Environment

Prepared for:
National Grid
Hicksville, NY

Prepared by:
AECOM
Chelmsford, MA
60137357 500
December 2011

Feasibility Study Report
Far Rockaway Former MGP

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1200 – 1224 Brunswick Avenue
Far Rockaway, Queens County, New York
NYSDEC Site No.: 2-41-032
Index #: A2-0552-0606

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bgs	below ground surface
BTEX	benzene, ethylbenzene, toluene, and xylene
CAMP	Community Air Monitoring Plan
cf	cubic feet
COC	Compounds of Concern
COD	Chemical Oxygen Demand
COI	Constituents of Interest
DER	Department of Environmental Conservation
EMNA	Enhanced Monitored Natural Attenuation
FS	Feasibility Study
GAC	Granulated Activated Carbon
HASP	Health and Safety Plan
HSA	Hollow Stem Auger
ISCO	In Situ Chemical Oxidation
iSCO®	In Situ Submerged Oxygen Curtain ®
ISS	In Situ Solidification
K	Hydraulic Conductivity
LILCO	Long Island Lighting Company
LIRR	Long Island Railroad
mg/kg	milligrams per kilogram
MGP	manufactured gas plant
MNA	Monitored Natural Attenuation
NAPL	non-aqueous phase liquid
NGVD	Natural Geodetic Vertical Datum
NYCRR	New York Codes, Rules and Regulations
NYS	New York State
NYSDEC	New York State Department of Environmental Conservation
NYSDOH	New York State Department of Health
O&M	Operations and Maintenance
ºF	Degrees Fahrenheit
ORP	Oxidation Reduction Potential
OSHA	Occupational Safety and Health Administration
PAH	Polycyclic Aromatic Hydrocarbon
PCE	Perchloroethylene
PDI	Pre-Design Investigation
PE	Professional Engineer
PID	Photo Ionization Detection
POTW	Publicly Owned Treatment Works
PSA	Preliminary Site Assessment
PSAR	Preliminary Site Assessment Report
QHEA	Qualitative Human Health Exposure Assessment
RAG	Remedial Action Goal
RAOs	Remedial Action Objectives

RCRA	Resource Conservation and Recovery Act
RI	Remedial Investigation
SCGs	Standards, Criteria and Guidance
SCO	Soil Cleanup Objectives
SGVs	Standard or Guidance Values
SPDES	State Pollutant Discharge Elimination System
SPT	Standard Penetration Test
SVE	Solid Vapor Extraction
SVOCs	Semi-Volatile Organic Compounds
TEAs	Terminal Electron Acceptors
TMV	Toxicity, Mobility, and Volume
TOGS	Technical Operation Guidance Series
ug/L	micrograms per liter
UIC	Underground Injection Control
USCS	Unified Soil Classification System
USEPA	United States Environmental Protection Agency
USGS	United States Geologic Survey
VOCs	Volatile Organic Compounds

Professional Certification

I, Michael J. Gardner, certify that I am currently a New York State registered professional engineer as defined in 6 NYCRR Part 375 and that this Report was prepared in accordance with all applicable statutes and regulations and in substantial conformance with the DER Technical Guidance for Site Investigation and Remediation (DER-10) and that all activities were performed in full accordance with the DER-approved work plan and any DER-approved modifications.

Michael Gardner

2/14/2012

Michael J. Gardner, P.E.
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Date

1.0 Introduction

The Feasibility Study Report (FS) has been prepared for National Grid by AECOM to define site-specific remedial action goals and objectives and identify an appropriate approach to address the environmental conditions encountered at the property located at 1200-1224 Brunswick Avenue, Far Rockaway, Queens County, New York (Site). This property was the site of a former manufactured gas plant (MGP) that was operated by Hempstead Gas and Electric Light Company in the late 1800's and early 1900's. In 1902, the operations were transferred to the Queensborough Gas and Electric Company when the two entities consolidated. Based on available historical records, the MGP appears to have actively operated until approximately 1909. The Long Island Lighting Company (LILCO) acquired Queensborough Gas and Electric Company via stock purchase in 1923. LILCO was acquired by KeySpan in 1998. KeySpan was eventually acquired by National Grid in August 2007.

The Site's remediation is being performed in accordance with Order on Consent #A2-0552-0660 between National Grid and the New York State Department of Environmental Conservation (NYSDEC). A remedial Investigation Report (RI) was completed and approved by NYSDEC on August 31, 2011. This FS has been prepared in accordance with the most recent and applicable guidelines of the NYSDEC including the Department of Environmental Remediation's (DER) Technical Guidance for Site Investigation and Remediation (DER-10) (NYSDEC, May 3, 2010).

2.0 Site Description and History

This section presents a description of the Site, including adjacent properties, and provides a history of the Site.

2.1 Site Description

The Far Rockaway former MGP Site is located between Beach 12th Street and Minton Street, on the north side of Brunswick Avenue. The Site address is 1200-1224 Brunswick Avenue and it occupies Section 59/Block 15529/Lots 102, 105, 110, and 115 according to the Queens County Land Records. The Site location is illustrated on Figure 2-1 and is situated at latitude 40 36' 35.78"N and longitude 74 44' 57.92"W. The site and adjacent properties where investigation work was performed are zoned as M1-Light Manufacturing.

The Site is approximately one-acre in size and is currently owned by individual third parties and used by three separate tenants for warehousing, shipping and distribution operations, including paper products and footwear. Figure 2-2 illustrates the current site layout as well as the location of former MGP structures. The Site contains three two-story buildings which are used for office space and warehousing and includes paved parking. A limited area of exposed surface soil is present in the parking lot area of the 1224 Brunswick Avenue property within the former MGP site footprint. The buildings are serviced by public utilities including electric, water, sewer, and natural gas.

2.1.1 Adjacent Properties

The Site is located in a mixed commercial/industrial and residential area of Far Rockaway. The Long Island Rail Road (LIRR) bounds the site to the north, beyond which is a property owned by Verizon, located at 1211 Redfern Avenue. To the northwest is a property owned by 1263 Redfern Associates, LLC which is used to store construction supplies (steel I beams, etc.) and equipment. Beyond these two properties to the northwest is a large residential complex consisting of numerous apartment buildings.

Residential housing is located to the east and south of the Site along Brunswick Avenue, Beach 12th Street and other streets further east and south. Commercial buildings are situated west of the Site. Figure 2-3 is a photograph showing the site and surrounding land uses.

2.2 Site History

Based on information provided in the Preliminary Site Assessment Report (PSAR) (PS&S, 2003) and review of Sanborn maps, a gas works operated at the Site between the mid 1890's and 1909. Until 1902, the property was owned by Hempstead Gas and Electric Light Company. The operations were transferred to the Queensborough Gas and Electric Company in 1902 when the two entities consolidated. LILCO acquired Queensborough Gas and Electric Company via stock purchase in 1923. LILCO was acquired by KeySpan in 1998. KeySpan was eventually acquired by National Grid in August 2007.

Figure 2-2 illustrates the former MGP structures that were located at the Site based on information provided on the 1901 Sanborn Fire Insurance Map shown in Appendix B of the PSAR (PS&S, 2003).

The former MGP included a building which housed coal bins, a purifier, and a gas generator and a 75,000 cubic foot (cf) gas holder. The PSAR also states the presence of a former gasoline tank in the southern central portion of the property near Brunswick Avenue, as noted on the 1933 and 1951 Sanborn Maps. No information was available whether it was an above ground or below ground tank. Brown's Directory reports indicate two MGPs in Rockaway, including Far Rockaway (the Site) and Rockaway Beach (also known as the Rockaway Park site) located 5.5 miles southwest of the site. Gas production was likely most pronounced in the summer given the resort nature of the area at that time with summer populations being about one order of magnitude higher than winter months. Annual production estimates, available for the period of 1900 through 1909 for both MGPs, ranged from a low of 15 million cf in 1900 to a maximum of 100 million cf from 1907 through 1909. No information on byproducts made or sold was available in the directory.

The Site was used by LILCO and the Queensborough Gas and Electric Company as office space following the cessation of MGP operations. Based on Sanborn Fire Insurance Maps, it appears that the gas holder was demolished sometime between 1950 and 1981. After 1981, no MGP-related features were present at the site with the exception of the MGP Process Building.

2.2.1 Potential source areas for MGP-related residuals

The historical research identified various former site features which could have been potential source areas for MGP residuals. The key features of the MGP, shown on Figure 2-2, are summarized as follows:

- The MGP Process Building, which is still present at 1216 Brunswick Avenue, was the original building located in the northwestern portion of the site. This building housed two former coal bins, a purifier, and a gas generator and is currently used to house a commercial business that distributes paper products. These operations are housed on the ground floor and offices to support the business are located on the second floor.
- A 75,000 cf Gas Holder was present west of the MGP Process Building, in the current parking lot of 1224 Brunswick Avenue.
- Two coal bins housed in the former MGP Process building at 1216 Brunswick Avenue.
- A purifier formerly located in the former MGP Process building at 1216 Brunswick Avenue.
- A Gas Generator located in the former MGP Process building at 1216 Brunswick Avenue.

In addition, the PSAR stated the presence of a former gasoline tank in the southern central portion of the property near Brunswick Avenue, as noted on the 1933 and 1951 Sanborn Maps. The gasoline tank area post-dated the operational period of the MGP. The preliminary site assessment (PSA) and subsequent RI phases included the investigation of the areas discussed above.

3.0 Summary of Remedial Investigation and Exposure Assessment

AECOM completed a RI Report in August 2011 (AECOM, 2011), which documented the results of RI work performed at the Site. The RI Report (AECOM, 2011) was approved by the NYSDEC on August 31, 2011. Figure 3-1 provides a map of the investigation locations. A summary of the RI findings are provided below.

3.1 Site Setting

3.1.1 Geology

The southern shores of Long Island consist of reworked glacially deposited sands of Long Island bordered by low-relief barrier islands and shallow lagoons. Long Island was deposited on Late Jurassic to Cenozoic sediments of the Long Island Platform and adjacent Baltimore Trough. Metamorphic bedrock is present at depths up to 600 meters below ground surface (bgs) near Fire Island on the Southern shore of Long Island (United States Geologic Survey [USGS], 1999). The nearest surface water body to the site is Motts Basin, located approximately 1,270 feet to the west/northwest of the site. Groundwater beneath the site is not tidally influenced.

The site area is underlain by glacial outwash deposits that contain fresh water aquifers for Nassau and Suffolk Counties (Doriski and Wilde-Katz, 1983). The upper portion of the glacial outwash sequence in this part of Long Island contains two confining layers, the “20-foot” clay and the Gardiners Clay, that are known to influence local groundwater flow patterns. The shallowest of these two confining units is the “20-foot” clay, which was documented in Doriski and Wilde-Katz’s 1983 study as being present at depths of 20 to 40 feet below National Geodetic Vertical Datum (NGVD) in the general site area. The “20-foot” clay, interpreted to be a marine deposit between deeper and shallower glacial outwash deposits, ranges ranging in thickness from 2 to 40 feet and is discontinuous in narrow north-south channels in the study area (Doriski and Wilde-Katz, 1983). Collectively, these units are referred to regionally as the upper glacial unit/aquifer.

Historic fill material covers the majority of the site in a layer typically ranging from 5 to 7 feet thick, but up to 10 feet thick in the eastern portion of the site near Brunswick Avenue. The fill is comprised of mostly poorly graded sand and gravel with varying amounts of coal fragments, wood fragments, steel fragments, brick fragments, glass, and cinder and ash-like material.

Beneath the fill is a native sand unit that is comprised largely of poorly graded sand, with lesser amounts of well graded sand and poorly graded silty sand. The sand unit extends to approximately 35 to 40 feet bgs. Small clay lenses were periodically seen within the sand unit, as were some shell fragments (observed at 34 to 36 feet bgs).

Underlying the sand unit is a firm, silty clay unit with high plasticity known regionally as the “20-foot” clay layer. The silty clay layer was only observed at deeper boring locations, at approximately 35 to 40 feet bgs. In most of the boring locations shell fragments were observed in this unit. The silty clay layer extended to the deepest boring depths (45 feet bgs). This regional confining unit represents the base of the shallow aquifer at the Site.

Cross sections of the site geology are presented on Figures 3-2 and 3-3.

3.1.2 Hydrogeology

Storm water runoff flows locally towards various private and municipal storm water catch basins located adjacent to and within the site. The upper unconfined aquifer zone is present within the poorly graded fine to medium sand unit that underlies the fill and overlies the regional confining “20-foot” clay unit. The water table is present at depths that roughly coincide with the base of the shallow fill layer.

Groundwater is found at depths which ranged from approximately 3 to 7 feet bgs across the site. Groundwater generally flows from the east/southeast to the west/northwest across the site. Flow in the deep wells screened at the base of the unconfined aquifer has a more pronounced northwesterly flow component. Calculated horizontal hydraulic gradients ranged between 0.0034 to 0.0037 feet/foot in shallow zone wells and 0.0034 to 0.004 in deep zone wells.

Vertically, gradients were mixed, with five shallow and deep well pairs exhibiting downward gradients (MW-105, MW-116, MW-117, MW-118, and MW-1119) ranging from 0.0012 to 0.004 feet/foot, three well pairs (MW-110, MW-111, and MW-121) exhibiting upward vertical gradients ranging from 0.0042 to 0.0056 feet/foot, and one well pair (MW-113) with equal groundwater elevations based on the February 11, 2009 gauging event. Refer to Figure 3-1 for monitoring well locations.

Hydraulic conductivity (K) testing (rising head tests) performed at four monitoring wells provided a calculated average K in shallow ranging from 40 to 1,026 feet/day, with a geometric mean of 219.2 feet/day. The hydraulic conductivity at one well (MW-109) located upgradient of the site along Brunswick Avenue was calculated to be 1,026 feet/day due to the high gravel content in the soil formation around this well that is not representative of the geology beneath the former site area. When this well was removed from the geometric mean, the estimated K value decreased to 80.5 feet/day, with a range in average K values of 40 to 163 feet/day, which is interpreted to be more consistent with site geology. The calculated hydraulic conductivity for the deep aquifer zone based on one well (MW-116D) was 2.4 feet/day.

Using the calculated site hydraulic conductivity values and horizontal site gradients and estimated porosity in each aquifer zone, the estimated shallow groundwater seepage velocity in water table wells was 0.99 feet/day, or 362 feet/year and the estimated deep zone groundwater seepage velocity at wells screened above the confining clay interface was 0.03 feet/day, or 10.8 feet/year.

Investigations indicated there are no tidal or train traffic influences on water levels.

Shallow and deep groundwater elevation contours are provided on Figures 3-4 and 3-5, respectively. These contour maps are based on the February 11, 2009 gauging event. Maps for other gauging events were provided in the RI Report (AECOM, 2011).

3.2 Geotechnical Investigation

Seven pre-design investigation (PDI) borings (PDI-1 through PDI-7) were advanced to obtain geotechnical information, to support the evaluation of the potential remedial options (Figure 3-1). Borings were advanced using hollow stem auger (HSA) drilling. Continuous Standard Penetration Test (SPT) were conducted in each boring. Geotechnical samples were collected from PDI-1, PDI-3, and PDI-4 and analyzed for Atterberg limits, grain size, and Unified Soil Classification System (USCS) classification. The results of the geotechnical investigation are presented in Appendix A.

3.3 Nature and Extent of Constituents of Interest

A summary of the investigation activities and results is provided below. Additional details are provided in the RI Report (AECOM, 2011). Refer to Figure 3-1 for investigation locations.

3.3.1 Surface Soil (0-2 inches)

As part of the RI, five surface soil samples were collected along the northern and western limits of the former MGP operations. These were analyzed for benzene, toluene, ethylbenzene, and xylene (BTEX), volatile organic compounds (VOCs), semi-volatile organic compounds (SVOCs) including polycyclic aromatic hydrocarbons (PAHs), metals, and cyanide. In addition, 10 background surface soil samples were collected from public space areas surrounding the site for analysis for SVOCs including PAHs and metals as shown on Figure 3-6.

Surface soil results are included in Table 3-1 and Figure 3-7 and are compared to the commercial Restricted Use Soil Cleanup Objectives (SCOs) provided in the document entitled "*NYSDEC Rules and Regulations, 6 NYCRR Subpart 375-6, Remedial Program Soil Cleanup Objectives*", dated December 14, 2006 [NYSDEC, 2006a].

Sample results indicate that BTEX, VOCs, and SVOCs were mainly non-detect with some compounds detected at very low levels. Metals and total cyanide were also detected, generally at low levels. PAHs were either not detected or detected at low levels, with the exception that four of the five surficial soil samples contained individual PAH compounds (i.e., benzo(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, and dibenz(a,h)anthracene) in concentrations greater than the Commercial SCOs for soil. PAHs in site surface soil samples are consistent with typical urban background concentrations as stated in the RI approved by the NYSDEC.

All background samples collected and analyzed had concentrations of individual PAHs detected; however, only one PAH compound (i.e., benzo(a)pyrene at 3.6 milligrams per kilograms [mg/kg]) was greater than the Commercial SCO for soil at an upgradient location. Detected PAH concentrations are consistent with typical urban background concentrations.

Each metal was detected at least once in the 10 background samples collected. Only copper was detected greater than the Commercial SCP for soil at an estimated value of 1,470 mg/kg at an upgradient location.

3.3.2 Subsurface Soil (Greater than 2-inches bgs)

As part of the RI, subsurface soil samples were collected via test trenches and soil borings advanced to depths up to 45 feet bgs. A minimum of two soil samples were collected from each boring location for laboratory analysis. A sample was collected at the greatest observed impact based on olfactory and visual observation and photo ionization detection (PID) readings and a second sample was collected below the deepest impacts or at the base of the boring to provide vertical delineation information. If no impacts were observed, a sample was collected at the water table. Additional samples were also collected above the clay interface. Samples were analyzed for VOCs, SVOCs, metals, and cyanide.

The results of the subsurface soil analytical results are summarized in Table 3-2. A summary of visual field observations is provided on Table 3-3 and Figures 3-8 through 3-11. The subsurface soil results were compared to the commercial SCOs provided in the document entitled "*NYSDEC Rules and Regulations, 6 NYCRR Subpart 375-6, Remedial Program Soil Cleanup Objectives*", dated December 14, 2006 [NYSDEC, 2006a].

Fourteen of the 34 subsurface soil samples had concentrations of individual PAHs detected. Three compounds (i.e., benzo(a)anthracene, benzo(a)pyrene, and benzo(b)fluoranthene) were detected greater than the Commercial SCO for soil at SB-115, located near a former gas holder on the southeast side of the Site from a depth of 7.5 to 8.5 feet bgs.

Each metal was detected at least once in the 34 subsurface soil samples collected; however, only one metal was greater than the Commercial SCO for soil (i.e., mercury was detected at 11.6 mg/kg at SB-100 from a depth of 4.5 to 5 feet bgs). SB-100 is located on the LIRR property just north of the 1224 Brunswick Avenue building.

All soil samples collected from the soil borings and test trenches were logged for the presence of MGP source material. MGP source material consists of potentially mobile non-aqueous phase liquid (NAPL) coal tar present in the soil pore spaces. Only NAPL saturated intervals would be considered as having the potential to be mobile in the environment. MGP source material at the site is typically observed as coal tar blebs, globs, lenses, grain coating, or sheen. MGP source material represents a potential source of dissolved phase groundwater impacts. Stained (discolored) soils do not constitute the presence of MGP source material.

No visual impacts were noted in the upper few feet of the borings and test trenches. Coal tar blebs, globs, etc. were observed from 5 feet bgs to 15 feet bgs in the parking area of the 1224 Brunswick Avenue Property. These observations were generally in the vicinity of the former gas holder. Varying degrees of NAPL saturation were observed in this area but free phase NAPL was not observed. No NAPL was detected in any of the monitoring wells installed in this area or other areas during the RI, indicating the limited mobility of the NAPL where observed in soils at the site. Staining was also observed in soil borings in the parking lot area overlying the former gas holder, as well as borings further downgradient and west/northwest of the former gas holder extending approximately 160 feet off-site. The staining observations envelope the area where potential MGP source material has been identified via observations of tar blebs and globules. These indications of potential MGP source material are limited to the upper 15 feet of soil within the 1224 Brunswick Property.

Test trenches also encountered what appeared to be the gas holder walls and the holder base (at approximately 3.5 feet bgs). Beneath the slab, which was approximately 0.3 feet thick, was approximately 0.8 feet of angular gravel fill underlain by fine sand. No visible tar was observed at the apparent base of the holder or in gravel fill beneath the holder slab. However, coal tar-impacted soils were noted at nearby soil borings as described above.

Visual impacts at deeper depths (15 to 30 feet bgs) were only noted at two deep PDI boring locations and one deep boring (SB-102) at the 1224 Brunswick Avenue property, where a thin (approximately 0.1 foot thick) tar saturated band of soil was observed in a thin gravel lenses at approximately 27 feet bgs at PDI-2, at approximately 25.5 feet bgs at PDI-3, and at approximately 24.0 feet bgs at SB-102. Each boring intersected a laterally discontinuous sandy gravel lens that was not detected in adjacent deep borings. The tar saturation was detected within this sandy gravel lens. No other visual observations were noted at deeper depths or at other adjacent deep boring locations. The sandy gravel lens is not encountered in nearby boring PDI-1 to the west or PDI-6 and PDI-7 located between these borings and the likely source area (former holder). The presence of this material represents an isolated occurrence and does not appear to be connected to an obvious on-site source.

3.3.3 Groundwater

As part of the RI, groundwater sampling was conducted from 2008 through 2009. Upon installation of borings, groundwater grab samples were obtained and analyzed for a subset of VOCs including BTEX, naphthalene, and styrene to aid in the selection of locations to be converted to permanent monitoring wells. Groundwater samples were analyzed for VOCs, SVOCs, Resource Conservation and Recovery Act (RCRA) 8 Metals plus iron, copper, and zinc; and total cyanide. A total of 13 groundwater grab samples were collected and a total of 36 groundwater samples were collected. Grab samples were analyzed for a reduced laboratory parameter list, including primary site constituents of interest (BTEX, naphthalene, and styrene).

The results of the groundwater samples are summarized in Table 3-4, Table 3-5, Figure 3-12 and Figure 3-13. Samples were analyzed for VOCs, SVOCs, metals, and cyanide. The evaluation of the groundwater results is based on a comparison to the standards or guidance values (SGVs) provided in the NYSDEC - Division of Water – Technical Operation Guidance Series (TOGS) (1.1.1) [NYSDEC, 1998, with addendums].

Groundwater sampling in the shallow zone identified five wells where BTEX compounds were detected greater than the groundwater guidance values. Naphthalene and styrene were detected above groundwater guidance values in four wells. The distribution of BTEX compounds, naphthalene, and styrene in the shallow zone indicate concentrations are located west and north/northwest (downgradient) of the former gas holder, and follow groundwater flow (Figure 3-12). Naphthalene was detected in all samples ranging from 64 to 15,200 micrograms per liter (µg/L), exceeding the groundwater guidance value of 300 µg/L in 13 of the 17 samples analyzed. Mercury was detected at estimated value of 0.85 µg/L in one well and was above the groundwater guidance value of 0.7 µg/L.

Groundwater sampling in the deep zone identified three wells where BTEX compounds were detected greater than the groundwater guidance values. One of these wells was sampled a second time and the BTEX compounds were non-detect. Naphthalene was detected above groundwater guidance values in four wells. One of these wells was sampled a second time and naphthalene was detected, but did not exceed the groundwater guidance value. Therefore, as of September 2009, only two wells have BTEX compounds and three wells have naphthalene greater than the groundwater guidance values. The distribution of BTEX compounds and naphthalene in the deep zone indicate concentrations are located west and north/northwest (downgradient) of the former gas holder, and generally follow groundwater flow (Figure 3-13). Iron concentrations in deep wells ranged from 735 to 26,500 µg/L, and all results were above the groundwater guidance value. The concentration patterns of iron in groundwater and the detection of mercury in groundwater in one well (MW-100) at the adjacent LIRR property do not indicate that they are associated with the former MGP. Therefore, these detections will not be actively addressed by the recommended remedy in this document.

The network of shallow and deep monitoring wells installed during the various RI phases has effectively delineated the extent of dissolved phase impacts originating from the former MGP footprint.

3.3.4 Soil Vapor and Indoor Air

Samples of soil gas were collected from eight locations in the immediate vicinity of the former MGP site (Figure 3-1). Three samples were collected in the vadose zone below foundation slabs of occupied structures used for commercial/industrial purposes. Remaining samples were collected in unoccupied areas (parking lot, street, storage yard). The most significant constituent concentrations were observed in the unoccupied areas adjacent to the former gas holder.

Refer to Table 3-6 for soil gas analytical results. The sampling was conducted to satisfy the requirements of the New York State Department of Health (NYSDOH) Soil Vapor Intrusion Guidance.

A screening evaluation was conducted for the soil gas results to identify locations where constituent concentrations could potentially provide a source of impacts to indoor air. The results demonstrated a low potential for impacts (i.e., exceedances of NYSDOH background values at the 90th percentile) in the occupied structures at 1224, 1216 and 1200 Brunswick Ave. However, the potential for any future indoor impacts in the currently undeveloped area associated with the former gas holder (SV-4) is higher and will be addressed by the proposed remedy in this document.

Indoor air samples were collected from within each of the occupied structures in conjunction with the soil gas samples. Refer to Table 3-7 for indoor air analytical results. The levels of the indoor air results were compared to screening criteria developed by the USEPA (USEPA, 2001). The criteria presented in the table are associated with a hazard index of 1 and an excess cancer risk of 1 $x10^{-4}$ and were derived to be protective of non-residential scenarios. This approach was approved by the NYSDEC and the NYSDOH during their review of the RI. An evaluation of the analytical results demonstrates that all constituent concentrations are below their respective non-residential indoor air risk-based screening criteria except for 1,2,4-trimethylbenzene and perchloroethylene (PCE) at 1224 Brunswick Avenue. However, based on comparisons with sub-slab vapor data, it is concluded that the concentrations of these two constituents in indoor air are not associated with the vapor intrusion pathway. Indoor air concentrations of both of these constituents are also significantly less than the Occupational Safety and Health Administration (OSHA) “occupational” exposure levels, which are derived to be protective of workplace exposures.

3.4 Monitored Natural Attenuation Evaluation

As part of the RI, a preliminary monitored natural attenuation evaluation was performed. Two shallow zone wells (MW-114 and MW-116S) and two deep zone wells (MW-116D and MW-119D) were sampled for geochemical parameters to evaluate whether natural attenuation was occurring at the Site. Data from this evaluation are presented on Table 3-8. Using a combination of field and laboratory parameters, the goal of the evaluation was to determine if there was evidence that intrinsic biodegradation of dissolved constituents of interest (COIs) was occurring and if so, which terminal electron acceptors (TEAs) were active at the Site.

The preliminary evaluation, which is provided in more detail in the RI Report, concluded that the geochemical data provides evidence that intrinsic biodegradation of dissolved organics is occurring at the Site under anaerobic conditions adjacent to and within the former MGP operations area. This conclusion was based on the concentration and general distribution of dissolved oxygen, chemical oxygen demand (COD), oxidation reduction potential (ORP), nitrate, and dissolved iron in wells across the site. Should monitored natural attenuation (MNA) be further pursued, additional monitoring at a larger subset of wells is recommended to more fully develop this evaluation.

3.5 Qualitative Human Health Exposure Assessment Summary

A qualitative human health exposure assessment was performed, as part of the RI, for the site and off-site areas characterized by the investigation. The assessment identified the following potential pathways that may result in an exposure to impacted media at the site. The exposure associated with the majority of these potentially complete exposure pathways is expected to be low and is not likely to pose an unacceptable risk to receptors.

- Several MGP-associated constituents were detected in indoor air and sub-slab vapor at 1224 Brunswick Avenue. However, the measured indoor air concentrations of these constituents are either believed to be influenced by indoor sources (and not vapor intrusion from constituents in the subsurface media) or are detected at concentrations below United States Environmental Protection Agency (USEPA) target indoor air concentrations associated with an acceptable risk level and at concentrations significantly less than the OSHA “occupational” exposure levels, which are derived to be protective of workplace exposures.
- Outdoor workers may potentially be exposed to constituents in site soil while performing light maintenance activities such as lawn care. However, since the site is mostly paved and the

period of time that workers would be present in the unpaved area is minimal, the potential exposure to soil for an outdoor worker is considered to be low.

- Construction workers who perform excavation work on the 1224 Brunswick Avenue or adjacent to the property (along the fence line between the 1224 and 1250 Brunswick Avenue properties) may potentially be exposed to PAHs, metals, and/or VOCs in surface soil, subsurface soil, and groundwater if subsurface excavation work is needed to repair or replace underground gas lines or other utilities or equipment adjacent to the Site. Only properly trained field personnel should complete the subsurface utility work in this area using methods specified in a site-specific Health and Safety Plan (HASP) until the area has been cleared of impacted soils and groundwater.
- Residents near the Site and commercial workers located in the LIRR utility building between the Site and the railroad tracks north of the site may be exposed to MGP constituents in outdoor air originating from soil during on-site construction activities, although the potential for exposure is considered to be low. Furthermore, if these activities were performed at the site, work would be performed by trained personnel and fugitive dust and other air emissions would be controlled using appropriate engineering controls.

4.0 Remedial Goals and Remedial Action Objectives

DER-10 specifies the process to be followed to select a remedy to address environmental conditions at a contaminated site. The first step in that process is establishment of remedial action goals, objectives, and criteria to be used to evaluate the expected performance of remedial technologies to be applied at the site.

4.1 Standards, Criteria and Guidance

An evaluation of whether or not a remedy will meet applicable environmental laws, regulations, standards and guidance is required during this remedy selection process. Potentially applicable standards, criteria, and guidance (SCGs) for the site are listed below. These include chemical-specific, action-specific, and location-specific SCGs.

Chemical-specific SCGs, for soil and groundwater are as follows:

- Surficial and Subsurface Soil: Restricted Use SCOs provided in the document entitled "*NYSDEC Rules and Regulations, 6 NYCRR Subpart 375-6, Remedial Program Soil Cleanup Objectives*", dated December 14, 2006 [NYSDEC, 2006a] (included in Tables 3-1 and 3-2)
- Groundwater: SGVs provided in the NYSDEC - Division of Water – Technical Operation Guidance Series (TOGS) (1.1.1) [NYSDEC, 1998, with addendums] (included in Tables 3-4 and 3-5)

Location- or action-specific SCGs that may apply to an alternative are as follows:

- Requirements to dispose of waste material in accordance with NY solid waste management rules and guidance on management of MGP wastes – these will be addressed by sending MGP impacted waste to appropriately permitted landfills and thermal treatment facilities.
- Local ordinances concerning noise, permitting, and transportation – these will be addressed by restricting contractor's work practices in according with local requirements and obtaining required local permits.
- Occupational safety and health regulations for construction and hazardous waste site operations – these will be addressed by requiring the contractor to complete all work under the provisions of a site-specific HASP.
- Requirements for State Pollutant Discharge Elimination System (SPDES) permitted discharge of water generated by dewatering – these will be addressed by meeting the substantive requirements of an SPDES discharge permit including treating water to meet discharge limits. An operations and maintenance (O&M) Plan will be prepared to ensure compliance.
- Regulations concerning work near an active commuter rail system (LIRR). These will be addressed during design. The design will be submitted to and reviewed by LIRR to ensure adequate work procedures and shoring systems are utilized.
- Requirements for work adjacent to occupied buildings. The design will incorporate shoring and structural monitoring to ensure buildings adjacent to the remediation activities are not damaged.

- Requirements for management of air emissions under the Clean Air Act and the NYSDOH – these will be addressed by implementation of a site HASP and a Community Air Monitoring Plan (CAMP) during remedial activities.

4.2 Remedial Goals

Remedial Action Goals (RAGs) were established for the site in accordance with DER-10. They require that any selected remedy must:

- Eliminate and mitigate the potential risk posed by MGP residuals associated with the current and potential future uses of the property.
- Remove MGP source material to the extent feasible. Source material includes subsurface soils from 5-15 ft bgs and in a thin (approximately 0.1 foot thick) gravel lens between 25 – 27 feet bgs.

RAGs are presented in DER-10 as general baseline considerations that are applicable without regard to site use. More specific, media based remedial action objectives (RAOs) are presented below.

4.3 Remedial Action Objectives

RAOs were developed to address impacts to surface soil, subsurface soil, and groundwater in accordance with DER-10 requirements. These RAOs are based on the observed impacts described in Section 3. Remedial action to address potential soil vapor and indoor air impacts are not required as described in Section 3.

4.3.1 Surface and Subsurface Soil Remedial Action Objectives

The extent of impacted soils is show in Figures 3-8 and 3-9 (plan view for shallow and deep impacts, respectively) and Figures 3-10 and 3-11 (cross-sections). The approximate impacted volume is presented in Table 4-1.

Four of the five surface soil samples collected exceeded the SCOs. However, these concentrations were similar to background levels and three of the samples were in the immediate vicinity to the railroad tracks. Therefore, these constituents of concern (COC) are not considered to be associated with MGP contaminants and will not be addressed by these remedial activities. Remedial action to address surface soil impacts is not required.

Two subsurface soil samples exceeded the SCOs. They included mercury detected in SB-100 (on the LIRR property) at 4.5 to 5 feet bgs and benzo(a)pyrene in sample SB-115 (on the 1224 Brunswick Avenue property adjacent to the former gas holder at 7.5 to 8.5 feet bgs). Mercury is not considered to be a COC as it is not associated with MGP contaminants, therefore this exceedance will not be addressed with this remediation activity. The exposure pathway for the PAHs at SB-115 will be addressed by the remedial alternatives evaluated in Sections 5 - 7.

Potential MGP source material (i.e., tar and blebs) was observed from approximately 5 – 15 feet and in a thin (approximately 0.1 foot thick) gravel lens between 25 – 27 feet bgs. The potential MGP source material between 5 to 15 feet bgs encompasses the SB-115 impacts and consists of approximately 1,400 cubic yards as detailed in Table 4-1. The deeper source material consists of approximately 10 cubic yards. The potential source material will be addressed by remedial alternatives evaluated in Sections 5 through 7. Soil staining present off-site within the limits of the groundwater impacts is not considered to be MGP source materials and will be addressed as part of the groundwater remedies evaluated in Sections 5 through 7.

The RAOs in subsurface soils are as follows:

- Eliminate the potential for direct contact/ingestion with MGP source material and MGP residuals for media that exceed the Part 375 soil criteria, and
- Remove the identified MGP source material to the extent feasible.

4.3.2 Groundwater Remedial Action Objectives (on-site by former gas holder and downgradient of site)

The extent of impacted groundwater is shown in Figures 3-12 and 3-11 (shallow and deep wells, respectively).

Groundwater within the limits of and downgradient from the former MGP operations exceed the SGVs. Remedial alternatives to address these impacts are evaluated in Sections 5 through 7.

The RAOs for groundwater are as follows:

- Eliminate the potential for direct contact/ingestion for media having constituent concentrations that exceed the SGVs; and
- Control the migration of remaining groundwater impacts to the extent feasible.

The RAOs will be used in the subsequent phases of the alternative analysis to facilitate the evaluation of general response actions and associated remedial technologies.

5.0 General Response Actions

General response actions are broad classifications of remedial technologies which describe general strategies for addressing constituents and media of interest. The results from the investigation activities discussed in Section 3 of this document have identified MGP impacts in soil and groundwater at the Site. Remedial action goals and objectives to address these impacts are presented in Section 4. The following section provides an evaluation to identify a set of general response actions, that are generally appropriate for use at the Site, and achieve the RAGs and RAOs. The response actions have been grouped by the media (soil and groundwater) that they are designed to address and are evaluated using the following criteria: Site-Specific Appropriateness (implementability given the current site conditions/use) and protectiveness (ability to limit risk/reduce contamination). A summary of the evaluation results is provided in Table 5-1.

5.1 Soil

Soil impacts requiring remedial action are limited to areas containing blebs, globs, lenses, grain coating, and sheen. This is an area of approximately 8,800 square feet in the five to fifteen foot depth interval with an average thickness of 4 feet (resulting in approximately 1,400 cubic yards) and 3,600 square feet in the fifteen to 30 foot depth interval with an average thickness of 0.1 feet (resulting in approximately 10 cubic yards). These limits were developed from the Section 3 figures and are shown in the Section 7 figures. All the potential MGP source material is within Former MGP limits and does not extend to the LIRR property. Soil staining was observed off-site but samples of the stained soils did not exceed the SCOs and does not represent MGP source material. There were off-site exceedance of SCOs in surface soil but these are attributed to urban background concentrations as discussed in Section 3.

A review of the general response actions associated with the removal/treatment of contaminated soil is provided below.

5.1.1 Excavation and Disposal/Treatment

Excavation and off-site disposal is a physical process that would permanently remove the contaminated soil. Note that on-site treatment of excavated material has not been included in the evaluation due to the logistical impracticalities of permitting and siting treatment facilities given the site location and surrounding property uses.

<u>Site-Specific Appropriateness</u>

Excavation would address the on-site impacts and the source to groundwater. Excavation would be disruptive to the occupants of the property since it would limit access to parking and storage areas of the property for extended periods of time. It would require shoring to protect site buildings and protect the LIRR spur track. Disposal and treatment facilities are within reasonable proximity to the site.

Excavation of the deep coal tar lenses would require a very complex shoring system with bracing and\or tiebacks to protect the LIRR spur track and the 1224 Brunswick Avenue building.

Protectiveness

Excavation and disposal can remove most or all of the MGP source materials and remove the soil exceeding the SCOs. Removal or the source material would allow natural attenuation processes to reduce the groundwater impacts. It would eliminate the potential risk to on-site construction workers who would generally work in accessible areas of the site and at relatively shallow depths (i.e., to 15 feet bgs).

5.1.2 NAPL Extraction and Disposal

Extraction of NAPL can be achieved through the use of recovery wells or trenches, with the recovered product pumped to the surface for off-site disposal.

Site-Specific Appropriateness

While coal tar blebs, globs, lenses, grain coating, and sheen were observed on-site, free phase (flowable) NAPL was not observed. The observed coal tar impacts were generally trapped in the soil pore space and are not removable by the available extraction technologies. Since the observed coal tar source material present on the site (i.e., sheen, tar) is not amenable to the available extraction processes, this general response action is not appropriate for the site.

Protectiveness

Because the available NAPL extraction processes could not remove the coal tar impacts observed at this site, source material would remain and the response action would not be protective.

5.1.3 *In situ* Treatment

In situ treatment is designed to mitigate soil impacts by adding liquid or solid treatment reagent to reduce the impact levels or to encapsulate impacts to reduce their ability to dissolve into groundwater. *In situ* treatment technologies include in-situ solidification, chemical oxidation, bioremediation, air sparging and in-well air stripping. Disruption to the property occupants during remedy implementation would vary depending on the technology selected.

Site-Specific Appropriateness

The general application of *in situ* treatment would be used to reach depths of impacted soil observed on-site. The site does not present any features that would prohibit the use of *in situ* treatment technologies, although some in-situ technologies are very difficult to apply near buildings. *In situ* treatment can reduce or immobilize contaminants in soil to the proposed treatment depths for this project

Protectiveness

Therefore this option would eliminate on-site and off-site potential exposure risks to construction workers depending on the type of *in situ* technology chosen. Consideration must be taken regarding effects on remediation construction workers and site occupants regarding the surface effects of certain *in situ* treatment technologies.

5.1.4 Containment

Containment is designed to prevent impacted materials from migrating into less contaminated areas of the site. Containment can be achieved through the use of vertically oriented barriers, or extraction points/areas that are optimally keyed into a confining layer.

Site-Specific Appropriateness

Containment would be effective in preventing off-site migration of MGP impacts in groundwater and therefore have a reducing effect of off-site contamination over time. Installation of the containment system would be disruptive to property occupants since it would limit access to parking and storage areas of the property for extended periods of time.

Protectiveness

Containment processes will not reduce contamination or eliminate risk unless implemented in conjunction with a contaminant removal technology. Containment would only prevent migration of impacts in groundwater.

5.1.5 Institutional Controls

Institutional controls may include the following requirements: implementing soil management and health and safety plans for any subsurface excavation work, restrictions on the use of groundwater, and requirements for on-going monitoring, inspection/maintenance of engineering.

Site-Specific Appropriateness

Institutional controls would be readily implementable, but would require an agreement with on-site and off-site owners, and restrictions to the deeds that will apply to current and future owners of the site.

Protectiveness

Institutional controls will not reduce the contamination levels at the site, but would eliminate risk by controlling potential exposure pathways.

5.2 Groundwater

The results from the site investigation indicate that groundwater is impacted on the western portion of the site and then to the west/northwest downgradient of the site for approximately 160 feet (Figure 3-12). Groundwater impacts can be addressed through two means: the treatment/removal of source material, i.e., impacted soil that, through contact with groundwater or infiltrating storm water can cause increased constituent concentrations in the aquifer; or specific treatment of the dissolved phase to reduce constituent levels. Response actions for these approaches are evaluated below.

5.2.1 Source Material – *In Situ* Treatment or Excavation and Disposal with Monitored Natural Attenuation

The most significant improvement in groundwater quality is expected to come from the removal or treatment of MGP impacts in soil, as discussed previously in Section 5.1. A review of excavation and *in situ* treatment as related to groundwater impacts in the saturated zone is provided below.

Site-Specific Appropriateness

Treatment or excavation of source material could be implemented as described in Section 5.1. Removing or treating the source material will allow natural attenuation processes to treat the remaining dissolved phase impacts.

Protectiveness

By eliminating the source material groundwater concentrations will reduce with time. However this could take several years to complete and during this time dissolved phase impacts above the SVGs would remain.

5.2.2 *In situ* Treatment

In-situ treatment technologies include; solidification, chemical oxidation, bioremediation, air sparging, in-well air stripping, soil vapor extraction and in situ thermal treatment. *In situ* treatment is designed to reduce the "strength" of source material to limit the continuing contamination of groundwater flowing through the site.

Site-Specific Appropriateness

In situ treatment could reduce contaminant levels in soils therefore reducing groundwater contamination. *In situ* treatment could be used to reach all depths of the saturated zone at the site. Treatment would be limited to 15 feet due to the limited area of deep impacts and the additional resources and time required to access the deep impacts. Also, for several types of *in situ* treatment, placement of *in situ* wells and the potential need for multiple injection events may be hindered or difficult due to the on-going activities of the on- and off-site occupants.

Protectiveness

In situ treatment for groundwater provides protection to human and environmental receptors by removing MGP impacts from groundwater and soil and therefore reducing or removing potential exposure pathways.

5.2.3 Extraction and Treatment

Extraction and treatment of contaminated groundwater (pump and treat) is a source reduction process that uses well points/pumps to remove contaminated groundwater for treatment on the surface with subsequent management at a publicly owned treatment works (POTW).

Site-Specific Appropriateness

The effectiveness of groundwater extraction and treatment would be limited by the areas where the extraction wells could be placed and would be affected by the hydraulic conductivity of the soil. Permanent infrastructure would be required and limited space is available to place a groundwater treatment system. Provisions for discharge of treated groundwater would have to be made. Placement of the necessary infrastructure may be possible on-site; however this would not be a possibility for off-site due to access issues and disruption of operations.

Protectiveness

Extraction of contaminated groundwater will reduce dissolved-phase contamination at the site, but it only has the potential to eliminate risk if a source removal technology would be conducted with this option. If a quantity of contaminated groundwater could be removed and treated, it is likely that residual source material will provide a continuing source of contamination if it remained.

5.2.4 Institutional Controls

Institutional controls may include the following requirements: implementing soil management and health and safety plans for any subsurface excavation work, restrictions on the use of groundwater, and requirements for on-going monitoring, inspection/maintenance of engineering. These would be incorporated in a Site Management Plan and Groundwater Management Plan.

Site-Specific Appropriateness

Institutional controls would be readily implementable, but would require an agreement with on-site and off-site owners, and restrictions to the deeds that will apply to current and future owners of the site.

Protectiveness

Institutional controls will not reduce the contamination levels at the site, but would eliminate risk by controlling potential exposure pathways.

6.0 Identification and Screening of Technologies

The goal of this initial identification and screening of remedial technologies is development of a list of specific technologies for each general response action, as identified in Section 5.0, which show promise for addressing the particular environmental conditions at the site. The technologies identified are screened based on their technical implementability/applicability to the site and whether they alone or combined with another technology meet RAOs. The technology evaluations are grouped according to the media that they are designed to treat. Based on the results from the evaluation, preferred technologies are identified for each general response action and are further evaluated in the subsequent development of remedial alternatives in Section 7. The results from the technology evaluation are summarized in Table 4-3.

6.1 Technology Screening for Soils

The previous review of general response actions for soil in Section 5 indicates that excavation, *in situ* treatment, containment and institutional controls would be applicable at the Site to reduce MGP impacts and eliminating potential exposure pathways. Discussions of these specific technologies/approaches are provided below.

6.1.1 Excavation and Disposal/Treatment

Excavation and disposal/treatment of impacted soils is a physical process that removes the contaminated soil for ex-situ management. Site preparation activities would include erecting security fencing, relocation of utilities, installation of erosion controls, delineation of soil stockpile/loading areas, and construction of decontamination pads/facilities.

Implementation of this remedial technology would require removal and dewatering of subsurface soil, which contribute to groundwater contamination. Subsurface soils would be excavated to depths up to about 15 feet bgs and possibly up to 30 feet bgs. The groundwater table ranges from a depth of 3 to 7 feet bgs over the site. Excavation below groundwater and to these depths will require the use of standard excavation equipment and the installation of temporary sheet piling. A sealant may be applied to the sheet pile interlocks to limit groundwater infiltration. Sheeted excavations would require internal or external bracing to ensure that nearby structures are not damaged due to deflections and/or settlement.

Excavation below the water table would require dewatering. Sumps would be dug at various locations within the excavation area and submersible pumps installed. The dewatering rate is expected to be relatively low, with water pumped into an on-site treatment system. The treatment system would consist of settling tanks (typically 20,000 gallon), a filtration unit to remove silt, and a contaminant treatment unit, likely activated carbon. Treated water would be discharged to the POTW or city stormwater system under a SPDES permit.

Excavation would proceed after the groundwater is drawn down. Excavated soil would be placed in lined and covered stockpile areas on site or loaded directly into trucks (preferred approach). Excavated soil that exhibits residual free liquid would require additional treatment using drying/stabilization agents prior to shipment. Waste characterization sampling would be conducted either pre- or post- excavation for acceptance at the selected disposal facility, e.g., permitted landfill or thermal desorption facility (pre-characterization is preferred given limited space at site). Material would be shipped by truck using appropriate procedures; trucks would be inspected, decontaminated as necessary, and covered prior to leaving the site. Once the excavation depth is reached, documentation samples would be collected and the excavation would be backfilled using common borrow from a clean off-site source and graded. The site would then be restored.

Applicability

Typically, excavation is a commonly implemented option at MGP sites. In order to implement it at the Far Rockaway site, installation of shoring will be required to protect the site building and the street and achieve removal depths of 15 to 30 feet bgs. Excavation activities will provide the potential for odor, dust and noise. Measures to mitigate the potential risks from these conditions would be employed; they would likely pose an inconvenience to site occupants of the property and potentially to adjacent properties.

Ability to Meet Remedial Action Objectives

Excavation is one component of a potentially effective subsurface soil remedy that would include off-site treatment or disposal. The remedy would achieve the RAOs for eliminating the potential exposure pathways of on-site MGP impacts and would permanently reduce concentration, toxicity, mobility, and volume of impacted material. Short-term risks would result from disturbing impacted subsurface soil. Careful work practices would be required during excavation in order to mitigate exposure risks to construction workers. No long-term maintenance would be required with this technology.

Evaluation

Excavation is retained because it would provide a permanent on-site remedy when performed in conjunction with off-site treatment or disposal.

6.1.2 *In Situ* Treatment

The review of *in situ* treatment indicates that the principal benefit of the approach lies in its ability to access impacted soil to a greater depth than excavation. The following discussion provides a review of several specific technologies including chemical oxidation and solidification.

6.1.2.1 Chemical Oxidation

In situ chemical oxidation (ISCO) is a source reduction process that injects a chemical oxidant into the pore space of the contaminated soils. Typical oxidants are Fenton's reagent, sodium persulfate, and potassium permanganate; however, the actual chemical oxidant would be evaluated during a pilot and/or bench test. The chosen reagent would react with the constituents of interest and oxidize them into non-toxic reaction products. Typically, the oxidant is applied as a liquid and delivered to the subsurface through a series of injection points/wells. ISCO is not generally applicable to shallow impacts since the reaction of the oxidant with the impacted soil may generate excessive heat and steam at the ground surface, and may damage utility lines. This effect can be reduced if the reagent is added stepwise or in a slow, controlled continuous fashion. Several injection events are typically required. ISCO has limited impacts on NAPL at MGP sites. However, the addition of surfactants or multiple injections may improve the treatment of separate phase product.

Applicability

Implementation of this remedy is feasible for this site but the heat generated by the oxidation reduction reaction with coal tar material may generate excessive steam. This could be expressed at the ground surface causing uncontrolled odors and vapors.

Ability to Meet Remedial Action Objectives

The separate phase product present on-site (i.e., blebs, globs, lenses, grain coating and sheen) is not amenable to ISCO based on the published literature and experience, and increased treatment efforts and resources would be required. ISCO would not significantly reduce the amount of MGP source material present on-site because the oxidant demand of the organic compounds contained in the coal tar material will greatly exceed the amount of oxidant that can reasonable be delivered to the subsurface.

Evaluation

ISCO is not retained as a treatment technology for subsurface soils but it is further evaluated as a remedy for offsite groundwater below.

6.1.2.2 *In Situ* Solidification (treatment from 0 – 30 feet bgs)

In situ solidification (ISS) is a source containment process that uses cement slurry to immobilize contaminants in soil by decreasing the relative permeability of the impacted media. Augers or jet grout rigs are typically used to introduce cement slurry in overlapping columns producing a monolithic solidified mass to “isolate” the areas of contamination from groundwater flow.

ISS would occur in three phases. In the preparation phase, utilities would be relocated and major subsurface obstructions such as concrete debris and foundations would be removed by conventional excavation. In the second phase, impacted soils in the accessible areas would be mixed with the cement slurry and allowed to cure to a solidified mass. The solidification process results in an increase in soil volume, typically ranging from 10 to 30%, with the excess material, or “spoils’, typically transported off-site for disposal at a permitted landfill. The third phase would be site restoration including final grading, addition of 2 ft. of clean soil, and seeding or other appropriate surfacing. A notice would be placed in the property deed describing the location and characteristics of the solidified material. Implementation of ISS can be a good choice to address the source of COCs to groundwater in situations where there are large quantities of highly impacted materials located at significant depths or in the locations where access is difficult.

Site Applicability

Solidification has the ability to reach the entire depth of impacts (30 feet bgs) at the site and provide uniform coverage of treatment areas. ISS activities will provide the potential for odor, dust and noise. Measures to mitigate the potential risks from these conditions would be employed; they would likely pose an inconvenience to site occupants of the property and potentially to adjacent properties.

Ability to Meet Remedial Action Objectives

ISS would not reduce the total concentration of constituents in soil and would not eliminate direct contact risk to on-site potential receptors (i.e., construction workers). However institutional controls (Site Management Plan) would be required to control any direct contact with solidified materials by construction workers or others. The technology would eliminate MGP source material as source of dissolved phase impacts to groundwater.

Evaluation

ISS is retained for on-site because it may provide a permanent on-site remedy for soils, which would also result in the reduction of groundwater impacts due to prevention of contaminant leaching into groundwater.

6.1.2.3 Bio-Remediation

In situ bioremediation provides treatment for COC by optimizing subsurface conditions to support the growth of microorganisms which are capable of metabolizing organic compounds, including VOCs and PAHs. For non-chlorinated compounds such as those at the site, this is typically accomplished by adding oxygen and nutrients, which the microorganisms require to live and reproduce. Sometimes specially produced microorganisms are injected to further enhance biodegradation, although generally naturally occurring organisms are used. Oxygen, nutrients, and microorganisms can be added by injecting them using permanently installed wells or temporary wellpoints. Oxygen can also be provided by installing oxygen diffusers in permanent wells (in situ submerged oxygen curtain® [iSOC®]). A network of wells or wellpoints are installed in a spacing determined based on the characteristics of the subsurface soil and the materials and equipment being used. It is not unusual for injection points to be installed at a spacing of 10 to 15 feet. *In situ* bioremediation may be effective in treating organic constituents, including PAHs, when concentrations of COC are low or moderate.

Site Applicability

Bioremediation could be applied fairly broadly on- and off-site with minimal disturbance to site occupants or operations. However, reductions in constituent concentrations would only occur over an extended period of time and are not likely to be dramatic due to the nature of the impacts (i.e., separate phase material within former MGP site boundary). Bioremediation does not have a measurable effect in areas with heavy staining, sheens or NAPL. Also, the effectiveness of treatment is uncertain due to the potential for non-uniform distribution of injected material (i.e., nutrients, oxygen, microorganisms) due to potential variations in the permeability of subsurface media.

Ability to Meet Remedial Action Objectives

Bio-remediation has the potential to provide some reduction in constituent concentrations, however it is unlikely that treatment rate or endpoint would be appropriate to address the risk to construction workers or provide a significant reduction in site-wide levels of contamination.

Evaluation

Bio-Remediation is not retained for soils because it will most likely not provide a permanent on- or off-site remedy due to the presence of staining, tar and blebs.

6.1.2.4 Soil Vapor Extraction

Soil vapor extraction is a technology process that uses vacuum pumps connected to extraction wells screened in the vadose zone to remove contaminated soil vapor for on-site *ex situ* treatment. The flowing air also draws un-contaminated air past the contaminated soil driving the preferential partitioning of VOCs into the vapor phase. The wells are generally spaced relatively closely together, and are connected through piping to a central vacuum and treatment system.

Site Applicability

Soil vapor extraction provides the potential for reducing concentrations of low molecular weight constituents in the vadose zone. However, the significant surface infrastructure (wells, power/steam supply, vapor extraction/treatment system) and long-term nature of treatment make its use impractical since it would disrupt site operations for extended periods of time.

Ability to Meet Remedial Action Objectives

Vapor extraction is not practical for use at the site because it is effective in the vadose zone and the bulk of contamination is in the saturated zone both on and off-site. The contaminants present on site in vadose zone soils include NAPL, PAHs, and metals, which are not amenable to this technology.

Evaluation

Soil vapor extraction is not retained for soils and since over 95% of the soil impacts are in the saturated zone.

6.1.2.5 *In situ* Thermal Treatment

In situ thermal treatment is a process where subsurface media are heated in-place to reduce levels of contamination. Typically, heat is applied through a series of tightly-spaced wells (15 foot spacing or less). There are three basic means of heating: steam injection, electrical resistance, and thermal conductance. With steam injection, steam is generated above ground and injected into the subsurface. Electrical resistance heating involves installation of electrodes and creating an electrical current between the electrodes, with the resulting increase in the temperature of the impacted media. Typically, the maximum temperature achieved with steam injection and electrical inductance heating is 212 degrees Fahrenheit (°F). Treatment is often used in conjunction with NAPL recovery wells to improve product recovery, and a vapor extraction system is generally used to control vapors and excess steam. Thermal conductance heating provides a means to achieve more elevated media temperatures (up to 600 °F) utilizing heater elements in wells to directly heat subsurface soils. Buffer zones are required around buildings to prevent migration of contaminated vapors into the structures, and around utilities to prevent damage to sub-surface utilities.

Site Applicability

In situ thermal treatment is generally not applicable to medium grained saturated soils and would only be considered for use in the vadose zone of the site since the energy requirements to heat saturated media would be prohibitive. Additionally, the significant surface infrastructure (wells, power/steam supply, vapor extractions system) and long-term nature of treatment make the use of thermal treatment impractical since it would preclude the use of areas of the property for extended periods of time.

Ability to Meet Remedial Action Objectives

Since *in situ* thermal treatment is not practical for use at the site, it cannot meet the site-specific RAOs for soils. The technology would be capable of treating the MGP source material found on-site.

Evaluation

In situ thermal treatment is not retained for soils because it would not address the impacts on the site. The technology would be capable of treating the MGP source material found on-site.

6.1.3 Containment

Several technologies are available to contain impacted soils to prevent contact with groundwater. These processes include barrier walls and/or recovery areas. Common types of barrier walls include sheet pile walls, soil mix walls, or jet grout barriers. These technologies can be placed to 30 feet below ground surface. Sheet pile walls involve driving sheet pile into a confining layer around the impacted soil. The sheet pile is interlocked and grouted between the interlocks to form a barrier that is largely impenetrable to the flow of water. Underground utilities must be disconnected where they would cross the barrier wall, and re-routed. Soil mixing creates a barrier using overlapping vertical columns of soil and grout. The columns are installed using an auger (typically 8 -12 feet. in diameter) and keyed into the confining layer. Sheet pile and soil mix walls can be placed to the proposed remediation limits for this project. Jet grouting is a process where grout is injected into the subsurface at high pressures to create overlapping grout columns (typically 3 - 6 feet. in diameter) to create the barrier wall. Jet grout can reach greater depths than sheet piling or soil mix walls. Jet grout barriers may have unknown weaknesses where preferential pathways in the subsurface result in uneven mixing of grout.

Site Applicability

The optimum placement of continuous barrier walls at the site would be precluded by the physical limitations posed by existing buildings and utilities. Containment would not be applicable for off-site use due to the major disruption to off-site operations.

Ability to Meet Remedial Action Objectives

Containment would prevent soil impacts from leaching into groundwater and migrating off-site. This technology would not reduce soil impacts. It would require a hydraulic control system (pumping wells or trenches) to reduce downgradient groundwater impacts. Potential exposure pathways would remain on the site.

Evaluation

Containment is not retained as a potential remedy for soils because it would not reduce contamination or remove direct contact risks.

6.1.4 Institutional Controls

Institutional controls could be used to place restrictions on activities where there was a reasonable potential for direct contact with impacted media, e.g., the repair of subsurface utility lines. The controls would require the use of established practices to ensure the safe handling and proper on-site management/off-site disposal of impacted soil. The implementation of the controls would be ensured through the use of deed restrictions for current and future owners of the property. Institutional controls may include the following requirements: implementing soil management and health and safety plans for any subsurface excavation work, restrictions on the use of groundwater, requirements for on-going monitoring, and/or inspection/maintenance of engineering.

Site Applicability

Institutional controls could be implemented on- and off-site. Institutional controls would be readily implementable, but would require an agreement with on-site and off-site owners, and restrictions to the deeds that will apply to current and future owners of the site.

Ability to Meet Remedial Action Objectives

Institutional controls provide the ability to effectively limit the direct exposure pathway for impacted soil and groundwater encountered in an excavation or brought to the ground surface as part of routine maintenance activities at the site. Institutional controls will not reduce the contamination levels at the site, but would eliminate risk by controlling potential exposure pathways.

Evaluation

Institutional controls are retained as a potential remedy because it would remove potential exposure pathways where it is not technically feasible or practical to remove impacts by other physical/chemical means.

6.1.5 Preferred Approaches for Soil

The review of options for managing impacted soil indicates that the following approaches provide the best opportunity for achieving the RAOs given the restrictions and physical limitations of the site.

- Excavation and Disposal: can permanently mitigate the ingestion/dermal contact risks for the primary risk receptors (construction workers) by removing impacted soil. It can also remove MGP source material. It is not applicable off-site due to access issues.
- *In situ* Solidification on-site: can permanently mitigate ingestion/dermal contact risks for the primary risk receptors (construction workers) by immobilizing all soil impacts to depths of 30 feet and would reduce contamination by removing the source and thus reducing groundwater impacts. It provides the ability to reach the greatest quantity of impacted media below the practical depth of excavation. It will require institutional controls to manage exposure to construction workers. It is not applicable off-site due to access issues.
- Institutional Controls on- and off-site: provide the means for eliminating the ingestion/dermal contact pathways for impacted material in areas of the site that are difficult to gain access by controlling on-site and off-site activities. The areas with access issues (i.e., proximity to buildings, major disruption of site activities) include the deep soil impacts (25 – 27 feet bgs) on the site.

6.2 Technology Screening for Groundwater

The evaluation of general response actions for groundwater demonstrated that a significant benefit for treating groundwater impacts would come from treatment or removal of source material. Evaluation of approaches for removal or treatment of source material are included in Section 5.2 and include excavation and disposal and *in situ* treatment. Remediation of dissolved impacts in groundwater in combination with source removal is an effective remediation strategy. Based on evaluation of the general response actions, approaches for groundwater treatment include *in situ* treatment, extraction and treatment, and institutional controls. Discussions of these specific technologies/approaches are provided below.

6.2.1 *In situ* Treatment

The following discussion provides a review of several specific *in situ* technologies including chemical oxidation, air sparging, in well air stripping, bioremediation, and monitored natural attenuation.

6.2.1.1 Chemical Oxidation

Refer to Section 6.1.2.1 for a description of this process.

Site Applicability

ISCO may be appropriate to treat site impacts in the saturated zone for groundwater and soil and has the potential to reach impacts located below the practical depth of excavation (20 feet bgs). The vapors produced by the typically exothermic reactions may cause effects that require installation of a vapor extraction system (additional infrastructure) to ensure vapors are not released into occupied buildings on- and off-site. Installation of permanent infrastructure may result in disruption to on-site operations. ISCO would be effective in treating dissolved impacts, but it is not always effective and timely in treatment of separate phase product. This option may be applicable off-site due to the potential limited infrastructure required to reach subsurface impacts and the presence of only staining in soils.

Ability to Meet Remedial Action Objectives

ISCO would reduce groundwater and potentially off-site soil impacts; however on-site soils would be a continued source of contamination to groundwater. The separate phase product present on-site (i.e., blebs, globs, lenses, grain coating and sheen) is not amenable to ISCO based on the published literature and experience, and potential exposure pathways may not be eliminated. The off-site impacts are limited to staining and therefore more amenable to ISCO, reduction of impacts and elimination of risks.

Evaluation

ISCO is retained for off-site treatment because it may provide a permanent off-site remedy for soil and groundwater. The options for off-site treatment are limited due to access issues, and ISCO provides a potential option with limited infrastructure for treatment of impacts.

6.2.1.2 Air Sparging

Air sparging is an in situ process for remediation of groundwater generally impacted by VOCs and low molecular weight SVOCs. The process involves the injection of air into a saturated formation (soils) below the groundwater table via vertical or angled air sparge wells. The injected air moves through the saturated soil, and promotes the volatilization of dissolved contaminants out of the groundwater into the injected air. The injected air flows through discrete air channels within the saturated soil, eventually flowing into the overlying unsaturated soil. Dissolved contaminants that volatilize into the air enter the vadose zone and move upward to the surface. If concentrations are significant or receptors are nearby, this method can be paired with soil vapor extraction (SVE) for collection and removal. The number of wells installed depends on the radius of influence of the air sparging system. Operation and maintenance including groundwater and air monitoring and system checks will be required. A typical treatment timeframe this type of site is approximately 2 years.

Site Applicability

All depths of contaminated groundwater can be reached. Requires permanent infrastructure (multiple wells, piping, treatment system shed), which would disrupt on-site operations and be difficult to implement due to access issues off-site. The timeframe for this to remain on the site would be based on a pilot study and source removal. Regular operation and maintenance of the system would be required. This method is unlikely to affect a significant change in groundwater quality if residual soil impacts remain in place. Therefore, it would need to be conducted with a source removal technology other than air sparging due to the presence of separate phase product.

Ability to Meet Remedial Action Objectives

Air sparging treatment in conjunction with source removal/treatment would result in removal of the exposure pathways and meet the RAOs.

Evaluation

Air sparging is not retained as an appropriate technology due to extensive infrastructure required, disruption to site operations and difficult off-site access, treatment timeframe and required system O&M.

6.2.1.3 In-Well Air Stripping

This technology remediates VOCs, some of the lighter SVOCs, and fuels in groundwater. In-well air stripping injects air into a vertical well that has been screened at two depths. The lower screen is set in the saturated zone (i.e., groundwater), and the upper screen is in the unsaturated zone. Pressurized air is injected into the well below the water table, aerating the water. The aerated water rises in the well and flows out of the system at the upper screen. Contaminated water is drawn into the system at the lower screen. The contaminants vaporize within the well at the top of the water table, as the air bubbles out of the water, very similar to an above-ground air stripper. The vapors are drawn off by a SVE system and treated.

The partially treated groundwater is never brought to the surface. After it is released to the unsaturated zone, the water percolates back down to the groundwater. Contaminant concentrations are gradually reduced as the process is repeated. These systems only treat the water that pass through the stripping well. Thus the radius of influence is limited by the pumping capacity of each well and the hydrogeologic characteristics of the site. In general, in-well air strippers are most effective at sites containing high concentrations of dissolved contaminants.

Effectiveness may be limited in shallow aquifers. To prevent smearing the contaminants in the area immediately above the groundwater level, the process should not be used at sites containing NAPLs. In-well stripping generally takes a very long time.

Site Applicability

In well air stripping could reach all depths of contaminated groundwater It is limited to treatment of VOCs and requires permanent infrastructure (multiple wells, piping, treatment system shed), which would disrupt on-site operations and be difficult to implement due to site access issues off-site. The treatment timeframe is generally long for this technology and would also require source removal. Regular operation and maintenance of the system would be required. Air stripping is not amenable to treating the separate phase product present in soils and site conditions, in general.

Ability to Meet Remedial Action Objectives

In well air stripping in conjunction with source removal/treatment would result in removal of the exposure pathways and meet the RAOs after an extended period of time.

Evaluation

This option is not retained as an appropriate technology due to extensive infrastructure required, disruption to site operations and difficult off-site access, extended time for treatment and regular system O&M.

