



# **Revised Performance Monitoring Plan**

**Hyde Park Landfill Site  
Town of Niagara, New York**

Glenn Springs Holdings, Inc.

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# 1. Introduction and Background

## 1.1 Purpose of this report

The Hyde Park Landfill Site (Site or Landfill) is located in the Town of Niagara, New York. A Site location map is presented on Figure 1.1. This revised Performance Monitoring Plan (PMP) presents an update to the PMP dated July 31, 2006, and documents the Site monitoring and reporting activities that will be performed to ensure that the remedial systems continue to operate effectively and thereby adhere to agency regulations at the Site. This PMP has been completed in accordance with the Stipulation on Requisite Remedial Technology (RRT).

This PMP is organized as follows:

Section 1.0	Introduction and Background
Section 2.0	Implementation
Section 3.0	Overburden Operations and Monitoring
Section 4.0	Bedrock Operations and Monitoring
Section 5.0	Community Monitoring
Section 6.0	Treatment System Monitoring
Section 7.0	Fifth-Year Monitoring Event
Section 8.0	Maintenance Inspections Field Procedure Development

## 1.2 Background

### 1.2.1 Site History

The Hyde Park Landfill is an inactive disposal facility where approximately 80,000 tons of liquid, sludge, and debris chemicals, primarily chlorobenzenes, were placed from 1953 until 1975 when the landfill was closed. Hooker Chemical Corporation operated the Site during this time period. During the period of operation, the Site received chemical waste, including non-aqueous phase liquids (NAPL). The chemical wastes were primarily chlorinated organic compounds and phenols. OCC acquired the Site in 1975. The landfill portion of the Site was closed by OCC in 1975 and covered with a clay cap in 1978. Glenn Springs Holdings, Inc. (GSH), an affiliate of OCC, has managed the Site since 1988. In 1995, a final cap, including a subsurface synthetic membrane, was installed over the landfill. Remedial systems were installed at the Site between 1978 and 1996 in the overburden and bedrock to control the flow of groundwater and NAPL in the vicinity of the Site. These systems have been operated and maintained since the time of installation. A list of the personnel involved with the operation and maintenance (O&M) of the Site is presented in Table 1.1.

In July 2011, New York State Department of Environmental Conservation (NYSDEC) reclassified the Site on the Registry of Inactive Hazardous Waste Disposal Sites to a Class 4 site, indicating that it no longer presents a significant threat to public health and/or the environment. Effective October 23, 2013, United States Environmental Protection Agency (USEPA) deleted the Site from the National Priorities List. As published in the Federal Register, Vol. 78, No. 205, Pg. 63099, "The EPA and the State of New York, through the Department of Environmental Conservation, have determined that all appropriate response actions under CERCLA, other than operation, maintenance, and 5-year reviews, have been completed."

## 1.2.2 Remedial Actions and Historical Monitoring Programs

On April 30, 1982, the United States District Court (Court) approved a "Stipulation and Judgment Approving Settlement Agreement" (Settlement Agreement) between OCC and the USEPA and NYSDEC. The Settlement Agreement required a Site geologic and hydrogeologic characterization. Initial subsurface investigations at the Site between 1983 and 1986 (CRA, 1983; CRA, 1984). These investigations identified off Site migration of dissolved phase contaminants and NAPL in the overburden and the Lockport Formation bedrock.

The requirements for Site remediation were presented in the RRT, which was approved by the Court on August 11, 1986. The RRT defined the following remedial action elements/monitoring programs:

- Source Control System
- Overburden Requisite Remedial Technology (RRT) System
- Lockport Bedrock RRT NAPL Plume Containment System
- Lockport Bedrock RRT Aqueous Phase Liquid (APL) Plume Containment System
- Intermediate Formations Monitoring
- Gorge Face Seep Program
- Residential Community Monitoring Program
- Bloody Run Creek Monitoring Program
- Collected Liquids and Treatment Plant

The RRT also specified hydraulic, physical, and chemical monitoring programs for each remedial action element, as well as performance criteria. Figure 1.2 shows the location and extent of the various remedial action elements.

A Long-Term Monitoring Manual was prepared in 1998 and approved by the USEPA. That plan defined distinct monitoring programs for each of the RRT remedial action elements listed above.

Since 1993, the performance of the RRT remedial action elements have been tracked by OCC and GSH and reported to the Agencies (the USEPA, NYSDEC, and New York State Department of Health [NYSDOH]) in the Site monitoring reports. The Site data indicated that each remedial action element satisfied the performance requirements of the RRT with the exception of the Lockport Bedrock RRT NAPL Plume Containment System. The existing hydraulic monitoring could not demonstrate 100 percent containment of the bedrock NAPL plume. Therefore, an additional investigation and/or remedial action element was required at the Site.

In 2000, GSH initiated a review of the groundwater conditions in the Lockport Formation bedrock in the vicinity of the Site. This review resulted in the completion of extensive additional investigations and the preparation of seven significant reports, as follows:

- Site Characterization Report: Revised Geologic and Hydrogeologic Characterization (SCR-G), February 2002
- Site Characterization Report: Hydrologic Characterization (SCR-H), February 2003
- Site Characterization Report: Groundwater Flow Model (SCR-M), May 2003
- Remedial Characterization Report (RCR-03), May 2003
- Major Ions Study, November 2003
- Site Characterization Report: Bedrock Groundwater Quality (SCR-Q), April 2004
- Comprehensive Remedial Characterization Report (RCR -04), August 2004

The results of these efforts demonstrated that the Lockport Bedrock RRT NAPL Plume Containment System satisfied the remedial objectives presented in the RRT.

### 1.2.3 Site Conceptual Groundwater Model

The following section presents the conceptual model for the groundwater system at the Site. The conceptual model is a summary of the findings of the SCR-G, SCR-H, and SCR-M. For additional details on the hydrogeologic conditions at the Site refer to these reports. The major elements of the Site conceptual model are as follows:

- The hydrogeologic units of interest are the overburden and the Lockport Formation bedrock.
- The overburden is a low permeability glacial till, except where it has been disturbed for the installation of subsurface utilities:
  - Vertical downward flow is dominant in the overburden.
  - Containment of the Site groundwater in the overburden is accomplished by a combination of the horizontal collection systems, and flow into the bedrock that is ultimately contained by groundwater recovery from the bedrock.
- The Lockport Formation bedrock contains 11 bedding-parallel (dipping approximately 9 degrees south) groundwater flow zones, FZ-01 being the shallowest and FZ-11 being the deepest:
  - Vertical downward flow is dominant in the shallowest flow zones.
  - Horizontal flow is dominant in the deeper flow zones.
  - Local disruptions of flow conditions can occur due to wells or subsurface features that are open across multiple flow zones.
  - Containment of Site groundwater is achieved by the bedrock purge wells under pumping conditions.
  - Groundwater is recharged by precipitation, the New York Power Authority (NYPA) Forebay, and potentially the NYPA conduits.
  - Under non-pumping conditions, Site groundwater discharges to the Niagara River gorge and potentially to the NYPA Forebay and conduits. It is possible that at the same time, some flow zones may discharge to the NYPA Forebay and conduits while others are recharged by these features.

The 11 bedding-parallel flow zones were identified in the SCR -G based on Site geophysical studies and correlation with studies performed by Johnston (1964), Kappel and Tepper (1992), and Yager (1996). The hydraulic significance of the flow zones varies across the site and is discussed in detail in the SCR -H.

As of October 2004, 126 1-inch diameter piezometers had been installed to monitor 8 of the 11 flow zones. Due to constructability issues, it was not practical to monitor all 11 flow zones. Flow zones FZ-03, FZ-08, and FZ-10 were not included in the monitoring. Flow zones FZ-03 and FZ-08 are in very close proximity to adjacent flow zones. The hydraulic properties measured in FZ-10 (after it was designated as a flow zone) are more like those of an aquitard than a flow zone. FZ-10 is currently considered part of the aquitard between FZ-09 and FZ-11. The Site characterizations show that a program that does not monitor flow zones FZ-03, FZ-08, and FZ-10 does not hinder the understanding of the groundwater system at the Site and is appropriate for the Site.

### 1.2.4 Bloody Run Creek

Bloody Run Creek receives surface runoff from the Landfill and surrounding area. During Landfill operation, NAPL entered the storm sewer/surface drainage at the Landfill, flowed north into Bloody Run Creek, and ultimately discharged into the Niagara River. Major remedial activities related to Bloody Run were completed between 1990 and 1995. These activities are described in Final Construction Report Bloody Run Excavation and Sewer Remediation Hyde Park Remedial Program, dated March 1, 1993.

Four Bloody Run monitoring wells were installed into the upper bedrock in 1999. Figure 1.3 shows the locations of these wells. Groundwater samples from these wells were analyzed in 2000, 2001, and 2002 for chlorobenzene, monochlorotoluenes, 2,4,5-Trichlorophenol, and hexachlorobenzene, Bloody Run Monitoring Parameters listed in the RRT. All samples were non -detect with the exception of a 1.1 micrograms per liter ( $\mu\text{g/L}$ ) detection of chlorobenzene at BR-4 in 2000 which is well below the USEPA Maximum Contaminant Level (MCL) for chlorobenzene of 100  $\mu\text{g/L}$ .

## 1.2.5 APL and NAPL Plume Boundaries

The RRT defined boundaries for the APL and NAPL plumes in the overburden and bedrock in 1986. Figure 1.4 presents both plumes for the bedrock as defined in the RRT. The overburden APL plume boundary was modified from the RRT delineation in the vicinity of Bloody Run Creek in 1995 following installation and sampling the Bloody Run monitoring wells. The NAPL and APL boundaries were modified after delisting of the Landfill in 2011.

Following re-characterization of the Lockport bedrock between 2002 and 2004, NAPL plume boundaries were defined for each of the 11 flow zones. The NAPL plume boundaries were determined jointly by the Agencies, GSH, and GSH's consultants during a meeting on April 28 and 29, 2003. The criteria for NAPL plume delineation, and maps of the NAPL plumes were presented in Appendix A of the RCR-03.

## 2. Implementation

This section outlines the numerous Site monitoring programs to be performed at various frequencies to ensure that the remedial systems continue to operate effectively and within agency reporting requirements. Details on each monitoring program are presented in Sections 3 through 6.

### 2.1 Regulatory Requirements

The original Site monitoring and remedial performance requirements for the Site were defined in the 1986 RRT document. Extensive remediation, investigation, and evaluation of the Site have been completed since the RRT was approved. The monitoring and performance requirements presented in this PMP were based on these studies and experience operating the remedial systems at the Site.

Section 10.4 of the RRT states, "Following any reassessment per this Section 10.0, appropriate modification of this Stipulation may be made by agreement of EPA/State and OCC or by order of the Court." Upon agreement by the Agencies, the monitoring and performance requirements presented in this PMP will supersede those of the RRT.

### 2.2 Current Monitoring Programs

The RRT defined nine remedial action elements/monitoring programs as presented in Section 1.1.2. The PMP groups the nine remedial action elements/monitoring programs into four monitoring programs based on the current Site understanding and the similar nature of some of the original nine remedial action elements/monitoring programs. The four monitoring programs are as follows:

- Overburden Monitoring: The Overburden Monitoring Program was developed to monitor the performance of the RRT Source Control System and the Overburden RRT System. The procedures of the Overburden Monitoring Program are described in Section 3.
- Bedrock Monitoring: The Bedrock Monitoring Program was developed to monitor the Lockport Bedrock RRT APL and NAPL Plume Containment Systems, and the Bloody Run Creek Monitoring that. The procedures of the Bedrock Monitoring Program are described in Section 4.
- Community Monitoring: The Community Monitoring Program includes the Gorge Face Seep Inspection Program, the APL flux monitoring program, and the Residential Community Monitoring Program. The procedures of the Community Monitoring Program are described in Section 5. These programs are in place to ensure that no current exposure to Site-related parameters is occurring at levels of concern and the Site groundwater capture and treatment systems provide protection to human health and the environment.
- Treatment System Monitoring: The Treatment System Monitoring Program was developed to replace the Collected Liquids and Treatment Plant Monitoring that was presented in the RRT. The procedures of the Treatment System Monitoring Program are described in Section 6.

The Intermediate Formations Monitoring Program presented in the RRT was eliminated. The additional investigations that began in 2000 and ended with the submission of the RCR-04 identified that the monitoring of long, open-interval bedrock monitoring wells was not appropriate for the Site. The long, open-interval bedrock monitoring wells caused a connection between the groundwater flow zones present at the Site. Therefore, these monitoring wells were not appropriately designed to monitor the bedrock aquifer at the Site. In order to monitor the bedrock aquifer at the Site, some of the existing wells were retro-fit with 1-inch diameter piezometers to monitor individual flow zones. The Intermediate Formation wells and Lockport Bedrock monitoring wells which were not retro-fit with 1-inch diameter piezometers were sealed and abandoned in 2008 using the abandonment procedures defined in FP-07a of the FPM.

## 2.3 Monitoring Program and Reporting Summary

Table 2.1 presents a summary of the monitoring and reporting activities defined in Sections 3 through 6. For each activity, Table 2.1 references the program that encompasses the activity, additional tables and procedures that relate to the activity, the frequency of the activity and the report that will present the results of the activity.

## 2.4 Field Procedures

Standard field procedures have been defined for the monitoring program activities. These procedures are numbered FP-01A through FP-08A and are referenced when a measurement or sampling task is discussed. The appropriate field procedures for each monitoring program activity are identified on Table 2.1. Descriptions of the field procedures are provided in the GSH Field Procedures Manual (FPM which is presented in Appendix A). All field activities will be conducted in accordance with the applicable Field Procedures presented in the FPM (GHD, 2016), the analytical requirements presented in Appendix B, and the current Site-Specific Health and Safety Plan for the GSH Western New York Sites (HASP).

## 2.5 Analytical Parameters

The analytical parameters, included in individual sampling events are defined in Table 2.1. These analytical parameters were selected based on the findings of the SCR-Q, Major Ions Report, the RCR-04, and comments from the EPA. Analytical requirements, e.g., quality assurance and controls, are presented in Appendix B of this PMP. Table B.1 identifies laboratory analytical methodologies; Table B.2 presents parameter lists by analytical group, including: the Volatile Organic Compounds (VOCs), Semi-Volatile Organic Compounds (SVOCs), Dioxins/Furans, Polychlorinated Biphenyls (PCBs), Organic Acids, and Pesticides.

## 2.6 Site Groundwater Screening Values

The SCR-Q presented the first detailed groundwater quality sampling event completed at the Site since the mid-1980s. The SCR-Q sampling included analyses for the full target compound list of VOCs and SVOCs, plus organic acids and major ions. The Site groundwater screening levels were developed in the SCR-Q because interpretation of Site-related impact has historically been based on the detection of the Site-related parameters. No consideration of the "significance" of a detection was incorporated. A 100 µg/L detection of toluene (USEPA MCL=1,000 µg/L) was treated identically to a 100 µg/L detection of 1,2,4-trichlorobenzene (USEPA MCL=70 µg/L). In order to account for the toxicity of individual parameters, "screening values" for the Site-related organics were developed.

The screening values were developed based on published drinking water criteria. A review of available, published, risk-based drinking water standards was conducted. Screening values were established for all organic parameters included in the analysis of the groundwater samples using the following hierarchy of sources:

1. USEPA MCLs
2. USEPA Region III Risk-Based Concentrations (RBCs), ingestion of tap water

3. New Jersey Department of Environmental Protection (NJDEP), Groundwater Quality Standards, ingestion of tap water
4. Ontario Ministry of the Environment (MOE) GW-1 Drinking Water (risk-based)
5. NYCRR Title 6, Groundwater Standards/Guidance Values
6. NYCRR Title 10, Drinking Water Standards

For example, if a parameter had an MCL, then the MCL was used as the screening value. If the parameter did not have an MCL, but had a Region III RBC, then the Region III value was used as the screening value. In the case of 2-chlorotoluene, 3-chlorotoluene, and 4-chlorotoluene, the Region III RBC of 120 micrograms per liter ( $\mu\text{g/L}$ ) for 2-chlorotoluene was applied for all isomers given their similar chemistry and toxicology. The same approach was used for 2-chlorobenzoic acid, 3-chlorobenzoic acid, and 4-chlorobenzoic acid, where the Region III RBC of 7.3 milligrams per liter ( $\text{mg/L}$ ) for 4-chlorobenzoic acid was applied to the other isomers. The New York State NYCRR Title 6 and 10 standards were assigned the lowest position in the hierarchy because these standards are not consistently risk based. Table 2.2 presents a summary of the Hyde Park screening levels developed in the SCR-Q. Only Outer piezometers (piezometers located outside the perimeter of historical NAPL presence) were considered in this screening comparison. The Inner piezometers (locations within or near the Site NAPL plume) are expected to have higher chemical concentrations and are therefore not appropriate for monitoring the extent of APL migration.

Following the development of the screening values, the analytical data collected for the development of the SCR-Q were compared to the screening values. This was done in order to select parameters for further evaluation. The analytical data used in the screening were compiled in the following manner:

- The values of duplicate samples for a well in the same monitoring event were averaged. If one value was non-detect, the detected result was used for screening.
- For wells that were sampled in more than one event, the highest value was used in the screening process.

Eleven parameters were identified as being both potentially Site-related (detected in the NAPL solubility study) and exceeding a screening value in one or more of the Outer piezometers or the APL purge wells. Only the Outer piezometers and APL purge well data were used in this screening as the objective of the SCR-Q was to assess the extent of potential Site impact beyond the NAPL plumes, not to study the nature of the source area.

Two parameters, 1,1,2-trichloroethane and 1,2,3-trichlorobenzene, had only one exceedance of a screening value. The 1,1,2-trichloroethane exceedance occurred in G6-01 where there were several other VOC exceedances. The 1,2,3-trichlorobenzene was a J-qualified detection of  $5.95 \mu\text{g/L}$ . The screening value is  $5 \mu\text{g/L}$ . A duplicate sample was reported as non-detect. The laboratory quantitation limit was  $10 \mu\text{g/L}$ ; however, detections as low as  $1 \mu\text{g/L}$  are normally reported with a J-qualifier. A sample from the same piezometer on a different date was also reported as non-detect with a laboratory quantitation limit of  $10 \mu\text{g/L}$ .

Based on these observations, nine organic parameters were defined as Site Organic Indicators (SOIs). The SOIs are listed in the table below along with a comment regarding the parameter. The comments in the table point out important characteristics of these parameters; they are not intended as an argument that they are not Site-related. The common industrial solvents and petroleum hydrocarbons have long been recognized as having potential sources other than the landfill and have not been included in the historical analytical list for this reason.

**Table 1**                      *Historical Analytical List*

SOI	Abbreviation	Comment
Chlorendic Acid		Site-related organic acid
Benzene		Common petroleum hydrocarbon
1,1,2,2-Tetrachloroethane	1122PCA	Common industrial solvent
Tetrachloroethene	PCE	Common industrial solvent
Trichloroethene	TCE	Common industrial solvent

SOI	Abbreviation	Comment
Cis -1,2-dichloroethene	Cis12DCE	Degradation product of PCE and TCE
Vinyl Chloride	VC	Degradation product of PCE and TCE
Bis(2-ethylhexyl)phthalate	BEHP	Common laboratory contaminant
Methylene Chloride	MC	Common laboratory contaminant

Of the SOIs, chlorendic acid is the most useful indicator parameter to monitor Site-related impacts to groundwater. Of the nine SOIs, only chlorendic acid was included in the RRT sampling requirements. Five of the SOIs are common industrial solvents (or their environmental degradation/breakdown products) while associated with the Landfill, they are also potentially related to nearby industries. Benzene is related to petroleum hydrocarbons and is usually associated with fuel releases. Two of the SOIs, MC and BEHP, are common laboratory contaminants.

Chlorendic acid is detected in the organic acids analysis. Therefore, the organic acids analysis is proposed for the most frequent sampling.

## 2.7 Notifications

The Agencies will be contacted at least 4 weeks prior to a Gorge Face Seep Inspection. The notification will allow the agencies adequate time to coordinate oversight of the activity, if required.

## 2.8 Reporting

Four types of reports will be prepared based on the monitoring defined in this PMP.

- Quarterly Operations Report
- Quarterly Significant Industrial Discharge Report
- Annual Periodic Review Report (PRR)
- Five -Year Site Remedial Performance Report

### 2.8.1 Quarterly Operations Report

The Quarterly Operations Report (Quarterly Report) will provide performance data necessary to ensure that the remediation systems are operating as designed, i.e., that pumping systems are recovering the volume of water necessary to control the contaminant migration. The following will be included in the Quarterly Reports:

- i. Potentiometric surface maps for the overburden and the eight monitored flow zones in the Lockport Formation Bedrock.
- ii. Graphs of continuously recorded water levels at flow zone piezometer PMW-1M-09.
- iii. A water level elevation summary table of the quarterly water levels measured at the overburden and bedrock monitoring wells.
- iv. Purge well performance graphs indicating daily level and flow information.

In addition to the above-mentioned report elements, any relevant Site maintenance activities will be included.

The remedial activities to be outlined in the Quarterly Reports are listed in Table 2.1 in the "Report" column. The Quarterly Reports will be submitted to the Agencies within 30 days following the end of each quarter.

### 2.8.2 Quarterly Significant Industrial Discharge Report

The Quarterly Significant Industrial (SIU) Discharge Report is a required element of the Site's SIU Permit No. 49 from the Niagara Falls Water Board (NFWB). As such, the required elements of the SIU Discharge Report are outlined in

the Site's current SIU Permit. Please refer to the current SIU permit for the current report details. NYSDEC will be copied on the submittal email of this report to the NFWB.

### 2.8.3 Periodic Review Report

In a letter dated January 23, 2015 the NYSDEC requested the Site's Annual Report to be submitted as a PRR drafted in accordance with Section 6.3(b) of the NYSDEC's DER-10 *Technical Guidance for Site Investigation and Remediation* (DER -10). The Site's 2014 annual report was the first report submitted as a PRR due to the NYSDEC request. The PRR replaces the Annual Site Remedial Performance Report previously submitted to the Agencies. An Annual PRR will be prepared yearly for the Site. The PRR will provide all of the required information referenced in DER-10, including the year's monitoring data (analytical, water levels, and flow rates), and an assessment of the Overburden, Bedrock, and Community Monitoring data. The remedial activities to be outlined in the PRR are listed in Table 2.1 in the "Report" column. The objective of the report is to provide a yearly evaluation of the overall remedial performance. If appropriate, the PRR will include recommended modifications to the PMP. The PRR will be submitted by April 30 of the following year.

### 2.8.4 Five -Year Site Remedial Performance Report

The Five-Year Report will present a review of the Site conditions and a statistical evaluation of the analytical data collected over the preceding five years. The sampling parameters, frequency, and locations will be reassessed. The need for sampling of the Inner piezometers (piezometers within or near the current or historical NAPL Plume boundaries) will be reviewed. The remedial activities to be outlined in the Five-Year Report are listed in Table 2.1 in the "Report" column. The Five-Year Report will recommend any appropriate modifications to the PMP for the following five years.

The first Five-Year Report was submitted on April 30, 2012 covering the period 2006 through 2011. Future Five-Year Reports will be submitted by April 30<sup>th</sup> in five-year increments from 2012.

## 3. Overburden Operations and Monitoring

The locations of the monitoring wells and the remedial action elements completed in the overburden are presented in Figure 3.1.

### 3.1 Operations

There are three active remediation systems installed in the overburden:

- The Source Control (SC) System
- The Existing Barrier Collection System installed in 1978 (1978 BCS)
- The Overburden Barrier Collection System installed in 1992 (1992 OBCS)

The SC System includes five recovery wells (SC-2 to SC-6) completed within the Landfill to recover NAPL before it enters the Lockport Bedrock, and seven observation wells (OEW-1 to OEW-7) to monitor SC performance. The SC wells and their classification are presented in Table 3.1. SC-1 is no longer utilized for source control. SC-1's well casing and well screen have separated. Additionally, historical data indicates that SC-1 did not yield significant amounts of NAPL. Therefore, SC-1 is no longer utilized at the Site.

The 1978 BCS and 1992 OBCS are French-drain systems completed through the overburden to the top of bedrock. The 1978 BCS is an on-site system located along the Landfill perimeter to control and recover NAPL and groundwater. The 1992 OBCS is an off-site system intended primarily to control the migration of dissolved phase contaminants.

Pumping from the 1978 BCS and 1992 OBBS occurs at three "wet wells" or sumps. One wet well is in the 1978 BCS and two are in the 1992 OBBS. In the 1978 BCS, pumping is controlled by high-low level switches. The 1992 OBBS pumping is controlled electronically by adjusting set-points to achieve target water levels in the wet wells. Pumping is cycled to maintain the set-points. To ensure continued performance of the overburden control systems, the wet well set-points listed on Table 3.2 are maintained. Water levels in wet wells C and D are monitored continuously.

Quarterly water level monitoring of overburden wells surrounding the 1978 BCS and 1992 OBBS have always demonstrated a horizontal hydraulic gradient indicating groundwater flow toward the 1978 BCS and 1992 OBBS, and/or a downward hydraulic gradient indicating vertical flow from the overburden into the bedrock. The monitoring locations are presented in Table 3.3. These conditions satisfy the requirements of the RRT.

As needed, adjustments to the set-points may be recommended in the Quarterly Report and Annual PRR.

## **3.2 Monitoring**

All overburden groundwater monitoring will be performed in accordance with the applicable Field Procedures presented in the FPM, analytical requirements presented in Appendix A, and the HASP.

### **3.2.1 Water Level Monitoring**

Groundwater levels will be measured in the overburden system monitoring wells and in the overburden collection system manholes listed in Table 3.3. Groundwater levels will be measured in the SC monitoring wells listed in Table 3.1. The water levels in all of these monitoring locations will be measured at the frequencies presented in Table 2.1. The water level data will be reported in the Quarterly Reports and evaluated in the PRR to ensure that the systems are providing containment.

### **3.2.2 NAPL Presence Monitoring**

NAPL presence monitoring will be performed annually in overburden wells outside of the 1992 OBBS to ensure that NAPL is not bypassing the 1992 OBBS. Wells, manholes, and wet wells scheduled for NAPL presence monitoring are listed in Table 3.3.

### **3.2.3 Groundwater Quality Monitoring**

No groundwater quality monitoring is proposed for the overburden wells. The composite influent from the 1992 OBBS and 1978 BCS will be analyzed and reported as defined in Section 6, Treatment System Monitoring.

### **3.2.4 Source Control NAPL Monitoring and Collection**

The SC wells (SC-2 to SC-6) were historically operated on a monthly basis to pump down the APL/NAPL level to approximately the top of the pump in each well. The 2014 Annual PRR recommended that monthly purging of the SC wells and subsequent water level and NAPL thickness measurements be discontinued; however, in order to provide additional data to support discontinuation, it also recommended that the frequency be changed to quarterly for one year. After one year, the original recommendation to discontinue would be reevaluated. NYSDEC approved the quarterly frequency of SC water level and NAPL thickness measurements in a letter dated May 5, 2015; however, GSH maintained monthly water level and NAPL thickness measurements throughout 2015. Starting in 2016, the SC water levels and NAPL thickness were measured quarterly.

In an effort to further demonstrate that the SC wells do not produce significant amounts of NAPL, monthly manual NAPL removal from SC-6 was implemented in April 2015. Based on the declining amount of NAPL removed, the frequency was revised to quarterly.

