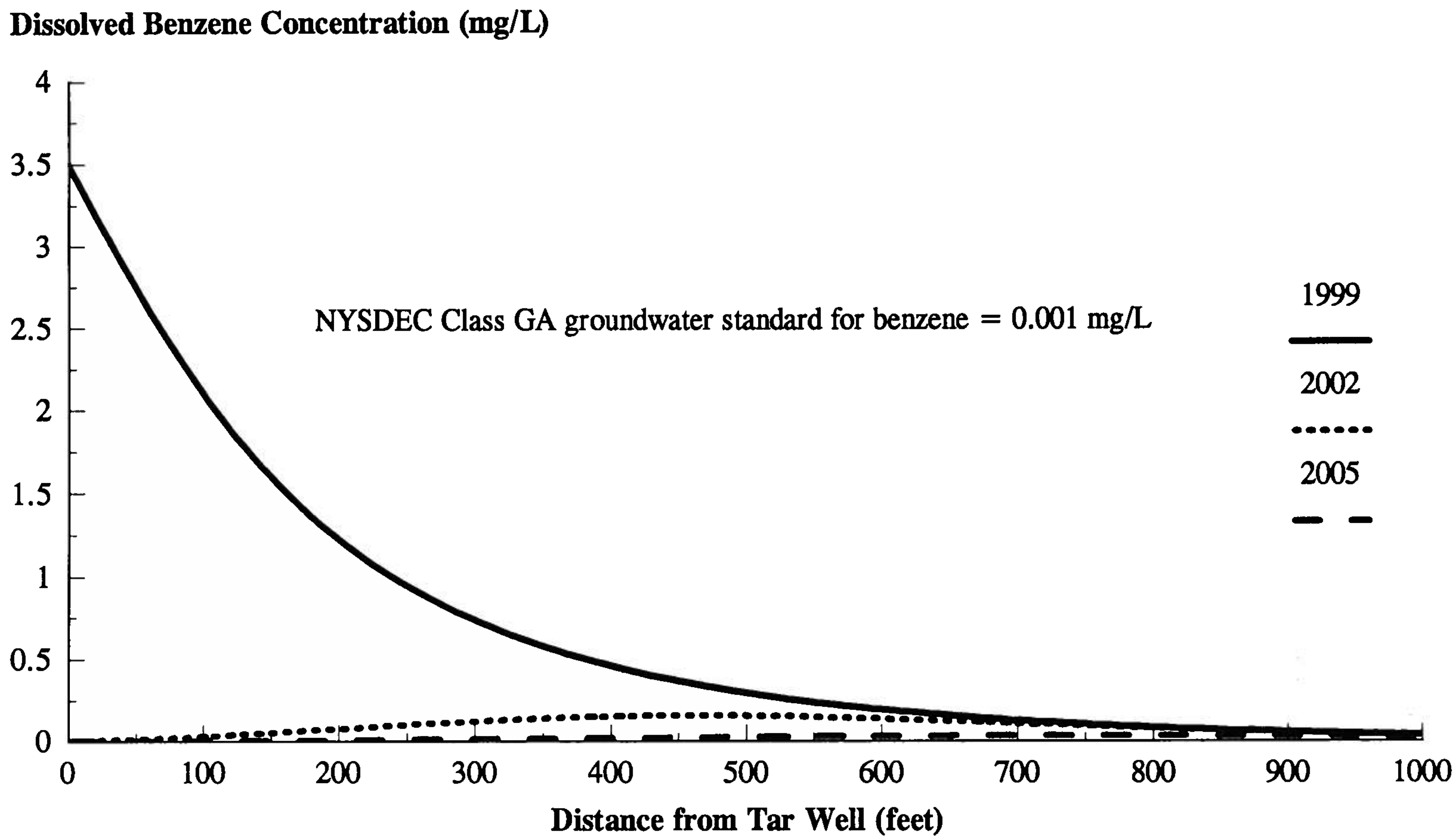
The results of the benzene model predictions for the tar well source are shown in Figures 7-11 and 7-12 for concentration versus distance and concentration versus time, respectively. Figure 7-11 shows the theoretical benzene concentrations in groundwater if the tar well was removed in 1999. Based on the input assumptions (Table 7-3), the model predicts that if the tar well was removed in 1999 it would take approximately 5 years for the benzene concentrations in the groundwater to fall below the NYSDEC Class GA standard of 0.001 mg/L (assuming the tar well is the only source of benzene to the groundwater).

MYGRT™ calculations showed that steady-state benzene concentrations of approximately 0.47 mg/L would be found at well SW-3 (Figure 7-12). However, the measured benzene concentration at this location is 0.051 mg/L, nearly an order of magnitude less. Therefore, it is reasonable to infer that observed benzene, while lower than predicted, could be a result of dissolved phase transport from tar well area, although SW-3 is likely not located in the centerline of the benzene plume.

MW-4, on the other hand, has an observed benzene concentration of 16 mg/L, almost five times higher than the concentration observed at the tar well source in MW-1 (3.5 mg/L). The addendum to this report shows that the benzene concentration declined to 2.6 mg/L in the second round of sampling. Benzene was also lower in the groundwater in the tar well. These data indicate temporal variability. The presence of higher levels of benzene in MW-4 compared to MW-1 points to the presence of a nearby source of benzene affecting the dissolved benzene concentration at well MW-4.

Figure 7-11

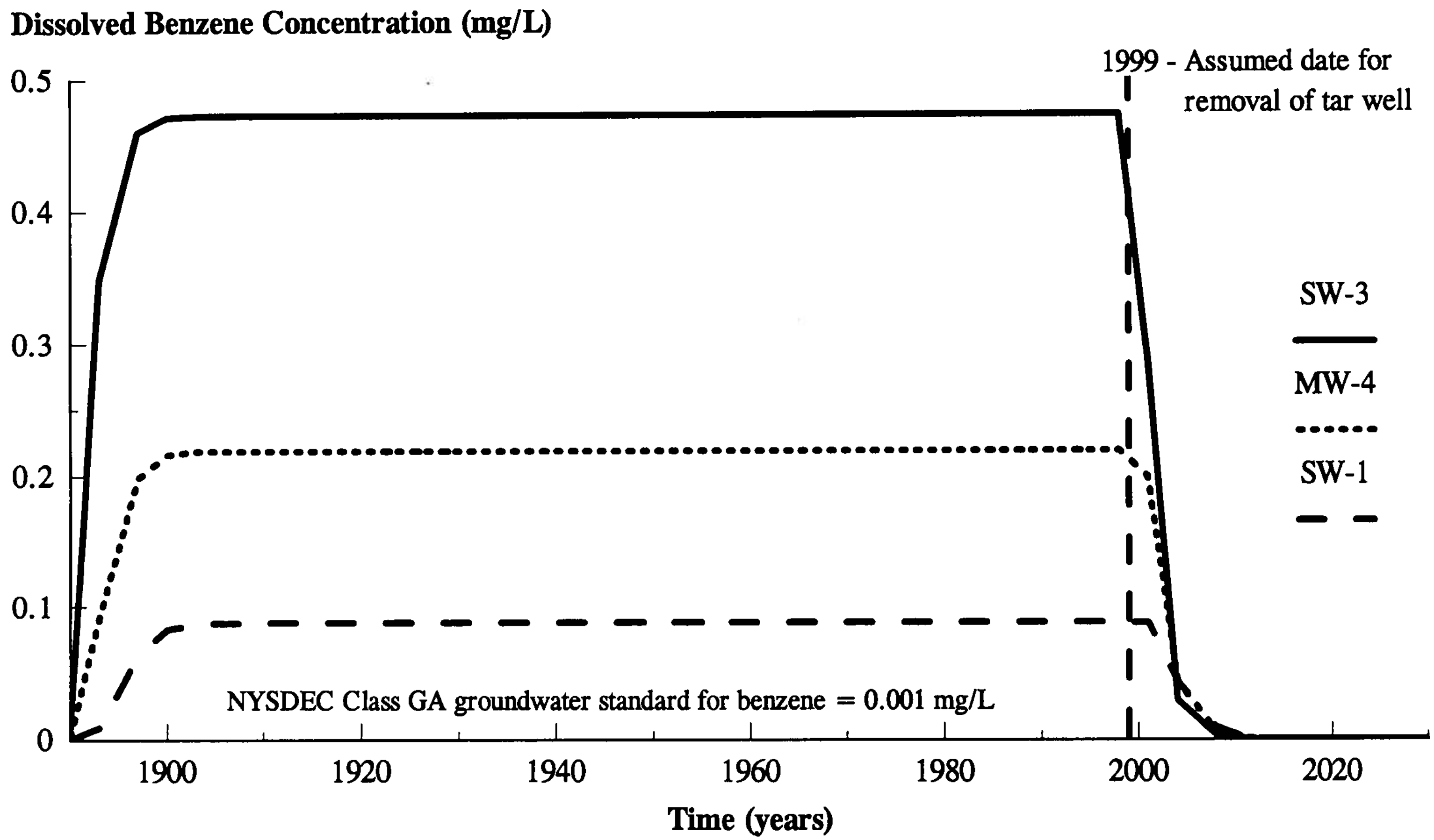
## Theoretical Benzene Concentrations in Groundwater with Distance at Multiple Times




This simulation assumes that the DNAPL in the tar well is the only source of benzene to the groundwater. Predicted concentrations in figure are representative of centerline plume flow path.

Figure 7-12

## Theoretical Benzene Concentrations in Groundwater at Several Downgradient Well Locations over Time




This simulation assumes that the DNAPL in the tar well is the only source of naphthalene to the groundwater, that each well is placed in the centerline of the plume, and that the tar well is removed in 1999.

For example, tar was observed in this western part of the site both in the boring program and in the river bank survey.

The MYGRT™ predicted benzene concentration for SW-1 was about 0.092 mg/L whereas the measured benzene level is 0.38 mg/L (Figure 7-12). This difference again points to the possibility that there is a localized source of benzene near SW-1.

**Modeling Summary**

MYGRT™ calculations showed that eliminating the release of benzene from the tar well source area will result in the rapid dissipation of the benzene plume at the site. Based on these predictions, within ten years after elimination of the benzene discharge (Figure 7-10), the groundwater near the river and the entire site will have near detection limit levels of benzene. Naphthalene, on the other hand, will require approximately fifty years for the dissipation from the overburden aquifer (Figure 7-11), based on the model predictions. These results indicate that if the DNAPL sources are removed or isolated, natural attenuation of the naphthalene and benzene plumes would occur over time. The concentrations of benzene would fall to near background levels within about 10 years, while it would take about 50 years for naphthalene concentrations to approach background. Other MAH and PAH concentrations would decline similarly.

The modeling exercise was based on the largest known source of DNAPL in the overburden, the tar well. However, the results from soil borings clearly identified other on-site locations which contained tar and/or tarry soils in the overburden. The tar-containing soils in some of these other locations likely are sources of additional dissolved phase tar constituents to the groundwater in their areas, if not the entire site. At this time, it is difficult to model the water quality impacts from the widespread presence of DNAPL in the overburden combined with known impacts from the tar well. Because of the possible presence of localized sources of DNAPL, the model simulations may provide optimistic predictions of plume dissipation over time if the tar well source is controlled or removed.

Even though these theoretical predictions may be optimistic, they still provide useful insights in establishing a connection between the leachate release area and the downgradient locations. In addition, this modeling calibration allows the evaluation of possible responses from remedial actions undertaken to control or eliminate the release of dissolved constituents from postulated sources. Finally, as with any predictive model, greater confidence in the nature and extent of DNAPL source areas would enhance model accuracy.

**Groundwater Results Summary**

The groundwater from the overburden and deep bedrock wells generally showed elevated levels of naphthalene, benzene, and cyanide. The highest level of dissolved naphthalene was observed in the monitoring well installed in the tar well (MW-1), whereas the highest concentration of benzene was found in MW-4 near the river and downgradient of several former oil tanks.

Although, the groundwater in the northwestern quarter of the site had relatively low levels of naphthalene and benzene, it contained relatively high amounts of total cyanide. Total cyanide appeared to be present at a concentration of about 2 mg/L in almost all of the groundwater wells in the northern half of the site where deposits of cyanide-containing residues were observed in the unsaturated zone soils.

It appears that the groundwater flow is generally from east to west, thereby accounting for the westerly transport of dissolved constituents from source tars in the tar well and other contaminated overburden materials. The groundwater in the vicinity of the source tars appears to reflect the releases and transport of the constituents, as indicated by the estimations from the Raoult's Law calculations.

Overall, the groundwater modeling indicated that there is dissolved phase transport of tar constituents across the site, approximately from east to west. The modeling analysis also suggested that there are some localized contributions of both naphthalene and benzene to the groundwater, particularly near MW-4. Furthermore, the modeling analysis also indicated that elimination of leaching from the tarry source areas could significantly improve the groundwater quality in the overburden aquifer within ten to fifty years. However, as indicated in the discussion on the modeling results, the simulations were carried out using one specific source of tar (the tar well). This approach oversimplifies site conditions since soil boring results show tar or tarry soils at several other on-site locations. Thus, the model simulations did not account for the localized impacts to groundwater from these other locations and, as such, the resulting predictions must be viewed as being optimistic. Nevertheless, the model simulations did show that there would be a significant impact from eliminating the tar well. Predictions of the impacts of source control would be more accurate if the locations of other source tars were further delineated.

Similar modeling analysis on cyanide are included in the addendum to this report.

Section 8

# CONCLUSIONS

One of the major objectives of the focused remedial investigation was to investigate the source(s) of NAPL observed adjacent to the site along the Genesee River. However, it became apparent during the field work phase of this investigation that the tar well was a significant source of DNAPL to the overburden and bedrock, a characterization effort of the tar well contents was undertaken. Following this characterization, groundwater quality at the site was evaluated. Based on the observations made during the riverbank survey and the bedrock/soil drilling program, and information obtained from the physical and chemical analysis of NAPL, sediment, soil, rock, and groundwater samples, the following conclusions are presented:

1. Based on chromatographic and geologic evidence, the tar well appears to have been a significant source of DNAPL to the overburden or shallow bedrock,

2. The tar well currently contains a large volume of tar, including flowable tar, which can serve as a continuing source of DNAPL,

3. Pools of NAPL exist in several locations in the riverbed adjacent to the site; the NAPL was found to be chemically similar, though not exactly the same as DNAPLs found in on-site borings and wells,

4. The presence of horizontal and vertical fractures in the bedrock has the potential to facilitate the lateral and vertical migration of DNAPL both in a west/southwesterly direction and in a northerly direction,

5. Discrete areas of LNAPL exist but appear limited in size,

6. In general, based on geologic logging observations, little evidence of odors or staining was present from 0 to 10 feet in the central and western portions of the site and 0 to 6 feet in the eastern portion,

7. Based on several rising head slug tests and static water table elevation data, groundwater generally flows westerly toward the river at a rate of about 150 ft/yr,

8. NYSDEC standards and guidance values for Class GA waters were exceeded in many of the wells for approximately 16 VOCs and SVOCs. Benzene concentrations ranged from 0.03 to 16 mg/L and naphthalene concentrations ranged from 0.01 to 9 mg/L, with the most impacted areas being proximate to the river from the southern property line extending northward about 750 feet, and at the northeast corner of the site,

9. Seven metals (arsenic, iron, magnesium, manganese, nickel, sodium, and thallium) were detected above the NYSDEC standards and guidance values for Class GA waters,

10. The Class GA standard at seven wells (most prominently in the northern part of the site) was exceeded for cyanide. Speciation analysis has determined that cyanide is present as the relatively non-toxic iron complexed species, and

11. Two-dimensional modeling using EPRI's MYGRT™ indicates that attenuation of benzene and naphthalene concentration in groundwater to levels below NYSDEC standards could be achieved within ten and fifty years, respectively, upon elimination of the tar well as an active source. However, these time frames may be overly optimistic given the identification of additional areas of DNAPL and LNAPL impacts observed throughout the site.

Section 9

## REFERENCES


Atlantic Environmental Services, Inc. and Remediation Technologies, Inc., "Site Investigation Report for East Station MGP Site", June 30, 1993.

Electric Power Research Institute, "Microscale Solvent Extraction Methods for the Analysis of Solids and Liquids", TR-105317-V1, July 1995.

Electric Power Research Institute, "Chemical and Physical Characteristics of Tar Samples From Selected Manufactured Gas Plant (MGP) Sites", pp. 4-2, May 1993.

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Lee, L., Hagwell, M., Delfino, J., Rao, S., "Partitioning of Polycyclic Aromatic Hydrocarbons from Diesel Fuel into Water", Environmental Science and Technology, 26, pp. 2104 - 2110, 1992.

Massachusetts Department of Environmental Protection, "Compilation of Data on the Composition, Physical Characteristics and Water Solubility of Fuel Products", pp.2-5, December 1990.

Morrison-Knudsen Engineers, Inc., "Preliminary Site Review NYS Superfund Site No. 828044", June, 1986.

Scherzer, J.L., "Subsurface Structure and Stratigraphy of Rochester, NY - Submitted in Partial Fulfillment of the Requirements for the Degree of Master of Science," 1983.

# Appendicies to

# PRELIMINARY FOCUSED REMEDIAL INVESTIGATION FORMER MANUFACTURED GAS PLANT SITE EAST STATION, ROCHESTER, NEW YORK REPORT

Prepared for:

**Rochester Gas & Electric Corporation**
Mr. Kevin Hylton
89 East Avenue
Rochester, NY 14649

Prepared by:

**Ish Inc.**
690 West Fremont Ave., Ste. 9C & 9D
Sunnyvale, CA 94087

and

**META Environmental, Inc.**
49 Clarendon Street
Watertown, MA 02472

February 2000

# APPENDIX A
# SOIL BORING LOGS

# Lithology Key

PROJECT: RG&E East Staion
PROJECT NO.: I03002
LOCATION:
DATE STARTED:
DATE COMPLETED:
DRILLING CONTRACTOR:
DRILLER:
DRILLING METHOD:
SAMPLE METHOD:

GROUND ELEVATION:
PROTECTIVE CASING ELEVATION:
WELL ELEVATION (TOC):
DEPTH TO WATER:
X-COORDINATE:
Y-COORDINATE:
WEATHER:
GEOLOGIST/OBSERVER: Steve Maxwell
ENTERED BY: Steve Maxwell

| SPLIT SPOON INTERVAL (ft.) | BLOWS PER 0.5 ft. | % RECOVERY | OVM (ppm) | SOIL DESCRIPTION<br>moisture, color, fraction, other notes, origin | OBSV. NONE | OBSV. ODOR | OBSV. STAIN | OBSV. SHEEN | SAMPLED | LITHOLOGY | DEPTH (ft.) | WELL CONSTRUCTION |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Bedrock (Rochester Shale)<br>May include geologically similar unit (Irondiquoit Limestone), see geological overview in section 6 | | | | | | | 0 | |
| | | | | Brick | | | | | | | | |
| | | | | Clay | | | | | | | | |
| | | | | Fill Material | | | | | | | | |
| | | | | Layered Sand, Silt, and Clay | | | | | | | | |
| | | | | Sand | | | | | | | | |
| | | | | Sand and Gravel | | | | | | | | |
| | | | | Sand and Silt | | | | | | | | |
| | | | | Wood | | | | | | | 5 | |

# SB-1/MW-1

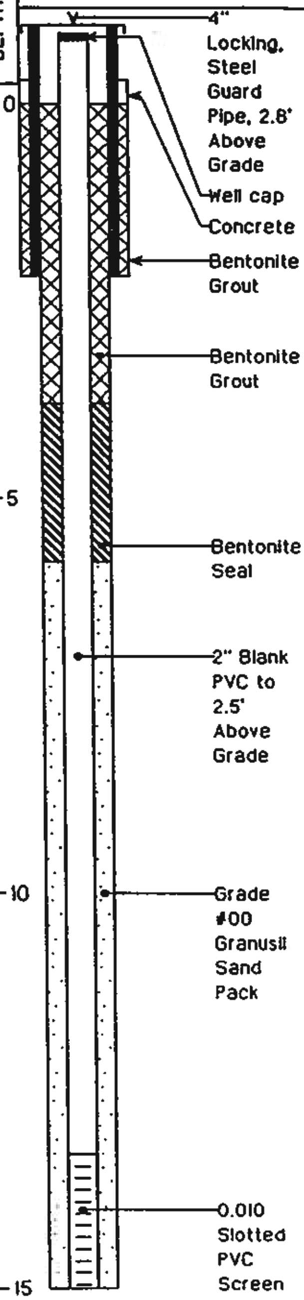
PROJECT: RG&E East Station
PROJECT NO.: 103002
LOCATION: In Tar Well About 3 ft ENE of PZ-15
DATE STARTED: 10/26/98
DATE COMPLETED: 10/26/98
DRILLING CONTRACTOR: Lyon Drilling
DRILLER: Harry Lyon
DRILLING METHOD: 4 1/4" ID Hollow stem auger
SAMPLE METHOD: 2"x2' Split spoon sampler, 300# hammer

GROUND ELEVATION: 427.1
PROTECTIVE CASING ELEVATION: N/A
WELL ELEVATION (TOC): 429.57
DEPTH TO WATER: 15.43
X-COORDINATE: E 757276.4250
Y-COORDINATE: N 1155577.0880
WEATHER: Overcast, 50° F. Light Winds
GEOLOGIST/OBSERVER: Steve Maxwell
ENTERED BY: Steve Maxwell

| SPLIT SPOON INTERVAL (ft.) | BLOWS PER 0.5 ft. | % RECOVERY | OVM (ppm) | SOIL DESCRIPTION (moisture, color, fraction, other notes, origin) |
|---|---|---|---|---|
| | | | | Augered to 4.0' |
| 4.0-6.0 | 7,23, 18,15 | 90 | 0.0 | No recovery |
| | | | 0.0 | SILT with some fine SAND and CLAY with pebbles, brick, and concrete, FILL |
| | | | | Fine loose SAND with coal and ash fragments and pebbles, FILL |
| | | | | Fine SAND with ash, coal, cynders, and brick fragments, FILL |
| | | | | Augered to 8.0' |
| 8.0-10.0 | 1,8, 17,11 | 95 | 0.0 | No recovery |
| | | | 0.0<br>0.0 | Fine moist SAND with some SILT and pebbles, FILL |
| | | | | Soft, moist red/brown CLAY with SILT and SAND, FILL |
| 10-10.9 | 25,50 | | | Fine, moist SAND and SILT with brick and coal residue, FILL |
| | | | | Fine SAND with coal and brick residue, stained black, FILL |
| 12.0-14.0 | 5,5, 2,1 | 85 | 6.7 | Refusal at 10.9' augered to 12.0' |
| | | | 89.0 | SILT with CLAY, pebbles and, concrete fragments, FILL |
| | | | | Thick viscous TAR layer, "Taffy Tar" |
| 14.0-16.0 | 1,2, 2,6 | 35 | | Fine moist SAND with coal and ash residue, black staining, odor, FILL |
| | | | | No recovery |

OBSV.: NONE, ODOR, STAIN, SHEEN, SAMPLED; LITHOLOGY; DEPTH (ft.): 0, 5, 10, 15

WELL CONSTRUCTION

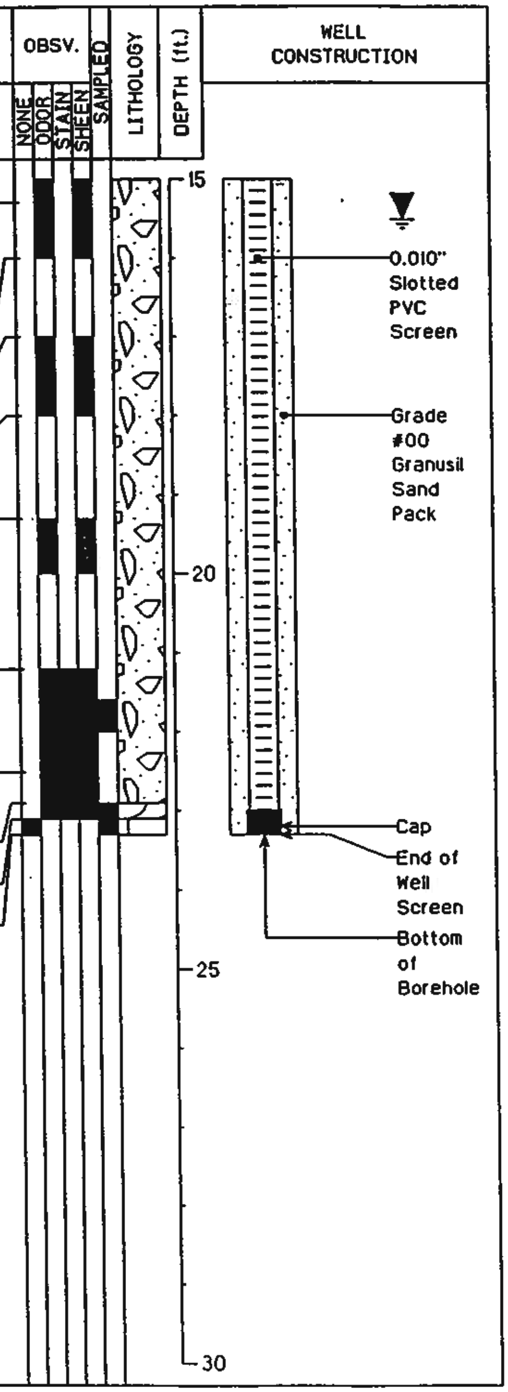


# SB-1/MW-1

PROJECT: RG&E East Station
PROJECT NO.: 103002
LOCATION: In Tar Well About 3 ft ENE of PZ-15
DATE STARTED: 10/26/98
DATE COMPLETED: 10/26/98
DRILLING CONTRACTOR: Lyon Drilling
DRILLER: Harry Lyon
DRILLING METHOD: 4 1/4" ID Hollow stem auger
SAMPLE METHOD: 2"x2' Split spoon sampler, 300# hammer

GROUND ELEVATION: 427.1
PROTECTIVE CASING ELEVATION: N/A
WELL ELEVATION (TOC): 429.57
DEPTH TO WATER: 15.43
X-COORDINATE: E 757276.4250
Y-COORDINATE: N 1155577.0880
WEATHER: Overcast, 50° F. Light Winds
GEOLOGIST/OBSERVER: Steve Maxwell
ENTERED BY: Steve Maxwell

| SPLIT SPOON INTERVAL (ft.) | BLOWS PER 0.5 ft. | % RECOVERY | OVM (ppm) | SOIL DESCRIPTION (moisture, color, fraction, other notes, origin) |
|---|---|---|---|---|
| 16.0-18.0 | 5,6, 3,2 | 50 | 11.9 | Wet brick, coal, and ash fragments with pebbles, sheen, and odor, **FILL** |
| | | | | **Water Table** |
| | | | | No recovery |
| 18.0-20.0 | Wt of Rod, 1,2 | 35 | | Saturated coal, concrete, and brick fragments with sheen and odor, **FILL** |
| | | | | No recovery |
| 20.0-22.0 | 1 for 1', 1,1 | 40 | 3.0 | Saturated coal and slag fragments with **TAR, FILL** |
| 22.0-23.3 | 3,7 50 | 62 | 29.2 | Saturated brick, concrete, and ash fragments with sheen, strong odor, and **TAR, FILL** |
| | | | 726 | Brick, concrete, and ash fragments with sheen, strong odor, and **TAR, FILL** |
| | | | | Wood |
| | | | | Brick, Base of Tar Well |
| | | | | End of Boring **TOTAL DEPTH = 23.3'** |



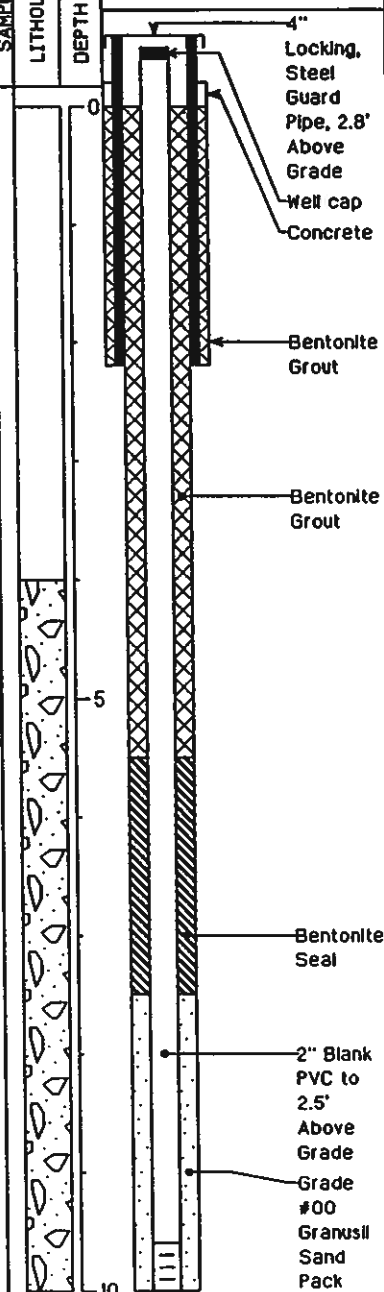
# SB-2/MW-2

PROJECT: RG&E East Station
PROJECT NO.: 103002
LOCATION: Northwest corner of site, near PZ-08
DATE STARTED: 10/26/98
DATE COMPLETED: 10/26/98
DRILLING CONTRACTOR: Lyon Drilling
DRILLER: Harry Lyon
DRILLING METHOD: 4 1/4" ID Hollow stem auger
SAMPLE METHOD: 2"x2' Split spoon sampler, 300# hammer

GROUND ELEVATION: 401.6
PROTECTIVE CASING ELEVATION: N/A
WELL ELEVATION (TOC): 403.68
DEPTH TO WATER: 12.69
X-COORDINATE: E 756528.5910
Y-COORDINATE: N 1156046.4560
WEATHER: Overcast, 50° F. Light Winds
GEOLOGIST/OBSERVER: Steve Maxwell
ENTERED BY: Steve Maxwell

| SPLIT SPOON INTERVAL (ft.) | BLOWS PER 0.5 ft. | % RECOVERY | OVM (ppm) | SOIL DESCRIPTION (moisture, color, fraction, other notes, origin) |
|---|---|---|---|---|
| | | | | Augered to 4.0' |
| 4.0-6.0 | 3,2, 11,2 | 30 | 0.0 0.0 | No recovery |
| | | | | Fine, brown SAND with some SILT, pebbles, and glass fragments, **FILL** |
| | | | | Augered to 8.0' |
| 8.0-10.0 | wt of Rod, 2,1 | 25 | | No recovery |
| | | | | Moist, fine brown SAND and SILT with pebbles, and limestone fragments, **FILL** |
| | | | 0.0 | Moist brick fragments with SAND, **FILL** |

OBSV.: NONE / ODOR / STAIN / SHEEN / SAMPLED — LITHOLOGY — DEPTH (ft.) — WELL CONSTRUCTION

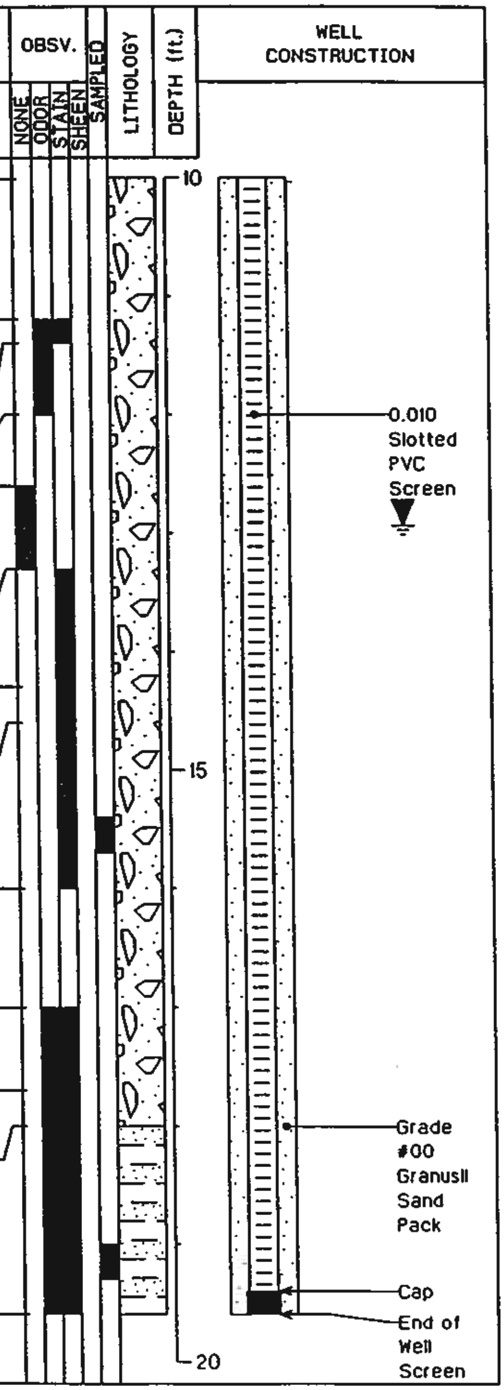


# SB-2/MW-2

PROJECT: RG&E East Station
PROJECT NO.: I03002
LOCATION: Northwest corner of site, near PZ-08
DATE STARTED: 10/26/98
DATE COMPLETED: 10/26/98
DRILLING CONTRACTOR: Lyon Drilling
DRILLER: Harry Lyon
DRILLING METHOD: 4 1/4" ID Hollow stem auger
SAMPLE METHOD: 2"x2' Split spoon sampler, 300# hammer

GROUND ELEVATION: 401.6
PROTECTIVE CASING ELEVATION: N/A
WELL ELEVATION (TOC): 403.68
DEPTH TO WATER: 12.69
X-COORDINATE: E 756528.5910
Y-COORDINATE: N 1156046.4560
WEATHER: Overcast, 50° F. Light Winds
GEOLOGIST/OBSERVER: Steve Maxwell
ENTERED BY: Steve Maxwell

| SPLIT SPOON INTERVAL (ft.) | BLOWS PER 0.5 ft. | % RECOVERY | OVM (ppm) | SOIL DESCRIPTION (moisture, color, fraction, other notes, origin) |
|---|---|---|---|---|
| 10.0-12.0 | 3,2,1,3 | 40 | 0.0 | No recovery |
| | | | | SAND, moist with purifier wood and brick fragments, **FILL** |
| | | | | Wet SILT and CLAY with odor, **FILL** |
| 12.0-14.0 | 3,2,4,2 | 60 | | No recovery |
| | | | | Soft saturated SILT and CLAY with brick fragment and pebbles, **FILL**<br>**Water Table** |
| 14.0-16.0 | 2,2,1,2 | 65 | | Soft saturated SILT and CLAY with concrete fragments and pebbles, **FILL** |
| | | | | Saturated SILT and CLAY with brick fragments, **FILL** |
| | | | 11.3<br>9.3 | Saturated SILT and CLAY with purifier wood fragments, **FILL** |
| 16.0-18.0 | 2,1,10,20 | 50 | 6.0 | No recovery |
| | | | 7.2 | Soft, saturated grey CLAY with purifier wood fragments and pebbles, **FILL** |
| 18.0-19.6 | 8,12,17,50 | 63 | | Fine SAND and SILT with oily liquid, strong odor, **FILL** |
| | | | 3.1 | Saturated fine SAND and **SILT** with grey **CLAY** lenses and **SHALE** fragments, and light odor |
| | | | | Split Spoon Refusal, End of Boring<br>**TOTAL DEPTH = 19.6'** |



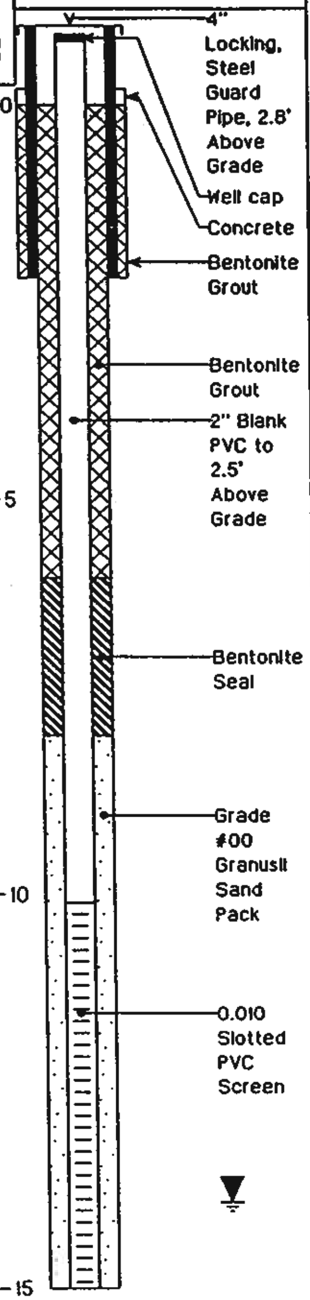

*META Environmental, Inc.*

# SB-3/MW-3

PROJECT: RG&E East Station
PROJECT NO.: I03002
LOCATION: 10' Towards the river from PZ-07
DATE STARTED: 10/27/98
DATE COMPLETED: 10/27/98
DRILLING CONTRACTOR: Lyon Drilling
DRILLER: Harry Lyon
DRILLING METHOD: 4 1/4" ID Hollow stem auger
SAMPLE METHOD: 2"x2' Split spoon sampler, 300# hammer

GROUND ELEVATION: 402.3
PROTECTIVE CASING ELEVATION: N/A
WELL ELEVATION (TOC): 404.91
DEPTH TO WATER: 13.83
X-COORDINATE: E 758544.2450
Y-COORDINATE: N 1155883.4860
WEATHER: Clear 60° F, Calm Winds
GEOLOGIST/OBSERVER: Steve Maxwell
ENTERED BY: Steve Maxwell

| SPLIT SPOON INTERVAL (ft.) | BLOWS PER 0.5 ft. | % RECOVERY | OVM (ppm) | SOIL DESCRIPTION (moisture, color, fraction, other notes, origin) |
|---|---|---|---|---|
| | | | | Augered to 6.0' |
| 6.0-8.0 | 2,2, 1,1 | 85 | 0.0 | No recovery, loose soil |
| 8.0-10.0 | wt of Rod, 1, 1,1 | 30 | 0.0 | |
| 10.0-12.0 | 1,1, 1,1 | 45 | | Brown SILT and CLAY with some pebbles and slag. **FILL** |
| | | | | Fine SAND with black slag. **FILL** |
| | | | | No recovery |
| 12.0-14.0 | 2,3, 3,4 | 40 | | Wet SILT and CLAY with slag, purifier wood and light odor. **FILL** |
| | | | | No recovery |
| | | | 13.1 | |
| 14.0-16.0 | 2,5, 4,4 | 45 | | Loose, wet SAND with strong odor and black water. **FILL** |
| | | | | **Water Table** |
| | | | | No recovery |