6.2.1.4 Bioremediation

Refer to Section 5.1.2.3 for a general description of bioremediation. Bioremediation is most effective treating low molecular weight compounds such as VOCs and naphthalene. A non-intrusive and low cost bioremediation technology mentioned in the description in Section 5.1.2.3 includes iSOC®. iSOC® is a gas delivery system that will infuse gas into a liquid. It's a low cost technology for enhancing natural attenuation. The iSOC® stainless steel device is a successful passive gas mass-transfer device, which provides up to 1.5 cubic feet of oxygen per day per well on a continuous basis. The pressure in the oxygen tank delivers the oxygen into the aquifer. The device is installed in 2-inch or larger monitoring wells and easily moved from well to well. The radius of influence is typically 10 – 15 feet, but this is ultimately dependent on site soil and groundwater characteristics.

<u>Site Applicability</u>

Bioremediation could be applied fairly broadly on- and off-site with minimal disturbance to site occupants or operations. This treatment method applies to the groundwater contaminants and conditions at the site. Bioremediation generally does not have a measurable effect in areas with heavy staining, sheens or NAPL and therefore a different technology would be required for source removal/treatment. The effectiveness of treatment is uncertain due to the potential for non-uniform distribution of injected materials due to potential variations in the permeability of subsurface media. The use of iSOC® is an inexpensive bioremediation method to promote the degradation of VOCs originating from petroleum sources.

<u>Ability to Meet Remedial Action Objectives</u>

Bioremediation has the potential to reduce constituent concentrations in groundwater in conjunction with source removal/treatment. The treatment timeframe or effectiveness is uncertain to address the risks to construction workers.

<u>Evaluation</u>

Bioremediation via iSOC® is retained for off-site groundwater (in combination with source removal/treatment) because it will provide a low cost treatment option with minimal disruption to site operations.

6.2.1.5 Monitored Natural Attenuation

MNA of groundwater refers to the monitoring of natural processes that act to reduce concentration, toxicity, mobility, and volume of COC as the groundwater flows through a porous media. At this site, the constituents found above remedial criteria in groundwater are BTEX compounds and PAHs. The amount of benzene and PAHs that can dissolve in the groundwater is a function of their solubility. Typically, lower molecular weight and polar compounds have higher solubility. In general, BTEX compounds are much more soluble than most of the PAHs.

Once in solution, the ability of these constituents to be transported within groundwater is a function of the compound's characteristics and the properties of the surrounding soil. In advective transport, the constituents migrate in the direction of groundwater flow. Advective transport is a function of the direction and magnitude of groundwater seepage velocity. If the source of the contaminant is continuous and advection is the only solute transport mechanism, the distribution of contaminants in the groundwater will expand indefinitely. Dispersion, retardation, and degradation can each influence a constituent's fate and transport. These three natural mechanisms can reduce the concentration, rate of transport and total mass of these constituents.

Natural attenuation monitoring would involve the sampling of onsite wells at regular intervals. Samples would be analyzed for BTEX, PAHs, and MNA parameters. The results of the sampling events would be used to document any changes in site conditions.

Site Applicability

A limited MNA evaluation conducted for the remedial investigation collected geochemical data which provides evidence that intrinsic biodegradation of dissolved organics is occurring naturally at the site. Additional monitoring at a larger subset of wells would be required to more fully develop this evaluation. This option would have minimal disturbance to site occupants and operations. There is minimal required infrastructure and risks. This treatment method is applicable to the groundwater contaminants and conditions at the site. Enhanced MNA with oxygen injection (iSOC®) may accelerate treatment timeframes as discussed in Section 5.2.1.4.

Ability to Meet Remedial Action Objectives

MNA has a high potential to eliminate the groundwater potential exposure pathway if combined with source removal or other source treatments. Institutional controls may be required prior to reaching the treatment goals. iSOC®may be implemented to enhance MNA process.

Evaluation

The MNA option retained because of minimal disruption and high potential for meeting groundwater RAOs.

6.2.2 Extraction and Treatment

Groundwater extraction and treatment involves extracting the water from the subsurface and treating it at the surface. After treatment, the water is pumped back into the aquifer through a series of reinjection wells or disposed of via POTW discharge location or shipped off-site. This process also is known as "pump and treat" technology. Groundwater extraction is generally more effective as a containment technology than for reducing groundwater concentrations to below criteria throughout a large area due the generally extensive treatment timeframes.

Any remedial alternative which includes excavation dewatering will also require treatment and discharge of the extracted groundwater. Once water is extracted, a number of treatment technologies are available for the treatment of VOCs and SVOCs in groundwater including air stripping (VOCs only) and granular activated carbon (GAC) as described below. Depending on site conditions oil-water separation and filtration may be needed in the treatment process.

6.2.2.1 Air Stripping

Air stripping remediates VOCs and lighter SVOCs in groundwater. High temperature improves the removal of SVOCs. Air stripping is the process of forcing air bubbles through contaminated water to remove harmful or unwanted chemicals. The air moving through the water causes the chemicals to change to a gaseous state. This gas is then bubbled out of the water with the air. This air and other gas mixture is then collected and treated. Air stripping is commonly used to treat groundwater.

6.2.2.2 Liquid Phase Adsorption

Liquid-phase GAC adsorption is a treatment technology to remove contaminants from groundwater. Groundwater is pumped through one or more vessels containing GAC. The thermal processing of carbon, often derived from ground coconut shells, creates small porous particles with a large internal surface area. The activated carbon attracts and adsorbs dissolved organic molecules and certain inorganic molecules. Water is passed through the vessels relatively quickly. When the concentration of contaminants in the water exiting the vessels exceeds a certain level, the carbon must be replaced. Spent carbon can be regenerated in place, removed and regenerated at an off-site facility, or most commonly, removed and disposed.

Groundwater with suspended solids, oil and grease or iron may cause fouling of the carbon. In many cases pretreatment may be required to ensure the treatment's effectiveness. The technology is well proven for groundwater contaminated with VOCs, metals, and explosives.

<u>Site Applicability</u>

All depths of contaminated groundwater can be reached. Requires extensive permanent infrastructure (i.e., piping, trenching, extraction wells and possibly reinjection wells) that would require strategic placement on the site so operations could continue. Regular O&M would be required over an extended period of time.

<u>Ability to Meet Remedial Action Objectives</u>

Low potential to eliminate groundwater potential exposure pathways within a reasonable timeframe. Institutional controls may be required prior to reaching the treatment goals. Pump and treat would remove some contamination from the site, but would be of questionable effectiveness if significant quantities of residual source material remained.

<u>Evaluation</u>

The extraction and treatment option is not retained due to the extensive infrastructure required, the long timeframe before RAOs could be met and resulting high costs. The post-extraction treatment methods (air stripping/GAC) will be evaluated for treatment for dewatering during the remediation design phase.

6.2.3 Institutional Controls

Refer to Section 5.1.4 for a description of this process. Institutional controls for groundwater provide administrative restrictions on groundwater use. Environmental easements, local ordinances, and a site management plan are potential options. This would be necessary to protect human exposure to groundwater during remediation.

<u>Site Applicability</u>

Institutional controls could be implemented on- and off-site. Institutional controls would be readily implementable, but would require an agreement with on-site and off-site owners, and restrictions to the deeds that will apply to current and future owners of the site.

<u>Ability to Meet Remedial Action Objectives</u>

Institutional controls provide the ability to effectively limit the direct exposure pathway for groundwater (and impacted soil) encountered in an excavation or brought to the ground surface as part of routine maintenance activities at the site. Institutional controls will not reduce the contamination levels at the site, but would eliminate risk by controlling potential exposure pathways.

<u>Evaluation</u>

Institutional controls is retained as a potential technology because it would remove potential exposure pathways where it is not technically feasible or practical to remove impacts by other physical/chemical means.

6.2.4 Preferred Approaches for Groundwater

The review of options for managing impacted groundwater indicates that the following approaches provide the best opportunity for achieving the RAOs given the restrictions and physical limitations of the site.

- Monitored natural attenuation - This option is retained because of minimal disruption and high potential for meeting groundwater RAOs. The iSOC® bioremediation technology is retained as well to act as a potential enhancement to the MNA process.
- *In situ* Chemical Oxidation for off-site – ISCO is retained for off-site treatment because it may provide a permanent off-site remedy for soil and groundwater. The options for off-site treatment are limited due to access issues, and ISCO provides a potential option to reduce the remaining COIs in off-site groundwater but require installation of wells and piping on the LIRR property. Treatment or removal of the MGP source material would be required for this remedy to be effective for off-site groundwater.
- Institutional Controls: provides a comprehensive means for eliminating the potential exposure pathways in groundwater on- and off-site in areas that are difficult to gain access by controlling site activities. The difficult access areas include on-site saturated depths from 15 – 30 feet bgs and off-site impacted areas in general.

7.0 Development and Analysis of Alternatives

The preferred technologies/approaches from the previous section have been assembled into a set of four remedial alternatives potentially capable of achieving remedial goals and objectives. These alternatives will be evaluated to provide a basis for the selection of a remedial action for the site. The alternatives include the following:

- Alternative 1 – No Action
- Alternative 2 – Restore Site to Pre-Release Conditions
- Alternative 3 – Excavate On-Site Visual Impacts with Enhanced Monitored Natural Attenuation
- Alternative 4 – Solidification with Enhanced Monitored Natural Attenuation

This section reviews these alternatives on their ability to meet the nine evaluation criteria set forth in 6 NYCRR 375-1.8(f) and detailed in Section 4.2 of DER-10. The first two criteria must be satisfied in order for an alternative to be considered for selection, the remaining criteria are primary balancing criteria which are used to compare the positive and negative aspects of each of the remedial alternatives. As required in DER-10, the description of each alternative includes a discussion of its size/configuration, time for remediation, special requirements, disposal options, permit requirements and limitation or other factors required for evaluation. A summary of the findings from the evaluation is presented in Table 7-1. A summary of the criteria are as follows:

- Overall protection of human health and the environment - An evaluation of the remedy's ability to protect human health and the environment by assessing how risks posed through the potential exposure pathways are eliminated, reduced, or controlled through removal, treatment, engineering controls, and/or institutional controls. <u>The remedy's ability to achieve each of the RAOs will be evaluated (i.e., elimination of potential exposure pathways and reduction/mitigation of contamination).</u> Alternatives that permanently reduce or eliminate exposure pathways under any reasonable future site use without causing significant risks during implementation are rated as "Good." A "Fair" rating is applied to alternatives that provide adequate protection of human health and the environment but have one or more potential drawbacks (i.e., reliance on long-term maintenance or institutional controls or uncertainty regarding final levels of contamination). A "Poor" rating applies to alternatives that do not protect against reasonably foreseeable future exposures to site contaminants or may increase the likelihood of certain exposure scenarios (e.g., increased contaminant mobility or toxicity). A rating of "Unacceptable" is given to alternatives that, on balance, pose more risks to human health and the environment than no action.
- Compliance with SCGs values – An evaluation of whether the remedy will meet the SCGs presented in Section 3. A rating of "Good" is given to alternatives that are expected to achieve the SCGs or is expected to result in significant reductions in current concentrations. A rating of "Fair" is given if an alternative will achieve the remedial goals but is not expected to achieve the SCGs. A rating of "Poor" is given if an alternative is not expected to achieve most of the remedial goals and SCGs. Conformance with the standards and criteria is required, unless good cause exists for this not to occur.

- Long-term effectiveness and permanence – An evaluation of the long-term effectiveness of the remedy after implementation. The magnitude of remaining risks to human health and the environment and the adequacy and reliability of institutional/engineering controls will be evaluated. Alternatives received a rating of “Good” if there is a reasonable expectation that the primary objectives can be met and maintained. Alternatives that do not require maintenance of any on-going site controls generally were rated higher than alternatives that required on-going maintenance activities. Alternatives that completely remove or completely destroy contaminants received a better rating than alternatives that change the chemical composition or rely on containment. If an alternative has been successfully implemented at another MGP site under similar conditions and demonstrated long-term effectiveness, the remedial action generally receives a rating of “Good”. A rating of “Fair” was given to alternatives that had a reasonable expectation of providing a permanent remedy. Alternatives with a “Fair” rating may result in contaminants remaining in place and may require long-term maintenance of controls. A “Poor” rating was given to alternatives that do not remove or treat contaminants, do not provide adequate controls to prevent future exposure scenarios, or rely on on-going maintenance of controls that will be difficult to assure. A rating of “Unacceptable” is given to technologies that have been tested under similar conditions and were found to be ineffective.
- Reduction in toxicity, mobility, and volume (TMV) - An evaluation of the remedy’s ability to reduce the toxicity, mobility and/or volume of site contamination through treatment. Considers the quantity of contaminants that are permanently destroyed, immobilized, or otherwise treated; the degree to which the treatment may be irreversible; and the nature and amount of treatment residuals. Alternatives that remove or fully treat (i.e. mineralize) contaminants received a rating of “Good.” A rating of “Fair” is for alternatives that immobilize or reduce contaminants to less toxic forms, or provide only partial treatment. Treatment alternatives that are reversible or provide no significant reduction in toxicity, mobility, or volume received a rating of “Poor.” A rating of “Unacceptable” was given to technologies which under similar circumstances increased the toxicity, mobility, or volume of contaminants.
- Short-term effectiveness – An evaluation of potential risks to the public, remediation workers, and the environment during remedy implementation. The duration of remedial activities is also considered. Alternatives with minimal intrusive site work received a rating of “Good” for short-term effectiveness. Alternatives that pose short-term risks that can be effectively managed received a rating of “Fair.” Also, alternatives that include bringing partially treated or untreated contaminants to the surface received a rating of “Fair” if potential exposures are short and easily controlled. Alternatives received a rating of “Poor” if they present significant short-term risks and the ability to fully control these risks is uncertain. Also, if contaminants are brought to the surface over a long period of time and exposures are difficult to control, a rating of “Poor” was given to the alternative. A rating of “Unacceptable” is given to technologies that, despite implementation of control technologies, would still present unacceptable risks to receptors.
- Implementability – Consideration of potential obstacles to construction of the remedy at the site. The availability of personnel and equipment to implement the remedy is considered as is the need for permits and the likelihood of obtaining regulatory approvals. Site owner acceptance of the alternative is also a key issue. The expected effectiveness and ability to monitor the effectiveness of the alternative are also considered. Alternatives that are known to have been successfully implemented at similar sites and/or with minimal obstacles or difficulties to implement the alternative on the site receive a rating of “Good.” Alternatives that are likely to be implemented successfully but where uncertainty exists in terms of effectiveness, ability to confirm treatment, or require extensive permitting received a rating of

“Fair.” A “Poor” rating was given to alternatives that are expected to be difficult to implement. A rating of “Unacceptable” is given to alternatives that are not possible to implement.

- Cost Effectiveness – Provides an estimate of the capital and operational costs for each alternative for reference and comparison. A remedy is cost effective if its costs are proportional to its overall effectiveness. Summary sheets providing the basis for the cost estimates are included in Appendix B of this document. Costs estimates are FS level and have been prepared to present a range of costs which may vary between -30 % and +50 % from actual costs.
- Land Use – An evaluation of the proposed alternatives with regards to the current, intended, and reasonable anticipated future use of the site and its surroundings. Historical and current use of the property will be used as the best guide to future use, with planning and zoning, proximity of the site to natural resources, and all other applicable land-use criterion used to evaluate the proposed alternatives. Alternatives that are not disruptive to current and potential future site and that maintain no risk for current/future site use receive a rating of “Good.” Alternatives that will be disruptive to current and potential future site use, but maintain no risks for current/future site use received a rating of “Fair.” A “Poor” rating was given to alternatives that will be majorly disruptive to current/future site uses and/or result in risks to human health and the environment for current or potentially future uses of the site.

The ninth criterion, community acceptance, will be evaluated after the public comment period for this FS.

7.1 Alternative 1 – No Action

The evaluation of No Action is a requirement of DER-10 to provide a baseline for the comparison of the other alternatives. This option is a true no action alternative. The site would continue in its current state and no efforts would be made to address the soil and groundwater impacts

7.1.1 Description of Activities

The No Action alternative is retained as a baseline to compare subsequent alternatives. No action would be taken to address impacted surface soil, subsurface soil, and groundwater.

7.1.2 Summary of Remedial Processes

There are no remedial processes for this alternative.

7.1.3 Criteria Evaluation

7.1.3.1 Overall Protection Of Public Health And The Environment

Alternative 1 rated as “Poor” for overall protection of public health and the environment and meeting RAOs. This alternative would not achieve the RAGs or RAOs. MGP source material and dissolved phase groundwater impacts would continue indefinitely.

7.1.3.2 Compliance with Standards, Criteria And Guidance

Alternative 1 is rated as “Poor” for this criterion. No applicable location- or action-specific SCGs exist for this alternative. This alternative will not meet chemical-specific SCGs for groundwater or soil.

7.1.3.3 Long-Term Effectiveness And Permanence

Alternative 1 is rated “Poor” for this criterion. Since no activity would be conducted to remediate site impacts, contaminants will remain in place.

7.1.3.4 Reduction In Toxicity, Mobility, And Volume

Alternative 1 is rated “Poor” for this criterion. No Action would not result in the reduction of contaminant concentrations or volumes in soil or groundwater other than from the potential effect of natural processes. Also, contaminants would remain in place with no means to control off-site migration.

7.1.3.5 Short-Term Effectiveness

Alternative 1 is rated “Good” for this criterion. This alternative poses no significant potential implementation risks to the public, remediation workers, or the environment as no intrusive site work is proposed.

7.1.3.6 Implementability

Alternative 1 is rated “Good” for this criterion since implementation provide no disruption to current on- and off-site activities.

7.1.3.7 Cost

There are no costs associated with the No Action Alternative.

7.1.3.8 Land Use

The Site is comprised of the property at 1200-1224 Brunswick Avenue occupying Section 59/Block 15529/Lots 102, 105, 110, and 115 according to the Queens County Land Records and adjacent properties to the northwest zoned as M1-Light Manufacturing and occupied by the LIRR. The site is located in an urban setting where the surrounding land is used for mixed commercial/industrial and residential purposes.

Alternative 1 is rated “Poor” as potential exposure pathways will remain.

7.2 Alternative 2 – Restore Site to Pre-Release Conditions

In accordance with DER-10 Alternative 2, depicted in Figure 7-1, was developed provide a remedial action to restore the site to pre-release conditions. It would include the following:

- Excavate all MGP source material and stained soil on the 1224 and 1250 Brunswick Avenue property.
- Dispose of soil at an off-site thermal desorption facility.
- Excavation shoring to protect rail and adjacent structures.
- Excavation dewatering.
- Clean backfill and restore asphalt.
- Inject a chemical oxidant to treat off-site dissolved phase impacts.

- Install oxidant injection wells approximately 20 feet on center across extent of off-site visual impacts.
- Continue to monitor groundwater to determine the effectiveness of chemical oxidation and re-inject as necessary treat dissolved phase impacts.

7.2.1 Description of Activities

Restoring the Site to pre-release conditions involves complete source removal of MGP impacts, through on-site excavation and off-site *in situ* chemical oxidation.

7.2.1.1 Excavation

Excavation and off-site disposal would consist of the following elements: site preparation, excavation shoring, dewatering, excavation, loading, transport and disposal of impacted soil, backfilling, and site restoration.

Site preparation activities would include setting up construction fencing, Site trailers, erosion controls, soil stockpile areas, soil loading areas, decontamination stations, and baseline air monitoring. Sheet pile shoring would be utilized to brace the excavation, and to protect adjacent buildings and railroad structures. Excavation would proceed as the groundwater was being drawn down. Dewatering sump wells would be installed at various locations within the excavation area and submersible pumps installed. Water would be pumped into an on-site treatment system. The treatment system would consist of settling tanks, filtration unit to remove silt, and treatment system to remove contaminants. Treated water would be discharged to the POTW.

A fence-line monitoring program would be used to identify any potential vapor, dust, and noise impacts to the public so that appropriate measures to mitigate odor, noise, and dust during excavation would be employed. Contaminated soil would be segregated and placed in lined and covered stockpile areas on site or directly loaded into trucks. Excavated soil that contains free liquid would require the addition of drying/stabilization agents prior to shipment to an off-site facility.

Excavated soils would be sent to a permitted off-site landfill or thermal desorption facility. Waste characterization sampling would be conducted prior to the start of work to facilitate direct loading of soil. Documentation would include waste profile sheets and waste manifests. Soils would be loaded on site into trucks. Trucks would be inspected, decontaminated as necessary, and covered prior to leaving the site.

Once the excavation depth is reached, the excavation would be backfilled using “clean” site soil and common borrow from an off-site source. The sheet pile shoring would be removed. Site restoration would begin with filling to the required grade and stabilizing surface soils. Remediation support equipment (water treatment system, soil stockpile areas, decontamination area, and site trailers) would be removed. The Site would be restored to conditions to be determined during the design phase.

7.2.1.2 *In Situ* Chemical Oxidation

Off-site impacts would be treated using ISCO. The ISCO process is a source reduction process in which a chemical oxidant is injected into the subsurface to react with contaminants. ISCO can be useful in treating contaminated areas while causing minimal surficial disruption. A wide variety of oxidants, additives, and delivery methods are available. Ideally, the chemical oxidant reacts with the contaminants and oxidizes them to non-toxic constituents (i.e., carbon dioxide and water).

Treatment requires the installation of multiple vertical injection wells through the clean backfill of the excavation to the depth of impacts. Oxidant would be applied to the off-site impacted media. Liquid chemical mixtures would be prepared and injected using pumps, hoses, and tanks. The injected material can migrate in groundwater and treat downgradient contamination.

The effectiveness of ISCO is highly dependent on subsurface soil conditions and nature of the contaminants present. As a result, several injection events may be required. The injection wells would be in place for the duration of the treatment, which may be for an extended period of time of one to two years. Disruption to off-site activities would be limited to the injection periods. Injection of the treatment chemical may result in the generation of heat or steam generation from exothermic reactions due to the relatively shallow depth that the treatment would occur. Once ISCO treatment is complete, site restoration activities would include abandonment of injection wells and landscaping.

7.2.2 Summary of Remedial Processes

7.2.2.1 Excavation

- Size and configuration of process options: Alternative 2 includes excavation of all visually impacted soils on site. The horizontal footprint of the excavation is depicted on Figure 7-1. Vertically the excavation will extend down to a depth of approximately 27 feet bgs, as needed to remove all visual impacts. The excavation will require shoring to protect the adjacent buildings and rail road operations. Site preparation and management facilities would also require some space, including fencing, site trailers, erosion controls and soil stockpile areas. Soil stockpile and equipment decontamination areas would be needed.
- Time for remediation: The excavation and site restoration is anticipated to require approximately six months.
- Spatial requirements: The estimated excavation area is approximately 9,500 square feet. Additional space would be necessary for soil stockpiles, heavy equipment staging, etc.
- Options for disposal: On-site treatment of the excavated soil would not be feasible. Off-site disposal would primarily be at a thermal desorption facility. Wastes that do not meet the size requirements (greater than 3 inch diameter) would be disposed at a landfill permitted to handle MGP wastes.
- Permit requirements: The excavation would require construction permits.
- Limitations or other factors necessary to evaluate the alternative: Excavation will be disruptive to on-site activities during implementation.

7.2.2.2 In Situ Chemical Oxidation

- Size and configuration of process options: Alternative 2 also includes ISCO to address off-site groundwater impacts. Oxidant injection wells will be installed approximately 20 feet on center across the extent of the off-site visual impacts. The area of well placement is depicted on Figure 7-1. Approximately 30 injection wells will be installed. Vertical injection and will be installed in areas to be treated. Drums, storage tanks, or tanker trucks would be on site during injection events. Additional above ground equipment would include vapor treatment (carbon vessels or thermal oxidizer) and water treatment facilities (storage tanks, pumps, carbon vessels).

- Time for remediation: Initial installation of the ISCO wells will take approximately two months. ISCO injections will be performed on iterative basis as needed to achieve remedial goals. One to two years for construction and injection events is anticipated.
- Spatial requirements: Vertical wells would be placed in approximately 20 feet on center across the off-site area of impacts. Minor space would be required for storage of the injection equipment and chemicals.
- Options for disposal: Spent activated carbon from vapor treatment would be sent to an off-site regeneration facility. Recovered NAPL and groundwater would be sent for off-site treatment and disposal. Well tailings and construction waste would be characterized and sent to an appropriate off site facility for proper disposal.
- Permit requirements: An Underground Injection Control (UIC) permit may be required. Also, any air treatment equipment would be required to meet substantive permit requirements. Notification to residents and the local fire department for the chemicals to be used is recommended.
- Limitations or other factors necessary to evaluate the alternative: Health and safety factors need to be carefully evaluated when designing and implementing an ISCO program. An on-site pilot study is recommended.

7.2.3 Criteria Evaluation

7.2.3.1 Overall Protection Of Public Health And The Environment

Alternative 2 is rated “Good” for this criterion. This alternative provides on-site source removal via excavation and off-site source treatment via ISCO. By removing and treating source material, public health and the environment are protected from the potential risks from the MGP impacts.

7.2.3.2 Compliance With Standards, Criteria And Guidance

Alternative 2 is rated “Good” for this criterion. This alternative will likely achieve applicable soil and groundwater SCGs through on-site removal.

7.2.3.3 Long-Term Effectiveness And Permanence

Alternative 2 is rated “Good” for this criterion. This alternative provides permanent source removal on-site through excavation. Off-site, follow-up ISCO injections may be required for continued effectiveness.

7.2.3.4 Reduction In Toxicity, Mobility, And Volume

Alternative 2 is rated “Good” for this criterion. The volume of impacts in soil will be reduced through source removal. The toxicity of impacts in groundwater will be reduced as a result of the soil removal and through ISCO injections.

7.2.3.5 Short-Term Effectiveness

Alternative 2 is rated “Fair” for this criterion. This alternative has the potential for generation of dust and odors during the excavation phase of the work. Steam and odors may potentially be generated during the ISCO phase of the work.

7.2.3.6 Implementability

Alternative 2 is rated “Fair” for this criterion. On-site excavation work will be disruptive to current on-site activities during implementation. Excavation shoring will need to be reviewed and approved by LIRR. Off-site ISCO injections will require an access agreement with the LIRR and other downgradient current property owners. ISCO injections may interfere with rail operations and will require approval from LIRR.

7.2.3.7 Cost

The total estimated total costs for Alternative 2 is $10,491,000. It assumes 30 years of groundwater monitoring following the ISCO implementation. This includes:

- $6,916,000 in capital construction
- $1,250,000 in design, construction oversight, and construction monitoring
- $2,325,000 in contingency (20% to 30% of total costs)

Cost estimate details are provided in Appendix B.

7.2.3.8 Land Use

Alternative 2 is rated “Good” for this criterion. Although there will be short-term disruptions to current on- and off-site activities, this alternative will ultimately result in removal/reduction of risk. No land use restrictions or institutional controls will be required upon implementation of this alternative.

7.3 Alternative 3 – Excavate Source Material with Enhanced Monitored Natural Attenuation

Alternative 3, depicted in Figure 7-2, includes the following:

- Excavate MGP source material (upper 15 feet).
- Dispose of soil at an off-site thermal desorption facility.
- Excavation shoring to protect rail and adjacent structures.
- Excavation dewatering.
- Clean backfill and restore asphalt.
- Institutional controls to address soil and groundwater impacts and soil impacts beyond the excavation limits.
- Monitor groundwater plume following excavation to establish the extent of dissolved phase impacts following source remediation.
- Inject oxygen through a series of injection wells if monitoring does not demonstrate a significant reduction in dissolved phase impacts following the on-site source remediation.

7.3.1 Description of Activities

The primary components of Alternative 3 are excavation, Enhanced Monitored Natural Attenuation (EMNA), and institutional controls. Each component is discussed below.

7.3.1.1 Excavation

Excavation would occur as discussed in Section 7.2.1.1. Excavation for this alternative would encompass a smaller footprint and would only extend to impacts up to a maximum of 15 feet bgs.

7.3.1.2 Enhanced Monitored Natural Attenuation

Alternative 3 would include monitoring the Site's MGP impacts via an EMNA program. The program would require groundwater monitoring as described in section 7.1.1.2. In this alternative (differing from Alternative 1), attenuation of impacts would be enhanced if natural degradation is not occurring at a significant rate. Dissolved phase impacts would be reduced through oxygen injections, likely using iSOC® technology. Injection wells would be installed along the downgradient alignment of the excavation, to treat impacts further downgradient. The proposed alignment of injection wells is shown on Figure 7-2.

7.3.1.3 Institutional Controls

Institutional controls are as discussed in Section 7.1.1.1. Institutional controls for this alternative would be less restrictive because the only remaining impacts would be at depths greater than 15 feet bgs.

7.3.2 Summary of Remedial Processes

7.3.2.1 Excavation

- Size and configuration of process options: Alternative 3 includes excavation of visually impacted soils on-site to a depth of up to 15 feet bgs. The horizontal footprint of the excavation is depicted on Figure 7-2. The excavation will require shoring to protect the adjacent buildings and rail road operations. Site preparation and management facilities would also require some space, including fencing, site trailers, erosion controls and soil stockpile areas. Soil stockpile and equipment decontamination areas would be needed.
- Time for remediation: The excavation and site restoration is anticipated to require approximately six months.
- Spatial requirements: The estimated excavation area is approximately 7,800 square feet. Additional space would be necessary for soil stockpiles, heavy equipment staging, etc.
- Options for disposal: On-site treatment of the excavated soil would not be feasible. Off-site disposal would primarily be at a thermal desorption facility. Wastes that do not meet the size requirements (greater than 3 inch diameter) would be disposed at a landfill permitted to handle MGP wastes.
- Permit requirements: The excavation would require construction permits.
- Limitations or other factors necessary to evaluate the alternative: Excavation will be disruptive to on-site activities during implementation.

7.3.2.2 Enhanced Monitored Natural Attenuation

- Size and configuration of process options: The layout of the proposed injection well system is provided on Figure 7-2. The exiting monitoring well system will be utilized for monitoring.
- Time for remediation: EMNA is an iterative process that may take several years.
- Spatial requirements: Existing wells would be used for monitoring. Injection points would be placed on-site as shown on Figure 7-2.

- Options for disposal: Recovered NAPL, groundwater, and spent ISOCs would be sent for off-site treatment and disposal. Well tailings and construction waste would be characterized and sent to an appropriate off-site facility for proper disposal.
- Permit requirements: None required.
- Limitations or other factors necessary to evaluate the alternative: None.

7.3.3 Criteria Evaluation

7.3.3.1 Overall Protection Of Public Health And The Environment

Alternative 3 is rated “Good” for this criterion. This alternative provides on-site source removal via excavation and off-site source treatment via EMNA. By removing and treating source material, public health and the environment are protected from the potential risks from the MGP impacts.

7.3.3.2 Compliance With Standards, Criteria And Guidance

Alternative 3 is rated “Fair” for this criterion. This alternative will likely achieve applicable soil and groundwater SCGs through source removal and treatment in the 0-15 feet bgs interval. Deeper impacts in the 15-30 feet bgs interval (the thin (0.1 foot) tar lenses) will not be addressed, and therefore soil and groundwater SCGs may not be met at these deeper locations. Institutional controls will be required to control exposure to the inaccessible source material.

7.3.3.3 Long-Term Effectiveness And Permanence

Alternative 3 is rated “Good” for this criterion. This alternative provides permanent source removal on-site in the upper 15 feet through excavation. Off-site, long-term follow-up EMNA and ISOC applications may be required for continued effectiveness.

7.3.3.4 Reduction In Toxicity, Mobility, And Volume

Alternative 3 is rated “Good” for this criterion. The volume of impacts in soil will be reduced through source removal. The toxicity of impacts in groundwater will be reduced as a result of the soil removal and through EMNA.

7.3.3.5 Short-Term Effectiveness

Alternative 3 is rated “Fair” for this criterion. This alternative has the potential for generation of dust and odors during the excavation phase of the work. Controls will be in-place to control odors and dust and other impacts that will occur during construction.

7.3.3.6 Implementability

Alternative 3 is rated “Fair” for this criterion. On-site excavation work will be disruptive to current on-site activities during implementation. Excavation shoring will need to be reviewed and approved by LIRR. Off-site EMNA will require an access agreement with the LIRR and current downgradient property owner, but should be fairly non-disruptive to off-site activities.

7.3.3.7 Cost

The total estimated total costs for Alternative 3 is $6,018,000. It assumes 30 years of groundwater monitoring and assumes that ISOC implementation is not utilized. This includes:

- $2,621,000 in capital construction
- $638,000 in design, construction oversight, and construction monitoring
- $1,537,000 in groundwater monitoring (net present value of $100,000/year for 30 years at 5% annual)
- $1,222,000 in contingency (20% to 30% of total costs)

Cost estimate details are provided in Appendix B.

7.3.3.8 Land Use

Alternative 3 is rated “Fair” for this criterion. Although there will be short-term disruptions to current on-site activities, this alternative will ultimately result in removal/reduction of risk for impacts within the 0-15 feet bgs interval. Land use restrictions in the form of institutional controls will be required to address remaining impacts in the 15-30 feet bgs interval.

7.4 Alternative 4 – Solidification with Enhanced Monitored Natural Attenuation

Alternative 4, depicted in Figure 7-3, includes the following:

- Excavate obstructions and debris and dispose of them off-site.
- Mix visually impacted soil (south of property line in the upper 15 feet) with a cement bentonite mixture using augers or excavator bucket.
- Excavate solidification spoils (approximately 30% of volume) and dispose of spoils off-site.
- Cover solidified mass and restore asphalt.
- Institutional controls to address soil groundwater impacts and prevent exposure to or disruption of the solidified mass.
- Monitor groundwater plume following excavation to establish the extent of dissolved phase impacts following source remediation.
- Inject oxygen through a series of injection wells if monitoring does not demonstrate a significant reduction in dissolved phase impacts following the on-site source remediation.

7.4.1 Description of Activities

The primary components of Alternative 4 are ISS, EMNA, and institutional controls. Each component is discussed below.

7.4.1.1 *In Situ* Solidification

ISS is a source containment process that uses cement slurry to immobilize contaminants in soil by decreasing the relative permeability of the impacted media. Augers or bucket mixing would be used to introduce cement slurry in overlapping columns producing a monolithic solidified mass to “isolate” the areas of contamination from groundwater flow.

ISS would consist of the following elements: site preparation, ISS implementation, loading, transport and disposal of impacted soil, backfilling, and site restoration.

Site preparation activities would include setting up construction fencing, Site trailers, erosion controls, soil stockpile areas, soil loading areas, decontamination stations, and baseline air monitoring. Utilities would be relocated and major subsurface obstructions such as concrete debris and foundations would be removed by conventional excavation. A fence-line monitoring program would be used to identify any potential vapor, dust, and noise impacts to the public so that appropriate measures to mitigate odor, noise, and dust during ISS would be employed.

Upon completion of site preparation activities, impacted soils in the accessible areas would be mixed with the cement slurry and allowed to cure to a solidified mass. The solidification process results in an increase in soil volume, typically ranging from 10 to 30%, with the excess material, or "spoils', typically transported off-site for disposal at a permitted landfill. Special care must be taken to manage these spoils, such that they do not run off site or cause sedimentation issues. Contaminated spoils would be segregated and placed in lined and covered stockpile areas on site or directly loaded into trucks. Waste characterization sampling would be conducted. Documentation would include waste profile sheets and waste manifests. Soils would be loaded on site into trucks. Trucks would be inspected, decontaminated as necessary, and covered prior to leaving the site.

Site restoration would placing addition of 2 feet of clean soil above the ISS mass and restoring the ground surface with pavement. Remediation support equipment (soil stockpile areas, decontamination area, and site trailers) would be removed. The Site would be restored to conditions to be determined during the design phase.

7.4.1.2 Enhanced Monitored Natural Attenuation

EMNA is as described in Section 7.3.1.2. The layout for the proposed injection wells for this alternative is shown on Figure 7-3. This layout would be located approximately 30 feet downgradient of the remaining ISS mass.

7.4.1.3 Institutional Controls

Institutional controls are as discussed in Section 7.1.1.1. Institutional controls would be needed to address impacts remaining in-place within the solidified ISS mass.

7.4.1.4 *In Situ* Solidification

- Size and configuration of process options: Alternative 4 includes ISS of visually impacted soils on-site to a depth of 15 feet bgs. The horizontal footprint of ISS is depicted on Figure 7-3. Site preparation and management facilities would also require some space, including fencing, site trailers, erosion controls, soil stockpile areas, and equipment decontamination areas.
- Time for remediation: ISS and site restoration is anticipated to require approximately six months.
- Spatial requirements: The estimated ISS area is approximately 7,800 square feet. Additional space would be necessary for soil stockpiles, heavy equipment staging, etc.
- Options for disposal: Off-site disposal would primarily be at an off-site landfill permitted to handle MGP wastes.
- Permit requirements: ISS would require construction permits.
- Limitations or other factors necessary to evaluate the alternative: A thorough evaluation of subsurface utilities within the ISS footprint would be necessary prior to implementation.

7.4.1.5 Enhanced Monitored Natural Attenuation

- Size and configuration of process options: The layout of the proposed injection well system is provided on Figure 7-3. The exiting monitoring well system will be utilized for monitoring.
- Time for remediation: EMNA is an iterative process that may take several years.
- Spatial requirements: Existing wells would be used for monitoring. Injection points would be placed off-site as shown on Figure 7-3.
- Options for disposal: Recovered NAPL, groundwater, and spent ISOCs would be sent for off-site treatment and disposal. Well tailings and construction waste would be characterized and sent to an appropriate off-site facility for proper disposal.
- Permit requirements: None required.
- Limitations or other factors necessary to evaluate the alternative: None.

7.4.2 Criteria Evaluation

7.4.2.1 Overall Protection Of Public Health And The Environment

Alternative 4 is rated “Good” for this criterion. This alternative provides on-site source immobilization via ISS and off-site source treatment via EMNA. By immobilizing and treating source material, public health and the environment are protected from the potential risks from the MGP impacts.

7.4.2.2 Compliance With Standards, Criteria And Guidance

Alternative 4 is rated “Poor” for this criterion. This alternative immobilizes on-site impacts, but does not reduce total concentrations of COI in the MGP source material, so that SGCs for soil may not be achieved. However, groundwater quality will likely improve with time, and may eventually achieve SCGs.

7.4.2.3 Long-term effectiveness and permanence

Alternative 4 is rated “Good” for this criterion. This alternative provides permanent source solidification on-site through ISS. Off-site, long-term follow-up EMNA and ISOC applications may be required for continued effectiveness.

7.4.2.4 Reduction In Toxicity, Mobility, And Volume

Alternative 4 is rated “Fair” for this criterion. The mobility of impacts in soil will be reduced through ISS. The toxicity of impacts in groundwater will be reduced as a result of the source immobility and through EMNA.

7.4.2.5 Short-Term Effectiveness

Alternative 4 is rated “Fair” for this criterion. This alternative has the potential for generation of sediment runoff (if ISS spoils are not handled properly) and odors during the ISS phase of the work.

7.4.2.6 Implementability

Alternative 4 is rated “Fair” for this criterion. On-site ISS work will be disruptive to current on-site activities during implementation. Off-site EMNA will require an access agreement with the current property owner, but should be fairly non-disruptive to off-site activities.

7.4.2.7 Cost

The total estimated total costs for Alternative 4 is $6,436,000. It assumes 30 years of groundwater monitoring and assumes that ISCO implementation is not utilized. This includes:

- $2,798,000 in capital construction
- $795,000 in design, construction oversight, and construction monitoring
- $1,537,000 in groundwater monitoring (net present value of $100,000/year for 30 years at 5% annual)
- $1,306,000 in contingency (20% to 30% of total costs)

Cost estimate details are provided in Appendix B.

7.4.2.8 Land Use

Alternative 4 is rated “Fair” for this criterion. Although there will be short-term disruptions to current on-site activities, this alternative will ultimately result in immobilization/reduction of risk for impacts within the 0-15 feet bgs interval. Land use restrictions in the form of institutional controls will be required to address remaining immobilized impacts within the 0-15 feet bgs interval (within this ISS mass) and remaining impacts in the 15-30 feet bgs interval.

8.0 Remedy Recommendation

Alternative 3, Excavate On-Site Visual Impacts with EMNA, is the proposed remedial alternative for the Site. This alternative, depicted in Figure 7-2, includes the following:

- Excavate visually impacted soils (up to 15 feet) south of property line.
- Dispose of soil at an off-site thermal desorption facility.
- Excavation shoring to protect rail and adjacent structures.
- Excavation dewatering.
- Clean backfill and restore asphalt.
- Institutional controls to address soil and groundwater impacts and soil impacts beyond the excavation limits.
- Monitor groundwater plume following excavation to establish the extent of dissolved phase impacts following source remediation.
- Inject oxygen through a series of injection wells if monitoring does not demonstrate a significant reduction in dissolved phase impacts following the on-site source remediation.

A detailed description of the proposed remedy and an analysis of the remedy's compliance with the seven evaluation criteria are discussed in Section 7.3. Alternative 3 was chosen because it meets the RAGs and RAOs, is implementable and consistent with site conditions and site use, and is cost effective.

While Alternative 2 removed the additional source material located in the gravel lenses (approximately 0.1 feet thick) between 24 and 27 feet bgs, it was rejected because of the additional site disruption required to access a limited amount of material. Approximately 2,500 cubic yards of un-impacted overburden soil would need to be excavated to access approximately 10 cubic yards of source material.

Given the fact that estimated costs for Alternative 3 and 4 were comparable and the bulk of the MGP source material is readily accessible, Alternative 3 was selected as a more protective remedy.

9.0 References

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Tables

Table 3-1
Summary of Surface Soil Analytical Results
Former MGP, Far Rockaway, NY

			Site Surface Soil					Background Surface Soil										
Sample Location:	CAS Number	NYSDEC Part 375-6 Commercial	SS-104	SS-105	SS-106	SS-112	SS-113	BSS-1	BSS-2	BSS-3	BSS-4	BSS-5	BSS-6	BSS-7	BSS-8	BSS-9	BSS-9 (DUP)	BSS-10
Sample Date:			1/24/2008	1/23/2008	1/23/2008	1/23/2008	1/23/2008	1/23/2008	1/24/2008	1/24/2008	1/24/2008	1/24/2008	1/24/2008	1/24/2008	1/24/2008	1/24/2008	1/24/2008	1/24/2008
Sample ID:			SS-104-012408	SS-105-012308	SS-106-012308	SS-112-012308	SS-113-012308	BSS-1-012308	BSS-2-012408	BSS-3-012408	BSS-4-012408	BSS-5-012408	BSS-6-012408	BSS-7-012408	BSS-8-012408	BSS-9-012408	BSS-15-012408	BSS-10-012408
Sample Interval (inches):			0 - 2	0 - 2	0 - 2	0 - 2	0 - 2	0 - 2	0 - 2	0 - 2	0 - 2	0 - 2	0 - 2	0 - 2	0 - 2	0 - 2	0 - 2	0 - 2
Laboratory Identification:			Z1331-01	Z1331-02	Z1331-03	Z1331-04	Z1331-05	Z1331-06	Z1331-07	Z1331-08	Z1331-09	Z1331-10	Z1331-11	Z1331-12	Z1331-13	Z1331-14	Z1331-18	Z1331-17
Sample Type:			Sample	Sample	Sample	Sample	Sample	Sample	Sample	Sample	Sample	Sample	Sample	Sample	Sample	Sample	Duplicate	Sample
BTEX (mg/Kg)																		
Benzene	71-43-2	44	0.051 U	0.033 U	0.031 U	0.029 U	**0.013 J**	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Ethyl Benzene	100-41-4	390	0.051 U	0.033 U	0.031 U	0.029 U	**0.014 J**	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
m/p-Xylenes	126777-61-2	NL	0.100 U	0.065 U	0.063 U	0.058 U	0.064 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
o-Xylene	95-47-6	NL	0.051 U	0.033 U	0.031 U	0.029 U	0.032 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Toluene	108-88-3	500	0.051 U	0.033 U	0.031 U	0.029 U	0.032 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Xylenes, Total	1330-20-7	500	0.151 U	0.098 U	0.094 U	0.087 U	0.096 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Total BTEX		*NL*	*ND*	*ND*	*ND*	*ND*	***0.027***	*NA*	*NA*	*NA*	*NA*	*NA*	*NA*	*NA*	*NA*	*NA*	*NA*	*NA*
Volatile Organic Compounds (VOCs) (mg/Kg)																		
1,1,1-Trichloroethane	71-55-6	500	0.051 U	0.033 U	0.031 U	0.029 U	0.032 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,1,2,2-Tetrachloroethane	79-34-5	NL	R	R	0.031 U	R	R	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,1,2-Trichloroethane	79-00-5	NL	0.051 U	0.033 U	0.031 U	0.029 U	0.032 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,1-Dichloroethane	75-34-3	240	0.051 U	0.033 U	0.031 U	0.029 U	0.032 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,1-Dichloroethene	75-35-4	500	0.051 U	0.033 U	0.031 U	0.029 U	0.032 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,2-Dichloroethane	107-06-2	30	0.051 U	0.033 U	0.031 U	0.029 U	0.032 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,2-Dichloropropane	78-87-5	NL	0.051 U	0.033 U	0.031 U	0.029 U	0.032 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2-Butanone	78-93-3	500	0.260 U	0.160 U	0.160 U	0.140 U	0.160 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2-Hexanone	591-78-6	NL	0.260 U	0.160 U	0.160 U	0.140 U	0.160 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
4-Methyl-2-Pentanone	108-10-1	NL	0.260 U	0.160 U	0.160 U	0.140 U	0.160 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Acetone	67-64-1	500	0.260 UJ	0.160 UJ	0.160 UJ	0.140 UJ	0.160 UJ	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Bromodichloromethane	75-27-4	NL	0.051 U	0.033 U	0.031 U	0.029 U	0.032 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Bromoform	75-25-2	NL	0.051 U	0.033 U	0.031 U	0.029 U	0.032 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Bromomethane	74-83-9	NL	0.051 U	0.033 U	0.031 U	0.029 U	0.032 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Carbon Disulfide	75-15-0	NL	0.051 U	0.033 U	0.031 U	0.029 U	0.032 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Carbon Tetrachloride	56-23-5	22	0.051 U	0.033 U	0.031 U	0.029 U	0.032 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Chlorobenzene	108-90-7	500	0.051 U	0.033 U	0.031 U	0.029 U	0.032 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Chloroethane	75-00-3	NL	0.051 U	0.033 U	0.031 U	0.029 U	0.032 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Chloroform	67-66-3	350	0.051 U	0.033 U	0.031 U	0.029 U	0.032 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Chloromethane	74-87-3	NL	0.051 U	0.033 U	0.031 U	0.029 U	0.032 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
cis-1,2-Dichloroethene	156-59-2	500	0.051 U	0.033 U	0.031 U	0.029 U	0.032 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
cis-1,3-Dichloropropene	10061-01-5	NL	0.051 U	0.033 U	0.031 U	0.029 U	0.032 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Dibromochloromethane	124-48-1	NL	0.051 U	0.033 U	0.031 U	0.029 U	0.032 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Methylene Chloride	75-09-2	500	0.051 U	0.033 U	0.031 U	0.029 U	0.032 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Styrene	100-42-5	NL	0.051 U	0.033 U	0.031 U	0.029 U	0.032 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Tetrachloroethene	127-18-4	150	**0.024 J**	**0.020 J**	**0.011 J**	0.029 U	**0.015 J**	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Total 1,2-Dichloroethene	540-59-0	NL	0.102 U	0.066 U	0.062 U	0.058 U	0.064 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
trans-1,2-Dichloroethene	156-60-5	500	0.051 U	0.033 U	0.031 U	0.029 U	0.032 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
trans-1,3-Dichloropropene	10061-02-6	NL	0.051 U	0.033 U	0.031 U	0.029 U	0.032 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Trichloroethene	79-01-6	200	0.051 U	0.033 U	0.031 U	0.029 U	0.032 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Vinyl Chloride	75-01-4	13	0.051 U	0.033 U	0.031 U	0.029 U	0.032 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Total VOCs		*NL*	***0.024***	***0.020***	***0.011***	*ND*	***0.042***	*NA*	*NA*	*NA*	*NA*	*NA*	*NA*	*NA*	*NA*	*NA*	*NA*	*NA*
Polynuclear Aromatic Hydrocarbons (PAHs) (mg/Kg)																		
2-Methylnaphthalene	91-57-6	NL	17 U	4.2 U	**0.38 J**	9.7 U	2.1 U	0.87 U	0.48 U	7.9 U	0.80 U	21 U	2.5 U	0.48 U	0.47 U	0.51 U	0.52 U	3.9 U
Acenaphthene	83-32-9	500	17 U	4.2 U	0.42 U	9.7 U	2.1 U	0.87 U	0.48 U	7.9 U	0.80 U	21 U	2.5 U	0.48 U	0.47 U	0.51 U	0.52 U	3.9 U
Acenaphthylene	208-96-8	500	17 U	**1.9 J**	**0.10 J**	9.7 U	**1.2 J**	**0.19 J**	**0.052 J**	7.9 U	0.80 U	21 U	2.5 U	0.48 U	**0.048 J**	0.51 U	0.52 U	3.9 U
Anthracene	120-12-7	500	17 U	**2.1 J**	**0.098 J**	9.7 U	**0.53 J**	**0.25 J**	**0.063 J**	7.9 U	0.80 U	21 U	2.5 U	0.48 U	**0.089 J**	**0.056 J**	**0.12 J**	3.9 U
Benzo(a)anthracene	56-55-3	5.6	17 U	**6.9**	**0.12 J**	**2.5 J**	**1.5 J**	**0.58 J**	**0.26 J**	7.9 U	**0.15 J**	**3.7 J**	**0.26 J**	**0.15 J**	**0.39 J**	**0.24 J**	**0.59**	**0.44 J**
Benzo(a)pyrene	50-32-8	1	**2.0 J**	**9**	**0.13 J**	**2.6 J**	**2.0 J**	**0.61 J**	**0.28 J**	**0.80 J**	**0.18 J**	**3.6 J**	**0.30 J**	**0.16 J**	**0.37 J**	**0.24 J**	**0.54**	**0.53 J**
Benzo(b)fluoranthene	205-99-2	5.6	**3.2 J**	**14**	**0.32 J**	**4.5 J**	**2.9**	**1.2**	**0.42 J**	**1.5 J**	**0.27 J**	**4.5 J**	**0.50 J**	**0.22 J**	**0.49**	**0.38 J**	**0.83**	**0.71 J**
Benzo(g,h,i)perylene	191-24-2	500	**2.0 J**	**5.2**	**0.18 J**	**1.8 J**	**2.1**	**0.48 J**	**0.22 J**	7.9 U	**0.14 J**	**2.4 J**	2.5 U	**0.11 J**	**0.23 J**	**0.15 J**	**0.32 J**	3.9 U
Benzo(k)fluoranthene	207-08-9	56	17 U	**5.7**	**0.11 J**	**1.2 J**	**0.93 J**	**0.35 J**	**0.17 J**	7.9 U	**0.097 J**	21 U	2.5 U	**0.08 J**	**0.19 J**	**0.089 J**	**0.23 J**	3.9 U
Chrysene	218-01-9	56	**1.9 J**	**8.6**	**0.18 J**	**2.8 J**	**1.8 J**	**0.71 J**	**0.34 J**	**0.87 J**	**0.18 J**	**3.7 J**	**0.31 J**	**0.15 J**	**0.40 J**	**0.25 J**	**0.63 J**	**0.49 J**
Dibenz(a,h)anthracene	53-70-3	0.56	17 U	**1.8 J**	**0.051 J**	9.7 U	**0.40 J**	**0.16 J**	**0.065 J**	7.9 U	0.80 U	21 U	2.5 U	0.48 U	**0.066 J**	**0.057 J**	**0.12 J**	3.9 U
Fluoranthene	206-44-0	500	**3.2 J**	**4.5**	**0.21 J**	**5.4 J**	**2.7**	**0.95**	**0.76**	**1.3 J**	**0.33 J**	**8.3 J**	**0.51 J**	**0.33 J**	**0.81**	**0.44 J**	**1.2 J**	**1.0 J**
Fluorene	86-73-7	500	17 U	4.2 U	0.42 U	9.7 U	2.1 U	0.87 U	0.48 U	7.9 U	0.80 U	21 U	2.5 U	0.48 U	0.47 U	0.51 U	0.52 U	3.9 U
Indeno(1,2,3-cd)pyrene	193-39-5	5.6	17 U	**4.5**	**0.14 J**	**1.5 J**	**1.4 J**	**0.40 J**	**0.17 J**	7.9 U	**0.097 J**	21 U	2.5 U	**0.085 J**	**0.20 J**	**0.13 J**	**0.27 J**	3.9 U
Naphthalene	91-20-3	500	17 U	4.2 U	**0.23 J**	9.7 U	**1.0 J**	0.87 U	0.48 U	7.9 U	0.80 U	21 U	2.5 U	0.48 U	0.47 U	0.51 U	0.52 U	3.9 U
Phenanthrene	85-01-8	500	17 U	**0.82 J**	**0.099 J**	**2.0 J**	**1.1 J**	**0.42 J**	**0.65**	7.9 U	**0.12 J**	**5.6 J**	2.5 U	**0.17 J**	**0.48**	**0.29 J**	**0.85 J**	**0.45 J**
Pyrene	129-00-0	500	**2.9 J**	**5.8**	**0.19 J**	**5.0 J**	**4**	**0.95**	**0.68**	**1.2 J**	**0.30 J**	**7.4 J**	**0.46 J**	**0.29 J**	**0.75**	**0.38 J**	**1.0 J**	**0.88 J**
Total PAHs		*NL*	***15.2***	***70.82***	***2.538***	***29.3***	***23.56***	***7.25***	***4.13***	***5.67***	***1.864***	***39.2***	***2.34***	***1.745***	***4.513***	***2.702***	***6.7***	***4.5***
Total Carcinogenic PAHs		*NL*	***7.1***	***50.5***	***1.051***	***15.1***	***10.93***	***4.01***	***1.702***	***3.17***	***0.974***	***15.5***	***1.37***	***0.845***	***2.106***	***1.386***	***3.21***	***2.17***

Notes and definitions provided at end of table.

Other Semivolatile Organic Compounds (mg/Kg)																		
1,2,4-Trichlorobenzene	120-82-1	NL	17 U	4.2 U	0.42 U	9.7 U	2.1 U	0.87 U	0.48 U	7.9 U	0.80 U	21 U	2.5 U	0.48 U	0.47 U	0.51 U	0.52 U	3.9 U
1,2-Dichlorobenzene	95-50-1	500	17 U	4.2 U	0.42 U	9.7 U	2.1 U	0.87 U	0.48 U	7.9 U	0.80 U	21 U	2.5 U	0.48 U	0.47 U	0.51 UJ	0.52 U	3.9 U
1,3-Dichlorobenzene	541-73-1	280	17 U	4.2 U	0.42 U	9.7 U	2.1 U	0.87 U	0.48 U	7.9 U	0.80 U	21 U	2.5 U	0.48 U	0.47 U	0.51 U	0.52 U	3.9 U
1,4-Dichlorobenzene	106-46-7	130	17 U	4.2 U	0.42 U	9.7 U	2.1 U	0.87 U	0.48 U	7.9 U	0.80 U	21 U	2.5 U	0.48 U	0.47 U	0.51 U	0.52 U	3.9 U
2,2-oxybis(1-Chloropropane)	108-60-1	NL	17 U	4.2 U	0.42 U	9.7 U	2.1 U	0.87 U	0.48 U	7.9 U	0.80 U	21 U	2.5 U	0.48 U	0.47 U	0.51 U	0.52 U	3.9 U
2,4,5-Trichlorophenol	95-95-4	NL	42 U	11 U	1.0 U	24 U	5.3 U	2.2 U	1.2 U	20 U	2.0 U	53 U	6.2 U	1.2 U	1.2 U	1.3 U	1.3 U	9.9 U
2,4,6-Trichlorophenol	88-06-2	NL	17 U	4.2 U	0.42 U	9.7 U	2.1 U	0.87 U	0.48 U	7.9 U	0.80 U	21 U	2.5 U	0.48 U	0.47 U	0.51 U	0.52 U	3.9 U
2,4-Dichlorophenol	120-83-2	NL	17 U	4.2 U	0.42 U	9.7 U	2.1 U	0.87 U	0.48 U	7.9 U	0.80 U	21 U	2.5 U	0.48 U	0.47 U	0.51 U	0.52 U	3.9 U

Table 3-1
Summary of Surface Soil Analytical Results
Former MGP, Far Rockaway, NY

Sample Location: / Sample Date: / Sample ID: / Sample Interval (inches): / Laboratory Identification: / Sample Type:	CAS Number	NYSDEC Part 375-6 Commercial	Site Surface Soil					Background Surface Soil										
			SS-104 1/24/2008 SS-104-012408 0 - 2 Z1331-01 Sample	**SS-105** 1/23/2008 SS-105-012308 0 - 2 Z1331-02 Sample	**SS-106** 1/23/2008 SS-106-012308 0 - 2 Z1331-03 Sample	**SS-112** 1/23/2008 SS-112-012308 0 - 2 Z1331-04 Sample	**SS-113** 1/23/2008 SS-113-012308 0 - 2 Z1331-05 Sample	**BSS-1** 1/23/2008 BSS-1-012308 0 - 2 Z1331-06 Sample	**BSS-2** 1/24/2008 BSS-2-012408 0 - 2 Z1331-07 Sample	**BSS-3** 1/24/2008 BSS-3-012408 0 - 2 Z1331-08 Sample	**BSS-4** 1/24/2008 BSS-4-012408 0 - 2 Z1331-09 Sample	**BSS-5** 1/24/2008 BSS-5-012408 0 - 2 Z1331-10 Sample	**BSS-6** 1/24/2008 BSS-6-012408 0 - 2 Z1331-11 Sample	**BSS-7** 1/24/2008 BSS-7-012408 0 - 2 Z1331-12 Sample	**BSS-8** 1/24/2008 BSS-8-012408 0 - 2 Z1331-13 Sample	**BSS-9** 1/24/2008 BSS-9-012408 0 - 2 Z1331-14 Sample	**BSS-9 (DUP)** 1/24/2008 BSS-15-012408 0 - 2 Z1331-18 Duplicate	**BSS-10** 1/24/2008 BSS-10-012408 0 - 2 Z1331-17 Sample
2,4-Dimethylphenol	105-67-9	NL	17 U	4.2 U	0.42 U	9.7 U	2.1 U	0.87 U	0.48 U	7.9 U	0.80 U	21 U	2.5 U	0.48 U	0.47 U	0.51 U	0.52 U	3.9 U
2,4-Dinitrophenol	51-28-5	NL	42 U	11 U	1.0 U	24 U	5.3 U	2.2 U	1.2 U	20 U	2.0 U	53 U	6.2 U	1.2 U	1.2 U	1.3 UJ	1.3 U	9.9 U
2,4-Dinitrotoluene	121-14-2	NL	17 U	4.2 U	0.42 U	9.7 U	2.1 U	0.87 U	0.48 U	7.9 U	0.80 U	21 U	2.5 U	0.48 U	0.47 U	0.51 U	0.52 U	3.9 U
2,6-Dinitrotoluene	606-20-2	NL	17 U	4.2 U	0.42 U	9.7 U	2.1 U	0.87 U	0.48 U	7.9 U	0.80 U	21 U	2.5 U	0.48 U	0.47 U	0.51 U	0.52 U	3.9 U
2-Chloronaphthalene	91-58-7	NL	17 U	4.2 U	0.42 U	9.7 U	2.1 U	0.87 U	0.48 U	7.9 U	0.80 U	21 U	2.5 U	0.48 U	0.47 U	0.51 U	0.52 U	3.9 U
2-Chlorophenol	95-57-8	NL	17 U	4.2 U	0.42 U	9.7 U	2.1 U	0.87 U	0.48 U	7.9 U	0.80 U	21 U	2.5 U	0.48 U	0.47 U	0.51 UJ	0.52 U	3.9 U
2-Methylphenol	95-48-7	500	17 U	4.2 U	0.42 U	9.7 U	2.1 U	0.87 U	0.48 U	7.9 U	0.80 U	21 U	2.5 U	0.48 U	0.47 U	0.51 U	0.52 U	3.9 U
2-Nitroaniline	88-74-4	NL	42 U	11 U	1.0 U	24 U	5.3 U	2.2 U	1.2 U	20 U	2.0 U	53 U	6.2 U	1.2 U	1.2 U	1.3 U	1.3 U	9.9 U
2-Nitrophenol	88-75-5	NL	17 U	4.2 U	0.42 U	9.7 U	2.1 U	0.87 U	0.48 U	7.9 U	0.80 U	21 U	2.5 U	0.48 U	0.47 U	0.51 UJ	0.52 U	3.9 U
3,3-Dichlorobenzidine	91-94-1	NL	17 U	4.2 U	0.42 U	9.7 U	2.1 U	0.87 U	0.48 U	7.9 U	0.80 U	21 U	2.5 U	0.48 U	0.47 U	0.51 U	0.52 U	3.9 U
3Methylphenols	106-44-5	500	17 U	4.2 U	0.42 U	9.7 U	2.1 U	0.87 U	0.48 U	7.9 U	0.80 U	21 U	2.5 U	0.48 U	0.47 U	0.51 U	0.52 U	3.9 U
3-Nitroaniline	99-09-2	NL	42 U	11 U	1.0 U	24 U	5.3 U	2.2 U	1.2 U	20 U	2.0 U	53 U	6.2 U	1.2 U	1.2 U	1.3 U	1.3 U	9.9 U
4,6-Dinitro-2-methylphenol	534-52-1	NL	42 U	11 U	1.0 U	24 U	5.3 U	2.2 U	1.2 U	20 U	2.0 U	53 U	6.2 U	1.2 U	1.2 U	1.3 UJ	1.3 U	9.9 U
4-Bromophenyl-phenylether	101-55-3	NL	17 U	4.2 U	0.42 U	9.7 U	2.1 U	0.87 U	0.48 U	7.9 U	0.80 U	21 U	2.5 U	0.48 U	0.47 U	0.51 U	0.52 U	3.9 U
4-Chloro-3-methylphenol	59-50-7	NL	17 U	4.2 U	0.42 U	9.7 U	2.1 U	0.87 U	0.48 U	7.9 U	0.80 U	21 U	2.5 U	0.48 U	0.47 U	0.51 U	0.52 U	3.9 U
4-Chloroaniline	106-47-8	NL	17 U	4.2 U	0.42 U	9.7 U	2.1 U	0.87 U	0.48 U	7.9 U	0.80 U	21 U	2.5 U	0.48 U	0.47 U	0.51 U	0.52 U	3.9 U
4-Chlorophenyl-phenylether	7005-72-3	NL	17 U	4.2 U	0.42 U	9.7 U	2.1 U	0.87 U	0.48 U	7.9 U	0.80 U	21 U	2.5 U	0.48 U	0.47 U	0.51 U	0.52 U	3.9 U
4-Nitroaniline	100-01-6	NL	42 U	11 U	1.0 U	24 U	5.3 U	2.2 U	1.2 U	20 U	2.0 U	53 U	6.2 U	1.2 U	1.2 U	1.3 U	1.3 U	9.9 U
4-Nitrophenol	100-02-7	NL	42 U	11 U	1.0 U	24 U	5.3 U	2.2 U	1.2 U	20 U	2.0 U	53 U	6.2 U	1.2 U	1.2 U	1.3 U	1.3 U	9.9 U
bis(2-Chloroethoxy)methane	111-91-1	NL	17 U	4.2 U	0.42 U	9.7 U	2.1 U	0.87 U	0.48 U	7.9 U	0.80 U	21 U	2.5 U	0.48 U	0.47 U	0.51 U	0.52 U	3.9 U
bis(2-Chloroethyl)ether	111-44-4	NL	17 U	4.2 U	0.42 U	9.7 U	2.1 U	0.87 U	0.48 U	7.9 U	0.80 U	21 U	2.5 U	0.48 U	0.47 U	0.51 U	0.52 U	3.9 U
bis(2-Ethylhexyl)phthalate	117-81-7	NL	**3.3 J**	4.2 U	**0.09 J**	9.7 U	2.1 U	**0.11 J**	**0.33 J**	7.9 U	**0.19 J**	**2.6 J**	**0.93 J**	**0.16 J**	**0.29 J**	**0.37 J**	**0.80**	**1.3 J**
Butylbenzylphthalate	85-68-7	NL	17 U	4.2 U	**0.72**	9.7 U	2.1 U	0.87 U	**0.13 J**	7.9 U	**0.11 J**	21 U	2.5 U	0.48 U	0.47 U	0.51 U	0.52 U	3.9 U
Carbazole	86-74-8	NL	17 U	4.2 U	**0.049 J**	9.7 U	2.1 U	**0.10 J**	**0.066 J**	7.9 U	0.80 U	21 U	2.5 U	0.48 U	**0.05 J**	0.51 UJ	**0.073 J**	3.9 U
Dibenzofuran	132-64-9	350	17 U	4.2 U	0.42 U	9.7 U	2.1 U	0.87 U	0.48 U	7.9 U	0.80 U	21 U	2.5 U	0.48 U	0.47 U	0.51 U	0.52 U	3.9 U
Diethylphthalate	84-66-2	NL	17 U	4.2 U	0.42 U	9.7 U	2.1 U	0.87 U	0.48 U	7.9 U	0.80 U	21 U	2.5 U	0.48 U	0.47 U	0.51 U	0.52 U	3.9 U
Dimethylphthalate	131-11-3	NL	17 U	4.2 U	0.42 U	9.7 U	2.1 U	0.87 U	0.48 U	7.9 U	0.80 U	21 U	2.5 U	0.48 U	0.47 U	0.51 U	0.52 U	3.9 U
Di-n-butylphthalate	84-74-2	NL	17 U	4.2 U	0.42 U	9.7 U	2.1 U	0.87 U	0.48 U	7.9 U	0.80 U	21 U	2.5 U	0.48 U	0.47 U	0.51 U	0.52 U	3.9 U
Di-n-octyl phthalate	117-84-0	NL	17 U	4.2 U	0.42 U	9.7 U	2.1 U	0.87 U	0.48 U	7.9 U	0.80 U	21 U	2.5 U	0.48 U	0.47 U	0.51 U	0.52 U	3.9 U
Hexachlorobenzene	118-74-1	6	17 U	4.2 U	0.42 U	9.7 U	2.1 U	0.87 U	0.48 U	7.9 U	0.80 U	21 U	2.5 U	0.48 U	0.47 U	0.51 U	0.52 U	3.9 U
Hexachlorobutadiene	87-68-3	NL	17 U	4.2 U	0.42 U	9.7 U	2.1 U	0.87 U	0.48 U	7.9 U	0.80 U	21 U	2.5 U	0.48 U	0.47 U	0.51 U	0.52 U	3.9 U
Hexachlorocyclopentadiene	77-47-4	NL	17 U	4.2 U	0.42 U	9.7 U	2.1 U	0.87 U	0.48 U	7.9 U	0.80 U	21 U	2.5 U	0.48 U	0.47 U	0.51 UJ	0.52 U	3.9 U
Hexachloroethane	67-72-1	NL	17 U	4.2 U	0.42 U	9.7 U	2.1 U	0.87 U	0.48 U	7.9 U	0.80 U	21 U	2.5 U	0.48 U	0.47 U	0.51 UJ	0.52 U	3.9 U
Isophorone	78-59-1	NL	17 U	4.2 U	0.42 U	9.7 U	2.1 U	0.87 U	0.48 U	7.9 U	0.80 U	21 U	2.5 U	0.48 U	0.47 U	0.51 U	0.52 U	3.9 U
Nitrobenzene	98-95-3	NL	17 U	4.2 U	0.42 U	9.7 U	2.1 U	0.87 U	0.48 U	7.9 U	0.80 U	21 U	2.5 U	0.48 U	0.47 U	0.51 U	0.52 U	3.9 U
N-Nitroso-di-n-propylamine	621-64-7	NL	17 U	4.2 U	0.42 U	9.7 U	2.1 U	0.87 U	0.48 U	7.9 U	0.80 U	21 U	2.5 U	0.48 U	0.47 U	0.51 UJ	0.52 U	3.9 U
N-Nitrosodiphenylamine	86-30-6	NL	17 U	4.2 U	0.42 U	9.7 U	2.1 U	0.87 U	0.48 U	7.9 U	0.80 U	21 U	2.5 U	0.48 U	0.47 U	0.51 U	0.52 U	3.9 U
Pentachlorophenol	87-86-5	6.7	42 U	11 U	1.0 U	24 U	5.3 U	2.2 U	1.2 U	20 U	2.0 U	53 U	6.2 U	1.2 U	1.2 U	1.3 U	1.3 U	9.9 U
Phenol	108-95-2	500	17 U	4.2 U	0.42 U	9.7 U	2.1 U	0.87 U	0.48 U	7.9 U	0.80 U	21 U	2.5 U	0.48 U	0.47 U	0.51 U	0.52 U	3.9 U
Total Other SVOCs		*NL*	***3.3***	*ND*	***0.859***	*ND*	*ND*	***0.21***	***0.526***	*ND*	***0.30***	***2.6***	***0.93***	***0.16***	***0.34***	***0.370***	***0.873***	***1.3***
Inorganic Compounds (mg/Kg)																		
Arsenic	7440-38-2	16	**3.320**	**6.170**	**4.700**	**1.590**	**3.420**	**5.220**	**5.430**	**1.380**	**2.120**	**1.350**	**3.420**	**7.800**	**6.520**	**8.950 J**	**4.420 J**	**1.210**
Barium	7440-39-3	400	**63.5**	**51.9**	**15.3**	**38.0**	**96.5**	**42.0**	**210**	**26.2**	**19.9**	**108**	**43.4**	**53.5**	**94.2**	**121 J**	**58.8 J**	**29.9**
Cadmium	7440-43-9	9.3	**0.564 J**	**1.230**	0.848 U	**0.297 J**	**0.260 J**	**0.475 J**	**0.309 J**	**0.145 J**	0.817 U	**0.123 J**	**0.118 J**	0.970 U	0.951 U	1.030 U	1.040 U	0.794 U
Chromium	7440-47-3	1500	**18.1**	**6.980**	**5.490**	**4.700**	**5.340**	**9.190**	**11.2**	**4.700**	**4.250**	**5.630**	**7.490**	**5.600**	**7.290**	**12.6 J**	**6.830**	**7.890**
Copper	7440-50-8	270	**68.1**	**113**	**26.1**	**33.1**	**195**	**1470**	**33.8**	**16.1**	**10.6**	**22.7**	**18.8**	**19.1**	**21.0**	**47.3 J**	**24.0 J**	**24.4**
Iron	7439-89-6	NL	**5960**	**7720**	**5040**	**4340**	**5800**	**5930**	**4100**	**2830**	**3190**	**2710**	**2750**	**5220**	**5670**	**9870 J**	**5170 J**	**4190**
Lead	7439-92-1	1000	**194**	**212**	**78.2**	**163**	**289**	**143**	**798**	**80.6**	**50.4**	**134**	**107**	**110**	**179**	**223 J**	**111 J**	**88.7**
Selenium	7782-49-2	1500	1.340 U	0.850 U	**0.248 J**	0.784 U	0.846 U	0.876 U	0.965 U	0.785 U	0.817 U	0.850 U	0.984 U	0.970 U	**0.206 J**	**0.576 J**	1.040 UJ	**0.180 J**
Silver	7440-22-4	1500	0.672 U	0.425 U	0.424 U	0.392 U	0.423 U	0.438 U	0.482 U	0.392 U	0.408 U	0.425 U	0.492 U	0.485 U	0.476 U	**0.570**	**0.225 J**	0.397 U
Zinc	7440-66-6	10000	**348**	**259**	**125**	**123**	**363**	**819**	**127**	**95.2**	**50.7**	**209**	**129**	**120**	**187**	**290 J**	**151 J**	**154**
Mercury	7439-97-6	2.8	**0.409**	**0.348**	**0.145**	**0.224**	**0.440**	**0.253**	**0.383**	**0.143**	**0.100**	**0.371**	**0.137**	**0.220**	**0.188**	**0.210**	**0.213**	**0.402**
Cyanide	57-12-5	27	**1.640**	0.638 U	0.636 U	**0.612**	0.639 U	0.657 U	0.724 U	**2.880**	0.613 U	0.638 U	0.743 U	**1.060**	0.713 U	0.770 U	0.779 U	0.595 U

Notes and definitions provided at end of table.

