Department of Environmental Conservation

Division of Environmental Remediation

Site Investigation Report

Former Gastown MGP Site, 126 East Niagara Street, Tonawanda, Erie County, New York Registry Number 915171

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New York State Department of Environmental Conservation
Region 9
270 Michigan Avenue
Buffalo, New York 14203-2999

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1.0 EXECUTIVE SUMMARY

The Former Gastown Manufactured Gas Plant (MGP) Site is located at 126 East Niagara Street in the City of Tonawanda, Erie County, New York. The total area of the Site is approximately 3.5 acres, and is bordered by railroad tracks to the west and south, Carney Street to the east, and East Niagara Street and Tonawanda Creek to the north (Figures 1-1 and 1-2). The property was formerly operated as a manufactured gas plant, but is now rented to several local industries. Adjacent property to the east is owned by the Niagara Frontier Transportation Authority (NFTA), which leases a portion of the property to the Gastown Sportsmen's Club (located further east) for parking (Figure 1-2). Residential property is located west of the site across the railroad tracks, while backyards of residential properties along Carney Street abut the Gastown Sportsmen's Club property. The topography of the site is relatively flat-lying with a gradual northerly downward slope toward Tonawanda Creek.

In response to the presence of non aqueous phase liquids (NAPL) in the basement sumps of the Gastown Sportsmen's Club, the Department's Hazardous Waste Remediation Unit designed and installed a groundwater/NAPL extraction and treatment system to capture NAPL and contaminated groundwater before they enter the clubhouse sumps. This system began operation in September 1998 and has operated continuously since that time. The general layout of the system is shown in Figure 1-3.

Beginning December 1999 the Department implemented a Site Investigation to fully evaluate the effectiveness of the groundwater/NAPL extraction and treatment system, and to determine the areal extent to which NAPL and contaminated groundwater has migrated under the Gastown Sportsman's Club toward nearby residences on East Niagara and Carney streets. Field activities for this investigation were completed in September 2000.

The stratigraphy of the Former Gastown MGP Site, with increasing depth, includes the following: miscellaneous fill, an upper silty clay deposit, an alluvium deposit, a sand and gravel deposit and a lower silty clay deposit. Fill material at the Site consists predominantly of crushed stone, various colored ash, coal, coke, slag and brick. The NAPL underlying the Site is contained within the alluvium deposit, and is prevented from migrating further downward by the lower silty clay deposit.

A total of fourteen (14) monitoring wells have been installed throughout the Former Gastown MGP Site and monitor both the upper silty clay (shallow zone) and recent alluvium (intermediate zone) deposits. The latter deposit is the principal aquifer underlying the Site. Water levels in all on-site monitoring wells

were measured eleven (11) times between December 13, 1999 and September 14, 2000, while Tonawanda Creek water levels were measured 9 times during this period. These data were utilized to further evaluate groundwater flow patterns across the Site to fully evaluate the effectiveness of the groundwater extraction system.

The water level data obtained from the Site were utilized to construct hydrographs for both the shallow and intermediate zone wells. These hydrographs show a cyclical pattern of high and low water levels: high during periods of high rainfall and snowmelt; low during drier months when the groundwater extraction system is operating at peak efficiency. The hydrographs also reveal that water levels in on-site monitoring wells do not fluctuate in response to changing water levels in Tonawanda Creek, indicating that the creek is not hydraulically connected to the recent alluvium deposit.

The water level data obtained from the Site were also utilized to construct groundwater contour maps. These maps reveal that even prior to the installation of the groundwater extraction system, groundwater flowed toward the Gastown Sportsmen's Club. This flow pattern suggests that the club's basement drain system (sumps and floor drains) acts as a significant groundwater sink. Operation of the groundwater extraction system alters this flow pattern by producing an elliptical cone of depression around the extraction well that extends to the eastern property line of the Gastown Sportsmen's Club. Hydrographs for the Site show that groundwater extraction affects water levels in all on-site wells that screen the recent alluvium deposit, indicating that the influence of the extraction system is larger areally than the cone of depression delineated by the groundwater contour maps. These data, therefore, suggest that the groundwater extraction system collects contaminated groundwater from throughout the Site, and when operating at peak efficiency, prevents this groundwater from migrating off-site.

NAPL was encountered in fifteen (15) borings completed at the Site, and where encountered, ranged in thickness from 3.0 to 15.0 feet. NAPL thickness is greatest near the former manufactured gas plant, and thins to the east under the NFTA and Gastown Sportsmen's Club properties. NAPL thickness also appears to thin near the edges of the plume. The NAPL plume associated with the Former Gastown MGP Site forms a general "L" shape; the short leg being located between the former manufactured gas plant and the coal bins with the long leg extending eastward under the NFTA and Gastown Sportsmen's Club properties (Figure 6-1). While this investigation did not fully delineate the downgradient extent of the plume, the presence of NAPL in small, isolated pockets in two borings along the eastern property line of the Gastown Sportsmen's Club suggests that the plume edge is located near these borings.

During the Site Investigation, nineteen (19) subsurface soil samples were collected and submitted to a lab for chemical analysis. Eight of these samples were collected from borings outside the NAPL plume to verify that visually "clean" was also analytically "clean." As a screening tool, these results were compared to the soil cleanup objectives of NYSDEC Technical and Administrative Guidance Memoranda (TAGM) No. 4046. Although a few contaminants were detected in these samples, only benzene in one boring was detected at a concentration that exceeded the TAGM 4046 soil cleanup objectives. The remaining subsurface soil samples were collected from borings within the NAPL plume to evaluate further the nature and extent of contamination associated with the plume. Significant volatile contamination was detected in these samples, with the concentrations of fourteen VOCs exceeding the TAGM 4046 soil cleanup objectives or the TCLP alternative guidance values of Stars Memo #1.

NAPL was encountered at a shallow depth (5.0'-8.0' bgs) in boring SB-29, with eight VOCs detected at concentrations that exceeded the TAGM 4046 soil cleanup objectives or the TCLP alternative guidance values. The source of this NAPL is likely the club's former sump discharge line that ruptured and was replaced by the Department's Spill Unit in March 1998. Groundwater samples collected from two shallow wells installed along the discharge line to monitor residual contamination indicate that groundwater is contaminated with benzene, toluene, xylenes, phenol, pentachlorophenol, naphthalene, endrin and iron at concentrations that exceeded the Department's Class GA groundwater standards or guidance values. The groundwater data, combined with the soil results from boring SB-29, indicate that residual contamination remains along some portions of the replaced sump discharge line, and that additional remediation may be necessary.

One sample of the lower silty clay deposit underlying the NAPL plume was collected and analyzed to evaluate the effectiveness of this deposit as a confining layer. While a few contaminants were detected in this sample, only benzene was detected at a concentration that exceeded the TAGM 4046 soil cleanup objectives. These results suggest that the lower silty clay deposit is an effective barrier against the further downward migration of NAPL and related contaminants. The thickness of this deposit under the Site, however, is unknown.

Petroleum contamination unrelated to the NAPL plume was encountered in boring SB-39. This contamination does not have a coal tar odor and is an LNAPL, floating on top of the water table. A monitoring well (MW-39) installed in this boring was contaminated with benzene, vinyl chloride, dichloroethene, fluorene, phenanthrene, pyrene, benzo(a)anthracene, chrysene, benzo(b)fluoranthene,

benzo(a)pyrene, dieldrin, endrin, arsenic, iron, lead, manganese, zinc and cyanide at concentrations that exceeded the Department's Class GA groundwater standards or guidance values. While the soil sample from this boring did not contain petroleum products, petroleum products were detected in the well at a concentration of 120,000 µg/l. While the source of this petroleum contamination is unknown, a concrete pier located near this boring could have been a cradle for an aboveground storage tank. Additional borings will be required in this area to determine the areal extent of this contamination.

In total, twelve groundwater samples were collected during the Site Investigation and submitted to a lab for chemical analysis. Six of these samples were collected from wells installed within the NAPL plume, three were collected from wells installed outside the plume, two were collected from wells along the replaced sump discharge line (results previously discussed) and the last sample was collected from MW-39 (results discussed in the previous paragraph). The samples collected from wells installed within the NAPL plume were extensively contaminated with both volatile and semivolatile compounds. Fifteen VOCs were detected in these wells, with the concentrations of twelve exceeding the Department's Class GA groundwater standards or guidance values. Seventeen PAH's were also detected in these samples with the concentrations of fourteen exceeding the Department's Class GA groundwater standards or guidance values.

Phenolic compounds and PCBs were not detected in any wells installed within the NAPL plume, while pesticides (heptachlor) were only detected in one well. This pesticide, however, was detected at a concentration that exceeded the Department's Class GA groundwater standard. Arsenic, iron, lead, manganese, zinc and cyanide were also detected in these wells at concentrations that exceeded the Department's Class GA groundwater standards or guidance values.

An evaluation of the analytical results for the three wells installed outside the NAPL plume reveals much lower contaminant concentrations than in the six plume wells. Although thirteen VOCs were detected in the wells installed outside the plume, twelve of these detections were documented in well MW-1I, which is located close to the NAPL plume. Seven of these VOCs were detected at concentrations that exceeded the Department's Class GA groundwater standards or guidance values. Five PAH's were also detected in these samples with only the concentrations of naphthalene and acenaphthene exceeding the Department's Class GA groundwater standards or guidance values.

Five phenolic compounds were detected in wells installed outside the NAPL plume, with all five detections documented in one well. Of these compounds, phenol, pentachlorophenol, 2-nitrophenol and 4-

nitrophenol were detected at concentrations that exceeded the Department's Class GA groundwater standards. Trichlorobenzene, dichlorobenzene and dinitrotoluene were also detected in this well at concentrations that exceeded the Department's Class GA groundwater standards. PCBs were not detected in any of these samples, while pesticides (endrin) were detected in two wells. The concentration of endrin in both wells, however, exceeded the Department's Class GA groundwater standard for this compound.

Arsenic, iron, lead, manganese and zinc were detected in each well installed outside the NAPL plume, with the concentration of each metal exceeding the Department's Class GA groundwater standard or guidance value. Cyanide was also detected in all three wells, with the concentration in two wells exceeding the Department's Class GA groundwater standard for this compound.

One water sample from the primary sump of the Gastown Sportsmen's Club was collected for chemical analysis during the Site Investigation and submitted to a lab for chemical analysis. This sample was collected to further evaluate the effectiveness of the groundwater/NAPL extraction and treatment system by determining if contaminant concentrations in the clubhouse sump had decreased since the startup of the system in September 1998.

Prior to startup of the groundwater/NAPL extraction and treatment system, fifteen VOCs were detected in water from the club's primary sump, with the concentrations of all fifteen contaminants exceeding the Department's Class GA groundwater standards or guidance values. An evaluation of the analytical results for the sump water collected during the Site Investigation (15 months after system startup) indicates that although fourteen VOCs were detected, the concentrations of these contaminants are approximately one order of magnitude lower than the concentrations documented prior to system startup. Only eight of these compounds were detected at concentrations that exceeded the Department's Class GA groundwater standards or guidance values.

Five phenolic compounds were detected in the sump water prior to system startup, with the concentrations of phenol and pentachlorophenol exceeding the Department's Class GA groundwater standards. Four phenolic compounds were detected in the post-startup sump water, with only the concentration of phenol exceeding the Department's Class GA groundwater standards.

Prior to system startup, nineteen PAH's were detected in the club's primary sump water, with the concentrations of thirteen exceeding the Department's Class GA groundwater standards or guidance values.

Only seven PAH's were detected in the post-startup sump water, with none of the concentrations exceeding groundwater standards or guidance values. PCBs and pesticides were not detected in the post-startup sump water. Prior to system startup, however, heptachlor epoxide, DDD and chlordane had been detected, with the concentration of DDD having exceeded the Department's Class GA groundwater standard for this compound.

Arsenic, iron, manganese, zinc and cyanide were detected in the sump water prior to system startup, with the concentrations of iron, manganese and cyanide exceeding the Department's Class GA groundwater standards. While iron, manganese, zinc and cyanide were detected in the post startup sump water, only the concentration of iron exceeded the Department's Class GA groundwater standards.

Finally, recommendations for additional investigative activities to be completed during the Remedial Investigation are presented.

2.0 INTRODUCTION

The Former Gastown MGP Site, located at 126 East Niagara Street (Figures 1-1 and 1-2) in the City of Tonawanda, Erie County, New York, occupies a total area of approximately 3.5 acres. The property was formerly operated as a manufactured gas plant, but is now rented to several local industries. The Site is listed in the Registry of Inactive Hazardous Waste Disposal Sites in New York State (Registry) as site number 915171. The Site has been designated a Class 2 site, indicating that the Site presents a significant threat to human health and/or the environment.

In response to the presence of non aqueous phase liquids (NAPL) in the basement sumps of the nearby Gastown Sportsmen's Club, and the related odors in the basement of the clubhouse, the Department's Hazardous Waste Remediation Unit designed and installed a groundwater/NAPL extraction and treatment system to capture NAPL and contaminated groundwater before they enter the clubhouse sumps. This system began operation on September 2, 1998 and has operated continuously since that time. Operation and maintenance of this system is completed by a Department contractor from funds allocated in the Emergency Spill Response Program. The general layout of the system is shown in Figure 1-3.

While installation of the groundwater/NAPL extraction and treatment system has drastically reduced the exposure potential to members of the Gastown Sportsmen's Club, a long term remedial solution for the Site is required. As a result, the Division of Environmental Remediation (DER) began a Site Investigation in December 1999, in part, to evaluate the effectiveness of the groundwater/NAPL extraction and treatment system, and to determine the areal extent to which NAPL and contaminated groundwater has migrated under the Gastown Sportsman's Club toward nearby residences on East Niagara and Carney Streets. Field activities for this investigation were completed in September 2000. This report summarizes the findings of the Site Investigation. The remaining sections of this report are organized as follows:

- **Section 3.0, Site History and Background:** This section discusses the history of the Site, and briefly describes the remedial and investigative actions undertaken by the Department's Spill and Remediation Units.

- **Section 4.0, Study Objectives and Scope of Work:** This section describes the objectives of the Site Investigation and the activities that were completed during the study.

- **Section 5.0, Geology and Hydrogeology:** This section describes regional and Site geology

and hydrogeology. The characteristics, areal extent and hydrogeologic properties of the strata are discussed. Also discussed is the effect of the groundwater extraction system on local groundwater flow, which is a measure of system effectiveness.

- **Section 6.0, Investigation Results:** This section describes the findings of the Site Investigation, including a summary of analytical results obtained from various environmental media (i.e., soil and water). Section 6.0 also evaluates the areal extent of NAPL and contaminated groundwater underlying the Site.

- **Section 7.0, Discussions and Conclusions:** This section summarizes the findings of the Site Investigation as they relate to the objectives presented in Section 4.0. Conclusions drawn from the study are also discussed.

- **Section 8.0, Recommendations:** This section discusses the Department's recommendations for future Site activities, including additional investigative activities that would be required to complete a Remedial Investigation.

- **Section 9.0, References:** This section contains a list of references utilized or cited in the report.

3.0 SITE HISTORY AND BACKGROUND

3.1 Site Description

The approximately 3.5 acre Former Gastown MGP Site is located at 126 East Niagara Street in the City of Tonawanda, Erie County, New York (Figures 1-1 and 1-2). The Site is bordered by railroad tracks to the west and south, Carney Street to the east, and East Niagara Street and Tonawanda Creek to the north (Figure 1-2). The property was formerly operated as a manufactured gas plant, but is now rented to several local industries.

Adjacent property to the east is owned by the Niagara Frontier Transportation Authority (NFTA), which leases a portion of the property to the Gastown Sportsmen's Club (located further east) for parking (Figure 1-2). An AT&T fiber optic underground cable (Figure 1-2) is located within this parking lot approximately 25 feet west of the club. Residential property is located west of the Site across the railroad tracks, while backyards of residential properties along Carney Street abut the Gastown Sportsmen's Club property.

The topography of the Former Gastown Manufactured Gas Plant Site is relatively flat-lying with a gradual northerly downward slope toward Tonawanda Creek. South of the Gastown Sportsmen's Club parking lot, however, is the berm of a former railroad bed that rises approximately 8.5 feet above the general topography of the Site.

3.2 Site History

The Former Gastown MGP Site was formerly operated as a manufactured gas plant under the ownership of the Tonawanda Gas Light Company; the Niagara Light, Heat & Power Company; the Republic Light, Heat & Power Company; and the Iroquois Gas Corporation. This property was purchased from Iroquois by Mr. Wilbert Holler in 1964, incorporated into the Holler and Schenk Building Company in 1968, and transferred to Mr. Jack Holler in 1986 under corporate dissolution. The property is currently utilized by Mr. Holler as rental income, and houses several local industries.

In March 1993 the Department's Spill Unit responded to a spill complaint at the Gastown Sportsmen's Club where an unknown petroleum product was entering the basement sumps of the clubhouse. Spill Unit investigations revealed that the material found in the sumps was likely coal tars related to the former coal gas manufacturing operations. Remedial and investigative actions completed by the Spill Unit include the following:

- Records search revealing the former Site use and owners/operators;

- Sampling of NAPL and water from the basement sumps of the Gastown Sportsmen's Club for chemical analysis;

- Completion of test pits/trenches to facilitate sampling of contaminated soil and groundwater;

- Completion of a push probe investigation and groundwater sampling to determine groundwater flow direction, the magnitude of groundwater contamination, and the areal extent of NAPL in the subsurface environment;

- Removal and disposal of contaminated soils where coal tars had surfaced in the club's parking lot due to blockage of the club's sump discharge line;

- Replacement of the sump discharge line (Figure 1-3) following the removal action; and

- Construction of a temporary shroud around the club's basement sump and installation of a fan to vent potentially hazardous organic vapors.

A sample of NAPL from the club's basement sumps was collected on February 12, 1998 and submitted for TCLP analysis. The result of this analysis revealed that the NAPL was a characteristic hazardous waste for benzene (D018). Based upon this finding, the Site was referred to the Hazardous Waste Remediation Unit in March 1998 for follow-up action.

Following an initial inspection of the Site, the Hazardous Waste Remediation Unit contacted the NYS DOH to express its concern over potential health impacts from contamination within the Gastown Sportsmen's Club. The NYS DOH subsequently conducted an indoor air evaluation of the clubhouse on April 13, 1998 and found elevated levels (2-4 times above background) of volatile organics in the basement (sump and game rooms). Since this was not a residential property, an evacuation or restricted use was not imposed. The NYS DOH assessment confirmed, however, that volatile organics existed in the clubhouse at levels of concern relative to public health. Based upon verbal discussions with the NYS DOH, which were subsequently expressed in writing, timely action to mitigate exposures was determined to be necessary.

The Hazardous Waste Remediation Unit subsequently designed and installed a groundwater/NAPL extraction and treatment system to capture NAPL and contaminated groundwater before they enter the clubhouse sumps. The general layout of this system is shown in Figure 1-3, which consists of a single 10" diameter extraction well and conveyance system that transports contaminated groundwater and NAPL to the treatment system. Treated water is discharged directly to Tonawanda Creek and must meet applicable discharge limits as specified by the Department's Division of Water. This system began operation on September 2, 1998 and has operated continuously since that time. Operation and maintenance of this system is completed by a Department contractor from funds allocated in the Emergency Response Program.

4.0 STUDY OBJECTIVES AND SCOPE OF WORK

4.1 Objectives

Although the groundwater/NAPL extraction and treatment system has effectively mitigated the threat to members of the Gastown Sportsmen's Club from the presence of NAPL and contaminated groundwater in the clubhouse sumps, the total effectiveness of the extraction system is unknown. As a result, it is not known if contaminated groundwater is migrating off-site to adjacent residences along East Niagara and Carney Streets. In addition, it is not known to what extent NAPL has migrated under the club. The data required to make these determinations were obtained during the Site Investigation. The specific objectives of the Site Investigation were to:

- fully evaluate the effectiveness of the groundwater/NAPL extraction and treatment system;
- determine the extent to which NAPL has migrated under the Gastown Sportsmen's Club toward nearby properties; and
- determine the extent to which contaminated groundwater has migrated from the Site.

These objectives were evaluated through an examination of water level data, visual observation of soil samples, and the analysis of water samples obtained from monitoring wells and the Gastown Sportsmen's Club primary basement sump. Subsurface soil samples were sent to a lab for chemical analysis to confirm the visual observations.

4.2 Scope of Work

To meet the study objectives, the following activities were completed during the Site Investigation: (1) a soil boring program, (2) monitoring well installation, (3) water level measurements, (4) collection of environmental samples for chemical analysis, and (5) preparation of a Site map. These activities are briefly described in the following sections. All field work was conducted in level D personal protective equipment, while air monitoring for organic vapors was completed during intrusive activities by DEC personnel utilizing Department owned equipment. The direct push vehicle and sampling equipment were deconed prior to the implementation of field activities, with the sampling equipment decontaminated between samples.

4.2.1 *Soil Boring Program*

To determine the areal extent of NAPL underlying the NFTA and Gastown Sportsmen's Club

properties, thirteen (13) soil borings (SB-27 thru SB-39) were completed utilizing the direct push technique. The locations of these borings are shown on Figure 4-1, with the boring logs and stratigraphic summaries included as Appendices A and C, respectively. Continuous macro core samples were collected through the overburden soils until a reddish brown silty clay confining layer was encountered. Discrete samples (Figure 4-2) were collected based upon visual observations and/or air monitoring results of the macro core samples and submitted to a contract laboratory for chemical analysis. Ground surface elevation at each boring location was subsequently surveyed by DEC personnel utilizing Department owned equipment.

4.2.2 *Monitoring Wells*

Five (5) soil borings (SB-27, SB-34, SB-35, SB-36 and SB-39) were converted into monitoring wells to expand the existing monitoring well network. The locations of these wells are shown on Figure 4-3. The wells are constructed of 1" diameter threaded/flush joint Schedule 80 PVC screen and riser with appropriate sand pack, bentonite seal and grout. Each well was completed by installing a limited access, flush-mounted curb box. Well construction diagrams are included in Appendix A, while specific details concerning well construction are summarized in Table C-2. Following construction, the wells were developed in accordance with standard DEC well development protocols by DEC personnel utilizing Department owned equipment. Well development and purging logs are included in Appendix B. Once development was complete, samples were collected from each well and submitted to a contract laboratory for chemical analysis. These data were utilized to determine if contaminated groundwater is migrating from the Site to adjacent properties. Monitoring well elevations were subsequently surveyed by DEC personnel utilizing Department owned equipment.

4.2.3 *Water Level Measurements*

Water levels in all on-site monitoring wells were measured eleven (11) times between December 13, 1999 and September 14, 2000. Water level measurements for Tonawanda Creek were also obtained during the Site Investigation. These data were utilized to further evaluate groundwater flow patterns across the Site to fully evaluate the effectiveness of the groundwater extraction system.

4.2.4 *Sump Sampling*

One water sample from the primary sump of the Gastown Sportsmen’s Club was collected for chemical analysis during the Site Investigation. This sample was collected to determine if contaminant concentrations in the clubhouse sumps had decreased since the startup of the groundwater/NAPL extraction and treatment system in September 1998.

4.2.5 *Sampling and Sample Analysis*

With the exception of the macro core samples described in Section 4.2.1, all sampling was completed by DEC staff utilizing Department owned equipment. Sample analysis was completed by Severn Trent Laboratories, Inc. in Amherst, New York, a DEC contract laboratory. Specific conductance, pH, Eh, temperature and turbidity of water samples were measured in the field at the time of sample collection. These values are included on the purge logs in Appendix B.

4.2.6 *Mapping*

A map of the Former Gastown MGP Site was prepared by Department personnel using the AutoCAD LT 97 Software Program. The area mapped included the entire site boundaries; adjacent impacted properties; site buildings; the Gastown Sportsmen's Club; Tonawanda Creek in the vicinity of the Site; all soil boring and monitoring well locations (new and historical); and the locations of all samples collected as part of the Site Investigation.

5.0 GEOLOGY AND HYDROGEOLOGY

Site Investigation activities were undertaken, in part, to fully evaluate the effectiveness of the groundwater/NAPL extraction and treatment system. To complete such an evaluation, the characteristics, areal extent and hydrogeologic properties of the strata underlying the Former Gastown MGP Site must first be determined. Such an evaluation is important as these attributes of the geologic strata govern the occurrence and flow of groundwater and NAPL across the Site. These attributes, however, also govern the potential for contaminant migration from the Site, and dictate the rate and extent of this migration. As a result, a detailed evaluation of the geology and hydrogeology of the Former Gastown MGP Site is essential. Before completing such a detailed evaluation, however, it is important to first describe the regional geologic history of the western New York area as a general knowledge of this history is critical to a complete understanding of the complex interrelationships between the various geologic strata and their hydrogeologic properties.

5.1 Regional Geology

5.1.1 *Surficial Geology*

Geologic evidence suggests that at least four major glacial episodes covered parts of North America during the Pleistocene Epoch (Buehler and Tesmer, 1963). In western New York, however, there is evidence of only two such episodes. The last glacial event in the area, the Wisconsin, eroded and modified the earlier glacial deposits to such an extent that little evidence of their existence remains. These glacial events also resulted in the widening of preexisting valleys and basins, and led to the development of the present day drainage system in western New York (La Sala, 1968).

A complex sequence of proglacial lakes that formed during the final retreat of the Wisconsin ice sheet inundated an extensive area of western New York. This succession originated in the Erie-Huron Basin prior to 14,000 years ago as the ice sheet retreated from the basin. Further retreat produced Lake Arkona about 13,600 years ago (Hough, 1958); a readvance of the ice sheet followed about 13,000 years ago and resulted in a water level increase to the Lake Whittlesey stage. A series of advances and retreats over the next 300 years produced, from latest to earliest, lakes Warren, Wayne, Lowest Warren, Grassmere, Lundy and Tonawanda, the last forming about 9,800 years ago (Calkins and Brett, 1978) and having an outlet in the Lockport area. To the north, Lake Iroquois occupied the Ontario Basin at this time. This lake sequence was responsible for the deposition of stratified lacustrine clays, silts, sands and gravels that now cover much of western New York.

The Pleistocene Epoch presented a variety of environments that resulted in the deposition of several types of unconsolidated deposits. In the Tonawanda area these deposits include the following (Malcolm Pirnie, 1987; Recra Environmental, 1990; URS, 1992; Woodward-Clyde, 1993; Conestoga Rovers & Associates, 1997; Weston, 1998):

- Glacial till consisting of a non-sorted, non-stratified mixture of sand, silt, clay, gravel and rock fragments deposited directly from glacial ice;

- Glaciolacustrine deposits consisting primarily of silt, sand and clay deposited in lakes that formed during melting and retreat of the ice sheets;

- Glaciofluvial deposits consisting of sand and gravel deposited either by glacial meltwater streams or by the reworking of till and other glacial deposits along the shore of former glacial lakes; and

- Alluvial deposits consisting of silt, sand and gravel deposited by streams during comparatively recent geologic time. An alluvial deposit is the principal deposit encountered at the Former Gastown MGP Site.

La Sala (1968) reports that glacial till is the most widespread deposit in the Erie-Niagara Basin, ranging in thickness from 2 to 200 feet. Lacustrine clay is also widespread, reaching thicknesses of 300 feet in some valleys within the basin (La Sala, 1968). In the Tonawanda area, the combined thickness of glacial till and lacustrine clay ranges considerably, from approximately 45 feet at the nearby Columbus McKinnon Corporation (Malcolm Pirnie, 1991) to more than 95 feet at the Town of Tonawanda Landfill (Malcolm Pirnie, 1995). The thickness of these deposits at the Former Gastown MGP Site is unknown, but is expected to be similar to that at Columbus McKinnon, which is located approximately 1,800 feet to the south on Fillmore Avenue near Fremont Street (Figure 1-1).

5.1.2 *Bedrock Geology*

The bedrock underlying western New York is characterized as a thick sequence of shales, sandstones, limestones and dolostones deposited in ancient seas during the Silurian and Devonian Periods (Buehler and Tesmer, 1963). This stratigraphic sequence is summarized in Table 5-1. Bedrock bedding generally strikes in an east-west direction, approximately paralleling the Niagara and Onondaga Escarpments, and dips to the

south at approximately 30 to 40 feet per mile (Johnson, 1964; La Sala, 1968; Yager and Kappel, 1987). Erosion and weathering, however, have produced local variations in the bedrock surface configuration (Snyder Engineering, 1987).

The uppermost bedrock formation underlying the Former Gastown MGP Site is the Camillus Shale Formation of the Salina Group, which was deposited in a shallow sea environment during the Late Silurian Period (Rickard and Fisher, 1970). This formation extends across northern Erie County in an east-west trending belt approximately 6 to 8 miles wide (Conestoga-Rovers & Associates, 1997). Exposures of this formation are rare because of the low relief of the outcrop area and the mantle of glacial deposits. This formation was not encountered during any drilling activities conducted at the Site.

5.2 Site Geology

The stratigraphy of the Former Gastown MGP Site has been evaluated by examining the stratigraphic logs obtained from twenty-six (26) soil borings completed by Environmental Products & Services, Inc. in June 1996, five (5) soil borings completed by Maxim Technologies in June 1998 as a prelude to the installation of the groundwater/NAPL extraction and treatment system, and thirteen (13) soil borings completed during the Site Investigation in December 1999. The locations of these borings are shown on Figure 4-1. Stratigraphic logs are included as Appendix A, while a stratigraphic summary is contained in Appendix C.

5.2.1 *Fill*

Fill material overlies the native deposits throughout most of the Former Gastown MGP Site; 31 of 42 soil borings encountering some type of fill material (Table C-1). Fill material consists predominantly of crushed stone, cinders, various colored ash, coal, coke, slag and brick, and ranges in thickness from 0.4 to 6.5 feet (Table C-1). The greatest fill thickness was encountered in the area of the former railroad berm (e.g., borings SB-18, SB-28, SB-30 and SB-38) and near the main building of the former manufactured gas plant (e.g., borings SB-20, SB-21, SB-25 ans SB-39).

5.2.2 *Upper Silty Clay Deposit*

A moderately thick silty clay deposit is encountered throughout the Site; only at soil boring location SB-33 was this deposit not encountered. This deposit underlies either the miscellaneous fill or a thin topsoil layer where fill is absent. The upper silty clay deposit is generally gray in color, but is extensively mottled yellow, brown, orange and black. The thickness of this deposit ranges from 2.2 to 14.5 feet (Table C-1).

5.2.3 *Recent Alluvium Deposit*

A relatively thick recent alluvium deposit underlies the entire Former Gastown MGP Site and is the primary aquifer encountered. This deposit directly underlies the upper silty clay deposit, and consists predominantly of fine grained, gray sand interbedded with thin layers of gray clay and silty clay. The thickness of this deposit is quite variable, ranging from 3.5 to 19.8 feet (Table C-1). The NAPL underlying the Site is found in this deposit.

5.2.4 *Sand and Gravel Deposit*

A relatively thin sand and gravel deposit directly underlies the recent alluvium deposit and was encountered in 21 of 26 deep borings completed at the Site (Table C-1). The thickness of this deposit is relatively constant, ranging from 0.2 to 1.0 feet (Table C-1). NAPL is also found in this deposit.

5.2.5 *Lower Silty Clay Deposit*

A lower silty clay deposit underlies either the sand and gravel deposit or the recent alluvium deposit where the sand and gravel deposit is absent. This glaciolacustrine deposit is encountered throughout the Tonawanda area and consists predominantly of reddish brown to brown, soft to very soft, saturated, highly plastic, silty clay. Laminations (varves) are common throughout the glaciolacustrine deposit, indicating that it was deposited in a glacial lake environment. Silt lenses, fine sand lenses, and distinct layers of subangular to subrounded gravel and pebbles (drop stones) are also observed within this deposit. This deposit acts as a confining layer that prevents the further downward migration of contaminated groundwater and NAPL. The thickness of the glaciolacustrine deposit under the Former Gastown MGP Site is unknown as borings have not completely penetrated this deposit.

5.3 Regional Hydrogeology

Many site investigations and hydrogeologic studies have been completed in the Tonawanda area, and indicate that there are three principal hydrogeologic zones described as follows:

- The upper Camillus Shale bedrock, which can be characterized as a confined aquifer;
- A glaciolacustrine deposit, which can be characterized as an aquitard, confining groundwater from the underlying Camillus Shale; and
- Shallow alluvium, glaciofluvial and fill deposits, which can be characterized as either

unconfined (water table) or perched aquifers.

Of these zones, the principal aquifers include sands and gravels of the recent alluvium and glaciofluvial deposits, and upper bedrock of the Camillus Shale Formation. In the Tonawanda area, unconfined groundwater is encountered largely within the glaciofluvial, alluvium and fill deposits. Where these deposits overlie the glaciolacustrine deposit, perched groundwater conditions occur. Well yields from these deposits in the Tonawanda area are generally unknown, although wells installed in highly permeable outwash deposits in the Tonawanda Creek valley have yielded 1,000 to 1,400 gallons per minute (gpm) (La Sala, 1968).

The glaciolacustrine deposit separates the water table and/or perched aquifer from the confined upper bedrock aquifer. The hydraulic conductivity of this deposit is extremely low, typically ranging from 10^{-6} to 10^{-8} cm/s. The glaciolacustrine deposit, therefore, can be considered an aquitard, preventing the vertical movement of shallow groundwater to the underlying Camillus Shale. Horizontal groundwater flow within this deposit is also severely limited. In fact, the glaciolacustrine deposit is generally not water bearing, yielding only small quantities of water, which is primarily interstitial pore water that is tightly bound to the soil particles. This deposit, however, often contains thin seams and stringers of silt and sand that can allow limited horizontal groundwater flow. If areally extensive, these seams and stringers can be utilized as a source of water (La Sala, 1968).

La Sala (1968) reports that the Camillus Shale is "by far the most productive bedrock aquifer" in the Erie-Niagara Basin, with individual well yields ranging from 300 to 1,200 gpm. The production well at the Dunlop Tire Corporation yields 600 to 900 gpm (Pyanowski, 1990), although yields of 1,800 gpm were observed during a 1995 DEC study of the area.

5.4 Site Hydrogeology

The hydrogeology of the Former Gastown MGP Site has been evaluated by examining both historical hydrogeologic data and hydrogeologic data obtained during the Site Investigation. These data suggest that the recent alluvium deposit is the principal aquifer underlying the Site, although some groundwater is present within the upper silty clay deposit. As described above, the glaciolacustrine deposit (lower silty clay deposit) acts as an aquitard, restricting the downward movement of contaminated groundwater and NAPL to the deeper water bearing zones (i.e., the Camillus Shale bedrock).

Five (5) overburden monitoring wells were installed during the Site Investigation to supplement the

existing monitoring well network (Figure 4-3; Table C-2). These wells are screened entirely within the recent alluvium deposit, with the exception of monitoring well MW-39, which was installed at a shallower depth to monitor petroleum contamination encountered during the investigation. This contamination is different from that associated with the former manufactured gas plant, and appears to be related to an aboveground storage tank that was formerly located in the area. Construction diagrams for all wells installed on Site are provided in Appendix A, while monitoring well specifications are given in Appendix C.

A total of fourteen (14) monitoring wells have been installed throughout the Former Gastown MGP Site (Figure 4-3; Table C-2): three (3) of these wells monitor the upper silty clay deposit (shallow zone), three (3) wells monitor both the upper silty clay deposit and upper portion of the recent alluvium deposit (shallow zone), and eight (8) wells monitor the recent alluvium deposit (intermediate zone). Water levels in all on-site monitoring wells were measured eleven (11) times between December 13, 1999 and September 14, 2000, while Tonawanda Creek water levels were measured 9 times during this period (Table 5-2). These data were utilized to further evaluate groundwater flow patterns across the Site to fully evaluate the effectiveness of the groundwater extraction system. Water levels in on-site wells have now been measured 55 times since June 14, 1996, while Tonawanda Creek water levels have now been measured 46 times since July 13, 1998 (Table 5-2).

The water level data obtained during the Site Investigation were utilized to construct hydrographs for both the shallow and intermediate zone wells (Figures 5-1 thru 5-4). These hydrographs reveal that water levels fluctuated substantially throughout the year, but fluctuated in response to the groundwater extraction system (compare Figure 5-4 to Figure 5-3). The water level fluctuations in the extraction well (Figure 5-3) result from the discharge of the Gastown Sportsmen's Club sumps into the well. While the groundwater extraction system has generally been able to handle this excess water in the past (Figure 5-8), the higher than average rainfall earlier this year, the concomitant higher than average discharge from the club's sumps, and biofouling of the well screen and pumps have significantly reduced the groundwater extraction system's ability to lower Site groundwater elevations.

The water level fluctuations in monitoring wells MW-1S and MW-3S mirror the response of the other shallow zone wells, but at a significantly lower amplitude (Figure 5-1). Since these wells only screen the upper silty clay deposit (Table C-2), the low amplitude response suggests that these wells are not connected hydraulically to the underlying recent alluvium deposit. While the exact nature of the mirrored response is unknown, it could be related to either pressure changes in the hydrogeologic system due to groundwater

extraction or to drying/rewetting of the upper silty clay deposit as water levels fluctuate in the underlying recent alluvium deposit.

Monitoring well MW-2S also screens the upper silty clay deposit, but exhibits water level fluctuations that are similar to the shallow zone wells that partially screen the recent alluvium deposit (Figure 5-1). This response suggests that well MW-2S is connected hydraulically to the recent alluvium deposit. The historical hydrograph for this well (Figure 5-6), however, shows variations in response over time: relatively high amplitude, short duration fluctuations during 1998 followed by relatively low amplitude, long duration fluctuations during 1999 and 2000. As a result of these different responses, the true relationship between this well and the recent alluvium deposit is uncertain.

Due to the problems associated with the higher than average precipitation this year, the hydrographs shown in Figures 5-1 thru 5-4 do not accurately represent the influence of the groundwater extraction system. As a result, hydrographs for both the shallow and intermediate zone wells have been constructed from historical water level data (Figures 5-5 thru 5-9). These hydrographs show a cyclical pattern of high and low water levels: high during periods of high rainfall and snowmelt; low during drier months when the groundwater extraction system is operating at peak efficiency. The hydrographs also reveal that water levels in on-site monitoring wells do not fluctuate in response to changing water levels in Tonawanda Creek (Figures 5-1 thru 5-3 and Figures 5-5 thru 5-8). This indicates that Tonawanda Creek is not hydraulically connected to the recent alluvium deposit.

The similarity in water level fluctuations between the shallow and intermediate zone wells (compare Figure 5-4 with Figure 5-9) suggests that the shallow zone wells (with the exception of wells MW-1S, MW-2S and MW-3S as discussed above) are hydraulically connected to the recent alluvium deposit. These data, therefore, can be combined and utilized to generate groundwater contour maps for the Site. Water levels from Tonawanda Creek were not included in these contours since the creek is not hydraulically connected to the recent alluvium deposit.

Figures 5-10 and 5-11 illustrate the groundwater flow pattern across the Former Gastown MGP Site prior to the installation of the groundwater extraction system. While different well data were utilized to generate these contours, both figures indicate that under steady state conditions, groundwater flows toward the Gastown Sportsmen's Club. This flow pattern suggests that the club's basement drain system (sumps and floor drains) acts as a significant groundwater sink.

Figure 5-12 illustrates the groundwater flow pattern across the Former Gastown MGP Site on November 23, 1998, almost 3 months after startup of the groundwater extraction system. This figure indicates that groundwater extraction alters the steady state groundwater flow pattern by producing a cone of depression around the extraction well. The magnitude and extent of this drawdown, however, can not be determined from this figure due to the absence of wells east and south of the clubhouse. Using water level data from the wells installed during the Site Investigation, a groundwater contour map for July 13, 2000 was generated (Figure 5-13). This figure indicates that groundwater extraction produces an elliptical cone of depression around the extraction well that extends from well MW-13 to the eastern property line of the Gastown Sportsmen's Club (wells MW-34 and MW-35). Hydrographs for the Site indicate that groundwater extraction also affects water levels as far west as well MW-39 (Figure 5-1) and as far north as well MW-23 (Figure 5-2 and 5-7).

In situ hydraulic conductivity testing has only been conducted on monitoring well MW-1I, which completely screens the recent alluvium deposit. This test was completed by utilizing bail down test methods, with the field data evaluated by the solution developed by Bouwer and Rice (1976). The hydraulic conductivity obtained from this test was 1.2×10^{-4} cm/sec. This value is comparable to those obtained at the nearby Columbus McKinnon Corporation Site, where hydraulic conductivities of the recent alluvium deposit range from 1.4×10^{-3} to 4.0×10^{-4} cm/sec (Malcolm Pirnie, 1991).

5.5 Groundwater Extraction System Efficiency

Water level data obtained from on-site wells prior to implementation of the Site Investigation indicated that the groundwater extraction system substantially lowered groundwater elevations from steady state conditions. These data, however, were not sufficient to determine the magnitude and extent of this drawdown due to the absence of wells east and south of the clubhouse. As a result, one objective of the Site Investigation was to fully evaluate the effectiveness of the groundwater extraction system. To accomplish this objective, five additional monitoring wells were installed during the investigation to supplement the existing monitoring well network. Water levels in all on-site wells were subsequently measured eleven (11) times between December 13, 1999 and September 14, 2000. These data were then utilized to construct hydrographs (Figures 5-1 thru 5-4) and a groundwater contour map (Figure 5-13), which were evaluated to determine the effectiveness of the groundwater extraction system.

Figure 5-13 illustrates the groundwater flow pattern across the Former Gastown MGP Site on July 13, 2000. As discussed above, this figure indicates that groundwater extraction produces an elliptical cone

of depression around the extraction well that extends from well MW-13 to the eastern property line of the Gastown Sportsmen's Club (wells MW-34 and MW-35). This drawdown is substantial, and is produced by groundwater extraction rates that range from 0.19 to 1.79 gallons per minute (gpm). These low extraction rates, however, are consistent with the moderate hydraulic conductivities of the recent alluvium deposit.

Hydrographs for the Site indicate that groundwater extraction affects water levels in all on-site wells that screen the recent alluvium deposit, indicating that the influence of the extraction system is larger areally than the cone of depression delineated in Figure 5-13. As a result, water level data for the Site suggest that the groundwater extraction system collects contaminated groundwater from the entire Site.

While the groundwater extraction system is capable of collecting contaminated groundwater from the entire Site, the hydrographs (Figures 5-1 thru 5-9) indicate that the system does not always operate at peak efficiency. A major reason for this decrease in efficiency is the discharge of the club's basement sumps into the extraction well. The system was designed this way to direct contaminated sump water through the treatment system prior to discharge. In the past the groundwater extraction system has generally been able to handle this excess water (Figure 5-8), however, the greater discharge from the club's sumps this year due to increased rainfall has significantly reduced the system's ability to keep up with this additional discharge. In fact, at times this year this increased discharge has caused contaminated groundwater to spill out of the vault onto the ground surface.

To alleviate future spill-over events from the existing vault, and to increase system efficiency, a secondary vault and pump was installed at the Site in October 2000. The club's sump discharge was redirected to this vault, and is pumped directly to the treatment system. To fully evaluate the effect of this modification on the efficiency of the groundwater extraction system, water level measurements in on-site wells will be required over time, with the data utilized to construct hydrographs and groundwater contour maps.

6.0 INVESTIGATION RESULTS

A brief description of the activities completed during the Site Investigation at the Former Gastown MGP Site was presented in Section 4.0. In this section, a detailed evaluation of the observations made during the Site Investigation and the analytical results obtained from the field activities is presented. Analytical results are summarized by environmental media, and include subsurface soil, groundwater and the Gastown Sportsmen's Club sump water.

6.1 NAPL Delineation

One objective of the Site Investigation was to determine the extent to which NAPL has migrated under the Gastown Sportsmen's Club toward nearby properties on Carney Street. To accomplish this objective, thirteen (13) soil borings were completed during the Site Investigation, with the subsurface soil samples examined for the presence of NAPL. Because the NAPL underlying the Site is black in color and has a distinctive coal tar-like odor, visual observation combined with volatile screening with a PID was utilized to evaluate NAPL presence. The information obtained during this study, combined with historical soil boring data, was then utilized to determine the areal extent of NAPL underlying the NFTA and Gastown Sportsmen's Club properties. The borings completed during the Site Investigation are designated SB-27 thru SB-39 inclusive (Figure 4-1), and except for boring SB-33, were completed to the lower silty clay deposit. The stratigraphic logs for all borings completed at the Site are given in Appendix A and summarized in Table C-1.

A review of all stratigraphic logs available for the Site (13 new and 26 historical) indicates that NAPL was encountered in fifteen (15), and where encountered, ranged in thickness from 3.0 to 15.0 feet (Table 6-1). It is important to note, however, that the thickness of NAPL in four of these borings (SB-15, SB-21, SB-22 and SB-34) is estimated because the depth to the underlying confining layer could not be positively identified from the boring logs. For these borings, the depth to the confining layer was estimated from nearby borings, and is thought to be accurate to ±1 foot. A comparison of NAPL thickness to Figure 4-1 indicates that NAPL thickness is greatest near the former Gastown MGP plant (e.g., borings SB-21, SB-22 and SB-23) and thins to the east under the NFTA (e.g., borings SB-15, SB-16 and SB-17) and Gastown Sportsmen's Club (e.g., borings SB-34 and SB-35) properties. NAPL thickness also appears to thin near the edges of the plume (e.g., borings SB-25, SB-13 and SB-29).

The underlying confining layer in 10 of the 15 borings is the reddish brown silty clay of the lower silty clay deposit. In the other five borings the NAPL appears confined by the sand and gravel deposit. It

is not obvious from visual observations of this deposit, however, why NAPL in these areas did not migrate through the deposit to the underlying lower silty clay deposit.

The data from Table 6-1 was utilized to construct Figure 6-1, a map showing the location of the NAPL plume associated with the Former Gastown MGP Site. This plume forms a general "L" shape; the short leg being located between the former manufactured gas plant and the coal bins with the long leg extending eastward under the NFTA and Gastown Sportsmen's Club properties. While this investigation did not fully delineate the eastern boundary of the NAPL plume, the presence of NAPL in small, isolated pockets in borings SB-34 and SB-35 suggests that the plume edge is located near these borings.

6.2 Subsurface Soil

During the Site Investigation, nineteen (19) subsurface soil samples were collected and submitted to Severn Trent Laboratories for chemical analysis. All samples were analyzed for Target Compound List (TCL) volatiles, except for the samples collected from soil boring SB-39, which were also analyzed for TCL semivolatiles, Target Analyte List (TAL) metals and/or petroleum products. The samples selected for analysis were determined in the field based upon visual observation and screening for volatile organic vapors using a PID meter. Figure 4-2 shows the boring locations from which samples were collected, while Tables 6-2 and 6-3 summarize the analytical results.

Because the NAPL underlying the Former Gastown MGP Site is denser than water (DNAPL), it has migrated through the recent alluvium deposit and pooled on top of either the sand and gravel or lower silty clay deposit (confining layer). As a result, subsurface samples from borings completed outside the NAPL plume were collected from soils immediately above the lower silty clay deposit as these soils had the greatest potential of being contaminated. The exception to this was the sample collected from boring SB-33, which was collected from a depth of 8.0-10.0 feet below ground surface (bgs). This sample was collected from a shallower depth to determine if soil contamination (or NAPL) was present along the portion of the club's sump discharge line that was not replaced by the Department's Spill Unit in March 1998.