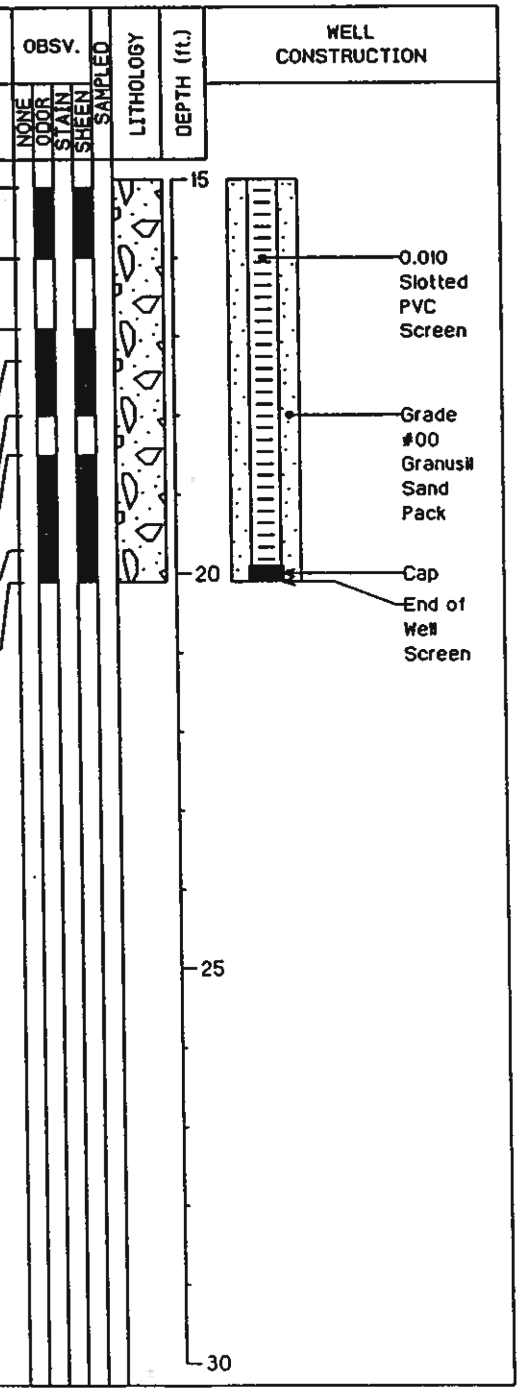


# SB-3/MW-3

PROJECT: RG&E East Station
PROJECT NO.: I03002
LOCATION: 10' Towards the river from PZ-07
DATE STARTED: 10/27/98
DATE COMPLETED: 10/27/98
DRILLING CONTRACTOR: Lyon Drilling
DRILLER: Harry Lyon
DRILLING METHOD: 4 1/4" ID Hollow stem auger
SAMPLE METHOD: 2"x2' Split spoon sampler, 300# hammer

GROUND ELEVATION: 402.3
PROTECTIVE CASING ELEVATION: N/A
WELL ELEVATION (TOC): 404.91
DEPTH TO WATER: 13.83
X-COORDINATE: E 756544.2450
Y-COORDINATE: N 1155883.4860
WEATHER: Clear 60° F, Calm Winds
GEOLOGIST/OBSERVER: Steve Maxwell
ENTERED BY: Steve Maxwell

| SPLIT SPOON INTERVAL (ft.) | BLOWS PER 0.5 ft. | % RECOVERY | OVM (ppm) | SOIL DESCRIPTION (moisture, color, fraction, other notes, origin) |
|---|---|---|---|---|
| | | | 17.5 | Saturated black SAND with coal fines black water and strong sheen and odor, FILL |
| 16.0-18.0 | 4,3, 8,15 | 55 | | No recovery |
| | | | 13.8 | Loose saturated SAND with slag, black water, strong sheen, and odor, FILL |
| 18.0-20.0 | 12,11, 6,7 | 75 | 9.2<br>5.7 | Soft, saturated SAND with slag, strong sheen, and odor, FILL |
| | | | | No recovery |
| | | | | Saturated fine SAND with slag and TAR, FILL |
| 20.0-20.1 | 50 | 100 | 2.9 | Saturated, SILT with grey CLAY layers, slag, and TAR, FILL |
| | | | | Split Spoon Refusal, End of Boring<br>TOTAL DEPTH = 20.1' |

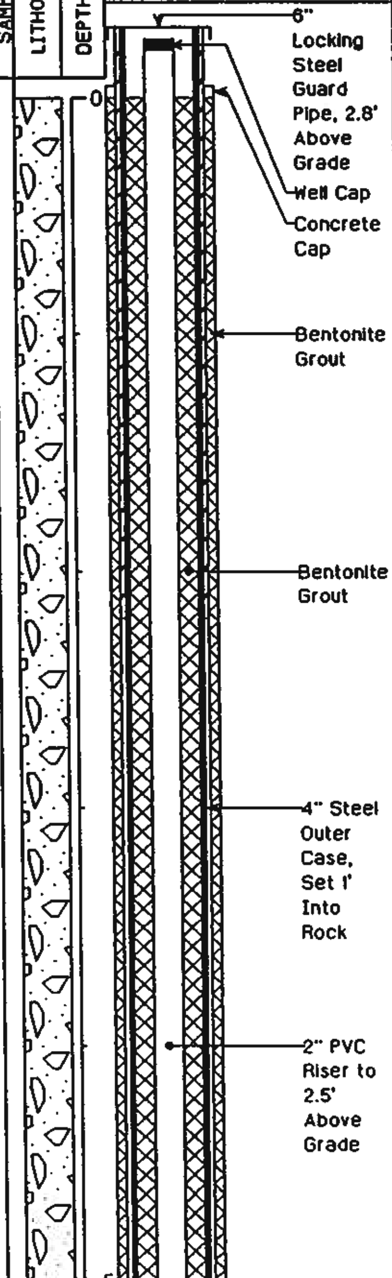


# MW-3-D

PROJECT: RG&E East Station
PROJECT NO.: I03002
LOCATION: About 3' east of SB-3/MW-3
DATE STARTED: 10/28/98
DATE COMPLETED: 10/28/98
DRILLING CONTRACTOR: Lyon Drilling
DRILLER: Harry Lyon
DRILLING METHOD: 6 1/4" ID Hollow stem auger
SAMPLE METHOD: None

GROUND ELEVATION: 402.6
PROTECTIVE CASING ELEVATION: N/A
WELL ELEVATION (TOC): 405.03
DEPTH TO WATER: 13.83
X-COORDINATE: E 756548.7940
Y-COORDINATE: N 1155879.6400
WEATHER: Clear, 60° F calm winds
GEOLOGIST/OBSERVER: Steve Maxwell
ENTERED BY: Steve Maxwell

| SPLIT SPOON INTERVAL (ft.) | BLOWS PER 0.5 ft. | % RECOVERY | OVM (ppm) | SOIL DESCRIPTION<br>moisture, color, fraction, other notes, origin | OBSV. NONE | OBSV. ODOR | OBSV. STAIN | OBSV. SHEEN | SAMPLED | LITHOLOGY | DEPTH (ft.) | WELL CONSTRUCTION |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Augered to 20.3' | | | | | | | | |

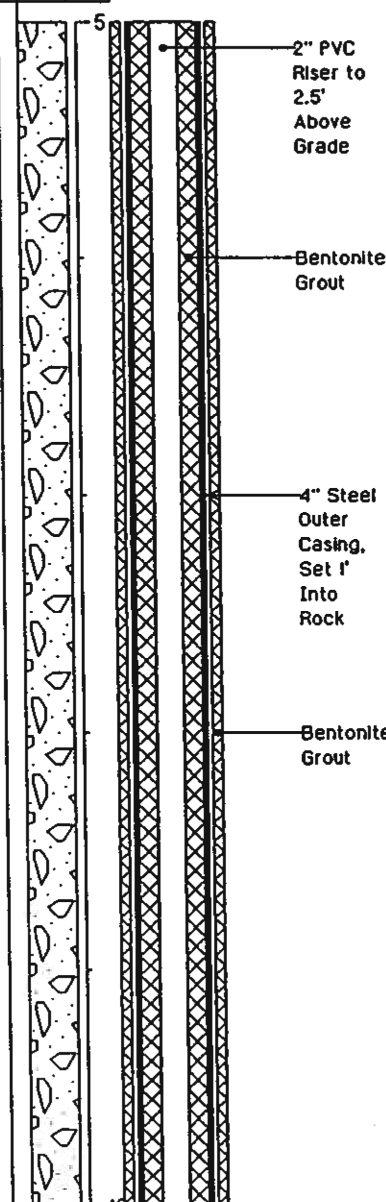


# MW-3-D

PROJECT: RG&E East Station
PROJECT NO.: I03002
LOCATION: About 3' east of SB-3/MW-3
DATE STARTED: 10/28/98
DATE COMPLETED: 10/28/98
DRILLING CONTRACTOR: Lyon Drilling
DRILLER: Harry Lyon
DRILLING METHOD: 6 1/4" ID Hollow stem auger
SAMPLE METHOD: None

GROUND ELEVATION: 402.6
PROTECTIVE CASING ELEVATION: N/A
WELL ELEVATION (TOC): 405.03
DEPTH TO WATER: 13.83
X-COORDINATE: E 756548.7940
Y-COORDINATE: N 1155879.6400
WEATHER: Clear, 60° F calm winds
GEOLOGIST/OBSERVER: Steve Maxwell
ENTERED BY: Steve Maxwell

| SPLIT SPOON INTERVAL (ft.) | BLOWS PER 0.5 ft. | % RECOVERY | OVM (ppm) | SOIL DESCRIPTION: moisture, color, fraction, other notes, origin | OBSV.: NONE | ODOR | STAIN | SHEEN | SAMPLED | LITHOLOGY | DEPTH (ft.) | WELL CONSTRUCTION |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Augered to 20.3' | | | | | | | 5–10 | |

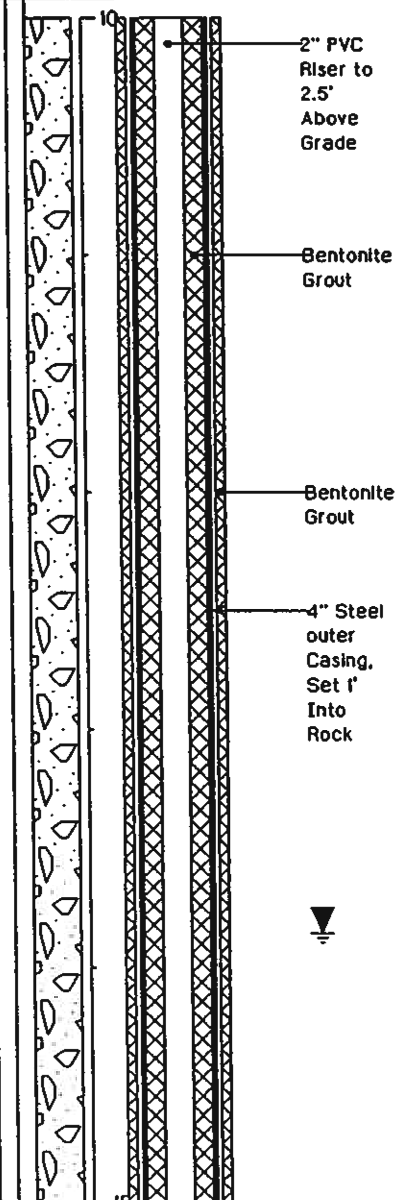


# MW-3-D

PROJECT: RG&E East Station
PROJECT NO.: I03002
LOCATION: About 3' east of SB-3/MW-3
DATE STARTED: 10/28/98
DATE COMPLETED: 10/28/98
DRILLING CONTRACTOR: Lyon Drilling
DRILLER: Harry Lyon
DRILLING METHOD: 6 1/4" ID Hollow stem auger
SAMPLE METHOD: None

GROUND ELEVATION: 402.6
PROTECTIVE CASING ELEVATION: N/A
WELL ELEVATION (TOC): 405.03
DEPTH TO WATER: 13.83
X-COORDINATE: E 756548.7940
Y-COORDINATE: N 1155879.6400
WEATHER: Clear, 60° F calm winds
GEOLOGIST/OBSERVER: Steve Maxwell
ENTERED BY: Steve Maxwell

| SPLIT SPOON INTERVAL (ft.) | BLOWS PER 0.5 ft. | % RECOVERY | OVM (ppm) | SOIL DESCRIPTION<br>moisture, color, fraction, other notes, origin | OBSV. NONE | OBSV. ODOR | OBSV. STAIN | OBSV. SHEEN | SAMPLED | LITHOLOGY | DEPTH (ft.) | WELL CONSTRUCTION |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Augered to 20.3' | | | | | | | 10 | |
| | | | | Water Table | | | | | | | | |
| | | | | | | | | | | | 15 | |

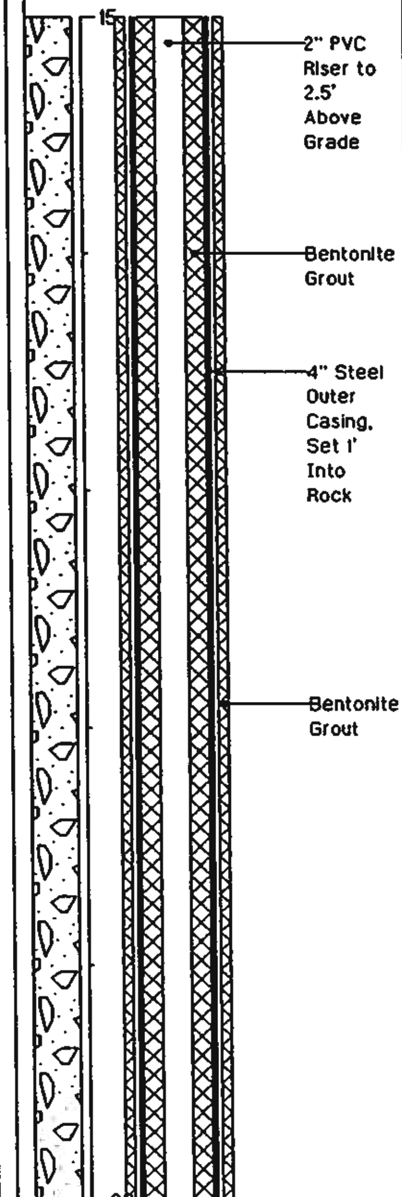


# MW-3-D

PROJECT: RG&E East Station
PROJECT NO.: 103002
LOCATION: About 3' east of SB-3/MW-3
DATE STARTED: 10/28/98
DATE COMPLETED: 10/28/98
DRILLING CONTRACTOR: Lyon Drilling
DRILLER: Harry Lyon
DRILLING METHOD: 6 1/4" ID Hollow stem auger
SAMPLE METHOD: None

GROUND ELEVATION: 402.6
PROTECTIVE CASING ELEVATION: N/A
WELL ELEVATION (TOC): 405.03
DEPTH TO WATER: 13.83
X-COORDINATE: E 756548.7940
Y-COORDINATE: N 1155879.6400
WEATHER: Clear, 60° F calm winds
GEOLOGIST/OBSERVER: Steve Maxwell
ENTERED BY: Steve Maxwell

| SPLIT SPOON INTERVAL (ft.) | BLOWS PER 0.5 ft. | % RECOVERY | OVM (ppm) | SOIL DESCRIPTION: moisture, color, fraction, other notes, origin | OBSV.: NONE | OBSV.: ODOR | OBSV.: STAIN | OBSV.: SHEEN | SAMPLED | LITHOLOGY | DEPTH (ft.) | WELL CONSTRUCTION |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Augered to 20.3' | | | | | | | 15–20 | |



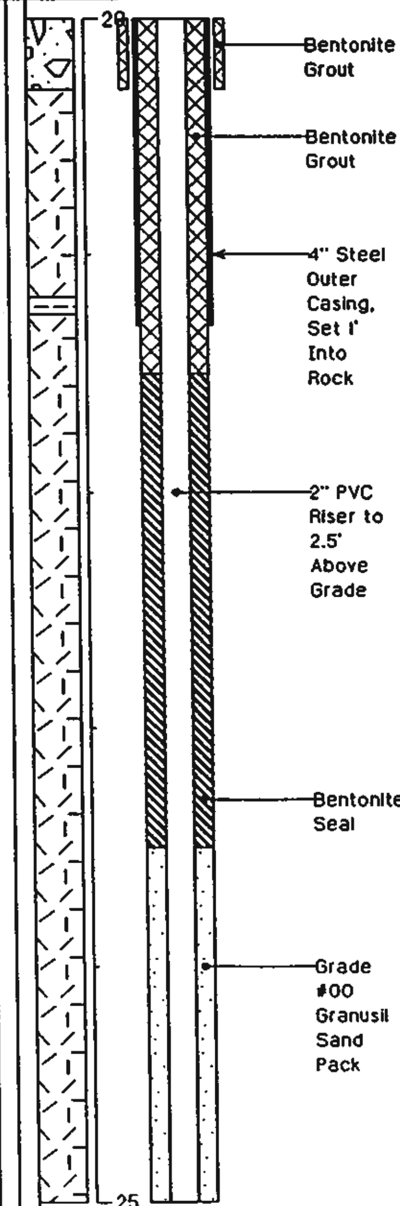
# MW-3-D

PROJECT: RG&E East Station
PROJECT NO.: I03002
LOCATION: About 3' east of SB-3/MW-3
DATE STARTED: 10/28/98
DATE COMPLETED: 10/28/98
DRILLING CONTRACTOR: Lyon Drilling
DRILLER: Harry Lyon
DRILLING METHOD: 6 1/4" ID Hollow stem auger
SAMPLE METHOD: None

GROUND ELEVATION: 402.6
PROTECTIVE CASING ELEVATION: N/A
WELL ELEVATION (TOC): 405.03
DEPTH TO WATER: 13.83
X-COORDINATE: E 756548.7940
Y-COORDINATE: N 1155879.6400
WEATHER: Clear, 60° F calm winds
GEOLOGIST/OBSERVER: Steve Maxwell
ENTERED BY: Steve Maxwell

| SPLIT SPOON INTERVAL (ft.) | BLOWS PER 0.5 ft. | % RECOVERY | OVM (ppm) | SOIL DESCRIPTION (moisture, color, fraction, other notes, origin) | OBSV. NONE | ODOR | STAIN | SHEEN | SAMPLED |
|---|---|---|---|---|---|---|---|---|---|
| | | | | Augered to 20.3' | | | | | |
| | | | | Rochester SHALE, medium soft, grey, calcerous with fine bedding | | | | | |
| | | | | Grey CLAY seem | | | | | |
| | | | | HC with brown NAPL | | | | | |
| | | | | HF | | | | | |
| | | | | HF | | | | | |
| | | | | HF | | | | | |
| | | | | HF | | | | | |
| | | | | HF | | | | | |
| | | | | HF | | | | | |
| | | | | HF | | | | | |
| | | | | HF | | | | | |
| | | | | HF | | | | | |

LITHOLOGY / DEPTH (ft.) / WELL CONSTRUCTION



# MW-3-D

PROJECT: RG&E East Station
PROJECT NO.: I03002
LOCATION: About 3' east of SB-3/MW-3
DATE STARTED: 10/28/98
DATE COMPLETED: 10/28/98
DRILLING CONTRACTOR: Lyon Drilling
DRILLER: Harry Lyon
DRILLING METHOD: 6 1/4" ID Hollow stem auger
SAMPLE METHOD: None

GROUND ELEVATION: 402.6
PROTECTIVE CASING ELEVATION: N/A
WELL ELEVATION (TOC): 405.03
DEPTH TO WATER: 13.83
X-COORDINATE: E 756548.7940
Y-COORDINATE: N 1155879.6400
WEATHER: Clear, 60° F calm winds
GEOLOGIST/OBSERVER: Steve Maxwell
ENTERED BY: Steve Maxwell

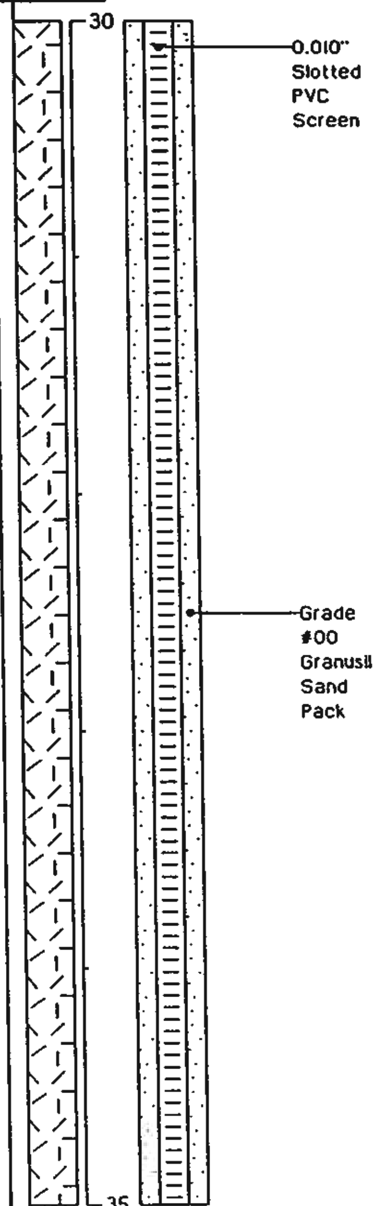
| SPLIT SPOON INTERVAL (ft.) | BLOWS PER 0.5 ft. | % RECOVERY | OVM (ppm) | SOIL DESCRIPTION: moisture, color, fraction, other notes, origin | OBSV.: NONE / ODOR / STAIN / SHEEN | SAMPLED | LITHOLOGY | DEPTH (ft.) | WELL CONSTRUCTION |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | 25 | 2" PVC Riser to 2.5' Above Grade |
| | | | | END OF RUN 1, RQD = 75.62% | | | | | |
| | | | | BEGINNING OF RUN 2 | | | | | |
| | | | | HF | | | | | Grade #00 Granusil Sand Pack |
| | | | | HF | | | | | |
| | | | | HF with light odor | | | | | |
| | | | | HF with light odor | | | | | |
| | | | | HF | | | | | |
| | | | | HF | | | | | 0.010" Slotted PVC Screen |
| | | | | HF | | | | | |
| | | | | HF | | | | | |
| | | | | HF with odor | | | | | |
| | | | | HF | | | | | |
| | | | | HF | | | | | |
| | | | | HF | | | | 30 | |

# MW-3-D

PROJECT: RG&E East Station
PROJECT NO.: I03002
LOCATION: About 3' east of SB-3/MW-3
DATE STARTED: 10/28/98
DATE COMPLETED: 10/28/98
DRILLING CONTRACTOR: Lyon Drilling
DRILLER: Harry Lyon
DRILLING METHOD: 6 1/4" ID Hollow stem auger
SAMPLE METHOD: None

GROUND ELEVATION: 402.6
PROTECTIVE CASING ELEVATION: N/A
WELL ELEVATION (TOC): 405.03
DEPTH TO WATER: 13.83
X-COORDINATE: E 756548.7940
Y-COORDINATE: N 1155879.6400
WEATHER: Clear, 60° F calm winds
GEOLOGIST/OBSERVER: Steve Maxwell
ENTERED BY: Steve Maxwell

| SPLIT SPOON INTERVAL (ft.) | BLOWS PER 0.5 ft. | % RECOVERY | OVM (ppm) | SOIL DESCRIPTION: moisture, color, fraction, other notes, origin | OBSV.: NONE / ODOR / STAIN / SHEEN | SAMPLED | LITHOLOGY | DEPTH (ft.) | WELL CONSTRUCTION |
|---|---|---|---|---|---|---|---|---|---|
| | | | | HF | | | | 30 | |
| | | | | END OF RUN 2, RQD = 62.58% | | | | | |
| | | | | BEGINNING OF RUN 3 | | | | | |
| | | | | HF | | | | | |
| | | | | HF | | | | | |
| | | | | HF | | | | | |
| | | | | HF | | | | | |
| | | | | HF | | | | | |
| | | | | HF | | | | | |
| | | | | HF | | | | | |
| | | | | HF | | | | | |
| | | | | HF | | | | | |
| | | | | HF | | | | | |
| | | | | HF | | | | | |
| | | | | HF | | | | | |
| | | | | HF | | | | 35 | |

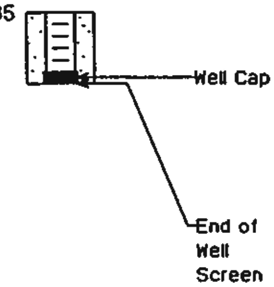


# MW-3-D

PROJECT: RG&E East Station
PROJECT NO.: 103002
LOCATION: About 3' east of SB-3/MW-3
DATE STARTED: 10/28/98
DATE COMPLETED: 10/28/98
DRILLING CONTRACTOR: Lyon Drilling
DRILLER: Harry Lyon
DRILLING METHOD: 6 1/4" ID Hollow stem auger
SAMPLE METHOD: None

GROUND ELEVATION: 402.6
PROTECTIVE CASING ELEVATION: N/A
WELL ELEVATION (TOC): 405.03
DEPTH TO WATER: 13.83
X-COORDINATE: E 756548.7940
Y-COORDINATE: N 1155879.6400
WEATHER: Clear, 60° F calm winds
GEOLOGIST/OBSERVER: Steve Maxwell
ENTERED BY: Steve Maxwell

| SPLIT SPOON INTERVAL (ft.) | BLOWS PER 0.5 ft. | % RECOVERY | OVM (ppm) | SOIL DESCRIPTION: moisture, color, fraction, other notes, origin | OBSV.: NONE | ODOR | STAIN | SHEEN | SAMPLED | LITHOLOGY | DEPTH (ft.) | WELL CONSTRUCTION |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | | | 35 | |
| | | | | END OF RUN 3, RQD = 63.38% | | | | | | | | |
| | | | | End of Boring<br>TOTAL DEPTH = 35.3' | | | | | | | | |
| | | | | | | | | | | | 40 | |



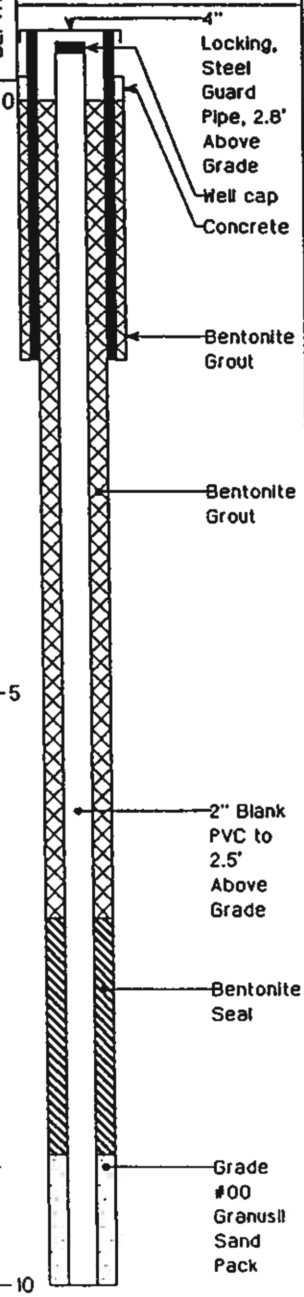
# SB-4/MW-4

PROJECT: RG&E East Station
PROJECT NO.: 103002
LOCATION: About half way between PZ-03 and PZ-04
DATE STARTED: 10/27/98
DATE COMPLETED: 10/27/98
DRILLING CONTRACTOR: Lyon Drilling
DRILLER: Harry Lyon
DRILLING METHOD: 4 1/4" ID Hollow stem auger
SAMPLE METHOD: 2"x2' Split spoon sampler, 300# hammer

GROUND ELEVATION: 401.3
PROTECTIVE CASING ELEVATION: N/A
WELL ELEVATION (TOC): 403.78
DEPTH TO WATER: 12.14
X-COORDINATE: E 756698.8010
Y-COORDINATE: N 1155566.8230
WEATHER: Clear, 60° F, calm winds
GEOLOGIST/OBSERVER: Steve Maxwell
ENTERED BY: Steve Maxwell

| SPLIT SPOON INTERVAL (ft.) | BLOWS PER 0.5 ft. | % RECOVERY | OVM (ppm) | SOIL DESCRIPTION (moisture, color, fraction, other notes, origin) | OBSV. NONE | OBSV. ODOR | OBSV. STAIN | OBSV. SHEEN | SAMPLED | LITHOLOGY | DEPTH (ft.) |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Augered to 6.0' | | | | | | | 0 |
| 6.0-8.0 | 1,1, 1,1 | 90 | 9.9 | Moist fine brown SAND and SILT with trace pebbles and brick fragments, **FILL** | X | | | | | | 5 |
| | | | | Soft, moist fine SAND with purifier wood, brick fragments, light sheen , and strong odor, **FILL** | | X | | X | X | | |
| | | | | Augered to 10.0' | | | | | | | 10 |

WELL CONSTRUCTION

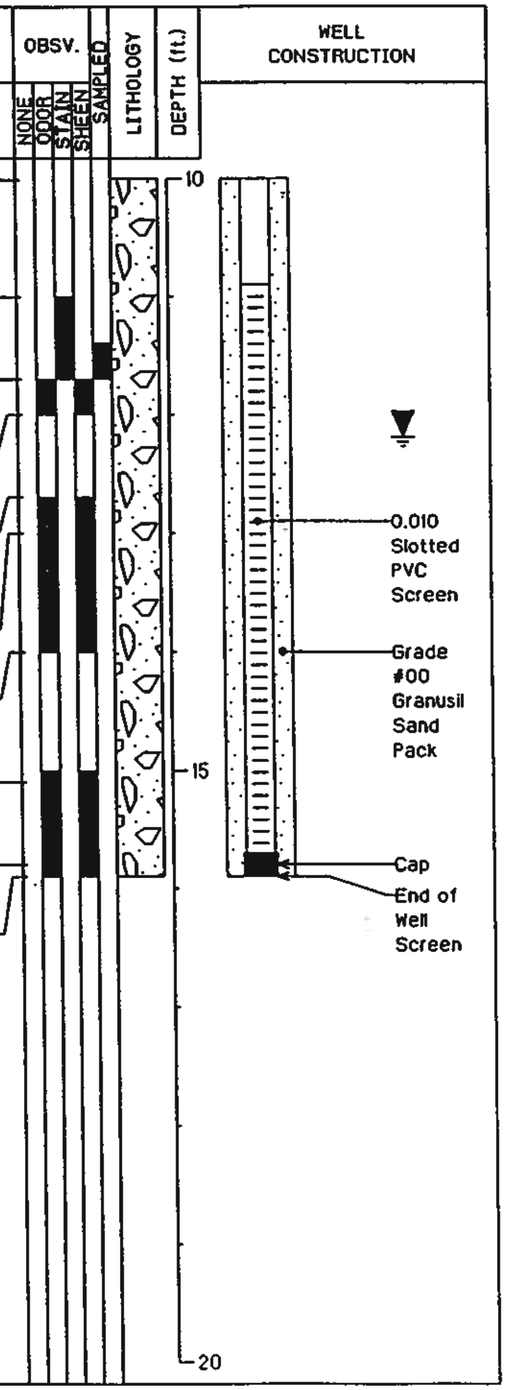


# SB-4/MW-4

PROJECT: RG&E East Station
PROJECT NO.: 103002
LOCATION: About half way between PZ-03 and PZ-04
DATE STARTED: 10/27/98
DATE COMPLETED: 10/27/98
DRILLING CONTRACTOR: Lyon Drilling
DRILLER: Harry Lyon
DRILLING METHOD: 4 1/4" ID Hollow stem auger
SAMPLE METHOD: 2"x2' Split spoon sampler, 300# hammer

GROUND ELEVATION: 401.3
PROTECTIVE CASING ELEVATION: N/A
WELL ELEVATION (TOC): 403.78
DEPTH TO WATER: 12.14
X-COORDINATE: E 756698.8010
Y-COORDINATE: N 1155566.8230
WEATHER: Clear, 80° F, calm winds
GEOLOGIST/OBSERVER: Steve Maxwell
ENTERED BY: Steve Maxwell

| SPLIT SPOON INTERVAL (ft.) | BLOWS PER 0.5 ft. | % RECOVERY | OVM (ppm) | SOIL DESCRIPTION (moisture, color, fraction, other notes, origin) |
|---|---|---|---|---|
| 10.0-12.0 | wt of Rod,2 3,4 | 50 | | No recovery |
| | | | 7.1 | Wet, brown SAND with some SILT, and black stains, **FILL** |
| 12.0-14.0 | 2,5, 2,2 | 65 | | Wet, loose SAND and GRAVEL with some clinker ash, strong sheen and odor, **FILL** |
| | | | | No recovery |
| | | | | **Water Table** |
| | | | 5.2 | Saturated SAND with large clinker ash, brick fragments, strong sheen, and odor, **FILL** |
| 14.0-15.9 | 1,1, 1,50 | 50 | | Saturated fine SAND with some brick fragments, strong sheen, and odor, **FILL** |
| | | | | No recovery |
| | | | 5.9 | Saturated fine SAND with clinker ash, brick fragments, strong sheen and odor, **FILL** |
| | | | | Saturated fine SAND with SHALE chips, **FILL** |
| | | | | Stipit Spoon Refusal, End of Boring **TOTAL DEPTH = 15.9'** |



# SB-5

PROJECT: RG&E East Station
PROJECT NO.: I03002
LOCATION: Near former light oil plant
DATE STARTED: 10/28/98
DATE COMPLETED: 10/28/98
DRILLING CONTRACTOR: Lyon Drilling
DRILLER: Harry Lyon
DRILLING METHOD: 4 1/4" ID Hollow stem auger
SAMPLE METHOD: 2"x2' Split spoon sampler, 300# hammer

GROUND ELEVATION: N/A
PROTECTIVE CASING ELEVATION: N/A
WELL ELEVATION (TOC): N/A
DEPTH TO WATER: Not reached
X-COORDINATE: N/A
Y-COORDINATE: N/A
WEATHER: Mostly cloudy 55° F, windy
GEOLOGIST/OBSERVER: Steve Maxwell
ENTERED BY: Steve Maxwell

| SPLIT SPOON INTERVAL (ft.) | BLOWS PER 0.5 ft. | % RECOVERY | OVM (ppm) | SOIL DESCRIPTION (moisture, color, fraction, other notes, origin) | OBSV. (NONE / ODOR / STAIN / SHEEN) | SAMPLED | LITHOLOGY | DEPTH (ft.) | WELL CONSTRUCTION |
|---|---|---|---|---|---|---|---|---|---|
| | | | | Augered to 6.0' | | | | 0 | |
| | | | | | | | | 5 | |
| 6.0-8.0 | 8,9, 10,17 | 50 | 0.0 | No recovery | | | | | |
| | | | | Dark brown, moist fine SAND and SILT with pebbles, clinker ash and brick fragments, FILL | | | | | |
| | | | | Brick fragments | | | | | |
| | | | | Brown, moist, medium SAND with pebbles, concrete, and brick fragments, FILL | | | | | |
| | | | | Augered to 10.0' | | | | 10 | |

*META Environmental, Inc.*

# SB-5

PROJECT: RG&E East Station
PROJECT NO.: 103002
LOCATION: Near former light oil plant
DATE STARTED: 10/28/98
DATE COMPLETED: 10/28/98
DRILLING CONTRACTOR: Lyon Drilling
DRILLER: Harry Lyon
DRILLING METHOD: 4 1/4" ID Hollow stem auger
SAMPLE METHOD: 2"x2' Split spoon sampler, 300# hammer

GROUND ELEVATION: N/A
PROTECTIVE CASING ELEVATION: N/A
WELL ELEVATION (TOC): N/A
DEPTH TO WATER: Not reached
X-COORDINATE: N/A
Y-COORDINATE: N/A
WEATHER: Mostly cloudy 55° F, windy
GEOLOGIST/OBSERVER: Steve Maxwell
ENTERED BY: Steve Maxwell

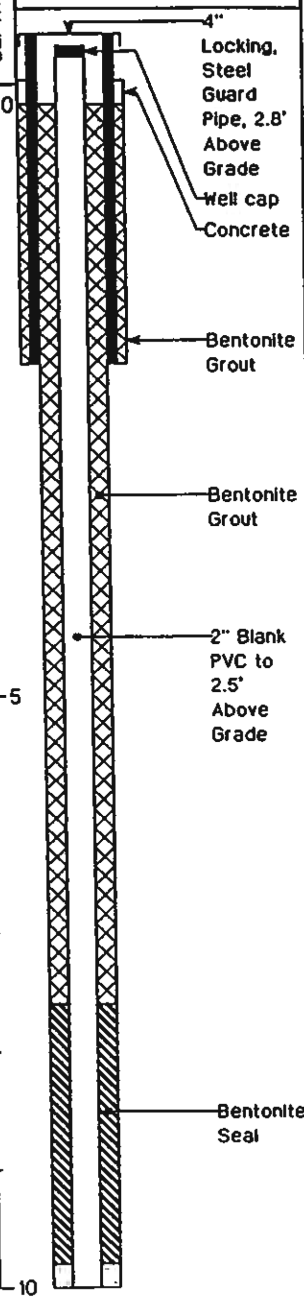
| SPLIT SPOON INTERVAL (ft.) | BLOWS PER 0.5 ft. | % RECOVERY | OVM (ppm) | SOIL DESCRIPTION (moisture, color, fraction, other notes, origin) | OBSV. (NONE / ODOR / STAIN / SHEEN / SAMPLED) | LITHOLOGY | DEPTH (ft.) | WELL CONSTRUCTION |
|---|---|---|---|---|---|---|---|---|
| 10.0-12.0 | 5,5, 8,8 | 100 | 18.7 | Moist SAND and SILT with some CLAY, brick fragments, and odor, **FILL** | | | 10 | |
| | | | 54.6 | Moist SILT and CLAY with pebbles, brick fragments, and strong odor, **FILL** | | | | |
| | | | 306 | | | | | |
| | | | 390 | Moist, firm SILT and CLAY with coal, clinker ash, brick fragments, and strong odor, **FILL** | | | | |
| 12.0-14.0 | 5,7, 4,4 | 10 | | No recovery | | | | |
| 14.0-14.4 | 50 | 100 | 230 | Firm moist grey CLAY with some pebbles, sheen, odor, and stain, **FILL** | | | | |
| | | | 26.9 | Firm moist grey CLAY with some pebbles, Stain and strong odor, **FILL** | | | 15 | |
| | | | | Auger refusal, End of Boring **TOTAL DEPTH = 14.4'** | | | | |
| | | | | | | | 20 | |

# SB-5B/MW-5

PROJECT: RG&E East Station
PROJECT NO.: I03002
LOCATION: About 5' to the sout of SB-5
DATE STARTED: 10/28/98
DATE COMPLETED: 10/28/98
DRILLING CONTRACTOR: Lyon Drilling
DRILLER: Harry Lyon
DRILLING METHOD: 4 1/4" ID Hollow stem auger
SAMPLE METHOD: 2"x2' Split spoon sampler, 300# hammer

GROUND ELEVATION: 411.8
PROTECTIVE CASING ELEVATION: N/A
WELL ELEVATION (TOC): 414.23
DEPTH TO WATER: 15.73
X-COORDINATE: E 759864.9450
Y-COORDINATE: N 1155353.9470
WEATHER: Clear, 60° F, calm winds
GEOLOGIST/OBSERVER: Steve Maxwell
ENTERED BY: Steve Maxwell

| SPLIT SPOON INTERVAL (ft.) | BLOWS PER 0.5 ft. | % RECOVERY | OVM (ppm) | SOIL DESCRIPTION: moisture, color, fraction, other notes, origin | OBSV.: NONE | OBSV.: ODOR | OBSV.: STAIN | OBSV.: SHEEN | SAMPLED | LITHOLOGY | DEPTH (ft.) | WELL CONSTRUCTION |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Augered to 10.0' | | | | | | | 0 | |
| | | | | | | | | | | | 5 | |
| | | | | | | | | | | | 10 | |