Based on the results of manual NAPL removal from SC-6, quarterly manual NAPL removal was implemented at SC-2, SC-3, SC-4, and SC-5 in October 2016. Based on the volumes of NAPL recovered, it was recommended in the

2016 PRR that quarterly manual NAPL removal from SC wells will continue in 2017 except at SC-3 where removal will be performed on an approximate monthly basis. This change was implemented in 2017. Based on the low amounts of NAPL recovered each year from SC 5 and SC 6 since 2016, the 2019 PRR recommended that the frequency of manual NAPL at these two wells be changed to semiannual. This recommendation was approved by the NYSDEC in its 2019 PRR acceptance letter dated July 29, 2020. As such, manual NAPL removal is performed approximately monthly at SC 3, quarterly at SC 2 and SC 4, and semiannually at SC 5 and SC 6 as indicated in Table 2.1.

## 4. Bedrock Operations and Monitoring

Figure 4.1 presents the piezometers and the remedial action elements (purge wells) completed in the Lockport Formation Bedrock. All bedrock groundwater monitoring described below will be performed in accordance the applicable Field Procedures presented in the FPM in Appendix A, the analytical requirements presented in Appendix B, HASP, and following the schedules presented in Table 2.1.

### 4.1 Operations

There are two active remediation systems in the Lockport Formation bedrock:

- The NAPL Plume Containment System
- The APL Plume Containment System

Both containment systems are operated by maintaining the water level in each purge well at a fixed "set-point." Set-points have been developed to maintain an inward gradient around the Site and to maintain a maximum sustainable pumping rate at each well. Actual pumping rates from individual wells will vary seasonally to maintain the defined set-point. The pumps operate to maintain the "set point" within a typical range of 2 to 2.5 feet above (pump on) and 2 to 2.5 feet below (pump off) the "set point". All well control is computerized and remotely controllable. Water levels in the purge wells are continuously monitored. Table 4.1 presents target set-points and average pumping rate for each purge well.

The water levels in flow zone FZ-09 in the area between the Landfill and the APL purge wells (APW-1 and APW-2), are maintained at 526 feet above mean sea level (AMSL), or lower. This level requirement will ensure that the FZ-09 outcrop along the NYPA access road remains unsaturated. Water levels in piezometer PMW-1M -09, located west of the Landfill, will be monitored hourly with an electronic water level recorder for this assessment.

Well set-points, water levels, and pumping rates for each of the purge wells will be reported in the Quarterly Reports. These data will be reported as a graph to allow easy performance evaluation. Water levels from PMW-1M-09 will also be reported in the Quarterly Reports. If modifications to the well set-points or pumping rates are determined to be necessary, changes will be noted in the Quarterly Report.

### 4.2 Monitoring

#### 4.2.1 Bedrock Water Level Monitoring

Groundwater levels will be measured in the bedrock piezometers listed in Table 4.2 and at a frequency presented in Table 2.1.

Water levels in piezometer PMW-1M -09 will be recorded hourly with an electronic water level recorder. The PMW-1M-09 data will be evaluated to ensure that water levels are at or below 526 feet AMSL on a quarterly basis, as discussed previously in Subsection 4.1.

## 4.2.2 NAPL Presence Monitoring

Checks for the presence of NAPL in bedrock wells will be measured during annual well inspections. The NAPL presence data generated during the annual well inspection will be used to adjust the current bedrock NAPL boundary on the bedrock groundwater elevation figure included in the Quarterly Reports.

## 4.2.3 Groundwater Quality Monitoring

All bedrock groundwater quality sampling will be performed as defined in Table 2.1, and in accordance with the Analytical Requirements presented in Appendix B.

Groundwater quality sampling is conducted on sub-sets of the Landfill's piezometers. The frequency of groundwater sample collection is based on which sub-set the piezometer is in. Each sub-set selection was based on location, groundwater yield, and chemical concentrations.

The piezometer location criteria are defined as inner or outer piezometers. Inner piezometers are located within or near the limits of the current or historical NAPL plumes. The inner piezometers contain relatively high concentrations of Site-related parameters, greater than the screening values, and concentrations are not expected to change significantly until the NAPL plumes have been recovered. Therefore, the inner piezometers are not sampled. Outer piezometers are located beyond the limits of the NAPL plume boundaries and concentrations may change in the short term. Monitoring of these piezometers will provide information regarding the performance of the remedial elements at the Site. Classification as an outer piezometer is required for selection for groundwater sampling. Each piezometer's location classification is presented in the Type column in Table 4.2.

The piezometer yield criteria are based on whether or not the piezometer can produce sufficient groundwater to provide a reliable groundwater quality sample. Only piezometers with sufficient yield are suitable for groundwater sampling.

The piezometer chemical concentration criteria are based on historical chemical concentrations. The chemical concentration criterion is not used for selection as a sampling location but for the frequency of the groundwater sampling. If a piezometer has a chemical in concentrations above the screening values, more frequent sampling will be conducted.

The sub-set of piezometers selected for periodic groundwater sampling are identified either as Group A or Group B piezometers. Group A piezometers are classified as outer piezometers with sufficient yield for groundwater sampling. The Group B piezometers are classified as an outer piezometer with sufficient yield that contains groundwater that exceeds one or more screening values. The piezometers selected for groundwater sampling and piezometer grouping are presented in Table 4.2.

Quarterly sampling of the Group B piezometers is no longer conducted. Groundwater sampling at Group A will be conducted every fifth quarter. The Group A piezometers includes the Group B piezometers. The five-quarter sample collection interval was selected to collect data at the Group A piezometers that takes into account any potential seasonal fluctuation in groundwater quality. This sampling frequency will be re-evaluated in the Five Year reports. All Group A piezometers will be sampled for VOCs during the fifth quarter event. In addition, the following piezometers will be sampled for organic acids during the fifth quarter event: D1U-05, D2M-09, D2U-05, G6-04, G6-05, H2M-06, and H2U-02.

In addition to the quarterly sampling, a Fifth-Year monitoring program will be conducted. The Fifth-Year monitoring program is intended to capture a comprehensive view of the Site. Therefore, in addition to the Group A and B piezometers, all Bloody Run Monitoring Wells (Table 4.3) and operating bedrock APL and NAPL purge wells (Table 4.1) will be sampled. This sampling frequency will be re-evaluated in the Five-Year Report. Additional information on the Fifth-Year monitoring program is presented in Section 7.0.

Figures 4.2 to 4.9 present a map of each bedrock flow zone and identify which piezometers are to be sampled in the particular zone.

## 4.3 Bloody Run Creek Monitoring

The Bloody Run Monitoring locations are identified in Table 4.3. These four wells will be sampled and the groundwater analyzed for VOCs and Organic Acids during the Fifth-Year monitoring events. Sampling of the Bloody Run Monitoring wells will be completed according to field procedure FP-04B.

As part of the Bloody Run Creek Monitoring and in addition to the Fifth-Year monitoring of the Bloody Run Monitoring wells, the catch basin on the north side of 4901 Hyde Park Boulevard will be checked annually for NAPL presence following field procedure FP-03A. NAPL presence results will be reported in the PRR. This catch basin will also be sampled annually in accordance with field procedure FP-04D. This sample will be analyzed for organic acids and results will be included in the PRR.

Additional or more frequent monitoring and sampling may be performed pending any future land use changes (e.g., parking lots, dormitories, etc.)

## 5. Community Monitoring

There are three programs that fall under community monitoring:

- Gorge Face Seep Inspection
- APL Flux Monitoring
- Community Well Monitoring

All monitoring will be performed according to the schedule in Table 2.1 and in accordance with FPM. There are no active remedial action elements for the Community Monitoring Program.

### 5.1 Gorge Face Seep Inspection

The Niagara River Gorge is open to the public and is, therefore, an area of potential direct contact with Site -related compounds through groundwater seeps. With the operation of the bedrock remedial action elements, especially the APL Collection System, groundwater from the vicinity of the Landfill no longer discharges in the gorge. However, continuing the Gorge Face Seep Inspection will ensure that the potential for public exposure is minimized. The Gorge Face Seep Inspection is currently performed biennially (24 months) on the odd numbered years; however, this frequency may be revised to every five years depending on the results of a future seep sampling event to be conducted in the fourth quarter of 2021.

The Agency Representatives, provided in Table 1.1, will be contacted at least four weeks prior to a Gorge Face Seep Inspection. A GSH representative will complete the walkover with all Agency representatives. The inspection normally takes place during the summer (August) and requires strenuous hiking in wooded and rocky terrain. Therefore, all participants should prepare for these conditions. Table 5.1 lists recommended gear for the seep inspection. Figures 5.1 to 5.3 show the locations of the known gorge face seeps. Table 5.2 presents the approximate state plane coordinates and longitude/latitude of the seep locations.

As requested by the Agencies, seep locations may be identified for subsequent water sampling. Samples will be collected within one month of a written sampling request from the Agencies. Seep samples will be collected in accordance with field procedure FP-04D in the FPM.

Seep sample results and a seep inspection summary will be included in the PRR, if conducted during the reporting period.

## 5.2 APL PLUME Flux Monitoring

The APL Plume Flux Monitoring is completed to ensure that select Site-related parameters are not discharging to the Niagara River Gorge at concentrations above the Flux Action Levels defined in the RRT. The APL Plume Flux Monitoring will be conducted in accordance with the procedures outlined in Appendix C. Table 5.3 presents the APL Flux Monitoring Parameters for the PMP and the Flux Action Levels. APL Plume Flux samples will be collected annually and the results evaluated as discussed in Appendix C. Results of the APL Plume Flux sampling will be reported in the PRR.

## 5.3 Community Well Monitoring

Community Well Monitoring is performed in shallow bedrock and overburden wells in areas of potential public exposure to vapors of Site-related compounds. The potential pathway for a community exposure is through the volatilization of chemicals. Therefore, the monitoring is focused on vapor monitoring. Should vapor monitoring results suggest a potential volatilization issue, groundwater sampling will be performed.

Figure 5.4 shows the locations of the Community Monitoring Wells.

### 5.3.1 Community Well - Groundwater Level Monitoring

Water levels will be measured in the Community Monitoring Wells listed in Table 5.4 according to the schedule in Table 2.1.

### 5.3.2 Community Well - Vapor Monitoring

Vapor monitoring will be performed annually in the soil vapor probes SVP-1 through SVP-4 and in overburden community monitoring wells CMW-7OB and CMW-8OB as listed in Table 5.5 according to the schedule in Table 2.1. The monitoring has been scheduled to occur in the third quarter of the year (July, August, or September) when temperature is high and volatilization potential is the greatest. Vapor monitoring will be performed according to FP-05A using an organic vapor analyzer (OVA) capable of detecting 0.010 parts per million by volume (ppmv) or lower, total VOCs. Should the stabilized OVA reading exceed 0.050 ppmv above background concentrations in CMW-7OB or CMW-8OB, a groundwater quality sample will be collected from the well where the elevated measurement was obtained within 2 weeks of vapor monitoring and analyzed for the parameters listed in Table 2.1 (Group A bedrock piezometer sampling list - VOCs, SVOCs, and organic acids). If the overburden well to be sampled is dry at the time of the vapor monitoring event, or if the stabilized OVA reading exceeds 0.050 ppmv above background conditions in one of the soil vapor probes during the vapor monitoring event, an air sample will be collected from the headspace of the well or soil vapor probe where the elevated measurement was obtained and analyzed for the Community Early Warning Parameters (monochlorobenzene, monochlorotoluenes, and monochlorobenzotrifluorides) in the RRT Stipulation. The air sample(s) will be collected within 2 weeks of the vapor monitoring event.

The groundwater and/or sampling results will be reported to the Agencies within 30 days of sample collection. If necessary, additional action may be taken after consultation with the Agencies. Monitoring results will also be reported in the PRR.

## 6. Treatment System Monitoring

The treatment system collects all of the liquids, groundwater, and NAPL, produced by the overburden and bedrock remediation systems. Purge and decontamination liquids generated during Site monitoring are also discharged to the Site treatment system. The water is treated and discharged to the Niagara Falls Water Board sanitary sewer system

via SIU Permit No. 49. NAPL is accumulated on Site until a sufficient quantity is available for transport to an approved hazardous waste facility.

## 6.1 Operations

The treatment system purifies approximately 50 million gallons of water each year. The treatment system effluent is monitored regularly to ensure compliance with the discharge requirements. The operations and monitoring of the treatment system are further described in the *Operation and Maintenance Manual* dated July 12, 2019.

## 6.2 Monitoring

Table 6.1 presents the sampling frequency, location, and analyte list for the treatment system monitoring as required for the SIU Permit and treatment system process monitoring as required in the O&M Manual. Figure 6.1 presents a process schematic for the Hyde Park Treatment System, including sample locations and analyses required.

SIU Permit sampling results are submitted to NFWB quarterly. NYSDEC will be copied on the submittal email submitting this report to the NFWB. Process sampling results will be reported annually in the PRR. Volumes of APL and NAPL produced from the overburden and bedrock remediation systems will be reported in the Quarterly Reports.

# 7. Fifth -Year Monitoring Event

The monitoring program will be expanded every fifth year to include additional sample locations and analytical parameters. The Fifth-Year monitoring program will:

- Evaluate whether significant changes have occurred in analytical parameters not included in the quarterly and annual programs.
- Provide a milestone for a more detailed evaluation of the Site conditions than completed in the Annual PRR.
- Provide a time to reassess the requirements of this PMP.

The additional locations to be sampled and the sample analyses to be completed are listed in Table 7.1.

The results of this monitoring will be presented in the Five-Year Report, which is described in Section 2.6. The first Five-Year Report was submitted in April 2012 covering the period 2006 through 2011. Future Five-Year Reports will be submitted by April 30<sup>th</sup> in five-year increments from 2012.

# 8. Maintenance Inspections

Maintaining the Site remedial elements is critical to the remedial performance. Therefore, inspections of the monitoring points (wells and piezometers), the Landfill cap, and the security fence surrounding the landfill have been included in the PMP and are detailed in FPM - Field Procedure FP-01B. Monitoring frequency is defined in Table 2.1.

## 8.1 Well and Piezometer Inspections

Annually, the Site monitoring wells and piezometers will be inspected to ensure that the casings and caps are secure and in good condition, and well depths will be measured for possible infilling.

Field inspection records will be maintained and will be available for inspection on request.

## **8.2 Landfill Cap Inspection**

Maintaining the Landfill cap will minimize the potential for a breach of the cap and ensure a long operational life. The cap is routinely inspected during field sampling events. These are informal inspections. A formal inspection will be completed semiannually and documented as scheduled in Table 2.1.

Field inspection records will be maintained. The inspection information will not be included in any regular reporting but will be available for inspection on request.

## **8.3 Landfill Fence Inspection**

Unauthorized access to the Landfill and treatment facility is controlled by the presence of a chain-link fence surrounding both areas. The fenced area is inspected informally every weekday during routine activities, and formally semiannually and documented as scheduled in Table 2.1. Any breach of the fence or locked gates is noted and promptly repaired.

Inspection procedures are described in Field Procedure FP-01B. Field inspection records will be maintained. The inspection information will not be included in any regular reporting, but will be available for inspection on request.

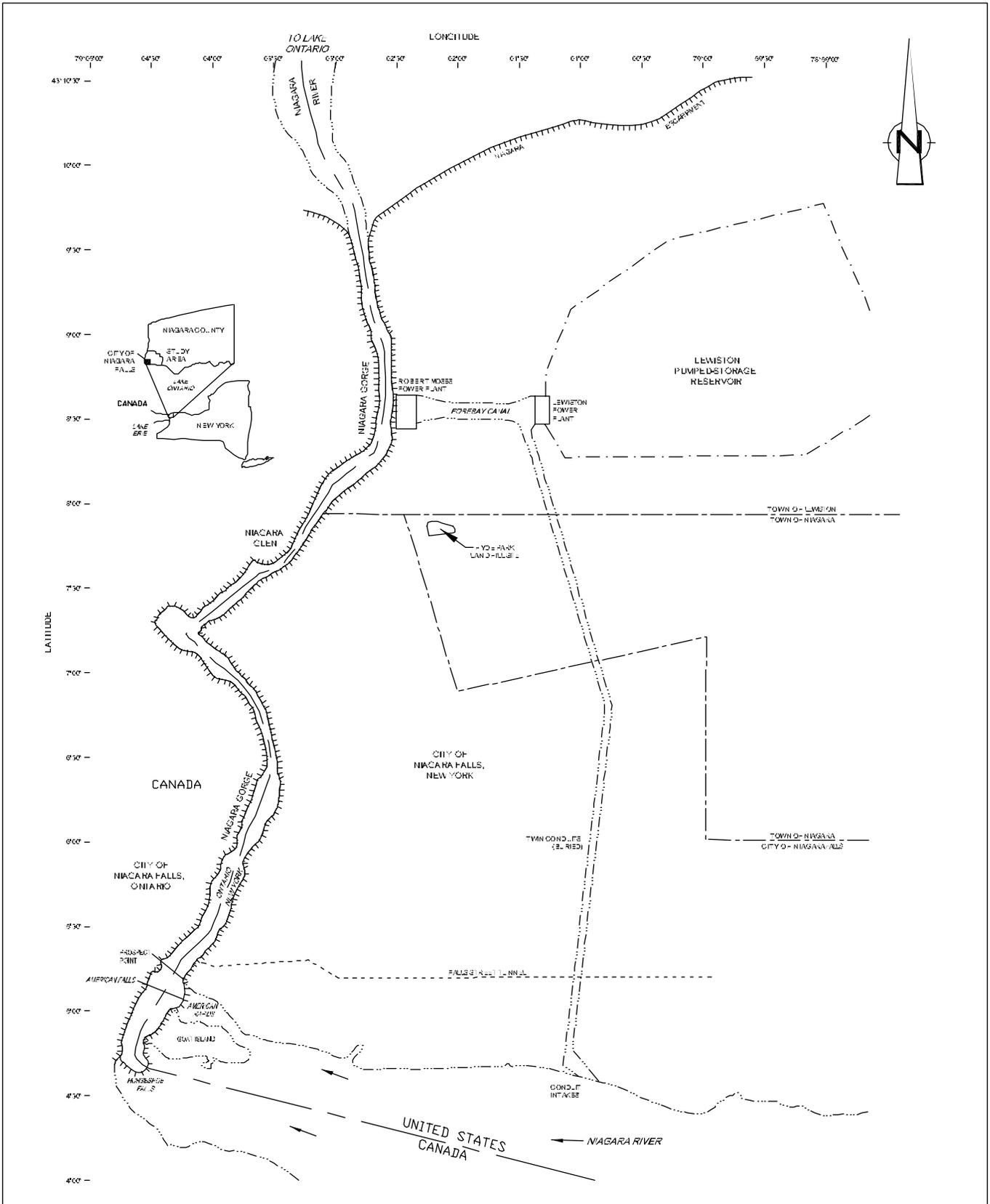


figure 1.1

**SITE LOCATION  
PERFORMANCE MONITORING PLAN  
Hyde Park Landfill Site**

SOURCE: MILLER, KAPPEL, 1987



Miller Springs Remediation Management, Inc.