Table 6-2 summarizes the analytical results for the eight subsurface soil samples collected from borings outside the NAPL plume. These samples were submitted for analysis to verify that visually "clean" was also analytically "clean." As a screening tool these results were compared to the soil cleanup objectives of NYSDEC Technical and Administrative Guidance Memoranda (TAGM) No. 4046. Although a few contaminants were detected in these samples, only benzene in boring SB-28 (23.6'-23.9' bgs) was detected

at a concentration that exceeded the TAGM 4046 soil cleanup objectives (Table 6-2). Toluene, ethylbenzene and xylenes were also detected in this sample. A review of the boring log for this location (Appendix A) indicates that this sample exhibited a NAPL odor and had a PID reading of 13.8 ppm. The second sample collected from this boring (20.0'-23.6' bgs) contained benzene, toluene, dichloroethene and vinyl chloride at concentrations below the TAGM 4046 soil cleanup objectives (Table 6-2). This sample did not exhibit any odors or PID readings. The presence of contamination in this boring suggests that it is close to the NAPL plume (Figure 6-1).

An evaluation of the results from boring SB-33 indicates the presence of only benzene and ethylbenzene at concentrations below the TAGM 4046 soil cleanup objectives (Table 6-2). In addition, no NAPL was observed in this boring. These data indicate that remediation is not required along this portion of the club's sump discharge line.

Table 6-3 summarizes the analytical results for eleven subsurface soil samples collected from borings within the NAPL plume. These samples were submitted for analysis to evaluate further the nature and extent of contamination associated with the plume. In general, significant volatile contamination was detected in the ten samples submitted for VOC analysis by method 8260. Contaminant concentrations that exceeded the TAGM 4046 soil cleanup objectives include benzene (6 samples), toluene (6 samples), ethylbenzene (5 samples), xylenes (7 samples), 2-butanone (3 samples) and naphthalene (6 samples). Two of these samples were also submitted for VOC analysis by method 8021, with the concentration of eight contaminants exceeding the TAGM 4046 soil cleanup objectives or the TCLP alternative guidance values of Stars Memo #1. A more detailed evaluation of these results follows.

Two samples from boring SB-29 were submitted for analysis as NAPL was observed in two separate zones in the subsurface environment. The source of the NAPL observed from 5.0'-8.0' bgs is the club's former sump discharge line that ruptured and was replaced by the Department's Spill Unit. During this project a large quantity of contaminated soil and NAPL was excavated. Eight VOCs were detected in this sample at concentrations that exceeded the TAGM 4046 soil cleanup objectives or the TCLP alternative guidance values (Table 6-3). Benzene, toluene and ethylbenzene were also detected in this sample. The presence of NAPL and contaminated soil in this boring suggests that additional remediation is necessary along this portion of the club's sump discharge line.

The NAPL observed from 19.5'-19.8' bgs is part of the NAPL plume underlying the Site. Five VOCs

were detected in this sample at concentrations that significantly exceeded the TAGM 4046 soil cleanup objectives (Table 6-3). Styrene was also detected in this sample at a concentration of 130,000 µg/kg, but no soil cleanup objective is available for this compound.

The samples collected from boring SB-31 evaluate three separate zones within the NAPL plume. The sample from 15.8'-16.0' bgs exhibited a coal tar odor and had a slight (1.2 ppm) PID reading, but did not contain any NAPL. Although a few contaminants were detected in this sample (Table 6-3), their concentrations were below the TAGM 4046 soil cleanup objectives. The sample from 23.4'-24.0' bgs contained NAPL and exhibited a PID reading of 1,330 ppm. This sample contained benzene, toluene, and xylenes at concentrations well above the TAGM 4046 soil cleanup objectives (Table 6-3). Ethylbenzene and styrene were also detected in this sample. The sample from 24.3'-26.0' bgs was collected from the lower silty clay deposit to evaluate the effectiveness of this deposit as a confining layer. While a few contaminants were detected in this sample, only benzene was detected at a concentration that exceeded the TAGM 4046 soil cleanup objectives (Table 6-3). These results suggest that the lower silty clay deposit is an effective barrier against the further downward migration of NAPL and related contaminants.

Two samples from borings SB-34 and SB-35 were submitted to the lab for chemical analysis. These borings are located along the eastern boundary of the Gastown Sportsmen's Club property and the downgradient edge of the NAPL plume (Figure 6-1). The shallow sample from each boring was collected from a narrow zone that marked the first occurrence of NAPL in these borings (see boring logs in Appendix A). The deeper samples were each composited over a ±3' interval that contained NAPL.

Both samples from boring SB-34 contained benzene, ethylbenzene, toluene, xylenes and naphthalene at concentrations that exceeded the TAGM 4046 soil cleanup objectives (Table 6-3). Styrene was also detected in both samples, while the deeper sample contained 2-butanone at a concentration that exceeded the TAGM 4046 soil cleanup objective (Table 6-3). The results from boring SB-35 are similar, with the exception that benzene was not detected in the shallow sample (although the detection limit was quite high). Styrene was again detected in both samples, while the deeper sample contained 2-butanone at a concentration that exceeded the TAGM 4046 soil cleanup objective (Table 6-3). It is interesting to note that the shallow sample from each boring contained higher contaminant concentrations than the deeper samples by about one order of magnitude (Table 6-3).

While boring SB-39 did not encounter the NAPL plume, analytical results from the two samples

collected from this boring are included in Table 6-3 because contamination was encountered in these samples. The first sample collected from this boring (1.1'-4.0' bgs) was a tan ash with brown and green mottling (see boring log in Appendix A), and was analyzed for TCL semivolatiles and TAL metals. Although the ash did not contain any semivolatile compounds, it did contain numerous metals at various concentrations (Table 6-3). Only the concentrations of mercury and zinc, however, exceeded the TAGM 4046 soil cleanup objectives. This sample also contained manganese at a significant concentration (657,000 µg/kg). The TAGM 4046 soil cleanup objective for manganese is the site background concentration. Since background samples were not collected during the Site Investigation this concentration is unknown.

The second sample collected from boring SB-39 (6.4'-9.0' bgs) was collected from a zone containing petroleum contamination that is distinct from the NAPL associated with the former manufactured gas plant. The petroleum contamination does not have a coal tar odor and is an LNAPL, floating on top of the water table. Nine VOCs were detected in this sample at concentrations that exceeded the TAGM 4046 soil cleanup objectives or the TCLP alternative guidance values (Table 6-3). Ten semivolatile compounds (primarily PAH's) were also detected in this sample; however, the concentrations of these contaminants did not exceed the TAGM 4046 soil cleanup objectives (Table 6-3). In addition to TCL volatile and semivolatile analysis, this sample was also analyzed for petroleum products by DOH method 313.13. No petroleum products were identified in this sample. While the source of the petroleum contamination in boring SB-39 is unknown, a concrete pier located near this boring could have been a cradle for an aboveground storage tank. Additional borings will be required in this area to determine the areal extent of this petroleum contamination.

The analytical results presented in Tables 6-2 and 6-3 show significant differences in contaminant concentrations between samples collected outside the NAPL plume and those collected from within the plume. This difference indicates that visual observation, combined with volatile screening with a PID, is effective in delineating the NAPL plume.

6.3 Groundwater

Five groundwater monitoring wells (Figure 4-3) were installed during the Site Investigation, in part, to further evaluate groundwater contamination at the Site. Twelve groundwater samples were collected during the Site Investigation and submitted to Severn Trent Laboratories for chemical analysis. Analyses included TCL volatiles, TCL semivolatiles, PCBs, pesticides and TAL metals. Because the monitoring wells at the Former Gastown MGP Site monitor both the shallow and intermediate hydrogeologic zones, analytical results are summarized by zone (Tables 6-4 and 6-5). For comparison purposes, these tables include all

contaminants historically detected at the Site. The well development and purge logs are included as Appendix B.

As discussed in Section 5.4, monitoring wells MW-2S and MW-3S are not hydraulically connected to the recent alluvium deposit. These wells were installed to monitor residual contamination following remediation of the Gastown Sportsmen's Club sump discharge line by the Department's Spill Unit in March 1998. The analytical results for these wells (Table 6-4) indicate the presence of groundwater contamination, but at significantly lower concentrations than wells that monitor the intermediate hydrogeologic zone (Table 6-5). Contaminants detected at concentrations that exceed the Department's Class GA groundwater standards or guidance values include benzene (both wells), toluene (MW-2S), xylenes (MW-2S), phenol (both wells), pentachlorophenol (MW-3S), naphthalene (MW-2S), endrin (MW-3S) and iron (MW-3S). These data, combined with the soil results from boring SB-29, indicate that residual contamination remains along some portions of the replaced sump discharge line.

During the Site Investigation, monitoring well MW-39 was installed in the shallow zone to monitor petroleum contamination encountered during the investigation. Individual contaminants detected in this well that exceeded the Department's Class GA groundwater standards or guidance values include benzene, vinyl chloride, dichloroethene, fluorene, phenanthrene, pyrene, benzo(a)anthracene, chrysene, benzo(b)-fluoranthene, benzo(a)pyrene, dieldrin, endrin, arsenic, iron, lead, manganese, zinc and cyanide. Cyanide was detected at a concentration of 18,300 µg/l, well above the 200 µg/l Class GA groundwater standard for this compound. While the soil sample from this boring did not contain petroleum products (see Section 6.2), petroleum products were detected in this well at a concentration of 120,000 µg/l (Table 6-4).

The remaining nine wells monitor all or part of the recent alluvium deposit (see Section 5.4), with six of these wells (MW-13, MW-17, MW-23, MW-2I, MW-34 and MW-35) installed within the NAPL plume (Figures 4-3 and 6-1). The organic analyses of groundwater samples collected from these wells reveal the presence of both volatile and semivolatile compounds (Tables 6-4 and 6-5). Fifteen VOCs were detected in these wells, with the concentrations of benzene (5 samples), toluene (5 samples), ethylbenzene (4 samples), xylenes (5 samples), isopropylbenzene (1 sample), trimethylbenzenes (5 samples), butylbenzenes (5 samples), naphthalene (4 samples), MTBE (1 sample), vinyl chloride (1 sample), styrene (4 samples) and dichloroethene (1 sample) exceeding the Department's Class GA groundwater standards or guidance values. These VOCs are similar to those detected in the subsurface soil samples collected from within the NAPL plume (compare with Table 6-3).

Seventeen PAH's were detected in the groundwater samples collected from wells within the NAPL plume with the concentrations of fourteen exceeding the Department's Class GA groundwater standards or guidance values (Tables 6-4 and 6-5). Groundwater exceedances were documented for naphthalene (5 samples), acenaphthene (3 samples), fluorene (3 samples), phenanthrene (4 samples), anthracene (3 samples), fluoranthene (3 samples), pyrene (5 samples), benzo(a)anthracene (5 samples), chrysene (5 samples), benzo(b)fluoranthene (5 samples), benzo(k)fluoranthene (4 samples), benzo(a)pyrene (5 samples), indeno(1,2,3-cd)pyrene (3 samples) and benzo(g,h,i)perylene (1 sample). Phenolic compounds and PCBs were not detected in any of these wells, while heptachlor (MW-2I) was the only pesticide detected. The concentration of this contaminant, however, exceeded the Department's Class GA groundwater standard for this compound (Table 6-5).

Although a number of inorganic compounds were detected in the groundwater samples, only the concentrations of arsenic, iron, lead, manganese and zinc are reported in Tables 6-4 and 6-5. Each of these compounds were detected in wells installed within the NAPL plume at concentrations that exceeded the Department's Class GA groundwater standards or guidance values. Groundwater exceedances include arsenic (5 samples), iron (6 samples), lead (4 samples), manganese (6 samples) and zinc (3 samples). Cyanide was also detected in five of the six wells installed within the NAPL plume, with the concentration in three wells exceeding the Department's Class GA groundwater standard for this compound (Tables 6-4 and 6-5).

An evaluation of the analytical results for the three wells installed outside the NAPL plume (MW-27, MW-36 and MW-1I) reveals much lower contaminant concentrations than in wells within the plume (Table 6-5). Although thirteen VOCs were detected in these wells, twelve of these detections were documented in well MW-1I, which is located close to the NAPL plume (Figures 4-3 and 6-1). In contrast, wells MW-27 and MW-36 each contained only two VOCs (Table 6-5). Groundwater exceedances were documented for benzene (2 samples), toluene (2 samples), ethylbenzene (1 sample), xylenes (1 sample), n-butylbenzene (1 sample), vinyl chloride (1 sample) and dichloroethene (1 sample). No groundwater exceedances were documented for well MW-36.

Five phenolic compounds were detected in the groundwater samples collected from wells outside the NAPL plume with all five detections documented in well MW-27 (Table 6-5). Of these compounds, phenol, pentachlorophenol, 2-nitrophenol and 4-nitrophenol were detected at concentrations that exceeded the Department's Class GA groundwater standards. Trichlorobenzene, dichlorobenzene and dinitrotoluene were also detected in this well (Table 6-5), with all three compounds detected at concentrations that exceeded the

Department's Class GA groundwater standards.

Five PAH's were detected in the groundwater samples collected from wells outside the NAPL plume with only the concentrations of naphthalene (MW-1I) and acenaphthene (MW-27) exceeding the Department's Class GA groundwater standards or guidance values (Table 6-5). Naphthalene was the only PAH detected in well MW-36. PCBs were not detected in any of these wells, while endrin in wells MW-27 and MW-36 was the only pesticide detected. The concentration of endrin in both wells, however, exceeded the Department's Class GA groundwater standard for this compound (Table 6-5).

Arsenic, iron, lead, manganese and zinc were detected in each well installed outside the NAPL plume (Table 6-5), with the concentration of each metal in wells MW-27 and MW-36 exceeding the Department's Class GA groundwater standard or guidance value. Only the concentrations of iron and manganese in well MW-1I exceeded the groundwater standards. Cyanide was also detected in all three wells, with the concentration in wells MW-1I and MW-36 exceeding the Department's Class GA groundwater standard for this compound (Table 6-5).

Like the soil analytical results presented in Section 6.2, the groundwater analytical results (Tables 6-4 and 6-5) show significant differences in contaminant concentrations between samples collected outside the NAPL plume and those collected from within the plume.

6.4 Sump Water

One water sample from the primary sump of the Gastown Sportsmen's Club was collected for chemical analysis during the Site Investigation and submitted to Severn Trent Laboratories for chemical analysis. Analyses included TCL volatiles, TCL semivolatiles, PCBs, pesticides and TAL metals. This sample was collected to further evaluate the effectiveness of the groundwater/NAPL extraction and treatment system by determining if contaminant concentrations in the clubhouse sump had decreased since the startup of the system in September 1998. Analytical results from this and previous sampling events are summarized in Table 6-6.

Prior to startup of the groundwater/NAPL extraction and treatment system, fifteen VOCs were detected in water from the club's primary sump (Table 6-6), with the concentrations of all fifteen contaminants exceeding the Department's Class GA groundwater standards or guidance values. These contaminants are similar to those detected in the subsurface soil and groundwater samples. An evaluation

of the analytical results for the sump water collected during the Site Investigation (15 months after system startup) indicates that although fourteen VOCs were detected, the concentrations of these contaminants are approximately one order of magnitude lower than the concentrations documented prior to system startup. Only eight of these compounds were detected at concentrations that exceeded the Department's Class GA groundwater standards or guidance values, and include benzene, toluene, ethylbenzene, xylenes, n-butylbenzene, trimethylbenzene and styrene (Table 6-6).

Five phenolic compounds were detected in the sump water prior to system startup, with the concentrations of phenol and pentachlorophenol having exceeded the Department's Class GA groundwater standards (Tables 6-6). Four phenolic compounds were detected in the post-startup sump water, with only the concentration of phenol exceeding the Department's Class GA groundwater standards (Table 6-6). Pentachlorophenol was not detected in this sample.

Prior to system startup, nineteen PAH's were detected in the club's primary sump water, with the concentration of thirteen of these contaminants exceeding the Department's Class GA groundwater standards or guidance values (Tables 6-6). There are no groundwater standards or guidance values for the other six PAH's detected. Only seven PAH's were detected in the post-startup sump water, with none of the concentrations exceeding groundwater standards or guidance values (Tables 6-6). PCBs and pesticides were not detected in the post-startup sump water. Prior to system startup, however, heptachlor epoxide, DDD and chlordane had been detected (Table 6-6), with the concentration of DDD having exceeded the Department's Class GA groundwater standard for this compound.

Arsenic, iron, manganese, zinc and cyanide were detected in the sump water prior to system startup, with the concentrations of iron, manganese and cyanide exceeding the Department's Class GA groundwater standards (Table 6-6). While iron, manganese, zinc and cyanide were still detected in the post startup sump water, only the concentration of iron exceeded the Department's Class GA groundwater standards (Table 6-6).

7.0 DISCUSSIONS AND CONCLUSIONS

7.1 Discussion

The principle objectives of the Site Investigation were to (1) fully evaluate the effectiveness of the groundwater/NAPL extraction and treatment system; (2) determine the extent to which NAPL has migrated under the Gastown Sportsmen's Club toward nearby properties; and (3) determine the extent to which contaminated groundwater has migrated from the Site. These objectives were evaluated through an examination of water level data, visual observation of soil samples, and the analysis of water samples obtained from monitoring wells and the Gastown Sportsmen's Club primary basement sump. Subsurface soil samples were sent to a lab for chemical analysis to confirm the visual observations.

The effectiveness of the groundwater/NAPL extraction and treatment system was evaluated through an examination of water level data from on-site monitoring wells and a review of analytical data from a water sample collected from the primary sump of the Gastown Sportsmen's Club. The water level data obtained from the Site were utilized to construct hydrographs for both the shallow and intermediate zone wells. These hydrographs show a cyclical pattern of high and low water levels: high during periods of high rainfall and snowmelt; low during drier months when the groundwater extraction system is operating at peak efficiency. The hydrographs also reveal that water levels in on-site monitoring wells do not fluctuate in response to changing water levels in Tonawanda Creek, indicating that the creek is not hydraulically connected to the recent alluvium deposit.

Water level data were also utilized to construct groundwater contour maps. These maps reveal that even prior to the installation of the groundwater extraction system, groundwater flowed toward the Gastown Sportsmen's Club. This flow pattern suggests that the club's basement drain system (sumps and floor drains) acts as a significant groundwater sink. Operation of the groundwater extraction system alters this flow pattern by producing an elliptical cone of depression around the extraction well that extends to the eastern property line of the Gastown Sportsmen's Club. Drawdown is substantial, and is produced by groundwater extraction rates that range from 0.19 to 1.79 gallons per minute (gpm). Hydrographs for the Site show that groundwater extraction affects water levels in all on-site wells that screen the recent alluvium deposit, indicating that the influence of the extraction system is larger areally than the cone of depression delineated by the groundwater contour maps. These data, therefore, suggest that the groundwater extraction system collects contaminated groundwater from throughout the Site, and when operating at peak efficiency, prevents this groundwater from migrating offsite. Installation of a secondary vault in October 2000 to better manage the club's basement sump discharge is expected to increase system efficiency while preventing future spill-over events of

contaminated groundwater to the ground surface.

The analytical results from the club's primary basement sump also confirm that the groundwater extraction system is operating effectively. While this water is still contaminated, the concentrations of individual contaminants have decreased by approximately one order of magnitude since operation of the system began. Furthermore, prior to system startup, fifteen VOCs, two phenolic compounds, thirteen PAH's, three pesticides, two inorganic compounds and cyanide were detected in the sump water at concentrations that exceeded the Department's Class GA groundwater standards or guidance values. The post-startup sump water, however, contained only eight VOCs, one phenolic compound, seven PAH's and one inorganic compound at concentrations that exceeded the groundwater standards or guidance values. This decrease in both contaminant concentrations and the number of contaminants exceeding groundwater standards or guidance values indicates that the groundwater extraction and treatment system has dramatically reduced the exposure potential to members of the Gastown Sportsmen's Club.

The second objective of the Site Investigation was to determine the extent to which NAPL has migrated under the Gastown Sportsmen's Club toward nearby properties on Carney Street. To accomplish this objective, thirteen (13) soil borings were completed during the Site Investigation, with the subsurface soil samples examined for the presence of NAPL. This information, combined with that obtained from historical borings completed at the Site, indicate that the NAPL plume associated with the Former Gastown MGP Site forms a general "L" shape; the short leg being located between the former manufactured gas plant and the coal bins with the long leg extending eastward under the NFTA and Gastown Sportsmen's Club properties. While this investigation did not fully delineate the downgradient extent of the plume, the presence of NAPL in small, isolated pockets in two borings along the eastern property line of the Gastown Sportsmen's Club suggests that the plume edge is located near these borings.

The last objective of the Site Investigation was to determine the extent to which contaminated groundwater has migrated from the Former Gastown MGP Site. To accomplish this objective, five groundwater monitoring wells were installed during the investigation to expand the existing monitoring well network. Twelve groundwater samples were collected during the Site Investigation and submitted to a lab for chemical analysis. These results indicate that groundwater from wells installed within the NAPL plume is significantly more contaminated than groundwater from wells installed outside the plume. Groundwater contamination also extends under the NFTA and Gastown Sportsmen's Club properties, being documented in two wells installed along the eastern boundary of the latter property. As discussed above, however, water

level data suggest that the groundwater extraction system, when operating at peak efficiency, prevents contaminated groundwater from migrating offsite.

7.2 Conclusion

The Site Investigation completed at the Former Gastown MGP Site revealed that NAPL extends under the NFTA and Gastown Sportsmen's Club properties. While this investigation did not fully delineate the downgradient extent of the plume, the presence of NAPL in small, isolated pockets in two borings along the eastern boundary of the club's property suggests that the plume edge is located near these borings. Groundwater samples collected from the wells installed in these borings is extensively contaminated. Water level data for the Site, however, suggest that the groundwater extraction system collects contaminated groundwater from throughout the Site, further suggesting that off-site migration of contaminated groundwater is not occurring.

8.0 RECOMMENDATIONS

A Remedial Investigation/Feasibility Study (RI/FS) is required at the Former Gastown MGP Site to fully delineate the nature and extent of contamination associated with the Site (RI) and to select a long term remedial action (FS). The field investigations completed to date, including the Site Investigation discussed in this report, should constitute a significant portion of the RI as these investigations have delineated the nature and extent of contamination under the NFTA and Gastown Sportsmen's Club properties. As a result, the primary focus of the RI should be on the Holler property, where the areal extent of the NAPL plume has not been delineated. The nature and extent of both subsurface soil and groundwater contamination associated with this property should also be evaluated. During the Site Investigation several issues were identified that also require further investigation. These issues, and the investigative activities required, are discussed in the following paragraphs.

In an attempt to alleviate future spill-over events from the primary vault, and to increase system efficiency, a secondary vault and pump was installed at the Site in October 2000. The club's sump discharge, which originally discharged to the extraction well, was redirected to this vault and is pumped directly to the treatment system. To fully evaluate the effect of this modification on the efficiency of the groundwater extraction system, water level measurements in on-site wells will be required over time, with the data utilized to construct hydrographs and groundwater contour maps. To ensure that members of the Gastown Sportsmen's Club remain adequately protected, water samples from the club's basement sumps should also be collected over time.

The Site Investigation determined that residual contamination remains along the replaced sump discharge line. To determine the areal extent of this contamination, additional shallow soil borings should be completed, especially around soil boring SB-29 where NAPL was encountered. Monitoring wells MW-2S and MW-3S should also be sampled periodically to evaluate trends in groundwater contaminant concentrations.

The Site Investigation also identified petroleum contamination in soil boring SB-39 that may be related to a former aboveground storage tank. Additional shallow soil borings should be completed in this area of the Site to determine the areal extent of contamination.

While the lower silty clay deposit has prevented the further downward migration of contaminated groundwater and NAPL, the thickness of this deposit under the Former Gastown MGP Site is unknown. This

information is critical as the thickness of this deposit, along with its integrity, determines the effectiveness of the unit as a confining layer. If this deposit is thin or fractured, NAPL could migrate through it to deeper, more permeable deposits. During the RI, therefore, at least one soil boring should be completed to refusal to determine the thickness of the lower silty clay deposit, and to identify other stratigraphic units underlying the Site.

9.0 REFERENCES

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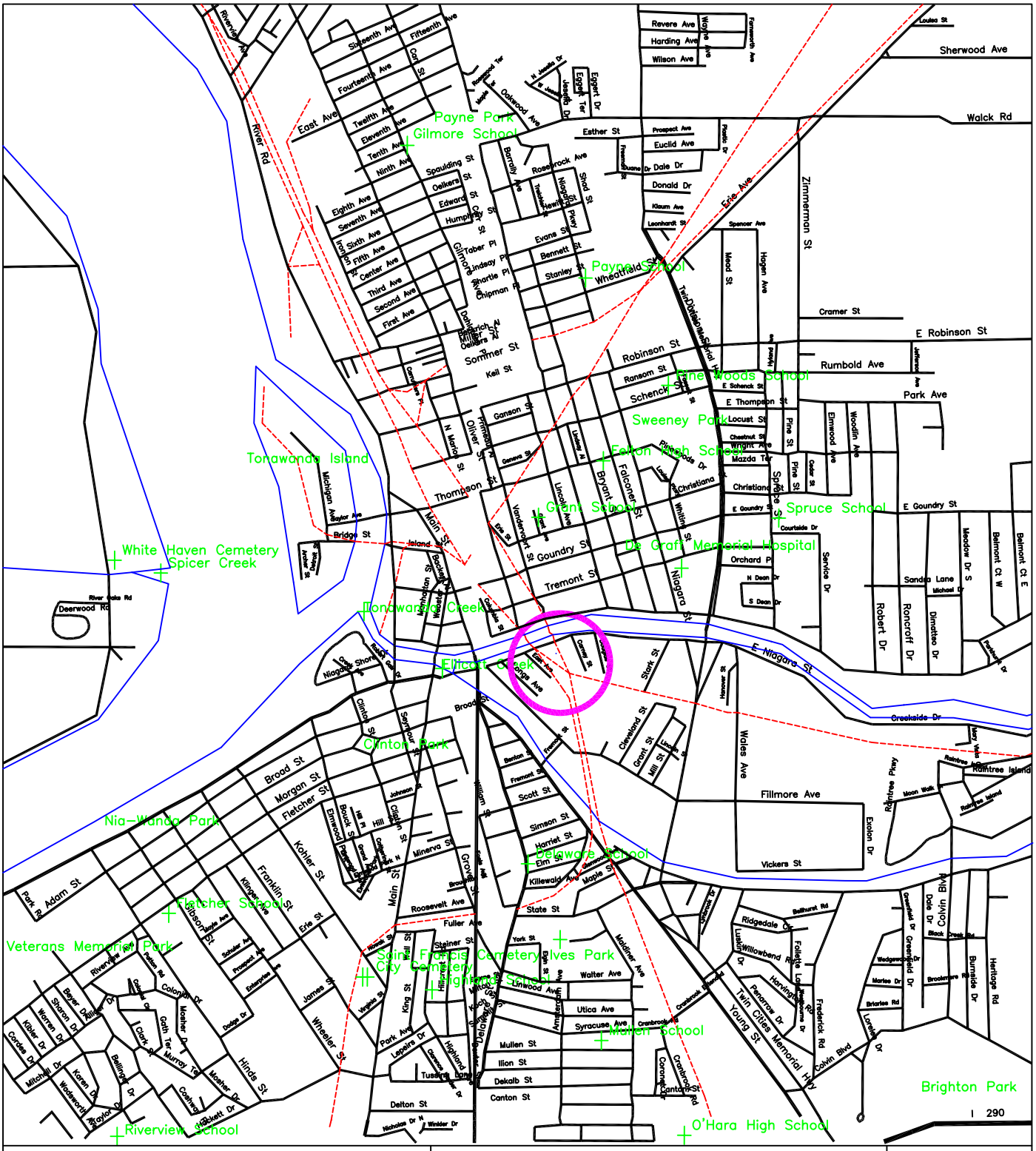


Tonawanda East Quadrangle &
Tonawanda West Quadrangle

Scale Depends on Final Plotted Size

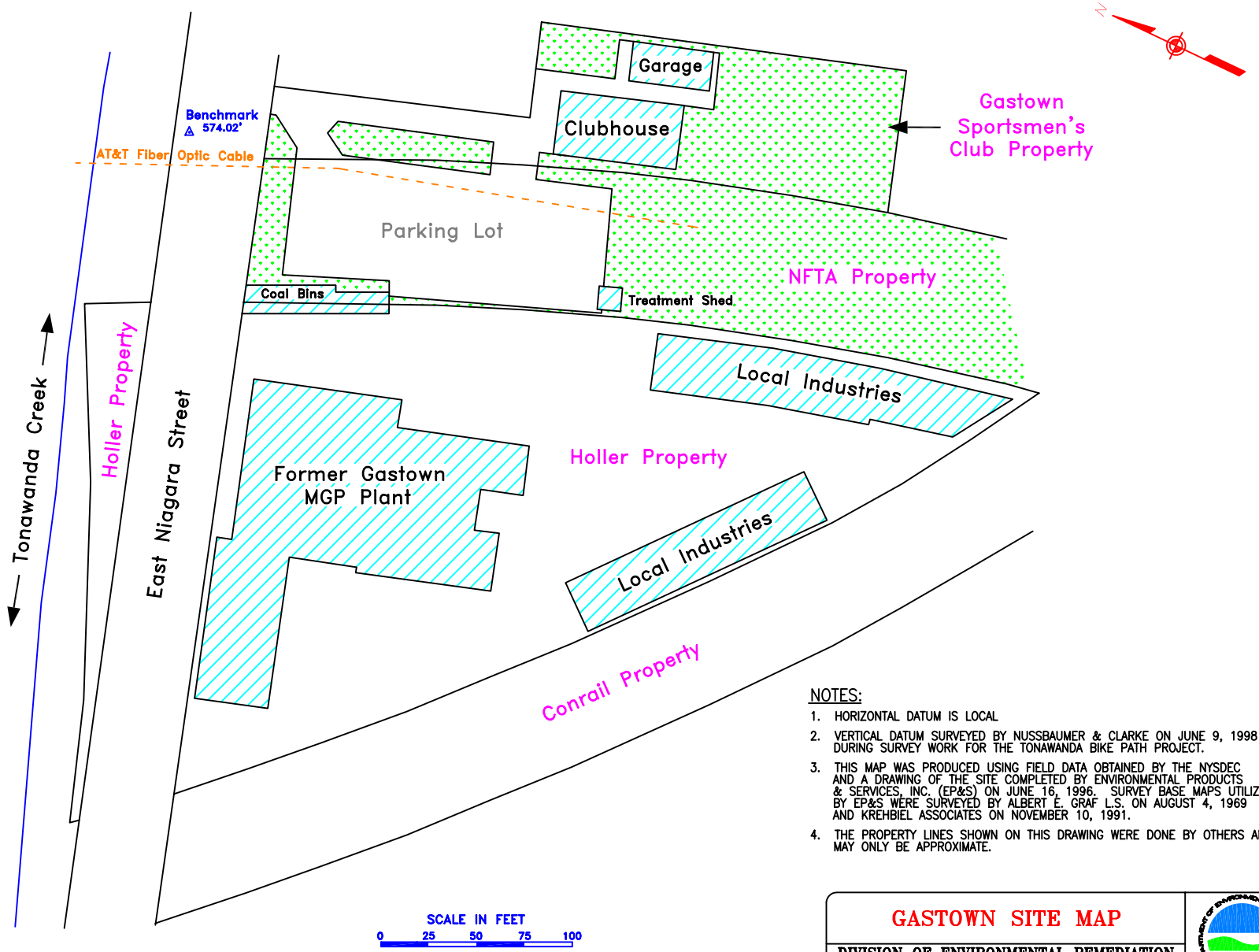
SITE LOCATION MAP

DIVISION OF ENVIRONMENTAL REMEDIATION

DATE: 09/19/00 | DRAWING: Location.dwg

SITE: FORMER GASTOWN MGP SITE

FIGURE 1-1



NOTES:

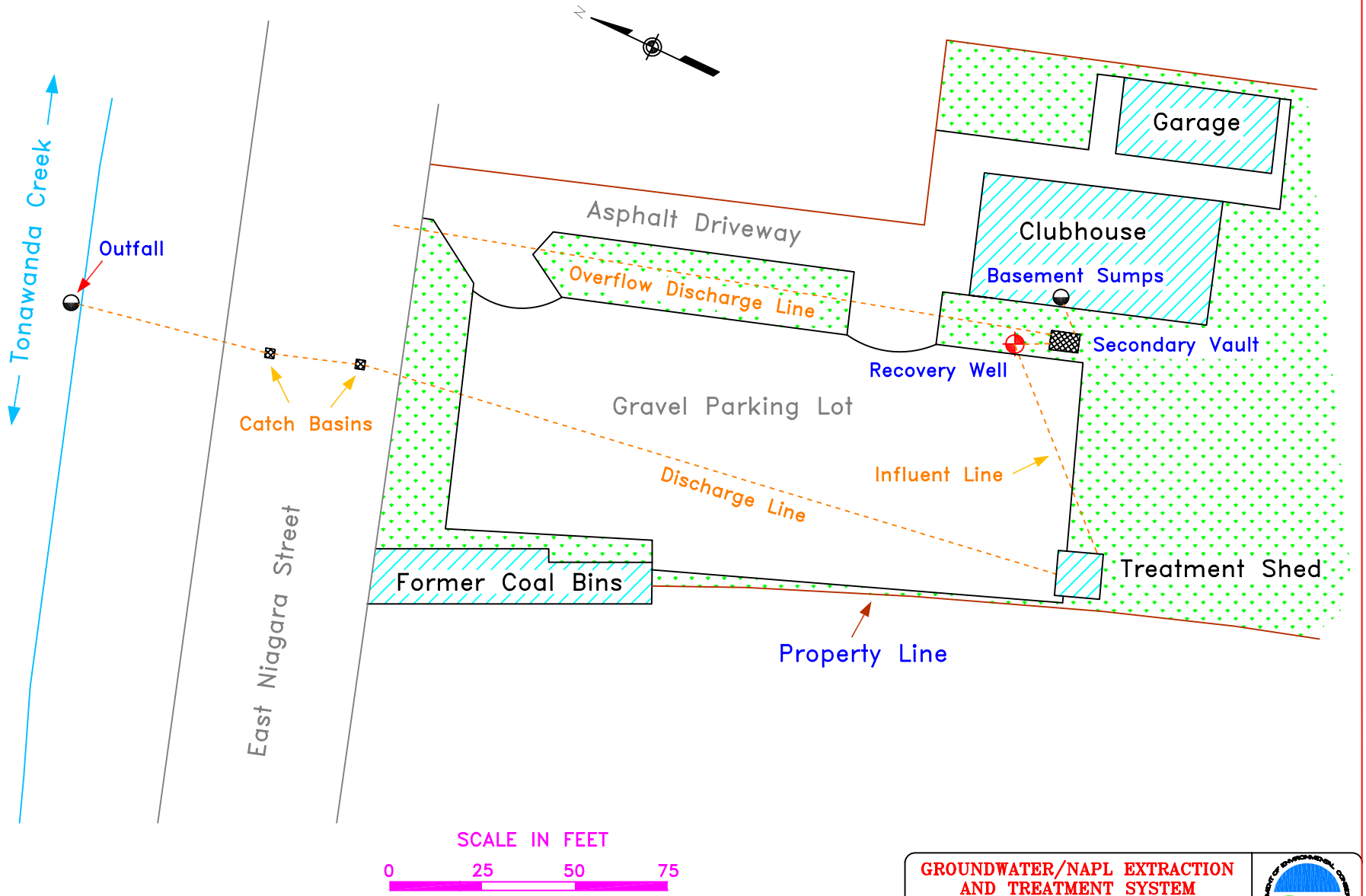
1. HORIZONTAL DATUM IS LOCAL
2. VERTICAL DATUM SURVEYED BY NUSSBAUMER & CLARKE ON JUNE 9, 1998 DURING SURVEY WORK FOR THE TONAWANDA BIKE PATH PROJECT.
3. THIS MAP WAS PRODUCED USING FIELD DATA OBTAINED BY THE NYSDEC AND A DRAWING OF THE SITE COMPLETED BY ENVIRONMENTAL PRODUCTS & SERVICES, INC. (EP&S) ON JUNE 16, 1996. SURVEY BASE MAPS UTILIZED BY EP&S WERE SURVEYED BY ALBERT E. GRAF L.S. ON AUGUST 4, 1969 AND KREHBIEL ASSOCIATES ON NOVEMBER 10, 1991.
4. THE PROPERTY LINES SHOWN ON THIS DRAWING WERE DONE BY OTHERS AND MAY ONLY BE APPROXIMATE.

GASTOWN SITE MAP

DIVISION OF ENVIRONMENTAL REMEDIATION

DATE: 10/12/99 DRAWING: Sitemap.dwg

SITE: FORMER GASTOWN MGP SITE FIGURE 1-2



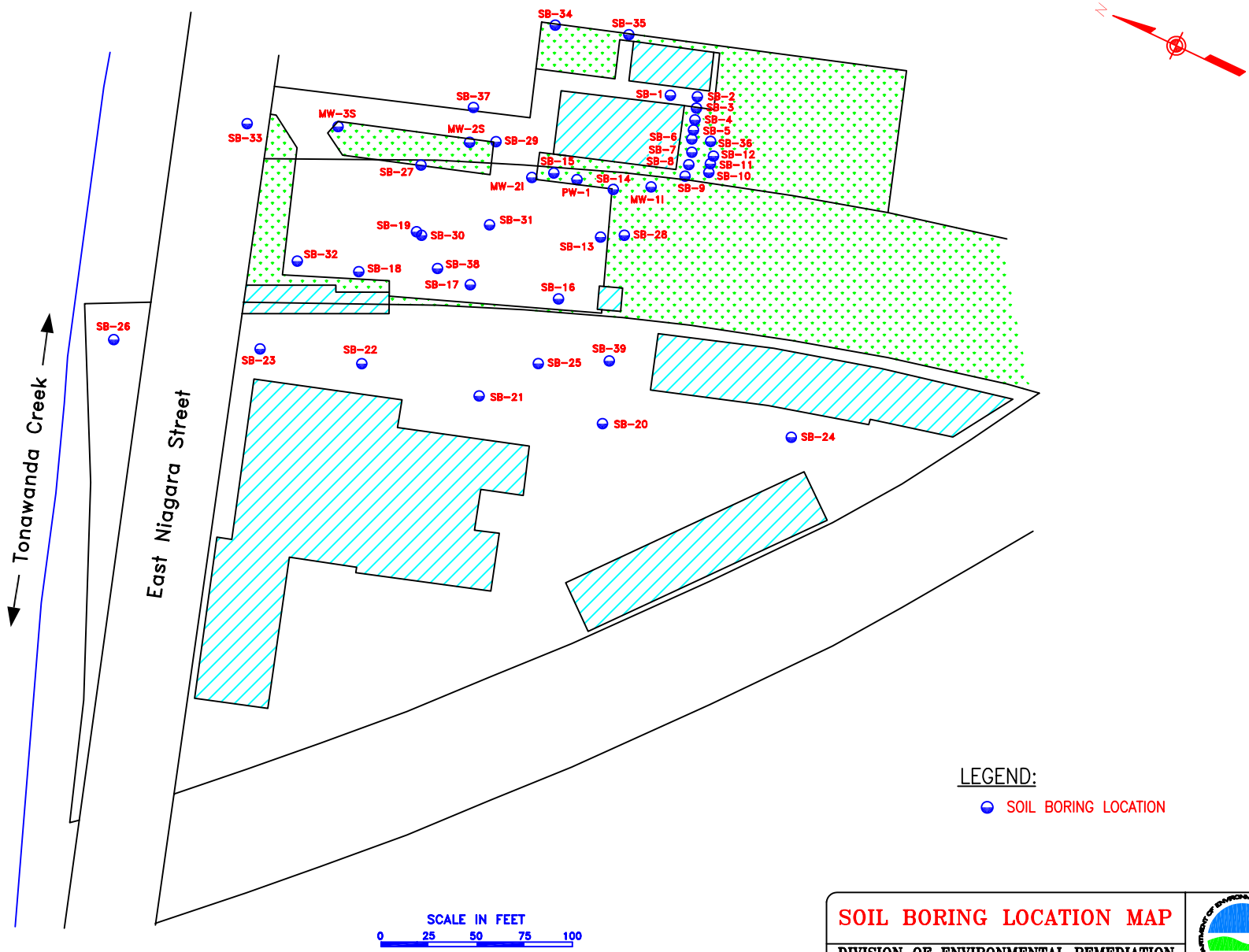
GROUNDWATER/NAPL EXTRACTION AND TREATMENT SYSTEM

DIVISION OF ENVIRONMENTAL REMEDIATION

DATE: 01/25/01 DRAWING: System.dwg

SITE: FORMER GASTOWN MGP SITE

FIGURE 1-3



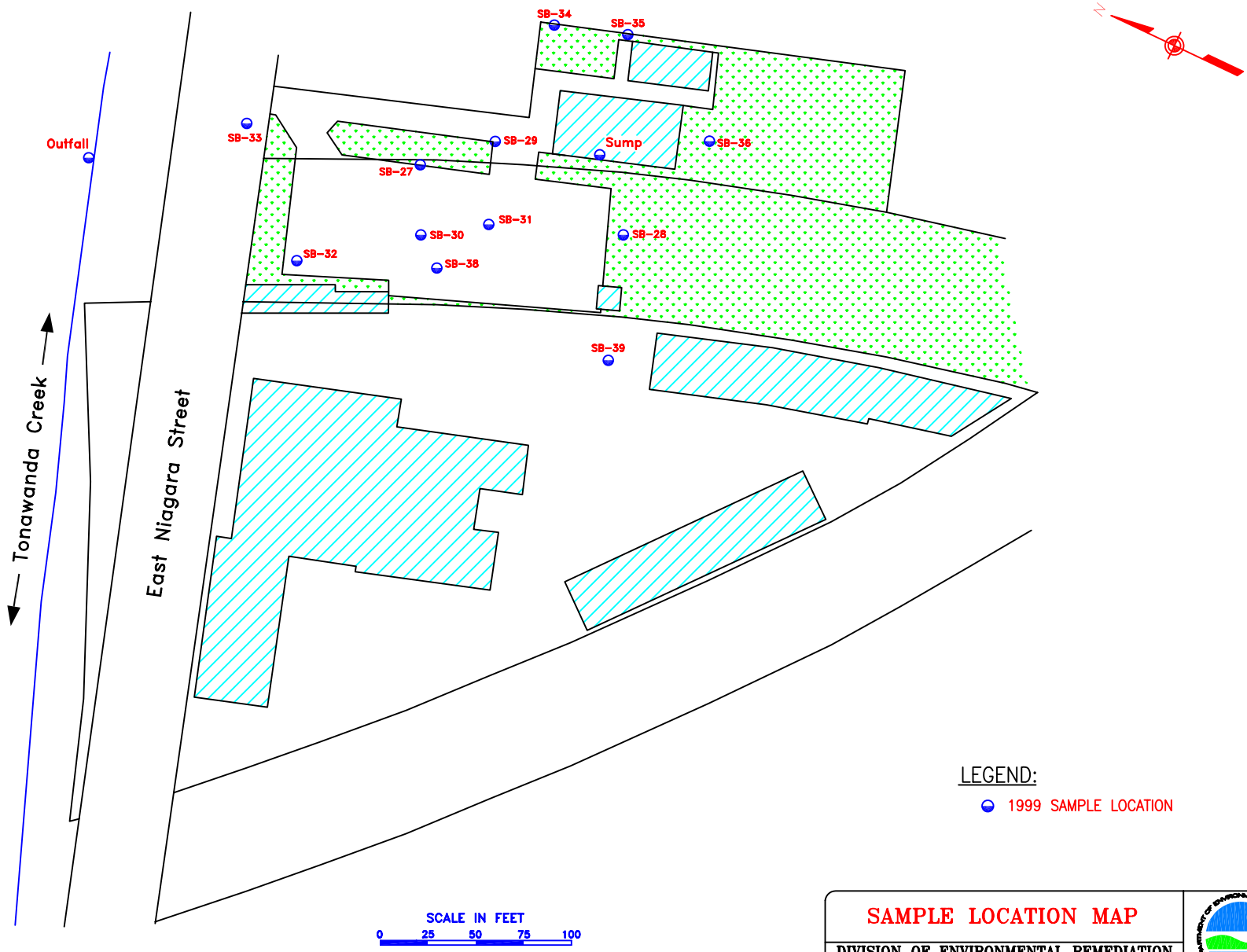
SOIL BORING LOCATION MAP

DIVISION OF ENVIRONMENTAL REMEDIATION

DATE: 10/12/99 DRAWING: Sitemap.dwg

SITE: FORMER GASTOWN MGP SITE

FIGURE 4-1



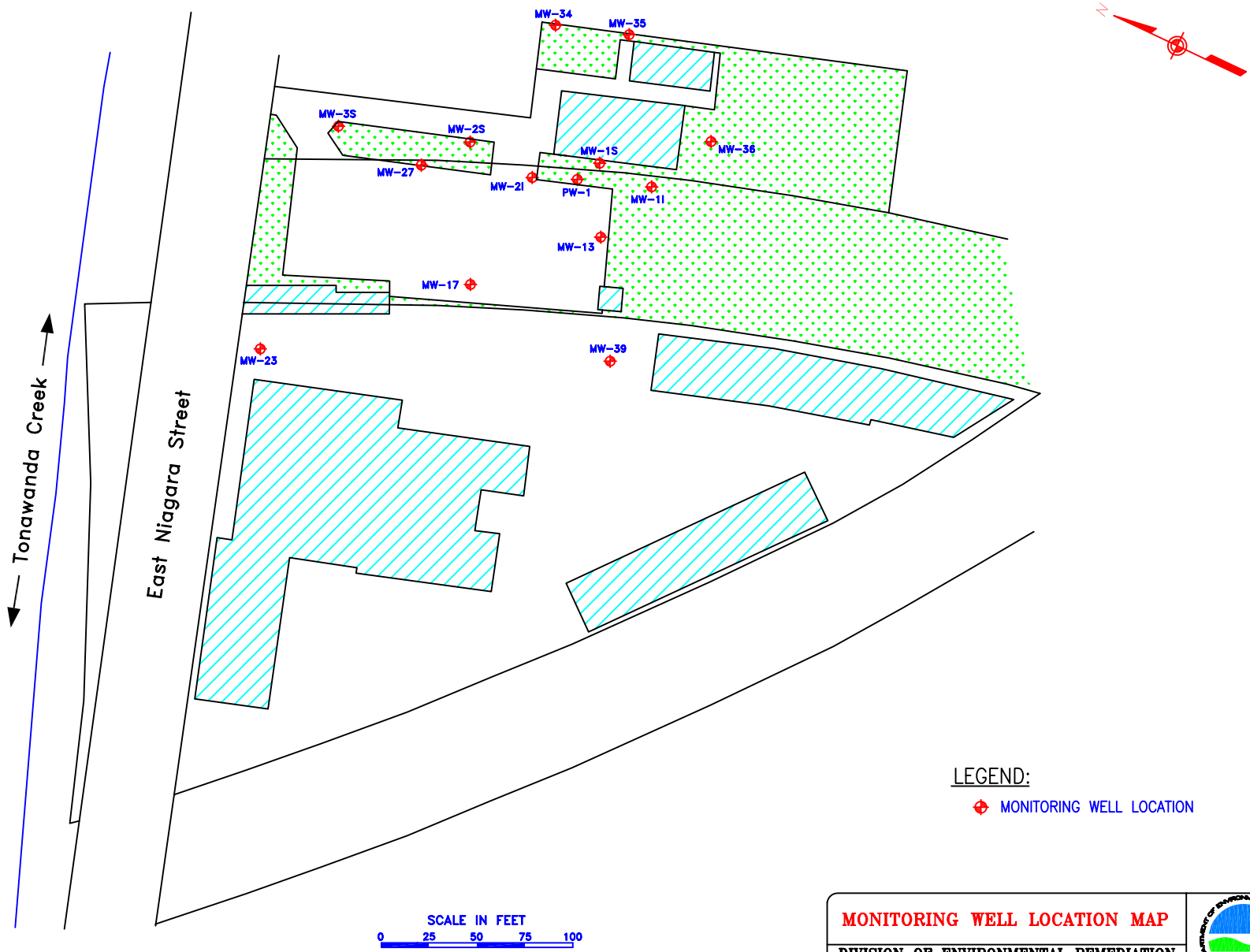
SAMPLE LOCATION MAP

DIVISION OF ENVIRONMENTAL REMEDIATION

DATE: 10/12/99 DRAWING: Sitemap.dwg

SITE: FORMER GASTOWN MGP SITE

FIGURE 4-2



MONITORING WELL LOCATION MAP

DIVISION OF ENVIRONMENTAL REMEDIATION

DATE: 10/12/99 DRAWING: Sitemap.dwg

SITE: FORMER GASTOWN MGP SITE

FIGURE 4-3

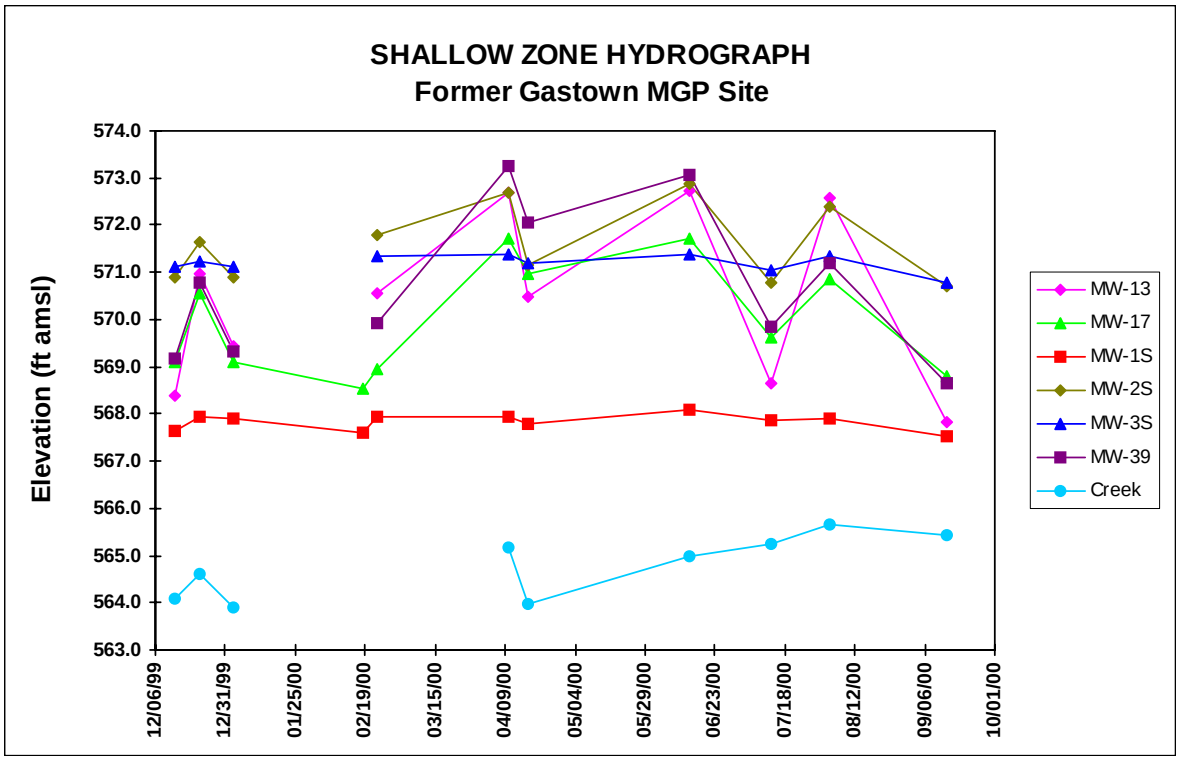


Figure 5-1. Shallow zone hydrograph for data obtained during the Site Investigation.