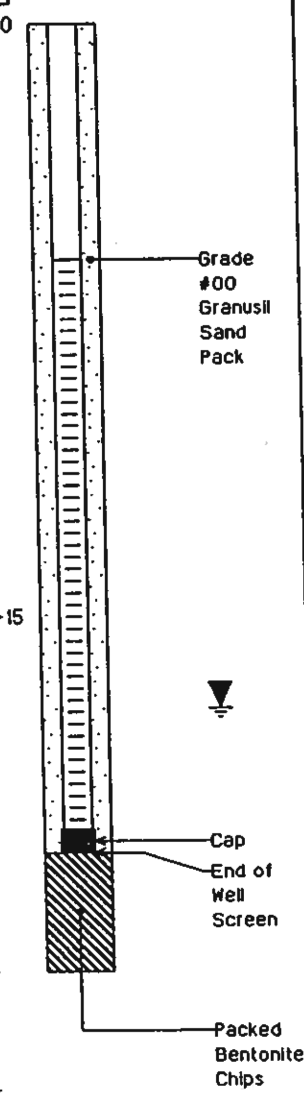
# SB-5B/MW-5

PROJECT: RG&E East Station
PROJECT NO.: 103002
LOCATION: About 5' to the sout of SB-5
DATE STARTED: 10/28/98
DATE COMPLETED: 10/28/98
DRILLING CONTRACTOR: Lyon Drilling
DRILLER: Harry Lyon
DRILLING METHOD: 4 1/4" ID Hollow stem auger
SAMPLE METHOD: 2"x2' Split spoon sampler, 300# hammer

GROUND ELEVATION: 411.8
PROTECTIVE CASING ELEVATION: N/A
WELL ELEVATION (TOC): 414.23
DEPTH TO WATER: 15.73
X-COORDINATE: E 759864.9450
Y-COORDINATE: N 1155353.9470
WEATHER: Clear, 60° F, calm winds
GEOLOGIST/OBSERVER: Steve Maxwell
ENTERED BY: Steve Maxwell

| SPLIT SPOON INTERVAL (ft.) | BLOWS PER 0.5 ft. | % RECOVERY | OVM (ppm) | SOIL DESCRIPTION (moisture, color, fraction, other notes, origin) | DEPTH (ft.) |
|---|---|---|---|---|---|
| 10.0-12.0 | 15,9, 7,12 | 15 | | No recovery | 10 |
| 12.0-14.0 | 1,4, 4,3 | 65 | 44.7 | Loose, moist black SAND, with strong sheen and odor, **FILL** | |
| | | | | No recovery | |
| | | | 372 | Loose, moist, fine black SAND and SILT with pebbles, strong sheen and odor, **FILL** | |
| 14.0-16.0 | wt of Rod,1, 2,2 | 55 | | No recovery | |
| | | | 111 | Very soft saturated SAND and SILT with black water, sheen, and odor, **FILL** | 15 |
| | | | | **Water Table** | |
| 16.0-18.0 | 5,14, 15,50 | 60 | | | |
| | | | 110 | Stiff grey **CLAY** with dark grey bands, not stained, strong odor | |
| | | | | Split Spoon Refusal, End of Boring **TOTAL DEPTH = 18.0'** | 20 |

WELL CONSTRUCTION

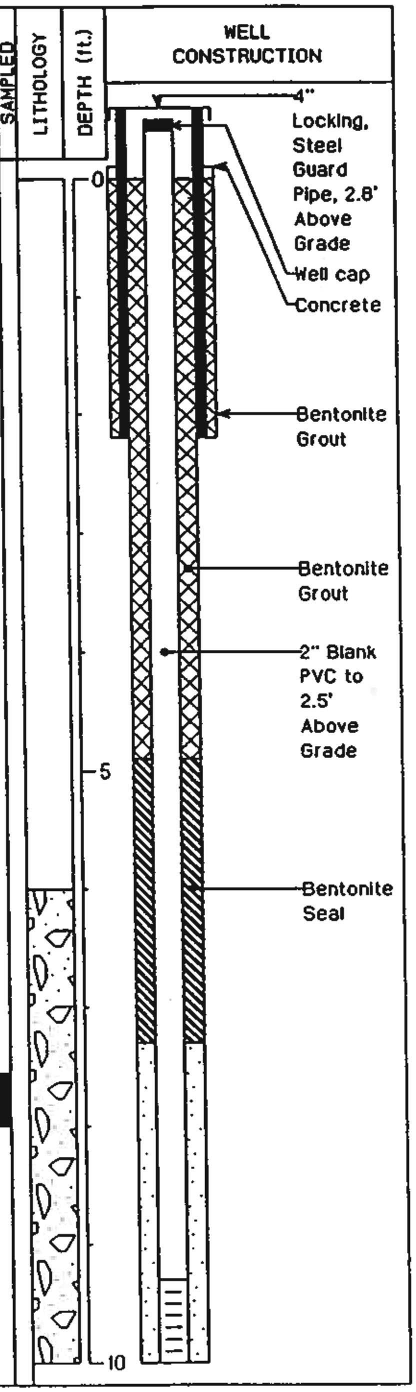


# SB-6/MW-6

PROJECT: RG&E East Station
PROJECT NO.: 103002
LOCATION: 10' Towards the river from PZ-07
DATE STARTED: 10/29/98
DATE COMPLETED: 10/29/98
DRILLING CONTRACTOR: Lyon Drilling
DRILLER: Harry Lyon
DRILLING METHOD: 4 1/4" ID Hollow stem auger
SAMPLE METHOD: 2"x2' Split spoon sampler, 300# hammer

GROUND ELEVATION: 418.9
PROTECTIVE CASING ELEVATION: N/A
WELL ELEVATION (TOC): 421.24
DEPTH TO WATER: 13.22
X-COORDINATE: E1155917.6920
Y-COORDINATE: N757246.0460
WEATHER: mostly sunny 50° F, light wind
GEOLOGIST/OBSERVER: Steve Maxwell
ENTERED BY: Steve Maxwell

| SPLIT SPOON INTERVAL (ft.) | BLOWS PER 0.5 ft. | % RECOVERY | OVM (ppm) | SOIL DESCRIPTION (moisture, color, fraction, other notes, origin) | OBSV. NONE | OBSV. ODOR | OBSV. STAIN | OBSV. SHEEN | SAMPLED |
|---|---|---|---|---|---|---|---|---|---|
| | | | | Augered to 6.0' | | | | | |
| 6.0-8.0 | 8,12, 7,5 | 80 | 0.0 | No recovery | | | | | |
| | | | | Brown SAND and SILT with clinker ash, pebbles and some black staining, **FILL** | | | ■ | | |
| | | | | Moist, black SAND with coal fines and clinker ash, **FILL** | ■ | | | | |
| | | | | Brown, moist fine SAND with clinker ash, light sheen, **FILL** | | | | ■ | |
| | | | | Augered to 10.0' | | | | | |

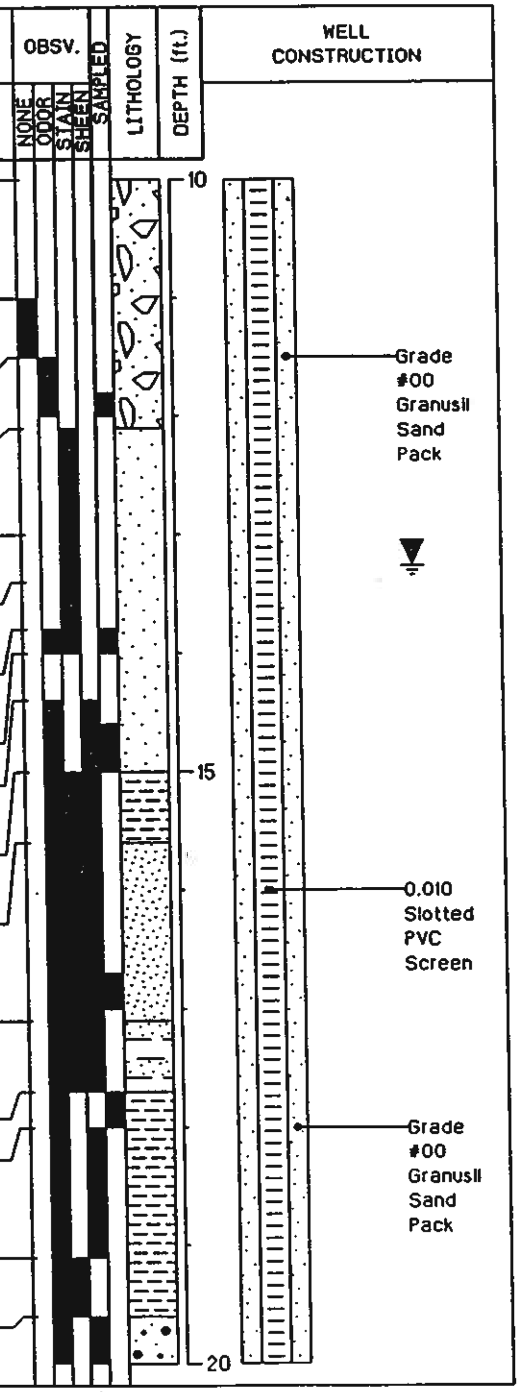


# SB-6/MW-6

PROJECT: RG&E East Station
PROJECT NO.: 103002
LOCATION: 10' Towards the river from PZ-07
DATE STARTED: 10/29/98
DATE COMPLETED: 10/29/98
DRILLING CONTRACTOR: Lyon Drilling
DRILLER: Harry Lyon
DRILLING METHOD: 4 1/4" ID Hollow stem auger
SAMPLE METHOD: 2"x2' Split spoon sampler, 300# hammer

GROUND ELEVATION: 418.9
PROTECTIVE CASING ELEVATION: N/A
WELL ELEVATION (TOC): 421.24
DEPTH TO WATER: 13.22
X-COORDINATE: E1155917.6920
Y-COORDINATE: N757246.0460
WEATHER: mostly sunny 50° F, light wind
GEOLOGIST/OBSERVER: Steve Maxwell
ENTERED BY: Steve Maxwell

| SPLIT SPOON INTERVAL (ft.) | BLOWS PER 0.5 ft. | % RECOVERY | OVM (ppm) | SOIL DESCRIPTION (moisture, color, fraction, other notes, origin) |
|---|---|---|---|---|
| 10.0-12.0 | 3,3, 4,3 | 50 | | No recovery |
| | | | | Dark brown SAND with some SILT, brick fragments and pebbles, FILL |
| 12.0-14.0 | 5,8, 8,9 | 95 | 35.6 | Wet fine brown SAND with concrete fragments and fuel oil odor, FILL |
| | | | | Wet fine, loose SAND with pebbles and black stain |
| | | | | Saturated fine brown SAND and SILT with some pebbles and black stain, Water Table |
| 14.0-16.0 | 6,9, 10,12 | 80 | 30.2 | Saturated SILT and CLAY with pebbles and black staining |
| | | | | Saturated SAND and SILT with pebbles, fuel oil odor, and black staining |
| | | | 179 | No recovery |
| | | | | Saturated fine SAND with strong odor, sheen, and TAR |
| 16.0-18.0 | 12,18, 32,30 | 100 | 25.3 | Firm CLAY with SILT, stained black, stong odor and sheen |
| | | | 87.2 | Moist loose fine SAND and SILT with strong sheen, odor and black stain |
| | | | 118 | |
| | | | | Firm CLAY with some SILT and layers of pebbles with black staining, sheen and odor |
| 18.0-20.0 | 15,22, 16,15 | 100 | 60.8 | Stiff brown CLAY with odor |
| | | | 23.2 | Stiff brown CLAY with layers of GRAVEL, strong sheen and odor |
| | | | 41.3 | |
| | | | 6.9 | Stiff, moist brown CLAY with bands of iron staining |
| | | | | Dark brown SAND and GRAVEL with sheen and odor |



# SB-6/MW-6

PROJECT: RG&E East Station
PROJECT NO.: 103002
LOCATION: 10' Towards the river from PZ-07
DATE STARTED: 10/29/98
DATE COMPLETED: 10/29/98
DRILLING CONTRACTOR: Lyon Drilling
DRILLER: Harry Lyon
DRILLING METHOD: 4 1/4" ID Hollow stem auger
SAMPLE METHOD: 2"x2' Split spoon sampler, 300# hammer

GROUND ELEVATION: 418.9
PROTECTIVE CASING ELEVATION: N/A
WELL ELEVATION (TOC): 421.24
DEPTH TO WATER: 13.22
X-COORDINATE: E1155917.6920
Y-COORDINATE: N757246.0460
WEATHER: mostly sunny 50° F, light wind
GEOLOGIST/OBSERVER: Steve Maxwell
ENTERED BY: Steve Maxwell

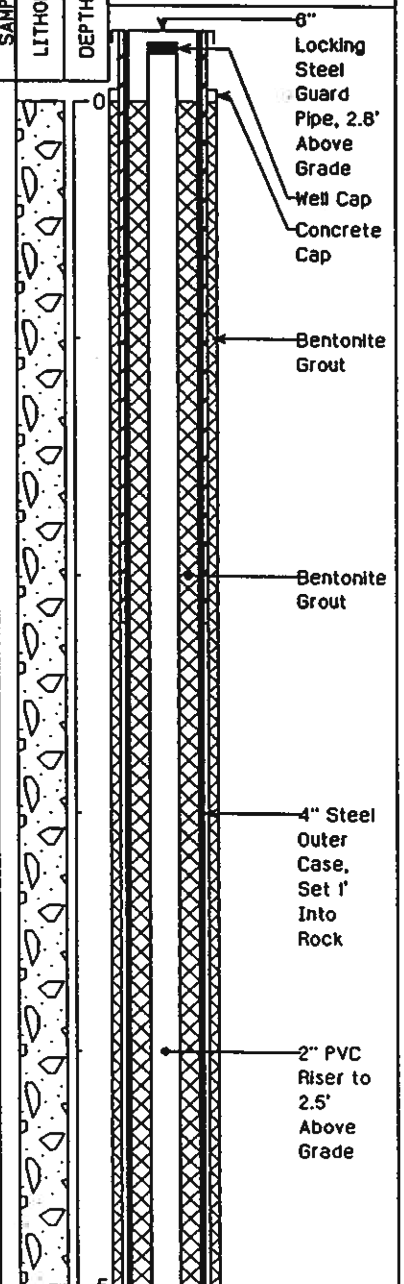
| SPLIT SPOON INTERVAL (ft.) | BLOWS PER 0.5 ft. | % RECOVERY | OVM (ppm) | SOIL DESCRIPTION (moisture, color, fraction, other notes, origin) | OBSV. (NONE / ODOR / STAIN / SHEEN / SAMPLED) | LITHOLOGY | DEPTH (ft.) | WELL CONSTRUCTION |
|---|---|---|---|---|---|---|---|---|
| 20.0-21.3 | 14,12, 50 | 62 | | No recovery | | | 20 | |
| | | | 20.2 | Dark brown **SAND** and **GRAVEL** with black staining | STAIN; SAMPLED | | | Cap; End of Well Screen |
| | | | | Split Spoon Refusal, End of Boring **TOTAL DEPTH = 21.3'** | | | | |
| | | | | | | | 25 | |
| | | | | | | | 30 | |

# MW-6-D

PROJECT: RG&E East Station
PROJECT NO.: I03002
LOCATION: About 6' towards the river from MW-6
DATE STARTED: 11/3/98
DATE COMPLETED: 11/3/98
DRILLING CONTRACTOR: Lyon Drilling
DRILLER: Harry Lyon
DRILLING METHOD: 6 1/4" ID Hollow stem auger
SAMPLE METHOD: None

GROUND ELEVATION: 418.5
PROTECTIVE CASING ELEVATION: N/A
WELL ELEVATION (TOC): 421.16
DEPTH TO WATER: 13.22
X-COORDINATE: E 757238.3640
Y-COORDINATE: N 1155916.5870
WEATHER: Overcast and cold, 40° F, and windy
GEOLOGIST/OBSERVER: Steve Maxwell
ENTERED BY: Steve Maxwell

| SPLIT SPOON INTERVAL (ft.) | BLOWS PER 0.5 ft. | % RECOVERY | OVM (ppm) | SOIL DESCRIPTION<br>moisture, color, fraction, other notes, origin | OBSV.<br>NONE | ODOR | STAIN | SHEEN | SAMPLED | LITHOLOGY | DEPTH (ft.) | WELL CONSTRUCTION |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Augered to 21.5" | | | | | | | | |

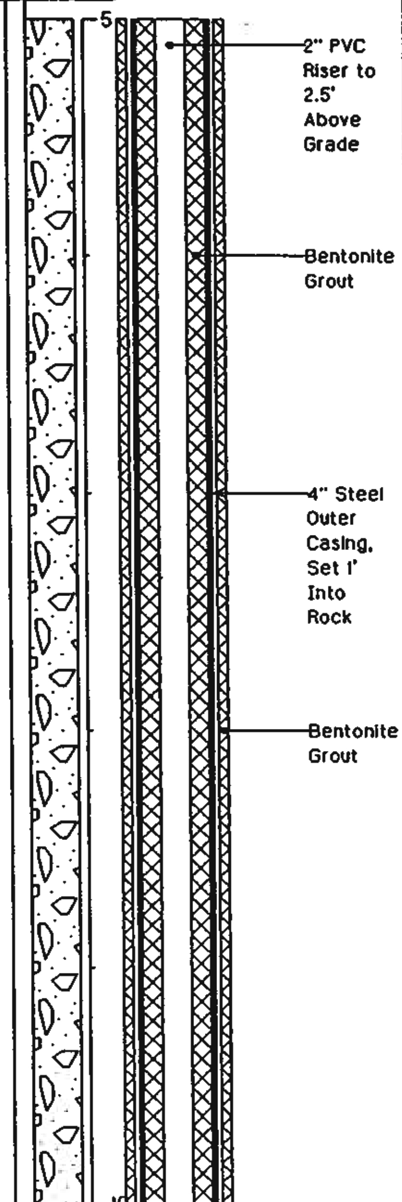


# MW-6-D

PROJECT: RG&E East Station
PROJECT NO.: I03002
LOCATION: About 6' towards the river from MW-6
DATE STARTED: 11/3/98
DATE COMPLETED: 11/3/98
DRILLING CONTRACTOR: Lyon Drilling
DRILLER: Harry Lyon
DRILLING METHOD: 6 1/4" ID Hollow stem auger
SAMPLE METHOD: None

GROUND ELEVATION: 418.5
PROTECTIVE CASING ELEVATION: N/A
WELL ELEVATION (TOC): 421.16
DEPTH TO WATER: 13.22
X-COORDINATE: E 757238.3640
Y-COORDINATE: N 1155916.5870
WEATHER: Overcast and cold, 40° F, and windy
GEOLOGIST/OBSERVER: Steve Maxwell
ENTERED BY: Steve Maxwell

| SPLIT SPOON INTERVAL (ft.) | BLOWS PER 0.5 ft. | % RECOVERY | OVM (ppm) | SOIL DESCRIPTION<br>moisture, color, fraction, other notes, origin | OBSV.<br>NONE | ODOR | STAIN | SHEEN | SAMPLED | LITHOLOGY | DEPTH (ft.) | WELL CONSTRUCTION |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Augered to 21.5' | | | | | | | 5–10 | |

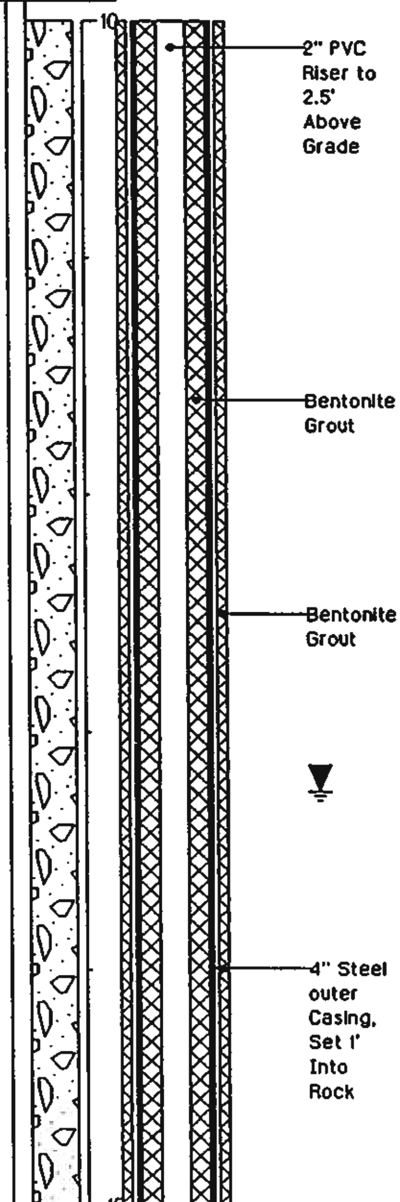


# MW-6-D

PROJECT: RG&E East Station
PROJECT NO.: 103002
LOCATION: About 6' towards the river from MW-6
DATE STARTED: 11/3/98
DATE COMPLETED: 11/3/98
DRILLING CONTRACTOR: Lyon Drilling
DRILLER: Harry Lyon
DRILLING METHOD: 6 1/4" ID Hollow stem auger
SAMPLE METHOD: None

GROUND ELEVATION: 418.5
PROTECTIVE CASING ELEVATION: N/A
WELL ELEVATION (TOC): 421.16
DEPTH TO WATER: 13.22
X-COORDINATE: E 757238.3640
Y-COORDINATE: N 1155916.5870
WEATHER: Overcast and cold, 40° F, and windy
GEOLOGIST/OBSERVER: Steve Maxwell
ENTERED BY: Steve Maxwell

| SPLIT SPOON INTERVAL (ft.) | BLOWS PER 0.5 ft. | % RECOVERY | OVM (ppm) | SOIL DESCRIPTION: moisture, color, fraction, other notes, origin | OBSV.: NONE | ODOR | STAIN | SHEEN | SAMPLED | LITHOLOGY | DEPTH (ft.) | WELL CONSTRUCTION |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Augered to 21.5' | | | | | | | 10 | |
| | | | | Water Table | | | | | | | | |
| | | | | | | | | | | | 15 | |

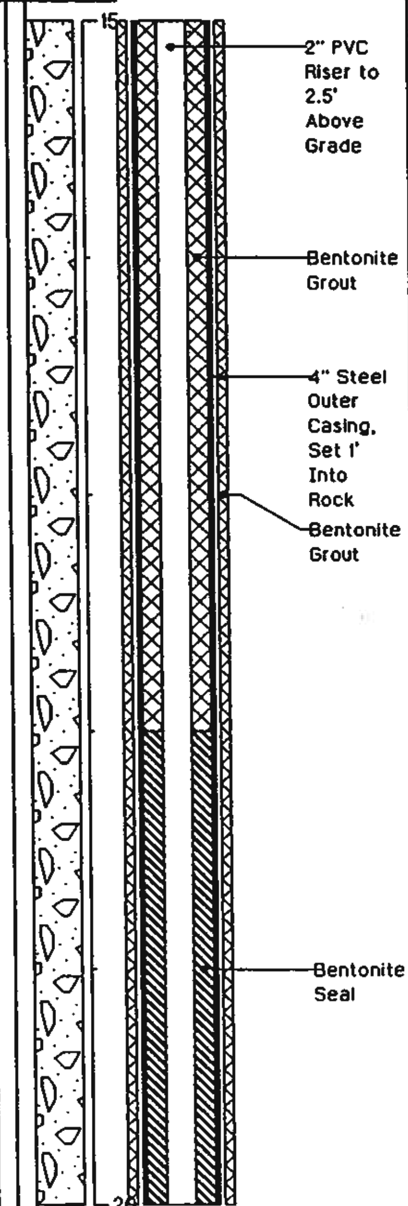


# MW-6-D

PROJECT: RG&E East Station
PROJECT NO.: I03002
LOCATION: About 6' towards the river from MW-6
DATE STARTED: 11/3/98
DATE COMPLETED: 11/3/98
DRILLING CONTRACTOR: Lyon Drilling
DRILLER: Harry Lyon
DRILLING METHOD: 6 1/4" ID Hollow stem auger
SAMPLE METHOD: None

GROUND ELEVATION: 418.5
PROTECTIVE CASING ELEVATION: N/A
WELL ELEVATION (TOC): 421.16
DEPTH TO WATER: 13.22
X-COORDINATE: E 757238.3640
Y-COORDINATE: N 1155916.5870
WEATHER: Overcast and cold, 40° F, and windy
GEOLOGIST/OBSERVER: Steve Maxwell
ENTERED BY: Steve Maxwell

| SPLIT SPOON INTERVAL (ft.) | BLOWS PER 0.5 ft. | % RECOVERY | OVM (ppm) | SOIL DESCRIPTION<br>moisture, color, fraction, other notes, origin | OBSV.<br>NONE | ODOR | STAIN | SHEEN | SAMPLED | LITHOLOGY | DEPTH (ft.) | WELL CONSTRUCTION |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Augered to 21.5' | | | | | | | 15–20 | |



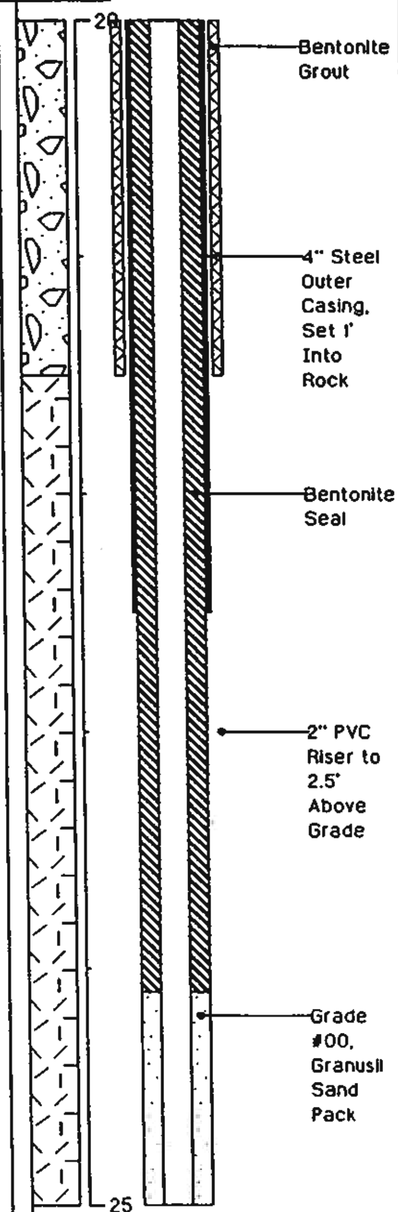
# MW-6-D

PROJECT: RG&E East Station
PROJECT NO.: I03002
LOCATION: About 6' towards the river from MW-6
DATE STARTED: 11/3/98
DATE COMPLETED: 11/3/98
DRILLING CONTRACTOR: Lyon Drilling
DRILLER: Harry Lyon
DRILLING METHOD: 6 1/4" ID Hollow stem auger
SAMPLE METHOD: None

GROUND ELEVATION: 418.5
PROTECTIVE CASING ELEVATION: N/A
WELL ELEVATION (TOC): 421.16
DEPTH TO WATER: 13.22
X-COORDINATE: E 757238.3640
Y-COORDINATE: N 1155916.5870
WEATHER: Overcast and cold, 40° F, and windy
GEOLOGIST/OBSERVER: Steve Maxwell
ENTERED BY: Steve Maxwell

| SPLIT SPOON INTERVAL (ft.) | BLOWS PER 0.5 ft. | % RECOVERY | OVM (ppm) | SOIL DESCRIPTION (moisture, color, fraction, other notes, origin) | OBSV. (NONE / ODOR / STAIN / SHEEN / SAMPLED) |
|---|---|---|---|---|---|
| | | | | Augered to 21.5' | |
| | | | | BEGINNING OF RUN 1, Rochester SHALE, medium soft, grey, calcerous with fine bedding | |
| | | | | SHALE with horizontal fracture (HF) | |
| | | | | HF | |
| | | | | Vertical Fracture (VF) | |
| | | | | HF and pulverized rock | |
| | | | | | |
| | | | | CLAY filled HF | |
| | | | | HF with Vertical Crack (VC) | |
| | | | | | |
| | | | | HF | |
| | | | | HF | |
| | | | | HF with iron staining | |
| | | | | Vertical Fracture (VF) | |
| | | | | HF and VF | |
| | | | | VF | |
| | | | | HF with fossils and iron staining | |
| | | | | HF | |
| | | | | | |
| | | | | VC | |

LITHOLOGY | DEPTH (ft.) | WELL CONSTRUCTION



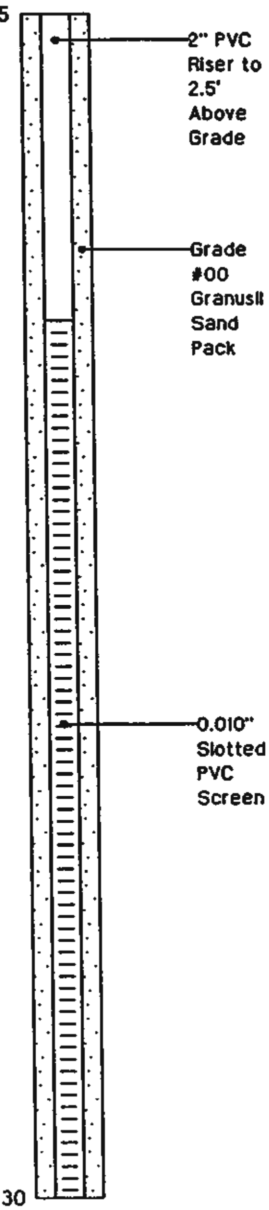
# MW-6-D

PROJECT: RG&E East Station
PROJECT NO.: I03002
LOCATION: About 6' towards the river from MW-6
DATE STARTED: 11/3/98
DATE COMPLETED: 11/3/98
DRILLING CONTRACTOR: Lyon Drilling
DRILLER: Harry Lyon
DRILLING METHOD: 6 1/4" ID Hollow stem auger
SAMPLE METHOD: None

GROUND ELEVATION: 418.5
PROTECTIVE CASING ELEVATION: N/A
WELL ELEVATION (TOC): 421.16
DEPTH TO WATER: 13.22
X-COORDINATE: E 757238.3640
Y-COORDINATE: N 1155916.5870
WEATHER: Overcast and cold, 40° F, and windy
GEOLOGIST/OBSERVER: Steve Maxwell
ENTERED BY: Steve Maxwell

| SPLIT SPOON INTERVAL (ft.) | BLOWS PER 0.5 ft. | % RECOVERY | OVM (ppm) | SOIL DESCRIPTION (moisture, color, fraction, other notes, origin) | OBSV. (NONE / ODOR / STAIN / SHEEN) | SAMPLED | LITHOLOGY | DEPTH (ft.) |
|---|---|---|---|---|---|---|---|---|
| | | | | CLAY seem | | | | 25 |
| | | | | HF | | | | |
| | | | | END OF RUN 1, RQD = 46.00% | | | | |
| | | | | BEGINNING OF RUN 2 | | | | |
| | | | | HF with heavy iron staining | | | | |
| | | | | HF with iron staining | | | | |
| | | | | HF with fossils | | | | |
| | | | | HF | | | | |
| | | | | HF | | | | |
| | | | | HF | | | | |
| | | | | Vertical Crack (VC) | | | | |
| | | | | HF | | | | |
| | | | | HF | | | | |
| | | | | HF | | | | 30 |

WELL CONSTRUCTION

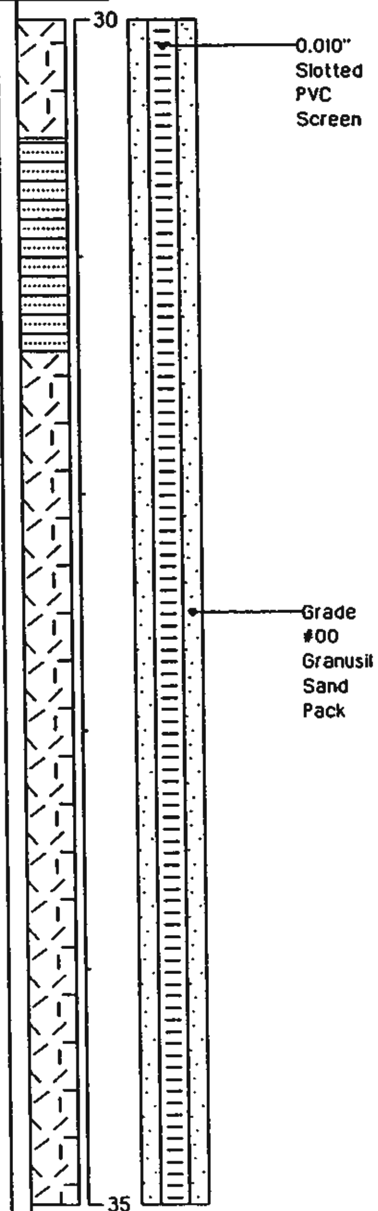


# MW-6-D

PROJECT: RG&E East Station
PROJECT NO.: I03002
LOCATION: About 6' towards the river from MW-6
DATE STARTED: 11/3/98
DATE COMPLETED: 11/3/98
DRILLING CONTRACTOR: Lyon Drilling
DRILLER: Harry Lyon
DRILLING METHOD: 6 1/4" ID Hollow stem auger
SAMPLE METHOD: None

GROUND ELEVATION: 418.5
PROTECTIVE CASING ELEVATION: N/A
WELL ELEVATION (TOC): 421.16
DEPTH TO WATER: 13.22
X-COORDINATE: E 757238.3640
Y-COORDINATE: N 1155916.5870
WEATHER: Overcast and cold, 40° F, and windy
GEOLOGIST/OBSERVER: Steve Maxwell
ENTERED BY: Steve Maxwell

| SPLIT SPOON INTERVAL (ft.) | BLOWS PER 0.5 ft. | % RECOVERY | OVM (ppm) | SOIL DESCRIPTION (moisture, color, fraction, other notes, origin) | OBSV. NONE | ODOR | STAIN | SHEEN | SAMPLED | LITHOLOGY | DEPTH (ft.) | WELL CONSTRUCTION |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | | | 30 | |
| | | | | Intermittent CLAY seems and SHALE | | | | | | | | |
| | | | | END OF RUN 2, RQD = 49.59% | | | | | | | | |
| | | | | BEGINNING OF RUN 3, sheen and odor | | | | | | | | |
| | | | | HF with NAPL | | | | | | | | |
| | | | | HF with NAPL | | | | | | | | |
| | | | | HF with NAPL | | | | | | | | |
| | | | | HF with NAPL | | | | | | | | |
| | | | | HF with NAPL | | | | | | | | |
| | | | | VC | | | | | | | | |
| | | | | HF with NAPL | | | | | | | | |
| | | | | HF with sheen and odor | | | | | | | | |
| | | | | HF with sheen and odor | | | | | | | | |
| | | | | HF with fossils, sheen and odor | | | | | | | | |
| | | | | HF with sheen and odor | | | | | | | 35 | |



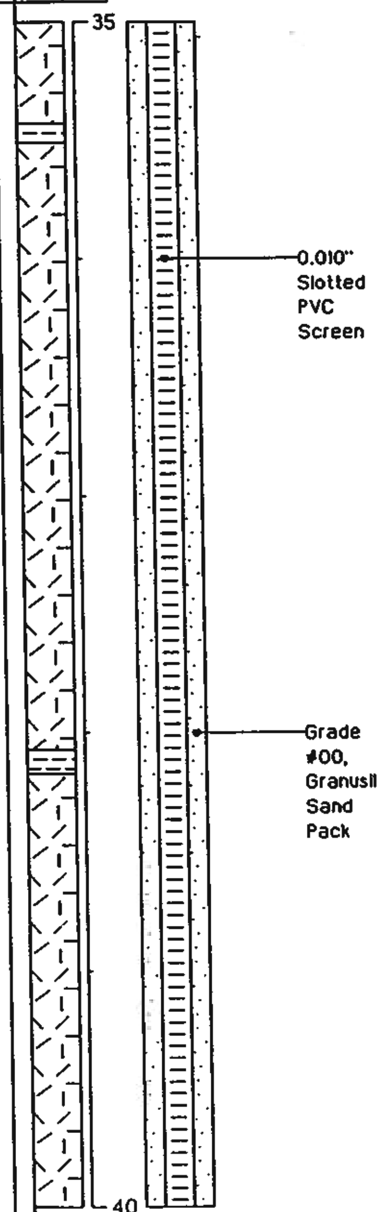
# MW-6-D

PROJECT: RG&E East Station
PROJECT NO.: I03002
LOCATION: About 6' towards the river from MW-6
DATE STARTED: 11/3/98
DATE COMPLETED: 11/3/98
DRILLING CONTRACTOR: Lyon Drilling
DRILLER: Harry Lyon
DRILLING METHOD: 6 1/4" ID Hollow stem auger
SAMPLE METHOD: None

GROUND ELEVATION: 418.5
PROTECTIVE CASING ELEVATION: N/A
WELL ELEVATION (TOC): 421.16
DEPTH TO WATER: 13.22
X-COORDINATE: E 757238.3640
Y-COORDINATE: N 1155916.5870
WEATHER: Overcast and cold, 40° F, and windy
GEOLOGIST/OBSERVER: Steve Maxwell
ENTERED BY: Steve Maxwell

| SPLIT SPOON INTERVAL (ft.) | BLOWS PER 0.5 ft. | % RECOVERY | OVM (ppm) | SOIL DESCRIPTION (moisture, color, fraction, other notes, origin) | OBSV. (NONE / ODOR / STAIN / SHEEN / SAMPLED) |
|---|---|---|---|---|---|
| | | | | CLAY seem with sheen and odor | |
| | | | | Sheen and odor | |
| | | | | HF with NAPL | |
| | | | | HF with NAPL | |
| | | | | END OF RUN 3, NAPL, RQD = 38.00% | |
| | | | | BEGINNING OF RUN 4, sheen and odor | |
| | | | | Pulverized rock with sheen and odor | |
| | | | | HF with sheen and odor | |
| | | | | HF with sheen and odor | |
| | | | | HF with sheen and odor | |
| | | | | HF with sheen and odor | |
| | | | | CLAY seem with sheen and odor | |
| | | | | Vertical Fracture (VF) with sheen and odor | |
| | | | | HF with sheen and odor | |
| | | | | HF with sheen and odor | |
| | | | | HF with sheen and odor | |
| | | | | HF with sheen and odor | |
| | | | | HF with fossils, sheen and odor | |
| | | | | HF with sheen and odor | |
| | | | | HF and VF with sheen and odor | |

LITHOLOGY / DEPTH (ft.) / WELL CONSTRUCTION

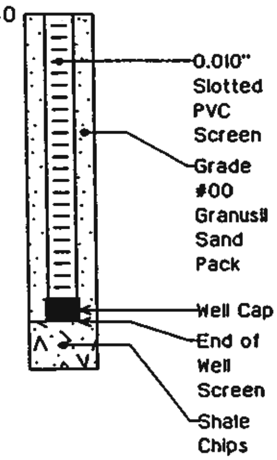


# MW-6-D

PROJECT: RG&E East Station
PROJECT NO.: I03002
LOCATION: About 6' towards the river from MW-6
DATE STARTED: 11/3/98
DATE COMPLETED: 11/3/98
DRILLING CONTRACTOR: Lyon Drilling
DRILLER: Harry Lyon
DRILLING METHOD: 6 1/4" ID Hollow stem auger
SAMPLE METHOD: None