Notes:

mg/Kg - milligrams per kilogram

NA = Not Analyzed

ND = Not Detected

NL = Not Listed

J = The associated numerical value is an estimated quantity.

R = The associated data is rejected.

U = The material was analyzed for but not detected at, or above, the reporting limit. The associated numerical value is the sample quantitation limit.

Bold indicates compound detected in a concentration greater than the method reporting limit.

Yellow highlight indicates exceedance of the NYSDEC Part 375-6.8(b) Restricted Use Soil Cleanup Objective Commercial value.

Table 3-2
Summary of Subsurface Soil Analytical Results
Former MGP, Far Rockaway, NY

Sample Location Sample Date Sample ID Sample Interval (feet) Laboratory Identification Sample Type	CAS Number	NYSDEC Part 375-6 Commercial	SB-100 12/27/2007 SB100(4.5-5.0)-122707 4.5 - 5 Z1009-03 Sample	SB-100 12/27/2007 SB100(14-15)-122707 14 - 15 Z1009-04 Sample	SB-101 12/27/2007 SB101(4.8-5.0)-122707 4.8 - 5 Z1009-01 Sample	SB-101 12/27/2007 SB101(19-20)-122707 19 - 20 Z1009-02 Sample	SB-102 12/5/2007 SB102(4-5.5)-120507 4 - 5.5 Y5676-01 Sample	SB-102 12/5/2007 SB102(18-20)-120507 18 - 20 Y5676-02 Sample	SB-103 12/5/2007 SB103(5.5-6.5)-120507 5.5 - 6.5 Y5676-05 Sample	SB-103 12/5/2007 SB103(14-15)-120507 14 - 15 Y5676-06 Sample	SB-104 12/5/2007 SB104(5-10)-120507 5 - 10 Y5676-12 Sample	SB-104 12/5/2007 SB104(14-15)-120507 14 - 15 Y5676-13 Sample	SB-105 12/28/2007 SB105(12.0-14.0)-122807 12 - 14 Z1009-14 Sample	SB-105 12/28/2007 SB226(13.0-14.0)-122807 13 - 14 Z1009-16 Duplicate
BTEX (mg/Kg)														
Benzene	71-43-2	44	0.029 U	0.031 U	0.030 U	0.032 U	**0.037**	0.032 UJ	0.028 U	0.033 U	0.029 U	0.031 U	0.029 U	0.029 U
Ethyl Benzene	100-41-4	390	0.029 U	0.031 U	0.030 U	0.032 U	**0.770**	0.032 U	0.028 U	0.033 U	0.029 U	0.031 U	0.029 U	0.029 U
m/p-Xylenes	126777-61-2	NL	0.058 U	0.062 U	0.059 U	0.065 U	**1.400**	0.064 U	0.056 U	0.065 U	0.058 U	0.062 U	0.058 U	0.059 U
o-Xylene	95-47-6	NL	0.029 U	0.031 U	0.030 U	0.032 U	**0.830**	0.032 U	0.028 U	0.033 U	0.029 U	0.031 U	0.029 U	0.029 U
Toluene	108-88-3	500	0.029 U	0.031 U	0.030 U	0.032 U	**0.140**	0.032 U	0.028 U	0.033 U	0.029 U	0.031 U	0.029 U	0.029 U
Xylenes, Total	1330-20-7	500	0.087 U	0.093 U	0.089 U	0.097 U	**2.200**	0.096 U	0.084 U	0.098 U	0.087 U	0.094 U	0.087 U	0.088 U
Total BTEX		*NL*	*ND*	*ND*	*ND*	*ND*	***3.147***	*ND*	*ND*	*ND*	*ND*	*ND*	*ND*	*ND*
Volatile Organic Compounds (VOCs)(mg/Kg)														
1,1,1-Trichloroethane	71-55-6	500	0.029 U	0.031 U	0.030 U	0.032 U	0.029 U	0.032 U	0.028 U	0.033 U	0.029 U	0.031 U	0.029 U	0.029 U
1,1,2,2-Tetrachloroethane	79-34-5	NL	0.029 U	0.031 U	0.030 U	0.032 U	0.029 U	0.032 U	0.028 U	0.033 U	0.029 U	0.031 U	0.029 U	0.029 U
1,1,2-Trichloroethane	79-00-5	NL	0.029 U	0.031 U	0.030 U	0.032 U	0.029 U	0.032 U	0.028 U	0.033 U	0.029 U	0.031 U	0.029 U	0.029 U
1,1-Dichloroethane	75-34-3	240	0.029 U	0.031 U	0.030 U	0.032 U	0.029 U	0.032 U	0.028 U	0.033 U	0.029 U	0.031 U	0.029 U	0.029 U
1,1-Dichloroethene	75-35-4	500	0.029 U	0.031 U	0.030 U	0.032 U	0.029 U	0.032 U	0.028 U	0.033 U	0.029 U	0.031 U	0.029 U	0.029 U
1,2-Dichloroethane	107-06-2	30	0.029 U	0.031 U	0.030 U	0.032 U	0.029 U	0.032 UJ	0.028 U	0.033 U	0.029 U	0.031 U	0.029 U	0.029 U
1,2-Dichloropropane	78-87-5	NL	0.029 U	0.031 U	0.030 U	0.032 U	0.029 U	0.032 UJ	0.028 U	0.033 U	0.029 U	0.031 U	0.029 U	0.029 U
2-Butanone	78-93-3	500	0.150 U	0.150 U	0.150 U	0.160 U	0.150 U	0.160 U	0.140 U	0.160 U	0.150 U	0.160 U	0.140 U	0.150 U
2-Hexanone	591-78-6	NL	0.150 U	0.150 U	0.150 U	0.160 U	0.150 U	0.160 U	0.140 U	0.160 U	0.150 U	0.160 U	0.140 U	0.150 U
4-Methyl-2-Pentanone	108-10-1	NL	0.150 U	0.150 U	0.150 U	0.160 U	0.150 U	0.160 U	0.140 U	0.160 U	0.150 U	0.160 U	0.140 U	0.150 U
Acetone	67-64-1	500	0.150 U	0.150 U	0.150 U	0.160 U	0.150 U	0.160 U	0.140 U	0.160 U	0.150 U	0.160 U	**0.100 J**	0.150 U
Bromodichloromethane	75-27-4	NL	0.029 U	0.031 U	0.030 U	0.032 U	0.029 U	0.032 U	0.028 U	0.033 U	0.029 U	0.031 U	0.029 U	0.029 U
Bromoform	75-25-2	NL	0.029 U	0.031 U	0.030 U	0.032 U	0.029 U	0.032 U	0.028 U	0.033 U	0.029 U	0.031 U	0.029 U	0.029 U
Bromomethane	74-83-9	NL	0.029 U	0.031 U	0.030 U	0.032 U	0.029 U	0.032 U	0.028 U	0.033 U	0.029 U	0.031 U	0.029 U	0.029 U
Carbon Disulfide	75-15-0	NL	0.029 U	0.031 U	0.030 U	0.032 U	**0.024 J**	0.032 U	0.028 U	0.033 U	0.029 U	0.031 U	0.029 U	0.029 U
Carbon Tetrachloride	56-23-5	22	0.029 U	0.031 U	0.030 U	0.032 U	0.029 U	0.032 U	0.028 U	0.033 U	0.029 U	0.031 U	0.029 U	0.029 U
Chlorobenzene	108-90-7	500	0.029 U	0.031 U	0.030 U	0.032 U	0.029 U	0.032 U	0.028 U	0.033 U	0.029 U	0.031 U	0.029 U	0.029 U
Chloroethane	75-00-3	NL	0.029 U	0.031 U	0.030 U	0.032 U	0.029 U	0.032 U	0.028 U	0.033 U	0.029 U	0.031 U	0.029 U	0.029 U
Chloroform	67-66-3	350	0.029 U	0.031 U	0.030 U	0.032 U	0.029 U	0.032 U	0.028 U	0.033 U	0.029 U	0.031 U	0.029 U	0.029 U
Chloromethane	74-87-3	NL	0.029 U	0.031 U	0.030 U	0.032 U	0.029 U	0.032 U	0.028 U	0.033 U	0.029 U	0.031 U	0.029 U	0.029 U
cis-1,2-Dichloroethene	156-59-2	500	0.029 U	0.031 U	0.030 U	0.032 U	0.029 U	0.032 U	0.028 U	0.033 U	0.029 U	0.031 U	0.029 U	0.029 U
cis-1,3-Dichloropropene	10061-01-5	NL	0.029 U	0.031 U	0.030 U	0.032 U	0.029 U	0.032 UJ	0.028 U	0.033 U	0.029 U	0.031 U	0.029 U	0.029 U
Dibromochloromethane	124-48-1	NL	0.029 U	0.031 U	0.030 U	0.032 U	0.029 U	0.032 U	0.028 U	0.033 U	0.029 U	0.031 U	0.029 U	0.029 U
Methylene Chloride	75-09-2	500	0.029 U	0.031 U	0.030 U	0.032 U	0.029 U	0.032 U	0.028 U	0.033 U	0.029 U	0.031 U	0.029 U	0.029 UJ
Styrene	100-42-5	NL	0.029 U	0.031 U	0.030 U	0.032 U	**0.014 J**	0.032 U	0.028 U	0.033 U	0.029 U	0.031 U	0.029 U	0.029 U
Tetrachloroethene	127-18-4	150	0.029 U	0.031 U	0.030 U	0.032 U	0.029 U	0.032 U	0.028 U	0.033 U	**0.011 J**	0.031 U	0.029 U	0.029 U
Total 1,2-Dichloroethene	540-59-0	NL	0.058 U	0.062 U	0.060 U	0.064 U	0.059 U	0.064 U	0.056 U	0.065 U	0.058 U	0.062 U	0.058 U	0.058 U
trans-1,2-Dichloroethene	156-60-5	500	0.029 U	0.031 U	0.030 U	0.032 U	0.029 U	0.032 U	0.028 U	0.033 U	0.029 U	0.031 U	0.029 U	0.029 U
trans-1,3-Dichloropropene	10061-02-6	NL	0.029 U	0.031 U	0.030 U	0.032 U	0.029 UJ	0.032 UJ	0.028 U	0.033 U	0.029 UJ	0.031 UJ	0.029 U	0.029 U
Trichloroethene	79-01-6	200	0.029 U	0.031 U	0.030 U	0.032 U	0.029 U	0.032 U	0.028 U	0.033 U	0.029 U	0.031 U	0.029 U	0.029 U
Vinyl Chloride	75-01-4	13	0.029 U	0.031 U	0.030 U	0.032 U	0.029 U	0.032 U	0.028 U	0.033 U	0.029 U	0.031 U	0.029 U	0.029 U
Total VOCs		*NL*	*ND*	*ND*	*ND*	*ND*	***3.185***	*ND*	*ND*	*ND*	***0.011***	*ND*	***0.100***	*ND*
Polynuclear Aromatic Hydrocarbons (PAHs) (mg/Kg)														
2-Methylnaphthalene	91-57-6	NL	0.38 U	0.41 U	0.39 U	0.43 U	**0.38 J**	0.42 U	0.37 U	0.42 U	**1.3 J**	0.41 U	0.39 U	0.39 U
Acenaphthene	83-32-9	500	0.38 U	0.41 U	0.39 U	0.43 U	**0.24 J**	0.42 U	0.37 U	0.42 U	1.9 U	0.41 U	0.39 U	0.39 U
Acenaphthylene	208-96-8	500	0.38 U	0.41 U	0.39 U	0.43 U	**0.19 J**	0.42 U	0.37 U	0.42 U	1.9 U	0.41 U	0.39 U	0.39 U
Anthracene	120-12-7	500	0.38 U	0.41 U	0.39 U	0.43 U	**0.30 J**	0.42 U	0.37 U	0.42 U	1.9 U	0.41 U	0.39 U	0.39 U
Benzo(a)anthracene	56-55-3	5.6	0.38 U	0.41 U	0.39 U	0.43 U	**0.18 J**	0.42 U	0.37 U	0.42 U	1.9 U	0.41 U	0.39 U	0.39 U
Benzo(a)pyrene	50-32-8	1	0.38 U	0.41 U	0.39 U	0.43 U	**0.19 J**	0.42 U	0.37 U	0.42 U	1.9 U	0.41 U	0.39 U	0.39 U
Benzo(b)fluoranthene	205-99-2	5.6	0.38 U	0.41 U	**0.045 J**	0.43 U	**0.15 J**	0.42 U	0.37 U	0.42 U	1.9 U	0.41 U	0.39 U	0.39 U
Benzo(g,h,i)perylene	191-24-2	500	0.38 U	0.41 U	0.39 U	0.43 U	**0.17 J**	0.42 U	0.37 U	0.42 U	1.9 U	0.41 U	0.39 U	0.39 U
Benzo(k)fluoranthene	207-08-9	56	0.38 U	0.41 U	0.39 U	0.43 U	0.39 U	0.42 U	0.37 U	0.42 U	1.9 U	0.41 U	0.39 U	0.39 U
Chrysene	218-01-9	56	0.38 U	0.41 U	**0.041 J**	0.43 U	**0.19 J**	0.42 U	0.37 U	0.42 U	1.9 U	0.41 U	0.39 U	0.39 U
Dibenz(a,h)anthracene	53-70-3	0.56	0.38 U	0.41 U	0.39 U	0.43 U	0.39 U	0.42 U	0.37 U	0.42 U	1.9 U	0.41 U	0.39 U	0.39 U
Fluoranthene	206-44-0	500	0.38 U	0.41 U	**0.06 J**	0.43 U	**0.63**	0.42 U	0.37 U	0.42 U	1.9 U	0.41 U	0.39 U	0.39 U
Fluorene	86-73-7	500	0.38 U	0.41 U	0.39 U	0.43 U	**0.22 J**	0.42 U	0.37 U	0.42 U	1.9 U	0.41 U	0.39 U	0.39 U
Indeno(1,2,3-cd)pyrene	193-39-5	5.6	0.38 U	0.41 U	0.39 U	0.43 U	**0.12 J**	0.42 U	0.37 U	0.42 U	1.9 U	0.41 U	0.39 U	0.39 U
Naphthalene	91-20-3	500	0.38 U	0.41 U	0.39 U	0.43 U	**1.8**	**0.16 J**	0.37 U	0.42 U	**0.38 J**	0.41 U	**0.12 J**	**0.11 J**
Phenanthrene	85-01-8	500	0.38 U	0.41 U	**0.048 J**	0.43 U	**1.1**	0.42 U	0.37 U	0.42 U	**0.41 J**	0.41 U	0.39 U	0.39 U
Pyrene	129-00-0	500	0.38 U	0.41 U	**0.072 J**	0.43 U	**1**	0.42 U	0.37 U	0.42 U	**0.35 J**	0.41 U	0.39 U	0.39 U
Total PAHs		*NL*	*ND*	*ND*	***0.266***	*ND*	***6.86***	***0.16***	*ND*	*ND*	***2.44***	*ND*	***0.12***	***0.11***
Total Carcinogenic PAHs		*NL*	*ND*	*ND*	***0.086***	*ND*	***0.83***	*ND*	*ND*	*ND*	*ND*	*ND*	*ND*	*ND*

Notes and definitions provided at end of table.

Table 3-2
Summary of Subsurface Soil Analytical Results
Former MGP, Far Rockaway, NY

Sample Location Sample Date Sample ID Sample Interval (feet) Laboratory Identification Sample Type	CAS Number	NYSDEC Part 375-6 Commercial	SB-100 12/27/2007 SB100(4.5-5.0)-122707 4.5 - 5 Z1009-03 Sample	SB-100 12/27/2007 SB100(14-15)-122707 14 - 15 Z1009-04 Sample	SB-101 12/27/2007 SB101(4.8-5.0)-122707 4.8 - 5 Z1009-01 Sample	SB-101 12/27/2007 SB101(19-20)-122707 19 - 20 Z1009-02 Sample	SB-102 12/5/2007 SB102(4-5.5)-120507 4 - 5.5 Y5676-01 Sample	SB-102 12/5/2007 SB102(18-20)-120507 18 - 20 Y5676-02 Sample	SB-103 12/5/2007 SB103(5.5-6.5)-120507 5.5 - 6.5 Y5676-05 Sample	SB-103 12/5/2007 SB103(14-15)-120507 14 - 15 Y5676-06 Sample	SB-104 12/5/2007 SB104(5-10)-120507 5 - 10 Y5676-12 Sample	SB-104 12/5/2007 SB104(14-15)-120507 14 - 15 Y5676-13 Sample	SB-105 12/28/2007 SB105(12.0-14.0)-122807 12 - 14 Z1009-14 Sample	SB-105 12/28/2007 SB226(13.0-14.0)-122807 13 - 14 Z1009-16 Duplicate
Other Semivolatile Organic Compounds (SVOCs) (mg/Kg)														
1,2,4-Trichlorobenzene	120-82-1	NL	0.38 U	0.41 U	0.39 U	0.43 U	0.39 U	0.42 U	0.37 U	0.42 U	1.9 U	0.41 U	0.39 U	0.39 U
1,2-Dichlorobenzene	95-50-1	500	0.38 U	0.41 U	0.39 U	0.43 U	0.39 U	0.42 U	0.37 U	0.42 U	1.9 U	0.41 U	0.39 U	0.39 U
1,3-Dichlorobenzene	541-73-1	280	0.38 U	0.41 U	0.39 U	0.43 U	0.39 U	0.42 U	0.37 U	0.42 U	1.9 U	0.41 U	0.39 U	0.39 U
1,4-Dichlorobenzene	106-46-7	130	0.38 U	0.41 U	0.39 U	0.43 U	0.39 U	0.42 U	0.37 U	0.42 U	1.9 U	0.41 U	0.39 U	0.39 U
2,2-oxybis(1-Chloropropane)	108-60-1	NL	0.38 U	0.41 U	0.39 U	0.43 U	0.39 U	0.42 U	0.37 U	0.42 U	1.9 U	0.41 U	0.39 U	0.39 U
2,4,5-Trichlorophenol	95-95-4	NL	0.95 U	1.0 U	0.99 U	1.1 U	0.97 U	1.1 U	0.94 U	1.0 U	4.9 U	1.0 U	0.99 U	0.98 U
2,4,6-Trichlorophenol	88-06-2	NL	0.38 U	0.41 U	0.39 U	0.43 U	0.39 U	0.42 U	0.37 U	0.42 U	1.9 U	0.41 U	0.39 U	0.39 U
2,4-Dichlorophenol	120-83-2	NL	0.38 U	0.41 U	0.39 U	0.43 U	0.39 U	0.42 U	0.37 U	0.42 U	1.9 U	0.41 U	0.39 U	0.39 U
2,4-Dimethylphenol	105-67-9	NL	0.38 U	0.41 U	0.39 U	0.43 U	0.39 U	0.42 U	0.37 U	0.42 U	1.9 U	0.41 U	0.39 U	0.39 U
2,4-Dinitrophenol	51-28-5	NL	0.95 U	1.0 U	0.99 U	1.1 U	0.97 UJ	1.1 U	0.94 U	1.0 U	4.9 U	1.0 U	0.99 U	0.98 U
2,4-Dinitrotoluene	121-14-2	NL	0.38 U	0.41 U	0.39 U	0.43 U	0.39 U	0.42 U	0.37 U	0.42 U	1.9 U	0.41 U	0.39 U	0.39 U
2,6-Dinitrotoluene	606-20-2	NL	0.38 U	0.41 U	0.39 U	0.43 U	0.39 U	0.42 U	0.37 U	0.42 U	1.9 U	0.41 U	0.39 U	0.39 U
2-Chloronaphthalene	91-58-7	NL	0.38 U	0.41 U	0.39 U	0.43 U	0.39 U	0.42 U	0.37 U	0.42 U	1.9 U	0.41 U	0.39 U	0.39 U
2-Chlorophenol	95-57-8	NL	0.38 U	0.41 U	0.39 U	0.43 U	0.39 U	0.42 U	0.37 U	0.42 U	1.9 U	0.41 U	0.39 U	0.39 U
2-Methylphenol	95-48-7	500	0.38 U	0.41 U	0.39 U	0.43 U	0.39 U	0.42 U	0.37 U	0.42 U	1.9 U	0.41 U	0.39 U	0.39 U
2-Nitroaniline	88-74-4	NL	0.95 U	1.0 U	0.99 U	1.1 U	0.97 U	1.1 U	0.94 U	1.0 U	4.9 U	1.0 U	0.99 U	0.98 U
2-Nitrophenol	88-75-5	NL	0.38 U	0.41 U	0.39 U	0.43 U	0.39 U	0.42 U	0.37 U	0.42 U	1.9 U	0.41 U	0.39 U	0.39 U
3,3-Dichlorobenzidine	91-94-1	NL	0.38 U	0.41 U	0.39 U	0.43 U	0.39 U	0.42 U	0.37 U	0.42 U	1.9 U	0.41 U	0.39 U	0.39 U
3Methylphenols	106-44-5	500	0.38 U	0.41 U	0.39 U	0.43 U	0.39 U	0.42 U	0.37 U	0.42 U	1.9 U	0.41 U	0.39 U	0.39 U
3-Nitroaniline	99-09-2	NL	0.95 U	1.0 U	0.99 U	1.1 U	0.97 U	1.1 U	0.94 U	1.0 U	4.9 U	1.0 U	0.99 U	0.98 U
4,6-Dinitro-2-methylphenol	534-52-1	NL	0.95 U	1.0 U	0.99 U	1.1 U	0.97 UJ	1.1 U	0.94 U	1.0 U	4.9 U	1.0 U	0.99 U	0.98 U
4-Bromophenyl-phenylether	101-55-3	NL	0.38 U	0.41 U	0.39 U	0.43 U	0.39 U	0.42 U	0.37 U	0.42 U	1.9 U	0.41 U	0.39 U	0.39 U
4-Chloro-3-methylphenol	59-50-7	NL	0.38 U	0.41 U	0.39 U	0.43 U	0.39 U	0.42 U	0.37 U	0.42 U	1.9 U	0.41 U	0.39 U	0.39 U
4-Chloroaniline	106-47-8	NL	0.38 U	0.41 U	0.39 U	0.43 U	0.39 U	0.42 U	0.37 U	0.42 U	1.9 U	0.41 U	0.39 U	0.39 U
4-Chlorophenyl-phenylether	7005-72-3	NL	0.38 U	0.41 U	0.39 U	0.43 U	0.39 U	0.42 U	0.37 U	0.42 U	1.9 U	0.41 U	0.39 U	0.39 U
4-Nitroaniline	100-01-6	NL	0.95 U	1.0 U	0.99 U	1.1 U	0.97 U	1.1 U	0.94 U	1.0 U	4.9 U	1.0 U	0.99 U	0.98 U
4-Nitrophenol	100-02-7	NL	0.95 U	1.0 U	0.99 U	1.1 U	0.97 U	1.1 U	0.94 U	1.0 U	4.9 U	1.0 U	0.99 U	0.98 U
bis(2-Chloroethoxy)methane	111-91-1	NL	0.38 U	0.41 U	0.39 U	0.43 U	0.39 U	0.42 U	0.37 U	0.42 U	1.9 U	0.41 U	0.39 U	0.39 U
bis(2-Chloroethyl)ether	111-44-4	NL	0.38 U	0.41 U	0.39 U	0.43 U	0.39 U	0.42 U	0.37 U	0.42 U	1.9 U	0.41 U	0.39 U	0.39 U
bis(2-Ethylhexyl)phthalate	117-81-7	NL	0.38 U	0.41 U	0.39 U	0.43 U	0.39 U	0.42 U	0.37 U	0.42 U	1.9 U	0.41 U	0.39 U	0.39 U
Butylbenzylphthalate	85-68-7	NL	0.38 U	0.41 U	0.39 U	0.43 U	0.39 U	0.42 U	0.37 U	0.42 U	1.9 U	0.41 U	0.39 U	0.39 U
Carbazole	86-74-8	NL	0.38 U	0.41 U	0.39 U	0.43 U	0.39 U	0.42 U	0.37 U	0.42 U	1.9 U	0.41 U	0.39 U	0.39 U
Dibenzofuran	132-64-9	350	0.38 U	0.41 U	0.39 U	0.43 U	0.39 U	0.42 U	0.37 U	0.42 U	1.9 U	0.41 U	0.39 U	0.39 U
Diethylphthalate	84-66-2	NL	0.38 U	0.41 U	0.39 U	0.43 U	0.39 U	0.42 U	0.37 U	0.42 U	1.9 U	0.41 U	0.39 U	0.39 U
Dimethylphthalate	131-11-3	NL	0.38 U	0.41 U	0.39 U	0.43 U	0.39 U	0.42 U	0.37 U	0.42 U	1.9 U	0.41 U	0.39 U	0.39 U
Di-n-butylphthalate	84-74-2	NL	0.38 U	0.41 U	0.39 U	0.43 U	0.39 U	0.42 U	0.37 U	0.42 U	1.9 U	0.41 U	0.39 U	0.39 U
Di-n-octyl phthalate	117-84-0	NL	0.38 U	0.41 U	0.39 U	0.43 U	0.39 U	0.42 U	0.37 U	0.42 U	1.9 U	0.41 U	0.39 U	0.39 U
Hexachlorobenzene	118-74-1	6	0.38 U	0.41 U	0.39 U	0.43 U	0.39 U	0.42 U	0.37 U	0.42 U	1.9 U	0.41 U	0.39 U	0.39 U
Hexachlorobutadiene	87-68-3	NL	0.38 U	0.41 U	0.39 U	0.43 U	0.39 U	0.42 U	0.37 U	0.42 U	1.9 U	0.41 U	0.39 U	0.39 U
Hexachlorocyclopentadiene	77-47-4	NL	0.38 U	0.41 U	0.39 U	0.43 U	0.39 U	0.42 U	0.37 U	0.42 U	1.9 U	0.41 U	0.39 U	0.39 U
Hexachloroethane	67-72-1	NL	0.38 U	0.41 U	0.39 U	0.43 U	0.39 U	0.42 U	0.37 U	0.42 U	1.9 U	0.41 U	0.39 U	0.39 U
Isophorone	78-59-1	NL	0.38 U	0.41 U	0.39 U	0.43 U	0.39 U	0.42 U	0.37 U	0.42 U	1.9 U	0.41 U	0.39 U	0.39 U
Nitrobenzene	98-95-3	NL	0.38 U	0.41 U	0.39 U	0.43 U	0.39 U	0.42 U	0.37 U	0.42 U	1.9 U	0.41 U	0.39 U	0.39 U
N-Nitroso-di-n-propylamine	621-64-7	NL	0.38 U	0.41 U	0.39 U	0.43 U	0.39 U	0.42 U	0.37 U	0.42 U	1.9 U	0.41 U	0.39 U	0.39 U
N-Nitrosodiphenylamine	86-30-6	NL	0.38 U	0.41 U	0.39 U	0.43 U	0.39 U	0.42 U	0.37 U	0.42 U	1.9 U	0.41 U	0.39 U	0.39 U
Pentachlorophenol	87-86-5	6.7	0.95 U	1.0 U	0.99 U	1.1 U	0.97 U	1.1 U	0.94 U	1.0 U	4.9 U	1.0 U	0.99 U	0.98 U
Phenol	108-95-2	500	0.38 U	0.41 U	0.39 U	0.43 U	0.39 U	0.42 U	0.37 U	0.42 U	1.9 U	0.41 U	0.39 U	0.39 U
Total Other SVOCs		*NL*	*ND*	*ND*	*ND*	*ND*	*ND*	*ND*	*ND*	*ND*	*ND*	*ND*	*ND*	*ND*
Inorganic Compounds (mg/Kg)														
Arsenic	7440-38-2	16	**0.935**	**0.764 J**	**1.530**	**15.1**	**1.920**	**1.280**	**2.980**	**1.640**	**4.700**	**1.770**	0.796 U	0.791 U
Barium	7440-39-3	400	**22.9**	**1.140 J**	**12.1**	**11.4**	**6.490**	**1.410 J**	**6.060**	**1.740 J**	**63.9**	**0.931 J**	**0.154 J**	**0.411 J**
Cadmium	7440-43-9	9.3	**0.172 J**	0.826 U	0.800 U	0.864 U	0.786 U	0.857 U	0.756 U	0.840 U	0.782 U	0.839 U	0.796 U	0.791 U
Chromium	7440-47-3	1500	**8.230**	**1.730**	**7.860**	**7.020**	**16.1 J**	**1.660 J**	**13.4 J**	**2.370 J**	**11.0 J**	**2.900 J**	**1.500**	**1.470**
Copper	7440-50-8	270	**11.4**	**0.558 J**	**9.850**	**1.630**	**6.030**	0.857 U	**4.830**	0.840 U	**23.7**	**1.030 J+**	**0.208 J**	**0.395 J**
Iron	7439-89-6	NL	**4600**	**1230**	**5840**	**9510**	**8490 J**	**1320 J**	**9610 J**	**1850 J**	**6880 J**	**1650 J**	**692**	**757**
Lead	7439-92-1	1000	**20.8**	**0.595 J**	**23.8**	**2.970**	**3.580**	**0.630 J**	**2.660**	**0.831 J**	**246**	**0.850**	**0.344 J**	**0.467 J**
Selenium	7782-49-2	1500	0.765 U	0.826 U	0.800 U	0.864 U	0.786 U	0.857 U	0.756 U	0.840 U	**0.197 J**	0.839 U	0.796 U	0.791 U
Silver	7440-22-4	1500	0.383 U	0.413 U	0.400 U	0.432 U	0.393 U	0.428 U	0.378 U	0.420 U	0.391 U	0.419 U	0.398 U	0.395 U
Zinc	7440-66-6	10000	**103**	**3.800 J+**	**31.2**	**9.160 J+**	**11.0**	1.710 U	**30.4**	**2.670 J+**	**122**	1.680 U	**1.940 J+**	**2.600 J+**
Mercury	7439-97-6	2.8	**11.6**	**0.068**	**0.011 J**	0.013 U	**0.007 J**	0.012 U	0.011 U	0.013 U	**0.167**	0.012 U	0.012 U	0.012 U
Cyanide	57-12-5	27	0.574 U	0.619 U	0.600 U	0.647 U	0.590 U	0.643 U	0.567 U	0.630 U	0.586 U	0.629 U	0.597 U	0.593 U

Notes:

mg/Kg - milligrams per kilogram

NA = Not Analyzed

ND = Not Detected

NL = Not Listed

J = The associated numerical value is an estimated quantity.

J+ = The associated numerical value is an estimated quantity, suspected high bias.

U = The material was analyzed for but not detected at, or above, the reporting limit. The associated numerical value is the sample quantitation limit.

Bold indicates compound detected at a concentration greater than the reporting limit.

Yellow highlight indicates exceedance of the NYSDEC Part 375-6.8(b) Restricted Use Soil Cleanup Objective Commercial value.

Table 3-2
Summary of Subsurface Soil Analytical Results
Former MGP, Far Rockaway, NY

Sample Location	CAS Number	NYSDEC Part 375-6 Commercial	SB-105	SB-106	SB-106	SB-107	SB-107	SB-109	SB-109	SB-109	SB-110	SB-110	SB-110	SB-111
Sample Date			12/28/2007	12/27/2007	12/27/2007	12/5/2007	12/5/2007	12/14/2007	12/14/2007	12/14/2007	12/5/2007	12/6/2007	12/6/2007	12/27/2007
Sample ID			SB105(15.0-16.0)-122807	SB106(13-14)-122707	SB106(17.2-18.2)-122707	SB107(5.3-6.3)-120507	SB107(14-15)-120507	SB125(5-6)-121407	SB109(8-11)-121407	SB109(15-20)-121407	SB110(14-15)-120607	SB110(15-16.5)-120607	SB110(24-25)-120607	SB111(4.3-4.5)-122707
Sample Interval (feet)			15 - 16	13 - 14	17.2 - 18.2	5.3 - 6.3	14 - 15	5 - 6	8 - 11	15 - 20	14 - 15	15 - 16.5	24 - 25	4.3 - 4.5
Laboratory Identification			Z1009-15	Z1009-08	Z1009-07	Y5676-07	Y5676-08	Y5820-05	Y5820-01	Y5820-02	Y5676-09	Y5676-10	Y5676-11	Z1009-06
Sample Type			Sample	Sample	Sample	Sample	Sample	Duplicate	Sample	Sample	Sample	Sample	Sample	Sample
BTEX (mg/Kg)														
Benzene	71-43-2	44	0.030 U	0.030 U	0.031 U	0.034 U	0.031 U	0.028 U	0.028 U	0.028 U	0.031 U	0.029 U	0.030 U	0.031 U
Ethyl Benzene	100-41-4	390	0.030 U	0.030 U	0.031 U	0.034 U	0.031 U	0.028 U	0.028 U	0.028 U	0.031 U	0.029 U	0.030 U	0.031 U
m/p-Xylenes	126777-61-2	NL	0.060 U	0.060 U	0.061 U	0.068 U	0.061 U	0.057 U	0.055 U	0.056 U	0.062 U	0.058 U	0.060 U	0.062 U
o-Xylene	95-47-6	NL	0.030 U	0.030 U	0.031 U	0.034 U	0.031 U	0.028 U	0.028 U	0.028 U	0.031 U	0.029 U	0.030 U	0.031 U
Toluene	108-88-3	500	0.030 U	0.030 U	0.031 U	0.034 U	0.031 U	0.028 U	0.028 U	0.028 U	0.031 U	0.029 U	0.030 U	0.031 U
Xylenes, Total	1330-20-7	500	0.090 U	0.090 U	0.092 U	0.100 U	0.092 U	0.085 U	0.083 U	0.084 U	0.094 U	0.087 U	0.090 U	0.093 U
Total BTEX		*NL*	*ND*	*ND*	*ND*	*ND*	*ND*	*ND*	*ND*	*ND*	*ND*	*ND*	*ND*	*ND*
Volatile Organic Compounds (VOCs)(mg/Kg)														
1,1,1-Trichloroethane	71-55-6	500	0.030 U	0.030 U	0.031 U	0.034 U	0.031 U	0.028 U	0.028 U	0.028 U	0.031 U	0.029 U	0.030 U	0.031 U
1,1,2,2-Tetrachloroethane	79-34-5	NL	0.030 U	0.030 U	0.031 U	0.034 U	0.031 U	0.028 U	0.028 U	0.028 U	0.031 U	0.029 U	0.030 U	0.031 U
1,1,2-Trichloroethane	79-00-5	NL	0.030 U	0.030 U	0.031 U	0.034 U	0.031 U	0.028 U	0.028 U	0.028 U	0.031 U	0.029 U	0.030 U	0.031 U
1,1-Dichloroethane	75-34-3	240	0.030 U	0.030 U	0.031 U	0.034 U	0.031 U	0.028 U	0.028 U	0.028 U	0.031 U	0.029 U	0.030 U	0.031 U
1,1-Dichloroethene	75-35-4	500	0.030 U	0.030 U	0.031 U	0.034 U	0.031 U	0.028 U	0.028 U	0.028 U	0.031 U	0.029 U	0.030 U	0.031 U
1,2-Dichloroethane	107-06-2	30	0.030 U	0.030 U	0.031 U	0.034 U	0.031 U	0.028 U	0.028 U	0.028 U	0.031 U	0.029 U	0.030 U	0.031 U
1,2-Dichloropropane	78-87-5	NL	0.030 U	0.030 U	0.031 U	0.034 U	0.031 U	0.028 U	0.028 U	0.028 UJ	0.031 U	0.029 U	0.030 U	0.031 U
2-Butanone	78-93-3	500	0.150 U	0.150 U	0.150 U	0.170 U	0.150 U	0.140 U	0.140 U	0.140 U	0.160 U	0.140 U	0.150 U	0.150 U
2-Hexanone	591-78-6	NL	0.150 U	0.150 U	0.150 U	0.170 U	0.150 U	0.140 U	0.140 U	0.140 U	0.160 U	0.140 U	0.150 U	0.150 U
4-Methyl-2-Pentanone	108-10-1	NL	0.150 U	0.150 U	0.150 U	0.170 U	0.150 U	0.140 U	0.140 U	0.140 U	0.160 U	0.140 U	0.150 U	0.150 U
Acetone	67-64-1	500	0.150 U	0.150 U	0.150 U	0.170 U	0.150 U	0.140 U	0.140 U	0.140 U	0.160 U	0.140 U	0.150 U	0.150 U
Bromodichloromethane	75-27-4	NL	0.030 U	0.030 U	0.031 U	0.034 U	0.031 U	0.028 U	0.028 U	0.028 U	0.031 U	0.029 U	0.030 U	0.031 U
Bromoform	75-25-2	NL	0.030 U	0.030 U	0.031 U	0.034 U	0.031 U	0.028 U	0.028 U	0.028 U	0.031 U	0.029 U	0.030 U	0.031 U
Bromomethane	74-83-9	NL	0.030 U	0.030 U	0.031 U	0.034 U	0.031 U	0.028 UJ	0.028 UJ	0.028 UJ	0.031 U	0.029 U	0.030 U	0.031 U
Carbon Disulfide	75-15-0	NL	0.030 U	0.030 U	0.031 U	0.034 U	0.031 U	0.028 U	0.028 U	0.028 UJ	0.031 U	0.029 U	0.030 U	0.031 U
Carbon Tetrachloride	56-23-5	22	0.030 U	0.030 U	0.031 U	0.034 U	0.031 U	0.028 U	0.028 U	0.028 U	0.031 U	0.029 U	0.030 U	0.031 U
Chlorobenzene	108-90-7	500	0.030 U	0.030 U	0.031 U	0.034 U	0.031 U	0.028 U	0.028 U	0.028 U	0.031 U	0.029 U	0.030 U	0.031 U
Chloroethane	75-00-3	NL	0.030 U	0.030 U	0.031 U	0.034 U	0.031 U	0.028 U	0.028 U	0.028 U	0.031 U	0.029 U	0.030 U	0.031 U
Chloroform	67-66-3	350	0.030 U	0.030 U	0.031 U	0.034 U	0.031 U	0.028 U	0.028 U	0.028 U	0.031 U	0.029 U	0.030 U	0.031 U
Chloromethane	74-87-3	NL	0.030 U	0.030 U	0.031 U	0.034 U	0.031 U	0.028 U	0.028 U	0.028 U	0.031 U	0.029 U	0.030 U	0.031 U
cis-1,2-Dichloroethene	156-59-2	500	0.030 U	0.030 U	0.031 U	0.034 U	0.031 U	0.028 U	0.028 U	0.028 U	0.031 U	0.029 U	0.030 U	0.031 U
cis-1,3-Dichloropropene	10061-01-5	NL	0.030 U	0.030 U	0.031 U	0.034 U	0.031 U	0.028 U	0.028 U	0.028 U	0.031 U	0.029 U	0.030 U	0.031 U
Dibromochloromethane	124-48-1	NL	0.030 U	0.030 U	0.031 U	0.034 U	0.031 U	0.028 U	0.028 U	0.028 U	0.031 U	0.029 U	0.030 U	0.031 U
Methylene Chloride	75-09-2	500	0.030 UJ	0.030 U	0.031 U	0.034 U	0.031 U	0.028 U	0.028 U	0.028 U	0.031 U	0.029 U	0.030 U	0.031 U
Styrene	100-42-5	NL	0.030 U	0.030 U	0.031 U	0.034 U	0.031 U	0.028 U	0.028 U	0.028 U	0.031 U	0.029 U	0.030 U	0.031 U
Tetrachloroethene	127-18-4	150	0.030 U	0.030 U	0.031 U	0.034 U	0.031 U	0.028 U	0.028 U	0.028 U	0.031 U	0.029 U	0.030 U	0.031 U
Total 1,2-Dichloroethene	540-59-0	NL	0.060 U	0.060 U	0.062 U	0.068 U	0.061 U	0.056 U	0.056 U	0.056 U	0.062 U	0.058 U	0.060 U	0.062 U
trans-1,2-Dichloroethene	156-60-5	500	0.030 U	0.030 U	0.031 U	0.034 U	0.031 U	0.028 U	0.028 U	0.028 U	0.031 U	0.029 U	0.030 U	0.031 U
trans-1,3-Dichloropropene	10061-02-6	NL	0.030 U	0.030 U	0.031 U	0.034 U	0.031 UJ	0.028 U	0.028 U	0.028 U	0.031 U	0.029 U	0.030 U	0.031 U
Trichloroethene	79-01-6	200	0.030 U	0.030 U	0.031 U	0.034 U	0.031 U	0.028 U	0.028 U	0.028 U	0.031 U	0.029 U	0.030 U	0.031 U
Vinyl Chloride	75-01-4	13	0.030 U	0.030 U	0.031 U	0.034 U	0.031 U	0.028 U	0.028 U	0.028 U	0.031 U	0.029 U	0.030 U	0.031 U
Total VOCs		*NL*	*ND*	*ND*	*ND*	*ND*	*ND*	*ND*	*ND*	*ND*	*ND*	*ND*	*ND*	*ND*
Polynuclear Aromatic Hydrocarbons (PAHs) (mg/Kg)														
2-Methylnaphthalene	91-57-6	NL	0.39 U	0.39 U	0.41 U	0.45 U	0.41 U	0.38 U	0.37 U	0.37 U	0.41 U	0.39 U	**0.08 J**	0.41 U
Acenaphthene	83-32-9	500	0.39 U	0.39 U	0.41 U	0.45 U	0.41 U	0.38 U	0.37 U	0.37 U	0.41 U	0.39 U	0.40 U	0.41 U
Acenaphthylene	208-96-8	500	0.39 U	0.39 U	0.41 U	0.45 U	0.41 U	0.38 U	0.37 U	0.37 U	0.41 U	0.39 U	**0.092 J**	0.41 U
Anthracene	120-12-7	500	0.39 U	0.39 U	0.41 U	0.45 U	0.41 U	0.38 U	0.37 U	0.37 U	0.41 U	0.39 U	0.40 U	0.41 U
Benzo(a)anthracene	56-55-3	5.6	0.39 U	0.39 U	0.41 U	0.45 U	0.41 U	0.38 U	0.37 U	0.37 U	0.41 U	0.39 U	0.40 U	0.41 U
Benzo(a)pyrene	50-32-8	1	0.39 U	0.39 U	0.41 U	0.45 U	0.41 U	0.38 U	0.37 U	0.37 U	0.41 U	0.39 U	0.40 U	0.41 U
Benzo(b)fluoranthene	205-99-2	5.6	0.39 U	0.39 U	0.41 U	0.45 U	0.41 U	0.38 U	0.37 U	0.37 U	0.41 U	0.39 U	0.40 U	0.41 U
Benzo(g,h,i)perylene	191-24-2	500	0.39 U	0.39 U	0.41 U	0.45 U	0.41 U	0.38 U	0.37 U	0.37 U	0.41 U	0.39 U	0.40 U	0.41 U
Benzo(k)fluoranthene	207-08-9	56	0.39 U	0.39 U	0.41 U	0.45 U	0.41 U	0.38 U	0.37 U	0.37 U	0.41 U	0.39 U	0.40 U	0.41 U
Chrysene	218-01-9	56	0.39 U	0.39 U	0.41 U	0.45 U	0.41 U	0.38 U	0.37 U	0.37 U	0.41 U	0.39 U	0.40 U	0.41 U
Dibenz(a,h)anthracene	53-70-3	0.56	0.39 U	0.39 U	0.41 U	0.45 U	0.41 U	0.38 U	0.37 U	0.37 U	0.41 U	0.39 U	0.40 U	0.41 U
Fluoranthene	206-44-0	500	0.39 U	0.39 U	0.41 U	0.45 U	0.41 U	0.38 U	0.37 U	0.37 U	0.41 U	0.39 U	0.40 U	0.41 U
Fluorene	86-73-7	500	0.39 U	0.39 U	0.41 U	0.45 U	0.41 U	0.38 U	0.37 U	0.37 U	0.41 U	0.39 U	0.40 U	0.41 U
Indeno(1,2,3-cd)pyrene	193-39-5	5.6	0.39 U	0.39 U	0.41 U	0.45 U	0.41 U	0.38 U	0.37 U	0.37 U	0.41 U	0.39 U	0.40 U	0.41 U
Naphthalene	91-20-3	500	0.39 U	**0.12 J**	0.41 U	0.45 U	0.41 U	0.38 U	0.37 U	0.37 U	**0.32 J**	0.39 U	**0.15 J**	0.41 U
Phenanthrene	85-01-8	500	0.39 U	0.39 U	0.41 U	0.45 U	0.41 U	0.38 U	0.37 U	0.37 U	0.41 U	0.39 U	**0.12 J**	0.41 U
Pyrene	129-00-0	500	0.39 U	0.39 U	0.41 U	0.45 U	0.41 U	0.38 U	0.37 U	0.37 U	0.41 U	0.39 U	0.40 U	0.41 U
Total PAHs		*NL*	*ND*	***0.12***	*ND*	*ND*	*ND*	*ND*	*ND*	*ND*	***0.32***	*ND*	***0.442***	*ND*
Total Carcinogenic PAHs		*NL*	*ND*	*ND*	*ND*	*ND*	*ND*	*ND*	*ND*	*ND*	*ND*	*ND*	*ND*	*ND*

Notes and definitions provided at end of table.

Table 3-2
Summary of Subsurface Soil Analytical Results
Former MGP, Far Rockaway, NY

Sample Location / Sample Date / Sample ID / Sample Interval (feet) / Laboratory Identification / Sample Type	CAS Number	NYSDEC Part 375-6 Commercial	SB-105 12/28/2007 SB105(15.0-16.0)-122807 15 - 16 Z1009-15 Sample	SB-106 12/27/2007 SB106(13-14)-122707 13 - 14 Z1009-08 Sample	SB-106 12/27/2007 SB106(17.2-18.2)-122707 17.2 - 18.2 Z1009-07 Sample	SB-107 12/5/2007 SB107(5.3-6.3)-120507 5.3 - 6.3 Y5676-07 Sample	SB-107 12/5/2007 SB107(14-15)-120507 14 - 15 Y5676-08 Sample	SB-109 12/14/2007 SB125(5-6)-121407 5 - 6 Y5820-05 Duplicate	SB-109 12/14/2007 SB109(8-11)-121407 8 - 11 Y5820-01 Sample	SB-109 12/14/2007 SB109(15-20)-121407 15 - 20 Y5820-02 Sample	SB-110 12/5/2007 SB110(14-15)-120607 14 - 15 Y5676-09 Sample	SB-110 12/6/2007 SB110(15-16.5)-120607 15 - 16.5 Y5676-10 Sample	SB-110 12/6/2007 SB110(24-25)-120607 24 - 25 Y5676-11 Sample	SB-111 12/27/2007 SB111(4.3-4.5)-122707 4.3 - 4.5 Z1009-06 Sample
Other Semivolatile Organic Compounds (SVOCs) (mg/Kg)														
1,2,4-Trichlorobenzene	120-82-1	NL	0.39 U	0.39 U	0.41 U	0.45 U	0.41 U	0.38 U	0.37 U	0.37 U	0.41 U	0.39 U	0.40 U	0.41 U
1,2-Dichlorobenzene	95-50-1	500	0.39 U	0.39 U	0.41 U	0.45 U	0.41 U	0.38 U	0.37 U	0.37 U	0.41 U	0.39 U	0.40 U	0.41 U
1,3-Dichlorobenzene	541-73-1	280	0.39 U	0.39 U	0.41 U	0.45 U	0.41 U	0.38 U	0.37 U	0.37 U	0.41 U	0.39 U	0.40 U	0.41 U
1,4-Dichlorobenzene	106-46-7	130	0.39 U	0.39 U	0.41 U	0.45 U	0.41 U	0.38 U	0.37 U	0.37 U	0.41 U	0.39 U	0.40 U	0.41 U
2,2-oxybis(1-Chloropropane)	108-60-1	NL	0.39 U	0.39 U	0.41 U	0.45 U	0.41 U	0.38 U	0.37 U	0.37 U	0.41 U	0.39 U	0.40 U	0.41 U
2,4,5-Trichlorophenol	95-95-4	NL	0.98 U	0.99 U	1.0 U	1.1 U	1.0 U	0.96 U	0.93 U	0.94 U	1.0 U	0.99 U	1.0 U	1.0 U
2,4,6-Trichlorophenol	88-06-2	NL	0.39 U	0.39 U	0.41 U	0.45 U	0.41 U	0.38 U	0.37 U	0.37 U	0.41 U	0.39 U	0.40 U	0.41 U
2,4-Dichlorophenol	120-83-2	NL	0.39 U	0.39 U	0.41 U	0.45 U	0.41 U	0.38 U	0.37 U	0.37 U	0.41 U	0.39 U	0.40 U	0.41 U
2,4-Dimethylphenol	105-67-9	NL	0.39 U	0.39 U	0.41 U	0.45 U	0.41 U	0.38 U	0.37 U	0.37 U	0.41 U	0.39 U	0.40 U	0.41 U
2,4-Dinitrophenol	51-28-5	NL	0.98 U	0.99 U	1.0 U	1.1 U	1.0 U	0.96 UJ	0.93 UJ	0.94 UJ	1.0 U	0.99 U	1.0 U	1.0 U
2,4-Dinitrotoluene	121-14-2	NL	0.39 U	0.39 U	0.41 U	0.45 U	0.41 U	0.38 U	0.37 U	0.37 U	0.41 U	0.39 U	0.40 U	0.41 U
2,6-Dinitrotoluene	606-20-2	NL	0.39 U	0.39 U	0.41 U	0.45 U	0.41 U	0.38 U	0.37 U	0.37 U	0.41 U	0.39 U	0.40 U	0.41 U
2-Chloronaphthalene	91-58-7	NL	0.39 U	0.39 U	0.41 U	0.45 U	0.41 U	0.38 U	0.37 U	0.37 U	0.41 U	0.39 U	0.40 U	0.41 U
2-Chlorophenol	95-57-8	NL	0.39 U	0.39 U	0.41 U	0.45 U	0.41 U	0.38 U	0.37 U	0.37 U	0.41 U	0.39 U	0.40 U	0.41 U
2-Methylphenol	95-48-7	500	0.39 U	0.39 U	0.41 U	0.45 U	0.41 U	0.38 U	0.37 U	0.37 U	0.41 U	0.39 U	0.40 U	0.41 U
2-Nitroaniline	88-74-4	NL	0.98 U	0.99 U	1.0 U	1.1 U	1.0 U	0.96 U	0.93 U	0.94 U	1.0 U	0.99 U	1.0 U	1.0 U
2-Nitrophenol	88-75-5	NL	0.39 U	0.39 U	0.41 U	0.45 U	0.41 U	0.38 U	0.37 U	0.37 U	0.41 U	0.39 U	0.40 U	0.41 U
3,3-Dichlorobenzidine	91-94-1	NL	0.39 U	0.39 U	0.41 U	0.45 U	0.41 U	0.38 U	0.37 U	0.37 U	0.41 U	0.39 U	0.40 U	0.41 U
3Methylphenols	106-44-5	500	0.39 U	0.39 U	0.41 U	0.45 U	0.41 U	0.38 U	0.37 U	0.37 U	0.41 U	0.39 U	0.40 U	0.41 U
3-Nitroaniline	99-09-2	NL	0.98 U	0.99 U	1.0 U	1.1 U	1.0 U	0.96 U	0.93 U	0.94 U	1.0 U	0.99 U	1.0 U	1.0 U
4,6-Dinitro-2-methylphenol	534-52-1	NL	0.98 U	0.99 U	1.0 U	1.1 U	1.0 U	0.96 U	0.93 U	0.94 UJ	1.0 U	0.99 U	1.0 U	1.0 U
4-Bromophenyl-phenylether	101-55-3	NL	0.39 U	0.39 U	0.41 U	0.45 U	0.41 U	0.38 U	0.37 U	0.37 U	0.41 U	0.39 U	0.40 U	0.41 U
4-Chloro-3-methylphenol	59-50-7	NL	0.39 U	0.39 U	0.41 U	0.45 U	0.41 U	0.38 U	0.37 U	0.37 U	0.41 U	0.39 U	0.40 U	0.41 U
4-Chloroaniline	106-47-8	NL	0.39 U	0.39 U	0.41 U	0.45 U	0.41 U	0.38 UJ	0.37 UJ	0.37 UJ	0.41 U	0.39 U	0.40 U	0.41 U
4-Chlorophenyl-phenylether	7005-72-3	NL	0.39 U	0.39 U	0.41 U	0.45 U	0.41 U	0.38 U	0.37 U	0.37 U	0.41 U	0.39 U	0.40 U	0.41 U
4-Nitroaniline	100-01-6	NL	0.98 U	0.99 U	1.0 U	1.1 U	1.0 U	0.96 U	0.93 U	0.94 U	1.0 U	0.99 U	1.0 U	1.0 U
4-Nitrophenol	100-02-7	NL	0.98 U	0.99 U	1.0 U	1.1 U	1.0 U	0.96 U	0.93 U	0.94 U	1.0 U	0.99 U	1.0 U	1.0 U
bis(2-Chloroethoxy)methane	111-91-1	NL	0.39 U	0.39 U	0.41 U	0.45 U	0.41 U	0.38 U	0.37 U	0.37 U	0.41 U	0.39 U	0.40 U	0.41 U
bis(2-Chloroethyl)ether	111-44-4	NL	0.39 U	0.39 U	0.41 U	0.45 U	0.41 U	0.38 U	0.37 U	0.37 U	0.41 U	0.39 U	0.40 U	0.41 U
bis(2-Ethylhexyl)phthalate	117-81-7	NL	0.39 U	0.39 U	0.41 U	0.45 U	0.41 U	0.38 U	0.37 U	0.37 U	0.41 U	0.39 U	0.40 U	0.41 U
Butylbenzylphthalate	85-68-7	NL	0.39 U	0.39 U	0.41 U	0.45 U	0.41 U	0.38 U	0.37 U	0.37 U	0.41 U	0.39 U	0.40 U	0.41 U
Carbazole	86-74-8	NL	0.39 U	0.39 U	0.41 U	0.45 U	0.41 U	0.38 U	0.37 U	0.37 U	0.41 U	0.39 U	0.40 U	0.41 U
Dibenzofuran	132-64-9	350	0.39 U	0.39 U	0.41 U	0.45 U	0.41 U	0.38 U	0.37 U	0.37 U	0.41 U	0.39 U	0.40 U	0.41 U
Diethylphthalate	84-66-2	NL	0.39 U	0.39 U	0.41 U	0.45 U	0.41 U	0.38 U	0.37 U	0.37 U	0.41 U	0.39 U	0.40 U	0.41 U
Dimethylphthalate	131-11-3	NL	0.39 U	0.39 U	0.41 U	0.45 U	0.41 U	0.38 U	0.37 U	0.37 U	0.41 U	0.39 U	0.40 U	0.41 U
Di-n-butylphthalate	84-74-2	NL	0.39 U	0.39 U	0.41 U	0.45 U	0.41 U	0.38 U	0.37 U	0.37 U	0.41 U	0.39 U	0.40 U	0.41 U
Di-n-octyl phthalate	117-84-0	NL	0.39 U	0.39 U	0.41 U	0.45 U	0.41 U	0.38 U	0.37 U	0.37 U	0.41 U	0.39 U	0.40 U	0.41 U
Hexachlorobenzene	118-74-1	6	0.39 U	0.39 U	0.41 U	0.45 U	0.41 U	0.38 U	0.37 U	0.37 U	0.41 U	0.39 U	0.40 U	0.41 U
Hexachlorobutadiene	87-68-3	NL	0.39 U	0.39 U	0.41 U	0.45 U	0.41 U	0.38 U	0.37 U	0.37 U	0.41 U	0.39 U	0.40 U	0.41 U
Hexachlorocyclopentadiene	77-47-4	NL	0.39 U	0.39 U	0.41 U	0.45 U	0.41 U	0.38 UJ	0.37 UJ	0.37 UJ	0.41 U	0.39 U	0.40 U	0.41 U
Hexachloroethane	67-72-1	NL	0.39 U	0.39 U	0.41 U	0.45 U	0.41 U	0.38 U	0.37 U	0.37 U	0.41 U	0.39 U	0.40 U	0.41 U
Isophorone	78-59-1	NL	0.39 U	0.39 U	0.41 U	0.45 U	0.41 U	0.38 U	0.37 U	0.37 U	0.41 U	0.39 U	0.40 U	0.41 U
Nitrobenzene	98-95-3	NL	0.39 U	0.39 U	0.41 U	0.45 U	0.41 U	0.38 U	0.37 U	0.37 U	0.41 U	0.39 U	0.40 U	0.41 U
N-Nitroso-di-n-propylamine	621-64-7	NL	0.39 U	0.39 U	0.41 U	0.45 U	0.41 U	0.38 U	0.37 U	0.37 U	0.41 U	0.39 U	0.40 U	0.41 U
N-Nitrosodiphenylamine	86-30-6	NL	0.39 U	0.39 U	0.41 U	0.45 U	0.41 U	0.38 U	0.37 U	0.37 U	0.41 U	0.39 U	0.40 U	0.41 U
Pentachlorophenol	87-86-5	6.7	0.98 U	0.99 U	1.0 U	1.1 U	1.0 U	0.96 U	0.93 U	0.94 U	1.0 U	0.99 U	1.0 U	1.0 U
Phenol	108-95-2	500	0.39 U	0.39 U	0.41 U	0.45 U	0.41 U	0.38 U	0.37 U	0.37 U	0.41 U	0.39 U	0.40 U	0.41 U
Total Other SVOCs		*NL*	*ND*	*ND*	*ND*	*ND*	*ND*	*ND*	*ND*	*ND*	*ND*	*ND*	*ND*	*ND*
Inorganic Compounds (mg/Kg)														
Arsenic	7440-38-2	16	**0.506 J**	**0.283 J**	**0.333 J**	**1.740**	**1.340**	**1.120**	**1.150**	**2.080**	**0.559 J**	**0.372 J**	**6.880**	**0.840**
Barium	7440-39-3	400	3.960 U	**1.910 J**	4.150 U	**5.710**	**3.340 J**	**2.040 J**	**1.310 J**	**0.591 J**	**0.611 J**	3.990 U	**21.3**	**6.580**
Cadmium	7440-43-9	9.3	0.793 U	0.808 U	0.829 U	0.896 U	0.831 U	0.779 U	0.752 U	0.754 U	0.838 U	0.798 U	0.812 U	0.822 U
Chromium	7440-47-3	1500	**1.480**	**2.230**	**1.250**	**4.170 J**	**2.690 J**	**4.750**	**2.970**	**4.700**	**1.280 J**	**0.695 J**	**14.3 J**	**3.430**
Copper	7440-50-8	270	**0.204 J**	**0.707 J**	**0.188 J**	**2.410**	**0.943 J+**	**1.480**	**0.952**	**1.530**	0.838 U	0.798 U	**5.100**	**2.730**
Iron	7439-89-6	NL	**822**	**1690**	**950**	**2510 J**	**2280 J**	**2790**	**2920**	**4130**	**782 J**	**357 J**	**12300 J**	**2900**
Lead	7439-92-1	1000	**0.243 J**	**0.987**	**0.188 J**	**4.450**	**1.150**	**0.780**	**0.320 J**	0.754 U	**0.488 J**	0.798 U	**5.040**	**1.870**
Selenium	7782-49-2	1500	0.793 U	0.808 U	0.829 U	0.896 U	0.831 U	0.779 U	0.752 U	0.754 U	0.838 U	0.798 U	0.812 U	0.822 U
Silver	7440-22-4	1500	0.396 U	0.404 U	0.415 U	0.448 U	0.416 U	0.389 U	0.376 U	**0.164 J**	0.419 U	0.399 U	0.406 U	0.411 U
Zinc	7440-66-6	10000	**1.830 J+**	**3.930 J+**	**2.240 J+**	**9.190 J+**	**3.020 J+**	**7.140**	**4.960**	**5.220**	1.680 U	1.600 U	**17.4**	**13.7 J+**
Mercury	7439-97-6	2.8	0.012 U	0.012 U	0.012 U	0.013 U	**0.011 J**	0.012 UJ	0.011 UJ	0.011 UJ	**0.004 J**	0.012 U	0.012 U	0.012 U
Cyanide	57-12-5	27	0.595 U	0.606 U	0.622 U	0.672 U	0.623 U	0.584 U	0.564 U	0.566 U	0.628 U	0.599 U	0.609 U	0.617 U