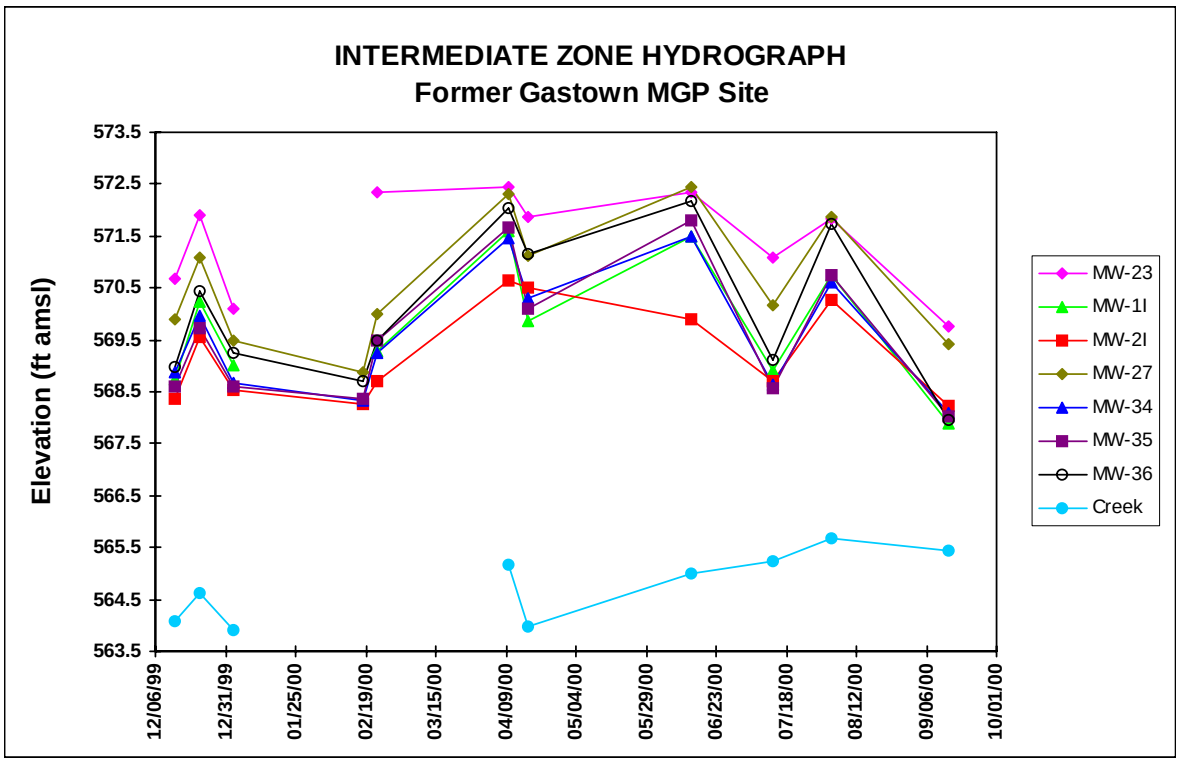


Figure 5-2. Intermediate zone hydrograph for data obtained during the Site investigation.

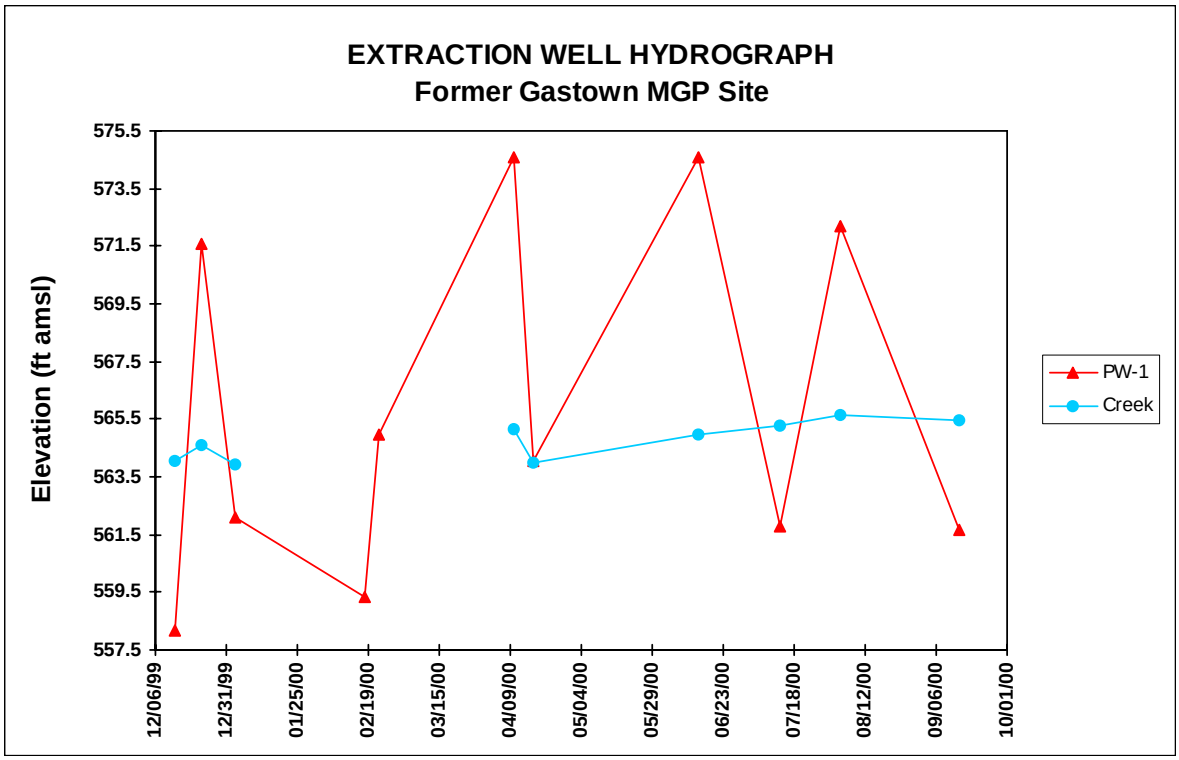


Figure 5-3. Extraction well hydrograph for data obtained during the Site Investigation. High water levels are caused by discharge of the club's sumps into the extraction well.

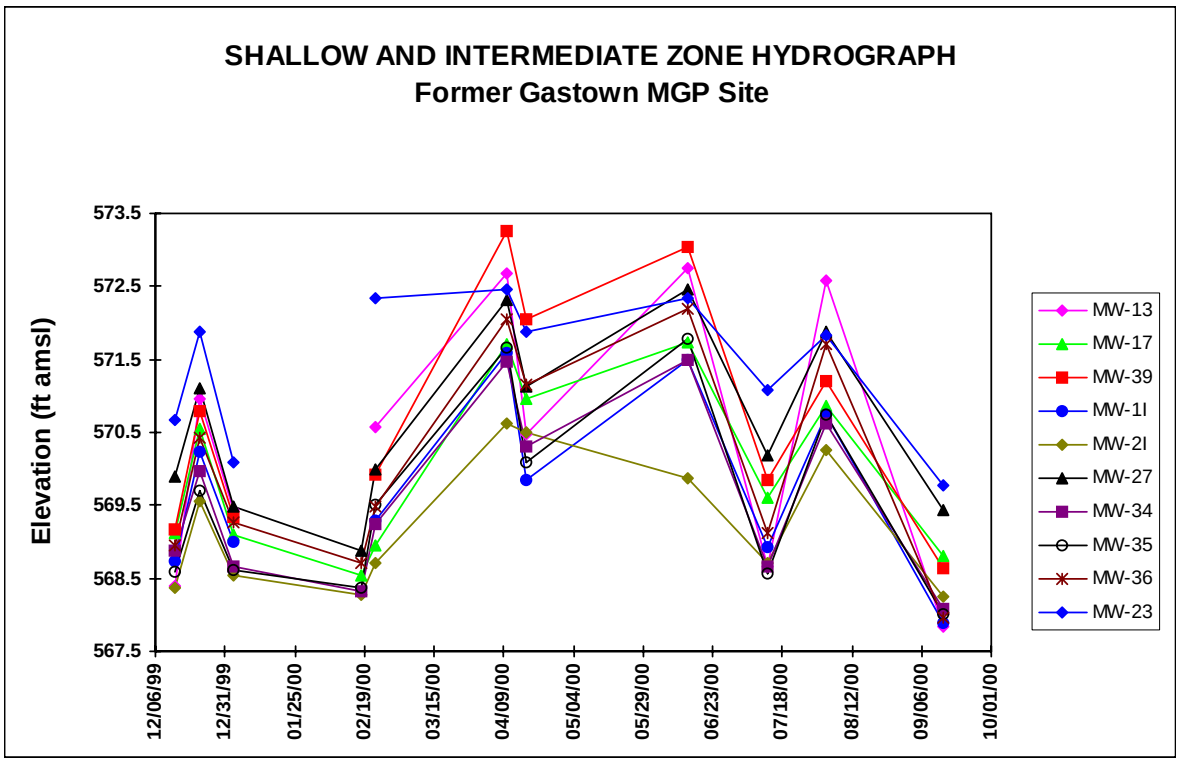


Figure 5-4. Shallow and intermediate zone hydrograph for data obtained during the Site Investigation. Data from wells MW-1S, MW-2S and MW-3S have been omitted (see text for explanation).

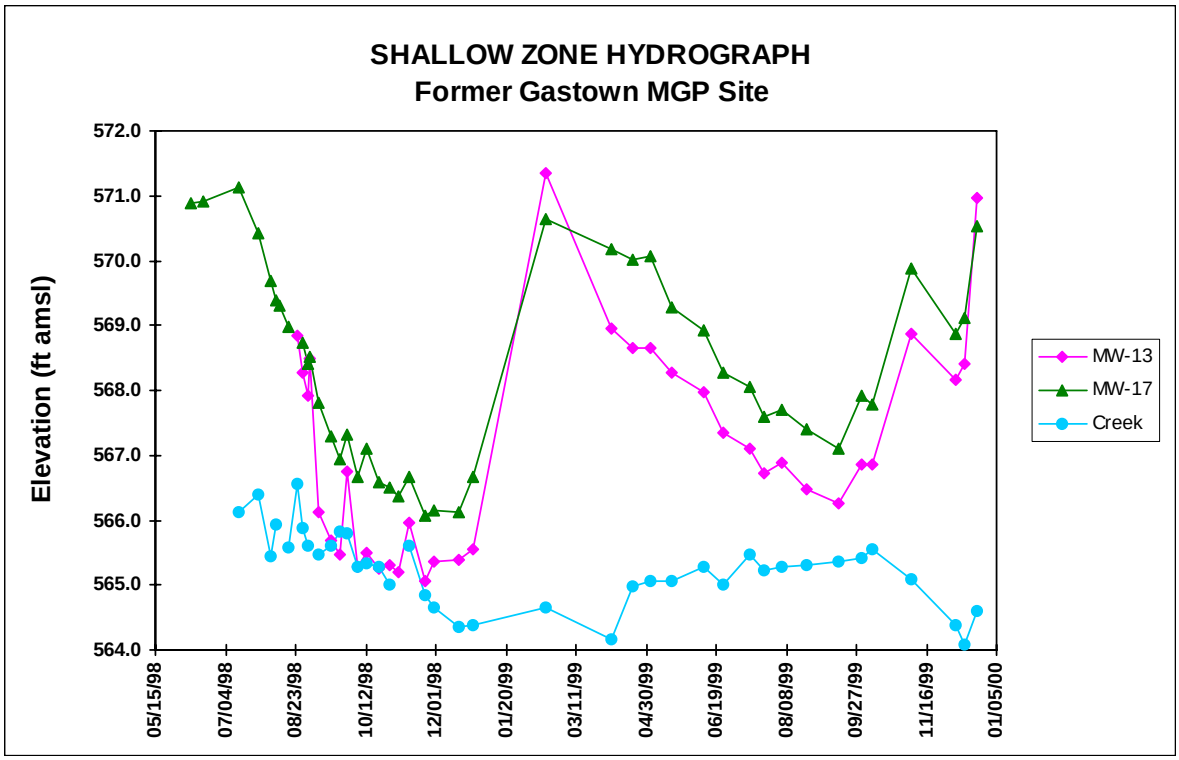


Figure 5-5. Shallow zone hydrograph for data obtained prior to the Site Investigation.

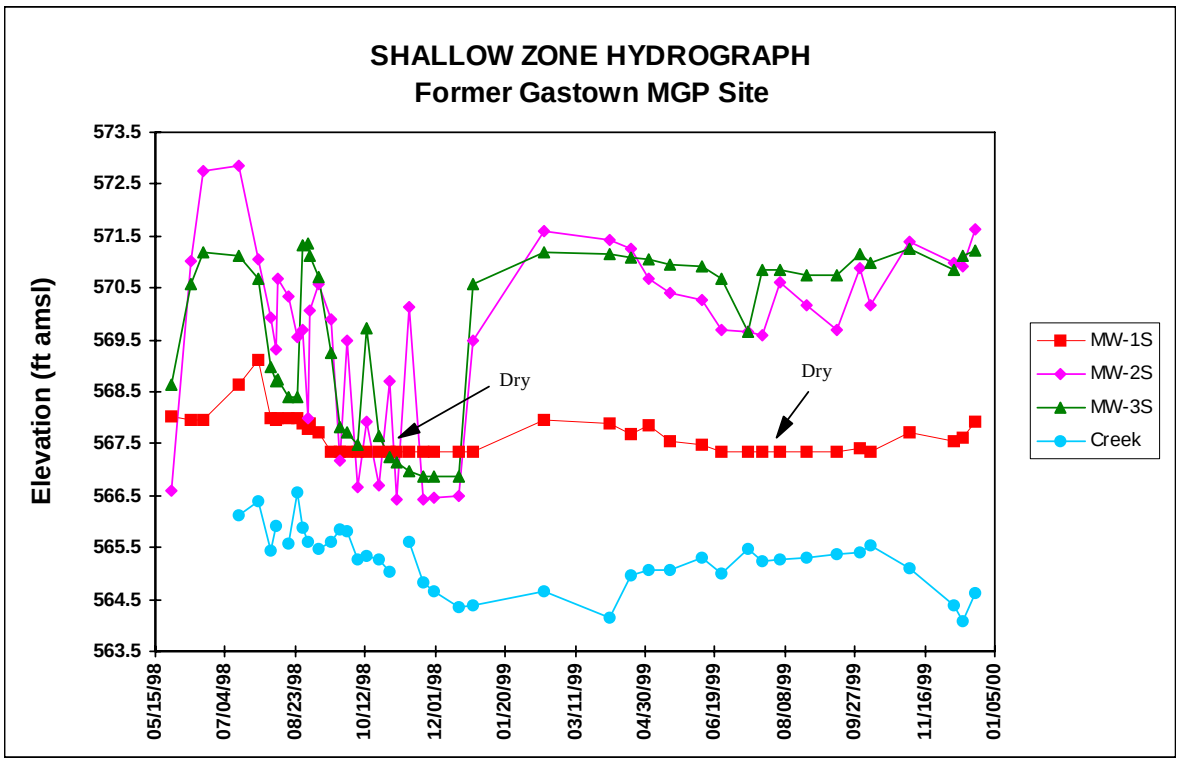


Figure 5-6. Historical shallow zone hydrograph for wells not hydraulically connected to the recent alluvium deposit. See text for further explanation.

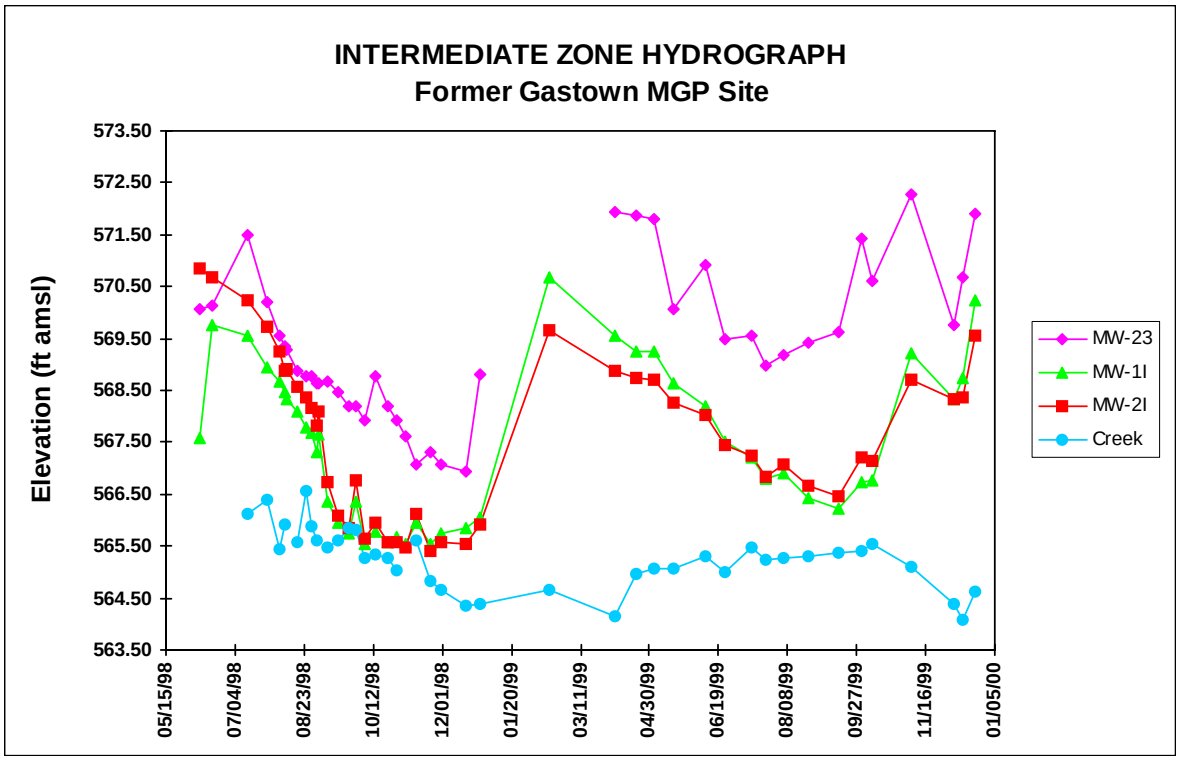


Figure 5-7. Intermediate zone hydrograph for data obtained prior to the Site Investigation.

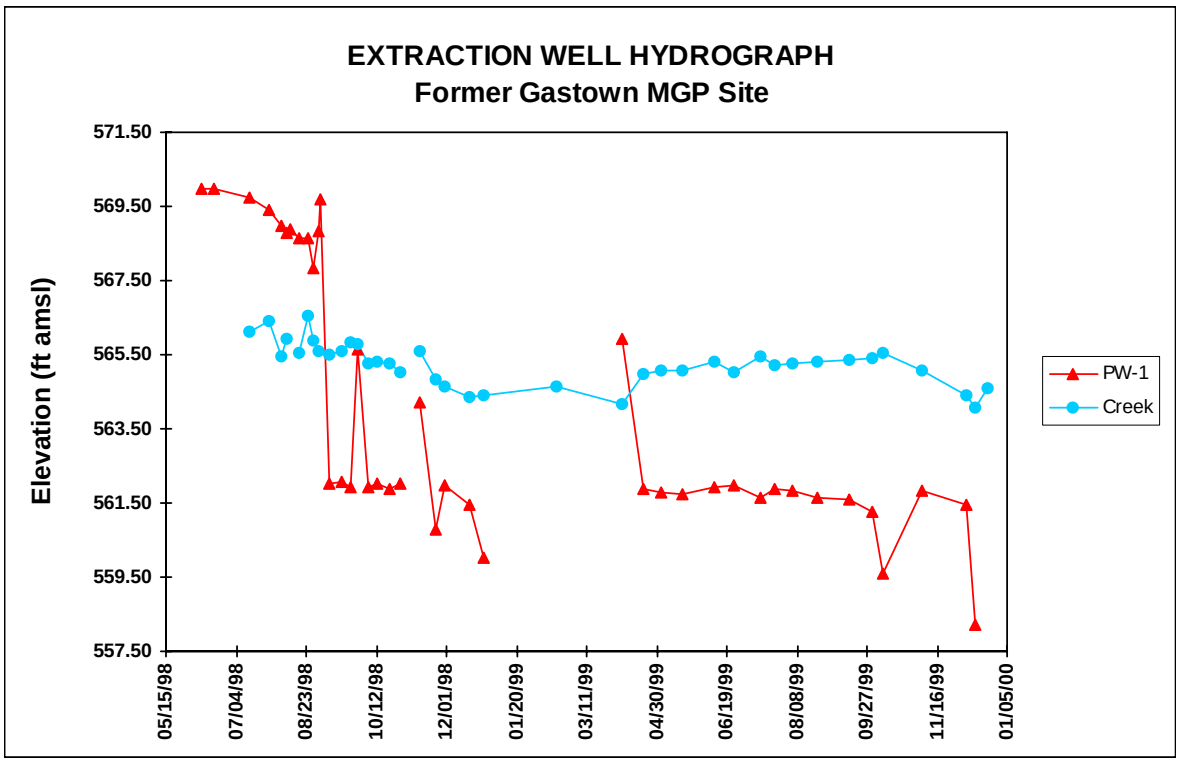


Figure 5-8. Extraction well hydrograph for data obtained prior to the Site Investigation. High water levels are caused by discharge of the club's sumps into the extraction well.

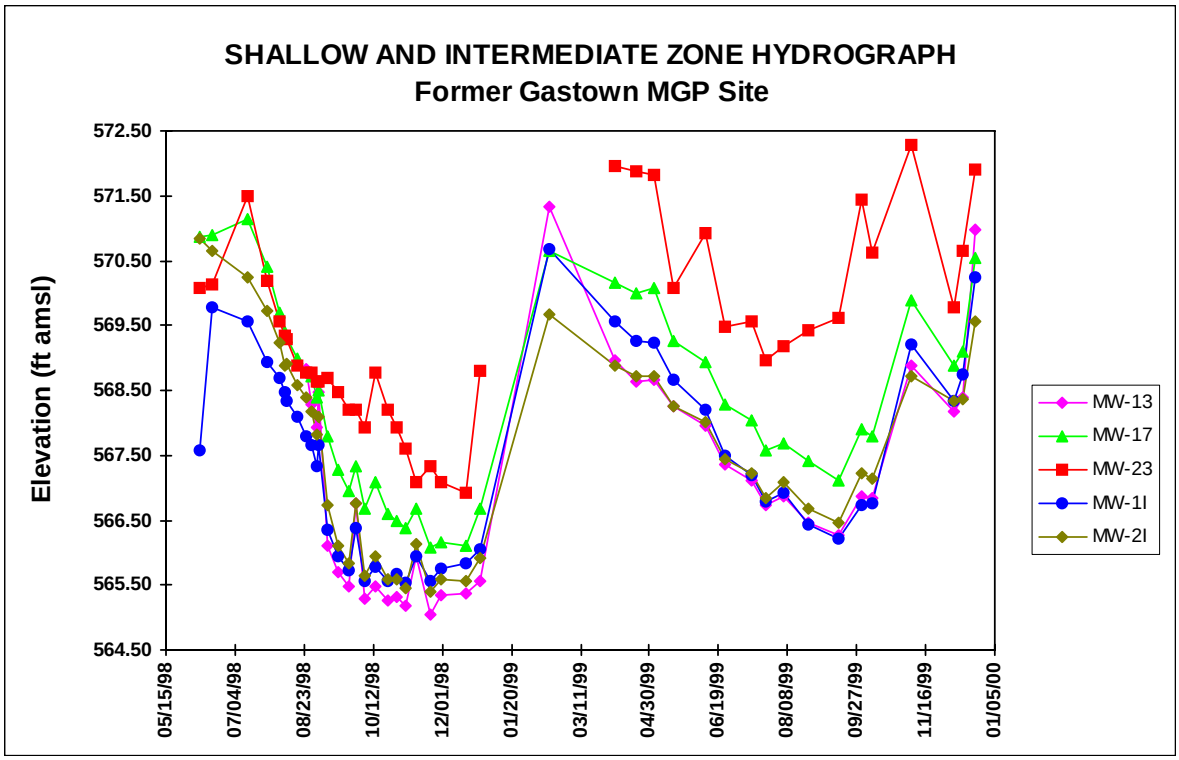
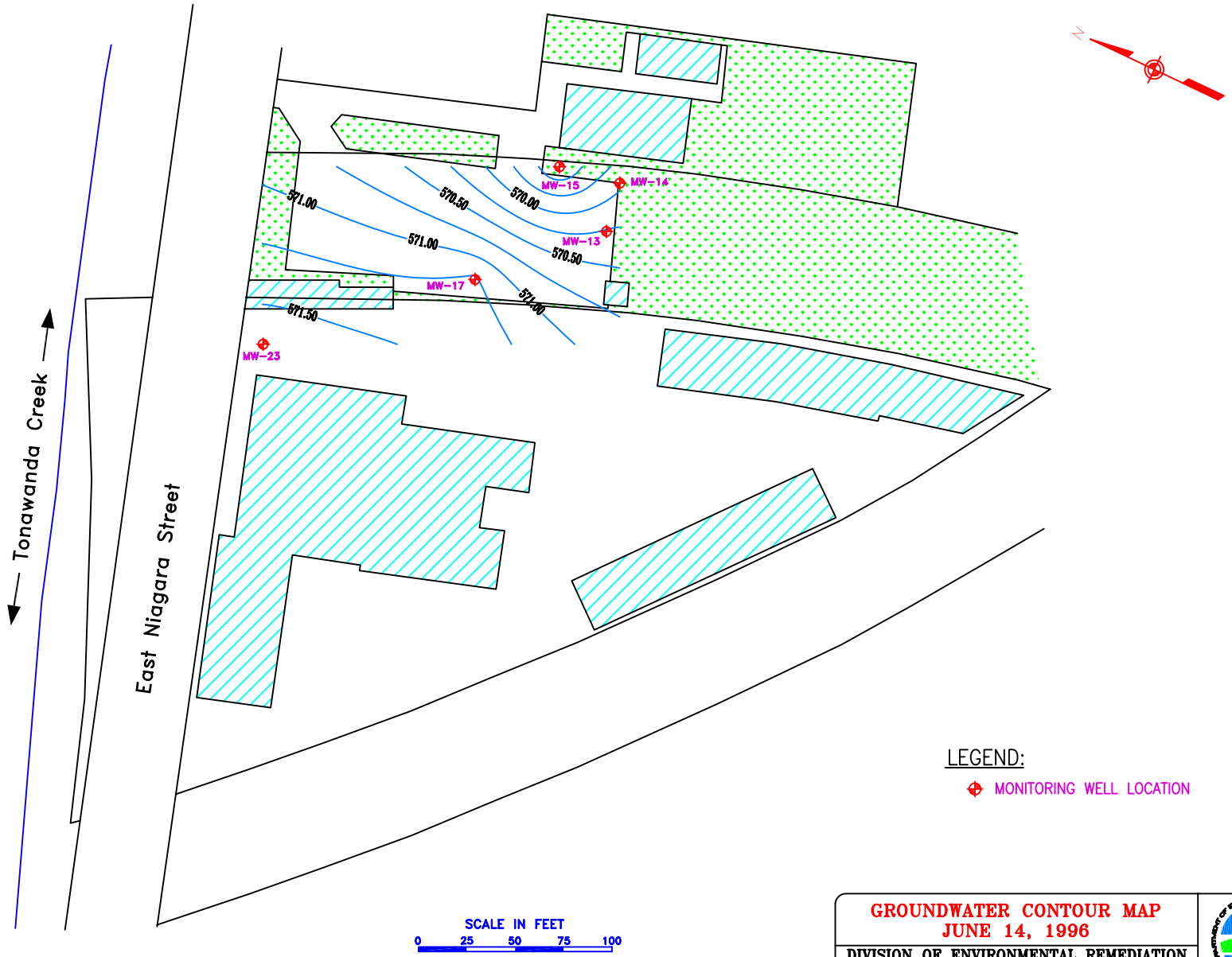


Figure 5-9. Shallow and intermediate zone hydrograph for data obtained prior to the Site Investigation.

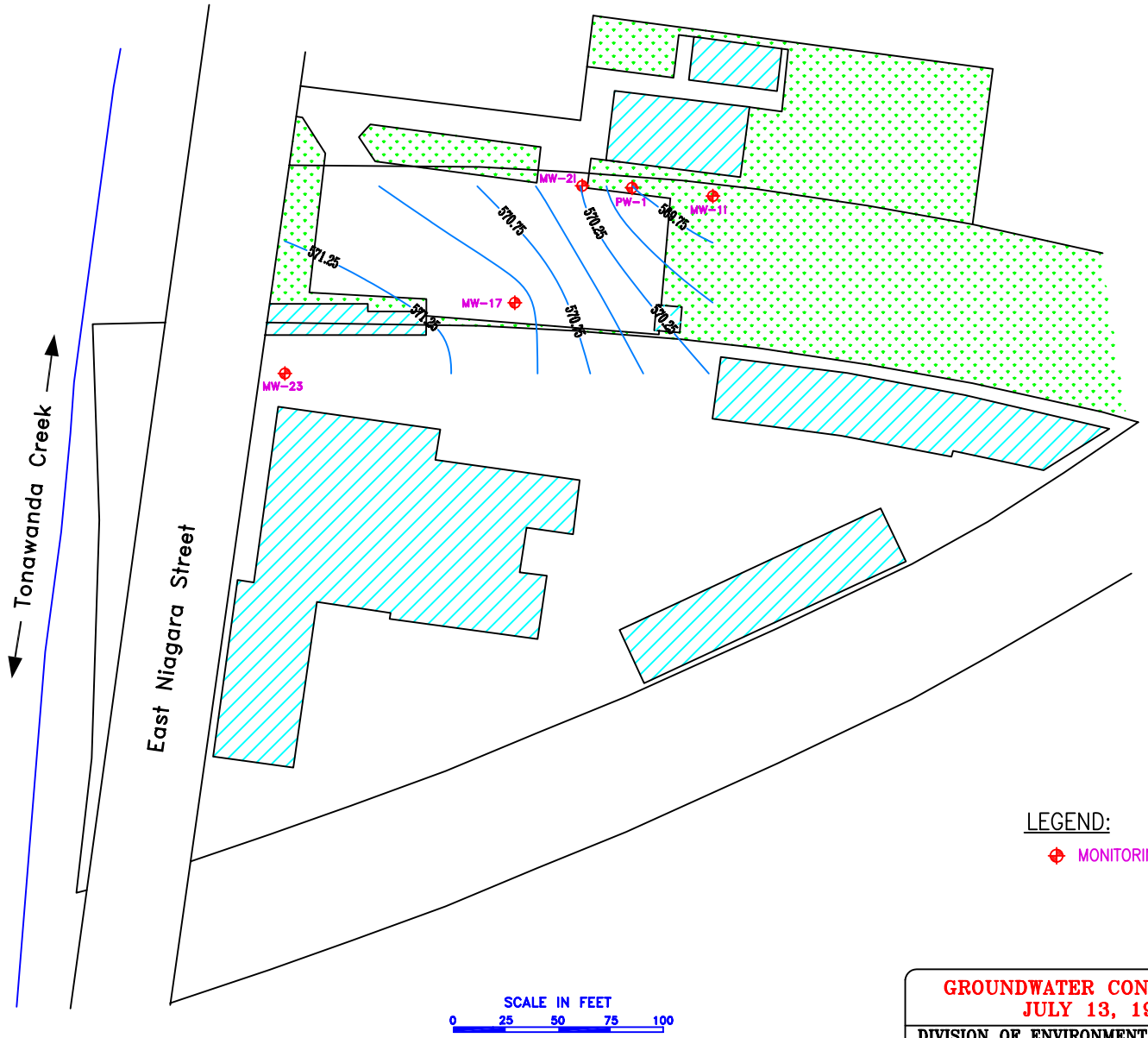


GROUNDWATER CONTOUR MAP
JUNE 14, 1996

DIVISION OF ENVIRONMENTAL REMEDIATION

DATE: 10/12/99 DRAWING: Groundwater.dwg

SITE: FORMER GASTOWN MGP SITE FIGURE 5-10



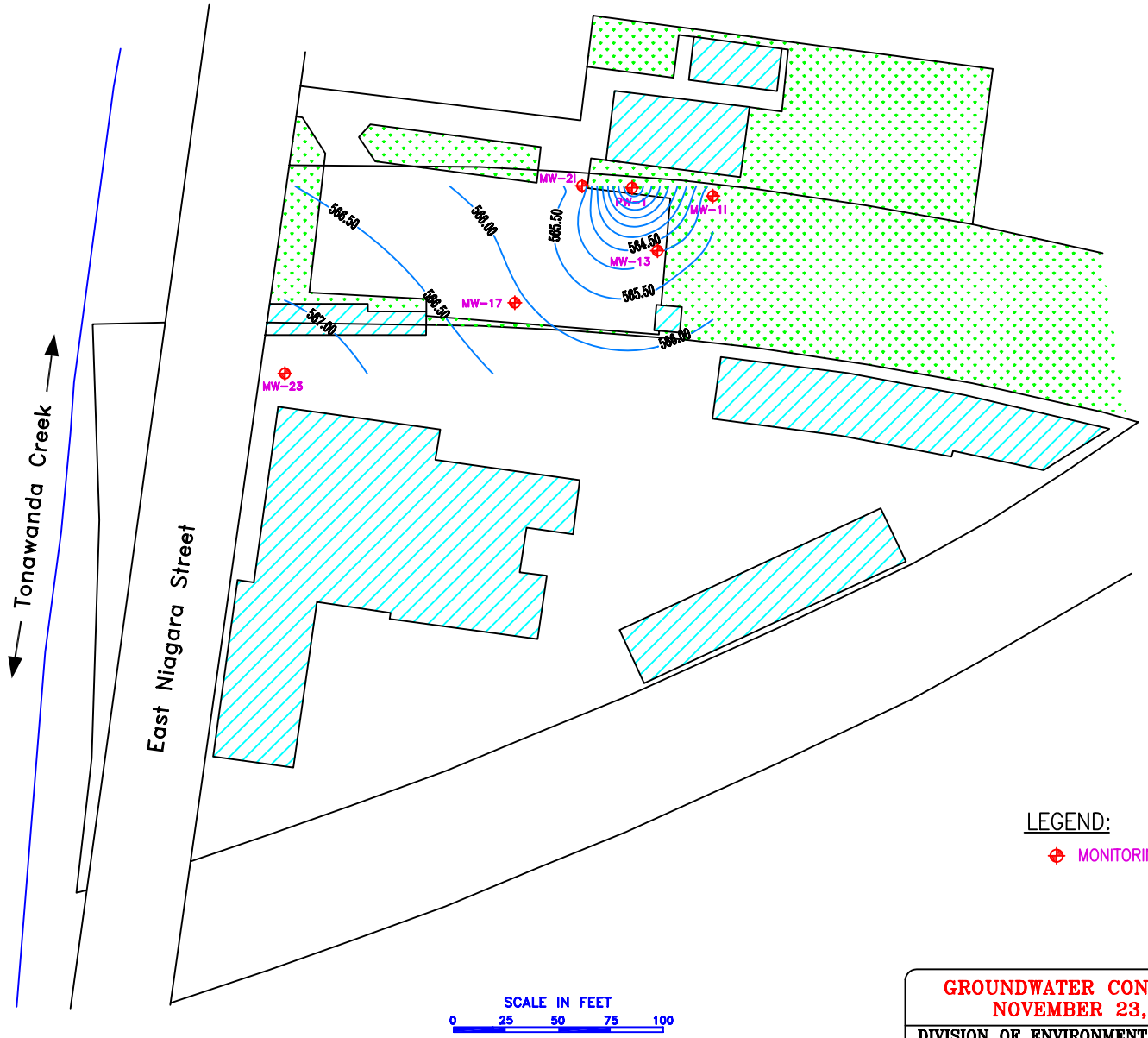
GROUNDWATER CONTOUR MAP
JULY 13, 1998

DIVISION OF ENVIRONMENTAL REMEDIATION

DATE: 10/12/99 DRAWING: Groundwater.dwg

SITE: FORMER GASTOWN MGP SITE

FIGURE 5-11



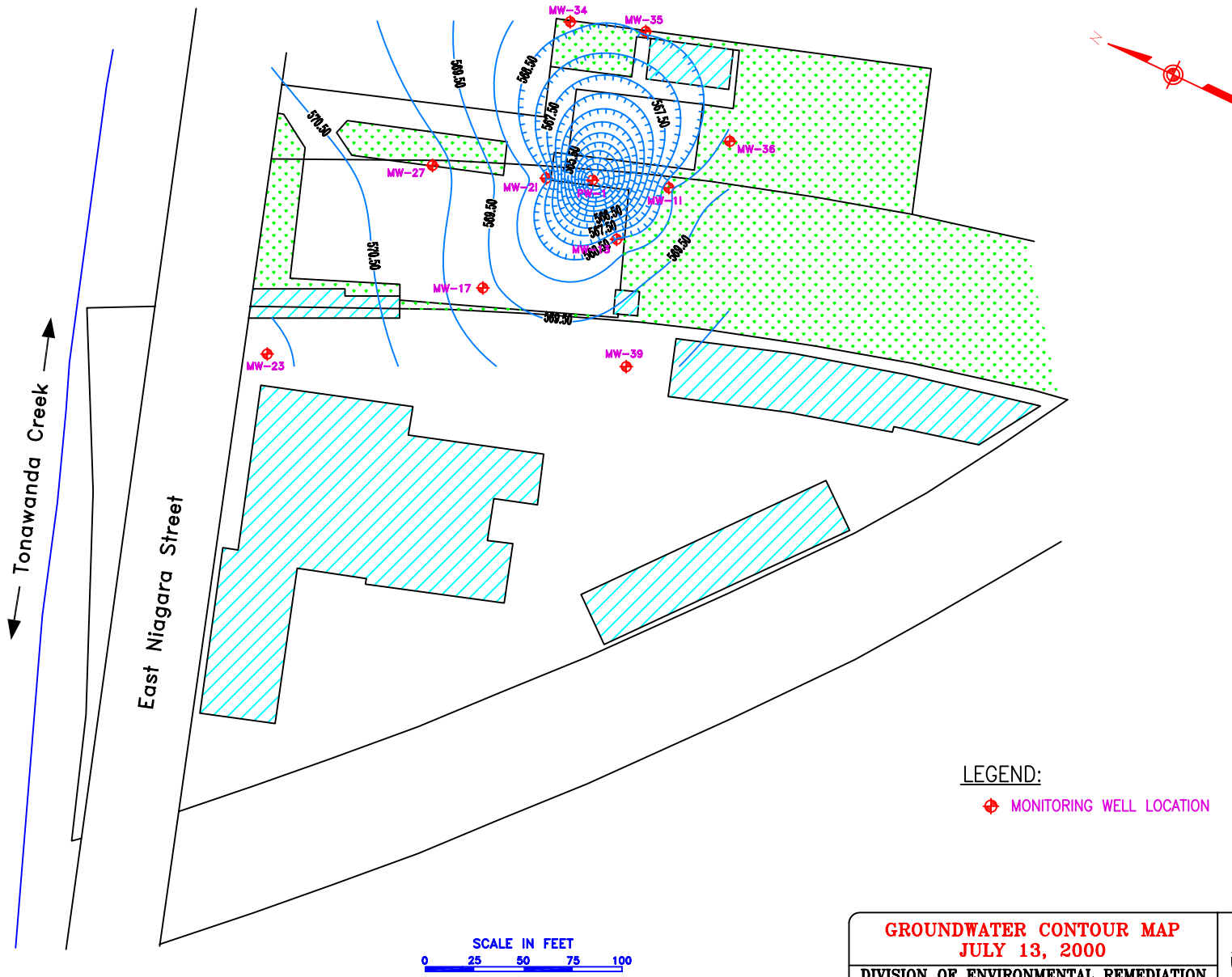
GROUNDWATER CONTOUR MAP
NOVEMBER 23, 1998

DIVISION OF ENVIRONMENTAL REMEDIATION

DATE: 10/12/99 DRAWING: Groundwater.dwg

SITE: FORMER GASTOWN MGP SITE

FIGURE 5-12



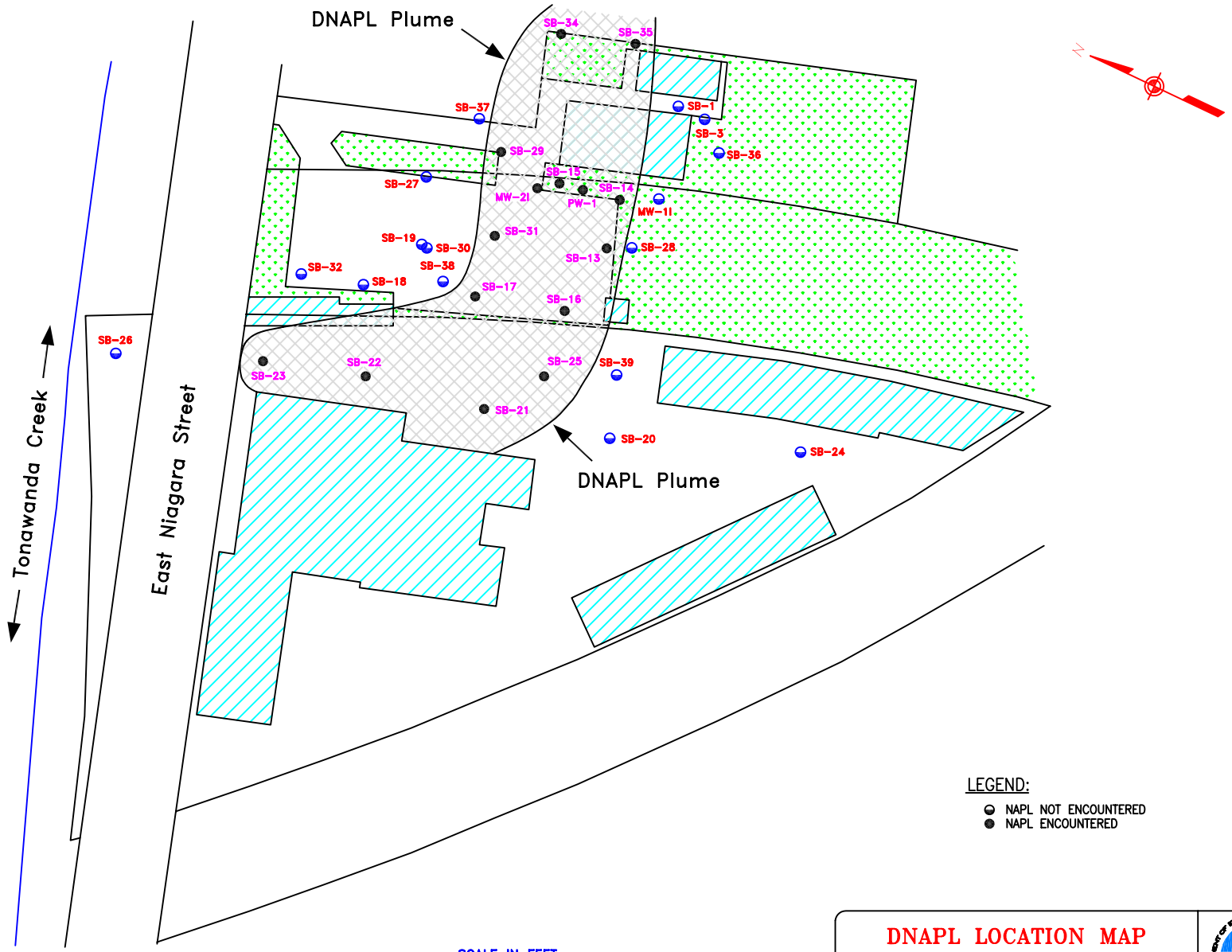
GROUNDWATER CONTOUR MAP
JULY 13, 2000

DIVISION OF ENVIRONMENTAL REMEDIATION

DATE: 10/12/99 DRAWING: Groundwater.dwg

SITE: FORMER GASTOWN MGP SITE

FIGURE 5-13



DNAPL LOCATION MAP

DIVISION OF ENVIRONMENTAL REMEDIATION

DATE: 10/12/99 DRAWING: NAPL-map.dwg

SITE: FORMER GASTOWN MGP SITE

FIGURE 6-1

Table 5-1.
Stratigraphic Sequence of the Western New York Area. Compiled from Buehler and Tesmer (1963) and Brett et al. (1995).

