Fountain Avenue Landfill
Brooklyn, New York
NYSDEC Site No. 224003

Annual Post Closure Operation, Maintenance and Monitoring Report
January 2013 through December 2013

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New York City Department of Environmental Protection
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Section 1 - Introduction

This Post-Closure Annual Report (Report) has been prepared by the New York City Department of Environmental Protection (DEP) to fulfill the reporting requirements contained in the Fountain Avenue Landfill (FAL) Operation and Maintenance (O&M) Manual, the FAL Monitoring Plan, and 6 NYCRR Part 360. This Report contains current background information and documents the operation, maintenance and monitoring activities performed from January 1 through December 31, 2013.

Section 2 - Site Background

The FAL is an inactive hazardous waste disposal site located on 297 acres at the southern end of Fountain Avenue in Brooklyn, New York. It is bounded on the northwest by the Belt Parkway, on the southeast by Jamaica Bay, on the southwest by Hendrix Creek and on the east by Old Mill Creek. A site location map is provided in Figure 1.

The FAL was opened in 1961, when land-filling activities shifted from the Pennsylvania Avenue Landfill (PAL) located on the other side of Hendrix Creek. Under the responsibility of the New York City Department of Sanitation (DOS), the landfill received municipal and industrial wastes between 1961 and 1985. It is reported that, between 1974 and 1980, illegal dumping of hazardous wastes occurred at the Site. Liquid wastes reportedly disposed of at the FAL included waste oils, and spent plating baths, sludges, thinners and lacquers. Asbestos and medical wastes were also reported to have been discarded. In addition, contaminated waste oils were sprayed on site access roads for dust control.

The FAL was added to the New York State Registry of Inactive Hazardous Waste Disposal Sites initially as a Class 3 site, requiring further surveillance. In 1983, the FAL was reclassified as a Class 2 site, posing a significant threat to public health and the environment.

In 1974, ownership of the lands on which the FAL are situated transferred from the City of New York to the United States Department of the Interior, National Park Service, with the understanding that landfill operations could continue at the Site until the end of 1985.

On December 16, 1985 and again on April 17, 1990, NYSDEC executed Orders on Consent with DOS to close and remediate the Site. On May 15, 1992, DEP entered into an Order on Consent (Index 2-24-003) with the New York State Department of Environmental Conservation (NYSDEC) for the remediation of the FAL. In response, the DEP initiated a Remedial Investigation/Feasibility Study (RI/FS) in March 1993 to assess the nature and extent of contamination. The Remedial Investigation Report was released in May 1994, and the Feasibility Study Report was released in September 1994. The RI/FS revealed that certain areas and media at the Site required remediation. A summary of the findings follows:

- Soils – Surface soils exhibited semi-volatile organic compounds (SVOs) and metal levels that exceeded soil cleanup guidelines.
- Groundwater – Levels of volatile organic compounds (VOCs), SVOs, metals and Polychlorinated Biphenyls (PCBs) exceeding the drinking water standards were confined to groundwater samples collected from the leachate mound (Fill Aquifer). As a result, the Upper Glacial Aquifer does not require remediation.
- Surface Water – the primary landfill-related exceedances of surface water standards is chlorobenzene which is present in low concentrations in the leachate mound and in high concentrations in surface water at the drainage outlet into Old Mill Creek.
- Sediments – samples taken along the Hendrix Creek demonstrated levels of VOCs, SVOs, metals, PCBs and pesticides that generally exceeded the wildlife and human bioaccumulation guideline concentrations, but were below the benthic toxicity guidelines.

As specified by the Order on Consent, Interim Remedial Measures (IRMs) were implemented. An interim cover was placed to prevent casual contact with exposed waste and rip-rap was installed for shoreline protection.

The goals for the remediation program were set to eliminate or minimize the threats to the public health and the environment, by addressing the contamination of surface soils and waste disposal areas; by protecting surface waters through eradication of run-off and erosion from contaminated substrates and the migration of leachate into surrounding waters; by minimizing the impact of contaminated groundwater; by reducing soil and sediment contamination levels and removing the possibility of human or animal contact; and, by controlling and containing landfill gas emissions.

Subsequently, in 1995, the NYSDEC published their Record of Decision (ROD) for the FAL which mandated that the selected remedy for the site consist of "landfill capping with active gas collection and long term environmental monitoring." In accordance with the ROD, in October 2000, the DEP awarded Construction Contract No. LF-FAL-G4 for the remediation of the FAL. The main elements of the selected remedy included regrading of the top of the landfill to ensure proper drainage and minimize erosion, a landfill cap meeting the requirements of 6NYCRR Part 360 regulations, and landfill gas control with an active collection system consisting of extraction wells screened in the waste and connected via blowers to an enclosed flare. Construction of the final cover, stormwater management, landfill gas management, environmental monitoring and ancillary systems was completed in July 2009.

Once construction of the landfill components was completed, responsibility for their operation and maintenance was transferred from the DEP Bureau of Engineering Design and Construction (BEDC) to the DEP Bureau of Wastewater Treatment (BWT) and the operations, maintenance and monitoring contractor. The landfill cover, stormwater and ancillary systems were transferred to BWT on March 1, 2009. The landfill gas management system was transferred to BWT on August 1, 2009.

The ROD called for a pre-approved Post-Closure Monitoring, Sampling and Analysis Plan (the Plan), to commence within one month of DEP's receipt of NYSDEC's written acceptance of the FER. The Plan requires monitoring water-level elevation and groundwater quality in twelve monitoring wells, and monitoring for the presence of methane in seven gas monitoring wells located beyond the perimeter of the cap. The Plan was approved in March 2009. Subsequently, NYSDEC approved the following modifications to the groundwater monitoring portion of the Plan in their letter of May 9, 2011 to the DEP:

- Monitoring can be performed independently of the tide cycle
- The low-flow purging and sampling method can be used to collect the samples
- Sampling can be performed annually in rotating calendar quarters instead of quarterly
- During the first five-year review period, monitoring should be performed for all Plan parameters
- Based on the results from the first five annual monitoring rounds, the NYSDEC may allow non-detected parameters to be excluded from subsequent annual monitoring rounds, except as indicated below
- Monitoring for all Plan parameters will be performed once every five years, coinciding with the last year of each five-year review period

Additionally, per Part 360 the groundwater samples are to be analyzed by a State-certified environmental laboratory, and validated by an independent data validation company.

The Final Engineering Report (FER) was submitted to NYSDEC for review on September 7, 2011. The FER was accepted by the NYSDEC on January 31, 2012. The formal Post-Closure Monitoring period officially began on February 1, 2012. The first round of quarterly gas monitoring was performed in February 2012, within one month of the start of the Post-Closure period. With the concurrence of the NYSDEC, the first round of annual groundwater monitoring was performed during the second quarter of 2012 to coincide with the annual groundwater monitoring round at the PAL. Annual groundwater monitoring will be performed in rotating calendar quarters (i.e., once every five quarters) thereafter similar to PAL.

In July 2012, the NYSDEC changed the classification of the FAL site from a Class 2 to a Class 4 site on the Registry of Inactive Hazardous Waste Disposal Sites since it was properly remediated and requires site management.

Section 3 – Annual Summary

This Report covers the period from January 1 through December 31, 2013. It summarizes the operation, maintenance and monitoring activities at the Site during this period.

3.1 Landfill Gas Management System

The landfill gas management system represents one of the elements of the selected remedy in the Site's ROD. The ROD required the selected remedy "to ensure full collection and control of landfill gas". This system must also meet the requirements of 6 NYCRR Part 360 to limit off-site gas migration to the lower explosive limit at the property line (i.e., 5% gas in air) and 25% of the LEL in structures (i.e., 1.25% gas in air). In 2011, due to below-threshold NOx emissions, the NYSDEC downgraded the Air Title V Facility Permit for the operation of the landfill gas management system to an Air Facility Registration (Certificate # 2-6105-00687/00003). The flaring system is also monitored in accordance with the EPA's Greenhouse Gas Reporting Rule. The 2013 Greenhouse Gas Report was submitted to the USEPA electronically in February 2014.

The system features 265 gas extraction wells (EWs), a below-grade polyethylene collection header piping network with 56 isolation valves, three 2,600-scfm centrifugal blowers, condensate collection system, an enclosed high temperature flare system, process instrumentation and controls, a programmable logic control (PLC) management system, a fire alarm system and an emergency condition alarm auto-dialer phone system. A plan of the overall landfill gas management system is shown on Figure 2 illustrating the location of the extraction wells, header pipes and flare facility.

All 265 EWs are inspected and monitored for gas content (percent CH_4, CO_2 and O_2), temperature and vacuum pressure each month. Deficiencies such as missing signage, track cleaning or sampling port repair were corrected, when possible at the times of the inspections. Work orders are issued for all other work. The LFG-3 reports are included in Appendix A of the corresponding Quarterly Reports.

The main headers that convey the landfill gas slope continuously around the landfill to a low point adjacent to the blower and flare station located at the southeastern corner of the landfill. Each of the headers is connected to a condensate drain line at their low point. These drain lines and the drain lines from the three blower demisters (knock out pots) empty into the 8,000 gallon condensate tank located within the flare station. On January 7th, April 4th, August 2nd and December 18th, a total 28,000 gallons of condensate was removed by a private waste hauler for proper off-site disposal. The condensate was sampled and the laboratory reports are included in Appendix A of the Quarterly Reports.

The landfill gas collection system is comprised of three closed loops, each of which is split into two headers. The system includes 56 isolation valve boxes for pressure and flow adjustments and to isolate portions of the system for repairs. As the six (two 8-inch and four 12-inch) headers come up into the blower and flare station they each contain a manually operated butterfly valve for individual header vacuum adjustment, temperature and vacuum gauges, and monitoring ports. They then join into the 12-inch main header on the vacuum side of the blower station. This main header contains an electric modulating butterfly valve which automatically adjusts the valve position to control the landfill vacuum or flow according to PLC programming. This is followed by an electro-pneumatic butterfly valve which, actuated by compressed nitrogen, automatically closes in the event of any system failure or shutdown.

The landfill gas then flows through three 12" plug valves into the three demisters, exits through 12" piping which is reduced to 8" before entering the blowers, exits the blowers through 8" plug valves and discharges through a single 16-inch header and flame arrestor into the enclosed flare. The system is operated with one blower in service and the remaining two on standby. Blowers are switched periodically and preventive maintenance is performed to ensure all three blowers remain in good operating condition. The flare support system includes a propane fired pilot, a purge air blower, two manual and two automatic dampers, and temperature control with three thermocouples. The flare operation is normally on automatic control using the bottom thermocouple at a target temperature of 1,600 ^{o}F. Figure 3 exhibits the layout of the Flare and Blower Station.