Notes:
mg/Kg - milligrams per kilogram
NA = Not Analyzed
ND = Not Detected
NL = Not Listed
J = The associated numerical value is an estimated quantity.
J+ = The associated numerical value is an estimated quantity, suspected high bias.
U = The material was analyzed for but not detected at, or above, the reporting limit. The a
Bold indicates compound detected at a concentration greater than the reporting limit.
Yellow highlight indicates exceedance of the NYSDEC Part 375-6.8(b) Restricted Use Soi

Table 3-2
Summary of Subsurface Soil Analytical Results
Former MGP, Far Rockaway, NY

Sample Location	CAS Number	NYSDEC Part 375-6 Commercial	SB-111	SB-113D	SB-113D	SB-113D	SB-114	SB-114	SB-115	SB-115	SB-116	SB-116
Sample Date			12/27/2007	12/28/2007	12/28/2007	12/28/2007	12/7/2007	12/7/2007	12/5/2007	12/5/2007	12/7/2007	12/7/2007
Sample ID			SB111(36.3-37.3)-122707	SB113D(9.0-10.0)-122807	SB113D(14.0-15.0)-122807	SB113D(34.5-37.3)-122807	SB114(8.2-9.2)-120707	SB114(14-15)-120707	SB115(7.5-8.5)-120507	SB115(11.5-12.5)-120507	SB116D(5-5.5)-120707	SB116D(38.9-39.9)-120707
Sample Interval (feet)			36.3 - 37.3	9 - 10	14 - 15	34.5 - 37.3	8.2 - 9.2	14 - 15	7.5 - 8.5	11.5 - 12.5	5 - 5.5	38.9 - 39.9
Laboratory Identification			Z1009-05	Z1009-09	Z1009-10	Z1009-12	Y5676-14	Y5676-15	Y5676-03	Y5676-04	Y5676-16	Y5676-17
Sample Type			Sample	Sample	Sample	Sample	Sample	Sample	Sample	Sample	Sample	Sample
BTEX (mg/Kg)												
Benzene	71-43-2	44	0.031 U	0.028 U	0.030 U	0.031 U	0.028 U	0.030 U	0.700 U	0.030 U	0.029 U	0.031 U
Ethyl Benzene	100-41-4	390	0.031 U	**0.038**	0.030 U	0.031 U	0.028 U	0.030 U	0.700 U	0.030 U	0.029 U	0.031 U
m/p-Xylenes	126777-61-2	NL	0.062 U	**0.040 J**	0.060 U	0.063 U	0.057 U	0.061 U	**1.400 J**	0.060 U	0.057 U	0.062 U
o-Xylene	95-47-6	NL	0.031 U	**0.021 J**	0.030 U	0.031 U	0.028 U	0.030 U	0.700 U	0.030 U	0.029 U	0.031 U
Toluene	108-88-3	500	0.031 U	**0.038**	0.030 U	0.031 U	0.028 U	0.030 U	0.700 U	0.030 U	0.029 U	0.031 U
Xylenes, Total	1330-20-7	500	0.093 U	**0.061 J**	0.090 U	0.094 U	0.085 U	0.091 U	**1.400 J**	0.090 U	0.086 U	0.093 U
Total BTEX		*NL*	*ND*	***0.137***	*ND*	*ND*	*ND*	*ND*	***1.400***	*ND*	*ND*	*ND*
Volatile Organic Compounds (VOCs)(mg/Kg)												
1,1,1-Trichloroethane	71-55-6	500	0.031 U	0.028 U	0.030 U	0.031 U	0.028 U	0.030 U	0.700 U	0.030 U	0.029 U	0.031 U
1,1,2,2-Tetrachloroethane	79-34-5	NL	0.031 U	0.028 U	0.030 U	0.031 U	0.028 U	0.030 U	0.700 U	0.030 U	0.029 U	0.031 U
1,1,2-Trichloroethane	79-00-5	NL	0.031 U	0.028 U	0.030 U	0.031 U	0.028 U	0.030 U	0.700 U	0.030 U	0.029 U	0.031 U
1,1-Dichloroethane	75-34-3	240	0.031 U	0.028 U	0.030 U	0.031 U	0.028 U	0.030 U	0.700 U	0.030 U	0.029 U	0.031 U
1,1-Dichloroethene	75-35-4	500	0.031 U	0.028 U	0.030 U	0.031 U	0.028 U	0.030 U	0.700 U	0.030 U	0.029 U	0.031 U
1,2-Dichloroethane	107-06-2	30	0.031 U	0.028 U	0.030 U	0.031 U	0.028 U	0.030 U	0.700 U	0.030 U	0.029 U	0.031 U
1,2-Dichloropropane	78-87-5	NL	0.031 U	0.028 U	0.030 U	0.031 U	0.028 U	0.030 U	0.700 U	0.030 U	0.029 U	0.031 U
2-Butanone	78-93-3	500	0.160 U	0.140 U	0.150 U	0.160 U	0.140 U	0.150 U	3.500 U	0.150 U	0.140 U	0.150 U
2-Hexanone	591-78-6	NL	0.160 U	0.140 U	0.150 U	0.160 U	0.140 U	0.150 U	3.500 U	0.150 U	0.140 U	0.150 U
4-Methyl-2-Pentanone	108-10-1	NL	0.160 U	0.140 U	0.150 U	0.160 U	0.140 U	0.150 U	3.500 U	0.150 U	0.140 U	0.150 U
Acetone	67-64-1	500	**0.180**	**0.160 J**	0.150 U	**0.250**	0.140 U	0.150 U	3.500 U	0.150 U	0.140 U	0.150 U
Bromodichloromethane	75-27-4	NL	0.031 U	0.028 U	0.030 U	0.031 U	0.028 U	0.030 U	0.700 U	0.030 U	0.029 U	0.031 U
Bromoform	75-25-2	NL	0.031 U	0.028 U	0.030 U	0.031 U	0.028 U	0.030 U	0.700 U	0.030 U	0.029 U	0.031 U
Bromomethane	74-83-9	NL	0.031 U	0.028 U	0.030 U	0.031 U	0.028 U	0.030 U	0.700 U	0.030 U	0.029 U	0.031 U
Carbon Disulfide	75-15-0	NL	0.031 U	0.028 U	0.030 U	0.031 U	0.028 U	0.030 U	0.700 U	0.030 U	0.029 U	0.031 U
Carbon Tetrachloride	56-23-5	22	0.031 U	0.028 U	0.030 U	0.031 UJ	0.028 U	0.030 U	0.700 U	0.030 U	0.029 U	0.031 U
Chlorobenzene	108-90-7	500	0.031 U	0.028 U	0.030 U	0.031 U	0.028 U	0.030 U	0.700 U	0.030 U	0.029 U	0.031 U
Chloroethane	75-00-3	NL	0.031 U	0.028 U	0.030 U	0.031 U	0.028 U	0.030 U	0.700 U	0.030 U	0.029 U	0.031 U
Chloroform	67-66-3	350	0.031 U	0.028 U	0.030 U	0.031 U	0.028 U	0.030 U	0.700 U	0.030 U	0.029 U	0.031 U
Chloromethane	74-87-3	NL	0.031 U	0.028 U	0.030 U	0.031 U	0.028 UJ	0.030 UJ	0.700 U	0.030 U	0.029 U	0.031 U
cis-1,2-Dichloroethene	156-59-2	500	0.031 U	0.028 U	0.030 U	0.031 U	0.028 U	0.030 U	0.700 U	0.030 U	0.029 U	0.031 U
cis-1,3-Dichloropropene	10061-01-5	NL	0.031 U	0.028 U	0.030 U	0.031 U	0.028 U	0.030 U	0.700 U	0.030 U	0.029 U	0.031 U
Dibromochloromethane	124-48-1	NL	0.031 U	0.028 U	0.030 U	0.031 U	0.028 U	0.030 U	0.700 U	0.030 U	0.029 U	0.031 U
Methylene Chloride	75-09-2	500	0.031 U	0.028 UJ	0.030 UJ	0.031 U	0.028 U	0.030 U	0.700 U	0.030 U	0.029 U	0.031 U
Styrene	100-42-5	NL	0.031 U	0.028 U	0.030 U	0.031 U	0.028 U	0.030 U	0.700 U	0.030 U	0.029 U	0.031 U
Tetrachloroethene	127-18-4	150	0.031 U	0.028 U	0.030 U	0.031 U	0.028 U	0.030 U	0.700 U	0.030 U	0.029 U	0.031 U
Total 1,2-Dichloroethene	540-59-0	NL	0.062 U	0.056 U	0.060 U	0.062 U	0.057 U	0.061 U	1.400 U	0.060 U	0.057 U	0.062 U
trans-1,2-Dichloroethene	156-60-5	500	0.031 U	0.028 U	0.030 U	0.031 U	0.028 U	0.030 U	0.700 U	0.030 U	0.029 U	0.031 U
trans-1,3-Dichloropropene	10061-02-6	NL	0.031 U	0.028 U	0.030 U	0.031 U	0.028 U	0.030 U	0.700 U	0.030 U	0.029 UJ	0.031 UJ
Trichloroethene	79-01-6	200	0.031 U	0.028 U	0.030 U	0.031 U	0.028 U	0.030 U	0.700 U	0.030 U	0.029 U	0.031 U
Vinyl Chloride	75-01-4	13	0.031 U	0.028 U	0.030 U	0.031 U	0.028 U	0.030 U	0.700 U	0.030 U	0.029 U	0.031 U
Total VOCs		*NL*	***0.180***	***0.297***	*ND*	***0.250***	*ND*	*ND*	***1.400***	*ND*	*ND*	*ND*
Polynuclear Aromatic Hydrocarbons (PAHs) (mg/Kg)												
2-Methylnaphthalene	91-57-6	NL	0.42 U	0.37 U	0.40 U	0.42 U	0.38 U	0.41 U	**91**	**0.069 J**	0.39 U	0.41 U
Acenaphthene	83-32-9	500	0.42 U	0.37 U	0.40 U	0.42 U	**0.072 J**	0.41 U	**9.2**	0.40 U	0.39 U	0.41 U
Acenaphthylene	208-96-8	500	0.42 U	0.37 U	0.40 U	0.42 U	**0.310 J**	0.41 U	**74**	**0.085 J**	0.39 U	0.41 U
Anthracene	120-12-7	500	0.42 U	0.37 U	0.40 U	0.42 U	**0.55**	0.41 U	**15**	0.40 U	0.39 U	0.41 U
Benzo(a)anthracene	56-55-3	5.6	0.42 U	0.37 U	0.40 U	0.42 U	**0.77**	0.41 U	**8.4**	0.40 U	**0.072 J**	0.41 U
Benzo(a)pyrene	50-32-8	1	0.42 U	0.37 U	0.40 U	0.42 U	**0.67**	0.41 U	**7.9**	0.40 U	**0.08 J**	0.41 U
Benzo(b)fluoranthene	205-99-2	5.6	0.42 U	0.37 U	0.40 U	0.42 U	**0.71**	0.41 U	**7.2**	0.40 U	**0.12 J**	0.41 U
Benzo(g,h,i)perylene	191-24-2	500	0.42 U	0.37 U	0.40 U	0.42 U	**0.58**	0.41 U	**6.3**	0.40 U	**0.096 J**	0.41 U
Benzo(k)fluoranthene	207-08-9	56	0.42 U	0.37 U	0.40 U	0.42 U	**0.28 J**	0.41 U	**1.8**	0.40 U	0.39 U	0.41 U
Chrysene	218-01-9	56	0.42 U	0.37 U	0.40 U	0.42 U	**0.83**	0.41 U	**8.7**	0.40 U	**0.096 J**	0.41 U
Dibenz(a,h)anthracene	53-70-3	0.56	0.42 U	0.37 U	0.40 U	0.42 U	0.38 U	0.41 U	**0.17 J**	0.40 U	0.39 U	0.41 U
Fluoranthene	206-44-0	500	0.42 U	0.37 U	0.40 U	0.42 U	**2.4**	0.41 U	**30**	0.40 U	**0.14 J**	0.41 U
Fluorene	86-73-7	500	0.42 U	0.37 U	0.40 U	0.42 U	**0.35 J**	0.41 U	**22**	0.40 U	0.39 U	0.41 U
Indeno(1,2,3-cd)pyrene	193-39-5	5.6	0.42 U	0.37 U	0.40 U	0.42 U	**0.46**	0.41 U	**4.2**	0.40 U	**0.095 J**	0.41 U
Naphthalene	91-20-3	500	0.42 U	**0.38**	0.40 U	0.42 U	0.38 U	0.41 U	**140**	**0.07 J**	0.39 U	0.41 U
Phenanthrene	85-01-8	500	0.42 U	**0.06 J**	0.40 U	0.42 U	**2.1**	0.41 U	**74**	**0.11 J**	**0.072 J**	0.41 U
Pyrene	129-00-0	500	0.42 U	0.37 U	0.40 U	0.42 U	**2.7**	0.41 U	**44**	**0.073 J**	**0.17 J**	0.41 U
Total PAHs		*NL*	*ND*	***0.44***	*ND*	*ND*	***12.782***	*ND*	***543.87***	***0.407***	***0.941***	*ND*
Total Carcinogenic PAHs		*NL*	*ND*	*ND*	*ND*	*ND*	***3.72***	*ND*	***38.37***	*ND*	***0.463***	*ND*

Notes and definitions provided at end of table.

Table 3-2
Summary of Subsurface Soil Analytical Results
Former MGP, Far Rockaway, NY

Sample Location	CAS Number	NYSDEC Part 375-6 Commercial	SB-111	SB-113D	SB-113D	SB-113D	SB-114	SB-114	SB-115	SB-115	SB-116	SB-116
Sample Date			12/27/2007	12/28/2007	12/28/2007	12/28/2007	12/7/2007	12/7/2007	12/5/2007	12/5/2007	12/7/2007	12/7/2007
Sample ID			SB111(36.3-37.3)-122707	SB113D(9.0-10.0)-122807	SB113D(14.0-15.0)-122807	SB113D(34.5-37.3)-122807	SB114(8.2-9.2)-120707	SB114(14-15)-120707	SB115(7.5-8.5)-120507	SB115(11.5-12.5)-120507	SB116D(5-5.5)-120707	SB116D(38.9-39.9)-120707
Sample Interval (feet)			36.3 - 37.3	9 - 10	14 - 15	34.5 - 37.3	8.2 - 9.2	14 - 15	7.5 - 8.5	11.5 - 12.5	5 - 5.5	38.9 - 39.9
Laboratory Identification			Z1009-05	Z1009-09	Z1009-10	Z1009-12	Y5676-14	Y5676-15	Y5676-03	Y5676-04	Y5676-16	Y5676-17
Sample Type			Sample	Sample	Sample	Sample	Sample	Sample	Sample	Sample	Sample	Sample
Other Semivolatile Organic Compounds (SVOCs) (mg/Kg)												
1,2,4-Trichlorobenzene	120-82-1	NL	0.42 U	0.37 U	0.40 U	0.42 U	0.38 U	0.41 U	0.37 U	0.40 U	0.39 U	0.41 U
1,2-Dichlorobenzene	95-50-1	500	0.42 U	0.37 U	0.40 U	0.42 U	0.38 U	0.41 U	0.37 U	0.40 U	0.39 U	0.41 U
1,3-Dichlorobenzene	541-73-1	280	0.42 U	0.37 U	0.40 U	0.42 U	0.38 U	0.41 U	0.37 U	0.40 U	0.39 U	0.41 U
1,4-Dichlorobenzene	106-46-7	130	0.42 U	0.37 U	0.40 U	0.42 U	0.38 U	0.41 U	0.37 U	0.40 U	0.39 U	0.41 U
2,2-oxybis(1-Chloropropane)	108-60-1	NL	0.42 U	0.37 U	0.40 U	0.42 U	0.38 U	0.41 U	0.37 U	0.40 U	0.39 U	0.41 U
2,4,5-Trichlorophenol	95-95-4	NL	1.1 U	0.94 U	1.0 U	1.0 U	0.95 U	1.0 U	0.93 U	1.0 U	0.97 U	1.0 U
2,4,6-Trichlorophenol	88-06-2	NL	0.42 U	0.37 U	0.40 U	0.42 U	0.38 U	0.41 U	0.37 U	0.40 U	0.39 U	0.41 U
2,4-Dichlorophenol	120-83-2	NL	0.42 U	0.37 U	0.40 U	0.42 U	0.38 U	0.41 U	0.37 U	0.40 U	0.39 U	0.41 U
2,4-Dimethylphenol	105-67-9	NL	0.42 U	0.37 U	0.40 U	0.42 U	0.38 U	0.41 U	0.37 U	0.40 U	0.39 U	0.41 U
2,4-Dinitrophenol	51-28-5	NL	1.1 U	0.94 U	1.0 U	1.0 U	0.95 U	1.0 U	0.93 U	1.0 U	0.97 U	1.0 U
2,4-Dinitrotoluene	121-14-2	NL	0.42 U	0.37 U	0.40 U	0.42 U	0.38 U	0.41 U	0.37 U	0.40 U	0.39 U	0.41 U
2,6-Dinitrotoluene	606-20-2	NL	0.42 U	0.37 U	0.40 U	0.42 U	0.38 U	0.41 U	0.37 U	0.40 U	0.39 U	0.41 U
2-Chloronaphthalene	91-58-7	NL	0.42 U	0.37 U	0.40 U	0.42 U	0.38 U	0.41 U	0.37 U	0.40 U	0.39 U	0.41 U
2-Chlorophenol	95-57-8	NL	0.42 U	0.37 U	0.40 U	0.42 U	0.38 U	0.41 U	0.37 U	0.40 U	0.39 U	0.41 U
2-Methylphenol	95-48-7	500	0.42 U	0.37 U	0.40 U	0.42 U	0.38 U	0.41 U	0.37 U	0.40 U	0.39 U	0.41 U
2-Nitroaniline	88-74-4	NL	1.1 U	0.94 U	1.0 U	1.0 U	0.95 U	1.0 U	0.93 U	1.0 U	0.97 U	1.0 U
2-Nitrophenol	88-75-5	NL	0.42 U	0.37 U	0.40 U	0.42 U	0.38 U	0.41 U	0.37 U	0.40 U	0.39 U	0.41 U
3,3-Dichlorobenzidine	91-94-1	NL	0.42 U	0.37 U	0.40 U	0.42 U	0.38 U	0.41 U	0.37 U	0.40 U	0.39 U	0.41 U
3Methylphenols	106-44-5	500	0.42 U	0.37 U	0.40 U	0.42 U	0.38 U	0.41 U	0.37 U	0.40 U	0.39 U	0.41 U
3-Nitroaniline	99-09-2	NL	1.1 U	0.94 U	1.0 U	1.0 U	0.95 U	1.0 U	0.93 U	1.0 U	0.97 U	1.0 U
4,6-Dinitro-2-methylphenol	534-52-1	NL	1.1 U	0.94 U	1.0 U	1.0 U	0.95 U	1.0 U	0.93 U	1.0 U	0.97 U	1.0 U
4-Bromophenyl-phenylether	101-55-3	NL	0.42 U	0.37 U	0.40 U	0.42 U	0.38 U	0.41 U	0.37 U	0.40 U	0.39 U	0.41 U
4-Chloro-3-methylphenol	59-50-7	NL	0.42 U	0.37 U	0.40 U	0.42 U	0.38 U	0.41 U	0.37 U	0.40 U	0.39 U	0.41 U
4-Chloroaniline	106-47-8	NL	0.42 U	0.37 U	0.40 U	0.42 U	0.38 U	0.41 U	0.37 U	0.40 U	0.39 U	0.41 U
4-Chlorophenyl-phenylether	7005-72-3	NL	0.42 U	0.37 U	0.40 U	0.42 U	0.38 U	0.41 U	0.37 U	0.40 U	0.39 U	0.41 U
4-Nitroaniline	100-01-6	NL	1.1 U	0.94 U	1.0 U	1.0 U	0.95 U	1.0 U	0.93 U	1.0 U	0.97 U	1.0 U
4-Nitrophenol	100-02-7	NL	1.1 U	0.94 U	1.0 U	1.0 U	0.95 U	1.0 U	0.93 U	1.0 U	0.97 U	1.0 U
bis(2-Chloroethoxy)methane	111-91-1	NL	0.42 U	0.37 U	0.40 U	0.42 U	0.38 U	0.41 U	0.37 U	0.40 U	0.39 U	0.41 U
bis(2-Chloroethyl)ether	111-44-4	NL	0.42 U	0.37 U	0.40 U	0.42 U	0.38 U	0.41 U	0.37 U	0.40 U	0.39 U	0.41 U
bis(2-Ethylhexyl)phthalate	117-81-7	NL	0.42 U	0.37 U	0.40 U	0.42 U	0.38 U	0.41 U	0.37 U	0.40 U	0.39 U	0.41 U
Butylbenzylphthalate	85-68-7	NL	0.42 U	0.37 U	0.40 U	0.42 U	0.38 U	0.41 U	0.37 U	0.40 U	0.39 U	0.41 U
Carbazole	86-74-8	NL	0.42 U	0.37 U	0.40 U	0.42 U	0.38 U	0.41 U	0.37 U	0.40 U	0.39 U	0.41 U
Dibenzofuran	132-64-9	350	0.42 U	0.37 U	0.40 U	0.42 U	0.38 U	0.41 U	0.37 U	0.40 U	0.39 U	0.41 U
Diethylphthalate	84-66-2	NL	0.42 U	0.37 U	0.40 U	0.42 U	0.38 U	0.41 U	0.37 U	0.40 U	0.39 U	0.41 U
Dimethylphthalate	131-11-3	NL	0.42 U	0.37 U	0.40 U	0.42 U	0.38 U	0.41 U	0.37 U	0.40 U	0.39 U	0.41 U
Di-n-butylphthalate	84-74-2	NL	0.42 U	0.37 U	0.40 U	0.42 U	0.38 U	0.41 U	0.37 U	0.40 U	0.39 U	0.41 U
Di-n-octyl phthalate	117-84-0	NL	0.42 U	0.37 U	0.40 U	0.42 U	0.38 U	0.41 U	0.37 U	0.40 U	0.39 U	0.41 U
Hexachlorobenzene	118-74-1	6	0.42 U	0.37 U	0.40 U	0.42 U	0.38 U	0.41 U	0.37 U	0.40 U	0.39 U	0.41 U
Hexachlorobutadiene	87-68-3	NL	0.42 U	0.37 U	0.40 U	0.42 U	0.38 U	0.41 U	0.37 U	0.40 U	0.39 U	0.41 U
Hexachlorocyclopentadiene	77-47-4	NL	0.42 U	0.37 U	0.40 U	0.42 U	0.38 U	0.41 U	0.37 U	0.40 U	0.39 U	0.41 U
Hexachloroethane	67-72-1	NL	0.42 U	0.37 U	0.40 U	0.42 U	0.38 U	0.41 U	0.37 U	0.40 U	0.39 U	0.41 U
Isophorone	78-59-1	NL	0.42 U	0.37 U	0.40 U	0.42 U	0.38 U	0.41 U	0.37 U	0.40 U	0.39 U	0.41 U
Nitrobenzene	98-95-3	NL	0.42 U	0.37 U	0.40 U	0.42 U	0.38 U	0.41 U	0.37 U	0.40 U	0.39 U	0.41 U
N-Nitroso-di-n-propylamine	621-64-7	NL	0.42 U	0.37 U	0.40 U	0.42 U	0.38 U	0.41 U	0.37 U	0.40 U	0.39 U	0.41 U
N-Nitrosodiphenylamine	86-30-6	NL	0.42 U	0.37 U	0.40 U	0.42 U	0.38 U	0.41 U	0.37 U	0.40 U	0.39 U	0.41 U
Pentachlorophenol	87-86-5	6.7	1.1 U	0.94 U	1.0 U	1.0 U	0.95 U	1.0 U	0.93 U	1.0 U	0.97 U	1.0 U
Phenol	108-95-2	500	0.42 U	0.37 U	0.40 U	0.42 U	0.38 U	0.41 U	0.37 U	0.40 U	0.39 U	0.41 U
Total Other SVOCs		*NL*	*ND*	*ND*	*ND*	*ND*	*ND*	*ND*	*ND*	*ND*	*ND*	*ND*
Inorganic Compounds (mg/Kg)												
Arsenic	7440-38-2	16	**10.8**	**1.350**	**0.944**	**8.540**	**1.010**	**1.930**	**2.060**	**2.610**	**2.850**	**8.830**
Barium	7440-39-3	400	**18.4**	**4.050**	**0.602 J**	**15.5**	**10.4**	**2.800 J**	**5.880**	**4.940**	**27.3**	**15.0**
Cadmium	7440-43-9	9.3	**0.073 J**	0.755 U	0.817 U	**0.068 J**	0.766 U	0.820 U	0.750 U	0.803 U	0.782 U	0.826 U
Chromium	7440-47-3	1500	**19.0**	**5.760**	**1.500**	**16.8**	**12.5 J**	**2.840 J**	**16.7 J**	**3.990 J**	**8.130 J**	**19.1 J**
Copper	7440-50-8	270	**2.320**	**2.670**	**0.215 J**	**1.460**	**7.860**	**1.110 J+**	**4.180**	**1.690 J+**	**28.6**	**3.480**
Iron	7439-89-6	NL	**23900**	**4520**	**1000**	**23000**	**6340 J**	**2090 J**	**11200 J**	**2700 J**	**5920 J**	**17900 J**
Lead	7439-92-1	1000	**6.420**	**1.990**	**0.435 J**	**5.600**	**2.330**	**1.110**	**2.200**	**1.330**	**86.5**	**4.740**
Selenium	7782-49-2	1500	0.860 U	0.755 U	0.817 U	0.843 U	**0.330 J**	0.820 U	0.750 U	0.803 U	0.782 U	0.826 U
Silver	7440-22-4	1500	0.430 U	0.378 U	0.408 U	0.421 U	0.383 U	0.410 U	0.375 U	0.402 U	0.391 U	0.413 U
Zinc	7440-66-6	10000	**41.3**	**7.590 J+**	**2.280 J+**	**41.9**	**31.2**	**2.810 J+**	**9.160 J+**	**4.570 J+**	**47.7**	**33.7**
Mercury	7439-97-6	2.8	0.013 U	0.011 U	0.012 U	0.013 U	0.011 U	0.012 U	0.011 U	**0.007 J**	**0.081**	0.012 U
Cyanide	57-12-5	27	0.645 U	0.566 U	0.613 U	0.632 U	0.575 U	0.615 U	0.562 U	0.602 U	0.587 U	0.620 U

Notes:

mg/Kg - milligrams per kilogram

NA = Not Analyzed

ND = Not Detected

NL = Not Listed

J = The associated numerical value is an estimated quantity.

J+ = The associated numerical value is an estimated quantity, suspected high bias.

U = The material was analyzed for but not detected at, or above, the reporting limit. The a

Bold indicates compound detected at a concentration greater than the reporting limit.

Yellow highlight indicates exceedance of the NYSDEC Part 375-6.8(b) Restricted Use Soi

Table 3-4
Summary of Groundwater Grab Sample Analytical Results
Former MGP, Far Rockaway, NY

Location ID / Sample Date / Sample Depth (ft bgs) / Sample ID	CAS Number	NYSDEC Groundwater Guidance or Standard Value[1]	105-1D 1/13/2009 32 - 36 105-1D-011309	110-D 11/12/2008 29.5 - 33.5 110D-111208	118-1D 1/12/2009 32 - 36 118-1D-011209	118-1S 1/12/2009 6 - 10 118-1S-011209	119-1D 11/11/2008 30 - 34 119-1D-111108	119-1S 11/11/2008 5 - 9 119-1S-111108	120-1S 1/13/2009 5 - 9 120-1S-011309
BTEX (ug/L)									
Benzene	71-43-2	1	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Ethylbenzene	100-41-4	5	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Toluene	108-88-3	5	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
m/p-Xylenes	1330-20-7-M,P	NL	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U
o-Xylene	95-47-6	NL	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Xylenes (total)		5	3.0 U	3.0 U	3.0 U	3.0 U	3.0 U	3.0 U	3.0 U
Total BTEX		*NL*	*ND*	*ND*	*ND*	*ND*	*ND*	*ND*	*ND*
Volatile Organic Compounds (VOCs) (ug/L)									
Naphthalene	91-20-3	10	1.0 U	**1.3**	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Styrene	100-42-5	5	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Total VOCs		*NL*	*ND*	***1.3***	*ND*	*ND*	*ND*	*ND*	*ND*

Notes:

1 - Guidance or Standard Values - NYSDEC, Division of Water, TOGS (1.1.1) - 6 NYCRR 703.5 [NYSDEC, 1998].

ft bgs = Feet below ground surface

ug/L - micrograms per liter

NL = Not Listed

ND = Not Detected

D = The associated numerical value is from a diluted sample.

J = The associated numerical value is an estimated quantity.

U = The material was analyzed for but not detected at, or above, the reporting limit. The associated numerical value is the sample quantitation limit.

Bold indicates compound detected at a concentration greater than the reporting limit.

Yellow highlight indicates exceedance of the NYSDEC Groundwater Guidance or Standard Value.

Table 3-3
Summary of Subsurface Soil Sample Impacts
Former MGP, Far Rockaway, NY

Sample ID	Sample Date	Boring Depth (feet bgs)	Sample Depth (feet bgs)	Impacts	
				Impact Type	Depth (feet bgs)
SB100(4.5-5.0)-12272007	12/27/2007	15	4.5 to 5	-	-
SB100(14-15)-12272007	12/27/2007		14 to 15	-	-
SB101(4.8-5.0)-12272007	12/27/2007	20	4.8 to 5	-	-
SB101(19-20)-12272007	12/27/2007		19 to 20	-	-
SB102(4-5.5)-12052007	12/5/2007	20	4 to 5.5	NLO	0.2 to 10
SB102(18-20)-12052007	12/5/2007		18 to 20	Sheen	4 to 5.5
					4 to 5.5
SB103(5.5-6.5)-12052007	12/5/2007	15	5.5 to 6.5	-	-
SB103(14-15)-12052007	12/5/2007		14 to 15	-	-
SB104(5-10)-12052007	12/5/2007	15	5 to 10	NLO	5.7 to 6.2
SB104(14-15)-12052007	12/5/2007		14 to 15	Staining	5.7 to 6.2
SB105(12.0-14.0)-12282007	12/28/2007	25	12 to 14	Staining	5 to 6.7 11.2 to 14
SB105(15.0-16.0)-12282007	12/28/2007		15 to 16	NLO	5 to 6.7 11.2 to 14
SB106(13-14)-12272007	12/27/2007	25	13 to 14	NLO	6.8 to 6.9 7.6 to 7.7 9.6 to 14.8 15 to 17.2 24.5 to 25
SB106(17.2-18.2)-12272007	12/27/2007		17.2 to 18.2	Staining	6.8 to 6.9 7.6 to 7.7 9.6 to 14.8
SB107(5.3-6.3)-12052007	12/5/2007	15	5.3 to 6.3	-	-
SB107(14-15)-12052007	12/5/2007		14 to 15	-	-
SB125(5-6)-12142007 (Duplicate of SB109(8-11)-12142007)	12/14/2007	20	5 to 6		
SB109(8-11)-12142007	12/14/2007		8 to 11	-	-
SB109(15-20)-12142007	12/14/2007		15 to 20	-	-
SB109(15-20)-12142007MS	12/14/2007		15 to 20	-	-
SB109(15-20)-12142007MSD	12/14/2007		15 to 20	-	-
SB110(14-15)-12062007	12/6/2007	25	14 to 15	Staining	11.8 to 15
SB110(15-16.5)-12062007	12/6/2007		15 to 16.5	NLO	12 to 15
SB110(24-25)-12062007	12/6/2007		24 to 25		
SB111(4.3-4.5)-12272007	12/27/2007	45	4.3 to 4.5	-	-
SB111(36.3-37.3)-12272007	12/27/2007		36.3 to 37.3	-	-
SB113D(9.0-10.0)-12282007	12/28/2007	45	9 to 10	PLO	1.3 to 4
SB113D(14.0-15.0)-12282007	12/28/2007		14 to 15	Staining	7.3 to 12.8
				NLO	4 to 13.3 18.5 to 20 24 to 24.1
SB113D(34.5-37.3)-12282007	12/28/2007		35 to 37.3	-	-
SB114(8.2-9.2)-12072007	12/7/2007	20	8.2 to 9.2	Sheen	8.2 to 8.4
SB114(14-15)-12072007	12/7/2007		14 to 15	Staining	8.2 to 11.3
				NLO	8.2 to 12
SB115(7.5-8.5)-12052007	12/5/2007	20	7.5 to 8.5	Tar Coating	5 to 9.5
				Staining	5 to 8.8
SB115(11.5-12.5)-12052007	12/5/2007		11.5 to 12.5	Sheen	5 to 6
				NLO	5 to 9.5
SB116D(5-5.5)-12072007	12/7/2007	45	7 to 11.2	-	-
SB116D(38.9-39.9)-12072007	12/7/2007		38.9 to 39.9	-	-
PDI-1	8/31/2009	37	0 to 7	-	0 to 7
PDI-1	8/31/2009		7 9	NLO	7.4 to 8.1
PDI-1	8/31/2009		9.0 13	Staining	9 to 11.2
PDI-1	8/31/2009		13 15	Staining	13 to 13.6
PDI-1	8/31/2009		15 to 37	-	15 to 37
PDI-2	8/31/2009	37	0 to 7	-	0 to 7
PDI-2	8/31/2009		7.0 9	Staining	7.6 to 7.9
PDI-2	8/31/2009		7.0 9	Tar Coating	7.9 to 9
PDI-2	8/31/2009		9.0 15	Staining	9.7 to 13.5

Table 3-3
Summary of Subsurface Soil Sample Impacts
Former MGP, Far Rockaway, NY

Sample ID	Sample Date	Boring Depth (feet bgs)	Sample Depth (feet bgs)	Impacts	
				Impact Type	Depth (feet bgs)
PDI-2	8/31/2009		15 25	Staining	13 to 13.6
PDI-2	8/31/2009		25 to 27	Tar Coating	26.75 to 26.80
PDI-2	8/31/2009		27 37	-	27 to 37
PDI-3	9/1/2009		0 to 24	-	0 to 24
PDI-3	9/1/2009	37	24 26	Tar Coating	25.65 to 25.72
PDI-3	9/1/2009		26.0 37	-	26 to 37
PDI-4	9/4/2009	37	0 to 38	-	0 to 37
PDI-5	9/2/2009		0 to 7	-	0 to 7
PDI-5	9/2/2009	37	7 9	Staining	7.8 to 9.0
PDI-5	9/2/2009		9.0 37	-	9 to 37
PDI-6	9/3/2009		0 to 5	Tar Coating	2 to 5
PDI-6	9/3/2009		5.0 7	Staining	7.6 to 7.9
PDI-6	9/3/2009	38	7.0 9	Sheen	7 to 8.6
PDI-6	9/3/2009		7.0 9	Staining	8.6 to 9
PDI-6	9/3/2009		9 11	Staining	9 to 9.2
PDI-6	9/3/2009		11 38	-	11 to 38
PDI-7	9/3/2009		0 to 9	-	0 to 9
PDI-7	9/3/2009		9.0 11	Coating	9 to 9.25
PDI-7	9/3/2009	40	9.0 11	Staining	9.7 to 11
PDI-7	9/3/2009		11 13	Staining	11 to 11.7
PDI-7	9/3/2009		11 13	NLO	12.8 to 13
PDI-7	9/3/2009		13 40	-	11 to 40

Notes:

bgs = below ground surface

NLO = Naphthalene-like odor

PLO = Petroleum-like odor

Staining is not representative of MGP source material

- = MGP impacts were not observed

Table 3-4
Summary of Groundwater Grab Sample Analytical Results
Former MGP, Far Rockaway, NY

Location ID Sample Date Sample Depth (ft bgs) Sample ID	CAS Number	NYSDEC Groundwater Guidance or Standard Value[1]	121-1D 11/10/2008 31 - 35 121-1D-111008	121-2D 11/14/2008 32 - 36 121-2D-111408	121-1S 11/10/2008 5 - 9 121-1S-111008	121-2S 11/10/2008 5 - 9 121-2S-111008	121-3S 11/11/2008 7 - 11 121-3S-111108	121-4S 11/25/2008 5 - 9 121-4S-112508
BTEX (ug/L)								
Benzene	71-43-2	1	1.0 U	1.0 U	**33**	**8.6 J**	1.0 U	**4.5**
Ethylbenzene	100-41-4	5	**7.6**	1.0 U	**6900 D**	**2800 D**	1.0 U	**2000 D**
Toluene	108-88-3	5	**1.1**	1.0 U	**8300 D**	**1100**	1.0 U	**40**
m/p-Xylenes	1330-20-7-M,P	NL	**7.5**	2.0 U	**12000 D**	**4700 D**	2.0 U	**180**
o-Xylene	95-47-6	NL	**4.6**	**0.74 J**	**7100 D**	**2800 D**	1.0 U	**700 D**
Xylenes (total)		5	**12.1**	**2.74**	**19100**	**7500**	3.0 U	**880**
Total BTEX		*NL*	***20.8***	***2.74***	***34333***	***11408.6***	*ND*	***2924.5***
Volatile Organic Compounds (VOCs) (ug/L)								
Naphthalene	91-20-3	10	**56**	**8.9**	**27000 D**	**12000 D**	1.0 U	**5500 D**
Styrene	100-42-5	5	**1.4**	**0.58 J**	**13000 D**	**3000 D**	1.0 U	1.0 U
Total VOCs		*NL*	***78.2***	***12.22***	***74333***	***26408.6***	*ND*	***8424.5***

Notes:

1 - Guidance or Standard Values - NYSDEC, Division of Water, TOGS (1.1.1) - 6 NYCRR 703.5 [NYSDEC, 1998].

ft bgs = Feet below ground surface

ug/L - micrograms per liter

NL = Not Listed

ND = Not Detected

D = The associated numerical value is from a diluted sample.

J = The associated numerical value is an estimated quantity.

U = The material was analyzed for but not detected at, or above, the reporting limit. The associated numerical value is the sample quantitation limit.

Bold indicates compound detected at a concentration greater than the reporting limit.

Yellow highlight indicates exceedance of the NYSDEC Groundwater Guidance or Standard Value.

Table 3-5
Summary of Groundwater Analytical Results
Former MGP, Far Rockaway, NY

Sample Location Sample Date Sample ID Laboratory Identification Sample Type	CAS Number	NYSDEC Groundwater Guidance or Standard Value[1]	MW-100 1/22/2008 MW-100-012208 Z1256-01 Sample	MW-105 1/21/2008 MW-105-012108 Z1256-02 Sample	MW-105D 2/11/2009 MW-105D-021109 A1500-11 Sample	MW-107 1/22/2008 MW-107-012208 Z1256-03 Sample	MW-109 1/22/2008 MW-109-012208 Z1256-06 Sample	MW-110 1/22/2008 MW-110-012208 Z1256-07 Sample	MW-110 11/4/2008 MW-110-110408 Z5420-01 Sample	MW-110 9/9/2009 MW-110-090909 A4296-01 Sample	MW-110 9/9/2009 DUP-090909 A4296-06 Duplicate	MW-110D 2/12/2009 MW-110D-021209 A1500-07 Sample	MW-110D 9/9/2009 MW-110D-090909 A4296-02 Sample	MW-111S 1/21/2008 MW-111S-012108 Z1256-09 Sample	MW-111D 1/21/2008 MW-111D-012108 Z1256-08 Sample	MW-113S 1/22/2008 MW-113S-012208 Z1256-11 Sample	MW-113D 1/22/2008 MW-113D-012208 Z1256-10 Sample	MW-114 1/22/2008 MW-225-012208 Z1256-12 Sample	MW-114 1/22/2008 MW-114-012208 Z1256-15 Duplicate	MW-116S 1/21/2008 MW-116S-012108 Z1256-14 Sample
BTEX (ug/L)																				
Benzene	71-43-2	1	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	**0.71 J**	**0.80 J**	**0.95 J**	**1.4**	**2.7**	1.0 U	1.0 U	1.0 U	**400**	**4.4**	**3.2**	**2.8**	1.0 U
Ethyl Benzene	100-41-4	5	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	**0.52 J**	1.0 U	1.0 U	1.0 U	**16**	1.0 U	1.0 U	1.0 U	**7300**	**66**	**700 J**	**340 J**	1.0 U
m/p-Xylenes	126777-61-2	NL	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	NA	NA	**5.0**	NA	2.0 U	2.0 U	**5600**	**42**	**1600 J**	**760 J**	2.0 U
o-Xylene	95-47-6	NL	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	**9.6**	**34**	NA	NA	**7.3**	NA	1.0 U	1.0 U	**2500**	**29**	**800 J**	**380 J**	1.0 U
Toluene	108-88-3	5	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	**1.7**	**0.56 J**	1.0 U	1.0 U	**1.7**	1.0 U	1.0 U	1.0 U	**15000**	**5.9**	**76 J**	**39 J**	1.0 U
Xylenes, Total	1330-20-7	5	3.0 U	3.0 U	3.0 U	3.0 U	3.0 U	**9.6**	**34**	3.0 U	3.0 U	**12**	3.0 U	3.0 U	3.0 U	**8100**	**71**	**2400 J**	**1100 J**	3.0 U
Total BTEX		*NL*	*ND*	*ND*	ND	*ND*	*ND*	***12.53***	***35.36***	***0.95***	***1.4***	***32.4***	*ND*	*ND*	*ND*	***30800***	***147.3***	***3179.2***	***1481.8***	*ND*
Volatile Organic Compounds (VOCs) (ug/L)																				
1,1,1-Trichloroethane	71-55-6	5	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	2.0 U	1.0 U	1.0 U	1.0 U
1,1,2,2-Tetrachloroethane	79-34-5	5	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	**R**	2.0 U	1.0 U	1.0 U	1.0 U
1,1,2-Trichloroethane	79-00-5	1	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	2.0 U	1.0 U	1.0 U	1.0 U
1,1-Dichloroethane	75-34-3	5	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	2.0 U	1.0 U	1.0 U	1.0 U
1,1-Dichloroethene	75-35-4	5	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	2.0 U	1.0 U	1.0 U	1.0 U
1,2-Dichloroethane	107-06-2	5	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	2.0 U	1.0 U	1.0 U	1.0 U
1,2-Dichloropropane	78-87-5	1	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	2.0 U	1.0 U	1.0 U	1.0 U
2-Butanone	78-93-3	50	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	10 U	5.0 U	5.0 U	5.0 U
2-Hexanone	591-78-6	50	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	10 U	5.0 U	5.0 U	5.0 U
4-Methyl-2-Pentanone	108-10-1	NL	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	10 U	5.0 U	5.0 U	5.0 U
Acetone	67-64-1	50	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	**15**	10 U	5.0 U	5.0 U	5.0 U
Bromodichloromethane	75-27-4	50	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	2.0 U	1.0 U	1.0 U	1.0 U
Bromoform	75-25-2	50	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	2.0 U	1.0 U	1.0 U	1.0 U
Bromomethane	74-83-9	5	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	2.0 U	1.0 U	1.0 U	1.0 U
Carbon Disulfide	75-15-0	60	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	**0.75 J**	1.0 U	1.0 U	1.0 U	1.0 U	2.0 U	1.0 U	1.0 U	1.0 U
Carbon Tetrachloride	56-23-5	5	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	2.0 U	1.0 U	1.0 U	1.0 U
Chlorobenzene	108-90-7	5	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	2.0 U	1.0 U	1.0 U	1.0 U
Chloroethane	75-00-3	5	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	2.0 U	1.0 U	1.0 U	1.0 U
Chloroform	67-66-3	7	1.0 U	1.0 U	1.0 U	**0.51 J**	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	2.0 U	1.0 U	1.0 U	1.0 U
Chloromethane	74-87-3	5	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	2.0 U	1.0 U	1.0 U	1.0 U
cis-1,2-Dichloroethene	156-59-2	5	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	NA	NA	1.0 U	NA	1.0 U	1.0 U	1.0 U	2.0 U	1.0 U	1.0 U	1.0 U
cis-1,3-Dichloropropene	10061-01-5	0.4	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	2.0 U	1.0 U	1.0 U	1.0 U
Dibromochloromethane	124-48-1	5	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	2.0 U	1.0 U	1.0 U	1.0 U
Methylene Chloride	75-09-2	5	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	2.0 U	1.0 U	1.0 U	1.0 U
Styrene	100-42-5	5	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	**1900**	**2.0 J**	**960 J**	**480 J**	1.0 U
Tetrachloroethene	127-18-4	5	1.0 U	1.0 U	1.0 U	1.0 U	**0.78 J**	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	2.0 U	1.0 U	1.0 U	1.0 U
Total 1,2-Dichloroethene	540-59-0	NL	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	4.0 U	2.0 U	2.0 U	2.0 U
trans-1,2-Dichloroethene	156-60-5	5	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	NA	NA	1.0 U	NA	1.0 U	1.0 U	1.0 U	2.0 U	1.0 U	1.0 U	1.0 U
trans-1,3-Dichloropropene	10061-02-6	0.4	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	2.0 U	1.0 U	1.0 U	1.0 U
Trichloroethene	79-01-6	5	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	2.0 U	1.0 U	1.0 U	1.0 U
Vinyl Chloride	75-01-4	2	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	2.0 U	1.0 U	1.0 U	1.0 U
Total VOCs		*NL*	*ND*	*ND*	*ND*	***0.51***	***0.78***	***12.53***	***35.36***	***0.95***	***1.4***	***33.15***	*ND*	*ND*	*ND*	***32715***	***149.3***	***4139.2***	***1961.8***	*ND*
Polynuclear Aromatic Hydrocarbons (PAHs) (ug/L)																				
2-Methylnaphthalene	91-57-6	NL	11 U	11 U	11 U	11 U	11 U	12 U	11 U	10 U	10 U	10 U	11 U	10 U	11 U	**160**	**130**	**20**	**21**	11 U
Acenaphthene	83-32-9	20	11 U	11 U	11 U	11 U	11 U	12 U	11 U	**1.9 J**	**1.6 J**	10 U	11 U	10 U	11 U	**18**	**12**	**7.4 J**	**7.7 J**	11 U
Acenaphthylene	208-96-8	NL	11 U	11 U	11 U	11 U	11 U	**2.3 J**	**1.2 J**	10 U	10 U	**1.2 J**	**2.6 J**	10 U	11 U	**22**	**260**	**14**	**14**	11 U
Anthracene	120-12-7	50	11 U	11 U	11 U	11 U	11 U	12 U	11 U	10 U	10 U	10 U	11 U	10 U	11 U	11 U	11 U	11 U	11 U	11 U
Benzo(a)anthracene	56-55-3	0.002	11 U	11 U	11 U	11 U	11 U	12 U	11 U	10 U	10 U	10 U	11 U	10 U	11 U	11 U	11 U	11 U	11 U	11 U
Benzo(a)pyrene	50-32-8	NL	11 U	11 U	11 U	11 U	11 U	12 U	11 U	10 U	10 U	10 U	11 U	10 U	11 U	11 U	11 U	11 U	11 U	11 U
Benzo(b)fluoranthene	205-99-2	0.002	11 U	11 U	11 U	11 U	11 U	12 U	11 U	10 U	10 U	10 U	11 U	10 U	11 U	11 U	11 U	11 U	11 U	11 U
Benzo(g,h,i)perylene	191-24-2	NL	11 U	11 U	11 U	11 U	11 U	12 U	11 U	10 U	10 U	10 U	11 U	10 U	11 U	11 U	11 U	11 U	11 U	11 U
Benzo(k)fluoranthene	207-08-9	0.002	11 U	11 U	11 U	11 U	11 U	12 U	11 U	10 U	10 U	10 U	11 U	10 U	11 U	11 U	11 U	11 U	11 U	11 U
Chrysene	218-01-9	0.002	11 U	11 U	11 U	11 U	11 U	12 U	11 U	10 U	10 U	10 U	11 U	10 U	11 U	11 U	11 U	11 U	11 U	11 U
Dibenz(a,h)anthracene	53-70-3	NL	11 U	11 U	11 U	11 U	11 U	12 U	11 U	10 U	10 U	10 U	11 U	10 U	11 U	11 U	11 U	11 U	11 U	11 U
Fluoranthene	206-44-0	50	11 U	11 U	11 U	11 U	11 U	12 U	11 U	10 U	10 U	10 U	11 U	10 U	11 U	11 U	11 U	11 U	11 U	11 U
Fluorene	86-73-7	50	11 U	11 U	11 U	11 U	11 U	12 U	11 U	10 U	10 U	10 U	11 U	10 U	11 U	**11 J**	**29**	**2.4 J**	**2.4 J**	11 U
Indeno(1,2,3-cd)pyrene	193-39-5	0.002	11 U	11 U	11 U	11 U	11 U	12 U	11 U	10 U	10 U	10 U	11 U	10 U	11 U	11 U	11 U	11 U	11 U	11 U
Naphthalene	91-20-3	10	11 U	11 U	11 U	11 U	11 U	**3.1 J**	11 U	10 U	10 U	**12**	**7.5 J**	10 U	11 U	**4100**	**1100**	**1200**	**1000**	11 U
Phenanthrene	85-01-8	50	11 U	11 U	11 U	11 U	11 U	12 U	11 U	10 U	10 U	10 U	11 U	10 U	11 U	**7.8 J**	**23**	11 U	**1.5 J**	11 U
Pyrene	129-00-0	50	11 U	11 U	11 U	11 U	11 U	12 U	11 U	10 U	10 U	10 U	11 U	10 U	11 U	11 U	11 U	11 U	11 U	11 U
Total PAHs		*NL*	*ND*	*ND*	*ND*	*ND*	*ND*	***5.4***	***1.2***	***1.9***	***1.6***	***13.2***	***10.1***	*ND*	*ND*	***4318.8***	***1554***	***1243.8***	***1046.6***	*ND*
Total Carcinogenic PAHs		*NL*	*ND*	*ND*	*ND*	*ND*	*ND*	*ND*	*ND*	*ND*	*ND*	*ND*	*ND*	*ND*	*ND*	*ND*	*ND*	*ND*	*ND*	*ND*

Notes and definitions provided at end of table.

Table 3-5
Summary of Groundwater Analytical Results
Former MGP, Far Rockaway, NY

Sample Location Sample Date Sample ID Laboratory Identification Sample Type	CAS Number	NYSDEC Groundwater Guidance or Standard Value[1]	MW-100 1/22/2008 MW-100-012208 Z1256-01 Sample	MW-105 1/21/2008 MW-105-012108 Z1256-02 Sample	MW-105D 2/11/2009 MW-105D-021109 A1500-11 Sample	MW-107 1/22/2008 MW-107-012208 Z1256-03 Sample	MW-109 1/22/2008 MW-109-012208 Z1256-06 Sample	MW-110 1/22/2008 MW-110-012208 Z1256-07 Sample	MW-110 11/4/2008 MW-110-110408 Z5420-01 Sample	MW-110 9/9/2009 MW-110-090909 A4296-01 Sample	MW-110 9/9/2009 DUP-090909 A4296-06 Duplicate	MW-110D 2/12/2009 MW-110D-021209 A1500-07 Sample	MW-110D 9/9/2009 MW-110D-090909 A4296-02 Sample	MW-111S 1/21/2008 MW-111S-012108 Z1256-09 Sample	MW-111D 1/21/2008 MW-111D-012108 Z1256-08 Sample	MW-113S 1/22/2008 MW-113S-012208 Z1256-11 Sample	MW-113D 1/22/2008 MW-113D-012208 Z1256-10 Sample	MW-114 1/22/2008 MW-225-012208 Z1256-12 Sample	MW-114 1/22/2008 MW-114-012208 Z1256-15 Duplicate	MW-116S 1/21/2008 MW-116S-012108 Z1256-14 Sample
Other Semivolatile Organic Compounds (SVOCs) (ug/L)																				
1,2,4-Trichlorobenzene	120-82-1	5	11 U	11 U	11 U	11 U	11 U	12 U	11 U	10 U	10 U	10 U	11 U	10 U	11 U	11 U	11 U	11 U	11 U	11 U
1,2-Dichlorobenzene	95-50-1	3	11 U	11 U	11 U	11 U	11 U	12 U	11 U	10 U	10 U	10 U	11 U	10 U	11 U	11 U	11 U	11 U	11 U	11 U
1,3-Dichlorobenzene	541-73-1	3	11 U	11 U	11 U	11 U	11 U	12 U	11 U	10 U	10 U	10 U	11 U	10 U	11 U	11 U	11 U	11 U	11 U	11 U
1,4-Dichlorobenzene	106-46-7	3	11 U	11 U	11 U	11 U	11 U	12 U	11 U	10 U	10 U	10 U	11 U	10 U	11 U	11 U	11 U	11 U	11 U	11 U
2,2-oxybis(1-Chloropropane)	108-60-1	NL	11 U	11 U	11 U	11 U	11 U	12 U	11 U	10 U	10 U	10 U	11 U	10 U	11 U	11 U	11 U	11 U	11 U	11 U
2,4,5-Trichlorophenol	95-95-4	NL	11 U	11 U	11 U	11 U	11 U	12 U	11 U	10 U	10 U	10 U	11 U	10 U	**R**	11 U	**R**	11 U	11 U	**R**
2,4,6-Trichlorophenol	88-06-2	NL	11 U	11 U	11 U	11 U	11 U	12 U	11 U	10 U	10 U	10 U	11 U	10 U	**R**	11 U	**R**	11 U	11 U	**R**
2,4-Dichlorophenol	120-83-2	5	11 U	11 U	11 U	11 U	11 U	12 U	11 U	10 U	10 U	10 U	11 U	10 U	**R**	11 U	**R**	11 U	11 U	**R**
2,4-Dimethylphenol	105-67-9	50	11 U	11 U	11 U	11 U	11 U	12 U	11 U	10 U	10 U	10 U	11 U	10 U	**R**	**7.6 J**	**R**	**2.3 J**	**2.8 J**	**R**
2,4-Dinitrophenol	51-28-5	10	21 U	22 U	22 U	22 U	21 U	24 U	22 U	10 U	10 U	21 U	11 U	21 U	**R**	22 U	**R**	22 U	21 U	**R**
2,4-Dinitrotoluene	121-14-2	5	11 U	11 U	11 U	11 U	11 U	12 U	11 U	10 U	10 U	10 U	11 U	10 U	11 U	11 U	11 U	11 U	11 U	11 U
2,6-Dinitrotoluene	606-20-2	5	11 U	11 U	11 U	11 U	11 U	12 U	11 U	10 U	10 U	10 U	11 U	10 U	11 U	11 U	11 U	11 U	11 U	11 U
2-Chloronaphthalene	91-58-7	10	11 U	11 U	11 U	11 U	11 U	12 U	11 U	10 U	10 U	10 U	11 U	10 U	11 U	11 U	11 U	11 U	11 U	11 U
2-Chlorophenol	95-57-8	NL	11 U	11 U	11 U	11 U	11 U	12 U	11 U	10 U	10 U	10 U	11 U	10 U	**R**	11 U	**R**	11 U	11 U	**11 R**
2-Methylphenol	95-48-7	NL	11 U	11 U	11 U	11 U	11 U	12 U	11 U	10 U	10 U	10 U	11 U	10 U	**R**	**11 J**	**R**	11 U	11 U	**11 R**
2-Nitroaniline	88-74-4	5	11 U	11 U	11 U	11 U	11 U	12 U	11 U	10 U	10 U	10 U	11 U	10 U	11 U	11 U	11 U	11 U	11 U	11 U
2-Nitrophenol	88-75-5	NL	11 U	11 U	11 U	11 U	11 U	12 U	11 U	10 U	10 U	10 U	11 U	10 U	**R**	11 U	**R**	11 U	11 U	**R**
3,3-Dichlorobenzidine	91-94-1	5	21 U	22 U	22 U	22 U	21 U	24 U	22 U	10 U	10 U	21 U	11 U	21 U	21 U	22 U	21 U	22 U	21 U	22 U
3Methylphenols	106-44-5	NL	11 U	11 U	11 U	11 U	11 U	12 U	11 U	NA	NA	10 U	NA	10 U	**R**	**17**	**R**	11 U	11 U	**R**
3&4 Methylphenol	3&4 MPH	NL	NA	NA	NA	NA	NA	NA	NA	10 U	10 U	NA	11 U	NA	NA	NA	NA	NA	NA	NA
3-Nitroaniline	99-09-2	5	11 U	11 U	11 U	11 U	11 U	12 U	11 U	10 U	10 U	10 U	11 U	10 U	11 U	11 U	11 U	11 U	11 U	11 U
4,6-Dinitro-2-methylphenol	534-52-1	NL	21 U	22 U	22 U	22 U	21 U	24 U	22 U	10 U	10 U	21 U	11 U	21 U	**R**	22 U	**R**	22 U	21 U	**R**
4-Bromophenyl-phenylether	101-55-3	NL	11 U	11 U	11 U	11 U	11 U	12 U	11 U	10 U	10 U	10 U	11 U	10 U	11 U	11 U	11 U	11 U	11 U	11 U
4-Chloro-3-methylphenol	59-50-7	NL	11 U	11 U	11 U	11 U	11 U	12 U	11 U	10 U	10 U	10 U	11 U	10 U	**R**	11 U	**R**	11 U	11 U	**R**
4-Chloroaniline	106-47-8	5	11 U	11 U	11 U	11 U	11 U	12 U	11 U	10 U	10 U	10 U	11 U	10 U	11 U	11 U	11 U	11 U	11 U	11 U
4-Chlorophenyl-phenylether	7005-72-3	NL	11 U	11 U	11 U	11 U	11 U	12 U	11 U	10 U	10 U	10 U	11 U	10 U	11 U	11 U	11 U	11 U	11 U	11 U
4-Nitroaniline	100-01-6	5	11 U	11 U	11 U	11 U	11 U	12 U	11 U	10 U	10 U	10 U	11 U	10 U	11 U	11 U	11 U	11 U	11 U	11 U
4-Nitrophenol	100-02-7	NL	21 U	22 U	33 U	22 U	21 U	24 U	22 U	10 U	10 U	31 U	11 U	21 U	**R**	22 U	**R**	22 U	21 U	**R**
Atrazine	1912-24-9	7.5	NA	NA	11 U	NA	NA	NA	11 U	NA	NA	10 U	NA	NA	NA	NA	NA	NA	NA	NA
bis(2-Chloroethoxy)methane	111-91-1	5	11 U	11 U	11 U	11 U	11 U	12 U	11 U	10 U	10 U	10 U	11 U	10 U	11 U	11 U	11 U	11 U	11 U	11 U
bis(2-Chloroethyl)ether	111-44-4	1	11 U	11 U	11 U	11 U	11 U	12 U	11 U	10 U	10 U	10 U	11 U	10 U	11 U	11 U	11 U	11 U	11 U	11 U
bis(2-Ethylhexyl)phthalate	117-81-7	5	11 U	11 U	11 U	11 U	11 U	12 U	11 U	10 U	10 U	10 U	11 U	10 U	11 U	11 U	11 U	11 U	11 U	11 U
Butylbenzylphthalate	85-68-7	50	11 U	11 U	11 U	11 U	11 U	12 U	11 U	10 U	10 U	10 U	11 U	10 U	11 U	11 U	11 U	11 U	11 U	11 U
Carbazole	86-74-8	NL	11 U	11 U	NA	11 U	11 U	12 U	NA	10 U	10 U	NA	11 U	10 U	11 U	11 U	11 U	11 U	11 U	11 U
Dibenzofuran	132-64-9	NL	11 U	11 U	11 U	11 U	11 U	12 U	11 U	10 U	10 U	10 U	11 U	10 U	11 U	11 U	11 U	11 U	11 U	11 U
Diethylphthalate	84-66-2	50	11 U	11 U	11 U	11 U	11 U	12 U	11 U	10 U	10 U	10 U	11 U	10 U	11 U	11 U	11 U	11 U	11 U	11 U
Dimethylphthalate	131-11-3	50	11 UJ	11 UJ	11 U	11 UJ	11 UJ	12 UJ	11 U	10 U	10 U	10 U	11 U	10 UJ	11 UJ	11 UJ	11 UJ	11 UJ	11 UJ	11 UJ
Di-n-butylphthalate	84-74-2	50	11 U	11 U	22 U	11 U	11 U	12 U	11 U	10 U	10 U	21 U	11 U	10 U	11 U	11 U	11 U	11 U	11 U	11 U
Di-n-octyl phthalate	117-84-0	NL	11 U	11 U	11 U	11 U	11 U	12 U	11 U	10 U	10 U	10 U	11 U	10 U	11 U	11 U	11 U	11 U	11 U	11 U
Hexachlorobenzene	118-74-1	0.4	11 U	11 U	11 U	11 U	11 U	12 U	11 U	10 U	10 U	10 U	11 U	10 U	11 U	11 U	11 U	11 U	11 U	11 U
Hexachlorobutadiene	87-68-3	0.5	11 U	11 U	11 U	11 U	11 U	12 U	11 U	10 U	10 U	10 U	11 U	10 U	11 U	11 U	11 U	11 U	11 U	11 U
Hexachlorocyclopentadiene	77-47-4	5	11 U	11 U	11 U	11 U	11 U	12 U	11 U	10 U	10 U	10 U	11 U	10 U	11 U	11 U	11 U	11 U	11 U	11 U
Hexachloroethane	67-72-1	5	11 U	11 U	11 U	11 U	11 U	12 U	11 U	10 U	10 U	10 U	11 U	10 U	11 U	11 U	11 U	11 U	11 U	11 U
Isophorone	78-59-1	50	11 U	11 U	11 U	11 U	11 U	12 U	11 U	10 U	10 U	10 U	11 U	10 U	11 U	11 U	11 U	11 U	11 U	11 U
Nitrobenzene	98-95-3	0.4	11 U	11 U	11 U	11 U	11 U	12 U	11 U	10 U	10 U	10 U	11 U	10 U	11 U	11 U	11 U	11 U	11 U	11 U
N-Nitroso-di-n-propylamine	621-64-7	50	11 U	11 U	11 U	11 U	11 U	12 U	11 U	10 U	10 U	10 U	11 U	10 U	11 U	11 U	11 U	11 U	11 U	11 U
N-Nitrosodiphenylamine	86-30-6	50	11 U	11 U	11 U	11 U	11 U	12 U	11 U	10 U	10 U	10 U	11 U	10 U	11 U	11 U	11 U	11 U	11 U	11 U
Pentachlorophenol	87-86-5	1	21 U	22 U	22 U	22 U	21 U	24 U	22 U	10 U	10 U	21 U	11 U	21 U	**R**	22 U	**R**	22 U	21 U	**R**
Phenol	108-95-2	1	11 U	11 U	11 U	11 U	11 U	12 U	11 UJ	10 U	10 U	10 U	11 U	10 U	**R**	11 U	**R**	11 U	11 U	**R**
Total Other SVOCs		*NL*	*ND*	*ND*	*ND*	*ND*	*ND*	*ND*	*ND*	*ND*	*ND*	*ND*	*ND*	*ND*	*ND*	***35.6***	*ND*	***2.3***	***2.8***	*ND*
Inorganic Compounds (ug/L)																				
Arsenic	7440-38-2	25	**3.030 J**	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U	NA	NA	10.0 U	NA	10.0 U	10.0 U	**10.9**	10.0 U	10.0 U	10.0 U	10.0 U
Barium	7440-39-3	1000	**44.7 J**	**76.6**	**19.1 J**	**15.4 J**	**12.9 J**	**22.7 J**	20.0 U	NA	NA	**9.740 J**	NA	**12.8 J**	**33.9 J**	**24.0 J**	**37.5 J**	**81.9**	**81.0**	**5.720 J**
Cadmium	7440-43-9	5	10.0 U	10.0 U	3.000 U	10.0 U	10.0 U	10.0 U	2.000 U	NA	NA	3.000 U	NA	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U
Chromium	7440-47-3	50	**1.510 J**	**7.060**	**1.920 J**	**2.110 J**	5.000 U	5.000 U	10.0 U	NA	NA	5.000 U	NA	5.000 U	**2.250 J**	**13.0**	5.000 U	**7.960 J**	5.000 U	5.000 U
Copper	7440-50-8	200	**8.080 J**	**6.170 J**	**4.340 J**	**5.920 J**	**6.290 J**	10.0 U	10.0 U	NA	NA	**4.270 J**	NA	10.0 U	**2.930 J**	10.0 U	10.0 U	**20.0**	**17.8**	**9.280 J**
Iron	7439-89-6	300	**2230**	**270**	**7900**	**64.0**	**143**	**8790**	**1010**	NA	NA	**26500**	NA	**119**	**4670**	**15200**	**11100**	**10200**	**9950**	**1060**
Lead	7439-92-1	25	10.0 U	10.0 U	**5.060 J**	10.0 U	10.0 U	10.0 U	6.000 U	NA	NA	6.000 U	NA	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U
Selenium	7782-49-2	10	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U	NA	NA	10.0 U	NA	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U
Silver	7440-22-4	50	5.000 U	5.000 U	5.000 U	**3.420 J**	5.000 U	5.000 U	10.0 U	NA	NA	5.000 U	NA	5.000 U	5.000 U	5.000 U	5.000 U	5.000 U	5.000 U	5.000 U
Zinc	7440-66-6	2000	**181**	**83.4**	**12.6 J**	**44.4**	**45.6**	**48.2**	**11.1 J**	NA	NA	**10.3 J**	NA	**55.0**	**57.8**	**51.4**	**54.2**	**231**	**235**	**56.4**
Mercury	7439-97-6	0.7	**0.85 J-**	**R**	0.2000 U	**R**	**R**	**R**	0.2000 U	NA	NA	0.2000 U	NA	**R**	**R**	**R**	**R**	**R**	**R**	**R**
Cyanide (mg/L)	57-12-5	0.2	0.010 U	0.010 U	0.010 U	0.010 U	0.010 U	0.010 U	0.010 U	NA	NA	0.010 U	NA	0.010 U	**0.039**	0.010 U	**0.017**	0.010 U	0.010 U	0.010 U

Notes and definitions provided at end of table.