Epoch	Group	Formation	Member
Middle Devonian	Hamilton	Moscow Shale	Windom Shale Kashong Shale
		Ludlowville Formation	Tichenor Limestone Wanakah Shale Ledyard Shale Centerfield Limestone
		Skaneateles Formation	Levanna Shale Stafford Limestone
		Marcellus Shale	Oatka Creek Shale
		Onondaga Limestone	Seneca Limestone Morehouse Limestone Nedrow Limestone Clarence Limestone Edgecliff Limestone
Late Silurian	Salina	Akron Dolostone	
		Bertie Dolostone	Williamsville Dolostone Scajaquada Dolostone Falkirk Dolostone Oatka Dolostone
		Camillus Shale Syracuse Formation Vernon Shale	
Middle Silurian	Lockport	Guelph Dolostone Eramosa Dolostone	
		Goat Island Dolostone	Vinemount Dolostone Ancaster Dolostone Niagara Falls Dolostone
		Gasport Limestone	Pekin Dolostone Gothic Hill Limestone
	Clinton	Decew Dolostone	
		Rochester Shale	Burleigh Hill Shale Lewiston Shale
		Irondequoit Limestone Rockway Dolostone Williamson Shale Merritton Limestone	
		Reynales Limestone	Hickory Corners Limestone
		Neahga Shale	
Early Silurian	Medina	Kodak Sandstone Cambria Shale Thorold Sandstone Grimsby Formation Devils Hole Shale Power Glen Shale Whirlpool Sandstone	
Late Ordivician	Richmond	Queenston Shale Oswego Sandstone	

Table 5-2.
Groundwater Elevations in Shallow and Intermediate Zone Wells Installed at the Former Gastown Manufactured Gas Plant Site.
(All water levels and elevations measured in feet)

Well Designation	Top of Riser Elevation	06/14/96		05/27/98		06/09/98		06/18/98		07/13/98	
		Depth to Water	Elev.	Depth to Water	Elev.	Depth to Water	Elev.	Depth to Water	Elev.	Depth to Water	Elev.
Shallow Zone Wells											
MW-13 **	576.29	6.01	570.28								
MW-14 **	575.55	5.59	569.96								
MW-17	576.86	5.58	571.28			5.98	570.88	5.96	570.90	5.73	571.13
MW-1S	576.84			8.81	568.03	8.87	567.97	8.88	567.96	8.21	568.63
MW-2S	574.77			8.16 *	566.61	3.74	571.03	2.01	572.76	1.91	572.86
MW-3S	574.55			5.90 *	568.65	3.98	570.57	3.36	571.19	3.44	571.11
Intermediate Zone Wells											
MW-15 **	575.38	6.11	569.27								
MW-23	576.61	4.96	571.65			6.53	570.08	6.49	570.12	5.13	571.48
MW-1I	575.43					7.85	567.58	5.66	569.77	5.87	569.56
MW-2I	575.08					4.25	570.83	4.42	570.66	4.84	570.24
PW-1	577.47					7.51	569.96	7.47	570.00	7.72	569.75
Tonawanda Creek											
East Guard Rail	567.67									1.54	566.13
West Guard Rail	567.71									1.58	566.13

*** Water level measured in a perforated PVC pipe and/or well screen prior to replacement by a monitoring well June 2-5, 1998.**

**** Well believed to have been destroyed during excavation activities by the Department's Spill Unit during March and April, 1998 to replace the sump discharge line.**

Table 5-2 (Continued).
Groundwater Elevations in Shallow and Intermediate Zone Wells Installed at the Former Gastown Manufactured Gas Plant Site.
(All water levels and elevations measured in feet)

Well Designation	Top of Riser Elevation	07/27/98		08/05/98		08/09/98		08/11/98 **		08/18/98 ++	
		Depth to Water	Elev.	Depth to Water	Elev.	Depth to Water	Elev.	Depth to Water	Elev.	Depth to Water	Elev.
Shallow Zone Wells											
MW-17	576.86	6.45	570.41	7.17	569.69	7.46	569.40	7.55	569.31	7.87	568.99
MW-1S	576.84	7.72 *	569.12	8.86 +	567.98	8.87	567.97	8.84	568.00	8.86	567.98
MW-2S	574.77	3.73	571.04	4.85	569.92	5.44	569.33	4.11	570.66	4.42	570.35
MW-3S	574.55	3.88	570.67	5.56	568.99	5.86	568.69	5.80	568.75	6.14	568.41
Intermediate Zone Wells											
MW-23	576.61	6.42	570.19	7.06	569.55	7.26	569.35	7.33	569.28	7.72	568.89
MW-1I	575.43	6.50	568.93	6.75	568.68	6.97	568.46	7.09	568.34	7.35	568.08
MW-2I	575.08	5.35	569.73	5.84	569.24	6.19	568.89	6.17	568.91	6.51	568.57
PW-1	577.47	8.08	569.39	8.48	568.99	8.68	568.79	8.61	568.86	8.84	568.63
Tonawanda Creek											
East Guard Rail	567.67	1.30	566.37	2.22	565.45	1.45	566.22	NM	NA	2.09	565.58
West Guard Rail	567.71	1.31	566.40	2.26	565.45	1.79	565.92	NM	NA	2.14	565.57

***** Water from sump disposal pit is flowing toward MW-1S and is likely leaking into the well . NAPL observed on probe.
+ No water observed flowing toward MW-1S.
NA Not Applicable.
****** It rained late morning on August 10, 1998 and early morning on August 11, 1998.
++ It rained during the night and morning on August 18, 1998.
NM Not Measured.

Table 5-2 (Continued).
Groundwater Elevations in Shallow and Intermediate Zone Wells Installed at the Former Gastown Manufactured Gas Plant Site.
(All water levels and elevations measured in feet)

Well Designation	Top of Riser Elevation	08/24/98		08/28/98		09/01/98		09/02/98		09/09/98	
		Depth to Water	Elev.	Depth to Water	Elev.	Depth to Water	Elev.	Depth to Water	Elev.	Depth to Water	Elev.
Shallow Zone Wells											
MW-13 **	576.09	7.26	568.83	7.82	568.27	8.16	567.93	7.61	568.48	9.98	566.11
MW-17	576.86	NM	NA	8.13	568.73	8.46	568.40	8.35	568.51	9.06	567.80
MW-1S	576.84	8.85	567.99	8.95	567.89	9.05	567.79	8.96	567.88	9.11	567.73
MW-2S	574.77	5.21	569.56	5.09	569.68	6.78	567.99	4.72	570.05	4.21	570.56
MW-3S	574.55	6.15	568.40	3.21 *	571.34	3.20 *	571.35	3.43	571.12	3.83	570.72
Intermediate Zone Wells											
MW-23	576.61	7.84	568.77	7.85	568.76	7.97	568.64	7.97	568.64	7.93	568.68
MW-1I	575.43	7.65	567.78	7.76	567.67	8.11	567.32	7.77	567.66	9.07	566.36
MW-2I	575.08	6.70	568.38	6.91	568.17	7.27	567.81	6.98	568.10	8.35	566.73
PW-1	577.47	8.83 +	568.64	6.75 ++	567.83	5.76	568.82	4.89 ●	569.69	12.55	562.03
Tonawanda Creek											
East Guard Rail	567.67	1.11	566.56	1.77	565.90	2.06	565.61	NM	NA	2.19	565.48
West Guard Rail	567.71	1.15	566.56	1.82	565.89	2.11	565.60	NM	NA	2.23	565.48

NA Not Applicable.
NM Not Measured.
+ Submersible pump being utilized to pump out sump water being discharged to the well.
***** Water level affected by discharge from the submersible pump through the existing sump discharge pipe.
****** Well found during excavation activities when installing the groundwater extraction and treatment system.
++ PVC riser cut shorter during installation of the groundwater extraction and treatment system. New elevation is 574.58 feet amsl.
● Submersible pump removed from well to install pumps. Water levels affected by sump discharge.

Table 5-2 (Continued).
Groundwater Elevations in Shallow and Intermediate Zone Wells Installed at the Former Gastown Manufactured Gas Plant Site.
(All water levels and elevations measured in feet)

Well Designation	Top of Riser Elevation	09/17/98		09/24/98		09/29/98 *		10/06/98		10/13/98	
		Depth to Water	Elev.	Depth to Water	Elev.	Depth to Water	Elev.	Depth to Water	Elev.	Depth to Water	Elev.
Shallow Zone Wells											
MW-13	576.09	10.40	565.69	10.61	565.48	9.33	566.76	10.80	565.29	10.60	565.49
MW-17	576.86	9.58	567.28	9.92	566.94	9.53	567.33	10.19	566.67	9.77	567.09
MW-1S	576.84	Dry	NA	Dry	NA	Dry	NA	Dry	NA	Dry	NA
MW-2S	574.77	4.87	569.90	7.61	567.16	5.28	569.49	8.10	566.67	6.86	567.91
MW-3S	574.55	5.31	569.24	6.72	567.83	6.83	567.72	7.08	567.47	4.82	569.73
Intermediate Zone Wells											
MW-23	576.61	8.14	568.47	8.42	568.19	8.41	568.20	8.69	567.92	7.84	568.77
MW-1I	575.43	9.48	565.95	9.70	565.73	9.06	566.37	9.88	565.55	9.66	565.77
MW-2I	575.08	8.98	566.10	9.25	565.83	8.32	566.76	9.44	565.64	9.13	565.95
PW-1	574.58	12.51	562.07	12.65	561.93	8.93	565.65	12.66	561.92	12.57	562.01
Tonawanda Creek											
East Guard Rail	567.67	2.07	565.60	1.85	565.82	1.86	565.81	2.39	565.28	2.38	565.29
West Guard Rail	567.71	2.11	565.60	1.88	565.83	1.91	565.80	2.43	565.28	2.38	565.33

NA Not Applicable.
NM Not Measured.

*** System was shut down for approximately 24 hours at the time of water level measurements.**

Table 5-2 (Continued).
Groundwater Elevations in Shallow and Intermediate Zone Wells Installed at the Former Gastown Manufactured Gas Plant Site.
(All water levels and elevations measured in feet)

Well Designation	Top of Riser Elevation	10/22/98		10/29/98		11/04/98 *		11/12/98		11/23/98	
		Depth to Water	Elev.	Depth to Water	Elev.	Depth to Water	Elev.	Depth to Water	Elev.	Depth to Water	Elev.
Shallow Zone Wells											
MW-13	576.09	10.84	565.25	10.78	565.31	10.90	565.19	10.14	565.95	11.04	565.05
MW-17	576.86	10.27	566.59	10.37	566.49	10.48	566.38	10.19	566.67	10.78	566.08
MW-1S	576.84	Dry	NA	Dry	NA	Dry	NA	Dry	NA	Dry	NA
MW-2S	574.77	8.08	566.69	6.07	568.70	Dry	NA	4.64	570.13	Dry	NA
MW-3S	574.55	6.89	567.66	7.32	567.23	7.42	567.13	7.57	566.98	7.68	566.87
Intermediate Zone Wells											
MW-23	576.61	8.41	568.20	8.68	567.93	9.00	567.61	9.53	567.08	9.29	567.32
MW-1I	575.43	9.87	565.56	9.77	565.66	9.89	565.54	9.48	565.95	9.88	565.55
MW-2I	575.08	9.49	565.59	9.49	565.59	9.62	565.46	8.95	566.13	9.68	565.40
PW-1	574.58	12.71	561.87	12.57	562.01	NM	NA	10.36	564.22	13.8 **	560.78
Tonawanda Creek											
East Guard Rail	567.67	2.39	565.28	2.65	565.02	NM	NA	2.08	565.59	3.37 +	565.00
West Guard Rail	567.71	2.43	565.28	NM	NA	NM	NA	2.10	565.61	3.38 +	564.84

NA Not Applicable.
NM Not Measured.
** Bubbler was found to be inoperational. Water level prior to fixing the bubbler was 16.66 feet below TOR and rose to 13.8 feet below TOR within 15 minutes of fixing the bubbler. Left site before water returned to normal pumping levels.

* Water levels measured from November 2, 1998 to November 5, 1998 during well development.
+ Tonawanda Creek water levels have receded past the guard rails. Water levels measured from the east and west ends of the Gastown Sportsmen's Club dock. Estimated elevations are 568.37 and 568.22 for the east and west ends of the dock, respectively.

Table 5-2 (Continued).
Groundwater Elevations in Shallow and Intermediate Zone Wells Installed at the Former Gastown Manufactured Gas Plant Site.
(All water levels and elevations measured in feet)

Well Designation	Top of Riser Elevation	11/30/98		12/18/98		12/28/98		02/17/99 *		04/05/99	
		Depth to Water	Elev.	Depth to Water	Elev.	Depth to Water	Elev.	Depth to Water	Elev.	Depth to Water	Elev.
Shallow Zone Wells											
MW-13	576.09	10.74	565.35	10.71	565.38	10.53	565.56	4.75	571.34	7.13	568.96
MW-17	576.86	10.71	566.15	10.75	566.11	10.19	566.67	6.22	570.64	6.69	570.17
MW-1S	576.84	Dry	NA	Dry	NA	Dry	NA	8.90	567.94	8.94	567.90
MW-2S	574.77	8.31	566.46	8.29	566.48	5.27	569.50	3.18	571.59	3.34	571.43
MW-3S	574.55	7.68	566.87	7.68	566.87	3.96	570.59	3.36	571.19	3.39	571.16
Intermediate Zone Wells											
MW-23	576.61	9.53	567.08	9.69	566.92	7.82	568.79	NM	NA	4.66	571.95
MW-1I	575.43	9.68	565.75	9.59	565.84	9.38	566.05	4.74	570.69	5.87	569.56
MW-2I	575.08	9.50	565.58	9.53	565.55	9.17	565.91	5.42	569.66	6.21	568.87
PW-1	574.58	12.61	561.97	13.11	561.47	14.56	560.02	NM **	NA	8.65 **	565.93
Tonawanda Creek											
East End Dock	568.37	3.58	564.79	3.91	564.46	3.86	564.51	3.84	564.53	4.34	564.03
West End Dock	568.22	3.56	564.66	3.87	564.35	3.83	564.39	3.56	564.66	4.07	564.15

NA Not Applicable.
NM Not Measured.
** Water level artificially elevated by sump discharge from the Gastown Sportsmen's Club.

* System was shut down for approximately 3 hours at the time of water level measurements to replace the activated carbon.

Table 5-2 (Continued).
Groundwater Elevations in Shallow and Intermediate Zone Wells Installed at the Former Gastown Manufactured Gas Plant Site.
(All water levels and elevations measured in feet)

Well Designation	Top of Riser Elevation	04/20/99		05/03/99		05/18/99		06/10/99		06/24/99	
		Depth to Water	Elev.	Depth to Water	Elev.	Depth to Water	Elev.	Depth to Water	Elev.	Depth to Water	Elev.
Shallow Zone Wells											
MW-13	576.09	7.45	568.64	7.44	568.65	7.83	568.26	8.13	567.96	8.74	567.35
MW-17	576.86	6.85	570.01	6.78	570.08	7.59	569.27	7.93	568.93	8.59	568.27
MW-1S	576.84	9.15	567.69	8.98	567.86	9.30	567.54	9.36	567.48	Dry	NA
MW-2S	574.77	3.53	571.24	4.09	570.68	4.38	570.39	4.49	570.28	5.09	569.68
MW-3S	574.55	3.46	571.09	3.51	571.04	3.61	570.94	3.65	570.90	3.89	570.66
Intermediate Zone Wells											
MW-23	576.61	4.74	571.87	4.80	571.81	6.54	570.07	5.70	570.91	7.13	569.48
MW-1I	575.43	6.17	569.26	6.19	569.24	6.78	568.65	7.22	568.21	7.93	567.50
MW-2I	575.08	6.35	568.73	6.37	568.71	6.82	568.26	7.06	568.02	7.64	567.44
PW-1	574.58	12.72	561.86	12.81	561.77	12.83	561.75	12.66	561.92	12.62	561.96
Tonawanda Creek											
East End Dock	568.37	3.53	564.84	3.43	564.94	3.44	564.93	3.22	565.15	3.37	565.00
West End Dock	568.22	3.25	564.97	3.15	565.07	3.16	565.06	2.93	565.29	3.21	565.01

NA Not Applicable.
NM Not Measured.

Table 5-2 (Continued).
Groundwater Elevations in Shallow and Intermediate Zone Wells Installed at the Former Gastown Manufactured Gas Plant Site.
(All water levels and elevations measured in feet)

Well Designation	Top of Riser Elevation	07/13/99		07/23/99		8/5/99 *		8/23/99		9/14/99	
		Depth to Water	Elev.	Depth to Water	Elev.	Depth to Water	Elev.	Depth to Water	Elev.	Depth to Water	Elev.
Shallow Zone Wells											
MW-13	576.09	8.99	567.10	9.36	566.73	9.21	566.88	9.62	566.47	9.82	566.27
MW-17	576.86	8.81	568.05	9.28	567.58	9.17	567.69	9.45	567.41	9.75	567.11
MW-1S	576.84	Dry	NA	Dry	NA	Dry	NA	Dry	NA	Dry	NA
MW-2S	574.77	5.13	569.64	5.18	569.59	4.17	570.60	4.59	570.18	5.07	569.70
MW-3S	574.55	4.88	569.67	3.69	570.86	3.69	570.86	3.79	570.76	3.82	570.73
Intermediate Zone Wells											
MW-23	576.61	7.04	569.57	7.65	568.96	7.43	569.18	7.19	569.42	6.99	569.62
MW-1I	575.43	8.23	567.20	8.64	566.79	8.52	566.91	9.01	566.42	9.21	566.22
MW-2I	575.08	7.85	567.23	8.25	566.83	8.00	567.08	8.41	566.67	8.63	566.45
PW-1	574.58	12.96	561.62	12.69	561.89	12.73	561.85	12.96	561.62	13.00	561.58
Tonawanda Creek											
East End Dock	568.37	2.92	565.45	3.14	565.23	3.07	565.30	3.09	565.28	3.00	565.37
West End Dock	568.22	2.76	565.46	2.99	565.23	2.94	565.28	2.92	565.30	2.86	565.36

NA Not Applicable.
NM Not Measured.

*** Thunderstorms on July 31 and August 3, 1999 dropped 1 inch of rain. The July 31 storm knocked out power to the treatment shed.**

Table 5-2 (Continued).
Groundwater Elevations in Shallow and Intermediate Zone Wells Installed at the Former Gastown Manufactured Gas Plant Site.
(All water levels and elevations measured in feet)

Well Designation	Top of Riser Elevation	10/1/99		10/8/99		11/5/99		12/7/99		12/13/99	
		Depth to Water	Elev.	Depth to Water	Elev.	Depth to Water	Elev.	Depth to Water	Elev.	Depth to Water	Elev.
Shallow Zone Wells											
MW-13	576.09	9.23	566.86	9.24	566.85	7.22	568.87	7.92	568.17	7.69	568.40
MW-17	576.86	8.95	567.91	9.07	567.79	6.97	569.89	7.98	568.88	7.75	569.11
MW-1S	576.84	9.43	567.41	Dry	NA	9.12	567.72	9.29	567.55	9.21	567.63
MW-2S	574.77	3.89	570.88	4.59	570.18	3.38	571.39	3.80	570.97	3.87	570.90
MW-3S	574.55	3.39	571.16	3.55	571.00	3.31	571.24	3.69	570.86	3.43	571.12
MW-39	576.85									7.69	569.16
Intermediate Zone Wells											
MW-23	576.61	5.18	571.43	5.99	570.62	4.34	572.27	6.84	569.77	5.95	570.66
MW-1I	575.43	8.70	566.73	8.66	566.77	6.22	569.21	7.09	568.34	6.69	568.74
MW-2I	575.08	7.86	567.22	7.95	567.13	6.36	568.72	6.74	568.34	6.72	568.36
PW-1	574.58	13.30 +	561.28	15.00 +	559.58	12.77	561.81	13.11	561.47	16.38	558.20
MW-27	575.17									5.27	569.90
MW-34	574.56									5.69	568.87
MW-35	574.31									5.71	568.60
MW-36	574.13									5.17	568.96
Tonawanda Creek											
East End Dock	568.37	2.95	565.42	2.81	565.56	3.28	565.09	3.97	564.40	4.30	564.07
West End Dock	568.22	2.80	565.42	2.67	565.55	3.13	565.09	3.83	564.39	4.15	564.07

NA Not Applicable.
NM Not Measured.

+ NAPL observed on end of probe.

Table 5-2 (Continued).
Groundwater Elevations in Shallow and Intermediate Zone Wells Installed at the Former Gastown Manufactured Gas Plant Site.
(All water levels and elevations measured in feet)

Well Designation	Top of Riser Elevation	12/22/99 *		1/3/00		2/18/00		2/23/00		4/10/00	
		Depth to Water	Elev.	Depth to Water	Elev.	Depth to Water	Elev.	Depth to Water	Elev.	Depth to Water	Elev.
Shallow Zone Wells											
MW-13	576.09	5.12	570.97	6.66	569.43	NM ++	NA	5.52	570.57	3.41	572.68
MW-17	576.86	6.32	570.54	7.77	569.09	8.32	568.54	7.92	568.94	5.15	571.71
MW-1S	576.84	8.91	567.93	8.92	567.92	9.25	567.59	8.90	567.94	8.91	567.93
MW-2S	574.77	3.14	571.63	3.88	570.89	NM	NA	2.99	571.78	2.09	572.68
MW-3S	574.55	3.33	571.22	3.43	571.12	NM	NA	3.22	571.33	3.16	571.39
MW-39	576.85	6.06	570.79	7.51	569.34	NM ++	NA	6.94	569.91	3.60	573.25
Intermediate Zone Wells											
MW-23	576.61	4.72	571.89	6.51	570.10	NM ++	NA	4.28	572.33	4.16	572.45
MW-1I	575.43	5.20	570.23	6.42	569.01	NM ++	NA	6.15	569.28	3.84	571.59
MW-2I	575.08	5.52	569.56	6.53	568.55	6.81	568.27	6.36	568.72	4.45	570.63
PW-1	574.58	3.01	571.57	12.48	562.10	15.27	559.31	9.60	564.98	NM ^{O}	NA
MW-27	575.17	4.07	571.10	5.69	569.48	6.29	568.88	5.19	569.98	2.86	572.31
MW-34	574.56	4.60	569.96	5.90	568.66	6.23	568.33	5.32	569.24	3.10	571.46
MW-35	574.31	4.60	569.71	5.70	568.61	5.94	568.37	4.81	569.50	2.66	571.65
MW-36	574.13	3.70	570.43	4.87	569.26	5.41	568.72	4.64	569.49	2.08	572.05
Tonawanda Creek											
East End Dock	568.37	3.81	564.56	4.45	563.92	Frozen	NA	Frozen	NA	3.06	565.31
West End Dock	568.22	3.61	564.61	4.32	563.90	Frozen	NA	Frozen	NA	3.04	565.18

NA Not Applicable.
NM Not Measured.
o Water bubbling out of manway onto ground surface.
***** Pump malfunctioned on December 19, 1999 causing system shut down.
++ Could not locate under snow.

Table 5-2 (Continued).
Groundwater Elevations in Shallow and Intermediate Zone Wells Installed at the Former Gastown Manufactured Gas Plant Site.
(All water levels and elevations measured in feet)

Well Designation	Top of Riser Elevation	4/17/00		6/14/00		7/13/00		8/3/00 ●		9/14/00	
		Depth to Water	Elev.	Depth to Water	Elev.	Depth to Water	Elev.	Depth to Water	Elev.	Depth to Water	Elev.
Shallow Zone Wells											
MW-13	576.09	5.62	570.47	3.35	572.74	7.44	568.65	3.50	572.59	8.25	567.84
MW-17	576.86	5.90	570.96	5.13	571.73	7.25	569.61	6.00	570.86	8.05	568.81
MW-1S	576.84	9.04	567.80	8.77	568.07	8.99	567.85	8.94	567.90	9.32	567.52
MW-2S	574.77	3.63	571.14	1.90	572.87	4.00	570.77	2.39	572.38	4.07	570.70
MW-3S	574.55	3.37	571.18	3.16	571.39	3.50	571.05	3.21	571.34	3.78	570.77
MW-39	576.85	4.81	572.04	3.80	573.05	7.01	569.84	5.66	571.19	8.21	568.64
Intermediate Zone Wells											
MW-23	576.61	4.73	571.88	4.26	572.35	5.52	571.09	4.78	571.83	6.84	569.77
MW-1I	575.43	5.58	569.85	3.94	571.49	6.51	568.92	4.69	570.74	7.54	567.89
MW-2I	575.08	4.58	570.50	5.20 **	569.88	6.36	568.72	4.81	570.27	6.84 **	568.24
PW-1	574.58	10.52	564.06	NM ○	NA	12.80	561.78	2.40	572.18	12.90	561.68
MW-27	575.17	4.05	571.12	2.71	572.46	4.99	570.18	3.30	571.87	5.74	569.43
MW-34	574.56	4.25	570.31	3.08	571.48	5.91	568.65	3.94	570.62	6.47	568.09
MW-35	574.31	4.21	570.10	2.52	571.79	5.75	568.56	3.57	570.74	6.30	568.01
MW-36	574.13	2.97	571.16	1.94	572.19	5.02	569.11	2.41	571.72	6.17	567.96
Tonawanda Creek											
East End Dock	568.37	4.32 *	564.05	3.24	565.13	2.99	565.38	2.57	565.80	2.78 *	565.59
West End Dock	568.22	4.25 *	563.97	3.22	565.00	2.97	565.25	2.55	565.67	2.77 *	565.45

NA Not Applicable.
NM Not Measured.
***** Creek very wavy due to wind - difficult to measure.
****** LNAPL in well.
○ Water above riser in manway.
● Major rainstorm on August 1 and 2, 2000 - 0.59" total rainfall.

Table 6-1.
Summary of NAPL Presence and Underlying Confining Layer Data from borings completed at the Former Gastown Manufactured Gas Plant Site.
(All depths and elevations measured in feet)

Boring Number	Total Depth	Ground Surface Elevation	NAPL			Underlying Confining Layer		
			Depth	Surface Elevation	Thickness	Depth	Surface Elevation	Deposit
SB-1	20.0	574.45				20.0	554.45	Sand & Gravel
SB-2	12.0	574.45 *						
SB-3	21.0	574.44				20.0	554.44	Lower Silty Clay
SB-4	12.0	574.45 *						
SB-5	12.0	574.30 *						
SB-6	8.0	574.30 *						
SB-7	8.0	574.30 *						
SB-8	8.0	574.30 *						
SB-9	8.0	574.75 *						
SB-10	8.0	574.30 *						
SB-11	8.0	574.30 *						
SB-12	8.0	574.30 *						
SB-13	22.0	576.39	19.0	557.39	3.0	22.0	554.39	Sand & Gravel
SB-14	24.0	575.58	19.5	556.08	3.0	22.5	553.08	Sand & Gravel
SB-15	20.0	575.41	15.0	560.41	7.0	22.0 +	553.41	
SB-16	24.0	576.89	16.0	560.89	7.0	23.0	553.89	Lower Silty Clay
SB-17	24.0	577.08	16.0	561.08	6.0	22.0	555.08	Lower Silty Clay
SB-18	24.0	575.85				22.5	553.35	Lower Silty Clay
SB-19	24.0	576.02				23.2	552.82	Lower Silty Clay
SB-20	24.0	576.49				23.4	553.09	Lower Silty Clay
SB-21	12.0	577.54	8.0	569.54	15.0	23.0 +	554.54	
SB-22	20.0	577.33	11.0	566.33	11.0	22.0 +	555.33	
SB-23	24.0	576.85	7.2	569.65	14.0	21.2	555.65	Lower Silty Clay
SB-24	24.0	576.43				24.0	552.43	Lower Silty Clay
SB-25	23.2	577.60	18.9	558.70	4.3	23.2	554.40	Lower Silty Clay
SB-26	20.0	574.21				19.7	554.51	Lower Silty Clay
MW-2S	9.0	575.32	Stratigraphic log not available					
MW-3S	8.5	574.91	Stratigraphic log not available					
MW-1I	26.0	575.85				22.0	553.85	Lower Silty Clay
MW-2I	26.0	575.47	16.4	559.07	5.6	22.0	553.47	Lower Silty Clay
PW-1	30.0	575.50	16.9	558.60	5.1	22.0	553.50	Sand & Gravel
SB-27	28.0	575.27						
SB-28	24.0	577.93				23.9	554.03	Lower Silty Clay

Table 6-1 (Continued).
Summary of NAPL Presence and Underlying Confining Layer Data from borings completed at the Former Gastown Manufactured Gas Plant Site.
(All depths and elevations measured in feet)

Boring Number	Total Depth	Ground Surface Elevation	NAPL			Underlying Confining Layer		
			Depth	Surface Elevation	Thickness	Depth	Surface Elevation	Deposit
SB-29	24.0	575.20	16.0	559.20	3.8	19.8	555.40	Sand & Gravel
SB-30	32.0	576.13						
SB-31	26.0	576.21	19.8	556.41	4.5	24.3	551.91	Lower Silty Clay
SB-32	28.0	575.32				23.8	551.52	Lower Silty Clay
SB-33	16.0	574.03						
SB-34	20.0	574.72	15.8	558.92	4.2	20.0 +	554.72	
SB-35	20.0	574.52	14.5	560.02	4.8	19.3	555.22	Sand & Gravel
SB-36	20.0	574.28				18.8	555.48	Lower Silty Clay
SB-37	20.0	574.69						
SB-38	24.0	576.81				23.7	553.11	Lower Silty Clay
SB-39	24.0	577.09				24.0	553.09	Lower Silty Clay

***** **Ground surface elevation estimated from nearby surveyed borehole locations.**
+ **Depth estimated from nearby borings.**

Table 6-2.
Former Gastown Manufactured Gas Plant Site.
Summary of Subsurface Soil Analytical Results from Samples Collected Outside the NAPL Plume.
(All results in µg/kg. All depths in feet below ground surface)

Parameter	Soil + Cleanup Objectives	SB-27 20.0'-24.0' 12/7/99	SB-28 20.0'-23.6' 12/7/99	SB-28 23.6'-23.9' 12/7/99	SB-30 20.0'-24.0' 12/6/99	SB-32 20.0'-23.8' 12/6/99	SB-33 8.0'-12.0' 12/7/99	SB-36 16.0'-18.3' 12/8/99	SB-38 20.0'-22.7' 12/9/99
Volatile Organic Compounds									
Carbon Disulfide	2,700	6.0	4 J	4 J	ND (6)	2 J	ND (7)	ND (6)	4 J
Benzene	60	ND (6)	9.0	**340 E (22 J)**	ND (6)	2 J	5 J	2 J	8.0
Toluene	1,500	ND (6)	1 J	7.0	ND (6)	ND (6)	ND (7)	ND (6)	ND (6)
Ethylbenzene	5,500	ND (6)	ND (6)	450 E (67.0)	ND (6)	ND (6)	2 J	ND (6)	ND (6)
Total Xylenes	1,200	ND (6)	ND (6)	51.0 (12 J)	ND (6)	ND (6)	ND (7)	ND (6)	ND (6)
tert-Butylbenzene	100*	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Isopropylbenzene	5	″	″	″	″	″	″	″	″
n-Propylbenzene	14	″	″	″	″	″	″	″	″
1,2,4-Trimethylbenzene	13	″	″	″	″	″	″	″	″
1,3,5-Trimethylbenzene	3.3	″	″	″	″	″	″	″	″
sec-Butylbenzene	25	″	″	″	″	″	″	″	″
p-Isopropyltoluene	11	″	″	″	″	″	″	″	″
n-Butylbenzene	18	″	″	″	″	″	″	″	″
1,2-Dichloroethene (total)	300	ND (6)	140.0	ND (5)	ND (6)	ND (6)	ND (7)	ND (6)	7.0
Vinyl Chloride	200	ND (12)	30.0	ND (10)	ND (12)	ND (12)	ND (14)	ND (12)	ND (12)
2-Butanone	300	ND (12)	ND (12)	ND (10)	ND (12)	ND (12)	ND (14)	ND (12)	ND (12)
Styrene	NS	ND (6)	ND (6)	ND (5)	ND (6)	ND (6)	ND (7)	ND (6)	ND (6)
Thiophene (TIC)	NS								
Naphthalene (TIC)	13,000				280 J	98 J			170 J
Total Volatile TICs	NS	44 J	40 J	199 J (106 J)	288 J	108 J	29 J		180 J

Table 6-2 (Continued).
Former Gastown Manufactured Gas Plant Site.
Summary of Subsurface Soil Analytical Results from Samples Collected Outside the NAPL Plume.
(All results in µg/kg. All depths in feet below ground surface)

+	NYSDEC TAGM 4046: Determination of Soil Cleanup Objectives and Cleanup Levels; December 20, 2000 addendum.
*	TCLP alternative guidance values from Stars Memo #1: Petroleum-Contaminated Soil Guidance Policy.
NS	No standard.
ND	Indicates that the compound was not detected at the method detection limit specified in parentheses.
J	Estimated concentration that is less than the sample quantitation limit but greater than zero.
E	Estimated concentration that exceeds the calibration range of the GC/MS instrument.
(2.8)	Results of duplicate analysis.
	Shaded values equal or exceed soil cleanup guidance values (ARARs).

Table 6-3.
Former Gastown Manufactured Gas Plant Site.
Summary of Subsurface Soil Analytical Results from Samples Collected Within the NAPL Plume.
(All results in µg/kg. All depths in feet below ground surface)

Parameter	Soil + Cleanup Objectives	SB-29 5.0'-8.0' 12/8/99	SB-29 19.5'-19.8' 12/8/99	SB-31 15.8'-16.0' 12/6/99	SB-31 23.4'-24.0' 12/6/99	SB-31 24.3'-26.0' 12/6/99
Volatile Organic Compounds						
Carbon Disulfide	2,700	N/A	15 J	15.0	ND (650)	5 J
Benzene	60	34.0	**49,000**	34.0	**8,300**	**900.0**
Toluene	1,500	470.0 (720.0)	**100,000**	1 J	**17,000 B**	290 E (69.0)
Ethylbenzene	5,500	1,800 (3,600)	**40,000**	ND (6)	3,000	870.0
Total Xylenes	1,200	**2,540 (11,300)**	**92,000**	2 J	**13,000**	840 E (140.0)
tert-Butylbenzene	100*	**67.0 (9,600)**	N/A	N/A	N/A	N/A
Isopropylbenzene	5	**23.0**	″	″	″	″
n-Propylbenzene	14	**78.0 (14,000)**	″	″	″	″
1,2,4-Trimethylbenzene	13	**15,000**	″	″	″	″
1,3,5-Trimethylbenzene	3.3	**510.0 (4,600)**	″	″	″	″
sec-Butylbenzene	25	ND (2.4)	″	″	″	″
p-Isopropyltoluene	11	**210.0 (3,600)**	″	″	″	″
n-Butylbenzene	18	ND (6)	″	″	″	″
1,2-Dichloroethene (total)	300	N/A	ND (28)	ND (6)	ND (650)	ND (6)
Vinyl Chloride	200	″	ND (57)	ND (12)	ND (1300)	ND (13)
2-Butanone	300	″	ND (57)	ND (12)	ND (1300)	ND (13)
Styrene	NS	″	130,000	ND (6)	16,000	110.0 (46.0)
Thiophene (TIC)	NS					33 J
Naphthalene (TIC)	13,000	**140,000**	**960,000 J**			
Total Volatile TICs	NS	N/A	55,600 J (1,397,000 J)	740 J	138,000 J	1,353 J (1,075 J)

Table 6-3 (Continued).
Former Gastown Manufactured Gas Plant Site.
Summary of Subsurface Soil Analytical Results from Samples Collected Within the NAPL Plume.
(All results in µg/kg. All depths in feet below ground surface)

Parameter	Soil + Cleanup Objectives	SB-34 15.8'-16.0' 12/8/99	SB-34 16.0'-19.2' 12/8/99	SB-35 15.6-16.0' 12/8/99	SB-35 16.0'-19.3' 12/8/99	SB-39 1.1'-4.0' 12/9/99	SB-39 6.4'-9.0' 12/9/99
Volatile Organic Compounds							
Carbon Disulfide	2,700	ND (3900)	17 J	ND (75,000)	35.0	N/A	ND (750)
Benzene	60	**69,000 (56,000)**	**2,200**	ND (75,000)	**100.0**	″	ND (12)
Toluene	1,500	**94,000 (80,000)**	**1,000 (6,400)**	**340,000**	**22,000**	″	ND (12)
Ethylbenzene	5,500	**36,000 (31,000)**	**7,600**	**270,000**	**23,000**	″	1,100
Total Xylenes	1,200	**89,000 (75,000)**	**2,800 (11,000)**	**480,000**	**30,000**	″	1,020
tert-Butylbenzene	100*	N/A	N/A	N/A	N/A	″	**2,600**
Isopropylbenzene	5	″	″	″	″	″	**1,400**
n-Propylbenzene	14	″	″	″	″	″	**720.0**
1,2,4-Trimethylbenzene	13	″	″	″	″	″	**2,400**
1,3,5-Trimethylbenzene	3.3	″	″	″	″	″	**2,200**
sec-Butylbenzene	25	″	″	″	″	″	**4,500**
p-Isopropyltoluene	11	″	″	″	″	″	**2,100**
n-Butylbenzene	18	″	″	″	″	″	**3,400**
1,2-Dichloroethene (total)	300	ND (3900)	ND (28)	ND (75,000)	ND (27)	″	ND (750)
Vinyl Chloride	200	ND (7900)	ND (57)	ND (150,000)	ND (54)	″	ND (1500)
2-Butanone	300	ND (7900)	**1,500**	ND (150,000)	**1,700 J**	″	**1,200 J**
Styrene	NS	110,000 (91,000)	14,000	470,000	28,000	″	ND (750)
Thiophene (TIC)	NS					″	
Naphthalene (TIC)	13,000	**820,000 J (680,000 J)**	**150,000 J**	**5,400,000 J**	**280,000 J**	″	7,700 ●
Total Volatile TICs	NS	1,435,000 J (1,069,000 J)	17,800 J (240,500 J)	9,230,000 J	55,400 J (443,400 J)	″	48,300 J

Table 6-3 (Continued).
Former Gastown Manufactured Gas Plant Site.
Summary of Subsurface Soil Analytical Results from Samples Collected Within the NAPL Plume.
(All results in µg/kg. All depths in feet below ground surface)

Parameter	Soil + Cleanup Objectives	SB-34 15.8'-16.0' 12/8/99	SB-34 16.0'-19.2' 12/8/99	SB-35 15.6-16.0' 12/8/99	SB-35 16.0'-19.3' 12/8/99	SB-39 1.1'-4.0' 12/9/99	SB-39 6.4'-9.0' 12/9/99
Semi-Volatile Compounds							
2-Methylnaphthalene	36,400	N/A	N/A	N/A	N/A	ND (1300)	3,800
Dibenzofuran	6,200	″	″	″	″	ND (1300)	1,900
Fluorene	50,000	″	″	″	″	ND (1300)	1,600
Phenanthrene	50,000	″	″	″	″	ND (1300)	5,200
Anthracene	50,000	″	″	″	″	ND (1300)	570.0
Fluoranthene	50,000	″	″	″	″	ND (1300)	1,600
Pyrene	50,000	″	″	″	″	ND (1300)	2,400
Benzo(a)anthracene	224	″	″	″	″	ND (1300)	680.0
Chrysene	400	″	″	″	″	ND (1300)	600.0
Benzo(b)fluoranthene	1,100	″	″	″	″	ND (1300)	650.0
Inorganics							
Arsenic	7,500	N/A	N/A	N/A	N/A	3,500	N/A
Chromium	10,000	″	″	″	″	4,600	″
Cobalt	30,000	″	″	″	″	1,200	″
Lead	500,000	″	″	″	″	14,200	″
Manganese	SB	″	″	″	″	657,000	″
Mercury	100	″	″	″	″	**910.0**	″
Nickel	13,000	″	″	″	″	1,700	″
Vanadium	150,000	″	″	″	″	6,500	″
Zinc	20,000	″	″	″	″	**39,400**	″

Table 6-3 (Continued).
Former Gastown Manufactured Gas Plant Site.
Summary of Subsurface Soil Analytical Results from Samples Collected Within the NAPL Plume.
(All results in µg/kg. All depths in feet below ground surface)

+	NYSDEC TAGM 4046: Determination of Soil Cleanup Objectives and Cleanup Levels; December 20, 2000 addendum.
*	TCLP alternative guidance values from Stars Memo #1: Petroleum-Contaminated Soil Guidance Policy.
NS	No standard.
ND	Indicates that the compound was not detected at the method detection limit specified in parentheses.
J	Estimated concentration that is less than the sample quantitation limit but greater than zero.
E	Estimated concentration that exceeds the calibration range of the GC/MS instrument.
B	Analyte detected in the associated blank as well as in the sample.
(2.8)	Results of duplicate analysis.
●	Results from 8021 analysis (not a tentatively identified compound).
	Shaded values equal or exceed soil cleanup guidance values (ARARs).

Table 6-4.
Summary of Groundwater Analytical Results from Shallow Depth Wells Installed at the Former Gastown Manufactured Gas Plant Site.
(All results in µg/l unless otherwise specified)

Parameter	Groundwater Standards +	MW-13; 12/14/99	MW-17; 12/15/99	MW-2S; 12/14/99	MW-3S; 12/13/99	MW-39; 12/15/99
Volatile Organic Compounds						
Benzene	1	**52.0 (32.0)**	**210.0 (200.0)**	**37.0 (40.0)**	**4.4 (4 J)**	**4.8 (11 J)**
Toluene	5	**0.77 (6 J)**	**420.0 (330.0)**	**35.0 (27.0)**	ND (0.2) (3 J)	0.31
Ethylbenzene	5	1.1	**250.0 (100.0)**	3 J (4.7)	0.38	1.0
Xylene-O	5	0.67	**270.0**	**11.0**	ND (0.2)	0.35
Xylene-M&P	5	0.4	**480.0**	**7.5**	ND (0.2)	0.63
Isopropylbenzene	5	ND (0.2)	ND (6.4)	ND (0.2)	ND (0.2)	1.5
n-Propylbenzene	5	ND (0.4)	ND (6.4)	ND (0.4)	ND (0.4)	ND (0.4)
1,3,5-Trimethylbenzene	5	ND (1)	**42.0**	0.36 J	ND (1)	0.28 J
1,2,4-Trimethylbenzene	5	0.68	ND (6.4)	0.53	ND (0.2)	0.93 (0.82)
p-Isopropyltoluene	5	ND (1)	ND (6.4)	ND (1)	ND (1)	0.86 J
n-Butylbenzene	5	ND (0.4)	**1,100**	ND (0.4)	ND (0.4)	1.8 (1.3)
sec-Butylbenzene	5	ND (0.4)	ND (3.2)	ND (0.4)	ND (0.4)	2.1
Naphthalene	10G		**2,400**			3.7
MTBE	10G	**13.0**		ND (5)	ND (5)	
Vinyl Chloride	2	**37.0**	ND (20)	ND 10)	ND (10)	**24.0**
Styrene	5	ND (10)	**230.0**	3 J	ND (10)	ND (20)
Chloromethane	NS	ND (10)	ND (20)	ND (10)	ND (10)	ND (20)
1,2-Dichloroethene (total)	5	**45.0**	ND (20)	ND (10)	ND (10)	**14 J**
Chloroform	7	ND (10)	ND (20)	ND (10)	ND (10)	ND (20)
1,2-Dichloroethane	0.6	ND (10)	ND (20)	ND (10)	ND (10)	ND (20)
2-Butanone	50G	ND (10)	ND (20)	ND (10)	ND (10)	ND (20)
1,2-Dichloropropane	1	ND (10)	ND (20)	ND (10)	ND (10)	ND (20)
Chlorobenzene	5	ND (10)	ND (20)	ND (10)	ND (10)	ND (20)

Table 6-4 (Continued).
Summary of Groundwater Analytical Results from Shallow Depth Wells Installed at the Former Gastown Manufactured Gas Plant Site.
(All results in µg/l unless otherwise specified)

Parameter	Groundwater Standards +	MW-13; 12/14/99	MW-17; 12/15/99	MW-2S; 12/14/99	MW-3S; 12/13/99	MW-39; 12/15/99
Semi-Volatile Compounds - Phenols						
Phenol	1	ND (49)	ND (10)	**1 J**	**2 J**	ND (50)
2-Methylphenol	NS	ND (49)	ND (10)	ND (9)	ND (10)	ND (50)
4-Methylphenol	NS	ND (49)	1 J	ND (9)	ND (10)	ND (50)
2-Nitrophenol	1	ND (49)	ND (10)	ND (9)	ND (10)	ND (50)
4-Nitrophenol	1	ND (120)	ND (26)	ND (24)	ND (25)	ND (120)
2,4-Dimethylphenol	50G	ND (49)	ND (10)	ND (9)	ND (10)	ND (50)
Pentachlorophenol	1	ND (120)	ND (26)	ND (24)	**3 J**	ND (120)
4-Chloro-3-Methylphenol	NS	ND (49)	ND (10)	ND (9)	ND (10)	ND (50)
Semi-Volatile Compounds - PAHs						
Naphthalene	10G	ND (49)	**1,100**	**13.0**	2 J	ND (50)
2-Methylnaphthalene	NS	11 J	80.0 (88 J)	ND (9)	ND (10)	71.0 (70 J)
Acenaphthylene	NS	30 J	100 J	ND (9)	ND (10)	8 J
Acenaphthene	20G	ND (49)	19.0	ND (9)	ND (10)	9 J
Dibenzofuran	NS	ND (49)	4 J	ND (9)	ND (10)	40 J (46 J)
Fluorene	50G	10 J	22.0	ND (9)	ND (10)	**89.0 (100 J)**
Phenanthrene	50G	48 J	30.0 (33 J)	ND (9)	ND (10)	**85.0 (86 J)**
Anthracene	50G	25 J	5 J	ND (9)	ND (10)	ND (50)
Carbazole	NS					
Fluoranthene	50G	35 J	5 J	ND (9)	ND (10)	42 J (48 J)
Pyrene	50G	**64.0**	8 J	ND (9)	2 J	**36 J (51 J)**
Benzo(a)anthracene	0.002G	**17 J**	ND (10)	ND (9)	ND (10)	**13 J**
Chrysene	0.002G	**18 J**	ND (10)	ND (9)	ND (10)	**9 J**

Table 6-4 (Continued).
Summary of Groundwater Analytical Results from Shallow Depth Wells Installed at the Former Gastown Manufactured Gas Plant Site.
(All results in µg/l unless otherwise specified)

Parameter	Groundwater Standards +	MW-13; 12/14/99	MW-17; 12/15/99	MW-2S; 12/14/99	MW-3S; 12/13/99	MW-39; 12/15/99
Semi-Volatile Compounds - PAHs (continued)						
Benzo(b)fluoranthene	0.002G	**16 J**	ND (10)	ND (9)	ND (10)	**15 J**
Benzo(k)fluoranthene	0.002G	**4 J**	ND (10)	ND (9)	ND (10)	ND (50)
Benzo(a)pyrene	ND	**19 J**	ND (10)	ND (9)	ND (10)	**7 J**
Indeno(1,2,3-cd)pyrene	0.002G	ND (49)	ND (10)	ND (9)	ND (10)	ND (50)
Dibenz(a,h)anthracene	NS	ND (49)	ND (10)	ND (9)	ND (10)	ND (50)
Benzo(g,h,i)perylene	NS	ND (49)	ND (10)	ND (9)	ND (10)	ND (50)
Semi-Volatile Compounds - Miscellaneous Compounds						
1,2,4-Trichlorobenzene	5	ND (49)	ND (10)	ND (9)	ND (10)	ND (50)
Hexachlorobutadiene	0.5	ND (49)	ND (10)	ND (9)	ND (10)	ND (50)
Dimethylphthalate	50G	ND (49)	ND (10)	ND (9)	ND (10)	ND (50)
2,6-Dinotrotoluene	5	ND (49)	ND (10)	ND (9)	ND (10)	ND (50)
2,4-Dinitrotoluene	5	ND (49)	ND (10)	ND (9)	ND (10)	ND (50)
Di-n-butylphthalate	NS	ND (49)	ND (10)	ND (9)	ND (10)	ND (50)
Bis(2-ethylhexyl)phthalate	5	ND (49)	ND (10)	ND (9)	ND (10)	ND (50)
Pesticides						
Heptachlor Epoxide	0.03	ND (0.05)	ND (0.5)	ND (0.05)	ND (0.05)	ND (0.05)
Dieldrin	0.004	ND (0.1)	ND (1.1)	ND (0.09)	ND (0.09)	**0.1**
Endrin	ND	ND (0.1)	ND (1.1)	ND (0.09)	**0.055 BJ**	**0.088 J**
Endosulfan II	NS	ND (0.1)	ND (1.1)	ND (0.09)	ND (0.09)	0.058 J
4,4'-DDD	0.3	ND (0.1)	ND (1.1)	ND (0.09)	ND (0.09)	ND (0.1)
Methoxychlor	35	ND (0.5)	ND (5.4)	ND (0.5)	ND (0.5)	0.036 J
Chlordane	0.05	ND (0.05)	ND (0.5)	ND (0.05)	ND (0.05)	ND (0.05)

Table 6-4 (Continued).
Summary of Groundwater Analytical Results from Shallow Depth Wells Installed at the Former Gastown Manufactured Gas Plant Site.
(All results in µg/l unless otherwise specified)

Parameter	Groundwater Standards +	MW-13; 12/14/99	MW-17; 12/15/99	MW-2S; 12/14/99	MW-3S; 12/13/99	MW-39; 12/15/99
Inorganic Compounds						
Arsenic	25	**179 E**	**473 E**	ND (3.5)	ND (3.5)	**284 E**
Iron	300	**464,000 E**	**2,010,000**	287 E	**6,740 E**	**843,000**
Lead	25	ND (3)	**708 E**	ND (3)	22.3	**655 E**
Manganese	300	**6,220 E**	**33100 E**	4.7 E	123 E	**22,500 E**
Zinc	2000G	1,410 E	**2510 E**	16.0 E	50.2 E	**2,110 E**
Miscellaneous Detected Compounds						
Cyanide	200	167.0	**2,800**	21.0	19.0	**18,300**
Hexadecanoic acid	NS	46 J				
Indene	NS		300 J (360 J)			
Biphenyl	5		**12 J**			
Petroleum Products	NS					120,000

+ **NYSDEC Ambient Water Quality Standards and Guidance Values, June 1998; April 2000 amendment.**
G **Guidance value.**
NS **No standard.**
ND **Indicates that the compound was not detected at the method detection limit specified in parentheses.**
J **Estimated concentration that is less than the sample quantitation limit but greater than zero.**
E **Estimated concentration that exceeds the calibration range of the GC/MS instrument.**
B **Compound detected in both the sample and blank (organics) or Concentration greater than or equal to the instrument detection limit, but less than the contract required detection limit (inorganics).**
(2.8) **Results of duplicate analysis.**

Shaded values equal or exceed groundwater standards or guidance values (ARARs).