Daily inspections are conducted and readings are recorded on the LFG-1 inspection logs. The monthly summary reports of the LFG-1 daily inspections can be found in Appendix A of the Quarterly Reports.

During this reporting period, the landfill gas flaring system processed 1,002,063,165 SCF of landfill gas. The flare ran for 87.6% of the time at an average flow of 2,176 scfm. The flare operation down time totaled 1,090.2 hours or 12.4% of the twelve-month interval. Down time was attributed to system evaluation by the manufacturer and electrician, temperature control related problems, thermocouple and T/C-PLC module malfunction and replacement, blower soft start and belt problems, false fire alarms, short circuiting and repair of the oxygen and LEL monitoring system wiring, the annual FDNY inspection, and scheduled corrective maintenance by the manufacturer addressing the items identified in their assessment that included Hurricane Sandy damaged components. Flow data is summarized in the table that follows.

Fountain Avenue Landfill Flare Operation - 2013			
Month	**CH4** (% by Volume)	**Time in service** (Hours)	**Flow (SCF)**
January	21.81	542.5	76,046,000
February	20.26	574.0	81,391,000
March	19.49	710.8	97,650,000
April	20.84	545.7	76,657,000
May	19.65	620.9	84,966,250
June	21.83	581.0	72,978,000
July	22.98	616.0	67,118,000
August	21.11	730.0	83,128,462
September	22.26	632.0	78,739,539
October	19.98	730.0	96,256,000
November	18.27	660.9	90,585,915
December 2013	17.64	726.0	96,547,000
Average	**20.51**	NA	83,505,264
Total	NA	**7,669.8**	**1,002,063,166**

Bi-weekly (LFG-2) and quarterly (LFG-4) inspections were conducted, and copies are included in Appendix A. Deficiencies encountered at the flare and blower station during scheduled inspections addressed in the manufacturer's scope of work included replacement of the shut-off actuating valve, replacement of Blower No. 1 motor, soft start, discharge valve, bearings, belts and sheaves, replacement of Blower No. 2 bearings, belts and sheaves, replacement of Blower No. 3 soft start, belts sheaves and bushings, replacement of the UDC3200 louver controller and louver actuator rods and fine tuning of the temperature control system. The landfill gas flare flow meter was serviced and calibrated on October 13th, and the readings continued to remain in range. The only deficiency pending at the end of this annual reporting period was the Condensate Tank Sentinel whose replacement is under investigation, in the interim the condensate inventory is monitored twice a week. However, additional recommended operational equipment components that were impacted by the Hurricane Sandy surge waters will be replaced under DEP Contract 1400-FLP which is being procured by the DEP in 2014. Other equipment components exposed to the Hurricane Sandy surge that are currently operational but not designated for replacement under Contract 1400-FLP will continue to be monitored and assessed over time and may be replaced in the future, if necessary.

3.2 Final Cover System

The landfill final cover system prevents stormwater infiltration into the landfill and landfill gas migration into the atmosphere. The ROD stipulated the construction of a 6 NYCRR Part 360 landfill cap. The landfill final cover system is comprised of layers, from top to bottom, as follows:

- Vegetative topsoil layer with a minimum thickness of 6 inches.
- 12-inch thick barrier protection layer.
- Geocomposite drainage layer as follows.
  - A cushion geotextile in the Type 1 Cover System (areas with <5% slopes); or
  - A double-sided geocomposite in the Type 2 Cover System (areas with >5% slopes).
- Linear Low Density Polyethene (LLDPE) geomembrane material.
  - Smooth 40-mil thick LLDPE geomembrane in the Type 1 Cover System (areas with <5% slopes); or
  - Textured 40-mil thick LLDPE geomembrane in the Type 2 Cover System (areas with >5% slopes).
- 6-inch-thick Type II cover soil layer was placed over the re-graded waste material.

The O&M Manual requires the final cover system be inspected on a monthly basis and after storm events equal to or exceeding the 2-year 24-hour precipitation event (3.5 inches in 24 hours). The surface of the landfill was divided into sixteen inspection zones. All 16 inspection zones are shown in Figure 4, which is utilized to identify the system components. This figure is also utilized to identify the components of the stormwater and ancillary systems. A record of the final cover system inspection is summarized on a Monthly Checklist Form FCS-1, with deficiencies noted on the Deficiency and Problems Form (DP-1). The monthly inspection reports can be found in Appendix B of the Quarterly Reports. The final cover system is inspected for surface cracking, vegetative growth, vector penetration, settlement, erosion, slope stability, seepage, and vandalism. The inspection is performed by walking up and down the side slopes and across each zone several times. Work orders are issued for deficiencies noted during monthly inspections that cannot be addressed at the time. Deficiencies include the ponding area in inspection Zone M, and areas of erosion identified on the DP-1 Form. Inspection Zones A, C and P experienced some erosion in the aftermath of Hurricane Sandy that will be addressed with the other Hurricane Sandy repair work under Contract 1400-FLP which is being procured by the DEP in 2014.

3.3 Stormwater Management System

The stormwater management system is an integral part of the capping and closure system required under the 6 NYCRR Part 360 regulations to protect the landfill final cover system. The system was designed to collect, transport and discharge stormwater to the surface waters surrounding the FAL in order to prevent stormwater ponding and erosion damage to the final cover system.

This system consists of several components (as shown on Figure 4) which require monitoring, inspection, and periodic maintenance. The system has been divided into three subsystems (SWM-1, SWM-2 and SWM-3) for ease of inspection and reporting. These subsystems include:

- SWM-1: Stormwater drainage swales, wetlands and revetment area
- SWM-2: Outlets, culverts, and rip-rap inlet and outlet protection, and
- SWM-3: Downchute pipes, manholes, pipe trenches and energy dissipation structures.

The O&M Manual requires that stormwater management systems SWM-1, SWM-2 and SWM-3 be inspected on a monthly basis and after a storm event equal to or exceeding the 2-year 24-hour precipitation event (3.5 inches in 24 hours). A record of the inspection is summarized on Monthly Checklist Forms SWM-1, SWM-2, SWM-3 and DP-1 in accordance with the requirements of the O&M Manual. A Deficiency and Problems Form DP-1 is completed to summarize the items marked not satisfactory (NS) in the stormwater system checklist forms.

Deficiencies identified during the period covered by this Annual Report do not necessarily affect the efficient performance of this system. Inspection of the system during and after storm events, indicate that it is working properly. The swales and culverts were mowed, weed-wacked, cleaned out, invasive trees and excessive vegetative growth was removed and repairs performed. The repair of the Hurricane Sandy damage to Outlets C and D, the reconstruction of the wetland berm, and repair of Swales F2 and D1X were completed during this reporting period. Work on repair details for other Hurricane Sandy storm damage previously identified is in progress and repair work will be performed under Contract 1400-FLP, which is being procured by the DEP in 2014. The DP-1 Form also identifies other locations where sediment and standing water have been observed and provides corrective actions for each location. Where necessary, investigations are being performed, repair details are being developed and repairs will be addressed as weather permits. The monthly inspection reports can be found in Appendix B of the Quarterly Reports.

3.4 Ancillary Systems

The ancillary systems (ANS) are those support systems at the FAL that are used for site access and security. The ancillary systems include seven (7) access roads (A, B, C, D, E, F and G - as shown on Figure 4), along with fences, gates, and locks. The roadways are integral in providing access to perform required inspection, monitoring and maintenance activities. In addition, since the selected remedy resulted in leaving waste on-site, the security fences and gates provide important institutional controls to prevent site access to unauthorized individuals.

The O&M Manual requires that the ANS be inspected on a monthly basis. A record of the inspection is summarized on Monthly Checklist Forms ANS-1 and DP-1 (for ANS-1) in accordance with the requirements of the O&M Manual. The instructions for the checklists further require inspections after storm events equal to or exceeding the 2-year 24-hour precipitation event (3.5 inches in 24 hours). These are incorporated into the monthly inspections found in Appendix B.

Damage and wear are inherent in unpaved roads. Potholes on the access roads are recurring and are filled in as part of routine maintenance. Pending from the previous annual reporting period, the debris that washed in by the Hurricane Sandy surge was removed off site and repairs to Road B and Road G were completed. Repair details are being developed for damage caused by Hurricane Sandy to sections of Road A and the embankment along the Jamaica Bay shoreline of the landfill. This repair work will be performed under Contract 1400-FLP which is being procured by the DEP in 2014.

Holes found in the perimeter fence are repaired after each monthly inspection, and during the warm season the perimeter is inspected and holes are repaired on a weekly schedule. Missing “No Trespassing” signs along the perimeter fence are replaced when noted during the weekly inspections. Locks are inspected and lubricated quarterly, and as needed. Safety inspections are performed monthly. Damaged and missing “Confined Space” and/or “Hazard” signs were also replaced. The Security Guard Trailer that was damaged during Hurricane Sandy was replaced. Work to repair the supports and replace the project signs damaged by severe weather is scheduled to commence during the next reporting period.

3.5 Post-Closure Environmental Monitoring

As noted previously in Section 2, the Plan for the FAL went into effect on February 1, 2012 following acceptance of the FER by the NYSDEC, and now incorporates modifications approved by the NYSDEC in 2011. The Plan addresses the performance evaluation of the effectiveness of the cap and/or landfill gas collection system in controlling leachate and landfill gas migration. The Plan entails annual monitoring of the groundwater elevation and quality at twelve wells (HF wells) located around the perimeter, outside the limits of the closure cap, as shown in Figure 5. It should be noted that the groundwater beneath the FAL is influenced by the tide cycle, but hydraulic analysis determined that this influence is limited fluctuations in hydraulic pressure in the monitoring wells, and that the tide cycle does not significantly influence groundwater flow. Accordingly, water-level data are used for informational purposes only and not to determine groundwater flow directions or gradients; and the monitoring rounds can be performed independently of the tide cycle.

The Plan also entails quarterly monitoring of soil gas quality in seven perimeter gas monitoring wells (GMW wells) located outside the limits of the cap at the perimeter of the landfill site as shown on Figure 5. Wells GMW-1 and 2 are located in the northwest corner of the site adjacent to Hendrix Creek. Wells GMW-3, 4 and 5 are located along the northern perimeter of the landfill parallel to the site property line at the Belt Parkway. Wells GMW-6 and 7 are located in the north eastern corner of the site, east of the perimeter road. Well GMW-6 is located west of the parking lot while Well GMW-7 is located west of Old Mill Creek. Additionally, the landfill surface gas was monitored semi-annually. The gas monitoring portion of the Plan was being performed prior to the NYSDEC acceptance of the FER on January 31, 2012 to verify the proper operation of the gas collection system and confirm that off-site gas migration was not occurring.