GROUND ELEVATION: 418.5
PROTECTIVE CASING ELEVATION: N/A
WELL ELEVATION (TOC): 421.16
DEPTH TO WATER: 13.22
X-COORDINATE: E 757238.3640
Y-COORDINATE: N 1155916.5870
WEATHER: Overcast and cold, 40° F, and windy
GEOLOGIST/OBSERVER: Steve Maxwell
ENTERED BY: Steve Maxwell

| SPLIT SPOON INTERVAL (ft.) | BLOWS PER 0.5 ft. | % RECOVERY | OVM (ppm) | SOIL DESCRIPTION (moisture, color, fraction, other notes, origin) | OBSV. (NONE / ODOR / STAIN / SHEEN / SAMPLED) | LITHOLOGY | DEPTH (ft.) | WELL CONSTRUCTION |
|---|---|---|---|---|---|---|---|---|
| | | | | | | | 40 | |
| | | | | HF with NAPL | | | | |
| | | | | HF with NAPL | | | | |
| | | | | HF with NAPL | | | | |
| | | | | HF and VF with fossils and NAPL | | | | |
| | | | | HF with NAPL | | | | |
| | | | | END OF RUN 4, NAPL, RQD = 19.40%<br>TOTAL DEPTH = 41.5' | | | | |
| | | | | | | | 45 | |



# SB-7

PROJECT: RG&E East Station
PROJECT NO.: 103002
LOCATION: 5 feet south of PZ-19
DATE STARTED: 10/30/98
DATE COMPLETED: 10/30/98
DRILLING CONTRACTOR: Lyon Drilling
DRILLER: Harry Lyon
DRILLING METHOD: 4 1/4" ID Hollow stem auger
SAMPLE METHOD: 2"x2' Split spoon sampler, 300# hammer

GROUND ELEVATION: 424.8
PROTECTIVE CASING ELEVATION: None
WELL ELEVATION (TOC): None
DEPTH TO WATER: 15.5
X-COORDINATE: N/A
Y-COORDINATE: N/A
WEATHER: Mostly clear 50° F light wind
GEOLOGIST/OBSERVER: Steve Maxwell
ENTERED BY: Steve Maxwell

| SPLIT SPOON INTERVAL (ft.) | BLOWS PER 0.5 ft. | % RECOVERY | OVM (ppm) | SOIL DESCRIPTION<br>moisture, color, fraction, other notes, origin | OBSV. NONE | OBSV. ODOR | OBSV. STAIN | OBSV. SHEEN | SAMPLED | LITHOLOGY | DEPTH (ft.) | WELL CONSTRUCTION |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Augered to 6.0' | | | | | | | 0 | |
| | | | | | | | | | | | 5 | |
| 6.0-8.0 | 3,3, 10,17 | 85 | 0.0 | No recovery | | | | | | | | |
| | | | | Loose, dry SAND with some pebbles, FILL | X | | | | | Fill | | |
| | | | | Dark brown, moist SAND with brick fragments, and light odor, FILL | | X | | | | Fill | | |
| | | | | Augered to 10.0' | | | | | | Fill | 10 | |

# SB-7

PROJECT: RG&E East Station
PROJECT NO.: 103002
LOCATION: 5 feet south of PZ-19
DATE STARTED: 10/30/98
DATE COMPLETED: 10/30/98
DRILLING CONTRACTOR: Lyon Drilling
DRILLER: Harry Lyon
DRILLING METHOD: 4 1/4" ID Hollow stem auger
SAMPLE METHOD: 2"x2' Split spoon sampler, 300# hammer

GROUND ELEVATION: 424.8
PROTECTIVE CASING ELEVATION: None
WELL ELEVATION (TOC): None
DEPTH TO WATER: 15.5
X-COORDINATE: N/A
Y-COORDINATE: N/A
WEATHER: Mostly clear 50° F light wind
GEOLOGIST/OBSERVER: Steve Maxwell
ENTERED BY: Steve Maxwell

| SPLIT SPOON INTERVAL (ft.) | BLOWS PER 0.5 ft. | % RECOVERY | OVM (ppm) | SOIL DESCRIPTION (moisture, color, fraction, other notes, origin) |
|---|---|---|---|---|
| 10.0-12.0 | 1,1, 1,1 | 60 | | No recovery |
| | | | | Brown, dry to moist CLAY and SILT, with some pebbles, **FILL** |
| | | | 43.2 | Firm, dry grey CLAY with bands of black staining and odor, **FILL** |
| 12.0-14.0 | 2,3, 5,7 | 25 | | No recovery |
| | | | 35.2 | Loose, moist grey CLAY with pebbles, bands of black stain, and odor, **FILL** |
| 14.0-16.0 | 8,10, 12,13 | 65 | | No recovery |
| | | | | Firm, moist grey CLAY with pebbles, bands of black stain, and odor, **FILL** |
| | | | | Light grey, dry ash with concrete fragments, **FILL** |
| 16.0-17.3 | 15,17, 50 | 1.2 | 250 | **Water Table** |
| | | | | Fine saturated black SAND, with coal fines, pebbles, strong odor, and sheen, **FILL** |
| | | | | No recovery |
| | | | | Fine saturated SAND and SILT with large pebbles, concrete fragments, strong sheen, and odor, **FILL** |
| | | | | Auger Refusal, End of Boring **TOTAL DEPTH = 17.3'** |

OBSV.: NONE / ODOR / STAIN / SHEEN / SAMPLED — LITHOLOGY — DEPTH (ft.): 10, 15, 20 — WELL CONSTRUCTION

# SB-7B

PROJECT: RG&E East Station
PROJECT NO.: I03002
LOCATION: 5' east of SB-7
DATE STARTED: 10/30/98
DATE COMPLETED: 10/30/98
DRILLING CONTRACTOR: Lyon Drilling
DRILLER: Harry Lyon
DRILLING METHOD: 4 1/4" ID Hollow stem auger
SAMPLE METHOD: 2"x2' Split spoon sampler, 300# hammer

GROUND ELEVATION: 424.8
PROTECTIVE CASING ELEVATION: None
WELL ELEVATION (TOC): None
DEPTH TO WATER: 15.5
X-COORDINATE: E 1155548.9300
Y-COORDINATE: N 757256.5280
WEATHER: Mostly sunny 50° F, light wind
GEOLOGIST/OBSERVER: Steve Maxwell
ENTERED BY: Steve Maxwell

| SPLIT SPOON INTERVAL (ft.) | BLOWS PER 0.5 ft. | % RECOVERY | OVM (ppm) | SOIL DESCRIPTION: moisture, color, fraction, other notes, origin | OBSV.: NONE | ODOR | STAIN | SHEEN | SAMPLED | LITHOLOGY | DEPTH (ft.) | WELL CONSTRUCTION |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Augered to 18.0' | | | | | | | 0 | |
| | | | | | | | | | | | 5 | |

# SB-7B

PROJECT: RG&E East Station
PROJECT NO.: I03002
LOCATION: 5' east of SB-7
DATE STARTED: 10/30/98
DATE COMPLETED: 10/30/98
DRILLING CONTRACTOR: Lyon Drilling
DRILLER: Harry Lyon
DRILLING METHOD: 4 1/4" ID Hollow stem auger
SAMPLE METHOD: 2"x2' Split spoon sampler, 300# hammer

GROUND ELEVATION: 424.8
PROTECTIVE CASING ELEVATION: None
WELL ELEVATION (TOC): None
DEPTH TO WATER: 15.5
X-COORDINATE: E 1155548.9300
Y-COORDINATE: N 757256.5280
WEATHER: Mostly sunny 50° F, light wind
GEOLOGIST/OBSERVER: Steve Maxwell
ENTERED BY: Steve Maxwell

| SPLIT SPOON INTERVAL (ft.) | BLOWS PER 0.5 ft. | % RECOVERY | OVM (ppm) | SOIL DESCRIPTION: moisture, color, fraction, other notes, origin | OBSV.: NONE | ODOR | STAIN | SHEEN | SAMPLED | LITHOLOGY | DEPTH (ft.) | WELL CONSTRUCTION |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Augered to 18.0' | | | | | | | 5 | |
| | | | | | | | | | | | 10 | |

# SB-7B

PROJECT: RG&E East Station
PROJECT NO.: I03002
LOCATION: 5' east of SB-7
DATE STARTED: 10/30/98
DATE COMPLETED: 10/30/98
DRILLING CONTRACTOR: Lyon Drilling
DRILLER: Harry Lyon
DRILLING METHOD: 4 1/4" ID Hollow stem auger
SAMPLE METHOD: 2"x2' Split spoon sampler, 300# hammer

GROUND ELEVATION: 424.8
PROTECTIVE CASING ELEVATION: None
WELL ELEVATION (TOC): None
DEPTH TO WATER: 15.5
X-COORDINATE: E 1155548.9300
Y-COORDINATE: N 757256.5280
WEATHER: Mostly sunny 50° F, light wind
GEOLOGIST/OBSERVER: Steve Maxwell
ENTERED BY: Steve Maxwell

| SPLIT SPOON INTERVAL (ft.) | BLOWS PER 0.5 ft. | % RECOVERY | OVM (ppm) | SOIL DESCRIPTION moisture, color, fraction, other notes, origin | OBSV. NONE | ODOR | STAIN | SHEEN | SAMPLED | LITHOLOGY | DEPTH (ft.) | WELL CONSTRUCTION |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Augered to 18.0' | | | | | | | 10 | |
| | | | | | | | | | | | 15 | |

# SB-7B

PROJECT: RG&E East Station
PROJECT NO.: I03002
LOCATION: 5' east of SB-7
DATE STARTED: 10/30/98
DATE COMPLETED: 10/30/98
DRILLING CONTRACTOR: Lyon Drilling
DRILLER: Harry Lyon
DRILLING METHOD: 4 1/4" ID Hollow stem auger
SAMPLE METHOD: 2"x2' Split spoon sampler, 300# hammer

GROUND ELEVATION: 424.8
PROTECTIVE CASING ELEVATION: None
WELL ELEVATION (TOC): None
DEPTH TO WATER: 15.5
X-COORDINATE: E 1155548.9300
Y-COORDINATE: N 757256.5280
WEATHER: Mostly sunny 50° F, light wind
GEOLOGIST/OBSERVER: Steve Maxwell
ENTERED BY: Steve Maxwell

| SPLIT SPOON INTERVAL (ft.) | BLOWS PER 0.5 ft. | % RECOVERY | OVM (ppm) | SOIL DESCRIPTION (moisture, color, fraction, other notes, origin) | OBSV. (NONE / ODOR / STAIN / SHEEN) | SAMPLED | LITHOLOGY | DEPTH (ft.) | WELL CONSTRUCTION |
|---|---|---|---|---|---|---|---|---|---|
| | | | | Augered to 18.0' | | | | 15 | |
| | | | | Water Table | | | | | ▼ |
| 18.0-20.0 | 37,40, 32,25 | 90 | | Soft brown CLAY with some fine SAND and SILT with black stain, FILL | | | | | |
| | | | | Concrete fragments, FILL | | | | | |
| | | | | Brown, dry CLAY with large pebbles, black stain, and some odor, FILL | | | | | |
| | | | | Medium firm, moist grey CLAY with layers of SAND and pebbles containing sheen, odor, and stain | | | | 20 | |

# SB-7B

PROJECT: RG&E East Station
PROJECT NO.: 103002
LOCATION: 5' east of SB-7
DATE STARTED: 10/30/98
DATE COMPLETED: 10/30/98
DRILLING CONTRACTOR: Lyon Drilling
DRILLER: Harry Lyon
DRILLING METHOD: 4 1/4" ID Hollow stem auger
SAMPLE METHOD: 2"x2' Split spoon sampler, 300# hammer

GROUND ELEVATION: 424.8
PROTECTIVE CASING ELEVATION: None
WELL ELEVATION (TOC): None
DEPTH TO WATER: 15.5
X-COORDINATE: E 1155548.9300
Y-COORDINATE: N 757256.5280
WEATHER: Mostly sunny 50° F, light wind
GEOLOGIST/OBSERVER: Steve Maxwell
ENTERED BY: Steve Maxwell

| SPLIT SPOON INTERVAL (ft.) | BLOWS PER 0.5 ft. | % RECOVERY | OVM (ppm) | SOIL DESCRIPTION (moisture, color, fraction, other notes, origin) | DEPTH (ft.) |
|---|---|---|---|---|---|
| 20.0-21.2 | 30,30, 50 | 65 | | | 20 |
| | | | | Fine moist **SAND** with some **SHALE** fragments, strong sheen, odor, and stain | |
| | | | | Stiff moist grey **CLAY** with dark grey bands and pebbles | |
| | | | | Split spoon refusal, Augered to 22.0' | |
| 22.0-24.0 | 25,14, 8,8 | 70 | | No recovery | |
| | | | | Firm, moist grey **SILT** with **SHALE** fragments and black stain | |
| | | | | Fine, saturated **SAND** and **SILT** with **SHALE** fragments with strong sheen and odor | |
| | | | | Fine saturated **SAND** and **SILT** with some pebbles and black stain | |
| 24.0-25.7 | 24,21, 35,50 | 100 | | No recovery | |
| | | | | Brown saturated **SILT** and **SAND** with some pebbles | 25 |

OBSV.: NONE, ODOR, STAIN, SHEEN, SAMPLED; LITHOLOGY; WELL CONSTRUCTION

# SB-7B

PROJECT: RG&E East Station
PROJECT NO.: I03002
LOCATION: 5' east of SB-7
DATE STARTED: 10/30/98
DATE COMPLETED: 10/30/98
DRILLING CONTRACTOR: Lyon Drilling
DRILLER: Harry Lyon
DRILLING METHOD: 4 1/4" ID Hollow stem auger
SAMPLE METHOD: 2"x2' Split spoon sampler, 300# hammer

GROUND ELEVATION: 424.8
PROTECTIVE CASING ELEVATION: None
WELL ELEVATION (TOC): None
DEPTH TO WATER: 15.5
X-COORDINATE: E 1155548.9300
Y-COORDINATE: N 757256.5280
WEATHER: Mostly sunny 50° F, light wind
GEOLOGIST/OBSERVER: Steve Maxwell
ENTERED BY: Steve Maxwell

| SPLIT SPOON INTERVAL (ft.) | BLOWS PER 0.5 ft. | % RECOVERY | OVM (ppm) | SOIL DESCRIPTION (moisture, color, fraction, other notes, origin) | OBSV. (NONE / ODOR / STAIN / SHEEN) | SAMPLED | LITHOLOGY | DEPTH (ft.) | WELL CONSTRUCTION |
|---|---|---|---|---|---|---|---|---|---|
| | | | | Brown **SILT** with layers of pebbles containing sheen and odor | ODOR, SHEEN | | | 25 | |
| | | | | Fine saturated **SILT** and **SAND** with some pebbles and **TAR** | ODOR, SHEEN | SAMPLED | | | |
| | | | | Split spoon refusal | | | | | |
| | | | | BEGINNING OF RUN 1, **Rochester SHALE**, medium soft, grey calcerous with fine bedding | | | | | |
| | | | | Horizontal fracture (HF) | | | | | |
| | | | | 4" Flush joint casing set | | | | | |
| | | | | HF with odor and sheen | | | | | |
| | | | | HF with odor and sheen | | | | | |
| | | | | HF with odor and sheen | | | | | |
| | | | | HF with odor and sheen | | | | | |
| | | | | HF with odor and sheen | | | | | |
| | | | | HF with odor and sheen | | | | | |
| | | | | HF with odor and sheen | | | | | |
| | | | | HF and Vertical Fracture (VF) with odor and sheen | | | | | |
| | | | | HF and VF with odor and sheen | | | | | |
| | | | | HF with odor and sheen | | | | | |
| | | | | HF with odor and sheen | | | | | |
| | | | | HF with odor and sheen | | | | 30 | |

# SB-7B

PROJECT: RG&E East Station
PROJECT NO.: 103002
LOCATION: 5' east of SB-7
DATE STARTED: 10/30/98
DATE COMPLETED: 10/30/98
DRILLING CONTRACTOR: Lyon Drilling
DRILLER: Harry Lyon
DRILLING METHOD: 4 1/4" ID Hollow stem auger
SAMPLE METHOD: 2"x2' Split spoon sampler, 300# hammer

GROUND ELEVATION: 424.8
PROTECTIVE CASING ELEVATION: None
WELL ELEVATION (TOC): None
DEPTH TO WATER: 15.5
X-COORDINATE: E 1155548.9300
Y-COORDINATE: N 757256.5280
WEATHER: Mostly sunny 50° F, light wind
GEOLOGIST/OBSERVER: Steve Maxwell
ENTERED BY: Steve Maxwell

| SPLIT SPOON INTERVAL (ft.) | BLOWS PER 0.5 ft. | % RECOVERY | OVM (ppm) | SOIL DESCRIPTION (moisture, color, fraction, other notes, origin) | OBSV. NONE | OBSV. ODOR | OBSV. STAIN | OBSV. SHEEN | SAMPLED | LITHOLOGY | DEPTH (ft.) | WELL CONSTRUCTION |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | HF with odor and sheen | | | | | | | 30 | |
| | | | | HF with odor and sheen | | | | | | | | |
| | | | | END OF RUN 1, RQD = 27.45% | | | | | | | | |
| | | | | START OF RUN 2 | | | | | | | | |
| | | | | HF with odor and sheen | | | | | | | | |
| | | | | HF with odor and sheen | | | | | | | | |
| | | | | HF with odor and sheen | | | | | | | | |
| | | | | VF with sheen and odor | | | | | | | | |
| | | | | pulverized with NAPL | | | | | | | | |
| | | | | | | | | | | | | |
| | | | | HF with NAPL | | | | | | | | |
| | | | | HF with NAPL | | | | | | | | |
| | | | | HF with NAPL | | | | | | | | |
| | | | | HF with NAPL | | | | | | | | |
| | | | | HF with NAPL | | | | | | | | |
| | | | | HF with NAPL | | | | | | | | |
| | | | | HF with NAPL | | | | | | | 35 | |

# SB-7B

PROJECT: RG&E East Station
PROJECT NO.: I03002
LOCATION: 5' east of SB-7
DATE STARTED: 10/30/98
DATE COMPLETED: 10/30/98
DRILLING CONTRACTOR: Lyon Drilling
DRILLER: Harry Lyon
DRILLING METHOD: 4 1/4" ID Hollow stem auger
SAMPLE METHOD: 2"x2' Split spoon sampler, 300# hammer

GROUND ELEVATION: 424.8
PROTECTIVE CASING ELEVATION: None
WELL ELEVATION (TOC): None
DEPTH TO WATER: 15.5
X-COORDINATE: E 1155548.9300
Y-COORDINATE: N 757256.5280
WEATHER: Mostly sunny 50° F, light wind
GEOLOGIST/OBSERVER: Steve Maxwell
ENTERED BY: Steve Maxwell

| SPLIT SPOON INTERVAL (ft.) | BLOWS PER 0.5 ft. | % RECOVERY | OVM (ppm) | SOIL DESCRIPTION (moisture, color, fraction, other notes, origin) | OBSV. NONE | ODOR | STAIN | SHEEN | SAMPLED | LITHOLOGY | DEPTH (ft.) | WELL CONSTRUCTION |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | | | 35 | |
| | | | | Pulverized with NAPL | | | | | | | | |
| | | | | | | | | | | | | |
| | | | | HF with NAPL | | | | | | | | |
| | | | | HF with NAPL | | | | | | | | |
| | | | | END OF RUN 2, RQD = 50.21<br>TOTAL DEPTH = 36.0' | | | | | | | | |
| | | | | | | | | | | | 40 | |

# SB-8

PROJECT: RG&E East Station
PROJECT NO.: I03002
LOCATION: About 50' NNW of PZ-05
DATE STARTED: 11/2/98
DATE COMPLETED: 11/2/98
DRILLING CONTRACTOR: Lyon Drilling
DRILLER: Harry Lyon
DRILLING METHOD: 4 1/4" ID Hollow stem auger
SAMPLE METHOD: 2"x2' Split spoon sampler, 300# hammer

GROUND ELEVATION: 418.0
PROTECTIVE CASING ELEVATION: None
WELL ELEVATION (TOC): None
DEPTH TO WATER: 18.4
X-COORDINATE: E 757909.9568
Y-COORDINATE: N 1155516.2122
WEATHER: Cold, 35° F, mostly cloudy, light wind
GEOLOGIST/OBSERVER: Steve Maxwell
ENTERED BY: Steve Maxwell

| SPLIT SPOON INTERVAL (ft.) | BLOWS PER 0.5 ft. | % RECOVERY | OVM (ppm) | SOIL DESCRIPTION<br>moisture, color, fraction, other notes, origin | OBSV. NONE | ODOR | STAIN | SHEEN | SAMPLED | LITHOLOGY | DEPTH (ft.) | WELL CONSTRUCTION |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Augered to 6.0' | | | | | | | 0 | |

# SB-8

PROJECT: RG&E East Station
PROJECT NO.: I03002
LOCATION: About 50' NNW of PZ-05
DATE STARTED: 11/2/98
DATE COMPLETED: 11/2/98
DRILLING CONTRACTOR: Lyon Drilling
DRILLER: Harry Lyon
DRILLING METHOD: 4 1/4" ID Hollow stem auger
SAMPLE METHOD: 2"x2' Split spoon sampler, 300# hammer

GROUND ELEVATION: 418.0
PROTECTIVE CASING ELEVATION: None
WELL ELEVATION (TOC): None
DEPTH TO WATER: 18.4
X-COORDINATE: E 757909.9568
Y-COORDINATE: N 1155516.2122
WEATHER: Cold, 35° F, mostly cloudy, light wind
GEOLOGIST/OBSERVER: Steve Maxwell
ENTERED BY: Steve Maxwell

| SPLIT SPOON INTERVAL (ft.) | BLOWS PER 0.5 ft. | % RECOVERY | OVM (ppm) | SOIL DESCRIPTION<br>moisture, color, fraction, other notes, origin | OBSV.<br>NONE / ODOR / STAIN / SHEEN | SAMPLED | LITHOLOGY | DEPTH (ft.) | WELL CONSTRUCTION |
|---|---|---|---|---|---|---|---|---|---|
| | | | | Augered to 6.0' | | | | 4 | |
| 6.0-8.0 | 2,3,<br>4,6 | 100 | 0.0 | Dry, dark brown SAND with trace SILT and pebbles, **FILL** | | | | | |
| | | | | Moist, brown SAND with some SILT and pebbles, **FILL** | | | | | |
| | | | | Dry, loose SAND with some pebbles and wood, **FILL** | | | | | |

# SB-8

PROJECT: RG&E East Station
PROJECT NO.: I03002
LOCATION: About 50' NNW of PZ-05
DATE STARTED: 11/2/98
DATE COMPLETED: 11/2/98
DRILLING CONTRACTOR: Lyon Drilling
DRILLER: Harry Lyon
DRILLING METHOD: 4 1/4" ID Hollow stem auger
SAMPLE METHOD: 2"x2' Split spoon sampler, 300# hammer

GROUND ELEVATION: 418.0
PROTECTIVE CASING ELEVATION: None
WELL ELEVATION (TOC): None
DEPTH TO WATER: 18.4
X-COORDINATE: E 757909.9568
Y-COORDINATE: N 1155516.2122
WEATHER: Cold, 35° F, mostly cloudy, light wind
GEOLOGIST/OBSERVER: Steve Maxwell
ENTERED BY: Steve Maxwell

| SPLIT SPOON INTERVAL (ft.) | BLOWS PER 0.5 ft. | % RECOVERY | OVM (ppm) | SOIL DESCRIPTION<br>moisture, color, fraction, other notes, origin | OBSV. NONE | OBSV. ODOR | OBSV. STAIN | OBSV. SHEEN | SAMPLED | LITHOLOGY | DEPTH (ft.) | WELL CONSTRUCTION |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Augered to 12.0' | | | | | | | 8 | |

# SB-8

PROJECT: RG&E East Station
PROJECT NO.: 103002
LOCATION: About 50' NNW of PZ-05
DATE STARTED: 11/2/98
DATE COMPLETED: 11/2/98
DRILLING CONTRACTOR: Lyon Drilling
DRILLER: Harry Lyon
DRILLING METHOD: 4 1/4" ID Hollow stem auger
SAMPLE METHOD: 2"x2' Split spoon sampler, 300# hammer

GROUND ELEVATION: 418.0
PROTECTIVE CASING ELEVATION: None
WELL ELEVATION (TOC): None
DEPTH TO WATER: 18.4
X-COORDINATE: E 757909.9568
Y-COORDINATE: N 1155516.2122
WEATHER: Cold, 35° F, mostly cloudy, light wind
GEOLOGIST/OBSERVER: Steve Maxwell
ENTERED BY: Steve Maxwell

| SPLIT SPOON INTERVAL (ft.) | BLOWS PER 0.5 ft. | % RECOVERY | OVM (ppm) | SOIL DESCRIPTION (moisture, color, fraction, other notes, origin) | OBSV. (NONE / ODOR / STAIN / SHEEN / SAMPLED) | LITHOLOGY | DEPTH (ft.) | WELL CONSTRUCTION |
|---|---|---|---|---|---|---|---|---|
| 12.0–14.0 | 7,5, 6,13 | 25 | 0.0 | No recovery | | | 12 | |
| | | | | Moist, loose brown SAND with some pebbles, SILT, and coal fragments, **FILL** | NONE | | | |
| | | | | Soft moist, brown to grey CLAY with trace SAND and pebbles, **FILL** | NONE | | | |
| | | | | Augered to 18.0' | | | | |

# SB-8

PROJECT: RG&E East Station
PROJECT NO.: I03002
LOCATION: About 50' NNW of PZ-05
DATE STARTED: 11/2/98
DATE COMPLETED: 11/2/98
DRILLING CONTRACTOR: Lyon Drilling
DRILLER: Harry Lyon
DRILLING METHOD: 4 1/4" ID Hollow stem auger
SAMPLE METHOD: 2"x2' Split spoon sampler, 300# hammer

GROUND ELEVATION: 418.0
PROTECTIVE CASING ELEVATION: None
WELL ELEVATION (TOC): None
DEPTH TO WATER: 18.4
X-COORDINATE: E 757909.9568
Y-COORDINATE: N 1155516.2122
WEATHER: Cold, 35° F, mostly cloudy, light wind
GEOLOGIST/OBSERVER: Steve Maxwell
ENTERED BY: Steve Maxwell

| SPLIT SPOON INTERVAL (ft.) | BLOWS PER 0.5 ft. | % RECOVERY | OVM (ppm) | SOIL DESCRIPTION moisture, color, fraction, other notes, origin | OBSV. (NONE / ODOR / STAIN / SHEEN / SAMPLED) | LITHOLOGY | DEPTH (ft.) | WELL CONSTRUCTION |
|---|---|---|---|---|---|---|---|---|
| | | | | Augered to 18.0' | | | 18 | |
| 18.0-20.0 | wt of Rod,1 1,1 | 100 | | Wet to saturated soft, fine brown SAND and SILT with some pebbles, sheen and odor, **FILL** | | | | |
| | | | | **Water Table (Estimated)** | | | | ▼ |
| | | | 22.9 | | | | | |
| | | | 32.1 | Firm saturated brown SILT and CLAY with sheen and odor, **FILL** | | | | |
| | | | 36.8 | | | | | |

# SB-8

PROJECT: RG&E East Station
PROJECT NO.: 103002
LOCATION: About 50' NNW of PZ-05
DATE STARTED: 11/2/98
DATE COMPLETED: 11/2/98
DRILLING CONTRACTOR: Lyon Drilling
DRILLER: Harry Lyon
DRILLING METHOD: 4 1/4" ID Hollow stem auger
SAMPLE METHOD: 2"x2' Split spoon sampler, 300# hammer

GROUND ELEVATION: 418.0
PROTECTIVE CASING ELEVATION: None
WELL ELEVATION (TOC): None
DEPTH TO WATER: 18.4
X-COORDINATE: E 757909.9568
Y-COORDINATE: N 1155516.2122
WEATHER: Cold, 35° F, mostly cloudy, light wind
GEOLOGIST/OBSERVER: Steve Maxwell
ENTERED BY: Steve Maxwell

| SPLIT SPOON INTERVAL (ft.) | BLOWS PER 0.5 ft. | % RECOVERY | OVM (ppm) | SOIL DESCRIPTION (moisture, color, fraction, other notes, origin) | OBSV. (NONE / ODOR / STAIN / SHEEN / SAMPLED) | LITHOLOGY | DEPTH (ft.) | WELL CONSTRUCTION |
|---|---|---|---|---|---|---|---|---|
| 20.0-22.0 | 2,3, 3,12 | 85 | | No recovery | | | 20 | |
| | | | | Soft, fine brown SAND and SILT with some pebbles, light sheen, odor, and black stain, **FILL** | | | | |
| | | | 666 | Fine saturated **SAND** with, **TAR** | | | | |
| | | | | Fine saturated **SILT** and **CLAY** with bands of black stain, odor, and sheen | | | | |
| 22.0-22.4 | 50 | 100 | 106 | Dry, tight brown **CLAY** with stain and odor | | | | |
| | | | | Split spoon refusal, Augered to 23.0' | | | | |
| | | | | BEGINNING OF RUN 1, **Rochester SHALE**, medium soft grey, calcerous with fine bedding | | | | |
| | | | | SHALE with horizontal fracture (HF) | | | | |
| | | | | Grey CLAY seem | | | | |
| | | | | | | | | |
| | | | | HF with fossils | | | | |

# SB-8

PROJECT: RG&E East Station
PROJECT NO.: I03002
LOCATION: About 50' NNW of PZ-05
DATE STARTED: 11/2/98
DATE COMPLETED: 11/2/98
DRILLING CONTRACTOR: Lyon Drilling
DRILLER: Harry Lyon
DRILLING METHOD: 4 1/4" ID Hollow stem auger
SAMPLE METHOD: 2"x2' Split spoon sampler, 300# hammer

GROUND ELEVATION: 418.0
PROTECTIVE CASING ELEVATION: None
WELL ELEVATION (TOC): None
DEPTH TO WATER: 18.4
X-COORDINATE: E 757909.9568
Y-COORDINATE: N 1155516.2122
WEATHER: Cold, 35° F, mostly cloudy, light wind
GEOLOGIST/OBSERVER: Steve Maxwell
ENTERED BY: Steve Maxwell

| SPLIT SPOON INTERVAL (ft.) | BLOWS PER 0.5 ft. | % RECOVERY | OVM (ppm) | SOIL DESCRIPTION: moisture, color, fraction, other notes, origin | OBSV.: NONE / ODOR / STAIN / SHEEN | SAMPLED | LITHOLOGY | DEPTH (ft.) | WELL CONSTRUCTION |
|---|---|---|---|---|---|---|---|---|---|
| | | | | 4" Flush joint casing set | | | | 24 | |
| | | | | HF | | | | | |
| | | | | HF | | | | | |
| | | | | HF with sheen | | | | | |
| | | | | HF and Vertical Fracture (VF) and sheen | | | | | |
| | | | | HF and VF, with NAPL | | | | | |
| | | | | HF and VF | | | | | |
| | | | | HF with light sheen | | | | | |
| | | | | HF with sheen | | | | | |
| | | | | HC | | | | | |
| | | | | HF with light sheen | | | | | |
| | | | | HF with light sheen | | | | | |
| | | | | Pulverized rock | | | | | |
| | | | | | | | | | |
| | | | | HF with light sheen | | | | | |
| | | | | HF with light sheen | | | | | |
| | | | | HF and VF with light sheen | | | | | |
| | | | | END OF RUN 1, light sheen, RQD = 33.33% | | | | | |

# SB-8

PROJECT: RG&E East Station
PROJECT NO.: I03002
LOCATION: About 50' NNW of PZ-05
DATE STARTED: 11/2/98
DATE COMPLETED: 11/2/98
DRILLING CONTRACTOR: Lyon Drilling
DRILLER: Harry Lyon
DRILLING METHOD: 4 1/4" ID Hollow stem auger
SAMPLE METHOD: 2"x2' Split spoon sampler, 300# hammer

GROUND ELEVATION: 418.0
PROTECTIVE CASING ELEVATION: None
WELL ELEVATION (TOC): None
DEPTH TO WATER: 18.4
X-COORDINATE: E 757909.9568
Y-COORDINATE: N 1155516.2122
WEATHER: Cold, 35° F, mostly cloudy, light wind
GEOLOGIST/OBSERVER: Steve Maxwell
ENTERED BY: Steve Maxwell

| SPLIT SPOON INTERVAL (ft.) | BLOWS PER 0.5 ft. | % RECOVERY | OVM (ppm) | SOIL DESCRIPTION — moisture, color, fraction, other notes, origin | OBSV. NONE | ODOR | STAIN | SHEEN | SAMPLED | LITHOLOGY | DEPTH (ft.) | WELL CONSTRUCTION |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | BEGINNING OF RUN 2 | | | | | | | 28 | |
| | | | | HF with sheen and odor | | | | | | | | |
| | | | | HF | | | | | | | | |
| | | | | HF with light odor | | | | | | | | |
| | | | | HF with odor | | | | | | | | |
| | | | | HF | | | | | | | | |
| | | | | HF with Vertical Crack (VC) | | | | | | | | |
| | | | | | | | | | | | | |
| | | | | VC | | | | | | | | |
| | | | | HF with sheen | | | | | | | | |
| | | | | HF with sheen | | | | | | | | |
| | | | | HF | | | | | | | | |

# SB-8

PROJECT: RG&E East Station
PROJECT NO.: I03002
LOCATION: About 50' NNW of PZ-05
DATE STARTED: 11/2/98
DATE COMPLETED: 11/2/98
DRILLING CONTRACTOR: Lyon Drilling
DRILLER: Harry Lyon
DRILLING METHOD: 4 1/4" ID Hollow stem auger
SAMPLE METHOD: 2"x2' Split spoon sampler, 300# hammer

GROUND ELEVATION: 418.0
PROTECTIVE CASING ELEVATION: None
WELL ELEVATION (TOC): None
DEPTH TO WATER: 18.4
X-COORDINATE: E 757909.9568
Y-COORDINATE: N 1155516.2122
WEATHER: Cold, 35° F, mostly cloudy, light wind
GEOLOGIST/OBSERVER: Steve Maxwell
ENTERED BY: Steve Maxwell

| SPLIT SPOON INTERVAL (ft.) | BLOWS PER 0.5 ft. | % RECOVERY | OVM (ppm) | SOIL DESCRIPTION: moisture, color, fraction, other notes, origin | OBSV.: NONE | ODOR | STAIN | SHEEN | SAMPLED | LITHOLOGY | DEPTH (ft.) | WELL CONSTRUCTION |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | | | 32 | |
| | | | | HF with sheen and odor | | | | | | | | |
| | | | | END OF RUN 2, sheen and odor, RQD = 77.00%<br>TOTAL DEPTH = 33.0' | | | | | | | | |

# SB-9

PROJECT: RG&E East Station
PROJECT NO.: I03002
LOCATION: About 180' WNW of Atlantic well pair #3
DATE STARTED: 11/2/98
DATE COMPLETED: 11/2/98
DRILLING CONTRACTOR: Lyon Drilling
DRILLER: Harry Lyon
DRILLING METHOD: 4 1/4" ID Hollow stem auger
SAMPLE METHOD: 2"x2' Split spoon sampler, 300# hammer

GROUND ELEVATION: 414.9
PROTECTIVE CASING ELEVATION: None
WELL ELEVATION (TOC): None
DEPTH TO WATER: 18.8
X-COORDINATE: E 756807.4710
Y-COORDINATE: N 1155632.8150
WEATHER: Cold, 35° F, mostly cloudy, light winds
GEOLOGIST/OBSERVER: Steve Maxwell
ENTERED BY: Steve Maxwell

| SPLIT SPOON INTERVAL (ft.) | BLOWS PER 0.5 ft. | % RECOVERY | OVM (ppm) | SOIL DESCRIPTION: moisture, color, fraction, other notes, origin | OBSV.: NONE | ODOR | STAIN | SHEEN | SAMPLED | LITHOLOGY | DEPTH (ft.) | WELL CONSTRUCTION |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Augered to 6.0' | | | | | | | 0 | |
| | | | | | | | | | | | 5 | |

META Environmental, Inc.