Table 6-5.
Summary of Groundwater Analytical Results from Intermediate Depth Wells Installed at the Former Gastown Manufactured Gas Plant Site.
(All results in µg/l unless otherwise specified)

Parameter	Groundwater Standards +	MW-23; 12/15/99	MW-1I; 12/16/99	MW-2I; 12/16/99	MW-27; 12/14/99	MW-34; 12/15/99	MW-35; 12/15/99	MW-36; 12/15/99
Volatile Organic Compounds								
Benzene	1	0.43	**540.0 (530.0)**	**12,000 (7,500)**	**1.2 (2 J)**	**11,000 (16,000)**	**140.0 (190.0)**	ND (0.2)
Toluene	5	1.3	**6.5 E**	**5,200 (1,800)**	**7 J**	**1,100 (2,800)**	**1,400 (1,600)**	0.22
Ethylbenzene	5	2.8	**9.0 (8 J)**	**440.0 (370.0)**	ND (0.2)	**1,300 (3,200)**	**1,100 (1,000)**	ND (0.2)
Xylene-O	5	**7.5**	**6.1**	**420.0**	ND (0.2)	**830.0 (460.0)**	**460.0**	ND (0.2)
Xylene-M&P	5	**13.0**	2.9 E	**750.0**	ND (0.2)	**1,200 (540.0)**	**880.0**	ND (0.32)
Isopropylbenzene	5	0.74	0.33	**6.3**	ND (0.2)	ND (8)	ND (32)	ND (0.2)
n-Propylbenzene	5	ND (0.4)	ND (0.4)	ND (0.4)	ND (0.4)	ND (8)	ND (32)	ND (0.4)
1,3,5-Trimethylbenzene	5	4.1	0.46 J	**26.0**	ND (1)	**80.0**	ND (32)	ND (1)
1,2,4-Trimethylbenzene	5	**13.0**	2.8 (4.1)	**440.0**	ND (0.2)	**940.0 (550.0)**	**800.0**	ND (0.2)
p-Isopropyltoluene	5	ND (1)	ND (1)	ND (1)	ND (1)	ND (8)	ND (32)	ND (1)
n-Butylbenzene	5	**35.0**	**20.0**	**3,700**	ND (0.4)	**5,700**	**4,000**	ND (0.4)
sec-Butylbenzene	5	**5.3**	ND (0.4)	**120 E**	ND (0.4)	ND (4)	ND (16)	ND (0.4)
Naphthalene	10G	**63.0**				**9,600**	**9,800**	4.0
MTBE	10G		**11.0**	0.89 J	ND (5)			
Vinyl Chloride	2	ND (200)	**52.0**	ND (200)	ND (10)	ND (400)	ND (50)	ND (10)
Styrene	5	ND (200)	ND (50)	**1,400 (410)**	ND (10)	**2,300 (1,800)**	**900.0 (1,200)**	ND (10)
Chloromethane	NS	ND (200)	ND (50)	ND (200)	ND (10)	ND (400)	ND (50)	ND (10)
1,2-Dichloroethene (total)	5	ND (200)	**89.0**	ND (200)	ND (10)	ND (400)	ND (50)	ND (10)
Chloroform	7	ND (200)	ND (50)	ND (200)	ND (10)	ND (400)	ND (50)	ND (10)
1,2-Dichloroethane	0.6	ND (200)	ND (50)	ND (200)	ND (10)	ND (400)	ND (50)	ND (10)
2-Butanone	50G	ND (200)	ND (50)	ND (200)	ND (10)	ND (400)	ND (50)	ND (10)
1,2-Dichloropropane	1	ND (200)	ND (50)	ND (200)	ND (10)	ND (400)	ND (50)	ND (10)
Chlorobenzene	5	ND (200)	ND (50)	ND (200)	ND (10)	ND (400)	ND (50)	ND (10)

Table 6-5 (Continued).
Summary of Groundwater Analytical Results from Intermediate Depth Wells Installed at the Former Gastown Manufactured Gas Plant Site.
(All results in µg/l unless otherwise specified)

Parameter	Groundwater Standards +	MW-23; 12/15/99	MW-1I; 12/16/99	MW-2I; 12/16/99	MW-27; 12/14/99	MW-34; 12/15/99	MW-35; 12/15/99	MW-36; 12/15/99
Semi-Volatile Compounds - Phenols								
Phenol	1	ND (100)	ND (48)	ND (94)	**21.0**	ND (200)	ND (210)	ND (13)
2-Methylphenol	NS	ND (100)	ND (48)	ND (94)	ND (10)	ND (200)	ND (210)	ND (13)
4-Methylphenol	NS	ND (100)	ND (48)	ND (94)	ND (10)	ND (200)	ND (210)	ND (13)
2-Nitrophenol	1	ND (100)	ND (48)	ND (94)	**24 J**	ND (200)	ND (210)	ND (13)
4-Nitrophenol	1	ND (260)	ND (120)	ND (240)	**38.0**	ND (500)	ND (520)	ND (32)
2,4-Dimethylphenol	50G	ND (100)	ND (48)	ND (94)	ND (10)	ND (200)	ND (210)	ND (13)
Pentachlorophenol	1	ND (260)	ND (120)	ND (240)	**36.0**	ND (500)	ND (520)	ND (32)
4-Chloro-3-Methylphenol	NS	ND (100)	ND (48)	ND (94)	46.0	ND (200)	ND (210)	ND (13)
Semi-Volatile Compounds - PAHs								
Naphthalene	10G	**250.0**	**170.0**	**3,000**	ND (10)	**7,300**	**9,700**	4 J
2-Methylnaphthalene	NS	22 J	8 J	77 J	ND (10)	710.0 (780 J)	970.0 (1,100 J)	ND (13)
Acenaphthylene	NS	120.0	15 J	180.0 (170 J)	ND (10)	820.0 (830 J)	1,000 (1,100 J)	ND (13)
Acenaphthene	20G	**23 J**	ND (48)	ND (94)	**23.0**	**54 J**	**63 J**	ND (13)
Dibenzofuran	NS	34 J	ND (48)	ND (94)	ND (10)	55 J	54 J	ND (13)
Fluorene	50G	**58 J**	ND (48)	33 J	ND (10)	**370.0 (320 J)**	**400.0 (360 J)**	ND (13)
Phenanthrene	50G	**170.0**	ND (48)	**76 J**	ND (10)	**1,000 (1,200 J)**	**1,000 (1,400 J)**	ND (13)
Anthracene	50G	**69 J**	ND (48)	13 J	ND (10)	**310.0 (270 J)**	**270.0 (250 J)**	ND (13)
Carbazole	NS							
Fluoranthene	50G	**180.0**	ND (48)	33 J	ND (10)	**480.0 (480 J)**	**460.0 (480 J)**	ND (13)
Pyrene	50G	**210.0**	ND (48)	**54 J**	24.0	**740.0 (900 J)**	**660.0 (940 J)**	ND (13)
Benzo(a)anthracene	0.002G	**77 J**	ND (48)	**19 J**	ND (10)	**210.0**	**200 J**	ND (13)
Chrysene	0.002G	**71 J**	ND (48)	**17 J**	ND (10)	**180 J**	**160 J**	ND (13)

Table 6-5 (Continued).
Summary of Groundwater Analytical Results from Intermediate Depth Wells Installed at the Former Gastown Manufactured Gas Plant Site.
(All results in µg/l unless otherwise specified)

Parameter	Groundwater Standards +	MW-23; 12/15/99	MW-1I; 12/16/99	MW-2I; 12/16/99	MW-27; 12/14/99	MW-34; 12/15/99	MW-35; 12/15/99	MW-36; 12/15/99
Semi-Volatile Compounds - PAHs (continued)								
Benzo(b)fluoranthene	0.002G	**96 J**	ND (48)	**21 J**	ND (10)	**140 J**	**150 J**	ND (13)
Benzo(k)fluoranthene	0.002G	**34 J**	ND (48)	ND (94)	ND (10)	**40 J**	**45 J**	ND (13)
Benzo(a)pyrene	ND	**110.0**	ND (48)	**22 J**	ND (10)	**200.0**	**220.0**	ND (13)
Indeno(1,2,3-cd)pyrene	0.002G	**42 J**	ND (48)	ND (94)	ND (10)	**51 J**	**57 J**	ND (13)
Dibenz(a,h)anthracene	NS	ND (100)	ND (48)	ND (94)	ND (10)	ND (200)	ND (210)	ND (13)
Benzo(g,h,i)perylene	NS	45 J	ND (48)	ND (94)	ND (10)	**69 J**	75 J	ND (13)
Semi-Volatile Compounds - Miscellaneous Compounds								
1,2,4-Trichlorobenzene	5	ND (100)	ND (48)	ND (94)	**16.0**	ND (200)	ND (210)	ND (13)
Hexachlorobutadiene	0.5	ND (100)	ND (48)	ND (94)	ND (10)	ND (200)	ND (210)	ND (13)
Dimethylphthalate	50G	ND (100)	ND (48)	ND (94)	ND (10)	ND (200)	ND (210)	ND (13)
2,6-Dinotrotoluene	5	ND (100)	ND (48)	ND (94)	ND (10)	ND (200)	ND (210)	ND (13)
2,4-Dinitrotoluene	5	ND (100)	ND (48)	ND (94)	**23.0**	ND (200)	ND (210)	ND (13)
Di-n-butylphthalate	NS	ND (100)	ND (48)	ND (94)	ND (10)	ND (200)	ND (210)	ND (13)
Bis(2-ethylhexyl)phthalate	5	ND (100)	ND (48)	ND (94)	ND (10)	ND (200)	ND (210)	ND (13)
Pesticides								
Heptachlor Epoxide	0.03	ND (0.5)	ND (0.05)	ND (0.05)	ND (0.05)	ND (0.5)	ND (0.55)	ND (0.07)
Heptachlor	0.04	ND (0.5)	ND (0.05)	**0.054**	ND (0.05)	ND (0.5)	ND (0.55)	ND (0.07)
Dieldrin	0.004	ND (1)	ND (0.09)	ND (0.1)	ND (0.09)	ND (1)	ND (1.1)	ND (0.1)
Endrin	ND	ND (1)	ND (0.09)	ND (0.1)	**0.079 BJ**	ND (1)	ND (1.1)	**0.09 J**
Endosulfan II	NS	ND (1)	ND (0.09)	ND (0.1)	ND (0.09)	ND (1)	ND (1.1)	ND (0.1)
4,4'-DDD	0.3	ND (1)	ND (0.09)	ND (0.1)	ND (0.09)	ND (1)	ND (1.1)	ND (0.1)
Methoxychlor	35	ND (5.2)	ND (0.5)	ND (0.5)	ND (0.5)	ND (5)	ND (5.5)	ND (0.7)
Chlordane	0.05	ND (0.5)	ND (0.05)	ND (0.05)	ND (0.05)	ND (0.5)	ND (0.55)	ND (0.07)

Table 6-5 (Continued).
Summary of Groundwater Analytical Results from Intermediate Depth Wells Installed at the Former Gastown Manufactured Gas Plant Site.
(All results in µg/l unless otherwise specified)

Parameter	Groundwater Standards +	MW-23; 12/15/99	MW-1I; 12/16/99	MW-2I; 12/16/99	MW-27; 12/14/99	MW-34; 12/15/99	MW-35; 12/15/99	MW-36; 12/15/99
Inorganic Compounds								
Arsenic	25	**233 E**	14.6 E	3.5 BE	**692 E**	**171 E**	**149 E**	**275 E**
Iron	300	**1,190,000**	**37,800 E**	**9,320**	**1,630,000 E**	**443,000**	**438,000**	**846,000**
Lead	25	**524 E**	15.5 E	3.6 E	**682.0**	**548 E**	**218 E**	**342 E**
Manganese	300	**8,720 E**	**1,010 E**	**2,170 E**	**30,300 E**	**8,550 E**	**19,200 E**	**16,400 E**
Zinc	2000G	**2,760 E**	103 E	33.0 E	**2,800 E**	**2,400 E**	1,200 E	**2,090 E**
Miscellaneous Detected Compounds								
Cyanide	200	**14,500**	**344.0**	101.0	128.0	**280.0**		**370.0**
Indene	NS	**160 J**		**1,600 J**		**2,200 J (2,400 J)**	**2,300 J**	
Biphenyl	5					**110 J**	**160 J**	
Cis-1,3-dichloropropene	0.4			**69 J**				
Dibenzothiophene	NS						67 J	
N-nitrosodimethylamine	50G			32 J				
1,4-Dichlorobenzene	3				**16.0**			
N-Nitroso-di-n-propylamine	NS				24.0			

+ **NYSDEC Ambient Water Quality Standards and Guidance Values, June 1998; April 2000 amendment.**
G **Guidance value.**
NS **No standard.**
ND **Indicates that the compound was not detected at the method detection limit specified in parentheses.**
J **Estimated concentration that is less than the sample quantitation limit but greater than zero.**
E **Estimated concentration that exceeds the calibration range of the GC/MS instrument.**
B **Compound detected in both the sample and blank (organics) or Concentration greater than or equal to the instrument detection limit, but less than the contract required detection limit (inorganics).**
(2.8) **Results of duplicate analysis.**

Shaded values equal or exceed groundwater standards or guidance values (ARARs).

Table 6-6.
Former Gastown Manufactured Gas Plant Site.
Summary of Water Analytical Results from the Primary Sump in the Basement of the Gastown Sportsman's Club.
(All results in µg/l unless otherwise noted)

Parameter	Ground- + Water Standards	Date Sampled						
		3/8/93	6/8/95	11/6/95	4/13/98	4/23/98 *	4/24/98 **	12/16/99
Volatile Organic Compounds								
Benzene	1		**10,500**	**6,200**	**4,535**	**3,964**	**12,000**	**350.0 (1,600)**
Toluene	5		**1,390**	**1,200**	**1,767**	**1,117**	**5,200 (4,900)**	**580.0 (130.0)**
Ethylbenzene	5		**120.0**	**250.0**	ND (100)	ND (5)	**460.0 (450 J)**	**94.0 (100.0)**
Xylene-O	5		**493.0**	**330.0**	**298.9**	ND (5)	**1,800 (1,300)**	**58.0 (9.3)**
Xylene-M&P	5		**97.6 J**	**560.0**	**613.1**	ND (10)		**95.0 (11.0)**
Isopropylbenzene	5		ND (240)	ND (200)	ND (100)	**1,552**		0.54
n-Propylbenzene	5		ND (280)	ND (200)	ND (100)	**1,507**		0.43
1,3,5-Trimethylbenzene	5		ND (160)	ND (200)	**126.2**	**24.2**		4.3
1,2,4-Trimethylbenzene	5		ND (210)	**240.0**	**267.6**	**89.5**		**45.0 (6.0)**
p-Isopropyltoluene	5		ND (190)	ND (200)	**222.9**	**209.0**		3.7
n-Butylbenzene	5		ND (320)	ND (200)	**499.1**	**1,120**		**320.0 (130.0)**
sec-Butylbenzene	5		ND (650)	ND (200)	**306.4**	**168.0**		ND (0.4)
Naphthalene	10G		**6,070**	ND (200)	**672.1**	**156.0**		
MTBE	10G		ND (1000)	ND (200)	ND (1000)	**202.0**		ND (5)
Vinyl Chloride	2						ND (100)	1 J
Styrene	5						**2,000 (1,900)**	**130.0 (100.0)**
Chloromethane	NS						ND (100)	ND (10)
1,2-Dichloroethene (total)	5						ND (100)	1 J
Chloroform	7						ND (100)	ND (10)
1,2-Dichloroethane	0.6						ND (100)	ND (10)
2-Butanone	50G						ND (100)	ND (10)
1,2-Dichloropropane	1						ND (100)	ND (10)
Chlorobenzene	5						ND (100)	ND (10)

Table 6-6 (Continued).
Former Gastown Manufactured Gas Plant Site.
Summary of Water Analytical Results from the Primary Sump in the Basement of the Gastown Sportsman's Club.
(All results in µg/l unless otherwise noted)

Parameter	Ground- + Water Standards	3/8/93	6/8/95	11/6/95	4/13/98	4/23/98 *	4/24/98 **	12/16/99
Semi-Volatile Compounds - Phenols								
Phenol	1	**11.0**					ND (50)	**9 J**
2-Methylphenol	NS	ND (10)					13 J	9 J
4-Methylphenol	NS	15.0					20 J	4 J
2-Nitrophenol	1	ND (10)					ND (50)	ND (10)
4-Nitrophenol	1	ND (10)					ND (120)	ND (24)
2,4-Dimethylphenol	50G	33.0					33 J	9 J
Pentachlorophenol	1	**16.0**					**19 J**	ND (24)
4-Chloro-3-Methylphenol	NS	ND (10)					ND (50)	ND (10)
Semi-Volatile Compounds - PAHs								
Naphthalene	10G	**190.0**			**34.0**		**9,300**	9 J
2-Methylnaphthalene	NS	98.0				546.0	2,200 BJ	5 J
Acenaphthylene	NS	130.0			214.0	570.0	3,800 J	15.0
Acenaphthene	20G	**25.0**			**37.0**	ND (10)	**330.0**	1 J
Dibenzofuran	NS	21.0					290.0	ND (10)
Fluorene	50G	**98.0**			**56.0**	**168.0**	**1,600 J**	3 J
Phenanthrene	50G	**120.0**			**73.0**	**619.0**	**5,700.0**	2 J
Anthracene	50G	**52.0**			16.0	**614.0**	**1,500 J**	ND (10)
Carbazole	NS						88.0	
Fluoranthene	50G	**61.0**			10 J	**162.0**	**2,500 J**	ND (10)
Pyrene	50G	**70.0**			8 J	**271.0**	**3,800 J**	1 J
Benzo(a)anthracene	0.002G	**26.0**			ND (10)	ND (10)	**940 J**	ND (10)
Chrysene	0.002G	**22.0**			ND (10)	ND (10)	**720 J**	ND (10)

Table 6-6 (Continued).
Former Gastown Manufactured Gas Plant Site.
Summary of Water Analytical Results from the Primary Sump in the Basement of the Gastown Sportsman's Club.
(All results in µg/l unless otherwise noted)

Parameter	Ground- + Water Standards	3/8/93	6/8/95	11/6/95	4/13/98	4/23/98 *	4/24/98 **	12/16/99
Semi-Volatile Compounds - PAHs (continued)								
Benzo(b)fluoranthene	0.002G	**17.0**			ND (10)	ND (10)	**1,100 E**	ND (10)
Benzo(k)fluoranthene	0.002G	ND (10)			ND (10)	**127.0**	**510 E**	ND (10)
Benzo(a)pyrene	ND	**24.0**			ND (10)	ND (10)	**800 J**	ND (10)
Indeno(1,2,3-cd)pyrene	0.002G	**10.0**			ND (10)	ND (10)	**280.0**	ND (10)
Dibenz(a,h)anthracene	NS	ND (10)			ND (10)	ND (10)	55.0	ND (10)
Benzo(g,h,i)perylene	NS	12.0			ND (10)	ND (10)	250.0	ND (10)
Semi-Volatile Compounds - Miscellaneous Compounds								
1,2,4-Trichlorobenzene	5	ND (10)					ND (50)	ND (10)
Hexachlorobutadiene	0.5	ND (10)					ND (50)	ND (10)
Dimethylphthalate	50G	ND (10)					ND (50)	ND (10)
2,6-Dinotrotoluene	5	ND (10)					ND (50)	ND (10)
2,4-Dinitrotoluene	5	ND (10)					ND (50)	ND (10)
Di-n-butylphthalate	NS	ND (10)					ND (50)	ND (10)
Bis(2-ethylhexyl)phthalate	5	**19.0**					ND (50)	ND (10)
Pesticides								
Heptachlor Epoxide	0.03						0.023 J	ND (0.05)
Dieldrin	0.004						ND (0.5)	ND (0.09)
Endrin	ND						ND (0.5)	ND (0.09)
Endosulfan II	NS						ND (0.5)	ND (0.09)
4,4'-DDD	0.3						**0.099 JP**	ND (0.09)
Methoxychlor	35						ND (2.5)	ND (0.5)
Chlordane	0.05						0.017 JP	ND (0.05)

Table 6-6 (Continued).
Former Gastown Manufactured Gas Plant Site.
Summary of Water Analytical Results from the Primary Sump in the Basement of the Gastown Sportsman's Club.
(All results in µg/l unless otherwise noted)

Parameter	Ground- + Water Standards	3/8/93	6/8/95	11/6/95	4/13/98	4/23/98 *	4/24/98 **	12/16/99
Inorganic Compounds								
Arsenic	25						3.4 B	ND (3.5)
Iron	300						**1,690**	**455.0**
Lead	25						ND (2.6)	ND (3)
Manganese	300						**863.0**	108 E
Zinc	2000G						29.0	15.9 BE
Miscellaneous Detected Parameters								
Cyanide	200						**200.0**	50.0
Indene	NS						1,400 J (4,000 J)	120 J
Biphenyl	5						**580 J**	
Benzyl Alcohol	NS							7 J

+ **NYSDEC Ambient Water Quality Standards and Guidance Values, June 1998; April 2000 amendment.**
G **Guidance value.**
NS **No standard.**
ND **Indicates that the compound was not detected at the method detection limit specified in parentheses.**
J **Estimated concentration that is less than the sample quantitation limit but greater than zero.**
E **Estimated concentration that exceeds the calibration range of the GC/MS instrument.**
B **Compound detected in both the sample and blank (organics) or Concentration greater than or equal to the instrument detection limit, but less than the contract required detection limit (inorganics).**
(2.8) **Results of duplicate analysis.**
P **There is a >25% difference between the analytical results between the two GC columns. The lower value is reported.**
***** **Kanti Technologies, Inc.**
****** **Recra Labnet.**

Shaded values equal or exceed groundwater and/or surface water standards or guidance values (ARARs).

APPENDIX A

STRATIGRAPHIC LOGS AND WELL CONSTRUCTION DIAGRAMS

1996 Boring Logs,
Environmental Products & Services

Environmental PRODUCTS & SERVICES, INC.	Subsurface Log	Hole No.:1	Date Started: 06/03/96
		Sheet 1of 1	Date Finished: 06/03/96

Client: NYSDEC
Gastown Sportsmen's Club
Location: Tonawanda, N.Y.

Method of Investigation: Direct push method, Geoprobe tooling, 2-inch diameter, 4-foot long soil probe.

Project No.: B1113
Proj. Mgr: D. Ellsworth
Geologist: T. Burmeier

Drilling Co.: Environmental Products & Services
Driller: R. Varno
Drill Rig: Concord 9200

Weather: 65-70 degrees F, light rain

Depth (ft.)	Sample No.	Sample Depth (ft.)	Blows /6"	"N"	Recovery (ft.)	Sample Description	Field Analytical Readings	Well Details	Groundwater and Other Observations
0	S1	0-4			3.0	0.0'-0.5' TOP SOIL. 0.5'-4.0' Tan to light brown, moist, silty CLAY, trace sand. Changes to dark gray, silty CLAY, some black coal.			NO ODOR OBSERVED IN SAMPLES 0'-19.8'
5	S2	4-8			3.5	4.0'-4.4' Medium gray CLAY. 4.4'-7.8' Medium yellow/brown, firm to soft, moist to very moist, silty CLAY.			
	S3	8-12			4.0	7.8'-10.3' Medium yellow/brown, fine to medium SAND. Becomes medium gray, fine SAND (10.3' -15.4').			SAMPLES WET AT 8.0'
10									
	S4	12-16			4.0				
15						15.4'-15.6' Medium gray, sandy CLAY. 15.6'-19.8' Gray, fine to medium SAND.			
	S5	16-20			3.5				19.8'-20' FAINT PETROLEUM ODOR
20						19.8'-20' Rounded GRAVEL.			REFUSAL ON GRAVEL @ 20'
									20' = BOTTOM OF BORING

Sample Types:
S=Split Spoon: 2"
R= Rock Core: _____
N = ASTM D1586

Backfill Well Key
Cement
Native Fill
Sand
Bentonite

Environmental PRODUCTS & SERVICES, INC.	Subsurface Log	Hole No.:2 Sheet 1of 1	Date Started: 06/03/96 Date Finished: 06/03/96

Client: NYSDEC
Gastown Sportsmen's Club
Location: Tonawanda, N.Y.

Method of Investigation: Direct push method, Geoprobe tooling, 2-inch diameter, 4-foot long soil probe.

Project No.: B1113
Proj. Mgr: D. Ellsworth
Geologist: T. Burmeier

Drilling Co.: Environmental Products & Services
Driller: R. Varno
Drill Rig: Concord 9200

Weather: 65-70 degrees F, light rain

Depth (ft.)	Sample No.	Sample Depth (ft.)	Blows /6"	"N"	Recovery (ft.)	Sample Description	Field Analytical Readings	Well Details	Groundwater and Other Observations
0	S1	0-4			2.3	0.0'-1.0' TOP SOIL.			NO ODOR OBSERVED IN SAMPLES 0'-12'
						1.0'-4.0' Yellow/brown and gray, stiff, slightly moist CLAY.			
5	S2	4-8			3.7	4.0'-7.0' Grades to sandy CLAY.			
						7.0'-10.3' Yellow/brown, loose, clayey, fine SAND.			
	S3	8-12			4.0				SAMPLES WET AT 8.0'
10						10.3'-11.5' Yellow/brown, firm, silty CLAY.			
						11.5'-12.0' Medium gray, fine SAND.			
									12' = BOTTOM OF BORING
15									
20									

Sample Types:
S=Split Spoon: 2"
R= Rock Core: _____
N = ASTM D1586

Backfill Well Key
Cement
Native Fill
Sand
Bentonite

Environmental PRODUCTS & SERVICES, INC.	Subsurface Log	Hole No.:3	Date Started: 06/03/96
		Sheet 1of 1	Date Finished: 06/10/96

Client: NYSDEC
Gastown Sportsmen's Club
Location: Tonawanda, N.Y.

Method of Investigation: Direct push method, Geoprobe tooling, 2-inch diameter, 4-foot long soil probe.

Project No.: B1113
Proj. Mgr: D. Ellsworth
Geologist: T. Burmeier

Drilling Co.: Environmental Products & Services
Driller: R. Varno
Drill Rig: Concord 9200

Weather: 65-70 degrees F, light rain

Depth (ft.)	Sample No.	Sample Depth (ft.)	Blows /6"	"N"	Recovery (ft.)	Sample Description	Field Analytical Readings	Well Details	Groundwater and Other Observations
0	S1	0-4			4.0	0.0'-2.0' Dark brown TOP SOIL.			
						2.0'-4.0' Yellow/brown, mottled, silty CLAY.			
5	S2	4-8			3.3	4.0'-6.0' Medium yellow/brown, sandy CLAY.			
						6.0'-11.5' Gray, sandy CLAY. Grades to yellow/brown at 10.0'.			ODOR AND SHEEN OBSERVED IN SAMPLES 6.0'-8.5'
	S3	8-12			4.0				
10									
						11.5'-16.0' Medium gray/brown, firm, silty SAND.			
	S4	12-16			4.0				
15									
	S5	16-20			4.0	16.0'-17.7' Yellow/brown, wet, loose, very fine SAND.			
						17.7'-18.5' Dark gray, medium SAND.			
						18.5'-19.4' Dark gray/brown CLAY.			
20						19.4'-20.0' SAND and GRAVEL.			
						20.0'-21.0' Red/brown, soft CLAY.			
									21' = BOTTOM OF BORING

Sample Types:
S=Split Spoon: 2"
R= Rock Core:
N = ASTM D1586

Backfill Well Key
Cement
Native Fill
Sand
Bentonite

Environmental PRODUCTS & SERVICES, INC.	Subsurface Log	Hole No.:4	Date Started: 06/03/96
		Sheet 1of 1	Date Finished: 06/03/96

Client: NYSDEC
Gastown Sportsmen's Club
Location: Tonawanda, N.Y.

Method of Investigation: Direct push method, Geoprobe tooling, 2-inch diameter, 4-foot long soil probe.

Project No.: B1113
Proj. Mgr: D. Ellsworth
Geologist: T. Burmeier

Drilling Co.: Environmental Products & Services
Driller: R. Varno
Drill Rig: Concord 9200

Weather: 65-70 degrees F, light rain

Depth (ft.)	Sample No.	Sample Depth (ft.)	Blows /6"	"N"	Recovery (ft.)	Sample Description	Field Analytical Readings	Well Details	Groundwater and Other Observations
0	S1	0-4			3.8	0.0'-1.8' TOP SOIL, trace coal.	MICROTIP PID AFFECTED BY RAIN		
						1.8'-4.4' Yellow/brown, firm, slightly moist, silty CLAY.			
5	S2	4-8			3.4	4.4'-5.5' Sandy CLAY.			
						5.5'-9.3' Medium gray/brown, mottled, loose, clayey, fine SAND.			FAINT PETROLEUM ODOR OBSERVED IN SAMPLES 6.0' - 6.5' SAMPLES WET AT 6.5'
	S3	8-12			4.0				
10						9.3'-10.1' Yellow/brown, firm, silty CLAY.			
						10.1'-11.3' Yellow, medium SAND.			
						11.3'-12.0' Gray, medium SAND.			
									12' = BOTTOM OF BORING
15									
20									

Sample Types:
S=Split Spoon: 2"
R= Rock Core:
N = ASTM D1586

Backfill Well Key
Cement
Native Fill
Sand
Bentonite

Environmental PRODUCTS & SERVICES, INC.	Subsurface Log	Hole No.:5	Date Started: 06/03/96
		Sheet 1of 1	Date Finished: 06/03/96

Client: NYSDEC
Gastown Sportsmen's Club
Location: Tonawanda, N.Y.

Method of Investigation: Direct push method, Geoprobe tooling, 2-inch diameter, 4-foot long soil probe.

Project No.: B1113
Proj. Mgr: D. Ellsworth
Geologist: T. Burmeier

Drilling Co.: Environmental Products & Services
Driller: R. Varno
Drill Rig: Concord 9200

Weather: 65-70 degrees F, light rain

Depth (ft.)	Sample No.	Sample Depth (ft.)	Blows /6"	"N"	Recovery (ft.)	Sample Description	Field Analytical Readings	Well Details	Groundwater and Other Observations
0	S1	0-4			4.0	0.0'-2.0' TOP SOIL, trace coal .	MICROTIP PID AFFECTED BY RAIN		NO ODOR OBSERVED IN SAMPLES 0.0' - 12.0'
						2.0'-8.0' Light gray/brown to yellow/brown to red/brown, firm to soft, silty CLAY.			
5	S2	4-8			3.6				SAMPLES WET AT 6.5'
	S3	8-12			4.0	8.0'-9.5' Yellow/red, silty CLAY with loose, very fine sand.			
10						9.5'-11.0' Yellow/brown, mottled, silty CLAY.			
						11.0'-12.0' Medium gray/brown, fine SAND.			
15									12' = BOTTOM OF BORING
20									

Sample Types:
S=Split Spoon: 2"
R= Rock Core: _____
N = ASTM D1586

Backfill Well Key
Cement
Native Fill
Sand
Bentonite

Environmental PRODUCTS & SERVICES, INC.	Subsurface Log	Hole No. : 6	Date Started: 06/03/96
		Sheet 1of 1	Date Finished: 06/03/96

Client: NYSDEC
Gastown Sportsmen's Club
Location: Tonawanda, N.Y.

Method of Investigation: Direct push method, Geoprobe tooling, 2-inch diameter, 4-foot long soil probe.

Project No.: B1113
Proj. Mgr: D. Ellsworth
Geologist: T. Burmeier

Drilling Co.: Environmental Products & Services
Driller: R. Varno
Drill Rig: Concord 9200

Weather: 65-70 degrees F, light rain

Depth (ft.)	Sample No.	Sample Depth (ft.)	Blows /6"	"N"	Recovery (ft.)	Sample Description	Field Analytical Readings	Well Details	Groundwater and Other Observations
0	S1	0-4			2.5	0.0'-1.5' TOP SOIL, trace coal.	MICROTIP PID AFFECTED BY RAIN		
						1.5'-6.5' Tan, yellow/brown, mottled, firm to soft, silty CLAY.			
5	S2	4-8			4.0				
						6.5'-8.0' Grades to medium gray.			PETROLEUM ODOR AND SHEEN OBSERVED AT 6.7'
10									8' = BOTTOM OF BORING
15									
20									

Sample Types:
S=Split Spoon: 2"
R= Rock Core:
N = ASTM D1586

Backfill Well Key
Cement
Native Fill
Sand
Bentonite

Environmental PRODUCTS & SERVICES, INC.	Subsurface Log	Hole No. : 7	Date Started: 06/03/96
		Sheet 1of 1	Date Finished: 06/03/96

Client: NYSDEC
Gastown Sportsmen's Club
Location: Tonawanda, N.Y.

Method of Investigation: Direct push method, Geoprobe tooling, 2-inch diameter, 4-foot long soil probe.

Project No.: B1113
Proj. Mgr: D. Ellsworth
Geologist: T. Burmeier

Drilling Co.: Environmental Products & Services
Driller: R. Varno
Drill Rig: Concord 9200

Weather: 65-70 degrees F, light rain

Depth (ft.)	Sample No.	Sample Depth (ft.)	Blows /6"	"N"	Recovery (ft.)	Sample Description	Field Analytical Readings	Well Details	Groundwater and Other Observations
0	S1	0-4			3.4	0.0'-2.0' TOP SOIL.	MICROTIP PID AFFECTED BY RAIN		
						2.0'-6.0' Yellow/brown and gray, firm to soft, slightly moist, silty CLAY.			
5	S2	4-8			4.0				
						6.0'-8.0' Grades to sandy CLAY.			PETROLEUM ODOR AND SHEEN OBSERVED AT 6.8'
10									8' = BOTTOM OF BORING
15									
20									

Sample Types:
S=Split Spoon: 2"
R= Rock Core:
N = ASTM D1586

Backfill Well Key
Cement
Native Fill
Sand
Bentonite

Environmental PRODUCTS & SERVICES, INC.	Subsurface Log	Hole No. : 8	Date Started: 06/03/96
		Sheet 1of 1	Date Finished: 06/03/96

Client: NYSDEC
Gastown Sportsmen's Club
Location: Tonawanda, N.Y.

Method of Investigation: Direct push method, Geoprobe tooling, 2-inch diameter, 4-foot long soil probe.

Project No.: B1113
Proj. Mgr: D. Ellsworth
Geologist: T. Burmeier

Drilling Co.: Environmental Products & Services
Driller: R. Varno
Drill Rig: Concord 9200

Weather: 65-70 degrees F, light rain

Depth (ft.)	Sample No.	Sample Depth (ft.)	Blows /6"	"N"	Recovery (ft.)	Sample Description	Field Analytical Readings	Well Details	Groundwater and Other Observations
0	S1	0-4			4.0	0.0'-2.0' TOP SOIL.	MICROTIP PID AFFECTED BY RAIN		NO ODOR OR SHEEN OBSERVED 0.0'-8.0'
						2.0'-6.0' Tan, yellow/brown, silty CLAY.			
5	S2	4-8			3.4				
						6.0'-8.0' Gray/green with tan interbeds, silty CLAY, some black blebs.			
10									8' = BOTTOM OF BORING
15									
20									

Sample Types:
S=Split Spoon: 2"
R= Rock Core:
N = ASTM D1586

Backfill Well Key
Cement
Native Fill
Sand
Bentonite

Environmental PRODUCTS & SERVICES, INC.	Subsurface Log	Hole No.: 9	Date Started: 06/03/96
		Sheet 1of 1	Date Finished: 06/03/96

Client: NYSDEC
Gastown Sportsmen's Club
Location: Tonawanda, N.Y.

Method of Investigation: Direct push method, Geoprobe tooling, 2-inch diameter, 4-foot long soil probe.

Project No.: B1113
Proj. Mgr: D. Ellsworth
Geologist: T. Burmeier

Drilling Co.: Environmental Products & Services
Driller: R. Varno
Drill Rig: Concord 9200

Weather: 65-70 degrees F, light rain

Depth (ft.)	Sample No.	Sample Depth (ft.)	Blows /6"	"N"	Recovery (ft.)	Sample Description	Field Analytical Readings	Well Details	Groundwater and Other Observations
0	S1	0-4			4.0	0.0'-2.8' TOP SOIL.	MICROTIP PID AFFECTED BY RAIN		NO ODOR OR SHEEN OBSERVED 0.0' - 8.0'
						2.8'-8.0' Tan, yellow/brown, mottled, silty CLAY.			
5	S2	4-8			3.6				
10									8' = BOTTOM OF BORING
15									
20									

Sample Types:
S=Split Spoon: 2"
R= Rock Core:
N = ASTM D1586

Backfill Well Key
Cement
Native Fill
Sand
Bentonite

Environmental PRODUCTS & SERVICES, INC.	Subsurface Log	Hole No.: 10	Date Started: 06/03/96
		Sheet 1of 1	Date Finished: 06/03/96

Client: NYSDEC
Gastown Sportsmen's Club
Location: Tonawanda, N.Y.

Method of Investigation: Direct push method, Geoprobe tooling, 2-inch diameter, 4-foot long soil probe.

Project No.: B1113
Proj. Mgr: D. Ellsworth
Geologist: T. Burmeier

Drilling Co.: Environmental Products & Services
Driller: R. Vamo
Drill Rig: Concord 9200

Weather: 65-70 degrees F, light rain

Depth (ft.)	Sample No.	Sample Depth (ft.)	Blows /6"	"N"	Recovery (ft.)	Sample Description	Field Analytical Readings	Well Details	Groundwater and Other Observations
0	S1	0-4			3.5	0.0'-2.2' TOP SOIL.	MICROTIP PID AFFECTED BY RAIN		NO ODOR OR SHEEN OBSERVED 0.0' - 8.0'
						2.2'-4.0' Tan, yellow/brown, firm, slightly moist, silty CLAY.			
5	S2	4-8			3.0	4.0'-8.0' Tan, gray, yellow/brown, silty CLAY.			
10									8' = BOTTOM OF BORING
15									
20									

Sample Types:
S=Split Spoon: 2"
R= Rock Core:
N = ASTM D1586

Backfill Well Key
Cement
Native Fill
Sand
Bentonite

Environmental PRODUCTS & SERVICES, INC.	Subsurface Log	Hole No.: 11	Date Started: 06/03/96
		Sheet 1of 1	Date Finished: 06/03/96

Client: NYSDEC
Gastown Sportsmen's Club
Location: Tonawanda, N.Y.

Method of Investigation: Direct push method, Geoprobe tooling, 2-inch diameter, 4-foot long soil probe.

Project No.: B1113
Proj. Mgr: D. Ellsworth
Geologist: T. Burmeier

Drilling Co.: Environmental Products & Services
Driller: R. Varno
Drill Rig: Concord 9200

Weather: 65-70 degrees F, light rain

Depth (ft.)	Sample No.	Sample Depth (ft.)	Blows /6"	"N"	Recovery (ft.)	Sample Description	Field Analytical Readings	Well Details	Groundwater and Other Observations
0	S1	0-4			3.6	0.0'-2.0' TOP SOIL.	MICROTIP PID AFFECTED BY RAIN		NO ODOR OR SHEEN OBSERVED 0.0' - 8.0'
						2.0'-8.0' Yellow/brown, mottled, silty CLAY. Grades to medium gray at 4.0'.			
5	S2	4-8			1.2				
10									8' = BOTTOM OF BORING
15									
20									

Sample Types:
S=Split Spoon: 2"
R= Rock Core: _____
N = ASTM D1586

Backfill Well Key
Cement
Native Fill
Sand
Bentonite

Environmental PRODUCTS & SERVICES, INC.	Subsurface Log	Hole No.: 12	Date Started: 06/03/96
		Sheet 1of 1	Date Finished: 06/03/96

Client: NYSDEC
Gastown Sportsmen's Club
Location: Tonawanda, N.Y.

Method of Investigation: Direct push method, Geoprobe tooling, 2-inch diameter, 4-foot long soil probe.

Project No.: B1113
Proj. Mgr: D. Ellsworth
Geologist: T. Burmeier

Drilling Co.: Environmental Products & Services
Driller: R. Varno
Drill Rig: Concord 9200

Weather: 65-70 degrees F, light rain

Depth (ft.)	Sample No.	Sample Depth (ft.)	Blows /6"	"N"	Recovery (ft.)	Sample Description	Field Analytical Readings	Well Details	Groundwater and Other Observations
0	S1	0-4			3.6	0.0'-2.2' TOP SOIL.	MICROTIP PID AFFECTED BY RAIN		NO ODOR OR SHEEN OBSERVED 0.0' - 8.0'
						2.2'-8.0' Tan, yellow/brown, mottled, silty CLAY.			
5	S2	4-8			3.7				
10									8' = BOTTOM OF BORING
15									
20									

Sample Types:
S=Split Spoon: 2"
R= Rock Core:
N = ASTM D1586

Backfill Well Key
Cement
Native Fill
Sand
Bentonite

Environmental PRODUCTS & SERVICES, INC.	Subsurface Log	Hole No.:13 Sheet 1of 1	Date Started: 06/04/96 Date Finished: 06/04/96

Client: NYSDEC
Gastown Sportsmen's Club
Location: Tonawanda, N.Y.

Method of Investigation: Direct push method, Geoprobe tooling, 2-inch diameter, 4-foot long soil probe.

Project No.: B1113
Proj. Mgr: D. Ellsworth
Geologist: T. Burmeier

Drilling Co.: Environmental Products & Services
Driller: R. Varno
Drill Rig: Concord 9200

Weather: 65-70 degrees F, cloudy

Depth (ft.)	Sample No.	Sample Depth (ft.)	Blows /6"	"N"	Recovery (ft.)	Sample Description	Field Analytical Readings	Well Details	Groundwater and Other Observations
0	S1	0-4			3.2	0.0'-1.8' Crushed limestone GRAVEL and CLAY, FILL.			
						1.8'-4.2' Medium gray/green and yellow/brown CLAY, trace slightly moist sand.			
5	S2	4-8			2.2	4.2'-11.0' Tan, yellow/brown, silty CLAY.			
	S3	8-12			4.0				SAMPLES WET AT 8.0'
10									PETROLEUM ODOR AND SHEEN OBSERVED IN SAMPLES 8.0' - 10.0'
						11.0'-14.0' Medium brown, fine to medium SAND.			
	S4	12-16			4.0				
15						14.0'-16.0' Grades to gray, fine to very fine SAND, some fine black particles (unknown).			
	S5	16-20			4.0	16.0'-19.0' Medium yellow/brown, loose, medium SAND.			Hydrocarbon odor at 18.0'
20						19.0'-20.0' Grades to medium gray, firm, fine SAND.			Free oily substance 19.0' - 22.0'
	S6	20 -22			2.0	20.0'-22.0' Grades to medium SAND.			
						22.0' Refusal on black, rounded GRAVEL.			22' = BOTTOM OF BORING

Sample Types:
S=Split Spoon: 2"
R= Rock Core:
N = ASTM D1586

Backfill Well Key
Cement
Native Fill
Sand
Bentonite

Environmental PRODUCTS & SERVICES, INC.	Subsurface Log	Hole No.:14 Sheet 1of 1	Date Started: 06/04/96 Date Finished: 06/04/96

Client: NYSDEC
Gastown Sportsmen's Club
Location: Tonawanda, N.Y.