3.5.1 Groundwater Monitoring Program

Modifications to the groundwater portion of the Monitoring Plan were approved by NYSDEC prior to the start of the post-closure period. The changes were to the sampling procedures and analysis. Specifically, purging a minimum of three well volumes is no longer required. Instead, the low-flow purging and sampling procedure is used for collection of groundwater samples. The samples are analyzed by a State-certified environmental laboratory and are validated by an independent data validation company.

The third quarter 2013 monitoring round was the second post-closure monitoring event and served as the annual monitoring event for the period covered by this report. The next groundwater monitoring round will be performed during the fourth quarter of 2014. On September, 3rd, 4th, 5th and 6th, samples were collected from eleven groundwater monitoring wells (see Figure 5). Groundwater monitoring well HF-104-U was dry and could not be sampled. The synoptic water-level readings were taken on September 3rd. The analytical results of the third quarter of 2013 post-closure groundwater monitoring round are summarized in Tables 1 through 5. Note that Tables 1 through 5 only list the parameters that were detected in at least one groundwater sample during 2012 and/or 2013.

Overall, the results of the 2013 annual ground water-monitoring round are consistent with last year’s results, and continue to indicate that the Site is not a significant source of releases of hazardous or toxic substances to ground water. The results for each analyte group are also compared to the State’s Class GA potable ground-water standards and guidance values in Tables 1 through 5, respectively. It should be noted that the ground water beneath the Site is naturally saline and therefore non-potable. The results are compared to the potable water standards and guidance values because no standards or guidance values exist for saline ground water.

Accordingly, an exceedance of a potable ground-water standard or guidance value does not necessarily indicate a significant concern for this Site. The specific results for each analyte group are summarized below.

VOCs – The results of the 2013 annual ground water-monitoring round continue to indicate that the Site is not a significant source of VOC impacts to ground water. Specifically, as shown in Table 1, a majority of the target VOCs analyzed for were not detected. Only six VOCs were detected in 2013, and only at low, primarily estimated concentrations. All but two of the 2013 detections occurred in two wells (HF-102-U and HF-608-U) screened in the saturated zone above the tidal marsh deposits. VOC detections in the wells screened in the upper portion of the Upper Glacial Aquifer were limited to low, estimated concentrations of chlorobenzene and 1,1-dichloroethane, respectively, in Wells HF-104-S and HF-608-S. VOCs were not detected in the wells screened in the lower portion of the Upper Glacial Aquifer. These findings indicate that the tidal marsh deposits are continuing to serve as a hydraulic barrier to vertical migration of ground water from the saturated zone above to tidal marsh deposits to the underlying Upper Glacial Formation. Exceedances of the Class GA potable ground-water standards and guidance values were limited to slight exceedances for benzene and chlorobenzene in Well HF-608-U. Compared to the 2012 annual ground water-monitoring results, VOC concentrations are lower in Wells HF-102-U, HF-608-U and HF-608-S, and basically unchanged in Well HF-104-S.

SVOCs - The results of the 2013 annual ground water-monitoring round also continue to indicate that the Site is not a significant source of SVOC impacts to ground water. Specifically, as shown in Table 2, a majority of the target SVOCs analyzed for were also not detected. Only eight SVOCs were detected in 2013, primarily at low, estimated concentrations. Most of the detections, and the highest concentrations, occurred in Well HF-608-U, which is screened in the saturated zone above the tidal marsh deposits. SVOC detections in the wells screened in the upper portion of the Upper Glacial Aquifer were limited to low concentrations of several SVOCs in Well HF-104-S. Except for a low concentrations of bis-(2-ethylhexyl) phthalate in Well HF-102-D and naphthalene in Well HF-608-D, SVOCs were not detected in the wells screened in the lower portion of the Upper Glacial Aquifer. As such, these findings also indicate that the tidal marsh deposits are continuing to serve as a hydraulic barrier to vertical ground-water flow. Exceedances of the Class GA potable ground-water standards and guidance values in 2013 were limited to naphthalene in Well HF-608-U. Compared to the 2012 annual ground water-monitoring results, SVOC concentrations decreased to non-detectable levels in Wells HF-102-U, HF-602-U, HF-608-S, HF-608S and HF-602-D; and remained basically unchanged in Well HF-104-S. Except for a slight increase in naphthalene, SVOC concentrations in Well HF-608-U also remained basically unchanged.

Pesticides – As shown in Table 3, except for one detection in Well HF-608-U (beta-BHC at 0.059 ug/L), pesticides were not detected in the ground-water samples collected during the 2013 annual ground-water monitoring round. Well HF-608-U is screened in the saturated zone above the tidal marsh deposits. The lack of pesticide detections in the wells screened in the Upper Glacial Formation indicates that the tidal marsh deposits are continuing to serve as a hydraulic barrier to vertical ground-water flow. The beta-BHC concentration detected in Well HF-608-U is slightly higher than the 0.04-ug/L Class GA ground-water standard, but is not a significant concern as the ground water beneath the Site is naturally saline and therefore non-potable. Pesticides were not detected in any of the ground-water samples collected during the 2012 annual monitoring round. Taken as a whole, the pesticide results to date indicate that the Site is not a significant source of pesticide impacts to ground water.

PCBs – Also as shown in Table 3, PCBs were not detected in any of the ground-water samples collected during the 2013 annual ground-water monitoring round; including Well HF-102S, which contained a low concentration of Aroclor 1016 during the 2012 monitoring round. These results indicate that the Site continues to not be a source of PCB impacts to ground water.

Metals – The 2013 metals results continue to indicate that the Site is not a significant source of metals-related impacts to ground water. Specifically, as shown in Table 4, most of the target analytes, including the heavy metals, were either not detected or were only detected sporadically and/or at low concentrations. The concentrations of the frequently-detected parameters, such as magnesium, potassium and sodium, are generally higher in the wells screened in the Upper Glacial Aquifer than in the wells screened in the saturated zone above the tidal marsh deposits. This pattern indicates that they are primarily attributed to the naturally saline ground-water conditions beneath the Site. The concentrations of certain metals exceed the Class GA potable ground-water standards and guidance values. However, it should be noted nearly all of the exceedances, and the highest-magnitude exceedances, are for parameters that are related to the naturally saline ground water beneath the Site. Exceedances for heavy metals are limited to chromium and nickel in Well HF-608-U, which is screened in the saturated zone above the tidal marsh deposits. Moreover, the magnitudes of these exceedances are similar to last year's results. Overall, metal concentrations in ground water are similar to, or lower than, last year's results. The limited number of increases primarily occurred for seawater-related parameters in wells screened in the lower portion of the Upper Glacial Formation, and are attributed to a natural increase in ground water salinity beneath the Site since the 2012 monitoring round. The increase in ground-water salinity is consistent with the below-average precipitation in the area during the fourth quarter of 2012, and the first and third quarters of 2013.

Leachate Indicators – The 2013 leachate indicator parameter results are consistent with the Site being an old, closed and capped municipal landfill that is underlain by saline ground water. Specifically, as shown in Table 5, most of these parameters were detected in nearly every well; except for cyanide and phenols, which typically do not occur naturally at detectable concentrations in saline ground water; and nitrate and nitrite, which are metabolized by bacteria in the ground water. Moreover, the concentrations of the parameters known to occur naturally in seawater, such as bromide, chloride, hardness, sulfate, and total dissolved solids, are highest in the wells screened in the lower portion of the Upper Glacial Aquifer where the ground water is most saline. Other parameters, such as alkalinity, ammonia, color, cyanide (in two wells only) and phenols (also in two wells only), appear to be Site-related because they are detected only, or at significantly higher concentrations, in wells screened in the saturated zone above the tidal marsh deposits. The concentrations of a number of parameters exceed the Class GA potable ground-water standards. However, it should be noted that most of the exceedances are for parameters that are related to the naturally saline ground water beneath the Site. The exceedances for the Site-related parameters, such as ammonia, are not a significant concern because the ground water is non-potable, as noted above. Moreover, ammonia occurs naturally in seawater, and is not persistent in the environment. Compared to last year's results, the concentrations of certain parameters increased in two of the three wells screened in the saturated zone above the tidal marsh deposits (HF-102-U and HF-608-U); in one of the four wells screened in upper portion of the Upper Glacial Aquifer (HF-104-S); and in all four of the wells screened in the lower portion of the Upper Glacial Aquifer. The increases in the Wells HF-102-U, HF-608-U and HF-104-S may be Site-related as VOCs and/or SVOCs were also detected in these wells, but may also reflect the below-average recharge from precipitation (i.e., less dilution) noted above. The increases in the wells screened in the lower portion of the Upper Glacial Aquifer are attributed to an increase in the salinity of the ground water beneath the Site. The concentrations of other parameters decreased relative to last year's results. Most of the decreases occurred in Well HF-602-U, which is screened in the saturated zone above the tidal marsh deposits, and Wells HF-102-S and HF-104-D, which are screened in the upper and lower portions of the Upper Glacial Aquifer, respectively. The decreases in Well HF-602-U, which are in contrast to the increases in the other two wells screened in the saturated zone above the tidal marsh deposits, may be due to this well's close proximity to Old Mill Creek.

Included in Appendix C of the 2013 third Quarterly Report are the groundwater elevations synoptic, the sample collection field logs, the tabulated summary of laboratory results, the laboratory reports, and the Data Usability Summary Report. The complete Data Validation Report can be found in the enclosed computer disk located in Appendix E of the 2013 third Quarterly Report.

3.5.2 Gas Monitoring Program

Soil gas readings at the seven perimeter gas monitoring wells were taken quarterly on February1st, April 3rd, August 27th, September 17th, and November 29th and are summarized in Table 6. The locations of the perimeter soil gas monitoring wells are shown in Figure 5. Methane readings were 0.0% at GMW-1 and GMW-4; 0.0% (on three occasions), 0.2% and 0.5% at GMW-2; 0.0% (on three occasions), 0.2% and 0.8% at GMW-3; 0.0% (on two occasions), 0.1%, 0.3% and 1.8% at GMW-5, and 0.0% (on two occasions), 0.3%, 0.4%, and 10.2% at GMW-6. The existence of methane within GMW-6 at times may also be attributed to this gas monitoring well being screened in the vicinity of a naturally-occurring tidal marsh deposit present at depth in this area (see discussion below for gas monitoring well GMW-7).