Notes:

1 - Guidance or Standard Values - NYSDEC, Division of Water, TOGS (1.1.1) - 6 NYCRR 703.5 [NYSDEC, 1998].

ug/L - micrograms per liter

mg/L - milligrams per liter

NL = Not Listed

NA = Not Analyzed

ND = Not Detected

J = The associated numerical value is an estimated quantity.

J- = The associated numerical value is an estimated quantity, suspected low bias.

R = The associated data is rejected.

U = The material was analyzed for but not detected at, or above, the reporting limit. The associated numerical value is the sample quantitation limit.

Bold indicates compound detected at a concentration greater than the reporting limit.

Yellow highlight indicates exceedance of the NYSDEC Groundwater Guidance or Standard Value.

Table 3-5
Summary of Groundwater Analytical Results
Former MGP, Far Rockaway, NY

Sample Location Sample Date Sample ID Laboratory Identification Sample Type	CAS Number	NYSDEC Groundwater Guidance or Standard Value[1]	MW-116D 1/21/2008 MW-116D-012108 Z1256-13 Sample	MW-117S 2/11/2009 MW-117S-021109 A1500-05 Sample	MW-117D 2/11/2009 MW-117D-021109 A1500-10 Sample	MW-118S 2/11/2009 MW-118S-021109 A1500-06 Sample	MW-118D 2/12/2009 MW-118D-021209 A1500-01 Sample	MW-119S 2/11/2009 MW-119S-021109 A1500-04 Sample	MW-119S 9/9/2009 MW-119S-090909 A4296-03 Sample	MW-119D 2/11/2009 MW-119D-021109 A1500-08 Sample	MW-119D 9/11/2009 MW-119D-091109 A4296-13 Sample	MW-120 2/12/2009 MW-120-021209 A1500-09 Sample	MW-120S 9/10/2009 MW-120S-091009 A4296-07 Sample	MW-121S 2/11/2009 MW-121S-021109 A1500-02 Sample	MW-121S 2/11/2009 MW-200-021109 A1500-03 Duplicate	MW-121D 2/11/2009 MW-121D-021109 A1500-12 Sample	MW-122D 9/10/2009 MW-122D-091009 A4296-08 Sample	MW-123D 9/10/2009 MW-123D-091009 A4296-10 Sample	MW-124S 9/10/2009 MW-124S-091009 A4296-11 Sample	MW-125S 9/10/2009 MW-125S-091009 A4296-12 Sample
BTEX (ug/L)																				
Benzene	71-43-2	1	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	**1.8**	**68**	**0.96 J**	**0.79 J**	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Ethyl Benzene	100-41-4	5	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	**1.1**	1.0 U	1.0 U	1.0 U	**52**	**1100 D**	**420 D**	**470 D**	**4.0**	1.0 U	1.0 U	1.0 U	1.0 U
m/p-Xylenes	126777-61-2	NL	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	**1.8 J**	NA	2.0 U	NA	**25**	NA	**660 D**	**740 D**	**8.5**	NA	NA	NA	NA
o-Xylene	95-47-6	NL	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	**0.88 J**	NA	1.0 U	NA	**54**	NA	**370 D**	**420 D**	**5.4**	NA	NA	NA	NA
Toluene	108-88-3	5	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	**18**	**180 D**	**130**	**110**	**1.5**	1.0 U	1.0 U	1.0 U	1.0 U
Xylenes, Total	1330-20-7	5	3.0 U	3.0 U	3.0 U	3.0 U	3.0 U	**2.7 J**	3.0 U	3.0 U	3.0 U	**79**	**530 D**	**1000 D**	**1200 D**	**14**	3.0 U	3.0 U	3.0 U	3.0 U
Total BTEX		*NL*	*ND*	ND	ND	ND	ND	***3.8***	*ND*	ND	ND	***150.8***	***1878***	***1550.96***	***1780.79***	***19.5***	*ND*	*ND*	*ND*	*ND*
Volatile Organic Compounds (VOCs) (ug/L)																				
1,1,1-Trichloroethane	71-55-6	5	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
1,1,2,2-Tetrachloroethane	79-34-5	5	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
1,1,2-Trichloroethane	79-00-5	1	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
1,1-Dichloroethane	75-34-3	5	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
1,1-Dichloroethene	75-35-4	5	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
1,2-Dichloroethane	107-06-2	5	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
1,2-Dichloropropane	78-87-5	1	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
2-Butanone	78-93-3	50	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U
2-Hexanone	591-78-6	50	5.0 U	5.0 U	5.0 U	5.0 U	**5.4**	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U
4-Methyl-2-Pentanone	108-10-1	NL	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U
Acetone	67-64-1	50	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U
Bromodichloromethane	75-27-4	50	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Bromoform	75-25-2	50	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Bromomethane	74-83-9	5	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Carbon Disulfide	75-15-0	60	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Carbon Tetrachloride	56-23-5	5	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Chlorobenzene	108-90-7	5	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Chloroethane	75-00-3	5	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Chloroform	67-66-3	7	1.0 U	1.0 U	1.0 U	1.0 U	**0.66 J**	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Chloromethane	74-87-3	5	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
cis-1,2-Dichloroethene	156-59-2	5	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	NA	1.0 U	NA	1.0 U	NA	1.0 U	1.0 U	1.0 U	NA	NA	NA	NA
cis-1,3-Dichloropropene	10061-01-5	0.4	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Dibromochloromethane	124-48-1	5	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Methylene Chloride	75-09-2	5	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	**1.1**	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Styrene	100-42-5	5	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	**0.85 J**	1.0 U	1.0 U	1.0 U	**8.2**	**66**	**300 D**	**350 D**	**1.8**	1.0 U	1.0 U	1.0 U	1.0 U
Tetrachloroethene	127-18-4	5	**0.77 J**	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Total 1,2-Dichloroethene	540-59-0	NL	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U
trans-1,2-Dichloroethene	156-60-5	5	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	NA	1.0 U	NA	1.0 U	NA	1.0 U	1.0 U	1.0 U	NA	NA	NA	NA
trans-1,3-Dichloropropene	10061-02-6	0.4	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Trichloroethene	79-01-6	5	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Vinyl Chloride	75-01-4	2	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Total VOCs		*NL*	***0.77***	*ND*	*ND*	*ND*	***6.06***	***4.65***	*ND*	*ND*	*ND*	***159***	***1944***	***1852.06***	***2130.79***	***21.3***	*ND*	*ND*	*ND*	*ND*
Polynuclear Aromatic Hydrocarbons (PAHs) (ug/L)																				
2-Methylnaphthalene	91-57-6	NL	10 U	52 U	11 U	50 U	10 U	50 U	10 U	**12**	**19**	53 U	**8.0 J**	**41 J**	**32 J**	**2.0 J**	10 U	10 U	11 U	10 U
Acenaphthene	83-32-9	20	10 U	52 U	11 U	50 U	10 U	50 U	10 U	**3.1 J**	**3.8 J**	53 U	**5.4 J**	52 U	51 U	11 U	10 U	10 U	11 U	10 U
Acenaphthylene	208-96-8	NL	10 U	52 U	11 U	50 U	10 U	50 U	10 U	**42**	**68**	53 U	**11**	52 U	51 U	11 U	10 U	10 U	11 U	10 U
Anthracene	120-12-7	50	10 U	52 U	11 U	50 U	10 U	50 U	10 U	11 U	11 U	53 U	11 U	52 U	51 U	11 U	10 U	10 U	11 U	10 U
Benzo(a)anthracene	56-55-3	0.002	10 U	52 U	11 U	50 U	10 U	50 U	10 U	11 U	11 U	53 U	11 U	52 U	51 U	11 U	10 U	10 U	11 U	10 U
Benzo(a)pyrene	50-32-8	NL	10 U	52 U	11 U	50 U	10 U	50 U	10 U	11 U	11 U	53 U	11 U	52 U	51 U	11 U	10 U	10 U	11 U	10 U
Benzo(b)fluoranthene	205-99-2	0.002	10 U	52 U	11 U	50 U	10 U	50 U	10 U	11 U	11 U	53 U	11 U	52 U	51 U	11 U	10 U	10 U	11 U	10 U
Benzo(g,h,i)perylene	191-24-2	NL	10 U	52 U	11 U	50 U	10 U	50 U	10 U	11 U	11 U	53 U	11 U	52 U	51 U	11 U	10 U	10 U	11 U	10 U
Benzo(k)fluoranthene	207-08-9	0.002	10 U	52 U	11 U	50 U	10 U	50 U	10 U	11 U	11 U	53 U	11 U	52 U	51 U	11 U	10 U	10 U	11 U	10 U
Chrysene	218-01-9	0.002	10 U	52 U	11 U	50 U	10 U	50 U	10 U	11 U	11 U	53 U	11 U	52 U	51 U	11 U	10 U	10 U	11 U	10 U
Dibenz(a,h)anthracene	53-70-3	NL	10 U	52 U	11 U	50 U	10 U	50 U	10 U	11 U	11 U	53 U	11 U	52 U	51 U	11 U	10 U	10 U	11 U	10 U
Fluoranthene	206-44-0	50	10 U	52 U	11 U	50 U	10 U	50 U	10 U	11 U	11 U	53 U	11 U	52 U	51 U	11 U	10 U	10 U	11 U	10 U
Fluorene	86-73-7	50	10 U	52 U	11 U	50 U	10 U	50 U	10 U	**2.2 J**	**2.5 J**	53 U	11 U	52 U	51 U	11 U	10 U	10 U	11 U	10 U
Indeno(1,2,3-cd)pyrene	193-39-5	0.002	10 U	52 U	11 U	50 U	10 U	50 U	10 U	11 U	11 U	53 U	11 U	52 U	51 U	11 U	10 U	10 U	11 U	10 U
Naphthalene	91-20-3	10	10 U	52 U	11 U	50 U	10 U	50 U	10 U	**130 D**	**120 D**	**110**	**560 D**	**1400 D**	**1000 D**	**47**	10 U	**1.5 J**	11 U	10 U
Phenanthrene	85-01-8	50	10 U	52 U	11 U	50 U	10 U	50 U	10 U	**1.3 J**	**1.7 J**	53 U	11 U	52 U	51 U	11 U	10 U	10 U	11 U	10 U
Pyrene	129-00-0	50	10 U	**5.3 J**	11 U	50 U	10 U	50 U	10 U	11 U	11 U	53 U	11 U	52 U	51 U	11 U	10 U	10 U	11 U	10 U
Total PAHs		*NL*	*ND*	***5.3***	*ND*	*ND*	*ND*	*ND*	*ND*	***190.6***	***215***	***110***	***584.4***	***1441***	***1032***	***49***	*ND*	***1.5***	*ND*	*ND*
Total Carcinogenic PAHs		*NL*	*ND*	*ND*	*ND*	*ND*	*ND*	*ND*	*ND*	*ND*	*ND*	*ND*	*ND*	*ND*	*ND*	*ND*	*ND*	*ND*	*ND*	*ND*

Notes and definitions provided at end of table.

Table 3-5
Summary of Groundwater Analytical Results
Former MGP, Far Rockaway, NY

Sample Location Sample Date Sample ID Laboratory Identification Sample Type	CAS Number	NYSDEC Groundwater Guidance or Standard Value[1]	MW-116D 1/21/2008 MW-116D-012108 Z1256-13 Sample	MW-117S 2/11/2009 MW-117S-021109 A1500-05 Sample	MW-117D 2/11/2009 MW-117D-021109 A1500-10 Sample	MW-118S 2/11/2009 MW-118S-021109 A1500-06 Sample	MW-118D 2/12/2009 MW-118D-021209 A1500-01 Sample	MW-119S 2/11/2009 MW-119S-021109 A1500-04 Sample	MW-119S 9/9/2009 MW-119S-090909 A4296-03 Sample	MW-119D 2/11/2009 MW-119D-021109 A1500-08 Sample	MW-119D 9/11/2009 MW-119D-091109 A4296-13 Sample	MW-120 2/12/2009 MW-120-021209 A1500-09 Sample	MW-120S 9/10/2009 MW-120S-091009 A4296-07 Sample	MW-121S 2/11/2009 MW-121S-021109 A1500-02 Sample	MW-121S 2/11/2009 MW-200-021109 A1500-03 Duplicate	MW-121D 2/11/2009 MW-121D-021109 A1500-12 Sample	MW-122D 9/10/2009 MW-122D-091009 A4296-08 Sample	MW-123D 9/10/2009 MW-123D-091009 A4296-10 Sample	MW-124S 9/10/2009 MW-124S-091009 A4296-11 Sample	MW-125S 9/10/2009 MW-125S-091009 A4296-12 Sample
Other Semivolatile Organic Compounds (SVOCs) (ug/L)																				
1,2,4-Trichlorobenzene	120-82-1	5	10 U	52 U	11 U	50 U	10 U	50 U	10 U	11 U	11 U	53 U	11 U	52 U	51 U	11 U	10 U	10 U	11 U	10 U
1,2-Dichlorobenzene	95-50-1	3	10 U	52 U	11 U	50 U	10 U	50 U	10 U	11 U	11 U	53 U	11 U	52 U	51 U	11 U	10 U	10 U	11 U	10 U
1,3-Dichlorobenzene	541-73-1	3	10 U	52 U	11 U	50 U	10 U	50 U	10 U	11 U	11 U	53 U	11 U	52 U	51 U	11 U	10 U	10 U	11 U	10 U
1,4-Dichlorobenzene	106-46-7	3	10 U	52 U	11 U	50 U	10 U	50 U	10 U	11 U	11 U	53 U	11 U	52 U	51 U	11 U	10 U	10 U	11 U	10 U
2,2-oxybis(1-Chloropropane)	108-60-1	NL	10 U	52 U	11 U	50 U	10 U	50 U	10 U	11 U	11 U	53 U	11 U	52 U	51 U	11 U	10 U	10 U	11 U	10 U
2,4,5-Trichlorophenol	95-95-4	NL	**R**	52 U	11 U	50 U	10 U	50 U	10 U	11 U	11 U	53 U	11 U	52 U	51 U	11 U	10 U	10 U	11 U	10 U
2,4,6-Trichlorophenol	88-06-2	NL	**R**	52 U	11 U	50 U	10 U	50 U	10 U	11 U	11 U	53 U	11 U	52 U	51 U	11 U	10 U	10 U	11 U	10 U
2,4-Dichlorophenol	120-83-2	5	**R**	52 U	11 U	50 U	10 U	50 U	10 U	11 U	11 U	53 U	11 U	52 U	51 U	11 U	10 U	10 U	11 U	10 U
2,4-Dimethylphenol	105-67-9	50	**R**	52 U	11 U	50 U	10 U	50 U	10 U	11 U	11 U	53 U	11 U	52 U	51 U	11 U	10 U	10 U	11 U	10 U
2,4-Dinitrophenol	51-28-5	10	**R**	100 U	21 U	100 U	20 U	100 U	10 U	22 U	11 U	110 U	11 U	100 U	100 U	22 U	10 U	10 U	11 U	10 U
2,4-Dinitrotoluene	121-14-2	5	10 U	52 U	11 U	50 U	10 U	50 U	10 U	11 U	11 U	53 U	11 U	52 U	51 U	11 U	10 U	10 U	11 U	10 U
2,6-Dinitrotoluene	606-20-2	5	10 U	52 U	11 U	50 U	10 U	50 U	10 U	11 U	11 U	53 U	11 U	52 U	51 U	11 U	10 U	10 U	11 U	10 U
2-Chloronaphthalene	91-58-7	10	10 U	52 U	11 U	50 U	10 U	50 U	10 U	11 U	11 U	53 U	11 U	52 U	51 U	11 U	10 U	10 U	11 U	10 U
2-Chlorophenol	95-57-8	NL	**10 R**	52 U	11 U	50 U	10 U	50 U	10 U	11 U	11 U	53 U	11 U	52 U	51 U	11 U	10 U	10 U	11 U	10 U
2-Methylphenol	95-48-7	NL	**10 R**	52 U	11 U	50 U	10 U	50 U	10 U	11 U	11 U	53 U	11 U	52 U	51 U	11 U	10 U	10 U	11 U	10 U
2-Nitroaniline	88-74-4	5	10 U	52 U	11 U	50 U	10 U	50 U	10 U	11 U	11 U	53 U	11 U	52 U	51 U	11 U	10 U	10 U	11 U	10 U
2-Nitrophenol	88-75-5	NL	**R**	52 U	11 U	50 U	10 U	50 U	10 U	11 U	11 U	53 U	11 U	52 U	51 U	11 U	10 U	10 U	11 U	10 U
3,3-Dichlorobenzidine	91-94-1	5	21 U	100 U	21 U	100 U	20 U	100 U	10 U	22 U	11 U	110 U	11 U	100 U	100 U	22 U	10 U	10 U	11 U	10 U
3Methylphenols	106-44-5	NL	**R**	52 U	11 U	50 U	10 U	50 U	NA	11 U	NA	53 U	NA	52 U	51 U	11 U	NA	NA	NA	NA
3&4 Methylphenol	3&4 MPH	NL	NA	NA	NA	NA	NA	NA	10 U	NA	11 U	NA	11 U	NA	NA	NA	10 U	10 U	11 U	10 U
3-Nitroaniline	99-09-2	5	10 U	52 U	11 U	50 U	10 U	50 U	10 U	11 U	11 U	53 U	11 U	52 U	51 U	11 U	10 U	10 U	11 U	10 U
4,6-Dinitro-2-methylphenol	534-52-1	NL	**R**	100 U	21 U	100 U	20 U	100 U	10 U	22 U	11 U	110 U	11 U	100 U	100 U	22 U	10 U	10 U	11 U	10 U
4-Bromophenyl-phenylether	101-55-3	NL	10 U	52 U	11 U	50 U	10 U	50 U	10 U	11 U	11 U	53 U	11 U	52 U	51 U	11 U	10 U	10 U	11 U	10 U
4-Chloro-3-methylphenol	59-50-7	NL	**R**	52 U	11 U	50 U	10 U	50 U	10 U	11 U	11 U	53 U	11 U	52 U	51 U	11 U	10 U	10 U	11 U	10 U
4-Chloroaniline	106-47-8	5	10 U	52 U	11 U	50 U	10 U	50 U	10 U	11 U	11 U	53 U	11 U	52 U	51 U	11 U	10 U	10 U	11 U	10 U
4-Chlorophenyl-phenylether	7005-72-3	NL	10 U	52 U	11 U	50 U	10 U	50 U	10 U	11 U	11 U	53 U	11 U	52 U	51 U	11 U	10 U	10 U	11 U	10 U
4-Nitroaniline	100-01-6	5	10 U	52 U	11 U	50 U	10 U	50 U	10 U	11 U	11 U	53 U	11 U	52 U	51 U	11 U	10 U	10 U	11 U	10 U
4-Nitrophenol	100-02-7	NL	**R**	160 U	32 U	150 U	30 U	150 U	10 U	33 U	11 U	160 U	11 U	150 U	150 U	34 U	10 U	10 U	11 U	10 U
Atrazine	1912-24-9	7.5	NA	52 U	11 U	50 U	10 U	50 U	NA	11 U	NA	53 U	NA	52 U	51 U	11 U	NA	NA	NA	NA
bis(2-Chloroethoxy)methane	111-91-1	5	10 U	52 U	11 U	50 U	10 U	50 U	10 U	11 U	11 U	53 U	11 U	52 U	51 U	11 U	10 U	10 U	11 U	10 U
bis(2-Chloroethyl)ether	111-44-4	1	10 U	52 U	11 U	50 U	10 U	50 U	10 U	11 U	11 U	53 U	11 U	52 U	51 U	11 U	10 U	10 U	11 U	10 U
bis(2-Ethylhexyl)phthalate	117-81-7	5	10 U	52 U	11 U	50 U	10 U	50 U	10 U	11 U	11 U	53 U	11 U	52 U	51 U	11 U	10 U	10 U	11 U	10 U
Butylbenzylphthalate	85-68-7	50	10 U	52 U	11 U	50 U	10 U	50 U	10 U	11 U	11 U	53 U	11 U	52 U	51 U	11 U	10 U	10 U	11 U	10 U
Carbazole	86-74-8	NL	10 U	NA	NA	NA	NA	NA	10 U	NA	11 U	NA	11 U	NA	NA	NA	10 U	10 U	11 U	10 U
Dibenzofuran	132-64-9	NL	10 U	52 U	11 U	50 U	10 U	50 U	10 U	11 U	11 U	53 U	11 U	52 U	51 U	11 U	10 U	10 U	11 U	10 U
Diethylphthalate	84-66-2	50	10 U	52 U	11 U	50 U	10 U	50 U	10 U	11 U	11 U	53 U	11 U	52 U	51 U	11 U	10 U	10 U	11 U	10 U
Dimethylphthalate	131-11-3	50	10 U	52 U	11 U	50 U	10 U	50 U	10 U	11 U	11 U	53 U	11 U	52 U	51 U	11 U	10 U	10 U	11 U	10 U
Di-n-butylphthalate	84-74-2	50	10 U	100 U	21 U	100 U	20 U	100 U	10 U	22 U	11 U	110 U	11 U	100 U	100 U	22 U	10 U	10 U	11 U	10 U
Di-n-octyl phthalate	117-84-0	NL	10 U	52 U	11 U	50 U	10 U	50 U	10 U	11 U	11 U	53 U	11 U	52 U	51 U	11 U	10 U	10 U	11 U	10 U
Hexachlorobenzene	118-74-1	0.4	10 U	52 U	11 U	50 U	10 U	50 U	10 U	11 U	11 U	53 U	11 U	52 U	51 U	11 U	10 U	10 U	11 U	10 U
Hexachlorobutadiene	87-68-3	0.5	10 U	52 U	11 U	50 U	10 U	50 U	10 U	11 U	11 U	53 U	11 U	52 U	51 U	11 U	10 U	10 U	11 U	10 U
Hexachlorocyclopentadiene	77-47-4	5	10 U	52 U	11 U	50 U	10 U	50 U	10 U	11 U	11 U	53 U	11 U	52 U	51 U	11 U	10 U	10 U	11 U	10 U
Hexachloroethane	67-72-1	5	10 U	52 U	11 U	50 U	10 U	50 U	10 U	11 U	11 U	53 U	11 U	52 U	51 U	11 U	10 U	10 U	11 U	10 U
Isophorone	78-59-1	50	10 U	52 U	11 U	50 U	10 U	50 U	10 U	11 U	11 U	53 U	11 U	52 U	51 U	11 U	10 U	10 U	11 U	10 U
Nitrobenzene	98-95-3	0.4	10 U	52 U	11 U	50 U	10 U	50 U	10 U	11 U	11 U	53 U	11 U	52 U	51 U	11 U	10 U	10 U	11 U	10 U
N-Nitroso-di-n-propylamine	621-64-7	50	10 U	52 U	11 U	50 U	10 U	50 U	10 U	11 U	11 U	53 U	11 U	52 U	51 U	11 U	10 U	10 U	11 U	10 U
N-Nitrosodiphenylamine	86-30-6	50	10 U	52 U	11 U	50 U	10 U	50 U	10 U	11 U	11 U	53 U	11 U	52 U	51 U	11 U	10 U	10 U	11 U	10 U
Pentachlorophenol	87-86-5	1	**R**	100 U	21 U	100 U	20 U	100 U	10 U	22 U	11 U	110 U	11 U	100 U	100 U	22 U	10 U	10 U	11 U	10 U
Phenol	108-95-2	1	**R**	52 U	11 U	50 U	10 U	50 U	10 U	11 U	11 U	53 U	11 U	52 U	51 U	11 U	10 U	10 U	11 U	10 U
Total Other SVOCs		*NL*	*ND*	*ND*	*ND*	*ND*	*ND*	*ND*	*ND*	*ND*	*ND*	*ND*	*ND*	*ND*	*ND*	*ND*	*ND*	*ND*	*ND*	*ND*
Inorganic Compounds (ug/L)																				
Arsenic	7440-38-2	25	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U	NA	10.0 U	NA	10.0 U	NA	10.0 U	10.0 U	10.0 U	NA	NA	NA	NA
Barium	7440-39-3	1000	**45.9 J**	**17.1 J**	**19.4 J**	**14.0 J**	**78.4**	**14.3 J**	NA	**107**	NA	**21.0 J**	NA	**12.3 J**	**12.5 J**	**33.2 J**	NA	NA	NA	NA
Cadmium	7440-43-9	5	10.0 U	3.000 U	3.000 U	3.000 U	3.000 U	3.000 U	NA	3.000 U	NA	3.000 U	NA	3.000 U	3.000 U	3.000 U	NA	NA	NA	NA
Chromium	7440-47-3	50	5.000 U	**1.910 J**	5.000 U	**27.0**	5.000 U	**5.060**	NA	5.000 U	NA	5.000 U	NA	5.000 U	5.000 U	5.000 U	NA	NA	NA	NA
Copper	7440-50-8	200	**5.530 J**	**5.500 J**	**3.400 J**	**4.190 J**	**3.020 J**	**5.530 J**	NA	**2.940 J**	NA	**3.900 J**	NA	**3.890 J**	**3.740 J**	**3.400 J**	NA	NA	NA	NA
Iron	7439-89-6	300	**2540**	**1090**	**929**	**815**	**1770**	**2090**	NA	**735**	NA	**12500**	NA	**9800**	**9980**	**4460**	NA	NA	NA	NA
Lead	7439-92-1	25	10.0 U	6.000 U	**4.200 J**	6.000 U	6.000 U	6.000 U	NA	6.000 U	NA	6.000 U	NA	6.000 U	6.000 U	**4.630 J**	NA	NA	NA	NA
Selenium	7782-49-2	10	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U	NA	10.0 U	NA	10.0 U	NA	10.0 U	10.0 U	10.0 U	NA	NA	NA	NA
Silver	7440-22-4	50	5.000 U	5.000 U	5.000 U	5.000 U	5.000 U	5.000 U	NA	5.000 U	NA	5.000 U	NA	5.000 U	5.000 U	5.000 U	NA	NA	NA	NA
Zinc	7440-66-6	2000	**51.6**	**29.2**	**15.5 J**	**50.4**	**18.2 J**	**13.0 J**	NA	**14.1 J**	NA	**11.0 J**	NA	**8.980 J**	**8.550 J**	**19.8 J**	NA	NA	NA	NA
Mercury	7439-97-6	0.7	**R**	0.2000 U	0.2000 U	0.2000 U	0.2000 U	0.2000 U	NA	0.2000 U	NA	0.2000 U	NA	0.2000 U	0.2000 U	0.2000 U	NA	NA	NA	NA
Cyanide (mg/L)	57-12-5	0.2	**0.018**	0.010 U	0.010 U	0.010 U	0.010 U	0.010 U	NA	0.010 U	NA	0.010 U	NA	0.010 U	0.010 U	0.010 U	NA	NA	NA	NA

Notes and definitions provided at end of table.

Notes:

1 - Guidance or Standard Values - NYSDEC, Division of Water, TOGS (1.1.1) - 6 NYCRR 703

ug/L - micrograms per liter

mg/L - milligrams per liter

NL = Not Listed

NA = Not Analyzed

ND = Not Detected

J = The associated numerical value is an estimated quantity.

J- = The associated numerical value is an estimated quantity, suspected low bias.

R = The associated data is rejected.

U = The material was analyzed for but not detected at, or above, the reporting limit. The assoc

Bold indicates compound detected at a concentration greater than the reporting limit.

Yellow highlight indicates exceedance of the NYSDEC Groundwater Guidance or Standard Va

Table 3-6
Summary of Soil Gas Results
Former MGP Site, Far Rockaway, NY

Sample Location	CAS Number	1224 Brunswick Ave.		1216 Brunswick Ave.		1200 Brunswick Ave.				West of Former Holder		South of Former Holder		On Brunswick Ave.				Adjacent to Hardware Store				Adjacent to Hardware Store			
Location Description		Commercial Building		Commercial Building		Commercial Building		Parking Lot		Storage Yard		Storage Yard		Street		Street		Parking Lot		Parking Lot		Storage Yard		Storage Yard	
Type of Sample		Sub-slab Vapor		Sub-slab Vapor		Sub-slab Vapor		Soil Vapor		Soil Vapor		Soil Vapor		Soil Vapor		Ambient Air		Soil Vapor		Ambient Air		Soil Vapor		Ambient Air	
Sample ID		SV-1		SV-2		SV-3		SV-7		SV-4		SV-5		SV-6		AMB-1		FRSV-8		FRAMB-2		FRSV-9		AMB-3	
Sample Depth (ft bgs)		Sub-slab		Sub-slab		Sub-slab		3.0 - 3.5		4.0 - 4.5		4.0 - 4.5		4.0 - 4.5		NA		3.0 - 3.5		NA		3.0 - 3.5		NA	
Sampling Date		12/5/2007		12/5/2007		1/24/2008		1/24/2008		12/5/2007		12/5/2007		12/5/2007		12/5/2007		11/4/2008		11/4/2008		6/23/2010		6/23/2010	
Compound (ug/m³)																									
Possible MGP Related or Other Sources[1]																									
1,2,4-Trimethylbenzene	95-63-6	1.6	UJ	1.7	U	0.72	U	0.68	U	**25000**		**5.8**		0.81	U	0.76	U	0.79	U	0.78	U	0.90	U	0.94	U
1,3,5-Trimethylbenzene	108-67-8	**1.8**		1.7	U	0.72	U	0.68	U	**3400**		**5.3**		0.81	U	0.76	U	0.79	U	0.78	U	0.90	U	0.94	U
2,2,4-Trimethylpentane (Isooctane)	540-84-1	7.5	U	8.1	U	3.4	U	3.2	U	190	U	**22**		3.8	U	3.6	U	3.8	U	3.7	U	4.3	U	4.5	U
2,3-Dimethylpentane	565-59-3	6.6	U	7.1	U	3	U	2.8	U	660	U	**9.0**		3.4	U	3.2	U	3.3	U	3.2	U	3.8	U	3.9	U
2-Methylpentane	107-83-5	5.7	UJ	**8.5**		2.6	U	2.4	U	**570**	**J**	**110**		2.9	U	2.7	U	**3.6**		2.8	U	3.2	U	3.4	U
4-Ethyltoluene	622-96-8	7.9	U	8.6	U	3.6	U	3.4	U	**11000**		**16**		4.0	U	3.8	U	4.0	U	3.9	U	4.5	U	4.7	U
Benzene	71-43-2	**300**		**1.7**		**1.7**		**1.9**		**490**		**64**		**0.99**		**2.7**		**8.0**		**1.0**		**0.73**		0.61	U
Carbon Disulfide	75-15-0	**17**		5.4	U	2.3	U	2.2	U	120	U	**6.0**		2.6	U	2.4	U	**5.3**		2.5	U	2.8	U	**3.2**	
Cyclohexane	110-82-7	5.5	U	6.0	U	2.5	U	2.4	U	140	U	**43**		2.8	U	2.7	U	2.8	U	2.7	U	3.1	U	3.3	U
Ethylbenzene	100-41-4	**9.6**		1.5	U	0.63	U	0.6	U	**31000**		**75**		0.71	U	0.67	U	**6.5**		0.69	U	0.79	U	0.83	U
Heptane	142-82-5	6.6	UJ	7.1	U	3	U	2.8	U	**200**		**79**		3.4	U	3.2	U	**5.3**		3.2	U	3.7	U	3.9	U
Hexane	110-54-3	**6.7**		6.1	U	2.6	U	2.4	U	**340**		**760**	**J**	2.9	U	2.7	U	**7.2**		2.8	U	3.2	U	3.4	U
Indan	496-11-7	7.8	U	8.4	U	3.5	U	3.4	U	**27000**		6.1	U	4.0	U	3.7	U	3.9	U	3.8	U	4.4	U	4.6	U
Indene	95-13-6	7.6	U	8.3	U	3.5	U	3.3	U	**1500**		6.0	U	3.9	U	3.7	U	3.8	U	3.8	U	4.3	U	4.5	U
Isopentane	78-784	**6.2**		**64**		2.2	U	2	U	**630**		**73**		2.4	U	**3.8**		**5.4**		**4.7**		2.7	U	2.8	U
Naphthalene	91-20-3	8.4	U	9.1	U	3.8	U	3.6	U	**23000**		6.6	U	4.3	U	4.1	U	4.2	U	4.1	U	4.8	U	5.0	U
Styrene	100-42-5	**3.2**	**J**	1.5	U	0.62	U	0.59	U	170	U	1.1	U	0.7	U	0.66	U	0.68	U	0.67	U	0.78	U	0.81	U
Thiophene	110-02-1	5.5	U	6.0	U	2.5	U	2.4	U	550	U	4.4	U	2.8	U	2.7	U	2.8	U	2.7	U	3.1	U	3.3	U
Toluene	108-88-3	**270**		**15**		**11**		**2.3**		**720**		**70**		**1.4**		**2.8**		**10**		**3.5**		**1.1**		**1.3**	
m/p-Xylenes	136777-61-2	**25**		**1.8**		0.63	U	0.6	U	**7900**		**320**		0.71	U	**1.0**		**19**		**1.4**		0.79	U	0.83	U
o-Xylene	95-47-6	**8.2**		1.5	U	0.63	U	0.6	U	**9700**		**81**		0.71	U	0.67	U	**9.6**		0.69	U	0.79	U	0.83	U
Non-MGP Related[2]																									
1,1,1-Trichloroethane (1,1,1-TCA)	71-55-6	**22**		1.9	U	0.8	U	0.76	U	220	U	1.4	U	**42**		0.84	UJ	0.88	UJ	0.86	UJ	1.0	U	1.0	U
1,1,2,2-Tetrachloroethane	79-34-5	2.2	U	2.4	U	1	U	0.95	U	280	U	1.7	U	1.1	U	1.1	U	1.1	U	1.1	U	1.2	U	1.3	U
1,1,2-Trichloroethane	79-00-5	1.8	U	1.9	U	0.8	U	0.76	U	220	U	1.4	U	0.89	U	0.84	U	0.88	U	0.86	U	1.0	U	1.0	U
1,1-Dichloroethane	75-34-3	1.3	U	1.4	U	0.59	U	0.56	U	160	U	1.0	U	0.66	U	0.63	U	0.65	U	0.64	U	0.74	U	0.77	U
1,1-Dichloroethene	75-35-4	1.3	UJ	1.4	U	0.58	U	0.55	U	160	U	1.0	U	**2.1**		0.61	U	0.64	U	0.63	U	0.72	U	0.76	U
1,2,4-Trichlorobenzene	120-82-1	12	U	13	U	5.4	U	5.2	U	1200	U	9.4	U	6.1	U	5.8	U	6	U	5.9	U	6.8	U	7.1	U
1,2-Dibromoethane (EDB)	106-93-4	2.5	U	2.7	U	1.1	U	1.1	U	310	U	1.9	U	1.3	U	1.2	U	1.2	U	1.2	U	1.4	U	1.5	U
1,2-Dichlorobenzene	95-50-1	1.9	U	2.1	U	0.88	U	0.84	U	240	U	1.5	U	0.99	U	0.93	U	0.97	U	0.95	U	1.1	U	1.1	U
1,2-Dichloroethane	107-06-2	1.3	U	1.4	U	0.59	U	0.56	U	160	U	1.0	U	0.66	U	0.63	U	0.65	U	0.64	U	0.74	U	0.77	U
1,2-Dichloropropane	78-87-5	1.5	U	1.6	U	0.67	U	0.63	U	190	U	1.2	U	0.76	U	0.72	U	0.74	U	0.73	U	0.84	U	0.88	U
1,3-Butadiene	106-99-0	3.6	U	3.8	U	1.6	U	1.5	U	89	U	**5.8**		1.8	U	1.7	U	1.8	U	1.7	U	2.0	U	2.1	U
1.3-Dichlorobenzene	541-73-1	1.9	U	2.1	U	0.88	U	0.84	U	240	U	1.5	U	0.99	U	0.93	U	0.97	U	0.95	U	1.1	U	1.1	U
1,4-Dichlorobenzene	106-46-7	1.9	U	2.1	U	0.88	U	0.84	U	240	U	1.5	U	0.99	U	0.93	U	0.97	U	0.95	U	1.1	U	1.1	U
1,4-Dioxane	123-91-1	5.8	U	6.3	U	2.6	U	2.5	U	580	U	4.6	U	3.0	U	2.8	U	2.9	U	2.8	U	3.3	U	3.4	U
2-Butanone (MEK)	78-93-3	4.7	UJ	5.1	U	**6.4**		**2.8**		120	U	**7.9**		2.4	U	2.3	U	**5.9**		**2.4**		**5.4**		2.8	U
2-Hexanone	591-78-6	6.6	U	7.1	U	3	U	2.8	U	660	U	5.2	U	3.4	U	3.2	U	3.3	U	3.2	U	3.7	U	3.9	U
4-Methyl-2-pentanone	108-10-1	6.6	U	7.1	U	3	U	2.8	U	160	U	5.2	U	3.4	U	3.2	U	3.3	U	3.2	U	3.7	U	3.9	U
Acetone	67-64-1	**47**		**12**		**22**		**8.4**		380	U	**21**		**5.5**		**5.4**		**24**		**15**		**37**		**20**	
Benzyl chloride	100-44-7	1.7	U	1.8	U	0.76	U	0.72	U	210	U	1.3	U	0.85	U	0.8	U	0.83	U	0.82	U	0.95	U	0.99	U
Bromodichloromethane	75-27-4	11	U	12	U	4.9	U	4.6	U	270	U	8.5	U	5.5	U	5.2	U	5.4	U	5.3	U	6.1	U	6.4	U
Bromoform	75-25-2	17	U	18	U	7.5	U	7.2	U	420	U	13	U	8.5	U	8.0	U	8.3	U	8.2	U	9.4	U	9.9	U
Bromomethane	74-83-9	**1.5**	**J**	1.4	U	0.57	U	0.54	U	160	U	0.98	U	**0.89**		**0.62**		0.62	U	**0.61**	U	0.71	U	0.74	U
Carbon Tetrachloride	56-23-5	2.0	U	**4.6**		0.9	U	0.9	U	250	U	1.6	U	1.0	U	0.98	U	1.0	U	0.99	U	1.2	U	1.2	U
Chlorobenzene	108-90-7	1.5	U	1.6	U	0.67	U	0.64	U	180	U	1.2	U	0.76	U	0.71	U	0.74	U	0.73	U	0.84	U	0.88	U
Chloroethane	75-00-3	0.85	U	0.92	U	0.38	U	0.37	U	110	U	0.67	U	0.43	U	0.41	U	0.42	U	0.42	U	0.48	U	0.50	U
Chloroform	67-66-3	**1.8**		**2.0**		0.71	U	0.68	U	200	U	**1.3**		0.8	U	0.76	U	0.79	U	0.77	U	0.89	U	0.93	U
Chloromethane	74-87-3	0.66	U	0.72	U	0.3	U	0.29	U	330	U	**0.68**		0.34	U	**0.60**		0.33	U	**1.3**		0.38	U	**1.8**	
cis-1,2-Dichloroethene	156-59-2	1.3	U	1.4	U	0.58	U	0.55	U	160	U	1.0	U	0.65	U	0.61	U	0.64	U	0.63	U	0.72	U	0.76	U
cis-1,3-Dichloropropene	10061-01-5	1.5	U	1.6	U	0.66	U	0.63	U	180	U	1.1	U	0.74	U	0.7	U	0.73	U	0.72	U	0.83	U	0.87	U
Dibromochloromethane	124-48-1	14	U	15	U	6.2	U	5.9	U	340	U	11	U	7.0	U	6.6	U	6.8	U	6.7	U	7.8	U	8.1	U
Ethanol	64-17-5	3.0	UJ	**18**	**J**	**2.0**		**1.4**		300	U	**3.2**	**J**	**2.1**	**J**	**3.8**	**J**	**12**		**9.4**		**12**		**23**	
Trichlorofluoromethane (Freon 11)	75-69-4	**6.7**		**19**		**19**		0.95	U	230	U	1.4	U	**2.0**		**1.4**		**4.3**		**2.0**		**2.8**		**1.5**	
1,1,2-Trichlorotrifluoroethane (Freon 113)	76-13-1	2.5	U	2.7	U	1.1	U	1.1	U	310	U	1.9	U	**2.4**		1.2	U	1.2	U	1.2	U	1.4	U	1.5	U
1,2-Dichlorotetrafluoroethane	76-14-2	2.2	U	2.4	U	1	U	0.97	U	280	U	1.8	U	1.1	U	1.1	U	1.1	U	1.1	U	1.3	U	1.3	U
Dichlorodifluoromethane (Freon 12)	75-71-8	**23**		**420**		**4.9**		**1**		200	U	**2.6**		**2.4**		**2.6**		0.8	U	**3.2**		**2.9**		**2.3**	

Table 3-6
Summary of Soil Gas Results
Former MGP Site, Far Rockaway, NY

Sample Location	CAS Number	1224 Brunswick Ave.		1216 Brunswick Ave.		1200 Brunswick Ave.				West of Former Holder		South of Former Holder	
Location Description		Commercial Building		Commercial Building		Commercial Building		Parking Lot		Storage Yard		Storage Yard	
Type of Sample		Sub-slab Vapor		Sub-slab Vapor		Sub-slab Vapor		Soil Vapor		Soil Vapor		Soil Vapor	
Sample ID		SV-1		SV-2		SV-3		SV-7		SV-4		SV-5	
Sample Depth (ft bgs)		Sub-slab		Sub-slab		Sub-slab		3.0 - 3.5		4.0 - 4.5		4.0 - 4.5	
Sampling Date		12/5/2007		12/5/2007		1/24/2008		1/24/2008		12/5/2007		12/5/2007	
Compound (ug/m³)													
Hexachlorobutadiene (C-46)	87-68-3	17	U	18	U	7.8	U	7.4	U	1700	U	13	U
Methyl tert-Butyl Ether (MTBE)	1634-04-4	5.8	U	6.3	U	2.6	U	2.5	U	140	U	4.6	U
Methylene Chloride (Dichloromethane)	75-09-2	1.1	U	**1.9**		0.51	U	0.48	U	140	U	0.88	U
2-Propanol	67-63-0	4.0	UJ	4.3	UJ	1.8	U	1.7	U	400	U	3.1	UJ
Propene	115-07-1	2.8	U	3.0	U	1.2	U	**2.5**		280	U	**150**	
Tetrachloroethene (PCE)	127-18-4	**22**		**3.5**		**2.3**		**1.1**		270	U	**1.9**	
Tetrahydrofuran	109-99-9	4.7	U	5.1	U	2.2	U	2	U	120	U	3.7	U
Trans-1,2-Dichloroethene	156-60-5	6.4	U	6.9	U	2.9	U	2.8	U	160	U	5.0	U
Trans-1,3-Dichloropropene	10061-02-6	1.5	U	1.6	U	0.66	U	0.63	U	180	U	1.1	U
Trichloroethene (TCE)	79-01-6	1.7	U	1.9	U	0.78	U	0.75	U	220	U	**5.3**	
Vinyl Chloride	75-01-4	0.82	U	0.89	U	0.37	U	0.36	U	100	U	0.65	U
Helium (percent)	7440-59-7	0.080	U	0.070	U	**0.22**		0.070	U	0.080	U	0.076	U

Sample Location	CAS Number	On Brunswick Ave.				Adjacent to Hardware Store				Adjacent to Hardware Store			
Location Description		Street		Street		Parking Lot		Parking Lot		Storage Yard		Storage Yard	
Type of Sample		Soil Vapor		Ambient Air		Soil Vapor		Ambient Air		Soil Vapor		Ambient Air	
Sample ID		SV-6		AMB-1		FRSV-8		FRAMB-2		FRSV-9		AMB-3	
Sample Depth (ft bgs)		4.0 - 4.5		NA		3.0 - 3.5		NA		3.0 - 3.5		NA	
Sampling Date		12/5/2007		12/5/2007		11/4/2008		11/4/2008		6/23/2010		6/23/2010	
Compound (ug/m³)													
Hexachlorobutadiene (C-46)	87-68-3	8.7	U	8.3	U	8.6	U	8.4	U	9.8	U	10	U
Methyl tert-Butyl Ether (MTBE)	1634-04-4	3.0	U	2.8	U	2.9	U	2.8	U	3.3	U	3.4	U
Methylene Chloride (Dichloromethane)	75-09-2	0.57	U	**1.1**		**1.5**	**J**	**0.80**	**J**	0.64	U	0.66	U
2-Propanol	67-63-0	2.0	UJ	1.9	UJ	2.0	U	1.9	U	2.2	U	2.3	U
Propene	115-07-1	1.4	U	1.3	U	**22**		1.4	U	1.6	U	1.6	U
Tetrachloroethene (PCE)	127-18-4	**1.9**		1.0	U	1.1	U	1.1	U	1.2	U	1.3	U
Tetrahydrofuran	109-99-9	2.4	U	2.3	U	2.4	U	2.3	U	2.7	U	2.8	U
Trans-1,2-Dichloroethene	156-60-5	3.2	U	3.1	U	3.2	U	3.1	U	3.6	U	3.8	U
Trans-1,3-Dichloropropene	10061-02-6	0.74	U	0.7	U	0.73	U	0.72	U	0.83	U	0.87	U
Trichloroethene (TCE)	79-01-6	0.88	U	0.83	U	0.86	U	0.85	U	0.98	U	1.0	U
Vinyl Chloride	75-01-4	0.42	U	0.40	U	0.41	U	0.40	U	0.47	U	0.49	U
Helium (percent)	7440-59-7	0.082	U	--		0.080	U	0.079	U	0.092	U	--	

Notes:

All units in micrograms per cubic meter (µg/m³)

1 - These compounds may be related to either MGP sources or non-MGP sources, or both. MGP sources include MGP tars and petroleum feedstocks used in MGP processes, such as the carburetted water gas process. Non-MGP sources include cleaning products, floor wax and polish, vehicle exhaust, construction materials, and cigarette smoke.

2 - Constituent not associated with MGP residuals or processes.

Bold indicates compound detected in a concentration greater than the method reporting limit.

NA - Not applicable.

NL - Not listed - data not available for background concentrations for these compounds.

U - The compound was analyzed for, but was not detected above the method reporting limit.

J - The analyte was positively identified. The associated numerical value is the approximate concentration of the analyte in the sample.

Table 3-7
Summary of Indoor Air Results
Former MGP Site, Far Rockaway, NY

Sample Location	CAS Number	1224 Brunswick Ave.				1216 Brunswick Ave.		1200 Brunswick Ave.		NYSDOH Background Indoor Air Values[3]		USEPA Indoor Air Screening Criteria [4]
Type of Sample		Indoor Air		Indoor Air		Indoor Air		Indoor Air				
Sample ID		IA-1		IA-1 Dup		IA-2		IA-3		75th Percentile	90th Percentile	
Sample Depth (ft bgs)		NA		NA		NA		NA				
Sampling Date		12/5/2007		12/5/2007		12/5/2007		1/24/2008				
Compound (ug/m³)												
Possible MGP Related or Other Sources[1]												
1,2,4-Trimethylbenzene	95-63-6	**13**		**11**		**0.89**		**0.85**		4.3	9.5	6
1,3,5-Trimethylbenzene	108-67-8	7.8	U	9.3	U	0.75	U	0.72	U	1.7	3.6	NP
2,2,4-Trimethylpentane (Isooctane)	540-84-1	37	U	44	U	3.6	U	3.4	U	NL	NL	NP
2,3-Dimethylpentane	565-59-3	32	U	39	U	3.1	U	3	U	2.2	7.5	NP
2-Methylpentane	107-83-5	**35**		**33**		2.7	U	2.6	U	NL	NL	NP
4-Ethyltoluene	622-96-8	39	U	47	U	3.7	U	3.6	U	NL	NL	NP
Benzene	71-43-2	**25**		**26**		**4.2**		**2.4**		5.9	15	31
Carbon Disulfide	75-15-0	25	U	30	U	2.4	U	2.3	U	NL	NL	NP
Cyclohexane	110-82-7	27	U	33	U	2.6	U	2.5	U	2.6	8.1	NP
Ethylbenzene	100-41-4	**14**		**15**		**0.98**		**0.88**		2.8	7.4	220
Heptane	142-82-5	32	U	39	U	3.1	U	3	U	7.6	19	NP
Hexane	110-54-3	**30**	**J**	33	UJ	2.7	U	2.6	U	6	18	200
Indan	496-11-7	38	U	46	U	3.7	U	3.5	U	NL	NL	NP
Indene	95-13-6	38	U	45	U	3.6	U	3.5	U	NL	NL	NP
Isopentane	78-784	**110**		**110**		**88**		**7.2**		NL	NL	NP
Naphthalene	91-20-3	42	U	50	U	4.0	U	3.8	U	NL	NL	NP
Styrene	100-42-5	6.8	U	8.1	U	**0.72**	**J**	0.62	U	0.64	1.3	NP
Thiophene	110-02-1	27	U	33	U	2.6	U	2.5	U	NL	NL	NP
Toluene	108-88-3	**110**		**110**		**5.1**		**39**		24.8	58	400
m/p-Xylenes	136777-61-2	**48**		**41**		**2.3**		**2.2**		4.6	12	7000
o-Xylene	95-47-6	**15**		**15**		**0.78**		**0.69**		3.1	7.6	7000
Non-MGP Related[2]												
1,1,1-Trichloroethane (1,1,1-TCA)	71-55-6	8.7	U	10	U	0.83	U	0.8	U	1.1	3.1	NP
1,1,2,2-Tetrachloroethane	79-34-5	11	U	13	U	1.0	U	1	U	<0.25	<0.25	NP
1,1,2-Trichloroethane	79-00-5	8.7	U	10	U	0.83	U	0.8	U	<0.25	<0.25	NP
1,1-Dichloroethane	75-34-3	6.4	U	7.7	U	0.62	U	0.59	U	<0.25	<0.25	NP
1,1-Dichloroethene	75-35-4	6.3	U	7.5	U	0.6	U	0.58	U	<0.25	<0.25	NP
1,2,4-Trichlorobenzene	120-82-1	59	U	70	U	5.6	U	5.4	U	<0.25	3.4	NP
1,2-Dibromoethane (EDB)	106-93-4	12	U	15	U	1.2	U	1.1	U	<0.25	<0.25	NP
1,2-Dichlorobenzene	95-50-1	9.6	U	11	U	0.91	U	0.88	U	<0.25	0.72	NP
1,2-Dichloroethane	107-06-2	6.4	U	7.7	U	0.62	U	0.59	U	<0.25	<0.25	NP
1,2-Dichloropropane	78-87-5	7.3	U	8.8	U	0.70	U	**0.73**		<0.25	<0.25	4
1,3-Butadiene	106-99-0	18	U	21	U	1.7	U	1.6	U	NL	NL	NP
1.3-Dichlorobenzene	541-73-1	9.6	U	11	U	0.91	U	0.88	U	<0.25	0.6	NP
1,4-Dichlorobenzene	106-46-7	9.6	U	11	U	0.91	U	0.88	U	0.54	1.3	NP
1,4-Dioxane	123-91-1	29	U	34	U	2.7	U	2.6	U	NL	NL	NP
2-Butanone (MEK)	78-93-3	23	U	28	U	2.2	U	**22**		7.3	16	1000
2-Hexanone	591-78-6	32	U	39	U	3.1	U	3	U	NL	NL	NP
4-Methyl-2-pentanone	108-10-1	32	U	39	U	3.1	U	3	U	0.86	2.2	NP
Acetone	67-64-1	19	U	22	U	**9.5**		**9.1**		52	110	NP
Benzyl chloride	100-44-7	8.2	U	9.8	U	0.79	U	0.76	U	NL	NL	NP
Bromodichloromethane	75-27-4	53	U	64	U	5.1	U	4.9	U	NL	NL	NP
Bromoform	75-25-2	82	U	98	U	7.8	U	7.5	U	NL	NL	NP
Bromomethane	74-83-9	6.2	U	7.4	U	**1.0**		0.57	U	<0.25	0.6	NL

Table 3-7
Summary of Indoor Air Results
Former MGP Site, Far Rockaway, NY

Sample Location	CAS Number	1224 Brunswick Ave.				1216 Brunswick Ave.		1200 Brunswick Ave.		NYSDOH Background Indoor Air Values[3]		USEPA Indoor Air Screening Criteria[4]
Type of Sample		Indoor Air		Indoor Air		Indoor Air		Indoor Air		75th Percentile	90th Percentile	
Sample ID		IA-1		IA-1 Dup		IA-2		IA-3				
Sample Depth (ft bgs)		NA		NA		NA		NA				
Sampling Date		12/5/2007		12/5/2007		12/5/2007		1/24/2008				
Compound (ug/m³)												
Carbon Tetrachloride	56-23-5	10	U	12	U	0.96	U	0.9	U	0.59	0.81	NP
Chlorobenzene	108-90-7	7.3	U	8.7	U	0.70	U	0.67	U	<0.25	<0.25	NP
Chloroethane	75-00-3	4.2	U	5.0	U	0.40	U	0.38	U	<0.25	<0.25	NP
Chloroform	67-66-3	7.8	U	9.3	U	0.74	U	0.71	U	0.54	1.4	NP
Chloromethane	74-87-3	3.3	U	3.9	U	**0.91**		**1.3**		1.8	3.3	NP
cis-1,2-Dichloroethene	156-59-2	6.3	U	7.5	U	0.60	U	0.58	U	<0.25	<0.25	NP
cis-1,3-Dichloropropene	10061-01-5	7.2	U	8.6	U	0.69	U	0.66	U	<0.25	<0.25	NP
Dibromochloromethane	124-48-1	68	U	81	U	6.5	U	6.2	U	NL	NL	NP
Ethanol	64-17-5	**100**	**J**	**80**	**J**	**13**	**J**	**14**		540	1400	NP
Trichlorofluoromethane (Freon 11)	75-69-4	8.9	U	11	U	**2.3**		**1.3**		5.4	17	NP
1,1,2-Trichlorotrifluoroethane (Freon 113)	76-13-1	12	U	14	U	1.2	U	1.1	U	1.1	1.8	NP
1,2-Dichlorotetrafluoroethane	76-14-2	11	U	13	U	1.1	U	1	U	<0.25	0.52	NP
Dichlorodifluoromethane (Freon 12)	75-71-8	7.9	U	9.4	U	**22**		**2.9**		4.1	15	40
Hexachlorobutadiene (C-46)	87-68-3	85	U	100	U	8.1	U	7.8	U	<0.25	4.6	NP
Methyl tert-Butyl Ether (MTBE)	1634-04-4	29	U	34	U	2.7	U	2.6	U	5.6	27	NP
Methylene Chloride (Dichloromethane)	75-09-2	5.5	U	6.6	U	**0.83**		**0.65**		6.6	22	NP
2-Propanol	67-63-0	20	UJ	23	UJ	**4.2**	**J**	**2**		NL	NL	NP
Propene	115-07-1	14	U	16	U	1.3	U	**84**		NL	NL	NP
Tetrachloroethene (PCE)	127-18-4	**3100**		**3400**		**6.6**		**28**		1.1	2.9	81
Tetrahydrofuran	109-99-9	23	U	28	U	2.2	U	2.2	U	0.35	3.3	NP
Trans-1,2-Dichloroethene	156-60-5	32	U	38	U	3.00	U	2.9	U	NA	NA	NP
Trans-1,3-Dichloropropene	10061-02-6	7.2	U	8.6	U	0.69	U	0.66	U	<0.25	<0.25	NP
Trichloroethene (TCE)	79-01-6	8.5	U	10	U	**2.1**		0.78	U	<0.25	0.48	2.2
Vinyl Chloride	75-01-4	4.1	U	4.8	U	0.39	U	0.37	U	<0.25	<0.25	NP
Helium (percent)	7440-59-7	--		--		--		--		NA	NA	NP

Notes:

All units in micrograms per cubic meter (µg/m³)

1 - These compounds may be related to either MGP sources or non-MGP sources, or both. MGP sources include MGP tars and petroleum feedstocks used in MGP processes, such as the carburetted water gas process. Non-MGP sources include cleaning products, floor wax and polish, vehicle exhaust, construction materials, and cigarette smoke.

2 - Constituent not associated with MGP residuals or processes.

3 - New York State Department of Health, November 14, 2005.

4 - U.S. EPA, Draft Indoor Air Guidance, 2002.

Bold indicates compound detected in a concentration greater than the method reporting limit.

Exceedance of NYSDOH 90th Pecentile Background Value for Ambient Air

Exceedance of U.S. EPA Screening Criteria

Dup - As suffix on sample ID indicates that the sample is a field duplicate.

NA - Not applicable.

NL - Not listed - data not available for background concentrations for these compounds.

NP - Not provided - USEPA Screening Criteria values provided only for compounds which exceeded either NYSDOH Background Indoor Air values or USEPA Screening Criteria.

U - The compound was analyzed for, but was not detected above the method reporting limit.

J - The analyte was positively identified. The associated numerical value is the approximate concentration of the analyte in the sample.

Table 3-8
Summary of Monitored Natural Attenuation Analytical Results
Former MGP, Far Rockaway, NY

Sample Location Sample Date Sample ID Laboratory Identification	Units	CAS Number	NYSDEC Groundwater Guidance or Standard Value[1]	MW-114 9/14/2009 MW-114-091409 P0909159-03	MW-116D 9/14/2009 MW-116D-091409 P0909159-02	MW-116S 9/14/2009 MW-116S-091409 P0909159-01	MW-119D 9/11/2009 MW-119D-091109 P0909146-01
Field Parameters[2]							
Dissloved Oxygen	mg/L	NA	NL	0.23	0.25	0.26	0.45
pH	pH	NA	NL	7.06	6.38	7.18	5.89
Oxygen Reduction Potential	mV	NA	NL	-9.5	106.7	-61.2	137.9
Specific Conductivity	mS/cm	NA	NL	0.830	0.859	0.546	0.611
Temperature	degrees C	NA	NL	20.24	17.78	21.66	16.15
Turbidity	NTU	NA	NL	2.19	6.65	9.54	0.91
MNA Parameters							
Carbon Dioxide	mg/L	124-38-9	NL	**86**	**130**	**49**	**120**
Methane	ug/L	74-82-8	NL	**120**	**7**	**410**	**3.3**
Nitrogen	mg/L	7727-37-9	NL	**18**	**20**	**15**	**18**
Oxygen	mg/L	7782-44-7	NL	**1.90**	**2.20**	**1.90**	**1.70**
Chemical Oxygen Demand (COD)	mg/L	COD	NL	**28.0**	<25.0	**53.0**	<25.0
Ferrous Iron	mg/L	C-FE+2	NL	**12**	<1.0	**1.90**	<1.0
Total Sulfide	mg/L	18496-25-8	NL	<2.0	<2.0	<2.0	<2.0
Iron, Dissolved	mg/L	7439-89-6	0.3	**13**	**0.32**	**2.4**	<0.05
Iron, Total	mg/L	7439-89-6	0.3	**14**	**0.83**	**3.1**	**0.064**
Manganese, Dissolved	mg/L	7439-96-5	0.3	**0.20**	**0.48**	**0.12**	**0.48**
Manganese, Total	mg/L	7439-96-5	0.3	**0.22**	**0.52**	**0.14**	**0.54**
Nitrate as N	mg/L	14797-55-8	NL	**6.8**	**6.8**	**7.5**	**16**
Sulfate	mg/L	14808-79-8	NL	**18**	**60**	**16**	**47**

Notes:

1 - Guidance or Standard Values - NYSDEC, Division of Water, TOGS (1.1.1) - 6 NYCRR 703.5 [NYSDEC, 1998].

2 - Field parameters shown are the final measurements recorded after stabilization.

mg/L - milligrams per liter

mS/cm - milliSiemens per centimeter

mV - millivolts

NTU - Nephelometric Turbidity Units

ug/L - micrograms per liter

NA = Not Applicable

NL = Not Listed

Bold indicates compound detected at a concentration greater than the reporting limit.

Yellow highlight indicates exceedance of the NYSDEC Groundwater Guidance or Standard Value.

Table 4-1
Estimated Quantities of Impacted Soil
Former MGP, Far Rockaway, NY

	On-Site			Off-Site			Total		
	Thickness (ft)	Area (sq. ft.)	Quantity (cu.yds.)	Thickness (ft)	Area (sq. ft.)	Quantity (cu.yds.)	Thickness (ft)	Area (sq. ft.)	Quantity (cu.yds.)
Soil 0 - 15 ft									
Impacted soil	4	8,777	1,400	7	10,879	2,600	5	19,655	4,000
Soil 15 - 30 ft									
Impacted Soil	2	3,556	300	NA	NA	NA	2	3,556	300
Total Impacted Soil			1,700			2,600			4,300

Notes:
Impacted Soil = visible impacts and PAH criteria exceedances in soil. Visible impacts - staining, blebs, globs, lenses, grain coating, sheen.
bgs = below ground surface

Table 5-1
Summary of General Response Actions
Former MGP, Far Rockaway, NY

Media	General Response Actions	Site-Specific Appropriateness	Protectiveness/Ability to Achieve Remedial Goals for the Site[1]	
			Reduce Contamination	Eliminate Risk
Soil	Excavation and Disposal/Treatment (on-site and off site treatment)	- Excavation will occur on existing parking lot and current storage areas - Coordination with current site occupants will be required to coordinate Excavation activities regarding temporary parking and storage - Off-site Excavation not practical due to presence of active railroad operations	Yes - excavation can permanently remove contaminated soil on-Site, most likely reducing groundwater contaminant levels on- and off-Site	On-site: Yes - will eliminate soil exposure pathways Off-Site: No - access to impacted soil is not feasible
	NAPL Extraction and Disposal	- Will require permanent infrastructure, waste storage and waste management on site - Separate phase impacts (sheen, staining, tar) are not amenable to extraction processes	No - Separate phase impacts (sheen, staining, tar) are not amenable to extraction	On & Off-Site: No - separate phase in soils are impractical to remove via this technology and therefore will not meet remedial goals/RAOs
	In-Situ Treatment	- Can access soil to depth of impacts (5 to 30 ft bgs) - Uncertain contact of reagents with contaminated media with varying grades of the soil - Requires coordination with occupants on-site and off-Site	Yes - treatment can reduce or immobilize contaminant levels in soil, potentially reducing groundwater contaminant levels	On & Off-site: Yes - will eliminate soil exposure pathways based on the particular in-situ technology
	Containment	- Will prevent on-site contamination from migrating off-site - Extent of off-site contamination does not warrant containment - This not possible off Site due to presence of railroad operations - Limited ability to place containment structures in required locations due buildings/utilities off-site	No - unless combined with another treatment alternative	On & Off-Site: No - containment would only control the migration of mobile MGP residuals
	Institutional Controls	- Will require an agreement with site owners Implementable	No - will not reduce contamination levels or reduce mobility of MGP residuals	On & Off-site: Yes - will eliminate remaining exposure pathways
Groundwater	In-Situ Treatment	- Can access soil to depth of impacts (5 to 39 ft bgs) The silty clay layer ranges from approximately 35 - 40 feet bgs The deepest well is on-site and extends to 39 ft bgs (MW-121D) - Uncertain contact of reagents with contaminated media with varying grades of the soil - Requires coordination and agreement with site occupants - Off-site treatment not practical due to presence of railroad operations	Yes - treatment can reduce contaminant levels in soil, therefore reducing groundwater contaminant levels	On & Off-site: Yes - the elimination of risks is possible based on the particular in-situ technology
	Extraction and Treatment	- Will require permanent infrastructure, waste storage and waste management on site	Yes - groundwater extraction can permanently remove dissolved-phase contaminants	On & Off-site: No - source will continually result in groundwater impacts Yes if used with source removal technology
	Institutional Controls	- Will require an agreement with site owners Implementable	No - will not reduce contamination levels or reduce mobility of MGP residuals	On & Off-site: Yes - will eliminate remaining exposure pathways

Notes:

On-site and off-site Impacted Areas = the former MGP property and the area downgradient of the Site (Figures 4-14, 4-15, 4-16, 4-17, 5-1, 5-2, 5-3)

[1] Remedial Goals:
- Eliminate/mitigate potential risk posed by MGP residuals associated with the continued use of the property for commercial use
- Removal of the sources of MGP contamination to the extent feasible

Table 6-1
Summary of Technology Screening
Former MGP, Far Rockaway, NY

Media	General Response Action/Technology	Site Applicability	Ability to Meet Remedial Action Objectives[1]		Preferred Technology
			Contaminant Reduction	Eliminate Risk	
Soil	**Excavation and Disposal/Treatment**				
	- Excavation*†	- Appropriate to be used to remove impacted soil on the site.	-Could be used to eliminate 80 percent (to be finalized based on soil vol calcs) of the contaminated soil at the site	Yes - in conjunction with institutional controls for 15-30 ft soils, could be used to eliminate direct contact risk to potential receptors (construction workers)	
	- Disposal Treatment On-Site Thermal Desorption*†	- Requires infrastructure, soil handling areas and permits. Possible limited space for this.			Excavation with Off-Site Thermal Desorption - provides the best regulatory option and offers "final" disposal
	Off-Site Landfill*†	- Appropriate for MGP residuals that are not classified as Toxicity Characteristic wastes and pass the Paint Filter Test			
	Thermal Desorption/Incineration*†	- Generally appropriate all MGP residuals that pass the Paint Filter Test and meet maximum particle size requirements (< 3 inches)			
	In-Situ Treatment - Chemical Oxidation	- Delivery/uniform coverage uncertain due to potential preferential pathways in subsurface media - May require multiple "rounds" of treatment, large quantity of oxidant -Surfactant would need to be used to improve treatment of separate phase product. - Subsurface reactions are exothermic and may cause surface effects (steam, odor, etc.) - Reagents may be damaging to subsurface utility lines - Requires permanent infrastructure (multiple wells)	Yes- would reduce contamination levels in saturated soils	Yes - could be used to eliminate direct contact risk to potential receptors (construction workers). Risk associated with use in shallow areas due to potential surface effects (steam, odor) and potential damage to utility lines.	
	- Solidification	- Will decrease the permeability of impacted soil in the saturated zone, reducing contaminant levels in groundwater - Provides ability to control uniform coverage of treatment areas - Potential surface effects (steam, odor) and potential damage to utility lines	No - will not reduce soil contamination levels. Soil contaminants will be immobilized in place and therefore will not leach into groundwater.	Yes - could be used to eliminate direct contact risk to potential receptors (construction workers). Surface effects would need to be addressed.	Solidification - provides ability to immobilize bulk of contamination at depth and therefore reduce contaminant levels in groundwater. Surface effects could be readily addressed.
	- Bio-Remediation†	- Unable to treat areas with separate phase or concentrations of PAHs - Delivery/uniform coverage of nutrients, etc. uncertain due to potential preferential pathways in subsurface media	No - will not significantly reduce soil contamination levels	No - would not significantly reduce concentrations of heavier molecular weight constituents such as PAHs	
	- Soil Vapor Extraction†	- Not feasible since over 95% of the soil impacts are in the saturated zone (vapor extraction not feasible).	No - not feasible	No - not feasible	
	- Thermal Treatment	- Not feasible since over 95% of the soil impacts are in the saturated zone (excessive energy requirements).	No- not feasible	No - not feasible	
	Containment - Sheet Piling	- Proper placement of barrier wall may be complicated by obstructions (buildings/utilities)			
	- Soil Mix	- Proper placement of barrier wall complicated by obstructions (buildings/utilities)	No - containment technologies will not reduce soil contamination levels. Only prevents on-site contamination from migrating off-site.	No. Containment technologies will not eliminate risk.	None.
	- Jet Grouting	- Offers limited flexibility in addressing problems posed by surface obstructions - Provides means to access full range of depths - Provides ability to target selected depth intervals			
	Institutional Controls	- Deed restriction to require appropriate management of soil and groundwater to prevent potential risks.	No - would not reduce contaminant levels	Yes - would eliminate potential exposure pathways	Institutional Controls - required to ensure that direct contact risk is eliminated for all pathways.
Groundwater[2]	**In-Situ Treatment** Chemical Oxidation[2]*†	(See Soil above)			
	Air Sparging†	- All depths of contaminated groundwater can be reached. - Requires permanent infrastructure (multiple wells, piping) - Unlikely to affect a significant change in groundwater quality if residual soil impacts remain in place	Yes - would result in contaminant reduction, but would be of questionable effectiveness if quantities of residual source material remained.	Yes - in-situ treatment in conjunction with source treatment would result in removal of the exposure pathways and meet the RAOs.	Chemical Oxidation of impacted soil and groundwater will reduce constituent concentrations in groundwater within a reasonable timeframe and with minimal infrastructure. MNA/ Enhanced MNA - combined with source reduction/removal, will reduce constituent concentrations in groundwater non-intrusively, with minimal infrastructure and with minimal risks.
	In-Well Air Stripping†	- All depths of contaminated groundwater can be reached. - On-site treatment of off-gas required (carbon absorption, catalytic/thermal oxidation) - Requires permanent infrastructure (multiple wells, piping, gas treatment system, discharge stack) - Unlikely to affect a significant change in groundwater quality if residual soil impacts remain in place			
	Bio-Remediation†	(See Soil above)	No - will not significantly reduce soil contamination levels	No - would not significantly reduce concentrations of heavier molecular weight constituents such as PAHs	
	Monitored Natural Attenuation/Enhanced MNA	- Monitoring of MNA/geochemical parameters during the RI indicate evidence that intrinsic biodegradation of dissolved organics is occurring adjacent to and within the former MGP operations area. - Additional monitoring at a larger subset of wells is required to more fully develop this evaluation. - Enhanced MNA with oxygen injection may accelerate treatment timeframe.	Yes - high potential to eliminate the potential exposure pathway. Additional MNA evaluation required. Institutional controls may be required prior to reaching the treatment goals. ISOC may be implemented to enhance MNA process.	Yes - high potential to eliminate the potential exposure pathway. Institutional controls may be required prior to reaching the treatment goals. ISOC may be implemented to enhance MNA process.	
	Extraction and Treatment Air Stripping†	- All depths of contaminated groundwater can be reached. - Requires permanent infrastructure	Yes - would remove some contamination from the site, but would be of questionable effectiveness if significant quantities of residual source material remained	No - it is unlikely that the decrease in constituent concentrations would be sufficient to eliminate the direct contact risk to potential receptors with an acceptable timeframe.	None. Chemical oxidation more timely.
	Liquid Phase Adsorption/GAC*†	- On-site treatment (adsorption, air stripping) required prior to discharge off-site - Unlikely to affect a significant change in groundwater quality if residual soil impacts remain in place			
	Institutional Controls	- Deed restriction to prohibit the use of groundwater for any purpose	No - would not reduce contaminant levels	Yes - would eliminate the potential exposure pathway	Institutional Controls would be required if source material remains in place.