Method of Investigation: Direct push method, Geoprobe tooling, 2-inch diameter, 4-foot long soil probe.l

Project No.: B1113
Proj. Mgr: D. Ellsworth
Geologist: T. Burmeier

Drilling Co.: Environmental Products & Services
Driller: R. Varno
Drill Rig: Concord 9200

Weather: 65 degrees F, cloudy

Depth (ft.)	Sample No.	Sample Depth (ft.)	Blows /6"	"N"	Recovery (ft.)	Sample Description	Field Analytical Readings	Well Details	Groundwater and Other Observations
0	S1	0-4			3.3	0.0'-0.5' GRAVEL FILL. 0.5'-4.0' Medium yellow/brown, silty CLAY.			
5	S2	4-8			3.2	4.0'-10.0' Tan, yellow/brown, mottled, sandy, silty CLAY.			
	S3	8-12			4.0				
10						10.0'-15.0' Yellow/brown, loose, fine to medium SAND.			SAMPLES WET AT 10.0'
	S4	12-16			4.0				
15						15.0'-16.0' Medium gray, fine, clayey SAND.			
	S5	16-20			4.0	16.0'-22.5' Gray, loose, wet, fine SAND. Grades to yellow/brown, firm, medium to fine SAND from 18.0'-19.0'.			
20	S6	20 -22			4.0				Free oily substance 19.5' - 22.5'
						22.5'-22.7' Dark gray GRAVEL. 22.7'-24.0' Reddish brown, soft CLAY.			Strong petroleum odor in gravel
									24' = BOTTOM OF BORING

Sample Types:
S=Split Spoon: 2"
R= Rock Core:
N = ASTM D1586

Backfill Well Key

Environmental PRODUCTS & SERVICES, INC.	Subsurface Log	Hole No.:15 Sheet 1of 1	Date Started: 06/04/96 Date Finished: 06/04/96

Client: NYSDEC
Gastown Sportsmen's Club
Location: Tonawanda, N.Y.

Method of Investigation: Direct push method, Geoprobe tooling, 2-inch diameter, 4-foot long soil probe.

Project No.: B1113
Proj. Mgr: D. Ellsworth
Geologist: T. Burmeier

Drilling Co.: Environmental Products & Services
Driller: R. Varno
Drill Rig: Concord 9200

Weather: 65 degrees F, cloudy

Depth (ft.)	Sample No.	Sample Depth (ft.)	Blows /6"	"N"	Recovery (ft.)	Sample Description	Field Analytical Readings	Well Details	Groundwater and Other Observations
0	S1	0-4			4.0	0.0'-2.0' Crushed GRAVEL and CLAY FILL.			
						2.0'-8.0' Medium yellow/brown, mottled, silty CLAY, some sand.			
5	S2	4-8			4.0				SAMPLES WET AT 7.0'
	S3	8-12			4.0	8.0'-10.0' Yellow/brown, loose to firm, sandy, silty CLAY.			
10						10.0'-10.5' Medium SAND.			
						10.5'-11.5' Medium yellow/brown, sandy, silty CLAY.			
						11.5'-13.5' Medium gray, fine SAND.			
	S4	12-16			4.0				
						13.5'-15.0' Gray/brown CLAY.			
15						15.0'-19.0' Medium/gray, medium SAND. Grades to yellow/brown at 16.0'.			Free oily substance 15.0' - 20.0'
	S5	16-20			4.0				
						19.0'-20.0' Medium gray, silty SAND.			
20									20' = BOTTOM OF BORING

Sample Types:
S=Split Spoon: 2"
R= Rock Core:
N = ASTM D1586

Backfill Well Key
Cement
Native Fill
Sand
Bentonite

Environmental PRODUCTS & SERVICES, INC.	Subsurface Log	Hole No.:16	Date Started: 06/05/96
		Sheet 1of 1	Date Finished: 06/05/96

Client: NYSDEC
Gastown Sportsmen's Club
Location: Tonawanda, N.Y.

Method of Investigation: Direct push method, Geoprobe tooling, 2-inch diameter, 4-foot long soil probe.

Project No.: B1113
Proj. Mgr: D. Ellsworth
Geologist: T. Burmeier

Drilling Co.: Environmental Products & Services
Driller: R. Varno
Drill Rig: Concord 9200

Weather: 55 degrees F, cloudy and windy

Depth (ft.)	Sample No.	Sample Depth (ft.)	Blows /6"	"N"	Recovery (ft.)	Sample Description	Field Analytical Readings	Well Details	Groundwater and Other Observations
0	S1	0-4			3.3	0.0'-3.0' Crushed, fine GRAVEL FILL.	MICROTIP PID BACKGROUND AT 6.0 PPM		
						3.0'-4.0' Green/gray CLAY with black patches.			
5	S2	4-8			0.0				
	S3	8-12			3.4	8.0'-9.0' Green/gray CLAY.	14.4 ppm		
10						9.0'-12.0' Yellow/brown, firm to loose, fine to medium SAND.	7.8 ppm		Moderate Hydrocarbon Odor and Sheen at 8.0'-9.0'
	S4	12-16			3.4	12.0'-16.0' Green/gray, fine SAND, occasional clay interbeds.			
15	S5	16-20			3.7	16.0'-19.5' Green/gray, loose, medium to fine SAND. Grades to firm at 17.0', clay interbeds, thin black zones.	8.0 ppm		Free oily substance 16.0' - 23.0'
20	S6	20 -24			3.0	19.5'-23.0' Loose, wet, fine to silty SAND.	20-55 ppm		
						23.0'-24.0' Reddish brown, soft, plastic CLAY.			
									24' = BOTTOM OF BORING

Sample Types:
S=Split Spoon: 2"
R= Rock Core:
N = ASTM D1586

Backfill Well Key
Cement
Native Fill
Sand
Bentonite

Environmental PRODUCTS & SERVICES, INC.	Subsurface Log	Hole No.:17 Sheet 1of 1	Date Started: 06/05/96 Date Finished: 06/05/96

Client: NYSDEC
Gastown Sportsmen's Club
Location: Tonawanda, N.Y.

Method of Investigation: Direct push method, Geoprobe tooling, 2-inch diameter, 4-foot long soil probe.

Project No.: B1113
Proj. Mgr: D. Ellsworth
Geologist: T. Burmeier

Drilling Co.: Environmental Products & Services
Driller: R. Varno
Drill Rig: Concord 9200

Weather: 55 degrees F, cloudy and windy

Depth (ft.)	Sample No.	Sample Depth (ft.)	Blows /6"	"N"	Recovery (ft.)	Sample Description	Field Analytical Readings	Well Details	Groundwater and Other Observations
0	S1	0-4			3.4	0.0'-0.5' GRAVEL FILL. 0.5'-3.1' White to green GRANULAR MATERIAL.			
						3.1'-4.2' Light brown to yellow/brown, silty CLAY.			
5	S2	4-8			4.0	4.2'-8.0' Black to dark gray/green SILT.			
	S3	8-12			4.0	8.0'-9.2' Medium gray, silty CLAY.			
10						9.2'-11.0' Black to dark gray/green, silty CLAY.			
	S4	12-16			4.0	11.0'-19.5' Gray/green to yellow/brown, mottled, fine SAND.			SAMPLES WET WITH BLACK WATER AT 10.5'
15						13.5'-16.0' Zone of tan, loose, fine SAND.			
	S5	16-20			4.0	16.0'-19.5' Non-cohesive.	15 ppm		Free oily substance 16.0' - 22.0'
20						19.5'-20.0' Medium brown CLAY.			
	S6	20 -22			3.0	20.0'-22.0' Loose, fine SAND.			
						22.0'-24.0' Reddish brown, soft CLAY, some scattered 2" diameter pebbles.			24' = BOTTOM OF BORING

Sample Types:
S=Split Spoon: 2"
R= Rock Core:
N = ASTM D1586

Backfill Well Key

Environmental PRODUCTS & SERVICES, INC.	Subsurface Log	Hole No.:18	Date Started: 06/05/96
		Sheet 1of 1	Date Finished: 06/05/96

Client: NYSDEC
Gastown Sportsmen's Club
Location: Tonawanda, N.Y.

Method of Investigation: Direct push method, Geoprobe tooling, 2-inch diameter, 4-foot long soil probe.

Project No.: B1113
Proj. Mgr: D. Ellsworth
Geologist: T. Burmeier

Drilling Co.: Environmental Products & Services
Driller: R. Varno
Drill Rig: Concord 9200

Weather: 55 degrees F, cloudy and windy

Depth (ft.)	Sample No.	Sample Depth (ft.)	Blows /6"	"N"	Recovery (ft.)	Sample Description	Field Analytical Readings	Well Details	Groundwater and Other Observations
0	S1	0-4			3.2	0.0' -2.2' Crushed GRAVEL FILL.			NO ODOR DETECTED 0.0'-24.0'
						2.2' - 3.0' CLAY FILL.			
						3.0' -3.5' COAL.			
						3.5' - 5.0' Green/gray CLAY, some wood.			
5	S2	4-8			4.0	5.0' - 6.2' Yellow/brown, crumbly SILT, non-cohesive.			
						6.2' - 9.0' Green/gray, silty CLAY, grades to dark gray/black.			
	S3	8-12			4.0				
10						9.0' - 11.0' Light green/gray mottled, dense CLAY.			
						11.0' - 12.0' Yellow/brown CLAY.			
	S4	12-16			0.5	12.0' -17.5' Medium gray, loose, fine SAND.			
15									
	S5	16-20			3.0	17.5' - 20.0' Medium gray/brown, soft CLAY.			
20	S6	20 -24			4.0	20.0' -21.5' Medium gray/brown SAND.			
						21.5' - 22.5' SAND and subrounded GRAVEL.			
						22.5' - 24.0' Reddish brown, soft CLAY.			
									24' = BOTTOM OF BORING

Sample Types:
S=Split Spoon: 2"
R= Rock Core: _____
N = ASTM D1586

Backfill Well Key
Cement
Native Fill
Sand
Bentonite

Environmental PRODUCTS & SERVICES, INC.	Subsurface Log	Hole No.:19 Sheet 1of 1	Date Started: 06/05/96 Date Finished: 06/05/96

Client: NYSDEC Gastown Sportsmen's Club
Location: Tonawanda, N.Y.

Method of Investigation: Direct push method, Geoprobe tooling, 2-inch diameter, 4-foot long soil probe.

Project No.: B1113
Proj. Mgr: D. Ellsworth
Geologist: T. Burmeier

Drilling Co.: Environmental Products & Services
Driller: R. Varno
Drill Rig: Concord 9200

Weather: 55 degrees F, cloudy and windy

Depth (ft.)	Sample No.	Sample Depth (ft.)	Blows /6"	"N"	Recovery (ft.)	Sample Description	Field Analytical Readings	Well Details	Groundwater and Other Observations
0	S1	0-4			3.3	0.0' -3.0' GRAVEL FILL.			NO ODOR DETECTED 0.0'-24.0'
						3.0' -4.0' Tan, silty CLAY.			
5	S2	4-8			4.0	4.0' - 8.0' Black, organic, clayey SILT, partly crumbly and granular. Grades to gray/green and yellow/brown, mottled CLAY.			
	S3	8-12			3.4	8.0' - 10.0' Light gray/green, silty CLAY.			
10						10.0' -10.5' Mottled, fine to medium SAND. 10.5' - 10.9' Gray/green CLAY 10.9' - 12.0' Fine to Medium SAND.			
	S4	12-16			4.0	12.0' - 15.5' Gray/brown, loose, wet, fine SAND.			
15						15.5' - 16.0' Gray/brown, silty CLAY.			
	S5	16-20			2.0	16.0' - 22.5' Loose, fine SAND. Grades to silty at 18.5' - 20.0'.			
20	S6	20 -24			4.0				
						22.5' - 23.2' Gray, angular to rounded GRAVEL.			
						23.2' - 24.0' Reddish brown, soft CLAY.			
									24' = BOTTOM OF BORING

Sample Types:
S=Split Spoon: 2"
R= Rock Core:
N = ASTM D1586

Backfill Well Key
Cement
Native Fill
Sand
Bentonite

Environmental PRODUCTS & SERVICES, INC.	Subsurface Log	Hole No.:20 Sheet 1of 1	Date Started: 06/06/96 Date Finished: 06/06/96

Client: NYSDEC
Gastown Sportsmen's Club
Location: Tonawanda, N.Y.

Method of Investigation: Direct push method, Geoprobe tooling, 2-inch diameter, 4-foot long soil probe.

Project No.: B1113
Proj. Mgr: D. Ellsworth
Geologist: T. Burmeier

Drilling Co.: Environmental Products & Services
Driller: T. Osier
Drill Rig: Concord 9200

Weather: 68-80 degrees F, sunny

Depth (ft.)	Sample No.	Sample Depth (ft.)	Blows /6"	"N"	Recovery (ft.)	Sample Description	Field Analytical Readings	Well Details	Groundwater and Other Observations
0	S1	0-4			2.3	0.0'-1.1' GRAVEL FILL.			NO ODOR 0.0' - 24.0'
						1.1'-4.5' COAL, white GRANULATED MATERIAL, black SILT FILL.			
5	S2	4-8			3.5	4.5'-6.0' Yellow/brown, mottled, dense CLAY.			
						6.0'-8.0' Gray/brown to yellow/brown, mottled, soft, silty CLAY with interbedded, thin, fine SAND layers.			
	S3	8-12			4.0	8.0'-9.4' Tan, yellow/brown, silty CLAY.			
10						9.4'-12.0' Yellow/brown, soft to dense, silty SAND.			
	S4	12-16			4.0	12.0'-13.4' Yellow/brown, loose, wet, fine SAND.			
						13.4'-16.0' Medium gray/brown, silty CLAY with fine sand.			
15	S5	16-20			4.0	16.0'-19.1' Yellow/brown, loose, fine SAND.			
						19.1'-19.9' Gray/brown, sandy SILT.			
20	S6	20 -24			4.0	19.9'-20.0' Subangular GRAVEL, 2" in diameter. 20.0'-23.2' Medium to fine SAND.			
						23.2'-23.4' GRAVEL and SAND. 23.4'-24.0' Reddish brown CLAY.			
									24' = BOTTOM OF BORING

Sample Types:
S=Split Spoon: 2"
R= Rock Core:
N = ASTM D1586

Backfill Well Key
Cement
Native Fill
Sand
Bentonite

Environmental PRODUCTS & SERVICES, INC.	Subsurface Log	Hole No.:21	Date Started: 06/06/96
		Sheet 1of 1	Date Finished: 06/06/96

Client: NYSDEC
Gastown Sportsmen's Club
Location: Tonawanda, N.Y.

Method of Investigation: Direct push method, Geoprobe tooling, 2-inch diameter, 4-foot long soil probe.

Project No.: B1113
Proj. Mgr: D. Ellsworth
Geologist: T. Burmeier

Drilling Co.: Environmental Products & Services
Driller: T. Osier
Drill Rig: Concord 9200

Weather: 68 to 80 degrees F, sunny

Depth (ft.)	Sample No.	Sample Depth (ft.)	Blows /6"	"N"	Recovery (ft.)	Sample Description	Field Analytical Readings	Well Details	Groundwater and Other Observations
0	S1	0-4			2.6	0.0'-5.8' CINDERS, FILL.	MICROTIP PID		
5	S2	4-8			2.3	5.8'-8.0' Black, soft SILT.			HYDROCARBON ODOR OBSERVED AT 5.8'- 8.0'
10	S3	8-12			3.6	8.0'-11.0' Black PEBBLY MATERIAL.	20.0-30.0 ppm		SATURATED WITH OILY SUBSTANCE AT 8.0' TO 12.0'
						11.0'-12.0' Tan, soft SILT.			
15									12' = BOTTOM OF BORING
20									

Sample Types:
S=Split Spoon: 2"
R= Rock Core:
N = ASTM D1586

Backfill Well Key
Cement
Native Fill
Sand
Bentonite

Environmental PRODUCTS & SERVICES, INC.	Subsurface Log	Hole No.:22	Date Started: 06/06/96
		Sheet 1of 1	Date Finished: 06/06/96

Client: NYSDEC
Gastown Sportsmen's Club
Location: Tonawanda, N.Y.

Method of Investigation: Direct push method, Geoprobe tooling, 2-inch diameter, 4-foot long soil probe.

Project No.: B1113
Proj. Mgr: D. Ellsworth
Geologist: T. Burmeier

Drilling Co.: Environmental Products & Services
Driller: T. Osier
Drill Rig: Concord 9200

Weather: 68 to 80 degrees F, sunny

Depth (ft.)	Sample No.	Sample Depth (ft.)	Blows /6"	"N"	Recovery (ft.)	Sample Description	Field Analytical Readings	Well Details	Groundwater and Other Observations
0	S1	0-4			3.0	0.0'-2.0' GRAVEL, CINDERS, BRICK, and tan GRANULAR MATERIAL, FILL.			
						2.0'-4.0' Tan, sandy, silty CLAY.			
5	S2	4-8			1.6	4.0'-12.0' Medium gray/green to yellow/brown, mottled, silty CLAY.			HYDROCARBON ODOR OBSERVED AT 4.0' to 11.0'
	S3	8-12			4.0				
10									SATURATED WITH OILY SUBSTANCE AT 11.0' TO 20.0'
	S4	12-16			3.5	12.0'-13.0' Fine, sandy GRAVEL.			
						13.0'-14.0' Gray to yellow/brown, soft CLAY.			
15						14.0'-16.0' Medium gray/green, fine, clayey SAND.			
	S5	16-20			2.8	16.0'-17.0' Medium gray/brown, semi-firm SILT.			
						17.0'-20.0' Medium gray/brown, sandy CLAY.			
20									20' = BOTTOM OF BORING

Sample Types:
S=Split Spoon: 2"
R= Rock Core: _____
N = ASTM D1586

Backfill Well Key
Cement
Native Fill
Sand
Bentonite

Environmental PRODUCTS & SERVICES, INC.	Subsurface Log	Hole No.:23	Date Started: 06/07/96
		Sheet 1of 1	Date Finished: 06/07/96

Client: NYSDEC Gastown Sportsmen's Club	Method of Investigation: Direct push method, Geoprobe tooling, 2-inch diameter, 4-foot long soil probe.
Location: Tonawanda, N.Y.	
Project No.: B1113	Drilling Co.: Environmental Products & Services
Proj. Mgr: D. Ellsworth	Driller: T. Osier
Geologist: T. Burmeier	Drill Rig: Concord 9200
	Weather: 68 to 75 degrees F, cloudy and rainy

Depth (ft.)	Sample No.	Sample Depth (ft.)	Blows /6"	"N"	Recovery (ft.)	Sample Description	Field Analytical Readings	Well Details	Groundwater and Other Observations
0	S1	0-4			1.4	0.0'-4.0' Crushed GRAVEL, BRICK, and tan silty CLAY FILL.			
5	S2	4-8			3.2	4.0'-8.0' Light brown, silty CLAY. Grades to black or gray/green at 7.2'.			SATURATED WITH OILY SUBSTANCE AT 7.2' TO 24.0'
	S3	8-12			0.0				
10	S4	12-16			4.0	12.0'-15.5' Yellow/brown, soft, silty CLAY.			
15	S5	16-20			4.0	15.5'-20.0' Medium gray/brown, fine SAND. Becomes wet at 16.0'. Grades to silty SAND at 18.0'.			
20	S6	20 -24			4.0	20.0'-20.8' Gray/green, very soft, silty CLAY. 20.8'-21.2' Coarse SAND and rounded GRAVEL. 21.2'-24.0' Reddish brown, very soft CLAY.			24' = BOTTOM OF BORING

Sample Types:
S=Split Spoon: 2"
R= Rock Core:
N = ASTM D1586

Backfill Well Key
Cement
Native Fill
Sand
Bentonite

Environmental PRODUCTS & SERVICES, INC.	Subsurface Log	Hole No.:24	Date Started: 06/07/96
		Sheet 1of 1	Date Finished: 06/07/96

Client: NYSDEC
Gastown Sportsmen's Club
Location: Tonawanda, N.Y.

Method of Investigation: Direct push method, Geoprobe tooling, 2-inch diameter, 4-foot long soil probe.

Project No.: B1113
Proj. Mgr: D. Ellsworth
Geologist: T. Burmeier

Drilling Co.: Environmental Products & Services
Driller: T. Osier
Drill Rig: Concord 9200

Weather: 68 to 75 degrees F, cloudy and rainy

Depth (ft.)	Sample No.	Sample Depth (ft.)	Blows /6"	"N"	Recovery (ft.)	Sample Description	Field Analytical Readings	Well Details	Groundwater and Other Observations
0	S1	0-4			4.0	0.0'-2.0' Black CINDERS, GRAVEL, CLAY and SAND.	MICROTIP PID AFFECTED BY RAIN		
						2.0'-7.0' Light green to yellow/brown, mottled CLAY. Grades to medium brown with gravel at 4.0'. Grades to yellow/brown at 7.0'.			
5	S2	4-8			4.0				FAINT HYDROCARBON ODOR OBSERVED AT 3.5'
						7.0'-12.0' Yellow/brown and gray, semi-firm SILT. Increasing percent of fine sand at 8.0 -12.0'.			
	S3	8-12			3.0				
10									
	S4	12-16			3.0	12.0'-16.0' Gray and yellow/brown, firm to soft, fine SAND, trace coarse sand.			
15									
	S5	16-20			4.0	16.0'-20.0' Gray/brown to speckled, fine to medium SAND.			
20	S6	20 -24			1.0	20.0'-24.0' Fine to medium SAND.			
						24.0' Reddish brown CLAY.			24' = BOTTOM OF BORING

Sample Types:
S=Split Spoon: 2"
R= Rock Core:
N = ASTM D1586

Backfill Well Key
Cement
Native Fill
Sand
Bentonite

Environmental PRODUCTS & SERVICES, INC.	Subsurface Log	Hole No.:25	Date Started: 06/10/96
		Sheet 1of 1	Date Finished: 06/10/96

Client: NYSDEC
Gastown Sportsmen's Club
Location: Tonawanda, N.Y.

Method of Investigation: Direct push method, Geoprobe tooling, 2-inch diameter, 4-foot long soil probe.

Project No.: B1113
Proj. Mgr: D. Ellsworth
Geologist: T. Burmeier

Drilling Co.: Environmental Products & Services
Driller: T. Osier
Drill Rig: Concord 9200

Weather: 75 degrees F, overcast

Depth (ft.)	Sample No.	Sample Depth (ft.)	Blows /6"	"N"	Recovery (ft.)	Sample Description	Field Analytical Readings	Well Details	Groundwater and Other Observations
0	S1	0-4			3.0	0.0'-4.0' Tan, granular FILL.	MICROTIP PID		
5	S2	4-8			3.1	4.0'-5.5' Medium brown to black, granular FILL.	54.0 ppm		FAINT HYDROCARBON ODOR OBSERVED AT 4.0' to 23.2'
						5.5'-12.0' Gray/green, slightly mottled, firm to soft (at 8.0'), silty CLAY. Grades to light pink to yellow/brown, mottled.			
	S3	8-12			2.7		20.0 ppm		
10									
	S4	12-16			4.0	12.0'-15.2' Yellow/brown, very fine to fine SAND.			
15						15.2'-16.0' Gray/brown, silty, sandy CLAY.			
	S5	16-20			3.0	16.0'-18.9' Medium gray/brown, loose, wet, very fine to fine SAND.			
						18.9'-20.0' Fine SAND.			SATURATED WITH OILY SUBSTANCE AT 18.9' TO 23.2'
20	S6	20 -24			3.2	20.0'-23.0' Fine to Medium SAND.			
						23.0'-23.2' Rounded GRAVEL.			
						23.2'-24.0' Reddish brown CLAY on the tip of the sampler.			23.2' = BOTTOM OF BORING

Sample Types:
S=Split Spoon: 2"
R= Rock Core:
N = ASTM D1586

Backfill Well Key
Cement
Native Fill
Sand
Bentonite

Environmental PRODUCTS & SERVICES, INC.	Subsurface Log	Hole No.:26 Sheet 1of 1	Date Started: 06/10/96 Date Finished: 06/10/96

Client: NYSDEC
Gastown Sportsmen's Club
Location: Tonawanda, N.Y.

Method of Investigation: Direct push method, Geoprobe tooling, 2-inch diameter, 4-foot long soil probe.

Project No.: B1113
Proj. Mgr: D. Ellsworth
Geologist: T. Burmeier

Drilling Co.: Environmental Products & Services
Driller: T. Osier
Drill Rig: Concord 9200

Weather: 75 degrees F, overcast

Depth (ft.)	Sample No.	Sample Depth (ft.)	Blows /6"	"N"	Recovery (ft.)	Sample Description	Field Analytical Readings	Well Details	Groundwater and Other Observations
0	S1	0-4			3.1	0.0'-1.5' Medium brown TOP SOIL. 1.5'-4.5' Medium brown SILT and tan granular material.			NO HYDROCARBON ODOR AT 0.0' - 20.0'
5	S2	4-8			4.0	4.5'-8.0' Medium brown to yellow/brown SILT. Grades to sandy SILT at 7.0'.			
10	S3	8-12			4.0	8.0'-16.0' Medium gray/brown, silty CLAY, some plant debris and sandy interbeds with fossil fragments at 12.0'.			
	S4	12-16			4.0				
15	S5	16-20			4.0	16.0'-17.8' Dark gray/brown, very soft CLAY and SAND. 17.8'-19.5' Dark gray/brown SILT, numerous fossil fragments. 19.5'-19.7' GRAVEL. 19.7'-20.0' Reddish brown, soft CLAY.			
20									20.0' = BOTTOM OF BORING

Sample Types:
S=Split Spoon: 2"
R= Rock Core: _____
N = ASTM D1586

Backfill Well Key

1998 Boring Logs,
New York State Department of Environmental Conservation

NYSDEC - Region 9 - Division of Environmental Remediation
Stratigraphic Log (Overburden)

Project Name:	Former Gastown MGP Site	**Hole Designation:**	MW-1I
Site Number:	915171	**Date Completed:**	6/4/98
Location:	Tonawanda, New York	**Drilling Company:**	Maximum Technologies
Logged By:	Glenn M. May	**Drilling Method:**	4¼" Hollow Stem Augers
Total Depth:	26.0 feet	**Sampling Method:**	Split Spoon

Depth (ft bgs)	Stratigraphic Description & Remarks	Elevation (ft amsl)	Sample			
			NUMBER	COUNT	N VALUE	HNU
	Ground Surface	**575.85**				
0.0	0.0'-0.3': Brown topsoil with many rootlets and high clay content. Dry. Poor recovery.		1	6 8 6	14	0.0
	0.3'-2.0': Brown silty clay with large rock fragments, small pieces of coke and coal, some cinders. Silty clay has red and brown varves. Dry. FILL MATERIAL.	575.55		18		
2.0	2.0'-4.0': Yellow brown silty clay with large rock fragments and gray mottling. Dry. Poor recovery. NATIVE.	573.85	2	15 5 9 5	14	0.0
4.0	4.0'-4.7': Yellow brown silty clay with gray and red mottling, few black blebs. Dry to moist. NATIVE.		3	14 9	20	0.0
	4.7'-6.0': Yellow brown, fine grained sand with iron red and orange mottling, some black blebs. Few rootlets. Moist. NATIVE.	571.15		11 12		
6.0	6.0'-8.0': Sample same as above. Becomes saturated at 6.75' bgs. There are no black blebs within the saturated zone but iron red blebs are prevalent. This deposit grades into a gray, fine grained sand at 7.25' bgs with yellow brown mottling and red blebs. Saturated. NATIVE.		4	8 7 5 4	12	0.0
8.0	8.0'-10.0': Interbedded zones of gray, fine grained sand (seams 0.2' to 0.5' thick) and thin seams (0.1' to 0.2') of gray silty clay. Orange mottling throughout, which appears to be staining. Black blebs observed within the silty clay seams. Saturated. NATIVE.		5	4 5 5 7	10	0.6
10.0	10.0'-12.0': Sample same as above with fewer silty clay seams - only two about 0.02' thick were observed. Orange mottling throughout sample. Saturated. NATIVE.		6	6 7 7 5	14	1.2

Notes: Measuring Point Elevations May Change: Refer to Current Elevation Table

Grain Size ◯ Water Found ▽ Static Level ▼

NYSDEC - Region 9 - Division of Environmental Remediation
Stratigraphic Log (Overburden)

Project Name:	Former Gastown MGP Site	**Hole Designation:**	MW-1I
Site Number:	915171	**Date Completed:**	6/4/98
Location:	Tonawanda, New York	**Drilling Company:**	Maximum Technologies
Logged By:	Glenn M. May	**Drilling Method:**	4¼" Hollow Stem Augers
Total Depth:	26.0 feet	**Sampling Method:**	Split Spoon

Depth (ft bgs)	Stratigraphic Description & Remarks	Elevation (ft amsl)	Sample			
			NUMBER	COUNT	N VALUE	HNU
	Ground Surface	**575.85**				
12.0	12.0'-14.0': Medium gray, very fine grained sand with no mottling. Only one silty clay seam (0.02' thick) observed. Saturated. NATIVE.		7	1 2 2 3	4	0.0
14.0	14.0'-16.0': No recovery.		8	7 5 4 6	9	NA
16.0	16.0'-18.0': Medium gray, very fine grained sand with no mottling or silty clay seams. Some sand grains near bottom of sample are dark gray. Saturated. NATIVE.		9	3 4 5 8	9	0.0
18.0	18.0'-20.0': Interbedded zones of medium to dark gray, fine grained sand and brownish gray clay. Clay seams are 0.2' to 0.25' thick. Saturated. NATIVE.		10	5 1 2 3	3	0.0
20.0	20.0'-21.1': Sample same as above with large, round, rock fragments approximately 0.1' in diameter. Saturated. NATIVE. 21.1'-22.0': Gravel with a few shells. Saturated. NATIVE.	Sample sent to lab 554.75	11	1 1 13 8	14	16.2
22.0	22.0'-24.0': Reddish brown silty clay with varves, very plastic. Few pebbles observed at 22.6' bgs. Saturated. NATIVE. Augered to 26.0' bgs without sampling. BOH=26.0' bgs.	553.85; Sample sent to lab	12	1 1 1 1	2	45.8

Notes: Measuring Point Elevations May Change: Refer to Current Elevation Table

Grain Size ◯ Water Found ▽ Static Level ▼

NYSDEC - Region 9 - Division of Environmental Remediation
Stratigraphic Log (Overburden)

Project Name:	Former Gastown MGP Site	**Hole Designation:**	MW-2I
Site Number:	915171	**Date Completed:**	6/4/98
Location:	Tonawanda, New York	**Drilling Company:**	Maximum Technologies
Logged By:	Glenn M. May	**Drilling Method:**	4¼" Hollow Stem Augers
Total Depth:	26.0 feet	**Sampling Method:**	Split Spoon

Depth (ft bgs)	Stratigraphic Description & Remarks	Elevation (ft amsl)	Sample			
			NUMBER	COUNT	N VALUE	HNU
	Ground Surface	**575.47**				
0.0	0.0'-2.0': Crushed stone and asphalt from driveway. Large rock fragment in bottom of spoon. Dry. Poor recovery. FILL MATERIAL.	575.47	1	22 10 8 7	18	2.5
2.0	2.0'-4.0': No recovery.		2	4 3 6 7	9	NA
4.0	4.0'-4.4': Yellow brown silty clay with gray and orange mottling. Rootlets. Dry to moist. NATIVE.		3	6 5 6 6	11	12.2
	4.4'-6.0': Yellow brown, fine grained sand with gray and orange mottling. Rootlets. Saturated. NATIVE.	571.07				
6.0	6.0'-8.0': Gray, fine grained sand with extensive orange mottling. Few black blebs and some iron red staining. One 0.2' thick clay seam observed at 7.6' bgs. Saturated. NATIVE.		4	4 4 3 3	7	28.8
8.0	8.0'-10.0': Sample same as above with much less staining. One 0.2' thick clay seam observed in middle of sample. Orange mottling and black blebs in this seam. Sand below clay is brown with dark gray or black grains. Saturated. NATIVE.		5	2 2 9 9	11	34.4
10.0	10.0'-12.0': Sample same as above (below clay seam). Strong petroleum odor. Saturated. NATIVE.	Sample sent to lab	6	5 7 6 6	13	27.3

Notes: Measuring Point Elevations May Change: Refer to Current Elevation Table

Grain Size ◯ Water Found ▽ Static Level ▼

NYSDEC - Region 9 - Division of Environmental Remediation
Stratigraphic Log (Overburden)

Project Name:	Former Gastown MGP Site	**Hole Designation:**	MW-2I
Site Number:	915171	**Date Completed:**	6/4/98
Location:	Tonawanda, New York	**Drilling Company:**	Maximum Technologies
Logged By:	Glenn M. May	**Drilling Method:**	4¼" Hollow Stem Augers
Total Depth:	26.0 feet	**Sampling Method:**	Split Spoon

Depth (ft bgs)	Stratigraphic Description & Remarks	Elevation (ft amsl)	Sample			
			NUMBER	COUNT	N VALUE	HNU
	Ground Surface	**575.47**				
12.0	12.0'-13.3': Yellow brown, fine grained sand. A clay seam 0.1' thick at 13.3' bgs. Extensive orange staining observed immediately above this clay seam. Saturated. NATIVE. 13.3'-14.0': Medium to dark gray sand with black grains. Few small clay seams. Saturated. NATIVE.		7	2 3 5 5	8	67.4
14.0	14.0'-16.0': Sample same as above (below clay seam). Odor observed but no sheen. Saturated. NATIVE.		8	5 3 3 4	6	48.4
16.0	16.0'-18.0': Interbedded zones of dark gray sand and dark gray clay. NAPL observed at 16.4' bgs and throughout remainder of sample. Saturated. NATIVE.	Sample sent to lab	9	4 4 7 7	11	3531
18.0	18.0'-20.0': Sample same as above with the sand seams containing NAPL. Both sand and clay seams are 0.1' to 0.2' thick. Saturated. NATIVE.		10	1 2 1 3	3	438
20.0	20.0'-21.0': Sample same as above with NAPL. Saturated. NATIVE. 21.0'-22.0': Reddish brown clay containing NAPL. A 0.1' thick gravel seam at 21.75' bgs. Trace NAPL below this seam. Saturated. NATIVE.	554.47	11	wor wor 9 2	9	346
22.0	22.0'-24.0': Reddish brown to brown, silty clay with varves below 23.0' bgs, very plastic. No NAPL. Saturated. NATIVE. Augered to 26.0' bgs without sampling. BOH=26.0' bgs.		12	wor wor wor wor	0	121

Notes: Measuring Point Elevations May Change: Refer to Current Elevation Table

Grain Size ◯ Water Found ▽ Static Level ▼

NYSDEC - Region 9 - Division of Environmental Remediation
Stratigraphic Log (Overburden)

Project Name:	Former Gastown MGP Site	**Hole Designation:**	PW-1
Site Number:	915171	**Date Completed:**	6/3/98
Location:	Tonawanda, New York	**Drilling Company:**	Maximum Technologies
Logged By:	Glenn M. May	**Drilling Method:**	4¼" Hollow Stem Augers
Total Depth:	30.0 feet	**Sampling Method:**	Split Spoon

Depth (ft bgs)	Stratigraphic Description & Remarks	Elevation (ft amsl)	Sample			
			NUMBER	COUNT	N VALUE	HNU
	Ground Surface	**575.50**				
0.0	0.0'-2.0': Mottled clay and brown, fine grained sand with some rootlets and few small pebbles. Pieces of coal or coke near bottom of sample. Moist. FILL MATERIAL.	575.50	1	1 3 6 13	9	1.0
2.0	2.0'-4.0': No recovery.		2	5 4 4 5	8	NA
4.0	4.0'-4.75': Yellow brown silty clay with mottling. Moist. NATIVE.		3	8 6 7 7	13	9.7
	4.75'-6.0': Yellow brown, very fine grained sand with mottling. Moist. NATIVE.	570.75				
6.0	6.0'-8.0': Yellow brown, very fine grained sand with red, gray and brown mottling. Trace silt and clay. Few rootlets. Moist. NATIVE.		4	4 4 3 3	7	10.2
8.0	8.0'-8.25': Sample same as above.		5	3 3	7	20.7
	8.25'-10.0': Interbedded zones of dark gray sand and thin (0.1') seams of gray clay. Moist. NATIVE.			4 8		
10.0	10.0'-12.0': Sample same as above with fine to medium grained sand. A thin (0.02') black seam near bottom of sample. Moist to saturated. NATIVE.	Sample sent to lab	6	5 4 5 4	9	23.7
12.0	12.0'-14.0': Dark gray, fine grained sand with yellow brown mottling to 13.0' bgs. Few pebbles observed at this depth. Saturated. NATIVE.		7	3 6 4 8	10	14.4

Notes: Measuring Point Elevations May Change: Refer to Current Elevation Table

Grain Size ◯ Water Found ▽ Static Level ▼

NYSDEC - Region 9 - Division of Environmental Remediation
Stratigraphic Log (Overburden)

Project Name:	Former Gastown MGP Site	**Hole Designation:**	PW-1
Site Number:	915171	**Date Completed:**	6/3/98
Location:	Tonawanda, New York	**Drilling Company:**	Maximum Technologies
Logged By:	Glenn M. May	**Drilling Method:**	4¼" Hollow Stem Augers
Total Depth:	30.0 feet	**Sampling Method:**	Split Spoon

Depth (ft bgs)	Stratigraphic Description & Remarks	Elevation (ft amsl)	Sample			
			NUMBER	COUNT	N VALUE	HNU
	Ground Surface	**575.50**				
14.0	14.0'-16.0': Sample same as above without mottling.		8	7 10 9 9	19	7.3
16.0	16.0'-18.0': Sample same as above. NAPL observed at 16.9' bgs and throughout remainder of sample. The NAPL is black with a petroleum odor. Saturated. NATIVE.		9	6 4 3 6	7	325
18.0	18.0'-20.0': Interbedded zones of dark gray, fine grained sand and dark gray clay. Sand seams contain thin layers (0.04') of NAPL perched on the clay seams. Saturated. NATIVE.	Sample sent to lab	10	wor 2 1 1	3	680
20.0	20.0'-22.0': Sample same as above with NAPL observed in the sand seams. Gravel of various sizes at bottom of sample. One clam shell observed in gravel. Saturated. NATIVE.		11	wor wor 8 16	8	672
22.0	22.0'-23.0': Dark gray, course grained sand and gravel. Sheen observed throughout sample. Few shells. No NAPL. Saturated. NATIVE.	553.50	12	4 2 2 2	4	152
	23.0'-24.0': Reddish brown silty clay with traces of gravel. No NAPL. Saturated. NATIVE.	552.50				
24.0	24.0'-26.0': Reddish brown silty clay with gray varves, very plastic. No gravel, sheen or NAPL observed. Saturated. NATIVE.		13	2 4 1 1	5	64.9

Notes: Measuring Point Elevations May Change: Refer to Current Elevation Table

Grain Size ◯ Water Found ▽ Static Level ▼

NYSDEC - Region 9 - Division of Environmental Remediation
Stratigraphic Log (Overburden)

Project Name:	Former Gastown MGP Site	**Hole Designation:**	PW-1
Site Number:	915171	**Date Completed:**	6/3/98
Location:	Tonawanda, New York	**Drilling Company:**	Maximum Technologies
Logged By:	Glenn M. May	**Drilling Method:**	4¼" Hollow Stem Augers
Total Depth:	30.0 feet	**Sampling Method:**	Split Spoon

Depth (ft bgs)	Stratigraphic Description & Remarks	Elevation (ft amsl)	Sample			
			NUMBER	COUNT	N VALUE	HNU
	Ground Surface	**575.50**				
26.0	26.0'-28.0': Sample same as above.		14	1 1 1 1	2	73.8
28.0	28.0'-30.0': Sample same as above.		15	1 1 1 1	2	80.4
	BOH=30' bgs.					

Notes: Measuring Point Elevations May Change: Refer to Current Elevation Table

Grain Size ◯ Water Found ▽ Static Level ▼

NYSDEC - Region 9 - Division of Environmental Remediation
Stratigraphic Log (Overburden)

Project Name:	Former Gastown MGP Site	**Hole Designation:**	MW-2S
Site Number:	915171	**Date Completed:**	6/5/98
Location:	Tonawanda, New York	**Drilling Company:**	Maximum Technologies
Logged By:	Glenn M. May	**Drilling Method:**	4¼" Hollow Stem Augers
Total Depth:	9.0 feet	**Sampling Method:**	N/A

Depth (ft bgs)	Stratigraphic Description & Remarks	Elevation (ft amsl)	Sample			
			NUMBER	COUNT	N VALUE	HNU
	Ground Surface	**575.32**				
	Boring augered to depth - not logged. BOH=9' bgs.					

Notes: Measuring Point Elevations May Change: Refer to Current Elevation Table

Grain Size ◯ Water Found ▽ Static Level ▼

NYSDEC - Region 9 - Division of Environmental Remediation
Stratigraphic Log (Overburden)

Project Name:	Former Gastown MGP Site	**Hole Designation:**	MW-3S
Site Number:	915171	**Date Completed:**	6/5/98
Location:	Tonawanda, New York	**Drilling Company:**	Maximum Technologies
Logged By:	Glenn M. May	**Drilling Method:**	4¼" Hollow Stem Augers
Total Depth:	8.5 feet	**Sampling Method:**	N/A

Depth (ft bgs)	Stratigraphic Description & Remarks	Elevation (ft amsl)	Sample			
			NUMBER	COUNT	N VALUE	HNU
	Ground Surface	**574.91**				
	Boring augered to depth - not logged. BOH=8.5' bgs.					