It should be noted that GMW-7 is screened in a tidal marsh deposit. This finding was documented following the installation of the monitoring well and reported to the NYSDEC. Methane readings within this well have been consistently high since its installation. Monitoring of GMW-7 prior to the post-closure monitoring period, resulted in some methane readings above 80%, opening of the neighboring gas extraction wells provided no relief. The well was passively vented and the methane levels were consistently below 40% in 2013, i.e., 36.0%, 30.2%, 34.1%, 37.9%, and 32.8%, a reduction of 10% by volume of methane when compared to results obtained in the previous annual reporting period. The methane level within GMW-7 is higher than the higher explosive limit (i.e., 15% gas in air), but is attributed to this gas monitoring well being screened in the naturally-occurring tidal marsh deposits present at depth at certain locations, not due to landfill gas migration. To confirm that there is no off-site gas migration, bar-hole readings were taken in the shallow subsurface soil in the vicinity of Well GMW-7 detecting 0.0% to 0.2% methane; confirming that the methane detected in this well is from the deeper tidal marsh zone. The bar-hole results, along with the results for the six other gas monitoring wells, confirm that landfill gas is being controlled by the LFG management system.

On March 19th and September 18th, landfill surface gas readings were taken, with no detections observed throughout the landfill. Sample locations are shown in Figure 6, and results in Appendix D, of the First and Third Quarter Reports.

Section 4 – Conclusions and Recommendations

Based on the results of the Post-Closure activities performed this quarter, the FAL engineering controls and associated institutional controls are in place, performing properly and remain effective. The FAL remedy continues to be protective of public health and the environment and is compliant with the FAL ROD. The activities associated with the O&M Manual and the Post-Closure Monitoring Plan (as approved by the NYSDEC) continue to be implemented.

Routine system maintenance and repair of each of the remediation systems should continue in compliance with the requirements of the FAL O&M Manual. In general, it is recommended that areas of the Site affected by Hurricane Sandy should be restored to their existing condition prior to the storm event. To this end, DEP is procuring a contract for the repair of certain perimeter roads and embankments outside of the landfill limits damaged during Hurricane Sandy. As part of this contract, selected operational equipment will be replaced or rehabilitated.

Specific recommendations for each of the remedial systems are identified in the following paragraphs.

4.1 Landfill Gas Management System

The landfill gas management system is operational and is preventing off-site gas migration. The recommended equipment components that are currently operational but were exposed to the Hurricane Sandy surge and have been designated for replacement should be replaced under DEP Contract 1400-FLP (scheduled for procurement in 2014). Other equipment components exposed to the Hurricane Sandy surge that are currently operational but not designated for replacement under Contract 1400-FLP should continue to be monitored and assessed over time and may be replaced in the future, if necessary. In addition, the recommended corrective actions listed in Form DP-1, Landfill Gas System, Descriptions of Deficiencies and Problems, in Appendix A should be implemented.

4.2 Final Cover System

Overall the landfill final cover system is in good condition and protecting landfill cap beneath it as intended. It is recommended that routine maintenance continue to be performed to control problem areas. This would include filling ruts caused by erosion, reseeding areas where necessary, and maintaining landfill surface slope to promote stormwater runoff. Mowing should be conducted as needed to control invasive species and to provide access for inspections and maintenance. In addition, perimeter areas of the final cover system affected by Hurricane Sandy should be restored to their existing condition prior to the storm event as proposed under DEP Contract 1400-FLP (scheduled for procurement in 2014). The recommended corrective actions listed in Form DP-1, FCS-1, Descriptions of Deficiencies and Problems, in Appendix B should be implemented.

4.3 Stormwater Management System

The stormwater management system continues to convey stormwater runoff to its outfall locations. Conditions found are typical of those encountered during the landfill post-closure period, with a few deficiencies noted. In general, it is recommended that silt and vegetation in drainage swales continue to be periodically removed and sediment be removed from other portions of the drainage system. In addition, areas of the stormwater management system affected by Hurricane Sandy should be restored to their existing condition prior to the storm event as proposed under DEP Contract 1400-FLP (scheduled for procurement in 2014). Specifically, the recommended corrective actions listed in Form DP-1 (SWM-1, SWM-2 SWM-3), Descriptions of Deficiencies and Problems, in Appendix B should be implemented.

4.4 Ancillary Systems

The roads and nature trails of the ancillary systems continue to provide access throughout the site while the fencing and gates continue to allow for controlled site access. Conditions found are typical of those encountered during the landfill post-closure period, with a few deficiencies noted. In general, it is recommended that routine maintenance continue to be performed to control problem areas from expanding and worsening. This would include filling ruts and potholes in roads and repairing site fencing and gates when necessary. In addition, areas of the ancillary systems affected by Hurricane Sandy should be restored to their existing condition prior to the storm event as proposed under DEP Contract 1400-FLP (scheduled for procurement in 2014). Specifically, the recommended corrective actions listed in Form DP-1, ANS-1, Descriptions of Deficiencies and Problems, in Appendix B should be implemented.

4.5 Post-Closure Environmental Monitoring

Overall, the results of the 2013 annual ground water-monitoring round are consistent with last year's results, and continue to indicate that the Site is not a significant source of releases of hazardous or toxic substances to ground water. The perimeter gas monitoring and the surface gas monitoring performed to date indicate that the landfill gas being generated by the FAL is being contained by the collection and treatment system and preventing off-site methane migration. It is expected that landfill gas concentrations will decrease over time as the landfill ages.

Recommendations for post-closure monitoring are to continue to perform the environmental monitoring in accordance with the modified Monitoring Plan (approved by the NYSDEC in May 2011) throughout the first Five-Year post-closure period reflecting the reduction in the frequency of groundwater monitoring to annually, in rotating quarters (i.e., once every five quarters). Accordingly, the next groundwater monitoring round will be performed during the fourth quarter of 2014.

Following a review of the groundwater monitoring data to be presented in the first FAL Five-Year Review Report, the NYSDEC may allow non-detected parameters to be excluded from subsequent annual monitoring rounds, with the condition that all Plan parameters will be performed once every five years, coinciding with the last year of each five-year review period.