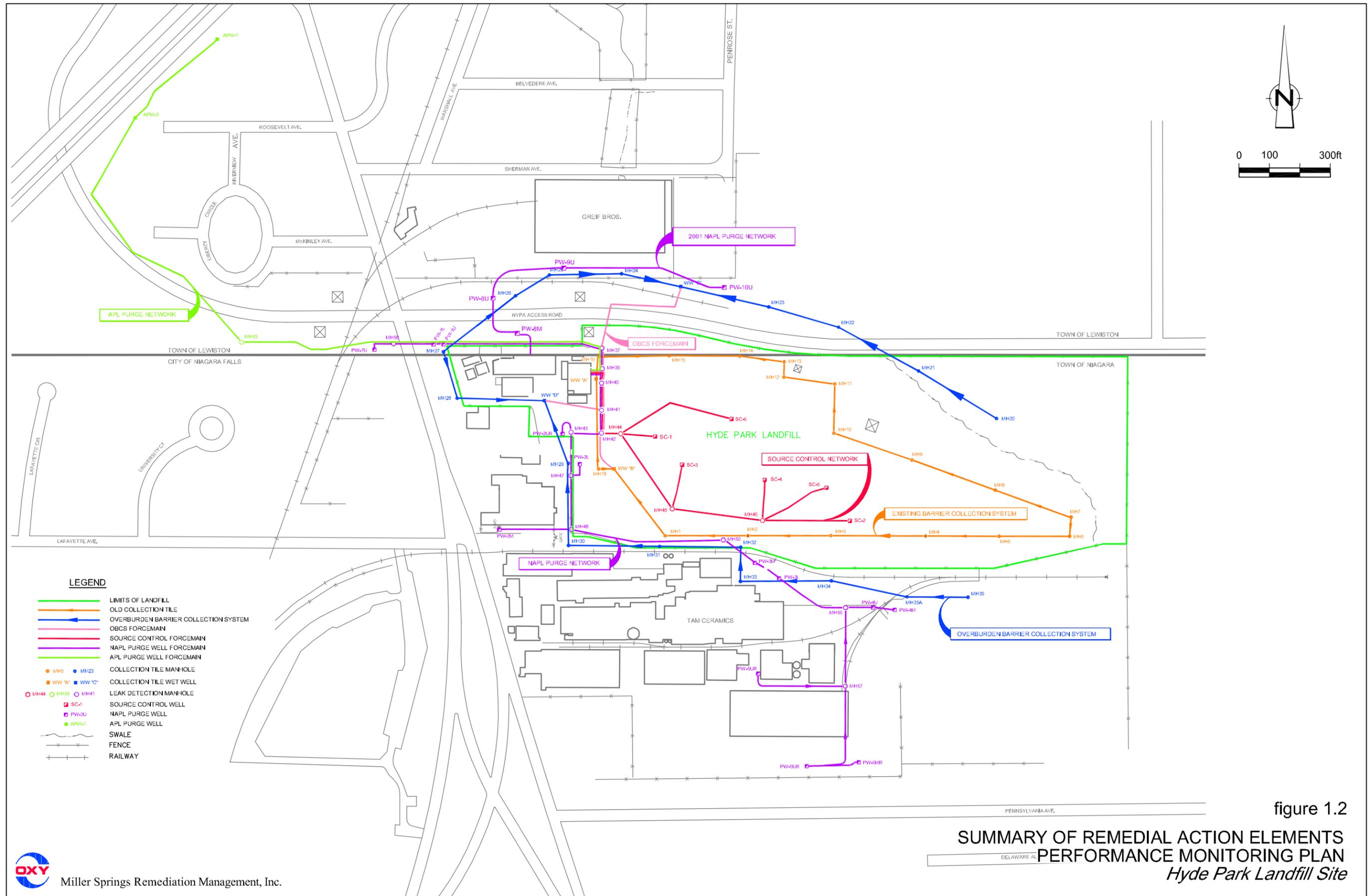


figure 1.2

**SUMMARY OF REMEDIAL ACTION ELEMENTS  
PERFORMANCE MONITORING PLAN  
Hyde Park Landfill Site**

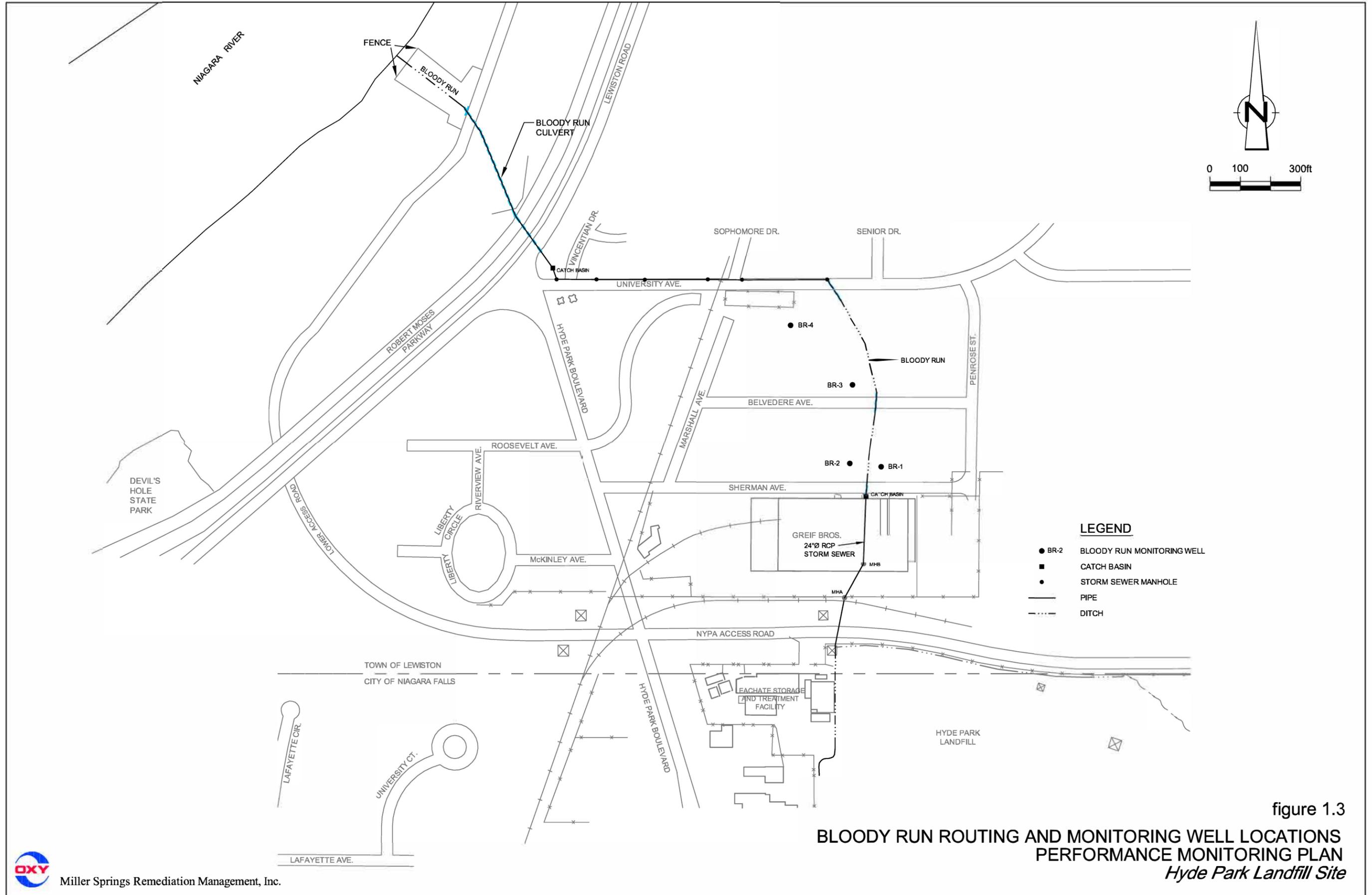
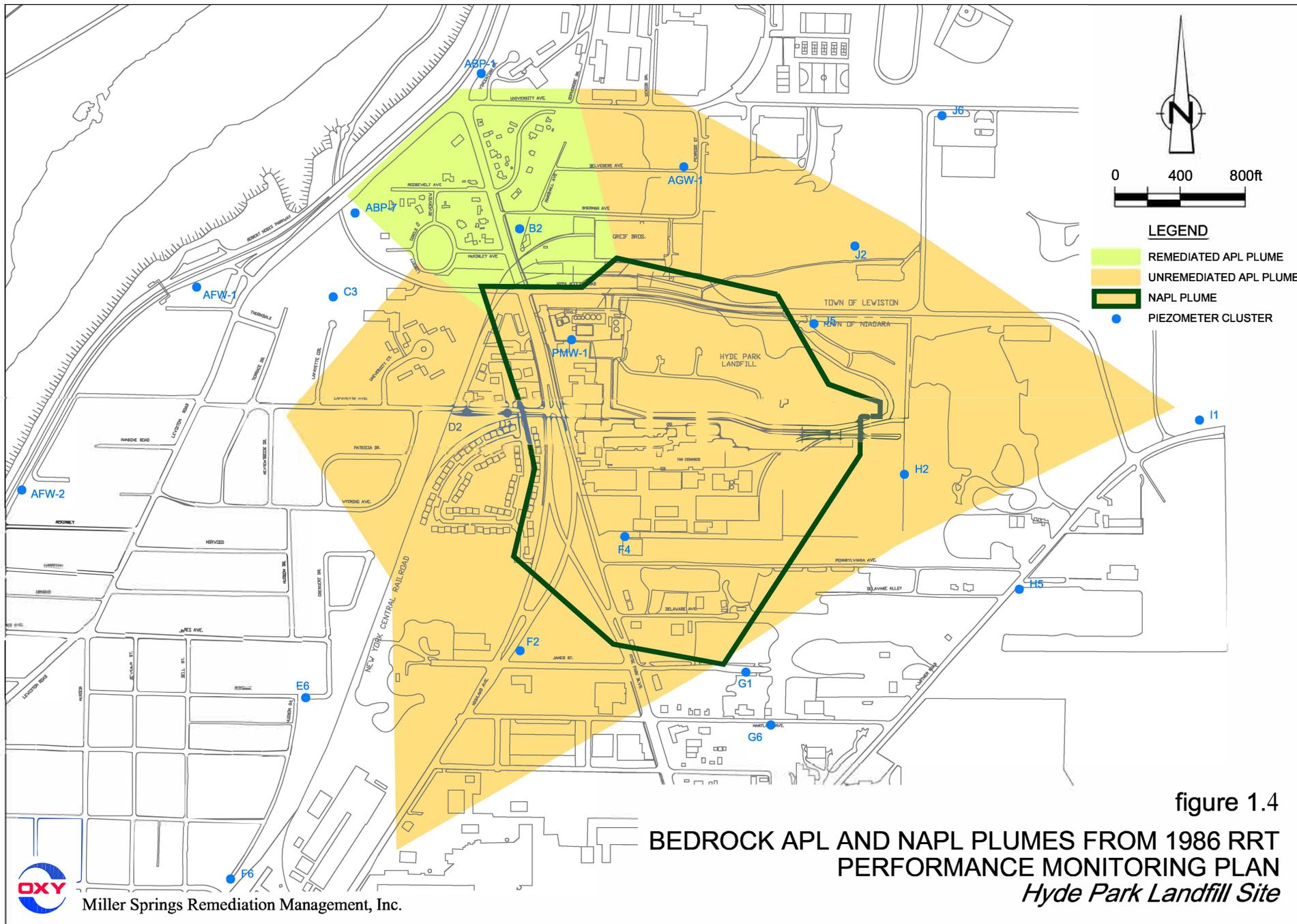
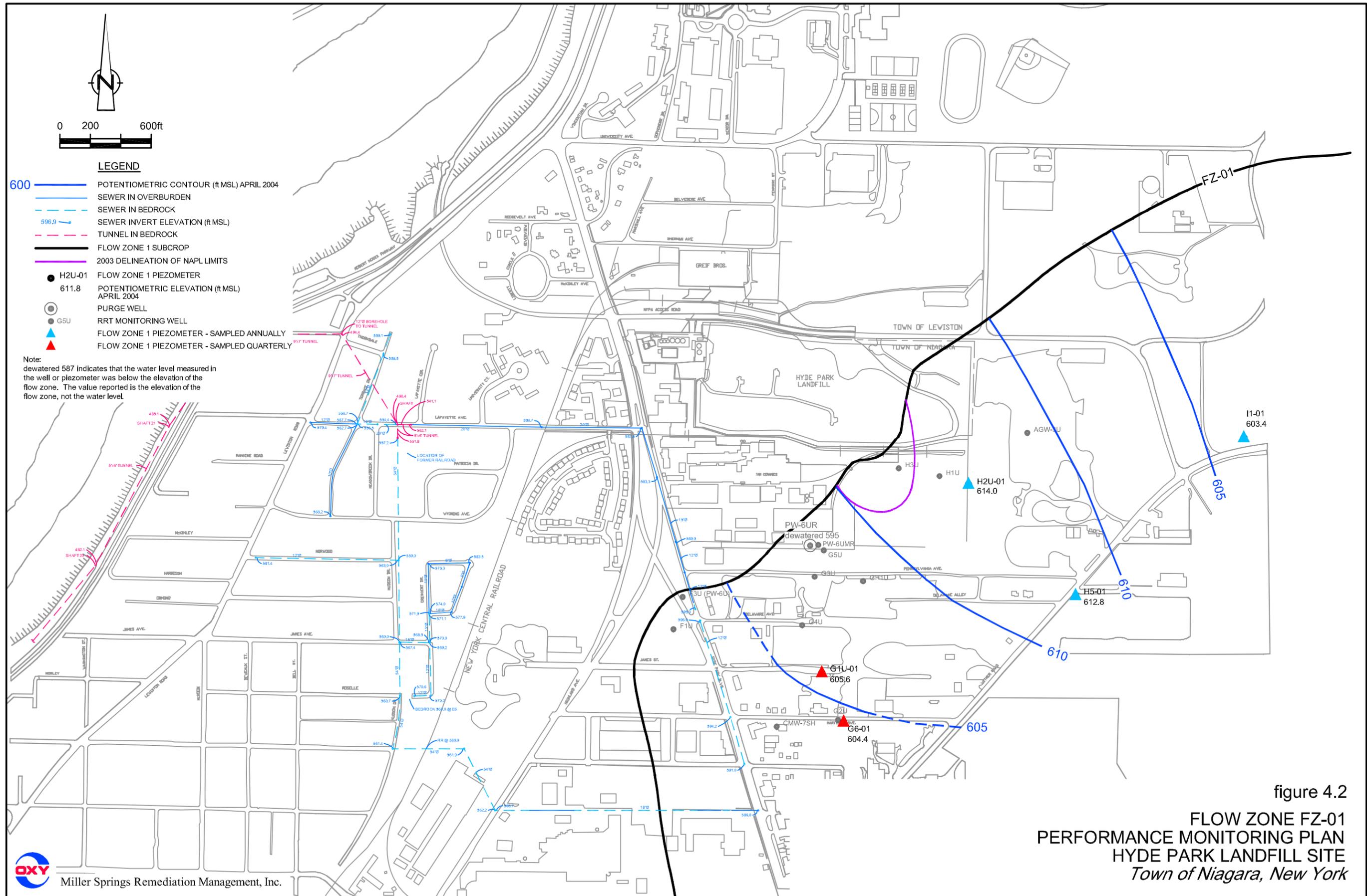


figure 1.3  
**BLOODY RUN ROUTING AND MONITORING WELL LOCATIONS**  
**PERFORMANCE MONITORING PLAN**  
*Hyde Park Landfill Site*









- LEGEND**
- 600 POTENTIOMETRIC CONTOUR (ft MSL) APRIL 2004
  - SEWER IN OVERBURDEN
  - SEWER IN BEDROCK
  - 596.9 SEWER INVERT ELEVATION (ft MSL)
  - TUNNEL IN BEDROCK
  - FLOW ZONE 1 SUBCROP
  - 2003 DELINEATION OF NAPL LIMITS
  - H2U-01 FLOW ZONE 1 PIEZOMETER
  - 611.8 POTENTIOMETRIC ELEVATION (ft MSL) APRIL 2004
  - PURGE WELL
  - G5U RRT MONITORING WELL
  - ▲ FLOW ZONE 1 PIEZOMETER - SAMPLED ANNUALLY
  - ▲ FLOW ZONE 1 PIEZOMETER - SAMPLED QUARTERLY

Note:  
 dewatered 587 indicates that the water level measured in the well or piezometer was below the elevation of the flow zone. The value reported is the elevation of the flow zone, not the water level.

figure 4.2  
 FLOW ZONE FZ-01  
 PERFORMANCE MONITORING PLAN  
 HYDE PARK LANDFILL SITE  
 Town of Niagara, New York



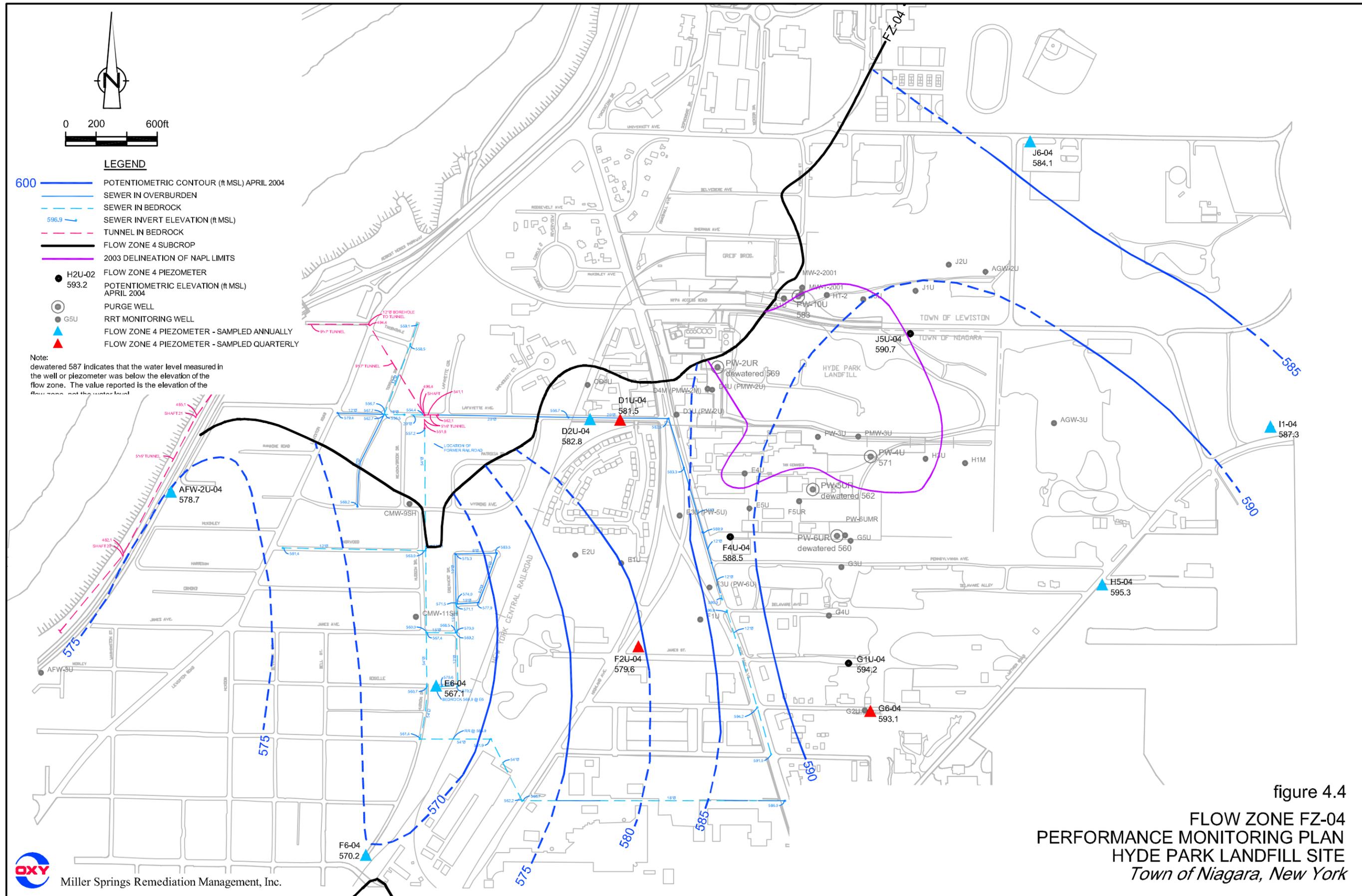


figure 4.4  
**FLOW ZONE FZ-04**  
**PERFORMANCE MONITORING PLAN**  
**HYDE PARK LANDFILL SITE**  
*Town of Niagara, New York*

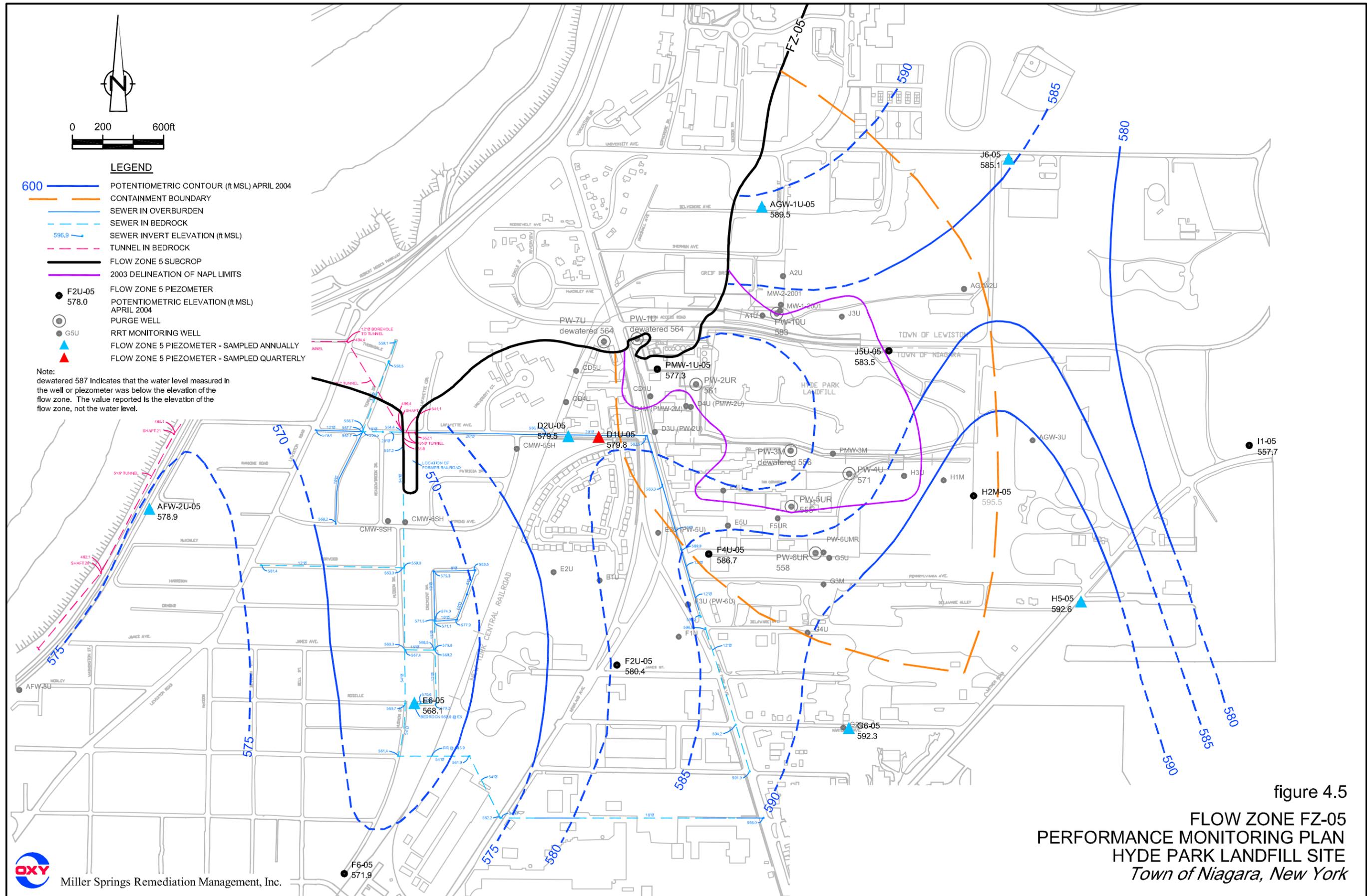


figure 4.5  
**FLOW ZONE FZ-05**  
**PERFORMANCE MONITORING PLAN**  
**HYDE PARK LANDFILL SITE**  
*Town of Niagara, New York*

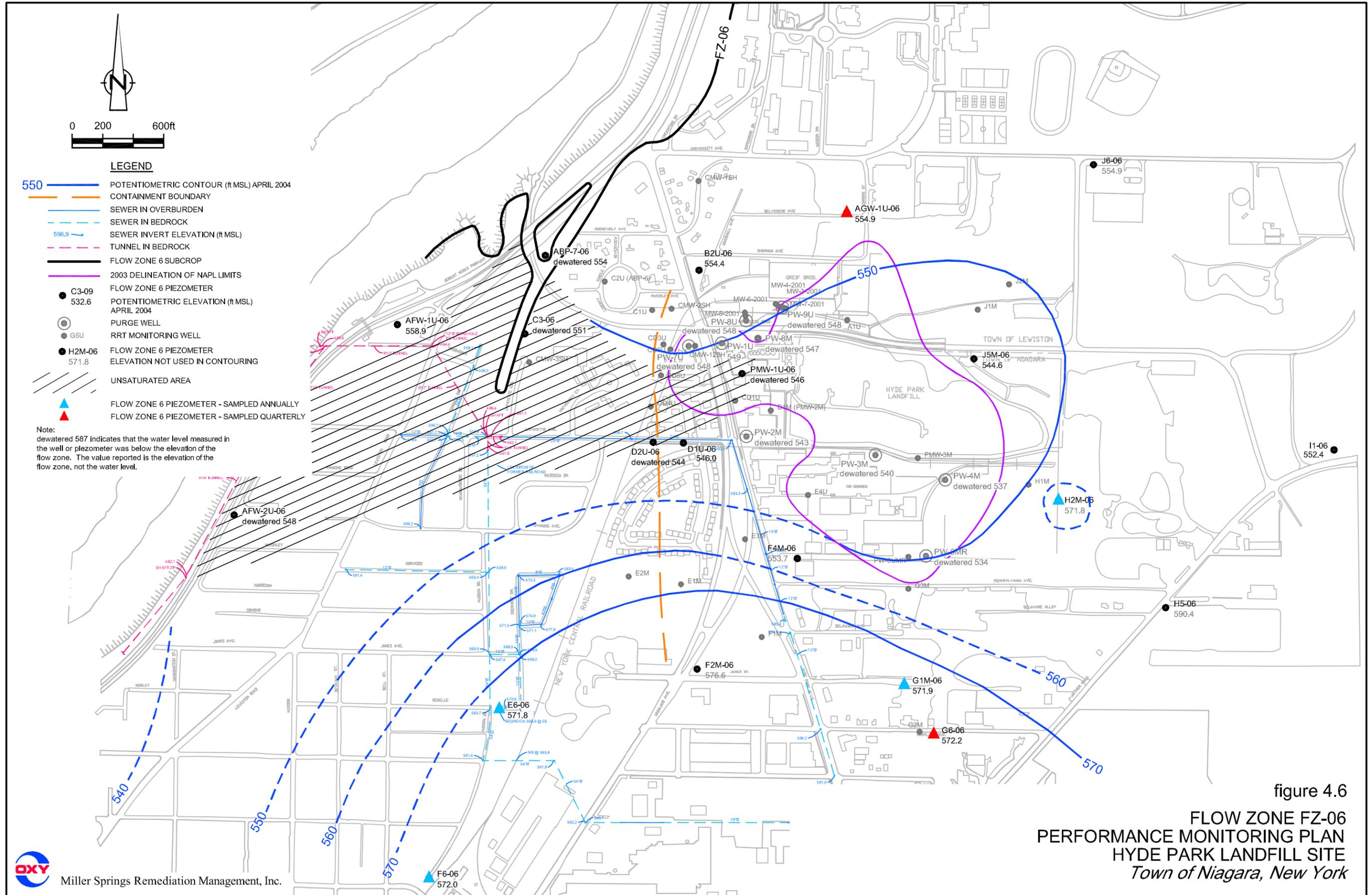


figure 4.6  
**FLOW ZONE FZ-06  
 PERFORMANCE MONITORING PLAN  
 HYDE PARK LANDFILL SITE  
 Town of Niagara, New York**

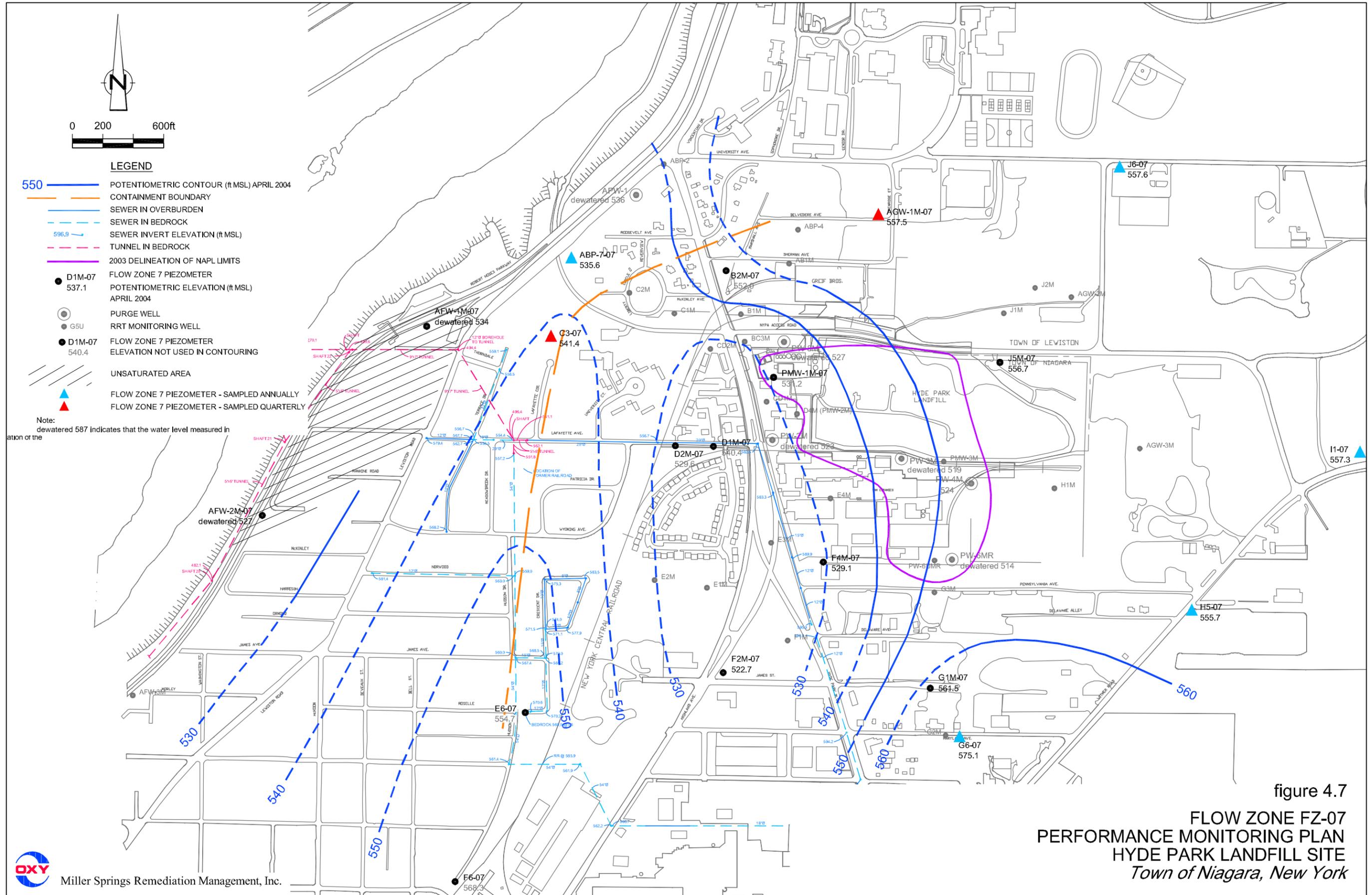


figure 4.7  
 FLOW ZONE FZ-07  
 PERFORMANCE MONITORING PLAN  
 HYDE PARK LANDFILL SITE  
 Town of Niagara, New York

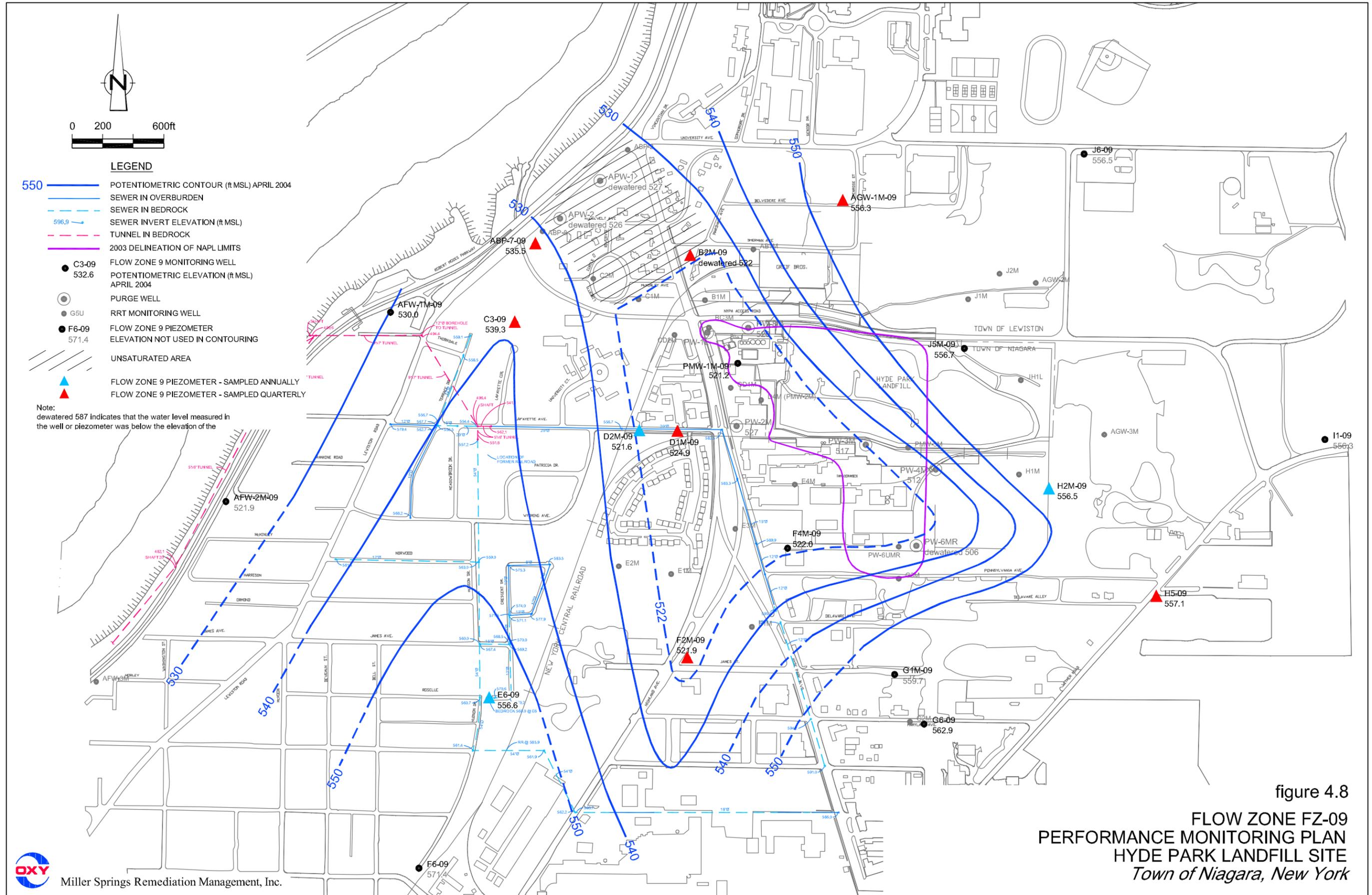


figure 4.8  
**FLOW ZONE FZ-09**  
**PERFORMANCE MONITORING PLAN**  
**HYDE PARK LANDFILL SITE**  
*Town of Niagara, New York*