Notes: Measuring Point Elevations May Change: Refer to Current Elevation Table

Grain Size ◯ Water Found ▽ Static Level ▼

New York State Department of Environmental Conservation
270 Michigan Avenue, Buffalo, New York, 14203-2999

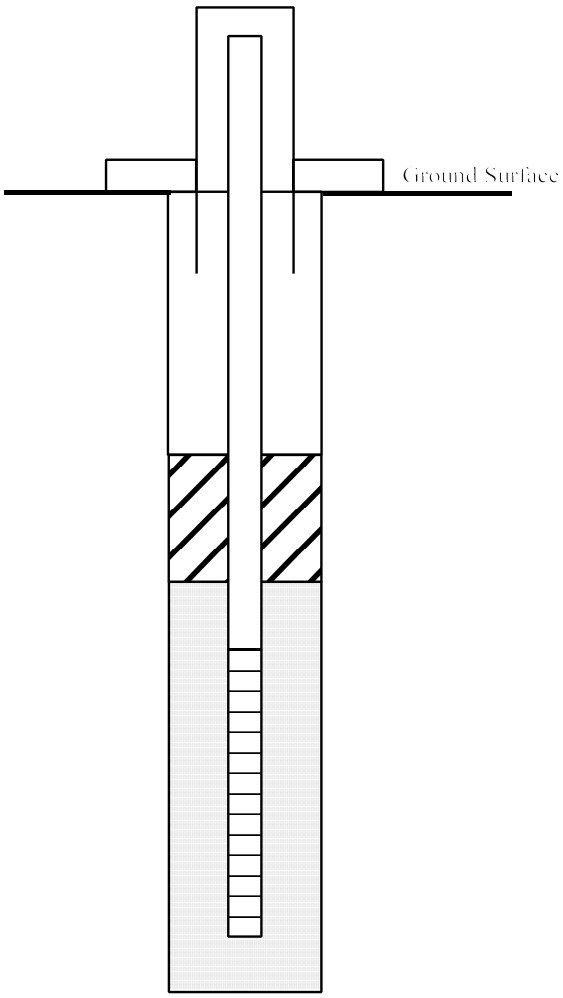
MONITORING WELL LOG

Project Name:	Former Gastown MGP Site	**Hole Designation:**	MW-1I
Site Number:	915171	**Date Completed:**	6/4/98
Location:	Tonawanda, New York	**Drilling Company:**	Maxim Technologies
Screen Type:	PVC	**Casing Type:**	Not Applicable
Screen Diameter:	2 inch	**Casing Diameter:**	Not Applicable
Screen Length:	20 feet	**Total Depth:**	26.0 feet

Top of Riser Elevation: 575.43 ft amsl

Ground Surface Elevation: 575.85 ft amsl

Top of Grout: 0.0 ft



Top of Seal: 4.0 ft

Top of Filter Pack: 5.0 ft

Top of Screen: 6.0 ft

Bottom of Screen: 26.0 ft

Bottom of Filter Pack: 26.0 ft

New York State Department of Environmental Conservation
270 Michigan Avenue, Buffalo, New York, 14203-2999

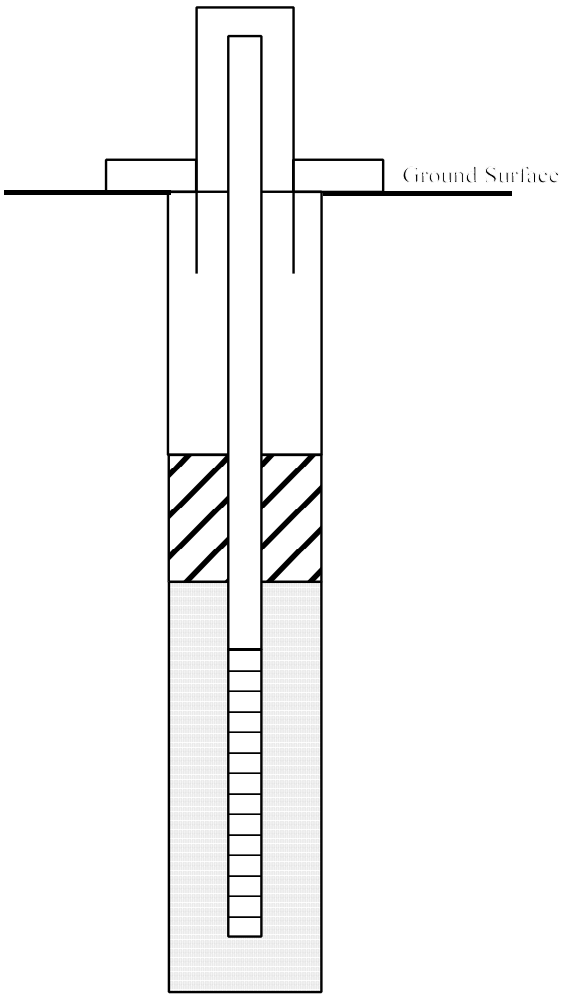
MONITORING WELL LOG

Project Name:	Former Gastown MGP Site	**Hole Designation:**	MW-2I
Site Number:	915171	**Date Completed:**	6/4/98
Location:	Tonawanda, New York	**Drilling Company:**	Maxim Technologies
Screen Type:	PVC	**Casing Type:**	Not Applicable
Screen Diameter:	2 inch	**Casing Diameter:**	Not Applicable
Screen Length:	20 feet	**Total Depth:**	26.0 feet

Top of Riser Elevation: 575.08 ft amsl

Ground Surface Elevation: 575.47 ft amsl

Top of Grout: 0.0 ft



Top of Seal: 4.0 ft

Top of Filter Pack: 5.0 ft

Top of Screen: 6.0 ft

Bottom of Screen: 26.0 ft

Bottom of Filter Pack: 26.0 ft

New York State Department of Environmental Conservation
270 Michigan Avenue, Buffalo, New York, 14203-2999

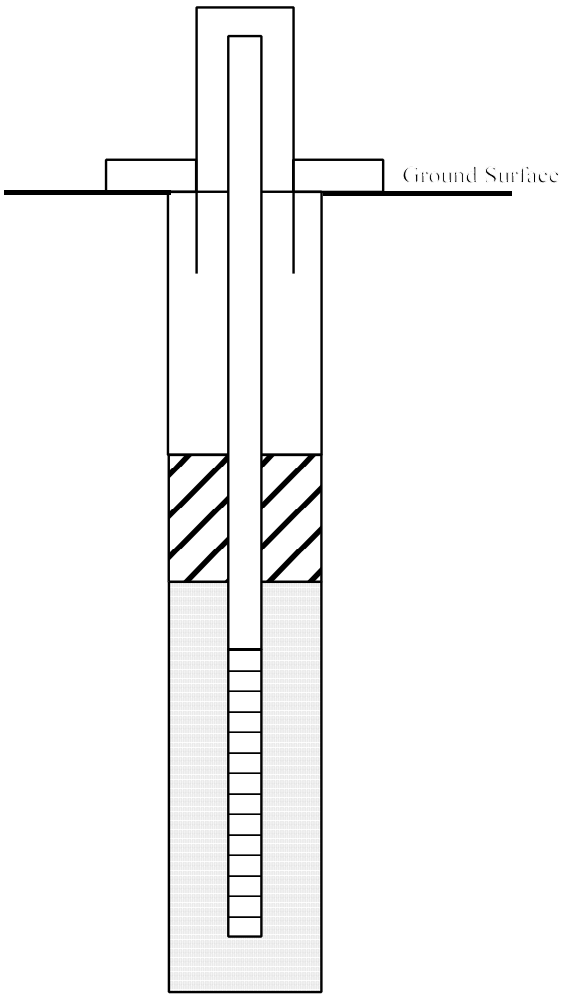
MONITORING WELL LOG

Project Name:	Former Gastown MGP Site	**Hole Designation:**	PW-1
Site Number:	915171	**Date Completed:**	6/3/98
Location:	Tonawanda, New York	**Drilling Company:**	Maxim Technologies
Screen Type:	PVC	**Casing Type:**	Not Applicable
Screen Diameter:	2 inch	**Casing Diameter:**	Not Applicable
Screen Length:	15 feet	**Total Depth:**	30.0 feet

Top of Riser Elevation: 574.58 ft amsl

Ground Surface Elevation: 575.50 ft amsl

Top of Grout: 0.0 ft



Top of Seal: 7.0 ft

Top of Filter Pack: 8.0 ft

Top of Screen: 10.0 ft

Bottom of Screen: 25.0 ft

Bottom of Filter Pack: 25.5 ft

New York State Department of Environmental Conservation
270 Michigan Avenue, Buffalo, New York, 14203-2999

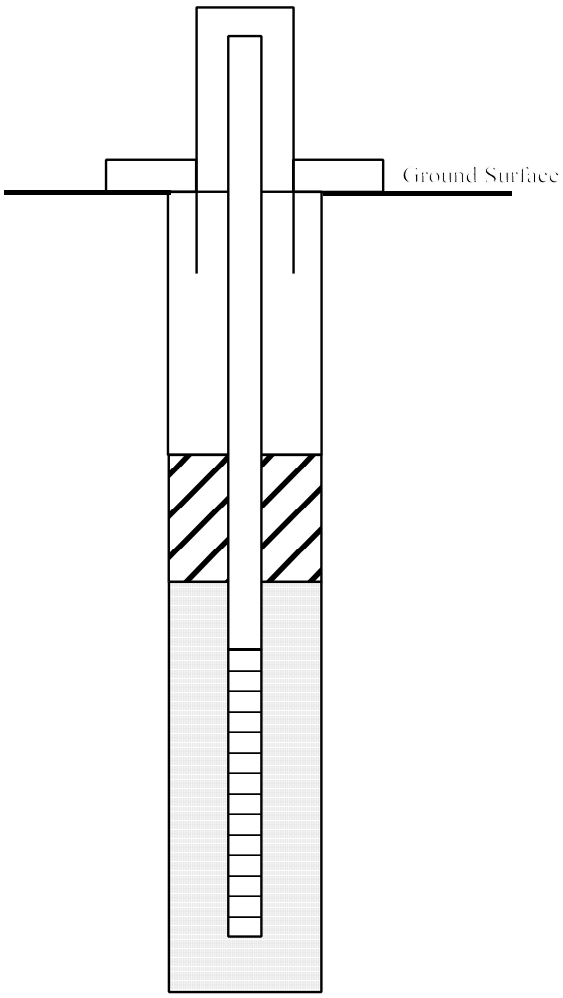
MONITORING WELL LOG

Project Name:	Former Gastown MGP Site	**Hole Designation:**	MW-2S
Site Number:	915171	**Date Completed:**	6/5/98
Location:	Tonawanda, New York	**Drilling Company:**	Maxim Technologies
Screen Type:	PVC	**Casing Type:**	Not Applicable
Screen Diameter:	2 inch	**Casing Diameter:**	Not Applicable
Screen Length:	5 feet	**Total Depth:**	9.0 feet

Top of Riser Elevation: 574.77 ft amsl

Ground Surface Elevation: 575.32 ft amsl

Top of Grout: 0.0 ft



Top of Seal: 2.5 ft

Top of Filter Pack: 3.5 ft

Top of Screen: 4.0 ft

Bottom of Screen: 9.0 ft

Bottom of Filter Pack: 9.0 ft

New York State Department of Environmental Conservation
270 Michigan Avenue, Buffalo, New York, 14203-2999

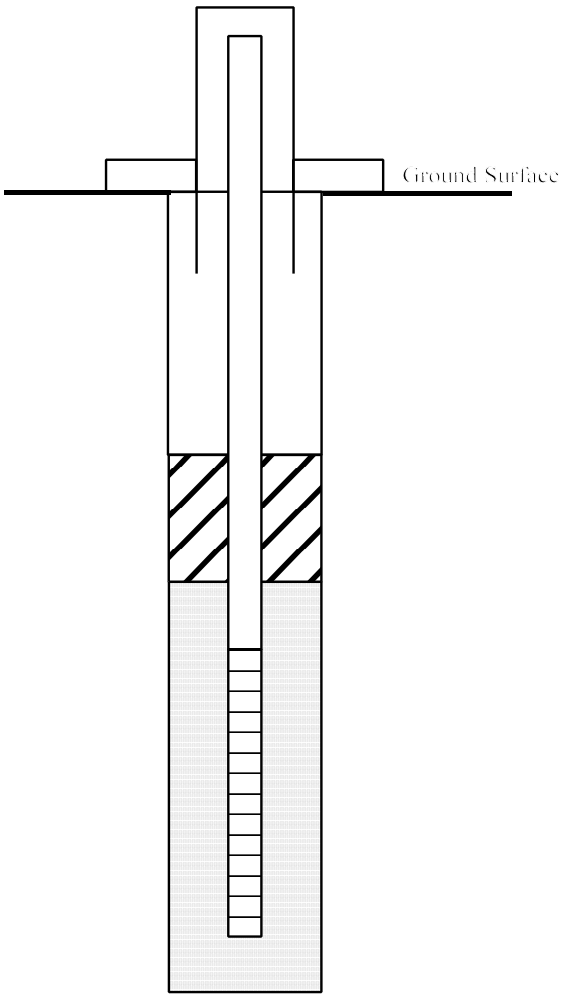
MONITORING WELL LOG

Project Name:	Former Gastown MGP Site	**Hole Designation:**	MW-3S
Site Number:	915171	**Date Completed:**	6/5/98
Location:	Tonawanda, New York	**Drilling Company:**	Maxim Technologies
Screen Type:	PVC	**Casing Type:**	Not Applicable
Screen Diameter:	2 inch	**Casing Diameter:**	Not Applicable
Screen Length:	5 feet	**Total Depth:**	8.5 feet

Top of Riser Elevation: 574.55 ft amsl

Ground Surface Elevation: 574.91 ft amsl

Top of Grout: 0.0 ft



Top of Seal: 2.0 ft

Top of Filter Pack: 3.0 ft

Top of Screen: 3.5 ft

Bottom of Screen: 8.5 ft

Bottom of Filter Pack: 8.5 ft

1999 Boring Logs,
New York State Department of Environmental Conservation

NYSDEC - Region 9 - Division of Environmental Remediation
Stratigraphic Log (Overburden)

Project Name:	Former Gastown MGP Site	**Hole Designation:**	SB-27
Site Number:	915171	**Date Completed:**	12/7/99
Location:	Tonawanda, New York	**Drilling Company:**	Advanced Cleanup Tech.
Logged By:	Glenn M. May	**Drilling Method:**	Direct Push
Total Depth:	28.0 feet	**Sampling Method:**	Macro Core

Depth (ft bgs)	Stratigraphic Description & Remarks	Elevation (ft amsl)	Sample			
			NUMBER	COUNT	N VALUE	HNU
	Ground Surface	**575.27**				
0.0	0.0'-1.0': Crushed stone from parking lot.	575.27	1			0.0
	1.0'-4.0': Fine grained sand with some silt, coal, brick and rock fragments. Moist. FILL MATERIAL.					
4.0	4.0'-4.4': Sample same as above.		2			0.0
	4.4'-8.0': Gray silty clay with orange mottling. Few rootlets near top of sample. Few thin, saturated sand seams. Silty clay is cohesive and slightly plastic. Moist. NATIVE.	570.87				
8.0	8.0'-11.3': Sample same as above. A gravel seam 0.1' thick at 8.8' bgs. Saturated. NATIVE.		3			0.0
	11.3'-12.0': Gray, fine grained sand, no pebbles. Saturated. NATIVE.	563.97				
12.0	12.0'-16.0': Gray brown, fine to medium grained sand grading to dark gray, fine to medium grained sand. Sample contains a few orange mottled, silty clay seams 0.2' to 0.3' thick. Saturated. NATIVE.		4			0.0
16.0	16.0'-20.0': Sample same as above with orange mottled silty clay seams 0.4' thick. Saturated. NATIVE.		5			0.0
20.0	20.0'-24.0': Sample same as above with no silty clay seams. Saturated. NATIVE.	Sample sent to lab	6			0.0
24.0	24.0'-28.0': No recovery. Reddish brown silty clay observed on outside of sampler. NATIVE.		7			0.0
	BOH=28.0' bgs.					

Notes: Measuring Point Elevations May Change: Refer to Current Elevation Table

Grain Size ◯ Water Found ▽ Static Level ▼

NYSDEC - Region 9 - Division of Environmental Remediation
Stratigraphic Log (Overburden)

Project Name:	Former Gastown MGP Site	**Hole Designation:**	SB-28
Site Number:	915171	**Date Completed:**	12/7/99
Location:	Tonawanda, New York	**Drilling Company:**	Advanced Cleanup Tech.
Logged By:	Glenn M. May	**Drilling Method:**	Direct Push
Total Depth:	24.0 feet	**Sampling Method:**	Macro Core

Depth (ft bgs)	Stratigraphic Description & Remarks	Elevation (ft amsl)	Sample			
			NUMBER	COUNT	N VALUE	HNU
	Ground Surface	**577.93**				
0.0	0.0'-0.6': Brown topsoil with rootlets. Moist.		1			0.0
	0.6'-0.9': Reworked brown silty clay with many small pebbles. Moist. FILL MATERIAL.	577.33				
	0.9'-1.6': Brown, fine to medium grained sand with few rock and coke fragments, and some white ash. Dry to moist. FILL MATERIAL.					
	1.6'-4.0': Reddish brown silty clay with few pieces of coal, some ash, and many rock fragments. Dry to moist. FILL MATERIAL.					
4.0	4.0'-4.8': Sample same as above.		2			0.0
	4.8'-5.0': Slag, coal and coke mixed with brown silty clay. Moist. FILL MATERIAL.					
	5.0'-7.2': Gray silty clay mottled brown at top and orange throughout remainder of zone. Dry to moist. NATIVE.	572.93				
	7.2'-8.0': Yellow brown, fine grained sand with silt and orange mottling. Moist. NATIVE.	570.73				
8.0	8.0'-12.0': Interbedded zones of gray, fine grained sand and gray silty clay with extensive orange and yellow brown mottling. Clay seams are moist, while sand seams are saturated. NATIVE.		3			0.0
12.0	12.0'-15.0': Sample same as above.		4			0.1
	15.0'-16.0': Medium gray, fine to medium grained sand. Saturated. NATIVE.					

Notes: Measuring Point Elevations May Change: Refer to Current Elevation Table

Grain Size ◯ Water Found ▽ Static Level ▼

NYSDEC - Region 9 - Division of Environmental Remediation
Stratigraphic Log (Overburden)

Project Name:	Former Gastown MGP Site	**Hole Designation:**	SB-28
Site Number:	915171	**Date Completed:**	12/7/99
Location:	Tonawanda, New York	**Drilling Company:**	Advanced Cleanup Tech.
Logged By:	Glenn M. May	**Drilling Method:**	Direct Push
Total Depth:	24.0 feet	**Sampling Method:**	Macro Core

Depth (ft bgs)	Stratigraphic Description & Remarks	Elevation (ft amsl)	Sample			
			NUMBER	COUNT	N VALUE	HNU
	Ground Surface	**577.93**				
16.0	16.0'-20.0': Interbedded zones of medium gray, fine to medium grained sand and silty clay. Silty clay seams are only 0.05' thick. Saturated. NATIVE.		5			0.0
20.0	20.0'-23.6': Sample same as above.	Sample sent to lab	6			0.0
	23.6'-23.9': Gravel of various sizes. NAPL odor detected but no sheen or NAPL observed. NATIVE.	554.43; Sample sent to lab				13.8
	23.9'-24.0': Reddish brown silty clay. Saturated. NATIVE.	554.03				0.0
	BOH=24.0' bgs.					

Notes: Measuring Point Elevations May Change: Refer to Current Elevation Table

Grain Size ◯ Water Found ▽ Static Level ▼

NYSDEC - Region 9 - Division of Environmental Remediation
Stratigraphic Log (Overburden)

Project Name:	Former Gastown MGP Site	**Hole Designation:**	SB-29
Site Number:	915171	**Date Completed:**	12/8/99
Location:	Tonawanda, New York	**Drilling Company:**	Advanced Cleanup Tech.
Logged By:	Glenn M. May	**Drilling Method:**	Direct Push
Total Depth:	24.0 feet	**Sampling Method:**	Macro Core

Depth (ft bgs)	Stratigraphic Description & Remarks	Elevation (ft amsl)	Sample			
			NUMBER	COUNT	N VALUE	HNU
	Ground Surface	**575.20**				
0.0	0.0'-0.2': Asphalt.	575.20	1			0.0
	0.2'-2.0': Reworked, yellow brown and reddish brown silty clay with rocks, brick, black ash, and orange and black mottling. Dry. FILL MATERIAL.					
	2.0'-4.0': Gray silty clay with orange and black mottling and few pebbles. Cohesive and dense. Dry. NATIVE.	573.20				
4.0	4.0'-5.0': Gray silty clay with orange, black and white mottling. Cohesive, dense and slightly plastic. Trace NAPL. Dry to moist. NATIVE.		2			18.0
	5.0'-8.0': Yellow brown, very fine grained sand with silt, some clay, and orange and gray mottling. NAPL observed. Dry. NATIVE.	570.20; Sample sent to lab				
8.0	8.0'-12.0': Interbedded zones of yellow brown, fine grained sand and gray silty clay. Sand seams become gray and fine to medium grained with depth. Sheen observed throughout sample but no NAPL observed. NATIVE.		3			4.3
12.0	12.0'-16.0': Sample same as above. No NAPL or sheen observed in sand but a sheen was observed in a 0.3' thick silty clay seam at bottom of sample. Saturated. NATIVE.		4			0.0
16.0	16.0'-19.8': Gray, medium grained sand. Sheen and small pockets of NAPL observed throughout sample. The bottom 0.3' of sample contains NAPL. Saturated. NATIVE.	Bottom 0.3' sent to lab	5			5.3
	19.8'-20.0': Gravel mixed with gray sand. Saturated. NATIVE.	555.40				

Notes: Measuring Point Elevations May Change: Refer to Current Elevation Table

Grain Size ◯ Water Found ▽ Static Level ▼

NYSDEC - Region 9 - Division of Environmental Remediation
Stratigraphic Log (Overburden)

Project Name:	Former Gastown MGP Site	**Hole Designation:**	SB-29
Site Number:	915171	**Date Completed:**	12/8/99
Location:	Tonawanda, New York	**Drilling Company:**	Advanced Cleanup Tech.
Logged By:	Glenn M. May	**Drilling Method:**	Direct Push
Total Depth:	24.0 feet	**Sampling Method:**	Macro Core

Depth (ft bgs)	Stratigraphic Description & Remarks	Elevation (ft amsl)	Sample			
			NUMBER	COUNT	N VALUE	HNU
	Ground Surface	**575.20**				
20.0	20.0'-24.0': Sample appears to be fall-in. Large stones in shoe suggestive of gravel zone. Reddish brown silty clay observed on outside of sampler. NATIVE. BOH=24.0' bgs.		6			NM

Notes: Measuring Point Elevations May Change: Refer to Current Elevation Table

Grain Size ◯ Water Found ▽ Static Level ▼

NYSDEC - Region 9 - Division of Environmental Remediation
Stratigraphic Log (Overburden)

Project Name:	Former Gastown MGP Site	**Hole Designation:**	SB-30
Site Number:	915171	**Date Completed:**	12/6/99
Location:	Tonawanda, New York	**Drilling Company:**	Advanced Cleanup Tech.
Logged By:	Glenn M. May	**Drilling Method:**	Direct Push
Total Depth:	32.0 feet	**Sampling Method:**	Macro Core

Depth (ft bgs)	Stratigraphic Description & Remarks	Elevation (ft amsl)	Sample			
			NUMBER	COUNT	N VALUE	HNU
	Ground Surface	**576.13**				
0.0	0.0'-0.6': Crushed stone from parking lot.	576.13	1			0.0
	0.6'-1.8': Black ash containing coal and slag. Moist. FILL MATERIAL.					
	1.8'-4.0': Light brown silty clay with black mottling, small pebbles and a few pieces of coal. Wood (railroad tie?) at end of sample. Dry to moist. FILL MATERIAL					
4.0	4.0'-4.7': Sample same as above (1.8'-4.0' bgs).		2			0.0
	4.7'-5.0': Ash containing large pieces of coal. Moist. FILL MATERIAL.					
	5.0'-6.0': Gray clay with orange and black mottling and coal pieces near top of sample. Moist. FILL MATERIAL.					
	6.0'-6.5': Wood.					
	6.5'-8.0': Gray clayey silt with orange mottling. Layered. Moist. NATIVE.	569.63				
8.0	8.0'-11.5': Sample same as above with some zones more clayey than others. Moist. NATIVE.		3			0.0
	11.5'-12.0': Very fine grained sand with orange mottling. Dry. NATIVE.	564.63				
12.0	12.0'-16.0': Interbedded zones of gray, fine grained sand and gray clay. Clay seams are moist; sand seams are saturated. NATIVE.		4			0.0
16.0	16.0'-20.0': Sample appears to be fall-in. Poor recovery.		5			0.0

Notes: Measuring Point Elevations May Change: Refer to Current Elevation Table

Grain Size ◯ Water Found ▽ Static Level ▼

NYSDEC - Region 9 - Division of Environmental Remediation
Stratigraphic Log (Overburden)

Project Name:	Former Gastown MGP Site	**Hole Designation:**	SB-30
Site Number:	915171	**Date Completed:**	12/6/99
Location:	Tonawanda, New York	**Drilling Company:**	Advanced Cleanup Tech.
Logged By:	Glenn M. May	**Drilling Method:**	Direct Push
Total Depth:	32.0 feet	**Sampling Method:**	Macro Core

Depth (ft bgs)	Stratigraphic Description & Remarks	Elevation (ft amsl)	Sample			
			NUMBER	COUNT	N VALUE	HNU
	Ground Surface	**576.13**				
20.0	20.0'-24.0': Gray clay. Saturated. Poor recovery. NATIVE.	Sample sent to lab	6			0.0
24.0	24.0'-28.0': Brownish gray to gray clay. Bottom of sample is reddish brown to gray clay with rounded rock fragments. Saturated. Poor recovery. NATIVE.		7			0.0
28.0	28.0'-32.0': Reddish brown silty clay with many small rounded pebbles and many larger, rounded to subrounded rock fragments. Very dense. Dry. NATIVE. BOH=32.0' bgs.		8			NM

Notes: Measuring Point Elevations May Change: Refer to Current Elevation Table

Grain Size ◯ Water Found ▽ Static Level ▼

NYSDEC - Region 9 - Division of Environmental Remediation
Stratigraphic Log (Overburden)

Project Name:	Former Gastown MGP Site	**Hole Designation:**	SB-31
Site Number:	915171	**Date Completed:**	12/6/99
Location:	Tonawanda, New York	**Drilling Company:**	Advanced Cleanup Tech.
Logged By:	Glenn M. May	**Drilling Method:**	Direct Push
Total Depth:	26.0 feet	**Sampling Method:**	Macro Core

Depth (ft bgs)	Stratigraphic Description & Remarks	Elevation (ft amsl)	Sample			
			NUMBER	COUNT	N VALUE	HNU
	Ground Surface	**576.21**				
0.0	0.0'-0.8': Crushed stone from parking lot.	576.21	1			0.0
	0.8'-2.0': Reworked yellow brown, fine grained sand with some silt and clay, and many large, subrounded pebbles near bottom of sample. Dry. FILL MATERIAL.					
	2.0'-4.0': Yellow brown clayey silt with rusty brown and black mottling, some rootlets and a few pieces of coal (carry down?). Moist. NATIVE?	574.21				
4.0	4.0'-6.4': Yellow brown clayey silt with rusty brown, brown and black mottling near top of sample. Silty clay becomes more gray with depth and contains orange mottling. Moist. NATIVE.		2			0.0
	6.4'-8.0': Gray, fine grained sand with silt, clay and orange mottling. Moist. NATIVE.	569.81				
8.0	8.0'-12.0': Interbedded zones of gray, fine grained sand and orange mottled, gray silty clay. The sand become coarser grained at bottom of sample. Saturated. NATIVE.		3			0.0
12.0	12.0'-15.1': Gray, medium grained sand with yellow brown mottling. Grades into brown sand with gray mottling at depth. Saturated. NATIVE.		4			0.0
	15.1'-15.8': Gray, fine grained sand with some clay seams. Saturated. NATIVE.					
	15.8'-16.0': Medium gray, medium grained sand with a coal tar odor. Saturated. NATIVE.	Sample sent to lab				1.2
16.0	16.0'-20.0': Gray, medium grained sand with many pebbles and rock fragments. Bottom of sample is dark gray and contains NAPL. Saturated. NATIVE.		5			0.0

Notes: Measuring Point Elevations May Change: Refer to Current Elevation Table

Grain Size ◯ Water Found ▽ Static Level ▼

NYSDEC - Region 9 - Division of Environmental Remediation
Stratigraphic Log (Overburden)

Project Name:	Former Gastown MGP Site	**Hole Designation:**	SB-31
Site Number:	915171	**Date Completed:**	12/6/99
Location:	Tonawanda, New York	**Drilling Company:**	Advanced Cleanup Tech.
Logged By:	Glenn M. May	**Drilling Method:**	Direct Push
Total Depth:	26.0 feet	**Sampling Method:**	Macro Core

Depth (ft bgs)	Stratigraphic Description & Remarks	Elevation (ft amsl)	Sample			
			NUMBER	COUNT	N VALUE	HNU
	Ground Surface	**576.21**				
20.0	20.0'-23.4': Gray, medium grained sand. Sheen observed throughout sample but only a trace of NAPL observed. Saturated. NATIVE.		6			30.0
	23.4'-24.0': Gravel mixed with sand. Staining and NAPL observed. Saturated. NATIVE.	552.81; Sample sent to lab				1330
24.0	24.0'-24.3': Sample same as above.		7			19.8
	24.3'-26.0': Reddish brown clay with some pebbles and gray mottling. Very plastic. Saturated. Becomes less saturated, more dense and contains more pebbles at bottom of sample. NATIVE.	551.91; Sample sent to lab				
	BOH=26.0' bgs.					

Notes: Measuring Point Elevations May Change: Refer to Current Elevation Table

Grain Size ◯ Water Found ▽ Static Level ▼

NYSDEC - Region 9 - Division of Environmental Remediation
Stratigraphic Log (Overburden)

Project Name:	Former Gastown MGP Site	**Hole Designation:**	SB-32
Site Number:	915171	**Date Completed:**	12/6/99
Location:	Tonawanda, New York	**Drilling Company:**	Advanced Cleanup Tech.
Logged By:	Glenn M. May	**Drilling Method:**	Direct Push
Total Depth:	28.0 feet	**Sampling Method:**	Macro Core

Depth (ft bgs)	Stratigraphic Description & Remarks	Elevation (ft amsl)	Sample			
			NUMBER	COUNT	N VALUE	HNU
	Ground Surface	**575.32**				
0.0	0.0'-0.4': Crushed stone from parking lot.	575.32	1			0.0
	0.4'-1.3': Black ash with coal and rock fragments. Moist. FILL MATERIAL.					
	1.3'-1.7': Yellow brown clayey silt with rusty brown and gray mottling. Moist. NATIVE.	574.02				
	1.7'-4.0': Gray silty clay with black mottling and some pebbles. Moist. NATIVE.					
4.0	4.0'-7.3': Interbedded zones of fine grained sand and silty clay with orange mottling. Moist. NATIVE.	571.32	2			0.0
	7.3'-8.0': Gray clay with rusty brown and dark gray mottling. Saturated. NATIVE.					
8.0	8.0'-10.0': Sample same as above.		3			0.0
	10.0'-10.6': Dark brown clayey silt with shell fragments. Dry. NATIVE.					
	10.6'-12.0': Gray clay with some dark brown and rusty brown mottling near top of sample. Sightly plastic. Moist. NATIVE.					
12.0	12.0'-16.0': Gray, fine grained sand with some clay, silt and wood. Saturated. NATIVE.		4			0.0
16.0	16.0'-20.0': Interbedded zones of gray, fine grained sand and gray clay with a few shells. Saturated. NATIVE.		5			0.0

Notes: Measuring Point Elevations May Change: Refer to Current Elevation Table

Grain Size ◯ Water Found ▽ Static Level ▼

NYSDEC - Region 9 - Division of Environmental Remediation
Stratigraphic Log (Overburden)

Project Name:	Former Gastown MGP Site	**Hole Designation:**	SB-32
Site Number:	915171	**Date Completed:**	12/6/99
Location:	Tonawanda, New York	**Drilling Company:**	Advanced Cleanup Tech.
Logged By:	Glenn M. May	**Drilling Method:**	Direct Push
Total Depth:	28.0 feet	**Sampling Method:**	Macro Core

Depth (ft bgs)	Stratigraphic Description & Remarks	Elevation (ft amsl)	Sample			
			NUMBER	COUNT	N VALUE	HNU
	Ground Surface	**575.32**				
20.0	20.0'-23.8': Yellow brown clay. Saturated. Poor recovery. NATIVE.	Sample sent to lab	6			0.0
	23.8'-24.0': Reddish brown and gray clay. Saturated. NATIVE.	551.52				
24.0	24.0'-28.0': Difficult to log due to poor recovery. Reddish brown silty clay observed on outside of sampler. NATIVE.		7			0.0
	BOH=28.0' bgs.					

Notes: Measuring Point Elevations May Change: Refer to Current Elevation Table

Grain Size ◯ Water Found ▽ Static Level ▼

NYSDEC - Region 9 - Division of Environmental Remediation
Stratigraphic Log (Overburden)

Project Name:	Former Gastown MGP Site	**Hole Designation:**	SB-33
Site Number:	915171	**Date Completed:**	12/7/99
Location:	Tonawanda, New York	**Drilling Company:**	Advanced Cleanup Tech.
Logged By:	Glenn M. May	**Drilling Method:**	Direct Push
Total Depth:	16.0 feet	**Sampling Method:**	Macro Core

Depth (ft bgs)	Stratigraphic Description & Remarks	Elevation (ft amsl)	Sample			
			NUMBER	COUNT	N VALUE	HNU
	Ground Surface	**574.03**				
0.0	0.0'-0.4': Brown topsoil with rootlets and rock fragments. Moist.		1			0.0
	0.4'-0.8': Yellow brown, fine grained sand with rock and coke fragments. Moist. FILL MATERIAL.	573.63				
	0.8'-4.0': Gray brown, fine grained sand with orange mottling. Moist. NATIVE.	573.23				
4.0	4.0'-7.8': Sample same as above with silty clay seams. Becomes more gray and less mottled with depth. Moist. NATIVE.		2			0.0
	7.8'-8.0': Black clay with shells. Moist. NATIVE.					
8.0	8.0'-12.0': Sample same as above for first 0.3'. Sample then grades into a plastic, very cohesive, greenish gray clay with orange mottling. Bottom of sample becomes more brown and contains shells. Moist. NATIVE.	Sample sent to lab	3			0.1
12.0	12.0'-16.0': Gray, fine grained sand with gray clay seams. Saturated. NATIVE.		4			0.0
	BOH=16.0' bgs.					

Notes: Measuring Point Elevations May Change: Refer to Current Elevation Table

Grain Size ◯ Water Found ▽ Static Level ▼

NYSDEC - Region 9 - Division of Environmental Remediation
Stratigraphic Log (Overburden)

Project Name:	Former Gastown MGP Site	**Hole Designation:**	SB-34
Site Number:	915171	**Date Completed:**	12/8/99
Location:	Tonawanda, New York	**Drilling Company:**	Advanced Cleanup Tech.
Logged By:	Glenn M. May	**Drilling Method:**	Direct Push
Total Depth:	20.0 feet	**Sampling Method:**	Macro Core

Depth (ft bgs)	Stratigraphic Description & Remarks	Elevation (ft amsl)	Sample			
			NUMBER	COUNT	N VALUE	HNU
	Ground Surface	**574.72**				
0.0	0.0'-1.0': Black topsoil with brown mottling, roots, rootlets and some coal. Moist.		1			0.0
	1.0'-4.0': Gray silty clay with extensive orange mottling and some rootlets. Dry to Moist. NATIVE.	573.72				
4.0	4.0'-5.5': Sample same as above.		2			0.0
	5.5'-8.0': Gray, fine grained sand with extensive orange mottling, some silt and clay, and a few silty clay seams. Saturated. NATIVE.					
8.0	8.0'-11.6': Interbedded zones of gray, fine to medium grained sand and gray silty clay with extensive orange mottling. Saturated. NATIVE.		3			0.0
	11.6'-12.0': Sample same as above but more medium gray in color and unmottled.					
12.0	12.0'-16.0': Gray, fine grained sand with a 0.4' seam that contains rusty orange mottling. NAPL observed in bottom 0.2' of sample. Saturated. NATIVE.	Bottom 0.2' sent to lab	4			194
16.0	16.0'-19.2': Sample same as above. Sheen observed throughout sample with small pockets of NAPL. Saturated. NATIVE.	Sample sent to lab	5			183
	19.2'-20.0': Gravel of various sizes with only a trace of NAPL. Saturated. NATIVE.	555.52				30.7
	BOH=20.0' bgs.					

Notes: Measuring Point Elevations May Change: Refer to Current Elevation Table

Grain Size ◯ Water Found ▽ Static Level ▼

NYSDEC - Region 9 - Division of Environmental Remediation
Stratigraphic Log (Overburden)

Project Name:	Former Gastown MGP Site	**Hole Designation:**	SB-35
Site Number:	915171	**Date Completed:**	12/8/99
Location:	Tonawanda, New York	**Drilling Company:**	Advanced Cleanup Tech.
Logged By:	Glenn M. May	**Drilling Method:**	Direct Push
Total Depth:	20.0 feet	**Sampling Method:**	Macro Core

Depth (ft bgs)	Stratigraphic Description & Remarks	Elevation (ft amsl)	Sample			
			NUMBER	COUNT	N VALUE	HNU
	Ground Surface	**574.52**				
0.0	0.0'-0.9': Topsoil with rootlets. Glass and coal near bottom of sample. Moist. FILL MATERIAL.		1			0.0
	0.9'-3.5': Gray silty clay with extensive orange and black mottling. Moist. NATIVE.	573.62				
	3.5'-4.0': Yellow brown, very fine grained sand with clay and silt. Saturated. NATIVE.	571.02				
4.0	4.0'-8.0': Interbedded zones of yellow brown, very fine grained sand and thin (0.1') seams of gray silty clay with orange mottling. Sand seams become gray with depth and contain orange mottling. Saturated. NATIVE.		2			0.0
8.0	8.0'-11.1': Sample same as above.		3			0.0
	11.1'-12.0': Dark gray sand without mottling. Saturated. NATIVE.					
12.0	12.0'-16.0': Sample same as above with a sheen observed throughout. Trace of NAPL at 14.5' bgs with the bottom 0.4' of sample saturated with NAPL. Saturated. NATIVE.	Bottom 0.4' sent to lab	4			38.4
16.0	16.0'-19.3': Sample same as above with NAPL observed throughout. Saturated. NATIVE.	Sample sent to lab	5			321
	19.3'-20.0': Gravel of various sizes, compact, no NAPL. Saturated. NATIVE.	555.22				
	BOH=20.0' bgs.					

Notes: Measuring Point Elevations May Change: Refer to Current Elevation Table

Grain Size ◯ Water Found ▽ Static Level ▼

NYSDEC - Region 9 - Division of Environmental Remediation
Stratigraphic Log (Overburden)

Project Name:	Former Gastown MGP Site	**Hole Designation:**	SB-36
Site Number:	915171	**Date Completed:**	12/8/99
Location:	Tonawanda, New York	**Drilling Company:**	Advanced Cleanup Tech.
Logged By:	Glenn M. May	**Drilling Method:**	Direct Push
Total Depth:	20.0 feet	**Sampling Method:**	Macro Core

Depth (ft bgs)	Stratigraphic Description & Remarks	Elevation (ft amsl)	Sample			
			NUMBER	COUNT	N VALUE	HNU
	Ground Surface	**574.28**				
0.0	0.0'-0.3': Topsoil with rootlets. Moist.		1			0.0
	0.3'-2.0': Dark brown subsoil with orange mottling, few pebbles and some rootlets. Moist. NATIVE.					
	2.0'-4.0': Gray silty clay with extensive orange mottling. Dry to moist. NATIVE.	572.28				
4.0	4.0'-4.4': Sample same as above.		2			0.0
	4.4'-8.0': Interbedded zones of gray, fine grained sand and gray silty clay with extensive orange mottling throughout. Sand saturated; silty clay moist. NATIVE.	569.88				
8.0	8.0'-11.2': Gray, fine grained sand with extensive orange mottling. Saturated. NATIVE.		3			0.0
	11.2'-12.0': Dark gray, fine grained sand without mottling. Saturated. NATIVE.					
12.0	12.0'-16.0': Sample same as above.		4			0.0
16.0	16.0'-18.3': Brown, medium to coarse grained sand. Saturated. NATIVE.	Sample sent to lab	5			0.0
	18.3'-18.8': Gravel of various sizes, angular. Saturated. NATIVE.	555.98				
	18.8'-20.0': Reddish brown silty clay. Very plastic and cohesive. Saturated. NATIVE.	555.48				
	BOH=20.0' bgs.					

Notes: Measuring Point Elevations May Change: Refer to Current Elevation Table

Grain Size ◯ Water Found ▽ Static Level ▼

NYSDEC - Region 9 - Division of Environmental Remediation
Stratigraphic Log (Overburden)

Project Name:	Former Gastown MGP Site	**Hole Designation:**	SB-37
Site Number:	915171	**Date Completed:**	12/9/99
Location:	Tonawanda, New York	**Drilling Company:**	Advanced Cleanup Tech.
Logged By:	Glenn M. May	**Drilling Method:**	Direct Push
Total Depth:	20.0 feet	**Sampling Method:**	Macro Core

Depth (ft bgs)	Stratigraphic Description & Remarks	Elevation (ft amsl)	Sample			
			NUMBER	COUNT	N VALUE	HNU
	Ground Surface	**574.69**				
0.0	0.0'-0.7': Crushed stone from parking lot.	574.69	1			0.0
	0.7'-2.0': Reworked black silty clay with coke and many rocks fragments of various sizes. Dry. FILL MATERIAL.					
	2.0'-4.0': Gray silty clay with orange and dark brown mottling, few rock fragments and some rootlets. Moist. NATIVE.	572.69				
4.0	4.0'-7.6': Sample same as above with mostly orange mottling, although some white and black mottling are observed. Moist. NATIVE.		2			0.0
	7.6'-8.0': Gray, fine grained sand with extensive orange mottling. Saturated. NATIVE.	567.09				
8.0	8.0'-12.0': Interbedded zones of gray, fine grained sand and thin (0.1') seams of gray silty clay with extensive orange mottling that decreases with depth. Saturated. NATIVE.		3			0.0
12.0	12.0'-14.8': Sample same as above with fewer silty clay seams. Saturated. NATIVE.		4			0.0
	14.8'-15.8': Interbedded zones of dark gray, fine grained sand and dark gray silty clay. The silty clay seams are approximately 0.4' thick. Saturated. NATIVE.					
	15.8'-16.0': Gray gravel of various sizes. Saturated. NATIVE.	558.89				
16.0	16.0'-20.0': No recovery. Reddish brown silty clay observed on shoe of sampler. NATIVE.		5			NM
	BOH=20.0' bgs.					

Notes: Measuring Point Elevations May Change: Refer to Current Elevation Table

Grain Size ◯ Water Found ▽ Static Level ▼

NYSDEC - Region 9 - Division of Environmental Remediation
Stratigraphic Log (Overburden)

Project Name:	Former Gastown MGP Site	**Hole Designation:**	SB-38
Site Number:	915171	**Date Completed:**	12/9/99
Location:	Tonawanda, New York	**Drilling Company:**	Advanced Cleanup Tech.
Logged By:	Glenn M. May	**Drilling Method:**	Direct Push
Total Depth:	24.0 feet	**Sampling Method:**	Macro Core

Depth (ft bgs)	Stratigraphic Description & Remarks	Elevation (ft amsl)	Sample			
			NUMBER	COUNT	N VALUE	HNU
	Ground Surface	**576.81**				
0.0	0.0'-0.6': Crushed stone from parking lot.	576.81	1			0.0
	0.6'-1.0': Brown sand with many rock fragments of various sizes. Dry. FILL MATERIAL.					
	1.0'-1.4': Black ash with slag and coke fragments. Dry. FILL MATERIAL.					
	1.4'-1.8': Light brown, fine grained sand. Dry. FILL MATERIAL.					
	1.8'-4.0': Yellow brown silty clay with few sand seams, many rock fragments, and a few pieces of slag. Moist. FILL MATERIAL.					
4.0	4.0'-4.6': Brown, fine grained sand with slag, ash, coal and rock fragments. Dry. FILL MATERIAL.		2			0.0
	4.6'-5.2': Interbedded zones of brown to yellow brown, fine grained sand and silty clay with orange mottling. Saturated. NATIVE.					
	5.2'-8.0': Gray silty clay with extensive black and brown mottling. Cohesive and compact. Moist. NATIVE.	571.61				
8.0	8.0'-9.2': Sample same as above. Mottling decreases with depth. Saturated. NATIVE.		3			0.0
	9.2'-12.0': Interbedded zones of gray, fine grained sand and silty clay. Sand seams contain a high clay content and are moist, not saturated. NATIVE.	567.61				
12.0	12.0'-14.9': Dark gray silty clay with gravel seams. Saturated. NATIVE.		4			0.0

Notes: Measuring Point Elevations May Change: Refer to Current Elevation Table

Grain Size ◯ Water Found ▽ Static Level ▼

NYSDEC - Region 9 - Division of Environmental Remediation
Stratigraphic Log (Overburden)

Project Name:	Former Gastown MGP Site	**Hole Designation:**	SB-38
Site Number:	915171	**Date Completed:**	12/9/99
Location:	Tonawanda, New York	**Drilling Company:**	Advanced Cleanup Tech.
Logged By:	Glenn M. May	**Drilling Method:**	Direct Push
Total Depth:	24.0 feet	**Sampling Method:**	Macro Core

Depth (ft bgs)	Stratigraphic Description & Remarks	Elevation (ft amsl)	Sample			
			NUMBER	COUNT	N VALUE	HNU
	Ground Surface	**576.81**				
12.0	14.9'-15.8': Medium gray silty clay with orange mottling. Cohesive and very plastic. Moist. NATIVE.		4			0.0
	15.8'-16.0': Gray sand. Saturated. NATIVE.					
16.0	16.0'-20.0': Interbedded zones of gray, fine grained sand and thin (0.1') seams of silty clay. Bottom of sample is more reddish brown in color. Saturated. NATIVE.		5			0.0
20.0	20.0'-22.7': Sample same as above (reddish brown, fine grained sand). Saturated. NATIVE.	Sample sent to lab	6			0.2
	22.7'-23.7': Gravel of various sizes. Moist but not saturated. NATIVE.	554.11				4.1
	23.7'-24.0': Reddish brown silty clay. Saturated. NATIVE.	553.11				
	BOH=24.0' bgs.					

Notes: Measuring Point Elevations May Change: Refer to Current Elevation Table

Grain Size ◯ Water Found ▽ Static Level ▼

NYSDEC - Region 9 - Division of Environmental Remediation
Stratigraphic Log (Overburden)

Project Name:	Former Gastown MGP Site	**Hole Designation:**	SB-39
Site Number:	915171	**Date Completed:**	12/9/99
Location:	Tonawanda, New York	**Drilling Company:**	Advanced Cleanup Tech.
Logged By:	Glenn M. May	**Drilling Method:**	Direct Push
Total Depth:	24.0 feet	**Sampling Method:**	Macro Core

Depth (ft bgs)	Stratigraphic Description & Remarks	Elevation (ft amsl)	Sample			
			NUMBER	COUNT	N VALUE	HNU
	Ground Surface	**577.09**				
0.0	0.0'-0.8': Crushed stone from parking lot.	577.09	1			NM
	0.8'-1.0': Brown silty clay with many rock fragments. FILL MATERIAL.					
	1.0'-1.1': Black ash with small brick fragments. Moist. FILL MATERIAL.					
	1.1'-4.0': Tan ash with brown and green mottling. Moist to Saturated (bottom of sample). FILL MATERIAL.	Sample sent to lab				0.0
4.0	4.0'-4.2': Tan ash same as above.		2			0.0
	4.2'-8.0': Gray silty clay with black mottling throughout except for a zone from 5.4' to 6.4' bgs, which is mottled orange. Petroleum contamination observed at 6.4' bgs. A sand seam observed from 7.1' to 7.4' bgs with a strong petroleum odor. A sand seam was also observed at bottom of sample. Moist. NATIVE.	572.89; Sample sent to lab (6.4'-9.0')				11.5
8.0	8.0'-11.6': Interbedded zones of gray, fine to medium grained sand and thin (0.1') seams of gray silty clay. Extensive black mottling and a strong petroleum odor to 9.0' bgs. Sheen observed throughout sample. Saturated. NATIVE.	569.09	3			40.0 2.9*
	11.6'-12.0': Gray sand with brown mottling. Saturated. NATIVE.					
12.0	12.0'-15.0': Sample same as above.		4			3.6
	15.0'-16.0': Gray, medium grained sand. Saturated. NATIVE.					
	* soils below petroleum contamination zone.					

Notes: Measuring Point Elevations May Change: Refer to Current Elevation Table

Grain Size ◯ Water Found ▽ Static Level ▼

NYSDEC - Region 9 - Division of Environmental Remediation
Stratigraphic Log (Overburden)

Project Name:	Former Gastown MGP Site	**Hole Designation:**	SB-39
Site Number:	915171	**Date Completed:**	12/9/99
Location:	Tonawanda, New York	**Drilling Company:**	Advanced Cleanup Tech.
Logged By:	Glenn M. May	**Drilling Method:**	Direct Push
Total Depth:	24.0 feet	**Sampling Method:**	Macro Core

Depth (ft bgs)	Stratigraphic Description & Remarks	Elevation (ft amsl)	Sample			
			NUMBER	COUNT	N VALUE	HNU
	Ground Surface	**577.09**				
16.0	16.0'-20.0': Sample same as above.		5			3.8
20.0	20.0'-23.1': Sample same as above.		6			NM
	23.1'-24.0': Gravel of various sizes. Saturated. NATIVE.	553.99				
	24.0': Reddish brown, silty clay observed on shoe of sampler. NATIVE.	553.09				
	BOH=24.0' bgs.					