FIGURES

Figure 1: Fountain Avenue Landfill Site Map

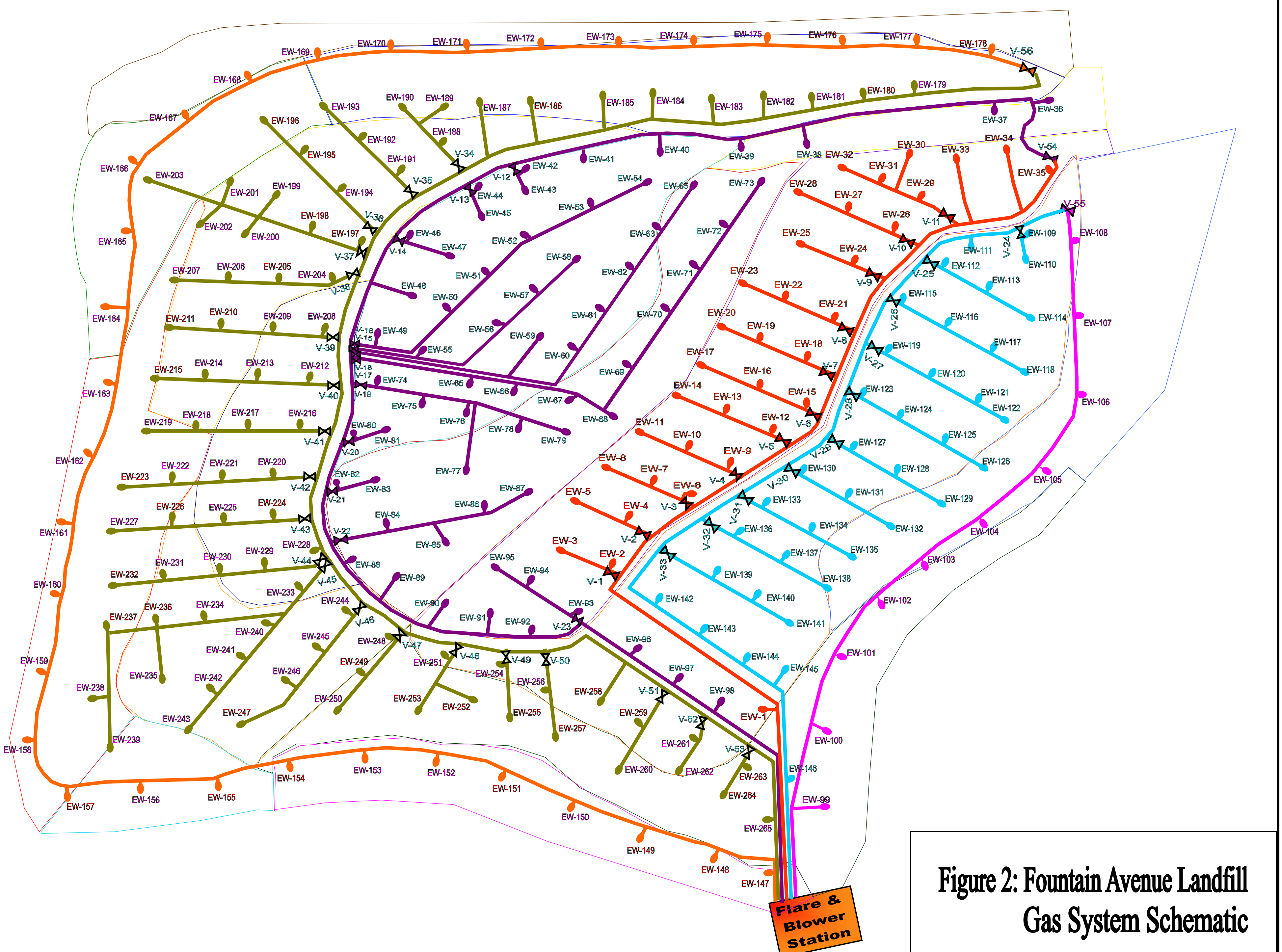


Figure 2: Fountain Avenue Landfill
Gas System Schematic

Figure 3: Fountain Avenue Landfill Flare and Blower Station

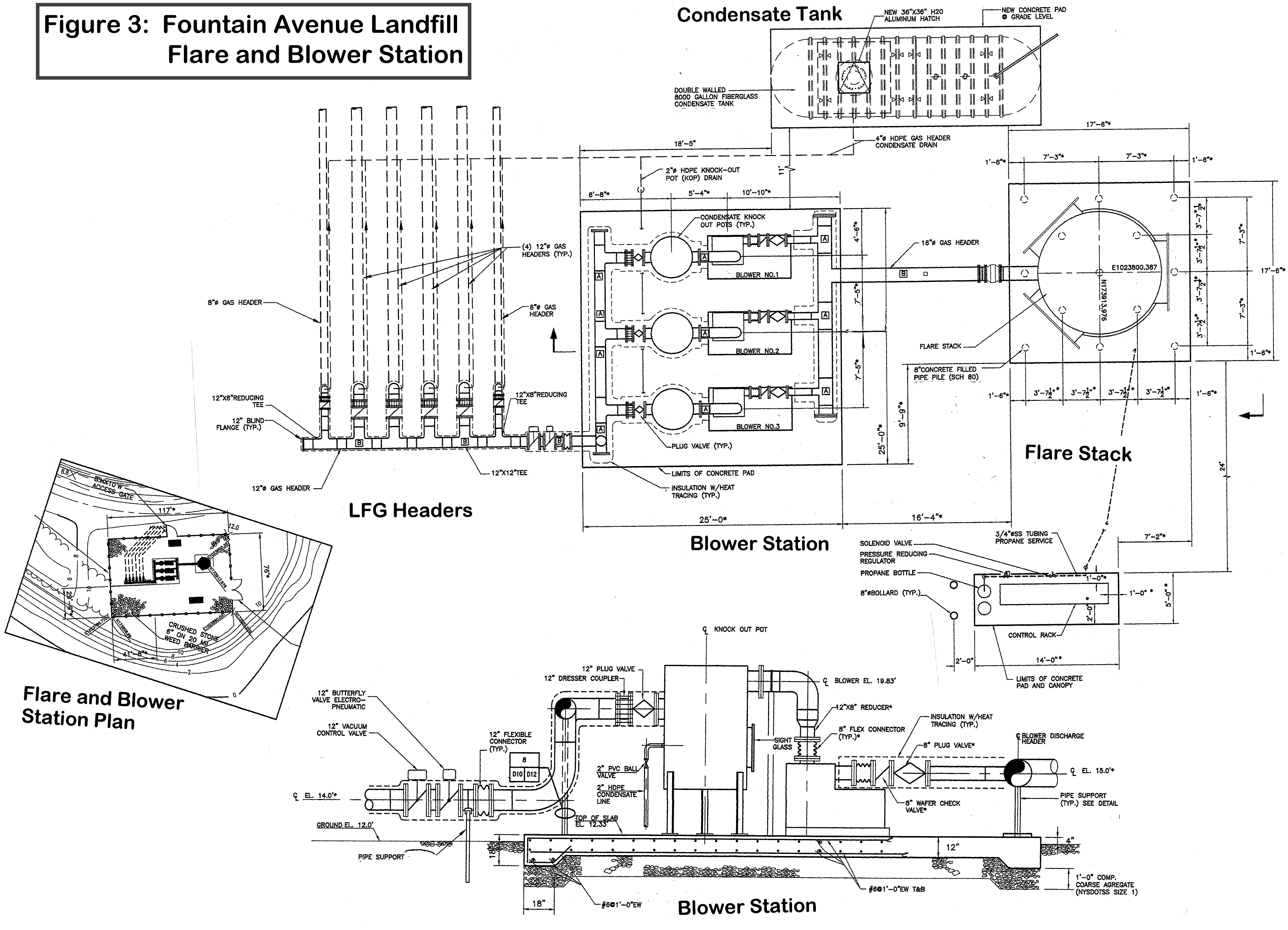
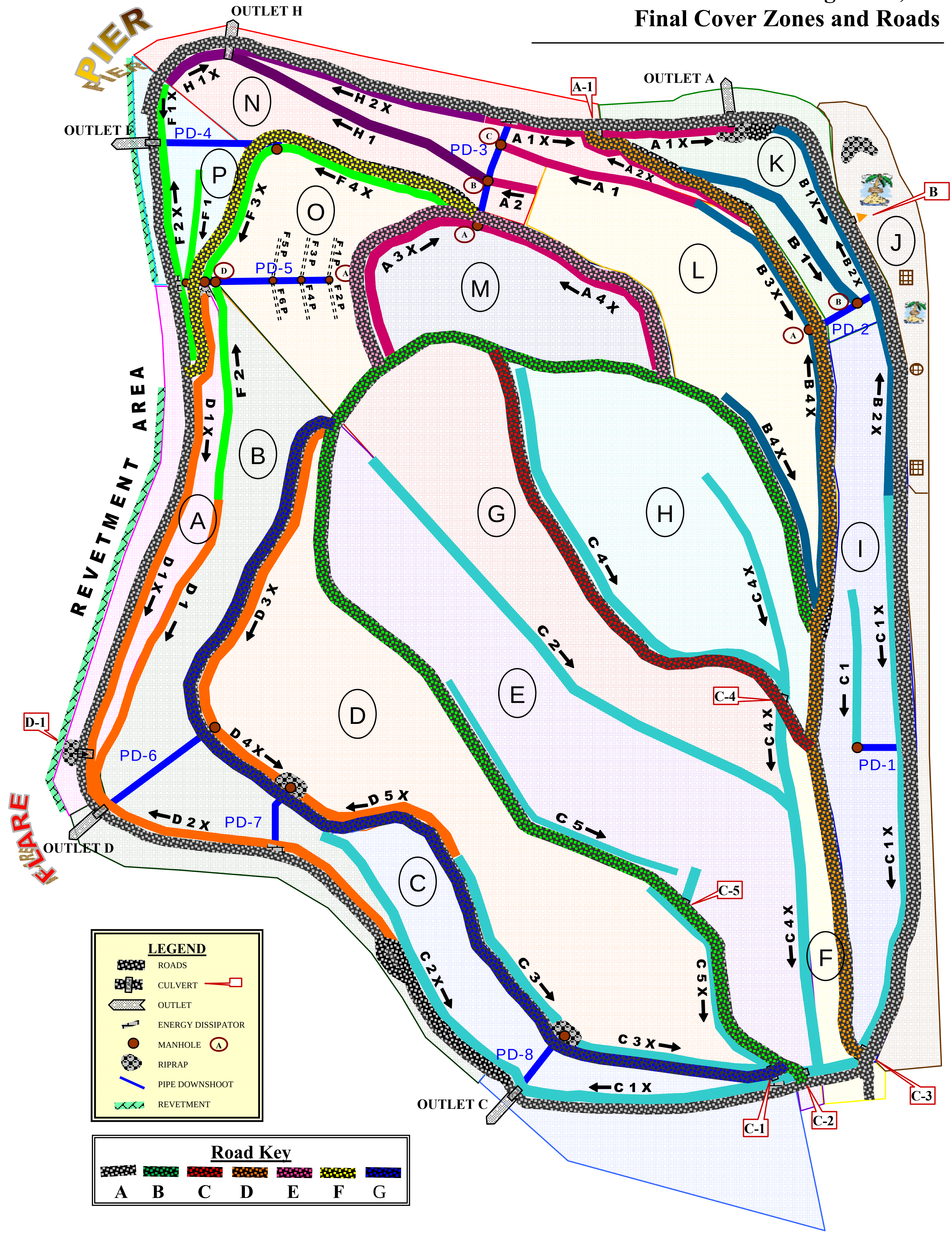
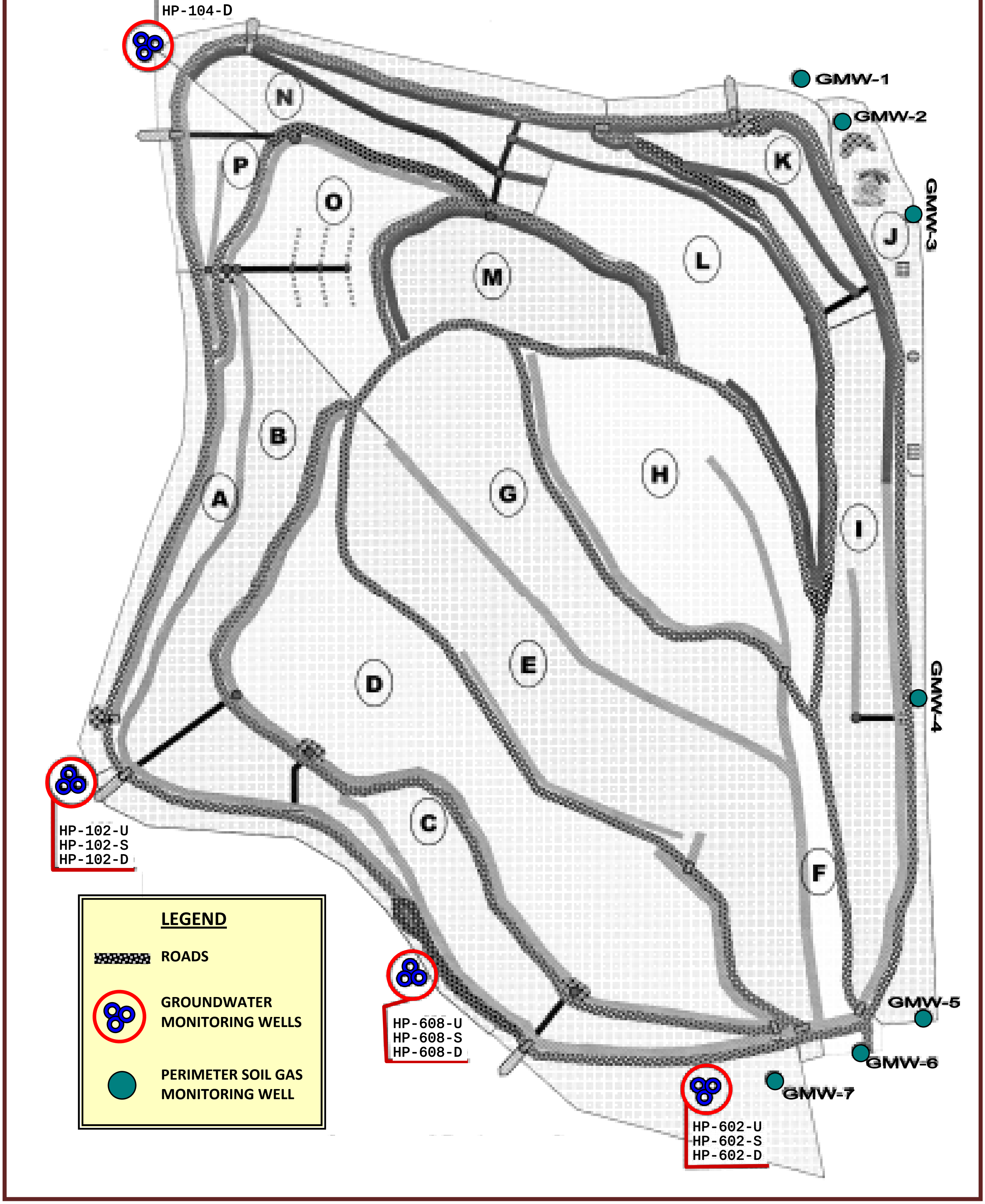


Figure 4: Fountain Avenue Landfill Stormwater Management, Final Cover Zones and Roads



<u>Figure 5</u>: Fountain Avenue Landfill Groundwater and Perimeter Gas Monitoring Well Locations