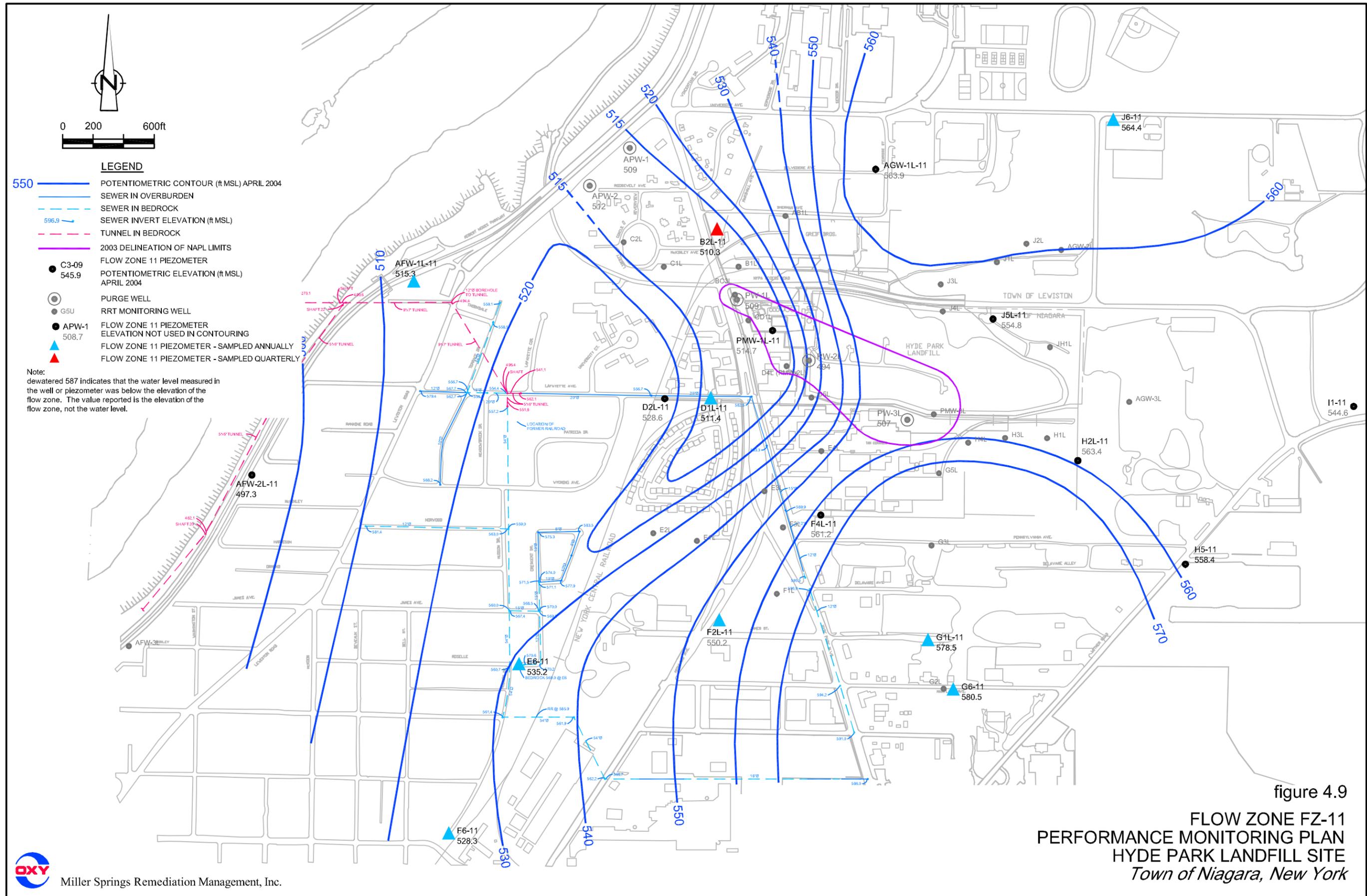


figure 4.9  
**FLOW ZONE FZ-11**  
**PERFORMANCE MONITORING PLAN**  
**HYDE PARK LANDFILL SITE**  
*Town of Niagara, New York*



figure 5.1  
 SEEP LOCATIONS - OVERVIEW  
 PERFORMANCE MONITORING PLAN  
 HYDE PARK LANDFILL SITE  
 Town of Niagara, New York



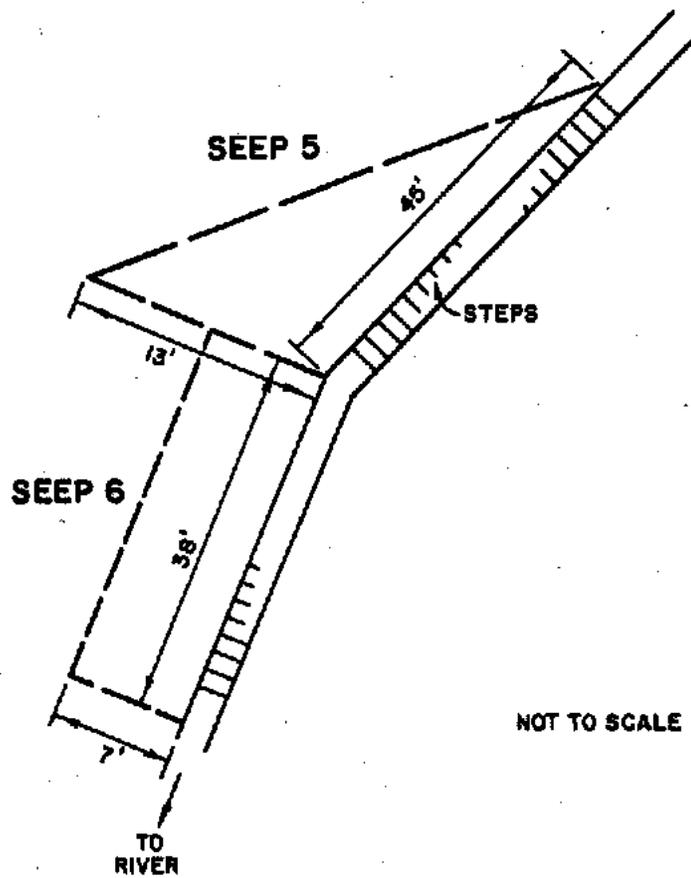


figure 5.2

SEEP LOCATIONS - UPPER DEVIL'S HOLE  
 PERFORMANCE MONITORING PLAN  
*Hyde Park Landfill Site*



Miller Springs Remediation Management, Inc.

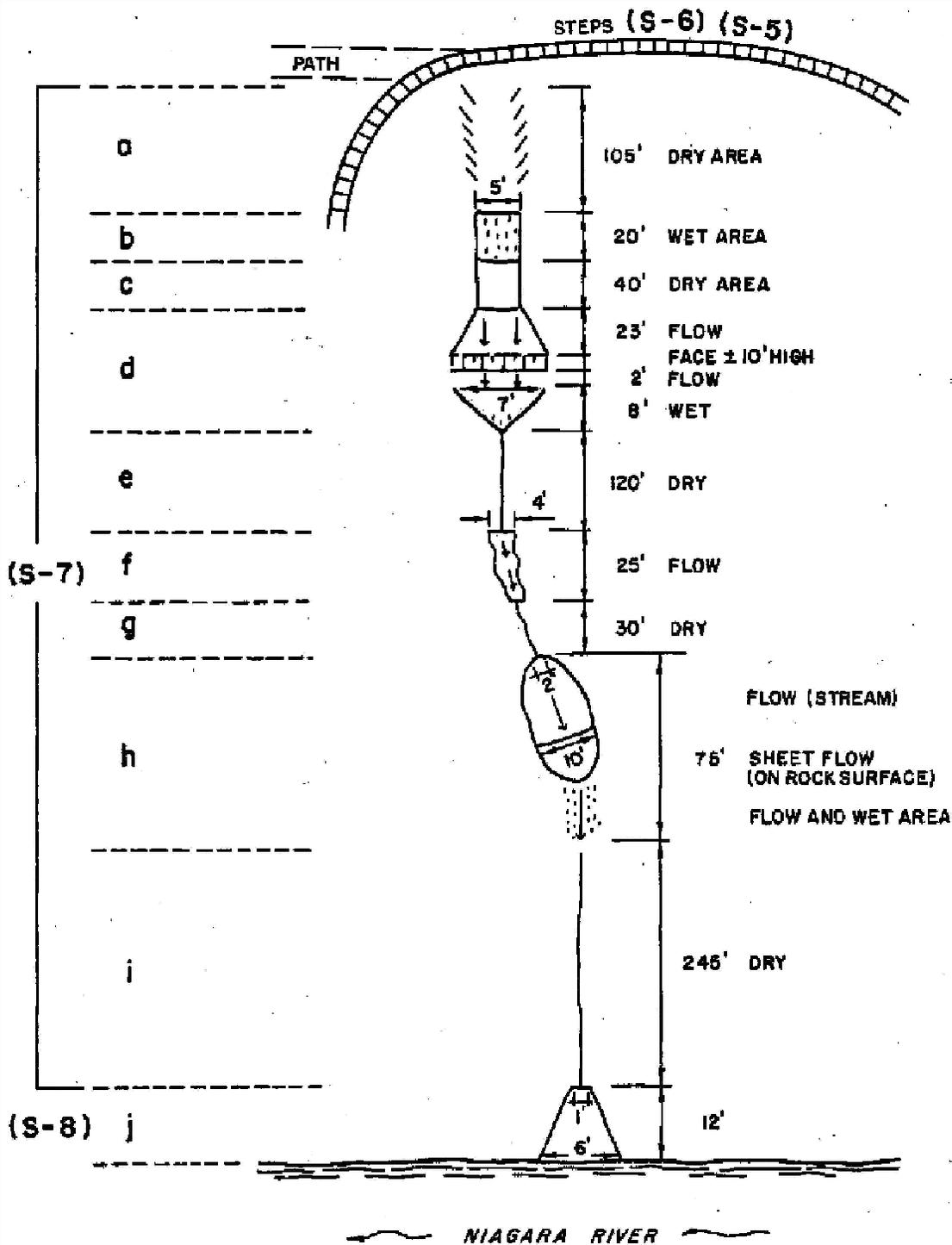
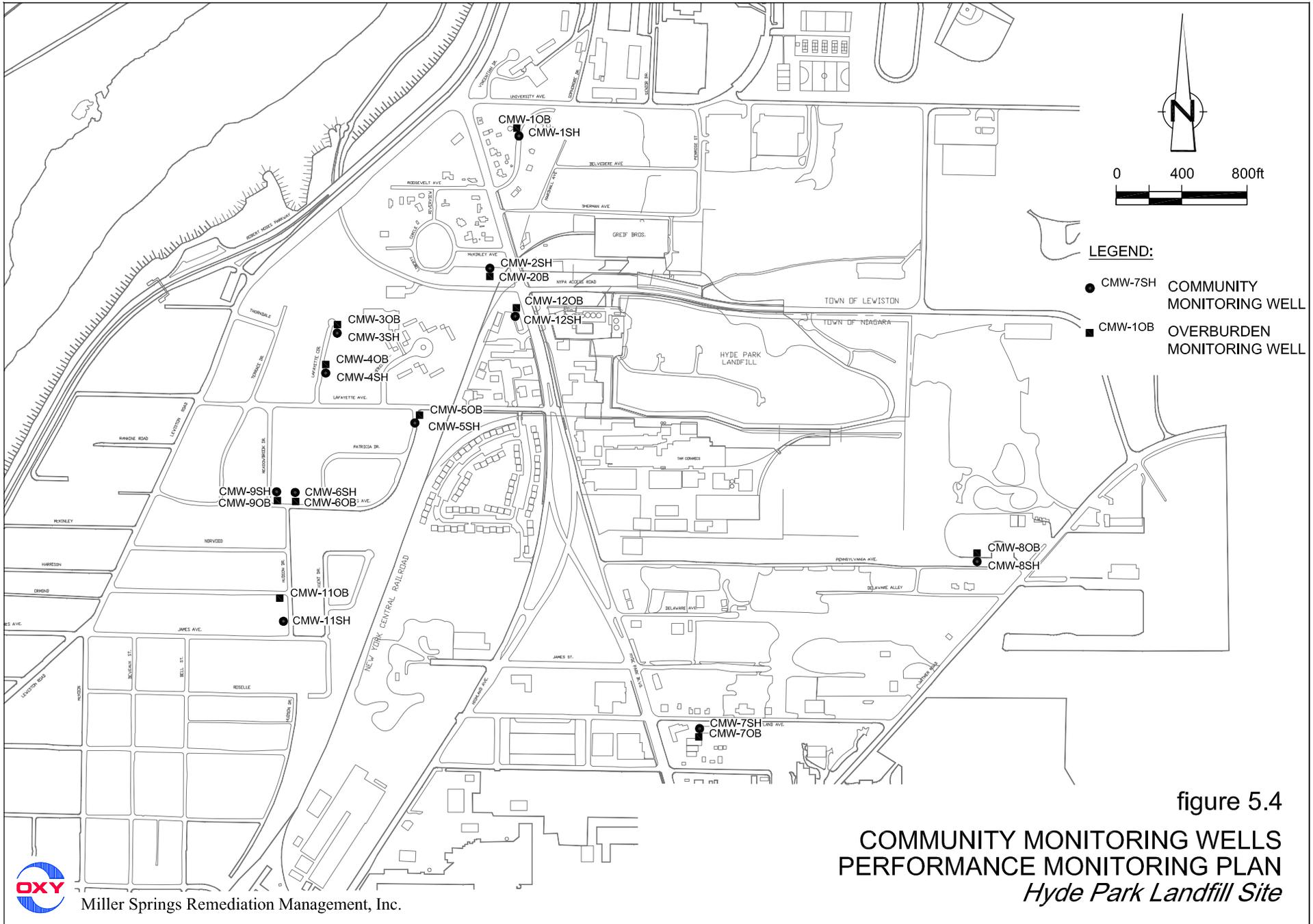


figure 5.3

SEEP LOCATIONS - LOWER DEVIL'S HOLE  
PERFORMANCE MONITORING PLAN  
*Hyde Park Landfill Site*

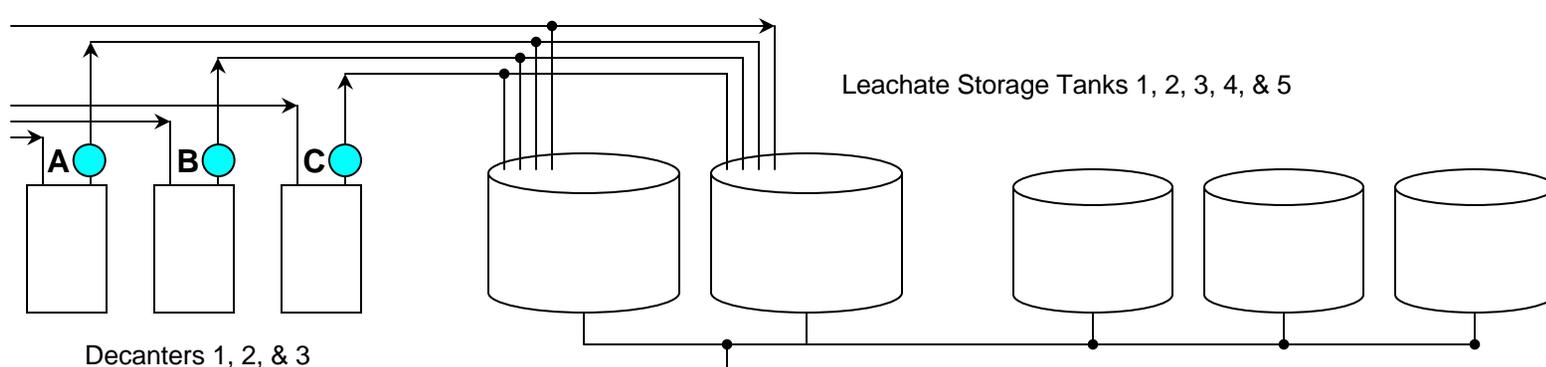


Miller Springs Remediation Management, Inc.



Miller Springs Remediation Management, Inc.

Influent from  
Hyde Park  
Remedial  
Action  
Elements

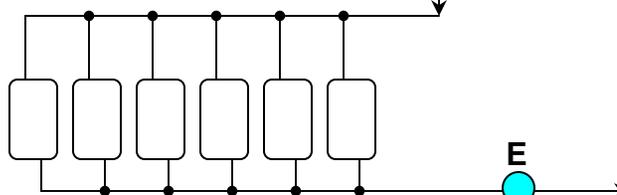


Decanters 1, 2, & 3

Leachate Storage Tanks 1, 2, 3, 4, & 5

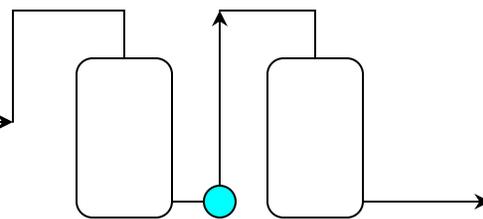
D

Sand Filters



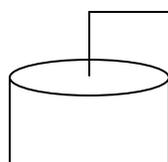
E

Sacrificial Carbon Beds



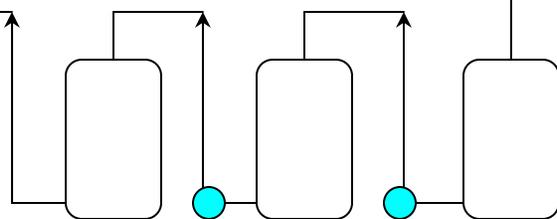
F

Effluent Tank



To  
POTW  
I

Main Carbon Adsorbers



H

G

- Treatment System Sample Location
- A - Decanter 1 (Bedrock NAPL PWs)
- B - Decanter 2 (Overburden Collection)
- C - Decanter 3 (SC-wells, PW-8U, PW-8M, PW-9U, and PW-10U)
- D - Leachate Feed
- E - Carbon Bed Feed
- F - Sacrificial Carbon Bed Interstage
- G - Main Carbon – First Interstage
- H - Main Carbon – Second Interstage
- I - Treated Effluent to the POTW

figure 6.1  
TREATMENT SYSTEM: WATER SAMPLE LOCATIONS  
PERFORMANCE MONITORING PLAN  
HYDE PARK LANDFILL SITE  
Town of Niagara, New York



**Table 1.1**

**Project Contacts  
Performance Monitoring Plan  
Hyde Park Landfill Site  
Niagara Falls, New York**

**Glenn Springs Holdings, Inc.**

---

Project Manager

Mr. Joe Branch - (231) 670-6809  
Glenn Springs Holdings, Inc.  
7601 Old Channel Trail  
Montague, MI 4937

**GHD Contacts**

---

Project Manager

Mr. John Pentilchuk - (519) 340-4313  
GHD  
455 Phillip Street  
Waterloo, Ontario, Canada N2L 3X2

Project Coordinator

Ms. Margaret Popek - (716) 205-1973  
GHD  
2055 Niagara Falls Boulevard  
Niagara Falls, NY 14304

Laboratory Coordinator

Ms. Susan Scrocchi - (716) 205-1984  
GHD  
2055 Niagara Falls Boulevard  
Niagara Falls, NY 14304

Site Operator

Mr. Joel Spring - (716) 998-6975  
Hyde Park Landfill  
4825 Hyde Park Boulevard  
Niagara Falls, NY 14305

**Table 1.1**

**Project Contacts  
Performance Monitoring Plan  
Hyde Park Landfill Site  
Niagara Falls, New York**

**Agency Representatives**

---

**United States Environmental Protection Agency**

Ms. Jaclyn Kondrk - (212) 637-4317  
U.S. EPA, Region II  
Site Investigation L & C Branch  
290 Broadway, 20th Floor  
New York, NY 10007-1866

**New York State Dept of Environmental Conservation**

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Mr. Andrew Zwack - (716) 851-7220  
New York State Department of Environmental Conservation  
270 Michigan Avenue  
Buffalo, NY 14203-2999

**New York State Dept of Health**

Mr. John Robinson - (518) 402-7860  
New York State Department of Health  
Empire State Plaza, Corning Tower Room 1787  
Albany NY 12237

**Table 2.1**  
**Activity Summary**  
**Performance Monitoring Plan**  
**Hyde Park Landfill Site**  
**Niagara Falls, New York**

Frequency	Activity	Program	Table / Reference	Number of Monitoring Locations	Field Procedure	Report Section	Report	Analytical Parameter Suite/Comment
Continuous	APL Sampling - Treatment System Effluent	Treatment	Table 6.1	1	PLC	6.2	Quarterly & SIU	pH
	Total Water Flow - Treatment System Effluent	Treatment	Table 6.1	1	PLC	6.2	Quarterly & SIU	Total Effluent Discharged
	Water Level Measurement - NAPL & APL Purge Wells	Bedrock	Table 4.1	19	PLC	4.1	Quarterly	
	Water Level Measurement - Wet Wells	Overburden	Table 3.2	2	PLC	3.1	Annual	
Hourly	Water Level Measurement of PMW-1M-09	Bedrock		1	transducer	4.2	Quarterly	
Daily	Overburden - Total Groundwater Extracted	Overburden	O&M Manual	1	PLC	6.2	NR	
	Bedrock - Total Groundwater Extracted	Bedrock	O&M Manual	2	PLC	6.2	NR	
Weekly	Main Carbon - First Interstage APL Sampling	Treatment	Table 6.1	1	FP-04A	6.2	Annual	VOCs
	Treated Effluent - APL Sampling	Treatment	Table 6.1	1	FP-04A	6.2	Quarterly	VOCs, Total Phenolics
Monthly	NAPL Recovery - SC-3	Overburden	Table 3.1	1	FP-03B	3.2	Annual	
Quarterly	Hand Water Level Measurement - Community monitoring Wells	Community	Table 5.4	11	FP-02A	5.3	Quarterly	
	Hand Water Level Measurement - Bedrock Piezometers	Bedrock	Table 4.2	126	FP-02A	4.2	Quarterly	
	Hand Water Level Measurement - Manholes	Overburden	Table 3.2	19	FP-02A	3.2	Quarterly	
	Hand Water Level Measurement - OBSC Wells	Overburden	Table 3.2	16	FP-02A	3.2	Quarterly	
	Hand water Level Measurement - SC NAPL Wells	Overburden	Table 3.1	5	FP-02A	3.2	Quarterly	
	NAPL Recovery - SC-2,4,5,6	Overburden	Table 3.1	4	FP-03B	3.2	Annual	
	NAPL Volumes - Decanters	Treatment	O&M Manual	3		6.2	Quarterly	
	APL Sampling - Leachate Feed	Treatment	Table 6.1	1	FP-04A	6.2	Annual	VOCs, SVOCs, organic acids
	APL Sampling - Sac Bed Interstage	Treatment	Table 6.1	1	FP-04A	6.2	Annual	PCBs, dioxins/furans
APL Sampling - Treated Effluent	Treatment	Table 6.1	1	FP-04A	6.2	Quarterly & SIU	Per SIU Permit	
Semiannual	Fence Inspections	Maintenance	O&M Manual		FP-01B	8.3	NR	Inspection form in O&M Manual
	Cap Inspection	Maintenance	O&M Manual		FP-01B	8.2	NR	Inspection form in O&M Manual
Annual	NAPL Presence - Manholes	Overburden	Table 3.3	19	FP-03A	3.2	Annual	
	NAPL Presence - OBSC Monitoring Wells	Overburden	Table 3.3	16	FP-03A	3.2	Annual	
	NAPL Presence - Catch Basin at 4901 Hyde Park Blvd.	Bedrock		1	FP-03A	4.3	Annual	
	APL Sampling - Catch Basin at 4901 Hyde Park Blvd.	Bedrock		1	FP-04D	4.3	Annual	Organic Acids
	APL Plume Flux Monitoring	Community	Table 5.3		Appendix B	5.2	Annual	APL Flux Monitoring Parameters (Table 5.3)
	Vapor Monitoring - Community Monitoring Wells	Community	Table 5.5	6	FP-05B	5.3	Annual	OVA Screening in third quarter.
	Well Inspections	Maintenance			FP-01B	8.1	Annual	
15-Month (Every 5th Q)	APL Sampling - Group A Piezometers	Bedrock	Table 4.2	62	FP-04C	4.2	Annual	VOCs, Organic Acids in select wells
Biennial	Gorge Face Seep Inspection	Community	Tables 5.1/5.2	1		5.1	Annual	As requested, Organic Acids
Five-Year	APL Sampling - Bloody Run Monitoring Wells	Bedrock	Tables 4.3/7.1	4	FP-04B	4.3	Five-Year	VOCs, Organic Acids
	APL Sampling - Group A Piezometers	Bedrock	Table 4.2	62	FP-04C	4.2	Five-Year	SVOCs, Organic Acids
	APL Sampling - APL & NAPL Purge Wells	Bedrock	Tables 4.3/7.1	19	FP-04A	4.2	Five-Year	VOCs, Organic Acids, Sulfate

PLC - Programmable Logic Controllers - Data Recorded in Treatment Building

NR - Not Reported, data available on request

SIU - Significant Industrial User

Table 2.2

**Summary of Hyde Park Screening Values  
Performance Monitoring Plan  
Hyde Park Landfill Site  
Niagara Falls, New York**

Parameters	Units	Screening Value	Source
<b>VOAs</b>			
1,1,1-Trichloroethane	µg/L	200	EPA-MCL
1,1,1,2,2-Tetrachloroethane	µg/L	0.053	R3-RBC [C]
1,1,2-Trichloroethane	µg/L	5	EPA-MCL
1,1-Dichloroethane	µg/L	800	R3-RBC [NC]
1,1-Dichloroethene	µg/L	7	EPA-MCL
1,2,3-Trichlorobenzene	µg/L	5	NYCRR Title 6
1,2,4-Trichlorobenzene	µg/L	70	EPA-MCL
1,2-Dichlorobenzene	µg/L	600	EPA-MCL
1,2-Dichloroethane	µg/L	5	EPA-MCL
1,2-Dichloropropane	µg/L	5	EPA-MCL
1,3,5-Trichlorobenzene	µg/L	5	NYCRR Title 6
1,3-Dichlorobenzene	µg/L	180	R3-RBC [NC]
1,4-Dichlorobenzene	µg/L	75	EPA-MCL
2-Butanone (Methyl Ethyl Ketone)	µg/L	7000	R3-RBC [NC]
2-Chlorotoluene	µg/L	120	R3-RBC [NC]
2-Hexanone	µg/L	50	NYCRR Title 10
3-Chlorotoluene	µg/L	120 ***	R3-RBC [NC]
4-Chlorotoluene	µg/L	120 ***	R3-RBC [NC]
4-Methyl-2-Pentanone (Methyl Isobutyl Ketone)	µg/L	6300	R3-RBC [NC]
Acetone	µg/L	5500	R3-RBC [NC]
Benzene	µg/L	5	EPA-MCL
Bromodichloromethane	µg/L	80	EPA-MCL
Bromoform	µg/L	80	EPA-MCL
Bromomethane (Methyl Bromide)	µg/L	8.5	R3-RBC [C]
Carbon disulfide	µg/L	1000	R3-RBC [NC]
Carbon tetrachloride	µg/L	5	EPA-MCL
Chlorobenzene	µg/L	100	EPA-MCL
Chloroethane	µg/L	3.6	R3-RBC [C]
Chloroform (Trichloromethane)	µg/L	80	EPA-MCL
Chloromethane (Methyl Chloride)	µg/L	190	R3-RBC [NC]
cis-1,2-Dichloroethene	µg/L	70	EPA-MCL
cis-1,3-Dichloropropene	µg/L	0.44	R3-RBC [C]
Dibromochloromethane	µg/L	80	EPA-MCL
Dichlorodifluoromethane (CFC-12)	µg/L	350	R3-RBC [C]
Ethylbenzene	µg/L	700	EPA-MCL
Methylene chloride	µg/L	30	NJDEP-GWQS
m-Monochlorobenzotrifluoride	µg/L	5	NYCRR Title 6
o-Monochlorobenzotrifluoride	µg/L	50	NYCRR Title 10
p-Monochlorobenzotrifluoride	µg/L	50	NYCRR Title 10
Styrene	µg/L	100	EPA-MCL
Tetrachloroethene	µg/L	5	EPA-MCL
Toluene	µg/L	1000	EPA-MCL
trans-1,2-Dichloroethene	µg/L	100	EPA-MCL
trans-1,3-Dichloropropene	µg/L	0.44	R3-RBC [C]
Trichloroethene	µg/L	5	EPA-MCL
Vinyl chloride	µg/L	2	EPA-MCL
Xylene (total)	µg/L	10000	EPA-MCL