# SB-9

PROJECT: RG&E East Station
PROJECT NO.: I03002
LOCATION: About 180' WNW of Atlantic well pair #3
DATE STARTED: 11/2/98
DATE COMPLETED: 11/2/98
DRILLING CONTRACTOR: Lyon Drilling
DRILLER: Harry Lyon
DRILLING METHOD: 4 1/4" ID Hollow stem auger
SAMPLE METHOD: 2"x2' Split spoon sampler, 300# hammer

GROUND ELEVATION: 414.9
PROTECTIVE CASING ELEVATION: None
WELL ELEVATION (TOC): None
DEPTH TO WATER: 18.8
X-COORDINATE: E 756807.4710
Y-COORDINATE: N 1155632.8150
WEATHER: Cold, 35° F, mostly cloudy, light winds
GEOLOGIST/OBSERVER: Steve Maxwell
ENTERED BY: Steve Maxwell

| SPLIT SPOON INTERVAL (ft.) | BLOWS PER 0.5 ft. | % RECOVERY | OVM (ppm) | SOIL DESCRIPTION (moisture, color, fraction, other notes, origin) | OBSV. (NONE / ODOR / STAIN / SHEEN) | SAMPLED | LITHOLOGY | DEPTH (ft.) | WELL CONSTRUCTION |
|---|---|---|---|---|---|---|---|---|---|
| | | | | Augered to 6.0' | | | | 5 | |
| 6.0-8.0 | 37,15, 11,10 | 55 | 0.0 | No recovery | | | | | |
| | | | | Firm, moist fine SAND with brick, concrete, coal fragments, and pebbles, FILL | NONE | | | | |
| | | | | Augered to 12.0' | | | | 10 | |

# SB-9

PROJECT: RG&E East Station
PROJECT NO.: I03002
LOCATION: About 180' WNW of Atlantic well pair #3
DATE STARTED: 11/2/98
DATE COMPLETED: 11/2/98
DRILLING CONTRACTOR: Lyon Drilling
DRILLER: Harry Lyon
DRILLING METHOD: 4 1/4" ID Hollow stem auger
SAMPLE METHOD: 2"x2' Split spoon sampler, 300# hammer

GROUND ELEVATION: 414.9
PROTECTIVE CASING ELEVATION: None
WELL ELEVATION (TOC): None
DEPTH-TO WATER: 18.8
X-COORDINATE: E 756807.4710
Y-COORDINATE: N 1155632.8150
WEATHER: Cold, 35° F, mostly cloudy, light winds
GEOLOGIST/OBSERVER: Steve Maxwell
ENTERED BY: Steve Maxwell

| SPLIT SPOON INTERVAL (ft.) | BLOWS PER 0.5 ft. | % RECOVERY | OVM (ppm) | SOIL DESCRIPTION (moisture, color, fraction, other notes, origin) | OBSV. (NONE / ODOR / STAIN / SHEEN) | SAMPLED | LITHOLOGY | DEPTH (ft.) | WELL CONSTRUCTION |
|---|---|---|---|---|---|---|---|---|---|
| | | | | Augered to 12.0' | | | | 10 | |
| 12.0-14.0 | 1,13, 11,9 | 60 | 0.0 | No recovery | | | | | |
| | | | | Dry, brown SAND with some SILT, pebbles and brick fragments, **FILL** | NONE | | | | |
| | | | | Moist, soft grey SILT and fine SAND with brick fragments, and pebbles, **FILL** | NONE | | | | |
| | | | | Moist, fine brown SAND with coal fragments, pebbles, and light odor, **FILL** | ODOR | | | | |
| | | | | Augered to 18.0' | | | | 15 | |

# SB-9

PROJECT: RG&E East Station
PROJECT NO.: 103002
LOCATION: About 180' WNW of Atlantic well pair #3
DATE STARTED: 11/2/98
DATE COMPLETED: 11/2/98
DRILLING CONTRACTOR: Lyon Drilling
DRILLER: Harry Lyon
DRILLING METHOD: 4 1/4" ID Hollow stem auger
SAMPLE METHOD: 2"x2' Split spoon sampler, 300# hammer

GROUND ELEVATION: 414.9
PROTECTIVE CASING ELEVATION: None
WELL ELEVATION (TOC): None
DEPTH TO WATER: 18.8
X-COORDINATE: E 756807.4710
Y-COORDINATE: N 1155632.8150
WEATHER: Cold, 35° F, mostly cloudy, light winds
GEOLOGIST/OBSERVER: Steve Maxwell
ENTERED BY: Steve Maxwell

| SPLIT SPOON INTERVAL (ft.) | BLOWS PER 0.5 ft. | % RECOVERY | OVM (ppm) | SOIL DESCRIPTION (moisture, color, fraction, other notes, origin) | OBSV. (NONE / ODOR / STAIN / SHEEN / SAMPLED) | LITHOLOGY | DEPTH (ft.) | WELL CONSTRUCTION |
|---|---|---|---|---|---|---|---|---|
| | | | | Augered to 18.0' | | | 15 | |
| 18.0-20.0 | wt of Rod, 2,2 | 100 | | Fine saturated black SAND with coal fines, brick fragments, sheen and odor, **FILL** | | | | |
| | | | 52.6 | Water Table (Estimated) | | | | |
| | | | | | | | 20 | |

# SB-9

PROJECT: RG&E East Station
PROJECT NO.: 103002
LOCATION: About 180' WNW of Atlantic well pair #3
DATE STARTED: 11/2/98
DATE COMPLETED: 11/2/98
DRILLING CONTRACTOR: Lyon Drilling
DRILLER: Harry Lyon
DRILLING METHOD: 4 1/4" ID Hollow stem auger
SAMPLE METHOD: 2"x2' Split spoon sampler, 300# hammer

GROUND ELEVATION: 414.9
PROTECTIVE CASING ELEVATION: None
WELL ELEVATION (TOC): None
DEPTH TO WATER: 18.8
X-COORDINATE: E 756807.4710
Y-COORDINATE: N 1155632.8150
WEATHER: Cold, 35° F, mostly cloudy, light winds
GEOLOGIST/OBSERVER: Steve Maxwell
ENTERED BY: Steve Maxwell

| SPLIT SPOON INTERVAL (ft.) | BLOWS PER 0.5 ft. | % RECOVERY | OVM (ppm) | SOIL DESCRIPTION (moisture, color, fraction, other notes, origin) | OBSV. (NONE / ODOR / STAIN / SHEEN / SAMPLED) | LITHOLOGY | DEPTH (ft.) | WELL CONSTRUCTION |
|---|---|---|---|---|---|---|---|---|
| 20.0-22.0 | wt of Rod,7, 15,35 | 68 | | No recovery | | | 20 | |
| | | | 50.2 | Fine saturated SAND with large pebbles and coal fragments, **FILL** | | | | |
| 22.0-23.3 | 10,6, 50 | 38 | | No recovery | | | | |
| | | | | Pulverized weathered **SHALE** with odor | | | | |
| | | | 72.3 | Weathered SHALE | | | | |
| | | | | Split spoon refusal, Augered to 24.0' | | | | |
| | | | | BEGINNING OF RUN 1, **Rochester SHALE** medium soft, grey, calcerous with fine bedding | | | | |
| | | | | Horizontal Fracture (HF) with sheen and odor | | | | |
| | | | | HF with sheen and odor | | | 25 | |

# SB-9

PROJECT: RG&E East Station
PROJECT NO.: 103002
LOCATION: About 180' WNW of Atlantic well pair #3
DATE STARTED: 11/2/98
DATE COMPLETED: 11/2/98
DRILLING CONTRACTOR: Lyon Drilling
DRILLER: Harry Lyon
DRILLING METHOD: 4 1/4" ID Hollow stem auger
SAMPLE METHOD: 2"x2' Split spoon sampler, 300# hammer

GROUND ELEVATION: 414.9
PROTECTIVE CASING ELEVATION: None
WELL ELEVATION (TOC): None
DEPTH TO WATER: 18.8
X-COORDINATE: E 756807.4710
Y-COORDINATE: N 1155632.8150
WEATHER: Cold, 35° F, mostly cloudy, light winds
GEOLOGIST/OBSERVER: Steve Maxwell
ENTERED BY: Steve Maxwell

| SPLIT SPOON INTERVAL (ft.) | BLOWS PER 0.5 ft. | % RECOVERY | OVM (ppm) | SOIL DESCRIPTION (moisture, color, fraction, other notes, origin) | OBSV. NONE | ODOR | STAIN | SHEEN | SAMPLED | LITHOLOGY | DEPTH (ft.) | WELL CONSTRUCTION |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | 4" Flush joint casing set | | | | | | | 25 | |
| | | | | HF with sheen and odor | | | | | | | | |
| | | | | HF with light sheen | | | | | | | | |
| | | | | HF with light sheen | | | | | | | | |
| | | | | HF with light sheen | | | | | | | | |
| | | | | HF | | | | | | | | |
| | | | | HF with sheen and odor | | | | | | | | |
| | | | | Vertical Fracture (VF) | | | | | | | | |
| | | | | HF | | | | | | | | |
| | | | | HF with sheen and odor | | | | | | | | |
| | | | | HF with sheen | | | | | | | | |
| | | | | HF | | | | | | | | |
| | | | | HF with light sheen | | | | | | | | |
| | | | | Vertical Crack (VC) | | | | | | | | |
| | | | | | | | | | | | | |
| | | | | HF | | | | | | | | |
| | | | | HF with sheen and odor | | | | | | | | |
| | | | | END OF RUN 1, BEGINNING OF RUN 2, RQD = 46.80% | | | | | | | | |
| | | | | HF with very light shenn | | | | | | | | |
| | | | | Grey CLAY layer with sheen and odor | | | | | | | 30 | |

# SB-9

PROJECT: RG&E East Station
PROJECT NO.: I03002
LOCATION: About 180' WNW of Atlantic well pair #3
DATE STARTED: 11/2/98
DATE COMPLETED: 11/2/98
DRILLING CONTRACTOR: Lyon Drilling
DRILLER: Harry Lyon
DRILLING METHOD: 4 1/4" ID Hollow stem auger
SAMPLE METHOD: 2"x2' Split spoon sampler, 300# hammer

GROUND ELEVATION: 414.9
PROTECTIVE CASING ELEVATION: None
WELL ELEVATION (TOC): None
DEPTH TO WATER: 18.8
X-COORDINATE: E 756807.4710
Y-COORDINATE: N 1155632.8150
WEATHER: Cold, 35° F, mostly cloudy, light winds
GEOLOGIST/OBSERVER: Steve Maxwell
ENTERED BY: Steve Maxwell

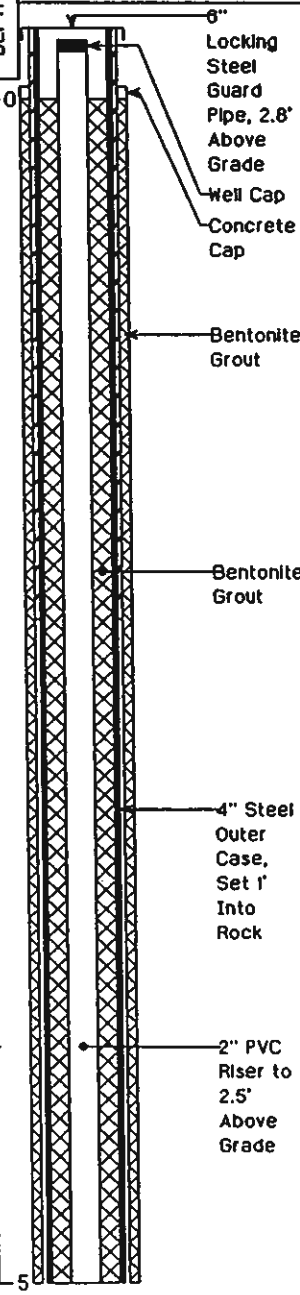
| SPLIT SPOON INTERVAL (ft.) | BLOWS PER 0.5 ft. | % RECOVERY | OVM (ppm) | SOIL DESCRIPTION (moisture, color, fraction, other notes, origin) | OBSV. NONE | ODOR | STAIN | SHEEN | SAMPLED | LITHOLOGY | DEPTH (ft.) | WELL CONSTRUCTION |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | | | 30 | |
| | | | | HF | | | | | | | | |
| | | | | HF | | | | | | | | |
| | | | | HF | | | | | | | | |
| | | | | HF | | | | | | | | |
| | | | | HF | | | | | | | | |
| | | | | HF | | | | | | | | |
| | | | | HF | | | | | | | | |
| | | | | HF | | | | | | | | |
| | | | | HF | | | | | | | | |
| | | | | HF | | | | | | | | |
| | | | | HF | | | | | | | | |
| | | | | Grey CLAY seem with light sheen | | | | | | | | |
| | | | | Grey CLAY seem | | | | | | | | |
| | | | | VF | | | | | | | | |
| | | | | HF and VF | | | | | | | | |
| | | | | END OF RUN 2, RQD = 46.87% TOTAL DEPTH = 34.0' | | | | | | | | |
| | | | | | | | | | | | 35 | |

# SB-10/MW-8-D

PROJECT: RG&E East Station
PROJECT NO.: 103002
LOCATION: About 10' towards the river from PZ-01
DATE STARTED: 11/4/98
DATE COMPLETED: 11/4/98
DRILLING CONTRACTOR: Lyon Drilling
DRILLER: Harry Lyon
DRILLING METHOD: 6 1/4" ID Hollow stem auger
SAMPLE METHOD: 2"x2' split spoon, 300# hammer

GROUND ELEVATION: 412.2
PROTECTIVE CASING ELEVATION: N/A
WELL ELEVATION (TOC): 414.67
DEPTH TO WATER: 22.34
X-COORDINATE: E 756893.2890
Y-COORDINATE: N 1155206.6360
WEATHER: Overcast and cold, 35° F, and windy
GEOLOGIST/OBSERVER: Steve Maxwell
ENTERED BY: Steve Maxwell

| SPLIT SPOON INTERVAL (ft.) | BLOWS PER 0.5 ft. | % RECOVERY | OVM (ppm) | SOIL DESCRIPTION: moisture, color, fraction, other notes, origin | OBSV.: NONE | ODOR | STAIN | SHEEN | SAMPLED | LITHOLOGY | DEPTH (ft.) | WELL CONSTRUCTION |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Augered to 6.0' | | | | | | | 0–5 | |



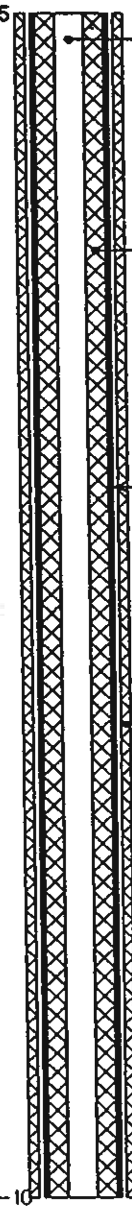
# SB-10/MW-8-D

PROJECT: RG&E East Station
PROJECT NO.: I03002
LOCATION: About 10' towards the river from PZ-01
DATE STARTED: 11/4/98
DATE COMPLETED: 11/4/98
DRILLING CONTRACTOR: Lyon Drilling
DRILLER: Harry Lyon
DRILLING METHOD: 6 1/4" ID Hollow stem auger
SAMPLE METHOD: 2"x2' split spoon, 300# hammer

GROUND ELEVATION: 412.2
PROTECTIVE CASING ELEVATION: N/A
WELL ELEVATION (TOC): 414.67
DEPTH TO WATER: 22.34
X-COORDINATE: E 756893.2890
Y-COORDINATE: N 1155206.6360
WEATHER: Overcast and cold, 35° F, and windy
GEOLOGIST/OBSERVER: Steve Maxwell
ENTERED BY: Steve Maxwell

| SPLIT SPOON INTERVAL (ft.) | BLOWS PER 0.5 ft. | % RECOVERY | OVM (ppm) | SOIL DESCRIPTION (moisture, color, fraction, other notes, origin) | OBSV. (NONE / ODOR / STAIN / SHEEN) | SAMPLED | LITHOLOGY | DEPTH (ft.) |
|---|---|---|---|---|---|---|---|---|
| | | | | Augered to 6.0' | | | | 5 |
| 6.0-8.0 | 1,1, 1,1 | 30 | | No recovery | | | | |
| | | | 0.0 | Loose, dry fine SAND with brick, coal, and clinker ash fragments, **FILL** | | | | |
| | | | | Augered to 10.0' | | | | 10 |

WELL CONSTRUCTION

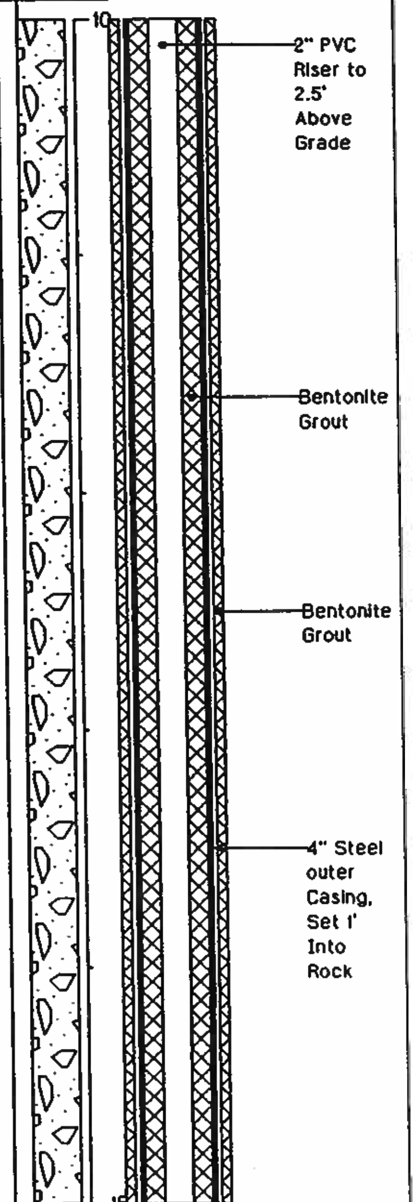


# SB-10/MW-8-D

PROJECT: RG&E East Station
PROJECT NO.: I03002
LOCATION: About 10' towards the river from PZ-01
DATE STARTED: 11/4/98
DATE COMPLETED: 11/4/98
DRILLING CONTRACTOR: Lyon Drilling
DRILLER: Harry Lyon
DRILLING METHOD: 6 1/4" ID Hollow stem auger
SAMPLE METHOD: 2"x2' split spoon, 300# hammer

GROUND ELEVATION: 412.2
PROTECTIVE CASING ELEVATION: N/A
WELL ELEVATION (TOC): 414.67
DEPTH TO WATER: 22.34
X-COORDINATE: E 756893.2890
Y-COORDINATE: N 1155206.6360
WEATHER: Overcast and cold, 35° F, and windy
GEOLOGIST/OBSERVER: Steve Maxwell
ENTERED BY: Steve Maxwell

| SPLIT SPOON INTERVAL (ft.) | BLOWS PER 0.5 ft. | % RECOVERY | OVM (ppm) | SOIL DESCRIPTION (moisture, color, fraction, other notes, origin) | OBSV. NONE | ODOR | STAIN | SHEEN | SAMPLED | LITHOLOGY | DEPTH (ft.) | WELL CONSTRUCTION |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 10.0–12.0 | 2,2, 3,2 | 70 | | No recovery | | | | | | | 10 | |
| | | | 0.0 | Loose dry SAND with coal and brick fragments, **FILL** | | | | | | | | |
| | | | 0.0 | Moist, firm fine SAND with brick, concrete, coal, and ash fragments, **FILL** | | | | | | | | |
| | | | 0.0 | Moist, dark brown SAND with brick, ash, and coal fragments, **FILL** | | | | | | | | |
| | | | | Augered to 16.0' | | | | | | | 15 | |



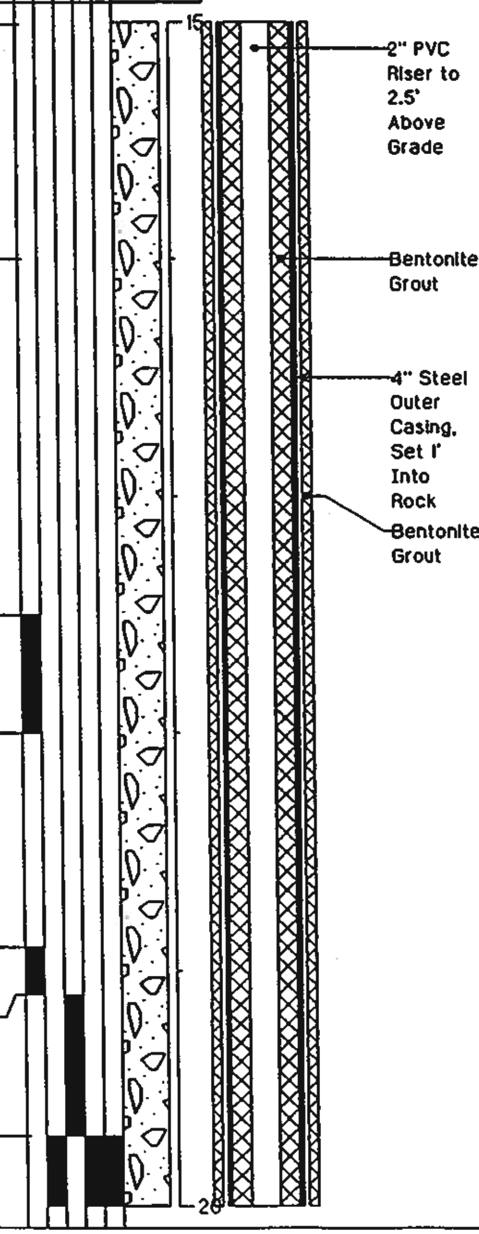
# SB-10/MW-8-D

PROJECT: RG&E East Station
PROJECT NO.: 103002
LOCATION: About 10' towards the river from PZ-01
DATE STARTED: 11/4/98
DATE COMPLETED: 11/4/98
DRILLING CONTRACTOR: Lyon Drilling
DRILLER: Harry Lyon
DRILLING METHOD: 6 1/4" ID Hollow stem auger
SAMPLE METHOD: 2"x2' split spoon, 300# hammer

GROUND ELEVATION: 412.2
PROTECTIVE CASING ELEVATION: N/A
WELL ELEVATION (TOC): 414.67
DEPTH TO WATER: 22.34
X-COORDINATE: E 756893.2890
Y-COORDINATE: N 1155206.6360
WEATHER: Overcast and cold, 35° F, and windy
GEOLOGIST/OBSERVER: Steve Maxwell
ENTERED BY: Steve Maxwell

| SPLIT SPOON INTERVAL (ft.) | BLOWS PER 0.5 ft. | % RECOVERY | OVM (ppm) | SOIL DESCRIPTION (moisture, color, fraction, other notes, origin) |
|---|---|---|---|---|
| | | | | Augered to 16.0' |
| 16.0-18.0 | 1,1 | 25 | | No recovery |
| | | | 3.2 | Loose, dry black SAND, coal fines, with brick, ash, and concrete fragments, **FILL** |
| 18.0-20.0 | wt of Rod, 1,1 | 55 | | No recovery |
| | | | | Loose, dry, black SAND, coal fines, with brick and ash fragments, **FILL** |
| | | | | Loose, moist to wet brown SAND with ash fragments, pebbles, and stain, **FILL** |
| | | | 34.5 | Fine saturated SAND with pebbles and TAR, **FILL** |

OBSV.: NONE, ODOR, STAIN, SHEEN, SAMPLED — LITHOLOGY — DEPTH (ft.) — WELL CONSTRUCTION

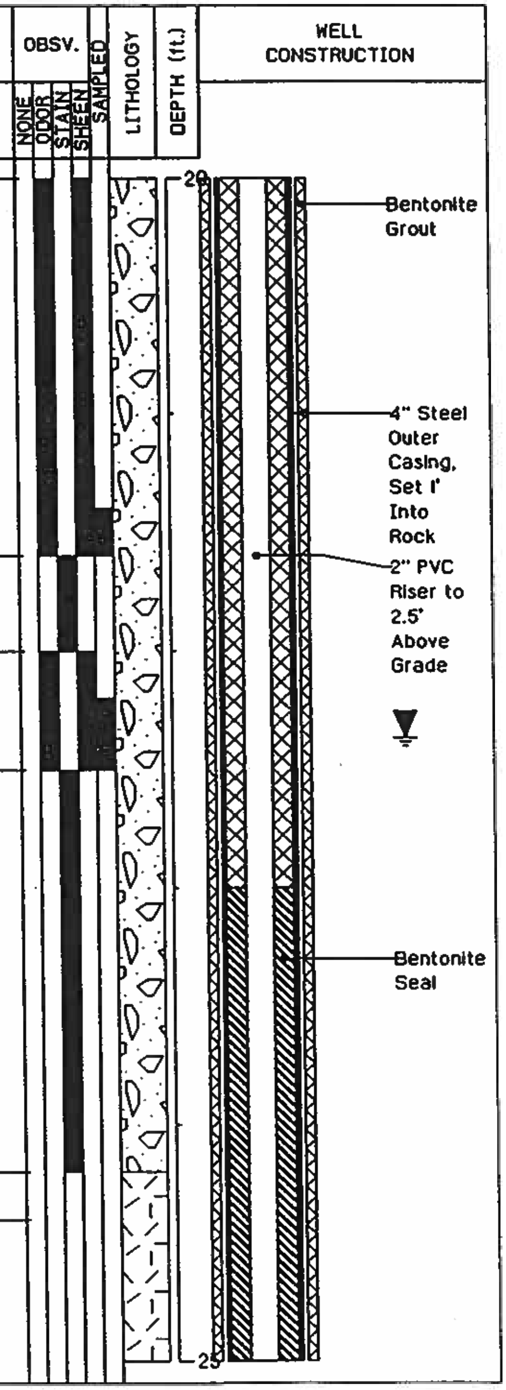


# SB-10/MW-8-D

PROJECT: RG&E East Station
PROJECT NO.: I03002
LOCATION: About 10' towards the river from PZ-01
DATE STARTED: 11/4/98
DATE COMPLETED: 11/4/98
DRILLING CONTRACTOR: Lyon Drilling
DRILLER: Harry Lyon
DRILLING METHOD: 6 1/4" ID Hollow stem auger
SAMPLE METHOD: 2"x2' split spoon, 300# hammer

GROUND ELEVATION: 412.2
PROTECTIVE CASING ELEVATION: N/A
WELL ELEVATION (TOC): 414.67
DEPTH TO WATER: 22.34
X-COORDINATE: E 756893.2890
Y-COORDINATE: N 1155206.6360
WEATHER: Overcast and cold, 35° F, and windy
GEOLOGIST/OBSERVER: Steve Maxwell
ENTERED BY: Steve Maxwell

| SPLIT SPOON INTERVAL (ft.) | BLOWS PER 0.5 ft. | % RECOVERY | OVM (ppm) | SOIL DESCRIPTION (moisture, color, fraction, other notes, origin) |
|---|---|---|---|---|
| 20.0-22.0 | wt of Rod, 2,5 | 100 | | Loose, saturated fine SAND with pebbles and **TAR, FILL** |
| | | | 185 | Firm brown CLAY with SILT, **FILL** |
| 22.0-24.0 | 3,3, 6,8 | 100 | | Loose fine SAND with concrete fragments and **TAR, FILL** |
| | | | | **Water Table** |
| | | | 49 | Firm brown CLAY with some SILT with ash, brick fragments, and stain, **FILL** |
| 24.0-24.4 | 50 | | | |
| | | | | Weathered SHALE |
| | | | | Split spoon refusal, Augered to 25.0' |



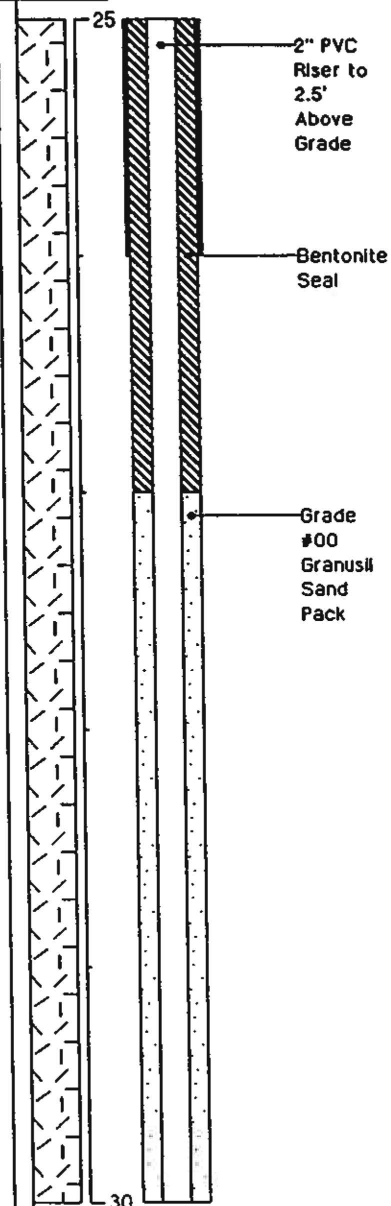
# SB-10/MW-8-D

PROJECT: RG&E East Station
PROJECT NO.: I03002
LOCATION: About 10' towards the river from PZ-01
DATE STARTED: 11/4/98
DATE COMPLETED: 11/4/98
DRILLING CONTRACTOR: Lyon Drilling
DRILLER: Harry Lyon
DRILLING METHOD: 6 1/4" ID Hollow stem auger
SAMPLE METHOD: 2"x2' split spoon, 300# hammer

GROUND ELEVATION: 412.2
PROTECTIVE CASING ELEVATION: N/A
WELL ELEVATION (TOC): 414.67
DEPTH TO WATER: 22.34
X-COORDINATE: E 756893.2890
Y-COORDINATE: N 1155206.6360
WEATHER: Overcast and cold, 35° F, and windy
GEOLOGIST/OBSERVER: Steve Maxwell
ENTERED BY: Steve Maxwell

| SPLIT SPOON INTERVAL (ft.) | BLOWS PER 0.5 ft. | % RECOVERY | OVM (ppm) | SOIL DESCRIPTION (moisture, color, fraction, other notes, origin) | OBSV. (NONE / ODOR / STAIN / SHEEN / SAMPLED) | LITHOLOGY | DEPTH (ft.) |
|---|---|---|---|---|---|---|---|
| | | | | BEGINNING OF RUN 1. Rochester SHALE, medium soft, grey, calcerous with fine bedding | | | 25 |
| | | | | Horizontal Fracture (HF) | | | |
| | | | | HF | | | |
| | | | | HF | | | |
| | | | | HF | | | |
| | | | | HF and Vertical Fracture (VF) | | | |
| | | | | HF | | | |
| | | | | HF | | | |
| | | | | HF | | | |
| | | | | HF | | | |
| | | | | HF | | | |
| | | | | Vertical Crack (VC) | | | |
| | | | | HF and VC with sheen and odor | | | |
| | | | | HF and VC | | | |
| | | | | HF | | | |
| | | | | HF | | | |
| | | | | HF | | | |
| | | | | END OF RUN 1, RQD = 50.85% | | | 30 |

WELL CONSTRUCTION



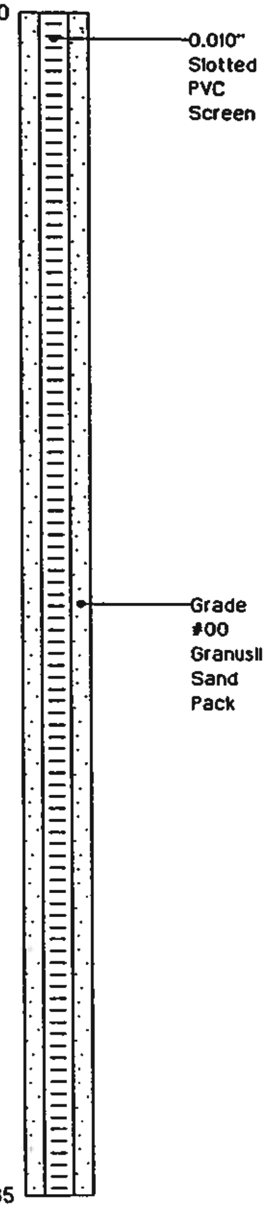
# SB-10/MW-8-D

PROJECT: RG&E East Station
PROJECT NO.: 103002
LOCATION: About 10' towards the river from PZ-01
DATE STARTED: 11/4/98
DATE COMPLETED: 11/4/98
DRILLING CONTRACTOR: Lyon Drilling
DRILLER: Harry Lyon
DRILLING METHOD: 6 1/4" ID Hollow stem auger
SAMPLE METHOD: 2"x2' split spoon, 300# hammer

GROUND ELEVATION: 412.2
PROTECTIVE CASING ELEVATION: N/A
WELL ELEVATION (TOC): 414.67
DEPTH TO WATER: 22.34
X-COORDINATE: E 756893.2890
Y-COORDINATE: N 1155206.6360
WEATHER: Overcast and cold, 35° F, and windy
GEOLOGIST/OBSERVER: Steve Maxwell
ENTERED BY: Steve Maxwell

| SPLIT SPOON INTERVAL (ft.) | BLOWS PER 0.5 ft. | % RECOVERY | OVM (ppm) | SOIL DESCRIPTION (moisture, color, fraction, other notes, origin) | OBSV. NONE | ODOR | STAIN | SHEEN | SAMPLED | LITHOLOGY | DEPTH (ft.) |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | BEGINNING OF RUN 2 | | | | | | | 30 |
| | | | | HF | | | | | | | |
| | | | | HF | | | | | | | |
| | | | | HF | | | | | | | |
| | | | | HF | | | | | | | |
| | | | | HF | | | | | | | |
| | | | | HF | | | | | | | |
| | | | | HF | | | | | | | |
| | | | | HF | | | | | | | |
| | | | | HF | | | | | | | |
| | | | | Clay seem with light sheen | | | | | | | |
| | | | | HF with sheen and odor | | | | | | | |
| | | | | HF with sheen and odor | | | | | | | |
| | | | | END OF RUN 2, sheen and odor, RQD = 80.00% | | | | | | | 35 |

WELL CONSTRUCTION

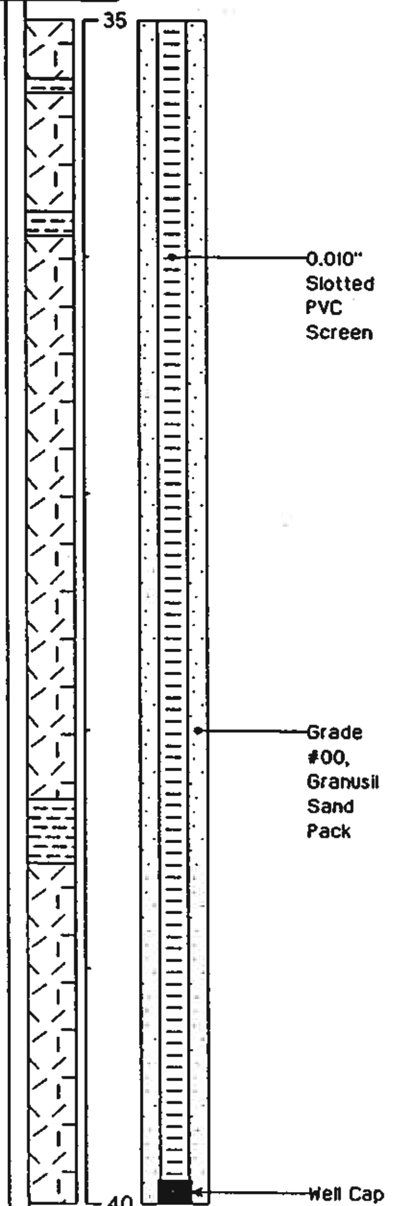


# SB-10/MW-8-D

PROJECT: RG&E East Station
PROJECT NO.: I03002
LOCATION: About 10' towards the river from PZ-01
DATE STARTED: 11/4/98
DATE COMPLETED: 11/4/98
DRILLING CONTRACTOR: Lyon Drilling
DRILLER: Harry Lyon
DRILLING METHOD: 6 1/4" ID Hollow stem auger
SAMPLE METHOD: 2"x2' split spoon, 300# hammer

GROUND ELEVATION: 412.2
PROTECTIVE CASING ELEVATION: N/A
WELL ELEVATION (TOC): 414.67
DEPTH TO WATER: 22.34
X-COORDINATE: E 756893.2890
Y-COORDINATE: N 1155206.6360
WEATHER: Overcast and cold, 35° F, and windy
GEOLOGIST/OBSERVER: Steve Maxwell
ENTERED BY: Steve Maxwell

| SPLIT SPOON INTERVAL (ft.) | BLOWS PER 0.5 ft. | % RECOVERY | OVM (ppm) | SOIL DESCRIPTION (moisture, color, fraction, other notes, origin) | OBSV. (NONE / ODOR / STAIN / SHEEN) | SAMPLED | LITHOLOGY | DEPTH (ft.) | WELL CONSTRUCTION |
|---|---|---|---|---|---|---|---|---|---|
| | | | | BEGINNING OF RUN 3 | | | | 35 | |
| | | | | Brown CLAY seem | | | | | |
| | | | | HF | | | | | |
| | | | | Grey CLAY seem | | | | | |
| | | | | HF with light sheen | | | | | |
| | | | | HF with light sheen | | | | | |
| | | | | HF and Vertical Fracture (VF) with sheen and odor | | | | | |
| | | | | Grey CLAY seem | | | | | |
| | | | | Dark grey SHALE | | | | | |
| | | | | Grey CLAY seem | | | | | |
| | | | | HF | | | | | |
| | | | | HF | | | | | |
| | | | | HF | | | | | |
| | | | | HF | | | | | |
| | | | | HF with sheen and odor | | | | | |
| | | | | END OF RUN 3, RQD = 29.80% TOTAL DEPTH = 40.0' | | | | 40 | |



# SB-11

PROJECT: RG&E East Station
PROJECT NO.: 103002
LOCATION: About 105' from center of the tar well
DATE STARTED: 11/4/98
DATE COMPLETED: 11/4/98
DRILLING CONTRACTOR: Lyon Drilling
DRILLER: Harry Lyon
DRILLING METHOD: 4 1/4" ID Hollow stem auger
SAMPLE METHOD: 2"x2' Split spoon sampler, 300# hammer

GROUND ELEVATION: N/A
PROTECTIVE CASING ELEVATION: N/A
WELL ELEVATION (TOC): N/A
DEPTH TO WATER: 7.0
X-COORDINATE: N/A
Y-COORDINATE: N/A
WEATHER: Overcast and cold, 35° F, windy
GEOLOGIST/OBSERVER: Steve Maxwell
ENTERED BY: Steve Maxwell

| SPLIT SPOON INTERVAL (ft.) | BLOWS PER 0.5 ft. | % RECOVERY | OVM (ppm) | SOIL DESCRIPTION: moisture, color, fraction, other notes, origin | OBSV. (NONE / ODOR / STAIN / SHEEN) | SAMPLED | LITHOLOGY | DEPTH (ft.) | WELL CONSTRUCTION |
|---|---|---|---|---|---|---|---|---|---|
| | | | | Augered to 6.0'. | | | | 0 | |
| | | | | | | | | 5 | |
| 6.0-8.0 | 16,10, 12,9 | 20 | 0.0 | No recovery | | | | | |
| | | | | **Water Table (Estimated)** | | | | | |
| 8.0-10.0 | 2,2, 2,2 | 90 | 0.0 | Fine, saturated SAND with some SILT, CLAY, and stain FILL | | | | | |
| | | | | No recovery | | | | | |
| | | | | Fine saturated SAND and SILT with angular pebbles, light odor, and black stain. FILL | | | | 10 | |

# SB-11

PROJECT: RG&E East Station
PROJECT NO.: 103002
LOCATION: About 105' from center of the tar well
DATE STARTED: 11/4/98
DATE COMPLETED: 11/4/98
DRILLING CONTRACTOR: Lyon Drilling
DRILLER: Harry Lyon
DRILLING METHOD: 4 1/4" ID Hollow stem auger
SAMPLE METHOD: 2"x2' Split spoon sampler, 300# hammer

GROUND ELEVATION: N/A
PROTECTIVE CASING ELEVATION: N/A
WELL ELEVATION (TOC): N/A
DEPTH TO WATER: 7.0
X-COORDINATE: N/A
Y-COORDINATE: N/A
WEATHER: Overcast and cold, 35° F, windy
GEOLOGIST/OBSERVER: Steve Maxwell
ENTERED BY: Steve Maxwell

| SPLIT SPOON INTERVAL (ft.) | BLOWS PER 0.5 ft. | % RECOVERY | OVM (ppm) | SOIL DESCRIPTION (moisture, color, fraction, other notes, origin) | OBSV. (NONE / ODOR / STAIN / SHEEN) | SAMPLED | LITHOLOGY | DEPTH (ft.) | WELL CONSTRUCTION |
|---|---|---|---|---|---|---|---|---|---|
| | | | | Augered to 12.0 | | | | 10 | |
| 12.0-13.4 | 2,3, 50 | 29 | 0.0 | No recovery | | | | | |
| | | | | Fine saturated SAND and SILT with concrete fragments stained black, **FILL** | STAIN | | | | |
| | | | | Brick | | | | | |
| | | | | Split spoon and Auger refusal **TOTAL DEPTH = 13.4'** | | | | 15 | |
| | | | | | | | | 20 | |

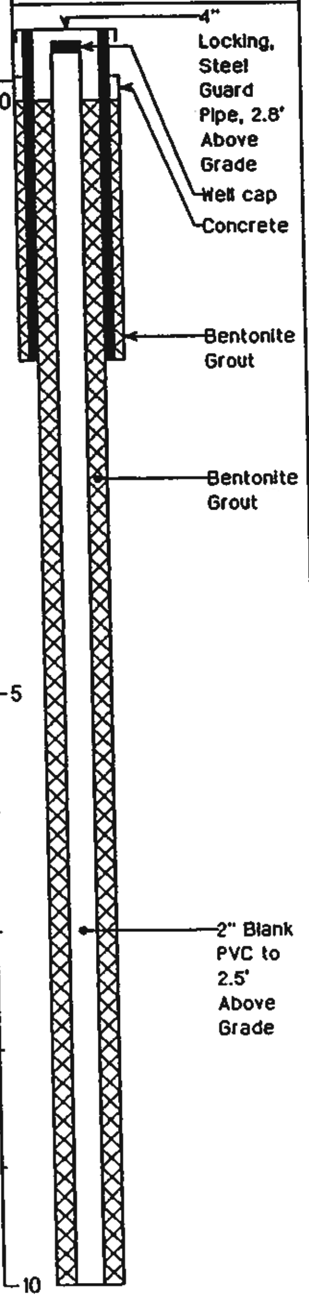
# SB-11b/MW-7

PROJECT: RG&E East Station
PROJECT NO.: 103002
LOCATION: About 25' east of SB-11
DATE STARTED: 11/5/98
DATE COMPLETED: 11/5/98
DRILLING CONTRACTOR: Lyon Drilling
DRILLER: Harry Lyon
DRILLING METHOD: 4 1/4" ID Hollow stem auger
SAMPLE METHOD: 2"x2' Split spoon sampler, 300# hammer