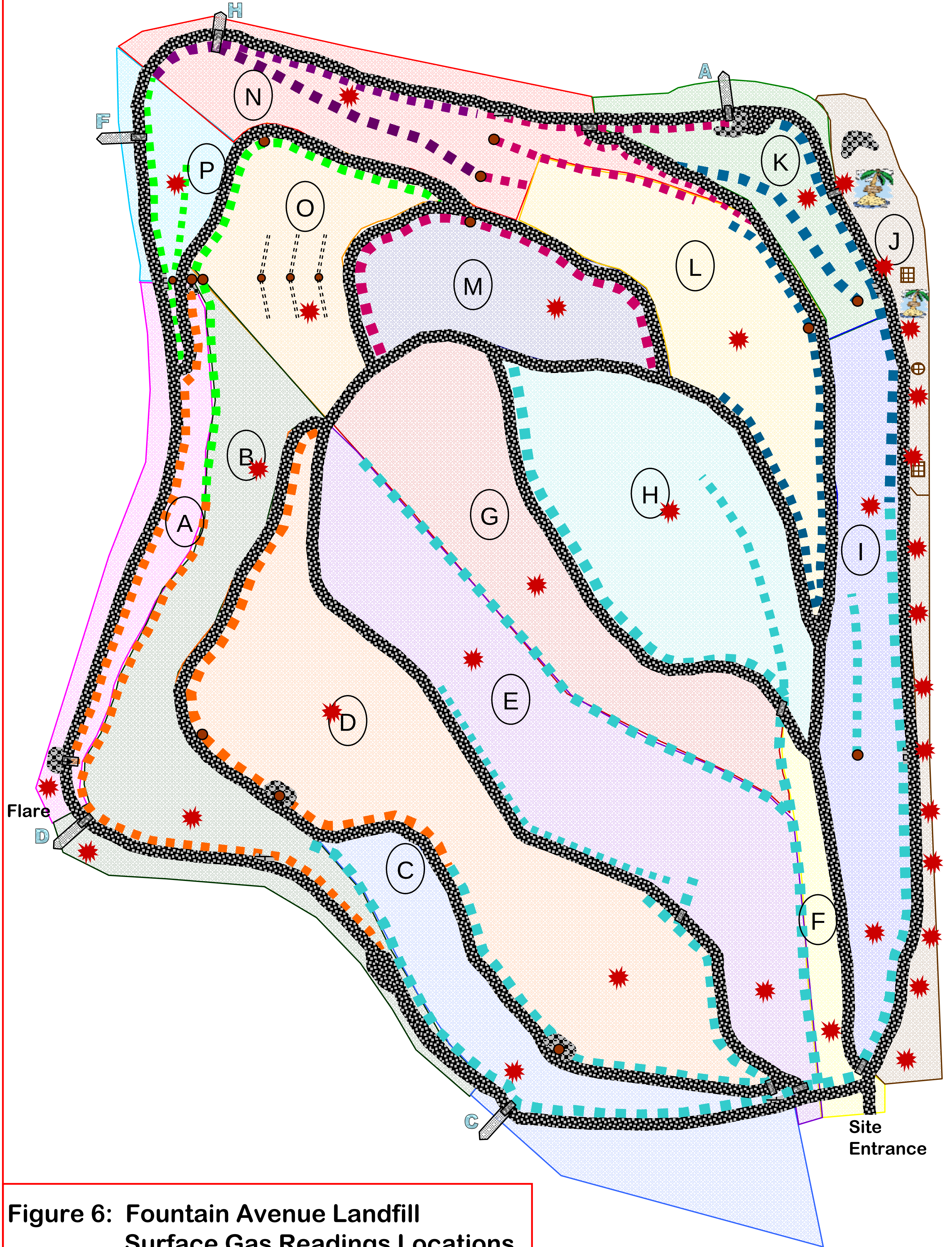


Figure 6: Fountain Avenue Landfill Surface Gas Readings Locations

TABLES

Table 1: Summary of Target Volatile Organic Compounds (VOCs) Detected in Ground-Water Samples

			Wells Screened in the Saturated Zone Above the Tidal Marsh Deposit						Wells Screened in the Upper Portion of the Upper Glacial Aquifer							
		NYSDEC Class GA Standard	HF-102-U		HF-602-U		HF-608-U		HF-102-S		HF-104-S		HF-602-S		HF-608-S	
Analyte	**Unit**		**2Q12**	**3Q13**	**2Q12**	**3Q13**	**2Q12**	**3Q13**	**2Q12**	**3Q13**	**2Q12**	**3Q13**	**2Q12**	**3Q13**	**2Q12**	**3Q13**
1,1 Dichloroethane	ug/L	**5**	<1	<5	<1	<5	<1	<5	<1	<5	<1	<5	<1	<5	**10**	2 J
1,4 Dichlorobenzene (v)	ug/L	**3**	3	2 J	<1	<5	2	<5	<1	<5	<1	<5	<1	<5	<1	<5
124-Trimethylbenzene	ug/L	**5**	<1	NA	<1	NA	2	NA	<1	NA	<1	NA	<1	NA	<1	NA
1,2,4,5-Tetramethylbenzene	ug/L	**5**	<1	NA	<1	NA	4	NA	<1	NA	<1	NA	<1	NA	<1	NA
Benzene	ug/L	**1**	<1	<5	<1	<5	**4**	**2 J**	<1	<5	<1	<5	<1	<5	<1	<5
Chlorobenzene	ug/L	**5**	5	4 J	3	<5	**18**	**6**	<1	<5	1	2 J	<1	<5	<1	<5
Chloroform	ug/L	**7**	<1	<5	<1	<5	<1	<5	<1	<5	5	<5	<1	<5	<1	<5
Ethyl Benzene	ug/L	**5**	<1	<5	<1	<5	4	2 J	<1	<5	<1	<5	<1	<5	<1	<5
Isopropylbenzene	ug/L	**5**	<1	NA	<1	NA	2	NA	<1	NA	<1	NA	<1	NA	<1	NA
Methylene Chloride	ug/L	**5**	<1	<5	<1	<5	<1	<5	<1	<5	1	<5	<1	<5	<1	<5
n-Propylbenzene	ug/L	**5**	<1	NA	<1	NA	2	NA	<1	NA	<1	NA	<1	NA	<1	NA
Xylene, total	ug/L	**15**	<2	<5	<2	<5	1	2 J	<2	<5	<2	<5	<2	<5	<2	<5

			Wells Screened in the Lower Portion of the Upper Glacial Aquifer							
		NYSDEC Class GA Standard	HF-102-D		HF-104-D		HF-602-D		HF-608-D	
Analyte	**Unit**		**2Q12**	**3Q13**	**2Q12**	**3Q13**	**2Q12**	**3Q13**	**2Q12**	**3Q13**
1,1 Dichloroethane	ug/L	**5**	<1	<5	<1	<5	<1	<5	<1	<5
1,4 Dichlorobenzene (v)	ug/L	**3**	<1	<5	<1	<5	<1	<5	<1	<5
1,2,4-Trimethylbenzene	ug/L	**5**	<1	NA	<1	NA	<1	NA	<1	NA
1,2,4,5-Tetramethylbenzene	ug/L	**5**	<1	NA	<1	NA	<1	NA	<1	NA
Benzene	ug/L	**1**	<1	<5	<1	<5	<1	<5	<1	<5
Chlorobenzene	ug/L	**5**	<1	<5	<1	<5	<1	<5	<1	<5
Chloroform	ug/L	**7**	<1	<5	<1	<5	<1	<5	<1	<5
Ethyl Benzene	ug/L	**5**	<1	<5	<1	<5	<1	<5	<1	<5
Isopropylbenzene	ug/L	**5**	<1	NA	<1	NA	<1	NA	<1	NA
Methylene Chloride	ug/L	**5**	<1	<5	<1	<5	<1	<5	<1	<5
n-Propylbenzene	ug/L	**5**	<1	NA	<1	NA	<1	NA	<1	NA
Xylene,total	ug/L	**15**	<2	<5	<2	<5	<2	<5	<2	<5

Footnotes:

Only the parameters detected in at least one ground-water sample in 2012 and/or 2013 are listed.

The NYSDEC Class GA Standards are for potable ground water. The ground water at the site is naturally saline; therefore, non-potable. There are no saline ground-water standards for these parameters. Standards with the (GV) notation are guidance values only.

Results shown in bold font are higher than the potable ground-water standard. J = estimated value.

Table 2: Summary of Target Semi-Volatile Organic Compounds (SVOCs) Detected in Ground-Water Samples

			Wells Screened in the Saturated Zone Above the Tidal Marsh Deposit						Wells Screened in the Upper Portion of the Upper Glacial Aquifer							
		NYSDEC Class GA Standard	HF-102-U		HF-602-U		HF-608-U		HF-102-S		HF-104-S		HF-602-S		HF-608-S	
Analyte	**Unit**		2Q12	3Q13	2Q12	3Q13	2Q12	3Q13	2Q12	3Q13	2Q12	3Q13	2Q12	3Q13	2Q12	3Q13
2-Methylnaphthalene	ug/L	**None**	<1	<1	<1	<1	1.1	2 J	<1	<1 J	<1	<1	<1	<1 J	<1	<1
4-Chloro-3-methylphenol	ug/L	**1***	<1	<1	<1	<1	**3.1**	<1	<1	<1 J	<1	<1	<1	<1 J	**1.7**	<1
Acenaphthene	ug/L	**20 (GV)**	1.2	<1	<1	<1	<1	<1 J	<1	<1 J	1	3	<1	<1 J	<1	<1
Anthracene	ug/L	**50 (GV)**	<1	<1	<1	<1	<1	1 J	<1	<1 J	<1	<1	<1	<1 J	<1	<1
Bis(2-ethylhexyl)phthalate	ug/L	**5**	<1	<1 J	<1	<1	<1	<1 J	<1	<1 J	1	<3	<1	<3 J	<1	<1
Diethyl Phthalate	ug/L	**50 (GV)**	<1	<1	<1	<1	<1	<1 J	<1	<1 J	<1	2	<1	<1 J	<1	<1
Di-n-Butyl Phthalate	ug/L	**50**	<1	<1	1	<1	1.2	<1 J	<1	<1 J	1	<1	<1	<1 J	<1	<1
Fluoranthene	ug/L	**50 (GV)**	<1	<1	<1	<1	<1	<1 J	<1	<1 J	<1	1	<1	<1 J	<1	<1
Fluorene	ug/L	**50 (GV)**	<1	<1	<1	<1	<1	1 J	<1	<1 J	<1	<1	<1	<1 J	<1	<1
Naphthalene(sv)	ug/L	**10 (GV)**	<1	<1	<1	<1	**18**	**61 J**	<1	<1 J	<1	<1	<1	<1 J	<1	<1
sec-Butylbenzene	ug/L	**5**	<1	NA	<1	NA	1	NA	<1	NA	<1	NA	<1	NA	<1	NA