Table 2.2

**Summary of Hyde Park Screening Values  
Performance Monitoring Plan  
Hyde Park Landfill Site  
Niagara Falls, New York**

Parameters	Units	Screening Value	Source
<b>Organic Acids</b>			
2-Chlorobenzoic acid	mg/L	7.3	R3-RBC [NC]
3-Chlorobenzoic acid	mg/L	7.3 ***	R3-RBC [NC]
4-Chlorobenzoic acid	mg/L	7.3 ***	R3-RBC [NC]
Benzoic acid	mg/L	150	R3-RBC [NC]
Chlorendic acid	mg/L	0.05	NYCRR Title 10
<b>SVOAs</b>			
1,2,4-Trichlorobenzene	µg/L	70	EPA-MCL
1,2-Dichlorobenzene	µg/L	600	EPA-MCL
1,3-Dichlorobenzene	µg/L	180	R3-RBC [NC]
1,4-Dichlorobenzene	µg/L	75	EPA-MCL
2,2'-oxybis(1-Chloropropane) (bis(2-chloroisopropyl) ether)	µg/L	0.26	R3-RBC [C]
2,4,5-Trichlorophenol	µg/L	3700	R3-RBC [NC]
2,4,6-Trichlorophenol	µg/L	6.1	R3-RBC [C]
2,4-Dichlorophenol	µg/L	110	R3-RBC [C]
2,4-Dimethylphenol	µg/L	730	R3-RBC [NC]
2,4-Dinitrophenol	µg/L	73	R3-RBC [NC]
2,4-Dinitrotoluene	µg/L	73	R3-RBC [NC]
2,6-Dinitrotoluene	µg/L	37	R3-RBC [NC]
2-Chloronaphthalene	µg/L	490	R3-RBC [NC]
2-Chlorophenol	µg/L	30	R3-RBC [NC]
2-Methylnaphthalene	µg/L	120	R3-RBC [NC]
2-Methylphenol	µg/L	1800	R3-RBC [NC]
2-Nitroaniline	µg/L	110	R3-RBC [NC]
2-Nitrophenol	µg/L	50	NYCRR Title 10
3,3'-Dichlorobenzidine	µg/L	0.15	R3-RBC [C]
3-Nitroaniline	µg/L	3.3	R3-RBC [C]
4,6-Dinitro-2-methylphenol	µg/L	3.7	R3-RBC [NC]
4-Bromophenyl phenyl ether	µg/L	50	NYCRR Title 10
4-Chloro-3-methylphenol	µg/L	50	NYCRR Title 10
4-Chloroaniline	µg/L	150	R3-RBC [NC]
4-Chlorophenyl phenyl ether	µg/L	50	NYCRR Title 10
4-Methylphenol	µg/L	180	R3-RBC [NC]
4-Nitroaniline	µg/L	3.3	R3-RBC [C]
4-Nitrophenol	µg/L	50	NYCRR Title 10
Acenaphthene	µg/L	370	R3-RBC [NC]
Acenaphthylene	µg/L	310	MOE-GW1
Anthracene	µg/L	1800	R3-RBC [NC]
Benzo(a)anthracene	µg/L	0.092	R3-RBC [C]
Benzo(a)pyrene	µg/L	0.2	EPA-MCL
Benzo(b)fluoranthene	µg/L	0.092	R3-RBC [C]
Benzo(g,h,i)perylene	µg/L	310	MOE-GW1
Benzo(k)fluoranthene	µg/L	0.92	R3-RBC [C]
bis(2-Chloroethoxy)methane	µg/L	5	NYCRR Title 6
bis(2-Chloroethyl)ether	µg/L	0.0096	R3-RBC [C]
bis(2-Ethylhexyl)phthalate	µg/L	6	EPA-MCL
Butyl benzylphthalate	µg/L	7300	R3-RBC [NC]
Carbazole	µg/L	50	NYCRR Title 10

Table 2.2

**Summary of Hyde Park Screening Values  
Performance Monitoring Plan  
Hyde Park Landfill Site  
Niagara Falls, New York**

Parameters	Units	Screening Value	Source
<b><u>SVOAs continued</u></b>			
Chrysene	µg/L	9.2	R3-RBC [C]
Dibenz(a,h)anthracene	µg/L	0.0092	R3-RBC [C]
Dibenzofuran	µg/L	12	R3-RBC [NC]
Diethyl phthalate	µg/L	29000	R3-RBC [NC]
Dimethyl phthalate	µg/L	370000	R3-RBC [NC]
Di-n-butylphthalate	µg/L	3700	R3-RBC [NC]
Di-n-octyl phthalate	µg/L	1500	R3-RBC [NC]
Fluoranthene	µg/L	1500	R3-RBC [NC]
Fluorene	µg/L	240	R3-RBC [NC]
Hexachlorobenzene	µg/L	1	EPA-MCL
Hexachlorobutadiene	µg/L	0.86	R3-RBC [C]
Hexachlorocyclopentadiene	µg/L	50	EPA-MCL
Hexachloroethane	µg/L	4.8	R3-RBC [C]
Indeno(1,2,3-cd)pyrene	µg/L	0.092	R3-RBC [C]
Isophorone	µg/L	70	R3-RBC [C]
Naphthalene	µg/L	6.5	R3-RBC [NC]
Nitrobenzene	µg/L	3.5	R3-RBC [NC]
N-Nitrosodi-n-propylamine	µg/L	0.0096	R3-RBC [C]
N-Nitrosodiphenylamine	µg/L	14	R3-RBC [C]
Pentachlorophenol	µg/L	1	EPA-MCL
Phenanthrene	µg/L	310	MOE-GW1
Phenol	µg/L	11000	R3-RBC [NC]
Pyrene	µg/L	180	R3-RBC [NC]

## Notes:

\*\* Due to the need to dilute samples, especially those from the purge wells, which contained elevated concentrations of key compounds, the reporting limits were often raised, in some cases up to 100 times. Therefore, the purge wells sample results that were reported as not-detected at an elevated laboratory reporting limit equal to at least twice the screening value have been counted in addition to positive detections. This is to account for locations where there is a high potential that the compound is present in the purge well, but not detected due to laboratory methods.

\*\*\* As the only screening levels for these parameters were available through NYCRR Title 10, which is based solely on the detection limits, screening levels of surrogate chemical were obtained from R3-RBC

**Source for Screening Criteria** (presented by selection priority)

**EPA-MCL** => USEPA Maximum Contaminant Levels

**R3-RBC** => EPA Region II Risk-based Concentrations, ingestion of tap water. [C] or [NC] indicates carcinogenic or non-carcinogenic risk evaluation.

**MOE-GWI** => Ontario Ministry of the Environment GW-1 Drinking Water Standard

**NYCRR** => State of New York Codes, Rules, and Regulations. Title 6 = Groundwater Standards/Guidance Values; Title 10 = Drinking Water Standards.

Table 3.1

**Source Control Monitoring Wells and NAPL Recovery Wells  
Performance Monitoring Plan  
Hyde Park Landfill Site  
Niagara Falls, New York**

<u>NAPL Recovery Well</u>	<u>Monitoring Well</u>
	OEW-1
SC-2	OEW-2
SC-3	OEW-3
SC-4	OEW-4
SC-5	OEW-5
SC-6	OEW-6
	OEW-7

Table 3.2

**Overburden Wet Well Set-Points  
Performance Monitoring Plan  
Hyde Park Landfill Site  
Niagara Falls, New York**

<b><u>Pumping Location</u></b>	<b><u>Collection System</u></b>	<b><u>Set-Point (ft msl)</u></b>
Wet Well A	1978 BCS	fixed level switches
Wet Well B	1978 BCS	Not Pumped
Wet Well C	1992 OBCS	583
Wet Well D	1992 OBCS	580

## Notes:

- BCS - Barrier Collection System  
OBCS - Overburden Barrier Collection System  
ft msl - Feet Above Mean Sea Level

Table 3.3

**Overburden Monitoring Locations  
Performance Monitoring Plan  
Hyde Park Landfill Site  
Niagara Falls, New York**

<b>Wells</b>	<b>Manholes</b>
OMW-1	MH-20
OMW-2	MH-21
OMW-3	MH-22
OMW-4R	MH-23
OMW-5R	Wet Well C
OMW-6	MH-24
OMW-7	MH-25
OMW-8R2	MH-26
OMW-9	MH-27
OMW-10R	MH-28
OMW-11R	Wet Well D
OMW-12R	MH-29
OMW-13R	MH-30
OMW-14R	MH-31
OMW-15	MH-32
OMW-16R	MH-33
	MH-34
	MH-35A
	MH-35

\*Water Level Measurements should be completed for Wells and Manholes on the same day.

Table 4.1

**Bedrock Purge Well Set-Points  
Performance Monitoring Plan  
Hyde Park Landfill Site  
Niagara Falls, New York**

<b>Purge Well</b>	<b>Grade (ft msl)</b>	<b>Top of Open Interval (ft msl)</b>	<b>Bottom of Open Interval (ft msl)</b>	<b>Pump Set POINT (ft msl)</b>	<b>Average Flow Rate (gpm)</b>
APW-1	569	555	492	509	1.4
APW-2	574	531	497	512	0.4
PW-1U	597	565	535	545	0.4
PW-1L	597	525	487	497	13.5
PW-2UR	598	576	546	559	1.5
PW-2M	598	544	498	511	32.9
PW-2L	600	506	482	495	0.2
PW-3M	601	556	496	518	0.1
PW-3L	603	497	476	495	5.9
PW-4U	608	595	551	572	0.7
PW-4M (1)	610	549	499	525	0.0 (1)
PW-5UR	605	593	544	556	3.6
PW-6UR	611	599	549	558	1.4
PW-6MR	612	546	493	503	4.2
PW-7U	597	563	533	540	0.7
PW-8U	594	563	538	550	0.9
PW-8M	597	553	507	520	0.3
PW-9U	592	562	537	542	1.4
PW-10U	598	579	551	565	3.0

## Notes:

ft msl - Feet Above Mean Sea Level

gpm - Gallons Per Minute

**APL Sampling Locations  
Performance Monitoring Plan  
Hyde Park Landfill Site  
Niagara Falls, New York**

Type	Piezometer ID	Flow Zone	Group A	Group B	Transmissivity (ft <sup>2</sup> /day)
Outer	G1U-01	1	X	X	66.000
Outer	G6-01	1	X	X	70.000
Outer	H2U-01	1	X		80.000
Outer	H5-01	1	X		75.000
Outer	I1-01	1	X		0.500
Outer	F2U-02	2	X	X	30.000
Inner	F4U-02	2			14.000
Inner	G1-02	2			0.700
Outer	G6-02	2	X		240.000
Outer	H2U-02	2	X	X	0.500
Outer	H5-02	2	X		1.600
Outer	I1-02	2	X		9.000
Inner	J2U-02	2			44.000
Inner	J5U-02	2			75.000
Outer	J6-02	2	X		71.000
Outer	AFW-2U-04	4	X		77.000
Outer	D1U-04	4	X	X	49.000
Outer	D2U-04	4	X		28.500
Outer	E6-04	4	X		1.400
Outer	F2U-04	4	X	X	422.000
Inner	F4U-04	4			0.300
Outer	F6-04	4	X		40.200
Outer	G1U-04	4			0.009
Outer	G6-04	4	X	X	190.000
Outer	H5-04	4	X		0.600
Outer	I1-04	4	X		3.100
Inner	J2U-04	4			140.000
Inner	J5U-04	4			0.010
Outer	J6-04	4	X		4.000
Outer	AFW-2U-05	5	X		13.000
Outer	AGW-1U-05	5	X		360.000
Outer	D1U-05	5	X	X	21.900
Outer	D2U-05	5	X		30.300
Outer	E6-05	5	X		0.700
Outer	F2U-05	5			0.070
Inner	F4U-05	5			0.030
Outer	F6-05	5			0.300
Outer	G6-05	5	X		8.000
Outer	H2M-05	5			0.001
Outer	H5-05	5	X		16.000
Outer	I1-05	5			0.200
Inner	J2U-05	5			300.000
Inner	J5U-05	5			66.000
Outer	J6-05	5	X		64.000
Inner	PMW-1U-05	5			2.100

**APL Sampling Locations  
Performance Monitoring Plan  
Hyde Park Landfill Site  
Niagara Falls, New York**

Type	Piezometer ID	Flow Zone	Group A	Group B	Transmissivity (ft <sup>2</sup> /day)
Outer	ABP-7-06	6			0.500
Outer	AFW-1U-06	6			2.300
Outer	AFW-2U-06	6			0.300
Outer	AGW-1U-06	6	X	X	6.700
Outer	B2U-06	6			0.001
Outer	C3-06	6			0.070
Outer	D1U-06	6			1.000
Outer	D2U-06	6			0.440
Outer	E6-06	6	X		218.000
Outer	F2M-06	6			0.001
Inner	F4M-06	6			0.007
Outer	F6-06	6	X		134.000
Outer	G1M-06	6	X		58.000
Outer	G6-06	6	X	X	79.000
Outer	H2M-06	6	X		16.000
Outer	H5-06	6			0.040
Outer	I1-06	6			0.060
Inner	J2M-06	6			280.000
Inner	J5M-06	6			11.000
Outer	J6-06	6			0.001
Inner	PMW-1U-06	6			0.001
Outer	ABP-1-07	7			0.001
Outer	ABP-7-07	7	X		1.500
Outer	AFW-1M-07	7			0.001
Outer	AFW-2M-07	7			0.001
Outer	AGW-1M-07	7	X	X	140.000
Outer	B2M-07	7			0.050
Outer	C3-07	7	X	X	13.000
Outer	D1M-07	7			0.300
Outer	D2M-07	7			0.001
Outer	E6-07	7			0.150
Outer	F2M-07	7			0.001
Inner	F4M-07	7			0.001
Outer	F6-07	7			0.001
Outer	G1M-07	7			0.004
Outer	G6-07	7	X		1.100
Outer	H5-07	7	X		219.000
Outer	I1-07	7	X		39.500
Inner	J5M-07	7			220.000
Outer	J6-07	7	X		65.000
Inner	PMW-1M-07	7			0.001
Outer	ABP-1-09	9	X		2.600
Outer	ABP-7-09	9	X	X	67.000
Outer	AFW-1M-09	9			0.600
Outer	AFW-2M-09	9			0.001
Outer	AGW-1M-09	9	X	X	150.000

**APL Sampling Locations  
Performance Monitoring Plan  
Hyde Park Landfill Site  
Niagara Falls, New York**

Type	Piezometer ID	Flow Zone	Group A	Group B	Transmissivity (ft <sup>2</sup> /day)
Outer	B2M-09	9	X	X	38.000
Outer	C3-09	9	X	X	117.000
Outer	D1M-09	9	X	X	184.000
Outer	D2M-09	9	X		160.400
Outer	E6-09	9	X		4.900
Outer	F2M-09	9	X	X	110.000
Inner	F4M-09	9			30.000
Outer	F6-09	9			0.001
Outer	G1M-09	9			0.001
Outer	G6-09	9			0.003
Outer	H2M-09	9	X		16.000
Outer	H5-09	9	X	X	132.000
Outer	I1-09	9			0.001
Inner	J2M-09	9			1.700
Inner	J5M-09	9			150.000
Outer	J6-09	9			0.002
Inner	PMW-1M-09	9			57.600
Outer	AFW-1L-11	11	X		3.200
Outer	AFW-2L-11	11			0.007
Outer	AGW-1L-11	11			0.005
Outer	B2L-11	11	X	X	16.000
Outer	D1L-11	11	X		15.200
Outer	D2L-11	11			2.100
Outer	E6-11	11	X		68.200
Outer	F2L-11	11	X		1.300
Inner	F4L-11	11			0.001
Outer	F6-11	11	X		13.800
Outer	G1L-11	11	X		55.000
Outer	G6-11	11	X		1.600
Outer	H2L-11	11			0.100
Outer	H5-11	11			1.300
Outer	I1-11	11			0.001
Inner	J5L-11	11			7.000
Outer	J6-11	11	X		21.000
Inner	PMW-1L-11	11			1.400

Summary: 101 Outer & 25 Inner Piezometers  
20 Semi-Annual Samples  
62 18-Month Samples

**Group A** Outer piezometer with sufficient yield to provided a representative sample.  
**Group B** Group A piezometer that also exceeded a GSH screening level.

**Table 4.3**

**Bloody Run Monitoring Locations  
Performance Monitoring Plan  
Hyde Park Landfill Site  
Niagara Falls, New York**

**Bloody Run Monitoring Wells**

BR-1  
BR-2  
BR-3  
BR-4

**Table 5.1**

**Personal Protective Equipment For the Gorge Face Seep Section Inspection  
Performance Monitoring Plan  
Hyde Park Landfill Site  
Niagara Falls, New York**

The Gorge Face Seep Inspection is a strenuous hike and is typically completed on a hot and dry summer day. The inspection cannot be completed during rainy weather as the seeps would not be visible. The hike begins at the top of the gorge and follows the NYPA access road down to the Niagara River. The inspection then follows a trail along the Niagara River and back to the top of the gorge via the Devil's Hole trail/stairway. All participants in this inspection should be prepared for the strenuous activity and hot weather. There is no requirement that participants be OSHA Hazwopper (40 hour) trained. The following list provides suggested clothing and accessories.

**Wear:**

- Light-weight long pants

- Long-sleeved, light weight shirt

- Sunscreen

- Hat with a brim (a hardhat must be worn during the portion of the inspection along the NYPA access road)

- Sunglasses

- Hiking boots

**Carry in a backpack:**

- 1 to 2 liters of drinking water

Table 5.2

**Coordinates for Seep Locations  
Performance Monitoring Plan  
Hyde Park Landfill Site  
Niagara Falls, New York**

<b>Location</b>	<b>NY State Plane Easting (ft)</b>	<b>NY State Plane Northing (ft)</b>	<b>Longitude</b>	<b>Latitude</b>
Seep-01	TBD	TBD	TBD	TBD
Seep-02	1,025,546	1,142,966	43.1359658	-79.043201
Seep-03	1,025,797	1,143,232	43.1366994	-79.0422661
Seep-04	1,026,009	1,143,839	43.138368	-79.0414843
Seep-05	1,024,901	1,142,119	43.1336321	-79.0455999
Seep-06	1,024,897	1,142,168	43.1337665	-79.0456159
Seep-07d	1,024,898	1,142,356	43.1342824	-79.045616
Seep-07ef	1,024,809	1,142,418	43.1344511	-79.0459507
Seep-07h	1,024,801	1,142,497	43.1346677	-79.0459823
Seep-07i	1,024,592	1,142,656	43.1351008	-79.0467686
Seep-08	1,024,553	1,142,686	43.1351825	-79.0469153
Seep-11	1,025,518	1,143,416	43.1372	-79.0433151
Seep-12	1,025,985	1,144,355	43.1397833	-79.0415848
Seep-14	1,025,721	1,143,123	43.1363992	-79.0425486
Seep-17b	1,025,560	1,142,997	43.136051	-79.0431492
Seep-17a	1,025,649	1,143,075	43.1362664	-79.0428173
Seep-18a	1,025,793	1,143,317	43.1369325	-79.0422828
Seep-19	1,026,002	1,144,167	43.1392678	-79.0415172
Seep-20	1,026,063	1,143,978	43.1387501	-79.0412848
Seep-21	1,024,499	1,143,507	43.1374343	-79.0471347

Seep coordinates were determined with a hand-held GPS unit in 2004.  
Accuracy is approximately +/- 30 ft.

Table 5.3

**Analytical Parameters for APL Flux Monitoring  
Performance Plan Monitoring  
Hyde Park Landfill Site  
Niagara Falls, New York**

Parameters for APL Plume Flux Monitoring	RRT Flux Action Level	RRT Detection Level
2,3,7,8-Tetrachlorodibenzo-p-dioxin (TCDD)	0.5 grams per year	0.5 ng/L
Polychlorinatedbiphenyls as Aroclor 1248	0.005 pounds per day	1 µg/L
Pesticides as follows:		
Hexachlorocyclohexanes: $\alpha$ -BHC, $\beta$ -BHC, $\delta$ -BHC, $\gamma$ -BHC(Lindane)	none defined	
Mirex	0.005 pounds per day	1 µg/L

Table 5.4

**Community Monitoring Wells  
Performance Monitoring Plan  
Hyde Park Landfill Site  
Niagara Falls, New York**

<u>Overburden</u>	<u>Bedrock</u>
CMW- 1OB	CMW- 1SH
CMW- 2OB	CMW- 2SH
CMW- 3OB	CMW- 3SH
CMW- 4OB	CMW- 4SH
CMW- 5OB	CMW- 5SH
CMW- 6OB	CMW- 6SH
CMW- 7OB	CMW- 7SH
CMW- 8OB	CMW- 8SH
CMW- 9OB	CMW- 9SH
CMW-11OB	CMW-11SH
CMW-12OB	CMW-12SH

**Table 5.5**

**Soil Vapor Monitoring Locations  
Performance Monitoring Plan  
Hyde Park Landfill Site  
Niagara Falls, New York**

**Soil Vapor Monitoring Locations**

SVP-1  
SVP-2  
SVP-3  
SVP-4  
CMW-7OB  
CMW-8OB

Table 6.1

**Treatment System Sample Locations and Monitoring Schedule**  
**Performance Monitoring Plan**  
**Hyde Park Landfill Site**  
**Niagara Falls, New York**

<b>Frequency</b>	<b>Sample Location</b>	<b>Analytical Parameters</b>
<b>Continuous</b>	Treatment System Effluent	Total Flow
	Treatment System Effluent	pH
<b>Weekly</b>	Main Carbon - First Interstage	VOCs
	Treatment System Effluent	VOCs, Total Phenolics
	Sacrificial Carbon Bed Interstage	VOCs
<b>Quarterly</b>	Leachate Feed	VOCs, SVOCs, Organic acids
	Sacrificial Carbon Bed Interstage	PCBs, dioxin/furans
	Treatment System Effluent per SIU Permt No. 49	VOCs, Total Phosphorus

**Notes:**

The Treatment System Effluent is monitored by the Niagara Falls Water Board under SIU Permt No. 49 five times per quarter for TSS and SOC.

**Abbreviations**

VOCs	- Volatile Organic Compounds
SVOCs	- Semi-volatile Organic Compounds
PCBs	- Polychlorinated Biphenyls
SIU	- Significant Industrial User
TSS	- Total Suspended Solids
SOC	- Soluble Organic Carbon

Table 7.1

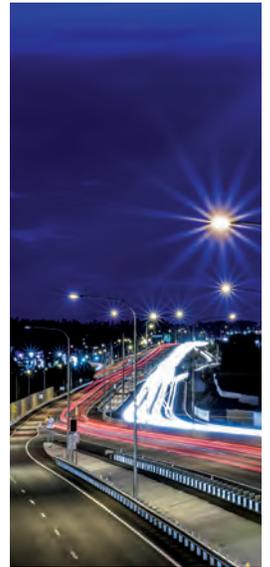
**Additional Fifth-Year Sampling Locations/Analytes  
Performance Monitoring Plan  
Hyde Park Landfill Site  
Niagara Falls, New York**

<u>Monitoring Location</u>	<u>Analytical</u>
BR-1	VOCs, Organic Acids
BR-2	VOCs, Organic Acids
BR-3	VOCs, Organic Acids
BR-4	VOCs, Organic Acids
All sampled piezometers (Table 4.2)	VOCs, SVOCs, Organic Acids, Sulfate
All purge wells (Table 4.1)	VOCs, Organic Acids, Sulfate
Group A piezometers (Table 4.2)	SVOCs, Organic Acids
Notes:	
VOCs	- Volatile Organic Compounds
SVOCs	- Semi-volatile Organic Compounds

# Appendices

# **Appendix A**

**GSH Field Procedures Manual (FPM)**



# Field Procedures Manual

Western New York Sites

Revised June 2016

Glenn Springs Holdings, Inc.

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## Appendices

Appendix A	FP-04C Piezometer Sample Rates and Duration Table
Appendix B	FP-05A Community Monitoring Well Soil Vapor Monitoring Form

# 1. Introduction

GHD Services Inc. (GHD) has updated the Field Procedures developed by Glenn Springs Holdings, Inc. (GSH) for use at their Western New York sites (Sites) and compiled them into this Field Procedure Manual (FPM). GHD is currently conducting Operation, Maintenance, and Monitoring (OM&M) activities at the Sites on behalf of GSH. The Sites in WNY include the Love Canal Landfill, the Hyde Park Landfill, the 102nd Street landfill, the former Durez North Tonawanda Facility, the Durez Inlet Site, the Durez Packard Road Site, the OxyChem Niagara Plant, and the S-Area Landfill.

## 1.1 Site Operations

The Sites are located at the following addresses.

- Love Canal – 805 97th Street, Niagara Falls, New York
- Hyde Park Landfill – 4825 Hyde Park Boulevard, Niagara Falls, New York
- Durez North Tonawanda – 700 Walck Road, North Tonawanda, New York
- Durez Inlet – 512 River Road, North Tonawanda, New York
- OxyChem Niagara Plant – 47th Street and Buffalo Avenue, Niagara Falls, New York
- S-Area Landfill – 100 53rd Street, Niagara Falls, New York
- 102nd Street Landfill – 9857 Buffalo Avenue, Niagara Falls, New York
- Durez Packard Road – 5000 Packard Road, Niagara Falls, New York

## 1.2 Field Procedure Development

The field procedures were developed using previous GSH Field Procedures updated to reflect applicable GHD's Standard Operating Procedures, United States Environmental Protection Agency (USEPA), and New York State Department of Environmental Conservation (NYSDEC) guidelines,.

# 2. General

## 2.1 General Procedures

Certain activities can adversely affect the sample quality; therefore, it is imperative that the following rules are obeyed during implementation of field activities.

1. Do not smoke.
2. Do not use insect repellents.
3. Do not use wasp/hornet spray near a well.
4. Do not use after-shaves, cologne, or astringents.
5. Be aware of wind direction. Do not run a vehicle or small engines upwind of a well that is being sampled.

6. Be cognizant of traffic fumes and nearby activities. Suspend sampling if fumes are strong. Make a notation of any such observations on the field log.
7. Do not handle or pour gasoline or fuel oils near sampling locations.

## **2.2 Health and Safety**

Prior to the commencement of any field activities, all sampling personnel shall have read the Site-specific Health and Safety Plan (HASP) for Operation and Maintenance Activities. Health and Safety monitoring requirements and appropriate Personal Protective Equipment (PPE) are defined in the HASP. A copy of the HASP is available at each of the individual Sites.