Notes:

[1] Remedial Action Objectives

Soil:
- Eliminate the potential for direct contact with MGP residuals for impacted (i.e., exceed applicable soil criteria, visual impacts) media
- Reduce MGP impacts that are adversely impacting GW quality to the extent feasible

GW:
- Eliminate the potential for direct contact/ingestion for media having constituent concentrations that exceed the applicable criteria
- Control the migration of remaining groundwater impacts to the extent feasible

[2] Since impacted soil in the saturated zone is the principal source of groundwater impacts, and the areas of impacted soil and groundwater coincide on the Site, the evaluation of this action for soil applies to groundwater as well.

* Presumptive Remedy for SVOCs

† Presumptive Remedy for VOCs

Table 7-1
Alternatives Evaluation
Former MGP, Far Rockaway, NY

Evaluation Criteria	Alternative 1 No Action	Alternative 2 Restore Site to Pre-Release Conditions	Alternative 3 Excavate On-Site Visual Impacts with Enhanced Monitored Natural Attenuation	Alternative 4 Solidification with Monitored Natural Attenuation
Exposure Pathway Elimination	YES - institutional controls	YES - source removal	YES - source removal; institutional controls	YES - institutional controls
Reduction of Contaminants				
5 - 15 ft bgs				
Subsurface Soil	NO	YES - excavation	YES - excavation	NO - ISS; institutional controls
Groundwater	NO	YES - excavation; ISCO	YES - excavation; EMNA	YES - ISS; EMNA
15 - 30 ft bgs				
Subsurface Soil	NO	YES - excavation	NO - instituational controls	NO - insitutional controls
Groundwater	NO	YES - excavation; ISCO	YES - EMNA	YES - EMNA
Evaluation Criteria				
1 Overall Protection of Public Health and Environment	**Fair** does not reduce impacts, but manages exposure pathways via instituational controls	**Good:** on-site source removal via excavation; off-site source removal via ISCO	**Good:** on-site source removal via excavation; off-site source removal via EMNA	**Good:** on-site source removal via excavation; off-site source removal via EMNA
2 Compliance with Standards, Criteria and Guidance	**Poor:** does not result in site-wide compliance with SCGs	**Good:** SGCs achieved through source removal	**Fair:** SGCs achieved for 0-15 ft bgs; SGCs not achieved for 15-30 ft bgs	**Poor:** does not achieve SGCs, though off-site groundwater quality would improve
3 Long-term Effectiveness and Permanence	**Poor:** contaminants will remain in-place, instituational controls would control the potential exposure pathway	**Good:** Permanent source removal. May require follow-up ISCO injections.	**Good:** permanent source removal with long term EMNA	**Good:** permanent source solidification with long term EMNA
4 Reduction of Toxicity, Mobility. or Volume	**Poor:** provides no reduction in contaminant levels	**Good:** volume of impacts reduced	**Good:** volume of impacts reduced	**Fari:** mobility of impacts reduced
5 Short-term Effectiveness	**Good:** no intrusive site work	**Fair:** Potential generation of dust & odors during excavation. Potential generation of steam & odors during ISCO.	**Fair:** Potential generation of dust & odors during excavation.	**Fair:** Potential generation of dust & odors during excavation.
6 Implementability	**Good:** MNA sampling events would require minimal coordination with property owners	**Fair:** On-site activities disrupted during implemenation. Requires access to off-site property.	**Fair:** on-site activities disrupted during implementation	**Fair:** on-site activities disrupted during implementation
7 Estimated Cost (Net Present Value) Annual O & M Costs O&M 30 Year NPV @ 3% Cost Effectiveness	Good			
8 Land Use	**Poor:** Human health risks not removed.	**Fair:** short-term disruption (on- and off-site), but will result in risk removal/reduction	**Fair:** short-term disruption (on-site), but will result in risk removal/reduction	**Fair:** short-term disruption (on-site), but will result in risk removal/reduction

Notes:

SCG = standards, criteria, guidance

1 Land use is currently commercial and expected to remain commercial for the foreseeable future. All alternatives were chosen based on commercial land use currently and for foreseeable future.

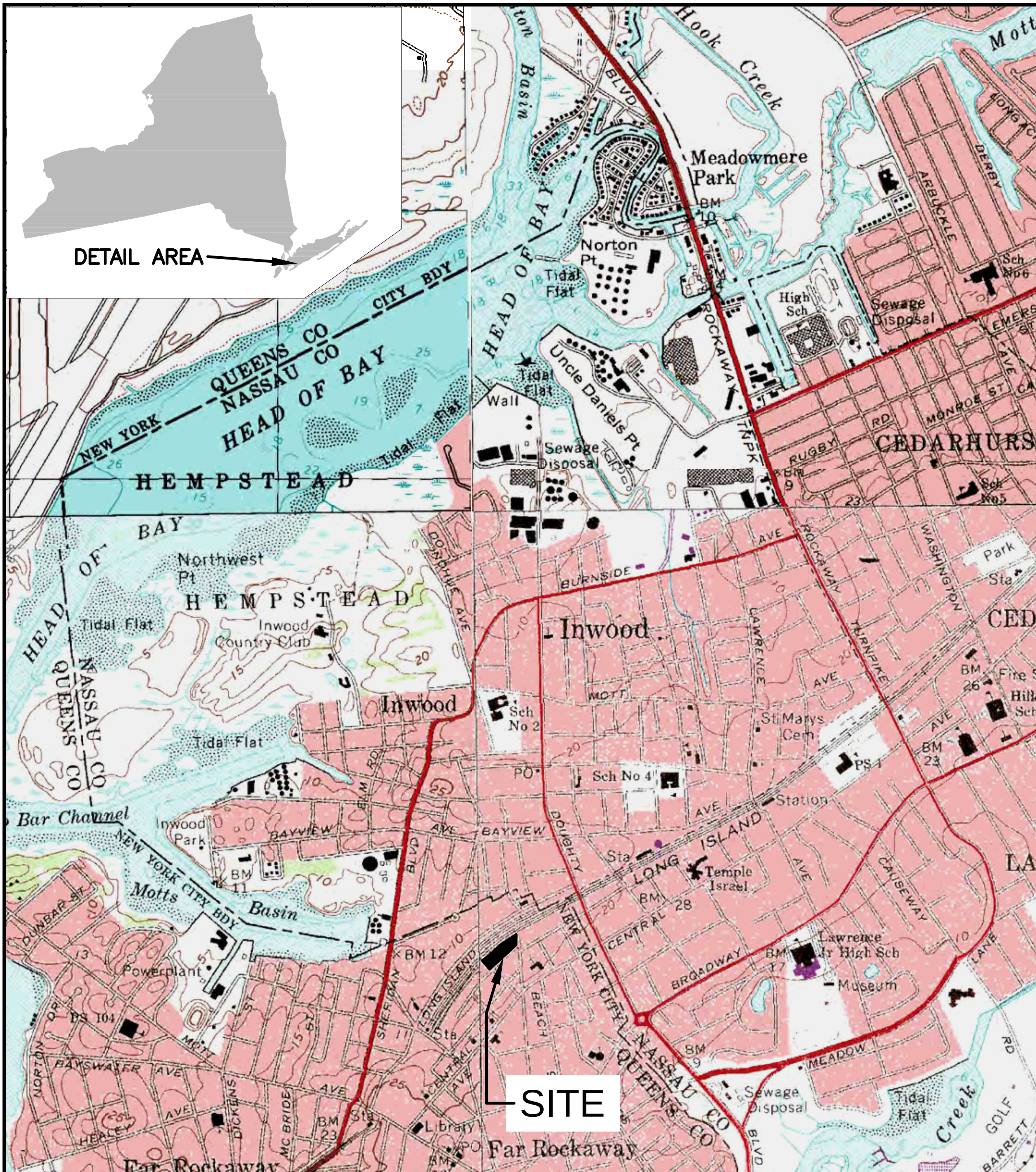
2 MNA for 3 years. If significant decrease not observed, conduct in-situ submerged oxygen curtain (ISOC).

3 Remedial Goals:

- Eliminate/mitigate potential risk posed by MGP residuals associated with the continued use of the property for commercial use.
- Removal of the sources of MGP contamination to the extent feasible.

Figures

File: J:\Rem_Eng\Project Files\National Grid\01765-067 Far Rockaway Former MGP\CADD\60137357-500\60137357-SL01.dwg Layout: Site Location Map User: warrenr Plotted: Feb 10, 2012 - 11:59am Xref's:



SOURCE: USGS QUADRANGLES:
LAWRENCE, 1979

SCALE 1:24000

1 1/2 0 1 MILE

1000 0 1000 2000 3000 4000 5000 6000 7000 FEET

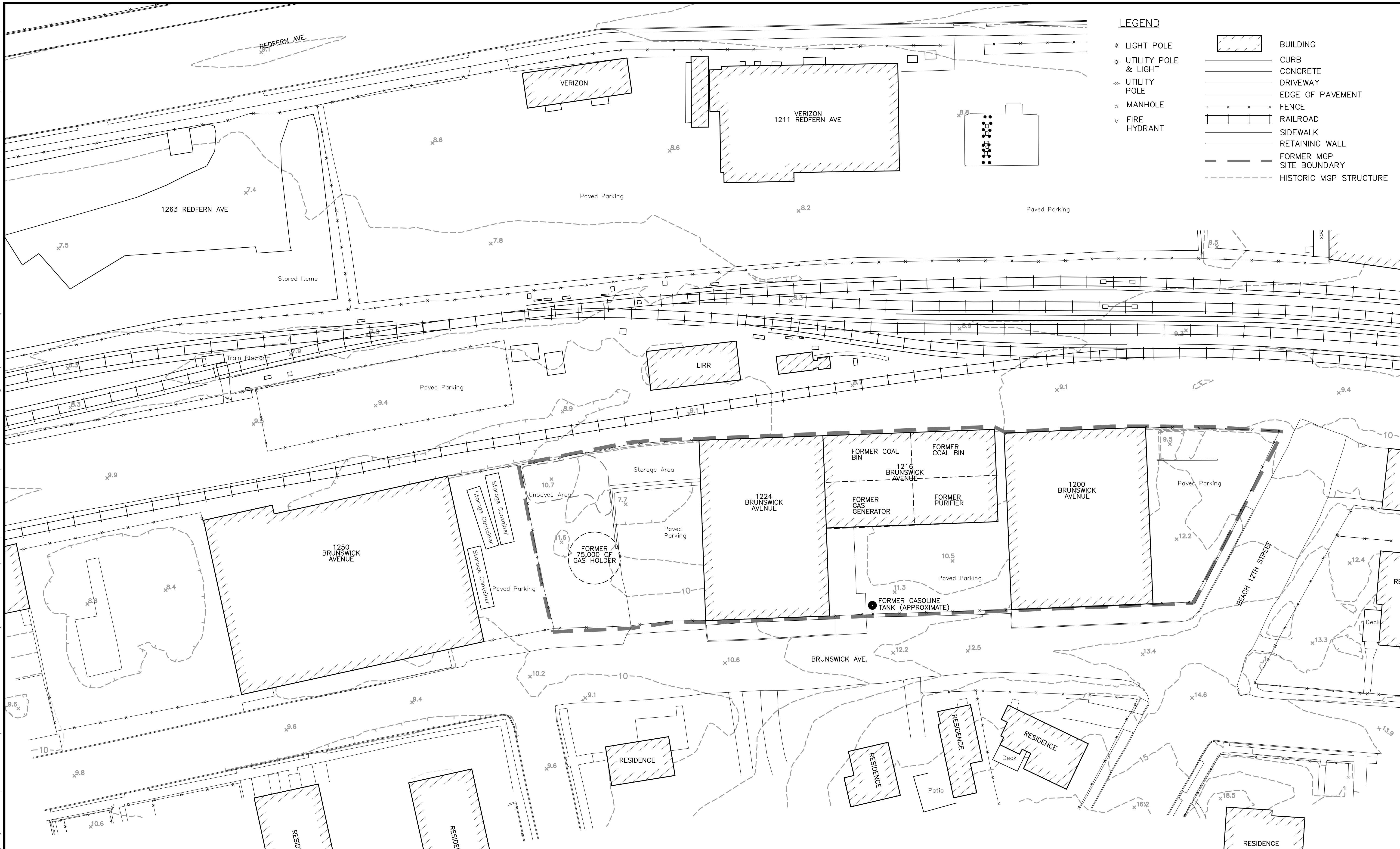
AECOM

NATIONAL GRID
FORMER MGP, FAR ROCKAWAY, NY

SITE LOCATION MAP

DATE: 02/10/12 DRWN: RCW

FIGURE 2-1



AECOM

NATIONAL GRID FORMER MGP SITE, FAR ROCKAWAY, NY	SITE LAYOUT
DATE: 02/10/2012 DRWN: RCW	FIGURE 2-2

AECOM

NATIONAL GRID
FORMER MGP, FAR ROCKAWAY, NY

SITE VICINITY PHOTOGRAPH

DATE: 02/10/2012	DRWN: RCW		FIGURE 2-3

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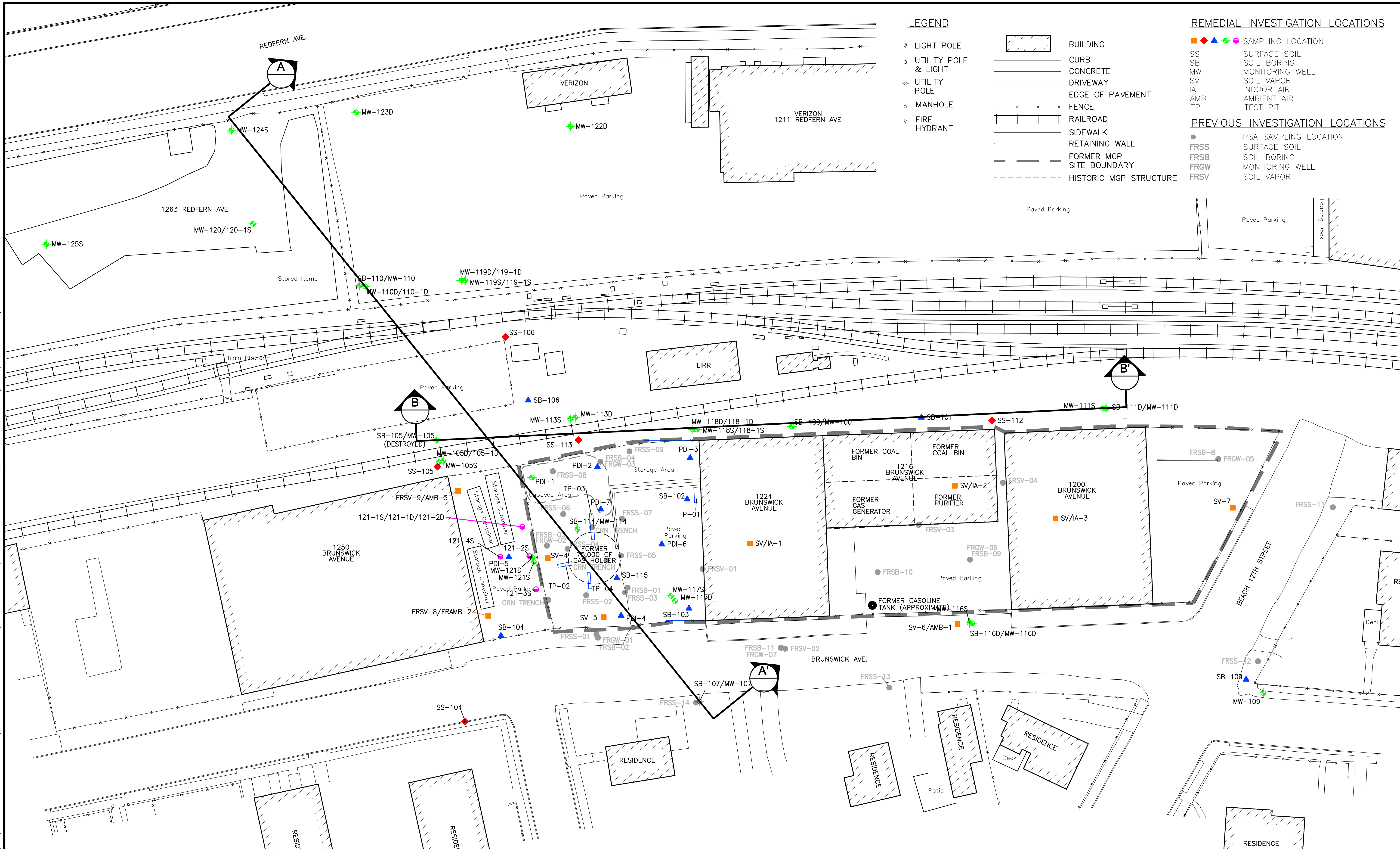


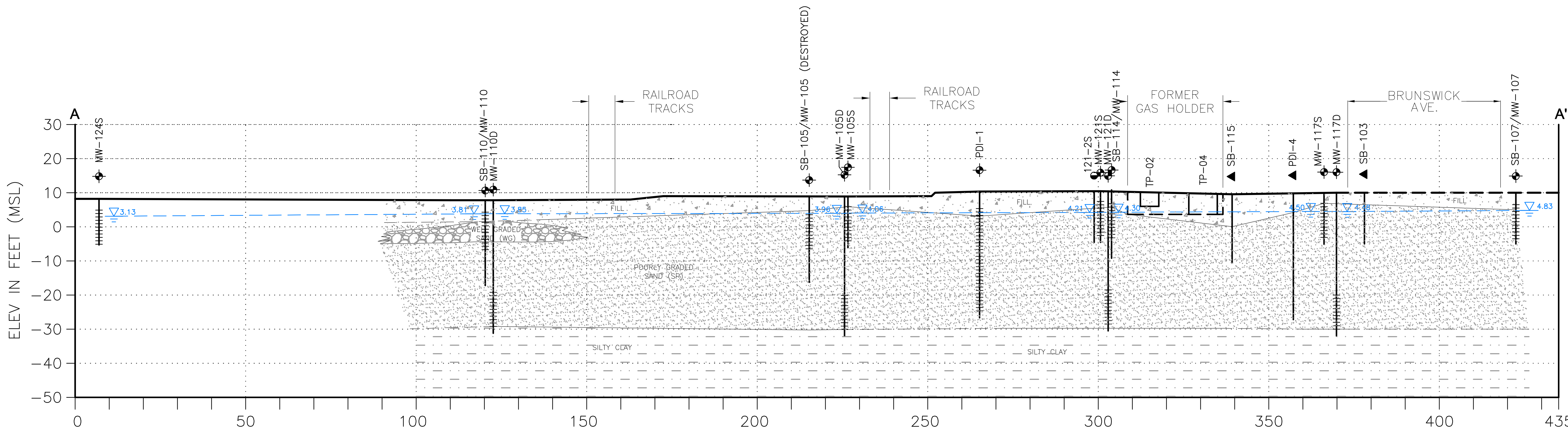
NATIONAL GRID
FORMER MGP SITE, FAR ROCKAWAY, NY

REMEDIAL INVESTIGATION SAMPLING LOCATIONS

DATE: 02/10/2012 | DRWN: RCW

FIGURE 3-1

File: J:\Rem_Eng\Project Files\National Grid\01765-067 Far Rockaway Former MGP\CADD\60137357-500\60137357-C01.dwg Layout: RI Samp Locs 50 User: warrenr Plotted: Feb 10, 2012 - 2:57pm Xref's:



CROSS SECTION A–A' SCALE: 1" = 30'

LEGEND

FILL, SANDY, POORLY GRADED

WELL GRADED F–C GRAVELLY SAND (WG)

POORLY GRADED F–M SAND (SP)

SILTY CLAY

NOTE:

WATER LEVELS BASED ON FEBRUARY 11, 2009 AND SEPTEMBER 9–14, 2009 GAUGING EVENT.

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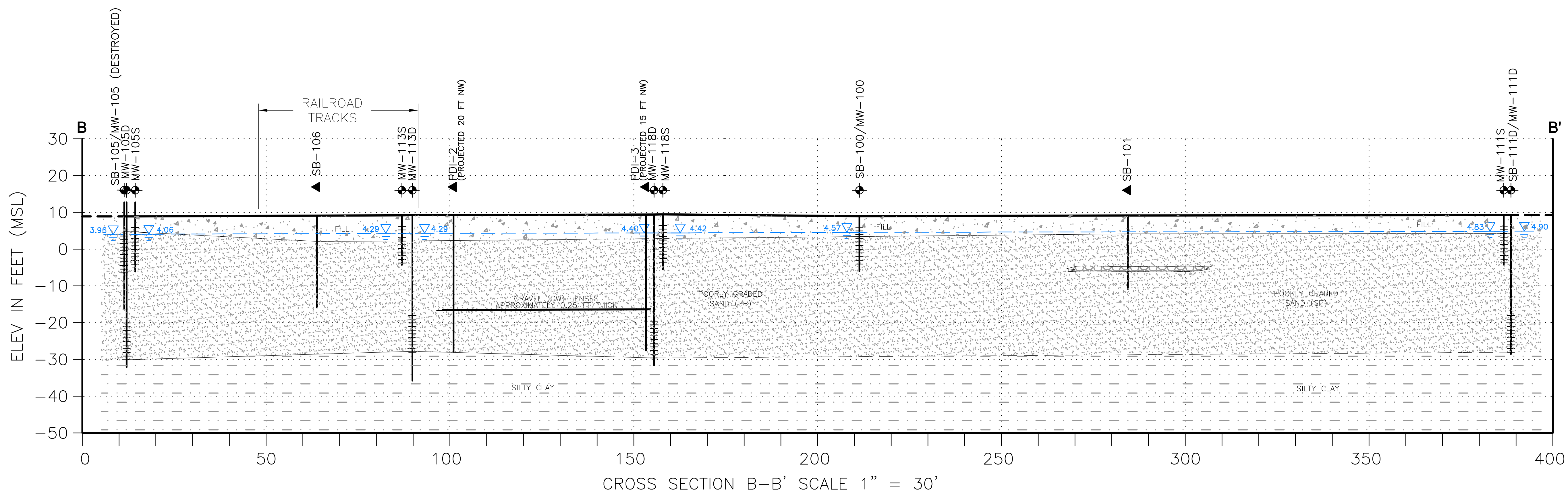
NATIONAL GRID
FORMER MGP SITE, FAR ROCKAWAY, NY

CROSS SECTION A-A'

DATE: 02/10/2012 | DRWN: RCW

FIGURE 3-2



LEGEND

FILL, SANDY, POORLY GRADED

WELL GRADED F-C GRAVELLY SAND (WG)

POORLY GRADED F-M SAND (SP)

SILTY CLAY

NOTE:

WATER LEVELS BASED ON FEBRUARY 11, 2009
AND SEPTEMBER 9-14, 2009 GAUGING EVENT.

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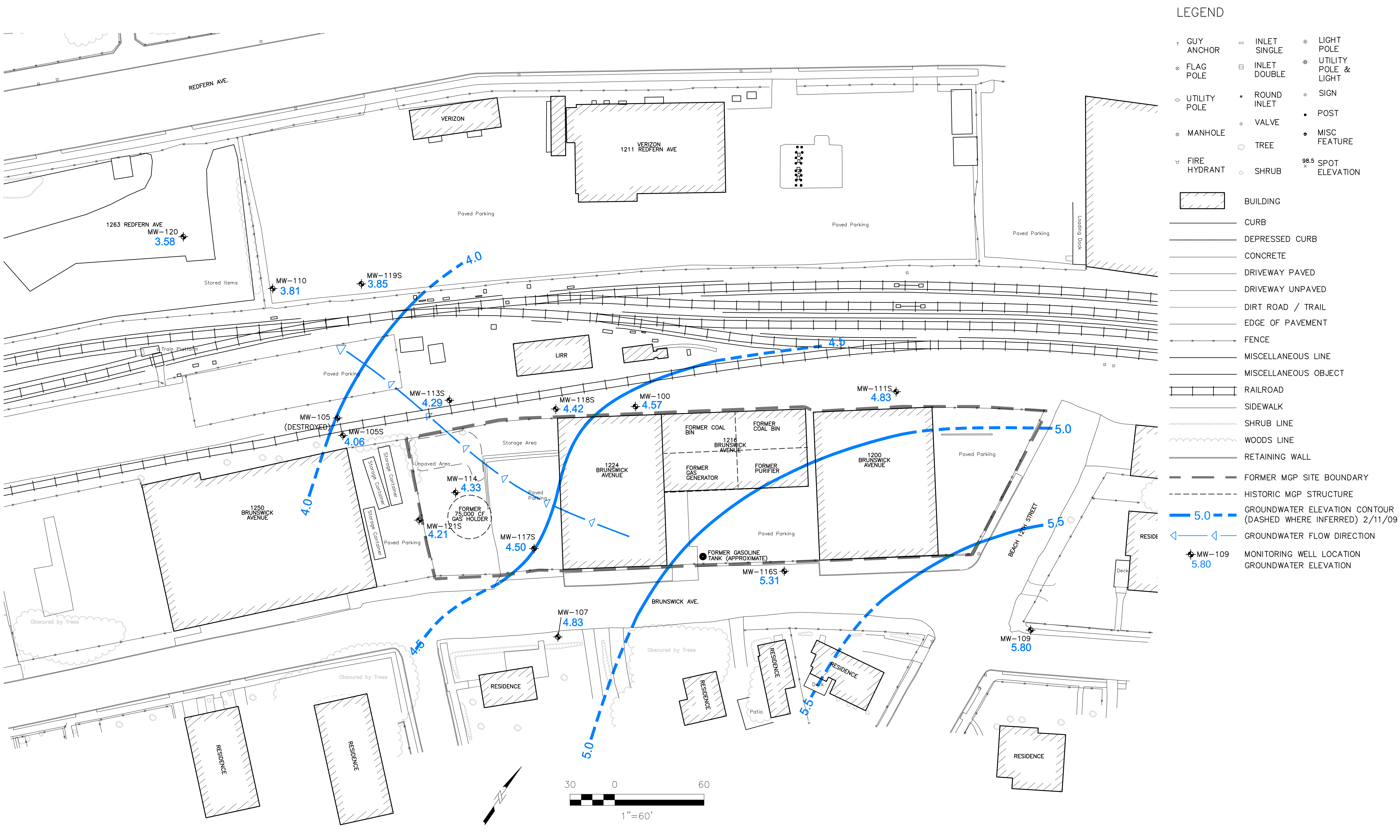
NATIONAL GRID
FORMER MGP SITE, FAR ROCKAWAY, NY

CROSS SECTION B-B'

DATE: 02/10/2012 | DRWN: RCW

FIGURE 3-3



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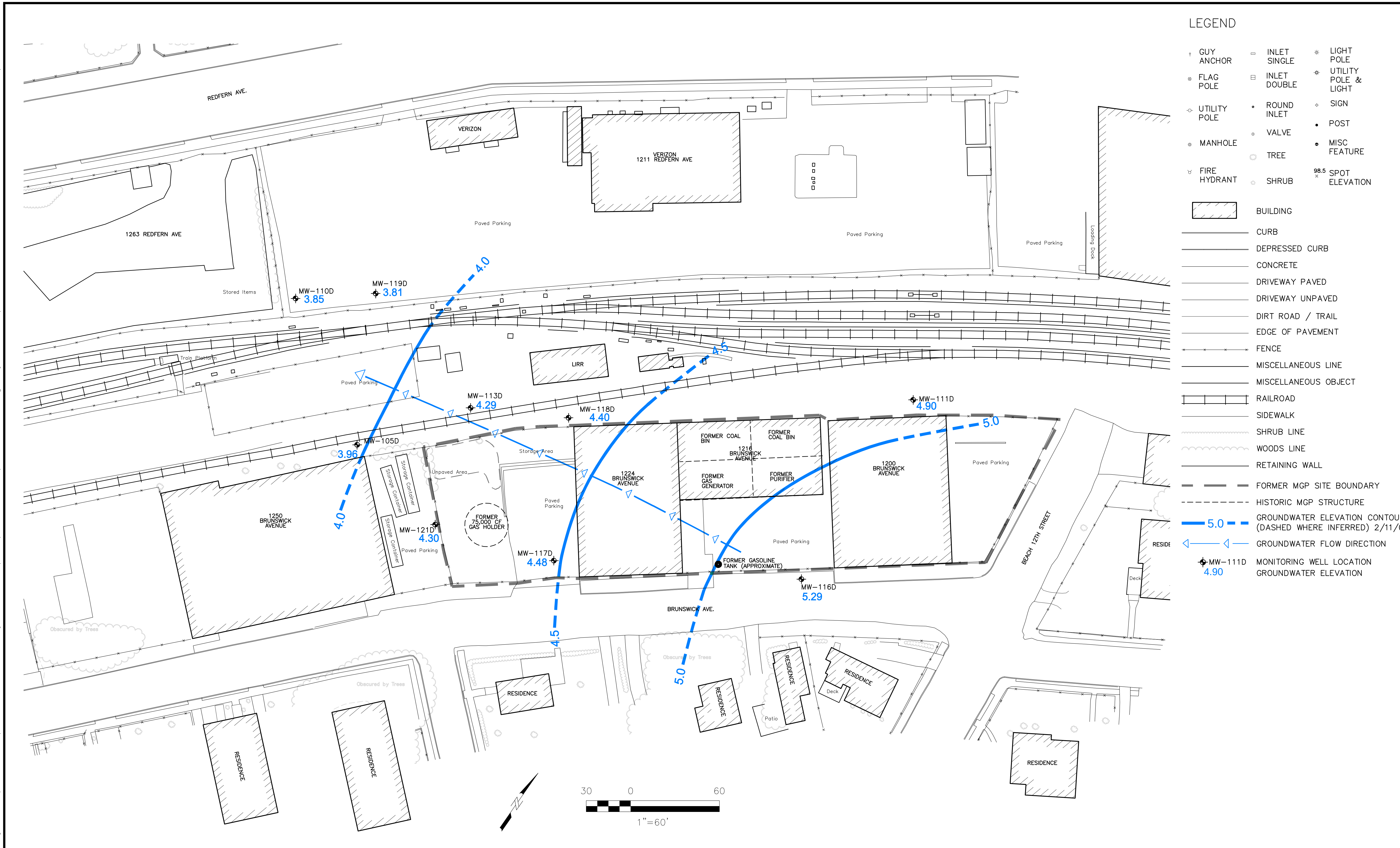
NATIONAL GRID
FORMER MGP SITE, FAR ROCKAWAY, NY

SHALLOW GROUNDWATER ELEVATION CONTOURS FEBRUARY 11, 2009

DATE: 02/10/2012 | DRWN: RCW

FIGURE 3-4



AECOM

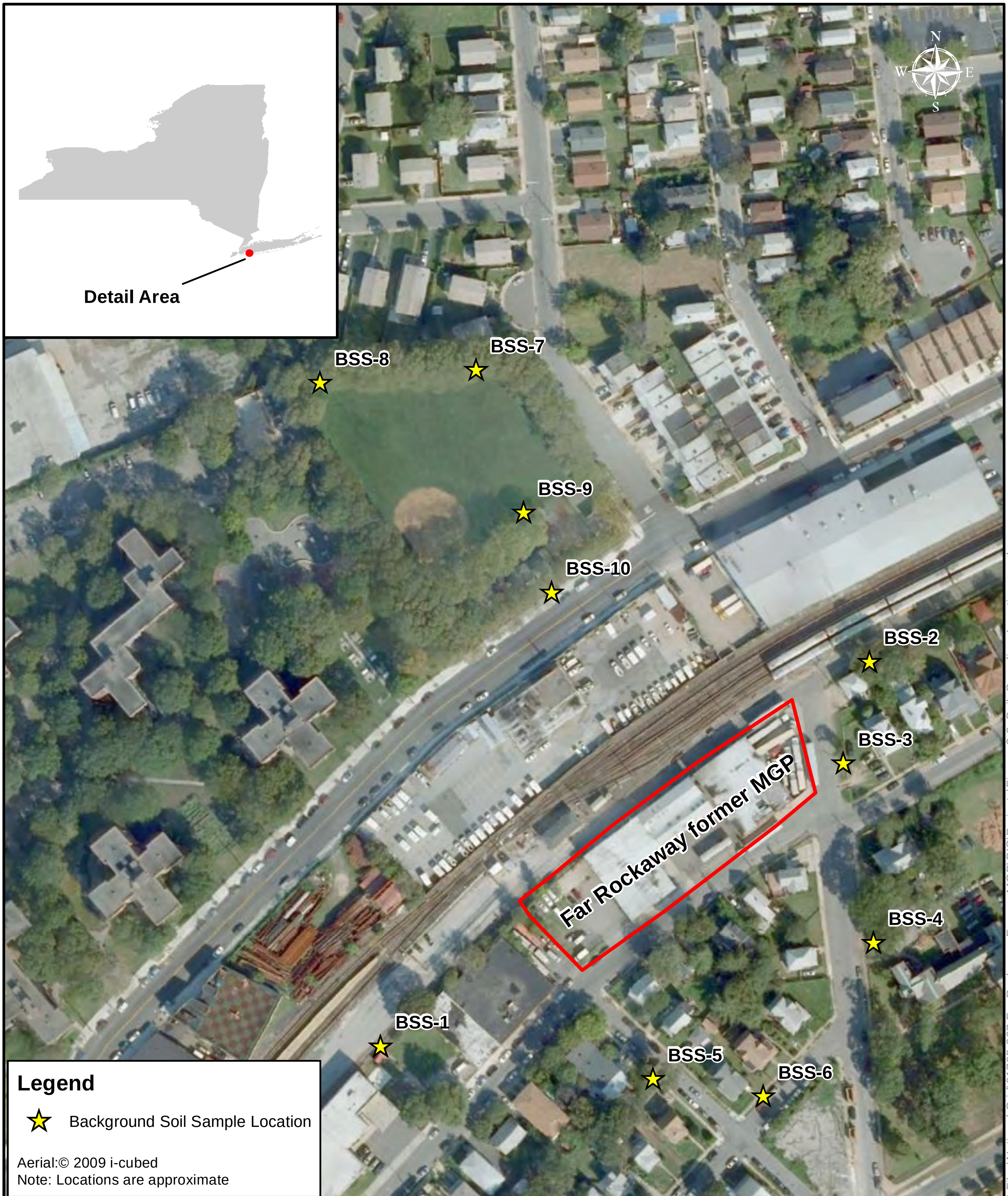
NATIONAL GRID
FORMER MGP SITE, FAR ROCKAWAY, NY

DEEP GROUNDWATER ELEVATION CONTOURS
FEBRUARY 11, 2009

DATE: 02/10/2012 | DRWN: RCW

FIGURE 3-5

File: J:\Rem_Eng\Project Files\National Grid\01765-067 Far Rockaway Former MGP\CADD\60137357-500\60137357-C01.dwg Layout: GW Deep 02-09 User: warrenr Plotted: Feb 10, 2012 - 3:00pm Xref's:



AECOM

NATIONAL GRID
FORMER MGP SITE
FAR ROCKAWAY, NY

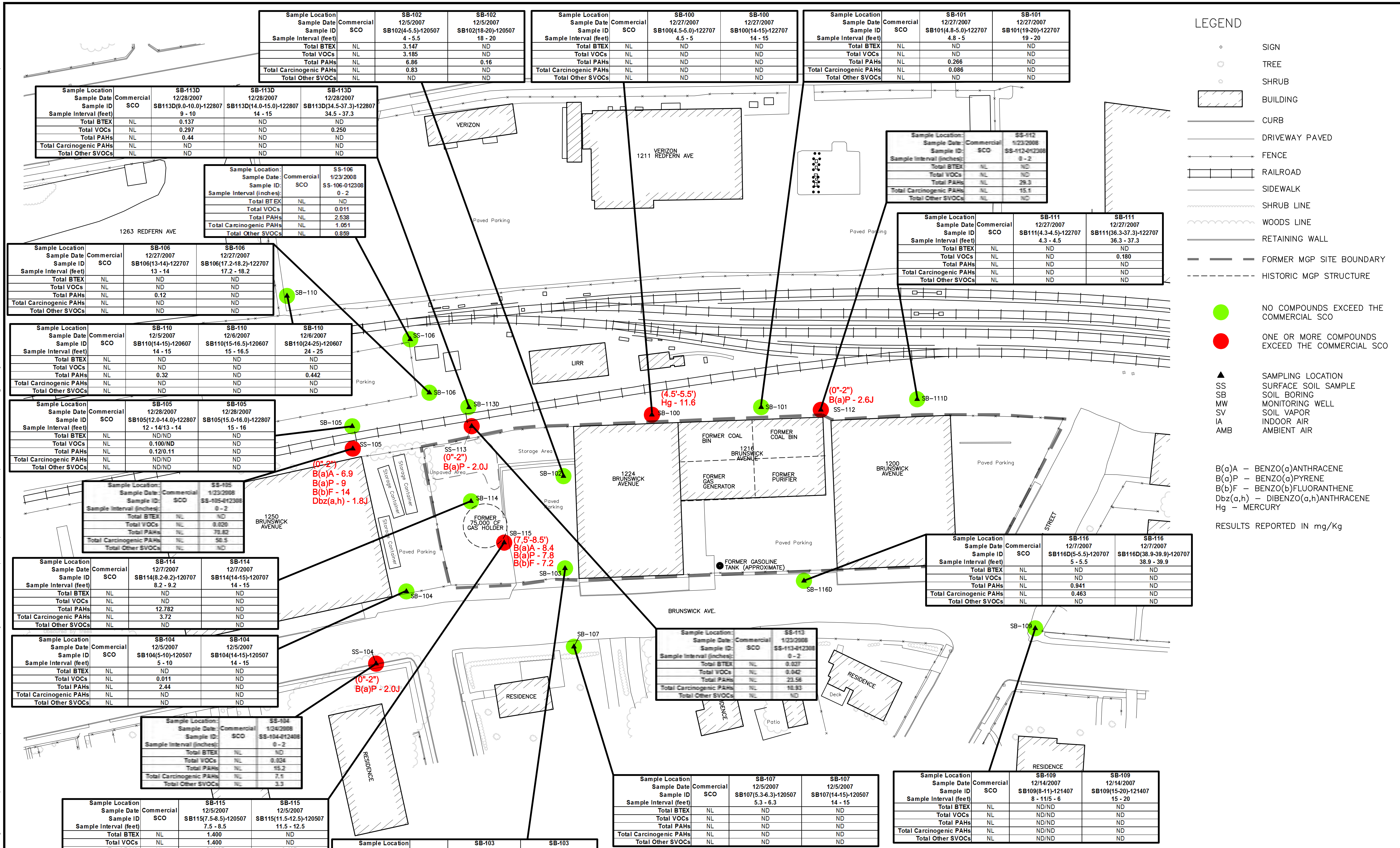
Background Surface Soil Sample Locations

Date: October 2011

0 50 100 150 Feet

Figure 3-6

Path: J:\Rem_Eng\Project Files\National Grid\01765-067 Far Rockaway Former MGP\GIS\Projects\Figure_3-2_Soil_Sampling_Locations.mxd



Sample Location	Commercial	SB-102	SB-102
Sample Date		12/5/2007	12/5/2007
Sample ID	SCO	SB102(4-5.5)-120507	SB102(18-20)-120507
Sample Interval (feet)		4 - 5.5	18 - 20
Total BTEX	NL	3.147	ND
Total VOCs	NL	3.185	ND
Total PAHs	NL	6.86	0.16
Total Carcinogenic PAHs	NL	0.83	ND
Total Other SVOCs	NL	ND	ND

Sample Location	Commercial	SB-100	SB-100
Sample Date		12/27/2007	12/27/2007
Sample ID	SCO	SB100(4.5-5.5)-122707	SB100(14-15)-122707
Sample Interval (feet)		4.5 - 5	14 - 15
Total BTEX	NL	ND	ND
Total VOCs	NL	ND	ND
Total PAHs	NL	ND	ND
Total Carcinogenic PAHs	NL	ND	ND
Total Other SVOCs	NL	ND	ND

Sample Location	Commercial	SB-101	SB-101
Sample Date		12/27/2007	12/27/2007
Sample ID	SCO	SB101(4.8-5.0)-122707	SB101(19-20)-122707
Sample Interval (feet)		4.8 - 5	19 - 20
Total BTEX	NL	ND	ND
Total VOCs	NL	ND	ND
Total PAHs	NL	0.266	ND
Total Carcinogenic PAHs	NL	0.086	ND
Total Other SVOCs	NL	ND	ND

Sample Location	Commercial	SB-113D	SB-113D	SB-113D
Sample Date		12/28/2007	12/28/2007	12/28/2007
Sample ID	SCO	SB113D(9.0-10.0)-122807	SB113D(14.0-15.0)-122807	SB113D(34.5-37.3)-122807
Sample Interval (feet)		9 - 10	14 - 15	34.5 - 37.3
Total BTEX	NL	0.137	ND	ND
Total VOCs	NL	0.297	ND	0.250
Total PAHs	NL	0.44	ND	ND
Total Carcinogenic PAHs	NL	ND	ND	ND
Total Other SVOCs	NL	ND	ND	ND

Sample Location:	Commercial	SS-112
Sample Date:		1/23/2008
Sample ID:	SCO	SS-112-012308
Sample Interval (inches):		0 - 2
Total BTEX	NL	ND
Total VOCs	NL	ND
Total PAHs	NL	29.3
Total Carcinogenic PAHs	NL	15.1
Total Other SVOCs	NL	ND

Sample Location:	Commercial	SS-106
Sample Date:		1/23/2008
Sample ID:	SCO	SS-106-012308
Sample Interval (inches):		0 - 2
Total BTEX	NL	ND
Total VOCs	NL	0.011
Total PAHs	NL	2.538
Total Carcinogenic PAHs	NL	1.051
Total Other SVOCs	NL	0.859

Sample Location	Commercial	SB-111	SB-111
Sample Date		12/27/2007	12/27/2007
Sample ID	SCO	SB111(4.3-4.5)-122707	SB111(36.3-37.3)-122707
Sample Interval (feet)		4.3 - 4.5	36.3 - 37.3
Total BTEX	NL	ND	ND
Total VOCs	NL	ND	0.180
Total PAHs	NL	ND	ND
Total Carcinogenic PAHs	NL	ND	ND
Total Other SVOCs	NL	ND	ND

Sample Location	Commercial	SB-106	SB-106
Sample Date		12/27/2007	12/27/2007
Sample ID	SCO	SB106(13-14)-122707	SB106(17.2-18.2)-122707
Sample Interval (feet)		13 - 14	17.2 - 18.2
Total BTEX	NL	ND	ND
Total VOCs	NL	ND	ND
Total PAHs	NL	0.12	ND
Total Carcinogenic PAHs	NL	ND	ND
Total Other SVOCs	NL	ND	ND

Sample Location	Commercial	SB-110	SB-110	SB-110
Sample Date		12/5/2007	12/6/2007	12/6/2007
Sample ID	SCO	SB110(14-15)-120607	SB110(15-16.5)-120607	SB110(24-25)-120607
Sample Interval (feet)		14 - 15	15 - 16.5	24 - 25
Total BTEX	NL	ND	ND	ND
Total VOCs	NL	ND	ND	ND
Total PAHs	NL	0.32	ND	0.442
Total Carcinogenic PAHs	NL	ND	ND	ND
Total Other SVOCs	NL	ND	ND	ND

Sample Location	Commercial	SB-105	SB-105
Sample Date		12/28/2007	12/28/2007
Sample ID	SCO	SB105(12.0-14.0)-122807	SB105(15.0-16.0)-122807
Sample Interval (feet)		12 - 14/13 - 14	15 - 16
Total BTEX	NL	ND/ND	ND
Total VOCs	NL	0.100/ND	ND
Total PAHs	NL	0.12/0.11	ND
Total Carcinogenic PAHs	NL	ND/ND	ND
Total Other SVOCs	NL	ND/ND	ND

Sample Location:	Commercial	SS-105
Sample Date:		1/23/2008
Sample ID:	SCO	SS-105-012308
Sample Interval (inches):		0 - 2
Total BTEX	NL	ND
Total VOCs	NL	0.020
Total PAHs	NL	70.82
Total Carcinogenic PAHs	NL	50.5
Total Other SVOCs	NL	ND

Sample Location	Commercial	SB-114	SB-114
Sample Date		12/7/2007	12/7/2007
Sample ID	SCO	SB114(8.2-9.2)-120707	SB114(14-15)-120707
Sample Interval (feet)		8.2 - 9.2	14 - 15
Total BTEX	NL	ND	ND
Total VOCs	NL	ND	ND
Total PAHs	NL	12.782	ND
Total Carcinogenic PAHs	NL	3.72	ND
Total Other SVOCs	NL	ND	ND

Sample Location	Commercial	SB-116	SB-116
Sample Date		12/7/2007	12/7/2007
Sample ID	SCO	SB116D(5-5.5)-120707	SB116D(38.9-39.9)-120707
Sample Interval (feet)		5 - 5.5	38.9 - 39.9
Total BTEX	NL	ND	ND
Total VOCs	NL	ND	ND
Total PAHs	NL	0.941	ND
Total Carcinogenic PAHs	NL	0.463	ND
Total Other SVOCs	NL	ND	ND

Sample Location	Commercial	SB-104	SB-104
Sample Date		12/5/2007	12/5/2007
Sample ID	SCO	SB104(5-10)-120507	SB104(14-15)-120507
Sample Interval (feet)		5 - 10	14 - 15
Total BTEX	NL	ND	ND
Total VOCs	NL	0.011	ND
Total PAHs	NL	2.44	ND
Total Carcinogenic PAHs	NL	ND	ND
Total Other SVOCs	NL	ND	ND

Sample Location:	Commercial	SS-113
Sample Date:		1/23/2008
Sample ID:	SCO	SS-113-012308
Sample Interval (inches):		0 - 2
Total BTEX	NL	0.027
Total VOCs	NL	0.042
Total PAHs	NL	23.56
Total Carcinogenic PAHs	NL	10.93
Total Other SVOCs	NL	ND

Sample Location:	Commercial	SS-104
Sample Date:		1/24/2008
Sample ID:	SCO	SS-104-012408
Sample Interval (inches):		0 - 2
Total BTEX	NL	ND
Total VOCs	NL	0.024
Total PAHs	NL	15.2
Total Carcinogenic PAHs	NL	7.1
Total Other SVOCs	NL	3.3

Sample Location	Commercial	SB-107	SB-107
Sample Date		12/5/2007	12/5/2007
Sample ID	SCO	SB107(5.3-6.3)-120507	SB107(14-15)-120507
Sample Interval (feet)		5.3 - 6.3	14 - 15
Total BTEX	NL	ND	ND
Total VOCs	NL	ND	ND
Total PAHs	NL	ND	ND
Total Carcinogenic PAHs	NL	ND	ND
Total Other SVOCs	NL	ND	ND

Sample Location	Commercial	SB-109	SB-109
Sample Date		12/14/2007	12/14/2007
Sample ID	SCO	SB109(8-11)-121407	SB109(15-20)-121407
Sample Interval (feet)		8 - 11/5 - 6	15 - 20
Total BTEX	NL	ND/ND	ND
Total VOCs	NL	ND/ND	ND
Total PAHs	NL	ND/ND	ND
Total Carcinogenic PAHs	NL	ND/ND	ND
Total Other SVOCs	NL	ND/ND	ND

Sample Location	Commercial	SB-115	SB-115
Sample Date		12/5/2007	12/5/2007
Sample ID	SCO	SB115(7.5-8.5)-120507	SB115(11.5-12.5)-120507
Sample Interval (feet)		7.5 - 8.5	11.5 - 12.5
Total BTEX	NL	1.400	ND
Total VOCs	NL	1.400	ND
Total PAHs	NL	543.87	0.407
Total Carcinogenic PAHs	NL	38.37	ND
Total Other SVOCs	NL	ND	ND

Sample Location	Commercial	SB-103	SB-103
Sample Date		12/5/2007	12/5/2007
Sample ID	SCO	SB103(5.5-6.5)-120507	SB103(14-15)-120507
Sample Interval (feet)		5.5 - 6.5	14 - 15
Total BTEX	NL	ND	ND
Total VOCs	NL	ND	ND
Total PAHs	NL	ND	ND
Total Carcinogenic PAHs	NL	ND	ND
Total Other SVOCs	NL	ND	ND

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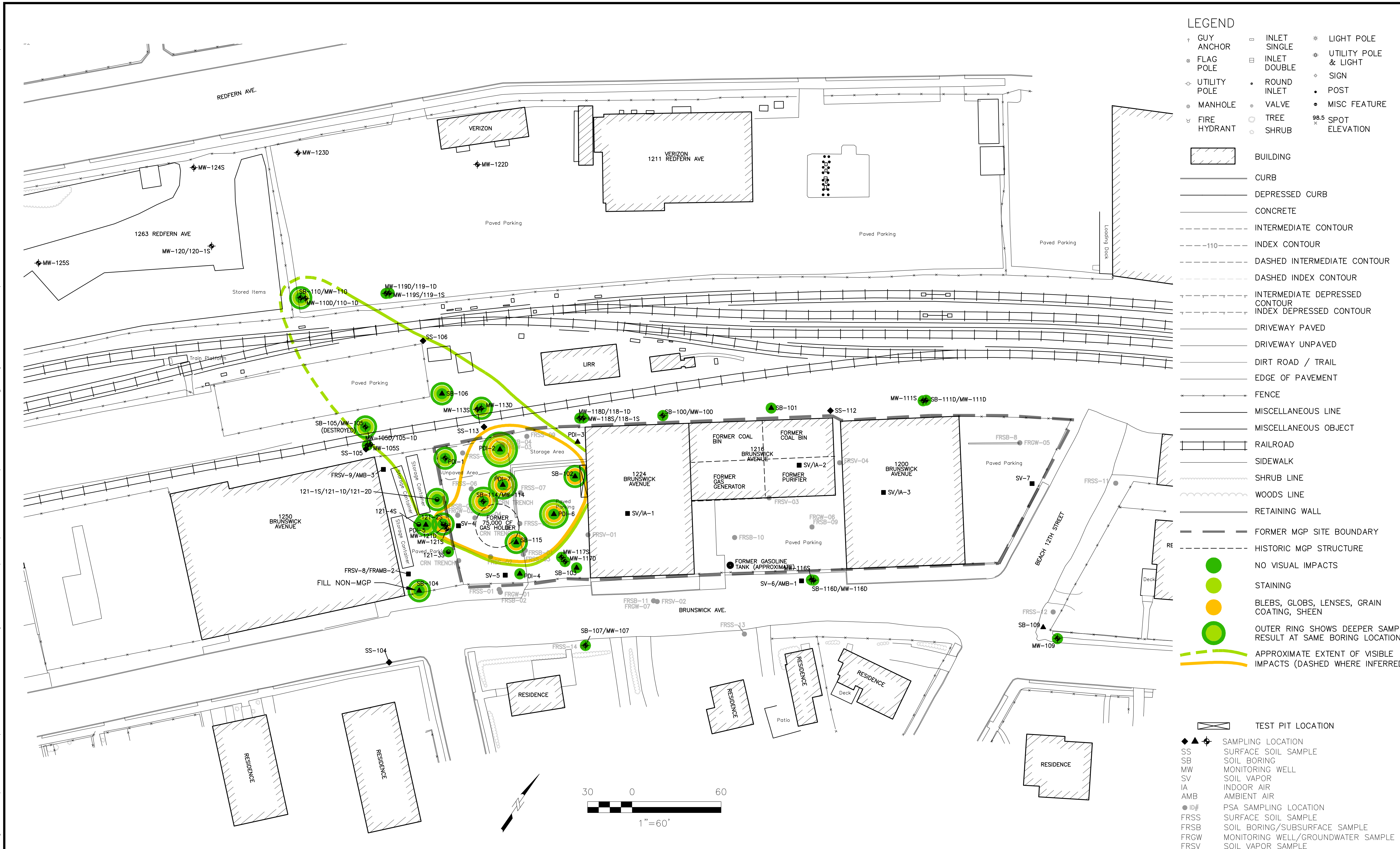
NATIONAL GRID
FORMER MGP SITE, FAR ROCKAWAY, NY

REMEDIAL INVESTIGATION SOIL RESULTS ALL DEPTHS COMBINED

DATE: 02/10/2012 DRWN: RCW

FIGURE 3-7

File: J:\Rem_Eng\Project Files\National Grid\01765-067 Far Rockaway Former MGP\CADD\60137357-500\60137357-C01.dwg Layout: Subsurf Soil Ana User: warrenr Plotted: Feb 10, 2012 – 3:02pm Xref's:



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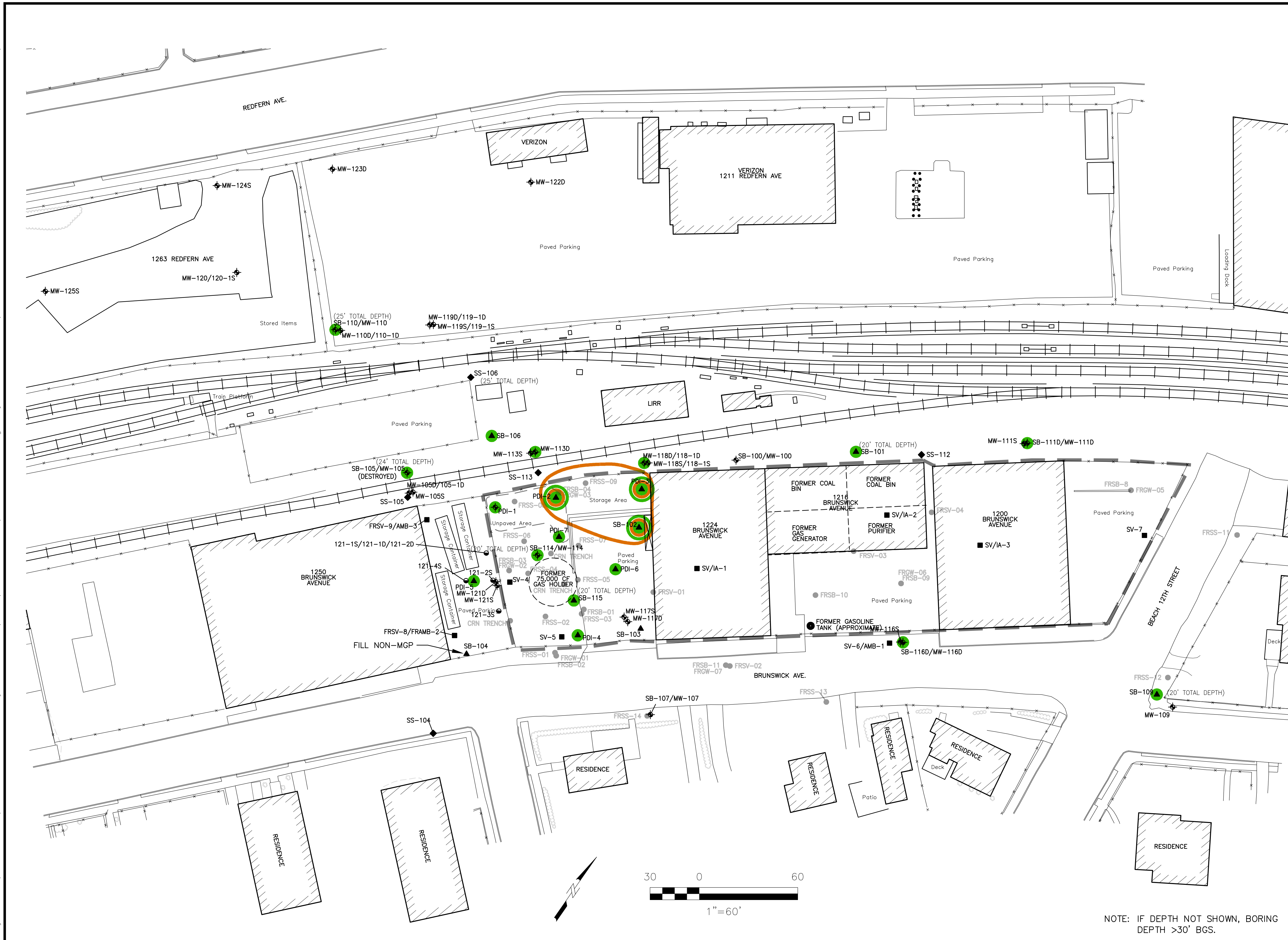
NATIONAL GRID
FORMER MGP SITE, FAR ROCKAWAY, NY

SUMMARY OF VISIBLE IMPACTS (0-15')

DATE: 02/10/2012 | DRWN: RCW

FIGURE 3-8



LEGEND

- GUY ANCHOR
- FLAG POLE
- UTILITY POLE
- MANHOLE
- FIRE HYDRANT
- INLET SINGLE
- INLET DOUBLE
- ROUND INLET
- VALVE
- TREE
- SHRUB
- LIGHT POLE
- UTILITY POLE & LIGHT
- SIGN
- POST
- MISC FEATURE
- 98.5 SPOT ELEVATION
- BUILDING
- CURB
- DEPRESSED CURB
- CONCRETE
- INTERMEDIATE CONTOUR
- 110 INDEX CONTOUR
- DASHED INTERMEDIATE CONTOUR
- DASHED INDEX CONTOUR
- INTERMEDIATE DEPRESSED CONTOUR
- INDEX DEPRESSED CONTOUR
- DRIVEWAY PAVED
- DRIVEWAY UNPAVED
- DIRT ROAD / TRAIL
- EDGE OF PAVEMENT
- FENCE
- MISCELLANEOUS LINE
- MISCELLANEOUS OBJECT
- RAILROAD
- SIDEWALK
- SHRUB LINE
- WOODS LINE
- RETAINING WALL
- FORMER MGP SITE BOUNDARY
- HISTORIC MGP STRUCTURE
- NO VISUAL IMPACTS
- STAINING
- BLEBS, GLOBS, LENSES, GRAIN COATING, SHEEN
- TAR SATURATED
- OUTER RING SHOWS DEEPER SAMPLE RESULT AT SAME BORING LOCATION
- APPROXIMATE EXTENT OF VISIBLE IMPACTS
- TEST PIT LOCATION

SAMPLING LOCATION
- SS SURFACE SOIL SAMPLE
- SB SOIL BORING
- MW MONITORING WELL
- SV SOIL VAPOR
- IA INDOOR AIR
- AMB AMBIENT AIR
- ID# PSA SAMPLING LOCATION
- FRSS SURFACE SOIL SAMPLE
- FRSB SOIL BORING/SUBSURFACE SAMPLE
- FRGW MONITORING WELL/GROUNDWATER SAMPLE
- FRSV SOIL VAPOR SAMPLE

NOTE: IF DEPTH NOT SHOWN, BORING DEPTH >30' BGS.

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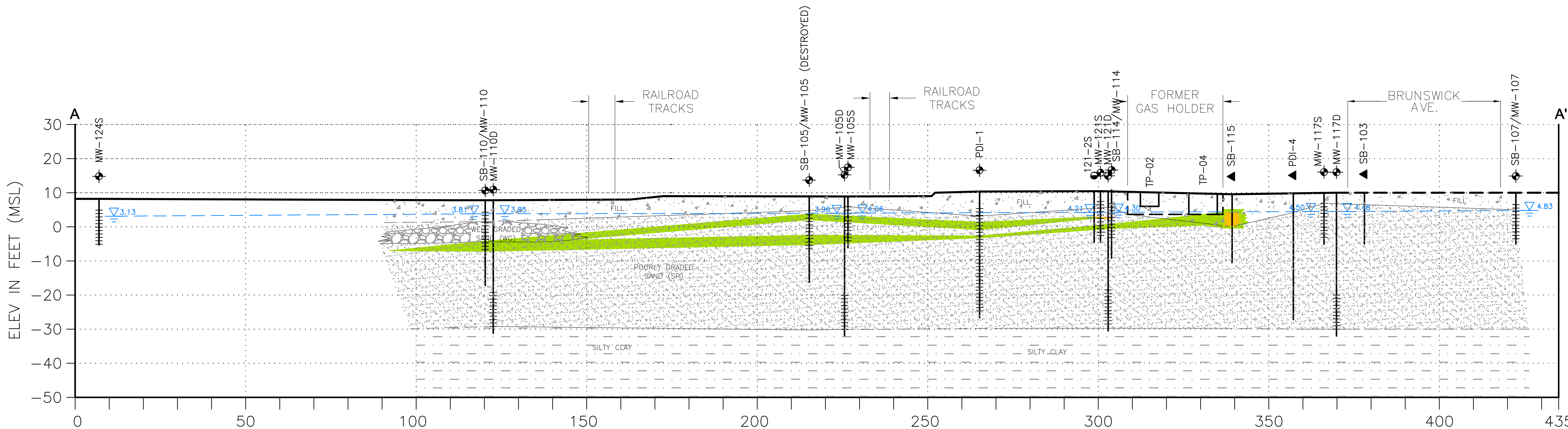
NATIONAL GRID
FORMER MGP SITE, FAR ROCKAWAY, NY

SUMMARY OF VISIBLE IMPACTS (15-30')

DATE: 02/10/2012 | DRWN: RCW

FIGURE 3-9

File: J:\Rem_Eng\Project Files\National Grid\01765-067 Far Rockaway Former MGP\CADD\60137357-500\60137357-C01.dwg Layout: Summ Vis Imp 15-30 User: warrenr Plotted: Feb 10, 2012 - 3:04pm Xref's:



CROSS SECTION A–A' SCALE: 1" = 30'

LEGEND

FILL, SANDY, POORLY GRADED

WELL GRADED F–C GRAVELLY SAND (WG)

POORLY GRADED F–M SAND (SP)

SILTY CLAY

STAINING

BLEBS, GLOBS, LENSES, GRAIN COATING, SHEEN

NOTE:

WATER LEVELS BASED ON FEBRUARY 11, 2009 AND SEPTEMBER 9–14, 2009 GAUGING EVENT.