			Wells Screened in the Lower Portion of the Upper Glacial Aquifer							
		NYSDEC Class GA Standard	HF-102-D		HF-104-D		HF-602-D		HF-608-D	
Analyte	**Unit**		2Q12	3Q13	2Q12	3Q13	2Q12	3Q13	2Q12	3Q13
2-Methylnaphthalene	ug/L	**None**	<1	<1 J	<1	<1	<1	<1	<1	<1
4-Chloro-3-methylphenol	ug/L	**1***	<1	<1 J	<1	<1	1	<1	<1	<1
Acenaphthene	ug/L	**20 (GV)**	<1	<1 J	<1	<1 J	<1	<1	<1	<1
Anthracene	ug/L	**50 (GV)**	<1	<1 J	<1	<1	<1	<1	<1	<1
Bis(2-ethylhexyl)phthalate	ug/L	**5**	<1	1 J	<1	<2	<1	<1	<1	<1
Diethyl Phthalate	ug/L	**50 (GV)**	<1	<1 J	<1	<1	<1	<1	<1	<1
Di-n-Butyl Phthalate	ug/L	**50**	<1	<1 J	<1	<1	<1	<1	<1	<1
Fluoranthene	ug/L	**50 (GV)**	<1	<1 J	<1	<1	<1	<1	<1	<1
Fluorene	ug/L	**50 (GV)**	<1	<1 J	<1	<1	<1	<1	<1	<1
Naphthalene(sv)	ug/L	**10 (GV)**	<1	<1 J	<1	<1	<1	<1	<1	3
sec-Butylbenzene	ug/L	**5**	<1	NA	<1	NA	<1	NA	<1	NA

Footnotes: Only the parameters detected in at least one sample in 2012 and/or 2013 are listed.

The NYSDEC Class GA Standards are for potable ground water. The ground water at the site is naturally saline; therefore, non-potable. There are no saline ground-water standards for these parameters. (GV) notation is guidance value only.

Results shown in bold font are higher than the potable ground-water standard.

* NYSDEC Class GA Standard is for Total Phenols

J = estimated value.

Table 3: Summary of Pesticides and Polychlorinated Biphenyls (PCBs) Detected in Ground-Water Samples

			Wells Screened in the Saturated Zone Above the Tidal Marsh Deposit					
			HF-102-U		HF-602-U		HF-608-U	
Analyte	Unit	NYSDEC Class GA Standard	2Q12	3Q13	2Q12	3Q13	2Q12	3Q13
Aroclor 1016	ug/L	**0.09***	<0.065	<0.065	<0.065	<0.065	<0.065	<0.065
beta-BHC	ug/L	**0.04**	<0.05	<0.05	<0.05	<0.05	<0.05 J	**0.059 J**

			Wells Screened in the Upper Portion of the Upper Glacial Aquifer							
			HF-102-S		HF-104-S		HF-602-S		HF-608-S	
Analyte	Unit	NYSDEC Class GA Standard	2Q12	3Q13	2Q12	3Q13	2Q12	3Q13	2Q12	3Q13
Aroclor 1016	ug/L	**0.09***	**0.3**	<0.065	<0.065	<0.065	<0.065	<0.065	<0.065	<0.065
beta-BHC	ug/L	**0.04**	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05

			Wells Screened in the Lower Portion of the Upper Glacial Aquifer							
			HF-102-D		HF-104-D		HF-602-D		HF-608-D	
Analyte	Unit	NYSDEC Class GA Standard	2Q12	3Q13	2Q12	3Q13	2Q12	3Q13	2Q12	3Q13
Aroclor 1016	ug/L	**0.09***	<0.065	<0.065	<0.065	<0.065	<0.065	<0.065	<0.065	<0.065
beta-BHC	ug/L	**0.04**	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05

Footnotes: J = estimated value

Only the PCBs and pesticides detected in at least one sample during 2012 and/or 2013 are listed.

The NYSDEC Class GA Standards are for potable ground water. The ground water at the site is naturally saline; therefore, non-potable. There are no saline ground water standards for these parameters.

* The GA Standard applies to the sum of PCBs

Results shown in bold font are higher than the potable ground-water standard.

Table 4: Summary of Metals Detected in Ground-Water Samples

Analyte	Unit	NYSDEC Class GA Standard	Wells Screened in the Saturated Zone Above the Tidal Marsh Deposit						Wells Screened in the Upper Portion of the Upper Glacial Aquifer							
			HF-102-U		HF-602-U		HF-608-U		HF-102-S		HF-104-S		HF-602-S		HF-608-S	
			2Q12	3Q13	2Q12	3Q13	2Q12	3Q13	2Q12	3Q13	2Q12	3Q13	2Q12	3Q13	2Q12	3Q13
Aluminum as Al	mg/L	**No Std.**	0.06	<0.0132	<0.05	<0.0465	0.25	0.289 J	<0.05	<0.0272	<0.05	0.0709 J	<0.05	<0.0302	<0.05	0.442
Barium as Ba	mg/L	**1**	0.47	0.351	0.29	0.235	0.86	0.98	0.11	<0.0599	0.2	0.523	<0.025	<0.0203	0.033	<0.0299
Boron as B	mg/L	**1**	0.16	0.355 J	**2.1**	0.264 J	**6.4**	**6.99 J**	**1.5**	0.494 J	**1.9**	**3.38 J**	**2.1**	**1.78 J**	**3.3**	**2.8 J**
Cadmium as Cd	mg/L	**0.005**	<0.025	<0.00015	<0.025	<0.00015	<0.025	<0.00015	<0.025	<0.00015	<0.025	<0.00015	<0.025	<0.00015	<0.025	<0.00015
Calcium as Ca	mg/L	**No Std.**	190	240 J	140	204 J	72	125 J	240	117 J	200	194 J	64	66.2 J	120	98.2 J
Chromium as Cr	mg/L	**0.05**	<0.025	<0.0015	<0.025	<0.0025	**0.19**	**0.211**	<0.025	<0.0035	<0.025	0.0209	<0.025	<0.0078	<0.025	<0.0078
Cobalt as Co	mg/L	**No Std.**	<0.025	<0.0004	<0.025	0.0005 J	0.038	0.05 J	<0.025	<0.0004	<0.025	0.0104 J	<0.025	0.0005 J	<0.025	<0.0004
Copper as Cu	mg/L	**0.2**	<0.05	<0.0007	**0.31**	0.0063 J	0.13	<0.007	0.16	0.0011 J	0.11	0.0019 J	**0.23**	0.0008 J	**0.25**	<0.0007
Iron as Fe	mg/L	**0.3**	**7.5**	**2.06 J**	**5.7**	**0.424 J**	**5.4**	**6.21 J**	**23**	**9.49 J**	**2**	0.254 J	0.05	0.106 J	**8.1**	**9.87 J**
Lead	mg/L	**0.05**	<0.025	<0.0072	<0.025	<0.0104	<0.025	0.0197 J	<0.025	<0.0102	<0.025	<0.0101	<0.025	<0.0094	<0.025	0.0144
Magnesium as Mg	mg/L	**35 (GV)**	28	**46.1**	**54**	26.4	**45**	**63.2**	**410**	**89.7**	**56**	**77.1**	**160**	**170**	**340**	**276**
Manganese as Mn	mg/L	**0.3**	**0.34**	0.28 J	**0.34**	**0.42 J**	0.08	0.103 J	**0.86**	0.146 J	0.19	0.0849 J	<0.05	0.0067 J	0.28	**0.302 J**
Mercury as Hg	mg/L	**0.0007**	<0.0008	<0.0001	<0.0008	<0.0001	<0.0008	<0.0005	<0.0008	<0.0001	**0.0009**	0.00013 J	<0.0008	<0.0001	<0.0008	<0.0001
Nickel as Ni	mg/L	**0.1**	<0.05	<0.0005	<0.05	0.0025 J	0.1	**0.131 J**	<0.05	0.0009 J	<0.05	0.0123 J	<0.05	0.0012 J	<0.05	<0.0005
Potassium as K	mg/L	**No Std.**	5.9	<28.7	110	<18.4	400	442	180	<54.8	90	152	160	<130	230	153
Selenium	mg/L	**0.01**	<0.05	<0.0018	<0.15	<0.0027	<0.1	0.0247 J	<0.25	<0.0018	<0.1	<0.0018	<0.15	<0.0018	<0.25	<0.0041
Sodium as Na	mg/L	**20**	**22**	**251**	**390**	**54.4**	**1,500**	**1,680**	**3,100**	**788**	**330**	**794**	**930**	**956**	**3,500**	**3,360**
Thallium	mg/L	**0.0005 (GV)**	<0.05	<0.0019	<0.15	<0.0019	<0.15	<0.0191	<0.1	<1.9	<0.1	<0.0019	<0.15	<0.0019	<0.1	<0.0019
Vanadium as V	mg/L	**No Std.**	<0.025	0.0011 J	<0.025	0.0029 J	0.24	0.307 J	<0.025	0.004 J	<0.025	0.018 J	0.037	0.0293 J	<0.025	0.0095 J
Zinc as Zn	mg/L	**2 (GV)**	<0.05	<0.0103	0.11	<0.013	0.12	0.064 J	0.18	<0.0153	0.15	<0.0119	0.09	<0.0213	0.12	<0.0119