During sample collection or monitoring, the basic health and safety rules listed below should be applied.

1. Wear, at a minimum, modified OSHA Level D PPE, which includes safety glasses, full-length pants, and industrial quality work boots.
2. Wear hardhats in any areas where there is a potential for objects falling from overhead or where there is fixed piping or obstructions at head level.
3. Do not eat, drink, or smoke during monitoring or sampling.
4. Be aware of potential slip, trip, and fall hazards and uneven terrain.
5. Be aware of any hazards of working with portable machinery, electrically operated equipment, gasoline-powered equipment, and high-pressure air.
6. Use proper lifting techniques when lifting is required.
7. Be aware of moving vehicles when sampling or monitoring at locations along roads; use safety cones and a flagman as necessary.
8. Handle sediment and water removed during sampling activities as if contaminated.
9. Use caution when opening protective covers on wells as wasps, hornets, bees, snakes, or other wildlife may be present.

## **2.3 Field Calibration of Equipment**

In addition to factory/laboratory calibration of field equipment, certain instruments require field calibration prior to use and as field conditions (temperature, humidity, wind, etc.) change throughout the day. The manufacturer generally defines the schedule for such calibration. The manufacturer's recommendations should be available to field personnel for review and should be conformed to, to the extent practicable.

## **2.4 Cleaning/Decontamination Requirements**

Any equipment not dedicated for use at a specific location must be cleaned prior to use and decontaminated between sampling locations. Cleaning/decontamination protocols are defined in the Field Procedures included in this document.

The following cleaners/solvents are used for decontamination. A short summary of the use and precautions to follow when using these cleaners is presented for each cleaner. These summaries

are not complete, the manufacturer's guidelines and Material Safety Data Sheets (MSDS) should be read and understood before using any of these cleaners.

#### ***Low-Phosphate Soap: Alconox® or Equivalent***

Alconox® is formulated to be "free rinsing" (e.g., easily rinsed off with running tap or distilled water) with virtually no redeposition of removed (and unwanted) materials, all of which translates to virtually a complete absence of residues.

Use Alconox® at a 1-percent solution, which is equivalent to approximately 2 1/2 tablespoons (1 1/4 ounces) per gallon of cold, warm, or hot water. Alconox® is not formulated for spray machines since it will foam. For critical cleaning, do final or all rinsing with distilled, deionized, or purified water.

Alconox® has a shelf life of 2 years after the date of manufacture.

#### ***Citri-Clean***

Protective gloves and goggles should be worn when using Citri-Clean. Do not use near fire, flame, spark, or any ignition source. It is harmful if swallowed.

Heavily caked grease/NAPL areas should be scraped before application.

The standard solution for Citri-Clean is 15 percent (20 ounces of Citri-Clean concentrate in 1 gallon of water). Citri-Clean may be used at up to 100 percent concentrate to remove heavy contamination. Citri-Clean can be applied with sprayer or other conventional means. Following application, allow the materials to stand for 2 to 10 minutes. After allowing the materials to stand, scrub the contaminated area, and flush with water to remove loose particles. Reapply to areas where stains remain or where heavy accumulations of oil, grease, or other contaminants have occurred.

#### ***Sprayon Flash Free Electrical Degreaser***

Sprayon brand Flash Free Electrical Degreaser (Sprayon Degreaser) is used to remove NAPL from equipment. Protective gloves and goggles should be worn when using Sprayon Degreaser.

Heavily caked grease/NAPL areas should be scraped before application. Once NAPL is removed from the article being decontaminated, the article should be wiped clean, rinsed with distilled water, and allowed to dry thoroughly to remove any residual Sprayon Degreaser remaining.

## **2.5 Documentation**

Field conditions, collection, and handling of samples, as well as information regarding each sample collected, will be recorded and stored on standardized forms and/or in a designated project field notebook, paper, or electronic journal. Certain information is recorded in the field directly on a standardized form (e.g., Groundwater Field Sample Purge Record form or Chain of Custody form) while other information is recorded and remains in the field notebook (i.e., weather conditions, description of Site activities, etc.) This type of documentation along with Chain of Custody documentation provides a permanent record of all significant activities completed during a field investigation. All notebooks and logs should be completed using waterproof pens to prevent smudging should the notes get wet while in the field. Once complete, the notebooks, standardized

forms, and logs should be signed and dated on the bottom of each page. All field notes shall be maintained at the GHD Niagara Falls Office.

## **2.6 Training**

All personnel performing field monitoring/sampling are required to have completed 40 hours of health and safety training in compliance with Occupational Safety and Health Administration (OSHA) 1910.120. Annually, an 8-hour health and safety training class must be attended to maintain compliance with current OSHA 1910.120 requirements. Further, all field personnel must be familiar with the health and safety requirements defined in the Site-specific HASP for Operation and Maintenance Activities.

Field personnel must be thoroughly trained before using any field sampling equipment that they are responsible to operate. This includes the operation and calibration of all instruments.

## **2.7 Equipment Preparation**

Approximately 2 weeks prior to sampling, the equipment required for the monitoring program should be checked to ensure that it is clean and operates properly. Any missing or broken equipment or accessories should be replaced or repaired. The equipment condition and calibration will also be checked before being used in the field.

Most instruments require routine calibration. Calibration may be performed as part of routine equipment maintenance or during field activities. Recommended calibration schedules are typically provided in equipment owner's manuals. Vendor's data and/or user manuals are available at the GSH Love Canal office for all equipment as well as GHD's Niagara Falls Office. Records of calibrations performed as part of routine equipment maintenance, as well as factory calibrations, should be maintained in GSH files.

## **2.8 Sample Containers**

Bottles for all regularly scheduled sampling events will be provided by the laboratory. The GHD Project Chemist is responsible for contacting the laboratory to order the appropriate sample bottles, with preservatives, if required.

# **3. Field Procedures**

## **3.1 FP-01A – Waste Management**

### *Disposables (PPE, towels, tubing, etc.)*

All field disposables will be placed plastic bags at point of use. At the end of each day, these wastes will be placed in an approved/labeled 55-gallon waste disposal drum at the site for management as Hazardous Solid Waste.

### *Purge Water*

All purge water from sampling will be disposed of at the relevant GSH site water treatment system. Water will be discharged to an appropriate sump or drainage feature that connects to the Site water

treatment system. The discharge locations should be discussed with the Site Operator to determine the appropriateness of the discharge location prior to the collection of purge water.

### ***Decontamination Liquids***

Alconox Wash: All decontamination wash is contained and disposed of in the same Site location as purge water.

Solvents: minimal volumes of solvents are used. Small quantities of solvents (Citri-Clean and electrical degreaser [spray on]) that are spilled during decontamination may be washed into the decontamination containment area. These areas are connected to the site water treatment system.

### ***NAPL/solvent coated Disposables (PPE, towels, tubing, etc.)***

NAPL coated disposables will be managed in the same manner as described above for non-NAPL coated disposables.

## **3.2 FP-01B – Maintenance Inspection**

### ***Monitoring Wells***

Each monitoring well and piezometer should be inspected annually to ensure that the cap is secure from unauthorized entry, that rain and surface water cannot enter the casing, and that the well/piezometer condition is satisfactory for the desired monitoring objectives, including the monitoring of total well depths for possible infilling. A "Well Maintenance Inspection Form", or a similar form, will be completed during each inspection. The inspection forms should be copied or scanned to an Adobe Acrobat PDF format, stored in the Project File maintained at the GHD Niagara Falls office.

Upon completing the inspection, a memorandum should be prepared which documents the inspection findings, including a summary of required maintenance items, if needed and submitted to the Project Manager.

The memo, as well as copies of the Well Maintenance Inspection Forms, should be submitted to the GHD Project Coordinator (either electronic or hard copy is acceptable).

### ***Landfill Cap***

The following list summarizes the areas for Landfill Cap inspection.

**Table 3.1 Areas for Landfill Cap Inspection**

<b>Feature</b>	<b>Inspect for:</b>
Vegetation and Topsoil	Erosion, bare areas, washouts, dead/dying vegetation, remove woody growth
Access Roads	Erosion, obstructions, potholes, puddles, debris
Drainage Ditches	Sediment buildup, erosion, condition of erosion
	Protection, obstructions, dead/dying vegetation
Drainage Culverts	Obstructions, plugging
Riprap	Missing, erosion, excessive vegetation or woody growth

All personnel should be aware of these inspection guidelines. If problems are identified at any time, the Project Coordinator and Site Operator should be notified and the problem promptly corrected. Log sheets for this inspection are available in the Operation and Maintenance (O&M) Manual for each site. Inspection forms should be stored in the Project file at the Site.

### **Landfill Fence**

Access to the landfill (e.g., fences and gates) should be secure. Gates must be intact and locked, and the fence must be free of openings that would allow access. All posted signs on the fence should be secure and readable.

All personnel should be aware of these access security requirements and should report any breach in the fence or gates immediately. Problems should be promptly corrected. If the fence or locks appear to have been intentionally cut for access, the breach must be documented for the Project file and the Project Manager and Site Operator must be immediately notified.

## **3.3 FP-02A – Groundwater Level Measurement**

### **Equipment**

1. PPE (according to the HASP)
2. Keys to the wells/piezometers
3. Water level indicator
4. Low phosphate soap (Alconox® or equivalent)
5. Decontamination solvents (Citri-Clean and electrical degreaser [spray-on])
6. Distilled water
7. Paper towels, cotton rags
8. Buckets
9. Water level measurement form or log-book
10. Trash bags,
11. Site map
12. Table of well/piezometer depths and previous water level(s)

### **Pre-field Activities**

1. Collect Equipment.
2. Using a glass of water, check that the water level indicator is functioning. Measure the distance from the reference point on the indicator probe to the 2-foot mark on the tape – this should be 2 feet.
3. Decontaminate the water level indicator. Wash the probe and entire length of the tape with a low phosphate soap solution followed by a tap water rinse. Dry with a clean cloth or paper towel. If the tape or probe has been in contact with NAPL, remove NAPL with a rag soaked in Citri-Clean or electrical degreaser, followed by the soap wash described above, and a distilled or deionized water rinse. Any liquid wastes will be contained and disposed of as described below.

### ***Field Procedures***

1. Check well/piezometer ID. If there is any uncertainty that the correct well/piezometer is being measured, measure the total depth of the well using a separate decontaminated tape with a solid weight. Compare the measured depth to the reported depth of the well.
2. Check condition of the protective casing, cement, etc. and make notes as necessary. Serious problems regarding the well condition (e.g., the protective housing has been broken into) should be called in to the GHD Project Manager. Problems that require general maintenance should be documented and added to the Well Maintenance List.
3. Remove cap from well, if there was a sound of air entering or escaping make a note of this and check to see if there is a vent hole in the cap.
4. Check for the measuring point mark on the well riser and for any sharp edges, which may damage the indicator tape.
5. Slowly lower the water level indicator probe until contact with the water surface is indicated, either by audible alarm or by light. To the extent possible, avoid dragging the indicator cable on the top edge of the well casing, this can damage the cable and potentially introduce shavings from the cable into the well/piezometer.
6. Read the depth to water at the measuring point and record the measurement to the nearest 0.01 foot.
7. Retract the tape by winding onto the spool, holding a clean paper towel to remove water and/or debris.
8. For newly installed wells and wells with known contamination, decontaminate the probe and tape between wells with soap and water wash. Rinse with distilled or deionized water. If necessary, decontamination solvents may be used to remove heavy contamination.
9. Replace the well cap and relock the well.

Note: Whenever possible, water level measurements should be collected from least to most contaminated wells.

### ***Decontamination of the Water Level Indicator***

At the end of each day, decontaminate the water level indicator as described under Pre-field Activity, above.

### ***Disposal of Wastes***

All materials will be handled according to Field Procedure FP-01A.

### ***Reporting***

Field data will be entered into the field database management system or an Excel spreadsheet. The GHD Project Manager will specify formats and procedures.

### **3.4 FP-03A – NAPL Presence Check**

#### ***Equipment***

1. PPE (according to the HASP)
2. Keys to the wells/piezometers
3. A 250-foot measuring tape with weighted end and cotton rope attachment to help determine NAPL presence dedicated for wells containing NAPL.
4. Solvents: Citri-Clean or electrical degreaser
5. Tap water
6. Paper towels, cotton rags
7. Bucket
8. NAPL presence form or log-book
9. Site-map
10. Well-depth information.

#### ***Field Procedure***

1. Check well ID against Site map to determine if you have the correct well. If there is any uncertainty that the correct well/piezometer is being measured, measure the total depth of the well using a separate decontaminated tape with a solid weight. Compare the measured depth to the reported depth recorded of that well.
2. Inspect well condition and note apparent problems requiring maintenance.
3. Remove cap from well and check for the measuring point mark on the well riser. Check for any rough or sharp edges that might damage the measuring tape.
4. Lower the weighted tape down into the center of the well until contact with the bottom of the well. Verify this by checking the depth of the tape against the known well depth.
5. Retract the tape to the top to check amount of NAPL present on the measuring tape. If no NAPL is present, check the attached cotton rope for NAPL.
6. Note the NAPL presence (yes or no) on the form or in the log book.
7. Replace well cap.
8. Decontaminate tape. Tape will be wiped clean with paper towels and rinsed with water. If necessary, wipe tape with a rag soaked in Citri-Clean or electrical degreaser. Wipe solvents from the tape with clean paper towels or cotton rags and rinse with water.
9. Replace cotton rope with a clean piece of rope between well measurements to avoid cross-contamination.

#### ***Disposal of Wastes***

All materials will be handled according to Field Procedure FP-01A.

## ***Reporting***

Field data will be entered into the field database management system or an Excel spreadsheet. The GHD Project Manager will specify formats and procedures.

### **3.5 FP-03B – NAPL Thickness Measurement Procedure**

#### ***Equipment***

1. PPE (according to the HASP).
2. Keys to the wells/piezometers.
3. Solvents: Citri-Clean or electrical degreaser.
4. Tap water.
5. Paper towels, cotton rags.
6. Bucket.
7. NAPL thickness form or log-book.
8. Site map.
9. A 250-foot measuring tape with 1-foot piece of 1/4-inch rebar dedicated for wells containing NAPL. Attach rebar to the measuring tape with duct tape.

#### ***Field Procedure***

1. Check well ID against Site map to determine if you have the correct well. If there is any uncertainty that the correct well/piezometer is being measured, measure the total depth of the well using a separate decontaminated tape with a solid weight. Compare the measured depth to the reported depth recorded of that well.
2. Inspect well condition and note apparent problems requiring maintenance.
3. Remove cap from well and check for the measuring point mark on the well riser. Check for any rough or sharp edges that might damage the measuring tape.
4. Lower the measuring tape until the rebar contacts the bottom of the well.
5. Record the depth to the bottom of the well from top of casing (or the appropriate reference used for water level measurements).
6. Slowly rewind tape and record NAPL thickness based on visual inspection of NAPL on the tape or rebar.
7. Decontaminate tape. Tape will be wiped clean with a rag soaked in Citri-Clean or electrical degreaser. Wipe solvents from the tape with clean paper towels or cotton rags and rinsed with water.
8. Repeat for next well.

#### ***Disposal of Wastes***

All materials will be handled according to Field Procedure FP-01A.

## **Reporting**

Field data will be entered into the field database management system or an Excel spreadsheet. The GHD Project Manager will specify formats and procedures.

### **3.6 FP-03C – NAPL Removal from Wells**

#### **Equipment**

1. PPE (according to the HASP).
2. Keys to the wells/piezometers.
3. Solvents: Citri-Clean or electrical degreaser.
4. Tap water.
5. Paper towels, cotton rags.
6. Bucket.
7. NAPL recovery form or log-book.
8. Site map.
9. A 250-foot measuring tape with 1-foot piece of 1/4-inch rebar dedicated for wells containing NAPL. Attach rebar to the measuring tape with duct tape.
10. Tubing and foot valve by hand or using a gasoline or electric powered pump actuators (Waterra Hydrolift or equivalent), persitaltic pump, or bailer

#### **Field Procedure**

1. Check well ID against Site map to determine if you have the correct well. If there is any uncertainty that the correct well/piezometer is being measured, measure the total depth of the well using a separate decontaminated tape with a solid weight. Compare the measured depth to the reported depth recorded of that well.
2. Inspect well condition and note apparent problems requiring maintenance.
3. Open monitoring well.
4. Send tubing down or bailer to the bottom of the well.
5. Purge monitoring well location with selected purge equipment until the NAPL has been removed.
6. Collect NAPL in plastic carboys or other appropriate containers.
7. Remove purging equipment unless tubing or bailer are dedicated.
8. Close monitoring well.
9. Record amount on NAPL removed.
10. Transfer NAPL from carboys site treatment system decanters or to 55-gallon drums.
11. Decontaminate tape if used. Tape will be wiped clean with a rag soaked in Citri-Clean or electrical degreaser. Wipe solvents from the tape with clean paper towels or cotton rags and rinsed with water.

### ***Disposal of Wastes***

All materials will be handled according to Field Procedure FP 01A.

### ***Reporting***

Field data will be entered into the field database management system or an Excel spreadsheet. The Project Manager will specify formats and procedures.

## **3.7 FP-04A – APL Sampling - Pressurized Taps**

### ***Equipment***

1. PPE (according to the HASP)
2. Bucket for purge water
3. Sampling forms or field notebook
4. Site map

### ***Pre-Field Activities***

1. Contact GHD Project Chemist to acquire sample bottles
2. Prepare bottle labels
3. Prepare Chain of Custody forms

### ***Field Procedure***

1. Identify proper sample tap
2. Place purge bucket under sample tap
3. Slowly open sample valve and purge enough into bucket to sufficiently clear the line of stagnant water
4. Place sample bottle under the tap and close-down the valve to achieve a slow, steady stream of water
5. Fill sample bottles
6. Close sample tap valve
7. Securely pack samples in ice filled coolers for shipment to the appropriate laboratory. Coolers must:
  - Have chain-of-custody forms in a zip-lock bag in the cooler
  - Be securely taped closed with security seals across the cooler opening

### ***Disposal of Wastes***

All materials will be handled according to Field Procedure FP-01A.

### ***Reporting***

Field data will be entered into the field database management system via completion of a Field Sample Key (FSK). The GHD Project Manager will specify formats and procedures.

A copy of the Chain of Custody forms must be sent to the GHD Laboratory Coordinator.

### **3.8 FP-04B – APL Sampling – 3 Well Volume Method**

#### ***Equipment***

1. PPE (according to the HASP).
2. Keys to the wells/piezometers.
3. Water level indicator.
4. Purging equipment: water level meter, pumps (Grundfos, peristaltic pumps, hand bailers, or bladder pumps), generator, and compressor. Enough decontaminated pumps will be taken to the field to complete the day's sampling schedule. Water storage tank for purge water.
5. Field Parameter Monitoring Instruments: Multi-parameter (pH, specific conductance, and temperature) flow-through cell.
6. Decontamination Equipment/Supplies: Sheet plastic, low phosphate soap (Alconox®), distilled water (DI), paper towels or cotton rags, and buckets.
7. Sampling forms or field notebook.
8. Site map.

#### ***Pre-Field Activities***

1. Contact GHD Project Chemist to acquire sample bottles.
2. Prepare bottle labels.
3. Prepare Chain of Custody forms.
4. Print field log/data recording sheets (pre-printed with location IDs).
5. Calibrate field parameter monitoring instruments and record calibration results.
6. Acquire table of locations to be sampled including total piezometer depth.
7. Decontaminate enough pumps to complete at least 1 day's sampling schedule. For peristaltic pumps, decontamination is replacement of used tubing with new tubing cleaned by the manufacturer. For inertial pumps (Waterra), decontaminate the check valves and replace the tubing. The following procedure is for any submersible pumps. Wearing appropriate PPE:
  - Remove all visible sediment/soil by hand brush scrubbing or power washing
  - Remove drain plug from pump and drain trapped water. Refill pump with deionized water and replace the drain plug.
  - Submerge pump in a 5-gallon bucket of low-phosphate soap water and recirculate soap solution for 5 minutes.
  - Remove drain plug from pump and drain trapped water. Replace the drain plug.
  - Submerge pump in a 5-gallon bucket of tap water and recirculate water for 5 minutes.
  - Rinse equipment with deionized water.
  - Allow equipment to air dry.
  - When dry - reassemble equipment and place in plastic bag for storage to avoid re-contaminating equipment.

- An equipment blank may be required. The equipment blank is collected by pouring deionized water in the top of the pump and catching the water as it runs off the bottom of the pump in a labeled sample jar. Equipment blanks should be managed consistent with water samples as described below.

If the pump is contaminated with NAPL, the pump will be cleaned outside with Citri-Clean, pressure-washed outside, the drain plug removed to drain residual water and replaced, run through a 5-minute recirculation with a Citri-Clean solution, and then pressure-washed. Following this aggressive cleaning, the procedure defined above will be completed.

### **Field Procedures**

1. Check well/piezometer ID. If there is any uncertainty that the correct well/piezometer is being measured, measure the total depth of the well using a separate decontaminated tape with a solid weight. Compare the measured depth to the reported depth of the well.
2. Inspect well/piezometer for damage or problems that require maintenance or may compromise the integrity of the water sample to be collected.
3. Check for the measuring point mark on the well riser and for any sharp edges, which may damage the indicator tape.
4. Measure water level and record on the field log. Determine the volume of water to be purged according to diameter of the well and formulas on the sample collection forms.
5. Install pump into well for purging. Lower pump deep enough that the well/piezometer does not go dry during the purging; but as close to the top of the water column as possible to remove all stagnant water.
  - Purge tubing is dedicated to each well and remains in the well between sampling events. A decontaminated pump will be used for each well purging. The dedicated tubing is pulled from the well and connected the decontaminated pump.
  - Care must be taken to ensure that the dedicated tubing is not contaminated when it is removed from the well, and that no debris is introduced to the well when the pump is lowered.
6. Start pump and purge as follows:
  - Start pump and adjust flow rate to a rate sustainable by the well. The goal of the sampling is to purge and sample without drying up the well/piezometer.
  - Monitor field parameters (pH, specific conductance, and temperature), water level, and pumping rate, and record in the field log including the time of the measurements. One set of readings will be taken at the start of purging and an additional set will be taken after removal of each standing well volume.
    - If the well goes dry, purge 3 consecutive days to dryness and then sample. Full recovery is not necessary. Sampling can commence on Day 3 if water is available and can be conducted over the next 4 days if required to fill the sample bottles.
    - If the well goes dry, a sustainable pumping rate should be determined for future sampling events. Contact the GHD Project Manager or Coordinator regarding adjustment of pumping rates.

7. Samples shall be collected by use of a bailer or directly from pump discharge tubing.
  - Note: If possible, sampling in the rain should be avoided to avoid cross-contamination from airborne contaminants picked up by the precipitation.
  - Wells should be sampled beginning with lowest concentration wells, progressing to highest concentrations. This minimizes the potential for cross-contamination.
  - Securely pack samples in ice filled coolers for shipment to the appropriate laboratory. Coolers must:
    - Have chain-of-custody forms in a zip-lock bag in the cooler
    - Be securely taped closed with security seals across the cooler opening
8. Remove pump and disconnect from purge tubing. Purge tubing should be returned to the well.
  - Care must be taken to ensure that the dedicated tubing is not contaminated when it is removed from the well, and that no debris is introduced to the well when the tubing and pump is lowered into the well.
9. Manage purge water and sampling disposables as described below.

### ***Disposal of Wastes***

All materials will be handled according to Field Procedure FP-01A.

### ***Reporting***

Field data will be entered into the field database management system via completion of a FSK. The GHD Project Manager will specify formats and procedures.

A copy of the Chain of Custody forms must be sent to the GHD Laboratory Coordinator.

## **3.9 FP-04C – APL Sampling - T<sub>95</sub> Piezometer Sampling Method**

### ***Background***

The T<sub>95</sub> Purge Sampling Protocol is designed to collect a representative groundwater sample from the Hyde Park piezometers. The protocol specifies a recommended pumping rate and a fixed purge time. The purge time and rate based on a mathematical analysis to ensure that more than 95 percent of the water sampled is collected from the formation outside of the well, and less than 5 percent from wellbore storage.

**An important element of the T<sub>95</sub> sampling protocol is consistency. A table is included as Appendix A of this Field Procedure Manual defining a purge time and pumping rate for each piezometer. The purge time and pumping rate are to be followed as closely as possible. Field testing has proven that the recommended purge rates can be sustained. If a field sampling pump cannot provide the recommended pumping rate, then a different sampling pump should be acquired.**

The time (t<sub>95</sub>) to achieve this target was calculated based on a piezometer-specific transmissivity and storage coefficient determined prior to the sampling event. The maximum purge rate was determined based on the available drawdown (static water level – top of the well screen) in the piezometer. An upper limit of 1.0 liters per minute (L/min) was defined for purging. For piezometers

with a calculated  $t_{95}$  less than 5 minutes, a 5-minute minimum purge time is required; this ensures that the entire screened interval will be flushed with formation water. As a practical limit, piezometers requiring more than 90 minutes to purge were eliminated from the sampling program. Piezometers that exceed this time limit are either in very low transmissivity areas of the formation, or have very little standing water.

In the event that it is not possible to purge at the pumping rate recommended on the included table, a minimum purge volume must be calculated. The calculation is included near the end of this field procedure. Reducing the pumping rate from the values listed on the attached table will require calculations to be performed in the field and may significantly increase the time to collect samples. Any deviations from the sampling requirements are acceptable only on a temporary basis, and only if sampling cannot be delayed until proper equipment is available.

### ***Equipment***

1. PPE (according to the HASP).
2. Keys to the wells/piezometers.
3. Water level indicator.
4. Purging equipment: Waterra pump and generator. Water storage tank for purge water.
5. Field Parameter Monitoring Instruments: Multi-parameter (pH, dissolved oxygen (DO), oxygen reduction potential (ORP), temperature, turbidity, and conductivity) flow-through cell.
6. Decontamination Equipment/Supplies: Sheet plastic, low phosphate soap (Alconox®), distilled water (DI), paper towels or cotton rags, and buckets.
7. Sampling forms or field notebook.
8. Site map.

The Hyde Park piezometers are 1-inch diameter stainless steel or polyvinyl chloride (PVC) with a 2-foot long screen. They will be purged using a Waterra inertial pump. Peristaltic pumps are not acceptable.

### ***Pre-Field Activities***

1. Contact GHD Project Chemist to acquire sample bottles.
2. Prepare labels for sample bottles.
3. Prepare chain-of-custody forms.
4. Print field log/data recording sheets (pre-printed with location IDs).
5. Calibrate flow-through Cell instrument according to the manufacture's specifications.
6. The Waterra pump is decontaminated by washing the check valve in a low-phosphate water solution and rinsing with DI water. Discharge tubing will be either dedicated to the piezometers, or new tubing will be used for each sample.
7. Acquire table of locations to be sampled including total piezometer depth.