Notes: Measuring Point Elevations May Change: Refer to Current Elevation Table

Grain Size ◯ Water Found ▽ Static Level ▼

New York State Department of Environmental Conservation
270 Michigan Avenue, Buffalo, New York, 14203-2999

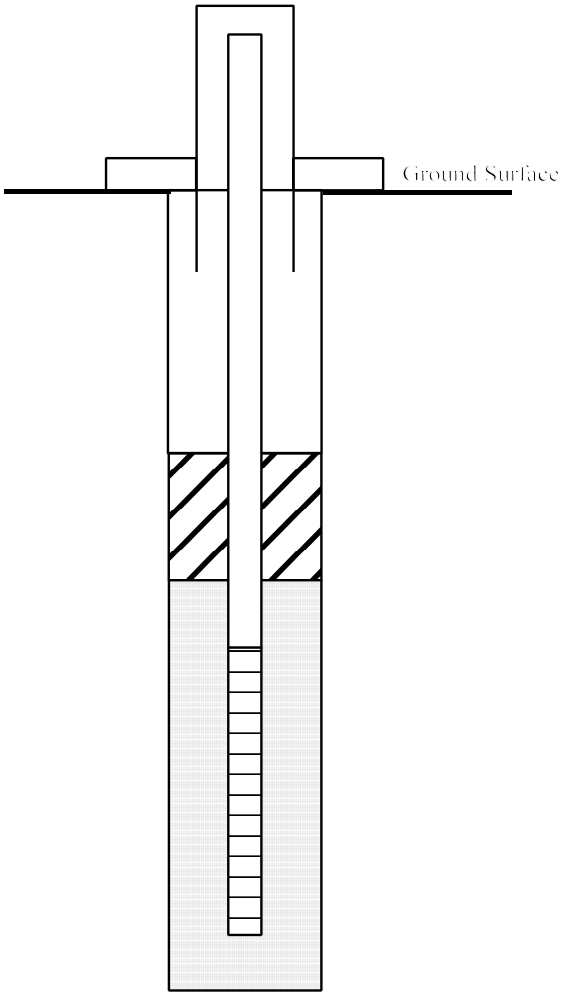
MONITORING WELL LOG

Project Name:	Former Gastown MGP Site	**Hole Designation:**	MW-27
Site Number:	915171	**Date Completed:**	12/7/99
Location:	Tonawanda, New York	**Drilling Company:**	Advanced Cleanup Tech.
Screen Type:	PVC	**Casing Type:**	Not Applicable
Screen Diameter:	1 inch	**Casing Diameter:**	Not Applicable
Screen Length:	15 feet	**Total Depth:**	25.0 feet

Top of Riser Elevation: 575.17 ft amsl

Ground Surface Elevation: 575.27 ft amsl

Top of Grout: 0.0 ft



Top of Seal: 6.0 ft

Top of Filter Pack: 8.0 ft

Top of Screen: 10.0 ft

Bottom of Screen: 25.0 ft

Bottom of Filter Pack: 25.0 ft

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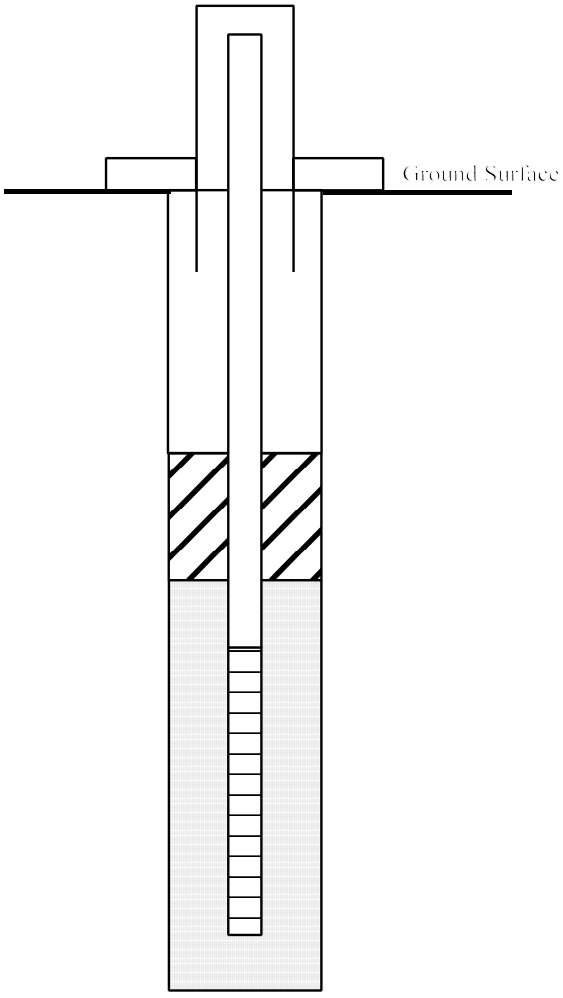
MONITORING WELL LOG

Project Name:	Former Gastown MGP Site	**Hole Designation:**	MW-34
Site Number:	915171	**Date Completed:**	12/8/99
Location:	Tonawanda, New York	**Drilling Company:**	Advanced Cleanup Tech.
Screen Type:	PVC	**Casing Type:**	Not Applicable
Screen Diameter:	1 inch	**Casing Diameter:**	Not Applicable
Screen Length:	15 feet	**Total Depth:**	20.0 feet

Top of Riser Elevation: 574.56 ft amsl

Ground Surface Elevation: 574.72 ft amsl

Top of Grout: 0.0 ft



Top of Seal: 2.0 ft

Top of Filter Pack: 3.0 ft

Top of Screen: 5.0 ft

Bottom of Screen: 20.0 ft

Bottom of Filter Pack: 20.0 ft

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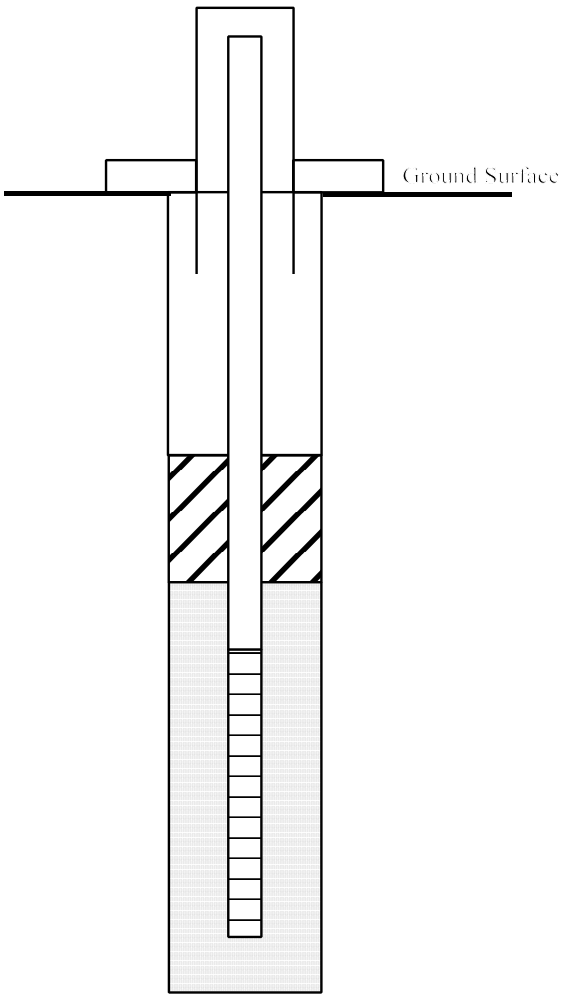
MONITORING WELL LOG

Project Name:	Former Gastown MGP Site	**Hole Designation:**	MW-35
Site Number:	915171	**Date Completed:**	12/8/99
Location:	Tonawanda, New York	**Drilling Company:**	Advanced Cleanup Tech.
Screen Type:	PVC	**Casing Type:**	Not Applicable
Screen Diameter:	1 inch	**Casing Diameter:**	Not Applicable
Screen Length:	15 feet	**Total Depth:**	20.0 feet

Top of Riser Elevation: 574.31 ft amsl

Ground Surface Elevation: 574.52 ft amsl

Top of Grout: 0.0 ft



Top of Seal: 2.0 ft

Top of Filter Pack: 3.0 ft

Top of Screen: 5.0 ft

Bottom of Screen: 20.0 ft

Bottom of Filter Pack: 20.0 ft

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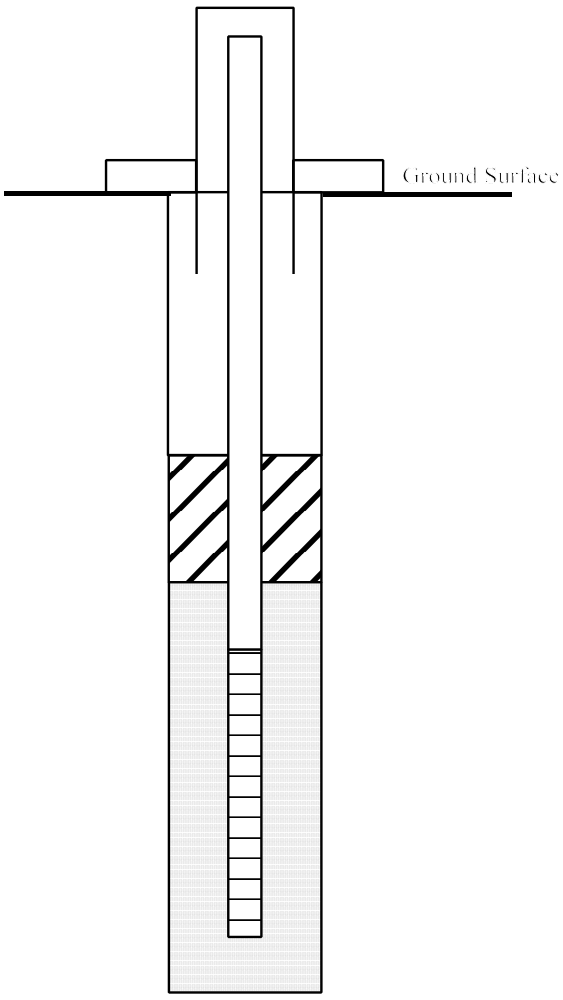
MONITORING WELL LOG

Project Name:	Former Gastown MGP Site	**Hole Designation:**	MW-36
Site Number:	915171	**Date Completed:**	12/8/99
Location:	Tonawanda, New York	**Drilling Company:**	Advanced Cleanup Tech.
Screen Type:	PVC	**Casing Type:**	Not Applicable
Screen Diameter:	1 inch	**Casing Diameter:**	Not Applicable
Screen Length:	15 feet	**Total Depth:**	20.0 feet

Top of Riser Elevation: 574.13 ft amsl

Ground Surface Elevation: 574.28 ft amsl

Top of Grout: 0.0 ft



Top of Seal: 2.0 ft

Top of Filter Pack: 3.0 ft

Top of Screen: 5.0 ft

Bottom of Screen: 20.0 ft

Bottom of Filter Pack: 20.0 ft

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270 Michigan Avenue, Buffalo, New York, 14203-2999

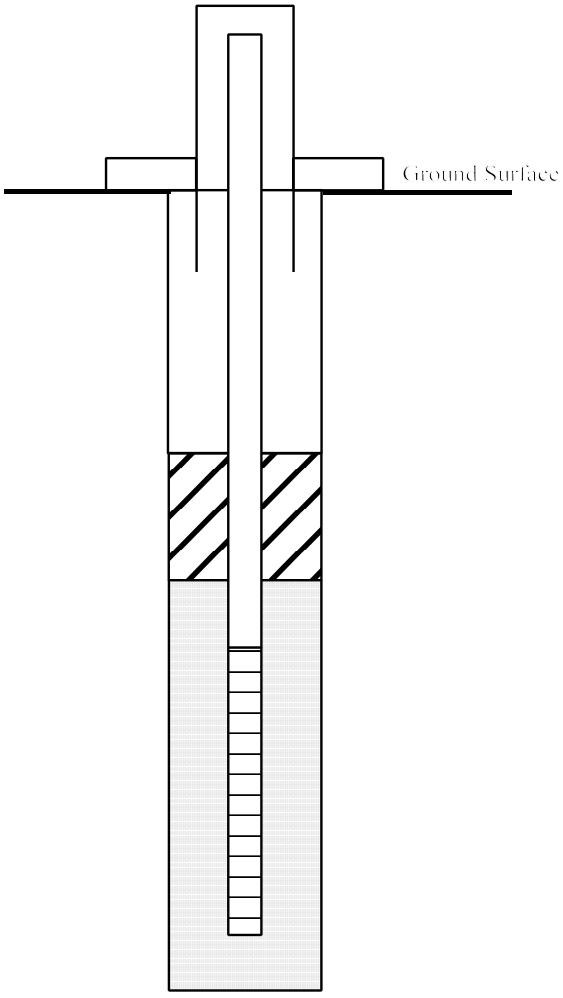
MONITORING WELL LOG

Project Name:	Former Gastown MGP Site	**Hole Designation:**	MW-39
Site Number:	915171	**Date Completed:**	12/9/99
Location:	Tonawanda, New York	**Drilling Company:**	Advanced Cleanup Tech.
Screen Type:	PVC	**Casing Type:**	Not Applicable
Screen Diameter:	1 inch	**Casing Diameter:**	Not Applicable
Screen Length:	7 feet	**Total Depth:**	12.0 feet

Top of Riser Elevation: 576.85 ft amsl

Ground Surface Elevation: 577.09 ft amsl

Top of Grout: 0.0 ft



Top of Seal: 2.0 ft

Top of Filter Pack: 3.0 ft

Top of Screen: 5.0 ft

Bottom of Screen: 12.0 ft

Bottom of Filter Pack: 12.0 ft

APPENDIX B

WELL DEVELOPMENT AND PURGE LOGS

New York State Department of Environmental Conservation
270 Michigan Avenue, Buffalo, New York, 14203-2999

WELL PURGING AND SAMPLING LOG

SITE NAME:	Former Gastown Manufactured Gas Plant Site	SITE NUMBER:	915171
SAMPLER:	Glenn M. May		
PURGE DATE:	December 14, 1999	START PURGE: 1210	END PURGE: 1217
SAMPLE DATE:	December 14, 1999		SAMPLE TIME: 1245

WELL NUMBER: **MW-13**

1. TOTAL CASING AND SCREEN LENGTH (FT): **14.10**
2. CASING INTERNAL DIAMETER (IN): **1.0**
3. WATER LEVEL BELOW TOP OF CASING (FT): **7.69**
4. VOLUME OF WATER IN CASING (GAL): **0.26**

#1 - #3 x #2 (Gal/Ft)

VOLUME OF 3 CASINGS: **0.78** GAL

WELL ID.	VOL. (GAL/FT)
1"	0.041
2"	0.163
3"	0.367
4"	0.653
5"	1.020
6"	1.469
8"	2.611

PARAMETERS	ACCUMULATED VOLUME PURGED (GALLONS)									
	0.0									
pH	7.19									
CONDUCTIVITY (µmhos)	884									
TURBIDITY (NTU)	>1000									
TEMPERATURE (^{O}F)	8.7									
Eh	-22.2									
TIME	1211									

COMMENTS:

12/14/99: Initial purge water was very turbid - reddish brown in color. No sheen or odors observed. Purged dry after 0.5 gallons. Well recovered sufficiently, however, to collect entire suite of samples.

New York State Department of Environmental Conservation
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WELL PURGING AND SAMPLING LOG

SITE NAME:	Former Gastown Manufactured Gas Plant Site	SITE NUMBER:	915171
SAMPLER:	Glenn M. May		
PURGE DATE:	December 15, 1999	START PURGE: 0805	END PURGE: 0825
SAMPLE DATE:	December 15, 1999		SAMPLE TIME: 0845

WELL NUMBER: **MW-17**

1. TOTAL CASING AND SCREEN LENGTH (FT): **17.78**
2. CASING INTERNAL DIAMETER (IN): **1.0**
3. WATER LEVEL BELOW TOP OF CASING (FT): **7.75**
4. VOLUME OF WATER IN CASING (GAL): **0.41**

#1 - #3 x #2 (Gal/Ft)

VOLUME OF 3 CASINGS: **1.23** GAL

WELL ID.	VOL. (GAL/FT)
1"	0.041
2"	0.163
3"	0.367
4"	0.653
5"	1.020
6"	1.469
8"	2.611

	ACCUMULATED VOLUME PURGED (GALLONS)									
PARAMETERS	0.0	0.5	1.0	1.5	2.0					
pH	6.77	6.86	6.83	6.86	6.87					
CONDUCTIVITY (µmhos)	2000	2190	2000	2000	2000					
TURBIDITY (NTU)	>1000	>1000	>1000	>1000	>1000					
TEMPERATURE (^{O}F)	8.3	9.5	9.8	9.5	9.3					
Eh	0.2	-4.8	-3.5	-5.0	-5.4					
TIME	0805	0807	0813	0817	0825					

COMMENTS:

12/15/99: Initial purge water was very turbid - rusty brown in color with a slight petroleum odor. By 0.5 gallons the water was brownish gray in color. Sheen observed at this time. Heavy sheen and small blebs of NAPL observed by 1 gallon.

New York State Department of Environmental Conservation
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WELL PURGING AND SAMPLING LOG

SITE NAME:	Former Gastown Manufactured Gas Plant Site	SITE NUMBER:	915171
SAMPLER:	Glenn M. May		
PURGE DATE:	December 14, 1999	START PURGE: 0943	END PURGE: 1003
SAMPLE DATE:	December 14, 1999		SAMPLE TIME: 1030

WELL NUMBER: **MW-2S**

1. TOTAL CASING AND SCREEN LENGTH (FT): **8.32**
2. CASING INTERNAL DIAMETER (IN): **2.0**
3. WATER LEVEL BELOW TOP OF CASING (FT): **3.87**
4. VOLUME OF WATER IN CASING (GAL): **0.73**

#1 - #3 x #2 (Gal/Ft)

VOLUME OF 3 CASINGS: **2.19** GAL

WELL ID.	VOL. (GAL/FT)
1"	0.041
2"	0.163
3"	0.367
4"	0.653
5"	1.020
6"	1.469
8"	2.611

	ACCUMULATED VOLUME PURGED (GALLONS)									
PARAMETERS	0.0	2.0	4.0	6.0	Sample					
pH	11.56	11.52	11.53	11.51	11.58					
CONDUCTIVITY (µmhos)	819	834	840	844	867					
TURBIDITY (NTU)	> 200	45.9	48.6	48.2	14.0					
TEMPERATURE (^{O}F)	9.6	10.5	10.2	9.8	9.1					
Eh	-249	-248	-248	-247	-249					
TIME	0945	0950	0957	1003	1037					

COMMENTS: Field parameters measured following sample collection.

12/14/99: Initial purge water was very turbid - gray in color with fine sand particles. No sheen or odor observed. The turbidity cleared considerably by 2 gallons.

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WELL PURGING AND SAMPLING LOG

SITE NAME:	Former Gastown Manufactured Gas Plant Site	SITE NUMBER:	915171
SAMPLER:	Glenn M. May		
PURGE DATE:	December 13, 1999	START PURGE: 1415	END PURGE: 1505
SAMPLE DATE:	December 13, 1999		SAMPLE TIME: 1530

WELL NUMBER: **MW-3S**

1. TOTAL CASING AND SCREEN LENGTH (FT): **7.81**
2. CASING INTERNAL DIAMETER (IN): **2.0**
3. WATER LEVEL BELOW TOP OF CASING (FT): **3.43**
4. VOLUME OF WATER IN CASING (GAL): **0.71**

#1 - #3 x #2 (Gal/Ft)

VOLUME OF 3 CASINGS: **2.13** GAL

WELL ID.	VOL. (GAL/FT)
1"	0.041
2"	0.163
3"	0.367
4"	0.653
5"	1.020
6"	1.469
8"	2.611

	ACCUMULATED VOLUME PURGED (GALLONS)									
PARAMETERS	0.0	1.0	2.0	3.0	4.0	6.0	8.0	12.0	17.0	Sample
pH	7.39	7.65	7.67	7.75	7.75	7.83	7.92	8.08	8.05	8.87
CONDUCTIVITY (µmhos)	1069	1007	1000	1001	1004	1036	1045	1064	1082	1055
TURBIDITY (NTU)	NM	> 200	> 200	> 200	> 200	> 200	> 200	> 200	> 200	99.4
TEMPERATURE (^{O}F)	8.0	7.8	7.7	7.6	7.6	7.4	7.5	7.0	8.0	6.3
Eh	-33.4	-45.3	-46.8	-50.4	-50.7	-54.1	-58.6	-67.9	-65.7	-107.9
TIME	1415	1420	1425	1429	1433	1441	1445	1455	1505	1540

COMMENTS: NM Not Measured. Field parameters measured following sample collection.

12/13/99: Initial purge water was cloudy. No sheen or odor observed. Bailed dry after 17 gallons. Sheen observed in purge bucket following purging.

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WELL DEVELOPMENT LOG

SITE NAME: Former Gastown Manufactured Gas Plant Site	SITE NUMBER: 915171
DEVELOPER: Glenn M. May	
DEVELOPMENT DATE: December 15, 1999	
START DEVELOPMENT: 1615	END DEVELOPMENT: 1635

WELL NUMBER: **MW-39**

1. TOTAL CASING AND SCREEN LENGTH (FT): **11.45**
2. CASING INTERNAL DIAMETER (IN): **1.0**
3. WATER LEVEL BELOW TOP OF CASING (FT): **7.69**
4. VOLUME OF WATER IN CASING (GAL): **0.15**

#1 - #3 x #2 (Gal/Ft)

VOLUME OF 10 CASINGS: **1.50** GAL.

WELL ID.	VOL. (GAL/FT)
1"	0.041
2"	0.163
3"	0.367
4"	0.653
5"	1.020
6"	1.469
8"	2.611

	ACCUMULATED VOLUME PURGED (GALLONS)									
PARAMETERS	0.0	1.0	Sample							
pH	7.63	7.67	7.51							
CONDUCTIVITY (µmhos)	3070	3040	2000							
TURBIDITY (NTU)	>1000	>1000	>1000							
TEMPERATURE (^{O}C)	11.6	12.0	12.0							
Eh	-45.0	-47.3	-38.5							
TIME	1620	1625	1647							

COMMENTS: Field parameters measured following sample collection.

12/15/99: Initial purge water was very turbid - dark gray in color. A sheen and strong petroleum odor observed. Purged a total of 1.5 gallons.

12/15/99: Well sampled at 1640 following completion of development.

New York State Department of Environmental Conservation
270 Michigan Avenue, Buffalo, New York, 14203-2999

WELL PURGING AND SAMPLING LOG

SITE NAME:	Former Gastown Manufactured Gas Plant Site	SITE NUMBER:	915171
SAMPLER:	Glenn M. May		
PURGE DATE:	December 15, 1999	START PURGE: 1500	END PURGE: 1540
SAMPLE DATE:	December 15, 1999		SAMPLE TIME: 1545

WELL NUMBER: **MW-23**

1. TOTAL CASING AND SCREEN LENGTH (FT): **14.03**
2. CASING INTERNAL DIAMETER (IN): **1.0**
3. WATER LEVEL BELOW TOP OF CASING (FT): **5.95**
4. VOLUME OF WATER IN CASING (GAL): **0.33**

   #1 - #3 x #2 (Gal/Ft)

   VOLUME OF 3 CASINGS: **1.00** GAL

WELL ID.	VOL. (GAL/FT)
1"	0.041
2"	0.163
3"	0.367
4"	0.653
5"	1.020
6"	1.469
8"	2.611

	ACCUMULATED VOLUME PURGED (GALLONS)									
PARAMETERS	0.0	1.0	1.5	2.0	3.0	Sample				
pH	7.18	7.29	7.36	7.26	7.22	7.24				
CONDUCTIVITY (µmhos)	810	839	833	821	797	802				
TURBIDITY (NTU)	>1000	>1000	>1000	>1000	>1000	>1000				
TEMPERATURE (^{O}F)	10.9	10.7	10.2	10.0	10.4	9.6				
Eh	-21.6	-27.5	-30.6	-25.2	-23.8	-24.7				
TIME	1500	1510	1516	1525	1540	1553				

COMMENTS: Field parameters measured following sample collection.

12/15/99: Initial purge water was very turbid - initially yellow brown in color but quickly turning to gray brown. No sheen or odor observed. Sheen and odor observed by 2 gallons.

New York State Department of Environmental Conservation
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WELL PURGING AND SAMPLING LOG

SITE NAME:	Former Gastown Manufactured Gas Plant Site	SITE NUMBER:	915171
SAMPLER:	Glenn M. May		
PURGE DATE:	December 16, 1999	START PURGE: 1250	END PURGE: 1332
SAMPLE DATE:	December 16, 1999		SAMPLE TIME: 1340

WELL NUMBER: **MW-1I**

1. TOTAL CASING AND SCREEN LENGTH (FT): **21.61**
2. CASING INTERNAL DIAMETER (IN): **2.0**
3. WATER LEVEL BELOW TOP OF CASING (FT): **6.69**
4. VOLUME OF WATER IN CASING (GAL): **2.43**

#1 - #3 x #2 (Gal/Ft)

VOLUME OF 3 CASINGS: **7.29** GAL

WELL ID.	VOL. (GAL/FT)
1"	0.041
2"	0.163
3"	0.367
4"	0.653
5"	1.020
6"	1.469
8"	2.611

	ACCUMULATED VOLUME PURGED (GALLONS)									
PARAMETERS	1.0	4.0	8.0	12.0	15.0	Sample				
pH	6.77	6.82	6.87	6.89	6.93	6.89				
CONDUCTIVITY (µmhos)	1932	1932	1941	1940	1922	1940				
TURBIDITY (NTU)	157	> 200	>1000	>1000	>1000	>1000				
TEMPERATURE (^{O}F)	11.0	11.4	11.6	11.8	11.5	11.0				
Eh	-0.04	-2.9	-5.6	-6.6	-9.0	-6.4				
TIME	1255	1303	1313	1323	1332	1347				

COMMENTS: Field parameters measured following sample collection.

12/16/99: Initial purge water was clear with a slight gray color. Slight NAPL odor noticed but no sheen observed. By 4 gallons the water was more turbid and reddish brown in color. The water was very turbid by 8 gallons.

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WELL PURGING AND SAMPLING LOG

SITE NAME:	Former Gastown Manufactured Gas Plant Site	SITE NUMBER:	915171
SAMPLER:	Glenn M. May		
PURGE DATE:	December 16, 1999	START PURGE: 1045	END PURGE: 1133
SAMPLE DATE:	December 16, 1999		SAMPLE TIME: 1145

WELL NUMBER: **MW-2I**

1. TOTAL CASING AND SCREEN LENGTH (FT): **24.00 ***
2. CASING INTERNAL DIAMETER (IN): **2.0**
3. WATER LEVEL BELOW TOP OF CASING (FT): **6.72**
4. VOLUME OF WATER IN CASING (GAL): **2.82**
   #1 - #3 x #2 (Gal/Ft)
   VOLUME OF 3 CASINGS: **8.46** GAL

WELL ID.	VOL. (GAL/FT)
1"	0.041
2"	0.163
3"	0.367
4"	0.653
5"	1.020
6"	1.469
8"	2.611

	ACCUMULATED VOLUME PURGED (GALLONS)									
PARAMETERS	1.0	3.0	6.0	9.0	12.0	15.0	Sample			
pH	6.67	6.68	6.67	6.73	6.77	6.78	6.83			
CONDUCTIVITY (µmhos)	2080	2000	2000	2000	2000	2000	2000			
TURBIDITY (NTU)	> 200	> 200	> 200	> 200	> 200	> 200	111.1			
TEMPERATURE (^{O}F)	11.3	12.1	12.5	12.5	12.5	12.5	11.8			
Eh	5.1	4.1	5.4	1.6	-0.3	-0.7	-3.6			
TIME	1047	1055	1100	1110	1122	1133	1150			

COMMENTS: * The total well depth measurement from the May 4, 1999 sampling event was utilized due to the historical presence of DNAPL in the well.

Field parameters measured following sample collection.

12/16/99: Initial purge water was clear but became reddish brown in color by 1 gallon. NAPL odor noticed by 3 gallons. By 9 gallons the water was gray in color with no sheen or NAPL observed. No sheen or NAPL observed throughout purging.

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270 Michigan Avenue, Buffalo, New York, 14203-2999

WELL DEVELOPMENT LOG

SITE NAME: Former Gastown Manufactured Gas Plant Site	SITE NUMBER: 915171
DEVELOPER: Glenn M. May	
DEVELOPMENT DATE: December 14, 1999	
START DEVELOPMENT: 1053	END DEVELOPMENT: 1117

WELL NUMBER: **MW-27**

1. TOTAL CASING AND SCREEN LENGTH (FT): **17.12**
2. CASING INTERNAL DIAMETER (IN): **1.0**
3. WATER LEVEL BELOW TOP OF CASING (FT): **5.27**
4. VOLUME OF WATER IN CASING (GAL): **0.49**

#1 - #3 x #2 (Gal/Ft)

VOLUME OF 10 CASINGS: **4.90** GAL.

WELL ID.	VOL. (GAL/FT)
1"	0.041
2"	0.163
3"	0.367
4"	0.653
5"	1.020
6"	1.469
8"	2.611

	ACCUMULATED VOLUME PURGED (GALLONS)									
PARAMETERS	0.0	1.0	3.0	5.0	7.0	Sample				
pH	6.98	7.02	6.94	6.96	6.89	6.91				
CONDUCTIVITY (µmhos)	1886	1843	2060	2140	2070	2060				
TURBIDITY (NTU)	>200	>1000	>1000	>1000	>1000	>1000				
TEMPERATURE (^{O}C)	9.0	11.2	10.9	10.7	11.3	10.3				
Eh	-11.1	-12.8	-10.0	-8.8	-6.2	-7.2				
TIME	1053	1057	1105	1111	1117	1145				

COMMENTS: Field parameters measured following sample collection.

12/14/99: Initial purge water was very turbid - brown in color. No sheen or odors observed. Water was very turbid throughout purging.

12/14/99: Well sampled at 1145 following completion of development.

New York State Department of Environmental Conservation
270 Michigan Avenue, Buffalo, New York, 14203-2999

WELL DEVELOPMENT LOG

SITE NAME: Former Gastown Manufactured Gas Plant Site	SITE NUMBER: 915171
DEVELOPER: Glenn M. May	
DEVELOPMENT DATE: December 15, 1999	
START DEVELOPMENT: 1325	END DEVELOPMENT: 1400

WELL NUMBER: **MW-34**

1. TOTAL CASING AND SCREEN LENGTH (FT): **18.80**
2. CASING INTERNAL DIAMETER (IN): **1.0**
3. WATER LEVEL BELOW TOP OF CASING (FT): **5.69**
4. VOLUME OF WATER IN CASING (GAL): **0.54**

#1 - #3 x #2 (Gal/Ft)

VOLUME OF 10 CASINGS: **5.40** GAL.

WELL ID.	VOL. (GAL/FT)
1"	0.041
2"	0.163
3"	0.367
4"	0.653
5"	1.020
6"	1.469
8"	2.611

	ACCUMULATED VOLUME PURGED (GALLONS)									
PARAMETERS	0.0	1.0	3.0	6.0	9.0					
pH	6.91	6.87	6.89	6.92	6.97					
CONDUCTIVITY (µmhos)	2000	2000	2000	2000	2000					
TURBIDITY (NTU)	>1000	>1000	>1000	>1000	>1000					
TEMPERATURE (^{O}C)	11.5	11.7	11.4	11.5	11.5					
Eh	-7.2	-5.5	-6.2	-8.1	-10.4					
TIME	1333	1340	1343	1353	1400					

COMMENTS:

12/15/99: Initial purge water was very turbid - gray brown in color. Slight coal tar odor observed. NAPL observed by 1 gallon. The quantity of NAPL increased with continued purging.

12/15/99: Well sampled at 1405 following completion of development.

New York State Department of Environmental Conservation
270 Michigan Avenue, Buffalo, New York, 14203-2999

WELL DEVELOPMENT LOG

SITE NAME: Former Gastown Manufactured Gas Plant Site	SITE NUMBER: 915171
DEVELOPER: Glenn M. May	
DEVELOPMENT DATE: December 15, 1999	
START DEVELOPMENT: 1150	END DEVELOPMENT: 1230

WELL NUMBER: **MW-35**

1. TOTAL CASING AND SCREEN LENGTH (FT): **13.70**
2. CASING INTERNAL DIAMETER (IN): **1.0**
3. WATER LEVEL BELOW TOP OF CASING (FT): **5.71**
4. VOLUME OF WATER IN CASING (GAL): **0.33**

#1 - #3 x #2 (Gal/Ft)

VOLUME OF 10 CASINGS: **3.30** GAL.

WELL ID.	VOL. (GAL/FT)
1"	0.041
2"	0.163
3"	0.367
4"	0.653
5"	1.020
6"	1.469
8"	2.611

	ACCUMULATED VOLUME PURGED (GALLONS)									
PARAMETERS	0.0	1.0	3.0	6.0						
pH	7.28	7.22	7.20	7.25						
CONDUCTIVITY (µmhos)	714	522	724	772						
TURBIDITY (NTU)	>1000	>1000	>1000	>1000						
TEMPERATURE (^{O}C)	10.4	11.3	10.8	11.1						
Eh	-27.0	-24.2	-22.6	-25.1						
TIME	1153	1202	1211	1230						

COMMENTS:

12/15/99: Initial purge water was very turbid - brown in color. A sheen, coal tar odor and NAPL observed. The quantity of NAPL increased with continued purging.

12/15/99: Well sampled at 1240 following completion of development.

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WELL DEVELOPMENT LOG

SITE NAME: Former Gastown Manufactured Gas Plant Site	SITE NUMBER: 915171
DEVELOPER: Glenn M. May	
DEVELOPMENT DATE: December 15, 1999	
START DEVELOPMENT: 1000	END DEVELOPMENT: 1100

WELL NUMBER: **MW-36**

1. TOTAL CASING AND SCREEN LENGTH (FT): **13.18**
2. CASING INTERNAL DIAMETER (IN): **1.0**
3. WATER LEVEL BELOW TOP OF CASING (FT): **5.17**
4. VOLUME OF WATER IN CASING (GAL): **0.33**

#1 - #3 x #2 (Gal/Ft)

VOLUME OF 10 CASINGS: **3.30** GAL.

WELL ID.	VOL. (GAL/FT)
1"	0.041
2"	0.163
3"	0.367
4"	0.653
5"	1.020
6"	1.469
8"	2.611

	ACCUMULATED VOLUME PURGED (GALLONS)									
PARAMETERS	0.0	0.75	1.5	2.0	3.0	4.0	5.0	Sample		
pH	7.31	7.52	7.25	7.08	7.05	6.96	6.96	6.91		
CONDUCTIVITY (µmhos)	472	499	680	767	861	857	865	1108		
TURBIDITY (NTU)	>1000	>1000	>1000	>1000	>1000	>1000	>1000	>1000		
TEMPERATURE (^{O}C)	10.3	11.2	11.2	11.1	11.3	11.2	11.8	11.2		
Eh	-28.1	-38.7	-25.3	-15.9	-14.6	-10.2	-9.8	-7.3		
TIME	1000	1005	1012	1017	1025	1050	1100	1110		

COMMENTS: Field parameters measured following sample collection.

12/15/99: Initial purge water was very turbid - brown in color. No sheen or odors observed.

12/15/99: Well sampled at 1105 following completion of development.

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WELL PURGING AND SAMPLING LOG

SITE NAME:	Former Gastown Manufactured Gas Plant Site	SITE NUMBER:	915171
SAMPLER:	Glenn M. May		
PURGE DATE:	N/A	START PURGE: N/A	END PURGE: N/A
SAMPLE DATE:	December 16, 1999		SAMPLE TIME: 1020

WELL NUMBER:_____**Tonawanda Creek**_____

1. TOTAL CASING AND SCREEN LENGTH (FT): _____
2. CASING INTERNAL DIAMETER (IN): _____
3. WATER LEVEL BELOW TOP OF CASING (FT): _____
4. VOLUME OF WATER IN CASING (GAL): _____

#1 - #3 x #2 (Gal/Ft)

VOLUME OF 3 CASINGS: _____GAL

WELL ID.	VOL. (GAL/FT)
1"	0.041
2"	0.163
3"	0.367
4"	0.653
5"	1.020
6"	1.469
8"	2.611

	ACCUMULATED VOLUME PURGED (GALLONS)									
PARAMETERS	Sample									
pH	7.23									
CONDUCTIVITY (µmhos)	930									
TURBIDITY (NTU)	34.1									
TEMPERATURE (^{O}F)	4.4									
Eh	-23.6									
TIME	1025									

COMMENTS: Field parameters measured following sample collection.

12/16/99: Sample collected from the dock of the Gastown Sportsmen's Club. Water was very clear. No sheen or odors observed.

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WELL PURGING AND SAMPLING LOG

SITE NAME:	Former Gastown Manufactured Gas Plant Site	SITE NUMBER:	915171
SAMPLER:	Glenn M. May		
PURGE DATE:	N/A	START PURGE: N/A	END PURGE: N/A
SAMPLE DATE:	December 16, 1999		SAMPLE TIME: 0940

WELL NUMBER:_____**Outfall to Creek**_____

1. TOTAL CASING AND SCREEN LENGTH (FT): _____
2. CASING INTERNAL DIAMETER (IN): _____
3. WATER LEVEL BELOW TOP OF CASING (FT): _____
4. VOLUME OF WATER IN CASING (GAL): _____

#1 - #3 x #2 (Gal/Ft)

VOLUME OF 3 CASINGS: _____GAL

WELL ID.	VOL. (GAL/FT)
1"	0.041
2"	0.163
3"	0.367
4"	0.653
5"	1.020
6"	1.469
8"	2.611

	ACCUMULATED VOLUME PURGED (GALLONS)									
PARAMETERS	Sample									
pH	7.40									
CONDUCTIVITY (µmhos)	631									
TURBIDITY (NTU)	97.9									
TEMPERATURE (^{O}F)	3.3									
Eh	-33.7									
TIME	0947									

COMMENTS: Field parameters measured following sample collection.

12/16/99: Sample collected from the SPDES outfall at Tonawanda Creek. Water was very clear. No sheen or odors observed.

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WELL PURGING AND SAMPLING LOG

SITE NAME:	Former Gastown Manufactured Gas Plant Site	SITE NUMBER:	915171
SAMPLER:	Glenn M. May		
PURGE DATE:	N/A	START PURGE: N/A	END PURGE: N/A
SAMPLE DATE:	December 16, 1999		SAMPLE TIME: 1415

WELL NUMBER:_____**Primary Sump**_____

1. TOTAL CASING AND SCREEN LENGTH (FT): _____
2. CASING INTERNAL DIAMETER (IN): _____
3. WATER LEVEL BELOW TOP OF CASING (FT): _____
4. VOLUME OF WATER IN CASING (GAL): _____

#1 - #3 x #2 (Gal/Ft)

VOLUME OF 3 CASINGS: _____GAL

WELL ID.	VOL. (GAL/FT)
1"	0.041
2"	0.163
3"	0.367
4"	0.653
5"	1.020
6"	1.469
8"	2.611

	ACCUMULATED VOLUME PURGED (GALLONS)									
PARAMETERS	Sample									
pH	7.14									
CONDUCTIVITY (µmhos)	1082									
TURBIDITY (NTU)	5.2									
TEMPERATURE (^{O}F)	14.1									
Eh	-20.0									
TIME	1425									

COMMENTS: Field parameters measured following sample collection.

12/16/99: Sample collected from the primary sump of the Gastown Sportsmen's Club. Water was very clear with a slight NAPL odor, but no sheen or NAPL was observed.

APPENDIX C

SOIL BORING AND MONITORING WELL SUMMARY TABLES

Table C-1.
Stratigraphic Summary of Borings and Monitoring Wells Completed at the Former Gastown Manufactured Gas Plant Site.
All Depths and Elevations are Measured in Feet.

Well or Boring Number	Date Completed	Total Depth	Ground Surface Elevation	Miscellaneous Fill **			Upper Silty Clay			Alluvial Deposit			Gravel Deposit			Lower Silty Clay	
				Depth	Surface Elevation	Thickness	Depth	Surface Elevation	Thickness	Depth	Surface Elevation	Thickness	Depth	Surface Elevation	Thickness	Depth	Surface Elevation
SB-1	6/3/96	20.0	574.45				0.5	573.95	7.3	7.8	566.65	12.0	19.8	554.65			
SB-2	6/3/96	12.0	574.45 *				1.0	573.45	6.0	7.0	567.45						
SB-3	6/3/96	21.0	574.44				2.0	572.44	9.5	11.5	562.94	7.9	19.4	555.04	0.6	20.0	554.44
SB-4	6/3/96	12.0	574.45 *	0.3 •	574.15	1.5	1.8	572.65	3.7	5.5	568.95						
SB-5	6/3/96	12.0	574.30 *	0.3 •	574.00	1.7	2.0	572.30	9.0	11.0	563.30						
SB-6	6/3/96	8.0	574.30 *	0.3 •	574.00	1.2	1.5	572.80									
SB-7	6/3/96	8.0	574.30 *				2.0	572.30									
SB-8	6/3/96	8.0	574.30 *				2.0	572.30									
SB-9	6/3/96	8.0	574.75 *				2.8	571.95									
SB-10	6/3/96	8.0	574.30 *				2.2	572.10									
SB-11	6/3/96	8.0	574.30 *				2.0	572.30									
SB-12	6/3/96	8.0	574.30 *				2.2	572.10									
SB-13	6/4/96	22.0	576.39	0.0	576.39	1.8	1.8	574.59	9.2	11.0	565.39	11.0	22.0	554.39			
SB-14	6/4/96	24.0	575.58	0.0	575.58	0.5	0.5	575.08	9.5	10.0	565.58	12.5	22.5	553.08	0.2	22.7	552.88
SB-15	6/4/96	20.0	575.41	0.0	575.41	2.0	2.0	573.41	8.0	10.0	565.41						
SB-16	6/5/96	24.0	576.89	0.0	576.89	3.0	3.0	573.89	6.0	9.0	567.89	14.0				23.0	553.89
SB-17	6/5/96	24.0	577.08	0.0	577.08	3.1	3.1	573.98	7.9	11.0	566.08	11.0				22.0	555.08
SB-18	6/5/96	24.0	575.85	0.0	575.85	5.0	5.0	570.85	7.0	12.0	563.85	9.5	21.5	554.35	1.0	22.5	553.35
SB-19	6/5/96	24.0	576.02	0.0	576.02	3.0	3.0	573.02	7.0	10.0	566.02	12.5	22.5	553.52	0.7	23.2	552.82
SB-20	6/6/96	24.0	576.49	0.0	576.49	4.5	4.5	571.99	4.9	9.4	567.09	13.8	23.2	553.29	0.2	23.4	553.09
SB-21	6/6/96	12.0	577.54	0.0	577.54	5.8	5.8	571.74									
SB-22	6/6/96	20.0	577.33	0.0	577.33	2.0	2.0	575.33	10.0	12.0	565.33						
SB-23	6/7/96	24.0	576.85	0.0	576.85	4.0	4.0	572.85	11.5	15.5	561.35	5.3	20.8	556.05	0.4	21.2	555.65
SB-24	6/7/96	24.0	576.43	0.0	576.43	2.0	2.0	574.43	10.0	12.0	564.43	12.0				24.0	552.43
SB-25	6/10/96	23.2	577.60	0.0	577.60	5.5	5.5	572.10	6.5	12.0	565.60	11.0	23.0	554.60	0.2	23.2	554.40

Table C-1 (continued).
Stratigraphic Summary of Borings and Monitoring Wells Completed at the Former Gastown Manufactured Gas Plant Site.
All Depths and Elevations are Measured in Feet.

Well or Boring Number	Date Completed	Total Depth	Ground Surface Elevation	Miscellaneous Fill **			Upper Silty Clay			Alluvial Deposit			Gravel Deposit			Lower Silty Clay	
				Depth	Surface Elevation	Thickness	Depth	Surface Elevation	Thickness	Depth	Surface Elevation	Thickness	Depth	Surface Elevation	Thickness	Depth	Surface Elevation
SB-26	6/10/96	20.0	574.21				1.5	572.71	14.5	16.0	558.21	3.5	19.5	554.71	0.2	19.7	554.51
MW-2S	6/5/98	9.0	575.32	A stratigraphic log is not available for this boring													
MW-3S	6/5/98	8.5	574.91	A stratigraphic log is not available for this boring													
MW-1I	6/4/98	26.0	575.85	0.3	575.55	1.7	2.0	573.85	2.7	4.7	571.15	16.4	21.1	554.75	0.9	22.0	553.85
MW-2I	6/4/98	26.0	575.47	0.0	575.47					4.4	571.07	16.6				21.0	554.47
PW-1	6/3/98	30.0	575.50	0.0	575.50					4.8	570.75	17.3	22.0	553.50	1.0	23.0	552.50
SB-27	12/7/99	28.0	575.27	0.0	575.27	4.4	4.4	570.87	6.9	11.3	563.97						
SB-28	12/7/99	24.0	577.93	0.6	577.33	4.4	5.0	572.93	2.2	7.2	570.73	16.4	23.6	554.33	0.3	23.9	554.03
SB-29	12/8/99	24.0	575.20	0.0	575.20	2.0	2.0	573.20	3.0	5.0	570.20	14.8	19.8	555.40			
SB-30	12/6/99	32.0	576.13	0.0	576.13	6.5	6.5	569.63	5.0	11.5	564.63						
SB-31	12/6/99	26.0	576.21	0.0	576.21	2.0	2.0	574.21	4.4	6.4	569.81	17.0	23.4	552.81	0.9	24.3	551.91
SB-32	12/6/99	28.0	575.32	0.0	575.32	1.3	1.3	574.02	2.7	4.0	571.32	19.8				23.8	551.52
SB-33	12/7/99	16.0	574.03	0.4	573.63	0.4				0.8	573.23						
SB-34	12/8/99	20.0	574.72	0.3 ●	574.42	0.7	1.0	573.72					19.2	555.52			
SB-35	12/8/99	20.0	574.52	0.3 ●	574.22	0.6	0.9	573.62	2.6	3.5	571.02	15.8	19.3	555.22			
SB-36	12/8/99	20.0	574.28				2.0	572.28	2.4	4.4	569.88	13.9	18.3	555.98	0.5	18.8	555.48
SB-37	12/9/99	20.0	574.69	0.0	574.69	2.0	2.0	572.69	5.6	7.6	567.09	8.2	15.8	558.89			
SB-38	12/9/99	24.0	576.81	0.0	576.81	5.2	5.2	571.61	4.0	9.2	567.61	13.5	22.7	554.11	1.0	23.7	553.11
SB-39	12/9/99	24.0	577.09	0.0	577.09	4.2	4.2	572.89	3.8	8.0	569.09	15.1	23.1	553.99	0.9	24.0	553.09

*** Ground surface elevation estimated from nearby surveyed borehole locations.**
**** Miscellaneous fill includes the crushed stone of the parking lots but does not include topsoil.**
● Topsoil thickness estimated at 0.3 feet when a specific thickness is not given.

Table C-2.
Monitoring Well Instrumentation Summary for Monitoring Wells Installed at the Former Gastown MGP Site.

Well Designation	Ground Surface Elevation (ft. AMSL)	Top of Riser Elevation (ft. AMSL)	Sandpack Interval (ft. BGS)	Sandpack Interval (ft. AMSL)	Well Screen Interval (ft. BGS)	Well Screen Interval (ft. AMSL)	Primary Geologic Unit(s) Screened
Shallow Zone Wells							
MW-13	576.39	576.09	5.0 to 16.0	571.39 to 560.39	6.0 to 16.0	570.39 to 560.39	Upper Silty Clay; Alluvial
MW-17	577.08	576.86	6.0 to 17.0	571.08 to 560.08	7.0 to 17.0	570.08 to 560.08	Upper Silty Clay; Alluvial
MW-1S	575.39	576.84	N/A	N/A	0.0 to 9.5	575.39 to 565.89	Upper Silty Clay
MW-2S	575.32	574.77	3.5 to 9.0	571.82 to 566.32	4.0 to 9.0	571.32 to 566.32	Upper Silty Clay
MW-3S	574.91	574.55	3.0 to 8.5	571.91 to 566.41	3.5 to 8.5	571.41 to 566.41	Upper Silty Clay
MW-39	577.09	576.85	3.0 to 12.0	574.09 to 565.09	5.0 to 12.0	572.09 to 565.09	Upper Silty Clay; Alluvial
Intermediate Zone Wells							
MW-23	576.85	576.61	13.0 to 24.0	563.85 to 552.85	14.0 to 24.0	562.85 to 552.85	Alluvial Deposit
MW-1I	575.85	575.43	5.0 to 26.0	570.85 to 549.85	6.0 to 26.0	569.85 to 549.85	Alluvial Deposit
MW-2I	575.47	575.08	5.0 to 26.0	570.47 to 549.47	6.0 to 26.0	569.47 to 549.47	Alluvial Deposit
PW-1	575.50	574.58	8.0 to 25.5	567.50 to 550.00	10.0 to 25.0	565.50 to 550.50	Alluvial Deposit
MW-27	575.27	575.17	8.0 to 25.0	567.27 to 550.27	10.0 to 25.0	565.27 to 550.27	Alluvial Deposit
MW-34	574.72	574.56	3.0 to 20.0	571.72 to 554.72	5.0 to 20.0	569.72 to 554.72	Alluvial Deposit
MW-35	574.52	574.31	3.0 to 20.0	571.52 to 554.52	5.0 to 20.0	569.52 to 554.52	Alluvial Deposit
MW-36	574.28	574.13	3.0 to 20.0	571.28 to 554.28	5.0 to 20.0	569.28 to 554.28	Alluvial Deposit

Ft. AMSL **Feet Above Mean Sea Level.**
Ft. BGS **Feet Below Ground Surface.**
N/A **Not Applicable.**