GROUND ELEVATION: 426.4
PROTECTIVE CASING ELEVATION: 428.82
WELL ELEVATION (TOC): N/A
DEPTH TO WATER: 20.06
X-COORDINATE: E 1155647.4340
Y-COORDINATE: N 757341.7530
WEATHER: Rain and cool, 40° F, 10mph winds
GEOLOGIST/OBSERVER: Steve Maxwell
ENTERED BY: Steve Maxwell

| SPLIT SPOON INTERVAL (ft.) | BLOWS PER 0.5 ft. | % RECOVERY | OVM (ppm) | SOIL DESCRIPTION (moisture, color, fraction, other notes, origin) | OBSV. (NONE / ODOR / STAIN / SHEEN / SAMPLED) | LITHOLOGY | DEPTH (ft.) |
|---|---|---|---|---|---|---|---|
| | | | | Augered to 6.0' | | | 0 |
| | | | | | | | 5 |
| 6.0-8.0 | 6,4, 2,2 | 100 | 0.0 | Course, dry SAND and trace SILT, with pebbles, brick, and coal fragments, FILL | | | |
| | | | | Fine loose, moist SAND with pebbles, concrete, ash, brick and SHALE fragments, FILL | | | |
| | | | | Soft, moist SAND and SILT with pebbles and large concrete fragments, FILL | | | |
| | | | | Augered to 12.0' | | | 10 |

WELL CONSTRUCTION



# SB-11b/MW-7

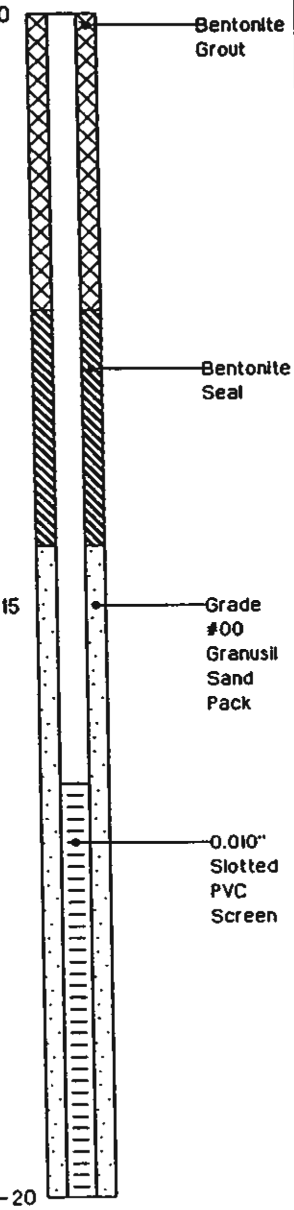
PROJECT: RG&E East Station
PROJECT NO.: 103002
LOCATION: About 25' east of SB-11
DATE STARTED: 11/5/98
DATE COMPLETED: 11/5/98
DRILLING CONTRACTOR: Lyon Drilling
DRILLER: Harry Lyon
DRILLING METHOD: 4 1/4" ID Hollow stem auger
SAMPLE METHOD: 2"x2' Split spoon sampler, 300# hammer

GROUND ELEVATION: 426.4
PROTECTIVE CASING ELEVATION: 428.82
WELL ELEVATION (TOC): N/A
DEPTH TO WATER: 20.06
X-COORDINATE: E 1155647.4340
Y-COORDINATE: N 757341.7530
WEATHER: Rain and cool, 40° F, 10mph winds
GEOLOGIST/OBSERVER: Steve Maxwell
ENTERED BY: Steve Maxwell

| SPLIT SPOON INTERVAL (ft.) | BLOWS PER 0.5 ft. | % RECOVERY | OVM (ppm) | SOIL DESCRIPTION (moisture, color, fraction, other notes, origin) |
|---|---|---|---|---|
| | | | | Augered to 12.0' |
| 12.0-14.0 | 4,7, 6,6 | 50 | | No recovery |
| | | | 5.3 | Firm, moist SAND and SILT, with pebbles, brick, concrete, and coal fragments, FILL |
| | | | | Loose, dry SAND with pebbles, brick, coal, and ash fragments, FILL |
| | | | | Augered to 16.0' |
| 16.0-18.0 | 1,2, 2,1 | 100 | 128<br>211 | Firm wet fine SAND and SILT with strong fuel oil odor and stain, FILL |
| | | | 142 | Loose, wet fine SAND and SILT with some pebbles, strong fuel oil odor, and stain, FILL |
| 18.0-20.0 | 2,3, 3,2 | 100 | 122 | Loose, wet fine SAND with pebbles, brick fragments, strong fuel oil odor, and stain, FILL |
| | | | 236 | Fine SAND and SILT, with strong fuel oil odor, sheen, and stain, FILL |

OBSV.: NONE, ODOR, STAIN, SHEEN, SAMPLED — LITHOLOGY — DEPTH (ft.): 10, 15, 20

WELL CONSTRUCTION



# SB-11b/MW-7

PROJECT: RG&E East Station
PROJECT NO.: I03002
LOCATION: About 25' east of SB-11
DATE STARTED: 11/5/98
DATE COMPLETED: 11/5/98
DRILLING CONTRACTOR: Lyon Drilling
DRILLER: Harry Lyon
DRILLING METHOD: 4 1/4" ID Hollow stem auger
SAMPLE METHOD: 2"x2' Split spoon sampler, 300# hammer

GROUND ELEVATION: 426.4
PROTECTIVE CASING ELEVATION: 428.82
WELL ELEVATION (TOC): N/A
DEPTH TO WATER: 20.06
X-COORDINATE: E 1155647.4340
Y-COORDINATE: N 757341.7530
WEATHER: Rain and cool, 40° F, 10mph winds
GEOLOGIST/OBSERVER: Steve Maxwell
ENTERED BY: Steve Maxwell

| SPLIT SPOON INTERVAL (ft.) | BLOWS PER 0.5 ft. | % RECOVERY | OVM (ppm) | SOIL DESCRIPTION (moisture, color, fraction, other notes, origin) |
|---|---|---|---|---|
| 20.0-22.0 | 5,8, 11,11 | 45 | | No recovery **Water Table** |
| | | | 135 | Fine saturated **SAND** and **SILT** with some pebbles, sheen, and odor |
| 22.0-23.3 | 11,13, 20,10 | 50 | | Banded moist grey and brown **CLAY** with some pebbles, sheen, and odor |
| | | | | No recovery |
| | | | 664 | Tight banded grey and brown **CLAY** with layers of pebbles, containing **TAR** |
| | | | 466 | |
| 24.0-26.0 | 9,19, 12,17 | 65 | | No recovery |
| | | | 732 | Tight banded grey and brown **CLAY** with layers of pebbles, containing **TAR** |
| | | | 211 | |
| 26.0-28.0 | 14,25, 33,47 | 55 | | No recovery |
| | | | 21.3 | Tight banded grey and brown **CLAY** with layers of pebbles |
| | | | 30.4 | |
| 28.0-30.0 | 12,30, 31,37 | 50 | 13.1 | No recovery |
| | | | 10.0 | Tight banded grey and brown **CLAY** with layers of pebbles |
| | | | | Weathered SHALE |

OBSV.: NONE, ODOR, STAIN, SHEEN, SAMPLED; LITHOLOGY; DEPTH (ft.): 20, 25, 30

WELL CONSTRUCTION:
- 0.010" Slotted PVC Screen
- Grade #00 Granusil Sand Pack
- Well Cap
- End of Well Screen
- Packed Bentonite Chips

# SB-11b/MW-7

PROJECT: RG&E East Station
PROJECT NO.: 103002
LOCATION: About 25' east of SB-11
DATE STARTED: 11/5/98
DATE COMPLETED: 11/5/98
DRILLING CONTRACTOR: Lyon Drilling
DRILLER: Harry Lyon
DRILLING METHOD: 4 1/4" ID Hollow stem auger
SAMPLE METHOD: 2"x2' Split spoon sampler, 300# hammer

GROUND ELEVATION: 426.4
PROTECTIVE CASING ELEVATION: 428.82
WELL ELEVATION (TOC): N/A
DEPTH TO WATER: 20.06
X-COORDINATE: E 1155647.4340
Y-COORDINATE: N 757341.7530
WEATHER: Rain and cool, 40° F, 10mph winds
GEOLOGIST/OBSERVER: Steve Maxwell
ENTERED BY: Steve Maxwell

| SPLIT SPOON INTERVAL (ft.) | BLOWS PER 0.5 ft. | % RECOVERY | OVM (ppm) | SOIL DESCRIPTION: moisture, color, fraction, other notes, origin | OBSV. (NONE / ODOR / STAIN / SHEEN) | SAMPLED | LITHOLOGY | DEPTH (ft.) | WELL CONSTRUCTION |
|---|---|---|---|---|---|---|---|---|---|
| 30.0-31.2 | 18,28, 50 | 83 | 315 | Stiff brown **CLAY** with **SAND** and **SILT** with **TAR** | ODOR, SHEEN | X | | 30 | Packed Bentonite Chips |
| | | | | Split Spoon Refusal, End of Boring **TOTAL DEPTH = 31.2'** | | | | 35 | |
| | | | | | | | | 40 | |

# SB-12

PROJECT: RG&E East Station
PROJECT NO.: I03002
LOCATION: About 120' from the western corner of storage shed
DATE STARTED: 11/5/98
DATE COMPLETED: 11/5/98
DRILLING CONTRACTOR: Lyon Drilling
DRILLER: Harry Lyon
DRILLING METHOD: 4 1/4" ID Hollow stem auger
SAMPLE METHOD: 2"x2' Split spoon sampler, 300# hammer

GROUND ELEVATION: 414.8
PROTECTIVE CASING ELEVATION: None
WELL ELEVATION (TOC): None
DEPTH TO WATER: Not found
X-COORDINATE: E 756971.4608
Y-COORDINATE: N 1155725.4608
WEATHER: Rain and cool, 40° F, 10 mph winds
GEOLOGIST/OBSERVER: Steve Maxwell
ENTERED BY: Steve Maxwell

| SPLIT SPOON INTERVAL (ft.) | BLOWS PER 0.5 ft. | % RECOVERY | OVM (ppm) | SOIL DESCRIPTION<br>moisture, color, fraction, other notes, origin | OBSV. NONE | ODOR | STAIN | SHEEN | SAMPLED | LITHOLOGY | DEPTH (ft.) | WELL CONSTRUCTION |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Augered to 6.0' | | | | | | | 0 | |
| | | | | | | | | | | | 5 | |

# SB-12

PROJECT: RG&E East Station
PROJECT NO.: I03002
LOCATION: About 120' from the western corner of storage shed
DATE STARTED: 11/5/98
DATE COMPLETED: 11/5/98
DRILLING CONTRACTOR: Lyon Drilling
DRILLER: Harry Lyon
DRILLING METHOD: 4 1/4" ID Hollow stem auger
SAMPLE METHOD: 2"x2' Split spoon sampler, 300# hammer

GROUND ELEVATION: 414.8
PROTECTIVE CASING ELEVATION: None
WELL ELEVATION (TOC): None
DEPTH TO WATER: Not found
X-COORDINATE: E 756971.4608
Y-COORDINATE: N 1155725.4608
WEATHER: Rain and cool, 40° F, 10 mph winds
GEOLOGIST/OBSERVER: Steve Maxwell
ENTERED BY: Steve Maxwell

| SPLIT SPOON INTERVAL (ft.) | BLOWS PER 0.5 ft. | % RECOVERY | OVM (ppm) | SOIL DESCRIPTION: moisture, color, fraction, other notes, origin | OBSV. (NONE / ODOR / STAIN / SHEEN) | SAMPLED | LITHOLOGY | DEPTH (ft.) | WELL CONSTRUCTION |
|---|---|---|---|---|---|---|---|---|---|
| | | | | Augered to 6.0' | | | | 5 | |
| 6.0-8.0 | 5,8, 10,10 | 60 | 0.0 | No recovery | | | | | |
| | | | 3.1 | Soft, wet grey SAND with trace of clinker ash, SHALE fragments, and iron staining. **FILL** | ODOR | | | | |
| | | | 5.4 | Soft grey SAND with brick, clinker ash, and SHALE fragments, iron staining. **FILL** | ODOR | | | | |
| | | | | Augered to 12.0' | | | | 10 | |

*META Environmental, Inc.*

# SB-12

PROJECT: RG&E East Station
PROJECT NO.: I03002
LOCATION: About 120' from the western corner of storage shed
DATE STARTED: 11/5/98
DATE COMPLETED: 11/5/98
DRILLING CONTRACTOR: Lyon Drilling
DRILLER: Harry Lyon
DRILLING METHOD: 4 1/4" ID Hollow stem auger
SAMPLE METHOD: 2"x2' Split spoon sampler, 300# hammer

GROUND ELEVATION: 414.8
PROTECTIVE CASING ELEVATION: None
WELL ELEVATION (TOC): None
DEPTH TO WATER: Not found
X-COORDINATE: E 756971.4608
Y-COORDINATE: N 1155725.4608
WEATHER: Rain and cool, 40° F, 10 mph winds
GEOLOGIST/OBSERVER: Steve Maxwell
ENTERED BY: Steve Maxwell

| SPLIT SPOON INTERVAL (ft.) | BLOWS PER 0.5 ft. | % RECOVERY | OVM (ppm) | SOIL DESCRIPTION (moisture, color, fraction, other notes, origin) | OBSV. (NONE / ODOR / STAIN / SHEEN / SAMPLED) | LITHOLOGY | DEPTH (ft.) | WELL CONSTRUCTION |
|---|---|---|---|---|---|---|---|---|
| | | | | Augered to 12.0' | | | 10 | |
| 12.0-14.0 | 1,1, 1,1 | 80 | | No recovery | | | | |
| | | | | **Water Table (Estimated)** Loose, wet grey SAND with brick clinker ash fragments, sheen, and odor , **FILL** | ODOR, SHEEN | | | ▼ |
| | | | | Stiff brown CLAY with odor, FILL | ODOR | | | |
| 14.0-14.6 | 6,50 | 100 | | Loose, dry grey SAND, with brick fragments and odor, **FILL** | ODOR | | | |
| | | | 2.8 | SHALE | | | | |
| | | | | SHALE, split spoon refusal at 14.6' | | | | |
| | | | | 1" **Steel plate** | | | 15 | |

# SB-12

PROJECT: RG&E East Station
PROJECT NO.: I03002
LOCATION: About 120' from the western corner of storage shed
DATE STARTED: 11/5/98
DATE COMPLETED: 11/5/98
DRILLING CONTRACTOR: Lyon Drilling
DRILLER: Harry Lyon
DRILLING METHOD: 4 1/4" ID Hollow stem auger
SAMPLE METHOD: 2"x2' Split spoon sampler, 300# hammer

GROUND ELEVATION: 414.8
PROTECTIVE CASING ELEVATION: None
WELL ELEVATION (TOC): None
DEPTH TO WATER: Not found
X-COORDINATE: E 756971.4608
Y-COORDINATE: N 1155725.4608
WEATHER: Rain and cool, 40° F, 10 mph winds
GEOLOGIST/OBSERVER: Steve Maxwell
ENTERED BY: Steve Maxwell

| SPLIT SPOON INTERVAL (ft.) | BLOWS PER 0.5 ft. | % RECOVERY | OVM (ppm) | SOIL DESCRIPTION (moisture, color, fraction, other notes, origin) | OBSV.: NONE | ODOR | STAIN | SHEEN | SAMPLED | LITHOLOGY | DEPTH (ft.) | WELL CONSTRUCTION |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | | | 15 | |
| | | | | Void in SHALE | | | | | | | | |
| | | | | SHALE, Reamed to 17.0' | | | | | | | | |
| | | | | BEGINNING OF RUN 1, **Rochester SHALE** medium soft, grey, calcerous with fine bedding | | | | | | | | |
| | | | | Dark grey SHALE | | | | | | | | |
| | | | | Highly fractured CLAY and SHALE<br>4" Flush joint casing set | | | | | | | | |
| | | | | Dark grey SHALE | | | | | | | | |
| | | | | grey CLAY seem | | | | | | | 20 | |

# SB-12

PROJECT: RG&E East Station
PROJECT NO.: 103002
LOCATION: About 120' from the western corner of storage shed
DATE STARTED: 11/5/98
DATE COMPLETED: 11/5/98
DRILLING CONTRACTOR: Lyon Drilling
DRILLER: Harry Lyon
DRILLING METHOD: 4 1/4" ID Hollow stem auger
SAMPLE METHOD: 2"x2' Split spoon sampler, 300# hammer

GROUND ELEVATION: 414.8
PROTECTIVE CASING ELEVATION: None
WELL ELEVATION (TOC): None
DEPTH TO WATER: Not found
X-COORDINATE: E 756971.4608
Y-COORDINATE: N 1155725.4608
WEATHER: Rain and cool, 40° F, 10 mph winds
GEOLOGIST/OBSERVER: Steve Maxwell
ENTERED BY: Steve Maxwell

| SPLIT SPOON INTERVAL (ft.) | BLOWS PER 0.5 ft. | % RECOVERY | OVM (ppm) | SOIL DESCRIPTION: moisture, color, fraction, other notes, origin | OBSV.: NONE / ODOR / STAIN / SHEEN / SAMPLED | LITHOLOGY | DEPTH (ft.) | WELL CONSTRUCTION |
|---|---|---|---|---|---|---|---|---|
| | | | | Dark grey SHALE | | | 20 | |
| | | | | Horizontal Fracture (HF) and Vertical Fracture (VF) | | | | |
| | | | | HF and VF | | | | |
| | | | | HF | | | | |
| | | | | HF | | | | |
| | | | | HF | | | | |
| | | | | Vertical Crack (VC) | | | | |
| | | | | | | | | |
| | | | | HF | | | | |
| | | | | HF | | | | |
| | | | | HF | | | | |
| | | | | HF | | | | |
| | | | | HF | | | | |
| | | | | END OF RUN 1, BEGINNING OF RUN 2, RQD = 9.20% | | | | |
| | | | | HF with light odor | | | | |
| | | | | HF with sheen and odor | | | | |
| | | | | HF and (VF) with sheen and odor | | | | |
| | | | | HF and VF with sheen and odor | | | | |
| | | | | HF with sheen and odor | | | | |
| | | | | HF with light odor | | | | |
| | | | | VC | | | | |
| | | | | | | | | |
| | | | | HF with sheen and odor | | | | |
| | | | | HF and VF with odor | | | | |
| | | | | HF with sheen and odor | | | | |
| | | | | HF with NAPL | | | | |
| | | | | HF with sheen and odor | | | 25 | |

# SB-12

PROJECT: RG&E East Station
PROJECT NO.: I03002
LOCATION: About 120' from the western corner of storage shed
DATE STARTED: 11/5/98
DATE COMPLETED: 11/5/98
DRILLING CONTRACTOR: Lyon Drilling
DRILLER: Harry Lyon
DRILLING METHOD: 4 1/4" ID Hollow stem auger
SAMPLE METHOD: 2"x2' Split spoon sampler, 300# hammer

GROUND ELEVATION: 414.8
PROTECTIVE CASING ELEVATION: None
WELL ELEVATION (TOC): None
DEPTH TO WATER: Not found
X-COORDINATE: E 756971.4608
Y-COORDINATE: N 1155725.4608
WEATHER: Rain and cool, 40° F, 10 mph winds
GEOLOGIST/OBSERVER: Steve Maxwell
ENTERED BY: Steve Maxwell

| SPLIT SPOON INTERVAL (ft.) | BLOWS PER 0.5 ft. | % RECOVERY | OVM (ppm) | SOIL DESCRIPTION moisture, color, fraction, other notes, origin | OBSV. NONE | ODOR | STAIN | SHEEN | SAMPLED | LITHOLOGY | DEPTH (ft.) | WELL CONSTRUCTION |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | | | 25 | |
| | | | | HF with sheen and odor | | | | | | | | |
| | | | | HF with sheen and odor | | | | | | | | |
| | | | | HF with sheen and odor | | | | | | | | |
| | | | | END OF RUN 2, RQD = 46.33% | | | | | | | | |
| | | | | End of Boring<br>TOTAL DEPTH = 27.0' | | | | | | | | |
| | | | | | | | | | | | 30 | |

# SB-13

PROJECT: RG&E East Station
PROJECT NO.: 103002
LOCATION: 78' behind present lab, in old raceway
DATE STARTED: 11/9/98
DATE COMPLETED: 11/9/98
DRILLING CONTRACTOR: Lyon Drilling
DRILLER: Harry Lyon
DRILLING METHOD: 4 1/4" ID Hollow stem auger
SAMPLE METHOD: 2"x2' Split spoon sampler, 300# hammer

GROUND ELEVATION: 406.1
PROTECTIVE CASING ELEVATION: None
WELL ELEVATION (TOC): None
DEPTH TO WATER: 11.9
X-COORDINATE: E 756773.9510
Y-COORDINATE: N 1155938.1210
WEATHER: Rain and cool, 40° F, calm winds
GEOLOGIST/OBSERVER: Steve Maxwell
ENTERED BY: Steve Maxwell

| SPLIT SPOON INTERVAL (ft.) | BLOWS PER 0.5 ft. | % RECOVERY | OVM (ppm) | SOIL DESCRIPTION: moisture, color, fraction, other notes, origin | OBSV.: NONE | ODOR | STAIN | SHEEN | SAMPLED | LITHOLOGY | DEPTH (ft.) | WELL CONSTRUCTION |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Augered to 4.0' | | | | | | | 0 | |
| | | | | No recovery | | | | | | | 5 | |

# SB-13

PROJECT: RG&E East Station
PROJECT NO.: 103002
LOCATION: 78' behind present lab, in old raceway
DATE STARTED: 11/9/98
DATE COMPLETED: 11/9/98
DRILLING CONTRACTOR: Lyon Drilling
DRILLER: Harry Lyon
DRILLING METHOD: 4 1/4" ID Hollow stem auger
SAMPLE METHOD: 2"x2' Split spoon sampler, 300# hammer

GROUND ELEVATION: 406.1
PROTECTIVE CASING ELEVATION: None
WELL ELEVATION (TOC): None
DEPTH TO WATER: 11.9
X-COORDINATE: E 756773.9510
Y-COORDINATE: N 1155938.1210
WEATHER: Rain and cool, 40° F, calm winds
GEOLOGIST/OBSERVER: Steve Maxwell
ENTERED BY: Steve Maxwell

| SPLIT SPOON INTERVAL (ft.) | BLOWS PER 0.5 ft. | % RECOVERY | OVM (ppm) | SOIL DESCRIPTION (moisture, color, fraction, other notes, origin) | OBSV. (NONE / ODOR / STAIN / SHEEN) | SAMPLED | LITHOLOGY | DEPTH (ft.) | WELL CONSTRUCTION |
|---|---|---|---|---|---|---|---|---|---|
| | | | | No recovery | | | | 5 | |
| 6.0-8.0 | 5,8, 7,9 | 20 | 0.0 | Dry, loose SAND with pebbles, brick and concrete fragments, FILL | NONE | | | | |
| | | | | Augered to 8.0' | | | | | |
| 8.0-10.0 | 4,4, 2,3 | 15 | | No recovery | | | | | |
| | | | | Dry, loose SAND with pebbles, brick and concrete fragments, FILL | NONE | | | 10 | |

# SB-13

PROJECT: RG&E East Station
PROJECT NO.: I03002
LOCATION: 78' behind present lab, in old raceway
DATE STARTED: 11/9/98
DATE COMPLETED: 11/9/98
DRILLING CONTRACTOR: Lyon Drilling
DRILLER: Harry Lyon
DRILLING METHOD: 4 1/4" ID Hollow stem auger
SAMPLE METHOD: 2"x2' Split spoon sampler, 300# hammer

GROUND ELEVATION: 406.1
PROTECTIVE CASING ELEVATION: None
WELL ELEVATION (TOC): None
DEPTH TO WATER: 11.9
X-COORDINATE: E 756773.9510
Y-COORDINATE: N 1155938.1210
WEATHER: Rain and cool, 40° F, calm winds
GEOLOGIST/OBSERVER: Steve Maxwell
ENTERED BY: Steve Maxwell

| SPLIT SPOON INTERVAL (ft.) | BLOWS PER 0.5 ft. | % RECOVERY | OVM (ppm) | SOIL DESCRIPTION: moisture, color, fraction, other notes, origin | OBSV. (NONE / ODOR / STAIN / SHEEN) | SAMPLED | LITHOLOGY | DEPTH (ft.) | WELL CONSTRUCTION |
|---|---|---|---|---|---|---|---|---|---|
| 10.0-12.0 | 2,5, 6,9 | 60 | 0.0 | No recovery | | | | 10 | |
| | | | | Moist loose SAND with pebbles, brick, and concrete fragments, FILL | NONE | | | | |
| 12.0-14.0 | 1,1, 1,1 | 65 | | Water Table (Estimated) Saturated, loose SAND with pebbles, brick, and concrete fragments, FILL | | | | | ▼ |
| | | | | No recovery | | | | | |
| | | | | Loose, saturated fine SAND with pebbles, brick, and concrete fragments , FILL | NONE | | | | |
| | | | | Very loose saturated SAND with pebbles, large brick, and concrete fragments, FILL | NONE | | | | |
| | | | | Loose SAND with pebbles, brick, concrete fragments, and black stain, FILL | STAIN | | | | |
| 14.0-16.0 | 4,5, 6,8 | 25 | | No recovery | | | | 15 | |

# SB-13

PROJECT: RG&E East Station
PROJECT NO.: I03002
LOCATION: 78' behind present lab, in old raceway
DATE STARTED: 11/9/98
DATE COMPLETED: 11/9/98
DRILLING CONTRACTOR: Lyon Drilling
DRILLER: Harry Lyon
DRILLING METHOD: 4 1/4" ID Hollow stem auger
SAMPLE METHOD: 2"x2' Split spoon sampler, 300# hammer

GROUND ELEVATION: 406.1
PROTECTIVE CASING ELEVATION: None
WELL ELEVATION (TOC): None
DEPTH TO WATER: 11.9
X-COORDINATE: E 756773.8510
Y-COORDINATE: N 1155938.1210
WEATHER: Rain and cool, 40° F, calm winds
GEOLOGIST/OBSERVER: Steve Maxwell
ENTERED BY: Steve Maxwell

| SPLIT SPOON INTERVAL (ft.) | BLOWS PER 0.5 ft. | % RECOVERY | OVM (ppm) | SOIL DESCRIPTION (moisture, color, fraction, other notes, origin) | OBSV. (NONE / ODOR / STAIN / SHEEN / SAMPLED) | LITHOLOGY | DEPTH (ft.) | WELL CONSTRUCTION |
|---|---|---|---|---|---|---|---|---|
| | | | | | | | 15 | |
| | | | | Firm, saturated, fine SAND with small pebbles, FILL | | | | |
| | | | | Firm, saturated SAND with pebbles, large brick and concrete fragments, FILL | | | | |
| 16.0-18.0 | 9,12, 15,11 | 70 | | No recovery | | | | |
| | | | | Loose, saturated fine SAND with wood, brick fragments, and light purifier odor, FILL | | | | |
| | | | 1.6 | | | | | |
| | | | 0.8 | | | | | |
| | | | 1.1 | | | | | |
| 18.0-20.0 | 2,5, 7,6 | 90 | | | | | | |
| | | | 1.4 | Fine, saturated dark brown SAND with pebbles, brick, concrete fragments, and light odor, FILL | | | | |
| | | | | Loose, saturated black SAND with pebbles, wood, brick fragments, and light odor, FILL | | | | |
| | | | 0.8 | | | | | |
| | | | | Saturated green/grey fine SAND, with light odor, FILL | | | | |
| | | | | Loose black SAND with pebbles, coal fines, and brick fragments, FILL | | | 20 | |

# SB-13

PROJECT: RG&E East Station
PROJECT NO.: 103002
LOCATION: 78' behind present lab, in old raceway
DATE STARTED: 11/9/98
DATE COMPLETED: 11/9/98
DRILLING CONTRACTOR: Lyon Drilling
DRILLER: Harry Lyon
DRILLING METHOD: 4 1/4" ID Hollow stem auger
SAMPLE METHOD: 2"x2' Split spoon sampler, 300# hammer

GROUND ELEVATION: 406.1
PROTECTIVE CASING ELEVATION: None
WELL ELEVATION (TOC): None
DEPTH TO WATER: 11.9
X-COORDINATE: E 756773.9510
Y-COORDINATE: N 1155938.1210
WEATHER: Rain and cool, 40° F, calm winds
GEOLOGIST/OBSERVER: Steve Maxwell
ENTERED BY: Steve Maxwell

| SPLIT SPOON INTERVAL (ft.) | BLOWS PER 0.5 ft. | % RECOVERY | OVM (ppm) | SOIL DESCRIPTION (moisture, color, fraction, other notes, origin) | OBSV. (NONE / ODOR / STAIN / SHEEN) | SAMPLED | LITHOLOGY | DEPTH (ft.) | WELL CONSTRUCTION |
|---|---|---|---|---|---|---|---|---|---|
| 20.0-20.4 | 50 | 100 | | Firm, saturated green/grey fine SAND, with light odor. **FILL** | | | | 20 | |
| | | | | Split spoon refusal | | | | | |
| | | | | Possible void space | | | | | |
| | | | | | | | | | |
| | | | | BEGINNING OF RUN 1. Rochester SHALE medium soft, grey, calcerous with fine bedding | | | | | |
| | | | | Horizontal Fracture (HF) | | | | | |
| | | | | HF with some CLAY | | | | | |
| | | | | HF | | | | | |
| | | | | HF and Vertical Fracture (VF) with iron staining | | | | | |
| | | | | 4" Flush joint casing set | | | | | |
| | | | | HF | | | | | |
| | | | | Grey CLAY seem | | | | | |
| | | | | | | | | | |
| | | | | Grey CLAY seem | | | | | |
| | | | | | | | | | |
| | | | | HF | | | | | |
| | | | | HF | | | | 25 | |

# SB-13

PROJECT: RG&E East Station
PROJECT NO.: I03002
LOCATION: 78' behind present lab, in old raceway
DATE STARTED: 11/9/98
DATE COMPLETED: 11/9/98
DRILLING CONTRACTOR: Lyon Drilling
DRILLER: Harry Lyon
DRILLING METHOD: 4 1/4" ID Hollow stem auger
SAMPLE METHOD: 2"x2' Split spoon sampler, 300# hammer

GROUND ELEVATION: 406.1
PROTECTIVE CASING ELEVATION: None
WELL ELEVATION (TOC): None
DEPTH TO WATER: 11.9
X-COORDINATE: E 756773.9510
Y-COORDINATE: N 1155938.1210
WEATHER: Rain and cool, 40° F, calm winds
GEOLOGIST/OBSERVER: Steve Maxwell
ENTERED BY: Steve Maxwell

| SPLIT SPOON INTERVAL (ft.) | BLOWS PER 0.5 ft. | % RECOVERY | OVM (ppm) | SOIL DESCRIPTION: moisture, color, fraction, other notes, origin | OBSV.: NONE / ODOR / STAIN / SHEEN | SAMPLED | LITHOLOGY | DEPTH (ft.) | WELL CONSTRUCTION |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | 25 | |
| | | | | HF with calcite crystals | | | | | |
| | | | | HF | | | | | |
| | | | | Grey CLAY seem | | | | | |
| | | | | HF | | | | | |
| | | | | END OF RUN 1, RQD = 54.75% | | | | | |
| | | | | BEGINNING OF RUN 2 | | | | | |
| | | | | HF | | | | | |
| | | | | HF | | | | | |
| | | | | Grey CLAY seem | | | | | |
| | | | | HF | | | | | |
| | | | | HF | | | | | |
| | | | | HF | | | | | |
| | | | | HF | | | | | |
| | | | | HF | | | | | |
| | | | | HF | | | | | |
| | | | | VF | | | | 30 | |

# SB-13

PROJECT: RG&E East Station
PROJECT NO.: I03002
LOCATION: 78' behind present lab, in old raceway
DATE STARTED: 11/9/98
DATE COMPLETED: 11/9/98
DRILLING CONTRACTOR: Lyon Drilling
DRILLER: Harry Lyon
DRILLING METHOD: 4 1/4" ID Hollow stem auger
SAMPLE METHOD: 2"x2' Split spoon sampler, 300# hammer

GROUND ELEVATION: 406.1
PROTECTIVE CASING ELEVATION: None
WELL ELEVATION (TOC): None
DEPTH TO WATER: 11.9
X-COORDINATE: E 756773.9510
Y-COORDINATE: N 1155938.1210
WEATHER: Rain and cool, 40° F, calm winds
GEOLOGIST/OBSERVER: Steve Maxwell
ENTERED BY: Steve Maxwell

| SPLIT SPOON INTERVAL (ft.) | BLOWS PER 0.5 ft. | % RECOVERY | OVM (ppm) | SOIL DESCRIPTION (moisture, color, fraction, other notes, origin) | OBSV. NONE | ODOR | STAIN | SHEEN | SAMPLED | LITHOLOGY | DEPTH (ft.) | WELL CONSTRUCTION |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | | | 30 | |
| | | | | HF and VF | | | | | | | | |
| | | | | HF | | | | | | | | |
| | | | | HF with light sheen | | | | | | | | |
| | | | | HF | | | | | | | | |
| | | | | END OF RUN 2, End of Boring, RQD = 65.50%<br>TOTAL DEPTH = 31.5' | | | | | | | | |
| | | | | | | | | | | | 35 | |

# SB-14

PROJECT: RG&E East Station
PROJECT NO.: I03002
LOCATION: Near PZ-02 in possible Hg contaminated area.
DATE STARTED: 11/9/98
DATE COMPLETED: 11/9/98
DRILLING CONTRACTOR: Lyon Drillingng
DRILLER: Harry Lyon
DRILLING METHOD: 4 1/4" ID Hollow stem auger
SAMPLE METHOD: 2"x2' Split spoon sampler, 300# hammer

GROUND ELEVATION: 400.7
PROTECTIVE CASING ELEVATION: None
WELL ELEVATION (TOC): None
DEPTH TO WATER: Not reached
X-COORDINATE: E 756580.0310
Y-COORDINATE: N 1155999.0920
WEATHER: Rain and cold, 40° F, calm winds
GEOLOGIST/OBSERVER: Steve Maxwell
ENTERED BY: Steve Maxwell

| SPLIT SPOON INTERVAL (ft.) | BLOWS PER 0.5 ft. | % RECOVERY | OVM (ppm) | SOIL DESCRIPTION (moisture, color, fraction, other notes, origin) | OBSV. (NONE / ODOR / STAIN / SHEEN / SAMPLED) | LITHOLOGY | DEPTH (ft.) | WELL CONSTRUCTION |
|---|---|---|---|---|---|---|---|---|
| | | | | No recovery | | | 0 | |
| | | | | Dry Brown SAND with some pebbles, FILL | NONE | | | |
| 0.0-2.0 | 3,3, 16,11 | 25 | 0.0 | No recovery | SAMPLED | | | |
| | | | | Brown SAND and CLAY with pebbles and concrete fragments, FILL | NONE, SAMPLED | | | |
| | | | | Grey ash with pebbles, and odor, FILL | ODOR, SAMPLED | | | |
| 2.0-4.0 | 10,8, 6,6 | 75 | 0.0 | Dry coures brown SAND with pebbles, concrete and ash fragments, FILL | NONE, SAMPLED | | | |
| | | | | Grey ash with SAND, pebbles and concrete fragments, FILL | ODOR, SAMPLED | | | |
| | | | | Fine black sand with pebbles and wood fragments, FILL | ODOR, SAMPLED | | 5 | |
| | | | | Soft red SAND with wood fragments, FILL | ODOR, SAMPLED | | | |
| 6.0-8.0 | 11,8, 6,17 | 70 | 0.0 | End of Boring<br>**TOTAL DEPTH = 6.0'** | | | | |
| | | | | | | | 10 | |

# SB-15

PROJECT: RG&E East Station
PROJECT NO.: I03002
LOCATION: Near PZ-02 in possible Hg contaminated area
DATE STARTED: 11/10/98
DATE COMPLETED: 11/10/98
DRILLING CONTRACTOR: Lyon Drilling
DRILLER: Harry Lyon
DRILLING METHOD: 4 1/4" ID Hollow stem auger
SAMPLE METHOD: 2"x2' Split spoon sampler, 300# hammer

GROUND ELEVATION: 411.1
PROTECTIVE CASING ELEVATION: None
WELL ELEVATION (TOC): None
DEPTH TO WATER: 11.4
X-COORDINATE: E 1156057.5690
Y-COORDINATE: N 756951.3370
WEATHER: Rain and cold, 40° F, 10-15 mph winds
GEOLOGIST/OBSERVER: Steve Maxwell
ENTERED BY: Steve Maxwell

| SPLIT SPOON INTERVAL (ft.) | BLOWS PER 0.5 ft. | % RECOVERY | OVM (ppm) | SOIL DESCRIPTION<br>moisture, color, fraction, other notes, origin | OBSV. NONE | ODOR | STAIN | SHEEN | SAMPLED | LITHOLOGY | DEPTH (ft.) | WELL CONSTRUCTION |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Augered to 6.0' | | | | | | | 0 | |
| | | | | | | | | | | | 5 | |

# SB-15

PROJECT: RG&E East Station
PROJECT NO.: I03002
LOCATION: Near PZ-02 in possible Hg contaminated area
DATE STARTED: 11/10/98
DATE COMPLETED: 11/10/98
DRILLING CONTRACTOR: Lyon Drilling
DRILLER: Harry Lyon
DRILLING METHOD: 4 1/4" ID Hollow stem auger
SAMPLE METHOD: 2"x2' Split spoon sampler, 300# hammer

GROUND ELEVATION: 411.1
PROTECTIVE CASING ELEVATION: None
WELL ELEVATION (TOC): None
DEPTH TO WATER: 11.4
X-COORDINATE: E 1156057.5690
Y-COORDINATE: N 756951.3370
WEATHER: Rain and cold, 40° F, 10-15 mph winds
GEOLOGIST/OBSERVER: Steve Maxwell
ENTERED BY: Steve Maxwell

| SPLIT SPOON INTERVAL (ft.) | BLOWS PER 0.5 ft. | % RECOVERY | OVM (ppm) | SOIL DESCRIPTION<br>moisture, color, fraction, other notes, origin | OBSV. NONE | OBSV. ODOR | OBSV. STAIN | OBSV. SHEEN | SAMPLED | LITHOLOGY | DEPTH (ft.) | WELL CONSTRUCTION |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Augered to 6.0' | | | | | | | 5 | |
| 6.0-8.0 | 3,3,<br>1,3 | 30 | 0.0 | No recovery | | | | | | | | |
| | | | | Moist, fine brown SAND and SILT with pebbles, **FILL** | ■ | | | | | | | |
| | | | | Augered to 10.0' | | | | | | | 10 | |