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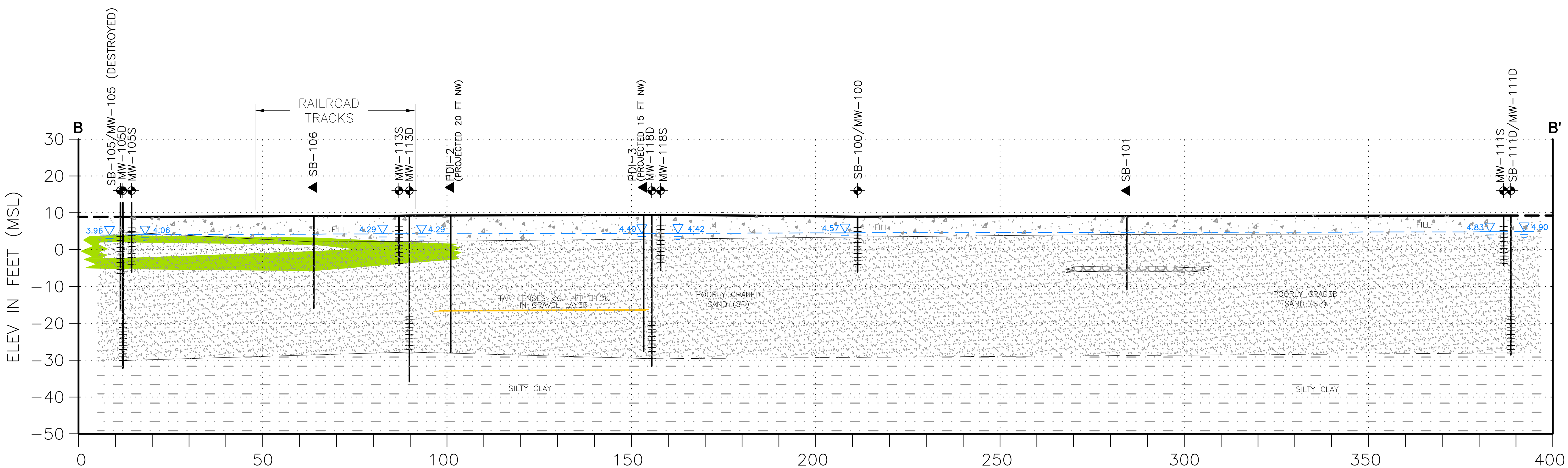
NATIONAL GRID FORMER MGP SITE, FAR ROCKAWAY, NY	**SUMMARY OF VISIBLE IMPACTS CROSS SECTION A-A'**
DATE: 02/10/2012 DRWN: RCW	**FIGURE 3-10**

File: J:\Rem_Eng\Project Files\National Grid\01765-067 Far Rockaway Former MGP\CADD\60137357-500\60137357-X01.dwg Layout: Sect A-A Vis Impacts User: warrenr Plotted: Feb 10, 2012 – 2:46pm Xref's:



CROSS SECTION B−B' SCALE 1" = 30'

LEGEND

- FILL, SANDY, POORLY GRADED
- WELL GRADED F−C GRAVELLY SAND (WG)
- POORLY GRADED F−M SAND (SP)
- SILTY CLAY
- STAINING
- BLEBS, GLOBS, LENSES, GRAIN COATING, SHEEN

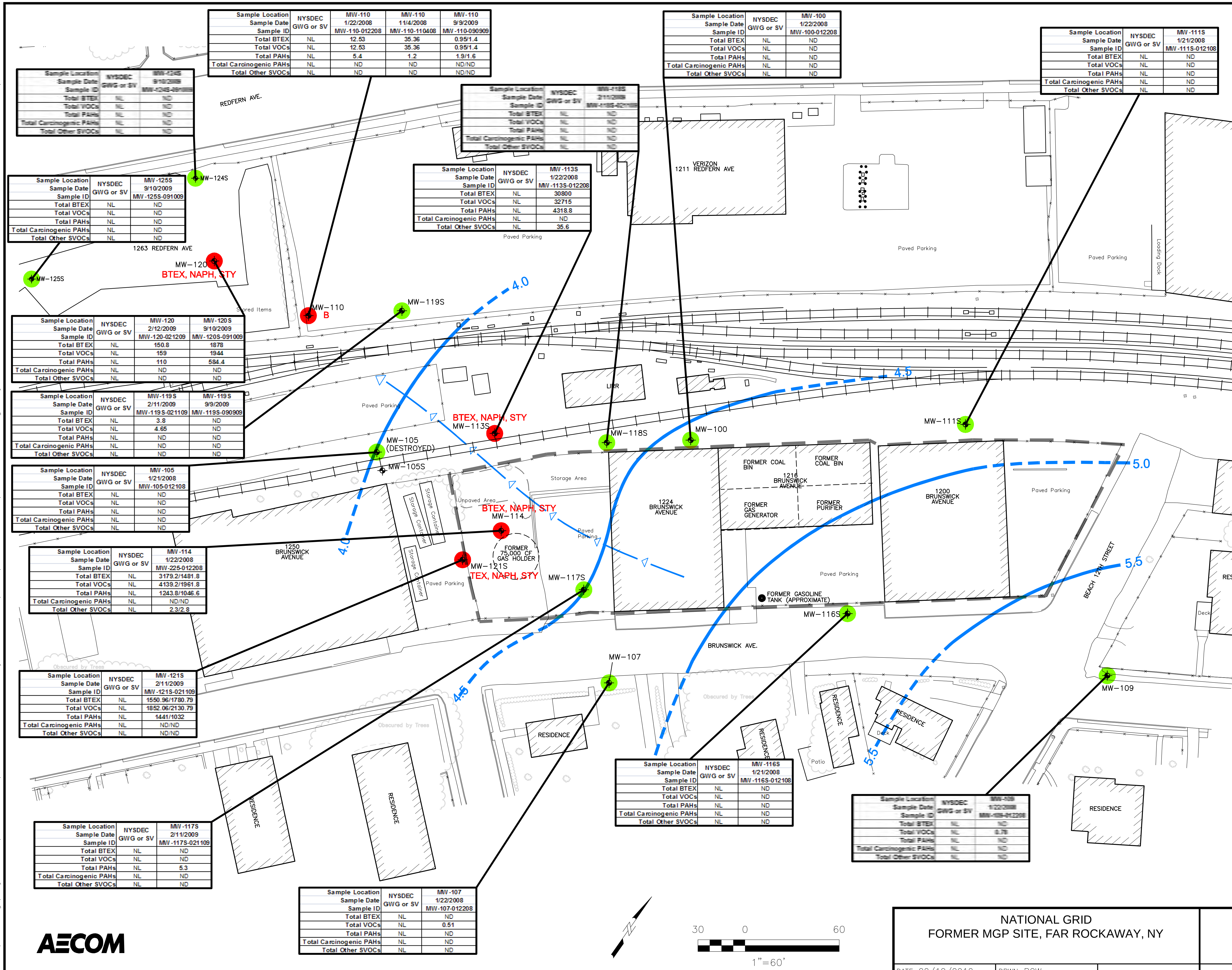
NOTE:

WATER LEVELS BASED ON FEBRUARY 11, 2009 AND SEPTEMBER 9−14, 2009 GAUGING EVENT.

AECOM

NATIONAL GRID FORMER MGP SITE, FAR ROCKAWAY, NY	SUMMARY OF VISIBLE IMPACTS CROSS SECTION B-B'
DATE: 02/10/2012 DRWN: RCW	FIGURE 3-11

File: J:\Rem_Eng\Project Files\National Grid\01765-067 Far Rockaway Former MGP\CADD\60137357-500\60137357-C01.dwg Layout: GW Shal SGVs User: warrenr Plotted: Feb 10, 2012 - 3:04pm Xref's:



Sample Location	NYSDEC GWG or SV	MW-124S
Sample Date		9/10/2009
Sample ID		MW-124S-091009
Total BTEX	NL	ND
Total VOCs	NL	ND
Total PAHs	NL	ND
Total Carcinogenic PAHs	NL	ND
Total Other SVOCs	NL	ND

Sample Location	NYSDEC GWG or SV	MW-110	MW-110	MW-110
Sample Date		1/22/2008	11/4/2008	9/9/2009
Sample ID		MW-110-012208	MW-110-110408	MW-110-090909
Total BTEX	NL	12.53	35.36	0.95/1.4
Total VOCs	NL	12.53	35.36	0.95/1.4
Total PAHs	NL	5.4	1.2	1.9/1.6
Total Carcinogenic PAHs	NL	ND	ND	ND/ND
Total Other SVOCs	NL	ND	ND	ND/ND

Sample Location	NYSDEC GWG or SV	MW-118S
Sample Date		2/11/2009
Sample ID		MW-118S-021109
Total BTEX	NL	ND
Total VOCs	NL	ND
Total PAHs	NL	ND
Total Carcinogenic PAHs	NL	ND
Total Other SVOCs	NL	ND

Sample Location	NYSDEC GWG or SV	MW-100
Sample Date		1/22/2008
Sample ID		MW-100-012208
Total BTEX	NL	ND
Total VOCs	NL	ND
Total PAHs	NL	ND
Total Carcinogenic PAHs	NL	ND
Total Other SVOCs	NL	ND

Sample Location	NYSDEC GWG or SV	MW-111S
Sample Date		1/21/2008
Sample ID		MW-111S-012108
Total BTEX	NL	ND
Total VOCs	NL	ND
Total PAHs	NL	ND
Total Carcinogenic PAHs	NL	ND
Total Other SVOCs	NL	ND

Sample Location	NYSDEC GWG or SV	MW-125S
Sample Date		9/10/2009
Sample ID		MW-125S-091009
Total BTEX	NL	ND
Total VOCs	NL	ND
Total PAHs	NL	ND
Total Carcinogenic PAHs	NL	ND
Total Other SVOCs	NL	ND

Sample Location	NYSDEC GWG or SV	MW-113S
Sample Date		1/22/2008
Sample ID		MW-113S-012208
Total BTEX	NL	30800
Total VOCs	NL	32715
Total PAHs	NL	4318.8
Total Carcinogenic PAHs	NL	ND
Total Other SVOCs	NL	35.6

Sample Location	NYSDEC GWG or SV	MW-120	MW-120S
Sample Date		2/12/2009	9/10/2009
Sample ID		MW-120-021209	MW-120S-091009
Total BTEX	NL	150.8	1878
Total VOCs	NL	159	1944
Total PAHs	NL	110	584.4
Total Carcinogenic PAHs	NL	ND	ND
Total Other SVOCs	NL	ND	ND

Sample Location	NYSDEC GWG or SV	MW-119S	MW-119S
Sample Date		2/11/2009	9/9/2009
Sample ID		MW-119S-021109	MW-119S-090909
Total BTEX	NL	3.8	ND
Total VOCs	NL	4.65	ND
Total PAHs	NL	ND	ND
Total Carcinogenic PAHs	NL	ND	ND
Total Other SVOCs	NL	ND	ND

Sample Location	NYSDEC GWG or SV	MW-105
Sample Date		1/21/2008
Sample ID		MW-105-012108
Total BTEX	NL	ND
Total VOCs	NL	ND
Total PAHs	NL	ND
Total Carcinogenic PAHs	NL	ND
Total Other SVOCs	NL	ND

Sample Location	NYSDEC GWG or SV	MW-114
Sample Date		1/22/2008
Sample ID		MW-225-012208
Total BTEX	NL	3179.2/1481.8
Total VOCs	NL	4139.2/1961.8
Total PAHs	NL	1243.8/1046.6
Total Carcinogenic PAHs	NL	ND/ND
Total Other SVOCs	NL	2.3/2.8

Sample Location	NYSDEC GWG or SV	MW-121S
Sample Date		2/11/2009
Sample ID		MW-121S-021109
Total BTEX	NL	1550.96/1780.79
Total VOCs	NL	1852.06/2130.79
Total PAHs	NL	1441/1032
Total Carcinogenic PAHs	NL	ND/ND
Total Other SVOCs	NL	ND/ND

Sample Location	NYSDEC GWG or SV	MW-117S
Sample Date		2/11/2009
Sample ID		MW-117S-021109
Total BTEX	NL	ND
Total VOCs	NL	ND
Total PAHs	NL	5.3
Total Carcinogenic PAHs	NL	ND
Total Other SVOCs	NL	ND

Sample Location	NYSDEC GWG or SV	MW-107
Sample Date		1/22/2008
Sample ID		MW-107-012208
Total BTEX	NL	ND
Total VOCs	NL	0.51
Total PAHs	NL	ND
Total Carcinogenic PAHs	NL	ND
Total Other SVOCs	NL	ND

Sample Location	NYSDEC GWG or SV	MW-116S
Sample Date		1/21/2008
Sample ID		MW-116S-012108
Total BTEX	NL	ND
Total VOCs	NL	ND
Total PAHs	NL	ND
Total Carcinogenic PAHs	NL	ND
Total Other SVOCs	NL	ND

Sample Location	NYSDEC GWG or SV	MW-109
Sample Date		1/22/2008
Sample ID		MW-109-012208
Total BTEX	NL	ND
Total VOCs	NL	0.78
Total PAHs	NL	ND
Total Carcinogenic PAHs	NL	ND
Total Other SVOCs	NL	ND

LEGEND

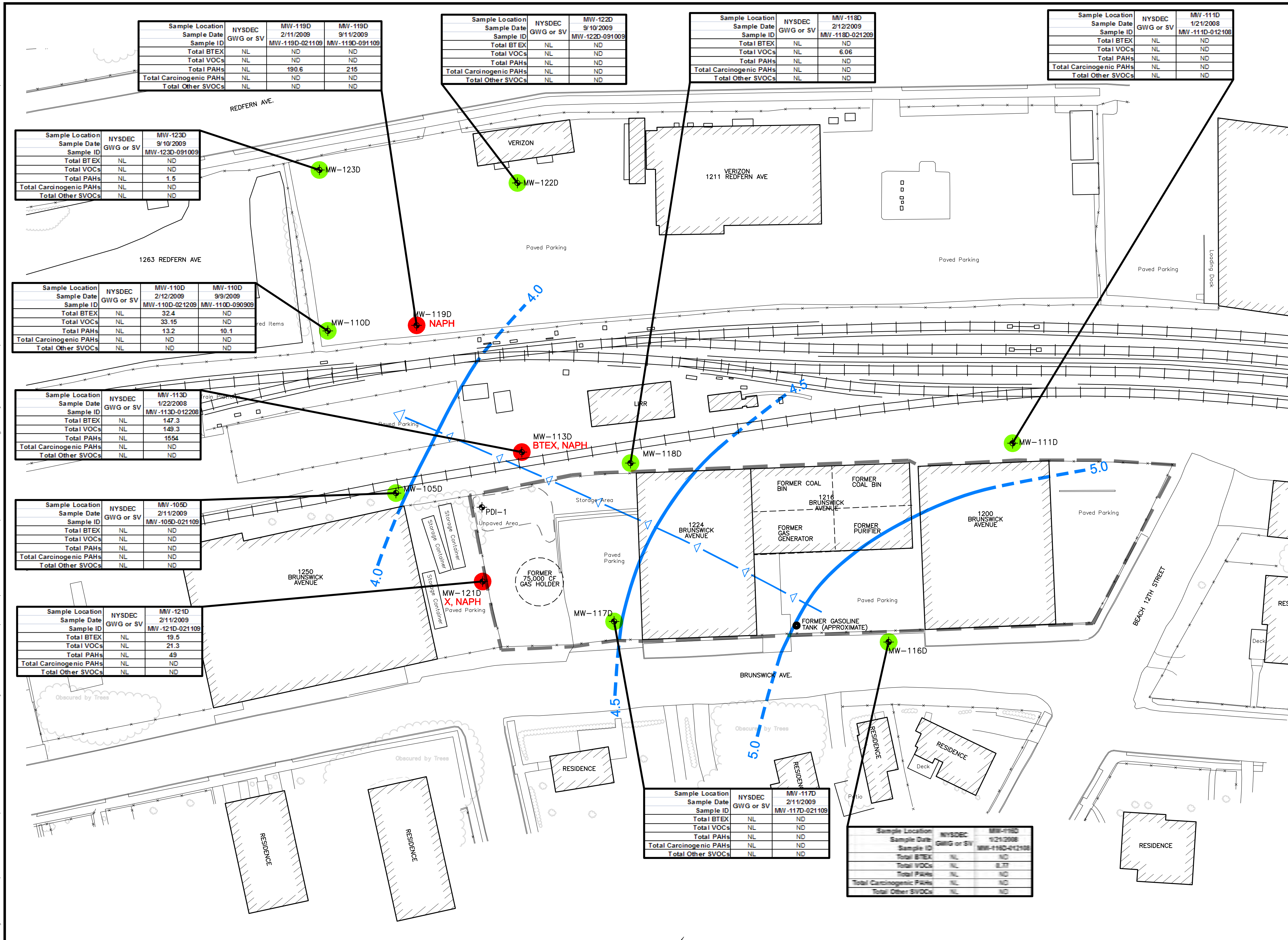
- SIGN
- TREE
- SHRUB
- BUILDING
- CURB
- DRIVEWAY PAVED
- FENCE
- RAILROAD
- SIDEWALK
- SHRUB LINE
- WOODS LINE
- RETAINING WALL
- FORMER MGP SITE BOUNDARY
- HISTORIC MGP STRUCTURE
- MW-109 MONITORING WELL LOCATION
- NO COMPOUNDS EXCEED THE GROUNDWATER GUIDANCE OR STANDARD VALUE
- ONE OR MORE COMPOUNDS EXCEED THE GROUNDWATER GUIDANCE OR STANDARD VALUE
- 5.0 GROUNDWATER ELEVATION CONTOUR (DASHED WHERE INFERRED) 2/11/09
- GROUNDWATER FLOW DIRECTION

B = BENZENE
E = ETHYL BENZENE
T = TOLUENE
X = TOTAL XYLENES
NAPH = NAPHTHALENE
STY = STYRENE

NOTES:
1. ALL RESULTS IN UG/L.
2. EXCEEDANCES SHOWN ARE FROM THE MOST RECENT SAMPLING DATE; DUPLICATE DATA HAS BEEN AVERAGED WHERE APPLICABLE.
3. EXCEEDANCES SHOWN DO NOT INCLUDE IRON OR MERCURY.
4. MORE THAN ONE RESULT SHOWN IN TEXT BOX INDICATES ORIGINAL/DUPLICATE SAMPLE RESULTS OR MULTIPLE SAMPLING EVENTS.

AECOM

NATIONAL GRID FORMER MGP SITE, FAR ROCKAWAY, NY	GROUNDWATER ANALYTICAL RESULTS SHALLOW WELLS
DATE: 02/10/2012 DRWN: RCW	FIGURE 3-12



Sample Location	NYSDEC	MW-119D	MW-119D
Sample Date	GWG or SV	2/11/2009	9/11/2009
Sample ID		MW-119D-021109	MW-119D-091109
Total BTEX	NL	ND	ND
Total VOCs	NL	ND	ND
Total PAHs	NL	190.6	215
Total Carcinogenic PAHs	NL	ND	ND
Total Other SVOCs	NL	ND	ND

Sample Location	NYSDEC	MW-122D
Sample Date	GWG or SV	9/10/2009
Sample ID		MW-122D-091009
Total BTEX	NL	ND
Total VOCs	NL	ND
Total PAHs	NL	ND
Total Carcinogenic PAHs	NL	ND
Total Other SVOCs	NL	ND

Sample Location	NYSDEC	MW-118D
Sample Date	GWG or SV	2/12/2009
Sample ID		MW-118D-021209
Total BTEX	NL	ND
Total VOCs	NL	6.06
Total PAHs	NL	ND
Total Carcinogenic PAHs	NL	ND
Total Other SVOCs	NL	ND

Sample Location	NYSDEC	MW-111D
Sample Date	GWG or SV	1/21/2008
Sample ID		MW-111D-012108
Total BTEX	NL	ND
Total VOCs	NL	ND
Total PAHs	NL	ND
Total Carcinogenic PAHs	NL	ND
Total Other SVOCs	NL	ND

Sample Location	NYSDEC	MW-123D
Sample Date	GWG or SV	9/10/2009
Sample ID		MW-123D-091009
Total BTEX	NL	ND
Total VOCs	NL	ND
Total PAHs	NL	1.5
Total Carcinogenic PAHs	NL	ND
Total Other SVOCs	NL	ND

Sample Location	NYSDEC	MW-110D	MW-110D
Sample Date	GWG or SV	2/12/2009	9/9/2009
Sample ID		MW-110D-021209	MW-110D-090909
Total BTEX	NL	32.4	ND
Total VOCs	NL	33.15	ND
Total PAHs	NL	13.2	10.1
Total Carcinogenic PAHs	NL	ND	ND
Total Other SVOCs	NL	ND	ND

Sample Location	NYSDEC	MW-113D
Sample Date	GWG or SV	1/22/2008
Sample ID		MW-113D-012208
Total BTEX	NL	147.3
Total VOCs	NL	149.3
Total PAHs	NL	1554
Total Carcinogenic PAHs	NL	ND
Total Other SVOCs	NL	ND

Sample Location	NYSDEC	MW-105D
Sample Date	GWG or SV	2/11/2009
Sample ID		MW-105D-021109
Total BTEX	NL	ND
Total VOCs	NL	ND
Total PAHs	NL	ND
Total Carcinogenic PAHs	NL	ND
Total Other SVOCs	NL	ND

Sample Location	NYSDEC	MW-121D
Sample Date	GWG or SV	2/11/2009
Sample ID		MW-121D-021109
Total BTEX	NL	19.5
Total VOCs	NL	21.3
Total PAHs	NL	49
Total Carcinogenic PAHs	NL	ND
Total Other SVOCs	NL	ND

Sample Location	NYSDEC	MW-117D
Sample Date	GWG or SV	2/11/2009
Sample ID		MW-117D-021109
Total BTEX	NL	ND
Total VOCs	NL	ND
Total PAHs	NL	ND
Total Carcinogenic PAHs	NL	ND
Total Other SVOCs	NL	ND

Sample Location	NYSDEC	MW-116D
Sample Date	GWG or SV	1/21/2008
Sample ID		MW-116D-012108
Total BTEX	NL	ND
Total VOCs	NL	8.77
Total PAHs	NL	ND
Total Carcinogenic PAHs	NL	ND
Total Other SVOCs	NL	ND

LEGEND

- SIGN
- TREE
- SHRUB
- BUILDING
- CURB
- DRIVEWAY PAVED
- FENCE
- RAILROAD
- SIDEWALK
- SHRUB LINE
- WOODS LINE
- RETAINING WALL
- FORMER MGP SITE BOUNDARY
- HISTORIC MGP STRUCTURE
- MW-111D MONITORING WELL LOCATION
- NO COMPOUNDS EXCEED THE GROUNDWATER GUIDANCE OR STANDARD VALUE
- ONE OR MORE COMPOUNDS EXCEED THE GROUNDWATER GUIDANCE OR STANDARD VALUE
- 5.0 GROUNDWATER ELEVATION CONTOUR (DASHED WHERE INFERRED) 2/11/09
- GROUNDWATER FLOW DIRECTION

B = BENZENE
E = ETHYL BENZENE
T = TOLUENE
X = TOTAL XYLENES
NAPH = NAPHTHALENE

NOTES:
1. ALL RESULTS IN UG/L.
2. EXCEEDANCES SHOWN ARE FROM THE MOST RECENT SAMPLING DATE; DUPLICATE DATA HAS BEEN AVERAGED WHERE APPLICABLE.
3. EXCEEDANCES SHOWN DO NOT INCLUDE IRON OR MERCURY.
4. MORE THAN ONE RESULT SHOWN IN TEXT BOX INDICATES ORIGINAL/DUPLICATE SAMPLE RESULTS OR MULTIPLE SAMPLING EVENTS.

AECOM

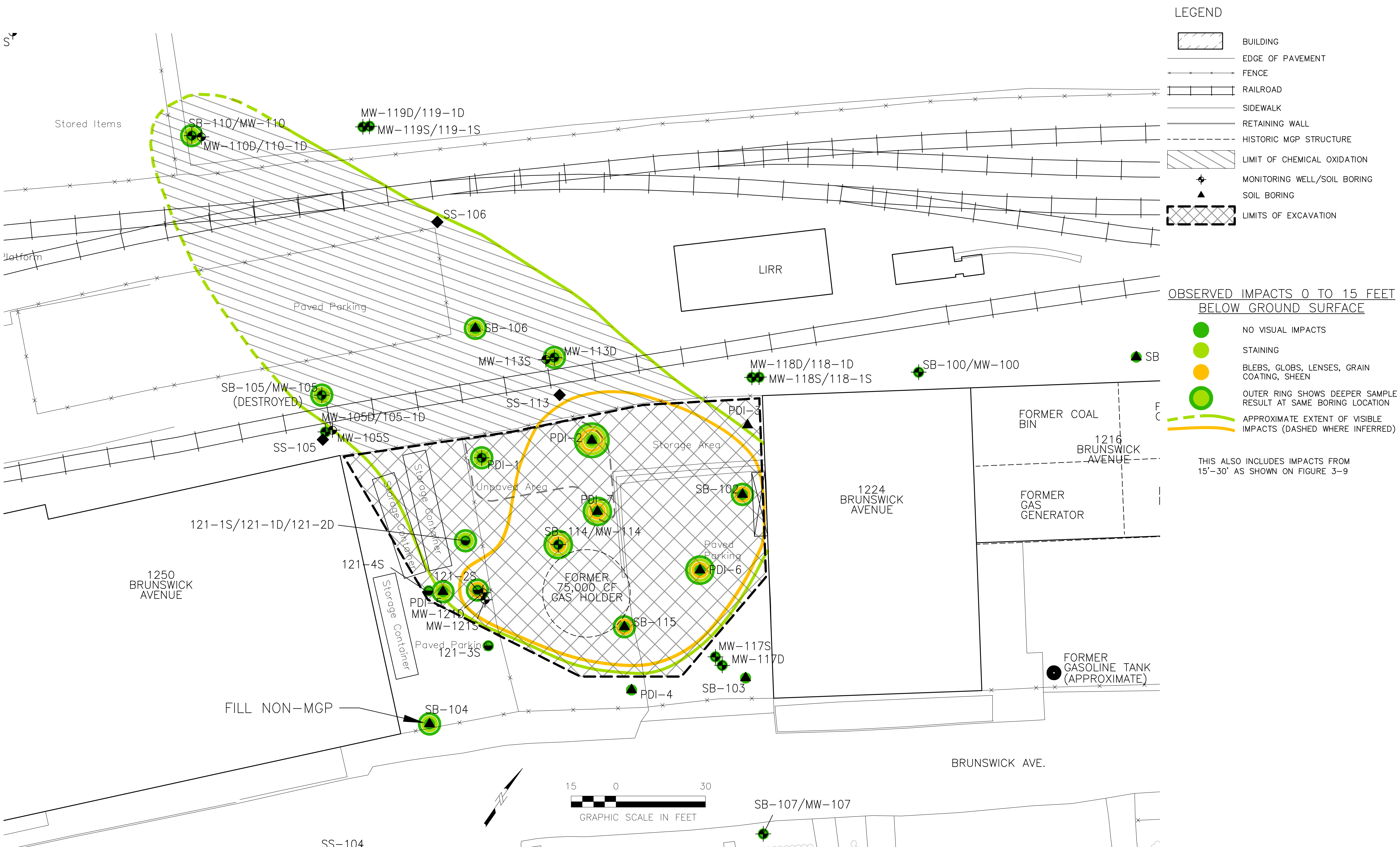
NATIONAL GRID
FORMER MGP SITE, FAR ROCKAWAY, NY

DATE: 02/10/2012 DRWN: RCW

GROUNDWATER ANALYTICAL RESULTS DEEP WELLS

FIGURE 3-13

File: J:\Rem_Eng\Project Files\National Grid\01765-067 Far Rockaway Former MGP\CADD\60137357-500\60137357-C01.dwg Layout: GW Deep SGVs User: warrenr Plotted: Feb 10, 2012 - 3:05pm Xref's:



AECOM

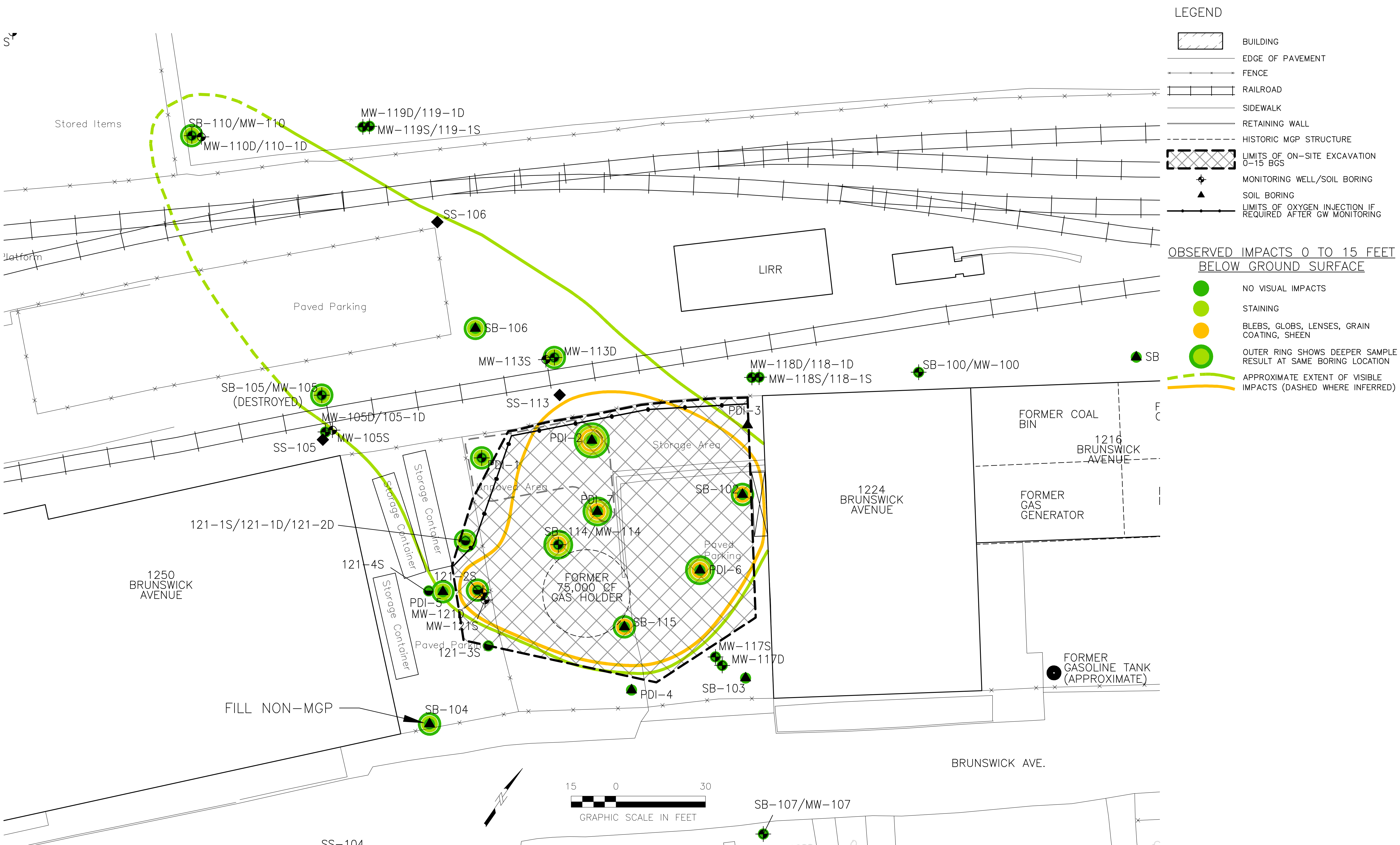
NATIONAL GRID
FORMER MGP SITE, FAR ROCKAWAY, NY

ALTERNATIVE 2
RESTORE TO
PRE-RELEASE CONDITIONS

DATE: 02/10/2012 DRWN: RCW

FIGURE 7-1

File: J:\Rem_Eng\Project Files\National Grid\01765-067 Far Rockaway Former MGP\CADD\60137357-500\60137357-C02.dwg Layout: ALT-2 User: warrenr Plotted: Feb 10, 2012 - 2:53pm Xref's:



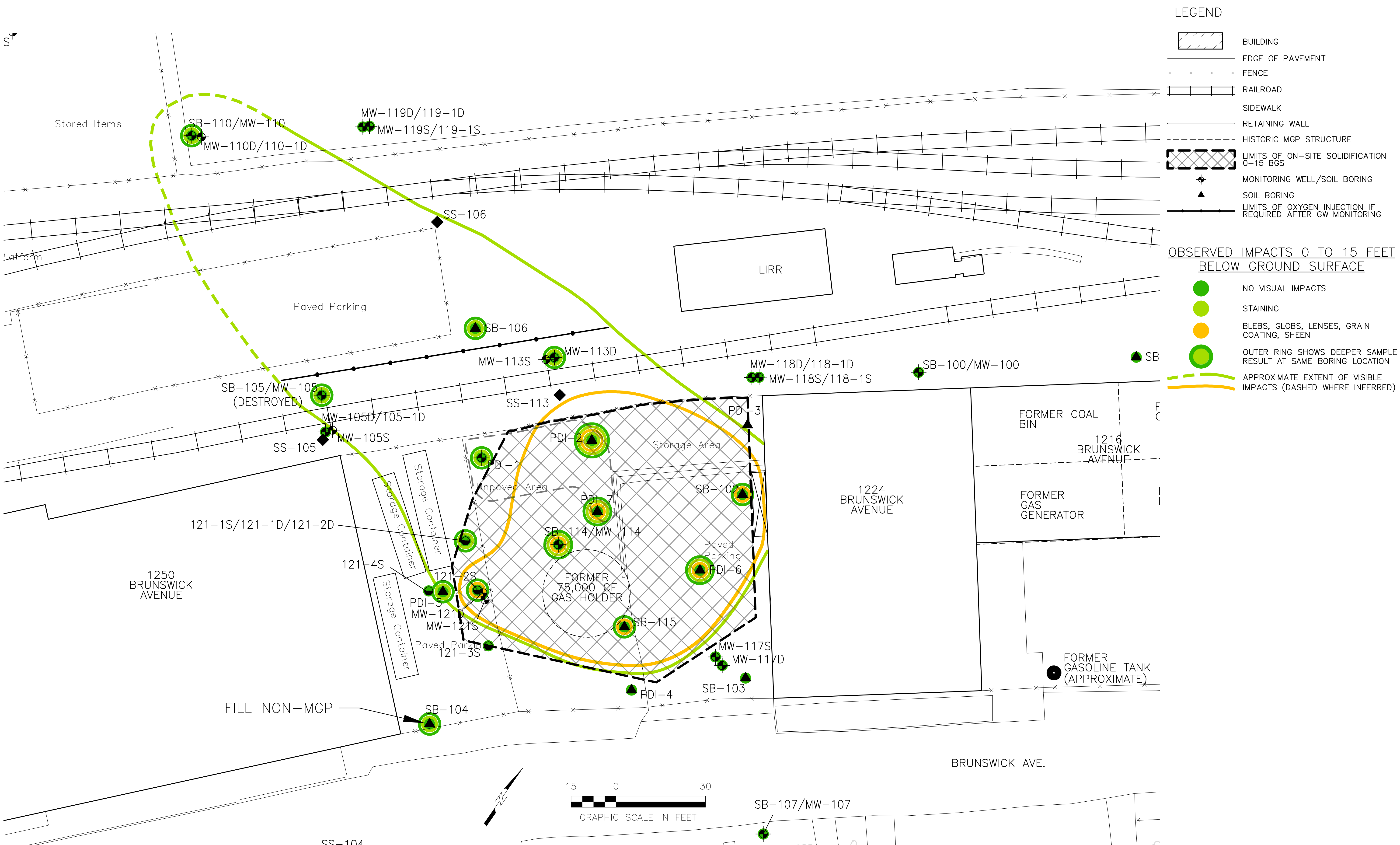
NATIONAL GRID
FORMER MGP SITE, FAR ROCKAWAY, NY

ALTERNATIVE 3
EXCAVATION WITH ENHANCED MONITORED NATURAL ATTENUATION

DATE: 02/10/2012 | DRWN: RCW

FIGURE 7-2

File: J:\Rem_Eng\Project Files\National Grid\01765-067 Far Rockaway Former MGP\CADD\60137357-500\60137357-C02.dwg Layout: ALT-3 User: warrenr Plotted: Feb 10, 2012 - 2:53pm Xref's:



AECOM

NATIONAL GRID
FORMER MGP SITE, FAR ROCKAWAY, NY

ALTERNATIVE 4
SOLIDIFICATION WITH
MONITORED NATURAL ATTENUATION

DATE: 02/10/2012 DRWN: RCW

FIGURE 7-3

File: J:\Rem_Eng\Project Files\National Grid\01765-067 Far Rockaway Former MGP\CADD\60137357-500\60137357-C02.dwg Layout: ALT-4 User: warrenr Plotted: Feb 10, 2012 - 2:54pm Xref's:

Appendix A

Geotechnical Investigation Report

GeoTesting express
a subsidiary of Geocomp Corporation

Client:	AECOM Environment				
Project:	Far Rockaway Former MGP				
Location:	Far Rockaway, NY			Project No:	GTX-9372
Boring ID:	---	Sample Type:	---	Tested By:	cam
Sample ID:	---	Test Date:	10/12/09	Checked By:	n/a
Depth :	---	Test Id:	165403		

USCS Classification - ASTM D 2487-06

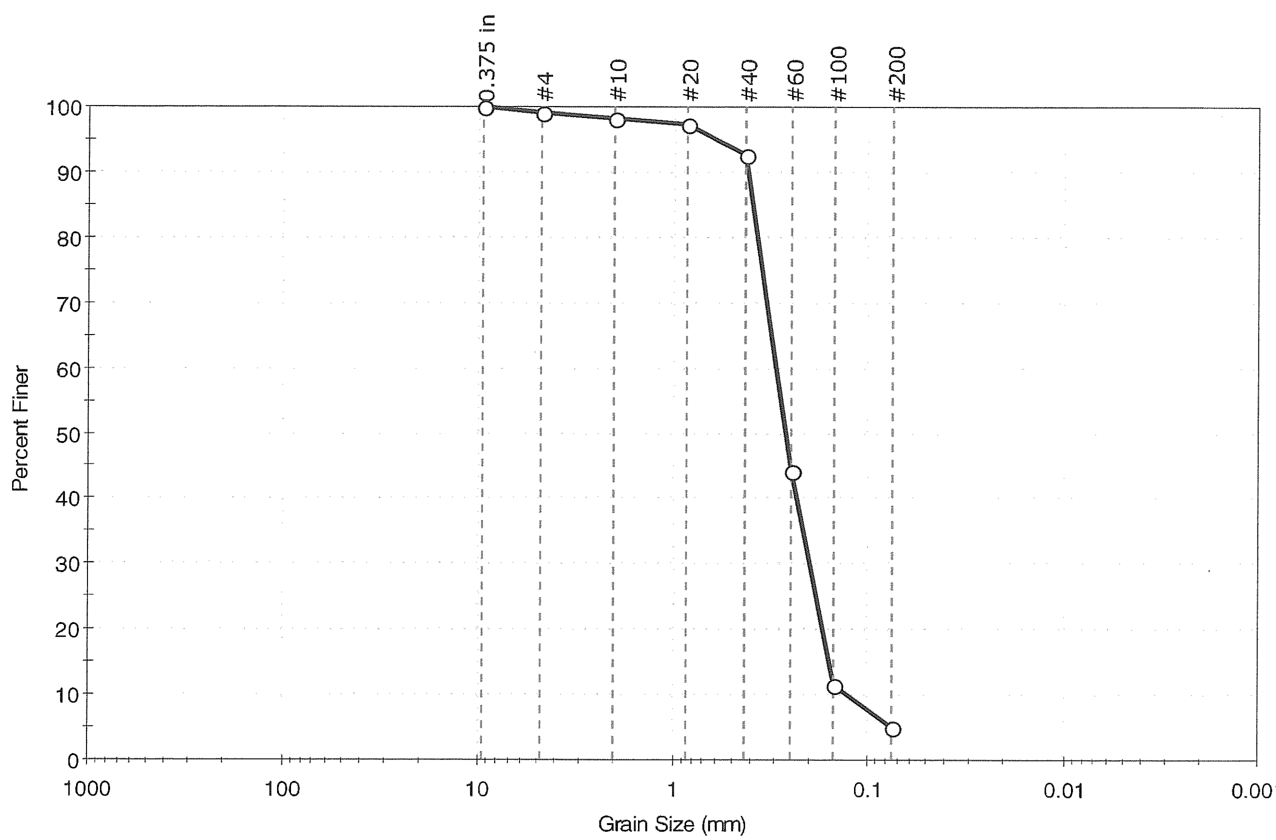
Boring ID	Sample ID	Depth	Group Name	Group Symbol	Gravel, %	Sand, %	Fines, %
---	PDI-1	20.0-22.0 ft	Poorly graded sand	SP	0.7	94.3	5.0
---	PDI-3	22.0-24.0 ft	Poorly graded sand	SP	0.0	96.6	3.4
---	PDI-4	22.0-24.0 ft	Poorly graded sand	SP	0.9	96.1	3.0

Remarks: Grain Size analysis performed by ASTM D422, results enclosed
Atterbeg Limits performed by ASTM 4318, results enclosed

GeoTesting express
a subsidiary of Geocomp Corporation

Client:	AECOM Environment				
Project:	Far Rockaway Former MGP				
Location:	Far Rockaway, NY			Project No:	GTX-9372
Boring ID:	---	Sample Type:	jar	Tested By:	jbr
Sample ID:	PDI-1	Test Date:	10/08/09	Checked By:	jdt
Depth :	20.0-22.0 ft	Test Id:	165398		
Test Comment:	---				
Sample Description:	Moist, very dark gray sand				
Sample Comment:	---				

Particle Size Analysis - ASTM D 422-63 (reapproved 2002)



% Cobble	% Gravel	% Sand	% Silt & Clay Size
---	0.7	94.3	5.0

Sieve Name	Sieve Size, mm	Percent Finer	Spec. Percent	Complies
0.375 in	9.50	100		
#4	4.75	99		
#10	2.00	98		
#20	0.85	97		
#40	0.42	93		
#60	0.25	44		
#100	0.15	11		
#200	0.075	5		

Coefficients

D_{85} =0.3910 mm D_{30} =0.2004 mm
D_{60} =0.2973 mm D_{15} =0.1586 mm
D_{50} =0.2665 mm D_{10} =0.1286 mm
C_u =2.312 C_c =1.050

Classification

ASTM Poorly graded sand (SP)

AASHTO Fine Sand (A-3 (0))

Sample/Test Description

Sand/Gravel Particle Shape : ---

Sand/Gravel Hardness : ---

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GeoTesting express
a subsidiary of Geocomp Corporation

Client:	AECOM Environment				
Project:	Far Rockaway Former MGP				
Location:	Far Rockaway, NY			Project No:	GTX-9372
Boring ID:	---	Sample Type:	jar	Tested By:	cam
Sample ID:	PDI-1	Test Date:	10/12/09	Checked By:	n/a
Depth :	20.0-22.0 ft	Test Id:	165395		

Test Comment: ---
Sample Description: Moist, very dark gray sand
Sample Comment: ---

Atterberg Limits - ASTM D 4318-05

Sample Determined to be non-plastic

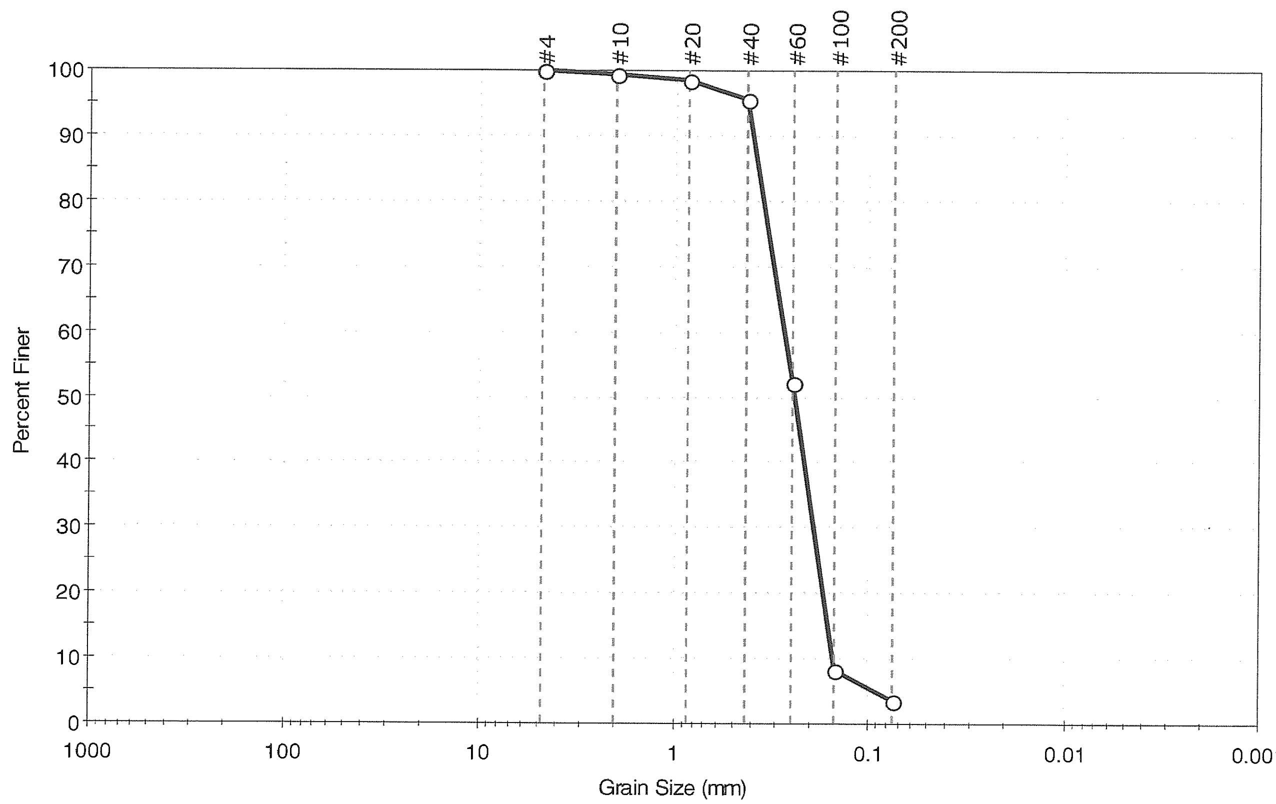
Symbol	Sample ID	Boring	Depth	Natural Moisture Content,%	Liquid Limit	Plastic Limit	Plasticity Index	Liquidity Index	Soil Classification
✳	PDI-1	---	20.0-22.0 ft	23	n/a	n/a	n/a	n/a	Poorly graded sand (SP)

7% Retained on #40 Sieve
Dry Strength: NONE
Dilentancy: RAPID
Toughness: n/a
The sample was determined to be Non-Plastic

GeoTesting express
a subsidiary of Geocomp Corporation

Client:	AECOM Environment				
Project:	Far Rockaway Former MGP				
Location:	Far Rockaway, NY			Project No:	GTX-9372
Boring ID:	---	Sample Type:	jar	Tested By:	jbr
Sample ID:	PDI-3	Test Date:	10/08/09	Checked By:	jdt
Depth :	22.0-24.0 ft	Test Id:	165399		
Test Comment:	---				
Sample Description:	Moist, very dark gray sand				
Sample Comment:	---				

Particle Size Analysis - ASTM D 422-63 (reapproved 2002)



% Cobble	% Gravel	% Sand	% Silt & Clay Size
---	0.0	96.6	3.4

Sieve Name	Sieve Size, mm	Percent Finer	Spec. Percent	Complies
#4	4.75	100		
#10	2.00	99		
#20	0.85	99		
#40	0.42	96		
#60	0.25	52		
#100	0.15	8		
#200	0.075	3		

Coefficients

D_{85} =0.3735 mm　　D_{30} =0.1932 mm

D_{60} =0.2749 mm　　D_{15} =0.1624 mm

D_{50} =0.2436 mm　　D_{10} =0.1533 mm

C_u =1.793　　C_c =0.886

Classification

ASTM　Poorly graded sand (SP)

AASHTO　Fine Sand (A-3 (0))

Sample/Test Description

Sand/Gravel Particle Shape : ---

Sand/Gravel Hardness : ---

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GeoTesting express
a subsidiary of Geocomp Corporation

Client:	AECOM Environment				
Project:	Far Rockaway Former MGP				
Location:	Far Rockaway, NY			Project No:	GTX-9372
Boring ID:	---	Sample Type:	jar	Tested By:	cam
Sample ID:	PDI-3	Test Date:	10/12/09	Checked By:	n/a
Depth :	22.0-24.0 ft	Test Id:	165396		
Test Comment:	---				
Sample Description:	Moist, very dark gray sand				
Sample Comment:	---				

Atterberg Limits - ASTM D 4318-05

Sample Determined to be non-plastic

Symbol	Sample ID	Boring	Depth	Natural Moisture Content,%	Liquid Limit	Plastic Limit	Plasticity Index	Liquidity Index	Soil Classification
*	PDI-3	---	22.0-24.0 ft	24	n/a	n/a	n/a	n/a	Poorly graded sand (SP)

4% Retained on #40 Sieve

Dry Strength: NONE

Dilentancy: RAPID

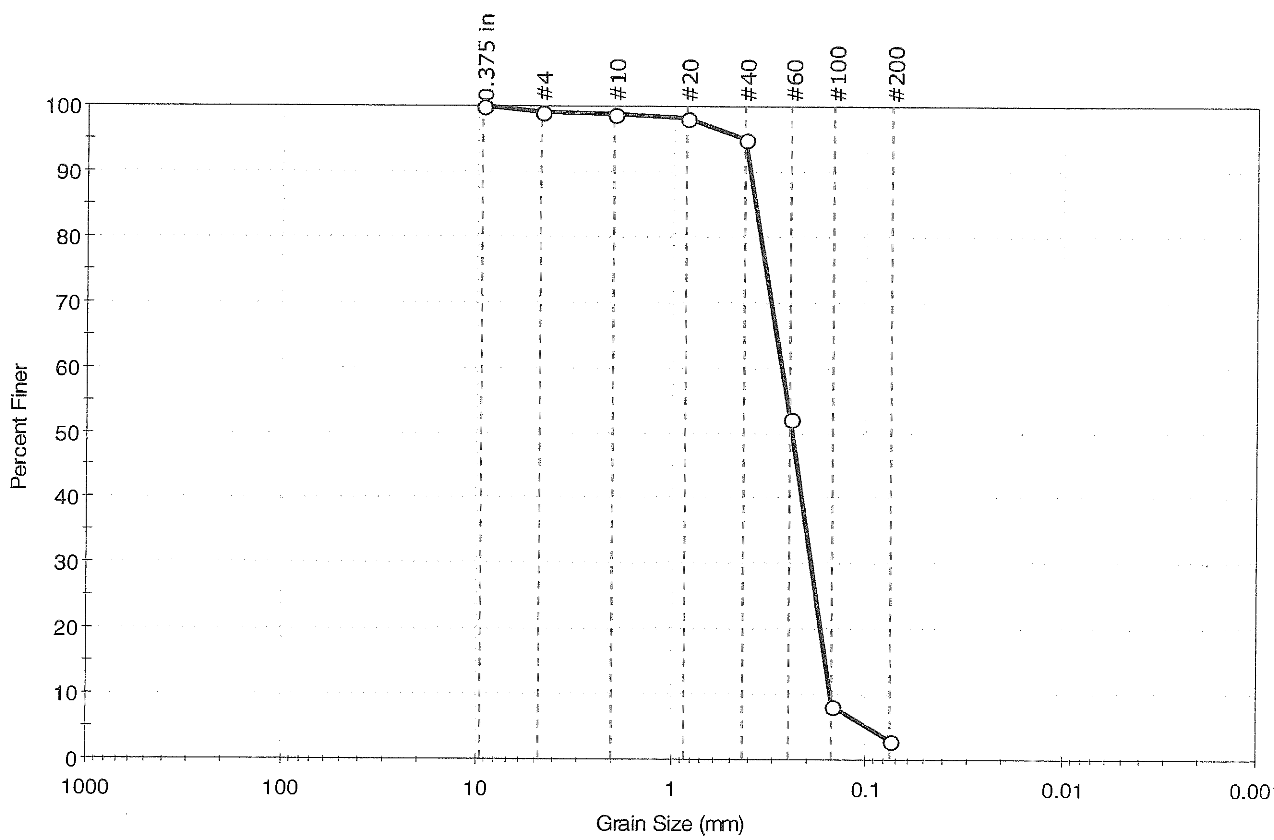
Toughness: n/a

The sample was determined to be Non-Plastic

GeoTesting express
a subsidiary of Geocomp Corporation

Client:	AECOM Environment				
Project:	Far Rockaway Former MGP				
Location:	Far Rockaway, NY			Project No:	GTX-9372
Boring ID:	---	Sample Type:	jar	Tested By:	jbr
Sample ID:	PDI-4	Test Date:	10/08/09	Checked By:	jdt
Depth :	22.0-24.0 ft	Test Id:	165400		
Test Comment:	---				
Sample Description:	Moist, very dark gray sand				
Sample Comment:	---				

Particle Size Analysis - ASTM D 422-63 (reapproved 2002)



% Cobble	% Gravel	% Sand	% Silt & Clay Size
---	0.9	96.1	3.0

Sieve Name	Sieve Size, mm	Percent Finer	Spec. Percent	Complies
0.375 in	9.50	100		
#4	4.75	99		
#10	2.00	99		
#20	0.85	98		
#40	0.42	95		
#60	0.25	52		
#100	0.15	8		
#200	0.075	3		

Coefficients

D_{85} =0.3754 mm D_{30} =0.1931 mm
D_{60} =0.2751 mm D_{15} =0.1624 mm
D_{50} =0.2434 mm D_{10} =0.1533 mm
C_u =1.795 C_c =0.884

Classification

ASTM Poorly graded sand (SP)

AASHTO Fine Sand (A-3 (0))

Sample/Test Description

Sand/Gravel Particle Shape : ---

Sand/Gravel Hardness : ---

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GeoTesting express
a subsidiary of Geocomp Corporation

Client:	AECOM Environment				
Project:	Far Rockaway Former MGP				
Location:	Far Rockaway, NY			Project No:	GTX-9372
Boring ID:	---	Sample Type:	jar	Tested By:	cam
Sample ID:	PDI-4	Test Date:	10/12/09	Checked By:	n/a
Depth :	22.0-24.0 ft	Test Id:	165397		
Test Comment:	---				
Sample Description:	Moist, very dark gray sand				
Sample Comment:	---				

Atterberg Limits - ASTM D 4318-05

Sample Determined to be non-plastic

Symbol	Sample ID	Boring	Depth	Natural Moisture Content,%	Liquid Limit	Plastic Limit	Plasticity Index	Liquidity Index	Soil Classification
✳	PDI-4	---	22.0-24.0 ft	23	n/a	n/a	n/a	n/a	Poorly graded sand (SP)

5% Retained on #40 Sieve

Dry Strength: NONE

Dilentancy: RAPID

Toughness: n/a

The sample was determined to be Non-Plastic

printed 10/12/2009 11:22:16 AM

PDI Boring Logs

AECOM

2 Technology Park Drive
Westford, Massachusetts 01886

Boring Log Legend

Project Name: Far Rockaway Former MGP
Project Number: 04940-176
Location: Far Rockaway, NY
Client: KeySpan Corporation

Lithology

- Asphalt
- Fill
- (SW) Well graded sand
- (GW) Well graded gravel
- (SP) Poorly graded sand
- (SM) Poorly graded silty sand
- (CH) Silt clay

Visual Impacts

- Solid Tar
- Tar Saturated
- Blebs, Globs, Lenses, Grain-Coating, Sheen
- Staining

Abbreviations

ft bgs:	Feet below ground surface
NA:	Not applicable
N/A:	Not available

AECOM	Client: National Grid	BORING ID: PDI-1
	Project Number: 01765-067-410	
	Site Location: Far Rockaway Former MGP	
	Boring Location: 1224 Brunswick Ave	Sheet: 1 of 2
	Drilling Method: Hollow Stem Auger	Monitoring Well Installed: Yes
	Sample Type(s): Split Spoon; Boring Diameter: 8.5"	Screened Interval: 5-35'
Weather: Sunny, 80's	Logged By: Jenny DeBoer; Date/Time Started: 8/31/09 1030	Depth of Boring: 37'
Drilling Contractor: Paragon Enivronmental Contruction	Ground Elevation: NA; Date/Time Finished: 8/31/09 1550	Water Level: 5.6'

Depth (ft)	Recovery (feet)	PID (ppm)	Blows per 6"	Lithology	U.S.C.S	Visual Impacts	Geologic Description	Lab Sample ID	Lab Sample Depth (Ft.)
1 2 3 4 5	NA	0.0 0.0 0.0 0.0	NA		FILL		0.0'-5.0': WELL GRADED GRAVELLY SAND (Fill): fine to coarse sub-rounded sand, dark brown, 30% sub-rounded to sub angular gravel, trace slag, brick, rootlets and concrete		
6 7	1.1	0.0 0.0	3 3 2 8				5.0'-5.6': Same as above 5.6'-7.0': Same as above dark brown to black. Wet at 5.6'		
8 9	1.2	0.3 39.9 70.2	5 7 7 9		SP		7.0'-7.2': Same as above 7.2'-9.0': POORLY GRADED SAND (SP): fine subrounded sand, light brown, trace rounded gravel from 7.4'-7.9', loose, wet. Moderate naphthalene-like odor 7.4' - 8.1'.		
10 11	1.2	23.5 24.5 30.9	11 8 12 15				9.0'-11.0: POORLY GRADED SAND (SP): fine sub-rounded sand, wet, stained light gray to dark gray, moderate naphthalene-like odor		
12 13	0.4	10.1 10.5	5 15 12 21				11.0'-11.2': Same as above 11.2'--13.0': Same as above but not stained, light brown		
14 15	1.3	19.5 16.2 4.0	2 5 8 10				13.0-'13.6' Same as above but stained light gray. Trace gravel 13.5' -13.6' 13.6'-15.0' Same as above but not stained, light brown		
20							No samples collected 15.0'-20.0'		
21 22	0.55	109.5 105.5	12 16 22 34				20.0-22.0: POORLY GRADED SAND (SP): fine, sub-rounded, light brown sand, medium dense, wet, moderate naphthalene-like odor	PDI-1	20 - 22
							No samples collected 22.0'-25.0'		

NOTES: Boring Location hand cleared to 5.0 ft bgs on August 31, 2009. Geotechnical soil sample PDI-1 (20-22') submitting to Geotesting Express for ASTM D 4318, ASTM D 2487, and ASTM D 422.

AECOM	Client: National Grid		BORING ID: PDI-1
	Project Number: 01765-067-410		
	Site Location: Far Rockaway Former MGP		
	Boring Location: 1224 Brunswick Ave		Sheet: 2 of 2
	Drilling Method: Hollow Stem Auger		Monitoring Well Installed: Yes
	Sample Type(s): Split Spoon	Boring Diameter: 8.5"	Screened Interval: 5-35'
Weather: Sunny, 80's	Logged By: Jenny DeBoer	Date/Time Started: 8/31/09 1030	Depth of Boring: 37'
Drilling Contractor: Paragon Enivronmental Contruction	Ground Elevation: NA	Date/Time Finished: 8/31/09 1550	Water Level: 5.6'

Depth (ft)	Recovery (feet)	PID (ppm)	Blows per 6"	Lithology	U.S.C.S	Visual Impacts	Geologic Description	Lab Sample ID	Lab Sample Depth (Ft.)
26 27	1.9	3.2 8.5 4.4	6 16 22 34		SW		25.0-27.0: WELL GRADED SAND (SW): fine-medium sand, light brown, some rounded gravel 26.8'-26.9', medium dense, wet. Slight naphthalene-like odor		
30							No samples collected 27.0'-30.0'		
31 32	0.7	0.0 0.0	8 8 11 12		SM		30.0-32.0 POORLY GRADED SILTY SAND (SM): Fine sand, light brown, 20% silt, dense, wetorange brown Fe iron staining at 30.0.		
35							No samples collected 32.0'-35.0'		
36 37	0.9	0.0 0.0 0.0	6 8 23 19		SM		35.0-37.0: POORLY GRADED SILTY SAND (SM): fine sand, dark gray, 30% silt, wet, dense End of boring at 37' bgs.		

NOTES: Boring Location hand cleared to 5.0 ft bgs on August 31, 2009. Geotechnical soil sample PDI-1 (20-22') submitting to Geotesting Express for ASTM D 4318, ASTM D 2487, and ASTM D 422.

AECOM	Client: National Grid		BORING ID: PDI-2
	Project Number: 01765-067-410		
	Site Location: Far Rockaway Former MGP		
	Boring Location: 1224 Brunswick Ave		Sheet: 1 of 2
	Drilling Method: Hollow Stem Auger		Monitoring Well Installed: No
	Sample Type(s): Split Spoon	Boring Diameter: 8.5"	Screened Interval:NA
Weather: Sunny, 75	Logged By: Jenny DeBoer	Date/Time Started: 8/31/09 1130	Depth of Boring: 37'
Drilling Contractor: Paragon Enivronmental Contruction	Ground Elevation: NA	Date/Time Finished: 9/1/09 1300	Water Level: 7.3'

Depth (ft)	Recovery (feet)	PID (ppm)	Blows per 6"	Lithology	U.S.C.S	Visual Impacts	Geologic Description	Lab Sample ID	Lab Sample Depth (Ft.)
1		0.0			FILL		0.0'-5.0' WELL GRADED GRAVELLY SAND (Fill): fine to coarse sub-rounded sand,		
2		0.0					dark brown, 20% angular to subrounded gravel, trace brick, concrete fragments		
	NA		NA				slag, wood fragemnts, slightly moist		
3		0.0							
4		0.0							
5									
		0.0	5		SP		5.0'-7.0' POORLY GRADED SAND (SP): fine sand, medium brown, medium dense,		
6	1.2	0.0	3				moist.		
		0.0	3						
7			5						
		0.0	5				7.0'-7.6' Same as above, wet at 7.3'		
8	1.4	28.0	5				7.6'-7.9' Same as above but stained light gray, moderate naphthalene-like odor		
		651.0	5				7.9'-9.0' POORLY GRADED GRAVELLY SAND (SP): fine sand, 30% sub-rounded		
9			9				gravel, dense, wet, coated grains, strong naphthalene-like odor		
		247.0	14				9.0'-9.7': Same as above but no coating, medium brown		
10	1.25	264.0	15				9.7'-10.25' Same as above with 20% sub-rounded gravel, some pockets of		
		120.0	17				gray staining,		
11			20						
		192.0	14				11.0'-11.4' Same as above		
12	2.0	36.6	19				11.4'-13.0' POORLY GRADED SAND (SP): fine sand, medium brown, trace medium		
		44.6	17				and fine sub-rounded gravel, moderate naphalene-like odor and pockets of gray		
13			16				staining		
		27.3	6				13.0'-13.5' Same as above		
14	1.2	5.7	6				13.5-15.0 Same as above but no gravel or staining, slight naphthalene-like odor		
		4.4	6						
15			6						
							No samples collected 15.0' to 20.0'		
20									
		17.0	WOH		SW		20.0'-22.0'- WELL GRADED SAND (SW): Fine to medium sand, light brown, Fe		
21	0.9	15.4	4				staining at 20.35', 20.55', and 20.65', black staining at 20.5'-20.6' and 20.8', slight		
		8.1	4				naphthalene-like odor, medium dense, wet		
22			5						
							No samples collected 22.0' to 25.0'		

NOTES: Boring Location hand cleared to 5.0 ft bgs on August 31, 2009.

AECOM	Client: National Grid	BORING ID: PDI-2
	Project Number: 01765-067-410	
	Site Location: Far Rockaway Former MGP	
	Boring Location: 1224 Brunswick Ave	Sheet: 2 of 2
	Drilling Method: Hollow Stem Auger	Monitoring Well Installed: No
	Sample Type(s): Split Spoon — Boring Diameter: 8.5"	Screened Interval:NA

Weather: Sunny, 75	Logged By: Jenny DeBoer	Date/Time Started: 8/31/09 1130	Depth of Boring: 37'
Drilling Contractor: Paragon Enivronmental Contruction	Ground Elevation: NA	Date/Time Finished: 9/1/09 1300	Water Level: 7.3'

Depth (ft)	Recovery (feet)	PID (ppm)	Blows per 6"	Lithology	U.S.C.S	Visual Impacts	Geologic Description	Lab Sample ID	Lab Sample Depth (Ft.)
26 27	1.65	33.6 51.2 68.2	2 4 4 8		SW GW		25.0'-26.75': WELL GRADED SAND (SW): fine to medium sand, light brown, medium dense, wet, slight naphthalene-like odor,. 26.75'-27.0': WELL GRADED GRAVEL (GW): fine to medium subrounded gravel, 5% coarse sand , tar saturated lenses at 26.75-26.80 and 26.90-27.0, strong naphthalene-like odor		
28 29	1.7	0.0 0.0 0.0	3 3 3 5		SM		27.0'-29.0': POORLY GRADED SILTY SAND (SM): Fine sand, little clay 25.8'-26.2', orange brown 25.0'-25.6', light gray w/orange brown banding 25.6'-28.0', dense, wet		
30							No samples collected 29.0'-30.0'		
31 32	0.6	0.0 0.0			SM		30.0'-32.0': POORLY GRADED SILTY SAND (SM): Fine sand, little clay orange brown 30.0'-30.3', gray w/ orange brown banding 30.3'-32.0', dense, wet		
35							No samples collected 32.0'-35.0'		
36 37	0.6	0.0 0.0			SM		35.0'-37.0': POORLY GRADED SILTY SAND (SM): fine sand, dark gray, dense, wet End of boring at 37' bgs.		