Analyte	Unit	NYSDEC Class GA Standard	Wells Screened in the Lower Portion of the Upper Glacial Aquifer							
			HF-102-D		HF-104-D		HF-602-D		HF-608-D	
			2Q12	3Q13	2Q12	3Q13	2Q12	3Q13	2Q12	3Q13
Aluminum as Al	mg/L	**No Std.**	<0.05	0.0715 J	0.21	<0.0213	<0.05	<0.0333	<0.05	<0.0069
Barium as Ba	mg/L	**1**	0.1	0.23	0.46	<0.0836	0.047	<0.0457	0.025	<0.0595
Boron as B	mg/L	**1**	0.15	0.0623 J	**2.2**	**3.08 J**	**2.5**	**2.4 J**	0.87	**2.04 J**
Cadmium as Cd	mg/L	**0.005**	<0.025	0.0105	<0.025	<0.00015	<0.025	0.0004 J	<0.025	<0.00015
Calcium as Ca	mg/L	**No Std.**	120	240 J	190	323 J	180	178 J	78	213 J
Chromium as Cr	mg/L	**0.05**	<0.025	0.0375	<0.025	<0.0004	<0.025	<0.001	<0.025	<0.0004
Cobalt as Co	mg/L	**No Std.**	<0.025	0.0238 J	<0.025	<0.0004	<0.025	0.0006 J	<0.025	<0.0004
Copper as Cu	mg/L	**0.2**	0.11	<0.0007	<0.05	<0.0007	**0.43**	<0.0007	**0.25**	0.0009 J
Iron as Fe	mg/L	**0.3**	**1.3**	**209 J**	**55**	**6.68 J**	**1.6**	**0.484 J**	<0.05	**1.24 J**
Lead	mg/L	**0.05**	<0.025	<0.0038	<0.025	<0.0069	<0.025	<0.007	<0.025	<0.0071
Magnesium as Mg	mg/L	**35 (GV)**	18	**101**	**140**	**998**	**610**	**574**	**210**	**634**
Manganese as Mn	mg/L	**0.3**	0.09	**4.57 J**	**0.4**	**0.544 J**	0.13	**0.126 J**	<0.05	**0.348 J**
Mercury as Hg	mg/L	**0.0007**	<0.0008	<0.0001	<0.0008	<0.0001	<0.0008	<0.0001	<0.0008	<0.0001
Nickel as Ni	mg/L	**0.1**	<0.05	0.0325 J	<0.05	<0.0005	<0.05	0.0027	<0.05	<0.0005
Potassium as K	mg/L	**No Std.**	5.6	<49.4	120	354	490	294	160	243
Selenium	mg/L	**0.01**	<0.1	**0.0215**	<0.05	<0.0031	<0.1	<0.0052	<0.1	<0.0018
Sodium as Na	mg/L	**20**	**44**	**880**	**1,000**	**8,780**	**4,400**	**5,590**	**1,700**	**5,400**
Thallium	mg/L	**0.0005 (GV)**	<0.1	**0.0021 J**	<0.05	<0.0019	<0.1	<0.0019	<0.1	<0.0019
Vanadium as V	mg/L	**No Std.**	<0.025	0.001 J	<0.025	<0.0003	<0.025	0.0005 J	<0.025	<0.0003
Zinc as Zn	mg/L	**2 (GV)**	0.12	0.14	0.07	<0.0245	0.16	<0.0212	0.09	<0.0067

Footnotes:

Only the metals detected in at least one ground-water sample during 2012 and/or 2013 are listed.

The NYSDEC Class GA Standards are for potable ground water. The ground water at the site is naturally saline; therefore, non-potable. There are no saline groundwater standards for these parameters. Standards with the (GV) notation are guidance values only.

Results shown in bold font are higher than the potable ground-water standard. J = estimated value.

Table 5: Summary of Leachate Indicator Parameters Detected in Ground-Water Samples

Analyte	Unit	NYSDEC Class GA Standard	Wells Screened in the Saturated Zone Above the Tidal Marsh Deposit						Wells Screened in the Upper Portion of the Upper Glacial Aquifer							
			HF-102-U		HF-602-U		HF-608-U		HF-102-S		HF-104-S		HF-602-S		HF-608-S	
			2Q12	3Q13	2Q12	3Q13	2Q12	3Q13	2Q12	3Q13	2Q12	3Q13	2Q12	3Q13	2Q12	3Q13
Alkalinity tot CaCo3	mg/L	**No Std.**	640	752	1,400	704	4,500	5,030	340	423	960	2,270	1,000	920	960	951
Ammonia as N	mg/L	**2**	**5.4**	**4.54**	**140**	**28.7**	**680**	**861**	**6.6**	**10.8**	**120**	**319**	**24**	**29.8**	2	**2.33**
BOD5	mg/L	**No Std.**	17	7	7.9	28	110	29	20	7	12	18	4.8	4	<2	<4
Bromide as Br	mg/L	**2 (GV)**	<0.5	**9.52**	**5.3**	<0.5	**16**	**48.2**	**29**	<0.5	**3.6**	**29.7**	**9**	1.72	**21**	**146**
Chloride as Cl	mg/L	**250**	20	**475**	**370**	62.1	**1,400**	**1,480**	**5,900**	**2,350**	**400**	**917**	**1,300**	**1,500**	**7,100**	**6,080**
COD	mg/L	**No Std.**	<40	31.2	210	32.5	1,500	1,360	300	129	150	401	170	86.7	450	97.2
Color units		**15**	**20**	**60**	**100**	**30**	**360**	**2,500**	**40**	**175**	**100**	**350**	**60**	**65**	**120**	**300**
Cyanide, Amenable	mg/L	**0.2***	<0.02	0.0255	<0.02	<0.010	<0.02	0.0227	<0.02	<0.010	<0.02	<0.010	<0.02	<0.010	<0.02	<0.010
Hardness as CaC03	mg/L	**No Std.**	600	940	580	1,250	360	480	2,300	700	730	750	820	860	1,700	1,280
Nitrate (As N)	mg/L	**10**	<0.05	<0.1	<0.05	<0.1	<0.05	<0.1	<0.05	<0.1	<0.05	<2.0	<0.05	<0.1	<0.05	<0.1
Nitrite	mg/L	**1**	NA	<0.1	NA	<0.1	NA	<0.1	NA	<0.1	NA	<0.1	NA	<0.1	NA	<0.1
Phenolics, Tot. Recov.	mg/L	**0.001**	<0.001	<0.005	<0.001	<0.005	<0.004	**22.2**	<0.001	<0.005	<0.001	**6.8**	<0.001	<0.005	<0.001	<0.005
Sulfate as SO4	mg/L	**250**	<25	11.1	23	92	**450**	152	**800**	164	**450**	**48.5**	**450**	**407**	**950**	**794**
Tot. Dissolved Solids	mg/L	**1,000**	590	**1,520**	**1,500**	914	**5,500**	**7,990**	**9,000**	**4,170**	**1,600**	**3,650**	**3,400**	**3,840**	**12,000**	**11,200**
Tot. Kjeldahl N.	mg/L	**No Std.**	6.2	6.38	140	30.8	740	968	7.4	11.1	130	362	25	31.2	3 J	8.11
Tot. Organic Carbon	mg/L	**No Std.**	9.4	11.3	48	15.6	250	51.5	<0.5	9.3	27	138	14	24.1	8.4	5.6

Analyte	Unit	Class GA Standard	Wells Screened in the Lower Portion of the Upper Glacial Aquifer							
			HF-102-D		HF-104-D		HF-602-D		HF-608-D	
			2Q12	3Q13	2Q12	3Q13	2Q12	3Q13	2Q12	3Q13
Alkalinity tot CaCo3	mg/L	**No Std.**	240	9.05	900	137	760	903	190	311
Ammonia as N	mg/L	**2**	<0.2	0.53	**72**	**2.56**	**2**	**12.8**	0.6	0.54
BOD5	mg/L	**No Std.**	<2	11	<5	<4	<2	<2	<2	<4
Bromide as Br	mg/L	**2 (GV)**	<0.5	**2.67**	**8.1**	**412**	**32**	**172**	**12**	**277**
Chloride as Cl	mg/L	**250**	46	**2,470**	**7,800**	**17,500**	**11,000**	**10,300**	**3,500**	**10,600**
COD	mg/L	**No Std.**	<40	48.6	450	144	300	129	200	123
Color units		**15**	**25**	**75**	**150**	**75**	**50**	**55**	<5	**50**
Cyanide, Amenable	mg/L	**0.2***	<0.02	<0.010	<0.02	<0.010	<0.02	<0.010	<0.02	<0.010
Hardness as CaC03	mg/L	**No Std.**	390	1,020	1,100	5,050	2,900	3,000	1,100	3,050
Nitrate (As N)	mg/L	**10**	<0.05	<0.05	<0.05	<0.1	<0.05	<0.1	<0.05	0.47
Nitrite	mg/L	**1**	NA	0.11	NA	<0.1	NA	<0.1	NA	<0.1
Phenolics, Tot. Recov.	mg/L	**0.001**	<0.001	<0.005	<0.001	<0.005	<0.001	<0.005	<0.001	<0.005
Sulfate as SO4	mg/L	**250**	200	155	**2,100**	**2,000**	**980**	**666**	**400**	**1,150**
Tot. Dissolved Solids	mg/L	**1,000**	600	**6,320**	**13,000**	**42,200**	**16,000**	**19,000**	**6,100**	**24,200**
Tot. Kjeldahl N.	mg/L	**No Std.**	0.4	0.73	77	2.39	2.6	12.1	1	0.87
Tot. Organic Carbon	mg/L	**No Std.**	<0.5	<1.0	51	2.1	2.1	12.5	<0.5	8.2

Footnotes:

Only the parameters detected in at least one ground-water sample during 2012 and/or 2013 are listed.

The NYSDEC Class GA Standards are for potable ground water. The ground water at the site is naturally saline; therefore, non-potable. There are no saline ground water standards for these parameters. Standards with the (GV) notation are guidance values only.

Results shown in bold font are higher than the potable ground-water standard.

* The GA Standard applies to Total Cyanide

Table 6
Summary of Perimeter Gas Monitoring Well Results
Fountain Avenue Landfill, Brooklyn, NY

Quarterly Monitoring Round	GMW-1	GMW-2	GMW-3	GMW-4	GMW-5	GMW-6	GMW-7
	Methane (% by volume)						
1Q13	0.0	0.2	0.0	0.0	0.1	0.3	36.0
2Q13	0.0	0.0	0.0	0.0	0.0	0.0	30.2
3Q13	0.0	0.5	0.0	0.0	1.8	10.2	34.1
	0.0	0.0	0.8	0.0	0.3	0.4	37.9
4Q13	0.0	0.0	0.2	0.0	0.0	0.0	32.8
	Carbon Dioxide (% by volume)						
1Q13	21.2	20.3	21.7	22.2	9.2	20.6	0.6
2Q13	16.4	19.8	19.4	20.2	8.5	20.6	0.2
3Q13	3.9	5.4	2.8	0.0	12.0	4.7	6.4
	1.2	3.7	7.3	0.8	10.4	1.0	10.1
4Q13	1.0	3.1	7.4	0.8	4.8	0.6	10.0
	Oxygen (% by volume)						
1Q13	21.2	20.3	21.7	22.2	9.2	20.6	0.6
2Q13	16.4	19.8	19.4	20.2	8.5	20.6	0.2
3Q13	10.2	17.0	17.7	20.8	0.7	16.1	0.5
	20.1	18.4	13.0	21.2	1.1	20.7	0.0
4Q13	20.8	18.6	10.0	21.5	11.8	21.4	0.0

Bar Hole Readings in Vicinity of GMW-7

	Methane (% by volume)				Carbon Dioxide (% by volume)		Oxygen (% by volume)	
Quarterly Monitoring Round	1Q13	2Q13	3Q13	4Q13	1Q13	2Q13	1Q13	2Q13
North	0.2	0.0	0.0	0.0	0.7	0.3	21.9	20.2
East	0.1	0.1	0.0	0.2	0.7	0.3	20.6	20.3
West	0.2	0.0	0.0	0.0	0.7	0.2	21.3	19.9
South	0.1	0.1	0.0	0.0	0.6	0.4	20.8	20.1