## Field Procedures

1. Check well/piezometer ID. If there is any uncertainty that the correct well/piezometer is being measured, measure the total depth of the well using a separate decontaminated tape with a solid weight. Compare the measured depth to the reported depth of the well.
2. Inspect well/piezometer for damage or problems that require maintenance or may compromise the integrity of the water sample to be collected.
3. Check for the measuring point mark on the well riser and for any sharp edges, which may damage the indicator tape.
4. Measure water level and record on the field log.
5. Lower dedicated Waterra inertial pump intake to the center of the screened interval of the piezometer (1 foot above the bottom of the piezometer).
6. Begin purging and adjust pumping rates as soon as possible.
  - Pumping rate should be adjusted to match, or be slightly less than, the defined maximum pumping rates. Pumping at higher rates to purge or sample will cause the piezometer to go dry.
  - During purging, the following field parameters will be collected:
    - pH, DO, ORP, temperature, turbidity, and conductivity using a flow-through cell
    - Total water volume purged
  - Field parameter measurements should be recorded at 1-minute intervals for the first 5 minutes, and at a regular interval determined by field personnel after 5 minutes. The total volume purged should be checked with a graduated container. The container should have 1-milliliter (mL) graduations.
  - The piezometers must be purged for the predefined  $t_{95}$  time before sample collection is initiated. Stabilization of field parameters is not a requirement or an endpoint for purging.
  - **If a piezometer goes dry during the purging DO NOT COLLECT A SAMPLE. The field data should be compiled and sent to the GHD Project Manager at the end of the sampling day. The data will be reviewed and a revised pumping rate will be proposed. Based on the review, the piezometer may be purged again using a lower pumping rate.**
7. Following purging, the flow through cell should be removed from the pump discharge and sample containers shall be filled directly from the pump discharge. The total volume of sample collected and the time that the last sample bottle was filled shall be recorded. The pumping rate used to purge the piezometer must be maintained during sampling. The defined purge rate for each piezometer is the maximum sustainable pumping rate, the piezometer will likely go dry at a higher pumping rate.
8. Following sample collection reconnect the discharge tube to the flow-through cell and take two sets of post sample field parameters 1 minute apart.
9. Securely pack samples in ice filled coolers for shipment to the appropriate laboratory. Coolers must:
  - Have chain-of-custody forms in a zip-lock bag in the cooler
  - Be securely taped closed with security seals across the cooler opening

10. Manage purge water and sampling disposables as described below.

### ***Pumping less than the Recommended Pumping Rates***

Purging at less than the maximum pumping rate is acceptable only on a temporary basis and only if:  
a) sampling cannot be delayed, or b) the piezometer can no longer sustain the recommended pumping rates.

The  $t_{95}$  time is dependent on the transmissivity and well construction, but it is independent of the pumping rate. When pumping rates are reduced, however, a minimum volume to pump becomes an issue. An extreme example demonstrates the issue. For a well with a  $t_{95}$  of 5 minutes, purging at 1 milliliters per minute (mL/min) the water will result in a stabilized water level after 5 mL of water have been recovered. The 2-foot long, 1-inch diameter piezometer screen contains 320 mL of water. The 5 mL purge volume has not flushed the pre-purge water from the screened interval. It is recommended that at a minimum, three full screen volumes are pumped before sampling. If both the minimum purge volume and the  $t_{95}$  time are satisfied, then the screen has been flushed and  $\geq 95\%$  of the water entering the pump intake is formation water.

The minimum purge volume has been set equal to the volume of water removed from wellbore storage during purging, plus three screen volumes. Three screen volumes is three times the volume per foot in a 2-foot long screen, or six times the volume in a 1-inch diameter pipe. The volume taken from wellbore storage is dependent on the stabilized drawdown in the piezometer. Previous analyses have shown that the stabilized drawdown in the 1-inch piezometers is approximately:

$$s_w = 0.083 Q/T$$

Where:

$s_w$  = stabilized drawdown (ft)

$Q$  = pumping rate (mL/min)

$T$  = transmissivity (ft<sup>2</sup>/day)

Therefore, minimum purge volume is then:

$$V_{\text{purge}} = V_{\text{ft}} * (6 + 0.083 Q/T)$$

Where:

$V_{\text{ft}}$  = volume per foot of the 1-inch diameter pipe = 160 mL/ft

$V_{\text{purge}}$  = 160 mL/ft \* (6 + 0.083 Q/T)

Sample Calculation for G1-02:

$Q$  recommended = 216 mL/min but assume that  $Q$  actual = 50 mL/min

$T$  = 0.7 ft<sup>2</sup>/day

$$\begin{aligned} V_{\text{purge}} &= 160 * (6 + 0.083*50/0.7) \\ &= 160 * (6 + 5.9) \\ &= 1,900 \text{ mL} \end{aligned}$$

For G1-02, pumping this volume at 50 mL/min takes 38 min. For G1-02,  $t_{95}$  is 47.1 min. The well is ready to sample as soon as the minimum purge volume, and  $t_{95}$  have been satisfied, i.e., after 47.1 minutes. If the pumping rate were 20 ml/min, then  $V_{\text{purge}}$  would be 1,190 mL and would take 67 minutes to purge at 20 mL/min. Then, the  $V_{\text{purge}}$  is the limiting factor, not  $t_{95}$ . In general, if:

$$Q \text{ (mL/min)} < 48 T \text{ (ft}^2\text{/day)} \quad \text{or} \quad Q \text{ (mL/min)} < 1580 / t_{95} \text{ (min)}$$

Then, minimum purge volume will take precedence over the  $t_{95}$ .

**REMINDER: NEVER INCREASE PUMPING RATES AFTER THE PURGING REQUIREMENTS HAVE BEEN SATISFIED. THE SYSTEM HAS STABILIZED FOR THE PURGE RATE USED (OR A LOWER RATE), BUT IT IS NOT STABILIZED IF THE PUMPING RATE IS INCREASED.**

### *Disposal of Wastes*

All materials will be handled according to Field Procedure FP-01A.

### *Reporting*

Field data will be entered into the field database management system via completion of a FSK. The GHD Project Manager will specify formats and procedures.

A copy of the Chain of Custody forms must be sent to the GHD Laboratory Coordinator.

## 3.10 FP-04D – APL Sampling - Surface Water and Seeps

### *Equipment*

1. PPE (according to the HASP)
2. sampling forms or field logbook
3. Site map

### *Pre-Field Activities*

1. Contact GHD Project Chemist to acquire sample bottles
2. Prepare bottle labels
3. Prepare Chain of Custody forms

### *Sample Collection Procedure*

1. Place sample bottle under seep or surface stream to be sampled.
  - In shallow running water, look for a flow with minimal aeration
  - If possible, submerge the entire sample bottle and expel all air
2. Securely pack samples in ice filled coolers for shipment to the appropriate laboratory. Coolers must:
  - Have chain-of-custody forms in a zip-lock bag in the cooler
  - Be securely taped closed with security seals across the cooler opening

## ***Disposal of Wastes***

All materials will be handled according to Field Procedure FP-01A.

## ***Reporting***

Field data will be entered into the field database management system via completion of a FSK. The GHD Project Manager will specify formats and procedures.

A copy of the Chain of Custody forms must be sent to the GHD Laboratory Coordinator.

## **3.11 FP-04E: Groundwater Sampling – Low-Flow Purge and Sampling**

### ***Equipment***

1. PPE (according to the HASP).
2. Keys to the wells/piezometers.
3. Water level indicator.
4. Purging equipment: water level indicator, pumps (Grundfos, peristaltic pumps, hand bailers, or bladder pumps), generator, and air compressor. Enough decontaminated pumps will be taken to the field to complete the day's sampling schedule. Water storage tank or buckets for purged water.
5. Field parameter monitoring instruments: flow-through cell and water level measurement tape.
6. Decontamination equipment: plastic sheeting, low phosphate soap (Alconox®), distilled water, paper towels, and buckets.
7. Groundwater sampling forms or field logbook.
8. Site map.

### ***Pre-Field Activities***

1. Contact GHD Project Chemist Coordinator to acquire sample bottles.
2. Prepare bottle labels.
3. Prepare Chain of Custody
4. Print field log/data recording sheets.
5. Calibrate field parameter meters; record calibration results.
6. Acquire table of locations to be sampled including total piezometer depth.
7. Decontaminate enough pumps to complete at least 1 day's sampling schedule. For peristaltic pumps, decontamination is replacement of used tubing with new tubing cleaned by the manufacturer. The following procedure is for any submersible pumps. Wearing appropriate PPE:
  - Remove all visible sediment/soil by hand brush scrubbing or power washing.
  - Remove drain plug from pump and drain trapped water. Replace the drain plug.
  - Submerge pump in a 5-gallon bucket of low-phosphate soap water, and recirculate soap solution for 5 minutes.

- Remove drain plug from pump and drain trapped water. Replace the drain plug.
- Submerge pump in a 5-gallon bucket of tap water, and recirculate water for 5 minutes.
- Rinse equipment with tap water.
- Allow equipment to air dry.
- When dry - reassemble equipment and place in plastic bag for storage to avoid re-contaminating equipment
- An equipment blank may be required. The equipment blank is collected by pouring de-ionized water into the top of the pump and collecting the water in sample jars as it runs off the clean pump. Equipment blanks should be managed consistent with water samples as described below.

If the pump is contaminated with NAPL, the pump will be cleaned outside with Citri-Clean, pressure washed outside, the drain plug removed to drain residual water and replaced, run through a 5-minute recirculation with a Citri-Clean solution, and then pressure washed. Following this aggressive cleaning, the procedure defined above will be completed.

### **Field Procedures**

1. Check well/piezometer ID. If there is any uncertainty that the correct well/piezometer is being measured, measure the total depth of the well using a separate decontaminated tape with a solid weight. Compare the measured depth to the reported depth of the well.
2. Inspect well/piezometer for damage or problems that require maintenance or may compromise the integrity of the water sample to be collected.
3. Check for the measuring point mark on the well riser and for any sharp edges, which may damage the indicator tape.
4. Measure the water level and record on the field log. Determine the volume of water in the well bore.
5. Install pump/tubing into well for purging. Lower pump/tubing to center of the screened interval.
6. Start pump and purge as follows:
  - Start pump and adjust flow rate to a rate sustainable by the well, if possible and no greater than 500 mL/min. The goal of the sampling is to purge and sample without significantly lowering the water level of the well.
  - Monitor field parameters (pH, specific conductance, ORP, DO, turbidity, and temperature), water level, and pumping rate, and record on the field log in five minute intervals. One set of readings will be taken at the start of purging and an additional set of readings will be taken after each 5-minute interval.
  - Groundwater stabilization is considered as having been achieved when three consecutive readings for each of the field parameters, taken at 5-minute intervals, are within the following limits:
 

pH	±0.1 pH units of the average value of the three readings
Temperature	±3 percent of the average value of the three readings
Conductivity	±3 percent of the average value of the three readings

ORP	±10 millivolts (mV) of the average value of the three readings
DO	±10 percent of the average value of the three readings
Turbidity	±10 percent of the average value of the three readings, or a final value of less than 5 nephelometric turbidity unit (NTU)

- Stabilization will be considered as being complete when the field parameters have stabilized as indicated in the above table. Purging will continue if stabilization does not occur until a maximum of 20-screen volumes have been removed. The screen volume is based on screen length.
  - If the recharge to the well is insufficient to conduct low-flow sampling, the well will be pumped dry and allowed to recharge sufficiently for the collection of the groundwater sample volume. Wells that are purged dry are not required to meet the stabilization criteria detailed above.
7. Samples shall be collected directly from the pump discharge immediately after stabilization:
    - Note: if possible, sampling in the rain should be avoided to avoid cross-contamination from airborne contaminants picked up in the precipitation.
    - Wells should be sampled beginning with the lowest concentration wells, progressing to the highest concentration wells. This minimizes the potential for cross-contamination.
  8. Securely pack samples in ice-filled coolers for shipment to the appropriate laboratory. Coolers must:
    - Have completed Chain of Custody forms in a zip-lock bag in the cooler.
    - Be securely taped closed with security seals across the cooler opening.
  9. Remove pump/tubing. Purge tubing can be returned to the well for reuse:
    - Care must be taken to ensure that the dedicated tubing is not contaminated when it is removed from the well, and that no debris is introduced to the well when the tubing is lowered into the well.
  10. Manage purge water and sampling disposables as described below.

### ***Disposal of Wastes***

All materials will be handled according to Field Procedure FP-01A.

### ***Reporting***

Field data will be entered into the field database management system via completion of a FSK. The Field Manager will specify formats and procedures.

A copy of the Chain of Custody forms must be sent to the GHD Laboratory Coordinator.

## **3.12 FP-05A – Vapor Sampling - Community Monitoring Wells**

### ***Equipment***

1. PPE
2. Keys to the wells
3. Water level indicator

4. Organic Vapor Analyzer (OVA)
5. Tubing
6. Forms or field logbook
7. Site map

#### ***Pre-Field Activities***

1. Print field log/data recording sheet.
2. Install vapor monitoring caps on all community monitoring wells at least 1 month before vapor sampling. Only the overburden wells need these caps.
3. Connect 5 feet of clean sample tubing to the OVA.
4. Calibrate the OVA according to the manufacturer's recommendations, with sample tubing connected.

#### ***Field Procedure***

1. Locate proper well and open flush-mount access. **DO NOT REMOVE VAPOR SAMPLING CAP UNTIL AN OVA READING HAS BEEN COLLECTED.**
2. Start the OVA pump. Before connecting sample tubing to the cap, collect and record an ambient OVA reading.
3. Record OVA readings at 1-minute intervals for 10 minutes on filed form (Appendix B).
4. Remove OVA.
5. Remove Vapor Sampling Cap.
6. Measure depth to water and record.
7. Close and lock the well.

#### ***Follow-up Procedure***

1. Review completed field form.
2. If vapor monitoring results are more than 50 parts per billion above background, field staff will notify project manager immediately.
3. Follow-up actions may be implemented to verify the measurements. These actions may include checking the OVA if it is suspected that water or debris may have entered the unit which could provide erroneous readings, recalibration of the OVA, and/or re-measurement with the recalibrated OVA or replacement OVA.
4. If the vapor monitoring results are more than 50 parts per billion above background and determined to be valid, a groundwater sample will be collected from the monitoring well where the measurement was obtained within 2 weeks. The groundwater sample will be collected using field procedure FP-04B.

#### **Notes:**

The vapor sampling protocol is defined to collect vapor near the end of the sample tubing. The purge time for sampling must be long enough to evacuate one tubing volume, but not long enough to draw vapors from outside of the well. The Community Monitoring Wells are 12-inch diameter wells. A sampling pump operating at 400 cc/minute will evacuate a 1-foot column of air from a

12-inch diameter pipe in about 55 minutes. Pumping 400 cc/min will evacuate a 10-foot length of a 0.25-inch ID tubing (5 feet in the well and 5 feet to the OVA) in approximately 15 seconds. The sampling schedule, 1-minute intervals for 10 minutes, with the intake 5 feet below the top of the well casing, will ensure that the connecting tubing has been purged for the first sample at 1 minute and that no atmospheric air will be drawn into the OVA.

Pipe/Tube ID (inches)	Volume (cc/foot)
0.25	10
0.5	39
1	154
2	618
4	22,481
6	5,560
12	22,240

### 3.13 FP-07A – Monitoring Well Decommissioning Procedure

Although it is not part of routine activities at the Site, it may be necessary to decommission environmental monitoring wells when they are no longer needed or when their integrity is suspect or compromised. The draft document, *Groundwater Monitoring Well Decommissioning Procedures*, (NYSDEC Guidance) provides guidelines for decommissioning (abandoning, plugging) environmental monitoring wells. The following procedure summarizes these guidelines as they apply to the Site.

#### Preparation

Well information including current conditions, well logs, and laboratory analytical data collected from soil and/or groundwater will be reviewed. This information will aid in developing a scope of work, establishing health and safety protocol(s), developing an appropriate abandonment technique, and aid in real-time field decisions, if necessary, during the decommissioning process.

#### Selection of Decommissioning Method

The primary rationale for well decommissioning is to prevent contaminant migration along the disturbed construction zone created by the original well boring. This requires selection of a procedure that considers such factors as:

- Hydrogeological conditions at the well site
- Presence/absence of contamination in the groundwater
- Original construction details

The four primary decommissioning procedures are:

1. Grouting the casing in place
2. Perforating the casing followed by grouting in place
3. Casing pulling
4. Overdrilling

Detailed discussion of the decommissioning selection process and methods are presented in the NYSDEC Guidance. The procedures for overburden and bedrock wells are discussed below.

### ***Overburden Wells:***

The procedures that will be used to decommission overburden wells are the casing pulling method. In this method, the well casing is lifted out of the borehole while grout is added into the borehole using positive placement techniques to ground surface. If the situation is encountered where the well casing is unable to be pulled, an alternate method involving grouting in-place will be used. This procedure involves filling the casing with grout using positive placement techniques to a level of 2 feet below the land surface, cutting the well casing at the 2-foot depth, and removing the top portion of the casing and associated well materials from the ground. In addition, the upper 2 feet of the borehole will be filled to land surface.

Based on a review of the NYSDEC Guidance, grouting in place appears to be the most appropriate technology for bedrock monitoring wells at the Site.

### ***Bedrock Monitoring Wells: Grouting In Place***

Grouting in place is the simplest decommissioning procedure. This method is preferred for bedrock wells with casings 2 inches or greater in diameter. The method involves filling the casing and open interval with a cement-bentonite grout. Unless special conditions, e.g., grout flowing into fractures and not filling the borehole, or grout entry into the filter pack of a screened well, is desired, the following grout mixture will be used:

- One 94-pound bag of Type I Portland Cement
- 3.9 pounds powdered bentonite
- 7.8 gallons of water

Based on past experience in the Lockport Bedrock, where there can be significant vertical flow in the open interval of a well, the flow may create "piping" conditions (an erosion of the cement-bentonite grout). The piping may result in an interconnection of flow zones within the abandoned well. Therefore, in wells with significant vertical flow, GSH will modify the NYSDEC procedure as described below. The GSH procedure is satisfactory for all wells; however, it is more time-consuming than the NYSDEC procedure. In wells with no apparent vertical flow, the NYSDEC Groundwater Monitoring Well Decommissioning Procedures may be followed.

### ***Bedrock Wells: NYSDEC Procedure***

The grout mixture will be placed using a tremie pipe at least 1 inch in diameter lowered to within 5 feet of the bottom of the borehole. The borehole will be filled with the grout mixture to the top of bedrock or 5 feet below grade, whichever is closer to grade. Any groundwater displaced during the placement of the grout will be containerized and managed according to Field Procedure FP-01A.

The grout will be allowed to set for a minimum of 24 hours. The casing will then be cut off at 5 feet below grade or at the top of bedrock. If the grout level has settled from the target 5 feet below grade or top of bedrock, additional grout will be added. To allow future location of the abandoned well, an iron marker detectable with a metal detector will be left in place. If steel casing (carbon or stainless) is left in the ground, this is a sufficient marker. Otherwise, a marker such as a large bolt should be placed on top of the grout. After adding the grout and iron marker, the unfilled portion of the

borehole will be filled to ground surface with material appropriate to the intended land use. For example, concrete or asphalt will be patched with concrete or asphalt of the same type and thickness; grassed areas will be seeded; and topsoil – similar to native soil – will be used to restore the Site.

#### ***Bedrock Wells: GSH Modification for Wells with Significant Vertical Flow***

The GSH modification replaces the cement-bentonite grout in the well open interval with bentonite chips. The well open interval will be filled with bentonite chips to at least 2 feet into the well casing. The chips will be introduced in 5-foot lifts. A predetermined volume of bentonite chips will be added to the well to create a 5-foot thickness of bentonite. Following the addition of each lift, a heavy cylindrical "tamp" will be lowered on a cable to the top of the bentonite chips and allowed to rest on the bentonite chips. The purpose of the tamp is to ensure that the bentonite chips are fully in place. A tape measure attached to the top of the tamp will be used to check that the actual thickness of bentonite is consistent with the expected thickness of the volume of chips added. The addition of bentonite chips will continue until the seal extends at least 2 feet into the well casing.

#### ***Field Oversight and Documentation***

Oversight personnel will document all well decommissioning activities in the field book. Additionally, a memorandum will be prepared to document the decommissioning activities and submitted to the Project Manager.

#### ***Disposal of Wastes***

All materials will be handled according to Field Procedure FP-01A.

### **3.14 FP-08A – Well Redevelopment**

Occasionally a monitoring or purge well may require redevelopment or rehabilitation. Indications of the need for redevelopment may include a decrease in purge well pumping rate, siltation occurring in the screened intervals of wells, or lack of hydraulic response.

#### ***Preparation***

Well information including current conditions, well logs, sampling logs, historical transmissivity or hydraulic conductivity values, and pumping rates will be reviewed. This information will aid in developing a scope of work, establishing health and safety protocol(s), determine whether redevelopment or rehabilitation is required, and aid in real-time field decisions, if necessary, during the redevelopment/rehabilitation process.

#### ***Equipment***

1. PPE (according to the HASP)
2. Purging equipment: water level indicator, pumps (Grundfos, hand bailers, air lift), generator, air compressor, and surge block
3. Water storage tank
4. Field parameter monitoring instruments (pH, specific conductance, temperature, and turbidimeter)

5. Decontamination equipment: plastic sheeting, low phosphate soap (Alconox®), distilled water, paper towels, and buckets

### ***Pre-Field Activities***

1. Print field log/data recording sheets (preprinted with location IDs).
2. Calibrate pH, specific conductance, and turbidimeter instruments; record calibration results.
3. Decontaminate enough pumps to complete at least 1 day's redevelopment schedule. Use decontamination procedure defined in FP-04B.

### ***Field Procedure – Well Redevelopment***

1. Measure the water level and record on the field log. Determine the volume of water to be purged according to formulas on the well redevelopment form.
2. Install pump and surge block into well for purging. Lower pump to approximately 5 feet below the water surface:
  - Purge tubing is dedicated to each well and remains in the well between uses. A decontaminated pump will be used for well redevelopment. The dedicated tubing is pulled from the well and connected to the decontaminated pump.
  - Care must be taken to ensure that the dedicated tubing is not contaminated when it is removed from the well, and that no debris is introduced into the well when the pump is lowered
3. Start the pump and purge as follows:
  - Start pump and adjust flow rate to the maximum sustainable by the well.
  - Surge the pump up and down over a 3- to 5-foot interval for 5 minutes. At the end of 5 minutes, lower the pump approximately 5 feet deeper into the well. Repeat this until the bottom of the well is reached.
  - Monitor field parameters (pH, conductivity, temperature, and turbidity), water level, pumping rate, and record on field log including the time of the measurements. One set of readings will be taken at the start of purging, and an additional set of readings will be taken after the removal of each standing well volume.
4. Remove pump and surge block and disconnect from purge tubing. Purge tubing should be returned to the well:
  - Care must be taken to ensure that the dedicated tubing is not contaminated when it is removed from the well, and that no debris is introduced to the well when the tubing is lowered.
5. Manage purge water as described in FP-04B above.

### ***Disposal of Wastes***

All materials will be handled according to Field Procedure FP-01A.

### ***Reporting***

Field data will be entered into the field database management system or an Excel spreadsheet. The GHD Project Manager will specify formats and procedures.

# Appendices

# Appendix A

## FP-04C Piezometer Sample Rates and Duration Table

**Piezometer Sample Rates and Duration  
Performance Monitoring Program**

Location	Flow Zone	Transmissivity ft <sup>2</sup> /day	Typical Water over Screen (ft)	Sustainable Pumping Rate (mL/min)	Recommended Pumping Rate (mL/min)	'95 Time 1 <sup>a</sup> (min)	Time 2 <sup>b</sup> (min)	Recommended Purge Time <sup>c</sup> (min)	Total Volume Purged (L)
G1U-01	1	66	13.5	10,740	1,000	0.5	1.2	5	5.0
G6-01	1	70	12.6	10,564	1,000	0.5	1.2	5	5.0
H2U-01	1	80	18.1	17,396	1,000	0.4	1.1	5	5.0
H5-01	1	75	17.8	16,032	1,000	0.4	1.1	5	5.0
I1-01	1	0.5	12.9	77	77	66	39	66	5.1
F2U-02	2	30	1.9	677	677	1.1	1.9	5	3.4
F4U-02	2	14	9.9	1,659	1,000	2.4	1.9	5	5.0
G1-02	2	0.7	25.8	217	217	47	23	47	10.2
G6-02	2	240	27.9	80,401	1,000	0.1	1.0	5	5.0
H2U-02	2	0.5	18.1	109	109	66	35	66	7.2
H5-02	2	1.6	22.5	432	432	21	11	21	8.9
I1-02	2	9	13.6	1,471	1,000	3.7	2.4	5	5.0
J2U-02	2	44	9.5	5,033	1,000	0.8	1.3	5	5.0
J5U-02	2	75	14.7	13,226	1,000	0.4	1.1	5	5.0
J6-02	2	71	3.4	2,921	1,000	0.5	1.1	5	5.0
AFW-2U-04	4	77	2.3	2,171	1,000	0.4	1.1	5	5.0
D1U-04	4	49	9.4	5,539	1,000	0.7	1.2	5	5.0
D2U-04	4	28.5	9.4	3,208	1,000	1.2	1.4	5	5.0
E6-04	4	1.4	4.5	75	75	24	22	24	1.8
F2U-04	4	422	20.4	103,279	1,000	0.1	1.0	5	5.0
F4U-04	4	0.3	26.2	94.28	94	110	55	110	10.4
F6-04	4	40.2	16.8	8,118	1,000	0.8	1.3	5	5.0
G1U-04	4	0.009	37.5	4.06	4.1	3,667	1,717	3,667	14.9
G6-04	4	190	40.3	91,914	1,000	0.2	1.0	5	5.0
H5-04	4	0.6	37.5	271	271	55	26	55	14.9
I1-04	4	3.1	26.5	988	988	11	5.3	11	10.5
J2U-04	4	140	44.8	75,296	1,000	0.2	1.1	5	5.0
J5U-04	4	0.01	20.3	2.44	2.4	3,300	1,726	3,300	8.1
J6-04	4	4	6	287	287	8.3	6.7	8	2.4
AFW-2U-05	5	13	10.2	1,595	1,000	2.5	2.0	5	5.0
AGW-1U-05	5	360	16.6	71,915	1,000	0.1	1.0	5	5.0
D1U-05	5	21.9	18.0	4,743	1,000	1.5	1.6	5	5.0
D2U-05	5	30.3	16.6	6,047	1,000	1.1	1.4	5	5.0
E6-05	5	0.7	16.4	138	138	47	26	47	6.5
F2U-05	5	0.07	29.0	24.36	24	471	230	471	11.5
F4U-05	5	0.03	31.7	11.41	11.41	1,100	528	1,100	12.6
F6-05	5	0.3	24.7	89	89	110	55	110	9.8