NOTES: Boring Location hand cleared to 5.0 ft bgs on August 31, 2009.

AECOM	Client: National Grid	BORING ID: PDI-3
	Project Number: 01765-067-410	
	Site Location: Far Rockaway Former MGP	
	Boring Location: 1224 Brunswick Ave	Sheet: 1 of 2
	Drilling Method: Hollow Stem Auger	Monitoring Well Installed: No
	Sample Type(s): Split Spoon / Boring Diameter: 8.5"	Screened Interval:NA
Weather: Sunny, 75	Logged By: Jenny DeBoer / Date/Time Started: 9/1/09 0900	Depth of Boring: 37'
Drilling Contractor: Paragon Enivronmental Contruction	Ground Elevation: NA / Date/Time Finished:9/2/09 1655	Water Level: 7.5'

Depth (ft)	Recovery (feet)	PID (ppm)	Blows per 6"	Lithology	U.S.C.S	Visual Impacts	Geologic Description	Lab Sample ID	Lab Sample Depth (Ft.)
1 2 3 4 5	NA	0.0 0.0 5.8	NA		FILL		0.0'-0.3' CONCRETE (loading dock) 0.3'-1.0': WELL GRADED GRAVELLY SAND (Fill): fine to coarse sand, brown, 15% gravel, trace silt, trace brick fragments and metal fragments, medium dense, moist 1.0'-5.0'- Same as above but dark brown		
6 7	0.6	8.2 1.7	5 5 4 4				5.0'-7.0' Same as above		
8 9	1.0	1.9 0.7 0.5	6 6 7 9		SP		7.0'-9.0' POORLY GRADED SAND (SP): fine sand, light brown, 20% fine rounded gravel 7.5'-7.9', medium dense, wet at 7.5'		
10 11	0.8	1.1 2.1 0.6	6 9 10 13				9.0'-11.0': Same as above, no gravel		
12 13	1.7	2.7 0.4 0.0	21 26 33 47				11.0'-13.0': Same as above Dark gray 11.0'-11.7'		
14 15	1.3	0.0 0.0 0.0	11 14 19 22				13.0'-15.0': Same as above Lens of silty fine sand 13.4'-13.5' with orange Fe staining above and below.		
20							No samples collected 15.0'-20.0'		
21 22	1.8	0.0 0.0 0.0	3 3 5 7				20.0'-22.0': Same as 7.0'-15.0' Sub-rounded to sub-angular gravel lens at 21.4'-21.5'		
23 24	1.4	0.0 0.0 0.0	6 6 9 14				22.0'-24.0' Same as above but light brown to gray	PDI-3	22 - 24

NOTES: Boring Location hand cleared to 5.0 ft bgs on September 1, 2009. Geotechnical soil sample PDI-3 (22-24') submitting to Geotesting Express for ASTM D 4318, ASTM D 2487, and ASTM D 422.

AECOM

Client: National Grid		BORING ID: PDI-3
Project Number: 01765-067-410		
Site Location: Far Rockaway Former MGP		
Boring Location: 1224 Brunswick Ave		Sheet: 2 of 2
Drilling Method: Hollow Stem Auger		Monitoring Well Installed: No
Sample Type(s): Split Spoon	Boring Diameter: 8.5"	Screened Interval:NA
Weather: Sunny, 75 / Logged By: Jenny DeBoer	Date/Time Started: 9/1/09 0900	Depth of Boring: 37'
Drilling Contractor: Paragon Enivronmental Contruction / Ground Elevation: NA	Date/Time Finished:9/2/09 1655	Water Level: 7.5'

Depth (ft)	Recovery (feet)	PID (ppm)	Blows per 6"	Lithology	U.S.C.S	Visual Impacts	Geologic Description	Lab Sample ID	Lab Sample Depth (Ft.)
		1.1	14		SP		24.0'-25.65' Same as above		
25	1.2	102.0	17		GW		25.65'-26.0': WELL GRADED SANDY GRAVEL (GW): 1mm to 1cm subrounded		
		4.0	19				gravel, medium to coarse sand, loose, wet. Tar saturated and strong		
26			16				naphthalene-like odor 25.65'-25.72'. Orange Fe staining 25.72'-26.0'.		
		0.0	14		SP		26.0'-28.0' POORLY GRADED SILTY SAND (SP): fine sand, light brown with		
27	0.5	0.0	17				orange Fe stained banding, medium dense, wet. Sub-rounded, white quartz		
		0.0	19				gravel lens 26.2'-26.35'. Trace clay 26.35'-26.5'		
28			16						
		0.0	2				28.0'-30.0': Same as above but light gray with orange Fe stained banding		
29	1.3	0.0	2						
		0.0	3						
30		0.0	3						
		0.0	WOR				30.0'-32.0': Same as above		
31	1.2	0.0	WOR						
		0.0	1						
32			1						
							No samples collected 32.0'-35.0'		
35									
		0.0	1		SP		35.0-36.4: Same as 26.0'-23.0'		
36	1.5	0.0	5				36.6'-37.0': POORLY GRADED SILTY SAND (SM): fine sand, 30% silt, dark gray,		
		0.0	5				dense, wet		
37			5		SM		End of boring at 37' bgs		

NOTES: Boring Location hand cleared to 5.0 ft bgs on September 1, 2009. Geotechnical soil sample PDI-3 (22-24') submitting to Geotesting Express for ASTM D 4318, ASTM D 2487, and ASTM D 422.

AECOM	*Client: National Grid*	**BORING ID: PDI-4**
	Project Number: 01765-067-410	
	Site Location: Far Rockaway Former MGP	
	Boring Location: 1224 Brunswick Ave	*Sheet: 1 of 2*
	Drilling Method: Hollow Stem Auger	*Monitoring Well Installed: No*
	Sample Type(s): Split Spoon — *Boring Diameter: 8.5"*	*Screened Interval:NA*
Weather: Sunny 65	*Logged By: Jenny DeBoer* — *Date/Time Started: 8/31/09 1535*	*Depth of Boring: 37'*
Drilling Contractor: Paragon Enivronmental Contruction	*Ground Elevation: NA* — *Date/Time Finished:9/4/09 1045*	*Water Level: 5.5'*

Depth (ft)	Recovery (feet)	PID (ppm)	Blows per 6"	Lithology	U.S.C.S	Visual Impacts	Geologic Description	Lab Sample ID	Lab Sample Depth (Ft.)
1 2 3 4 5	NA		NA		Fill SP		0.0'-0.1' Asphalt 0.1'-3.4' : WELL GRADED GRAVELY SAND (Fill): fine to coarse sand, dark brown, 30% sub-rounded to sub-angular grave, trace brick fragments 3.4'-5.0': POORLY GRADED SAND (SP): fine sand, light brown, dense, moist		
6 7	1.1	0.0 0.0 0.0 0.0	3 3 5 7				5.0-5.6: Same as above. Wet at 5.5' 5.6-7.0: POORLY GRADED GRAVELLY SAND (SP): fine sand, 30% sub-rounded to sub-angular quartz gravel, medium dense, wet		
8 9	1.2	0.0 0.0 0.0	3 6 6 5				7.0'-7.4' Same as above 7.4'-9.0' POORLY GRADED SAND (SP): fine sand, light brown, dense, wet		
10 11	0.5	0.0 0.0	N/A				9.0'-11.0' Same as above, piece of sub-rounded quartz gravel at 9.1'-9.2'		
12 13	0.5	0.1 0.0	7 8 11 15				11.0'-13.0' Same as above but light gray and orange with trace silt		
14 15	0.5	0.0 0.0	4 4 5 8				13.0'-15.0' Same as above but orange brown, no silt		
20							No samples collected 15.0'-20.0'		
21 22	1.0	0.1 0.2	6 6 8 11				20.0'-22.0' Same as 13.0'-15.0'		
23 24	1.7	0.2 0.3 0.2	5 7 7 13				22.0'-24.0' Same as above but light brown	PDI-4	22 - 24

NOTES: Boring Location hand cleared to 5.0 ft bgs on September 2, 2009. Geotechnical soil sample PDI-4 (22-24') submitting to Geotesting Express for ASTM D 4318, ASTM D 2487, and ASTM D 422.

AECOM	Client: National Grid		BORING ID: PDI-4
	Project Number: 01765-067-410		
	Site Location: Far Rockaway Former MGP		
	Boring Location: 1224 Brunswick Ave		Sheet: 2 of 2
	Drilling Method: Hollow Stem Auger		Monitoring Well Installed: No
	Sample Type(s): Split Spoon	Boring Diameter: 8.5"	Screened Interval:NA
Weather: Sunny 65	Logged By: Jenny DeBoer	Date/Time Started: 8/31/09 1535	Depth of Boring: 37'
Drilling Contractor: Paragon Enivronmental Contruction	Ground Elevation: NA	Date/Time Finished:9/4/09 1045	Water Level: 5.5'

Depth (ft)	Recovery (feet)	PID (ppm)	Blows per 6"	Lithology	U.S.C.S	Visual Impacts	Geologic Description	Lab Sample ID	Lab Sample Depth (Ft.)
		0.2	12		SP		24.0'-25.3': Same as above with orange Fe stained band at 24.8'.		
25	1.8	0.3	15				25.3-25.6':WELL GRADED SANDY GRAVEL (GW): fine rounded gravel, coarse		
		0.2	20		GW		sand, 25.3'-23.4' medium gravel and red staining, orange staining 25..4'-25.5'		
26		0.1	22		SP		25.6'-26.0': Same as 24.0'-25.3'		
		0.0	5		SM		26.0'-28.0' POORLY GRADED SILTY SAND (SM): fine sand, 15% silt, orange		
27	0.5	0.0	8				26.0'-26.4' and gray 26.4-28.0', dense, wet		
			8						
28			12						
		0.2	3				28.0'-28.3' Same as above		
29	0.5	0.1	3				28.3'-30.0' Same as above but orange		
		0.1	5						
30			8						
		0.1	2				30.0'-32.0' Same as above but gray with orange Fe staining 30.05-30.2 and 30.35'-30.6'.		
31	0.6	0.1	2						
			3						
32			4						
							No samples collected 32.0'-35.0'		
35									
		0.1	3				35.0'-35.2' Same as 26.0'-32.0'. Stained red 32.0'-32.1' and orange 32.1'-32.2'.		
36	0.9	0.4	5				35.2'-37.0' POORLY GRADED SILTY SAND (SM): fine sand, dark gray, 30% silt,		
		0.7	5				dense, wet.		
37			7				End of boring at 37' bgs		

NOTES: Boring Location hand cleared to 5.0 ft bgs on August 31, 2009.

AECOM	Client: National Grid		BORING ID: PDI-5
	Project Number: 01765-067-410		
	Site Location: Far Rockaway Former MGP		
	Boring Location: Richelieu Hardware		Sheet: 1 of 2
	Drilling Method: Hollow Stem Auger		Monitoring Well Installed: No
	Sample Type(s): Split Spoon	Boring Diameter: 8.5"	Screened Interval:NA
Weather: N/A	Logged By: Jenny DeBoer	Date/Time Started: 9/1/09 1445	Depth of Boring: 37'
Drilling Contractor: Paragon Enivronmental Contruction	Ground Elevation: NA	Date/Time Finished:9/2/09 1220	Water Level: 5.5'

Depth (ft)	Recovery (feet)	PID (ppm)	Blows per 6"	Lithology	U.S.C.S	Visual Impacts	Geologic Description	Lab Sample ID	Lab Sample Depth (Ft.)
							0.0'-0.1' Asphalt		
1		24.0			FILL		0.1'-4.5' : WELL GRADED SAND AND GRAVEL (Fill): fine to coarse sand,		
							dark gray,angular to rounded gravel, moist. Diesel-like odor 0.8'-4.5'		
2		12.7							
	NA		NA						
3		1.3							
4		3.5							
					SW		4.5'-5.0 WELL GRADED SAND: fine to medium sand, greenish gray, loose-medium		
5							dense, moist. Unknown chemical-like odor .		
		12.9	7				5.0'-7.0' Same as above with 10% silt, and diesel-like odor. Wet at 5.5'		
6	1.2	23.4	3				15% gravel 6.2'-7.0'		
		33.7	3						
7			7						
		11.2	9		SP		7.0'-7.8': POORLY GRADED GRAVELLY SAND (SP): fine sand, light brown,		
8	1.0	68.8	10				gray brown 7.0'-7.2', 15% rounded gravel, slight naphthalene-like odor and slight		
		242.0	10				diesel-like odor		
9			12				7.8'-9.0' Same as above but no gravel, stained black and mod. naphthalene-like odor		
		9.8	6				9.0'-9.3' POORLY GRADED SILTY SAND (SP): fine sand, dark gray to black. Bands		
10	1.2	1.9	1				of light brown coloring 9.15'-9.3', medium dense, wet, slight naphthalene-like odor		
		1.1	9				9.3'-9.5' Same as above but light orange brown, 5% rounded gravel and no odors		
11			12				9.5'-11.0' POORLY GRADED SAND (SP): fine to medium sand, light brown, wet.		
		1.4	9				11.0'-12.0'Same as above		
12	1.2	0.3	12				12.0'-13.0' POORLY GRADED SILTY SAND (SP): fine sand, light brown, medium		
		0.3	15				dense, wet.		
13		0.2	15						
		1.3	3				13.0'-15.0' Same as above. Orange Fe stained band at 14.35'.		
14	1	0.0	3						
		0.0	3						
15		0.0	4						
							No samples collected 15.0'-20.0'		
20									
		0.4	4				20.0'-22.0' Same 13.0'-15.0'. Light orange brown 20.5'-22.0'.		
21	1.4	0.6	5						
		0.0	6						
22			7						
		1.3	6				22.0'-24.0' Same as above but light brown, 1cm diameter black spots at 22.3', 23.2' and		
23	1.5	2.9	12				23.3'.		
		1.0	15						
24			23						

NOTES: Boring Location hand cleared to 5.0 ft bgs on September 1, 2009.

AECOM	Client: National Grid		BORING ID: PDI-5
	Project Number: 01765-067-410		
	Site Location: Far Rockaway Former MGP		
	Boring Location: Richelieu Hardware		Sheet: 2 of 2
	Drilling Method: Hollow Stem Auger		Monitoring Well Installed: No
	Sample Type(s): Split Spoon	Boring Diameter: 8.5"	Screened Interval:NA
Weather: N/A	Logged By: Jenny DeBoer	Date/Time Started: 9/1/09 1445	Depth of Boring: 37'
Drilling Contractor: Paragon Enivronmental Contruction	Ground Elevation: NA	Date/Time Finished:9/2/09 1220	Water Level: 5.5'

Depth (ft)	Recovery (feet)	PID (ppm)	Blows per 6"	Lithology	U.S.C.S	Visual Impacts	Geologic Description	Lab Sample ID	Lab Sample Depth (Ft.)
		0.8	4		SP		24.0'-24.4' Same as above		
25	1.1	0.5	4		SW		24.4-24.75' WELL GRADED GRAVELLY SAND (SW): medium to coarse sand, light brown, 40 % fine rounded quartz gravel,		
		0.0	7		SP		24.75-26.0 POORLY GRADED SAND (SP): fine sand, red 24.75-24.8, orange 24.8-26.0, medium dense, wet.		
26			9						
		0.7	6				26.0'-28.0' Same as above with trace silt.		
27	2	0.7	7						
		0.0	16						
28			26						
		0.0	4		SM		28.0'- 30.0' POORLY GRADED SILTY SAND (SM): fine sand, gray with orange Fe staining throughout, medium dense, wet.		
29	1.2	0.0	4						
		0.0	6						
30			12						
		0.1	WOH				30.0'-32.0' Same as above with trace clay.		
31	0.6	0.0	3						
		0.2	6						
32			9						
							No samples collected 32.0'-35.0'		
35									
		0.2	WOH				35.0'-37.0' POORLY GRADED SILTY SAND (SM): fine sand, dark gray, trace clay, dense, wet.		
36	1.1	0.6	3						
		0.8	3						
37			3				End of boring at 37.0'		

NOTES: Boring Location hand cleared to 5.0 ft bgs on September 1, 2009.

AECOM	Client: National Grid		BORING ID: PDI-6
	Project Number: 01765-067-410		
	Site Location: Far Rockaway Former MGP		
	Boring Location: 1224 Brunswick Ave		Sheet: 1 of 2
	Drilling Method: Hollow Stem Auger		Monitoring Well Installed: No
	Sample Type(s): Split Spoon	Boring Diameter: 8.5"	Screened Interval:NA
Weather: Partly sunny, 65	Logged By: Jenny DeBoer	Date/Time Started: 9/2/09 1210	Depth of Boring: 38'
Drilling Contractor: Paragon Enivronmental Contruction	Ground Elevation: NA	Date/Time Finished:9/3/09 1130	Water Level: 3.0'

Depth (ft)	Recovery (feet)	PID (ppm)	Blows per 6"	Lithology	U.S.C.S	Visual Impacts	Geologic Description	Lab Sample ID	Lab Sample Depth (Ft.)
							0.0'-0.15' Asphalt		
1		736			SW		0.15'-0.3': WELL GRADED SAND AND GRAVEL (SW): fine to medium sand, fine gravel, gray, moist. Strong, unknown chemical odor		
2		505					0.3'-5.0': WELL GRADED SAND (SW): fine to medium brown sand, moist. Strong unknown chemcial odor 0.3'-2.0'. Strong naphthalene-like odor and coated grains 2.0'-5.0'. Wet at 3.0'. Coating seems heavier from 3.0'-4.0', but may be due to water at 3'.		
	NA	426	NA						
3		1650							
		468							
4		4200							
		1043							
5		2794							
		2535	6		SP		5.0'-7.0' POORLY GRADED GRAVELLY SAND (SP): fine sand, medium brown, 30% fine rounded quartz gravel, some gray staining, strong naphalene-like-odor		
6	1.2	2400	9						
		1275	15						
7			11						
		1347	10				7.0'-8.6' Same as above, stained light gray and sheen on water 7.0-8.0', light brown and moderate naphthalene-like odor 8.0'-8.6'		
8	1.9	925	11						
		40.2	11				8.6'-9.0' POORLY GRADED SAND (SP): fine sand, light brown 8.6'-8.7', stained gray 8.7'-9.0', medium dense, wet, moderate naphthalene-like odor		
9			12						
		95.6	10				9.0'-9.2': Same as above		
10	0.8	40.9	10				9.2'-11.0' Same as above but no staining, light brown, moderate naphthalene-like odor grading to slight naphthalene-like odor at bottom of spoon.		
		11.4	11						
11			13						
		32.7	3				11.0'-13.0' Same as above with very slight napthalene like odor grading to no odors at bottom of spoon. Orange Fe staining at 12.65'-12.70' and 12.8'-13.0'		
12	0.5	15.0	3						
		8.0	7						
13		8.0	11						
		10.1					13.0'-15.0': Same as above with very slight naphthalene-like odor.		
14	0.7	5.3	N/A						
15									
							No samples collected 15.0'-20.0'		
20									
		102.3	WOR				20.0'-22.0': POORLY GRADED SAND (SP): fine sand, light brown, slight napthalene-like odor, wet.		
21	0.3		WOR						
			7						
22			9						
		178	27				22.0'-24.0 Same as above, but all recovery looks like slough.		
23	1.2	870	22						
		205	15						
24			15						

NOTES: Boring Location hand cleared to 5.0 ft bgs on September 2, 2009.

AECOM	*Client: National Grid*	***BORING ID: PDI-6***
	Project Number: 01765-067-410	
	Site Location: Far Rockaway Former MGP	
	Boring Location: 1224 Brunswick Ave	*Sheet: 2 of 2*
	Drilling Method: Hollow Stem Auger	*Monitoring Well Installed: No*
	Sample Type(s): Split Spoon — *Boring Diameter: 8.5"*	*Screened Interval:NA*
Weather: Partly sunny, 65	*Logged By: Jenny DeBoer* — *Date/Time Started: 8/31/09 1535*	*Depth of Boring: 37'*
Drilling Contractor: Paragon Enivronmental Contruction	*Ground Elevation: NA* — *Date/Time Finished:9/4/09 1045*	*Water Level: 3.0'*

Depth (ft)	Recovery (feet)	PID (ppm)	Blows per 6"	Lithology	U.S.C.S	Visual Impacts	**Geologic Description**	Lab Sample ID	Lab Sample Depth (Ft.)
25 26	1.1	11.8 5.5 1.0	7 5 3 3		SP SW SM		24.0'-24.2': POORLY GRADED SAND (SP): find sand, light brown, Fe stained band 24.05'-24.15', very slight naphthalene-like odor. 24.2'-24.4': WELL GRADED GRAVELLY SAND (SW): fine sand, light brown, fine rounded quartz gravel. Sand stained red 24.3'-24.4'. Very slight naphthalene-like odor. 24.4'-26.0' POORLY GRADED SILTY SAND (SM): fine sand, medium dense, wet orange 24.4'-.24.9', gray with orange Fe staining 24.9'-26.0'.		
27 28	1.3	2.0 1.0 1.0	3 3 3 5				26.0'-28.0': Same as above		
29 30	0.7	1.0 0.1 0.0	WOR 3 4 7				28.0'-30.0' Same as above		
31 32	1.4	0.0 0.1 0.5	WOR WOR 3 4				30.0'-32.0' Same as above but stained red and trace sub-angular to subrounded gravel 30.8'-30.95'		
33 34	1.2	0.4 0.0 0.0	11 14 13 11				32.0'-34.0' Same as above with 1mm clayey silt bands and red staining at 32.55'-32.65' and 33.0'-33.1'		
35 36	1.3	0.2 0.1 0.3	N/A				34.0'-34.05' Same as above. 34.05'-35.2' POORLY GRADED SILTY SAND (SM): fine sand, trace clay, dark gray very dense, wet 35.2'-37.0' Same as above with some clay.		
37 38	2.0	1.6 0.2 0.0	N/A		CH		36.0' 36.9' Same as above 36.9'-38.0' SILTY CLAY (CH): dark gray, medium plasticity, wet.		

NOTES: Boring Location hand cleared to 5.0 ft bgs on September 2, 2009.

AECOM	Client: National Grid	**BORING ID: PDI-7**
	Project Number: 01765-067-410	
	Site Location: Far Rockaway Former MGP	
	Boring Location: 1224 Brunswick Ave	Sheet: 1 of 2
	Drilling Method: Hollow Stem Auger	Monitoring Well Installed: No
	Sample Type(s): Split Spoon; Boring Diameter: 8.5"	Screened Interval:NA
Weather: Party sunny, 60	Logged By: Jenny DeBoer; Date/Time Started: 9/3/09 1110	Depth of Boring: 40'
Drilling Contractor: Paragon Enivronmental Contruction	Ground Elevation: NA; Date/Time Finished:9/3/09 1620	Water Level: Between 5 - 7 feet

Depth (ft)	Recovery (feet)	PID (ppm)	Blows per 6"	Lithology	U.S.C.S	Visual Impacts	Geologic Description	Lab Sample ID	Lab Sample Depth (Ft.)
1		0.0			FILL		0.0'-5.0' WELL GRADED GRAVELLY SAND (Fill): fine to medium sand, dark brown, some gravel, trace silt, trace copper wire fragments, brick fragments, conrete fragments, and wood, loose moist. Ash layer at 3.0'-3.2'.		
2		0.2							
	NA		NA						
3		0.2							
4		5.3							
5		2.8							
			3				5.0'-7.0' no recovery; water present.		
6	0		3						
			5						
7			7						
		41.3	8		SP		7.0'-9.0': POORLY GRADED SILTY SAND (SP): fine sand, dark brown, medium dense, wet, moderate napthalene-like odor.		
8	0.3		8						
			9						
9			27						
		14.1	13				9.0'-9.25': Same as above but coated grains, sheen and strong naphthalene-like odor		
10	1.35	9.1	10		SW		9.25'-9.7' WELL GRADED GRAVELLY SAND (SW): fine to medium sand, light brown, 10% fine gravel, medium dense, wet, moderate napthalene-like odor		
		4.6	10						
11		5.5	12		SP		9.7'-11.0': POORLY GRADED SAND (SP): fine sand, light brown, medium dense, some light gray staining, moderate naphalene-like odor		
		20.6	8				11.0'-11.2': Same as above		
12	2.0	12.6	14		SW		11.2'-11.7': Same as 9.25'-9.7'		
		18.8	20		SP		11.7'-13.0' POORLY GRADED SAND (SP): fine sand, light gray to black staining, strong napthalene-like odor. No staining 12.8'-13.0'.		
13		310	21						
		14.7					13.0'-15.0' Same as above. No staining.		
14	0.6	2.2	N/A						
15									
							No samples collected 15.0'-20.0'		
20									
		0.2	4				20.0-22.0': POORLY GRADED SAND (SP): fine sand, light brown, trace silt 20.0'-20.2' black band 20.4'-24.45', slight naphthalene-like odor, medium dense, wet.		
21	0.8	0.5	5						
		0.6	5						
22			7						
		0.5	8				22.0'-24.0' Same as above with very slight naphthalene-like odor		
23	1.4	0.8	15						
		1.1	20						
24			27						

NOTES: Boring Location hand cleared to 5.0 ft bgs on September 3, 2009.

AECOM	*Client: National Grid*	**BORING ID: PDI-7**
	Project Number: 01765-067-410	
	Site Location: Far Rockaway Former MGP	
	Boring Location: 1224 Brunswick Ave	*Sheet: 2 of 2*
	Drilling Method: Hollow Stem Auger	*Monitoring Well Installed: No*
	Sample Type(s): Split Spoon — *Boring Diameter: 8.5"*	*Screened Interval:NA*
Weather: Party sunny, 60	*Logged By: Jenny DeBoer* — *Date/Time Started: 9/3/09 1110*	*Depth of Boring: 40'*
Drilling Contractor: Paragon Enivronmental Contruction	*Ground Elevation: NA* — *Date/Time Finished:9/3/09 1620*	*Water Level:* Between 5 - 7 feet

Depth (ft)	Recovery (feet)	PID (ppm)	Blows per 6"	Lithology	U.S.C.S	Visual Impacts	**Geologic Description**	Lab Sample ID	Lab Sample Depth (Ft.)
25 26	0.6	4.0 1.0 0.1	WOH 2 4 6		SW		24.0'-26.0' WELL GRADED GRAVELLY SAND (SW): medium to coarse sand, light brown, orange Fe staining 24.5'-24.6', 40% fine and 5% medium sub-rounded quartz gravel, very slight naphthalene-like odor 24.0'-24.2', medium dense, wet.		
27 28	0.6	0.0 0.0	10 12 12 5				26.0'-28.0' Same as above, slight naphthalene-like odor 26.0'-26.5'. Sandy gravel lens 26.5'-26.6'.		
29 30	1.4	0.0 0.0 0.0	3 3 5 18		SM		28.0'-30.0' POORLY GRADED SILTY SAND (SM): fine sand, gray with abundent orange Fe staining, medium dense, wet.		
31 32	0.6	0.0 0.0	3 3 3 6				30.0'-32.0' Same as above		
33 34	1.1	0.0 0.0	4 6 5 8				32.0'-34.0' Same as above		
35 36	1.0	0.0 0.0 0.0	N/A				34.0'-34.7' Same as above 34.7'-36.0' Same as above but dark gray, no staining		
37 38	1.3	0.0 0.0 0.0	2 2 2 2				36.0'-38.0' Same as above with trace clay 36.1'-36.3'		
39 40	1.0	0.0 0.0 0.0	4 6 8 10		CH		38.0'-38.5' Same as above 38.5'-40.0' SILTY CLAY (CH): dark gray, medium plasticity, wet		

NOTES: Boring Location hand cleared to 5.0 ft bgs on September 3, 2009.

Appendix B

Alternative Cost Estimates

AECOM

Project Name:	Far Rockaway Former MGP	**Revision No.:**	2
Cost Estimate No.:	FS Alternative 2	**Date:**	1/26/12
Client	National Grid	**Status:**	Draft
Location	Far Rockaway, New York	**Author:**	MJG
		Office:	Chelmsford
Project Element:	Feasibility Study	**Reviewed By:**	AF

Type of Estimate: Feasibility/Conceptual

Project Details

Project Location:
Project Start Date:
Project Duration: 4.5 Months
Type of Contract: Direct Owner
Level of Accuracy: *-30% to +50%*
Contingency: 30%

Scope Summary

Summarize scope of work and provide project specific details with reference to source

Restore Site to Pre-Release Conditions By Excavating 7,000 CY of impacted Soil and Chemicaly Oxidizing Off-site Groundwater Impacts.

Document Source: ____________ **Rev. Date:** ____________ **Site Visit?** ____________
Document Source: ____________ **Rev. Date:** ____________
Document Source: ____________ **Rev. Date:** ____________

Cost Summary

Prime Contractor Costs	**$**	**7,239,473**
Other Contracts & Purchases	**$**	**1,751,750**
Design Oversight Costs	**$**	**1,499,559**
Project Total Estimated Cost	**$**	**10,490,782**

Notes:

1. Accuracy ranges are based on information provided in "Association for Advancement of Cost Engineering (AACE), International Cost Estimating Classifications, 18R-97"

Estimate Type	*Accuracy Range*
Preliminary	*-50% to +100%*
Feasibility/Conceptual	*-30% to +50%*
Engineering	
30%	*-20% to +30%*
60%	*-15% to +20%*
90%	*-10% to +15%*

2. Contingency values are based on information provided in 'USEPA, Guide to Developing Cost Estimates, July 2000

Remediation Technology	*Scope Contingency*
Soil Excavation	*15% to 55%*
Groundwater Treatment (Multiple	*15% to 35%*
On-site Incineration	*15% to 35%*
Extraction Wells	*10% to 30%*
Vertical Barriers	*10% to 30%*
Synthetic Cap	*10% to 20%*
Off-site Disposal	*5% to 15%*
Off-site Incineration	*5% to 15%*
Bulk Liquid Processing	*5% to 15%*
Clay Cap	*5% to 10%*
Surface Grading/Diking	*5% to 10%*
Revegetation	*5% to 10%*

Cost Summary
Far Rockaway Former MGP
FS Alternative 2
National Grid
Far Rockaway, New York

AECOM

Feasibility Study

By: MJG Rev Date: 1/26/2012

Task ID	Task Descr.	Unit	Quantity	Bare Cost	30% Contingency	Total Cost	Unit Rate	%
Prime Contractor Costs								
1	Mobilization	LS	1	$550,000	$165,000	$715,000	$715,000	10%
2	Temporary Facilities	Day	95	$465,825	$139,748	$605,573	$6,374	8%
3	Fencing and E&S Control	LF	2,000	$12,833	$3,850	$16,683	$8	0%
4	Excavation Shoring	SF	9,000	$747,900	$224,370	$972,270	$108	13%
5	Excavation	CY	7,000	$197,900	$59,370	$257,270	$37	4%
6	Excavation Dewatering	Day	50	$450,000	$135,000	$585,000	$11,700	8%
7	Odor Control Foam	MO	5	$27,575	$8,273	$35,848	$7,966	0%
8	Backfill and Site Restoration	CY	7,000	$316,792	$95,038	$411,830	$59	6%
9	Chemical Oxidation	LS	1	$2,800,000	$840,000	$3,640,000	$3,640,000	50%
				$5,568,825	$1,670,648	$7,239,473		100%
Other Contracts & Purchases					30%			
Task ID	Task Descr.	Unit	Quantity	Bare Cost	Contingency	Total Cost	Unit Rate	%
1	Transportation and Disposal	Ton	12,250	$1,347,500	$404,250	$1,751,750	$143	100%
				$1,347,500	$404,250	$1,751,750		100%
Design Oversight Costs					20%			
Task ID	Task Descr.	Unit	Quantity	Bare Cost	Contingency	Total Cost	Unit Rate	%
1	Temporary Facilities	MO	5	$47,500	$9,500	$57,000	$12,000	4%
2	Air Monitoring and Health and Safety	Day	45	$103,500	$20,700	$124,200	$2,760	8%
3	Groundwater Monitoring	Year	30	$0	$0	$0	$0	0%
4	Oversight Personnel	Man Hours	2,800	$407,000	$81,400	$488,400	$174	33%
5	Engineering Design	LS	1	$691,633	$138,327	$829,959	$829,959	55%
				$1,249,633	$249,927	$1,499,559		100%
Grand Total						$10,490,782		

Cost Details
Far Rockaway Former MGP
FS Alternative 2
National Grid
Far Rockaway, New York

Feasibility Study

Add Task | Delete Row | Add 1 Blank Row

By: MJG   Rev Date: 1/26/12

Task/Sub Task	Description	Unit	Qty	Rate	Total Cost		Estimate/Source Notes
Prime Contractor Costs		**NOTE- All costs include contractor Overhead and Profit**					
1	**Mobilization**	**LS**	**1**		**$550,000.00**		**NOTES**
	General Mobilization	LS	1	200000	$200,000.00		Consistent with Bayshore Bid (comparable size project)
	Excavation Shoring Equipment	LS	1	350000	$350,000.00		Assumes crane and drill rigs for underpinning
2	**Temporary Facilities**	**Day**	**95**		**$465,825.00**		**Notes:**
	Temporary Facilities-Porta/John	MO	4.75	2000	$9,500.00		Assumes 7,000 cy at 200 cy/day plus one month for setup, one month for shoring and one month for restoration (95 days total)
	Office Trailers & Equipment	MO	4.75	10000	$47,500.00		Total Daily Cost of $6347/day is consistent with Bayshore Bid and Clifton Daily Bid Costs ($5400/day to $6900/day).
	Office Supplies	MO	4.75	2000	$9,500.00		--
	Telephone	MO	4.75	2000	$9,500.00		--
	Cell Phones	MO	4.75	2500	$11,875.00		--
	Electric	MO	4.75	2500	$11,875.00		--
	Water	MO	4.75	2500	$11,875.00		--
	Pick Ups	MO	4.75	6000	$28,500.00		--
	Fuel/Maint	MO	4.75	12000	$57,000.00		--
	Misc. Supplies	MO	4.75	4000	$19,000.00		--
	Decontamination Facilities	LS	1	10000	$10,000.00		--
	Dumpster	Wk	19	500	$9,500.00		--
	Site Superintendant	Day	95	750	$71,250.00		--
	Project Manager	Day	70	750	$52,500.00		--
	Site Engineer	Day	95	750	$71,250.00		--
	Administration	Day	30	340	$10,200.00		--
	Surveying	LS	1	25000	$25,000.00		--
3	**Fencing and E&S Control**	**LF**	**2000**		**$12,833.33**		**Notes**
	Temporary Fencing	LF	300	25	$7,500.00		Jersey Barrier with Fence and Fabric; assumes no fencing along building
	E&S Controls	LF	1000	5	$5,000.00		Assumes E&S controls around chem ox area and along building
	Fence Wind Screen	SY	333.3	1	$333.33		Assumes 10' high along temp fence
					$0.00		
4	**Excavation Shoring**	**SF**	**9000**		**$747,900.00**		**Notes**
	Pre-Trenching	SF	5025	6	$30,150.00		From Sag and Clifton
	AZ19-700 Piles	SF	9000	18	$162,000.00		From Skyline Steel
	Pile Driving	SF	9000	36	$324,000.00		From Skyline Steel
	Bracing\Tiebacks	SF	6450	15	$96,750.00		From Skyline Steel
	Underpin Buildings	LS	1	135000	$135,000.00		Helical or mini piles 5 feet oc
5	**Excavation**	**CY**	**7000**		**$197,900.00**		**Notes**
	Excavator	Day	35	1000	$35,000.00		Assume 200 CY per day
	Operator	Day	35	870	$30,450.00		Total unit cost of $37/cy comparable to bid unit rates from $11/cy to $43/cy from Sag, Clifton. Hempstead, Bayshore
	Laborers(2)	Day	35	1500	$52,500.00		--
	Skid Steer	Day	35	500	$17,500.00		--
	Loader	Day	35	600	$21,000.00		--
	Operator	Day	35	870	$30,450.00		--
	Breakup of Concrete	CY	1000	11	$11,000.00		Assume roughly 15% concrete
					$0.00		
6	**Excavation Dewatering**	**Day**	**50**		**$450,000.00**		**Notes**
	Dewatering and Construction Water Treatment Mobilization and Setup	LS	1	200000	$200,000.00		100 gpm treatment system OWS, Organo Clay, Carbon (assumes ion exchange resin is not required)
	Dewatering and Construction Water Treatment Operation	Day	50	5000	$250,000.00		Operates during excavation plus 15 days for startup and backfill
					$0.00		
					$0.00		
7	**Odor Control Foam**	**MO**	**4.5**		**$27,575.00**		**Notes**
	Foam Unit Rental	MO	4.5	2500	$11,250.00		Costs from Sag Harbor and Bayshore for Rusmar Foam
	Foam Unit Labor	Day	35	395	$13,825.00		--
	Foam Unit Mob	LS	1	2500	$2,500.00		--
					$0.00		
8	**Backfill and Site Restoration**	**CY**	**7000**		**$316,792.00**		**Notes**
	Compactor	Day	14	68	$952.00		Assume 500 CY per Day
	Loader	Day	14	405	$5,670.00		Total unit cost of $59/cy ($49/CY without asphalt) comparable to unit rates from $33/cy to $87/cy from Sag, Clifton. Hempstead, Bayshore
	Operators(2)	Day	14	1740	$24,360.00		--
	Excavator	Day	14	565	$7,910.00		--
	Laborers(2)	Day	14	1100	$15,400.00		--
	Common Fill	CY	7000	30	$210,000.00		--
	Topsoil	CY	0	50	$0.00		--
	Asphalt	SF	15000	3.5	$52,500.00		--
					$0.00		
9	**Chemical Oxidation**	**LS**	**1**		**$2,800,000.00**		**Notes**
	Install Chem-ox injection system	LS	1	300000	$300,000.00		Roughly 30, 15 foot deep injection wells
	Dose of Chemical Oxidant	Each	5	500000	$2,500,000.00		Roughly 200,000 gallons per pore volume @ 1.75 gallon of chemical oxidant solution injected
					$0.00		
	SUB-TOTAL CONTRACTOR				**$5,568,825.33**	**$5,568,825.33**	
	Mark-up	0%				**$0.00**	
	Contingency	30%				**$1,670,647.60**	

	Total Subcontractor						**$7,239,472.93**	
Other Contracts & Purchases								
1	**Transportation and Disposal**	**Ton**	**12250**		**$1,347,500.00**			**NOTES**
	Transportation and Disposal (Non-Haz)	Ton	12250	110	$1,347,500.00			Unit costs from Sag, Clifton, Hempstead, Bayshore. Assumes 1.75 Tons/cy
					$0.00			
	SUB-TOTAL OTHER CONTRACTS				**$1,347,500.00**		**$1,347,500.00**	
	Mark-up	0%					**$0.00**	
	Contingency	30%					**$404,250.00**	
	Total Subcontractor						**$1,751,750.00**	
Design\Oversight\O&M Costs								
1	**Temporary Facilities**	**MO**	**4.75**		**$47,500.00**			**NOTES**
	Temporary Facilities and Supplies	MO	4.75	$10,000.00	$47,500.00			--
					$0.00			
					$0.00			
2	**Air Monitoring and Health and Safety**	**Day**	**45**		**$103,500.00**			**NOTES**
	Air Monitoring and Health and Safety	Day	45	$2,300.00	$103,500.00			From bids for Sag, Clifton, Bayshore, Hempstead 35 days excavation plus 10 days
					$0.00			
3	**Groundwater Monitoring**	**Year**	**30**		**$0.00**			**NOTES**
	30 Years of Groundwater Monitoring	Year	30	$0.00	$0.00			Assume 100,000 per year NPV, 5% interest rate
4	**Oversight Personnel**	**Man Hours**	**2800**		**$407,000.00**			**NOTES**
	Project Manager	Hr	500	$125.00	$62,500.00			--
	Construction Manager	HR	1000	$125.00	$125,000.00			--
	Engineer	Hr	1000	$105.00	$105,000.00			--
	Administration (Home Office)	HR	300	$65.00	$19,500.00			--
	Travel Expenses	MO	4.75	$20,000.00	$95,000.00			--
					$0.00			
5	**Engineering Design**	**LS**	**1**		**$691,632.53**			**Notes**
	Engineering Design	LS	1	$691,632.53	$691,632.53			10% of total before contingency
	SUB-TOTAL Design\Oversight\O&M Costs				**$1,249,632.53**		**$1,249,632.53**	
	Mark-up (ODCs Only)	0%			**(no m/u on labor)**		**$0.00**	
	Contingency	20%					**$249,926.51**	
	Total Design Oversight						**$1,499,559.04**	
	GRAND TOTAL						**$10,490,781.97**	

AECOM

Project Name:	Far Rockaway Former MGP	**Revision No.:**	1
Cost Estimate No.:	FS Alternative 3	**Date:**	1/13/12
Client	National Grid	**Status:**	Draft
Location	Far Rockaway, New York	**Author:**	MJG
		Office:	Chelmsford
Project Element:	Feasibility Study	**Reviewed By:**	AF
Type of Estimate:	Feasibility/Conceptual		

Project Details

Project Location:
Project Start Date:
Project Duration: 3 Months
Type of Contract: Direct Owner
Level of Accuracy: *-30% to +50%*
Contingency: 30%

Scope Summary

Summarize scope of work and provide project specific details with reference to source

Excavating 4,500 CY to Access MGP Source Material with EMNA for Off-site Groundwater Impacts.

Document Source: ____ **Rev. Date:** ____ **Site Visit?** ____
Document Source: ____ **Rev. Date:** ____
Document Source: ____ **Rev. Date:** ____

Cost Summary

Prime Contractor Costs	**$**	**2,281,539**
Other Contracts & Purchases	**$**	**1,126,125**
Design Oversight Costs	**$**	**2,610,088**
Project Total Estimated Cost	**$**	**6,017,752**

Notes:
1. Accuracy ranges are based on information provided in "Association for Advancement of Cost Engineering (AACE), International Cost Estimating Classifications, 18R-97"

Estimate Type	*Accuracy Range*
Preliminary	*-50% to +100%*
Feasibility/Conceptual	*-30% to +50%*
Engineering	
30%	*-20% to +30%*
60%	*-15% to +20%*
90%	*-10% to +15%*

2. Contingency values are based on information provided in 'USEPA, Guide to Developing Cost Estimates, July 2000

Remediation Technology	*Scope Contingency*
Soil Excavation	*15% to 55%*
Groundwater Treatment (Multiple	*15% to 35%*
On-site Incineration	*15% to 35%*
Extraction Wells	*10% to 30%*
Vertical Barriers	*10% to 30%*
Synthetic Cap	*10% to 20%*
Off-site Disposal	*5% to 15%*
Off-site Incineration	*5% to 15%*
Bulk Liquid Processing	*5% to 15%*
Clay Cap	*5% to 10%*
Surface Grading/Diking	*5% to 10%*
Revegetation	*5% to 10%*

Cost Summary
Far Rockaway Former MGP
FS Alternative 3
National Grid
Far Rockaway, New York

Feasibility Study

By: MJG Rev Date: 1/13/2012

					30%			
Prime Contractor Costs								
Task ID	*Task Descr.*	*Unit*	*Quantity*	*Bare Cost*	*Contingency*	*Total Cost*	*Unit Rate*	*%*
1	*Mobilization*	*LS*	*1*	*$350,000*	*$105,000*	*$455,000*	*$455,000*	*20%*
2	*Temporary Facilities*	*Day*	*62*	*$312,200*	*$93,660*	*$405,860*	*$6,546*	*18%*
3	*Fencing and E&S Control*	*LF*	*2,000*	*$10,333*	*$3,100*	*$13,433*	*$7*	*1%*
4	*Excavation Shoring*	*SF*	*5,025*	*$331,500*	*$99,450*	*$430,950*	*$86*	*19%*
5	*Excavation*	*CY*	*4,500*	*$124,905*	*$37,472*	*$162,377*	*$36*	*7%*
6	*Excavation Dewatering*	*Day*	*37*	*$385,000*	*$115,500*	*$500,500*	*$13,527*	*22%*
7	*Odor Control Foam*	*MO*	*3*	*$18,690*	*$5,607*	*$24,297*	*$8,099*	*1%*
8	*Backfill and Site Restoration*	*CY*	*4,500*	*$222,402*	*$66,721*	*$289,123*	*$64*	*13%*
				$1,755,030	*$526,509*	*$2,281,539*		*100%*
Other Contracts & Purchases					30%			
Task ID	*Task Descr.*	*Unit*	*Quantity*	*Bare Cost*	*Contingency*	*Total Cost*	*Unit Rate*	*%*
1	*Transportation and Disposal*	*Ton*	*7,875*	*$866,250*	*$259,875*	*$1,126,125*	*$143*	*100%*
				$866,250	*$259,875*	*$1,126,125*		*100%*
Design Oversight Costs					20%			
Task ID	*Task Descr.*	*Unit*	*Quantity*	*Bare Cost*	*Contingency*	*Total Cost*	*Unit Rate*	*%*
1	*Temporary Facilities*	*MO*	*3*	*$30,000*	*$6,000*	*$36,000*	*$12,000*	*1%*
2	*Air Monitoring and Health and Safety*	*Day*	*32*	*$73,600*	*$14,720*	*$88,320*	*$2,760*	*3%*
3	*Groundwater Monitoring*	*Year*	*30*	*$1,537,245*	*$307,449*	*$1,844,694*	*$61,490*	*71%*
4	*Oversight Personnel*	*Man Hours*	*1,940*	*$272,100*	*$54,420*	*$326,520*	*$168*	*13%*
5	*Engineering Design*	*LS*	*1*	*$262,128*	*$52,426*	*$314,554*	*$314,554*	*12%*
				$2,175,073	*$435,015*	*$2,610,088*		*100%*
Grand Total						*$6,017,752*		

Cost Details
Far Rockaway Former MGP
FS Alternative 3
National Grid
Far Rockaway, New York

$ 37.78

Feasibility Study

Add Task | Delete Row | Add 1 Blank Row

By: MJG   Rev Date: 1/13/12

Task/Sub Task	Description	Unit	Qty	Rate	Total Cost		Estimate/Source Notes
Prime Contractor Costs		**NOTE- All costs include contractor Overhead and Profit**					
1	**Mobilization**	**LS**	**1**		**$350,000.00**		**NOTES**
	General Mobilization	LS	1	200000	$200,000.00		Consistent with Bayshore Bid (comparable size project)
	Excavation Shoring Equipment	LS	1	150000	$150,000.00		Assumes hamer on excavator with no underpinning
2	**Temporary Facilities**	**Day**	**62**		**$312,200.00**		**Notes:**
	Temporary Facilities-Porta/John	MO	3	2000	$6,000.00		Assumes 4,500 cy at 200 cy/day plus one month for setup, two weeks for shoring and two weeks for restoration (62 days total)
	Office Trailers & Equipment	MO	3	10000	$30,000.00		Total Daily Cost of $6,546/day is consistent with Bayshore Bid and Clifton Daily Bid Costs ($5400/day to $6900/day).
	Office Supplies	MO	3	2000	$6,000.00		--
	Telephone	MO	3	2000	$6,000.00		--
	Cell Phones	MO	3	2500	$7,500.00		--
	Electric	MO	3	2500	$7,500.00		--
	Water	MO	3	2500	$7,500.00		--
	Pick Ups	MO	3	6000	$18,000.00		--
	Fuel/Maint	MO	3	12000	$36,000.00		--
	Misc. Supplies	MO	3	4000	$12,000.00		--
	Decontamination Facilities	LS	1	10000	$10,000.00		--
	Dumpster	Wk	12	500	$6,000.00		--
	Site Superintendant	Day	62	750	$46,500.00		--
	Project Manager	Day	42	750	$31,500.00		--
	Site Engineer	Day	62	750	$46,500.00		--
	Administration	Day	30	340	$10,200.00		--
	Surveying	LS	1	25000	$25,000.00		--
3	**Fencing and E&S Control**	**LF**	**2000**		**$10,333.33**		**Notes**
	Temporary Fencing	LF	300	25	$7,500.00		Jersey Barrier with Fence and Fabric; assumes no fencing along building
	E&S Controls	LF	500	5	$2,500.00		Assumes E&S controls along buildings
	Fence Wind Screen	SY	333.3	1	$333.33		Assumes 10' high along temp fence
					$0.00		
4	**Excavation Shoring**	**SF**	**5025**		**$331,500.00**		**Notes**
	Pre-Trenching	SF	5025	6	$30,150.00		From Sag and Clifton
	AZ19-700 Piles	SF	5025	18	$90,450.00		From Skyline Steel
	Pile Driving	SF	5025	36	$180,900.00		From Skyline Steel
	Bracing\Tiebacks	SF	2000	15	$30,000.00		From Skyline Steel
	Underpin Buildings	SF	0	135000	$0.00		Helical or mini piles 5 feet oc
5	**Excavation**	**CY**	**4500**		**$124,905.00**		**Notes**
	Excavator	Day	22	1000	$22,000.00		Assume 200 CY per day
	Operator	Day	22	870	$19,140.00		Total unit cost of $36/cy comparable to bid unit rates from $11/cy to $43/cy from Sag, Clifton. Hempstead, Bayshore
	Laborers(2)	Day	22	1500	$33,000.00		--
	Skid Steer	Day	22	500	$11,000.00		--
	Loader	Day	22	600	$13,200.00		--
	Operator	Day	22	870	$19,140.00		--
	Breakup of Concrete	CY	675	11	$7,425.00		Assume roughly 15% concrete
					$0.00		
6	**Excavation Dewatering**	**Day**	**37**		**$385,000.00**		**Notes**
	Dewatering and Construction Water Treatment Mobilization and Setup	LS	1	200000	$200,000.00		100 gpm treatment system OWS, Organo Clay, Carbon (assumes ion exchange resin is not required)
	Dewatering and Construction Water Treatment Operation	Day	37	5000	$185,000.00		Operates during excavation plus 15 days for startup and backfill
					$0.00		
					$0.00		
7	**Odor Control Foam**	**MO**	**3**		**$18,690.00**		**Notes**
	Foam Unit Rental	MO	3	2500	$7,500.00		Costs from Sag Harbor and Bayshore for Rusmar Foam
	Foam Unit Labor	Day	22	395	$8,690.00		--
	Foam Unit Mob	LS	1	2500	$2,500.00		--
					$0.00		
8	**Backfill and Site Restoration**	**CY**	**4500**		**$222,402.00**		**Notes**
	Compactor	Day	9	68	$612.00		Assume 500 CY per Day
	Loader	Day	9	405	$3,645.00		Total unit cost of $64/cy ($49/CY without asphalt) comparable to unit rates from $33/cy to $87/cy from Sag, Clifton. Hempstead, Bayshore
	Operators(2)	Day	9	1740	$15,660.00		
	Excavator	Day	9	565	$5,085.00		
	Laborers(2)	Day	9	1100	$9,900.00		
	Common Fill	CY	4500	30	$135,000.00		
	Topsoil	CY	0	50	$0.00		
	Asphalt	SF	15000	3.5	$52,500.00		--
					$0.00		
	SUB-TOTAL CONTRACTOR				**$1,755,030.33**	**$1,755,030.33**	
	Mark-up	0%				**$0.00**	
	Contingency	30%				**$526,509.10**	
	Total Subcontractor					**$2,281,539.43**	
Other Contracts & Purchases							
1	**Transportation and Disposal**	**Ton**	**7875**		**$866,250.00**		**NOTES**

	Transportation and Disposal (Non-Haz)	Ton	7875	110	$866,250.00 $0.00		Unit costs from Sag, Clifton, Hempstead, Bayshore. Assumes 1.75 Tons/CY
	SUB-TOTAL OTHER CONTRACTS				**$866,250.00**	**$866,250.00**	
	Mark-up	0%				**$0.00**	
	Contingency	30%				**$259,875.00**	
	Total Subcontractor					**$1,126,125.00**	
Oversight \ O&M \ Design							
1	**Temporary Facilities**	**MO**	**3**		**$30,000.00**		**NOTES**
	Temporary Facilities and Supplies	MO	3	$10,000.00	$30,000.00 $0.00 $0.00		--
2	**Air Monitoring and Health and Safety**	**Day**	**32**		**$73,600.00**		**NOTES**
	Air Monitoring and Health and Safety	Day	32	$2,300.00	$73,600.00 $0.00		From bids for Sag, Clifton, Bayshore, Hempstead 35 days excavation plus 10 days
3	**Groundwater Monitoring**	**Year**	**30**		**$1,537,245.10**		**NOTES**
	30 Years of Groundwater Monitoring	Year	30	$100,000.00	$1,537,245.10		Assume 100,000 per year NPV, 5% interest rate
4	**Oversight Personnel**	**Man Hours**	**1940**		**$272,100.00**		**NOTES**
	Project Manager	Hr	400	$125.00	$50,000.00		--
	Construction Manager	HR	620	$125.00	$77,500.00		--
	Engineer	Hr	620	$105.00	$65,100.00		--
	Administration (Home Office)	HR	300	$65.00	$19,500.00		--
	Travel Expenses	MO	3	$20,000.00	$60,000.00 $0.00		--
5	**Engineering Design**	**LS**	**1**		**$262,128.03**		**Notes**
	Engineering Design	LS	1	$262,128.03	$262,128.03		10% of total before contingency
	SUB-TOTAL Oversight COSTS				**$2,175,073.14**	**$2,175,073.14**	
	Mark-up (ODCs Only)	0%			**(no m/u on labor)**	**$0.00**	
	Contingency	20%				**$435,014.63**	
	Total Design Oversight					**$2,610,087.76**	
	GRAND TOTAL					**$6,017,752.20**	

AECOM

Project Name:	Far Rockaway Former MGP	**Revision No.:**	2
Cost Estimate No.:	FS Alternative 4	**Date:**	1/19/12
Client	National Grid	**Status:**	Draft
Location	Far Rockaway, New York	**Author:**	MJG
		Office:	Chelmsford
Project Element:	Feasibility Study	**Reviewed By:**	AF
Type of Estimate:	Feasibility/Conceptual		

Project Details

Project Location:
Project Start Date:
Project Duration: 3 Months
Type of Contract: Direct Owner
Level of Accuracy: *-30% to +50%*
Contingency: 30%

Scope Summary

Summarize scope of work and provide project specific details with reference to source

In Situ Solidification of MGP Source Material with EMNA for Off-site Groundwater Impacts.

Document Source: ______________ **Rev. Date:** ______________ **Site Visit?** ______________
Document Source: ______________ **Rev. Date:** ______________
Document Source: ______________ **Rev. Date:** ______________

Cost Summary

Prime Contractor Costs	**$**	**3,161,118**
Other Contracts & Purchases	**$**	**475,475**
Design Oversight Costs	**$**	**2,799,062**
Project Total Estimated Cost	**$**	**6,435,656**

Notes:
1. Accuracy ranges are based on information provided in "Association for Advancement of Cost Engineering (AACE), International Cost Estimating Classifications, 18R-97"

Estimate Type	*Accuracy Range*
Preliminary	*-50% to +100%*
Feasibility/Conceptual	*-30% to +50%*
Engineering	
30%	*-20% to +30%*
60%	*-15% to +20%*
90%	*-10% to +15%*

2. Contingency values are based on information provided in 'USEPA, Guide to Developing Cost Estimates, July 2000

Remediation Technology	*Scope Contingency*
Soil Excavation	*15% to 55%*
Groundwater Treatment (Multiple	*15% to 35%*
On-site Incineration	*15% to 35%*
Extraction Wells	*10% to 30%*
Vertical Barriers	*10% to 30%*
Synthetic Cap	*10% to 20%*
Off-site Disposal	*5% to 15%*
Off-site Incineration	*5% to 15%*
Bulk Liquid Processing	*5% to 15%*
Clay Cap	*5% to 10%*
Surface Grading/Diking	*5% to 10%*
Revegetation	*5% to 10%*

Cost Summary
Far Rockaway Former MGP
FS Alternative 4
National Grid
Far Rockaway, New York

Feasibility Study

By: MJG   Rev Date: 1/19/2012

Prime Contractor Costs					30%			
Task ID	Task Descr.	Unit	Quantity	Bare Cost	Contingency	Total Cost	Unit Rate	%
1	Mobilization	LS	1	$800,000	$240,000	$1,040,000	$1,040,000	33%
2	Temporary Facilities	Day	62	$312,200	$93,660	$405,860	$6,546	13%
3	Fencing and E&S Control	LF	2,000	$10,333	$3,100	$13,433	$7	0%
4	In Situ Solidification	SF	7,800	$1,125,000	$337,500	$1,462,500	$188	46%
5	Excavate Cover and Spoils	CY	1,900	$87,150	$26,145	$113,295	$60	4%
6	Excavation Dewatering	Day	-	$0	$0	$0	#DIV/0!	0%
7	Odor Control Foam	MO	3	$18,690	$5,607	$24,297	$8,099	1%
8	Backfill and Site Restoration	CY	600	$78,256	$23,477	$101,733	$170	3%
9	Chemical Oxidation	LS	-	$0	$0	$0	#DIV/0!	0%
				$2,431,629	$729,489	$3,161,118		100%
Other Contracts & Purchases					30%			
Task ID	Task Descr.	Unit	Quantity	Bare Cost	Contingency	Total Cost	Unit Rate	%
1	Transportation and Disposal	Ton	3,325	$365,750	$109,725	$475,475	$143	100%
				$365,750	$109,725	$475,475		100%
Design Oversight Costs					20%			
Task ID	Task Descr.	Unit	Quantity	Bare Cost	Contingency	Total Cost	Unit Rate	%
1	Temporary Facilities	MO	3	$30,000	$6,000	$36,000	$12,000	1%
2	Air Monitoring and Health and Safety	Day	32	$73,600	$14,720	$88,320	$2,760	3%
3	Groundwater Monitoring	Year	30	$1,537,245	$307,449	$1,844,694	$61,490	66%
4	Oversigth Personnel	Man Hours	1,940	$272,100	$54,420	$326,520	$168	12%
5	Engineering Design	LS	1	$419,607	$83,921	$503,528	$503,528	18%
				$2,332,552	$466,510	$2,799,062		100%
Grand Total					$1,305,724	$6,435,656		

Cost Details
Far Rockaway Former MGP
FS Alternative 4
National Grid
Far Rockaway, New York

AECOM

$ 37.78

Feasibility Study

Add Task | Delete Row | Add 1 Blank Row

By: MJG   Rev Date: 1/19/12

Task/Sub Task	Description	Unit	Qty	Rate	Total Cost		Estimate/Source Notes
Prime Contractor Costs		**NOTE- All costs include contractor Overhead and Profit**					
1	**Mobilization**	**LS**	**1**		**$800,000.00**		**NOTES**
	General Mobilization	LS	1	200000	$200,000.00		Consistent with Bayshore Bid (comparable size project)
	Mobilize ISS Auger Rig and Grout Plant	LS	1	600000	$600,000.00		Costs From Hempstead
2	**Temporary Facilities**	**Day**	**62**		**$312,200.00**		**Notes:**
	Temporary Facilities-Porta/John	MO	3	2000	$6,000.00		Assumes 4,500 cy at 200 cy/day plus one month for setup, two weeks for ISS setup, and two weeks for restoration (62 days total)
	Office Trailers & Equipment	MO	3	10000	$30,000.00		Total Daily Cost of $6546/day is consistent with Bayshore Bid and Clifton Daily Bid Costs ($5400/day to $6900/day).
	Office Supplies	MO	3	2000	$6,000.00		--
	Telephone	MO	3	2000	$6,000.00		--
	Cell Phones	MO	3	2500	$7,500.00		--
	Electric	MO	3	2500	$7,500.00		--
	Water	MO	3	2500	$7,500.00		--
	Pick Ups	MO	3	6000	$18,000.00		--
	Fuel/Maint	MO	3	12000	$36,000.00		--
	Misc. Supplies	MO	3	4000	$12,000.00		--
	Decontamination Facilities	LS	1	10000	$10,000.00		--
	Dumpster	Wk	12	500	$6,000.00		--
	Site Superintendant	Day	62	750	$46,500.00		--
	Project Manager	Day	42	750	$31,500.00		--
	Site Engineer	Day	62	750	$46,500.00		--
	Administration	Day	30	340	$10,200.00		--
	Surveying	LS	1	25000	$25,000.00		--
3	**Fencing and E&S Control**	**LF**	**2000**		**$10,333.33**		**Notes**
	Temporary Fencing	LF	300	25	$7,500.00		Jersey Barrier with Fence and Fabric; assumes no fencing along building
	E&S Controls	LF	500	5	$2,500.00		Assumes E&S controls along buildings
	Fence Wind Screen	SY	333.3	1	$333.33		Assumes 10' high along temp fence
					$0.00		
4	**In Situ Solidification**	**SF**	**7800**		**$1,125,000.00**		**Notes**
	ISS Source Material Area	CY	4500	250	$1,125,000.00		From Hempstead and Sag
			0	0	$0.00		
5	**Excavate Cover and Spoils**	**CY**	**1900**		**$87,150.00**		**Notes**
	Excavator	Day	10	1000	$10,000.00		Assume 200 CY per day @1900 CY of cover and spoils
	Operator	Day	10	870	$8,700.00		--
	Laborers(2)	Day	10	1500	$15,000.00		--
	Skid Steer	Day	10	500	$5,000.00		--
	Loader	Day	10	600	$6,000.00		--
	Operator	Day	10	870	$8,700.00		--
	Obstruction Removal Breakup of Concrete	CY	675	50	$33,750.00		Assume roughly 15% concrete
					$0.00		
6	**Excavation Dewatering**	**Day**	**0**		**$0.00**		**Notes**
	Dewatering and Construction Water Treatment Mobilization and Setup	LS	0	200000	$0.00		No dewatering required
	Dewatering and Construction Water Treatment Operation	Day	0	5000	$0.00		--
					$0.00		
					$0.00		
7	**Odor Control Foam**	**MO**	**3**		**$18,690.00**		**Notes**
	Foam Unit Rental	MO	3	2500	$7,500.00		Costs from Sag Harbor and Bayshore for Rusmar Foam
	Foam Unit Labor	Day	22	395	$8,690.00		--
	Foam Unit Mob	LS	1	2500	$2,500.00		--
					$0.00		
8	**Backfill and Site Restoration**	**CY**	**600**		**$78,256.00**		**Notes**
	Compactor	Day	2	68	$136.00		Assume 2 days
	Loader	Day	2	405	$810.00		Total unit cost of $124/cy ($36/CY without asphalt) comparable to unit rates from $33/cy to $87/cy from Sag, Clifton. Hempstead, Bayshore
	Operators(2)	Day	2	1740	$3,480.00		--
	Excavator	Day	2	565	$1,130.00		--
	Laborers(2)	Day	2	1100	$2,200.00		--
	Common Fill	CY	600	30	$18,000.00		--
	Topsoil	CY	0	50	$0.00		--
	Asphalt	SF	15000	3.5	$52,500.00		--
					$0.00		
9	**Chemical Oxidation**	**LS**	**0**		**$0.00**		**Notes**
	Install Chem-ox injection system	LS	0	150000	$0.00		--
	Three Doses of Chemical Oxidant	Each	0	350000	$0.00		--
					$0.00		
	SUB-TOTAL CONTRACTOR				**$2,431,629.33**	**$2,431,629.33**	
	Mark-up	0%				**$0.00**	
	Contingency	30%				**$729,488.80**	
	Total Subcontractor					**$3,161,118.13**	
Other Contracts & Purchases							

1	**Transportation and Disposal**	**Ton**	**3325**		**$365,750.00**		**NOTES**
	Transportation and Disposal (Non-Haz)	Ton	3325	110	$365,750.00		Unit costs from Sag, Clifton, Hempstead, Bayshore. Assumes 1.75 Tons/CY
					$0.00		
	SUB-TOTAL OTHER CONTRACTS				**$365,750.00**	**$365,750.00**	
	Mark-up	0%				**$0.00**	
	Contingency	30%				**$109,725.00**	
	Total Subcontractor					**$475,475.00**	
Oversight \ O&M \ Design							
1	**Temporary Facilities**	**MO**	**3**		**$30,000.00**		**NOTES**
	Temporary Facilities and Supplies	MO	3	$10,000.00	$30,000.00		--
					$0.00		
					$0.00		
2	**Air Monitoring and Health and Safety**	**Day**	**32**		**$73,600.00**		**NOTES**
	Air Monitoring and Health and Safety	Day	32	$2,300.00	$73,600.00		From bids for Sag, Clifton, Bayshore, Hempstead 35 days excavation plus 10 days
					$0.00		
3	**Groundwater Monitoring**	**Year**	**30**		**$1,537,245.10**		**NOTES**
	30 Years of Groundwater Monitoring	Year	30	$100,000.00	$1,537,245.10		Assume 100,000 per year NPV, 5% interest rate
4	**Oversigth Personnel**	**Man Hours**	**1940**		**$272,100.00**		**NOTES**
	Project Manager	Hr	400	$125.00	$50,000.00		--
	Construction Manager	HR	620	$125.00	$77,500.00		--
	Engineer	Hr	620	$105.00	$65,100.00		--
	Administration (Home Office)	HR	300	$65.00	$19,500.00		--
	Travel Expenses	MO	3	$20,000.00	$60,000.00		--
					$0.00		
5	**Engineering Design**	**LS**	**1**		**$419,606.90**		**Notes**
	Engineering Design	LS	1	$419,606.90	$419,606.90		15% of total before contingency (percentange higher than excavation to include mix study and design)
	SUB-TOTAL Oversight COSTS				**$2,332,552.00**	**$2,332,552.00**	
	Mark-up (ODCs Only)	0%			**(no m/u on labor)**	**$0.00**	
	Contingency	20%				**$466,510.40**	
	Total Design Oversight					**$2,799,062.40**	
	GRAND TOTAL					**$6,435,655.54**	