# SB-15

PROJECT: RG&E East Station
PROJECT NO.: I03002
LOCATION: Near PZ-02 in possible Hg contaminated area
DATE STARTED: 11/10/98
DATE COMPLETED: 11/10/98
DRILLING CONTRACTOR: Lyon Drilling
DRILLER: Harry Lyon
DRILLING METHOD: 4 1/4" ID Hollow stem auger
SAMPLE METHOD: 2"x2' Split spoon sampler, 300# hammer

GROUND ELEVATION: 411.1
PROTECTIVE CASING ELEVATION: None
WELL ELEVATION (TOC): None
DEPTH TO WATER: 11.4
X-COORDINATE: E 1156057.5690
Y-COORDINATE: N 756951.3370
WEATHER: Rain and cold, 40° F, 10-15 mph winds
GEOLOGIST/OBSERVER: Steve Maxwell
ENTERED BY: Steve Maxwell

| SPLIT SPOON INTERVAL (ft.) | BLOWS PER 0.5 ft. | % RECOVERY | OVM (ppm) | SOIL DESCRIPTION (moisture, color, fraction, other notes, origin) |
|---|---|---|---|---|
| 10.0-12.0 | 7,6, 2,2 | 30 | | No recovery |
| | | | 0.3 | Soft, saturated fine SAND and SILT with some black stain, **FILL**<br>**Water Table (Estimated)** |
| 12.0-14.0 | 6,4, 2,2 | 60 | | No recovery |
| | | | 1.2 | Saturated fine brown/grey SAND with some SILT, black stain and purifier odor, **FILL** |
| 14.0-16.0 | 2,2, 3,4 | 90 | | Saturated firm, green/grey **SAND** with black stain and purifier odor |

DEPTH (ft.): 10 – 15

# SB-15

PROJECT: RG&E East Station
PROJECT NO.: 103002
LOCATION: Near PZ-02 in possible Hg contaminated area
DATE STARTED: 11/10/98
DATE COMPLETED: 11/10/98
DRILLING CONTRACTOR: Lyon Drilling
DRILLER: Harry Lyon
DRILLING METHOD: 4 1/4" ID Hollow stem auger
SAMPLE METHOD: 2"x2' Split spoon sampler, 300# hammer

GROUND ELEVATION: 411.1
PROTECTIVE CASING ELEVATION: None
WELL ELEVATION (TOC): None
DEPTH TO WATER: 11.4
X-COORDINATE: E 1156057.5690
Y-COORDINATE: N 756951.3370
WEATHER: Rain and cold, 40° F, 10-15 mph winds
GEOLOGIST/OBSERVER: Steve Maxwell
ENTERED BY: Steve Maxwell

| SPLIT SPOON INTERVAL (ft.) | BLOWS PER 0.5 ft. | % RECOVERY | OVM (ppm) | SOIL DESCRIPTION<br>moisture, color, fraction, other notes, origin | OBSV. (NONE / ODOR / STAIN / SHEEN) | SAMPLED | LITHOLOGY | DEPTH (ft.) | WELL CONSTRUCTION |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | 15 | |
| | | | 2.7 | | | | | | |
| | | | | Tight green/grey **CLAY** with layers of **SAND** containing black stain and purifier odor | | | | | |
| 16.0-18.0 | 10,16, 19,26 | 50 | | No recovery | | | | | |
| | | | | Tight olive **CLAY** with layers of pebbles | | | | | |
| 18.0-18.5 | 50 | 100 | 78.2 | Tight, tan **CLAY** with grey bands that contain black stain | | | | | |
| | | | | Split spoon refusal, End of Boring | | | | | |
| | | | | BEGINNING OF RUN 1, **Rochester SHALE** medium soft, grey, calcerous with fine bedding | | | | | |
| | | | | Brown CLAY seem | | | | 20 | |

# SB-15

PROJECT: RG&E East Station
PROJECT NO.: I03002
LOCATION: Near PZ-02 in possible Hg contaminated area
DATE STARTED: 11/10/98
DATE COMPLETED: 11/10/98
DRILLING CONTRACTOR: Lyon Drilling
DRILLER: Harry Lyon
DRILLING METHOD: 4 1/4" ID Hollow stem auger
SAMPLE METHOD: 2"x2' Split spoon sampler, 300# hammer

GROUND ELEVATION: 411.1
PROTECTIVE CASING ELEVATION: None
WELL ELEVATION (TOC): None
DEPTH TO WATER: 11.4
X-COORDINATE: E 1156057.5690
Y-COORDINATE: N 756951.3370
WEATHER: Rain and cold, 40° F, 10-15 mph winds
GEOLOGIST/OBSERVER: Steve Maxwell
ENTERED BY: Steve Maxwell

| SPLIT SPOON INTERVAL (ft.) | BLOWS PER 0.5 ft. | % RECOVERY | OVM (ppm) | SOIL DESCRIPTION — moisture, color, fraction, other notes, origin | OBSV. NONE | ODOR | STAIN | SHEEN | SAMPLED | LITHOLOGY | DEPTH (ft.) | WELL CONSTRUCTION |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | 4" Flush joint casing set | | | | | | | 20 | |
| | | | | Brown CLAY seem | | | | | | | | |
| | | | | Grey SHALE with Vertical Crack (VC) | | | | | | | | |
| | | | | Grey CLAY seem | | | | | | | | |
| | | | | Horizontal Fracture (HF) | | | | | | | | |
| | | | | HF | | | | | | | | |
| | | | | HF | | | | | | | | |
| | | | | Grey CLAY seem | | | | | | | | |
| | | | | Grey SHALE | | | | | | | | |
| | | | | Grey CLAY seem | | | | | | | | |
| | | | | Grey SHALE | | | | | | | | |
| | | | | Grey CLAY seem | | | | | | | | |
| | | | | Grey SHALE | | | | | | | | |
| | | | | END OF RUN 1, RQD = 49.38% | | | | | | | | |
| | | | | BEGINNING OF RUN 2, Grey SHALE | | | | | | | | |
| | | | | HF | | | | | | | | |
| | | | | Grey CLAY seem | | | | | | | | |
| | | | | Grey SHALE | | | | | | | 25 | |

# SB-15

PROJECT: RG&E East Station
PROJECT NO.: 103002
LOCATION: Near PZ-02 in possible Hg contaminated area
DATE STARTED: 11/10/98
DATE COMPLETED: 11/10/98
DRILLING CONTRACTOR: Lyon Drilling
DRILLER: Harry Lyon
DRILLING METHOD: 4 1/4" ID Hollow stem auger
SAMPLE METHOD: 2"x2' Split spoon sampler, 300# hammer

GROUND ELEVATION: 411.1
PROTECTIVE CASING ELEVATION: None
WELL ELEVATION (TOC): None
DEPTH TO WATER: 11.4
X-COORDINATE: E 1156057.5690
Y-COORDINATE: N 756951.3370
WEATHER: Rain and cold, 40° F, 10-15 mph winds
GEOLOGIST/OBSERVER: Steve Maxwell
ENTERED BY: Steve Maxwell

| SPLIT SPOON INTERVAL (ft.) | BLOWS PER 0.5 ft. | % RECOVERY | OVM (ppm) | SOIL DESCRIPTION moisture, color, fraction, other notes, origin | OBSV. NONE | ODOR | STAIN | SHEEN | SAMPLED | LITHOLOGY | DEPTH (ft.) | WELL CONSTRUCTION |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | | | 25 | |
| | | | | HF | | | | | | | | |
| | | | | Brown Clay seem | | | | | | | | |
| | | | | Grey SHALE with Vertical Crack (VC) | | | | | | | | |
| | | | | Grey CLAY seem | | | | | | | | |
| | | | | Grey SHALE | | | | | | | | |
| | | | | Grey CLAY seem | | | | | | | | |
| | | | | Grey SHALE | | | | | | | | |
| | | | | Brown CLAY seem | | | | | | | | |
| | | | | Grey SHALE | | | | | | | | |
| | | | | HF with black stain and sheen | | | | | | | | |
| | | | | HF | | | | | | | | |
| | | | | Brown CLAY seem | | | | | | | | |
| | | | | Grey SHALE | | | | | | | | |
| | | | | HF and Vertical Fracture (VF) | | | | | | | | |
| | | | | HF | | | | | | | | |
| | | | | Grey CLAY seem | | | | | | | | |
| | | | | END OF RUN 2, RQD = 20.83% TOTAL DEPTH = 29.0' | | | | | | | | |
| | | | | | | | | | | | 30 | |

# SB-16

PROJECT: RG&E East Station
PROJECT NO.: 103002
LOCATION: By fenceline near old surge tanks
DATE STARTED: 11/10/98
DATE COMPLETED: 11/10/98
DRILLING CONTRACTOR: Lyon Drilling
DRILLER: Harry Lyon
DRILLING METHOD: 4 1/4" ID Hollow stem auger
SAMPLE METHOD: 2"x2' Split spoon sampler, 300# hammer

GROUND ELEVATION: 425.3
PROTECTIVE CASING ELEVATION: None
WELL ELEVATION (TOC): None
DEPTH TO WATER: 17.1
X-COORDINATE: E 757115.6260
Y-COORDINATE: N 1155276.9940
WEATHER: Rain and cold, 40° F, 10-15 mph winds
GEOLOGIST/OBSERVER: Steve Maxwell
ENTERED BY: Steve Maxwell

| SPLIT SPOON INTERVAL (ft.) | BLOWS PER 0.5 ft. | % RECOVERY | OVM (ppm) | SOIL DESCRIPTION (moisture, color, fraction, other notes, origin) | OBSV. (NONE / ODOR / STAIN / SHEEN) | SAMPLED | LITHOLOGY | DEPTH (ft.) | WELL CONSTRUCTION |
|---|---|---|---|---|---|---|---|---|---|
| | | | | Auger to 6.0'. | | | | 0 | |
| | | | | | | | | 5 | |
| 6.0-8.0 | 11,16, 26,33 | 55 | 0.0 | No recovery | | | | | |
| | | | | Red CLAY and SILT with brick, glass, concrete, pebbles, and coal fragments, **FILL** | NONE | | | | |
| | | | | Augered to 12.0' | | | | 10 | |
| 12.0-14.0 | 10,11, 14,16 | 55 | 0.0 | No recovery | | | | | |
| | | | | Dry to moist tan CLAY and SILT with some SAND brick and concrete fragments, FILL | NONE | | | | |
| | | | | Augered to 18.0' | | | | 15 | |

# SB-16

PROJECT: RG&E East Station
PROJECT NO.: 103002
LOCATION: By fenceline near old surge tanks
DATE STARTED: 11/10/98
DATE COMPLETED: 11/10/98
DRILLING CONTRACTOR: Lyon Drilling
DRILLER: Harry Lyon
DRILLING METHOD: 4 1/4" ID Hollow stem auger
SAMPLE METHOD: 2"x2' Split spoon sampler, 300# hammer

GROUND ELEVATION: 425.3
PROTECTIVE CASING ELEVATION: None
WELL ELEVATION (TOC): None
DEPTH TO WATER: 17.1
X-COORDINATE: E 757115.6260
Y-COORDINATE: N 1155276.9940
WEATHER: Rain and cold, 40° F, 10-15 mph winds
GEOLOGIST/OBSERVER: Steve Maxwell
ENTERED BY: Steve Maxwell

| SPLIT SPOON INTERVAL (ft.) | BLOWS PER 0.5 ft. | % RECOVERY | OVM (ppm) | SOIL DESCRIPTION (moisture, color, fraction, other notes, origin) | OBSV. (NONE / ODOR / STAIN / SHEEN / SAMPLED) | LITHOLOGY | DEPTH (ft.) | WELL CONSTRUCTION |
|---|---|---|---|---|---|---|---|---|
| | | | | Augered to 18.0' | | | 15 | |
| | | | | Water Table (Estimated) | | | | ▼ |
| 18.0-20.0 | 5,11, 5,1 | 45 | | No recovery | | | | |
| | | | 18.6 | Firm brown CLAY with bands of SAND and pebbles containing TAR | | | | |
| 20.0-22.0 | 7,17, 5,11 | 40 | | No recovery | | | 20 | |
| | | | 5.8 | Firm olive CLAY with red and black staining | | | | |
| 22.0-23.3 | 15,16, 50 | 38 | | No recovery | | | | |
| | | | | Firm olive CLAY with layers of SAND containing TAR | | | | |
| | | | | Brown weathered SHALE with TAR | | | | |
| | | | | Split spoon refusal, End of Boring TOTAL DEPTH = 23.1' | | | | |
| | | | | | | | 25 | |
| | | | | | | | 30 | |

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# SB-17

PROJECT: RG&E East Station
PROJECT NO.: I03002
LOCATION: In center of the tar well
DATE STARTED: 11/11/98
DATE COMPLETED: 11/11/98
DRILLING CONTRACTOR: Lyon Drilling
DRILLER: Harry Lyon
DRILLING METHOD: 4 1/4" ID Hollow stem auger
SAMPLE METHOD: 2"x2' Split spoon sampler, 300# hammer

GROUND ELEVATION: N/A
PROTECTIVE CASING ELEVATION: None
WELL ELEVATION (TOC): None
DEPTH TO WATER: 11.9
X-COORDINATE: N/A
Y-COORDINATE: N/A
WEATHER: Cool and cloudy, 40° F, strong wind 25
GEOLOGIST/OBSERVER: Steve Maxwell
ENTERED BY: Steve Maxwell

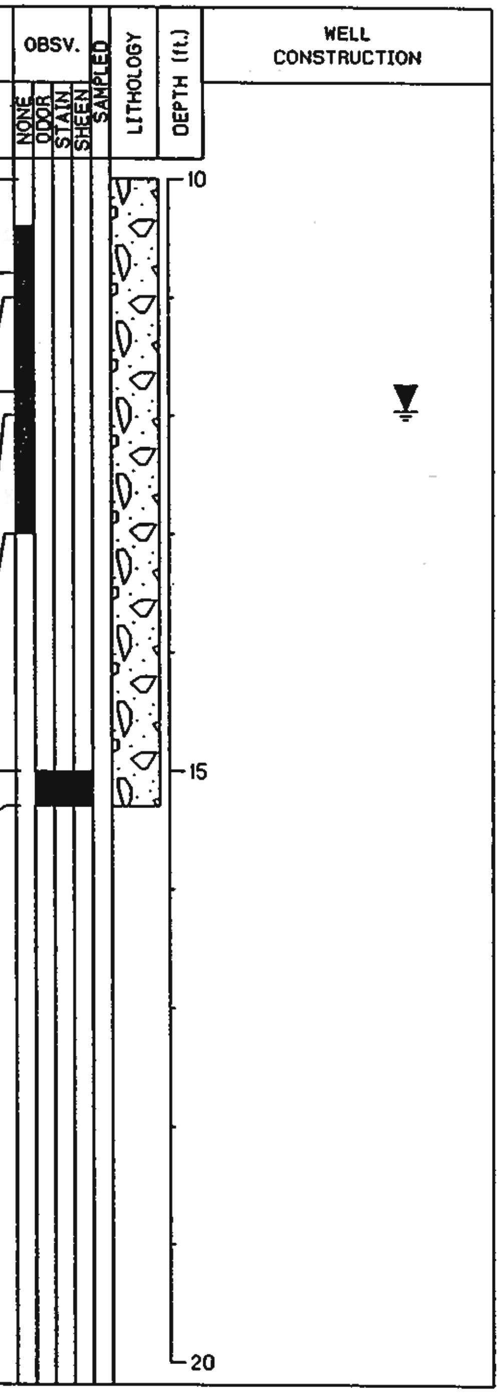
| SPLIT SPOON INTERVAL (ft.) | BLOWS PER 0.5 ft. | % RECOVERY | OVM (ppm) | SOIL DESCRIPTION | OBSV. | | | | | LITHOLOGY | DEPTH (ft.) | WELL CONSTRUCTION |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | moisture, color, fraction, other notes, origin | NONE | ODOR | STAIN | SHEEN | SAMPLED | | | |
| | | | | Auger to 9.0'. | | | | | | | 0 | |
| | | | | | | | | | | | 5 | |
| 9.0-11.0 | 11,11, 14,16 | 80 | 0.0 | No recovery | | | | | | | | |
| | | | | Fine SAND with some SILT and pebbles, FILL | | | | | | | 10 | |

# SB-17

PROJECT: RG&E East Station
PROJECT NO.: 103002
LOCATION: In center of the tar well
DATE STARTED: 11/11/98
DATE COMPLETED: 11/11/98
DRILLING CONTRACTOR: Lyon Drilling
DRILLER: Harry Lyon
DRILLING METHOD: 4 1/4" ID Hollow stem auger
SAMPLE METHOD: 2"x2' Split spoon sampler, 300# hammer

GROUND ELEVATION: N/A
PROTECTIVE CASING ELEVATION: None
WELL ELEVATION (TOC): None
DEPTH TO WATER: 11.9
X-COORDINATE: N/A
Y-COORDINATE: N/A
WEATHER: Cool and cloudy, 40° F, strong wind 25
GEOLOGIST/OBSERVER: Steve Maxwell
ENTERED BY: Steve Maxwell

| SPLIT SPOON INTERVAL (ft.) | BLOWS PER 0.5 ft. | % RECOVERY | OVM (ppm) | SOIL DESCRIPTION (moisture, color, fraction, other notes, origin) |
|---|---|---|---|---|
| | | | | Fine SAND with some SILT and pebbles, **FILL** |
| 11.0-13.0 | 8,7, 5,7 | 60 | 0.0 | Loose, moist SAND with pebbles, coal and clincker ash fragments, **FILL** |
| | | | | No recovery |
| | | | | Loose moist to wet SAND with brick and coal fragments, **FILL**, **Water Table (Estimated)** |
| 13.0-15.0 | 3,4, 4,7 | 0.0 | | Loose, saturated course SAND and pebbles with coal, brick, and clinker ash fragments, **FILL** |
| | | | | No recovery |
| 15.0-15.3 | 50 | | | Thick viscous **TAR** layer "taffy tar" |
| | | | | Split spoon and auger refusal, End of Boring **TOTAL DEPTH = 15.3'** |

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# SB-17B

PROJECT: RG&E East Station
PROJECT NO.: 103002
LOCATION: About 4' east of SB-17
DATE STARTED: 11/11/98
DATE COMPLETED: 11/11/98
DRILLING CONTRACTOR: Lyon Drilling
DRILLER: Harry Lyon
DRILLING METHOD: 4 1/4" ID Hollow stem auger
SAMPLE METHOD: 2"x2' Split spoon sampler, 300# hammer

GROUND ELEVATION: 425.8
PROTECTIVE CASING ELEVATION: None
WELL ELEVATION (TOC): None
DEPTH TO WATER: 11.9
X-COORDINATE: E 757280.0110
Y-COORDINATE: N 1155559.6180
WEATHER: Cool and cloudy, 40° F, strong wind 25
GEOLOGIST/OBSERVER: Steve Maxwell
ENTERED BY: Steve Maxwell

| SPLIT SPOON INTERVAL (ft.) | BLOWS PER 0.5 ft. | % RECOVERY | OVM (ppm) | SOIL DESCRIPTION moisture, color, fraction, other notes, origin | OBSV. NONE | ODOR | STAIN | SHEEN | SAMPLED | LITHOLOGY | DEPTH (ft.) | WELL CONSTRUCTION |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Augered to 15.0' | | | | | | | 0 | |
| | | | | | | | | | | | 5 | |
| | | | | | | | | | | | 10 | |
| | | | | Water Table (Estimated) | | | | | | | | ▼ |
| | | | | | | | | | | | 15 | |

# SB-17B

PROJECT: RG&E East Station
PROJECT NO.: I03002
LOCATION: About 4' east of SB-17
DATE STARTED: 11/11/98
DATE COMPLETED: 11/11/98
DRILLING CONTRACTOR: Lyon Drilling
DRILLER: Harry Lyon
DRILLING METHOD: 4 1/4" ID Hollow stem auger
SAMPLE METHOD: 2"x2' Split spoon sampler, 300# hammer

GROUND ELEVATION: 425.8
PROTECTIVE CASING ELEVATION: None
WELL ELEVATION (TOC): None
DEPTH TO WATER: 11.9
X-COORDINATE: E 757280.0110
Y-COORDINATE: N 1155559.6180
WEATHER: Cool and cloudy, 40° F, strong wind 25
GEOLOGIST/OBSERVER: Steve Maxwell
ENTERED BY: Steve Maxwell

| SPLIT SPOON INTERVAL (ft.) | BLOWS PER 0.5 ft. | % RECOVERY | OVM (ppm) | SOIL DESCRIPTION (moisture, color, fraction, other notes, origin) | OBSV. (NONE / ODOR / STAIN / SHEEN / SAMPLED) | LITHOLOGY | DEPTH (ft.) | WELL CONSTRUCTION |
|---|---|---|---|---|---|---|---|---|
| 15.0-17.0 | 2,2 2,2 | 20 | | No recovery | | | 15 | |
| 17.0-19.0 | 2,3, 10,12 | 43 | 0.7 | Loose, saturated course SAND with brick, clinker ash, and concrete. **FILL** | | | | |
| | | | | No recovery | | | | |
| | | | 0.3 4.3 | Loose, saturated course SAND with brick, clinker ash, and concrete fragments. **FILL** | | | | |
| 19.0-20.1 | 7,6, 50 | 78 | 24.2 | Loose course **FILL** with SAND and brick, clinker ash, and concrete fragments | | | 20 | |
| | | | | Course **FILL** saturated with thick plastic **TAR** "taffy tar" | | | | |
| | | | | Brick, Bottom of tar well **TOTAL DEPTH = 20.1'** | | | | |
| | | | | | | | 25 | |
| | | | | | | | 30 | |

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# SB-18B

PROJECT: RG&E East Station
PROJECT NO.: 103002
LOCATION: 36'NE of center of the tar well
DATE STARTED: 11/11/98
DATE COMPLETED: 11/11/98
DRILLING CONTRACTOR: Lyon Drilling
DRILLER: Harry Lyon
DRILLING METHOD: 4 1/4" ID Hollow stem auger
SAMPLE METHOD: 2"x2' Split spoon sampler, 300# hammer

GROUND ELEVATION: 427.1
PROTECTIVE CASING ELEVATION: None
WELL ELEVATION (TOC): None
DEPTH TO WATER: 14.4
X-COORDINATE: E 757296.0150
Y-COORDINATE: N 1155588.9540
WEATHER: Cool and cloudy, 40° F, strong wind 25
GEOLOGIST/OBSERVER: Steve Maxwell
ENTERED BY: Steve Maxwell

| SPLIT SPOON INTERVAL (ft.) | BLOWS PER 0.5 ft. | % RECOVERY | OVM (ppm) | SOIL DESCRIPTION<br>moisture, color, fraction, other notes, origin | OBSV. NONE | ODOR | STAIN | SHEEN | SAMPLED | LITHOLOGY | DEPTH (ft.) | WELL CONSTRUCTION |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Auger to 9.0'. | | | | | | | 0 | |
| | | | | | | | | | | | 5 | |
| 9.0-11.0 | 10,24, 35,50 | 56 | None | No recovery | | | | | | | 10 | |

# SB-18B

PROJECT: RG&E East Station
PROJECT NO.: 103002
LOCATION: 36'NE of center of the tar well
DATE STARTED: 11/11/98
DATE COMPLETED: 11/11/98
DRILLING CONTRACTOR: Lyon Drilling
DRILLER: Harry Lyon
DRILLING METHOD: 4 1/4" ID Hollow stem auger
SAMPLE METHOD: 2"x2' Split spoon sampler, 300# hammer

GROUND ELEVATION: 427.1
PROTECTIVE CASING ELEVATION: None
WELL ELEVATION (TOC): None
DEPTH TO WATER: 14.4
X-COORDINATE: E 757296.0150
Y-COORDINATE: N 1155588.9540
WEATHER: Cool and cloudy, 40° F, strong wind 25
GEOLOGIST/OBSERVER: Steve Maxwell
ENTERED BY: Steve Maxwell

| SPLIT SPOON INTERVAL (ft.) | BLOWS PER 0.5 ft. | % RECOVERY | OVM (ppm) | SOIL DESCRIPTION (moisture, color, fraction, other notes, origin) | DEPTH (ft.) |
|---|---|---|---|---|---|
| | | | | | 10 |
| | | | | Fine dry SAND and SILT with grey ash, clinker ash, and brick fragments , FILL | |
| | | | | Loose moist SAND with brick and ash fragments, FILL | |
| 11.5-13.0 | 9,8, 7 | 40 | | Augered through bricks | |
| | | | | No recovery | |
| | | | | Brick with concrete cementing | |
| 13.0-15.0 | 11,6, 6,10 | 45 | None | No recovery | |
| | | | | Brick and concrete cementing | |
| | | | | Water Table (Estimated) | |
| 15.0-17.0 | 2,2, 2,3 | 0 | | Fine saturated grey SAND and black ash fragments, FILL | 15 |
| | | | | No recovery | |
| 17.0-19.0 | 2,2, 2,2 | 30 | None | No recovery | |
| 19.0-21.0 | 1,1, 1,1 | 0 | | Very course Loose FILL containing, clinker ash, brick, fire brick fragments and SAND with black stain | |
| | | | | No recovery | 20 |

OBSV. columns: NONE, ODOR, STAIN, SHEEN, SAMPLED. LITHOLOGY. WELL CONSTRUCTION.

# SB-18B

PROJECT: RG&E East Station
PROJECT NO.: I03002
LOCATION: 36'NE of center of the tar well
DATE STARTED: 11/11/98
DATE COMPLETED: 11/11/98
DRILLING CONTRACTOR: Lyon Drilling
DRILLER: Harry Lyon
DRILLING METHOD: 4 1/4" ID Hollow stem auger
SAMPLE METHOD: 2"x2' Split spoon sampler, 300# hammer

GROUND ELEVATION: 427.1
PROTECTIVE CASING ELEVATION: None
WELL ELEVATION (TOC): None
DEPTH TO WATER: 14.4
X-COORDINATE: E 757296.0150
Y-COORDINATE: N 1155588.9540
WEATHER: Cool and cloudy, 40° F, strong wind 25
GEOLOGIST/OBSERVER: Steve Maxwell
ENTERED BY: Steve Maxwell

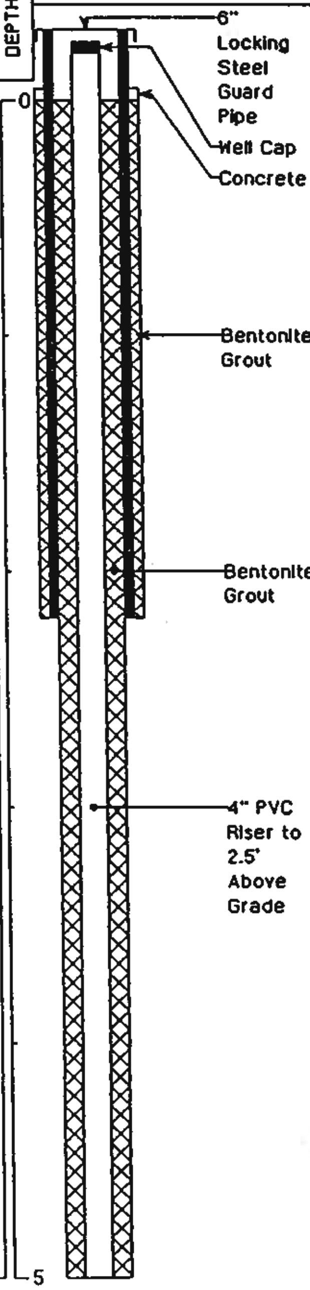
| SPLIT SPOON INTERVAL (ft.) | BLOWS PER 0.5 ft. | % RECOVERY | OVM (ppm) | SOIL DESCRIPTION (moisture, color, fraction, other notes, origin) | OBSV. (NONE / ODOR / STAIN / SHEEN / SAMPLED) | LITHOLOGY | DEPTH (ft.) | WELL CONSTRUCTION |
|---|---|---|---|---|---|---|---|---|
| | | | | | | | 20 | |
| 21.0-23.0 | 1,3, 6,5 | 25 | None | No recovery | | | | |
| | | | | Very loose **FILL** containing brick , ash, and coal fragments with flowing **TAR** | ODOR, SHEEN, SAMPLED | | | |
| 23.0-25.0 | 1,5, 6,7 | 50 | | No recovery | | | | |
| | | | | Course **FILL** with thick plastic **TAR** "taffy tar" | ODOR, SHEEN, SAMPLED | | 25 | |
| | | | | Brick, Bottom of tar well, End of Boring **TOTAL DEPTH = 25.0'** | | | | |
| | | | | | | | 30 | |

# SB-19/MW-10

PROJECT: RG&E East Station
PROJECT NO.: I03002
LOCATION: 40' South of center of tar well
DATE STARTED: 11/11/98
DATE COMPLETED: 11/11/98
DRILLING CONTRACTOR: Lyon Drilling
DRILLER: Harry Lyon
DRILLING METHOD: 4 1/4" ID Hollow stem auger
SAMPLE METHOD: 2"x2' Split spoon sampler, 300# hammer

GROUND ELEVATION: 425.9
PROTECTIVE CASING ELEVATION: 428.46
WELL ELEVATION (TOC): N/A
DEPTH TO WATER: 12.1
X-COORDINATE: E 757240.0700
Y-COORDINATE: N 1155547.7110
WEATHER: Cool and cloudy, 40° F, strong wind 25
GEOLOGIST/OBSERVER: Steve Maxwell
ENTERED BY: Steve Maxwell

| SPLIT SPOON INTERVAL (ft.) | BLOWS PER 0.5 ft. | % RECOVERY | OVM (ppm) | SOIL DESCRIPTION<br>moisture, color, fraction, other notes, origin | OBSV. NONE | OBSV. ODOR | OBSV. STAIN | OBSV. SHEEN | SAMPLED | LITHOLOGY | DEPTH (ft.) | WELL CONSTRUCTION |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Augered to 9.0' | | | | | | | 0 | |
| | | | | | | | | | | | 5 | |



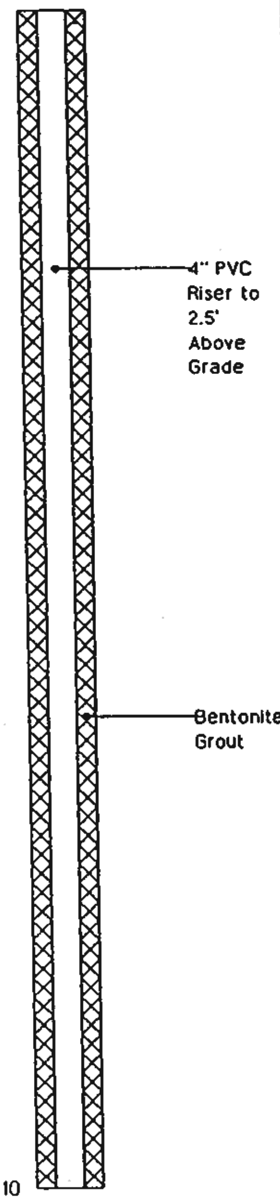
# SB-19/MW-10

PROJECT: RG&E East Station
PROJECT NO.: 103002
LOCATION: 40' South of center of tar well
DATE STARTED: 11/11/98
DATE COMPLETED: 11/11/98
DRILLING CONTRACTOR: Lyon Drilling
DRILLER: Harry Lyon
DRILLING METHOD: 4 1/4" ID Hollow stem auger
SAMPLE METHOD: 2"x2' Split spoon sampler, 300# hammer

GROUND ELEVATION: 425.9
PROTECTIVE CASING ELEVATION: 428.46
WELL ELEVATION (TOC): N/A
DEPTH TO WATER: 12.1
X-COORDINATE: E 757240.0700
Y-COORDINATE: N 1155547.7110
WEATHER: Cool and cloudy, 40° F, strong wind 25
GEOLOGIST/OBSERVER: Steve Maxwell
ENTERED BY: Steve Maxwell

| SPLIT SPOON INTERVAL (ft.) | BLOWS PER 0.5 ft. | % RECOVERY | OVM (ppm) | SOIL DESCRIPTION: moisture, color, fraction, other notes, origin | OBSV. (NONE / ODOR / STAIN / SHEEN) | SAMPLED | LITHOLOGY | DEPTH (ft.) |
|---|---|---|---|---|---|---|---|---|
| | | | | Augered to 9.0' | | | | 5 |
| 9.0-11.0 | 3,7, 5,4 | 80 | None | No recovery | | | | |
| | | | | Firm, fine brown SAND with pebbles, brick, ash, and concrete fragments **FILL** | | | | 10 |

WELL CONSTRUCTION

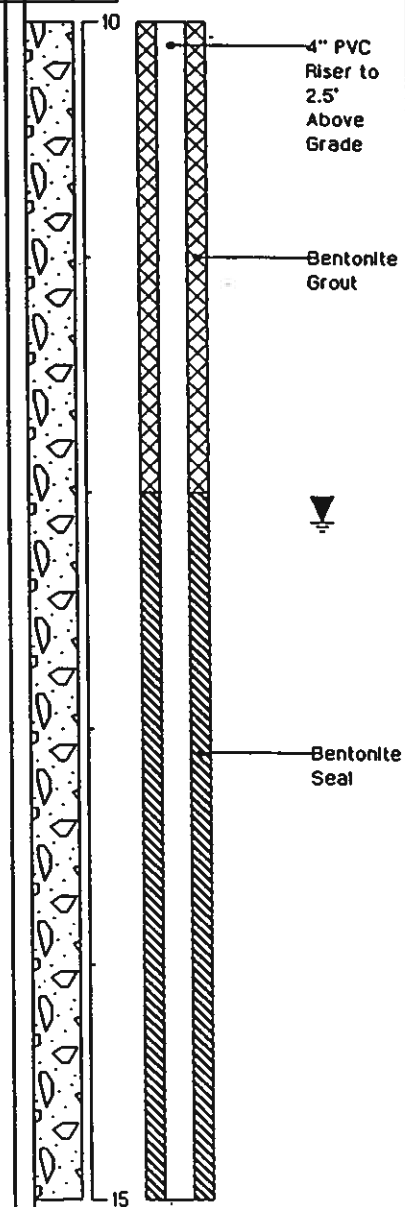


# SB-19/MW-10

PROJECT: RG&E East Station
PROJECT NO.: 103002
LOCATION: 40' South of center of tar well
DATE STARTED: 11/11/98
DATE COMPLETED: 11/11/98
DRILLING CONTRACTOR: Lyon Drilling
DRILLER: Harry Lyon
DRILLING METHOD: 4 1/4" ID Hollow stem auger
SAMPLE METHOD: 2"x2' Split spoon sampler, 300# hammer

GROUND ELEVATION: 425.9
PROTECTIVE CASING ELEVATION: 428.46
WELL ELEVATION (TOC): N/A
DEPTH TO WATER: 12.1
X-COORDINATE: E 757240.0700
Y-COORDINATE: N 1155547.7110
WEATHER: Cool and cloudy, 40° F, strong wind 25
GEOLOGIST/OBSERVER: Steve Maxwell
ENTERED BY: Steve Maxwell

| SPLIT SPOON INTERVAL (ft.) | BLOWS PER 0.5 ft. | % RECOVERY | OVM (ppm) | SOIL DESCRIPTION (moisture, color, fraction, other notes, origin) |
|---|---|---|---|---|
| | | | | Loose, dry SAND with pebbles, brick, and ash fragments, FILL |
| 11.0-13.0 | 4,3, 3,1 | 70 | | No recovery |
| | | | | Loose, wet to saturated coarse SAND with clinker ash and brick fragments, FILL<br>**Water Table (Estimated)** |
| 13.0-15.0 | 2,1, 1,2 | 25 | None | No recovery |
| | | | | Course saturated coarse SAND with clinker ash, brick, and concrete fragments, FILL |



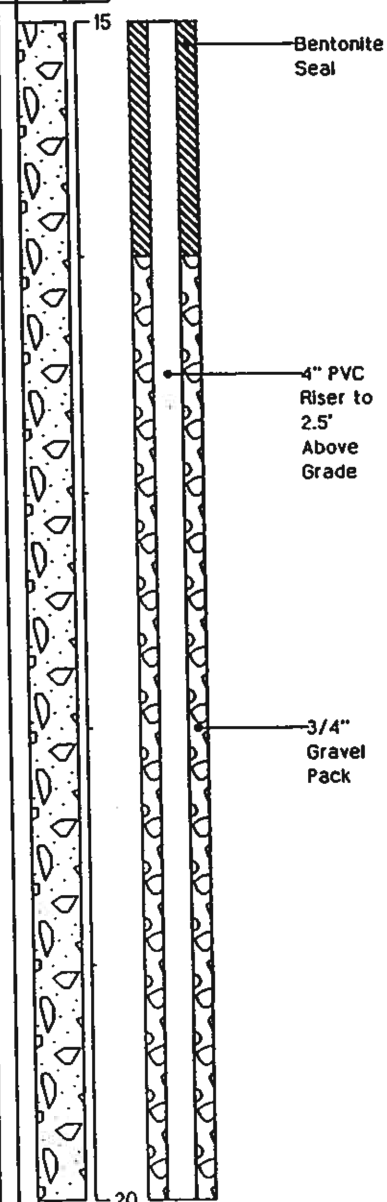
# SB-19/MW-10

PROJECT: RG&E East Station
PROJECT NO.: 103002
LOCATION: 40' South of center of tar well
DATE STARTED: 11/11/98
DATE COMPLETED: 11/11/98
DRILLING CONTRACTOR: Lyon Drilling
DRILLER: Harry Lyon
DRILLING METHOD: 4 1/4" ID Hollow stem auger
SAMPLE METHOD: 2"x2' Split spoon sampler, 300# hammer

GROUND ELEVATION: 425.9
PROTECTIVE CASING ELEVATION: 428.46
WELL ELEVATION (TOC): N/A
DEPTH TO WATER: 12.1
X-COORDINATE: E 757240.0700
Y-COORDINATE: N 1155547.7110
WEATHER: Cool and cloudy, 40° F, strong wind 25
GEOLOGIST/OBSERVER: Steve Maxwell
ENTERED BY: Steve Maxwell

| SPLIT SPOON INTERVAL (ft.) | BLOWS PER 0.5 ft. | % RECOVERY | OVM (ppm) | SOIL DESCRIPTION (moisture, color, fraction, other notes, origin) | OBSV. (NONE / ODOR / STAIN / SHEEN) | SAMPLED |
|---|---|---|---|---|---|---|
| 15.0-17.0 | 3,1, 1,1 | 15 | | No recovery | | |
| | | | | Loose, saturated coarse **FILL** containing clinker ash, concrete fragments, and SAND | NONE | |
| 17.0-19.0 | 2,1, 2,1 | 20 | None | No recovery | | |
| | | | | Loose coarse **FILL** containing clinker ash, brick fragments and SAND | NONE | |
| 19.0-21.0 | 1 for 1',1, 1 | 30 | | No recovery | | |