**Piezometer Sample Rates and Duration  
Performance Monitoring Program**

Location	Flow Zone	Transmissivity ft <sup>2</sup> /day	Typical Water over Screen (ft)	Sustainable Pumping Rate (mL/min)	Recommended Pumping Rate (mL/min)	'95 Time 1 <sup>a</sup> (min)	Time 2 <sup>b</sup> (min)	Recommended Purge Time <sup>c</sup> (min)	Total Volume Purged (L)
G6-05	5	8	48.2	4,632	1,000	4.1	2.6	5	5.0
H2M-05	5	0.001	42.0	0.51	0.51	33,000	15,228	33,000	16.7
H5-05	5	16	43.3	8,327	1,000	2.1	1.8	5	5.0
I1-05	5	0.2	3.9	9.41	9.4	165	169	169	1.6
J2U-05	5	300	16.8	60,560	1,000	0.1	1.0	5	5.0
J5U-05	5	66	20.6	16,342	1,000	0.5	1.2	5	5.0
J6-05	5	64	13.2	10,176	1,000	0.5	1.2	5	5.0
PMW-1U-05	5	2.1	13.4	338	338	16	9.2	16	5.3
ABP-7-06	dry 6	0.5	0.1	0.54	0.5	66	1,818	1,818	1.0
AFW-1U-06	dry 6	2.3	0.4	12.40	12	14	83	83	1.0
AFW-2U-06	dry 6	0.3	0.0	0.36	0.4	110	2,708	2,708	1.0
AGW-1U-06	6	6.7	1.3	103	103	4.9	11	11	1.2
B2U-06	6	0.001	2.4	0.03	0.03	33,000	46,843	46,843	1.3
C3-06	dry 6	0.07	0.0	0.08	0.08	471	11,604	11,604	1.0
D1U-06	dry 6	1	1.0	12.10	12.10	33	93	93	1.1
D2U-06	dry 6	0.44	0.4	1.97	2.0	75	518	518	1.0
E6-06	6	218	31.9	83,451	1,000	0.2	1.0	5	5.0
F2M-06	6	0.001	51.0	0.61	0.6	33,000	14,896	33,000	20.2
F4M-06	6	0.007	17.2	1.45	1.4	4,714	2,568	4,714	6.8
F6-06	6	134	35.1	56,529	1,000	0.2	1.1	5	5.0
G1M-06	6	58	36.8	25,656	1,000	0.6	1.2	5	5.0
G6-06	6	79	45.0	42,745	1,000	0.4	1.1	5	5.0
H2M-06	6	16	45.9	8,829	1,000	2.1	1.8	5	5.0
H5-06	6	0.04	25.6	12.33	12	825	411	825	10.2
I1-06	6	0.06	15.5	11.21	11.21	550	308	550	6.2
J2M-06	6	280	3.5	11,708	1,000	0.1	1.0	5	5.0
J5M-06	6	11	1.4	192	192	3.0	6.2	6	1.2
J6-06	6	0.001	7.7	0.09	0.09	33,000	23,688	33,000	3.1
PMW-1U-06	6	0.001	1.4	0.02	0.02	33,000	70,243	70,243	1.2
ABP-1-07	7	0.001	2.9	0.03	0.03	33,000	41,111	41,111	1.1
ABP-7-07	7	1.5	1.0	18.72	19	22	60	60	1.1
AFW-1M-07	dry 7	0.001	0.0	0.00	0.00	33,000	812,271	812,271	1.0
AFW-2M-07	dry 7	0.001	0.0	0.00	0.00	33,000	812,271	812,271	1.0
AGW-1M-07	7	140	22.3	37,507	1,000	0.2	1.1	5	5.0
B2M-07	7	0.05	18.2	10.95	11	660	354	660	7.2
C3-07	7	13	6.5	1,019	1,000	2.5	2.0	5	5.0
D1M-07	7	0.3	12.1	43.78	44	110	66	110	4.8
D2M-07	7	0.001	2.4	0.03	0.03	33,000	46,995	46,995	1.3

Piezometer Sample Rates and Duration  
Performance Monitoring Program

Location	Flow Zone	Transmissivity ft <sup>2</sup> /day	Typical Water over Screen (ft)	Sustainable Pumping Rate (mL/min)	Recommended Pumping Rate (mL/min)	'95 Time 1 <sup>a</sup> (min)	Time 2 <sup>b</sup> (min)	Recommended Purge Time <sup>c</sup> (min)	Total Volume Purged (L)
E6-07	7	0.15	34.9	62.82	63	220	104	220	13.8
F2M-07	7	0.001	37.9	0.46	0.5	33,000	15,437	33,000	15.0
F4M-07	7	0.001	19.8	0.24	0.2	33,000	17,365	33,000	7.8
F6-07	7	0.001	59.9	0.72	0.7	33,000	14,661	33,000	23.8
G1M-07	7	0.004	42.6	2.05	2.0	8,250	3,801	8,250	16.9
G6-07	7	1.1	60.9	804	804	30	13	30	24.1
H5-07	7	219	39.0	102,663	1,000	0.2	1.0	5	5.0
I1-07	7	39.5	39.2	18,591	1,000	0.8	1.3	5	5.0
J5M-07	7	220	31.2	82,463	1,000	0.2	1.0	5	5.0
J6-07	7	65	23.4	18,247	1,000	0.5	1.2	5	5.0
PMW-1M-07	dry 7	0.001	0.0	0.00	0.00	33,000	812,271	812,271	1
ABP-1-09	9	2.6	3.7	115	115	13	13	13	1.5
ABP-7-09	9	67	7.7	6,166	1,000	0.5	1.2	5	5.0
AFW-1M-09	dry 9	0.6	0.0	0.72	0.7	55	1,354	1,354	1.0
AFW-2M-09	9	0.001	5.0	0.06	0.06	33,000	29,337	33,000	2.0
AGW-1M-09	9	150	33.3	60,019	1,000	0.2	1.0	5	5.0
B2M-09	dry 9	38	0.0	45.66	46	0.9	21	21	1.0
C3-09	9	117	14.5	20,334	1,000	0.3	1.1	5	5.0
D1M-09	9	184	3.2	7,093	1,000	0.2	1.0	5	5.0
D2M-09	9	160.4	2.8	5,436	1,000	0.2	1.0	5	5.0
E6-09	9	4.9	53.7	3,159	1,000	6.7	3.7	7	6.7
F2M-09	9	110	14.3	18,892	1,000	0.3	1.1	5	5.0
F4M-09	9	30	10.6	3,834	1,000	1.1	1.4	5	5.0
F6-09	9	0.001	28.4	0.34	0.3	33,000	16,140	33,000	11.3
G1M-09	9	0.001	45.8	0.55	0.6	33,000	15,072	33,000	18.2
G6-09	9	0.003	68.2	2.46	2.5	11,000	4,833	11,000	27.0
H2M-09	9	16	47.1	9,050	1,000	2.1	1.8	5	5.0
H5-09	9	132	50.6	80,247	1,000	0.3	1.1	5	5.0
I1-09	9	0.001	15.8	0.19	0.19	33,000	18,388	33,000	6.3
J2M-09	9	1.7	31.9	652	652	19	9.3	19	12.7
J5M-09	9	150	40.7	73,301	1,000	0.2	1.0	5	5.0
J6-09	9	0.002	33.9	0.81	0.8	16,500	7,842	16,500	13.4
PMW-1M-09	9	57.6	1.2	802	802	0.6	1.4	5	4

**Piezometer Sample Rates and Duration  
Performance Monitoring Program**

Location	Flow Zone	Transmissivity ft <sup>2</sup> /day	Typical Water over Screen (ft)	Sustainable Pumping Rate (mL/min)	Recommended Pumping Rate (mL/min)	'95 Time 1 <sup>a</sup> (min)	Time 2 <sup>b</sup> (min)	Recommended Purge Time <sup>c</sup> (min)	Total Volume Purged (L)
AFW-1L-11	11	3.2	11.8	454.66	455	10	6.3	10	4.7
AFW-2L-11	11	0.007	3.0	0.26	0.3	4,714	5,667	5,667	1.4
AGW-1L-11	11	0.005	63.1	3.79	3.8	6,600	2,919	6,600	25.0
B2L-11	11	16	13.3	2,548	1,000	2.1	1.8	5	5.0
D1L-11	11	15.2	17.8	3,254	1,000	2.2	1.8	5	5.0
D2L-11	11	2.1	40.8	1,031	1,000	16	7.3	16	15.7
E6-11	11	68.2	55.6	45,530	1,000	0.5	1.2	5	5.0
F2L-11	11	1.3	77.9	1,216	1,000	25	11	25	25.4
F4L-11	11	0.001	55.5	0.67	0.67	33,000	14,768	33,000	22.0
F6-11	11	13.8	63.1	10,463	1,000	2.4	1.9	5	5.0
G1L-11	11	55	106.7	70,534	1,000	0.6	1.2	5	5.0
G6-11	11	1.6	105.1	2,021	1,000	21	9.3	21	20.6
H2L-11	11	0.1	56.8	68.30	68	330	147	330	22.5
H5-11	11	1.3	95.6	1,494	1,000	25	11	25	25.4
I1-11	11	0.001	40.6	0.49	0.5	33,000	15,294	33,000	16.1
J5L-11	11	7	67.8	5,706	1,000	4.7	2.9	5	5.0
J6-11	11	21	72.9	18,399	1,000	1.6	1.6	5	5.0
PMW-1L-11	11	1.4	20.5	345.68	346	24	12	36	12.4

Notes:

- a. Time1 is the time required for the formation to contribute 95% of the water to the pump - this time is independent of pumping rate.
- b. Time2 is the time required to remove wellbore storage plus 3 screen volumes at Recommended Pumping Rate
- c. Recommended Purge Time at the Recommended Pumping Rate = Maximum of Time1, Time2, or 5 minutes, whichever is greater

Note: the piezometer must be purged to satisfy both the Time1 (or 9t5) and a minimum purge volume.

If the purge flow rate is less than Recommended Pumping Rate, then calculate a minimum purge a volume as follows:  $V_{purge} = 160 * (6+0.083*Q/T)$

Where

V<sub>purge</sub> is in ml

Q is the actual pumping rate in ml/min

T is transmissivity in ft<sup>2</sup>/day

Q and A indicate a quarterly or an Annual Sample

"dry" indicates that this well is generally dewatered and it cannot be sampled

Appendix B  
FP-05A Community Monitoring Well  
Soil Vapor Monitoring Form

FP-05A

**Community Monitoring Well Soil Vapor Monitoring  
Community Monitoring Program  
Hyde Park Landfill Site  
Town of Niagara, New York**

**Field Team:** \_\_\_\_\_

**Date:** \_\_\_\_\_

**Wind Speed & Direction:** \_\_\_\_\_

**Temperature:** \_\_\_\_\_

**Instructions:**

- Using an organic vapor analyzer capable of detecting 10 parts per billion by volume (ppbv) or lower, collect a stabilized background reading, followed by readings from the monitoring point at 1-minute intervals for 10 minutes.
- If any of the stabilized readings exceed 50 ppbv, notify the project manager immediately so follow-up actions can be initiated.
- Submit this form directly to the project staff within 2 days of the event.

<b>Well ID</b>	<b>Time Intervals</b>	<b>Sampling Time (hhmm)</b>	<b>VOC Readings (ppbv)</b>	<b>Well ID</b>	<b>Time Intervals</b>	<b>Sampling Time (hhmm)</b>	<b>VOC Readings (ppbv)</b>
<b>SVP-1</b>	Background	_____	_____	<b>SVP-2</b>	Background	_____	_____
	At 1 minute	_____	_____		At 1 minute	_____	_____
	At 2 minutes	_____	_____		At 2 minutes	_____	_____
	At 3 minutes	_____	_____		At 3 minutes	_____	_____
	At 4 minutes	_____	_____		At 4 minutes	_____	_____
	At 5 minutes	_____	_____		At 5 minutes	_____	_____
	At 6 minutes	_____	_____		At 6 minutes	_____	_____
	At 7 minutes	_____	_____		At 7 minutes	_____	_____
	At 8 minutes	_____	_____		At 8 minutes	_____	_____
	At 9 minutes	_____	_____		At 9 minutes	_____	_____
At 10 minutes	_____	_____	At 10 minutes	_____	_____		

FP-05A

Community Monitoring Well Soil Vapor Monitoring  
 Community Monitoring Program  
 Hyde Park Landfill Site  
 Town of Niagara, New York

Well ID	Time Intervals	Sampling Time (hhmm)	VOC Readings (ppbv)	Well ID	Time Intervals	Sampling Time (hhmm)	VOC Readings (ppbv)
<b>SVP-3</b>	Background	_____	_____	<b>SVP-4</b>	Background	_____	_____
	At 1 minute	_____	_____		At 1 minute	_____	_____
	At 2 minutes	_____	_____		At 2 minutes	_____	_____
	At 3 minutes	_____	_____		At 3 minutes	_____	_____
	At 4 minutes	_____	_____		At 4 minutes	_____	_____
	At 5 minutes	_____	_____		At 5 minutes	_____	_____
	At 6 minutes	_____	_____		At 6 minutes	_____	_____
	At 7 minutes	_____	_____		At 7 minutes	_____	_____
	At 8 minutes	_____	_____		At 8 minutes	_____	_____
	At 9 minutes	_____	_____		At 9 minutes	_____	_____
	At 10 minutes	_____	_____		At 10 minutes	_____	_____
<b>CMW-7OB</b>	Background	_____	_____	<b>CMW-8OB</b>	Background	_____	_____
	At 1 minute	_____	_____		At 1 minute	_____	_____
	At 2 minutes	_____	_____		At 2 minutes	_____	_____
	At 3 minutes	_____	_____		At 3 minutes	_____	_____
	At 4 minutes	_____	_____		At 4 minutes	_____	_____
	At 5 minutes	_____	_____		At 5 minutes	_____	_____
	At 6 minutes	_____	_____		At 6 minutes	_____	_____
	At 7 minutes	_____	_____		At 7 minutes	_____	_____
	At 8 minutes	_____	_____		At 8 minutes	_____	_____
	At 9 minutes	_____	_____		At 9 minutes	_____	_____
	At 10 minutes	_____	_____		At 10 minutes	_____	_____

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# **Appendix B**

## **Analytical Requirements**

# **Appendix B Analytical Requirements Hyde Park Landfill Site**

## **1. Analytical Methods**

The analytes for each monitoring program are discussed with the PMP. Table B.1 summarizes the analytical methods to be used for each of the analyses. Table B.2 presents the analytes to be reported under each methodology.

## **2. Analytical Quality Assurance/Quality Control**

To ensure certainty in the data generated during monitoring at the Site, quality assurance/quality control sampling will be implemented as specified below.

### **2.1 Field Duplicate Samples**

Field duplicate samples are used to assess field sampling and laboratory analytical repeatability. Field duplicate samples are to be collected at a frequency of 1 for each 10 grab samples submitted for analyses. Field duplicates will be submitted "blind" to the laboratory. That is, a name shall be assigned that is different than the original sample name and should not contain the abbreviation "DUP". Names should not be used that might cause confusion with other sample locations, or potential sample locations (i.e. future piezometers).

### **2.2 Matrix Spike/Matrix Spike Duplicate Samples**

Matrix Spike/Matrix Spike Duplicate Samples (MS/MSD) are submitted to allow the laboratory to assess potential interference with the analytical results related to the composition of the sample matrix. MS/MSD samples require extra volume to be collected and submitted with an investigative sample to allow the laboratory to perform internal QA/QC testing of method precision and accuracy. MS/MSD samples are to be submitted at a frequency of 1 per 20 samples or one per week, whichever is more frequent.

### **2.3 Rinse Blank Samples**

Rinse blanks from the disposable nitrile gloves, the vinyl tubing, the disposable bailers, and from an item of cleaned, non-dedicated sampling equipment will be collected to analyze for trace contaminants that may be attributable to these materials. These samples will be collected by rinsing the above equipment with deionized water from the on-Site

deionizer and collecting the rinse water into a set of sample containers. Rinse blanks will be analyzed for the same parameters as the investigative samples.

## **2.4 Trip Blank Samples**

Trip blank samples consisting of analyte free water will be submitted to the laboratory for VOC analyses at a frequency of one per each sample shipment container of aqueous VOC samples. Trip blanks will be provided by the Contract Laboratory.

The laboratory will ship trip blank samples (analyzed for VOCs only) to the Site and the trip blanks will be shipped back to the laboratory without being opened in the field. Trip blank analyses will provide a measure of potential cross contamination of samples during shipment, handling, and from ambient conditions at the Site.

## **2.5 Bottles, Sample Preservation, and Holding Times**

Sample containers will be provided by the Contract Laboratory. Preservation and holding times required for each analysis will be provided by the designated Laboratory Coordinator in Table 1.1 of the Performance Monitoring Plan.

## **2.6 Contract Laboratory**

The laboratory providing contract analytical services for analysis of samples shall be an independent commercial laboratory which has current New York State Department of Health Certification to perform environmental analyses for the parameters required. Analytical arrangements will be made by the Laboratory Coordinator.

Table B.1

**Analytical Methods  
Performance Monitoring Plan  
Hyde Park Landfill Site  
Niagara Falls, New York**

<b>Parameter Group</b>	<b>Method</b>
Volatile Organic Compounds	SW-846 8260
Semi-Volatile Organic Compounds	SW-846 8270
Pesticides	SW-846 8081
Polychlorobiphenyls as Aroclor 1248	EPA 680
2,3,7,8-Tetrachlorodibenzo-p-dioxin (TCDD)	SW-846 8290
Chloride	EPA 300
Total Organic Carbon (TOC)	EPA 415.1
Phosphorous	EPA 365
Total Phenolics	EPA 420.2
Organic Acids	OxyChem HPLC Method
Sulfate	EPA 300

Table B.2

**Parameters by Analytical Method  
Performance Monitoring Plan  
Hyde Park Landfill Site  
Niagara Falls, New York**

<b>Method</b>	<b>VOC Parameters</b>
8260B	1,1,1-Trichloroethane 1,1,2,2-Tetrachloroethane 1,1,2-Trichloroethane 1,1-Dichloroethane 1,1-Dichloroethene 1,2,4-Trichlorobenzene 1,2-Dichlorobenzene 1,2-Dichloroethane 1,2-Dichloropropane 1,3-Dichlorobenzene 1,4-Dichlorobenzene 2-Chlorotoluene 3-Chlorotoluene 4-Chlorotoluene Benzene Bromodichloromethane Bromoform Bromomethane (Methyl Bromide) Carbon disulfide Carbon tetrachloride Chlorobenzene Chloroethane Chloroform (Trichloromethane) Chloromethane (Methyl Chloride) cis-1,2-Dichloroethene cis-1,3-Dichloropropene Dichlorodifluoromethane Ethylbenzene Methylene chloride m-Monochlorobenzotrifluoride o-Monochlorobenzotrifluoride p-Monochlorobenzotrifluoride Styrene Tetrachloroethene Toluene trans-1,2-Dichloroethene trans-1,3-Dichloropropene Trichloroethene Trichlorofluoromethane Vinyl acetate Vinyl chloride Xylene (total)

Table B.2

**Parameters by Analytical Method  
Performance Monitoring Plan  
Hyde Park Landfill Site  
Niagara Falls, New York**

<b>Method</b>	<b>Dioxin/furans</b>
8290	2,3,7,8-Tetrachlorodibenzo-p-dioxin
<b>Method</b>	<b>PCBs</b>
680	trichlorobiphenyls tetrachlorobiphenyls pentachlorobiphenyls
<b>Method</b>	<b>SVOC Parameters</b>
8270C	2,4,5-Trichlorophenol 2,4,6-Trichlorophenol 2,4-Dichlorophenol 2,4-Dimethylphenol 2,4-Dinitrophenol 2-Chloronaphthalene 2-Chlorophenol 2-Nitrophenol 4,6-Dinitro-2-methylphenol 4-Chloro-3-methylphenol 4-Nitrophenol Acenaphthene Acenaphthylene Anthracene Benzo(a)anthracene Benzo(a)pyrene Benzo(b)fluoranthene Benzo(g,h,i)perylene Bis(2-chloroethoxy) methane Bis(2-ethylhexyl) phthalate Butyl benzyl phthalate Chrysene Dibenz(a,h)anthracene Diethyl phthalate Dimethyl phthalate Di-n-butyl phthalate Di-n-octyl phthalate Fluoranthene Fluorene Hexachlorobenzene Hexachlorobutadiene Hexachlorocyclopentadiene Hexachloroethane Indeno(1,2,3-cd)pyrene

Table B.2

**Parameters by Analytical Method  
Performance Monitoring Plan  
Hyde Park Landfill Site  
Niagara Falls, New York**

<b>Method</b>	<b>SVOC Parameters (Continued)</b>
8270C	Isophorone Naphthalene Octachlorocyclopentene Pentachlorophenol Phenanthrene Phenol Pyrene
<b>Method</b>	<b>Organochlorine Pesticide Parameters</b>
8081A	4,4'-DDD 4,4'-DDE 4,4'-DDT Aldrin alpha-BHC beta-BHC Chlordane - not otherwise specified delta-BHC Dieldrin Endosulfan I Endosulfan II Endosulfan sulfate Endrin Endrin aldehyde gamma-BHC (Lindane) Heptachlor Heptachlor epoxide Methoxychlor Perchloropentacyclodecane (Mirex)
<b>Method</b>	<b>Organic Acids</b>
	Benzoic Acid Chlorendic Acid 2-Chlorobenzoic Acid 3-Chlorobenzoic Acid 4-Chlorobenzoic Acid

## Notes:

- VOC - Volatile Organic Compound  
 PCB - Polychlorinated Biphenyls  
 SVOC - Semi-volatile Organic Compound

# **Appendix C**

**APL Plume Flux Monitoring - AFW/APW  
Composite Sampling Methodology**

# Appendix C      APL Flume Flux Monitoring Hyde Park Landfill Site

## 1. Introduction

The *Stipulation on Requisite Remedial Technology (RRT) Program* (the RRT) required that a "composite sample [be prepared] from the flux monitoring wells and the APL Plume Containment System purge wells installed at the Gorge Face." The composite sample was to be prepared using aliquots from each of these wells "based on the proportion of groundwater flow represented by each well." Using the analytical results from this composite sample, a mass flux of select contaminants discharging to the Niagara River gorge was calculated. This sampling program is the APL Plume Flux Monitoring program.

Nine flux monitoring wells were installed for the RRT monitoring program: AFW-1U, AFW-1M, AFW-1L, AFW-2U, AFW-2M, AFW-2L, AFW-3U, AFW-3M, and AFW-3L. There are two APL Plume Containment System purge wells: APW-1 and APW-2. Composite sampling began in August 1999 and continued quarterly through May 2002. The results of this monitoring demonstrated that based on the composite sampling, the mass flux levels were well below the flux allowances defined in the RRT.

The APL Plume Flux Monitoring was temporarily stopped in 2002 for Site investigation activities which were subsequently completed in 2004. During the Site investigations, six of the flux monitoring wells (AFW-1U, AFW-1M, AFW-1L, AFW-2U, AFW-2M, and AFW-2L) were retrofit with small-diameter piezometers designed to discretely monitor bedding-parallel flow zones in the bedrock. Due to the retrofitting, and based on improved understanding of groundwater flow in the bedrock, the apportionment of composite aliquots from each monitoring point to the composite sample was reassessed.

This appendix presents the new sample aliquots for the composite sample and calculations to determine the mass flux discharging to the gorge. Sampling frequency, analytical parameters, and Flux Action Levels are defined in Tables 2.1 and 5.3 of the Performance Monitoring Plan.

## 2. Proposed Composite Sample Aliquot Determination

As part of the hydrogeologic characterization of the Site completed between 2002 and 2004, two of the AFW clusters (AFW-1 and AFW-2) were retrofitted with 1-inch diameter piezometers. As a result, new aliquots have been defined for the APW/AFW composite groundwater sample.

The most appropriate method of assessing the groundwater flow rate,  $Q$ , is to use Darcy's Law:

$$Q = K i A \quad (1)$$

Where:

$Q$  = flow rate

$K$  = hydraulic conductivity

$i$  = hydraulic gradient, and

A = cross-section area; A = Thickness (T) times Width (w)

T = Kt

Where:

T = Transmissivity

Substituting transmissivity into equation 1, yields  $Q = T I w$  (2)

A transmissivity value has been determined for each well and piezometer. The width of flow represented by a well/piezometer was determined using the midpoint distances between wells/piezometers. The T and w values are presented in the following tables. The hydraulic gradient difficult to determine for the flow zones. For the aliquot calculation, a uniform gradient will be assumed in each flow zone.

Transmissivities were calculated for each of the wells to be used in the composite sample and are tabulated below:

**Table 2.1 Transmissivity Values**

Well I.D.	Transmissivity (ft <sup>2</sup> /day)	Notes
APW-1	20	Pumped well drawdown
APW-2	12	Pumped well drawdown
AFW-1U-06	2	Slug test
AFW-1M-07	<<1	Slug test
AFW-1M-09	<<1	Slug test
AFW-1L-11	3	Slug test
AFW-2U-04	63	Slug test
AFW-2U-05	11	Slug test
AFW-2U-06	<<1	Slug test
AFW-2M-07	<<1	Slug test
AFW-2M-09	<<1	Slug test
AFW-2L-11	<<1	Slug test
AFW-3U	760	Slug test
AFW-3M	130	Slug test
AFW-3L	<<1	Slug test

Values of <<1 are so small that these zones do not contribute a significant volume to the composite sample, and representative samples are difficult to collect. Therefore, no sample will be collected from these zones.

A summary of the appropriate aliquot volume was determined and is tabulated below:

**Table 2.2 Calculated Sample Aliquots**

Well I.D.	Transmissivity (ft <sup>2</sup> /day)	Representative Width (ft)	Hydraulic Gradient*	Relative % of Flow	Required Volume (L)
APW-1	20	640	1	0.9	0.080
APW-2	12	830	1	0.7	0.062
AFW-1U-06	2	1470	1	0.2	0.018
AFW-1L-11	3	1470	1	0.3	0.027
AFW-2U-04	63	1550	1	6.8	0.609

Well I.D.	Transmissivity (ft <sup>2</sup> /day)	Representative Width (ft)	Hydraulic Gradient*	Relative % of Flow	Required Volume (L)
AFW-2U-05	11	1550	1	1.2	0.106
AFW-3U	760	1460	1	76.8	6.915
AFW-3M	130	1460	1	13.1	<u>1.183</u>
<b>Total</b>					<b><u>9.000</u></b>

Notes:

- If a uniform gradient is assigned, the actual value of the gradient does not affect the calculated flow percentages.
- No sample collected from these intervals.

### 3. Well Purging and Sampling Procedures

The wells and piezometers will be sampled according to the field procedures presented in the Performance Monitoring Plan for the Site. These procedures include:

- FP-04A for APL Sampling - Pressurized Taps
- FP-04B for APL Sampling - 3 Well Volume Method
- FP-04C for APL Sampling - T<sub>95</sub> Piezometer Sampling Method

### 4. Sample Compositing Procedures

The composite sample will be prepared by measuring the appropriate aliquot volume from the collected samples from each well with a graduated cylinder. Individual volumes will be poured into a large glass container for mixing. When all of the volumes have been collected, the sample will be mixed and poured into the sample containers for shipment to the analytical laboratories.

### 5. Mass Flux Calculations

The mass flux discharge to the gorge is calculated as the product of the composite sample concentration and the groundwater discharge to the gorge, as follows:

$$\text{Flux} = Q \times C$$

Where:

Q = groundwater discharge to the gorge

C = reported concentration of parameter

The groundwater containment system has been demonstrated to effectively contain the groundwater beneath the Hyde Park Landfill and there is limited, if any, continuing Site-related discharge to the gorge. However, previous evaluations of groundwater flux to the gorge (see the description in the Quarterly Bedrock Monitoring Report, Third Quarter 1997) estimated as much as 60 gallons of groundwater per day discharging to the gorge. This flow rate will continue to be used for consistency with previous evaluations.

For 2,3,7,8-Tetrachlorodibenzo-p-dioxin, the mass flux will be calculated as follows:

$$\text{Flux (g/year)} = 60 \text{ gal/day} \times 3.785 \text{ L/gal} \times C_{(\text{pg/L})} \times 10^{-12} \text{ g/pg} \times 365 \text{ days/year}$$

Where:

$$C_{(\text{pg/L})} = \text{reported concentration of parameter in pg/L}$$

For perchloropentacyclodecane (Mirex) and polychlorobiphenyls as Aroclor 1248, the mass flux will be calculated as follows:

$$\text{Flux (lb/day)} = 60 \text{ gal/day} \times 3.785 \text{ L/gal} \times C_{(\mu\text{g/L})} \times 10^{-6} \text{ g/\mu g} \times .0022 \text{ lb/g}$$

Where:

$$C_{(\mu\text{g/L})} = \text{reported concentration of parameter in } \mu\text{g/L}$$

Non-detect values for parameters will be assigned a value of zero if the detection level is below the RRT defined Detection Level. However, if the RRT defined Detection Level is exceeded, non-detect results will be assigned a concentration equal to 1/2 of the method detection limit.