LITHOLOGY / DEPTH (ft.) / WELL CONSTRUCTION

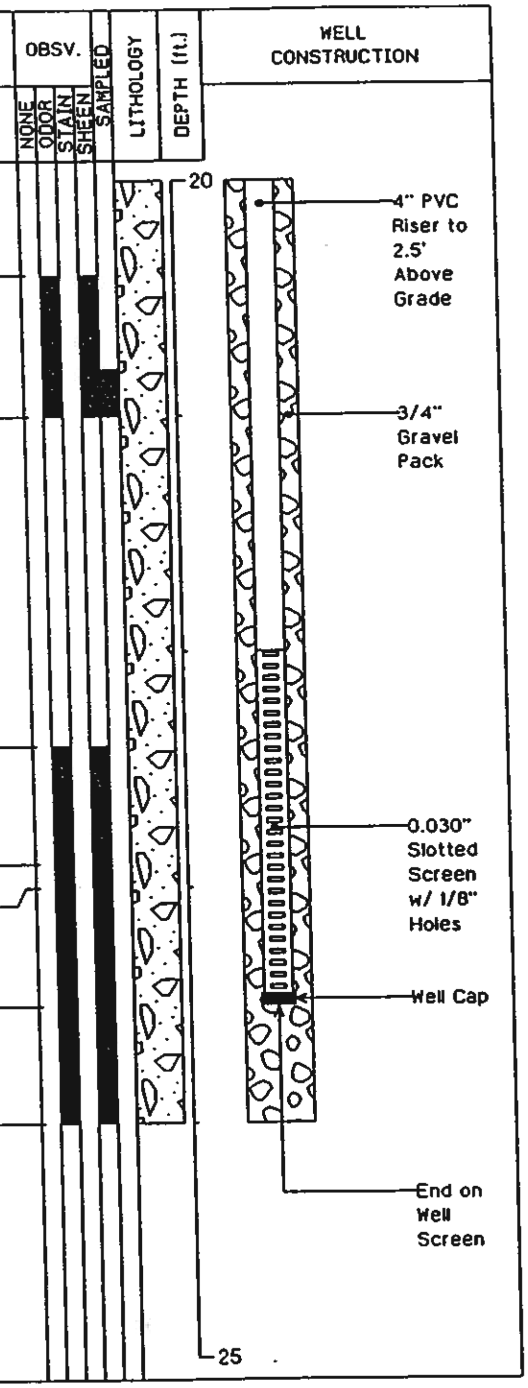


# SB-19/MW-10

PROJECT: RG&E East Station
PROJECT NO.: 103002
LOCATION: 40' South of center of tar well
DATE STARTED: 11/11/98
DATE COMPLETED: 11/11/98
DRILLING CONTRACTOR: Lyon Drilling
DRILLER: Harry Lyon
DRILLING METHOD: 4 1/4" ID Hollow stem auger
SAMPLE METHOD: 2"x2' Split spoon sampler, 300# hammer

GROUND ELEVATION: 425.9
PROTECTIVE CASING ELEVATION: 428.46
WELL ELEVATION (TOC): N/A
DEPTH TO WATER: 12.1
X-COORDINATE: E 757240.0700
Y-COORDINATE: N 1155547.7110
WEATHER: Cool and cloudy, 40° F, strong wind 25
GEOLOGIST/OBSERVER: Steve Maxwell
ENTERED BY: Steve Maxwell

| SPLIT SPOON INTERVAL (ft.) | BLOWS PER 0.5 ft. | % RECOVERY | OVM (ppm) | SOIL DESCRIPTION (moisture, color, fraction, other notes, origin) |
|---|---|---|---|---|
| | | | | Loose, saturated coarse **FILL** containing clinker ash and **TAR** |
| 21.0-23.0 | 1,6, 8,11 | 25 | None | No recovery |
| | | | | Coarse SAND **FILL** with clinker ash and viscous flowing **TAR** |
| | | | | Soft brick with viscous flowing **TAR** |
| 23.0-24.0 | 5,7 | 100 | | Coarse SAND with clinker ash, brick fragments, and viscous flowing **TAR, FILL** |
| | | | | Dense plastic **TAR** "taffy tar" |
| | | | | Brick, Bottom of tar well, End of Boring **TOTAL DEPTH = 24.0'** |

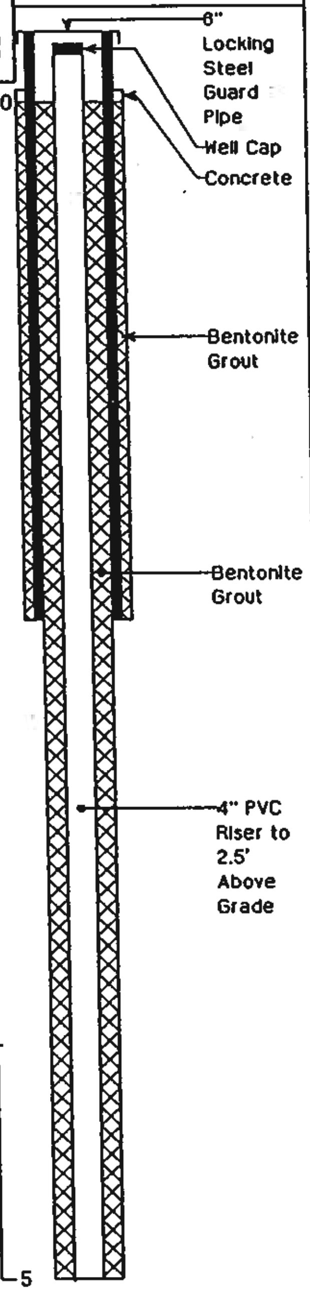


# SB-20/MW-9

PROJECT: RG&E East Station
PROJECT NO.: I03002
LOCATION: 39' North of center of tar well
DATE STARTED: 11/12/98
DATE COMPLETED: 11/12/98
DRILLING CONTRACTOR: Lyon Drilling
DRILLER: Harry Lyon
DRILLING METHOD: 4 1/4" ID Hollow stem auger
SAMPLE METHOD: 2"x2' Split spoon sampler, 300# hammer

GROUND ELEVATION: 426.4
PROTECTIVE CASING ELEVATION: N/A
WELL ELEVATION (TOC): 429.01
DEPTH TO WATER: 12.9
X-COORDINATE: E 757254.1260
Y-COORDINATE: N 1155587.4970
WEATHER: Clear and cool 40° F, 5-10 mph wind
GEOLOGIST/OBSERVER: Steve Maxwell
ENTERED BY: Steve Maxwell

| SPLIT SPOON INTERVAL (ft.) | BLOWS PER 0.5 ft. | % RECOVERY | OVM (ppm) | SOIL DESCRIPTION<br>moisture, color, fraction, other notes, origin | OBSV. NONE | ODOR | STAIN | SHEEN | SAMPLED | LITHOLOGY | DEPTH (ft.) | WELL CONSTRUCTION |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Augered to 9.0' | | | | | | | 0 | |
| | | | | | | | | | | | 5 | |



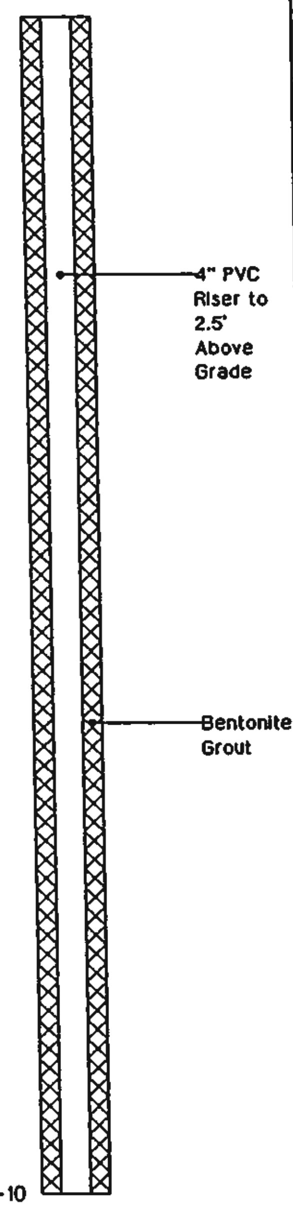
# SB-20/MW-9

PROJECT: RG&E East Station
PROJECT NO.: I03002
LOCATION: 39' North of center of tar well
DATE STARTED: 11/12/98
DATE COMPLETED: 11/12/98
DRILLING CONTRACTOR: Lyon Drilling
DRILLER: Harry Lyon
DRILLING METHOD: 4 1/4" ID Hollow stem auger
SAMPLE METHOD: 2"x2' Split spoon sampler, 300# hammer

GROUND ELEVATION: 426.4
PROTECTIVE CASING ELEVATION: N/A
WELL ELEVATION (TOC): 429.01
DEPTH TO WATER: 12.9
X-COORDINATE: E 757254.1260
Y-COORDINATE: N 1155587.4970
WEATHER: Clear and cool 40° F, 5-10 mph win
GEOLOGIST/OBSERVER: Steve Maxwell
ENTERED BY: Steve Maxwell

| SPLIT SPOON INTERVAL (ft.) | BLOWS PER 0.5 ft. | % RECOVERY | OVM (ppm) | SOIL DESCRIPTION (moisture, color, fraction, other notes, origin) | OBSV. (NONE / ODOR / STAIN / SHEEN / SAMPLED) | LITHOLOGY | DEPTH (ft.) |
|---|---|---|---|---|---|---|---|
| | | | | Augered to 9.0' | | | 5 |
| 9.0-11.0 | 5,12, 8,7 | 65 | None | No recovery | | | |
| | | | | Dry brown SAND with pebbles, coal and brick fragments, FILL | | | 10 |

WELL CONSTRUCTION



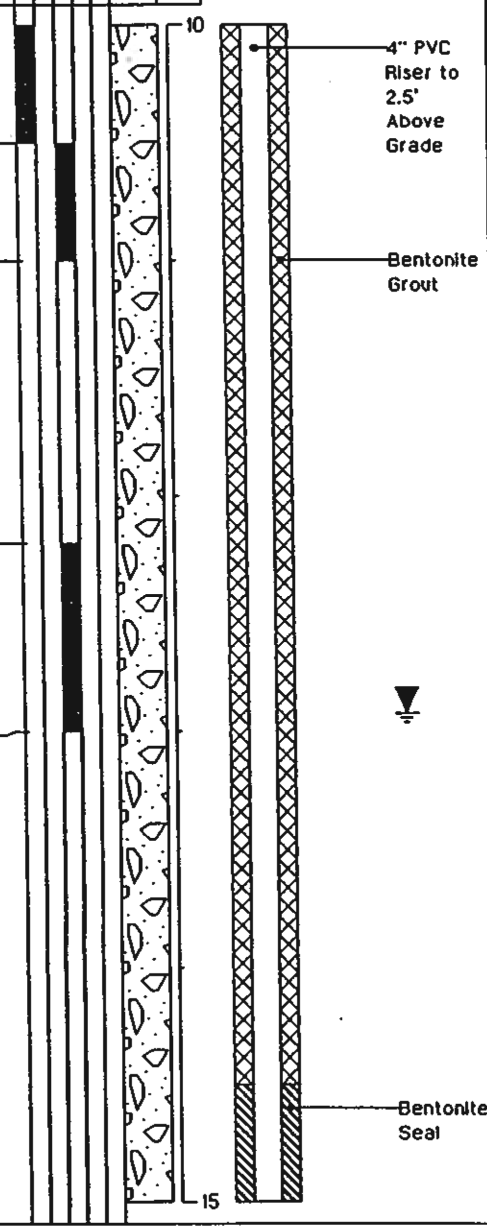
# SB-20/MW-9

PROJECT: RG&E East Station
PROJECT NO.: 103002
LOCATION: 39' North of center of tar well
DATE STARTED: 11/12/98
DATE COMPLETED: 11/12/98
DRILLING CONTRACTOR: Lyon Drilling
DRILLER: Harry Lyon
DRILLING METHOD: 4 1/4" ID Hollow stem auger
SAMPLE METHOD: 2"x2' Split spoon sampler, 300# hammer

GROUND ELEVATION: 426.4
PROTECTIVE CASING ELEVATION: N/A
WELL ELEVATION (TOC): 429.01
DEPTH TO WATER: 12.9
X-COORDINATE: E 757254.1260
Y-COORDINATE: N 1155587.4970
WEATHER: Clear and cool 40° F, 5-10 mph wind
GEOLOGIST/OBSERVER: Steve Maxwell
ENTERED BY: Steve Maxwell

| SPLIT SPOON INTERVAL (ft.) | BLOWS PER 0.5 ft. | % RECOVERY | OVM (ppm) | SOIL DESCRIPTION (moisture, color, fraction, other notes, origin) |
|---|---|---|---|---|
| | | | | Loose, dry, black SAND with clinker ash, coal, and brick fragments, **FILL** |
| 11.0-13.0 | 5,9, 3,2 | 40 | | No recovery |
| | | | | Loose, black SAND with clinker ash, brick, fire brick and SHALE fragments, **FILL** |
| | | | | **Water Table (Estimated)** |
| 13.0-15.0 | 2,1, 1,1 | 0 | None | No recovery |

OBSV.: NONE / ODOR / STAIN / SHEEN / SAMPLED — LITHOLOGY — DEPTH (ft.) — WELL CONSTRUCTION



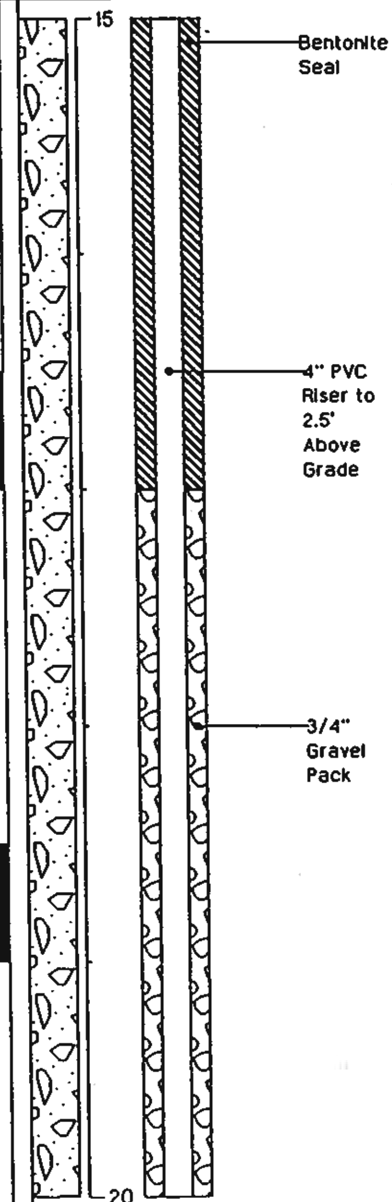
# SB-20/MW-9

PROJECT: RG&E East Station
PROJECT NO.: I03002
LOCATION: 39' North of center of tar well
DATE STARTED: 11/12/98
DATE COMPLETED: 11/12/98
DRILLING CONTRACTOR: Lyon Drilling
DRILLER: Harry Lyon
DRILLING METHOD: 4 1/4" ID Hollow stem auger
SAMPLE METHOD: 2"x2' Split spoon sampler, 300# hammer

GROUND ELEVATION: 426.4
PROTECTIVE CASING ELEVATION: N/A
WELL ELEVATION (TOC): 429.01
DEPTH TO WATER: 12.9
X-COORDINATE: E 757254.1260
Y-COORDINATE: N 1155587.4970
WEATHER: Clear and cool 40° F. 5-10 mph wind
GEOLOGIST/OBSERVER: Steve Maxwell
ENTERED BY: Steve Maxwell

| SPLIT SPOON INTERVAL (ft.) | BLOWS PER 0.5 ft. | % RECOVERY | OVM (ppm) | SOIL DESCRIPTION (moisture, color, fraction, other notes, origin) | OBSV. NONE | OBSV. ODOR | OBSV. STAIN | OBSV. SHEEN | SAMPLED |
|---|---|---|---|---|---|---|---|---|---|
| 15.0-17.0 | 2,1, 1 for 1' | 25 | | Loose FILL with SAND, brick, clinker ash, wood fragments, sheen, and odor | | ■ | | ■ | |
| 17.0-19.0 | 1,1, 1,1 | 25 | None | No recovery | | | | | |
| | | | | Loose saturated FILL with SAND, brick fragments, sheen, and odor | | ■ | | ■ | |
| 19.0-21.0 | 1, 1 for 1',2 | 20 | | No recovery | | | | | |

LITHOLOGY / DEPTH (ft.) / WELL CONSTRUCTION

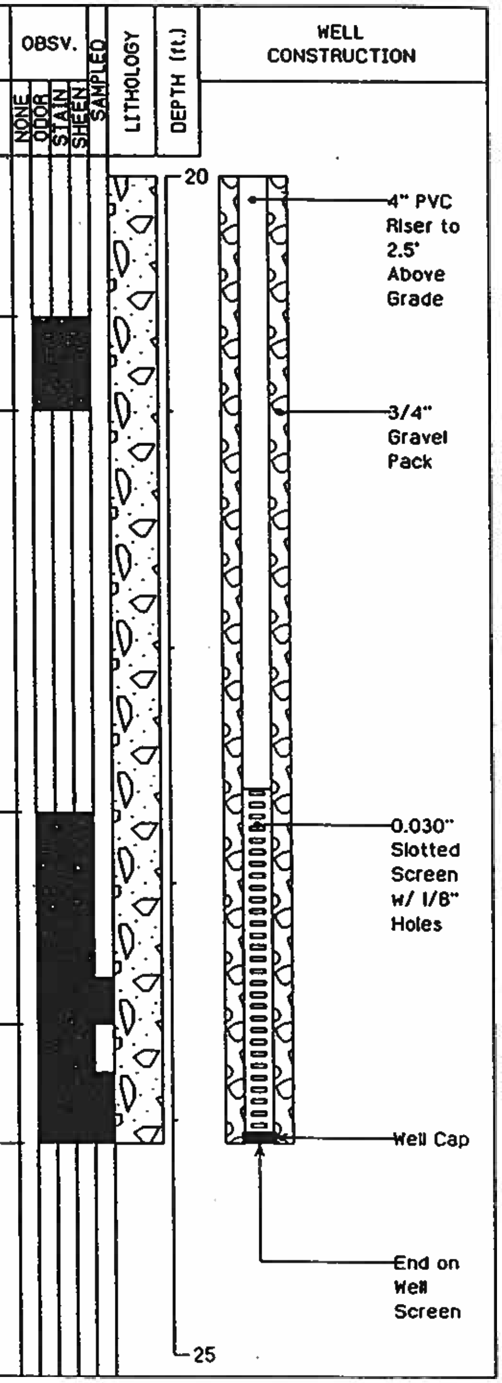


# SB-20/MW-9

PROJECT: RG&E East Station
PROJECT NO.: 103002
LOCATION: 39' North of center of tar well
DATE STARTED: 11/12/98
DATE COMPLETED: 11/12/98
DRILLING CONTRACTOR: Lyon Drilling
DRILLER: Harry Lyon
DRILLING METHOD: 4 1/4" ID Hollow stem auger
SAMPLE METHOD: 2"x2' Split spoon sampler, 300# hammer

GROUND ELEVATION: 426.4
PROTECTIVE CASING ELEVATION: N/A
WELL ELEVATION (TOC): 429.01
DEPTH TO WATER: 12.9
X-COORDINATE: E 757254.1260
Y-COORDINATE: N 1155587.4970
WEATHER: Clear and cool 40° F, 5-10 mph wind
GEOLOGIST/OBSERVER: Steve Maxwell
ENTERED BY: Steve Maxwell

| SPLIT SPOON INTERVAL (ft.) | BLOWS PER 0.5 ft. | % RECOVERY | OVM (ppm) | SOIL DESCRIPTION (moisture, color, fraction, other notes, origin) |
|---|---|---|---|---|
| 21.0-23.0 | 1,1, 1,1 | 15 | None | Loose saturated coarse **FILL** containing brick, clinker ash, and flowing **TAR**<br>No recovery |
| 23.0-24.1 | 1,5, 50 | 100 | | Loose, Coarse SAND **FILL** with clinker ash and soft flowing **TAR**<br>Dense plastic **TAR**, "taffy tar"<br>Brick, Bottom of tar well, End of Boring<br>**TOTAL DEPTH = 24.1'** |



# SB-21

PROJECT: RG&E East Station
PROJECT NO.: I03002
LOCATION: 39' SSE of center of the tar well
DATE STARTED: 11/12/98
DATE COMPLETED: 11/12/98
DRILLING CONTRACTOR: Lyon Drilling
DRILLER: Harry Lyon
DRILLING METHOD: 4 1/4" ID Hollow stem auger
SAMPLE METHOD: 2"x2' Split spoon sampler, 300# hammer

GROUND ELEVATION: 419.1
PROTECTIVE CASING ELEVATION: None
WELL ELEVATION (TOC): None
DEPTH TO WATER: 5.1
X-COORDINATE: E 757266.6800
Y-COORDINATE: N 1155523.7300
WEATHER: Clear and cool 40° F, 5-10 mph wind
GEOLOGIST/OBSERVER: Steve Maxwell
ENTERED BY: Steve Maxwell

| SPLIT SPOON INTERVAL (ft.) | BLOWS PER 0.5 ft. | % RECOVERY | OVM (ppm) | SOIL DESCRIPTION (moisture, color, fraction, other notes, origin) | OBSV. (NONE / ODOR / STAIN / SHEEN / SAMPLED) | LITHOLOGY | DEPTH (ft.) | WELL CONSTRUCTION |
|---|---|---|---|---|---|---|---|---|
| | | | | Augered to 3.0' | | | 0 | |
| 3.0-5.0 | 3,5, 8,12 | 65 | None | No recovery | | | | |
| | | | | Loose, black SAND with pebbles, brick, clinker ash, and coal fragments FILL | STAIN | | | |
| | | | | Dry pulverized brick | NONE | | | |
| | | | | Loose, wet black SAND with clinker ash and brick fragments, FILL with black stain | STAIN | | 5 | |

# SB-21

PROJECT: RG&E East Station
PROJECT NO.: I03002
LOCATION: 39' SSE of center of the tar well
DATE STARTED: 11/12/98
DATE COMPLETED: 11/12/98
DRILLING CONTRACTOR: Lyon Drilling
DRILLER: Harry Lyon
DRILLING METHOD: 4 1/4" ID Hollow stem auger
SAMPLE METHOD: 2"x2' Split spoon sampler, 300# hammer

GROUND ELEVATION: 419.1
PROTECTIVE CASING ELEVATION: None
WELL ELEVATION (TOC): None
DEPTH TO WATER: 5.1
X-COORDINATE: E 757266.8800
Y-COORDINATE: N 1155523.7300
WEATHER: Clear and cool 40° F, 5-10 mph wind
GEOLOGIST/OBSERVER: Steve Maxwell
ENTERED BY: Steve Maxwell

| SPLIT SPOON INTERVAL (ft.) | BLOWS PER 0.5 ft. | % RECOVERY | OVM (ppm) | SOIL DESCRIPTION (moisture, color, fraction, other notes, origin) | OBSV. (NONE / ODOR / STAIN / SHEEN) | SAMPLED | LITHOLOGY | DEPTH (ft.) | WELL CONSTRUCTION |
|---|---|---|---|---|---|---|---|---|---|
| 5.0-7.0 | 1,1, 1,1 | 35 | | No recovery, **Water Table (Estimated)** | | | | 5 | ▼ |
| | | | | Saturated loose **FILL** with SAND concrete, coal, clinker ash, brick fragments, odor, and black stain | ODOR, STAIN | | | | |
| 7.0-9.0 | wt of Rod,1, 1,2 | 40 | None | No recovery | | | | | |
| | | | | Loose, saturated black SAND with coal brick fragments, sheen, and odor, **FILL** | ODOR, SHEEN | | | | |
| 9.0-11.0 | 1,1, 4,8 | 40 | None | No recovery | | | | 10 | |

# SB-21

PROJECT: RG&E East Station
PROJECT NO.: 103002
LOCATION: 39' SSE of center of the tar well
DATE STARTED: 11/12/98
DATE COMPLETED: 11/12/98
DRILLING CONTRACTOR: Lyon Drilling
DRILLER: Harry Lyon
DRILLING METHOD: 4 1/4" ID Hollow stem auger
SAMPLE METHOD: 2"x2' Split spoon sampler, 300# hammer

GROUND ELEVATION: 419.1
PROTECTIVE CASING ELEVATION: None
WELL ELEVATION (TOC): None
DEPTH TO WATER: 5.1
X-COORDINATE: E 757266.8800
Y-COORDINATE: N 1155523.7300
WEATHER: Clear and cool 40° F, 5-10 mph wind
GEOLOGIST/OBSERVER: Steve Maxwell
ENTERED BY: Steve Maxwell

| SPLIT SPOON INTERVAL (ft.) | BLOWS PER 0.5 ft. | % RECOVERY | OVM (ppm) | SOIL DESCRIPTION moisture, color, fraction, other notes, origin | OBSV. (NONE / ODOR / STAIN / SHEEN / SAMPLED) | LITHOLOGY | DEPTH (ft.) | WELL CONSTRUCTION |
|---|---|---|---|---|---|---|---|---|
| | | | | | | | 10 | |
| 11.0-13.0 | 1,1, 6,8 | 45 | | Loose saturated FILL with SAND, clinker ash, concrete, brick fragments, and odor | | | | |
| | | | | No recovery | | | | |
| 13.0-15.0 | 4,3, 6,4 | 40 | None | Loose FILL with SAND, coal, clinker ash, and brick fragments | | | | |
| | | | | No recovery | | | | |
| | | | | Loose FILL with SAND, clinker ash, coal, brick fragments and flowing TAR | | | 15 | |

# SB-21

PROJECT: RG&E East Station
PROJECT NO.: I03002
LOCATION: 39' SSE of center of the tar well
DATE STARTED: 11/12/98
DATE COMPLETED: 11/12/98
DRILLING CONTRACTOR: Lyon Drilling
DRILLER: Harry Lyon
DRILLING METHOD: 4 1/4" ID Hollow stem auger
SAMPLE METHOD: 2"x2' Split spoon sampler, 300# hammer

GROUND ELEVATION: 419.1
PROTECTIVE CASING ELEVATION: None
WELL ELEVATION (TOC): None
DEPTH TO WATER: 5.1
X-COORDINATE: E 757266.8800
Y-COORDINATE: N 1155523.7300
WEATHER: Clear and cool 40° F, 5-10 mph wind
GEOLOGIST/OBSERVER: Steve Maxwell
ENTERED BY: Steve Maxwell

| SPLIT SPOON INTERVAL (ft.) | BLOWS PER 0.5 ft. | % RECOVERY | OVM (ppm) | SOIL DESCRIPTION (moisture, color, fraction, other notes, origin) | OBSV. (NONE / ODOR / STAIN / SHEEN / SAMPLED) | LITHOLOGY | DEPTH (ft.) | WELL CONSTRUCTION |
|---|---|---|---|---|---|---|---|---|
| 15.0-16.7 | 1,4, 3,50 | 47 | | No recovery | | | 15 | |
| | | | | Loose **FILL** with clinker ash, coal, concrete, and soft flowing **TAR** | | | | |
| | | | | Thick, heavy, plastic **TAR**, "taffy tar" | | | | |
| | | | | Brick, Bottom of tar well | | | | |
| | | | | End of Boring<br>**TOTAL DEPTH = 16.7'** | | | 20 | |

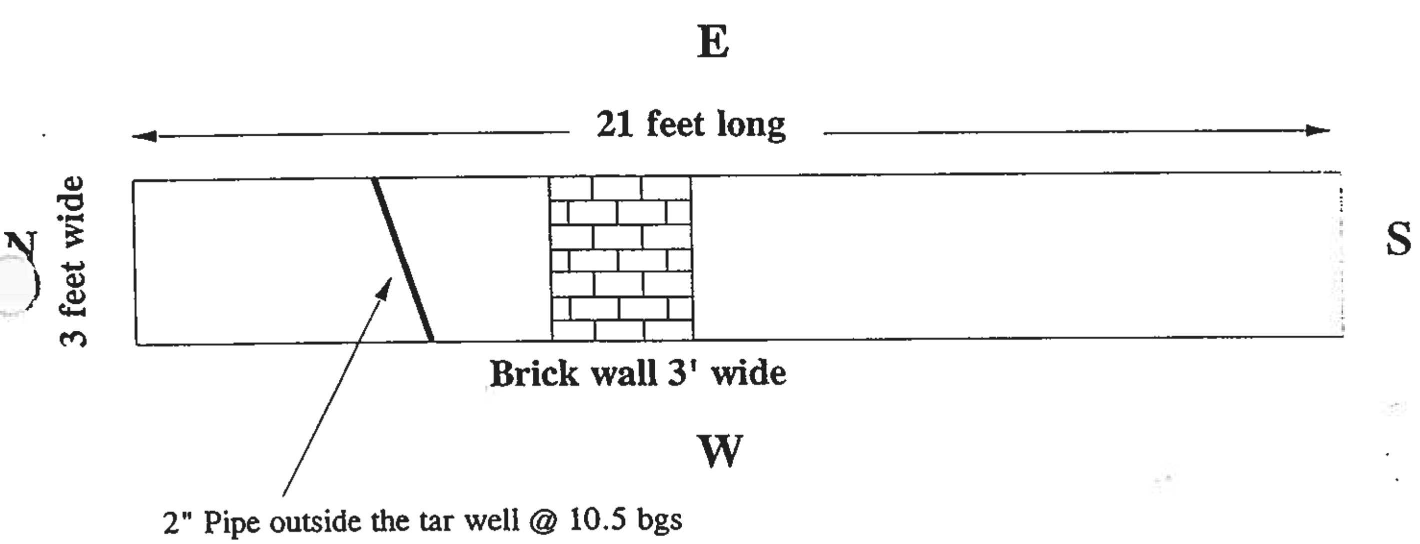
# APPENDIX B
# TEST PIT LOGS

# TEST PIT DESCRIPTION SHEET

PROJECT NUMBER: I03002-51
PROJECT: META-EPRI/ RG&E
SITE: East Station MGP
TEST PIT ID: TP-1
LOCATION: North side of circular tar well
PURPOSE: To aerially and vertically locate the tar well wall
DATE: 11/6/98
TIME: 10:00 am
WEATHER: overcast, low 50s°F

OBSERVER: C.Jones
ASSISTANT: K. Hylton
OTHER: none
EXCAVATOR: RG&E Operator
EQUIPMENT: Backhoe: CASE Extended Arm
LOCAL UTILITY CLEARANCE: J. Meehan (RG&E)
DEPTH TO GROUNDWATER: not encountered
TOTAL DEPTH : 12.0 feet
NAPL PRESENT: no

# TEST PIT 1

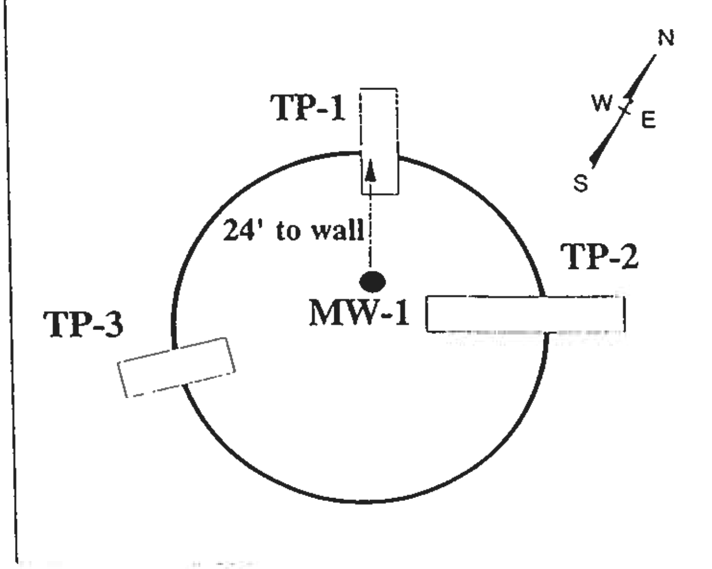



## Test Pit Stratigraphy

0' - 12.0' Fill comprised of ash, clinker, silts, sands, brick, concrete rubble, piping, and asphalt

@ 9.0' Top of tar well wall made of brick. Approximately 3' wide.

## Tar Well Test Pit Location

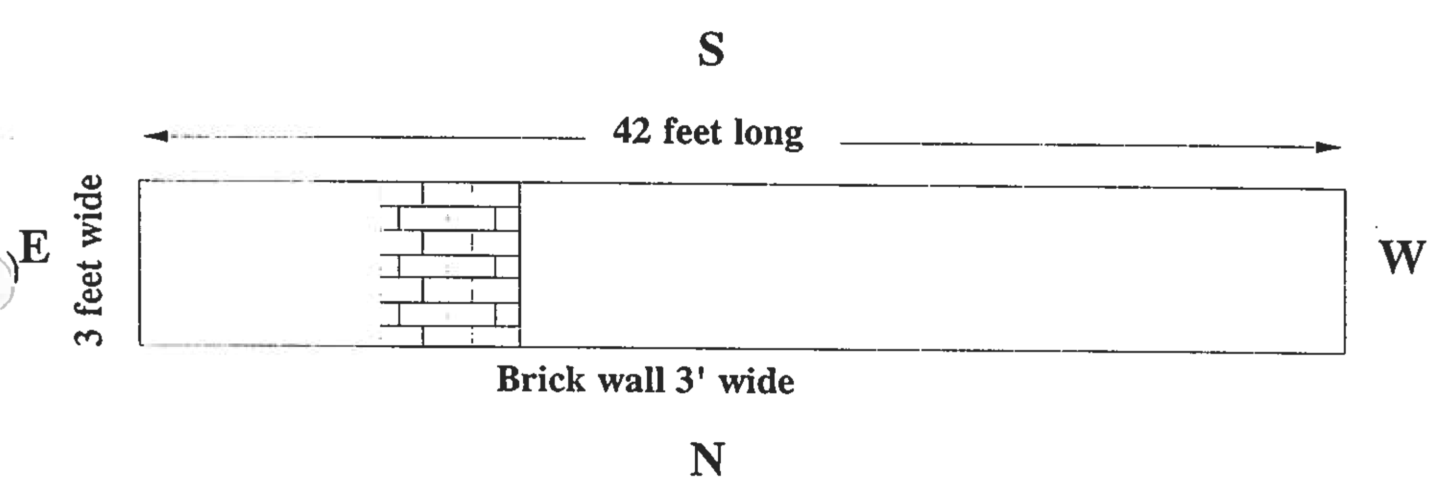


# TEST PIT DESCRIPTION SHEET

PROJECT NUMBER: 103002-51
PROJECT: META-EPRI/ RG&E
SITE: East Station MGP
TEST PIT ID: TP-2
LOCATION: East side of circular tar well
PURPOSE: To aerially and vertically locate the tar well wall
DATE: 11/6/98
TIME: 1:00 pm
WEATHER: overcast, low 50s°F

OBSERVER: C.Jones
ASSISTANT: K. Hylton
OTHER: none
EXCAVATOR: RG&E Operator
EQUIPMENT: Backhoe: CASE Extended Arm
LOCAL UTILITY CLEARANCE: J. Meehan (RG&E)
DEPTH TO GROUNDWATER: not encountered
TOTAL DEPTH : 11.5 feet
NAPL PRESENT: no

## TEST PIT 2

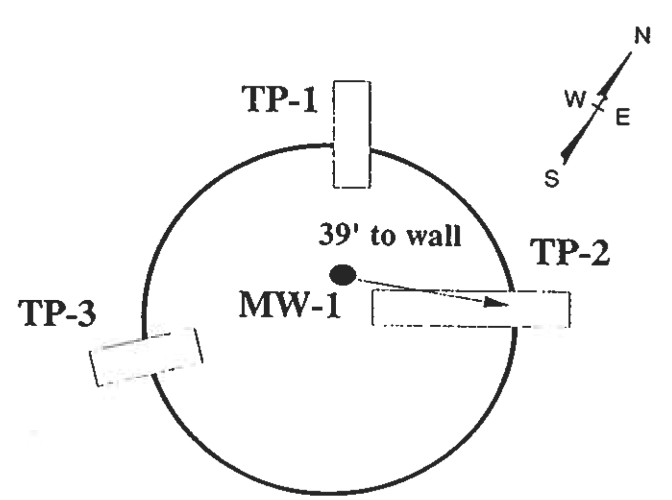



## Test Pit Stratigraphy

0' - 11.5' Fill comprised of ash, clinker, silts, sands, brick, concrete rubble, piping, asphalt, and large cobbles

@ 9.8' Top of tar well wall made of brick. Approximately 3' wide.

## Tar Well Test Pit Location

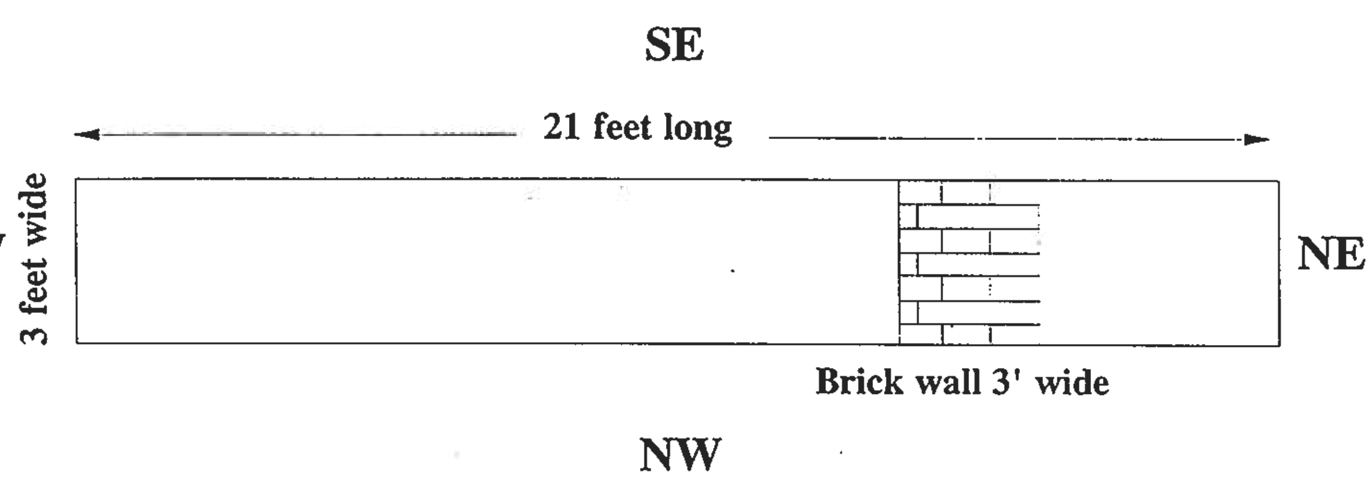


# TEST PIT DESCRIPTION SHEET

PROJECT NUMBER: I03002-51
PROJECT: META-EPRI/ RG&E
SITE: East Station MGP
TEST PIT ID: TP-3
LOCATION: South west side of circular tar well
PURPOSE: To aerially and vertically locate the tar well wall
DATE: 11/6/98
TIME: 4:00 pm
WEATHER: overcast, low 50s°F

OBSERVER: C.Jones
ASSISTANT: K. Hylton
OTHER: none
EXCAVATOR: RG&E Operator
EQUIPMENT: Backhoe: CASE Extended Arm
LOCAL UTILITY CLEARANCE: J. Meehan (RG&E)
DEPTH TO GROUNDWATER: not encountered
TOTAL DEPTH : 9.0 feet
NAPL PRESENT: no

# TEST PIT 3




## Test Pit Stratigraphy

0' - 9.0' Fill comprised of ash, clinker, silts, sands, brick, concrete rubble, piping, and asphalt

@ 7.0' Top of tar well wall made of brick. Approximately 3' wide.